



Characterization report of Vendor B VCSEL

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Introduction



- KDPOF has characterized a Vendor B 25Gbps (designed for NRZ, 25 GBd) multimode VCSEL for 850 nm
- L-I-V, AC and RIN have been measured according to test methodologies explained in [perezaranda_OMEGA_01_0720_VCSEL_test_methods.pdf](#)
- All the test parameters have been measured at -40, 0, 25, 85, 105 and 125 °C backside temperature
- Eye diagrams for 26.5625 GBd NRZ are shown
 - These eye diagrams are not intended to assess suitability of an specific VCSEL for OMEGA application.
 - These eye diagrams are intended to illustrate the effect of temperature and current in the VCSELs response
- Next step will be to carry out link budget analysis

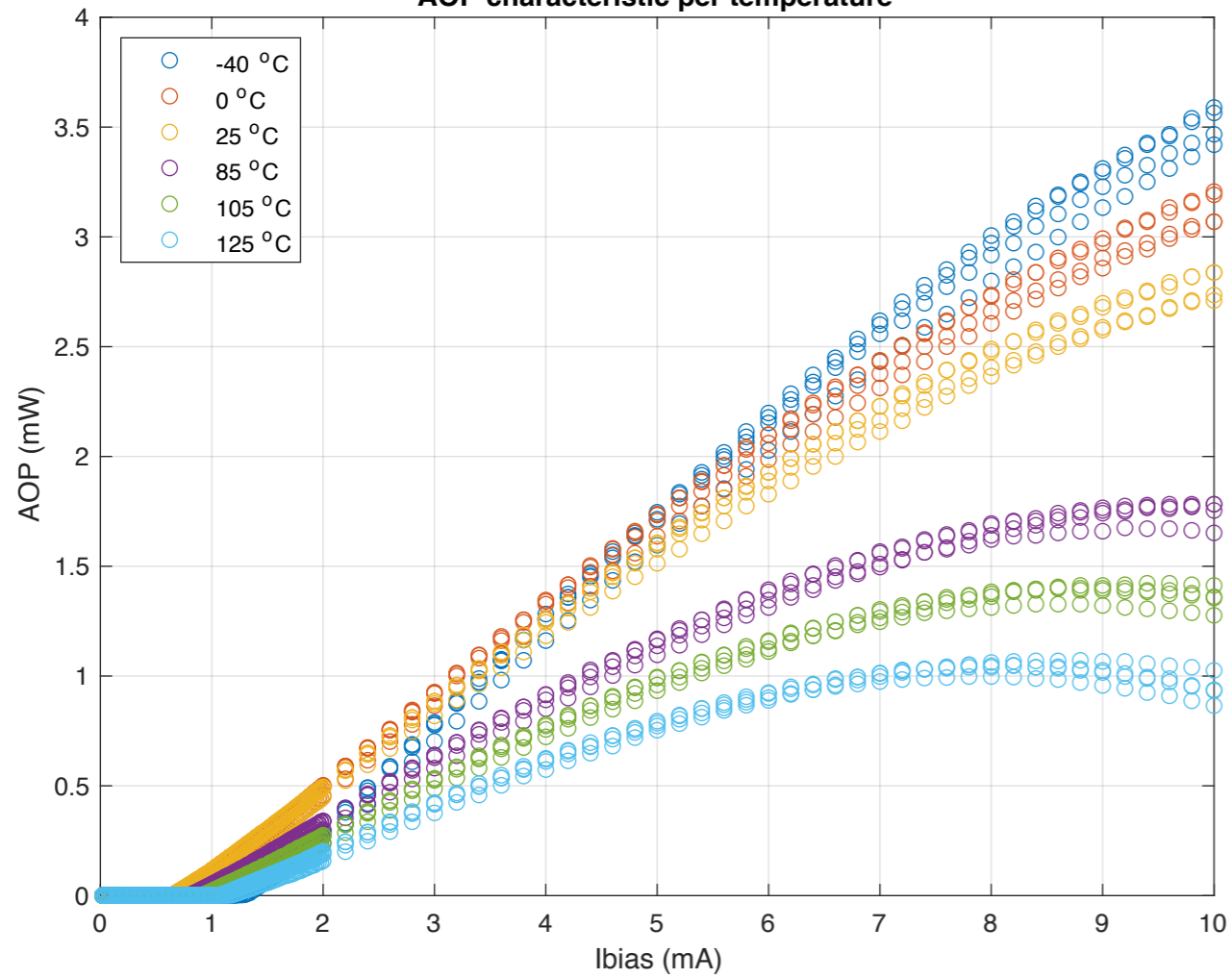


25Gbps multimode VCSEL for 850 nm

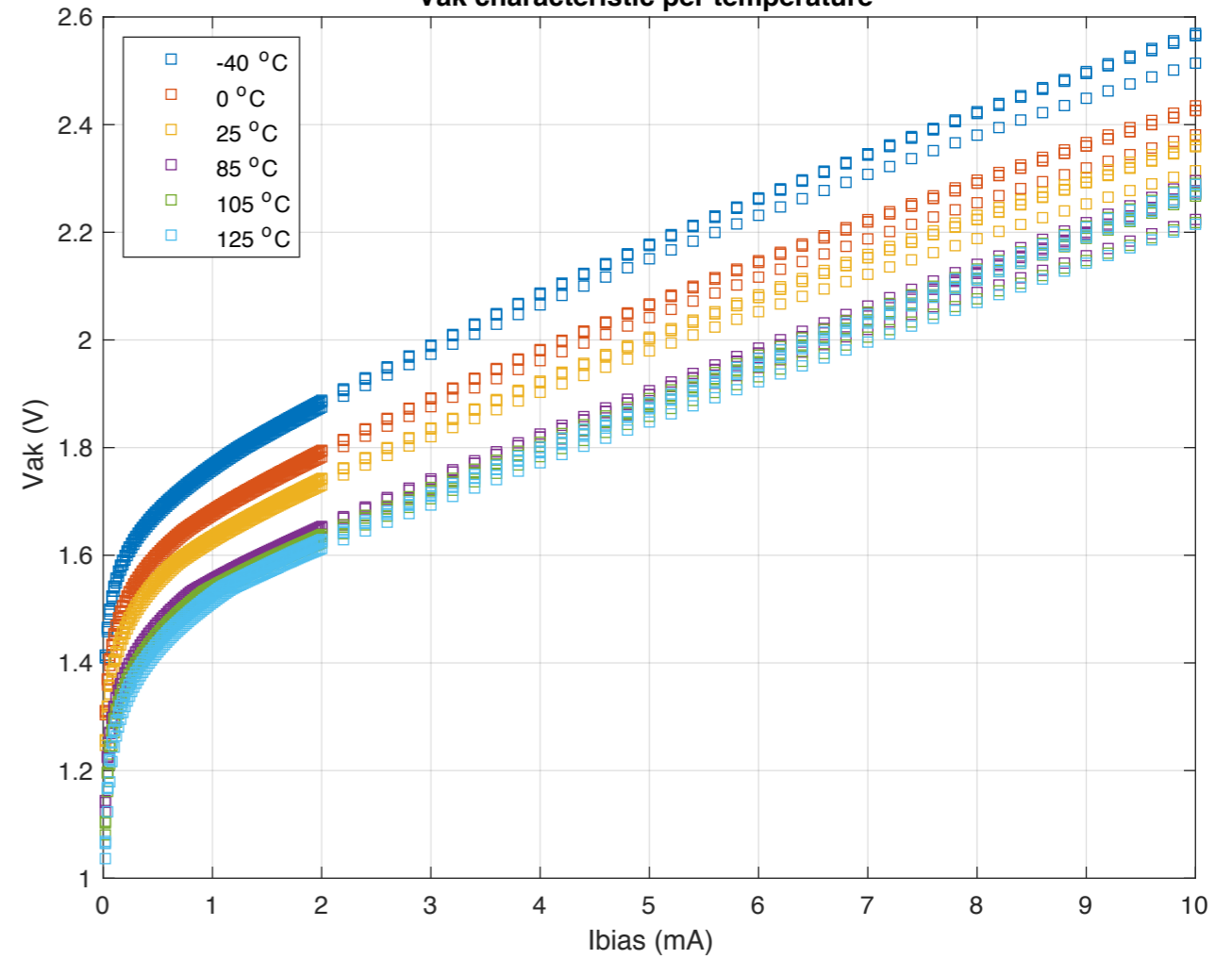
L-I-V characteristic



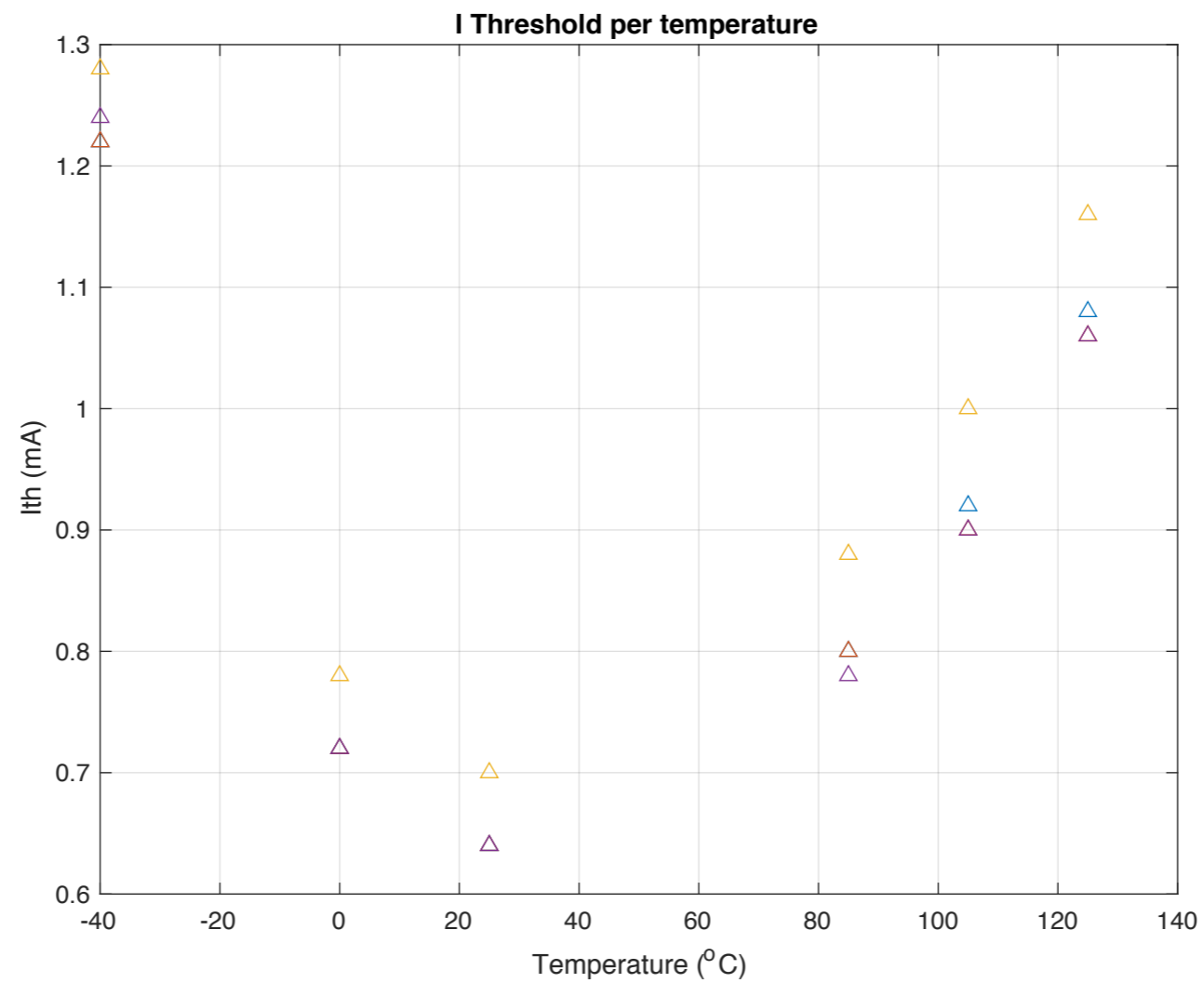
AOP characteristic per temperature



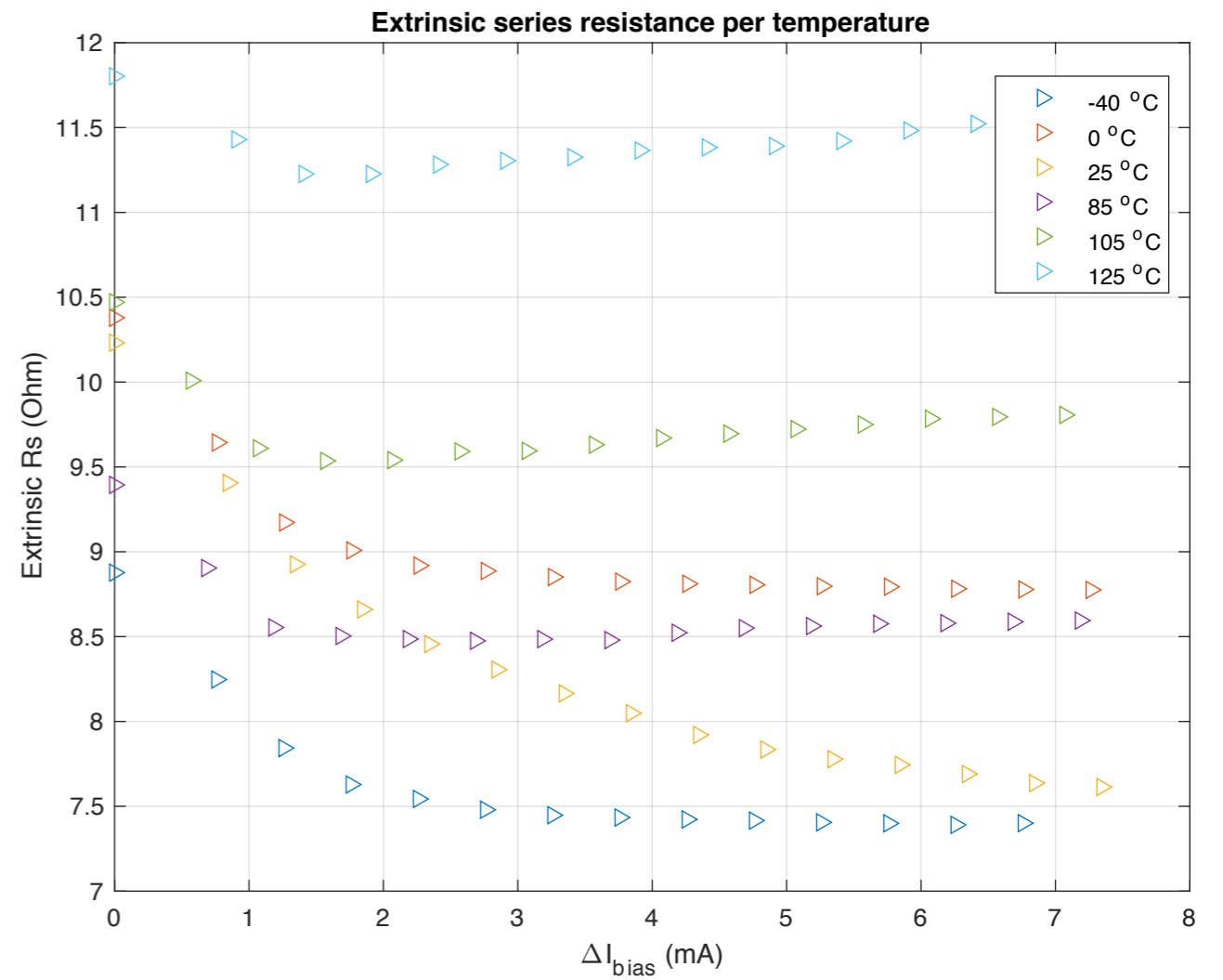
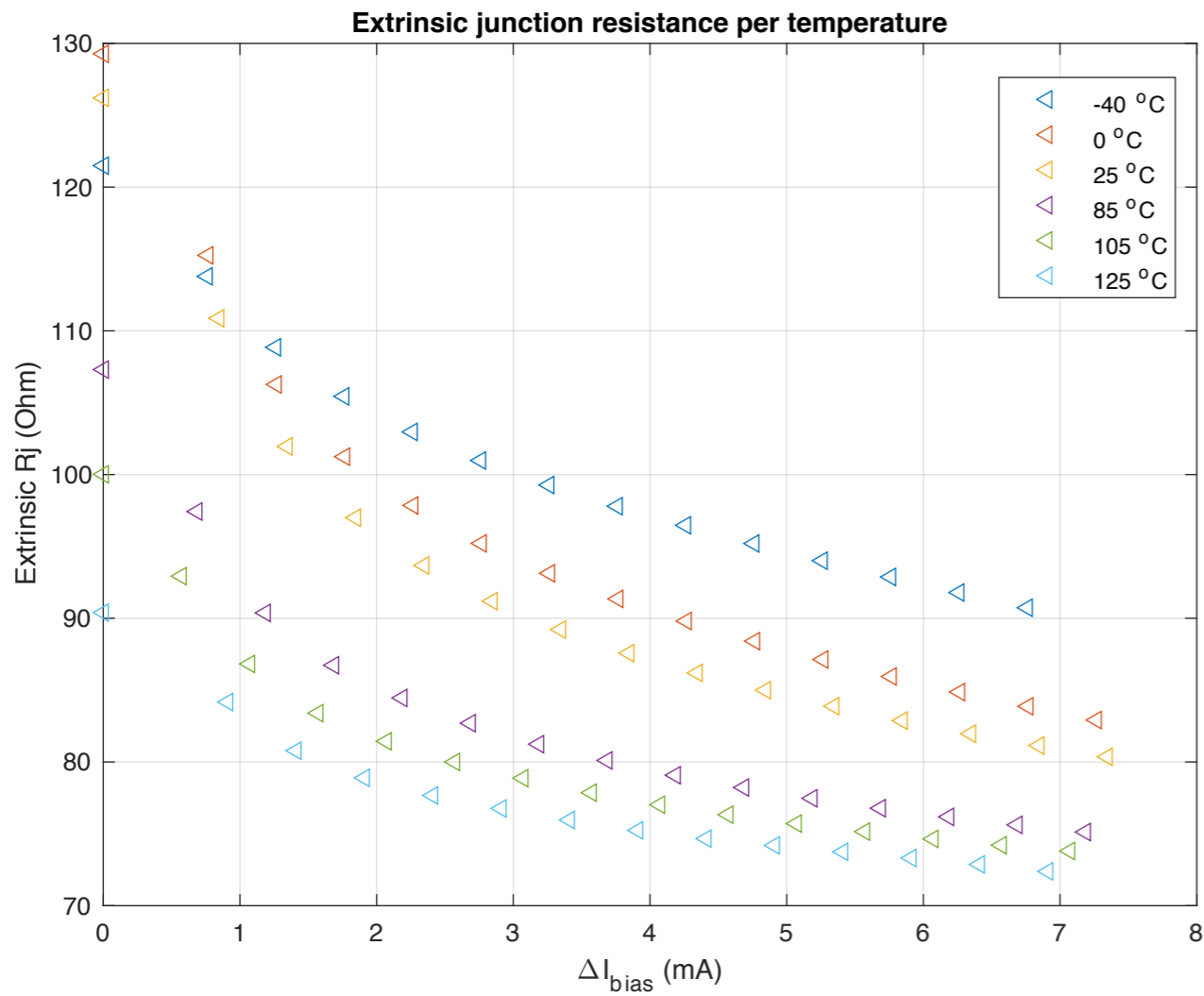
V_{ak} characteristic per temperature



