Observations of ERL Analysis

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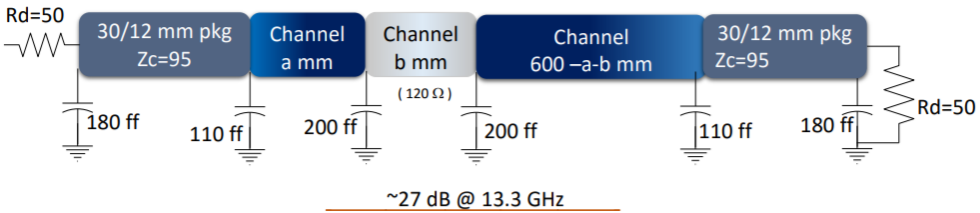
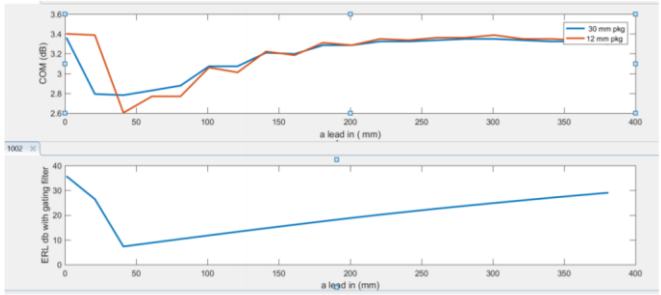
P802.3cd - 12/20 Ad Hoc call

Justification for ERL

- SNR_ISI measurement difficulty
- Possible “false positives” due to package interaction
  - http://www.ieee802.org/3/cd/public/Mar17/hidaka_3cd_01a_0317.pdf
  - http://www.ieee802.org/3/cd/public/May17/hidaka_3cd_01a_0517.pdf
- Latest ERL Analysis - http://www.ieee802.org/3/cd/public/Nov17/mellitz_3cd_01b_1117.pdf



Plot COM, ERL11 gated vs lead in (a) for b=10 mm and package length = 12 mm and 30 mm



Package Model in COM

- “Each signal path in the channel is augmented to **reflect the likely influence** of transmitter and receiver device packages.” *- 802.3-2015 standard - 93A.1.2 Transmitter and receiver device package models*
- Developed as a reference model
- Not a limit line, but designed to incorporate the imperfections of a package and represent the general impact as it interacts with the channel.
  - 2 model lengths
  - Loss equation
  - Modeled capacitance

… we've transitioned from using it as a ***reference model*** to "accepting" this model as a ***nominal package*.**

WAS THIS THE INTENTION??

Package Variations Used as Justification

The current draft references 95ohm operation (channel & package) with 50ohm termination.

Taking the reference package (which is already supposed to cover the majority of reasonable packages… is now varied:

- Zc: 85-105 ohms (+/- 10%)
- Rd: 35-65 ohm (+/- 30%)
- Cd: 0.3-2.7 pF (+/- 75%)
- Zp: 10-40mm (up from 12 & 30 mm)

COM package parameter variations

(Syntax from IEEE Std 802.3-2015 93A.1)

Zc (Ω)	Rd (Ω)	Rd (Ω)	Cd (pF)	Cd (pF)	Cd (pF)	Cd (pF)	Zp (mm)	Zp (mm)
85	35	50	0.9	0.9	0.3	0.3	40	40
105	35	65	0.9	1.8	1.8	0.3	40	40
85	65	65	2.7	2.7	1.8	1.8	40	40
105	65	35	0.9	2.7	1.8	1.8	40	10
105	35	35	2.7	2.7	0.3	1.8	25	10
85	35	65	2.7	2.7	1.8	0.3	10	40
105	65	35	2.7	0.9	1.05	1.8	10	25
105	35	65	0.9	0.9	0.3	1.8	10	10
85	65	65	2.7	0.9	1.05	1.8	25	10
85	65	65	0.9	0.9	1.8	1.8	10	40
85	35	35	2.7	0.9	1.8	1.8	10	40
105	65	65	0.9	2.7	0.3	0.3	10	40
85	35	35	0.9	2.7	0.3	1.8	40	10
95	35	35	2.7	2.7	1.8	0.3	40	40
105	65	35	0.9	2.7	1.8	0.3	10	40
105	65	50	2.7	0.9	1.8	1.8	40	40
85	65	35	0.9	2.7	0.3	0.3	40	25
85	65	50	2.7	2.7	0.3	0.3	10	10
105	35	65	2.7	0.9	0.3	1.8	40	40
85	65	65	0.9	0.9	0.3	1.8	40	40
85	35	35	2.7	0.9	0.3	1.8	10	10
85	35	35	0.9	0.9	1.8	0.3	40	10
105	65	50	2.7	2.7	0.3	1.8	40	10
85	65	65	2.7	2.7	1.8	0.3	25	10

Zc (Ω)	Rd (Ω)	Rd (Ω)	Cd (pF)	Cd (pF)	Cd (pF)	Cd (pF)	Zp (mm)	Zp (mm)
85	50	65	0.9	2.7	1.8	0.3	10	40
105	65	35	0.9	0.9	1.8	0.3	40	40
105	35	35	0.9	2.7	1.8	1.8	10	25
105	65	65	0.9	0.9	1.8	0.3	10	10
105	65	35	0.9	2.7	1.05	0.3	10	10
95	50	65	2.7	0.9	1.8	1.8	10	10
95	65	35	2.7	0.9	1.8	1.8	10	10
85	65	35	1.8	2.7	0.3	1.8	10	40
85	65	35	2.7	0.9	1.8	1.8	10	10
105	65	65	2.7	0.9	0.3	1.8	10	40
85	65	65	0.9	0.9	1.8	1.8	10	10
85	65	35	0.9	2.7	0.3	1.8	10	40
85	65	35	2.7	0.9	1.05	1.8	10	10
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105	35	35	0.9	0.9	0.3	1.05	40	40
95	35	65	2.7	0.9	0.3	1.05	10	25
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105	35	50	0.9	0.9	1.05	0.3	40	10
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105	35	35	2.7	0.9	1.8	1.05	25	10
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105	35	50	2.7	2.7	0.3	1.05	10	40
95	35	35	1.8	1.8	0.3	0.3	10	10
95	50	50	1.8	1.8	1.05	1.05	25	25
95	50	50	1.8	1.8	1.1	1.1	12	12
95	50	50	1.8	1.8	1.1	1.1	30	30

Real packages need to be analyzed, not varying a reference model.

Lots of **great** and hard work here!

But in the end, have we taken
a low-interoperability concern
Exaggerated the need with improbable channels
and compounded margins in the package
tightening the already tight channel?

Conclusion

- ERL process seems complicated and less straight forward for a channel designer or as a compliance test.
- ERL is being justified by exaggerated channels and packages.
- I oppose the adoption of a normative ERL for the channel.
  - Real packages haven’t been shown
  - Real false positives haven’t been shown
  - ERL essentially raises the COM limit for all channels
  - ERL doesn’t fully solve the original problem (gap in the spec) – channels still have a COM range based upon what package is attached – the actual package is the unknown

TOMORROW starts here.