

Evaluation of Optical Mode Filtering for 300 m MMF Reach

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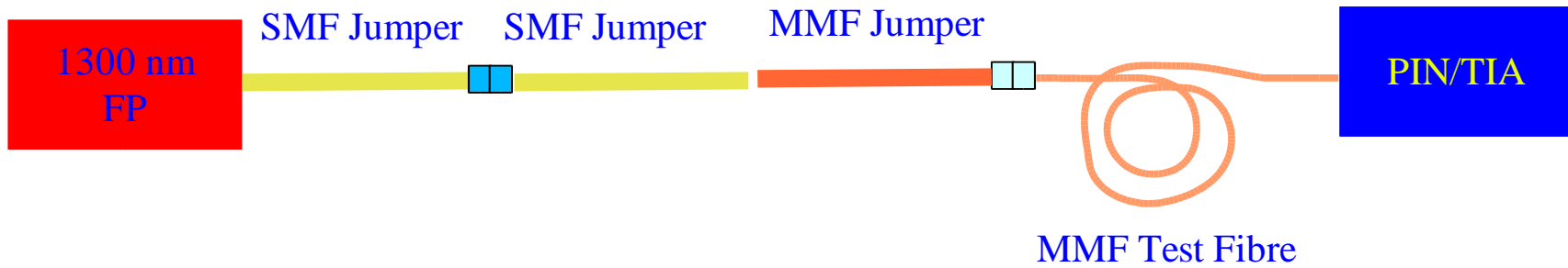
Overview

- ❑ **Broadcom has evaluated Optium Mode Filtering "OMF" proposal to complement a simpler lower power EDC.**
- ❑ **Boadcom 265A* and 300B* fibre were used to evaluate pulse and eye response with and without a 17um optical mode filter.**
- ❑ **OMF was tested with EA over Broadcom 265A and 300B.**

* **Broadcom 265A is a 265 m peaked index 62.5 DMD challenged fibre
Broadcom 300B is a 300 m peaked index 62.5 DMD challenged fibre**

