11B Analysis with S455 Setup

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Setup and Detectors

Particle Identification

12C(p,2p)11B reaction

Summary & Outlook

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

GSI

FAIR
Phase 0
Research Program

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The S455 Setup (February 2020)
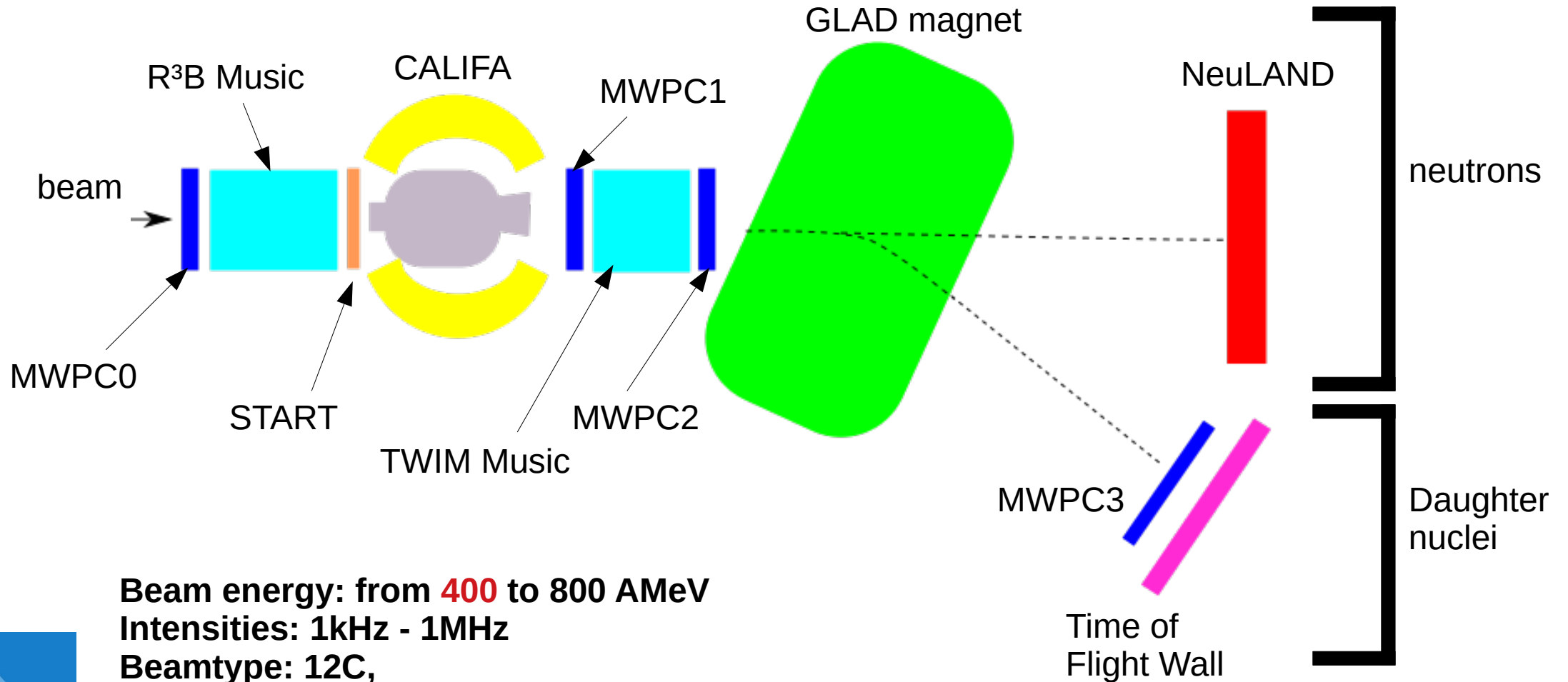
Beam energy: from 400 to 800 AMeV
Intensities: 1kHz - 1MHz
Beamtype: 12C,
Target: C, CH2
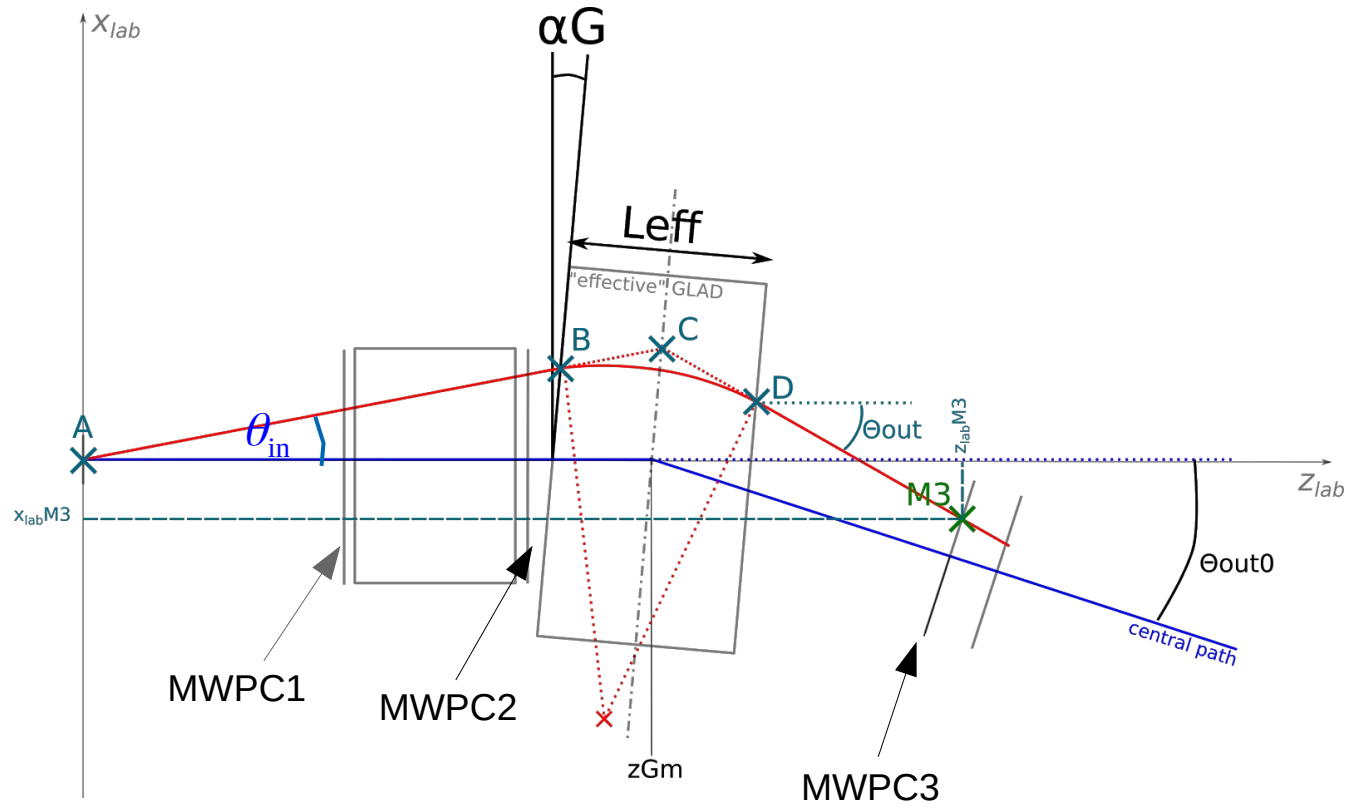
Particle Identification

