Update on Coherent 800 LR/ER Proposals

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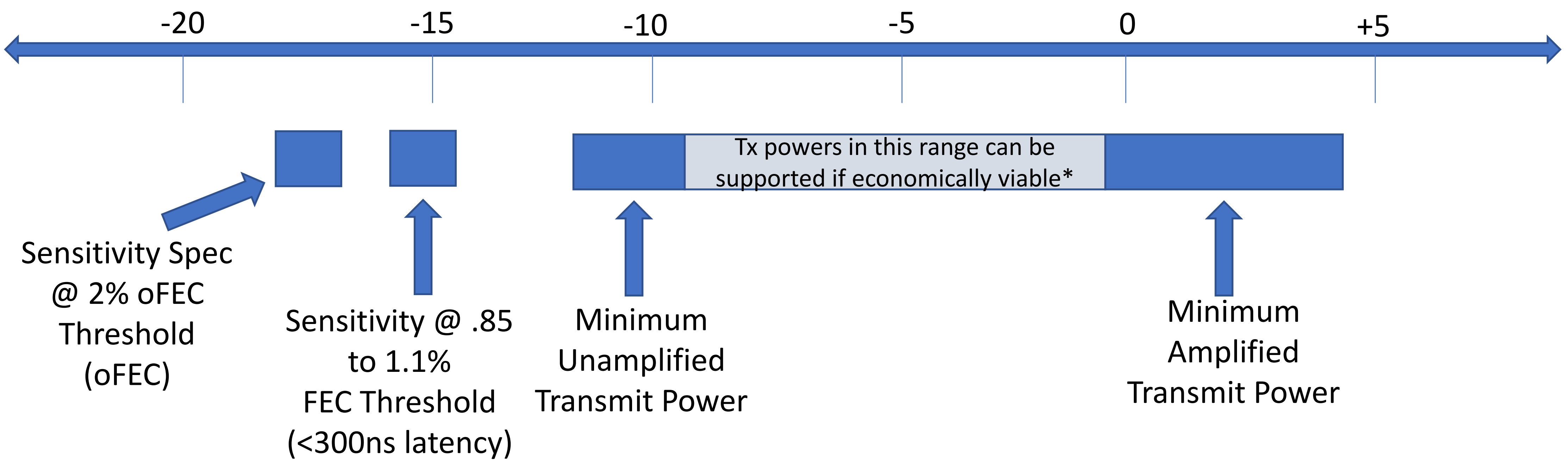
Objectives

- Initiate discussion on potential architecture decisions and impact on link budget of coherent interfaces that address a range of reaches at 800G
- Transmitter considerations
  - Cost optimized designs with no amplification
  - Amplified configurations
    - Technology selection impacts the trade-off between amplification and reach
- Receiver considerations
  - FEC selection
    - Latency requirements depend on application and are impacted by FEC architecture
    - Segmented FEC may be necessary for 200G electrical lanes, but bounds latency capabilities
    - Use of common oFEC-based protocol could enable interop between reaches (e.g, LR and ER)
    - Multiple alternatives may be needed in the industry
- Not an attempt to propose specific spec values
  - Wide ranges are intentional, and feedback is welcome
  - This is the start of the discussion, not the end

