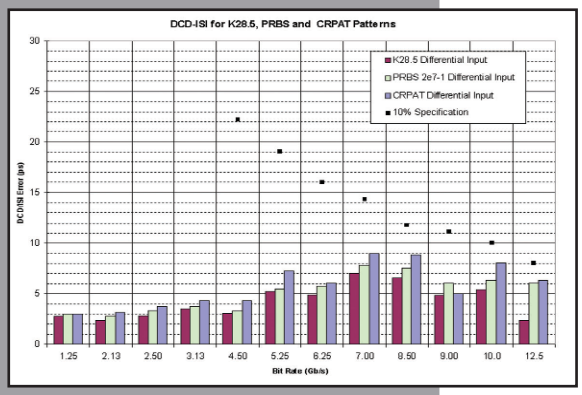
GIGAMAX TECHNOLOGIES

SIA-4000

Signal Integrity Analysis Solution

specifications

timing

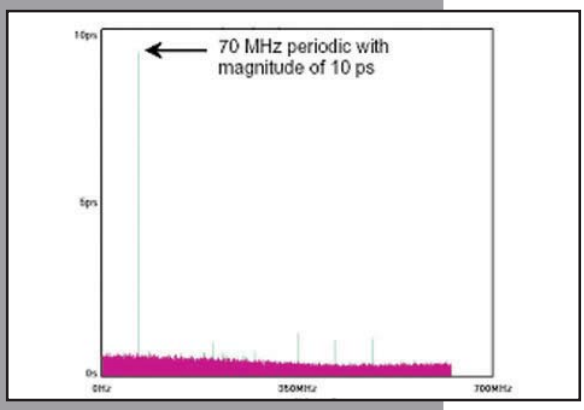


Plot 1

DATA JITTER

Timing Bandwidth	> 35 GHz
Data Rate Range	Up to 15 Gb/s
DCD&ISI	< 10% UI (Wavecrest specification) using K.28.5 as the test pattern
Gaussian Noise Floor	<200 fs typical

Plot 1 shows typical instrumentation DCD&ISI performance at various data rates and data patterns. The blue line represents the guaranteed DCD&ISI specification limit tested at 2.5, 5, 6, 8.5, 10 and 12.5 Gb/s. Noise floor measurements include the contributions from the pattern generator and cables. Plot 1 shows the typical DCD&ISI noise floor remains below 10% UI for K28.5, PRBS 2e7-1, and CRPAT.



Plot 2

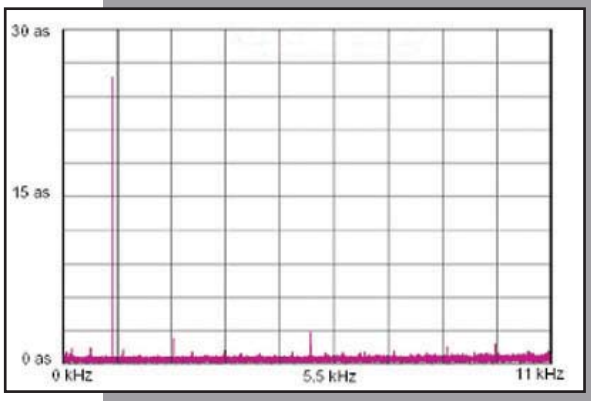
CLOCK JITTER

The stable time base of the SIA-4000 provides the ability to perform time interval measurements over a broad time span without any significant increase in the wideband jitter noise floor.

The input frequency range for jitter measurements is 0.4 Hz - 15 GHz.

Plot 2 illustrates the capability of the instrument to isolate periodic components and quantify jitter over a user-defined bandwidth. The plot shows a spectral view of jitter measured from 12 kHz to 613 MHz of a 2.5 GHz sine wave. A 70 MHz sine wave was added to the carrier having a magnitude of 10 ps. Post processing filters provide the ability to determine the rms noise over a bandwidth. For example, the typical rms jitter from 12 kHz to 20 MHz is 200 fs determined from this plot.

The Low Frequency Modulation tool provides the capability of measuring low frequency (<100 kHz) periodic components on a carrier. Plot 3 shows the spectral view of jitter over 1 clock period from 0 Hz to 10 kHz of a 2 GHz sinewave modulated with a 100 Hz peak deviation 1 kHz sinewave. The 1 kHz spectral component has a magnitude of 25 as and the background noise is <1 as.
NOTE: 1 attosecond (as) equals 10^{-18} sec.



