



Creating Infinite
Possibilities.

Preparing the Outside Plant Network for the road to 10G

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Introduction

- Multiple paths to the same destination
- If amplifiers are involved, there could be some shared “pot-holes”
- Lessons learned from the activation of expanded spectrum



Methodologies

Higher or Wider?

FDX or FDD

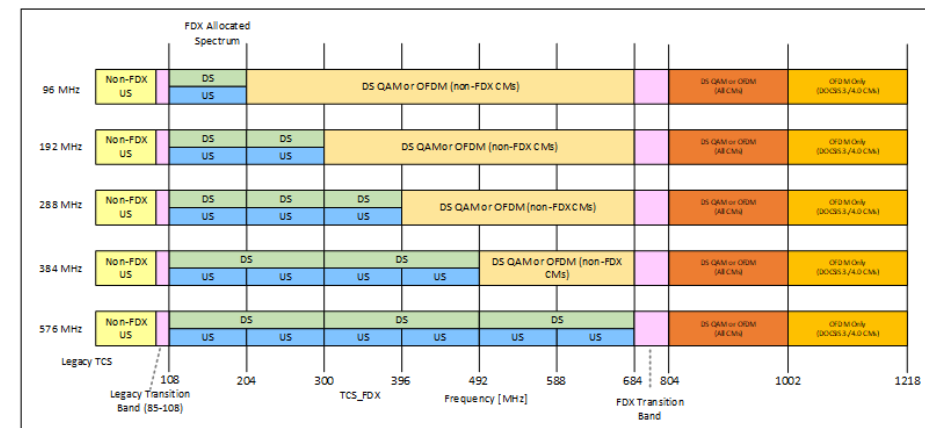
Higher Modulation Orders

Wider Bandwidth

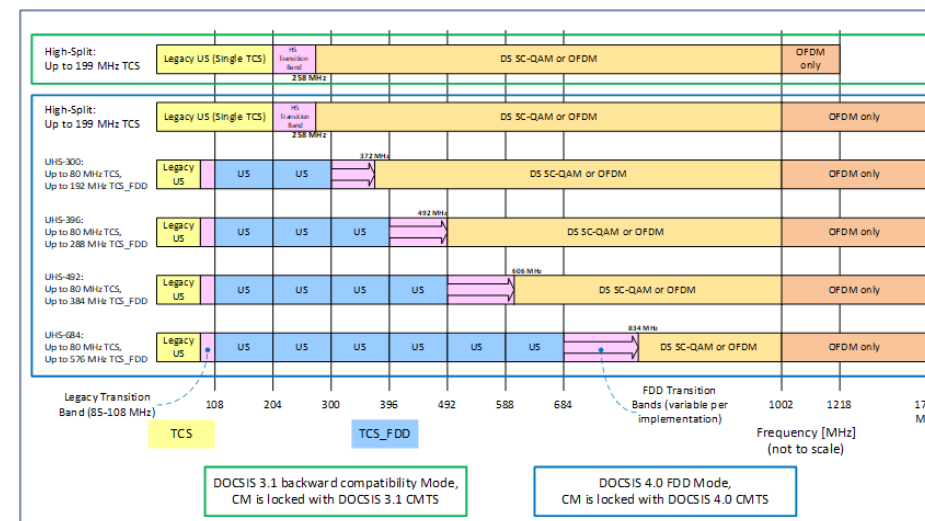
Both?

	Modulation Order	OFDM	OFDMA
Constellation minimum SNR/MER Performance of OFDM and OFDMA carriers	64-QAM	N/A	23dB
	128-QAM	N/A	26dB
	256-QAM	27dB	29dB
	512-QAM	30.5dB	32.5dB
	1024-QAM	34dB	35.5dB
	2048-QAM	37dB	39dB
	4096-QAM	41dB	43dB

