



Single channel 25G/50Gbaud APD receiver performance

802.3 Bidirectional 10 Gb/s and 25 Gb/s Optical Access PHYs Study Group
Sep 2018



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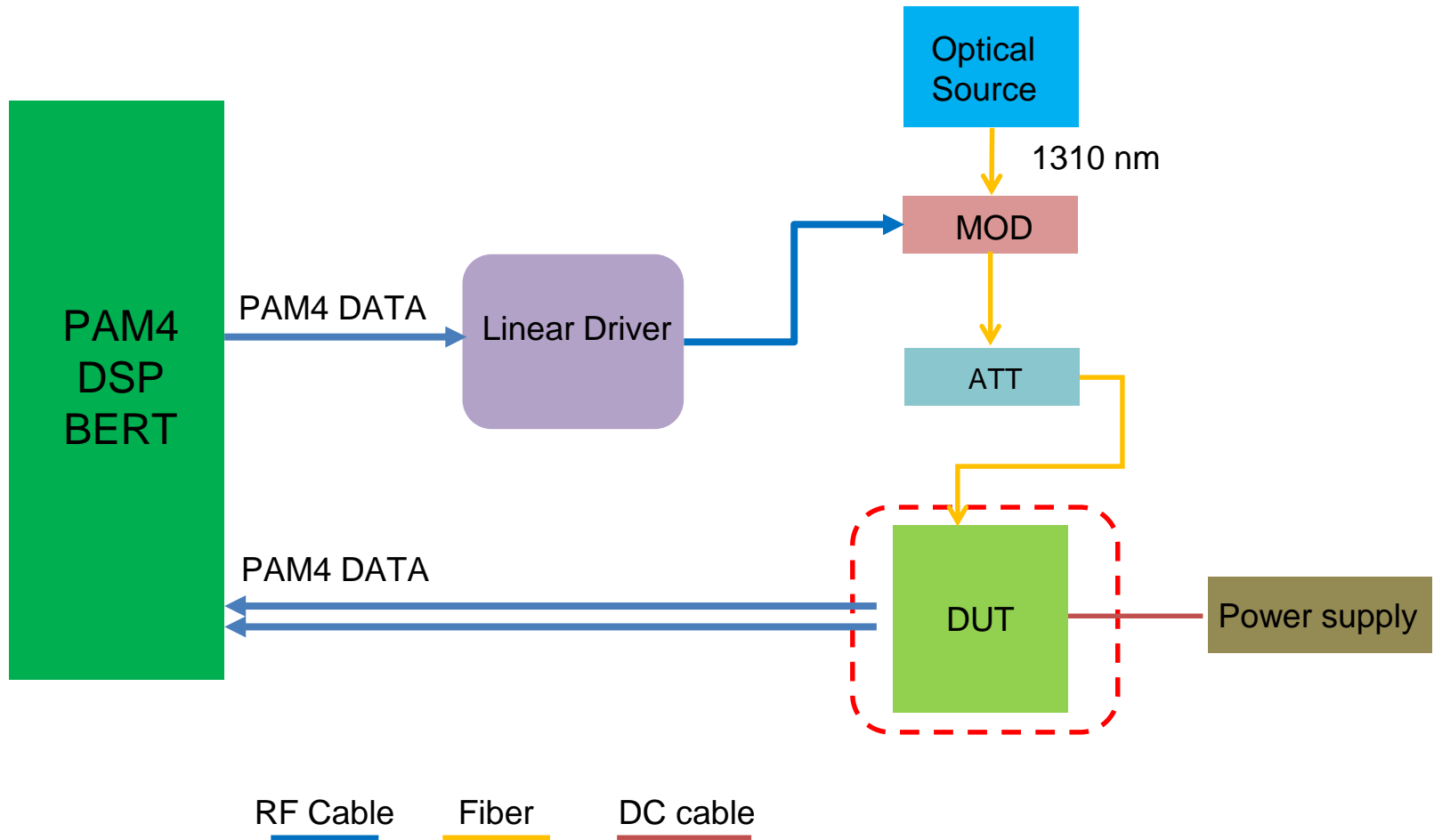
Solution 1: 25Gbaud TO-can based APD receiver

