Canova Tech

The Art of Silicon Sculpting

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IEEE802.3cg TF

PSD mask and updated EMC simulations

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Channel Characteristics

- Channel defined as in http://www.ieee802.org/3/cg/public/Sept2017/DiBiaso_Bergner_01c_0917.pdf slide #18

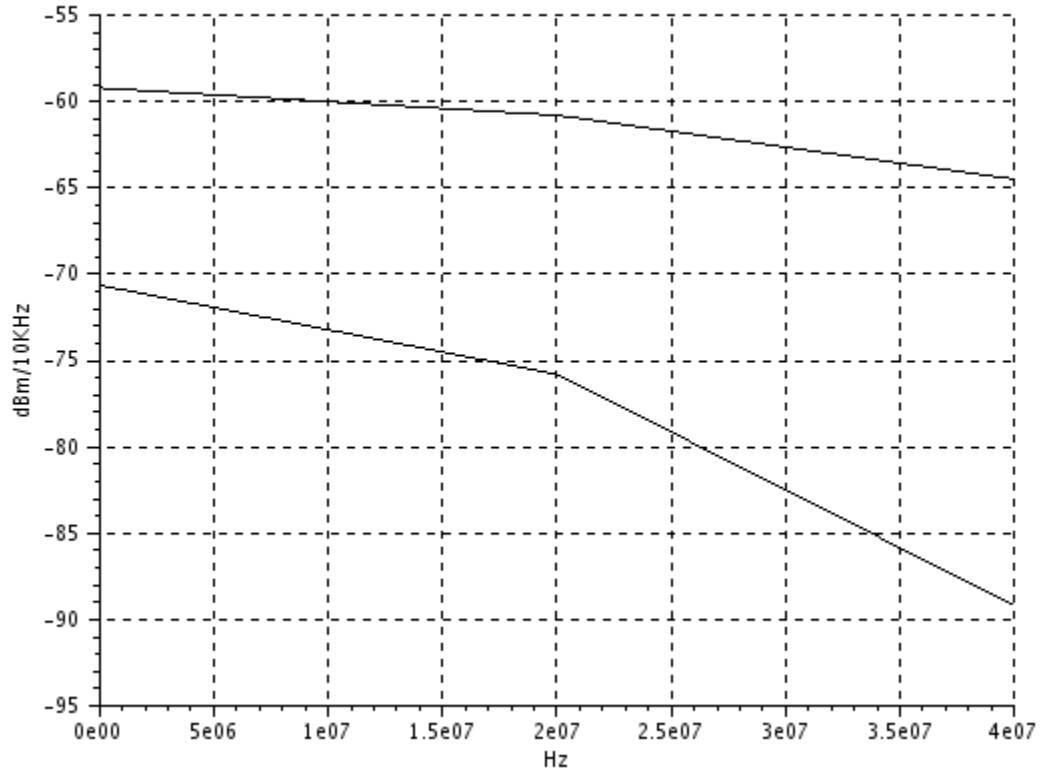
Return Loss (f)	> 14 dB	for f (0.3MHz -> 10MHz)
	> 14 - 10*log10(f/10) dB	for f (10MHz -> 40MHz)
Insertion Loss (f)	< 1.0 + 1.6*(f-1)/9 dB	for f (0.3MHz -> 10MHz)
	< 2.6 + 2.3*(f-10)/23 dB	for f (10MHz -> 33MHz)
	< 4.9 + 2.3*(f-33)/33 dB	for f (33MHz -> 40MHz)
Mode Conversion Loss (f)	> 30 dB	for f (0.3MHz -> 20MHz)
	> 30-20*log10(f/20) dB	for f (20MHz -> 200MHz)

Proposal for PSD mask

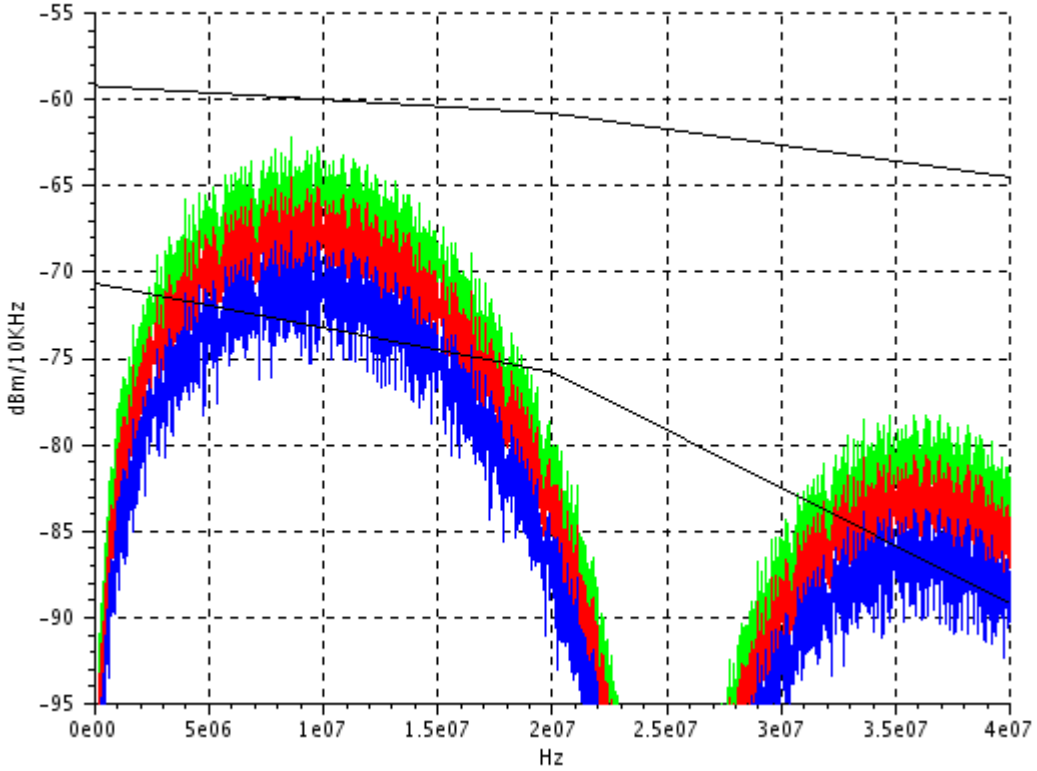
$$Upper\ PSD(f) = \begin{cases} -59.3 - 1.5 * \dfrac{f\ -1}{19} & 300KHz < f < 20\ MHz \\ -60.8 - 3.7 * \dfrac{f\ -20}{20} & 20\ MHz < f < 40\ MHz \\ -64.5 - 8.0 * \dfrac{f-40}{17} & f > 40\ MHz \end{cases}$$

$$Lower\ PSD(f) = \begin{cases} -70.9 - 4.9 * \dfrac{f\ -1}{19} & 300KHz < f < 20\ MHz \\ -75.8 - 13.4 * \dfrac{f-20}{20} & f > 20\ MHz \end{cases}$$

