

# Baseline Proposal for 100GAUI-1/200GAUI-2/400GAUI-4 C2M Reference Receiver

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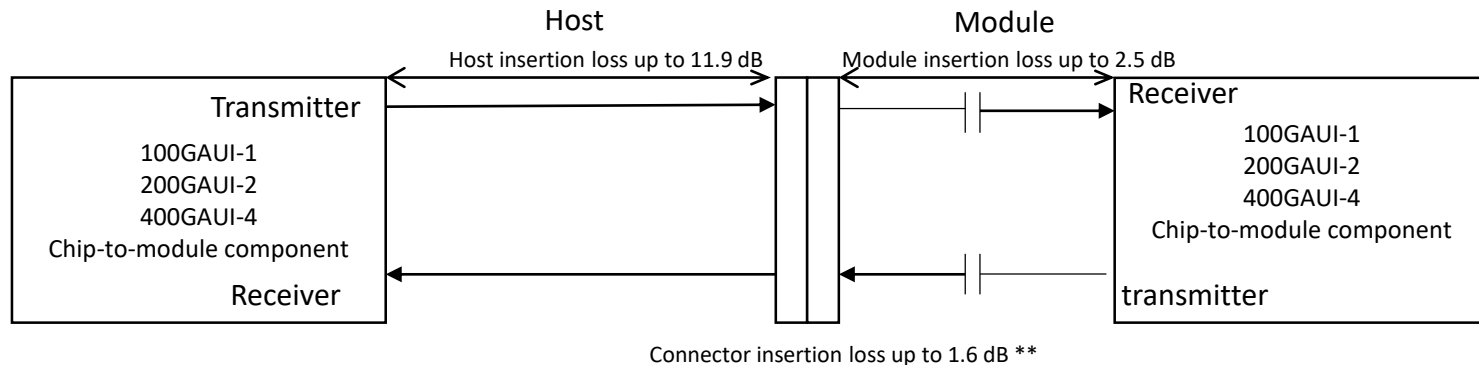
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# Introduction

- ❖ This baseline proposal is to complete open items of the adopted C2M baseline [sun 3ck 04b 0319](#), including the following items:
  - ❖ Channel loss allocation
  - ❖ Reference receiver and its optimization algorithm
  - ❖ EH, ESMW, and VEC thresholds
  - ❖ HCB/MCB characteristics
  - ❖ Return loss (ERL) parameters for host/module input and output

# Channel Insertion Loss Allocation

## ❖ C2M channel and insertion loss allocation:



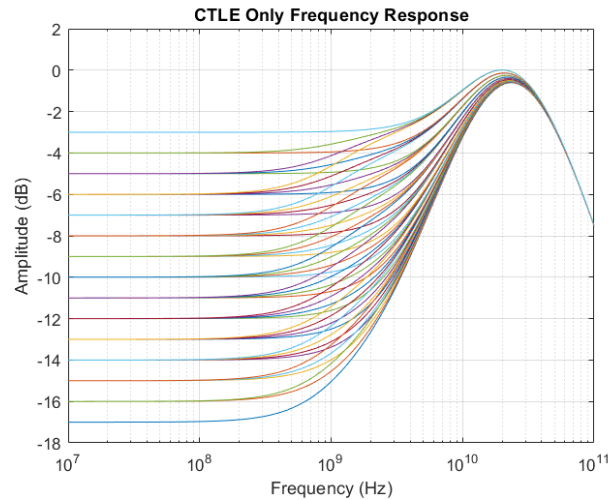
\*\* The host connector mating interface is allocated 0.3 dB variation allowance, not including via.

# Reference Receiver

- ❖ Reference receiver for both host and module output is CTLE + a 4-tap DFE with
  - $b_{\max}(1)$  limited to 0.5 or lower, and
  - $b_{\max}(2,3,4)$  limited to 0.2.

\* Parameters in magenta throughout this presentation need to be confirmed.

