Application Note #70A
emcware® v4.0

emcware is an intuitive, user-friendly, customizable and comprehensive electromagnetic compatibility (EMC) test software package. It is very comprehensive and includes automated routines for Radiated Immunity (RI), Conducted Immunity (CI), Radiated Emissions (RE) and Conducted Emissions (CE). These four test categories include over 500 pre-defined test setups built into emcware®. In addition, emcware® allows you to log, store and maintain all of the equipment in the Equipment List Manager. Compared with other EMC test software that is purchased as separate test category packages, you can see why AR's emcware® is a better alternative.

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

Equipment Management and Setup

The main emcware® screen shown in Figure 1 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. This input screen helps you organize the basic items needed to perform the required tests in an automated, organized and efficient manner while providing the utmost accuracy.

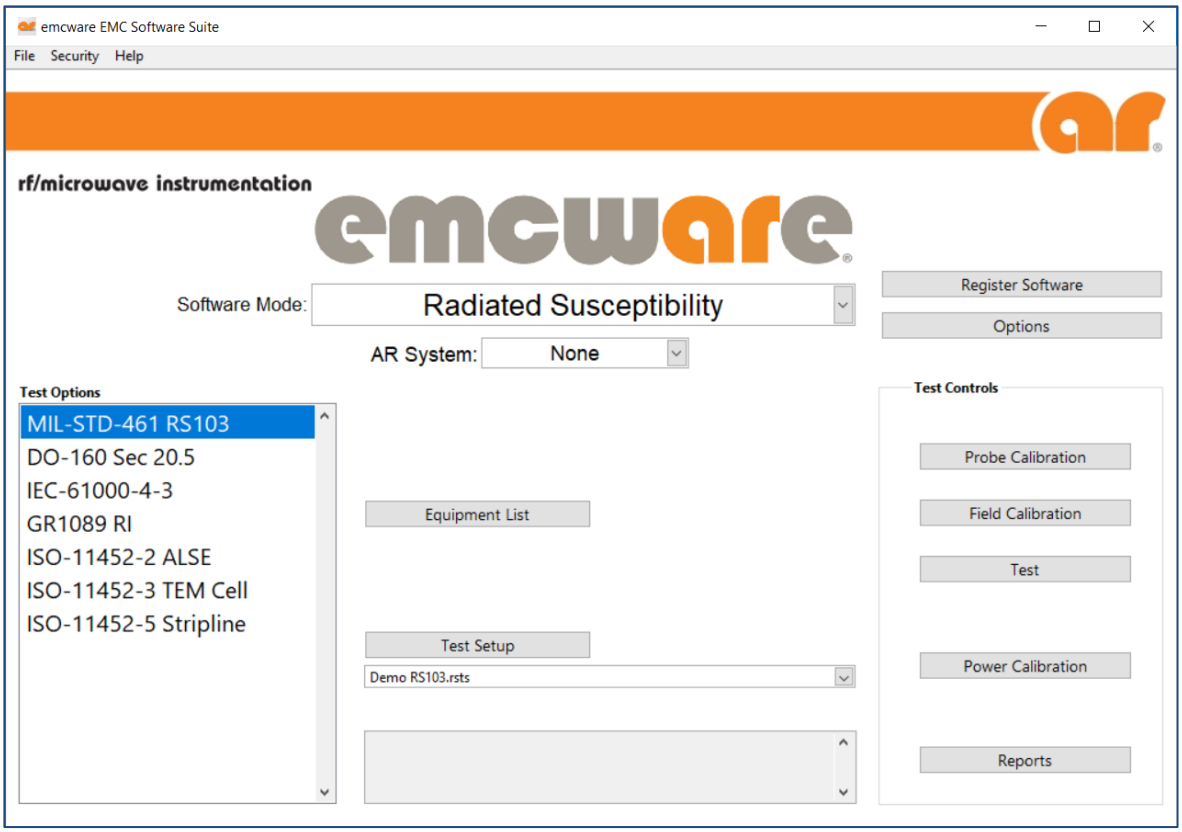

Figure 1 –Main Screen

The Equipment List Manager shown in Figure 2 allows the user to enter and store a wealth of information for all equipment required for testing. It also includes calibration dates as well as calibration data. The calibration dates are entered by the user for each piece of equipment, and emcware® notifies the user when these calibration dates are close to or past expiration. This can eliminate wasted time taking data with out-of-calibration equipment. Calibration data can include attenuator values, frequency correction factors, and cable and 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.

