Concept ‘B2B-light’

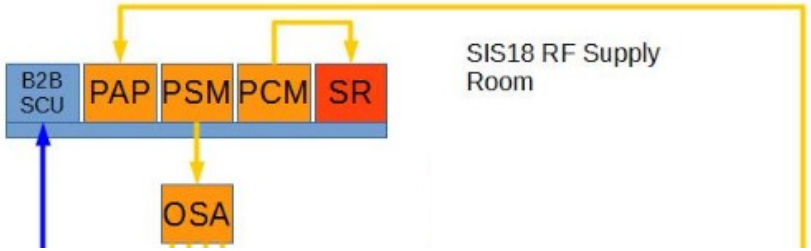
Assumptions

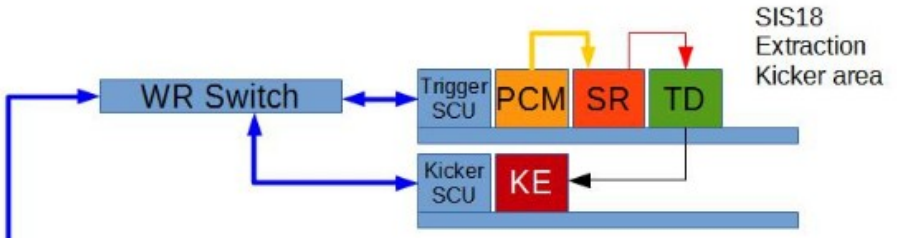
- ‘RF control loops’ work by phase-shift
  - → DDS output frequencies equal **LSA values**
    - with known corrections
    - when control loops are inactive
- (alternative: read DDS output frequencies from DDS registers)
- a FTRN can timestamp digital signals to about 1 ns
- BuTiS and GMT are **phase locked**

Consequence

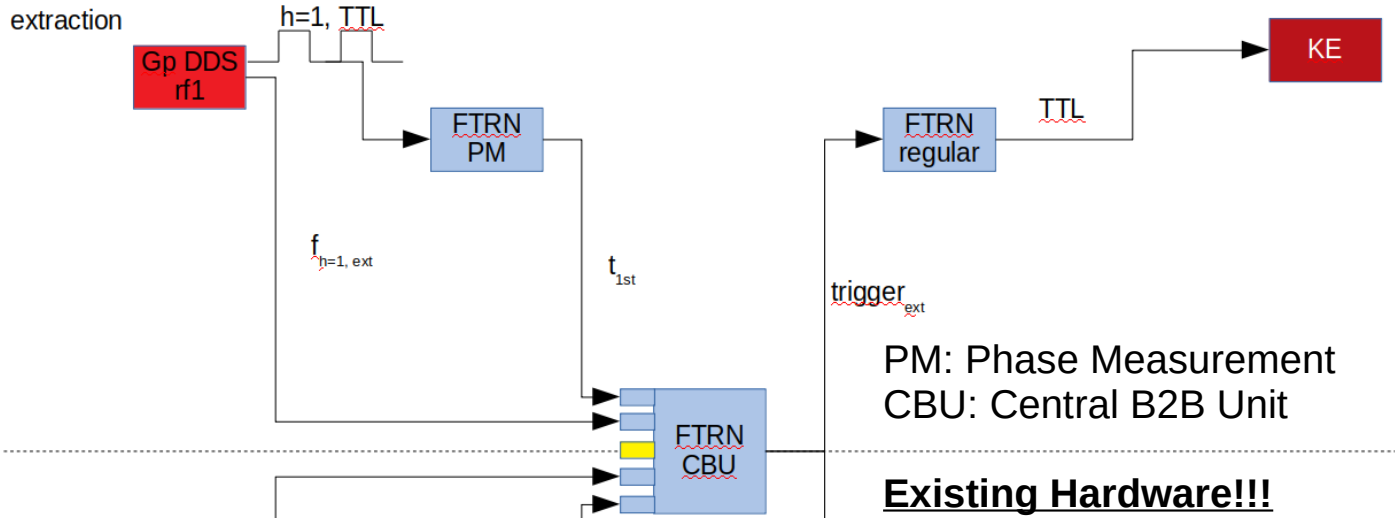
- → DDS frequency values are **exactly** known
- → error propagation (for extrapolation of a measured timestamp of 0-crossings into the future)
  - only depends on error of timestamp
  - precision of prediction is constant
- 0-crossing of h=1 signals can be predicted **forever**!!!
- precision of phase match ~ 1.4 * 1ns (~ 0.5 degree @ 1 MHz)