# CTLE and Noise Filter



CTLE		
$g_{DC}$	[-14:1:-3]	dB
$f_z$	12.58	GHz
$f_{p1}$	20	GHz
$f_{p2}$	28	GHz
$g_{DC2}$	[-3:1:0]	dB
$f_{LF}$	fb/40	GHz

- CTLE equation is the same as in Clause 93A:

$$H_{ctf}(f) = \frac{\left(10^{\frac{g_{DC}}{20}} + j\frac{f}{f_z}\right)\left(10^{\frac{g_{DC2}}{20}} + j\frac{f}{f_{LF}}\right)}{\left(1 + j\frac{f}{f_{p1}}\right)\left(1 + j\frac{f}{f_{p2}}\right)\left(1 + j\frac{f}{f_{LF}}\right)}$$

- An additional noise filter is a fourth-order Butter Worth filter with 3dB bandwidth  $f_r=39.8438$  GHz:

$$H_r(f) = \frac{1}{1 - 3.414214(f/f_r)^2 + (f/f_r)^4 + j2.613126(f/f_r - (f/f_r)^3)}$$

- \* CTLE is the same as in [sun 3ck 03 0319](#).

# Reference Receiver Adaptation Methodology

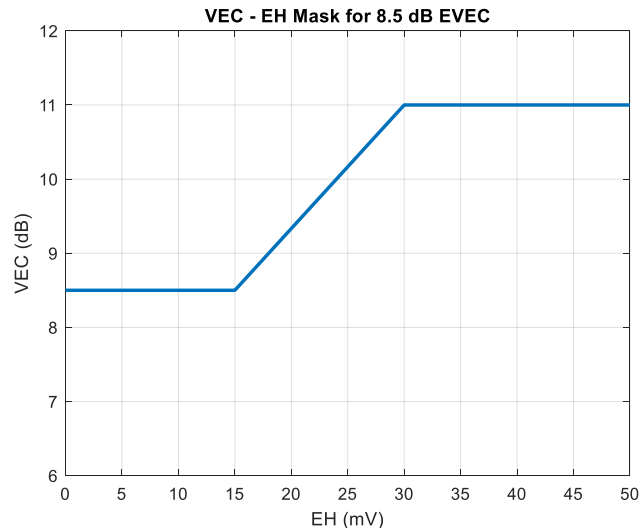
- ❖ Reference equalizer adaptation algorithm is **explicitly specified to achieve measurement consistency**.
  - Leverage Clause 85.8.3.3.5 linear fit methodology to extract pulse response. Parameter M is no less than 32, Dp is 3, and Np is 200.
  - Leverage Annex 93A for optimal phase and DFE tap weight.
  - Apply phase and DFE weight on measured waveforms. Noise and distortion are all kept. Reuse Annex 120E for test point measurement.

# Host Output Characteristics (at TP1a)

Parameter	400GAUI-8	100GAUI-1, 200GAUI-2, 400GAUI-4
ESMW (Eye symmetry mask width)	0.22 UI	TBD
Eye height, differential (min)	32 mV	15 mV
Vertical Eye Closure (max)	12 dB	8.5 dB EVEC (Effective Vertical Eye Closure)

EVEC definition:

$$\text{EVEC} = \begin{cases} \text{VEC}, & \text{if } EH < 15 \text{ mV} \\ \text{VEC} - 0.1667 * (EH - 15) \text{ dB}, & \text{if } EH \text{ is between 15 and 30 mV} \\ \text{VEC} - 2.5 \text{ dB}, & \text{if } EH > 30 \text{ mV} \end{cases}$$



