

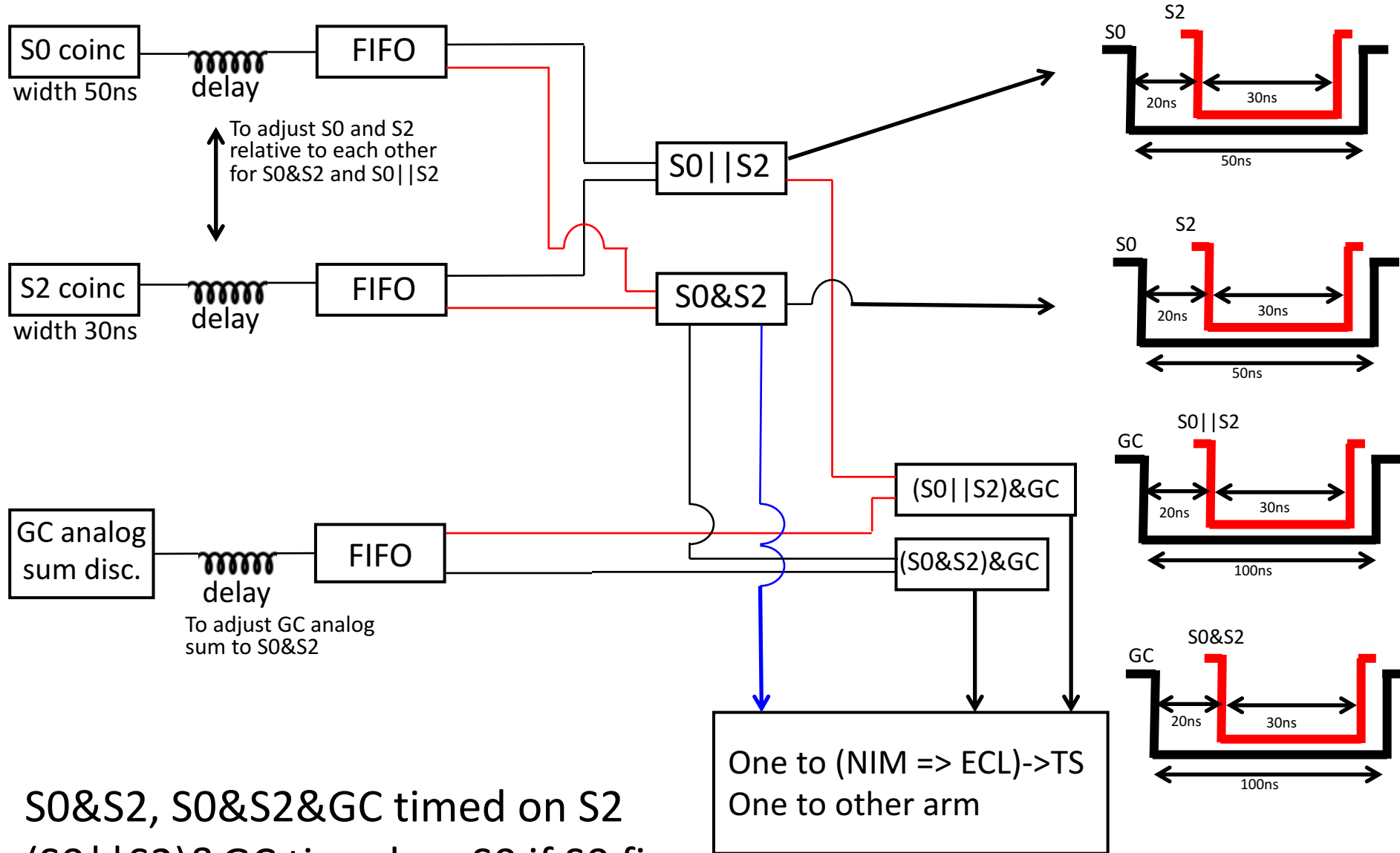
Trigger Delays for Single Arm Triggers

Florian Hauenstein
DAQ Meeting 10/13/2017

Thanks to Rey and Dien for the plots, figures and measurements

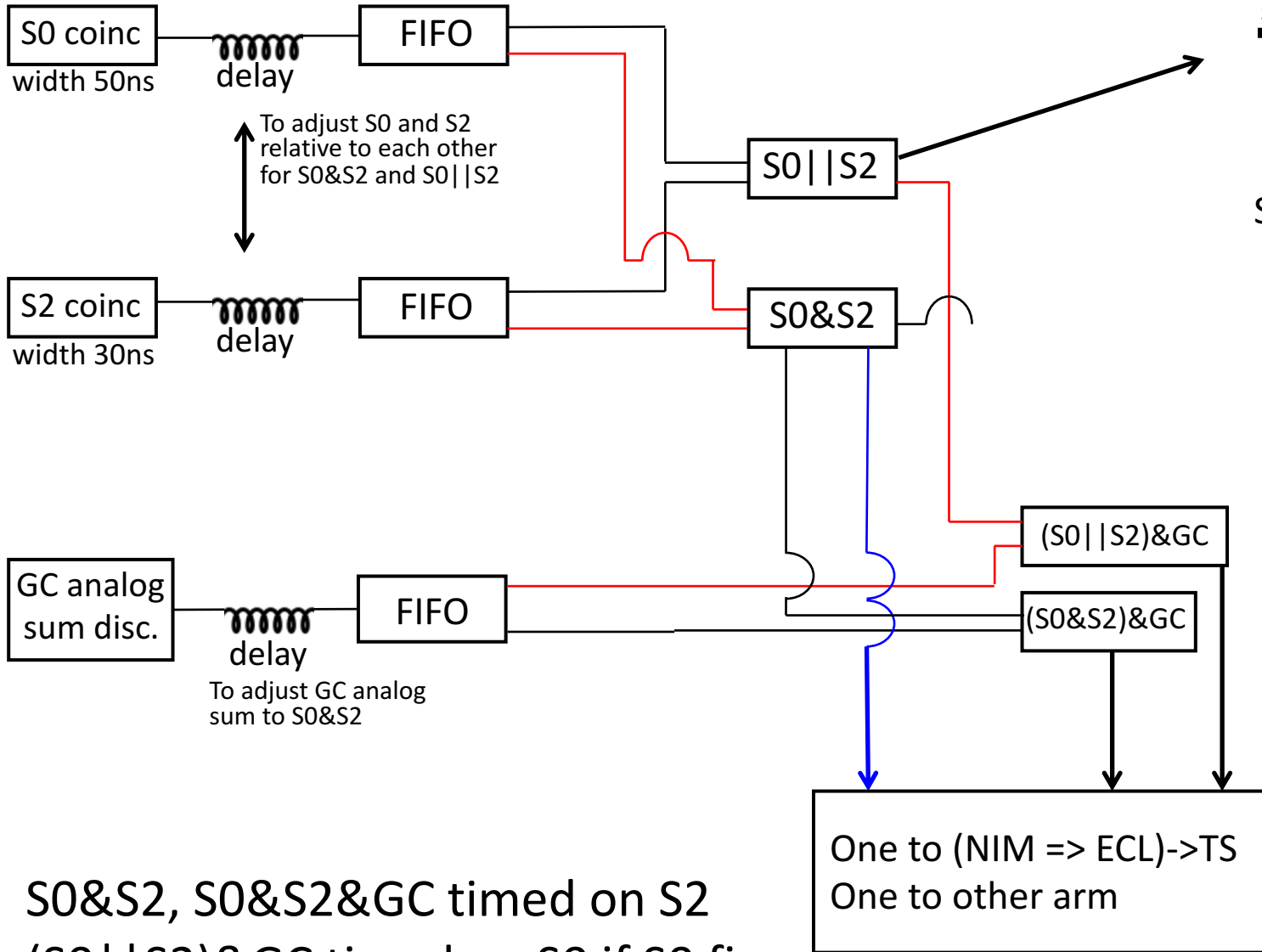
Trigger Delays RHRS

Single Arm Triggers ($S0 \& S2$); $(S0 \& S2) \& GC$; $(S0 || S2) \& GC$

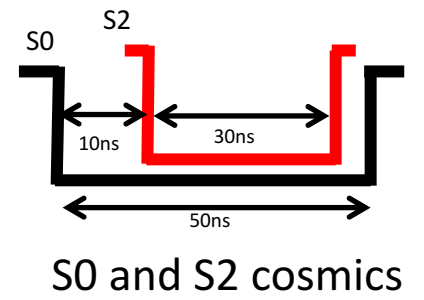
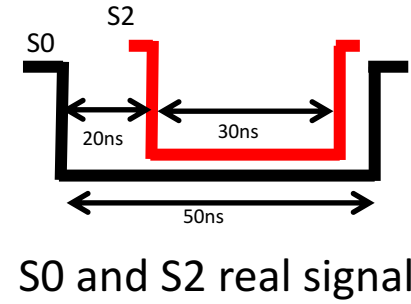


$S0 \& S2$, $S0 \& S2 \& GC$ timed on $S2$
 $(S0 || S2) \& GC$ timed on $S0$ if $S0$ fires

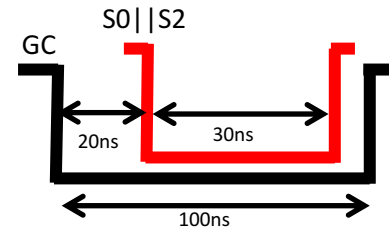
Single Arm Triggers (S0&S2); (S0&S2)&GC; (S0 || S2)&GC



