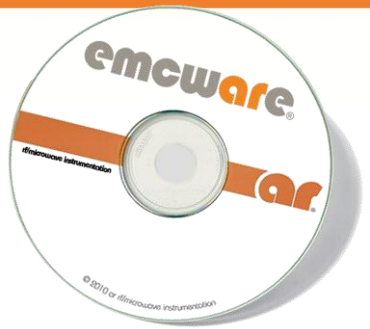
AUTOMATED EMC TESTING TO MAKE YOUR JOB EASIER

Presented By AR's emcware

rf/microwave instrumentation



Flynn Lawrence

Flynn Lawrence is an Applications Engineer for AR RF/Microwave Instrumentation. At AR, Flynn is actively engaged in new application and product development and testing, worldwide sales and customer support, as well as hardware demonstrations and training. Prior to joining AR, Flynn was an EMC Systems and Test engineer, working in requirements maintenance, test planning and test execution on military space components and systems.

Agenda

- Overview of traditional approaches without the use of software
- Negative aspects of EMC test software
- Benefits of EMC test software
- Attributes necessary for a successful software package
- The future of EMC Test Software

Overview of Traditional EMC Test Approaches Without the Use of Software

Traditional testing required juggling of an enormous amount of information

- Equipment calibration data / calibration dates
- Correction factor data (cables, attenuators, preamps, etc.)
- Frequency Data
  - Step sizes, Notches and Dwells
- Limit Data
- Injected signal and Field Calibration Data
- Recorded Emissions Data

Overview of Traditional EMC Test Approaches Without the Use of Software (continued)

Traditional manual approach provided data, but was susceptible to human error.

- Performing measurement calculations incorrectly
  - Incorrect calculations can lead to missed outages and out-of-spec conditions
- Large volume of data can be overwhelming to handle manually
- 'Autopilot' - Carelessness due to repetitive nature
- Depending on the EUT, failure detection could easily be missed
- Mitigation efforts relied heavily on experience of the test engineer/technician

Overview of Traditional EMC Test Approaches Without the Use of Software (continued)

The traditional manual approach was more time consuming

- Manual data reduction
- Lack of automation of probe positioner / antenna positioner makes field calibration unruly
- Have to constantly reload correction factors into measurement receiver or apply corrections after data recording
- Reports are created manually
- Human reaction times lead to longer field leveling and dwelling

Overview of Traditional EMC Test Approaches Without the Use of Software (continued)

There has been a transition from purely manually performed testing to full implementation of complete software packages.

- As budgets decrease, need for efficiency is always increasing

Many labs created their own software using various languages and implementations

- Tools such as Microsoft Excel were used to perform data manipulation
- LabVIEW gained popularity for instrument control

Negative Aspects of EMC Test Software

Overuse of valuable test resources

- Ongoing training of test lab personnel, to maintain skill set of complicated software
- Homegrown software
  - Generally one person developed and managed the software
  - Development takes test resource away from testing
  - If developer leaves, maintenance and support most likely ends, or learning curve with next resource
- Time required to enter correction factors, calibration due dates, equipment drivers

Negative Aspects of EMC Test Software

Overuse of valuable test resources (cont.)

- Software Validation
  - ISO 17025
  - Internal Quality Management System
  - Can be a monumental task if software developer provides no validation documentation
- Software that is not out of the box ready to use requires setup and configuration
- Lack of customer support from software company

Negative Aspects of EMC Test Software

Cost associated with some software packages

- Often times, several add-ons are needed to achieve desired functionality
- Expensive Initial AND recurring support costs
  - Even with support contracts, getting sufficient support can still be a challenge
- Potential additional cost associated with software updates
- Modular software (CE, CS, RE, RS) (i.e. separate packages for each test)

Negative Aspects of EMC Test Software

Technical issues with software

- Unexpected bugs and crashes
- Software wide open to user changes, often increases complexity and introduces errors
  - Poor software security could allow people to make changes (intentional or unintentional) to test procedures which could counteract ISO 17025 validation
- Software functionality was not fully tested before being made available to the public

Some tests are not conducive to full automation

- ESD Testing

Benefits of EMC Test Software

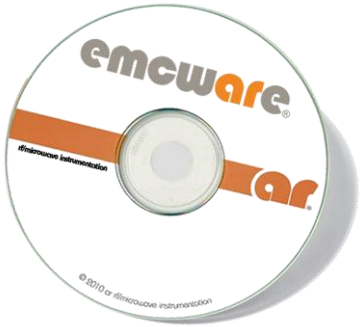
Better repeatability

- Consistent approach across test personnel
  - Test methods are either pre-programmed or programmed by the user once and stored in the software
- Some software packages provide System Administrator functions which allow improved security by restricting user ability to edit or modify the test
- Less opportunities for error
  - Input data and parameters are only entered once
  - Discreet frequency stepping

Benefits of EMC Test Software

Better accuracy

- Some packages offer EUT monitoring capabilities through DAQ (data acquisition) interfaces to quickly report failures at the precise moment of failure
- Less opportunity for rounding errors
- Determination of susceptibility thresholds and emissions outages are more precise
  - Clear and discreet frequency steps



Benefits of EMC Test Software

Reduces overall test time

- Eliminates the ‘human factor’
  - Inaccurate frequency steps
  - Longer dwells
  - Longer leveling times

Simplifies mitigation efforts

- Software can maintain a record of all mitigation steps taken to avoid backtracking
- Some software packages offer automated functions to determine susceptibility thresholds

Benefits of EMC Test Software

Simplifies reporting efforts

- Allows the transfer of information and data to multiple software platforms (e.g. Microsoft Excel and Word)
  - Can also allow integration of all data into one report
- Consistent formatting
- Software provides all equipment calibration information
- Alert user that calibration period is running out
- Frees up test resource to continue testing efforts rather than writing a formal report
- Calculations are error-free
- Avoid missing any key information or data

Attributes Necessary for a Successful Software Package

Software that offers flexibility without complexity

Software containing full test suites (e.g. MIL-STD-461, FCC, EU standards, IEC, automotive, Telecom, ISM, etc.)

