



# STA

El-swedy technical academe



# Outlines

- Introduction about the project (proposal).
- Plan and Preparations In Egypt
- Arrive At CERN
- Test Beam Activities
- Data Analysis
- Results.
- Prospects



# STA Project

Using eco-friendly gas ( $\text{CF}_3\text{I}$  + eco-Freon) mixture instead of ( $\text{SF}_6$ ) in order to reduce the global warm.

## How?

- We measure the efficiency of MRPC using the eco-friendly gas ( $\text{CF}_3\text{I}$  (50%) + eco-Freon (50%)) and compare it with the efficiency when using standard gas ( $\text{SF}_6$ ).
- Due to the negative effect of ( $\text{CF}_3\text{I}$ ) on DNA we decide to use ( $\text{CO}_2$  + eco-Freon) mixture.
- Due to the un-availability of  $\text{CO}_2$  we use the (He + eco-Freon) mixture.

→ *The results presented in these slides for the (Helium + eco-Freon) mixture*





# Work in Egypt

- Preparation for the work with glass-MRPC and learning software needed for Data Analysis.
- Follow zoom STA-CERN classes where support scientists from CERN presented the the experimental setup of the MRPC and electronics.





# Arrive at CERN

- Registration at CERN
- Following safety courses
- Visit different CERN facilities (ATLAS experiment – computing rooms - etc.)





# Day At Geneva

Visit Site seen places at Geneva city

Q  
—  
Q



Q  
—  
Q





# Test Beam Activities

1. Exploring the test beam area
2. Gas room (Adjusting the gas mixture)
3. Setup place
4. Control room (Where the data are taken and recorded)



Gas  
room  
image



# Working days

Shifts for Data-Taking  
(Test beam control room)



Data Analysis  
(Room 13-2R13)

