

Application Note #70 emcware®

You've heard the old adage 'you get what you pay for' probably more times than you'd like, and you've probably also seen, more often than not, that this philosophy rings true. What you may not have seen very often is when the exact opposite occurs. One of those rare instances is AR RF/Microwave Instrumentation's emcware, a user-friendly comprehensive electromagnetic compatibility (EMC) test software package including automation routines for Radiated Immunity (RI), Conducted Immunity (CI), Radiated Emissions (RE) and Conducted Emissions (CE). Within these four test categories, there are over 500 pre-defined test setups already built into emcware. On top of that, emcware allows you to log, store and maintain all of the equipment in your in emcware's dedicated Equipment List.

The best part of all? emcware is FREE. AR provides this software to their customers free to complement its complete product line taking the hassle out of writing your own test code.

In this Application Note, we will discuss the features and benefits of emcware.

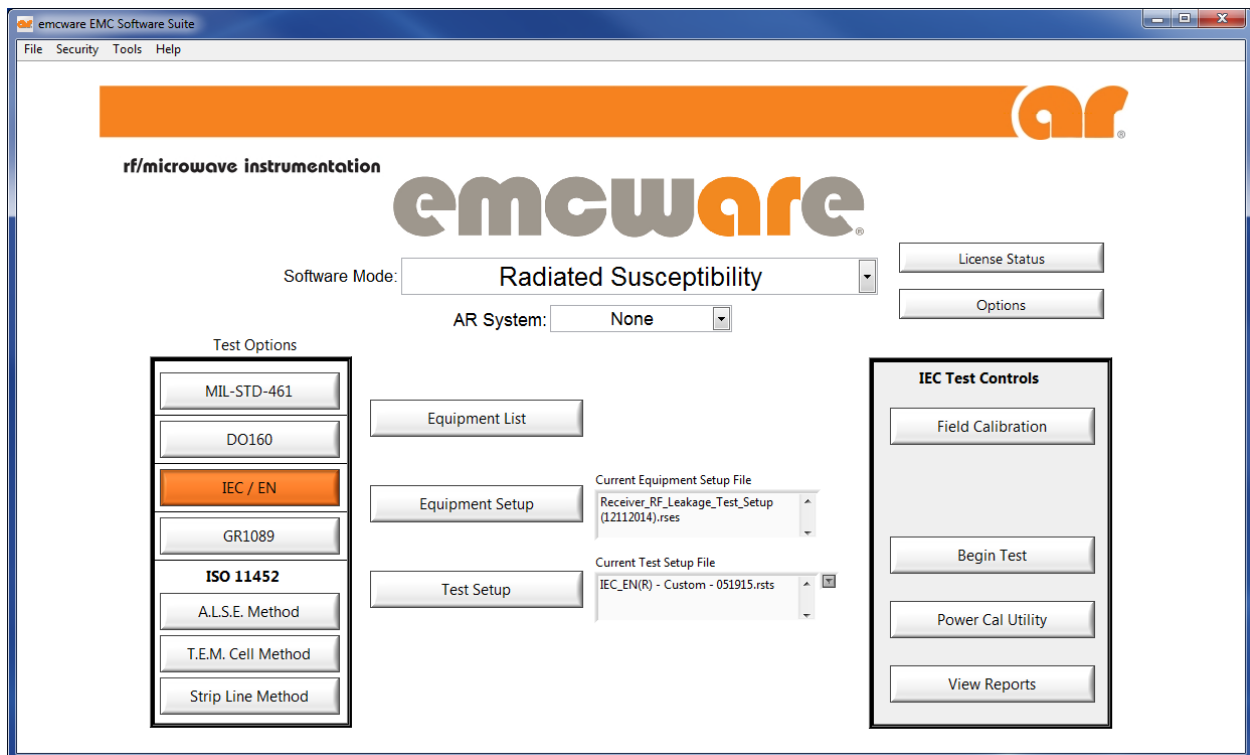


Figure 1 – emcware Main Window

Equipment Management and Setup

emcware's main window allows the user to easily identify which type of test will be performed (RI, CI, RE or CE), choose the EMC standard category and edit other global options. In general, before jumping into any kind of testing, it's important to be organized. After all, in any lab, organization is directly proportional to productivity. The same emphasis on organization is applied in emcware. This is where emcware's Equipment List comes into play. The Equipment List feature allows the

