CEPC

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CEPC stereo ECAL muon momentum reconstruction

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★ Introduction

This research focuses on the particle reconstruction algorithm of the **stereo crystal electromagnetic calorimeter (stereo ECAL)** for the CEPC. The stereo crystal structure, as one of the design options for the CEPC ECAL, possesses unique properties. It not only provides information on the energy deposition but also reconstructs 3D cluster information from 2D plane information with minimal dead zones.

★ Layout of CEPC stereo ECAL and Hitmap

θ=90° : particle through one layer

θ≠90° : particle through multi-layers
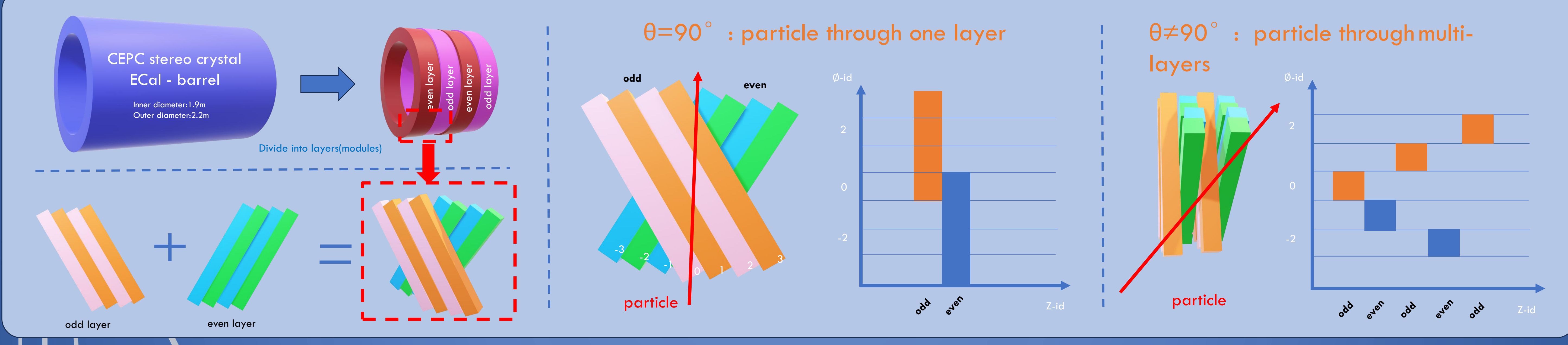
★ Reconstruct the charge info

The direction of the opening helps us determine the charge. Energy threshold is 2 MeV for this study.
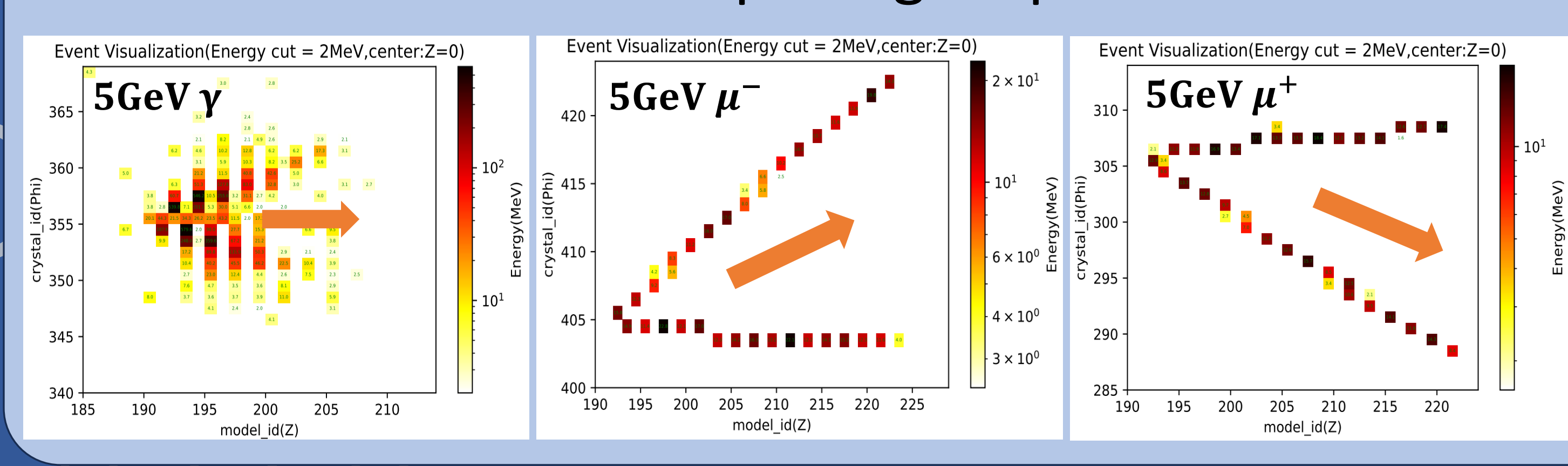
type	γ(left)	μ^-(medium)	μ^+(right)
rad(β)	-0.02	0.26	-0.26
degree(β)	-0.99°	14.86°	-14.66°
charge	0	-1	1

