EEE Baseline Proposal

Saied Benyamin, Aquantia
Jim Graba, Broadcom

October 31, 2018

Convergence work on LPI parameters

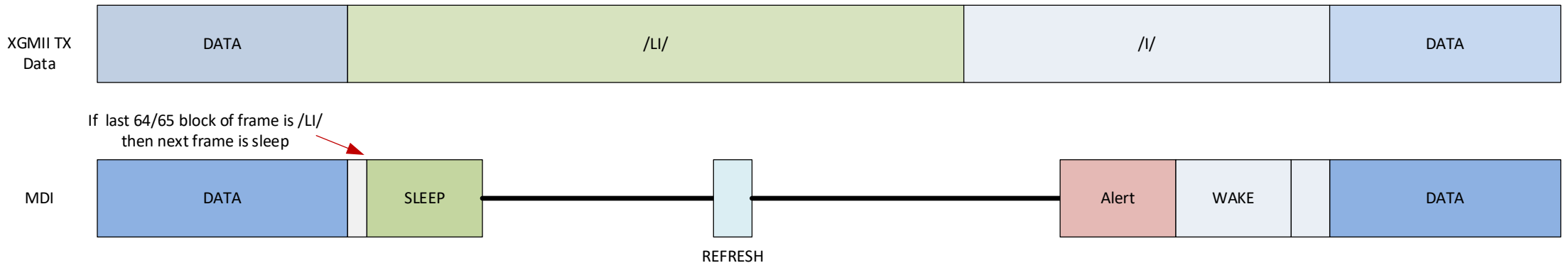
- Sleep
  - 8 RS FEC frames of low power Idles
- Quiet
  - ~ 60/30/30 us (50/50/100 RS frames) for 2.5/5/10G data rates
- Refresh
  - 1 RS FEC frame
- OAM during Refresh
- Alert
  - Low frequency traditional Alert
- Wake
  - 6 RS FEC frames of Idles

LPI parameters comparison

					Broadcom's original proposal			Joint proposal		
	10GBASE-T	802.3bz		1GBASE-T1	10GBASE-T1			10GBASE-T1		
Data Rate (Gb/s)	10	5	2.5	1	10	5	2.5	10	5	2.5
Trans. code rate	0.985	0.985	0.985	0.988	0.985	0.985	0.985	0.985	0.985	0.985
CRC rate	0.997	0.997	0.997	1.000	1	1	1	1	1	1
FEC coding rate	0.909	0.909	0.909	0.900	0.903	0.903	0.903	0.903	0.903	0.903
Modulation gain	3.5	3.5	3.5	1.5	2	2	2	2	2	2
Num TWP	4	4	4	1	1	1	1	1	1	1
Baud rate (MS/s)	800.00	400.00	200.00	750.00	5625.00	2812.50	1406.25	5625.00	2812.50	1406.25
Frame len. (ns)	320.00	320.00	640.00	3600.00	320.00	640.00	1280.00	320.00	640.00	1280.00
Frame len. (symbols)	256	128	128	2700	1800	1800	1800	1800	1800	1800
QR cyc len. (Fr)	128	128	128	24	100	50	50	100	50	50
Ref. len. (Fr)	4	8	8	0.4	5	3	3	1	1	1
QR (us)	40.96	40.96	81.92	86.4	32	32	64	32	32	64
Tq (us)	39.68	38.4	76.8	84.96	30.4	30.08	60.16	31.68	31.36	62.72
Tr (us)	1.28	2.56	5.12	1.44	1.6	1.92	3.84	0.32	0.64	1.28
Tq (symbols)	31744	15360	15360	63720	171000	84600	84600	178200	88200	88200
Tr (symbols)	1024	1024	1024	1080	9000	5400	5400	1800	1800	1800
Ref / QR	0.78%	1.56%	1.56%	1.67%	5.00%	6.00%	6.00%	1.00%	2.00%	2.00%

