

**RF POWER DIAGNOSTICS AND CONTROLS
ON THE DIII-D, 4 MW, 30-120 MHz FAST WAVE
CURRENT DRIVE SYSTEM***

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The DIII-D Fast Wave Current Drive System uses a pair of 2 MW transmitters to drive a pair of four current strap antennas inside the DIII-D vacuum vessel. This paper describes the diagnostics for this system.

A diagnostic system for these transmitters has been developed to measure the forward and reflected power plus voltages and currents in 56 places in the transmission line. Additionally the phase of all of these signals are measured to an accuracy of about 1° on a real time basis during a DIII-D shot. A unique superheterodyne receiver topology allows the two transmitters to operate at full power and within 1 MHz of each other without interference or diagnostic signal contamination. All power measurements are made on a microsecond time scale while phase measurements are made on a 100 μs time scale. Another unique feature of the superheterodyne receiver is the ability to make accurate (phase locked) measurement of the power and phase throughout the system while the transmitters are being frequency modulated to track transient plasma phenomenon. Because of the power and phase diagnostics throughout the system the transmitters can be exactly tuned to match the plasma with only one tuning shot into the plasma. This facilitates maximum RF power utilization.

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