

Autocorrelation of PRBS13Q

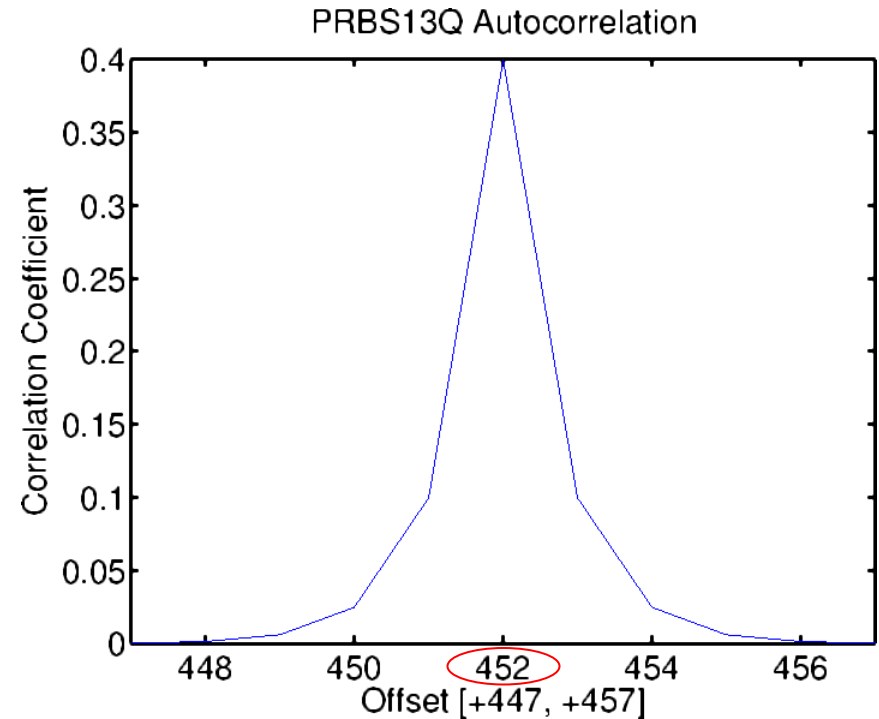
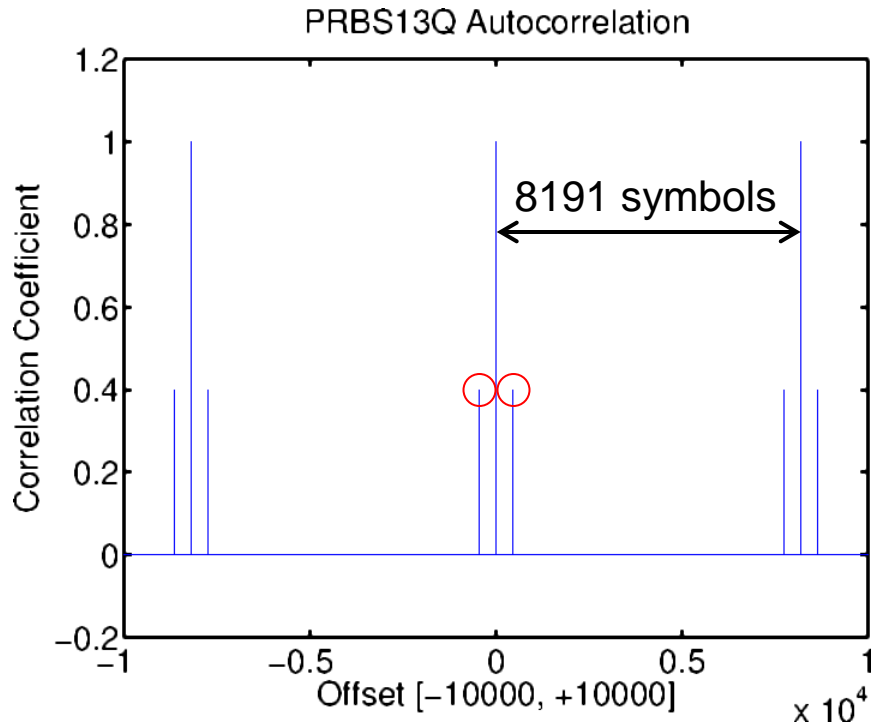
Yasuo Hidaka
Fujitsu Laboratories of America, Inc.