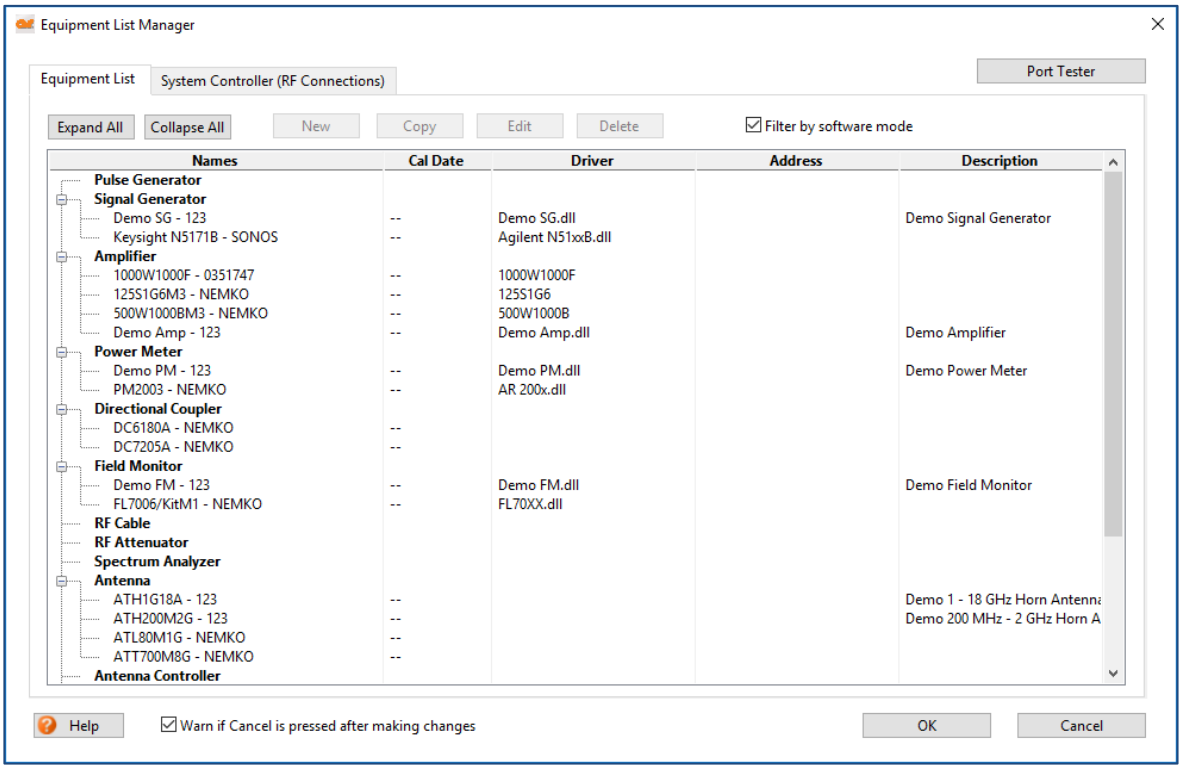

Figure 2 – emcware® Equipment List Manager

Another key feature of the Equipment List Manager is the extensive list of pre-loaded 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 the emcware® specification sheet available at www.arworld.us. If additional drivers are required, they can be created by the user in the form of dynamic link library (.dll) files using the installed driver templates. AR can also create new drivers at a small charge as needed.

In addition to selecting equipment, the Equipment List Manager window allows several other useful features. If a piece of equipment can be controlled through remote communication, the Equipment List Manager is where the user assigns the appropriate communication address. Once an address is set, the user can test the driver's functionality by clicking the Test button to open an equipment specific communications test window. Various other global parameters can be set as well. Figure 3 gives an example of the information that can be entered for an amplifier.

