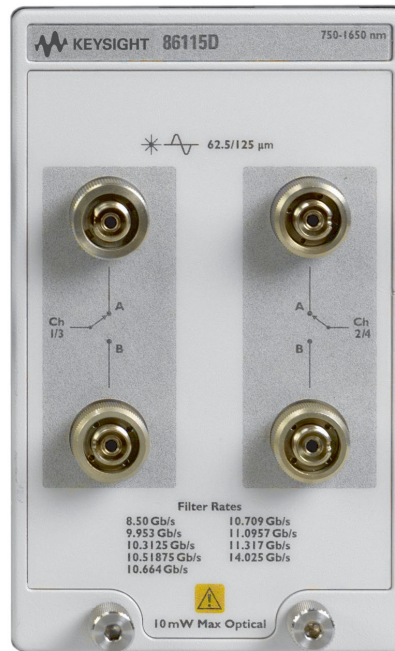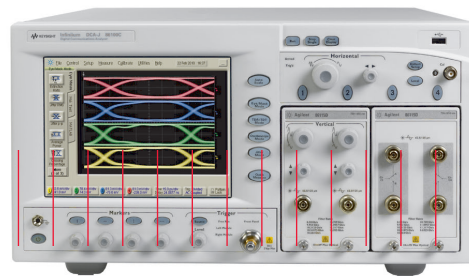# Keysight 86115D
Multi-Port Plug-In Module for High-Volume/Parallel Optical Transceiver Test

Data Sheet

Dramatically reduce the cost of test with high throughput test configurations

– Two or four 20 GHz optical ports or two 34 GHz optical ports for high volume or parallel channel test

– Compliance test solution for 8X Fibre Channel, 10 Gb/s, and 16X Fibre Channel rates or 25.78, 27.95, and 28.05 Gb/s rates

– Multimode and single-mode capability 750 to 1650 nm wavelength range

The 86115D is the ideal solution for high volume waveform analysis of transceivers operating at 8.5 Gb/s (8X Fibre Channel), 9.953 Gb/s (OC-192/STM-64), 10.3125 Gb/s (10 Gb Ethernet), 10.52 Gb/s (10X Fibre Channel), and 14.025 Gb/s (16X Fibre Channel) rates. The integrated optical receiver has an unfiltered bandwidth of 20 GHz. Option 282 provides a 34 GHz optical channel to allow compliance testing at 25.78 Gb/s (100 Gb Ethernet), 29.75 Gb/s (OTU4), and 28.05 Gb/s (32x Fibre Channel). A well-designed magnitude and phase response provides high-fidelity waveforms and accurate analysis of high-speed laser designs. Switchable reference receiver capability is available for eye-mask compliance testing at the rates mentioned above. The optical channel uses a broad wavelength photodetector operating from 750 to 1650 nm. The 62.5/125 μm connector is compatible with both multimode and single-mode fibers. (The performance of the 86115D is identical to that of the optical channel of the 86105D).

With 86115D option 002 or 282, the module is configured with two optical channels, allowing simultaneous measurements of two transmitters. By integrating very high quality, low insertion loss optical switches, the 86115D can be expanded to 4 ports[1] (option 004). These switches have been tested to over one billion switch cycles, with no signal degradation. Mode fidelity is preserved through the switch.

Option 004 provides an accurate and economical method to observe up to four transmitters in test schemes where sequential acquisition of waveforms is appropriate. For example, it is common to test many transceivers simultaneously in a temperature chamber. Test time is dominated by thermal ramp cycles. With two 86115D-004 modules, four transmitters can be simultaneously measured in one series of waveform acquisitions. The switches are then actuated and the second set of four transmitters are measured. In the time it normally takes to measure two transmitters, eight transmitters can be characterized. Only one 86100C/D[2] oscilloscope mainframe is required! Finally, an integrated rather than an external switch provides a convenient and fully calibrated measurement path as the switch insertion loss is integral to the oscilloscope channel. Option 282 is only available in a two-port configuration.

