GWNU Activities
&
The design of a double stack MRPC

Jinsook KIM

Gangneung-Wonju Nat. Univ.

GWNU Activities

1. Members of GWNU @ Ko-ALICE

* Dr. JS KIM (@ Gangneung)
* Dr. YW BAEK (@ CERN)
* Mr. KH KWON (Master student)

2. Activities of GWNU for Detector operation

* Dr. JS KIM
  – TOF QA(Quality Assurance)
  – R&D : MRPC study
* Dr. YW BAEK
  – Muon Trigger expert
  – R&D : MRPC study
* Mr. KH KWON
  – R&D : MRPC study

GWNU Activities

3. Analysis paper : Dr. YW BAEK

– Global Polarization of (anti-)Lambda @ 2.76 TeV in Pb-Pb

– pp multiplicity dependent $dN_{ch}d\eta$ (with Dr. Beomkyu KIM)

4. R&D paper : Dr. YW BAEK

– Study of the ecological gas for MRPCs (NIM A)
https://www.sciencedirect.com/science/article/pii/S0168900219302396?dgcid=author

– Study of a large size double stack MRPC with strip readout (NIM A)
https://www.sciencedirect.com/science/article/pii/S0168900219303389

– Study of a large strip-type MRPC with strip single-ended readout (NIM A)
https://www.sciencedirect.com/science/article/pii/S0168900219308472

– MRPC with eco-friendly gas (JINST)
https://iopscience.iop.org/article/10.1088/1748-0221/14/11/C11022

The design of a double stack MRPC

1. Introduction
2. Strategy
3. Description of a double stack MRPC
4. Construction
5. Summary

Introduction

1. About MRPC

* used in many experiments with excellent timing performance
* cover a large detection area at low cost
* easy to build

2. Motivation of a double stack MRPC

* to reduce the operating voltage using double stack
* useful for the ecological gas mixtures (i.e. with $C_3F_4H_2$) that require higher operating voltages than the typical gas mixture (i.e. $C_2F_4H_2/SF_6$)

Strategy

1. Gas Tube

* to improve the gas flow through gaps of the MRPC by adding small gas tubes.
* The same length Teflon tubes(0.8 mm in diameter) are extended from input/output gas connectors and distributed along the edge at intervals.

