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14.31 Variable location channels to improve efficiency and precision for direct grad Te measurements, and high spatial resolution Te-profile measurements using electron cyclotron emission

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ECE radiometers which use variable location channels based on YIG filters improve the precision and the efficiency of measurements of Te profiles and magnetic islands. These variable frequency filters were substituted for fixed filters in the IF section of a radiometer to achieve required higher resolution over a target radial range specified just before the experiment [Truong et al. Sci. Instrum. 85, 11D814 (2014)]. Here, we add real-time slewing for relocation of channels during long pulse for investigation of magnetic islands, and for high resolution measurement of electron temperature gradient scale length (LTe). The key component is the yttrium iron garnet (YIG) tunable filters with their narrow bandwidth and capability for high slew rate of the center frequency. These permit fast relocation of the ECE channels, direct measurement of LTe, and close spacing of channels. Taking full advantage of the filter requires intelligent feedback control. Here, the measured filter characteristics are combined with past performance of an eight channel EAST radiometer to redesign the radiometer for upcoming experiments at EAST. Simulations demonstrate the efficacy of the approach. *Supported by US DoE DE-SC0010500 and DE-FG02-97ER54415.

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