user to enter and store a wealth of information relating to all of their equipment required for testing. This includes Calibration Dates as well as Calibration Data. The Calibration Dates are entered by the user for each piece of new equipment and emcware provides warnings notifying the user when these calibration dates are close to or have expired. This can eliminate embarrassment and wasted time taking data with out-of-calibration equipment. Calibration Data can include attenuator values, frequency correction factors, cable factors, antenna factors, among others. This data can be entered manually or can be imported directly into emcware. Once entered, the data can be edited at any time with all changes immediately applied to all relevant test setups.

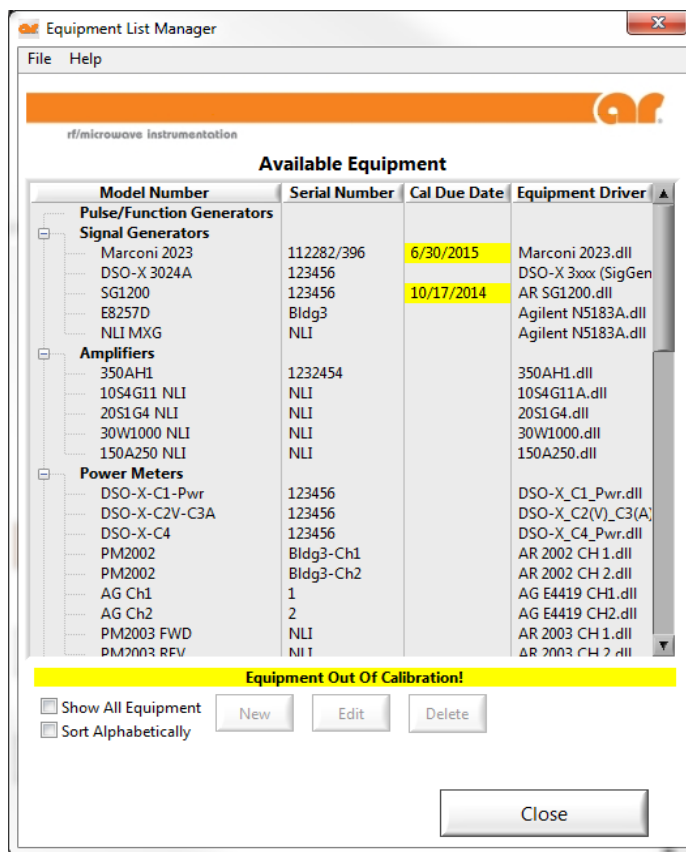


Figure 2 – Equipment List

Another key feature of the Equipment List is the extensive list of equipment drivers. emcware is designed to be used 'Out of the Box' to control most user's systems and thus has a library of over 300 equipment drivers with the complete list given in emcware's specification sheet available at www.arworld.us. Obviously, this is not a comprehensive list as there will always be the need for new drivers. With that in mind, AR can and has created new drivers. Drivers can also be created by the user in the form of dynamic link library (dll) files with AR providing the template.

Once all your equipment has been loaded into the Equipment List, you can begin the equipment selection process for the appropriate tests. This is done in the Equipment Setup window. Here, you can define a specific set of equipment to be used for a given test. Once complete, the Equipment Setup is saved and can be recalled later. Depending on which type of EMC test is selected to be performed, the Equipment List will adjust to accept inputs for only equipment

relevant to the test. For example, Figure 3 gives an example of an Equipment Setup window for RI testing.