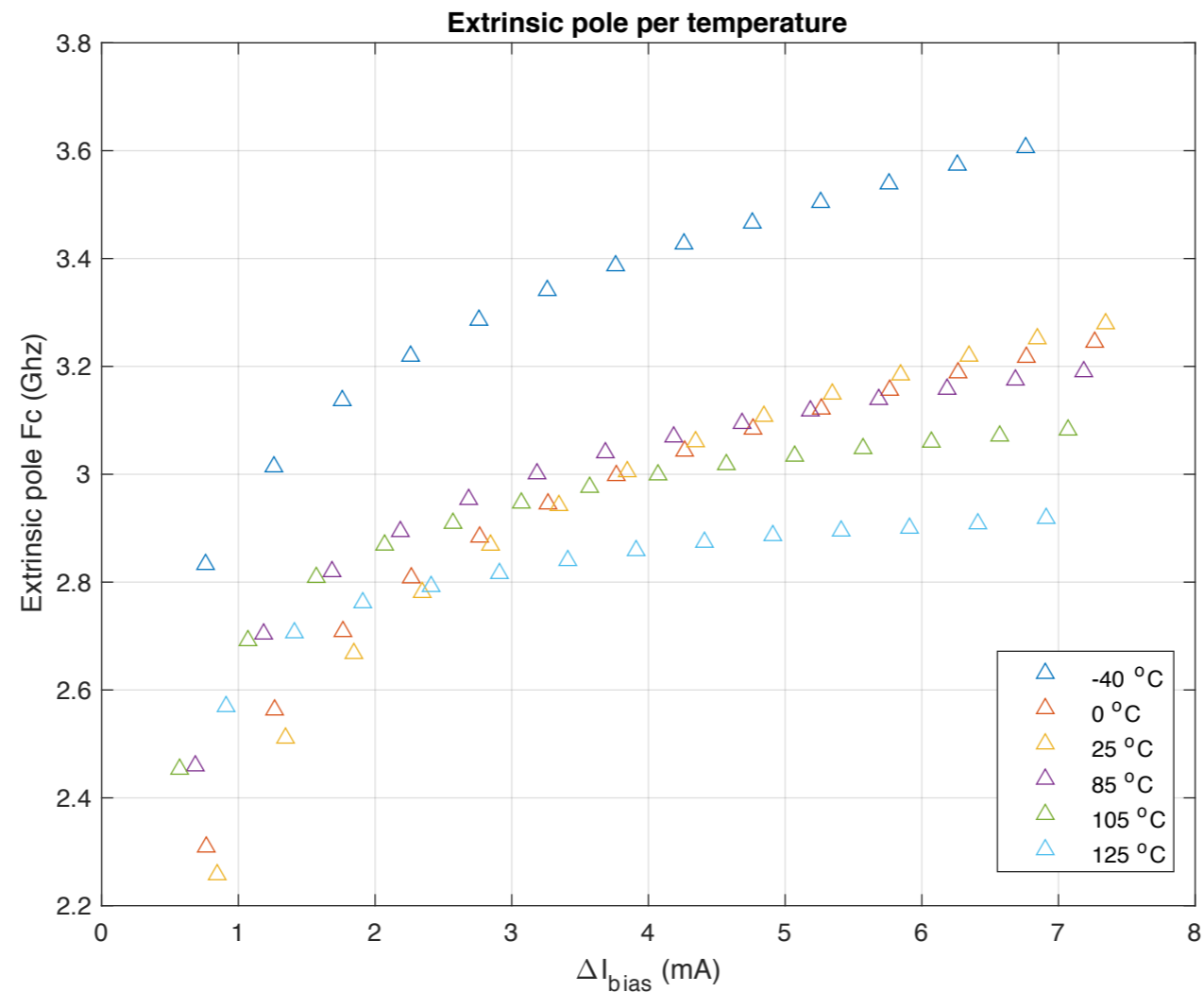
Threshold current characteristic



Small signal frequency response

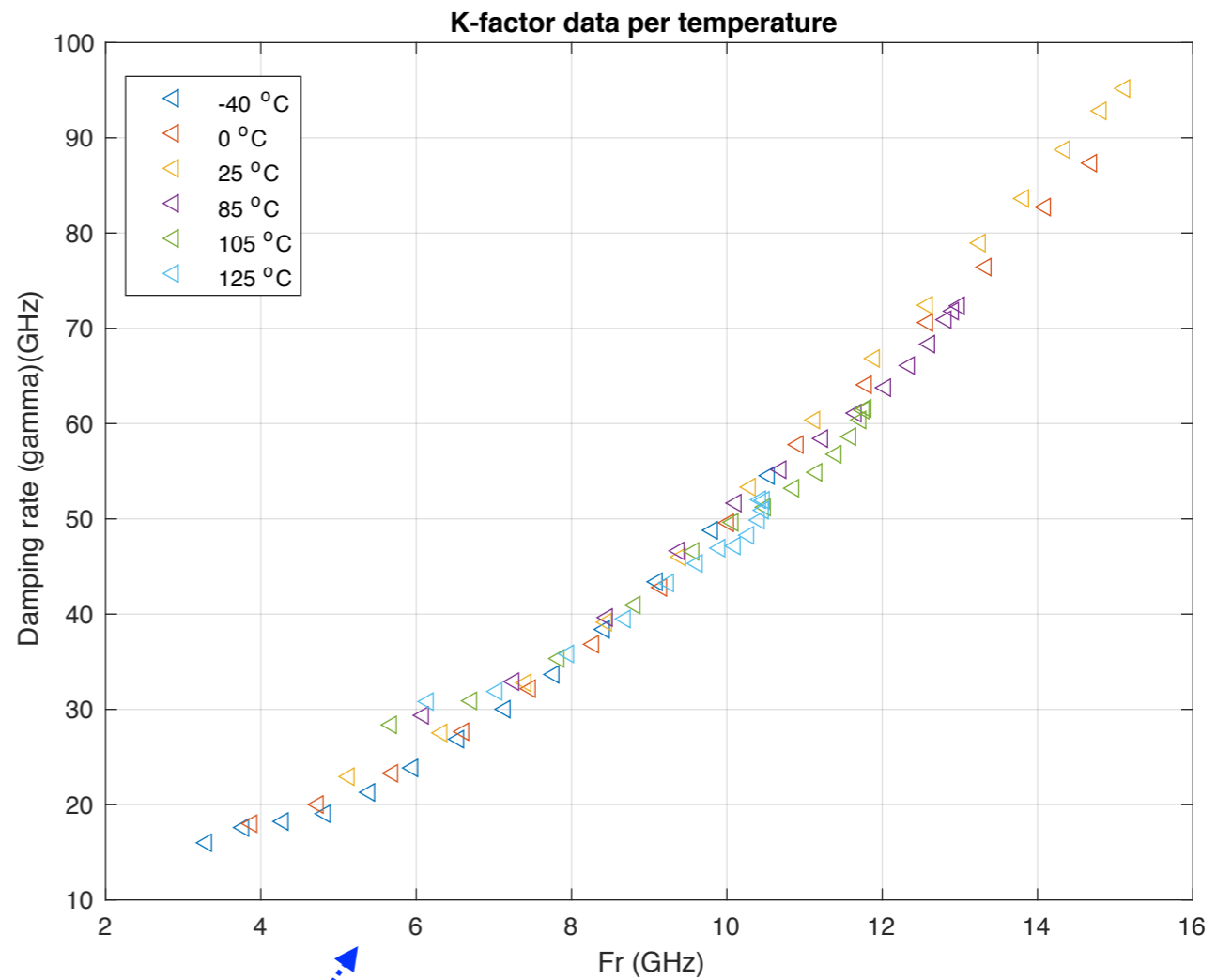
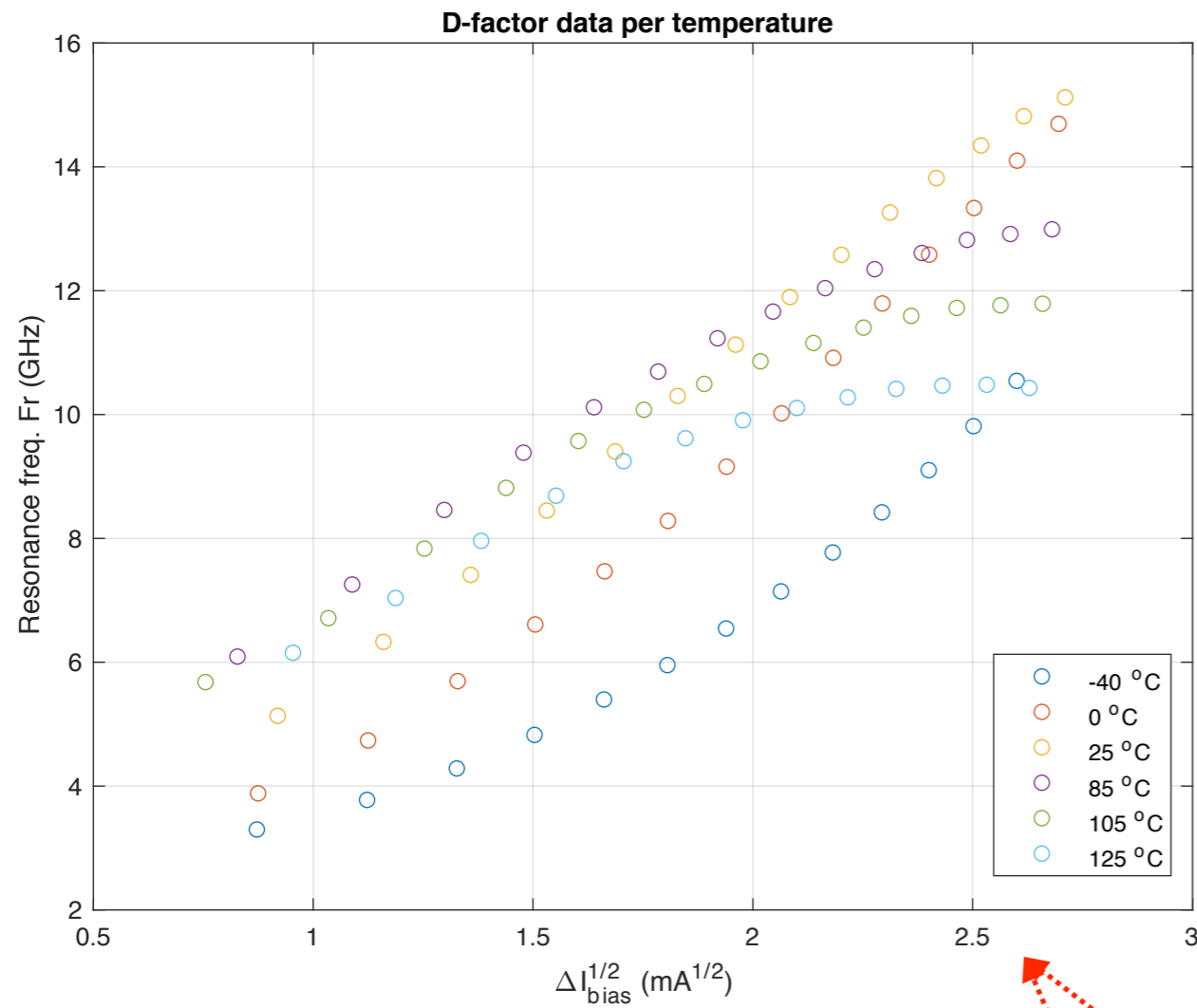


