RPCLab Update

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On behave of SJTU RPC Lab

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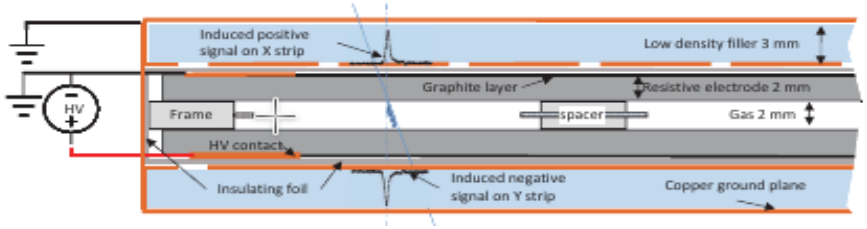
Outline

- 1. Introduction
- 2. Chamber making update
- 3. Future plan

Introduction

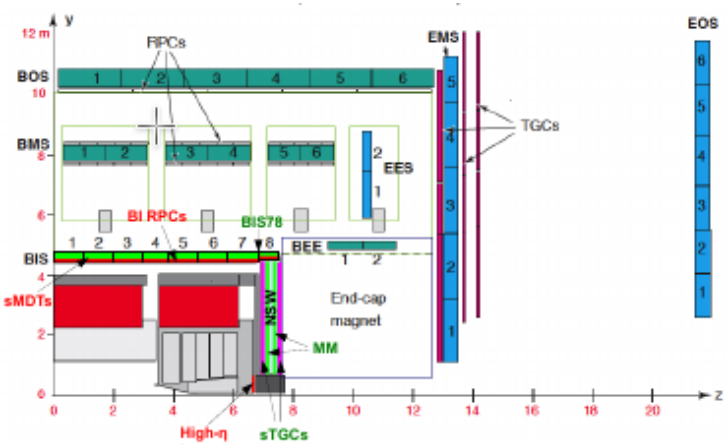
Upgrade for HL-LHC ATLAS detector
For RPC update

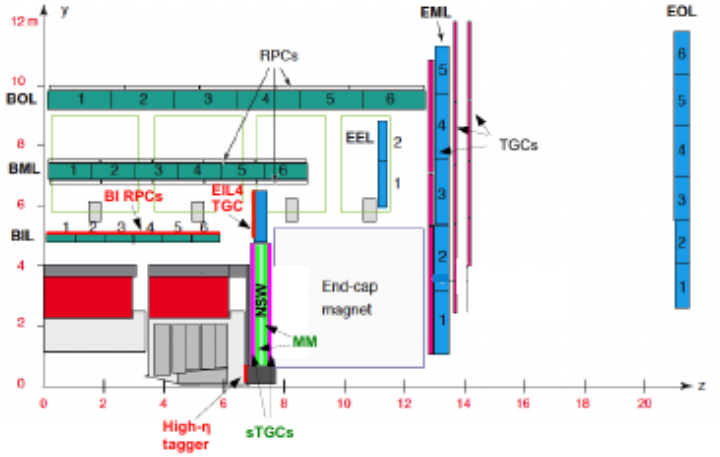
1. Guarantee for 10 years of operation at LHC
2. 10 years with counting rate of 100HZ/cm^2
3. Working under lower voltage with proper efficiency lost



RPC take use of the ionization of a gas mixture contained between the 2 resistive chambers .

The ionizations can create new one with applying strong electronic field, that can create the signals induced by the PCB and recorded by electronics





