

**CIRCUIT DESIGN TO STABILIZE THE REFLECTOMETER LOCAL
OSCILLATOR SIGNALS***

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Reflectometry is a very powerful tool to observe the fluctuations in a magnetically confined fusion plasma near a reflecting layer. By reflecting microwaves from different plasma layers simultaneously, the scale length of the fluctuations can be inferred from the correlation of the reflected signals. In order to map the radial correlation length of fluctuations in a fusion plasma, the frequency separation of two microwave beams needs to be varied cyclically through the discharge. The frequency separation of a reflectometer system on the DIII-D tokamak is capable of varying over 18 GHz. Due to the performance of the associated electronics for these LO frequencies, the power level at the LO port of the I/Q modulator might fluctuate so much that the I/Q modulator performance will be impaired. In order to correct this problem in the DIII-D reflectometer system, a simple leveling circuitry is introduced in the PPPL designed IF electronics. The components of this leveling circuit include a digitally controlled attenuator, an RF detector, a clock unit, a reference level unit, and an A/D converter. The combination of the RF detector and the digital controlled attenuator forms a feedback loop that effectively levels the LO power over a bandwidth of 18 GHz. According to the test results, the LO signal leveling was leveled to within 1 dB for greater than 16 dB input signal variation over the full dynamic bandwidth of the receiver.

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