

# Keysight 81491A Reference Transmitter

## Introduction

Keysight's 81491A Reference Transmitter is designed to offer excellent eye quality for NRZ and PAM4 signals at baud-rates up to 32Gbaud and can serve as universal E/O converter. It comes in Multimode (MM) and Single-Mode (SM) flavors and includes internal lasers at 850nm (MM) or 1310&1550nm (SM). External optical input for usage with tunable laser sources is available for the SM option. The integration in the LMS mainframe offers a variety of advanced features such as automated bias-point and power control, remote control via SCPI language and much more. The LMS mainframe platform also offers seamless integration into various performance and compliance test solutions like optical receiver stress test.

The separation of the signal source and the modulator is the only way to offer a zero-chirp modulation. This is essential for a clean and repeatable eye diagram when modulating with an appropriate clean external source to fulfill the requirements of the IEEE standard. Another advantage of this design compared to directly modulated transmitters is the wide extinction ratio range that can only be achieved with this design.

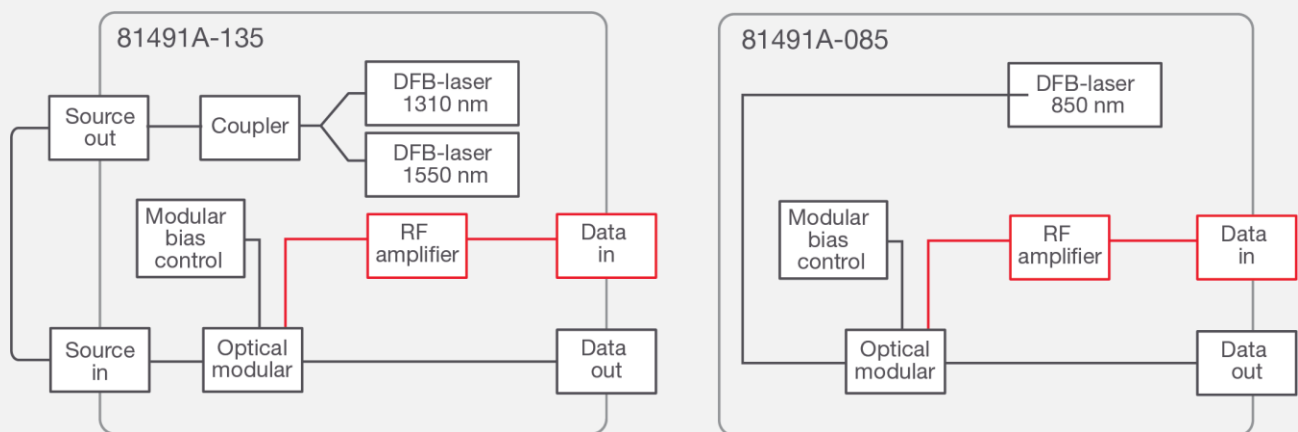


## Benefits

- Repeatable and reproducible measurements permit lower production test margins and improved specifications of the characterized devices.
- Reliable measurements ensure comparability of the test results.
- Support for full compliance to IEEE 802.3 stressed eye test in combination with Keysight's Optical Receiver Stress Test solutions.
- Wide extinction range offers highest test range coverage to ensure best quality of the tested devices under all target operating conditions.
- Rapid test reconfiguration with dual-wavelength to switch between 1310 nm and 1550 nm by remote control or manually without exchanging a module.
- Scalability with integration into industry-standard Keysight LMS platform extends your optical workbench capabilities.
- Fast signal calibration and optimization through integration with Keysight automation software

## Application

- Reference transmitter for stressed eye compliance test according to IEEE 802.3.
- Creation of arbitrary optical modulation signals in combination with waveform generators.
- General transmission system test with special pulse patterns in combination with a pattern generator.



Figures 1a and 1b: 1a) 131 nm/1550 nm reference transmitter; 1b) 850 nm reference transmitter

## Specifications

Characteristic		81491A-085	81491A-135
Optical source output	Optical wavelength	L1: 850 nm $\pm$ 10nm	L1: 1310 nm $\pm$ 10 nm L2: 1550 nm $\pm$ 10 nm
	Optical output power	NA	> +13 dBm typical
	Attenuation range	6 dB	6 dB
	Output power stability over 15 minutes	NA	$\pm$ 0.005 dB typical
	Optical interface type	No output	APC Panda PMF 9 / 125 $\mu$ m
Optical input	Wavelength range	NA	1260 nm to 1360 nm 1480 nm to 1640 nm
	Optical input power range	NA	+8 dBm to +16 dBm +10 dBm nom.
	Maximum safe input power	NA	+18 dBm
	Loss at quadrature bias point	NA	8 dB typical @ 1550 nm 10 dB typical @ 1310 nm
	Optical interface type	No input	APC Panda PMF 9 / 125 $\mu$ m
Data output	Optical interface type	APC MMF 50 / 125 $\mu$ m	APC SMF 28 9 / 125 $\mu$ m
	Electro-optical modulation bandwidth 3 dB	> 22 GHz typical	> 22 GHz typical
	Electro-optical modulation bandwidth 6 dB	> 35 GHz typical	> 35 GHz typical

## Specifications, Continued

	Characteristic	81491A-085	81491A-135
Data output	TDEC <sup>1)</sup>	< 1.3 dB typical	< 1.2 dB typical, 1310 nm < 0.9 dB typical, 1550 nm
	Extinction ratio <sup>1)</sup>	> 7 dB	> 8 dB 1310 nm > 6 dB 1550 nm
	Jitter (peak-peak) <sup>1)</sup>	< 6.5 ps typical	< 6.5 ps typical
	Jitter (rms) <sup>1)</sup>	< 400 fs typical	< 400 fs typical
	VECP for NRZ <sup>1)</sup>	< 1.5 dB typical	< 1.5 dB typical, 1310 nm < 1.7 dB typical, 1550 nm
	Rise and fall time (20% to 80%) <sup>2)</sup>	< 16.5 ps typical	< 16.5 ps typical
	Outer OMA (PAM4) <sup>3)</sup>	> 2.5 dBm typical	> 3 dBm typical, 1310 nm > 4 dBm typical, 1550 nm
	TDECQ (PAM4) <sup>3)</sup>	< 1.2 dB typical	< 1.2 dB typical

Measurements performed with M8045A pattern generator with 300 or 600mV output amplitude for option -085 and option -135 respectively. Optical waveforms captured and analyzed using a N1092A optical sampling scope. 1) 26Gbs NRZ, PRBS11 2) measured at 26/28Gbs NRZ, PRBS11 for -085/-135. 14ps characteristic rise/fall time at 32Gbs 3) 26.5625Gbaud PAM4, SSPRQ, 6dB ER, 13.3GHz scope BW.

## General specifications

RF connector interface	1.85 mm female
Module size (H x W x D)	75 mm x 64 mm x 335 mm (2.8" x 2.6" x 13.2")
Module weight	1.0 kg (2.2 lbs)
Warmup time	60 min
Operating temperature	+5°C to +40°C for 81491A-135 +15°C to +35°C for 81491A-085
Storage temperature	-40°C to +70°C *
Humidity	5% to 95% relative humidity, non-condensing
816xA/B firmware revision	5.25 and higher
Recommended recalibration period	2 years

(\*) recommended storage temperature range for 81491A-085 is +10°C to +40°C. If stored outside this range, the module must be conditioned at room temperature for at least 72 hours before use.

## Ordering information

Reference transmitter	
-135	1310 nm and 1550 nm
-085	850 nm

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