

EFM Cu Evaluation Proposal

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EFM Cu Status in Brief

- Agreements for things above α/β -interface reached in St. Louis
 - Three PMD alternatives were proposed
 - CAP/QAM
 - DMT
 - PAM
- } Cu sub-track narrowed choice to these two
- No easy way to meld them into a “compromise”
 - *So 802.3ah needs to pick one*

PMD Selection Process

- 802.3ah agrees on specific evaluation methods to verify compliance with Objectives
- 802.3ah generates any test plans, etc. needed
- Set deadline for nomination of proposals that satisfy ratified Objectives
- Proposals undergo evaluation process; results presented a subsequent meeting(s)
- Result is set of candidate(s) that meet Objectives

Evaluation Method

- Compliance with spectral compatibility objective have often been demonstrated via analysis and simulation
- Rate/Reach Compliance verification may be done via third-party testing, verifiable test results, etc.
- Timeframe TBD

Evaluation Criteria

- **Keep it simple!**
 - Just enough to ensure compliance with ratified Objectives and essential characteristics
 - **No Heroics:** Reasonable, Industry-accepted performance standards

Spectral Compatibility Objective

- **North America**
 - **Demonstrate compliance with T1.417**
 - Doesn't matter how
 - Use snapshot of T1.417 Issue 2 draft
- **Europe / ROW**
 - No T1.417 equivalent yet exists
 - So, demonstrate compliance with Plan 997
- **Must be compliant while in data mode**

Rate/Reach Criteria

- **Demonstrate compliance with Objective**
 - operation at 10 Mbps duplex;
 - @750m
- **That's it!**
- Other rates/reaches outside of EFM-Cu scope

Rate/Reach Criteria (*cont'd*)

- Noise Model - Is there one which:
 - Covers this rate/reach range,
 - Is an approved standard,
 - Developed by an ANSI-accredited, consensus-based group?
- **Yes!**
 - T1.424
 - Part 1, § 12 defines test conditions and methods

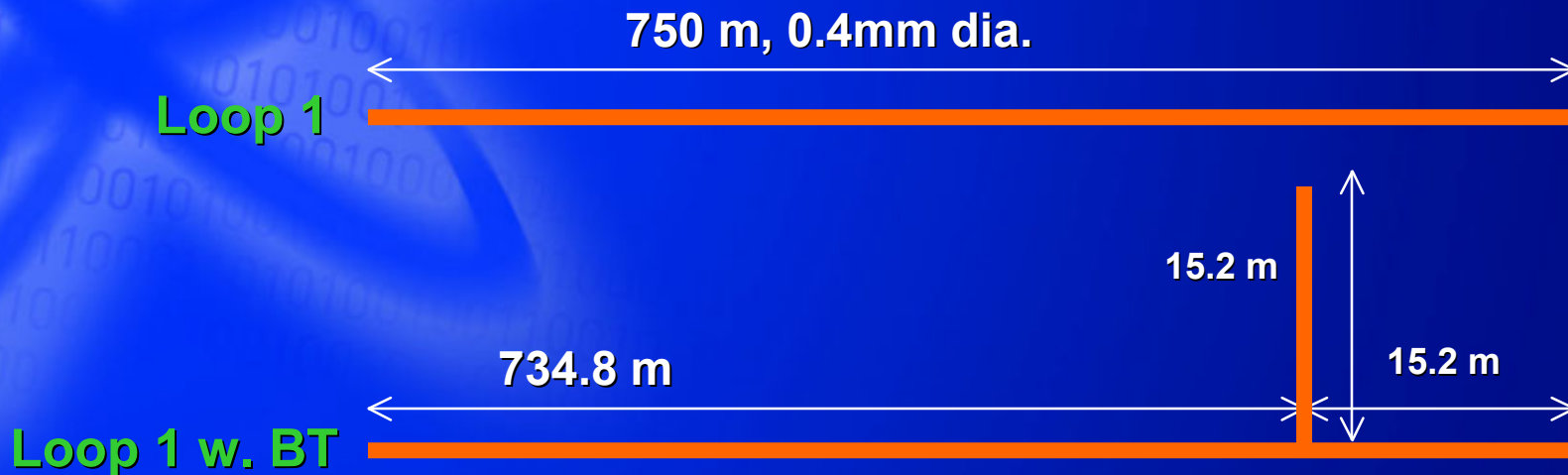
Rate Reach Test Summary

- 10 Mbps tests from Table 12.9 / T1.424 Part 1

Test name	Loop no.	Downstream rate	Upstream rate	Noise(s)
1.4 Symmetric 10/10	Loop 1, x = 750m, TP1 (0.4m)	10 Mbps	10 Mbps	AWGN 20 self- disturbers
2.4 Symmetric 10/10	Loop 1, x = 750m, TP1 (0.4m)	10 Mbps	10 Mbps	AWGN, RFI 20 self- disturbers
3.4 Symmetric 10/10	Loop 1, x = 750m, TP1 (0.4m)	10 Mbps	10 Mbps	AWGN Noise A 20 self- disturbers
4.4 Symmetric 10/10	Loop 1, x = 750m, TP1 (0.4m) With 50 ft BT, CPE	10 Mbps	10 Mbps	AWGN 20 self- disturbers

