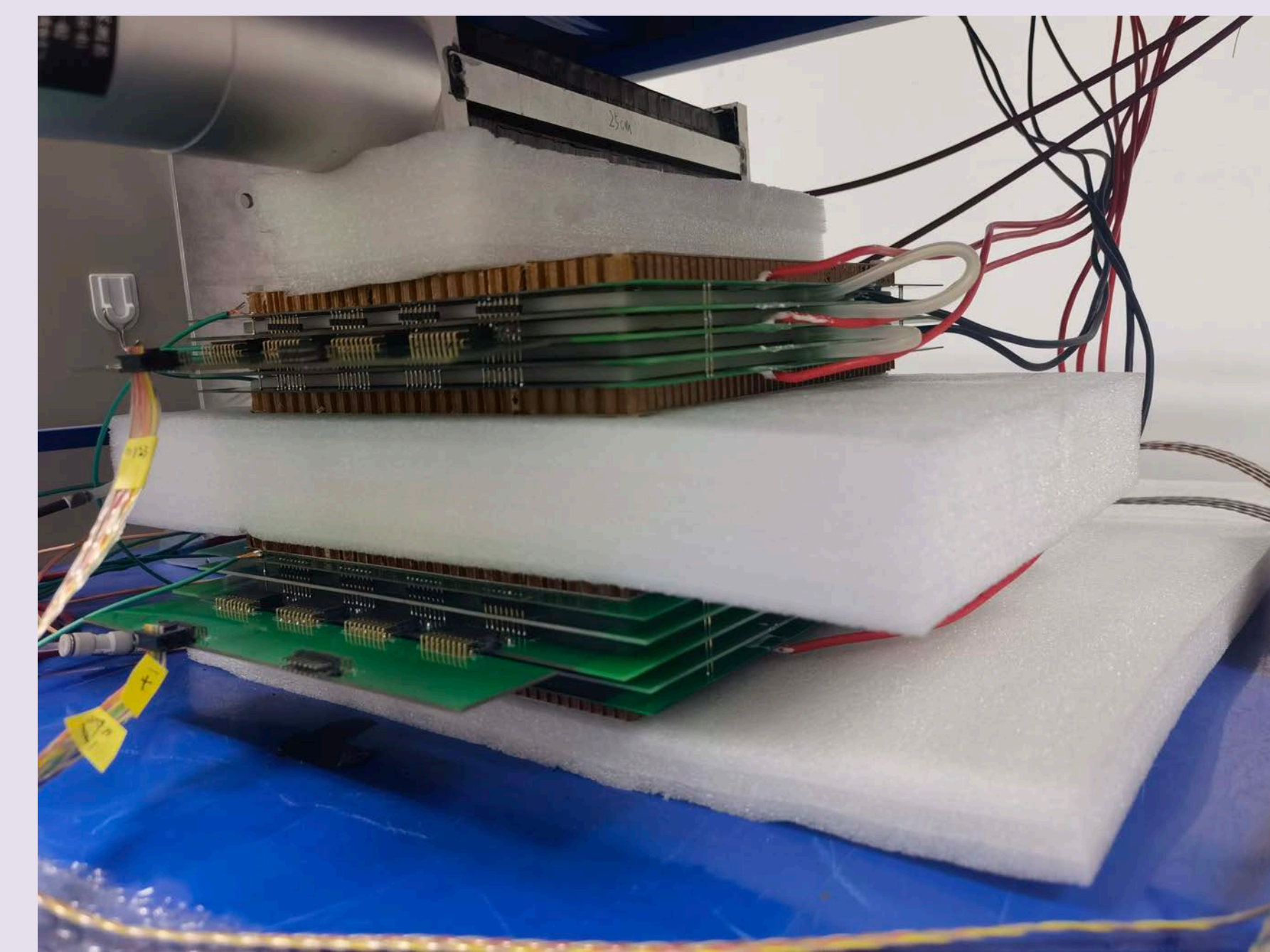


# Development of a sealed MRPC with a high time resolution

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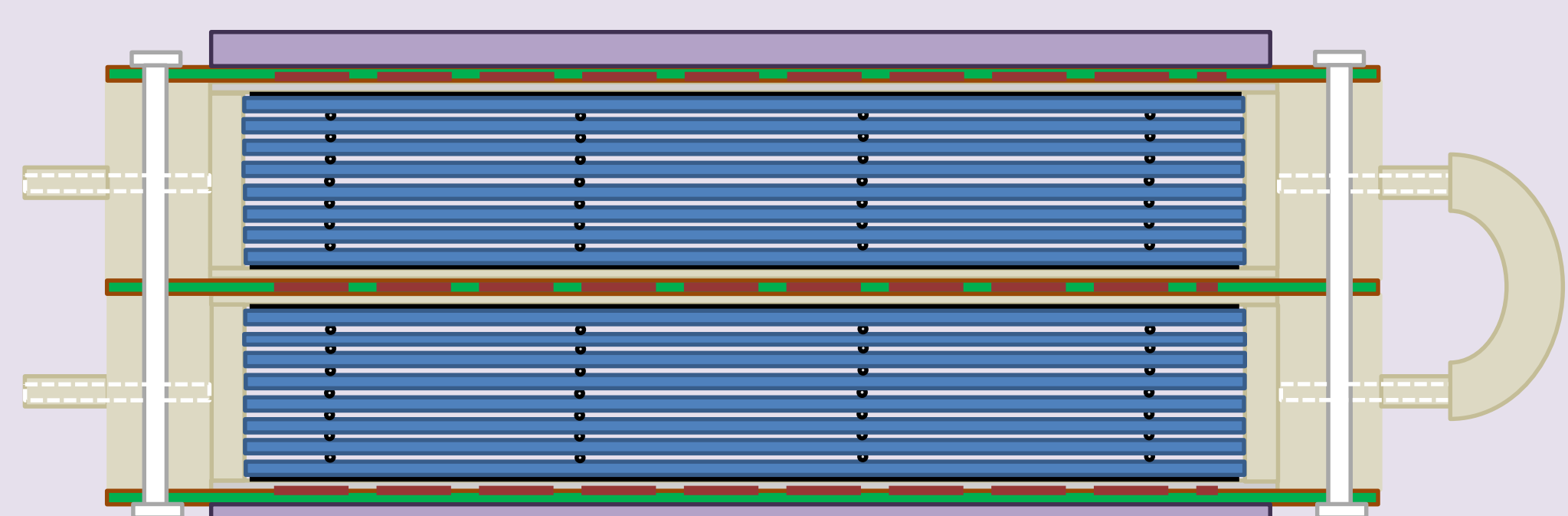
## Abstract

- \*A sealed MRPC (sMRPC) prototype with 4 stack and 7 uniform gas gaps is designed to reach a good time resolution.
- \*sMRPC can lower the airflow through the chamber to reduce the greenhouse pollution.
- \*Both FEE(Front End Electronics) and waveform sampling are used for the readout of the signal.
