CDR Lock Time Study

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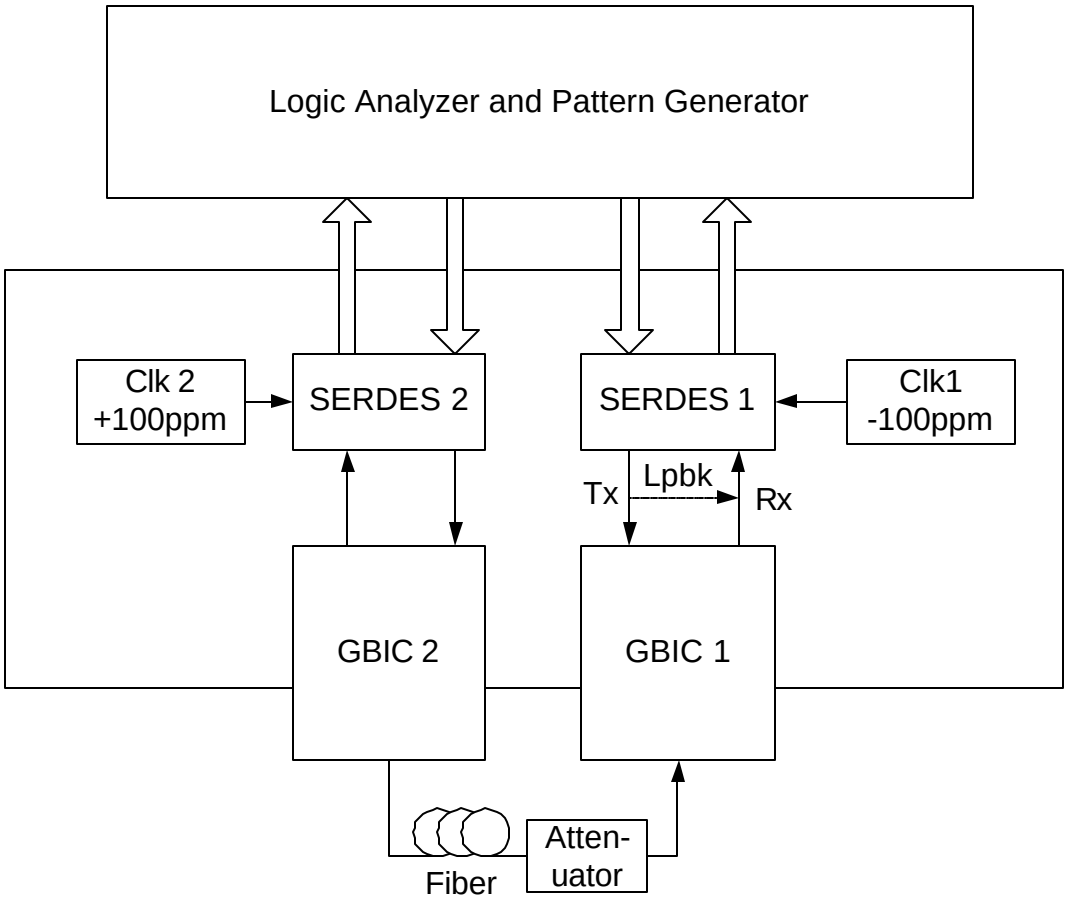
Block Diagram



Test procedure

- Connect channel between both GBICs such that a BER of 10^-4 exists from Tx of GBIC 2 to Rx of GBIC 1 while GBIC 2 is transmitting repeating pattern:
  - /-K28.5/+D30.7/ (low frequency content, all bits
  - /+K28.5/-D30.7/ transition on output at each clock)
- Place SERDES 1 in loopback with comma detect off while transmitting repeating pattern:
  - /-D21.5/ (high frequency square wave, constant SERDES output on each clock)
- Remove SERDES 1 from loopback and measure time until data from GBIC 2 is present on output of SERDES 1.