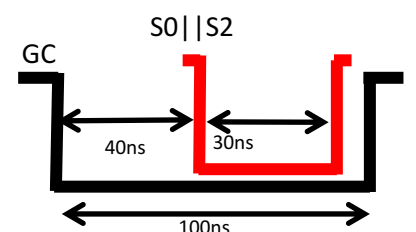
S0&S2, S0&S2&GC timed on S2
 (S0 || S2)&GC timed on S0 if S0 fires



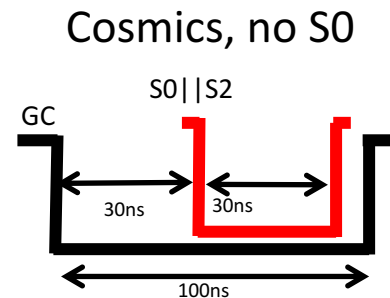
If S0 fires

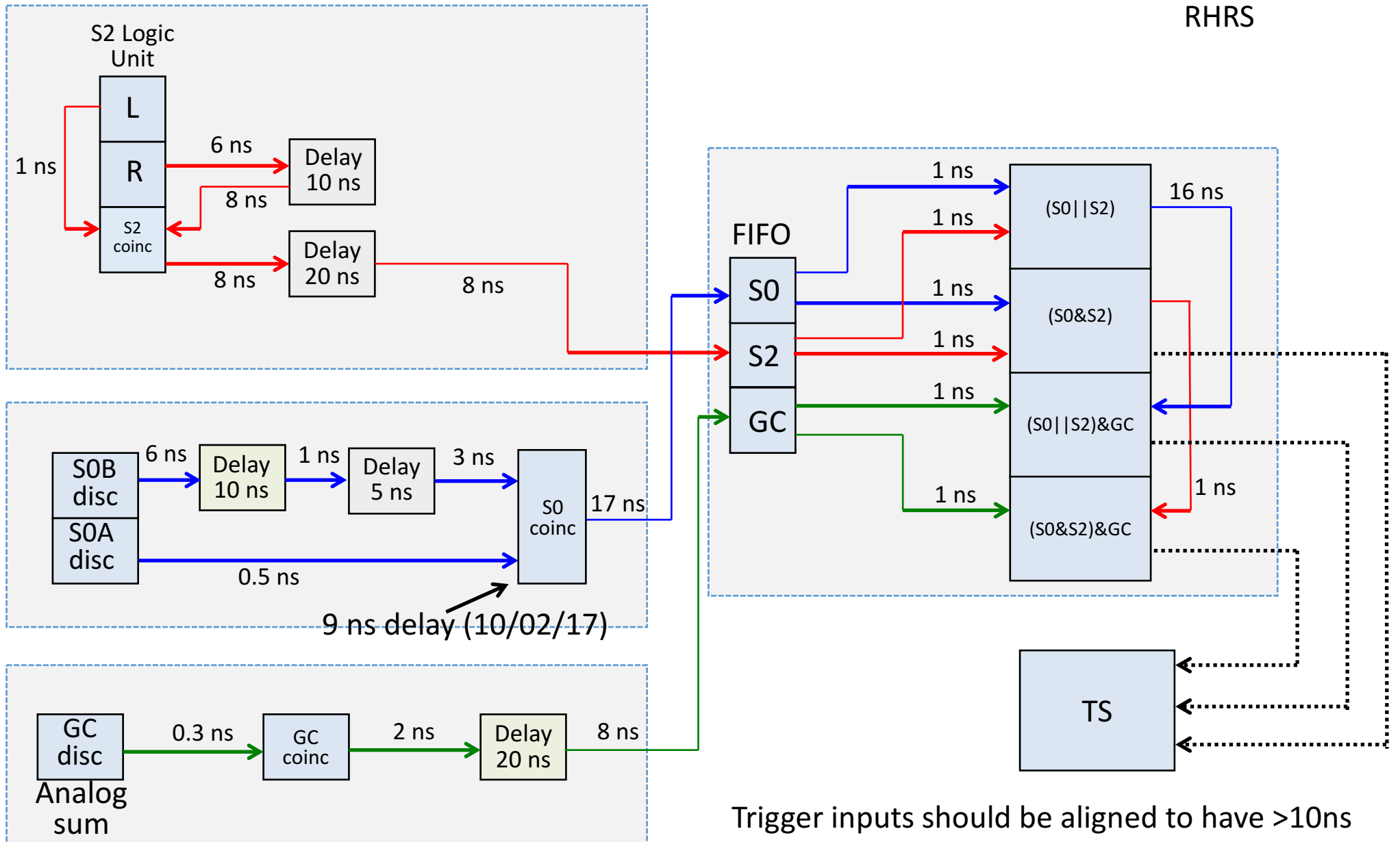


If no S0 but S2, real events

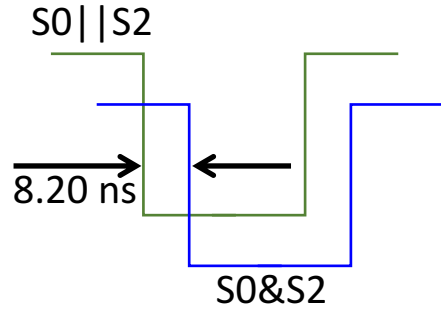
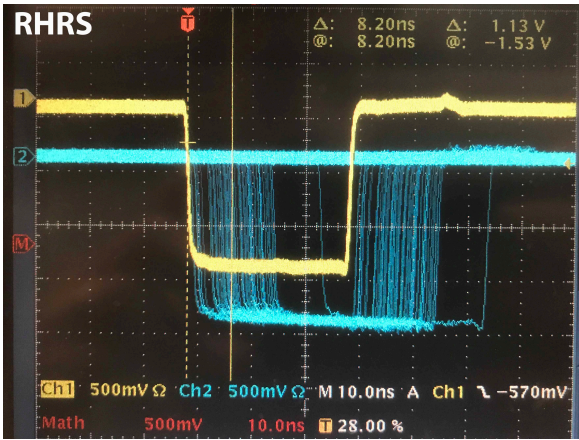


For cosmics difference (S0 || S2)&GC with S0 fires or not is **10ns**

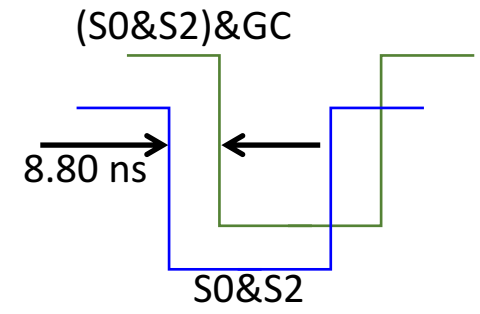
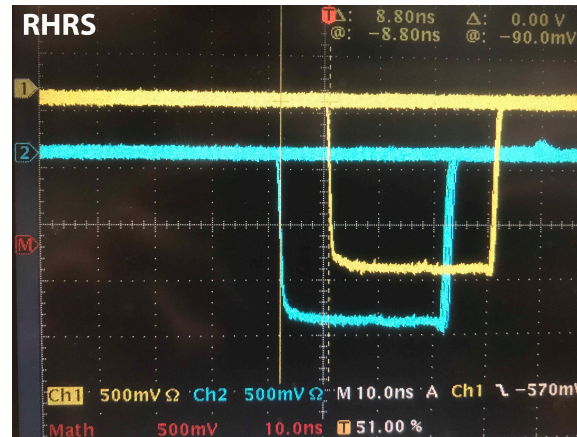
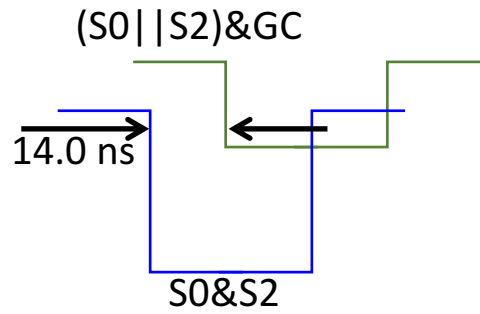
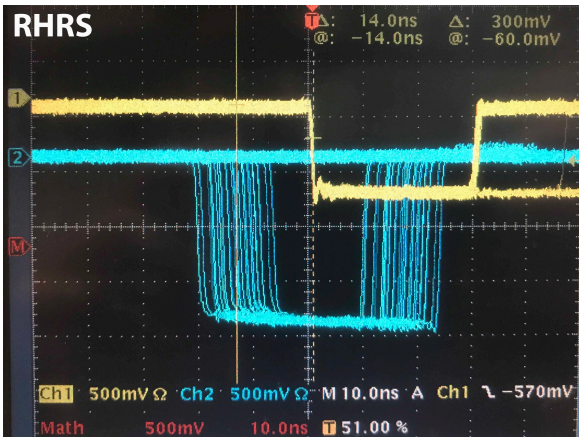




