Improving the Next Generation of Radio Test for Tactical and Public Safety Radios

Submitted by Keysight Technologies

Tactical and public safety communications continue to advance and has evolved designs to more complex radio technologies. New radio communications technology must address today's demand for more information, faster, and with increased bandwidth and frequency range. Many engineers are challenged to increase test capability while keeping new test system costs, including instruments and development time, to a minimum.

This article provides recommendations to overcome the key radio test system development challenges engineers face.

Design and test engineers are challenged to develop radio test systems that address older radio standards as well as create new designs with the most recently developed standards. MilCom (military communication), avionics, and land mobile radio (LMR,) including public safety and commercial radio applications, implement similar architectures and functionalities to ensure the quality and reliability of voice and data communications. Greater design and test challenges are associated with the different analog/digital modulation schemes, increased frequency band, and encryption algorithms for these radio systems. Managing overall test cost requires attention to each phase of radio device development, from R&D, through validation, and manufacturing, to ensure reliable, repeatable test results that correlate to other areas of test, and prevent re-test, or even re-design, when results cannot be verified by R&D. Effective radio system development and test, can quickly be achieved at a lower cost by following these key radio test system recommendations:

Test automation

Test automation can help accelerate both system development and test execution. Software development applications help to quickly connect instruments, generate signals, make measurements and provide results. Automated test is essential for fast test execution. In addition to faster test system development and execution, automated test can provide repeatable, reliable results by performing a test sequence, using the same measurement algorithms, without variation. With automated test you also have the ability to quickly display and view the summary of the test results for pass/fail test and to start any needed corrective action.

Correlate results for each test phase

As a radio design progresses from R&D, through validation and then manufacturing, engineers expect to see similar measurement results. If the results vary, engineers must spend valuable

time to troubleshoot where the differences have occurred. The variation could be due to the device under test, or caused by using different instruments. Determining the root cause of the different results can be very time consuming and hard to solve. To save time and ensure results that correlate between the various test phases, it is important to use the same test equipment and configuration or, use instruments from a single vendor that provides the same command and measurement algorithms between instrument platforms such as using bench in the R&D phase and then PXI during manufacturing. Using instruments from the same vendor with the same measurement algorithms can ensure more accurate, repeatable and consistent measurement results across all test phases, saving valuable development test time.

Instrument selection

Measurement accuracy, and overall test time depend greatly on the choice of instruments used in a test system. Choosing instruments from a reliable vendor will help to achieve confidence in test results. PXI instruments should also be considered for the benefits they provide including a smaller test footprint and increase test speed. PXI systems also offer a modular architecture making it easy to increase the number of channels and add to the measurement capabilities as the test system changes and/or grows.

Instrument calibration

Results that are not repeatable or gradually become worse over time cause measurement uncertainty, and ultimately false passes or product failures. Measurement uncertainty can be managed by routine instrument calibration to ensure instruments operate at factory-shipped specifications and produce accurate and repeatable results.

Consideration of these test recommendations will help to expedite radio test system development, ensure accurate and reliable results quickly, and continue to produce results you can to be confident in. Ultimately, this will help you build a test system to address the next generation of radio test for tactical and public safety radios.

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