Attention with Isolators

Isolators are extremely important in microwave test setups: they eliminate multiple reflections and improve vector corrections at the signal frequency. In particular after the input directional coupler in a load pull setup, an isolator eliminates measurement errors due to limited coupler directivity. Isolators also protect the driver amplifiers from power reflected at the source tuner, which might damage their output stages. Finally inserting a second input isolator after the driver amplifier and before the input coupler will ensure that the source impedance of the setup, which is the output impedance of the driver amplifier, will be well known.

However,
What is often forgotten is that isolators have a limited bandwidth: inside the operational bandwidth of the isolator we expect S11 < -20dB and S21 ~ 0dB, i.e. optimum behavior. The problem arises outside the operational bandwidth. In this frequency area isolators have S11 more than 0.5 and closer to 0.8 (see typical response below). This means that, if you test a strongly unstable device, there is a high risk that you will get spurious oscillations, in general at lower frequencies, independently on what you do with the tuners. In this case there is only one remedy: Insert a 3dB attenuator after the isolator and before the bias tee. This will improve the Return Loss looking into the isolator from the DUT side by at least 6dB. This is often enough. The drawback is that you will need more input power in order to saturate your device. This is a very important trade-off.