VISI Virtual Instruments™ Signal Integrity

Datacom Analysis Software

The Datacom module for Virtual Instruments™ Signal Integrity (VISI) Software from *WAVECREST* provides a fast, accurate way to analyze jitter and ensure signal integrity in high-speed data components and systems. This versatile software package includes all the characterization, debug and analysis tools you need to separate total jitter into its random and deterministic components, quantify the frequency and amplitude of periodic jitter, and test systems and devices to meet compliance standards. Specific applications include:

- **Fibre Channel**
- **XAUI**
- **InfiniBand**
- **DVI**
- **LVDS**
- **Gigabit Ethernet**
- **Serial ATA**
- **3GIO**
- **RapidIO**
- **HyperTransport**

The VISI Software Datacom module is a comprehensive software package that includes characterization and analysis tools that competitive software simply can't deliver. Its powerful algorithms can separate total jitter (TJ) into deterministic jitter (DJ) and random jitter (RJ), which enables you to predict the long-term reliability of systems and components. With the ***WAVECREST*** SIA-3000 and the Datacom module, design and production engineers can perform complete jitter analysis in seconds. That means you can characterize more systems in less time and accelerate time-to-market for new devices.

Quantify RJ and DJ

The Datacom module can analyze systems that have a data signal and bit clock, so you can take accurate clock-to-data jitter measurements (see Fig. 1). The software automatically displays separate histograms for rising and falling data edges so you can determine which edge polarity contributes most to the jitter. It also uses the patented ***WAVECREST*** TailFit™ algorithm to quantify RJ and DJ components, allowing thorough jitter analysis and compliance measurements.

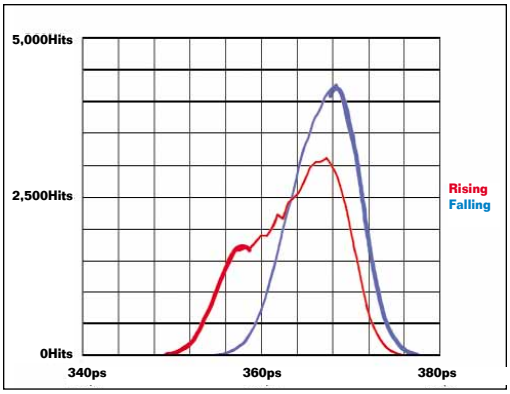

Fig. 1. Clock-to-data jitter measurements for a system with a data signal and bit clock. Separate histograms are displayed for the rising and falling edges.

Diagnose the root cause of jitter

The Datacom module also has debug and characterization capabilities for data signals with repeating patterns to quantify DCD and ISI along with periodic and random jitter components using ***WAVECREST*** patented algorithms. The magnitude of DCD and ISI provides essential information about bandwidth limitations. For example, you can see the DCD and ISI contribution for each edge in a pattern, which enables you to determine the contribution of data dependent jitter at the single-bit level (see Fig. 2). The Datacom module also makes it easy to observe the DCD and ISI histograms for rising and falling edges.

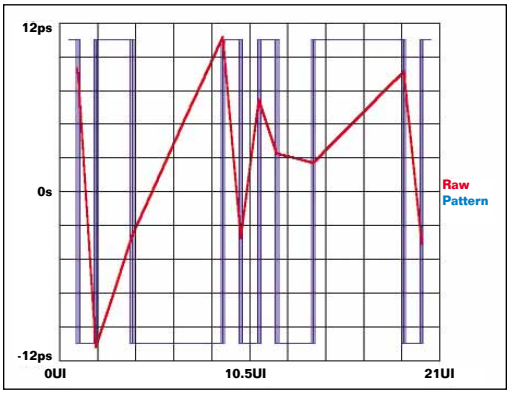

Fig. 2. DCD and ISI as a function of bit position for a K28.5 pattern. The magnitude of jitter from DCD and ISI is 24 ps.

Examining jitter in the frequency domain provides opportunities for deeper data signal analysis. Determining the magnitude and frequency of the PJ component (or components), for example, allows you to diagnose and debug potential EMI or crosstalk problems quickly and efficiently, without additional test equipment (see Fig. 3). Plus, the frequency band used to determine the PJ components ranges from the Nyquist to a user-defined corner frequency, enabling you to meet serial communication compliance standards without a Golden PLL.

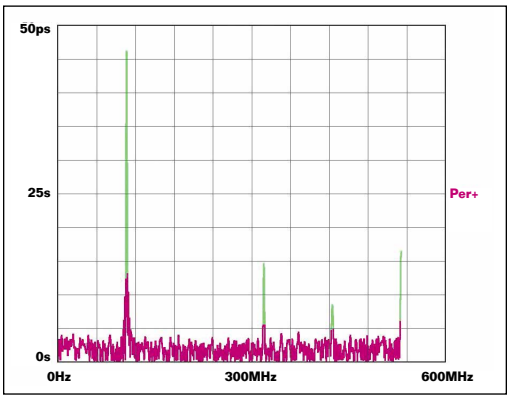

Fig. 3. Power spectral density showing a periodic spike at 106 MHz contributing 46 ps of jitter from a 1.0625 Gb/s SERDES. Together, Fig. 2 and Fig. 3 illustrate how easy it is to isolate deterministic components of TJ with the Datacom module.

