Brainstorm: Test & Measurement

Discuss the importance of test and measurement, especially as it relates to the development of advanced design software.

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DC I-V characterization of electronic materials and devices is fundamental in the development and production of new products. Today's advanced products are difficult to test and characterize; they require greater measurement precision over a wider range of conditions than ever before. These demands are colliding with lean test engineering staffs and budget constraints that require more productivity from test and measurement (T&M) instruments. This should prompt engineering managers to ask themselves, "Have we equipped our T&M operations with cost-effective instruments that supply the best combination of precision, throughput, and flexibility for our diverse applications?"

Like many other electronic products, T&M instrumentation is evolving so fast that unless purchased recently it probably doesn't meet this standard. It's certainly true of source-measure units (SMUs), which are the workhorses of DC I-V characterization. For several years, SMUs have been replacing general purpose instruments, because SMUs combine precision voltage and current sourcing with precision response measurements on devices under test. Today's SMUs supply automated measurements over the widest dynamic range of voltage, current and power, with the highest resolution and accuracy, low noise, fast A/D converters, multi-channel scalability, flexible I/O and data communications, plus simple yet powerful application software. Embedded in some of these SMUs is a test script processor, (for example, Keithley's TSP technology), an I-V test utility that precludes the need for additional software or programming. It allows an SMU to function as a complete standalone, automated test system or to interface with a PC. Either way it enables maximum precision and throughput of highly customized test sequences. LXI interfaces on some SMUs further ease their integration with computers and other instruments for sophisticated test system automation.

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Integrating test and measurement capabilities into advanced design software is becoming increasingly important as designs become more complex. We see two factors driving this. For design verification, models developed with advanced design software often need to be tested with real-world data. If the design software allows for the control of instruments, the real-world test data can be directly imported into the model. Testing the model with real world data provides additional early verification of the model which could reveal inaccuracies in the model.

In some cases, a behavioral model itself may be developed using real-world data collected from test equipment. For example a model for a digital pre-distortion algorithm of a high power amplifier may be developed by iteratively collecting data from a signal analyzer while driving a prototype amplifier with known input signals. The response of the prototype amplifier under these conditions is then used to refine the model.

As a result, advanced design software that includes test and measurement capabilities provides an important benefit for design engineers as they develop or verify their models.

Links:
[1] http://www.keithley.com
[2] http://www.mathworks.com