2. 9mm wide copper tape

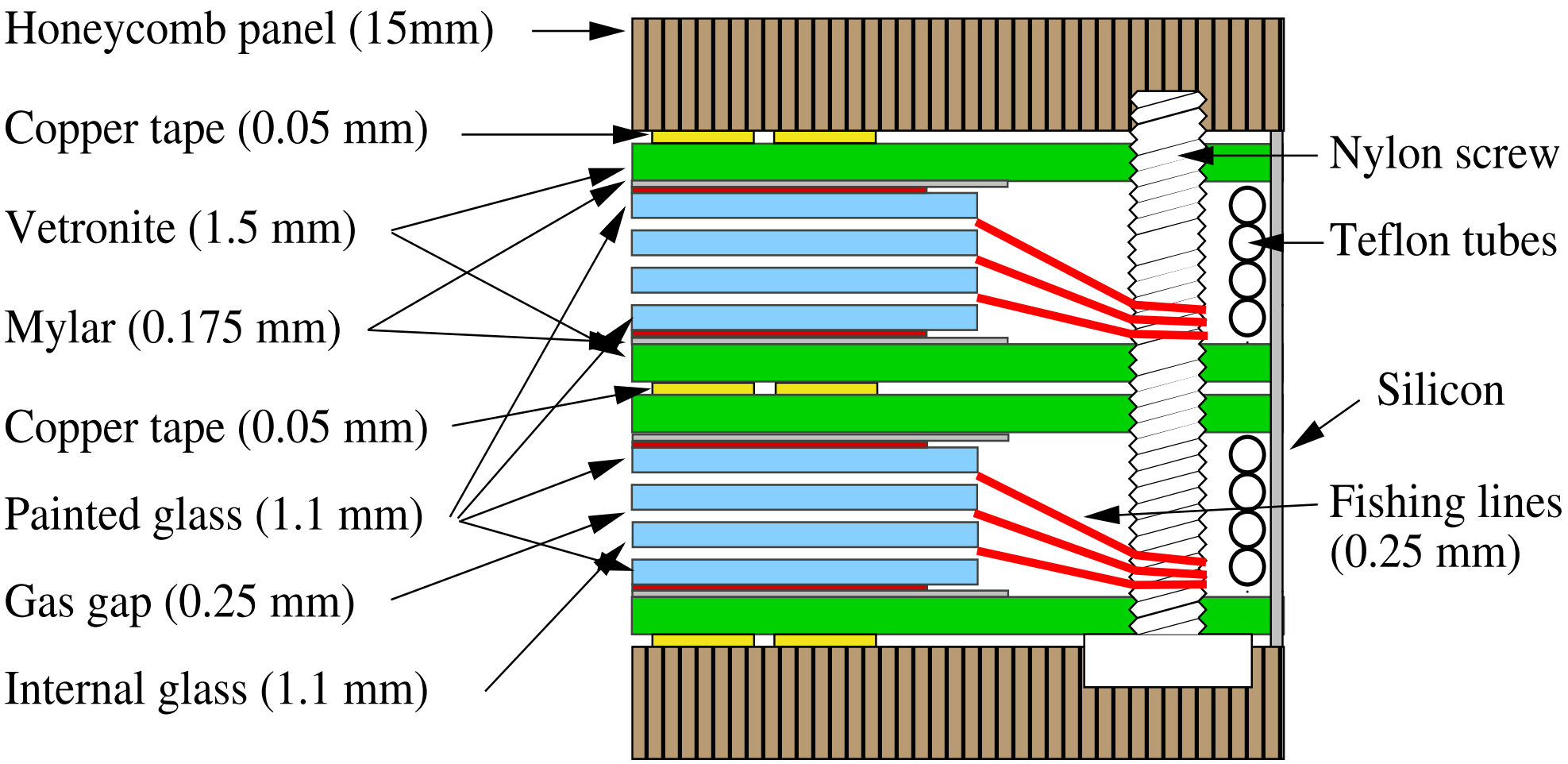
* allows a better position resolution

3. Two methods for readout

* test whether it was possible to mount a readout card at just one end of the chamber in a similar configuration

