SST Product Review
DMA Disposition

Version 2.0

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2.0	15/05/2023	Final issue		

Version History

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1.0	04/05/2023	First Issue		
2.0	15/05/2023	Final issue		

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1 Introduction

The present document states the disposition of the DMA on the Review Board recommendations and action items.

2 Documents of the review

2.1 Applicable Documents

[AD1] CTA Project Management Plan, CTA-PLA-MGT-000000-0003_1c, Version 1.2, 25 May 2020
[AD2] CTA-SST Engineering Review Panel Report - CTA-RER-SST-305000-0001_2a
[AD3] SST Engineering Review – DMA Disposition - CTA-INS-SST-305000-0001
[AD4] SST Product Review Plan – SST-ESC-PLA-001
[AD5] Product Review Panel Report V2.0

2.2 Reference Documents

[RD1] The ASTRI-Horn telescope validation toward the production of the ASTRI Mini-Array: a proposed pathfinder for the Cherenkov Telescope Array, Proc. SPIE 11119, 2019
[RD2] A Compact High Energy Camera (CHEC) for the Gamma-ray Cherenkov Telescope of the Cherenkov Telescope Array, 35th International Cosmic Ray Conference -ICRC217-10-20 July, 2017
[RD3] The ASTRI mini-array at the Teide observatory, Proc. SPIE 11822, 2021
[RD4] SST-PRO-ANR-006 Trade-off & top level analysis Report
[RD5] Mechanical optimization of the M1 Dish for the Small-Sized Telescopes of the future Cherenkov Telescope Array, Proc. SPIE. 12188
[RD6] The Small-Sized Telescope of CTAO, vol. 12182 of SPIE Conference Series, p. 121820K, August, 2022, DOI: 10.1117/12.2627956

2.3 Acronyms

ASTRI	Astrophysics with Italian Replicating Technology Mirrors
BKO	Bridging phase Kick-Off
CDR	Critical Design Review
CTA	Cherenkov Telescope Array
CTAO	Cherenkov Telescope Array Observatory
DMA	Decision Making Authority
DVER	Design Verification and Engineering Review
IACT	Imaging Atmospheric Cherenkov Telescope
INAF	Istituto Nazionale di Astrofisica
ICD	Interface Control Document

OBSPM	Observatoire de Paris Meudon – PSL, CNRS
PA	Product Assurance
PR	Product Review
QA	Quality Assurance
SST	Small Sized Telescope
SST-CAM	SST Camera
SST-STR	SST Structure

3 Scope of the review

3.1 Review purpose and expected outcome

The Product Review is the milestone closing the SST Bridging Phase, before entering the SST Design Consolidation Phase and it is organised by the SST consortium, with the active participation of CTAO both as reviewers and as part of the Decision Making Authority (DMA). During the review the design of the projects/subsystems was presented, along with the status of all verification and validation steps. Despite that the SST design was verified by prototypes it is expected that the outcome of the PR will identify any missing areas requiring further elaborations and provide advice as input to the SST Design Consolidation Phase (in particular for serialized production and on-site AIT/V plans).

A positive outcome of the Product Review represents an approval of the SST design baseline to be finalised in the SST Design Consolidation Phase.

The Product Review is performed in accordance with the guidelines provided in [AD2] and [AD3], with specific consideration of the development status achieved by the SST program based on the following elements:

- An SST Structure prototype, inherited from ASTRI-Horn Cherenkov telescope, has been produced and tested extensively in Catania, Serra La Nave, during the years 2014-2022 [RD1].
- A Camera Unit prototype (CHEC-S SiPM) [RD2].
- ASTRI/ASTRI1 Structure prototype [RD3].
- Several Trade-Offs analyses have been done during the bridging phase [RD4 and RD5] in accordance with [AD2] and [AD3].

3.2 Product Review objectives

Considering the above points, the objectives of the PR consist in providing answers to the following questions:

I. Does the documentation provided by the SST Project demonstrate the closure of the actions and recommendations assigned at the DVER (see the Appendix)?

