Ministry of Culture
Government of India

NATIONAL COUNCIL OF SCIENCE MUSEUMS
33, Block – GN, Sector V, Salt Lake, Bidhan Nagar,
Kolkata – 700091, West Bengal, India
Phone: +91 33 2357 9347/ 2357 5545 2357 0850
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NOTICE INVITING E-TENDER

for

Supply, Installation, Integration, Testing and Commissioning of complete and fully integrated functional Full dome Hybrid 2D Immersive Planetarium Projection System.

at

Regional Science Centre & Planetarium, Kozhikode (Calicut) – 673006, Kerala, India.

INDEX OF TENDER DOCUMENT

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Tender No. I-18012/7/24(195)

NOTICE INVITING TENDER

NAME OF THE WORK: Supply, Installation, Integration, Testing and Commissioning of complete and fully integrated functional Full dome Hybrid 2D Immersive Planetarium Projection System at Regional Science Centre & Planetarium (RSC&P), Kozhikode (Calicut), Kerala, India.

National Council of Science Museums (NCSM) invites on-line digitally signed e-tenders in two Bid System from the manufacturers or their authorized registered Indian agents for the

Supply, Installation, Integration, Testing and Commissioning of a complete and fully integrated functional Full dome 2D immersive Hybrid planetarium projection system in an existing approximately 15 meter diameter perforated aluminium dome screen with geometrical correction, image stitching and blending etc. for seamless projection of high resolution full dome Hybrid planetarium shows including onsite comprehensive warranty for five years.

The tender also includes the work of refurbishing and repainting of existing 15m diameter horizontal projection dome and installation of chairs, acoustics, carpet and associated works.

The location of site is **Regional Science Centre & Planetarium, Jaffer Khan Colony Rd, Near New Bus Stand, Kozhikode (Calicut) - 673006, Kerala, India.**

Interested bidders may download the tender documents from the https://eprocure.gov.in/eprocure/app with Tender No. I-18012/7/24(195 and shall apply online. The Tenders submitted through Central Public Procurement Portal (CPPP) only shall be accepted. However, a hard copy of 'Technical Bid' alone may also be submitted as a reference. The tender documents are also available at NCSM's website https://ncsm.gov.in and VITM website, https://www.vismuseum.gov.in as per the following schedule:-

1	Bid Document Published Date	20.09.2024
2	Bid document download start date	20.09.2024
3	Pre-bid queries/clarifications start date	20.09.2024
4	Last Date of submission of Pre-Bid Queries / clarifications (No later queries shall be entertained)	28.09.2024, 16:00 hrs IST only at the following email id: spo@ncsm.gov.in.
5	Pre-Bid meeting Date, time and Place.

Pre-Bid meeting will be held on hybrid mode. However, If any Agency want to attend the meeting physically, they can attend the meeting at NCSM office on the stipulated date and time. | Date & time : 30.09.2024, 3.00 p.m. onwards.
Place: National Council of Science Museums (NCSM),
33, Block GN, Sector V,
Salt Lake, Bidhan Nagar,
Kolkata - 700091
(Link for Pre-Bid meeting is mentioned below.) |
6	Bid Submission Start Date	04.10.2024
7	Bid Submission End Date	17.10.2024
8	Technical (Techno-commercial) Bid Opening	18.10.2024
09	Date and Place of Technical Presentation	To be notified later
10	Financial Bid Opening Date	To be notified later
Link for Pre-Bid Meeting: -

Topic: Supply, Installation, Integration, Testing and Commissioning of a complete and fully integrated functional Full dome 2D immersive Hybrid planetarium projection system

Time: Sep 30, 2024 03:00 PM India

Join Zoom Meeting
https://us06web.zoom.us/j/86024409125?pwd=QtuCXigcfjQyPVqh7e5gb4OCTcRHhD.1

Meeting ID: 860 2440 9125
Passcode: 941777 | | |

The purchaser will open the tenders at the specified date & time and at the specified place as indicated in the NIT. However, in case the specified date of tender opening falls on subsequently declared holiday or closed day for the purchaser, the tenders will be opened at the appointed time and place on the next working day.

Note: In case of any changes, corrigendum / addendum will be published on https://eprocure.gov.in/eprocure/app. as well as in NCSM/VITM websites. **Eligible vendors are requested to check the websites frequently**.

1. **Visit of the site at Regional Science Centre & Planetarium, Kozhikode (Calicut) :**
   Bidders are advised to visit the existing Planetarium building at Regional Science Centre & Planetarium, Jaffer Khan Colony Rd, Near New Bus Stand, Kozhikode (Calicut) - 673006, Kerala to ascertain and fully understand the nature and quantum of work before tendering. **Site inspection at RSC & P, Kozhikode (Calicut) may be carried before the scheduled pre-bid meeting at NCSM, Kolkata. In case, the representative of the bidder is unable**

to attend the pre-bid meeting, the queries may be submitted through email. However, lack of knowledge of site conditions cannot be considered as an excuse for mistake/ misrepresentation in the bid.

2. **Submission of the Bid:** This Tender is an e-Tender and bids are to be submitted through CPP Portal (**https://eprocure.gov.in** / eprocure/app) only. Bids submitted in physical forms will be summarily rejected.

3. Details of submission of tender, etc. are indicated in the tender document as per **Annexure-A.**

4. The bid, both Technical (Techno-Commercial) Bid and Financial bid, as per Cover – I and Cover – II respectively, should be uploaded within the due date and time as per the above schedule. The responsibility to ensure the same lies with the bidders.

5. It is intended to purchase the above equipment directly from the manufacturer without involving any agent or payment of any bidder commission. However, authorised registered Indian agents of foreign manufacturers who are capable of rendering After Sales Service (in case where foreign manufacturers do not quote any rate to the actual users) will be eligible to quote on behalf of their respective OEMs, but must submit along with the tender a copy of the Bidder-Agreement with foreign manufacturer proving that it is authorized to quote on behalf of the OEM and in such case, no bidder commission shall be paid by the NCSM. The bidder has to quote in Indian currency only, even if the items are imported.

6. NCSM reserves the right to amend / withdraw any of the terms and conditions in the tender document or to reject any or all tenders, in full or part, without giving any notice or assigning any reason whatsoever. NCSM shall also not be bound to accept merely the lowest offer but the technical suitability, capability and superiority of the concept / technology interface / system etc. shall be of prime consideration for selection of the agency.

Director
Central Research & Training Laboratory (CRTL), NCSM

Place: Kolkata
Date: 20.09.2024

GENERAL INFORMATION AND INSTRUCTIONS

1.1 The instructions given herein will be strictly binding on the bidders and deviation, if any, will make the tender or tenders liable to be considered invalid. Tenders incorporating additional conditions by the bidder are liable for rejection.

2.1 The online bids shall be submitted through (https://eprocure.gov.in/eprocure/app) TENDER No.I-18012/7/24(195).

3.1 An agent of foreign OEM, for submitting the offer on behalf of overseas OEM, would be required to produce a copy of their legal bidder agreement with their principal and a copy of registration as an Indian agent failing which their bid would be disqualified.

4.1 Earnest Money:

a. The Earnest Money of **₹40,00,000/- (Rupees Forty Lakhs Only)** being approx. 2.5% of the estimated tendered value of the work (rounded off to the nearest lac), only shall be submitted in the form of Pay Order / Demand Draft / Banker's Cheque / NEFT*/RTGS*/Bank Guarantee from any Nationalized Bank / Scheduled Commercial Bank. For NEFT, the details of our Banker are furnished below:

Bank Name	Indian Overseas Bank
Beneficiary Name	National Council of Science Museums
Branch Name	Sector V, Salt Lake, Kolkata Branch
Bank Address	GN-34/2, Sector V, Salt Lake, Kolkata - 700091
A/c No.	SB 164201000000491
IFSC Code	IOBA0001642

Pay Order / Demand Draft / Banker's Cheque / NEFT/ RTGS/ Bank Guarantee to be drawn in favour of National Council of Science Museums and payable at Kolkata. Demand Draft / Banker's Cheque / Documents confirming NEFT/RTGS (the EMD amount must be credited to NCSM account as mentioned above on or before the last date of submission) for the Earnest Money Deposit must accompany the part I of tender as indicated below. All tenderers must submit their complete document within the last date of submission. Tenders received after the due date and / or without Earnest Money Deposit (EMD) will be summarily rejected. No deviation from the mode of depositing Earnest Money stipulated above will be permissible and any deviation will render the tenders liable for rejection.

*Transaction Confirmation receipt of NEFT to NCSM must be submitted.

b. EMD of the unsuccessful bidders will be returned within 01 (one) month after the award of the contract to the successful bidder.
c. Bank Guarantee submitted against EMD must be valid for 06 months from date of submission and claim period must be 06 months after end of validity period.
d. The EMD submitted by the successful bidder will be returned after receiving total 10% of contract value as Security Deposit in the form of Demand Draft/ Online payment/Bank Guarantee.

5.1 Validity of Bids: The Bids shall remain valid for 180 days from the date of opening of Financial bid.

6.1 **Rejection of Bids:** Canvassing by the Bidder(s) in any form, unsolicited letter, conditional tenders and post-tender correction may invoke summary rejection. Non-compliance of applicable General Information and Instructions will disqualify the Bid.

In any case if the technical bid of any bidder is rejected, under any circumstances, any document submitted will not be returned to the bidder.

7.1 The bidder must follow "Instruction for submission of Bid" as per "**Annexure-A**".

8.1 The Bidders shall fill up the Prescribed Format as per "**Annexure-B**" for submission of **Technical (Techno-commercial) Bid duly signed by the authorized signatory**. **The person signing the tender document should be authorised for submitting the tender.**

9.1 The Financial Bid BOQ in xls format shall be downloaded from https://eprocure.gov.in/eprocure/app portal and shall be duly filled in and uploaded. The financial bid shall not be submitted in any other format and submitting in any other format may lead to disqualification. The breakup of financial bid as per the format, 'Annexure C', shall also be uploaded in PDF format in Financial bid cover (Cover II) in addition to that in xls format.

10.1 Tender must be uploaded in two separate covers marked **Part-1** (Technical/ techno-Commercial Bid) and **Part-2** (Financial Bid/BOQ). The contents of Envelope-1 and Envelope-2 shall be as follows:-

Part-1 (Cover I) : The below documents properly filled in, signed and sealed shall be scanned and uploaded in Cover 1 in E procurement portal (CPPP Portal).

i. Pay Order / Demand Draft / Banker's Cheque / NEFT/RTGS/ Bank Guarantee to be drawn in favour of National Council of Science Museums and payable at Kolkata. Demand Draft / Banker's Cheque / Documents confirming NEFT (the EMD amount must be credited to NCSM account as mentioned above on or before the last date of submission for the Earnest Money Deposit).

ii. The entire Tender document (all pages) including all Annexures, properly filled in, wherever applicable, signed and official stamped as a token of acceptance of all general conditions and conforming to technical requirements by the bidder.

iii. "Technical Compliance Table" (as per **Annexure-D** format) duly filled in and signed on each page by the Authorized Signatory with the official stamp.

iv. Bidder must submit "Past Experience" (as per **Annexure-E** format) and "Annual Turnover" (as per **Annexure- F** format) duly filled in and signed on each page by the Authorized Signatory with the official stamp. For annual turnover, the same must be certified from any registered chartered accountant.

v. Prescribed Undertaking by the "Original System Integrator" as per "**Annexure-G**" format, if applicable, duly signed on each page by the Authorized Signatory with office stamp. Prescribed Undertaking by the bidder/OEM as per "**Annexure-I**" format, duly signed on each page by the Authorized Signatory with office stamp.

vi. Prescribed Format as per "**Annexure-J**" format, duly signed on each page by the Authorized Signatory with office stamp AND Prescribed Declarations by the Bidder/OEM as per "**Annexure-K**" format, duly signed by the Authorized Signatory with office stamp.

vii. Prescribed Declaration by the Bidders/OEM as per "**Annexure-O1, Annexure-O2, Annexure-M, Annexure-N**" format, duly signed on each page by the Authorized Signatory with office stamp.

viii. The Technical Brochures of each equipment with technical explanation for every feature of the product offered by the bidders.

ix. Name, Address, Name of the contact person and his/her mobile number etc. of the Indian Agents as well as OEM for each product of the system.

x. All the documents pertaining to eligibility criteria as per relevant clauses of GTC of NIT.

Part-2 (Cover - 2)

i. The "Financial Bid (BOQ)" in xls format.
The bidder has to use and upload the same BoQ format downloaded from the NCSM E tender referred in the notice. It is also given in **Annexure C** for reference.

ii. Cost Break-up" (as per **Annexure-H** format Part A, B, C & D) duly filled in and signed with official stamp and shall be uploaded in Financial cover only. It should be ensured that all the columns of Cost break-up sheet are filled up, failing which the same will be rejected.

The Cover - 1, i.e. Technical (Techno-commercial) Bid shall be opened at the first stage and evaluated by the competent authority of NCSM. At the second stage, the Cover-2 containing Financial Bid of only acceptable techno-commercial offers shall be opened for further evaluation and ranking before awarding the contract.

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Tender No. I-18012/7/24(195)

GENERAL TERMS & CONDITIONS

National Council Of Science Museums invites sealed tender in two Bid System from the manufacturers or their authorized registered Indian agents for Supply, Installation, Integration, Testing and Commissioning of hardware and software packages, interfaces, tools and/or drivers of a complete and fully integrated functional Fulldome Hybrid (Optomechanical and digital) Planetarium projection system for an existing 15 meter diameter perforated aluminium dome screen with geometrical correction, image stitching and blending etc. for seamless projection of high-resolution 2D hybrid full dome film shows and Full Dome Hybrid planetarium shows including onsite comprehensive warranty for five years.

The work also includes refurbishment of existing dome screen and supply, installation, testing and commissioning of carpet, chairs, and other minor civil and electrical works associated with the installation.

NCSM has the right to accept part or whole of the tender based on the suitability of the product and budget approval.

DEFINITIONS:

In this Contract, the following terms will be interpreted as indicated:

i.   **"The Contract"** means that the agreement entered into between the Purchaser and the Supplier, as recorded in the contract form signed by the Parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

ii.   **"The Contract Price"** means that price payable to the supplier under the Contract for the full and proper performance of its contractual obligations.

iii. **"The Materials/Equipment"** means all of the equipment, machinery, and/or other materials which the Supplier is required to supply to Purchaser under the Contract.

iv.   **"The Services"** means those services ancillary to the supply of the Materials/equipment, such as transportation and insurance, and any other incidental Services, such as installation, commissioning, provision of technical assistance, training, and other such obligations of the Supplier covered under the Contract.

v.   **"GTC"** means the General Terms & Conditions of Contract contained in the section.

vi.   **"The Purchaser"** means the organization purchasing the Materials/Equipment.

vii. **"Bidder"** is a Manufacturer or authorised / registered Indian Agent of Overseas manufacturer participated in this tender.

viii. **"The Supplier"** means the firm supplying the Materials/equipment and Services under this Contract.

ix. **"Day"** means calendar day.

1.0 APPLICABILITY:

These General Conditions of the contract will apply to the extent that they are not superseded by provisions of salient features of the Bid.

a. STANDARDS:

The Materials/Equipment supplied under this Contract will conform to the Standards mentioned in the Technical specification, and, when no applicable standard is mentioned, the authoritative standards appropriate to the Materials/equipment' viz., BIS, such standards will be the latest. All materials will be of the best class and will be capable of satisfactory operation under tropical conditions without distortion or deterioration.

b. INTERCHANGEABILITY:

All similar materials and removable/replaceable parts of similar equipment will be interchangeable with each other. A specific confirmation of this should be furnished in the bid.

1.1 Bidders are required to submit with the tender in Cover-1, all the documents as per eligibility criterion mentioned in clause 3 along with **schematic design, schematic drawings of proposed control room/console, mechanisms with complete technical specifications, procurement strategy, flow chart / bar chart of the work, fabrication strategy with CPM/PERT chart, on how the work shall be completed and** within the stipulated time as per **Clause 7** of the General Terms & Conditions.

1.2 The successful Bidder shall submit the following within 7 (Seven) days from the date of placement of the work order:

a. Duplicate copy of the Work Order / LOI duly signed and with official stamp on all the pages as a token of acceptance of the same.
b. Non-judicial stamp paper of appropriate value for entering into an Agreement as per prescribed format.

2.0 ELIGIBLE BIDDERS:

Qualifying Eligibility Criterion for the selection of bidders.

i. Limited Company/Corporation/Agency/Consortium/JV etc. are allowed to bid for the work.

ii. Limited Company/Corporation/Agency/Consortium/JV etc. must have the experience of implementing 2D Full dome immersive projections system. The Bidder must be an original manufacturer of the Digital/Hybrid Full dome system software or an authorized Agent/Partner of OEM of Hybrid Fulldome system software. Also, the bidder should be either OEM of Optomechanical planetarium system or authorized Agent of the OEM of Optomechanical Planetarium System. In case the bidder is an authorized Agent of the manufacturer then authorization letters from OEM must be furnished with all the details.

iii. **The Bidder/lead partner of consortium/manufacturer must have previous experience of having supplied and installed at least two complete 2D 15m diameter or above full dome digital with optomechanical planetarium system and synchronisation of both / hybridisation, anywhere in the world within the last 7 years which was operational for public at least for one year. Both these projects should have been operational and functional for the public in all aspects for at least one year in the last seven years. Proof regarding the same must be submitted by the OEM as per Annexure N.**

iv. If the OEM is outside India, then they must have an authorized Agent in India. The authorized Agent must have experience of installation and integration of multichannel full dome digital and optomechanical projection system in India during the last seven years (The experience of authorized Agent with other OEMs in the past shall be considered). The documentary proof in this regard duly issued by the respective OEM, clearly indicating the kind of support/scope of work that the Indian Partner/Agent provided during the installation to substantiate the relevance of the experience, must be submitted as per **Annexure O1 and O2**.

v. Proof regarding the experience of the OEM/Bidder in providing the maintenance support for multi-channel digital and optomechanical projection systems must be submitted supported with the proof from the client. Proof regarding the same must be submitted by the OEM as per **Annexure N.**

vi. The Bidder/manufacturer must have trained staff in service and maintenance of digital and optomechanical planetarium systems (A list of suchs trained staff must be submitted separately in Cover-I). The service and support infrastructure for digital and optomechanical planetarium system should be available with Indian counterpart. Bidder/manufacturer must attach copy of certificates showing details of training provided by the OEM.

vii. The bidders shall be rejected on the basis of not fulfilling the above qualifying criteria (i to vi) and will not be considered for further evaluation of bids.

viii. **Work Experience Eligibility:** The Bidder should have completed similar works during the last 07 (seven) years from the date of the issue of this TENDER.

Estimated cost of the project (Supply, Installation, Integration, Testing and Commissioning of hardware and software packages, aluminium dome screen, interfaces, tools and / or drivers of a complete and fully integrated functional Hybrid Fulldome Hybrid 2D immersive Planetarium projection system (15 mtr. diameter) including onsite comprehensive warranty for five years and associated civil & electrical works, including seating arrangements) is approx. **INR 16 Crore (inclusive of all such as GST, customs duties/levies and all other incidental charges applicable)**. Please note that NCSM shall not issue any Certificate for exemption of customs duties/levies etc.). The bidder must provide supporting documents for the following work experiences in addition to eligibility conditions as mentioned in clause 2.0 (ELIGIBLE BIDDERS).

One similar work of value not less than 80% of the estimated cost of work.
Or
Two similar works each of value not less than 50% of the estimated cost of work.
Or
Three similar works each of value not less than 40% of the estimated cost of work.

Notes:

✓ Here the **similar works** shall mean concept, design, supply, installation, testing & commissioning of Optomechanical and Digital Fulldome 2D/3D immersive planetarium projection system along with the installation of dome. In the similar work experience name of the Planetarium and Fulldome software installed must be clearly mentioned and should be in use for operation of planetarium / full dome system for visitors.

✓ The details of qualifying and similar works/projects shall be furnished as per the proforma in **Annexure-E** and if required, the bidder shall also facilitate inspection of the above qualifying project(s) by NCSM's Officials to ascertain the performance of the system.

3.0 Documents Required: The bidder should submit a copy/copies of the work order(s) issued in the name of the agency as well as copies of Work Completion Certificate of the same work, clearly indicating the value of the work of similar nature. If the work order contains several works, only the value of the works of a similar nature shall be considered for work experience. If the value of the works of similar nature is not specifically mentioned in the cost breakup, the work experience against the work order will not be considered as valid.

NCSM may inspect any of those works at its discretion to verify the credentials of the bidder for the qualifying works / projects indicated above for which the Bidder shall provide references (including Referee names and contact details) in respect of projects implemented.

The bidder should provide valid documentary proof to clearly substantiate each eligibility criteria, failing which the bid will be summarily rejected.

i. Equipment manufacturing capability and up to date testing facilities. Bids may not be considered if the past manufacturing experience in the field of Optomechanical and digital planetarium is found to be un-satisfactory or is of less than 5(five) years for OEM.

ii. Balance sheet and profit and loss account of the bidder duly verified by the Chartered Accountant for the immediately 3 (three) preceding years (i.e. 2021-22, 2022-23 and 2023-24) should be enclosed to assess the financial soundness.

iii. No bankruptcy letter issued by appropriate Government authority or respective bank of the respective country.

iv. Certificate of the existence issued by Department of the commerce/Government accredited agencies of the respective country.

v. Letter of Good Standing (tax clearance) issued by Tax Commission of the respective authorises/country.

vi. Certificate of Incorporation / Business License issued by Government authority of the respective State / Country.

vii. The Average Annual Turnover of the Bidder (of the lead partner in case of Consortium/JV) for the financial years (2016-17, 2017-18,2018-19, 2019-20, 2020-21,2021-22 and 2022-23) **should be minimum INR 16 Crore. Best of five will be taken among the seven years.**

viii. Bank Solvency certificates of equivalent to INR 16 crore for the bidder is to be submitted.

Documents Required: Turnover of the bidder **(of the lead partner in case of consortium/JV)**and Indian Counterpart of the Bidder/OEM duly certified document from CA clearly indicating the

Turnover for the seven financial years (2017-18,2018-19, 2019-20, 2020-21,2021-22, 2022-23 and 2023-24) as per **Annexure – F.**

Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

Made misleading or false representation in the forms, statements and attachments submitted in proof of the qualification requirements; and/or recorded for poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.

Note:
1. Notwithstanding anything stated above the purchaser reserves the right to assess bidder's capability and capacity to perform the contract should circumstances warrant such an assessment in the overall interest of the purchaser.
2. Submitting unnecessary documents may lead to disqualification of bidders.

3. All the following documents shall be notarized:

    a. All kinds of MoU between Indian Counterpart/Agent and OEM.
    b. Audited balance sheets, financial statement of the bidder.
    c. No Bankruptcy letter issued by appropriate Government Authority.
    d. Letter of Good Standing (tax clearance) issued by Tax Commission of the respective authorises/country.
    e. Bank Solvency certificates.

4.0 JOINT VENTURES/CONSORTIUM

i. In the event that the successful bidder is a consortium/joint venture formed, lead partner/prime contractor in whose name the bid was issued, shall be fully and solely responsible for the performance of contract and all works designed and executed under the contract.

ii. Bids submitted by a consortium or joint venture of at least two firms including the lead partner, all partners shall comply with the following requirements:

a. The consortium as a whole must be a sound entity technically and the lead partner must be a sound entity financially.

b. The consortium as a whole must satisfy the qualification criteria set forth herein. The turnover of the lead partner must satisfy the eligibility criteria of the tender. **The bid shall contain a statement of the members of the consortium and shall provide all information necessary to satisfy Client/Employer that the Consortium fulfils the qualifying criteria.**

c. The Bids shall contain original copy of the Memorandum of Understanding (MOU) on ₹100/- Non-Judicial Stamp paper (or as applicable) between the consortium members clearly identifying the lead partner, scope and responsibility and financial part of each member in the performance of the contract.

d. The consortium members will obtain approval of the client for any change in the shareholding structure and scope of work or any other terms of MOU.

e. The lead partner of the consortium shall be nominated as being in-charge to represent the Consortium in all dealings with the Client/Employer and for providing any information or clarification sought from the Consortium.

f. The Bid shall be signed by all the consortium firms by their authorized person. The lead partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all member(s) of the Consortium and all dealings including billing and payments, shall be done exclusively with the leader of the consortium.

g. Only firms or joint ventures that have been qualified under this procedure will be eligible to bid for this project.

h. All members of the Consortium shall be liable for the execution of the project in accordance with the terms of the MOU and Contract agreement.

i. Any individual bidder or member of a consortium cannot be a member in another consortium and participate in this tender.

j. All correspondence or communications will be done by the Lead partner (or authorized representative of Lead partner) of the consortium.

k. Bidder submitted their bid shall not be under liquidation, court receivership or similar proceeding.

