11B Analysis with S455 Setup

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R3B Collaboration Meeting
30. Nov. 2020

Setup and Detectors

Particle Identification

12C(p,2p)11B reaction

Summary & Outlook

Supported by BMBF 05P15WOFNA and 05P19WOFN1.

The results presented here are based on the experiment s444/s473, which was performed at the beam line/infrastructure Cave C at the GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt (Germany) in the frame of FAIR Phase-0.

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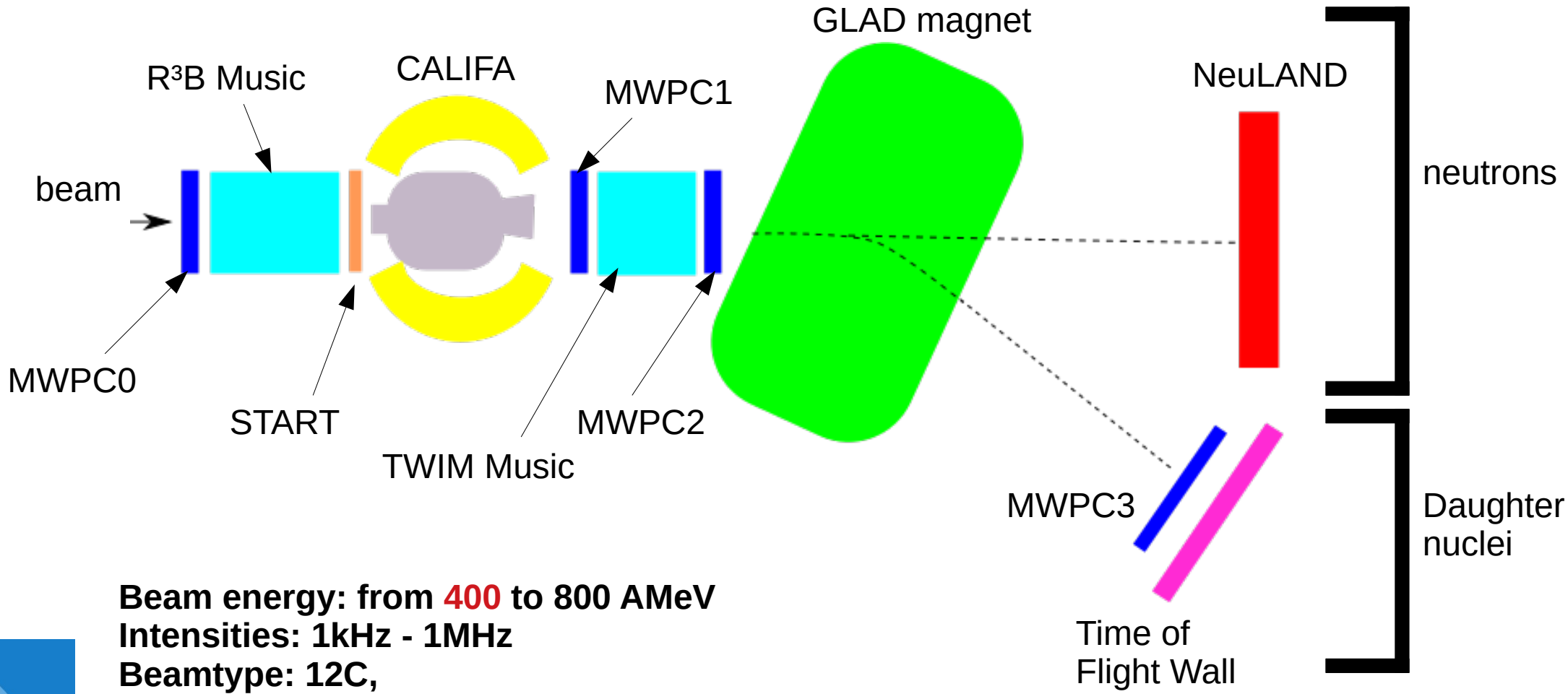
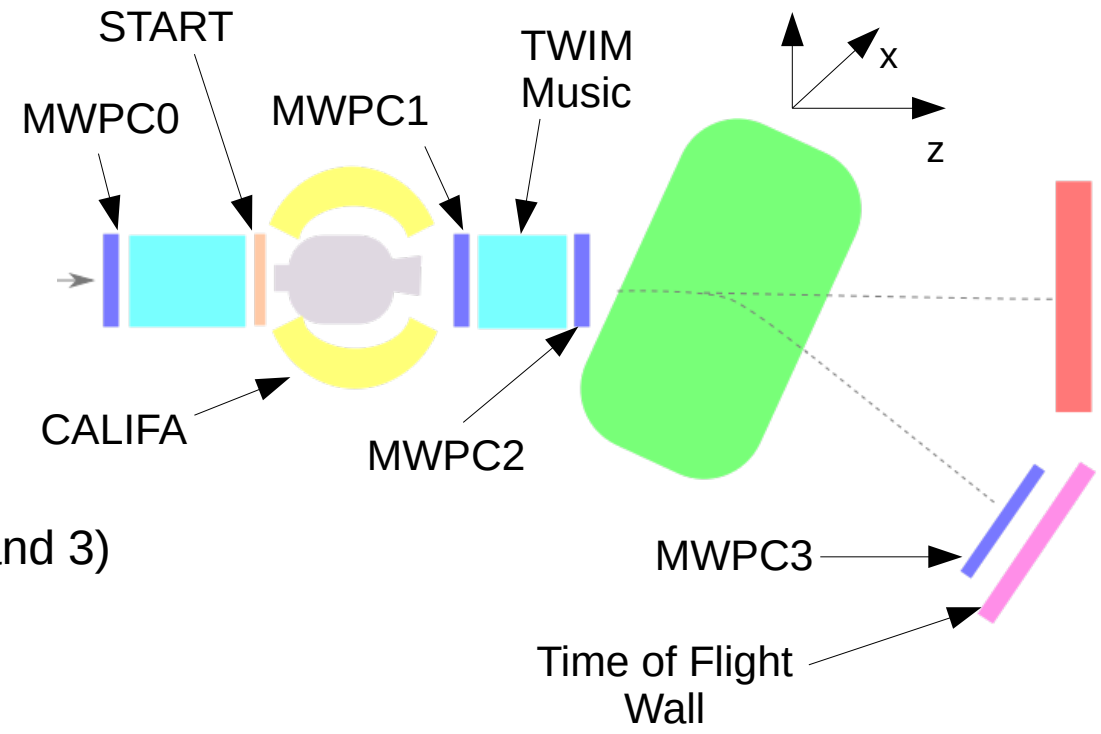
The S455 Setup (February 2020)



