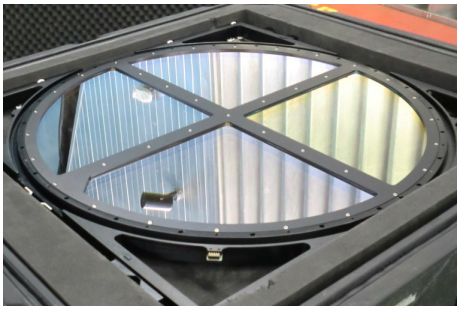
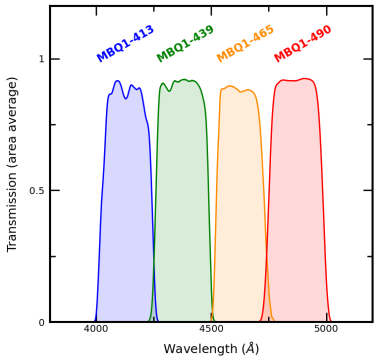
HSC filter: MBQ1

T.Terai (Subaru Telescope)

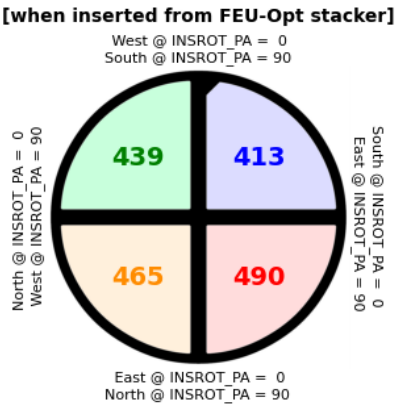
November 2026

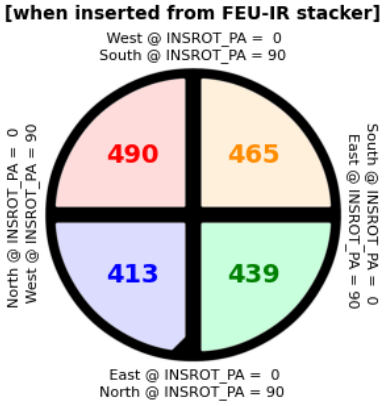
The "MBQ1" is a medium-band quadrant filter of HSC (PI: Dr. Atsushi J. Nishizawa) consisting of the four bands of 403–424 nm (**MBQ1-413**), 426–449 nm (**MBQ1-439**), 452–473 nm (**MBQ1-465**), and 475–498 nm (**MBQ1-490**). It has been opened since the semester S26A for open-use observations, and was used in the three HSC observing runs (February, June, and October, 2026) through S26A and S26B. The first light was achieved on Feb 12 HST.



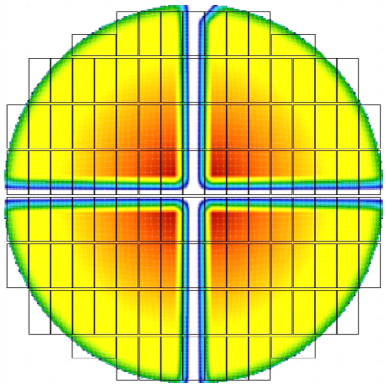


The band arrangement relative to the focal plane varies according to the orientation in which the filter is inserted into the camera unit, which depends on the side of the filter exchanger unit (FEU) on which the filter is stored (FEU-Opt side or FEU-IR side). **Please note that flat data used for data reduction must be those acquired in the same orientation as the science data.** For the filter orientation in each HSC run, please refer to https://subarutelescope.org/Instruments/HSC/HSC_FEU_config.html.



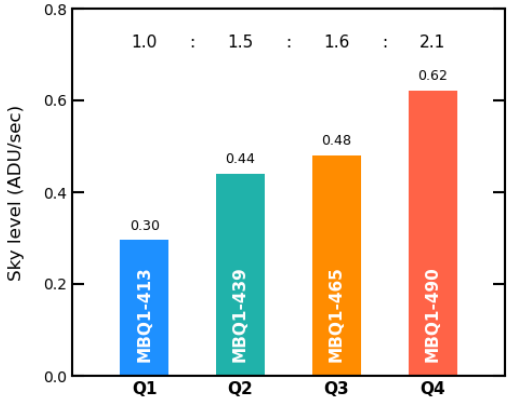


The following shows the filter sensitivity map (red indicates higher sensitivity, blue indicates lower sensitivity).



Background level

Based on the on-sky data obtained on dark nights in October 2026, the background level in each band is as follow.