LPI mode life cycle

- Very similar to 10G EEE

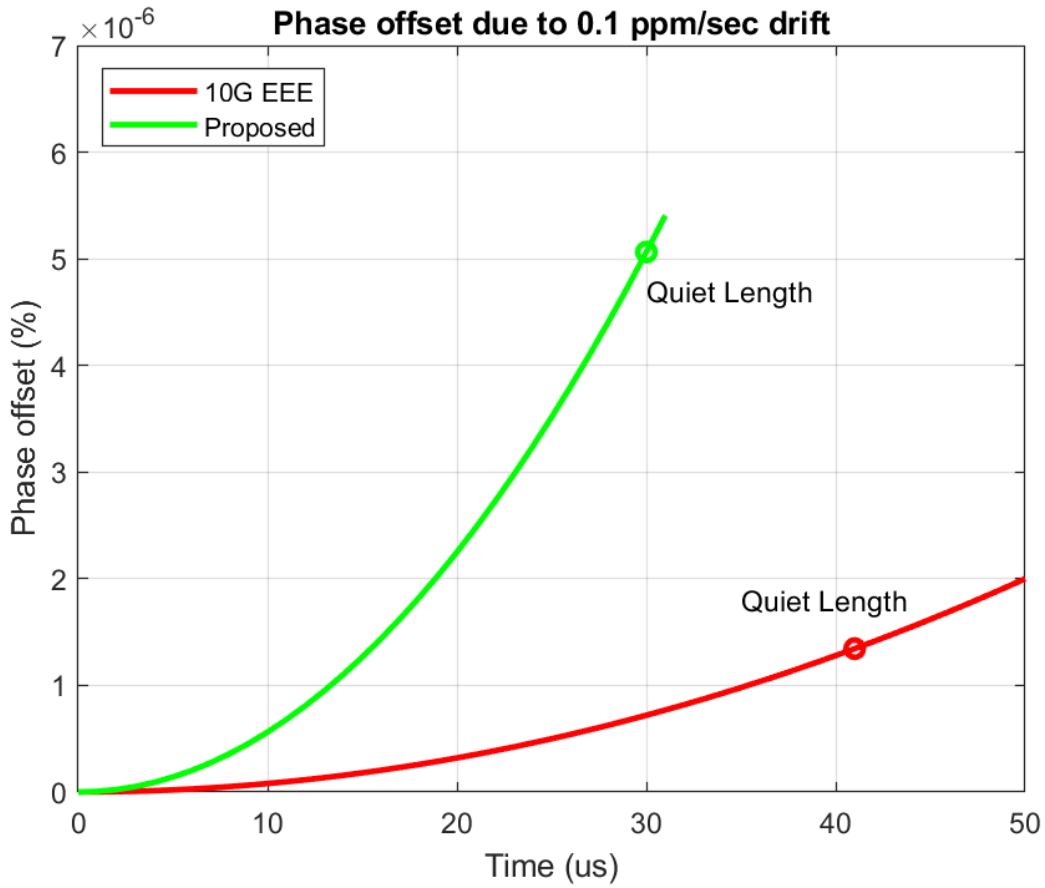


Sleep

- 8 RS FEC frames of low power Idles, otherwise indistinguishable from non-EEE data
- Supports interleave of 4 or less
- If last 64/65B block in RS frame is /LI/ then start Sleep on the next RS frame

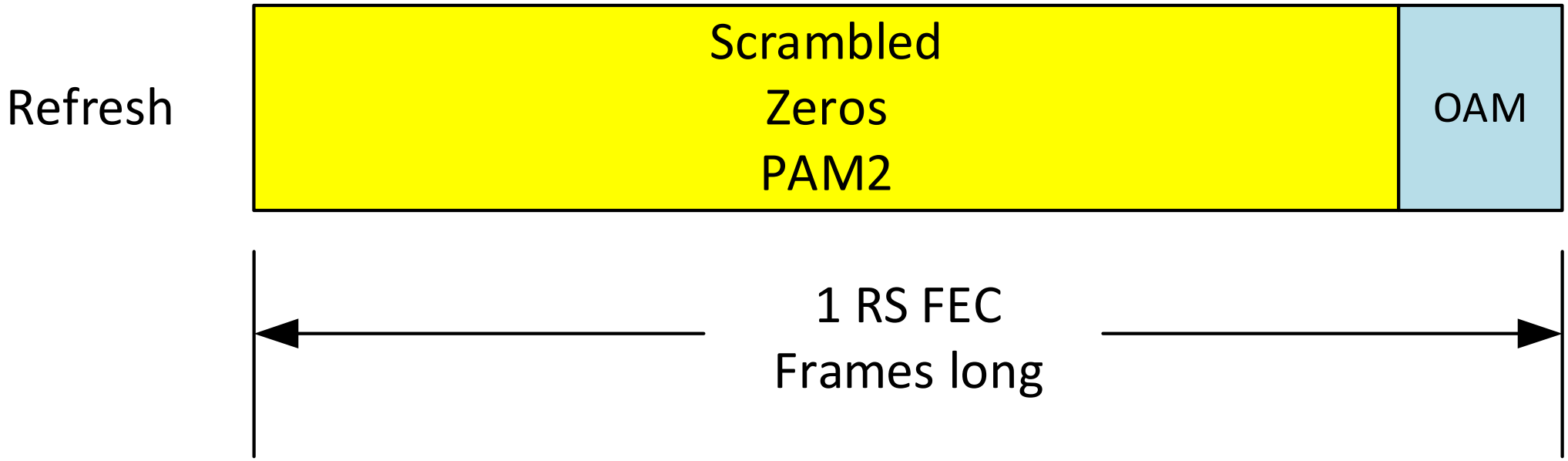
Quiet

- As long as possible
- Minimize amount of common mode bounce occurrence
- T_Q = 31.36/30.72/61.44 us
- Phase offset due to frequency drift is small ~ 5.1e-6%