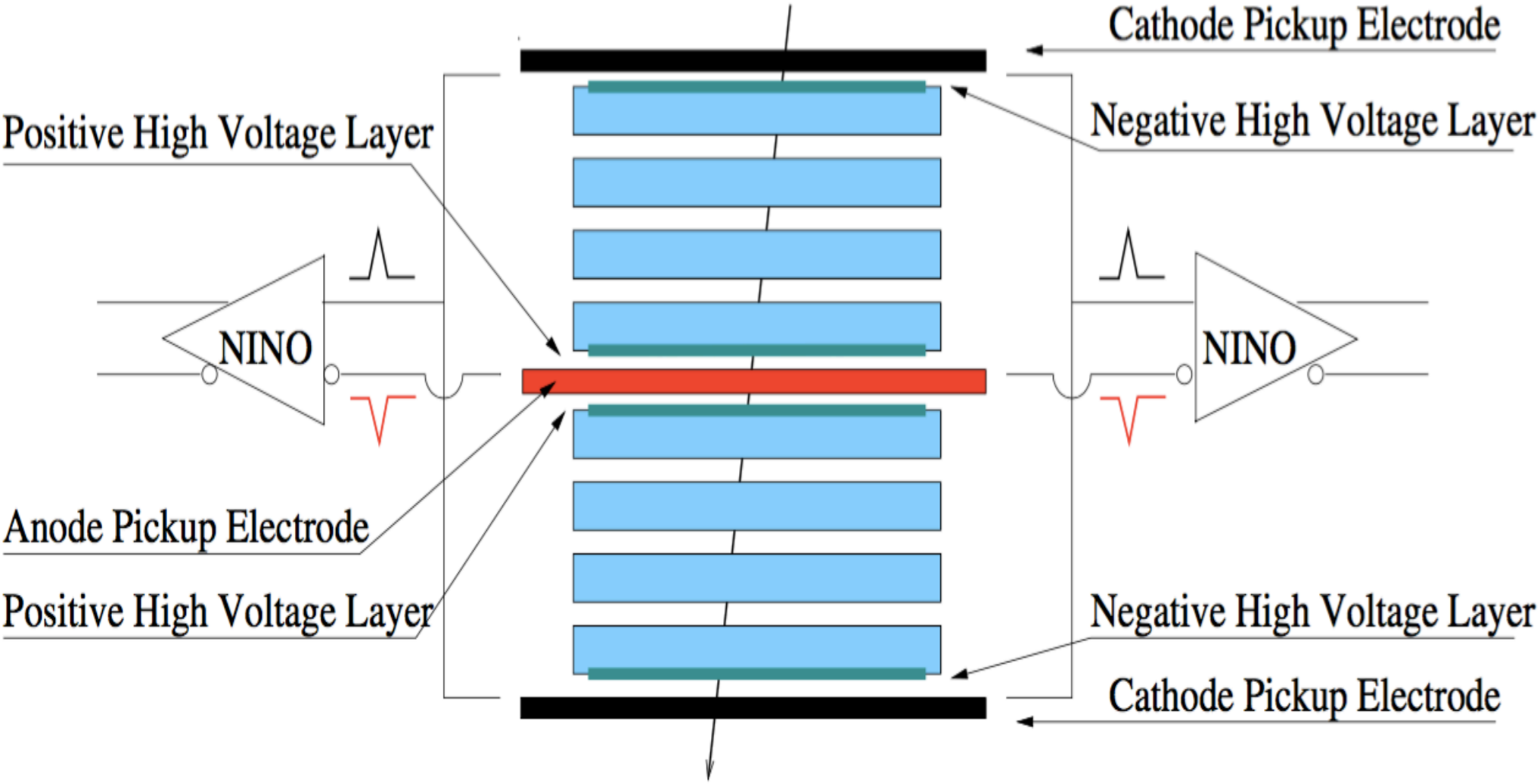
Description of a double stack MRPC

1. Schematic cross-section view of a double stack MRPC with 6 gaps (85 cm x 85 cm of sensitive area)



