

# 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.

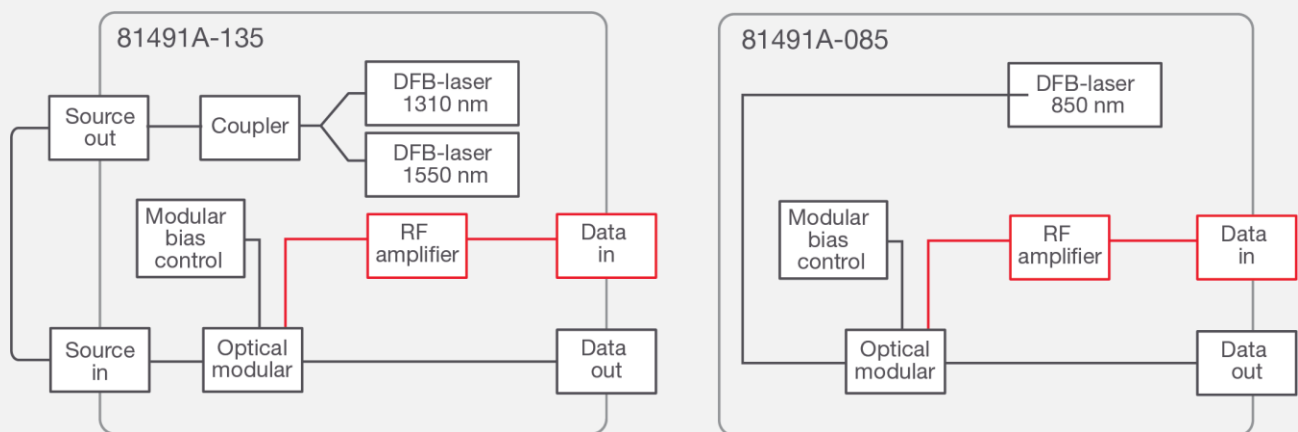


## Benefits

- 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<br>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<br>1480 nm to 1640 nm           |
|                       | Optical input power range                 | NA                       | +8 dBm to +16 dBm<br>+10 dBm nom.                  |
|                       | Maximum safe input power                  | NA                       | +18 dBm  |
|                       | Loss at quadrature bias point             | NA                       | 8 dB typical @ 1550 nm<br>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<br>< 0.9 dB typical, 1550 nm |
|             | Extinction ratio <sup>1)</sup>                | > 7 dB            | > 8 dB 1310 nm<br>> 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<br>< 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<br>> 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<br>+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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