Glass RPC Construction

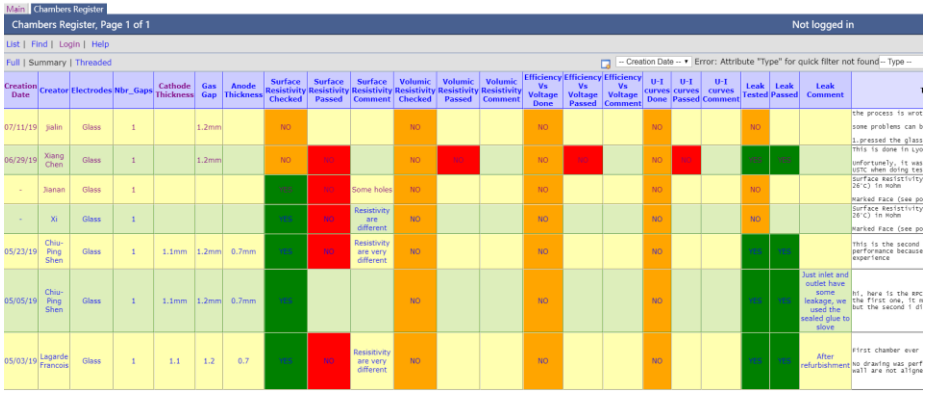
Two RPC design is applied in lab now

1.USTC-like: for ATLAS upgrade, stable ,more making procedure

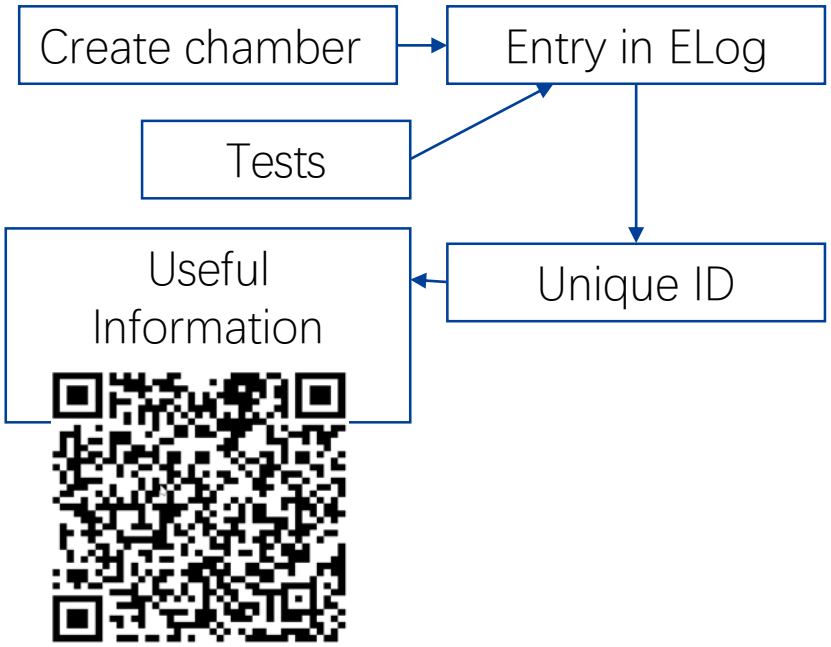
2.Lyon-like: CEPC SDHCAL, easy to build

Lyon-like

USTC-like



Elog is used for chamber registration. Each chamber have its own code. Now 8 chambers have been build.

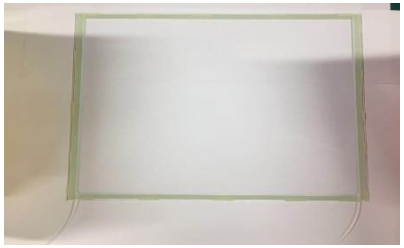


GRPC making procedure

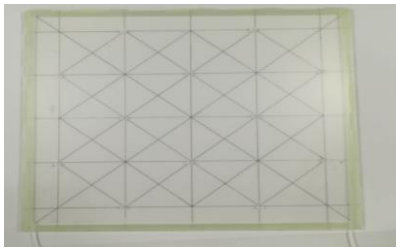
First production we decide to build (20*20cm2) SDHCAL like GRPC :

1.Position the walls and pipes

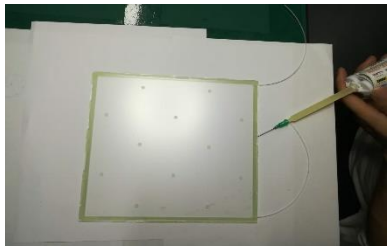
2.Glue walls and pipes.