B2B vs ‘B2B light’





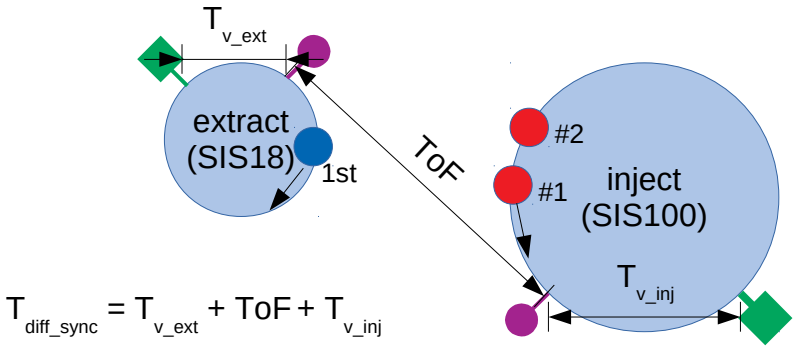
PAM: Phase Advance Measurement Module
PAP: Phase Advance Prediction Module
SR: Signal Reproduction Module
PCM: Phase Correction Module
TD: Trigger Decision Module
Source/Target SCUs...



PM: Phase Measurement
CBU: Central B2B Unit

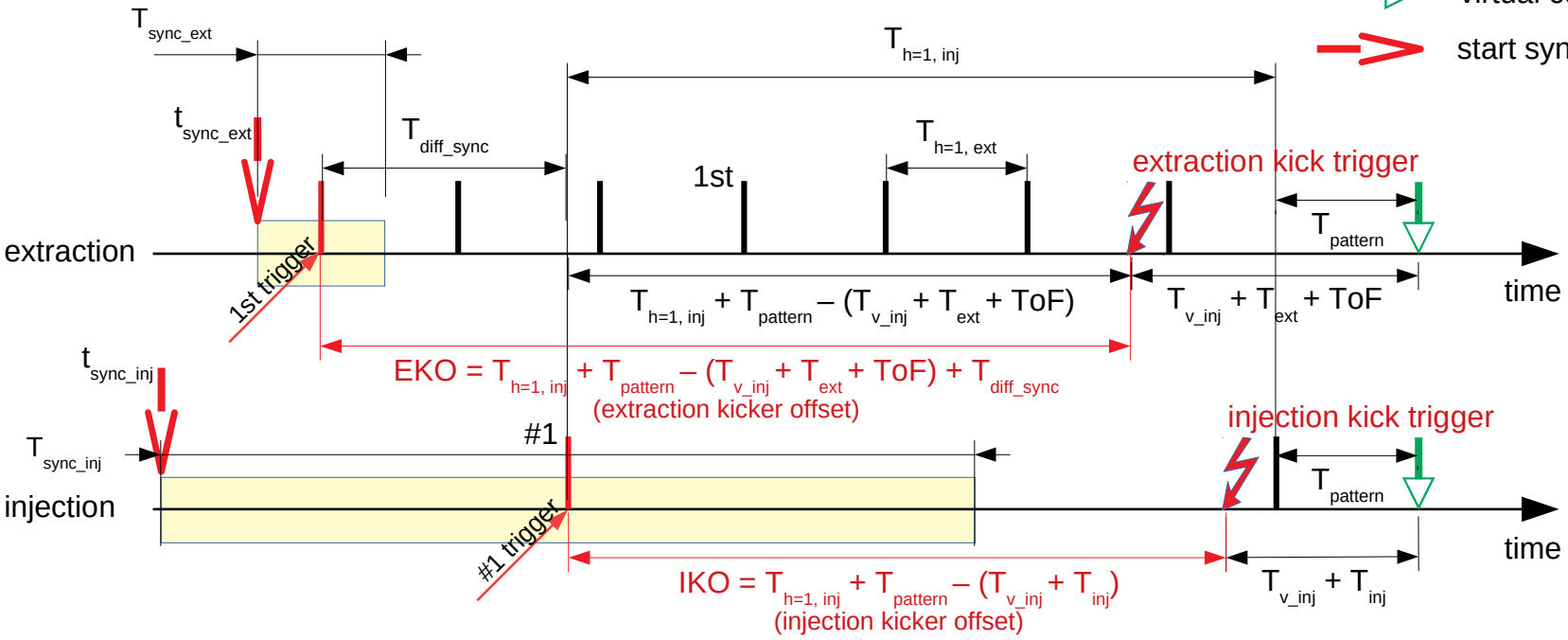
Existing Hardware!!!

