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## **Technical Specifications and Scope of work**

### **Section I**

This is a Tender document for an integrated system with High-end heavy-duty DLP front projectors with RGB PURE LASER light source to be deployed with an 18-meter diameter perforated aluminium dome screen tilted at 18 degrees with geometrical correction, image stitching and blending etc. for seamless projection of high-resolution Active 3D Digital full-dome film shows at Science City, Dehradun, Uttarakhand.

#### **The scope of work includes:**

- A. Site preparation and civil works as described in Annexure-L**
- B. Supply, installation, integration, training, testing and commissioning along with onsite comprehensive warranty support of Three Years with operation for three years. These provisions will be considered for evaluation of comparative statements of bids. Post warranty comprehensive maintenance for further five years of following comprehensive warranty will be operated, as per need, and these will not form part for evaluation. The quoted rate should factor for the following:**
  1. High resolution Active 3D visualization system with minimum **53/ million Pixel** before blending on the 18-meter perforated 18-degree tilted dome screen.
  2. 3-Chip DLP projectors with ANSI lumens of minimum 32,000, minimum individual contrast ratio of 5000:1 and minimum individual native resolution of 4096-pixel x 2160 pixel with signal processing at 120 Hz, shall be used for full dome projection system with effective screen resolution of minimum **30 million Pixel after seamless** blending on the dome screen mentioned below. Optimized blending technology should be adapted for laser light sources.
  3. Each 3-Chip DLP projector shall be pure RGB Laser with 25,000 hrs. life at 80% brightness.
  4. Edge blending and geometric correction for seamless display and accurate mapping to screen geometry shall have to be executed to achieve proper black-out.

5. A high-performance multi-channel media creation, image generator and playback system which can create as well as play high resolution Active 3D full dome shows, Active 3D large format films and Active 3D digital dome video shows. It should provide a user-friendly Graphical User Interface to control system configuration, content creation, distortion correction and blending configuration.
6. Display management system shall control the display configuration like tiling, positioning, alignment etc. Video transmission should be through QFSP+ module and multimode OM3- OM4 fiber-optics or Active HDMI.
7. 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.
8. Properly dressed & coded power and data cabling for all systems and devices so as not to cause interference with video signals and data networks.
9. Estimation of power required for the complete integrated system and providing suitable online UPS system having parallel redundancy 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 make and same batch of production.
10. For distribution of power to the UPS, Science City, Dehradun, Uttarakhand 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 suitably designed. A detailed drawing with full specifications of the proposed power distribution panel shall be submitted to NCSM for approval before initiating the work.
11. Design of seating arrangement with enhanced space between two rows. The new chairs should have a reclining arrangement as per required field of view of the visitors seated in different positions/rows from the dome screen with sufficient leg space. The optimum capacity should be **around 200** with space at the front for live interaction and such design to be provided by the bidder for approval by NCSM before execution.
12. A 7.1 surround audio system with minimum 7 speakers and one subwoofer for 18-metre Dome Theater complete with amplifier, mixer and high-quality speakers etc. giving appropriate audio power output.
13. LED cove lighting of the full dome theatre and its integration with the show control system. It is mandatory to have a brightness of minimum 1700 Lumen per meter including fixture for a Dome of 18m 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.
14. Emergency LED based exit signage inside the theatre suitable LED STEP LIGHTS with

its associated electrical wiring works.

15. Public address system inside the theatre for making announcements and or for conducting the live show with necessary wiring & cabling work.
16. Sound proofing and acoustic treatment of the Full dome theatre wherever necessary including Acoustic/insulation jacket for Dome Screen, shall be under the scope of the bidder.
17. The bidder shall submit detailed layout design, capacity, load calculation, requirement of cooling of projectors etc. for Full dome Theatre including locations for placement of projectors, UPS system, control system. Suggestive locations for equipment are marked in drawings. This work will be taken up by the bidder after approval of NCSM.
18. The bidder shall provide a site plan document with plan, elevation and mounting details for placement of Projectors, Screen, Viewer Gallery, and Rack Mounted assemblies for Image Generators and Playback system, Speakers and Display Management System.
19. Touchscreen-based show control systems shall be provided which should include general illumination, dome lighting control, exit signage control and emergency exit signage control, audio, projectors, device control units, colour correction, colour matching, etc. It shall be located in the viewer platform with wireless iPad/Tablet for operation of the show.
20. 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.
21. The agencies of the successful bidder are required to coordinate with other agencies for the work of HVAC, electrical work, fire alarm and fire suppression system that is planned for installation between the outer dome and the aluminum dome with due concurrence of NCSM.
22. Need based analysis, space planning, concept design, schematic design, detailed design, procurement management, site supervision, content production, special or general programming, set up, testing and commissioning, training, planned maintenance services, operational services, audio visual system management, illumination management etc. shall all be under the scope of the work of the bidder.
23. Special mountings 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.
24. **The system is to be designed with very high up-time commitment (90% per year). The selected bidder shall maintain inventory of spares for the designated up-time commitment for on-site warranty.**

25. Preventative maintenance shall be carried out by the bidder at regular intervals as per OEM guidelines during the Warranty period of Three Years and post warranty period without disturbance to the shows and a logbook to this effect shall be maintained at site. Suggested schedule for preventive maintenance shall be clearly defined and submitted in Cover 1.
26. 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.
27. Integration of all subsystems as indicated above to configure the “Full dome digital Active 3D Immersive projection system” shall be the responsibility of the bidder.
28. The bidders shall also quote for (a) Annual charges for operation of the installed facility during warranty period, (b) AMC charges for 5 years post warranty period of 3 years; (c) Annual Operation Charges for 5 Years (beyond the first three years for which costs are already included in the financial evaluation) for renewal on year-to-year basis for the visitors of Science City, Dehradun, Uttarakhand. The operation timing would be from 11:00 a.m. to 7:00 p.m. This timing may vary during the peak season (in single or parts).
29. For Technical bid (Cover -1) evaluation, the bidders shall provide a detailed bill of items and quantities (without cost) of each item proposed for their offer along with schematic system architecture and product catalogues for all hardware/software items.
30. Govt. of Uttarakhand shall provide incoming power cable of required capacity in the electric panel room which the bidder shall connect to their main distribution panel through online UPS.

