



**DEBRECENI  
EGYETEM**

**University of Debrecen,**  
Faculty of Informatics



# Spark protection system for sPHENIX TPC GEMs

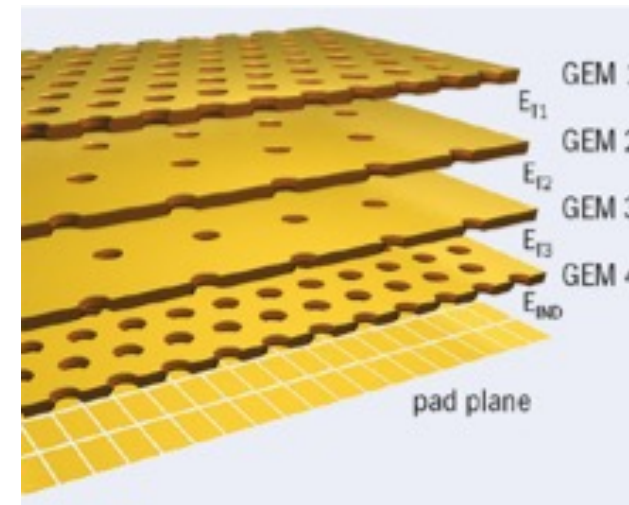
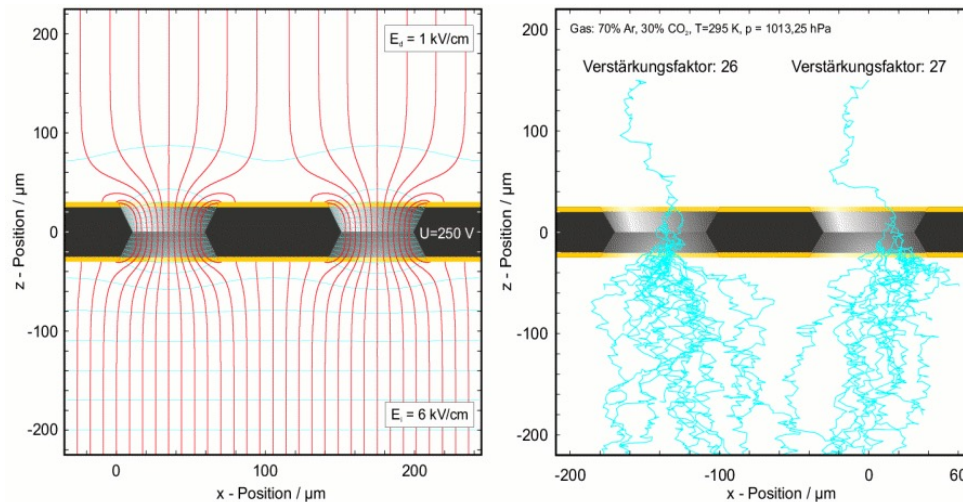
CPAD WORKSHOP 2023