Small signal frequency response



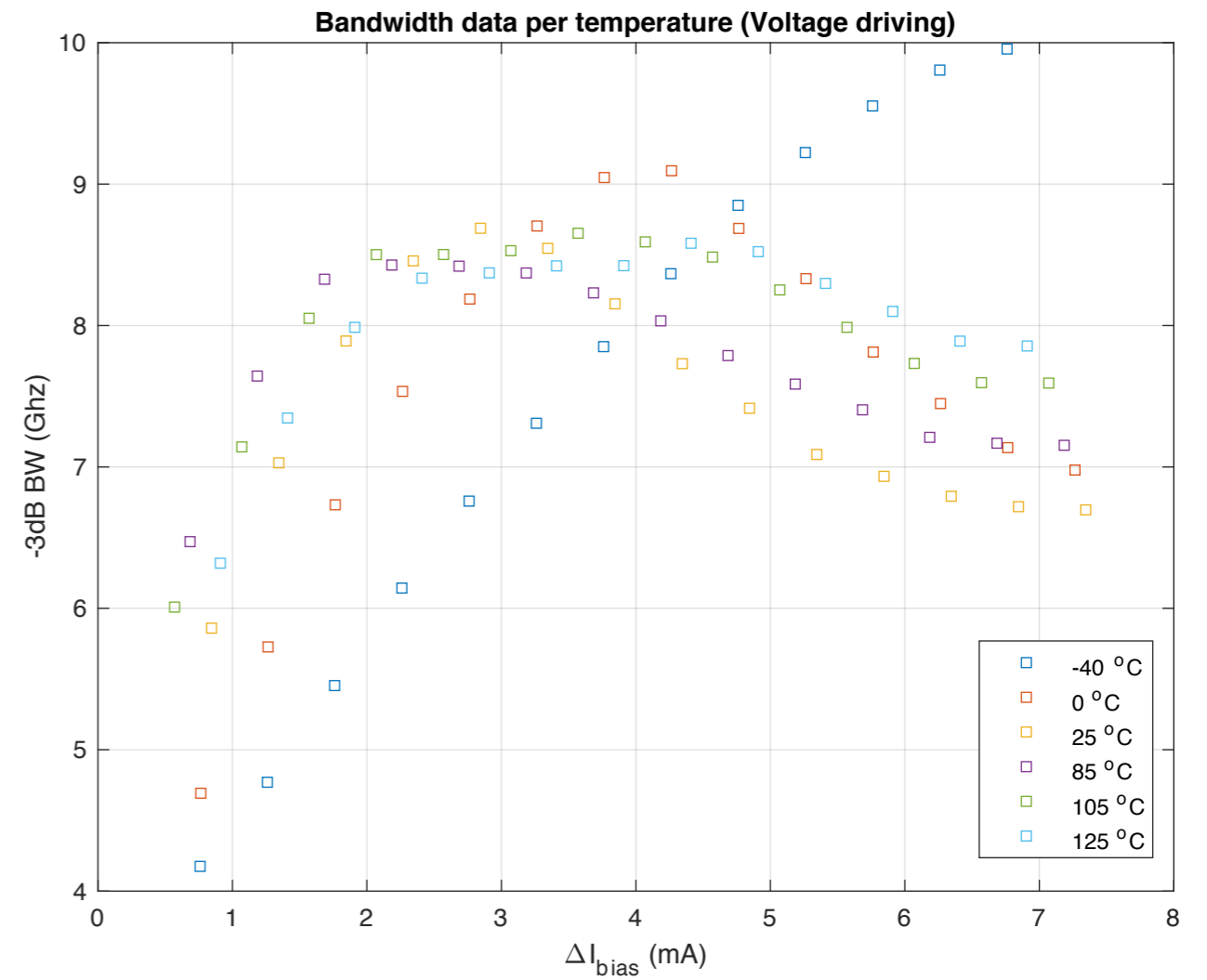
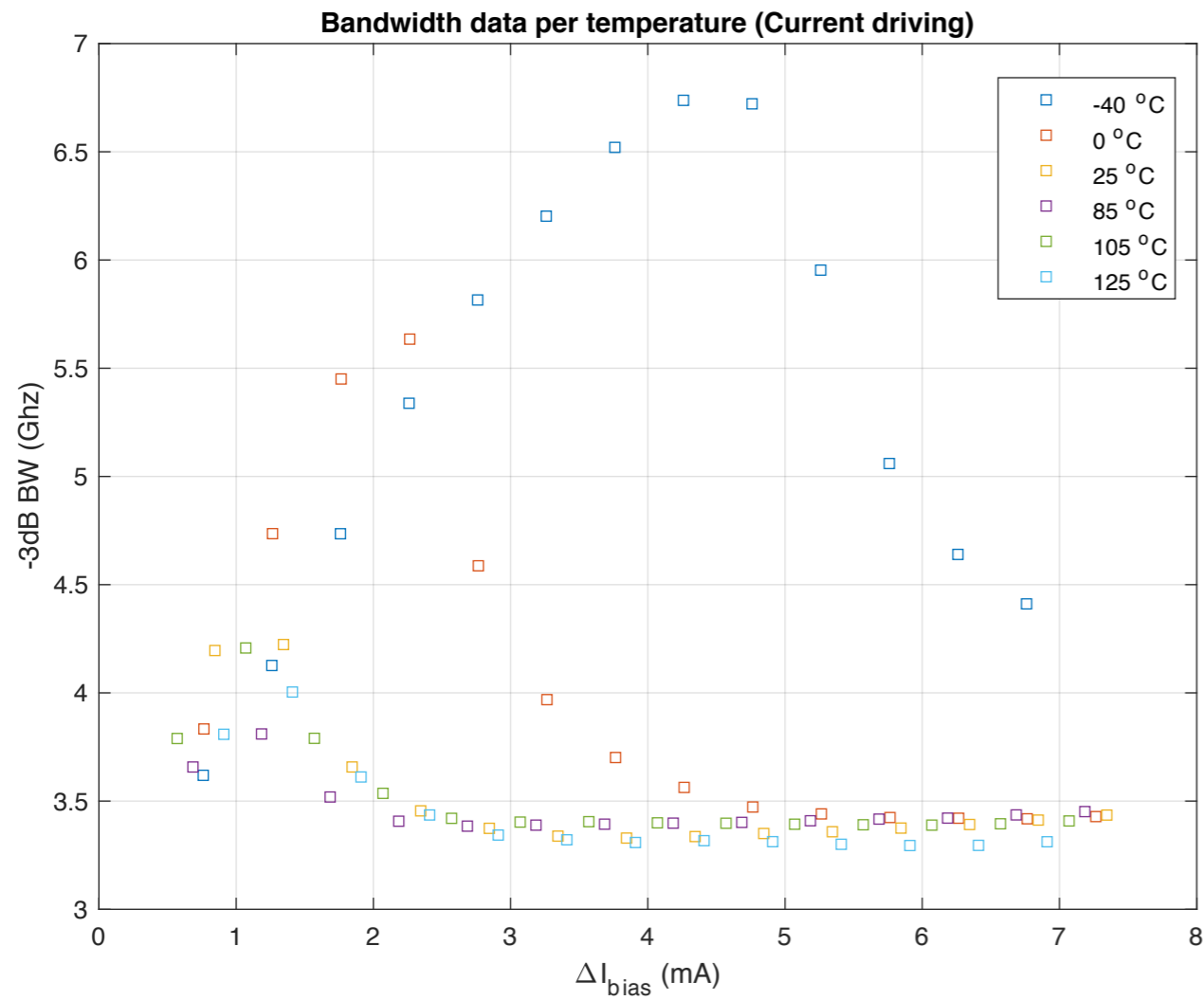
$$H(f) = C \cdot \frac{f_r^2}{f_r^2 - f^2 + j \frac{f}{2\pi} \gamma} \cdot \frac{1}{1 + j \frac{f}{f_p}} \quad (\text{see [1]})$$

Small signal frequency response



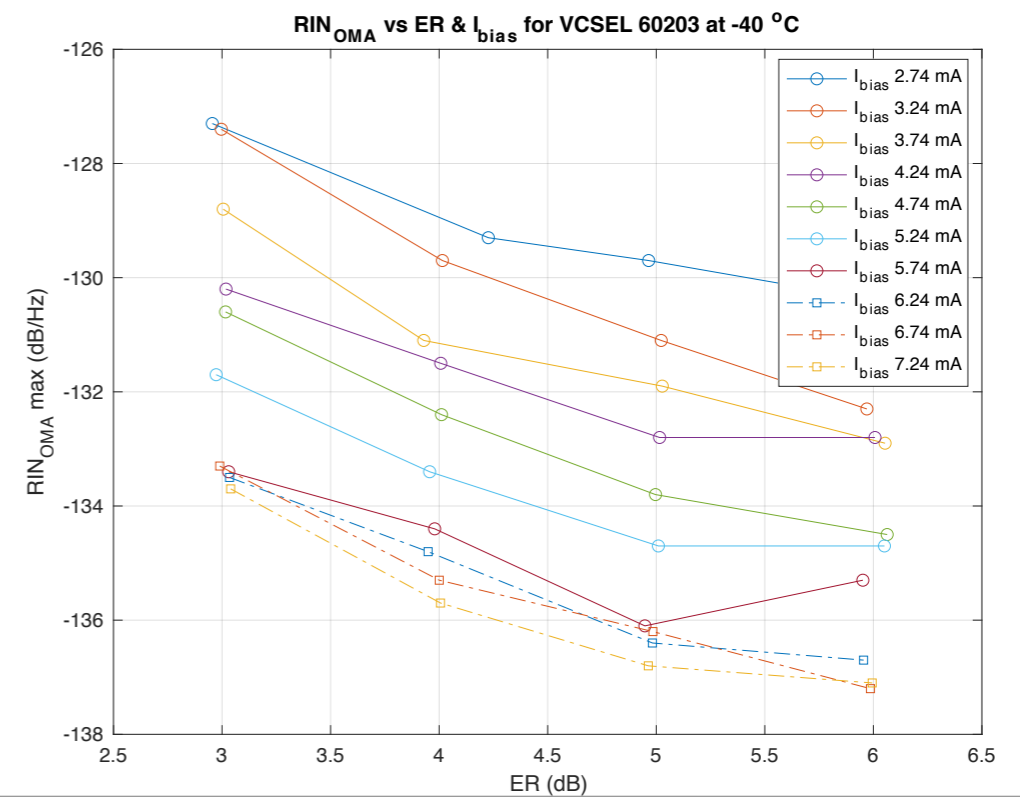
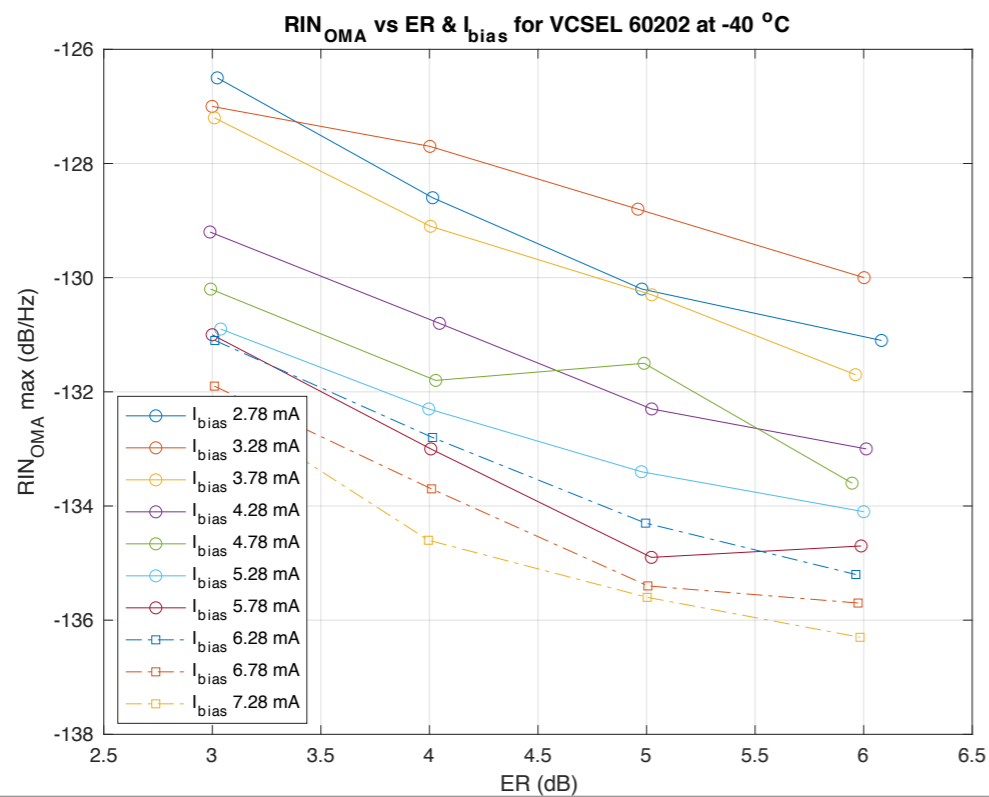
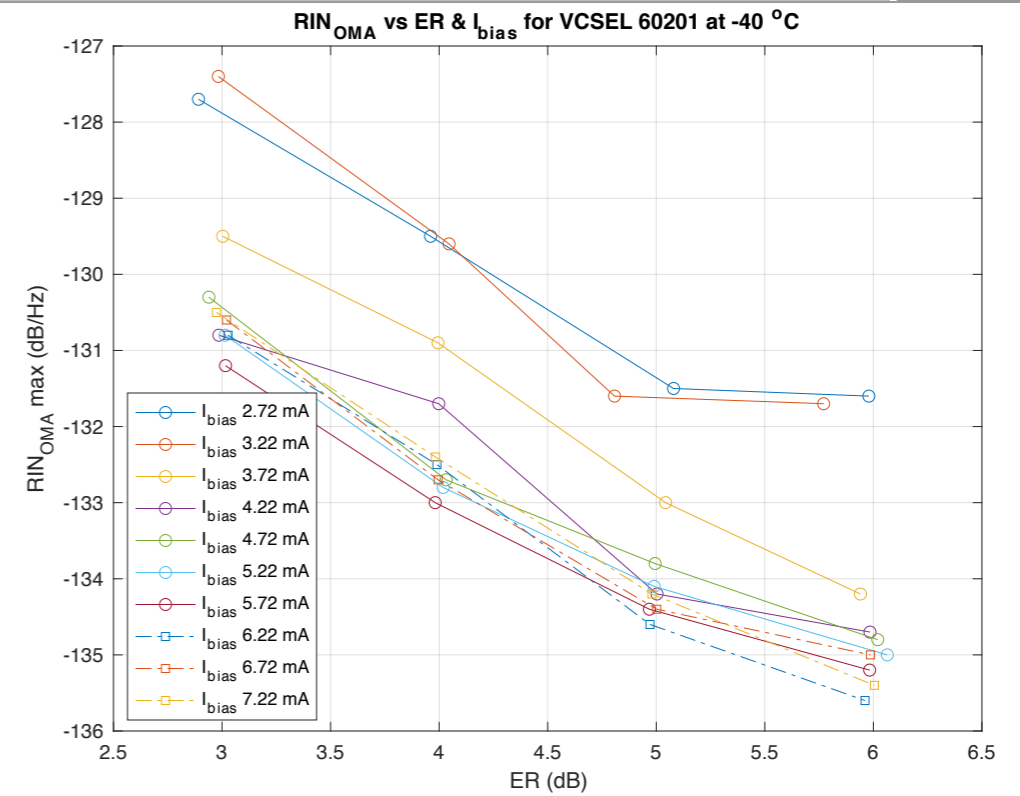
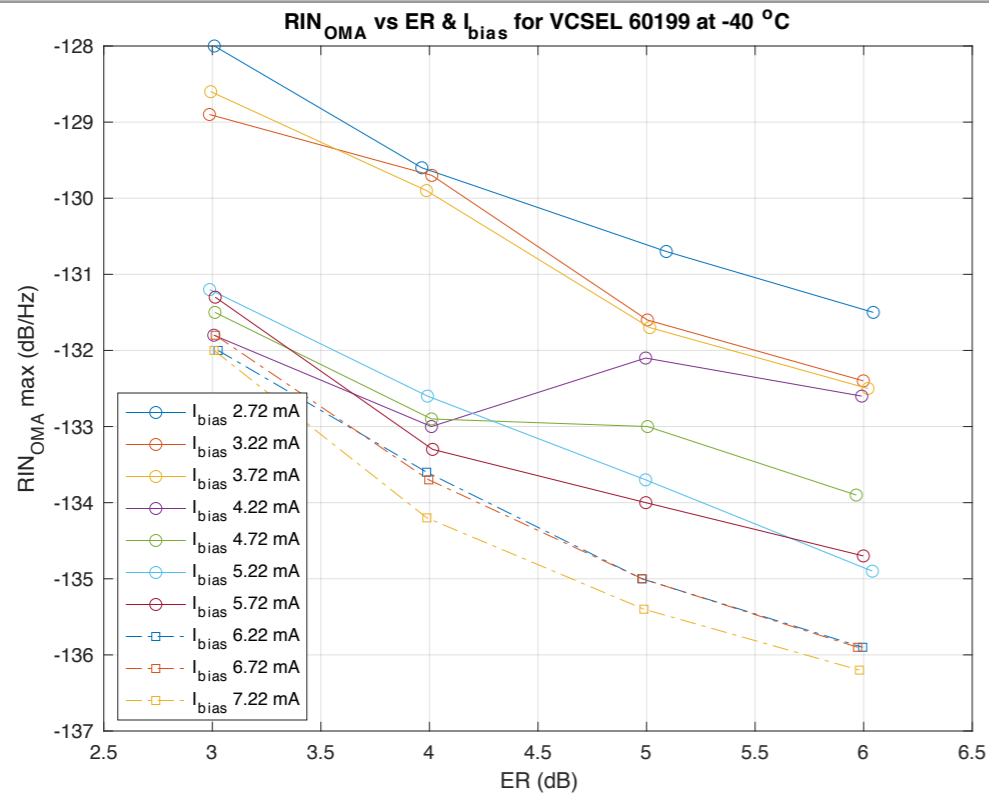
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Small signal frequency response

