



SST Product Review Panel Report

Version 1.0

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1 Introduction

This report summarises the findings obtained during the CTA-SST Product Review and assesses the achievement of the review charges.

2 Documents of the review

2.1 Applicable Documents

The following applicable documents (AD) form a part of this document to the extent described herein. If not explicitly stated otherwise, the latest issue of the document is valid. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document are considered a superseding requirement.

- [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

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 Documents submitted to the review

The list of the documents submitted by the SST Team is reported in this section.

2.3.1 Management Documentation

2.3.1.1 SST Programme Documentation

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
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1	SST Programme: Programme Management Plan [SST-PRO-PLA-001]	<p>In this document we describe the Program Management Plan (PMP) to deliver the Small-Sized Telescopes (SSTs) required for the southern site of CTA (CTA-South), as an in-kind contribution (IKC). This document is issued in the framework of SST-PO. The current CTA PMP [AD 1] is the main input of preliminary SST PMP from which the In-Kind Contribution Allocations and Management adopted the scheme A. The scope of this document is then:</p> <ul style="list-style-type: none"> • To define the deliverables from the SST Partners to CTAO. • To outline the SST organisation and identify a scheme by which SST Partners will be bound. • To specify the anticipated SST Partners involved and the anticipated resources available. • To specify the scope of the work and the phases over which it will be performed. • To outline the essentials of a management plan. • To present the steps needed to establish the proposed programme. 	SST-ER-02 SST-ER-13
2	SST Programme: Configuration & Data Management Plan [SST-PRO-PLA-002]	<p>This document establishes the overall Configuration And Data Management (CADM) rules and procedures to achieve an effective control over the design and finally over the products as built status and relevant supporting data. It defines rules and procedure for documentation release and control to be undertaken by SST Consortium.</p> <p>This plan defines the how and when the CADM rules and procedures are applied to ensure that:</p> <ul style="list-style-type: none"> • Each Configuration Item (CI) and related documentation are uniquely identified, • The design standard of the CI is defined, traceable and retrievable at each point in time, • Effective change control is established and maintained, • Reports are timely established and released to support program activities • Design and product inspections are performed to verify the current configuration status • Applicable CM process is monitored to verify correct application of CADM requirements • Program documentation is received, reviewed, released and recorded in an orderly and consistent manner 	SST-ER-15 SST-ER-02
3	SST Programme: Cost Plan [SST-PRO-PLA-003]	<p>This document outlines an approach to presenting cost estimates for the SST. The approach is designed to unify efforts made by different contributors, namely the STR-INAF, STR-Meudon, and CAM teams. Cost estimates are required prior to IKC-Agreement signing to ensure the intended IKC remains viable. Estimates will be used internally, and shared with CTAO following approval from the ESC, when and if the Money Matrix is updated</p>	SST-ER-01 SST-ER-02

4	SST Programme: Risk Management Plan [SST-PRO-PLA-004]	<p>The SST Risk Management Plan (RMP) is aimed to provide to SST-ESC a plan for the identification of risks scenario and potential causes. The risk shall be managed in the framework of SST Consortium responsibilities.</p> <p>The purpose of this plan is to specify the SST Programme risk management processes and describe the methods to be implemented in the SST Consortium and translated into management requirement documents to the industrial contractor, where applicable</p>	SST-ER-02
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2.3.2 PA, QA and Safety Documentation

2.3.2.1 SST Programme: PA, QA and Safety Documentation

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
5	SST Programme: Product Assurance & Quality Plan [SST-PRO-PLA-005]	<p>This document describes the general quality requirements, activities, methods and required resources applicable to all the Work Packages (WPs) of the SST programme and projects, with the aim to meet the quality objectives and to assure the expected performance and reliability.</p> <p>This quality plan will provide assurance that:</p> <ul style="list-style-type: none"> • The CTA SST items in all their parts are compliant with the specifications • The risks are identified, assessed and controlled • The traceability and quality of deliverables are accessible at all times • Non-conformities (NCs) are identified and addressed <p>This quality plane is:</p> <ul style="list-style-type: none"> • Written and updated by the the Lead and Deputy Programme Quality Managers • Approved by the SST Programme Office (SST-PRO) • Implemented by the SST Project Office coordinators with the help of the QM 	SST-ER-11 SST-ER-02
6	SST Programme: System Safety Management Plan [SST-PRO-PLA-006]	<p>The safety management plan is a living document that must be revised at each programme design. The safety management plan defines:</p> <ul style="list-style-type: none"> • the system safety programme tasks to be implemented; • the personnel or SST partners responsible for the execution of the tasks; • the schedule of system safety programme tasks related to project milestones; • the interface of the safety programme activity with the project system engineering and product assurance; • how the SST partners accomplish the tasks and verifies satisfactory completion. 	SST-ER-02

2.3.2.2 SST Camera PA Documentation

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
7	SST Camera - Declared Item List [SST-CAM-LIS-001]	Preliminary Declared item list for the camera indicating only the items critical for the procurement. The complete DIL will be delivered for the CDR.	

2.3.3 System Engineering Plan Documentation

2.3.3.1 SST Programme: System Engineering Plan

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
8	SST Programme: Engineering Development and Verification Plan [SST-PRO-PLA-009]	This document presents the development logic and model philosophy of SST telescope. This design and development plan has been prepared considering the share of responsibilities between the SST consortium.	SST-ER-02
9	SST Programme: Factory AIT Plan [SST-PRO-PLA-011]	This document describes the SST AIT plan and procedures that shall be executed at the SST factory premise after the Production Phase of the SST Structures, Cameras and Optic. The scope of this activities is to demonstrate that the SST Telescope has been designed and built to satisfy the requirements of the project. After the positive conclusion of these activities the Telescope will be delivered to the CTAO Site where the SST telescope will be assembled, integrated and verified again. The current version of the document includes the AIT plan and procedure related to the Mechanical Structure and the Optical Assembly. The next version of the document will include the full factory AIT plan.	SST-ER-02
10	SST Programme: On site AIT Plan [SST-PRO-PLA-012]	The plan describes the process of the Telescope AIT that will be performed on site.	SST-ER-02
11	SST Programme: Verification Plan [SST-PRO-PLA-013]	The Purpose of the document is to present at high level the verification strategy of the SST Telescope during the life of the project giving to the AIV/AIT team the right tools and guidelines to perform the complete verification process with respect to the requirements. The telescope verification will be performed by the SST Institutes involved in the consortium, instead the AIT, detailed in other documents, will be performed by the industries involved to support the programme. The verification will be carried out on-site with the exception of the first	SST-ER-02

		telescope that will be integrated and verified also in the factory. The contents of the AIV Plan will be consolidated before the Critical Design Review.	
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2.3.3.2 SST Camera System Engineering Plan

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
12	SST Camera - Engineering Development and Verification Plan [SST-CAM-PLA_009]	This document describes the plan for completing SST Camera (SST-CAM) instrument engineering work prior to the series production of SST Cameras, namely: finalisation of the camera design, verification of that design, and technical preparation for the series production of cameras. The development of camera software will be covered in a dedicated document for the CDR, and the preparation of series production plans and funding is the remit of the SST Camera PM & Camera Board.	SST-ER-02

2.3.4 Design Definition documents

2.3.4.1 SST Programme: Design Definition documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
13	SST Programme: Technical Requirements Specification [SST-PRO-SPE-001]	The SST Telescope Technical Specifications specifies the functional and performance requirement for the design, the development, the verification and the delivery of the SST Telescopes, provided as SST Consortium to CTAO. The SST Telescope requirements collected in this specification are classified as SST Level C requirements. They are: <ul style="list-style-type: none"> derived by transposition or decomposition from the CTAO JAMA level requirements; derived by ICDs documents. This document is the source of level D requirements, which are collected in the set of SST Sub-System specifications.	
14	SST Programme: Architecture & Design Summary Report [SST-PRO-DSR-002]	This document provides a description of the concept, design and functional architecture of the SST telescope.	

15	SST Programme: STR/CAM I/F Control Document [SST-PRO-ICD-007]	ICD between Structure and Camera describing all the relevant interfaces (mechanical, electrical, control, etc.)	
16	SST Programme: Telescope Concept of Operations [SST-PRO-OPD-001]	This document provides a brief and preliminary description of the concept of operations for the Telescope across all the various phases: Verification Phase, Commissioning Phase and Science Phase.	

2.3.4.2 SST Mechanical Structure Design Definition documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
17	SST Mechanical Structure - Subsystem Technical Requirement Specification [SST-MEC-SPE-002]	This document provides the Mechanical Requirements (Level D)	
18	SST Mechanical Structure – Design Report [SST-MEC-DSR-001]	Design description of the specific subsystem, in case with associated subsystem analysis, references, assumptions and conclusions with statement of compliance if relevant.	SST-ER-21 SST-ER-32 SST-ER-33
19	Mechanical Structure - On site Maintenance Plan [SST-MEC-PLA_015]	The On site Maintenance Plan describes the SST structure maintenance during the activities at CTAO south site.	SST-ER-02

2.3.4.3 SST Optics Definition documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
20	SST Optics - Subsystem Technical Requirements Specification [SST-OPT-SPE-002]	This document provides the Optics Requirements (Level D)	
21	SST Optics – Design Report [SST-PRO-DSR-001]	Design description of the specific subsystem, in case with associated subsystem analysis, references, assumptions and conclusions with statement of compliance if relevant.	SST-ER-35 SST-ER-36

2.3.4.4 SST Camera Design Definition documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
22	SST Camera - Subsystem Technical Requirements Specification [SST-CAM-SPE-002]	This document provides the Camera Requirements (Level D)	
23	SST Camera – Design Report [SST-CAM-DSR-001]	Design description of the specific subsystem, in case with associated subsystem analysis, references, assumptions and conclusions with statement of compliance if relevant.	

2.3.5 Design Justification documents

2.3.5.1 SST Programme Design Justification documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
24	SST Programme: Top level & trade-off analysis Report [SST-PRO-ANR-006]	<p>The SST Telescope architecture baseline was presented at KO of Bridging Phase on July 2021. This baseline (named Agreement Baseline) confirm the Baseline presented at the DVER in summer 2020. The actions and recommendations from DVER jointly with an updating of JAMA level B requirements and the outcomes from the bridging phase are combined for the identification of:</p> <ul style="list-style-type: none">• The level B (Top Level) requirements status revision for their implementation the SST baseline and decomposition on lower levels;• Possible design option which introduce improvement of SST architecture.	
25	SST Programme: Performance Analysis Report [SST-PRO-ANR-010]	<p>This is the user-requirement document of the performance analysis for the SST model. Its purpose is to collect and describe the results of the simulation-level analysis on the single telescope for evaluating its instrumental performances.</p> <p>This is a live document that is expected to be constantly updated with the outcome of the simulations dedicated to the study of the</p>	

		expected SST single-telescope performances. The current version of this document only contains a preliminary description of the performances of the separate telescope components determined with external tools or dedicated analyses.	
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2.3.5.2 SST Mechanical Structure Design Justification documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
26	SST Mechanical Structure: Structural Analysis Report [SST-MEC-ANR-008]	FE modelling and structural analysis results description.	

2.3.5.3 SST Camera Design Justification documents

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
27	SST Camera: Structural Analysis Report [SST-CAM-ANR-008]	FE modelling and structural analysis results description.	

2.3.6 Mathematical Models

2.3.6.1 SST Programme Mathematical Models

#	Document Name [Protocol]	Notes	DVER Actions / Recommendations
28	SST Programme: Monte Carlo Model Input Parameter Description [SST-PRO-MAT-005]	This is the user-requirement document of the input parameters to the Monte Carlo model (MCM) for an array of SSTs. Its purpose is to collect the parameters relevant to the SST case that are used to describe the structure, optical and camera performances of Imaging Atmospheric Cherenkov Telescopes (IACTs) in software pipelines for the simulation of the detection of electromagnetic showers emitting Cherenkov light in the atmosphere. This is a live document that is expected to be	

		constantly updated with the new versions of those SST parameters not yet frozen to an agreed value. The SST WT8 will enter such updates as soon as they will be made available by the dedicated WTs.	
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2.4 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 panel and review objectives

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). The expected outcome is reported in section 3.3.

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 Review panel charges

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).

3.3 Expected Output of the Review

The expected output of the review is:

Board Review Report - The review board is expected to write the current Report addressing the objectives listed in Section 3.2 and providing any recommendations related to the outcome of the review. The Report also contains the agreed ALL generated during the review.

3.4 Roles and Responsibilities

3.4.1 The Review Board Chair

The chair shall be responsible for the overall organization and conduct of the review. The chair shall:

1. Manage the activities of the review Board;
2. Prepare RIXs where relevant;
3. Consolidate the RIXs received from the reviewer members and submit them to the SST Team coordinator;
4. Assure that all RIXs are processed, or contact the issuing board member in case dropped only with the consent of the issuing board member;
5. Act as representative for RIXs issued by reviewers who may not be able to attend the meeting;
6. Lead the review meeting;
7. Prepare and release the final board review report and submit it to the DMA.

3.4.2 The Review Board Members

The board members shall, under the authority of the review chair:

1. Review the submitted documentation following the document assignments defined in the review plan (see section 2.5). In case their review is not complete they shall notify the chair;
2. Identify discrepancies or request explanations by means of RIXs, respectively, using the provided template;
 - 2.1. Board members may call for support from other specialists; their contributions shall be clearly identified.
 - 2.2. Review Chair is board member and as such may submit RIXs.
3. Participate in RID close-out activities, recommend open RIDs for discussion at the meeting and engage in the discussion in the review meeting;
4. Evaluate the responses from the SST Team to the RIXs;
5. Prepare possible recommendations when the SST Team response to a RID is not considered satisfactory;
6. Provide written input to the board report in their area of expertise.

3.5 Board Review Report

The Final Board Report (this document) is advisory to the DMA. It shall be approved by the review board, released by the board's chair, archived and sent to the DMA. It should contain:

1. A summary of the review objectives, an overview of the review board's composition, activities and meetings; a detailed response to each review objective and question identified in the review plan; the review board's assessment of the quality of the documentation submitted for review (completeness, technical content and compliance with Document Requirement Definitions (DRD)), a summary of the project's status and its major achievements.
2. A summary of major problems identified during the review, if any (including references to the applicable RID number(s) and identified solutions);
3. A list of all action items defined during the meeting (also those not originating from RIXs) together with their owners and scheduled closure dates. "Critical action items" shall be clearly marked as such if applicable;
4. Recommendations for any issues for which no agreement or solution may have been found;
5. The final recommendation of the board based on the level of achievement of the review objectives and measured against the defined success criteria. This should be one of the following:
 - a. Product Review passed. No critical actions were identified.
 - b. Recommend passing of the Product Review only after successful treatment of critical actions;
 - c. Product Review not passed. Not all the objectives of the review have been achieved and the project phase should be extended. Recommend a delta review to be organized for a later date for which critical actions need to be closed. The delta review will have a formal board, usually a subset of the main review board.
6. A broad list of the documents reviewed, if different from the list in the review plan;
7. The final register of all RIXs, including the SST Team responses and the final RIX disposition. The final RIX register may be included as an appendix or as a separate Applicable Document.

The review board report should be delivered, signed by the chair on behalf of the board, to the DMA within the period specified in the review review schedule (see sec. 4.2) after the review meeting.

4 Panel proceedings

4.1 Panel composition

The review Board is comprised of members not directly involved in the SST project (external) and members provided by CTAO. The Chair is an external member.

4.1.1 List of Reviewer Board Members

The lists below include the review board members.

Name	Affiliation & Role		Expertise
Marco Feroci (marco.feroci@inaf.it)	INAF, Director of IAPS; LAD-eXTP PI, coordinator of the European participation to eXTP, LOFT PI, SuperAgile PI	Chair	Management, Instruments, Detectors
Francesco Giordano (francesco.giordano@ba.infn.it)	INFN, Bari University In charge of Fermi tracker construction, Responsible of the INFN-Bari participation to Magic and CTAO, member of the camera team of the SCT project	Reviewer	Electronics, Detectors (expert of SiPM)
Gianalfredo Nicolini (gianalfredo.nicolini@inaf.it)	INAF, Osservatorio di Torino Co-I and Project Controller of METIS (before at ESO and then in Thales, where he was Head of “Metrology and Optical Instrumentation” team)	Reviewer	AIT/AIV, PA, system engineering
Marco Riva (marco.riva@inaf.it)	INAF, Osservatorio di Brera System Engineer of: ESPRESSO, HIRES and MAORY (ESO instruments)	Reviewer	Optomechanics, Mechanics, Optics, System Engineering
Christelle Rossin (c.rossin@opgc.fr)	Deputy Technical Director of the OSU Observatory of Physics of the Globe of Clermont-Ferrand (OPGC) (before as mechanical engineer at LAM for 15 years as well as Head of the Mechanical Department and Thermo-Mechanical Architect of the Euclid Grisms during the last years at LAM)	Reviewer	thermo-mechanical simulation, vibrations, correlation between simulation and tests, and opto-mechanics for space projects
Anne Bonnefoi (anne.bonnefoi@lam.fr)	Thermo-Mechanical Architect for the Harmoni Laser Guide star subsystem	Reviewer	Thermo-mecanical simulation, vibrations, opto-mechanics for

			ground and space project
James Buckley (buckley@wustl.edu)	Washington University, St. Louis Prof. of Physics PI and Spokesperson of ADAPT Spokesperson for APT (VERITAS, CTA-SCT)	Reviewer	Electronics, Detectors
Nick Whyborn (nick.whyborn@cta-observatory.org)	CTAO lead system Engineer	Reviewer	System engineering
Amaya Paredes (amaya.paredes@cta-observatory.org)	CTAO Telescope Engineer	Reviewer	System engineering
Volker Heinz (volker.heinz@cta-observatory.org)	CTAO-South Site Manager	Reviewer	AIT/AIV, system engineering
Silvio Rossi (silvio.rossi@cta-observatory.org)	ESO, Head of ALMA Technical Team	Reviewer	System engineering
Bernhard Lopez (bernhard.lopez@cta-observatory.org)	CTAO Quality Assurance	Reviewer	PA/QA

4.2 Meeting dates and Schedule

The Product Review was carried out according to the following baseline schedule:

	Date	Event
	01-12-2022	Release of PR review plan to the board
	01-12-2022	Acceptance Data Package made available to the board by SST Team
	09.01.2023	RIXs deadline (submission to Review Chair).
T _{rev} -5W	13.01.2023	Final consolidation of RIXs toward SST Team.
T _{rev} -3W	23.01.2023	Reply to RIXs by SST Team
	30-01-2023	Review Board complete the evaluation of replies to RIXs.
	06-02-2023	Finalize agenda of review meeting with SST Team.

T _{rev}	15-02-2023	SST Product Review Meeting in CTAO HQ, Bologna
	16-02-2023	Review Board provide the Board Draft Report and afterward instruct the SST Team.
	31-03.2022	The Review Board send the final board report to the DMA for consideration and final decision and release.

5 Review Board activities and main findings

5.1 Board activities

The Review Board carried out its tasks remotely, with the only face to face meeting being the Final Product Review meeting in Bologna. The interactions within the Board happened in on-line meetings and by e-mail exchanges.

The Board activity started with a Kick-Off Meeting called remotely by the Chair on 7th December 2022, for a duration of about 2 hours, open to the Review Board and to Team representatives. At the meeting the Team gave a presentation illustrating the project and data package.

The reviewing activity was coordinated by the Board Chair with a specific task assignment to each reviewer. Based on the specific expertise of each of the reviewers, every document was assigned as a review task to a subset of reviewers, with a number of “reviewers per document” ranging from 2 to 6 and a number of “documents per reviewer” ranging from 5 to 12. This strategy guaranteed a competent, adequate and balanced review of each document.

After the revision of the Data Package the Board met again in an online meeting for a general discussion about the documents and a coordination of the RIXs issued by each individual reviewer. This meeting happened on 12th January 2023. Following the discussion at this meeting, the Review Board agreed on the final list of RIXs that were then delivered to the Team through the readmine interface.

A final Product Review meeting was then held in presence in Bologna (CTAO Headquarters) on 14th February 2023, with participation of the Review Board, the Team and CTAO representatives.

5.2 Main findings

The Review Board went through the whole data package. The overall assessment of the documents set is highly positive and shows a mature design. Following a deep analysis of the complete Data Package, the Review Board issued a number of RIXs (328), which were sent to the Team for their consideration and address (see Annex I). Most of the RIXs were addressed in writing by the Team response through remote interaction either with a direct closure accepted by the Board (71) or with a closure subject to actions (219). Some of the RIXs () were considered by the Review Board as deserving a direct discussion at the final Product Review meeting, held in Bologna on 14 February 2023. These “high priority” RIXs concerned the following aspects of the SST project (number of RIXs):

- Management (5)
- Software (3)
- PA and Safety (4)
- Development Plan (8)
- Requirements (3)

-
- Concept of Operations (1)
 - Interfaces of the Camera and Structure (1)
 - Telescope AIT (2)
 - Mechanical Structure: requirements, design and analysis (8)
 - Camera: requirements and design (3)
 - Optics: requirements and design (4)

The discussion of the 42 RIXs started with a presentation by the Team at the meeting, addressing the RIXs and proposing a solution to the Review Board. The presentation by the Team may be found in Annex II. Following a specific request of the Review Board, the same presentation also addresses the status of the DVER actions.

The analysis of the RIXs, the presentation and proposed solutions by the Team were fully satisfactory for the Review Board. The actions requested to close the RIXs are all considered as normal work and mostly involve updating of the documents and, in a few cases, expanding analysis.

A specific and extensive discussion at the meeting was devoted to the location and interfaces of the camera chiller (on the ground vs onboard), related to RIXs 2650 and 2750. A trade-off analysis had been carried out by the Team and it was presented and extensively discussed at the meeting. Pro's and Con's were analysed, including heritage, maturity of the design, impacts on the development of the project, as well risks during operation (e.g., twisting of the cooling pipe or clearance of the area). Taking into account all the elements presented at the meeting, the Review Board decided to recommend a confirmation of the baseline design, with the chiller located next to the telescope basement, stressing however the need to consolidate the design and demonstrate reliability of the rotary joint, e.g. through a qualification of the operation of the cooling pipe through an accelerated aging test, as well as to adopt all necessary measures to guarantee the safety of the equipment during operation and maintenance (e.g., proper paths allowed around the telescope during the operation and maintenance shifts, installing fences, ...).

