Channel Operating Margin Program Usage: Post Draft 1.2 Comment Resolutions

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Changes after comment d1.2 resolution

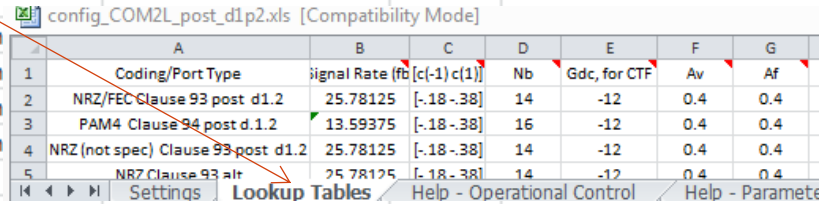
- Clause 93 and 94
  - Remove tx and rx package loss
  - Use new pkg RL model (embedded in code)
  - VFT 3 used to include reflections affect on total channel gain. (benartsi_3bj_01_1112)
  - COM minimum pass is 4 dB
  - C(-1) min= -.18
  - C(1) min= -.38
- Clause 93
  - 0.375*fb for tx rise time filter
  - SER0 is 1e-5
  - Add = 0.7
- Clause 94
  - SER0 is 3e-4
  - Sigma_r set to 0.0005 because 15 mv won't work in any of the channels. Derived from relation for sigma_rj between KP4 and KR4. Same ratio.
  - Pre-cursor noise included (omitted by error is 1.2)
- ISI channel interference is only sampled and UI intervals surrounding Tz.

Configuration Spreadsheet: Select Port Type

config_COM2L_post_d1p2.xls [Compatibility Mode]

	A	B	C	D	E	F	G
1	**Parameter**	**Setting**		**Coding/Port Type**	**Operational Control**		
2	Coding/Port Type	RZ/FEC Clause 93 post d1.2		NRZ/FEC Clause 93 post d1	INCLUDE_CTLE	1	
3	Signal Rate (fb)	25.78125	GHz	AM4 Clause 94 post d.1.	INCLUDE_TX_RX_FILTER	1	
4	[c(-1) c(1)]	[-.18 -.38]		NRZ (not spec) Clause 93 post	DEBUG	0	
5	Nb	14	UI		DISPLAY_WINDOW	1	
6	Gdc, for CTF	-12	dB		CSV_REPORT	1	
7	Av	0.4	V		SAVE_RESP	1	
8	Af	0.4	V		GET_FD	1	
9	An	0.6	V		INC_PACKAGE_RL	3	
10	L	2			USE_EXTERNAL_PARAM	0	
11	SER0	1			RESULT_DIR	est_results\	
12	CC1				INC_PACKAGE_IL	0	
13	sigma_rj				BREAD_CRUMBS	0	
14	Add				CALIBRATE	0	
15	sigma_r	0.001	V				
16	Samples Per UI	32					
17	Port Order	[1 3 2 4]					
18	Gamma_01	0.315	V/V	not used in			
19	Gamma_02	0.315	V/V	not used in			
20	f1	20.625	GHz	not used in			
21	f2	20.625	GHz	not used in			
22	CTF_step	1	dB				
23	TXFFE_step	0.02					
24	bmax	1					
25	f_v	0.375	*fb				
26	f_f	0.375					
27	f_n	1					
28	f_r	0.75					
29							
30							

Coding and port type selection roller



Data can be directly entered or defaults can be set in the lookup data table tab when using the selection roller.

