

# HIT

## First look at RAW data distributions

Explorer @ HIT (22-26/02/2014)

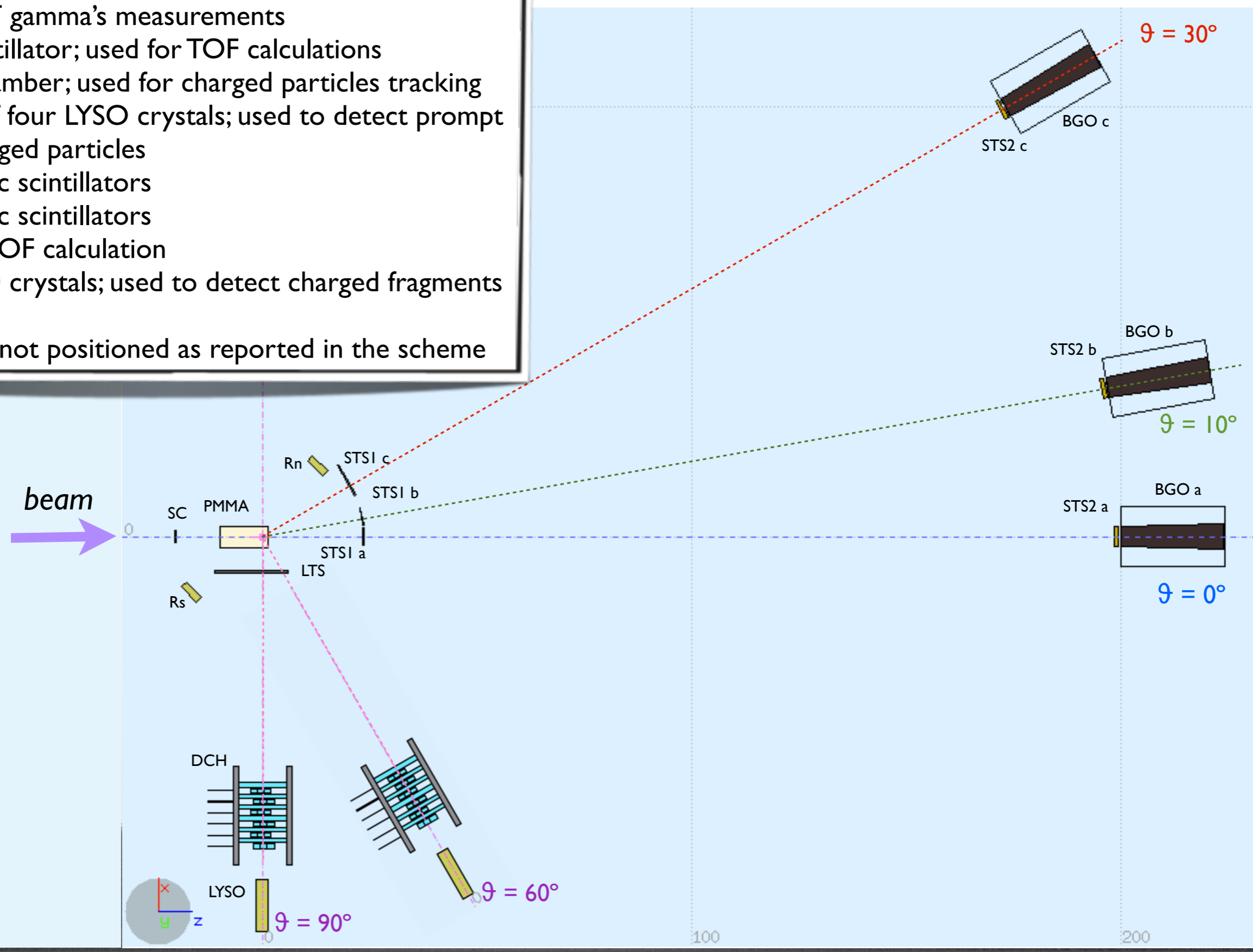
### Meeting INSIDE

Ilaria Mattei

25 Marzo 2014

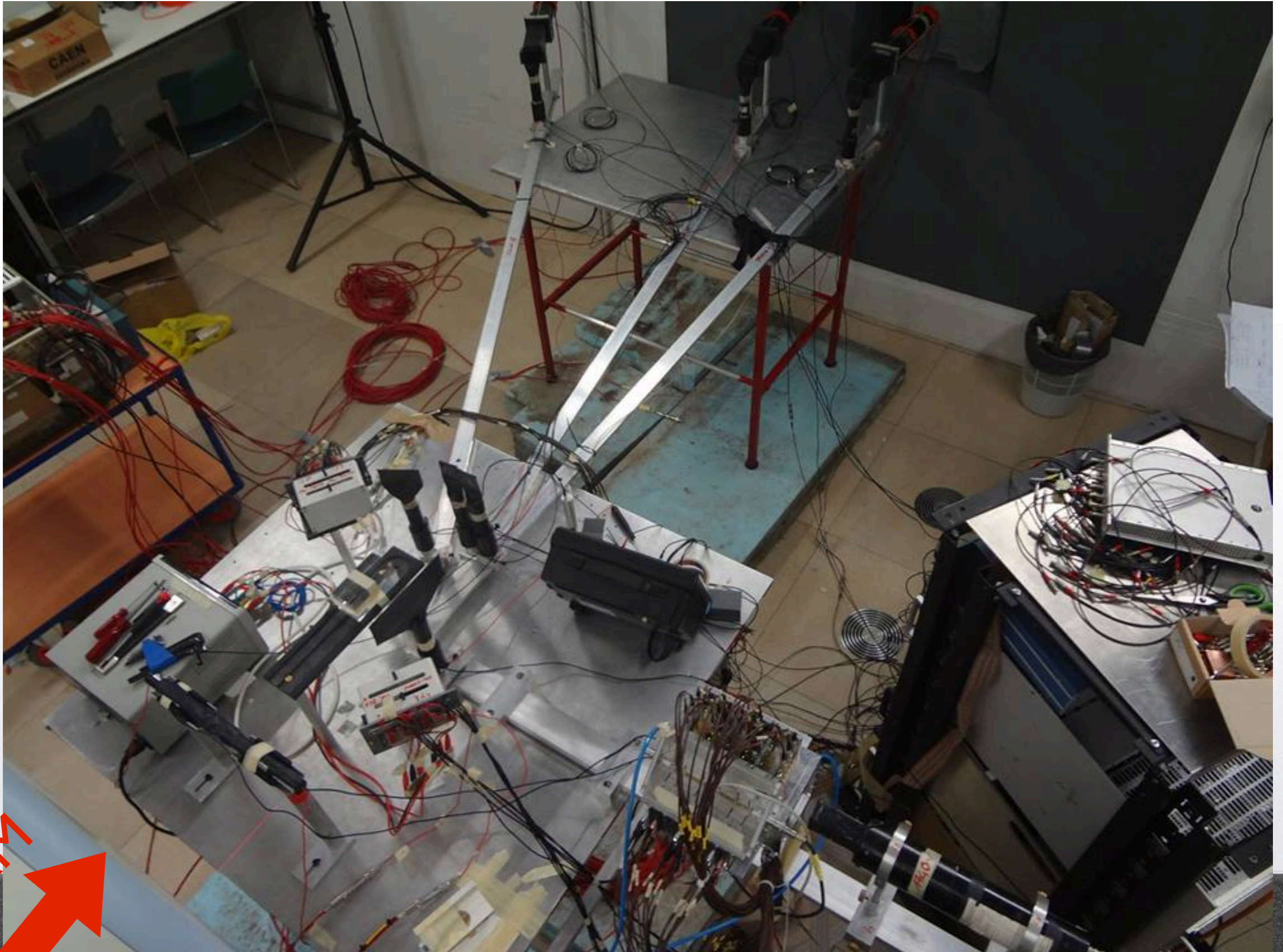
# Experimental Setup

SC = plastic scintillator; used as trigger for the DAQ  
 PMMA = phantom  
 Rn\* = 2 pixelated LYSO, side by side, 1.6 x 5 x 5 cm<sup>3</sup> each  
 Rs\* = 2 pixelated LYSO, side by side, 1.6 x 5 x 5 cm<sup>3</sup> each  
 Rn,s used for PET gamma's measurements  
 LTS = plastic scintillator; used for TOF calculations  
 DCH = Drift Chamber; used for charged particles tracking  
 LYSO = matrix of four LYSO crystals; used to detect prompt photons and charged particles  
 STS1a,b,c = plastic scintillators  
 STS2a,b,c = plastic scintillators  
 STS1,2 used for TOF calculation  
 BGOa,b,c = BGO crystals; used to detect charged fragments  
 \*Rn and Rs were not positioned as reported in the scheme





