

GNAO LLT Q&As

VERS. 6.0

The following questions were asked by potential offerors. The written answers below may include some clarification to the answers given at the conference.

Date	Version	Version Description
4/1/20	1.0	Initial set of Q&As released
4/3/20	2.0	Update to answer of question 13
4/8/20	3.0	New questions 24-28 and answers added
4/29/20	4.0	New question 29 and answer added
5/1/20	5.0	New question 30 and answer added
5/12/20	6.0	New questions 31-32 and answers added

Question 1: Section 8.2.3.7 specifies: The LLT thermally induced defocus shall be ≤ 0.2 PV waves RMS over the specified operating range. PV and RMS are considered as different indicators for the variation in a quantity. Can you clarify if RMS or PV?

Answer 1: Error in specification, RMS will be changed to PV in soon to be uploaded version.

Question 2: Section 8.2.3.6 specifies a WFE of 75 nm rms, does this exclude tip/tilt/focus?

Answer 2: The WFE requirement excludes tip/tilt/focus.

Question 3: It is understood that a high power laser will be used in operation. However nothing is specified of that laser for testing, nor is it mentioned in customer furnished items. It is therefore understood that no high power laser testing has to be performed prior to delivery.

a) Is that correct?

- b) Is it sufficient to perform verification based on a lower-power laser, and by analysis and comparison to previous high-power testing on virtually identical hardware?

Answer 3: Prior to delivery we will not provide a high power laser, but during the onsite acceptance one is available and provided by Gemini for use in the Hilo Lab.

Question 4: Section 8.3.2.1 reads “Documentation Standards. Requirement: The LLT shall have well documented Operational procedures, Maintenance procedures, Installation procedures, safety procedures, and Test procedure. [Goal, not testable]”

- a) We assume this means that the referenced well-documented procedures are all required as deliverable documents, and we can verify their effectiveness by experience/comparison.
- b) Does the term at the end of this section “**not testable**” mean that no physical tests will be required to validate the documents? Otherwise please explain what is meant with this term in the context of the requirement?

Answer 4: Correct. Documentation is a deliverable document that will be evaluated based on experience/comparison and not by any physical test.

Question 5: Throughout the technical specification it is not clear whether the specified values should be considered as 1s or 3s. Furthermore it is understood that rms values are meant (when applicable). Can you clarify whether values are as 1s or 3s, and that rms values are intended where applicable? (see clarification figure below).

Answer 5: Where applicable RMS values are intended at 1sigma and PV at 3sigma.

Question 6: Referring to **Instruction to Offerors**, page 11, the list of proposal contents states “1 C. The Technical Proposal, as outlined in the Statement of Work”. However the Statement of Work doesn’t seem to contain a technical proposal outline, only a Project Management Plan outline. Is this understanding correct and if so, could you provide this outline of the technical proposal?

Answer 6: An outline for the technical proposal is not provided. The proposal shall include a technical proposal that meets the requirements of the specifications.

Question 7: Referring to the **Statement of Work**, section 3.2 Project phase work, paragraphs “3.2.4 Implementation, Integration, Verification and Validation Phase” and “3.2.5 Delivery, Integration, and Acceptance Phase”. Some of the activities seem to be out of order (e.g. execution of the OAT and support for the On-Sky Acceptance Testing in the former phase (3.2.4), but delivery of the system in the latter (3.2.5). Can you please clarify, or may we propose our own interpretation?

Answer 7: The following lines will be moved from section 3.2.4 to 3.2.5 a new version of the document will be uploaded shortly to the webpage.:

The Contractor shall execute the On site Acceptance Test (OAT) plan.

The Contractor shall execute the OAT at the telescope base facility in Hilo, Hawaii.

The Contractor shall execute the final OAT by end of December 31 2022.