IEEE P802.3bs Task Force
Logic Ad hoc, October 27, 2016

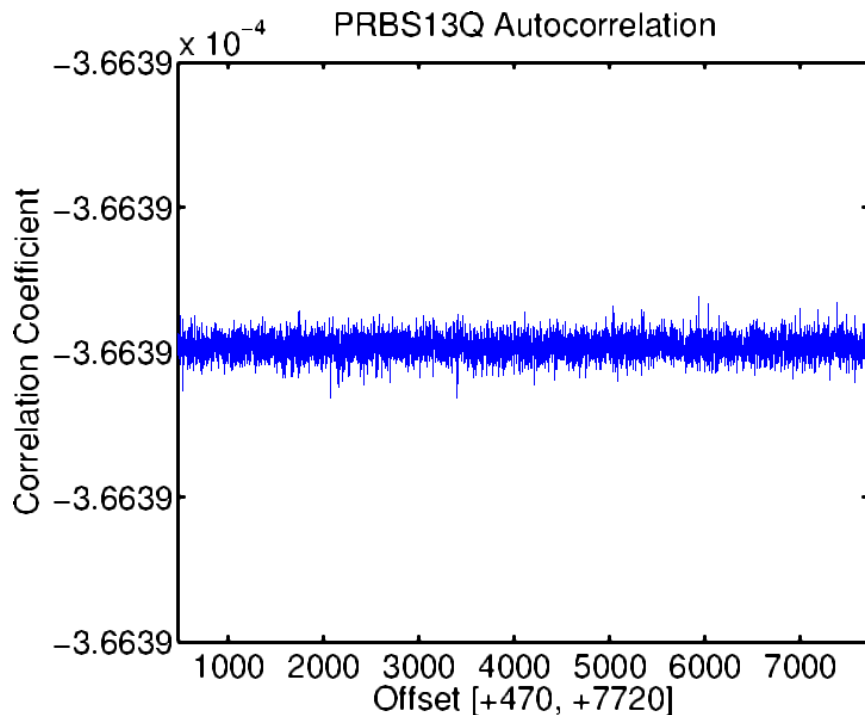
- Unlike PRBS31Q, PRBS13Q is not specified with the seed for each lane or the minimum offset between PRBS13Q on different lanes.
- Lack of specification of seed for each lane or the minimum offset between lanes may result in strong correlation between test patterns on different lanes that is not desired for measurement accurately.
- We may reuse Table 94-11 that has 4 seeds by adding 4 more seeds, but it is not clear if we can get large enough offset using the seeds in Table 94-11.
- Hence, I studied the autocorrelation function of PRBS13Q and the offset with 4 seeds in Table 94-11.

Autocorrelation function of PRBS13Q (1/2)

- Autocorrelation function of PRBS13Q is a periodic function with a cycle of 8191 symbols (i.e. length of PRBS13Q)
- It has a strong peak at an offset of ± 452 symbols with correlation coefficient of 0.4.



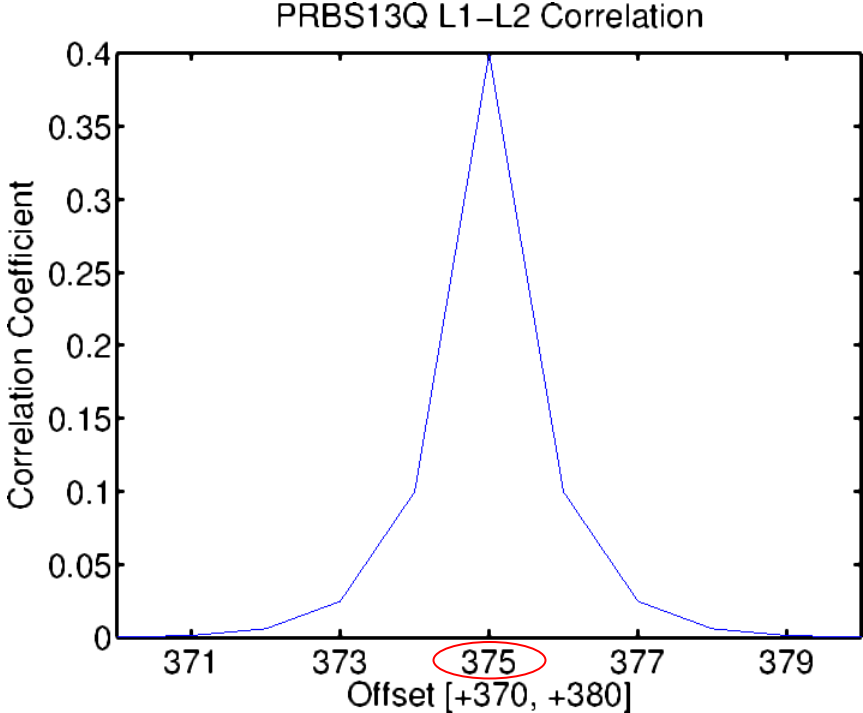
- Autocorrelation function of PRBS13Q has flat correlation coefficient about -3.6639×10^{-4} with an offset from 470 symbols to 7720 symbols