Proposal for PSD mask

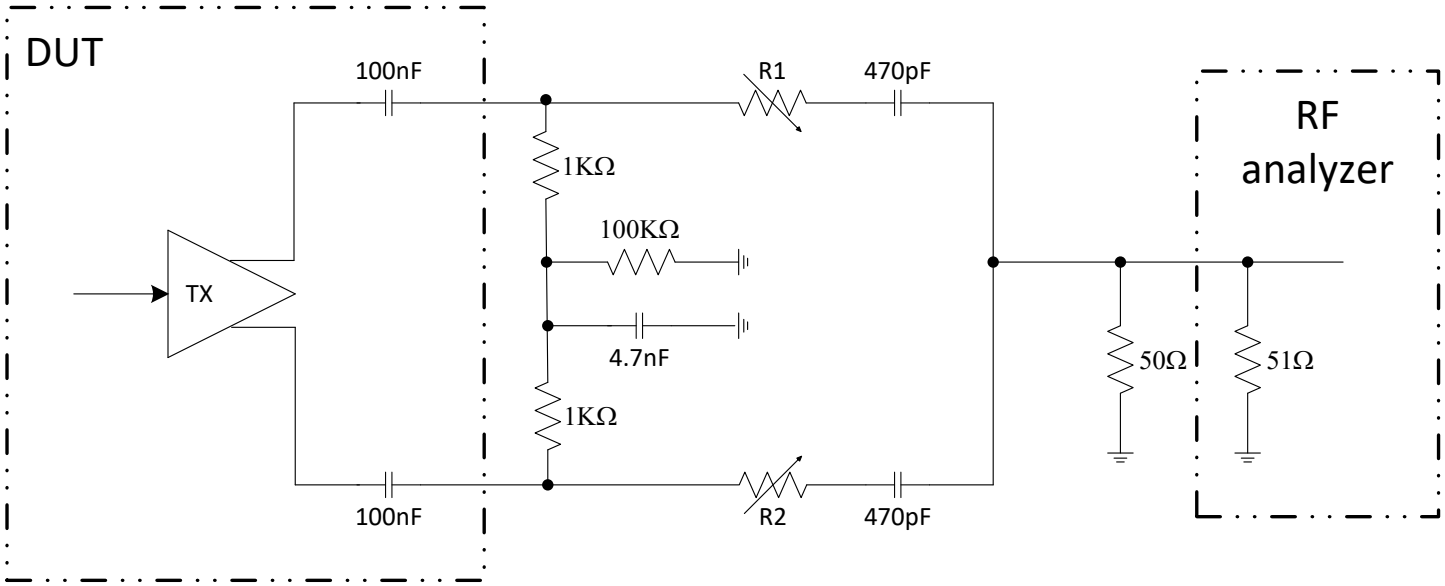


Proposal for PSD mask



- Red: typ 1Vpp TX amplitude
- Green: +30% TX amplitude
- Blue: -30% TX amplitude

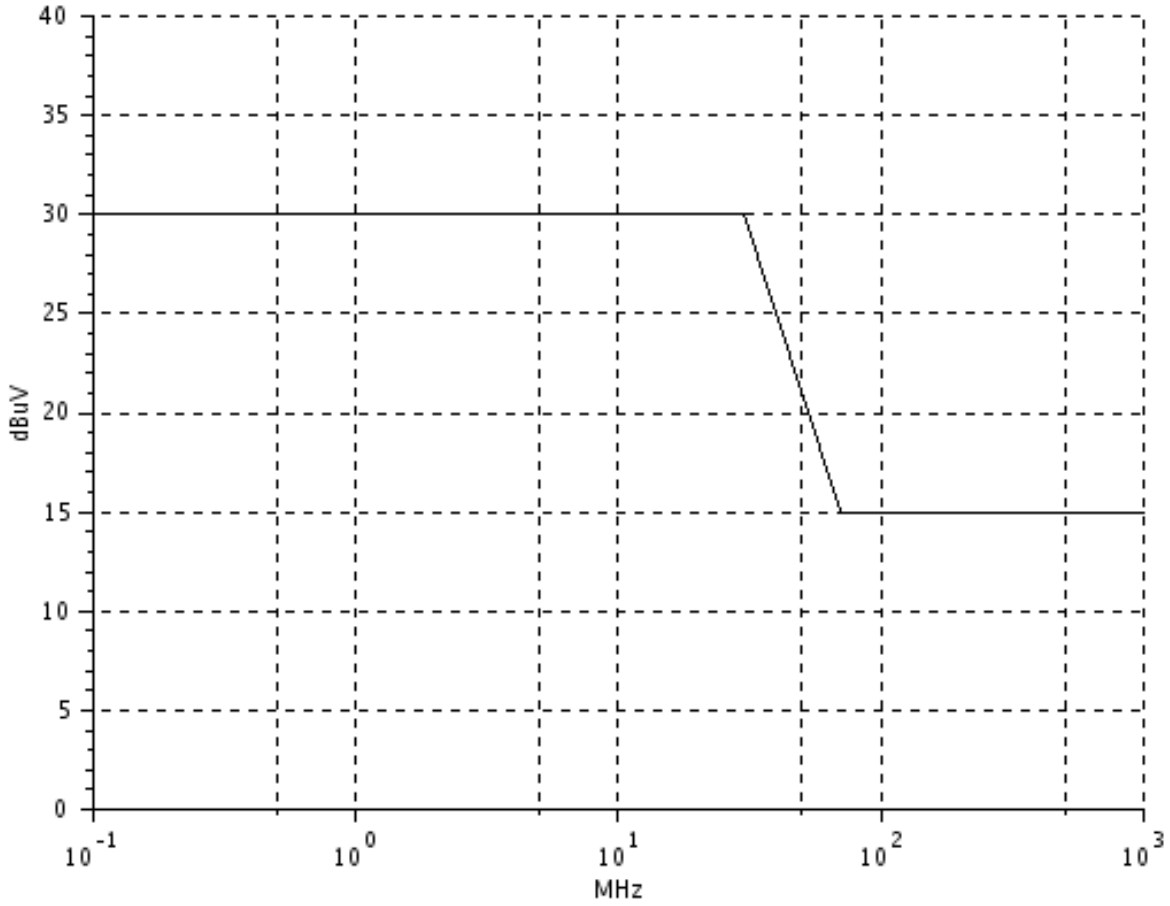
Simulations: EMI tests



- Direct Power Injection (DPI) and 150 Ohm emission tests for noise immunity and emission may be used to establish a baseline for PHY EMC performance

