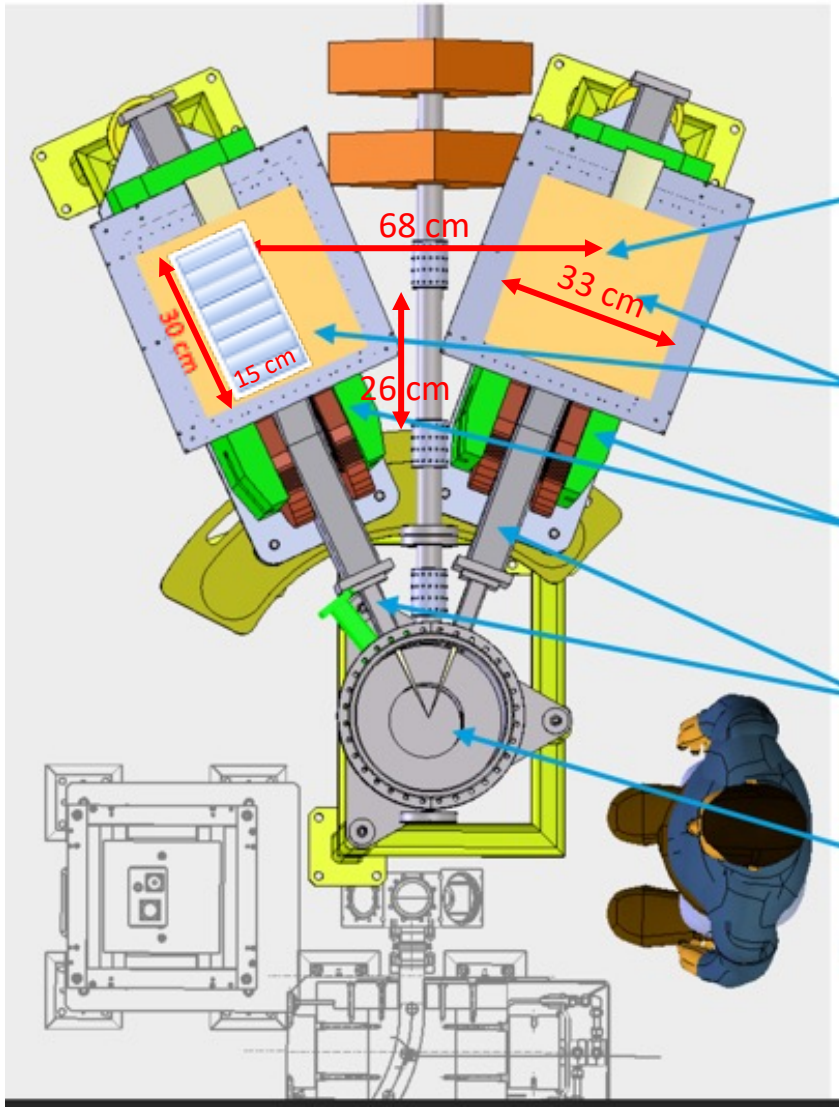
The experimental apparatus

Drawings: Chris
cvidal@mit.edu

DarkLight

11



BC-404
Trigger detectors
8 -- 15 x 3.8 cm^2 scint

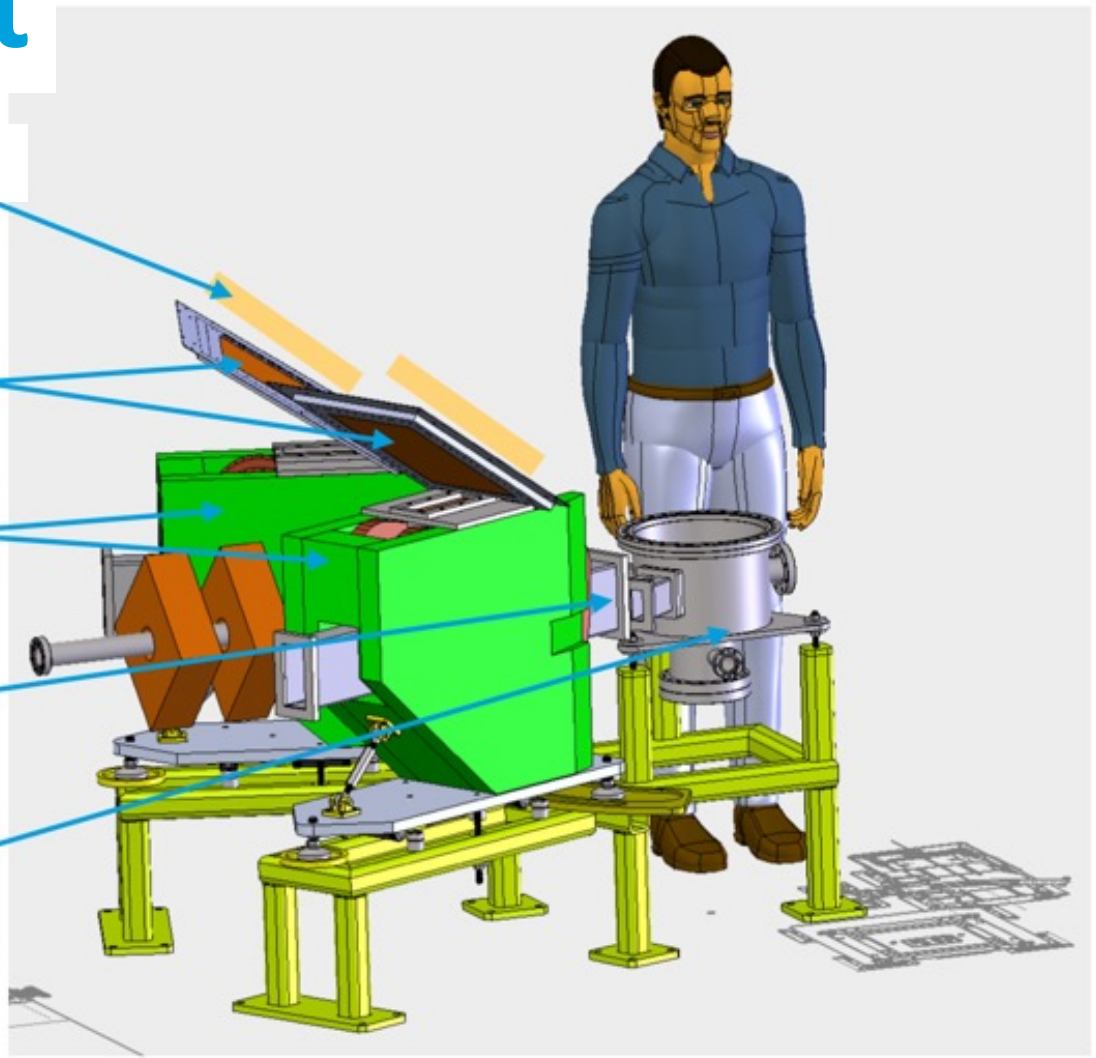
Tracking detectors

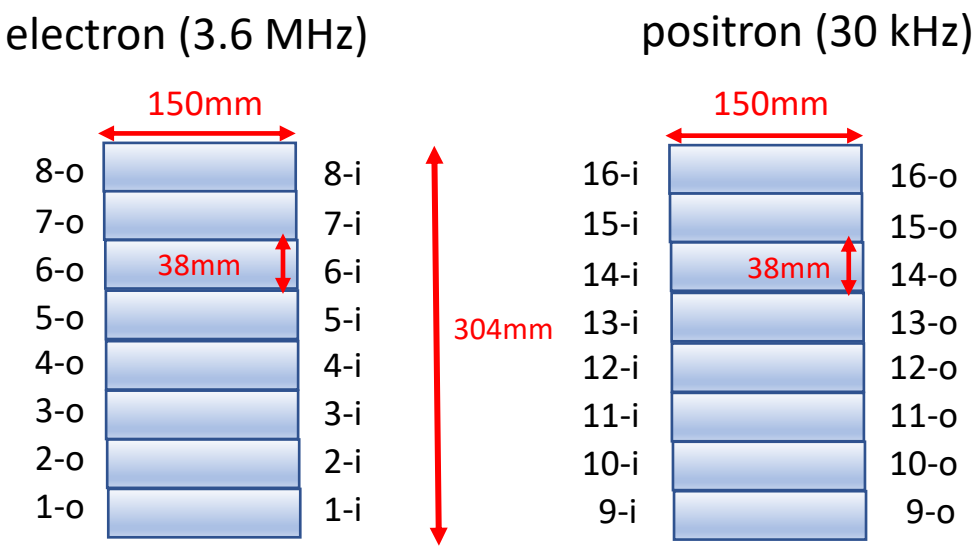
Dipole magnets

One fixed arm; one with two angles

Target chamber

Part of vacuum system

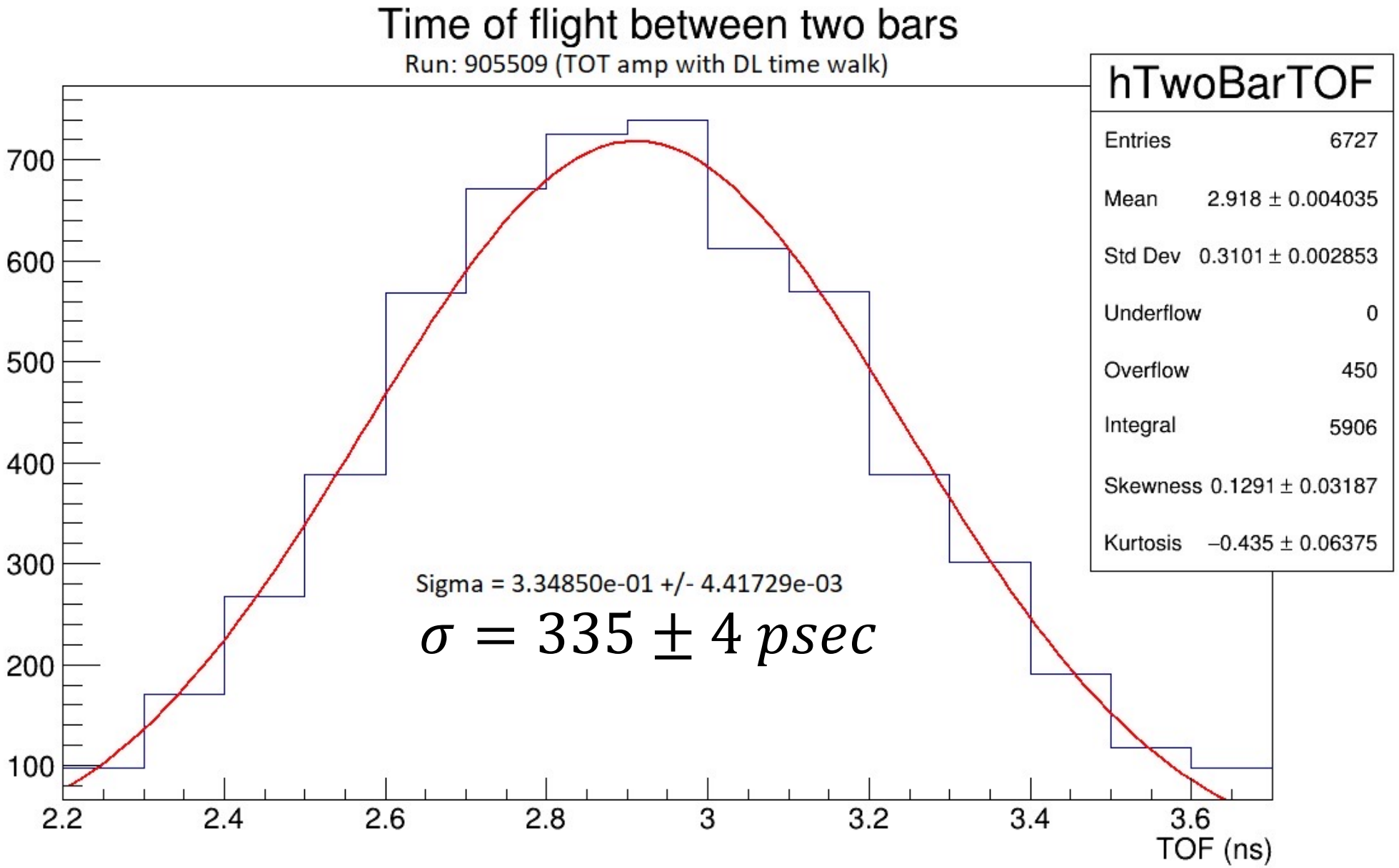




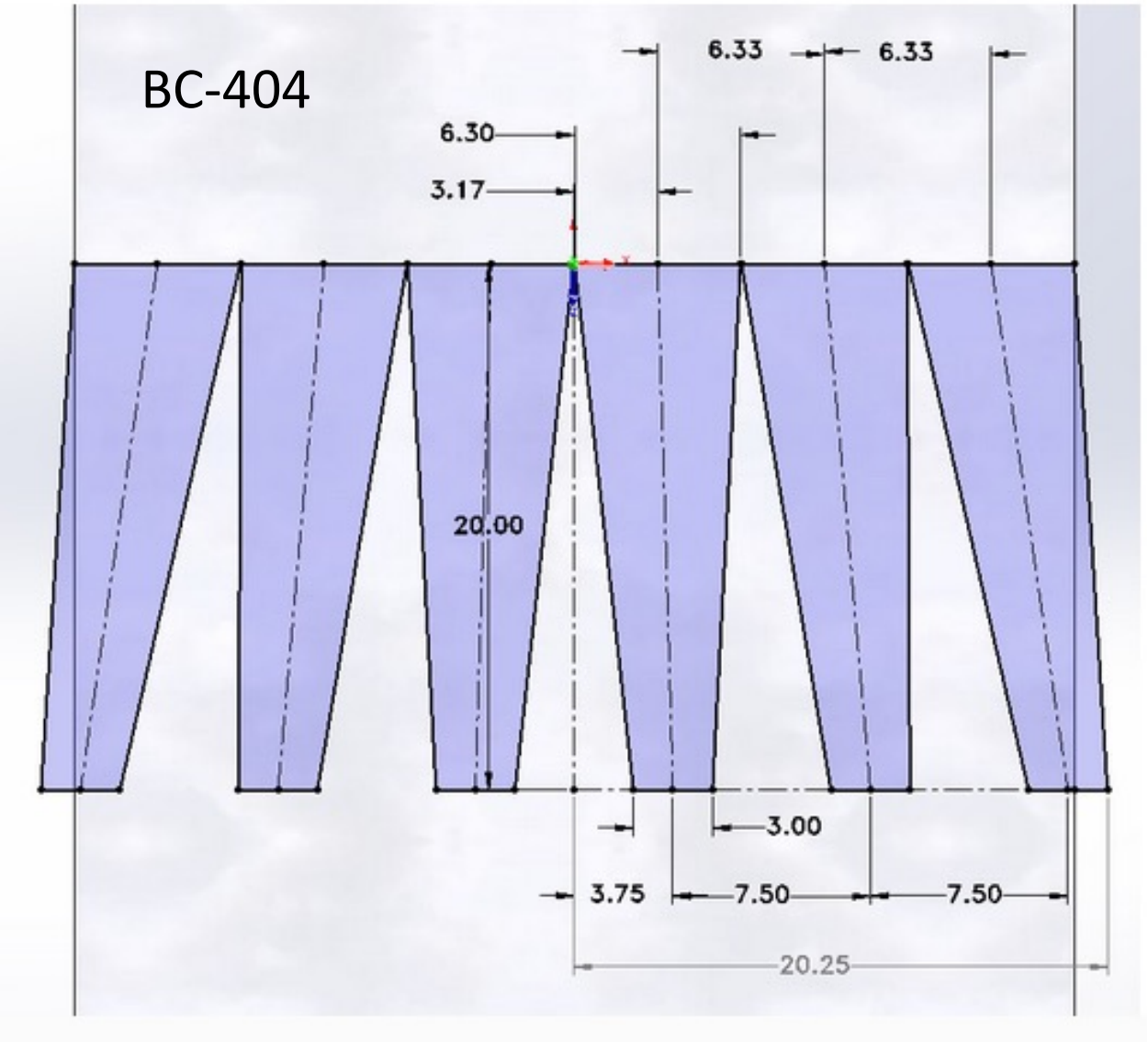
Different FPGA programs required

1. Need to be able to trigger on single counters for calibration.