Configurable FDX Allocated Spectrum Bandwidths



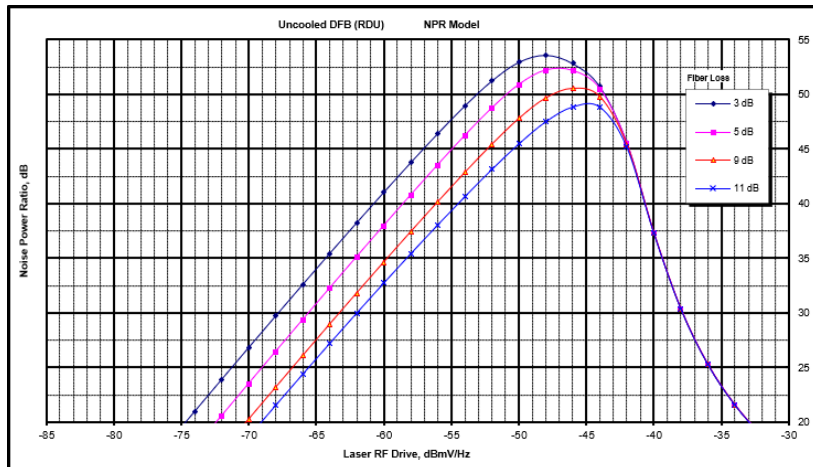
Configurable FDD Allocated Spectrum Bandwidths