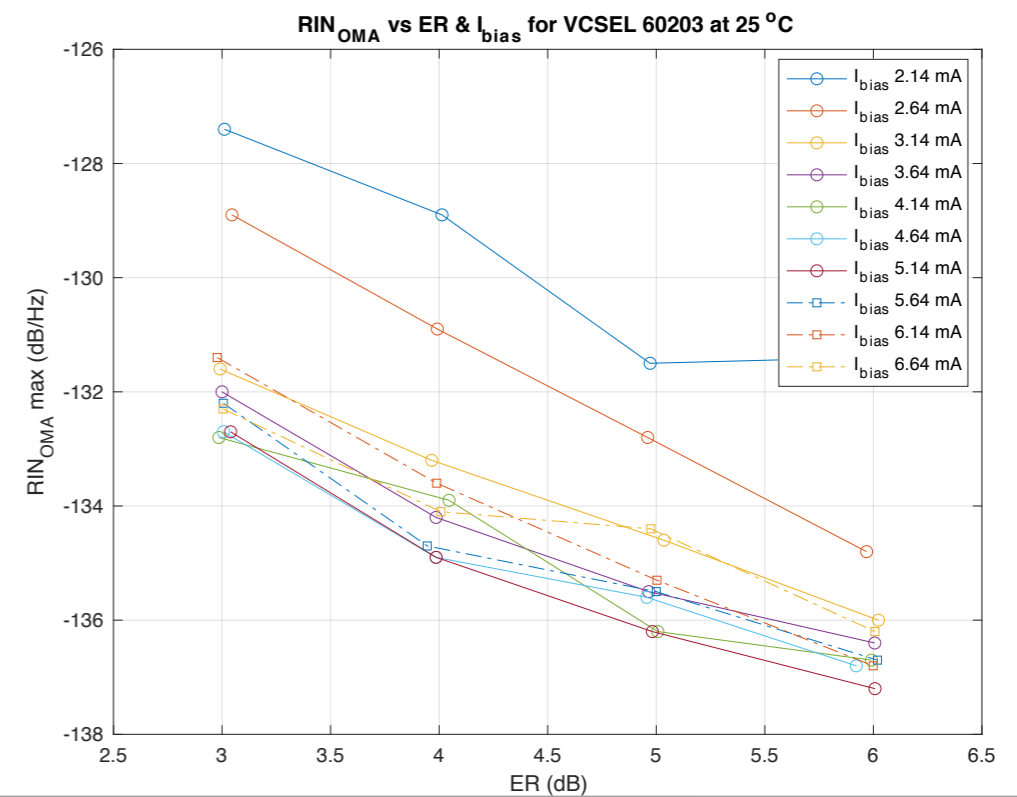
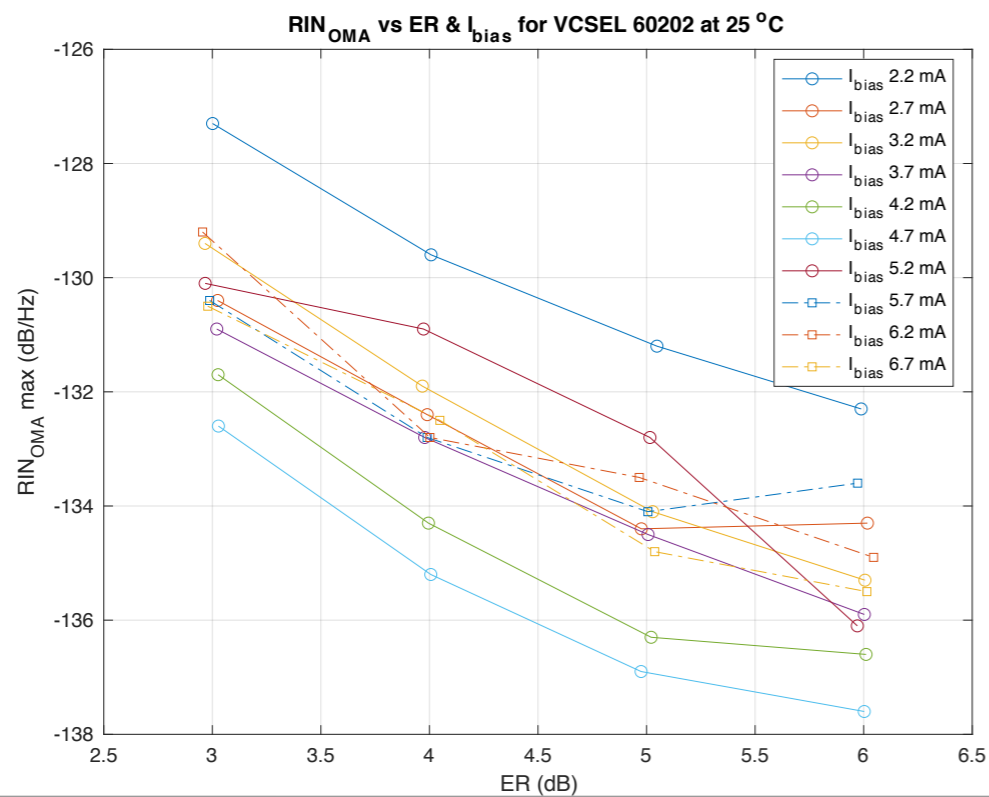
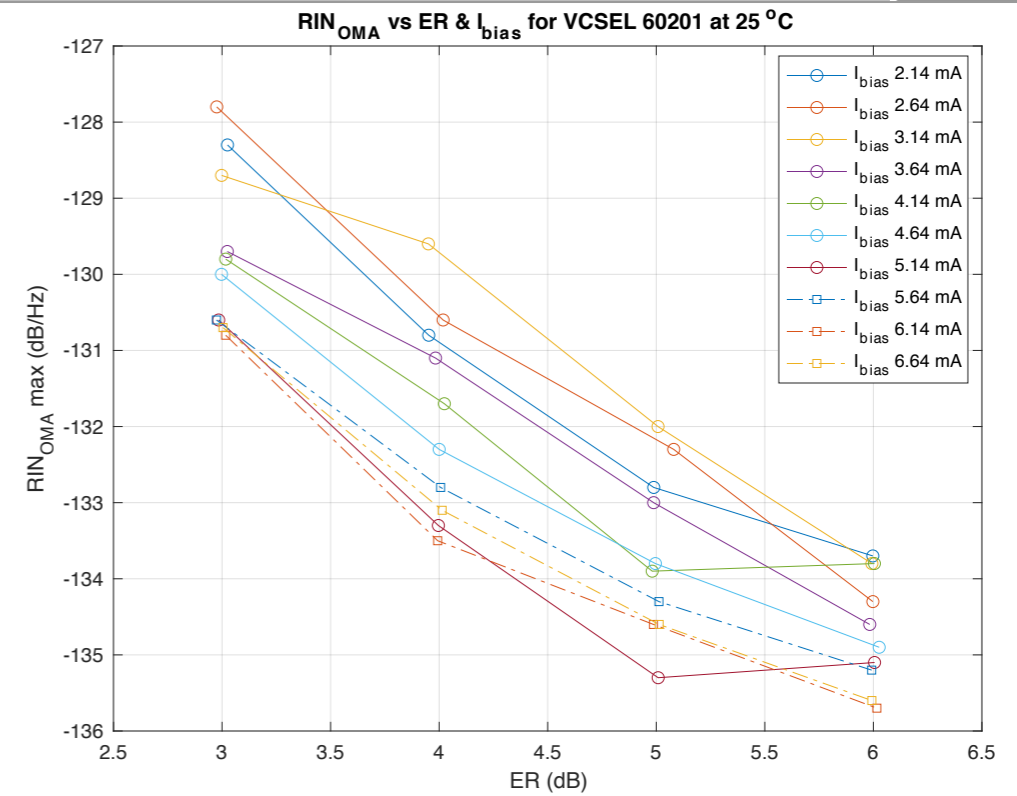
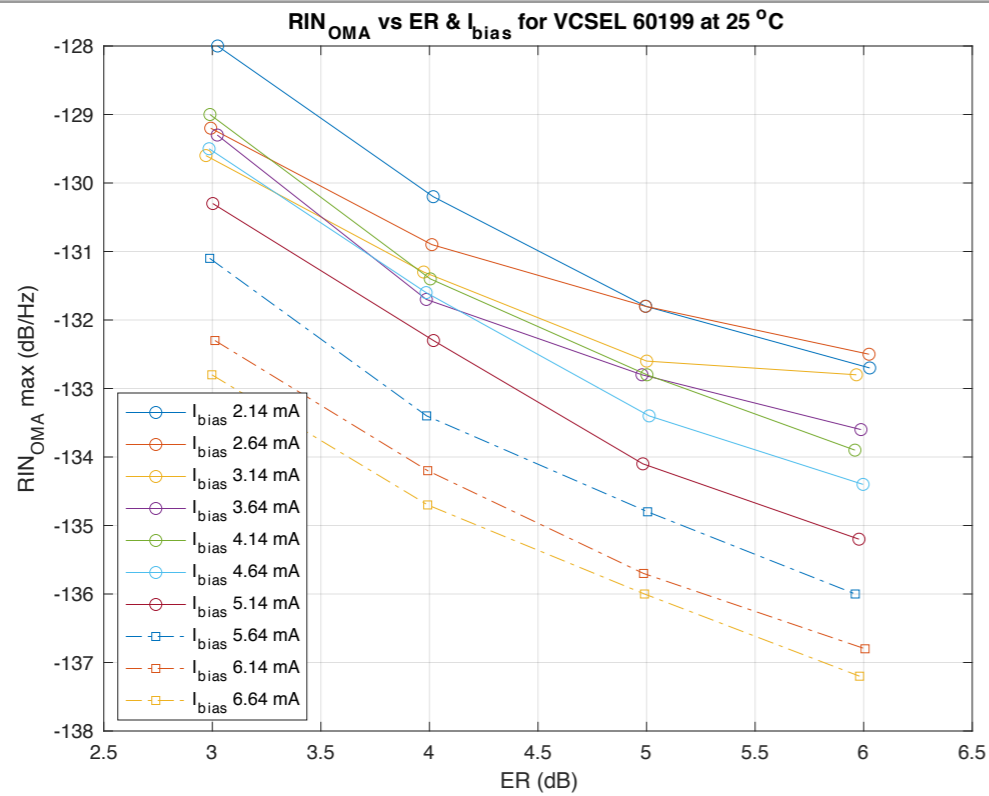