2. Need to adjust timing for each counter to account for the different path lengths in the spectrometers.
3. Need to form L-R coincident triggers for each bar, then form OR of 8 e- bars, 8 e+ bars, then trigger e- * e+
4. Need to generate the fast trigger for readout of the GEM tracking chambers – within 1 usec (??)
4. For each of the 16 scintillators that have signals above threshold –
   -- make in-out coincidence
   -- make electron – positron coincidence (want < 200 psec time resolution)
   -- output LE and TE time for an offline time walk correction

TOF Alpha bar with #1 DL Prototype Bar



v1b -- 6 SiPM DarkLight Scintillator 38mm wide



SiPM spacing at 7.50mm to match the existing frontend readout board designed for 4 SiPMs on 30mm scintillator

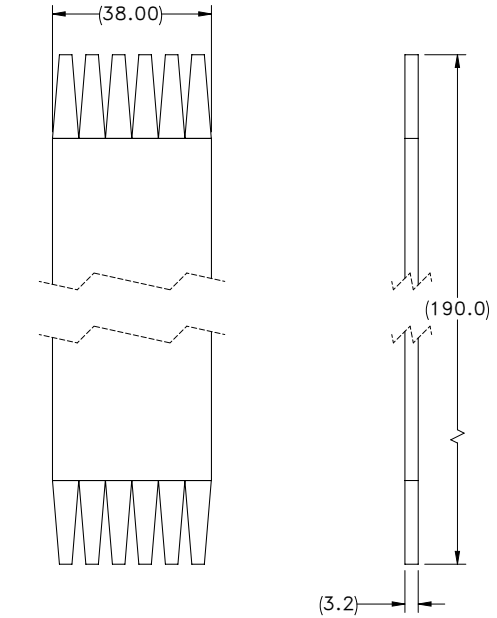
-- not tested

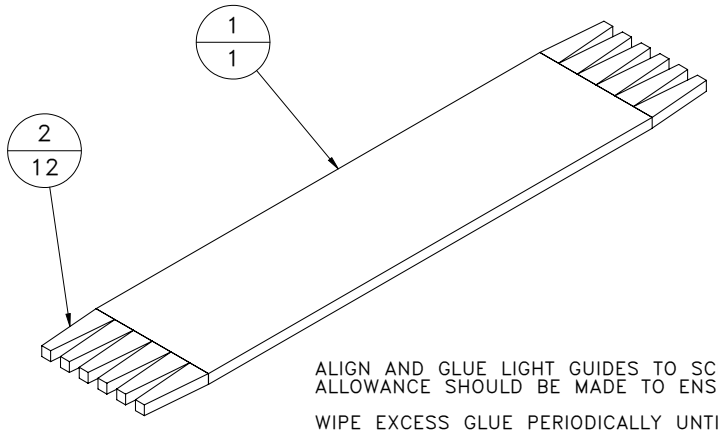
v2 -- 6 SiPM DarkLight Scintillator 38mm wide

ITEM	REF No.	DESCRIPTION	MATERIAL	QTY.
1	TDE3221	SCINTILLATOR PLATE	BC−404	1
2	TDE3222	WEDGE LIGHT GUIDE 20	UVT Light Guide	12

DIMENSIONS QUOTED ARE FINISHED DIMENSIONS, NO ALLOWANCE HAS BEEN MADE FOR MANUFACTURE.
INTERPRET DIMENSIONING AND TOLERANCING AS PER ASME Y14.5−2009.
REMOVE ALL BURRS AND SHARP EDGES.