6 Achievement of review charges

Following the review, the analysis of the written responses to the RIXs and the discussion at the Final Product Review Meeting, the Review Board considered all issued RIXs satisfactorily closed, under the assumption that the recommended actions will be suitably closed within 2 months from the start of the Consolidation Phase.

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 Authority 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)

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

7 Conclusion and panel overall evaluation

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.

With reference to the specific assignments to the Review Board:

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

The status of DVER actions have been specifically reviewed and either definitely closed or agreed for a closure at a later stage. Specific recommendations have been issued by the Review Board for activities connected to DVER actions, namely structural and finite-element analysis (SST-PR-1 and SST-PR-2).

- 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?*

The Review Board considers the SST design as adequately mature for its current phase and ready to enter its 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?*

The Review Board examined carefully the risks associated to an early procurement of the long-lead item. The assessment is considered as positive and procurement can be started with a reasonable, not null, level of risk.

8 Appendix

8.1 Annex I - RIXs and Closure Actions

The attached Annex I reports the complete list of RIXs.

The subset of RIXs closed before the Final Product Review Meeting are highlighted in green.

The subset of RIXs that have been explicitly discussed at the Final Product Review Meeting are highlighted in yellow.

RIX	Tracker	Subject	Author	Category	Description	Last notes	Due Date
2602	Action	Task code SST-3113-300-00-340A-A - AZ Braking Angle verification test	Silvio Rossi	SST-PRO	Document: SST-PRO-011 Section/Page: 3.2.2.9 / 55 Description: The procedure does not specify the EL position during the computation of the AZ axis braking time Solution Recommended: Define the EL angle in the Required condition section of the Procedure	Agreed. The braking test is to be performed at 0deg EL. Proposed solution: we will add the information to the required condition section	DMA Final Report approval + 2 months.
2603	Action	On-site AIT Plan	Silvio Rossi	SST-PRO	Document: SST-PRO-011 Section/Page: NA Description: The procedure templates do not have fields for the operator identification and date of the test Solution Recommended: Add Operator Identification and date fields.	Agreed Proposed solution: we will add the requested fields	DMA Final Report approval + 2 months.
2604	Action	Task code SST-3113-300-00-340A-A - AZ Braking Angle verification test	Silvio Rossi	SST-PRO	Document: SST-PRO-012 Section/Page: 3.2.2.9 / 55 See bug# 2602	See answer to RIX 2602	DMA Final Report approval + 2 months.

2605	Closed	Verification Plan - Verification of the Requirements fulfilment	Silvio Rossi	SST- PRO	<p>Document: SST-PRO-013 Section/Page: NA</p> <p>Description: I see that the plan includes the verification of high level performance of the telescope. It is not clear to me whether the verification of the complete list of telescope requirements is planned.</p>	<p>Reply: The plan is to verify by test as many as possible requirements after the integration onsite. Some of the requirements will be verified only for the first two telescopes. Some Level C requirements will be verified on the basis of the test performed on the subsystems (Level D). The Traceability & Verification Matrix will be provided for the CDR together with the tests specification.</p> <p>Propose solution: Closure without action.</p>	
2606	Action	Verification Plan - Safety	Silvio Rossi	SST- PRO	<p>Document: SST-PRO-013 Section/Page: NA</p> <p>Description: It is not clear to me whether Safety requirements will be verified (it should be the first among the first Verification procedures): Safety features of the telescope, Fulfilment of all Safety requirements (Electrical Safety, Labelling, Presence of safety hazards (e.g. sharp edges), etc.)</p>	<p>Structures are preassembled considering the proper safety standards, surfaces worked in order to avoid sharp dangerous edges, labelling of cables etc. That must be checked during installation. We'll add a specific statement on that.</p> <p>The infrastructure, civil work etc must be checked before the start of installation operations.</p> <p>Proposed solution: A specific paragraph will be inserted</p>	DMA Final Report approval + 2 months.
2607	Action	Verification Plan - Workmanship	Silvio Rossi	SST- PRO	<p>Document: SST-PRO-013 Section/Page: NA</p> <p>Description: It is not clear to me whether a Workmanship inspection will be part of the Verification</p>	<p>Reply: The AIT/V process will be continuously monitored with dedicated inspections. Representatives of the SST AIT/V Team (including a PA person) will be present at the site during the activities.</p> <p>Proposed solution: We will add a statement in the next release.</p>	DMA Final Report approval + 2 months.
2608	Closed	High Maintenance efforts	Silvio Rossi	SST- PRO	<p>Document: SST-PRO-001 Section/Page: 4.4 / 27</p> <p>Description: The total maintenance efforts accepted for each telescope seems to be very demanding. The total upper limit for Preventive and Corrective maintenance is 6 person-hours/week.</p>	<p>*Reply:* C-SST-TEL-0316 and C-SST-TEL-0318 requirements are the sum of respectively (C-SST-TEL-0320 + C-SST-TEL-1560) and (C-SST-TEL-0332 + C-SST-TEL-1565). So total upper limits for preventive and corrective maintenance are 1 and 2 person hours / week / telescope.</p> <p>*Proposed Solution:* Closure without Action</p>	

2609	Action	UV protection-resistance for outdoor cables and connectors	Silvio Rossi	SST-PRO	<p>Document: SST-PRO-001 Section/Page: NA</p> <p>Description: I recommend specific requirements to ensure the life time of cables and connectors in open air over the required 15 years of operation.</p> <p>Solution Recommended: Specify metallic housing for outdoor connectors. Specify that all external cables shall be routed inside cable ducts.</p>	<p>Reply: Agreed</p> <p>Proposed Solution : Closure with Action. We propose to add a specific requirement in this document and in the SST-MEC-SPE-002.</p>	DMA Final Report approval + 2 months.
2611	Action	Obsolescence of the selected Encoder Heads	Silvio Rossi	SST-PRO	<p>Document: SST-PRO-DSR-002 Section/Page: 4.2.1.3.1 / 19</p> <p>Description: The design proposes the encoder head ERA 7480 from Heidenhain. According to the information I received from the manufacturer, heads ERA 7480 will be discontinued at the end of 2022.</p>	<p>*Reply:* We contacted the Heidenhain responsible person for Italy and he said that will be not discontinued.</p> <p>*Proposed Solution:* Closure with Action. Try to contact the same person contacted by the reviewer.</p>	DMA Final Report approval + 2 months.
2613	Action	Typo	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section 3.3.4.4 -page 31</p> <p>Possible typo in the second comma: PDR to be corrected in DRB</p>	<p>*Reply:* Agreed</p> <p>*Proposed solution:* Closure with Action. We will update the document.</p>	DMA Final Report approval + 2 months.
2614	Action	(provisional) Specific reference to the VCD missing	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section: 3.3.x</p> <p>It is not clear if a single Verification Control Document is prepared or every unit will have its own. Moreover it is not clear either in which review (DRB? FAR?) the VCD is presented.</p>	<p>*Reply:* The VCD will be provided separately for the telescope and for the subsystems. It is planned to provide the VCD at telescope/subsystems level for the TRB, DRB and ACRB.</p> <p>* Proposed solution:* Closure with Action. We propose to update the document clarifying this aspect.</p>	DMA Final Report approval + 2 months.
2615	Closed	Software CDR	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section: 3.3.x</p> <p>It might be possible that the SW design and development will follow a disting track with respect to the hardware, taking also in consideration that SW upgrades should be possible also after the delivery of the first telescopes.</p> <p>I'd suggest to foresee the possibility to define reviews for the SW (e.g. SW CDR, SW FAR)</p>	<p>*Reply:* linked to 2617. Separation between HW and SW design is typical of space projects. In the framework of CTAO this duplication of reviews risk to be unsustainable for the compressed timeframe and induced extra cost. Anyhow a sustainable solution could be dedicate a specific pannel of each review to the SW development.</p> <p>*Proposed Solution:* Closure without action</p>	See SST-PR-7

2616	Action	Inconsistent Product Naming	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 5.1 In figures 5.1 and 5.2 the same product is called "Telescope Control System" and "Telescope Control Software".	*Reply:* Agreed, we will change in Telescope Control System *Proposed solution:* Closure with Action. We will update the document.	CDR
2617	Action	is software source code a deliverable?	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section 6.2 Software source code should be explicitly listed as deliverable, i.e correct the the third bullet in "Any and all associated software, including its source code, and documentation required by CTAO"	*Reply:* This is a good point and we understand the benefit of having the source code as the end result. This topic should be explored with CTAO as software source code delivery should be part of an overall software product development strategy with cost impacts. *Proposed solution:* Closure with Action. Clarification with CTAO by CDR	CDR
2618	Action	Reference not found	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 7.1 Reference to a document broken	*Reply:* Agreed *Proposed solution:* Closure with Action. We will update the document.	DMA Final Report approval + 2 months.
2619	Action	Difference between MTTF and MTBF	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Page 13 The difference between MTTF and MTBF, given in §1.6.2.4 *RAMS Related* Term definition table, is quite not clear for me, especially because the first sentence is the same for both terms. Could you just give a sentence like for example : MTTF : The average lifespan of a given device. MTTF is a reliability measure for non repairable systems/components. etc. MTBF : The average time between failures of something that can be repaired. MTBF is a reliability measure for repairable systems/components. etc.	Agreed Proposed solution: we will add the suggested phrasing to the definiton of MTTF and MTBF	DMA Final Report approval + 2 months.
2620	Action	Typo	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Page 20 In §3.6 Definition of type of Technical Requirements, there is a typo error. The last bullet shall concern Safety and Protection and not Documentation.	Agreed Proposed solution: correct the typo in the next version of the document	DMA Final Report approval + 2 months.
2621	Action	Difference between damage and survival	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Chapter 5 Environmental Can you define the difference made between damage and survival conditions in the column of the table ?	The column damage refers to damages that can be repaired in situ (see definitions of serviceable limit on page 10). Maybe we can substitute the term damage with serviceable and add a caption or a note to the table.	DMA Final Report approval + 2 months.

						Proposed solution: add a clarification note/caption in the table	
2622	Action	Word "parked" missing in table "Environmental"	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Chapt. 5 Environmental Page 27 In the parameter line relative to "Wind gusts (1 sec)", it should be written "< or = 170 km/h parked" in order to be consistent with requirement ID N° D-SST-MEC-0745 in page 30.	Agreed. Proposed solution: we will correct the table	DMA Final Report approval + 2 months.
2623	Action	Req. ID D-SST-MEC-0135 inconsistent with air pressure in table chapter 5	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Chapter 5 Environmental Page 29 Req. ID D-SST-MEC-035 The atmospheric pressure range of 770 +/- 50 mbar is inconsistent with the 750 +/- 50 mbar written in Air pressure parameter line in table page 27. Please correct the value in either the table page 27 or the requirement statement page 29.	Agreed. The correct value (CTAO requirement B-ENV-0135) is the one in the requirement statement. Proposed solution: we will correct the value in the table	DMA Final Report approval + 2 months.
2624	Action	Add Ice load parameter in table chapter 5 Environmental	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Chapter 5 Environmental Page 27 In order to be consistent with Req. ID D-SST-MEC-0625 about Survival Ice Load (page 29), maybe it could help to add Ice load parameter (under snow load) in table page 27 (in survival column) with wording like "ice thickness (on all surfaces) < or = 20 mm".	Agreed Proposed solution: we will add the information to the table	DMA Final Report approval + 2 months.
2626	Action	Req. ID D-SST-MEC-0743 inconsistent with "Wind sustained for 10 min" in table chapter 5	Christelle Rossin	SST-MEC	SST-MEC-SPE-002 Chapter 5 Environmental Page 30 Req. ID D-SST-MEC-0743 The Damage wind speed of up to 90 km/h averaged over 10 minutes, when the structure is parked, is inconsistent with the value of up to 80 km/h parked, written in "Wind sustained for 10 min" parameter line in table page 27 (in damage column). Please correct the value in either the table page 27 or the requirement statement page 30.	Agreed. The correct value (CTAO requirement B-ENV-0740) is the one in the table Proposed solution: we will correct the requirement statement	DMA Final Report approval + 2 months.

2627	Action	Definition of coordinate system XERS, YERS, ZERS	Christelle Rossin	SST-MEC	<p>SST-MEC-SPE-002 Chapter 8 Design Pages 44 & 45 Req. ID D-SST-MEC-3040</p> <p>Can you explain the coordinate system XERS, YERS and ZERS or define what it refers to ?</p> <p>Same question for Req. ID D-SS-MEC-3042 for M2.</p>	<p>We agree. Elevation Reference System (ERS)</p> <p>x-axis: Parallel to the Azimuth Reference system (ARS) x-axis; z-axis: Parallel to the ARS z-axis when the zenith angle is 0°. y-axis: Rotated around the z-axis according with right-handed system.</p> <p>Azimuth Reference System (ARS)</p> <p>x-axis: Points to the East, in the plane of the azimuth circle. z-axis: Right hand complement to x and y axes. y-axis: Points to the North, in the plane of the azimuth circle.</p> <p>Proposed Solution: We will update the document including these definitions</p>	DMA Final Report approval + 2 months.
2628	Action	Definition of MSA	Christelle Rossin	SST-MEC	<p>SST-MEC-SPE-002 Chapter 8 Design Page 45 Req. ID D-SS-MEC-3050</p> <p>Can you detail what MSA means please ?</p>	<p>MSA was the term used previously to indicate the TMS (Telescope Mechanical Structure).</p> <p>Proposed Solution: we will update the document replacing MSA with TMS adding also the meaning of the TMS to the acronym list.</p>	DMA Final Report approval + 2 months.
2629	Closed	Foundation stiffness	Christelle Rossin	SST-MEC	<p>SST-MEC-SPE-002 Chapter 11.7 Foundations Page 63 Req. ID D-SST-FOU-8001</p> <p>In which document can we find this analysis detailed ?</p>	<p>This is a requirement on the stiffness of the foundation. It is to be verified after the foundation design has been performed. The verification is performed by the SST team implementing a foundation model in the telescope FEM model. The 10% frequency loss is a reasonably achievable value based on the experience of the ASTRI mini-array. It is not a hard limit.</p> <p>Proposed solution: closure without action</p>	
2631	Action	Mass margin policy	Christelle Rossin	SST-MEC	<p>SST-MEC-ANR-008 Chapter 3.5 Mass and Inertia of the FE Model Pages 14 & 15</p> <p>What is the mass margin policy at the level of this review ?</p> <p>Do values of masses given in table 3.3 to 3.6 include some margin ?</p>	<p>Margin on the mass of the FE has been included as increased structural steel density. A table with FEM vs CAD mass comparison will be included in the document update to make the mass margin clear.</p> <p>Proposed solution: the document will be updated with the request information</p>	DMA Final Report approval + 2 months.

2632	Closed	Axial stiffness of the actuator	Christelle Rossin	SST-MEC	<p>SST-MEC-ANR-008 Chapter 3.6.2.3 Elevation actuator assembly Page 23</p> <p>How is the axial stiffness of the beam representing the actuator (E*S/L) taken into account in the analyses, compared with the spring element stiffness added ? Does this not introduce an additional (unwanted) stiffness ? Or thus, am I wrong ?</p>	<p>The two axial stiffness contributions (that of the actuator beam and that of the spring) are in series. The spring stiffness is adjusted so that the total stiffness of the series matches the one reported in the table at the given elevation angle.</p> <p>Proposed solution: closure without action</p>	
2633	Action	FEM verification analyses	Christelle Rossin	SST-MEC	<p>SST-MEC-ANR-008 Chapter 4 Analyses and results Page 33</p> <p>In order to validate the integrity of the FEM, have some checks been done ? For example, has the CoG of the CAD model been compared with the CoG of the FEM model ? Has a 1 g gravity loading check been done in each direction separately ? Has a free-free dynamic check been done ?</p>	<p>Integrity checks on the FEM model have been performed, however they are not currently reported in the document. The document will be updated with model checks.</p> <p>Proposed solution: Update the document</p>	DMA Final Report approval + 2 months.
2634	Action	M1 & M2 structural analyses	Christelle Rossin	SST-MEC	<p>SST-MEC-ANR-008</p> <p>Will there be in the future phases some FEA on the mirrors themselves (static and seismic) ?</p>	<p>Closed with the action to provide the updated analysis before the CDR.</p> <p>### Confirm closure of the action at CDR</p>	CDR
2635	Action	Camera survival wind : wrong image for figure 23	Christelle Rossin	SST-CAM	<p>SST-CAM-ANR-008 Chapter 2.3.4 Wind Page 27</p> <p>The image corresponding to figure 23 - Camera survival wind, equivalent stress- is the same as the total deformation in figure 22. Please replace it by the right one.</p>	<p>Agreed</p> <p>Proposed solution: we will replace the image in the next version of the document</p>	DMA Final Report approval + 2 months.
2636	Action	Camera load combinations	Christelle Rossin	SST-CAM	<p>SST-CAM-ANR-008 Chapter 2.4 Load combinations Page 33</p> <p>Can you explain where the load coefficient of 1.5 or 0.2 (in table 2-8) come from ? Is it usual in that type of combination for this region or does it come from a similarity with other project ?</p>	<p>Load coefficient of Table 2-8 come from Eurocode 0.</p> <p>Proposed solution: the reference will be included in the next version of the document.</p>	DMA Final Report approval + 2 months.

2637	Action	RD/AD list typos	Amaya Paredes	SST-PRO	<p>Document:SST-PRO-004 Risk Management Plan</p> <p>Page:5</p> <p>Description: AD2 and RD1 document title missing RD2: possible typo (" poer")</p> <p>Solution Recommended: typos correction in next document version</p>	closed with the AI to correct typos	DMA Final Report approval + 2 months.
2638	Action	AD title missing	Amaya Paredes	SST-PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page:8</p> <p>Description: AD8 title missing (CTA Generic Telescope State Machine)</p> <p>Solution Recommended: add it in the next document version</p>	close with the action to include AD8 title	DMA Final Report approval + 2 months.
2639	Action	Compliance Documentation	Amaya Paredes	SST-PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page: 46</p> <p>Description: Annex I: Compliance Matrix. When the compliance status is " compliant", could you add the reference document/s where the compliance is evidenced.</p> <p>Solution Recommended: in the next document version, update the compliance matrix to refer to the appropriate document. Update the RD list too.</p>	<p>Thanks, I think we are saying the same: the verification matrix/ compliance matrix for the CDR will will refer to the documents where it is shown the compliance.</p> <p>The RIX is then closed.</p>	DMA Final Report approval + 2 months.

2640	Closed	B-ENV-0915 partially compliance	Amaya Paredes	SST- PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page: 48</p> <p>Description: Concerning the partially compliance to B-ENV-0915, please could you clarify it.</p> <p>Recommended Solution: Clarification to be provided</p>	related to Bug #2683	
2641	Action	C-SST-TEL- 0316	Amaya Paredes	SST- PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page: 27</p> <p>Description: which is the added value of C-SST-TEL-0316 (sum of C-SST-320 / B-SST-0320 and C-SST-1560/ B-SST- 1560).</p> <p>Recommended Solution: clarification to be provided</p>	closed with the proposed action (to be discussed with CTAO). Please, clarify if it will be during the meeting or separately	DMA Final Report approval + 2 months.
2642	Action	C-SST-TEL- 0317	Amaya Paredes	SST- PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page: 27</p> <p>Description: which is the added value of C-SST-TEL- 0317 (sum of C-SST-332 / B-SST-0330 and C-SST- 1565/ B-SST-1565).</p> <p>Recommended Solution: clarification to be provided</p>	ok. To be addressed under RIX2641 closed	DMA Final Report approval + 2 months.

2643	Closed	C-SST-0610, C-SST-0620, C-SST-0630, C-SST-0640: meaning of the TBC	Amaya Paredes	SST-PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page: 37</p> <p>Description: Concerning C-SST-0610, and C-SST-0620: as stated in B-SST-0610 and B-SST-0620, the maximum values are higher (4kw, 11Kw, 2Kw). Do you expect to reduce the maximum values to those stated in the C-levels?</p> <p>Concerning C-SST-SST-630 and C-SST-0640: What does the TBC means? The compliance matrix shows right now compliance with the B-requirement. Do you expect maximum values below the B-requirements or a possible future non compliance?</p> <p>Recommended Solution: clarification</p>	thanks. closed	
2644	Closed	Fixation to Foundation	Amaya Paredes	SST-PRO	<p>Document: SST Programme: Telescope Technical Requirements Specification SST-PRO-001</p> <p>Page: 53</p> <p>Description: It is shown compliance to the foundation requirement B-TEL-0500: are the foundation design and related documentation already available (drawings, calculation of loads, etc)?</p> <p>Recommended Solution: clarification</p>	The RIX can be considered closed. As said, SST is cooperating with CTAO providing all drawings and constrains.	
2645	Action	AD missing?	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Subsyteme Technical Requirements Specification SST-MEC-SPE-002</p> <p>Page: 6 and 25</p> <p>Description:CTA-TEL-SPE-000000-002_01c Telescope Grounding - lightning and LEMP Protection is missing in the AD list. Has it been taken into account?</p> <p>Recommended Solution: clarification</p>	closed with the proposed AI	DMA Final Report approval + 2 months.

2646	Action	Base door switch and locking	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 15, the paragraph after figure 5 (" The access door is the key for safe operations...")</p> <p>Description:</p> <ol style="list-style-type: none"> 1. Could you clarify what kind of safety switch is implemented on the door ? Do you mean the electromechanical switch that monitors the door opening (as per page 69, the drives are inhibited when the door is open more than 5°)? 2. It is not clear to me the safety advise and how you have foreseen the door locking (with a key locker, with the door lock?) and if it has any relation with the safety interlock. <p>Recommended Solution: clarification</p>	closed with the proposed solution	DMA Final Report approval + 2 months.
2647	Action	Azimuth Fork - Subsystems parts in the figure	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page:</p> <p>Description: Fig 7 Could you clarify the position of the subsystems/ equipment?</p> <p>General comment: it would be appreciated if the different parts of complex figures are labeled, to ease their identification.</p> <p>Recommended Solution: clarification. In future versions, label the different parts of complex figures</p>	thanks. Closed with the proposed solution	DMA Final Report approval + 2 months.
2648	Action	Azimuth Fork - Access to the main platform on top	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 16</p> <p>Description: It is a ladder what is placed on the right side of the figure 7, that permits the access to the central platform on top of the fork structure"?</p> <p>Recommended Solution: clarification</p>	thanks. Closed with the proposed solution	DMA Final Report approval + 2 months.