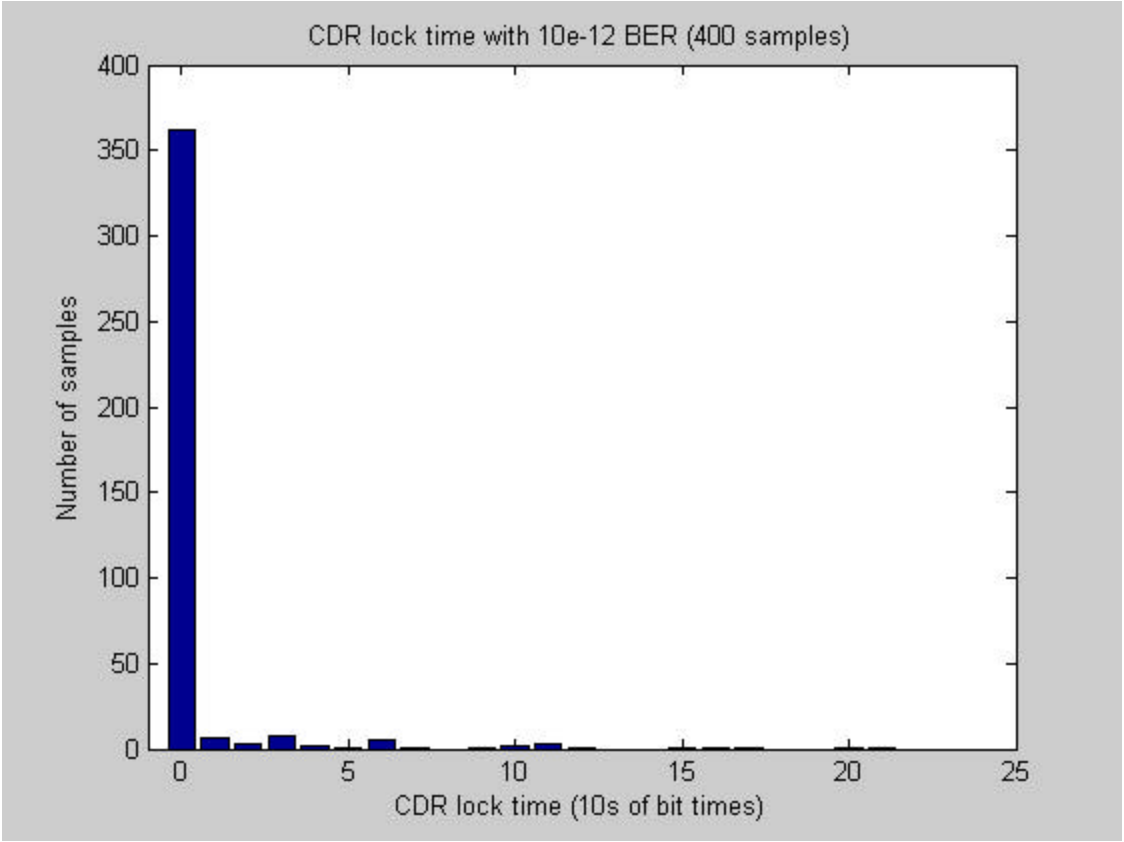
Test Procedure

- Repeat multiple runs on each channel to capture statistical nature of errors, phase, and lock time
- Repeat for channels with different BER (10e-4, 10e-6, 10e-8…)

Data Capture Example

Line #	Be4	Rx 10bCode	After	CG Name
1	+	0111110111	+	K17.7; Invalid(0111110111)
2	+	1000111101	+	-D17.4; RD Error (1000111101)
3	+	1100001110	+	K28.0; Invalid(1100001110)
4	+	1111100011	+	D31.3; Invalid(1111100011)
5	+	0011111010	+	-K28.5; RD Error (0011111010)
6	+	1000111110	+	D17.7; Invalid(1000111110)
7	+	1100000101	-	+K28.5
8	-	0111100001	-	-D30.7
9	-	0011111010	+	-K28.5
10	+	1000011110	+	+D30.7
11	+	1100000101	-	+K28.5

