

Wideband feed system development for SKA

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We present the recent development on wideband feed systems at Onsala space Observatory/Chalmers University. Two feed systems are currently being developed for the Square Kilometer Array (SKA) project; Band 1 covering frequencies 350 – 1050 MHz, and Band B of the Wideband Single Pixel Feed covering frequencies 4.6 – 24 GHz. Both these systems are extremely wide compared to traditional radio astronomy systems using corrugated feed horns.

Band 1 feed system would use a room temperature spline profiled quad ridge flared horn with about 1 m aperture diameter and 1 m in length. The feed is followed by a compact 20 K cryostat holding the calibration noise injection coupler, cryogenic low noise amplifier, noise source, second stage amplification and bias electronics. The receiver noise temperature for the Band 1 measured at the input of the cryostat is expected to be less than 18-20 K. The Band 1 system on the proposed 15 m offset Gregorian SKA dish is expected to provide sensitivity better than 4.2 m²/K, over 600 - 1050 MHz band, and better than 2.1 m²/K below 600 MHz where the sky noise dominates the system performance.

The WBSPF advanced instrument programs aims to push the wideband technology further, with two fully cryogenically cooled feed system integrated in a single cryostat, Band A covering 1.5 – 5.2 GHz and Band B covering 4.6 – 24 GHz band. For both the systems, two feed alternatives are currently being considered, Eleven feed and QRFH.

At the conference we plan to report the details on design of these systems and some preliminary measurement results.