Test Set-up

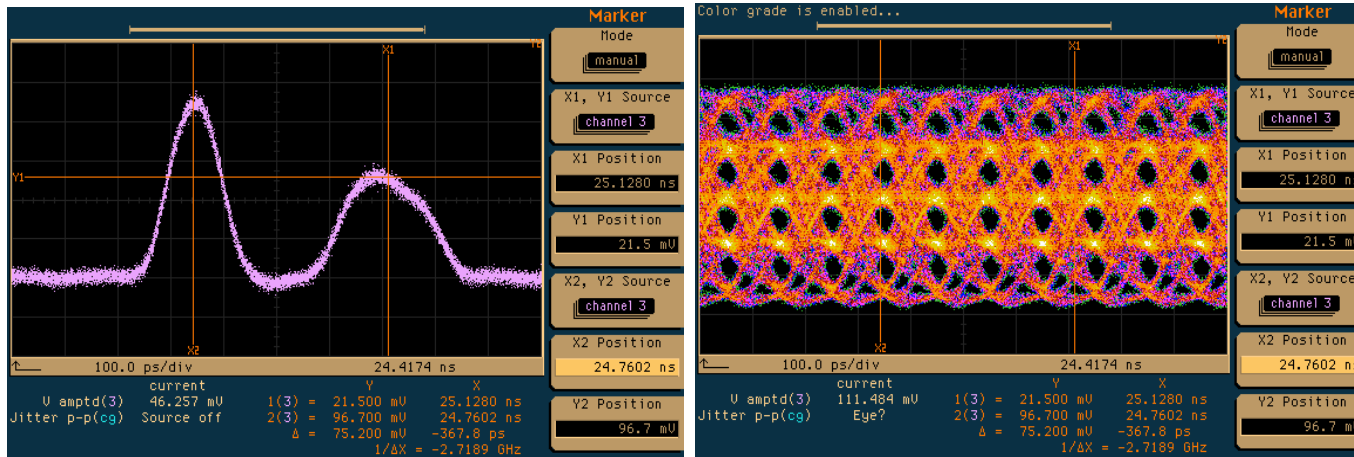
□ Test Set-up



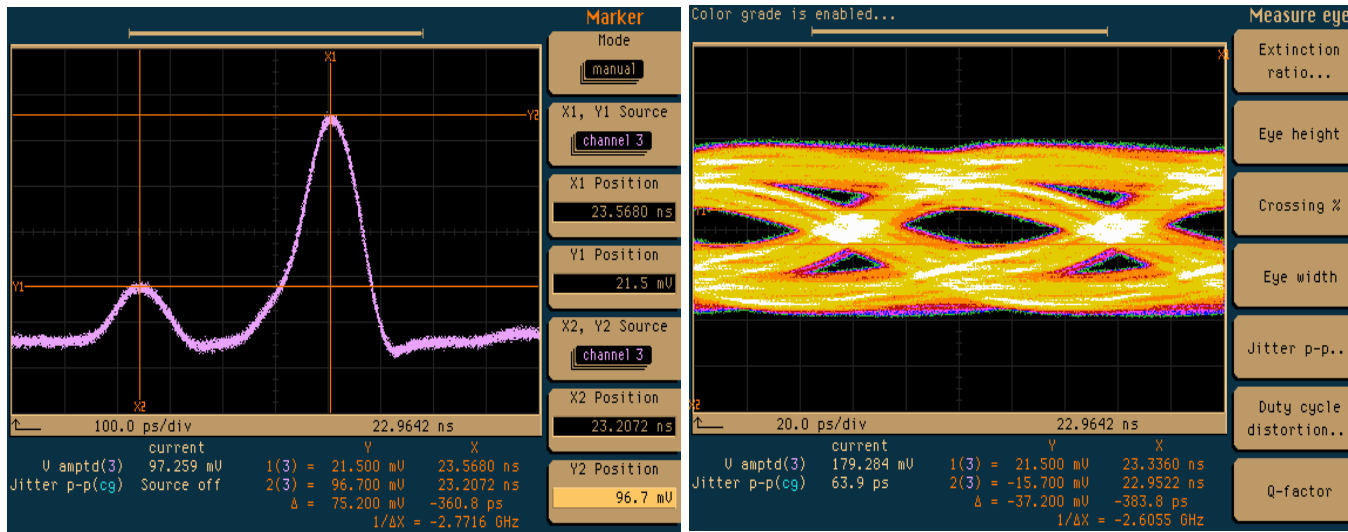
Broadcom 265A Fibre Response

ROFL (1dB) and Offset Launch (22 um)

ROFL



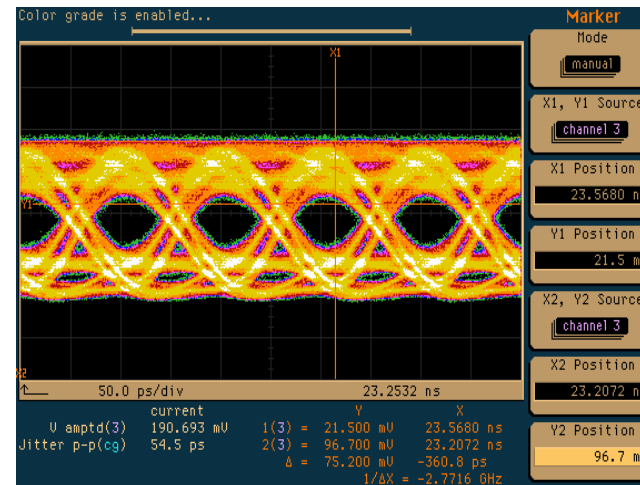
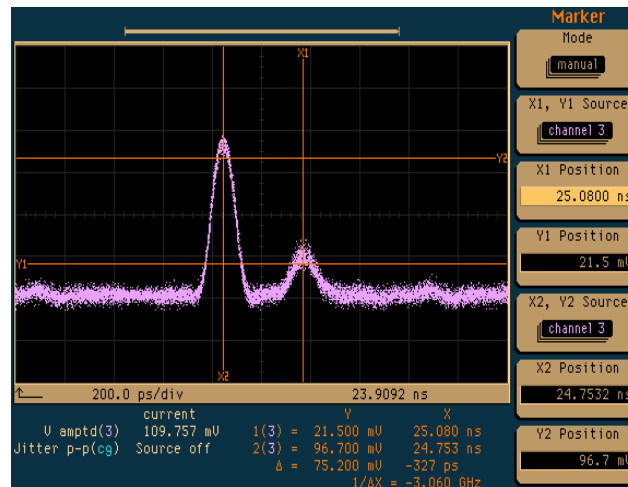
Offset



