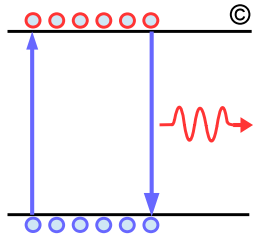

Defining 10 dB CAUI-4 C2C

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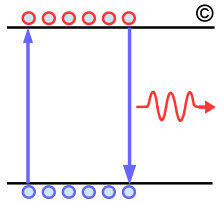
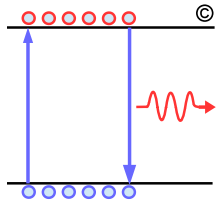
IEEE 802.3bm Task Force
January 2014 Interim

Overview



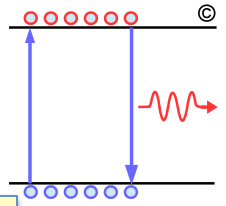
- Merits of 10 dB CAUI-4 C2C
- Application for CAUI-4 C2C
- How to define option 10 dB CAUI-4 C2C

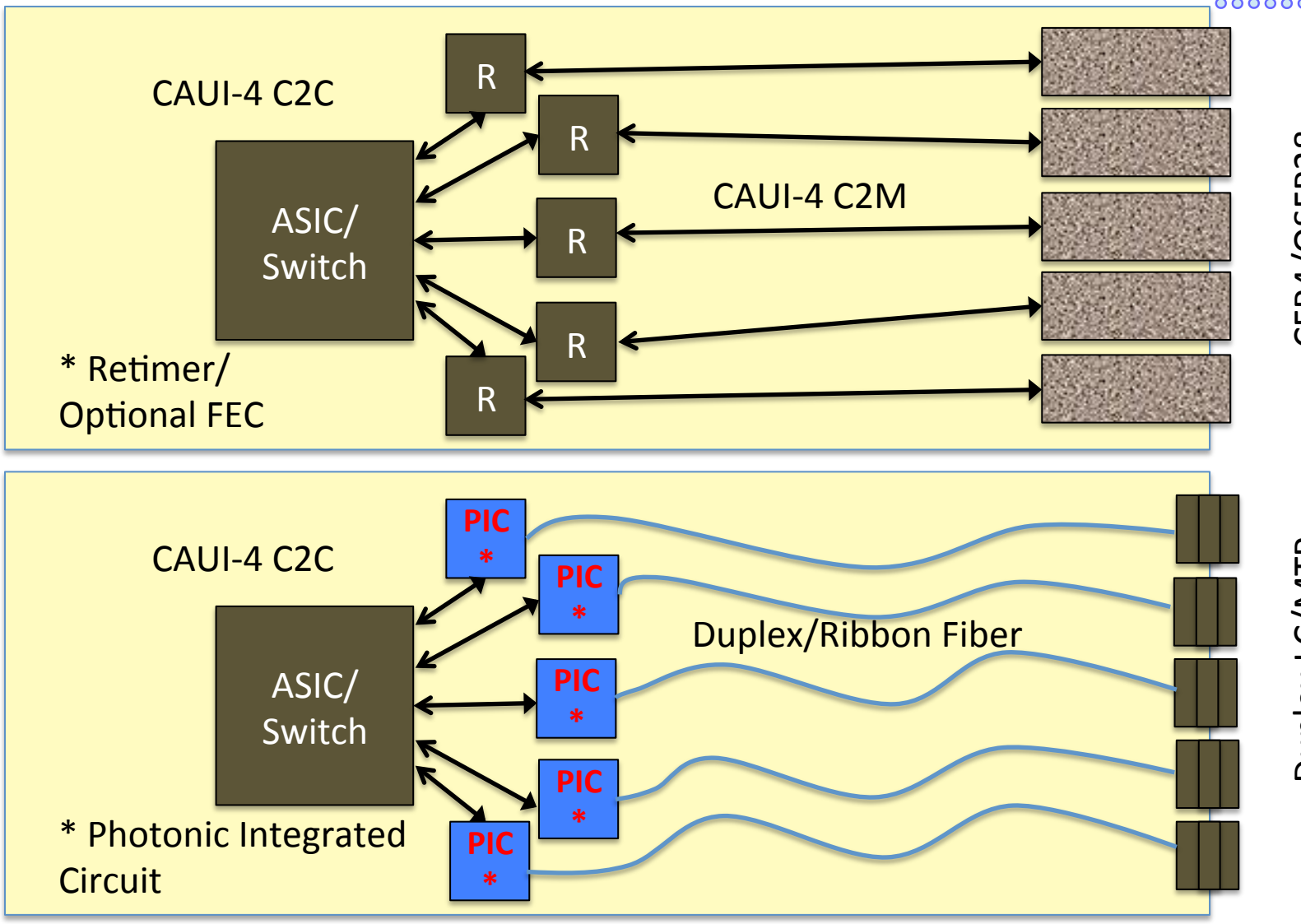
Merits of Defining 10 dB CAUI-4 C2C



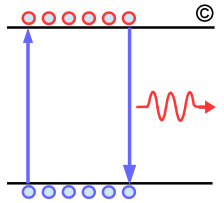
- **CAUI-4 with 10 dB loss budget already defined for chip to module**
  - The component to implement CAUI-4 C2C with 10 dB will be readily available or will be supported
- **Why define 10 dB CAUI-4 C2C?**
  - 10 dB CAUI-4 only require CTLE receiver
  - A CTLE receiver will have at least 50% lower PD
  - A CTLE receiver does not have MTTPFA issue that DFE receiver may requiring pre-coding and/or FEC
  - A 10 dB CTLE link can operate in transparent pass through mode
- **What application can be enabled with lower power CTLE receiver**
  - Higher density ASIC/switches
  - On board PIC (Photonic Integrated Circuit)
  - NIC
  - NPU
- **CAUI-4 C2C with 10 dB can support ~8" on Nelco 4000-SI and ~10.9" on Megtron 6 see** http://www.ieee802.org/3/bm/public/jul13/ghiasi_01_0713_optx.pdf