Beam energy: from 400 to 800 AMeV
Intensities: 1kHz - 1MHz
Beamtype: 12C,
Target: C, CH2

Particle Identification

$$B\rho = \frac{\beta \gamma M}{q}$$

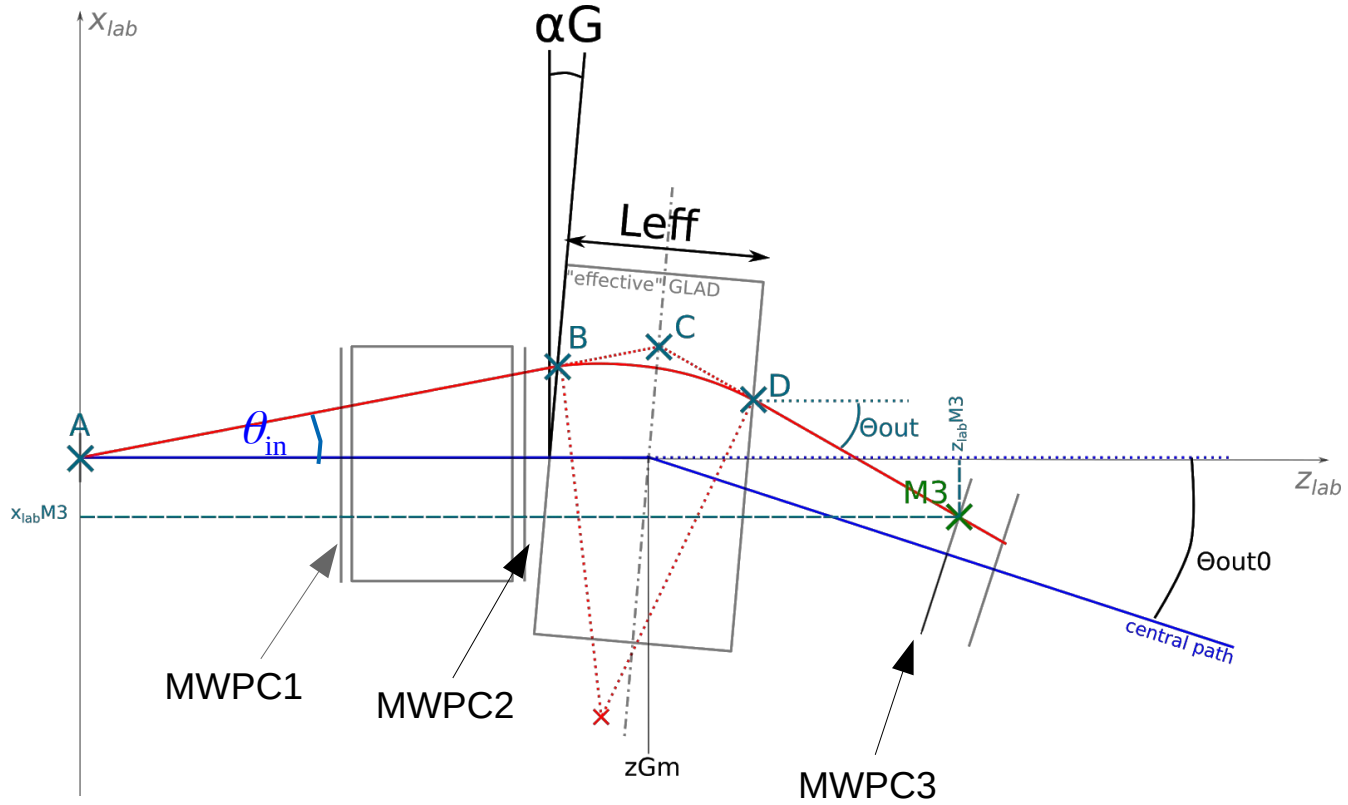


Time of Flight Measurement: Start to TOFW

Flight-path Reconstruction: Tracking Detectors (MWPC1, 2 and 3)

