Evaluation of Various channels

Using a Method proposed by Healey and Moore

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- This evaluation uses the method and values called out in another presentation at this meeting
- This evaluation has 2 goals:
    - Illustrate use of the evaluation method and the information it provides
    - Provide useful information toward setting taskforce objectives
- I intend to run this evaluation, or a refinement of it, if one is agreed upon, on all channels provided to the study group and taskforce, and make the results available.

Simulation parameters used as recommended in healey_01_0111 “Suggested practices of reporting simulation results”:

Bit rate	26 Gb/s
Modulation	PAM2
Signaling rate	26 Gbaud
Number of symbols simulated	N/A
Target symbol error ratio	$1 \cdot 10^{-12}$
Tx Test pattern	NA
Tx output voltage, peak-to-peak	0.8 V (NEXT is 1.2 V)
Tx Deterministic jitter, peak-to-peak	NA
Tx Deterministic jitter distribution	NA
Tx Random Jitter, RMS	NA
Rx Random noise, RMS	Included in implementation noise
Rx Deterministic jitter, peak-to-peak	NA
Rx Random Jitter, RMS	NA
Rx Low-frequency gain	1.0
Tx, Rx Device package	No loss, indefinite phase
Tx, Rx Single ended resistance	66 Ω (gives magnitude but not phase of device reflection coefficient)
Tx, Rx Single ended capacitance	200 fF (gives magnitude but not phase of device reflection coefficient)

Backplane channel Data

Provided by Megha Shanbhag TEConnectivity
(shanbhag_01a_0711.zip)

case	pulse gain	dibit gain	available Signal	implementation noise	ILD noise	Re-reflection Tx	Re-reflection Rx	Re-refelction Tx-Rx	total channle noise	NEXT 0	NEXT 1	NEXT 2	FEXT A	FEXT B	FEXT C	PSXT	total noise	S/N	margin
TEC_WhisperCabled_1meterCbl_10inDC_07132011	255.9m	198.0m	52.8mV	4.272mV	2.362mV	0.915mV	0.991mV	1.467mV	3.091mV	0.380mV	0.141mV	0.254mV	0.371mV	0.081mV	0.209mV	0.645mV	5.312mV	9.93	5.298mV
TEC_WhisperCabled_1meterCbl_5inDC_07132011	375.8m	313.4m	83.5mV	5.375mV	4.445mV	1.866mV	2.114mV	2.141mV	5.682mV	0.745mV	0.339mV	0.537mV	0.597mV	0.167mV	0.381mV	1.220mV	7.916mV	10.55	8.851mV
TEC_WhisperOrtho_07112011	524.8m	463.3m	123.4mV	6.534mV	5.544mV	3.522mV	3.021mV	3.925mV	8.226mV	0.942mV	0.425mV	0.703mV	0.933mV	0.245mV	0.598mV	1.688mV	10.640mV	11.60	13.957mV
TEC_WhisperStd_17inBP_5inDC_07112011	261.1m	207.6m	55.3mV	4.374mV	2.093mV	1.880mV	1.880mV	1.526mV	3.712mV	1.001mV	0.739mV	1.474mV	0.398mV	0.049mV	0.456mV	2.023mV	6.083mV	9.09	4.987mV

Color code

“passes” margin is > 0
“passes with 3 dB margin” margin > total noise
“fails near pass” margin < 0 but S/N>5.02
“fails badly” margin < 0 and S/N<5.02
margin column, if positive, additional noise which can be added and still meet BER<$1 \cdot 10^{-12}$

