



NGAO

Functional Requirements

Key	Name	Sect	Cat	Priority	WBS	Description	Rationale	Traceability	Status	Version	Verification	Originator	Last Modified
FR-1	Location	Mechanical	Functional	Essential	0	The AO system shall be located on the left Nasmyth platform.	Design decision of NGAO team. The bent Cassegrain ports are believed to have inadequate space and weight capacities. The prime focus could potentially be available but there would be many constraints on an instrument at this location. The most viable option is in the location of an existing AO system. Alternatives would be to decommission HIRES or for the existing AO system and the NGAO system to be able to share the same platform. The Keck telescope foci and Nasmyth deck storage locations are already heavily utilized. The current AO systems occupy the left Nasmyth platform locations of both telescopes. HIRES occupies the right Nasmyth on Keck I while DEIMOS and NIRSPEC share the right Nasmyth on Keck II. The Cassegrain foci are occupied by LRIS (and MOSFIRE in the future) on Keck I and by ESI on Keck II.	Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: 6.2.2 Facility requirements Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc	Draft	1.0	Inspection	Chris Neyman	Mar 4, 2009 4:25 PM
FR-2	Motion control	Mechanical	Performance	Essential	0	For devices that must track paralactic angle changes, the rate of compensation shall be consistent with the zenith "dead zone" of the telescope. The Keck telescope's maximum tracking rate in azimuth sets the size of the 'dead zone'.	Telescope's maximum azimuth tracking speed sets maximum required tracking speed for devices that track paralactic angle changes.	Engineering decision by Chris Neyman see attached URL document "Telescope Limits"	Draft	1.0	Test	Chris Neyman	Mar 4, 2009 5:02 PM
FR-3	Power consumption	Electrical	Performance	Important	0	The entire NGAO facility shall not exceed a total electrical power dissipation of 30 kW	Allowable power consumption has implication for removal of waste heat from the AO enclosure and from associated area in the observatory.	Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: 9 Electrical Requirements Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc	Draft	1.0	Test	Chris Neyman	Mar 4, 2009 5:00 PM
FR-4	Azimuth cable wrap	Electrical	Interface	Essential	0	Electrical connections between the NGAO systems on the Nasmyth platform and other locations in the observatory shall be through the azimuth cable wrap.	This is the standard cable routing between the Nasmyth platform and other locations at the observatory.	Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: 9 Electrical requirements Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc	Draft	1.0	Inspection	Chris Neyman	Mar 4, 2009 4:26 PM
FR-5	Downtime	Reliability	Reliability	Essential	0	NGAO shall be designed to minimize downtime. The current	Maximize observational opportunities for NGAO.	System requirements document v1.15	Draft	1.0	Analysis	Chris Neyman	Mar 4, 2009 5:02 PM

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						SRD requires <= 5% of observing time lost to problems and the median time between faults during observing time should be >= 3 hrs		Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: 13 reliability requirements Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc					
FR-6	Diagnostics	Reliability	Functional	Essential	0	NGAO shall be equipped with built-in diagnostics and shall be fully operable and maintainable by observatory staff	Implication of requirements for facility class instrumentation	System requirements document v 1.15 requirement 21.1 Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: 6.2.2 Facility Requirements (table 21.1) Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc	Draft	1.0	Demonstration	?	Mar 4, 2009 4:27 PM
FR-7	Operational readiness	Reliability	Performance	Essential	0	<p>The system shall be designed for operation on a TBD basis. The system shall be designed to be deployed at night with TBD hours of preparation for setup and calibration, so that it can support both classical and semi queue scheduled modes.</p> <p>Setup and preparation times: Daytime prep time TBD Nighttime setup time TBD Object setup TBD</p>	Maximize observational opportunities for NGAO	Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: 6.2.5 Observatory Operational Requirements Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc	Draft	1.0	Demonstration	Chris Neyman	Mar 4, 2009 4:58 PM
FR-8	Spares	Spares	Reliability	Essential	0	TBD pending results of a failure analysis of system.	Implication of requirements for facility class instrumentation	Title: NGAO: System Requirements Document KAON 456 Version: 1.16 Section: see sections 13-15 (Still TBD) Date: December 19, 2007 File: KAON456_NGAO_SRD_v1.16.doc	Draft	1.0	Analysis	Chris Neyman	Mar 4, 2009 5:00 PM
FR-9	Maintenance	Service and Maintenance	Reliability	Essential	0	TBD pending results of a failure analysis of system.	Implication of requirements for facility class instrumentation	Title: Instrument Baseline Requirements (draft by Sean Adkins) Version: 0.1 Section: 14 (section TBD in this version) Date: January 15, 2007 File: Baseline_Requirements_Document.doc	Draft	1.0	N/A	Chris Neyman	Mar 4, 2009 4:28 PM