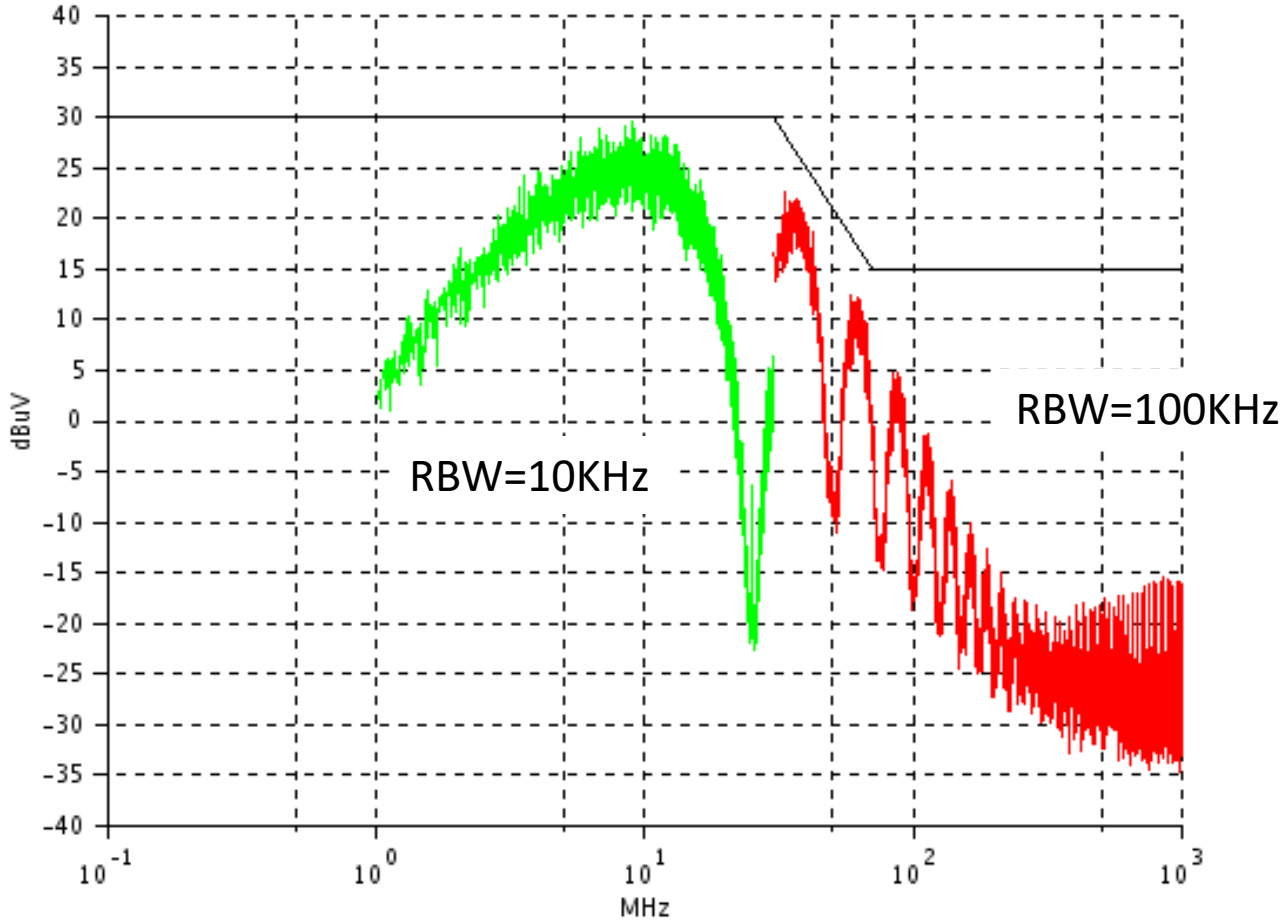
Parameter coupling	R1 [Ω] (MDI P)	R2 [Ω] (MDI N)
Symmetry	120	120
+ 2.5 % unbalance	121	118
- 2.5 % unbalance	118	121
+ 5.0 % unbalance	121	115
- 5.0 % unbalance	115	121