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

Time of Flight Measurement: Start to TOFW

Flight-path Reconstruction: Tracking Detectors (MWPC1, 2 and 3)
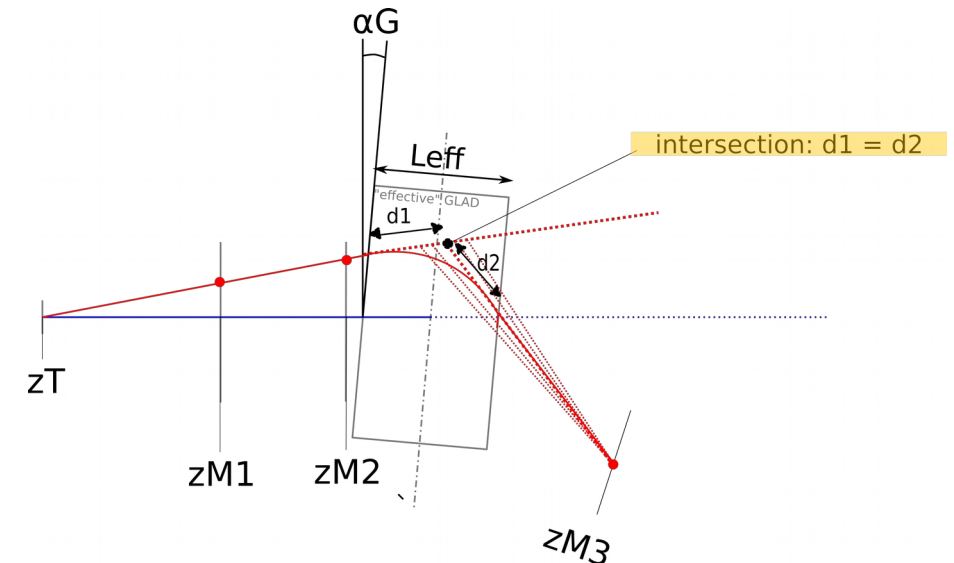
Charge Measurement : TWIM Music

