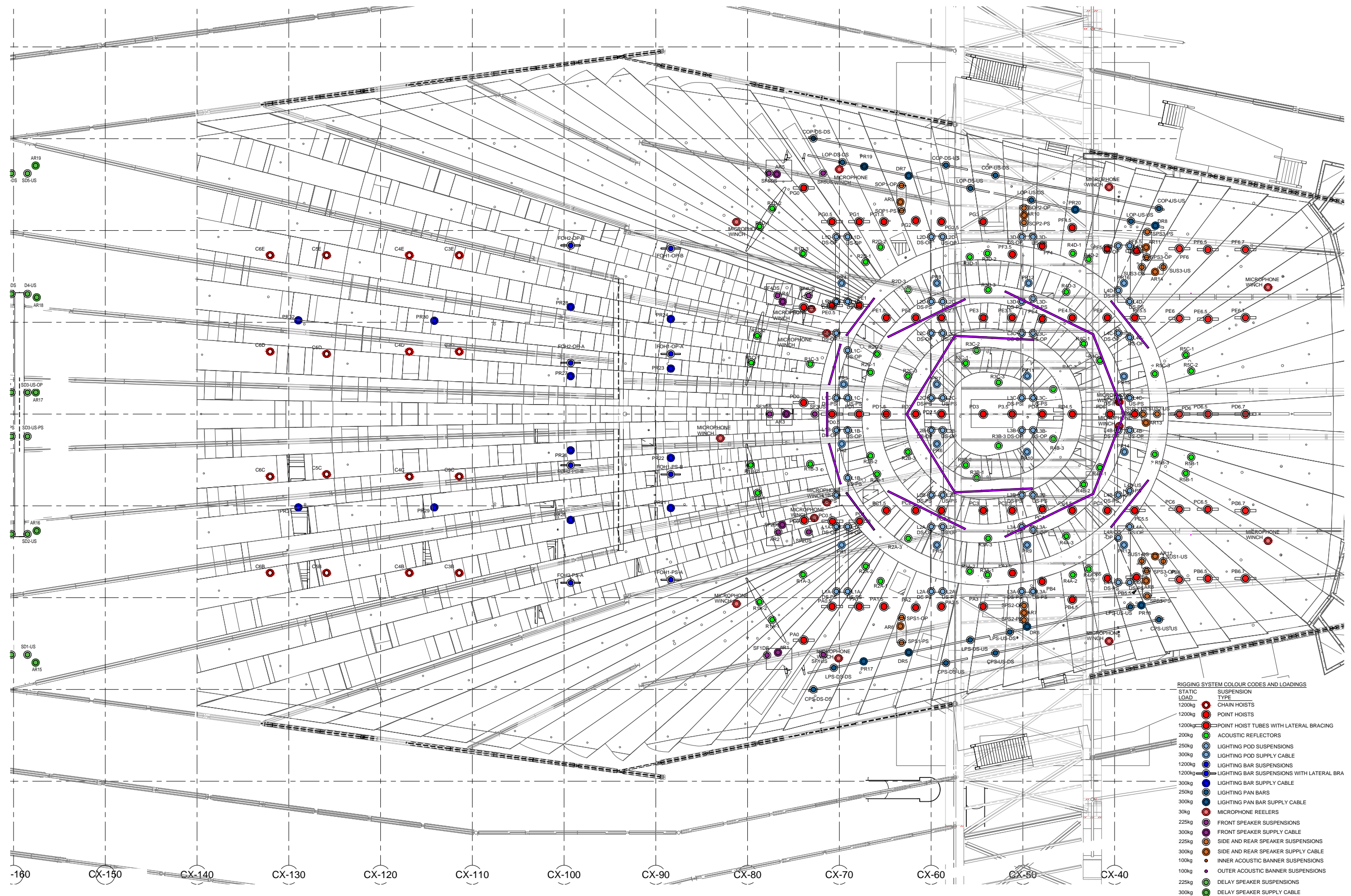


## TECHNICAL ZONE LEVEL 8 - THEATRE EQUIPMENT PLAN





**CONCERT HALL REFLECTED CEILING PLAN - THEATRE EQUIPMENT PENETRATIONS**



The brief to improve the acoustic performance of the Concert Hall in both acoustic mode and amplified mode requires significant changes to the interior.

These changes and the associated architectural impact on the interior are tailored to the two generic modes of music performance:

- Acoustic music performances and
- Amplified music performances

The design process for determining both the acoustic characteristics and shortcomings of the existing Hall and then the proposed options to improve its performance has included the following steps:

- Review of previous acoustic reports.
- Recording a variety of music performances and rehearsals using specialist instrumentation at various locations in the Hall to understand the acoustic characteristics experienced in those locations.
- Identification of noise emanating from services or operational equipment that may need to be eliminated or masked.

