

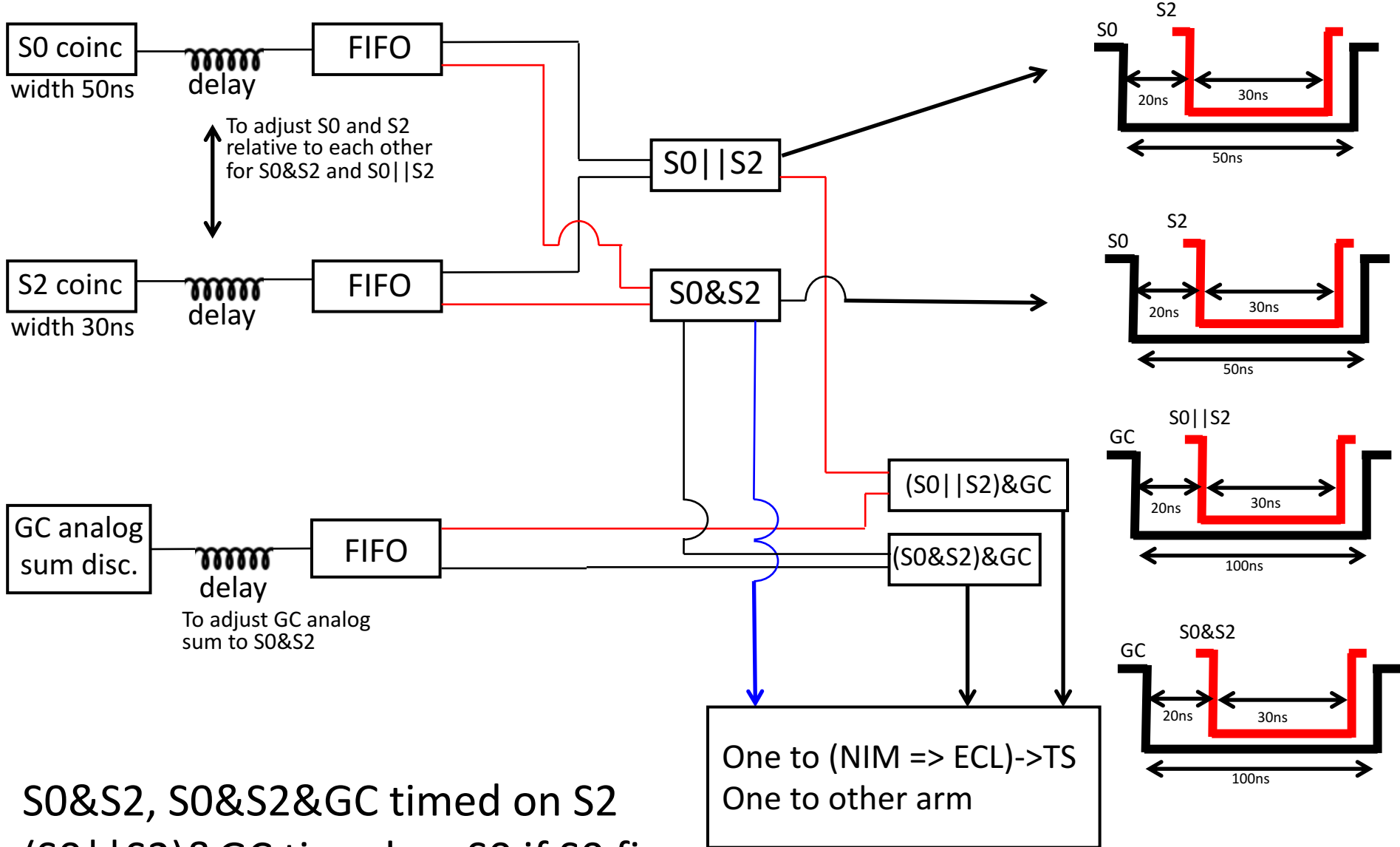
# Trigger Delays, Evtype and Evtypebits

Florian Hauenstein  
Tritium Meeting 10/10/2017

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

Trigger Delays RHRS

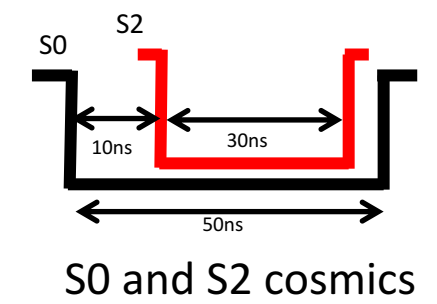
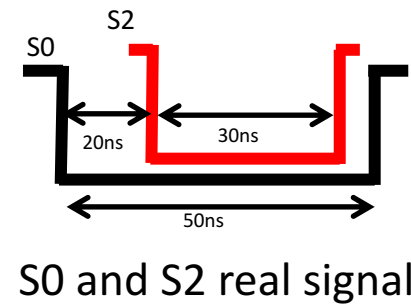
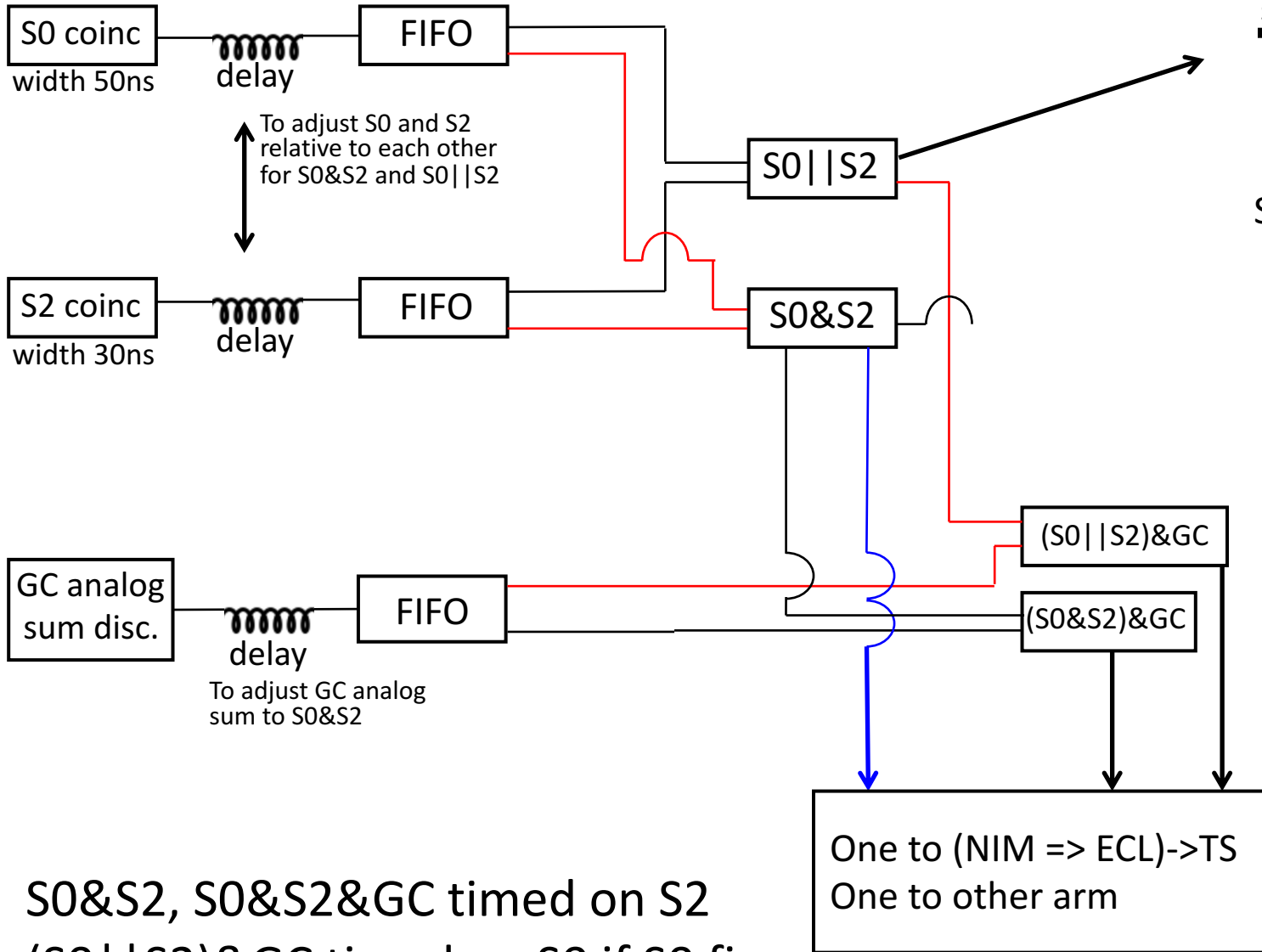
# Single Arm Triggers ( $S0\&S2$ ); $(S0\&S2)\&GC$ ; $(S0 || S2)\&GC$