START

TWIM Music

MWPC0

MWPC1

x

z

CALIFA

MWPC2

MWPC3

Time of Flight Wall

Flightpath Reconstruction
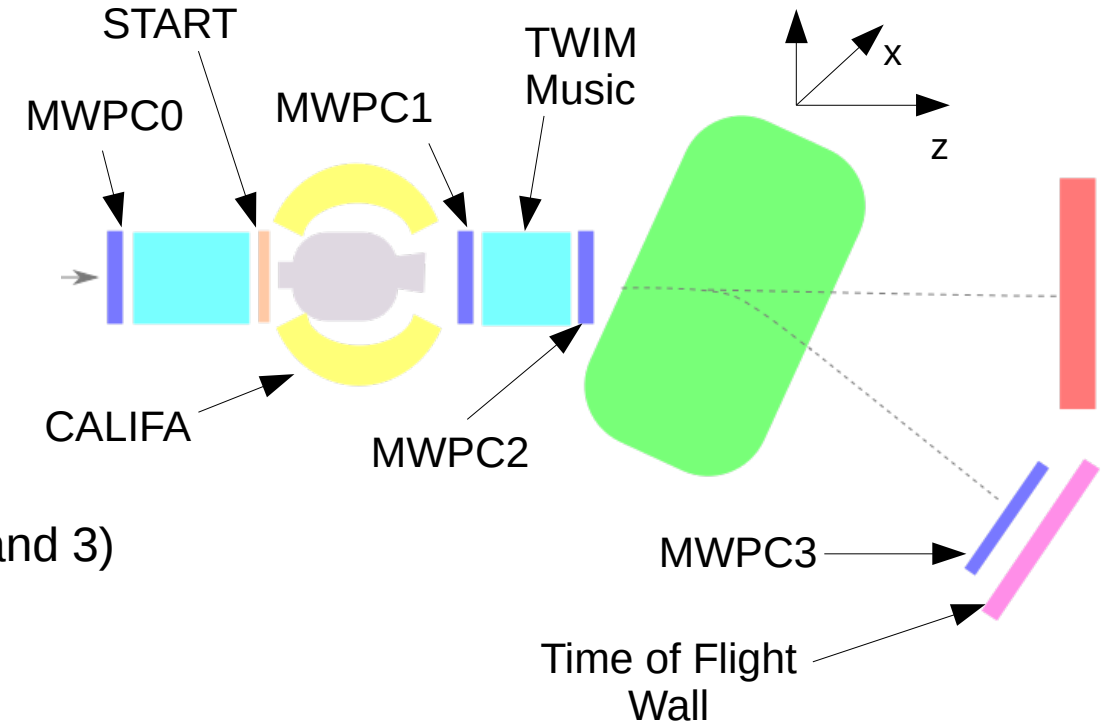
Radius Reconstruction:

$$R = \frac{L_{eff}}{2\sin\left(\frac{\theta_{in} + \theta_{out}}{2}\right)}$$
