

The Yebes 40 m radio telescope multi frequency system at K-, Q- and W-bands

The Yebes Observatory, operated by the National Geographic Institute of Spain (IGN), hosts a state-of-the-art 40-meter radio telescope equipped with a broad range of frequency receivers from S-band to W-band (2–90 GHz), all designed and mostly built in-house. All of them can be used in single-dish and VLBI observations. The ultra-wide K-, Q-, and W-band frontends are mounted on a single optical table in independent cryostats and can be used simultaneously, either in pairs or all three together.

The simultaneous operation of the receivers has been tested in single-dish mode using spectral observations and properly characterized by measuring pointing, focus, and system temperature. We have also focused on implementing the Frequency Phase Transfer (FPT) technique in collaboration with the Korean VLBI Network (KVN). FPT uses stable phase solutions from lower-frequency bands (e.g., K-band) to calibrate higher-frequency observations (e.g., Q- and W-bands), significantly extending coherence times at millimeter wavelengths. Some tests with the KVN have been conducted to check the entire data acquisition chain.

These advances are helping the Yebes Observatory establish itself as a key contributor to the future of high-frequency VLBI science within the EVN, GMVA, and Global VLBI Network.

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