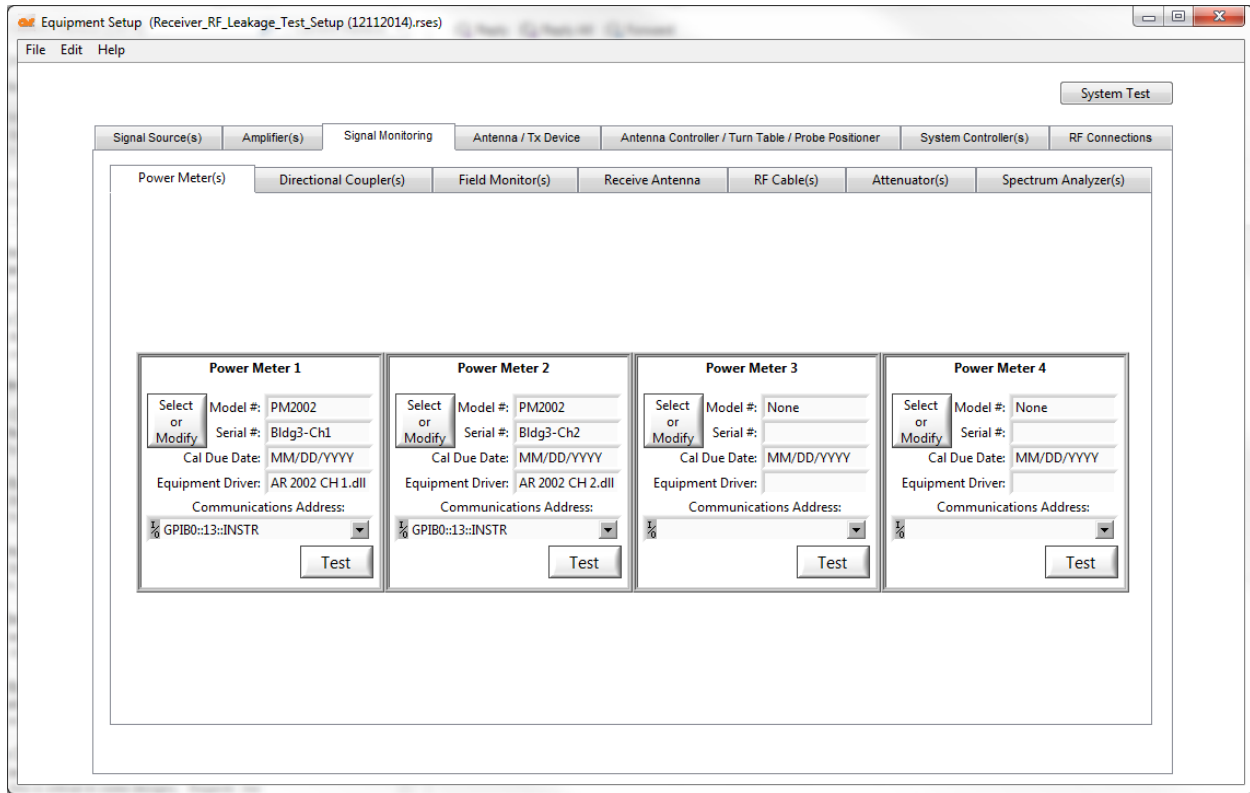


Figure 3 – RI Equipment Setup

In addition to selecting equipment, the Equipment Setup window allows several other useful features. If a piece of equipment can be controlled through remote communication, the Equipment Setup is where the user assigns the appropriate communication address. Once an address is set, the user can then send individual commands to the equipment to verify communication and operability. In the case of RI and CI Equipment Setups, the System Test button allows the user to test communication and operability of the entire test system. This allows the user to generate test fields or injections to ensure all equipment is working properly. Figure 4 shows an example System Test window for RI testing. If the setup includes an SC1000 System Controller, RF switch connections are also defined in the Equipment Setup window. Once all equipment is selected and verified in the Equipment Setup, the user can begin calibrations and/or testing depending on whether they are performing immunity or emissions testing.

