Agilent Technologies N5410A

Fibre Channel Compliance Application for Infiniium Series Oscilloscopes

Data Sheet

The Agilent Technologies N5410A Fibre Channel Compliance application for Infiniium Series Oscilloscopes provides you with a fast and easy way to characterize and evaluate the signal integrity of your Fibre Channel electrical measurements. Supporting FC4, FC2, and FC1 speeds, the N5410A allows you to specify the measurement point at which you are probing your signal (beta, delta, and gamma). The tests performed by the N5410A are based on the FC-PH (ANSI X3.230-1994) and FC-PH-2 Fibre Channel - Physical and Signaling Interface specification. Test methodologies used are based on the Methodologies for Jitter and Signal Quality Specification (MJSQ).

Key features:

The N5410A Fibre Channel Compliance application software offers several features to simplify the validation of Fibre Channel designs:

- Easy-to-use graphical test selection and setup
- Supports 4.250, 2.125, and 1.0625-Gb/s speeds
- Supports testing at Beta, Delta, and Gamma compliance points
- Automatic HTML report generation
- RJ/DJ jitter separation analysis at 10^{-12} BER
- Physical layer measurements for rise/fall time, jitter, differential voltage, and eye mask
- Debug mode allows changes in test parameters giving you better insight into problems

With the tremendous increase in data storage associated with the growth of the Internet, the dominance of Fibre Channel as the de-facto standard technology used in storage area networks is well accepted and sees continued growth. The tremendous increase of data traffic has fueled the need for higher speed networking components such as HBAs and systems. As a result, ensuring signal integrity of network systems and components by testing against industry standards has never been more important. As Fibre Channel moves forward with speeds of 4.25 and 8.5 Gb/s signal integrity validation becomes and an important consideration for ensuring interoperability and reliability between Fibre Channel devices.

Fibre Channel (FC) is a protocol used to transfer data between components that make up storage area networks such as redundant array of inexpensive disks (RAID) systems, just a bunch of disks (JBODs), workstations and servers.

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A typical SAN network structure is shown in Figure 1.

A key component of a SAN system is the Fibre Channel host bus adapter or HBA. This is typically part of a server and communicates with the server over an internal PCI, PCI-X, or PCI Express bus interface. Typically an HBA is capable of generating compliance test patterns such as CRPAT, CJTPAT and SPAT as well as IDLE patterns. The compliance patterns contain low frequency patterns (long and short runs of 0's and 1's) as well as composite patterns as described in the MJSQ standard. These patterns are used because they stress the clock data recovery unit in different ways. For example, the high and low transition density patterns are used to generate data dependent jitter.

The Agilent N5410A Fibre Channel Compliance application utilizes these patterns to perform electrical signal quality analysis of your Fibre Channel device, be it an HBA, switch or disk drive. You will need access to your own utility software or that provided by your HBA chipset manufacturer to control you HBA or disk drive device so that the proper signal is being repetitively transmitted for testing.