- Offset between L1 and L2 is only 827 symbols
 - It brings the strong peak of the adjacent lane closer than its own
 - The offset to the strong peak in the adjacent lane is 375 (=827-452) symbols
 - It is closer than its own peak at the offset of 452 symbols

Offset between lanes (# of symbols)

	Lane 3	Lane 2	Lane 1
Lane 0	1810	3259	4086
Lane 1	2267	827	
Lane 2	1449		



- It is recommended to specify PRBS13Q pattern has a minimum offset of 940 ($=470 \times 2$) symbols between any lane and any other lane.
- It is discouraged to reuse 4 seeds in Table 94-11 by adding 4 more seeds, because they will make the offset between L1 and L2 only 827 symbols which brings the strong peak of the adjacent lane closer than its own.

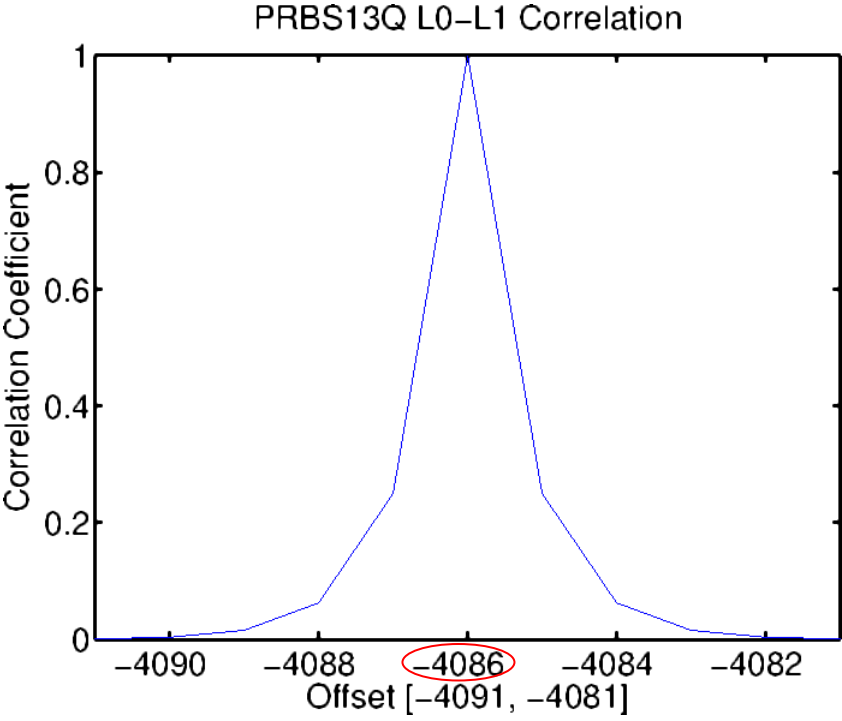
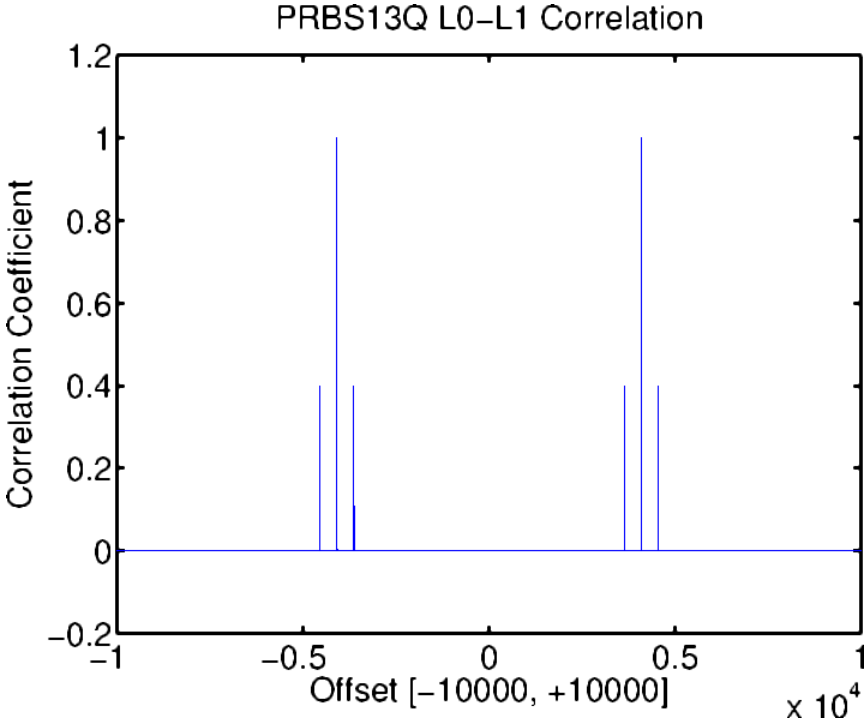
Back up Slides