Immunity

One of the biggest benefits of emcware is the amount of flexibility it provides when performing immunity testing, specifically, RI and bulk cable injection (BCI) testing. emcware provides full control over frequency, test level, tolerance and leveling parameters. It also provides a multitude of pre-loaded test setups including (but not limited to) IEC, MIL-STD-461 and DO-160 to help reduce user-error when defining a test setup. Once a user has selected a pre-loaded test setup, emcware automatically places a lock on all parameter editing, making it impossible for the user to save over any of the pre-loaded test setups. If the user decides they want to create their own test based on a pre-loaded test, they can choose to disable the lock which previously blocked them from edits and save the new test setup as a custom test setup. See Figure 4 for a BCI example of emcware's Test Setup window. The overall format remains the same for RI.

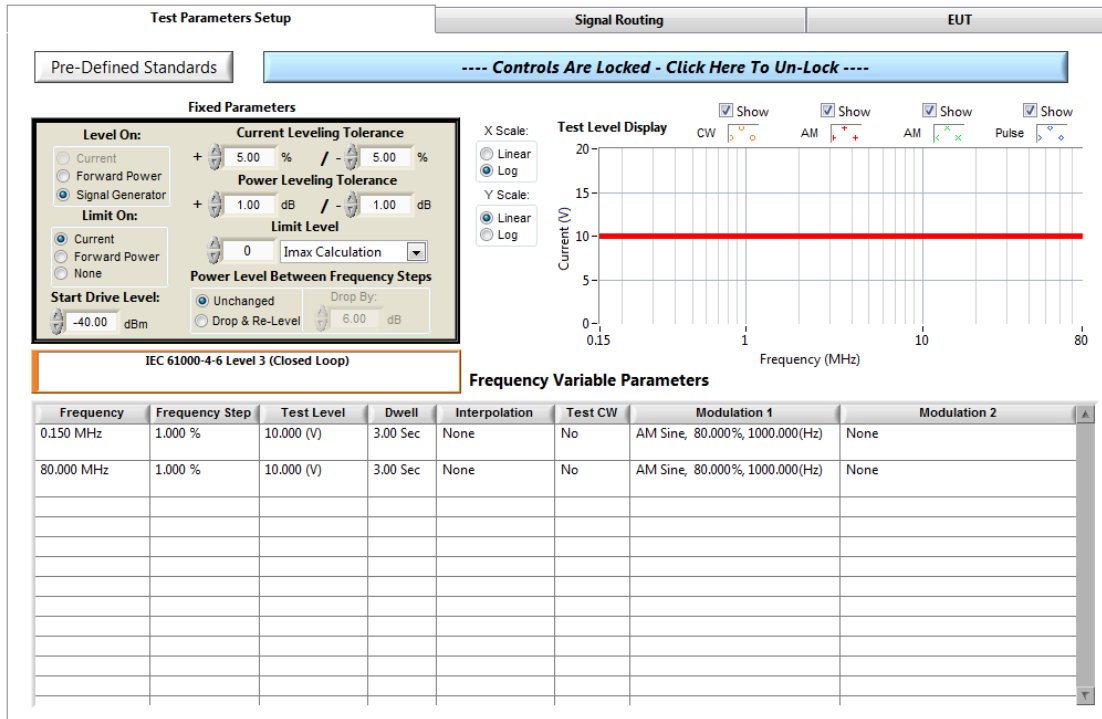


Figure 4 – Test Setup Window

The next step in the Test Setup routine is for the user to define their Signal Routing. The Signal Routing function presents the user with a block diagram of the test setup and allows the user to assign equipment from their Equipment Setup for defined frequency ranges. This becomes especially useful when there are multiple transducers (antennas, bulk current injection clamps, etc.). Figure 5 shows a blank signal routing associated with a typical IEC 61000-4-3 RI test configuration. The last tab of the Test Setup window provides equipment under test (EUT) monitoring. emcware allows communication with a National Instruments (NI) Data Acquisition Card (DAQ) for monitoring Digital and Analog Signals or any other remotely interfaced monitoring device (voltmeter, Oscilloscope, audio monitor, BERT tester, etc.) from the equipment list. Using this approach, the user can setup direct communication between the EUT and emcware so that emcware can initialize, exercise, monitor, reset and power down the EUT. While monitoring, any status changes and failures are detected immediately by emcware and therefore the user is aware of the exact point of failure.