2649	Closed	Foundation design	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 26</p> <p>Description:</p> <p>Foundation details: more details would be needed such as drawings with details of bolts patterns, concrete design including the earth ring, data & power cables ducts positioning and computation of loads and stiffness. Please, are the appropriate documentation already available?</p> <p>Recommended Solution: clarification</p>	closed. addressed under RIX 2644	
2650	Action	Camera Chiller position	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 27</p> <p>Description:</p> <p>Installation of the camera chiller on the foundation may add some constraints (e.g. movement of cherry picker) that could be avoided if it is positioned onboard. Could it be possible/feasible to install the cooler onboard, outside on a base's side?</p> <p>Recommended Solution: clarification to be provided</p>	<p>A trade-off analysis on the position of the camera chiller has been performed and reported in SST-PRO-ANR-006.</p> <p>Proposed solution: we propose to discuss the results of the trade-off analisis during the meeting.</p>	see SST-PR-6
2651	Action	Access to the EL Drive System	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 37</p> <p>Description:</p> <p>Concerning the sentence "the encoder is located in the inner side of the EL bearing unit in order to be easier to be accessed from the central platform on top of the fork structure" Question: how do you access the central platform for maintenance activities?</p> <p>Recommended Solution: clarification</p>	Agree with the proposed solution. Closed with proposed AI	DMA Final Report approval + 2 months.

2652	Action	Lubrication System Design	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 42</p> <p>Description: Please, could you clarify the proposed design of the automatic lubrication system and detail its parts and location (figure 4-47 is not clear)? Has the lubrication unit already been selected? What exactly would the maintenance activities consist of?</p> <p>Recommended Solution: clarification to be provided</p>	Proposed solution accepted: the detailed analysis and design will be performed for the CDR.	DMA Final Report approval + 2 months.
2653	Closed	Drives lockout/tagout	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 68</p> <p>Description: Where is the main drives lockout/tagout switch and what type of switch are you using? Please, could you clarify. Is it the one included in fig 4 of the onsite maintenance plan?</p> <p>Recommended Solution: clarification to be provided</p>	yes sorry, it was duplicated. Closed	
2654	Action	STOW Button - clarification	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 68</p> <p>Description: Concerning the STOW BUTTON. Could you please clarify the use and the TBC?</p> <p>Recommended Solution: clarification to be provided</p>	can be closed with proposed AI.	DMA Final Report approval + 2 months.

2655	Closed	Emergency Stops	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 68</p> <p>Description: Emergency stops: wouldn't be an additional emergency stop required inside the base?</p> <p>Recommended Solution: clarification to be provided</p>	can be closed	
2656	Action	E-stops and Hazard Analysis	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 68</p> <p>Description: The number of E-stop buttons and their location are a result from the hazard analysis. Is the hazard analysis already available?</p> <p>Recommended Solution: clarification concerning the required emergency buttons and positioning</p>	can be closed with the proposed AI. In addition, could you please deliver the preliminary hazard analysis, since it was not part of the data package.	DMA Final Report approval + 2 months.
2657	Action	AZ/EL SW prelimit & limits	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 68</p> <p>Description: Apart from the HW pre-limits and emergency limits (final limits) in AZ/EL, could you confirm if there are also SW limits, based on encoder readings, preventing commanding the telescope structure to go beyond the observing ranges?</p> <p>Recommended Solution: clarification to be provided</p>	can be closed with the proposed AI	

2658	Action	Fire Detection System	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: none</p> <p>Description: Could you clarify the design of the Fire Detection System? The document doesn't cover the fire safety topic.</p> <p>Recommended Solution: clarification to be provided</p>	Proposed solution is agreed. Action: SST & CTAO to discuss and agree about the firefighting measures.	DMA Final Report approval + 2 months.
2659	Closed	figure 38	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 35</p> <p>Description: fig 38: could you clarify the position of EL Drive components?</p> <p>Recommended Solution: clarification to be provided. A brief presentation in the meeting would be enough.</p>	Agreed Proposed solution: we will prepare a presentation for the meeting	
2660	Action	AZ End Stop	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: none</p> <p>Description: EL bumper exists, but the design seems to not have an AZ End Stop. How can you safeguard the AZ cable wraps if, for whatever reason, the AZ drive is not able to stop the rotation outside its mechanical limits)?</p> <p>Recommended Solution: clarification to be provided</p>	I propose including this clarification in the next version of the design report (about how the AZ cable wrap design and camera chiller pipe are capable of withstand torsion). RIX can be closed with the proposed action.	DMA Final Report approval + 2 months.
2661	Action	Figure 68	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: Design Report SST-MEC-DSR-001</p> <p>Page: 66</p> <p>Description: Figure 68(Cable ducts system): could you clarify the components in the figure?</p> <p>Recommended Solution: clarification to be provided</p>	thanks. closed with proposed AI	DMA Final Report approval + 2 months.

2662	Closed	Drives Lockout/tagout procedure	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: On-site Maintenance Plan SST-MEC-PLA-015</p> <p>Page: 19</p> <p>Description: Drives lockout procedure is not clear. Please, where is the drive lockout switch located ? Is it the one included in fig 4?</p> <p>Recommended Solution: clarification to be provided</p>	can be closed	
2663	Closed	Azimuth Fork - Maintenance tasks on the main platform on top	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: On-site Maintenance Plan SST-MEC-PLA-015</p> <p>Page: none</p> <p>Description: Is it possible to perform maintenance activities standing over the main platform on top of the Azimuth Fork? Is there space enough or a cherry picker is necessary?</p> <p>Recommended Solution: clarification to be provided</p>	can be closed	
2664	Action	Accesses for maintenance tasks	Amaya Paredes	SST-MEC	<p>Document: SST Mechanical Structure: On-site Maintenance Plan SST-MEC-PLA-015</p> <p>Page: none</p> <p>Description: The accesses to the different subsystems/equipment for maintenance tasks are not clear. Clarification would be needed in the next document version. With access it is meant where is the subsystem/equipment located and the steps required to safely access to it for maintenance purposes.</p> <p>Recommended Solution: include the preparation and access procedures to the diverse equipment in the next document version as well as the close-up procedures.</p>	can be closed with the proposed AI	DMA Final Report approval + 2 months.

2665	Action	Abbreviation list	Amaya Paredes	SST-PRO	<p>Document: SST Programme: Telescope Concept of Operations SST-PRO-OPD-001</p> <p>Page: 6</p> <p>Description: HMI and PI acronyms missing</p> <p>Recommended Solution: include in next version</p>	closed with proposed AI	DMA Final Report approval + 2 months
2666	Action	Document number and Document name missing in AD/RD list	Amaya Paredes	SST-PRO	<p>Document: STR-CAM Interface Control Document SST-PRO-ICD-007</p> <p>Page: 7</p> <p>Description: SD 24: ECSS-Q-ST-80C standard title missing-> Software product assurance) AD1: CTA Architecture Document v1.0 -> Document number missing</p> <p>Recommended Solution: add the document name/doc title in next version</p>	closed with the AI to add the titels	DMA Final Report approval + 2 months
2667	Action	STR-CAM Interface Control Document: open topics	Amaya Paredes	SST-PRO	<p>Document: STR-CAM Interface Control Document SST-PRO-ICD-007</p> <p>Page: all</p> <p>Description: It seems to be many open items (TBD) in the interface design. Could you make a brief summary of the open topics and the ongoing actions to close them? Among them, could especially deal with:</p> <ul style="list-style-type: none"> - Camera Chiller selection and location - IA1-05 Coolant Pipe Routing and Fixation, and the condensation on the tube surface - IA1-10 C.U. Installation, Access and Removal, and the four different options 	<p>Un updated version of the document is already in the works. Action to ber closed by CDR at the latest.</p> <p>Proposed solution: Agreed for the presentation to be prepared for the meeting. Closed.</p>	see SST-PR-6

					Recommended Solution: a brief presentation could be prepared for the product review.	
2668	Action	TRR: SST Review (CTAO support) vs. CTAO Review	Bernhard Lopez	SST-PRO	<p>Document: CADM Plan Section/Page: 4.5.3/Page 18</p> <p>Description: The TRR should also be identified as a "CTAO Review", according to section 5.3 of the CTA Project Management Plan (CTA-PLA-MGT-000000-0003_1c).</p> <p>Solution Recommended: In figure 4.2, change the "TRR" box from "SST Review (CTAO support)" to "CTAO Review", if in agreement.</p>	<p>Change the "TRR box" in the workflow to become a "CTAO review"</p> <p>DMA Final Report approval + 2 months</p>
2669	Action	O-TRR instead of ATRR (Editorial)	Bernhard Lopez	SST-PRO	<p>Document: CADM Plan Section/Page: 4.5.1.1/Page 22</p> <p>Description: (Editorial) In the paragraph twice the acronym "ATRR" is used, but probably "O-TRR" had been intended.</p> <p>Solution Recommended: Please check and correct, if applicable.</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* Agreed > > *Proposed solution:* Closure with Action. We will update the document.</p> <p>I agree with the proposed action, no further discussion needed from my side.</p> <p>Suggested due date: DMA Final Report approval + 2 months.</p> <p>DMA Final Report approval + 2 months.</p>

2670	Action	CADM & initiation of change	Bernhard Lopez	SST-PRO	<p>Document: CADM Plan Section/Page: 5.1.1.2/Page 25</p> <p>Description: From the listed possibilities how changes can be initiated it is not fully clear to me how a) the classification of the change into Class A or B should be considered; and b) how the context of the change defines the applicable process (e.g. CRs related to Level-B requirements or interfaces will be managed by the CTAO CCB, while changes affecting only Level-C or lower would be managed by the SST CCB). Furthermore, it could be beneficial to define which SST-internal, approved changes should be notified to the CTAO via Change Notices (All? Or Level-C only?).</p> <p>Solution Recommended: Suggested to add more details in this section that provide further clarity about a) which CCB is applicable for a CR (SST CCB vs. CTAO CCB), and b) which SST-internal, approved CRs should be notified to the CTAO.</p>	<p>Alessio Trois wrote in #note-2: > *Reply:* Agreed > > *Proposed solution:* Closure with Action. We will update the document adding more details.</p> <p>I agree with the proposed action, no further discussion needed from my side.</p> <p>Suggested due date: DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.
2671	Action	Minor terminology inconsistency (Editorial)	Bernhard Lopez	SST-PRO	<p>Document: CADM Plan Section/Page: 6.1.2/Page 28</p> <p>Description: (Editorial) At the end of section 6.1.2 (contents of the CIDL's 3rd section) the plan refers to "Engineering Change Proposals" and to "Contract Change Notices", while the rest of the document refers to "Change Request (CR)" and "Change Notice (CN)". Furthermore, the second bullet only mentions RFDs, but also RFWs could be mentioned here. And the acronym DRD is not defined.</p> <p>Solution Recommended: Suggested to edit the text correspondingly, for further consistency.</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* Agreed > > *Proposed solution:* Closure with Action. We will update the document adding more details.</p> <p>I agree with the proposed action, no further discussions are required from my side.</p> <p>*Suggested due date:* DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.

2672	Action	Software requirement specification is missing	Bernhard Lopez	SST-PRO	<p>Document: Software requirement specification Section/Page: N/A</p> <p>Description: This document is missing. It is noted that the review of the design of the Telescope Control System product is not part of the scope of the Product Review, but the related requirement specifications should at least exist (see also Annex 1 of the CADM Plan, item DD-003 on page 45).</p> <p>Solution Recommended: If available, please provide the software requirement specification. If not yet available, please describe the envisioned steps and timeline to develop these requirement specifications.</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* The set of documents to be submitted to the Product Review Board for review was decided after several iterations within the SST Program Office. In this set, the software documentation, originally planned, has been excluded with the aim of concentrating the team's efforts on the hardware and management documentation. The actual PR data package is not yet tracked in the CADM, which still contains the programmatic documentation envisaged at the beginning of the bridging phase. > > *Proposed solution:* Closure with Action. The CADM plan will be updated accordingly.</p> <p>Thank you for the information. It is though still not clear to me at what point it is expected that the software requirement specification (or equivalent documentation) will become available, and certainly this information is needed for the next project phase. Suggested to discuss at the PR meeting.</p>	See SST-PR-7
2673	Action	Risk mitigation: analysis and costs	Bernhard Lopez	SST-PRO	<p>Document: Risk Management Plan Section/Page: 3.3/Page 17</p> <p>Description: To allow for an efficient use of resources, it could be mentioned in this section that for risks that are being evaluated to imply a "low" or "very low" risk exposure for the organization, mitigations do not need to be defined. On the other hand, risk items with a "high" or "very high" risk exposure, apart from defining the mitigation actions, these should also be cost-ed and the estimated resource needs or costs be included as a column in the risk register (annex 1).</p> <p>Solution Recommended: if in agreement, edit section 3.3 to explain in which cases mitigation actions need to be defined. Add a column in the Risk Register Template to include a cost estimate of the planned mitigation.</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* Agreed > > *Proposed solution:* Closure with Action. We will update the document.</p> <p>I agree with the proposed action, no further discussion needed from my side.</p> <p>Suggested due date: DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.

2674	Action	Documentation Manager role not defined	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: 2.2.3 and 4.1.7</p> <p>Description: In sections 2.2.3 and 4.1.7 a "Documentation Manager" role is mentioned, which has not been defined in the plan. Maybe an editorial issue only?</p> <p>Solution Recommended: Please check and correct, or include also a description of the Documentation Manager role in the plan (if/as applicable).</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> Agreed. The Documentation Manager is defined in the CADM Plan (SST-PRO-002). The description of his/her role will be inserted in that document, while a reference to it will be inserted in the PA Plan.</p> <p>></p> <p>> *Proposed solution:* Closure with action</p> <p>I agree with the proposed action, no further discussions are required from my side.</p> <p>*Suggested due date:* DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.
2675	Action	Acceptance process	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: 5.1/Page 30</p> <p>Description: Section 5 states in the beginning that "the content of this section applies to both internal and external suppliers of the SST Projects", and in section 5.1 it also describes the high-level acceptance process of deliverables to the CTAO, in accordance with the SST PMP. I could imagine that it could be confusing for suppliers to understand what is expected from them as, for example, maybe they deliver only components to one of the SST Projects internally, so would not be related to, e.g., a Provisional Acceptance Review (ACRV).</p> <p>Solution Recommended: Suggested to edit section 5.1 in a way that SST-internal acceptance processes (e.g. accepting parts or components from a supplier) are separated from the established CTAO Acceptance Process (which would focus on accepting the integrated telescopes), to facilitate the interpretation by the suppliers.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> Agreed. In the revised version of the document we will follow the reviewer suggestion: we will keep the current acceptance process described in section 5.1 for the deliverables to CTAO, while we will add a separate process for the delivery from suppliers to the SST Projects.</p> <p>></p> <p>> *Proposed solution:* Closure with action</p> <p>I agree with the proposed action, no further discussions are required from my side.</p> <p>*Suggested due date:* DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.

2676	Action	Tailoring of the PA/QA scope	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: N/A</p> <p>Description: As a general comment, this PA and Quality Plan is a very complete and detailed plan, which I understand is aligned with the corresponding space (ECSS) PA/QA standards, and it includes also a corresponding set of general specifications and standards. It is also stated that this plan is applicable to all SST contracts, which means that all requirements and all reference documents would have to be considered in the call-for-tender processes, or with suppliers' sub-contracting. Specifically in those cases where only some minor parts or components are involved, many detailed PA/QA requirements could potentially complicate the procurement and/or production process, and/or increase the costs.</p> <p>Solution Recommended: Consider a strategy for tailoring/simplifying the PA/QA requirements for suppliers of lower-level parts/components, if/as deemed appropriate.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> Agreed. For the industrial partners, suppliers of lower-level parts/components, the applicable standards and requirements will be agreed case by case (in the SoW or within a specific document, if/as deemed appropriate) for all the activities under their responsibilities. This will be indicated in the next revision of the PA/ QA plan, to avoid the same comment in the future reviews.</p> <p>></p> <p>> *Proposed solution:* Closure with action</p> <p>I agree with the proposed action, no further discussions are required from my side.</p> <p>Suggested due date: by CDR.</p>	DMA Final Report approval + 2 months.
2677	Action	Organization of the Production Readiness Review (PRR)	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: 6.8.7/Page 38</p> <p>Description: As stated also in section 4.5.3.4 of the SST CADM Plan, the SST(&Subsystem) PRR would be organized jointly by the SST Programme and CTAO. Similarly as for the Acceptance Process/Review (see #2675), it could be an asset to provide more detail about SST-internal PRRs vs. those at SST-project or -subsystem level, if/as applicable.</p> <p>Solution Recommended: Consider revising this section.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> Agreed. In the revised version of the document we will follow the reviewer suggestion: as in the case of the Acceptance Process (#2675), we will keep the current PRR described in section 6.8.7 for the whole SSTs, deliverable to CTAO, while we will add a separate PRR definition for the PRRs internal to the SST Projects.</p> <p>></p> <p>> *Proposed solution:* Closure with action</p> <p>I agree with the proposed action, no further discussion needed from my side.</p> <p>Suggested due date: DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.

2678	Action	Reference to CTAO configuration management plan	Bernhard Lopez	SST-PRO	<p>Document: PMP Section/Page: 4.4/Page 39</p> <p>Description: "During the Production Phase any changes requests will require formal interaction with CTAO following a to-be-defined global CTAO policy": here "a to-be-defined policy" could be replaced by a reference to AD3 (CTAO Configuration Management Plan).</p> <p>Solution Recommended: edit the sentence, if in agreement.</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* Agreed > > *Proposed solution:* Closure with Action. We will update the document.</p> <p>I agree with the proposed action, no further discussion needed from my side.</p> <p>Suggested due date: DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.
2679	Action	Software PA & references to CTAO SW licensing policy and coding standards	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: 7.2.5/Page 44</p> <p>Description: Related to Software PA and "Coding", references to the already released and applicable "CTAO Software Licensing Policy (CTA-STD-OSO-000000-0002)" and the "Software Programming Standards (CTA-STD-OSO-000000-0001)" could be included. Furthermore, a placeholder reference to the "CTAO System Control Standards (CTA-STD-SEI-000000-0004, draft)" could be included.</p> <p>Solution Recommended: Include more specific references to the already released CTAO software-related policies/standards.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> Agreed: in the revised version of the document we will follow the reviewer suggestion. In Section 7.2.4 of the revised version of the document we will include explicitly a reference to the cited CTA documents. In addition, also a statement regarding the compliance of the SST SW with CTAO requirements and standards will be reported.</p> <p>> > *Proposed solution:* Closure with action</p> <p>I agree with the proposed action, no further discussion needed from my side.</p> <p>Suggested due date: DMA Final Report approval + 2 months.</p>	DMA Final Report approval + 2 months.
2680	Closed	Tool for managing non-conformance reports (NCRs)	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: Chapters 8 and 10 (Appendix)</p> <p>Description: Chapter 8 provides a general description of the NC management to be performed, and I assume that a related tool is going to be used to keep digital records of the NCs, and to follow up on the action items and NC dispositions. Therefore, it could be an asset to already mention/require that a related tool shall be set up and used by all SST members.</p> <p>Solution Recommended: If in agreement, consider including further details about the implementation of the shown NC processes using a corresponding tool (e.g. via a ticketing/task-management system).</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> For the time being, no specific tool has been selected for the NCR management. Currently the best option is Redmine, since the Consortium members are already familiar with it: it would be easily used, once it is properly configured for this task. As alternative, a shared Excel file will be considered.</p> <p>> > *Proposed solution:* Closure without action</p> <p>Ok, agreed to close this RIX.</p>	

2681	Action	PA and Quality Plan & scope, and resources required for implementation	Bernhard Lopez	SST-PRO	<p>Document: PA and Quality Plan Section/Page: N/A</p> <p>Description: The PA and Quality Plan defines four roles, namely the SST Programme QM, the deputy SST Programme QM, the SST-STR QM, and the SST-CAM QM, apart from the contractor/partner PA/QA Managers. Has the number of proposed positions been checked against the overall, estimated workload that is to be expected related to the implementation of all PA/QA activities and processes that are described in this plan?</p> <p>Solution Recommended: If available, provide information about effort estimates related to the implementation of the PA and Quality Plan within the SST Programme. If not available, consider performing a (ROM) effort estimation based on the envisioned PA/QA activities, to confirm that the presented resourcing is realistic.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> The revised version of the Plan will include a Task Definition Sheet for each of the four roles, describing duties, responsibilities, tasks, interfaces and workloads.</p> <p>> The implementation of the PA/QA requirements will be in charge of the industrial partners responsible for the MAIT activities. The monitoring and verification of this implementation will be in charge of the four SST key persons for the PA/QA issues.</p> <p>> During the next Design Consolidation phase, the SST Consortium will evaluate the need to hire additional personnel for the PA/QA task, in particular for the on-site CTA-S activities.</p> <p>> *Proposed solution:* Closure with action</p> <p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> The revised version of the Plan will include a Task Definition Sheet for each of the four roles, describing duties, responsibilities, tasks, interfaces and workloads.</p> <p>> The implementation of the PA/QA requirements will be in charge of the industrial partners responsible for the MAIT activities. The monitoring and verification of this implementation will be in charge of the four SST key persons for the PA/QA issues.</p> <p>> During the next Design Consolidation phase, the SST Consortium will evaluate the need to hire additional personnel for the PA/QA task, in particular for the on-site CTA-S activities.</p> <p>> *Proposed solution:* Closure with action</p> <p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> The revised version of the Plan will include a Task Definition Sheet for each of the four roles,</p>	CDR
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						<p>describing duties, responsibilities, tasks, interfaces and workloads.</p> <p>> The implementation of the PA/QA requirements will be in charge of the industrial partners responsible for the MAIT activities. The monitoring and verification of this implementation will be in charge of the four SST key persons for the PA/QA issues.</p> <p>> During the next Design Consolidation phase, the SST Consortium will evaluate the need to hire additional personnel for the PA/QA task, in particular for the on-site CTA-S activities.</p> <p>></p> <p>> *Proposed solution:* Closure with action</p> <p>I agree with the proposed action, no further discussion is needed from my side.</p> <p>Suggested due date: by CDR.</p>	
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2682	Action	AD title missing?	Amaya Paredes	SST-OPT	<p>Document: SST Programme: Optics Design Report SST-OPT-DES-001</p> <p>Page: 7</p> <p>Description: [AD5] Design Report SST-OPT-DSR-001 Please, is this AD an Optics Design report, different from the present document SST-OPT-DES-001? Might it be a typo?</p> <p>Recommended Solution: clarification and correction in next version, if needed</p>	closed with AI to remove the AD	DMA Final Report approval + 2 months.
2683	Closed	Mirrors Coating	Amaya Paredes	SST-OPT	<p>Documents: SST Programme: Optics Design Report SST-OPT-DES-001 and Subsystem Technical Requirement Specification SST-OPT-SPE-002</p> <p>Pages: Page 14 of Optics Design Report SST-OPT-DES-001 (Coating) and page 13 of Subsystem Technical Requirement Specification SST-OPT-SPE-002 (concerning D-SST-OPT-0915 requirement)</p> <p>Description: This is a question related to Bug#2640 (and the partial compliance to B-ENV-0915: dust and sand environmental requirements). It is not clear to me the expected degradation of the mirror's coating under the environmental conditions defined in B-ENV-0195 -> C-SST-TEL-0915 -> D-SST-OPT-0915. Could you clarify if a preventive recoating is necessary and, if needed, provide some details of the procedure?</p> <p>Recommended Solution: clarification to be provided. If needed, update SST maintenance plan to include the preventive/corrective tasks required.</p>	closed	