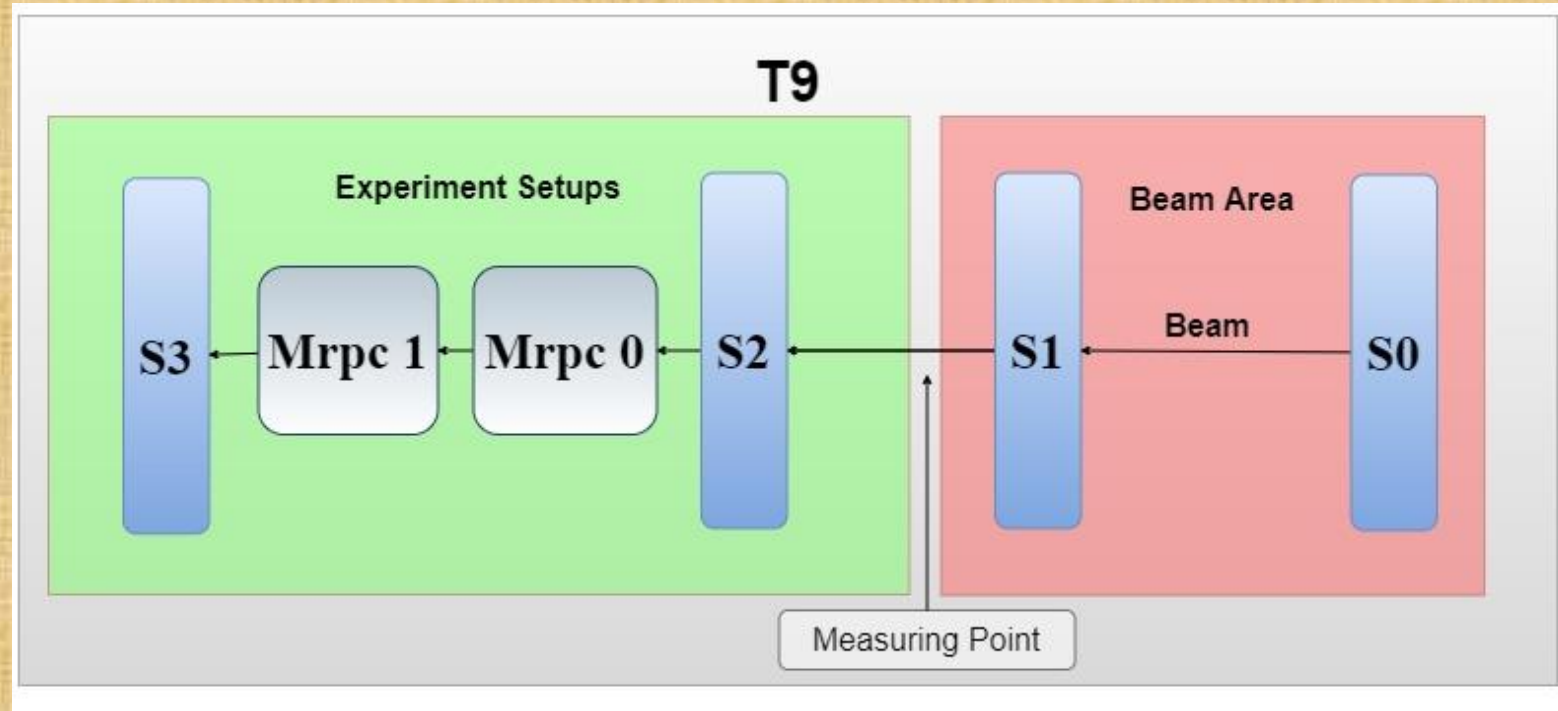


For 8 days working was going parallel in both sites (Test beam control room & Data analysis room)



# Test-Beam setup

Schematic diagram of test beam



Real photo of test beam



# Calibration of Scintillators

Calibration constant = TOF (theoretical – Experimental)