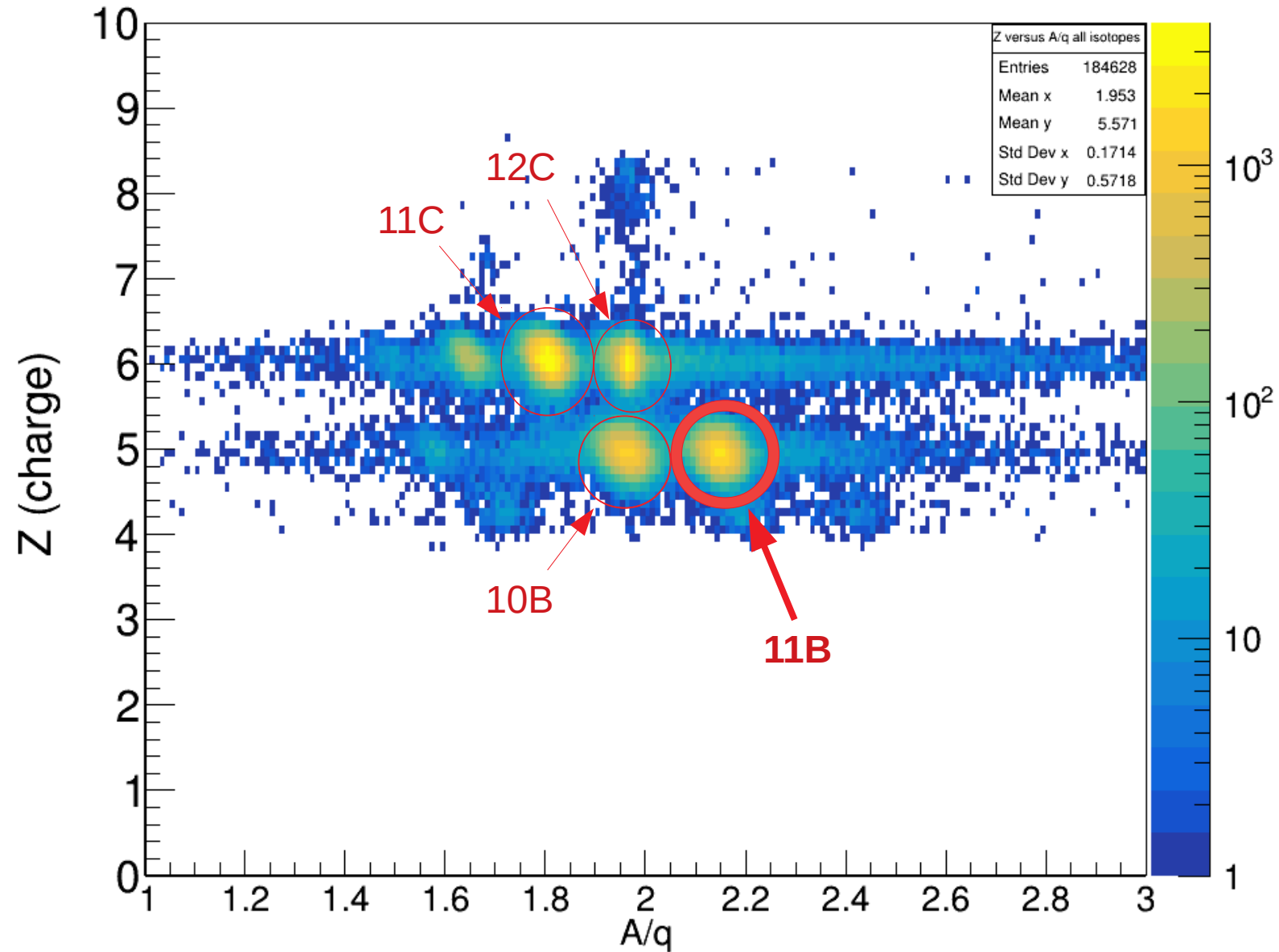
Known:
- position and inflight angle (θ_{in}) before GLAD
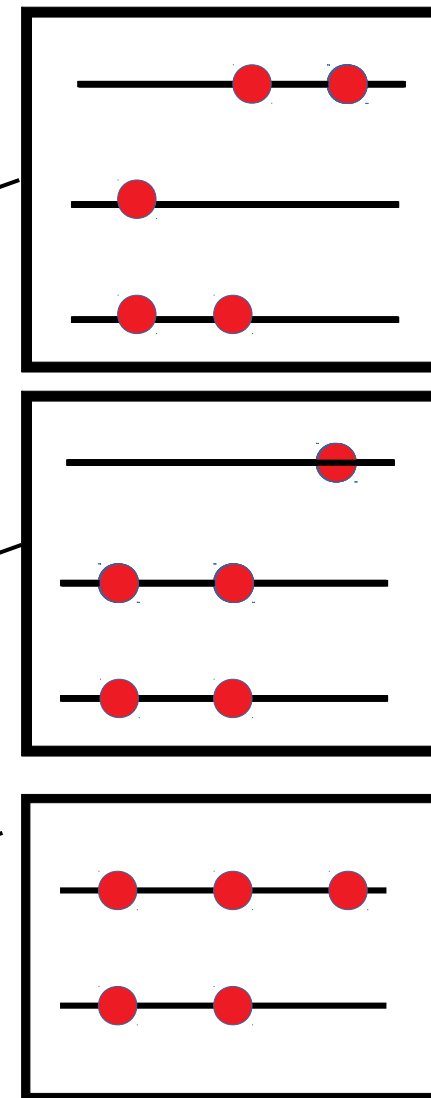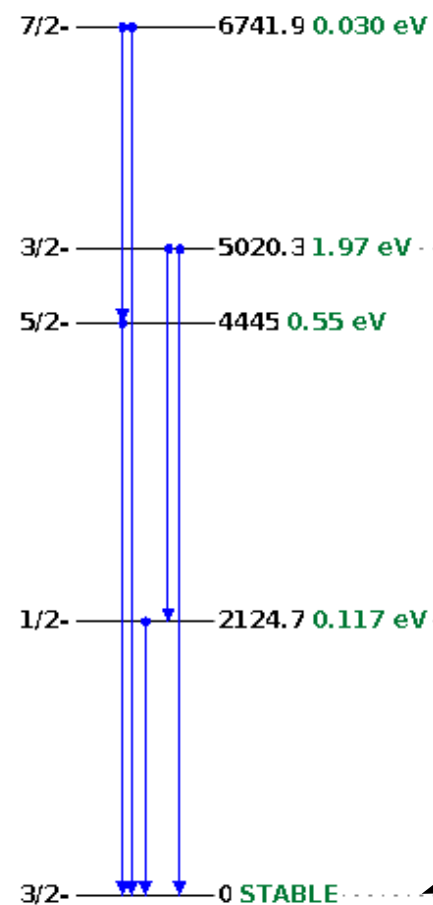- position after GLAD (MWPC3)