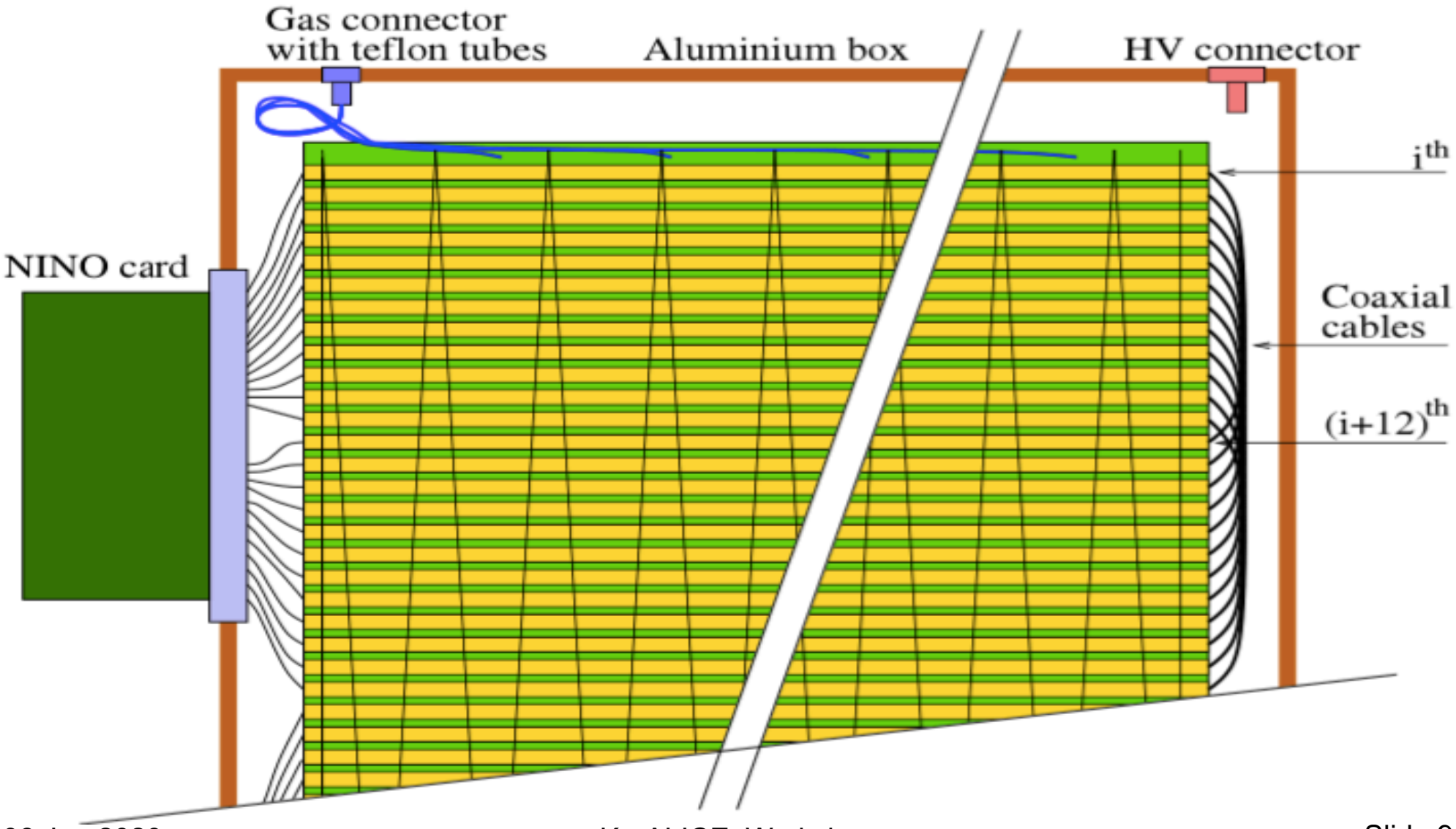
Description of a double stack MRPC

2. Schematic view of a double-ended readout MRPC

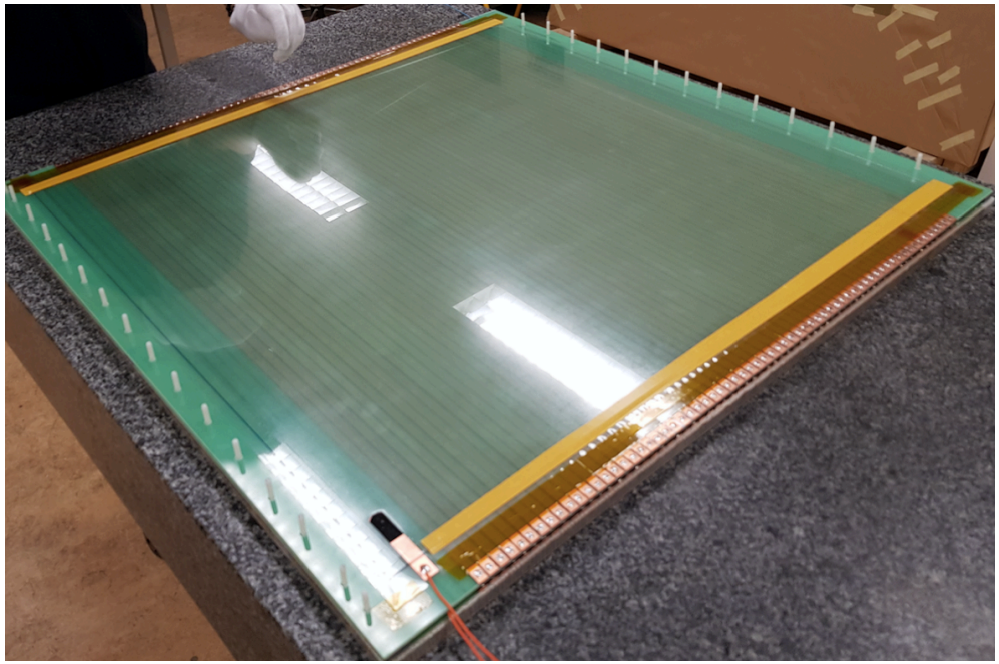


