Keysight N4917CPCA Optical Receiver Stress Test for CPRI Fronthaul Networks

User Guide



Notices

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Overview

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1

Optical Receiver Stress Test Solution for CPRI Fronthaul Networks - At a Glance

The N4917CPCA Optical Receiver Stress Test solution for CPRI Fronthaul Networks is based on the N4917B Optical Receiver Stress Test solution for 100GBASE transceivers, with some modifications to the stress calibration recipe and adjustable bit rate to meet the needs of CPRI Fronthaul Network Testing.

The Keysight N4917CPCA Optical Receiver Stress Test Solution provides a platform for stressed receiver sensitivity test, which can be used with 10GBASE, 40GBASE, and 100GBASE devices in a CPRI Fronthaul environment. The solution consists of several test instruments such as a Bit Error Rate Tester (BERT), Digital Sampling Scope (DCA), Optical Reference Transmitter, Tunable Laser, and Optical Attenuator operating together with the N4917CPCA software package.

Some salient features of the N4917CPCA Optical Receiver Stress Test Solution include:

- · remote control of all the test instrumentation
- automated calibration of the optical stressed eye parameters (ER, VECP J2, J9, and OMA)
- adjustable target values for ER, VECP, J2, J9, and OMA
- jitter tolerance compliance and margin tests

Applicable Standards

The N4917CPCA Optical Receiver Stress Test software supports automated optical stressed receiver sensitivity test for optical transceivers in a CPRI Fronthaul environment that are compliant with the following standards:

Test Name	Reference Standard
10GBASE-LR/ER/SR	IEEE 802.3 2018 Clause 52
40GBASE-LR4/ER4	IEEE 802.3 2018 Clause 87
100GBASE-LR4/ER4	IEEE 802.3 2018 Clause 88
-	CPRI Specification V7.0

System Description

The N4917CPCA Test Solution for Optical Stressed Eye consists of:

- a BERT to generate electrical signal
- an electrical-optical converter that modulates the optical signal from a fixed or tunable laser
- a digital sampling oscilloscope required for calibration of the stressed eye



Figure 1 shows a typical Optical Receiver Stressed Test equipment setup.

Figure 1 Example setup

In the Optical Stressed Eye Test Setup, the J-BERT M8020A High-Performance BERT system is the core instrument that generates an electrical signal with all the required impairments (random, BUJ and sinusoidal timing jitter, ISI and sinusoidal amplitude interference) at the data signal output. It uses a combination of built-in stress sources along with an external generator. The electrical signal generated from the BERT is fed into an 81490/91A electrical-optical converter to modulate the laser and create a stressed optical signal.

Depending on which standard is being tested, either an 8160xA tunable laser or the internal 8149xA laser can be used. The optical output of the 8149xA is attenuated to achieve the required optical power level at the input of the receiver under test.

Prior to testing the receiver, the optical signal for each wavelength is calibrated using an N1092x DCA-M Sampling Oscilloscope or an 86100D/N1000A DCA-X Wide-Bandwidth Oscilloscope with an 86105D optical module set up as a reference receiver.

The equipment used in the Optical Stressed Eye Test Setup is under control of the N4917CPCA Test Solution software, which takes care of the various equipment settings and performs an iterative adjustment of the BERT stresses until the optical signal measured on the DCA meets the required stressed eye parameters.

The N4917CPCA Optical Receiver Stress Test Solution software also allows for precise repeatable calibration of an optical stressed eye. The N4917CPCA Optical Receiver Stress Test solution enables an additional stress source, bounded uncorrelated jitter (BUJ) to be used as an alternative to sinusoidal jitter or random jitter when calibrating the stressed eye. BUJ can provide a better model for crosstalk in CPRI fronthaul network testing. A simple switch in the software GUI enables the user to choose between BUJ and PJ2 (sinusoidal jitter) for 40/100GBASE standards, or BUJ and RJ (random jitter) for the 10GBASE standard.

Additionally CPRI fronthaul networks generally run at slightly different line rates, e.g. CPRI option 10 bit rate is 24.33024 Gb/s instead of 25.78125 Gb/s. The N4917CPCA lets the user adjust the bit rate prior to a stressed eye calibration.

Once you achieve the calibrated stressed eye, proceed to test an actual device (DUT). In fronthaul testing priority is placed on the impact of jitter on the recovered clock frequency, which is usually measured with an oscilloscope. Consequently, DUT BER measurements at the receiver are not common. However if required, the N4917CPCA does provide semi-automated Jitter Tolerance measurements routines or you can perform the equivalent fully automated measurement on a Bit Error Rate Tester (BERT).

1 Overview

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Hardware and Software Requirements

NOTE

The N4917CPCA Optical Receiver Stress Test Solution Software runs on an external PC.

PC Hardware Requirements

Operating system

- Microsoft Windows 7 (64 bit)
- · Microsoft Windows 10 (64 bit)

Memory

• 8 GB RAM [minimum]

Monitor Resolution

• WXGA+ (1440 x 900) [minimum]

PC Software Requirements

Keysight IO Libraries Suite (Software)

• Ver.17.2.x or later

M8070A/B system software for M8000 series

- M8070A version 5.1 or later
- M8070B version 6.0 or later

N1010A FlexDCA Remote Access System

• A.06.02 or later

PC Interfaces

- USB
- LAN

Instrument Firmware Requirements

M8020A J-BERT

• M8070A/B System Software as specified earlier

86100D DCA-X

FlexDCA version A.06.02 or later

8164B LMS

• Ver.V5.25 or later

81490A/81491A Ref Tx

• Ver.5.01 or later

Supported Equipment

As mentioned earlier, the N4917CPCA Optical Receiver Stress Test Solution comprises of a variety of instruments. For some of the instruments, alternative selections are supported. The following sections detail the equipment, including the **minimum** option requirements, which are compatible with the N4917CPCA Optical Receiver Stress Test Solution.

BERT

- M8020A-BU2 mainframe with USB option
- M8070A-0TP System Software Or M8070B + M8070ADVB System Software

Pattern Generator only

- M8041A-G16/0G2/0G3 High Performance BERT module
- M8062A-G32/0G4/0G5 32 Gb/s Front End

Full BERT

- M8041A-C16/0G2/0G3/0A2 High Performance BERT module
- M8062A-C32/0G4/0G5/0A4 32 Gb/s Front End

Signal Generator for Sinusoidal Interference

- 81150A-001, M81160A-001 Pulse Function Arbitrary Noise Generator or
- N5171B-501, N5173B-513 EXG X-series RF Analog Signal Generator
- N5181B-503, N5183B-513 MXG X-series Analog Signal Generator
- E8257D PSG Analog Signal Generator
- Any other source that is SCPI code compatible with the Signal Generator listed above for setting frequency and output amplitude

Signal Generator for System Clock

You may optionally use system clock, if the internal clock of the BERT is not used.

- E8257D PSG Analog Signal Generator up to 67 GHz or
- N5173B EXG X-series Microwave Analog Signal Generator up to 40 GHz or
- N5183B MXG X-series Microwave Analog Signal Generator up to 40 GHz or

 any other source that is SCPI code compatible with the Signal Generators listed above for setting frequency and output amplitude

Lightwave Measurement System

- · 8164B LMS Mainframe
- 8163B LMS Mainframe

Tunable lasers (1310 nm):

- 81600B-132 Tunable Laser 1260-1375 nm or
- 81602A-013 Tunable Laser 1250-1370 nm or
- 81606A-113 Tunable Laser 1240-1380 nm or
- 81608A-113 Tunable Laser 1240-1380 nm or
- 81609A-113 Tunable Laser 1240-1380 nm

Tunable lasers (1550 nm):

- 81606A-116 Tunable laser 1490-1640 nm
- 81606A-216 Tunable laser 1450-1650 nm
- 81607A-116 Tunable laser 1490-1640 nm
- 81608A-116 Tunable laser 1490-1640 nm
- 81608A-216 Tunable laser 1450-1650 nm
- 81609A-116 Tunable laser 1490-1640 nm
- 81609A-216 Tunable laser 1450-1650 nm

Reference transmitters

- 81490A-E05 Reference Transmitter
- 81490A-E09 Reference Transmitter
- 81490A-135 Reference Transmitter
- 81490A-E10 Reference Transmitter
- 81490A-E03 Reference Transmitter
- 81490A-E06 Reference Transmitter
- 81491A-135 Reference Transmitter
- 81491A-085 Reference Transmitter

Attenuators:

- 81576A Attenuator module (straight SMF) or
- 81577A Attenuator module (angled SMF) or
- N7761A external Attenuator (1 ch straight SMF) or
- N7762A external Attenuator (2 ch straight SMF) or
- N7764A external Attenuator (4 ch straight SMF)
- N7766A external Attenuator (2 ch MMF)
- N7768A external Attenuator (4 ch MMF)

DCA-X Oscilloscope

- 86100D-ETR/PTB/200/300 DCA-X mainframe
- N1000A-PLK/LOJ/PTB DCA-X mainframe
- · 86105D-281/IRC 50 GHz Electrical, 34 GHz Optical module or
- · 86115D-282/IRC dual 34 GHz Optical module or
- 86105C-200/IRC 20 GHz Electrical, 9 GHz Optical module
- 86107A-020 Precision Time Base (not required, if DCA-X has the option –PTB)

DCA-M Oscilloscope

- N1092A one optical channel or
- N1092B two optical channels or
- N1092C one optical, two electrical channels or
- N1092D four optical channels or
- N1092E two optical, two electrical channels
- options LOJ/PLK/IRC/200/300/500

Clock Recovery

- N1077A-216-SMS Clock Recovery 50 Mbd 16 Gbd
- N1077A-232-SMS Clock Recovery 50 Mbd 32 Gbd
- N1078A-216-S50 Clock Recovery 125 Mbd 16 Gbd

- N1078A-225-S50 Clock Recovery 25 29 Gbd
- N1078A-232-S50 Clock Recovery 125 Mbd 32 Gbd
- N1078A-264-S50 Clock Recovery 125 Mbd 64 Gbd

2 System Requirements for N4917CPCA

Equipment Configuration

The supported equipment described in the previous section provides the flexibility to assemble the system configuration in various ways.

