Conducted Immunity Test Notes.

Conducted Immunity tests are performed to determine the ability of a device to withstand the presence of RF signals on the cables or power cords attached to the device.

A bare-bones test setup would include a signal generator, amp and coupling device. A coupling device could be a CDN (coupler-decoupler network), EM-clamp, or a BCI (bulk-current injection) probe. More advanced setups would include a power meter and perhaps a measurement receiver and current probe.

Before a test can be performed, a calibration of the setup must be made. This would include all of the above equipment, as well as a calibration fixture and a measurement device. The purpose of the calibration is to determine how much of a signal must be generated from the amp in order to impose a certain level of interference on the device to be tested.

Since every device in the test setup will have a unique frequency response, it is not possible to go to just one frequency to determine what signal generator output is needed for a given test level. The signal generator level will change throughout the frequency range. This is where automated testing is very desirable. I have actually run a conducted immunity test manually, including the calibration! Very painful and time consuming!

The simplest calibration is one that will record a list of frequencies and signal generator levels. A more involved calibration would also include the forward power from the amp, and some calibrations also require a reverse power reading as well. A fully automated test setup is the only practical way to do this.

The simplest way of performing the immunity test would be to replay the frequency/level list, dwelling at each frequency for a period required by the test standard. The problem with this type of test is that the amplifier output could drift over a period of time, or the amp could even go bad without the operator's knowledge. If a calibration were performed once a year, and at the next calibration it was determined the amp was bad, there would be no way of knowing when the amp went bad and how many test results could have been affected.

A better way of performing the test would be to monitor the forward power, or even to adjust the signal generator level to return to the same power levels that were recorded during the calibration. Some test standards require this, and some even require repeating the net-power levels recorded during the calibration. (Net power is Forward-Reverse, in linear terms). Having the forward power levels adjusted on-the-fly will make the test more accurate and repeatable. If the amplifier goes out, this method would immediately detect this.

Yet another improvement is to monitor the actual induced current on the cable. This is done using a measurement receiver and a current probe. Some test standards require this under certain situations, such as when the impedance of the cable can't be maintained within a certain range. The level of testing can be modified if the current exceeds a certain value. Also, there are some real-time leveling tests that require the use of this type of feedback.