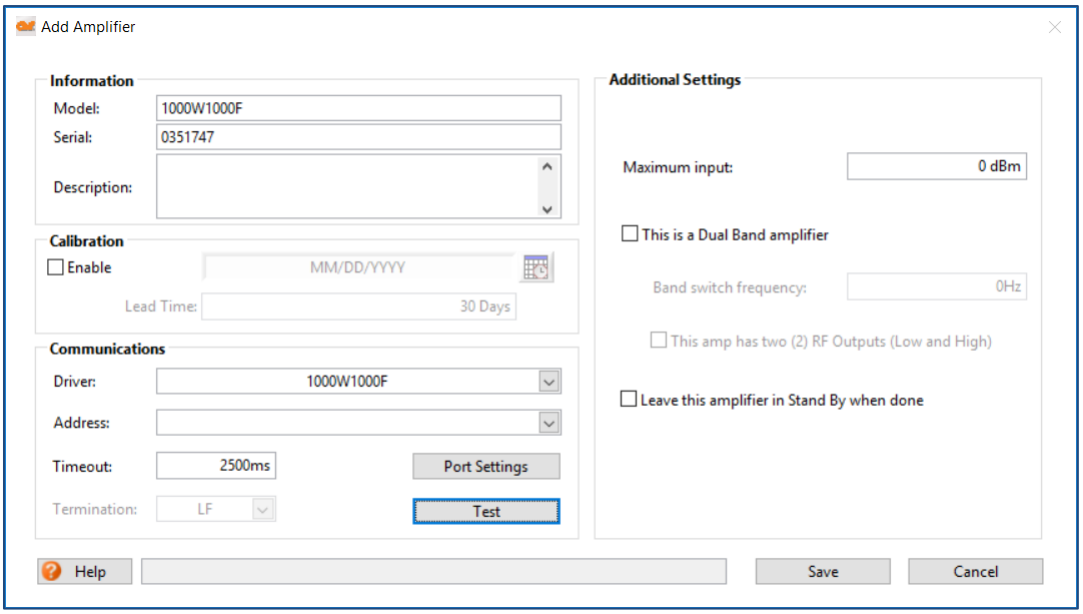

Figure 3 – Equipment Characteristics

The Port Tester window is a tool that can be used to send individual remote commands to any connected equipment and is designed as an aid to the user when developing an EUT monitor or a custom driver. If the setup includes an SC1000 or SC2000 System Controller, RF switch connections are also defined in the Equipment List Manager. emcware® provides full control over AR System Controllers as shown in Figure 4.

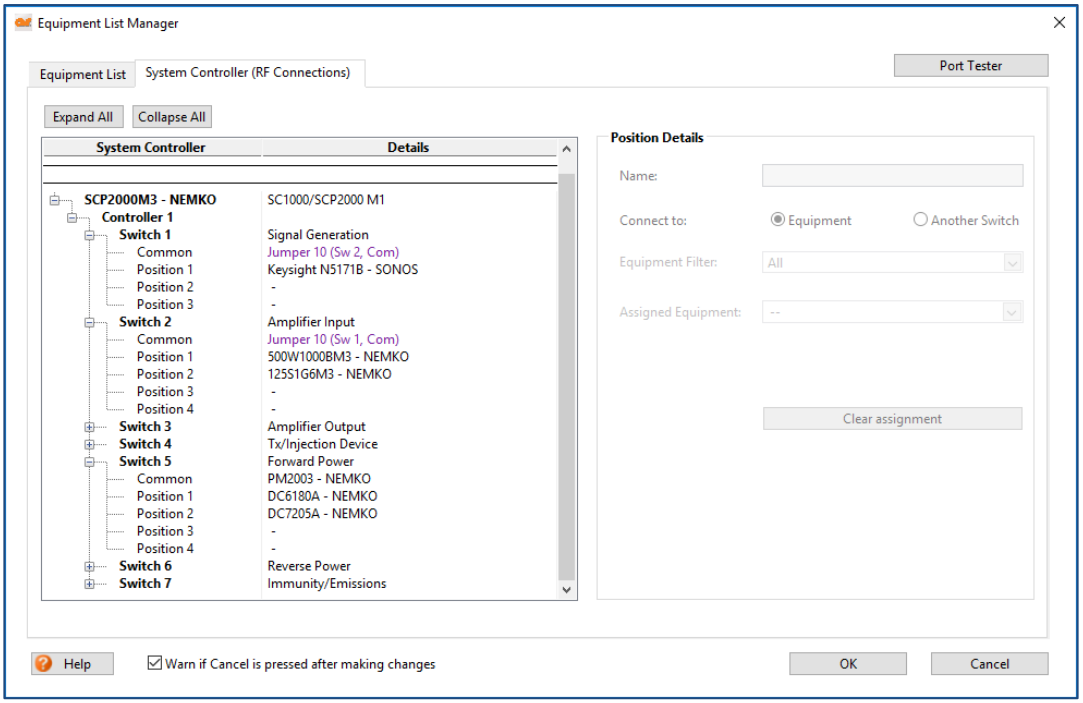

Figure 4 – System Controller Connections

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 while maintaining a simple user interface. 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, ISO and DO-160 to help reduce user-error when defining a test setup. See Figure 5 for an RI example of the emcware® Test Setup window. The overall format remains the same for BCI.