compute θ_{out} iteratively:

Charge versus A/q

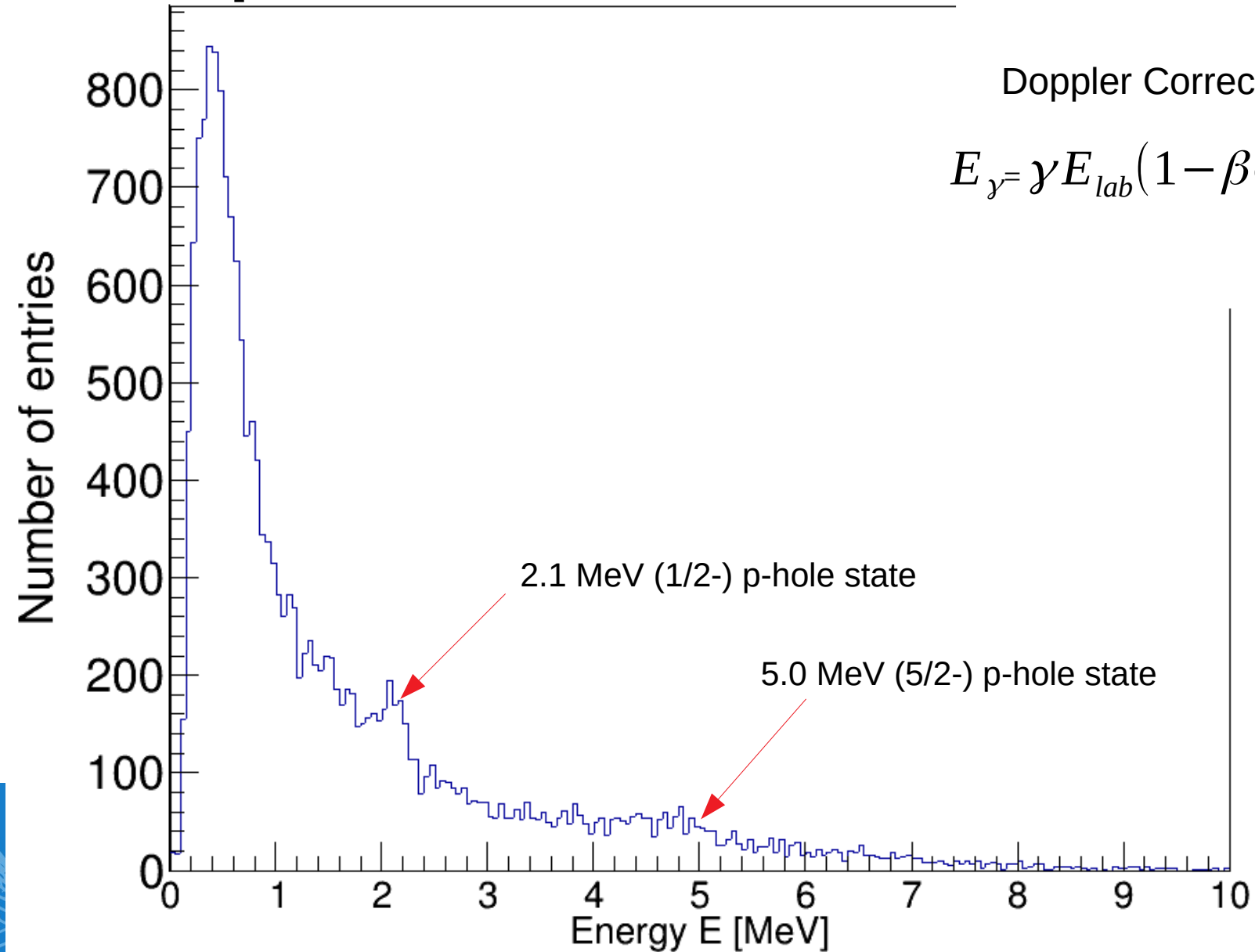# 12C(p,2p)11B reaction

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

Gamma Spectrum of 11B

Doppler Correction

$$E_{\gamma} = \gamma E_{lab}(1 - \beta \cos(\theta))$$
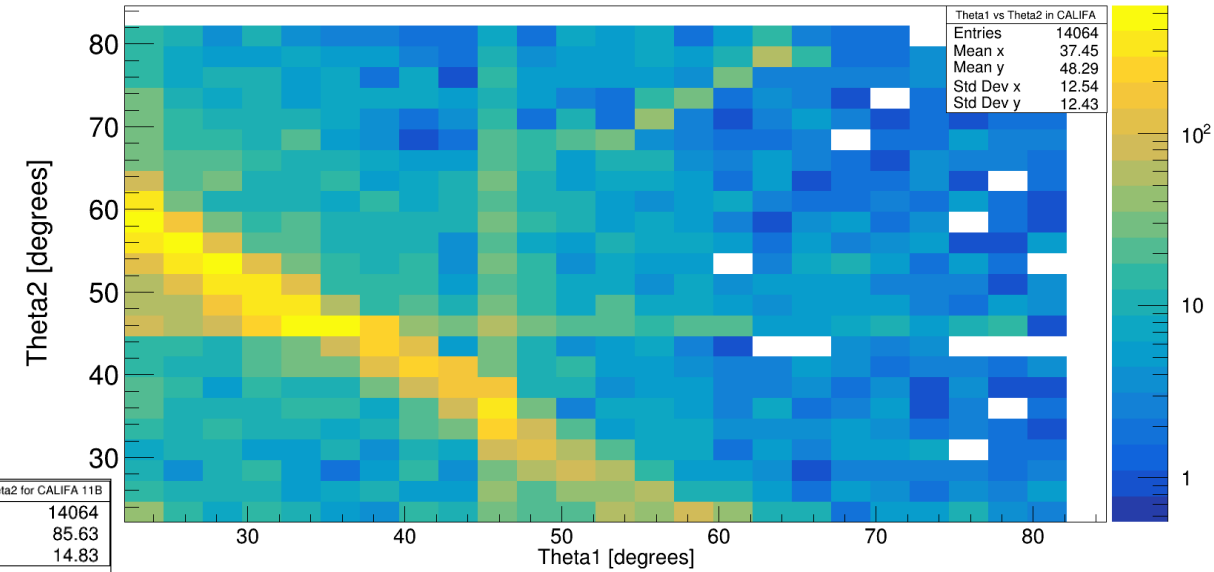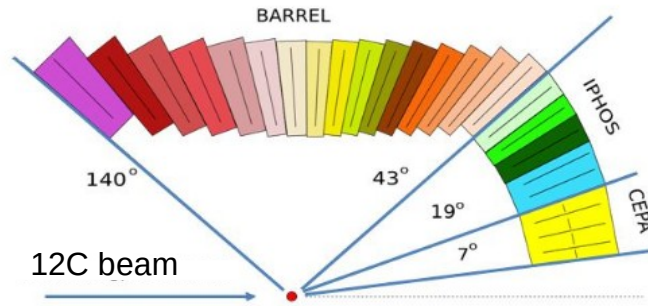
2.1 MeV (1/2-) p-hole state