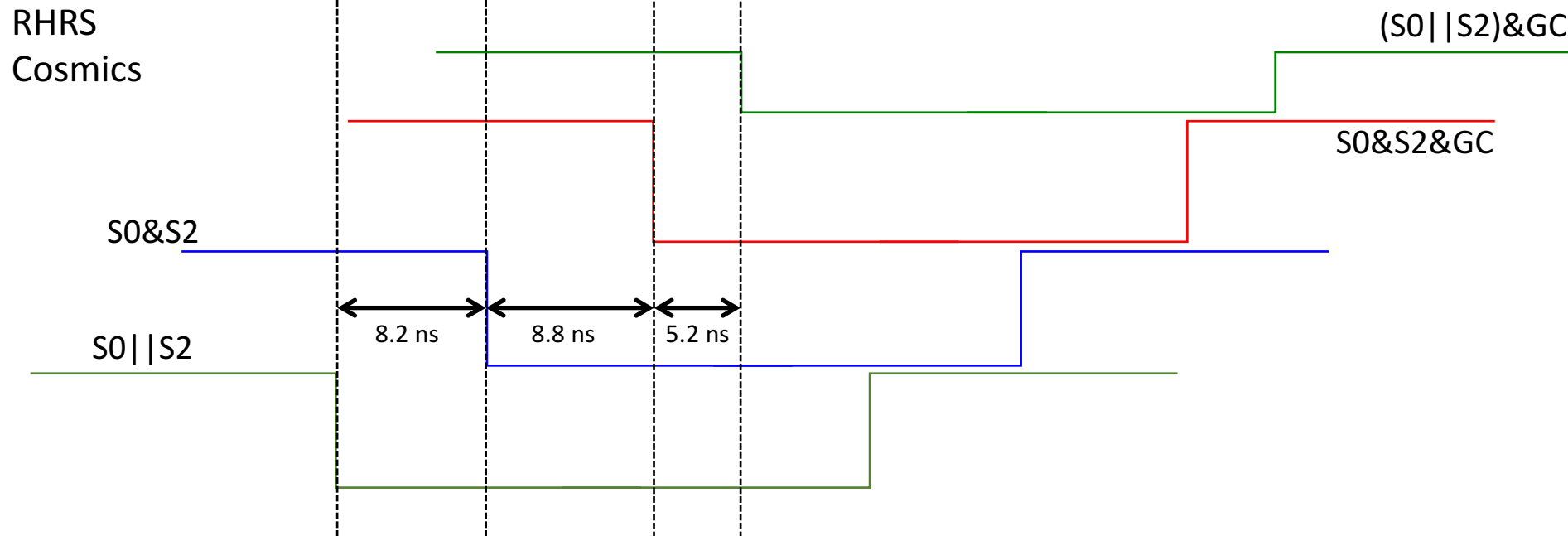
Trigger inputs should be aligned to have >10ns spacing for "evtype" with single trigger (especially important if triggers are prescaled!)



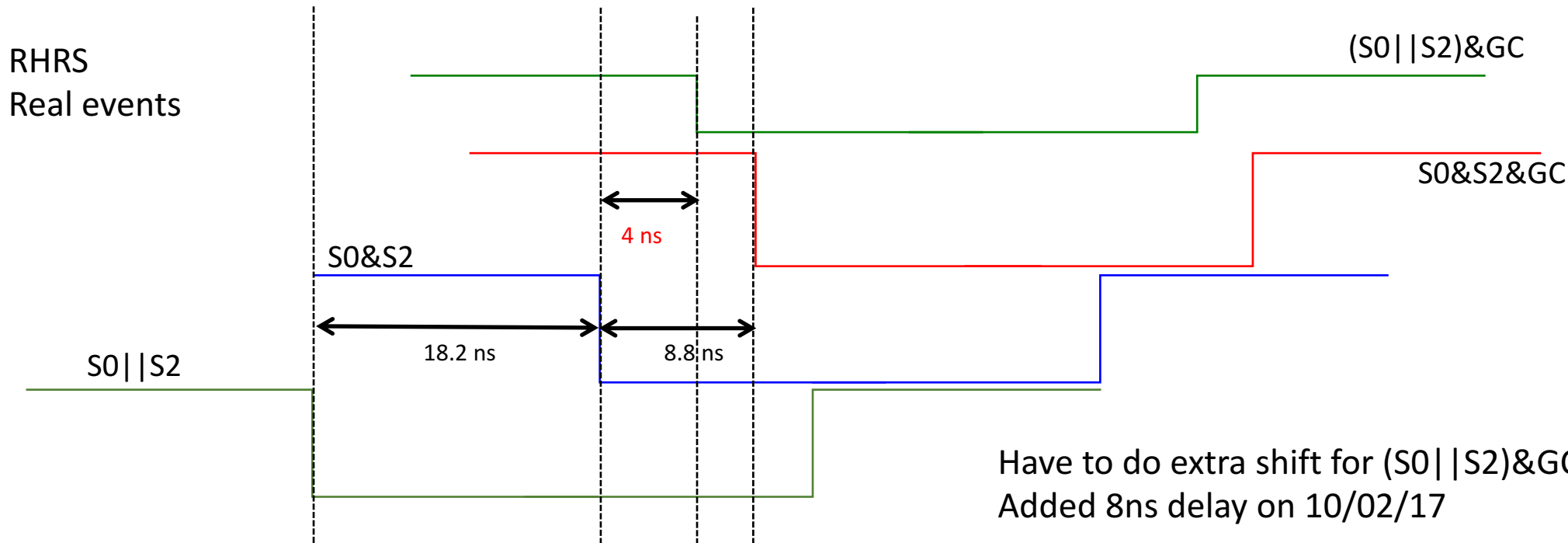
Trigger Delay Measurement RHRS Cosmics (09/27/17)



