Fwd ECAL Simulation

SuperB Generla Meeting

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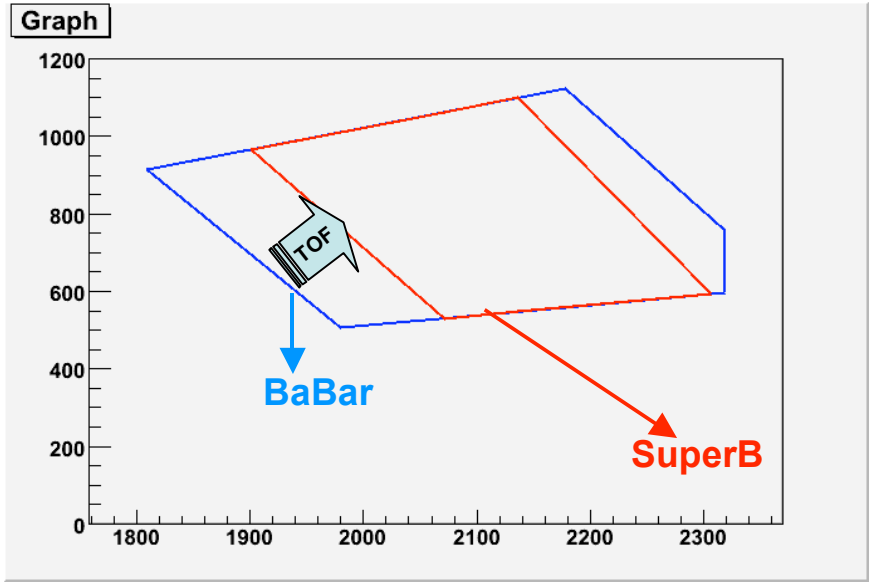
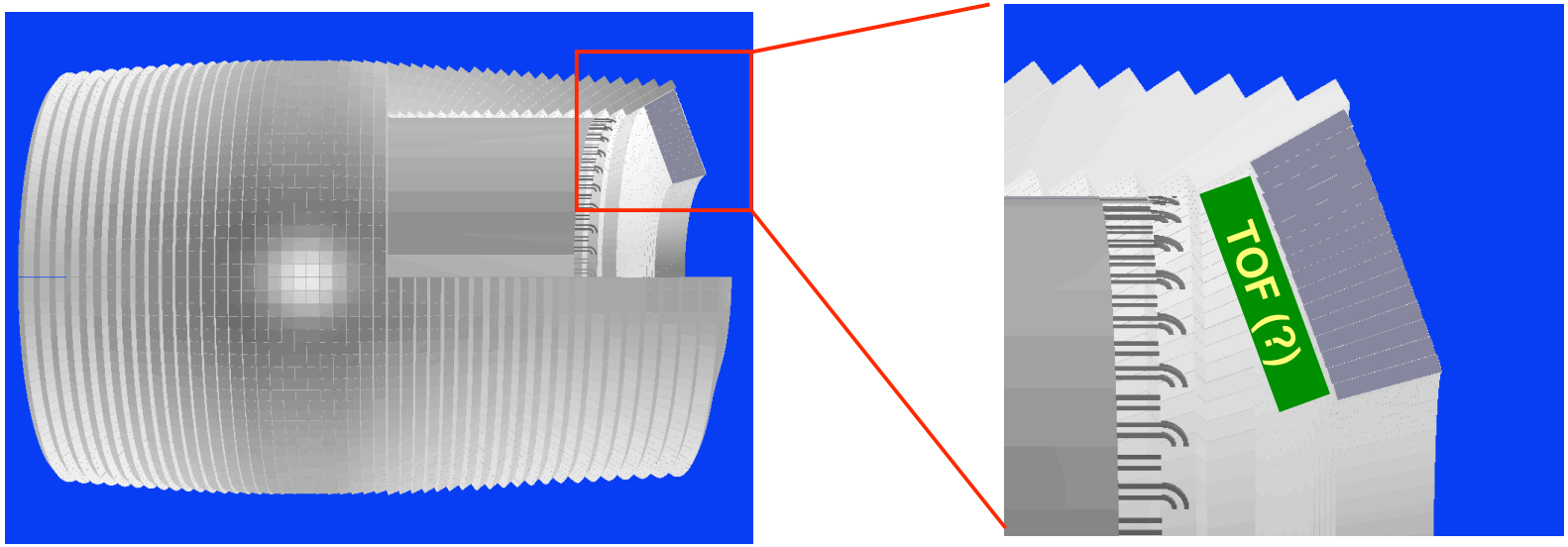
Fwd ECAL Geometry Envelop