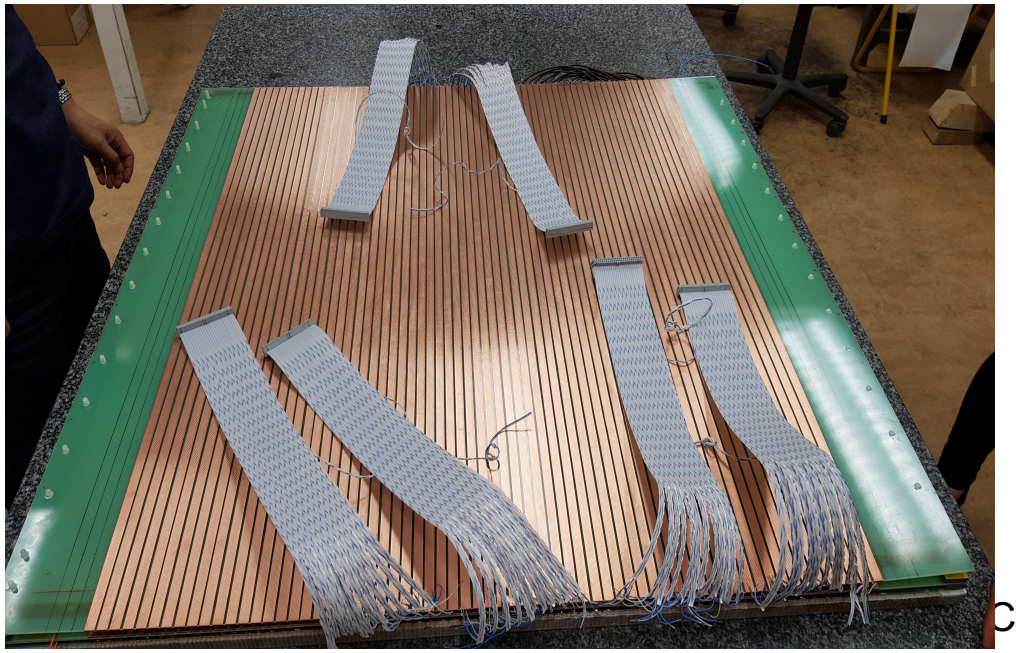
Description of a double stack MRPC

3. Schematic view of single-ended readout MRPC

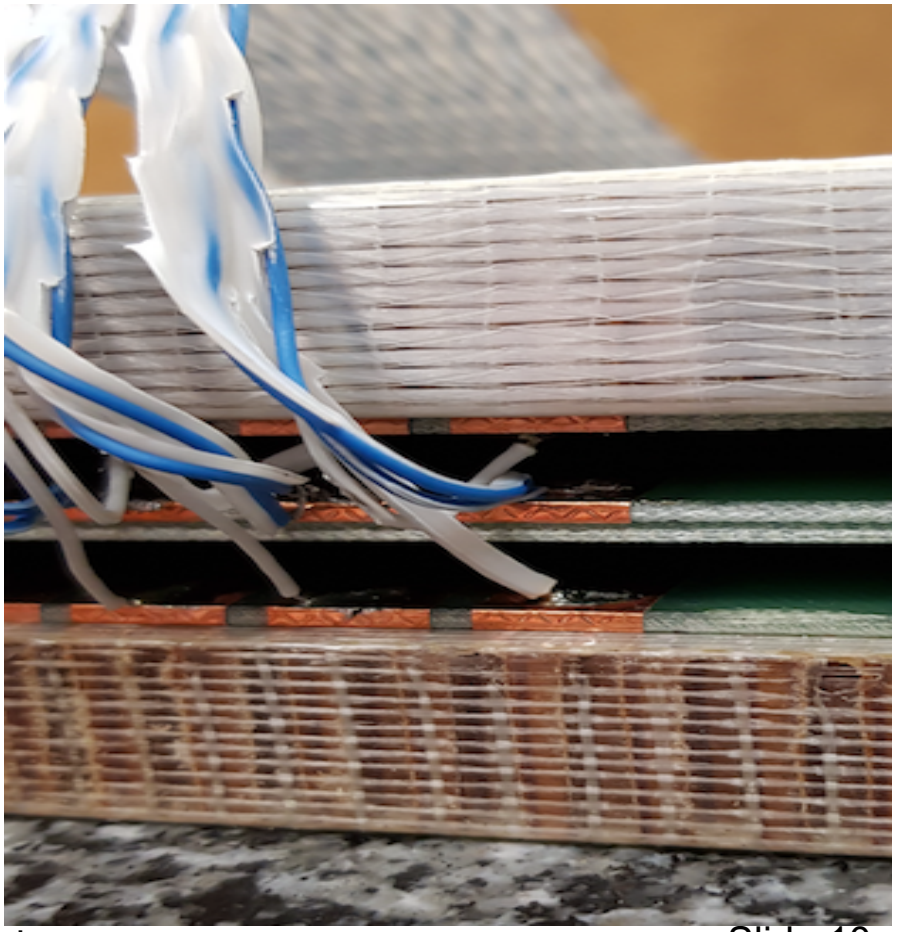


