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25G EPON downstream power budget- 3rd iteration

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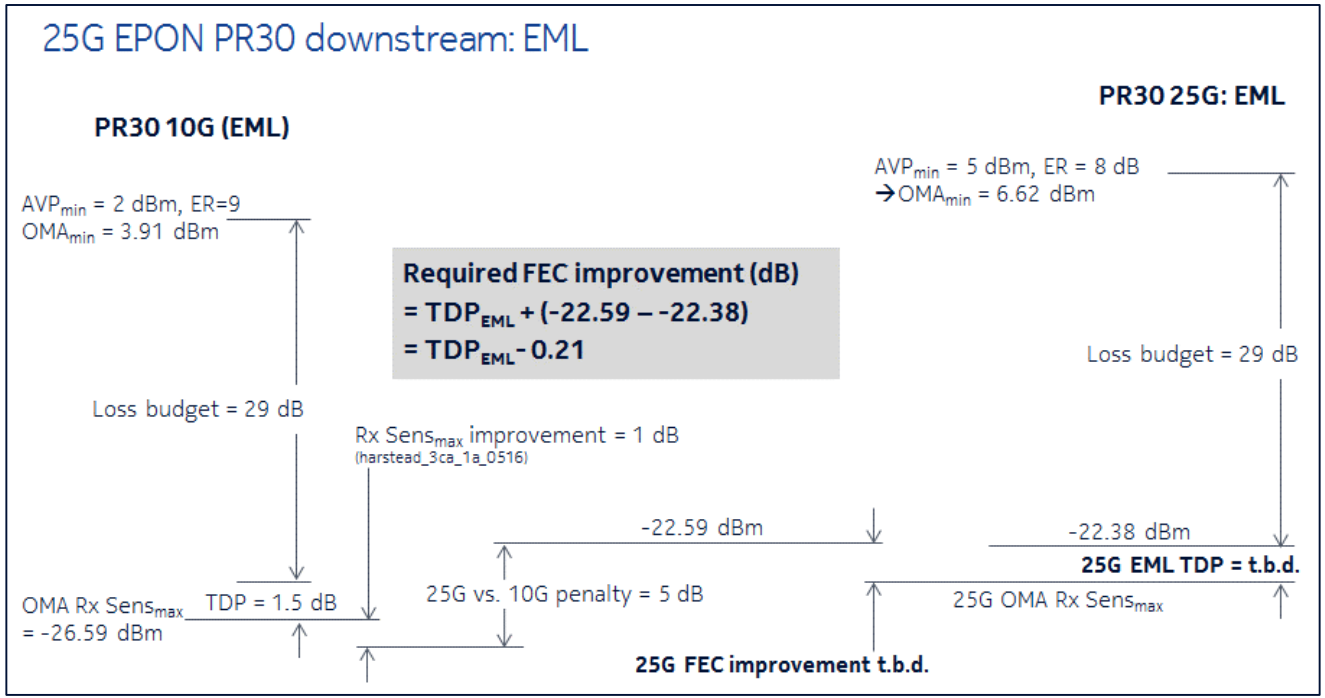
January 2017

Previous iteration:

- In harstead_3ca_2a_0716, proposed FEC requirement as a function of TDP:



- Subsequently we have had new contributions on FEC, TDP, DS/US gap, Rx sensitivity

