

# Advances in the miniBeBe detector

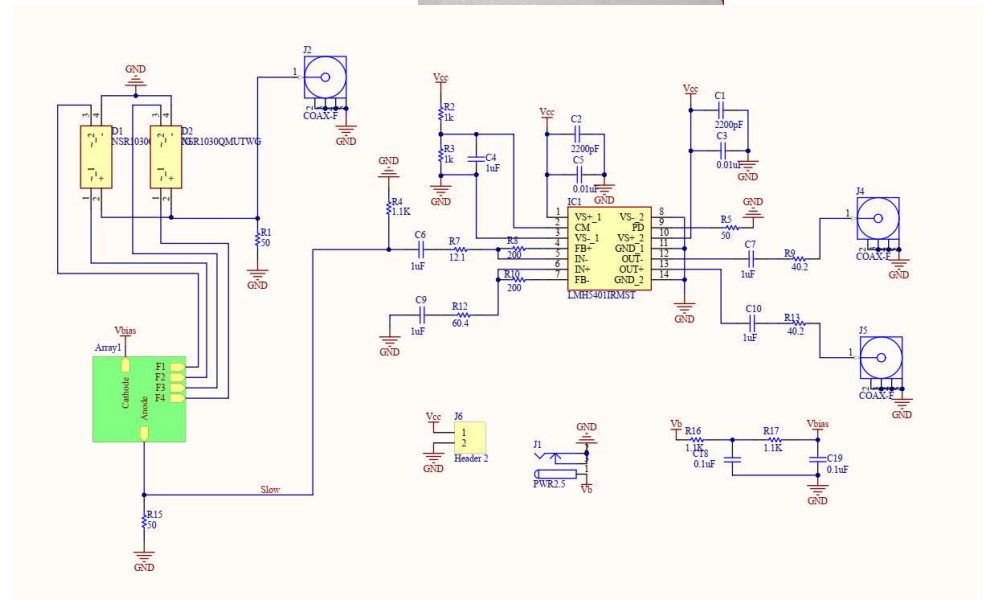
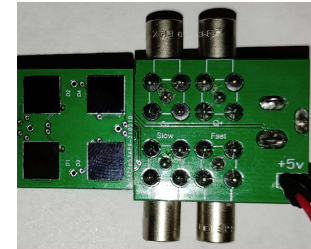
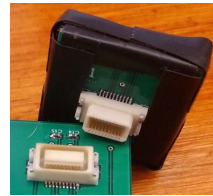
Dr. Lucio Rebolledo.

April 18th. 2023

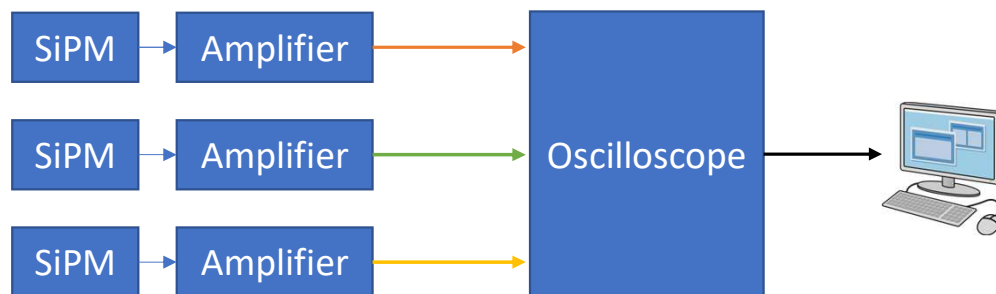
# Experimental setup 2021 and 2022

- Plastic scintillator:
  - BC404
  - $20 \times 20 \times 3 \text{ mm}^3$
- SiPM array:
  - MicroFJ-60035 (6 mm)
  - Array of 4 SiPMs
  - Series-Parallel interconnection
- Amplifier:
  - LMH5401-SP
  - $G = 17 \text{ dB}$
  - RF Fully differential (SE-DE)
- Cosmic rays muons