**Note:**

All civil and electrical works relating to the installation of the Dome Screen, Full-dome system/show, acoustic paneling, fabrication/installation of base steel structure for mounting of projectors array are to be taken up by the selected bidder, and all necessary materials, machines and any other machine tools required for the fabrication and installation are to be arranged by the selected bidder at their own cost. The selected bidder will provide design, drawings, details and complete specifications for acoustic treatment/dome structure /paneling and steel structure for installation of projectors array as described earlier before execution for approval and the same shall be maintained while execution at site.

All safety precautions and compliance of statutory obligations shall be taken care of by the selected bidder during execution of the entire project at site.

Client's responsibilities:

- i. Science City, Dehradun, Uttarakhand shall provide electrical power for execution of the work.
- ii. Science City, Dehradun, Uttarakhand shall provide lockable space within the site for storage of materials by the selected vendor.

## Section II

**Technical specifications of integrated high-resolution full dome digital Active 3D immersive projection system for an 18-meter diameter, 18 degree tilted perforated aluminium fixed base dome screen with geometrical correction, image stitching and blending etc. for seamless projection of high-resolution Active 3D digital full dome film shows and digital planetarium video shows:**

### **1. FULLY HIGH-RESOLUTION FULL DOME DIGITAL Active 3D IMMERSIVE PROJECTION SYSTEM**

The integrated High Resolution Full Dome Digital Active 3D Immersive Projection System consists of Projectors array, new perforated dome screen, Blending & Geometric Correction units, Image Generator Servers & GUI server for playback, show control, Server for dome slicing and content creation for full dome planetarium video shows, Display Management, Alignment & Calibration System, UPS system, 7.1 surround sound system, LED Cove lighting and Exit signage, emergency exit signage, LED Step Lights, etc. This system is a multi-channel display system with combined resolution of 53 million Pixels without blending. The specifications of the complete system are provided in section 1.1 to 1.2.20

#### **1.1 SUPPLY & INSTALLATION OF 18-METER DIAMETER 18 DEGREE TILTED DOME PROJECTION SCREEN**

Acceptable OEMs: Astro-tec or Spitz or equivalent make (to be got approved with proper comparison of technical parameters)

##### **A) DESIGN PARAMETERS FOR DOME PROJECTION SCREEN**

- i. It is required that the dome screen be of a bottom-fixed design resting on the ring-beam constructed at site by the bidder which is supported on a number of RCC framed pillars/ stool columns or a load bearing Steel drum structure fabricated accurately for the tilted Dome base.
- ii. An **adequate number of horizontal supports** must be incorporated to effectively **compensate for unequal load distribution**, particularly due to the **tilted inclination** of the dome screen at 18° from horizontal to prevent from shifting and sagging.
- iii. The **horizontal suspension chains, if any**, must be mounted on a **hanger system**, which is to be securely fixed to the **existing nearby RCC Beam or Pillars** of the building. This system must maintain the dome's inclination with a **tolerance of ±1 degree**, ensuring a stable and level projection surface on the inclined plane. These details are to be provided to the TIA for verification of structural strength aspects by the architect of the project.
- iv. A proposed **schematic design** of the mounting system for the dome should be submitted by the bidder for the purpose of evaluation and later as a GFC drawing for construction. Necessary items of work which are not specified / included in the scope of work of the bidder shall be taken care by the construction Civil contractor of the project but however its precision/accuracy shall be overseen and ensured by the

bidder/Dome supplier.

### **Compliance & Standards**

- a) **Structural Codes:** Must comply with local building codes (e.g., IBC, Eurocode, IS codes)
- b) **Projection Compatibility:** Compatible with 6K/8K Full-Dome projection systems
- c) **Fire Rating:** Flame-retardant interior surfaces (ASTM E84 / EN 13501 standards)

### **Key Structural Specifications**

1. **Flexible Connections:**
  - Supporting members and restraints should include flexible joints or seismic snubbers to accommodate lateral movement.
2. **Redundancy:**
  - Use *multiple load paths* for suspension to avoid failure if one connection fails.
3. **Lateral Restraints:**
  - Horizontal restraints fixed to the dome and building structure must be capable of resisting seismic sway.
4. **Damping Devices:**
  - Consider installing tuned mass dampers or elastomeric isolators where feasible, especially in Seismic Zone V.

Schematic drawing of the site enclosed understanding the site designs for planning & design of the dome installation at site. Bidders should submit their installation drawing for the dome considering the site designs.

- v. A circular compression ring shall be provided and located at the zenith or apex of the dome, to accommodate the terminal points for the main ribs and the perforated top circle.
- vi. The 18m diameter dome design must incorporate perforated aluminium panels of thickness 1 mm (19 - 20 SWG) to be powder coated and prefabricated structural aluminium ribs, equally spaced. The panels must be fixed in such a way that each panel is in flush with the neighboring panels without overlapping. The dome should support projection up to 8K resolution. The panel perforations are made of 1.2 mm to 1.6 mm diameter holes (smaller than star images) leaving a void area of approximately 23%. Rivets used for fixing the panels are countersunk and finished to perfectly match the panel surface, rendering them invisible under projection conditions.
- vii. 360° Aluminum Cove Trough should be provided and be fixed at the Horizon level of the Projection Dome without compromising projection Horizon. Cove Facia should not be more than 100 mm in height.
- viii. Fixed Ladder/s should be provided in North-South direction for the purpose of human access & maintenance.
- ix. The opening of the Dome should be 180° with a tilt of 18°
- x. The structural gauge of the dome shall be sufficiently stiff so that deflection and settlement of the structure will not lead to deformation of the screen panels, based on the stiffness of the support system provided by the owner.