   Notes:

1. Technical bids of only the agencies that fulfil the above pre-qualification criteria shall be opened.

2. The bidder has to submit the compliance letter on its letterhead duly signed by the authorized signatory & other supporting documents as asked for in the bid. Failing to submit the same or non-compliance/deviation from any bid terms and conditions, eligibility criteria or technical specifications may result in rejection of the bid.

5.0 EVALUATION / SELECTION CRITERIA

A two-stage Evaluation will be adopted in evaluating the proposals

i. **Eligibility Criteria Evaluation:** Any shortcoming of the documents will lead to rejection of the bid and other envelopes will not be opened.

ii. **Technical Presentation Evaluation:** Only the agencies qualifying on the basis of their credentials / evaluation will be called for Technical Presentations which can be at a very short notice of even three days.

iii. **Financial Evaluation:** Only the bidders/firms securing the minimum qualifying marks based on Eligibility Criteria Evaluation and Technical / Presentation Evaluation as described in detail below will be eligible for their Financial Bid Opening & Financial Evaluation.

   A. Technical Evaluation

   i. The Evaluation Committee appointed by the competent authority shall carryout its evaluation applying the evaluation criteria specified in the bid document. Evaluation of the application would be done as per the documents submitted. Bidders/Agencies

who are in the trade and are fulfilling the eligibility criteria as per the documents required would only be called for presentation which can be at a very short notice of even three days.

ii. Further, technical presentation will be evaluated and maximum marks be given up to 100.

iii. Each responsive proposal shall be attributed a technical score. On the basis of the technical assessment, agencies securing minimum 70 marks out of 100 will be shortlisted and the financial bids of only the shortlisted agencies will be opened. **The date and time of opening of the financial bids will be intimated to the selected / shortlisted agencies through NCSM's website/email.**

B. Financial Evaluation

Financial Bid:

i. The Financial Bids of the technically qualified bidders will be opened at NCSM Office, Kolkata.

ii. The lowest financial bid completed in all respects shall be selected for the award of contract.

iii. Only fixed price financial bids indicating total price for all the work/services specified in the bid document will be considered.

iv. Details of the applicable taxes and duties on the basic cost are to be indicated clearly in the Annexure C of financial bid (PDF) as well as in BOQ (in excel format downloaded from E procurement portal) only. Annexure C should not be uploaded in the technical cover.

v. **Errors & Rectification:** Arithmetical errors will be rectified on the following basis: "If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected accordingly. If there is a discrepancy between words and figures, the amount in words will prevail".

vi. In the event that the financial bid amount of two bidders are "tied", the bidder securing the highest technical score will be declared as the Best Value Bidder for award of the Project.

Note:
Technical Bids will be evaluated on the basis of documents as detailed above & presentations to be made by the eligible agencies before the Constituted Committee. The date and time of the presentations will be conveyed to the eligible agencies.

C. Technical Evaluation Marking Scheme
The Technical Bids will be evaluated on the basis of the indicated parameters in the table below:

Evaluation of bids found eligible as per eligibility criteria would be undertaken by the Technical Evaluation Committee Constituted by the competent authority as per parameters cited below.

Sl.	Parameter	Criteria	Max. Marks
1.	Experience of Bidder/agency in the tendered work	5 Years – 10 Marks	15
		More than 5 years up to 9 years – Bonus 1 Mark per every extra year of experience.	
		10 years and above- 15 Marks	

2.	Financial Soundness (averaged annual turnover for best five years during the last seven years (2023-24, 2022-23,2021-22,2020-21, 2019-20,2018-19, 2017-18).	i. For average annual turnover of ₹ 16.00 Crore– 10 marks ii. For average turnover in excess of ₹16.00 Crore @ 1 mark per ₹1.00 Crore each	20
3.	Similar Work Experience	For one similar completed works having value ≥ ₹13 Crore – 10 marks For two or more similar completed works each having value ≥ ₹13 Crore – 15 marks **Maximum Marks – 15 marks** For two similar completed works having value ≥ ₹8 Crore < ₹13 Crore – 5 marks 1 mark for each additional project **Maximum Marks – 10 marks** For three similar completed works having value ≥ ₹6.4 Crore < ₹8.0 Crore -5 marks 1 mark for each additional project **Maximum Marks – 8 marks**	15
4.	Maintenance experience of your Indian agent for Hybrid and/or 2D Full dome shows/ Planetarium.	1 project for minimum period of 1 year – 3 Marks 1 mark for each additional project **Maximum Marks – 05 Marks**	5
5.	Technical presentation before the Technical Evaluation Committee	i. Soundness of design and proposed execution of Full dome hybrid 2D theatre as per scope of work and technical specifications given in the tender document ii. Technology adopted / quality of proposed equipment – 40 Marks iii Experience in execution of ancillary works such as supply and fixing of chairs, acoustic insulation, civil works, electrical works etc. – 5 Marks	45

The bidders will have to enclose a presentation on the proposed solution along with the technical proposal to NCSM. The presentation shall cover the comprehensive details, approach &

methodology, Organization structure, Work program, Implementation strategy, offered equipment list, Technical brochures and specification sheet, timeline etc.

The eligible bidders will be called for giving a detailed presentation. The presentation shall cover the comprehensive details, approach & methodology, Organization structure, Work program, Implementation strategy, offered equipment list, Technical brochures and specification sheet, timeline etc. shall be submitted.

6.0 Price:

i. The price and rates indicated shall include all incidental charges like packing, forwarding, freight, insurance, and delivery at place (Regional Science Centre and Planetarium, Kozhikode (Calicut), Kerala etc. as may be applicable to this tender for supply, installation, commissioning, testing and training along with onsite **comprehensive** warranty for five years, of the complete and integrated functional Full dome 2D Hybrid Planetarium projection system at Regional Science Centre and Planetarium, Calicut. The price should include the cost of all associated minor civil works, electrical work, installation of planetarium chairs, interiors, acoustic, carpeting, cove lighting, step lighting, server room etc., and providing training for the operation of the system to the representatives of NCSM in detail.

ii. The rates quoted/indicated shall include cost of all materials, labour for fabrication, machining, assembling, testing, painting, finishing, supply, erection, loading/unloading installation, commissioning, labour supervision and all working accessories, tools, scaffolding and tackles, reliable standard testing equipment etc. including all handling charges.

iii. The Project Cost also Includes the following:
   ✓ Refurbishing and repainting of existing Aluminium Dome as per existing standards.
   ✓ SITC of online UPS
   ✓ Interior and SITC of planetarium chairs.
   ✓ Comprehensive warranty for 5 years.
   ✓ 1 Perpetual Full Dome hybrid film in English and Malayalam.

The selected bidder shall be responsible for proper co-ordination with NCSM and continuous supervision of these works at site to ensure the desired quality of workmanship and use of specified materials to achieve the desired result.

Bidders may submit the rates in INR only for the whole items. The basic prices (in INR) and applicable taxes shall be shown separately in the BoQ.

NCSM shall not provide custom duty exemption certificate. NCSM will have the final ownership of this project, **all necessary invoices/documents of the planetarium / projection equipment including UPS, servers, dome, sound system, cove light, chairs, interior works, sitting platform, acoustics, etc. shall be made in the name of NCSM. However, NCSM shall accept offers on Delivery at site basis only. Offer(s) on High Sea Sales or through Bond to Bond transfer (Warehousing Bond under Section 59 of Indian Customs Act, 1962) shall not be accepted since NCSM desires to acquire Propriety of the goods neither in transit nor in any Bonded Warehouse but after possessing the goods directly in their custody at site. Customs clearance of imported items, if any shall be the responsibility of the bidder. Transport cost from the nearest Airport / Seaport to the site shall be borne by the bidder. Delivery at Place for all the materials including loading, transportation and unloading at site at Kozhikode (Calicut) Planetarium shall be done by the successful bidder.**

No GST exemption (Form C/E/D) will be issued. Prices and rates quoted shall be firm and fixed for the entire period of execution of the order and no escalation of rates on any ground whatsoever shall be accepted.

7.0 Time of Completion:

Time is the essence of the work. The entire work comprising supply, installation, commissioning, testing and training for the complete **integrated functional Hybrid (Optomechanical and digital)full dome 2D immersive projection system** for a 15 meter diameter perforated aluminium dome screen with geometrical correction, image stitching and blending etc. for seamless projection of high resolution hybrid and 2D digital full dome film shows and digital planetarium shows shall be completed within **7 (SEVEN) months from the date of placement of confirmed order.**

8.0 Every effort should be made to complete the entire work by the successful bidder within the specified time. **In case the successful bidder fails to comply with the specified time schedule as per the approved bar chart and accepted terms and conditions, and where the progress of work is not found satisfactory, and commensurate with the expected progress as per the bar chart, NCSM reserves the right to cancel the order.** The decision of **NCSM** in this regard shall be final and binding on the successful bidder. The successful bidder cannot claim any compensation for such cancellation of contract.

9.0 Inspection:

The successful bidder shall also mandatorily facilitate for inspection of the equipment including its accessories at the site on completion of supply, whenever desired by the authorized officials of NCSM. Any / all defect(s) pointed out to the successful bidder by the competent representative of NCSM during such inspection shall be promptly rectified at the cost (including material cost) of the successful bidder to meet the desired quality, and specification as per requirement of NCSM failing which penal action shall be taken as deemed fit by NCSM. The decision of NCSM in this regard shall be final and binding on the successful bidder.

10. General Terms of payment

All items shall be quoted in INR and the payment terms shall be as follows:

    i.   **60% (Sixty percent)** of the total sum of the items on delivery of the materials/consignment at site and submission of bills.

    ii.   **30% (Thirty percent)** of the total sum of the items after successful installation and commissioning of the fully integrated high resolution immersive hybrid and Fulldome digital 2D projection system at site.

    iii.   **Balance 10% (Ten percent)** of the total sum of the items on successful operational training and handing over of the equipment to the authorized representative of RSC & Planetarium, Kozhikode (Calicut) and satisfactory running of the entire Fulldome hybrid 2D immersive projection system for a minimum period of 10 (Ten) consecutive days and on submission of a certificate issued by NCSM stating that installation and commissioning of the ordered

system has been done satisfactorily and also on submission of security deposit valid till the expiry of defect liability period and warranty certificate as detailed in clause No.12.

The successful bidder :

A. Shall submit security deposit equalling to 10% of the total value of the order in the form of demand draft/electronic fund transfer/irrevocable Bank Guarantee within 10 days of the issue of work order. The Bank Guarantee shall be valid for the period of five years and having a claim period of six years as security for fulfilment of warranty/defect liability obligations.

B. Shall organize Training for NCSM officials in Show production as well as on operation and maintenance of the system. Detailed Training module shall be submitted along with Techno-commercial bid. There shall be training in operation and maintenance of the entire ordered system at every stage of installation and also after satisfactory commissioning of the equipment at site.

For maintenance contract for two years (beyond the warranty period of five years) if awarded, the payment shall be made half-yearly on satisfactory completion of the work and this payment schedule shall continue for the entire duration of the contract. Comprehensive maintenance contract for two years may be awarded by NCSM/VITM to the bidder after the completion of warranty period of five years).

11. **Penalty Clause**

In case of non-completion of the entire work within the stipulated time, and when the delay is not attributable to site requirements, **Liquidated Damage (L.D.) @ 1% of the tendered value per week** shall be recovered from the bill of the successful bidder subject to a maximum of 10% of the tendered value.

12. **Defect Liability Period/ Onsite comprehensive warranty period for the planetarium/ projection system (Digital and Optical Projectors, Dome painting, Servers, computers, associated software, UPS, Audio system, cove lights, calibration equipment, console etc):**

The Defect Liability / Warranty period shall be five years from the date of certification of the completion of satisfactory installation and commissioning of the system. The successful bidder shall be responsible for setting right all defects of the installed equipment, manufacturing or other defects of components, playback and associated software etc. for a period of five years from the date of satisfactory completion of the installation and commissioning of the system. The successful bidder, shall at their own cost, rectify the defects and or replace the defective parts/equipment, up to the complete satisfaction of the competent authority of the NCSM/ Planetarium within reasonable time. **The successful bidder shall maintain an inventory of all necessary components to reduce downtime. If the successful bidder fail to set right the defects pointed out to them by NCSM authorities of the equipment or any other components or any other issues such issue of blending or issue of ghosting effect etc., their Bank Guarantee will be invoked and necessary action will be taken by NCSM as deem fit by it and the same shall be binding on the successful bidder.**

13. Specifications of the items under this tender are enclosed for guidance. However, if any ambiguity in the specification is detected, it shall be promptly brought to the notice of NCSM for clarification. The successful bidder should obtain written approval of NCSM for

any deviation from the approved specifications, if required due to site conditions or for betterment and safety of visitors and installations.

14. The authorities of NCSM reserve the right to amend, alter or modify the terms and conditions, specifications of the items if necessary for betterment and safety of visitors. No additional cost shall be borne by NCSM for such amendments.

15. In case the successful bidder refuse to accept the offer after finalization or does not comply with clause 2.2 of General Terms & Conditions within 07 (seven) days from the date of placement of the order as per the finalized and accepted terms & conditions, earnest money deposit would be automatically forfeited and the order shall be cancelled forthwith.

16. The authorities of NCSM do not bind themselves to accept the lowest tender and reserves the right to accept or reject any or all tenders wholly or partially without assigning any reason whatsoever.

17. The successful bidder shall obtain necessary trade and other licenses/permission as may be required to carry out the tendered job at Regional Science Centre & Planetarium, Kozhikopde (Calicut) and shall also be responsible for Compliance of all statutory rules and regulations which may be in force from time to time from the appropriate authorities at their own cost.

18. NCSM shall not be liable for any injury or death of an employee who is deployed by the successful bidder within/outside the work site during the time of execution of the work order.

19. **SECURITY DEPOSIT:**

    i. The Security Deposit shall be 10% of the gross value of work order and shall be submitted by the successful tenderer in the form of demand draft/electronic fund transfer/Bank Guarantee within 10 days from the date of issue of work order. In case, the gross value of the work executed is more than the ordered value, the successful tenderer shall submit additional Bank Guarantee for the differential amount before the release of final payment. For NEFT the details are as mentioned below:

Bank Name	Indian Overseas Bank
Beneficiary Name	National Council of Science Museums
Branch Name	Sector V, Salt Lake, Kolkata Branch
Bank Address	GN-34/2, Sector V, Salt Lake, Kolkata - 700091
A/c No.	SB 164201000000491
IFSC Code	IOBA0001642

    ii. The security deposit shall be released after expiry of the defect liability period of six years (including one year of claim period) from the date of satisfactory completion of the installation and commissioning of the system.

    iii. Bank Guarantee submitted against Security Deposit must be valid for 5 years from date of submission and claim period must be 12 months after end of validity period.

    iv. In case of cancellation of the contract, the Security Deposit submitted by the tenderer in the form of demand draft/electronic fund transfer/Bank Guarantee shall be revoked and

the amount necessary to make up this amount shall be recovered from any money due to the successful bidder under this or any other contract with NCSM.

    v. In case of death of successful bidder, Security Deposit shall be returned/refunded to the legal heir of the successful bidder after adjustment of dues, if any, post the actual completion of the work & upon expiry of the specified guarantee/defects liability period.

20. FORCE MAJEURE

Neither the successful bidder nor NCSM shall be considered in default in performance of its obligations under the terms of this MoU, if such performance is prevented or delayed for any causes beyond the reasonable control of the parties affected such as war, hostilities, revolution, riots, civil commotions, strikes, lockouts, epidemic, explosion, flood, earthquake or because of any law and other proclamation, regulations or ordinance of any government or sub-division thereof or because of any act of God or any other cause beyond the control of the concerned party which could not have been foreseen or avoided by the exercise of due diligence and so it becomes impossible to perform, provided notices in writing of any such cases, with necessary evidence that the obligation under this tender thereby affected or prevented or delayed is hereby given within 14 days from the happening of the event. In case it is not possible to serve the notice within the said 14 days period, then within the shortest possible period without delay. As soon as the cause of Force Majeure has been removed, the party whose liability to perform its obligation has been affected shall notify the other party the actual delay occurred in such affected activity and resume the performance immediately.

21. The successful bidder shall not transfer the whole order of supply, installation, testing and commissioning of the equipment to any other person(s) / firm / company for any reason whatsoever and in which case the order shall automatically stand cancelled.

22. The successful bidder may engage suitable and competent agencies to take up the necessary civil, electrical, etc. related works inside the dome**.**

23. All disputes and differences between the successful bidder and NCSM of any kind whatever arising out of or in connection with the order on carrying out supply, installation, testing and satisfactory commissioning of the system and during the period of five years (onsite warranty) and further during the subsequent period of two years of comprehensive maintenance beyond the warranty period (whether during the progress of the work or after the completion of work and whether before or after the determination, abandonment or breach of the terms and conditions of the order) shall be referred to the sole arbitration of a person nominated by NCSM, whose decision in this regard will be final and binding on both the successful bidder and the NCSM. The provisions of the Arbitration and Conciliation Act, 1996 or any modification or re-enactment thereof and of the rules made here under for the time being in force shall apply to arbitration's proceedings under this Clause.

24. Make-in India products would be preferred as far as practicable.

25. All other conditions given in the tender document under various sections shall stand valid and the successful bidder shall abide by them.

Technical Specifications and Scope of Work

Section I

This is a Tender document for an integrated system with High-end **Laser phosphor Projector and optical star projector (Hybrid projection System)** to be deployed with a 15 meter diameter perforated aluminium dome screen non tilted with geometrical correction, image stitching and blending etc. for seamless projection of high resolution digital, optomechanical and hybrid full dome film shows.

A. Supply, installation, integration, training, and commissioning along with onsite comprehensive warranty of five years of following sub systems. All of these provisions will be considered for evaluation of comparative statements of bids:

1. Refurbishment of existing Dome Screen as per the specifications laid down in Section II 1.1

2. High resolution visualization system with minimum 20 Million effective Pixel on the 15 meter perforated dome screen.

3. Phosphor Laser Projector with 10,000 Lumen per projector, minimum individual native contrast ratio of 16000:1 and minimum individual native resolution of 4096 pixel x 2160 pixel (4K) (not wobulated) with frame rate operational capability of 60 Hz, the brightness of the image across the dome must be the same and be of at least 62 lux with effective screen resolution of minimum 20 Million Pixel after seamless blending on the dome screen mentioned below.

4. **Optical star projector optimized for 15m dome with LED light source to magnitude 6.5 (optional, subject to availability of fund and approval)**

5. Each Digital Laser Projector shall have an operational life of minimum 20000 hrs of the light source Unit.

6. Image geometry and uniformity correction for seamless display and accurate mapping to screen geometry shall have to be executed.

7. A high performance multi-channel media creation, image generator and playback system which can create as well as play high resolution 2D full dome shows, 2D large format films and 2D digital planetarium shows, 2D hybrid planetarium shows. It should provide a user friendly Graphical User Interface to control system configuration, content creation, distortion correction and blending configuration.

8. Display management system shall control the display configuration like tilting, positioning, alignment etc.

9. Data cabling to carry lossless video signals from sources viz. Media Servers and playback system, projectors and/or video players and high speed data path network (if any) among computing and storage elements through fibre optic cables.

10. Properly dressed power and data cabling for all systems and devices so as not to cause interference with video signals and data networks.

11. Estimation of power required for the complete integrated system and providing suitable 40 kVA UPS system having with suitable rack mounted battery backup for at least 30 minutes for the complete display and illumination system shall be provided. The bidder must clearly

specify the number and type of batteries that will be used for providing 30 minutes backup. All batteries supplied must be from same batch of production.

12. For distribution of power to the UPS, NCSM shall only provide a 3 phase supply as per requirement which shall be terminated inside the control room. All electrical panels for power distribution conforming to prevailing Indian Electricity Rules shall be supplied, installed and arranged by the bidder as part of their scope of work. All safety devices comprising circuit breakers, bus bars, etc. shall be suitable designed. A detailed drawing with full specifications of the proposed power distribution panel shall be submitted to NCSM for approval before initiating the work.

13. Design of seating arrangement with enhanced space between two rows. The chairs should have reclining arrangement as per required field of view of the visitors seated in different positions from the dome screen with sufficient leg space.

14. A 7.1 surround audio system with **minimum 7 speakers** and one subwoofer for 15 metre dome theatre complete with amplifier, mixer and high quality speakers etc. giving appropriate audio power output shall be provided for the Full dome hybrid Immersive 2D theatre of the RSC&P Calicut.

15. LED cove lighting of the full dome theatre and its integration with show control system. It is mandatory to have brightness of minimum 1600 Lumens per unit including fixture for a Dome of 15m and sufficient number of fixtures to avoid any dark zone in the Dome. Separate additional white LED light is required to be installed for theatre maintenance purpose, controllable from single switch and Tablet.

16. An optical system with star projector, planets, sun and moon installed at the height of springline on lifting platform. (optional)

17. Emergency LED based exit signage inside the theatre.

18. Public address system inside the theatre for making announcements and or for conducting the live show with necessary wiring & cabling work.

19. Sound proofing and acoustic treatment of the Full dome theatre, particularly over the aluminium dome shall be under the scope of the bidder. The bidder executing the project must submit a detailed design and specifications in Cover – 1 of the tender towards acoustic treatment that will be undertaken for the Full dome theatre. The expected outcome of this sound and acoustic treatment shall be provided by the bidder and shall be measured on completion of the work. The bidder shall arrange to execute this work based on the design, drawings and specifications submitted by the selected bidder and duly approved by NCSM authorities. The Bidder shall be responsible for closely supervising the work at site and shall coordinate with NCSM to ensure desired results.

20. The bidder shall submit proposed modifications of HVAC ducts if necessary for the purpose of cooling of projectors etc. for Full dome Theatre including area of placement of projectors, U.P.S. system, Image Generators as per the requirement of site. This proposal of work will be taken up by the successful bidder immediately after awarding of the work. The modification work of HVAC will be done by NCSM.

21. The bidder shall provide site plan document with plan, elevation and mounting details for placement of Projectors, seating Gallery, and Rack Mounted assemblies for Image Generators and Playback system, Speakers and Display Management System.

22. Touch panel based control systems shall be provided for general illumination, dome lighting control, exit signage control and emergency exit signage control, audio, projectors, device control units, colour correction, colour matching, etc.

23. Touch panel based show control system shall be located in the viewer platform with wireless iPad/Tablet for operation of the show.

24. The system should be designed keeping in view that it must be manageable from a single control unit. All accessories needed for easy accessibility of devices for maintenance must be considered under the scope of the work.

25. The bidder shall provide the requirement of fire extinguishers (type and quantity) and fire fighting system to be placed in different areas of full dome theatre. NCSM shall install it after obtaining the approval from fire department.

26. Any kind of scaffoldings, temporary platforms for erection of dome, painting, insulating etc. has to be arranged by the successful bidder only.

27. Delivery at Place for all the materials including loading, transportation and unloading at site at RSC and Planetarium, Calicut will be done by the successful bidder only.

28. Special mounting for the projectors and all required alignments for final adjustments etc. shall remain within the scope of the selected bidder. The selected bidder must consider cost effective non rusting materials and anti-corrosive treatment for all metallic structures of projectors. All safety measures shall be considered while designing for safety of people and equipment. The selected bidder shall remain responsible for closely monitoring the work at site to ensure that desired quality of work is executed.

29. The system is to be designed with very high up-time commitment (99% over 364 days a year or 365 days in case of a leap year). The selected bidder shall maintain inventory of spares for the designated up-time commitment for on-site warranty.

30. **Preventive maintenance** shall be carried out by the bidder at regular intervals during the Warranty period of five years and post-warranty period of two years (if the AMC is awarded by NCSM) and a log book to this effect shall be maintained at site. **The suggested schedule for preventive maintenance shall be clearly defined and submitted in Technical Bid.**

31. If any disparity in terms of projector intensity, colour, alignment or otherwise is noticed and reported during the warranty period, immediate redressal of the issue through repair or replacement shall be within the scope of the successful bidder.

