CA9806 4 Channel 1.0 ~ 17.0 Gb/s Pulse Pattern Generator and Error Detector

Technical Specification V1.08

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UC INSTRUMENTS CORP.

www.ucinstruments.com

CA9806 4 Channel 1.0 ~ 17.0 Gb/s Pulse Pattern Generator and Error Detector

The UC INSTRUEMNTS CA9806 is a high performance, flexible four channel Pulse Pattern Generator and Error Detector that can operate from 1.0 to 17.0 Gb/s (consult factory for higher or lower operation speeds). It is also a standalone Bit Error Rate test solution that incorporates an internal full rate clock synthesizer. Its small size allows it to be placed close to the device under test, it can also be placed further away using the TX driver pre and post emphasis controls features to compensate for cable and interconnect losses. It also has a non destructive, integrated eye outline capture feature along with a quick eye height and width measurement capability. Build-in 8.5 ~ 15 Gb/s eye diagram testing function.

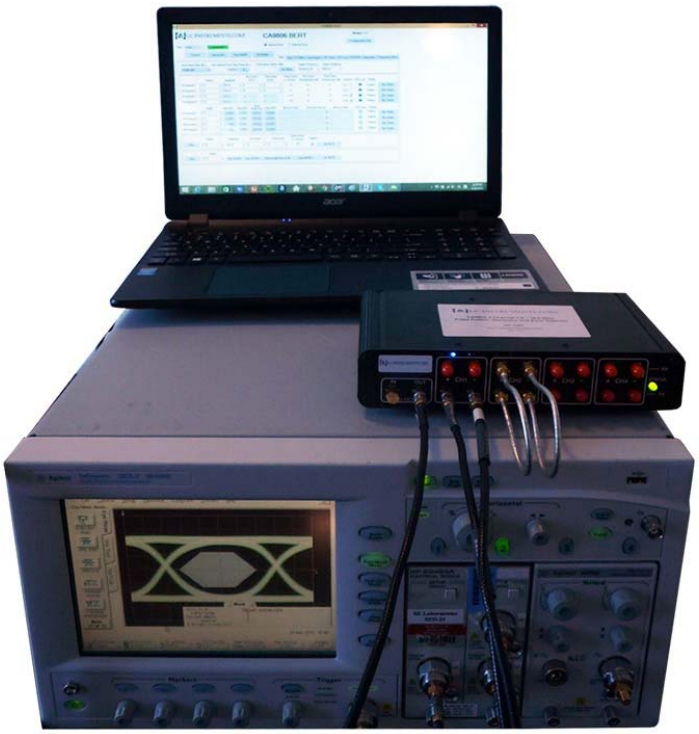
The CA9806 was designed to characterize high speed digital links during the engineering, manufacturing or installation phases of a project. Such applications could include the testing of IC's, optical components, transceivers, copper cables, back planes and interconnects. The CA9806 can be used for compliance testing of Ethernet, Fiber Channel, Infiniband, PCIE, SONET and proprietary link standards.

Features

- 1.0 to 17.0 Gb/s pulse pattern generator;
- PRBS 2^7-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{23}-1, 2^{31}-1, 2^{58}-1 ;
- Four channel NRZ PPG and ED ;
- Internal clock synthesizer;
- Adjustable clock output;
- Typical JRMS of 1 ps and JPP of 7 ps;
- TX level from 25 mV to 1500 m V PPDIFF;
- Eye monitor from 8.5 to 15.0 Gbps operation;
- Pre and Post cursor emphasis;
- 64 bit programmable fixed pattern
- Pre-emphasis output signal functionality
- PPM offset control;
- Computer control via USB
- Cost effective solution for production;
- API command set
- Small footprint size of 216 mm x 51 mm x 127 mm
- 3 sets CA9806 external sync., can build up a 12 CH X17 Gb/s(180 Gb/s) BERT system. Max 8 sets external sync., system can support 480Gb/s (4x8x15 Gb/s) testing.

Applications

- Testing of optical transceiver modules (SFP+, XFP, X2, Xenpak, XPAK), transponders, linecards, and subsystems
- Testing of opto-electronic components and devices (TOSA, ROSA, lasers, etc…)
- Testing of Gb/s ICs, PCBs, electronic modules, subsystems, and systems
- Serial bus and high-speed backplane design
- Installation testing and troubleshooting in optical transport networks
- can be used forcompliance testing of Ethernet, Fiber Channel, Infiniband, PCIE, SONET and proprietary link standards



CA9806 4 Channel 1.0 ~ 17.0 Gb/s Pulse Pattern Generator and Error Detector Testing System

Specification

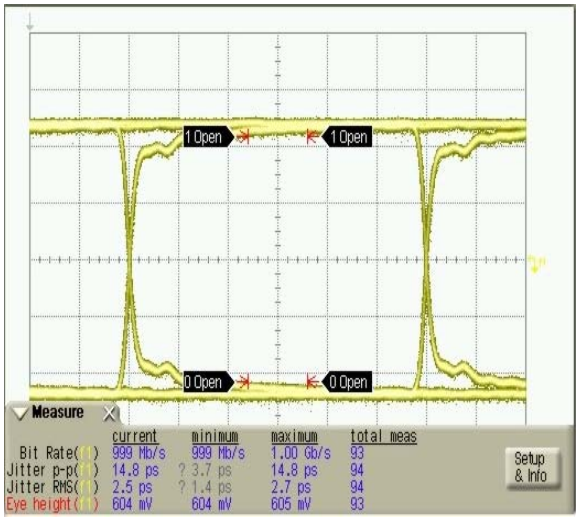
Absolute Maximum Ratings	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage Temperature	Ts	-20	–	70	°C	
AC Voltage Range	VAC	90	–	246	VAC	
AC Voltage Frequency Range	VFREQ	47	–	63	Hz	
Data RF and Clock Voltage Output	VOUT	-0.5	–	1.4	V	
Data RF Voltage Input	VinData	-0.5	–	1.8	V	
Clock In Voltage Input	VinClk	0	–	1.2	V	
USB Pin Voltage	VinUSB	-0.3	–	5.5	V	
RF and Clock ESD HBM	RFesdH	-1000	–	1000	V	
RF and Clock ESD CDM	RFesdC	-250	–	250	V	
RF, Clock and USB Latchup	VI	-100	–	100	mA	
USB ESD HBM	USBesdH	-2000	–	2000	V	
USB ESD CDM	USBesdC	-500	–	500	V	
Electrical Characteristics	Symbol	Min.	Typ.	Max.	Unit	Notes
Case Temperature	Tc	5	–	45	°C	
AC Supply Current	Icc	0.75	100	–	mA	
Baud Rate (NRZ format)	BR	1	15	–	Gb/s	(Note 1)
Baud Rate Setpoint Accuracy	BRa	-10	–	+10	PPM	(Note 2)
Baud Rate PPM Offset	BRo	-999	–	999	PPM	1 PPM step size
Power On Initialization Time	Ton	–	–	15	Seconds	
Eye Phase Steps	EMp	–	–	64	Steps	2 pS per unit
Eye Amplitude Steps	EMv	–	–	128	Steps	7.8 mV per unit
Fixed Pattern Length	PL	–	–	64	Bits	
Note 1: Contact Factory for higher and lower operation						
Note 2: Aging, Temperature and Voltage						