β is the relative deflection angle of the motion

★ Reconstruct the P_T info

This research analyzes the energy deposition distribution of single muon events within the stereo ECAL up to 10 GeV Based on the motion of charged particles in a magnetic field, the relationship between **β** and P_T is derived.
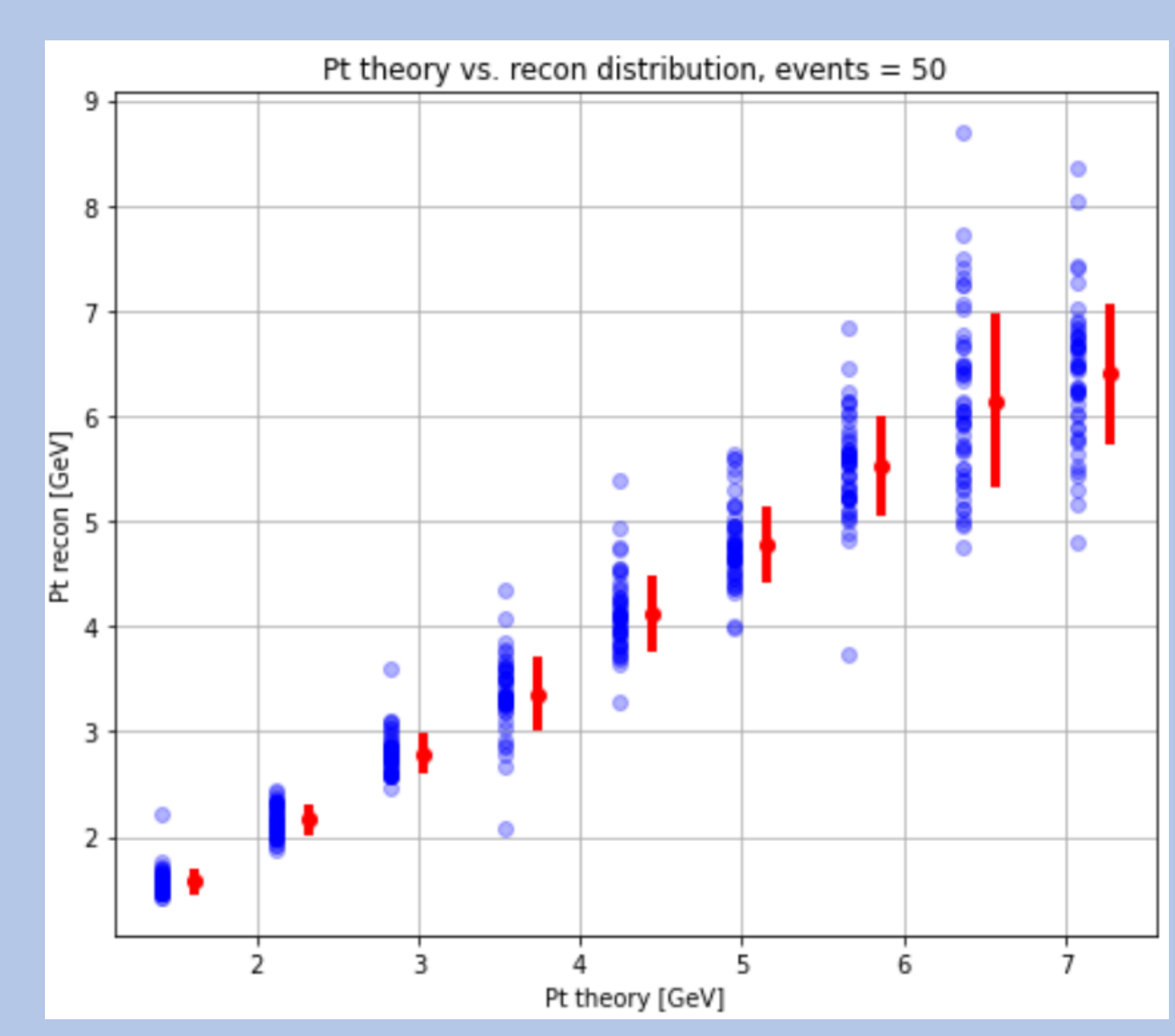
$$P_T = 0.15BL\frac{1}{\sin(\beta)}$$

9 Single μ^-, θ=45°, Φ=100° Samples:
- P: 2,3,4,5,6,7,8,9,10 GeV
- Statistic for each P: 50 events
- Energy threshold: 2MeV
- $P_T = P$ /sin(θ)= P /$\sqrt{2}$
- B= 3T, L=1.9m
- $\sigma = \frac{(P_T\_reco - P_T\_theory)}{P_T\_theory}$

★ Summary & Conclusion

- **Layout of CEPC stereo ECAL and Hitmap**
- **Preliminary study on CEPC stereo ECAL muon momentum reconstruction**
  - **Reconstruct the open angle**
    - **→ obtain the charge info**
  - **Obtain the relation between P_T and β**
    - **→ obtain the momentum info**
  - **Plot of P_T and σ** $(\sigma = \frac{(P_T\_reco - P_T\_theory)}{P_T\_theory})$
    - **→ σ study, mostly $\Delta P_T/P_T$ <20%**

THANKS FOR YOUR ATTENTION !