- xi. The dome must be strong enough to support audio speakers and special effects mounted behind the dome itself. This construction technique must provide for outstanding acoustic and visual properties.
- xii. The dome must allow optimum air circulation.
- xiii. The screen must offer the possibility to totally renew its surface after a long period of use by means of cleaning and repainting. This should allow to obtain a surface aspect almost as good as the first day of installation. The cleaning and painting must be done by the screen manufacturer and not by a sub-contractor. Bidders must provide a certificate from the dome-screen manufacturer attesting his capability of cleaning and repainting the dome together with at least 3 certificates of completion attesting for similar works carried out during the last 5 years.
- xiv. All necessary modifications of civil structure inside the RCC dome for installation of screen shall be designed and executed by the bidder with due concurrence of the TIA. It is in the scope of the bidder and the same may be vetted by NCSM/Centre.

## **B) SEAMS AND JOINTS**

- i. The joints must be done without gap and without overlapping
- ii. Seams between adjacent panels will be crimped & flushed or butt finished on all sides. All seams should be invisible against projection.
- iii. Provide a small finished sample section demonstrating joint construction in an area where four (4) adjacent panels meet for inspection and approval. In case of any observation on the joining, the same needs to be rectified and a modified sample to be shown for approval before going ahead for installation.

## **C) INSULATION BACK-COVER FOR DOME SCREEN**

A blackout insulation jacket with ASTM E84 standard with minimum 1inch thickness and having Noise Reduction Coefficient (NRC) of 0.6 - 0.7 to be installed on the top of the Dome screen.

## **D) SCOPES INCLUDED:**

- i. Necessary scaffolding, platform man power and all installation related equipment and resources shall be provided by the bidder.
- ii. All necessary modifications of civil structure inside the dome for installation of screen shall be designed and executed by the bidder with due concurrence of NCSM. It is in the scope of the bidder and the same may be vetted by NCSM/Centre

## **E) INSULATION OF INNER SURFACE OF CONCRETE DOME / ENCLOSURE:**

**Insulation:** Appropriate Thermal & Acoustic insulation shall be installed. Thermal Insulation material shall be laid with Vapour Barrier to achieve at least R-35 as a first layer on the concrete surface. Acoustic insulation should be laid over the thermal insulation to achieve an NRC of 0.6 -0.7 for the Dome Theatre.

**Acoustic paneling below the dome screen:**

Wall paneling system to provide excellent acoustical performance in the Full dome theatre by attaining at least 0.7 NRC. Modular Panels should be of formaldehyde-free Fiberglass material or Perforated Aluminium Panels with Acoustical Mineral Wool backing with integrated mounting system or similar - to be fabricated all along the peripheral wall of the Dome theatre below the Dome Horizon from stepped floor to Cove Bottom. Panels should come in modular sizes and should meet ASTM standards of Surface Burning (Fire), Moisture & Fungus. All panels should be butt joints with a good aesthetic finish. Colour should be carefully chosen to reduce cross- reflectance from Projection and should be got approved from TIA before application.

Total area should be measured before fabrication and prior approval should be obtained. Preferred Manufacturers: Hunter Douglas, Armstrong, Anutone or high-quality wooden slats and acoustic fabric backing and at least 40mm Polysynth or equivalent duly approved.

**1.2 PROJECTOR ARRAY****1.2.1 Immersive 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, **to provide a seamless display of at least 30 MP (after blending) arranged in a front projection configuration with the specifications as per table 1.2.1.** The projectors are to be mounted rigidly on a suitable structure by the bidder who will fabricate and install the projector mounting structure at site as per the design, details, drawings and specifications provided by the projector OEM. The bidder must study the drawings provided carefully before submission of tender and also note the locations earmarked in the building for keeping the Image Generator Server, projectors, Audio racks, UPS and other necessary units for routing of the cables needed to connect all constituent components of the system. The projection system must consist of 6 projectors (excluding spare projector), arranged along the periphery of the dome to evenly cover the entire dome with a uniform image with the required image resolution.

**Table 1.2.1**

<b>Specifications</b>	<b>Detailed description</b>
Number of Projectors	Please specify minimum nos. and make proposed to be used in the projector array. The dome has 4 projector rooms for placing the projectors. NB: All Projectors must be of the same specifications and from the same OEM and shall directly project contents on the dome screen.
Type of projector	3-Chip DLP Projectors with RGB Pure Laser Light Source of minimum 32000 ANSI Lumens or more and contrast ratio of 5000:1 or better with high frame rate of 120 Hz.
Projector array comprising multiple projectors	To cover 18-meter dome screen tilted at 18 degrees
<b>Total Resolution before and after blending</b>	<b>53 MP or higher (before blending) and minimum 30 MP or higher (after blending)</b>

Mounting	Projectors are to be mounted on the specially designed structure around the dome periphery. Each mount/cradle shall provide full optical alignment and calibration support along each of the X, Y and Z axes as well as rotation about the horizontal/vertical axis. The projectors will be installed along the periphery below the spring line of the screen.
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### 1.2.2 Projector

- i. The specifications of individual projector are provided at table 1.2.2: 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 the same specifications and manufactured by the same OEM in their own factory.
- ii. The proposed projectors must cover ~98% of the Rec2020
- iii. The maximum operating noise of the projector must not be higher than 35 dBA
- iv. For proper integration in the building, the proposed projectors' size should be kept within the limits of spaces earmarked for installation of projectors.
- v. If the projectors require additional cooling or air supply, the Contractor shall install them on his own
- vi. The geometry, brightness and gamma of the Full-Dome image must be uniform. To achieve that, the tenderer must supply an autocalibration system to achieve those adjustments automatically. The contractor must provide and install this auto-calibration system, i.e., all the necessary hardware and software, along with a description of procedures and operations.