Charge Measurement : TWIM Music

Flightpath Reconstruction



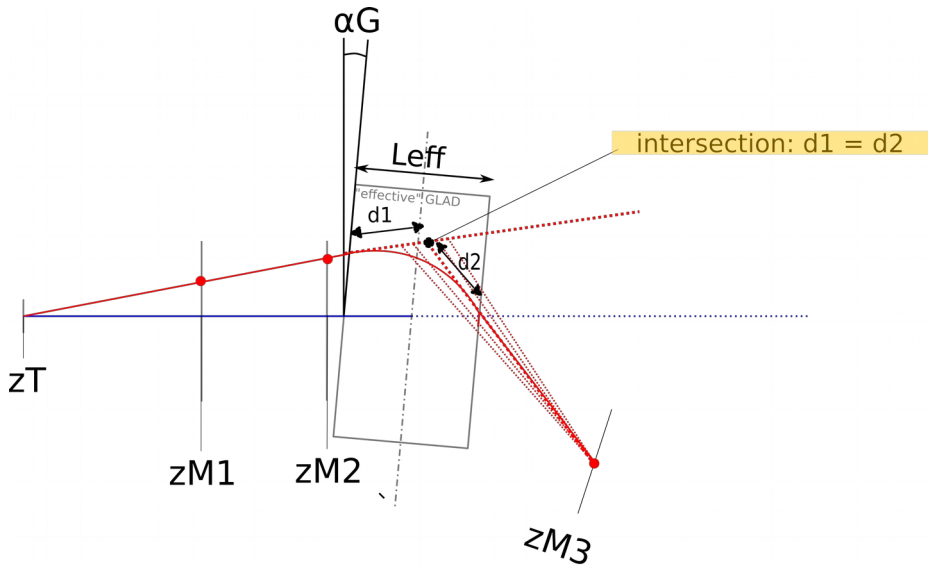
Radius Reconstruction:

$$R = \frac{L_{eff}}{2\sin\left(\frac{\theta_{in} + \theta_{out}}{2}\right)}$$

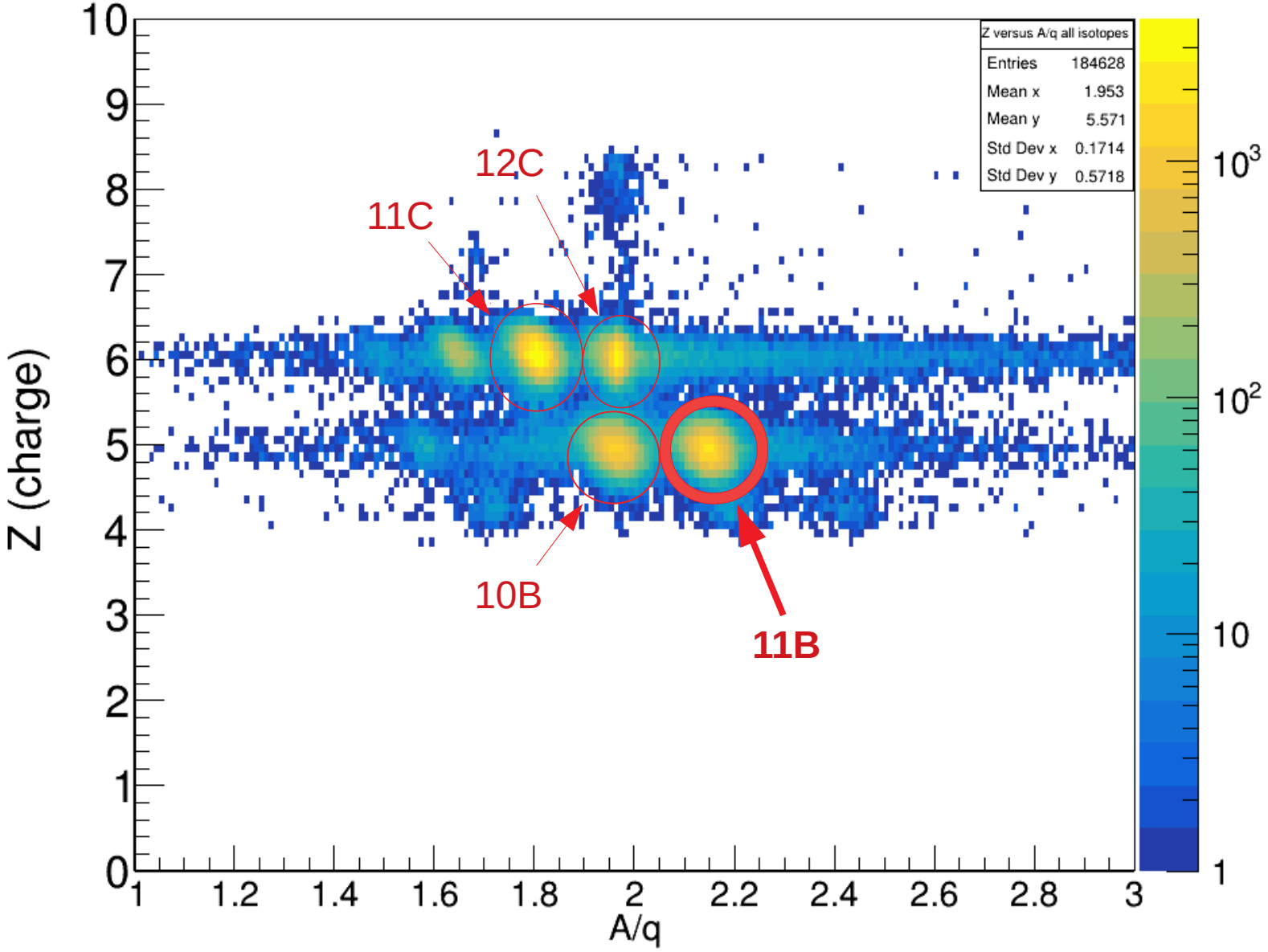
Known:

- position and inflight angle (θ_{in}) before GLAD
- position after GLAD (MWPC3)