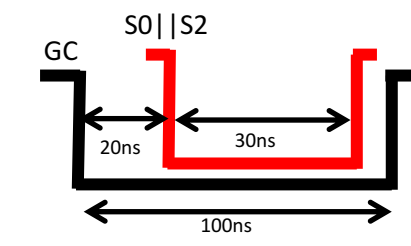
$S0\&S2$ ,  $S0\&S2\&GC$  timed on S2  
 $(S0 || S2)\&GC$  timed on S0 if S0 fires

One to (NIM => ECL)->TS  
 One to other arm

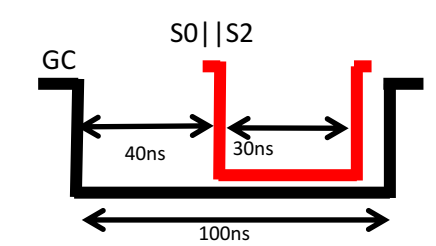
# Single Arm Triggers (S0&S2); (S0&S2)&GC; (S0 || S2)&GC



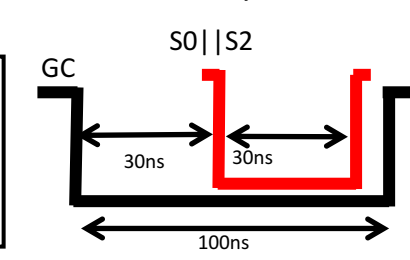
If S0 fires



If no S0 but S2, real events



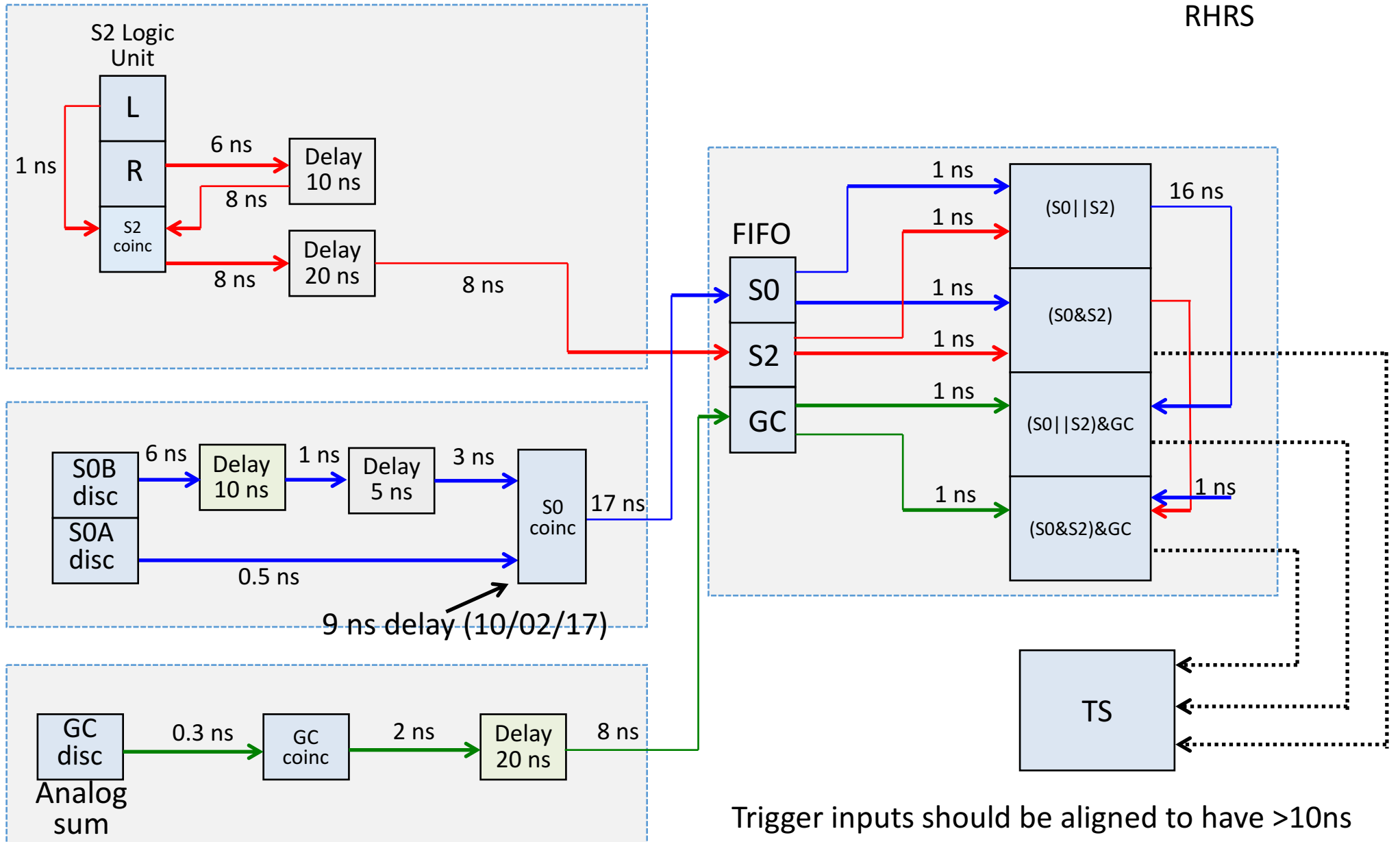
Cosmics, no S0



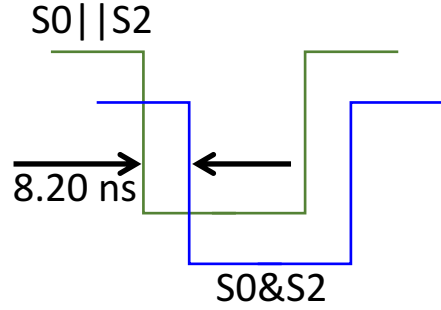
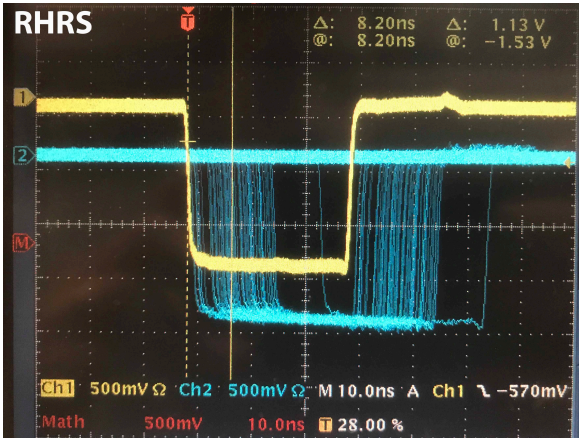
For cosmics difference (S0 || S2)&GC with S0 fires or not is 10ns