- TO-can based APD receiver
 - Linear 25Gbaud APD and TIA inside
 - Commercial TO-46 7pin header
 - Compatible with current 10Gb/s bi-direction module





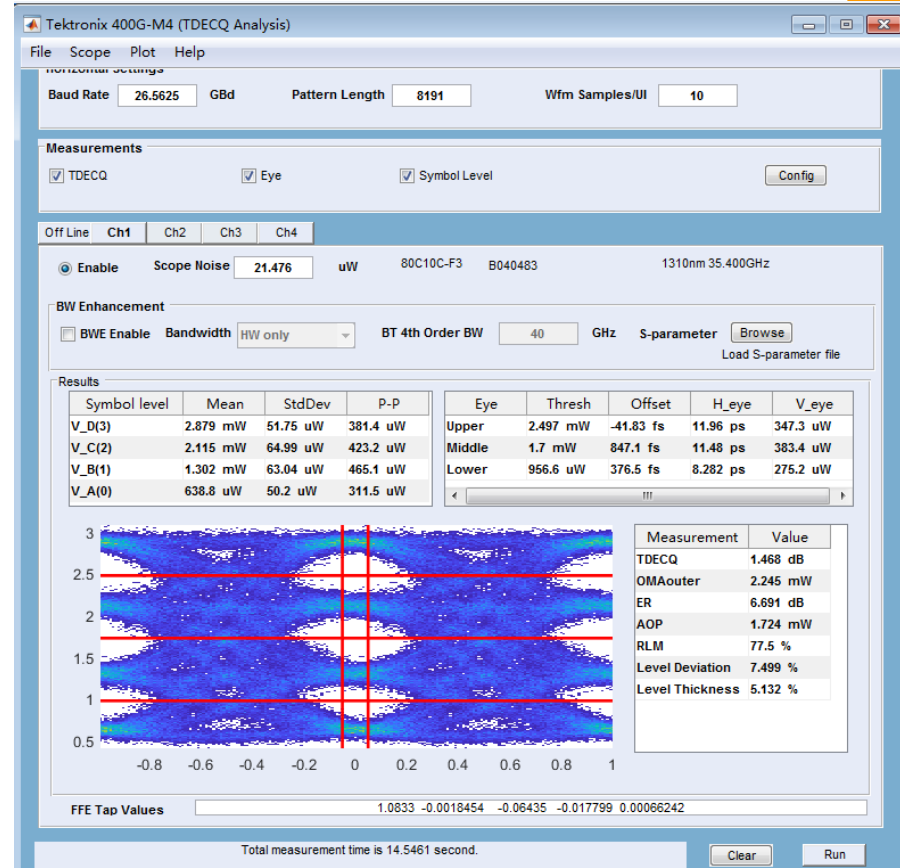
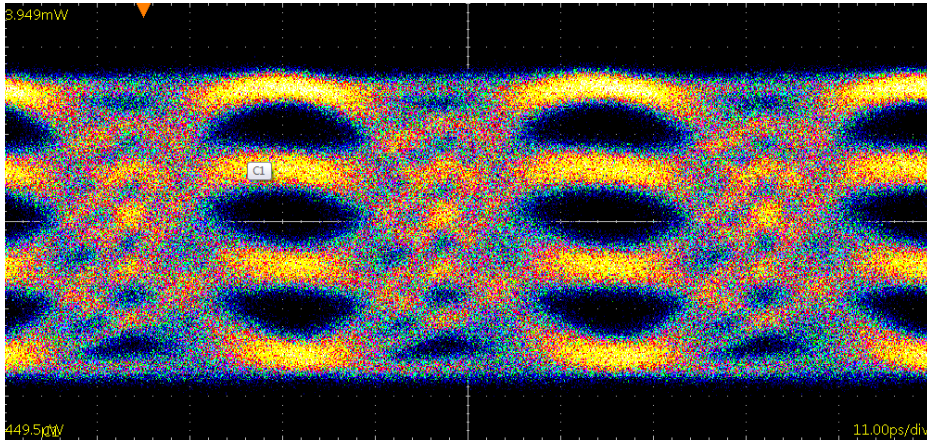
PAM4 test setup





