Small RPC gap assembly

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Report structure:

-Introduction to RPC in CMS
-Solving the inlet gas problem
-The making of a small 1mm RPC gap
-Gas calibration on a view of making a mixing station

Introduction to iRPC in CMS

Solving the gas inlet gas question

Solve three problems
-How to make a gas injection in a 1mm gap.
-Remove the fragile gas inlets in present-day RPC grass chambers.
-Improve gas flow distribution in the gap.

Three ways to inject gas into the gap

We have learned how the gas pipe system works and tried to build a new gas system by using small components and get an idea of how the system might work. We used a small scall pipe system so we can have a view of how it will be when it's on a big scale.

1- The first way that was used in the 20cmX20cm polycarbonate gap:

What happened→After we completed the step that is mentioned in (The Making of a working gap) we got a gap that is 20cmX20cm with a thickness of () and a gap thickness of () and two inlets and outlets with a length of (). First, we started by getting a polymer PU tube with an outer diameter of () and an inner diameter of () and cut it by using a cutter to 80cm length. After we have cut the polymer tube to the right length, We had an issue in making the pipe to create the holes for the gas injection. First, we measure where should we put the marks for the gas inlet and outlet interval as you see in Fig.1. Then we soldered the holes in the polymer pipe. But when we came to install the polymer pipe, we saw that the Bakelite side spacers have moved because the ()adhesive acts like grease in that it separates the different layers and allows free lateral movement of those layers till it polymerizes. This phenomenon is countered by using guides during the compression of the plates and marking the polymer pipe after gluing the two polycarbonate plates with the bakelite spacers if there was any slight change in the positioning of the bakelite spacers.

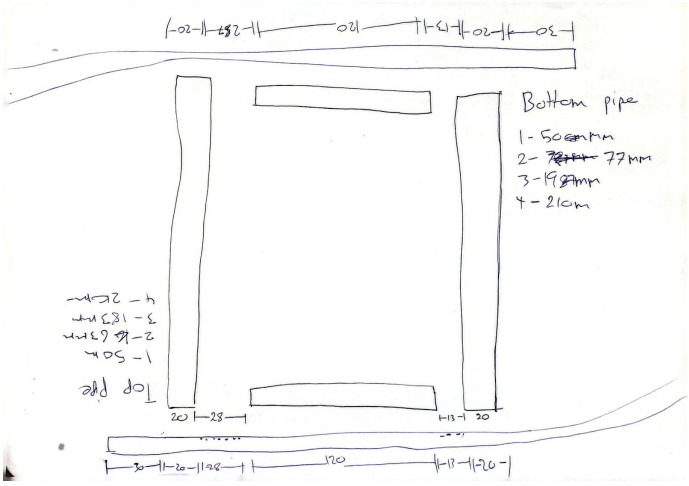


Figure 1: A sketch of the measurements of placing the gas inlet and outlet holes on the polymer pipe.

We have created a base for the gap to be stabilized by using a slab of PVC material, we drilled in the fours corner a hole of the size () and used for each hole one screw and two () to make the legs for the PVC platform as shown in Fig.2.