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

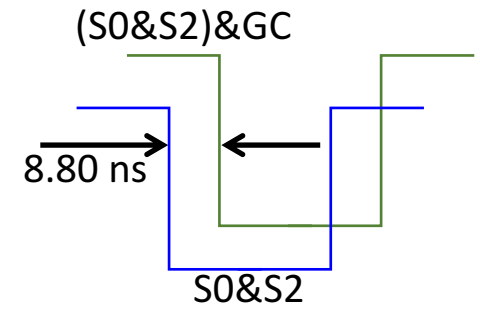
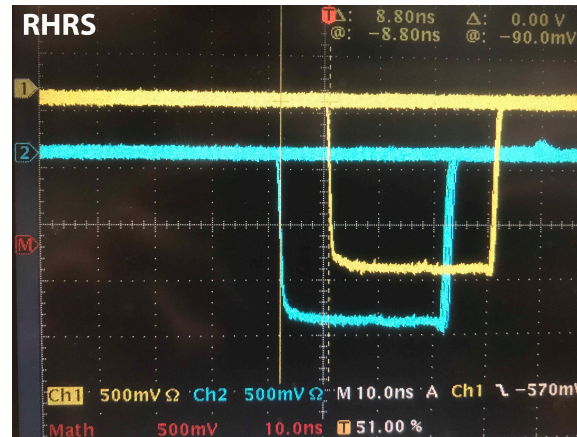
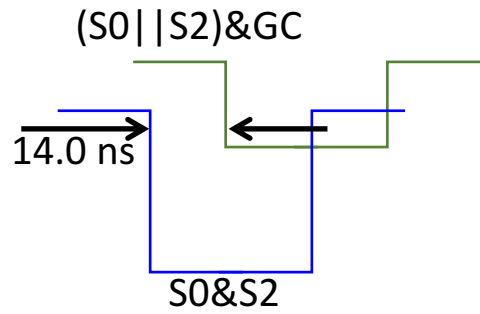
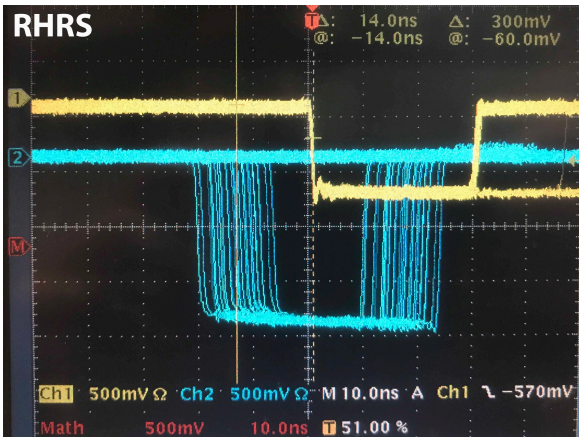
One to (NIM => ECL)->TS  
 One to other arm



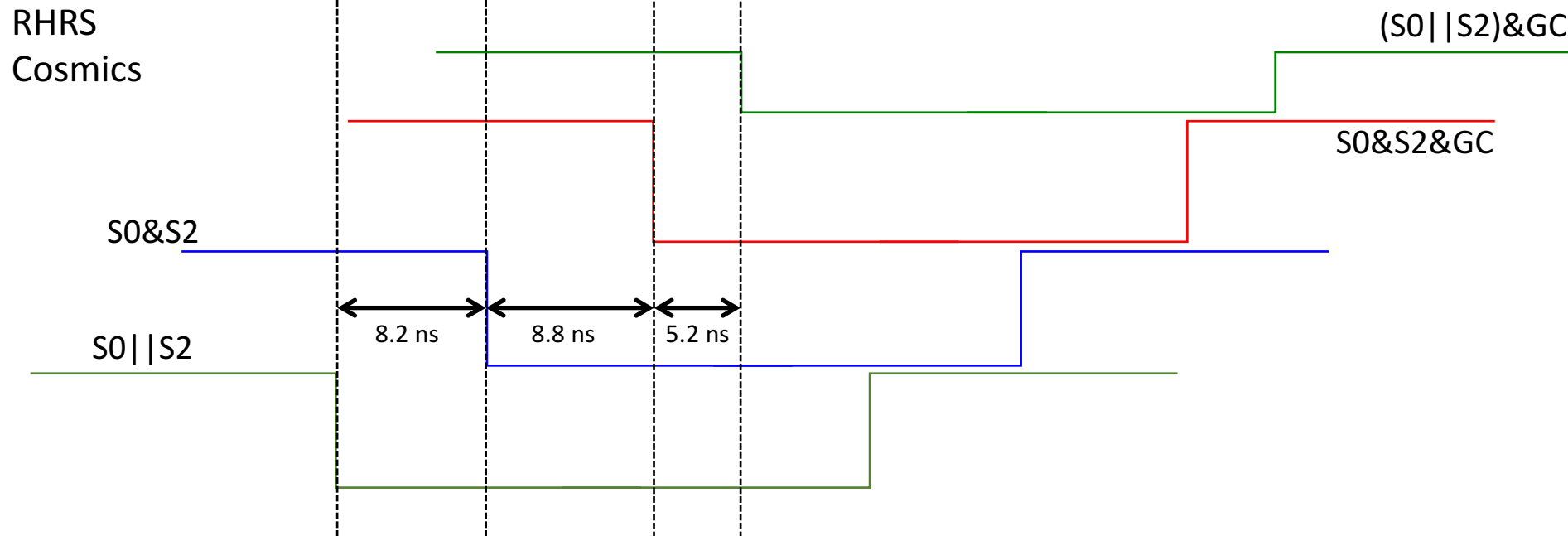
Trigger inputs should be aligned to have >10ns spacing for "evtype" with single trigger (especially important if triggers are prescaled!)



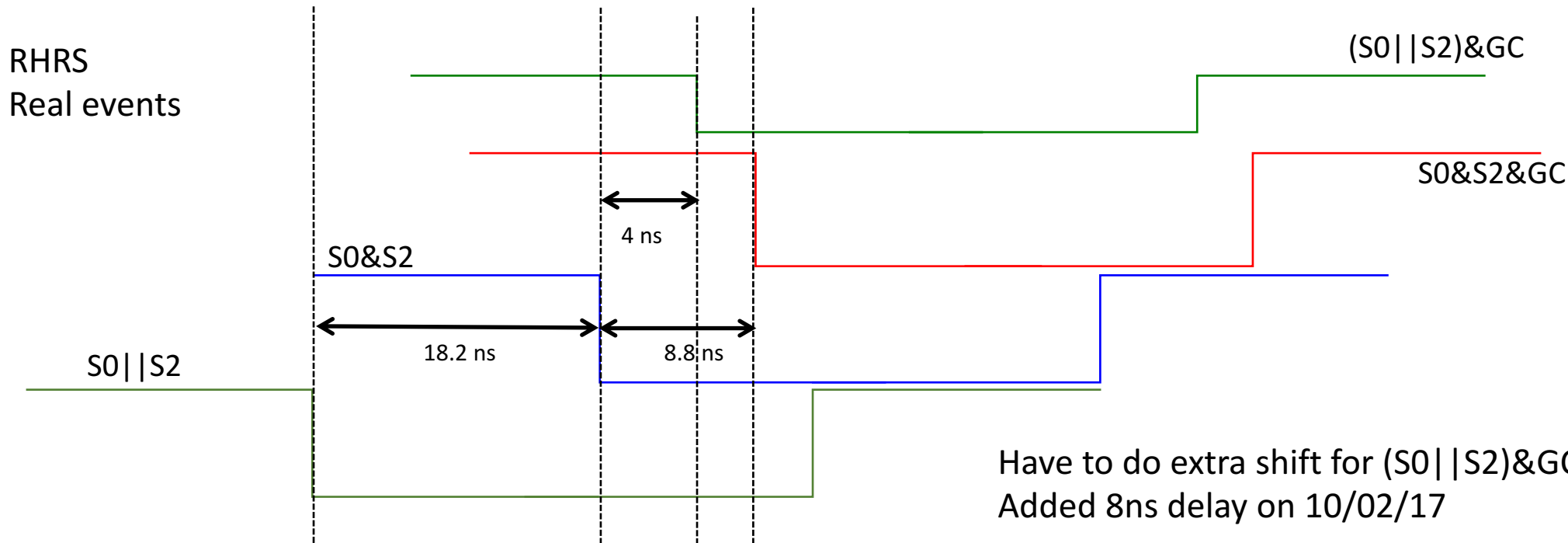
# Trigger Delay Measurement RHRS Cosmics (09/27/17)