Test Loops

- Seven Loops (+ null calibration loop) are defined
- But tests are only defined for Loop 1
 - With and without a Bridge Tap
 - Use of others in T1.424 'for further study'

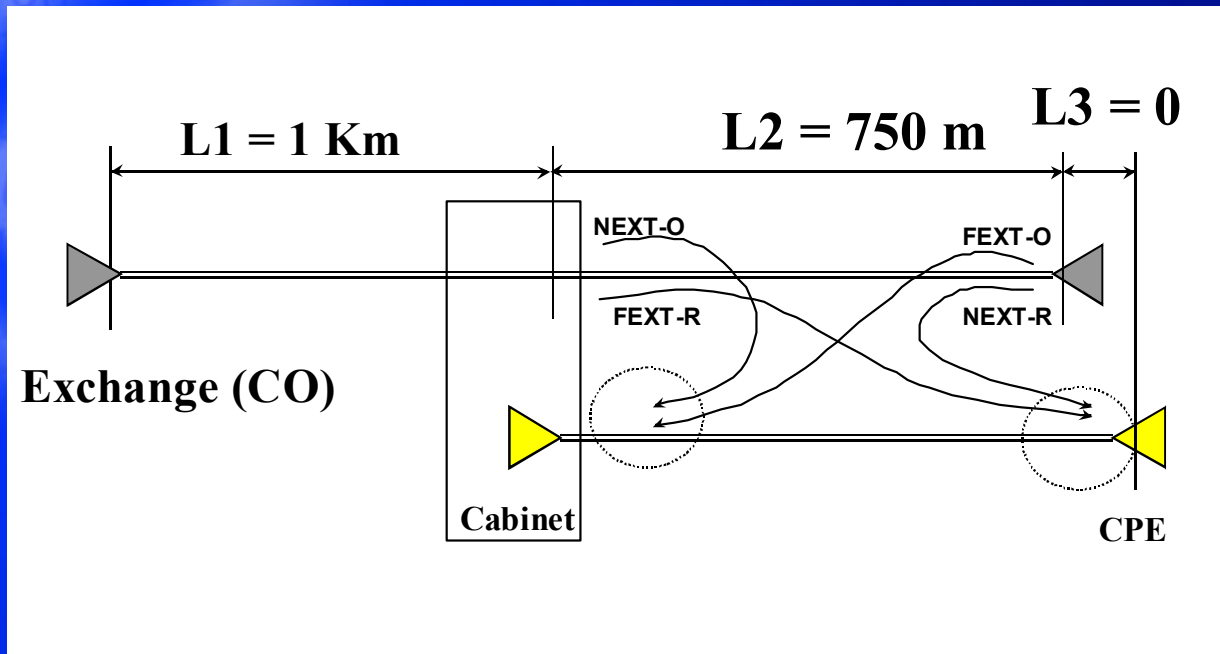


T1.424 Noise Model

- Already agreed to by QAM and DMT proponents in T1E1.4
- Use a subset relevant to EFM Objectives
 - Type A (FTTC) model
 - Loop length of 750m, 0.4 mm wire
 - 10 Mbps symmetric tests from Table 12.9 / T1.424 Part 1
 - Model 2 (worst-case) AM radio noise
 - Ham radio ingress as defined in § 12.2.3.2
 - AWGN = -140 dBm/Hz

Type A Noise Model

- Type A (FTTC) model is most appropriate
 - 20 self-disturbers
 - Alien disturbers from Exchange 1 Km upstream
 - 10 ADSL + 16 ISDN-BA + 4 HDSL



POTS Overlay

- Not an Objective, but assumed by many
- Should it be a requirement?
 - Could be needed for “Broad Market Potential” criterion
 - Meet objectives without using 0-25KHz
 - Does not rule out optional use of POTS band

Wrap up

- 802.3ah should agree to choose a PHY itself
 - Rather than waiting for another group to choose
- T1.417 compliance + Plan 997 is sufficient to comply with spectral compatibility Objective
- Use appropriate T1.424 subset to judge compliance with Rate/Reach Objective
- Ask proponents to demonstrate compliance via these criteria

Other Criteria

- No explicit objective for these,
- Not expected to be differentiators,
- But need to be accommodated by final PHY specification:
 - Impulse Noise Tolerance
 - Egress Control
 - Operation on shorter loops
 - Upstream Power Backoff
 - Device Power Dissipation

Impulse Noise Tolerance

- Verifies FEC / interleaver
- Applied as defined in T1.424 § 12.2.2
- Immunity levels specified in § 9.3 / G.993.1:
 - Tolerate 250 μ sec. burst with 10 msec. Interleaver delay,
 - And 500 μ sec. burst with 20 msec. delay

Egress Control

- PHY shall have capability to reduce PSD level HAM band(s) below -80 dBm/Hz
- See § 6.2.4 / G.993.1
- Not applied during rate/reach testing

Operation on Shorter Loops

- Final PHY compliance spec. should verify operation at shorter loops as well
- Ensures specific implementations have OK dynamic range

Upstream Power Backoff

- Capability Test Defined in T1.424 § 12.3.2
- Not applied during rate/reach testing

Device Power Dissipation

- Reasonable level needed for “Broad Market Potential”
- Specifics TBD
- Technology candidates shall have ability to meet this level