Calculated SNR Margin for 24AWG

cables in Gianordoli_Silvano_de_Sousa_3cy_01_02_09_21

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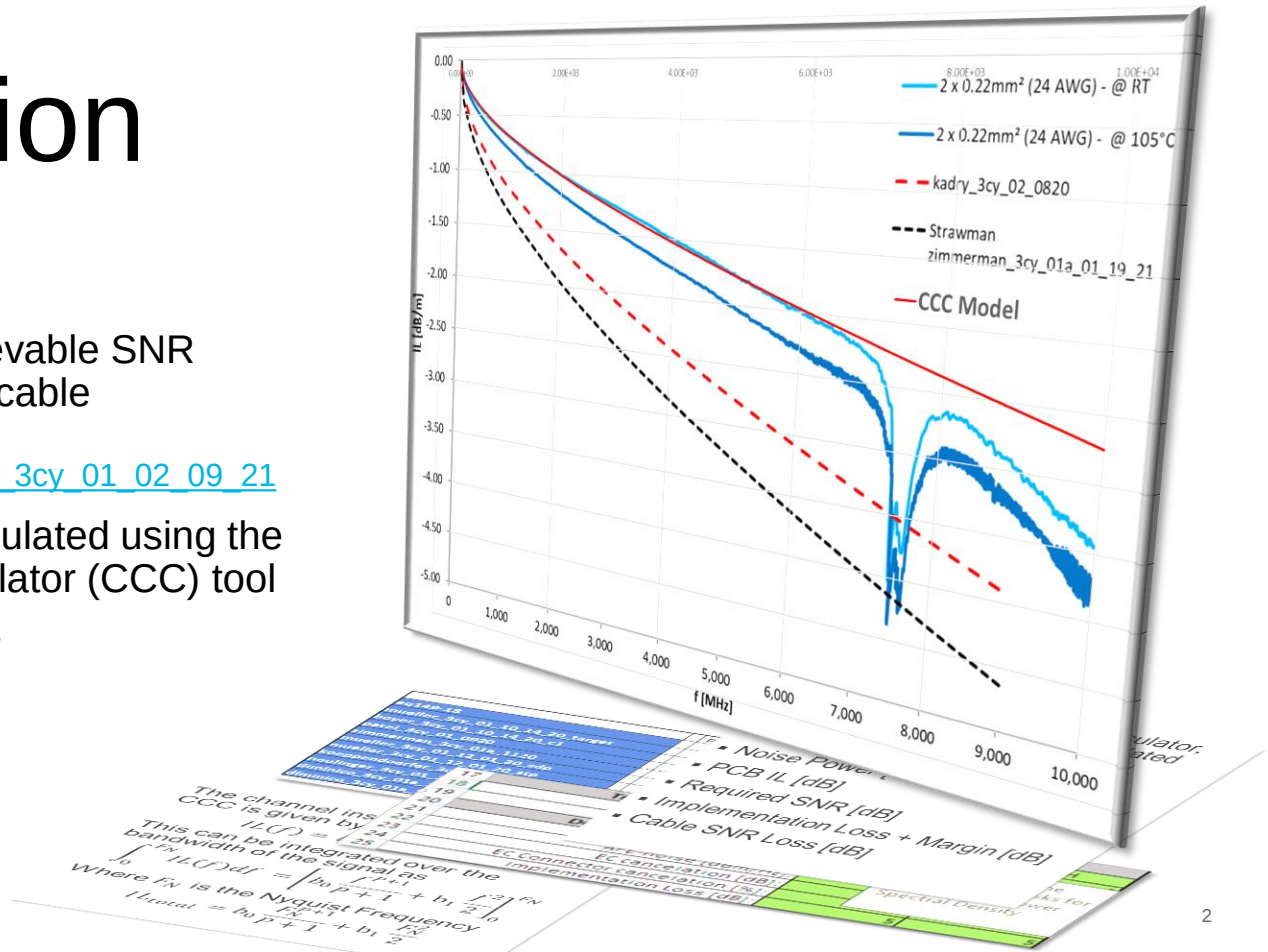
802.3cy

