Addendum 2

DATE: Tuesday, August 25, 2026

PROJECT: RFP No.: S342606_Lazuli Widefield Context Camera Interference Filters

OWNER: The University of Arizona

TO: Prospective Bidders

SUBJECT: Updated timeline & Response to Bidder's Questions

This addendum forms part of the contract documents and modifies the RFP documents dated August 5, 2026.

1. **Please note the following changes to RFP:**

Please note the timeline has been updated as follows:

Solicitation Milestone	Proposed Date
Answers to Supplier Questions	Tuesday, August 25, 2026
RFP Response Submittal Deadline	**Friday, September 7, 2026, by 2:30 PM MST**

2. **Please see below responses to bidder's questions:**

Table 1 - General Specifications:

Question: There's an AR specified for 400-1000 nm, but it doesn't specify which filter this is for. Standard practice for bandpass filters is to only AR side 2 for the passband, as the rest of the side 2 coating will cover the out of band blocking. However, let me know how this ties in with my original question of whether or not to even coat side 2.

Answer: *I am going to tackle this question first. I took a Sloan-r transmission curve, assumed that is applied to S1, and assumed R1 = 1 – T1. If side 2 is left uncoated, you will have a glass-air interface, so I assumed R2 = ((1.45 – 1) / (1.45 + 1))^2 = 0.0337, and applied that from 400-1000 nm, with T2 = 1 – R2. I did the FGF calculation, and FGF = 0.0007, which is about 6x under the 0.004 spec. If I assume OD=2 on S2 from 500-720 nm, the FGF is another factor of 3 lower. This suggests that if the bandpass is defined by S1*

coatings, you do not need to coat S2 for the Sloan-r filter. I did not repeat this calculation for other Sloan and the ultrawide filters, but I suspect the result is the same.

I repeated this exercise for a 2nm width H-alpha filter. Without an S2 coating, FGF = 0.0084, which is 2.1x the spec. If I assume an OD2 coating from 646.3 – 666.3 nm, FGF = 0.0025, which is under the 0.004 spec. So an AR coating will be needed for the passband for the narrowband filters, but it does not need to cover the full response band of the CMOS sensors provided the filter meets its out of band spec.

Question: We don't have a way to quantify ghosting. Typically, when ghosting is a concern, the customer will typically specify a wedged substrate and/or we will also just perform all of the coating onto one side and leave the other side uncoated.

Answer: *Our concern is filter ghosts. We prefer for the wedge angle to be very small so that the ghost image is nearly concentric with the primary image. The sensors have a large field of view, so we cannot plan to move the ghost image off the sensor.*

Question: AOI is listed as ≤ 3° - Does this mean AOI will vary between 0-3° with a collimated source? Or is 0-3° a tuning range?

Answer: The filters will be in a converging f/15 beam, which implies a half-angle of 57.3deg/30 = 1.9deg. The filter will be mounted orthogonal to the beam to within 0.2 deg. So we expect the incident light on each filter to range from 0 deg to 2.1 deg angle of incidence.

Question: For TWE, we would clarify the spec to be "per inch" rather than over the CA.

Answer: This is acceptable

Question: Out of band rejection is listed as 10^-6 - is this notated to mean OD6? What is the exact wavelength range to be covered? For a CMOS sensor, I assume this will be 200-1200 nm, but worth clarifying. Specifying any unnecessary blocking will increase coating time and cost.

Answer: Yes, the blocking should be OD6 or better. I agree that the out-of-band rejection range should be 200-1200 nm.

Question: There's a 0.2mm edge chamfer specified with no tolerance. What is this tolerance? Or, is this an optional max chamfer? Also to note, the spec sheet only lists this chamfer for the round filters, and not the rectangular filters. Please clarify whether or not you'd like both.

Answer: I see that I should have left a blank line after the dimension, center thickness, and minimum clear aperture specifications for the round filters. All subsequent specifications, starting with Radius S1 and S2, apply to both round and rectangular filters (except the corner radiusing, as noted below).

The tolerance is large on the chamfer angle. We are mainly just trying to avoid square angles. We can accept a tolerance as large as +/- 0.05mm, and verification by measurement is not required.

Question: There's a 3mm ROC corner specified under the round filter section, but there are no corners on a circle - I assume this was meant to apply to the rectangles?

Answer: Yes, this applies to the rectangles.

Question: We will quote roughness as < 10 Angstroms (< 1 nm) RMS pre-coating, as that's what our standard substrates are procured to.

Answer: Listing the pre-coating surface roughness is acceptable.