- \*This research aims to explore whether FEE readout can be used to replace waveform sampling system with heavy data, and maintaining good time resolution.



Sealed MRPC cosmic ray test

## High time resolution sMRPC



High time resolution sealed MRPC

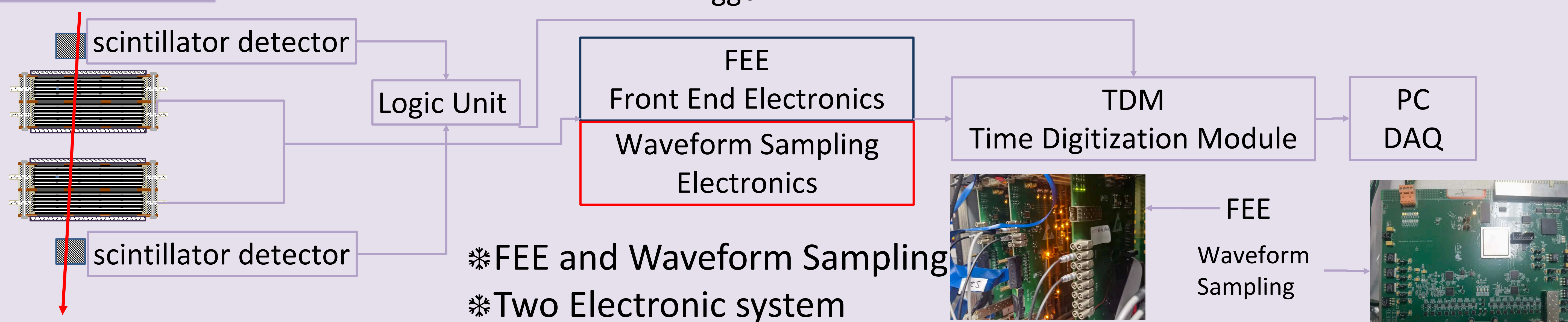
- \*Sealed by seal bar and outer glass

- Outer glass
- Paper honeycomb
- Sealing frame
- PCB board
- Readout strip
- glass
- gas
- Carbon film electrode
- fishing line