- Fill the same BaBar angular region but
  - leave space for TOF: ΔZ = (100 mm)*cos(22.7)
  - Xtals material : LSO (LYSO)
    - Xtal depth = 200 mm (~17.5 X_0)





Crystals Dimensions

LSO crystas

- depth: 20 cm ~17.5 X_0
- Crystas arranged in 20 rings within 5x5 modules

175 Xtals/Ring
35 Modules

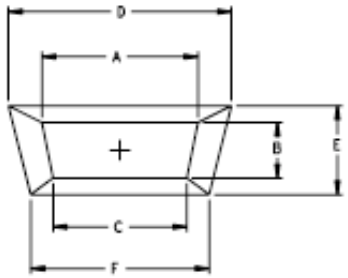
205 Xtals/Ring
41 Modules

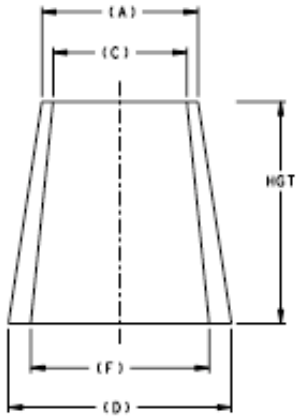
235 Xtals/Ring
45 Modules

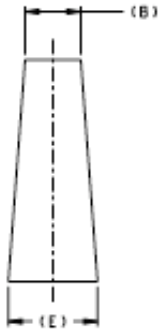
260 Xtals/Ring
52 Modules

Ring	A	B	C	D	E	F
1	19.52	23.05	18.66	21.53	25.53	20.58
2	20.30	23.01	19.44	22.40	25.49	21.45
3	21.08	22.98	20.22	23.27	25.46	22.31
4	21.86	22.95	20.99	24.13	25.43	23.18
5	22.63	22.82	21.77	24.99	25.29	24.04
6	19.92	22.90	19.18	22.02	25.38	21.19
7	20.58	22.89	19.84	22.75	25.37	21.93
8	21.24	22.87	20.49	23.49	25.35	22.66
9	21.90	22.86	21.15	24.22	25.34	23.39
10	22.55	22.76	21.80	24.95	25.23	24.11
11	20.16	22.85	19.50	22.31	25.33	21.57
12	20.73	22.85	20.07	22.95	25.33	22.21
13	21.31	22.86	20.64	23.59	25.34	22.85
14	21.89	22.87	21.22	24.23	25.35	23.48
15	22.46	22.80	21.79	24.87	25.27	24.12
16	20.83	22.90	20.21	23.07	25.38	22.38
17	21.36	22.92	20.73	23.65	25.40	22.96
18	21.88	22.95	21.26	24.23	25.43	23.54
19	22.41	22.98	21.78	24.82	25.46	24.12
20	22.93	22.93	22.30	25.40	25.40	24.70

~4400 Crystals



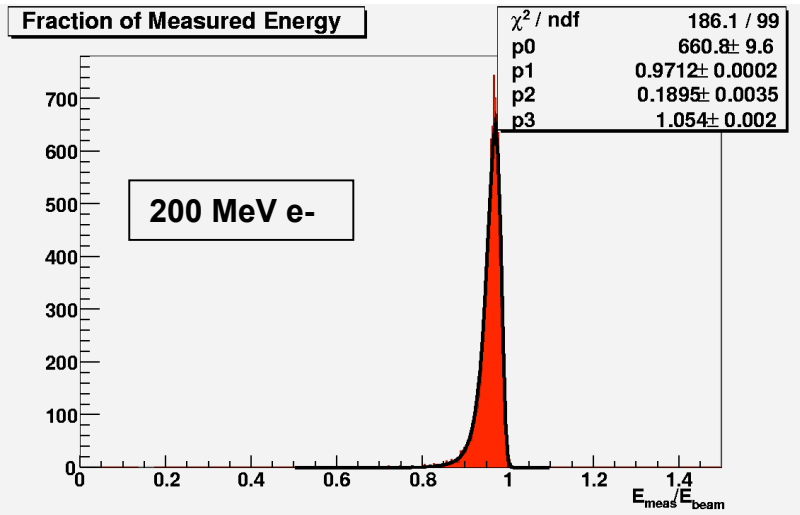




Energy Reconstruction

Algorithm:

1. Get Xtal deposited energy
2. Perform Poisson smearing with 8k pe/MeV
3. Assign 1% calibration error to crystals
   - Reconstruct with 8k±1% pe/MeV
4. Apply minimum energy cut for each xtal
   - 1 MeV to be tuned
5. Sum Xtal energy



Comments:

- All distributions have asymmetric low energy tails
  - Backsplash for low E particles
  - Forward leakege for high E particles
- Energy distributions fit with asymmetric Gauss function: $\sigma = \sigma(E)$
- Proposed parameterisation uses fit of p1,p2,p3 vs Energy

$$F(x) = P_0 e^{-\frac{(x-P_1)^2}{2[P_2(P_3-x)]^2}}$$

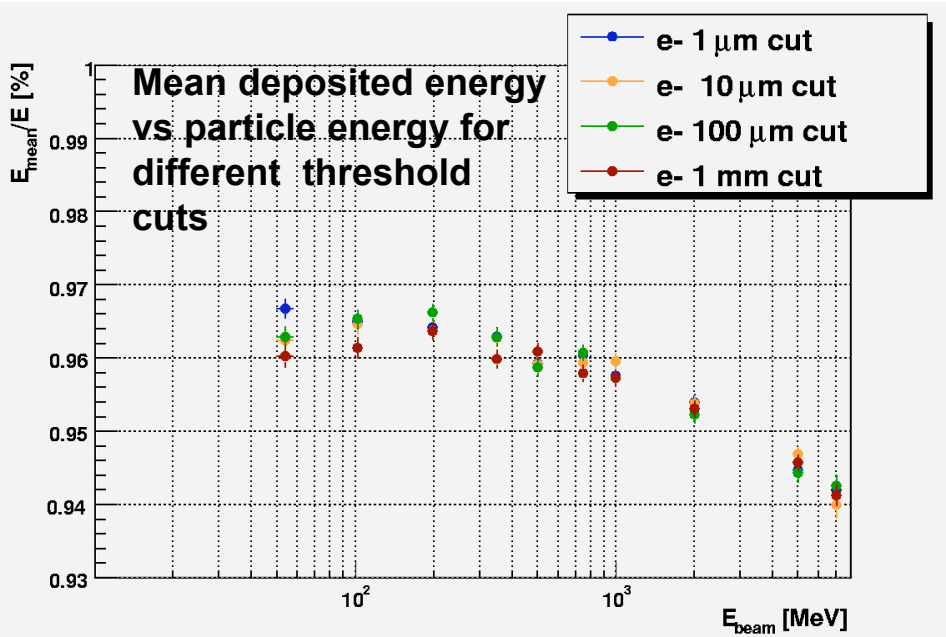
- P1 : most probable value (mpv)
- P2(P3-x) : running σ

