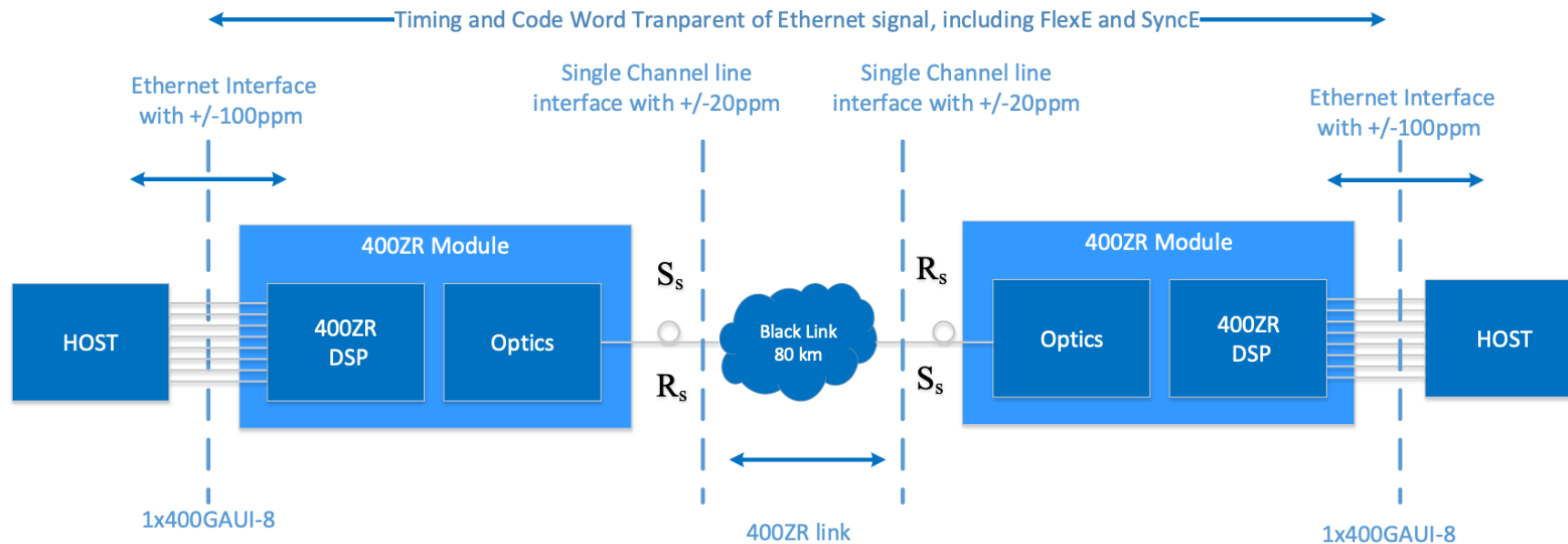# 400ZR+ Interoperability Demo
ECOC 2023

What is 400ZR?

- 400ZR is an interoperable, cost-effective, 400Gb/s interface based on single-carrier coherent DP-16QAM modulation, low power DSP supporting absolute (Non-Differential) phase encoding/decoding, and a Concatenated FEC (C-FEC) with a post-FEC error floor <1.0E-15.

- 400ZR operates as a 400GBASE-R PHY.

What is 400ZR+?

- 400ZR+ is a generic term for "more capable than 400ZR" and is not standardized across the ecosystem.

- OpenZR+ MSA is the product of an MSA designed to address extended reaches, including flexible Ethernet rates and modulation types.

- OpenROADM is the product of the Open ROADM MSA and supports both Ethernet and OTN traffic. Since it is similar, we've included it in our demo.