Configuration Spreadsheet

Parameter	Setting		Coding/Port Type	Operational Co	
Coding/Port Type	RZ/FEC Clause 93 post d1.2		NRZ/FEC Clause 93 post d1	INCLUDE_CTLE	1
Signal Rate (fb)	25.78125	GHz	AM4 Clause 94 post d.1.	INCLUDE_TX_RX_FILTER	1
[c(-1) c(1)]	[-.18 -.38]		NRZ (not spec) Clause 93 post	DEBUG	0
Nb	14	UI		DISPLAY_WINDOW	1
Gdc, for CTF	-12	dB		CSV_REPORT	0
Av	0.4	V		SAVE_RESP	0
Af	0.4	V		GET_FD	1
An	0.6	V		INC_PACKAGE_RL	3
L	2			USE_EXTERNAL_PARAM	0
SER0	1.00E-05			RESULT_DIR	est_result
CC1	4			INC_PACKAGE_IL	0
sigma_rj	0.01	UI		BREAD_CRUMBS	0
Add	0.07	UI		CALIBRATE	0
sigma_r	0.001	V			
Samples Per UI	32				
Port Order	[1 3 2 4]				
Gamma_01	0.315	V/V	not used in d1.3		
Gamma_02	0.315	V/V	not used in d1.3		
f1	20.625	GHz	not used in d1.3		
f2	20.625	GHz	not used in d1.3		
CTF_step	1	dB			
TXFFE_step	0.02				
bmax	1				
f_v	0.375	*fb			
f_f	0.375	*fb			
f_n	1	*fb			
f_r	0.75	*fb			

Set to 1 get have COM output parameters written to a csv file

Parameter list

	Example Setting	
Coding/Port Type	NRZ/FEC Clause 93 post d1.2	selector for port type name
Signal Rate (fb)	25.78125	Signal. Used to calculate unit interval
[c(-1) c(1)]	[-.18 -.38]	Transmitter equalizer, max pre and post cursor coefficient
Nb	14	Victim single bit response exception window (in UI). Decision feedback equalizer (DFE) length
Gdc, for CTF	-12	Continuous time filter, max DC gain
Av	0.4	Victim differential peak output voltage
Af	0.4	Transmitter differential peak output voltage for Far-end aggressor
An	0.6	Transmitter differential peak output voltage for Near-end aggressor
L	2	related to number of levels, L (symbol gain)
SER0	1.00E-05	Target uncorrected symbol error ratio
CC1	4	Minimum channel operating margin
sigma_rj	0.01	Normalized RMS Gaussian noise
Add	0.07	Normalized peak dual-Dirac noise
sigma_r	0.001	voltage sensitivey RMS Gaussian noise
Samples Per UI	32	
Port Order	[1 3 2 4]	for the 4 ports the first two listed are inputs and respective last two are outputs (RX)
Gamma_01	0.315	not used in draft 1.3 package embedded in code
Gamma_02	0.315	not used in draft 1.3 package embedded in code
f1	20.625	not used in draft 1.3 package embedded in code
f2	20.625	not used in draft 1.3 package embedded in code
CTF_step	1	Continuous time filter step size dB
TXFFE_step	0.02	Transmitter equalizer, pre/post cursor coefficient step size
bmax	1	max in W region
f_v	0.375	Transmitter 3 dB bandwith for victim. Set to > 2 to deactivate
f_f	0.375	Transmitter 3 dB bandwith for Far-end aggressor. Set to > 2 to deactivate
f_n	1	Transmitter 3 dB bandwith for Near-end aggressor. Set to > 2 to deactivate
f_r	0.75	Receiver 3dB bandwidth

Operational Control

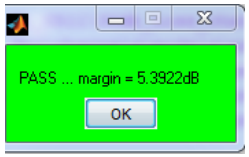
INCLUDE_CTLE	0 = do not include CTLE
	1 = include CTLE. May eventually be removed
INCLUDE_TX_RX_FILTER	0 = do not include TX/RX filters
	1 = include TX/RX filters. May eventually be removed
DEBUG	0 = do not print internal data;
	1 = prints and graphs internal data. May eventually be removed
DISPLAY_WINDOW	0 - do not display FD graphs
	1 - display FD graphs (IL, ILD, ICR, RL, MDPST)
CSV_REPORT	0 - do not create CSV report file
	1- create CSV report file in .\results directory
SAVE_RESP	0 - do no save channel time domian data
	1 - save channel time domian data in mat file
GET_FD	0 - do not report freqency domain metrics
	1 - report some freqency domain metrics
INC_PACKAGE_RL	0 - Do not include package return loss in the channel response
	1 - Include package return loss in the channel response
USE_EXTERNAL_PARAM	set to 0 . May eventually be removed
RESULT_DIR	Directory for writing the csv results file. It is advisable to use the full path name here
INC_PACKAGE_IL	0 - Do not include package return loss in the channel response
	1 - Include package return loss in the channel response
BREAD_CRUMBS	print intermediate time and frequency domain to csv files
CALIBRATE	for later use for rx compliance testing