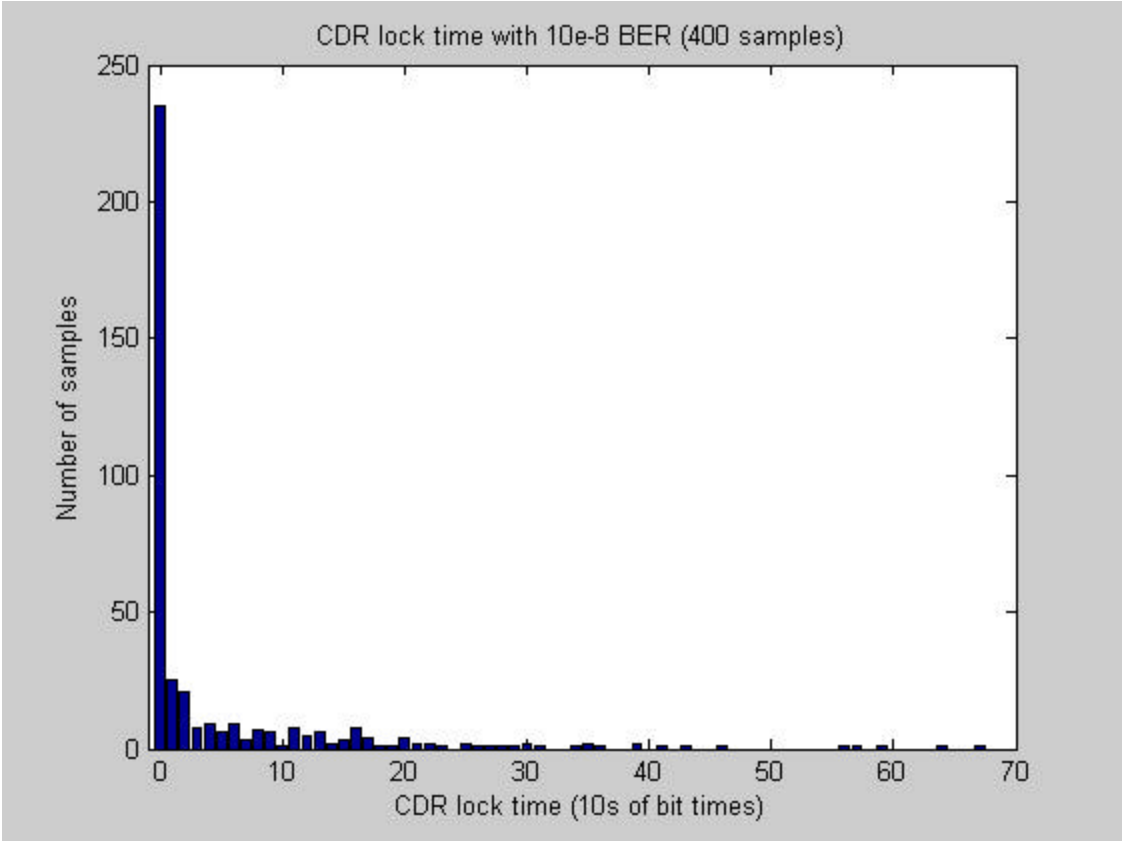
GBIC#1 10e-12 BER Histogram



GBIC#1 10e-12 BER statistics

- 400 samples
- Min of less than 10 bit times
- Max of 210 bit times (170ns)
- Mean of 6 bit times (5ns)
- Standard deviation of 25 bit times (20ns)