# 400ZR Single Span Network
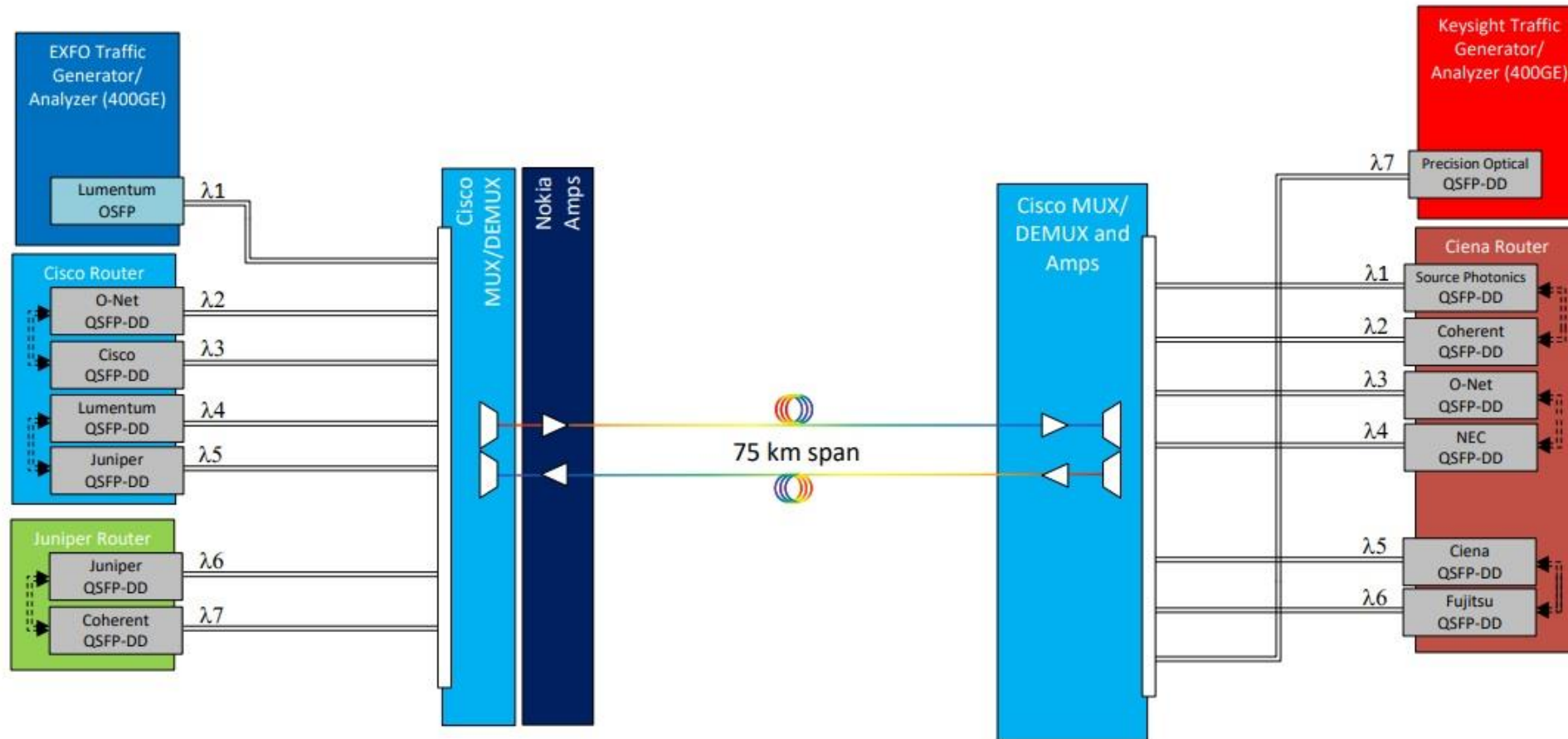
Multi-Span Network
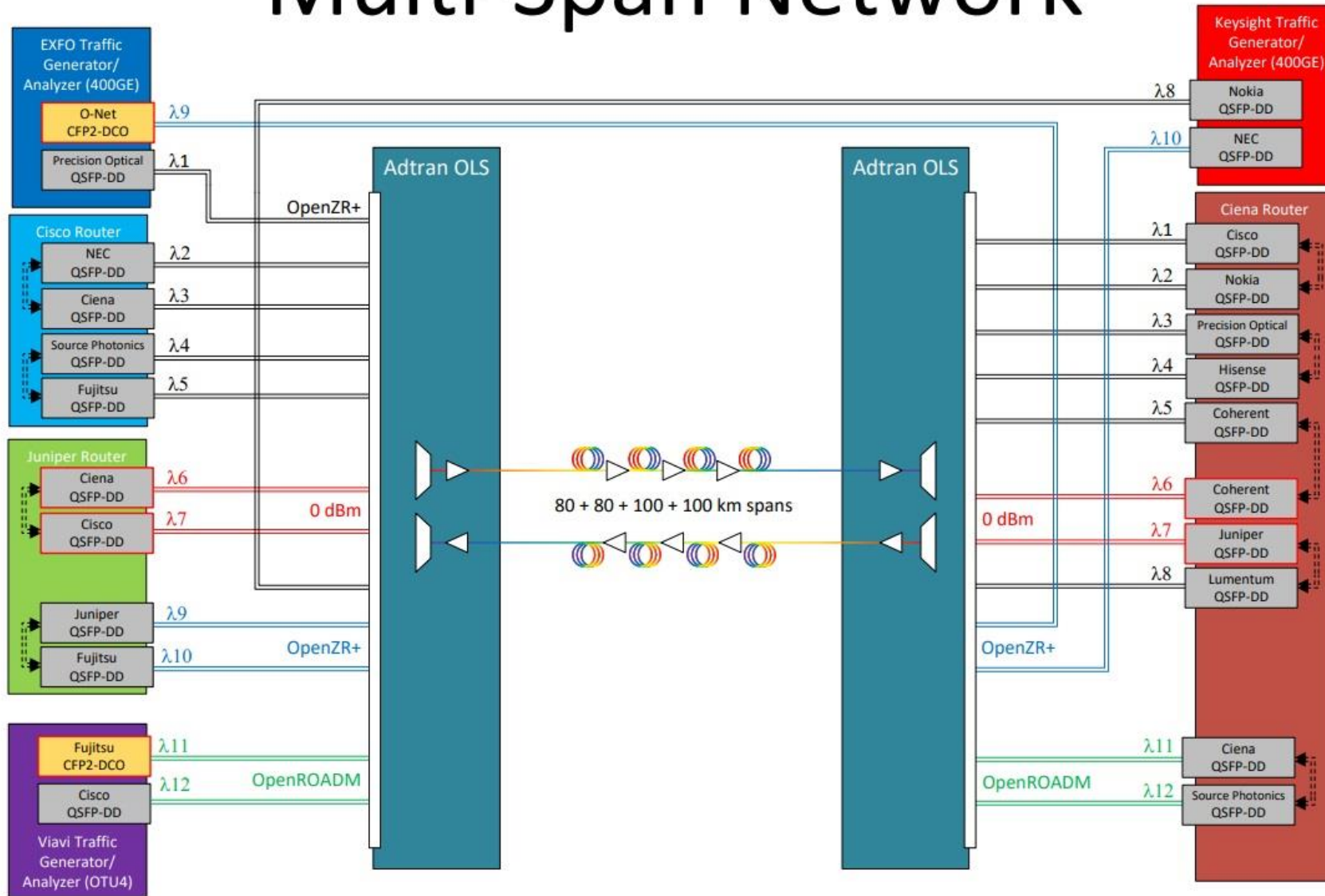
OIF Interop Demos

