Channel Performance Estimations with Extended Channel Probing

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Content

Optical Spectrum as a Service (OSaaS)

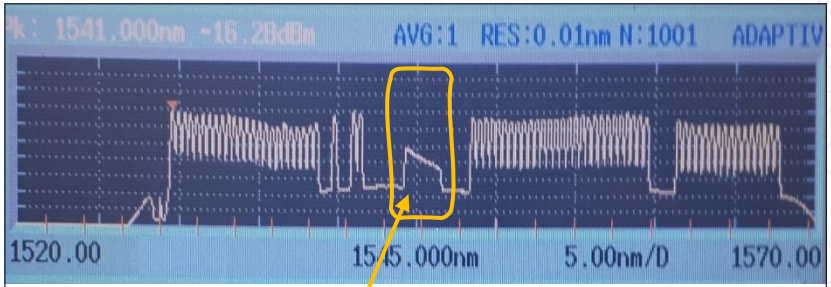
What is OSaaS?

Open spectral slot in the DWDM spectrum, capable of carrying single channel or multiple carriers

The Challenge

Determining the best possible transceiver configuration out of thousands of possible configurations in a scenario, where service provider can not share their business critical information about the system design, exact service parameters or data about daily and yearly performance changes

→ BLACK BOX SCENARIO

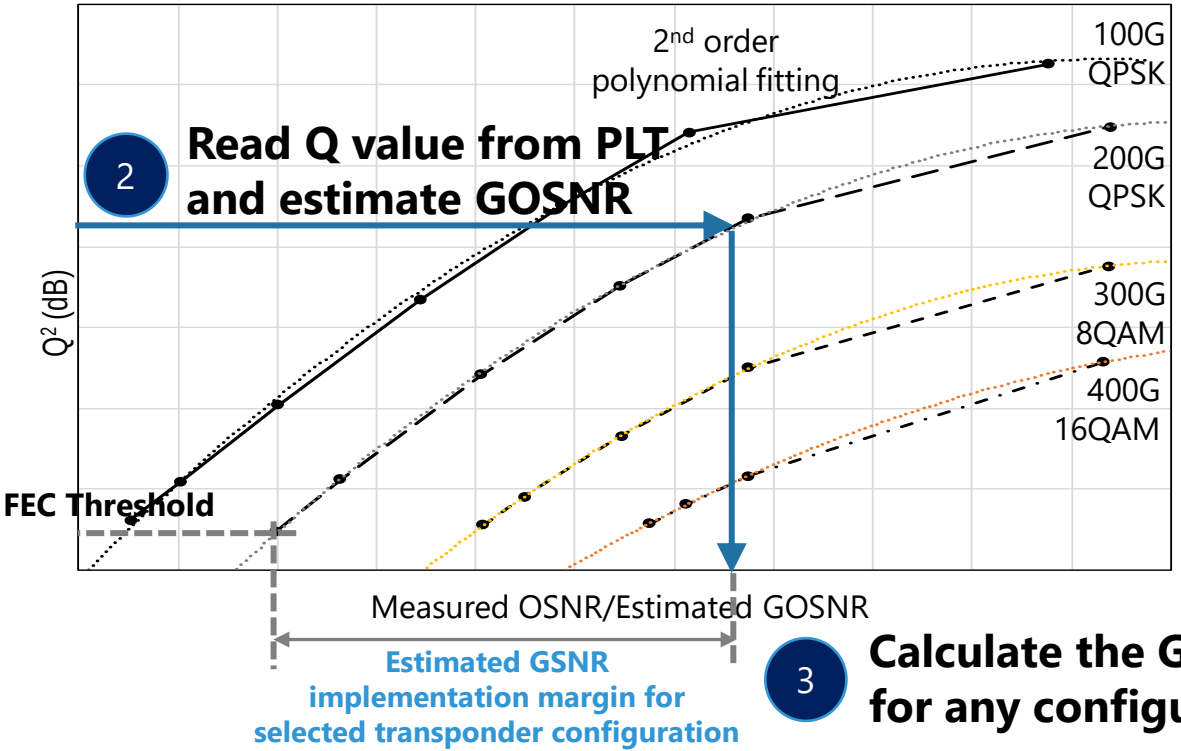


300GHz Spectrum as a Service example with no loaded channels

Solution: Channel probing concept

Channel probing concept

1 **Characterize transceiver (PLT) in linear domain**

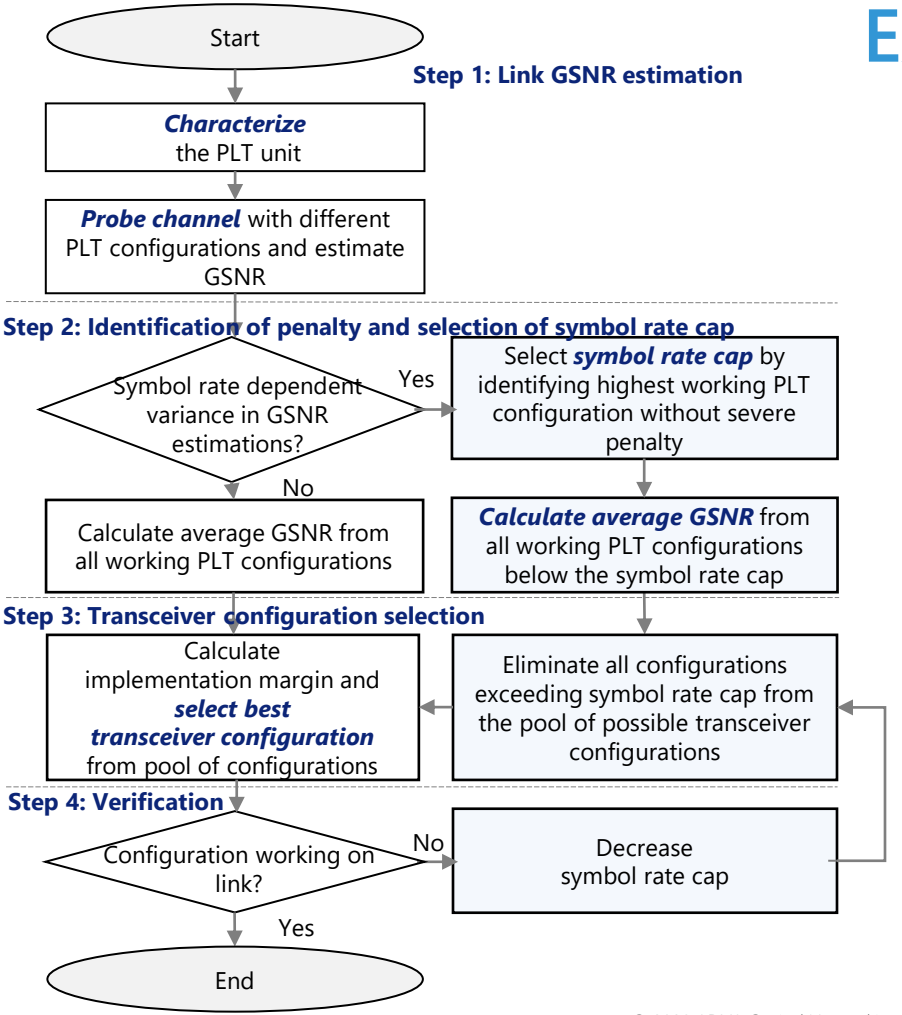


Shortcomings:

- Tied to single location in the network ($f_{central}$)
- Can give misleading predictions in advent of filtering penalty
- Does not allow to detect the operation regime
- Does not capture performance variations in time