BC-404





ALIGN AND GLUE LIGHT GUIDES TO SCINTILLATOR PLATE
ALLOWANCE SHOULD BE MADE TO ENSURE COUNTER IS FLAT

WIPE EXCESS GLUE PERIODICALLY UNTIL SET

WRAP COUNTER IN ALUMINIZED MYLAR & BLACK VINYL (TEDLAR)
AFTER FULL CURE (MIN. 24 HR)

PRE−GLUE WEIGHT: ~21G

PERMIT TO PRACTICE 1003150

TOLERANCES UNLESS OTHERWISE SPECIFIED

DECIMALS	X	± 0.5
	.X	± 0.2
	.XX	± 0.1
ANGULAR		± 1°
SURFACE FINISH		1.6 µm

ALL DIMS IN MILLIMETRES

REV	DATE	REVISION DESCRIPTION	BY	APPD

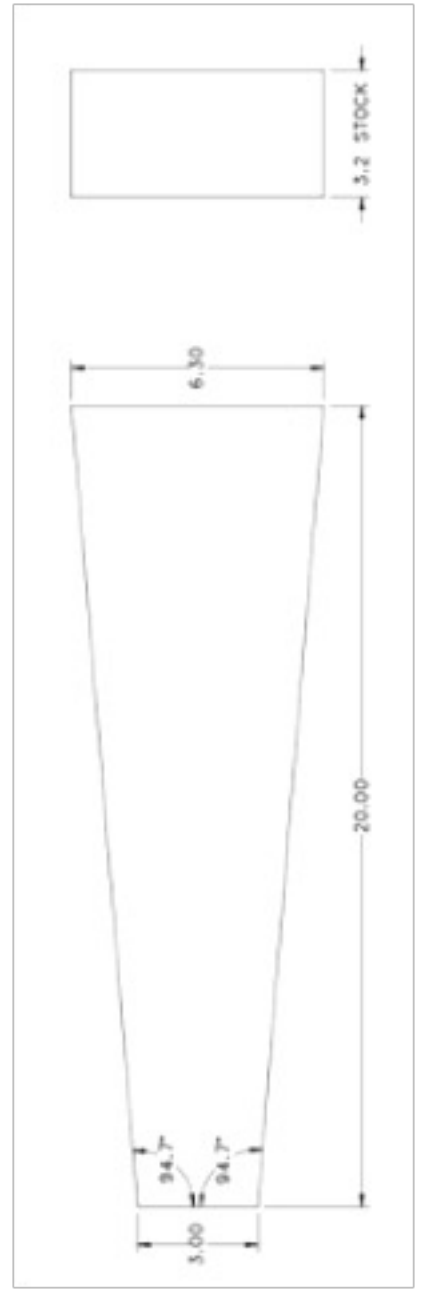
TRIUMF
Canada's particle accelerator centre
Centre canadien d'accélération des particules
4004 Wesbrook Mall, Vancouver, BC, V6T 2A3, Canada

DESIGNED Philip Lu
DRAWN Philip Lu
CHECKED Nicolas Massacret
WPN #
TRACKING # 0547