- Offset between lanes using seeds in Table 94-11

Offset between L0 and L1 using Table 94-11



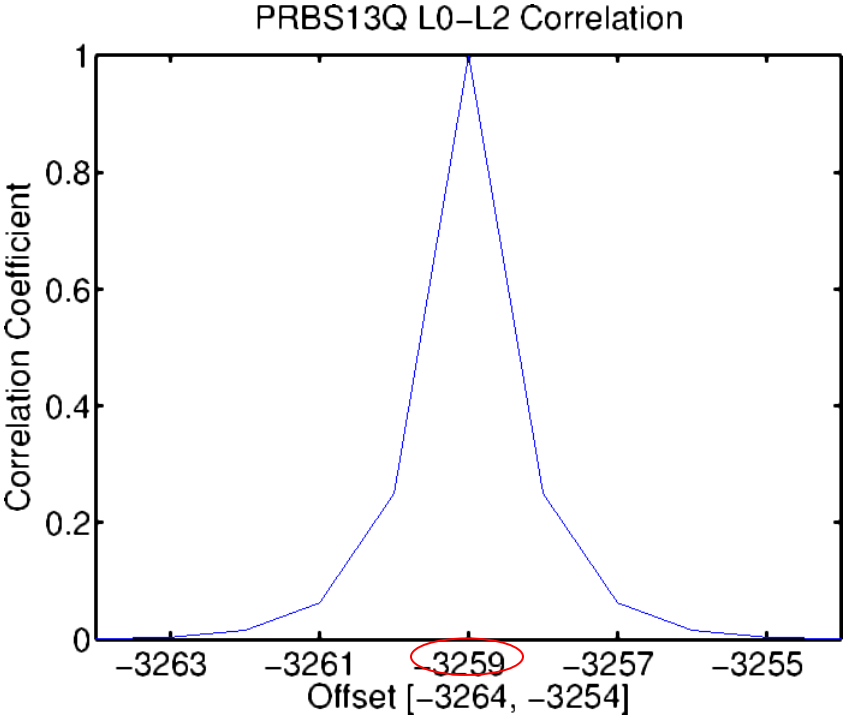
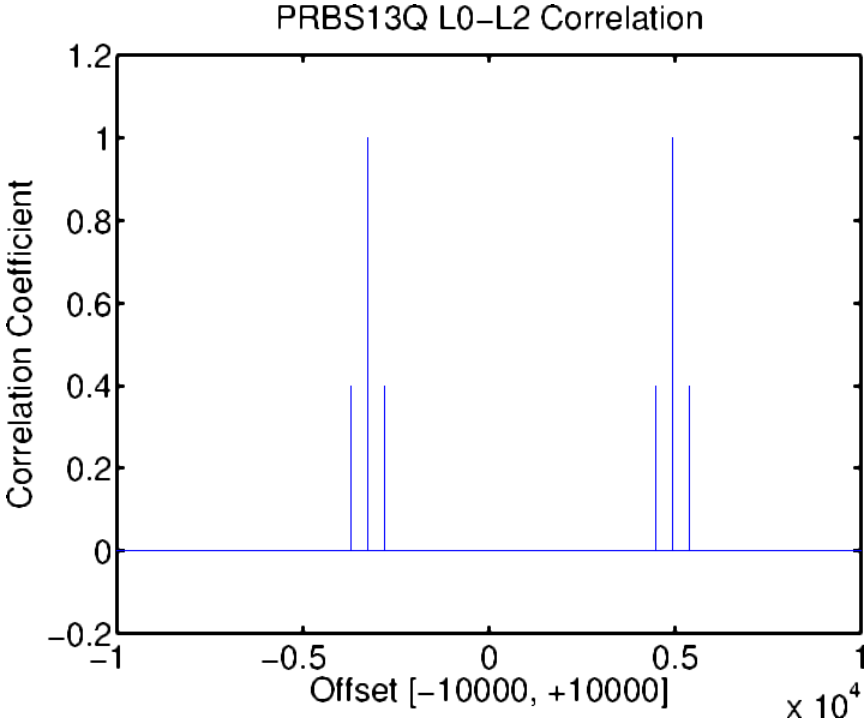
- The offset between Lane 0 and Lane 1 is 4086 symbols.



