

Efficere Technologies Develops World Class Test Fixtures

Agilent test equipment is instrumental to developing test fixtures that are essentially electrically invisible

Efficere Technologies

Complex Challenges

- Design a high-bandwidth test fixture that performs well at the fifth harmonic
- Accurately measure magnitude and physical location of low level crosstalk signals
- Clearly show the improved digital interconnect performance by removing the degradation of low bandwidth test fixtures

Innovative Solutions

- Efficere selects Agilent's Physical Layer Test System (PLTS) software based on its ability to precisely characterize high-speed interconnects and the system's intuitive user interface
- Agilent's 50 GHz E8364B vector network analyzer with the Agilent N4421B test set controlled by the Agilent N1930A PLTS software are chosen for the wide dynamic range and built-in time domain analysis capability
- Efficere uses Agilent's PLTS software to extract S-parameters that were exported to advanced modeling and simulation tools in the design of their fixture

Bottom Line Results

- Agilent's PLTS software played a key role in the successful and timely completion of Efficere's high-speed interconnect design project
- Efficere could instantaneously analyze both time domain and frequency domain data with one test set up, thus increasing their efficiency of the whole characterization process
- Efficere was able to control all equipment and further analyze the data right from their design engineer's desktop to arrive at technical conclusions immediately

The Company

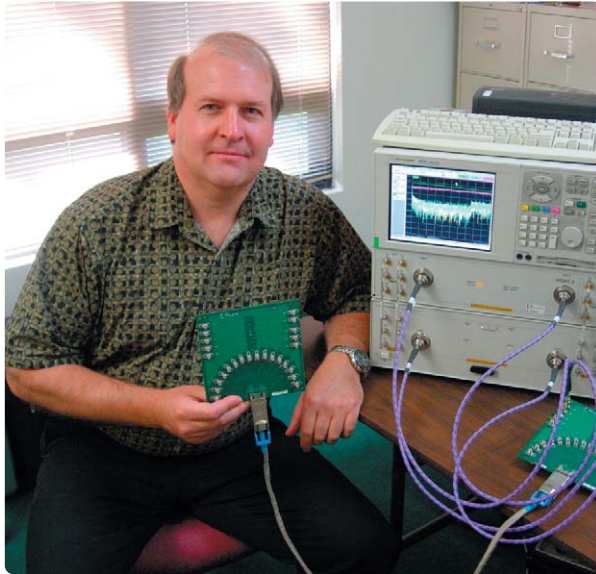
Efficere Technologies of Vancouver, Washington, is a firm specializing in applying innovative solutions to the most challenging high-performance signal integrity problems. Over the past year Efficere has designed and manufactured a variety of test fixtures that enable original equipment manufacturers (OEMs) to test and characterize high-speed digital cables and interconnect without the results being masked by the test fixtures. Recent products have included test fixture cards that are essentially electronically transparent to the 5th harmonic and function to 25 GHz. These innovative test fixtures enable digital design engineers to accurately test and obtain greater insight into the characteristics of their products.

A Complex Challenge

Efficere describes all systems as being made up of silicon and interconnect. In high-performance systems the silicon devices typically run at GHz speeds while the interconnect runs at hundreds of MHz. The typical signal path from one chip to another contains a dozen or more serious electrical signal disruptions. These disruptions in the interconnect are impedance discontinuities that cause the signal sent by one device to be severely distorted when it arrives at the next chip and limits the practical performance of the system to well below the capabilities of the raw silicon. Typical problem areas include the wires and substrates in the package containing the silicon, the connection of the package to the PCB, the hundreds or thousands of vias and inches of traces on the PCB, or even the cable to another system board. In any case the interconnect usually induces significant performance-limiting noise into the physical layer electronic signal path.



Success Story | Efficere Technologies



"The decision to use Agilent's Physical Layer Test System was a no brainer," said Efficere's VP of Engineering Will Miller. "Firing up only one test system saved me tons of development time".

Efficere's VP of engineering, Will Miller, is familiar with solving advanced signal integrity challenges. He spent most of his career working on complex semiconductor device test systems where the challenge was to design a system that could test microprocessor devices that would be built on tomorrow's technologies. He quickly became an innovator of advanced interconnect techniques.

The challenge at Efficere was to design a 12 Gbps Quad Data Rate (QDR) test fixture. Previous design challenges of 6 Gbps Double Data Rate (DDR) fixtures were achieved through the successful design cycle of modeling, design, layout, simulation, re-modeling, fabrication, and test. The new QDR would require some new tools in the Efficere signal integrity laboratory. It was extremely important to have very precise and detailed test measurements to demonstrate the QDR test adapter would perform as required.

An Innovative Solution

Miller knew exactly how he was going to take this test adaptor card project from conception to revenues in less than 90 days. He proposed to build a pair of alpha version test adapter cards and use one to test the other by connecting a very short precision PCB between the two female InfiniBand receptacles, one on each of the test adapter cards. These measurements, combined with results from the advanced calibration structures built onto the PCB cards, would be used to accurately show the performance of the cards.