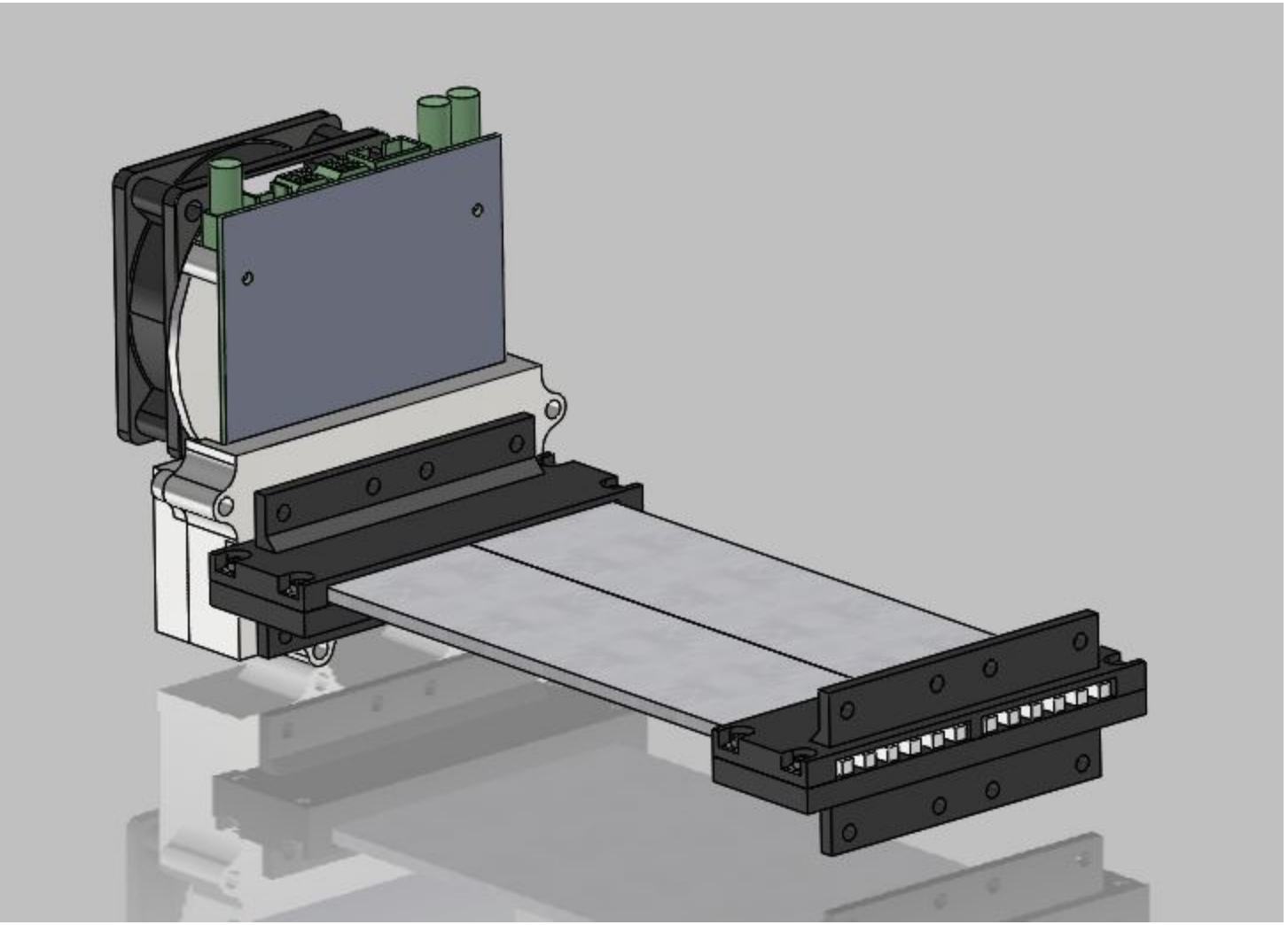
SUB−ASSY
ASSEMBLY

SCINTILLATOR ASSEMBLY V2
PROTOTYPE COUNTER V2
DARKLIGHT

SCALE 1:1
DATE 2022−09−12
THIRD−ANGLE PROJECTION
DWG NO. TDE3220
SIZE B
SHEET 1 OF 1
REV



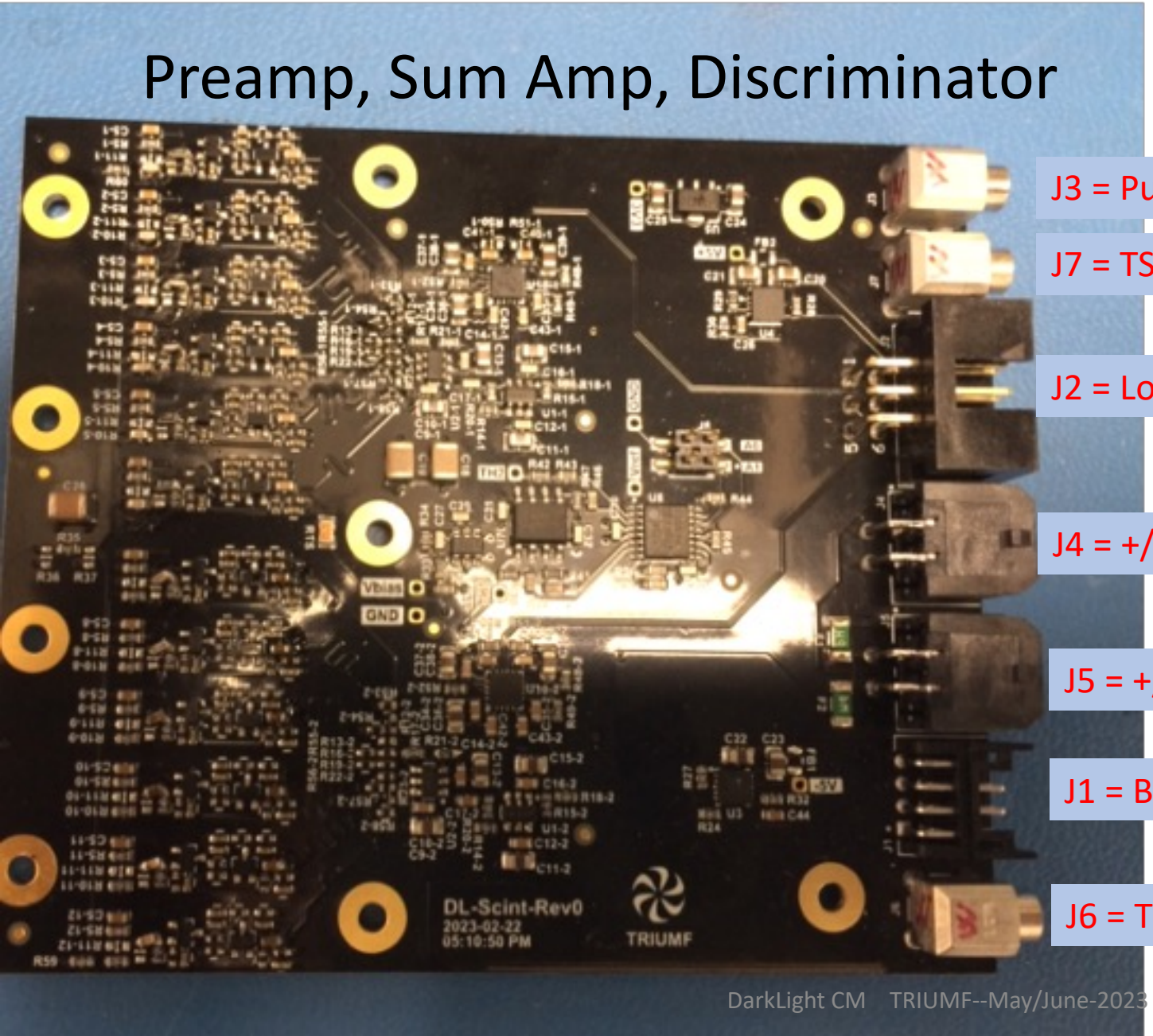
v2-- Prototype Scintillator May 2023



38 mm wide with 6 SiPMs at each end

One Electronic card holds
2 scintillators and 12 SiPMs

NEW v2 front end readout card (top side)