TX Electrical	Symbol	Min.	Typ.	Max.	Unit	Notes
CML Output (Single Ended)	VoutSE	0	–	750	mVpp	AC Coupled
CML Output (Differential)	VoutDIFF	0	–	1500	mVpp	AC Coupled
CML Output (Differential) Step Size	VoutSS	–	25	–	mVpp	
CML Output (Differential) Squelch	VoutSqu	0	–	30	mVpp	
CML Output (Rise/Fall Time)	tR, tF	20	–	–	ps	20-80%
Output Impedance (differential)	Zout	–	100	–	Ω	
Termination Mismatch	TZm	–	–	5	%	At 1 MHz
AC common mode voltage	TACcm	–	–	15	mVRMS	
Differential Return Loss	SDD22	-8	–	–	dB	.01 to 10 GHz
		(Note 3)	–	–	dB	10 to 15 GHz
Common Mode Return Loss	SCD22	-6	–	–	dB	.1 to 10 GHz
		(Note 4)	–	–	dB	10 to 15 GHz

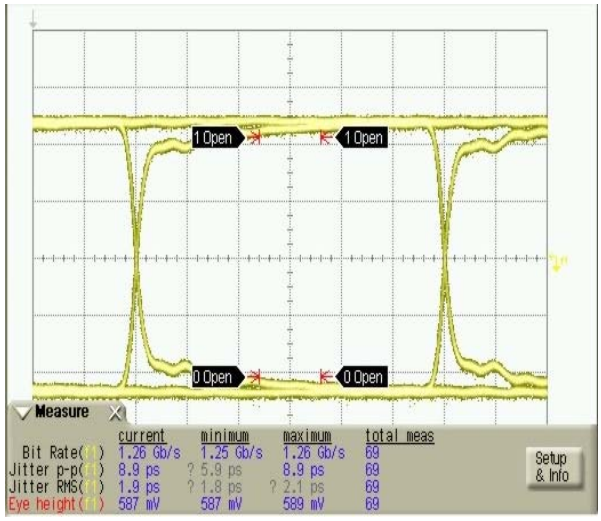
Transmitter Qsq	Tqsq	50	–	–	–	
Jitter (RMS)	TJrms	–	–	1.5	ps	(Note 5)
Jitter (PK-PK)	TJpp	–	–	8	ps	(Note 5)
Pre-Emphasis Control	TPE	–	17	–	dB	at 500 mVPPDIFF
De-Emphasis Control	TDE	–	17	–	dB	at 500 mVPPDIFF
Note 3: -8 dB + 16.6 dB/dec*log10(f/10 GHz)						
Note 4: -6 dB + 16.6 dB/dec*log10(f/10 GHz)						
Note 5: Agilent DCA-X with 50 GHz plug-in, 23-1 PRBS pattern and 500 waveforms using a precision time base trigger						
RX Electrical	Symbol	Min.	Typ.	Max.	Unit	Notes
Baud Rate Tolerance	BRt	-100	–	+100	PPM	
CML Input Voltage (Single Ended)	VinSE	100	–	800	mVpp	AC Coupled
CML Input Voltage (Differential)	VinDIFF	100	–	1600	mVpp	AC Coupled
Input Impedance (Differential)	Zin	–	100	–	Ω	
Termination Mismatch	RZm	–	–	5	%	At 1 MHz
AC common mode voltage	RACcm	–	–	25	mVRMS	
Differential Return Loss	SDD11	-12	–	–	dB	.01 to 2 GHz
		-8	–	–	dB	2 to 10 GHz
		(Note 3)	–	–	dB	10 to 15 GHz
Common Mode Return Loss	SCD11	-6	–	–	dB	.1 to 10 GHz
		(Note 4)	–	–	dB	10 to 15 GHz
CDR Acquisition Lock Time		–	–	300	mS	

Clock - Input	Symbol	Min.	Typ.	Max.	Unit	Notes
Frequency	CFin	156,248,438	156,250,000	156,251,562	Hz	Square wave
Single Ended Voltage Swing	CVpp	0.4	–	1.2	V	
Input Impedance	CRin	49.5	50	50.5	Ohm	AC coupled
Rise/Fall Time	CitR, CitF	–	–	1	nS	20%-80%
Duty Cycle	CDC	40	–	60	%	<1nS Tr/Tf
Random Jitter (RMS)	CRj	–	–	1	ps	12 kHz–20 MHz
Clock - Output	Symbol	Min.	Typ.	Max.	Unit	Notes
Programmable Divider of Line Rate	CPDLR	2	–	64	/N	Factors of 2
Single Ended Voltage Swing	CVoutSE	0	–	800	mVp	AC coupled
Squelch Voltage Output	CVsquelch	–	–	30	mVp	
Termination Mismatch	CZm	0	–	5	%	At 1 MHz
Rise/Fall Time	COtR, COtF	20	–	–	ps	20-80%
Ouptut Return Loss	CS22	-8	–	–	dB	
Jitter (RMS)	CJrms	–	–	750	fs	(Note 5)
Jitter (PK-PK)	CJpp	–	–	3.5	ps	(Note 5)
Note 5: Using Agilent DCA-X with 50 GHz plug-in. 500 waveforms using a precision time base trigger						
Note 6: Terminate clock output if not used						