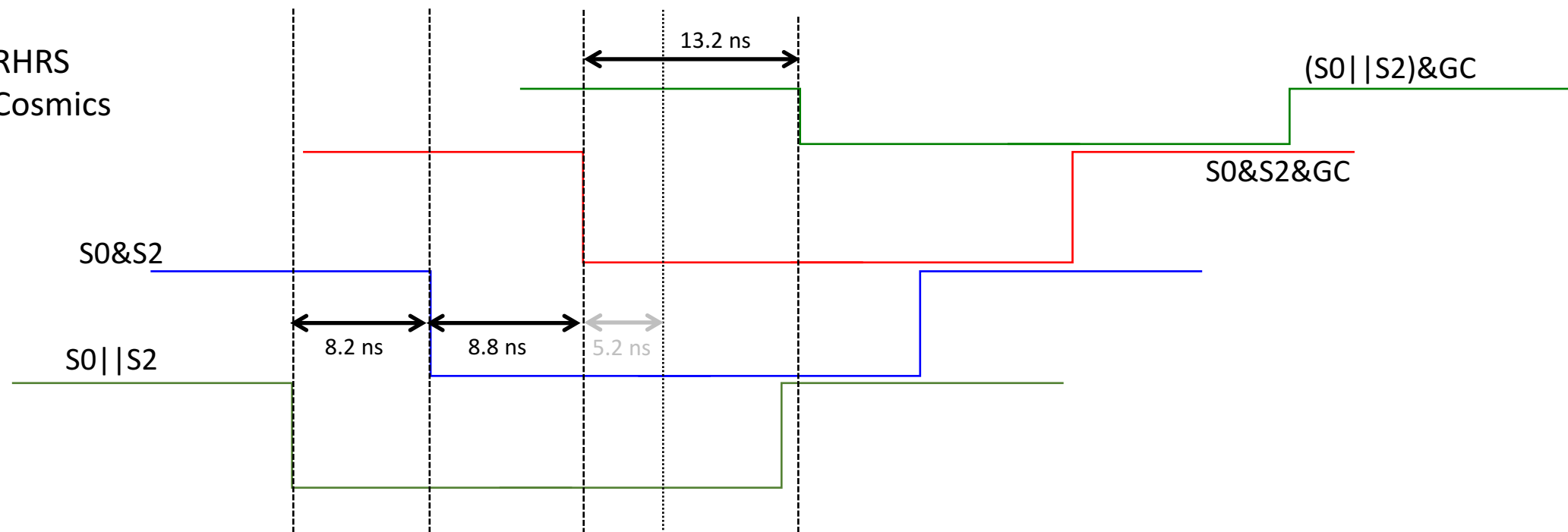
RHRS  
Cosmics



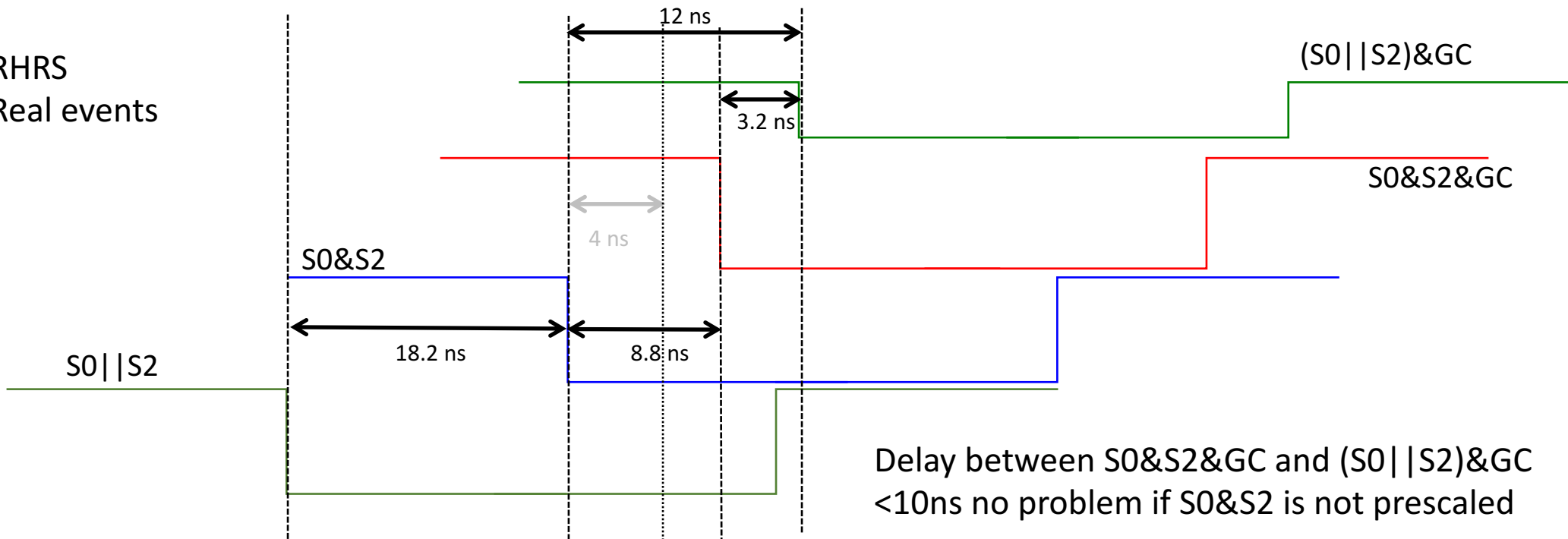
RHRS  
Real events



RHRS  
Cosmics



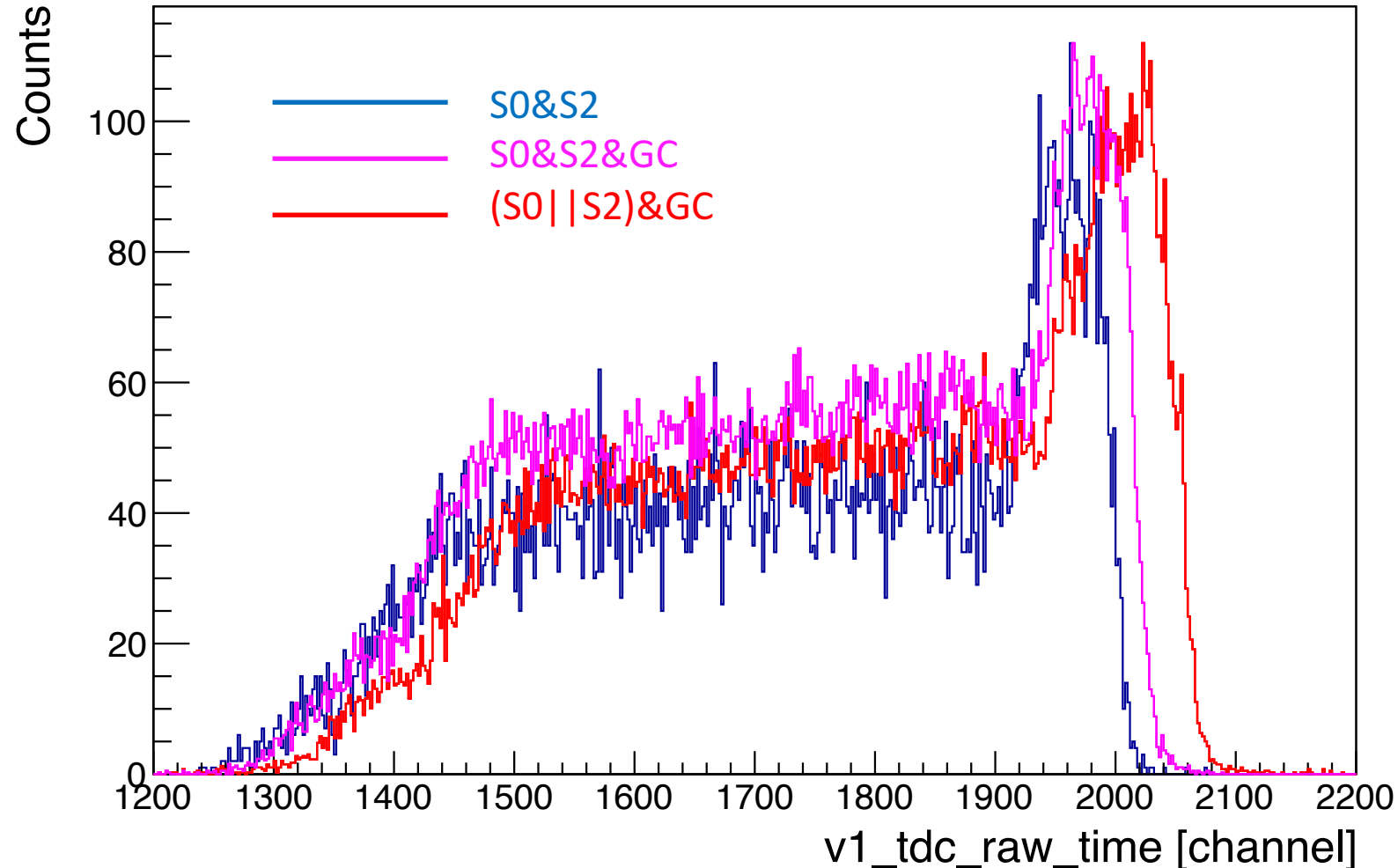
RHRS  
Real events



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



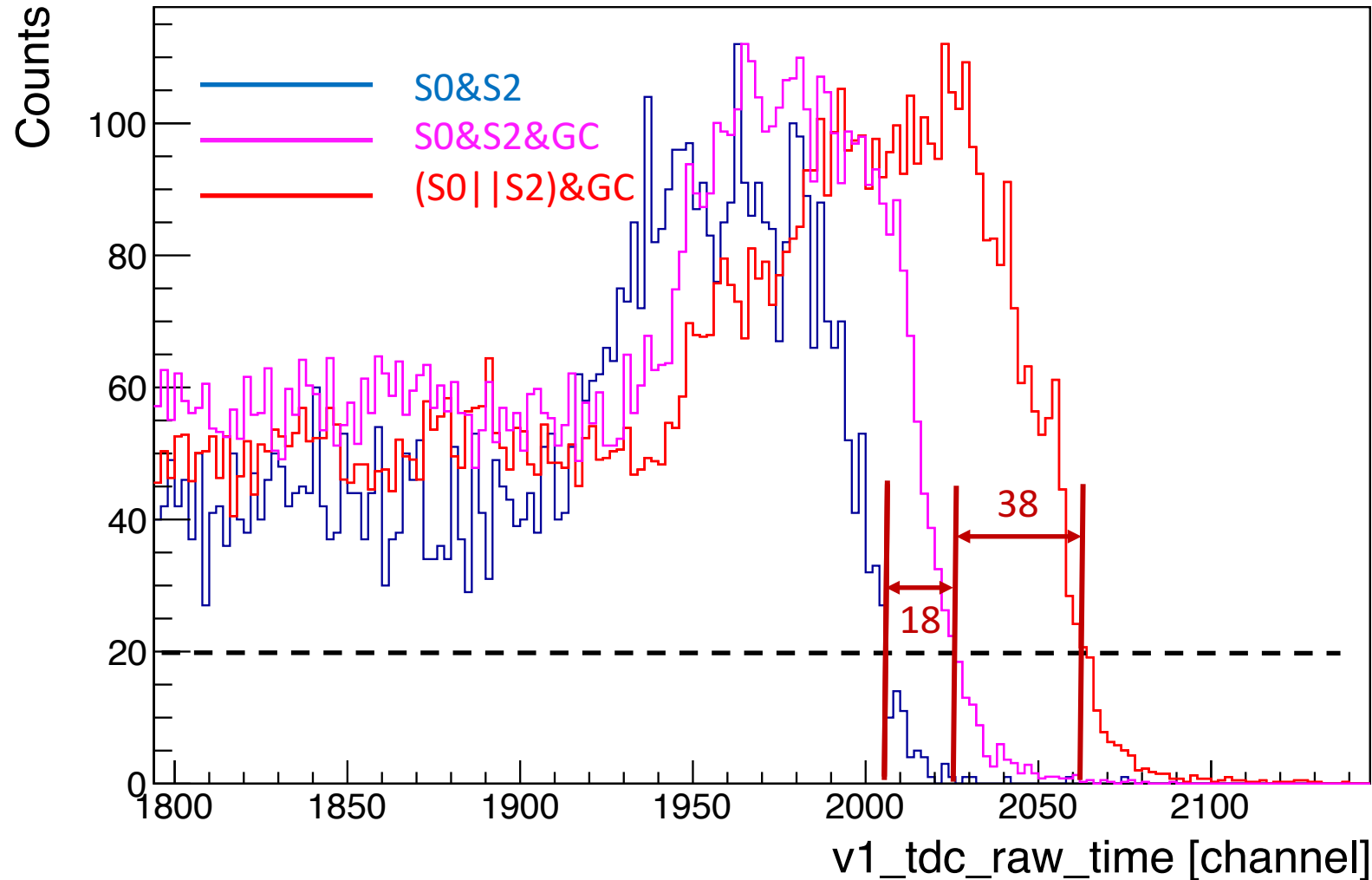