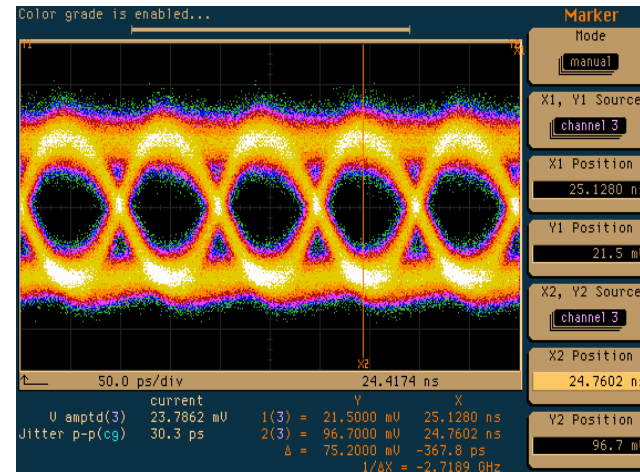
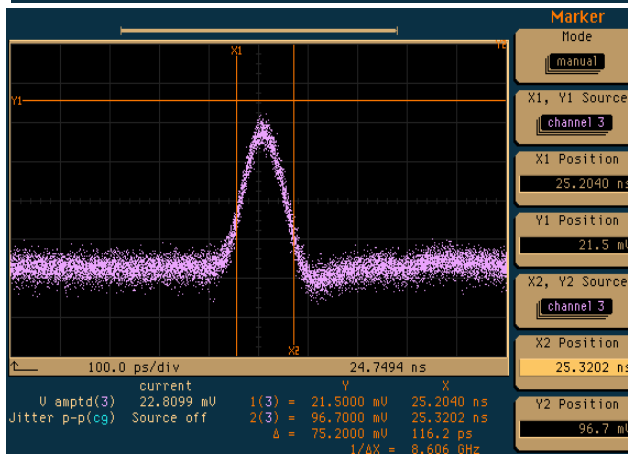
Broadcom 265A Fibre Response

□ Centrer Launch with Mode Filtering

Full aperture



17um aperture



Broadcom 265A Fibre Response

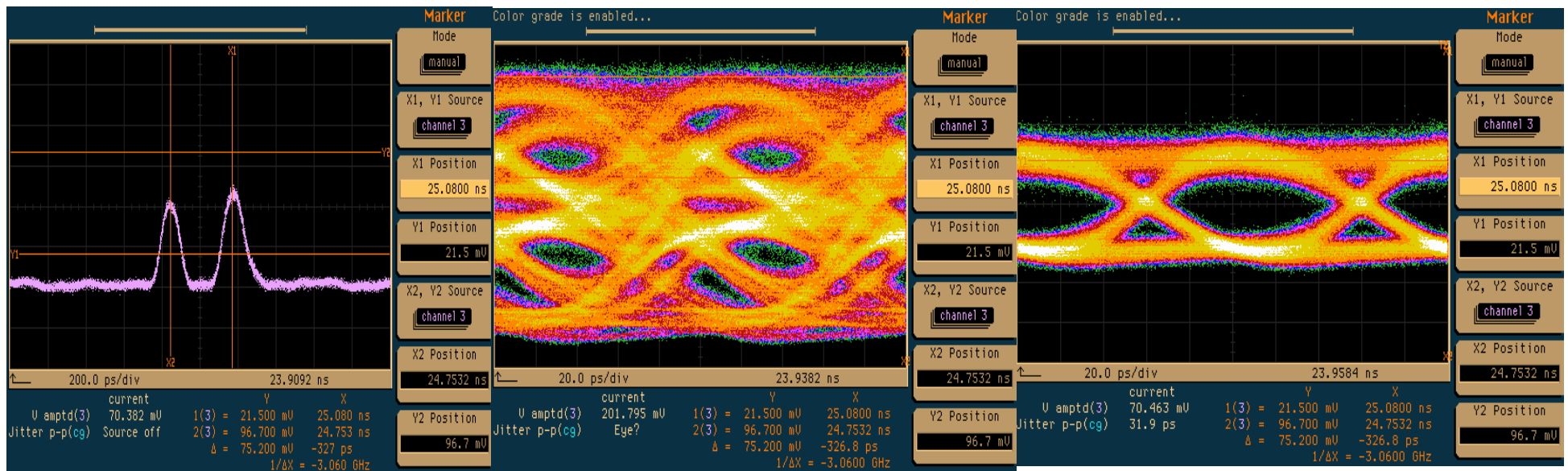
5um Offset Launch with Mode Filtering

- ⇒ OMF works well with 265A fibre
- ⇒ Noise is higher due to FP source and would be lower with EA.