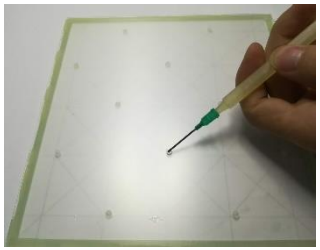
3.Draw the spacer position sketch



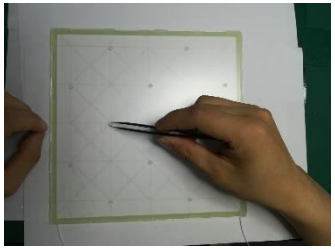
4.Put the spacers on the glass



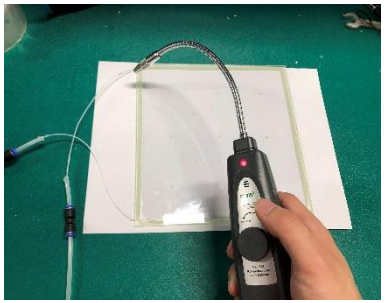
5.Glue the spacers



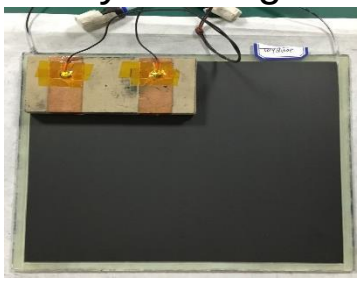
6. Glue the second glass to the walls



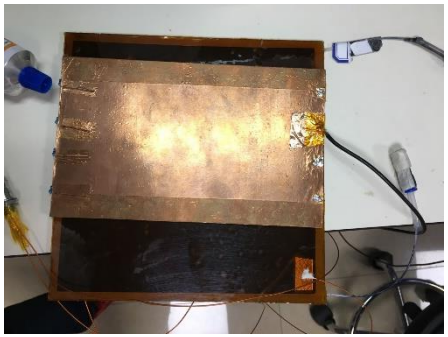
7. Gas tight with silicon and test leaks