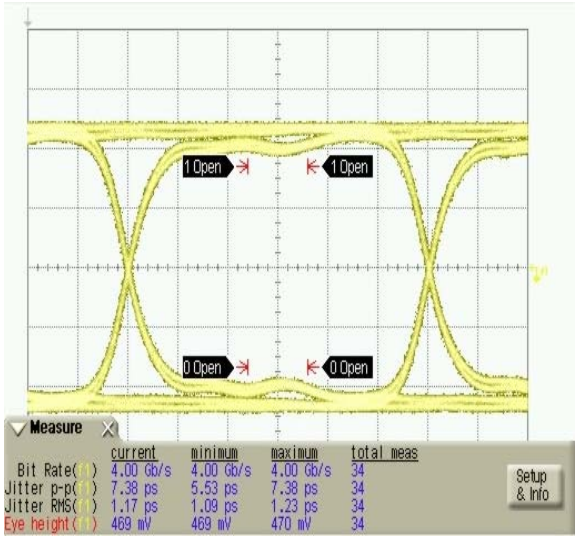
Typical Electronics Eye Diagram



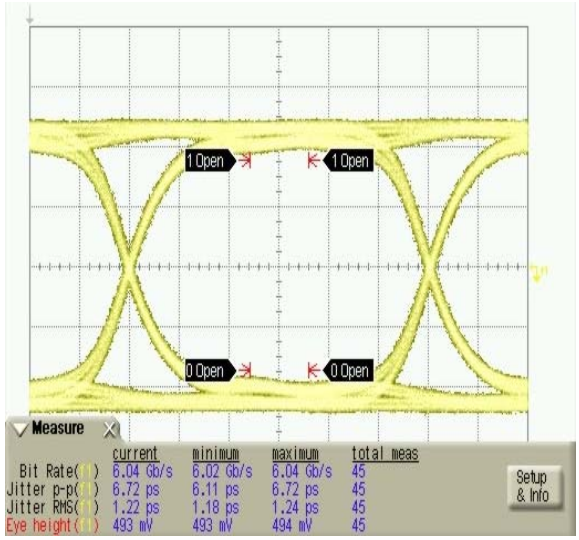
1.0 Gb/s



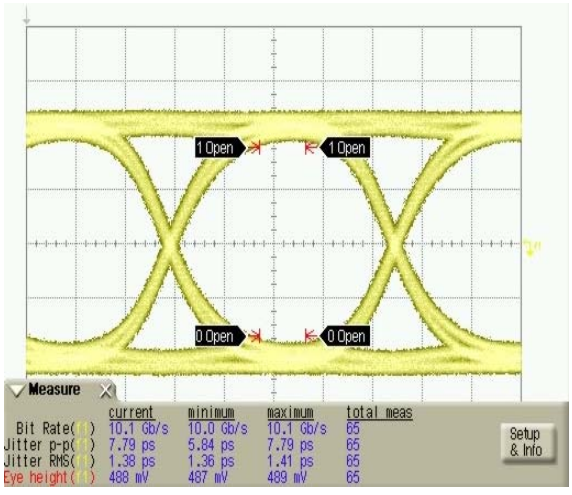
1.25 Gb/s



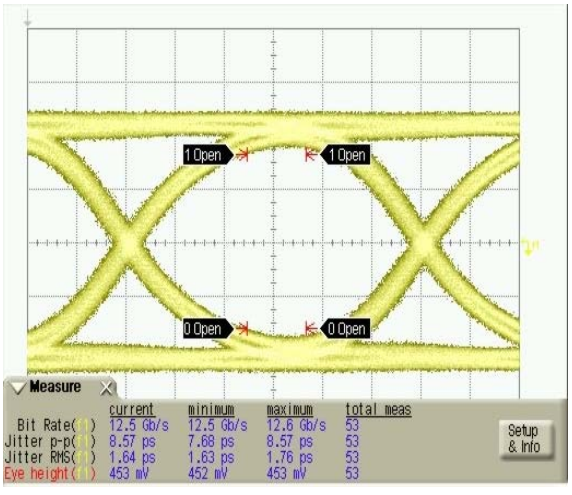