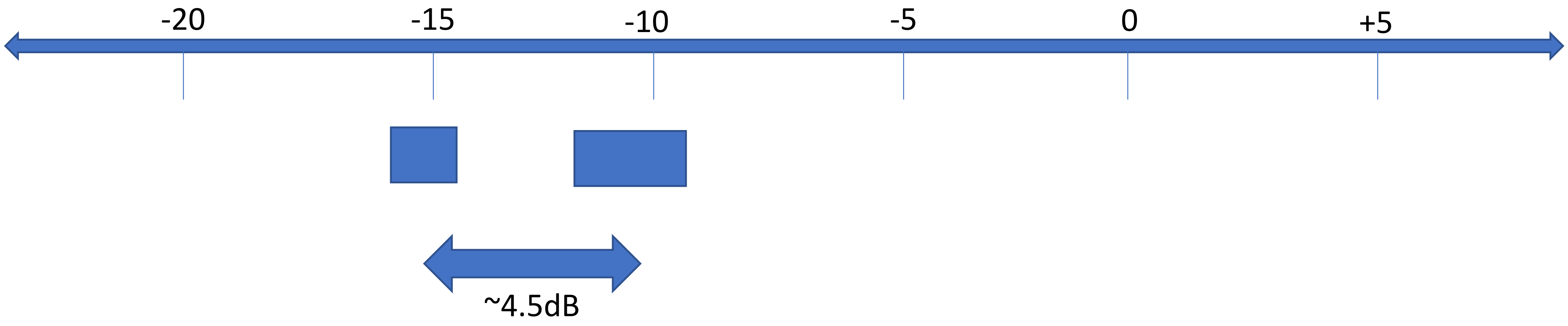
Link Budget Considerations



*Relative cost of amplification is technology specific

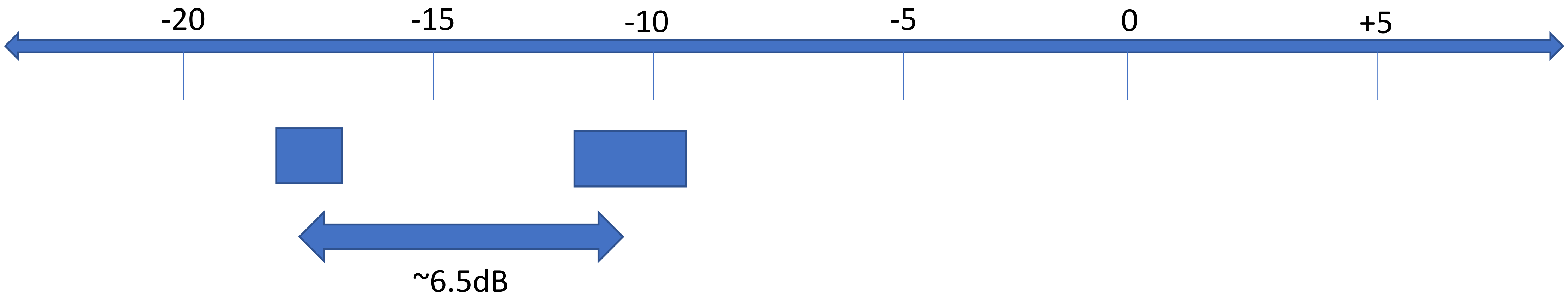
Fiber Loss (1550nm) → 0.25dB/km	10km = 4.5dB
Connector Loss → 1.0dB	40km = 12dB
Impairments → 1.0dB	80km = 22dB

Example: Lowest Relative Cost/Low Latency



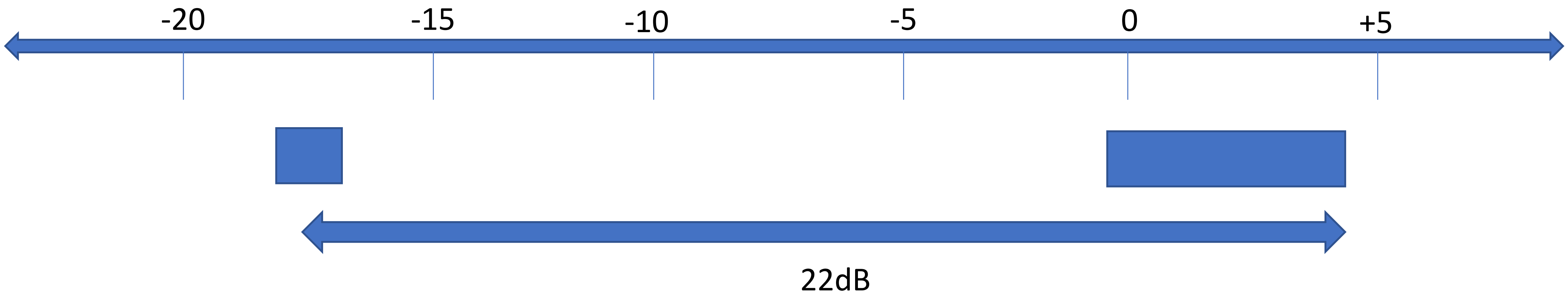
- Concatenated FEC assumptions need to be evaluated for 200G electrical lanes

Example: Lowest Relative Cost/Extra Link Budget(Margin)



- Segmented architecture
  - Latency of few µs
  - Decouples optical link budget from electrical
- Potential protocol interop with ER if both utilize oFEC

Example: Maximum Link Budget



- Amplified transmitter and high gain FEC
- Supports up to 80km link budget
- Higher relative cost due to amplification

Example Link Budgets

Description	Tx Power (dBm)	Rx Sensitivity (dBm)	Link Budget (dB)	Reach (km)
No Amp/Low Latency	**-11**	**-15.5**	4.5	10
5dB Amp/Low Latency	-6	**-15.5**	9.5	30
12.5dB Amp/Low Latency	+1.5	**-15.5**	17	60
No Amp/oFEC	**-11**	**-17.5**	6.5	18
5.5dB Amp/oFEC	-5.5	**-17.5**	12	40
15.5dB Amp/oFEC	+4.5	**-17.5**	22	80

Values only meant to show potential relation between implementations. Values in bold are constrained by technology limitations. Amplification levels can be adjusted to meet target link budgets. Values in table tweaked to generally give round numbers for reaches, not meant to be proposed specifications.

For a given sensitivity, each 5dB of gain offers 20km increase in reach.
For a given transmit power, oFEC offers about 8km increase in reach.
Alternatively, extra link budget can be used to increase manufacturing margins.

Conclusions

- We currently have objectives for 800G at 10km and 40km reaches
  - We should consider if these reach objectives are aligned with the technology, as well as end user requirements
  - End user inputs on link budget requirements for use cases that drive volume are needed
- This contribution has tried to provide a high-level overview of the approximate performance levels of various implementation options
- FEC architecture discussion is closely related to the link budget analysis