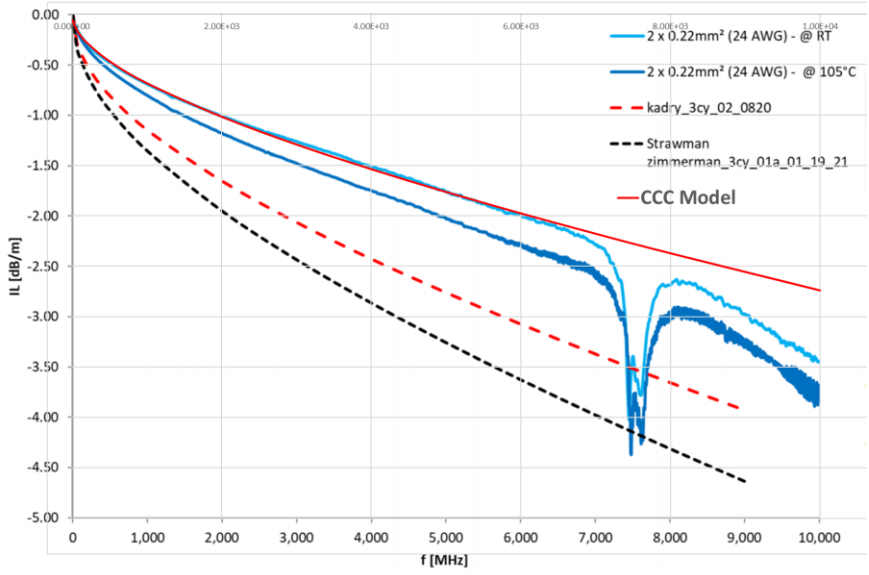
Introduction

- 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]



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

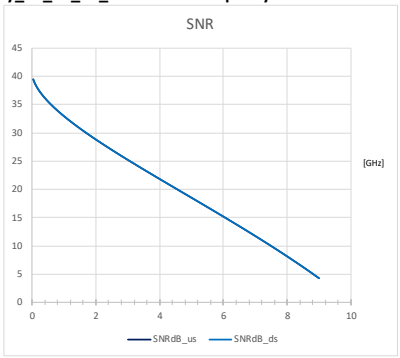


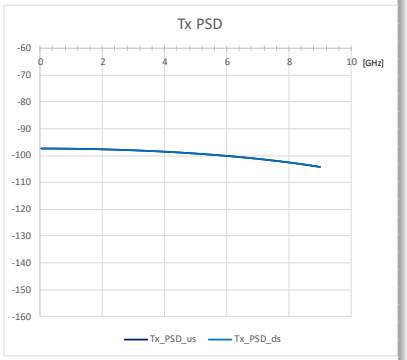
Evaluation of 24AWG cable at 20ºC

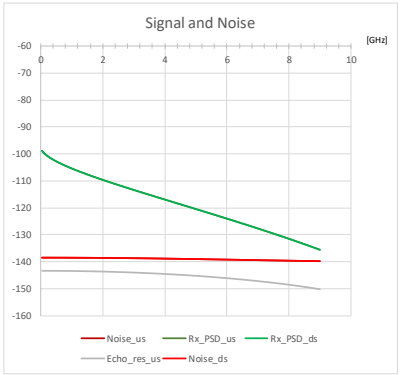
jonsson_3cy_01_01_12_21 - Channel Capacity Calculator Version 1.3

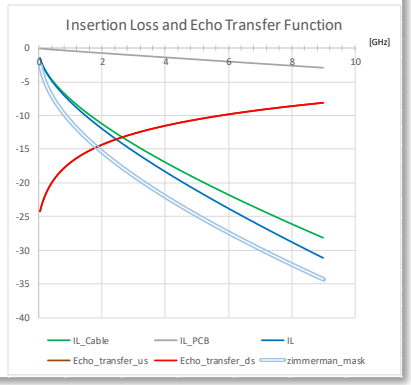
	Upstream	Downstream
Requirements		
Data Rate [Gbps]:	25	25
Target RS-FEC output BER:	1.00E-12	1.00E-12
Cable Length [m]:	11.000	11.000
Wire u-reflections limit:	jonsson*10_14_	jonsson*10_14_
Number of Connectors:	4	4
Modulation		
PAM Levels:	4	4
FEC Block Size (n):	360	360
FEC Data Size (k):	326	326
RS-FEC Correction Efficiency:	100%	100%
Bits per FEC Symbol:	10	10
TDD Time Duty-Cycle:	100%	100%
Framing Overhead:	1.875%	1.875%
Transmit Signal		
PSD-mask:	PSD_ZOH	PSD_ZOH
Transmit Power [dBm]:	0	0
Design Tradeoff		
Impulse Error Rate:	1.00E-04	1.00E-04
AFE-noise [dBm/Hz]:	-140	-140
EC cancelation [dB]:	6	6
EC Connector cancelation [%]:	100%	100%
Implementation Loss [dB]:	5	5
Simulation Parameters		
Cable Model:	Silvano_de_Sousa_3cy_01_02_05	
PCB model:	pcb_kadry_3cy_02_0820	
PCB trace length [m]:	0.0762	
Connector Echo Model:	Hard	
Temperature [°C]:	20	
Max Simulation Frequency:	9.00E+09	

Calculated Values	Upstream	Downstream
Theoretical Slicer SNR [dB]:	23.80	23.80
Estimated Slicer SNR [dB]:	18.80	18.80
Required Slicer SNR [dB]:	17.20	17.20
SNR Margin [dB]:	1.60	1.60
Wire u-reflections [dB]:	-40.00	-40.00
Nyquist Frequency [GHz]:	7.03	7.03
Channel Insertion Loss @ Nyquist [dB]:	26.34	26.34
Cable Insertion Loss @ Nyquist [dB]:	23.99	23.99









