

# Optical Multi-Format Transmitter

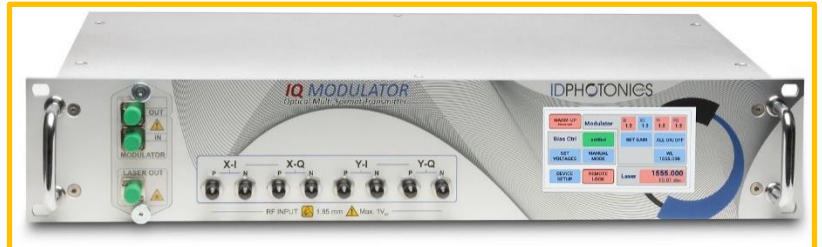
## IQ Modulator Reference Transmitter

### Feature Overview

- ✓ High-bandwidth single & dual-pol optical IQ modulation up to 60GHz E/O Bandwidth
- ✓ **Ultra-Precise Automated BIAS Control**
  - ✓ No dependency on applied modulation format and RF amplitude
  - ✓ No user tweaking required
  - ✓ Zero noise feature
- ✓ Supports fast and simple switching between modulation formats applied by signal source
- ✓ Built-in or external laser source
- ✓ Add-on to electrical AWG
- ✓ device specific calibration files enable software-based pre-distortion
- ✓ USB & Ethernet interface for remote control
- ✓ SCPI style remote control command set, LabView® drivers supplied
- ✓ Local Touch Panel display
- ✓ Built-in Web Server for instant access from any browser enabled device

### Applications

- ✓ Generation of advanced optical modulation formats (e.g. QPSK, 16-QAM, ...)
- ✓ Reference transmitter
- ✓ Testing coherent optical receivers
- ✓ Multi-channel transmission experiments for system design tests



The Optical Multi-Format Transmitter (OMFT) is a fully integrated optical frontend instrument that converts differential electrical RF signals into an IQ modulated optical signal.

This device provides excellent quality and matched channels optimized for next generation multi-level transmission formats at very high symbol rates. It is suitable as reference transmitter for receiver characterization or transmitter reference setup. The unit comprises a Mach Zehnder based optical modulator, RF amplifiers for connecting to Arbitrary Waveform Generators (AWG) or Pulse Pattern Generators (PPG).

The unique **RF amplitude / modulation format independent** automated BIAS control allows users to apply customized RF input signals without requiring manual tweaking of parameters and guaranteeing operation at the optimal operating point. This enables long-term stable operation and automated switching between modulation formats.

A zero noise feature allows to achieve optimal and repeatable performance.

A local touch Panel Display provides easy-to-use direct access to the unit.

Remote control is possible via a built-in Webserver eliminating the need for software installation on a remote PC and enabling any handheld device to access the unit via browser.

A SCPI based programming API allows straightforward implementation of automated test scripting.

# Key Features

- **Automatic BIAS control independent of RF input signals**

Unlike other solutions, our unique BIAS control does not rely RF feedback signals derived from the data signal to control the phase electrode in IQ Mach-Zehnder structures. Instead, it uses internally generated feedback signals to identify and track the optimal BIAS setting, which provides a number of advantages

- The control is stable and independent of the RF input signal; supports all modulation formats
- Operates without any RF signal applied to the modulator data inputs
- No manual tweaking by user of control loop parameters such as offset values required
- Almost zero average quadrature error of constellation

- **Zero noise feature**

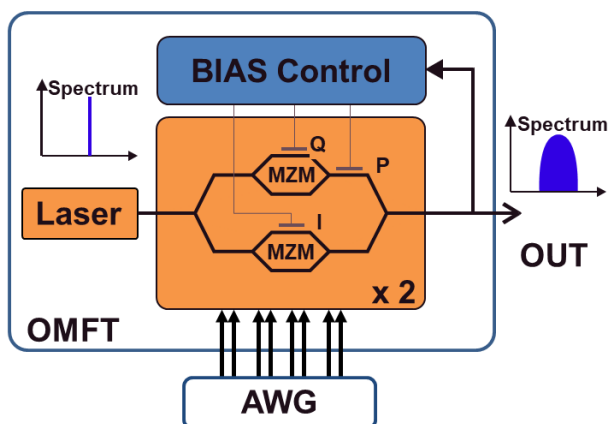
This feature will mute signals used for the automatic BIAS control and freeze its current status achieving optimum performance. Once disabled again, the automatic control will continue optimizing.