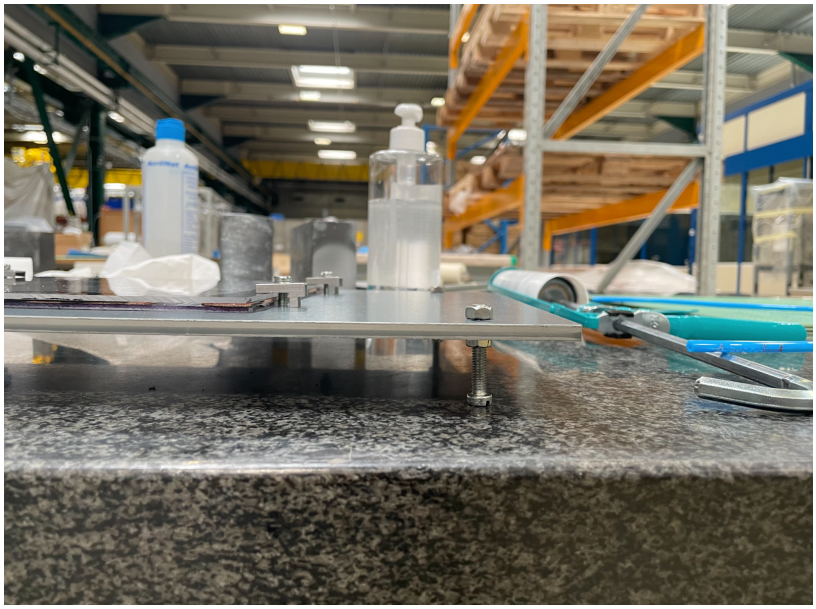


Figure 2: The legs for the PVC plate form that is made of one screw and two (..).

After that, we used () to have something holding the polycarbonate pipes in the PVC platform as you can see in Fig.3.

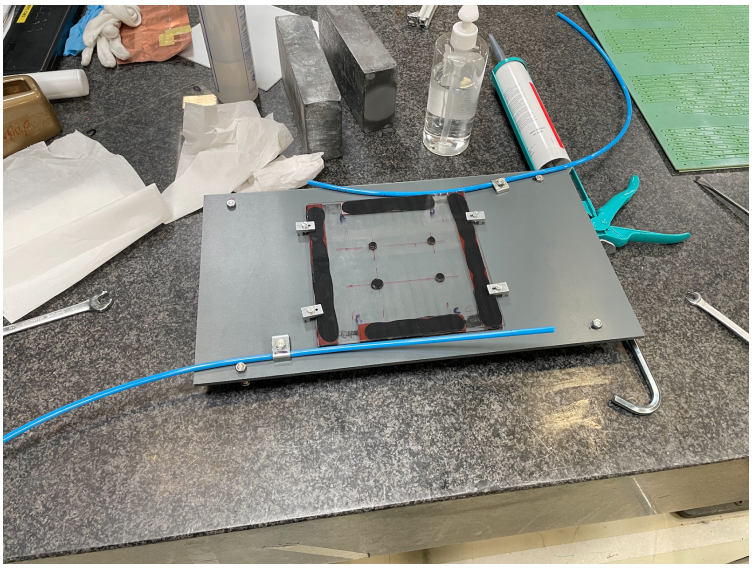


Figure 3: The Polycarbonate gap connected to the PVC platform with the polymer pipe conceded to the platform by using ()

Because the polymer pipe is so free to move we need more stabilization. Therefore, we used () tap to stabilize the outer part of the polycarbonate pipe and () tap to stabilize the inlet part of the polycarbonate pipe and seal the inlet and outlet of the gas system. The technic in this process is to tape the bottom side of the gap and

then tap the outer part of the polymer pipe to align the pipe() with the gap and then apply () black glue as shown in Fig.4 and then tape the inlet and outlet of the gap.

