

## Agilent N4915A-006 DisplayPort ISI Generator

Generate precise inter-symbol  
interference (ISI) for DisplayPort  
compliance testing

Data Sheet

- Covers ISI requirements for reduced bit rate (RBR, 1.62 Gb/s) and high bit rate (HBR, 2.7 Gb/s)
- Supports testing of sink devices with slot connector (Test Point 3 according to specification) and with tethered cable (Test Point 2 according to specification)
- Perfect fit for sink compliance test applications
- Ideal counterpart for Agilent test equipment
- Supported by Agilent N5990A test automation software



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DisplayPort is a high speed serial interface that connects digital displays with PCs, DVD players and other sources of digital video signals. The DisplayPort device specifications also include sophisticated means for testing, and a well defined physical layer to assure interoperability of devices from different vendors. The standard defines specific amounts of inter-symbol interference (ISI) for various bit rates and test points (TPs). The N4915A-006 delivers exactly the ISI requirements for DisplayPort compliance testing.

The DisplayPort interface consists of two communication busses: the main high speed digital lanes that are used to stream data from the source to the sink device and a bi-directional communication link that is called auxiliary channel. Furthermore there is a hot plug detect signal and a power lane. Four test points (TP1-TP4) are defined and signal integrity parameters specified. The N4915A-006 addresses receiver stress test at TP2 and TP3:

- TP3 is defined at the sink device’s input i.e. slot connector. This will be the most commonly used test point for receiver testing. The majority of the compliance testing will be performed at TP3.
- Sometimes sink devices ship with a tethered cable that has a plug connector. According to the compliance test specification (CTS) for such products, TP2 applies.

The unidirectional main link consists of either one, two or four serial lanes that operate at either 1.62 GBit/s (reduced bit rate, RBR) or at 2.7 GBit/s (high bit rate, HBR). Products that support HBR have to be compatible with RBR as well. In summary, the N4915A-006 provides one set of differential ISI generators for RBR and HBR speeds at both test points TP2 and TP3. This supports testing of one DisplayPort lane as required by the DisplayPort CTS.

### N4915A-006 Application

The N4915A-006 integrates perfectly into the Agilent sink test setups as described in detail in the method of implementation (MOI) documents for the Agilent J-BERT N4903A high-performance serial BERT and the Agilent ParBERT 81250.

### DisplayPort Test Setup Calibration with N4915A-006



In order to achieve the impaired signal requirements for sink testing, the test setup must first be calibrated. Figure 2 shows the required generators and accessories including the N4915A-006 for calibration at TP3. A slot test fixture allows for measurement of jitter and

eye opening at TP3, and adjustment of the stressed signal generator to achieve the desired signal.

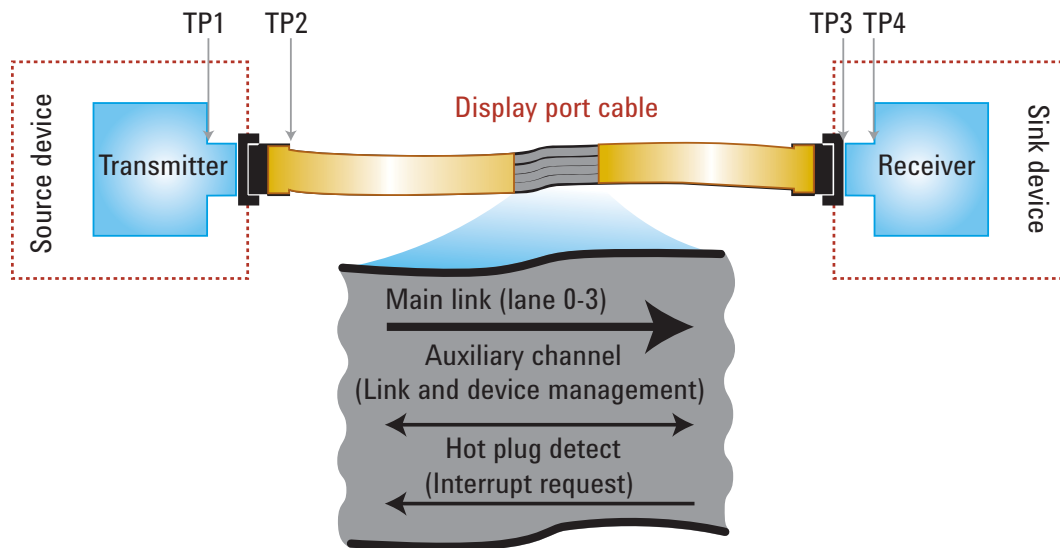


Figure 1. Overview of a DisplayPort setup, with test points and main interfaces between source and sink highlighted.