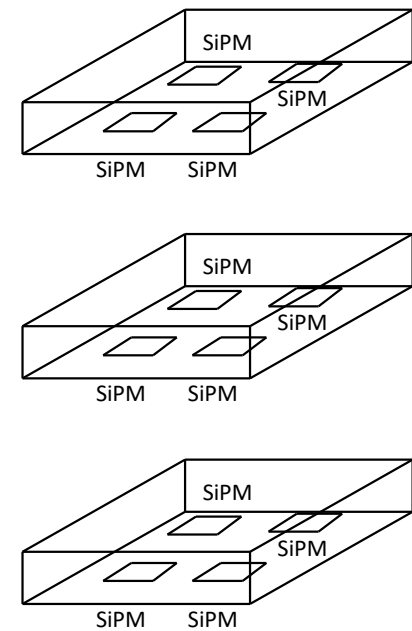
**Result:** Time resolution  $\approx 200 \text{ ps}$



# Instrumentation

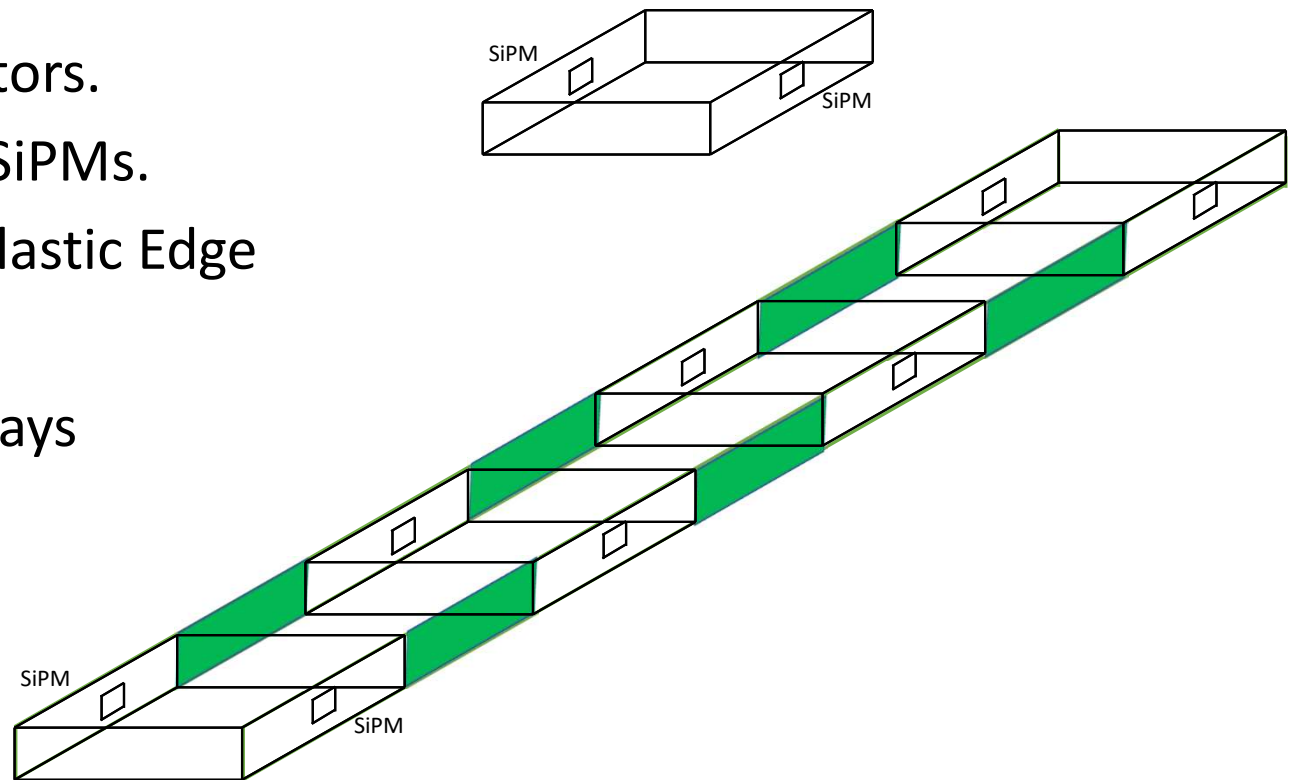


Muons from cosmic shower



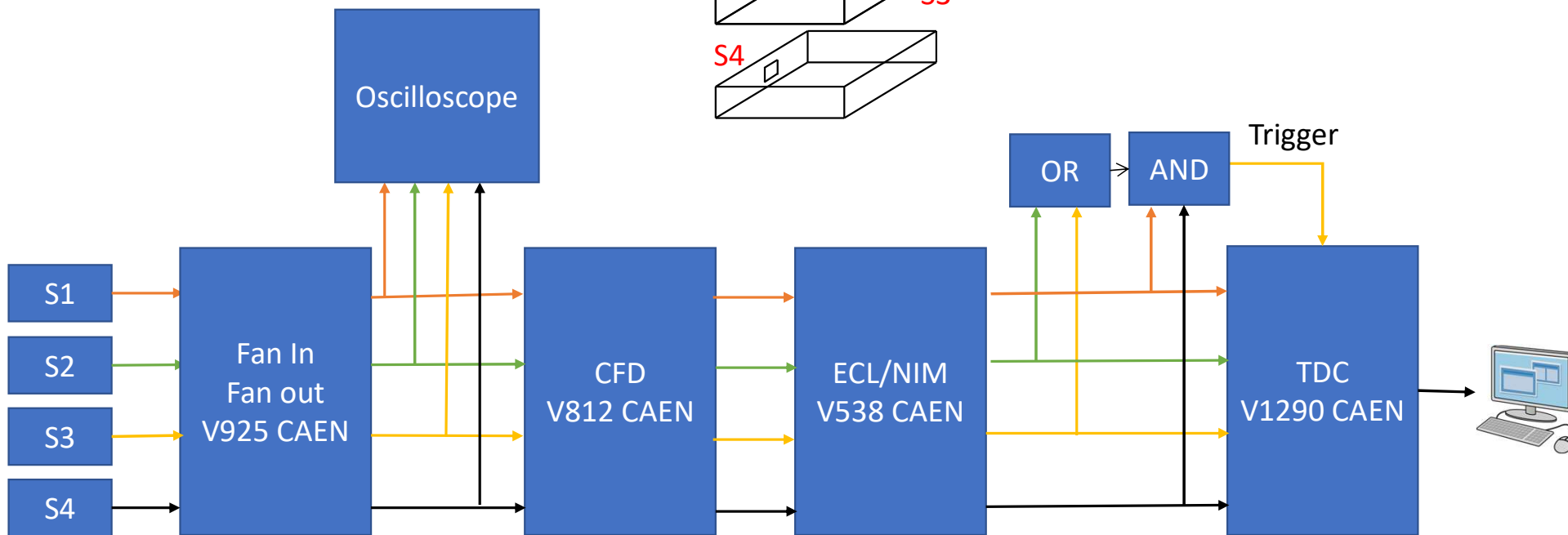
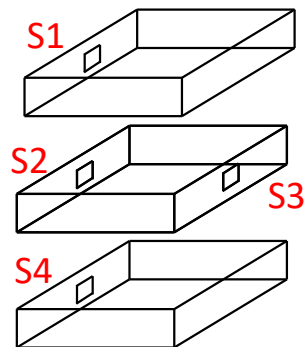
# Begining 2023

- EJ232 plastic scintillators.
- SensL J-Series 3 mm SiPMs.
- Two SiPMs on each plastic Edge
- No amplification
- Muons from cosmic rays