Command Line Syntax

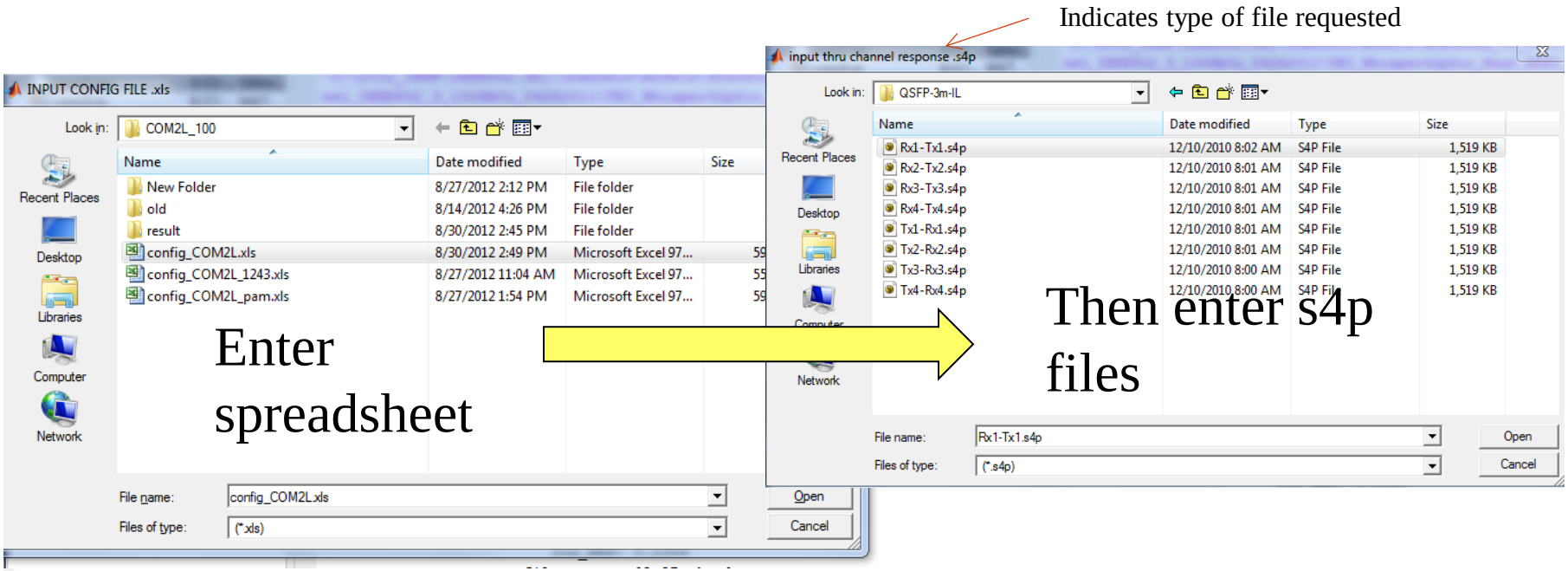
```
function [ output_args ] =com2l…(coding, num_fext,
num_next, varargin)
```