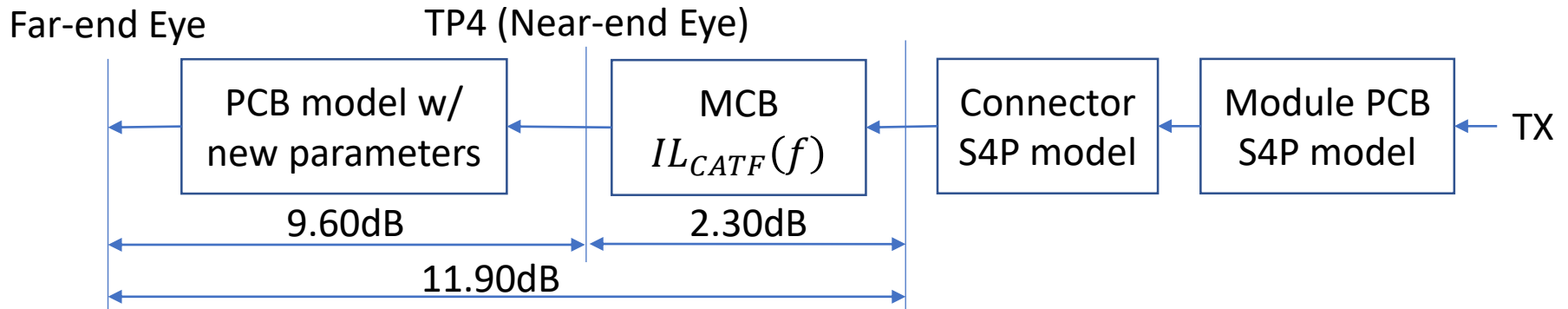


# Module Output Characteristics (at TP4)

Parameter	400GAUI-8	100GAUI-1, 200GAUI-2, 400GAUI-4
Near-end Vertical Eye Closure (max)	-	6.5 dB
Near-end Eye height, differential (min)	70 mV	50 mV
Near-end ESMW (Eye symmetry mask width)	0.265 UI	TBD
Far-end Vertical Eye Closure (max)	-	7 dB
Far-end Eye height, differential (min)	30 mV	20 mV
Far-end ESMW (Eye symmetry mask width)	0.2 UI	TBD

# Module Output Far-End Reference Channel model

- Host IL (11.9dB) – MCB IL (2.3dB) = PCB model IL budget (9.6dB)
  - 243.84mm PCB model has 9.60dB at 26.56GHz using Table 92-12 parameters shown in config\_example\_ieee8023\_93a=3ck\_CR\_mellitz\_01\_100219
    - $\gamma_0 = 0$ ,  $a_1 = 3.8206 \times 10^{-4}$ ,  $a_2 = 9.5909 \times 10^{-5}$ ,  $\tau = 5.790 \times 10^{-3}$



# HCB/MCB Characteristics

- HCB characteristics are described in 162B.1.1 where the HCB performs the same equivalent function as the TP2 or TP3 test fixture.
- MCB characteristics are described in 162B.1.2 where the MCB performs the equivalent functionality as the cable assembly test fixture.
- The mated compliance board characteristics are described in 162B.1.3 where the MCB and HCB perform the equivalent functionality as the cable assembly test fixtures.

# Host/Module Input / Output Effective Return Loss

Parameter	50GBASE-CR, 100GBASE-CR2, 200GBASE-CR4	100GAUI-1, 200GAUI-2, 400GAUI-4 Host	100GAUI-1, 200GAUI-2, 400GAUI-4 Module
Transition time associated with a pulse ( $T_r$ )	0.0189 ns	0.010 ns	0.010 ns
Incremental available signal loss factor ( $\beta_x$ )	1.7 GHz	2.4 GHz	2.4 GHz
Permitted reflection from a transmission line external to the device under test ( $\rho_x$ )	0.3	0.3	0.3
Length of the reflection signal (N)	300 UI	600 UI	600 UI
Transmitter steady-state voltage, $v_f$ (min.) Transmitter steady-state voltage, $v_f$ (max.)	0.354 V 0.6 V	0.39 V 0.6 V	0.41 V 0.6 V
Linear fit pulse peak (min.) ( $P_{max}$ )	$0.49 \times v_f$ V	$0.28 \times v_f$ V	$0.59 \times v_f$ V
Transmitter (Host/Module output) $ERL_{min}$	EQ 136-6 at TP2	See Equation below, at TP1a	$\geq 11$ dB at TP4a
Receiver (Host/Module input) $ERL_{min}$	$\geq 10$ dB at TP3	$\geq 11$ dB at TP4a	$\geq 11$ dB at TP4a
Equalizer length associated with reflection signal ( $N_{bx}$ )	-	4	4