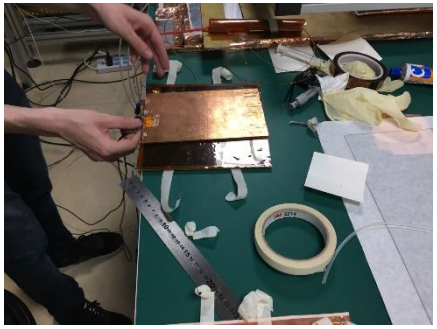


8. Graphite coating and mylar fixing

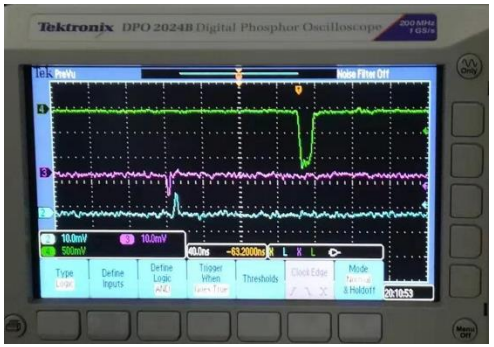


GRPC Testing Result

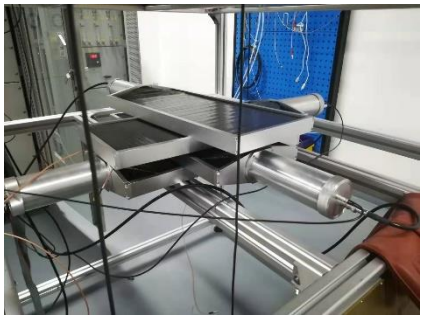


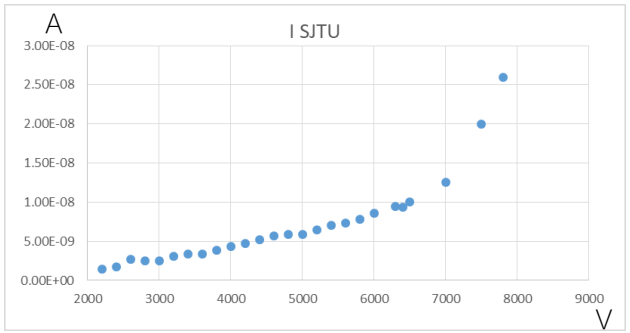


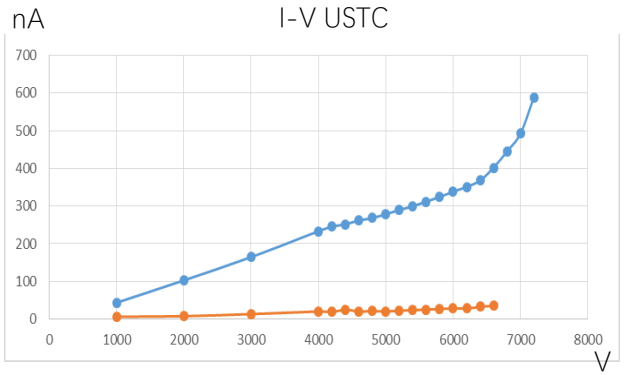
SDHCAL RPC has no signal
Possible reasons:
1. Higher glass resistivity.
The current of SJTU RPCs (~9nA)is smaller than USTC RPC(~30nA),
2. Whether uneven graphite resistivity affect the signal test or not.



One chamber make in USTC method succeed in finding signal for cosmic rays
Problem: high working voltage(7200V)
Reason: 1. Thickness
2. Gas mixture







Resistance testing

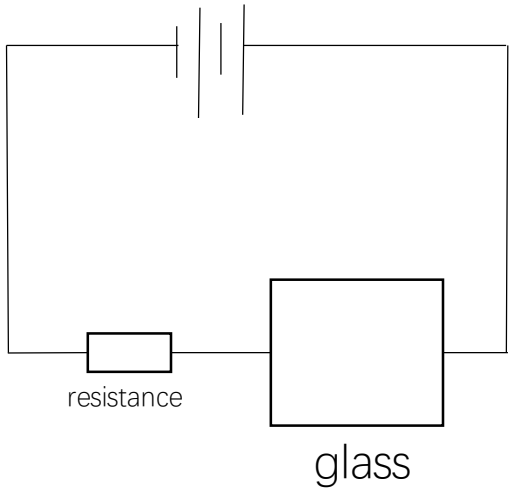
- USTC glass resistivity: $8*10^{11}$ ohm*cm
- SJTU glass : at least $6*10^{14}$ ohm*cm (all tested in USTC)

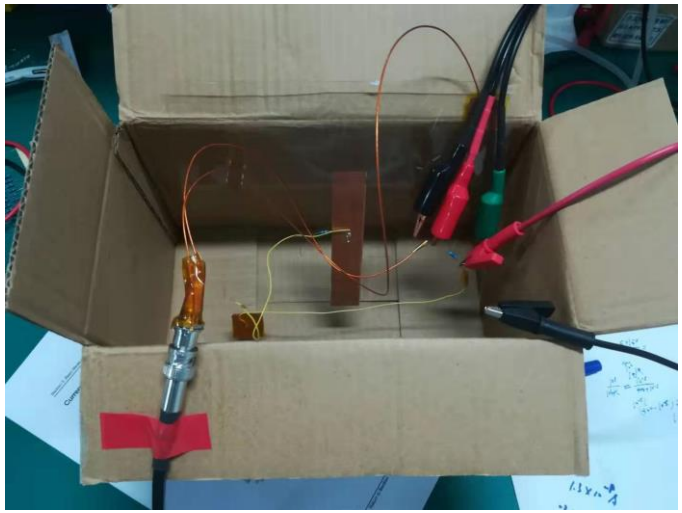
The circuit diagram of testing is show as below, using V-A method:

Problems: the display of electric-meter have bugs.(need a volt source to do some work like calibration and to double-check the manual)