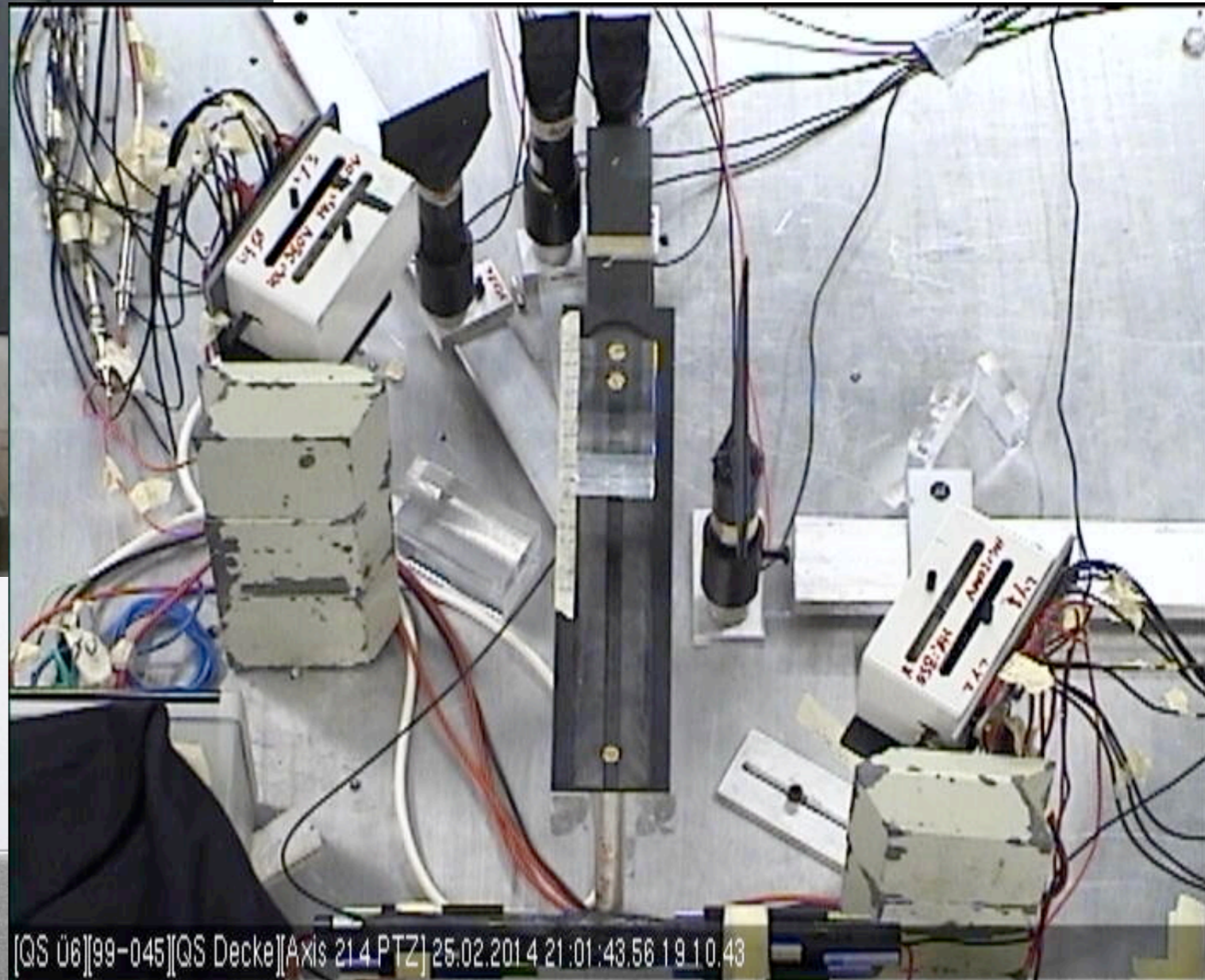
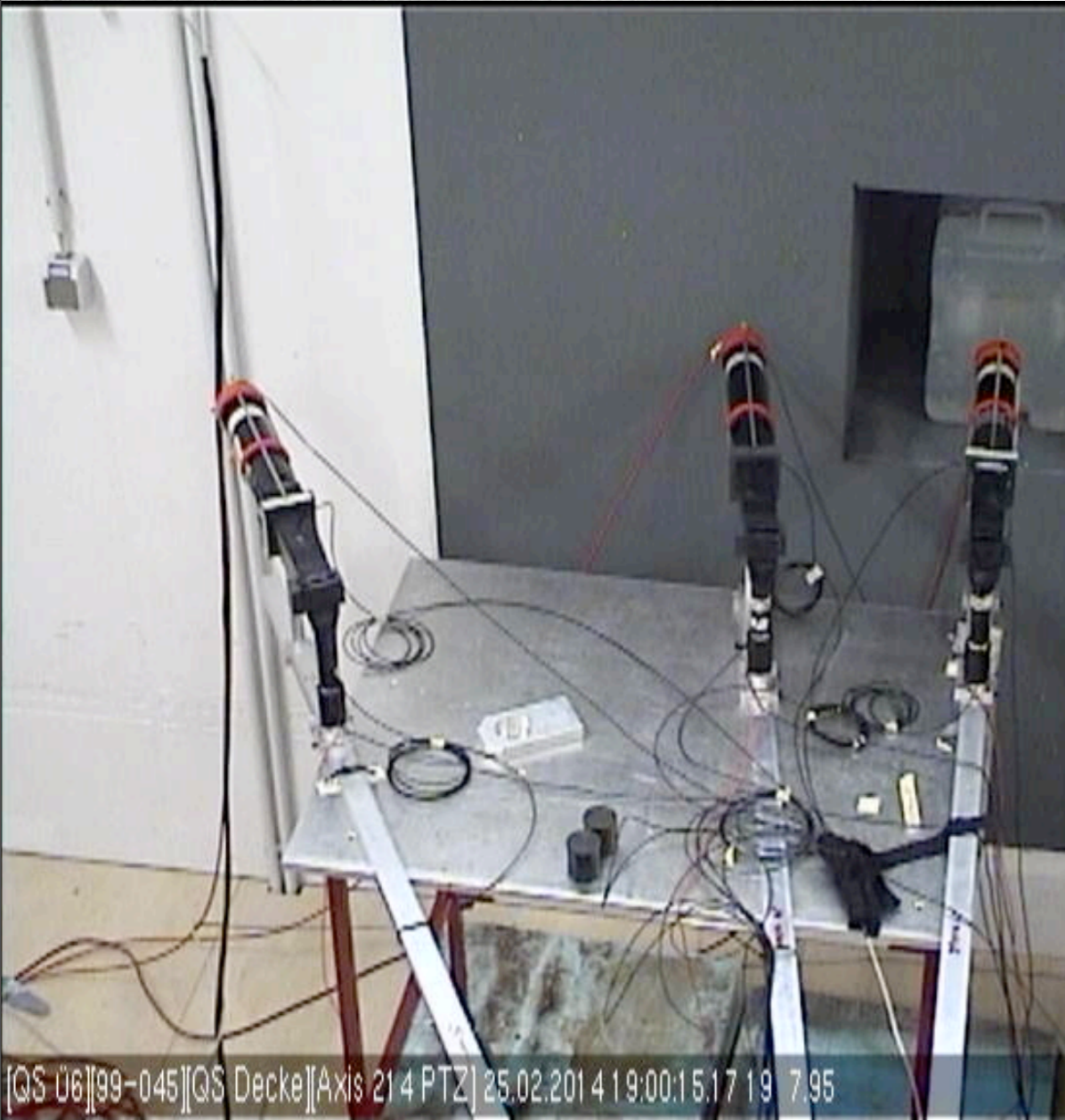
# Experimental Setup