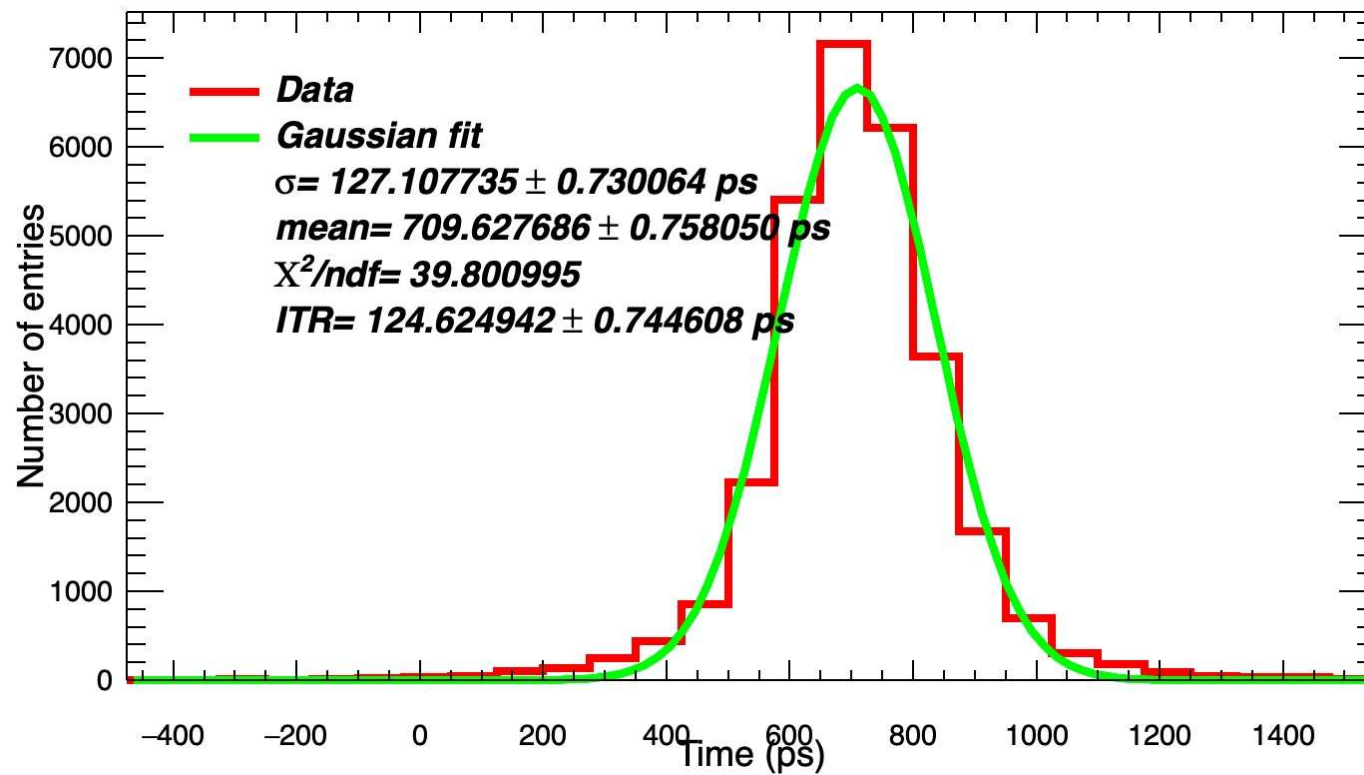


# Instrumentation

Muons from cosmic shower

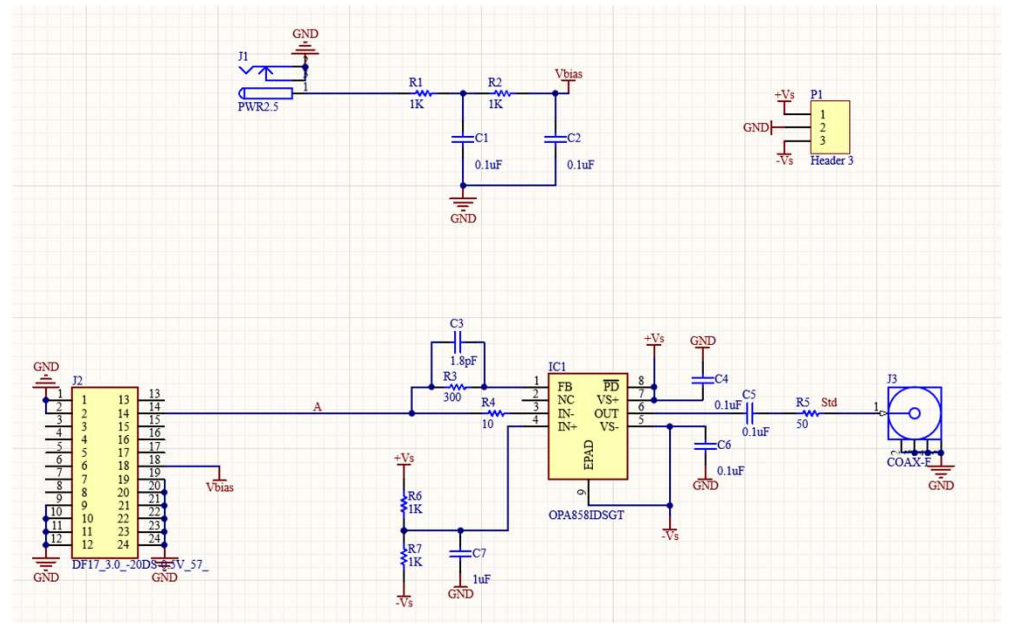
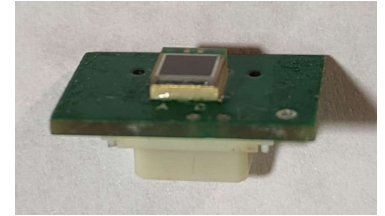
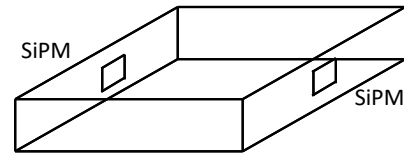