EMI Requirements

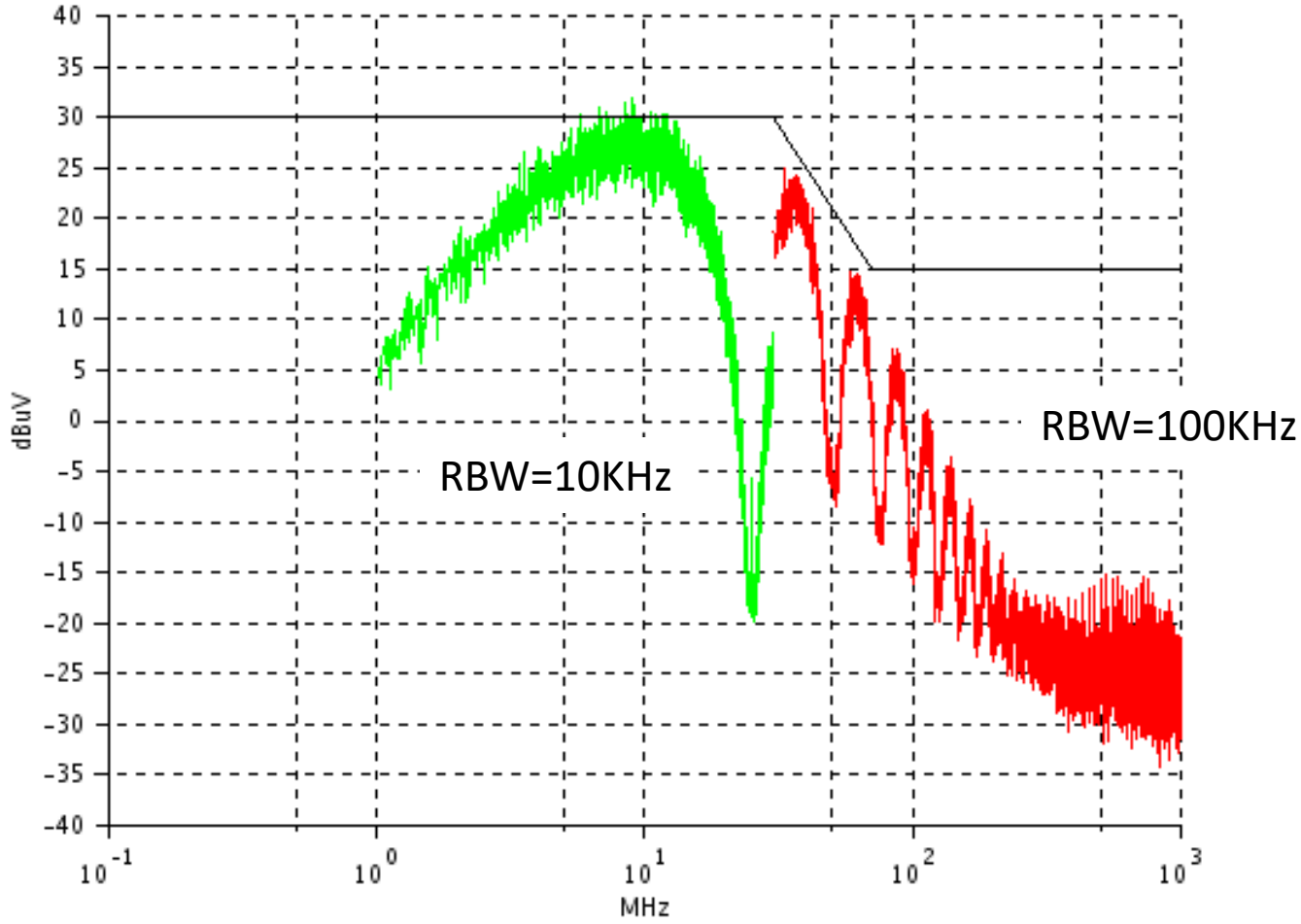


f < 30MHz => 30dBuV
f > 70MHz => 15dBuV

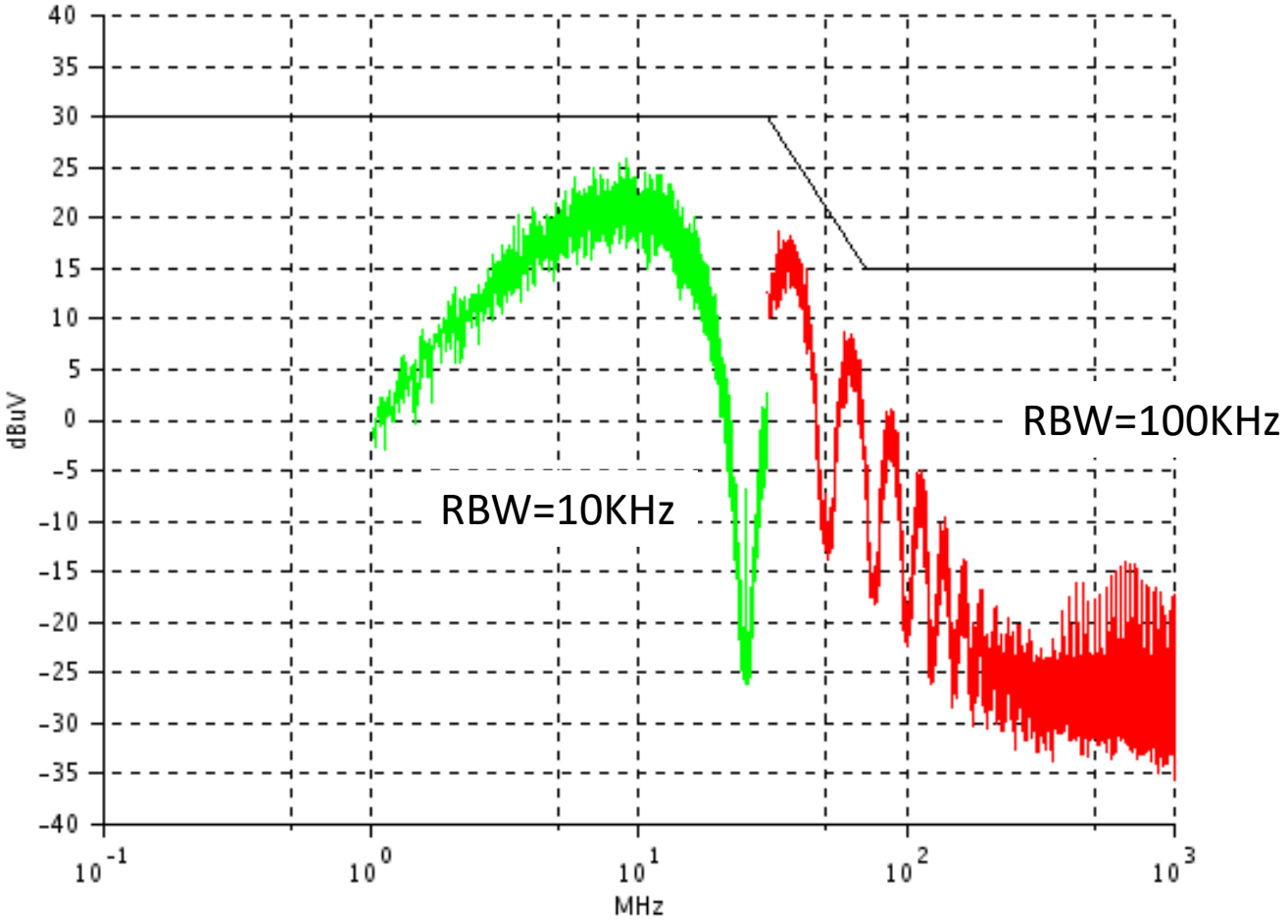
EMI Simulation ±5% unbalance, TX = 1 Vpp



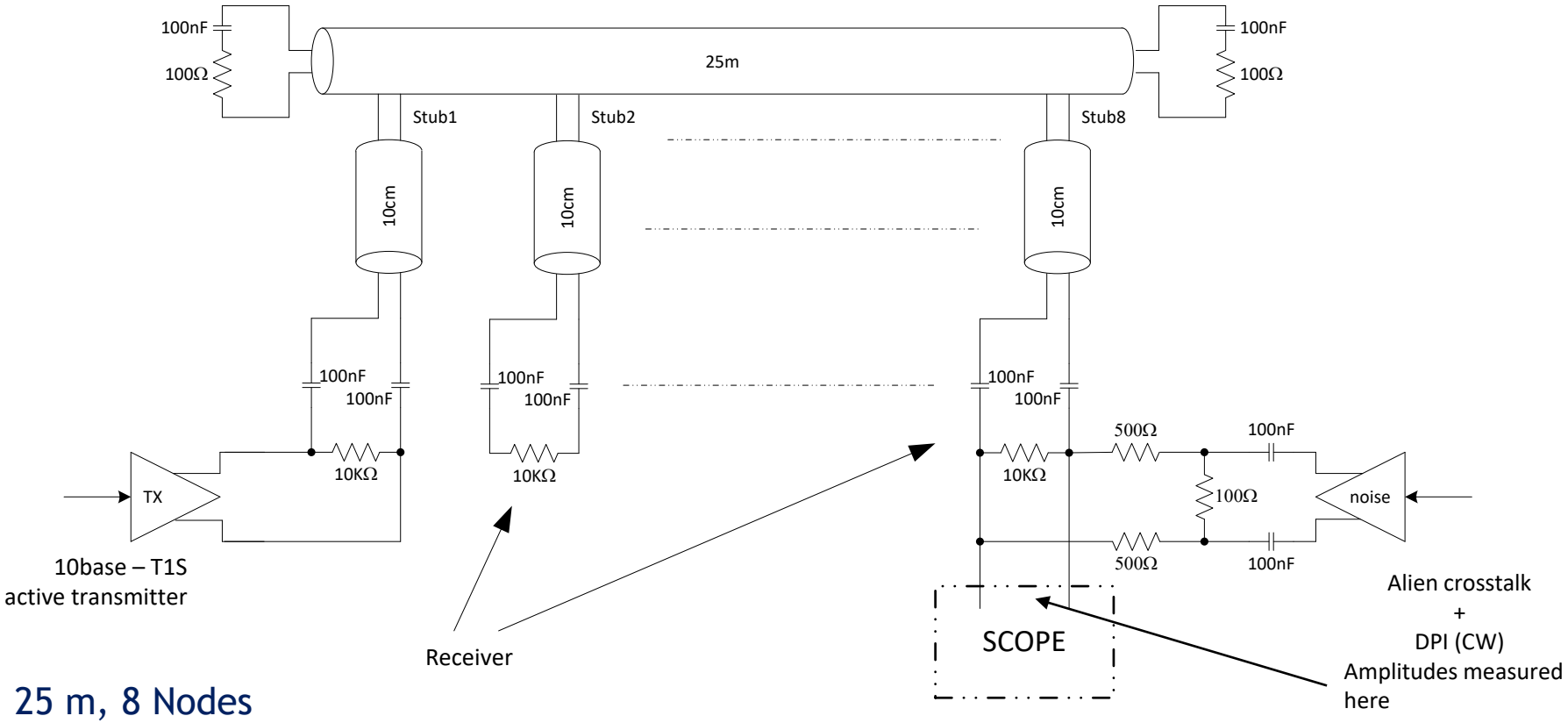
EMI Simulation ±5% unbalance, TX = 1.3 Vpp