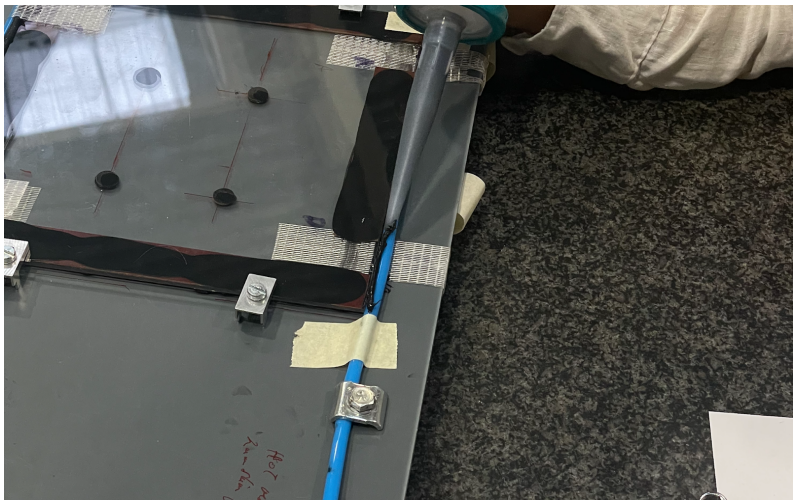


Figure 4: Appling the () black adhesive to the polymer pipe

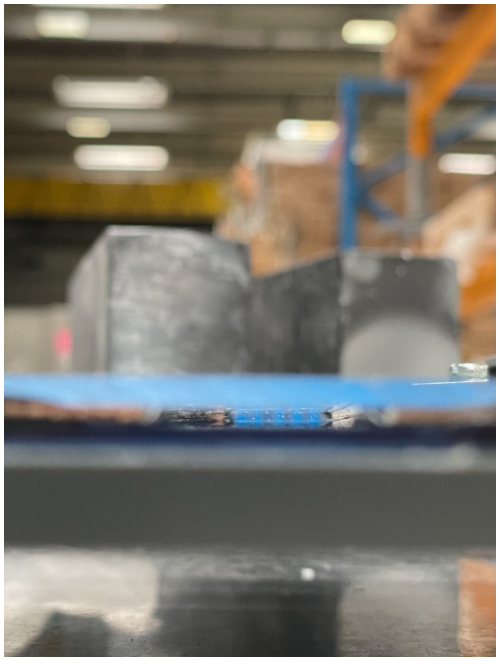


Figure 5: The polymer pipe aligned with the gap inlet.

Interpretation on how to make it better

We make five holes along the two inlets for one pipe. And then we repeat that again for the outlet.
Why do we use blue tubes?
Why do we glue them this way?

Random notes:

-Gas tightness test for each gap→Three ways in ways:1-Using bubbling soap() 2-Using the particle sniffer(ask about the name) 3-Using the RPC gas rack with standard RPC gas and checking the gas flow rate.

-**On the interpretation of the first gap→**Get the data of the gas leak test and explain how you did it and what happened. And then talk about what you can do to improve the technic.

-On the second polycarbonate gap→ explain like the first gap. And how the first gap interpretation leads to this technic.

-On the second polycarbonate gap interpretation→ Get the data of the gas leak test and explain how you did it and what happened. And then talk about what you can do to improve the technic.

-On building the first gap→Explain how you build the gap and what challenges you faced. and then talk about how you can make things better.

-On the second polycarbonate gap→ Explain how your interpretations of the first gap have led you to this technic. Explain what problems you faced and what you can do to make it better.

-On the glass gap→

-We have faced so many problems in obtaining a 300mmX300mm clean glass that I have to mention everything that we did and every step we have done. We bought a bunch of glass then we noticed that we can not use the glass because the glass surface was damaged and I had some difficulties in cutting the glass to the right size. Therefore, we were forced to buy a new glass plate that was ore cut to the right size.

The making of a working gap

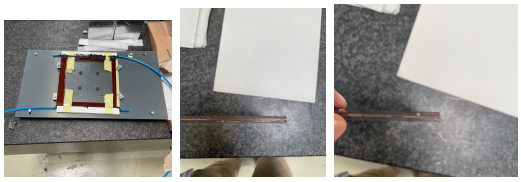
Polycarbonate
Why-
Easy to cut
Easy to find
Easy to manipulate
Useful glass gap-producing physics events
Standerd soldilnde glass
Relativist High resistivity glass
High resistive conducting coating

Gas calibration on a view of making a mixing station

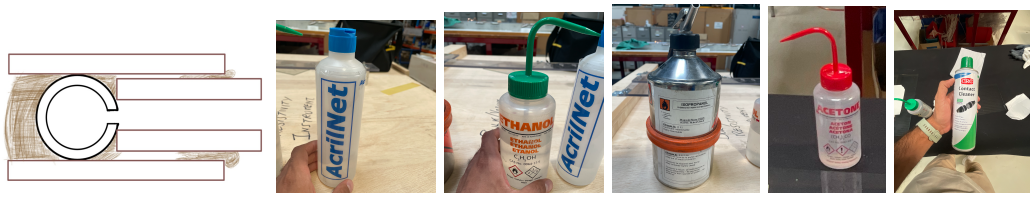
Presentation structure:

- **Work on the 1mm gap with the new injection system→**Talk about what happened after the last presentation till the last day at CERN.