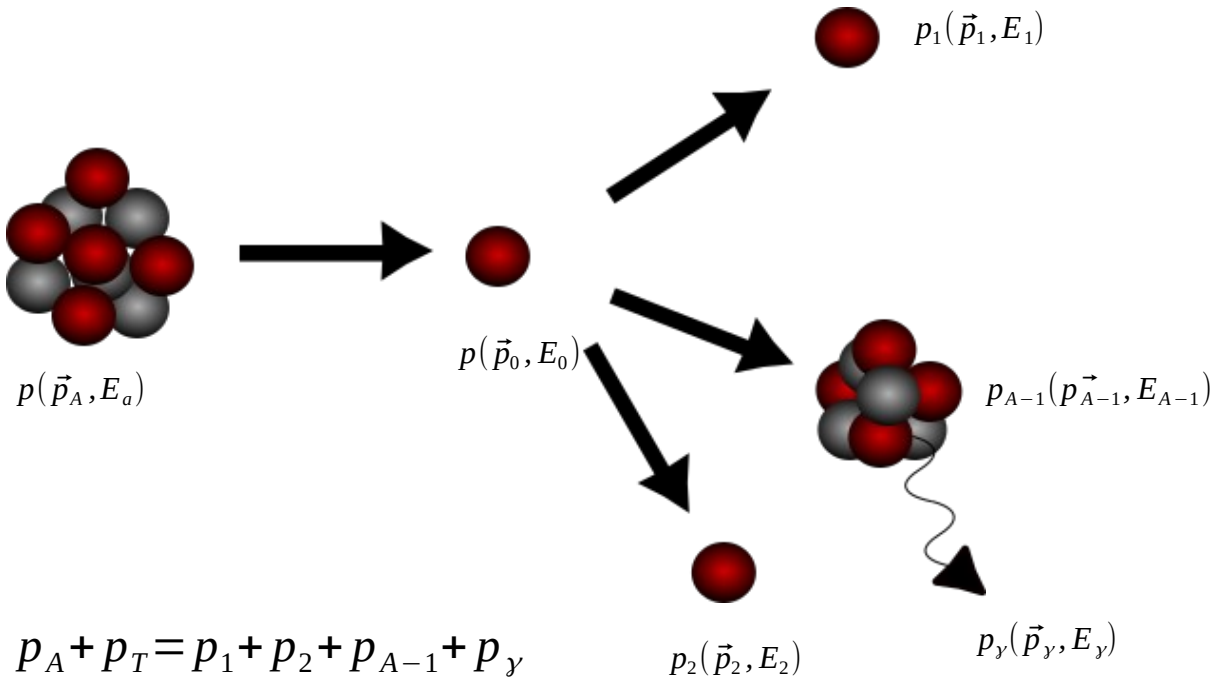
compute θ_{out} iteratively:



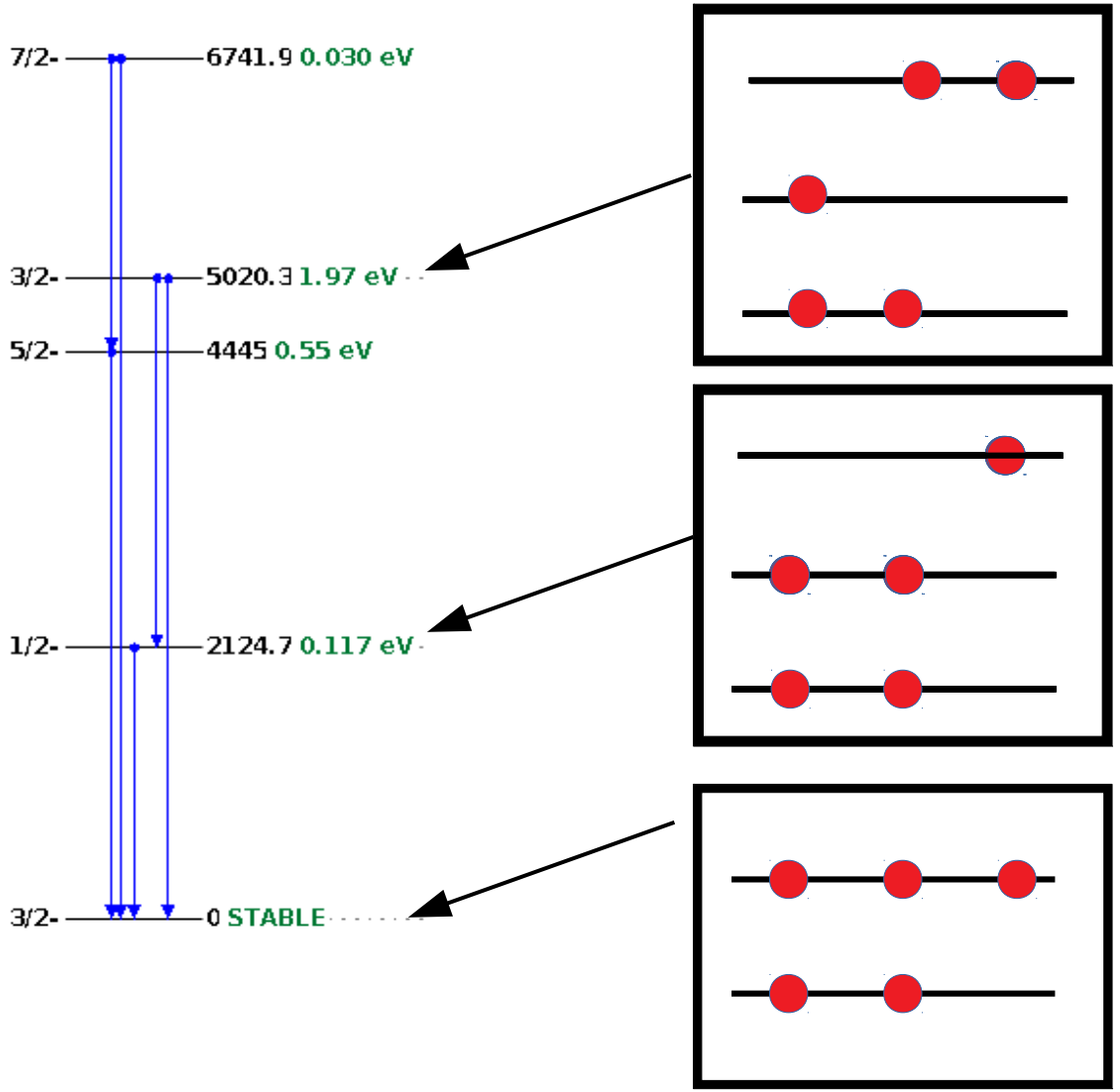
Charge versus A/q



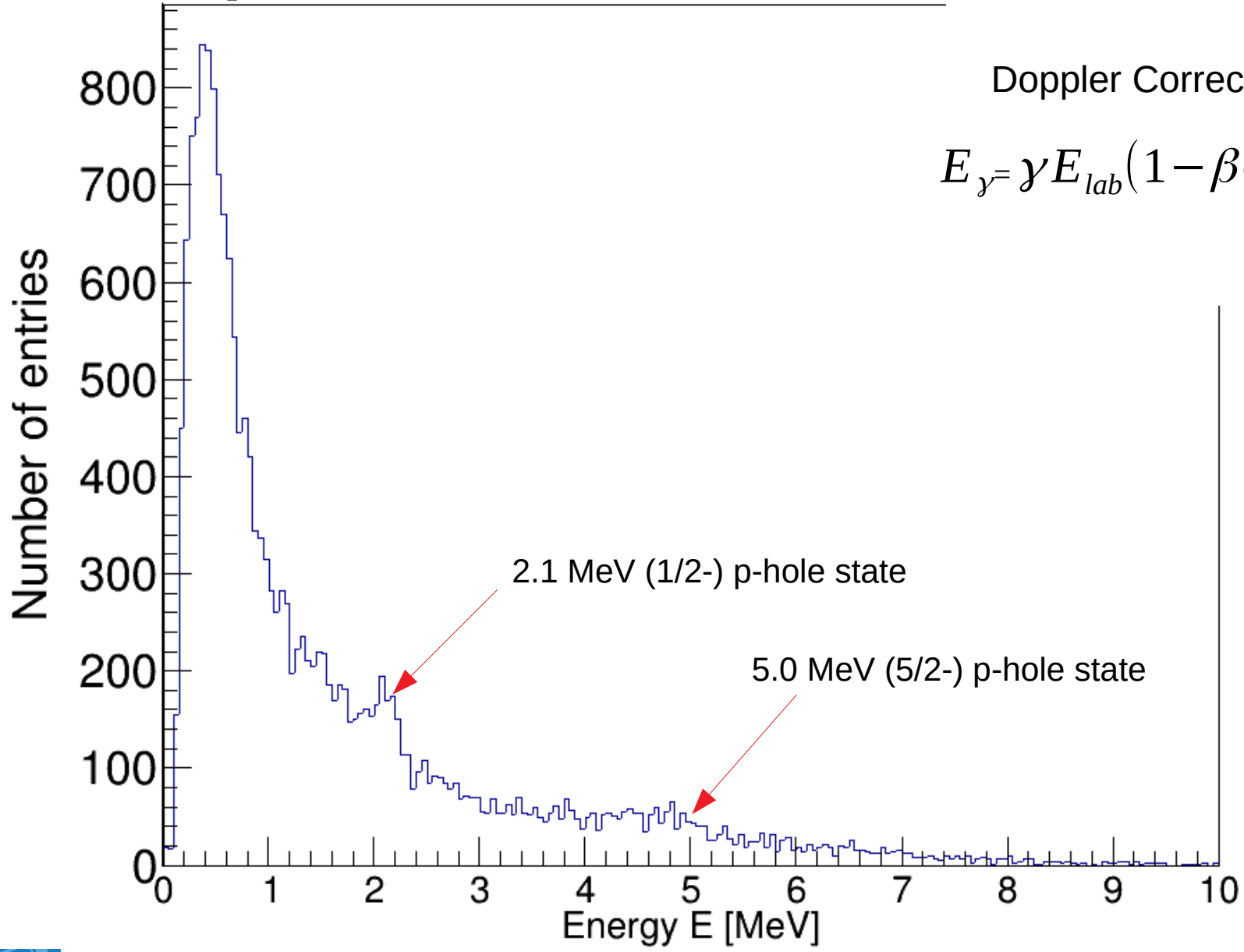
12C(p,2p)11B reaction



$$p_A + p_T = p_1 + p_2 + p_{A-1} + p_\gamma$$