Comparing modules in the 86105/86115 series

The 86105D/86115D modules provide superior value with the ability to accurately test a wide range of transceiver technologies from early research and development to high-volume manufacturing. Like the 86105'C' plug-in, the 86105 and 86115'D' are compatible with short and long wavelength optical signals. (The 86105'C' provides reference receiver coverage at rates from 155 Mb/s to 11 Gb/s and is amplified, providing very high sensitivity.) The 86105D/86115D can be configured with an unamplified 20 GHz or 34 GHz (option 281/282) optical channel for very high-fidelity measurements in filtered or unfiltered modes.

Several options for optimum cost and flexibility

86115D-002:	Two optical channels with reference receivers for 8xFC, all 10G rates, and 16xFC
86115D-102:	Two optical channels with reference receivers for 8xFC and all 10G rates
86115D-142:	Two optical channels with 16xFC reference receivers
86115D-004:	Four optical ports switched to two optical channels with reference receivers for 8xFC, all 10G rates, and 16xFC
86115D-104:	Four optical ports switched to two optical channels with reference receivers for 8xFC and all 10G rates
86115D-144:	Four optical ports switched to two optical channels with 16xFC reference receivers
86115D-282:	Two optical ports with reference receivers for 25.78, 27.95, and 28.05 Gb/s. A 15 Gb/s filter is also provided that closely approximates the response required for 16xFC compliance test. Contact Keysight for a special option that verifies compliance to the 16xFC reference receiver specification

	Option 002	Option 004	Option 282
Wavelength range	750 to 1650 nm	750 to 1650 nm	
RMS noise	1310/1550 nm: 5 uW (10 Gb/s receiver) 12 uW (14 Gb/s receiver) 850 nm: 10uW (10 Gb/s receiver) 16 uW (16xFC receiver)	1310/1550 nm: 6 uW (10 Gb/s receiver) 14 uW (14 Gb/s receiver) 850 nm: 12uW (10 Gb/s receiver) 20 uW (16xFC receiver)	1310/1550 nm: 8 uW (15 Gb/s filter) 13 uW (25.28 Gb/s receiver) 15 uW (27.9 and 28 Gb/s receiver) 18 uW (unfiltered) 850 nm: 9 uW (15 Gb/s filter) 17 uW (25.78 Gb/s receiver) 18 uW (27.9 and 28 Gb/s receiver) 25 uW (unfiltered)
Eye-mask sensitivity[3]	1310/1550 nm: -12 dBm 8.5 to 11.3 Gb/s rates, -9 dBm 14 Gb/s rates 850 nm: -9 dBm 8.5 to 11.3 Gb/s -6 dBm 14 Gb/s rates	1310/1550 nm: -11 dBm 8.5 to 11.3 Gb/s rates, -8 dBm 14 Gb/s rateS 850 nm: -8 dBm 8.5 to 11.3 Gb/s -5 dBm 14 Gb/s rates	1310/1550 nm: -9 dBm 15 Gb/s -8 dBm 25.78 Gb/s -7 dBm 27.95 and 28.05 Gb/s 850 nm: -9 dBm 15 Gb/s -8 dBm 25.78 Gb/s -5 dBm 27.95 and 28.05 Gb/s
Input connector	62.5/125 µm	62.5/125 µm	62.5/125 um
Reference receiver filters	8x FC 10 Gb SONET/SDH 10x FC 16x FC 10.66/10.71/11.1/11.3 Gb/s (FEC rates)	8x FC 10 Gb SONET/SDH 10x FC 16x FC 10.66/10.71/11.1/11.3 Gb/s (FEC rates)	25.78 Gb/s 100 Gb Ethernet 27.95 Gb/s OTU4 28.05 Gb/s 32x Fibre Channel 15 Gb/s general purpose 14.025 Gb/s 16x Fibre Channel (contact Keysight)

1 Option 004 configuration does not include front panel vertical scale and offset control knobs. Control is achieved with the 86100C/D mainframe user interface

2 Requires 86100C/D firmware revision 9.0 or higher. The 86115D is not compatible with the 86100A or B mainframes. For information regarding trade-in opportunities from A or B mainframes to C/D mainframes, contact your local Keysight representative

3 Sensitivity parameter indicates the average power level where eye-mask 'hits' occur due to the oscilloscope noise. 10 dB extinction ratio assumed. Used for a relative comparison to other optical receivers

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