Where

$$\text{Energy (E)} = (P^2 C^2 + m^2 C^4)^{1/2} = (P^2 + m^2)^{1/2}$$

$$\text{Speed (v)} = P/E$$

$$\text{Time of Flight (TOF)} = \text{detector distance} / (v * c) * 10^9$$





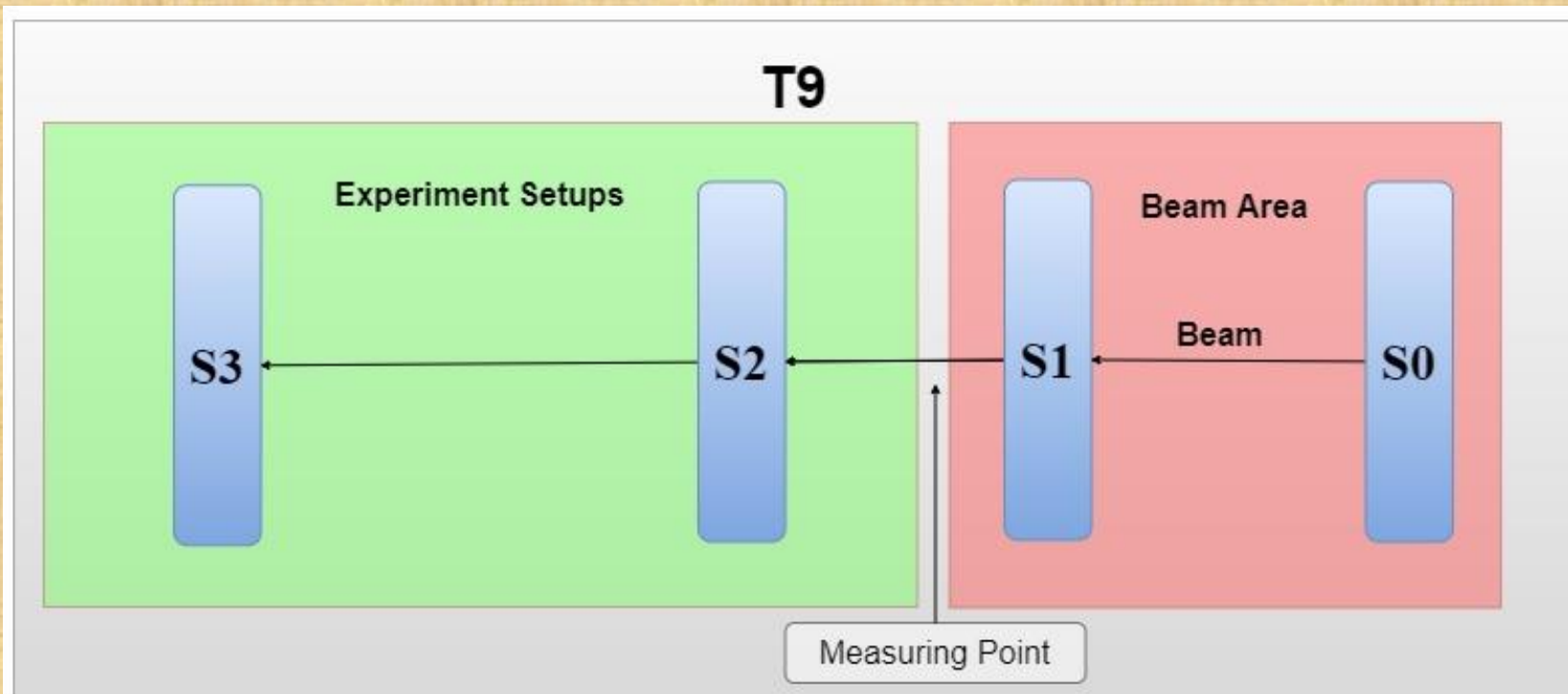
# Calibration of Scintillators

Calibration was done using **Positron beam** at 2 different distances between S1, S2 and S3.

Distance between S1- S2 is 268 cm & S1-S3 is 269.4 cm (standard)

Distance between S1- S2 is 218 cm & S1-S3 is 294.7 cm (Case1)

Distance between S1- S2 is 220.1 cm & S1-S3 is 295.6 cm (Case2)