Trying to solve the problem in weekends

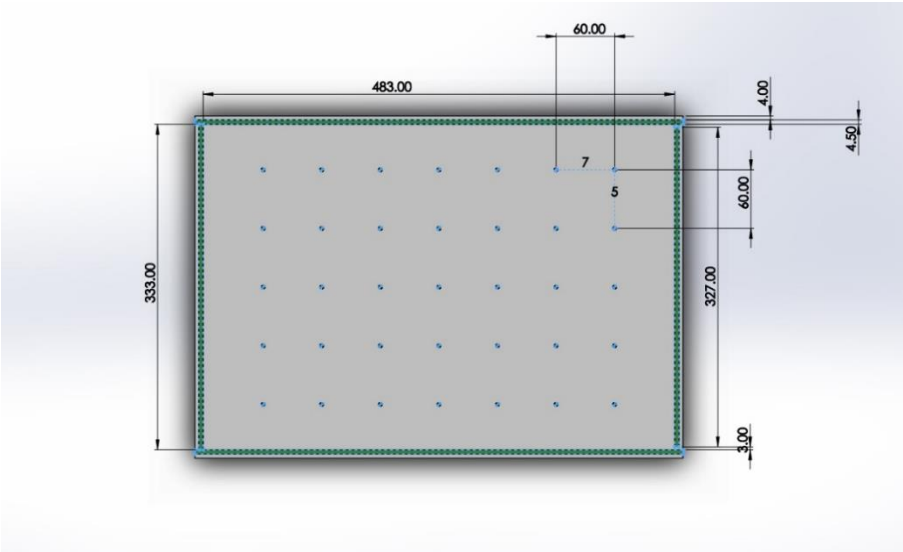
A Probe may be need for testing resistivity



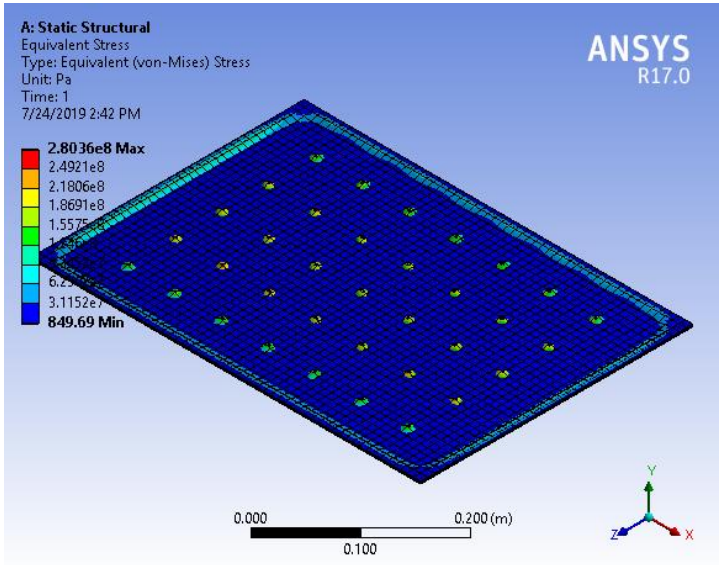


RPC Making Plan

- A stretch is made for the lager RPC(50cm * 35cm) chamber.
- The making is ongoing. Estimated to be done on Thursday(1st Aug)
- Graphite coating is preparing now
- Doing testing before 15th Aug