32. Integration of all subsystems as indicated above to configure the **"Full dome hybrid/ digital 2D immersive projection system"** shall be the responsibility of the bidder.

33. For Technical & Commercial (Envelope-1) bid evaluation, the bidders shall provide detailed bill of quantities (without cost) of each item proposed for their offer along with schematic system architecture and product catalogues for all hardware/software items.

34. NCSM shall provide incoming power cable of required capacity which the bidder shall connect to their main distribution panel.

Note:

All civil and electrical works relating to the installation of the system/show, fabrication/installation of base steel structure for mounting of projectors array are to be taken up by the selected / successful bidder, and all necessary materials, machines and any other machine tools required for the fabrication and installation are to be arranged by them at their own cost. The bidder shall also undertake minor civil works including floor concreting for making good the damages for the installation of chairs, carpet etc. The selected/successful bidder shall provide design, drawings, details and complete specifications for acoustic treatment of dome structure for installation of projectors array as described earlier. Selected / successful bidder shall also submit the design, drawings, details and complete specifications for installation of chairs and any other work required for completion of the planetarium interiors.

All safety precautions, insurance of workers and compliance with statutory obligations shall be taken care of by the selected/successful bidder during the execution of the entire project at the site.

Client's responsibilities:

1. NCSM shall provide electrical power for the execution of the work.
2. NCSM shall provide lockable space for the storage of materials by the selected bidder.

Section II

TECHNICAL SPECIFICATIONS OF INTEGRATED HIGH RESOLUTION FULL DOME HYBRID AND DIGITAL IMMERSIVE PLANETARIUM PROJECTION SYSTEM FOR AN EXISTING 15 METER DIAMETER PERFORATED ALUMINIUM DOME SCREEN NONTILTED WITH GEOMETRICAL CORRECTION, IMAGE STITCHING AND BLENDING ETC. FOR SEAMLESS PROJECTION OF HIGH RESOLUTION DIGITAL FULL DOME FILM SHOWS AND HYBRID PLANETARIUM SHOWS.

1. **Fully High Resolution Full dome digital immersive Planetarium projection system**

The integrated High Resolution Full dome Hybrid & Digital Immersive Projection System consists of Projectors array, perforated dome screen, Blending & Geometric Correction units, Image Generator Servers & GUI server for playback, show control, Server for dome slicing and content creating for full dome planetarium shows, Display Management, Alignment & Calibration System, UPS system, 7.1 surround sound system, LED Cove lighting and Exit signage, emergency exit signage. This system is a multi-channel display system with combined resolution of **20 Million effective Pixels**. The specifications of the complete system are provided in section 1.1.1 to 1.10.

1.1. Refurbishment, Cleaning and repainting of existing 15-METER diameter Dome Projection Screen

Scopes Included:

1. Cleaning and Refurbishment of 15m Dome Screen, repair of damaged & stained panels and repainting as per standard dome painting procedures using certified Dome screen paint from original Dome manufacturer. The entire dome shall be thoroughly cleaned by vaccuming and using other appropriate methods after removing the existing acoustic materials from outside the dome. Damaged or discoloured panels, if any has to be replaced/corrected.

2. Recommended to use airless paint guns for controlled application of paint after cleaning. The paint shall not fill the holes (perforations) on the dome. All discolourations and streaks shall be eliminated through perfect application of atleast two coat paints. The entire refurbishment process shall be executed through trained, skilled and experienced technicians.

3. The final reflectivity of the panels should be around 0.53

4. Removal of existing acoustic insulation and fixing Blackout insulation jacket with ASTM E84 standard with minimum 1 inch thickness and NRC 0.6 to 0.8 to be installed on the top of the Dome screen and to be supplied and installed for acoustic treatment.

5. Necessary scaffolding, man power and all installation related equipment and resources shall be provided by the bidder.

1.2. Projection System

Immersive Digital Projection System: An array of projectors and allied systems with the requisite overlap and edge blending is to be provided along with suitable geometry correction for the dome

screen as specified, to provide a seamless display of at least **20 MP arranged in a cove projection configuration (after blending)** with the specifications as per table 1.2. The projectors are to be mounted on a suitable structure. Selected bidder will fabricate and install the projector mounting structure at site as per the design, details, drawings and specifications provided by the bidder. The bidder must visit the site before submission of tender and identify the most suitable place in the building for keeping the Image Generator Server, projectors, Audio racks, UPS and other necessary units and routing of the cables needed to connect all constituent components of the system.

Table 1.2

Specifications	Detailed description
Number of Projectors	6 + 1 spare (without lens)
Type of Projector	Phosphor Laser Projector, 4K resolution, 10,000 Lumen from solid state illumination, 16000:1 of native contrast ratio, 60 hz frame rate.
Projector array comprising multiple projectors	To cover 15 meter dome screen non titled without casting shadow from the optical projector in the centre.
Total Resolution after blending	**20MP** or higher (after blending)
Mounting	Projectors are to be mounted on the specially designed structure around the dome periphery.

1.3. Digital Projector

The specifications of individual projector are provided at table 1.3: The Projector model quoted by the bidder must be capable of running continuously for at least 12 hours a day and 364 days a year. All projectors must be of same specifications and manufactured by the same OEM in their own factory. 6 projectors must be proposed by bidder. Apart from these 6 projectors 1 more spare projector without lens of same specifications and manufactured by the same OEM in their own factory must be provided by the successful bidder.

Acceptable OEMs: Sony/Christie/ Digital Projection/Barco or equivalent

Table 1.3

Specifications	Detailed Description
Display Technology	4K SXRD / DLP
Light Source	Phosphor Laser
Minimum native Resolution	Minimum 4096 pixel x 2160, 60 Hz, at minimum 16 000: 1 native contrast ratio.
Internal Input / Output ports	HDMI 10 bits minimum
Input / Output Control and	RS-232C, LAN

networking	
Lens Options	must be fitted with wide lenses specifically designed for the projector configurations on a dome-screen.
Source Life	Minimum 20000 hrs
Operating Hours	The System shall be capable of being used for twelve hours per day 364 days in a year.
Monitoring Parameters	Source life, Fan status, Temperature status, etc.
Noise	<40 db at 25°C per projector
Cooling	Self-contained
Accessories	All standard accessories including IR remote, Line cord etc.
Warranty	Manufacturer's standard warranty of not less than five years on projectors.

If the projectors require additional cooling or air supply, the Contractor shall install them on his own.

For Blending :
The final image should have homogeneous brightness over the entire dome without any visible change in brightness on images overlapping (blending) from different projectors. For this purpose, physical masks in front of the projectors' lenses that use opacity gradient to achieve the blend regions masking should be installed and calibrated. Masks (blend) should be physically connected to the projector base, which will ensure their permanent position relative to the projector and lens. Masks (blends) must be of top-quality glass with a light transmission of minimum 97% through the clear aperture. The masks should be double-sided antireflection coatings for maximum transmissions. Instructions and possible mask cleaning technology instruction should be provided. It will have a lifetime which is greater than 20,000 hours with typical simulation scene content. Enclosing the space between the lens and the mask with appropriate screens (covers) minimizing access of dust and reflections is allowed. The masking itself should be done in a mask density gradient technology that excludes any diffraction caused by unwanted structures in the masking area.

1.4. Optomechanical Projector System (Optional)

Preferred OEMs and Make: as like the table below or equivalent

Preferable OEM	Preferable Model
Konica Minolta	Cosmo Leap or higher
Goto INC	Orpheus Type A or higher
Carl Zeiss	Skymaster ZKP4 or higher

An optical star projector should be installed at the centre of the dome at the pit and integrated with digital projection system.

Table 1.4

Specification	Detailed description
Star projector	a) The optical star projector should be optimized for 15m dome to ensure top quality of projection of full sphere. b) The optical star projector should have bright LED as lift source serving at least 30,000 hours c) The optical star projector should be able to project fixed stars down to magnitude 6.3 to 6.56 all over celestial sphere in their apparent magnitude brightness with number of fixed stars from 7000 to 9500. d) at least 18 stars of the brightest magnitude should be projected individually in true colors. e) At least 4 stars should have the variable star presentation. f) Milky way should be represented as micro stars with at least 200,000 stars g) At least 26 deep space objects should be projected. h) Cardinal points of North, West, South and East should be available on the optical projector. i) At least 38 constellations to be projected with the optical projector j) The Sun to be projected optically capable of showing both daily and annual motions (preferably size of 1 degree) k) The Moon to be projected optically capable of showing both daily and annual motions (preferably size of 1 degree) l) The visible planets (Mercury, Venus, Mars, Jupiter and Saturn) to be projected optically with both daily and annual motions m) To be able to project optically constellation lines for Crux, Orion, Cassiopeia, and Scorpion. n) The optical projector should be able to simulate Dawn and Dusk, Sunrise and Sunset twilights. o) The optical projector should be able to project Ecliptic line, Meridian, equatorial coordinates p) The optical projector should be able to project cardinal 4 points. q) The optical projector should have gravity/electronic shutters for its star plates to avoid projecting stars below horizon r) The optical projector should be able to project its starfield from any given location on Earth. Map input should be available. s) The optical projector should be able to project its starfrield at any given time +- 4000 years, in Universal time and local mean time.

Hybrid projection	a) The Star projector should be capable of synchronizing with the Full-dome Digital Projection system with calibrated astronomy features enabling seamless switch over. The operation should be easy and comfortable and devoid of complex programming. The integrated automatic control is the necessary precondition for this hybrid system and should be integrated with the installed analogue Control Panel. b) There should be a single console allowing control of digital system and hybrid system. The same controls of digital system should be usable in hybrid mode. Separate consoles for each system, where digital system controls are locked in hybrid mode is not accepted. c) The planetarium system should be capable of operating either independently (Manual or Auto) or in hybrid mode in conjunction with the optical planetarium system, in complete synchronization. This feature should be available also through the Manual Console Panel. d) A manual analogue console should be installed, with backlit to control the hybrid system even when monitors are switched off. e) The tolerance between digital stars and optical stars should be less than 2cm f) The Constellation stick figures from the digital projection should be accurately placed through the optical stars. There should not be any deviation of accuracy during diurnal or polar movements. g) The planetarium control system should include easy to use icons/signs for Star field, Milky way, Planets, Sun, Moon, Astronomical Labels, Grids, etc. h) The system should have a graphical interface for user friendly operation, labels should be capable of being displayed in multiple languages such as English, Hindi and others and should accurately identify optical stars i) The digital projectors should cast no shadow of the optical projector in hybrid mode j) The optical device should be installed on lifting platform so that it is moved to the springline height when used, and lowered when not used. k) The system should allow dynamic contrast control lowering brightness to allow true black level in hybrid mode.
Installation of Star Projector	a) The optical star projector should be installed at the centre of the dome ~~in the pit.~~ b) The working position of the star projector should be at the springline of the dome that it allows projection of true horizon on the dome screen. c) The star projector should be installed on a lifting mechanism so that it can be lowered when not in use. The descended position of the star projector should be fully below the dome springline level.

1.5. Image Generator Server and Playback System with full dome and hybrid planetarium show software (1 master + 6 nodes + 1 spare)

A suitable solution shall be ensured to drive the required projector array with the specifications given below. Image Generator server shall drive one projector connected through fibre optic cables and planetarium shows to be displayed in real time onto digital immersive dome projection screen.

Acceptable OEMs: Dell, HP or equivalent

Table 1.5

Specifications	Detailed description
Image Generators	a) 8 cores, 16 threads, minimum 16 MD Cache. b) RAM 32 GB DDR4 with a frequency of at least 2900 MHz. Solid state Hard drives simulation software data and 30 hours of video at native resolution c) Graphics card with at least 5880 CUDA Core, 1.5 GHz base frequency, 1.7 GHz boost frequency, 8 Go GDDR6, Ampere architecture graphic cards. d) SSD drives with enough space to store system, simulation software data and 30 hours of video at native resolution. e) Integrated backup SSD allowing backup of data & system.
Pre-process Data transfer Rate	No jerks, flicker or image tearing should appear on screen. Frame rates up to 60 fps.
External video playback	HDMI or Display port inputs should be added to allow connecting external HDMI or Display Port signals and capture them into the planetarium digital projection system. These inputs must be able to capture the image in a resolution of 3840x2160@60Hz. In this way, the Planetarium digital projection system will enable real-time display of any content from an external source connected by the presenter in flat mode with a resolution of 3840x2160@60Hz or a 3840x3840@60Hz fulldome content. NDI low latency video streaming technology must be used between those inputs and the image generators.
Content	Astronomy software, calculated in real time Previously prepared shows, encoded in popular formats such as XVID-H.263, AVC-H.264, HEVC-H.265 Obtained from an external source via streaming. Obtained from an external source via External video Playback input.

*Additional SSD and RAMs may be configured to meet the overall specifications, if necessary.

1.6. Content creation Server/Player

One separate workstation / server for creation of planetarium shows as well as for conversion of large format shows into Fulldome shows shall be provided by the bidder with specification as mentioned in **Table 1.6.** The workstation server should be connected to the Master GUI Server of the main cluster for seamless transfer & access of data/resource.

Software:

- **Latest full version of OEM software with perpetual license for playback of Fulldome showsand planetarium shows and with facility to convert large format shows into Fulldome shows.**
- **Digital library/cloud access of the planetarium datasets for development of in-house planetarium shows.**
- **Interactive Astronomy Simulation tool & Datasets:**

Table 1.6

Specifications	Detailed description
1	Full dome projection system must be controlled by a fulldome simulation software with real time astronomy as one of the main features.
2	All images and databases provided with the fulldome simulation software must be completely free of copyrights and can be used to create shows as many times as desired. Automatic updation of database must be available at free of charge.
3	The fulldome software must incorporate the following: **Simulation of the followings:** • Night sky • Solar system • Extrasolar (multiple star systems, exoplanet systems) • Deep sky objects • Milky way • Earth sciences **Requirement of the following components:** • Fulldome video player • Slideshow player to allow the display of flat, fish-eye or panoramic videos and Images with transition like a "PowerPoint" presentation. • Data 2 Dome compatibility • Cloud sharing and social media **Requirement of the following interfaces:** • User Friendly Graphical Interface • Wireless interface • VR Compatibility
4	**Astronomical features required:** • The simulation of the sky including the following celestial objects: Sun, planets, dwarf planets, natural and artificial satellites, asteroids, comets, stars depending on the date over an interval of + or – 100,000 years, the position and the orientation of the observer using the VSOP87 and SPICE calculations. • The calculation and correct representation of the apparent magnitude of stars, planets and natural satellites depending on the position of the observer and the date. • The proper movement of the stars. • Steller parallax. • The representation of the variability in magnitude of at least 1,500 variable stars. • Simulation of multiple star systems • Simulating the position of at least 2,000 exoplanets around their star

	- Moon Libration - Real-time shadow projection: dark side of astronomical objects, shadow of a satellite on its planet, shadow of a planet on its rings, shadow of a planet on its satellites. The user should be able to remove the shadow from the dark side of planets and satellites. - The possibility of modifying the astronomical parameters of a body: diurnal movement, annual movement at constant solar time, annual movement at constant sidereal time, precession movement, size of the body, speed of rotation, of revolution, resizing of the orbit.
5	The full dome simulation software must be able to move from wide view up to 10^{27} m universe wide and zoom in to particles of 10^{-18} m anywhere in this universe in continuous without any visual jump or transition.
6	The full dome simulation software must include a movement management to switch from one reference to another at any time with no visual jump.
7	All parameters of the system (simulation date, observer position and orientation, parameters of objects such as intensity, colour, etc.) must be modifiable with a duration from an initial stage to a target state using different models of Interpolation.
8	For time control, following features should be available: Instantaneous or progressive movement forward or backward in time. The time can be defined in Julian day or in GMT or any local date / time. Change the data gradually, stopping at a target date etc. Change the date in increments with stopping at a target date etc. Automatically stop the evolution of the date when a star passes to certain position (rising and setting of a star, passage at 0° south, etc.).
9	The full dome simulation software must include labels to display names for any objects represented (Sun, Planets, Dwarf Planets, Satellites, Stars, Milky Way, Messier, etc.).
10	The full dome simulation software and the GUI must include language management and switch between various languages, including at least English and Hindi.
11	Facility for searching, downloading and uploading resources from / to a Cloud (images, videos, audio, scripts, 3D models)
12	The full dome simulation software shall include a Domecasting capability, i.e. the possibility that a Planetarium broadcast its live presentation to other domes.
13	Most of the data sets of the software shall be issued from public scientific institutions (observatories, universities, laboratories, etc.). It shall be possible for such datasets to be updated easily by the planetarium with a simple click in the GUI.
14	The full dome simulation software shall offer the possibility to visualise HiPS Sky Surveys from CDS servers. It shall be possible to display the

	Sky Survey on dome and to zoom in any area with a refinement of the resolution of the image.
15	The full dome simulation software shall offer the possibility to visualise WMS terrain data at the surface of at least Earth, Mars and Moon.
16	The full dome simulation software must be compatible with Data 2 Dome. The Data 2 Dome must be integrated in the graphical user interface.
17	The full dome simulation software shall be able to download and display any NASA JPL Horizons trajectory data with a few clicks in the GUI and allows to visualize the full path or a path evolving with the date of the simulation. It shall be possible to add a 3D Model that will follow the path accordingly.
18	The full dome simulation software shall be able to download 3D models of known asteroids from a reputed server and display it at its position in the GUI.
19	The Full dome simulation software must be compatible with VR Glasses for show production and for pre-show or exhibit purpose.
20	The full dome simulation software must include realistic atmospheres based on algorithms accounting for the physical phenomena (like Rayleigh scattering and Mie scattering) for at least Earth and Mars. Atmosphere model should simulate multiple scattering. The ground of the planet should also react according to atmosphere thickness.
21	The full dome simulation software must allow a continuous view of planets from, outer space up to several meters on the surface for Earth, Mars, Moon, Venus, Mercury, Ceres Vesta, Pluto, Charon etc. Such representation must include known data for terrain and ground imagery. Such visualisation should be at least 60 frames per second during motion. **For the Earth** • Satellite Imagery reaching a resolution of at least 15m per pixel based on various satellites over the entire surface with homogeneous colours over the whole globe. • Elevation with a resolution of minimum 30m • Cloud cover seen from space. This cloud cover can be modified by the user. • The Belt of Venus must be represented by the atmosphere of the Earth (shadow of the Earth on its atmosphere) • The reflection of the Sun on the oceans, sea and river must be simulated • The light reflected by the Moon must impact the atmosphere of Earth as well as the lighting of the ground of Earth and reflection on water according to its phase. • On the night side, light pollution in cities must be visible • The software should allow users to display the Earth following the different seasons, or speed up the time to show the changes of appearance of the Earth over a year. **For the Moon** • Images reaching a resolution up to 120mm per pixel • Elevation with a resolution up to 120m • Taking into account the illumination of the sun and the indirect illumination of the Earth (Earthshine)

	For Mars • Images reaching a resolution up to 230m per pixel • Elevation with a resolution up to 200m **For Mercury** • Images reaching a resolution up to 165m per pixel • Elevation with a resolution up to 665m **For Venus** • Images reaching a resolution up to 4,500m per pixel • Elevation with a resolution up to 4,500m • The full dome simulation software must include the terrain simulation of Pluto and Charon based on New Horizon mission. **All the data must be stored on the NAS or hard drives.**
22	It must be possible to load "on the fly" high resolution satellite imagery and high resolution relief files (Geotiff, JPEF2000 format, etc.) for a specific georeferenced area on at least Venus, Earth, Moon and Mars. Such images should be loaded on-line or off-line directly from the images generators.
23	The full dome simulation software must include shadow management as: • Shadow of the Moons on their planet • Shadow of the rings on their planet • Shadow of the planet on its rings • Shadow of the planet on satellites • Shadow of satellites on satellites • Shadow projected from mountains and craters for at least: Earth, Moon, Mars, Mercury, Ceres, Vesta, Phobos, Deimos, Comets nucleus, Asteroid's
24	It shall be possible to display rainbow at the surface of the planets, with proper position according to the observer position and orientation. The simulation should also allow to show primary and secondary rainbow as well as Alexander's band.
25	On Earth it shall be possible to show Aurora (shown in 3D and therefore visible from the surface as from space continuously)
26	On Earth, it shall be possible to visualize shooting stars. 2 modes shall be available: Generation of shooting stars according to defined parameters / Random generation of shooting stars. The user will define a precise position of a radian point with an area (expressed in degrees) around the radian point in which the shooting stars can start, as well as a number of stars per minute. It will also be possible to load these parameters from a meteor shower database. The database of shooting stars shall include at least the Leonids, the Perseids, the Orionids, Eta aquarids. The database can be updated by the user.
27	It shall be possible to show Animated volumetric procedural clouds when the observer is on the ground. Like the terrain and atmosphere,

	clouds shall use advanced lighting routines to provide the following realistic effects: red sunset, magnitude-based star hiding, light scattering, moonlight, glory, fogbow, illumination of the clouds by the Sun and the Moon, projection of the cloud's shadows on the terrain. The volumetric clouds need to be fully customizable directly from the user interface. It must be possible to choose their thickness, altitude, and type.
28	The full dome simulation software must represent lunar and solar eclipses. During solar eclipses, the atmosphere must react according to their magnitude and to the percentage of the eclipse. During a total solar eclipse, it must be possible to see the solar corona. It must be possible to see the Baily grain and the diamond ring effect. During a lunar eclipse the colour of the Moon become reddish according to Earth shadow position.
29	The simulation software should allow to simulate Zodiacal Light and Gegenschein under the Earth's atmosphere and also to leave the Earth for an extrapolated view of the dust cloud around the Sun.
30	The full dome simulation software must include Saturn's rings made up of endless particles of dirty ice. Each particle of the ring must react properly to the lighting of the Sun and allow to see the dark side of the particle.
31	The full dome simulation software must include a realistic representation of the sun view from Earth and Mars atmosphere and view from space
32	The full dome simulation software must include 3D animated model of the Sun showing variation of our Sun's surface in UV helium ionised 30.4mm wavelength and in visible wavelength.
33	The full dome simulation software must include various 3D models of known asteroids.
34	The full dome simulation software should include at least one 3D model of an interstellar object.
35	• The full dome simulation software must include 3D animated models of comets with automatic orientation of the comet's dust and plasma trails according to its position with respect to the Sun. • The plasma trail and the dust trail must adjust their length according to the comet distance to the Sun. The dust trail must simulate syndyne and synchrone.
36	At least 5 different 3D animated comets must be supplied to show the variety of comet's types: Bradfield like comet, Hale-Bopp like comet, Halley like comet, Hyakutake like comet and McNaught like comet.
37	It must be possible to show 3D model of Comets Nucleus, such model must show outgassing jets on the side illuminated by the Sun. 67P/Churyumov-Gerasimenko Comet Nucleus should be provided as such model.
38	• The software must include the possibility to show bolides entering the Earth atmosphere • It must be possible to visualize the bolide in 3D, meaning that it must be possible to take off the Earth Surface and visualize the bolide trajectory properly from atmosphere or from space. • The lighting of the bolides must affect the Earth's atmosphere and terrain, providing realistic renderings when visualized from

	the ground as well as from space looking down to the ground. • The famous Chelyabinsk bolide shall be available natively in the system, with a realistic rendering and accurate date and times of the phenomenon.
39	The luminosity of the stars, planets, satellites, in distant observation where the object is represented like a star, having a point representation and which are endowed with magnitude (stars, planets, satellites) will have to be calculated by a configurable function. The colour of such "stars representation" will be rendered and it will be possible to increase or decrease the visibility of their colour
40	The star database should contain more than 110,000 stars from the Hipparcos catalogue, more than 2 million stars from the Tycho-2 catalogue, and more than 1.3 billion stars from the Gaia DR2 catalogue. The stars will be positioned in 3D within the limits of the details provided in the original catalogues, during an interstellar movement, the apparent magnitude of each star will be recalculated taking into account for its representation.
41	It must be possible to get closer to at least 500 stars, during these movements, these stars will have to go from a point representation to a 3D representation as they approach. The labels of these stars can be displayed. It shall be possible to visit at least 100 stars in multiple systems with proper motion around their barycentre.
42	The stars will have to move according to their own movement, within the limits of the information contained in the catalogues, according to a date parameter of the simulation.
43	It should be possible to filter the stars, meaning to show only a part of the stars of these catalogues, according to information such as at least the spectral type, the absolute magnitude, the apparent magnitude, the distance, temperature, luminosity class, and radius.
44	The software has to represent the variability in magnitude of at least 1500 variable stars
45	The Milky Way must be represented in different ways. From the inside, it will be represented by an image wrapped around the viewer. From the outside, the galaxy will be represented by a volumetric 3D model. This volumetric model should represent the barred and spiral structure of our Milky Way and make it possible to show the absorption of dust clouds, particularly in side/edge-on view.
46	• In order to present the Milky Way in different forms from the solar system and allow the animator to narrate his speech, several such images must be provided: • Blurry texture giving the best possible perception of the Milky Way in a night sky. • Visible texture (real photo). • FERMI, IRAS and COBE image • HDR image accumulating the brightness of more than 1.6 billion stars from the Gaia DR2 catalog, whose appearance can be customized by the operator for color, brightness and contrast.
47	• The full dome simulation software must include an advanced volumetric representation of the Milky way when leaving the solar system. This representation must be based on scientific data and must represent when flying inside the model: • Population of Individual stars • Population of Individual Open clusters