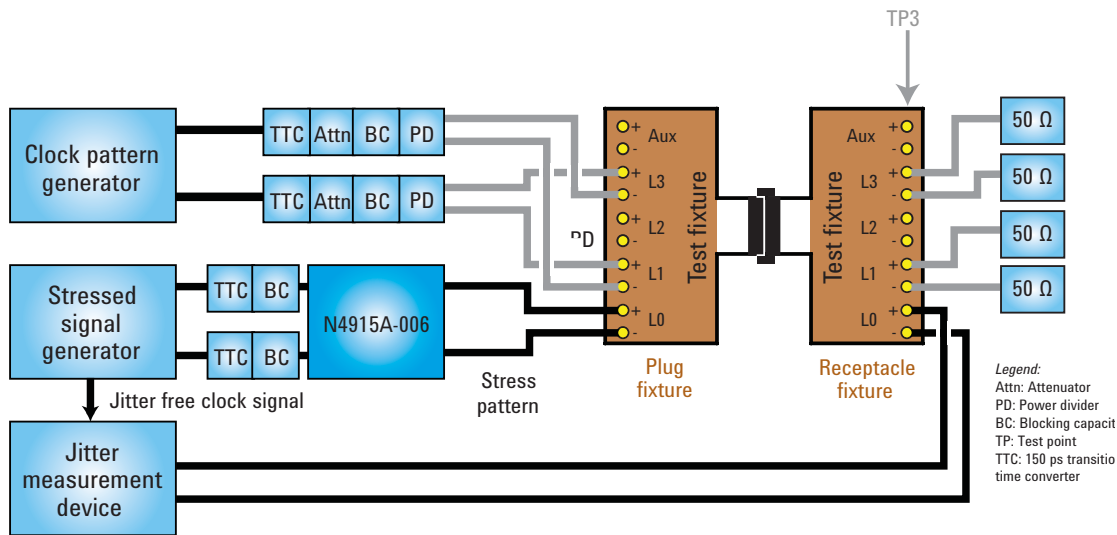


Figure 2: Calibrating a DisplayPort sink test setup with the N4915A-006.

The N4915A-006 matches the specified ISI numbers very accurately. See Table 1 for details. The N4915A-006 ISI jitter is calibrated with the setup shown in Figure 2 using a PRBS 27-1 pattern as defined by the DisplayPort standard.

The N4915A-006 is a precision ISI generator that allows for an accurately calibrated setup. It leaves no doubt in the compliance of the stress signal and gives the maximum margin to the device under test. It is recommended to refer to the material list and to follow the procedures that are detailed in the Agilent MOI document (see Related Literature).

