

# 100GBASE-KP4 TX (comment #222, 221/95)

January 2013

Kent Lusted, Intel  
Adee Ran, Intel

# Transition Times Options (Comment #222)

1. Calculate transition times on response created from linear fit pulse response  $p(k)$
2. Measure transition times directly from a waveform where a run of +1/-1 PAM4 symbols exist
3. Delete the transition times measurement requirement

# Step Response

- Use linear fit procedure is specified in Clause 94.3.12.6.1
  - Linear fit pulse response  $p(k)$  is computed in step 3
- From pulse response  $p(k)$ , compute  $s(k)$  by convolving with the sequence  $\{\dots -1 -1 -1 +1 +1 +1 \dots\}$
- Measure the respective transition times 20%/80% and 80%/20% on  $s(k)$

# Direct Measurement

- QPRBS13 (per 94.2.11.3) has sufficient runs of +/-1 PAM4 symbols for direct measurement

Symmetric Run length	Lane 0 Count	Lane 1 count	Lane 2 count	Lane 3 count
1	907 / 943	1009 / 1031	991 / 1003	937 / 981
2	50 / 61	68 / 57	59 / 80	59 / 58
3	2 / 3	4 / 3	2 / 3	4 / 4
4	0 / 0	0 / 0	0 / 0	0 / 0

Run length = count of PAM4 symbols

i.e. rise of 1 -> -1 +1

rise of 2 -> -1 -1 +1 +1

fall of 2 -> +1 +1 -1 -1

\* Count is denoted as rise / fall

Full table PAM4 symbols in backup

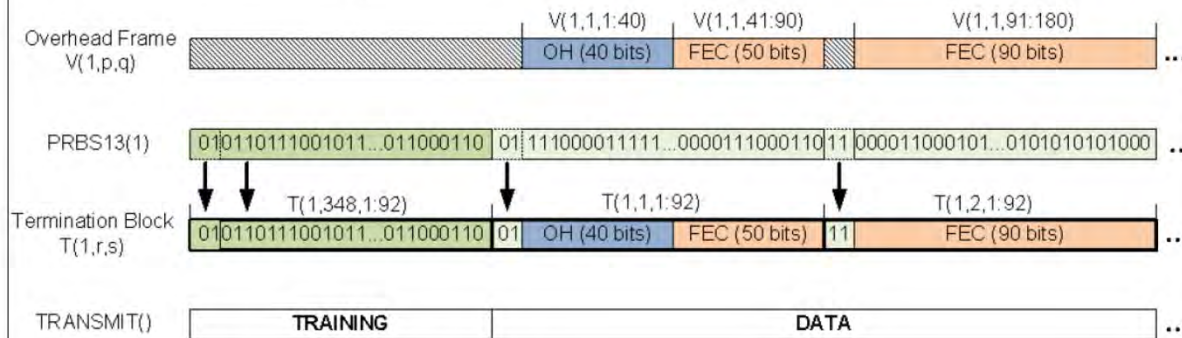
# Direct Measurement Change List

- In Draft 1.3, replace 2<sup>nd</sup> and 3<sup>rd</sup> paragraphs in 94.3.12.5 with:
  - The test pattern is quaternary PRBS13 per 94.2.11.3. The transitions within sequences of three -1 PAM4 symbols followed by three +1 PAM4 symbols and three +1 PAM4 symbols followed by three -1 PAM4 symbols are measured. The 0% level and the 100% level are as defined by the OMA measurement procedure (see 68.6.2).
- Update last paragraph to use a value for TBD:
  - The transition times shall be greater than or equal to **18** ps when transmit equalization is disabled. Transmit equalization may be disabled by asserting the preset control defined in Table 45–60 and 45.2.1.81.3.

18 ps = (25% of ~73 ps UI)