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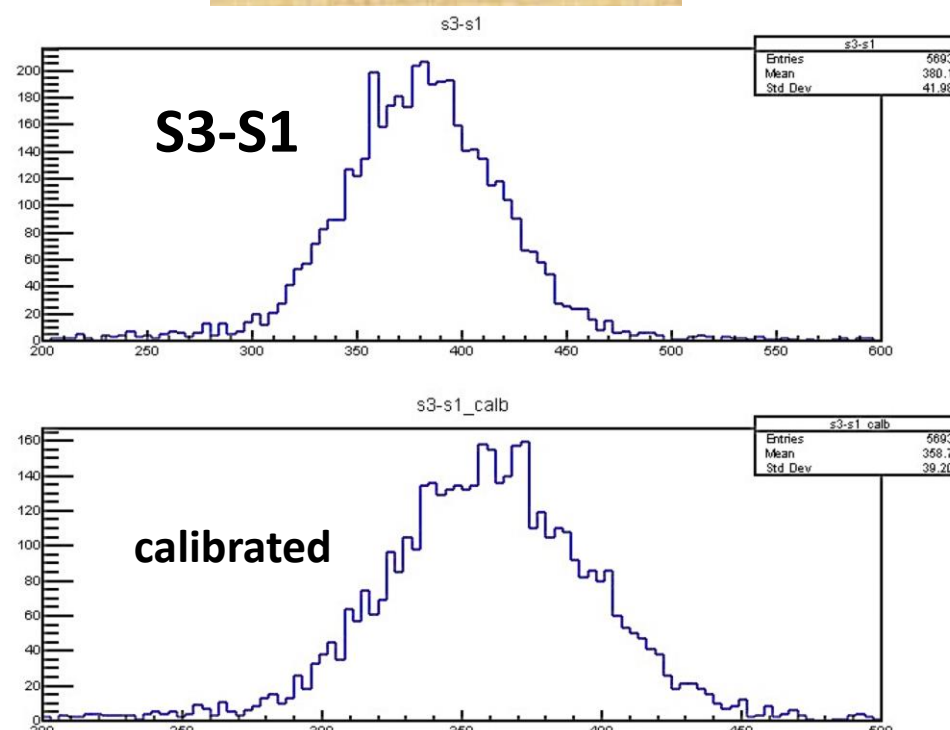
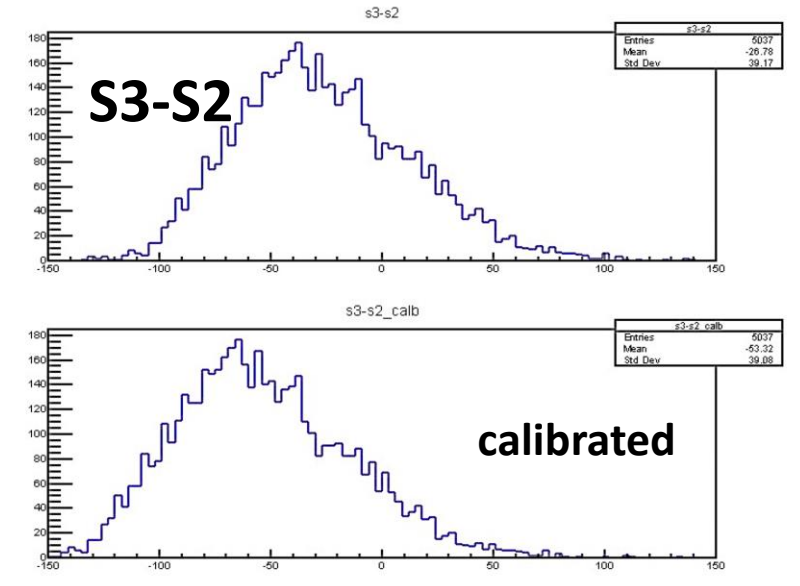
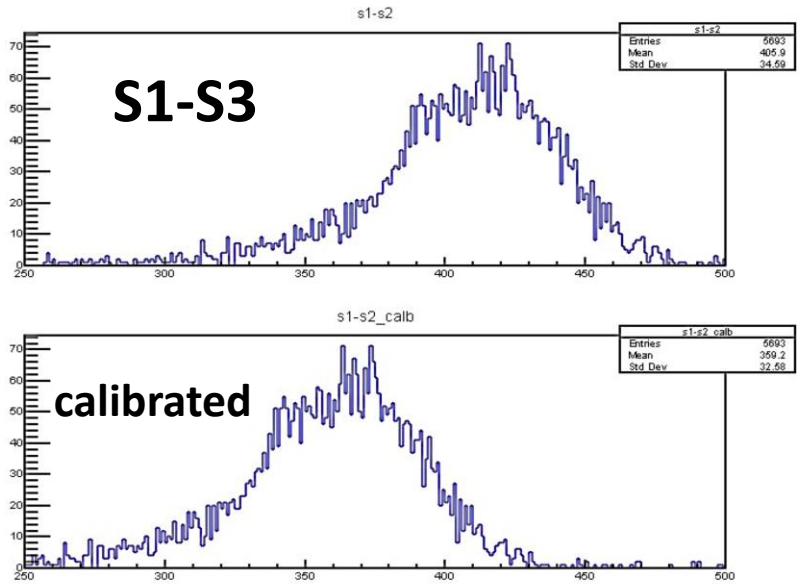
For each case Calibration was done as following:

- Calculate TOF Theoretically
- Calculate TOF Experimentally
- Calibrate TOF Experimentally





# Calibration of Scintillators (Results)



We noted that:  
When the distance between  
the scintillators increase we  
can distinguish between  
different charged particles  
because of different Time OF  
Flight (TOF)

# Calibration of Scintillators (Results)

Q<sub>1</sub> Q<sub>2</sub> Q<sub>3</sub>

Q<sub>4</sub> Q<sub>5</sub> Q<sub>6</sub>



# Calibration of Scintillators (Results)

Q<sub>1</sub> Q<sub>2</sub> Q<sub>3</sub>

Q<sub>4</sub> Q<sub>5</sub> Q<sub>6</sub>

# (Efficiency Measurements)



- Efficiency was calculated at working operation voltage = 5000 volt for MRPC with Standard gas mixture (SF6) and with Helium+ eco-Freon mixture.
- 8 MRPC strips (Channels) left (Ch8 to Ch15)
- 8 MRPC strips (Channels) right (Ch16 to Ch23)
- 8 MRPC strips (Channels) left (Ch24 to Ch31)
- Efficiency (Eff.) = output/input
- Where input is taken defined by the Coincidence signal between S1, S2 and S3.
- Output is taken from each MRPC strip group.