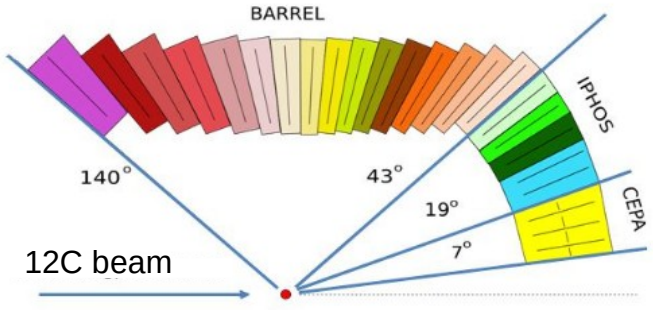
Gamma Spectrum of 11B

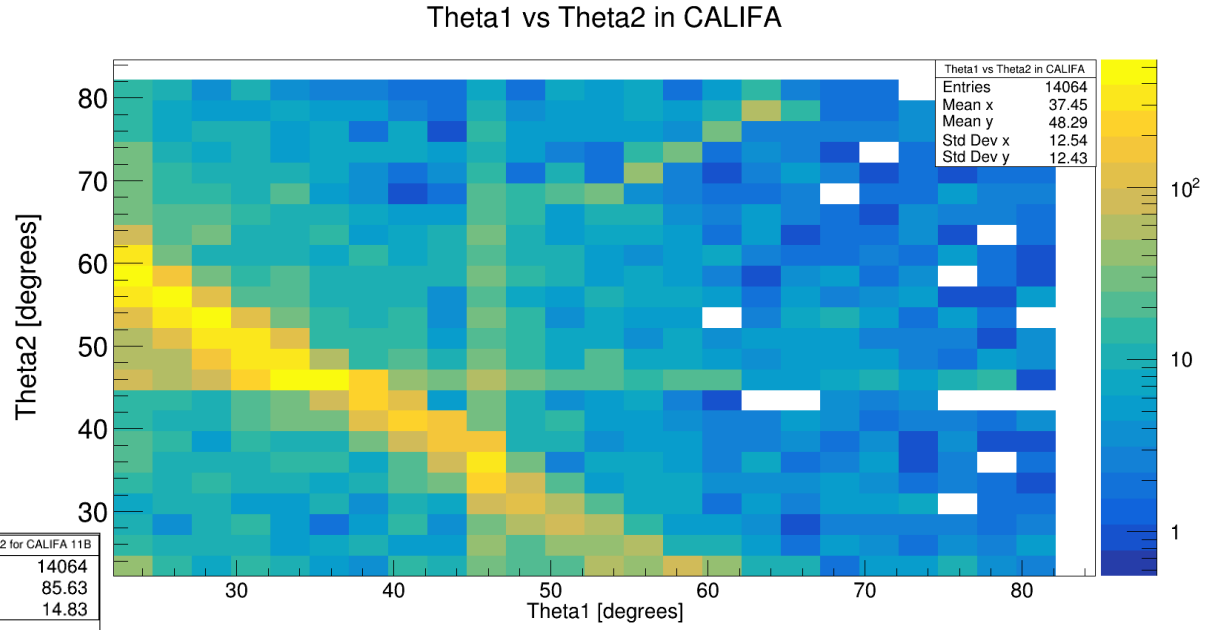


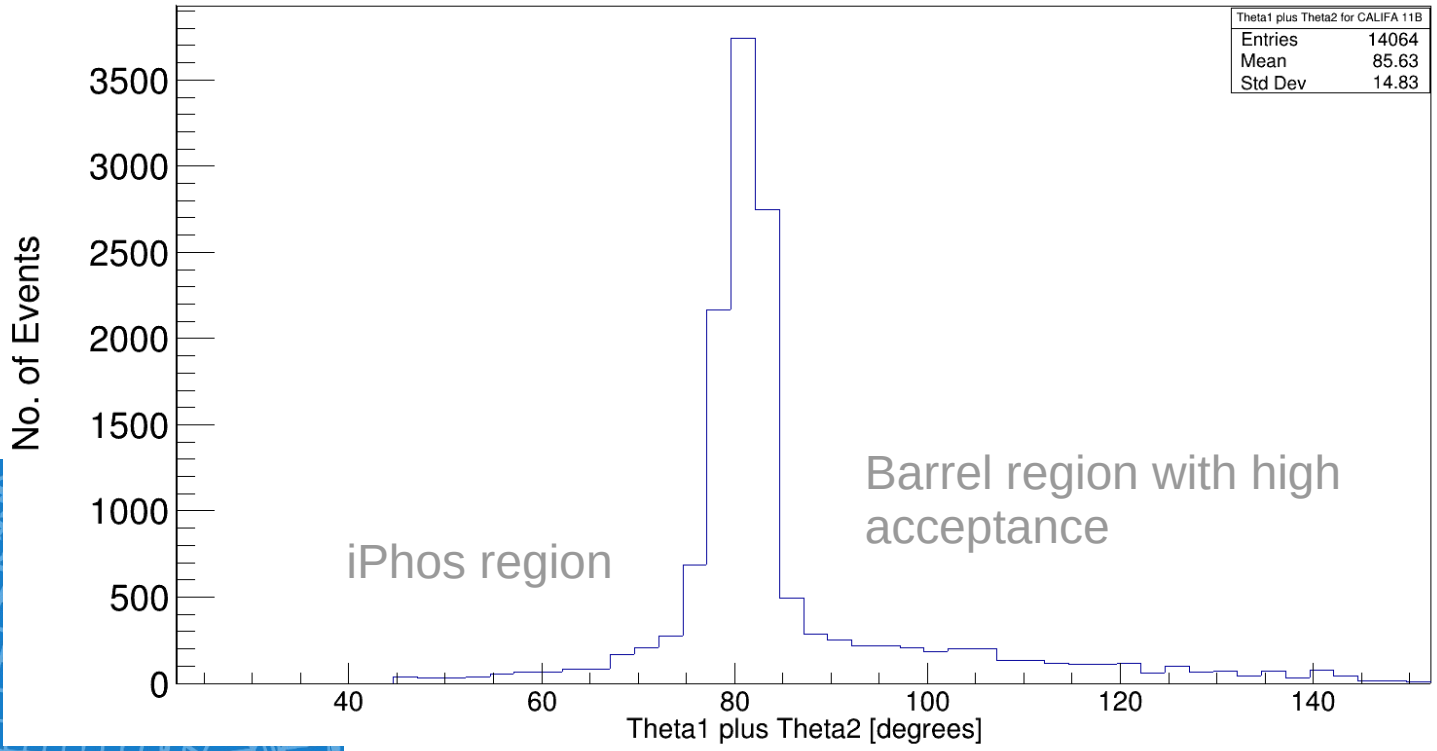
Doppler Correction