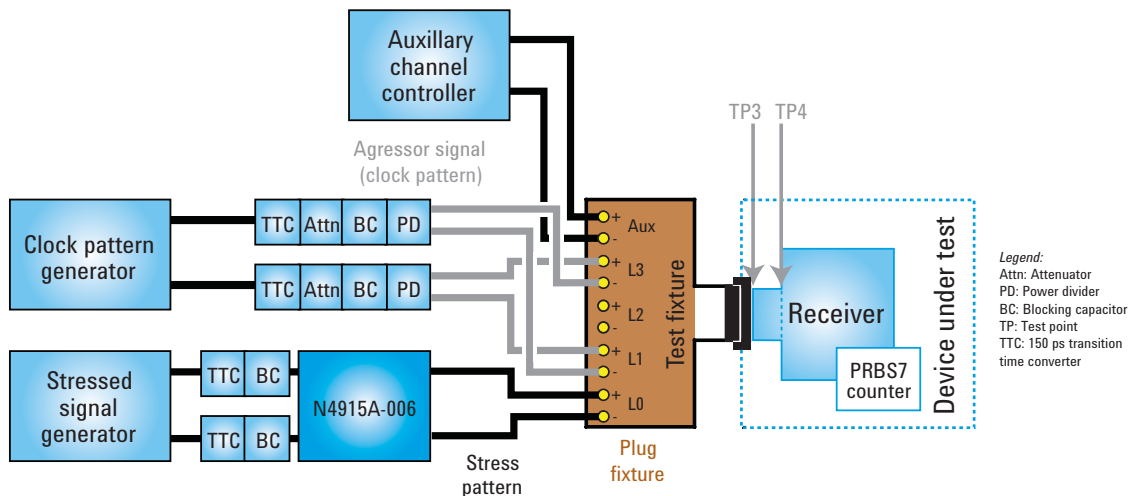


Figure 3. Overview on a typical sink test setup using the N4915A-006.



Figure 4. The N4915A-006 front panel.

## Technical Details

The N4915A-006 has four pairs of differential ISI generators for receiver stress testing. Each pair generates the required ISI as specified by the DisplayPort standard for one specific bit rate and test point. The given ISI numbers will be measured when using the DisplayPort PRBS7 pattern.

All ISI generators are in one box and have female SMA connectors. The signal inputs are at the front of the device and the outputs at the back. Refer to Figure 4.

## Specifications

Table 1: Specifications for N4915A-006

ISI jitter for TP2, RBR	100 mUI
ISI jitter for TP2, HBR	144 mUI
ISI jitter for TP3, RBR	570 mUI
ISI jitter for TP3, HBR	161 mUI
Accuracy of ISI values	± 10%
Max. input voltage levels	± 5 V
Differential impedance	100 Ω ± 10%
Skew for TP2, RBR	
TP2, HBR	
TP3, HBR	Intra-pair skew < 10 ps
Skew for TP3, RBR	Intra-pair skew < 30 ps
Operating temperature	0 °C - 55 °C
Dimensions (W x H x D)	228 x 59 x 222 mm
Bench top (with bumper)	With connectors: 9 x 2.3 x 8.7 inch
Rack mount (without bumper)	213 x 44.5 x 222 mm
	With connectors: 8.4 x 1.8 x 8.7 inch
Weight	840 g (1.9 lb)
Warranty	1 year

The given ISI numbers can be reproduced with the setup shown in Figure 2 when using a PRBS 2<sup>7</sup>-1 pattern, the clock pattern generator turned off and the following equipment:

- Stressed signal generator
  - Agilent J-Bert N4903A or
  - Agilent ParBERT 81250A with the N4871A generator
- Transition time converter (TTC) 150 ps: Agilent 15435A
- Blocking capacitor (BC): Agilent N9398C
- Play test fixture: Agilent W2641A
- Two matched pair cables with SMP right angle connector to straight SMA: Agilent N5460A
- N5460A two matched pair cables with SMP right angle connector to straight SMA
- SMA cables: Agilent 15442A (Two pairs manually matched for low differential skew)
- Receptacle test fixture: BitifEye BIT-OP-RTF-0001
- Jitter measurement device:
  - Agilent J-Bert N4903A or
  - Agilent ParBERT 81250A with N4875A analyzer or
  - Agilent DCA-J 86100C

The specifications in this document describe the warranted performance. Non-warranted values are described as typical. All specifications are subject to change without notice.