**Acceptable OEMs:** BARCO/Christie/NEC /Sony or Equivalent (to be approved based on proper technical comparison to be provided by the Bidder).

**Table 1.2.2**

Specifications	Detailed description
<b>Display Technology</b>	Three chip DLP; Light Source: Pure RGB Laser
<b>Minimum native Resolution and contrast ratio</b>	4096 x 2160 pixels, and minimum 5000:1 contrast ratio.
<b>Internal Input / Output ports</b>	HDMI/Display port
<b>Input / Output control and networking</b>	RS232, TCP/IP.
<b>Lens Options</b>	Standard Zoom to Wide Angle Zoom to cover the entire screen areas specified (please specify further technical details along with type and OEM of lenses to be used).
<b>Calibration</b>	Support for controlling individual colour and intensity on each colour channel.
<b>Source Life</b>	Minimum 25,000 hrs.
<b>Operating Hours</b>	The System shall be capable of being used for twelve hours per day 364 days in a year.

<b>Monitoring Parameters</b>	Source life, Fan status, Temperature status, etc. Self-contained liquid cooled
<b>Noise</b>	<35 db at 25°C per projector
<b>Accessories</b>	All standard accessories including IR remote, Line cord etc.
<b>Color gamut</b>	98% of the Rec. 2020 color space
<b>Warranty</b>	Manufacturer's standard warranty of not less than Three Years on projectors.

### 1.2.3 Blending and Geometry Correction (BG) unit:

- i. Blending and geometric correction for full dome to be primarily done using software-based, GPU-accelerated warping and blending and integrated with automatic alignment systems.
- ii. 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 desired effect (**so that merging areas are not visible**) could also be considered.

specifications and functionalities of this unit are as below:

**Table 1.2.3**

<b>Specifications</b>	<b>Detailed description</b>
Image Operations	Geometry Correction
	Edge Blending
	Colour Correction and Matching
	Uniformity Correction and Matching
	Software for geometric correction shall be incorporated in the system.

### 1.2.4 Image Generator Server and Playback System with full dome show software (minimum 12+2+2 standby. However, lesser nos. are preferred due to ease of installation and maintenance)

A suitable solution shall be ensured to drive the required projector array with the specifications given below. Image GUI server shall drive the projector array with two image render servers for each projector for Full-Dome films and planetarium video shows onto a digital immersive dome projection screen. The Image GUI server shall provide synchronization between images projected onto the dome through various image generator servers for a seamless image without any tearing. The server shall also provide synchronization of multilingual audio tracks with the projected film shows.

Acceptable OEMs: Dell, HP or equivalent to approved by TIA based on technical comparison.

- i. Image generators will be delivered and installed in the server room located outside the dome sphere at identified spaces.

- ii. Image generators will be placed in racks. The bidder will provide racks in the quantity necessary for the proper assembly of all equipment for operating the dome projection and ease of access for repair & maintenance. The racks supplied must be suitable for the room and the equipment supplied.
- iii. Image generators must have at least the following parameters:
  - 1. CPU, with a minimum of 8 cores, 16 threads, minimum 22 MB Cache and with the Pass Mark CPU Mark test result of min. 26000 points. The offer must be accompanied by a printout from the website: <http://www.cpubenchmark.net> confirming the fulfilment of the above condition.
  - 2. RAM 64 GB DDR5 ECC with a frequency of at least 4800MHz.
  - 3. **NVIDIA RTX 4500 Ada Generation professional workstation graphics card**
  - 4. Genlock Sync Card
  - 5. SSD drives should be able to store system, simulation software data and 30 hours of video at native resolution etc. in 50% of its storage capacity.
  - 6. Integrated backup SSD allowing backup of data & system
  - 7. No jerks, flicker or image tearing should appear on screen.
  - 8. Frame rates up to 60 fps.
  - 9. The Image generators must provide images in perfect synchronization with the appropriate parameters for the full-dome display with the projection system.
  - 10. They must be able to display images from various sources such as:
    - a. From astronomy software, calculated in real time
    - b. From previously prepared shows, encoded in popular formats such as XVID-H.263, AVC-H.264, HEVC-H.265
    - c. Obtained from an external source via streaming.
- iv. The Contractor will place two HDMI or Display Port inputs, allowing to connect external HDMI or Display Port signals and capture them into the digital projection system.
- v. These inputs must be able to capture the image in a resolution of 3840x2160@60Hz. In this way, the 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. Network Device Interface (NDI) low latency video streaming technology must be used between those inputs and the image generators.