# Results from TDC measurement

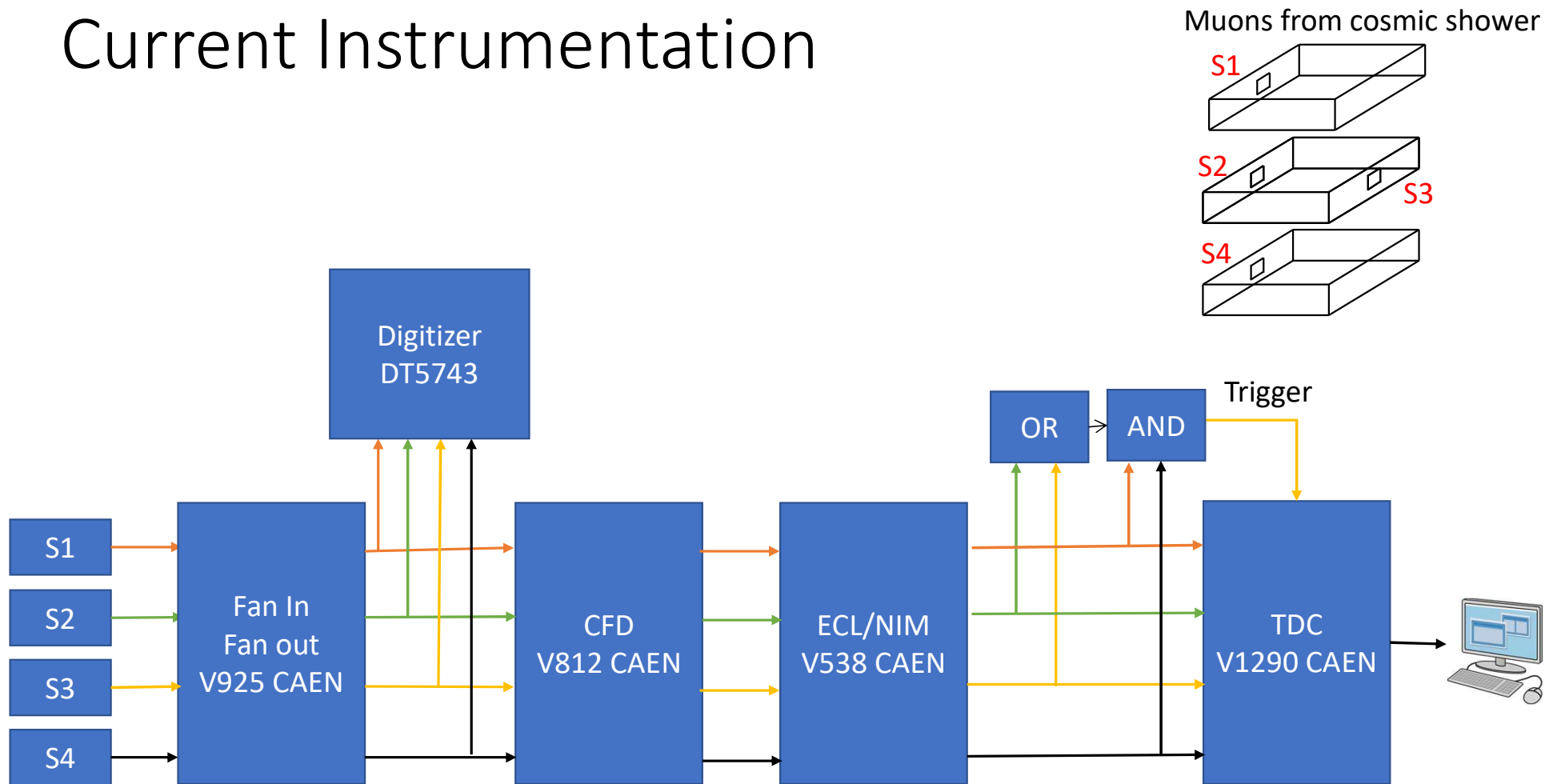


# Currently

- EJ232 plastic scintillators.
- Hamamatsu 3 mm SiPMs.
- Two SiPMs on each plastic Edge
- Transimpedance amplifier
- Muons from cosmic rays