RHRS
Cosmics

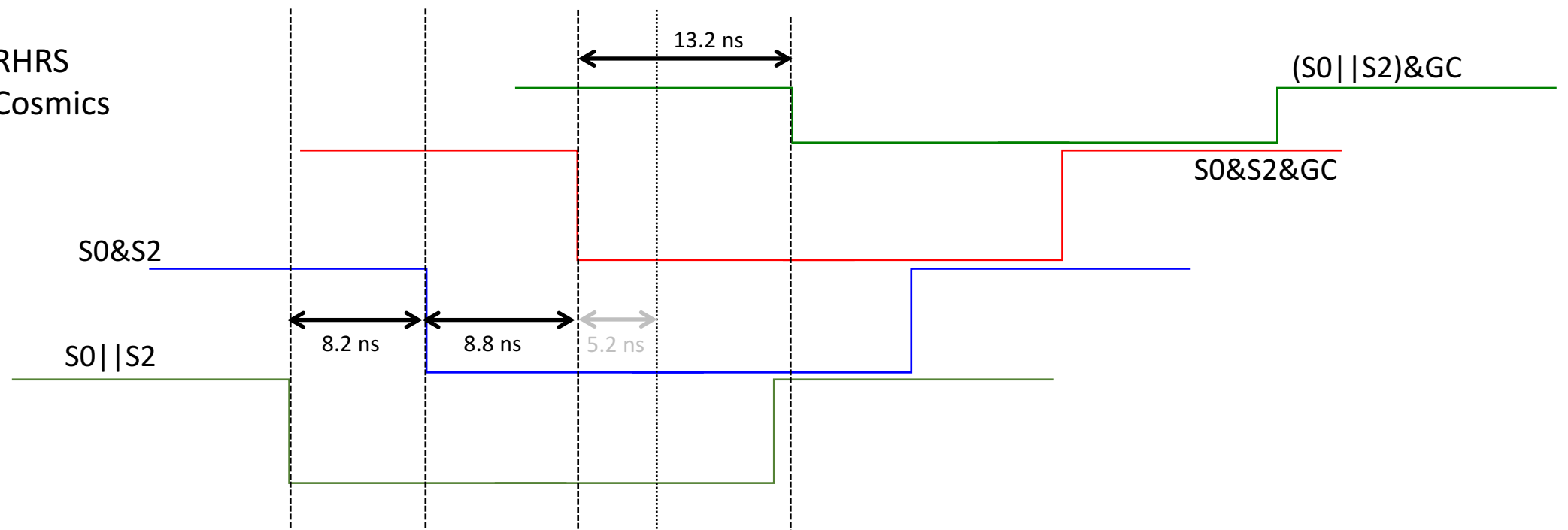


RHRS
Real events

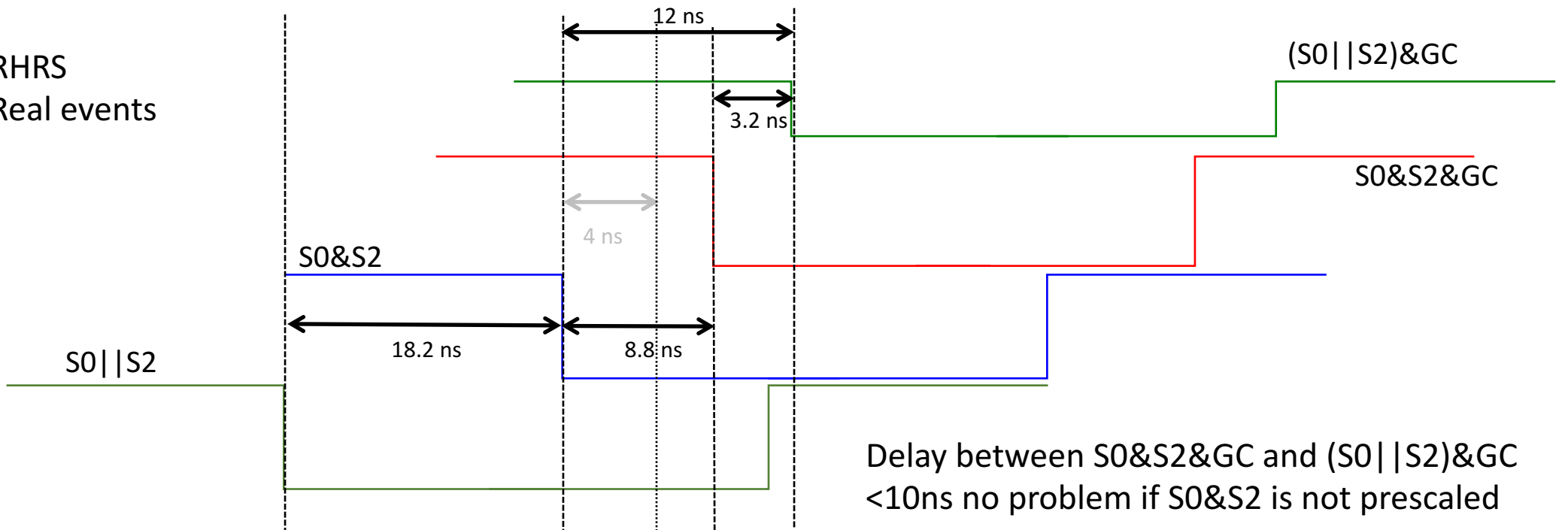


Have to do extra shift for $(S0 || S2) \& GC$
Added 8ns delay on 10/02/17

RHRS
Cosmics

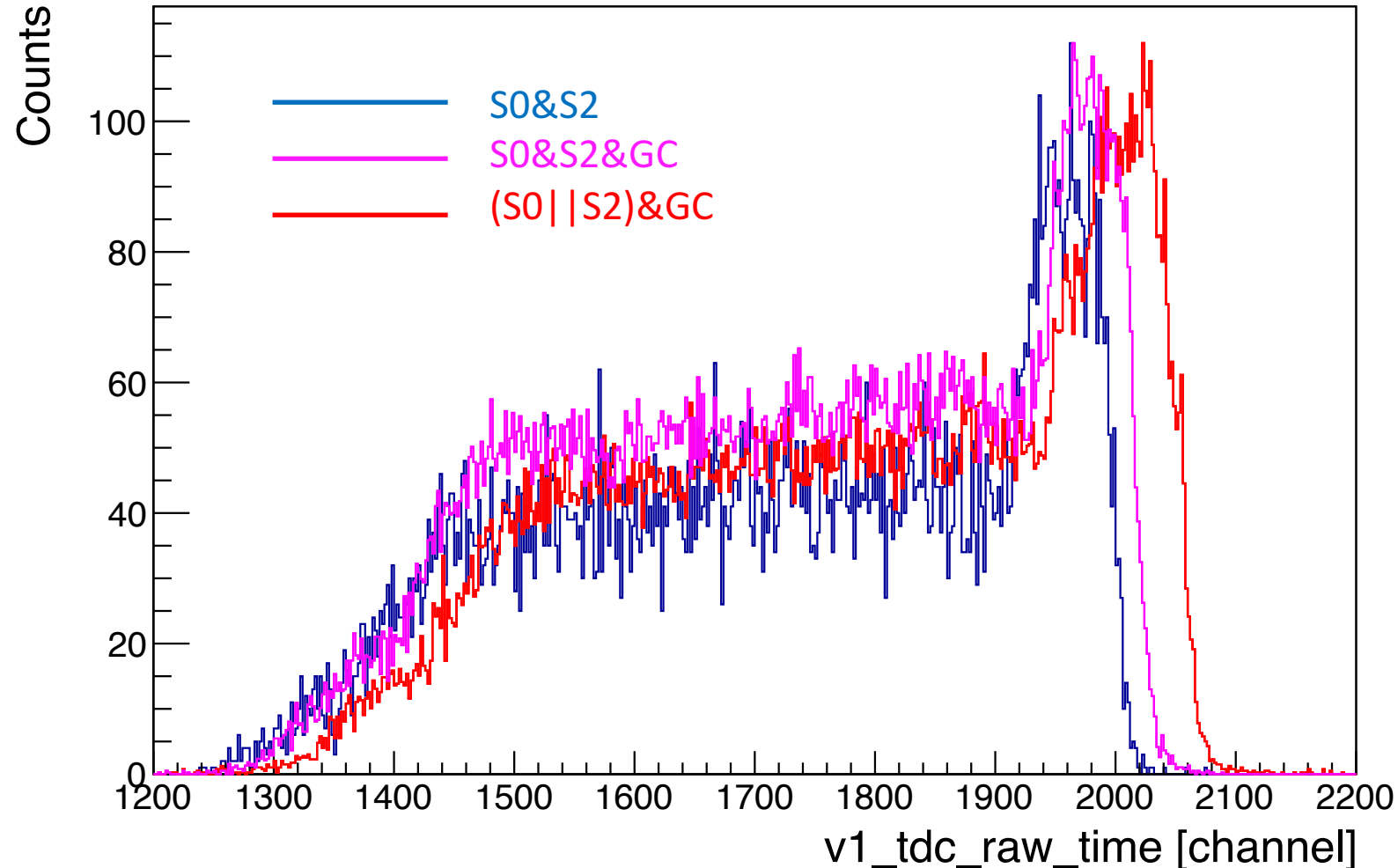


RHRS
Real events



Delay between S0&S2&GC and (S0||S2)&GC
<10ns no problem if S0&S2 is not prescaled

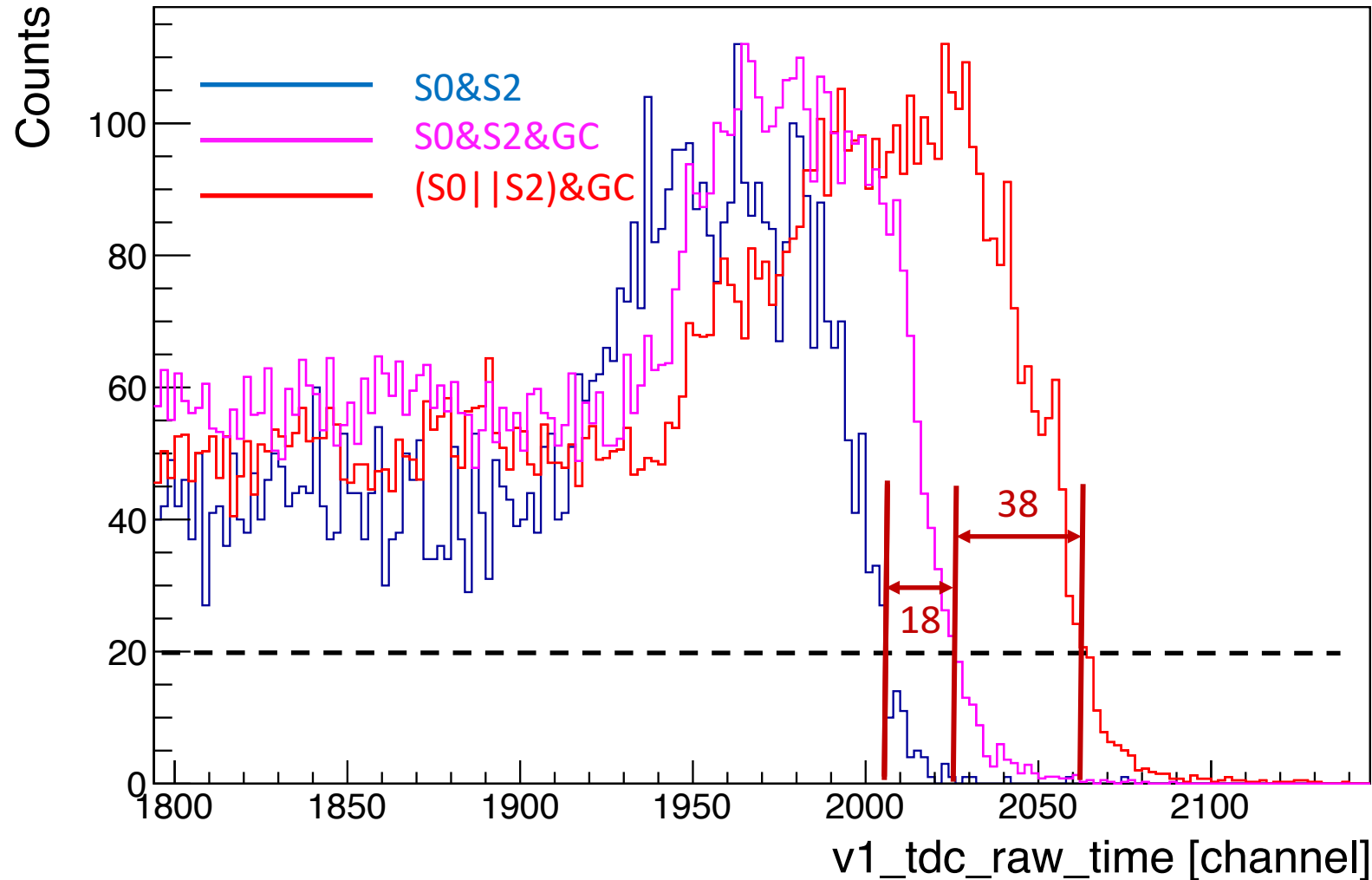
VDC TDC Spectra - Different Trigger cuts



- RHRS Runs 90160 (S0&S2) and 90164 (S0&S2&GC and [S0 | S2]&GC)
- Shifts due to trigger delays in TS input
-> Shift of TDC stop for all TDC spectra
- TDC spectrum for each trigger are scaled to maximum of S0&S2