- See 93A.5 for definition of parameters
- $N_p = 200$  for fitting.  $v_f$  is defined in 93.8.1.5.2 , i.e. 200 UI after the sample point is used for  $v_f$

- Host output  $ERL_{min}$  equation:

$$if \frac{\text{Linear fit pulse peak}}{v} \geq 0.375 ERL_{min} = 11 (dB)$$

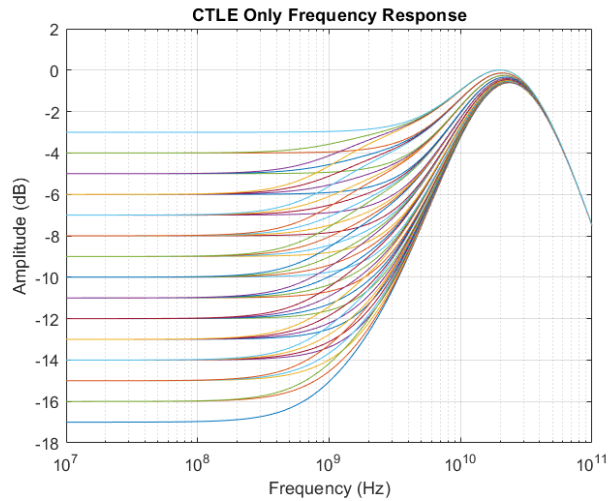
$$else ERL'_{min} = 14 dB$$

# Summary

- ❖ Propose 802.3ck task force to adopt these baseline proposals on slides 4-12, with a note that VEC, EH, ERL thresholds need to be further confirmed.

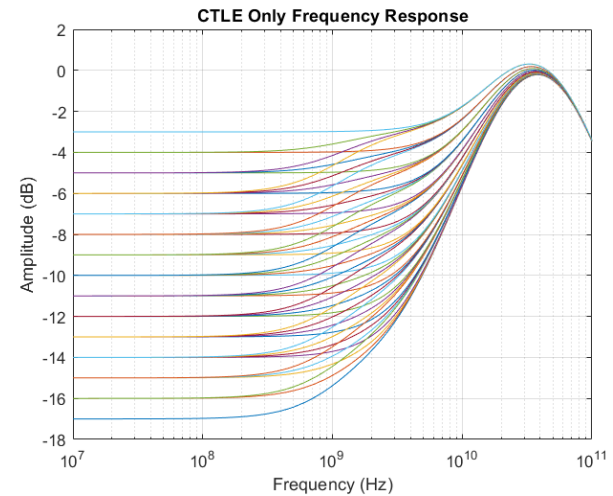
# Backup Slides

# CTLE



CTLE and Noise Filter for Receivers A, A2, and B		
$g_{DC}$	[-14:1:-3]	dB
$f_z$	12.58	GHz
$f_{p1}$	20	GHz
$f_{p2}$	28	GHz
$g_{DC2}$	[-3:1:0]	dB
$f_{LF}$	1.328125	GHz

CTLE for  $b_{\max}(1) > 0$



CTLE and Noise Filter for Receivers C and D		
$g_{DC}$	[-14:1:-3]	dB
$f_z$	18.88	GHz
$f_{p1}$	28	GHz
$f_{p2}$	53.125	GHz
$g_{DC2}$	[-3:1:0]	dB
$f_{LF}$	1.328125	GHz

CTLE for  $b_{\max}(1) = 0$