Offset between L0 and L2 using Table 94-11



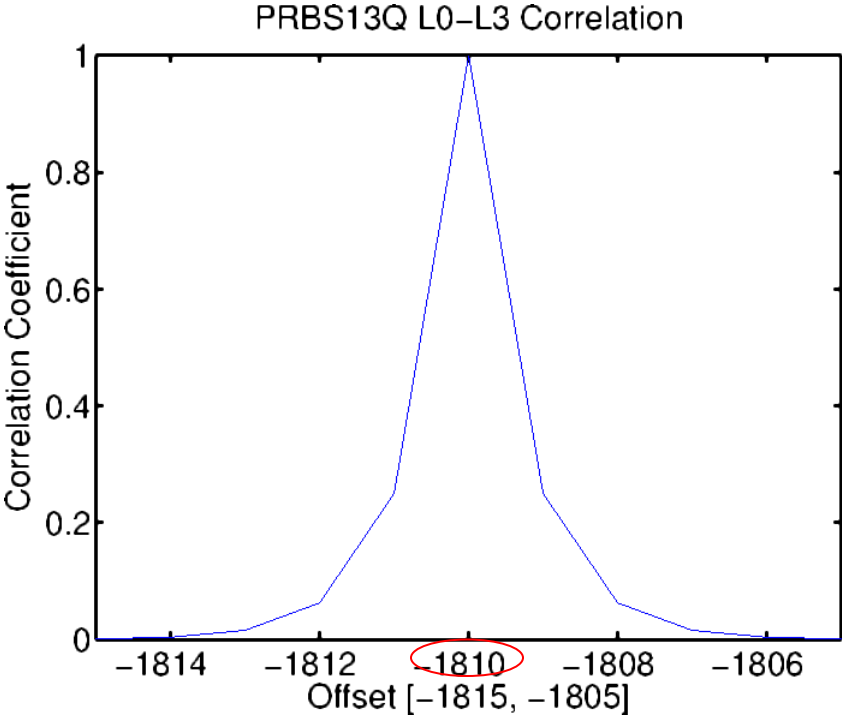
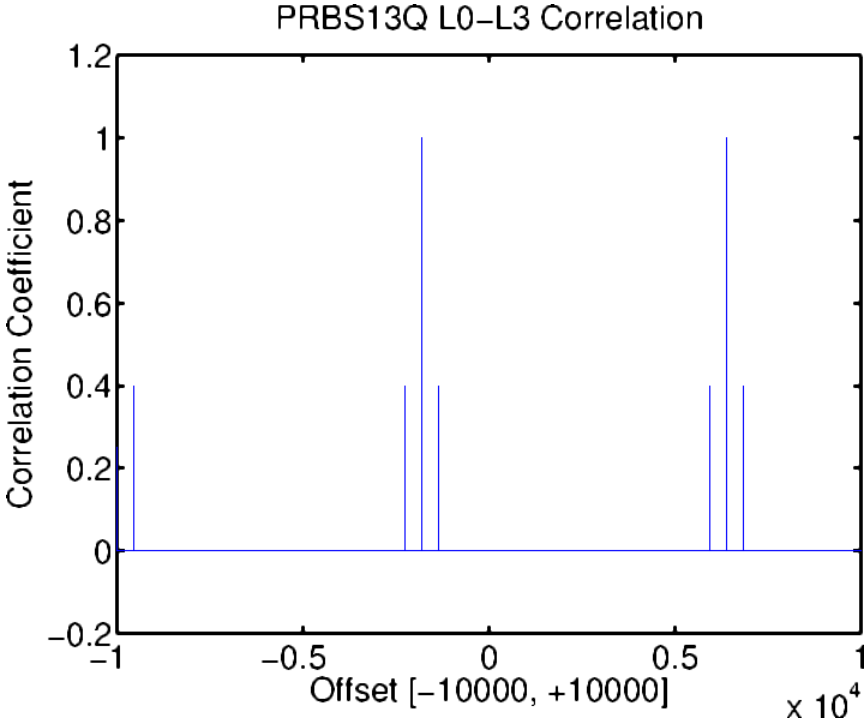
- The offset between Lane 0 and Lane 2 is 3259 symbols.