Tx's optical eye

Data Rate: 26.5625GBaud
SECQ: 1.468dB
ER: 6.691dB





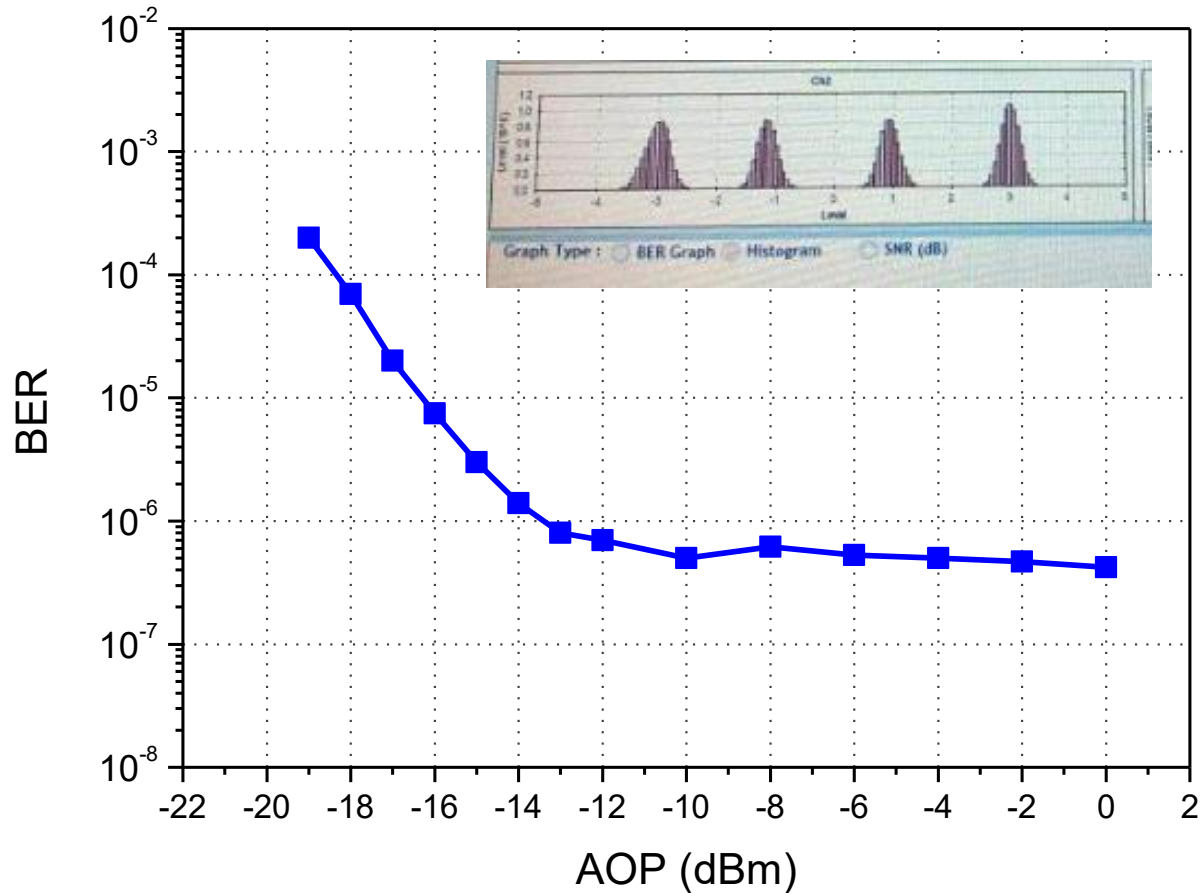
25Gbaud TO-can APD receiver PAM4 BER Curve and BERT/DSP PAM4 histogram