Extraction → Injection



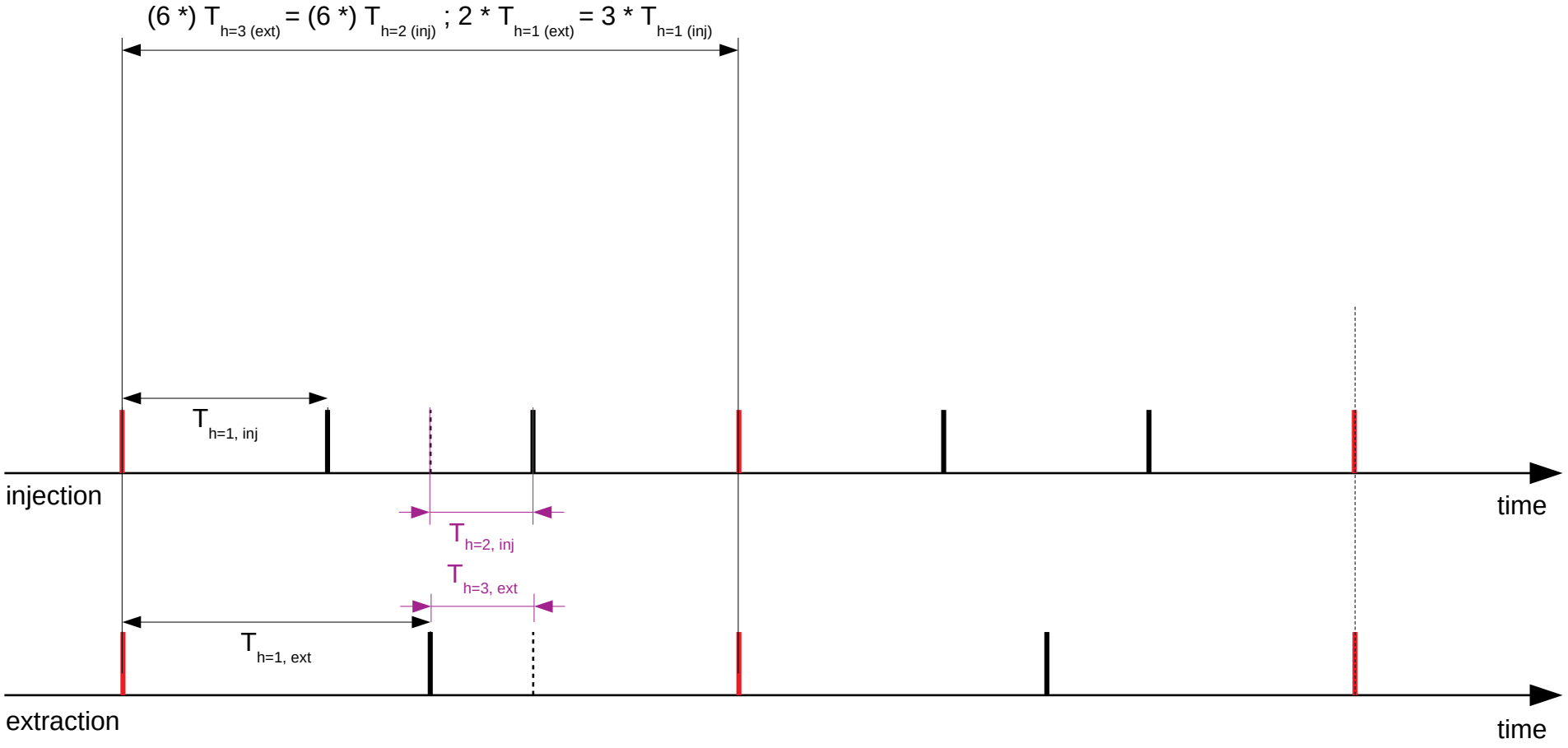
$T_{diff_sync} = T_{v_ext} + ToF + T_{v_inj}$

kicker
virtual cavity
1st
#1
synchronization window
virtual coincidence
start sync window