	• HII Regions
48	The full dome simulation software must include at least 25 Volumetric Deep Sky Objects represented in real time at their proper location. Orion Nebulae shall be represented with a volumetric model Eagle Neabulae shall be represented with a volumetric model allowing the visualisation of the Pillar of creation
49	All known Globular clusters with their accurate position, size and stars composition be represented with a 3D representation showing the proper number of stars as well as proper distribution in space and in number of type of stars.
50	• It must be possible to move the observer to black holes inside the volumetric Milky Way. • The transition from the Volumetric Galaxy to the black hole environment must be smooth. • Two kinds of black holes should be represented. One with accretion disk, the second one without accretion disk. • The black hole has to distort the light of object located behind it, and the model with accretion disk has to show the accretion disk distortion. • It has to be possible to display a representation of a space and time grip showing that there is a singularity due to the black hole.
51	The offered software must include a 3D model of a Pulsar. The pulsar magnetosphere, radio jets and gravitational effect close to the star should also be available.
52	The software will have to allow to visualize the Hubble sequence and also to be able to move continuously through it thanks to the integration of at least 10 different 3D volumetric models of galaxies.
53	It must be possible to visualize a set of 3D models to form an explanatory diagram of the stellar evolution cycle showing he different phases of evolution.
54	• The full dome simulation software must include advanced 3D models with reflection of light on the objects, and with projection of shadow of elements composing the 3D Model. The catalogue must at least include the following objects: • Cassini • Crew Dragon • Apollo CSM • Gaia • Galileo • Hubble telescope • International Space Station with the possibility to visit the inside of the station • James Webb Space Telescope • Juno • Messenger • New Horizons • Pioneer • Rosetta • Soyuz spacecraft • Space shuttle • Sputnik • Voyager

	• Curiosity • Philae • Venera 9 Probe • Ariana 5 • Falcon9 • Saturn V • Soyuz Rocket • Perseverance • Ingenuity • Several Indian spacecraft, with at least Chandrayaan-2, Chandrayaan-3, Megalayaan-1 and Magalayaan-2 • Those objects shall have a photo realistic representation including effect such as reflection on the metallic and reflective parts
55	The Full dome simulation software must include the superclusters of Laniakea, Perseus-Pisces and Shapley. The data and their integration in the software used has to be validated and certified by the scientist behind those datas.
56	On Earth and on Mars it will have to be possible to adjust the altitude of the sea, to simulate a rise in water on Earth and the presence of liquid water on Mars
57	The full dome simulation software must include the Earth's magnetosphere.
58	The full dome simulation software must include simulation of the internal structure of planets, main satellites and Sun.
59	The full dome software must include a set of Science on a Sphere dataset from NOAA. The user must be able to include any Science on a Sphere dataset from NOAA released after installation.
60	The software shall allow the visualisation of Placemark datasets at the surface of planets, including at least: • Earthquakes on Earth • Craters on Earth, Moon, Mars • Volcanoes on Earth and Mars
61	The software shall allow users to add new datasets of by importing external files. Such file contain at least elevation, longitude and altitude data, colour and label for each placemark.
62	The software must load KML files for vectorial GIS information. The software has to draw the lines directly on the ground, and has to allow to create area with specific colour with the possibility to adjust the opacity.
63	The software should also allow users to add any standard image (non-georeferenced) on the surface of planets and satellites following its elevation. The size, position should also be adaptable and the rotation of the image to fit perfectly with the real terrain data should also be possible.
64	• The full dome simulation software must include a massive open source dataset or it needs to be under a license agreement with a third party which should not add any extra cost for any future update of the dataset. It shall also be possible to use the datasets to create shows for the planetarium as well as for selling it to any other third party without any limitation or additional costs.

The datasets must include at least:

- Full Gaia DR2 star catalog with possibility to show information from Tycho2, Henry Draper (HD/HDE/HDEC), Hipparcos, Yale Bright Stars (BSC), Gliese & Jahreiss catalog as well as Flamsteed & Bayer designation.
- 110 Messier object and more than 100 NGC-IC objects, represented with an image at the proper position.
- Exoplanets System with more than 2000 individual exoplanets orbiting their stars with a 3D model with appropriate texture according to exoplanet type.
- Data base of the location of artificial satellites of the Earth: SPACETRACK data base with over 14,000 objects.
- Location of Asteroid database: ASTORB data base from Lowel Observatory with over 460,000 objects. The software should also offer the possibility to download and visualize 3D models of asteroids online from a reputable website (e.g. Damit).
- Location of Comet database: Jet Propulsion Laboratory and NASA database with over 800 comets represented at the same time
- Oort cloud data base
- Location of Brown Dwarfs database with more than 1500 stars
- Location of Exoplanets and Exoplanet candidates locating more than 8000 of them
- Location of Supernova remnants with more than 150 of them
- Location of Planetary nebulae with more than 280 of them
- Location of HII regions with more than 120 of them
- Location of Ob Associations, with more than 100 of them
- Location of Open Clusters, with more than 2600 of them
- Location of Variable stars with more than 9000 of them
- Location of pulsar with more than 3000 of them
- Location of Globular Cluster with more than 160 of them
- Location of NGC-IC objects with more than 14000 of them located in the star field (view form Earth) and more than 7500 of them in 3D
- Location of Galaxies of the local group with more than 140 of them
- Location of Galaxy groups, with more than 150 of them
- Location of Galaxies from Tully Catalog with more than 30000 of them
- Location of voids, with more than 30 of them
- Location of Galaxies from 2dF catalog with more than 225 000 of them
- Location of Galaxies from 6dF catalog with more than 110000 of them
- Over 17,000 galaxies of the Cosmicflows-3 catalog, from the Cosmicflows Collaboration
- Location of Galaxy clusters, with more than 3000 of them
- Location of Superclusters with more than 170 of them
- Location of Galaxies from SDSSRD16, with more than 3 million of them
- Location of Supernova with more than 10000 of them
- Location of Quasars with more than 700000 of them from 2dF, 6dF and SDSS datasets

	- WMAP, COBE and PLANCK cosmic microwave background - Boundaries of stellar halo of the Milky Way, of the local group, of Virgo and Laniakea - Star orbits in the Milky Way of at least 8 stars and the Sun - Uncertainties of star position of at least 100 stars from Hipparcos or Gaia catalog - Location of at least 20 stellar black holes - The presenter must have the possibility to decide which datasets are shown (on/off) automatically depending on the distance to the observer.
65	The fulldome simulation software must include the 88 IAU constellations with asterisms, graphic representations, IAU limits and names of the constellations.
66	It must be possible to change easily the images used for constellation, size of the image, position and orientation of the image, as well as its colour.
67	Video constellation must be provided at least for the zodiacal constellations
68	The software must include ready to use astronomical grids such as: - Cardinal points - Meridian - Azimuth - Equator - Ecliptic with a graduation in day month that automatically adjust labels and graduations depending on the year of the simulation as well as with a fix representation (fixed on one year). - Circum polar circle with automatic adjustment depending on observer latitude - Earth's rotation axis - Earth's pole in star field
69	Full dome simulation software must allow operator to draw a line between two objects among planets, moons or stars. The operator should be able to lengthen the line and to add graduations on such line.
70	All astronomical objects should be able to display their label as well as a pointer to help the audience locate the object in the dome.
71	The full dome simulation software must include trace mode to see the trail left by the stars during a diurnal motion and to track for instance the artificial satellites in the sky.
72	The full dome simulation software must include modification of astronomical parameters like: size, distance ratio between a satellite and its planet, the factor of revolution of a planet around its star, the factor of rotation of a planet around its axis, the factor of revolution of a satellite around its planet, the factor of rotation of a satellite around its axis.
73	It must be possible to show trajectory of a planet, a satellite and the Sun in the dome referential. This feature will be used for example to show Sun analema, planets retrogradation.
74	It must be possible to load a spacecraft trajectory from JPL website (a conversion of format is acceptable, in such case, the conversion must be explained in the documentation), with such load, it must be possible to add a 3D model of the spacecraft that will automatically follow the trajectory according to the date of the simulation.

75	It must be possible to define orbital motion to objects following Kepler's law and TLE. It must be possible to attach a 3D model to this orbit.
76	The full dome simulation software must include image and video inserts (virtual slides and video). Image and video insert can be placed on the dome or in the 3D model. The following parameters must be accessible for the user: opacity, intensity, position, orientation, color filter and chroma key with a tolerance that can be adjusted by the operator. For videos, the following commands must also be available: play, loop play, pause, stop, etc.
77	The full dome software must support fish-eye format, spherical projection format, panoramic format and flat format.
78	It has to be possible to create a presentation "like MS PowerPoint" using images and video. The software has to allow to create transition between different configurations of images on the dome. One configuration has to remember the position, the orientation for several images or video. Then it has to be possible to define transition such as fading to make new images/video appear or disappear.
79	It must be possible to alter image parameters (colour, intensity, opacity, etc.) depending on the height of the Sun.
80	The full dome simulation software should be able to show shadow cones of satellites on planets.
81	It must be possible to display the habitable zone for at least 100 stars.
82	The software shall be able to display the radio sphere and to show its propagation according to the date of simulation.
83	The full dome simulation software must include a full dome video player.
84	Controls of the full dome video player must be available on the live control interface. Accessible controls must be Play, Pause, Stop, Seek, Fastforward and FastRewind
85	Audio track must be synchronized automatically with the Full dome video player.
86	The Full dome video player must be able to play at least 4K @60fps full dome video without slicing.
87	The full dome simulation software must be able to support various streaming protocols including at least NDI, UDP and HTTP protocol. Such stream shall be displayed on the dome as a standard rectangular video or as a fish-eye video.
88	The software must support AVM files. For such files, the AVM Image should be placed and sized according to the metadata information.
89	The full dome simulation software must include 3D inserts to incorporate 3D objects into the simulation with the following format: DAE (Collada), 3DS (3D Studio), OBJ (Wavefront), LWO (Light Wave Objects), LWS (Light Wave Scenes), CMOD (Celestia models).
90	It must be possible to import 3D models with embedded animation, for such import the documentation has to describe the process to load the animation in a proper way.
91	The full dome simulation software must include text inserts to display texts. They must be placed on the dome or into the scene and users can define the following parameters: position of the text in the 3D scene and position of the text in the dome 3D projection, content of the text.
92	Such text should be fit by operator set of characters, and in the operator sentence, it has to be possible to add information calculated by the

	software such as: date and time of the simulation, speed of the camera, distance of the camera to an object.
93	• The system shall be able to project other content than astronomy. Various STEAM modules shall be offered in order to make sessions about at least some of the topics listed below: • Heart Anatomy showing Heart in motion • Human Body anatomy (male and female) showing nervous system lymphatic system, circulatory system, urinary system, reproductive system, respiratory system, digestive system, integumentary system, muscles, bones. • Eye Anatomy • Animal cell, vegetal cell, bacteria cell, fungal cell • Periodic Table of elements • Fourier mathematical equation • Optical path • Magnetic field • Fractals • Combustion engine • Colour (additive and subtractive) • Trigonometry • State of matter
94	The system shall allow users to create content using Unity 3D Engine and to display it on the dome at the native resolution of the projection system.
95	• The GUI should be simple and user friendly. • Creation of scripts to automatize actions shall be possible with a graphical interface without writing any complex codes. • Drag & Drop features shall be possible to add images, play videos, play a script, move to one astronomical object to another. • A Dome View shall be represented in the GUI showing in real-time in a fish-eye style the content of what is displayed on the dome, this Dome View shall be interactive allowing to click directly on an astronomical object (such as sun, planet, satellites, constellations, stars) to access features such as intensity, orbit, trajectory, label. • The software shall allow to move in a fluid motion to astronomical objects with a simple "Go to" function available in the GUI for the astronomical objects available.
96	• The GUI shall have a dedicated GUI for direct control typically for doing night sky presentation. It shall be possible to control below function within the GUI without any additional scripting: • Switch on/off of starry sky, milky way, planets, satellites, sun, atmosphere, atmospheric effects (rainbow, clouds, aurora, rain, snow, lighting, moonlight, twinkling), shooting stars, zodiacal light, messier & deep sky objects. • Customize the atmospheric effects directly from the graphical user interface • Switch on/off orbits of planets and satellites, trajectories in the sky of sun, planets and satellites, pointers, constellations, asterisms, pictures, boundaries and names • Scale up Sun, Planets, Satellites • Control time (pick a date, start diurnal motion, start annual

motion, start analemma motion, start precession motion)
- Modify orientation of the theatre
- Control the camera (Sky View, Terrain View, Space View) with various manipulators possibility (Rotation, Free Fly)
- Adjust the Sky quality (number, size, color factor of stars, Milky Way representation and brightness)
- Show proper motion of stars
- Apply filters on StarrySky, composed of various catalogue including at least Hipparcos and Gaia DR2 catalog, in order to highlight or reduce the visualization depending spectral type, luminosity class, temperature, absolute magnitude, apparent magnitude, distance, catalog, radius, proper motion, distance, right ascension and declination).
- It shall be possible to let the software switch on/off datasets automatically according to the position of the observer, for example, when getting close to the Earth showing the artificial satellites dataset, when viewing the solar system, showing the asteroids dataset, when leaving the solar system showing the oort cloud etc.
- GUI shall allow to switch on/off on the dome classical astronomical grids and information with dedicated buttons (cardinal points, azimuth, equator, ecliptic, precession circle, meridian, longitude, latitude, date, time etc.)
- It shall be possible to directly visualize the current position and change the position and orientation of the camera easily, giving access to a zoomable map of the planet with a mapped terminator (on Solar System planets, dwarf planets and satellites).
- It shall be possible for the user to create its own control page with buttons linked to scripts.
- A list of pre-produced user pages must be available in additional to the ones users can create by themselves.
- It must be possible to open any web page in the user page tabs by setting its URL.

97	The GUI shall allow to control lighting, audio, power on/off projectors and computer, etc. with dedicated windows.
98	The GUI has to offer a visualization of the dome image.
99	It shall be possible to directly click on Sun, planets, satellites, stars represented on the dome (picking technology) and access the menu showing various actions for this object.
100	It shall be possible to use the mouse within the dome view to control the position and orientation of the observer.
101	It shall be possible to use the mouse in the dome view and see it as a virtual laser pointer on the dome.
102	It shall be possible to click in the dome view to define a precise point to zoom, using the mouse it shall be possible to zoom like with a telescope on the selected point.
103	It shall be possible to draw directly on the interactive dome view.
104	The software shall allow the possibility to play several scripts at the same time.
105	The GUI shall allow a control of the scripts and full-dome video being played (pause/stop/play)
106	The GUI has to allow the view of all resources included in the software

	(planets, moons, stars, etc.) as well as all resources added by the user in a library (images, video, 3D models, scripts, full dome shows, etc.)
107	It shall be possible to browse the library of objects of resource, as well as by searching keywords.
108	It shall be possible to drag & drop a resource directly on the dome view to start an appropriate action depending on the resource type.
109	Installing a new image or a new video, has to be as simple as a drag & drop from operating system files explorer to the GUI. Such drag & drop will automatically install the resource properly on the system, especially it will copy the resource on all necessary computers. The software has to automatically detect the type of file (standard, fish-eye, and panorama) so the resource will be projected properly once added to the dome.
110	Users must be able add/modify/delete files only in the MASTER computer and the software will handle the synchronization.
111	An interactive help center needs to be accessible directly form the graphical user interface.
112	The help center must include a field search to find information easily.
113	The GUI must include an editor for creating scripts without need for coding.
114	
115	It also shall be possible to record a script while doing action in live with the GUI. In this fast script creation mode, any action done with the GUI can be recorded as a script.
116	The software shall be able to render a show created with a script. "Render" means that the full-dome software has to record the dome view image per image (one image for each frame for 30 frames per second and for 60 frames per second).
117	The rendering mode must be able to render up to 8K frames.
118	The software shall allow the possibility to create script that will allow deep control of the simulation software.
119	The software shall allow the possibility to develop a web application and control the software from an external web application.

1.7. Show Control System and Operator Console

The display environment should include an integrated Show Control System, capable of controlling all hardware, other equipment, including the display system, audio, media, cove, lighting system, exit and emergency exit signage lighting. The Show Control System should provide following features:

Table 1.7

Specifications	Detailed description
1	The entire dome projection system, including the videoplayer, the astronomical simulation, the projectors, the optical star projector, the audio, the lighting, must be controlled from the control station. The control of the above systems must be automated and programmable with the use of e.g. scripts.
2	Displays for controlling digital immersive full dome projection system
3	The screen should have following: Atleast 2 monitors with Display size: minimum 22inch/24 inch (diagonal) Display Resolution: 1920X1080 or better. And a dimming hardware to control monitor brightness in dark environment.
4	The control master computer must meet at least the following parameters: a) CPU, with a minimum of 8 cores, 16 threads, mini 16 MB Cache b) RAM 32 GB DDR4 with a frequency of at least 2900MHz. c) Graphics card with at least 5880 CUDA Core, 1.5 GHz base frequency, 1.7 GHz boost frequency, 8Go GDDR6, Ampere architecture d) SSD drives with enough space to store system, simulation software data and 30 hours of video at native resolution e) Integrated backup SSD allowing backup of data & system
5	From the control station level, it must be possible to exchange and share data with other users of the software in the world using a cloud technology integrated in the software. Internet connection for the same will be provided by NCSM.
6	The contractor has to offer a solution in order to take the control of the control computer from abroad to support and/or diagnose the system remotely. Internet connection for the same will be provided by NCSM.
7	It must be possible to conduct a full live presentations from the control station. As well as wirelessly from a mobile tablet or iPad. The range of the wireless connection should allow to move around the dome without losing control on the mobile device.
8	The software installed on the tablet is to be identical to that installed on the Master computer. in particular, the software installed on the tablet must have the following functionalities: The Graphical User Interface must be the same as on the Master computer. Provide an interactive view of the dome that allows the control of the observer's position, clicking on an object and taking actions from the displayed menu via the touch screen of the mobile device. Provide access to any data installed or created on the Master computer Support the drag & drop function to start displaying images and other multimedia. The software running on the tablet and the Master computer must be synchronized, which means that a change made on one device is immediately visible on the other.
9	Wireless gamepad that enables control the camera like in a flight simulations.

10	It must be possible to control the Planetarium software for live shows using a manual console. This manual console will offer at least : 1. knobs 2. backlighted buttons 3. motorized sliders 4. Play / Pause / Stop buttons 5. rotating wheel 6. buttons with backlight digital display A digital Display • It must be possible for the operator to change the function behind the knobs, the buttons, the motorized sliders and the backlighted digital display buttons. This configuration has to be saved and restored at the when the system is restarted. • The rotating wheel has to offer the possibility to change the simulation time in a smooth manner while moving it. Diurnal, Sun analemma, Annual and precession time motion has to be accessible with it. • Play / Pause / Stop has to allow the control of a full-dome show and of a script controlling as well the audio of such full-dome show or script • The digital display has to show the date and time of simulation and using other buttons it has to be possible to select a new date and time and instantly jump to it • It must be possible for the operator to customize all the buttons, knobs, motorized sliders of the manual console in order to control a specific parameter (such as an intensity, an opacity, a variable of the system such as time, position, orientation, etc.) • It shall be possible for the operator to link a Backlighed Digital display button to a script and it has to be possible for the operator to change the Digital display button text accordingly. • It shall be possible to switch from various configuration of the console (affectation of the elements) using buttons of the console to move from one configuration to another. it shall be possible for the operator to: • Change the time and the date of the simulation • Change the longitude, the latitude, the altitude of the observation • Change the intensity of Sun, planets, Moon, Milkyway, atmosphere, • Change the size of Sun, Planets, Moon • Display constellations (UAI limit, asterism, graphical representation) • Display grids (equator, ecliptic, meridian, precession circle, etc.) • Display Time and Date on the dome • Start scripts made by the operator • Start full-dome shows • Any modification made on the manual console will be reported on the control console as well as on the mobile controller.
11	The control station must be equipped with a black matt wheel chair with adjustable height and backrest.
12	The control station must allow connection to a professional audio surround system by means of a multi-channel audio Interface. The audio Interface must be capable of transferring analog and digital audio data and offer the latest Plug and Play technology to guarantee a simple installation. It must include the following minimum characteristics: • 8 Channel Analog Interface • 2 + 2 Channel AES / SPDIF Interface

	• 8 Channel ADAT Interface
	• 24 Bit / 192 kHz Digital Audio
	• 40 x 20 Matrix Router

1.5 Calibration and Alignment

For Full dome Projection System with multiple projectors, manual adjustments for calibration and alignment are not feasible and hence automatic features are required to maintain calibration and alignment as per table 1.5.1 & 1.5.2.

Table 1.5.1

Specifications	Detailed description
Auto alignment and calibration	Software, hardware and camera based mechanisms to be included in order to ensure error free edge blending / geometric correction on screen as well as to maintain uniform colour and contrast on projectors and dome screen.
	Auto alignment, auto edge blending and correction system shall be available in the system through GUI.
	Software Preset to manage optimum brightness levels of Projectors in 2D mode.

Table 1.5.2

Specifications	Detailed description
Tools for Verification of calibration and alignment	Set of Instrument and software for verification of calibration and alignment parameters at site as per table 1.5.1

1.6 Integrated Audio System

A 7.1 surround audio system of Harman, BOSE, Sony, JBL or Yamaha brand shall be an integrated part of the overall system. It shall be fully controlled under the Show Control System as per table 1.6 and needs to be supplied and installed and it shall address the requirements of Full dome projection environment to ensure maximum immersive experience. The system shall also provide public address system inside the theatre.

Table 1.6

Specifications	Detailed Description
7.1 channel surround audio system	The audio system shall be fully integrated with the show controlsystem.Audiosystem shall consist of 3 speakers for the main front channels, 4 speakers for the surround channels and dual subwoofer system mounted suitably above the viewing platform or else at suitable locations as maybe required. Amplifiers are to be solid state and network controlled
3 speakers Left/Center/Right	a) Type: 3-way speaker b) Frequency response (± 3 dB): 50 Hz - 18 kHz

	c) Dispersion: 90° x 50°(-30/+20° up/down)
	d) Power: 460W passive
	e) Max SPL pressure: 134 dB, @ 1 m
	f) Crossover: Bi-amp (LF+MF/HF) or passive
	g) Sensitivity @ 1 m: 98 dB
	Nominal impedance: 4 ohms passive
4 speakers for the surround channels	a) Type: 2-way speaker b) Frequency response: (± 3 dB): 55Hz - 18 kHz c) Dispersion: 90° x 110° d) Power: 260W e) Max SPL pressure: 125 dB, @ 1 m f) Sensitivity @ 1 m: 92 dB Nominal impedance: 8 ohms
1 Subwoofer	a) Type: 1x18" subwoofer b) Frequency response (± 3 dB): 30 Hz - 500 kHz c) Power: 650W d) Max SPL pressure: 132 dB, @ 1 m e) Sensitivity @ 1 m: 95 dB Nominal impedance: 4 ohms
PowerAmplifiers	a) The audio amplifiers shall allow to control and amplify each audio channel independently. Each channel shall deliver an output power at least equal with the power of the speaker connecter to corresponding channel at given impedance b) Signal-to-noise ratio: > 103 dB (8 ohms, 1 kHz) c) Damping Factor: >200 (8 ohms, 10 Hz to 400 Hz) d) THD: <0.5%
Audioprocessor	a) DSP, EQ b) Built-in crossover, can convert up to 7.1 audio channels into passive, bi- or tri-amp. c) Speaker management d) Interactive graphical interface that provides

	the processor with a 1/3 octave graphic equalizer, LCD screen and volume button accessible on the front panel e) System fault detection f) Analog input connector to accept 8 channels of signals from external sources. g) 8-channel analog output h) Redundant output to directly distribute audio signals during a power outage. i) Microphone input with gain level adjustment j) LAN connection via RJ45 connector k) Frequency response 20 Hz -20K Hz, ref 1KHz +/-1dB l) THD + N <0.01%, 20 Hz - 20 kHz m) Dynamic range >102 dB
Digital Audio Mixer	a) connection of a minimum of 20 inputs and 10 outputs. b) The adjustment of the parameters may be done by a min 5" touch screen display. It can also be operated from a distance through remote control application. c) Allow to adjust the sound level of each sound input separately (microphone or other). d) Patch panel with a minimum of 20 inputs and 10 outputs to be connected to the digital mixer through a single cable. e) Equipment connected to patch panel should be allowed to be patched in the digital mixer as audio input / outputs.
2 wireless handheld microphones as well as the associated rack mountable receivers	a) Sensitivity 1.6 mV/Pa b) Sound Pressure Level 150 dB SPL c) Cardioid d) Signal-to-noise-to-noise ratio≥110 dBA e) Total harmonic distortion (THD) ≤0.9%
2 wireless handheld headphones as well as the associated rack mountable receivers	a) Sensitivity 2.1 mV/Pa b) Sound Pressure Level 154 dB SPL c) Cardioid d) Signal-to-noise ratio ≥110 dBA

	e) Total harmonic distortion (THD) ≤0.9%

1.7 U.P.S. System

A minimum 40 KVA online ph3-ph3 UPS system with isolation transformer, reputed make and having backup time of 30 minutes to be provided by the bidder for digital immersive full dome 2D projection system as per table 1.7 given below.

