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MIR on NSTX: Conceptual Design[1] LU YANG, C.W. DOMIER, W-C. TSAI, N.C. LUHMANN, JR., University of California at Davis, H. PARK, Princeton Plasma Physics Laboratory — A 3-D Microwave Imaging Reflectometry (MIR) instrument is being designed for the National Spherical Tokamak Experiment (NSTX). Reflections from multiple, extended plasma cutoff surfaces are imaged onto a 2-D mixer array (8×2 or 8×4 elements, depending upon the size of the viewing window). Through the simultaneous launch and collection of 8 probe frequencies spanning a frequency range of 38-52 GHz (extendable to 70 GHz), the result is a 3-D visualization (up to 8×4×8 or 256 channels) of plasma density fluctuations associated with MHD and microturbulence. Each probe frequency may be independently controlled for radial correlation studies, or scanned to collect localized fluctuation data over a large plasma volume. The 2-D nature of the mixer array allows the magnetic pitch angle to be determined through correlation studies of toroidally and poloidally separated channels. Technical details regarding the MIR system design will be presented together with that of an innovative adaptive optics approach under development at UC Davis which can match the curvature of the illumination beam to that of the target plasma in real-time.

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