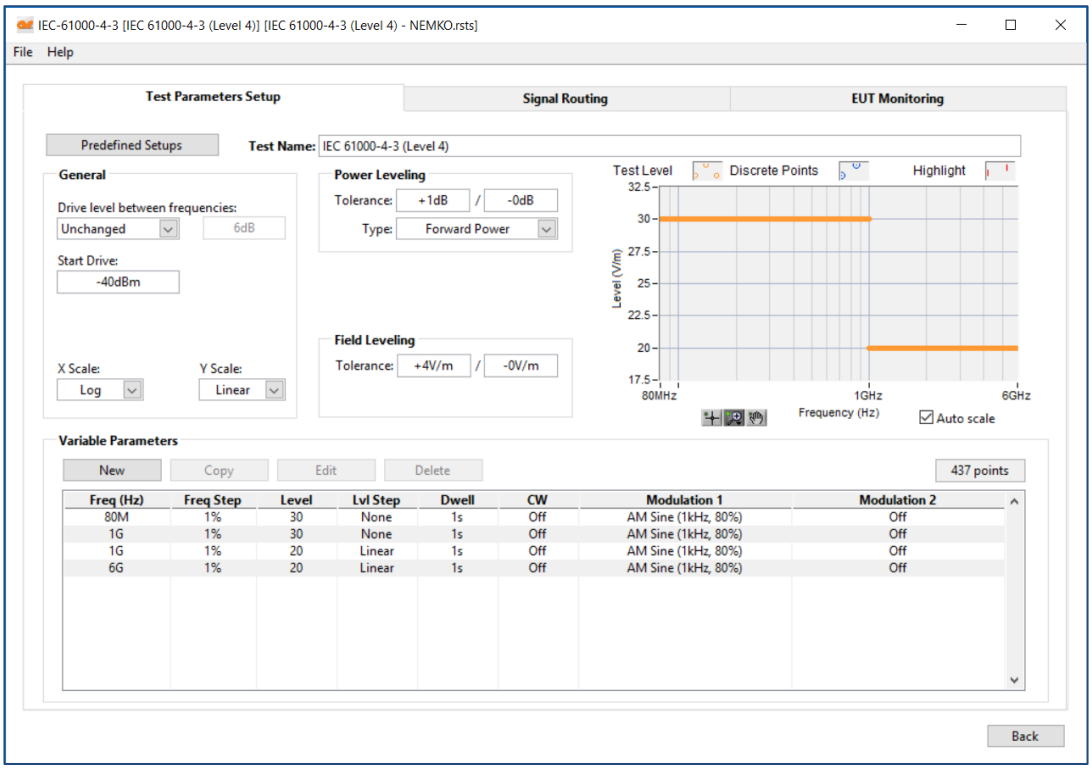

Figure 5 – Test Parameters Setup Window

The next step in defining a Test Setup 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 List Manager for defined frequency ranges. This window becomes a great reference to complete test setup and especially useful when there are multiple transducers (antennas, bulk current injection clamps, etc.). Figure 6 shows an example 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 Manager. 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. 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 7 shows an example System Test window for RI testing.