Construction

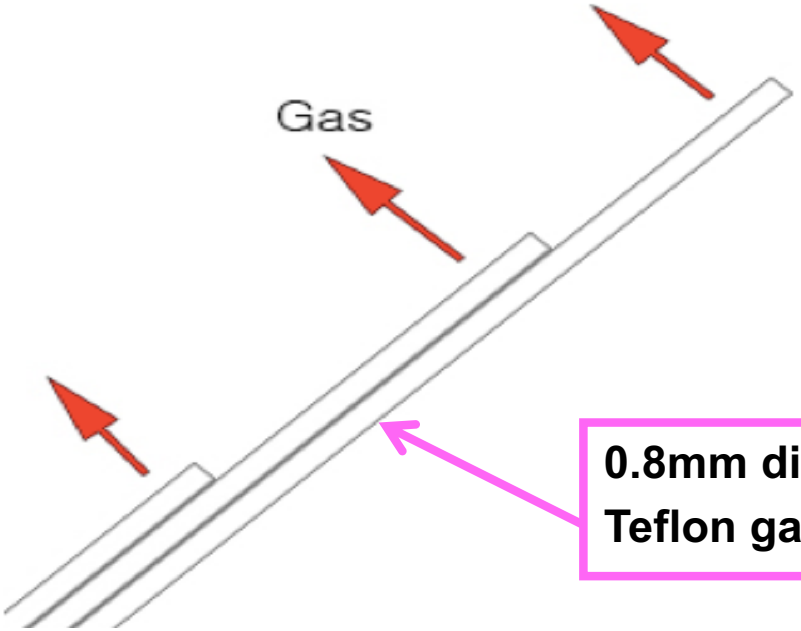




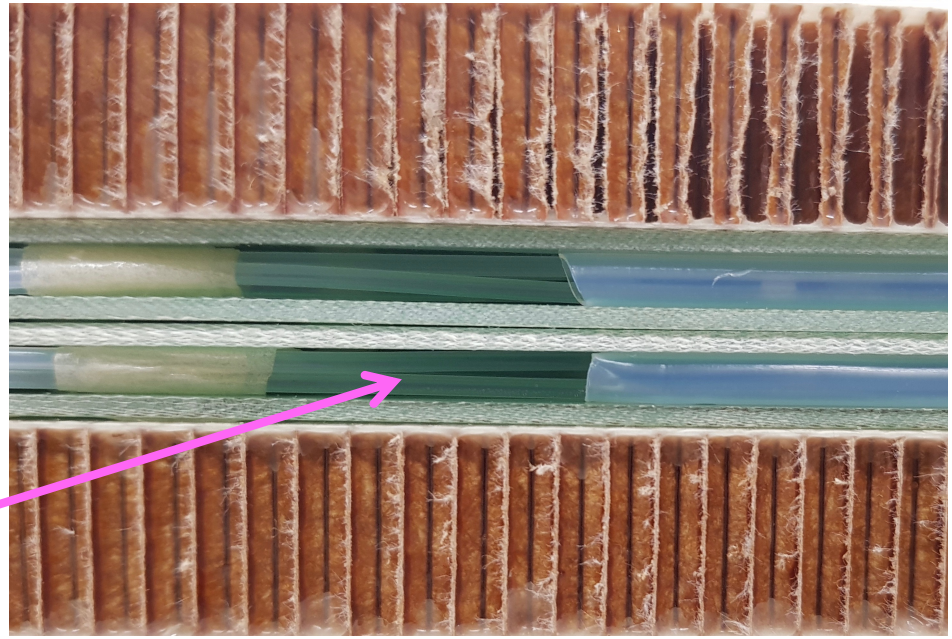
- made by adhering 9 mm wide copper tape to vetronite panel on a 11 mm pitch