EMI Simulation ±2.5% unbalance, TX = 1.3 Vpp



Simulations: Multidrop mixing segment Test Bench



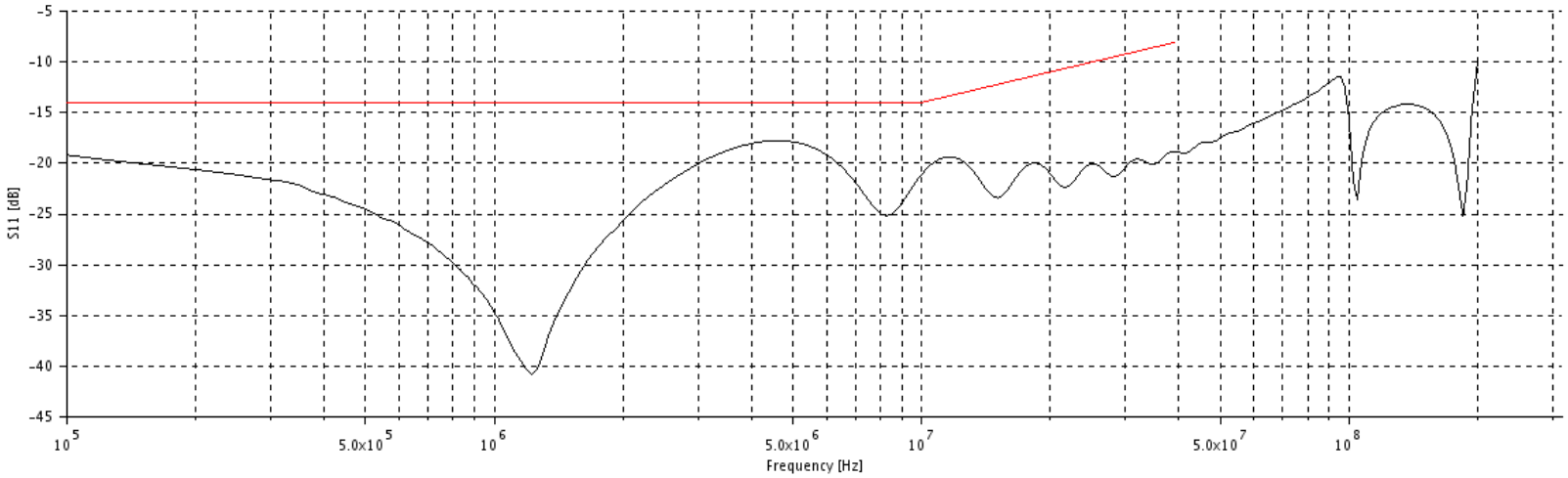
- 25 m, 8 Nodes
- 100Ω ±1% line termination resistance
- 50Ω ± 20% transmitters (high-Z when silent)
- MC 43dB, 36.5dB and 30dB (comparison)

- BCI: Severity Class IV :30dBm for 3-200MHz
- 50mVpp Alien noise considered
- MC = 43dBm
  - BCI injected noise = 140mVpp
  - BCI + Alien noise = 190mVpp

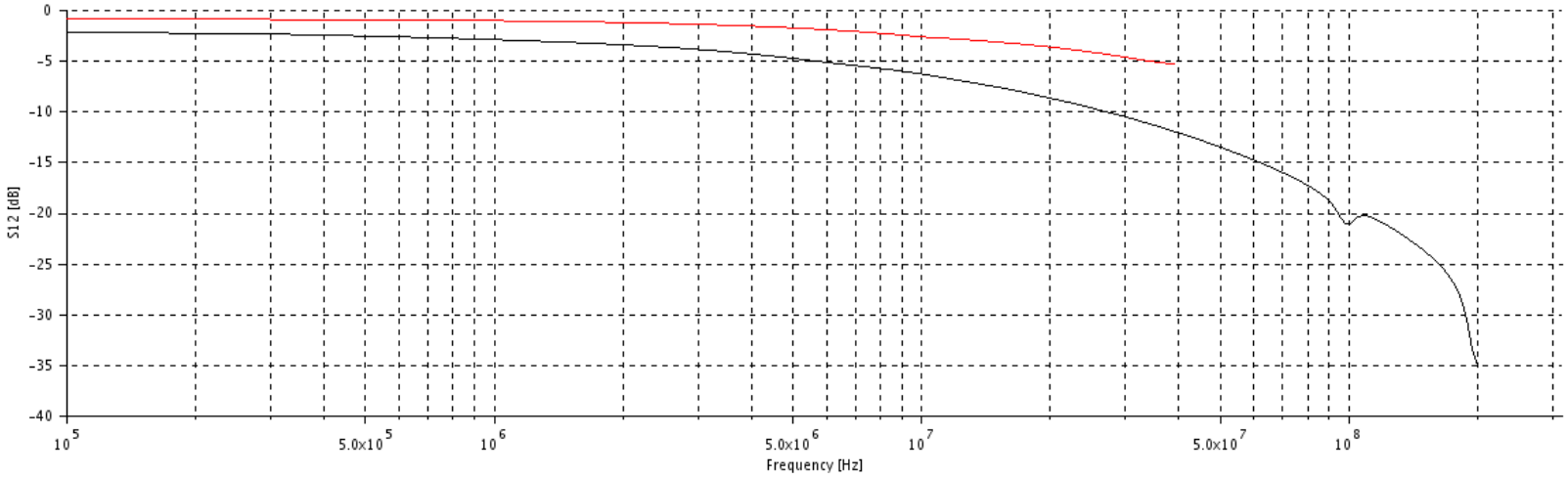
- MC = 36.5dBm
  - BCI injected noise = 300mVpp
  - BCI + Alien noise = 350mVpp
- MC = 30dBm
  - BCI injected noise = 630mVpp
  - BCI + Alien noise = 680mVpp