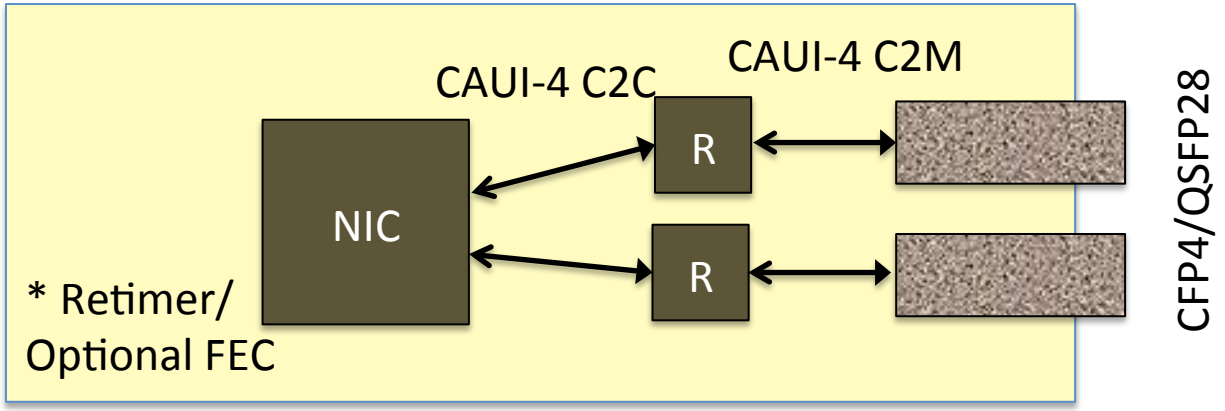
Application of CAUI-4 C2C with 10 dB

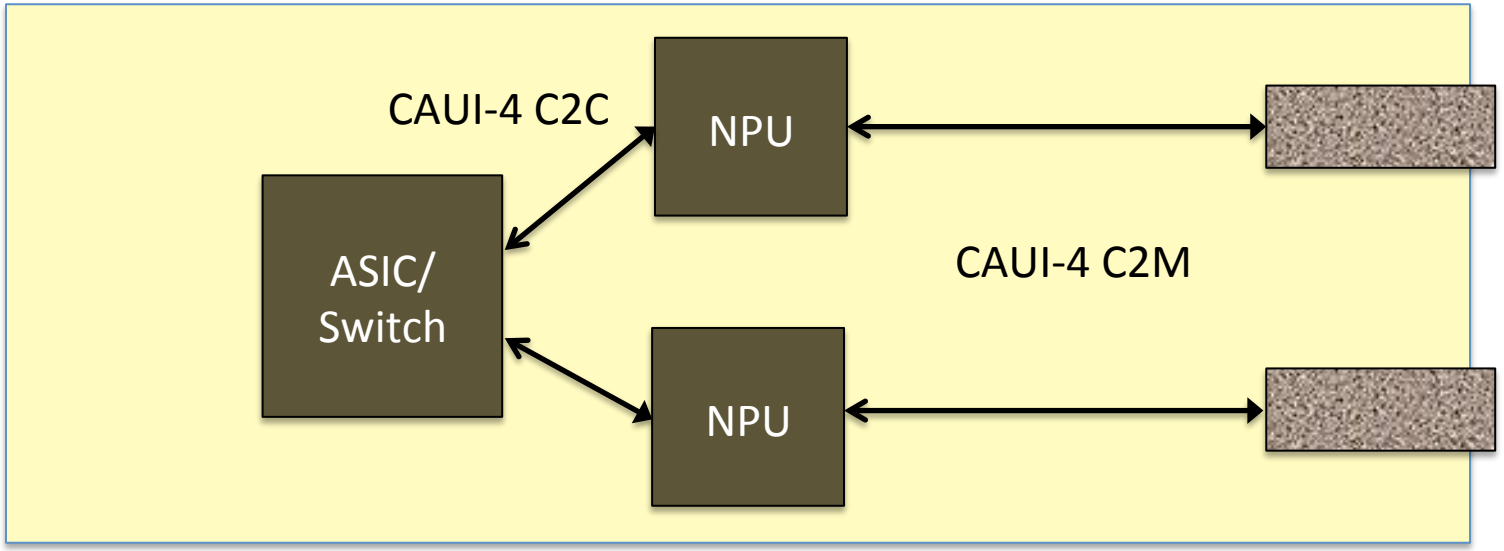




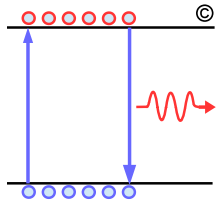
Application of CAUI-4 C2C with 10 dB Cont.







How to Define CAUI-4 C2C 10 dB



- **To save power go with 900 mV signal swing instead of 1200 mV**

Table 83D–1—CAUI-4 transmitter characteristics at TP0a

Parameter	Subclause Reference	Value	Units
Signaling rate per lane (range)	83E.3.1.1	25.78125 ± 100 ppm	GBd
Differential peak-to-peak output voltage (max) Transmitter disabled Transmitter enabled	83D.3.1.1	 30 ~~1200~~ 900 mV	mV
Common-mode voltage (max)	83D.3.1.1	1.9	V
Common-mode voltage (min)	83D.3.1.1	0	V
Common-mode AC output voltage (max, RMS)	83D.3.1.1	12	mV
Differential output return loss (min)	83D.3.1.2	Equation (83D–2)	dB
Common-mode output return loss (min)	83D.3.1.2	Equation (83D–3)	dB
Transition time (min, 20% to 80%)	83D.3.1.3	8	ps
Output Jitter (max) Random jitter Deterministic jitter Total jitter	83D.3.1.4	 0.15 0.15 0.28	UI
Transmitter eye mask definition X1	83D.3.1.5	0.14	UI
Transmitter eye mask definition X2	83D.3.1.5	0.4	UI
Transmitter eye mask definition Y1	83D.3.1.5	~~200~~ 150 mV	mV
Transmitter eye mask definition Y2	83D.3.1.5	~~600~~ 450 mV	mV
Minimum transmit equalization[a]: Pre-cursor Post-cursor	83D.3.1.6	 Table 83D–2 Table 83D–3	dB