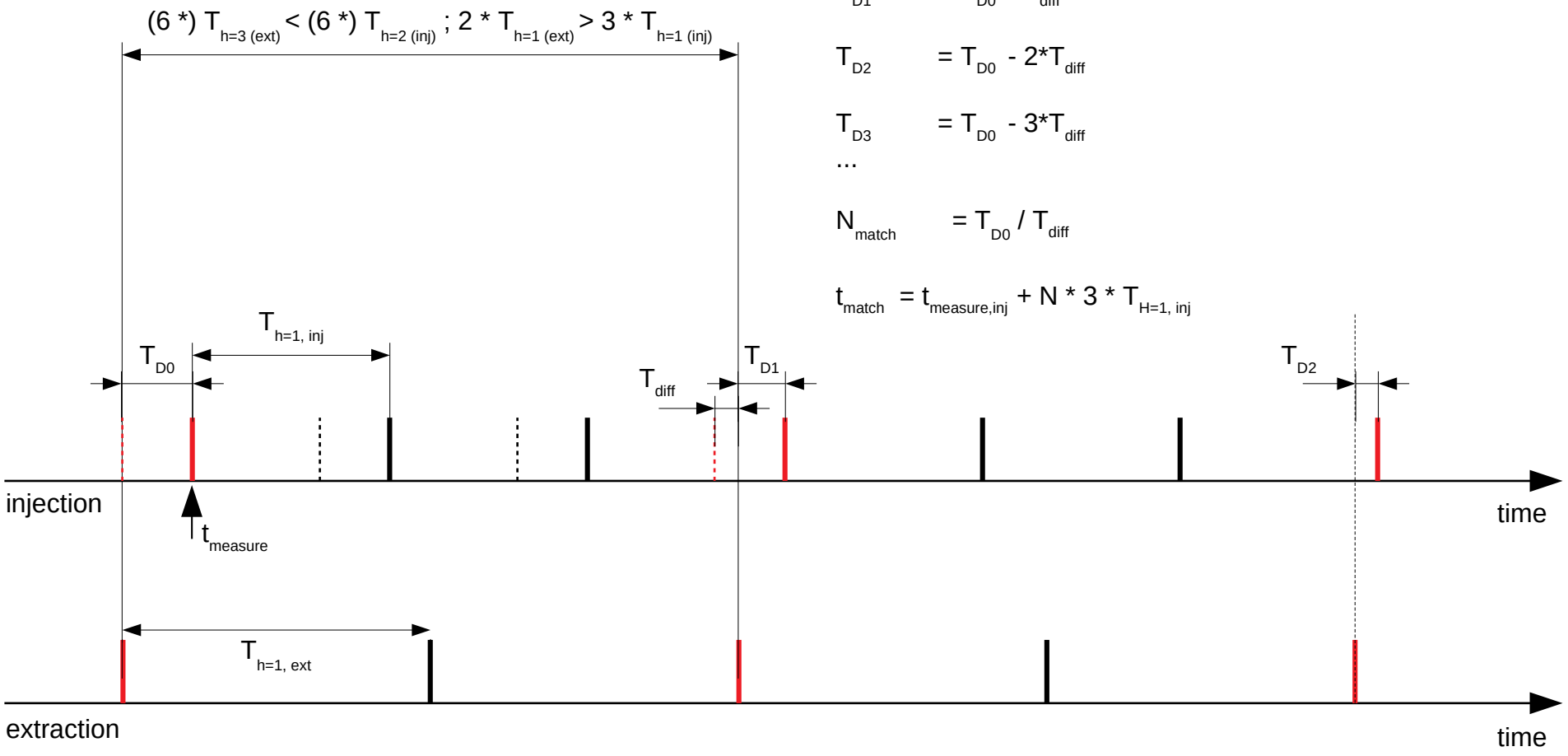


h=3 (ext) and h=2 (inj)