3 **Calculate the GSNR margin for any configuration**

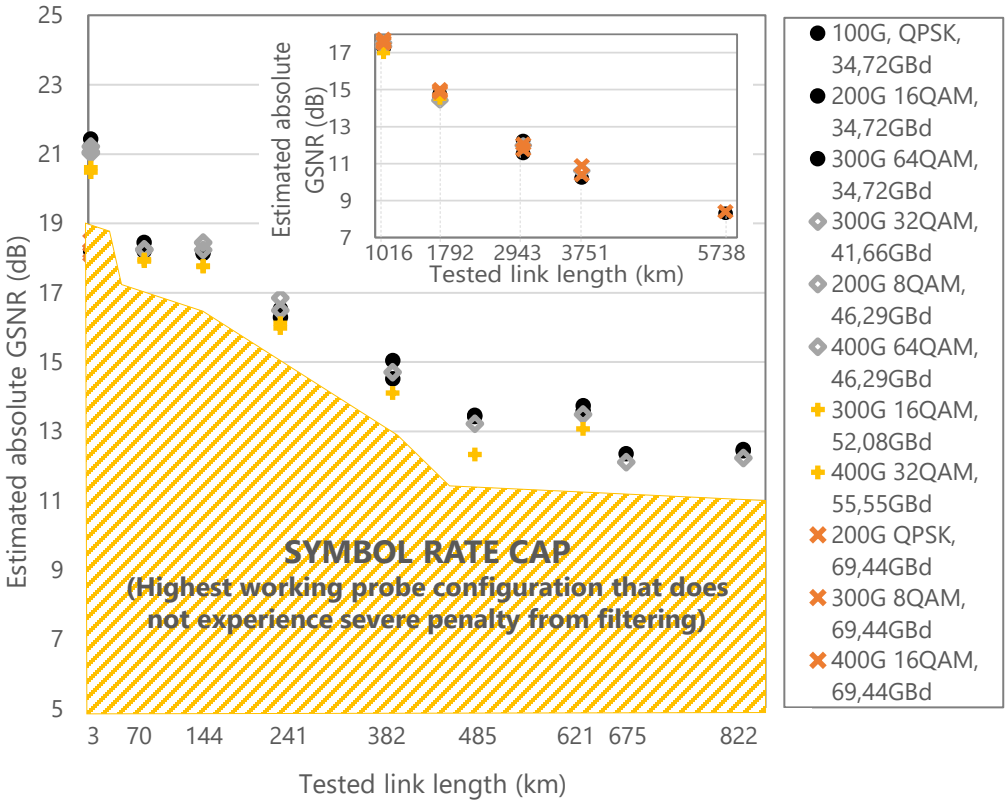
Extended channel probing



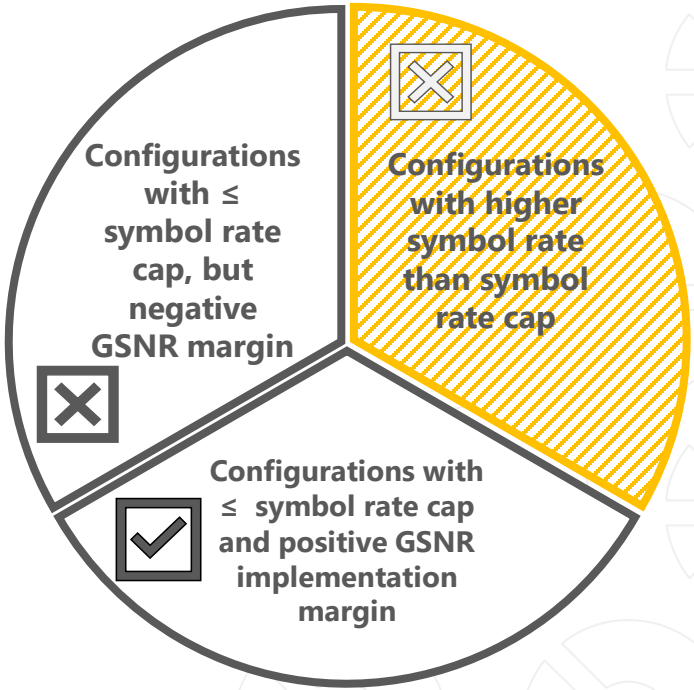
Introducing multiple probes with different symbol rates, would allow to:

- ✓ Eliminate estimation errors caused by the fast performance changes in the network
- ✓ Better estimate the maximum achievable performance in advent of filtering penalty
- ✓ Detect the channel operation regime by comparing results from constant power spectral density probing to constant signal power probing
- ✓ Pave the way to continuous probing capabilities, where channel G(O)SNR is continuously estimated based on the performance of the current transponder configuration

Extended channel probing results

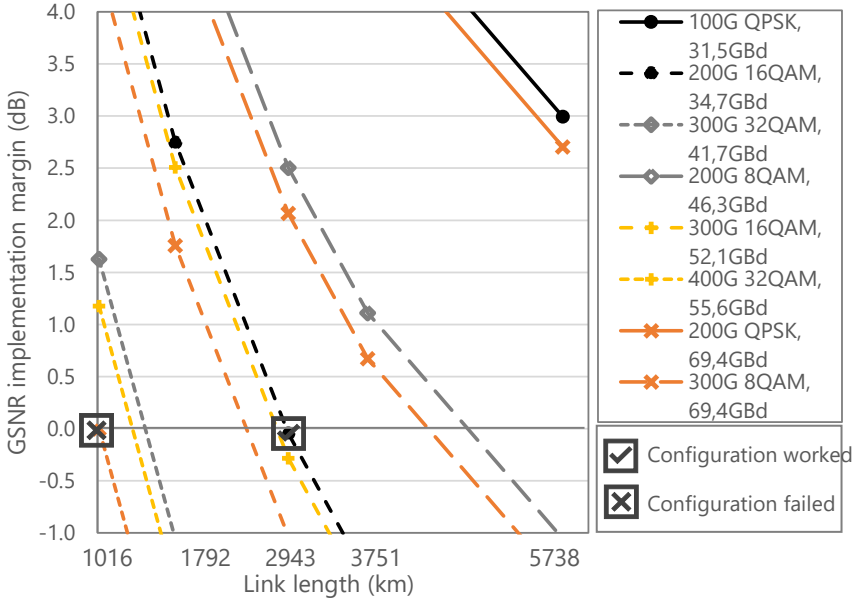