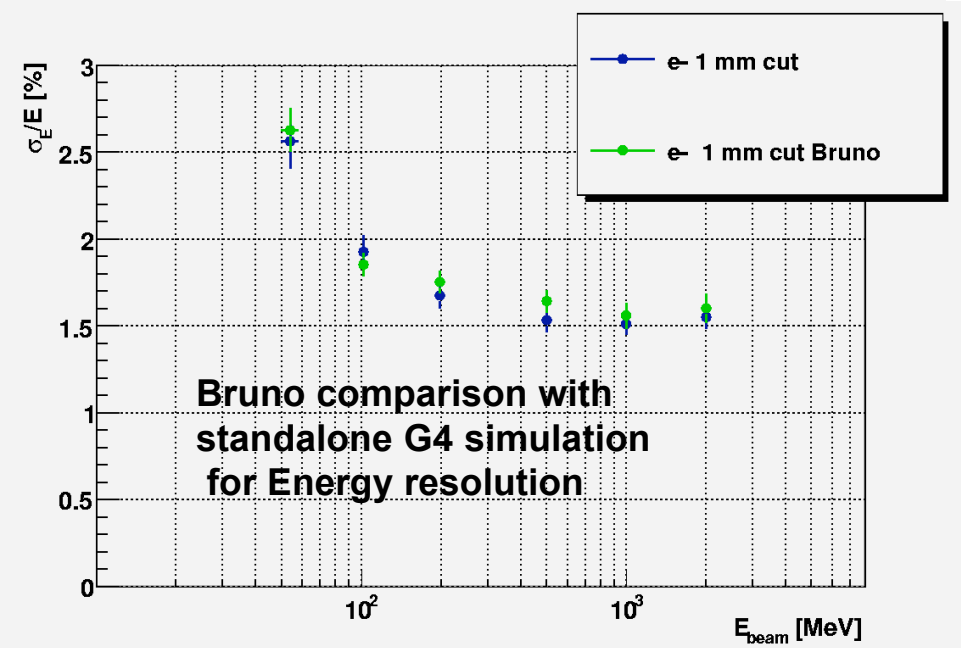
SuperB full simulation (Bruno)

- Super B (Bruno) full simulation is under development
- There is a working version but its validation at subdetector and general level is in progress
- Compare Bruno results for Fwd ECAL with our standalone G4 simulation
- Investigate Barrel-Fwd transition region