- Expert listening during performances and rehearsals by the appointed acoustic consultant.
- Consultation with performers and conductors who have performed in the Hall to understand their experience of the acoustic qualities of the existing space.
- Computer modelling and interpretation of the recordings to identify the specific acoustic characteristics of the Hall and areas of deficiency.
- The acoustic consultant advising which areas of the Hall require changes to improve the acoustic performance and advice about the architectural detail which will help improve the acoustics.
- Architectural computer modelling of design proposals that can then be tested using computer software to help refine the detail and acoustic performance of the changes.
- Peer review of the concept design proposals and the acoustic computer modelling and recommendations of the acoustic consultant.
- Full scale prototyping of new architectural elements mounted in the Hall to test their acoustic performance during rehearsals and performances and to get feedback from the performers and invited expert listeners.
- Subsequent adjustments to the design and further acoustic testing using computer software programs to fine tune the design.
- Detailed reporting of the acoustic and architectural design at the completed stages of the project i.e. Concept Design, Schematic Design and Design Development.

The following sections summarise these architectural design changes proposed to improve the acoustic performance for the various music modes.

## 3.5/ ACOUSTICS



To improve the acoustic performance of the Concert Hall for acoustic music the following changes will be required for the interior design. The following changes will improve the acoustic quality and experience for both the audience and the musicians:

- Deletion of the existing donut reflectors over the stage and the introduction of a new array of reflectors to be flown over the stage.

This will improve the acoustic response for the orchestra, the choir and project more energy from the stage into the audience.

The “petal” configuration of the array provides the desired percentage of coverage above the stage, the ability to fly other theatrical elements between them and allows view lines to the organ.

Their curved shape and profile are resolved to provide the optimum acoustic performance. The reflectors are able to be flown away and/or rotated to allow the introduction of rigging for amplified music performance.

- The reflective surface of the underside is required to have a specified mass and be smooth. The upper surface is designed to have a profiled surface that is aesthetically pleasing as the upper surface will be visible from some audience seating positions.

The colour and finish of the reflectors is proposed to be a semi gloss paint finish referencing the magenta colour of the existing seating fabric. The agreed colour has been prototyped in the Hall during October 2017 (refer both to the following images of the prototypes in the Hall and computer renders of the proposed colour).

- Introduction of side wall reflectors to provide acoustic enhancement to the stage and the audience. These are integrated into the existing side walls and are retractable to accommodate both for amplified mode when they are not required and acoustic mode when they are required. The finish for the reflectors will match the existing White Birch wall and ceiling finish.
- The addition of profiled diffusive and angled surfaces to the following parts of the existing interior walls to ensure optimum acoustic reflections and diffusion:
- The side box fronts, the walls surrounding the stage and the rear wall of the stalls all are designed to have a non-repetitive relief pattern of 100mm maximum depth constructed from brushbox timber to match the existing timber finish.
- The rear wall of the upper circle level, rear wall of the choir stalls and the rear walls of boxes C,D,E,F,W,X,Y,Z all are designed to have a non-repetitive relief pattern of 50mm maximum depth constructed from brushbox timber to match the existing timber finish. (Refer also to the plan in the following section)