Once the test setup is complete, the user is ready to perform testing. With many RI and CI tests, a level setting calibration must first be performed. For many test standards, emcware offers fully-automated calibration procedures which can control all functions, including antenna and probe positioning, while monitoring all relevant information, evaluating calibration pass/fail and storing all data into a calibration file for later recall.

Similarly, emcware offers fully-automated and fully-controlled test procedures to compliment the calibration procedures mentioned above, as well as for many standards that don't require formal calibration. An example of an RI test window is given in Figure 6. In addition to active monitoring of all relevant parameters, emcware has a unique Report Event tool used for addressing any anomaly the user observes. Once selecting the Report Event function, the test is paused at that

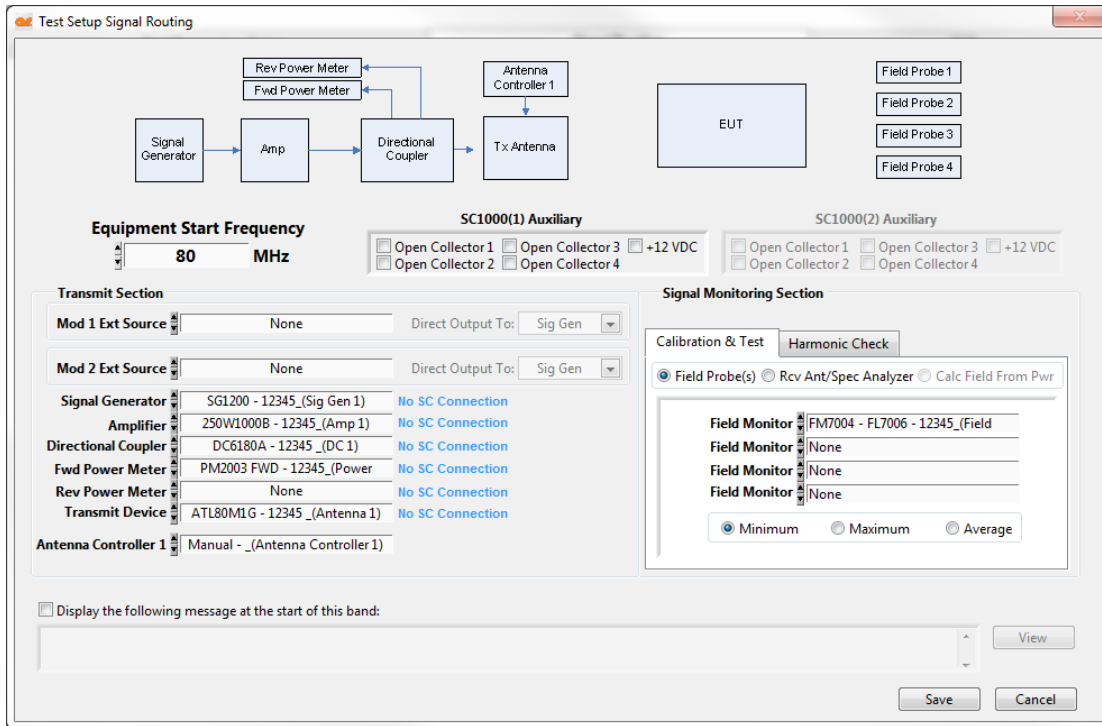


Figure 5 – Immunity Signal Routing

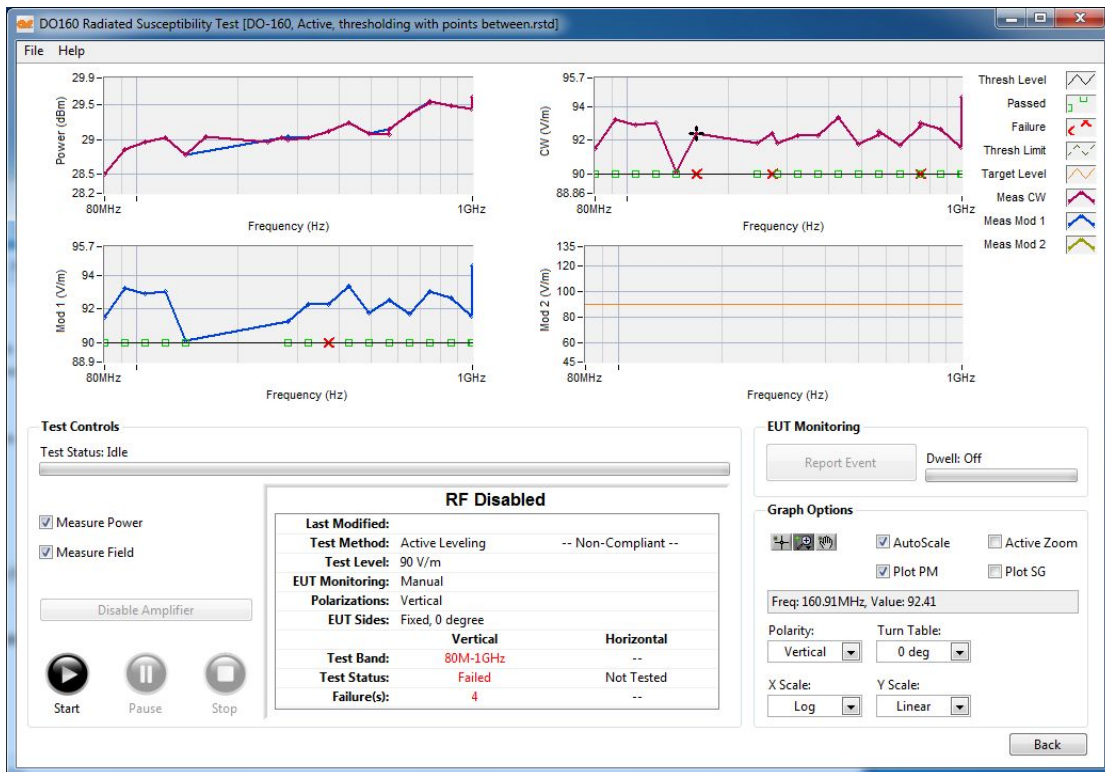


Figure 6 – Immunity Test Window

particular frequency, allowing the user to search around the anomaly in frequency and in amplitude to determine if there truly is an EUT failure and the threshold of failure is, if applicable. If the anomaly in question is truly an EUT failure, the user can choose to document the result to be displayed in the report. Otherwise, the user can choose to continue with the test from exactly where they left off.

After completion of the test, the user can choose to produce a report. emcware's Report function gives the user a full report of all test and equipment information at the push of a button. This includes a detailed test summary, test status, test parameters used, recorded data plots, recorded tabular data and the equipment setup including all equipment used in the test.

Emissions

In addition to the immunity capabilities, emcware also offers radiated and conducted emissions capabilities. Similar to the immunity capabilities, the emissions portion of emcware includes pre-loaded test setups for CISPR, MIL-STD-461, DO-160 and many other common standards. By selecting the testing category, emcware loads all of the appropriate scan parameters and scan tables. Emissions testing in emcware follows the same principles for equipment selection and setup as immunity testing, but, starting with the Test Setup, the emissions package begins to diverge. The Test Setup window in the emissions portion of emcware is essentially only the Signal Routing feature seen in immunity, tailored to the appropriate type of emissions test that you're running. Once inside the Test window, the user is presented with several tools for test automation, reporting and customization.