→ Check time difference

VDC TDC Spectra - Different Trigger cuts



1 TDC channel = 0.5 ns

S0&S2 – S0&S2&GC:

$$18/2 = 9 \text{ ns}$$

-> Difference as expected

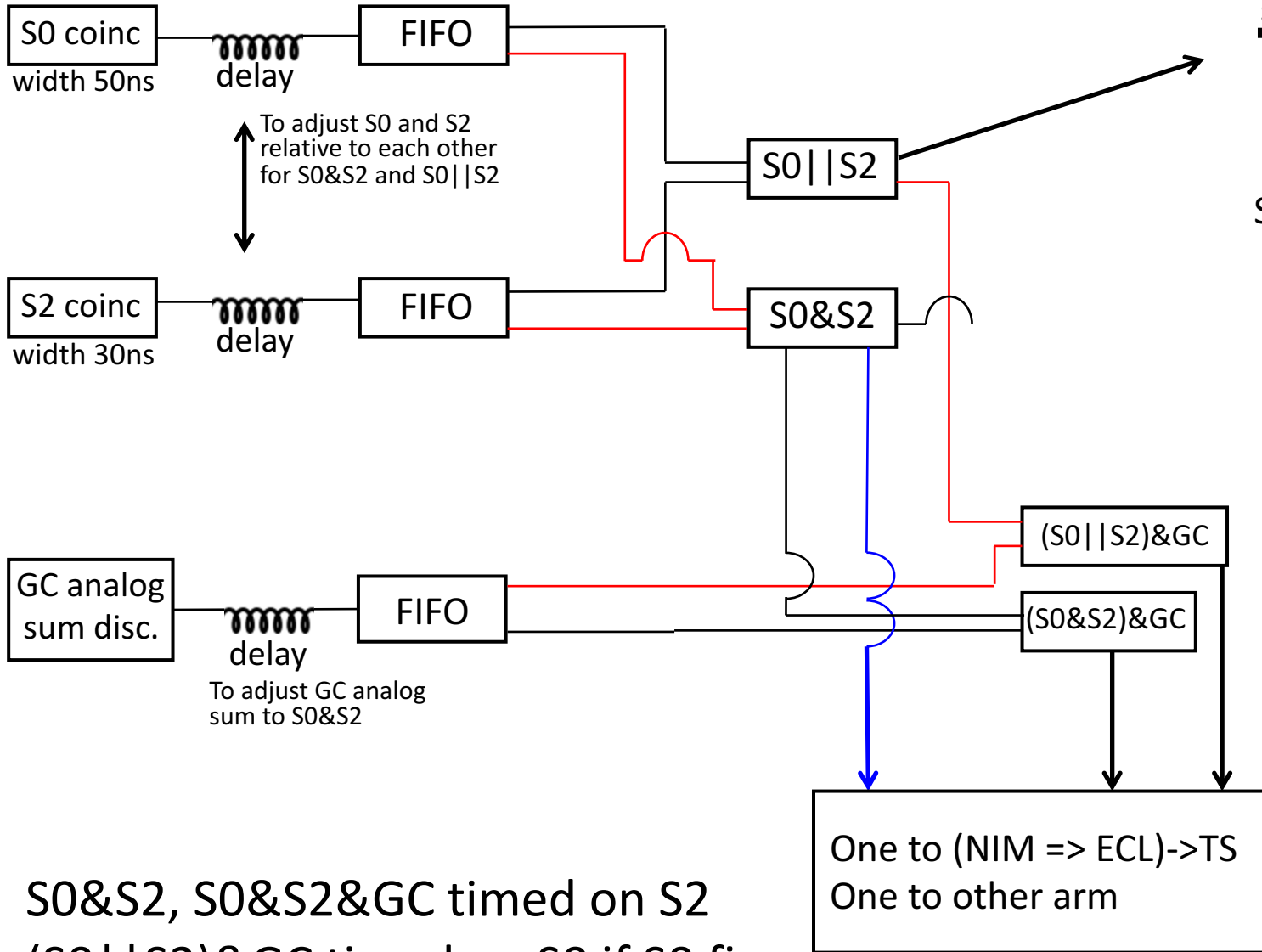
S0&S2&GC – (S0||S2)&GC:

$$38/2 = 19 \text{ ns}$$

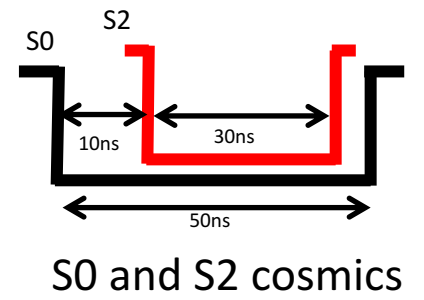
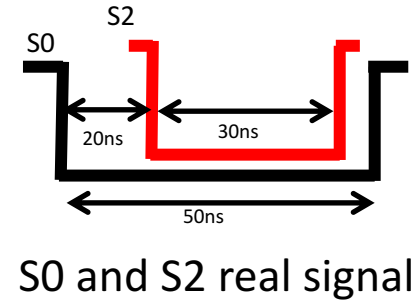
-> bigger than expected

-> What's going on?

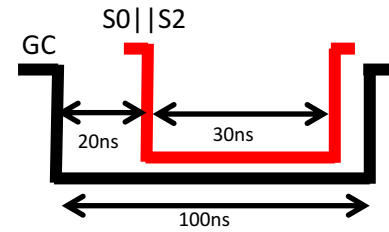
Single Arm Triggers (S0&S2); (S0&S2)&GC; (S0 || S2)&GC



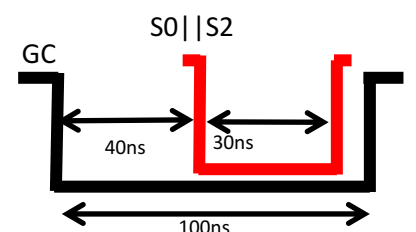
S0&S2, S0&S2&GC timed on S2
 (S0 || S2)&GC timed on S0 if S0 fires