2684	Action	ESO specific safety requirements	Bernhard Lopez	SST-PRO	<p>Document: System Safety Management Plan Section/Page: 3.2/Page 12</p> <p>Description: The text states that "all parts or the final products that will be delivered to the CTA-South site must comply with the EU product safety legislation plus ESO specific safety requirements". Are the ESO specific safety requirements known? Apart from the general outline related to safety contained in the CTAO-South Hosting Agreement with ESO, would there be technical safety requirements coming from ESO, e.g. related to the telescope design?</p> <p>Solution Recommended: Please explain the current status. If specific requirement specifications are known, suggested to include them as reference in the plan. If not known yet, please explain what path is envisioned to check/confirm any applicable safety requirements from ESO.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> This sentence was taken from the CTAO Product Safety Plan (CTA-PLA-SEI-00000-0001). Therefore, this RIX should be transferred to CTAO. We are waiting for the clarification/answer. ></p> <p>> *Proposed solution:* Closure without action</p> <p>Understood, suggested to assign the issue to the PR Chairperson to decide on how this should be followed up with the CTAO.</p>	see SST-PR-5
2685	Action	SST preliminary hazard analysis	Bernhard Lopez	SST-PRO	<p>Document: System Safety Management Plan Section/Page: 6.5.3/Page 29</p> <p>Description: As stated in this section, "Hazard analysis shall be performed in a systematic manner, beginning in the concept phase (...)" I can only agree with this statement, and I wonder if a preliminary SST hazard analysis (PHL/PHA) is available for review, as required also in Table 7-1 of the plan? Furthermore, what is the SST Team's expectation w/r to a CTAO system-level hazard analysis, which considers the interaction of all elements of the CTAO-South array, including the SSTs?</p> <p>Solution Recommended: Please explain.</p>	<p>Nicola La Palombara wrote in #note-2: > *Reply*</p> <p>> We do not have yet a complete document reporting the hazard analysis at system level, however this has been taken into account during the development of the SST subsystems. It is foreseen to provide this document for the CDR (see RIX 2686 reply) and during the next phase (Design Consolidation phase) we will coordinate with CTAO for the Safety issues. ></p> <p>> *Proposed Solution*: Closure without action</p> <p>I would agree with the proposed path forward, but would be glad to see this discussed briefly at the PR to cross-check also with the view of the other panel members.</p>	see SST-PR-4
2686	Action	Safety documents to be included at SST documentation	Bernhard Lopez	SST-PRO	<p>Document: CADM Plan Section/Page: Annex 1/Page 43</p> <p>Description: Table 4 (PA, QA & RAM Documents Set) only refers to a "Safety Assessment Report", but should also mention explicitly the "Safety Hazard Analysis (PHL/PHA/HA)" and the "Safety Compliance Assessment" (see section 7.4 of the System Safety Management Plan).</p> <p>Solution Recommended: Consider including these</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* Agreed. The ADP needed for the next review (CDR) needs to be discussed with CTAO. The plan is to propose a data package and discuss it with the CTAO. In any case we will propose to provide these two important documents. > *</p> <p>> Proposed solution:* Closure with Action. We will provide the documents for the CDR and we will update the CADM Plan.</p>	CDR

					two safety documents explicitly as documentation deliverables.	I agree with the proposed action, no further discussion needed from my side. Suggested due date: by CDR.	
2687	Action	Risk register	Bernhard Lopez	SST-PRO	<p>Document: Risk Register (or Risk Analysis Report) Section/Page: N/A</p> <p>Description: This document has not been included in the review documentation, would it be available?</p> <p>Solution Recommended: If available and if possible, please consider sharing this document with the PR panel. This to understand better the major risk scenerarios that have been identified for the overall SST Programme, e.g. in the context of the proposed procurement of camera long-lead items.</p>	<p>Alessio Trois wrote in #note-1: > *Reply:* risk register is excluded from the PR. scope of PR is to establish a RMP common to all the members of SST PRO. Risk register shall be available for CTAO PO at the beginning of the consolidation phase. > * > Proposed Solution:* Closure without Action"</p> <p>At least the assessment of the risks identified related to camera long-lead items could be beneficial to review. Suggested to briefly talk about this at the PR meeting.</p>	<p>See SST-PR-3</p> <p>Consolidation Phase KO + 3 months</p>
2688	Action	Software design not within scope of PR (for the records only)	Bernhard Lopez	SST-PRO	<p>Document: SST Product Review Plan Section/Page: N/A</p> <p>Description: It has been explained that the design of the SST-Strcuture and SST-Camera are not part of the scope of this Product Review (PR). This issue is to track a related note in the panel report, to indicate that this part of the SST design has not been reviewed (for the records only).</p> <p>Note: this issue is related to #2615.</p> <p>Solution Recommended: Please comment on when the design of the different software components is going to be presented for review. Then assign this issue to the Review Chairperson, for tracking and consideration in the panel report.</p>	<p>Bernhard Lopez wrote in #note-2: > Note: the first sentence of the description should read "It has been explained that the design of the SST-Stucture and SST-Camera +Software+ are not part of the scope of this Product Review (PR)."</p> <p>Suggested to assign the issue to the PR Chairperson to decide on how/if to follow up in the PR report.</p>	<p>See SST-PR-7</p>

2689	Action	FADC not defined	Nick Whyborn	SST-PRO	<p>SST-PRO-MAT-005 Monte Carlo Model Input Parameter Description. Section 1.7.1 Page 14.</p> <p>The important abbreviation FADC is not defined in the text or section 1.7.1.</p> <p>Suggest add this to the list of abbreviations.</p> <p>Comment: Some abbreviations in 1.7.1 are not used in this document (e.g. FAR, DR, QA, etc.). Other abbreviations defined in the text do not appear in section 1.7.1 (e.g. IACT, PDE, PDM, etc.). "PM" has two meanings though only one is listed.</p>	Proposed action accepted. Due date is TBD.	DMA Final Report approval + 2 months.
2690	Closed	question about optical parameters	Nick Whyborn	SST-PRO	<p>SST-PRO-MAT-005 Monte Carlo Model Input Parameter Description. Annex, Table 2-1 Pages 15 & 16.</p> <p>The effective_focal_length is listed as 215.191 cm but in the Optical Design Report (SST-OPT-DSR-001), p. 9 it is given as 2154 mm and fig. 12 shows a range of 2151 to 2156 across the FoV.</p> <p>The primary_diameter is listed as 424.1 cm whereas it is given as 4306 mm in SST-OPT-DSR-001, p. 9.</p> <p>Can you confirm that the numbers in SST-PRO-MAT-005 are correct?</p>	<p>Thanks for the clarification.</p> <p>Close.</p>	
2691	Closed	missing description of the baffle	Nick Whyborn	SST-OPT	<p>SST Optics Design Report (SST-OPT-DSR-001 1a)</p> <p>This design report does not appear to include a description of the baffle around the M2. I could not find a description in the other documents provided either (though have not looked exhaustively).</p> <p>Suggest you include the design and analysis of the baffle in the SST-OPT-DSR-001 unless it is covered elsewhere.</p>	<p>Proposal rejected.</p> <p>Unless I am mistaken, the baffle has an optical function and therefore at least its optical properties must be described and analysed in the optical design report.</p>	

2692	Action	AD list includes a reference to itself.	Nick Whyborn	SST-OPT	<p>SST Optics Design Report (SST-OPT-DSR-001 1a) Section 1.4. P. 7.</p> <p>This document includes a reference to itself (AD5). Suggest suppressing AD5.</p>	Action accepted	DMA Final Report approval + 2 months.
2693	Action	poor traceability of the origin of MC parameters	Nick Whyborn	SST-PRO	<p>SST-PRO-MAT-005 Monte Carlo Model Input Parameter Description. Annex, Table 2-1</p> <p>I am concerned that the MC parameters listed in the annex do not appear to be traced from any design or analysis report. Cross checking with the optical parameters listed in the SST Optical Design report I found a couple of apparent discrepancies. The two ADs listed in section 1.5 are not referenced in the text. AD2 appears to be relevant for the camera parameters but has not been provided in the Product Review document package so I can not judge whether those.</p> <p>I suggest you consider ways to improve traceability back to the origin of the SST MC parameters, preferably by referring to the report where they are derived.</p>	<p>Thanks for your response.</p> <p>Proposed action accepted. Due date is TBD.</p>	DMA Final Report approval + 2 months.
2694	Action	Inconsistency of the name of the M1 dish updated design	Christelle Rossin	SST-MEC	<p>SST-MEC-DSR-001 Chapter 3.2.2 M1 Dish, updated design Page 23</p> <p>In table 3, the wording used to qualify the M1 dish updated design is "Option 1". For better understanding, it could be good to replace it by the wording "updated design" as it is done in the rest of the document.</p>	<p>Agreed</p> <p>Proposed solution: we will change the wording as suggested in the next version of the document</p>	DMA Final Report approval + 2 months.
2695	Action	Wrong description for figure 18	Christelle Rossin	SST-MEC	<p>SST-MEC-DSR-001 Chapter 3.2.2 M1 Dish, updated design Page 23</p> <p>The description of figure 18 does not correspond to the maximum displacement in magnitude of the M1 dish updated design (22.6 microns of displacement - cf. table 3 option 1 value), but corresponds to the maximum displacement in magnitude of the M1 dish baseline design.</p>	<p>Agreed</p> <p>Proposed solution: We will correct the description in the next version of the document</p>	DMA Final Report approval + 2 months.

					Please correct the description of figure 18 in next release of this document.		
2697	Action	Door shadowing not included	Nick Whyborn	SST-PRO	<p>SST-PRO-MAT-005 Monte Carlo Model Input Parameter Description. Annex, Table 2-1 Page 16.</p> <p>The "camera_body_diameter" parameter does not appear to include the effect of shadowing caused by the open doors - see figure 1 in the SST Camera Design report (SST-CAM-DSR-001).</p> <p>Please clarify why this does not appear to be included.</p>	Proposed action accepted. Due date is TBD.	DMA Final Report approval + 2 months.
2698	Action	questions re chiller pipework	Nick Whyborn	SST-CAM	<p>SST Camera Design Report (SST-CAM-DSR-001) Section 7.1.4.</p> <p>The camera has two heat exchanger panels and a heat exchanger in the FPM. How is the coolant flow directed through these (series or parallel) and where is the description of the pipework needed to connect them (SST.4.2.1.2)? How many coolant connections must be undone and redone to replace the camera?</p> <p>Suggest include a diagram showing the cooling circuit in more detail than given in sections 7.1.4, 7.2 and 7.6.1.</p>	Proposed action agreed. Due date 15/2/2023	DMA Final Report approval + 2 months.

2699	Closed	thermal budget and temperature stability (SST-ER-06)	Nick Whyborn	SST-CAM	<p>SST Camera Design Report (SST-CAM-DSR-001) Section 8.</p> <p>There is no thermal budget showing the expected heating / cooling of the camera required to maintain the operating temperature in the extreme cases.</p> <p>Although section 7.2.4.3 does include a discussion of the need for thermal stability and Table 11 includes an temperature stability requirement at the chiller, I could not find a discussion of how the proposed design meets the stability requirements at the SiPM and FPM level (D-SST-CAM-0235-0n).</p> <p>The chiller stability requirement is expressed as a range whereas the SiPM & TM requirements are given as maximum rate of change of temperaturee with time.</p> <p>I suggest thermal budgets for both heating/cooling and temperature stability are included.</p> <p>I also suggest you use a common and easily measurable definition of temperature stability with a specified timescale. E.g. maximum change in temperature of 0.4°C in 1 hour or 0.1°C in 15 mins or whatever timescale is most relevant.</p>	<p>Thank you for the explanation.</p> <p>I was not an active participant to the DVER so am not familiar with the discussion that took place but the agreed action is clear and I think we should discuss this in the review meeting.</p> <p>I propose that you present the status of the thermal modelling at the meeting and the panel can assess if the provision of the thermal analysis can be deferred to the CDR as proposed in the Product Review Plan.</p> <p>For discussion.</p>	
2700	Action	missing PBS identifier codes	Nick Whyborn	SST-PRO	<p>SST-PRO-002 - SST Programme Configuration and Data Management Plan Section 4.4 & Annex 1.</p> <p>Section 4.4 states that each PBS element is identified by an alphanumeric code reported in Annex 1. However, Annex 1 does not contain this information.</p> <p>Include the missing information in an annex and rerelease the document.</p>	<p>Proposed action accepted.</p> <p>Due date is TBD.</p>	DMA Final Report approval + 2 months.
2701	Closed	SST-CAM-LIS-001 - FPGA	Francesco Giordano	SST-CAM	<p>SST-CAM-LIS-001 - SST Camera: Declared Item List 2.1 General procurement strategy pag8</p> <p>high Risk in using Fpga procured by grey market.</p> <p>In case grey marker is the final solution, A more severe contingency plan must be adopetd (acceptance test on all components and/or a higher number of FPGA to be procured)</p>	<p>We agree about the high risk of purchasing FPGAs on grey market. We agree with the suggestion of having a more severe acceptance tests for the parts procured on the grey market. This will be reported in the appropriate documents (quality plan and verification plan)</p>	

2702	Action	SST-PRO-ICD-007: STR-CAM Interface Control Document	Francesco Giordano	SST-PRO	2.3 Chiller specs and location pag 10 Two chiller under comparison. Is there any simulation FEM on thermal distribution? Is there any study on the temperature expected on site? Probably a thermal test at space facilities may help.	A thermal analysis of the expected temperature distribution inside the camera is available; the relevant chiller requirements are the cooling capacity and the coolant temperature stability, both chiller models can fulfill them. Both chiller models are manufactured and tested for operation in similar or harsher (i.e. mining sites in desertic australian outback) ambient conditions.	DMA Final Report approval + 2 months.
2703	Action	SST-CAM-SPE-002: SST Camera Subsystem Technical Requirements Specification	Francesco Giordano	SST-CAM	2.9 Performance Pag. 40 and 41 0011-11 SiPM PDE Wavelength Response there is a reference to a plot not shown in the document	Yes correct, will revise document and upload the PDE single wavelength response plot	DMA Final Report approval + 2 months.
2704	Closed	SST-CAM-SPE-002: SST Camera Subsystem Technical Requirements Specification	Francesco Giordano	SST-CAM	2.9 Performance Pag. 40 and 41 0011-18 Digitisation Range Resolution 0011-20 Pulse Shape 0011-22 Trigger Range Resolution the data are not reported in the document	Will insert and update numbers, they are still to be finalized but won't affect design any further, just dimensioning of few passive components.	
2705	Closed	SST-CAM-DSR-001 SST Camera: Design Report	Francesco Giordano	SST-CAM	2 Design Summary pag 9 the humidity in the camera may be a major issue if not adequately controlled, especially during the non operation phases. in the text: "The camera is hermetically sealed and a breather-desiccator maintains an acceptable level of humidity" what does acceptable mean? SiPM are definitely sensitive to temperature and humidity. In this sense, the idea of using bare sensors may prevent better any damage on the photosensing module. Protective coating may behave worse against temperature and humidity in a sealed camera.	We fully agree that the humidity (and more specifically, the dew point) must be adequately controlled, and that this is most important when the camera is non-operational (i.e. not generating a lot of heat). In the statement: "The camera is hermetically sealed and a breather-desiccator maintains an acceptable level of humidity" the term "acceptable" means: such that no condensation occurs inside in the camera, even at the lowest ambient temperatures without power. In practice this requires the camera to be purged at build time with dry air, to obtain a known dew point. The exact dew point to which the camera will be "set" is TBD. It may be most obvious to set the dew point based on the minimum temperature in the CTA requirements (-10 deg C without power). For example, at a dew point of -12 deg C, the camera has a relative humidity (RH) of 85% at the minimum CTA temperature requirement. During the required observing temperature range (-5 deg C to 25 deg C)	

						<p>all electronics will be on and the inside of the camera will be kept to between ~20 - 40 deg C, resulting in RH 3% - 8%. We note that the internal operating temperature of the camera is yet to be determined accurately (hence the wide range stated). If the internal temperature of the camera is too high, then the electronics will spend most of the time being operated at a very low relative humidity, and precautions may be needed to prevent static discharge (i.e. conformal coating).</p> <p>*Proposed Solution:* Close.</p>	
2706	Action	question about door motor cable feedthroughs	Nick Whyborn	SST-CAM	<p>SST Camera Design Report (SST-CAM-DSR-001) Section 7.2. P. 28 & figure 24</p> <p>It is stated that "Motor control and position sensor cables enter the camera via grommets on the transition plate."</p> <p>How are these cables or the grommets replaced should they fail?</p> <p>How are the cables connected at each end of the cable? Are connectors used or perhaps screw terminals?</p> <p>How are the cables mechanically supported along their length?</p> <p>I am somewhat concerned since these appear to be exposed to the sunlight and weather.</p>	<p>Thank you. I am happy with the clarification and will close this RIX with no further tracked action. I consider the editorial update of the document and checking of cable UV resistance can be done as normal work. RIX can be closed.</p>	DMA Final Report approval + 2 months.

2707	Action	Incorrect transition wind speed for door closing	Nick Whyborn	SST-CAM	<p>SST Camera Design Report (SST-CAM-DSR-001) Section 7.2.3.</p> <p>It is stated that the motors are sufficient to close the doors in wind speeds up to 40 km/h. However, the requirement is for 60 km/h:</p> <p>CTA-CAM-0724-01: Wind Speed - Door Transition Closed Limit</p> <p>The Camera Unit doors shall be able to close in wind speeds of up to 60 km/hr in any direction parallel to the focal plane.</p> <p>Please correct the text if this is a typo. If not then the design needs to be revisited to comply with the requirement.</p>	Action agreed. Due date 15/2/2023.	DMA Final Report approval + 2 months.
2708	Closed	SST-CAM-DSR-001 SST Camera: Design Report	Francesco Giordano	SST-CAM	<p>7.2.1 Focal Plane Mechanical Assembly (FPM) Page 29</p> <p>what liquid will be used for the cooling system?</p> <p>7.2.4.3 SiPM Power Dissipation page 38</p> <p>What tempeprature the numbers there refer to?</p> <p>Probably the cooling system requires a more detailed FEM simulation and a thermal test on the first prototype (or dummy model) should be scheduled.</p>	<p>The liquid is a water-glycol mixture as specified by the manufacturers for use of the expected operating temperature range. Inhibitors are also included to prevent corrosion, and microbial/algal growth. A suitable substance that includes both glycol and inhibitors and used in CHEC-M & CHEC-S is Antrogen-N by Clariant: (http://www.clariant.com/en/Solutions/Products/2013/12/09/18/25/Antifrogen-N)</p> <p>These power dissipation estimates do not include any assumption about ambient temperature. They represent the electrical power generated by photons falling onto the SiPM and creating a current that then flows through the bias resistor.</p> <p>We agree that a thermal test is needed and this is planned to take place as soon as thermally-representative SiPM tiles arrive from Hamamatsu.</p> <p>*Proposed Solution:* Close.</p>	
2709	Closed	SST-PRO-ANR-010: SST Programme:Performance Analysis Report	Francesco Giordano	SST-PRO	<p>2.2 Cherenkov Camera page 12 and 13</p> <p>I was windwering if the informations about the IR and NIR absorption are enough. Can more data about the absorption capability of the window be supplied?</p>	<p>*Reply:* to our knowledge, the camera window transmission curve already contains all of the information to describe the IR/NIR absorption. We would like to ask the reviewer additional details that should be checked about this topic by expanding the RID.</p> <p>*Proposed solution:* Request of further clarification to the reviewer.</p>	

2710	Action	SST-PRO-MAT-005: SST Programme: Monte Carlo Model Input Parameter Description	Francesco Giordano	SST-PRO	<p>Readout electronics page 22</p> <p>the degree of details about the simulation parameters that can be implemented is incredible. A lot of them are simply listed but not quoted. Is it worthwhile to try to give even a rough estimate of them?</p>	<p>*Reply:* Partially agreed. Since some parameters are related to quantities that are either left as <code>sim_tellarray</code> default or not used because not present in the SST-Cam structure (e.g., the low-gain channel), we either left them blank or highlighted as <code>""N/A""</code> (not applicable).</p> <p>*Proposed solution:* Closure with Action. We explicitly describe as <code>""Default Adopted""</code> or <code>""Not Applicable""</code> the relevant parameters.</p>	DMA Final Report approval + 2 months.
2711	Action	Selection of SiPM technology	Marco Feroci	SST-CAM	<p>Document: SST Camera: Design Report Section: 7.2.4.2 (page 36)</p> <p>RID: It is unclear how the declared "fallback option" for the SiPM model would impact the procurement of the SiPM. The stated "post-ECAM" decision time appears rather late in the project schedule. Would the alternative SiPM be procured in parallel (double procurement) or would the program be delayed waiting for the new procurement when deemed necessary? A decision point and criterion should be clearly defined, as well as the schedule impact.</p> <p>Suggested solution: allocate the tests required for this decision earlier in the project (even with the development of a dedicated breadboard if necessary) and solve this trade-off before ECAM AIV. If this is technically not feasible, then a procurement plan should be defined and matched with the project schedule.</p>	Closed with action, deadline at PR meeting.	DMA Final Report approval + 2 months.
2712	Action	Link to requirements	Marco Feroci	SST-CAM	<p>Document: SST Camera: Design Report Section: whole document. Example: sect. 7.2.2 (page 31)</p> <p>RID: When discussing the design solutions I seldom see a reference to the requirements. As an example, in Sect. 7.2.2. the transmittance is stated to be "in general exceeding expectations". The value of the parameter should indeed be compared to a requirement, demonstrating compliance.</p> <p>Suggested solution: particularly for critical parameters requirements should be quoted and, when useful/needed, discussed against specifications.</p>	Closed with action, deadline CDR.	DMA Final Report approval + 2 months.