[a]Independent of optimal setting used for transmitter jitter and output waveform measurements.

How to Define CAUI-4 C2C 10 dB Cont.

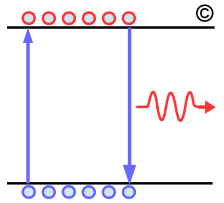
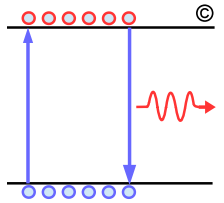


Table 83D–7—Channel operating margin parameters

Parameter	Symbol	Value	Units
Signaling rate	f_b	25.78125	GBd
Maximum start frequency	f_{min}	0.05	GHz
Maximum frequency step	Δf	0.01	GHz
Transmitter package model Single-ended device capacitance Transmission line length Single-ended board capacitance	 C_{dt} z_{pt} C_{bt}	 2.5×10^{-4} 12 1.8×10^{-4}	 nF mm nF
Receiver package model Single-ended device capacitance Transmission line length Single-ended board capacitance	 C_{dr} z_{pr} C_{br}	 0 0 0	 nF mm nF
Single-ended reference resistance	R_o	50	ohms
Single-ended termination resistance	R_d	55	ohms
Receiver 3 dB bandwidth	f_r	$0.75 \times f_b$	GHz
Transmitter equalizer, pre-cursor coefficient	$c(-1)$, $c(0)$, $c(1)$	Table 83D–8	 — — —
Transmitter equalizer, post-cursor coefficient	$c(-1)$, $c(0)$, $c(1)$	Table 83D–9	 — — —
Continuous time filter, DC gain	*CTLE*	Table 83D–6	 dB dB dB
Transmitter differential peak output voltage Victim Far-end aggressor Near-end aggressor	 Av A_{fe} A_{ne}	 ~~0.4~~ 0.3 ~~0.4~~ 0.3 ~~0.6~~ 0.45	 V V V
Number of signal levels	L	2	—
Level separation mismatch ratio	R_{LM}	1	
Transmitter signal to noise ratio	SNR_{TX}	27	dB
Number of samples per unit interval	M	32	—
Decision feedback equalizer (DFE) length	N_b	0	UI
Normalized DFE coefficient magnitude limit	b_{max}	1	—
Random jitter, RMS	σ_{RJ}	0.01	UI
Dual-Dirac jitter, peak	A_{DD}	0.05	UI
One-sided noise spectral density	η_o	5.2×10^{-4}	V^2/GHz
Target detector error ratio	DER_0	10^{-15}	—

How to Define CAUI-4 C2C 10 dB Cont



- **Max CTLE peaking required will be 9 dB**
- **Transmit FFE 83D-8/9 are not required**
- **The parameter listed are based on draft D2.0 and if there are update to CL 83D it can applied to 10 dB varient with exception of**
  - Transmitter amplitude reduced to 900 mV
  - Transmitter FFE NA
  - CTLE peaking 1-9 dB
  - Any implementation to overcome MTTPFA is not required
  - CAUI-4 C2C 10 dB will operate as pass through carrying transparently all 100Gbase-R or FEC data
- **Logistic of defining 10 dB C2C**
  - Last sub-clause in 83D with specific requirement to meet 10 dB C2C optional implementation.