Table 1.7

Specifications	Detailed Description
U.P.S. system (True IGBT with 30 minutes backup time and including isolation transformer of reputed brand: APC, Emersion, Numeric, Veritv or Schneider or equivalent	Please provide specifications of the U.P.S. system including make and model.
Battery bank with suitable rack	Please specify number of SMF batteries with detailed specifications and make. All batteries supplied must be from same batch of production.

1.8 Seating Arrangement (Minimum 190 chairs + 5 spare chairs)

The bidder shall submit scheme including sight line drawings for layout of seats, and detailed engineering drawings for change of existing layout if required. Specification of the chairs is given in table below.

Specifications	Detailed description
Reclining Chair	Tip-up and back push reclined chair • Centre to centre 21". • ABS moulded housing for seat & back cushions • All sheet metal parts with powder coated • Arm rest in Polyurethane injection moulded. • Seat numbering on inner both the side of the chair stands with silicon fluorescent thin stickers. • Row number for seat along the aisles. • Provision for LED lights on sides along with aisles with the row and the seat number display. • For Noise Reduction Nylon components on moving

	parts. • Angle of tilt of the chairs shall be adjusted as per the location of the seat for easy and optimal viewing of the shows.
Frames	15 mm thick high pressure steam pressed hard ply wood for seat and the back, out of which the back is of 12 mm bent ply.
Fabric	Colour to be approved by NCSM authorities. All fabric to be used shall be fire retardant. Test certificates should be submitted.
Spring	Spring for tip-up and back push mechanism shall be torsion spring with spring steel IS:4454-1 (2001) grade III.
Sheet-metal components	• DRCA/CRCA Sheet metal IS:1079 1994 • Side stand 3mm (+/- 0.2 mm) thick, size: 415 mm(+/- 5 mm) x 345 mm (+/- 5 mm) both side bottom circular cutting with 140 mm radius. • 75mm x 25mm 16g 190 mm length tubular pipe form the leg welded to the 3 mm plate. • Flat for base of the stands 280 mm (+/- 2 mm) length 50 mm (+/- 2 mm) x 5 mm (+/- 0.2 mm). • Mechanism components 2 mm HRCA Back push box 180 mm(+/-2 mm) x 70 mm (+/-2 mm) & height of the box 15 mm (+/-2 mm), ear "L" bracket attached to be box 190 mm (+/-2 mm) x 135 mm (+/- 2 mm). With two slot holes for fixing the back. Tip-up box 180 mm (+/-2mm) x 70 mm (+/-2mm) & height of the box 15mm (+/- 2mm), ear "L" bracket attached to the box 35 mm (+/-2mm) x 125 mm (+/-2mm). With two slots holes to fix the seat.
Seat and Back cushion housing	ABS moulded vacuum forming out of 2 mm sheet.
Vinyl Flooring	Dark coloured vinyl flooring with minimum 2 mm thickness.
Vinyl Flooring / Carpet Flooring	• Supply & laying of Nylon loop pile carpet over an under layer of 6 mm thick kinny foam as per following specifications: Make: Heritage Labelle, Colour: 6906 Peninsula or equivalent approved make & colour. • Specifications construction: 1/10" or 1/8" Tufted Cut & Loop pattern, Fibre: 100% Solution Dyed Nylon, 2-Ply Headset., Pile weight: can 1085g/sqm (32oz/y2), Pile height: ca 6.5mm (+/-3%), total height: ca 8.5mm (+/-3%), total height: ca 8.5nn (+/-3%), Density: 4500, Primary Backing: PP woven cloth, Secondary

	Backing: Action Bac
	• Standard Roll size: 3.66m x 30m
	• Performance: Stain Resistance: 10 (AATCC-175-2003), 3M Scotchguard Treatment, Static Control: Build in Permanent, Tuft

1.9LED Cove light

Cove lighting to be integrated with show control system.
Make: Philips or chroma cove or equivalent

Table 1.9

Specifications	Detailed description
Cove Light	• Beam Angle 120° x 120° • Lumens : As per BIS norms • LED Channels Red / Green / Blue • Mixing Distance 2 in (51 mm) to uniform light • Lumen Maintenance *50,000 hours L50 @ 50° C (Full output).
Design	360° Layout in Aluminium Cove Trough in aesthetical indirect lighting arrangement. Ample amount of LED Modules to be provided to avoid dark zones. Provision for software programmability of different modes and colour effects along with programmable hardware presets.
Maintenance lighting	Separate additional white LED light is required to be installed for theatre maintenance purpose, controllable from single switch.
Foot lighting, Exit signage and Emergency Exit signage	**Foot Lighting:** The lighting effect should be created using a fibre opticrod that is end-illuminated with high intensity LEDs with 50,000 hour life expectancy. The unit should flush with 6mm Carpet. **Entry & Exit Ramps Lighting:** Led wall light Should provide 2.2 lux at 1.9m distance when mounted 300 mm above floor. **Seat Row Indicators:** Seat row indicators should be installed to identify the location of seating rows, to provide illumination for guidance (e.g. by emergency exits) or to illuminate the floor for sage movement in full dome theatre when the main lighting is dimmed.

1.10 Full dome planetarium/ astronomy sky shows of 25 to 35 minutes duration in English and Malayalam.

1.10.1 One Licensed digital 4K 2D full dome film show in English and Malayalam for duration of about 30 minutes for 3 years license is to be supplied, encoded and tested for satisfactory projection.

1.10.2 The selected bidder shall provide at least 1perpetual Hybrid 2D full dome Planetarium Shows in English and Malayalam for duration of about 30 minutes . The films to be supplied, encoded and tested for satisfactory projection.

1.10.3 The selected bidder shall provide at least 8 free 2D full dome Planetarium as well as Astronomy Sky Shows available in-house or from international producers like NASA/ESO/ESA etc. in English and Malayalam. Out of 8 free shows, the agency must provide at least two Astronomy Sky Shows of duration 30-35 minutes.

Note:

i.   Necessary scripts and original sound tracks in digital format must be supplied.
ii. The shows should be of around 30-35 minutes duration.
iii. The selected vendors should provide list of all latest available shows in DVDs or other information storages from which NCSM will select above shows.

2.0 Brochures and complete specifications

Bidders shall provide printed brochures and detailed specifications for various OEM products. The brochures, documents and engineering drawings as per Table 2.0 have to be provided along with technical bid including compliance Table 2.0. The bidders have to respond with stipulated time for additional information/clarifications sought afterwards, if any.

Bidders may be required to make technical presentations explaining their offered scheme after opening of Technical & Commercial Bids (Cover-1), if decided by NCSM. The decision of the NCSM in respect of techno-commercial evaluation of Cover-1 of the tender and selection of qualified and eligible vendors for opening of Financial Bid (Cover-2) shall be final and binding on the bidders.

Information to be submitted by the bidders in Cover-1

Table 2.0

Detailed Description
Brochures and specifications of Digital Projectors, Lenses, Mounts, Blending and Geometric Correction Units, Display Management System, etc.
Brochures and specifications of Optomechanical projector.
Brochures and specifications for Image generator servers interactive Planetarium software, Fulldome configuration & playback system and projection systems.
Brochures and specifications for Show Control System.
Brochures and specifications for Calibration and related instruments and software.
Brochures and specifications of Software Elements along with licensing details.
Brochures and specifications of Show creation workstation and show creation software.

Brochures and specifications for Audio systems.
Brochures and specifications for UPS system with 30 minutes backup.
Engineering drawing (plan, elevation and sectional views wherever necessary for viewer's gallery and image servers from in pdf and Auto CAD file format), complete solution diagram, connectivity diagram, system deployment and foot print detail, electrical power requirement and location marked diagram/drawings, system cooling requirement (in BTU) with proper layout drawings.
Detailed write-up and specific system solution document explaining the integrated working of offered solution with the hardware and software describing various technical, interface and performance aspects, writing / network diagram of the proposed solution. This has to explain how the proposed design or solution meets to specifications and overall requirements as mentioned in the tender document.
Schematic diagram and broad material specifications of the structure for mounting the projectors showing suggested location of the projectors including arrangement for accessibility to the projectors for maintenance.
Details and product catalogues of LED Cove light, exit signage and emergency exit signage.
Details regarding source of content development for planetarium shows using datasets/ library of 3D models/cloud assets.

2.1 Write Ups Related to Design

Bidders shall provide following documents as per Table 2.1 along with technical bid.

Table 2.1

Detailed Description
Document on design techniques highlighting how Hybrid and Fulldome Digital 2D immersive projection system will be met by the offered solution using the proposed sub-systems. Detailed write-up of functional role of each sub system solution shall be described.

3.0 User Training and Documentation

Two levels of training are to be arranged – Basic training of two days for 5 executives and 10 days of technical training for 5 participants is required to be organized at **RSC&P, Calicut. Training material and complete installation manual in both hard and soft copies is to be provided (two sets of each).** The faculty providing training should be certified from parent company (OEM) or technical and experienced persons from system integrator. During maintenance period agency shall provide online assistance for the development of new programmes as per the requirement of the RSC&P Calicut/NCSM.

Training Topics on FULLDOME PROJECTION SYSTEM

Table 3.0

Sl. No.	Detailed Description
1.	Architecture of HYBRID &FULLDOME PROJECTION SYSTEM
2.	Hardware components of HYBRID &FULLDOME PROJECTION SYSTEM (Projectors, screen, controller, image servers, network elements, storage etc.)
3.	HYYBRID &FULLDOME PROJECTION SYSTEM Administration:

	Hardware and Software Installation, Configuration, Trouble-shooting and Maintenance procedure including preventive maintenance.
4.	Alignment and Calibration with usage of instrument and tools
5.	Field replaceable components and applicable procedures for field repalcement
6.	Special features of the show control software
7	New show creation
8.	FAQs

4.0 Delivery Schedule

The entire work shall be completed within **7 (SEVEN) months** from the date of placement of order.

5.0 Warranty and AMC:

Warranty: The successful bidder shall provide a **Single Window Onsite Comprehensive Warranty** on all the items supplied under the purchase order as has been enumerated in detail below. **The warranty period for the entire installation is for five years for all components of the system from the date of issue of acceptance certificate by NCSM.**

AMC: The comprehensive annual maintenance contract will be for a period of two years, after expiry of the warranty period of five years.

i. Bidders shall quote **comprehensive annual maintenance charges** along with applicable taxes for two years, after expiry of warranty period of five years from the date of commissioning and handing over to NCSM on year to year basis. The tax break-up for all such rates shall be clearly spelt out as on the date of submission of the tender.

   Note: The order for two years of comprehensive annual maintenance after the completion of five years of comprehensive warranty will be placed by VITM/NCSM separately after the completion of comprehensive warranty period.

   The bidder shall undertake at least one Preventive Maintenance Visit per year and attend to all break down maintenance calls or emails.

   Bidder shall provide remote support regarding the operation and maintenance of the digital projection system and servers. It must include at least the following services:

   - Hotline service accessible by telephone, video call, e-mail or internet.
   - Remote system checks (configuration problems)
   - Remote system access.
   - Self-alignment assistance.
   - Update database.
   - Troubleshooting and problem solving
   - Correction of all malfunctions that are possible to solve by remote maintenance.

ii. **During defect liability period of five years and subsequent comprehensive maintenance contract, comprising of two years, the following terms shall be applicable.**

   a) Preventive Maintenance for all the equipment including aluminium perforated dome and peripherals as supplied by the bidder. The bidders shall submit a schedule for such preventive maintenance and shall form part of the agreement.

b) Repair of faulty / defective parts and peripherals and maintenance of aluminium dome panels.

c) Replacement of faulty parts and peripherals. All replaced parts shall remain as property of NCSM.

d) During the AMC period the selected bidder has to replace all the UPS batteries as and when required. The batteries shall be provided by NCSM.

e) All the parts including networking cables, connectors, etc. that may be required to maintain the system shall be supplied by the bidder at their own cost.

f) Any break-down, failure or malfunctioning of the system shall be attended to and put back in service within 48 hours. However, all round efforts must be made to set right the system in shortest possible time. Service shall be available for at all times for 364 days in a year.

g) The selected bidder will maintain the minimum essential spares at their own stores and the required tools/test equipments/software so as to reduce the break-down time.

h) Spare parts manufactured by Original Equipment manufacturer (OEM) will be preferred. However, in unavoidable situations spares manufactured by equivalent manufacturers may be used with prior approval of NCSM.

In case of any requirement for replacement of any supplied spares by the bidder, NCSM shall not be responsible for re-export of the damaged components and that will be replaced by the successful bidder.

An overall remote supervision of the installation and maintenance shall be observed by the OEM/Authorised or Registered Agent.

NATIONAL COUNCIL OF SCIENCE MUSEUMS
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Tender No. I-18012/7/24(195)

INSTRUCTIONS FOR BID SUBMISSION

Interested bidders may download the tender documents from the https://eprocure.gov.in/eprocure/app with Tender No.: **I-18012/7/24(195)** and shall apply online. Only tenders submitted through E procurement portal is accepted. However, a hard copy of 'Technical Bid' alone may also be submitted to the above address as a reference. The instructions given below are meant to assist the bidders to prepare their bids in accordance with the requirements and submit their bids accordingly.

A. INSTRUCTIONS FOR ONLINE BID SUBMISSION

The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at:

https://eprocure.gov.in/eprocure/app**.**

REGISTRATION

1) Bidders are required to enrol on the e-Procurement module of the Central Public Procurement Portal (URL: https://eprocure.gov.in/eprocure/app) by clicking on the link "**Online bidder Enrolment**" on the CPP Portal which is free of charge.

2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.

5) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.

6) Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.

SEARCHING FOR TENDER DOCUMENTS

1) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders,

wherein the bidders may combine a number of search parameters such as Organization Name, Form of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.

2) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

1) Bidder should take into account any corrigendum published on the tender document before submitting their bids.

2) Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF/JPG formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" or ''Other Important Documents'' area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

Note: *My Documents space is only a repository given to the Bidders to ease the uploading process. If Bidder has uploaded his Documents in My Documents space, this does not automatically ensure these Documents being part of Technical Bid.*

SUBMISSION OF BIDS

1) Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

3) Bidder has to select the payment option as "offline" to pay the tender fee / EMD as applicable and enter details of the instrument.

4) Bidder should prepare the EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the concerned official in NCSM Purchase Department, latest by the last date of bid submission or as specified in the tender documents. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the uploaded bid will be rejected.

5) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. If the price bid has been given as a standard BoQ format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BoQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected. The cost break up sheet also is to be uploaded in Cover II as specified in the Tender.

6) The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

7) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid opener's public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.

8) Upon the successful and timely submission of bids (i.e. after Clicking "Freeze Bid Submission" in the portal), the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

9) The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

ASSISTANCE TO BIDDERS

1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk.

The Director
CRTL, NCSM

NATIONAL COUNCIL OF SCIENCE MUSEUMS
33, Block – GN, Sector V, Bidhan Nagar,
Kolkata – 700091, West Bengal, India
Phone: +91 33 2357 9347/ 2357 5545 2357 0850
Fax: +91 33 2357 6008 E-mail: sciencecentre@ncsm.gov.in

Tender No. I-18012/7/24(195)

TECHNICAL (Techno-Commercial) BID

Notes: ALL PARTICULARS / INFORMATION SHOULD BE GIVEN IN THE FOLLOWING FORMAT WITH COMPLETE DETAILS.

1	Name of the Bidder	:	
2	Back ground details of the Bidder Limited Company / Corporation / Agency / Consortium / JV	:	
3	In case of Consortium or JV, Name and Address of the Lead Partner		
4	The mailing address of the Bidder with PIN/ZIP Code	:	
5	Contact details	:	
	Name of the contact person Mobile no of the contact person	:	
	Telephone number(s) Mobile	:	
	E-mail address	:	
	Website	:	
6	a. Background details of the Bidders (State whether original manufacturer / authorised Registered Indian Agent of the Manufacturer).	:	
	b. In case of authorised Registered Indian Agent, submit a notary certified copy of the valid Bidder Agreement authorizing to bid on behalf of the OEM for the project. (Please mention "SUBMITTED' or "NOT SUBMITTED")	:	
	c. Name and Address of the Vendor to whom the order will be placed. NCSM would like to procure the ensure system from a single source.	:	

7	Whether capable to supply and install the Full dome Hybrid Planetarium (optomechanical and digital) System as per Technical Specification given in the tender document. (Please mention "YES" or "NO") Please fill up technical compliance sheet as per **Annexure-D.**	:	
	If it is mentioned "NO" above, submit a detailed deviation to be made from the enclosed Technical Specification. (Attach extra sheet, if required)	:	
	Submit the detailed specifications of the offered product including copies of the Product brochure	:	

8	Submit the proposed drawings of projection systems, audio system, dome screen, seating arrangement, console, reclining chairs, server room, Electrical schemes of the proposed solution.
	 Note:
	   a. Digital Projectors are to be mounted in the periphery of the dome.
	   b. Optomechanical Projector is to be mounted at the centre.
	   c. Seating arrangement should be unidirectional with minimum number of 190 seats
		:	

9	Single point contact details for all post-installation services related issues with hierarchy levels (if any)	:	
10	Please provide detailed address and set up link from where support for maintenance during post warranty shall be offered by the firm at RSC&P, Kozhikode (Calicut).	:	
11	Agency must supply the spare parts and provide maintenance support for the Digital immersive full dome 2D projection system at least for 10 years.	:	YES / NO
12	Agency must supply the spare parts and provide maintenance support for the Optomechanical Projection system at least for 15 years. (In case of NO, mention the number of years for the same.).	:	YES / NO
13	Submit technical brochures indicating the detailed technical specifications of the system as given in the table below:-	:	

Detailed Information is to be submitted by the Bidders as per the following table

Sl.	Details of Information Required	Qty
	Details of civil, seating layout and electrical work including air-conditioning for the projectors and servers enclosures to be taken up by the bidder.	1 Set
	Details of the six Digital Projectors with special mountings. This set should contain projectors proposed, its make, complete specifications, its weight, dimensions, details about lenses, heat load, power consumption, noise generated, location of projectors etc.	1 Set
	Details of one number of opto-mechanical projector with lifting platform. This set should contain projector proposed, its make, complete specifications, its weight, dimensions, details about lenses, heat load, power consumption, noise generated etc.	1 Set
	Edge blending and geometric correction details	1 Set
	Image Generator, Interactive planetarium software and playback system details including specifications and product catalogues. Digital library and software for playback and creation of planetarium shows.	1 Set
	Display management, calibration and alignment system details	1 Set
	Show Control System details	1 Set
	Networking and data cabling schematic layout	1 Set
	7.1 surround sound system details including product catalogues, location of speakers etc.	1 Set
	LED cove lighting, exit and emergency exit signage and LED step lighting with all associated electrical wiring works.	1 Set
	Complete details of U.P.S. of 40kVA with 30 minutes back up including technical catalogues/brochures. Details of batteries including their brochure is also required to be submitted.	1 Set
	Seating layout and design details of reclining chairs along with line of sight diagrams (locally available materials may be considered).	1 Set
	Indicative list of documents/manuals/drawings that shall be provided to NCSM while handing over. Suggested training scheme, topics may also be included in this set.	1 Set
	Timeline (PERT/CPM) for execution of the entire work from the date of placement of order indicating therein parallel activities and critical path to establish completion of the entire work within the stipulated time schedule.	1 Set
	List and quantity of each spare that shall be provided by the bidder initially to fulfil onsite comprehensive warranty of five years and AMC afterwards. All the tools, tackles, gadgets, devices that shall be required for measuring, operation, maintenance, testing etc. shall be included in this list and shall form part of the initial supply.	1 Set
	The bidders must provide a list of free shows and licensed shows, 4K, full dome as detailed below : (1) At least 08 Free shows having immersive experience and good scientific/educational content available in house or from international producers like NASA/ESO/ESA etc. in English and at least two shows to be selected by NCSM to be translated in Malayalam.	1 Set

	(2) One full dome hybrid planetarium show having perpetual license using Hybrid system in English as well as in Malayalam for about 30 minutes duration which is to be developed, supplied, encoded and tested for satisfactory projection. **(3)** 2D Digital full dome show from reputed producers with license for three years	
	Information/Details regarding any other items not included above may be submitted in this set.	1 Set

Note: Bidders shall provide proposed detailed Bill or Quantities of each item as mentioned in the above table along with schematic system architecture and product catalogues for all hardware items.

I / We hereby declare that the above statements are true and correct. I / We also declare that I / We shall abide by the decision of National Council of Science Museums regarding selection of eligible firm(s) / type of equipment or system / multimedia show contents scheme for opening of Financial Bid (Part-II).

Date:
Official Seal & Signature of the
Bidder/Constituted Attorney
Place:

NATIONAL COUNCIL OF SCIENCE MUSEUMS
33, Block – GN, Sector V, Bidhan Nagar,
Kolkata – 700091, West Bengal, India
Phone: +91 33 2357 9347/ 2357 5545 2357 0850
Fax: +91 33 2357 6008 E-mail: sciencecentre@ncsm.gov.in

Tender No. I-18012/7/24(195)

The Financial Bid Format is given here for reference only. The Bid Shall be uploaded only in the BoQ excel sheet in the financial cover

Tender Inviting Authority: National Council of Science Museums, Kolkata   **ANNEXURE C**

Name of Work: Supply, Installation, Integration, Testing and Commissioning of complete and fully integrated functional Full dome Hybrid 2D Immersive Planetarium Projection System at Regional Science Centre & Planetarium, Kozhikode (Calicut)

Contract No: I-18012/7/24(195)

Name of the Bidder/ Bidding Firm / Company :						
		PRICE SCHEDULE **(DOMESTIC TENDERS - RATES ARE TO GIVEN IN RUPEES (INR) ONLY)** (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)					
NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	Total Amount including all duties & taxes	TOTAL AMOUNT includign all duties & taxes in Rs. P	TOTAL AMOUNT In Words
1	2	4	5	7	14	15
1	Supply, Installation, Integration, Testing and Commissioning of complete and fully integrated functional Full dome Hybrid 2D Immersive Planetarium Projection System at Regional Science Centre & Planetarium, Kozhikode (Calicut)					
1.01	Supply, Installation, Integration, Testing and Commissioning of a complete and fully integrated functional Full dome 2D immersive Hybrid planetarium projection system in an existing approximately 15 meter diameter perforated aluminium dome screen with geometrical correction, image stitching and blending etc. for seamless projection of high resolution full dome Hybrid planetarium shows including onsite comprehensive warranty for five years. (With free shows) (Total Amount as per PART A & PART B of Cost Breakup Sheet Annexure H)	1.00	Set		0.00	INR Zero Only
1.02	Supply, Installation, testing and Commissioning of Optomechanical Projection System synchronized with digital projection system with hybrid show. (Total Amount as per PART C of Cost Breakup Sheet Annexure H)	1.00	Set		0.00	INR Zero Only
1.03	(-Minus) Buyback of existing Planetarium Projection System. (As per Annexure Z)	1.00	Set		0.00	INR Zero Only
Total in Figures					0.00	INR Zero Only
Quoted Rate in Words			INR Zero Only			

TECHNICAL COMPLIANCE TABLES

1.1 Refurbishment of Dome

Table 1.1

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Refurbishment of existing dome screen	Refurbishment of existing 15m Dome Screen that includes cleaning of dome, repair/replacement of damaged & stained panels using the spare panels available and repainting as per standard dome painting procedures using certified Dome screen paint from original Dome manufacturer. The final reflectivity of the panels should be 0.53.		
Acoustic Insulation for Dome Screen	Removal of existing acoustic insulation and supply and fixing of Blackout insulation jacket with ASTM E84 standard with minimum 1 inch thickness and NRC 0.6 to 0.8 on the top of the Dome screen		

1.2.1 Projector Array

Table 1.2.1

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Number of Projectors	6 Nos. and an additional spare projector		
Type of Projector	Phosphor Laser Projector, 4K resolution, minimum 10,000 Lumen from solid state illumination, at least 16000:1 of native contrast ratio, 60 Hz frame rate.		
Projector array comprising multiple projectors	To cover 15 meter dome screen non tilted without casting shadow from the optical projector in the centre.		