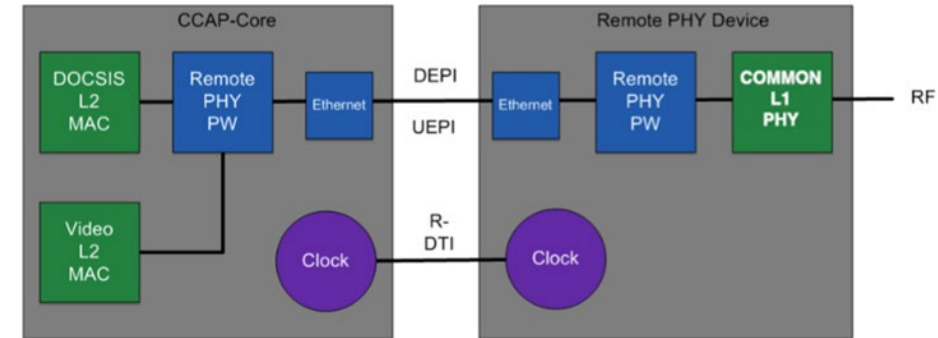
Optical Architectures and Capabilities

- Analog or digital optics vs.
- R-Phy or MAC-Phy

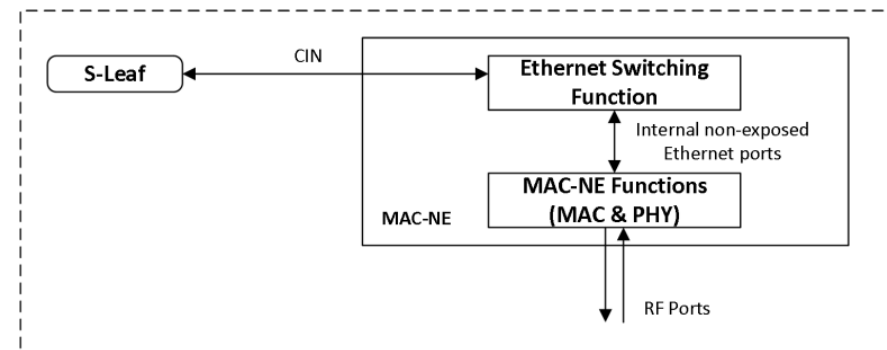
Analog DFB Laser NPR Curve



R-PHY Internal and External Connections

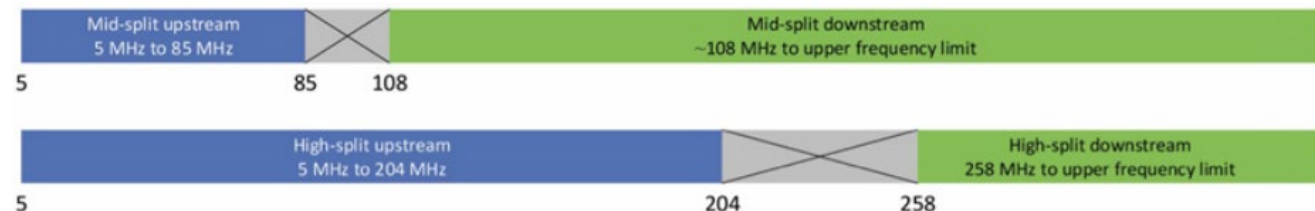
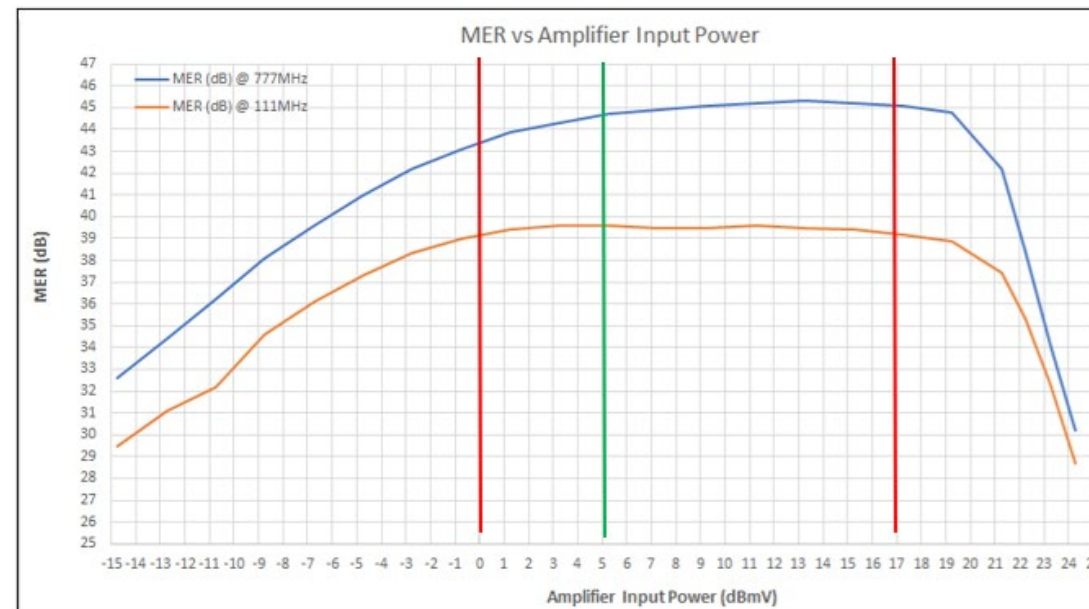
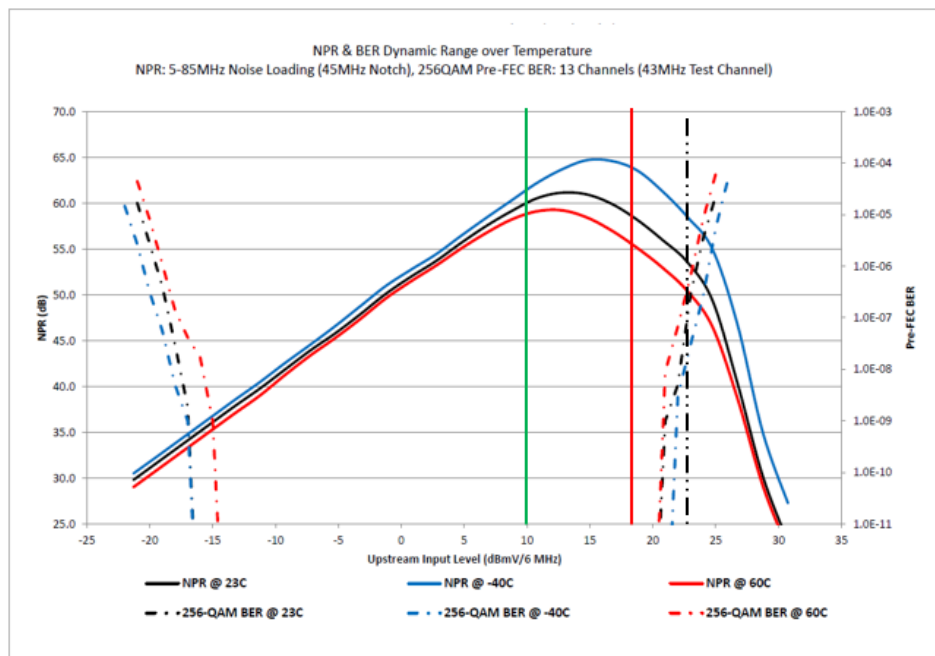