2713	Action	Assembly tolerances	Marco Feroci	SST-CAM	<p>Document: SST Camera: Design Report Section: 7.2.4.1 (page 35)</p> <p>RID: There is no tolerance associated to the positioning of the SiPM tiles. On which basis will the assembly process be validated and accepted?</p> <p>Suggested solution: elaborate and specify tolerances.</p>	Closed with action, deadline CDR.	DMA Final Report approval + 2 months.
2714	Action	Labels on CAD figure	Marco Feroci	SST-CAM	<p>Document: SST Camera: Design Report Section: 3 (Figure 1)</p> <p>RID: It would be useful to identify and label the same Camera subsystems as those listed at page 11</p> <p>Suggested solution: Add labels.</p>	<p>Agreed - the figure will be replaced with the following: https://pcloud.mpi-hd.mpg.de/index.php/s/eBtqySJyAbSCnNN</p> <p>*Proposed Solution:* Close with action. Update Figure 1 in the Camera Design Report.</p>	DMA Final Report approval + 2 months.
2715	Closed	Bad acronym	Marco Feroci	SST-CAM	<p>Document: SST Camera: Design Report Section: 3 (Page 11)</p> <p>RID: ENC (commonly Equivalent Noise Charge, also for SiPM) is not the ideal choice for the Enclosure</p> <p>Suggested solution: if not too late, change acronym</p>	<p>Changing the Enclosure acronym from ENC to something else is possible. This would require updating the PBS and every document that references it (which is effectively every document in the SST Camera Project and all SST Programme high-level documents). If the review panel believes that this is required then it can be done.</p> <p>*Proposed Solution:* Close.</p>	
2716	Action	no seismic standard in subsystem technical requirements spec	Volker Heinz	SST-MEC	<p>Document: SST-MEC-SPE-002 2a SST Mechanical Structure Subsystem Technical Requirements Specification</p> <p>does not contain any seismic design standard to be followed. This could be Eurocode 8 or (as the SST will exclusively be delivered to CTAO-S) also the Chilean standard NCH 2369.</p>	can be closed with the proposed AI	DMA Final Report approval + 2 months.

2717	Action	AIVT schedule allocation	Marco Feroci	SST-PRO	<p>Document: SST Programme: Programme Management Plan Section: 3.2 (Pag 15)</p> <p>RID: The time allocation for the "AIVT SST" activities is unclear and not adequately justified. The first 2 units require 70 days each, the next 3 require 56 days each, then 6-9 require 56 days in total (19 days each), then 10-13 require 112 days in total (28 days each, more than the previous units: a mistake?). While it is generally reasonable that climbing up the learning curve the AIVT time decreases, there is no stated analysis/justification that this is indeed feasible (that is, some of the AIVT time can indeed be compressed when gaining experience). In addition to that, AIVT of several units appears shifted yet parallel: are multiple teams at work? How many and how are they organized? Finally, I see no schedule contingency allocated to this activity. Considering the complexity of this "mass production" the probability of schedule slippage is rather high and this risk should be mitigated by a contingency allocation.</p> <p>Suggested solution: review and fix schedule, describe the process when needed and add a rationale for the schedule choices (e.g., the compression of AIVT times should come from an analysis of the AIVT activity sequence showing where/how experience could lead to time savings).</p>	Closed with action, deadline PR.	DMA Final Report approval + 2 months.
2718	Action	CTA-S alpha configuration	Volker Heinz	SST-MEC	SST Mechanical Structure Subsystem Technical Requirements Specification, p16: to my understanding the alpha configuration for CTA-S is defined with 14 MSTs and 37 SSTs, according to the Costbook. It does not contain LSTs.	This can be closed with the action to rephrase this correctly. However I am wondering, if there is an official update of the project beyond the alpha configuration. I am trying to be so formal here as also the CTA-S infrastructure to be built is affected.	DMA Final Report approval + 2 months.
2719	Action	SST-PO	Volker Heinz	SST-PRO	<p>SST Mechanical Structure Subsystem Technical Requirements Specification, p17</p> <p>According to the product tree the level D requirement spec is produced by the project office. Is there any industrial involvement in this phase, and where would that be described?</p>	I believe to recall that I had not found the referenced SoW and asked for. In any case some clarification of who does what so far in the SST project would to better understand the processes. I suggest to close this one after clarification.	DMA Final Report approval + 2 months.
2720	Action	type pf requirements	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Subsystem Technical Requirements Specification, p19/20:</p> <p>although mentioned under the last bullet</p>	can be closed with the proposed AI	DMA Final Report approval + 2 months.

					documentation, shouldn't there also be requirements related to safety?		
2721	Closed	drive lifetime	Volker Heinz	SST-MEC	SST Mechanical Structure Subsystem Technical Requirements Specification, p22: D-SST-Mec-0530: why do drives and gearboxes have only half of the structure lifetime requirements?	This comes from CTAO requirement B-TEL-0530 Drive Lifetime Proposed solution: Closure without action	
2722	Action	TMS	Volker Heinz	SST-MEC	SST Mechanical Structure Subsystem Technical Requirements Specification, p23: D-SST-Mec-2100: Does TMS mean telescope main structure? What does this requirement mean? What shall be interchangeable? Mechanical components?	can be closed with the proposed AI	DMA Final Report approval + 2 months.
2723	Action	documentation	Volker Heinz	SST-MEC	SST Mechanical Structure Subsystem Technical Requirements Specification, section 4.5: The AIV related documentation is missing in this list	can be closed with the proposed AI	DMA Final Report approval + 2 months.
2724	Closed	Environment related requirements	Volker Heinz	SST-MEC	SST Mechanical Structure Subsystem Technical Requirements Specification, section 5: Is precision pointing a requirement coming from CTAO?	Correct. B-ENV-0235 and B-ENV-0716. Proposed solution: Closure without action	
2725	Action	PSU power consumption missing?	Nick Whyborn	SST-CAM	SST Camera Design Report (SST-CAM-DSR-001) Section 8.2. The power budget in Table 13 does not appear to include the net power consumed by the power supplies (e.i. power drawn - power supplied to loads). Please clarify if this is missing or if the PSUs internal consumptions (losses) are included in the power drawn by each load. I suggest include a separate item for PSUs power internal consumption.	Action agreed. Due date 15/2/2023.	DMA Final Report approval + 2 months.
2726	Closed	environmental conditions	Volker Heinz	SST-MEC	where do the environmental conditions which were used in the requirement specifications come from? Some values appear rather high, even when comparing them to the ELT environmental conditions	I consider this an important issue and probably there were more reported on this topic. I propose to discuss the environmental conditions, even though they might have been defined by CTAO and adjust them where reasonable (maybe more an AI to CTAO).	

2727	Closed	Mirror alignment duration	Christelle Rossin	SST-PRO	<p>SST-PRO-DSR-002 1b Chapter 4.3.5.1 Mirror Alignment tool Page 27</p> <p>Do you have any idea about the necessary time for the completion of the mirror alignment ? It would be interesting to know this information to have a better estimation of the commissioning time for each SST Telescope.</p>	<p>*Reply:* The mirror alignment activity is described in the SST-PRO-013 (Verification Plan) in sections 4.1.6 and 4.1.7 hereafter reported.</p> <p>4.1.6 M1 setup for alignment (row 10) All mirrors must be already in place. The first operation is to put actuators in place (3 per segment). All 54 actuators must be put in place. The operation needs 2 full work days of 4 specialist people of the SST AIT/V Team, including cherry picker/software skilled people, supported by the contractor agency.</p> <p>4.1.7 M1 segments alignment (row 11) The operation must be performed from SST AIT/V Team personnel. Mirror segments control software must be already nominally operating. 1 observing night for the collimation and ?gravity test? stability, 2 other nights are needed to perform additional tests for the PFS verification and additional optimisation of the optic system. The operation is described in the Mirror Alignment Procedure [RD2, to be released] and will be performed by using the AMCU control software that is being developed and tested by INAF for the ASTRI-Horn Prototype and for the ASTRI-MiniArray. 4 SST AIT/V Team people involved, the operation will last 3 nights routinely. In the cases of telescope 1 and 2 more time is needed to refine procedures and software. Cherry Picker and software skill needed. 1 additional day to dismount the actuators and optical camera.</p> <p>*Proposed Solution:* Closure without action</p>	
2728	Action	ice build up	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Subsystem Technical Requirements Specification, p29</p> <p>D-SST-MEC-0625 Survival ice load Damage to the Telescope and its subsystems beyond the Serviceability Limit State shall not occur due to an ice thickness (on all surfaces) of up to 20 mm.</p> <p>Where does this requirement come from, the ice thickness cannot be found in the environmental conditions and appears quite high for the SST environment?</p>	<p>please refer to my comment on 2726.</p>	<p>DMA Final Report approval + 2 months.</p>

2729	Action	Error in figure title	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a : Factory AIT plan Chapter 2.1 Page 8</p> <p>At the end of the second paragraph of 2.1 section, it is mentioned that "Table 2.1 reports main properties of the Small-Sized telescope (SST)". However, there is no Table 2.1 below. For clarification, it would be useful to correct "Table 2.1" by "Figure number x.x" in chapter 2.1.1 and add the reference of the figure below the PBS of the SST.</p>	<p>The sentence at the end of section 2.1 is a typo.</p> <p>Proposed solution: it will be removed in the next version of the document.</p>	DMA Final Report approval + 2 months.
2730	Action	how are SiPM's mechanically retained in the FPP?	Nick Whyborn	SST-CAM	<p>SST Camera Design Report (SST-CAM-DSR-001) Section 7.2.4, 7.2.5, & 10.1.2.</p> <p>Section 7.2.4 states the SiPM heatsink is clamped to the FPP.</p> <p>Section 7.2.5 states that the FPE provides the mechanical interface for the SiPM.</p> <p>The AIT procedure in section 10.1.2, p. 86, states that the FPE is locked in place in the FPP using retention clamps and that the SiPM is pulled into place in the FPE using temporary screws that are removed.</p> <p>Please clarify how the SiPM is retained in the FPP and how the SiPM and FPE are mechanically fixed together.</p>	<p>Thanks for the explanation which is fine.</p> <p>Action to update the camera design report is agreed. Due date CDR.</p>	DMA Final Report approval + 2 months.
2731	Action	power requirements	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Subsystem Technical Requirements Specification, p47/48:</p> <p>D-SST-MEC-0513 and D-SST-MEC-2360 appear somehow redundant, isn't the AD 10, mentioned in 2360 the ICD which is required in 0513?</p>	can be closed with the proposed AI	DMA Final Report approval + 2 months.
2732	Action	AR definition	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a : Factory AIT/AIV plan Chapter 1.4 Page 6</p> <p>Even if many people know that AR means As Required in quantity columns of tables 2 and 3 (pages 10 and 11), it would be useful to add the definition of AR in chapter 1.4.1.</p>	<p>Agreed</p> <p>Proposed solution: we will add the AR definition in the lists of acronyms</p>	DMA Final Report approval + 2 months.

2733	Action	elevation drive encoder	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Subsystem Technical Requirements Specification, p53:</p> <p>D-SST-MNT-1080 Elevation encoder The elevation drive system shall be provided with an absolute encoder measuring directly the elevation axis orientation, providing RMS accuracy over 360deg of 2.5 arcsec or better</p> <p>How can an encoder mounted on the jack screw system measure directly the elevation axis orientation?</p>	closed with reference to 2763	DMA Final Report approval + 2 months.
2734	Action	Procedure step missing in factory AIT/AIV plan ?	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a Chapter 2.2.6 Procedure steps Page 20</p> <p>Isn't it necessary to precise after step 37 to "Tighten and torque the M20 fastenings, that attach the ELA Lower Hinge to the ELA Bracket, with a proper procedure ?</p> <p>Please correct, if necessary, in next release of the document.</p>	<p>Agreed</p> <p>Proposed solution: we will add the procedure/instructions in the next version of the document</p>	DMA Final Report approval + 2 months.
2735	Action	Error in Point Number in table 4	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a : Factory AIT/AIV plan Chapter 2.2.5 Telescope parts Page 12</p> <p>Please verify and correct if necessary PT NO. for Base cabling and AZ Fork cabling with respect to Table 1.</p>	<p>Agreed</p> <p>Proposed solution: Table 1 will be integrated with the relevant items of the Electrical System.</p>	DMA Final Report approval + 2 months.
2736	Action	OSS PBS	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a Chapter 2.3.1 PBS Table 5 Page 23</p> <p>Please correct PBS number (level 3) for Top ring : 3123-300 instead of 3124-300.</p>	<p>Agreed</p> <p>Proposed solution: we will apply the correction in the next version of the document</p>	DMA Final Report approval + 2 months.
2737	Action	Figure 2-32 missing	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a : Factory AIT plan Chapter 2.3.7 Procedure steps Page 40</p> <p>Please add figure 2.32.</p>	<p>Agreed</p> <p>Proposed solution: we will add fig. 2-32 to the next version of the document</p>	DMA Final Report approval + 2 months.

2738	Action	Verification procedure missing ?	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a : Factory AIT Plan Chapter 3.2.2.3 Azimuth range Page 51</p> <p>Why does the verification of the correct communication of the drive system and the congruent motion is only done for step 1 and not for step 2 to 4 ? Same question for step 6 to 8 page 53.</p>	<p>We implied that the verification of the motion was to be performed for all steps.</p> <p>Proposed solution: To make things clearer the statement can be repeated for all steps in the next document update.</p>	DMA Final Report approval + 2 months.
2739	Action	Typo	Christelle Rossin	SST-PRO	<p>SST-PRO-011 2.a : Factory AIT Plan Chapter 3.2.2.7.2 Elevation speed and acceleration Page 54</p> <p>Please replace AZ by EL in Requirement to be met.</p>	<p>Agreed</p> <p>Proposed solution: we will correct the document</p>	DMA Final Report approval + 2 months.
2740	Closed	Questions about long-lead items list	Nick Whyborn	SST-CAM	<p>SST-CAM-LIS-001 - SST Camera Declared Item List (long-lead-items) Annexed excel file.</p> <p>The I2C Bus switch (NXP Semiconductors, PCA9548APW) is marked as out of production. The Skyworks Solutions, Inc. SI5341A & SI5345A are marked as "future of product line uncertain". These all have lead-times of ~1 year.</p> <p>What is your plan on procurement for these obsolete or potentially unavailable items? Are replacements available?</p> <p>This list includes almost exclusively semiconductor components or electronic units (e.g. PSUs). Are there no issues with other components, for example, connectors, FO components, motors, encoders?</p>	<p>Thanks for your clarification.</p> <p>RIX can be closed without action.</p>	
2741	Action	Site interfaces verification	Christelle Rossin	SST-PRO	<p>SST-PRO-012 2.a : On site AIT plan Chapter 2 Pages 9 à 13</p> <p>It would be useful to add columns for the date and name of the operator in charge of the verifications and tests.</p>	<p>Agreed</p> <p>Proposed solution: we will add the information requested</p>	DMA Final Report approval + 2 months.

2742	Action	Check items point number in §3.4	Christelle Rossin	SST-PRO	<p>SST-PRO-012 2.a : On site AIT Plan Chapter 3.4 Items Page 15 & 16</p> <p>Please check point number for the different items listed to be consistent with OSS PBS given in SST-PRO-011 (page 23). There seem to be an error for Central tube and M1 shields.</p>	<p>Agreed</p> <p>Proposed solution: we will check the consistency of the information and correct it</p>	DMA Final Report approval + 2 months.
2743	Action	Repeated procedure step to be removed	Christelle Rossin	SST-PRO	<p>SST-PRO-012 2.a : On site AIT Plan Chapter 3.5 Procedure steps Page 21</p> <p>Please remove step number 49 already done in step 47.</p>	<p>Agreed</p> <p>Proposed solution: step 49 will be removed in the next version of the document</p>	DMA Final Report approval + 2 months.
2744	Action	Repeated step for "On site test plan" to be removed	Christelle Rossin	SST-PRO	<p>SST-PRO-012 2.a : On site AIT Plan Chapter 4.1.4 & 4.1.5 Page 34 & 35</p> <p>Fir clarification, please remove chapters 4.1.4 and 4.1.5 which are the same as 4.1.2 and 4.1.3.</p>	<p>Agreed</p> <p>Proposed solution: sections 4.1.4 and 4.1.5 will be removed in the next version of the document</p>	DMA Final Report approval + 2 months.
2745	Action	FPA replacement questions	Nick Whyborn	SST-CAM	<p>SST Camera Design Report (SST-CAM-DSR-001) Section 7.2.4.5 & 10.2.</p> <p>It is stated that the FPA is an LRU with no on-site maintenance (p. 40). The integration procedure (section 10.2) indicates that the main camera electronics (FPA with SiPMs, ERA, TMs & BP) is essentially built up on the FPA and then inserted into the ENC with its pre-mounted side panels.</p> <p>Is it intended that the described integration steps are executed in reverse and then forwards to replace the FPA onsite, or is a different procedure envisaged? How long does it take to integrate and disassemble the camera? Am I correct in my estimate of ~100 cable assemblies connecting the FPA to the rest of the camera?</p>	<p>Thanks for the explanation and proposed action to update the description in the design report. I look forward to the proposed presentation on this aspect at the meeting.</p> <p>For discussion.</p>	DMA Final Report approval + 2 months.

2746	Closed	Vibration of electronics modules and motion at connectors	Nick Whyborn	SST-CAM	<p>SST-CAM-ANR-008 Structural Analysis Report All.</p> <p>I did not find an analysis of the effects of earthquake on the the electronics modules and their fixation within the camera.</p> <p>Do you have an analysis that shows that the fixations hold each assembly in place and any relative motion between blind-mate connectors etc is acceptable?</p> <p>My main concern is the SiPMs/FPEs but maybe it could be an issue for the TMs too.</p>	<p>Thanks for the detailed response which I am happy to accept.</p> <p>RIX can be closed.</p>	
2747	Action	Applicable documents to the mech design report	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, p 7 AD:</p> <p>where can the SoW which is referenced under AD01 be found?</p> <p>The SST Mec specification is in draft version. Such the design report shall be considered preliminary?</p>	<p>please see my comments to my RIX 2719. If and why a SoW is confidential of course is at the discretion of INAF.</p>	<p>DMA Final Report approval + 2 months.</p>
2748	Closed	thread size anchor bolts	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 2:</p> <p>What is the rationale for thread size M33, which is not a standard ISO first row thread?</p> <p>Test and rectification tools, as well as the anchor rods might not be available in Chile.</p>	<p>I agree to briefly discuss this during the meeting</p>	
2749	Action	foundations	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 3 foundations:</p> <p>The foundation design must be adapted to the local conditions, common soil layer thickness may not allow installation of micro piles.</p> <p>Finalizing the installation with non shrinkage grout is a good solution, base plate must be adjustable, details are missing</p>	<p>Answer to part one is not fully clear.</p> <p>Answer to part 2: Sorry for having been misunderstanding, Of course the adjustment is only being done once before the grouting.</p>	<p>DMA Final Report approval + 2 months.</p>
2750	Closed	caera chiller interface	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 3.3.1 p 27:</p> <p>as indicated in the report, the chiller will require its own foundation, which has a certain cost impact for additional concrete and ducting. If no better solution can be elaborated, the position shall be chosen such that it will not be in the area of manipulating handling, lifting and access equipment as there is a non negligible risk of accidents with this equipment. In my</p>	<p>Sorry, I had not read the SST-PRO-ANR-006. I agree with the proposal to discuss the trade off results, as some ranking does not appear clear to me.</p>	

					opinion the chiller would best be hosted on the rotating part of the telescope.		
2751	Action	Inconsisten product naming	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-003 Section: 2.1 In figures 1 and 2 the same product is called "Telescope Control System" and "Telescope Control Software" respectively. Same figures of SST-PRO-001	*Reply:* Agreed * Proposed solution:* Closure with Action. We will update the document.	DMA Final Report approval + 2 months.
2752	Action	possibly wrong references	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-003 Section: 5 The text doing reference to AD3, 4, 5 it seems not coherent with the documents title in 1.2	*Reply:* Agreed * Proposed solution:* Closure with Action. We will update the document.	DMA Final Report approval + 2 months.
2753	Action	Limits for maximum acceptable expenses	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-003 Section: 5.1.4 In case limits for maximum acceptable expenses exist (e.g hourly salary for personnel, travel expenses) should be declared here.	*Reply:* The maximum acceptable expenses exist and is what is reported in the money matrix *Proposed solution:* Closure with Action. We will update the document stated this aspect.	DMA Final Report approval + 2 months.
2754	Action	Typo	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-003 Section: 5.3 The assumed FTE to euro conversion (71E/year) is likely a typo. kEuro?	*Reply:* Agreed *Proposed solution:* Closure with Action. We will update the document.	DMA Final Report approval + 2 months.
2755	Action	missing document title	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-005 Section: 1.7 Document title is missing for [SD24].	*Reply* Agreed: in the revised version of the document we will include the document title *Proposed solution:* Closure with action	DMA Final Report approval + 2 months.