4.0 Gb/s



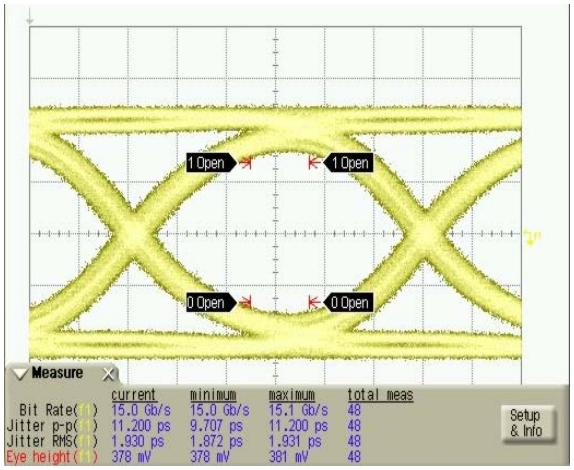
6.0 Gb/s



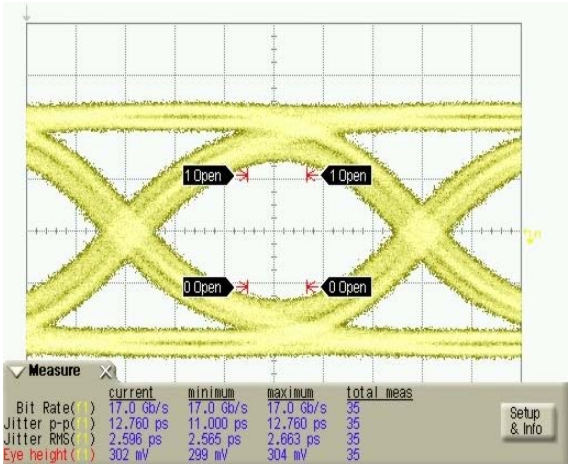
10.0 Gb/s



12.5 Gb/s

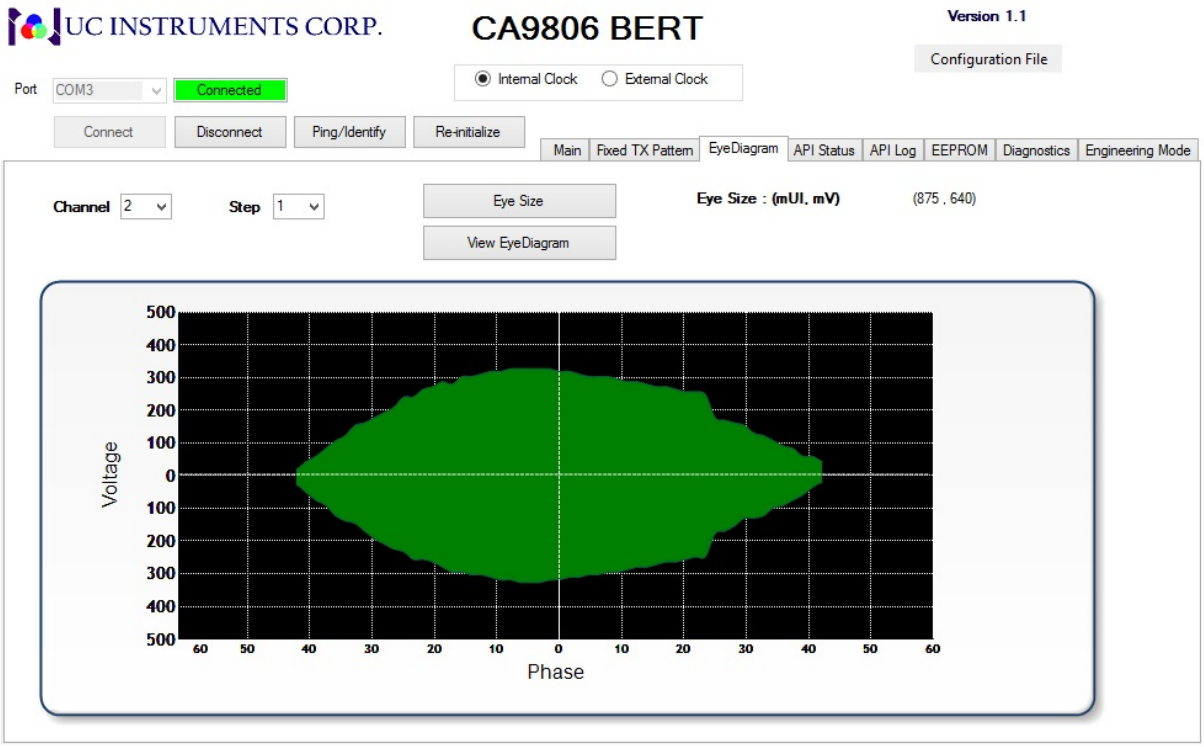


15.0 Gb/s

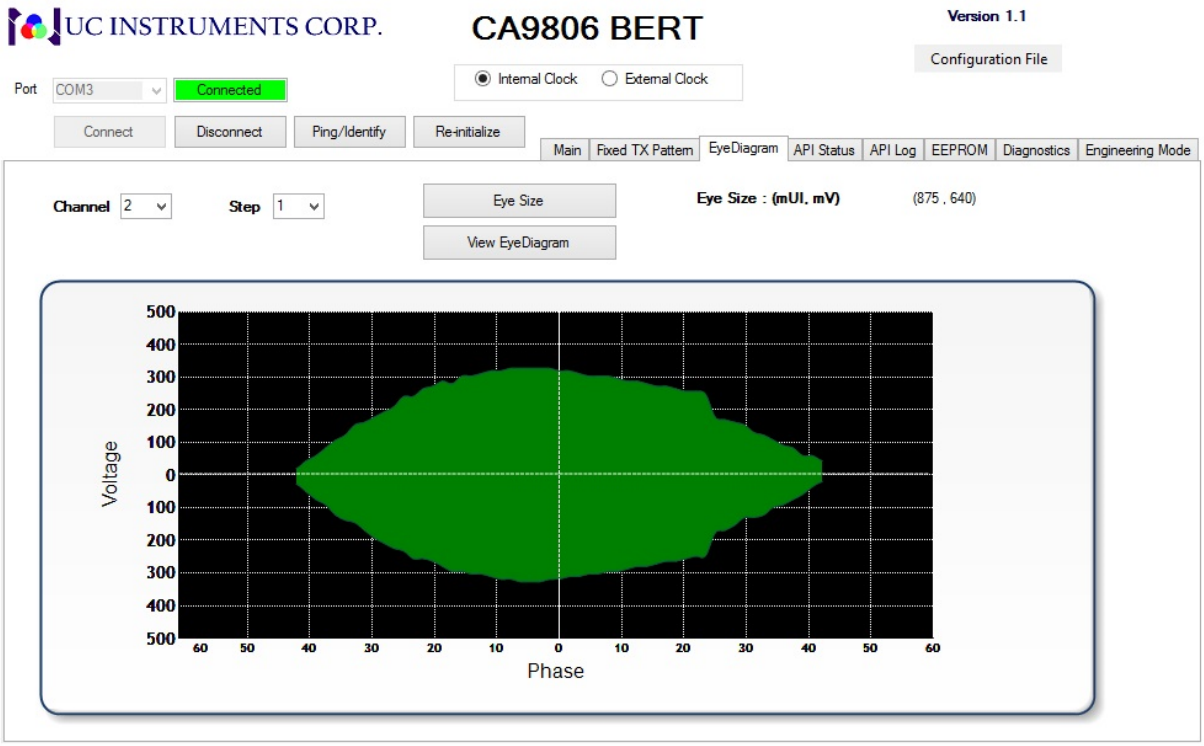


