

# **MEASUREMENT OF RECEIVER SENSITIVITY LIMITS**

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# MEASUREMENT OF RECEIVER SENSITIVITY LIMITS

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- **Receiver sensitivities over different parameters have been studied**
  - Wavelength regions
  - Laser type
  - Extinction ratio
- **Result are Typical “Begin of life values” of components of different suppliers**
- **Additional margins required**
  - Reference point is 1 m in the fiber after and before the connector:  
-> This means loss and loss variation tolerance of two connectors is required
  - Aging margin over lifetime power supply and temperature variation has to be added



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- Sensitivity versus ER follows the theory for a given source and pulse form



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- Wavelength and source dependence of sensitivity
  - Variation in sensitivity of receivers observed versus sources in different wavelength regions
    - Inherent difference between 1310 and 1550 is ~ 05 dB typical
    - Difference between 1550 and 1310 units show sensitivity differences of 1 dB (No pulse effects) up to 2 dB (Pulse and ER effects) .



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- Ranges of measured sensitivities for BER of  $10^{-12}$  as specified in the 10G interface standards
  - Such values can be accounted to be BOL **typical** values at connector
    - Experiences from measurements on 1550 nm RX (On base of EML source).
    - Variation of +/-2 dB of receiver sensitivities between -15 dBm and -19 dBm with peak around -17 dBm
    - Yield for such values above ~ 97 % at typical Tx ERs of 10 dB or better.
    - Additional penalty visible at 1310 nm (On base of directly modulated sources) consisting out of:
      - penalty related to wavelength about 0.5 dB
      - penalty due to pulse shape and ER degradation of 1 to 2 dB
- Preliminary tests indicate a **typical** range of -14 to -16 dBm at ERs of 6.6 - 8 dB, depending on vendor



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- Specified overload values

There are no components currently specified with overload value of +1dBm over lifetime

- Statement received that +1dBm overload is an issue

The + 1 dBm overload may be a cost driver for the 10GBASE-LR/LW interface.



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- Conclusion for Systems supplier  
(System suppliers have to deliver complete systems fulfilling specifications over complete lifetime under worst case conditions)  
There has to be additional margin for 2 connectors and EOL degradations. Such additional margin to guarantee worst case system performance could be 1dB for 2\*0.5 connector loss, 1 dB aging.
  - EOL margin is required due to the fact if BOL performance would be at the EOL spec, together with minimum Tx power and max outside loss, the system would run at  $BER=1*10^{-12}$  and thus NOT errorfree,  
( $BER=1*10^{-12}$  means 1 error every 100 seconds for 10Gb/s.)
- Currently no Transponders available which offer enough margin to expect a high yield assuming the current specification of the optical interfaces as defined in the 10G Ethernet spec.