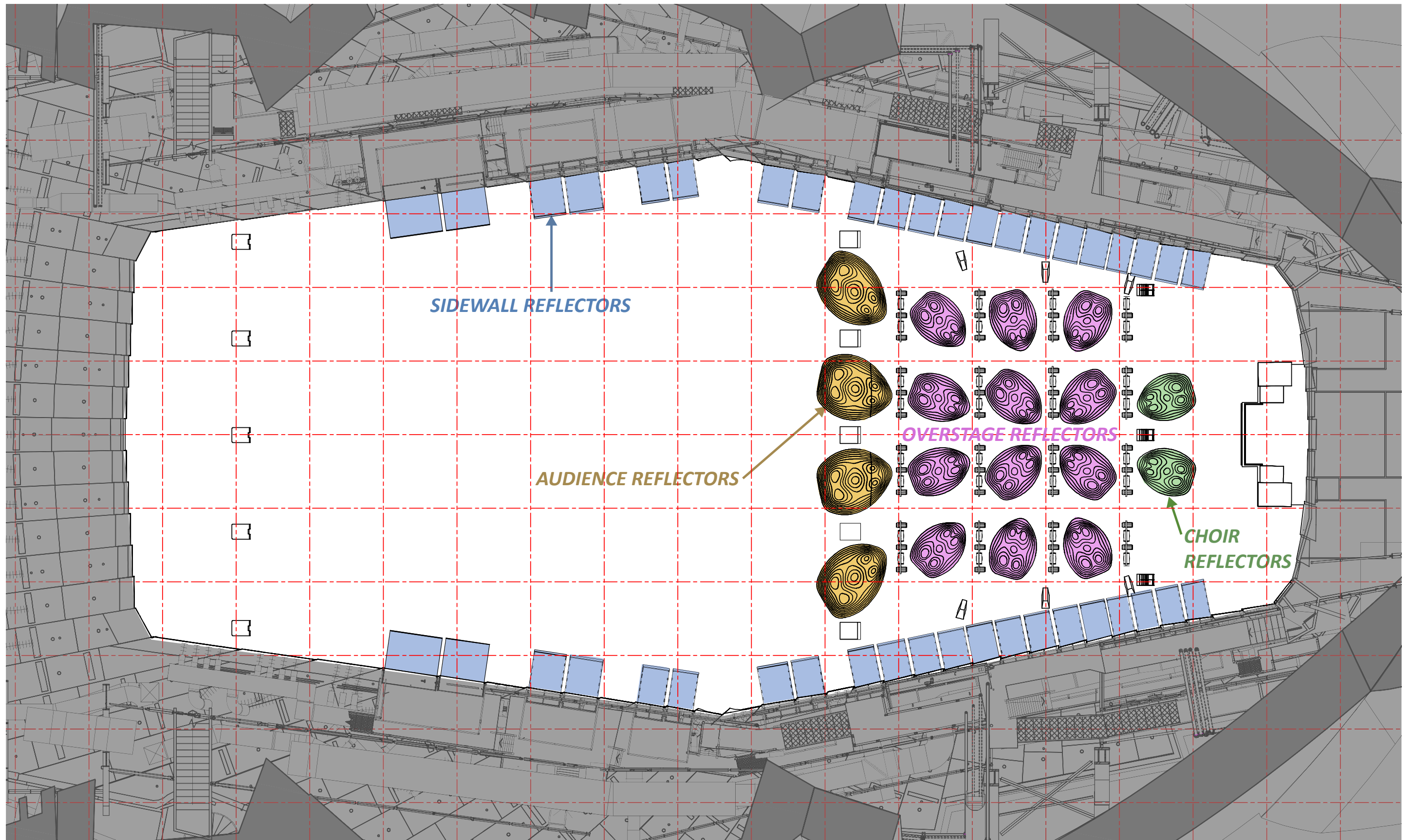
Various options for the pattern and profile of the diffusive wall panels have been explored. They have been based on patterns generated by musical wave geometry. This has allowed a variety of options to be easily generated and acoustically tested. The proposed pattern has also been prototyped in the brushbox timber finish and tested by the Acoustic Engineers. (Refer also to the prototype photos in the following section)

During design development full size prototypes of the over stage and side wall reflectors adjacent to the stage were temporarily installed and a series of rehearsals and concerts were performed to test the acoustic performance and assess the visual impact of the new reflectors. The results of the acoustic testing and responses to the design were very positive.

Following the success of this test two further prototype tests were conducted in the Hall exploring the colour and finish of the reflectors. The result of this process has been the selection of the magenta colour in the semi gloss finish. The exact shade of magenta is still to be refined further.