- **High-end full digital signal processing (DSP)**

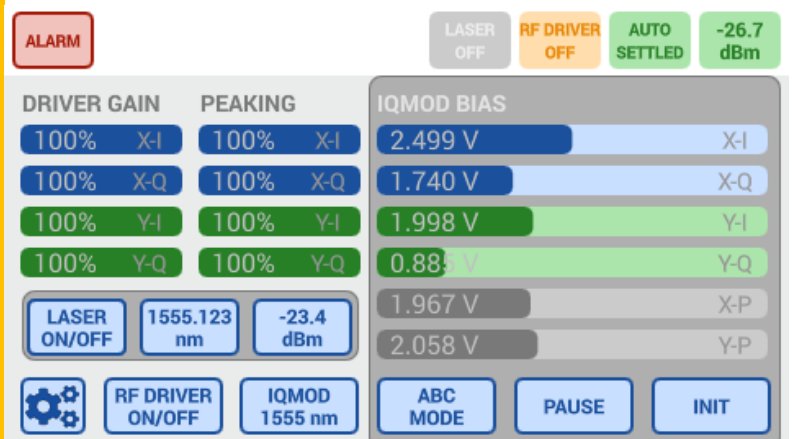
All feedback extraction and processing is done using digital DSP Technologies ensuring maximum of performance possible close to theoretical limits. Customized algorithms can be easily implemented by Software changes. A locking status indicator gives users certainty about current status of the control.

- **Easy to use graphical user interface (GUI) and Remote control**

A comprehensive GUI allows setting up, control and monitoring the unit within minutes. Remote control via Ethernet or USB gives a maximum of flexibility connecting to the board. Configurations can be stored locally on the unit which are still available after a reboot. The SCPI style interface allows to easily implement custom remote control software. LabView® drivers are provided.



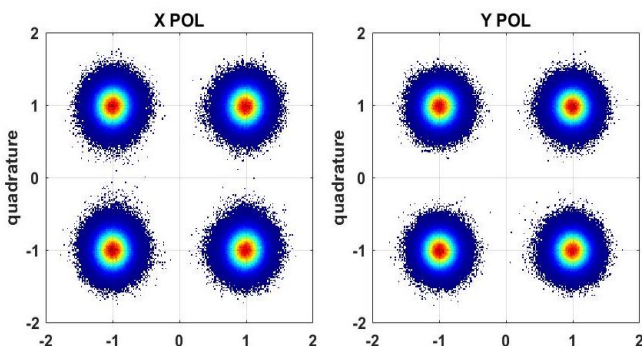
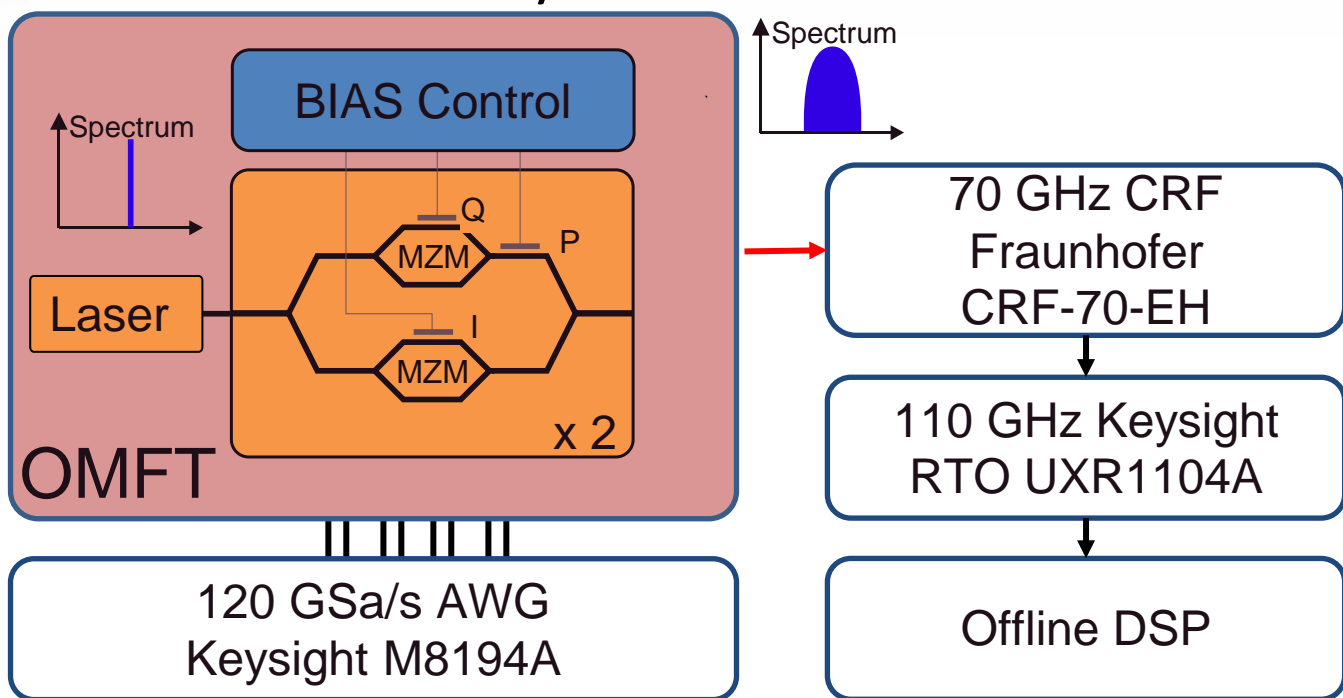
Application Example



