

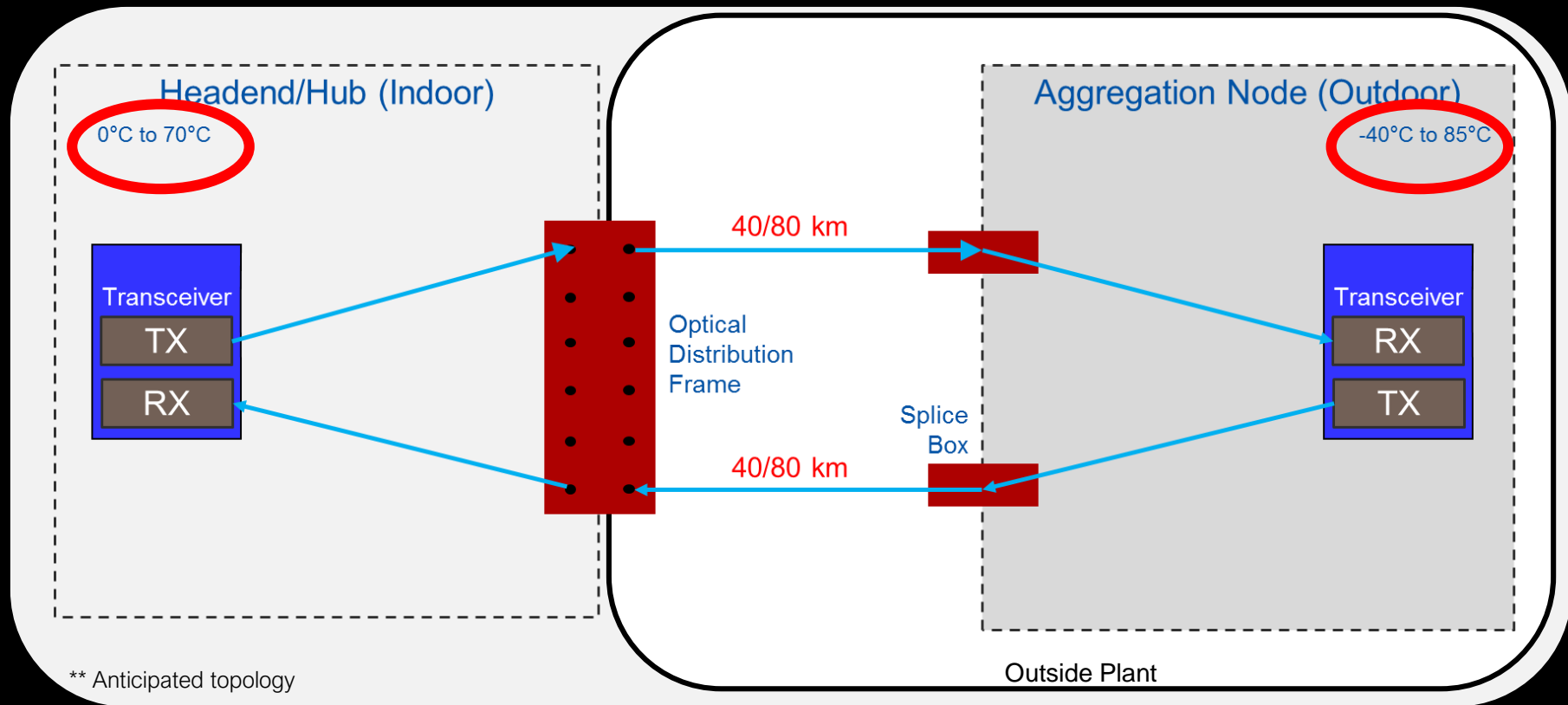
# Technical Feasibility of Industrial Temperature Lasers

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January, 2018

# Distributed Access Architecture (DAA) Recap

- DAA characterized by:
  - Digital optical links between headend/hub and “aggregation node”
  - Reduction in service group size relative to traditional hybrid fiber coax (HFC)
  - Devices moved to edge of optical network into aggregation node
    - DOCSIS PHY, DOCSIS MAC-PHY, OLT, 5G access point
- See:
  - knittle\_b10k\_01\_0118.pdf
  - villarruel\_b10k\_01b\_0917.pdf

# MSO Solution Temperature Requirements



$0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$

$-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

# MSO Solution Temperature Requirements

- Indoor deployment
  - Normal environmentally controlled environment
  - 0°C to 70°C operating range
- Outdoor deployment (aggregation node)
  - Normally uncooled, unheated enclosure
  - No direct exposure to moisture
  - -40°C to 85°C operating range for the transceiver
    - -40°C represents the startup temperature

# NeoPhotonics External Cavity Tunable Laser

-40°C to +85°C

## Preliminary Test Data

- This contribution shows preliminary test results of NeoPhotonics' external cavity tunable laser
- Test parameters under the two temperature extremes, -40°C to 85°C
- Results shown on next page

# NeoPhotonics External Cavity Tunable Laser

-40°C to +85°C

## Preliminary Test Data at BOL

EVT description	Test temp	Comments
Frequency error	-40/+85°C	< +/-1.5GHz
Optical power error	-40/+85°C	< +/- 0.75dB
Power consumption	-40/+85°C	<4.5W @ -40C <4.0W @ +85C <2.5W @ 55C
SMSR	-40/+85°C	> 45dB
Linewidth	-40/+85°C	< 100 KHz @ +85C < 300 KHz @ -40C
Transient warm start	-40/+85°C	Working in <45 sec
Transient cold start	-40/+85°C	Working in 60 sec
Off-grid tuning range	-40/+85°C	+/-6GHz
Power leveling	-40/+85°C	No issue

The laser frequency error of +/- 1.5GHz is the same as any telecom tunable laser specs, basically no change at all

Power consumption at -40°C is a bit high, at 4.5W, but due to internal heating of the outdoor box, the case temperature should be much higher than -40°C, and therefore the power consumption should be less than 4.5W under all conditions

Laser linewidth was as narrow as 100KHz at 85°C and 300KHz at -40°C

# Conclusions

- Test parameters under the two temperature extremes,  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  show very good performance
- Although test results are preliminary, they show a great potential for coherent tunable lasers to operate under I-temperature environment.
- At  $-40^{\circ}\text{C}$  about 1.5W higher than normal operating condition, and is probably the main penalty comparing to those under a telecom operating condition
- We encourage more vendors to carry out similar tests