

Abstract Submitted
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Microwave Imaging Radar Reflectometer System Utilizing Digital Beam Forming¹ FENGQI HU, MEIJIAO LI, CALVIN W. DOMIER, XIAO GUANG LIU, NEVILLE C. LUHMANN, JR., University of California, Davis — Microwave Imaging Reflectometry is a radar-like technique developed to measure the electron density fluctuations in fusion plasmas. Phased Antenna Arrays can serve as electronically controlled “lenses” that can generate the required wavefronts by phase shifting and amplitude scaling, which is being realized in the digital domain with higher flexibility and faster processing speed. In the transmitter, the resolution of the phase control is 1.4 degrees and the amplitude control is 0.5 dB/step. A V-band double-sided, printed bow tie antenna which exhibits 49% bandwidth (46 - 76 GHz) is employed. The antenna is fed by a microstrip transmission line for easy impedance matching. The simple structure and the small antenna are suitable for low cost fabrication, easy circuit integration, and phased antenna array multi-frequency applications. In the receiver part, a sub-array of 32 channels with 200 mil spacing is used to collect the scattered reflected signal from one unit spot on the plasma cutoff surface. Pre-amplification is used to control the noise level of the system and wire bondable components are used to accommodate the small spacing between each channel. After down converting, base band signals are digitized and processed in an FPGA module.

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