$$E_{\gamma} = \gamma E_{lab}\left(1 - \beta\cos\left(\theta\right)\right)$$

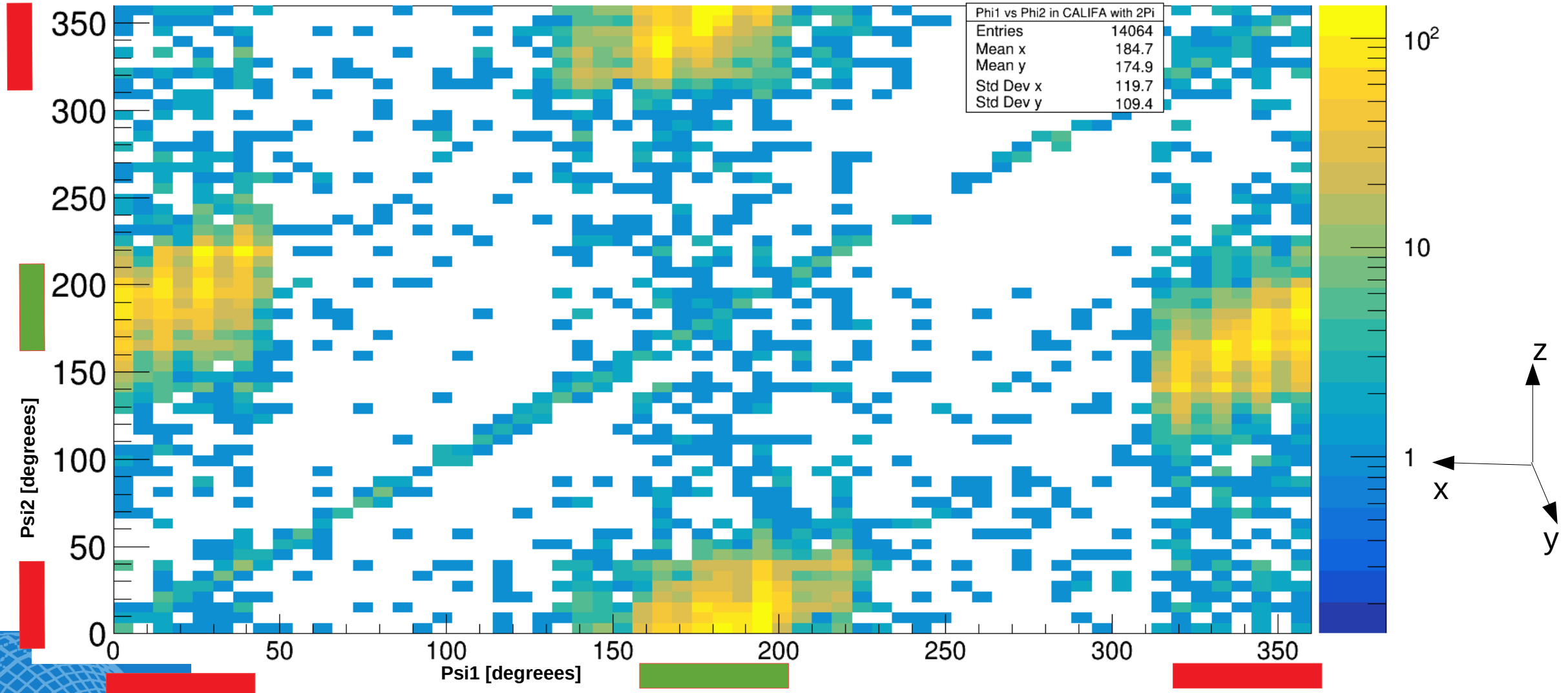
Polar Angular Distribution of protons for 12C(p,2p)11B