Considered source impedance 100 Ω

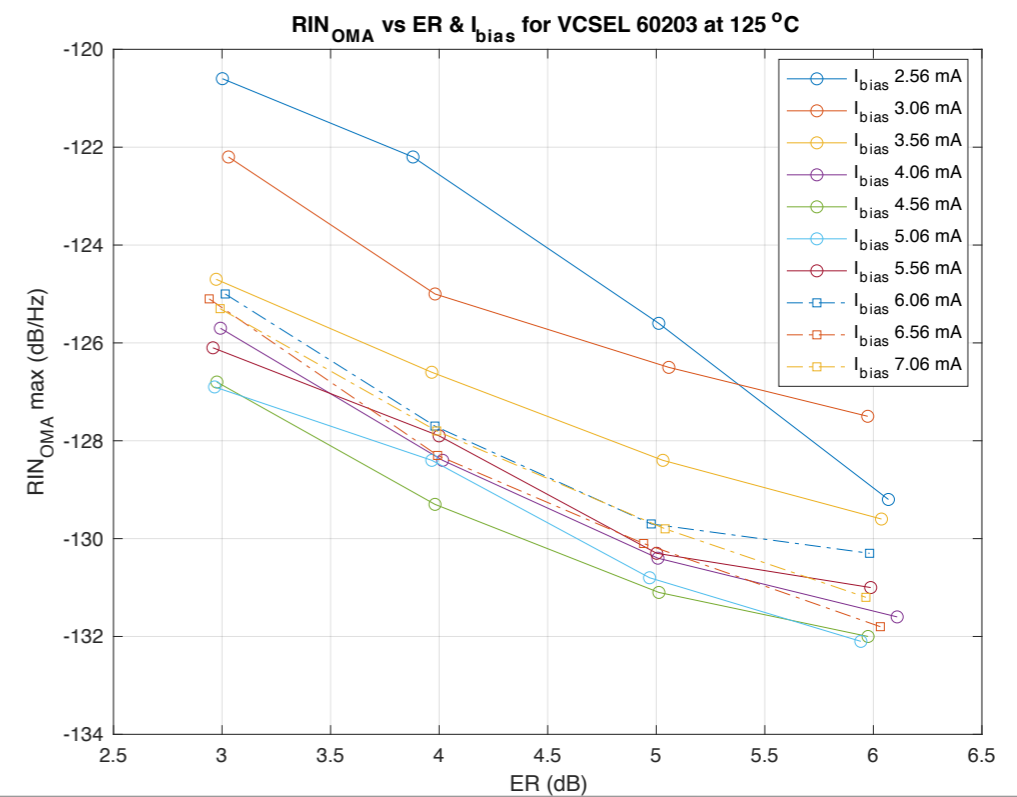
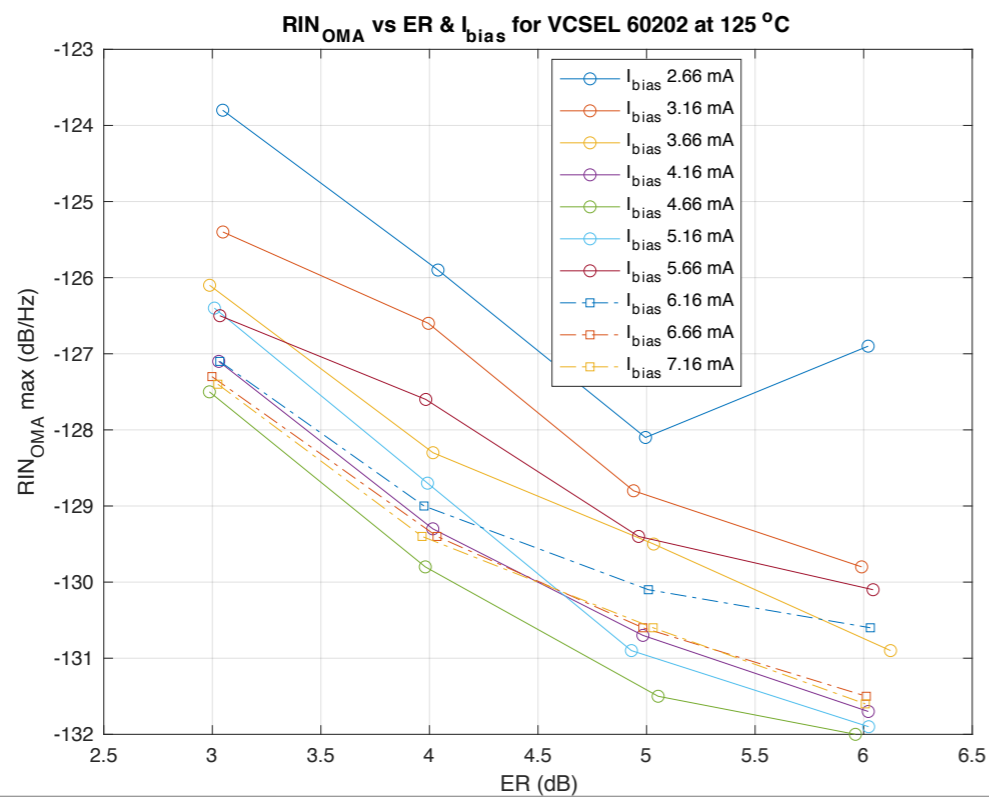
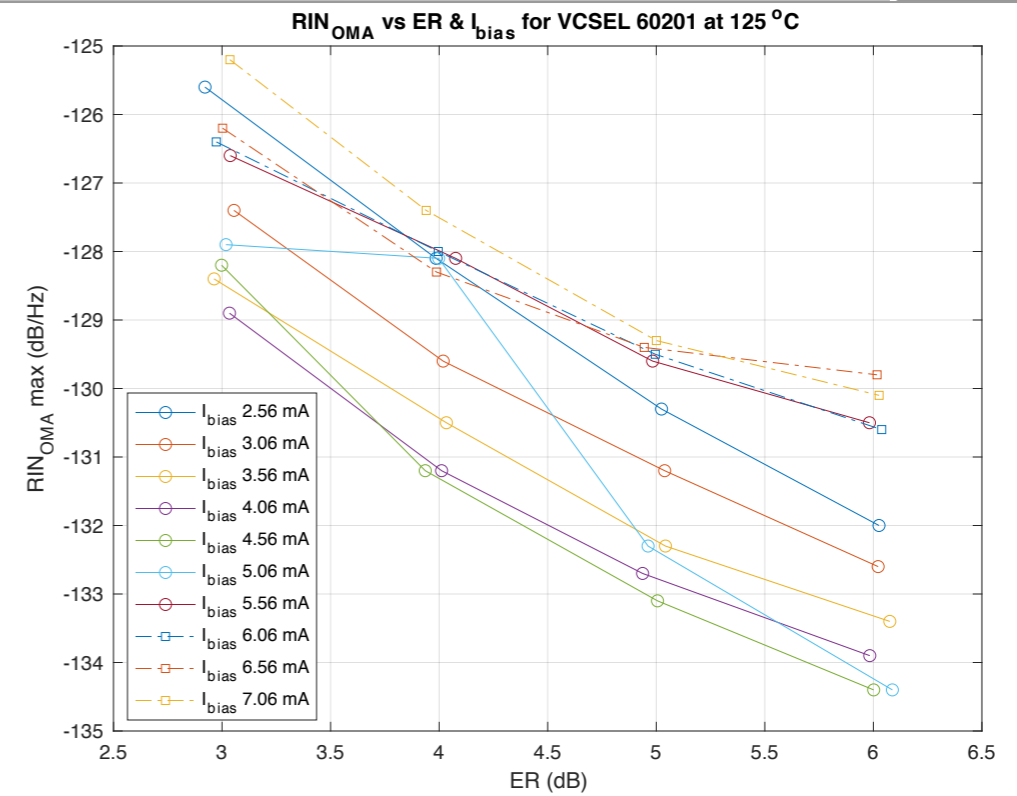
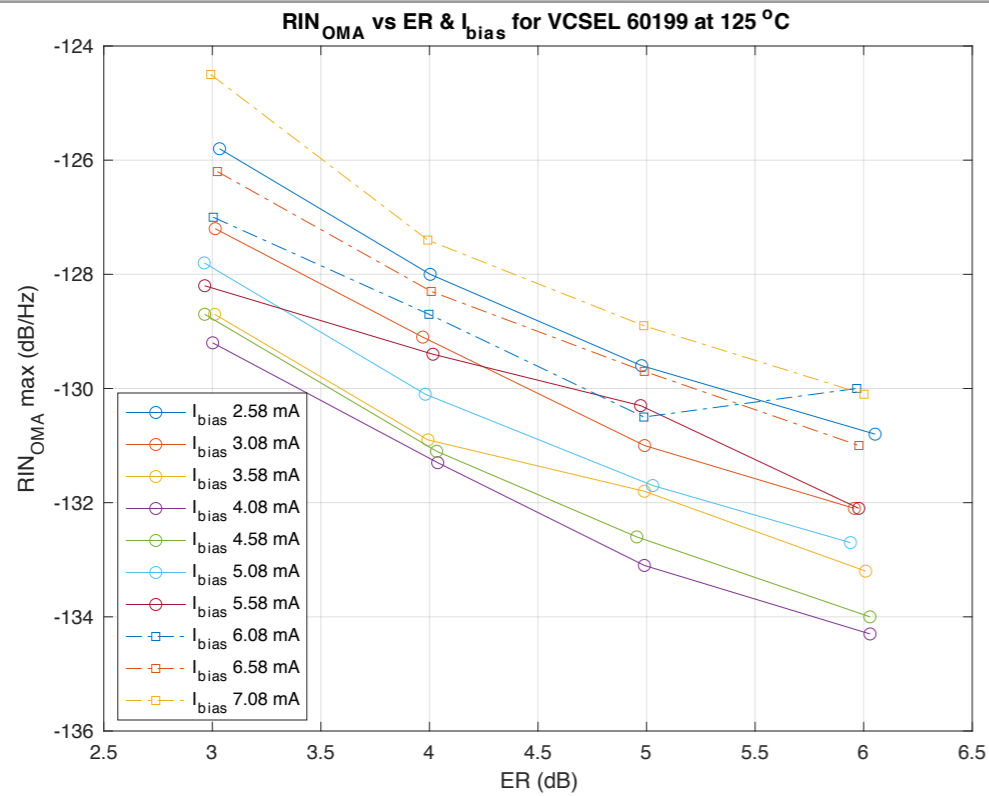
Relative intensity noise (RIN_{OMA}) at -40°C