17.0 Gb/s

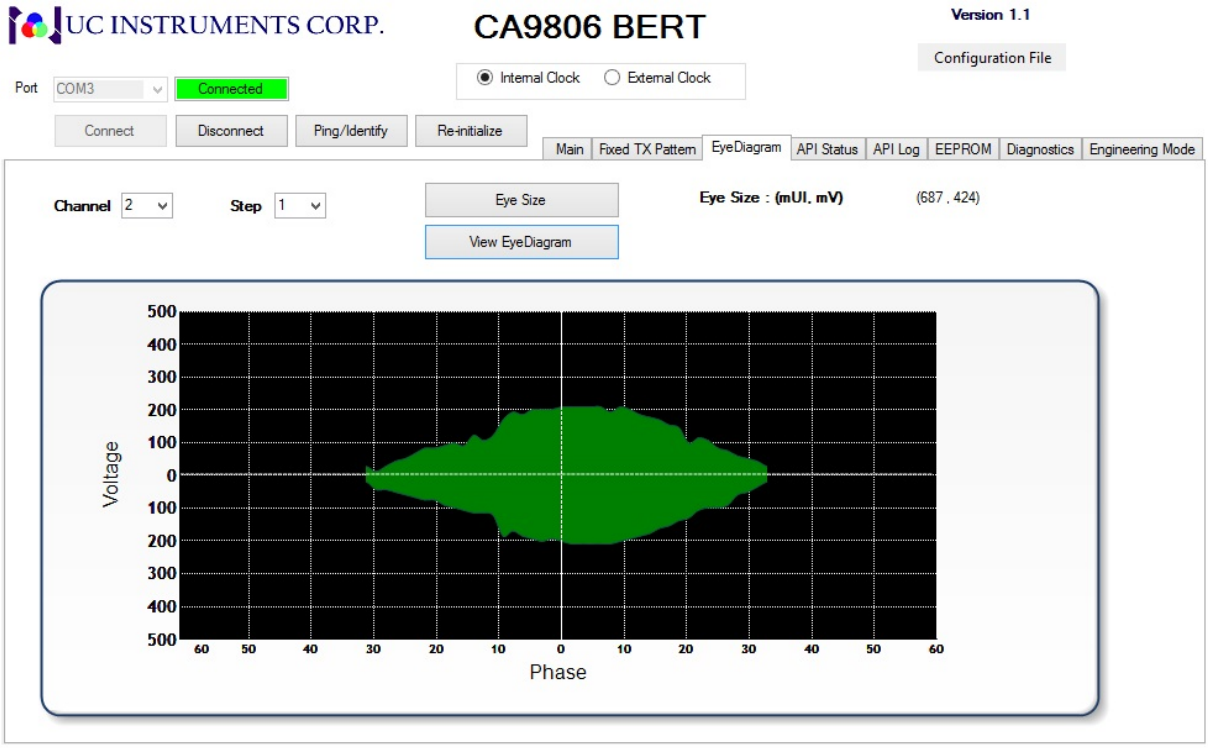
Buld-in Eye Diagram Testing Function



8.5 Gb/s Eye Diagram



10.0 Gb/s Eye Diagram



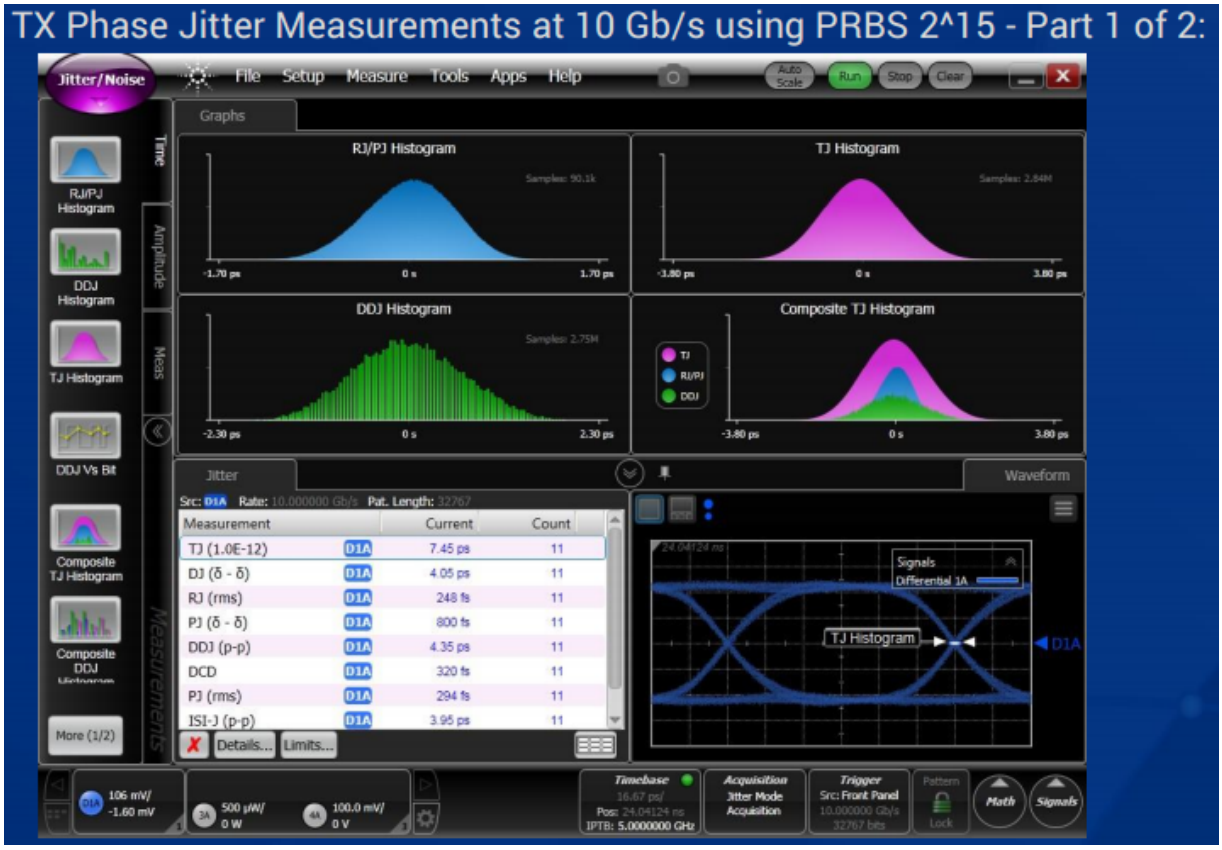
15.0 Gb/s Eye Diagram