5.0 MeV (5/2-) p-hole state
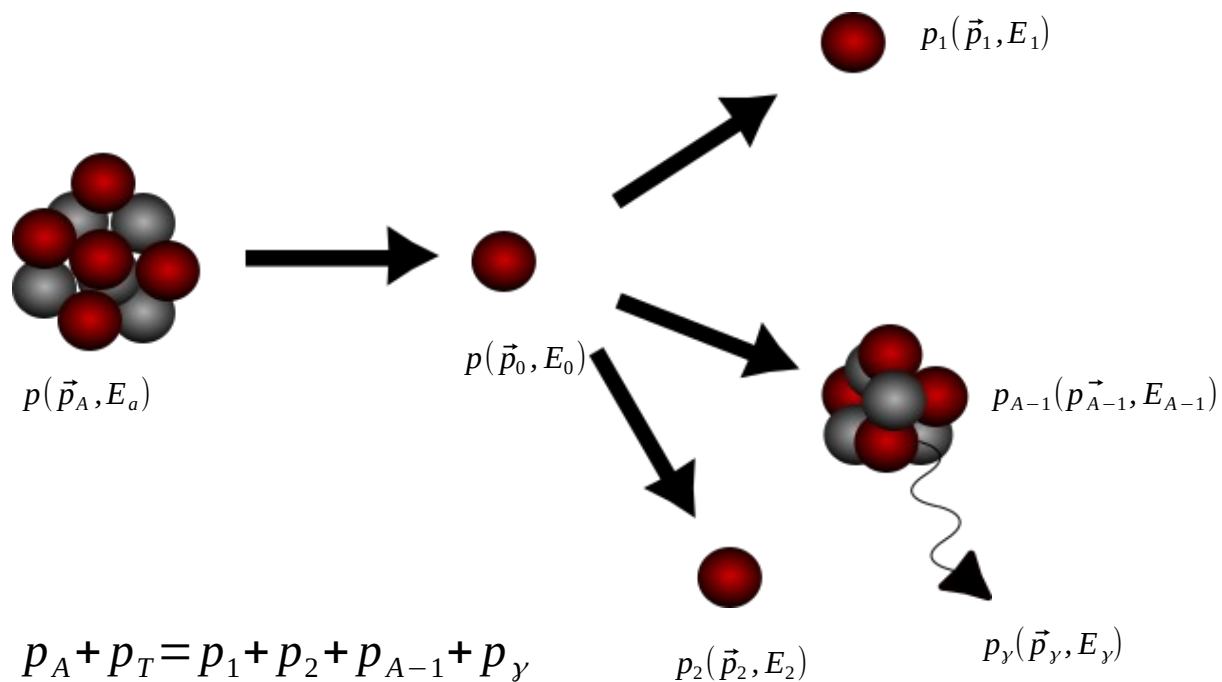
Polar Angular Distribution of protons for 12C(p,2p)11B

Theta1 vs Theta2 in CALIFA
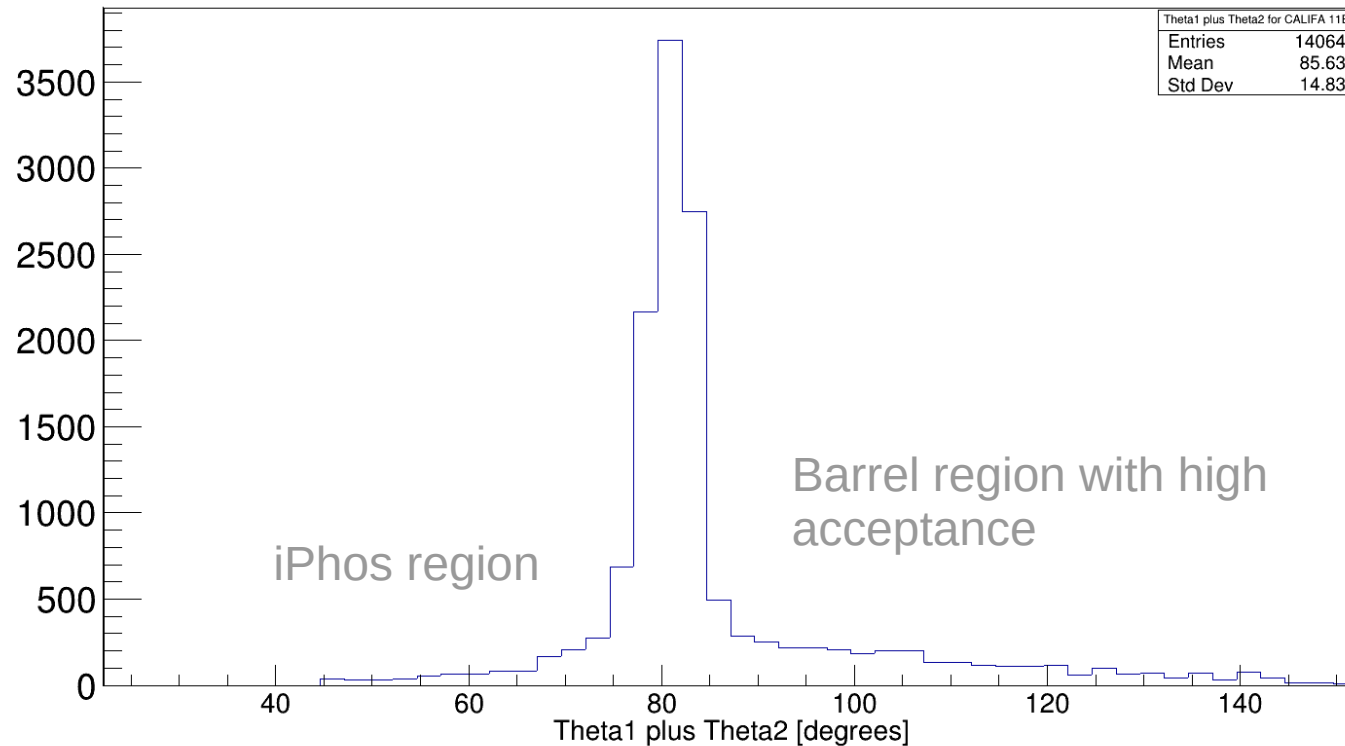
Arzimuthal Distribution of protons for 12C(p,2p)11B