Full aperture

Full aperture

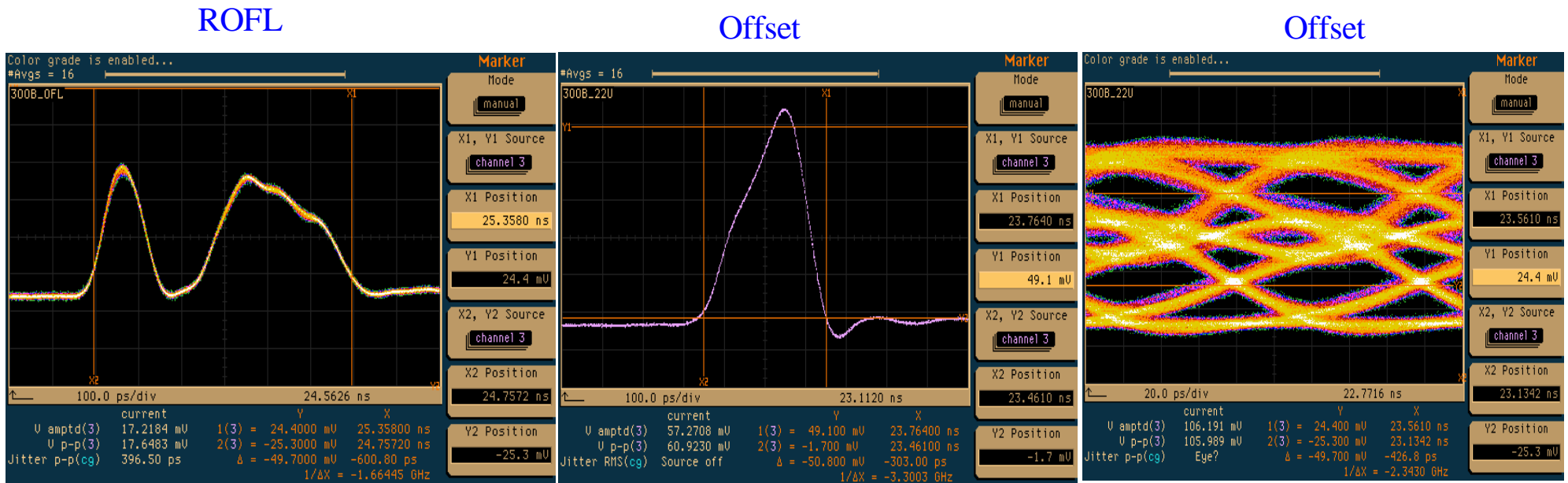
17um aperture



Broadcom 300B Fibre Response

ROFL (1dB) and Offset Launch (22 um)

⇒ 300B carries significant amount of energy in the high order mode.



Broadcom 300B Fibre Response

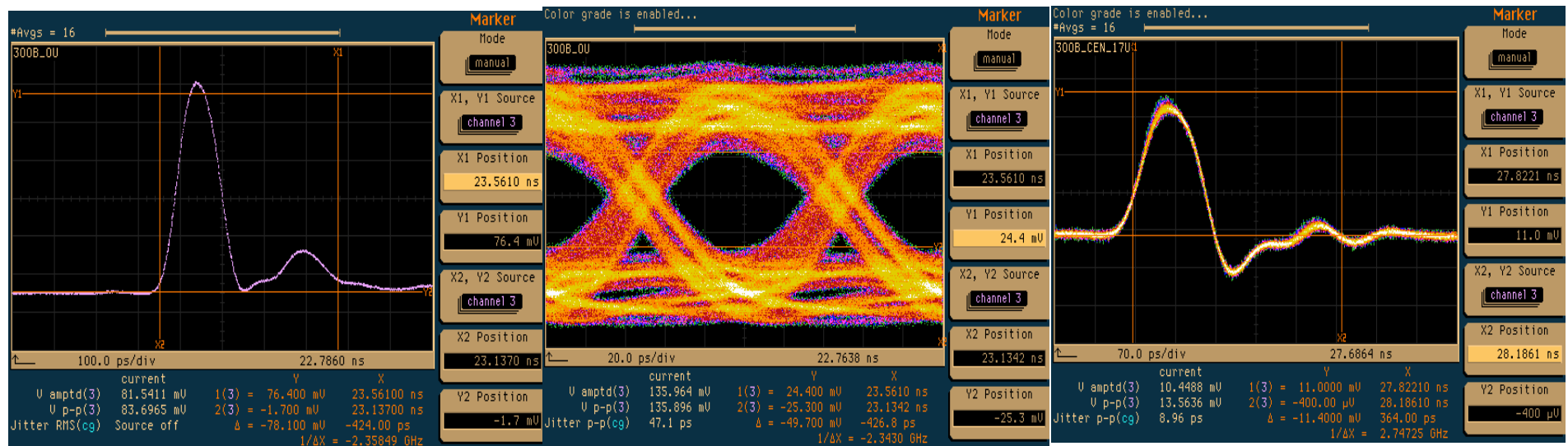
□ Centre Launch with Mode Filtering

⇒ Mode filter slightly improve the pulse shape but the pulse amplitude is reduced to 10%.