The N4917CPCA Optical Receiver Stress Test recommended configurations are described below. For assistance with other variants of equipment configuration, contact your local Keysight technical support.

Recommended Setup using DCA-M

Connect the equipment and cabling as shown in Figure 2.



Optical Receiver Stress Test Calibration with DCA-M

Figure 2 Optical Receiver Stress Test Calibration with DCA-M

Recommended Setup using DCA-X

Connect the equipment and cabling as shown in Figure 3.





Figure 3 Optical Receiver Stress Test Calibration with DCA-X

Other options to these configurations include:

- using an external system clock
- using a signal generator instead of the pulse function generator for the interference source
- using an external optical attenuator instead of 8157xA
- using an external tunable or fixed wavelength laser
- using LAN connections to the pulse function generator and LMS mainframe

2 System Requirements for N4917CPCA

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Concepts and Features of N4917CPCA Software

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Software concept and flow of Optical Receiver Test

The N4917CPCA Optical Receiver Stress Test solution software includes three main functions—Stressed Eye Calibration, Jitter Conformance Test and Jitter Performance Test.

A Stressed Eye calibration is required first to provide an optical waveform with jitter and interference impairments per the applicable standard. This stressed signal is then used in conjunction with a Jitter Conformance/Performance routine to test one channel at a time of the DUT.



Figure 4 Stressed Eye Calibration and Measurement flow

The calibrated parameters in the stressed eye are Extinction Ratio, VECP, J2, and J9. The Stressed Eye Calibration adjusts the values of these parameters until the respective values meet the limits defined in the specification.

The results and parameter settings from the Stressed Eye Calibration are saved in a file. These parameters are automatically referred to while running the Jitter Conformance Test and the Jitter Performance Test.



Figure 5 Using the Stressed Eye Calibration Results as reference

Software Functions and Features

The N4917CPCA Optical Receiver Stress Test solution software has the ability to create any stressed optical eye waveform and performs DUT testing based on the parameter settings provided. Load the parameters for the test from the Parameter file (or from a previous Results file). Once loaded, you may also adjust the parameter values in the software GUI prior to running the Stressed Eye Calibration.

Stressed Eye Calibration

This feature of the N4917CPCA software creates a stressed eye, based on the applicable standards, for stressed receiver sensitivity testing.

Table 4 lists the setting and measurement parameters for Stressed Eye Calibration. The Measurement Parameters are used to characterize the stressed eye.

		Parameters	
		Power level for calibration (dBm)	
	Optical	OMA for DUT test (dBm)	
		Laser Wavelength (nm)	
		Data Amplitude (mV _{pp})	
		Intersymbol interference frequency (GHz)	
		Intersymbol interference amplitude (dB)	
		Sinusoidal interference frequency (MHz)	
		Sinusoidal interference amplitude (mV_{pp})	
		Common mode interference gain	
		Periodic jitter 1 frequency (MHz)	
Setting Parameters		Periodic jitter 1 amplitude (UI _{pp})	
	Flectrical	Periodic jitter 2 frequency (MHz)	
	Licothout	Periodic jitter 2 amplitude (UI _{pp})	
		Random jitter amplitude (UI _{rms})	
		Bounded uncorrelated jitter amplitude (UIpp)	
		Bounded uncorrelated jitter PRBS rate (Gb/s)	
		Bounded uncorrelated jitter polynomial	
		Bounded uncorrelated jitter filter (MHz)	
		Bit Rate (Gb/s)	
		DCA Reference Receiver BW	
		De-Emphasis cursors (dB)	

Table 1 Parameters for Stressed Eye Calibration

	Parameters
Measurement Parameters	[ER] Extinction Ratio (dB)
	Initial [VECP] Vertical Eye Closure Penalty (dB)
	[VECP] Vertical Eye Closure Penalty (dB)
	J2 jitter (UI _{pp})
	J9 jitter (UI _{pp})
	[DDPWS] Data Dependent Pulse Width Shrinkage (ps)
	Calibration level OMA (dBm)

To speed up the stressed eye calibration, you may set the starting values for data amplitude, ISI amplitude, SI amplitude, PJ2/BUJ, and RJ/BUJ. Once the software achieves the initial stressed eye waveform from the setting parameters, the system adjusts those parameters until the measurement parameter targets are achieved. The measurement parameters—ER, VECP, J2 and J9—are adjusted using the parameters data amplitude, ISI amplitude, SI amplitude, PJ2 or BUJ amplitude, RJ or BUJ amplitude. Initial VECP is the portion created from ISI (inter-symbol interference). Initial VECP should be at least 2/3 of the VECP target.

The full value of VECP is then achieved by adding additional SI (sinusoidal interference) and jitter.

Jitter Conformance Test

This feature of the N4917CPCA software performs a jitter tolerance test based on the applicable standards, to confirm that the DUT meets the required Bit Error Rate (BER) when the specified SJ amplitude is applied at each SJ frequency. Note that the Jitter Conformance Test sets up only the SJ stress level. You must manually enter the device BER and the Pass/Fail criteria. The test builds a table and a plot for SJ frequency/amplitude versus BER.

As a prerequisite, you must run the Stressed Eye Calibration prior to running the Jitter Conformance Test.

Table 2 lists the Setting and Measurement Parameters for JitterConformance Test:

Parameters			
Setting Parameters	SJ start frequency (kHz)		
	SJ stop frequency (kHz)		
	SJ number of frequency points		
	SJ margin (%)		
	Optical power (dBm)		
	Data Polarity		
Massurament Decomptore	User entered BER		
measurement Parameters	User entered pass/fail (GO/NoGO)		

Table 2 Parameters for Jitter Conformance Test

Jitter Performance Test

This feature of the N4917CPCA software performs a jitter tolerance test based on the applicable standards, to explore the DUT margin and to find the maximum amplitude limits that meet the required Bit Error Rate (BER). Note that the Jitter Performance Test sets up only the SJ stress level. You must manually enter the device BER and the Pass/Fail criteria. The test builds a table and a plot for SJ frequency/amplitude versus BER.

As a prerequisite, you must run the Stressed Eye Calibration prior to running the Jitter Performance Test.

Table 3 lists the Setting and Measurement Parameters for JitterPerformance Test:

Parameters			
Setting Parameters	SJ start frequency (kHz)		
	SJ stop frequency (kHz)		
	SJ number of frequency points		
	SJ amplitude (UI)		
	Optical power (dBm)		
	Data Polarity		
Measurement Parameters	User entered BER		
	User entered pass/fail (GO/NoGO)		

Table 3 Parameters for Jitter Performance Test

Parameter files

These files store parameters to be used for stressed eye calibration or stressed eye test or both. An extended version of the files is used to store the stressed eye calibration results.

The parameter file contains all the necessary instrument parameter values to setup a stressed eye calibration or jitter measurement, including the target stressed eye parameters—ER, initial VECP, VECP, J2, J9, DDPWS, and final OMA. Default parameter files are provided as part of the software installation. However, in general, you must customize some of the values in the file for your own system.

Existing or new parameter files can also be saved/created directly from the N4917CPCA user interface, e.g. after a successful calibration, the actual instrument parameters will be updated. Saving a new/updated parameter file at this point means the starting values for data, ISI, SI, PJ2/RJ/BUJ amplitude will be close to final values for subsequent calibrations, resulting in a faster stressed eye calibration.

Navigate to C:\Users\Public\Public Documents\N4917CPCA\Parameter to access the default Parameter files.

There are sub-folders for each supported standard:

- · 10GBASE
- · 40GBASE
- · 100GBASE

Each sub-folder contains default parameters for each data lane/ wavelength/ reach. Stressed Receiver Sensitivity Specifications

For reference, Table 4 lists the salient conditions required for stressed receiver sensitivity test.

	100G	100G	40G	40G	10G	10G	10G
	BASE -LR4	BASE -ER4	BASE- LR4	BASE -ER4	BASE -LR	BASE -ER	BASE -SR
Conditions for Stressed Receiver Sensitivity Test							
Extinction Ratio	4 dB	8 dB	3.5 dB	5.5 dB	3.5 dB	3.0 dB	3.0 dB
Initial Vertical eye closure penalty (VECP) (SEC for SR4)	1.2 dB min	2.33 dB min	1.27 dB min	1.47 dB min	1.47 dB min	1.8 dB min	2.33 dB min
Vertical eye closure penalty (VECP), (Stressed eye closure for SR4)	1.8 dB	3.5 dB	1.9 dB	2.2 dB	2.2 dB	2.7 dB	3.5 dB
J2 Jitter	0.3 UI	0.3 UI	0.3 UI	0.3 UI	0.3 UI	0.3 UI	0.3 UI
J9 Jitter	0.47 UI	0.47 UI	0.47 UI	0.47 UI	-	-	-
DDPWS	-	-	-	-	5 ps	5 ps	5 ps
Optical Wavelength Assignments							
Spacing	5nm	5nm	20nm	20nm	-	-	-
Lane LO Nominal Wavelength	1295.56 nm	1295.56 nm	1271 nm	1271 nm		1550 nm	
Lane L1 Nominal Wavelength	1300.05 nm	1300.05 nm	1291 nm	1291 nm	1310		850 nm
Lane L2 Nominal Wavelength	1304.58 nm	1304.58 nm	1311 nm	1311 nm	nm		
Lane L3 Nominal Wavelength	1309.14 nm	1309.14 nm	1331 nm	1331 nm			
Stressed receiver sensitivity, OMA	-6.8 dBm	-17.9 dBm	-9.6 dBm	-16.8 dBm	-10.3 dBm	-11.3 dBm	-7.5 dBm
Aggressor lane OMA	-1.3 dBm	-13.4 dBm	-2.1 dBm	-9.8 dBm	-	-	-