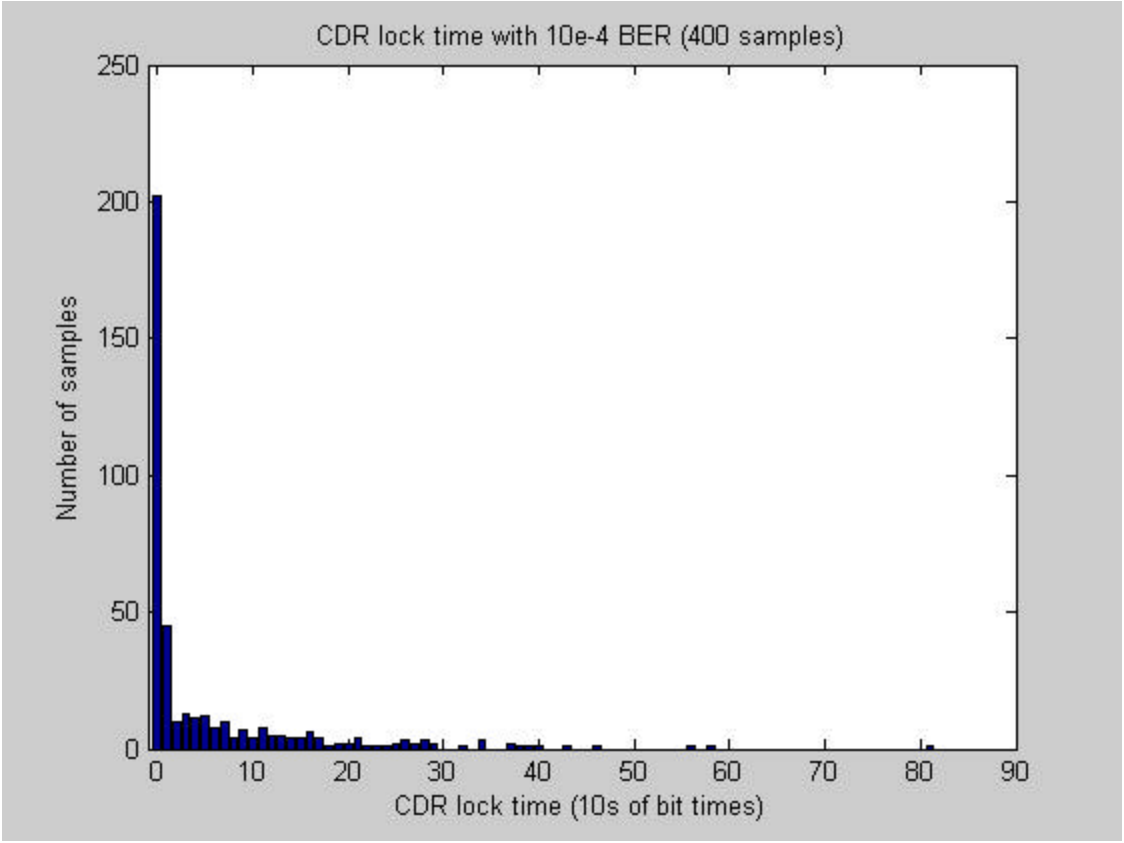
GBIC#1 10e-8 BER Histogram



GBIC#1 10e-8 BER statistics

- 400 samples
- Min of less than 10 bit times
- Max of 670 bit times (540ns)
- Mean of 50 bit times (40ns)
- Standard deviation of 100 bit times (80ns)

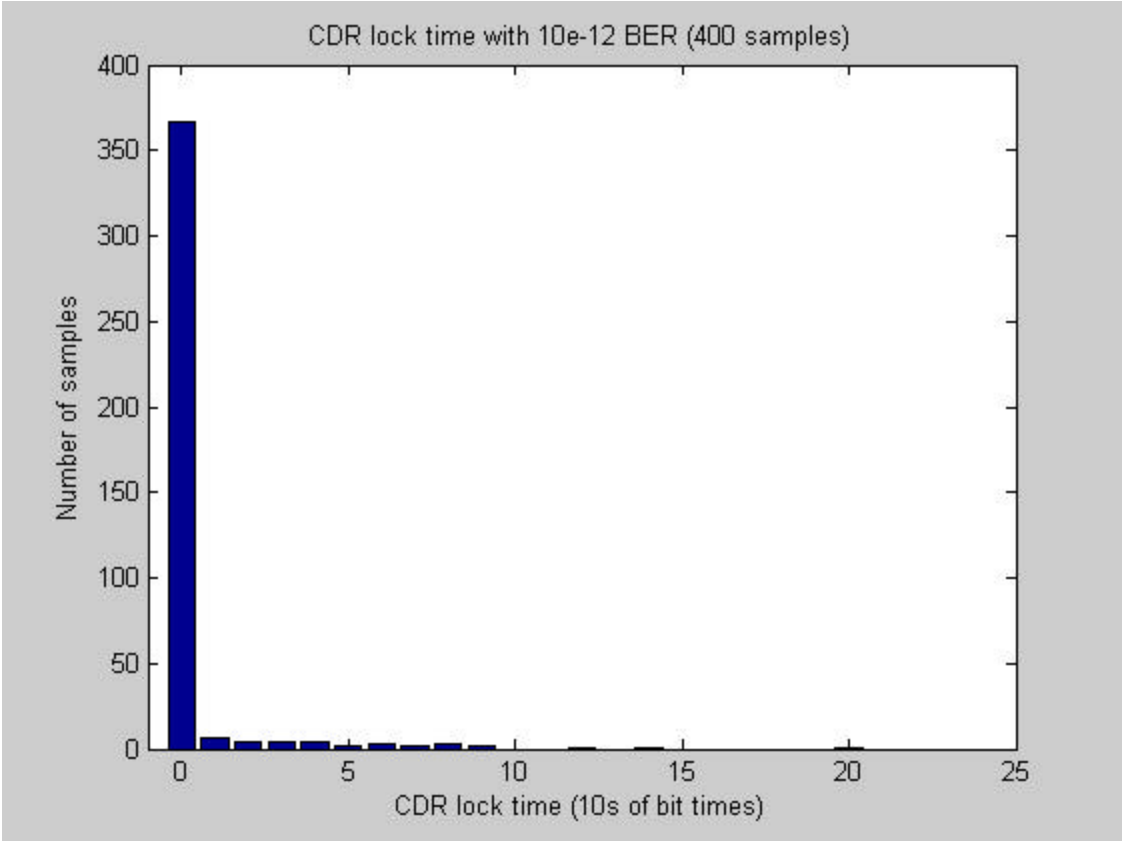
GBIC#1 10e-4 BER Histogram



GBIC#1 10e-4 BER statistics

- 400 samples
- Min of less than 10 bit times
- Max of 810 bit times (650ns)
- Mean of 60 bit times (50ns)
- Standard deviation of 100 bit times (80ns)