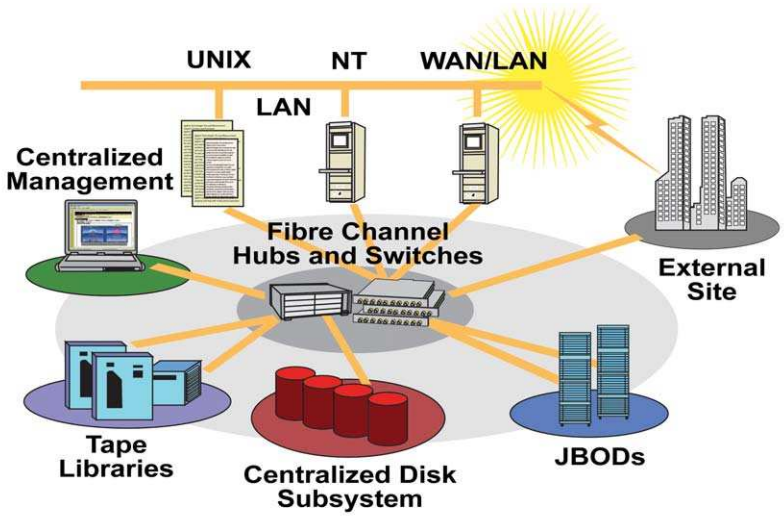


Figure 1. SAN infrastructure

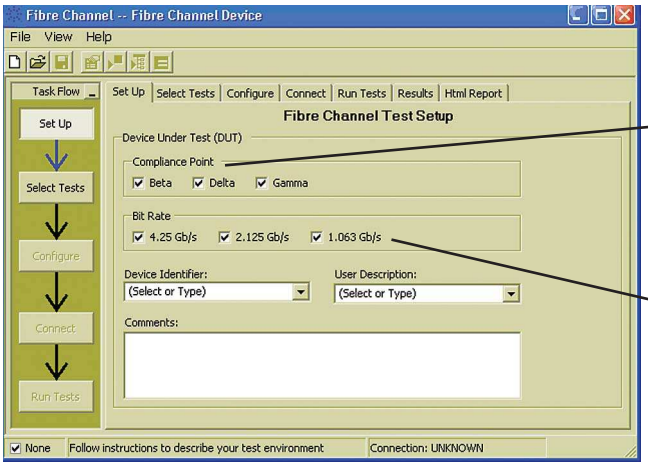


Figure 2. Pick the test points and speeds you wish to test.

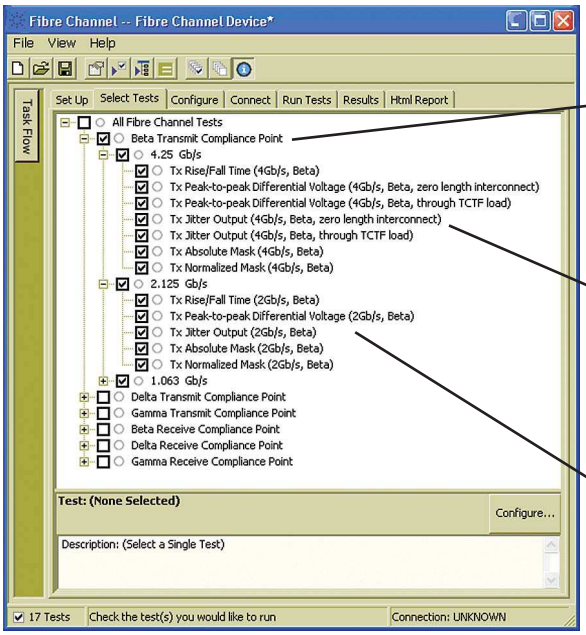
Easy-to-use graphical test selection and setup

The Agilent N5410A supports FC1, FC2, and FC4 speeds and prompts you for appropriate test point coverage of defined beta, delta, and gamma test points.

To configure the tests you wish to perform, simply select the appropriate test speed and test point in the N5410A's Set Up window as shown in Figure 2.

Once you pick the speeds and test points you want to test the next step is to select the actual tests you want performed, as shown in Figure 3.

How you connect the oscilloscope to your device is a critical step in achieving accurate and repeatable results. Often, the choice available to you will require the use of probed connections. These can be ideally made with the Agilent InfiniiMax series of differential, solder-in probes. In addition, the N5410A also supports connections via coaxial SMA where you can use two oscilloscope channels to analyze one differential signal. To configure the scope with your preferred probing method, use the Configure window to make your selections (Figure 4).

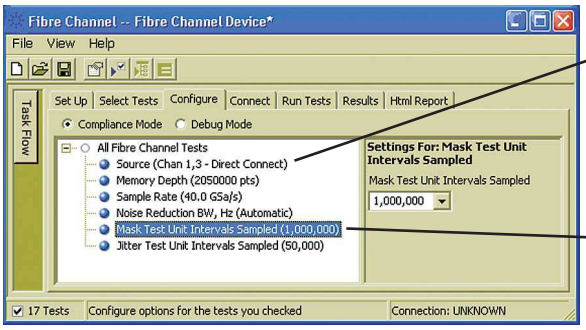


The tests are grouped by the compliance point connection to the oscilloscope.

Jitter tests are performed at 10^{-12} BER and RJ + DJ measurements are reported.

As the tests are performed you will be prompted to adjust speed and pattern on your DUT as each operational speed has different test requirements.

Figure 3. Select the tests you want performed in the Select Tests window.



You can choose a 2 channel connection via SMA cables, or using a single channel differential probe.