Question 8: Referring to the **Statement of Work**, Section 3.2.4, from the context we assume that Acceptance Test Plan (ATP), is the same as the Factory Acceptance Test (FAT) plan of section 4.8.4; not to be confused with the On-Site Acceptance Test (OAT) plan. Is this correct, or if not, can you please clarify?

Answer 8: The ATP in section 3.2.5 is the FAT described in section 4.8.4. A new version of the document will be uploaded shortly to clarify this.

Question 9: Referring to the **Statement of Work** Section 3.2.5, from the context we assume that “Final Acceptance Review” should be “Factory Acceptance Review”. Is this correct, or if not, can you please clarify?

Answer 9: The "Final Acceptance Review" is the "Factory acceptance review". A new version of the document will be uploaded shortly to clarify this.

Question 10: Referring to the **Specification**, section 8.2.3 LLT Optical requirements. We notice that there is a specification 8.2.3.4 for circular polarization of the output beam, however there does not seem to be a specification for the permissible PER (polarization extinction ratio).

Answer 10: The specifications document will be modified to add in a PER requirement of 97% for the LLT. A new version of the document will be uploaded shortly.

Question 11: Can we assume that Gemini has a refocuser in the BEaCoN to be able to actively refocus the exiting beam to cope with elevation angles and sodium layer height variations?

Answer 11: The Gemini designed optical train between the laser head and the LLT will have an adjustable beam expander to actively refocus the exiting beam.

Question 12: Are you going to provide a copy of the presentations?

Answer 12: Yes, both the recording and presentations will be available on the AURA website.

Question 13: Could you clarify what you mean by management plan and project plan, and what you expect that they should include?

Updated Answer 13 (4/3/20): Section 3.1 in the Statement of Work has been updated to request a single Project Management Plan (PMP), and includes a reference to a PMP template for additional guidance of content in the plan.

Question 14: Does the focus need to be controlled with respect to temperature, or do you accept a drift in focus?

Answer 14: We accept a thermal drift to the value that was listed in the Specifications, ≤ 0.2 waves PV, but we will also have a way to adjust for focus within our uplink optics beam chain.

Question 15: Is there a preference for vendors to manage the foreign exchange risk?

Answer 15: We do not have one specifically. We usually will negotiate on a historical exchange rate due to fluctuations.

Question 16: RMS wavefront error ... is defined over which area? Less than 75nm, but where?

Answer 16: Over the fully expanded beam.

Question 17: Given the unusual circumstances with COVID-19, do you have any recommendations about how vendors handle planning for contingency?

Answer 17: We suggest adding this to the vendor's risk register. Risk related to COVID-19 should be covered under force majeure clause in contract.

Question 18: When will you provide the interface documents?

Answer 18: Interfaces not yet defined shall be collaboratively defined by Contractor and Gemini as early in the design phase as possible.

Question 19: Dimensions provided in the specs document for the mechanical interface... how strict are they? Is there a specific space envelope issue, or can the dimensions be negotiated?
Trying to understand the environment that is causing the restraints.

Answer 19: Yes the space envelope can be negotiated. Many factors impact the available space envelope such as free space on the telescope structure, access for maintenance and service, telescope balancing, physical interference and/or beam vignetting with existing enclosure/shutter structure.... The space envelope defined in the specifications is thought to be a reasonable outer envelope that satisfies considered restrictions but in no means is the only solution. Gemini will consider exemptions to the space envelope on a case-by-case basis.

Question 20: Is the weight limit listed for each LLT, or for all five?

Answer 20: The specifications define the weight limit of an individual LLT.

Question 21: Is there any possibility of an extension of the proposal deadline?

Answer 21: Due to COVID-19 pandemic, AURA is extending the proposal deadline by 2 weeks, to May 14, 2020.

Question 22: Diameter of telescope- what is your laser spot size on sky without the atmosphere?

Answer 22: Goal is 1 arcsecond in median seeing. This corresponds to 0.55 arcseconds in the visible on Maunakea. This was not a specific requirement because it is not testable in the lab.