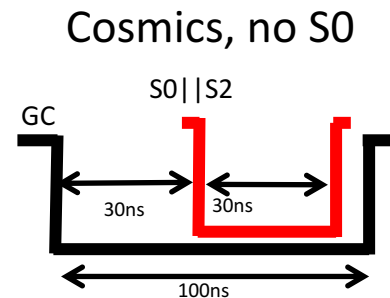
If S0 fires



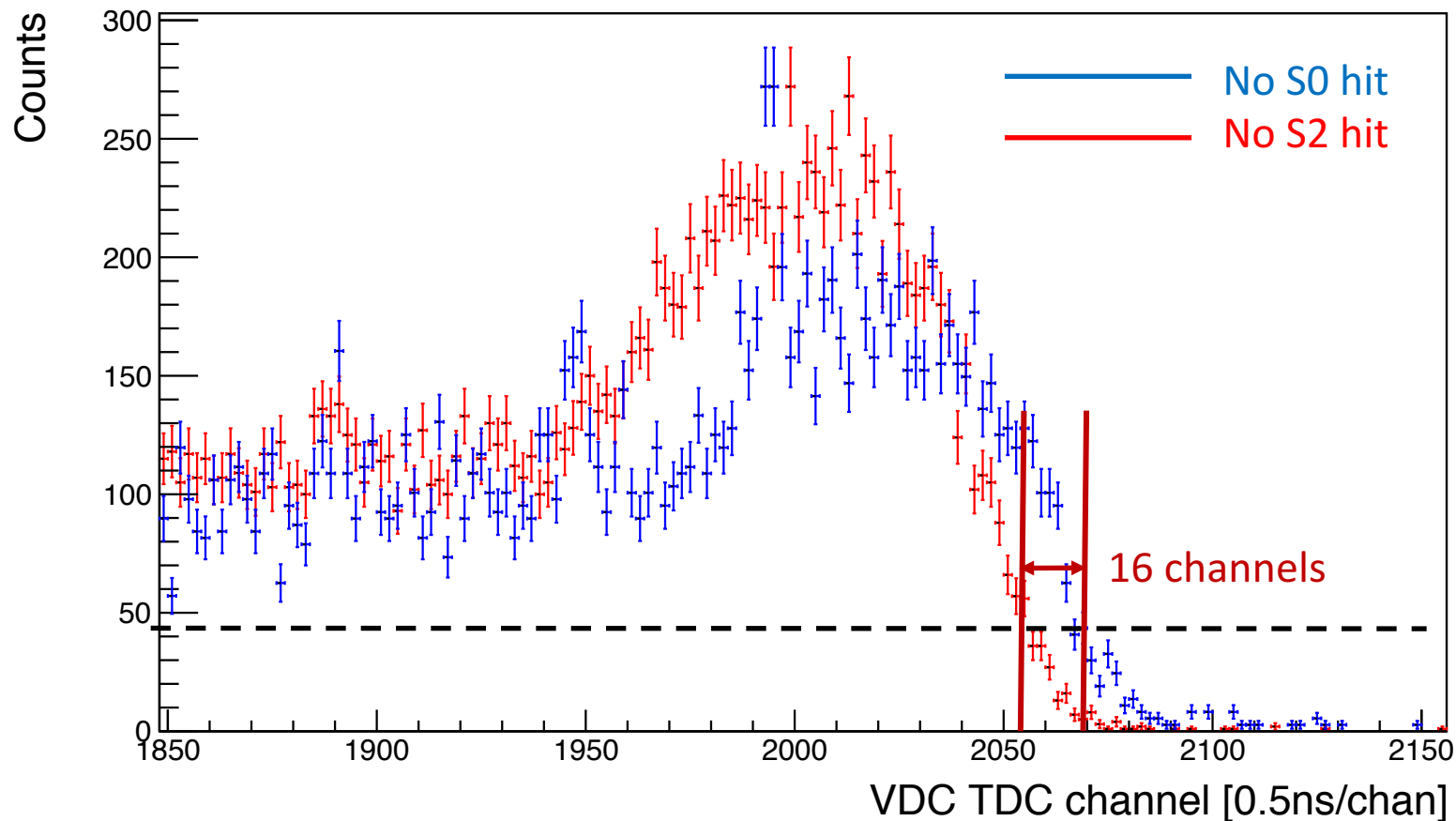
If no S0 but S2, real events



For cosmics difference (S0 || S2)&GC with S0 fires or not is **10ns**



VDC TDC Spectra – (S0 | | S2)&GC: Two Timings



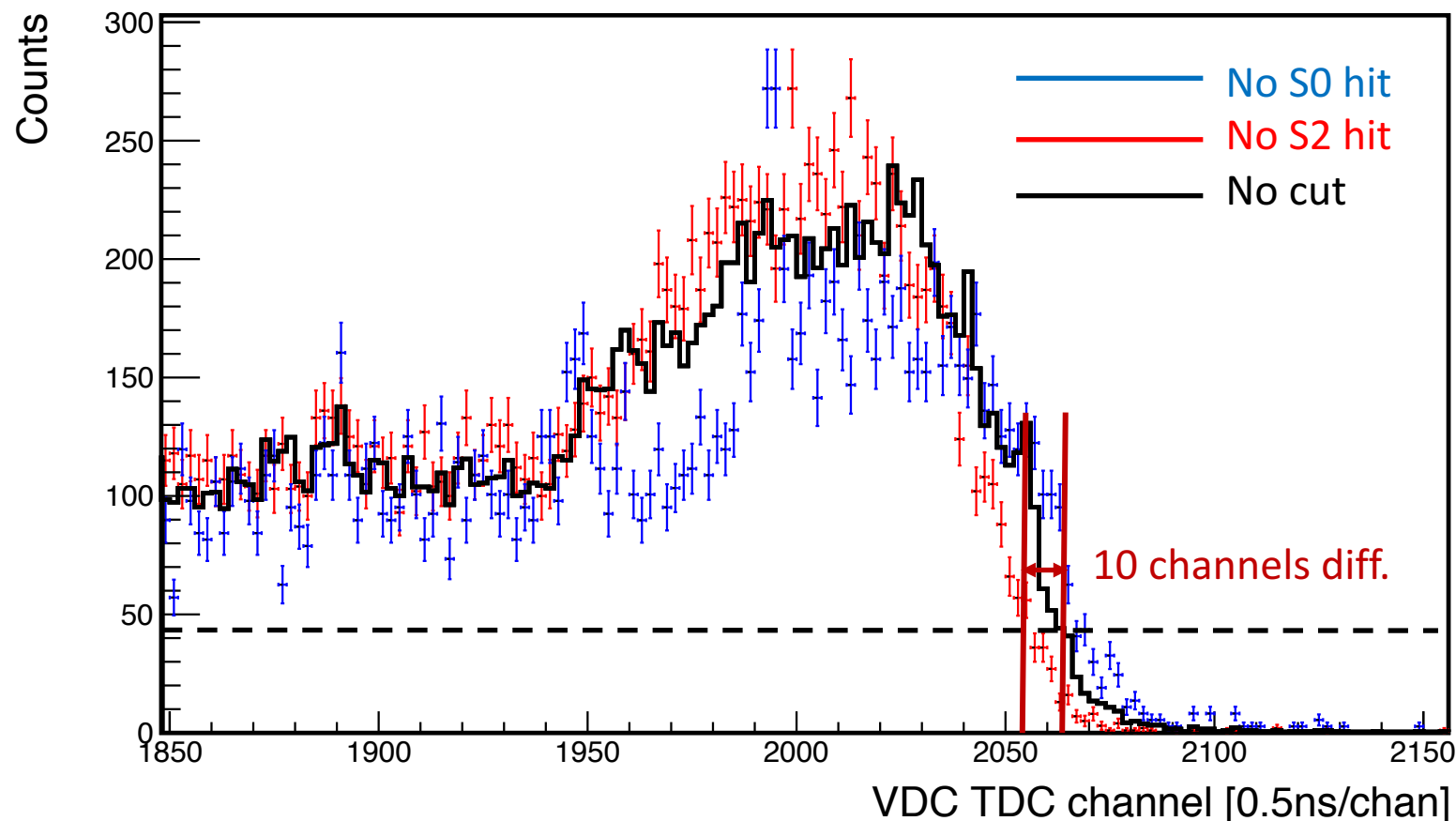
1 TDC channel = 0.5 ns

-> Difference is 8ns

-> Within expectation
(10ns)

Statistics for no S0 hit very limited (only about 0.1% of events) due to high S0 efficiency

VDC TDC Spectra – (S0 || S2)&GC : Two Timings

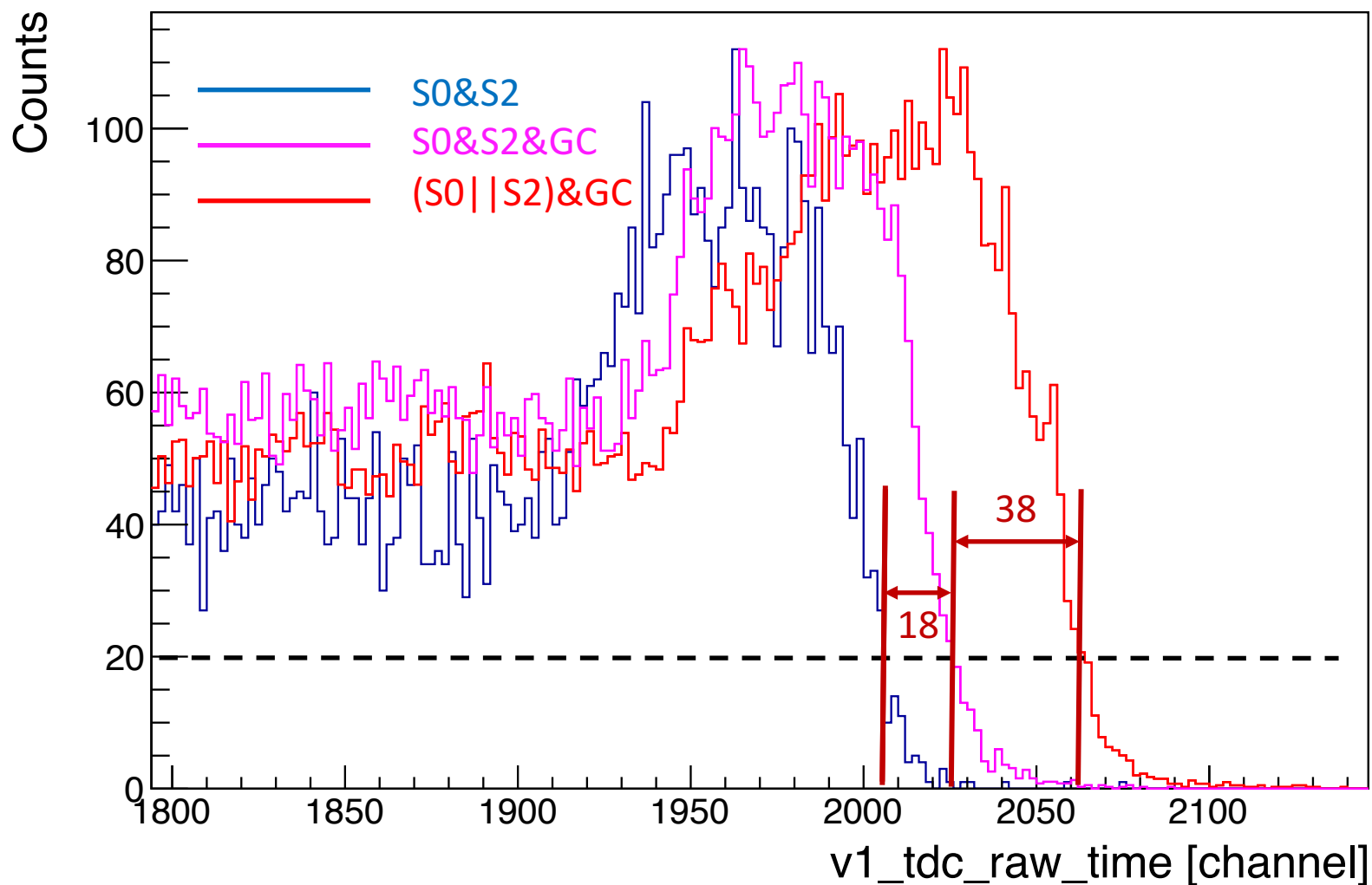


1 TDC channel = 0.5 ns

As expected (S0 || S2)&GC distribution without S0 or S2 hit cut between the spectra with extra cuts

Comparing (S0 || S2)&GC with S0 cut to S0&S2&GC gives $(38-10)/2 = 14$ ns as expected!!