Table 4 Stressed Receiver Sensitivity Test Specifications

Example CPRI parameter file

File Type,	Еуе	File type	
[Tag Data]			
OperatorName,			
ResultFile,			
EyeFile,	C:\Users\Public\Documents\N4917CPCA\ Parameter\100GBASE\ Eye_parameters_100G_LR4_PJ2_L0.csv		
Comment,			
[Measurement Condition]			
Measurement Mode,	100GBASE-LR4/ ER4	Measurement type	
ERTgt[dB],	4.25	Target values for defining a	
ERDelta[dB],	0.25	Stressed Optical waveform according to standard.	
ERAdj,	True		
<pre>InitialVECPTgt[dB],</pre>	1.3		
<pre>InitialVECPDelta[dB],</pre>	0.1		
InitialVECPAdj,	True		
VECPTgt[dB],	1.8		
VECPDelta[dB],	0.1		
VECPAdj,	True		
J2Tgt[UIpp],	0.3		
J2Delta[UIpp],	0.01		
J2Adj,	True		
J9Tgt[UIpp],	0.47		
J9Delta[UIpp],	0.04		
J9Adj,	True		
FinalOMA[dBm],	-6.8		

DataAmpDef[Vpp],	0.24	Starting values of adjustable	
ISIAmpDef[dB],	-0.8	to achieve a compliant	
SIAmpDef[Vpp],	0.2	stressed eye.	
RJAmpDef[UIrms],	0.01		
AvgOpticalPower[dBm],	3	Average power level for calibration	
PJ1Freq[MHz],	10	Sinusoidal jitter parameter	
PJ1AmpDef[UIpp],	0.05	to be swept for Jitter Conformance and Jitter Performance tests	
ISIFreq[GHz],	12.890625	Frequency point for ISI amplitude setting	
SIFreq[MHz],	150.13	Frequency of sinusoidal interference	
SourcePower[dBm],	13	Tunable laser power	
DataPattern,	PRBS9	Do not adjust	
BitRate[Gbps],	24.33024	Data rate	
WaveLength[nm],	1295.56	Wavelength of lane under test	
<pre>Pre_Cursor1[dB] ,</pre>	0	De-emphasis settings, adjust	
Post_Cursor1[dB],	-2	to achieve optimum optical waveform before impairments	
Post_Cursor2[dB],	0	are added. Use values established during System Performance Check.	
ISI Effect,	1	Do not adjust	
CMI[0.1-1.0],	0.33	Sinusoidal interference input gain	
DCA_offset[dB],	0	Offset for DCA average power measurement	
J2SignalType,	PJ2	J2 stressor signal	
PJ2Freq[MHz],	100.7	Frequency of 2nd periodic jitter	
PJ2AmpDef[UIpp],	0.1	Starting value of PJ2 amplitude	

BUJAmpDef[UIpp],	0.1	Starting value of BUJ amplitude
BUJDataRate[Mb/s],	625	BUJ PRBS data rate
BUJPolynomial,	2^7-1	BUJ PRBS pattern
BUJFilterType[MHz],	200	BUJ filter
RefRcvrBwVCouplingOn,	0	0 = set DCA reference receiver to value in next row
		1 = let DCA automatically set reference receiver bandwidth to ~ 75% of data bit rate
RefRcvrBw[GHz],	19.34	DCA reference receiver bandwidth

3 Concepts and Features of N4917CPCA Software
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Using the N4917CPCA Software

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Starting the System Software

NOTE

Before launching the N4917CPCA Optical Receiver Stress Test software, ensure that the BERT M8070A/B System software is running, and, if applicable, the DCA N1010A FlexDCA Remote Access System software is also running. Also make sure that all the physical cabling connections are in place.

To launch the N4917CPCA Test Solution software, click **Start**. From the **Start** menu, click **All Programs>Keysight N4917CPCA>Keysight N4917CPCA**.

The main window of the N4917CPCA software is displayed (see Figure 6).

N4917CPCA Optical Receiver Stress Test Solution					
File Setting Tool Help			Mode Se	lection 100GBASE-	LR4/-ER4
tressed Eye Jitter Conformance Jitter Performance			Node de		
Tag Data		Measurement Results			
Operator		ExtinctionRatio [dB]		Initial VECP [dB]	
Parameter file	Open file	VECP [dB]		J2 [Ulpp]	
Result File	Set file	J9 [Ulpp]		Calibration OMA [dBm]	
Comment					
Measument Items		Adjustment Results			
Adjustment Target Tol		Data Amplitude [Vpp]		ISI Amplitude [dB]	
ExtinctionRatio [dB]		SI Amplitude [Vpp]		BUJ Amplitude [UIpp]	0.1000
Initial VECP [dB]		RJ Amplitude [UIrms]		Final Avg Opt Pwr [dBm]	
VECP [dB]					
J2 [Ulpp]					
J9 [Ulpp]					
Final OMA [dBm]					
Adjustment Items					
Data Amplitude Mont					
ISI Amplitude [dB]					
SI Amplitude [Vop]					
BUJ Amplitude [Ulpo]					
RJ Amplitude [Ulims]					
Parameter Entru					
Ava Opt Power (dBm)					
PJ1 Frequency (MHz) SI Frequency (MHz)					
PJ1 Amplitude [UIpp] Data Pattern					
BUJ Data Rate [Mb/s]	_				
ISI Frequency [GHz] Ref. Rcvr. BW [GHz]		1			
Source Power [dBm] Wavelength [nm]				Start(S	Stop(P)



Selecting a Standard for Optical Receiver Stress Test

The N4917CPCA software supports different standards for optical receiver stress testing. Select the required standard from the Mode Selection drop-down list.

M4917CPCA Ontical Receiver Stress Test Solution	
File Setting Tool Help	
Stressed Eve.	Mode Selection 10GBASE-LR
- Tao Dala	100GBASE-LR4/-ER4 10GBASE-LR
	Fixing tion Bation (dB)
Parameter file Open file	VECP [dB]
Result File Set file	DDPWS [ps] Calibration OMA (dBm)
Comment	
Manumant Dama	A flute at Day h
Adjustment Target Tol	Adjustment Hesuits
ExtinctionBatio (dB)	Cl Amplitude [Vpp]
	B L Amplitude [19pp]
J2 [Ulpp]	
DDPWS [ps]	
, , , , , , , , , , , , , , , , , , , ,	
Final OMA [dBm]	
diustment Items	
Data Amplitude [Vpp]	
ISI Amplitude [dB]	
SI Amplitude [Vpp]	
RJ Amplitude [UIrms]	
- Promoto Falu	
Parameter Crity	
Avg upt Power (abm)	
PJ1 Frequency [MHz] SI Frequency [MHz]	
PJ1 Amplitude [Ulpp] Data Pattern	
Bit Hate [Libps]	
Ref. RCVf. BW [uHz]	Start/S) Stor/P
Source rower [dbm] Wavelength [nm]	Star(3) Stop(r)

Figure 7 N4917CPCA Mode Selection

Connecting to Equipment

From the **Setting** menu select **System Connection Check** to enter the remote control addresses for each instrument to be controlled.

File Setting Tool Help					
Stresse System Connection Check(I)			Mode Selection	100GBASE-L	.R4/-ER4 💌
Parameter switch between PJ2 and BUJ(P)		Manufacture Devulta			1
Ref. Rcvr. BW Coupling ON(C)		Measurement Hesuits			
December (In	0 (1			EUF [06]	
	Upen file		JZ	[UIPP]	
	Set file	19 [Olbb]	Laiibrat	ION UMA (dBm)	
Comment					
Measument Items		Adjustment Results			
Adjustment Target To		Data Amplitude [Vpp]	ISI Amp	litude [dB]	
ExtinctionRatio [dB]		SI Amplitude [Vpp]	BUJ An	nplitude [UIpp]	0.1000
Initial VECP [dB]		RJ Amplitude [UIrms]	Final Av	/g Opt Pwr [dBm]	
VECP [dB]					
J2 [Ulpp]					
J9 [Ulpp]					
Final OMA [dBm]					
Adjustment Items					
Data Amplitude [Vpp]					
ISI Amplitude [dB]					
SI Amplitude [Vpp]	СМІ				
BUJ Amplitude [UIpp]					
BJ Amplitude [UIrms]					
Parameter Entry					
Avg Opt Power [dBm]					
PJ1 Frequency [MHz] SI Frequency [MHz]				
PJ1 Amplitude [UIpp] Data Pattern					
BUJ Data Rate [Mb/s]	bps]				
ISI Frequency [GHz] Ref. Rovr. BW	[GHz]	1			
Source Power [dBm] Wavelength	nm]			Start(S)	Stop(P)

Figure 8 N4917CPCA System Connection Check

NOTE

Instruments may need to be connected or discovered with Keysight IO Libraries Connection Expert before running the N4917CPCA Software.

	heck (100GBASE-LR4/-ER4)		×
Signal Generator for Clock	Not used Visa name		
Signal Generator for SI	81160A Visa name GPIB1::6::INSTR	_	
BERT	M8020A(M8041A+M8062A-C32 BERT) Visa name TCPIP0::localhost::hislip0	/ M8070A/B	
Tunable Laser Source	81606A-113 Visa name GPIB1::20::INSTR	_	
Reference Tx	8164B + 81490A-E05/E09 /isa name GPIB1::20::INSTR	RefTx Slot	
Optical Attenuator	81577A Visa name GPIB1::20::INSTR	ATT Slot	
DCA	N1092A Visa name TCPIP0::localhost::hislip1	Channel 24	
		🗖 Use CDR	
			Check Start
			Exit

Figure 9 System Connection Check window

The N4917CPCA Software supports GPIB, LAN and USB connections to equipment, provided the instrument hardware supports those interfaces. For each instrument in use, select the correct model number, enter the VISA address and where necessary the slot or channel number.

NOTEFor LAN connections use either HISLIP or VXI-11 (INST) connections.
Connections via SOCKET or TELNET are not supported.

A selection of instruments is supported, including in some cases the option for non-remote control. If either "w/o control" (i.e. manual control of instrument) or "not use" is selected then the contents of the VISA address box are not used and it can be left blank.

NOTE	VISA IP addresses starting with TCPIP0::127.0.0.1:: or TCPIP0::localhost:: can be used if a remote instrument GUI (e.g. M8070A BERT SW or N1010A FlexDCA SW) is running on the same computer as the N4917CPCA Software.
NOTE	For any optical equipment that is installed in an 8163B/8164B LMS mainframe, use the VISA address of the 8163B/8164B mainframe plus slot number to identify it. Use of an external Tunable Laser Source is also supported but it will not be remotely controlled. You must set its power level and wavelength manually.