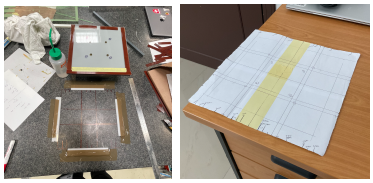
1-What we have changed in the next polycarbonate gap→The gas injection system, fixing the plate shifts and how was the result ,change the tape type, Mark the polymer pipe after you make the gap.



2-what we have done to start building the glass gap→Buying the glass plates and how we got the most operpiarte plates, The challenges behind having a clean glass plate, the thired new idea of the gas injection system.



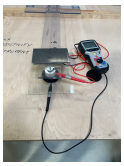
3-what challenges we have faced during the construction of the glass gap→Stabilizing the glass when gluing the two glass plates and what happen,mapping the side spacers and button spacers in the right position, having a gas tight gap



4-Why there was a broken glass gap→

5-Grapht layer for the electrodes→How did we paint the glass plate with () material, measure the surface resistivity, measure the bulk resistivity(Get pictures from: Parker Chomerics Surface vs. Volume Resistivity CS 030), do a test paint.



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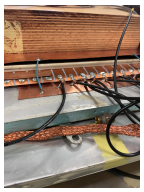
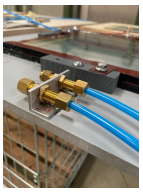
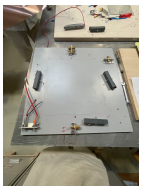
6-Building the RPC→steps on making the gap, Base for the gaps.

1-Making the gas injection polymer pipes
2-copper thin sheet
3-Glass gap
4-stips
5-mylar thin sheet
6-Glass gap
7-copper thin sheet

,1- 
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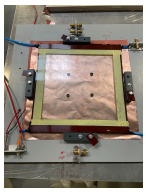
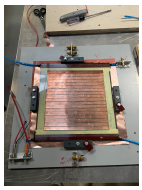
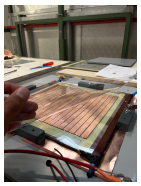
3- 
4- 
5- 
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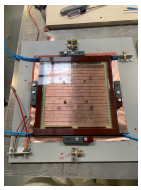
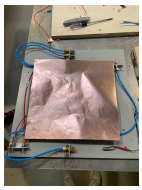

7- 

8-Gas calibration on a view of making a mixing station→How to calibrate a mix station, what I have done(Talk about the iPad record situation), what results I got.

Give graphics that you got from Excel.

9-what is next→

1-working with the gas.
2- Connecting the final part of the chamber.
3-Getting some data.
4-Making it as my bach thesis.

- **Construction of the iRPC chamber→**Talk about the spacers test you did and show some results. And talk about the gas leak test, why we couldn't conduct the spacers test in the first lab, How did we know that there was a broken spacer,

Gap test→ After concreting it to the (gas type) wait for I for 30 min, first 10 minutes let the pressure and temp stabilize(we had a problem in the first lab where the temp and pressure wasent stable because there was a lot of movement), after 10 other min we see if there is any leak(you know in this min), the 10 min we see if there is the problem in the spacers(push the (0.1mbar difference is good nothing is bad)

0.1 spacer test
0.4 mbar for gas leak

-Push in the spaces place
-0.4mbar different for each 10 min no leak

dark current test
-connected with gas 24 hour
-Increase the volt and see how much current you will get
-When the current increase is not a straight way there is a problem