Channel Link Model
Ad Hoc Activity Report

Marek Hajduczenia, Nokia Siemens Networks S.A.

Contributors

- Alphabetic list of contributors to Channel Link Model ad hoc (I do hope to have them all):
  - Andrey Kobyakov
  - Duane Remein
  - Frank Effenberger
  - Marek Hajduczenia
  - Pete Anslow
  - Piers Dawe
  - Robert Lingle
  - Sergey Ten
  - Tsutomu Tatsuta

Current Status [1]

- Chartered tasks
  - Update the existing Excel spreadsheet to reflect the 10G transmission channel impairments:examine:
    - last version accepted by EFM – available at: http://ieee802.org/3/efm/public/tools/EFM0_0_2.7.xls
    - Spreadsheet aligned to 802.3ae D3.2, D3.3 available at:
    - http://ieee802.org/3/ae/public/adhoc/serial_pmd/documents/10GEPBud3_1_16a.xls
  - Include splitter loss in the overall channel loss figure
  - Account for SBS and SRS due to analog signal transmission at high power levels
  - Make the spreadhseet user friendly

Current Status [2]

- Chartered tasks
  - Align the model with motion #19 from July 2007 minutes: “For budget calculations, assume the following mapping function between ITU-T sensitivity and IEEE stressed sensitivity. Sensitivity(ITU)[OMA] + Optical_Path_Penalty(ITU) = Stressed_Sensitivity(IEEE)[OMA]”
  - Implement the new dispersion penalty calculation mechanism proposed in 3av_0705_saeki_1.pdf
  - Insert the power budget parameters as proposed in 3av_0703_effenberger_5.pdf

Current Spreadsheet [1]

	A	B	C	D	E	F
1	Parameter name	Value	Unit	Value min	Value max	Description
2						
3	Transmitter parameters					
4	ITU_ERnom	9.00	-	0.00	9.00	Nominal Extinction Ratio
5	ITU_Tx_ave_Min	3.00	dBm	-99.00	99.00	Nominal average output power in ITU format (min)
6	ITU_Tx_ave_Max	7.00	dBm	-99.00	99.00	Nominal average output power in ITU format (max)
7	IEEE_Tx_OMA_Min	4.91	dBm	-99.00	99.00	Nominal average output power in IEEE OMA format (min)
8	Tx_Wavelength_Min	1260.00	nm	1200.00	1600.00	Transmission window (min)
9	Tx_Wavelength_Max	1280.00	nm	1200.00	1600.00	Transmission window (max)
10	Tx_Wavelength_Uc	1270.00	nm	1260.00	1280.00	Transmission window (central wavelength)
11	Tx_Spectral_Width_Max	0.10	nm	0.01	1.00	Spectral width of the transmitter signal (max)
12	Tx_Chirp_Parameter_Max	2.50	-			Chirp parameter for transmitter signal (max) [C]
13	Tx_Data_Rate	10312.50	MBd	9500	11500	Effective data rate in Mbaud
14						
15	Link parameters					
16	Fibre_attenuation_Curve	lambda^-4	-			Fibre attenuation curve type (lambda^-4,G652AB,G652CD models)
17	Fibre_attenuation_Curve_type	max	-			Maximum / minimum value curve (not available for lambda^-4 model)
18	Fibre_attenuation_Base_value	0.35	dB/km	0	1	Base fibre attenuation (for lambda^-4 model)
19	Fibre_attenuation_Base_wavelength	1310.00	nm			Base wavelength for fibre attenuation estimation
20	Fibre_attenuation_Value	0.36	dB/km			Fibre attenuation at base wavelength
21	Channel_Length_Max	20	km	0.5	20	Maximum distance between an ONU and the OLT
22	Fibre_loss	7.27	dB			Fibre (no connectors) CHIL @ Tx_Uc
23	PSC_Split_count	32.00	-	2	64	Number of splitter ports (powers of 2 only)
24	PSC_Loss_curve	ave	-			Type of PSC loss curve (minimum, average and maximum types)
25	PSC_loss	17.41	dB			PSC induced CHIL
26	Nonlinear_penalties	1.00	dB		10	Nonlinear panelties in the fibre plant (SBS + SRS induced)
27	Excess_loss	3.32	dB			Connectors, splices and any other excess loss
28	ITU_Optical_Path_Penalty	1.00	dB	0	5	Optical path penalty in accordance with ITU definition
29	Channel_Loss_Min	5.00	dB	0	29.00	Channel Insertion Loss (CHIL) (min) - user input
30	Channel_Loss_Max	29.00	dB		29	Channel Insertion Loss (CHIL) (max)
31	Dispersion_Uo_Min	1300.00	nm			
32	Dispersion_Uo_Max	1324.00	nm			
33	Dispersion_So	0.09	ps/nm^2·km			
34	Dispersion_D_Min	-1.90	ps/(nm·km)			
35	Dispersion_D_Max	-6.42	ps/(nm·km)			
36	Dispersion_penalty	0.91	dB			Dispersion penalty calculated following 3av_0705_saeki_1.pdf
37						
38	Receiver parameters					
39	ITU_Rx_Sensitivity_ave	-27.00	dBm			Average receiver sensitivity
40	ITU_Rx_Sensitivity_ave_OMA	-25.09	dBm			OMA receiver sensitivity (dBm)
41	ITU_Rx_Sensitivity_ave_OMA	24.22	uW			OMA receiver sensitivity (uW)
42	IEEE_Rx_Stressed_Sensitivity_ave	-26.00	dBm			Average stressed receiver sensitivity in IEEE formalism
43	IEEE_Rx_Stressed_Sensitivity_OMA	-24.09	dBm			OMA stressed receiver sensitivity in IEEE formalism (dBm)
44	IEEE_Rx_Stressed_Sensitivity_OMA	28.09	uW			OMA stressed receiver sensitivity in IEEE formalism (uW)
45	Rx_Overload	2.00	dBm			This is what the overload needs to be…
46						
47	Check Conditions					
48	Dispersion penalty <= ITU Optical Path Penalty					PASSED

Current Spreadsheet [2]

- Main features
  - Less clutter – more user friendly interface
  - Parameters divided into Tx, Rx and channel groups
  - Implements the new dispersion penalty calculation mechanism proposed in 3av_0705_saeki_1.pdf
  - Aligns the model with the contents of motion #19 from July 2007 minutes
  - Calculate the Channel Insertion Loss (ChIL) as a total of: splitter loss (calculated), fibre loss (ideal), connector loss and excess loss (user provided)

Current Spreadsheet [3]

- Main features
  - Required Rx sensitivity is calculated based on Tx output power (min value) and the maximum ChIL figure
  - Both IEEE and ITU Rx sensitivity figures are calculated
  - IEEE Stressed Rx Sensitivity is estimated
  - Included the power budgets proposed in 3av_0703_effenberger_5.pdf (demonstration purposes)

Current Spreadsheet [4]

- And some fireworks ...
  - Cells B16, B17 and B24 are based on drop down lists to allow only specific parameter values – prevents introduction of unexpected values by users
  - Added range checking for most of the user defined and calculated parameters
  - Added dispersion penalty testing (Dispersion_penalty <= ITU_Optical_Path_Penalty)
  - G652AB/CD fibre attenuation curves with min / max values
  - Added min/max/average curves for PSC insertion loss
  - Spreadsheet is locked but not password protected

Targets for the next 2 months

- Tasks under way / to be initiated ...
  - Estimation of the TDP penalty (informative parameter for new Clause 91)
  - Feed the development of Clause 91
  - Feed the extensions related with PX30 systems
  - Upload the new spreadsheet to the reflector once completed and seek input from TF members