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Total Resolution after blending	20MP or higher (after blending)		
Mounting	Projectors are to be mounted on the specially designed structure around the dome periphery.		

1.2.2 Digital Projector

Table 1.2.2

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Display Technology	4K SXRD panel		
	Source: Phosphor Laser		
Brightness	Min 10000 lumen		
Minimum native Resolution	Minimum 4096 pixel x 2160, 60 Hz, at minimum 16 000: 1 native contrast ratio.		
Internal Input / Output ports	HDMI 10 bits minimum		
Input / Output Control and networking	RS-232C, LAN		
Lens Options	must be fitted with wide lenses specifically designed for the projector configurations on a dome-screen.		
Source Life	Minimum 20000 hrs		
Operating Hours	The System shall be capable of being used for twelve hours per day 364 days in a year.		
Monitoring Parameters	Source life, Fan status, Temperature status, etc.		
Noise	<40 db at 25°C per projector		
Cooling	Self-contained		
Accessories	All standard accessories including IR remote, Line cord etc.		
Warranty	Manufacturer's standard warranty of not less than 5 (five) years on projectors.		

1.3 Optical star Projector

Table 1.3

Specification	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Star projector	a) The optical star projector should be optimized for 15m dome to ensure top quality of projection of full sphere. b) The optical star projector should have bright LED as lift source serving at least 30,000 hours c) The optical star projector should be able to project fixed stars down to magnitude 6.3 to 6.56 all over celestial sphere in their apparent magnitude brightness with number of fixed stars from 7000 to 9500. d) at least 18 stars of the brightest magnitude should be projected individually in true colours. e) At least 4 stars should have the variable star presentation. f) Milky way should be represented as micro stars with at least 200,000 stars g) At least 26 deep space objects should be projected. h) Cardinal points of North, West, South and East should be available on the optical projector. i) At least 38 constellations to be projected with the optical projector j) The Sun to be projected optically capable of showing both daily and annual motions (preferably size of 1 degree) k) The Moon to be projected optically capable of showing both daily and annual motions (preferably size of 1 degree) l) The visible planets (Mercury, Venus, Mars, Jupiter and Saturn) to be projected optically with both daily and annual motions m) To be able to project optically constellation lines for Crux, Orion, Cassiopeia, and Scorpion. n) The optical projector should be able to simulate Dawn and Dusk, Sunrise and Sunset twilights. o) The optical projector should be able to project Ecliptic line, Meridian, equatorial coordinates p) The optical projector should be able to project cardinal 4 points. q) The optical projector should have gravity/electronic shutters for its star plates to avoid projecting stars below horizon r) The optical projector should be able to project its starfield from any given location on Earth. Map input should be available. s) The optical projector should be able to project its starfrield at any given time +- 4000 years, in		

	Universal time and local mean time.		
Hybrid projection	a) The Star projector should be capable of synchronizing with the Full-dome Digital Projection system with calibrated astronomy features enabling seamless switch over. The operation should be easy and comfortable and devoid of complex programming. The integrated automatic control is the necessary precondition for this hybrid system and should be integrated with the installed analogue Control Panel. b) There should be a single GUI allowing control of digital system and hybrid system. The same controls of digital system should be usable in hybrid mode. Different console for each system, where digital system controls are locked in hybrid mode is not accepted. c) The planetarium system should be capable of operating either independently (Manual or Auto) or in hybrid mode in conjunction with the optical planetarium system, in complete synchronization. This feature should be available also through the Manual Console Panel. d) A manual analogue console should be installed, with backlit to control the hybrid system even when monitors are switched off. e) The tolerance between digital stars and optical stars should be less than 2cm f) The Constellation stick figures from the digital projection should be accurately placed through the optical stars. There should not any deviation of accuracy during diurnal or polar movements. g) The planetarium control system should include easy to use icons for Star field, Milky way, Planets, Sun, Moon, Astronomical Labels, Grids, etc. h) The system should have a graphical interface for user friendly operation, labels should be capable of being displayed in ~~multiple languages such as~~ English, and others and should accurately identify optical stars i) The digital projectors should cast no shadow of the optical projector in hybrid mode j) The optical device should be installed on lifting platform so that it is moved to the spring line height when used, and lowered when not used. k) The system should allow dynamic contrast control lowering brightness to allow true black level in hybrid mode.		
Lift and installation	a) The optical star projector should be installed in the centre of floor without casting shadow on dome. b) The working position of the star projector should be at the spring line of the dome that the allows projection the true horizon on the dome screen		

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
	c) The star projector should be installed on a lifting mechanism so that it is lowered when not in use. When lowering the star projector should be fully below the dome spring line level.		

1.4 Image Generator Server and Playback System with full dome and planetarium show software (1 master + 6 nodes+ 1 spare)

Table 1.4

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Image Generators	• 8 cores, 16 threads, mini 16 MD Cache. • RAM 32 GB DDR4 with a frequency of at least 2900 MHz. Solid state Hard drives simulation software data and 30 hours of video at native resolution • Graphics card with at least 5880 CUDA Core, 1.5 GHz base frequency, 1.7 GHz boost frequency, 8 Go GDDR6, Ampere architecture graphic cards. • SSD drives with enough space to store system, simulation software data and 30 hours of video at native resolution. • Integrated backup SSD allowing backup of data & system.		
Pre-process Data transfer Rate	No jerks, flicker or image tearing should appear on screen. Frame rates up to 60 fps.		
External video playback	HDMI or Display port inputs should be added to allow connecting external HDMI or Display Port signals and capture them into the planetarium digital projection system. These inputs must be able to capture the image in a resolution of 3840x2160@60Hz. In this way, the Planetarium digital projection system will enable real-time display of any content from an external source connected by the presenter in flat mode with a resolution of 3840x2160@60Hz or a 3840x3840@60Hz full dome content. NDI low latency video streaming technology must be used between those inputs and the image generators.		
Content	Astronomy software, calculated in real time Previously prepared shows, encoded in popular formats such as XVID-H.263, AVC-H.264, HEVC-H.265 Obtained from an external source via streaming. Obtained from an external source via External video Playback input.		
Acceptable	Dell/HP or equivalent		

make			

*Additional SSD and RAMs may be configured to meet the overall specifications, if necessary.

1.5 Content creation Server/ Player

Table 1.5

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
1	Full dome projection system must be controlled by a full dome simulation software with real time astronomy as one of the main features.		
2	All images and databases provided with the full dome simulation software must be completely free of copyrights and can be used to create shows as many times as desired. Automatic updation of database must be available at free of charge.		
3	The full dome software must incorporate the following: **Simulation of the followings:** • Night sky • Solar system • Extrasolar (multiple star systems, exoplanet systems) • Deep sky objects • Milky way • Earth sciences **Requirement of the following components:** • Full dome video player • Slideshow player to allow the display of flat, fish-eye or panoramic videos and Images with transition like a "PowerPoint" presentation. • Data 2 Dome compatibility • Cloud sharing and social media **Requirement of the following interfaces:** User Friendly Graphical Interface Wireless interface VR Compatibility		
4	• **Astronomical features required:** • The simulation of the sky including the following celestial objects: Sun, planets, dwarf planets, natural and artificial satellites, asteroids, comets, stars depending on the date over an interval of + or – 100,000 years, the position and the orientation of the observer using the VSOP87 and SPICE calculations.		

	- The calculation and correct representation of the apparent magnitude of stars, planets and natural satellites depending on the position of the observer and the date. - The proper movement of the stars. - Steller parallax. - The representation of the variability in magnitude of at least 1,500 variable stars - Simulation of multiple star systems - Simulating the position of at least 2,000 exoplanets around their star - Moon Libration - Real-time shadow projection: dark side of astronomical objects, shadow of a satellite on its planet, shadow of a planet on its rings, shadow of a planet on its satellites. The user should be able to remove the shadow from the dark side of planets and satellites. - The possibility of modifying the astronomical parameters of a body: diurnal movement, annual movement at constant solar time, annual movement at constant sidereal time, precession movement, size of the body, speed of rotation, of revolution, resizing of the orbit.		
5	The full dome simulation software must be able to move from wide view up to 1027 m universe wide and zoom in to particles of 10-18 m anywhere in this universe in continuous without any visual jump or transition.		
6	The full dome simulation software must include a movement management to switch from one reference to another at any time with no visual jump.		
7	All parameters of the system (simulation date, observer position and orientation, parameters of objects such as intensity, colour, etc.) must be modifiable with a duration from an initial stage to a target state using different models of Interpolation.		
8	For time control, following features should be available: Instantaneous or progressive movement forward or backward in time. The time can be defined in Julian day or in GMT or n local date / time. Change the data gradually, stopping at a target date etc. Change the date in increments with stopping at a target date etc. Automatically stop the evolution of the date when a star passes to certain position (rising and setting of a star, passage at 0° south, etc.).		

9	The full dome simulation software must include labels to display names for any objects represented (Sun, Planets, Dwarf Planets, Satellites, Stars, Milky Way, Messier, etc.).		
10	The full dome simulation software and the GUI must be in English language		
11	Facility for searching, downloading and uploading resources from / to a Cloud (images, videos, audio, scripts, 3D models)		
12	The full dome simulation software shall include a Dome casting capability, i.e. the possibility that a Planetarium broadcast its live presentation to other domes.		
13	Most of the date sets of the software shall be issued from public scientific institutions (observatories, universities, laboratories, etc.). It shall be possible for such datasets to be updated easily by the planetarium with a simple click in the GUI.		
14	The full dome simulation software shall offer the possibility to visualise HiPS Sky Surveys from CDS servers. It shall be possible to display the Sky Survey on dome and to zoom in any area with a refinement of the resolution of the image.		
15	The full dome simulation software shall offer the possibility to visualise WMS terrain data at the surface of at least Earth, Mars and Moon.		
16	The full dome simulation software must be compatible with Data 2 Dome. The Data 2 Dome must be integrated in the graphical user interface.		
17	The full dome simulation software shall be able to download and display any NASA JPL Horizons trajectory data with a few clicks in the GUI and allows to visualize the full path or a path evolving with the date of the simulation. It shall be possible to add a 3D Model that will follow the path accordingly.		
18	The full dome simulation software shall be able to download 3D models of known asteroids from a reputed server and display it at its position in the GUI.		
19	The Full dome simulation software must be compatible with VR Glasses for show production and for pre-show or exhibit purpose.		
20	The full dome simulation software must include realistic atmospheres based on algorithms accounting for the physical phenomena (like Rayleigh scattering and Mie scattering) for at least Earth and Mars. Atmosphere model should simulate multiple scattering. The ground of the planet should also react according to atmosphere thickness.		
21	The full dome simulation software must allow a continuous view of planets from, outer space up to several meters on the surface for Earth, Mars, Moon, Venus, Mercury, Ceres Vesta, Pluto, Charon etc. Such representation must include known data for terrain and		

ground imagery. Such visualisation should be at least 60 frames per second during motion.

For the Earth
- Satellite Imagery reaching a resolution of at least 15m per pixel based on various satellites over the entire surface with homogeneous colours over the whole globe.
- Elevation with a resolution of minimum 30m
- Cloud cover seen from space. This cloud cover can be modified by the user.
- The Belt of Venus must be represented by the atmosphere of the Earth (shadow of the Earth on its atmosphere)
- The reflection of the Sun on the oceans, sea and river must be simulated
- The light reflected by the Moon must impact the atmosphere of Earth as well as the lighting of the ground of Earth and reflection on water according to its phase.
- On the night side, light pollution in cities must be visible
- The software should allow users to display the Earth following the different seasons, or speed up the time to show the changes of appearance of the Earth over a year.

For the Moon
- Images reaching a resolution up to 120mm per pixel
- Elevation with a resolution up to 120m
- Taking into account the illumination of the sun and the indirect illumination of the Earth (Earthshine)

For Mars
- Images reaching a resolution up to 230m per pixel
- Elevation with a resolution up to 200m

For Mercury
- Images reaching a resolution up to 165m per pixel
- Elevation with a resolution up to 665m

For Venus
- Images reaching a resolution up to 4,500m per pixel
- Elevation with a resolution up to 4,500m
- The full dome simulation software must include the terrain simulation of Pluto and Charon based on New Horizon mission.

All the data must be stored on the NAS or hard drives.

It must be possible to load "on the fly" high resolution

22	satellite imagery and high resolution relief files (Geotiff, JPEF2000 format, etc.) for a specific georeferenced area on at least Venus, Earth, Moon and Mars. Such images should be loaded on-line or off-line directly from the images generators.		
23	The full dome simulation software must include shadow management as: • Shadow of the Moons on their planet • Shadow of the rings on their planet • Shadow of the planet on its rings • Shadow of the planet on satellites • Shadow of satellites on satellites • Shadow projected from mountains and craters for at least: Earth, Moon, Mars, Mercury, Ceres, Vesta, Phobos, Deimos, Comets nucleus, Asteroid's		
24	It shall be possible to display rainbow at the surface of the planets, with proper position according to the observer position and orientation. The simulation should also allow to show primary and secondary rainbow as well as Alexander's band.		
25	On Earth it shall be possible to show Aurora (shown in 3D and therefore visible from the surface as from space continuously)		
26	On Earth, it shall be possible to visualize shooting stars. 2 modes shall be available: Generation of shooting stars according to defined parameters / Random generation of shooting stars. The user will define a precise position of a radian point with an area (expressed in degrees) around the radian point in which the shooting stars can start, as well as a number of stars per minute. It will also be possible to load these parameters from a meteor shower database. The database of shooting stars shall include at least the Leonids, the Perseids, the Orionids, Eta aquarids. The database can be updated by the user.		
27	It shall be possible to show Animated volumetric procedural clouds when the observer is on the ground. Like the terrain and atmosphere, clouds shall use advanced lighting routines to provide the following realistic effects: red sunset, magnitude-based star hiding, light scattering, moonlight, glory, fogbow, illumination of the clouds by the Sun and the Moon, projection of the cloud's shadows on the terrain. The volumetric clouds need to be fully customizable directly from the user interface. It must be possible to choose their thickness, altitude, and type.		
	The full dome simulation software must represent lunar and solar eclipses. During solar eclipses, the atmosphere must react		

28	according to their magnitude and to the percentage of the eclipse. During a total solar eclipse, it must be possible to see the solar corona. It must be possible to see the Baily grain and the diamond ring effect. During a lunar eclipse the colour of the Moon become reddish according to Earth shadow position.		
29	The simulation software should allow to simulate Zodiacal Light and Gegenschein under the Earth's atmosphere and also to leave the Earth for an extrapolated view of the dust cloud around the Sun.		
30	The full dome simulation software must include Saturn's rings made up of endless particles of dirty ice. Each particle of the ring must react properly to the lighting of the Sun and allow to see the dark side of the particle. The ring must have the correct illumination to show proper lighting depending on the Sun's position and therefore the incident angle of the light reflecting on the rings particles		
31	The full dome simulation software must include a realistic representation of the sun view from Earth and Mars atmosphere and view from space		
32	The full dome simulation software must include 3D animated model of the Sun showing variation of our Sun's surface in UV helium ionised 30.4mm wavelength and in visible wavelength.		
33	The full dome simulation software must include various 3D models of known asteroids.		
34	The full dome simulation software should include at least one 3D model of an interstellar object.		
35	• The full dome simulation software must include 3D animated models of comets with automatic orientation of the comet's dust and plasma trails according to its position with respect to the Sun. • The plasma train and the dust train must adjust their length according to the comet distance to the Sun. The dust trail must simulate syndyne and synchrone.		
36	At least 5 different 3D animated comets must be supplied to show the variety of comet's types: Bradfield like comet, Hale-Bopp like comet, Halley like comet, Hyakutake like comet and McNaught like comet.		
37	It must be possible to show 3D model of Comets Nucleus, such model must show outgassing jets on the side illuminated by the Sun. 67P/Churyumov-Gerasimenko Comet Nucleus should be provided as such model.		
38	• The software must include the possibility to show bolides entering the Earth atmosphere • It must be possible to visualize the bolide in 3D, meaning that it must be possible to take off the		

	Earth Surface and visualize the bolide trajectory properly from atmosphere or from space • The lighting of the bolides must affect the Earth's atmosphere and terrain, providing realistic renderings when visualized from the ground as well as from space looking down to the ground. • The famous Chelyabinsk bolide shall be available natively in the system, with a realistic rendering and accurate date and times of the phenomenon.		
39	The luminosity of the stars, planets, satellites, in distant observation where the object is represented like a star, having a point representation and which are endowed with magnitude (stars, planets, satellites) will have to be calculated by a configurable function. The colour of such "stars representation" will be rendered and it will be possible to increase or decrease the visibility of their colour		
40	The star database should contain more than 110,000 stars from the Hipparcos catalogue, more than 2 million stars from the Tycho-2 catalogue, and more than 1.3 billion stars from the Gaia DR2 catalogue. The stars will be positioned in 3D within the limits of the details provided in the original catalogues, during an interstellar movement, the apparent magnitude of each star will be recalculated taking into account for its representation.		
41	It must be possible to get closer to at least 500 stars, during these movements, these stars will have to go from a point representation to a 3D representation as they approach. The labels of these stars can be displayed. It shall be possible to visit at least 100 stars in multiple systems with proper motion around their barycentre.		
42	The stars will have to move according to their own movement, within the limits of the information contained in the catalogues, according to a date parameter of the simulation.		
43	It should be possible to filter the stars, meaning to show only a part of the stars of these catalogues, according to information such as at least the spectral type, the absolute magnitude, the apparent magnitude, the distance, temperature, luminosity class, and radius.		
44	The software has to represent the variability in magnitude of at least 1500 variable stars		
45	The Milky Way must be represented in different ways. From the inside, it will be represented by an image wrapped around the viewer. From the outside, the galaxy will be represented by a volumetric 3D model. This volumetric model should represent the barred and spiral structure of our Milky Way and make it possible to show the absorption of dust clouds, particularly in side/edge-on view.		
	• In order to present the Milky Way in different forms		

46	from the solar system and allow the animator to narrate his speech, several such images must be provided: • Blurry texture giving the best possible perception of the Milky Way in a night sky. • Visible texture (real photo). • FERMI, IRAS and COBE image • HDR image accumulating the brightness of more than 1.6 billion stars from the Gaia DR2 catalogue, whose appearance can be customized by the operator for colour, brightness and contrast.		
47	• The full dome simulation software must include an advanced volumetric representation of the Milky way when leaving the solar system. This representation must be based on scientific data and must represent when flying inside the model: • Population of Individual stars • Population of Individual Open clusters • HII Regions		
48	The full dome simulation software must include at least 25 Volumetric Deep Sky Objects represented in real time at their proper location. Orion Nebulae shall be represented with a volumetric model Eagle Nebulae shall be represented with a volumetric model allowing the visualisation of the Pillar of creation		
49	All known Globular clusters with their accurate position, size and stars composition be represented with a 3D representation showing the proper number of stars as well as proper distribution in space and in number of type of stars.		
50	• It must be possible to move the observer to black holes inside the volumetric Milky Way. • The transition from the Volumetric Galaxy to the black hole environment must be smooth. • Two kinds of black holes should be represented. One with accretion disk, the second one without accretion disk. • The black hole has to distort the light of object located behind it, and the model with accretion disk has to show the accretion disk distortion. • It has to be possible to display a representation of a space and time grip showing that there is a singularity due to the black hole.		
51	The offered software must include a 3D model of a Pulsar. The pulsar magnetosphere, radio jets and gravitational effect close to the star should also be available.		
52	The software will have to allow to visualize the Hubble sequence and also to be able to move continuously through it thanks to the integration of at		

	least 10 different 3D volumetric models of galaxies.
53	It must be possible to visualize a set of 3D models to form an explanatory diagram of the stellar evolution cycle showing he different phases of evolution.
54	The full dome simulation software must include advanced 3D models with reflection of light on the objects, and with projection of shadow of elements composing the 3D Model. The catalogue must at least include the following objects: • Cassini • Crew Dragon • Apollo CSM • Gaia • Galileo • Hubble telescope • International Space Station with the possibility to visit the inside of the station • James Webb Space Telescope • Juno • Messenger • New Horizons • Pioneer • Rosetta • Soyuz spacecraft • Space shuttle • Sputnik • Voyager • Curiosity • Philae • Venera 9 Probe • Ariana 5 • Falcon9 • Saturn V • Soyuz Rocket • Perseverance • Ingenuity • Several Indian spacecraft, with at least Chandrayaan-2, Chandrayaan-3, Megalayaan-1 and Magalayaan-2 • Those objects shall have a photo realistic representation including effect such as reflection on the metallic and reflective parts
55	The Full dome simulation software must include the superclusters of Laniakea, Perseus-Pisces and Shapley. The data and their integration in the software used has to be validated and certified by the scientist behind those datas.
56	On Earth and on Mars it will have to be possible to adjust the altitude of the sea, to simulate a rise in water on Earth and the presence of liquid water on Mars

57	The full dome simulation software must include the Earth's magnetosphere.		
58	The full dome simulation software must include simulation of the internal structure of planets, main satellites and Sun.		
59	The full dome software must include a set of Science on a Sphere dataset from NOAA. The user must be able to include any Science on a Sphere dataset from NOAA released after installation.		
60	The software shall allow the visualisation of Placemark datasets at the surface of planets, including at least: • Earthquakes on Earth • Craters on Earth, Moon, Mars • Volcanoes on Earth and Mars		
61	The software shall allow users to add new datasets of by importing external files. Such file contain at least elevation, longitude and altitude data, colour and label for each place mark.		
62	The software must load KML files for vectorial GIS information. The software has to draw the lines directly on the ground, and has to allow to create area with specific colour with the possibility to adjust the opacity.		
63	The software should also allow users to add any standard image (non-georeferenced) on the surface of planets and satellites following its elevation. The size, position should also be adaptable and the rotation of the image to fit perfectly with the real terrain data should also be possible.		
64	• The full dome simulation software must include a massive open source dataset or it needs to be under a license agreement with a third party which should not add any extra cost for any future update of the dataset. It shall also be possible to use the datasets to create shows for the planetarium as well as for selling it to any other third party without any limitation or additional costs. The datasets must include at least: • Full Gaia DR2 star catalogue with possibility to show information from Tycho2, Henry Draper (HD/HDE/HDEC), Hipparcos, Yale Bright Stars (BSC), Gliese & Jahreiss catalogue as well as Flamsteed & Bayer designation. • 110 Messier object and more than 100 NGC-IC objects, represented with an image at the proper position. • Exoplanets System with more than 2000 individual		

	- exoplanets orbiting their stars with a 3D model with appropriate texture according to exoplanet type. - Data base of the location of artificial satellites of the Earth: SPACETRACK data base with over 14,000 objects. - Location of Asteroid database: ASTORB data base from Lowel Observatory with over 460,000 objects. The software should also offer the possibility to download and visualize 3D models of asteroids online from a reputable website (e.g. Damit). - Location of Comet database: Jet Propulsion Laboratory and NASA database with over 800 comets represented at the same time - Oort cloud data base - Location of Brown Dwarfs database with more than 1500 stars - Location of Exoplanets and Exoplanet candidates locating more than 8000 of them - Location of Supernova remnants with more than 150 of them - Location of Planetary nebulae with more than 280 of them - Location of HII regions with more than 120 of them - Location of Ob Associations, with more than 100 of them - Location of Open Clusters, with more than 2600 of them - Location of Variable stars with more than 9000 of them - Location of pulsar with more than 3000 of them - Location of Globular Cluster with more than 160 of them - Location of NGC-IC objects with more than 14000 of them located in the star field (view form Earth) and more than 7500 of them in 3D - Location of Galaxies of the local group with more than 140 of them - Location of Galaxy groups, with more than 150 of them - Location of Galaxies from Tully Catalogue with more than 30000 of them - Location of voids, with more than 30 of them - Location of Galaxies from 2dF catalogue with more than 225 000 of them - Location of Galaxies from 6dF catalogue with more than 110000 of them - Over 17,000 galaxies of the Cosmicflows-3 catalogue, from the Cosmicflows Collaboration - Location of Galaxy clusters, with more than 3000 of them		

- Location of Superclusters with more than 170 of them
- Location of Galaxies from SDSSRD16, with more than 3 million of them
- Location of Supernova with more than 10000 of them
- Location of Quasars with more than 700000 of them from 2dF, 6dF and SDSS datasets
- WMAP, COBE and PLANCK cosmic microwave background
- Boundaries of stellar halo of the Milky Way, of the local group, of Virgo and Laniakea
- Star orbits in the Milky Way of at least 8 stars and the Sun
- Uncertainties of star position of at least 100 stars from Hipparcos or Gaia catalogue
- Location of at least 20 stellar black holes

- The presenter must have the possibility to decide which datasets are shown (on/off) automatically depending on the distance to the observer.