2756	Action	Risk analysis domains	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-005 Section: 3</p> <p>The risk analysis domains list does not include the human factor. Human related issues are within INAF and similar research institutes a possible source of risk in terms of:</p> <ul style="list-style-type: none"> - personnel hired with fix term contracts - team making - free choice of research for staff personnel - AoB 	<p>*Reply*</p> <p>Agreed: in the revised version of the document we will add human risk to the list of risks. Moreover, we will also include the human risks in the risk analysis.</p> <p>*Proposed solution:* Closure with action</p>	DMA Final Report approval + 2 months.
2757	Action	Missing reference	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-005 Section: 4.1.2</p> <p>Missing reference to the ECSS standard(s)</p>	<p>*Reply*</p> <p>Agreed: in the revised version of the document we will include the missing reference to the ECSS document (ECSS-Q-ST-10-04C)</p> <p>*Proposed solution:* Closure with action</p>	DMA Final Report approval + 2 months.
2758	Action	missing acronym	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-005 Section: 4.2.1</p> <p>MIP and KIP missing in sect. 1.8</p>	<p>*Reply*</p> <p>Agreed: in the revised version of the document we will include the definition of MIP and KIP in the list of acronyms</p> <p>*Proposed solution:* Closure with action</p>	DMA Final Report approval + 2 months.
2759	Action	Risk management and surveillance	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-005 Section: 4.3.5</p> <p>(bit borderline between Management and PA) In the progress report layout should be present also an overview of the risks identified by the supplier before they might become a problem.</p>	<p>*Reply*</p> <p>Agreed: in the revised version of the document we will include also this item in the Table of Contents of the Progress Report</p> <p>*Proposed solution:* Closure with action</p>	DMA Final Report approval + 2 months.
2760	Action	SW testing	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-005 Section: 7.2.6</p> <p>SW testing (and development) might require a representative HW to interact with. This potentially reduce the time spent on site for deployment, commissioning and bug resolving. Performances and validation tests requiring the fully representative HW configuration should be evidenced. This topic can be addressed in details within the SW development plan</p>	<p>*Reply*</p> <p>A simulator fully representative of the whole telescope is already available and has been used to perform several SW tests. This activity has been reported in documents not delivered for this Review, since it does not involve the SW part.</p> <p>*Proposed solution:* Closure without action</p>	DMA Final Report approval + 2 months.

2761	Action	NCR management	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-005 Section: 8.4</p> <p>Any NCR management suite already adopted in similar programs that can be used also for SST? In case this should be cited in 8.4 and in SST-PRO-001 par 10.2 as well</p>	<p>*Reply*</p> <p>For the time being, no specific tool has been selected for the NCR management. Currently the best option is Redmine, since the Consortium members are already familiar with it: it would be easily used, once it is properly configured for this task. As alternative, a shared Excel file will be considered.</p> <p>*Proposed solution:* Closure without action</p>	DMA Final Report approval + 2 months.
2762	Action	wrong wording?	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 4.1.5 p 36:</p> <p>In a paragraph above the graph it says Azimuth motor, probably it should be elevation</p>	<p>Correct</p> <p>Proposed solution: we will correct the document</p>	DMA Final Report approval + 2 months.
2763	Action	elevation encoder	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 4.16 p 36</p> <p>It is my understanding that the encoder solution presented in this design report does not correspond to the Mec tech spec document, where it is described that the encoder shall be mounted on the drive directly and not on the bearing. The solution presented here appears to be the better one</p>	can be closed with the proposed AI	DMA Final Report approval + 2 months.
2764	Action	Az cable wrap	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report</p> <p>The Az cable wrap is mentioned in several sections but not described in the report. Could this be added, please?</p>	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2765	Action	lubrication system	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 4.1.13</p> <p>as described, a automatic central lubrication system for the amount telescopes and different greasing points is indispensable. The presented simple solution might not have the flexibility for lubricating the individual components with the exact amount of grease required. Additionally it is not clear from the description, if these cartridges have to be replaced when discharged or can be refilled, depending on the system availability of spares might be a problem on the local market.</p>	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2766	Action	M1 - M2 alignment	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 4.2.3, p 49</p> <p>When relying on an alignment based on machined surfaces a tolerance budget of all individual</p>	<p>issue can be closed with the proposed AI</p> <p>Additional comment: The tolerance budget will confirm that the actuator stroke is sufficient for the initial alignment and later operational movements</p>	DMA Final Report approval + 2 months.

					connections will give the final value of maximum error, it would be good to present such budget		
2767	Action	M1 Calibration	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report. section 4.2.4 p 50:</p> <p>The M1 calibration process is not described, only the equipment. Without knowing the process it is difficult to judge if the equipment is suitable to perform the task.</p>	Still missing the relevant information, therefore I would like to keep this open, until the procedure was presented	DMA Final Report approval + 2 months.
2768	Action	electrical system	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 5, p53:</p> <p>According to the the electrical distribution design and concept the 3 phase 400V power supply is considered secure and uninterrupted, an extra UPS line is not foreseen (at least to my knowledge)</p>	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2769	Action	lock out/tag out device	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report section 5.2.5, p 58</p> <p>It would be my understanding that a lock out/tag out system is part of the telescope, and not as recommended in the report an external system</p>	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2770	Closed	base cabling	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report . section 5.4.1 p65:</p> <p>_At the current stage there is no indication about the way that will interface the Telescope to the Telescope Infrastructure. We strongly recommend to provide at the level of the base floor two different incoming points in order to separate the routing of the power cables from that of the data cables._</p> <p>The tech specs indicate that the foundation design is par of the SST project, such it is recommended that the designer of the foundation foresees separate ducts for power and signal, and the telescope also has to separate entries for the different cables. Maybe this comment results from my misunderstanding what base floor means.</p>	> The answer to RIX 2644 does not fully apply to my RID. The fact that the foundation design is part of the project makes the ICD mentioned in 2644 more an internal one rather than a CTAO one. Should be briefly discussed during the meeting.	
2771	Closed	interface with CTA-S site	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report, section 5.7 p 71:</p> <p>Is the mentioned power socket for the emergency generator inside or outside the base?</p>	<p>Outside the base</p> <p>Proposed solution: Closed without action</p>	

2772	Action	pointing telescope	Volker Heinz	SST-MEC	SST Mechanical Structure Design Report section 2, p 10: Is the position of the optical pointing telescope sufficiently rigid and stable in its exposed location at the M2?	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2773	Action	access door operations	Volker Heinz	SST-MEC	SST Mechanical Structure Design Report, section 3.1.1. p15: Is the described operations procedure for the access door part of a LO/TO system?	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2774	Action	Az drives and gearboxes	Volker Heinz	SST-MEC	SST Mechanical Structure Design Report, section 3.1.2, p 16: How is the access to the Az drives and gear boxes for maintenance and potential replacement provided? Is such replacement possible in the fully assembled configuration of the telescope?	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2775	Action	alignment devices	Volker Heinz	SST-MEC	SST Mechanical Structure Design Report, section 3.1.1 p17: Which alignment devices were described in the previous sections?	issue can be closed with the proposed AI	DMA Final Report approval + 2 months.
2776	Action	electrical cabinet opening	Volker Heinz	SST-MEC	SST Mechanical Structure Design Report, section 3.1.2, p 18 as the possible removal of the handrails is explicitly mentioned I assume the nevertheless the electrical cabinet doors can be opened with them installed?	Yes this is correct. Proposed solution: this information will be added to the document.	DMA Final Report approval + 2 months.
2777	Closed	perforated sheets	Volker Heinz	SST-MEC	SST Mechanical Structure Design Report section 3.2.1 P21: How effective will the perforated sheets be in preventing small snow flakes from falling onto the protected surface and from ice built up on the components? If on the central part of these sheets snow and ice will be trapped, when melting all the water will drip on the components anyway?	The aim of the perforated sheets is to prevent the accumulation of snow on the primary mirror and on the secondary mirror. The perforation is performed just to reduce the wind load compared to a solid surface. Snow and rain will fall anyway on the mirrors from other directions, and mirrors and their supports are designed taking into consideration this. Proposed solution: Closure without action	

2778	Closed	optimized dish structure	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report section 3.2.2. p 23:</p> <p>After the optimization of of the dish structure a strong improvement in displacement and stresses was achieved, however only a minor reduction in mass. Wouldn't it be beneficial with the low displacement and stress values to perform also a weight optimization, there seems to be quite some margin? Such optimization would result in less inertia and smaller counterweights, less peak power to accelerate both axis, potentially smaller drives, savings in material cost for the structure itself.</p> <p>Having browsed through the structural analysis this seems to apply for the whole telescope.</p>	I agree with the proposed solution, a presentation will help to understand process and results	
2779	Action	foundation	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Design Report section 3.3 p 26:</p> <p>The foundation design must be adapted to local conditions, e.g micro piles will only work where solid rock is sufficiently close below the common soil, which at the CTA-S site is not everywhere the case</p>	See answer to RIX 2644	DMA Final Report approval + 2 months.
2780	Action	Reference and applicable document list	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section:1.2 and 1.3</p> <p>Listing of the AD and RD should be uniform, eg Reference - Title - Issue - Date</p>	<p>*Reply:* Agreed</p> <p>*Proposed solution:* Closure with Action. We will update the document.</p>	DMA Final Report approval + 2 months.
2781	Action	FDIR concept	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section 3.3</p> <p>The FDIR chapter should be improved as following:</p> <ul style="list-style-type: none"> - the description of the fault detection should be in line with the figure 3.1. From the text it seems that failures can happen only while observing. - Include a flow diagram describing graphically the the procedure followed to attempt the recovery - Define the methodology to exclude false positives and TM spikes 	<p>*Reply:* 1) we have choosen to describe in the text the logic flow of fault detection and recovery procedure of a single SST only during the observation operations, Observing state, the latter considered as use case, the main scenario.</p> <p>*Proposed solution:* 1) we could specify in the text that we consider the scenario of the observation phase. 2) We agree with the solution proposed by the reviewer (inclusion of a flow diagram). 3) Regarding the Telescope Structure, the local control systems continuously monitor possible hardware errors or raised alarms. They try to solve the problem autonomously, if the recover procedure failes they report the problem to TCS. Example of local control systems are the controllers of the synchronous motors used to move the Telescope mount around the Elevation and Azimuth axis. Then</p>	DMA Final Report approval + 2 months.

						<p>methodology to exclude false positives and TM spikes are internally implemented by the motors firmware implemented by the supplier. Similar for the Camera system, where the firmware is being implemented by the SST Camera team. We will take into consideration this RIX to focus on the most suitable methodology to exclude false positives and TM spikes by the Camera firmware, and reporting it to the software functionalities documentation. In case of possible auxiliary systems requiring direct interfacing, we will define and report the methodology to exclude false positives and TM spikes.</p> <p>Team answer not satisfactory</p>	
2782	Action	Telescope survival/Operative	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section 3.4</p> <p>This chapter should be renamed "Telescope Survival/Operative Environmental Conditions".</p> <p>Numbers reported in the text are identical to the ones reported in the table (good!) but it is potentially misleading to repeat the same info twice.</p>	<p>*Reply:* Agreed</p> <p>*Proposed solution:* Closure with Action. We agree will update the section 3.4 title and the text. We might add at the end of the paragraph the sentence "Table 3.1 more fully describes the Telescope survival/operative environmental conditions".</p>	DMA Final Report approval + 2 months.
2783	Action	Power budget	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section 3.7.1</p> <p>In the power budget table it not clear:</p> <ol style="list-style-type: none"> 1) if the contingency/design margins are included in the quantities. In case, please quantify them 2) Are numbers related to peak power or average power? 	<p>*Reply:* We agree. The table is not well described. It reports our current best estimation of the observation peak power (during slewing), the CBE of the average power during observation (tracking), the CBE of the peak power during the day (Initialized state) . It is not well explained and now we are also able to update the numbers following the test just performed on the ASTRI MA1.</p> <p>*Proposed Solution:* Closure with action. We propose to update the document explaining the table and adding the margin we can consider at this stage for the structure and camera. So we propose to report the CBE and the maximum expected value (MEV).</p>	DMA Final Report approval + 2 months.

2784	Closed	Scientific operations	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 Section 6.1.x</p> <p>I'd expected to find, at least as place holder for the CDR, sections describing the planning and operations concepts and interfaces. Or it is something to be treated at higher level by CTAO?</p>	<p>*Reply:* The SST Consortium responsibility refers to the Telescopes provision. The array will be responsibility of CTAO. In this sense, CTAO will prepare the document ConOps relative to the entire SST Array, where planning/operations concept/interfaces will be described. At this moment this document is available only for the CTAO North Site.</p> <p>*Proposed Solution:* Closure without action</p>	
2785	Closed	SST Camera: Design Report	Francesco Giordano	SST-CAM	<p>7.2.5 Focal Plane Electronics (FPE) Assembly figure 35 page 43</p> <p>I have not found extremely clear the FEM model for thermal the behaviour. By the way, I would go with a thermal test in a climatic chamber, simulating the expected environmental condition and verify the total power budget.</p>	<p>We agree that the Camera Design Report does not provide a detailed description of the camera thermal model. This information was planned to be included in another document (Camera Thermal Analysis Report) to be provided at the CDR. Once this document is complete, then a section can be added to the Design Report to summarize the thermal model.</p> <p>Whilst measuring a full camera in a thermal chamber would provide the simplest form or verification, we do not believe that this is necessary or practical. To do this realistically would not only require a chamber large enough to house the camera, but also the chiller and the full length of piping. Rather, we plan the following:</p> <p>* Test individual camera components (e.g. TARGET Modules) survive the on-site temperature requirements via climate-chamber tests.</p> <p>* Simulate changes in the internal camera temperature using ECAM by changing the chiller liquid temperature in the lab over a limited range (~ 4 deg to 20 deg C).</p> <p>* Make measurements on a telescope with ECAM over a reasonable ambient temperature range (ideally covering the required observing range from - 5 deg C to 25 deg C). Use these to show that the internal camera temperature is largely decoupled from the environment. This was the case for CHEC-S, where the internal camera temperature changed by on ~0.2 deg C was observed for every degree of external ambient temperature change (measured from 0 deg to 30 deg) (see ?SST End-to-End</p>	

						Prototype Report? Appendix 1, from the SST DVER (https://pcloud.mpi-hd.mpg.de/index.php/s/3mR4zAMs85eRejS) *Proposed Solution:* Close.	
2786	Closed	Software CDR	Gianalfredo Nicolini	SST-PRO	Note: same comment as per RIX #2615 Document: SST-PRO-002 Section: 4.5.x It might be possible that the SW design and development will follow a distinct track with respect to the hardware, taking also in consideration that SW upgrades should be possible also after the delivery of the first telescopes. I'd suggest to foresee the possibility to define reviews for the SW (e.g. SW CDR, SW FAR)	*Reply:* see RIX 2615	
2787	Action	References not found	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 1.6.1.x [Error! Reference source not found] twice in sections 1.6.1.3 and 1.6.1.4	*Reply:* Agreed *Proposed Solution:* Closure with action. We will update the document	DMA Final Report approval + 2 months.
2788	Action	Missing attachment?	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 1.6.1.8 Moonlight reference spectrum: I didn't find the cited attachments. My fault?	*Reply:* Agreed *Proposed Solution:* Closure with action. We will update the document	DMA Final Report approval + 2 months.

2789	Action	Missing definitions	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 1.6.1.9 Definitions not present for "Principal Investigator" and "Guest Observer"	*Reply:* Agreed *Proposed Solution:* Closure with action. We will update the document	DMA Final Report approval + 2 months
2790	Closed	TCS maintainability	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 4.4 Why TCS maintenance is not explicitly foreseen?	*Reply:* The maintenance onsite is managed by CTAO so they provide these requirements to be satisfy in terms of man power. The TCS product is provided by the institutes and it is a SW. In this sense,the preventive maintenance is not needed and the corrective will be provided by the Institutes until the end of the array commissioning. After that, the support for the TCS maintenance has not been already discussed and defined with CTAO. *Proposed Solution:* Closure without action.	
2791	Action	Movement control	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: 4.6 Requirement: C-SST-TEL-0180 It is correctly specified that TEL "can never move in uncontrolled manner". Anyhow: 1) the definition of "uncontrolled manner" is bit broad. It should be detailed for both technical and forensic/legal reasons. 2) better to use "shall not" as per shall/should/may	*Reply:* Agreed *Proposed Solution:* Closure with action. We will rephrase the requirement to avoid the use of "uncontrolled manner" and "can never" ##Team answer unclear	DMA Final Report approval + 2 months.
2792	Action	Tables formatting	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 Section: * Generic comment: due to the specific organisation of information presented, tables included in this document should be adopt two formatting guidelines: 1) repeat the table header at every page break 2) do not split rows across pages	*Reply:* Agreed *Proposed Solution:* Closure with action. We will update the document	DMA Final Report approval + 2 months.

2793	Closed	AIL of the Engineering Review Report	Stefano Stanghellini	SST-PRO	<p>Document: SST Product Review Plan</p> <p>Description Question:</p> <p>At the time of the preparation of the product Review Plan, which I duly contributed and signed, I did not check the Appendix with the AIL form the DVER. Now I note that the AIL list is not complete with respect to those of the SST Engineering Review Panel Report (AD2 of the Product Review Plan). Please explain</p>	<p>*Reply:* In the column ""Document/Description Action's Closure"" we indicated where/why the closure is demonstrated. In the Annex (par 6.1) we reported only the actions related to the PDR and the actions not closed at the Bridging Phase Kick-Off (SST-ER-21, SST-ER-23, SST-ER-28, SST-ER-29 and SST-ER-33).</p> <p>*Proposed Solution:* Closure with Action. We propose to give a presentation over the closure status of each of the DVER action items as one of the first items on the review meeting agenda.</p>	
2794	Action	screw verification	Anne Bonnefoi	SST-MEC	<p>doc : STT-MEC-ANR-008</p> <p>It is not clear, how screws has been chosen.</p> <p>Please provided justification for main screws.</p>	<p>Bolted joints have been dimensioned to provide a resistance equal or greater than the parts to be joined. The document will be updated with the structural verification of typical bolted joints.</p> <p>Proposed solution: update the document</p>	DMA Final Report approval + 2 months.
2795	Action	subsystems main dimensions	Anne Bonnefoi	SST-MEC	<p>doc : STT-DSR-001</p> <p>Please add main dimensions of components on description and/or picture of subsystems</p>	<p>As this documents is a descriptions of design, should be usefull to have mains dimensions without go into drawings for general informations.</p>	DMA Final Report approval + 2 months.
2797	Closed	Error notification	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 section: 6</p> <p>Requirement(s): C-SST-TEL-0729, C-SST-TEL-2210</p> <p>It is correctly specified that errors shall be notified to TCS. What about warnings and other lower level events?</p>	<p>*Reply:* the anomalies will be classified for severity. The lower severity anomalies will refer to the ""warning"" and they will be managed locally and the information sent to TCS.</p> <p>*Proposed Solution:* Closure without action.</p>	
2798	Closed	loss of reflectivity	Gianalfredo Nicolini	SST-PRO	<p>Document: SST-PRO-001 section: 7</p> <p>Requirement(s): C-SST-TEL-0125</p> <p>The 4%/year maximum loss has to be intended as absolute or relative to the previous year?</p>	<p>*Reply:* The original Level B req is not clear also to us. Our assumption in that the maximum loss has to be intended relative to the previous year.</p> <p>*Proposed Solution:* Closure without action. ##Team answer unclear</p>	

2799	Action	Is there a risk that the selected FPGA model is inadequate?	Nick Whyborn	SST-CAM	<p>SST-CAM-LIS-001 - SST Camera Declared Item List (long-lead-items) Annexed excel file.</p> <p>The backplane FPGAs logic design appear to have not yet been confirmed by test and these are long-lead items from a single source with high value.</p> <p>How large is the risk that the selected models will be inadequate to run the required functionality?</p>	<p>Thanks for the clarification and proposal to mention the minor cost risk in the document.</p> <p>The RIX can be closed with the minor update done as normal work.</p>	DMA Final Report approval + 2 months.
2800	Action	Documentation automation errors	Nick Whyborn	SST-PRO	<p>SST-PRO-001 SST Programme Telescope Technical Requirements Specification pp 12, 13 & 22.</p> <p>There are 3 broken links: "Error! Reference source not found."</p> <p>Correct and re-release document.</p>	<p>Proposed action accepted. Due date is TBD.</p>	DMA Final Report approval + 2 months.
2801	Action	Glossary, abbreviations & definitions not used in document	Nick Whyborn	SST-PRO	<p>SST-PRO-001 SST Programme Telescope Technical Requirements Specification Sections 1.6.</p> <p>Section 1.6 appears to contain an exhaustive list of abbreviations and glossary of which only a few of the defined terms are used in this document (12 pages of definitions). I don't think this is the appropriate place for the glossary or list of abbreviations.</p> <p>In my opinion, the SST should refer to a glossary maintained by CTAO and only keep a glossary of those terms that are internal to the SST project. However, the present official CTAO glossary is pending approval by the governing bodies before it can be released. I suggest this is discussed with CTAO management.</p> <p>Proposed action is to consult with CTAO management to ensure alignment with the existing CTAO glossary and agree on how to refer to the CTAO glossary. Remove the glossary from this document and only include those abbreviations that are used within the document.</p>	<p>Proposed action accepted. Due date TBD.</p>	DMA Final Report approval + 2 months.