Once all the equipment connections have been configured, click the **Check Start** button to test the connections. Connection to each instrument will be verified and either shown as a pass or fail with error information.



Figure 10 Successful System Connection Check

System Performance Check

Prior to running the N4917CPCA Test Solution software for the first time, or whenever equipment is re-configured, it is recommended to verify the intrinsic system performance. The System Performance Check ensures that all connections are correct and that the basic system performance is sufficient before running a stressed eye calibration.

Power on all equipment and allow them to warm up before you run the system performance verification process. Recommended warm up time is at least one hour.

Before running a System Performance Check you must run the System Connection Check per the previous section and also load an Eye Parameter file (see "Stressed Eye Calibration").

N4917CPCA Optical Receiver Stress Test Solution	
File Setting Tool Help	
Stressed Eve Litte System performance Check(P)	Mode Selection 100GBASE-LR4/-ER4 💌
-Taz Data	Mean rement Reculto
Operator	ExtinctionBatio [dB] 0.0000 [nitial VECP [dB] 0.0000
Parameter file ameter/100GBASE/Eve parameters 100G LR4 BUJ L3.csv Open file	VECP [dB] 0.0000 J2 [Ulip] 0.0000
Besult File Set file	J9 [Ulpo] 0.0000 Calibration OMA [dBm] 0.0000
Comment	
· · · · · · · · · · · · · · · · · · ·	
Measument Items	Adjustment Results
	Data Amplitude [Vpp] 0.0000 ISI Amplitude [dB] 0.0000
ExtinctionFratio [db] / [4.23 [0.25	SI Amplitude [Vpp] 0.0000 BUJ Amplitude [Ulpp] 0.0000
	RJ Amplitude [UIrms] 0.0000 Final Avg Opt Pwr [dBm] 0.0000
33 [01pp] 14 [0.47]0.04	
Final OMA [dBm]	
Adjustment Items	
Data Amplitude (Vpp) 0.24	
ISI Amplitude [dB] -0.8	
BUS Amplitude (Uipp) 0.1	
Parameter Entry	
Avg Opt Power [dBm] 3	
BIT Frequency (MHz) 10 Si Frequency (MHz) 150.13	
PJ1 Amplitude [Ulpp] 0.05 Data Pattern PRBS9	
BUJ Data Rate [Mb/s] 625 V Bit Rate [Gbps] 24.33024 V	
ISI Frequency [GHz] 12.890625 Ref. Rcvr. BW [GHz] 19.34	
Source Power [dBm] 13 Wavelength [nm] 1309.14	Start(S) Stop(P)

From the Tool menu select System Performance Check.



From the **System Performance Check** window you can set the BERT de-emphasis Pre-cursor1 and Post-cursors 1,2, if desired, to obtain an optimum optical waveform with minimum jitter. Usually, for 100GBASE configurations around -2 dB of Post-cursor 1 is all that is required. For 40GBASE/10GBASE configurations usually 0 to -0.5 dB of Post-cursor 1 is sufficient. Select the appropriate de-emphasis values and click the **Set** button to send to the hardware; observe the resulting optical waveform on the DCA.

Note the set of values for De-emphasis. You must also enter these values into the respective Eye Parameter files. Refer to the "Stressed Eye Calibration" section for more information on Parameter Files.

🔤 System Performa	nce Check (10	0GBASE-LR4/ER4)			×
De-Emphasis Set	0	Pre_Cursor1	Post_Cursor1	Post_Cursor2	
Intrinsic Meas. Start		Meas. Result	Lower Limit	Upper Limit	
Stop	ER(dB) [OMA(uW) [VECP [J2(mUI] [4 300 0 0	4.5 1500 1.3 200	
	J9[mUI]		0	350	Exit

Figure 12 System Performance Check window

To measure the basic system performance click the **Start** button under **Intrinsic Meas**. This initiates a sequence of tests with all jitter/impairment sources turned off, and measures extinction ratio (ER), optical modulation amplitude (OMA), vertical eye closure penalty (VECP), jitter J2, and jitter J9. The results of this clean optical signal are displayed in the first column of the table. The other columns, **Lower Limit** and **Upper Limit** are not hard limits; they are just a typical range of values that might be expected. Results above or below these limits might still be acceptable.

Figure 13 shows the results of a System Performance Check. Results are highlighted if the measured value falls outside of the lower/upper limits, as a warning only. In addition to checking whether the measured results fall within the limits, there is also a check on the amount of margin to the stressed eye specification for J2 and J9. For best performance and likelihood of achieving a successful stressed eye calibration there should be more margin for the J9 results than the J2 results, since the J9 parameter is most sensitive to the addition of the other eye impairments.

In	the	exam	ple	shown	below,	the J	2 mai	rgin:	300	mUI -	- J2	(mUI)	[76	mUI]
is	less	than	the	J9 ma	rgin: 47	70 mU	I - J9	(mU	JI) [16	60 ml	JI].			

System Performance Ch	eck (100GBASE-LR4/ER4))		×
De-Emphasis Set	Pre_Cursor1	Post_Cursor1	Post_Cursor2	
Intrinsic Meas. Start	Meas. Result	Lower Limit	Upper Limit	
Stop	[dB] 4.24	4	4.5	
OMA[[uW] [598	300	1500	
V	ECP 0.7947	0	1.3	
J2[i	mUI] 76	0	200	
J9[i	mUI] 160	0	350	
		300-J2 < 470-J9		
				Exit

Figure 13 Results of a System Performance Check

Main GUI

Figure 14 shows the different areas on the main window of the N4917CPCA Optical Receiver Stress Test Solution software. Also, there are three tabs–**Stressed Eye**, **Jitter Conformance** and **Jitter Performance**–that define the functions performed by the software. Switch tabs to access each function.

Stressed Eye Jitter Conformance Jitter	Performance				
IIIN 14917CPCA Ontical Receiver Stress Test Solution					
File Setting Tool Help					
Stressed Eye Litter Conformance Litter Performance			Mode Select	tion 100GBASE-	LR4/-ER4 💌
Tag Data	Measure	ment Results			
Operator	Extinc	tionRatio [dB]	4.0000 Ini	tial VECP [dB]	1.8000
Parameter file ameter\100GBASE\Eye_parameters_100G_LR	14_BUJ_L0.csv Open file VECP	[dB]	1.8000 J2	[UIpp]	0.3000
Result File ments\N4917CPCA\Result\100GBASE_LR4_L	Lane0_BUJ.csv Set file J9	[Ulpp]	0.4700 Ca	libration OMA [dBm]	
Comment					
Measument Items	- Adjustrad	ent Results			
Adjustment Target	Tol	molitude [Vop]	0.2400	Amplitude [dB]	-0.8000
ExtinctionRatio [dB] 🔽 4.25 0.25	SIAm	plitude [Vpp]	0.2000 BL	U Amplitude [UIpp]	0.1000
Initial VECP [dB] 🔽 1.3 0.1	BJAm	plitude [UIrms]	0.0100 Fir	al Avg Opt Pwr [dBm]	0.0000
VECP [dB] 🔽 1.8 0.1					
J2 [Ulpp] 🔽 0.3 0.01					
J9 [Ulpp] 🔽 0.47 0.04					
Final OMA [d8m]	Parameter	Results			
- Adjustment Items	Area	Area			
Data Amplitude [Vpp] 0.24	7 004				
ISI Amplitude [dB] -0.8					
SI Amplitude [Vpp] 0.2	CMI 0.33				
BUJ Amplitude [UIpp] 0.1					
RJ Amplitude [UIrms] 0.01					
Parameter Entry					
Avg Opt Power [dBm] 3					
PJ1 Frequency [MHz] 10 SI Frequenc	cy [MHz] 150.13				
PJ1 Amplitude [Ulpp] 0.05 Data Pattern	n PRBS9				
BUJ Data Rate [Mb/s] 625 V Bit Rate	[Gbps] 24.33024 💌				
ISI Frequency [GHz] 12.890625 Ref. Rcvr. B	3W [GHz] 19.34				
Source Power [dBm] 13 Wavelength	n [nm] 1295.56			Start(S) Stop(P)

Figure 14 Parameter settings and Results area on main window

Under each tab, you will commonly find that the left side of the window is an area to set parameters for measurements and the right side is an area that displays information and measurements results in the end.