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WAVECREST SIA-3000

- **Up to 10 parallel channels at 3 GHz/4.5 Gb/s**
- **Repeatable measurements with 200 fs resolution**
- **Multi-instrument functionality in the lab or production test**
- **The getting started wizard enables you to characterize period jitter, quantify RJ/DJ, and obtain a spectral view of jitter over a user-defined bandwidth at the touch of a button**

Datacom tools	DJ	DCD & ISI	PJ	RJ	TJ	Compliance measurement	Diagnostic tool
Data with a bit clock	✓			✓	✓	✓	✓
Repeating pattern	✓	✓	✓	✓	✓	✓	✓
Random data	✓	✓		✓	✓		✓

Table 1. The tools in the Datacom module can obtain a variety of jitter components. Two provide compliance measurement capabilities, and all three can be used as diagnostic tools.

View error probability vs. eye closure

Quantifying RJ with a high degree of accuracy is critical for system performance, because RJ is typically the best indicator of long-term reliability. The Datacom module employs the patented ***WAVECREST*** TailFit™ algorithm to measure RJ on the data stream quickly and easily. This software also has the ability to determine the effect of RJ and DJ in terms of eye closure using the bathtub plot (see Fig. 4). The ability to quantify TJ for very low bit error rates is significant, simply because so many datacom standards—including Fibre Channel, XAUI, InfiniBand, GBE and SATA—specify TJ at 10^{-12}.

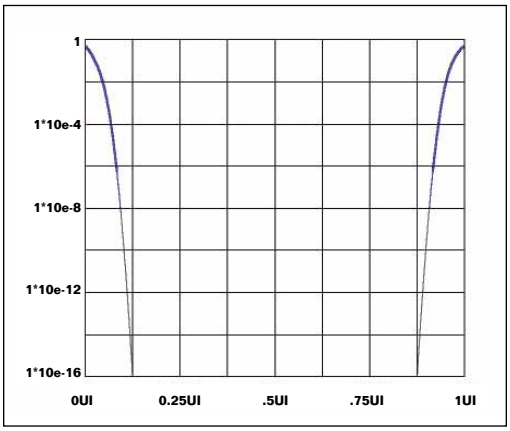

Fig. 4. Error probability vs. eye closure (TJ vs. BER), quantified down to 10^{-16} BER.

Perform compliance measurements in seconds

Although traditional jitter measurement instruments can quantify TJ for a given BER, test times may reach several hours for a BER of 10^{-12}—which is unacceptable for most design and production environments. The Datacom module, however, takes advantage of patented algorithms and the fast acquisition rates of the SIA-3000 enable jitter compliance measurements to be completed in seconds for BER as low as 10^{-16}. This capability also provides valuable information about design margins.

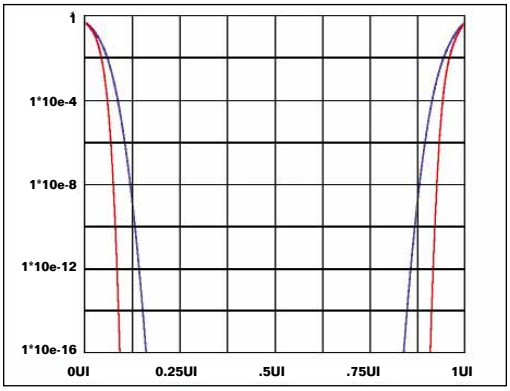

Fig. 5. Composite plot showing the effect of oscillator supply voltage on TJ for a 2.5 Gb/s SERDES. Here, TJ changes from 69 ps at 3.0 V (red line) to 117 ps at 2.5 V (blue line) at 10^{-12} BER.

View jitter as a function of a variable

High-speed systems and components must be able to operate within well-defined temperature and voltage ranges and still meet rigorous jitter specifications. The Datacom module includes several analysis tools that provide quantitative graphical views of jitter with respect to these variables on the device being tested. The composite plot tool shows the effect of the reference oscillator supply voltage on TJ by allowing you to overlay multiple plots within a single view. For example, you can overlay two bathtub curves for different reference oscillator supply voltages for a 2.5 Gb/s SERDES (see Fig. 5). The composite plot clearly shows the effect of voltage on TJ due to increased RJ.

WAVECREST
A Technologies Company

7626 Golden Triangle Drive
Eden Prairie, Minnesota 55344
phone 1-800-733-7128
fax (952) 831-4474

www.wavecrest.com