- OFC 2022 – 8 module vendors
  - 14 modules in demo

- ECOC 2022 – 8 module vendors
  - 22 modules in demo
  - White Paper: OIF 400ZR Interoperability ECOC 2022 Plugfest (November 2022)

- OFC 2023 – 13 module vendors
  - 28 modules in demo
  - White Paper: OIF 400ZR Interoperability OFC 2023 Plugfest (February 2023)

- ECOC 2023 – 12 module vendors
  - 400ZR, OpenZR+ (-10 dBm and 0 dBm), OpenROADM
  - 34 modules in demo
  - White Paper: ECOC 2023 OpenZR+ Interoperability Plugfest (October 2023)

OpenZR+ Interoperability Plugfest rOSNR Results

EXFO OSA		Tx									
		Vendor A	Vendor B	Vendor C	Vendor D	Vendor E	Vendor F	Vendor G	Vendor H	Vendor I	Vendor J
Rx	A	20.8	20.9	20.7	21.5	21.6	21.5	22.1	21.5	21.3	21.2
	B	20.9	20.9	20.7	21.4	21.6	21.5	22.1	21.6	*	21.3
	C	21.9	*	21.5	22.6	22.5	22.2	22.0	22.5	23.0	24.6
	D	21.5	21.5	21.3	21.8	22.0	21.8	22.0	22.0	22.3	24.1
	E	21.3	21.2	21.0	21.9	21.8	21.7	21.9	21.8	22.2	24.0
	F	21.9	21.8	21.4	22.8	22.6	21.9	22.6	22.1	22.8	25.4
	G	21.5	21.4	21.0	21.9	21.9	21.6	22.0	21.8	22.3	24.3
	H	21.9	21.7	21.4	22.8	22.6	22.1	22.5	22.0	23.3	25.1
	I	21.9	*	21.6	23.2	23.7	22.5	23.3	22.4	22.2	21.9
	J	22.5	22.4	22.2	24.0	24.2	23.0	24.1	23.1	22.7	22.7
EVM (%rms, OIF, no-noise, 7 tap, 1000 pts)		12.0	11.3	*	*	18.9*	11.6	12.5	11.3	11.9	17.6*

*While the Vendor B results indicate multiple failed links, these pairings were investigated and successfully interoperated since the Plugfest.