Stressed Eye Calibration

Set Parameter file and Result file

essed Eye Jitter Con	ntormance										
Tag Data				_							
Operator			motor\Eu	0.000000	tom CPE		1100	-	0-		
Parameter file	anameter me (VV4517CFCX/ranameter (Eye_parameters_CFX_b05_L0.csv									en tile	-
Result File									Se	tile	
Comment	μ										
Measurment Items 😑											
	Adj	ustment	Ta	arget		Tol					
ExtinctionRatio [dB]]	\checkmark	4.25		0.1						
Initial VECP [dB]		v	1.3		0.1						
VECP [dB]		v	1.8		0.1						
J2 [Ulpp]		v	0.3		0.01						
10 [[]]aa1		•	0.47		0.04						
Final OMA [dBm	n]		-6.8								
Final OMA [dBn Adjustment Items -	n]	4	-6.8								
Final OMA [dBn Adjustment Items	n] p] [0.2	4	-6.8		j						
Final OMA [dBn Adjustment Items — Data Amplitude [Vpp ISI Amplitude [dB]	p] [0.2	4	-6.8] 		CMI			3	
Final OMA [dBn Adjustment Items Data Amplitude [Vpp ISI Amplitude [dB] SI Amplitude [Vpp	p] [0.2 [-0.7] [-0.7] [0.1]	4	-6.8				СМІ		0.3	3	
Final OMA [dBm Adjustment Items — Data Amplitude [Vp ISI Amplitude [dB] SI Amplitude [Ulp BUJ Amplitude [Ulp	p] [0.2 [0.1 [0.1 [0.1 [0.1] [0.1] [0.1]	4 13	-6.8				СМІ		0.3	3	
Final OMA [dBm Adjustment Items	p] 0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.1 -0.1 -0.1 -0.1	4 13	-6.8				СМІ		0.3	3	
Final OMA [dBm Adjustment Items — Data Amplitude [Vpp ISI Amplitude [dB] SI Amplitude [Ulp BUJ Amplitude [Ulp RJ Amplitude [Ulrm Parameter Entry —	p] 0.2 -0. -0. -0. -0. -0. -0. -0. -0. -0. -0.	4 13 1	6.8				СМІ		0.3	3	
Final OMA [dBn Adjustment Items — Data Amplitude [Vpp ISI Amplitude [dB] SI Amplitude [Vlp BUJ Amplitude [Ulp RJ Amplitude [Ulp Parameter Entry Avg Opt Power [dBr	p] 0.2 -0.1 -0.1 -0.1 -0.1 -0.1 -0.1 -0.1 -0.1	4 13 1	-6.8				СМІ		0.3	3	
Final OMA [dBn Adjustment Items — Data Amplitude [Vpp ISI Amplitude [dB] SI Amplitude [Ulp RJ Amplitude [Ulp RJ Amplitude [Ulp Parameter Entry Avg Opt Power [dBr	n] 0.2 -0. -0. -0. -0. -0. -0. -0. -0. -0. -0.	4 13 1	-6.8				СМІ		0.3	3	
Final OMA [dBn Adjustment Items Data Amplitude [Vpp ISI Amplitude [Vlp BUJ Amplitude [Ulp RJ Amplitude [Ulp Parameter Entry Avg Opt Power [dBr PJ1 Frequency [MH	p] 0.2 p] 0.1 p] 0.1 ns] 0.0 m] 4	4 13 1	-6.8		Frequence		CMI Hz]		0.3	3	
Final OMA [dBn Adjustment Items — Data Amplitude [Vpp ISI Amplitude [Vpp BUJ Amplitude [Ulp RJ Amplitude [Ulp Parameter Entry — Avg Opt Power [dBr PJ1 Frequency [MH PJ1 Amplitude [Ulp	p] 0.2 -0. -0. -0. -0. -0. -0. -0. -0.	4 13 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-6.8	SI	Frequenc		CMI Hz]		0.3 150.13 PRBS9	3	
Final OMA [dBn Adjustment Items Data Amplitude [Vpp ISI Amplitude [dB] SI Amplitude [Vlp BUJ Amplitude [Ulp RJ Amplitude [Ulp Parameter Entry Avg Opt Power [dBr PJ1 Frequency [MH PJ1 Amplitude [Ulp BUJ Data Rate [Mb]	n] 0.2 -0000000000.	4 13 1 1 1 1 1 1 5 5	-6.8	SI Da Bit	Frequence ta Patterr Rate	:y [M 1 [Gbp	CMI Hz]		0.3	3	
Final OMA [dBn Adjustment Items — Data Amplitude [Vpp ISI Amplitude [dB] SI Amplitude [VIp BUJ Amplitude [UIp RJ Amplitude [UIp Parameter Entry — Avg Opt Power [dBn PJ1 Frequency [MH PJ1 Amplitude [UIp BUJ Data Rate [Mb] ISI Frequency [GH	n] 0.2 -0. 0.2 -0. 0.1 -0. 0.1 -0.1	4 13 1 1 15 5 8890625	-6.8	SI Da Biti	Frequenc ta Patterr Rate f. Rcvr. E		ECMI Hz] Hz]		0.3 50.13 PRBS9 24.3302 9.34	3	

Figure 15 Setting Parameter and Result file locations

To set the Parameter file and Result file:

- 1 Click the **Open file** button and select a parameter file. Default location for parameter files is C:\Users\Public\Public Documents\N4917CPCA\ Parameter\. There are sub-folders for each supported standard:
 - 10GBASE
 - 40GBASE
 - 100GBASE

Each sub-folder contains default parameters for each data lane/ wavelength/ reach. These files have a file name of form *Eye_parameters_uuuu_xxxx_yyy_zz.csv*.

It takes **about 1.5 minutes** to load a parameter file since the SW also establishes communication between the control PC and measurement instruments and sets up all the necessary parameters for the instruments. The status bar on the main window of the N4917CPCA software displays **Initializing instruments now...** at the bottom left corner until the set up is complete.

2 Click the Set file button to specify a result file. Default location for results files is C:\Users\Public\Public Documents\N4917CPCA\ Result\. These files can have any name format but it is recommend to keep a similar name format as the parameter files.

Since parameter files and results files have the same format, after at least one stressed calibration run, you could select a previous results file as a parameter file for the next stressed eye calibration run.



Figure 16 Parameter and Result files interaction

The **Parameter file** loads all of the parameters in the left side of the main window. If required, you may adjust parameters directly on the main window before clicking **Start(S)** to commence a stressed eye calibration.

The choice between PJ2 sinusoidal or RJ random jitter and BUJ, as well as the bit rate and DCA reference receiver bandwidth, can all be defined in the parameter file. There are default parameter files for each optical lane for both PJ2/RJ and BUJ. In the default files, the bit rate is set to the CPRI line rate, and the DCA reference receiver bandwidth is set to 75% of the bit rate.

PJ2/BUJ or RJ/BUJ: The dominant driving parameter for J2 is the BERT PJ2, RJ, or BUJ amplitude. The choice can be made by loading a parameter file or can also be chosen in the N4917CPCA GUI.

Bit Rate: The N4917CPCA can calibrate a stressed eye at either the IEEE802.3 standard rates or the CPRI rates e.g. for 100GBASE standards 25.78125 or 24.33024 Gb/s, for 10/40GBASE standards 10.3125, 10.1376 or 9.8304 Gb/s. This choice can be made in the parameter file or from a bit rate selection in the N4917CPCA GUI.

DCA Reference Receiver Bandwidth: IEEE 802.3 10/40/100GBASE sections define the DCA reference receiver bandwidth to be 75% of the bit rate e.g. 19.34 GHz BW for 25.78125 Gb/s data rate and 7.465 GHz BW for 10.3215 Gb/s date rate. This is achieved by using either hardware filters or the SIRC function in the DCA, so that the DCA has the same bandwidth as a compliant DUT when calibrating the stressed eye parameters.

When using IEEE 802.3 compliant devices in a CPRI fronthaul network application, even though the bit rate is different, the DUT receiver bandwidth should not change. To accommodate this, the DCA Ref Rcvr BW is user- adjustable. If Ref Rcvr BW Coupling is set to ON then the DCA receiver bandwidth will be set to 75 % of the bit rate, e.g., 19.34 GHz for 25.78125 Gb/s or 18.25 GHz for 24.33024 Gb/s. If Ref Rcvr BW Coupling is set to OFF, then initially, the value from the last loaded parameter file will be used, and the user can edit this value in the N4917CPCA GUI prior to starting a stressed eye calibration.

The default and the recommendation is Ref Rcvr BW Coupling = OFF, i.e., BW is always 75 % of the IEEE 802.3 data rates.

Parameter details

Figure 17 shows the stressed eye calibration targets and tolerance.

The **Adjustment** check box, if checked, adjusts the parameters shown in Figure 17 to meet the target values during the stressed eye calibration. (This is equivalent to a value of TRUE for these parameters in the parameter file). If an item is unchecked, it is measured but not optimized. You may uncheck all the items and still run the test to verify performance. It is not recommended to check some but uncheck others as these items, in general, are interdependent.

Measurment Items				
	Adjustment	larget	lol	
ExtinctionRatio [dB]	•	4.25	0.1	
Initial VECP [dB]	•	1.3	0.1	
VECP [dB]	•	1.8	0.1	
J2 [Ulpp]	•	0.3	0.01	
J9 [Ulpp]		0.47	0.04	
Final OMA [dBm]		-6.8		



Figure 18 and Figure 19 show the PJ2 and BUJ views of the parameters, respectively, that are adjusted by the N4917CPCA Test Solution software in order to meet the stressed eye calibration targets. Starting values, loaded from the parameter file, speed up the calibration. It is not recommended to put **0** as a value in for any of these parameters because doing so limits the initial adjustment in only one direction and can lead to long calibration times.

NOTE

For the 10GBASE standards, the selection is RJ or BUJ as there is no PJ2 component in the stressed eye for 10GBASE standards.

Adjustment Items			
Data Amplitude [Vpp]	0.24		
ISI Amplitude [dB]	-0.13		
SI Amplitude [Vpp]	0.1	CMI	0.33
PJ2 Amplitude [Ulpp]	0.1		
RJ Amplitude [Ulrms]	0.01		

Figure 18 Adjustment Parameters (PJ2)

Adjustment Items		
Data Amplitude [Vpp]	0.24	
ISI Amplitude [dB]	-0.13	
SI Amplitude [Vpp]	0.1	CMI 0.33
BUJ Amplitude [Ulpp]	0.1	
RJ Amplitude [UIrms]	0.01	



Although interdependent, Table 5 indicates which adjustment parameter has the most effect on each measurement item.

Order	Measurement Item	Adjustment Item	Note
1	Extinction Ratio	Data amplitude	
2	Initial VECP	ISI amplitude	VECP is calculated from OMA and Ao
3	VECP	SI amplitude	VECP is calculated from OMA and Ao
4	J2	PJ2/RJ amplitude or BUJ amplitude	
5	J9	RJ amplitude	

Table 5 Measurement Item/Adjustment Parameter Relationship



Figure 20 Other Parameters (PJ2)

Parameter Entry Avg Opt Power [dBm]	4		
PJ1 Frequency [MHz]	10	SI Frequency [MHz]	150.13
PJ1 Amplitude [Ulpp]	0.05	Data Pattern	PRBS9 -
BUJ Data Rate [Mb/s]	625 💌	Bit Rate [Gbps]	24.33024 💌
ISI Frequency [GHz]	12.890625	Ref. Rcvr. BW [GHz]	19.34
Source Power [dBm]	10	Wavelength [nm]	1295.56

Figure 21 Other Parameters (BUJ)

Generally, there is no need to make any changes to the remaining parameters.

NOTE

You cannot edit the Data Pattern here. This is fixed by the software. 40/100GBASE standards use PRBS9 for stressed eye calibration; 10GBASE uses PRBS11. In all the cases, the pattern is changed to PRBS31 for DUT Jitter Conformance/Performance testing. The N4917CPCA Test Solution software automatically toggles between these patterns, when required.

PJ2/BUJ or RJ/BUJ selection

Select between PJ2/RJ or BUJ from the **Setting** menu in the GUI. The following example shows PJ2/BUJ setting.



