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DOCUMENT

ATHENA - Mission Requirements Document

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CHANGE LOG

Reason for change	Issue	Revision	Date
Initial issue for CDF study – requirements held in embedded spreadsheet for better tracability.	1	0	12/06/2014
ITT revision	1	1	
Phase A KO revision (Update #1)	1	2	07/07/2015
Revision for Update #2	1	3	06/10/2015
Post-MCR update	2	0	10/06/2016
Post document numbering system update	2	1	06/09/2017
Pre SR#1	2	2	18/10/2017

CHANGE RECORD

Issue 2	Revision 2		
Reason for change	Date	Pages	Paragraph(s)
Updated the document reference number and the reference numbers of the affected ADs and RDs	06/09/2017		
Reason for change issue 2.0	Date	Pages	Paragraph(s)
Post MCR-Update: MRD MRD revised to include 'Fast channel' for observations with the WFI Fast-Chip. Clean-up of the OGS and SGS responsibilities definitions. Inclusion of POPS and AAP phases (SGS only).			

<p>Removed effective area/grasp goals and turned requirements into the large mirror.</p> <p>Included Fast channel effective area requirements.</p> <p>Included Fast channel energy resolution requirements.</p> <p>Removed WFI LDA 50' goal on FoV.</p> <p>Removed filling factor requirements (should be in WFI/X-IFU spec if needed).</p> <p>Tightened AKE requirement (ASST justification received).</p> <p>SRD</p> <p>Removed lifetime specifications associated with Baseline SC.</p> <p>Updated dV numbers to conform to the specified noise value and also include margins and operational contingency.</p> <p>Re-wrote requirements on effective area to transfer responsibility to Prime (removed 2% loss and 10% effective area change requirements, now to be derived by Prime under their control).</p> <p>Changed de-focus requirement to +15/-5mm.</p> <p>ToO requirement: replaced CDF figure with equation form for CDF.</p> <p>50ks maximum observation time.</p> <p>Tightened AKE requirement.</p> <p>X-IFU URD</p> <p>Focal plane area requirement added</p> <p>QE placeholders at 0.2 and 12 keV.</p> <p>ToO-support requirements refined (continuous observation 32h, freely selectable).</p> <p>Ground command check requirement added</p> <p>WFI URD</p> <p>Fast chip QE requirements added</p> <p>MIRD</p> <p>Corrected dV values</p> <p>ToO MTL packet contents requirement included.</p> <p>SIRD</p> <p>SGS responsibilities updated</p>			
<p>Pre SR#1:</p> <p>MRD & SRD updated for new descoped design point (different A_{eff} & decomposition and NoP duration). NO UPDATES TO THE OTHER tier-1 products along with the SRD – will be updated in next issue.</p>	18/10/2017		



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1 INTRODUCTION

1.1 Scope

This document is an instance of the ECSS standard Technical Specification [ECSS-E-ST-10-06C, Annex A], and is a constituent of DDF_1.0 (Mission), under the responsibility of the ESA Project Office.

The ATHENA MRD establishes the set of top-level requirements for the ATHENA mission, and, once approved by SPC, will constitute the ESA commitment with respect to the ATHENA mission. They are derived from the L2 requirements in the SciRD*, and the functional requirements and mission constraints as described in the ConOps [RD 2].

The ATHENA MRD defines the tier-1 architecture of the mission in accordance with the Product Tree [RD 4]: The Spacecraft (SC), X-IFU, WFI and NGRM payloads, the Operational Ground Segment (OGS), the Science Ground Segment (SGS) and the Launch Segment (LS). However, the MRD does not decompose performance or functional requirements between tier-1 items in the Product Tree. The requirements allocated to the tier-1 Products can be found in their respective specifications*, with decomposition (where required) described in the MBD [RD 3].

**Note: Currently this MRD also contains (in the embedded spreadsheet) the entire functional specification down to tier-1 of the Product Tree i.e.:*

- *SciRD – Science requirements document*
- *MRD – Mission requirements document*
- *SRD – SC requirements document*
- *XIFU URD X-IFU requirements document*
- *WFI URD – WFI requirements document*
- *MIRD – OGS requirements document*
- *SIRD – SGS requirements document*
- *LSRD – Launcher requirements document.*

The specification includes several fields which provide the following information per requirement:

Table 1: Fields contained in the requirement spreadsheet

ID	Unique identifier
Requirement	Requirement text
Value	Declaration of the requirement value
Conditions	Any conditions applicable to the value
DDF/DJF Ref.	Relevant references to the DDF/DJF, describing the source of the requirement and if needed the decomposition
Verification Method	Analysis, Inspection, Review, Test
Verification Description	More detailed description of the envisaged verification of the requirement during Phase B2/CD implementation
Verification Reference	Reference to documents [in square brackets] which support the verification - blank at the moment.
Phase A/B1 Assessment Description	More detailed description of the envisaged assessment of the requirement during Phase A/B1
Phase A/B1 Assessment Reference	Reference to documents [in square brackets] which support the Phase A/B1 assessment - anticipated documents are indicated when appropriate; otherwise this field will be populated with specific document titles as they become available
Trace Up	Traceability to parent requirements
Owner/Verifier	The organisation responsible for verification of the requirement during Phase A/B1 (note: in the SRD there are some requirements which cannot currently be evaluated by the Primes, and these are indicated in the Project Management Plan, which contains more information about responsibilities)
Author	The organisation responsible for authoring the requirement (see the Project Management Plan which lists the organisations involved in the ATHENA Phase A/B1 study)
Validation Status	Validation status of the requirement
Validation Reference	Reference to any documentation which supports the validation status
Change Status	Change status
Comment	Additional comments

1.2 Requirement Precedence

The present requirements document shall take precedence over all lower-level requirement documents. In the event of a discrepancy between the L2 requirements in the SciRD and those in the MRD, the MRD takes precedence.

Any change to the SciRD by the ATHENA Science Team shall not be automatically incorporated in the MRD, but shall be evaluated by ESA to assess the affordability to introduce the change to become part of the ATHENA baseline.

1.3 Requirements Identification

1.3.1 Requirement Identification

All requirements in this specification that require verification form a statement of the form ‘The ATHENA Mission shall...’, and are marked with a unique reference, which is given as follows:

X-MIS-nnn

where:

- X is the requirement theme: “**R**” for a requirement or “**G**” for a goal
- MIS is the requirement designation (applicable to the ATHENA Mission)



- *nnn* is the requirement identifier (sequential number of digits).

1.3.2 Requirements and Goals

For several performance requirements, a goal is also specified in the text. **Requirements** are mandatory and must be complied with. **Goals** (which will subject to an identical verification method to the requirement) are desirable in order to maximise the science return while keeping the impact on the cost and complexity to a minimum. They are to be the subject of system trade-offs and analysis, and are to be fulfilled under restricted conditions which are to be defined and quantified.

1.3.3 Explanatory Text

Supplementary text added to explain the source or reasoning behind a mission requirement is written after the requirement in *italics*. Where appropriate, the parent requirement justification is declared in supporting text to aid comprehension.

1.4 Definitions

See [RD 5].

1.5 Acronyms

See [RD 5].



2 APPLICABLE AND REFERENCE DOCUMENTS

2.1.1 *Applicable Documents*

- [AD 1] Space engineering: Technical requirements specification, ECSS-E-ST-10-06C, Issue 3, 06/03/2009.
- [AD 2] Margin Policy for SRE-PA Studies, SCI-PA/2007-022, Issue 1, Rev. 3, 15/06/20012.
- [AD 3] ECSS Set of Space Project Management Standards, ECSS-P-Series.
- [AD 4] ECSS Set of Space Engineering Standards, ECSS-E-Series.
- [AD 5] ECSS Set of Space Product Assurance Standards, ECSS-Q-Series.
- [AD 6] Technology Readiness Levels Handbook, TEC-SHS/5551/MG/ap. v1.6.

2.1.2 *Reference Documents*

- [RD 1] ATHENA - Science Requirements Document (SciRD), ESA-ATHENA-ESTEC-SCI-RS-0001, Issue 1.D1, 05/09/2017 (embedded).
- [RD 2] ATHENA – Concept of Operations, ESA-ATHENA-ESTEC-MIS-DD-0001, Issue 1.2, 07/07/2015.
- [RD 3] ATHENA – Mission Budgets Document, ESA-ATHENA-ESTEC-MAN-RP-0001, Issue 1.3, 07/07/2015.
- [RD 4] ATHENA – Product Tree, ESA-ATHENA-ESTEC-MAN-PT-0001, Issue 1.1, 12/06/2014.
- [RD 5] ATHENA – Acronyms and Definitions, ESA-ATHENA-ESTEC-MAN-LI-0001, Issue 1.0, 06/02/2015.



3 MISSION OVERVIEW

3.1 Mission Description

See the ConOps [RD 2].

3.2 Mission Objectives

See the SciRD [RD 1].

3.3 Measurement Principle

TBW.



4 REQUIREMENTS

See attached s/s for the requirements down to tier-1 products. Note that the current version has updated the MRD and SRD only to the new descoped mission. The other tier-1 products will be updated in the next issue.