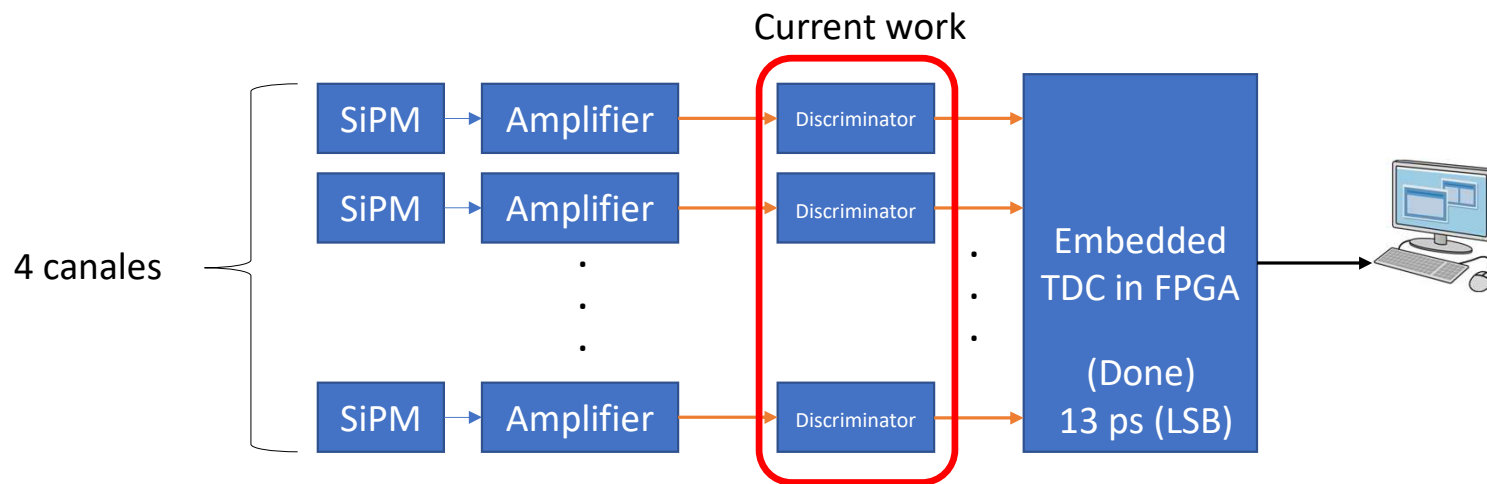


# Current Instrumentation





# FPGA implementation of TDC



# Cell geometry update

Geometry (by cell)	Plastic scintillator	Scintillator size ( $mm^3$ )	SiPM vendor and model	Amplifier	Array	Time resolution
Original	BC404	20x20x3	SensL 6x6 $mm^2$ (C series)	Differential	4 SiPM Serie - parallel	
Dubna (2021)	BC404	20x20x3	SensL 6x6 $mm^2$ (J series)	Differential	4 SiPM Serie - parallel	200 ps
Begining 2023	EJ232 (BC422)	20x20x5	SensL 3x3 $mm^2$ (J series)	None	2 SiPM On the edges	127 ps
<b>Current work</b>	EJ232 (BC422)	20x20x5	<b>Hamamatsu</b> 3x3 $mm^2$	Transimpedance	2 SiPM On the edges	-

# Summary

- We got a time resolution of 127 ps, with the updated geometry Cell.
- Hamamatsu SiPMs have arrived so
- 3 new cells are ready for testing (cards already build).
- Now we amplify with a High speed, transimpedance amplifier.
- Special thank's to Marcin Bielewicz and the Polish group who borrowed us these three Hamamatsu SIPMs.

# Future work

- Update the mechanical design (new cell geometry)
- Time resolution with Hamamatsu SIPMs
- Compare our TDC implementation with current CAEN TDC.
- Energy cuts during processing with Gamma photons experiments (Compton predominant).
- Simulations with GEANT4 to compare our results.

Спасибо  
(THANK YOU)