Figure 22 Selecting between PJ2 and BUJ from the Setting menu

Selecting **Parameter switch between PJ2/RJ and BUJ(P)** displays another dialog where the PJ2/BUJ or RJ/BUJ selection can be made. Additionally, you can select the BUJ Polynomial and Filter from this dialog.

Param switch between PJ2 a	nd BUJ	×
⊂Signal Kind ©PJ2 ○BUJ]	ок
BUJ Parameters		
Polynom	2^7-1 _	
Filter Type [MHz]	200 🔻	Cancel

Figure 23 Selecting the signal kind and BUJ parameters

BUJ amplitude and BUJ data rate can be edited in the main window.

- Adjustment Items					
Aquation (tonia		Orig	inal		
Data Amplitude [Vpp]	0.2530	0.24	00		
ISI Amplitude [dB]	-0.5600	-0.13	300		
SI Amplitude [Vpp]	0.2894	0.10	00 [CMI	0.33
BUJ Amplitude [Ulpp]	0.1	0.10	00		
RJ Amplitude [Ulrms]	0.0100	0.01	00		
Parameter Entry Avg Opt Power [dBm]	0.7624727				
PJ1 Frequency [MHz]	10		SI Frequency [MH	z]	150.13
PJ1 Amplitude [Ulpp]	0.05	_	Data Pattern		PRBS9 -
BUJ Data Rate [Mb/s]	625 💌		Bit Rate [Gbps	s]	24.33024 💌
ISI Frequency [GHz]	12.890625	-	Ref. Rovr. BW [GH	lz]	19.34
Source Power [dBm]	10		Wavelength [nm]		1295.56



BUJ or PJ2/RJ items are displayed in the main window depending on which is the currently active selection between BUJ and PJ2/RJ.

Bit Rate: Select the operating bit rate from the drop-down list. Ensure that you select a bit rate that is compatible with the selected standard.

SI Frequency [MHz]	150.13
Data Pattern	PRBS9
Bit Rate [Gbps]	24.33024 💌
Ref. Rovr. BW [GHz]	25.78125
Wavelength [nm]	10.3125 10.1376 9.8304



DCA Reference Receiver Bandwidth: Select Ref Rcvr BW Coupling ON or OFF from the **Setting** menu.









When Ref Rcvr BW is ON, the Ref. Rcvr. BW [GHz] parameter on the main window is grayed out and uneditable. The value shown in the box may be updated shortly after a stressed eye calibration is started to reflect the automatically set DCA Reference Receiver Bandwidth.

Running the Stressed Eye calibration

1 Click **Start(S)** to commence the Stressed Eye calibration.



Figure 28

Main window Results area (PJ2)





Measurement Results			
ExtinctionRatio [dB]	4.2410	Initial VECP [dB]	1.2493
VECP [dB]	1.8969	J2 [Ulpp]	0.2900
J9 [Ulpp]	0.4500	Calibration OMA [dBm]	-1.669



Keysight N4917CPCA Optical Receiver Stress Test for CPRI Fronthaul Networks User Guide

During the stressed eye calibration, current values of the measured results are shown on the GUI. When the calibration is complete, items highlighted with a green background, as shown in Figure 30, indicate that they have met the target +/- tolerance value. Items highlighted with an amber background indicate that calibration was not successful.

The stressed eye calibration sets the desired Extinction Ratio, then sets the initial VECP, followed by iterating a repetitive loop of setting VECP, J2 and J9; until either all measurements meet the target +/- tolerance values or at least 10 loops have been run.

-Δ	djustment Results		
	Data Amplitude [Vpp]	0.2530	ISI Amplitude [dB] -0.5600
	SI Amplitude [Vpp]	0.2894	PJ2 Amplitude [Ulpp] 0.1400
	RJ Amplitude [UIrms]	0.0100	Final Avg Opt Pwr [dBm] -5.9016



Adjustment Results			
Data Amplitude [Vpp]	0.2540	ISI Amplitude [dB]	-0.6800
SI Amplitude [Vpp]	0.3381	BUJ Amplitude [Ulpp]	0.1400
RJ Amplitude [Ulrms]	0.0100	Final Avg Opt Pwr [dBm]	-5.8563

Figure 32 Adjustment parameter results (BUJ)

During the stressed eye calibration, current values of adjustment parameters are also shown on the GUI. When the calibration has completed, the final values of the adjustment parameters are displayed, as shown in Figure 31 and Figure 32.

[Calibration Start] Unable to set optical power level to requested value. Requested Power[dBm] is 4 Actual Power[dBm] is -0.7328926 Start value_ER adjustment ER adjustment initialization ER measurement result =4.121 Change value_ER adjusting Last voltage =0.24 Voltage calculated =0.246 ER measurement result =4.117 Parameter limit_Calculate data amplitude Last voltage =0.24 Voltage this time =0.246 Last ER =4.121 ER this time =4.117 Voltage calculated =0.1 ER measurement result =1.681 Parameter limit_Calculate data amplitude Last voltage =0.246 Voltage this time =0.1 Last ER =4.117 ER this time =1.681 Voltage calculated =0.254 ER measurement result =4.241 Start value_Initial VECP adjustment

Figure 33 Stressed eye calibration status messages

During the stressed eye calibration, the lower part of the results area shows status messages and progress of the calibration, as shown in Figure 33.

When the calibration is complete, the N4917CPCA Test Solution software displays a screen capture of the stressed eye taken from the DCA, as shown in Figure 34.



Results of the calibration along with complete parameter settings are saved in the specified Results file.

OMA setting for DUT measurement

When a successful stressed eye calibration is achieved, the optical attenuator is adjusted to set the OMA to the level specified for DUT measurement and the data pattern is changed to PRBS31.

ile Setting To	al Receiver Stress ool Help	Test Solutio	n								
essed Eye Jitter Co	nformance Jitter '	Performance						Mode	Selection 🗎	OOGBASE-	-LR4/-ER4
Tag Data						Measurement F	Results				
Operator						ExtinctionRa	tio (dB1	4.1720	Initial VECP	[dB]	1.2947
Parameter file	ameter\100GBAS	E\Eye_parar		.R4_BUJ_L3.cs	v Open file	VECP	[dB]	1.7897	J2	[Ulpp]	0.2950
Result File	ocuments\N4917	CPCA\Resul	N100GBASE_L	.R4_L3_BUJ.cs1	v Set file	J9	[Ulpp]	0.4550	Calibration O	MA [dBm]	-2.19
Comment											
Measurment Items						Adjustment Res	sults				
	Adjustmer		jet	Tol		Data Amplitu	de [Vpp]	0.2400	ISI Amplitude	[dB]	-1.4200
ExtinctionRatio [dB]		4.25	0.25			SI Amplitude	[Vpp]	0.2079	PJ2 Amplitud	e [Ulpp]	0.1450
Initial VECP [dB]	¥	1.3	0.1			RJ Amplitude	e [Ulrms]	0.0100	Final Avg Op	t Pwr [dBm]	-5.4857
VECP [dB]		1.8									
J2 [Ulpp]		0.3	0.01			600					ello T
									+		Jidiliki ZH (SIKC)
Final OMA (dBrr Adjustment Items	1]	6.8	riginal 2400							C 1905 (C19 (1995 (C19)) (77 193 (C19) (C19)) (27 193 (C19) (C19) (C19))	
Final OMA [dBm Adjustment Items Data Amplitude [Vpj ISI Amplitude [dB]	D] 0.2400	-6.8 0 0.	riginal 2400 .4200								
Final OMA [dBm Adjustment Items Data Amplitude [Vpj ISI Amplitude [dB] SI Amplitude [Vpp	p] 0.2400 -1.4200] 0.2079	6.8 0 0. -1 0.	riginal 2400 .4200 2079	CMI	0.33			~			
Final OMA [dBr Adjustment Items Data Amplitude [Vpj ISI Amplitude [dB] SI Amplitude [Vpp PJ2 Amplitude [Ulpp	p] 0.2400 -1.4200] 0.2079 3] 0.1450	-6.8 0 0. -1 0. 0. 0.	riginal 2400 .4200 2079 1000	CMI	0.33						
Final OMA [dBr Adjustment Items — Data Amplitude [Vp ISI Amplitude [dB] SI Amplitude [Vpp PJ2 Amplitude [Ulpr RJ Amplitude [Ulpr) 0.2400 1.4200 1.4200 0.02079 0.01450 2] 0.1450 3] 0.0100	-6.8 0 0. -1 0. 0. 0.	riginal .2400 .4200 2079 1000 0100	CMI	0.33						
Final DMA (dBr Adjustment Items – Data Amplitude (Vpj ISI Amplitude (dB) SI Amplitude (Ulpj RJ Amplitude (Ulpj RJ Amplitude (Ulpj Parameter Entry	0.2400 1.4200 1.4200 1.0.2079 2) 0.1450 s) 0.0100	-6.8 0. -1 0. 0. 0. 0.	riginal .2400 .4200 2079 1000 0100	CMI	0.33	5					
Final DMA (dBr Adjustment Items – Data Amplitude (Vp) ISI Amplitude (dB) SI Amplitude (dB) PJ2 Amplitude (UIm PJ Amplitude (UIm Parameter Entry Avg Opt Power (dBr	n] 0.2400 1.1.4200 1.0.2079 2.1 0.1450 1.1450 1.1450 1.1450 1.1450 1.0.100	·6.8 0 0 1 1 0. 0 0 0 8	riginal .2400 .4200 2079 1000 0100	CMI	0.33						
Final DMA (dBr Adjustment Items – Data Amplitude (Vpj 151 Amplitude (dB) S1 Amplitude (Ulp RJ Amplitude (Ulpr RJ Amplitude (Ulpr Parameter Entry Avg Dpt Power (dBr B11 Exerciser: PMU	p] 0.2400 [1.4200] [1.4200] i] 0.2079 i] [0.1450] is] [0.0100] m] [-0.879097] a) 10	-6.8 0 0. -1 0. 0. 0. 0. 0. 0.	riginal 2400 4200 2073 1000 0100		0.33						
Final OMA (dBr Adjustment Items – Data Amplitude (Vp) ISI Amplitude (dB) SI Amplitude (Ulpr PJ2 Amplitude (Ulpr PJ2 Amplitude (Ulpr Parameter Entry Avg Opt Power (dBr PJ1 Frequency (MH	I 0.2400 I 1.4200 I 0.2079 I 0.1450 I 0.0100 I -0.879097 I 10 I 0.05	-6.8 0 0 1 0 0 0 0 0	riginal 2400 4200 2079 1000 0100	[CM]	0.33 150.13						
Final DMA (dBr Adjustment Items – Data Amplitude (Vp) ISI Amplitude (dB) SI Amplitude (Ulpr RJ Amplitude (Ulpr Parameter Enity Avg Opt Power (dBr PJ1 Frequency (MH PJ1 Amplitude (Ulpr PJ1 Amplitude (Ulpr PJ2 Frequency (MH	I 0.2400 I 1.4200 I 0.2079 J 0.1450 I 0.0100 I -0.879097 Z 10 P 1005 I 1007	-6.8 0 0 1 0 0 0 0 0 0 0	iiginal 2400 4200 2079 1000 0100 SI Frequer Data Patte Bit Bale	CMI ncy [MHz] sm	0.33 150.13 PRBS9 24.39024 V						
Final DMA (dBr Adjustment Items – Data Amplitude (Vp) ISI Amplitude (dB) SI Amplitude (Ulpr RJ Amplitude (Ulpr Parameter Entry Avg Dpt Power (dBr RJ1 Frequency (IMH RJ1 Amplitude (Ulp RJ2 Frequency (IMH SI5 Frequency (IMH	p] 0.2400 -1.4200 -1.4200 -1.4200 0.079 -1.6200 0.1450 -1.6200 0.0100 -1.4200 -0.879097 -1.1200 -0.879097 -1.1200 -0.05 -1.1229062 -100.7 -1.1229062 -11299062	-6.8 0 0 1 1 0 0 0 0 0 78	iiginal 2400 4.200 2079 1000 0100 SI Frequer Data Patte Bit Refer	CMI ncy [MHz] an [Gbps] BW (GHz)	0.33 150.13 PRES9 24.33024						
Final OMA (dBr Adjustment Items – Data Amplitude (Vp, ISI Amplitude (dB) SI Amplitude (UIp RJ Amplitude (UIpm Parameter Entry Avg Opt Power (dBi PJ1 Amplitude (UIp PJ1 Amplitude (UIp PJ1 Amplitude (UIp RJ3 Frequency (MH ISI Frequency (GH Source Power (dB	I 0.2400 I 1.4200 I 0.2079 I 0.1450 I 0.0100 I 0.0879097 I 0.05 I 100.7 I 12.89062 I 12.89062	78 5 5	iiginal 2400 4200 2073 1000 0100 SI Frequer Data Patte Bit Rate Ref. Rovr. Waveleng	CMI ncy [MHz] sm [Gbps] BW [GHz] th [rm]	0.33 150.13 PRB59 24.3024 19.34 1309.14					Start(() Stop(P)

