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12.2 A correlation ECE diagnostic for detecting small-amplitude, broadband Te fluctuation on EAST

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In order to detect the small-amplitude electron temperature fluctuation associated with the anomalous transport, a correlation ECE (CECE) diagnostic has been designed for EAST since 2016. Detailed description of the design and preliminary results of Te fluctuation measurements are presented here. An independent quasi-optical (QO) antenna was designed, which has an improved poloidal resolution (roughly 15 mm for the frequency range of the CECE diagnostic). This is essential for the CECE diagnostic, and it determines the maximum wavenumber of the detected fluctuation. The QO antenna is comprised of a flat mirror and an ellipsoidal mirror. This antenna is integrated for both the CECE diagnostic and an existing Doppler backscatter diagnostic, and the flat mirror is rotatable in the poloidal direction. The heterodyne detection part is similar to a conventional radiometer system, and a unique aspect is the application of YIG filters. The YIG filters (OMNIYIG INC) are of tunable central frequency in the frequency range of 4-18 GHz, and a 3 dB bandwidth of 100-250 MHz (central frequency dependent). This feature is very important for facilitating the radial correlation. The sensitivity of this CECE diagnostic can reach around 0.2-0.3% for a correlation analysis using 106 data points.

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