**Table 1.2.4**

<b>Specifications</b>	<b>Detailed description</b>
Image Generators	<ul style="list-style-type: none"> <li>i. CPU, with a minimum of 8 cores, 16 threads, minimum 22 MB Cache and with the Pass Mark CPU Mark test result of min. 26000 points. The offer must be accompanied by a printout from the website: <a href="http://www.cpubenchmark.net">http://www.cpubenchmark.net</a> confirming the fulfilment of the above condition.</li> <li>ii. RAM 64 GB DDR5 ECC with a frequency of at least</li> </ul>

	<p>4800MHz.</p> <ul style="list-style-type: none"> <li>iii. Graphics card with at least 7680 CUDA Core; min 60 3<sup>rd</sup> generation RT cores; min 240 4<sup>th</sup> generation Tensor Cores; single precision performance min 39 TFLOPS; RT Core Performance min 91 TFLPOS; Tensor Performance min 630 TFLOPS, 24Go GDDR6 ECC, Ada architecture.</li> <li>iv. Genlock Sync Card</li> <li>v. SSD drives with enough space to store system, simulation software data and 30 hours of video at native resolution.</li> <li>vi. Integrated backup SSD allowing backup of data &amp; system</li> </ul>
Media Server Architecture	<p>Choice of video codecs with loss less compression Full control of distortion correction-warp, blend &amp; channel management</p>
Pre-process Data transfer Rate*	<p>No jerks, flicker or image tearing should appear onscreen. Frame rates up to 60 fps per eye in 3D stereo.</p>

### 1.2.5 Show Control System

- i. 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.
- ii. The Contractor will design and install a desk furniture adapted to limit the emission of light from monitors and other light sources located in the control panel.
- iii. The control station must be equipped with a black matt wheel chair with adjustable height and backrest.
- iv. The entire dome projection system, including the video player, the astronomical simulation, the projectors, 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 scripts.
- v. The Control computer should have at least 2 monitors with Display size: minimum 22inch (diagonal) having Display Resolution of 1920X1080 or better with a dimming hardware to control monitor brightness in dark environment.
- vi. The control computer will be located in a technical rack with the image generators in a server room.
- vii. The control computer must meet at least the following parameters:
  - a. Accepted OEM – DELL, HP or equivalent approved based on technical comparison.
  - b. Intel CPU, with a minimum of 8 cores, 16 threads, mini 22.5 MB Cache with the Pass Mark CPU Mark test result of min. 26000 points. The offer must be accompanied by a printout from the website: <http://www.cpubenchmark.net> confirming the fulfilment of the above condition.
  - c. RAM 64 GB DDR5 ECC with a frequency of at least 4800MHz.
  - d. Graphics card with at least 5880 CUDA Core, 1.9 GHz base frequency, 2.4 GHz boost frequency, 12Go GDDR6X, Ada Lovelace architecture
  - e. SSD drives with enough space to store system, simulation software data and 30

hours of video at native resolution.

- f. Integrated backup SSD allowing backup of data & system
- viii. 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. (Note: The installation of an internet connection for such use will not be the responsibility of the bidder.)
- ix. 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 the TIA.
- x. 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:
  - a) USB 2.0 or 3.0 Digital I/O System
  - b) 8 Channel Analog Interface
  - c) 2 + 2 Channel AES / SPDIF Interface
  - d) 8 Channel ADAT Interface
  - e) Bit / 192 kHz Digital Audio
  - f) 40 x 20 Matrix Router
  - g) MIDI Input / Output
  - h) Full Stand-Alone Operation
  - i) Direct USB Recording
  - j) Class Compliant Operation

The Show Control System should provide the following features:

**External Control of Devices**

1	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. The installation of an internet connection for such use will not be the responsibility of the bidder.
2	It must be possible to conduct a full live presentation from the control station. As well as wirelessly from a mobile tablet or iPad. The range of the connection should allow you to move around the dome without losing control on the mobile device.
3	The software installed in the tablet is to be identical to that installed in the controlling 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 controlling 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 main computer Support the drag & drop function to start displaying images and other multimedia. The software running on the tablet and the main computer must be synchronized, which means that a change made on one device is immediately visible on the other.
4	The contractor should also provide a wireless gamepad that will enable to control the camera like in a flight simulation.
5	The contractor will have to supply a Manual Console to control the astronomical

	simulator and other equipment (Full-Dome video player, audio, lighting)
7	It must be possible for the operator to change the function controlled by the knobs & buttons and this configuration has to be saved and restored at the when the system is restarted.
9	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
11	It must be possible for the operator to customize all the buttons, knobs, and 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.)
13	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.
14	Any modification made on the manual console must be reported on the control console as well as on the mobile controller.

### 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 below:

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.

#### 1.2.6 Integrated Audio System

A 7.1 surround audio system of JBL, BOSE, Sony, AKG or Yamaha brand should be an integrated part of the overall system. It should be fully controlled under the Show Control System 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 should also include public address system inside the theatre.

Specification	Detailed description
7.1 channel surround audio system	The audio system should be fully integrated with the show control system. Audio system should consist of 3speakers for the main front channels, 2 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/Centre Right	Type: 3-way speaker Frequency response ( $\pm 3$ dB): 50 Hz - 18 kHz Dispersion: 90° x 50°(-30/+20° up/down) Power: 460W passive Max SPL pressure: 134 dB, @ 1 m Crossover: Bi-amp (LF+MF/HF) or passive