Test conditions:
26.6Gbaud PAM4,
PRBS31Q,
RT,

Sensitivity:
-19dBm at
BER=2e-4

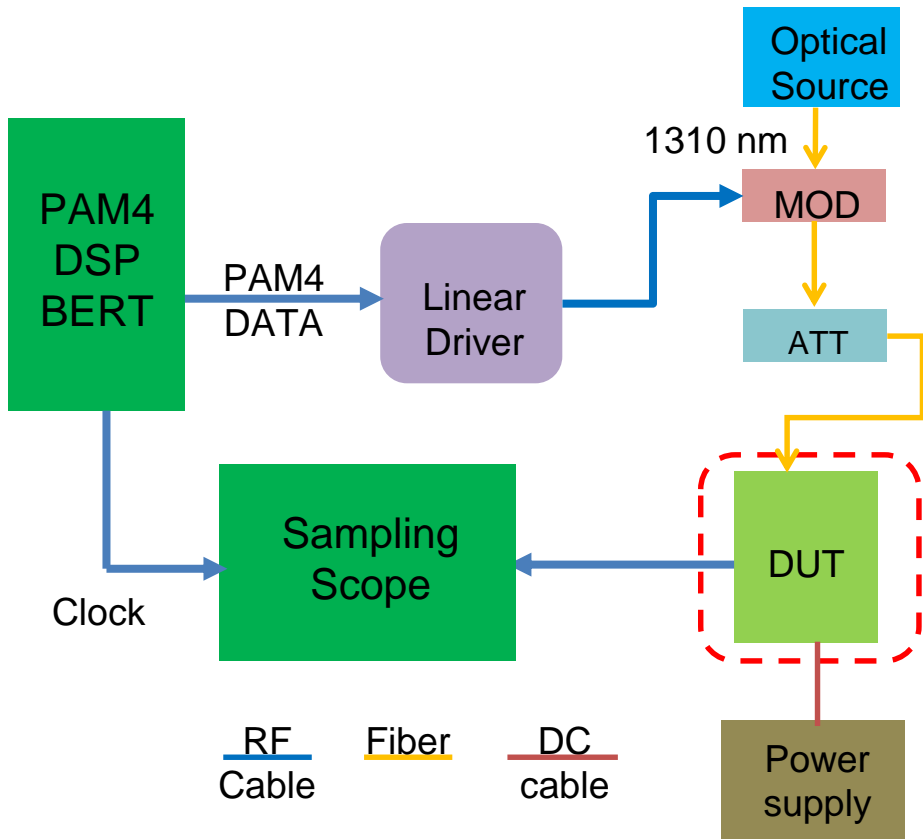
Overload: >0dBm,
limited by Tx power

Dynamic range:
>19dB

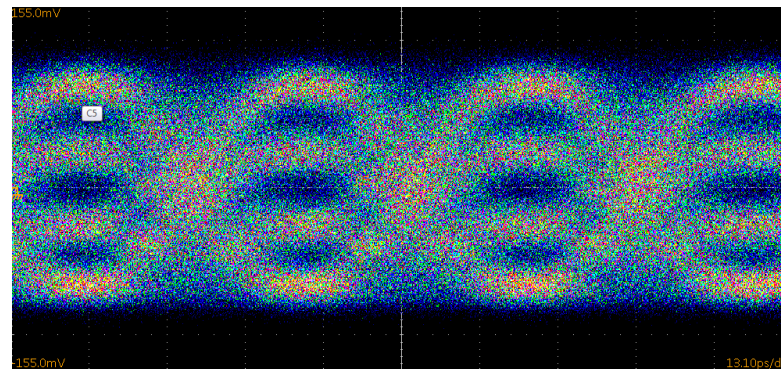




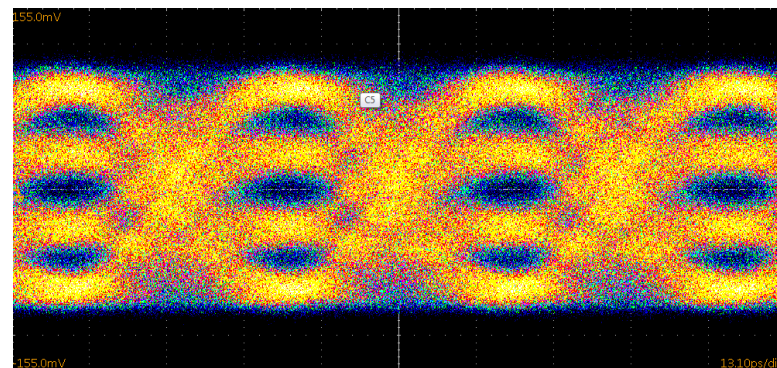
TO-can APD receiver output PAM4 electrical eye



