TDEC and stressed OMA consistency in 100GBASE-SR4

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IEEE P802.3bm, September 2014, Ottawa

Introduction

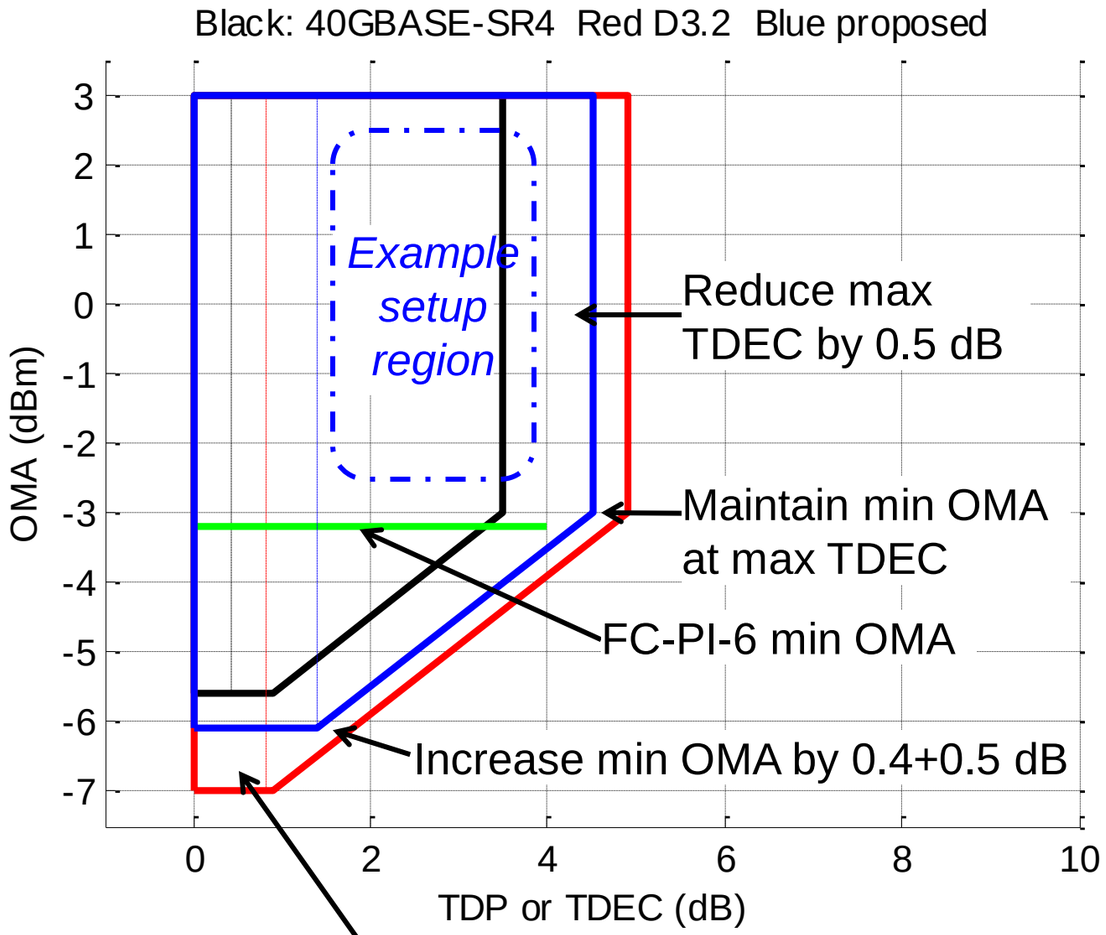
- In D3.2 we have set the SRS OMA lower than (min. Tx OMA at max. TDEC) – losses
  - We thought TDEC would account for most but not all of the penalties, like TDP
  - Min. Tx OMA at max TDEC = -3 dBm
- TDEC appears to predict more penalties than link simulations do – *under investigation*
  - *TDEC includes all penalties, measured or estimated, with a reference Rx – compare TDP which omits some*
- The target SEC for stressed sensitivity is the same as the transmitter max. TDEC
- We need to make these three consistent