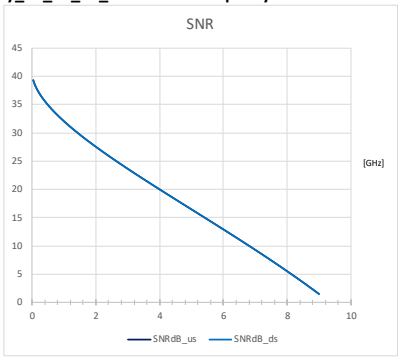
- At 20ºC the SNR margin is 1.6dB for 11m
- This is good margin, given that the assumed implementation loss is 5dB
- NOTE: The suck-out at 7.5GHz is not accounted for in this calculation
- NOTE: The micro-reflections are assumed to be -40dB

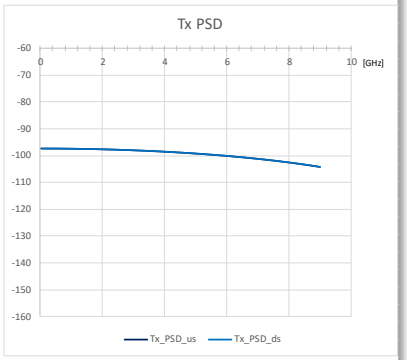
Evaluation of 24AWG cable at 95ºC

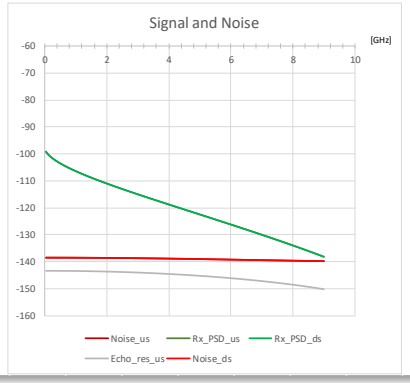
jonsson_3cy_01_01_12_21 - Channel Capacity Calculator Version 1.3

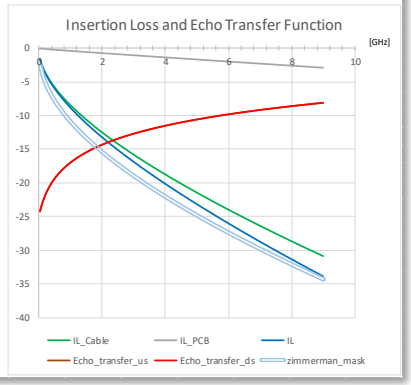
	Upstream	Downstream
Requirements		
Data Rate [Gbps]:	25	25
Target RS-FEC output BER:	1.00E-12	1.00E-12
Cable Length [m]:	11.000	11.000
Wire u-reflections limit:	jonsson*10_14_	jonsson*10_14_
Number of Connectors:	4	4
Modulation		
PAM Levels:	4	4
FEC Block Size (n):	360	360
FEC Data Size (k):	326	326
RS-FEC Correction Efficiency:	100%	100%
Bits per FEC Symbol:	10	10
TDD Time Duty-Cycle:	100%	100%
Framing Overhead:	1.875%	1.875%
Transmit Signal		
PSD-mask:	PSD_ZOH	PSD_ZOH
Transmit Power [dBm]:	0	0
Design Tradeoff		
Impulse Error Rate:	1.00E-04	1.00E-04
AFE-noise [dBm/Hz]:	-140	-140
EC cancelation [dB]:	6	6
EC Connector cancelation [%]:	100%	100%
Implementation Loss [dB]:	5	5
Simulation Parameters		
Cable Model:	Silvano_de_Sousa_3cy_01_02_05	
PCB model:	pcb_kadry_3cy_02_0820	
PCB trace length [m]:	0.0762	
Connector Echo Model:	Hard	
Temperature [°C]:	95	
Max Simulation Frequency:	9.00E+09	

Calculated Values		
	Upstream	Downstream
Theoretical Slicer SNR [dB]:	22.16	22.16
Estimated Slicer SNR [dB]:	17.16	17.16
Required Slicer SNR [dB]:	17.20	17.20
SNR Margin [dB]:	-0.04	-0.04
Wire u-reflections [dB]:	-40.00	-40.00
Nyquist Frequency [GHz]:	7.03	7.03
Channel Insertion Loss @ Nyquist [dB]:	28.79	28.79
Cable Insertion Loss @ Nyquist [dB]:	26.44	26.44









- At 95ºC 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 95ºC

Summary

We calculated the achievable SNR margin for 11m 24AWG cable introduced in Gianordoli_Silvano_de_Sousa_3cy_01_02_09_21

At 20ºC we have good margin

At 95ºC 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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