Input optical power @ -19dBm



Input optical power @ -14dBm



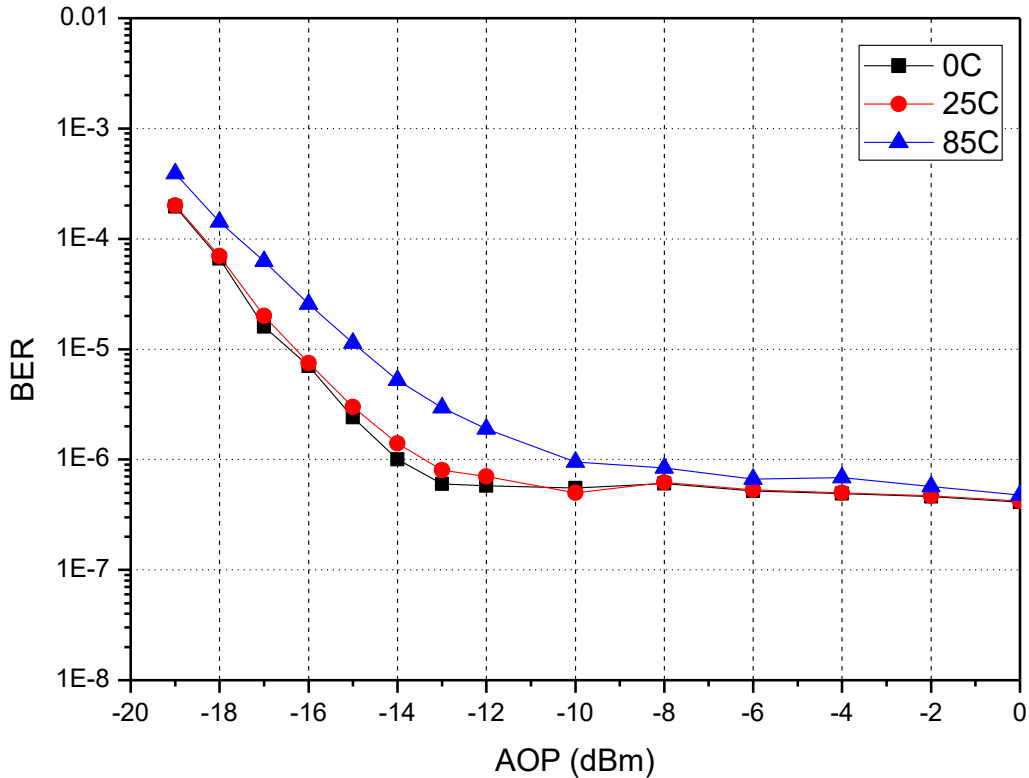


26.6Gbaud PAM4 BER at different temperature

Test conditions:
26.6Gbaud PAM4,
PRBS31Q,

Sensitivity <1dB
loss with operating
temperature
changed from 25C
to 85C.

