Towards adopting an 802.3cd Baseline for 50G Backplane and DAC

Upen Reddy Kareti - Cisco

IEEE P802.3cd ad-hoc , August 31st 2016

- Studies in kareti_3cd_01a_0716 provide solution space for ~30dB Backplane and DAC channels
  - Improve package and device termination
  - Optimize equalization
  - Reduce Gaussian noise contributors

- COM sensitivity to Key parameters
  - SNR_TX
  - eta_0
  - T_r
- These parameters play a key role in Silicon compliances for Transmitter SNDR and Receiver Interference Tolerance Test (RITT)
- Determine Baseline values through broader conversion

- Based on ‘STDS-802-3-50G’ Reflector response, interested participants discussed in an offline WebEx meeting on Aug 26th, 2016
  - Towards understanding what is necessary to adopt a baseline
  - Identify areas where further work is needed
  - Options for COM baseline

Attendees

Upen Kareti
T.SAKAI
Brandon Chen
scott sommers
Rich Melitz
Liav Ben-Artsi
Piers Dawe
peter kou
Yasuo Hidaka
Vasu Parthasarathy
Mark Nowell
Raj Hegde
M Ataul Karim
Joel Goergen

Bill Kirkland
Jane Lim
Tom Palkert
Venugopal Balasubramonian
Mike Dudek
Ali Ghiasi
Jayanthi Natarajan
Andy Zambell
James Fife
John Ewen
Phil Sun
Vivek Telang
Henry Chen
granthana

Vittal Balasubramani
Magesh Valliappan
Ranjeeth Doppala
Vivek Telang
Alex Haser
Mike Peng Li
Fernando De Bernardinis (Mrvl)
Will Bliss
Henry Chen

* Some of the voice only callers not identified

Proposed parameters as per kareti_3cd_01a_0716

Table 93A-1 parameters			
Parameter	**Setting**	**Units**	**Information**
f_b	26.5625	GBd	
f_min	0.05	GHz	
Delta_f	0.01	GHz	
C_d	[1.8e-4 1.8e-4]	nF	[TX RX]
z_p select	[1]		[test cases to run]
z_p (TX)	[30]	mm	[test cases]
z_p (NEXT)	[12]	mm	[test cases]
z_p (FEXT)	[30]	mm	[test cases]
z_p (RX)	[30]	mm	[test cases]
C_p	[1.1e-4 1.1e-4]	nF	[TX RX]
R_0	50	Ohm	
R_d	[55 55]	Ohm	[TX RX]
f_r	0.75	*fb	
c(0)	0.6		min
c(-1)	[-0.25:0.05:0]		[min:step:max]
c(-2)	[0:0.025:0.1]		[min:step:max]
c(1)	[-0.25:0.05:0]		[min:step:max]
g_DC	[-20:1:0]	dB	[min:step:max]
f_z	10.625	GHz	
f_p1	10.625	GHz	
f_p2	1.00E+99	GHz	
A_v	0.45	V	
A_fe	0.45	V	
A_ne	0.63	V	
L	4		
M	32		
N_b	12	UI	
b_max(1)	0.7		
b_max(2..N_b)	0.2		
sigma_RJ	0.01	UI	
A_DD	0.02	UI	
eta_0	TBD (2.60E-08)	V^2/GHz	
SNR_TX	TBD (31.1)	dB	
R_LM	0.95		
DER_0	1.00E-04		
Operational control			
COM Pass threshold	3	dB	
Include PCB	0	Value	0, 1, 2

g_DC_HP	[-6:1:0]		[min:step:max]
f_HP_PZ	0.6640625	GHz	

I/O control		
DIAGNOSTICS	1	logical
DISPLAY_WINDOW	1	logical
Display frequency domain	1	logical
CSV_REPORT	1	logical
RESULT_DIR	.\results\COM50_{date}\	
SAVE_FIGURES	0	logical
Port Order	[1 2 3 4]	
RUNTAG	_CDAUI-8	
Receiver testing		
RX_CALIBRATION	0	logical
Sigma BBN step	5.00E-03	V
IDEAL_TX_TERM	0	logical
T_r	1.30E-02	ns
T_r_filter_type	1	logical
T_r_meas_point	0	logical

Non standard control options		
INC_PACKAGE	1	logical
IDEAL_RX_TERM	0	logical
INCLUDE_CTLE	1	logical
INCLUDE_TX_RX_FILTER	1	logical
COM_CONTRIBUTION	0	logical
CDR_OVERSAMPLED	0	logical

Table 93A–3 parameters		
Parameter	**Setting**	**Units**
package_tl_gamma0_a1_a2	[0 1.734e-3 1.455e-4]	
package_tl_tau	6.141E-03	ns/mm
package_Z_c	90	Ohm

Table 92–12 parameters		
Parameter	**Setting**	
board_tl_gamma0_a1_a2	[0 4.114e-4 2.547e-4]	
board_tl_tau	6.191E-03	ns/mm
board_Z_c	110	Ohm
z_bp (TX)	151	mm
z_bp (NEXT)	72	mm
z_bp (FEXT)	72	mm
z_bp (RX)	151	mm

- Initial proposed Options for Baseline
  - Reduce COM limit to 2.2 dB
  - Choose one of the possible combination of SNR_TX and eta_0 from the solution space in the study with T_r as 13 ps (preferred)

SNR_TX	eta_0	COM
dB	x 1e-08 V^2/GHz	dB
31.1	1.3	3.1105
32.5	1.64	3.1229
33.4	1.84	3.1105

  - Leave SNR_TX and eta_0 as TBD for baseline and postpone this conversation

- Future Work
  - Explore improved modeling and/or constraining other parameters to gain more margin in order to Refine SNR_TX and eta_0

- Conclusion from the discussion was to follow 802.3bs approach to identify in the baseline the areas where further consideration and confirmation required marked as magenta
  - Magenta Items and their discussion points
    - C_d (160 fF, 180fF) - C2M type of conditions
    - C_p (110 fF) - overall package reflections
    - C(0),C(-1),C(-2),C(1) - range and resolution
    - F_P2 (25 GHz) - CTLE POLE2 location
    - A_v, A_fe, A_ne - Vf value with T_r filter
    - N_b, bmax(1), bmax(2 ..N_b) - number of taps and tap values; cumulative tap effects
    - Sigma_RJ; A_DD - visit basis for these numbers.
    - SNR_TX; eta_0 - impact of other parameter changes
    - COM - impact of other parameter changes
    - T_r - Vpeak/Vf ratio
    - Package_Z_c – Overall package reflections

New basis agreed after the meeting

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z_bp (RX)	151	mm

- The goal of these meetings is to have a baseline proposal ready for September IEEE802.3 Interim meeting.
- Next meeting is scheduled for

  Friday Sep 2nd 2016, 8-30 a.m. PDT.

- Contact Upen Reddy (ureddy@cisco.com) if anyone else wants to be included.

Thanks !!