MAC – Network Element Internal and External Connections



RF Architecture Characterization

- Amplifier and BW selection
- Amplifier Characterization
- Legacy Plant Evaluation

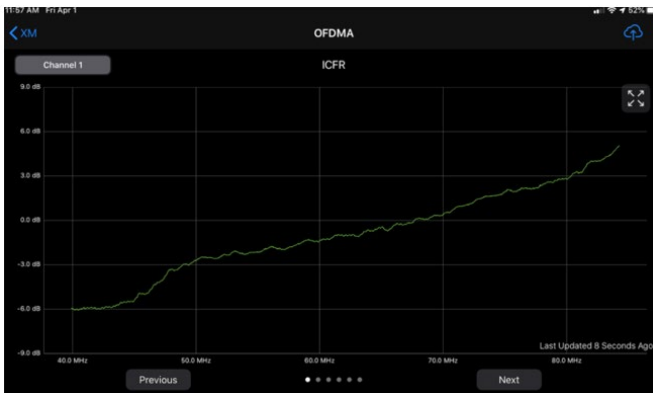


Evaluating Legacy Plant

Active and Passive Obstacles

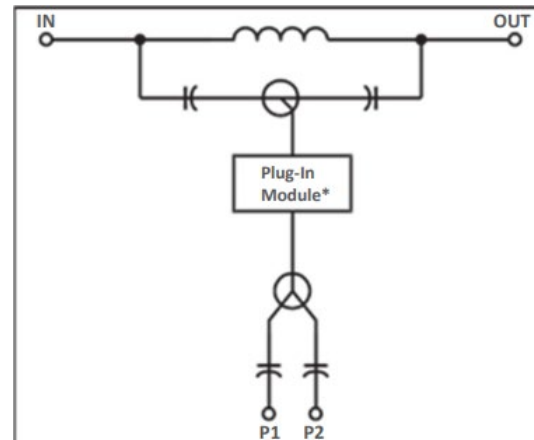
Active Devices

- “Temporary” amplifier placements
 - May not be in design files or maps
- Sub-Split Components in Mid or High Split amplifiers



Passive Devices

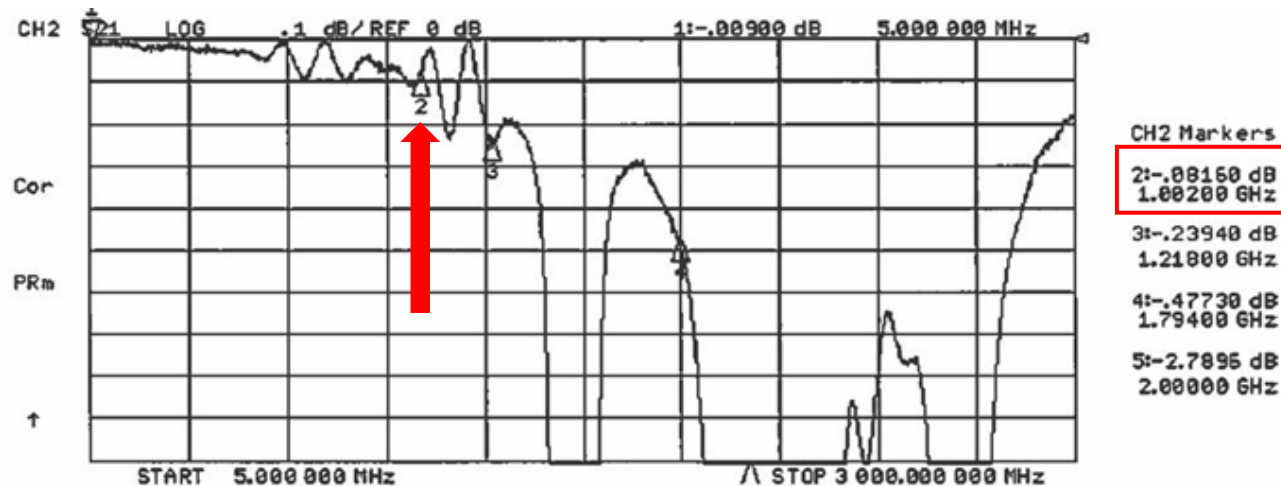
- Line Equalizers
- Conditioned Taps
 - Both may contain duplexers for upstream conditioning