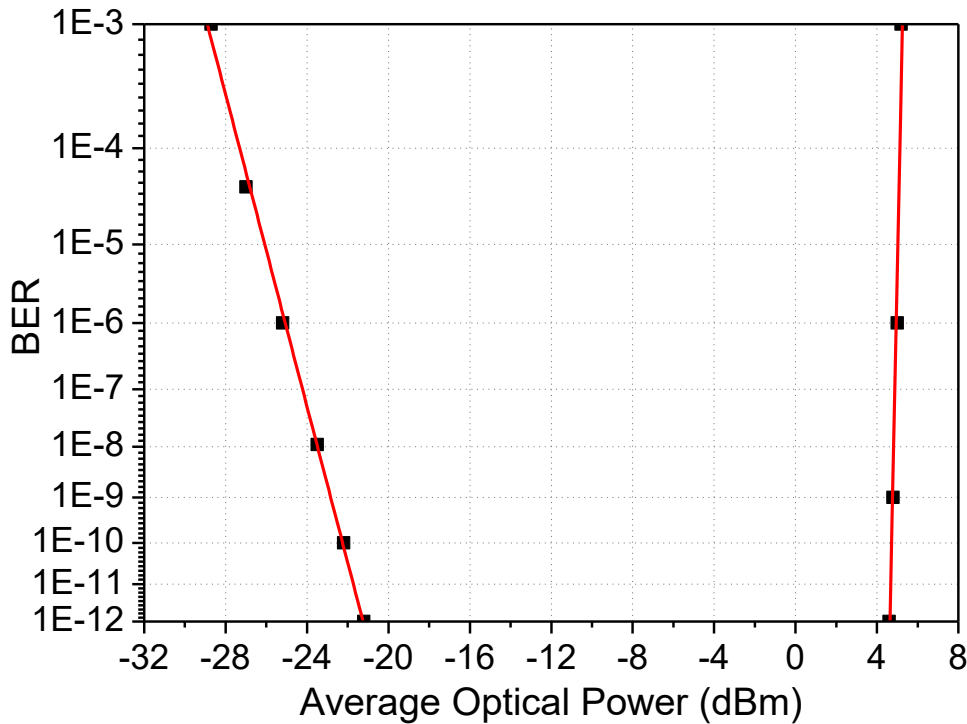
All temperature
overload >0dB,





Same APD TO-can receiver performance at 25.78Gb/s NRZ

- The same TO-can receiver present a good NRZ performance as well:



Test conditions:
25.78Gbps NRZ,
PRBS2³¹-1,
1310nm, ER=8dB,
RT

1e-12 sensitivity:
-21.2dBm

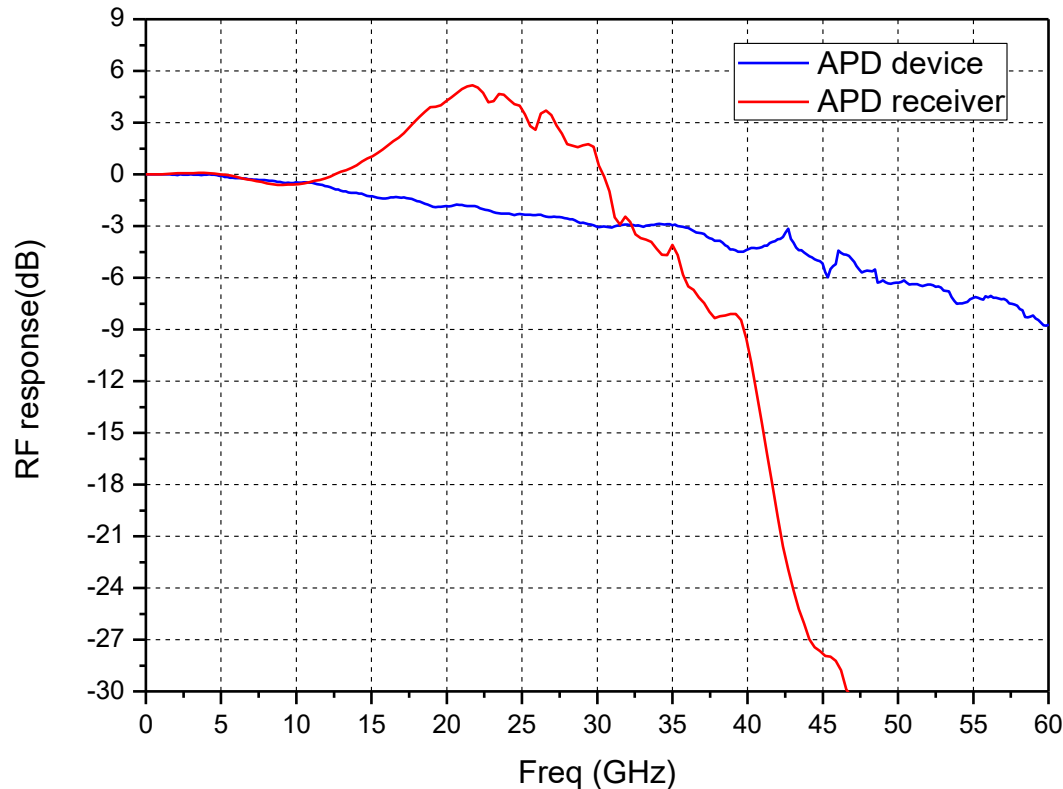
1e-3 sensitivity:
-28.7dBm

Overload: +4.6dBm



Solution 2: 50Gbaud APD receiver

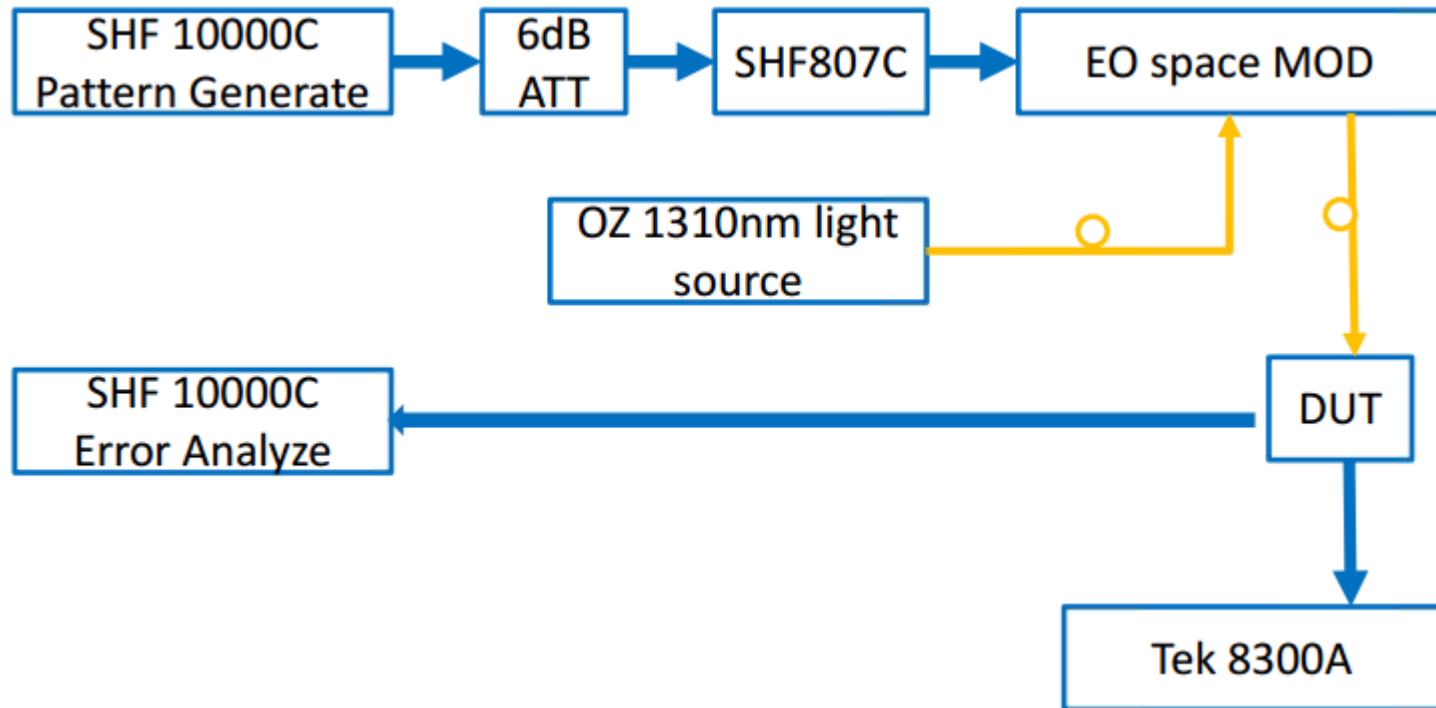
- 50Gbaud APD receiver has a very large 3-dB bandwidth $\sim 32\text{GHz}$ for 50Gb/s operation;



Test conditions:
1310nm,
-13dBm input power,
50-Ohm load, room
temperature,
APD biased at
gain=10