Question 23: Figure 2 in the Specifications document shows a 5X LLT. We understand this is not set, and that the supplier is to define the exact magnification to comply with every other specification in the documentation. Can you clarify?

Answer 23: The 5X on the figure is meant to convey that we will have 5 LLT units and not the magnification of the LLTs.

Question 24: Regarding the Project Management Plan and Technical Proposal, what shall be included in the 40 pages limit? Is it only the Technical Proposal or also the Project Management Plan?

Answer 24: Please refer to section 2.6 in the Instruction to offerors, attached documents such as spreadsheets and appendices do not count towards the 40 page limit. The main aspects of the Project management plan and the technical proposal should be in the 40 page proposal and supporting details in spreadsheets and appendices.

Question 25: What does FSM stand for? And how are the FSM and the jitter mirror envisaged to work together, in terms of optical design and control approach?

Answer 25: The FSM stands for Field Selecting Mechanism and is meant to provide for the slow large movements of the laser spot on sky. It does not need to be a single optical element but the entire mechanism must comply with requirements in 8.2.4. The FSM is controlled directly by the LGSF Control System. The jitter mirror (part of the BEACON assembly) will be driven directly by the RTC to provide fast tip/tilt control at up to 1 kHz but within a limited range of a few arcseconds on sky, the average error on the jitter mirror will be offloaded by the LGSF

control system to the FSM. The FSM will only receive positioning commands from the LGSP control system, it does not need to interact with the Jitter Mirror directly.

Question 26: Please clarify the Requirement 8.2.4.2 Projected beam positioning accuracy: is it blind pointing or with feedback from the control system?

Answer 26: This is the blind pointing within the patrol field of the LLT. The entire patrol field may be offset due to mechanical flexures, but must conform to requirement 8.2.1.6. An allowance for flexure due to the telescope mounting will also be assessed based on the agreed upon mounting solution.

Question 27: Please clarify the Requirement 8.2.1.8 LLT Power dissipation: is it 50W per LLT? Is it averaged over a certain time?

Answer 27: The 50W limit is intended for 1 LLT unit over a nominal time period. If this requirement poses a significant issue in the proposed design, please detail it in the proposal and we will consider easing the requirement.

Question 28: Please clarify the requirement 8.2.3.5 LLT Throughput: Does this spec include vignetting by the central obscuration and spider? Does it assume a Gaussian beam (which size?) or a uniform beam?

Answer 28: The throughput requirement must be met including possible losses from vignetting. Yes, a gaussian beam is assumed with an input beam size between 3 and 20 mm and an output beam size within the requirement as needed to generate a 1" spot on sky.

Question 29: Can the proposal page limit be relaxed?

Answer 29: Yes- we have expanded the page limit to 60 double-spaced pages. Please note that all other formatting requirements remain unchanged in the Instructions to Offerors sec. 2.6.

Question 30: Can the proposal deadline be extended due to delays related to COVID-19?

Answer 30: Yes- we have extended the deadline one additional week. The new deadline is Thursday, May 21, 2020 at 3:00PM MST.

Question 31: Regarding section 8.2.3, there are two sections (8.2.3.1 and 8.2.3.4) defining a relevant beam width based on $1/e^2$ definition, and a third section 8.2.3.5 requiring power throughput at 95%. As the $1/e^2$ definition contains 86% of the beam power, could we please have a clarification to assist us with evaluating our optical design? If more of the beam than $1/e^2$ must be transmitted, could you please clarify any WFE requirements outside the $1/e^2$ beam

Answer 31: The throughput and WFE are over the entire beam including the wings outside of the $1/e^2$ diameter.

Question 32: There's no clear definition about PER. Typical definitions are given as T_{max}/T_{min} where T is the Transmission. However this definition does not apply, could you please provide us with your definition?

Answer 32: Aside from the qwp, the internal optics of the Ilt should not change the orientation of polarization of the input beam by more than 3% across the fully expanded beam diameter.