Evaluating Legacy Plant

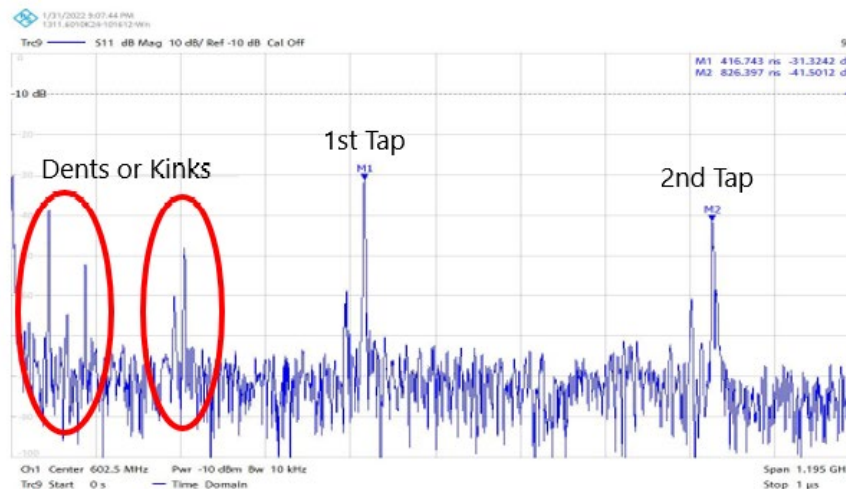
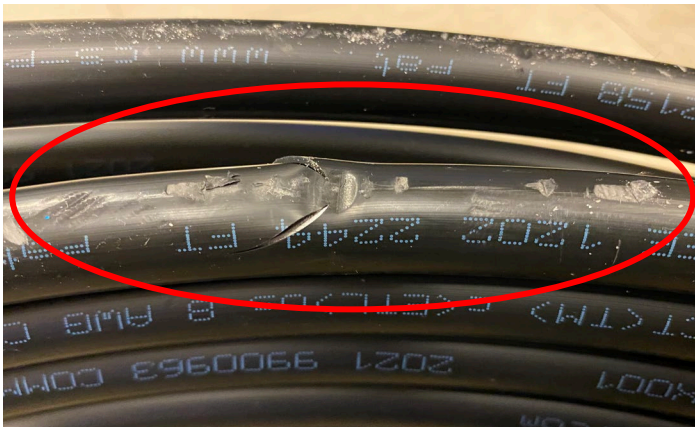
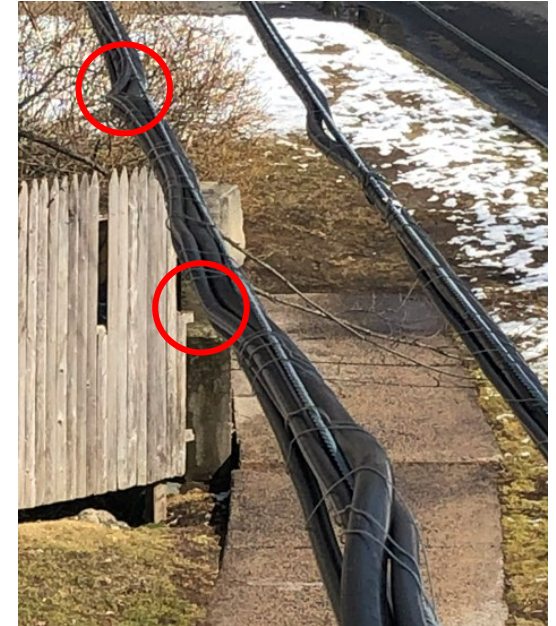
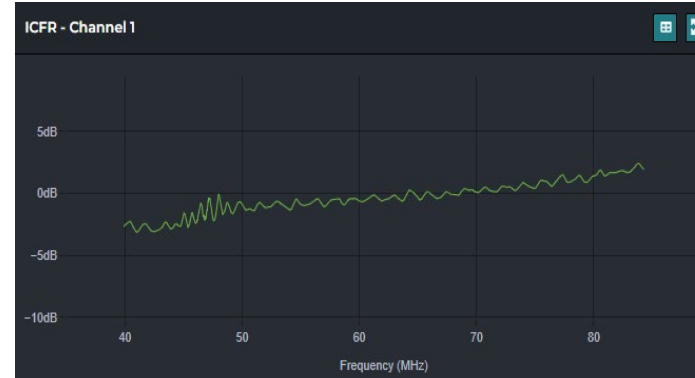
Coaxial Cable and Connectors

