

Channel Capacity for 24AWG

cables in Gianordoli_Silvano_de_Sousa_3cy_01_02_09_21

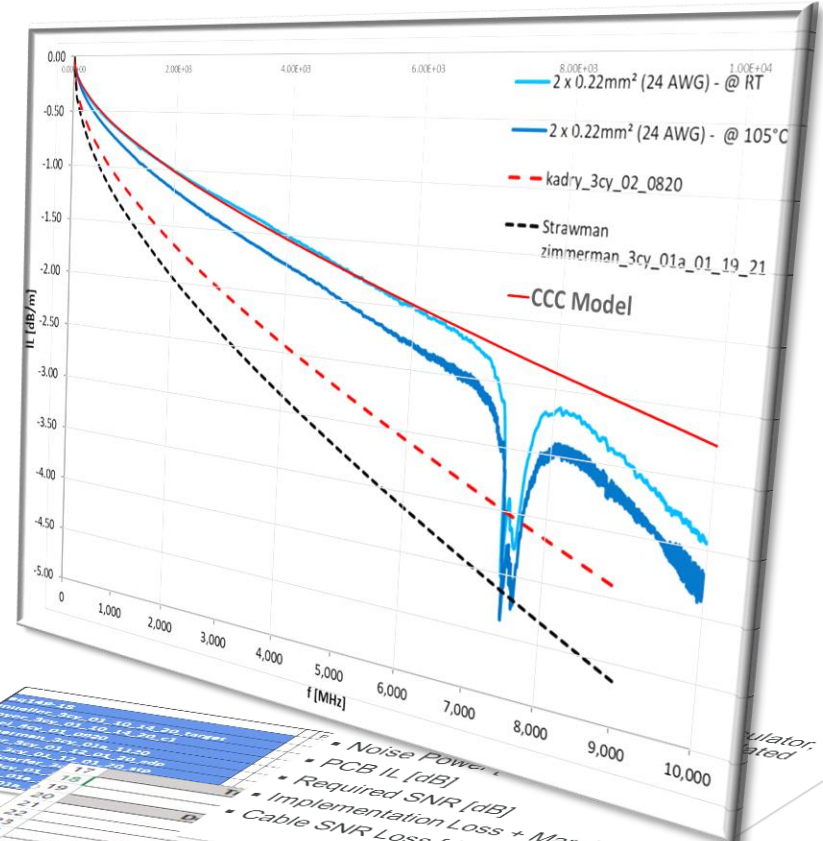
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802.3cy

Introduction

- We calculated the achievable SNR margin for 11m 24AWG cable introduced in [Gianordoli Silvano de Sousa 3cy 01 02 09 21](#)
- The SNR margin is calculated using the Channel Capacity Calculator (CCC) tool in [jonsson 3cy 01 01 12 21](#)



Calculator; integrated

Noise Power
 PCB IL [dB]
 Required SNR [dB]
 Implementation Loss + Margin [dB]
 Cable SNR Loss [dB]

The channel insertion loss (IL) is given by

$$IL(f) = \int_0^f \alpha(f) df$$
 This can be integrated over the bandwidth of the signal as

$$\int_0^{f_{Ny}} IL(f) df = \int_0^{f_{Ny}} \left[b_0 \sqrt{f+1} + b_1 \frac{1}{\sqrt{f+1}} \right] df$$
 where f_{Ny} is the Nyquist Frequency

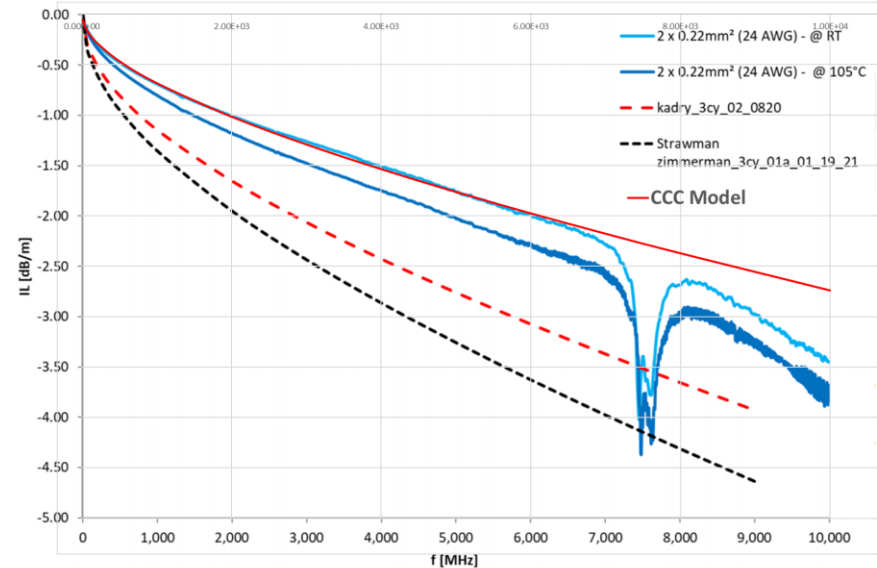
$$IL_{total} = b_0 \sqrt{f_{Ny}+1} + b_1 \frac{1}{\sqrt{f_{Ny}+1}}$$