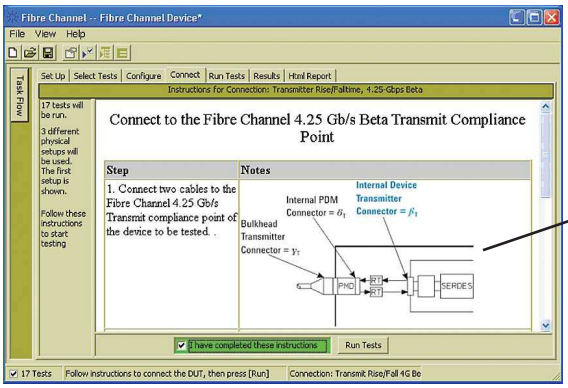
Here you can choose how many Unit Intervals are sampled for the mask and jitter tests.

Figure 4. Choose how you connect to your DUT in the Configure window.

Once you have chosen the tests to be performed and have properly configured the scope with the proper channel setup, etc., you can get connection assistance from the Connect window as shown in Figure 5.

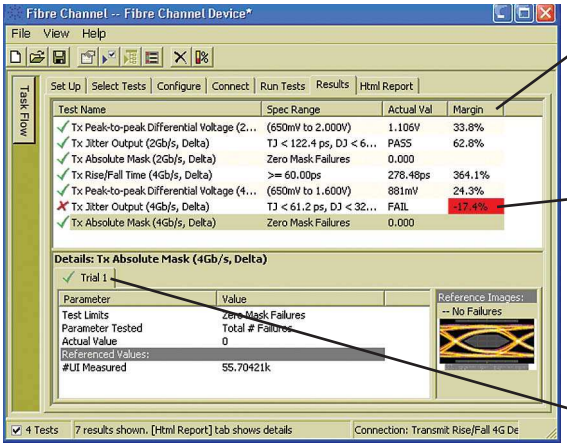
With your tests properly configured you are ready to press the Run Tests button and in doing so the N5410A will initialize the oscilloscope and begin the automated testing of your Fibre Channel target. The tests performed by the N5410A are electrical tests and are dependent upon your target being able to generate a repeating pattern such as a CJTPAT (compliance jitter test pattern). As target and target configurations vary from manufacturer to manufacturer you should contact you Fibre Channel chipset manufacturer for test setup details that will cause your device to output a compliant, repeating pattern.

When the tests complete, you will see a summary report as shown in Figure 6.



The N5410A shows you graphically where the test points for beta, delta, and gamma are as referenced by the Fibre Channel Specification.

Figure 5. The Connect window shows you what connection point to your DUT the N5410A tool expects.



The N5410A provides a quick summary report showing the tests performed as in addition to passing margin.

Test failures are highlighted in red, tests that pass with less than 2% margin are highlighted in yellow (you can also change the warning margin percentage).

Use Trials to track results of multiple runs.

Figure 6. Fibre Channel test summary report for FC2 and FC4 tests.

You can also use the Agilent N5410A Fibre Channel Compliance application to automatically generate a more detailed HTML report. This report can be shared with your team members and other vendors and includes screen shot captures of the test results in addition to actual measurements taken during the testing.

Mask test results and jitter test results are also included in your HTML summary report.

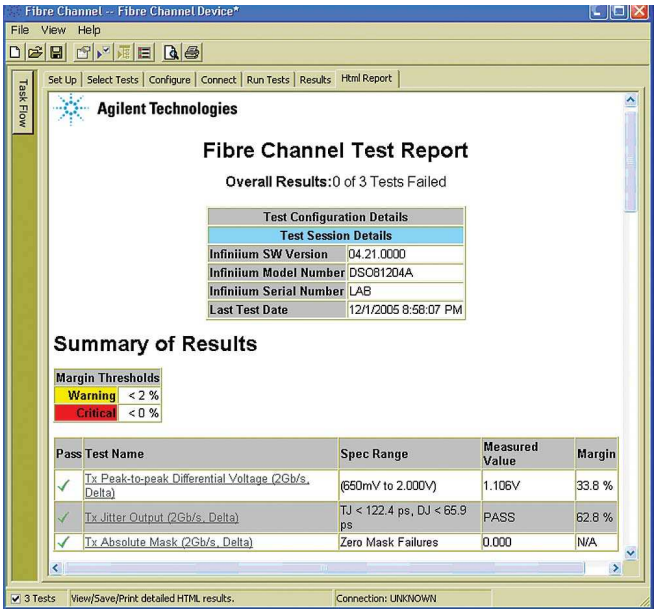


Figure 7. Detailed test report automatically generated.