- Fused Disc cables with “mold spike” beyond 1 GHz
- Hardline connectors may not be “tuned” to higher frequencies



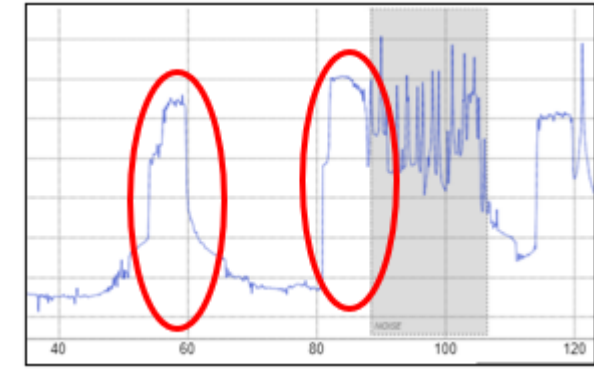
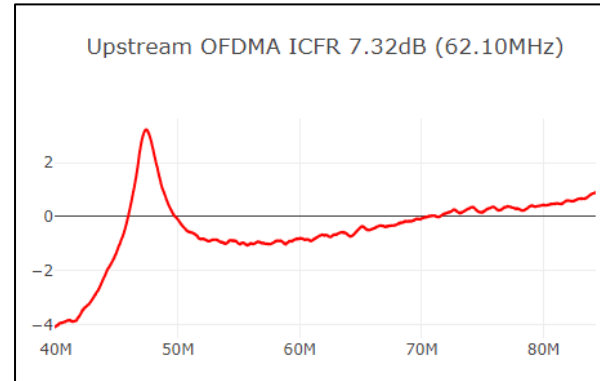
Craft Sensitivity

- Coaxial Cable Management
- Component Frequency Response
 - Extended Frequency Tuning
 - Fused Disc Cable
- Frequency Specific Testing



PNM Tools

- OFDMA/OFDM analysis
- FBC
- Thresholds



Device Health															
Registration State	6 (Online)														
Down Rx Power	5.2	5.2	5.2	5.4	5.5	5.7	5.8	6	6	6.1	6.2	6.1	6.1	6	6
Downstream SNR	35.5	35.4	35.5	35.5	35.5	35.5	35.6	35.6	35.7	35.3	35.8	35.8	35.8	35.7	35.7



Additional Considerations

Parallel Efforts

- Behavioral Identification
- Training
- Test Equipment





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Thank You!

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