Offset between L0 and L3 using Table 94-11



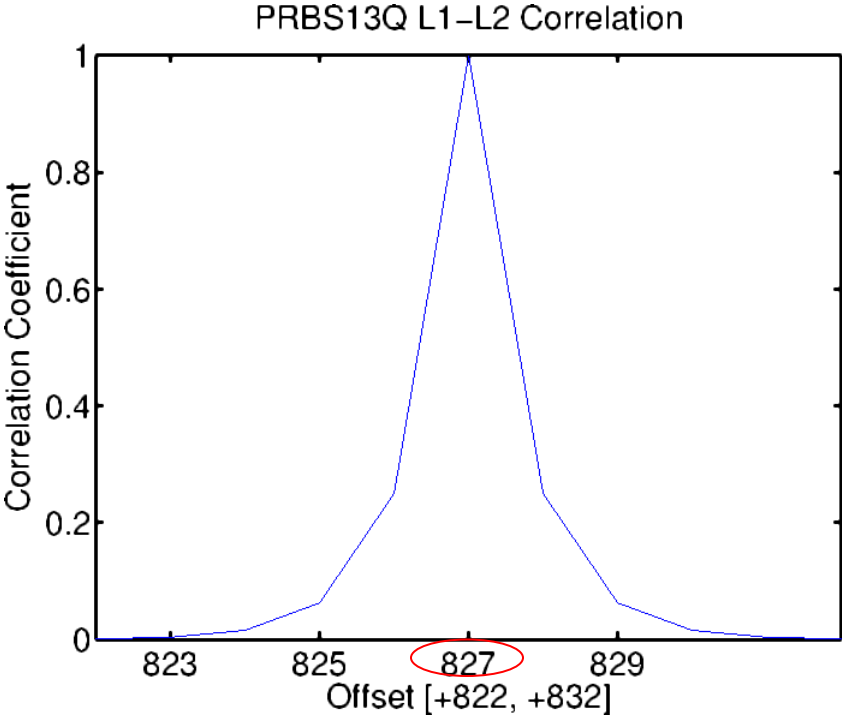
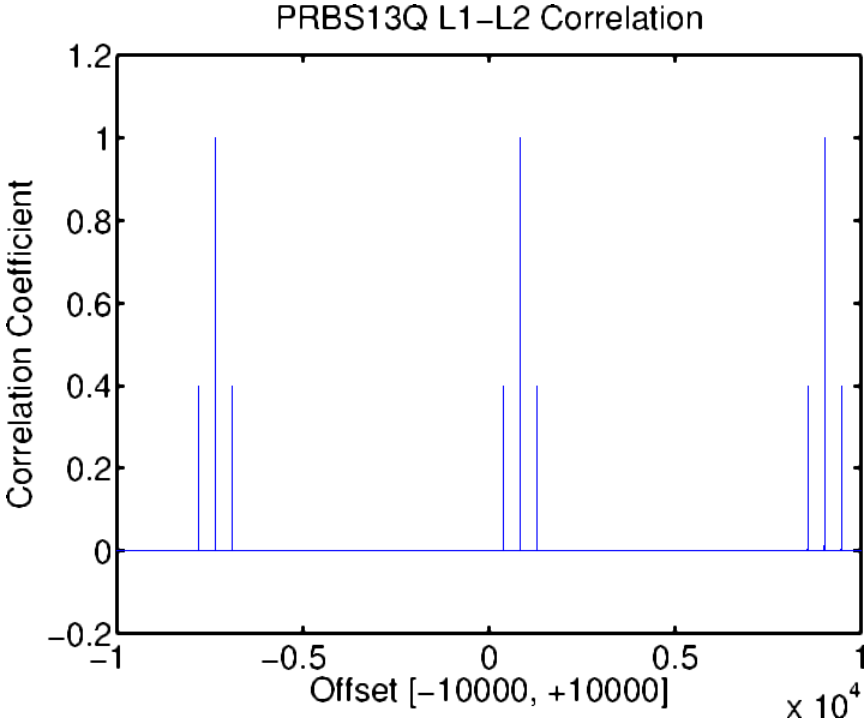
- The offset between Lane 0 and Lane 3 is 1810 symbols.