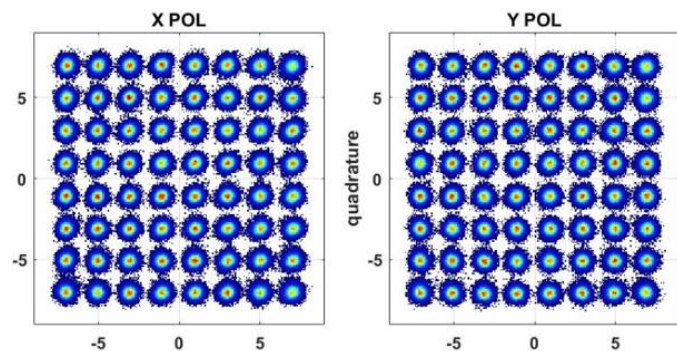
Touch GUI

# Application Example – Class 60

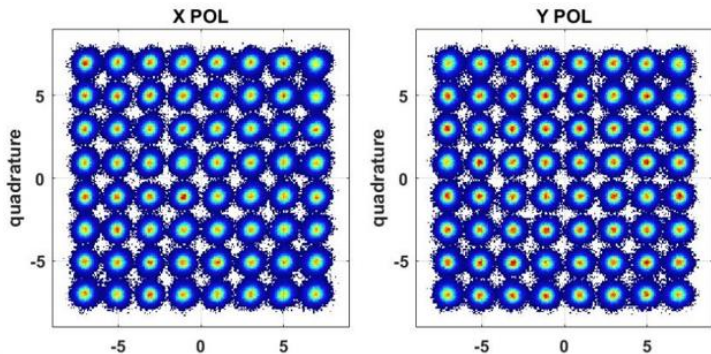
Performance limited by AWG RF source