	<p>Sensitivity @ 1 m: 98 dB Nominal impedance: 4 ohms passive</p>
4 speakers for the surround channels	<p>Type: 2-way speaker Frequency response: (<math>\pm 3</math> dB): 55Hz - 18 kHz Dispersion: 90° x 110° Power: 260W Max SPL pressure: 125 dB, @ 1 m Sensitivity @ 1 m: 92 dB Nominal impedance: 8 ohms</p>
Subwoofer	<p>Type: 1x18" subwoofer Frequency response (<math>\pm 3</math> dB): 30 Hz - 500 kHz Power: 650W Max SPL pressure: 132 dB, @ 1 m Sensitivity @ 1 m: 95 dB Nominal impedance: 4 ohms</p>
Power Amplifiers	<p>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 connector to corresponding channel at given impedance Signal-to-noise ratio: &gt; 103 dB (8 ohms, 1 kHz) Damping Factor: &gt;200 (8 ohms, 10 Hz to 400 Hz) THD: &lt;0.5%</p>
Audio processor	<p>DSP, EQ Built-in crossover, can convert up to 7.1 audio channels into passive, bi- or tri-amp. Speaker management Interactive graphical interface that provides the processor with a 1/3 octave graphic equalizer, LCD screen and volume button accessible on the front panel System fault detection Analog input connector to accept 8 channels of signals from external sources. 8-channel analog output Redundant output to directly distribute audio signals during a power outage. Microphone input with gain level adjustment LAN connection via RJ45 connector Frequency response 20 Hz -20K Hz, ref 1KHz +/-1dB THD + N &lt;0.01%, 20 Hz - 20 kHz Dynamic range &gt;102 dB</p>
Digital Audio Mixer	<p>connection of a minimum of 20 inputs and 10 outputs. 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. Allow to adjust the sound level of each sound input separately (microphone or other). Patch panel with a minimum of 20 inputs and 10 outputs to be connected to the digital mixer through a single cable. Equipment connected to patch panel should be allowed to be</p>

	patched in the digital mixer as audio input / outputs.
2 wireless lapel microphones as well as the associated rack mountable receivers	<ul style="list-style-type: none"> <li>b. Sound Pressure Level 120 dB SPL</li> <li>c. Cardioid</li> <li>d. Signal-to-noise-to-noise ratio <math>\geq 110</math> dBA</li> <li>e. Total harmonic distortion (THD) <math>\leq 0.9\%</math></li> </ul>
2 wireless handheld microphones as well as the associated rack mountable receivers	<ul style="list-style-type: none"> <li>a. Sensitivity 2.1 mV/Pa</li> <li>b. Sound Pressure Level 154 dB SPL</li> <li>c. Cardioid</li> <li>d. Signal-to-noise ratio <math>\geq 110</math> dBA</li> <li>e. Total harmonic distortion (THD) <math>\leq 0.9\%</math></li> </ul>

### 1.2.7 UPS system with parallel redundancy

Specification	Detailed description
Reclining chair	<p>Tip-up and back push reclined chair with recline angle 20 to 45 degrees Centre to centre 20".</p> <p>ABS molded housing for seat &amp; back cushions</p> <p>All sheet metal parts with powder coated in approved colour matching with interiors.</p> <p>Arm rest in Polyurethane injection molded.</p> <p>Seat numbering on inner both the side of the chair stands with silicon fluorescent thin stickers.</p> <p>Row number for seat along the aisles.</p> <p>Provision for LED lights on sides along with aisles with the row and the seat numbers display.</p> <p>For Noise Reduction, use Nylon 66 components on moving parts</p>
Frames of seat and back	15 mm thick high-pressure steam pressed hard ply wood for seat and the back out of which the back is of 12mm the bent ply.
Fabric	Colour to be approved by authorities. All fabric that shall be used shall be fire retardant. Test certificates shall be submitted
Spring	Spring for tip-up and back push mechanism torsion spring/spring steel IS:44541981 grade III
Sheet-metal components	<p>HRCA/CRCA Sheet metal IS:1079 1994</p> <p>Side stand 3mm (+/- 0.2 mm) thick size: 415 mm (+/-5 mm) x345 mm (+/-5mm) both side bottom circular cutting with 140 mm radius.</p> <p>75 mmx25 mm 16g 190 mm length tubular pipe for the leg welded to the 3 mm plate.</p> <p>Flat for base of the stands 280 mm (+/-2 mm) length 50 mm (+/- 2 mm) x 5 mm (+/-0.2mm).</p> <p>Mechanism components 2 mm HRCA Back push box 180 mm (+/-2 mm) x 70 mm (+/-2 mm) &amp; height of the box 15 mm (+/-2 mm), ear "L" bracket attached to the box 190 mm (+/-2 mm) x 135 mm (+/-2 mm). With two slot</p>

	holes for fixing the back. Tip-up box 180 mm (+/- 2 mm) x 70 mm (+/-2 mm) & height of the box 15mm (+/-2mm), ear “L” bracket attached to the box 95mm (+/-2mm) x 125 mm (+/-2mm). With two slot holes to fix the seat.
Seat and Back cushion housing	ABS molded vacuum forming out of 2mm sheet
Vinyl Flooring	Dark colored vinyl flooring with minimum 2mm thickness

A 40 KVA or higher online UPS system with parallel redundancy and Built-in Isolation Transformer and Surge Suppression TVSS (60 KA or more) of reputed make and having backup time of 30 minutes to be provided by the bidder for digital immersive Full-Dome Active 3Dprojection system as per table 1.7 given below.

Table 1.7

Specification	Detailed description
UPS system (True IGBT with parallel redundancy) with 30 minutes backup time of reputed brands viz. APC, Emersion or Numeric	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.

### 1.2.8 Seating Arrangement (Minimum 200 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.

#### i. Cove Lighting & other lighting systems

1	<p>The contractor should deliver and install LED lights on the projection dome to illuminate the screen. The screen lighting system must meet the following criteria:</p> <p>LED lights for illuminating the screen must be installed at the base of the screen (cove trough) to allow for uniform illumination of the screen surface around the perimeter.</p> <p>LED lights illuminating the screen must have three primary colors (green, red, blue) as well as white LED with the possibility of adjusting their intensity so as to enable the production of any color (within the range of colors typical for LED devices with three primary colors - RGB) and the possibility of total adjustment brightness ranging from 0 to 100% with a extremely gradual dimming on the first levels of intensity.</p> <p>Brightness should be at least 1700 Lumen per meter</p>
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	<p>LED bars shall offer LED with 120° light diffusion</p> <p>Control should be in 16 bits for smooth color transition, in DMX or ArtNet protocol.</p> <p>It must be possible to control the LED lights illuminating the screen by commands from the control computer and by sliders on the console of the control station so that these lights can be programmed automatically or manually controlled during the show.</p>
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LED Cove light. Accepted OEM: Philips or Chroma Cove or equivalent

