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Real-Time Plasma Rotation Diagnostic for Measuring Small Doppler Shifts on the HBT-EP Tokamak BRYAN DEBONO, JEREMY HANSON, ROYCE JAMES, DAVID MAURER, MICHAEL MAUEL, GERALD NAVRATIL, THOMAS PEDERSEN, Columbia University, STEVE PAUL, Princeton University — An optical fast time-scale toroidal velocity measurement has been developed for use on the HBT-EP tokamak [1,2]. A unique aspect of the measurement technique this diagnostic employs is that the Doppler shift is determined from the ratio of the light intensity from two detectors rather than by resolving the emission line with a traditional spectrometer. This is accomplished using an inexpensive, high-throughput measurement of impurity line emission using interference filters as the spectral device. One detector views the plasma through an interference filter whose passband has a negative slope, and the other views the identical volume of plasma through a positive-slope filter. The signal ratio varies as the emission line is Doppler shifted across the filter passbands. Importantly, the measurement technique is not sensitive to changes in plasma emission levels. For interference filters with a linear passband, the ratio is not sensitive to ion temperature, and the shifted He-II wavelength can be reduced to a simple function of the signal ratio, the channel's relative responsivity, and the two filters transmission curves. Diagnostic calibration procedures and edge plasma toroidal velocity measurements will be reported using a 10% Helium impurity seed in standard Deuterium discharges. Supported by U.S. DOE Grant DE-FG02-86ER53222.

Bryan DeBono
Columbia University

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