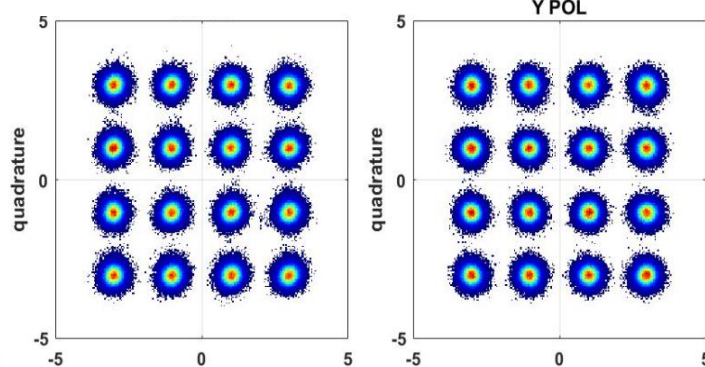
**105GBd 4QAM 960 GBit/s**  
EVM 15.6%



**64GBd 64QAM - 768 GBit/s**  
EVM 3.8%

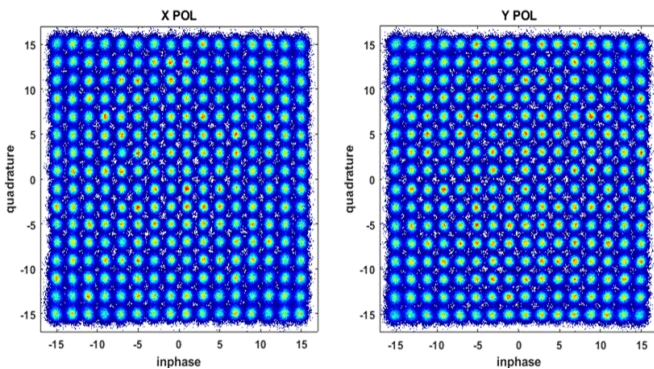
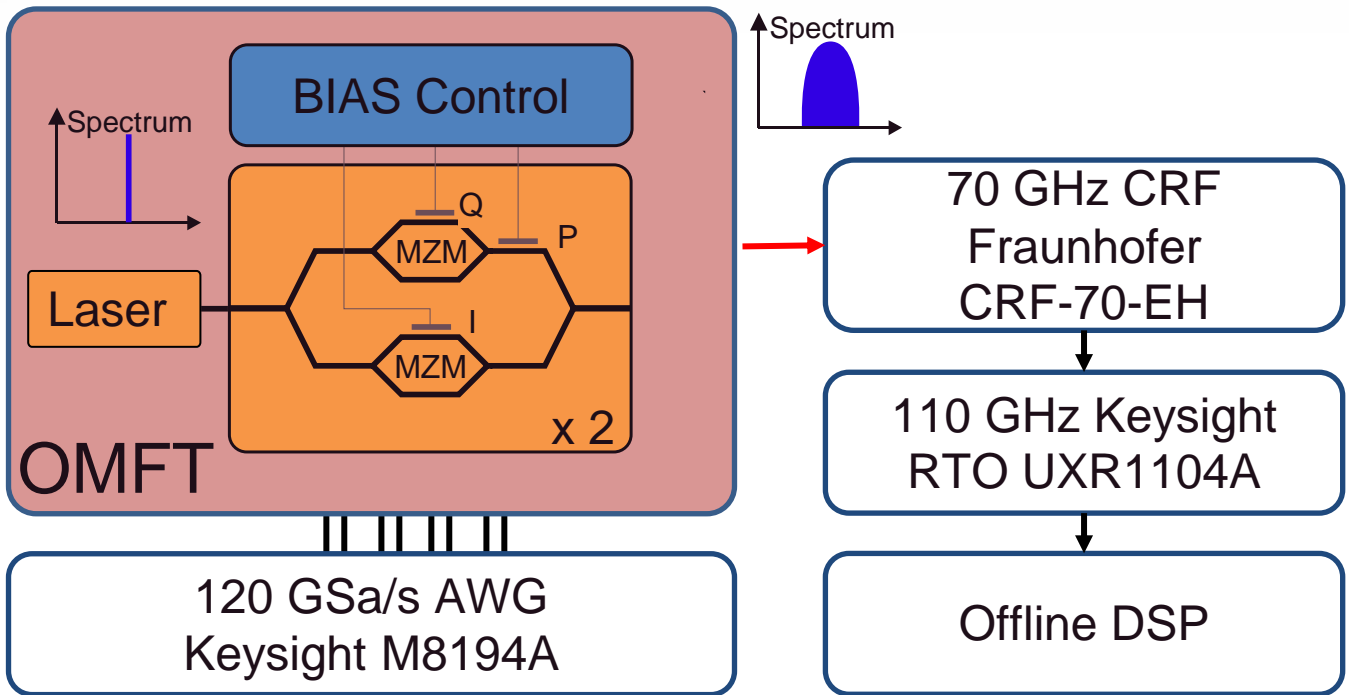