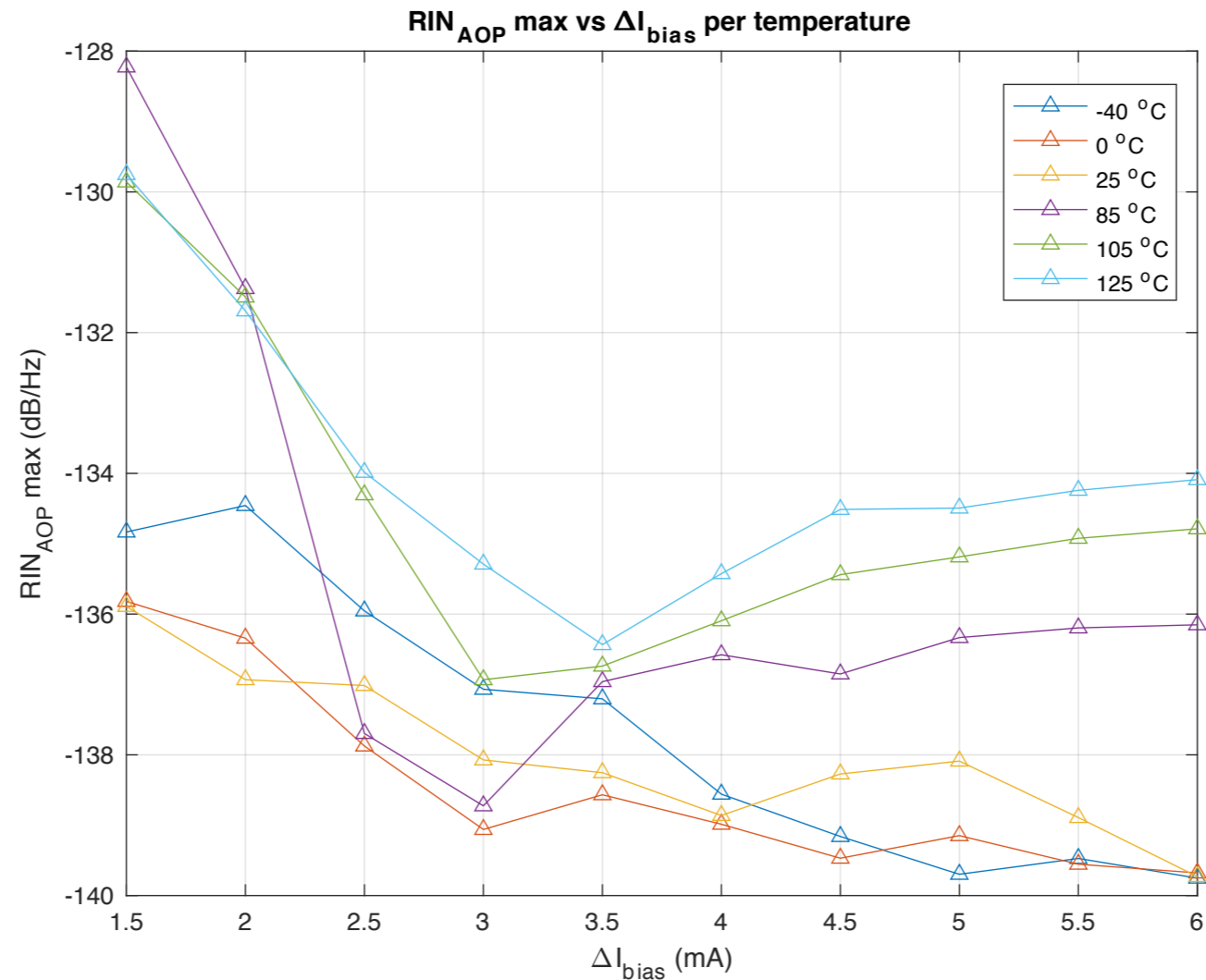
Relative intensity noise (RIN_{OMA}) at 25°C



Relative intensity noise (RIN_{OMA}) at 125°C



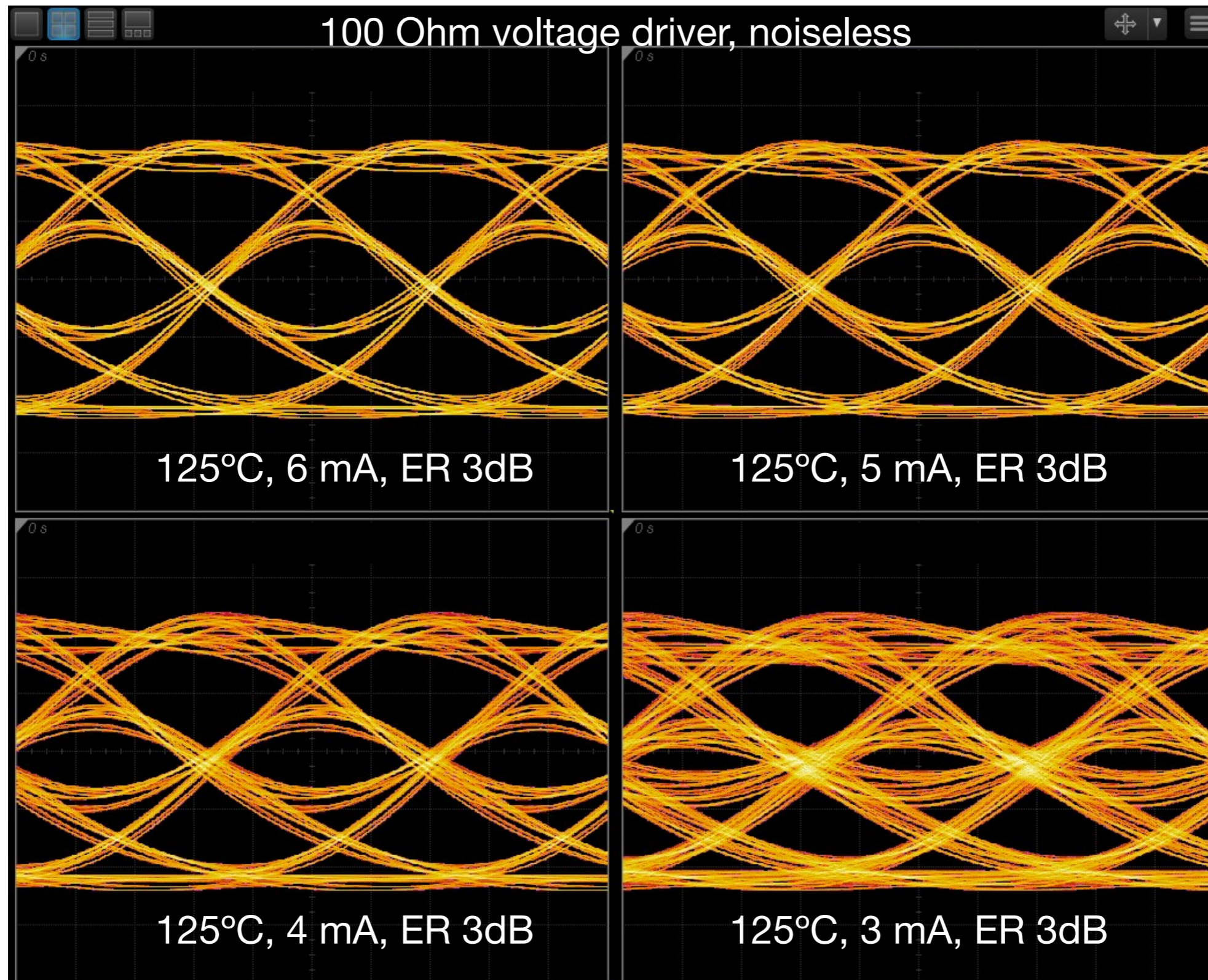
Normalized max RIN (RIN_{AOP})