David Baranyai  
Balazs Ujvari

08 November 2023

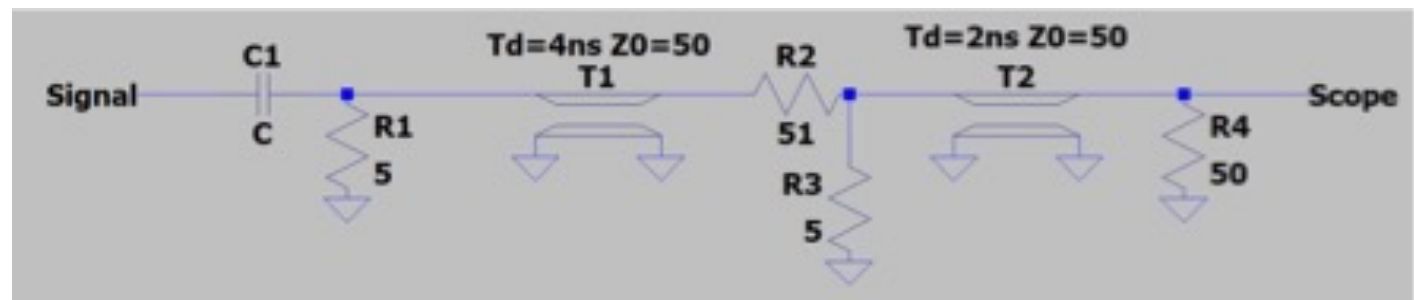
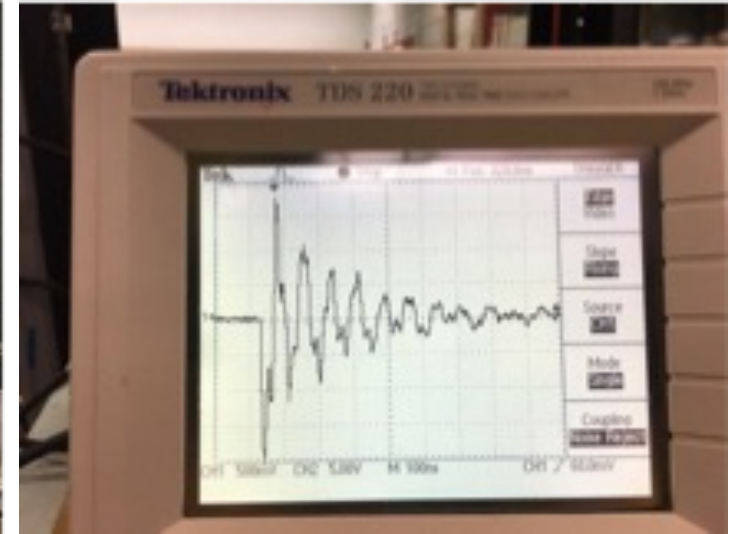
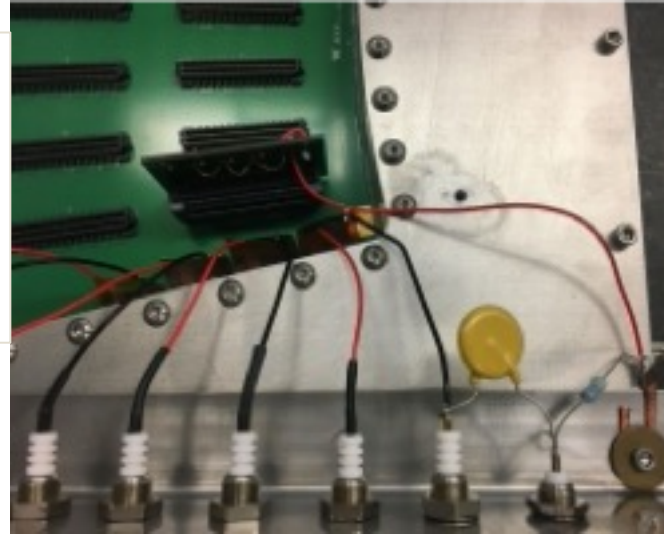
# Goals of Studying GEM Sparks

- It is important to prevent sparks to preserve the health of GEMs
- A module that sparks is likely to spark again