Phi1 vs Phi2 in CALIFA with 2Pi	
Entries	14064
Mean x	184.7
Mean y	174.9
Std Dev x	119.7
Std Dev y	109.4
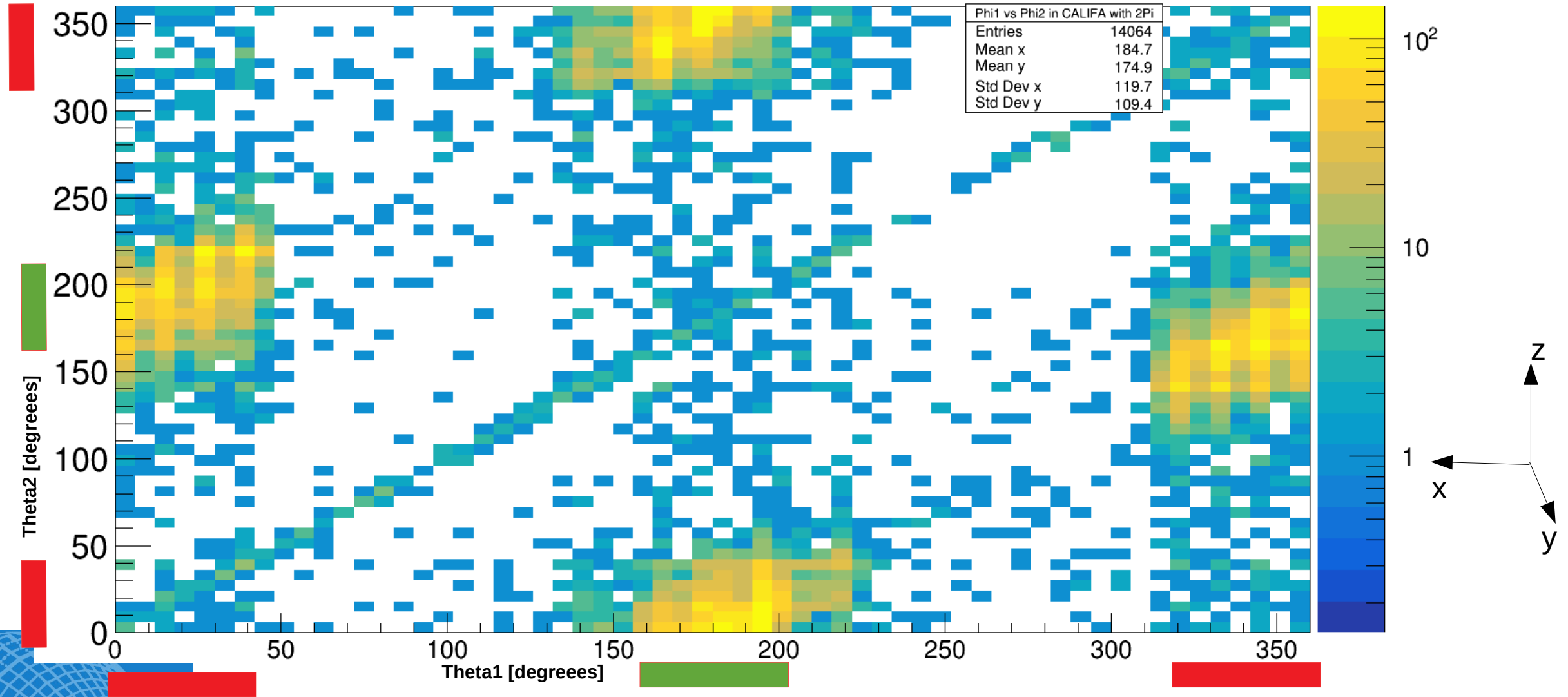
CALIFA left half (90°) iPhos