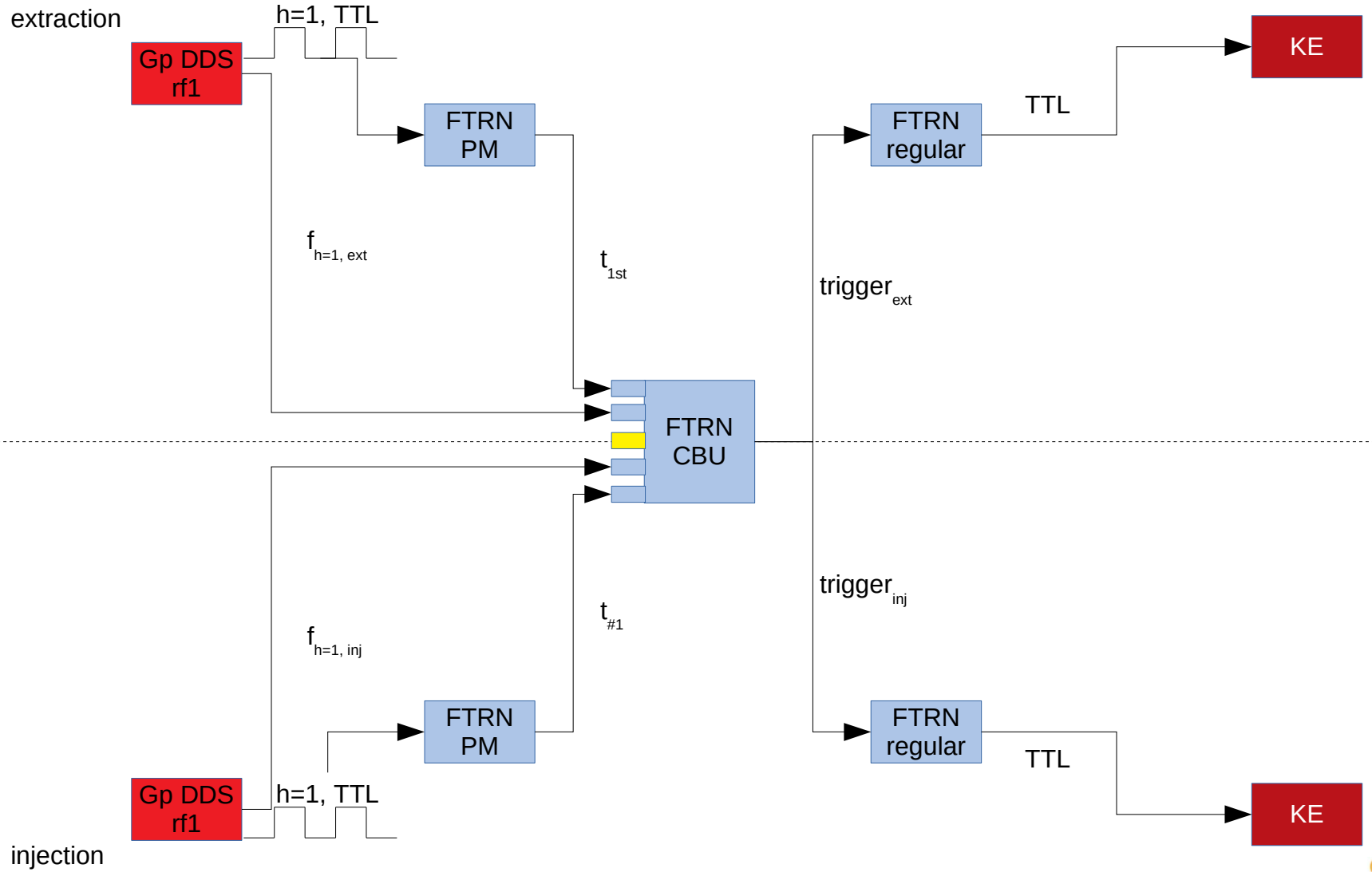
weird example ...