**Cove lighting to be integrated with control system.**

Specification	Detailed description
Cove Light	<ul style="list-style-type: none"> <li>- Light output of min 1700 lumens per meter (580 lumens per fixture)</li> <li>- 120° diffusion</li> <li>- RGB control resolution less than <b>10 cm</b></li> <li>- 16-bit control</li> <li>- Brightness curve specially designed for extremely gradual dimming on the first intensity levels</li> <li>-LED channels Red / Green / Blue / White</li> <li>- Tablet or DMX/ArtNet control</li> </ul>
Design	<p>360° Layout in Aluminium Cove Trough in aesthetical indirect lighting arrangement. Ample amount of LED Modules to be provided to avoid dark zones.</p> <p>Provision for software programmability of different modes and colour effects along with programmable hardware presets.</p>
Maintenance Lightning	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	<p>Foot Lighting: The lighting effect should be created using a fibre optic rod that is end-illuminated with high intensity LEDs with 50,000-hour life expectancy.</p> <p>The unit should flush with 6mm Carpet</p> <p>Entry &amp; Exit Ramps Lighting: LED wall light should provide 2.2 lux at 1.9m distance when mounted 300mm above floor.</p> <p>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 safe movement in Full-Dome theatre when the main lighting is dimmed.</p>

### 1.2.9 Shows

1	The bidder should provide new shows in English, Hindi languages.
2	At least 3 Nos. of 6K (or higher) Active 3D shows are to be supplied to the TIA with a minimum license term of 5 years. The TIA will select the shows from a list of show provided by the Vendor. Each show should be of between 20-25 minutes duration minimum. Those shows cannot be from the free shows available on the full-dome market.
3	Besides, bidders are required to offer 2 Nos. of 4K Active 3D free-shows along with the offer and provide rates of at least 10 Nos. of 4K Active 3D full-dome planetarium shows.
4	The agency should supply 3 astronomy-based full-dome video shows in Active 3D with license for minimum 5 years
5	All shows must be with 7.1 surround sound formats.
6	Necessary Scripts and original sound tracks must be supplied for future language modification.
7	Besides bidder shall also upload undertaking for license-free usage at the Dehradun venue from the show producers as per the details given in technical bid.

### 1.2.10 Spare Parts

1	As part of the offer, the Contractor should provide spare parts in order to quickly restore the Planetarium to operation during a failure and waiting for service. All spare parts must be new and the same as the parts delivered as basic.
2	The list of spare parts requested is the following: a) One spare Projector without lens of the projection system b) One spare Image generator c) One spare Control computer d) All items necessary to connect and interconnect computers, projectors, control console, audio systems, lighting etc. inside the Dome Theatre. e) One Audio board, if case necessary arises in the system f) 5% quantities of Seat handles, springs, etc. related to chairs; g) 10% length of cove-strip LED lights

### 1.2.11 Warranty and Services

1	The minimum warranty period must be 3 years.
2	The Dome should have 3-years of warranty for the surface/paint finish and the structural members etc. should have 5-year warranty.
3	It will be applied to the delivered projectors, dome, AV system, UPS and all other delivered devices, furniture etc.. During the warranty period, the agency will be obliged to remove / rectify / replace any defects in the Planetarium at its own expense.
4	In the event of a serious fault that prevents the Planetarium from functioning, the agency shall depute technician/s who will report at the site / premises to attend to the fault within 24 hrs. in case of domestic technical person and within 72 hrs. in case of international technicians from the date of reporting the fault (irrespective of weekends or holidays).
5	The contractor will provide training, telephonic and internet-based support as and when required for problem solving and repair service for all components.

## Comprehensive maintenance during warranty

1	Bidders should offer comprehensive annual maintenance contract for a period of 5 years beyond the warranty period of 3 years of installation and commissioning.
2	The Bidder shall undertake at least one Preventive Maintenance Visit <u>per quarter</u> in a year and attend to all break down maintenance calls or emails.
3	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 (for configuration problems). Remote system access via TeamViewer or similar software. Self-alignment assistance. Update databases. Troubleshooting and problem solving. Correction of all malfunctions that are possible to solve by remote maintenance.
4	The bidder shall also provide software releases and updates free of charge at least once a year for the duration of the AMC (except for the first year). The software updates must be installed during the preventive maintenance visits.
5	The bidder should have a strong support and back up team in India for attending to breakdowns or maintenance calls at short notice. Documentary evidence of this should be provided by the bidder.

### 1.2.12 Full-Dome Projection System Operation

Successful bidder shall operate full dome shows from 11:00 a.m. to 7:00 p.m. (or as decided by the authorities of Dehradun Science City) for the visitors. This timing may vary during the peak seasons. The facility shall remain operational for 364 days in a year (and 365 days in a leap year).

- a) Manning, operation and maintenance of the system shall be the sole responsibility of the successful bidder at their risk and cost by mobilizing their resources and trained technical manpower. Adequate manpower shall be deployed for the complete duration of the operation of the theatre.
- b) Successful bidder shall operate the system in proper and professional manner without downtime and shall fulfil the statutory obligatory requirements on bidder's part for the purpose of contract.
- c) All necessary manpower, tools and tackles with allied requirements will be arranged by the successful bidder for operation of the system.
- d) The date for the commencement of operation shall be communicated by authority at an appropriate time after the successful commissioning of the entire installation. This shall be done through a separate written communication after the completion of supply, installation, testing, commissioning, and the successful completion of training and other compliances as may be applicable to commence operation.
- e) Maintaining the active 3D spectacles in proper charged and working condition.
- f) Maintain a records of all the equipment and inventory with daily and/or periodic entries about the health and monitoring parameters.