Easy to implement or modify test profiles

- Modify existing test profiles
- Create new profiles from scratch

Wide array of drivers

- Driver updates and additional drivers are readily available

Attributes Necessary for a Successful Software Package

Software that is fully functional and supported

- Check company's commitment to the software
  - Years in business
  - Number of software resources devoted to maintenance and developing new features
  - What level of verification has the company performed on their own software?
- As with any software, test personnel must review and verify software's capabilities to ensure it is appropriate for use

Thorough report generation and data extraction

Attributes Necessary for a Successful Software Package

Support, either through direct contact with software or applications engineers, or embedded help features

Willingness of software developers to enhance features based on customer requests

Awareness of standards and willingness to evolve software based on new standards and standards updates

The Future of EMC Test Software

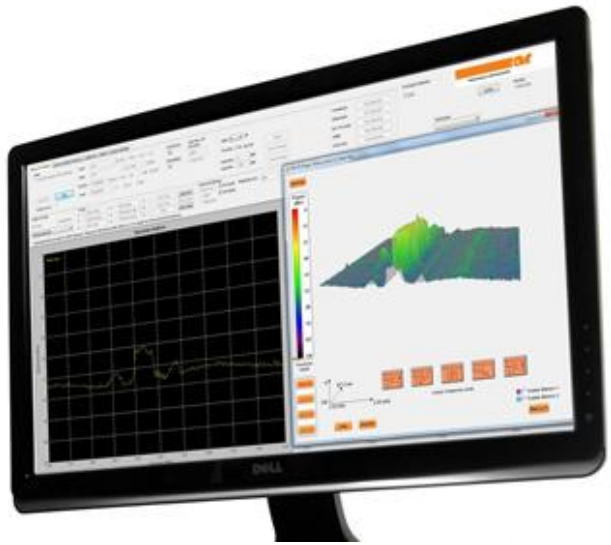
Many ‘complete’ software packages do not offer conducted transient or magnetic field susceptibility testing

- The majority of ‘complete’ software developers do not directly manufacture equipment to perform these tests
- A lot of test equipment that is designed specifically for these tests contain embedded software packages or narrow-scope software

The Future of EMC Test Software

Real-Time receiver capabilities

- Hardware capable of performing Real-Time measurements are just now beginning to gain momentum
- In some cases, software packages may only configured to run hardware in stepped-scan mode
- Utilizing Real-Time capable hardware in this way defeats the purpose as scan-speed benefits cannot be realized



The Future of EMC Test Software

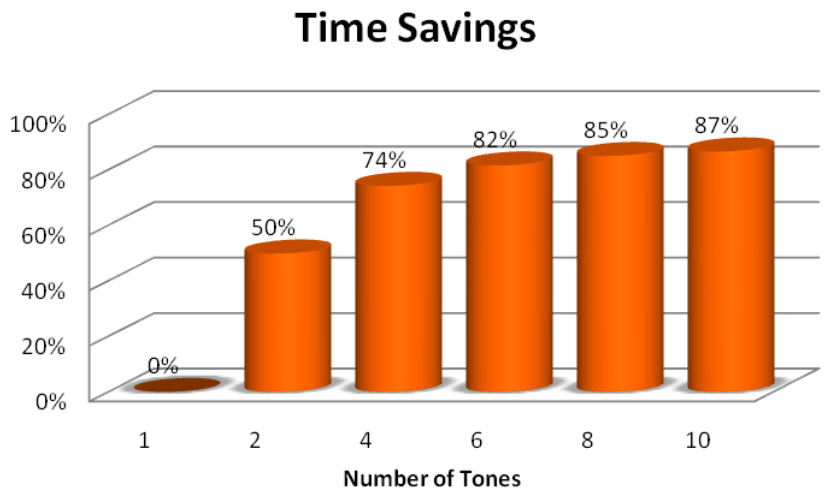
Multi-tone radiated immunity techniques

- Typical radiated and conducted immunity testing performed by testing a single frequency during a dwell period
- With Multi-tone, multiple frequencies are tested at once
- Concept is simple, but actual implementation can be more difficult
- Vector signal generation and analyzing has made hardware implementation of Mutli-tone testing more realistic

The Future of EMC Test Software

Multi-tone radiated immunity techniques

- However, manual handling of the full Multi-tone calibration and test routines can quickly eliminate any time savings gained from Multi-tone testing
- With the aid of software, one can automate field uniformity, amplifier linearity, Multi-tone calibration and test duties
- With full automation, Multi-tone testing can save an enormous amount of time when measured against traditional testing



The Future of EMC Test Software

Remote Testing

- The marriage of automated EMC test software, EUT monitoring and EUT control can lead to fully remote testing
- In today's wireless world, testing could be set up, run and monitored from multiple devices
- With the proper setup, this can ensure tremendous speed and accuracy improvements

Conclusion

Many factors must be considered when moving from a manual to automated test approach or upgrading software packages

- Different factors for different levels of testing (compliance, pre-compliance, contract acceptance, etc.)
- Depending on specific needs, software value should not necessarily be judged on cost

Important to consider what your current and future needs will be when selecting a software solution

A well-designed EMC test software package should increase the quality of testing while reducing overall test time

Thanks for attending!

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