Simulations: mixing segment RL, IL

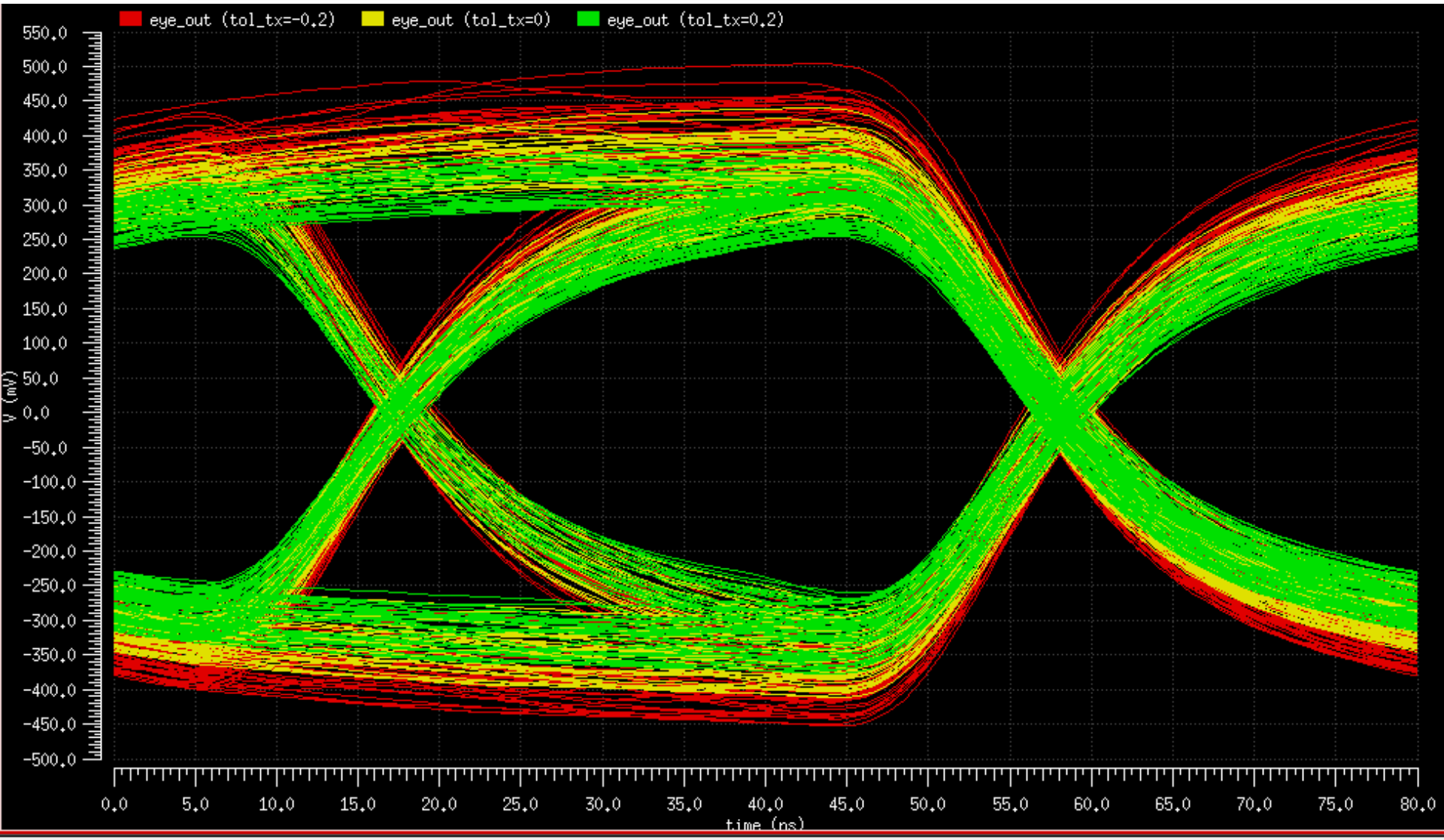
RL [dB]



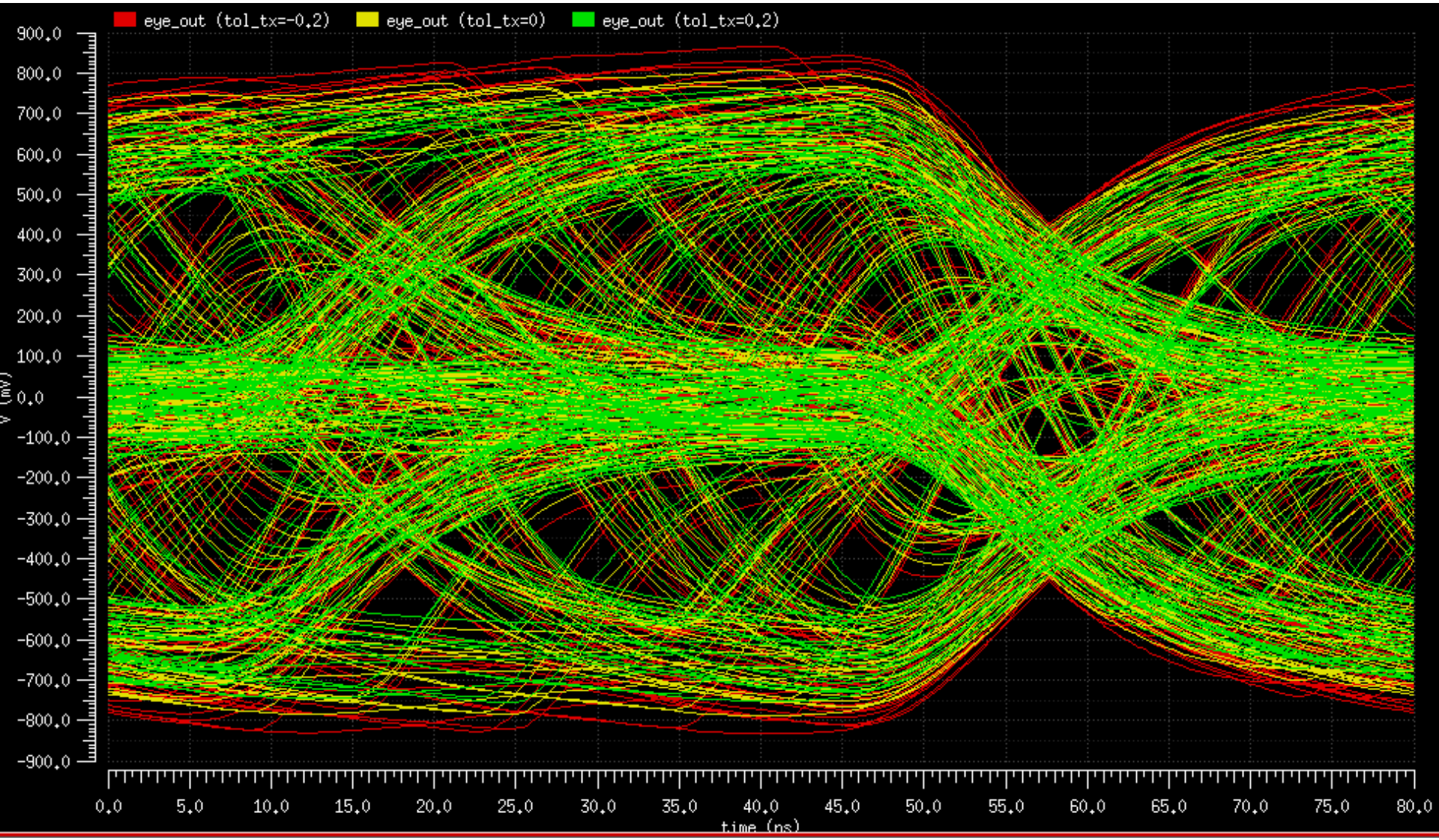
IL [dB]