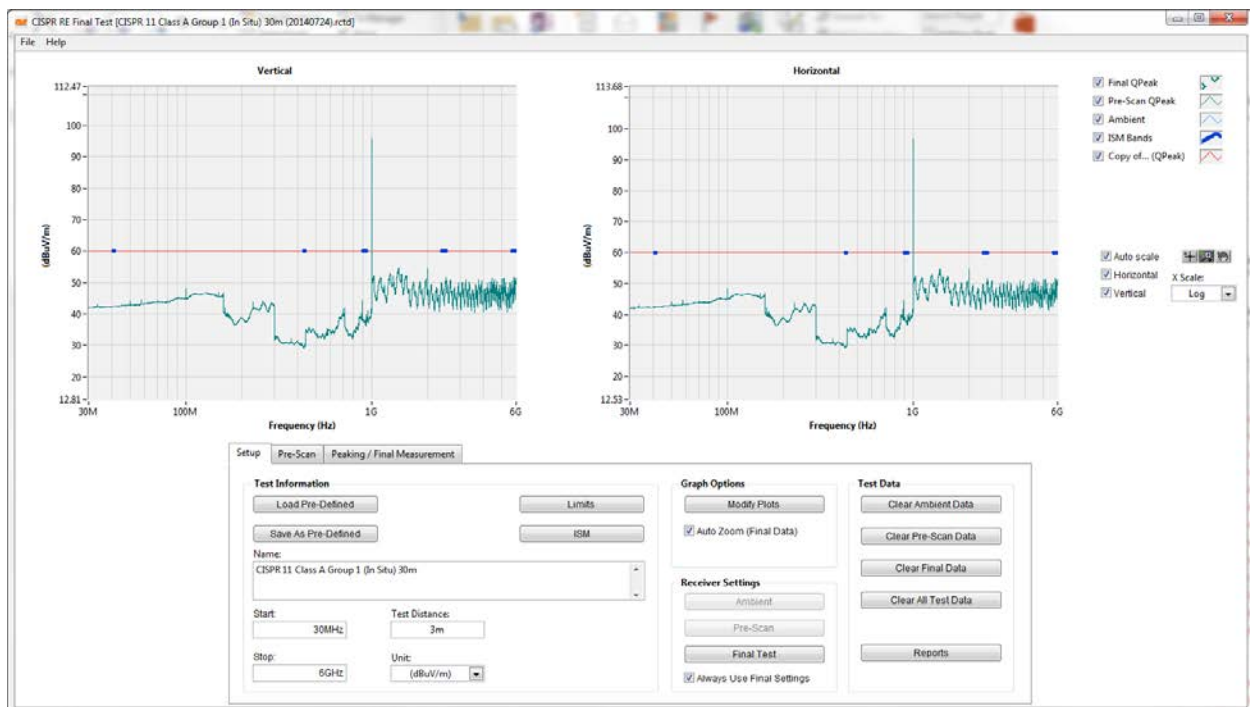


Figure 7 – Emissions Test Window

Figure 7 (previous page) gives an example of a CISPR radiated emissions Test Window. Here, the user has the flexibility to load and manipulate limit lines, add Industrial, Scientific and Medical (ISM) frequency exceptions, adjust scan parameters and perform Ambient, Pre-Scan and Final measurements. While making measurements, emcware offers an Investigate tool that allows a user to make additional measurements in an area of interest and record the information for inclusion in their final report. Once the scan is complete, emcware allows the user to easily select points of interest for final measurement when applicable. The user can also append the scan with additional data from other polarizations, EUT configurations, etc. All of this information can then be added to a comprehensive report, similar to the immunity reports described earlier.

Conclusion

When choosing an EMC test software package, many factors must be considered. What types of testing must be performed? What level (compliance, pre-compliance, contract acceptance, etc.) of testing must be performed? Will the software increase the quality of testing while also reducing overall test time? AR RF/Microwave Instrumentation's emcware can be the answer to all of these questions, all at zero cost to the user. If you would like to learn more, feel free to contact one of our applications engineers at 800-933-8181 or visit our website at www.arworld.us.