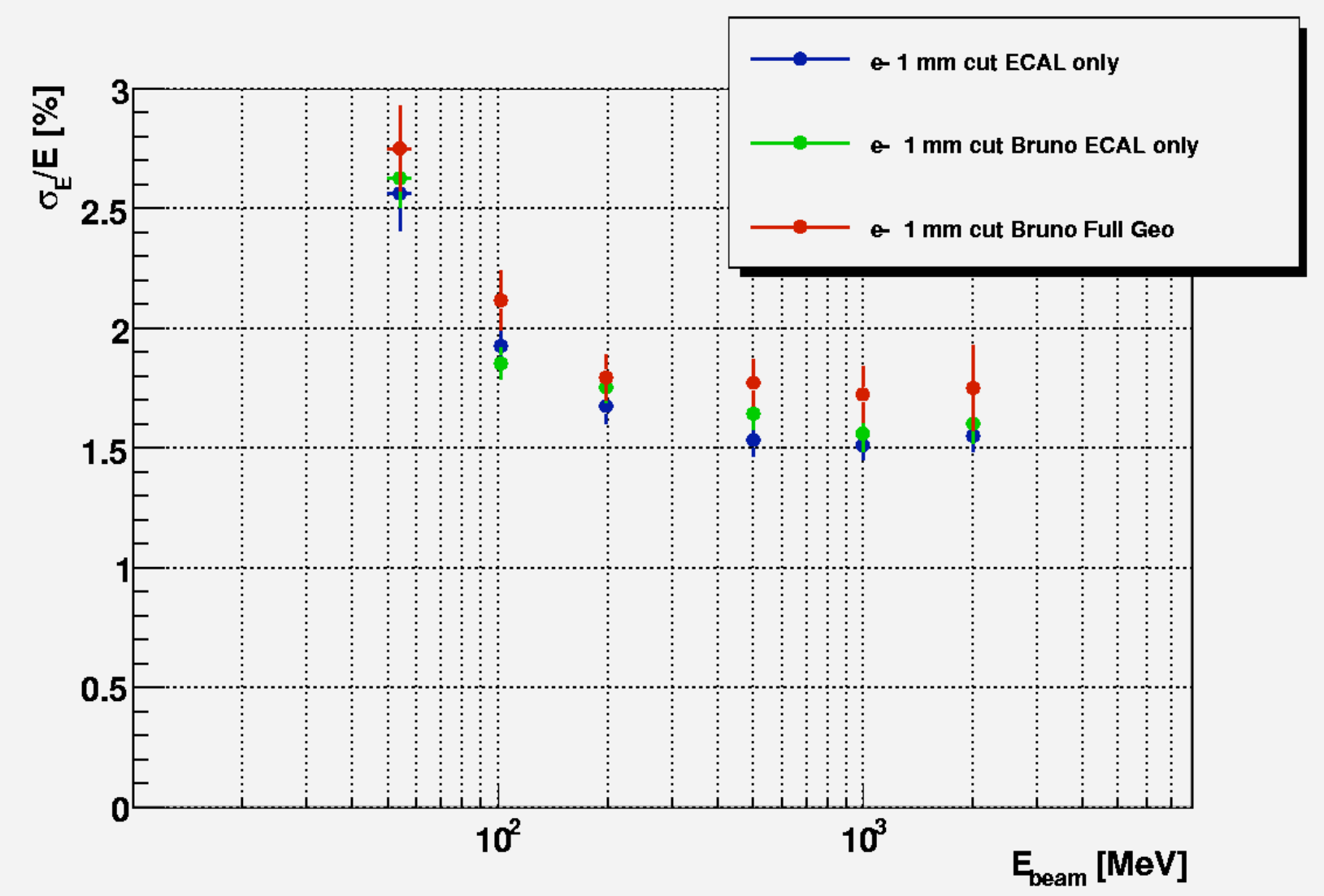
EMC Full Simulation

- Main develpmets for EMC full simulatios are:
  - GDML volumes renaming to allow correct Theta, Phi crystal index reconstruction
  - G4 partcicles generation threshold scan to optimize speed without affecting physics
  - Bruno comparison with standalone G4 simulation