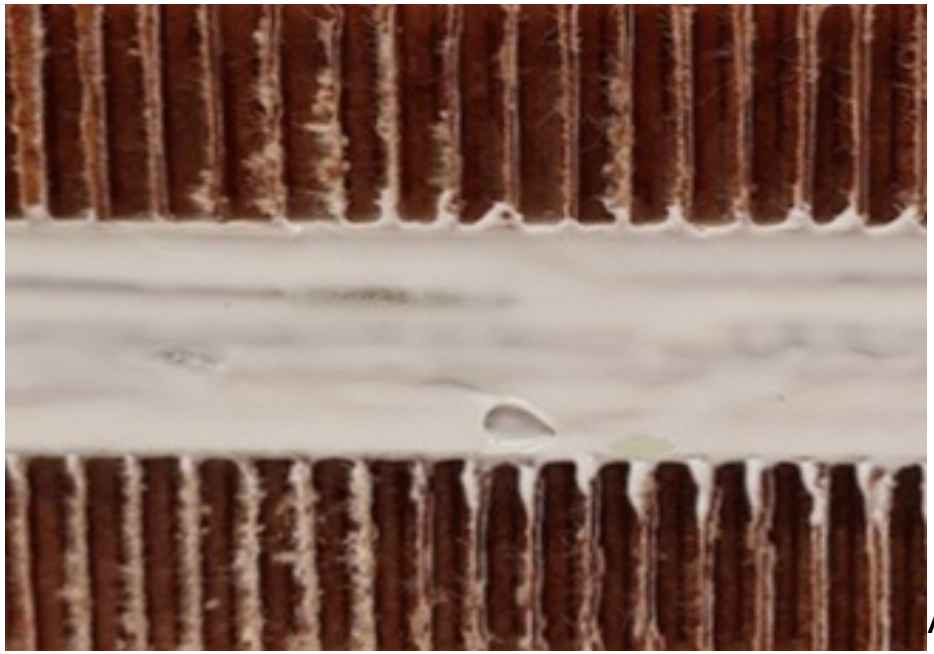


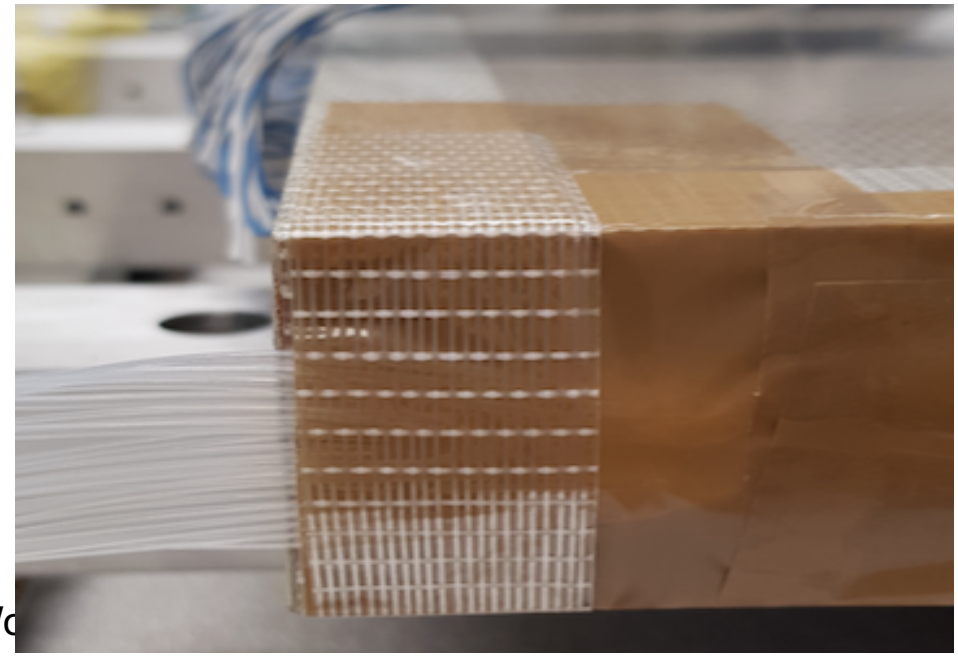
Adding Teflon tube



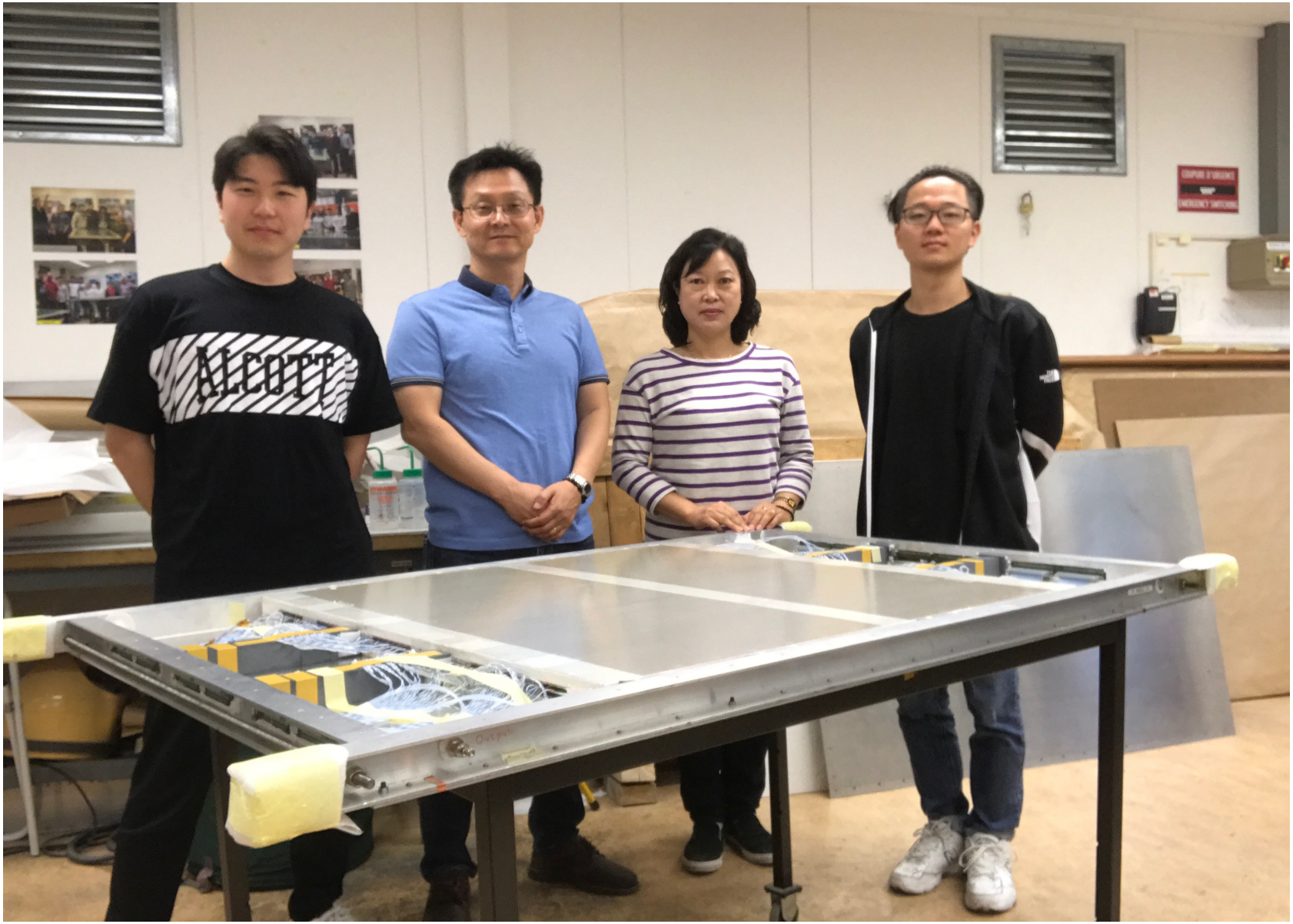
0.8mm diameter Teflon gas tube







Completed Chamber



Summary

1. New design of MRPC

* to reduce the operating voltage, useful for the ecological gas mixtures
* improve uniform and correct gas flow into the gap
* for low consumption with a small gas volume

2. Strategy

* Gas Tube : to add small Teflon tubes
* 9mm wide copper tape : allows better position resolution
* Two methods for readout : double or single-ended readout in a similar configuration

3. Results

* Dr. BAEK presentation

4. Next step

* to Install PVC bar instead of sealing with tape to enhance sealing
* make two more chambers and test with cosmic ray