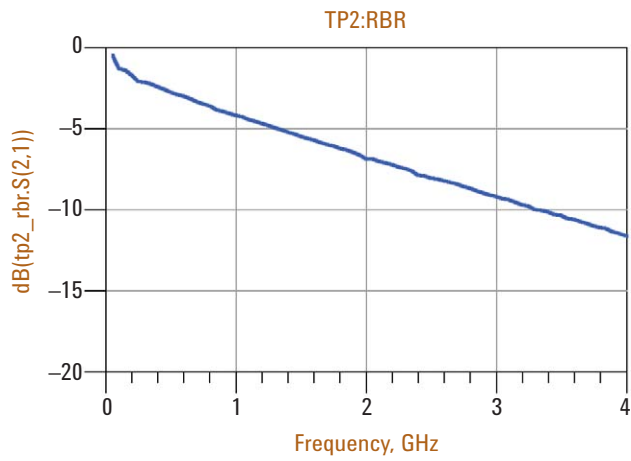


Figure 5. Mixed mode differential insertion loss of generator for TP2: RBR

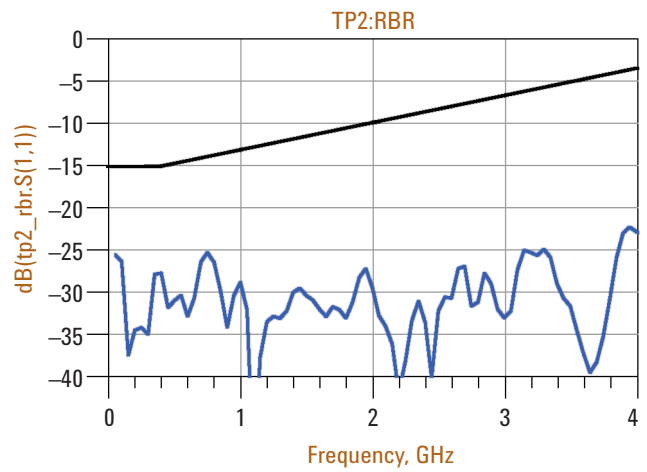


Figure 8. Mixed mode differential return loss of generator for TP2: RBR

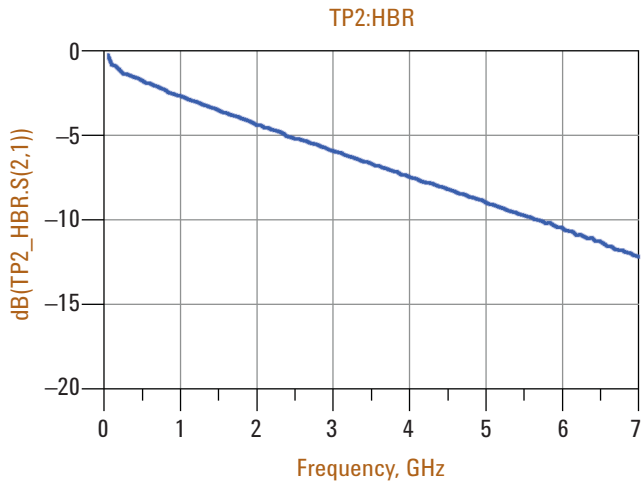


Figure 6. Mixed mode differential insertion loss of generator for TP2: HBR

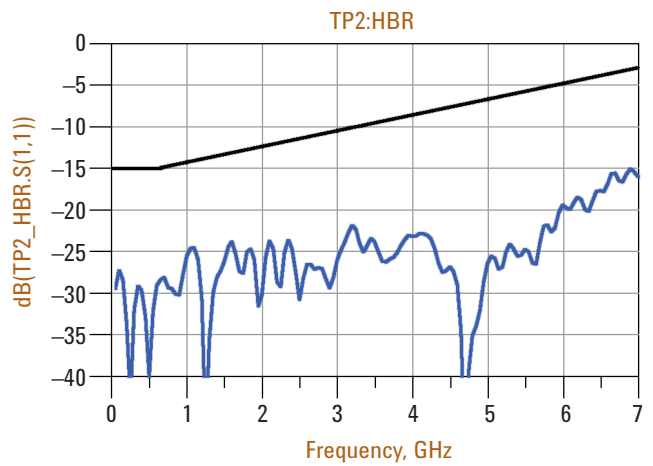


Figure 9. Mixed mode differential return loss of generator for TP2: HBR

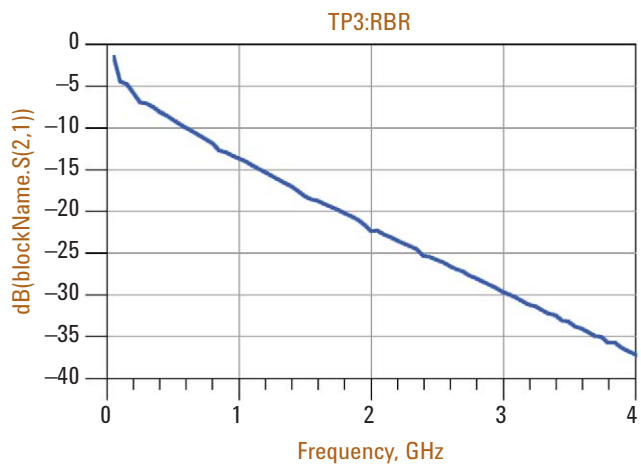


Figure 7. Mixed mode differential insertion loss of generator for TP3 RBR

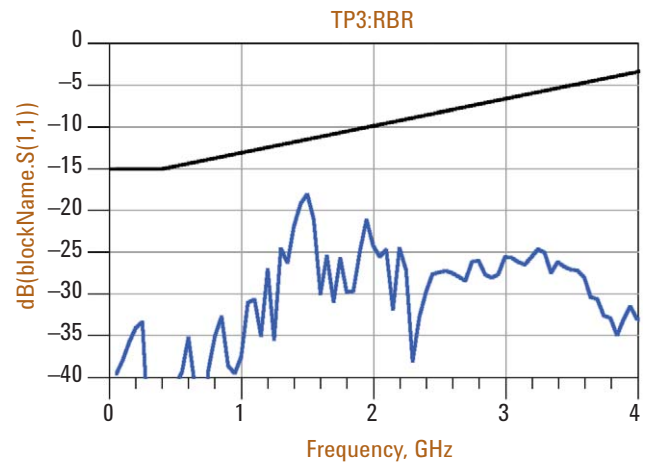


Figure 10. Mixed mode differential return loss of generator for TP3: RBR

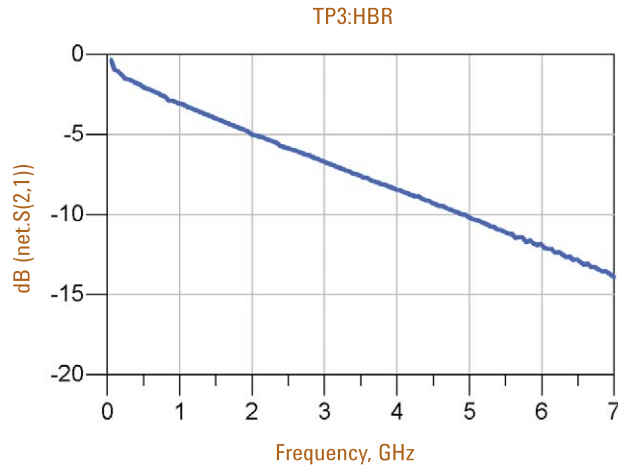