**80GBd 64QAM 960 GBit/s**  
EVM 4.4%

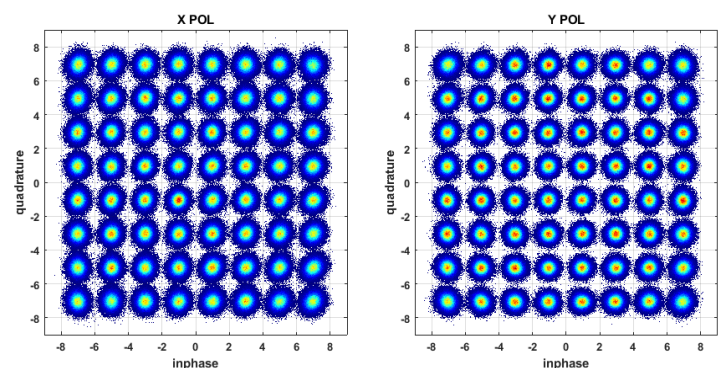


**96GBd 16QAM 768 GBit/s**  
EVM 6.8%

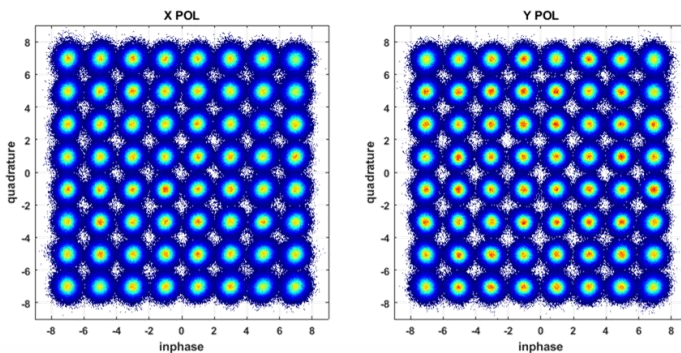
# Application Example – Class 40



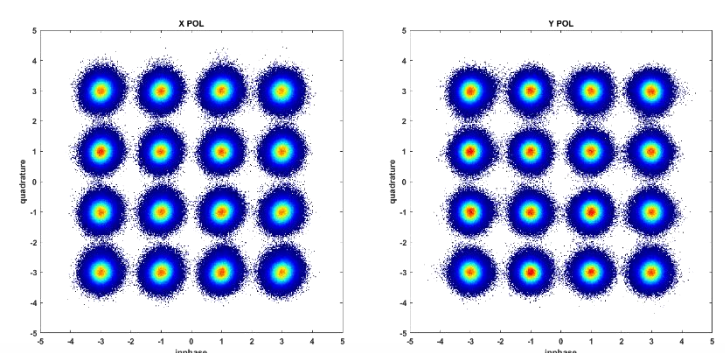
**40GBd 256QAM - 640 GBit/s**  
EVM 2.9%



**64GBd 64QAM - 768 GBit/s**  
EVM 4.0%



**80GBd 64QAM 960 GBit/s**  
EVM 4.9%



**96GBd 16QAM 768 GBit/s**  
EVM 7.9%

# Key Specifications

Parameter	Specification
Wavelength Range [nm] [THz]	1525 – 1570 191.1 – 196.25
XY Polarization Imbalance [dB]	< 1
Gain Imbalance [dB]	< 1
DC Extinction Ratio [dB]	> 18
IQ Offset [dB]	< -20
Electrical RF Connectors	1.85mm, female, differential
Insertion Loss [dB] (maximum transmission point setting, no RF modulation)	< 15.5dB
E/O Bandwidth [GHz], 6dB Class 40 Class 60	40, Typical: 45 55, Typical: 60
Input Power Range [dBm]	8 – 19
Maximum Ambient Temperature Gradient [K/hr]	+/- 1
Output Connector	FC/APC
Optical Fiber (MOD IN)	Polarization - maintaining PANDA type Fiber, PER > 20dB, 25typ.

**Inquire with us for an extended data sheet**

## Contact information

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## Mechanical & electrical Parameter

Operating Temperature	+10 to +35°C	non-condensing
Size of Device (H x W x D)	483 x 90 x 275mm 19 x 3.6 x 10.9 inch (depth w/o handles)	
Power Supply	100-240 VAC, 1A, 50/60Hz	