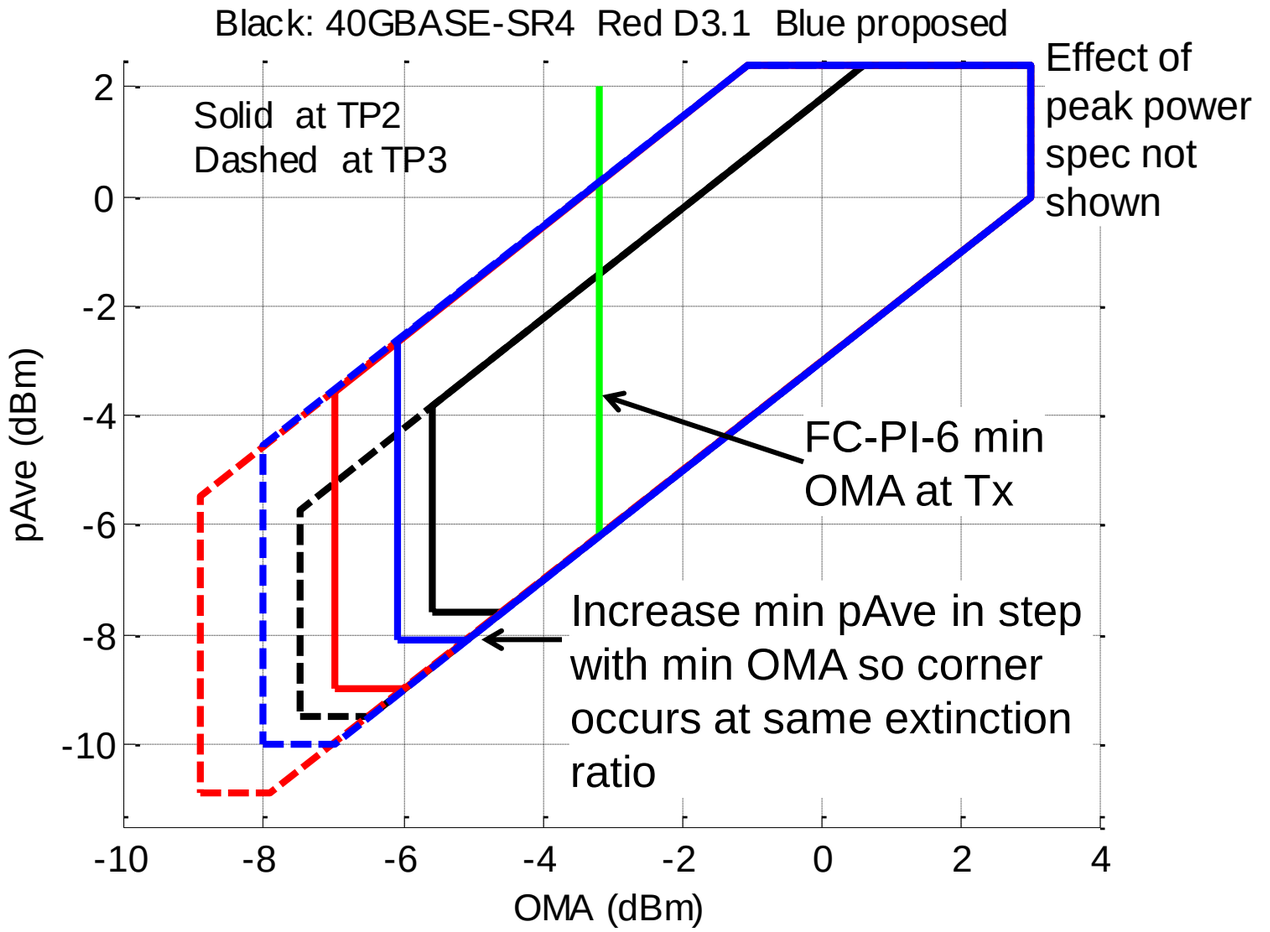
- We can test receivers with all the penalties, or with most of them, or a hybrid
  - If testing with all, we set the SRS OMA to (min. Tx OMA at max. TDEC) – losses
    - This risks over-stressing receivers unless we get it right
  - If testing with some, we could set the target SEC lower than the penalties expected from worst Tx and channel
    - And set the SRS OMA lower than (min. Tx OMA at max. TDEC) – losses by the same difference
    - This seems less thorough but less draconian
  - We could put more penalties (e.g. M) into the SEC calculation so that the SEC target is consistent for an equal TDEC number
- This presentation shows a consistent set of numbers for the draft