MBQ1-413: ∼0.30 ADU/sec

MBQ1-439: ∼0.44 ADU/sec

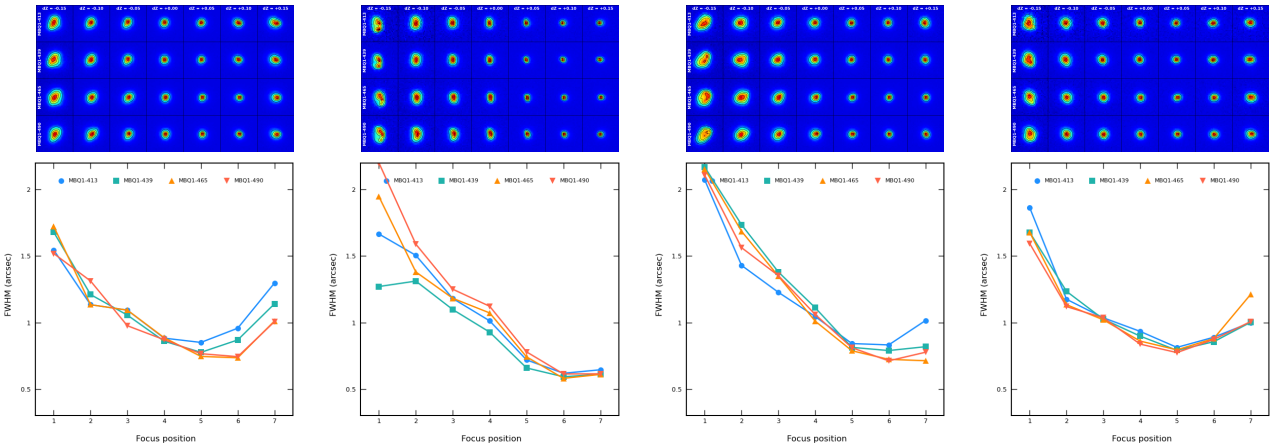
MBQ1-465: ∼0.48 ADU/sec

MBQ1-490: ∼0.62 ADU/sec

Stellar images

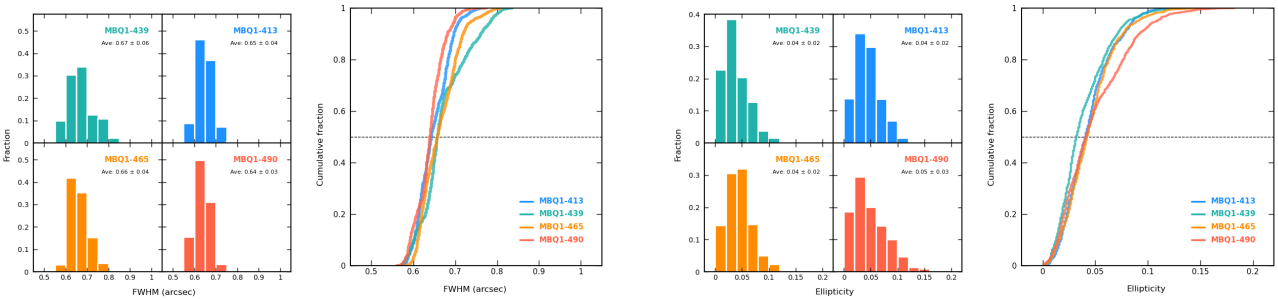
- **Focusing data**

  → Stars showed no significant differences in shape among the four bands.



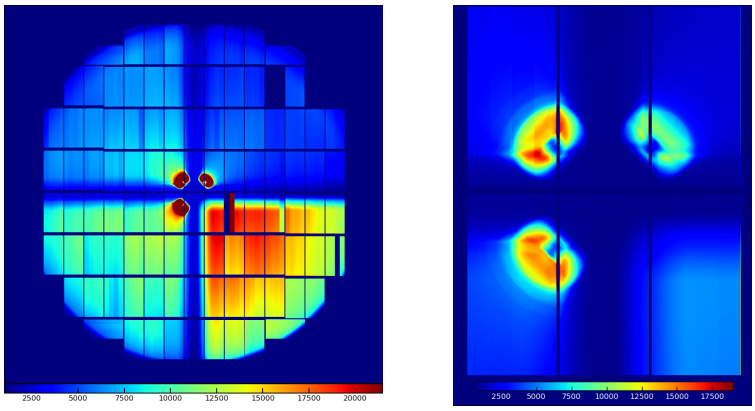
- **Object data**

  → Stars showed no significant differences in FWHM as well as ellipticity among the four bands.



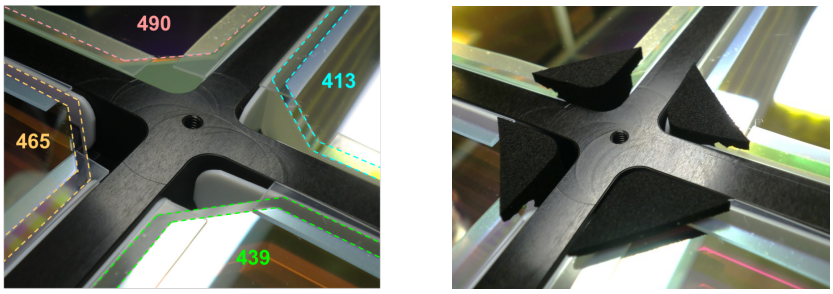
Light leak issue

- Since the beginning of operation of this filter, stray light appeared near the center of the field-of-view.
  - That was imaged as bright spots at the corner of the MBQ1-413, MBQ1-439, and MBQ1-465 filters.
  - The peak intensity within them was as much as ∼3500 ADU/sec, which affected the neighboring CCDs.