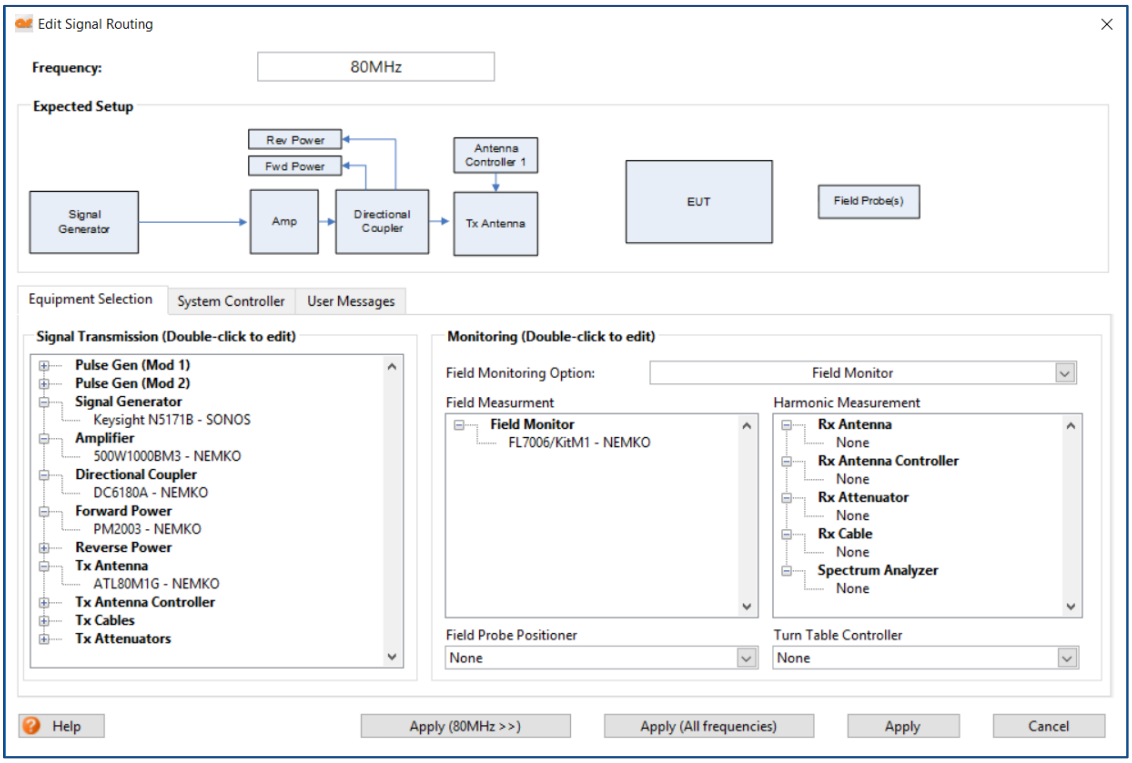

Figure 6 – Signal Routing

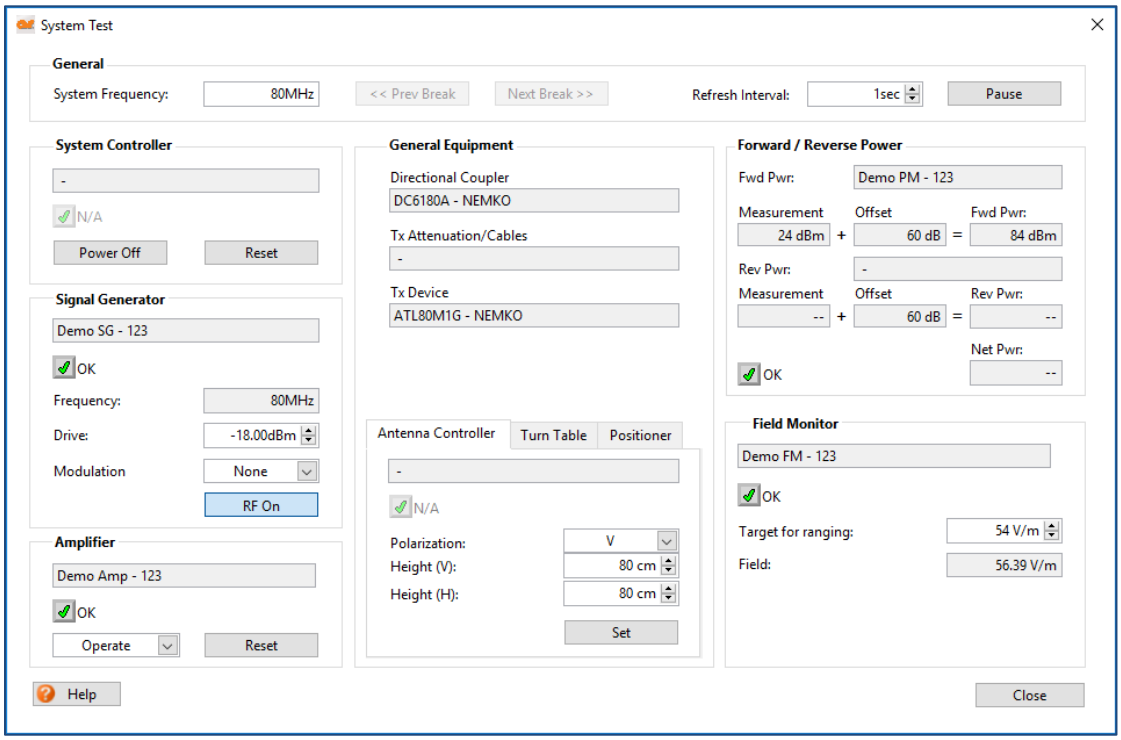

Figure 7 – System Test

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 8. In addition to active monitoring of all relevant parameters, emcware® has a Report Event tool used for addressing any anomaly the user observes. Once the Report Event button is pressed, the test is paused, and the user is free to manually change the test level, frequency, and dwell time to evaluate the extent of the anomaly and determine the true threshold of the EUT's susceptibility. If the anomaly in question is truly an EUT failure, the user can choose to log the results, or if no failure is found, can choose to discard the data and continue with the test from exactly where they left off.