TX Fix Pattern Output

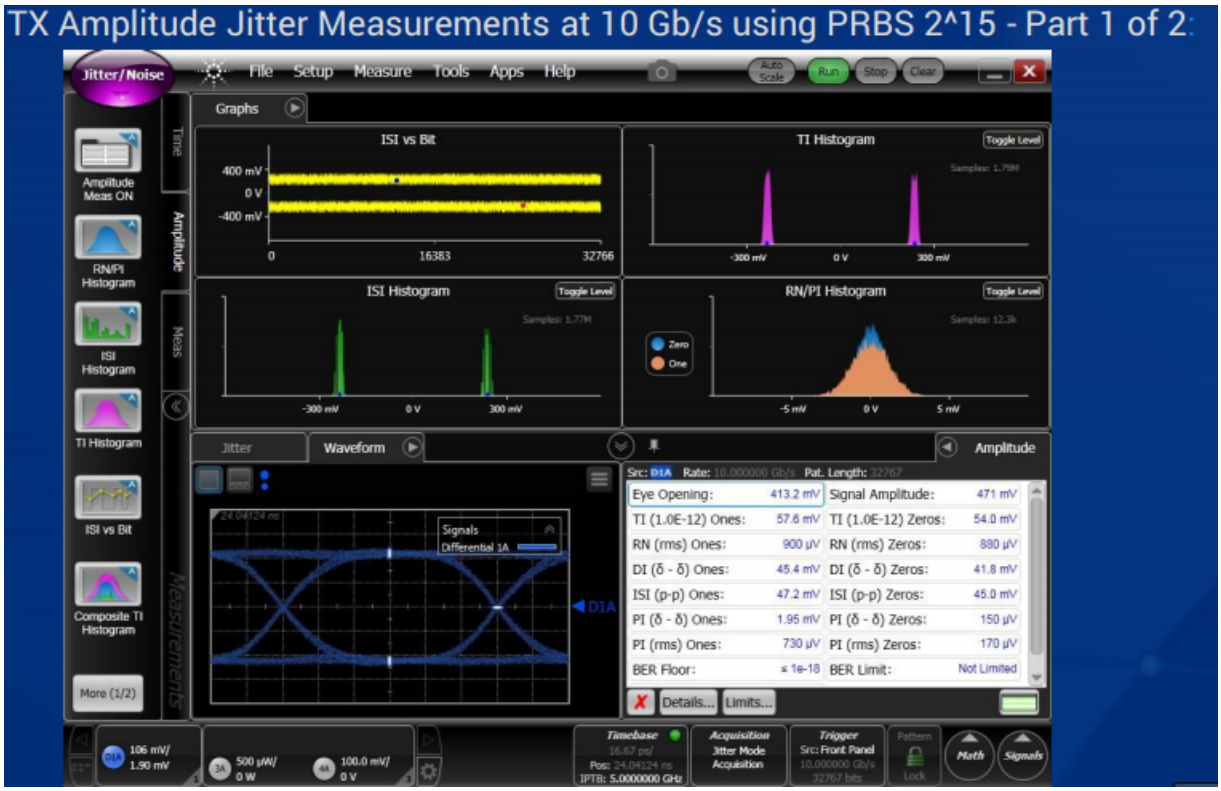
10 Gb/s Fixed TX Pattern 8-Bit 01010101 Pattern output

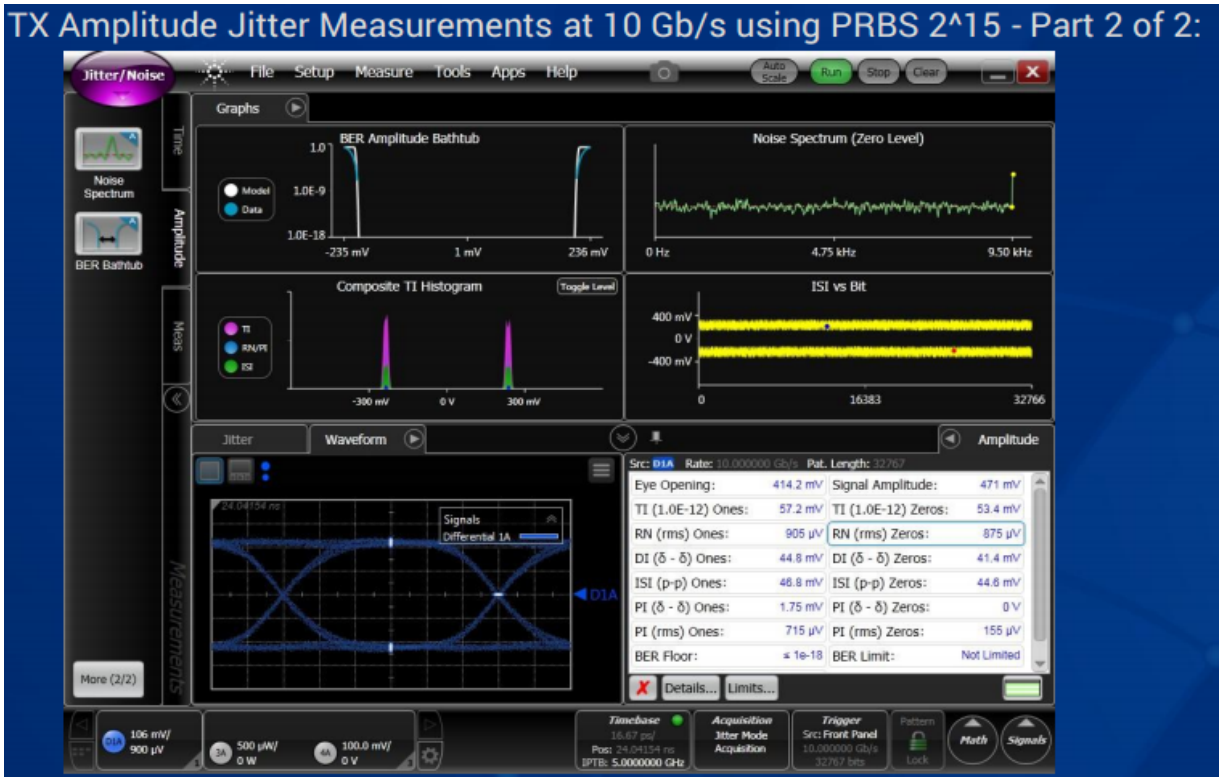
10 Gb/s Fixed TX Pattern 8-Bit 01010111 Pattern output