# ALERT Transition (comment #221/95)

## Training to Data Transition



- Notes:
  - PRBS13 bit inversion ends with transition to data mode

10

IEEE 802.3bj Nov 2012 Plenary

# ALERT Comment

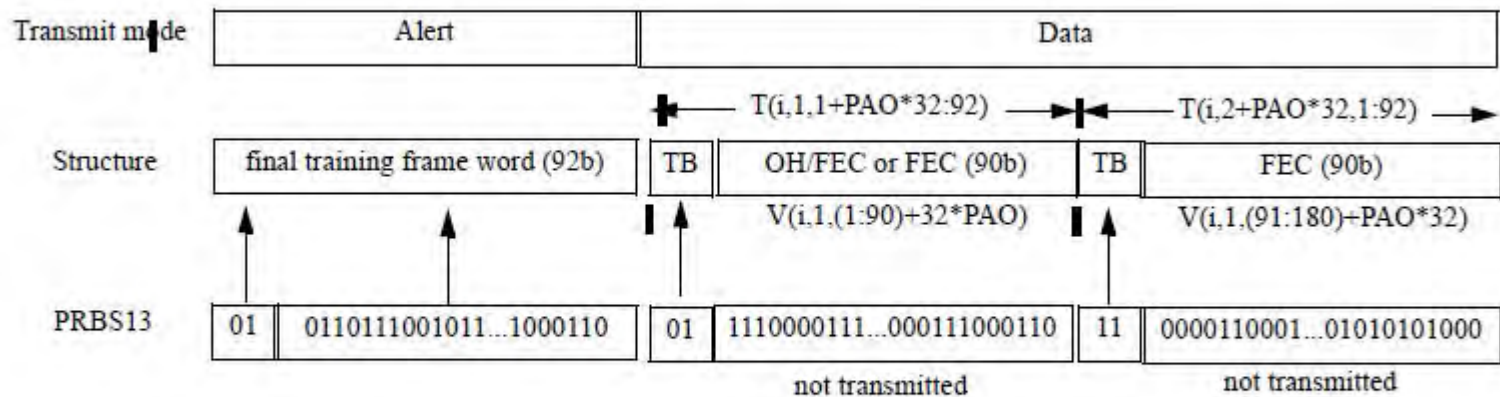


Figure 94-9—Transition from alert to data mode

- Add note to Figure 94-9: “The values for the PRBS13 are specific to a transition with a PAO of zero on Lane 0. The values will be different for other PAO values or lane number.”

# BACKUP



# +/-1 PAM4 Run Analysis of QPRBS13

lane 0 x y fall rise  
run\_results =

1	1	943	907
1	2	253	236
1	3	65	57
1	4	16	9
1	5	2	0
1	6	2	0
1	7	0	0
2	1	243	237
2	2	61	50
2	3	14	13
2	4	1	3
2	5	0	0
2	6	0	0
2	7	0	0
3	1	56	64
3	2	16	13
3	3	3	2
3	4	0	0
3	5	0	0
3	6	0	0
3	7	0	0
4	1	8	16
4	2	0	1
4	3	0	0
4	4	0	0
4	5	0	0
4	6	0	0
4	7	0	0
5	1	1	2
5	2	0	0
5	3	0	0
5	4	0	0
5	5	0	0
5	6	0	0
5	7	0	0
6	1	0	1
6	2	0	0
6	3	0	0
6	4	0	0
6	5	0	0
6	6	0	0
6	7	0	0
7	1	0	0
7	2	0	0
7	3	0	0
7	4	0	0
7	5	0	0
7	6	0	0
7	7	0	0

lane 1 x y fall rise  
run\_results =

1	1	1031	1009
1	2	239	231
1	3	48	54
1	4	10	12
1	5	3	4
1	6	1	1
1	7	1	1
2	1	240	258
2	2	57	68
2	3	15	18
2	4	4	6
2	5	1	1
2	6	0	0
2	7	0	0
3	1	58	68
3	2	14	14
3	3	3	4
3	4	0	2
3	5	0	0
3	6	0	0
3	7	0	0
4	1	19	18
4	2	5	4
4	3	2	0
4	4	0	0
4	5	0	0
4	6	0	0
4	7	0	0
5	1	2	4
5	2	1	0
5	3	0	0
5	4	0	0
5	5	0	0
5	6	0	0
5	7	0	0
6	1	1	1
6	2	0	0
6	3	0	0
6	4	0	0
6	5	0	0
6	6	0	0
6	7	0	0
7	1	1	1
7	2	0	0
7	3	0	0
7	4	0	0
7	5	0	0
7	6	0	0
7	7	0	0

lane 2 x y fall rise  
run\_results =

1	1	1003	991
1	2	255	226
1	3	63	48
1	4	14	12
1	5	1	3
1	6	0	0
1	7	0	0
2	1	256	245
2	2	80	59
2	3	21	12
2	4	6	3
2	5	0	0
2	6	0	0
2	7	0	0
3	1	65	60
3	2	21	11
3	3	3	2
3	4	1	1
3	5	0	0
3	6	0	0
3	7	0	0
4	1	18	18
4	2	7	3
4	3	1	0
4	4	0	0
4	5	0	0
4	6	0	0
4	7	0	0
5	1	7	3
5	2	2	0
5	3	0	0
5	4	0	0
5	5	0	0
5	6	0	0
5	7	0	0
6	1	0	2
6	2	0	0
6	3	0	0
6	4	0	0
6	5	0	0
6	6	0	0
6	7	0	0
7	1	0	0
7	2	0	0
7	3	0	0
7	4	0	0
7	5	0	0
7	6	0	0
7	7	0	0

lane 3 x y fall rise  
run\_results =

1	1	981	937
1	2	252	217
1	3	64	64
1	4	21	13
1	5	7	3
1	6	3	0
1	7	0	0
2	1	232	230
2	2	58	59
2	3	13	16
2	4	5	3
2	5	2	0
2	6	2	0
2	7	0	0
3	1	55	45
3	2	12	10
3	3	4	4
3	4	3	1
3	5	2	0
3	6	2	0
3	7	0	0
4	1	9	8
4	2	6	1
4	3	3	0
4	4	2	0
4	5	2	0
4	6	2	0
4	7	0	0
5	1	3	2
5	2	3	0
5	3	2	0
5	4	2	0
5	5	2	0
5	6	2	0
5	7	0	0
6	1	2	0
6	2	2	0
6	3	2	0
6	4	2	0
6	5	2	0
6	6	2	0
6	7	0	0
7	1	0	0
7	2	0	0
7	3	0	0
7	4	0	0
7	5	0	0
7	6	0	0
7	7	0	0