

Cable and cabling capabilities to suppress common mode noise

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Agenda

- Problem description
- Cable capabilities to suppress common mode noise
- Cabling capabilities to suppress common mode noise
- Summary
- Discussion

Problem description

In beruto_3da_20221114_emc_noise_margin on slide 7 we find:

Model	Max CWA at CORR > 0.65	
75 m, 30 node, uncompensated, Min TX	100 mV _{p-p}	-12 dB SNR !
75 m, 30 node, compensated, Typical TX	300 mV _{p-p}	-2.5 dB SNR !

How do we get 12dB additional margin for mode conversion? In 802.3cg we define 43 dB in band (1 MHz to 20 MHz). Therefore, we need at least 55dB.

Problem description

In the same presentation on slide 14 we find:

- Ideally, we need to be at least 12 dB better
- Use of shielded cables could be a solution

QUESTION for cables/connectors manufacturers:

What can we reasonably mandate as minimum MC?

Cable capabilities to suppress common mode noise

IEC 61156-11/-13 LFCA (0.1-20/30 MHz) and CA(>30 MHz); For MICE E3 at least Type Ib is required):

Type II: $55-10 \cdot \log(f/30)$, 70 dB max. → This would just meet the 55dB requirement for E1 (on the edge)

Type Ib: $70-10 \cdot \log(f/30)$, 85 dB max. → This would meet the requirements for E3, but...

Type I: $85-10 \cdot \log(f/30)$, 100 dB max.

Link capabilities to suppress common mode noise

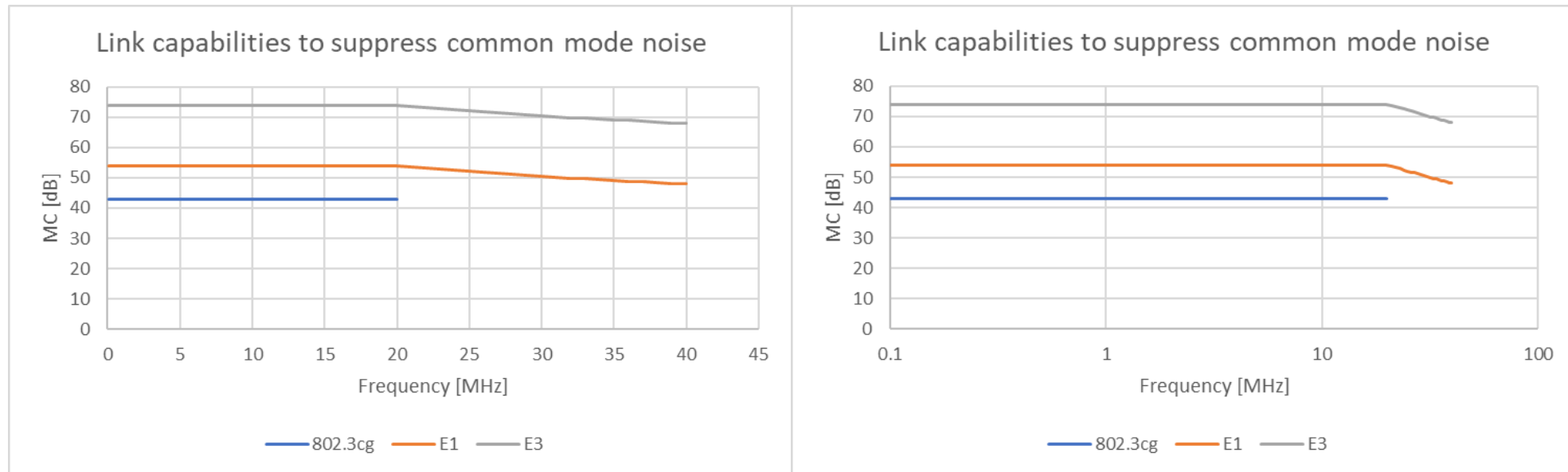
ISO/IEC 11801-1 AMD 1 (JTC1-SC25/3126/CD) defines in clause 6.6.3.8.4:

Class	Frequency MHz	Environmental classification		
		E ₁	E ₂	E ₃
		Minimum coupling attenuation dB		
T1-A	$0,1 \leq f \leq 20$	54	64	74
T1-C	$0,1 \leq f < 20$	54	64	74
	$20 \leq f \leq 600$	$80 - 20 \lg(f)$	$90 - 20 \lg(f)$	$100 - 20 \lg(f)$

Sufficient for 12dB SNR improvement?

Additional margin for E3 environment

Summary



Common mode suppression for links E1 and E3

...but the final solution could be a mix of PSD / MC changes, depending on the PHY relative cost / power consumption.

Discussion

This presentation is answering: What can reasonably be achieved?

This presentation can give guidance about:

What's the trade off between costs and performance?

- Frequency range is not a price driver in this low range
- To achieve E1 level an AI-foil is sufficient, for E3 a thin braid

Backup information

IEEE 802.3 already references and specifies IEC coupling attenuation test procedures; e.g., IEC 62153-4-7 using the triaxial test fixture.

Coupling attenuation requirements prior to SPE, BASE-T PHYs relied on a form of coupling attenuation for unshielded cabling to assure common-mode noise rejection; the injection clamp method of 1000BASE-T was updated for 25G/40GBASE-T.

Backup information

SPE PHYs adopted IEC coupling attenuation test procedures:

- 1000BASE-T1 Type-B, references IEC 62153-4-14.
- 10BASE-T1L, includes low-frequency coupling attenuation requirements.
- MultiGBASE-T1, IEC 62153-4-7, using the triaxial test fixture.