Offset between L1 and L2 using Table 94-11



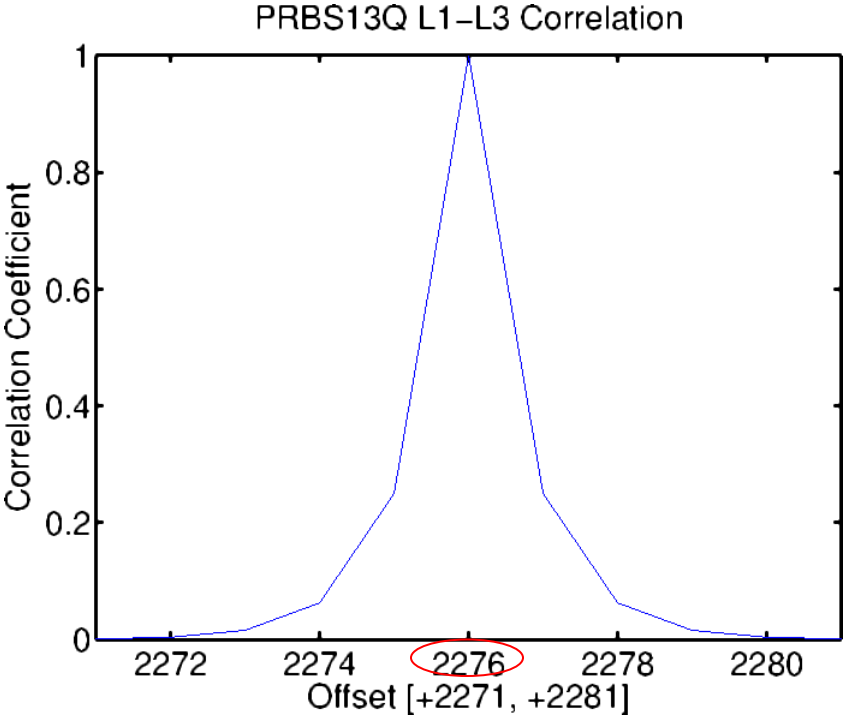
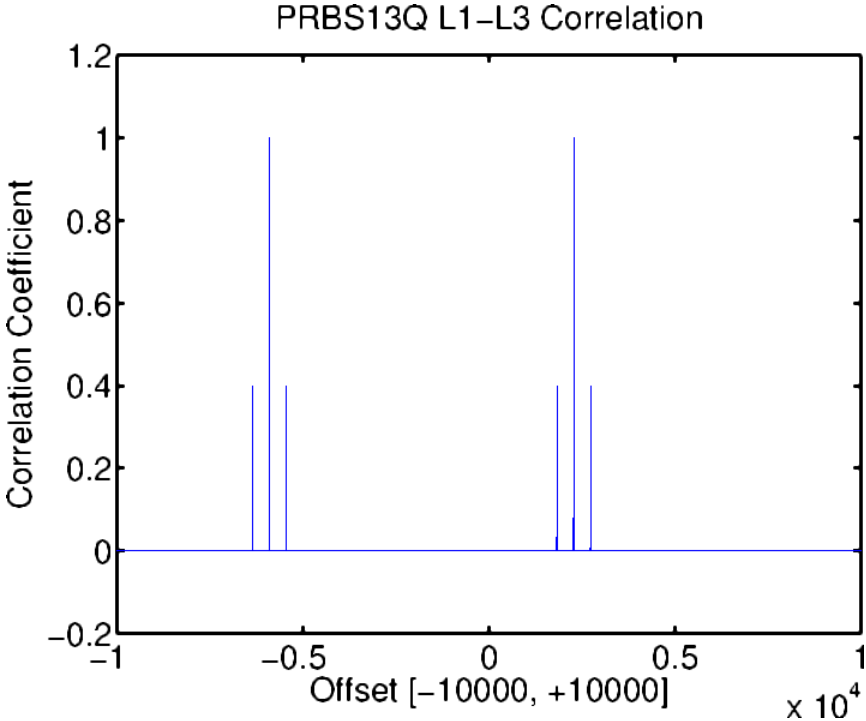
- The offset between Lane 1 and Lane 2 is 827 symbols.