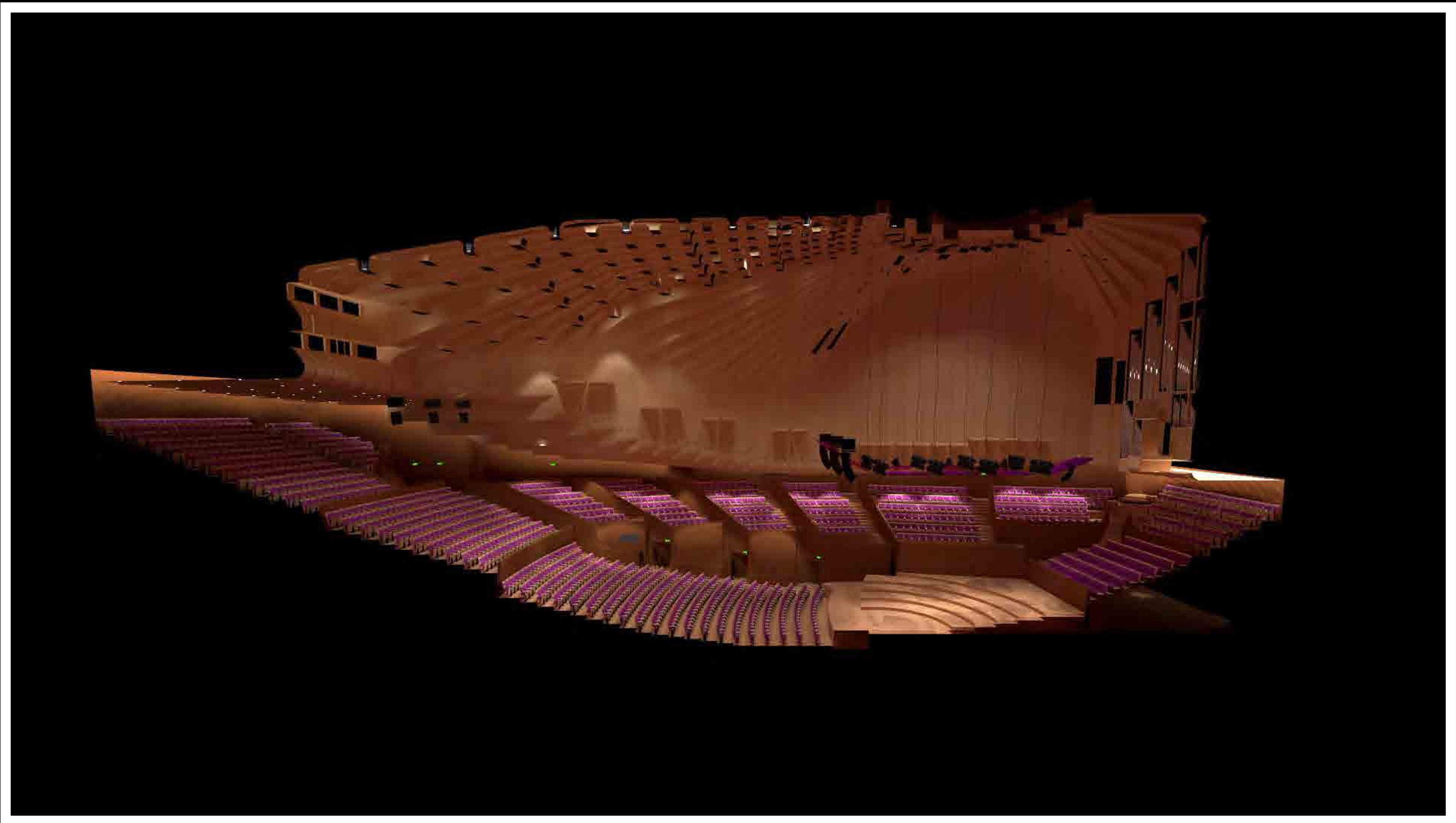
### 3.5.1/ ACOUSTICMUSIC





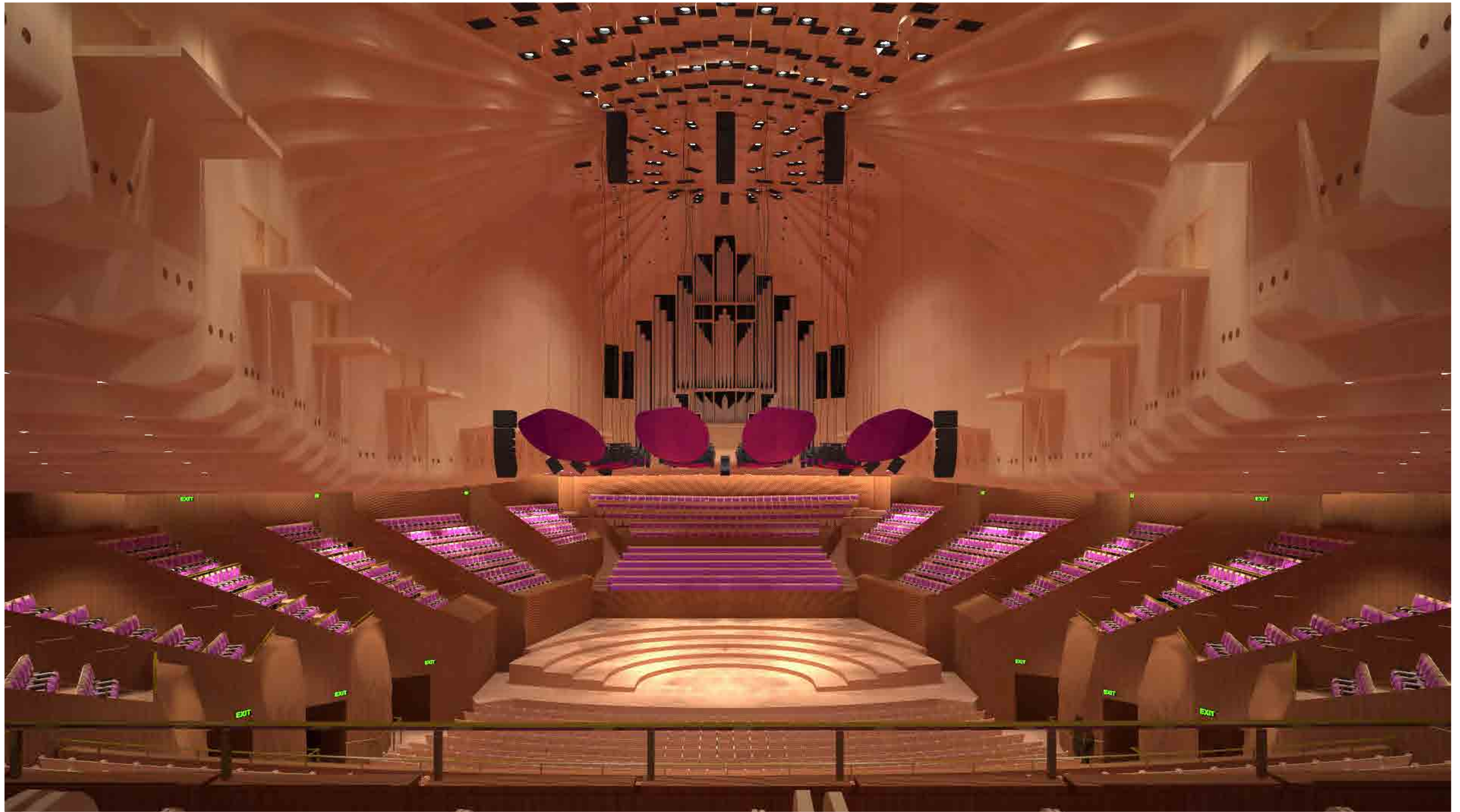
**NEW ACOUSTIC ELEMENTS - DIAGRAMMATIC PLAN**





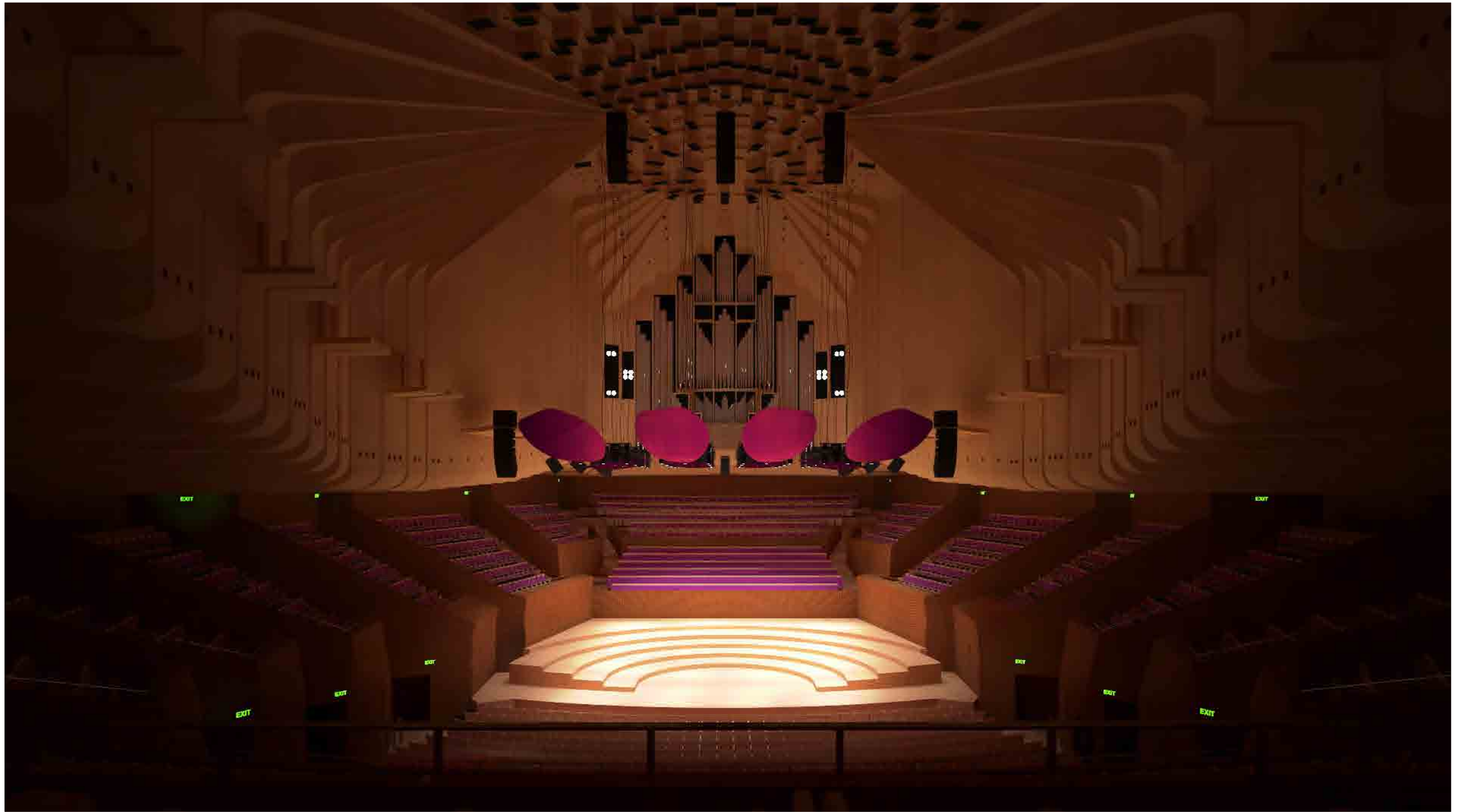