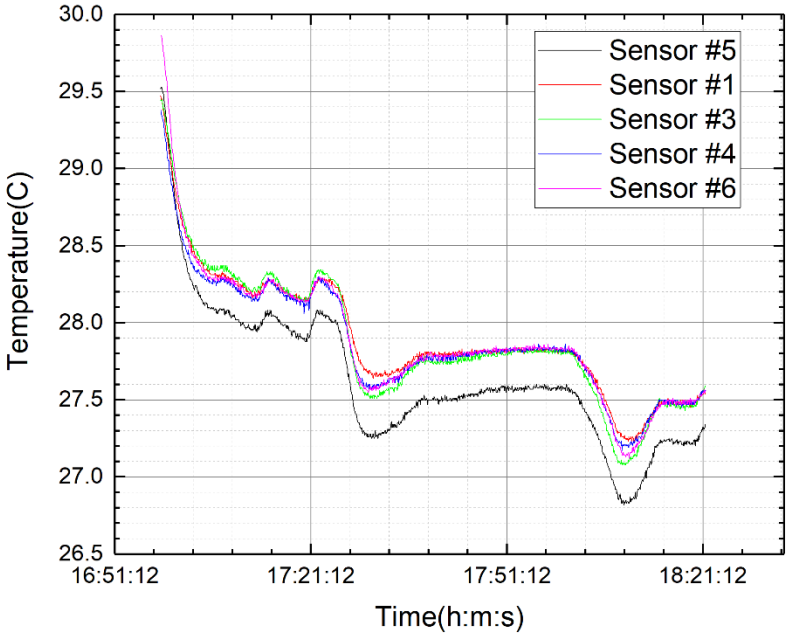


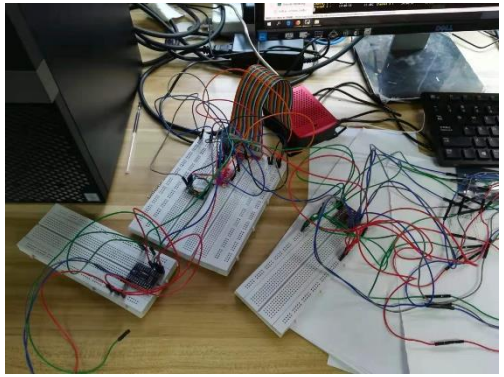
35 spacers(5*7) all units are mm in figure
Larger size spacers are ordering



Simulation is also doing at the same time
Shape change by adding 300N force on surface to avoid being damage

Cooing system update



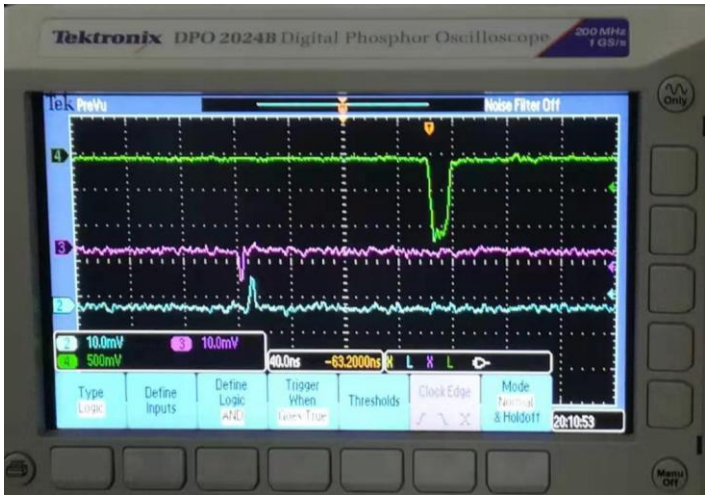


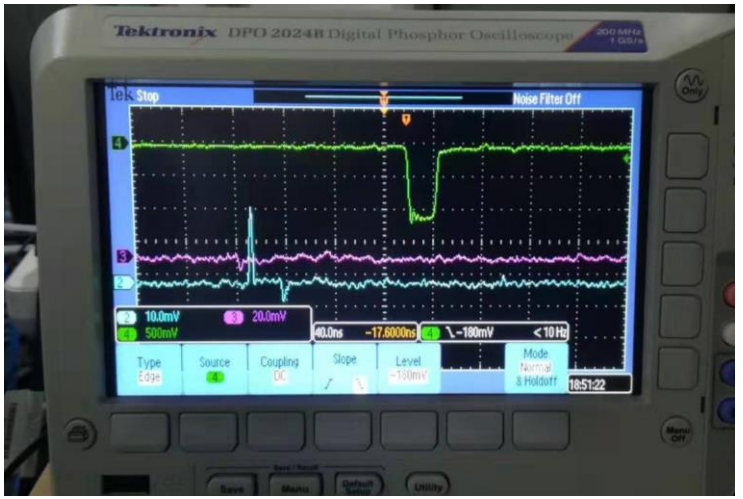
Temperature sensor is test for the cooling system
Putting all the sensor in a box to control the temperature

Future Plan

- 1.Check the resistivity for each glass in the lab now
- 2.Trying to make large RPC (50cm * 35cm)
- 3.Most important, found a way to make graphite by ourselves(not relying on going to USTC)

Backup


Tektronix DPO 2024B Digital Phosphor Oscilloscope
200 MHz 1 GS/s
PreVu
Noise Filter Off
10.0mV
10.0mV
500mV
40.0ns -63.2000ns
Type Logic
Define Inputs
Define Logic All
Trigger When Pulse Width
Thresholds
Clock Edge
Mode Normal & Holdoff
20:10:53


Tektronix DPO 2024B Digital Phosphor Oscilloscope
200 MHz 1 GS/s
Stop
Noise Filter Off
10.0mV
20.0mV
500mV
40.0ns -17.6000ns
-180mV
<10 Hz
Type Edge
Source
Coupling DC
Slope
Level -180mV
Mode Normal & Holdoff
18:51:22