# VDC TDC Spectra - Different Trigger cuts



- 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

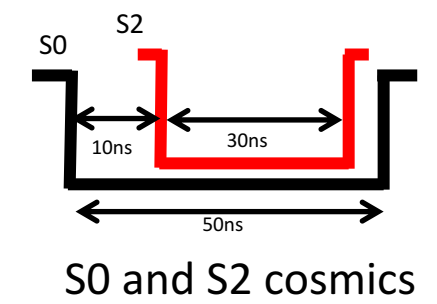
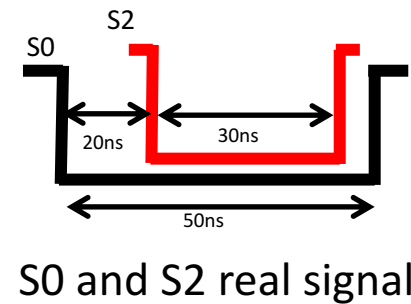
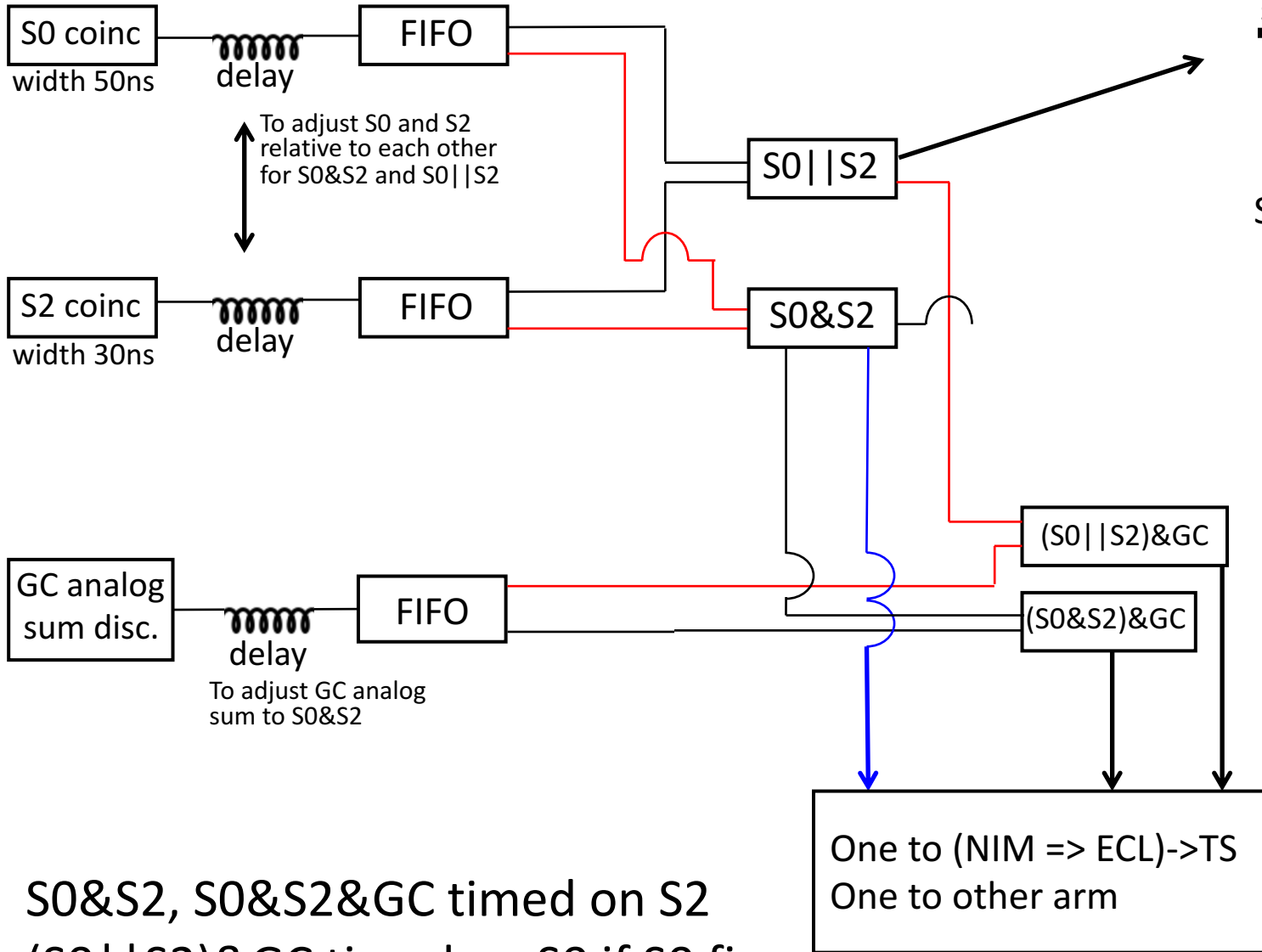
S0&S2&GC – (S0||S2)&GC:

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

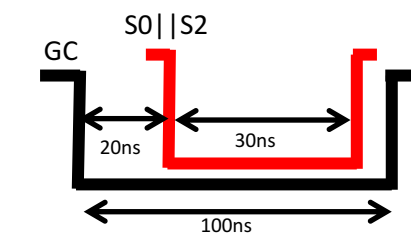
-> bigger than expected

-> What's going on?