2802	Action	Errors in level B power requirements	Nick Whyborn	SST-PRO	<p>SST-PRO-001 SST Programme Telescope Technical Requirements Specification Section 7.</p> <p>C-SST-TEL-0602: should refer to B-SST-0620 & B-SST-1570. The allowed combined peak power while observing is 15 kW. [11 kW + 4 kW]</p> <p>C-SST-TEL-0604: should refer to B-SST-0630 & B-SST-1590. [The stated combined power consumption is correct: 2 kW + 1 kW]</p> <p>C-SST-TEL-0606: should refer to B-SST-0640 & B-SST-1600. [The stated combined average power consumption is correct: 0.5 kW + 0.5 kW]</p> <p>Correct the errors.</p>	Proposed action accepted. Due date is TBD.	DMA Final Report approval + 2 months.
2803	Action	Missing requirements	Nick Whyborn	SST-PRO	<p>SST-PRO-001 SST Programme Telescope Technical Requirements Specification All.</p> <p>It appears that the following requirements are not addressed in this document.</p> <p>B-TEL-1100 Camera Mechanics (missing entirely)</p> <p>B-TEL-1160 Deadspace (not included in Annex)</p> <p>B-TEL-1170 Photon Detection Efficiency (not included in Annex)</p> <p>B-ONSITE-0710 Remote Control (included in Annex but not included in SST requirements)</p> <p>Please clarify why these are missing and probably correct.</p>	Proposed solution accepted. Due date is TBD.	DMA Final Report approval + 2 months.
2804	Action	Documentation automation errors	Nick Whyborn	SST-CAM	<p>SST-CAM-SPE-002 SST Camera Subsystem Technical Requirements Specification All</p> <p>There are multiple broken links: "Error! Bookmark not defined." "Error! Reference source not found."</p> <p>Fix the broken references and re-release.</p>	Thanks. Proposed action accepted. Due date TBD.	DMA Final Report approval + 2 months.

2805	Action	text in Context subsection is confusing	Nick Whyborn	SST-CAM	<p>SST-CAM-SPE-002 SST Camera Subsystem Technical Requirements Specification Section 1.2.</p> <p>It is stated that this document flows from the SST Camera Engineering Development & Verification Plan but it appears to flowdown from the SST-PRO-001 SST Programme Telescope Technical Requirement Specification. Perhaps this is a remnant from a previous document?</p> <p>Suggest revise the text and refer to SST-PRO-001 as an AD.</p>	Proposed action accepted. Due date is TBD.	DMA Final Report approval + 2 months.
2806	Action	EMC requirements need to be completed	Nick Whyborn	SST-CAM	<p>SST-CAM-SPE-002 SST Camera Subsystem Technical Requirements Specification Section 2.5 D-SST-CAM-0060-01 & -02</p> <p>The EMC requirements are more complex than stated in these 2 requirements, which anyway contain TBDs.</p> <p>Suggest that you develop an approach to addressing the EU EMC requirements, possibly with the help of Karl Tegel.</p>	Proposed action accepted. Due date to update the document is TBD.	DMA Final Report approval + 2 months.

2807	Action	Maintenance efforts estimation	Silvio Rossi	SST-MEC	<p>Document: SST-MEC-PLA-015 Section/Page: Section 4.2.1</p> <p>*Description* : The plan summarizes a normalized effort for preventive maintenance only of 4person/hours per month matching with no margin the maintainability requirements. It should be clarified whether the numbers provided also include the preparation, access to the equipment and close-up. At this stage I could not read the detailed procedures which probably need to be defined. However, efforts for many items look very optimistic.</p> <p>* AZ and EL bearing greasing (effort periodicity of only 6 months) is an example. The efforts do not seem to have included that an effective greasing of AZ and EL bearings usually needs (per manufacturer recommendation) to be performed per steps or while the mechanism is moving. Additionally, the cleaning of the old greasing may add tens of hours of efforts in the case the excess does not escape from the foreseen outlets.</p> <p>* The inspections of the LPS and Grounding, M1 and M2 mirrors most likely require a cherry picker. The efforts of making it available at the telescope within a several square kilometre array are in general much higher than the duration of the inspection itself.</p> <p>*Actions Recommended:*</p> <ul style="list-style-type: none"> * Clarify whether the numbers of table 1 include Operation duration, access, preparation and close-up * Review the periodicity and efforts of each activity (especially the ones with periodicity below 3 years) * Investigate the possibility of having permanent automatic greasing equipment. * Review the need of the cherry picker for scheduled maintenance 	<p>We acknowledge the observations. See also answer to RIX 2765 for the automatic lubrication system.</p> <p>Proposed solution: We will implement the recommended actions before the CDR.</p>	CDR
2808	Closed	TBD/TBW in performance parameters	Nick Whyborn	SST-CAM	<p>SST-CAM-SPE-002 SST Camera Subsystem Technical Requirements Specification 2.9 Performance D-SST-CAM-0011-18 & -22</p> <p>These two requirements have TBDs and TBW respectively.</p> <p>Are these not yet decided and does this have any impact on the design of the camera?</p>	<p>Thanks for the clarification.</p> <p>Closed. TBDs to be addressed as normal work.</p>	

2809	Action	TBC/TBD	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 section: all Requirement(s): Being a spec document, a section listing all TBC/TBD should be foreseen (possibly empty at CDR)	*Reply:* Agreed *Proposed Solution:* Closure with action. We will update the document with a section/table with the list of the TBC/TBD. We of course agree to avoid having TBC/TBS at the CDR.	DMA Final Report approval + 2 months.
2810	Action	Focal plane maximum tilt	Gianalfredo Nicolini	SST-PRO	Document: SST-PRO-001 section: 8 Requirement(s): C-SST-TEL-1110 I cannot fully understand the requirement. The displacement of a point wrt an axis is measured as length (nor degrees). Or it is intended to specify a misalignment between two axis?	*Reply:* Yes, it is technically correct that this should be a length, however at the focal plane degrees can be converted into lengths and vice-versa linearly with the plate scale, which is 37.643 mm/deg. So this requirement covers both maximum tilt and maximum displacement at of the centre of the focal plane. *Proposed Solution:* Closure with action. We will edit the text to better clarify this.	DMA Final Report approval + 2 months.
2811	Action	missing explanation of the abbreviations of the participating institutes	Nick Whyborn	SST-CAM	SST-CAM-PLA-009 SST Camera Engineering Development & Verification Plan Table 2 The explanation of the abbreviations of the participating institutes is missing. The information is not in the PMP or any other document provided for this review. Please add this in an abbreviations section.	Action agreed. Due date 15/2/2023.	DMA Final Report approval + 2 months.
2812	Closed	Reported technical readiness not consistent across documents	Nick Whyborn	SST-CAM	SST-CAM-DSR-001 SST Camera Design Report Section 9 SST-CAM-PLA-009 SST Camera Engineering Development & Verification Plan Table 1. There appear to be inconsistencies between the technical readiness reported in the two cited documents, for example: FPE: FPE tested with SiPM (i.e. TRL 6) in design report versus TRL 4 in EDVP. TM PCAs: "All aspects of the TARGET Module performance have now been verified with CHEC-S and/or on evaluation boards." (i.e. TRL 6) in DR vs level 3/4 in EDVP. BP: "... QBP has been produced ... and is under test at DESY." (TRL 5) in DR vs TRL 3 in EDVP. Please clarify.	For discussion at the review meeting.	

2813	Action	Comment on reported camera development schedule	Nick Whyborn	SST-CAM	<p>SST-CAM-PLA-009 SST Camera Engineering Development & Verification Plan Table 3.</p> <p>The schedule listed in Table 3 is not very useful as-is because it only shows the original baseline for many of the future milestones and that schedule is no longer feasible - many of the listed milestones should have occurred last year but did not. 12 of 16 the remaining milestones list the current estimated date as TBD.</p> <p>Consider either inserting the current estimated dates or updating baseline to show the current baseline.</p>	Proposed action agreed. Due date Feb 15.	DMA Final Report approval + 2 months.
2814	Action	SST AIT/V duration wrt the schedule in the PMP	Marco Feroci	SST-PRO	<p>Document: SST-PRO-009 Section: 10.3</p> <p>RID: The incremental learning approach is not clearly described.</p> <p>Suggested solution: Please clarify and report the expected durations in agreement with what is reported in the PMP.</p>	Closed with action, deadline PR	DMA Final Report approval + 2 months.
2815	Closed	Camera Test matrix	Marco Feroci	SST-PRO	<p>Document: SST-PRO-009 Section: 6.2</p> <p>RID: The camera test matrix is missing.</p> <p>Suggested solution: Please provide it.</p>	<p>*Reply:* The camera test Matrix is reported in SST-CAM-PLA-009</p> <p>*Proposed Solution:* Closure without action.</p>	
2816	Action	Missing Risk register	Marco Feroci	SST-PRO	<p>Document: SST-PRO-004 Section: NA</p> <p>RID: I could not find a risk register in the data package, which is a bit of a risk at this stage of the project.</p> <p>Suggested solution: Please provide a first draft, including at least the most critical risk items.</p>	Still open, to be discussed at PR meeting.	Consolidation Phase KO + 3 months

2817	Action	inconsistency in verification methods; verification approach can be optimised	Nick Whyborn	SST-CAM	<p>SST-CAM-SPE-002 SST Camera Subsystem Technical Requirements Specification Section 2.</p> <p>SST-CAM-PLA-009 SST Camera Engineering Development & Verification Plan Table 7.</p> <p>For all the requirements in the camera requirement specification, the proposed method is R, T (or T, R) whereas the EDVP Table 7 summarises a much more tailored, pragmatic and less-costly approach.</p> <p>Update the methods in the requirement spec. to match the proposed verification approach.</p> <p>I propose you work with Vanessa to develop a verification plan that minimises unnecessary effort while keeping the risk of undetected non-compliance at a reasonable level. This should also address the verification approach at different phases (design verification for the CDR, first-unit / early-unit verification, steady-state production verification).</p>	<p>Action agreed.</p> <p>The an optimised verification plan should be provided as input to the CDR.</p>	DMA Final Report approval + 2 months.
2818	Closed	Missing the development and status of support systems, software, tools and test facilities	Nick Whyborn	SST-CAM	<p>SST-CAM-PLA-009 SST Camera Engineering Development & Verification Plan Section 7 and table 5.</p> <p>The development, schedule and status of the development (procurement) of support systems (CSS), software (SCW), tools (part of which is the CMT) and test facilities is not given.</p> <p>I think these should be addressed either in this document or other documents. The products needed to complete the design finalisation process, or needed as inputs to the next phase of the project should be included in this document and their development tracked.</p>	For discussion at the review meeting.	
2819	Action	AIT plan	Volker Heinz	SST-MEC	<p>SST On-site AIT Plan:</p> <p>General: this is a very thorough document and very useful in the assembly and verification process, but it appears to be more a procedure/verification list rather than a plan. To my understanding an AIT/V plan would describe more globally the AIT/V process, will give schedule and resources information, but does make reference to the detailed procedures.</p>	keep this RIQ open until the update is available	DMA Final Report approval + 2 months.

2820	Action	pre-requisites and consumables provided by the site	Volker Heinz	SST-MEC	SST On-site AIT Plan; section 3: What will be required from the site for the AIT work? Will electricity be needed for the tasks, do you require water for the grout and cleaning activities? Do you need solvents and cleaning agents or do you provide them?	Keep this RIQ open until the information is included in the document	DMA Final Report approval + 2 months.
2821	Action	missing information during installation	Volker Heinz	SST-MEC	SST On-site AIT Plan; section3: bolt torque should be provided in the planfor the individual and different bolts	see answers to 2819 and 2820	DMA Final Report approval + 2 months.
2822	Action	AIT safety	Volker Heinz	SST-MEC	SST On-site AIT Plan; general: for the individual tasks safety measures should be included, or at least reference to applicable safety documents shall be made	see answers to 2819 and 2820	DMA Final Report approval + 2 months.
2823	Closed	Construction site safety	Volker Heinz	SST-PRO	System Safety Management Plan, section 1.3: The way the phrase is written it is not clear, if it refers to construction site safety in general or specifically to the SST. Also on site the SST team is responsible for its site safety and operations.	I believe this RID shall only be closed after the clarification with CTAO	
2824	Closed	CE marking	Volker Heinz	SST-PRO	System Safety Management Plan , section 2.1: Will the SSTs have CE marking? As far as I recall there is no requirement about CE marking in the technical specifications?	 *Reply* This sentence was taken from the CTAO Product Safety Plan (CTA-PLA-SEI-00000-0001). Therefore, this RIX should be transferred to CTAO. At any rate, we believe as well that the CE certification is not requested and we are wating for the CTA confirmation. *Proposed solution:* Closure without action	
2825	Action	CTAO-S site manager	Volker Heinz	SST-PRO	System Safety Management Plan , section 3.3.3.4: Although maybe correct, I am not sure that the SST safety safety document shall define responsibilities of the CTA-S site manager.	As I wrote, a SST safety document shall not define the responsibilities of the CTA0-S Site Manager, therefore I would appreciate at least a re-phrasing.	DMA Final Report approval + 2 months.
2826	Closed	safety approval authority	Volker Heinz	SST-PRO	System Safety Management Plan , section 3.13.3: Who or what is the safety approval authority?	 *Reply* According to ECSS-Q-ST-40C 3.2.9, the Safety Approval Authority is the "entity that defines or makes applicable, for a given project, detailed technical safety requirements, and reviews their implementation". In the case of SST, indeed, this entity is not yet defined in the current version of the document. However, we expect that this role will be assigned to an external certified safety specialist, with the help of the SST RAMS Manager; in principle, this	DMA Final Report approval + 2 months.

						<p>certified specialist can be the System Safety Manager itself.</p> <p>*Proposed solution:* Closure without action</p>	
2827	Action	On-site safety	Volker Heinz	SST-PRO	<p>System Safety Management Plan section 4.5</p> <p>First bullet refers to site safety officer. It is not clear, if this is the CTAO staff, or of the project? In any case during the site installation and phase until commissioning the project shall have a safety responsible on site.</p>	<p>There shall be a qualified safety responsible on site. If it is the RAMS Manager with an additional function, is not the matter, the person shall be qualified.</p>	DMA Final Report approval + 2 months.
2828	Action	Status and need for UVSIPM is unclear	Nick Whyborn	SST-PRO	<p>SST-PRO-ANR-006 SST Programme Top Level & Trade-Off Analysis Report Section 5.2.</p> <p>It is stated that the "UVSiPM is a device foreseen for calibration purpose of the telescope by the CTAO's calibration group. It is not part of SST-TEL."</p> <p>However, it is my understanding that this item is needed only for the SST and is included in both the SST PBS and cost book entry. It is not part of the array calibration C-B entry.</p> <p>I could not find a reference to this device in the SST requirements and it does not appear (with this name) in the CTA requirements database.</p> <p>Please clarify the status and need for this device. What are the requirements and who will provide it?</p>	<p>Thanks for the reply. Proposal accepted.</p> <p>Action due date TBD.</p>	DMA Final Report approval + 2 months.
2829	Closed	foundation stiffness	Volker Heinz	SST-MEC	<p>SST Mechanical Structure Subsystem Technical Requirements Specification, section 11.7:</p> <p>reduction of system eigenfrequencies induced by foundation: what is the rationale for the value of 10%? this might impose a very demanding requirement on the foundation design and size and volume.</p>	<p>As this requirement might impose quite demanding design solutions for the foundation, I suggest to discuss this in the review meeting and find an appropriate solution there. Making reference to another telescope location may be misleading, as the soil conditions may be much different.</p>	

2830	Action	missing key seismic specification reference	Nick Whyborn	SST-MEC	<p>SST-MEC-SPE-002 SST Mechanical Structure Subsystem Technical Requirements Specification Sections 1.3 & 1.4.</p> <p>[RD2] CTAO ? South Seismic Risk Specification (PC-Meeting 24-25-January2022) should be replaced by the released applicable document</p> <p>[ADnn] CTA-SPE-SEI-40000-0001-1c - CTAO ? South Seismic Risk Specification</p>	Action agreed.	DMA Final Report approval + 2 months.
2831	Action	Missing affiliation of authors and reviewers	Stefano Stanghelli ni	SST-MEC	<p>Document SST-MEC-DSR-001 (and others MEC documents)</p> <p>In general on the cover page of each documents there shall be the affiliation of the authors and of the reviewers. This is also helpful to see the management responsibilities between the various groups. It is unclear in this particular case who has prepared and checked the document. Documents also need to be signed for release.</p>	<p>Agreed.</p> <p>Proposed solution: we will add the missing affiliation. The signed documents were delivered after the deadline but will be made available during the PR process</p>	DMA Final Report approval + 2 months.
2832	Action	Project Management Plan clarification	Stefano Stanghelli ni	SST-CAM	<p>Document: SST-PRO-001 issue 2b Page 17, fig. 3-3.</p> <p>It is unclear the meaning of the Project management Hand-over to the CTAO PO. Clearly with the ERIC I tis expected that the CTAO PO will be able to perform tasks associated to the South site. However the CTAO PO cannot take management responsibilities for the SST program.</p>	<p>*Reply:* The figure/flow has been produced before the PNRR approval. We agree that we need to update it removing the boxes highlighted (hand over and eric).</p> <p>Proposed solution:* Closure with Action. We will update the figure.</p>	DMA Final Report approval + 2 months.
2833	Action	Project Management Plan issues	Stefano Stanghelli ni	SST-PRO	<p>The role of the SST-ESC and their interaction with the CTOA MD is unclear. I would have expected that the role of the SST-ESC is only to control the progress of the work by the PM and team and intervene if needed to regulate and solve the partnership issue between the SST program (which as in any collaboration will surely surface....like late deliveries etc) The double line of reporting between the SST program and the CTAO PO as reported in Fig. 4.2 is confusing and will be a problem during execution, The interaction to the CTAO PO shall only take place at PM level, and if delegated by the CTAO PM twit the Telescope Coordinator. Maybe all this is clarified in the AD05 (high level implementation plan (not delivered) but it is in general wrong. The principles is that the line of reporting between the PMs cannot be overridden by a superior entity. Please correct.</p> <p>Note that this plan</p>	<p>*Reply:* The commented governance schematics was reported in the SST documentation since the DVER. Anyhow we understand most of the comments because the givernance scheme considers an organization in place only after the ERIC.</p> <p>Solution Proposed:*</p> <ul style="list-style-type: none"> - the downgrade of AD05 to reference document (in which the partnership is described) - clean the document from the partnership description whith the exception of fig. 4.1, in scope with the PMP - figure 4.2 is removed - clarification that effective governance shall be defined only after ERIC" 	DMA Final Report approval + 2 months.

					<p>a) shall be self standing and not use AD05 (if anything relevant in AD05 exists it shall be moved here);</p> <p>b) does not describe the partnership neither their scope of delivery, not fundamental elements of the PMP plan.</p>		
2834	Closed	Optomechanical Interface	Marco Riva	SST-PRO	<p>SST-PRO-009 section 2.1 (but also everywhere the PBS is described</p> <p>It is not clear to me where is the interface between STR-MEC (by the way why is not SST-MEC?) and SST-OPT. Is there any optomechanics that belongs to the optics subsys?</p> <p>In general, being this a critical interface, I cannot find where it is documented (I would have expected an ICD)</p>	<p>*Reply:* The interfaces between the STR-MEC and the optics is described in the SST-MEC-DSR-001 (4.2 Optical Support Structure). The dedicated ICD (SST-PRO-ICD-015, Optical Interface Control Document (OICD)) will be written and finalized during the next phase and presented for the CDR.</p> <p>*Proposed Solution:* Closure without Action.</p>	
2835	Action	M1 integration and alignment time	Marco Riva	SST-PRO	<p>SST-PRO-009 end of section 3.1</p> <p>"With this configuration, the M1 segment integration and alignment is achieved in less than one day" this seems to be a strong statement, can you provide some more justification to that?</p>	perfect action agreed from my side	DMA Final Report approval + 2 months.
2836	Closed	target of optimization of Dish	Marco Riva	SST-PRO	<p>SST-PRO-009 pag 18</p> <p>If the previous design was in spec why the need of more stiffness? I would have pushed to keep stiffness and reduce mass so cost and power consumption</p>	Just for my understanding. Your message is that you did not manage the boundaries of the optimization and they were imposed by the external panel?	
2837	Closed	level of knowledge	Marco Riva	SST-PRO	<p>SST-PRO-009 sec 3.1.1.1</p> <p>everything was experimented but not the dish</p>	<p>*Reply:* this is correct. The M1 Dish Optimization, derived from the study conducted during the bridging phase, will be validated with the first structure produced for the qualification model of the Telescope, nominally the first telescope of the SST array.</p> <p>*Proposed Solution:* Closure without Action.</p>	

2838	Closed	comparability of M1 dishes	Marco Riva	SST-PRO	SST-PRO-009 sec 3.1.1.1 pag 19 I think that it is important to prove that the new m1 dish is comparable in term of aiv cost wrt the new one. Where can I find that?	see #2836	
2839	Closed	verification matrix	Marco Riva	SST-PRO	SST-PRO-009 sec 4.1 a table for verification for each requireent (task is needed)	I mean normally the plan is the implementation of the verification matrix	
2840	Action	prototyping and development plan	Marco Riva	SST-PRO	SST-PRO-009 sec 4.2 It is not clear on which basis the model philosophy (and prototype) has been defined. I think that a dev plan with a clear assessment of TRL is missing	Agreed!	DMA Final Report approval + 2 months.
2841	Closed	verification by demonstration and certification	Marco Riva	SST-PRO	SST-PRO-009 sec 6-1-5 I think that demonstration is quite confusing, it can be conveyed ither to tst or to analysis, can you provide examples? similar doubts on the demonstration by certification.	*Reply:* The verification methods have been provided by CTAO. I understand that ""demonstration"" can get the reader a little bit confused. We tried mainly to use only the Test and certification method. *Proposed Solution:* Closure without Action.	
2842	Closed	Mechanical Structure Test Matrix duplicated ?	Marco Riva	SST-PRO	SST-PRO-009 section 6.2 what is the difference between table 6.1 and 6.3?	*Reply:* At the moment we foreseen the same plan *Proposed Solution:* Closure without Action.	
2843	Action	clarify the test strategy	Marco Riva	SST-PRO	SST-PRO-009 sec 6.2.1 I think that in the data pack there is some confusion between different acceptance level, I think that this should be better clarified with a Verification matrix for different phases and different telescope (which test will be done only on the first and which on all the others? it seems related to the different between factory and on-site.	perfect action agreed from my side	DMA Final Report approval + 2 months.
2844	Action	not enough structural verification	Marco Riva	SST-PRO	SST-PRO-009 sec 6.2.3 This section needs to be expanded	perfect action agreed from my side	DMA Final Report approval + 2 months.