After completion of the test, the user can choose to produce a report. The report function for emcware® 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. The test report(s) can be printed in Microsoft Word, Excel and PDF formats.

Figure 8 – Radiated Immunity Test Window

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 9 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.

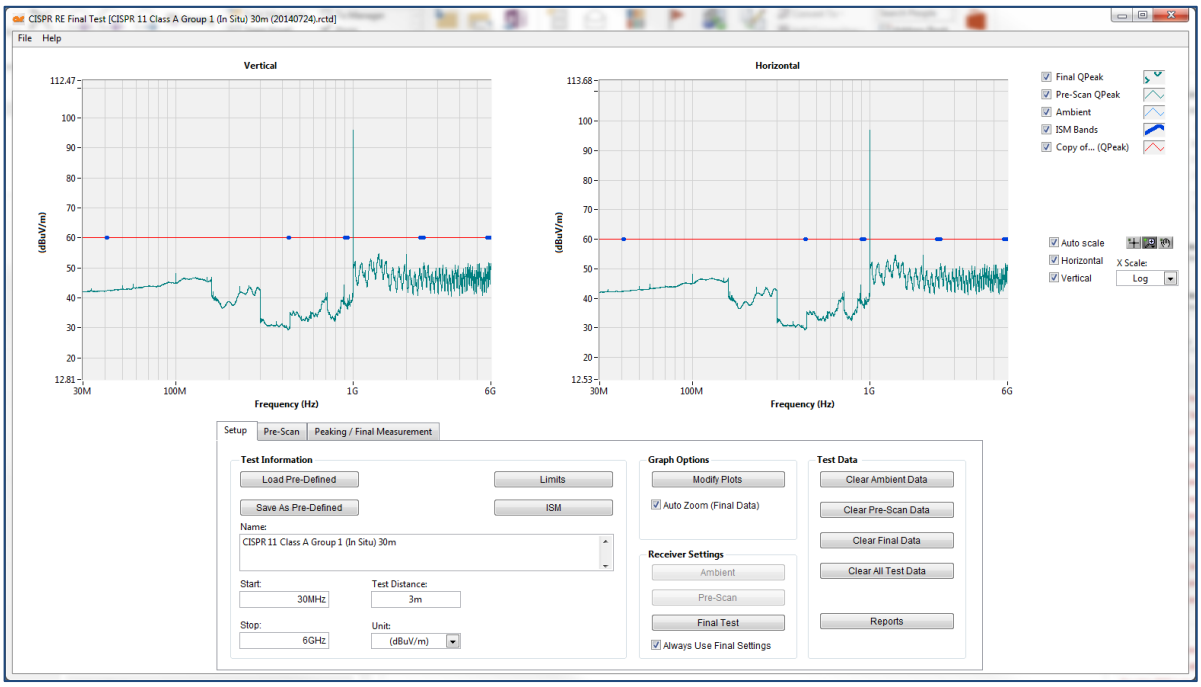

Figure 9 – CISPR Radiated Emissions

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? Can the software perform many tests in one comprehensive package? (Most other competitive software only perform one category of tests and you must purchase additional packages to perform these tests). AR RF/Microwave Instrumentation's emcware® can be the answer to all of these questions. 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.