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6.49 Real-time phase calibration of the DIII-D density profile reflectometer system

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Real-time phase calibration of the ITER profile reflectometer is essential due to the long plasma duration and path length changes during a discharge. Progress has been recently made in addressing this issue by employing real-time phase calibration on the DIII-D profile reflectometer system. With installing a thin wire perpendicularly at the end of the waveguide transmission system, the round trip phase shift from the wire is detected simultaneously with the plasma phase shifts. Variations in the reflectometer round trip path length (~26 m) can then be determined during each DIII-D plasma discharge, allowing the variation in the phase due to this movement to be accounted for and removed. The round-trip reflectometer path length is observed to vary by ~3 mm (RMS value) during a DIII-D discharge. With the real-time correction, the measurement accuracy is improved. Since the wire retro-reflected signal is ~10 dB smaller than the plasma signal, no effect is observed on the plasma density measurement. Importantly, the wire calibration signal is approximately independent of the reflectometer launch polarization, allowing this polarization to be changed to match the plasma pitch angle. Supported by the U.S. DOE under DE-FG02-08ER54984 and DE-FC02-04ER54698.

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