ACE-nurse (estimate)
 EC cancellation [dB]
 EC connector cancellation [dB]
 Implementation Loss [dB]

Spectral Density
 [dB/Hz]

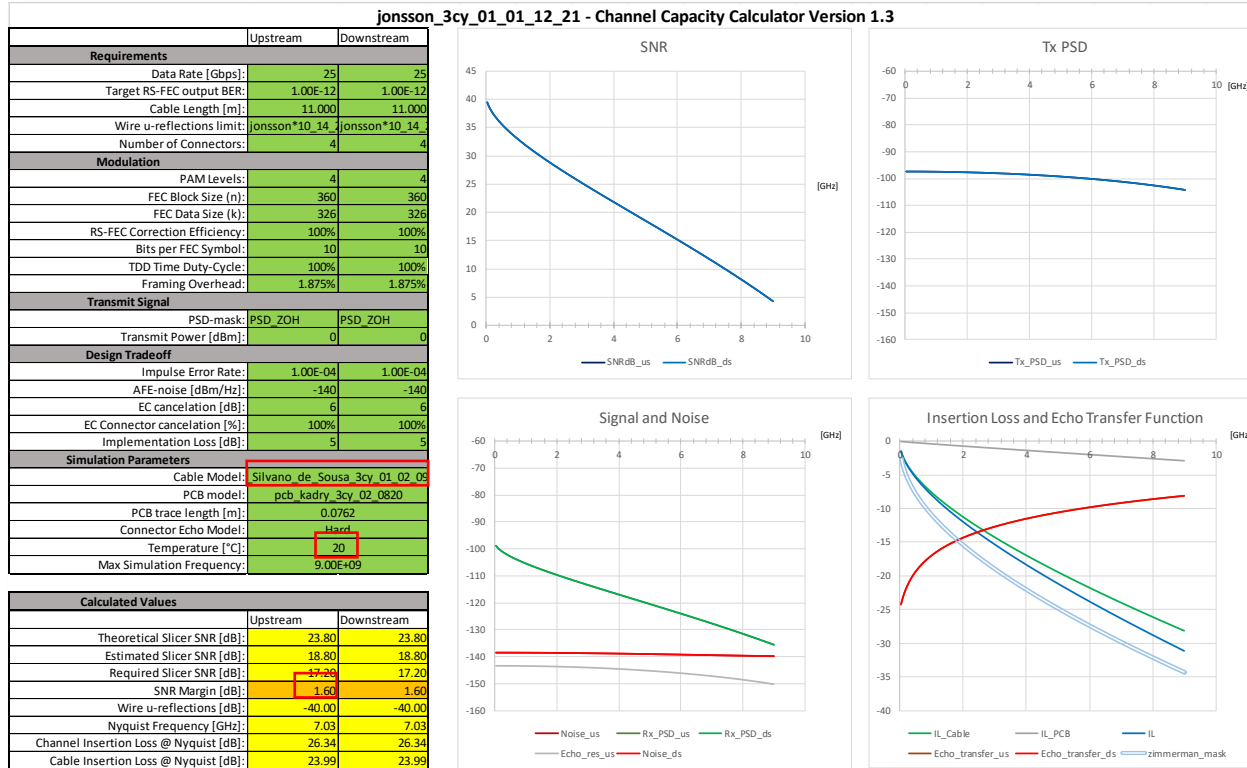
Creating the CCC IL Model

- The Insertion Loss Model is created by fitting the loss model to the measured IL curve
- The b0 and b1 parameters for the CCC IL model are then entered in column “AH” of the “Channels” tab of the CCC
- This updates the “R” column of the “Channels” tab
- After naming the “R” column after the new cable, the cable can be selected in the “Config” tab of the CCC
- The figure to the right show that the CCC IL Model is good until the suck-out frequencies