# Capturing sparks

- Pickoff capacitor on the bottom of the bottom GEM
- Pad-plane connected to ground
- Tried different resistors



# Digitizing spark signals

## Requirements:

- Continuously monitoring 72 channels simultaneously
- Fast and reliable signal detection

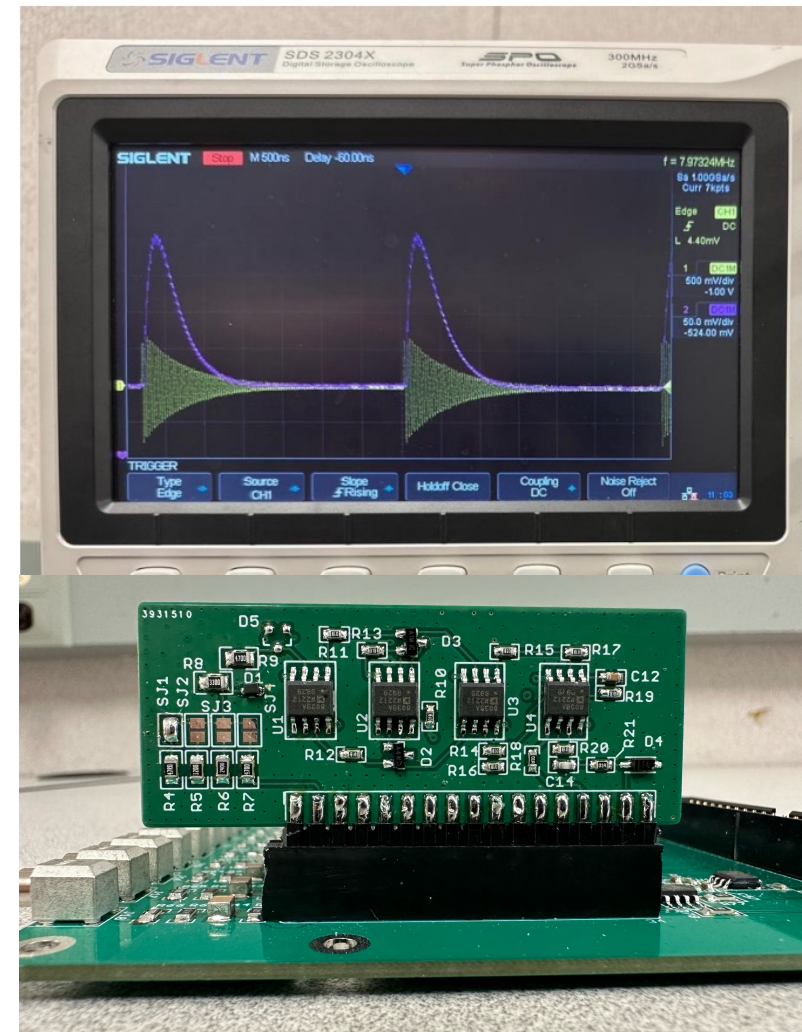
## Original signal:

- Has high frequency
- Bipolar

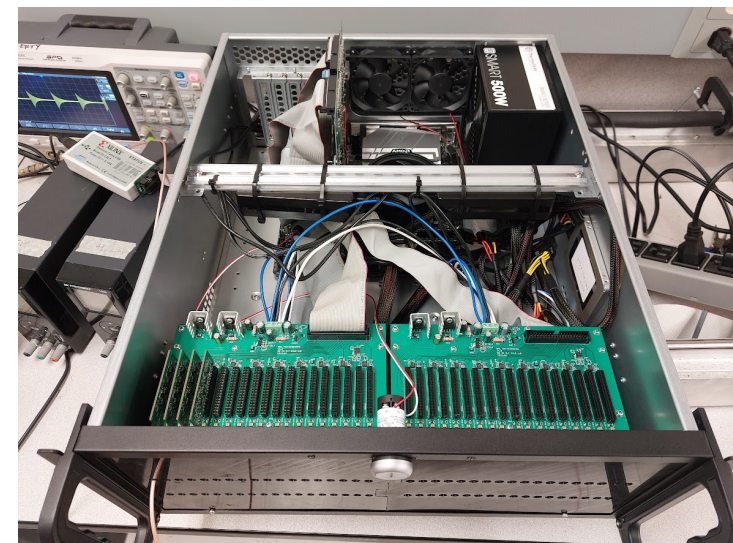
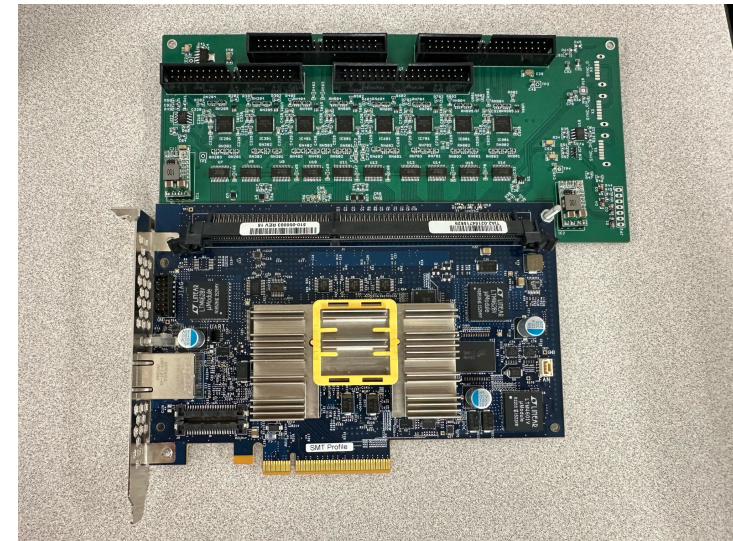
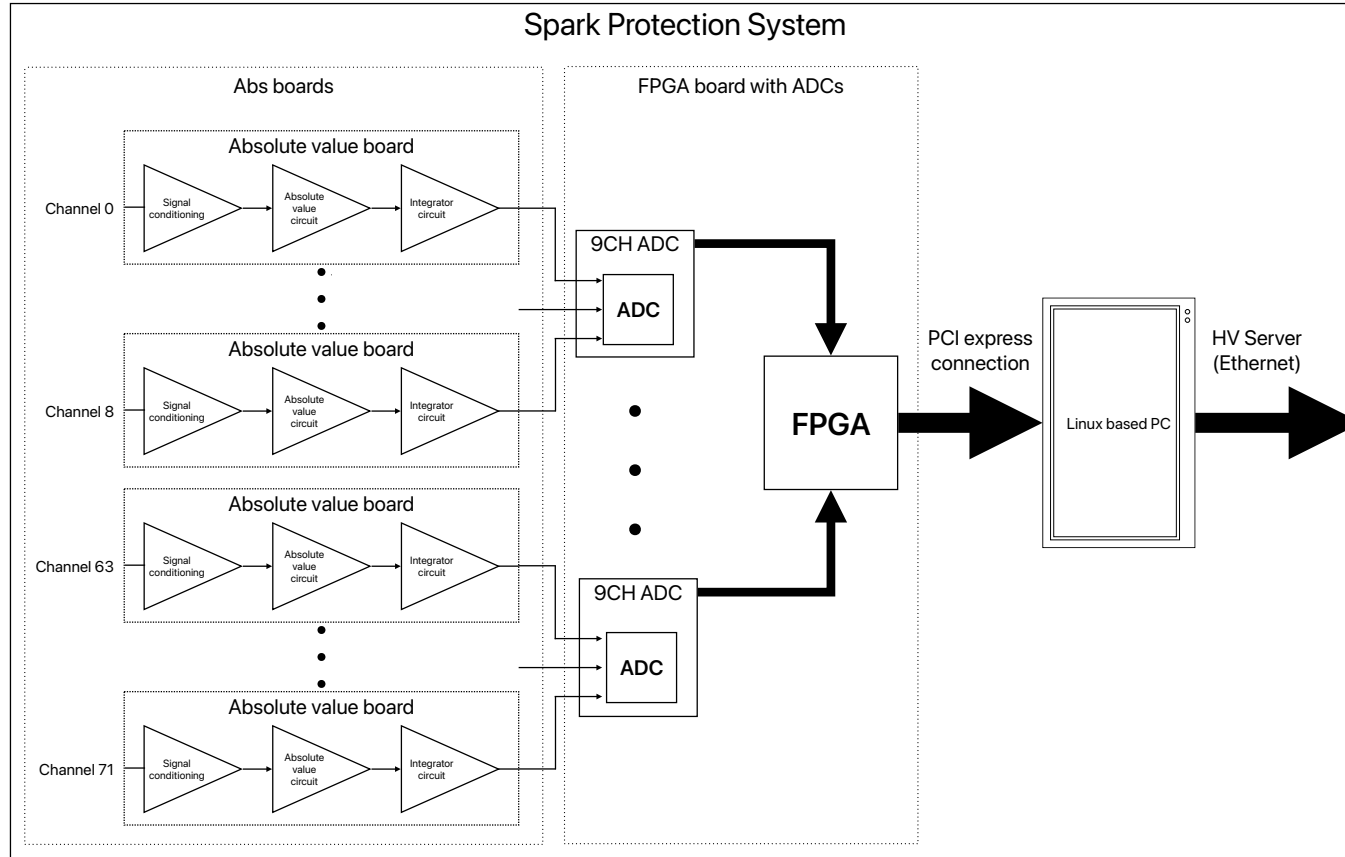
## Absolute value boards output:

- Pulse like signal
- Unipolar

Spark signal (700 mV):

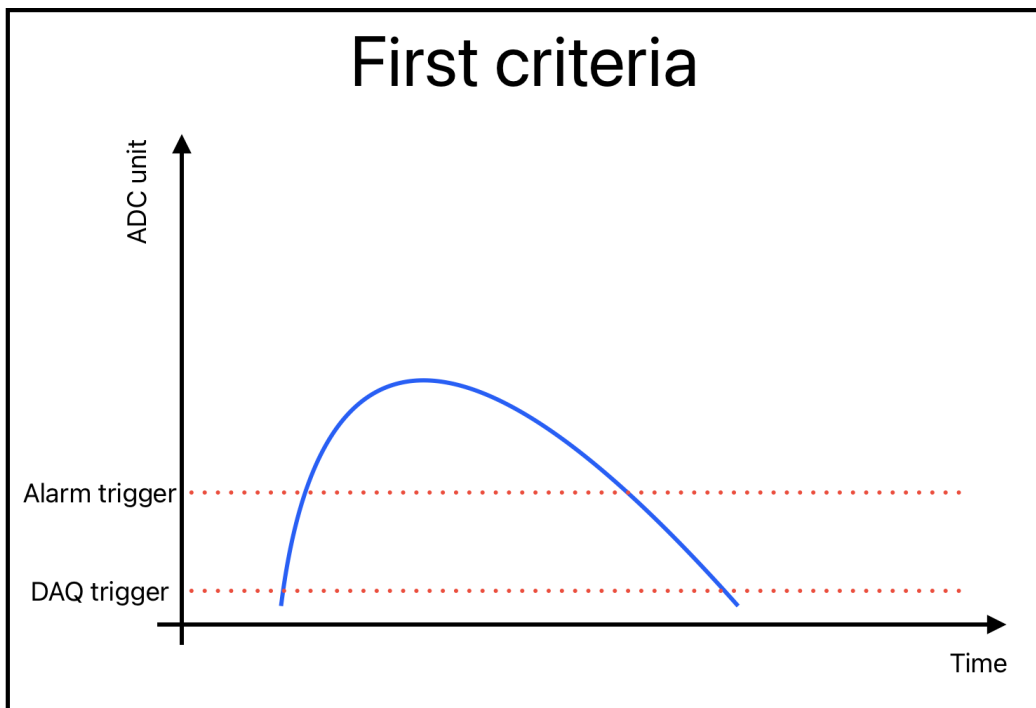


# DAQ overview



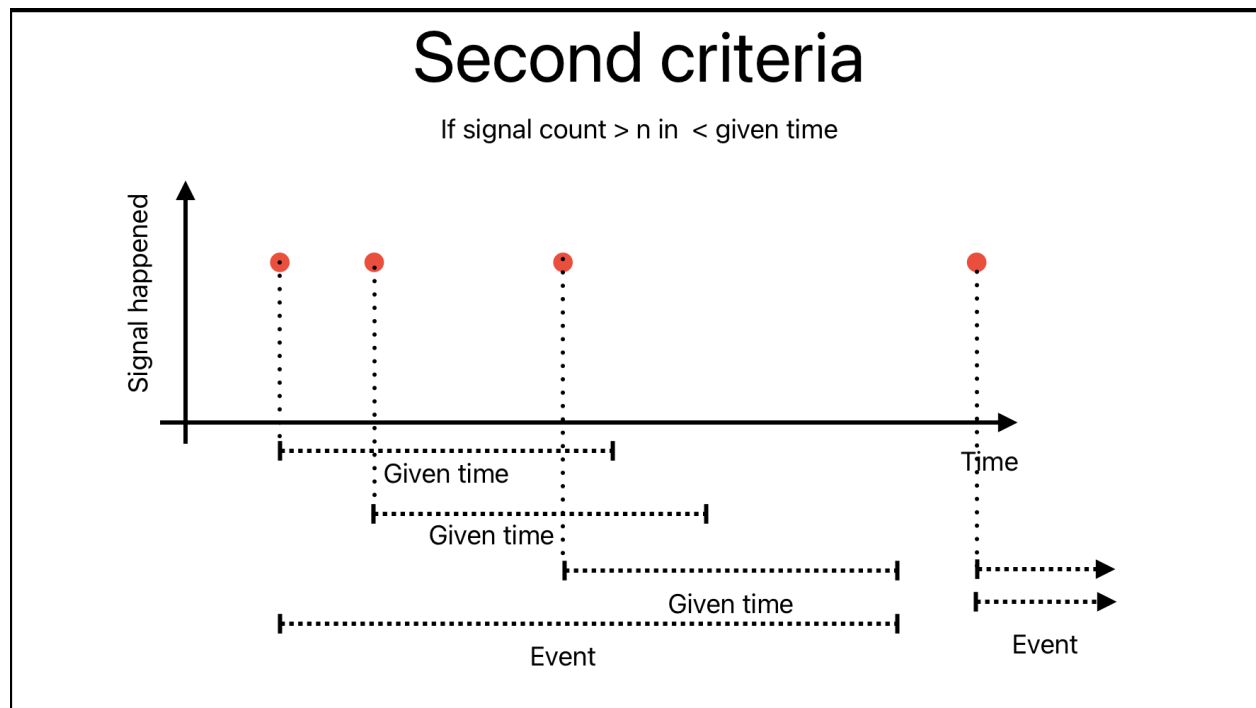
# Protecting against sparks

## First criteria



## Second criteria

If signal count  $> n$  in  $<$  given time



# Future plans

## Now:

- Spark protection is installed and using simple technics to prevent damaging the GEMs
- Analysed the available samples (0.5M events) and spark signals seems to be more complicated than using a single threshold level for detecting spark
- Reading out only the triggered channel

## Future:

- Understand the sparks by reading out all the 72 channels in case of an event
- Searching for patterns across channels
- Searching patterns on the signals Fourier Transforms



**Thank you for your attention!**

David Baranyai





# Backup