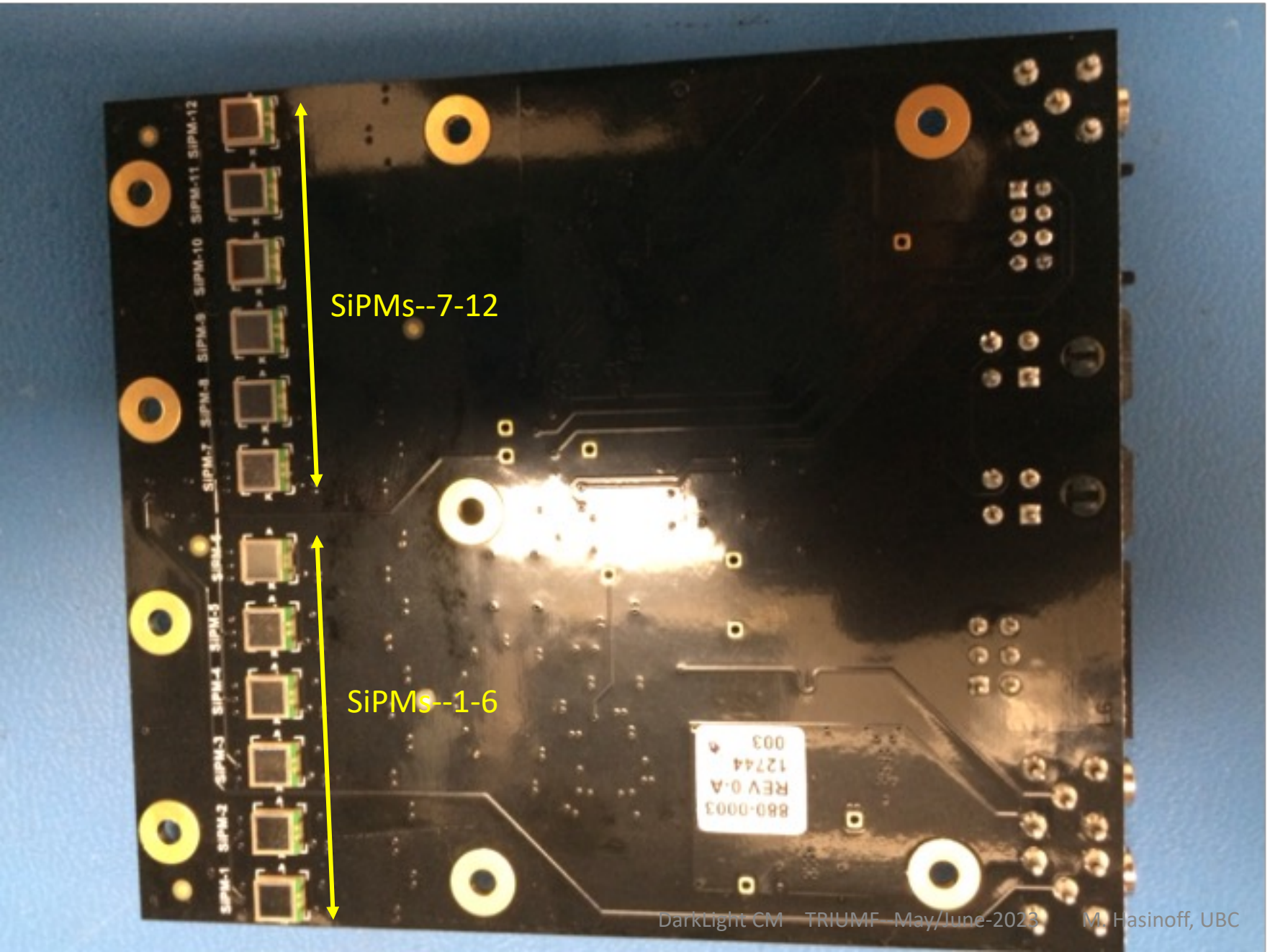


- holds 12 SiPMs/2 scintillators
- SUM(6)→fast amp→discriminator
- FPGA will check e+ e- coincidence
- FPGA will readout LE and TE time

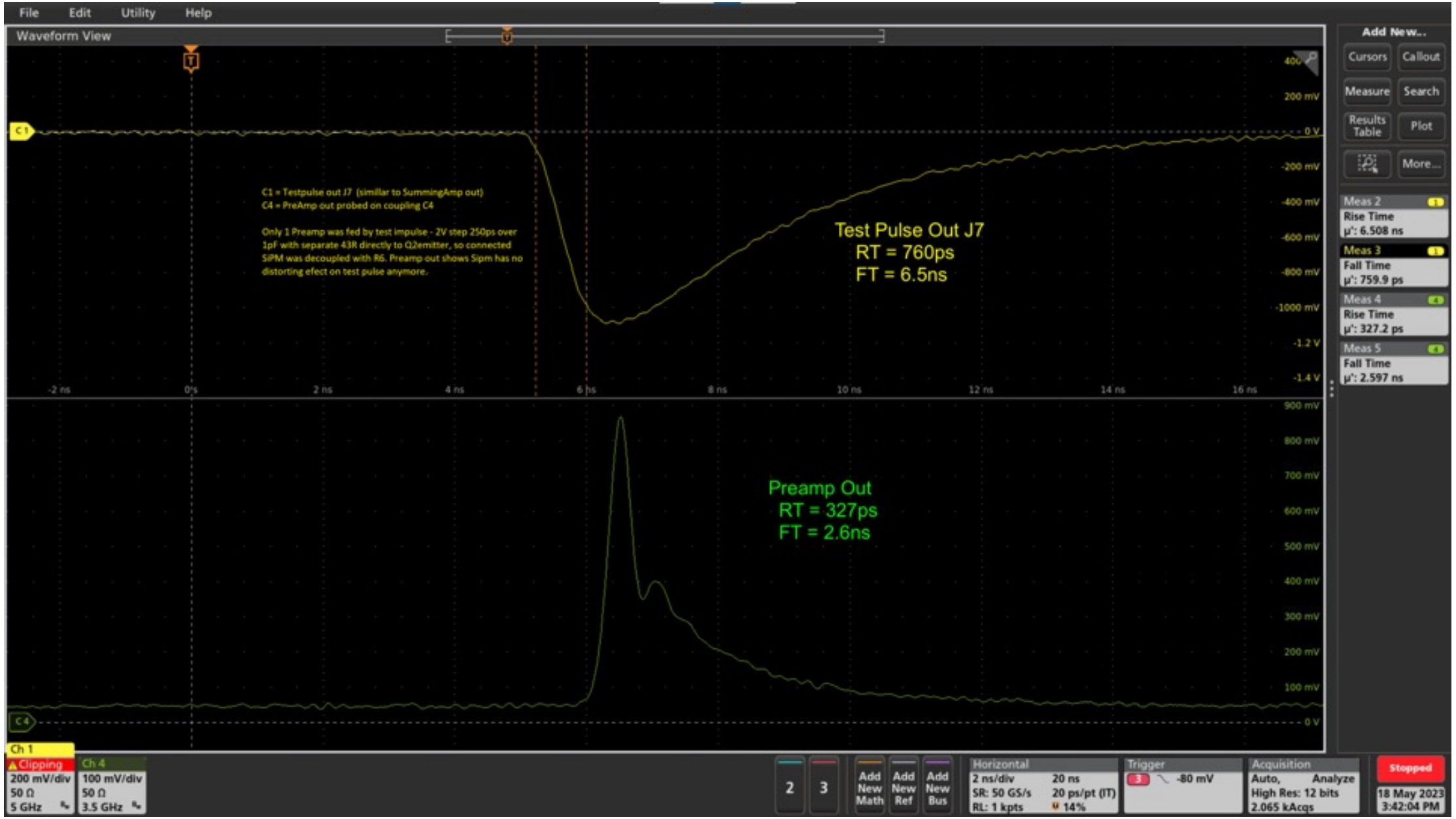
Next Stages—

- measure time resolution (L-R)
- measure time resolution -- 2 bars
- design power dist'n board
- design test pulse dist'n system
- develop trigger FPGA system