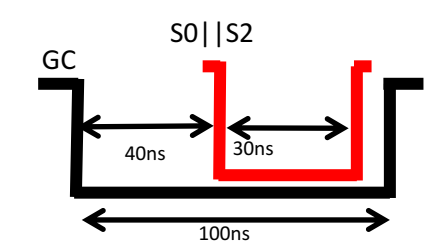
# Single Arm Triggers (S0&S2); (S0&S2)&GC; (S0 || S2)&GC



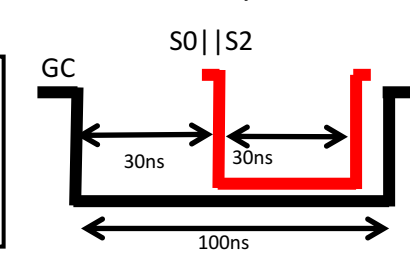
If S0 fires



If no S0 but S2, real events



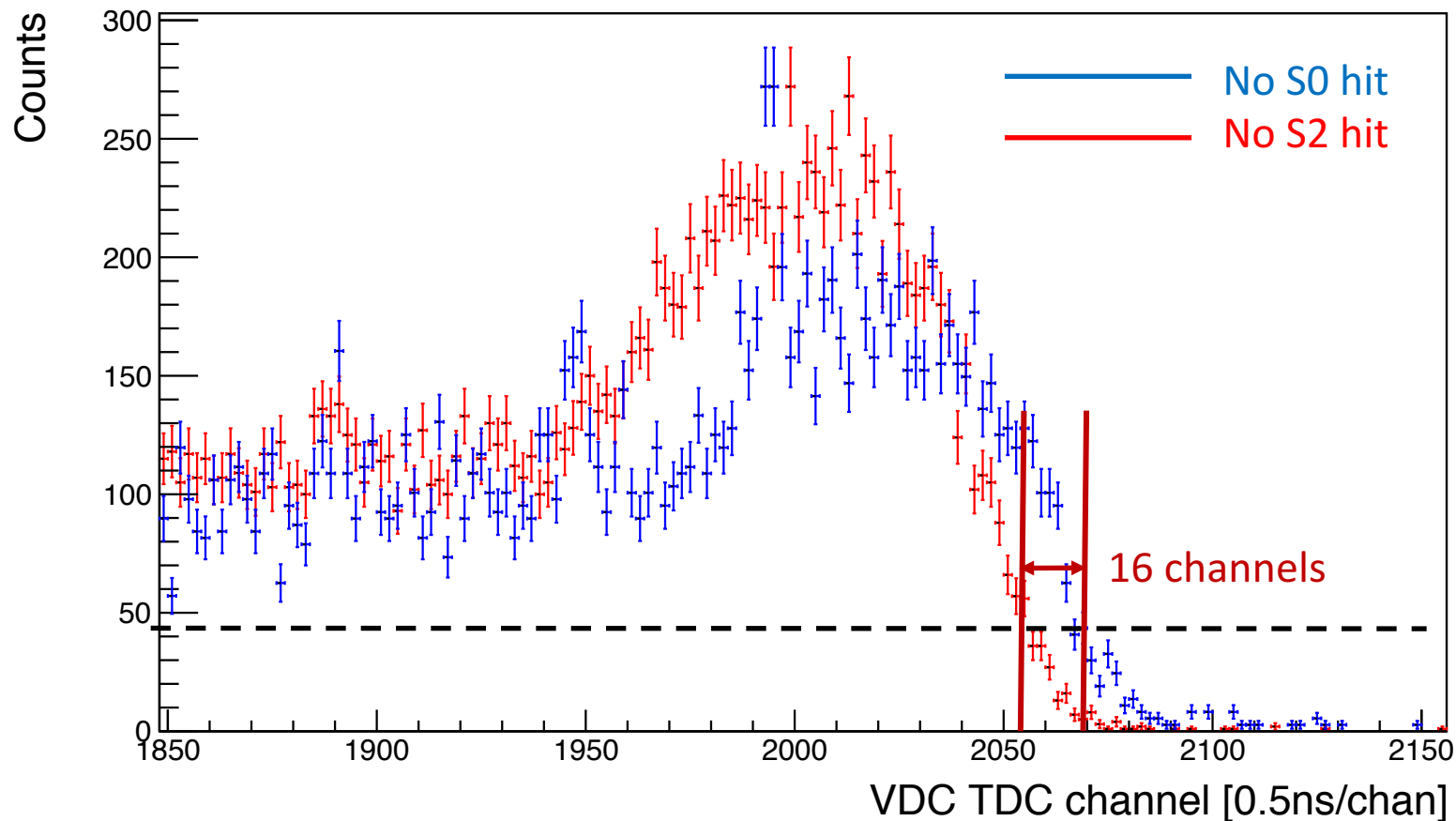
Cosmics, no S0



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

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