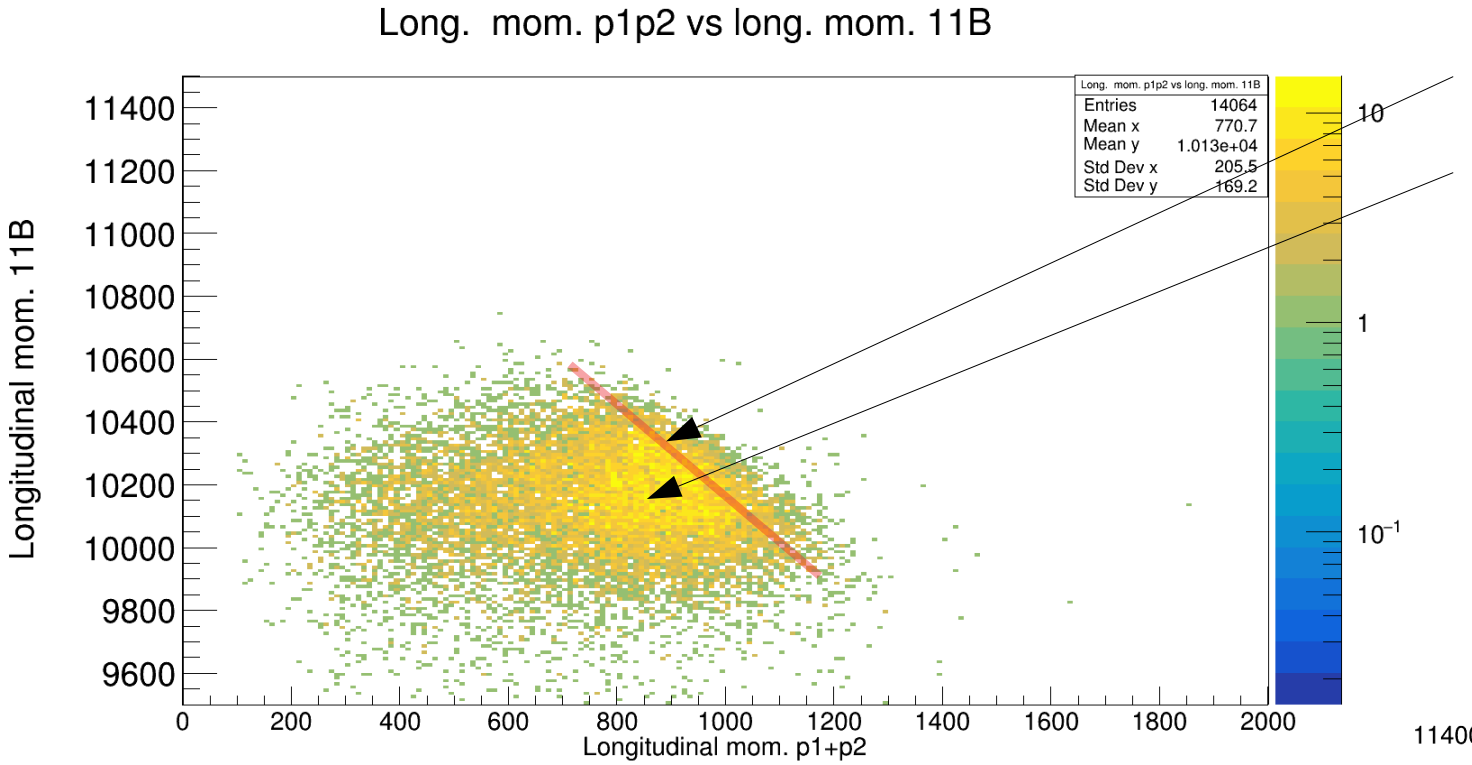
Arzimuthal Distribution of protons for 12C(p,2p)11B



CALIFA left half (90°) iPhos

CALIFA right half (45°) iPhos

Momentum Distribution 2p & 11B



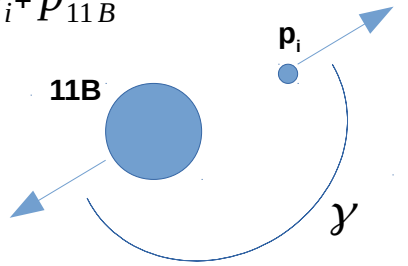
expected: barrier line

Explanation for smearing needed:

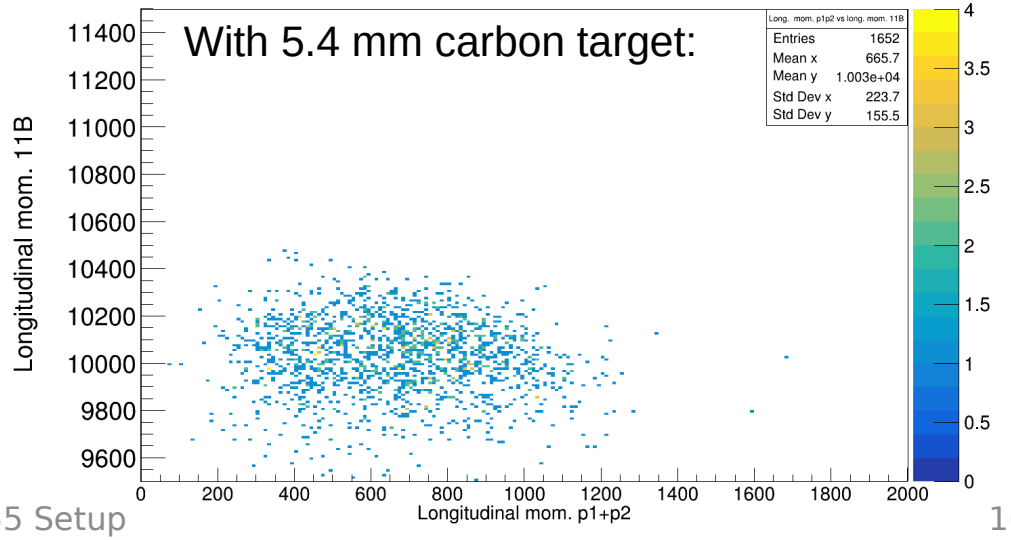
→ use simulation

→ boosting to 12C frame:

$$p_{12C} = p_i + p_{11B}$$



$$\cos(\gamma) \approx -1$$



Summary & Outlook

→ Particle Identification works out

→ Gamma spectrum and angular distribution plots look reasonable

→ Further investigations for momenta distributions of the outgoing particles needed

→ Expand analysis towards 10B isotope

Thank you!

CALIFA @ Technical University of Munich (TUM)

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GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

Backup