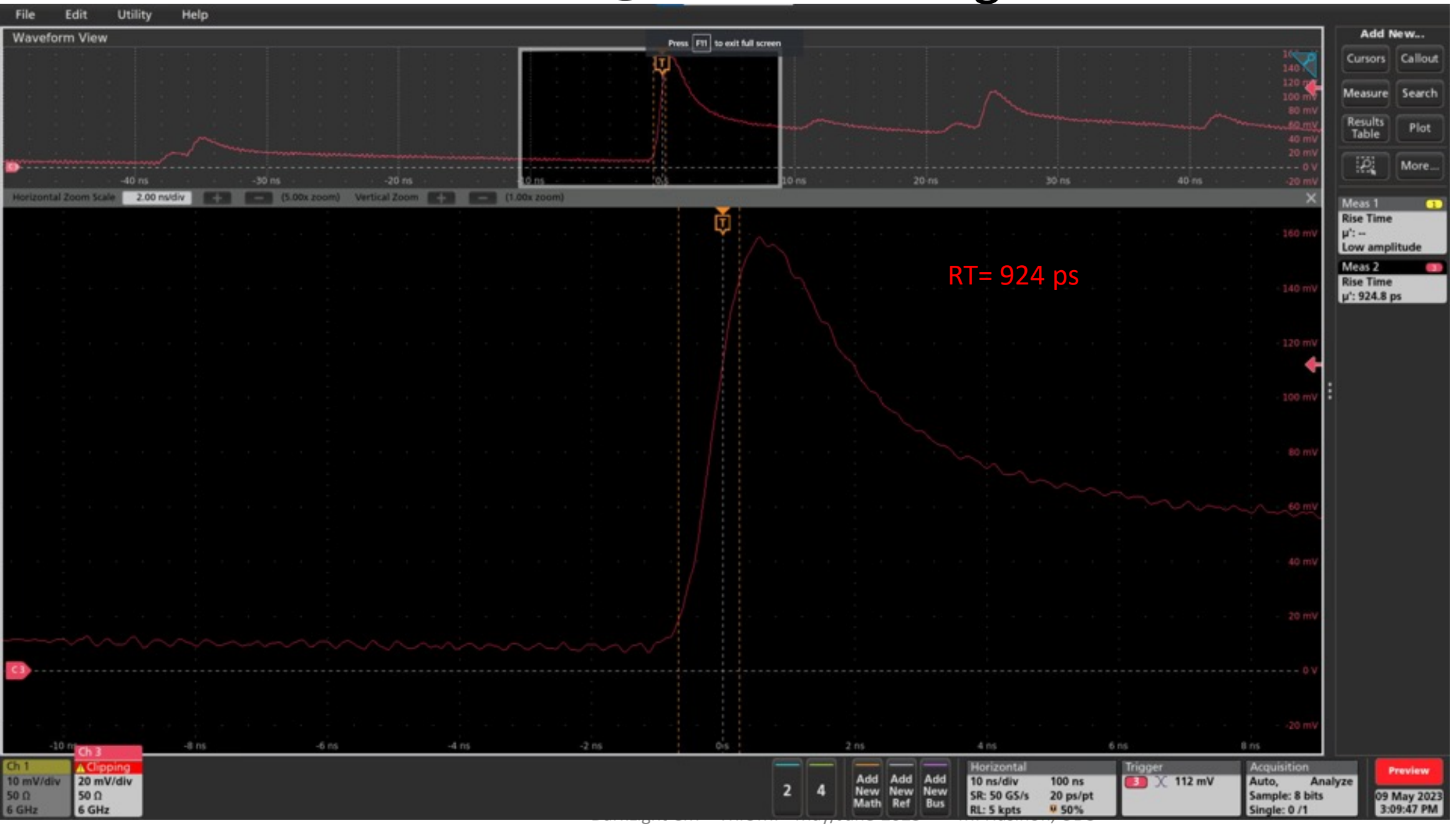
NEW v2 front end readout card (bottom side)