65	The full dome simulation software must include the 88 IAU constellations with asterisms, graphic representations, IAU limits and names of the constellations.		
66	It must be possible to change easily the images used for constellation, size of the image, position and orientation of the image, as well as its colour.		
67	Video constellation must be provided at least for the zodiacal constellations		
68	The software must include ready to use astronomical grids such as: • Cardinal points • Meridian • Azimuth • Equator • Ecliptic with a graduation in day month that automatically adjust labels and graduations depending on the year of the simulation as well as with a fix representation (fixed on one year). • Circum polar circle with automatic adjustment depending on observer latitude • Earth's rotation axis • Earth's pole in star field		
69	Full dome simulation software must allow operator to draw a line between two objects among planets, moons or stars. The operator should be able to lengthen the line and to add graduations on such line.		
70	All astronomical objects should be able to display their label as well as a pointer to help the audience locate the object in the dome.		
	The full dome simulation software must include trace		

71	mode to see the trail left by the stars during a diurnal motion and to track for instance the artificial satellites in the sky.		
72	The full dome simulation software must include modification of astronomical parameters like: size, distance ratio between a satellite and its planet, the factor of revolution of a planet around its star, the factor of rotation of a planet around its axis, the factor of revolution of a satellite around its planet, the factor of rotation of a satellite around its axis.		
73	It must be possible to show trajectory of a planet, a satellite and the Sun in the dome referential. This feature will be used for example to show Sun analema, planets retrogradation.		
74	It must be possible to load a spacecraft trajectory from JPL website (a conversion of format is acceptable, in such case, the conversion must be explained in the documentation), with such load, it must be possible to add a 3D model of the spacecraft that will automatically follow the trajectory according to the date of the simulation.		
75	It must be possible to define orbital motion to objects following Kepler's law and TLE. It must be possible to attach a 3D model to this orbit.		
76	The full dome simulation software must include image and video inserts (virtual slides and video). Image and video insert can be placed on the dome or in the 3D model. The following parameters must be accessible for the user: opacity, intensity, position, orientation, colour filter and chroma key with a tolerance that can be adjusted by the operator. For videos, the following commands must also be available: play, loop olay, pause, stop, etc.		
77	The full dome software must support fish-eye format, spherical projection format, panoramic format and flat format.		
78	It has to be possible to create a presentation "like MS PowerPoint" using images and video. The software has to allow to create transition between different configurations of images on the dome. One configuration has to remember the position, the orientation for several images or video. Then it has to be possible to define transition such as fading to make new images/video appear or disappear.		
79	It must be possible to alter image parameters (colour, intensity, opacity, etc.) depending on the height of the Sun.		
80	The full dome simulation software should be able to show shadow cones of satellites on planets.		
81	It must be possible to display the habitable zone for at least 100 stars.		
82	The software shall be able to display the radio sphere and to show its propagation according to the date of simulation.		

83	The full dome simulation software must include a full dome video player.		
84	Controls of the full dome video player must be available on the live control interface. Accessible controls must be Play, Pause, Stop, Seek, Fast-forward and Fast Rewind		
85	Audio track must be synchronized automatically with the Full dome video player.		
86	The Full dome video player must be able to play at least 4K @60fps full dome video without slicing.		
87	The full dome simulation software must be able to support various streaming protocols including at least NDI, UDP and HTTP protocol. Such stream shall be displayed on the dome as a standard rectangular video or as a fish-eye video.		
88	The software must support AVM files. For such files, the AVM Image should be placed and sized according to the metadata information.		
89	The full dome simulation software must include 3D inserts to incorporate 3D objects into the simulation with the following format: DAE (Collada), 3DS (3D Studio), OBJ (Wavefront), LWO (Light Wave Objects), LWS (Light Wave Scenes), CMOD (Celestia models).		
90	It must be possible to import 3D models with embedded animation, for such import the documentation has to describe the process to load the animation in a proper way.		
91	The full dome simulation software must include text inserts to display texts. They must be placed on the dome or into the scene and users can define the following parameters: position of the text in the 3D scene and position of the text in the dome 3D projection, content of the text.		
92	Such text should be fit by operator set of characters, and in the operator sentence, it has to be possible to add information calculated by the software such as: date and time of the simulation, speed of the camera, distance of the camera to an object.		
93	- The system shall be able to project other content than astronomy. Various STEAM modules shall be offered in order to make sessions about at least some of the topics listed below: - Heart Anatomy showing Heart in motion - Human Body anatomy (male and female) showing nervous system lymphatic system, circulatory system, urinary system, reproductive system, respiratory system, digestive system, integumentary system, muscles, bones. - Eye Anatomy - Animal cell, vegetal cell, bacteria cell, fungal cell - Periodic Table of elements		

	- Fourier mathematical equation - Optical path - Magnetic field - Fractals - Combustion engine - Colour (additive and subtractive) - Trigonometry - State of matter		
94	The system shall allow users to create content using Unity 3D Engine and to display it on the dome at the native resolution of the projection system.		
95	- The GUI should be simple and user friendly. - Creation of scripts to automatize actions shall be possible with a graphical interface without writing any complex codes. - Drag & Drop features shall be possible to add images, play videos, play a script, move to one astronomical object to another. - A Dome View shall be represented in the GUI showing in real-time in a fish-eye style the content of what is displayed on the dome, this Dome View shall be interactive allowing to click directly on an astronomical object (such as sun, planet, satellites, constellations, stars) to access features such as intensity, orbit, trajectory, label. - The software shall allow to move in a fluid motion to astronomical objects with a simple "Go to" function available in the GUI for the astronomical objects available.		
96	The GUI shall have a dedicated GUI for direct control typically for doing night sky presentation. It shall be possible to control below function within the GUI without any additional scripting: Switch on/off of starry sky, milky way, planets, satellites, sun, atmosphere, atmospheric effects (rainbow, clouds, aurora, rain, snow, lighting, moonlight, twinkling), shooting stars, zodiacal light, messier & deep sky objects. Customize the atmospheric effects directly from the graphical user interface Switch on/off orbits of planets and satellites, trajectories in the sky of sun, planets and satellites, pointers, constellations, asterisms, pictures, boundaries and names Scale up Sun, Planets, Satellites Control time (pick a date, start diurnal motion, start annual motion, start analemma motion, start precession motion) Modify orientation of the theatre Control the camera (Sky View, Terrain View, Space View) with various manipulators possibility (Rotation, Free Fly) Adjust the Sky quality (number, size, colour factor of stars, Milky Way representation and brightness)		

	Show proper motion of stars Apply filters on Starry Sky, composed of various catalogue including at least Hipparcos and Gaia DR2 catalogue, in order to highlight or reduce the visualization depending spectral type, luminosity class, temperature, absolute magnitude, apparent magnitude, distance, catalogue, radius, proper motion, distance, right ascension and declination). It shall be possible to let the software switch on/off datasets automatically according to the position of the observer, for example, when getting close to the Earth showing the artificial satellites dataset, when viewing the solar system, showing the asteroids dataset, when leaving the solar system showing the oort cloud etc. GUI shall allow to switch on/off on the dome classical astronomical grids and information with dedicated buttons (cardinal points, azimuth, equator, ecliptic, precession circle, meridian, longitude, latitude, date, time etc.) It shall be possible to directly visualize the current position and change the position and orientation of the camera easily, giving access to a zoomable map of the planet with a mapped terminator (on Solar System planets, dwarf planets and satellites). It shall be possible for the user to create its own control page with buttons linked to scripts. A list of pre-produced user pages must be available in additional to the ones users can create by themselves. It must be possible to open any web page in the user page tabs by setting its URL.		
97	The GUI shall allow to control lighting, audio, power on/off projectors and computer, etc. with dedicated windows.		
98	The GUI has to offer a visualization of the dome image.		
99	It shall be possible to directly click on Sun, planets, satellites, stars represented on the dome (picking technology) and access the menu showing various actions for this object.		
100	It shall be possible to use the mouse within the dome view to control the position and orientation of the observer.		
101	It shall be possible to use the mouse in the dome view and see it as a virtual laser pointer on the dome.		
102	It shall be possible to click in the dome view to define a precise point to zoom, using the mouse it shall be possible to zoom like with a telescope on the selected point.		
103	It shall be possible to draw directly on the interactive dome view.		
104	The software shall allow the possibility to play several scripts at the same time.		
	The GUI shall allow a control of the scripts and full-		

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if
105	dome video being played (pause/stop/play)		
106	The GUI has to allow the view of all resources included in the software (planets, moons, stars, etc.) as well as all resources added by the user in a library (images, video, 3D models, scripts, full dome shows, etc.)		
107	It shall be possible to browse the library of objects of resource, as well as by searching keywords.		
108	It shall be possible to drag & drop a resource directly on the dome view to start an appropriate action depending on the resource type.		
109	Installing a new image or a new video, has to be as simple as a drag & drop from operating system files explorer to the GUI. Such drag & drop will automatically install the resource properly on the system, especially it will copy the resource on all necessary computers. The software has to automatically detect the type of file (standard, fish-eye, and panorama) so the resource will be projected properly once added to the dome.		
110	Users must be able add/modify/delete files only in the MASTER computer and the software will handle the synchronization.		
111	An interactive help centre needs to be accessible directly form the graphical user interface.		
112	The help centre must include a field search to find information easily.		
113	The GUI must include an editor for creating scripts without need for coding.		
114			
115	It also shall be possible to record a script while doing action in live with the GUI. In this fast script creation mode, any action done with the GUI can be recorded as a script.		
116	The software shall be able to render a show created with a script. "Render" means that the full-dome software has to record the dome view image per image (one image for each frame for 30 frames per second and for 60 frames per second).		
117	The rendering mode must be able to render up to 8K frames.		
118	The software shall allow the possibility to create script that will allow deep control of the simulation software.		
119	The software shall allow the possibility to develop a web application and control the software from an external web application.		

1.6 Show Control System and Manual Console

Table 1.6

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if

			any, with complete justification
1	The entire dome projection system, including the video player, the astronomical simulation, the projectors, the optical star projector, the audio, the lighting, must be controlled from the control station. The control of the above systems must be automated and programmable with the use of e.g. scripts.		
2	Displays for controlling digital immersive full dome projection system		
3	The screen should have following: 2 monitors with Display size: minimum 22 inch (diagonal) Display Resolution: 1920X1080 or better. And a dimming hardware to control monitor brightness in dark environment.		
4	The control master computer must meet at least the following parameters: a) CPU, with a minimum of 8 cores, 16 threads, mini 16 MB Cache with the Pass Mark CPU Mark test result of min. 18000 points. The offer must be accompanied by a printout from the website: http://www.cpubenchmark.net confirming the fulfilment of the above condition. b) RAM 32 GB DDR4 with a frequency of at least 2900MHz. c) Graphics card with at least 5880 CUDA Core, 1.5 GHz base frequency, 1.7 GHz boost frequency, 8Go GDDR6, Ampere architecture d) SSD drives with enough space to store system, simulation software data and 30 hours of video at native resolution e) Integrated backup SSD allowing backup of data & system		
5	From the control station level, it must be possible to exchange and share data with other users of the software in the world using a cloud technology integrated in the software. Internet connection for the same will be provided by NCSM.		
6	The contractor has to offer a solution in order to take the control of the control computer from abroad to support and/or diagnose the system remotely. Internet connection for the same will be provided by NCSM.		
7	It must be possible to conduct a full live presentations from the control station. As well as wirelessly from a mobile tablet or iPad. The range of the wireless connection should allow to move around the dome without losing control on the mobile device.		
8	The software installed on the tablet is to be identical to that installed on the Master computer.		

	in particular, the software installed on the tablet must have the following functionalities: a) The Graphical User Interface must be the same as on the Master computer. b) Provide an interactive view of the dome that allows the control of the observer's position, clicking on an object and taking actions from the displayed menu via the touch screen of the mobile device. c) Provide access to any data installed or created on the Master computer d) Support the drag & drop function to start displaying images and other multimedia. e) The software running on the tablet and the Master computer must be synchronized, which means that a change made on one device is immediately visible on the other.		
9	Wireless gamepad that enables control the camera like in a flight simulations.		
10	It must be possible to control the Planetarium software for live shows using a manual console. ➢ This manual console will offer at least : • 8 knobs • 24 backlighted buttons • 8 motorized sliders • Play / Pause / Stop buttons • 1 rotating wheel • 24 buttons with backlight digital display • A digital Display • It must be possible for the operator to change the function behind the knobs, the buttons, the motorized sliders and the backlighted digital display buttons. This configuration has to be saved and restored at the when the system is restarted. • The rotating wheel has to offer the possibility to change the simulation time in a smooth manner while moving it. Diurnal, Sun analemma, Annual and precession time motion has to be accessible with it. • Play / Pause / Stop has to allow the control of a full-dome show and of a script controlling as well the audio of such full-dome show or script • The digital display has to show the date and time of simulation and using other buttons it has to be possible to select a new date and time and instantly jump to it • It must be possible for the operator to customize all the buttons, knobs, motorized sliders of the manual console in order to control a specific parameter (such as an intensity, an opacity, a variable of the system such as time, position, orientation, etc.)		

	- It shall be possible for the operator to link a Backlighed Digital display button to a script and it has to be possible for the operator to change the Digital display button text accordingly. - It shall be possible to switch from various configuration of the console (affectation of the elements) using buttons of the console to move from one configuration to another. It shall be possible for the operator to: - Change the time and the date of the simulation - Change the longitude, the latitude, the altitude of the observation - Change the intensity of Sun, planets, Moon, Milkyway, atmosphere, - Change the size of Sun, Planets, Moon - Display constellations (UAI limit, asterism, graphical representation) - Display grids (equator, ecliptic, meridian, precession circle, etc.) - Display Time and Date on the dome - Start scripts made by the operator - Start full-dome shows ➢ Any modification made on the manual console will be reported on the control console as well as on the mobile controller.		
11	The control station must be equipped with a black matt wheel chair with adjustable height and backrest.		
12	The control station must allow connection to a professional audio surround system by means of a multi-channel audio Interface. The audio Interface must be capable of transferring analogue and digital audio data and offer the latest Plug and Play technology to guarantee a simple installation. It must include the following minimum characteristics: 8 Channel Analog Interface 2 + 2 Channel AES / SPDIF Interface 8 Channel ADAT Interface 24 Bit / 192 kHz Digital Audio 40 x 20 Matrix Router		

1.7 Calibration and Alignment

Table 1.7.1

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Auto alignment and calibration	Software, hardware and camera based mechanisms to be included in order to ensure error free edge blending / geometric correction on screen as well as to maintain uniform colour and contrast on projectors and dome screen.		
	Auto alignment, auto edge blending and correction system shall be available in the system through GUI.		
	Software Preset to manage optimum brightness levels of Projectors in 2D mode.		

Table 1.7.2

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Tools for Verification of calibration and alignment	Set of Instruments and software for verification of calibration and alignment parameters at site as per table 1.5.1		

1.8 Integrated Audio System

Table 1.8

Specifications	Detailed Description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
7.1 channel surround audio system	The audio system shall be fully integrated with the show control system. Audio system shall consist of 3 speakers for the main front channels, 4 speakers for the surround channels and dual subwoofer system mounted suitably above the viewing platform or else at suitable locations as may be required. Amplifiers are to be solid state and network controlled		

3 speakers Left/Center Right	a) Type: 3-way speaker b) Frequency response (± 3 dB): 50 Hz - 18 kHz c) Dispersion: 90° x 50°(-30/+20° up/down) d) Power: 460W passive e) Max SPL pressure: 134 dB, @ 1 m f) Crossover: Bi-amp (LF+MF/HF) or passive g) Sensitivity @ 1 m: 98 dB Nominal impedance: 4 ohms passive		
4 speakers for the surround channels	a) Type: 2-way speaker b) Frequency response: (± 3 dB): 55Hz - 18 kHz c) Dispersion: 90° x 110° d) Power: 260W e) Max SPL pressure: 125 dB, @ 1 m f) Sensitivity @ 1 m: 92 dB Nominal impedance: 8 ohms		
Subwoofer	a) Type: 1x18" subwoofer b) Frequency response (± 3 dB): 30 Hz - 500 kHz c) Power: 650W d) Max SPL pressure: 132 dB, @ 1 m e) Sensitivity @ 1 m: 95 dB Nominal impedance: 4 ohms		
Power Amplifiers	e) The audio amplifiers shall allow to control and amplify each audio channel independently. Each channel shall deliver an output power at least equal with the power of the speaker connecter to corresponding channel at given impedance f) Signal-to-noise ratio: > 103 dB (8 ohms, 1 kHz) g) Damping Factor: >200 (8 ohms, 10 Hz to 400 Hz)		

	h) THD: <0.5%		
Audio processor	a) DSP, EQ b) Built-in crossover, can convert up to 7.1 audio channels into passive, bi- or tri-amp. c) Speaker management d) Interactive graphical interface that provides the processor with a 1/3 octave graphic equalizer, LCD screen and volume button accessible on the front panel e) System fault detection f) Analog input connector to accept 8 channels of signals from external sources. g) 8-channel analogue output h) Redundant output to directly distribute audio signals during a power outage. i) Microphone input with gain level adjustment j) LAN connection via RJ45 connector k) Frequency response 20 Hz -20K Hz, ref 1KHz +/-1dB l) THD + N <0.01%, 20 Hz - 20 kHz m) Dynamic range >102 dB		
Digital Audio Mixer	a) connection of a minimum of 20 inputs and 10 outputs. b) The adjustment of the parameters may be done by a min 5" touch screen display. It can also be operated from a distance through remote control application. c) Allow to adjust the sound level of each sound input separately (microphone or other). d) Patch panel with a minimum of 20 inputs and 10 outputs to be connected to the digital mixer through a single cable. e) Equipment connected to patch panel should be allowed to be patched in the digital mixer as audio input / outputs.		
2 wireless handheld microphones as well as the	a) Sensitivity 1.6 mV/Pa b) Sound Pressure Level 150 dB SPL b) Cardioid		

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
associated rack mountable receivers	d) Signal-to-noise-to-noise ratio≥110 dBA e) Total harmonic distortion (THD) ≤0.9%		
2 wireless handheld headphones as well as the associated rack mountable receivers	a) Sensitivity 2.1 mV/Pa b) Sound Pressure Level 154 dB SPL c) Cardioid d) Signal-to-noise ratio ≥110 dBA e) Total harmonic distortion (THD) ≤0.9%		
Make	Harman/ Bose/ Sony/ JBL/ Yamaha		

1.9 Online U.P.S. system with parallel redundancy

Table 1.9

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Online 40 KVAU.P.S. system (True IGBT with 30 minutes backup time and including isolation transformer of reputed brand: APC, Emersion, Numeric Veritv or Schneider or equivalent	Please provide specifications of the U.P.S. system including make and model.		
Battery bank with suitable rack	Please specify number of SMF batteries with detailed specifications. All batteries supplied must be from same batch of production.		

1.10 Seating Arrangement (Minimum 190 chairs + 5 spare chairs)

The bidder shall submit scheme including sight line drawings for layout of seats, and detailed engineering drawings for change of existing layout if required. Specification of the chairs is given in table below.

Table 1.10

Specifications	Detailed description
Reclining Chair	Tip-up and back push reclined chair • Centre to centre 21". • ABS moulded housing for seat & back cushions • All sheet metal parts with powder coated • Arm rest in Polyurethane injection moulded. • Seat numbering on inner both the side of the chair stands with silicon fluorescent thin stickers. • Row number for seat along the aisles. • Provision for LED lights on sides along with aisles with the row and the seat number display. • For Noise Reduction Nylon components on moving parts. • Angle of tilt of the chairs shall be adjusted as per the location of the seat for easy and optimal viewing of the shows.
Frames	15 mm thick high pressure steam pressed hard ply wood for seat and the back, out of which the back is of 12 mm bent ply.
Fabric	Colour to be approved by NCSM authorities. All fabric to be used shall be fire retardant. Test certificates should be submitted.
Spring	Spring for tip-up and back push mechanism shall be torsion spring with spring steel IS:4454-1 (2001) grade III.
Sheet-metal components	• DRCA/CRCA Sheet metal IS:1079 1994 • Side stand 3mm (+/- 0.2 mm) thick, size: 415 mm(+/- 5 mm) x 345 mm (+/- 5 mm) both side bottom circular cutting with 140 mm radius. • 75mm x 25mm 16g 190 mm length tubular pipe form the leg welded to the 3 mm plate. • Flat for base of the stands 280 mm (+/- 2 mm) length 50 mm (+/- 2 mm) x 5 mm (+/- 0.2 mm). • Mechanism components 2 mm HRCA Back push box 180 mm(+/-2 mm) x 70 mm (+/-2 mm) & height

	of the box 15 mm (+/-2 mm), ear "L" bracket attached to be box 190 mm (+/-2 mm) x 135 mm (+/- 2 mm). With two slot holes for fixing the back. Tip-up box 180 mm (+/-2mm) x 70 mm (+/-2mm) & height of the box 15mm (+/- 2mm), ear "L" bracket attached to the box 35 mm (+/-2mm) x 125 mm (+/-2mm). With two slots holes to fix the seat.
Seat and Back cushion housing	ABS moulded vacuum forming out of 2 mm sheet.
Vinyl Flooring	Dark coloured vinyl flooring with minimum 2 mm thickness.
Vinyl Flooring / Carpet Flooring	• Supply & laying of Nylon loop pile carpet over an under layer of 6 mm thick kinny foam in Planetarium of Dumka, Jharkhand as per following specifications: Make: Heritage Labelle, Colour: 6906 Peninsula or equivalent approved make & colour. • Specifications construction: 1/10" or 1/8" Tufted Cut & Loop pattern, Fibre: 100% Solution Dyed Nylon, 2-Ply Headset., Pile weight: can 1085g/sqm (32oz/y2), Pile height: ca 6.5mm (+/-3%), total height: ca 8.5mm (+/-3%), total height: ca 8.5nn (+/-3%), Density: 4500, Primary Backing: PP woven cloth, Secondary Backing: Action Bac • Standard Roll size: 3.66m x 30m • Performance: Stain Resistance: 10 (AATCC-175-2003), 3M Scotchguard Treatment, Static Control: Build in Permanent, Tuft
	• Bind 6.51bs (ASTM-D-1335), Dimensional stability: Max 0.2% change (AACHEN), Flammability Radiant Panel 0.12W/cm2 (ASTM-E-648), US Federal Flammability Std: Passed (GB20286 – 2006/Cfl-S1-T0), (ASTM-D-2859-96), Smoke density: Max 450 (ASTM-E-662-06), Color fastness: to light 5 (AATCC-16E), to wet & dry cleaning 5 (AATCC-1654), to ozone: 5 (AATCC-129), Indoor Air Quality: CRI Green Label Plus No. GLP1350. • Supply & fixing of 2" x 0.5" x 3mm Aluminium colour anodised stair nosing of approved quality.