Cable channel Data

From

Wolfgang Meier
Armin Jacht
of
Emerson Network Power

(meier_02_0811.zip)

case	pulse gain	dibit gain	available Signal	implementation noise	ILD noise	Re-reflection Tx	Re-reflection Rx	Re-refelction Tx-Rx	total channel noise	NEXT 0	NEXT 1	NEXT 2	NEXT3	FEXT	PSXT	total noise	S/N	margin
Longest/Thru_S06-P20-10-AB_S14-P23-04-CD_NNN.s4p	181.839m	113.234m	30.165mV	3.230mV	4.847mV	2.193mV	2.529mV	1.460mV	6.069mV	1.825mV	1.504mV	2.224mV	1.907mV	3.535mV	5.165mV	8.599mV	3.51	-7.453mV
Longest/Thru_S06-P20-10-EF_S14-P23-04-GH_NNN.s4p	170.967m	105.037m	27.982mV	3.111mV	5.186mV	2.575mV	3.186mV	1.388mV	6.752mV	1.825mV	1.504mV	2.224mV	1.907mV	3.535mV	5.165mV	9.053mV	3.09	-8.131mV
Longest/Thru_S14-P23-04-AB_S06-P20-10-CD_NNN.s4p	177.179m	111.963m	29.827mV	3.212mV	7.494mV	2.721mV	2.879mV	1.463mV	8.601mV	1.825mV	1.504mV	2.224mV	1.907mV	3.535mV	5.165mV	10.535mV	2.83	-9.643mV
:Longest/Thru_S14-P23-04-EF_S06-P20-10-GH_NNN.s4p	174.304m	110.464m	29.428mV	3.191mV	5.980mV	2.727mV	3.355mV	1.407mV	7.512mV	1.825mV	1.504mV	2.224mV	1.907mV	3.535mV	5.165mV	9.659mV	3.05	-8.705mV
Middle/Thru_S06-P22-06-AB_S10-P23-04-CD_NNN.s4p	212.316m	139.400m	37.136mV	3.584mV	7.404mV	2.720mV	2.994mV	1.659mV	8.599mV						0.000mV	9.316mV	3.99	-7.674mV
Middle/Thru_S06-P22-06-EF_S10-P23-04-GH_NNN.s4p	201.876m	131.007m	34.900mV	3.475mV	7.753mV	3.178mV	3.927mV	1.573mV	9.386mV						0.000mV	10.009mV	3.49	-8.691mV
Middle/Thru_S10-P23-04-AB_S06-P22-06-CD_NNN.s4p	209.372m	138.613m	36.927mV	3.574mV	10.417mV	3.392mV	3.500mV	1.654mV	11.619mV						0.000mV	12.156mV	3.04	-10.963mV
Middle/Thru_S10-P23-04-EF_S06-P22-06-GH_NNN.s4p	206.492m	137.373m	36.596mV	3.558mV	8.844mV	3.343mV	4.068mV	1.586mV	10.414mV						0.000mV	11.005mV	3.33	-9.697mV
Shortest/Thru_S07-P23-02-AB_S09-P23-02-CD_NNN.s4p	228.456m	156.743m	41.756mV	3.801mV	10.242mV	3.326mV	3.520mV	1.767mV	11.466mV	1.895mV	1.502mV	2.559mV	2.148mV	4.347mV	5.992mV	13.484mV	3.10	-12.107mV
Shortest/Thru_S07-P23-02-EF_S09-P23-02-GH_NNN.s4p	218.549m	149.345m	39.785mV	3.710mV	10.448mV	3.615mV	4.413mV	1.641mV	12.016mV	1.895mV	1.502mV	2.559mV	2.148mV	4.347mV	5.992mV	13.930mV	2.86	-12.730mV
Shortest/Thru_S09-P23-02-AB_S07-P23-02-CD_NNN.s4p	227.480m	147.338m	39.251mV	3.685mV	10.261mV	3.253mV	3.446mV	1.796mV	11.444mV	1.895mV	1.502mV	2.559mV	2.148mV	4.347mV	5.992mV	13.433mV	2.92	-12.218mV
Shortest/Thru_S09-P23-02-EF_S07-P23-02-GH_NNN.s4p	221.920m	147.774m	39.367mV	3.690mV	10.877mV	3.557mV	4.409mV	1.699mV	12.381mV	1.895mV	1.502mV	2.559mV	2.148mV	4.347mV	5.992mV	14.242mV	2.76	-13.095mV

Observations:

- The TEConnectivity channels are computed examples of non-conventional channels. They need to be viewed with some caution but seem promising to justify further investigation.
- The Emerson Network Power channels appear to be examples of legacy channels which will be extremely challenging or unworkable.