CALIFA right half (45°) iPhos
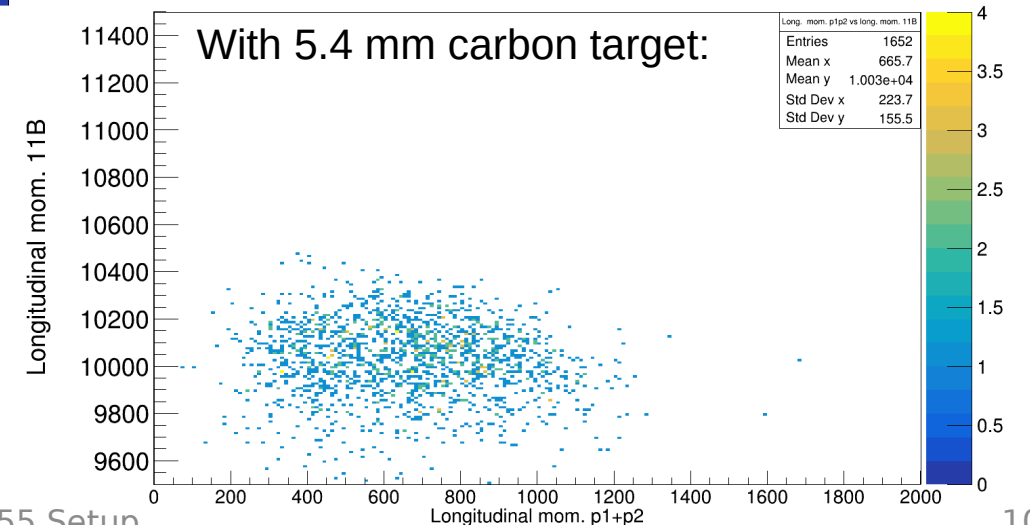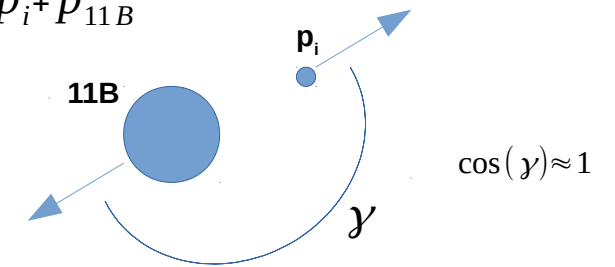
Momentum Distribution 2p & 11B

Long. mom. p1p2 vs long. mom. 11B
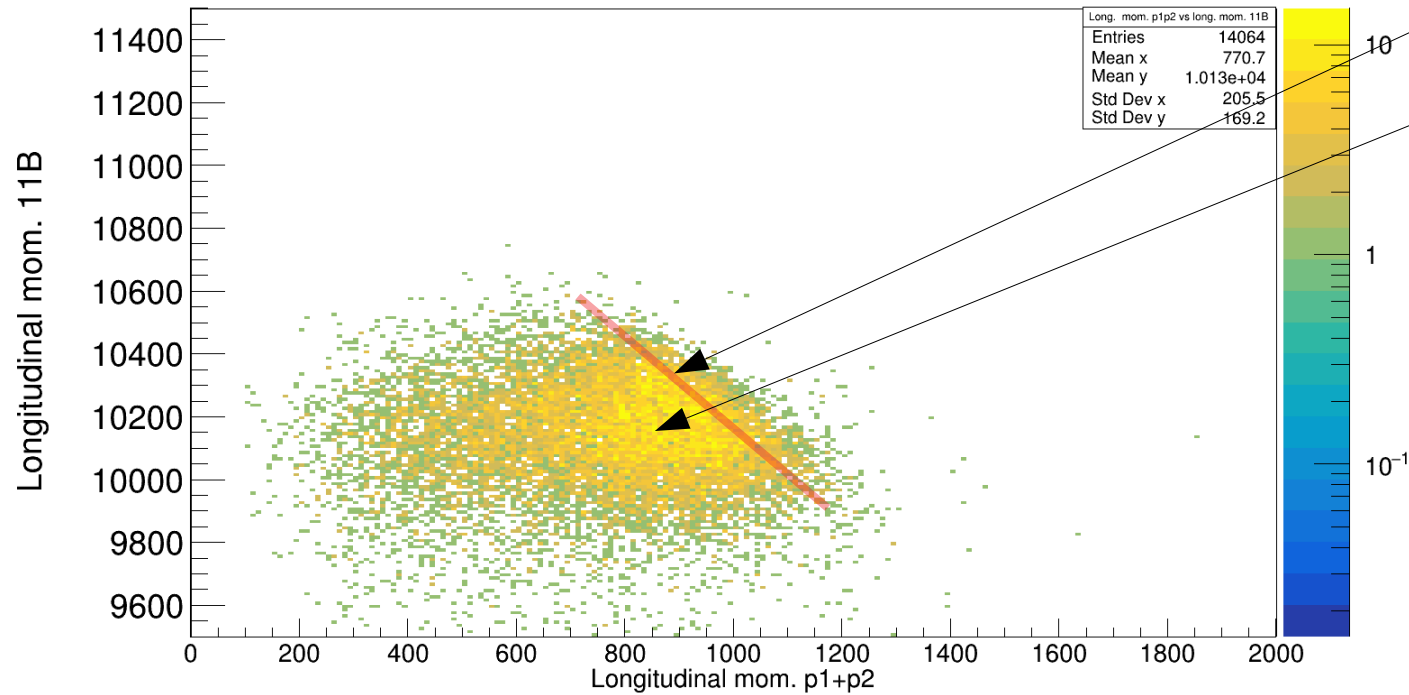
expected: barrier line

Explanation for smearing needed:

→ use simulation

→ boosting to 12C frame:

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

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

11B $\mathbf{p_i}$ γ

With 5.4 mm carbon target:

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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Backup