2845	Action	SGSE (software ground support equipment)	Marco Riva	SST-PRO	SST-PRO-009 sec 7.1.2 will you have also some dedicate AIV software?	perfect action agreed from my side	DMA Final Report approval + 2 months.
2846	Closed	manufacturing mangement	Marco Riva	SST-PRO	SST-PRO-009 pag 31 no manufacturing is planned to be managed by the consortium?	*Reply:* The camera will be manufactured by the consortium, instead the OPT/MEC will be provided by industries. The TCS will be provided by the consortium. *Proposed Solution:* Closure without Action.	
2847	Action	Interface management	Marco Riva	SST-PRO	SST-PRO-009 pag 31 I think that interface management should be added here (and in general in the documentation)	perfect action agreed from my side	DMA Final Report approval + 2 months.
2848	Action	error in documents naming	Marco Riva	SST-PRO	[RD21] SST-PRO_011, Factory AIT Plan this shold be SST-PRO_011 [RD22] SST-PRO_012, On site AIT Plan this shold be SST-PRO_012	perfect action agreed from my side	DMA Final Report approval + 2 months.
2849	Closed	transfer of property	Marco Riva	SST-PRO	SST-PRO-009 figure 10-1 WHen the transfer of property will occur?	*Reply:* The SST Consortium will provide 42 single telescopes. At the end of the AIT/V (SST Team task), each telescope will be preliminary accepted by CTAO. At the end of the array commissioning (CTAO task) the property will formally change. *Proposed Solution:* Closure without action.	
2850	Closed	tst philosophy to be discussed	Marco Riva	SST-PRO	SST-PRO-009 section 10.3.2 Some ore discussion should be done on the test philosophy, i think that make only test after the full integration can be done, if some intermediate level tests are foreseen.	Maybe we should discuss a bit on that. Normally any manufacturing needs some verification.	
2851	Closed	SST-PRO-011 general comment	Marco Riva	SST-PRO	SST-PRO-001 general This document is missing of some important details. I would recomment to add per each step, at least the needs and the success criteria. It seems more a procedure description rather then a plan	My understanding is that section 3.2 is factory test. What i mean with my rix is: when you can consider that each step of the integration is closed? maybe not valid for all the step. As an example in the step 56 (page 29). After the rotation performed what are the criteria to say that you can go on with the next?	
2852	Closed	pedestal leveling	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 step 1 would you do some levelling on the pdestall?	Levelling of the pedestal is done at step 3. Proposed solution: Closure without action	

2853	Closed	flange bending	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 step 3 Ho you guarantee that you do not bend the flange hen screwing it?	thank you for the clarification, I did not get it.	
2854	Action	lacking of figures	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 Please add mor figure to help the reader	perfect action agreed from my side	DMA Final Report approval + 2 months.
2855	Closed	lock and check before motor installation	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 step 17 is there a way to lock the bearing while waiting for the motor? do you want to make a runway check before installing the motor?	fine for me just check if you consider meaningfull to add (in case this should be the action)	
2856	Action	M1 dish nw design	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 step 47 shouldn't be updated with new desing?	perfect action agreed from my side	DMA Final Report approval + 2 months.
2857	Closed	no metrology?	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 general hy no metrolgy is foreseen at any level?	What if the manufacturing will perform huge errors?	
2858	Action	unbalancing	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 beteen step 55 and 54 please specify up to which step the structure will be unbalances	perfect action agreed from my side	DMA Final Report approval + 2 months.
2859	Closed	validation of intermediate steps	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 step 56 is this configuration simulated and validated in term of stresses?	In this configuration stresses in the structure are lower than in the nominal configuration. This procedure has already been performed with ASTRI- Horn and with ASTRI mini-array. Proposed solution: closure without action	
2860	Closed	nominal conunterweight	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 step 122 is there an estimation on how much it could difder from nominal one?	The actual Elevation unbalanace should be equal to the nominal one. Small differences in the actual weights of the various parts of the telescope may alter this value, but this variability is random. Proposed solution: Closure without action	

2861	Closed	mirror protection	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 sect 132 i suggest to include (if not already) protection for the mirrors during installation	During installation the mirrors have all a protective cover on them Proposed solution: Closure without action	
2862	Closed	mirror alignment	Marco Riva	SST-PRO	SST-PRO-011 sect 2.2.6 end Mirror alignment procedure should be part of this document but is missing	See answer to RIX 2936	
2863	Action	max survival load test	Marco Riva	SST-PRO	SST-PRO-011 sect 3.1.6 how you verify it? in particular how you verify that no yeld or plastic deformation occurred?	my point is thaht if the test fails you may yeld some where. action agreed for me	DMA Final Report approval + 2 months.
2864	Closed	check pointing	Marco Riva	SST-PRO	SST-PRO-011 sect 3.2.2.25 ho do you check that the telescope is really achieving the position you want? (there is no sky object in the factory)	my point is how you are sure that the position of the system is the one you want? (you should have some measurement independent from the encoder.	
2865	Closed	eigenfrequency verification	Marco Riva	SST-PRO	SST-PRO-011 sect 3.2.2.11 can you explain better this procdeure I see some limitation in the reliability of it	from what I understood (even if I had to guess a bit) if the encoder are near to node of the eigenvector their sensibility to some eigenfrequency could be limited.	
2866	Closed	EMC verification	Marco Riva	SST-PRO	SST-PRO-011 sect 3.2.2.23 EMC verification seems to be missing (is it on purpose?	I consider this approach quite risky but maybe I am missing the point	
2867	Action	wind load simulation	Marco Riva	SST-PRO	SST-PRO-011 sect 3.2.2.25 ho do you simulate the wind	acriion agreed for me	DMA Final Report approval + 2 months.
2869	Action	disassembly level	Marco Riva	SST-PRO	SST-PRO-011 sect 4.4 please add an exploded view on the disassembled telescope to understand at which level you will disassembly.	action agreed for me	DMA Final Report approval + 2 months.
2870	Action	any possiblity of rust?	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 1 I ould suggests to check also for rust.	Action agreed for me	DMA Final Report approval + 2 months.

2871	Action	hat are you grouting?	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 8 please add a picture to clarify hat you are grouting	Action agreed for me	DMA Final Report approval + 2 months.
2872	Closed	check on the installed bearin	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 14 do you want to check the axis and the runout of the bearing?	what about the azimuth? by check i mean to measure that when you rotate there is no (or acceptable) wobbling and run out	
2873	Closed	check on elvation axis	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 32 do you want to check the elevation axis?	As previous rix, ok to move it but any measurement of the runout and wobbling?	
2874	Action	modification of countweights	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 39 do you foresee the possibility to change the countereights (in partiualr for the telescope that ar not assembled in factory)	action agreed	DMA Final Report approval + 2 months.
2875	Closed	SST-PRO-012 general comment	Marco Riva	SST-PRO	see [[https://redmine.iasfbo.inaf.it/issues/2851]]	See answer to RIX 2851.	
2876	Closed	no unbalanced situation	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 40 just for understanding, at this point you do not have problem of unbalancing because the actuator is holding the dish right?	Yes, the actuator is holding the Dish from step 30 onwards. Proposed solution: Closure without action	
2877	Action	no alignment and mirror installation	Marco Riva	SST-PRO	SST-PRO-012 sect 3.5 step 52 this document is missing of the mirror installation and alignment	action agreed for me (considering that the document will be part of SST datapack)	DMA Final Report approval + 2 months.
2878	Closed	snow and ice test	Marco Riva	SST-PRO	SST-PRO-012 sect 4.1.1.1 how do you tst snow and ice?	Still my point is: do you foresee to drop water or similar on the telescope to verify infiltration?	
2879	Action	4.1.4 and 4.1.5 rpreated	Marco Riva	SST-PRO	SST-PRO-012 sect 4.1.4 and 4.1.5 itr seems that 4.1.4 and 4.1.5 are repetition of 4.1.2 and 4.1.3	agreed	DMA Final Report approval + 2 months.

2880	Closed	alignment verification	Marco Riva	SST-PRO	SST-PRO-012 sect 4.1 end there is no mention on mirror alignment verifications	SST-PRO-013 (section 4.1.7) points to a document which was unavailable	
2881	Closed	integration of multiple telescopes strategy	Marco Riva	SST-PRO	SST-PRO-013 sect 4 it is not clear how you manage the integration of different telescopes (series and parallel) in time (like you install all the pedestal, ...)	i close this risk provided that the action 2884 includes also this part	
2882	Closed	figure 4-1	Marco Riva	SST-PRO	SST-PRO-013 figure 4-1 How figure 4-1 relates to figure 4-8	I was expecting that 4.8 was a more detailed specification of 4.1 while the main phases are not exactly the same. For example integration 1 is made by foundation structure +M2 and M1 segments (in figure 4.1) while in figure 4.8 you have completely different naming for the phases. I do not consider it critical at all, is just for clarity.	
2883	Action	section 4.1	Marco Riva	SST-PRO	SST-PRO-012 sect 4.1 can you clarify better to what apply this section? to the first two or to all?	action agreed	DMA Final Report approval + 2 months.
2884	Action	parallelization of grouting	Marco Riva	SST-PRO	SST-PRO-013 section 4.1.1 wouldn't be better to prepare a group of structure and then grout them on the same day to save time?	Just remember to include also #2881 part	DMA Final Report approval + 2 months.
2885	Action	timing does not match	Marco Riva	SST-PRO	SST-PRO-013 section 4.1.1 the overall time is 7 days not 4	action agreed	DMA Final Report approval + 2 months.
2886	Closed	cabling time	Marco Riva	SST-PRO	SST-PRO-013 section 4.1.3 I personally think that being this the first time that the cables will be installed 1 day is a bit too optimistic	The section 4.1.3 refers to the connection of the telescope cabinets to the site cabinet. Telescope cabinets will arrive already preassembled. That is already stated in section 4.1.3 (row 7) the connection to the cabinet is straight forward. Proposed solution: No change suggested	
2887	Closed	mirrors installation time	Marco Riva	SST-PRO	SST-PRO-013 section 4.1.4 can you detail better how you think to match this time? I think is quite too optimistic	I still believe a bit optimistic, but I accept the answer	

2888	Closed	verification is not in AIV?	Marco Riva	SST-PRO	SST-PRO-013 general This document seems more a planning of AIV, it seems to be part of the overall discussion of SST-PRO-011 and SST-PRO-012. in general it should be clarified that AIV is Assembly Integration and Verification.	see RIX 2910	
2889	Action	pointing model and alignment	Marco Riva	SST-PRO	SST-PRO-013 section 4.1.5 up to 4.1.7 can you detail a bit more the operations here? it seems to me a bit optimistic and no contingency	ok thanks for the clarification, action agreed.	DMA Final Report approval + 2 months.
2890	Action	grouting to be added	Marco Riva	SST-PRO	SST-PRO-013 figure 4-8 grouting is missing	action agreed	DMA Final Report approval + 2 months.
2891	Closed	justification of the plan	Marco Riva	SST-CAM	SST-CAM-PLA-009 general maybe is somewhere else but I do not find a clear assessment of the TRL that guides the dev plan	good point to discuss	
2892	Closed	nice definition part	Marco Riva	SST-PRO	SST-PRO-001 general thank you for all the very clear definition I found this part very useful	*Reply:* Thanks! *Proposed Solution:* Closure without action.	
2893	Closed	definition of conditions	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 1.6.1.5 maybe this is clear to everyone, but I think it makes the narrative complex, why not simply operative, functional and survival? on the other hand I miss something like transport and storage	*Reply:* The terminology used reflects what provided by the Level B requirements. As SST we agree that some aspects can be clarified/simplified better but we needed to take into account the context and the terminology used. *Proposed Solution:* Closure without action.	
2894	Action	no rationale	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 3.4 In general the rationale column is missing and this makes difficult the understanding of their derivation	action agreed	DMA Final Report approval + 2 months.

2895	Closed	what is R for?	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 4.1 C-SST-TEL-0001 is R equal to ROD?	*Reply:* Yes, R means review of the design (par 3.4) *Proposed Solution:* Closure without action.	
2896	Closed	pbs	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 4.1 C-SST-TEL-0003 is this a requirement? what if the design in next phase will evolve with different decomposition?	*Reply:* These requirements indicate which functions the design of each subsystem needs to provide. We don't expect to change the functions assigned to each subsystem. If we will need to change/add/delete a function we will update the requirements documents and so the design of the subsystems involved. *Proposed Solution:* Closure without action.	
2897	Closed	requirement flo down	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 4.1 C-SST-TEL-520 and others can you explain in general the requirement flo down? what is B-TEL-0520	ok thanks for the clarification	
2898	Closed	budget managment	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 4.1 C-SST-TEL-0530 and general is not clear how you handle the budgets and flow down to differnt subsystem	I think we should discuss a bit at the meeting this point	
2899	Action	missing documenta rquests	Marco Riva	SST-PRO	SST-PRO-001 section 4.5 i think AIV and packing and transportation are missing	agreed	DMA Final Report approval + 2 months.
2900	Action	sunlinght protection	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 4.1 C-SST-TEL-04330 can you xplain better what sunlinght protection is?	agreed, and thanks for the answer	DMA Final Report approval + 2 months.
2901	Action	reedundant table	Marco Riva	SST-PRO	SST-CAM-PLA-009 beginning of section 5 the first table is redundant (thus source of error) with respecto fo the folloing requirements	agreed	DMA Final Report approval + 2 months.

2902	Closed	time average	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 5 C-SST-TEL-0600 averaged over what time?	I still believe that this should be better specified in the requirement	
2903	Closed	assembly and component requirement	Marco Riva	SST-PRO	SST-CAM-PLA-009 section 7 C-SST-TEL-0610 in the same set seems to have requirement for the whole assembly and for a subassembly it is a misleading	as for other comments, the definition and handling of the budget is missing	
2904	Closed	not engineering requirement	Marco Riva	SST-PRO	SST-PRO-001 section 4.1 C-SST-TEL-0530 and general i do not think that this is a proper requirement. it should be translated to engineering level	*Reply:* These requirements are derived/copied from Level B reqs. They are/will be translated to engineering level in Level D and lowers requirements specification *Proposed Solution:* Closure without action.	
2905	Closed	no pointer to the demonstration	Marco Riva	SST-PRO	SST-PRO-001 annex a a reference to where in the documentation the requirement is discussed is missing	See Reply to RIX 2639	
2906	Action	missing ad11	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 2.1 req D-SST-OPT-2030 there is no Ad11 which seems to me quite important	agreed	DMA Final Report approval + 2 months.
2907	Action	no figure	Marco Riva	SST-PRO	SST-OPT-SPE-002 sect. 2.1 req D-SST-OPT-0003 missing figure	agreed	DMA Final Report approval + 2 months.

2908	Action	Design of the Telescope Control System	Marco Feroci	SST-PRO	Document: SST-PRO-DSR-002 Section: NA RID: is there any design description of the Telescope Control System indicated in the PBS?	Closed with action, deadline CDR.	DMA Final Report approval + 2 months.
2910	Action	Architecture of AIV/T documentation	Marco Feroci	SST-PRO	Document: SST-PRO-009 Section: NA RID: Please clarify the architecture and hierarchy of the AIT/V documents.	Closed with action: please include your reply in the documentation, not just as RID answer. Deadline PR	DMA Final Report approval + 2 months.
2911	Action	Roadmap timeline	Marco Feroci	SST-PRO	Document: SST-PRO-ANR-010 Section: 1.3 RID: Please describe the timeline for the roadmap, showing compliance with the development schedule of the SST telescopes	Closed with action, deadline PR.	DMA Final Report approval + 2 months.
2912	Closed	flow down	Marco Riva	SST-OPT	SST-OPT-SPE-002 general can you explain in general the requirement flow down strategy? what is the relation between D-SST-OPT-1520 C-SST-TEL-1520	*Reply:* Is a system req (C level -TEL) directly applying to sub-system level (D level - OPT) *Proposed solution:* Closure without action.	
2913	Action	missing earthquake specification	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 2.3 req D-SST-OPT-1112 I cannot find the document CTA-SPE-SEI-400000-0001-1c	agreed	DMA Final Report approval + 2 months.
2914	Closed	reusability of the packages	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 2.6 maybe you want to add a requirement on the reusability of the packaging?	*Reply:* There is no packaging requirement at CTA level. It would be interesting to suggest them the site rules and to add general req if needed. *Proposed Solution:* Closure without action.	
2915	Closed	protection covers	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 2.6 if you want to use, maybe you should add also protection covers in the requirements	*Reply:* Plastic film protection for storage and handling are described in D-SST-OPT-3707 and D-SST-OPT3704 *Proposed Solution:* Closure without action	
2916	Action	no derivation of requirement	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3 It is completely missing the tracking of the derivation of M1 requirement from the telescope ones	*Proposed Solution:* #2919	DMA Final Report approval + 2 months.

2917	Closed	technology requirement	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.1 req D-SST-OPT-4003 why this requirement? shouldn't be only a limit of mass per m2? as D-sst-opt-4205	*Reply:* The manufacturing process is a requirement since the consolidation of the technology was already performed. This issue was already discussed at the DVER. *Proposed Solution:* Closure without action	
2918	Action	air side	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.2 req D-SST-OPT-4206 please add in the definition what Air side is	agreed	DMA Final Report approval + 2 months.
2919	Action	optical prescription derivation	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.2 req D-SST-OPT-4208/4210 it is not clear how those requirement have been derived from the telescope requirement	agreed	DMA Final Report approval + 2 months.
2920	Closed	prescription vs mountings	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.2 req D-SST-OPT-4208/4210 are those prescription with or without mounting?	I was referring more on the effect of gravity	
2921	Closed	no coating spec for mirror?	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.2 The specification of the coating for each single mirror is missing	Maybe we should discuss a bit on this approach. It seems anyway that the requirement is missing	
2922	Closed	scratch and dig	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.2 would you need to add specification for scratch and dig? I do not think.	*Reply:* Scratch and digs presence is considered a cosmetic effect. Macroscopic mirror integrity verification is part of visual inspection of acceptance procedure. *Proposed Solution:* Closure without action	
2923	Closed	coating adhesion	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.2 req D-SST-OPT-4211 i am not sure is the best way to define it, if the force is concentrate you may have problem, why not to specify the stress?	ok, but in that case I would specify that you ask the adhesion test according to the norms in the requirement. Otherwise is still misleading	

2924	Closed	interface drawing	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 3.3 I would suggest to refer to Interface drawing rather than this spelling out of a drawing	Still a drawing is much more clear and unabmbiguous than a list of numbers	
2925	Closed	same for M2	Marco Riva	SST-OPT	SST-OPT-SPE-002 sect. 4 same question as per M1 from 2917 to 2924	*Reply:* Same answer given for M1. *Proposed Solution:* Closure without action.	
2926	Closed	no compliance and or verification matrix	Marco Riva	SST-OPT	SST-OPT-DSR-001 general there is no compliance and or verification matrix that should help keeping the overview of the general staus of the design Vs the requirements	For me this is still a bit critical for a PDR level review	
2927	Closed	clarification on D80 requirement	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 3.3 is the D80 requirement the D-SST-OPT-0130? if so is it worthwhile to extend the analaysi up to 5°?	I can close the action, even if I do not understand why to push the system if this is not needed (maybe there could be some cost saving by optimising it?)	
2928	Closed	geometric area	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 3.4 Can you explain better to which requiremnt are you asnwering?	thanks for the answer	
2930	Action	parallesim tolerance?	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 4.1 first row of the table what is the symbol for? seems parallelism but of what?	agreed	
2931	Closed	roc tolerance	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 4.1 table 4 in the specification there is a range of 100mm (D-SST-OPT-4207) i understand that if the manufacturer eats the full budget the EE req wont be met by far	ok but still my question is on sect 4.1 table 4, maybe i misunderstood the table	
2932	Action	astri or no astri	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 4.3 I think that ASTRI should be removed from here	agreed	DMA Final Report approval + 2 months.

2933	Action	rms error	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 4.3 table 6 is this rms related to the shape error specified? if yes how?	agreed	DMA Final Report approval + 2 months.
2935	Action	actuator stroke	Marco Riva	SST-OPT	SST-OPT-DSR-001 sect. 4.3 is there an assesment of the actuator stroke needed?	agreed	DMA Final Report approval + 2 months.
2936	Action	alignment strategy	Marco Riva	SST-OPT	SST-OPT-DSR-001 general alignment strategy is missing to show how you match the budget	great thanks for the answer, action agreed on my side	DMA Final Report approval + 2 months.
2937	Closed	verification completeness	Marco Riva	SST-OPT	SST-OPT-DSR-001 general i do not think that all the specification listed in SST-OPT-SPE-002 have been veirfied	to be discussed, i still think that at this tsage a complete compliance matrix should be present	
2943	Closed	DVER action item SST-ER-01 is not addressed by the provided cost plan	Nick Whyborn	SST-PRO	SST-PRO-003 Cost Plan All. The DVER action item SST-ER-01 is "Elaborate an updated version of the costs that will permit to better understand if they are solid and that will permit to consolidate the total number of telescope to be built." In Section 6.1 of the SST Product Review Plan (SST-ESC-PLA-001) SST make the closure statement "The action is closed by the document "SST-PRO-003 Cost Plan" in which we detail the methodology we use to calculate the costs. The costs are considered by national organizations and others dedicated boards.'. However, the cost plan and associated annexes do not contain any cost information and so does not address the DVER action item. See also DVER action item SST-ER-17 which is related to cost optimisation and also does not appear to have been addressed. Suggested action: Provide the costing information.	This needs to be discussed in a wider forum since the agreed DVER action item has not been addressed. For discussion.	

2946	Closed	SST-CAM-PLA-009 - SST Camera: Engineering Development & Verification Plan	Francesco Giordano	SST-CAM	<p>7. AIT / AIV Tools & Facilities pag. 21</p> <p>Still concerning the thermal behaviour of the camera, I would think about the possibility to run also a thermal test in a environmental chamber.</p> <p>The environmental simulation will give a lot of feedback on the design of teh camkera as well as of the ancillary equipment</p>	<p>We will consider this possibility. We are not particularly concerned about the temperature, rather its stability against quick changes of illumination, and the humidity/condensation requirements. In order to test also these aspects, a thermal chamber might not suffice, and a field test of the engineering camera at the site of the ASTRI-Horn or ASTRI-Miniarray is foreseen.</p>	
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8.2 Annex II – Presentation by the Team at the Final Product Review Meeting

The attached presentation was given by the Team at the Final Product Review Meeting and provides the Team's answer to the subset of RIXs that were selected for direct discussion at the meeting.

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