Figure 11. Mixed mode differential insertion loss of generator for TP3 HBR

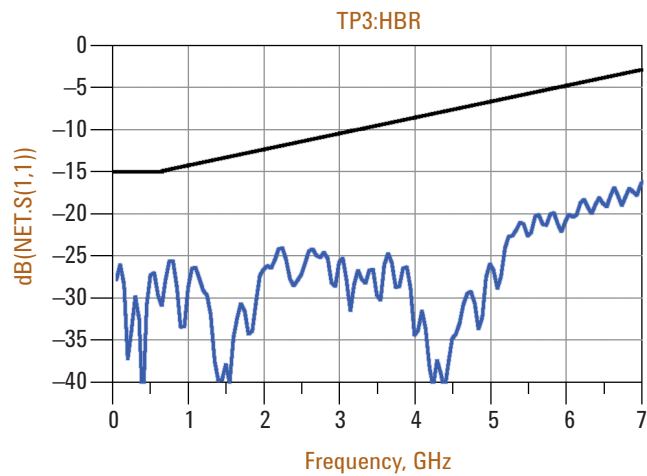


Figure 12. Mixed mode differential return loss of generator for TP3: HBR

## Ordering Information

DisplayPort ISI generator N4915A-006

## Related Literature

- *BERT* Brochure 5988-9514EN
- *J-BERT N4903A with Complete Jitter Tolerance Testing* Data Sheet 5989-2899EN
- *ParBERT 81250 Parallel BERT* Product Overview 5968-9188E
- *N5990A Test Automation Software Platform* Data Sheet 5989-5483EN
- *W2641A DisplayPort Test Point Access Adapter* Data Sheet 5989-7274EN
- *MOI for DisplayPort Sink Compliance Test* Application Note 5989-9147EN

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