Plot 3

Internal Timing Reference

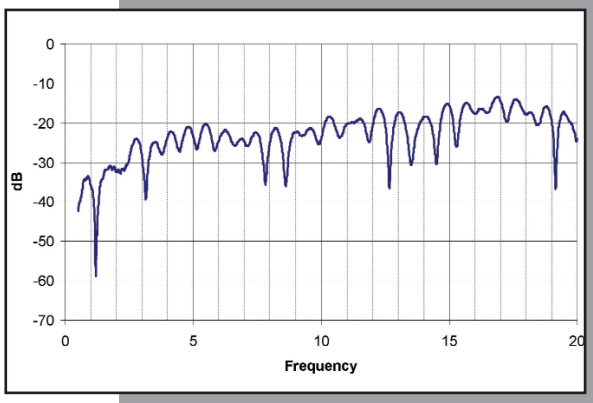
Frequency	10 MHz
Aging/year (after 24 hrs on)	1.5 X 10^{-7}
Aging/day (after 24 hrs on)	1 X 10^{-9}
Short term (1 sec) stability	5 X 10^{-11} (after 1 hr on)

Voltage Performance

Input voltage range	±1.0 V

The Input Voltage Range is defined as the minimum and maximum input voltage levels, relative to chassis ground, that the inputs can safely accept and meet performance specifications.

Electrical Input	Female SMA
Input Sensitivity	50 mVpp differential 100 mVpp single-ended
Return Loss	With respect to 50Ω greater than 15 dB from 50 MHz to 12 GHz as shown in Plot 4



Plot 4

Standard Timing Measurements and Features

Random Jitter, Deterministic Jitter, DCD&ISI, BER, Periodic Jitter, Skew, Propagation Delay, Period Jitter, Pulse Width Jitter, RMS Jitter over a bandwidth, Duty Cycle, Frequency, Damping Factor, Natural Frequency, Lock Range, Lock-in Time, Pull-in Time, Pull-out Range, Noise Bandwidth, PSD of Noise, Poles and Zeros.

oscilloscope

Pattern Marker

Traditionally, performing jitter measurements has been difficult because it requires the use of a bit clock or pattern trigger, which may be unavailable. The SIA-4000 has a built-in Pattern Marker on each channel, enabling jitter compliance measurements on systems without the need for a bit clock or external pattern trigger. This feature provides a simple and efficient tool for precise jitter measurements.

The Pattern Marker enables the user to simply input a data stream with a repeating pattern and obtain quantitative information on DJ, RJ, PJ, DCD&ISI and Total Jitter. This process improves measurement time over the traditional methods of using a pattern generator or pattern trigger, because a marker is generated for every pattern repeat.

Additionally the SIA-4000 automatically locates the marker in a low transition density region of the pattern, eliminating the need to use delay lines for optimal placement. The Pattern Marker feature is functional on each channel of a 2, 4 or 5 channel SIA-4000 system.

Oscilloscope Performance

Each input to the 15 Gb/s channel card has an integrated sampling oscilloscope to provide accurate and repeatable amplitude measurements. This section describes the performance characteristics of the amplitude engine:

Analog Bandwidth (-3 dB)	15 GHz
Rise Time	23 ps (10% to 90%, calculated from RT=0.35/BW)
Input Dynamic Range	+1.0V to -1.0V (Single-ended)
RMS Noise	1.5mV

Horizontal System

Delay	
Minimum	>24ns
Maximum	100 µs
Oscilloscope timebase jitter (rms)*	<1 ps + 10 ppm of delay setting
*Any additional trigger error will increase this value	
Timebase Delay Accuracy	<8 ps + 0.1% of delay
Time Interval Resolution	300 fs

Vertical System

Vertical Resolution	250 µV

Trigger Modes

Self Trigger (Using Pattern Marker)	up to 15 GHz
External Trigger	up to 15 GHz

Standard Amplitude Measurements and Features

Rise Time, Fall Time, Overshoot, Undershoot, V_{max}, V_{mid}, V_{min}, V_{top}, V_{base}, V_{pk-pk}, V_{amp}, V_{RMS}, V_{AVG}, Mask Violations, Mask Comparisons, Horizontal and Vertical histograms and statistics.

Note: Typical measurements provide non-warranted information about system performance or capabilities.

GIGAMAX TECHNOLOGIES

6550 Edenvale Blvd.
Eden Prairie, MN 55346
Phone: 952.374.5960 Fax: 952.374.5984
www.GigamaxTech.com