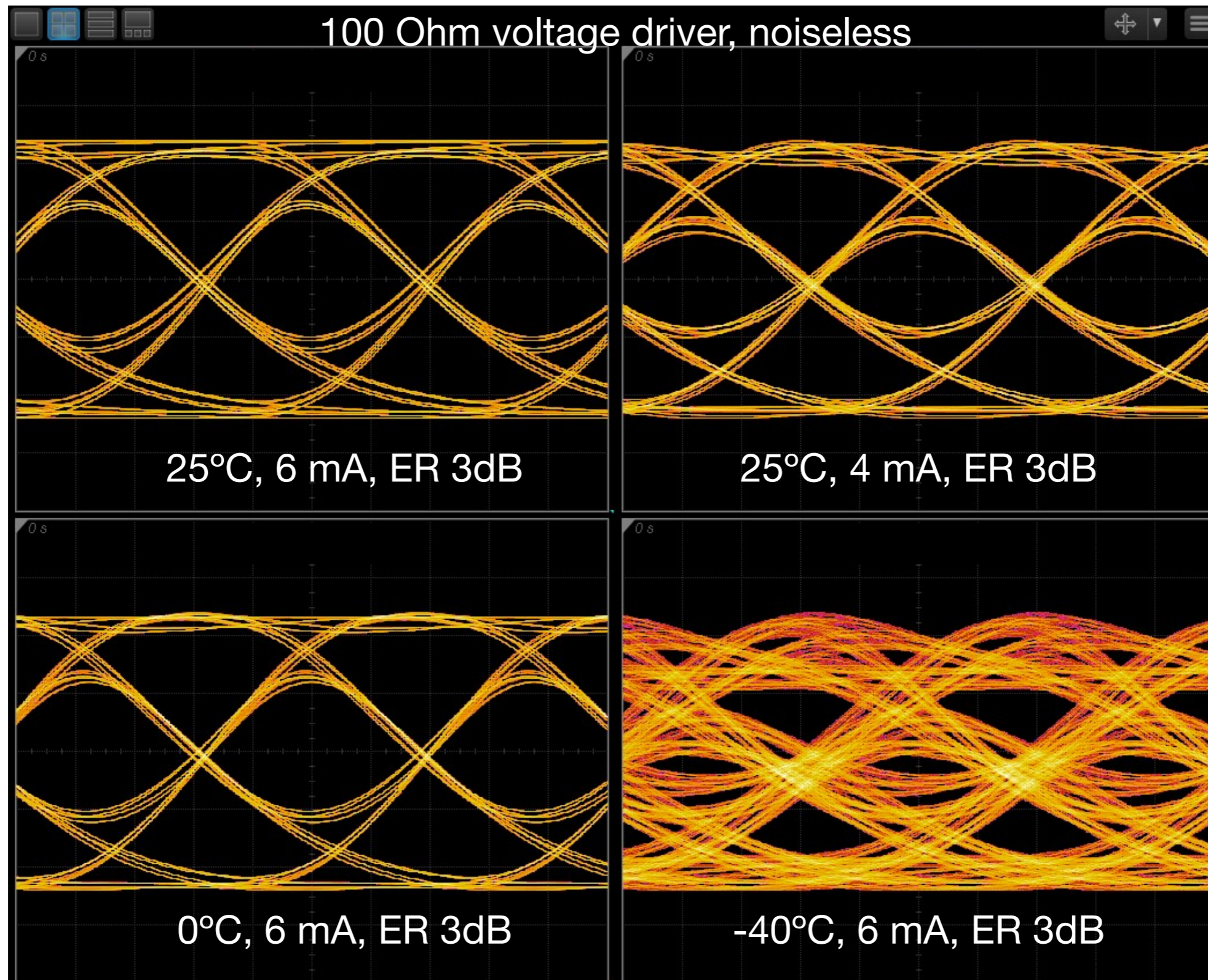
$$RIN_{AOP} \left(\frac{dB}{Hz} \right) = RIN_{OMA} \left(\frac{dB}{Hz} \right) - 20 \cdot \log_{10} \left(\frac{ER_L + 1}{ER_L - 1} \right)$$

$$ER_L = 10^{ER(dB)/10}$$

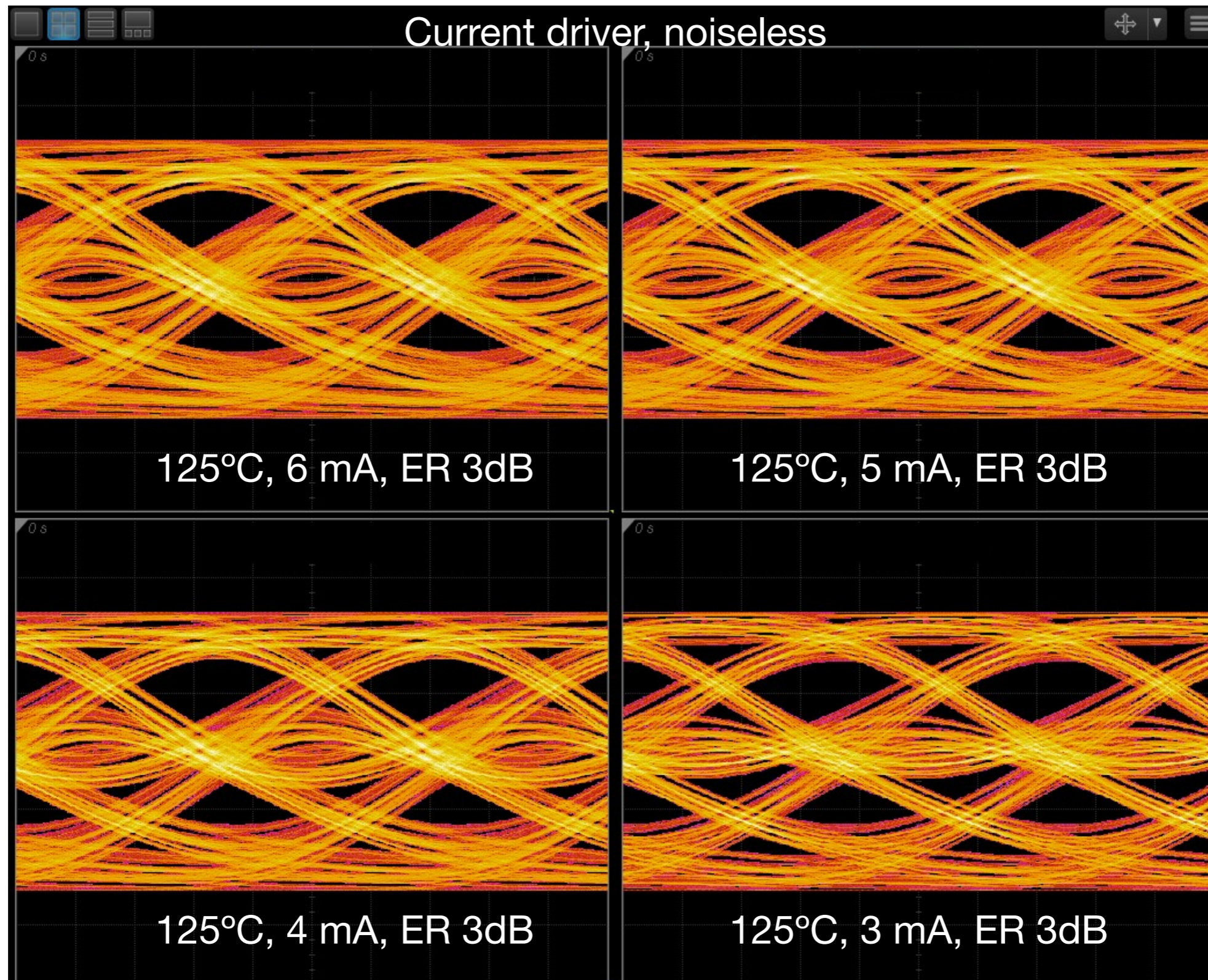
Eye diagram for 26.5625 GBd NRZ



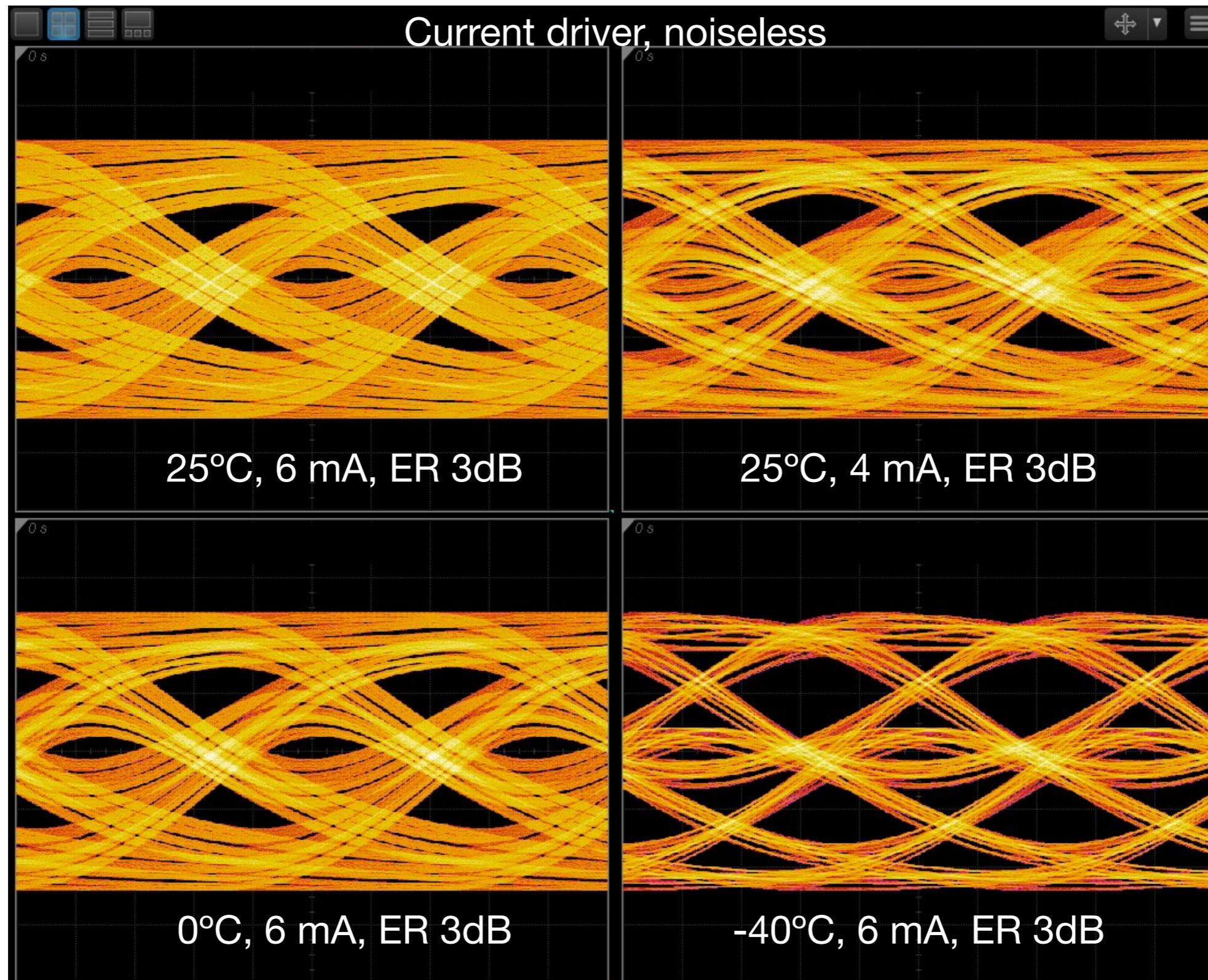
Eye diagram for 26.5625 GBd NRZ



Eye diagram for 26.5625 GBd NRZ



Eye diagram for 26.5625 GBd NRZ



References



- [1] Seyed Ehsan Hashemi, “Relative Intensity Noise (RIN) in High-Speed VCSELs for Short Reach Communication”, Master of Science Thesis in Photonics Engineering, Chalmers University of Technology