***SECTIONAL VIEW - NEW ACOUSTIC ELEMENTS - HOUSE LIGHTING***





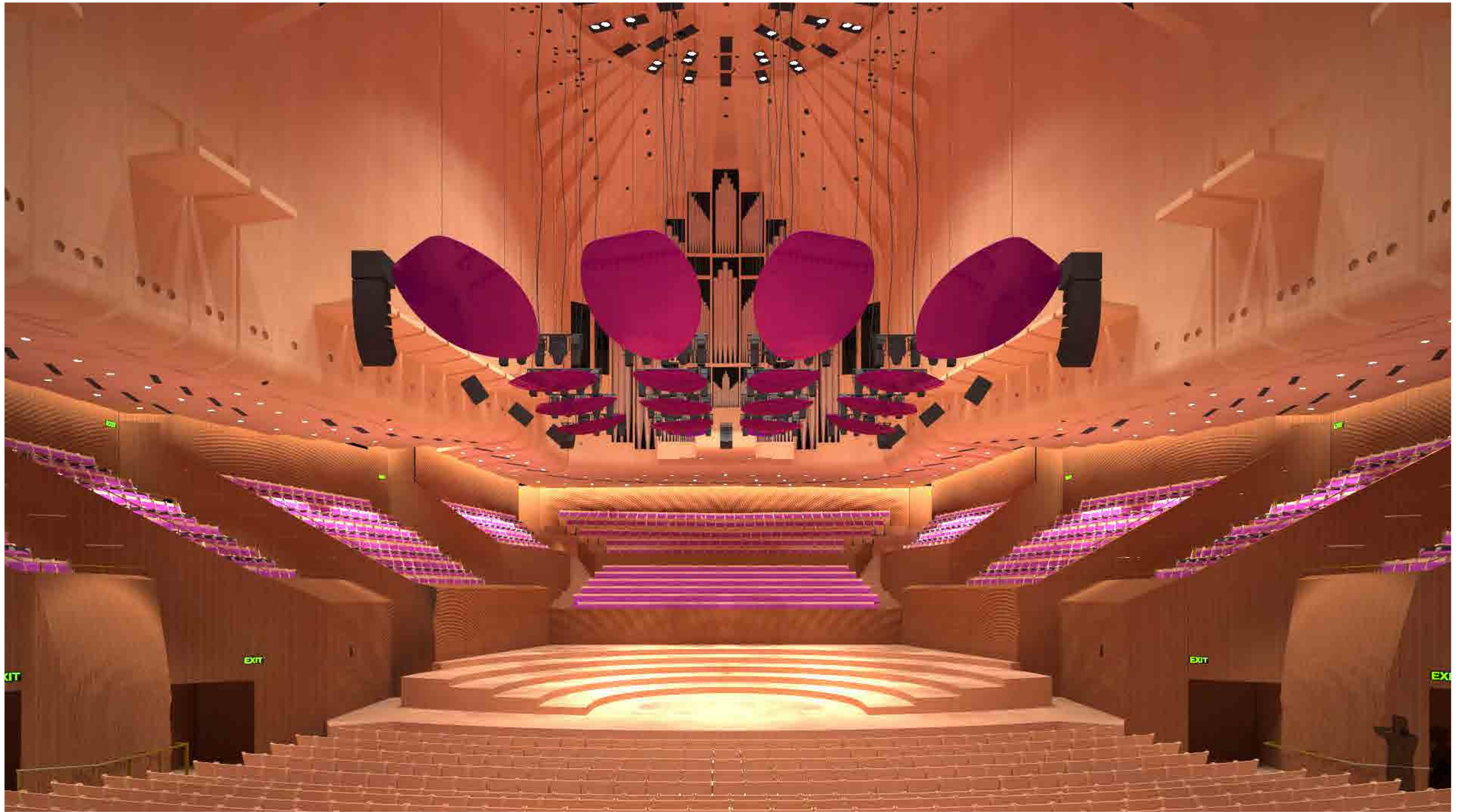
***VIEW FROM UPPER CIRCLE - NEW ACOUSTIC ELEMENTS - HOUSE LIGHTING***





***VIEW FROM