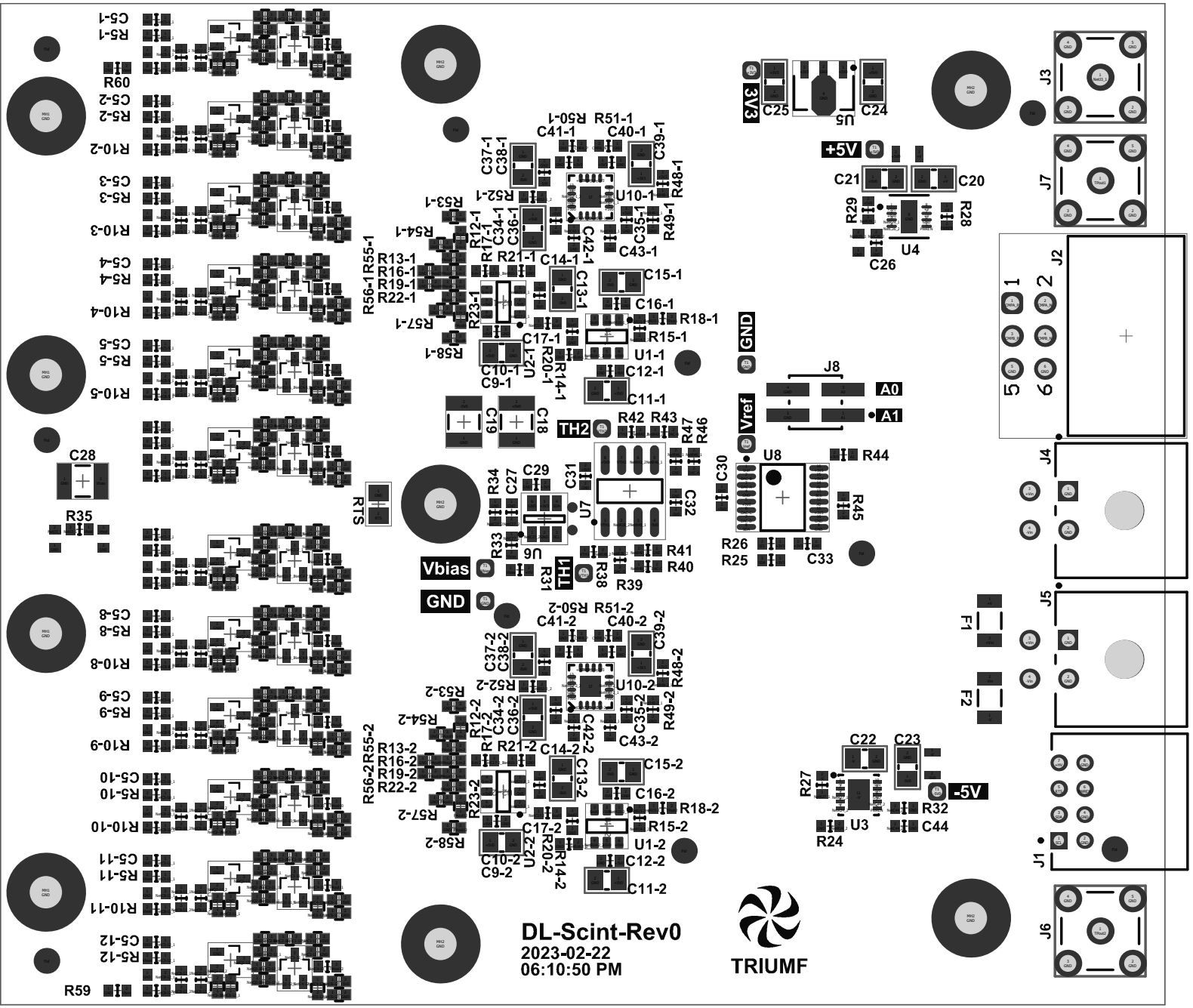


Square wave Test Input pulse



SiPM Dark Noise @ 8V overvoltage

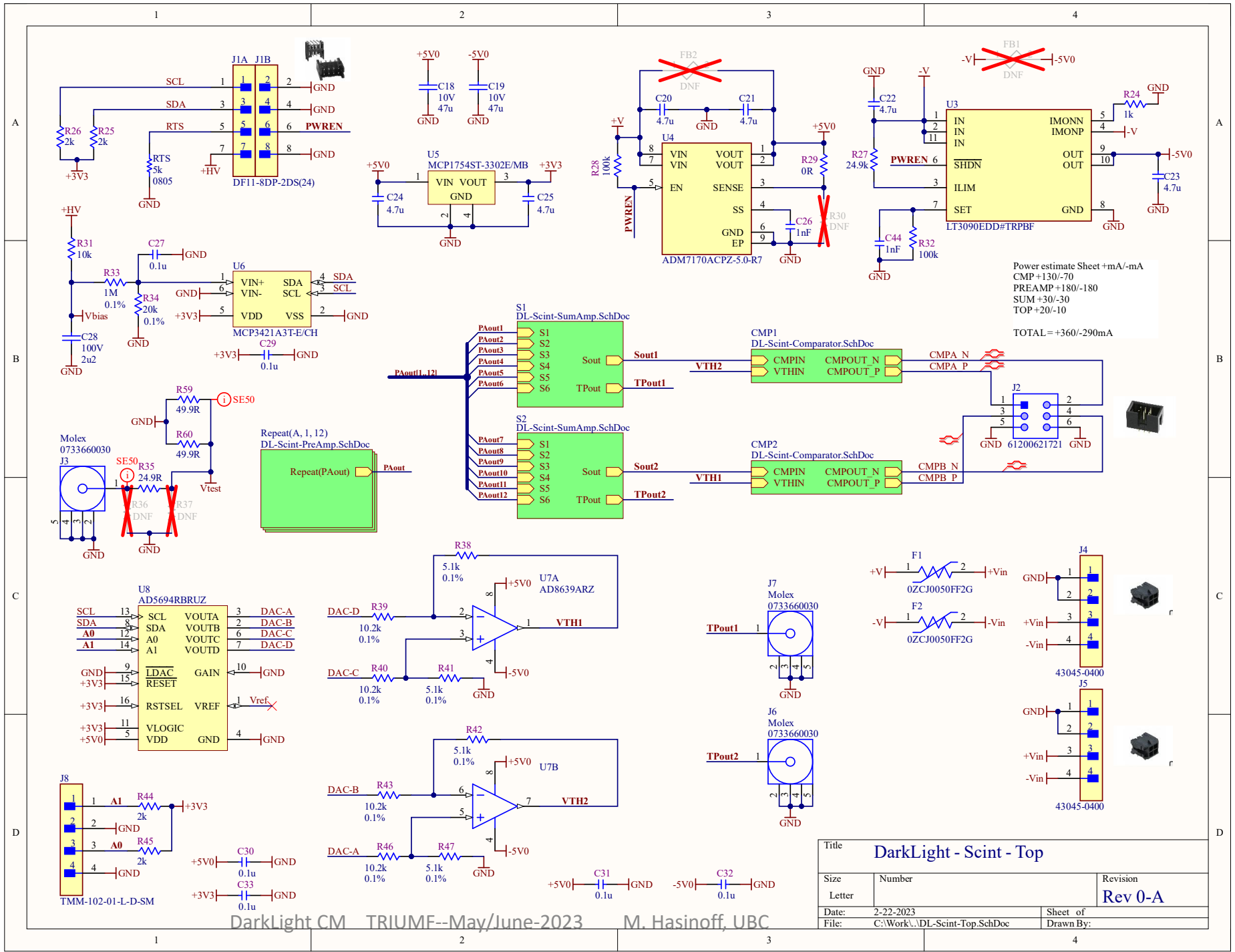




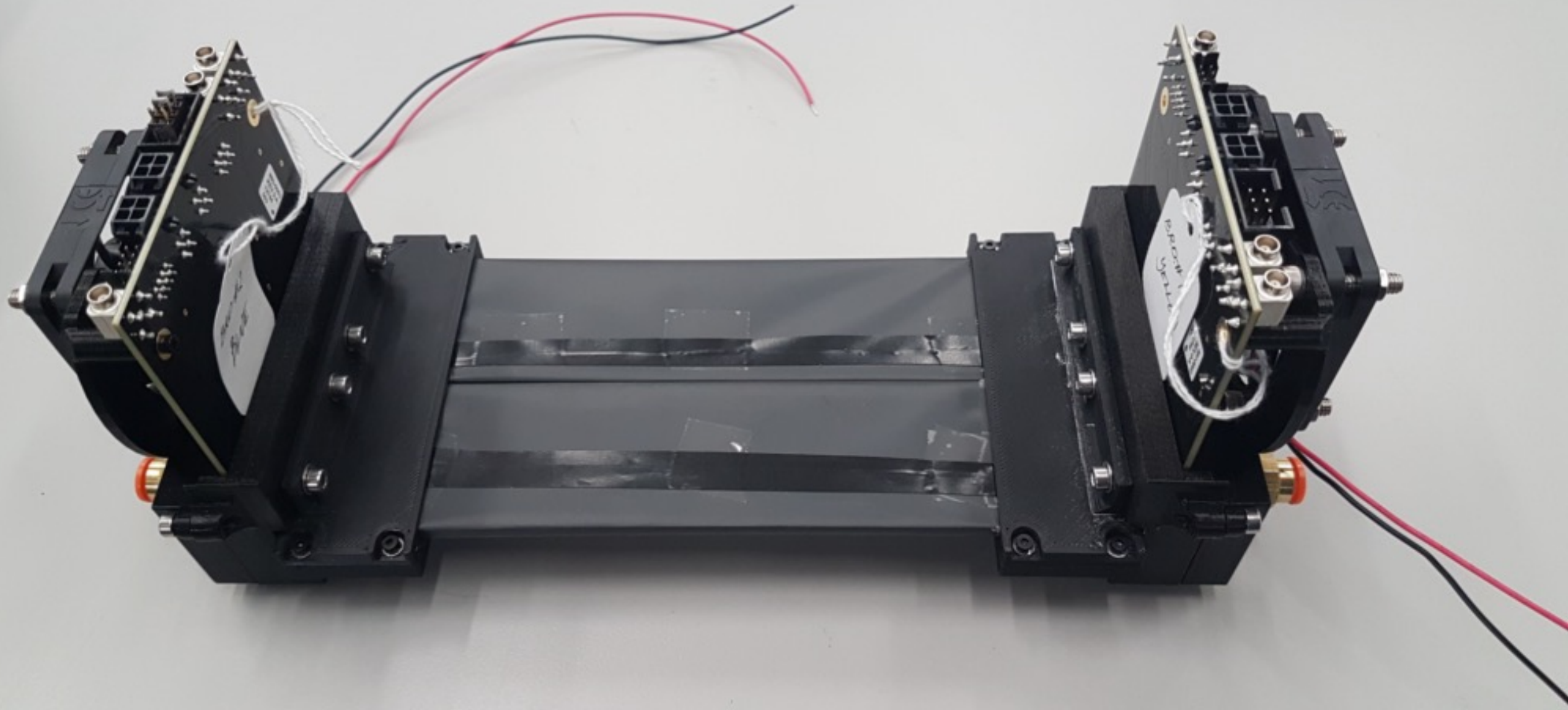
MCX output connectors

v2– Schematic May 2023

MCX output connectors for Test-out & pulser-in signals



v2-- Prototype Scintillator May 2023



v2-- Prototype Scintillator May 2023