BEAM

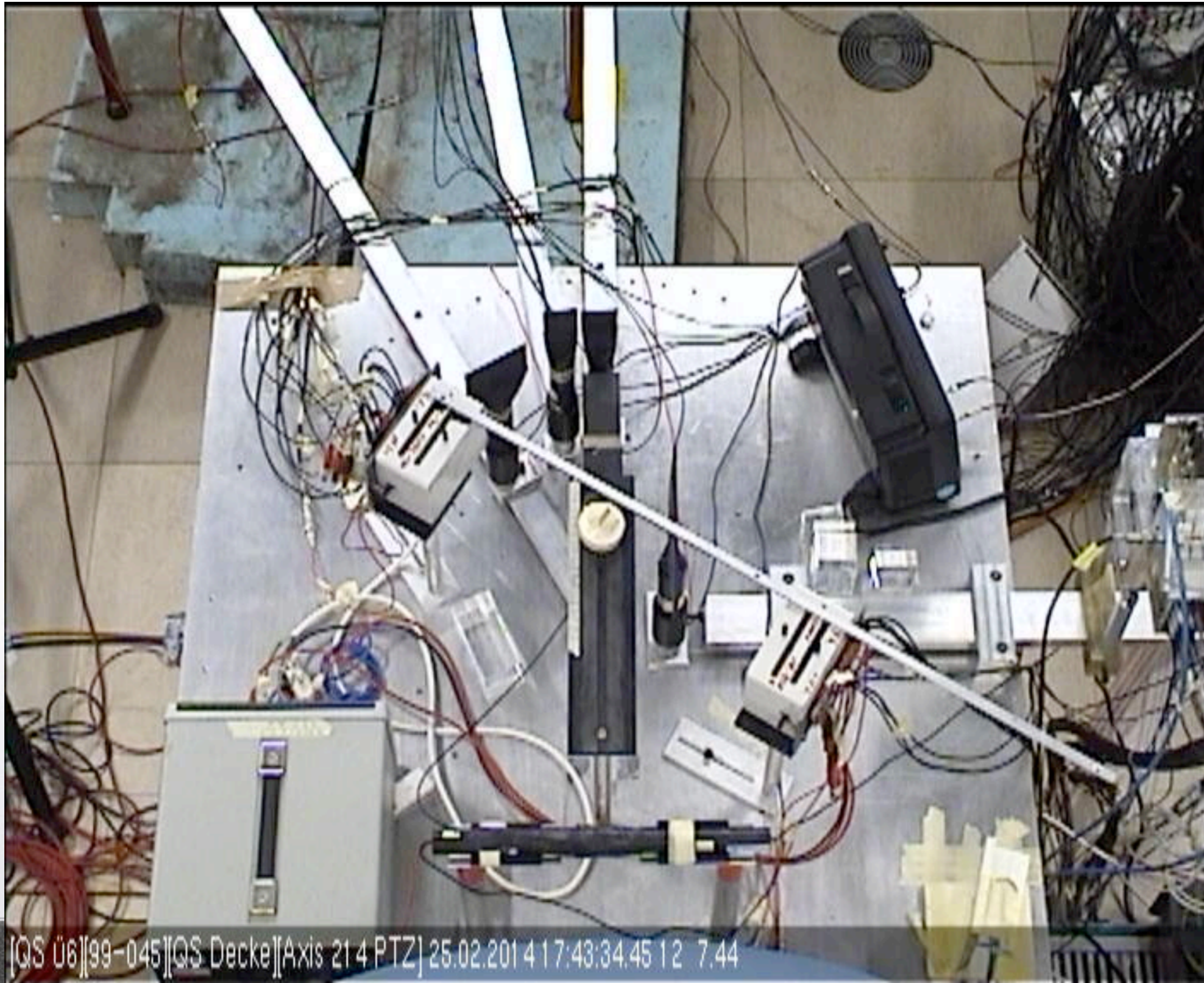


# Experimental Setup





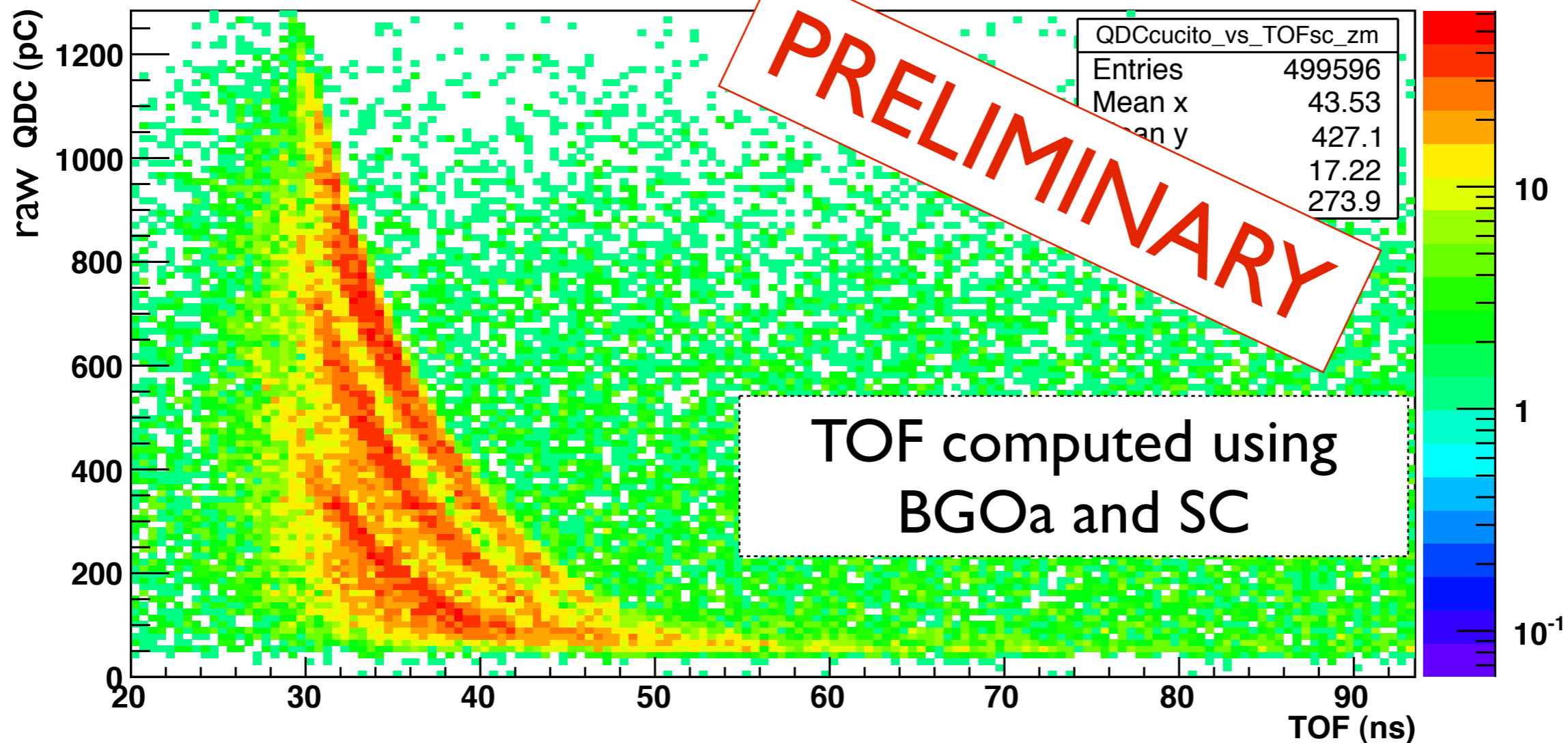
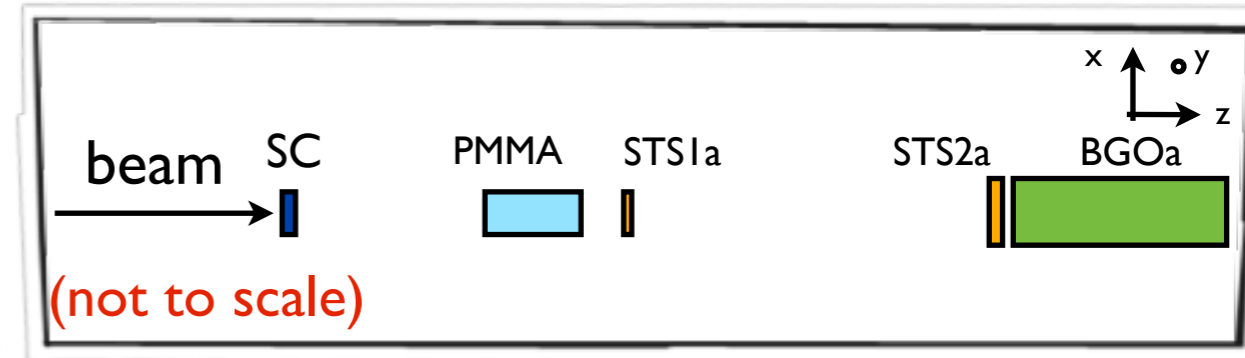
# Experimental Setup





