

SHARK-NIR Preliminary Acceptance Europe (PAE) Report

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April 4th, 2022

VCAN I630s00020

1. Introduction

The SHARK-NIR PAE was held on March 16th, 2022, via zoom. In addition to the review panel,¹ the SHARK team,² and the LBT director (Christian Veillet), the review was attended by several other interested parties from INAF and LBT. This report provides a summary of what took place at the review, the conclusion reached by the review panel, and selected topics of interest that came up during the discussion.

2. What took place before the review

Panel members reviewed the nine documents listed in appendix 1.

3. What took place at the review

Following a presentation of the capabilities and science goals, a series of live tests were performed. In the course of performing these tests the instrument was run continuously for two hours during which no crashes or unexpected behavior occurred. All mechanisms and camera read-outs were exercised. A complete list of the tests performed is given in appendix 2. The PAE was recorded.³

4. Conclusion reached by the review panel

The review panel unanimously concluded that SHARK-NIR passed the PAE review with no pending actions. The following conclusion text was generated jointly by the review panel members during the closed session:

The review panel wishes to thank the SHARK team for an impressive demonstration. We were impressed with the level of automation and reliability evident from the demonstration. We do not see any showstoppers and conclude that the instrument successfully passes the PAE.

5. Discussion topics of interest

¹ Al Conrad (co-chair), Laura Funk (co-chair), John Hill, David Carrol, Matthieu Bec, Steve Ertel, and Ewan Douglas

² Jacopo Farinato, Maria Bergomi, Valentina Viotto, Kalyan Radhakrishnan, Simonetta Chinellato, Davide Ricci, Fulvio Laudisio, Elena Carolo, Luca Marafatto, Daniele Vassallo, Valentina D'Orazi, Dino Mesa, Davide Greggio, Luigi Lessio, Andrea Baruffolo, Sona Chavan, Gabriele Umbriaco, Lars Mohr, Manny Montoya

³<https://arizona.zoom.us/rec/share/INGeys9pmFOgAg8e6LsMwmiFgLvfZuAWyf5mqQnqFhcwzWkGcnCQZoXmyrcv1TAP.5ZZVKehJYsxjDzAY>

Several technical discussions took place at the review and during email exchanges prior to the review. Five of these are noted here:

- a. Pupil Alignment - The question of how the SHARK-NIR internal pupil will be aligned to the telescope pupil was discussed. The alignment will involve the SHARK pupil re-imager and the SHARK internal tip-tilt mirror, and other features of the telescope, the AO system, and SHARK. Because SHARK has a rotator bearing, where LBTI SOUL does not, we have the possibility to make a more precise alignment of M3 with SHARK than LBTI alone can achieve. Details of this discussion are in the email exchange between John and Jacopo that took place just prior to the PAE and is ongoing.
- b. Labeling and Shipping - The SHARK team is advised to carefully label all items to be stored at the telescope either via a high-quality plastic label or, ideally, a label stamped into the metal. The SHARK team is also advised to avoid the use of sealed bags (*sacco barrieria*) for shipping. Based on experience, these tend to collect water. Instead leave an opening at the bottom. The SHARK team agreed to follow these suggestions. Details of this discussion are in the email exchange between John and Maria that took place just prior to the PAE.
- c. Simulating Jitter - The question of whether jitter was included in the tests using the internal fiber to, for example, test the procedure for centering a star behind a coronagraph was raised. While we learned that it is not possible using the lab set up, the possibility to perform a daytime test after SHARK is on the telescope was suggested. For this test, using the retroreflector or the ARGOS calibration source, jitter could be introduced for a daytime coronagraph alignment test before testing on sky.
- d. Shutdown Procedure - During the shutdown portion of the shutdown and startup test, the MACIE controller failed to turn off.
- e. Anti-collision Software - A question about providing an override feature to the anti-collision software was raised. For example, if one of those mechanism encoders had to be replaced, it might be necessary to carefully operate the mechanism to recalibrate.⁴ And it could be necessary to bypass anti-collision protection to perform that function. The team will make some changes (e.g., making the system more configurable) to accommodate this possibility.

Appendix 1 – List of documents reviewed by the panel

- Acceptance Test Plan
 - SHARK-NIR-INAFP-PLN-001
 - Last revised: March 4, 2022
 - Issue: 0.2
- SHARK-NIR Requirements to the LBT
 - SHARK-INAFP-REQ-001
 - Last revised: March 3rd, 2022

⁴ For the record, reviewers expressed mild concern that relative encoders were being used for stages that might interfere with each other and would therefore benefit from the more reliable location information provided by absolute encoders.

- Issue: 0.6
- SHARK-NIR Commissioning Plan (wiki)
 - SHARK-NIR-INAFP-COM-001
 - Last revised: February 28, 2022
 - Issue: 0.4
- Software Design Description
 - SHARK-NIR-INAFP-DES-004
 - Last revised: February 28, 2022
 - Issue: 0.2
- Packing, Handling, Shipping and Transportation
 - SHARK-NIR-INAFP-PLN-002
 - Last revised: March, 9th, 2022
 - Issue: 0.2
- Installation Plan
 - SHARK-NIR-INAFP-MAN-001
 - Last revised: February 28, 2022
 - Issue: 2.1
- Equipment Hazard and Risk Assessment
 - SHARK-NIR-INAFP-REP-017
 - Last revised: February 15, 2022
 - Issue: 0.1
- Verification Report
 - SHARK-NIR-INAFP-VER-001
 - Last revised: March 11, 2022
 - Issue: 0.1
- Flexure Test Report
 - SHARK-NIR-INAFP-VER-002
 - Last revised: March 09, 2022
 - Issue: 0.1

Appendix 2 – List of live tests performed at the review

- A visit to see the SHARK-NIR set-up in the cleanroom
- Image acquisition in several configurations through templates
 - Coronagraph acquisition
 - Direct Imaging acquisition
- Instrument Performance
 - On-axis optical quality
 - Occulting mask positioning repeatability
 - PSF to occulter automatic alignment
 - Tip-tilt closed loop correcting injected artificial jitter
- Instrument response to power-off and power-on
 - Mocon power-off and startup
 - Shutdown and startup
 - Loss of power and startup
- Fiber/Wheel anti-collision