1.11 LED Cove Light

Table 1.11

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Cove Light	• Beam Angle 120° x 120° • Lumens : As per BIS norms • LED Channels Red / Green / Blue • Mixing Distance 2 in (51 mm) to uniform light • Lumen Maintenance *50,000 hours L50 @ 50° C (Full output).		
Design	360° Layout in Aluminium Cove Trough in aesthetical indirect lighting arrangement. Ample amount of LED Modules to be provided to avoid dark zones. Provision for software programmability of different modes and colour effects along with programmable hardware presets.		
Maintenance lighting	Separate additional white LED light is required to be installed for theatre maintenance purpose, controllable from single switch.		
Foot lighting, Exit signage and Emergency Exit signage	**Foot Lighting:** The lighting effect should be created using a fibre opticrod that is end-illuminated with high intensity LEDs with 50,000 hour life expectancy. The unit should flush with 6mm Carpet. **Entry & Exit Ramps**		

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
	Lighting: Led wall light Should provide 2.2 lux at 1.9m distance when mounted 300 mm above floor. **Seat Row Indicators:** Seat row indicators should be installed to identify the location of seating rows, to provide illumination for guidance (e.g. by emergency exits) or to illuminate the floor for sage movement in full dome theatre when the main lighting is dimmed.		

1.12 Free Full dome planetary as well as Astronomy Sky Shows

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Complete Full dome Planetarium as well as Astronomy Sky Shows in English and Malayalam	a) At least 08 Free shows of 25-30 min duration available in house or from international producers like NASA/ESO/ESA etc. in English and at least two shows to be selected by NCSM to be translated in Malayalam. b) At least 1 Hybrid 2D full dome planetarium show having perpetual license for duration of about 30 minutes. The films to be supplied, encoded and tested for satisfactory projection. c) Necessary scripts and original sound tracks must be supplied for		

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
all shows. The selected vendors should provide list of all latest available shows in Hard drivess or other information storages from which NCSM will select above shows.			

1.13 Show production workstation with show production software

Specifications	Detailed description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
-CPU, with a minimum of 16 cores, 16 threads, 24 MB Cache, 2.3 GHz to 5.10 GHz P-core turbo, RAM 32 GB DDR5 with a frequency of at least 2900MHz, Graphics card with at least 5880 CUDA Core, 1.5 GHz base frequency, 1.7 GHz boost frequency, 8GB GDDR6, Ampere architecture, SSD drives with enough space to store system, simulation software data and 30 hours of video at native resolution, Integrated backup SSD allowing backup of data & system, 24 inch display, 240 Hz, with latest OS and all accessories complete -Show production software with editing and rendering capability for full dome, VR and conventional screen. Python integration preferable.			

2.0 Brochures & Complete Specifications

Information to be submitted by the bidders in Envelope-1

Table 2.0

Detailed Description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Brochures and specifications of Projectors, Lenses, Mounts, Blending and Geometric Correction Units, Display Management System, etc.		
Brochures and specifications of Optomechanical Projector		
Brochures and specifications for Image generator servers interactive Planetarium software, Full dome configuration & playback system and projection systems.		
Brochures and specifications for Show Control System.		
Brochures and specifications for Calibration and related instruments and software.		
Brochures and specifications of Software Elements along with licensing details.		
Brochures and specifications for Audio systems.		
Brochures and specifications for UPS system with 30 minutes backup.		
Engineering drawing (plan, elevation and sectional views wherever necessary for viewer's gallery and image servers from in pdf and Auto CAD file format), complete solution diagram, connectivity diagram, system deployment and foot print detail, electrical power requirement and location marked diagram/drawings, system cooling requirement (in BTU) with proper layout drawings.		
Detailed write-up and specific system solution document explaining the integrated working of offered solution with the hardware and software describing various technical, interface and performance aspects, writing / network diagram of the proposed solution. This has to explain how the proposed design or solution meets to specifications and overall requirements as mentioned in the tender document.		
Schematic diagram and broad material specifications of the structure for mounting the projectors showing suggested location of the projectors including arrangement for accessibility to the projectors for maintenance.		
Details and product catalogues of acoustic		

Detailed Description		
treatment of inner surface of concrete dome and acoustic panelling below the aluminium dome inside the theatre proposed and with relevant drawings, material specifications etc.		
Details and product catalogues of LED Cove light, exit signage and emergency exit signage.		
Details regarding source of content development for planetarium shows using datasets/ library of 3D models/cloud assets.		

2.1 Write ups related to design

Table 2.1

Detailed Description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Document on design techniques highlighting how Hybrid and Full dome Digital 2D immersive projection system will be met by the offered solution using the proposed sub-systems. Detailed write-up of functional role of each sub system solution shall be described. The effective resolution and brightness obtained on the dome after masking and edge blending shall be theoretically calculated and shall be tested and verified after installation.		

3.0 Training Topics on FULLDOME PROJECTION SYSTEM

Table 3.0

Sl. No.	Detailed Description	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
1.	Architecture of HYBRID &FULLDOME PROJECTION SYSTEM		
2.	Hardware components of FULLDOME PROJECTION SYSTEM (Projectors, screen, controller, image servers, network elements, storage etc.)		
3.	HYBRID & FULLDOME PROJECTION SYSTEM Administration: Hardware and Software Installation, Configuration, Trouble-shooting and Maintenance procedure including preventive maintenance.		
4.	Alignment and Calibration with usage		

	of instrument and tools		
5.	Field replaceable components and applicable procedures for field replacement		
6.	Special features of the show control software		
7.	Training on Full Dome show production and Hybrid Show production		
8.	FAQs		

4.0 Delivery Schedule

Time Schedule	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
Time entire work shall be completed within 7 (seven) months from the date of placement of order		

5.0 Warranty and AMC:

Time Schedule	Compliance (Yes/No)	Reason for deviation, if any, with complete justification
The Onsite comprehensive Warranty period is for five years from the date of issue of acceptance certificate by NCSM		
The comprehensive annual maintenance contract will be for a period of two years, after expiry of the warranty period for all components of the system except chairs for which warranty will be 5 years from the date of issue of acceptance certificate by NCSM.		

Past Experience in last 7 (seven) years from the date of issue of this tender in supply, installation, testing and commissioning for an integrated functional full dome optomechanical & digital 2D immersive planetarium projection system.

Agency Experience (Limited Company/Corporation/Agency/Consortium/JV Projects)

Sl. No.	Name of the project	Value of the order executed in INR (*)	Name of the Client	Phone no of Contact Person of Client	Starting Date of Project	Completion Date of Project	Details/Scope of work (including Dome size, Planetarium Software used)

Note:

i. Bidders must strictly submit this Annexure as per the above format, submission of past experiences in any other format may lead to the rejection of the bid.

ii. Bidder must submit the work order and completion certificate issued by client for each of the projects.

FORMAT FOR ANNUAL TURNOVER OF BIDDER AS PER THE AUDITED ACCOUNTS

TOWARDS THE QUALIFYING EXPERIENCE

Sl. No.	Financial Year	Turnover in Indian Rupees (INR)
1.	2023-24	
2.	2022-23	
3.	2021-22	
4.	2020-21	
5.	2019-20	
6.	2018-19	
7.	2017-18	

(In case of Consortium, the Turnover of only lead partner needs to be mentioned)

_____
(Signature of Authorised Signatory)

Signature, Address, Seal & Membership No. of Chartered Accountant.

PROFORMA FOR ISSUING UNDERTAKING BY ORIGINAL SYSTEM INTEGRATOR
(To be submitted on OEM's Letterhead)

Dated:

To
Director,
Central Research and Training Laboratory,
National Council of Science Museums,
Kolkata, India

Dear Sir,

We,_____hereby state that the product offered vide this tender by our authorized agent, M/s._____ and to be supplied if found suitable and selected shall be our original equipment and is to be deemed as if the supply has been made by us directly.

Accordingly, we stand by all the terms, conditions and stipulations as defined in the NCSM Tender No. I-18012/7/24(195) of National Council of Science Museums.

We also undertake to directly make good of any shortcomings either in product quality and/or in services which my/our authorized agent may fail to fulfil as a part of his obligations under the terms & conditions of this tender.

Thanking you,

Yours faithfully,

(Authorised Signatory with Seal)

COST BREAKUP

To be quoted in INR only

** Shall be filled in, signed and sealed and shall be uploaded in scanned PDF format in the Financial Cover of E tender only.

PART A:

Sl. No.	Description	Quantity	Rate	Amount	Applicable Taxes and other statutory charges (with break-up)	Total Amount
1.	Supply, Installation, testing and commissioning of digital projectors array with geometric correction and image blending for seamless projection complete. The digital projection set shall include 6 Nos. of projectors with projector stands, necessary masks, lens and an additional projector without lens as spare	7 (6+1 spare)				
2.	Supply, Installation, testing and Commissioning of Image Generator workstations. 8 Nos - 6 nodes + 1 master + 1 spare) and technical racks, network switches, cables along with Full dome configurator and Interactive planetarium and playback software with license complete	8 (1 master+6 nodes+1 spare)				
3.	SITC of Show control system and manual console including 1 no of master control computer with necessary switches, interfaces, extenders,					

	software etc. complete and a wireless tablet for remote operation, 2 Nos dimmable screens etc. complete					
4.	SITC of Full dome Show production workstation including full dome show production softwares, interfaces, accessories and license complete	1				
5.	SITC of Automatic Calibration and alignment system					
6.	SITC of Integrated 7.1 surround sound system.					
7.	SITC of 40 KVA U.P.S. system with 30 minute backup including electrical panel for distribution of power to the installed equipment					
8.	SITC of LED Cove light, staircase lighting, step lights, exit and emergency exit signage etc.					
9.	Training on HYBRID & FULL DOME PROJECTION SYSTEM and its operation & development of shows					
10.	Refurbishment of existing 15m Dome Screen- Repair of damaged & stained panels, repainting using certified Dome screen paint from ORIGINAL Dome manufacturer and installation of new acoustic covering behind dome screen after discarding old insulation.	1				
11.	Dismantling of existing Planetarium Projection System					

	including optomechanical and digital projectors and operator console, chairs and other Equipments in the server room.						
12.	Comprehensive AMC for 2 years after comprehensive warranty of 5 years.						
13.	Fabrication, Supply, Installation, Testing and Commissioning of Reclining chairs as per approved specifications provided in Section II of Annexure B.	190+5					
14.	Any other items of work/equipment etc. not covered above, under Sl. NO. 1 to 12 but required as per scope of work provided. (add additional rows as may be required)						

Part B
Miscellaneous Civil/Electrical works

1	Finishing Hall with Loop piled carpet at least 6 mm thick, 590 GSM over an underlay of 8 mm Kinny foam. The whole to be fixed as per manufacturers norms including anodised aluminium channels for edges. Preparation works for carpet flooring including PCC concreting for making good the damages.	Sqm	200.00	Colour : as decided by NCSM				
2	Miscellaneous painting and finishing works	LOT						

3	AC Retrofit Work for realigning ducting for the placement of the projectors as per requirement of site. And provision of separate AC for projectors, if required	LOT					
4	Electrification work in Server Room, Control Console & Projector locations with conductors, conduits, switches, receptacles, DBs etc. complete. All as per detailed Drawings and relevant standards. Drawings to be provided by the bidder	LOT					
5	Civil works related to fixing of projectors, including providing enclosures.	LOT					
	Total amount for all civil/electrical works including Carpeting						

Note: 3 phase raw power will be terminated in at the desired server room. Also necessary arrangements for earthing and surge protection will be done by NCSM.

Grand total (Including all duties and taxes) (PART A + PART B of Cost Breakup) (To be entered in Sl. No. 1.01 of price bid BoQ excel sheet)	To be entered by bidder

PART C:

Cost of Optomechanical Projection System synchronized with digital projection system with hybrid show

Sl. No.	Description	Quantity	Rate	Amount	Applicable Taxes and other statutory charges (with break-up)	Total Amount (To be entered in Sl. No. 1.02 of price bid BoQ excel sheet)
1.	Supply, Installation, testing and commissioning of optomechanical projector with hybrid image generator, manual console and lift, geometric correction and image blending for seamless projection complete	1				

Note: NCSM has the right to accept part or whole of the tender based on the suitability of the product and budget approval.

PART D

Cost of Planetarium Shows: (To be quoted in INR)

(Optional- to be considered subject to requirement)

Sl. No.	Description	Amount	Applicable duties & taxes	Total amount including all duties & taxes
01.	Supply and running of 4K Hybrid Planetarium show in English & Malayalam as per the title mentioned hereunder:- **(For three year license)**			
	a) Spark: The Universe in Us			
	b) Worlds Beyond Earth			
	c) VOYAGER: the Never-Ending Journey			
	d) ONE SKY			
	e) Non Astronomy Show: 'Expedition Reef' or 'Atlas of a Changing Earth'			

UNDERTAKING

Ref. No.:-----------   Date:-----------

Tender No. I-18012/2/24(195)

To

Director,
Central Research and Training Laboratory,
National Council of Science Museums,
Kolkata, India

Dear Sir,

We have read the clause regarding restrictions on procurement from the bidder or a country which shares a land border with India; we certify that this bidder is not from such a country or; if from such a country, has been registered with the Competent Authority. We hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where evidence of valid registration by the Competent Authority shall be attached.]

We also agree that, during any stage of the tender/contract agreement, in case the above information/documents submitted by us are found to be false, NCSM has the right to immediately reject our bid/terminate contract at any stage and carry out further legal action on us in accordance with law.

Yours faithfully

For (Name of the bidder)
Signature of the Authorized Signatory
(Seal of the Organization)

Name:
Designation:
Phone No.:
Place:
Date:

FORMAT FOR CONTRACT AGREEMENT

ARTICLES OF AGREEMENT made at Kolkata, this ……....…day of …………. (month and year) between the National Council of Science Museums, a Society registered under the Societies Registration Act of West Bengal, 1961, hereinafter referred to as NCSM which expression shall include its successors and assigns on the one part and ……………………………………………………………………………………………………… ……..(Name of the successful e-tenderer)   trading   in   the   name   and   style of ……………………………………………………………………………………………… (Name and complete address of the successful e-tenderer)
hereinafter referred to as the successful e-tenderer which expression shall include his/their respective heirs, executors, administrators and assigns on the other part.

WHEREAS the NCSM is desirous of getting the work of Supply, Installation, Integration, Testing and Commissioning of hardware and software packages, interfaces, tools and/or drivers of a complete and fully integrated functional Fulldome Hybrid (Optomechanical and digital) Planetarium projection system for an existing 15 meter diameter perforated aluminium dome screen with geometrical correction, image stitching and blending etc. for seamless projection of high-resolution 2D hybrid full dome film shows and Full Dome Hybrid planetarium shows including onsite comprehensive warranty for five years and also including refurbishment of existing dome screen and supply, installation, testing and commissioning of carpet, chairs, and other minor civil and electrical works associated with the installation therein done and has caused Notice Inviting E-Tender with Tender No.I-18012/7/24(195) (Including appendix), drawings, schedule of quantities and specifications describing the work and conditions of contract.

AND WHEREAS the said NIT (including appendix), specifications, and the period schedule of quantities and conditions of contract have been signed by or on behalf of the parties hereto. AND whereas the Successful tenderer has deposited in Bank Draft/Pay Order/NEFT/RTGS
………………………………………………………………………………………………
(Exact amount in words)
the amount being………. of the ordered value of the tender) with NCSM as Security Deposit for the due performance of this Agreement as provided in the said conditions.

NOT IT IS HEREBY AGREED AND DECLARED BY AND BETWEEN THE PARTIES HERETO AS FOLLOWS:

In consideration of the payments to be made to him as hereinafter provided the successful tenderer shall upon and subject to the conditions herein contained execute and complete the work within SEVEN months from the date of issue of Letter Of Intent / Work Order (as defined in the scope of work of the NIT) as described in the said specifications and the said priced schedule of quantities along with the progress of the work.

The NCSM shall pay to the successful tenderer such sum as shall become payable hereunder at the time and in the manner specified in the said conditions.

Time is the essence of this agreement and the successful tenderer shall proceed with the work, throughout the stipulated period of this contract, strictly according to the Terms & Conditions of NIT. At any stage during execution, if any work legs behind the target as indicated in the BAR CHART for reasons directly attributable to the successful tenderer, he shall pay or allow the NCSM to deduct the same from the Security Deposit or from any money due to him as liquidated damage as per Clause 11 General Terms & Conditions of the NIT.

This agreement comprises the work above and all subsidiary work connected therewith, even though such works may not be shown on the drawings, or described in the said specifications or the period Scheduled of Quantities.

The NCSM through the Engineer reserves to itself the right of altering the specifications and of adding to or omitting any item of work or of having portions of the same carried out departmentally or otherwise and such alterations or variations shall not vitiate this agreement.

After successful completion of works in all respects, successful tenderer will hand over all the materials including equipment and machinery, brochures, drawings etc. to the end-user RSC& Planetarium, Kozhikode (Calicut) in presence of NCSM representative and shall also render all service such as operations & maintenance of the systems, provide warranty of the equipment, machinery etc. at the finalized rates, terms & conditions of the tender documents.

All disputes and differences of any kind whatever, arising out of or in connection with the contract on the carrying out of works (Whether during the progress of the wok or after their completion and whether before or after the determination, abandonment or breach of contract) shall be referred to arbitration as per Clause 23 of General Terms & Conditions of the NIT. In case of any legal dispute, other than the arbitration, the court of jurisdiction shall be at the place written in the first line of this agreement.

The provisions of the Arbitration & Reconciliation Act, 1996 or any statutory modification or re-enactment thereof and of the rules made there under for the time being in force shall apply to arbitration proceedings under this clause.

In witness whereof the parties have set their respective hands the day and the year and the place hereinabove written.

-------------------------------------   ------------------------------
SIGNED, STAMPED AND   **SIGNED, STAMPED AND**
DELIVERED for Contractor   **DELIVERED for Council**
WITH SEAL   **WITH SEAL**

In presence of the following witnesses: In presence of the following witnesses:
(M/s. Planet Infrastructure Management   (National Council of Science Museums)
Pvt. Ltd.)

Signature, Name & Address of Witnesses   Signature, Name & Address of Witnesses

……………………….   ……………………….

……………………….   ……………………….

NATIONAL COUNCIL OF SCIENCE MUSEUMS
33, Block – GN, Sector V, Bidhan Nagar,
Kolkata – 700091, West Bengal, India
Phone: +91 33 2357 9347/ 2357 5545 2357 0850
Fax: +91 33 2357 6008
E-mail: sciencecentre@ncsm.gov.in

Tender No. I-18012/7/24(195)

DECLARATION 1

We hereby acknowledge that we have carefully read and agreed to the General Terms and Conditions as outlined in the tender documents by National Council of Science Museums, for the Supply, Installation, Integration, Testing, and Commissioning of hardware and software packages, aluminium dome screen, interfaces, tools and/or drivers of a complete and fully integrated functional Full dome Hybrid& Digital2D immersive Planetarium projection system (15 mtr. diameter) including the onsite comprehensive warranty for five years and operation for a period of five years. We guarantee to provide original equipment as per specification of the tender and carry out the work precisely in accordance with the drawings, specifications, and conditions listed in the tender documents, together with any necessary corrigendum, in the event of placement of any work order on us. We also understand that once the financial bid is opened, there will be no change allowed in the quoted price under any circumstances whatsoever.

Signature of the bidder / Constituted Attorney.

(With date and Official Seal)

DECLARATION 2

OF NON-RELATIONSHIP

It is certified that I/We, the undersigned, do not have relationship with any of the employees working at National Council of Science Museums. The above statement is true and is submitted against the Tender No. I-18012/7/24(195)   of NCSM.

Signature of the tenderer /Constituted Attorney.

(With date and Official Seal)

DECLARATION 3

This is to certify that our firm has not been blacklisted by any Govt., Semi Govt., Dept. or any other organization.

Signature of the tenderer /Constituted Attorney.

(With date and Official Seal)

FORMAT FOR BANK GUARANTEE BOND

(For EMD only)

1. In consideration of the National Council of Science Museums, Block GN, Sector V,Salt Lake,Bidhan Nagar, Kolkata 700091 hereinafter called the NCSM having stipulated under Clause 4.1 (page 5) of the Notice Inviting tender No. I-18012/7/24(195) for the work of (mention name of work as in NIT) at the aforesaid site agreed to accept payment of Earnest Money for due fulfilment of the terms and conditions contained in the said NIT (including appendix) for participation in the tender from (Name and address of the prospective tenderer) (hereinafter called the prospective tenderer) by production of a bank guarantee of Rs.40.00 Lakhs (Rupees forty lakhs only), we (Name and address of Bank furnishing guarantee(Br. Code ……………..) (hereinafter referred to as "The Bank") do hereby undertake to pay to the NCSM an amount not exceeding Rs.40.00 Lakhs (Rupees forty lakhs only) against any loss or damage caused to or suffered or would be caused to or suffered by the NCSM by reasons of any breach by the said prospective tenderer of any of the terms or conditions contained in the said NIT (including appendix) relating to participation in the tender.

2. We, (Name of Bank), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the NCSM stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the NCSM under National Council of Science Museums by reasons of any breach by the said prospective tenderer of any of the terms or conditions contained in the said NIT (including appendix) or by reason of the prospective tenderer's failure to comply with conditions contained in the said NIT relating to participation in the tender. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.40.00 Lakhs (Rupees forty lakhs only).

3. We, (Name of Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period as mentioned in Clauses 4.1 a, c, d - Page 6 of the said NIT (including appendix) for deciding the tender and that it shall continue to be enforceable till the dues of the NCSM under or by virtue of the said NIT (including appendix) have been fully paid and its claims satisfied or discharged or the NCSM certified that the terms and conditions of the said NIT (including appendix) have been fully and properly honoured and carried out by the said prospective tenderer for participation in the tender and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the periods stipulated above, we shall be discharged from all liability under this guarantee thereafter.

4. We, (Name of the Bank) further agree with the NCSM that they shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to extend time of deciding the tender as may be expedient and to forbear or enforce any of the terms and conditions relating to the NIT (including appendix) and we shall not be relieved from our liability by reason of any such extension being granted to the said proposed tenderer for any forbearance, or act of omission on the part of the NCSM or any indulgence by the NCSM to the said proposed tenderer or by any such matter or thing whatsoever which under the law relating to surety.

5. We, (Name of the Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the NCSM in writing.
   Dated, the …………………….. day of ……………..………….

   For ………………………………………..
   (Authorised signatory of the Bank with Seal)

PERFORMANCE CERTIFICATE
(To be submitted by OEM on letterhead of Client)

This is certified that M/s --------------------------- had successfully installed multi-channel Digital Projection and/or Optomechanical projection system using _____(OEM name) software at -------------------------- (Organizaion/Institute name) in a dome having size of ------------- ---------------(meters).

The Theatre using the said software was made open to the public on --------------. The system has consistently operated satisfactorily since -----------------------------.

Further, it is hereby certified that the Digital Planetarium and Optomechanical projection system has been operational for public use continuously for one year.

Signature of Authorised Signatory with seal

MAINTENANCE EXPEREINCE OF OEM

(To be issued by client of OEM)

This is certified that M/s ---------------------------- (Name of OEM) is/had providing/provided maintenance support to the multi-channel Digital and/or Optomechanical full dome 2D/3D Projection system installed at -------------------------- (Organizaion/Planetarium name) in a dome size of ----------(meters) since/from ------------------------(date) to ------------------------(date). The performance of the M/s ---------------------------- (Name of OEM) during the contract period has been found to be ------------.

Signature of Authorised Signatory with seal

EXPEREINCE OF AUTHORIZED AGENT

(To be issued by respective OEM)

This is certified that M/s ---------------------------- (Name of Authorized agent) had successfully installed multi-channel Digital system at --------------------------- (Organizaion/Institute name) as our authorized partner in India (kindly mention specific role if other than installation and integration). The system was installed on -------------------------(date) in a dome size of----------(meters). The Theatre was opened to the public on -------------- and operational.

Signature of Authorised Signatory with seal

EXPEREINCE OF AUTHORIZED AGENT

(To be issued by respective OEM)

This is certified that M/s ---------------------------- (Name of Authorized agent) had successfully installed Optomechanical Projection system at -------------------------- (Organizaion/Institute name) as our authorized partner in India (kindly mention specific role if other than installation and integration). The system was installed on ------------------------(date) in a dome size of---------- (meters). The Theatre was opened to the public on -------------- and operational.

Signature of Authorised Signatory with seal