### 1.2.13 Brochures and complete specifications

- i. 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 the technical bid including compliance Table 2.0. The bidders have to respond within stipulated time for additional information/clarifications sought afterwards, if any.

- ii. 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**

<b>Detailed description</b>	<b>Given in page no. and file name in tender</b>
1. Brochures and specifications for Projectors, Lenses, Mounts, Blending and Geometric Correction Units, Display Management System, etc.	
2. Brochures and specifications for Image generator servers, Interactive planetarium software and Full-Dome configurator & playback system and projection systems.	
3. Brochures and specifications for Show Control System.	
4. Brochures and specifications for Calibration and related instruments and software.	
5. Brochures and specifications for Software Elements along with licensing details.	
6. Brochures and specifications for Audio systems.	
7. Brochures and specifications for UPS system with 30 minutes backup.	
8. Engineering drawing (plan, elevation and sectional views wherever necessary for viewer's gallery and image servers' room in pdf and AutoCAD 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.	
9. 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, wiring / network diagram of the proposed solution. This has to explain how the proposed design or solution meets the specifications and overall requirements as mentioned in the tender document.	
10. Schematic diagram and broad material specifications of the structure for mounting the projector array showing suggested location of the projectors including arrangement for accessibility to the projectors for maintenance.	

11. Details and product catalogues of acoustic treatment of inner surface of concrete dome and acoustic paneling below the aluminium dome inside the theatre proposed and with relevant drawings, material specifications etc.	
12. Details and product catalogues of LED Cove light, exit signage and emergency exit signage lighting and ramp lighting scheme.	
13. Details regarding source of content development for planetarium shows using datasets/library of 3D models/cloud assets.	
14. Details and product catalogues of 3D spectacles and storage and sterilization equipment.	

**1.2.14 Write Ups Related to Design:** Bidders shall provide **Document on design techniques highlighting how Full-Dome Digital Active 3D Immersive projection system will be met by the offered solution using the proposed sub-systems. Detailed write-up of functional role of each subsystem in integrated solution shall be described.**

### 1.2.15 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 Science City, Dehradun. 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.

Table 3.1 Training Topics on FULL-DOME PROJECTION SYSTEM

Sl. No.	Detailed Description
1.	Architecture of FULL-DOME PROJECTION SYSTEM
2.	Hardware components of FULL-DOME PROJECTION SYSTEM (Projectors, screen, controller, image servers, network elements, storage etc.)
3.	FULL-DOME PROJECTION SYSTEM Administration: Hardware and Software Installation, Configuration, Trouble-shooting and Maintenance procedure including preventative 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, if any
7.	FAQs

### 1.2.16 Delivery Schedule

The entire work shall be completed within 10 (TEN) months from the date of placement of order or opening of Letter of Credit whichever is later. **No repeat and no extension will be granted.**

### Warranty and AMC:

#### 1.2.17 Comprehensive Annual Maintenance Contract (CAMC)

The comprehensive annual maintenance contract will be for a period of **five years**, after expiry of the warranty period of Three Years.

- i. Bidders shall quote for comprehensive annual maintenance charges along with applicable taxes for five years, after expiry of warranty period of Three 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.
- ii. During defect liability period of Three Years and subsequent comprehensive maintenance contract, the following terms shall be applicable.
  - a) Preventive Maintenance for all the equipment and peripherals supplied by the bidder. The bidders shall submit a schedule for such preventive maintenance and shall form part of the agreement.
  - b) Repair / Replacement of faulty / defective parts and peripherals.
  - c) All replaced parts shall remain as property of Science City, Dehradun, Uttarakhand.
  - d) During the AMC period (in which the life of the batteries of UPS is likely to be over), the selected bidder has to replace all the UPS batteries be provided by Science City, Dehradun, Uttarakhand.
  - 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 24 - 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 equipment / 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.*

#### **1.2.18 Operation of 3D and Active 3D Full dome planetarium and film shows for a period of 8 years**

Successful bidder shall operate full dome shows from 11:00 a.m to 7:00 p.m for the visitors of Science City, Dehradun, Uttarakhand. This timing may vary during the peak seasons. The show shall remain operational for 364 days in a year (and 365 days in a leap year). Sterilization, cleaning and distribution and collection-back of Active 3D spectacles to the visitors shall be under the scope of the successful bidder.

- i. Manning, operation and maintenance of the system shall be the sole responsibility of the successful bidder at their risk and cost by mobilising their resources and trained technical manpower. Adequate manpower shall be deployed for the complete duration of the operation of the theatre.
- ii. Successful bidder shall operate the system in proper and professional manner without downtime and shall fulfil the statutory obligatory requirements on bidder's part for the purpose of contract.
- iii. All necessary manpower, tools and tackles with allied requirements will be arranged by

- the successful bidder for operation of the system.
- iv. The date for commencement of operation shall be communicated by NCSM at an appropriate time after successful commissioning of the entire installation. This shall be through a separate written communication after completion of Supply, Installation, Testing, Commissioning and successful completion of training and other compliances as may be applicable to commence operation.
  - v. The bidder or its authorized agency will have to give separate quotation for operations & maintenance part.
  - vi. The bidder company, if it is a foreign company, can authorize an Indian agency to take complete responsibility of O&M and payments of the O&M amount can be made to the authorized agency directly.
  - vii. An overall remote supervision of the operations and maintenance should be observed by the foreign bidder in case the O&M responsibility is undertaken by their local agency.

**Dated:**

**Official Seal & Signature of the  
Bidder/ Constituted Attorney**

