



Keck Adaptive Optics Note 645

Keck Next Generation Adaptive Optics Guidelines for the Initial Review of the Functional Requirements

Erik Johansson, Chris Neyman
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1. Introduction

The NGAO Functional Requirements were initially written and included in the materials for the NGAO System Review held in March of 2008, but were never formally reviewed by the NGAO design team. This note documents the instructions to be followed by the NGAO team members to perform the requirements review. The purpose of the review is to make sure that we have a complete, accurate, and self-consistent set of requirements describing the system. The requirements will be used during the remaining phases of the design and during the implementation to ensure that the system we deliver will perform as intended.

2. Organization and location of the requirements

The requirements are maintained in the Contour requirements management database. The Contour database can be accessed here:

http://www.oir.caltech.edu/twiki_oir/bin/view/Keck/NGAO/ContourDatabase

The requirements are organized in a folder tree according to their Product Breakdown Structure (PBS) numbers. There are nearly 600 total requirements in the set. The PBS is new, with a different structure than the original one. The new PBS can be found on the NGAO Twiki here:

http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/SystemsEngineeringGroup/PBS_new.mpp

3. Review process

The requirements have been divided up into small manageable sets and assigned to two-person teams for the review. The review process is described in detail in the following note:

http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/SystemsEngineeringGroup/RequirementsChangeApprovalProcess_rev1.pdf

The team assignments are documented in the following spreadsheet:

http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/SystemsEngineeringGroup/RqmtsReview_rev2.xls.

Because the spreadsheet can be confusing, I will send out e-mail notification of the review assignments and due dates. The requirements to be reviewed can either be accessed directly in the Contour database, or you can access PDF reports of the requirement sets on the following Twiki page: http://www.oir.caltech.edu/twiki_oir/bin/view/Keck/NGAO/PdFrds.

4. Review guidelines

This review should be comprehensive, and not merely a review of the existing requirements.

When performing the review, look at the requirements set you are reviewing and think about the PBS component the set refers to. Is the requirement set complete? Are there requirements that should be there but are missing? If there are requirements that need to be written, then write them as part of this review process. If additional analysis is required, then write the new requirement to the best of your ability and put place holders (“To be determined” (TBD) or “To be resolved” (TBR)) for the missing information. Are there requirements that should be removed or deleted? If there are requirements that should be deleted, then follow the standard review process discussed above in section 3.

A note regarding the use of TBD and TBR: Try to avoid using TBD, if possible. Instead, put your best estimate or guess and include a TBR next to it. Please use only the abbreviations TBD and

TBR for missing information or information that must be verified or resolved. This will enable us to much more easily track requirements that are incomplete.

I have posted two documents on the NGAO Twiki to help you in writing good requirements:

- Appendix C from the NASA Systems Engineering Manual: How to write a good requirement:
http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/SystemsEngineeringGroup/AppC_HowToWriteAGoodRequirement.pdf
- Writing good requirements: Ambiguous terms to avoid:
http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/SystemsEngineeringGroup/Wiegers_Words_to_Avoid_Requirements.pdf

Please review these documents BEFORE you begin the requirements review.

In addition, I have listed some questions for you to consider as you do the review:

- Is the requirement written using clear, concise and grammatically correct English using complete sentences?
- Are all the requirement fields specified correctly?
 - Take the time to check all the fields, correcting those that need it.
- Is the requirement verifiable?
 - If we cannot verify a requirement through inspection, analysis, demonstration, or test, is the requirement really needed?
- Does the requirement as written contain multiple requirements that should be split apart as separate requirements?

Two additional references which may be of use:

- KAON 572: Instrument Baseline Requirements:
http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/WorkProducts/Baseline_Requirements_Document.doc
- Draft Engineering Guideline for the Preparation of Requirements Documents:
http://www.oir.caltech.edu/twiki_oir/pub/Keck/NGAO/FunctionalRequirements/Requirements_Document_Guideline2.pdf

5. Questions or concerns

If you have questions or concerns that arise during the review process, please start by discussing the issue with the members of the Systems Engineering Team: Erik Johansson, Chris Neyman, Rich Dekany, or Peter Wizinowich. If you have concerns regarding your ability to meet the due dates for the review, please contact Peter Wizinowich.

6. Requirement fields

This section describes the fields used in Contour to implement the Requirement template. It is important that the reviewers understand the intent of the different fields so that their values can be assessed properly during the review. The Requirement template consists of the fields shown below in Table 1.

Field name	Field type	Purpose
Short Name	String	A simple short recognizable name for this requirement
Section	Enumeration	The relevant section from the requirements document
Category	Enumeration	The requirement category
Priority	Enumeration	The requirement priority
PBS	String	The PBS component to which the requirement applies
Description	Text	A detailed description of the requirement

Rationale	Text	Any additional explanation to clarify the purpose of the requirement
Traceability	Text	Detailed information regarding the source or justification for the requirement: Science Requirement, System Requirement, architecture design decision, error budget, etc.
Status	Enumeration	The current status of the requirement
Version	String	The version number of the requirement.
Verification Method	Enumeration	How the requirement will be verified.
Originator	String	The original requirement author
Created By	User	The Contour user who created the requirement (auto-generated by the system)
Modified By	User	The Contour user who last modified the requirement (auto-generated by the system)
Modified Date	Date	The date the requirement was last modified (auto-generated by the system)
Imported	Boolean	A flag set to true (1) if this requirement was imported from another document (e.g., an Excel spreadsheet).

Table 1: Definitions of the fields used in the Functional Requirements template

Strings are short text fields with up to 255 characters.

The enumerations are choices that must be made from a pre-defined list. The lists appear as drop-down selection menus when editing a requirement. The enumerations have the following definitions:

- **Section:** The section of the requirements document to which this requirement applies. Valid choices are: Overall, Optical, Mechanical, Electrical, Safety, Software, Interface, Reliability, Spares, Service and Maintenance, Documentation.
- **Category:** The category of this requirement. These categories were taken from the NASA System Systems Engineering Manual. Valid choices are: Functional, Performance, Interface, Environmental, Reliability, Safety.
- **Priority:** The priority for this requirement. Valid choices are: Essential, Important, Desirable.
- **Status:** The status of this requirement. Valid choices are: Draft, Final, Approved, Pending Approval, Disapproved.

Text fields are Rich-Text format and are essentially unlimited in length (4 GB). Text fields can include graphical content as well as text.