# Conclusions

We calculate the efficiency for MRPC0 and MRPC1 at different (Positrons) beam energies We find that:

- The efficiency using SF6 gas is better than using Helium gas
- The efficiency of MRPC0 is better than that of MRPC1.
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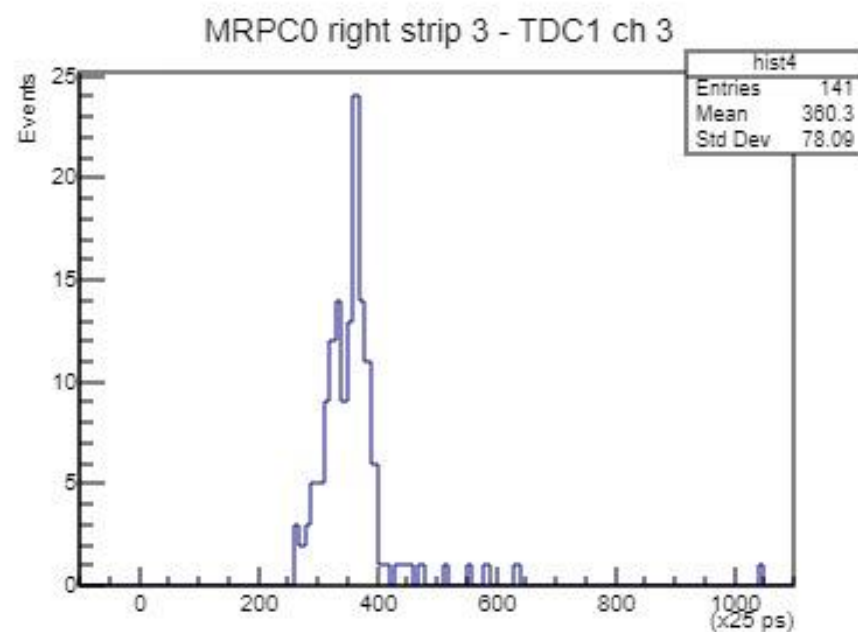