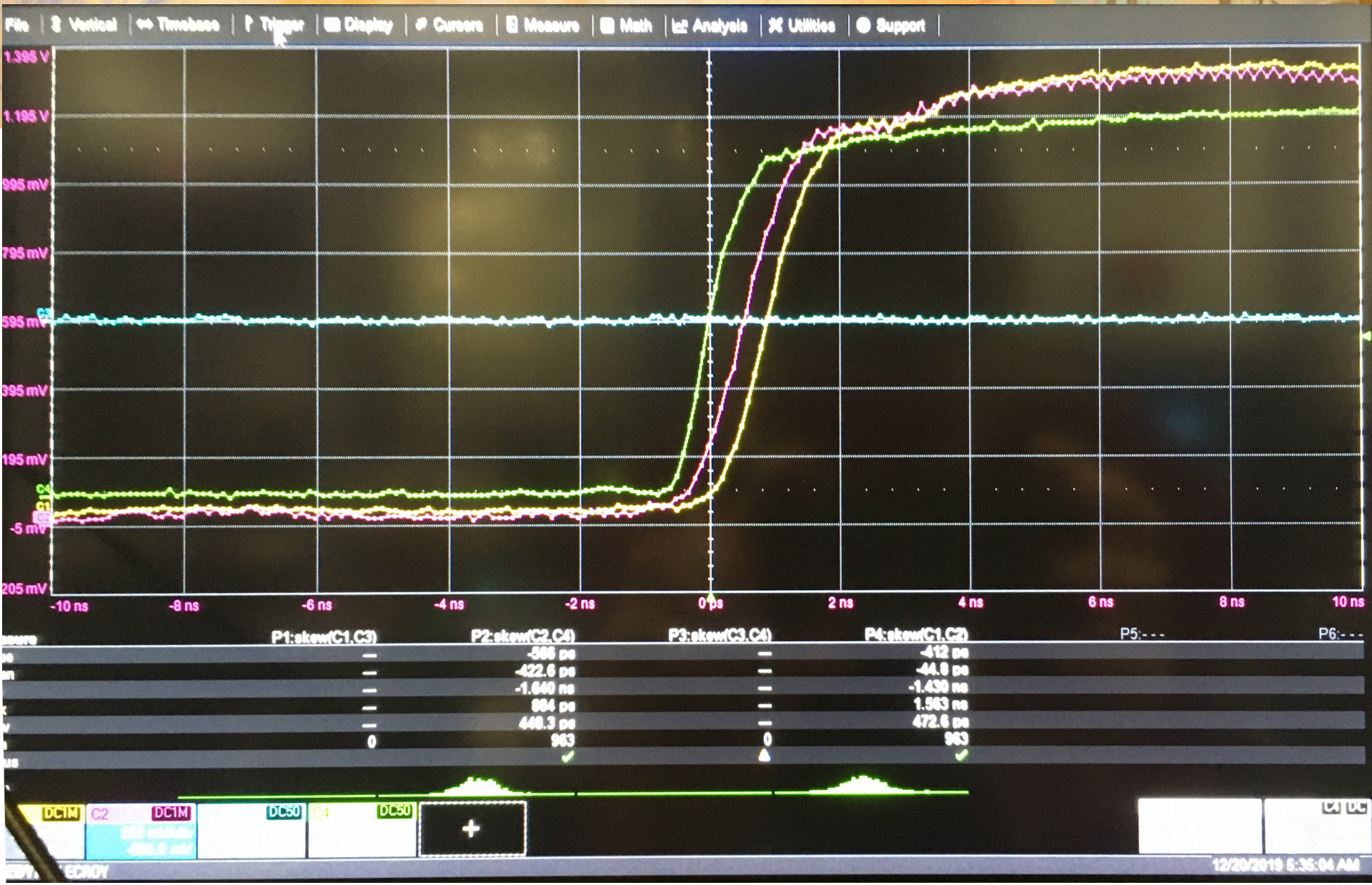
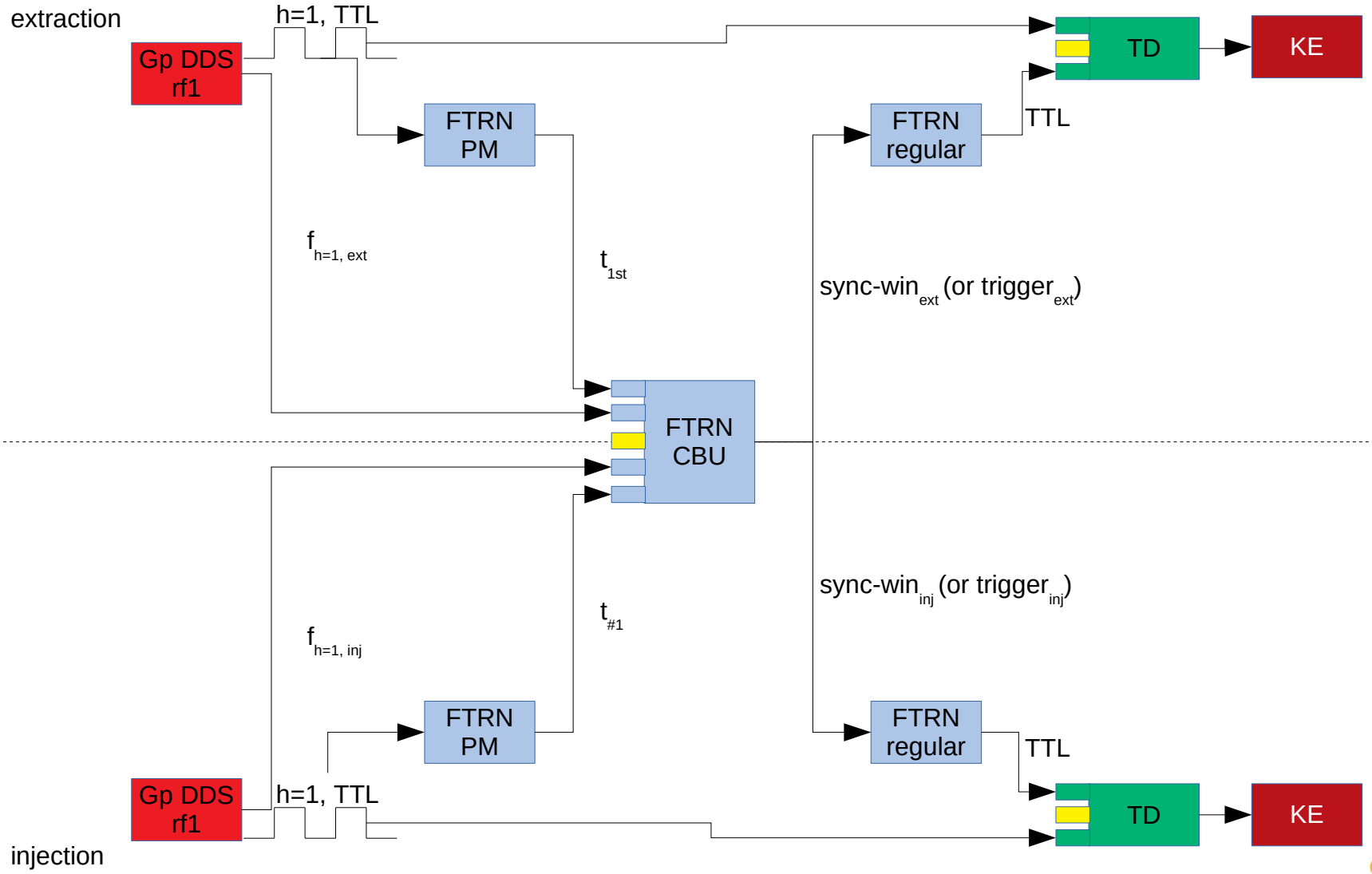


Beating with h=3 (ext) and h=2 (inj)



Direct Kicker Trigger




File
Vertical
Timebase
Trigger
Display
Cursors
Measure
Math
Analysis
Utilities
Support
1.395 V
1.195 V
995 mV
795 mV
595 mV
395 mV
195 mV
-5 mV
-205 mV
-10 ns
-8 ns
-6 ns
-4 ns
-2 ns
0 ps
2 ns
4 ns
6 ns
8 ns
10 ns
P1:skew(C1,C3)
P2:skew(C2,C4)
P3:skew(C3,C4)
P4:skew(C1,C2)
P5:- - -
P6:- - -
-586 ps
-412 ps
-422.6 ps
-44.8 ps
-1.640 ns
-1.430 ns
984 ps
1.563 ns
446.3 ps
472.6 ps
0
963
0
963
DC1M
C2
DC1M
DC50
C4
DC50
12/20/2019 5:35:04 AM

Kicker Trigger via TD Module