Figure 35

Main window after Stressed Eye Calibration is complete (PJ2)

ssed Eye Jitter Co	ool Help nformance Jitter F	erformance					Mode Se	election 🔟	GBASE-	LR4/-ER4 🗸
ag Data					Measurement R	esults				
Operator					ExtinctionBat	io [dB]	4.1849	Initial VECP [d	∃B]	1.2805
Parameter file	ameter\100GBAS	E\Eye_parame	ters_100G_LR4_BUJ_L3.csv	Open file	VECP	[dB]	1.7573	J2 [L	JIpp]	0.3000
Result File	ocuments\N49170	CPCA\Result\1	00GBASE_LR4_L3_BUJ.csv	Set file	J9	[Ulpp]	0.4750	Calibration OMA	[dBm]	-2.168
Comment										
feasurment Items					Adjustment Res	ults				
	Adjustmen	t Target	Tol		Data Amplitud	de [Vpp]	0.2400	ISI Amplitude	[dB]	-1.4200
ExtinctionRatio [dB]		4.25	0.25		SI Amplitude	[Vpp]	0.2079	BUJ Amplitude	[Ulpp]	0.1700
initial VECP [dB]	✓	1.3	0.1		RJ Amplitude	[UIrms]	0.0100	Final Avg Opt Po	wr [dBm]	-5.5086
VECP [dB]	✓	1.8	0.1							
J2 [Ulpp]		0.3	0.01							<u>−</u> <u>−</u> <u>−</u> <u>−</u> <u>−</u> <u>−</u> <u>−</u> <u>−</u>
							+		-	
Final OMA (dBm djustment Items -	1	-6.8 Orig	inal			eselist a toge go toge constraining			enternista Neterioren	
Final OMA [dBm djustment Items — Data Amplitude [Vpj	p] 0.2400	-6.8 Orig	inal 100							
Final OMA [dBm djustment Items — Data Amplitude [Vpj ISI Amplitude [dB] SI Amplitude [Vpp	p] 0.2400 -1.4200	-6.8 Orig 0.24 -1.4	inal 200 179 CMI	033						
Final OMA [dBm djustment Items — Data Amplitude [Vpj ISI Amplitude [dB] SI Amplitude [Vpp BI M Amplitude [UI]	p] 0.2400 -1.4200 -] 0.2079 	-6.8 Orig 0.24 -1.4 0.20 0.12	inal 200 200 779 CMI	0.33						
Final OMA [dBm djustment Items — Data Amplitude [Vpj ISI Amplitude [dB] SI Amplitude [Ulp BUJ Amplitude [Ulp RJ Amplitude [Ulpm]	p] 0.2400 -1.4200] 0.2079 p] 0.1700 s] 0.0100	-6.8 Orig 0.24 -1.4 0.20 0.17 0.17	inal 100 200 179 CMI 700 00	0.33						
Final OMA (dBm wdjustment Items — Data Amplitude (Vpj ISI Amplitude (dB) SI Amplitude (Ulp RJ Amplitude (Ulp RJ Amplitude (Ulp RJ Amplitude (Ulp	1 p] [0.2400 -1.4200] [0.2079 p] [0.1700 s] [0.0100	-6.8 Orig 0.24 -1.4 0.20 0.17 0.01	inal 000 200 779 CMI 000	0.33						
Final DMA [dBm djustment Items - Data Amplitude [Vp] ISI Amplitude [dB] SI Amplitude [VIp BUJ Amplitude [UIp RJ Amplitude [UIp arameter Entry - Avg Opt Power [dB]) p] [0.2400 -1.4200] [0.2079 p] [0.1700 s] [0.0100 -0.879097	-6.8 Orig 0.24 -1.4 0.20 0.17 0.01 8	inal 000 200 73 CMI 000 00	0.33						
Final DMA (dBm djustment Items — Data Amplitude (Vpp ISI Amplitude (dB) SI Amplitude (UIp BUJ Amplitude (UIp RJ Amplitude (UIp arameter Entry — Avg Opt Power (dBr PJ1 Frequency (MH	N P] [0.2400 [1.4200] [0.2079 P] [0.1700 s] [0.0100 m] [-0.879097 Iz] [10	-6.8 0rig 0.24 -1.4 0.22 0.17 0.01 8	inal 100 200 179 CMI 100 00 SI Frequency (MHz)	0.33						
Final DMA (dBm djustment Items – Data Amplitude (Vpp ISI Amplitude (dB) SI Amplitude (Ulp RJ Amplitude (Ulp RJ Amplitude (Ulp arameter Entry – Avg Opt Power (dBr PUT Frequency (MH PUT Amplitude (Ulp	I) I p) I I I.4200 J I I I.20079 p] I I I.1700 s] I I I.0000	-6.8 0rig 0.24 -1.4 0.22 0.17 0.01 8	inal 100 200 179 CMI 100 00 00 SI Frequency [MH2] Data Pattern	0.33 150.13 PRES9						
Final DMA (dBm djustment Items Data Amplitude (Vpp ISI Amplitude (dB) SI Amplitude (UIp BUJ Amplitude (UIp RJ Amplitude (UIp Arg Dpt Power (dBr PUT Frequency (MH PUT Amplitude (UIp BUJ Data Rate (Mb	I) I p) I I I		inal 100 200 179 CMI 100 00 00 00 00 00 00 00 00 0	0.33 150.13 PRES9 24.33024 •						
Final DMA (dBm djustment Items Data Amplitude (Vpp ISI Amplitude (dB) SI Amplitude (UIp BJ Amplitude (UIp BJ Amplitude (UIp Ang Opt Power (dBr PUT Frequency (MH BUJ Data Rate (Mb ISI Frequency (GH	I) I p) I I I.4200 I I.4200 I I.20079 p] II.1700 e] II.1700		inal	0.33 150.13 PRBS 9 24.33024 ¥ 19.34						

Figure 36 N

Main window after Stressed Eye Calibration is complete (BUJ)

Testing a CPRI Interface

Once the Stressed Eye Calibration is complete, remove the optical fiber connection from the DCA input and connect it to the input of the CPRI interface device under test. Exact connection details and setup depend on the system architecture being tested and are therefore not covered in detail in this guide.

CPRI Fronthaul Radio Equipment Input Test

Typically the calibrated stressed eye signal is connected to the input of the CPRI radio equipment lane under test, and either BER or Clock frequency stability and noise measurements are performed.



Figure 37 Example CPRI setup for running a stressed receiver sensitivity testing on a DUT

Jitter Conformance Test

The Jitter Conformance Test is a semi-automatic test to check the DUT stressed receiver sensitivity in accordance with the applicable standard.

You must run the Stressed Eye Calibration before running the Jitter Conformance Test.





The Jitter Conformance Test routine sets up the jitter frequency and amplitude for each test point. You must enter the BER value and make a **judgment** of whether the result is a pass (**GO**) or fail (**NoGO**).