Question: We do not have a certified clean room, but I see that's listed as a best effort anyways. Just letting you know.

Answer: Ok, thank you for the notification. This should be acceptable if the pre-coating cleaning is performed right before coating.

Table 2 - Sloan Filters:

Question: As another participant mentioned, there's not exactly a defined standard for the Sloan filters. Please let us know the following:

- CWL and tolerance

  Answer: See table. Tolerance of +/- 1 nm

- FWHM and tolerance

  Answer: See table. Tolerance of +/- 1 nm, except Sloan-z, which can have a red cutoff beyond 1100 nm

- Blocking OD and exact wavelength range

  Answer:

  - Out-of-band blocking of OD6 from 200-1200 nm for the narrowband filters
  - Out of-band blocking of OD4 or better from 200-1200 nm for the Sloan and ultra-broadband filters

Filter	Center Wavelength (nm)	FWHM (nm)
Sloan-u	350.6	79
Sloan-g	466.5	133
Sloan-r	612	124
Sloan-i	756.5	123
Sloan-z	962.9	274

Alternatively, you could also just point us towards a link for some specs you'd like us to replicate.

Table 3 - Broadband Filters:

Question: What's the blocking OD and exact wavelength range?

Filter	Center Wavelength (nm)	FWHM (nm)	50% Cut-on (nm)	50% Cut-off (nm)
Ultra-Broad #1	757.5	685	415	1100
Ultra-Broad #2	657.5	485	415	900

Answer: Please provide OD5 blocking out of band from 200-1200 nm

Question: 50% cut-on and cut-off wavelengths are listed with no tolerance - what should be the tolerance on each edge? Alternatively, we typically specify a bandpass by CWL and FWHM, with their respective tolerances (or nominal).

Answer: These filters are large light buckets. We can tolerate +/- 5 nm on the FWHM, cut-on, and cut-off wavelengths.

Table 4 - Narrowband Filters:

Question: What are the tolerances on the CWL and FWHM values?
Answer: The CWLs are tied to specific atomic transitions so have tight tolerances of +/- 0.1 nm. The width of the narrowest H-alpha filter should be in the range from 1.0-2.0 nm FWHM. The tolerance on the other filter FWHM is +/- 0.5 nm.

Question: We will treat the 90-10% slope values as nominal targets.

Answer: Yes, that is the intent

Question: What is the "% width" spec referring to?

Answer: FWHM / CWL I wouldn't refer to it as a spec but rather as part of the description of the filters.

Question: The filter is overconstrained with specs for cut-on and cut-off edges, in addition to the CWL and FWHM. We just need the CWL and FWHM, with their individual tolerances. The other way we'll often spec out narrowbands is with a nominal CWL, FWHM with tolerance (or a ≤ value), then the CWL placement is simply determined by the peak transmittance spec.

Answer: I agree with this. You can work to the CWL and FWHM, with the tolerances listed above, and ignore the 50% cut-on and cut-off wavelengths.

Bidders fill out specifications

Question: I believe bidder's comments for each specification of the items (astronomical filters) are the most critical for evaluation. Do you prepare the format where a bidder should fill out? Or free format?
Answer: Free format is fine

Question: If free format is acceptable, a bidder can attach the file in the portal?
Answer: Yes, Please attach it along with the proposal response.

Requested substrate material

Question: Can we substitute the requested substrate material with equivalent material?
Answer: The substrate must be fused silica, but an equivalent substitution for the specified Corning material is acceptable.

Question: Can we use the equation below when calculating the OD level requested in Tabel 1?

The fraction of the transmitted light outside of the Cut-On and Cut-Off Wavelengths of the passband. It is given by the expression:

$$1 - \frac{\int_{\lambda_{off}}^{\lambda_{on}} L_{BB}(\lambda, T = 5819K)\,\tau(\lambda) d\lambda}{\int_{\lambda_{min}}^{\lambda_{max}} L_{BB}(\lambda, T = 5819K)\tau(\lambda)\, d\lambda}$$

where $L_{BB}(\lambda, T=5819K)$ is Planck's blackbody spectral radiance equation for an idealized blackbody at a temperature of 5819K, provided below:

$$L_{BB}(\lambda, T) = \left(\frac{2hc^2}{\lambda^5}\right)\left(\frac{1}{e^{\frac{hc}{\lambda kT}} - 1}\right)$$

where h = 6.626e-34 J-s is Planck's constant, c = 3.0e8 m/s is the speed of light in vacuum, and k = 1.38e-23 J/K is Boltzmann's constant.

Answer: This is acceptable

End of Addendum