

Updating VLBI capability in the Nobeyama 45 m telescope

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Extended Abstract

The Nobeyama 45 m telescope (NRO45) has been dedicated for high-sensitivity, wide-field mapping of the radio skies in centimeter–millimeter bands (22–116 GHz). Recently, new receivers such as 7BEE and eQ have been developed for updating such capabilities in the frequency bands of 30–50 GHz and 70–116 GHz, respectively. They are currently operated for scientific verification. Here we present another new capability of NRO45 dedicated for VLBI. HINOTORI (Hybrid Integration Project in Nobeyama, Triple-band Oriented) aims to develop a VLBI system that can simultaneously observe in three bands (22/43/86 GHz)(Figure 1). The newly developed dichroic filter plates are installed in the telescope’s quasi-optics and stably operational. Therefore, the system will be soon ready for scientific operation in the single-dish mode, enabling us to efficiently conduct time-domain astronomy and source surveys mainly for compact astrophysical maser sources. HINOTORI is currently working on updating the VLBI backends enabling to record the received signals at a rate of 48 Gbps at maximum. Although the project has already been introduced in a previous paper [1], this paper reports on the update of the commissioning status, including VLBI fringe tests in the 86 GHz bands after completion of the operation system of 22- and 43-GHz bands simultaneous observations and serious failure of the hydrogen maser frequency standard. The forthcoming issue may be the scheme of VLBI fringe phase calibration throughout the multiple frequency bands. Thus, NRO45 will become one of the excellent millimeter VLBI stations for collaborating regionally in the East Asian VLBI Network (EAVN-high) and globally in the era of the Black Hole Explore (BHEX).

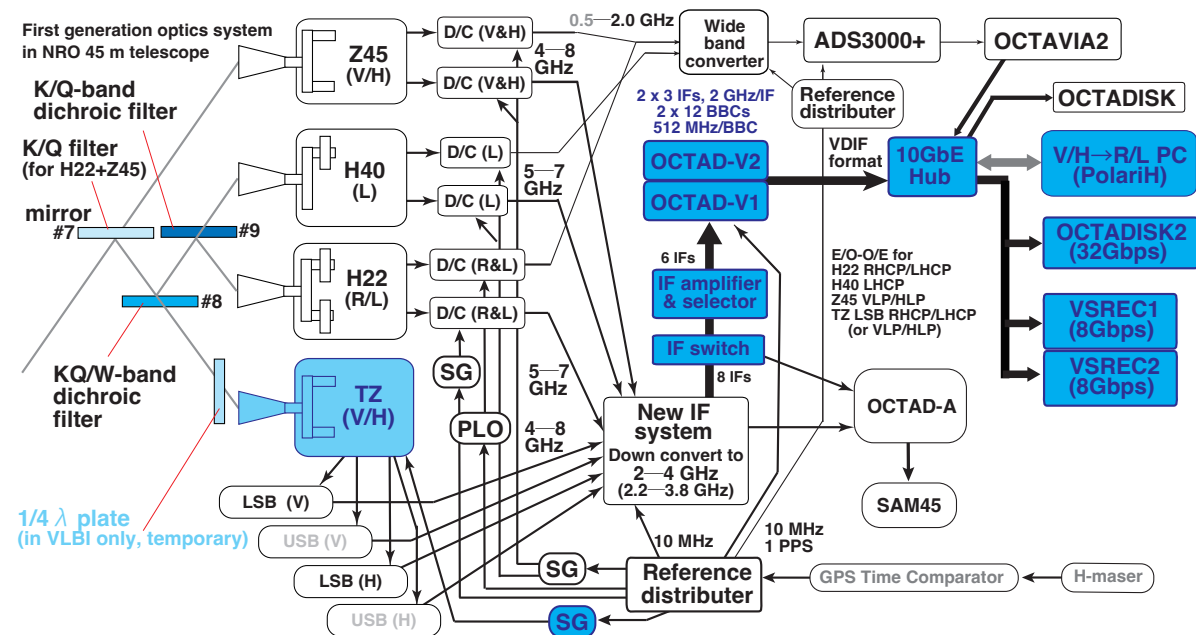


Figure 1. Radio signal flows from the quasi-optics of the Nobeyama 45 m telescope to the single-dish (SAM45 digital spectrometer) and VLBI (OCTADISK/OCTADISK2/VSREC recorders) backends, which are available in HINOTORI. The shaded blocks show the components installed by HINOTORI.

References

- [1] Imai, H., et al., “Double-/triple-bands simultaneous observation system with perforated dichroic filter plates equipped for the Nobeyama 45 m radio telescope”, *Proceedings of the Asian-Pacific Microwave Conference 2022*, 22511937, December 2022, pp. 587–589.