# Secondary Fragments from $^4\text{He}$ 102 MeV/u detected with BGO crystal at 0 degrees

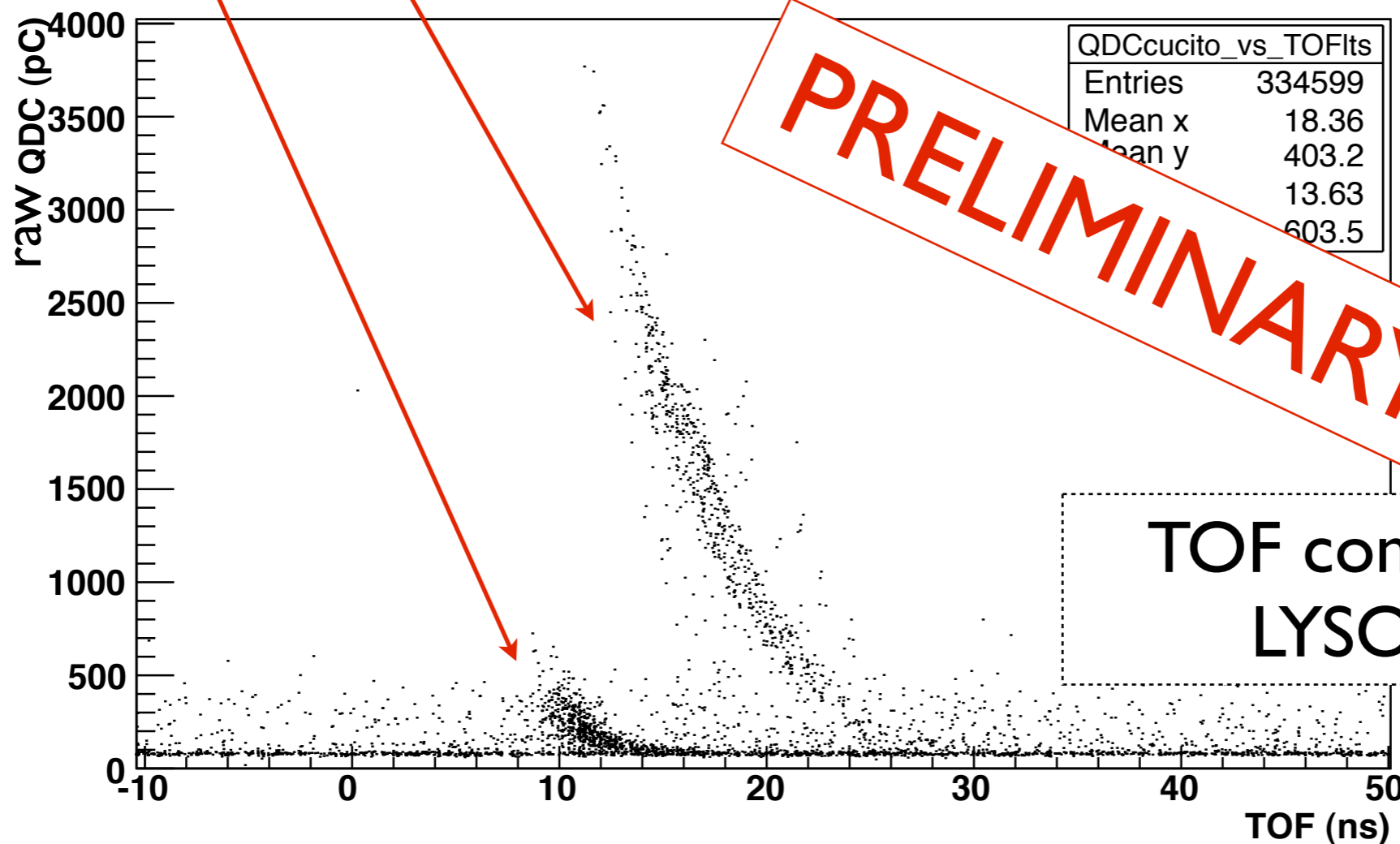
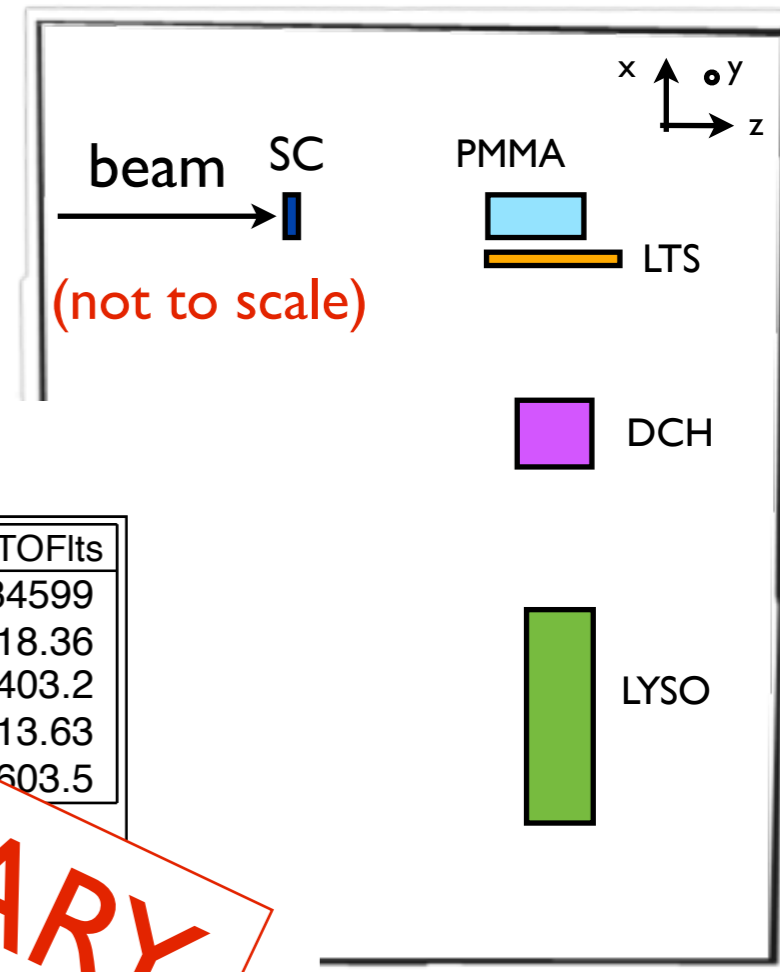
The protons, deuterons and tritons  
bands are visible.  
(no slewing effect correction)