VDC TDC Spectra - Different Trigger cuts



1 TDC channel = 0.5 ns

S0&S2 – S0&S2&GC:

$$18/2 = 9 \text{ ns}$$

-> Difference as expected

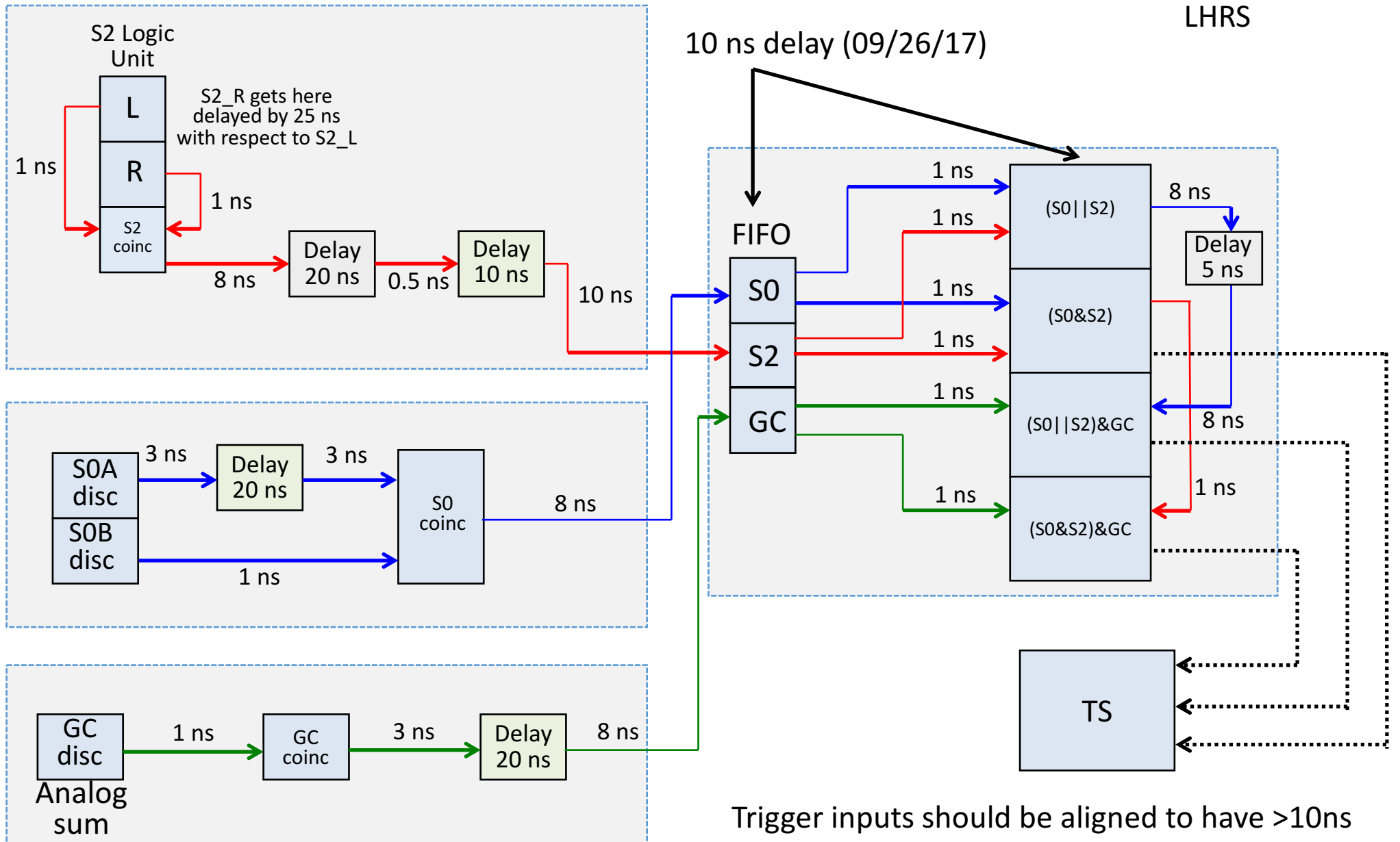
S0&S2&GC – (S0 || S2)&GC:

$$38/2 = 19 \text{ ns (14 with S0 cut)}$$

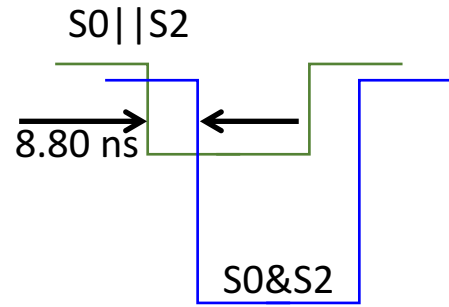
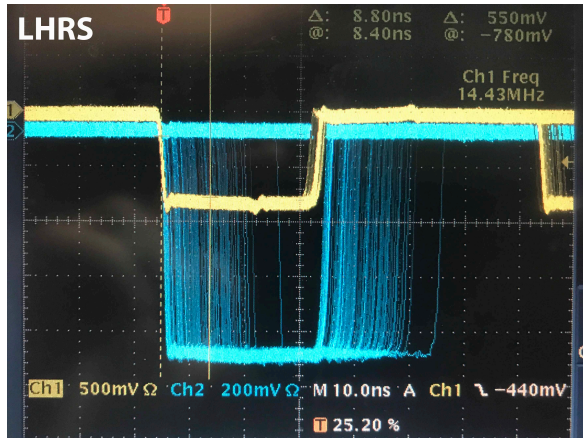
-> bigger than expected

-> What's going on?

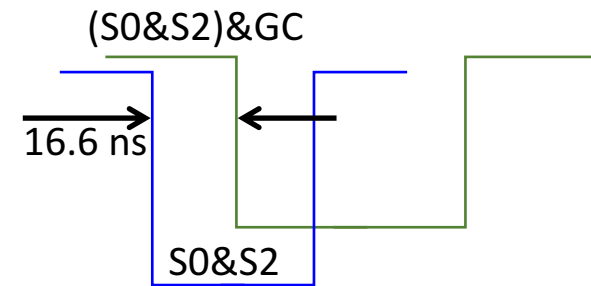
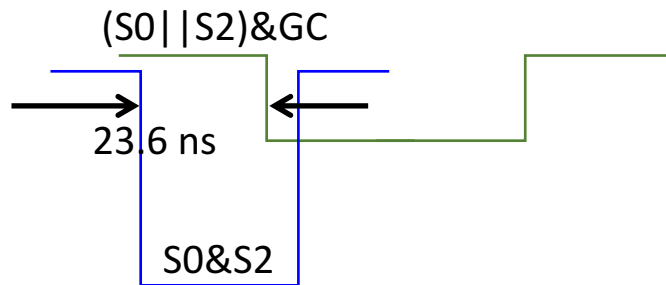
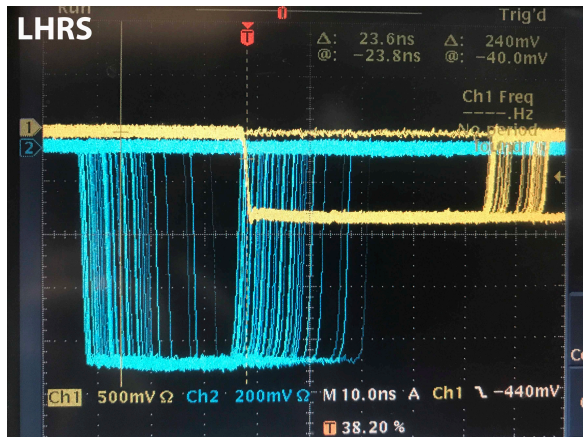
Outlook Trigger Delays LHRS



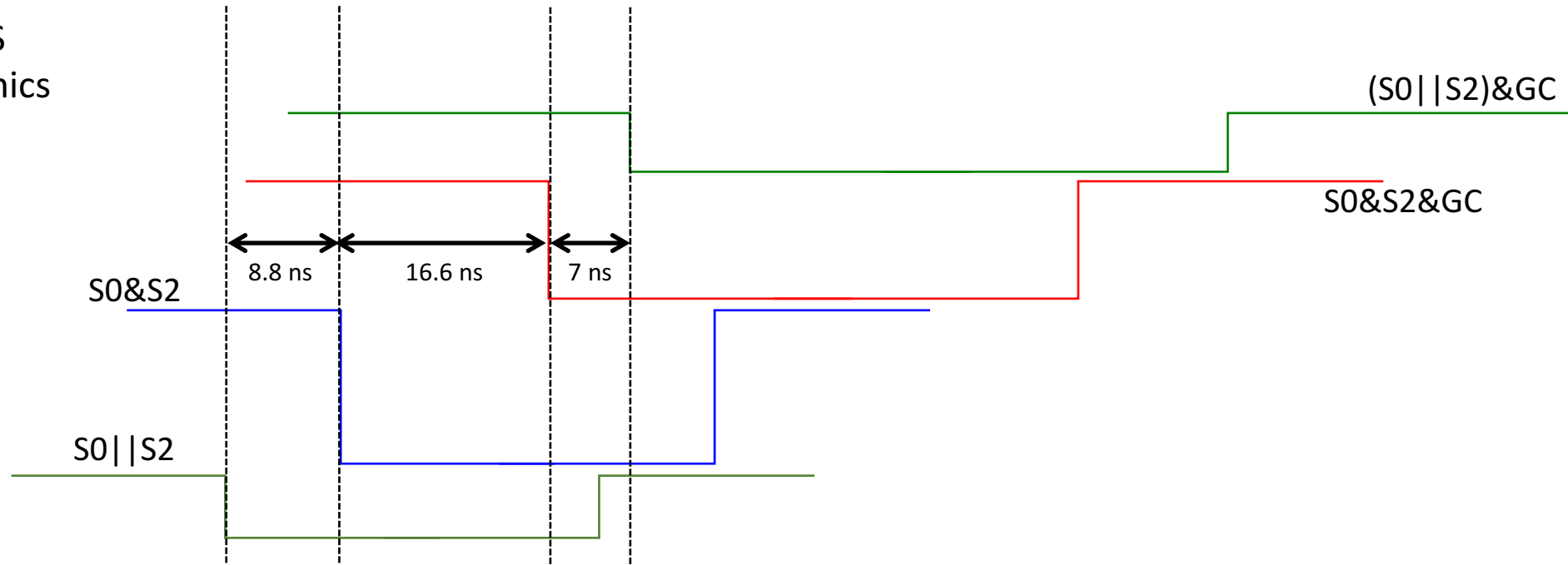
Trigger inputs should be aligned to have >10ns spacing for "evtype" with single trigger (especially important if triggers are prescaled!)