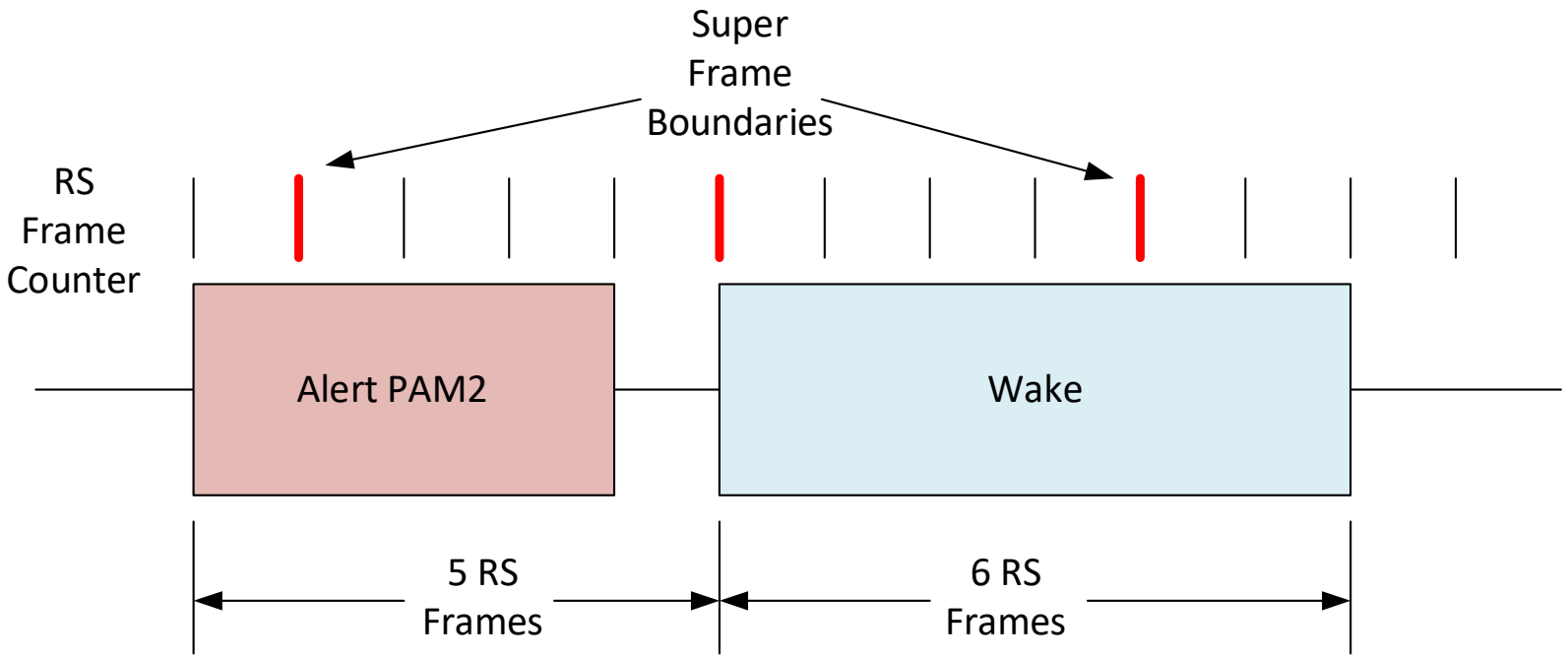
Refresh composition (including OAM)

- PAM2 scrambled zeros using the training scrambler
- OAM symbols encoded using info field modulation
- Implementable with margin for a challenging environment



Alert

- Traditional Alert
- 64 bit pattern, each bit repeated 16 times
- Similar in frequency content to 10G EEE Alert
- Alert starts just before a super frame boundary, interleave = 4



Latencies

- Case 1: Sleep, Alert, and Wake
- Case 2: Alert and Wake
- Similar latency to previous xGBASE-T EEE

Table 78-4	802.3ch EEE Latency		Previous EEE Latencies	
Data Rate	Case 1 (us)	Case 2 (us)	Case 1 (us)	Case 2 (us)
10G	7.36	4.8	7.36	4.48
5G	14.72	9.6	14.72	8.96
2.5G	29.44	19.2	29.44	17.92

Conclusion

- We have converged on the major EEE parameters
- Once the committee agrees we can generate text