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FR-10	Documentation	Documentation	Functional	Essential	0	Standard documentation shall be provided including: mechanical drawings, electrical schematics, optical design prescription, optical alignment plan, software design manual, theory of operation, and user's manual. See full requirements reference in Traceability section	Observatory requirement for new instrumentation	Date: January 15, 2007 File: Baseline_Requirements_Document.doc Title: Instrument Baseline Requirements (draft by Sean Adkins) Version: 0.1 Section: 16 Documentation Requirements Date: January 15, 2007 File: Baseline_Requirements_Document.doc	Draft	1.0	Inspection	Chris Neyman	Mar 4, 2009 4:59 PM																																																												
FR-21	Vibration	Mechanical	Performance	Essential	0	The AO system, laser system, and their associated enclosures shall comply with observatory vibration standards. Additional standards for NGAO are TBD	Observatory requirement for new instrumentation, NGAO may impose more stringent standards	Title: Instrument Baseline Requirements (draft by Sean Adkins) Version: 0.1 Section: 8.2.2.2 Vibration page 20 Date: January 15, 2007 File: Baseline_Requirements_Document.doc	Draft	1.0	Test	Chris Neyman	Mar 4, 2009 5:01 PM																																																												
FR-1398	Non-operating Environment	Overall	Environmental	Essential	0	<div>The Instrument shall meet all of the performance specifications without repair or realignment after being subjected to any number of cycles of any of the non-operating environment conditions defined in the table below. These represent environments associated with normal non-operating telescope activities including but not limited to storage and handling within the facility and installation and removal from the telescope.</div> <div><div>Non-Operating Environment</div><table><thead><tr><th>Parame</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Units</th><th>Notes</th></tr></thead><tbody><tr><td>Altitude</td><td>0</td><td>-</td><td>4300</td><td>m</td><td></td></tr><tr><td>Temperature</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Range</td><td>-10</td><td>0</td><td>30</td><td>°C</td><td>1</td></tr><tr><td>Rate</td><td>-0.8</td><td>-</td><td>0.8</td><td>°C/h</td><td></td></tr><tr><td>of change</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Humidit</td><td>0</td><td>-</td><td>90</td><td>%</td><td>2</td></tr><tr><td>Gravity</td><td>-</td><td>-1</td><td>-</td><td>g</td><td>3</td></tr><tr><td>orientati</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Vibratio</td><td>-</td><td>-</td><td>8.0x10⁻⁴</td><td>g²/Hz</td><td>4</td></tr></tbody></table></div>	Parame	Min.	Typ.	Max.	Units	Notes	Altitude	0	-	4300	m		Temperature						Range	-10	0	30	°C	1	Rate	-0.8	-	0.8	°C/h		of change						Humidit	0	-	90	%	2	Gravity	-	-1	-	g	3	orientati						Vibratio	-	-	8.0x10 ⁻⁴	g ² /Hz	4	Sean Adkins, K1 LGS documentation	Title: Instrument Baseline Requirements (draft by Sean Adkins) Version: 0.1 Section: 6.2.1.1.2 Non-operating Environment page 8 Date: January 15, 2007 File: Baseline_Requirements_Document.doc	Draft	1.0	Test	Viswa Velur?	Mar 4, 2009 4:26 PM
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						Notes: 1. See MIL-STD-810F Method 500 §2.3.1. 2. Maximum is for induced conditions, see MIL-STD-810F Method 501 Table 501.4-I. 3. Minimum is for induced conditions, see MIL-STD-810F Method 502 Table 502.4-II. 4. See MIL STD 810F Method 503. 5. Relative, condensing. 6. Packaged equipment may be subjected to all possible gravity orientations during transportation and shipping. 7. 10 Hz to 40 Hz, -6dB/oct. drop-off to 500 Hz, all axes. 8. See MIL-STD-810F Method 514. 9. 0.015 second half-sine, all axes. 10. All axes. 11. 0.5 Hz to 100Hz, all axes							