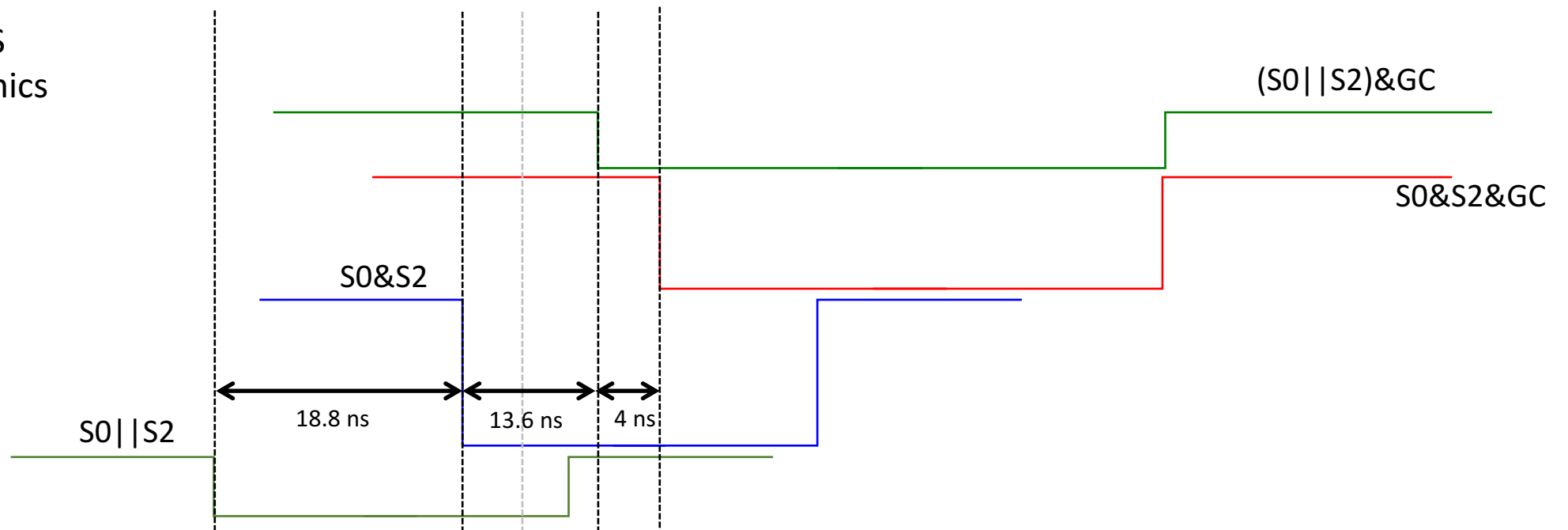
Trigger Delay Measurement LHRS Cosmics (09/27/17)



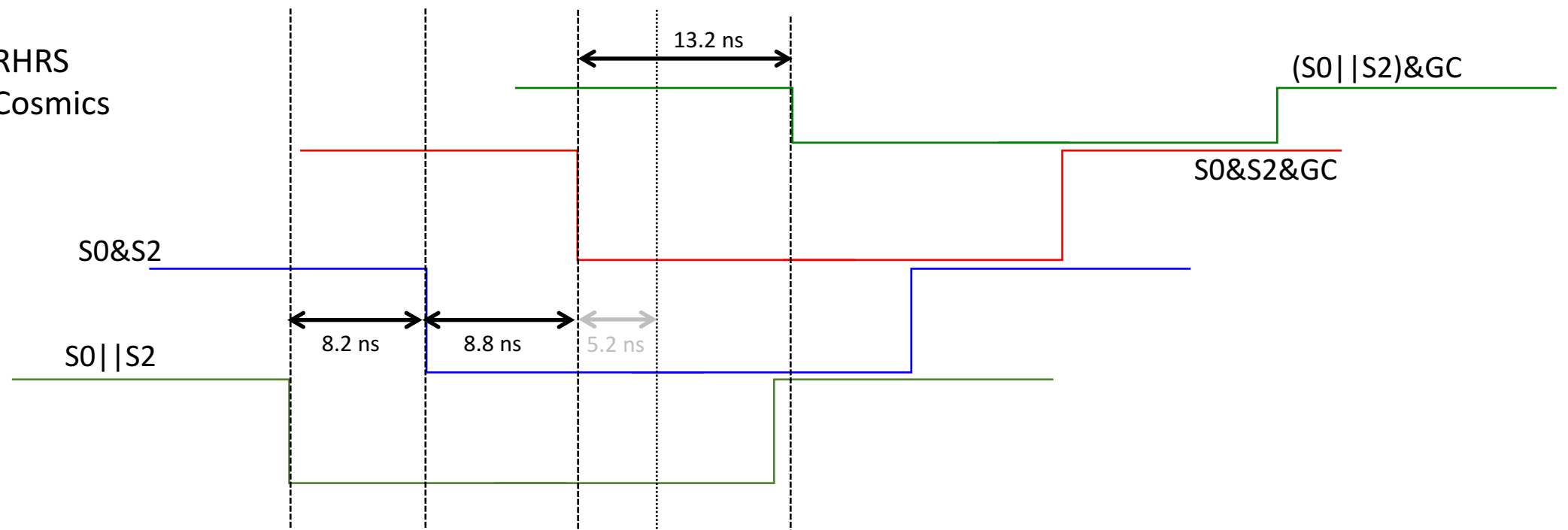
LHRS
cosmics



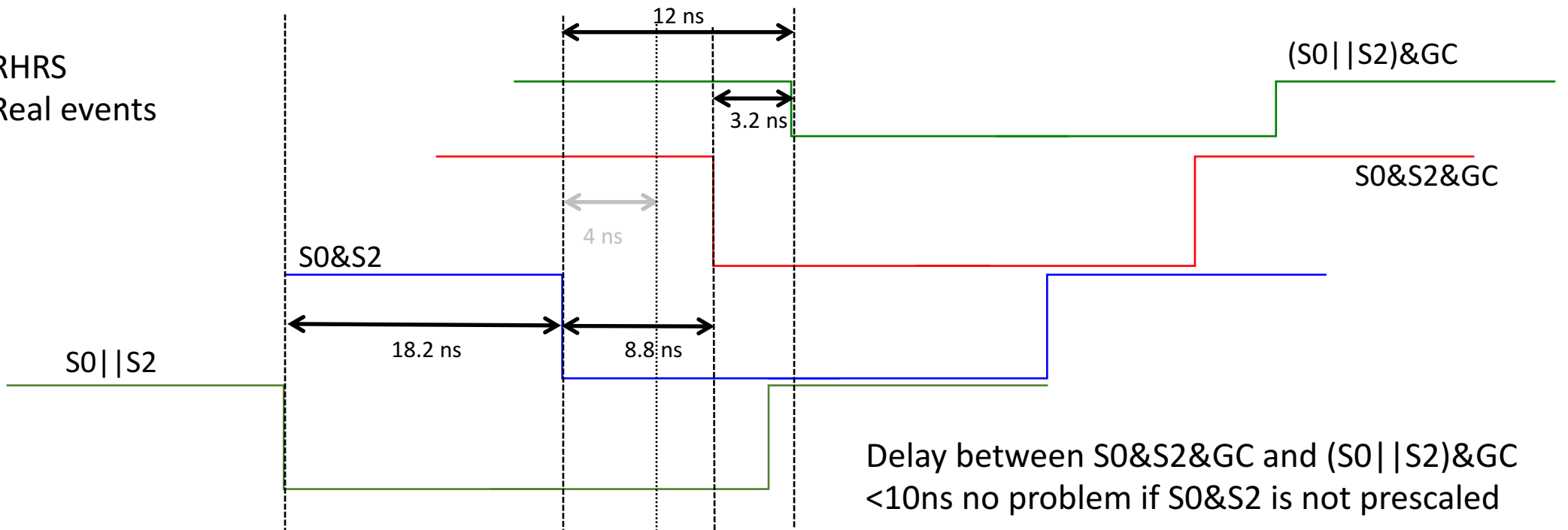
LHRS
cosmics



RHRS
Cosmics



RHRS
Real events



Delay between S0&S2&GC and (S0||S2)&GC
<10ns no problem if S0&S2 is not prescaled