- output_args is a structure with results
- coding is string containing the full path name of the configuration spreadsheet
- num_fext is the number for fext s4p files
- num_next is the number for next s4p files
- All the reset of the argument are strings containing the respective full path

```
>> com2l_post_d1p2_mtg('config_COM2L_post_d1p2.xls',    8,  0,'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\THRU.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT1.s4p',   'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT2.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT3.s4p',   'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT4.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT5.s4p',   'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT6.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT7.s4p',   'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT8.s4p')
COM2L for Draft post 1.2 comment resolution release
    This code is expected to change as the IEEE802.3bj document evolves.
    This is not a normative or an official IEEE document.
Files set is: 30db_Loss_channel--THRU

ans =

     channel_operating_margin_dB: 5.3922
           peak_interference_mV: 9.3000
    peak_channel_interference_mV: 6.8000
                  peak_ISI_mV: 6.8000
      peak_MDXTK_interference_mV: 0.6000
                        icn_mV: 1.3135
     peak_MDFEXT_interference_mV: 0.6000
    available_signal_after_eq_mV: 17.3018
              fit_loss_dB_at_Fnq: 27.7462
                   IL_dB_at_Fnq: 29.1627
                 baud_rate_GHz: 25.7813
                       ILD_RMS: 0.3798
                    file names: [9x23 char]
```