The N5410A provides reference text pointing back to the specific test description for the test being performed.

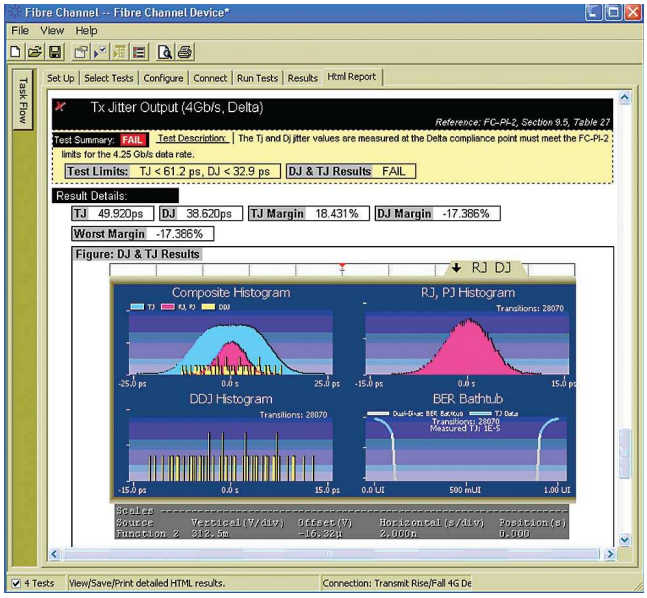


Figure 8. HTML report shows value for DJ exceeds specification for FC4 signals.

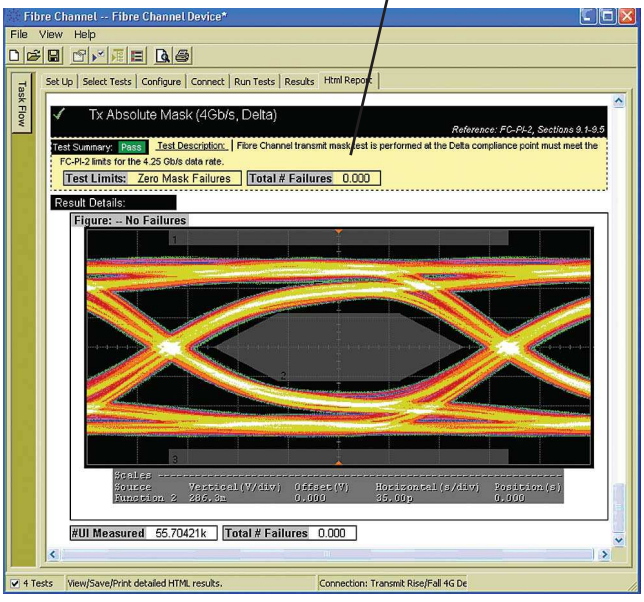


Figure 9. Mask test results for 4.25 Gb/s target.

Oscilloscope compatibility

The Agilent N5410A Fibre Channel Compliance application is compatible with Agilent 80000 and 54850 Series oscilloscopes with operating software revision A.04.21 or higher and 90000 and 90000 X-Series oscilloscopes revision A.02.10 or higher. Free upgrade software is available at **http://www.agilent.com/find/scope-apps-sw**.

Data rate DSO or DSA	Recommended oscilloscope	Bandwidth of recommended
1.0625 Gb/s	54854A	4 GHz
	54855A	6 GHz
	80804A/90804A	8 GHz
	81004A	10 GHz
	812004A/91204AV	12GHz
	813004A/91304A	13 GHz
	DSO/DSAX91604A	16 GHz
	DSO/DSAX92004A	20 GHz
	DSO/DSAX92504A	25 GHz
	DSO/DSAX92804A	28 GHz
	DSO/DSAX93204A	32 GHz
2.125 Gb/s	54855A	6 GHz
	80804A/90804A	8 GHz
	81004A	10 GHz
	812004A/91204AV	12GHz
	813004A/91304A	13 GHz
	DSO/DSAX91604A	16 GHz
	DSO/DSAX92004A	20 GHz
	DSO/DSAX92504A	25 GHz
	DSO/DSAX92804A	28 GHz
	DSO/DSAX93204A	32 GHz
4.25 Gb/s	81004A	10 GHz
	812004A/91204AV	12GHz
	813004A/91304A	13 GHz
	DSO/DSAX91604A	16 GHz
	DSO/DSAX92004A	20 GHz
	DSO/DSAX92504A	25 GHz
	DSO/DSAX92804A	28 GHz
	DSO/DSAX93204A	32 GHz

Ordering information

To purchase the Agilent N5410A Fibre Channel Compliance application to coincide with your order for an Infiniium Series oscilloscope, please add the following model numbers to your order. The Agilent N5410A tool also requires that you have current licenses for the E2688A high-speed serial data analysis software and the N5400A EZJIT Plus jitter analysis software.