II. Is the design of the SST as derived from the DVER and the successive trade-offs performed during the bridging phase (including internal interfaces definition) suitable for next consolidation phase?

III. Can the long lead items identified for the camera project be procured with an acceptable level of risk in advance of the formal CDR with CTAO?

If the above questions can be satisfactorily and positively answered the review objectives have been fulfilled and any critical action items resulting from the review and documented in the panel report have been adequately addressed, the SST has successfully passed this review. (Non-critical action items can be followed in the normal Action Item List (AIL) of the project, without preventing the next phases to start).

4 Review Board Conclusions

The Review Board conclusion and overall evaluation ([AD05], Section 9) is as follows:

> *The Review Board evaluation of the Data Package submitted for the Product Review of the SST programme is positive. The SST design demonstrated an adequate level of maturity, with prototypes providing confidence for the proposed design. No show-stoppers have been identified and all actions which have been issued are considered not critical and normal work for a project.*
>
> *The Board recommendation to the DMA is the following:*
>
> *Product Review passed. No critical actions were identified.*
>
> *In addition to what above, the Review Panel considered useful to issue a few specific recommendations concerning actions that are regarded as high priority for a successful progress of the project, reducing the associated risks at their best minimum. The Review Board expects that the execution of the actions associated to these recommendation are monitored by the Decision Making Autority in the near future. The Review Board recommendations are listed below:*
>
> *SST-PR-1*
>
> *(reference to the DVER Action SST-ER-22)*
>
> *Finite Element Analysis - Provide a document describing experimental tests finalized to compare computed values of displacements and frequencies with the measured ones.*
>
> *Due Date: CDR*
>
> *SST-PR-2*
>
> *(reference to the DVER Action SST-ER-28)*
>
> *Structural Analysis (Dynamic Simulation) - It is recommended that the Dynamic Simulations are performed early and with high priority during the Consolidation Phase to anticipate or prevent any potential issues.*
>
> *Due Date: Tender Contract KO + 2 months*
>
> *SST-PR-3*
>
> *(reference to the RIXs 2687 and 2816)*
>
> *Risk Register - It is recommended that a complete Risk Register for all subsystems is set-up early and with high priority during the Consolidation Phase.*
>
> *Due Date: Consolidation Phase KO + 3 months*
>
> *SST-PR-4*
>
> *(reference to the RIX 2685)*

Hazard Analysis – It is recommended that a hazard analysis is prepared early in the Consolidation Phase to face as soon as possible any design changes that might be required.

Due Date: Consolidation Phase KO + 4 months

SST-PR-5

(reference to the safety discussions during the PR meeting)

Safety – It is recommended to verify the compliance of the SST Design / Requirements /Plan with the "Telescope generic Safety Specification" issued by CTAO. The same document would need to be an Applicable Document to the main SST documents, as well as manual for onsite activity.

Due Date: Consolidation Phase KO + 2 months

SST-PR-6

(reference to the RIX 2650, 2667, 2750)

Cooling pipe – As discussed during the PR meeting, the SST Team intends to route the coolant pipes using a rotary joint. The board recommends to consolidate the design and to demonstrate reliability of the proposed routing in the early months of the Consolidation Phase.

Due Date: Consolidation Phase KO + 2 months

SST-PR-7

(reference to the RIX 2615, 2672, 2688, 2818)

Software – The board recommends organizing a review of the SST software architecture, design, and quality assurance, (outside the boundaries of the PR) early in the Consolidation Phase.

Due Date: Consolidation Phase KO + 2 months

SST-PR-8

(reference to Annex I, [AD05])

Actions closure – the board recommends that the update of the documents requested by the actions will be performed within two months from the DMA approval of the present report.

Due Date: DMA Final Report approval + 2 months

5 DMA Disposition

The DMA for the SST Product Review is very grateful to the Review Board for the high-quality panel report, with very relevant advice, recommendations and action items.

The DMA decides to accept the content of all recommendations and action items of the SST Product Review Panel as given in [AD05].

The DMA remarks that the real final closure of some of the recommendations will be effectively achieved and certified at the CDR.

End of the document