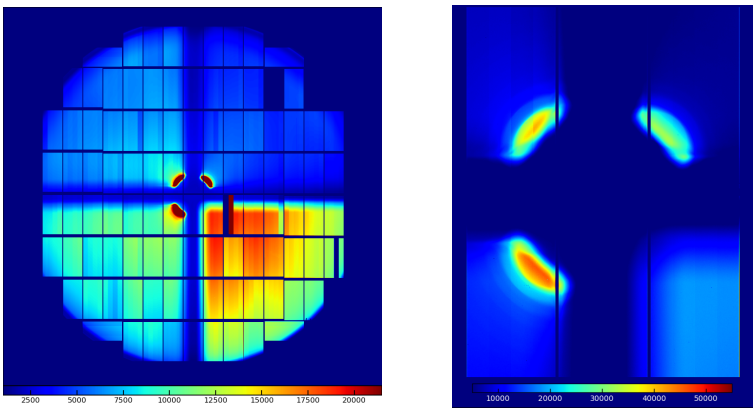
Domeflat data in February 2026 (left: 18 sec, right: 5 sec)

- Our investigation identified light transmitted through the uncoated area along the innermost edge of the filter glasses as the source of the stray light.
- As a temporary measure against this issue, we installed light blocking parts (EPDM foams) into the gaps between the glasses and the filter frames in May 2026.



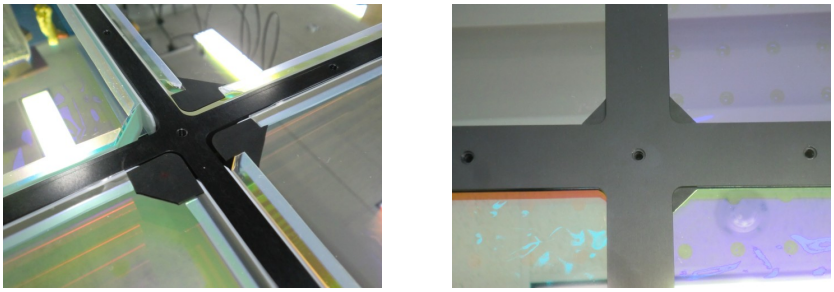
Left: Uncoated area along the edge of the filter glasses (enclosed by the dashed lines)
Right: EPDM foams fitted into the gaps between the glasses and the filter frames

- Although the impact of the light leak was mitigated by the next HSC run in June, a portion of it still remained.



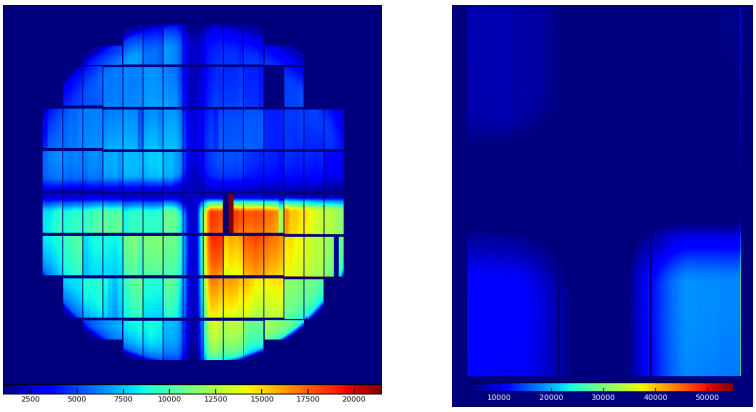
Domeflat data in June 2026 with 18-sec exposures

- We installed EPDM rubbers on both the front and rear sides of the innermost glass edges to further suppress light leakage in September 2026.



EPDM rubbers attached to both the front and rear sides of the glass edges

- Then, it was confirmed in the HSC October run that the light leakage had disappeared completely.



Domeflat data in October 2026 with 18-sec exposures

- A permanent corrective measure with the implementation of a newly fabricated filter cover is planned for the near future.

Links

- **HSC filter information**
  https://subarutelescope.org/Instruments/HSC/sensitivity.html

- **Filter Exchanger Unit configuration**
  https://subarutelescope.org/Instruments/HSC/HSC_FEU_config.html

- **Calibration data**
  https://subarutelescope.org/Instruments/HSC/calib_data.html

- **HSC-Niji Survey**
  https://hsc-niji.github.io/