UPPER CIRCLE - NEW ACOUSTIC ELEMENTS - PERFORMANCE LIGHTING***





***VIEW FROM REAR OF STALLS - NEW ACOUSTIC ELEMENTS - HOUSE LIGHTING***





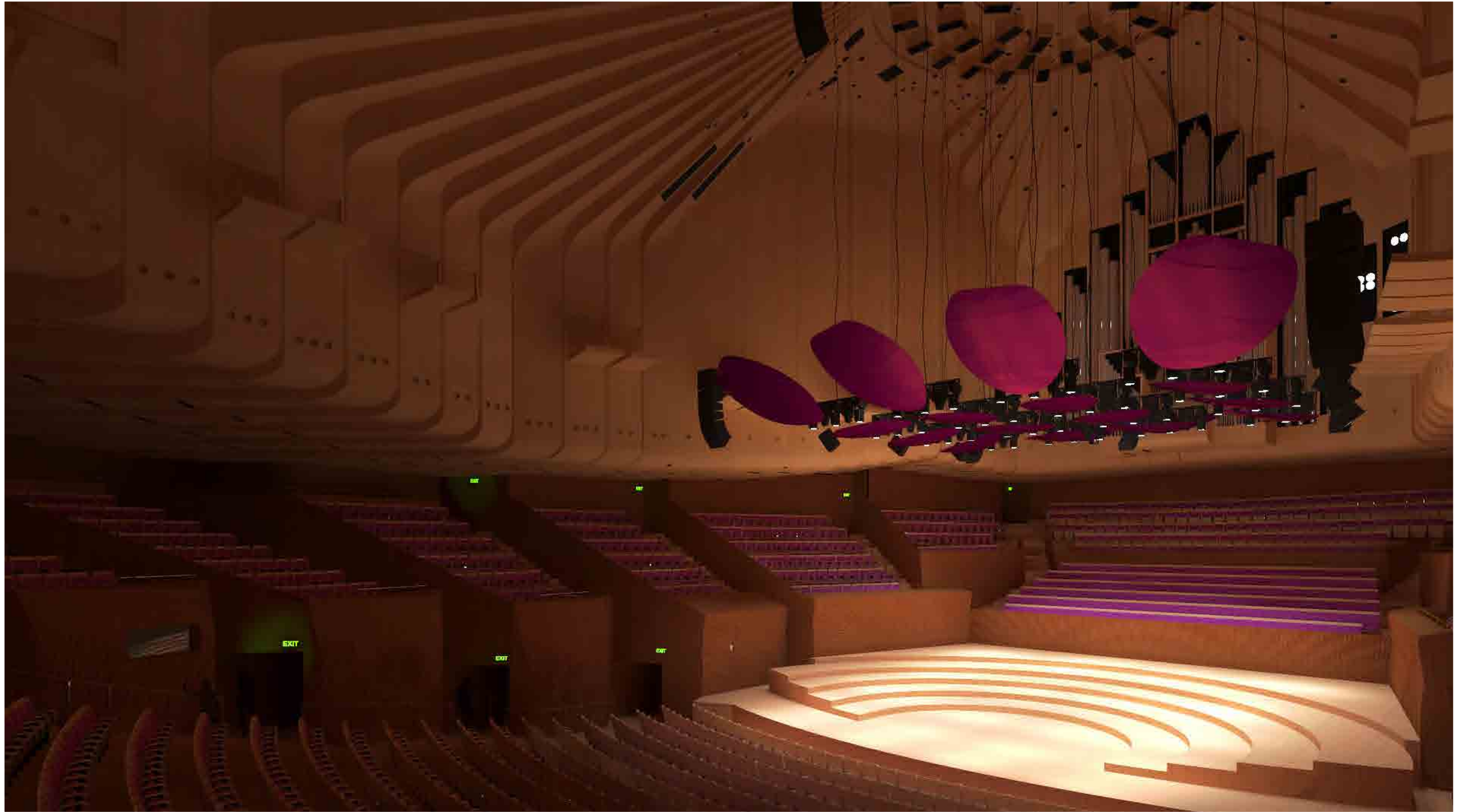