Jitter Phase Measurement

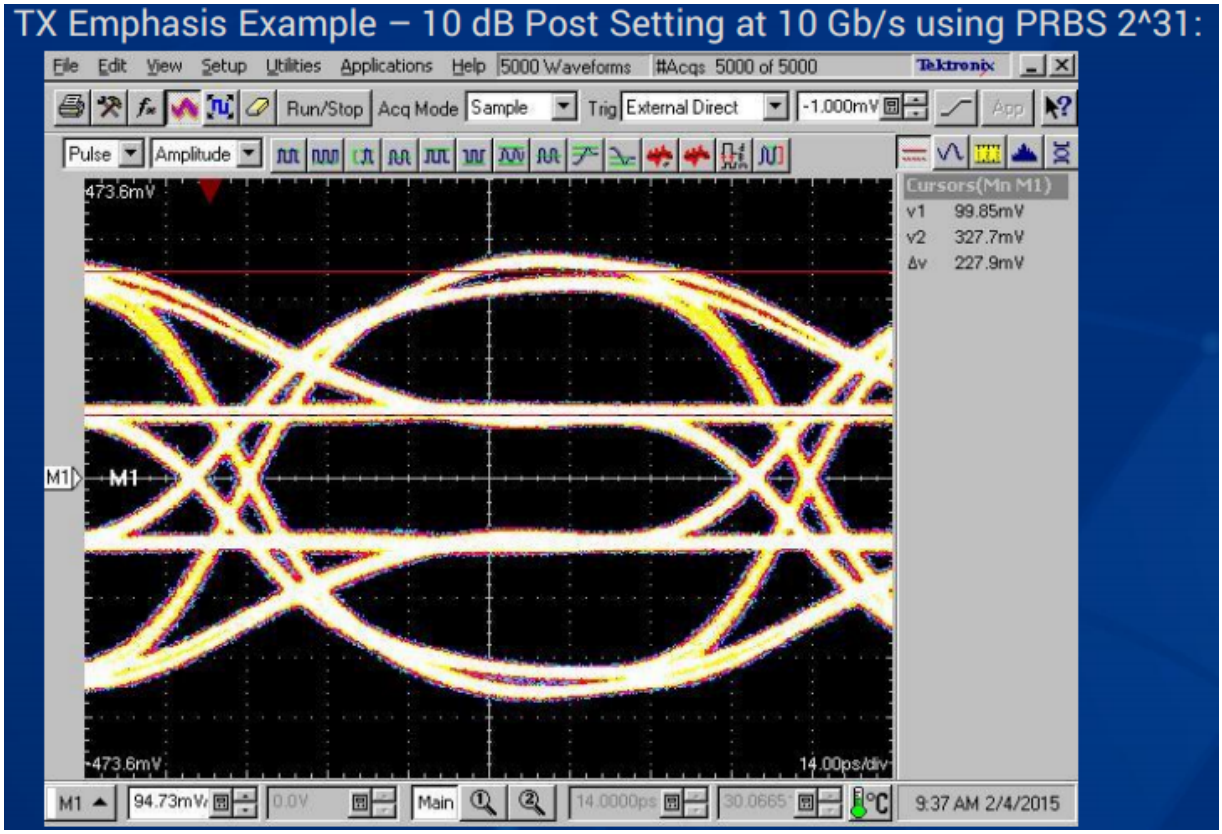


Amplitude Jitter Measurement;