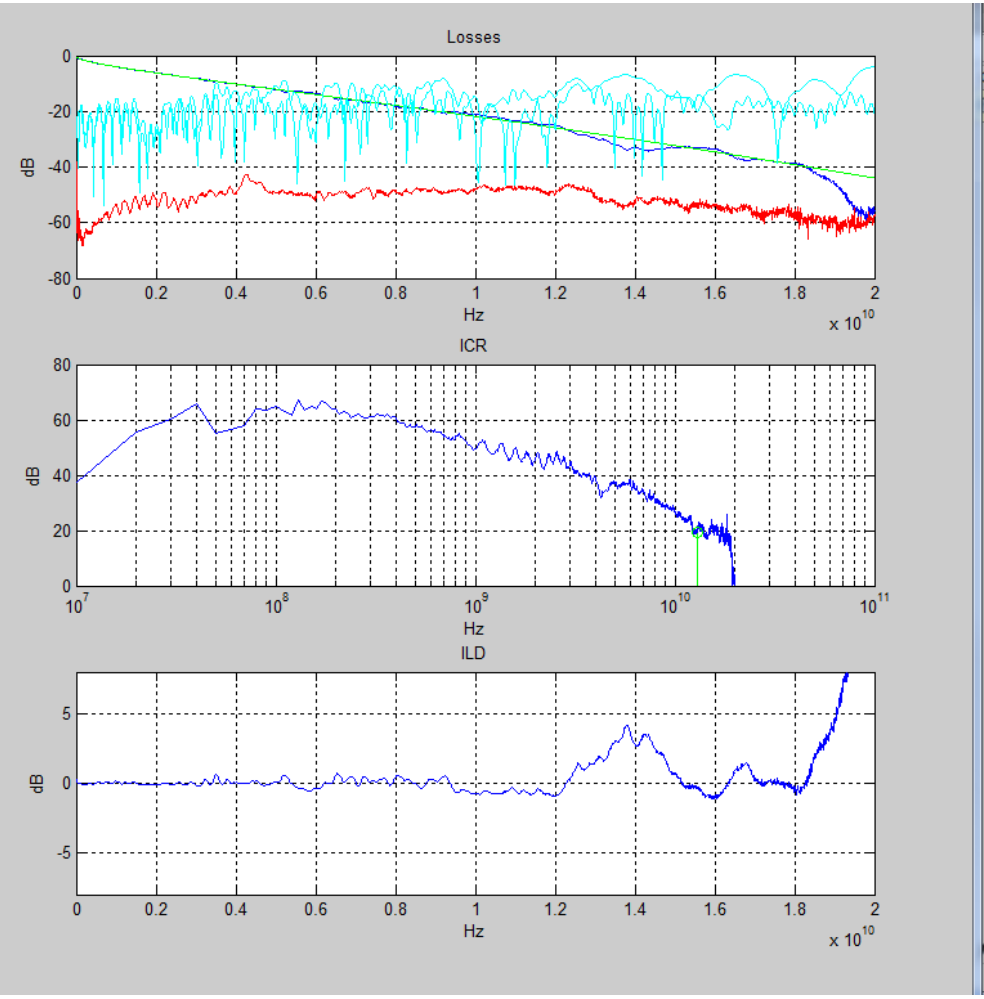


Interactive file input example

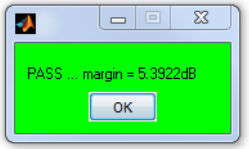



```
>> com2l_post_d1p2_mtg
COM2L for Draft post 1.2 comment resolution release
    This code is expected to change as the IEEE802.3bj document evolves.
    This is not a normative or an official IEEE document.
Enter config XLS file or return will just pop a window to ask for the XLS file]:
How many FEXT channels are to be entered? [return is means no FEXT]
How many NEXT channels are to be entered? [return is means no NEXT]
```

Example for single line entry




```
CODE  SIMULINK  ENVIRONMENT  RESOURCES

Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.

                baud_rate_GHz: 25.7813
                     ILD_RMS: 0.4494
                  file_names: [9x23 char]

>> com2l_post_d1p2_mtg('config_COM2L_post_d1p2.xls',    8,
0,'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\THRU.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT1.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT2.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT3.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT4.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT5.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT6.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT7.s4p',
'J:\2012_TEMP\IEEE802.3bj\channels\models\patel_01_0511\30db_Loss_channel\FEXT8.s4p')
COM2L for Draft post 1.2 comment resolution release
    This code is expected to change as the IEEE802.3bj document evolves.
    This is not a normative or an official IEEE document.
Files set is: 30db_Loss_channel--THRU

ans =

     channel_operating_margin_dB: 5.3922
           peak_interference_mV: 9.3000
    peak_channel_interference_mV: 6.8000
                   peak_ISI_mV: 6.8000
      peak_MDXTK_interference_mV: 0.6000
                         icn_mV: 1.3135
     peak_MDFEXT_interference_mV: 0.6000
    available_signal_after_eq_mV: 17.3018
              fit_loss_dB_at_Fnq: 27.7462
                   IL_dB_at_Fnq: 29.1627
                baud_rate_GHz: 25.7813
                     ILD_RMS: 0.3798
                  file_names: [9x23 char]

fx >>
```



CSV and display outputs

Output Parameters	
channel_operating_margin_dB: (COM)	Figure of merit. Adjusted so that above zero passes and below fails
peak_interference_mV:	Peak interference on channel include chip and system noise. For a test type of channel, this would be the value for additive rx tolerance injected noise. Since this is peak value of interference, dividing by 7 may be the amount of rms noise from an AWGN generator. Peak interference is measure at the spec BER.
peak_channel_interference_mV:	The peak interference. contribution for residual ISI and crosstalk.
peak_ISI_mV:	The peak interference. contribution for residual ISI.
peak_MDXTK_interference_mV:	The peak interference. contribution for all crosstalk.
icn_mV:	If FD is selected this is the integrated crosstalk noise. (CTLE not included)
peak_MDNEXT_interference_mV:	The peak interference contribution for all NEXT crosstalk.
peak_MDFEXT_interference_mV:	The peak interference contribution for all FEXT crosstalk.
available_signal_after_eq_mV:	Essentially the “zero-first-precursor” signal height after filtering and reference equalization
fit_loss_dB_at_Fnq:	If FD is selected this is the value of the fitted IL loss at Nyquist. Same as SCAT, IL_fit_atNq
IL_dB_at_Fnq:	If FD is selected this is the value of the IL loss at Nyquist.
ILD_RMS:	This may be useful for a quick evaluation of a channel. It is the RMS of the Insertion Loss Deviation in dB
file_names:	List of channel files