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A Multi-Channel, Frequency Comb Doppler Reflectometry System[1] J.C. HILLESHEIM, W.A. PEEBLES, T.L. RHODES, L. SCHMITZ, T.A. CARTER, UCLA — Enhanced diagnostic capabilities are needed for the study of turbulent transport, zonal flows, and global modes (TAE, NTM, etc.) in fusion plasmas. Doppler reflectometry is a microwave diagnostic technique that produces localized measurements of intermediate-scale ($k_\perp \rho_i \sim 1$) density fluctuations and turbulence flow. A microwave beam is launched at an angle with respect to normal to the cutoff layer; backscattering occurs for density fluctuations near the cutoff layer according to the Bragg condition. The incident angle can be varied to probe the k-spectrum of the turbulence and the Doppler shift of the return signal provides the poloidal velocity of the fluctuations. A comb generator will be used to create 8 distinct launch frequencies, separated by ∼2 GHz, in the 34-50 GHz range. The receiver will consist of a local oscillator at 32 GHz and a high-frequency mixer. The down-converted output, ranging 2-18 GHz, will be amplified, power split, and frequency selected via filter bank. Amplitude and phase information will be obtained by using radio frequency quadrature mixers. Technical details and results from laboratory testing will be presented.

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