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DOCUMENT

ATHENA - Mission Requirements Document (MRD)

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APPROVAL

Title ATHENA – Mission Requirements Document	
Issue 2	**Revision** 9
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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
Pre PhAx	2	3	13/03/2018
Post PhAx PM#1 update	2	4	30/04/2018
Removed SRD	2	5	10/08/2018
Update for Phase A2	2	6	13/11/2018
MFR update	2	7	05/08/2019
B1 start	2	8	16/03/2020
B1 start - updated	2	9	18/03/2020

CHANGE RECORD

Issue 2	**Revision** 9		
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).			
Removed effective area/grasp goals and turned requirements into the large mirror.			
Included Fast channel effective area requirements.			
Included Fast channel energy resolution requirements.			
Removed WFI LDA 50' goal on FoV.			
Removed filling factor requirements (should be in WFI/X-IFU spec if needed).			
Tightened AKE requirement (ASST justification received).			
SRD			
Removed lifetime specifications associated with Baseline SC.			
Updated dV numbers to conform to the specified noise value and also include margins and operational contingency.			
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).			
Changed de-focus requirement to +15/-5mm.			
ToO requirement: replaced CDF figure with equation form for CDF.			
50ks maximum observation time.			
Tightened AKE requirement.			
X-IFU URD			
Focal plane area requirement added			
QE placeholders at 0.2 and 12 keV.			
ToO-support requirements refined (continuous observation 32h, freely selectable.			
Ground command check requirement added			
WFI URD			
Fast chip QE requirements added			
MIRD			

Corrected dV values ToO MTL packet contents requirement included. **SIRD** SGS responsibilities updated			
Pre SR#1: 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.	18/10/2017		
Pre PhAx: Requirements updated to reflect updated MBD (v2.3)	13/04/2018		
Post PhAx PM#1 update: (v.2.4) MRD – no change SRD Made AKE 3'' the requirement, 2'' is now added as a goal. You should identify the difference in the AOCS architecture caused between requirement and goal. Put the WFI dwell-points explicitly in the requirement (same info as in MBD). Removed the new calibration requirements and placed them in the SIRD (SGS-responsibility - derived requirements to SC to eventually appear in OIRD). Put clarifying notes in the comment fields in various places in response to requests for clarification from Primes (esp. for requirements they are not expected to address in this phase). Reduced the daily downlink time to 1.5 h/day average. Please introduce TM-time as a free parameter in your analysis so we can converge on a reasonable duration. Mentioned 2 Safe Modes per year to be assumed in Operational Availability requirement (in-line with the CReMA). Corrected error on solar-system body tracking (changed the requirement to goal). Put an extra requirement in for performing a 50ks observation for the ToO (was not explicitly stated before, although there was a goal that a 100ks observation for a ToO should happen). 1' APE ALoS remains for the moment but without justification. Made the required FL offset 25mm instead of 35mm (TBC - believe the 35mm in the SciRD is not properly justified).	30/04/2018		
2.5: Removed SRD, which now has a separate document			
2.6: Corrected AKE flowdown.			
2.7: in-line with updated MBD, changed background requirements.			
2.8 Updated Effective Area requirements taking into account the latest reference telescope layout (v.2.6) and the latest QE information from the PLs. Note that the MRD is therefore capability led and there is a disconnect with the parent SciRD requirements.	16/03/2020		
2.9 corrected in attached spreadsheet: QE discrepancy (typo) between WFI detectors QE at 10 keV (both are now 0.043m^2)			

Table of contents:

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: 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].

The position of the MRD in the ATHENA Specification Tree is defined in [RD 4].

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

Table 1: Fields contained in the requirement spreadsheet

Object Identifier	Unique identifier (DOORS generated)
Object Type	Requirement, Goal or Note
Description	Requirement text
DDF/DJF Ref.	Relevant references to the DDF/DJF, describing the rationale of the requirement and if needed the decomposition reference
Verification Method	Analysis, Inspection, Review, Test
Comment	A general field for comments
Parent Requirement	Traceability to parent requirements

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 Acronyms & Definitions

See [RD 4].

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), TBD.

[RD 2] ATHENA – Concept of Operations, ESA-ATHENA-ESTEC-MIS-DD-0001.

[RD 3] ATHENA – Mission Budgets Document, ESA-ATHENA-ESTEC-MAN-RP-0001.

[RD 4] ATHENA – Specification Tree, ESA-ATHENA-ESTEC-MAN-SP-0001.

[RD 5] ATHENA – Acronyms and Definitions, ESA-ATHENA-ESTEC-MAN-LI-0001.

3 MISSION OVERVIEW

3.1 Mission Description

See the ConOps [RD 2].

3.2 Mission Objectives

See the SciRD [RD 1].

4 REQUIREMENTS

This pdf file contains the following attachments:

- MRD in Excel format, output from the DOORS module.

DOORs module will be provided in an update soon.