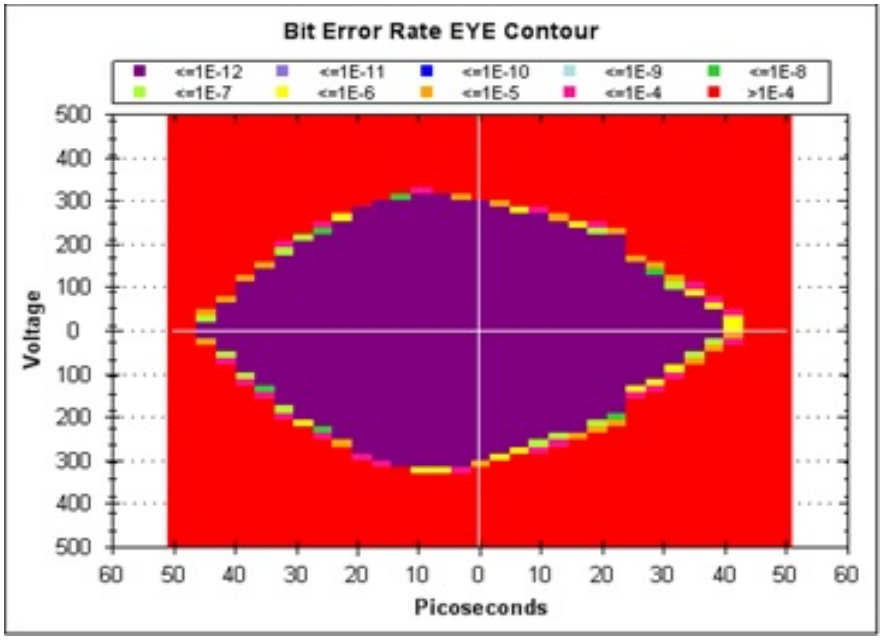




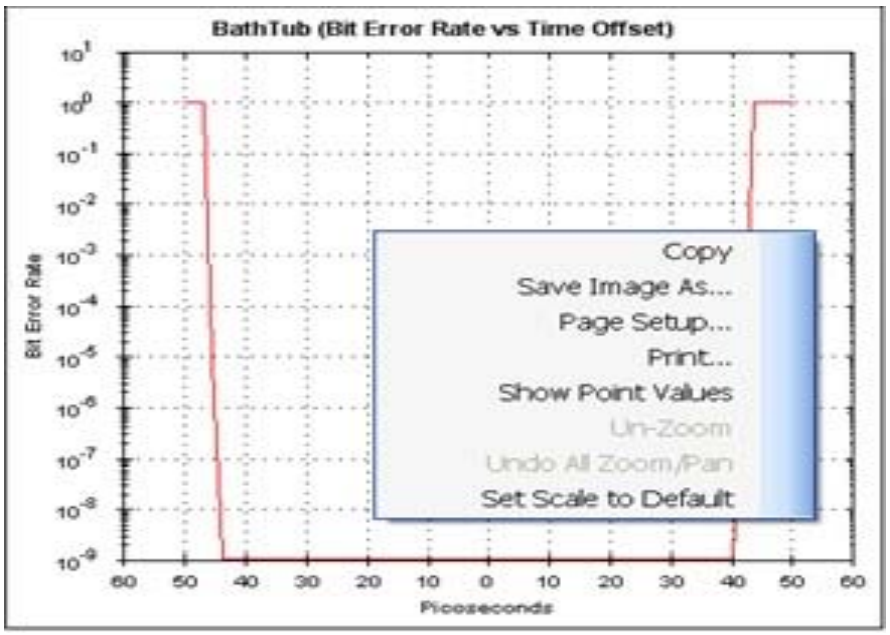
Additional Jitter and Emphasis Example

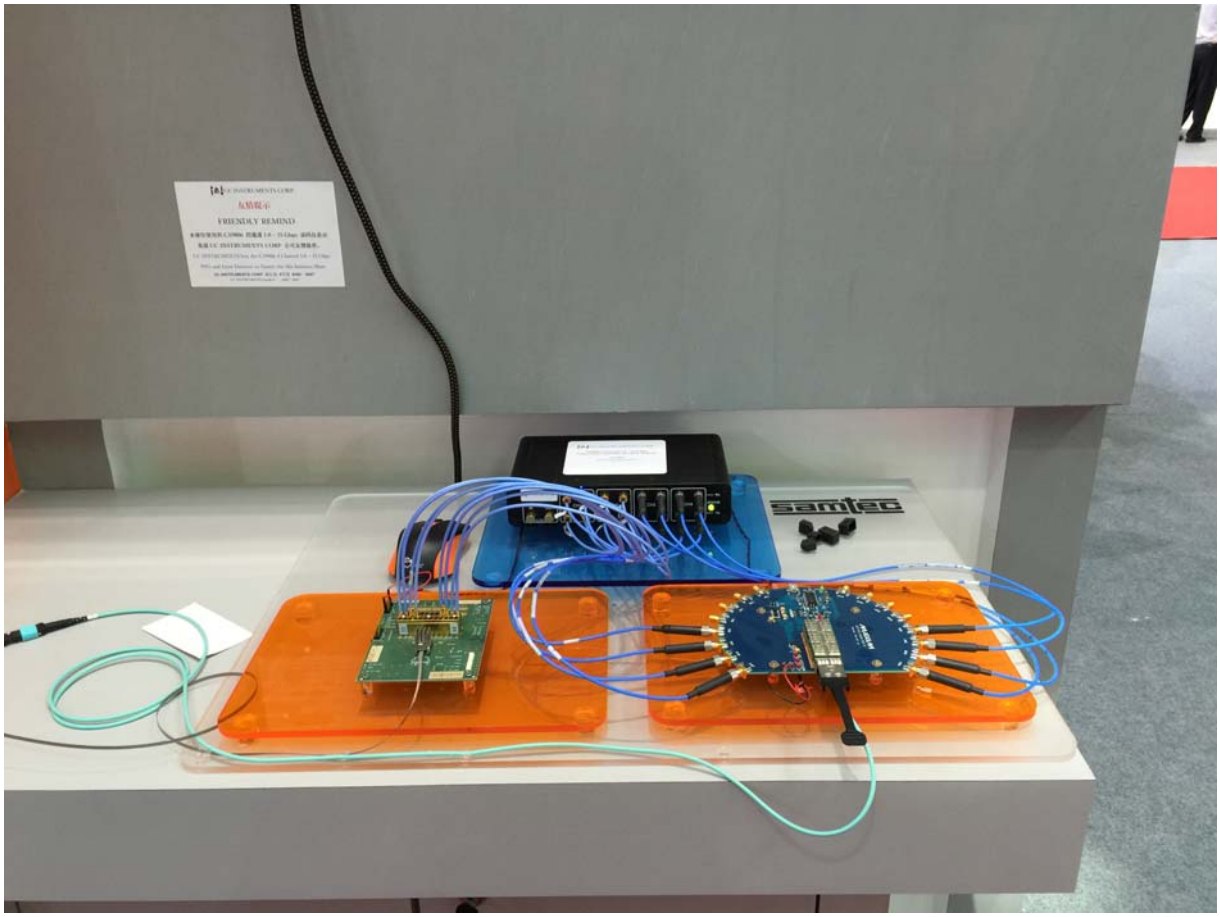


Bit Error Rate Eye Contour



BathTub (Bit Error Rate vs Time Offset)





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