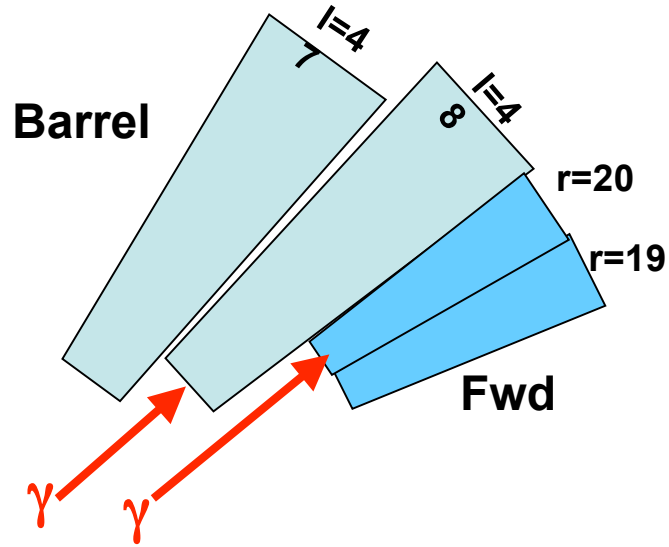
Bruno vs standalone G4

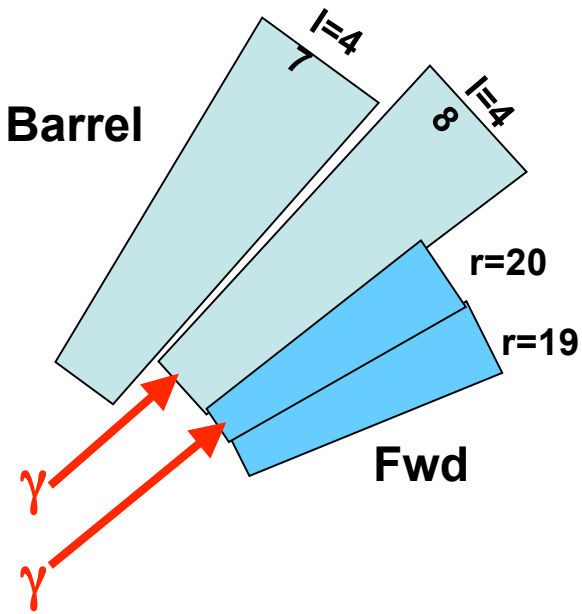


Investigate Barrel-Fwd Transition Region

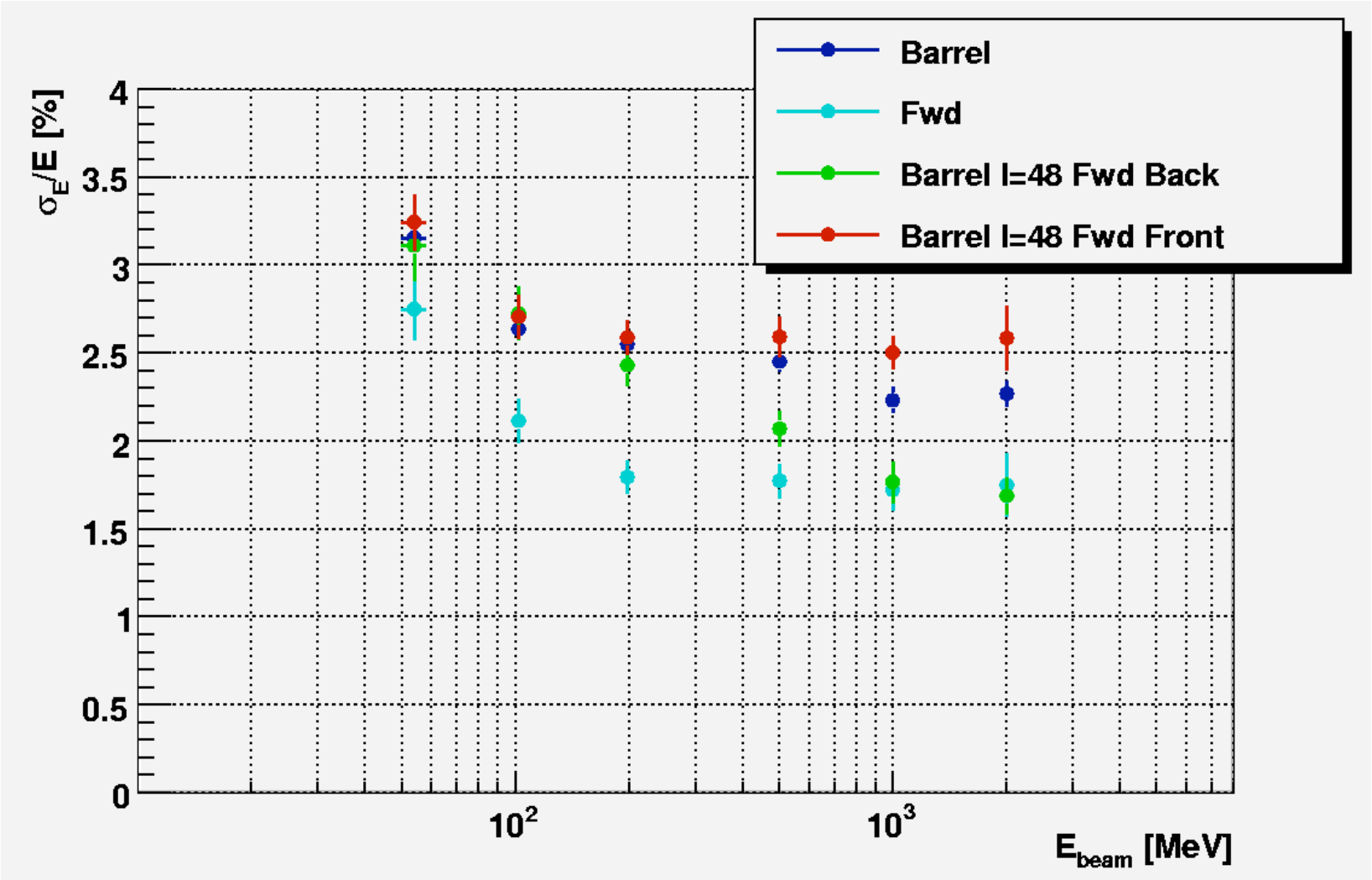
- Quick scan in theta angle to investigate the effect of Barrel-Fwd transition region and Fwd postion with respect to the barrel
  - Backward alignemnt (room for Fwd PID)
  - Front alignement