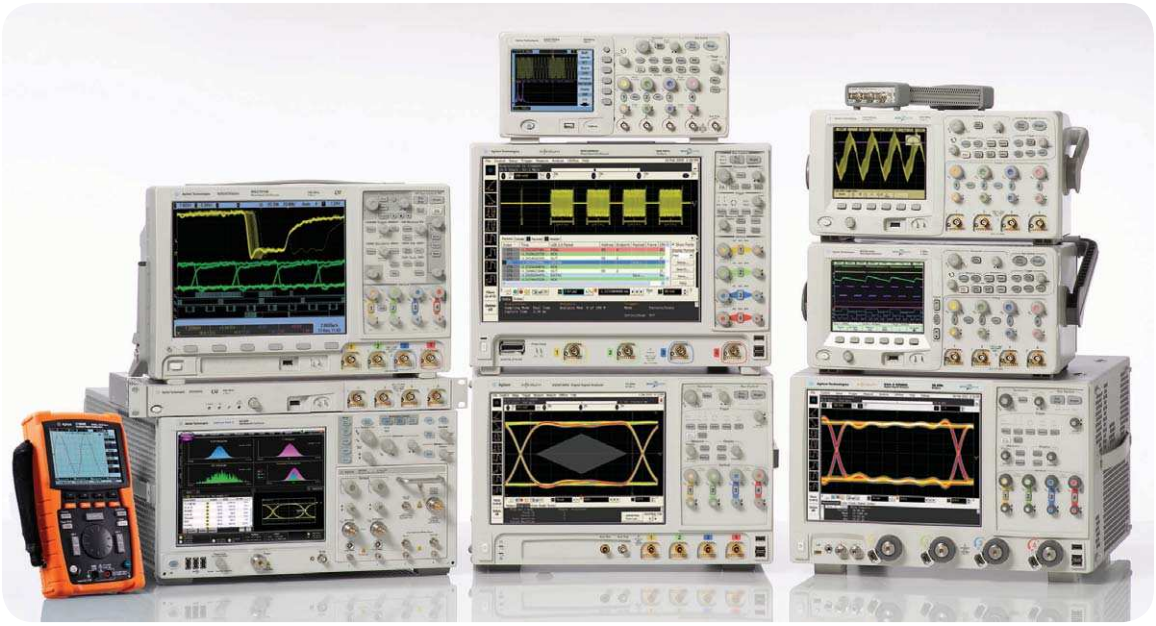
Model number	Description
N5410A	Fibre Channel Compliance application
E2688A	High-speed serial data analysis software
N5400A	EZJIT Plus jitter analysis software
113XA/116XA	InfiniiMax active differential probe (1131A 3.5 GHz, 1132A 5 GHz, or 1134A 7 GHz; 1169A 12 GHz, or 1168A 10 GHz)
E2677A/N5381A	InfiniiMax solder-in differential probe head
N280XA	InfiniiMax III active differential probe (N2803A 30 GHz, N2802A 25 GHz, N2801A 20 GHz, N2800A 16 GHz)

Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:
www.agilent.com/find/fibre_channel

Related Literature

Publication Title	Publication Type	Publication Number
Infiniium 90000 Series Oscilloscopes *InfiniiMax II Series Probes*	Data sheet	5989-7819EN
Infiniium 90000 X-Series Oscilloscopes	Data sheet	5990-5271EN
E2688A High-Speed Serial Data Analysis with Clock Recovery Software	Data sheet	5989-0108EN
EZJIT Plus and EZJIT Jitter Analysis	Data sheet	5989-0109EN
N5392A Ethernet Electrical Performance Validation and Compliance Software	Data sheet	5989-1527EN
N5393A PCI Express Electrical Performance Validation and Compliance Software	Data sheet	5989-1240EN



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