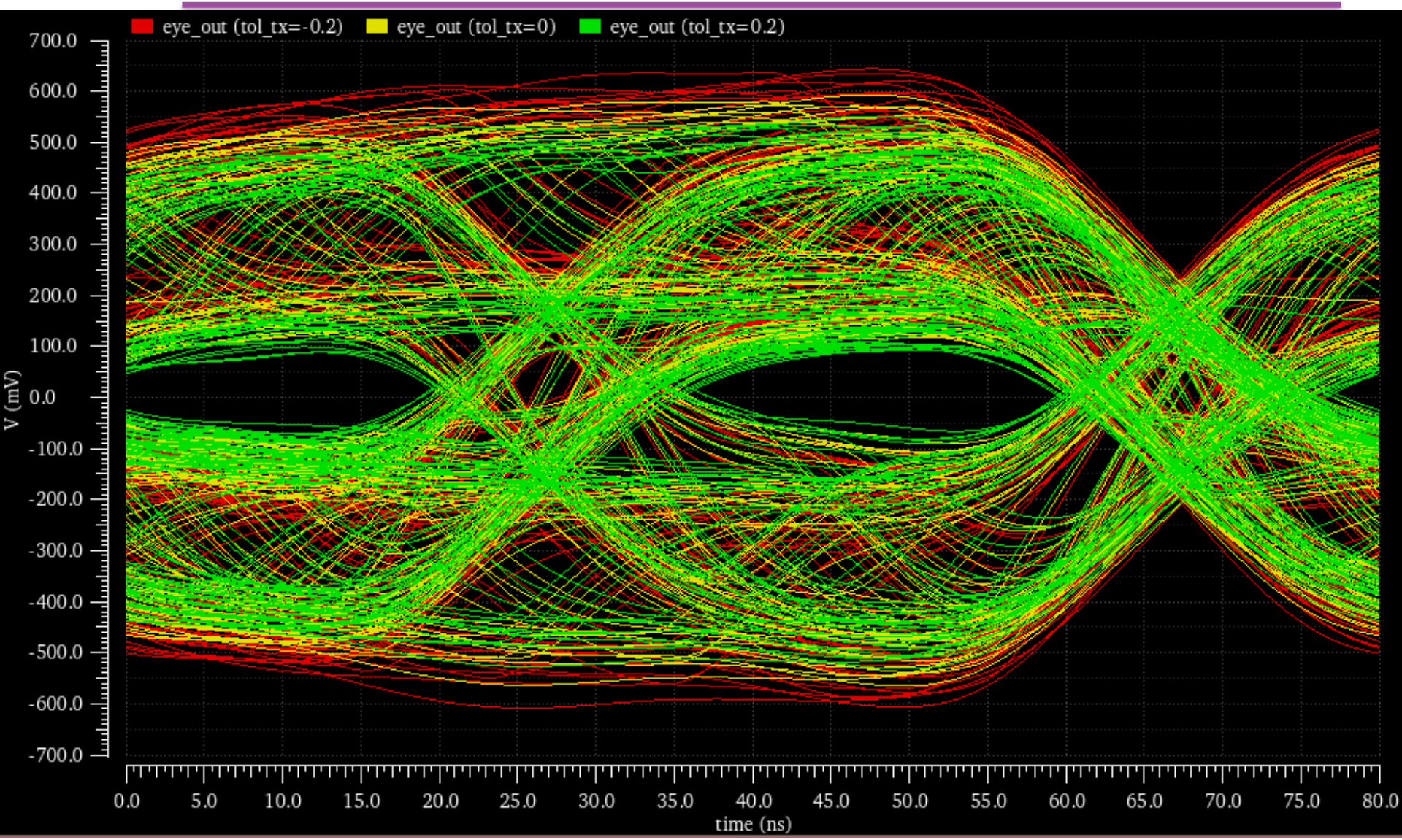
Mixing segment with 50mVpp Alien Noise



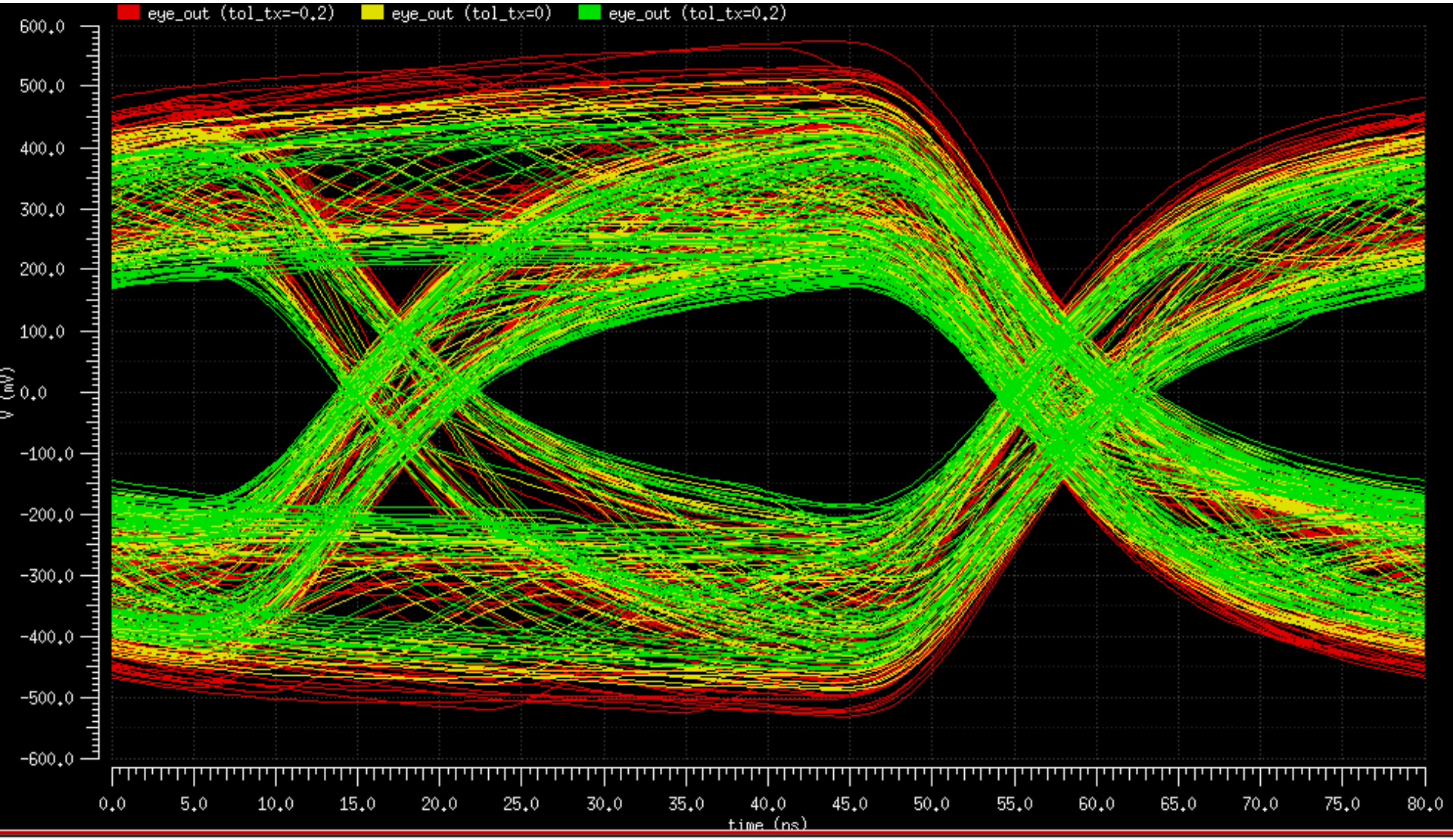
Mixing segment with 50mVpp Alien Noise + DPI (30dbm) and MC = 30dB (total = 680mVpp)



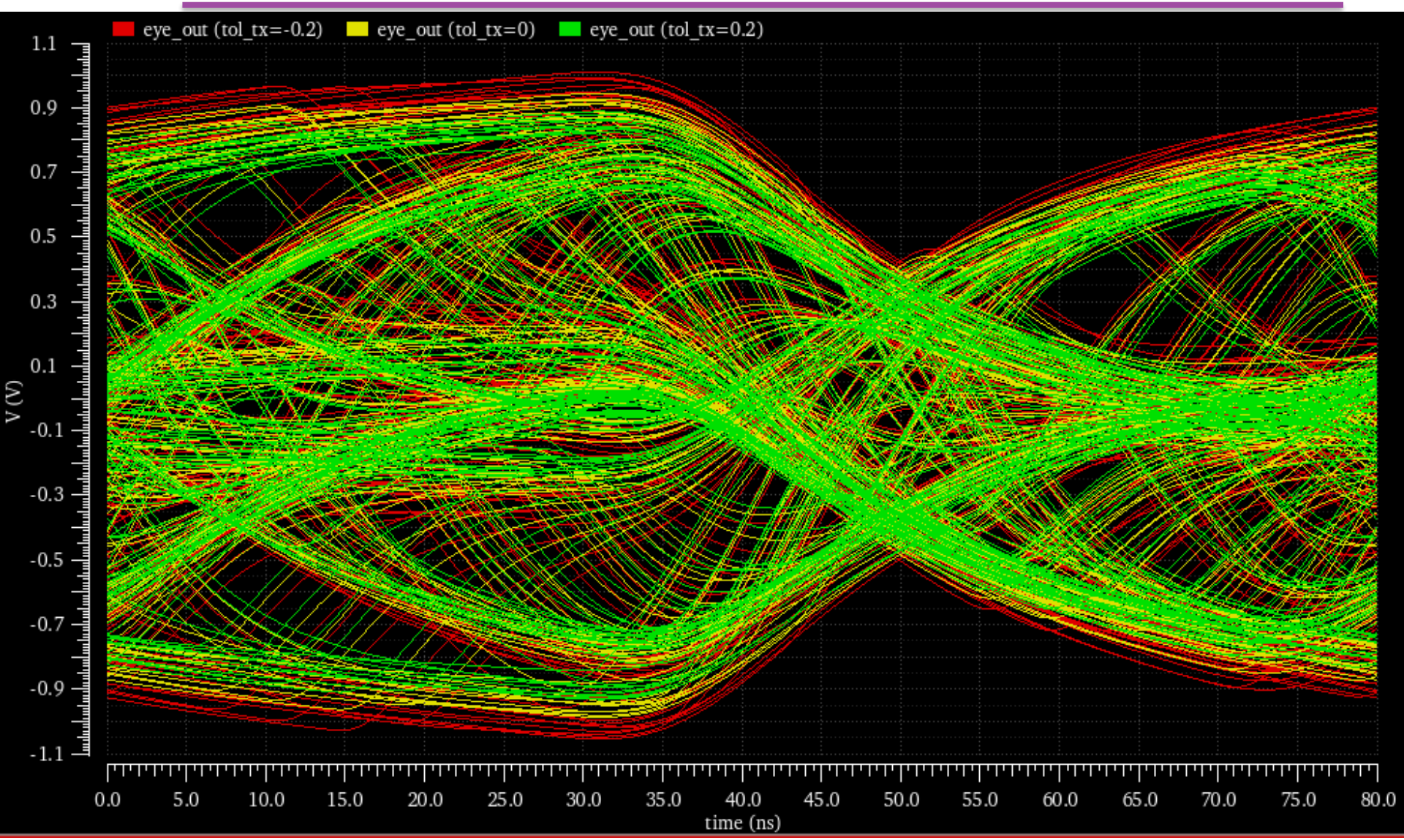
Mixing segment with 50mVpp Alien Noise + DPI (30dbm) and MC = 36.5dB (total = 350mVpp)



Mixing segment with 50mVpp Alien Noise + DPI (30dbm) and MC = 43dB (total = 190mVpp)



Mixing segment with 2Vpp TX + 100mVpp Alien Noise + DPI (30dbm) and MC = 30dB



Conclusions

- 30dB MC seems unreasonable
  - Increasing TX amplitude by 2x is not a solution
    - EMI likely out of specs anyway
- 36.5dB MC seems better but yields poor margin
- 43dB (as in 802.3bw) looks safe
- Proposed change for T1S link segment / mixing segment definition