Offset between L1 and L3 using Table 94-11



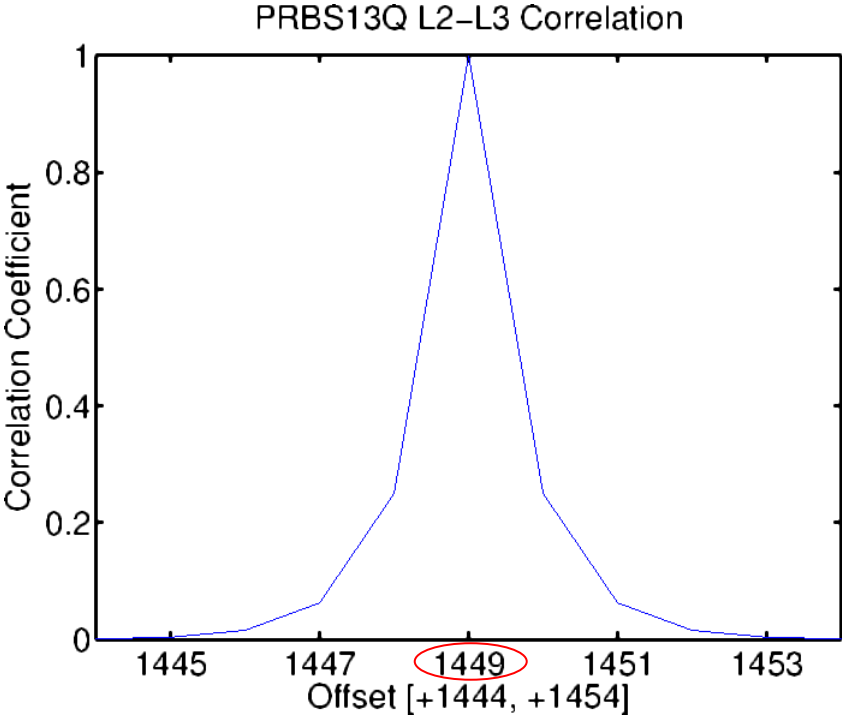
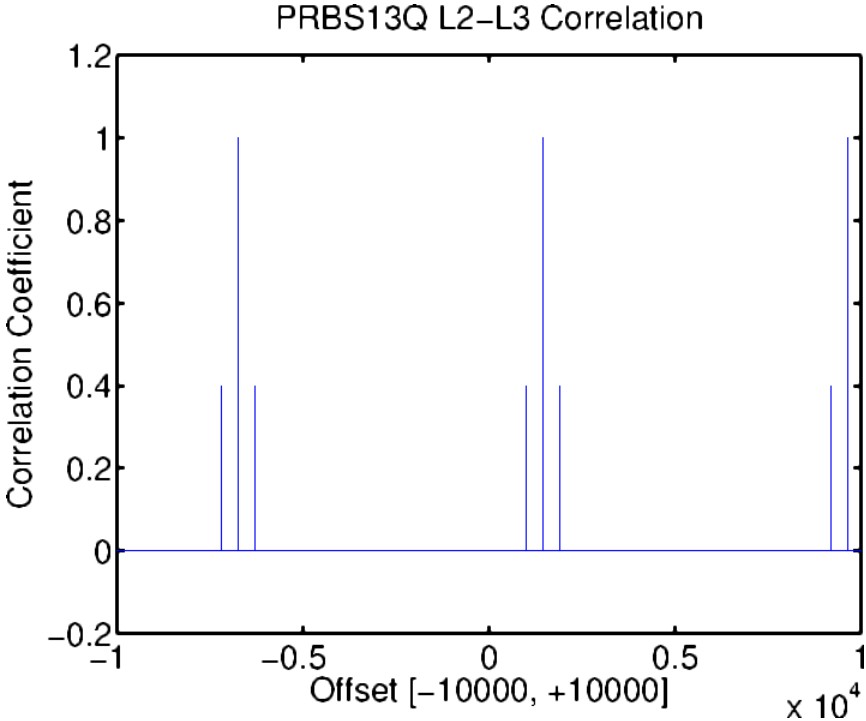
- The offset between Lane 1 and Lane 3 is 2267 symbols.



Offset between L2 and L3 using Table 94-11



- The offset between Lane 2 and Lane 3 is 1449 symbols.



Thank you