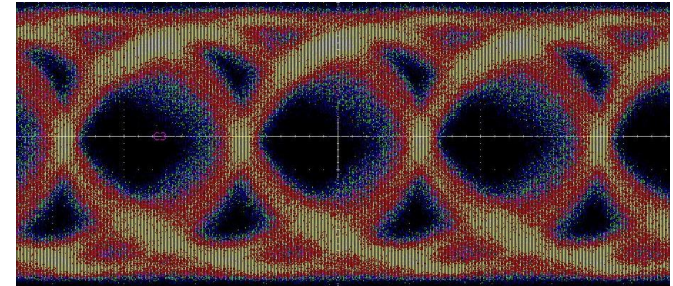
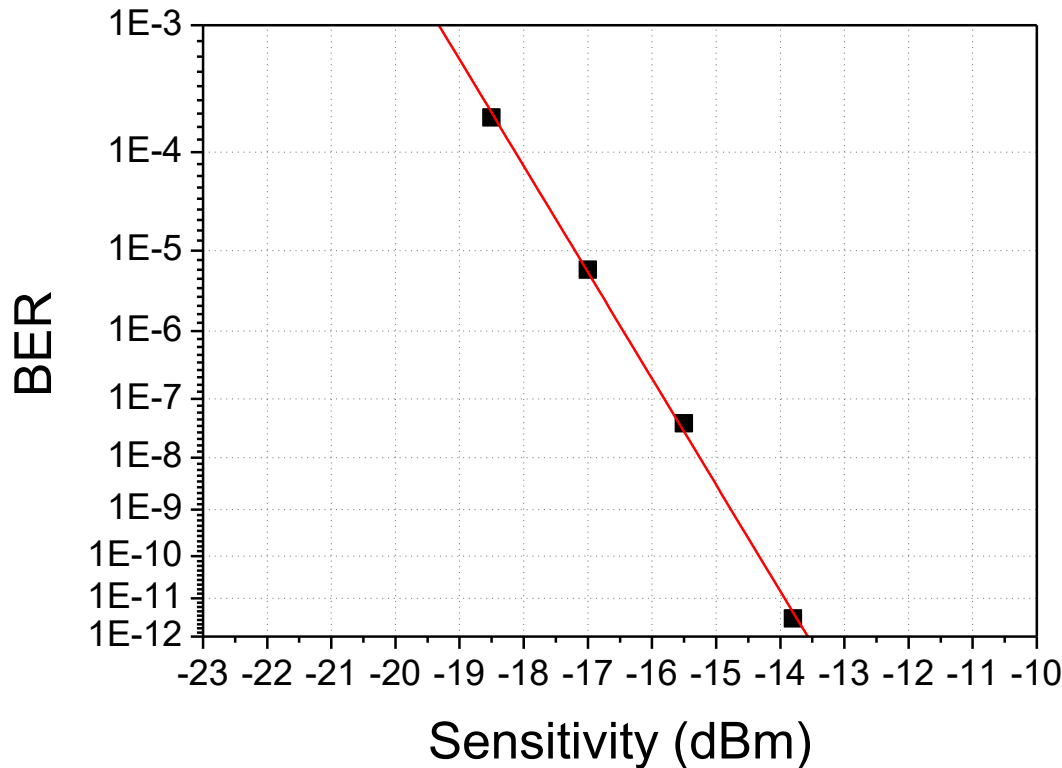


50Gbaud NRZ test setup





50G APD receiver BER curve and eye-diagram



Eye-diagram of APD receiver

Test conditions: 50Gb/s NRZ, back to back, ER=9dB, 1310nm, room temperature



Summary

- One TO-can based APD receiver solution for both 25Gbaud PAM4 and NRZ operating;
 - 26.6Gbaud PAM4 sensitivity: -19dBm at $2e-4$; overload: >0dBm; providing >19dB dynamic range for long distance operations;
 - 25.78Gb/s NRZ sensitivity: -21.2dBm at $1e-12$; -28.7dBm at $1e-3$;
 - 25.78Gb/s Overload:+4.6dBm;
- 50Gbaud APD receiver
 - 50Gb/s NRZ sensitivity: -13.5dBm at $1e-12$; -19.5dBm at $1e-3$;