Full aperture

Full aperture

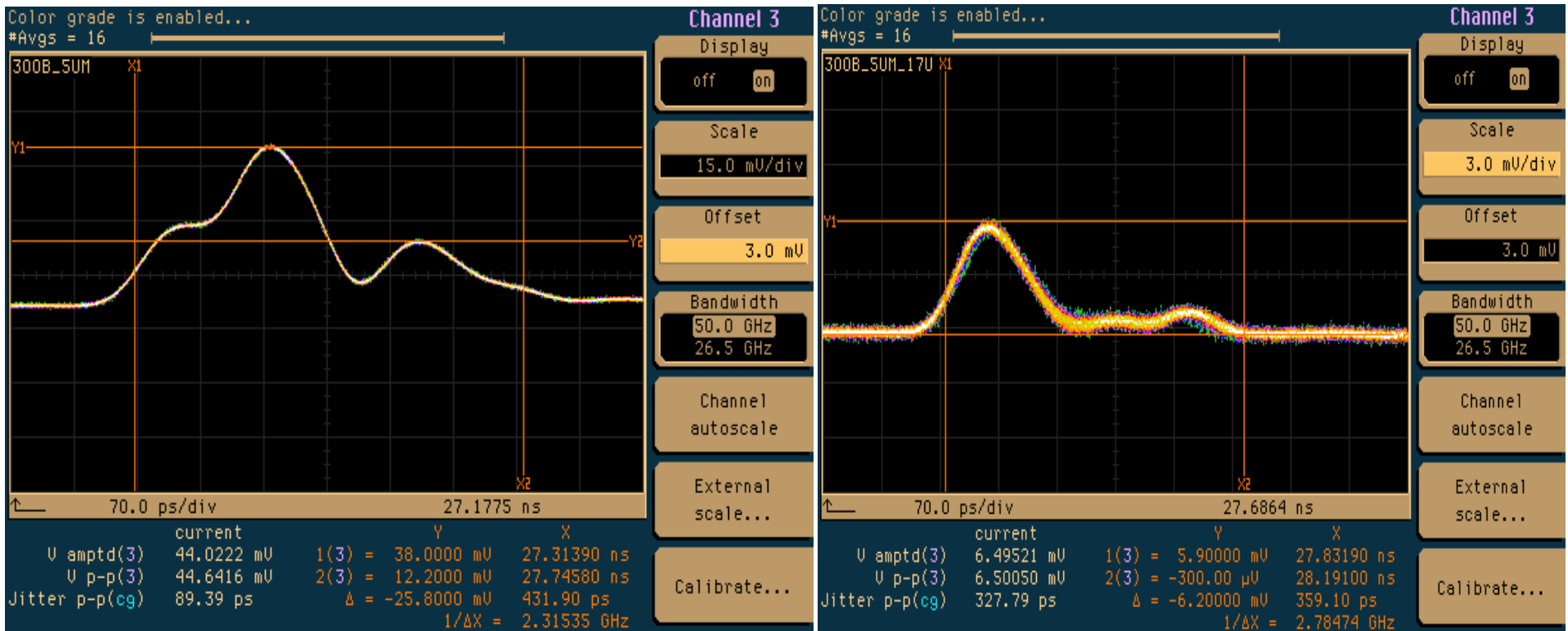
17um aperture



Broadcom 300B Fibre Response

5µm Offset Launch with Mode Filtering

⇒ At 5µm offset pulse amplitude is reduced to 14%, but the pulse energy is reduced to ~5%.



Link Operation at 10G with EA Source

□ **Broadcom 265 B**

⇒ Operated error free over 265 m with 5 um offset

□ **Broadcom 300B**

⇒ Operated error free with up to 3um offset

- At 3.5 um observed BER of 3.2E-6 and lost lock at 5.5 um.

⇒ Pulse response of the fiber after filter is adequate for standard CDR.

⇒ With small amount of offset this fiber carries significant portion of the total energy in higher order modes.

⇒ We believe the BER is due to the receiver sensitivity and not inheritance to the scheme.

Summary

- ❑ Investigated Optical Mode Filtering for two DMD challenged fiber.
- ❑ Mode filtering does improve overall pulse response but it also impacts the SNR.
- ❑ Fibre 300B has been very challenging and we are in process of measuring the index profile to better understand its behavior
 - ⇒ After measuring index profile then we can simulate and calculate the power penalty.
- ❑ IEEE LRM should continue to investigate optical mode filtering as it the promise 300 m reach and lowers the module total power based on similar EDC.