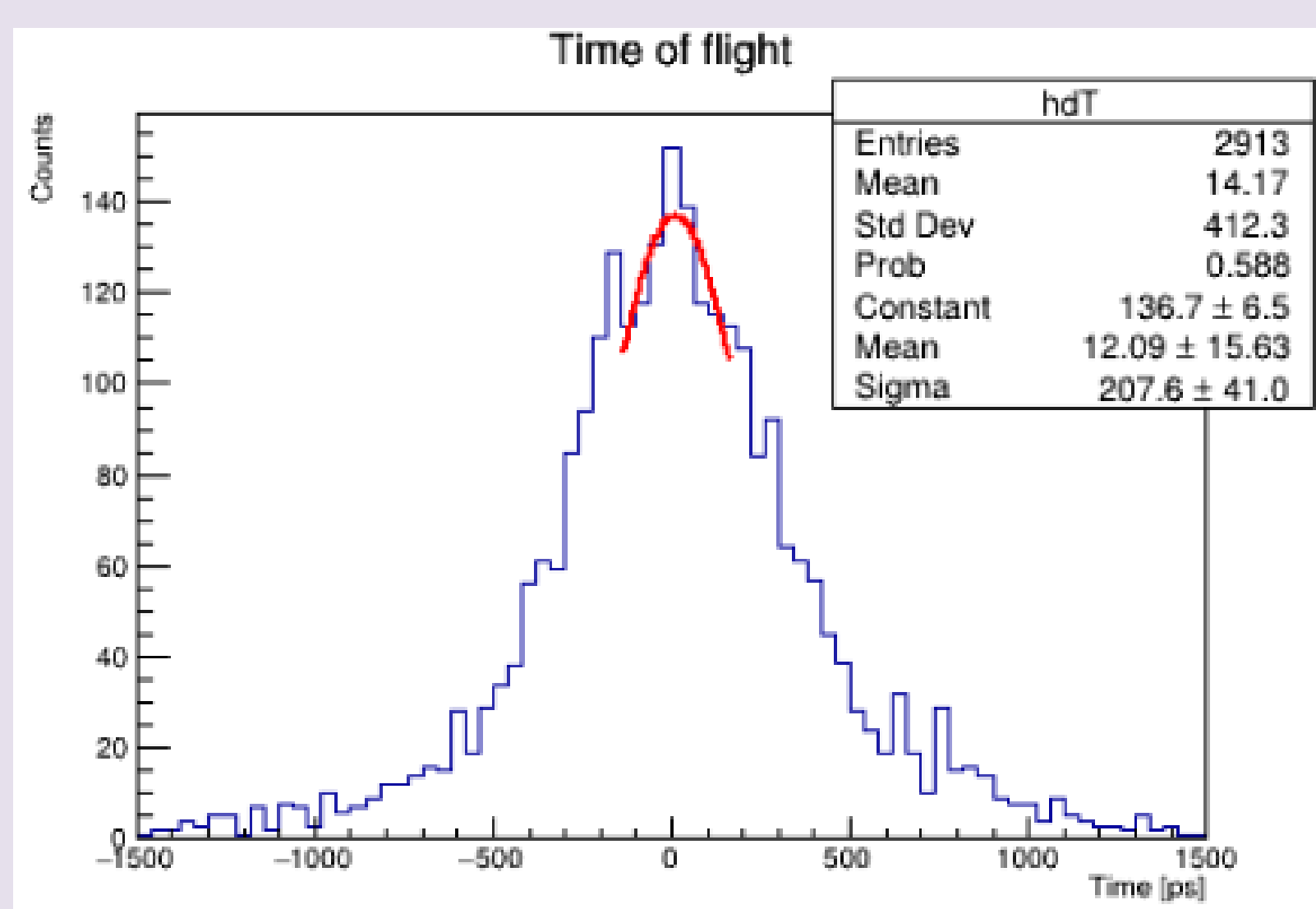
Gas composition	Fluent	percentage
R134a	18 ml/min	90%
C4H10	1 ml/min	5%
SF6	1 ml/min	5%

- \*2 × 4 stack MRPC gasfluent
- \*7 gasgap/stack, thickness 128nm
- \*High time resolution
- \*Lower gas pollution