Example scenario

- Reduce max TDEC from 4.9 dB to 4.5 dB — Down 0.4 dB
- Include all predicted penalties in stressed eye, set SRS OMA accordingly — Up 0.7 dB
- Reduce SEC for worst transmitter and channel from 4.9 dB to 4.3 dB — Down 0.6 dB
- Ideal transmitter has TDEC of 1.4 dB – do not give more credit for emphasising transmitters with lower TDEC (presently 0.9 dB) — Up 0.5 dB
- Predicted penalties 4.3 dB

Changes to the draft - illustrated





- Effect of reducing the max Tx TDEC by 0.4 dB
- Thin lines on the left show the TDP or TDEC of a fast noiseless signal without jitter or emphasis
- Transmitters with less than 1.4 dB TDEC have more emphasis than back-to-back penalty. We don't need to outlaw them but we should not give any such transmitters of the future an OMA credit

Changes to the draft 1/3

- **Table 95–6, 100GBASE-SR4 transmit characteristics**
- Average launch power, each lane (min) -9 dBm
- *Increase in step with min OMA by 0.9 dB to* -8.1 dBm
- Optical Modulation Amplitude (OMA), each lane (min) -7 dBm
- *Increase by 0.4 dB for change in max TDEC and 0.5 for change in TDEC of ideal Tx to* -6.1 dBm
- Launch power in OMA minus TDEC (min) -7.9 dBm
- *Increase by decrease in max TDEC, 0.4 dB, to* -7.5 dBm
- Transmitter vertical eye closure (TDEC), each lane (max) 4.9 dB
- *Too high, decrease by 0.4 dB to* 4.5 dB

Changes to the draft 2/3

- **Table 95-7, 100GBASE-SR4 receive characteristics**
- Average receive power, each lane (min) -10.9 dBm
- *Increase in step with min OMA by 0.5 dB to* -10.4 dBm
- Stressed receiver sensitivity (OMA), each lane[c] (max) -5.6 dBm
- *Set to (min OMA at max TDEC) – (max loss) = -3 -1.9, an increase of 0.7 dB to* -4.9 dBm
- *or set to (min OMA at max TDEC) – (max loss) – (max penalties) + target SEC ex. M = -3 -1.9 -4.3 +4? , an increase of 0.4 dB to* -5.2? dBm
- Stressed eye J2 Jitter, lane under test 0.39 UI ?
- Stressed eye J4 Jitter, lane under test 0.53 UI ?
- SEC of conformance signal 4.9 dB
- *Exclude M as present, decrease by 0.6 dB to* 4.3 dB
- *or include M, change to match TDEC: decrease to* 4.5 dB
  - *These are higher than for any previous PMD – and still seem very high*

"No M" and "with M" SEC options

Changes to the draft 3/3

- **Table 95-8, 100GBASE-SR4 illustrative link power budget**
- Power budget (for max TDEC) 8.2 dB
- *Change to max loss + modelled penalties + allocation for other penalties e.g. 1.9 + 4.3 + ? +* = 6.2+? dB
- Allocation for penalties[c] (for max TDEC) 6.3 dB
- *Tx TDEC – correction factor + other penalties e.g. 4.5-0.2+? =* 4.3 + ? dB

Conclusion

- This presentation shows a set of numbers based on changing transmit TDEC from 5 dB to 4.5 dB
- Further experience with transmit TDEC may suggest a better optimised limit
- Decisions on the definition of SEC for stressed receiver conformance signal calibration may affect some numbers

Thank You