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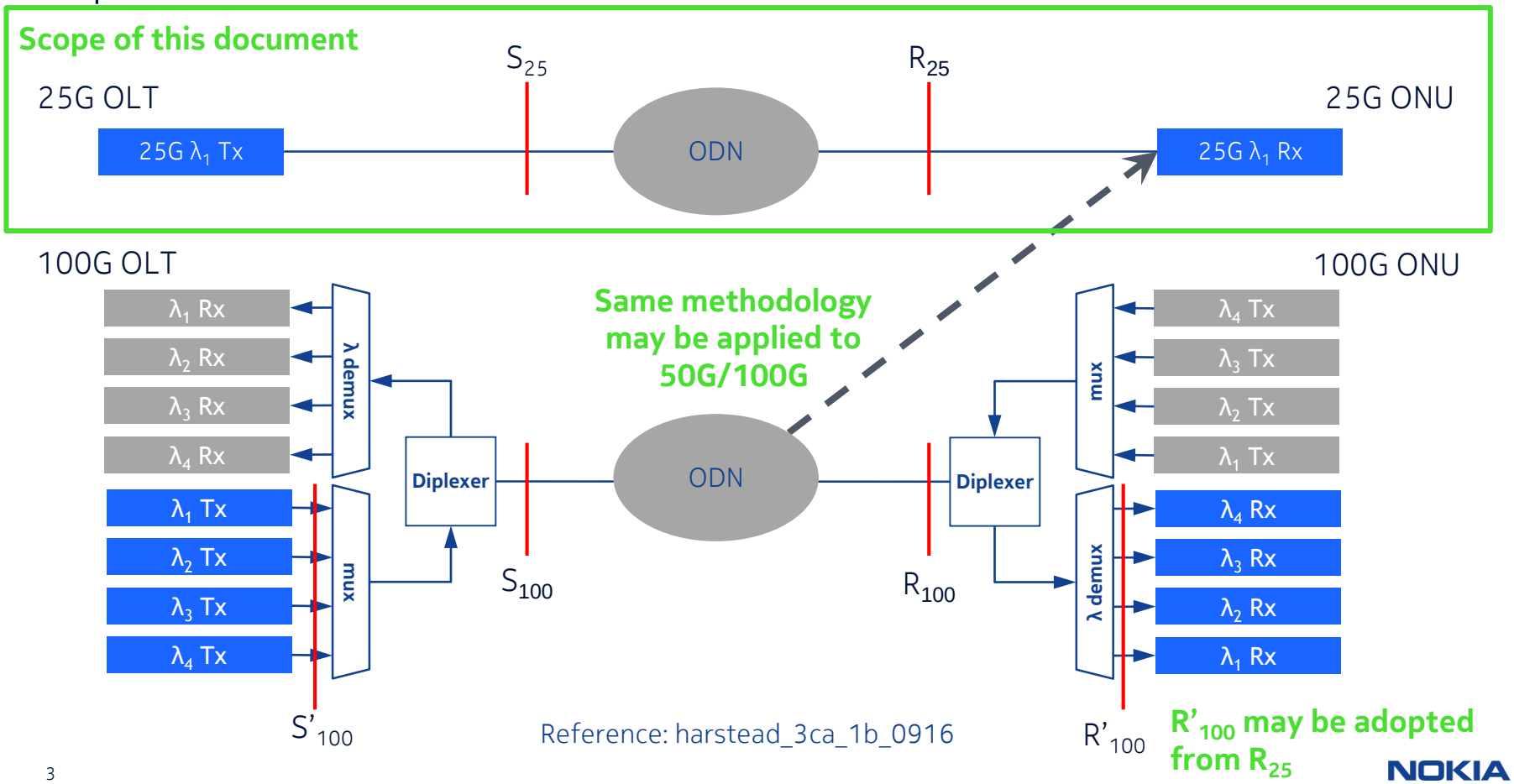
Scope


Scope of this document
25G OLT
S_{25}
R_{25}
25G ONU
25G λ_1 Tx
ODN
25G λ_1 Rx
100G OLT
100G ONU
λ_1 Rx
λ_2 Rx
λ_3 Rx
λ_4 Rx
λ demux
Diplexer
Same methodology may be applied to 50G/100G
ODN
Diplexer
mux
λ_4 Tx
λ_3 Tx
λ_2 Tx
λ_1 Tx
λ_1 Tx
λ_2 Tx
λ_3 Tx
λ_4 Tx
mux
S_{100}
R_{100}
λ demux
λ_4 Rx
λ_3 Rx
λ_2 Rx
λ_1 Rx
S'_{100}
R'_{100}
Reference: harstead_3ca_1b_0916
R'_{100} may be adopted from R_{25}