# Prompt Photons from $^4\text{He}$ 102 MeV/u detected with LYSO crystal at 90 degrees

Prompt Photons  
(slewing effect not corrected yet)

Charged Particles  
(protons)  
(slewing effect not corrected yet)

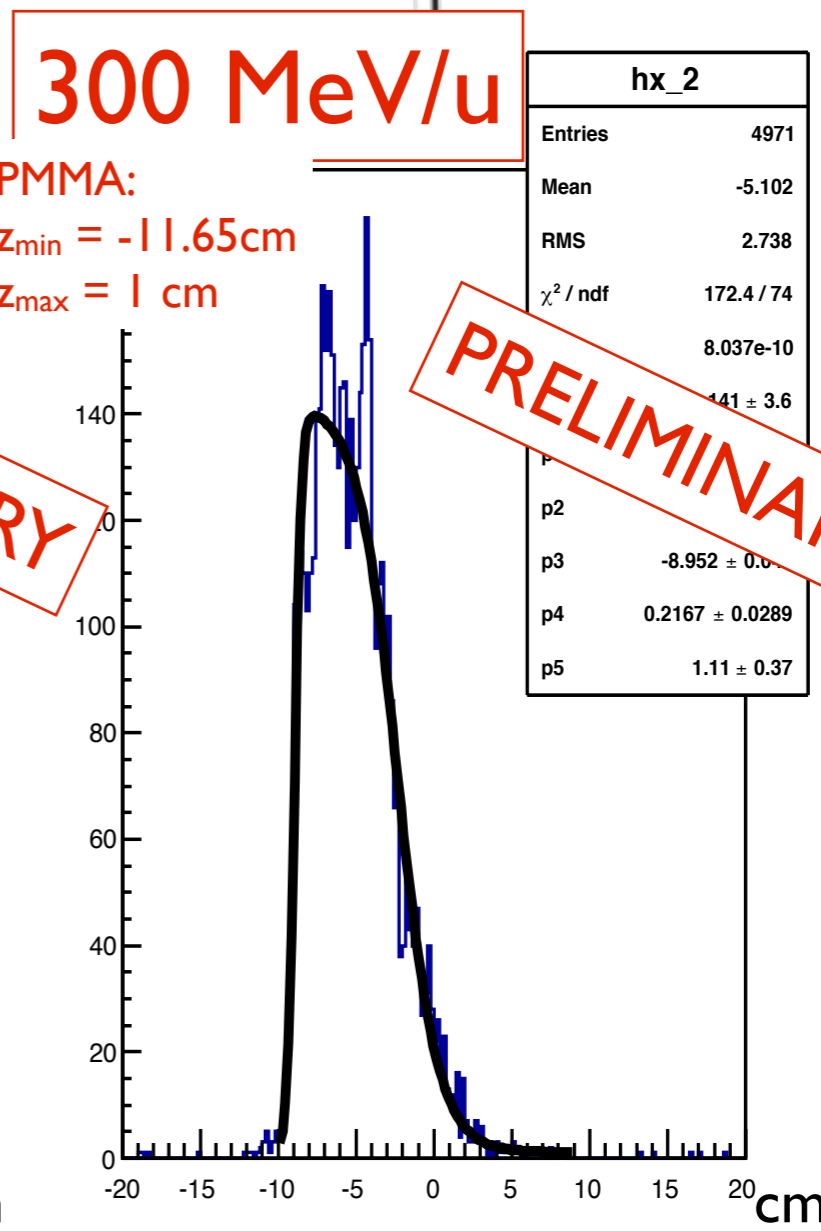
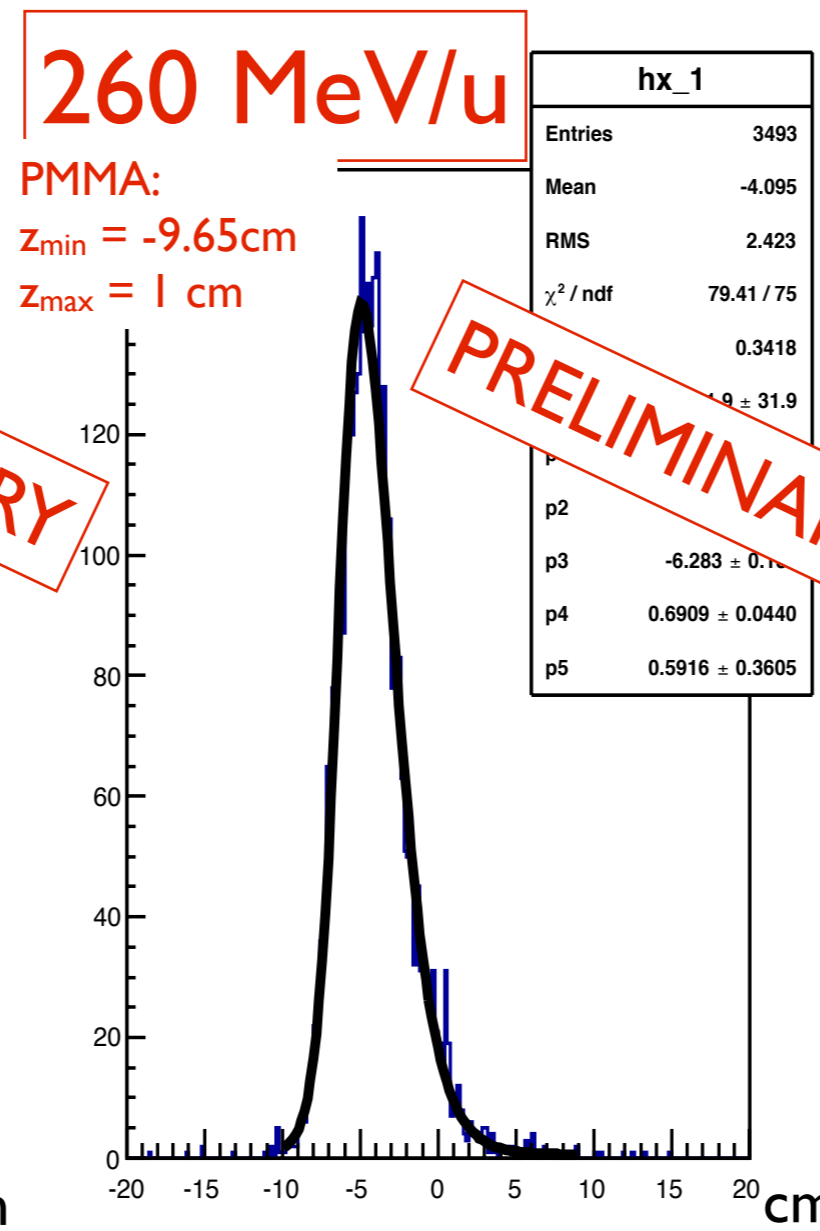
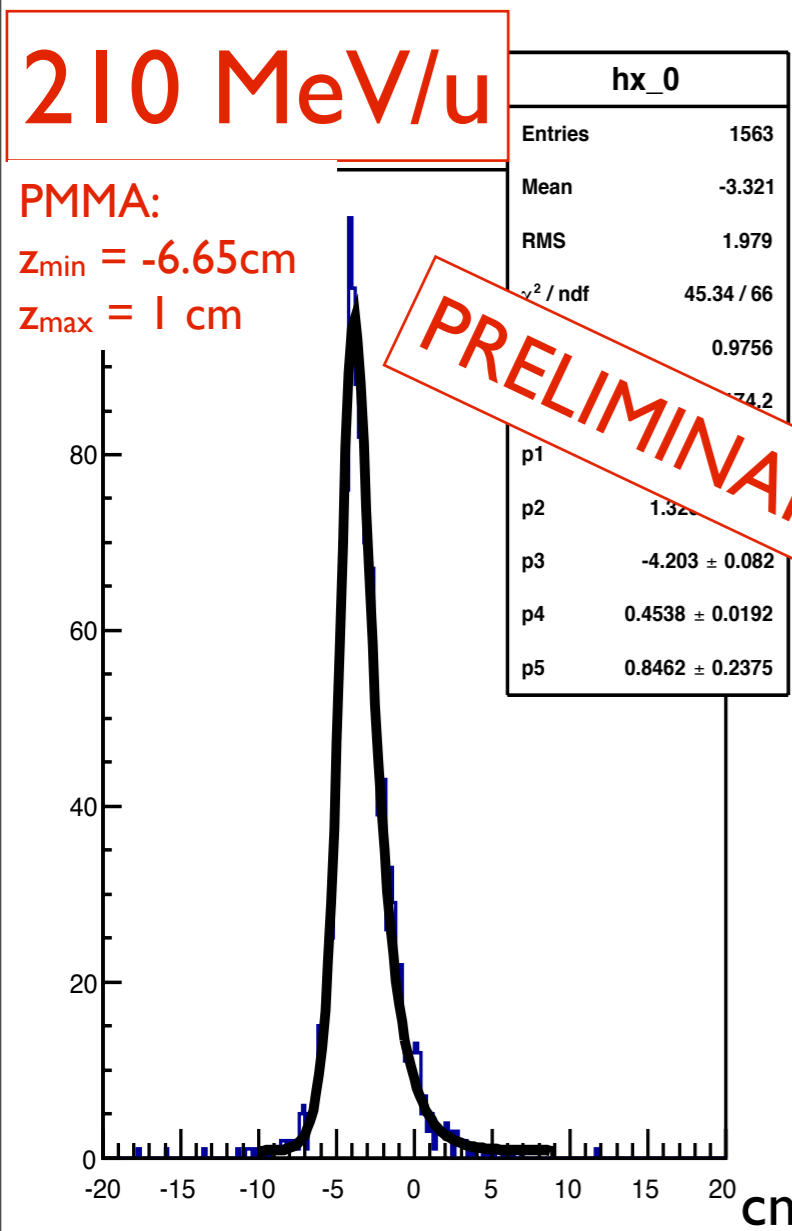
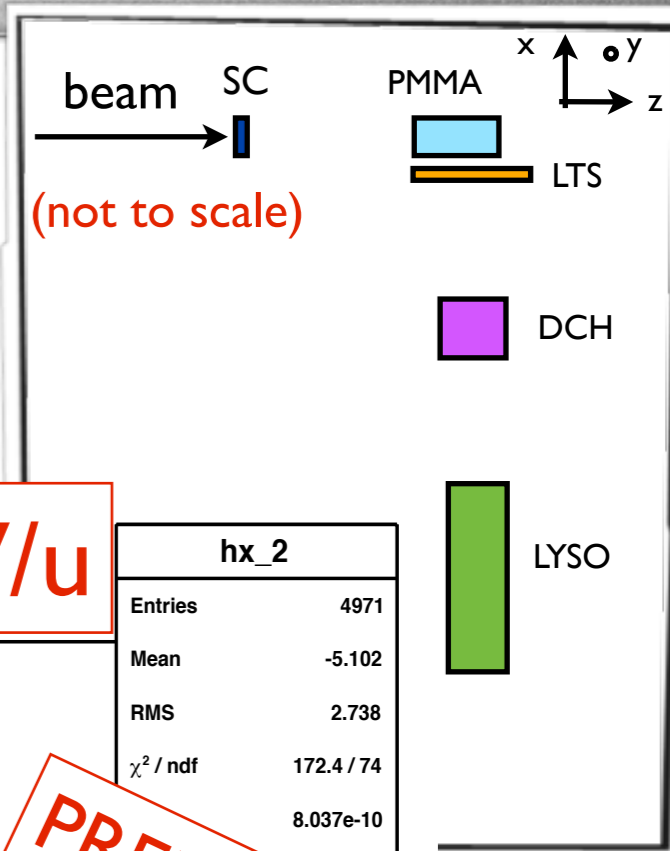