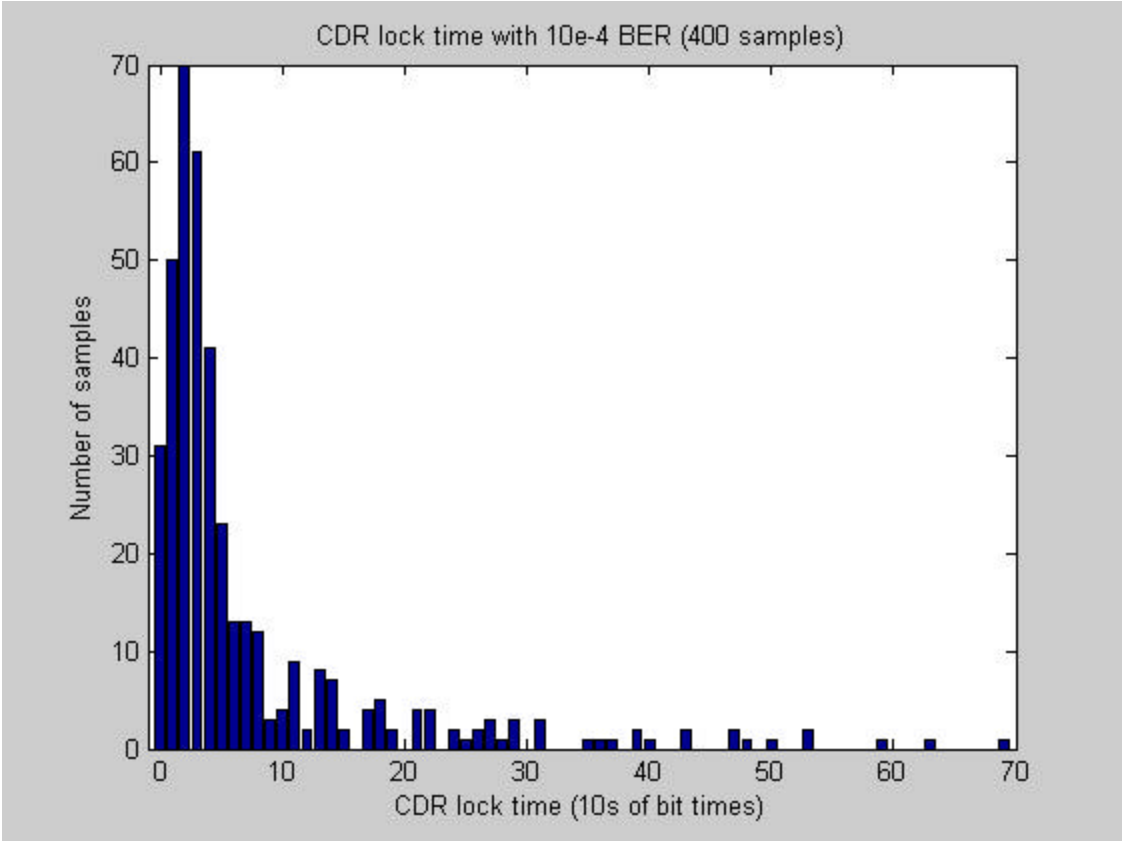
GBIC#2 10e-12 Histogram



GBIC#2 10e-12 BER statistics

- 400 samples
- Min of less than 10 bit times
- Max of 200 bit times (160ns)
- Mean of 4 bit times
- Standard deviation of 20 bit times (16ns)

GBIC#2 10e-4 Histogram



GBIC#2 10e-4 BER statistics

- 400 samples
- Min of less than 10 bit times
- Max of 690 bit times (550ns)
- Mean of 75 bit times (60ns)
- Standard deviation of 110 bit times (90ns)

Conclusions

- CDR lock time is impacted by BER
- CDR lock time is impacted by O/E conversion