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Korean VLBI Network and Extended-KVN Project

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The Korean VLBI Network (KVN) consists of three 21 m radio telescopes installed in Seoul, Ulsan, and Jeju Island with the world's first 4-channel receiver that can observe four different frequencies (e.g., 22, 43, 86, 129 GHz) simultaneously. This receiving system is specially designed for millimeter-wavelength VLBI (mm-VLBI) observations where fast atmospheric phase fluctuations cause severe coherence loss. Simultaneous multi-frequency VLBI observations of KVN provide a novel way for atmospheric phase calibration and for high-precision astrometric information in mm-VLBI. This receiving system is now being enhanced with a compact triband receiver and is being introduced in other VLBI telescopes. The high data rate for multi-frequency VLBI observations is essential not to lose its sensitivity. The highest operational data rate of KVN is up to 32 Gbps, and most are from 8 to 16 Gbps by utilizing a dual-polarization capability at four frequencies. The high-speed network of up to 40 Gbps to each KVN site and 100 Gbps to the Daejeon correlator are connected.

Based on the heritage of the KVN, the extended KVN (E-KVN) project, constructing a new telescope in Pyeongchang, Korea, has started since 2020. The new telescope is almost identical to the current KVN telescope, but it will have better surface accuracy to extend operational frequency up to 230 GHz, allowing a simultaneous maximum of five radio frequency bands (18-26, 35-50, 86-116, 125-175, 210-275 GHz) observation. Its construction will be completed in 2023, and KVN as a 4-element array with a new E-KVN telescope will operate from the middle of 2024. At the time of E-KVN, we prepare a high-sensitivity observation with a data rate of 32 Gbps. For this, a new GPU correlator is underdeveloped. In addition, a C/X/Ka-band receiver mainly for geodesy and a photonic-based phase-cal system for high-precision astrometry are also being developed. In this talk, I will present the current status and progress of the KVN and E-KVN projects in both operational and technical aspects, including prospects in mm-VLBI.