**PRELIMINARY**

TOF computed using  
LYSO and LTS

# Secondary Charged Particles from $^{16}\text{O}$

Emission profile of secondary charged particles, reconstructed tracing back charged particles to the beam line. Tracks are detected with the drift chamber (DCH) [1].



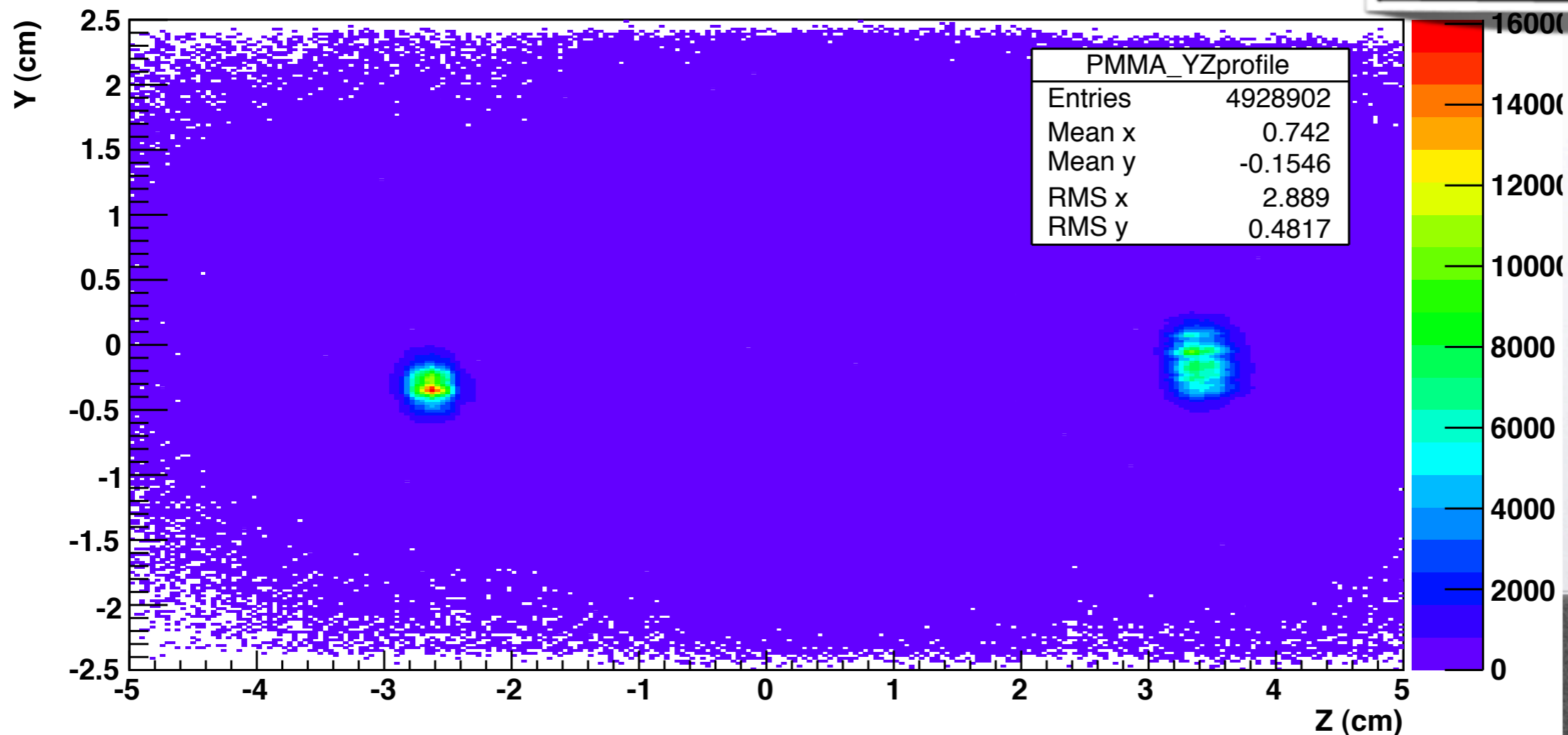
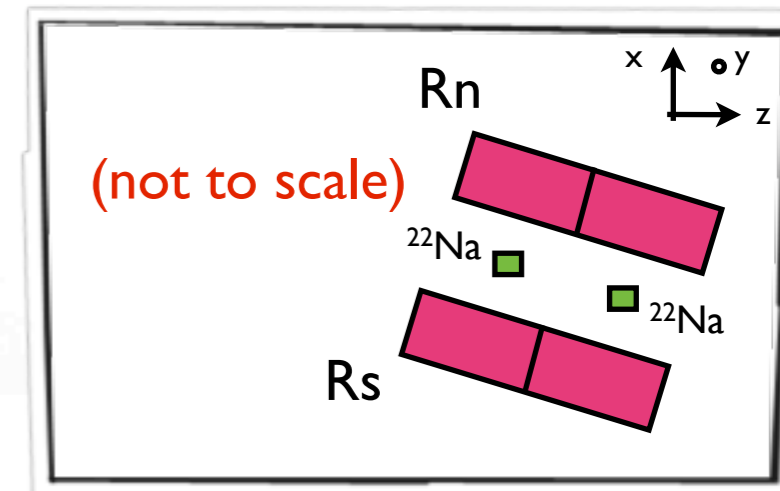
[1] C. Agodi et al. - Charged particle's flux measurement from PMMA irradiated by 80 MeV/u carbon ion beam, *Physics in Medicine and Biology*, vol. 57, no. 18, p. 5667, (2012)