- All results are VERY PRELIMINARY

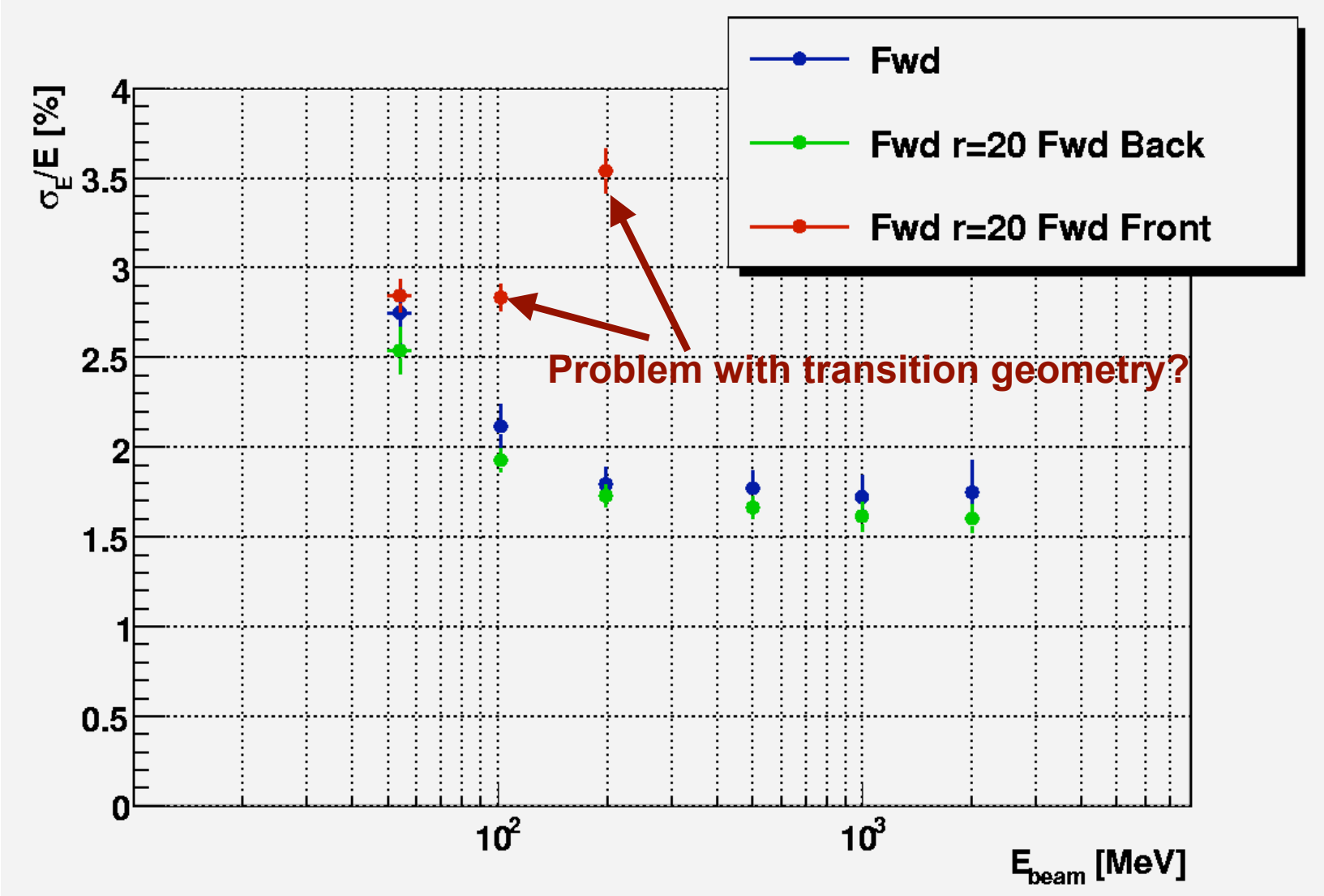




γ on last barrel crystal (l=48)



γ on first Fwd crystal (r=20)



Conclusions

- Full SuperB geant4 simulation (Bruno) allows more complex and realistic studies
  - Transition regions
  - Effect of upstream material

- Bruno validation still need to be completed
  - All studies need to be redone on firmer ground
  - Due to interaction with other subdetector each geometry option needs to be carefully checked
  - The overall response agrees quite well with the standalone G4