The project began with extensive design modeling. The precision of the signal integrity in the final product is evidence of the complexity of the front-end simulation efforts. With a SMA and an InfiniBand launch designed, the focus moved to the vias that were necessary to route the high-speed board signals. In layout, these via structures were combined with carefully routed traces and the whole board was re-modeled and then re-simulated to assure that the desired signal integrity performance was met. A few days in PCB fabrication followed by a quick stop for connector assembly and the boards were ready to test and characterize.

"The decision to use Agilent's Physical Layer Test System was a no brainer." Miller had used several brands of high-speed test instrumentation during the years he spent working at companies prior to Efficere. Agilent's reputation for robust and precision test solutions along with the intuitive PLTS graphical user interface made the equipment choice easy. He used Agilent's 50 GHz E8364B vector network analyzer (VNA) with the Agilent N4421B test set controlled by the Agilent N1930A PLTS software. This 4-port system was exactly what was needed for characterizing his high-speed interconnect design.

The VNA-based PLTS software was used to extract S-parameters that could be fed back to the advanced modeling and simulation tools used in other aspects of the design. Accurate models were critical, so the wide dynamic range of the VNA was well utilized. With the time domain analysis capability built into the software, the need to change the setup for a quick TDR was eliminated, increasing the efficiency of the test and characterization process. The PLTS software supports an accurate 4-port calibration that can be stored and used again with a particular test setup, again increasing efficiency. The calibration graphical user interface and electrical calibration module assured an error-free and fast calibration.

The Results

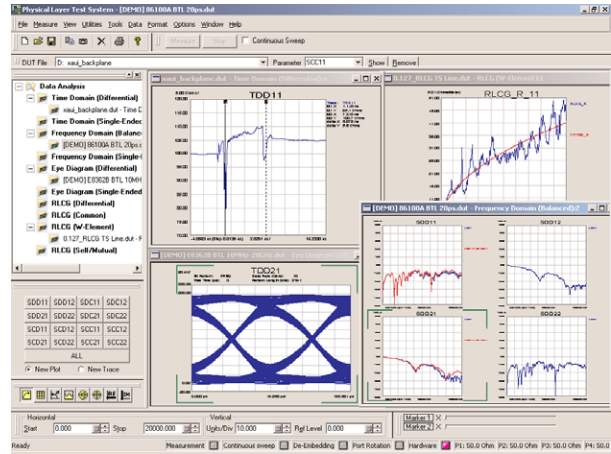
Extensive work and time went into preparing the test setup and then capturing the results. In this case, the test fixtures were tested with a simple setup. A single Physical Layer Test System measurement was able to gather all pertinent 4-port data that could be analyzed in both time domain and frequency domain.

“Firing up only one test system saved me tons of development time,” explains Miller.

One aspect of the capture and analysis of test results is the speed at which the testing and characterization can proceed. Engineering started with a test plan that included the basic parameters describing a test adapter board; insertion loss, return loss, jitter, rise time, eye diagram analysis and crosstalk. However, when a measurement was taken during the characterization phase of development it often led to another unplanned test. The schedule would have been delayed if not for the time savings of instantaneous time and frequency domain analysis.

According to Will, “The Agilent PLTS software has a user interface that is very intuitive and does not require a PhD to operate. The ability to control the equipment and further analyze the data on my desktop computer increased my efficiency and allowed me to more quickly arrive at solid technical conclusions.” Miller connected the VNA directly to the corporate network and generated numerous screen captures for team discussion and review. The VNA allowed for the screen captures to be saved directly into a JPEG format and be easily placed into PowerPoint presentations for management and customer reviews. Network connectivity allowed several engineers to access the raw data for their specific analysis.

“Time to revenue is especially critical for a young company,” said Dean Suhr, Vice President of Business Development and Operations. “The Agilent Physical Layer Test System was a key enabler in the successful and timely completion of



Efficere’s design schedule avoided delays due to the time savings of instantaneous time and frequency domain analysis in Agilent’s Physical Layer Test System software.

numerous projects as well as validating the claims made in our investor and customer presentations.” “We’re looking forward to acquiring the new 12-port VNA,” said Miller. “We’ll be able to measure and see crosstalk much better than we can today. And as soon as we can measure it, we have design ideas on how to eliminate it!”

For more information on Agilent’s Physical Layer Test Systems software, go to: www.agilent.com/find/PLTS

www.agilent.com

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Phone or Fax

United States:

(tel) 800 829 4444

(fax) 800 829 4433

Canada:

(tel) 877 894 4414

(fax) 800 746 4866

China:

(tel) 800 810 0189

(fax) 800 820 2816

Europe:

(tel) 31 20 547 2111

Japan:

(tel) (81) 426 56 7832

(fax) (81) 426 56 7840

Korea:

(tel) (080) 769 0800

(fax) (080) 769 0900

Latin America:

(tel) (305) 269 7500

Taiwan:

(tel) 0800 047 866

(fax) 0800 286 331

Other Asia Pacific Countries:

(tel) (65) 6375 8100

(fax) (65) 6755 0042

Email: tm_ap@agilent.com

Revised: 09/14/06



Agilent Email Updates

www.agilent.com/find/emailupdates

Get the latest information on the products and applications you select.

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2006

Printed in USA, November 29, 2006

5989-5846EN



Agilent Technologies