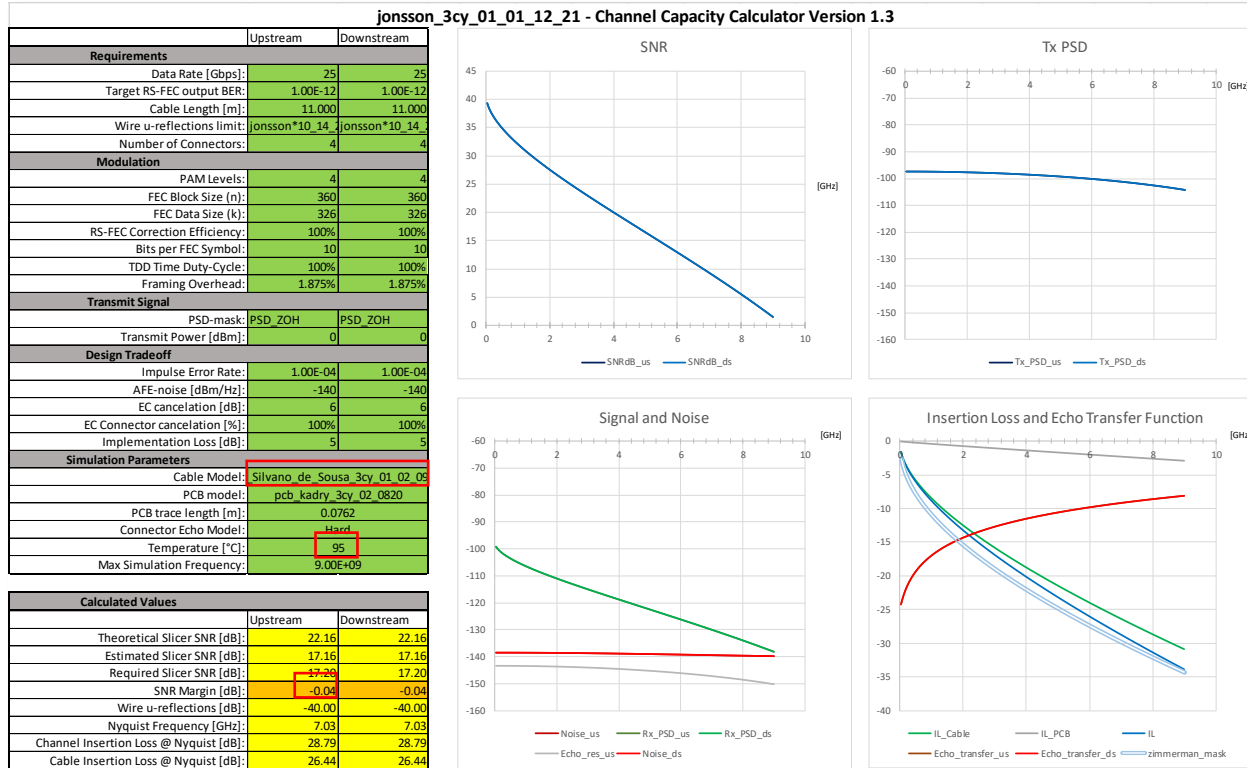
AH		R	
-	Gianordoli_Silvano	02	Gianordoli_Silvano
-09	-8.38E-11	1E+00	-1.49E-01
-05	-1.90E-05	2E-01	-2.13E-01
0.5	0.5	4E+00	-2.63E-01
0	0.004	0E+00	-3.06E-01
		4E+00	-3.44E-01

Evaluation of 24AWG cable at 20°C



- At 20°C the SNR margin is 1.6dB for 11m
- This is good margin, given that the assumed implementation loss is 5dB
- NOTE: The suck-out at 7.5GHz is not accounted for in this calculation
- NOTE: The micro-reflections are assumed to be -40dB

Evaluation of 24AWG cable at 95°C



- At 95°C the SNR margin is at 0dB for 11m
- This is narrow margin, but may be sufficient
- We need more information about echo and EMI characteristics of the cable
- NOTE: the CCC IL model slightly underestimates the IL at 95°C

Summary

We calculated the achievable SNR margin for 11m 24AWG cable introduced in [Gianordoli Silvano de Sousa 3cy 01_02_09_21](#)

At 20°C we have good margin

At 95°C we have no extra margin

We need more information about the overall characteristics of the cable, in particular echo and EMI characteristics



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