POOL OF POSSIBLE TRANSPONDER CONFIGURATIONS

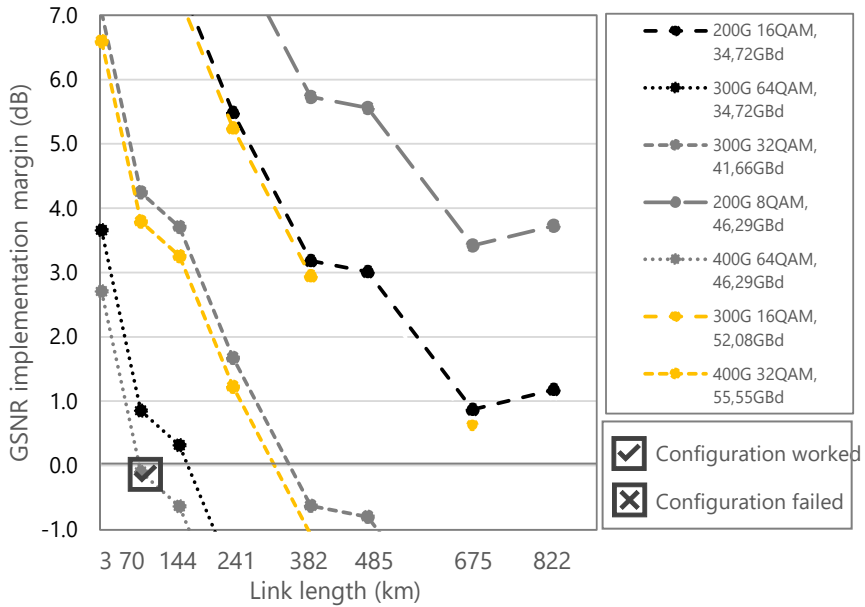


Implementation margin estimation accuracy

Long-haul Coherent optimized network

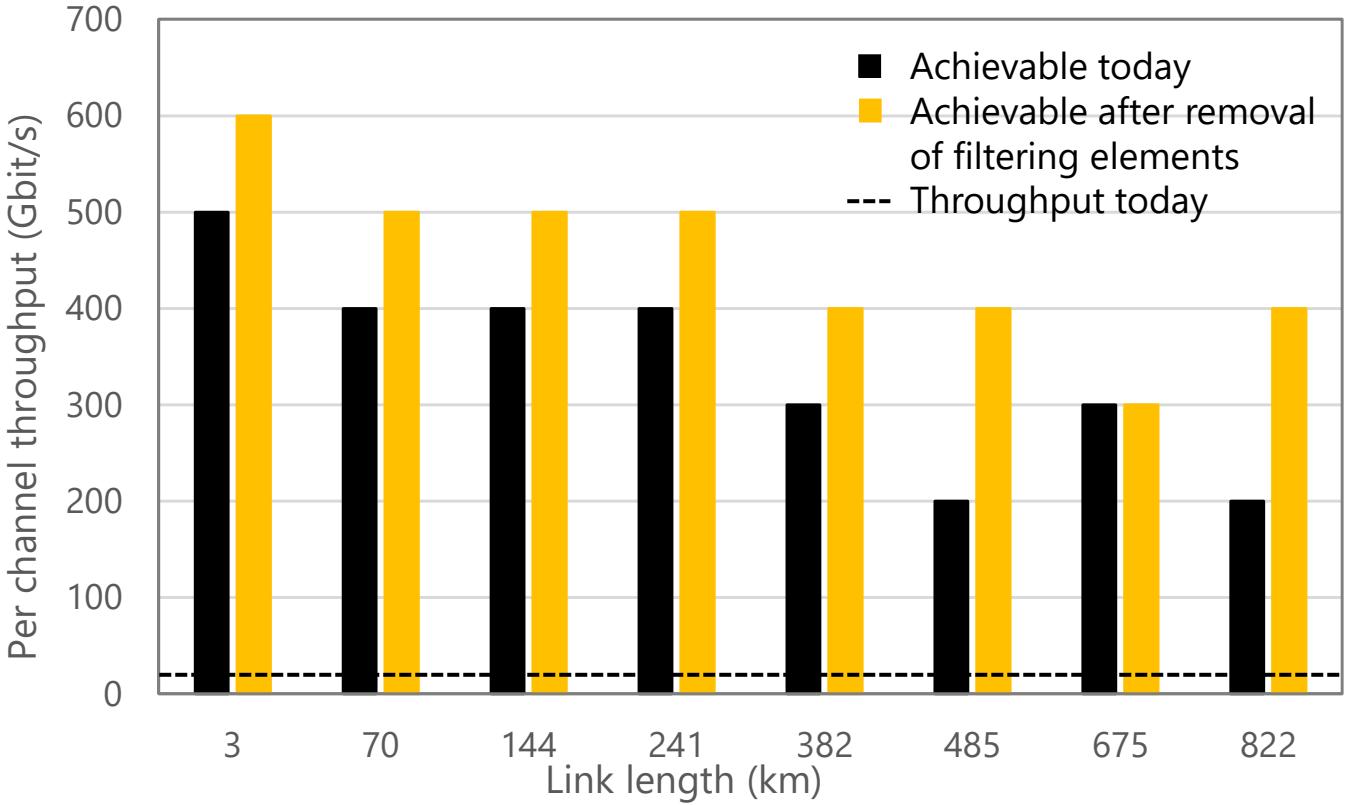


Regional-haul DCM-based network

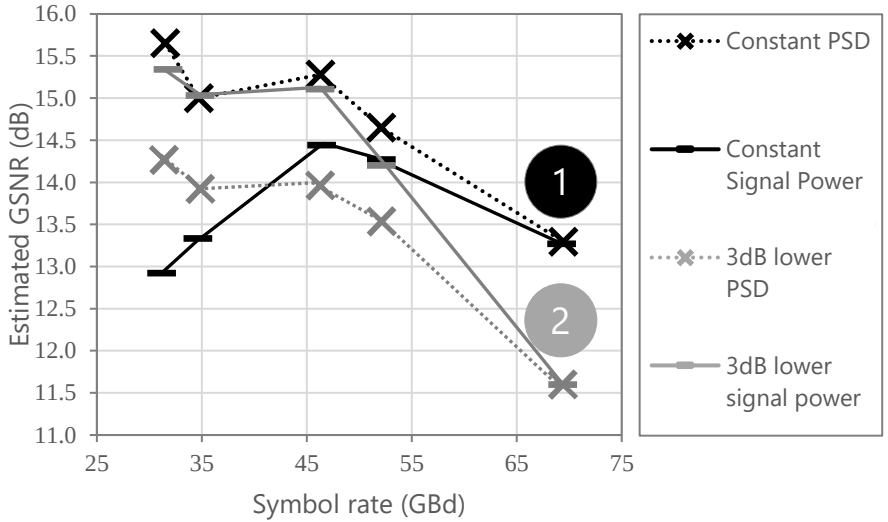


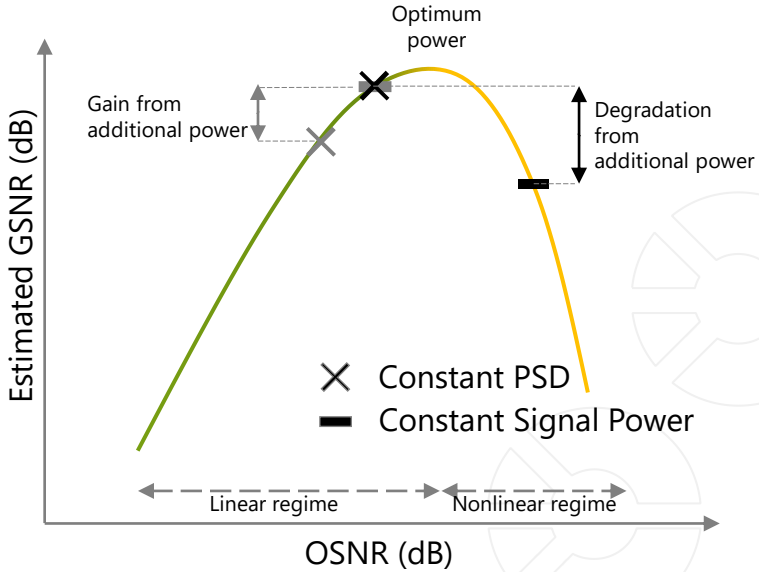
Estimation accuracy better than ±0.1dB in GSNR implementation margin achieved for all network scenarios

Potential throughput increase



Operation regime estimations





Useful tool for channel pre-emphasis and margin adjustment

Conclusions

Extended channel probing:

- Quick and cost-efficient approach for link performance estimations
- Provides accurate GSNR implementation margin estimations for all lightpaths, including ones experiencing filtering penalty
- Allows evaluation of possible gains from decommissioning the filtering elements from the network and detect signal operation regime

Future work directions:

- Extend the method to cover wider spectrum
- Develop algorithms for continuous channel probing

Thank you

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