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



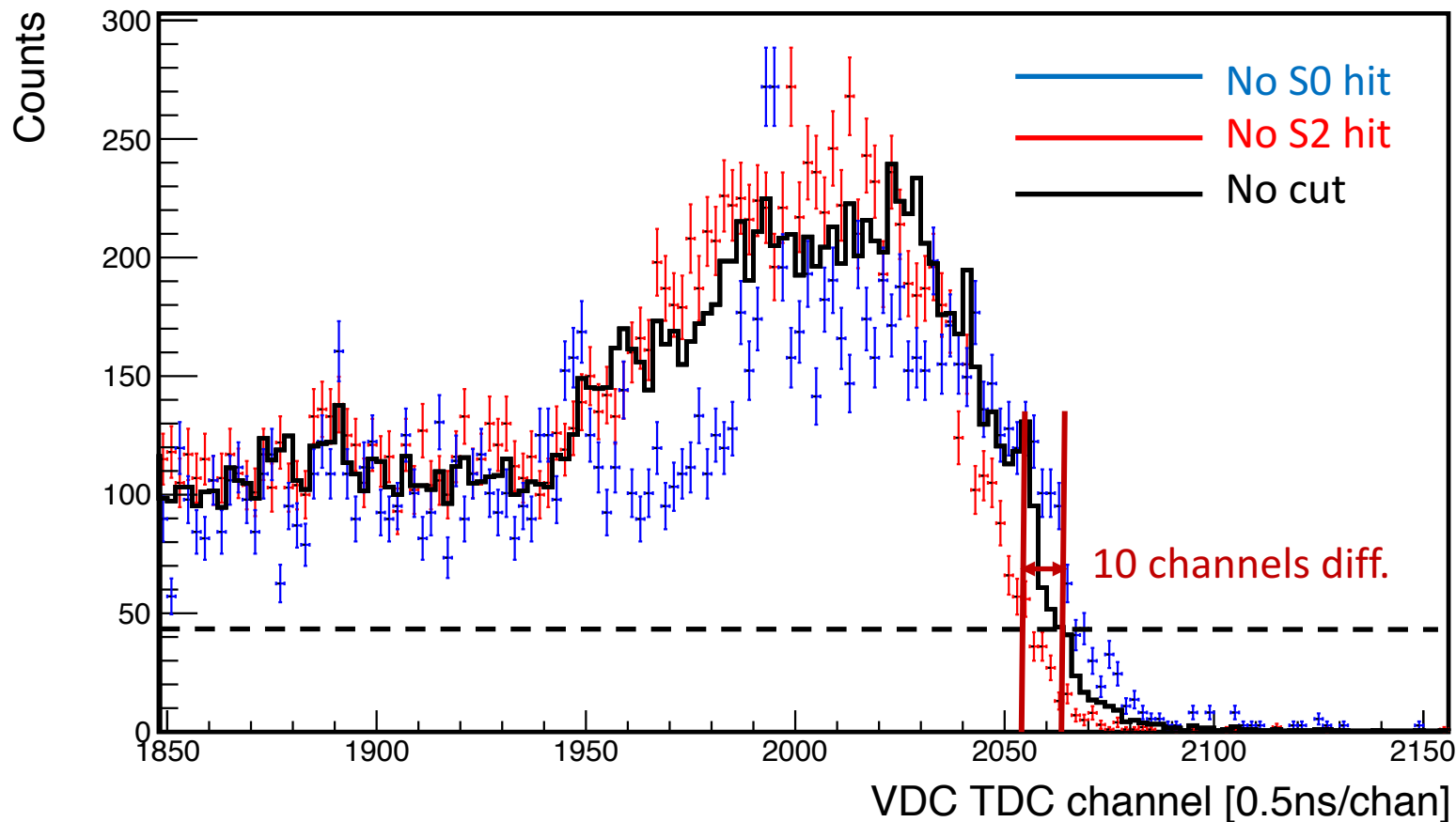
1 TDC channel = 0.5 ns

-> 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

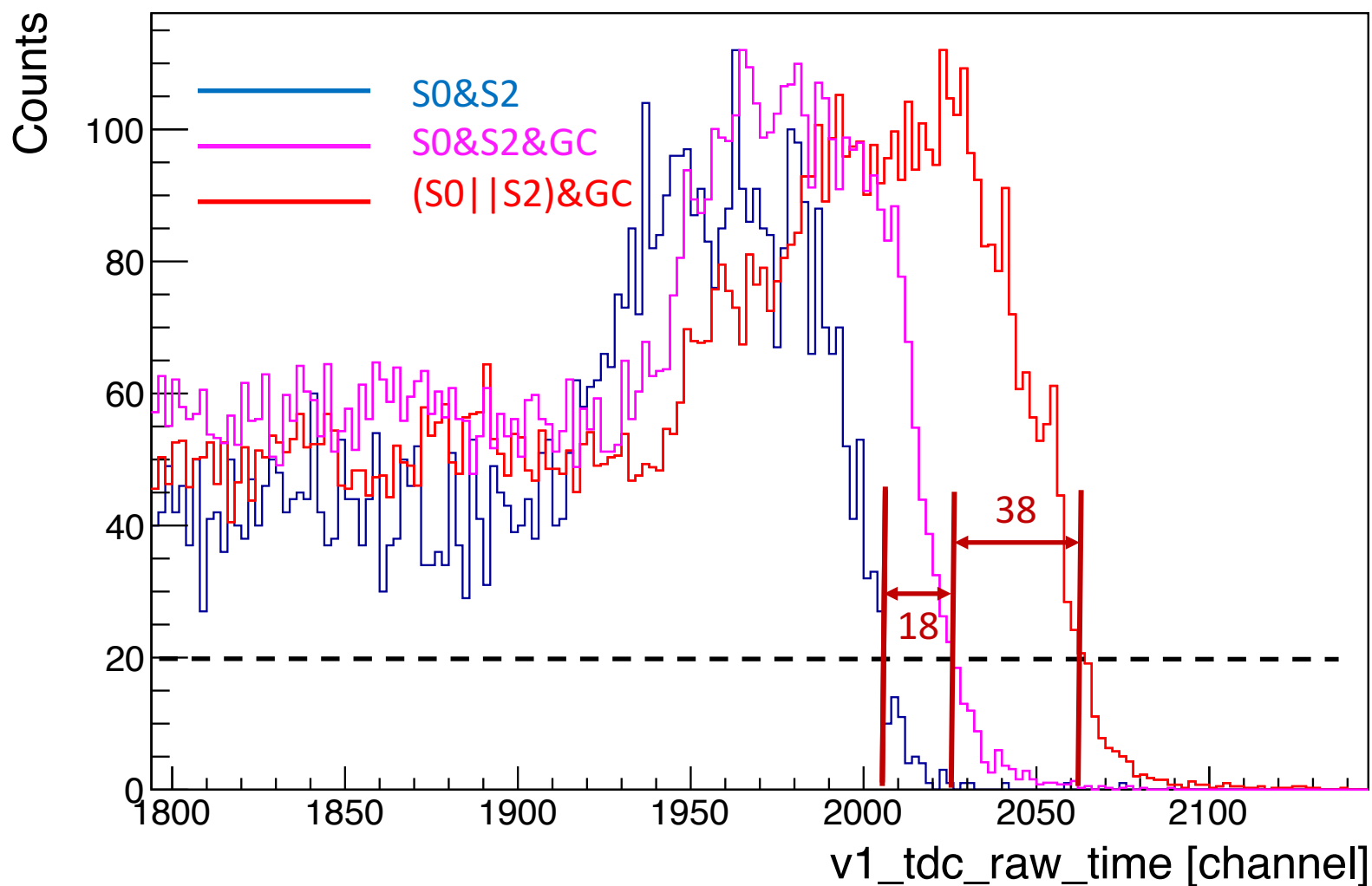


1 TDC channel = 0.5 ns

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

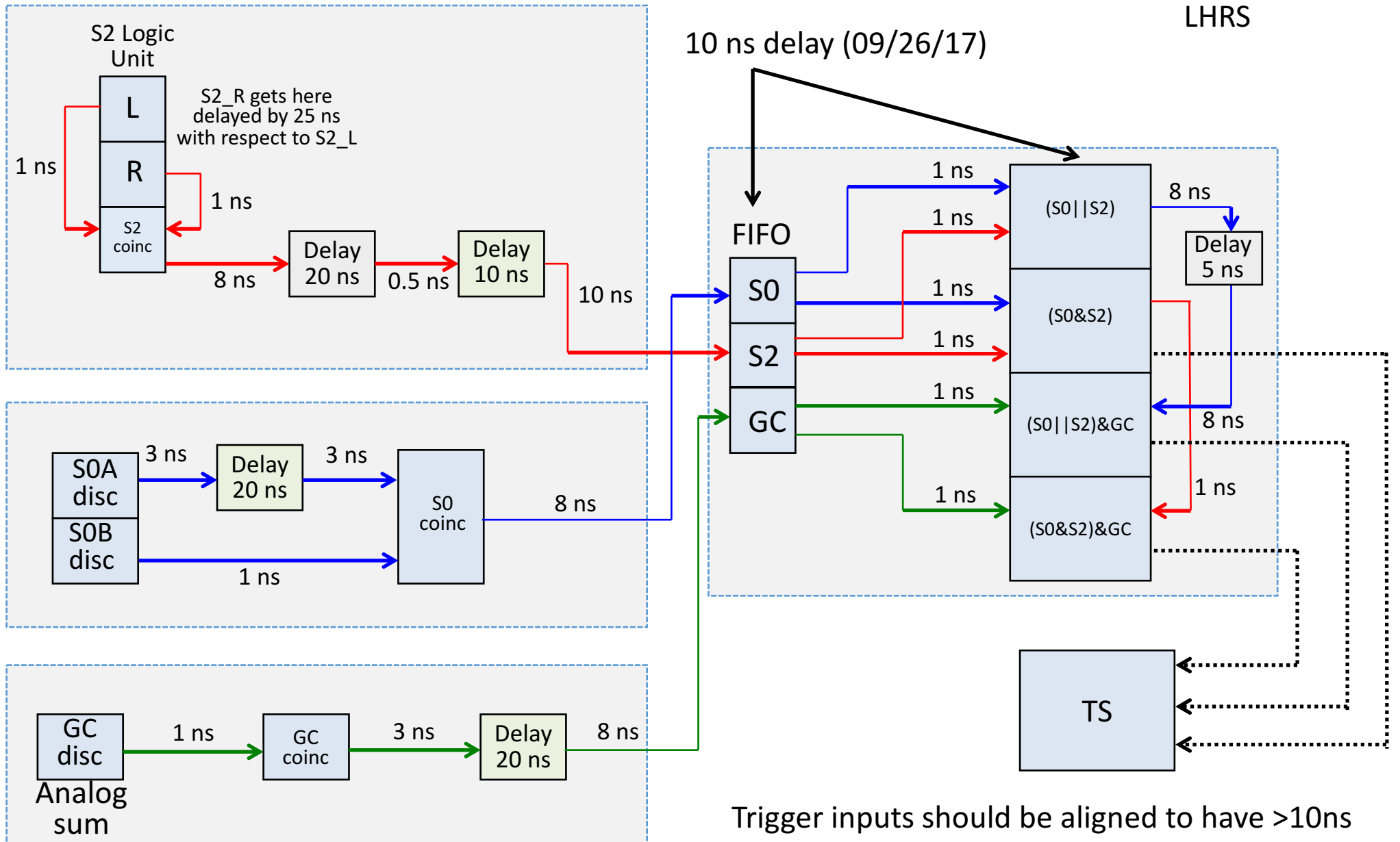
S0&S2&GC – (S0||S2)&GC:

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

-> bigger than expected

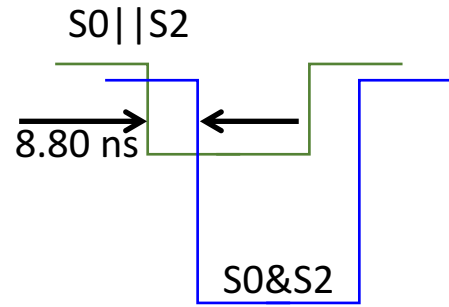
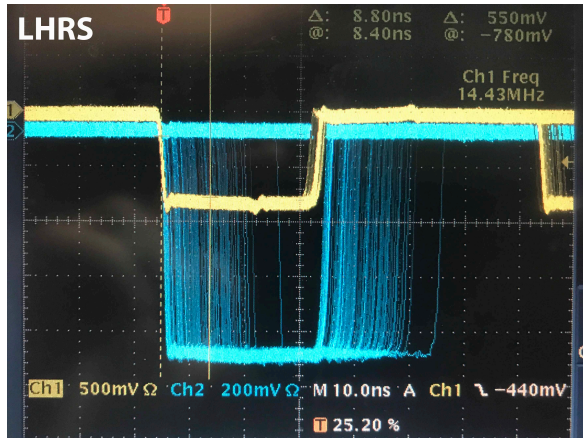
-> What's going on?

Outlook Trigger Delays LHRS

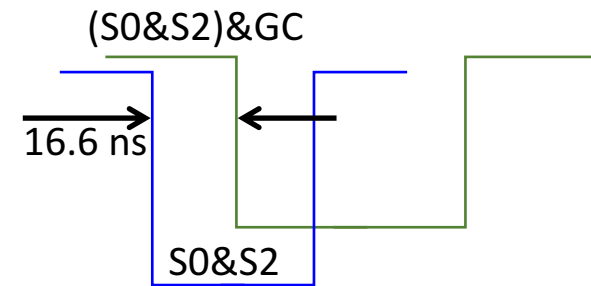
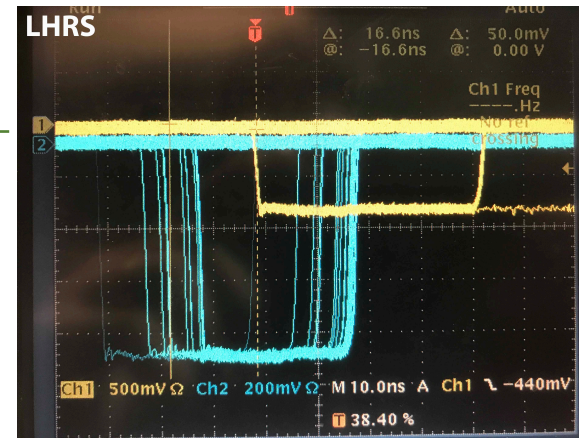
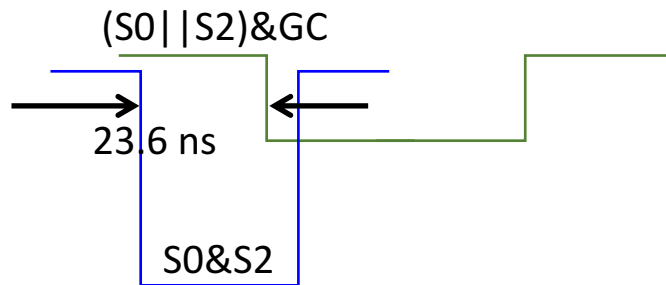
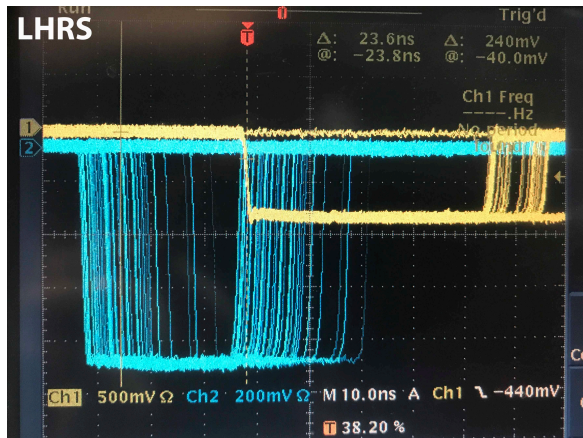


Trigger inputs should be aligned to have >10ns spacing for "evtype" with single trigger (especially important if triggers are prescaled!)

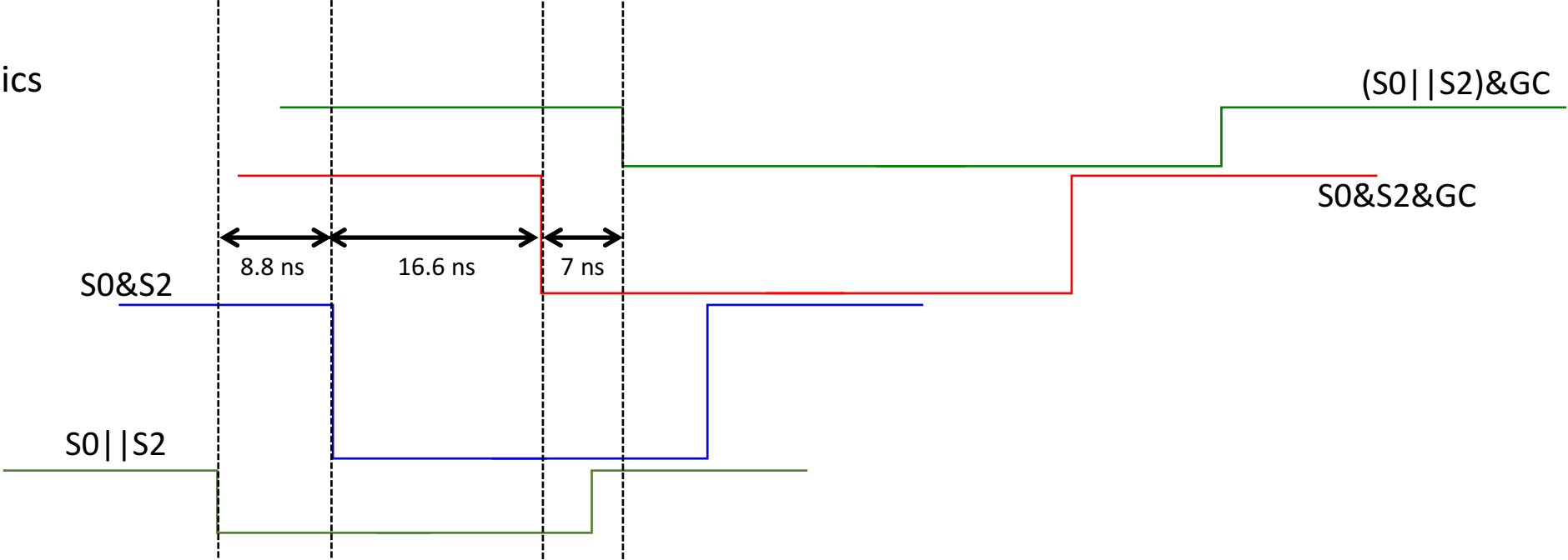




# Trigger Delay Measurement LHRS Cosmics (09/27/17)



LHRS  
cosmics



Details Evtpebits and Evtpe at  
whiteboard