## System of electronics



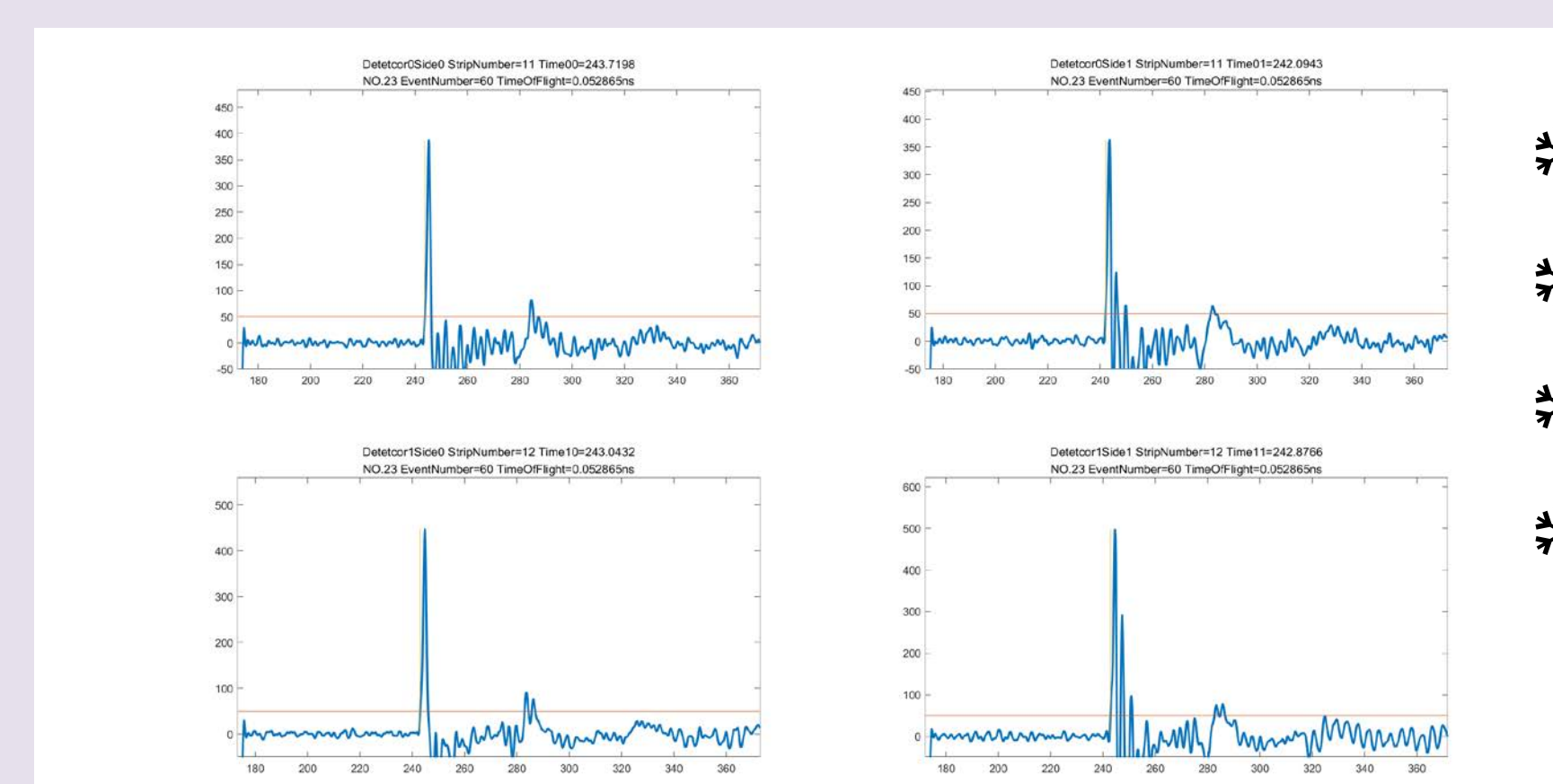
## FEE Result



- \*Electric field=145kV/cm
- \*ToF std=207.6ps
- \*Time resolution=146.8ps
- \*Efficiency 89.3%

\*Need further optimization

## Waveform Sampling Result



Waveform signal of 4 sides in 2 MRPC to calculate ToF

- \*Electric field=145kV/cm
- \*ToF std=180.2ps
- \*Time resolution=127.4ps
- \*Efficiency 86.4%

\*Need further optimization

## Conclusion/Further Study

- \*In our group's previous study, the high time resolution MRPC have a resolution of 20ps.
- \*The detector in this experiment needs to be further optimized, and solve the specific MRPC problem.
- \*The Front End Electronics method have similar time resolution with Waveform Sampling method.