Set Result file

Tag Data				
Operator			_	
Parameter file	e Documents\N4917CPCA\Parameter\jtc_parameters_CPRI.csv			Open file
Result file	cuments\N4917CPCA\Result\CPRI_Lane0_BUJ_JitConf.csv			Set file
Comment				
Parameter Entry				
Set SJ Frequency			Waveform information	
G	~ "		Wave Length [nm]	1295.56
Auto C Manual		anual	Bit Rate [Gbqs]	24.33024
Auto			Data Pattern	PRBS31
SJ Frequency Sta	rt [kHz]	100	Avg Opt Power [dBm]	-5.8563
SJ Frequency Sto	p (kHz)	300000	Extinction Ratio [dB]	4.2410
SJ Frequency Poi	nts	10	Initial VECP [dB]	1.2493
SJ Margin [%]		50	VECP [dB]	1.8969
Manual			J2 [Ulpp]	0.2900
Frequency list file Set			J9 [Ulpp]	0.4500
cuments\N4917CP	CA\Param	eter\Freq_list.csv		
			Calibration OMA [dBm]	-1.669
			Data Amplitude [Vpp]	0.2540
Power Setting[dBm]			ISI Frequency [GHz]	12.890625
Avg Opt Power -5.8563			ISI Amplitude [dB]	-0.6800
OMA Opt. Power -6.8000			SI Frequency [MHz]	150.13
Data Polavitu			SI Amplitute [Vpp]	0.3381
C Positive Negative			PJ1 Frequency [MHz]	10
			PJ1 Amplitude [Ulpp]	0.0500
			BUJ Data Rate [Mb/s]	625
			BUJ Amplitude [Ulpp]	0.1400
			P L Amelitude [] Illeme1	0.0100



The N4917CPCA Test Solution software automatically loads parameters from the most recent Stressed Eye Calibration.

1 Click the **Set file** button and specify a Results file. Default location for the results files is C:\Users\Public\Public Documents\N4917CPCA\ Result\

Parameter Details

The Jitter Conformance measurement sweeps sinusoidal jitter (PJ1) from a maximum range of 40/100 kHz to 300 MHz. You may set the Start frequency to a value, which is greater than or equal to the minimum and you may set the Stop frequency to a value, which is less than or equal to 300 MHz. Also, set the number of frequency points and the optional margin percentage (%).

In **Auto** mode, the specified number of test frequencies are equally spaced between the specified start and stop frequency. Jitter amplitude is set either to the specified compliance value or to a percentage (%) higher than the compliance value, if a non-zero value is entered in the **SJ Margin [%]** field.

In **Manual** mode, the SJ frequencies and amplitudes are defined in a Frequency List file. Default location for the Frequency List file is C:\Users\ *Public\Public Documents\N4917CPCA\Parameter*. The Frequency List file in the **.csv** format, consists of a simple list of SJ frequency and amplitude values as shown in Table 6:

Table 6 An example of Manual mode jitter frequency/amplitude list

Frequency (kHz)	Amplitude (UI)
100	10
300	5
1000	2
3000	1
10000	0.4
30000	0.3
100000	0.2
300000	0.15

Parameter Entry	
Set SJ Frequency	
⊙ Auto ⊂ M	anual
Auto	
SJ Frequency Start [kHz]	100
SJ Frequency Stop [kHz]	300000
SJ Frequency Points	10
SJ Margin [%]	50
Manual	
Frequency list file	Set
cuments\N4917CPCA\Param	eter\Freq_list.csv
pomono a vivo non or a dam	otor a roq_lot.cov

Figure 40 Jitter Conformance test parameters

Generally, you are not required to make any changes to the remaining parameters as the N4917CPCA Test Solution software automatically loads such parameters from the Stressed Eye Calibration Results file.

Running the Jitter Conformance Test

1 Click **Start(S)** to commence the Jitter Conformance Measurement.

For each SJ frequency/amplitude test point, a dialog box appears where you must enter the BER value, read from the DUT, and decide on selecting either **GO** or **NoGO** for the test point. See Figure 41.

Go-NoGo				
Frequency[kHz]	100.000			
Amplitude[UI]	7.500			
Enter the result of BER meas.				
BER value				
Type of judgment				
GO	NoGO			
	Exit			
	Exit			



Go-NoGo				
Frequency[kHz]	100.000			
Amplitude[UI]	7.500			
Enter the result of BER meas.				
BER value				
Type of judgment				
GO	NoGO			
Next	Exit			



2 Click **Next** to proceed to the next SJ test point, or click **Exit** to abort the Jitter Conformance Test.



Results of the Jitter Conformance test are saved in the specified Results file.

Figure 43 Jitter Co

Jitter Conformance window after the test is complete
Jitter Performance Test

The Jitter Performance Test is a semi-automatic test to check the DUT margin for stressed receiver sensitivity.

You must run the Stressed Eye Calibration before running the Jitter Performance Test. The Jitter Performance test routine sets up the jitter frequency and amplitude for each test point. You must enter the SJ amplitude for each test point as well as the BER result and make a **judgment** of whether the result is a pass (**GO**) or fail (**NoGO**).



Figure 44 Jitter Performance Test Window

Set Result file

Occupier and				
Operator			0	
Parameter file	Documents (N491/CPCA)	arameter ytp_parameters_CPRI.csv	Open file	
Result file	ocuments\N4917CPCA\Result\CPRI_Lane0_BUJ_JitPerf.csv			
Comment				
Parameter Entry -				
Set SJ Frequency		Waveform information		
G Auto	C. Manual	Wave Length [nm]	1295.56	
- Auto	Manual	Bit Rate [Gbqs]	24.33024	
Auto		Data Pattern	PRBS31	
SJ Frequency S	tart [kHz] 100	Avg Opt Power [dBm]	-5.8563	
SJ Frequency S	top [kHz] 300000	Extinction Ratio [dB]	4.2410	
SJ Frequency P	oints 10	Initial VECP [dB]	1.2493	
		VECP [dB]	1.8969	
-Manual		J2 [Ulpp]	0.2900	
Frequency list f	ile Set	J9 [Ulpp]	0.4500	
cuments\N49170	PCA\Parameter\Freq_list_csv]		
		Calibration OMA [dBm]	-1.669	
		Data Amplitude [Vpp]	0.2540	
Power Setting[dBr	n]	ISI Frequency [GHz]	12.890625	
Avg Opt Power	-5.8563	ISI Amplitude [dB]	-0.6800	
OMA Opt. Power	-6.8000	SI Frequency [MHz]	150.13	
Data Polaritu		SI Amplitute [Vpp]	0.3381	
C Positive	Negative	PJ1 Frequency [MHz]	10	
S TUSILIVE (Negalive	PJ1 Amplitude [Ulpp]	0.0500	
		BUJ Data Rate [Mb/s]	625	
		BUJ Amplitude [Ulpp]	0.1400	
		DIA DIA DI	1 0.0100	



The N4917CPCA Test Solution software automatically loads parameters from the most recent Stressed Eye Calibration.

1 Click the **Set file** button and specify a Results file. Default location for the Results files is C:\Users\Public\Public Documents\N4917CPCA\ Result\

Parameter Details

The Jitter Performance measurement sweeps sinusoidal jitter (PJ1) from a maximum range of 40/100 kHz to 300 MHz. You may set the Start frequency to a value, which is greater than or equal to the minimum and you may set the Stop frequency to a value, which is less than or equal to 300 MHz. Also, set the number of frequency points.

In **Auto** mode, the specified number of test frequencies are equally spaced between the specified start and stop frequency values.

In **Manual** mode, the SJ frequency and amplitude values are defined in a Frequency List file. Default location for the Frequency List file is *C*:\Users\ *Public*\Public Documents\N4917CPCA\Parameter\.

Parameter Entry	
Set SJ Frequency	
	anual
Auto	
SJ Frequency Start [kHz]	100
SJ Frequency Stop [kHz]	300000
SJ Frequency Points	10
	-
Manual	
Frequency list file	Set
cuments\N4917CPCA\Param	eter\Freq_list.csv

Figure 46 Jitter Performance Test Parameters

Generally, you are not required to make any changes to the remaining parameters as the N4917CPCA Test Solution software automatically loads such parameters from the Stressed Eye Calibration Results file.

Running the Jitter Performance Test

1 Click **Start(S)** to commence the Jitter Performance Measurement.

For each SJ frequency test point, a dialog box appears where you must enter the desired SJ amplitude value. See Figure 47.

UI Setting		
Frequency[kHz]	100.000	
Amplitude Limit[UI]	318.398	
Enter Jitter Amplitude[U	ŋ	
318.398		
Next		Exit



2 Click **Next**. A dialog box appears where you must enter the BER value, read from the DUT, and decide on selecting either **GO** or **NoGO** for the test point.

Go-NoGo	
Frequency[kHz]	100.000
Amplitude[UI]	10.000
Enter the result of I	BER meas.
BER value	
Type of judgmen	t
GO	NoGO
	Exit



Go-NoGo	
Frequency[kHz] 1	00.000
Amplitude[UI] 1	0.000
Enter the result of B	ER meas.
BER value	
Type of judgment	
GO	NoGO
Next	Exit

Figure 49 GO/NoGO dialog box with BER and judgment entered

- 3 Click **Next** to proceed to the next step, or click **Exit** to abort the Jitter Performance Test.
- 4 You may now enter another Jitter amplitude to test at the same SJ frequency, or click **Next Freq** to proceed to the next SJ frequency.

UI Setting			
Frequency[kHz] 100.000			
Amplitude Limit[UI] 318.398			
Enter Jitter Amplitude[UI]			
10.000			
Next Next Freq Exit			



Results of the Jitter Performance test are saved in the specified Results file.



Figure 51 Jitter

Jitter Performance window after the test is complete

Fully Automated Jitter Tolerance Testing

Depending on the test setup and DUT capabilities, it is also possible to run fully automated jitter tolerance measurements using the built-in JTOL measurement feature within the M8070A or M8070B JBERT System Software.

Use this test when either:

- a the DUT can be put into a loopback mode and a signal from the lane under test can be fed back to the BERT Analyzer input, or
- *b* the DUT can be controlled directly from the M8070A/B software using the 'DUT Control Interface' to read the BER directly from the DUT internal error checker counters.

The M8070A/B JTOL measurement can also be run as a compliance test with/without margin or a tolerance test to find the limits of the DUT. It has several additional features such as a choice of search algorithm, user definable BER depth, and so on.



Figure 52

Jitter Tolerance Measurement System Results within M8070A software

For more information on the M8070A/B Jitter Tolerance measurement capabilities, refer to M8070A/B System Software for M8000 Series of BER Test Solutions User Guide.

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