# PET Photons calibration with two $^{22}\text{Na}$ sources using four “PET heads” (pixelated LYSO)

Pixelated LYSO dimensions (i.e. each ‘head’):  $1.6 \times 5 \times 5 \text{ cm}^3$

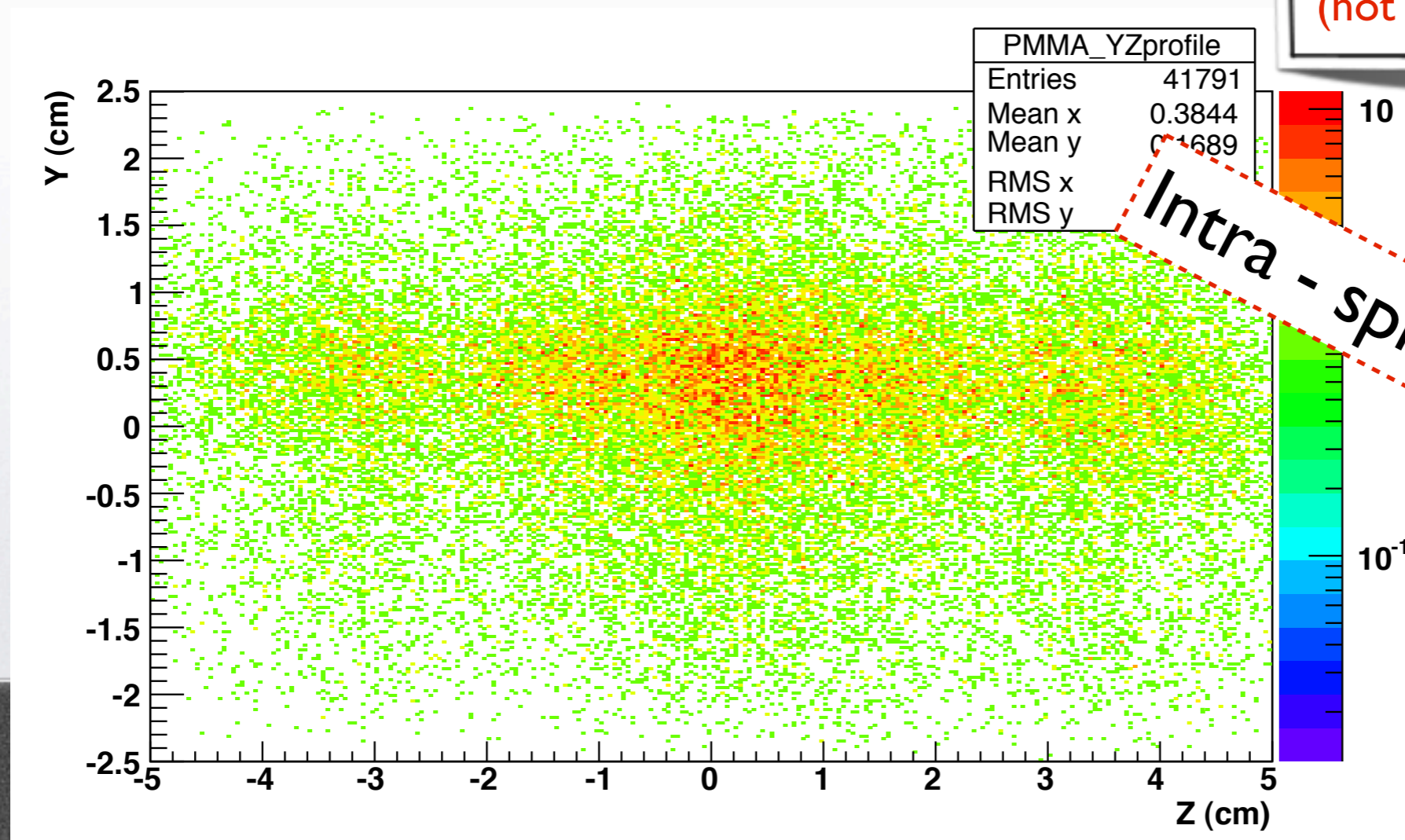
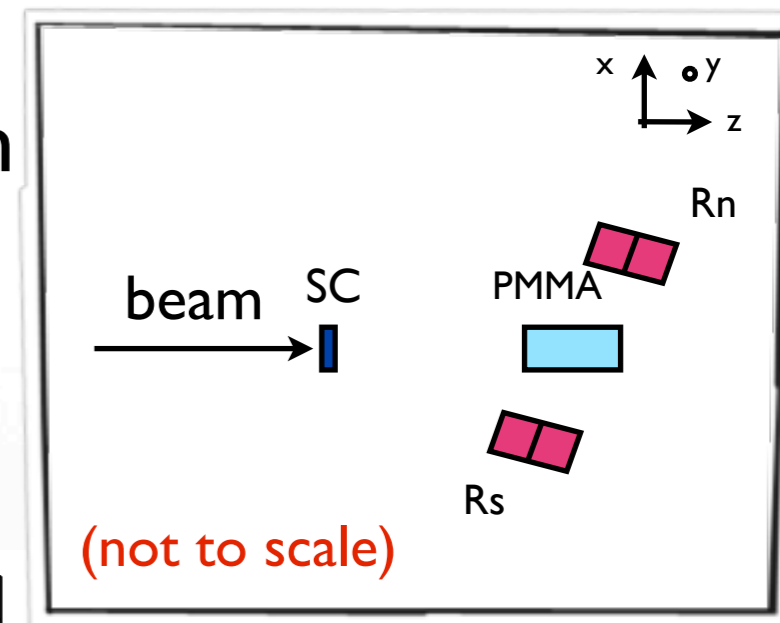
From a preliminary reconstruction of the back-to-back photons direction, it's possible to see the position of the  $^{22}\text{Na}$  sources





# PET Photons from ${}^4\text{He}$ 125 MeV/u detected with pixelated LYSO crystals

Preliminary reconstruction of the  $\beta^+$  decay point in the YZ plane (Z = beam axis, Y=vertical direction).  
N.b.: no corrections for detector efficiency nor geometry acceptance.