***VIEW FROM REAR OF STALLS - NEW ACOUSTIC ELEMENTS - PERFORMANCE LIGHTING***





***VIEW FROM BOX A - NEW ACOUSTIC ELEMENTS - HOUSE LIGHTING***





***VIEW FROM BOX A - NEW ACOUSTIC ELEMENTS - PERFORMANCE LIGHTING***





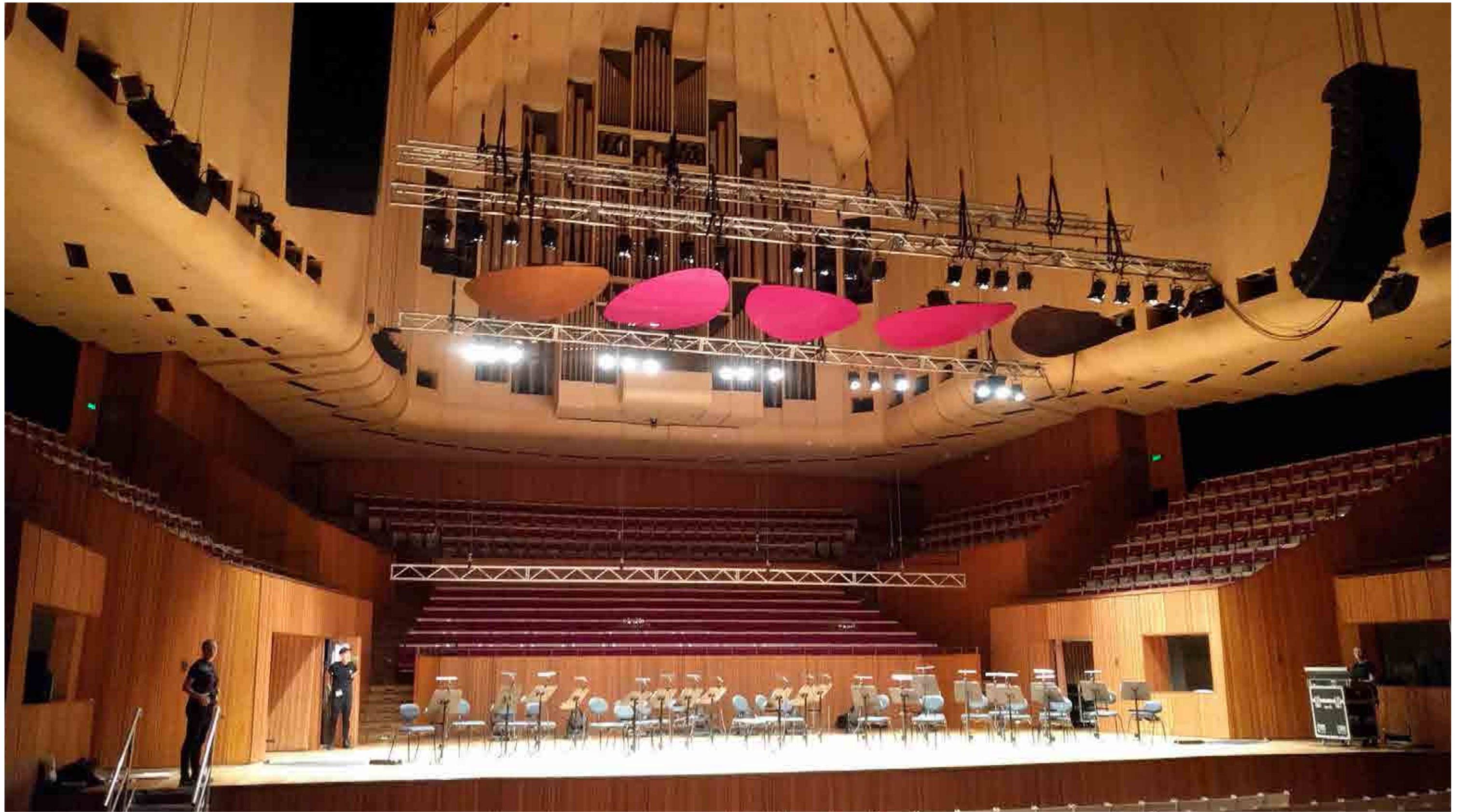
***REFLECTOR PROTOTYPES - 9TH NOVEMBER 2016***





***REFLECTOR PROTOTYPES - 3RD MAY 2017***





***REFLECTOR PROTOTYPES - 9TH OCTOBER 2017***