EVM for C and D was not measured. EVM for E and J was measured erroneously. OIF plans to revise these results once we have updated measurements.

rOSNR: Compare with Loopback rOSNR
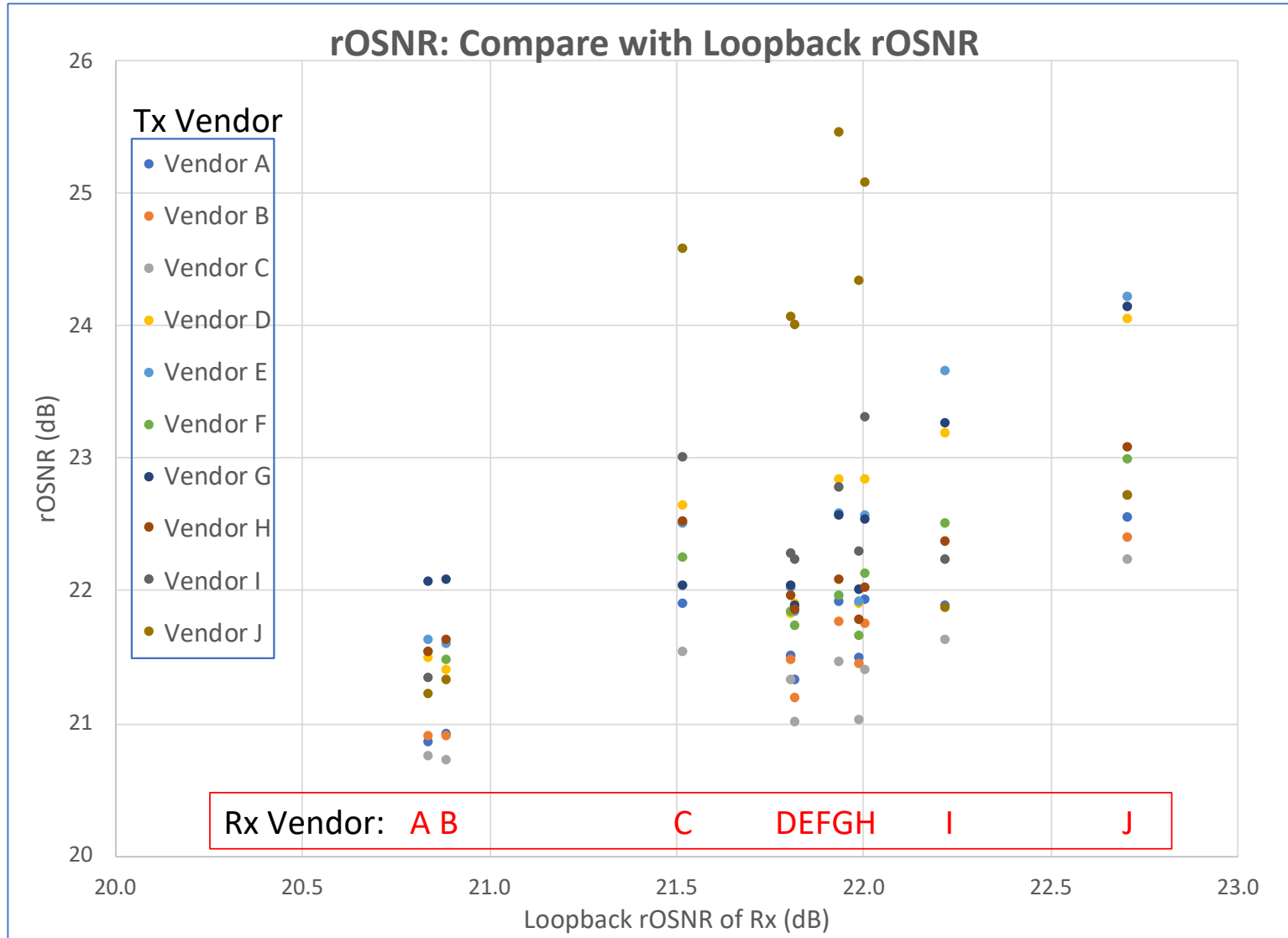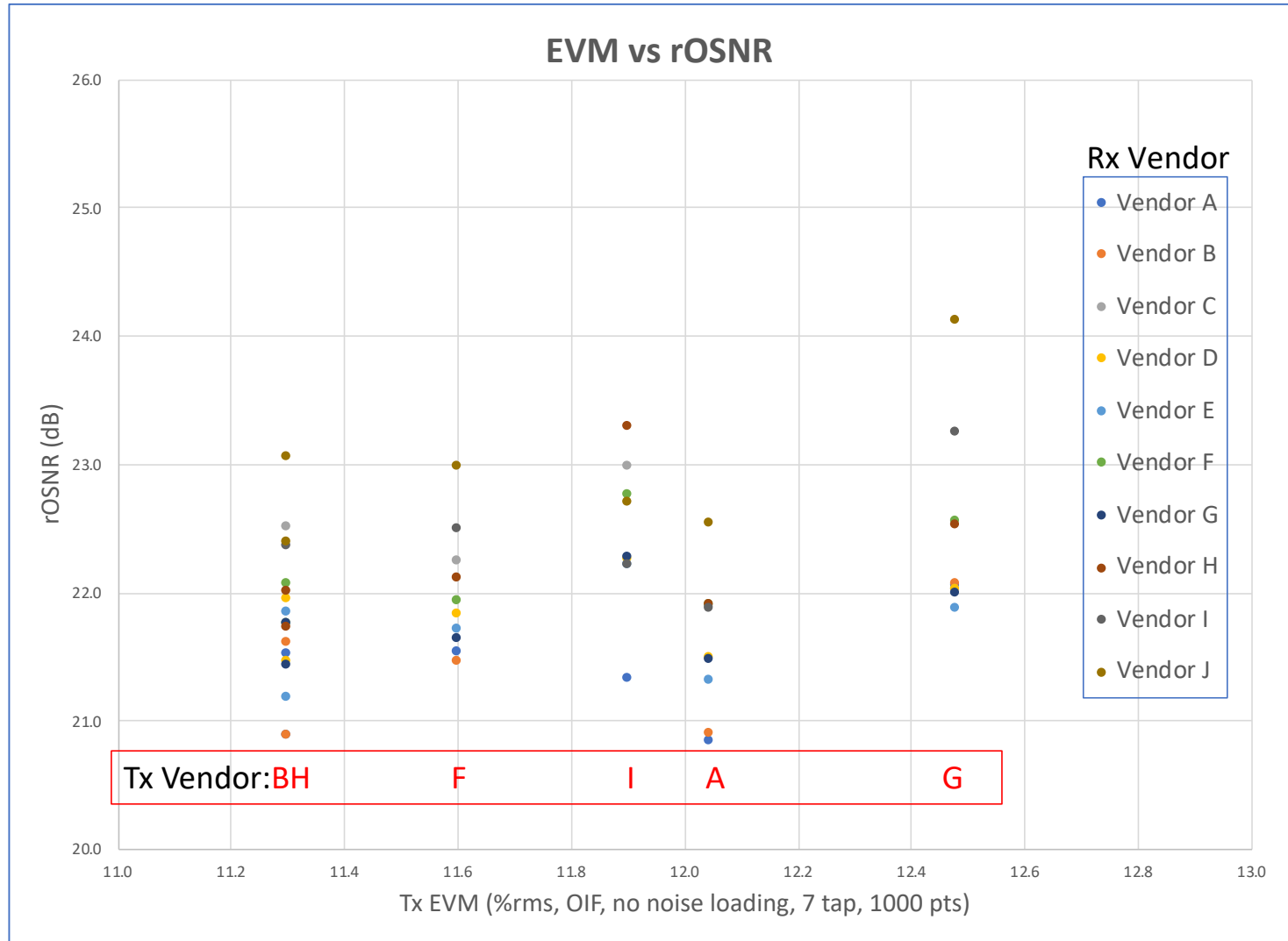
*Tx results for Vendors C, D, E, and J are omitted. EVM for C and D was not measured. EVM for E and J was measured erroneously. OIF plans to revise these results once we have updated measurements.

Special thanks to LightRiver for hosting the Plugfest and Telefonica for hosting the Dry Run of the ECOC demo.

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