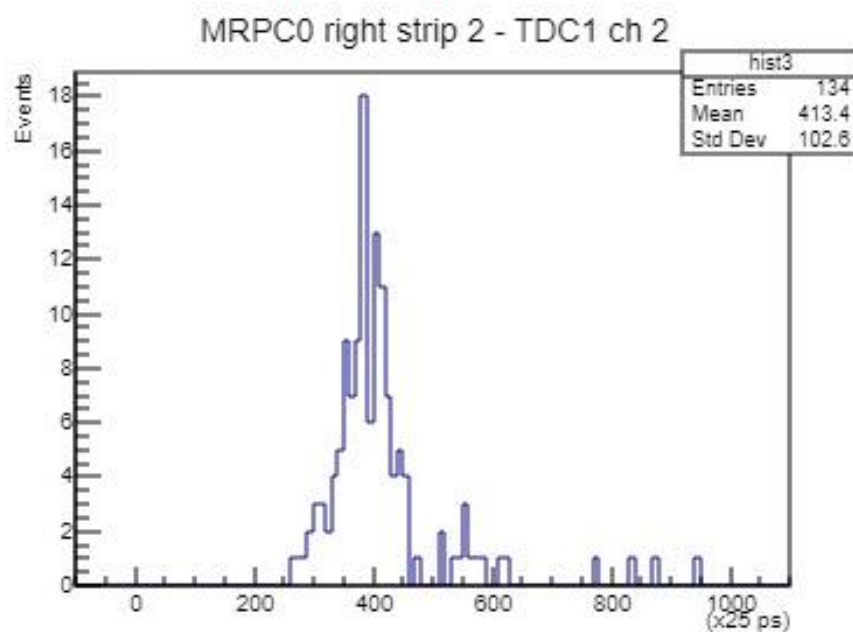
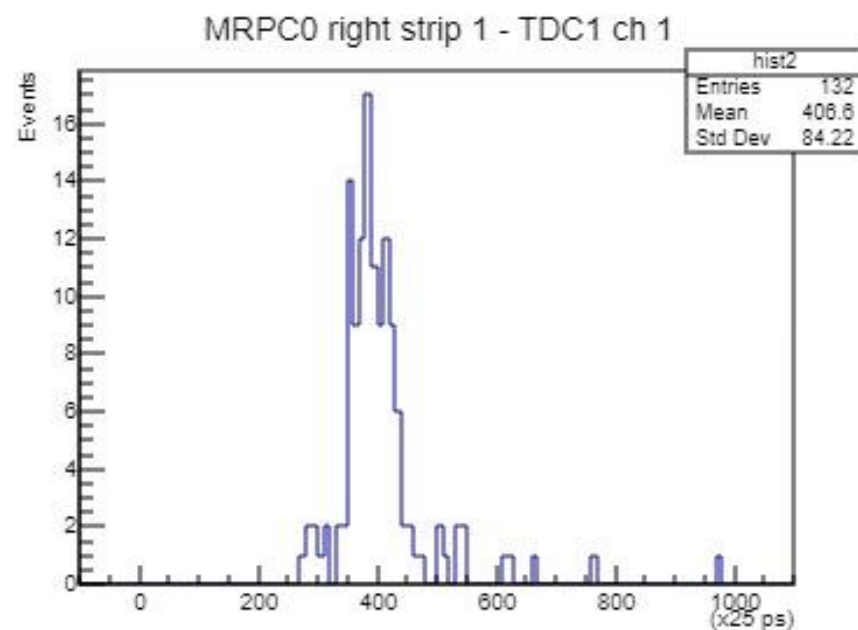
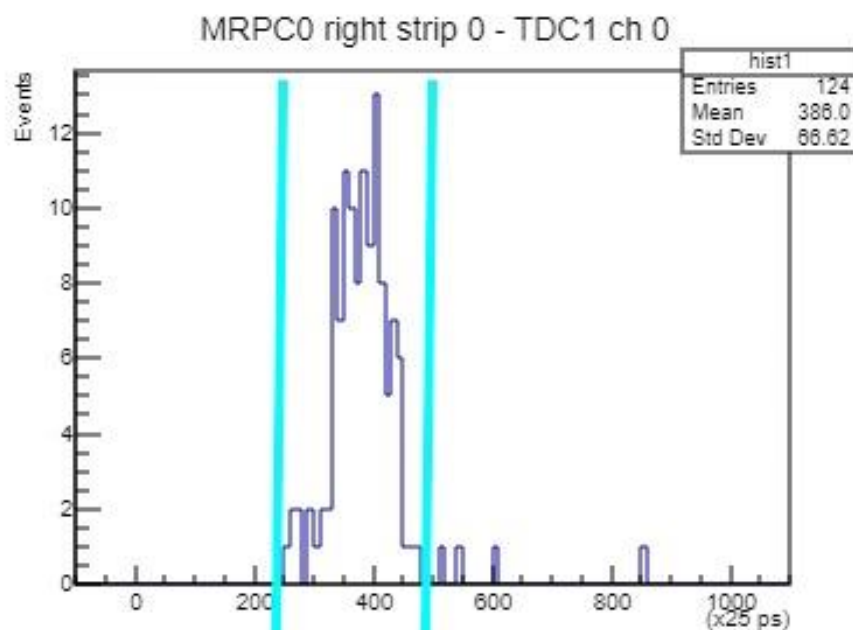
# Conclusions

We find that:

- The efficiency using SF6 gas is better than using Helium gas













Any questions ?