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Updates

- ER = 8
  - Previously, considered both EML (ER=8 dB) and cooled DML (ER=6 dB) OLT transmitters. Narrow to EML only. Why: the TDP for the DML increases quickly above 1330 nm
    - Elimination of Wavelength Plan C (could have put DS0 at e.g. 1310 nm, allowing DML with low TDP)
    - Want to maximize DS/US gap (johnson_3ca_1a_1116): move DS wavelengths as close as possible to 1360 nm.
- Receiver sensitivity = -24.2 dBm
  - From harstead_3ca_4_0117, ONU Rx $Sens_{max}$ = -24.2 dBm @ ER=8 dB , BER = 10^{-3}.
- FEC improvement = 0.5 dB
  - In houtsma_3ca_1_0916 and effenberger_3ca_1_1116, the best proposed FEC with low complexity and no additional overhead compared to 10G EPON is RS(992,864) (symbol length = 10 bits) with input BER = $4x10^{-3}$, which yields a 0.5 dB optical improvement.
  - Per tf_closing_3ca_1_1116.pdf: “FEC (use a strawman of RS(992,864) until further contributions for developing the loss budgets)”.
- TDP = 1.5 dB
  - Reference: tanaka_3ca_1_1116
  - Based on time resolved chirp method in tanaka_3ca_1_0516, plus margin, and not to be less than 10G EPON downstream TDP
- DS/US gap:
  - Receiver sensitivity is derived from low cost 10G EPON ONU focus beam BOSA with 295 nm DS/US gap.
  - depending on wavelength plan, there may be up to 1.3 dB additional filter loss for smaller DS/US gap.

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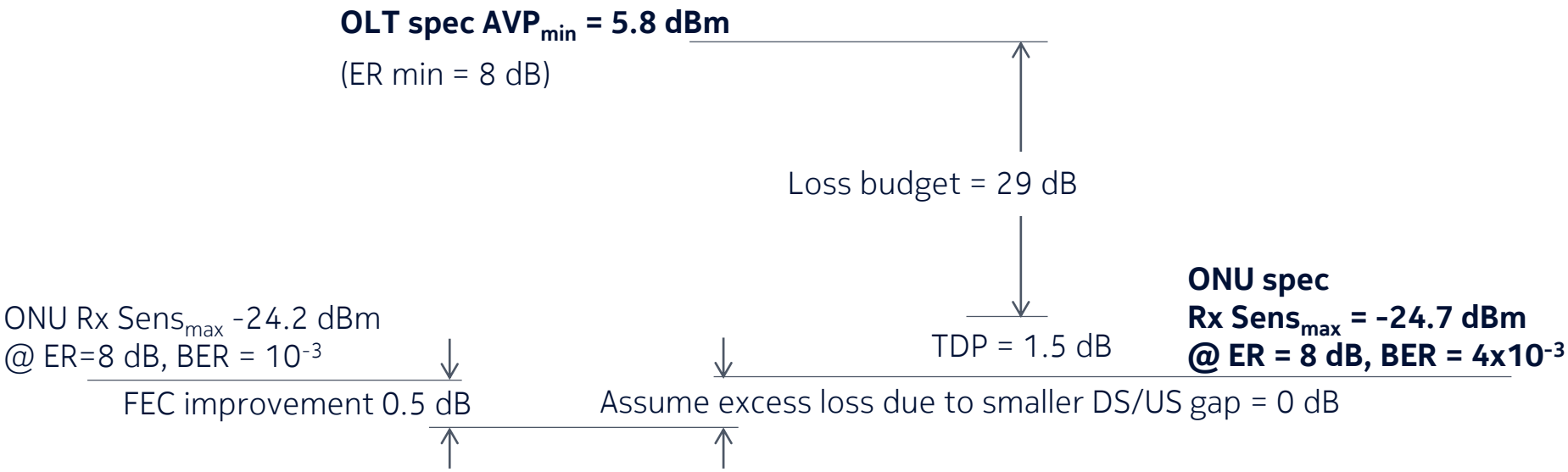
ONU receiver sensitivity and OLT launch power specs.



- 5.8 dBm is 0.5 dB more than the vendor input summarized in harstead_3ca_1a_0716 (mean + 1 sigma, p. 8)
- This assumes 0 dB excess diplexer loss for smaller DS/US gap. May need to be adjusted depending on wavelength plan selection and agreement on values.

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Decision: How to get 0.5 more dB

1. Increase Reed-Solomon FEC OH to obtain another 0.5 dB improvement (i.e. 1.0 dB improvement vs. 10G EPON). Two proposals have been made:
    1. RS(1023,847) per effenberger_3ca_1_1116. Increases FEC OH from 13% to 17%.
    2. RS(992,792) per houtsma_3ca_1_0916. Increases FEC OH from 13% to 20%:
    - It might be OK to increase the downstream overhead by 4-7% since upstream throughput is already compromised by other overheads (due to burst mode) to a greater degree.
2. Push optics vendors for 0.5 dB higher output power.


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