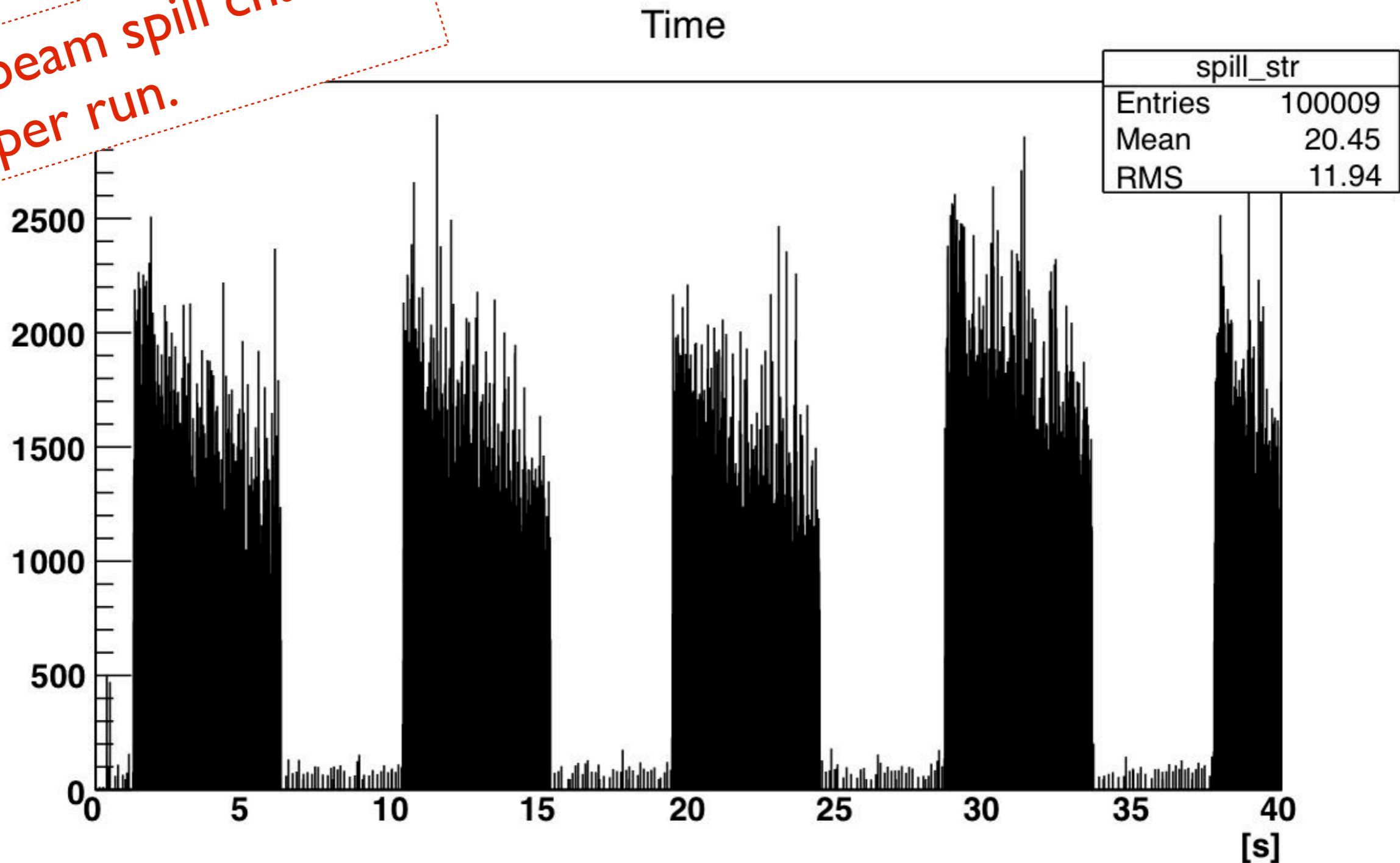




# About the Beam...

Example of spill structure of the 125 MeV/u Helium Beam in one run:

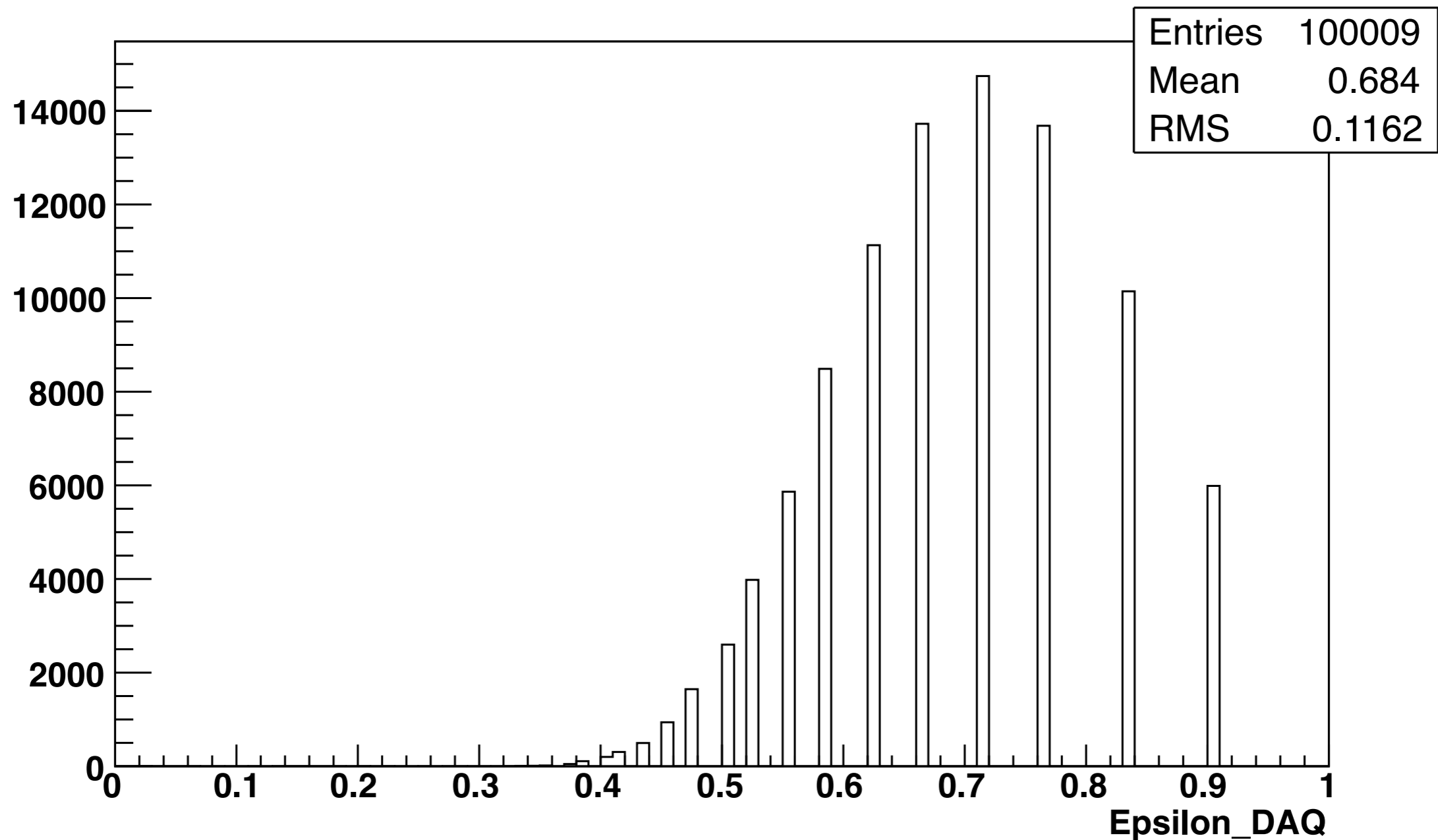
*The beam spill changes run per run.*





# DAQ efficiency evaluation

$\text{Epsilon\_DAQ} = (\text{Number of acquired ions}) / (\text{Number of traversing ions})$   
measured with the SC





...MEN at WORK...

