# Instrumentation of the Mask Region

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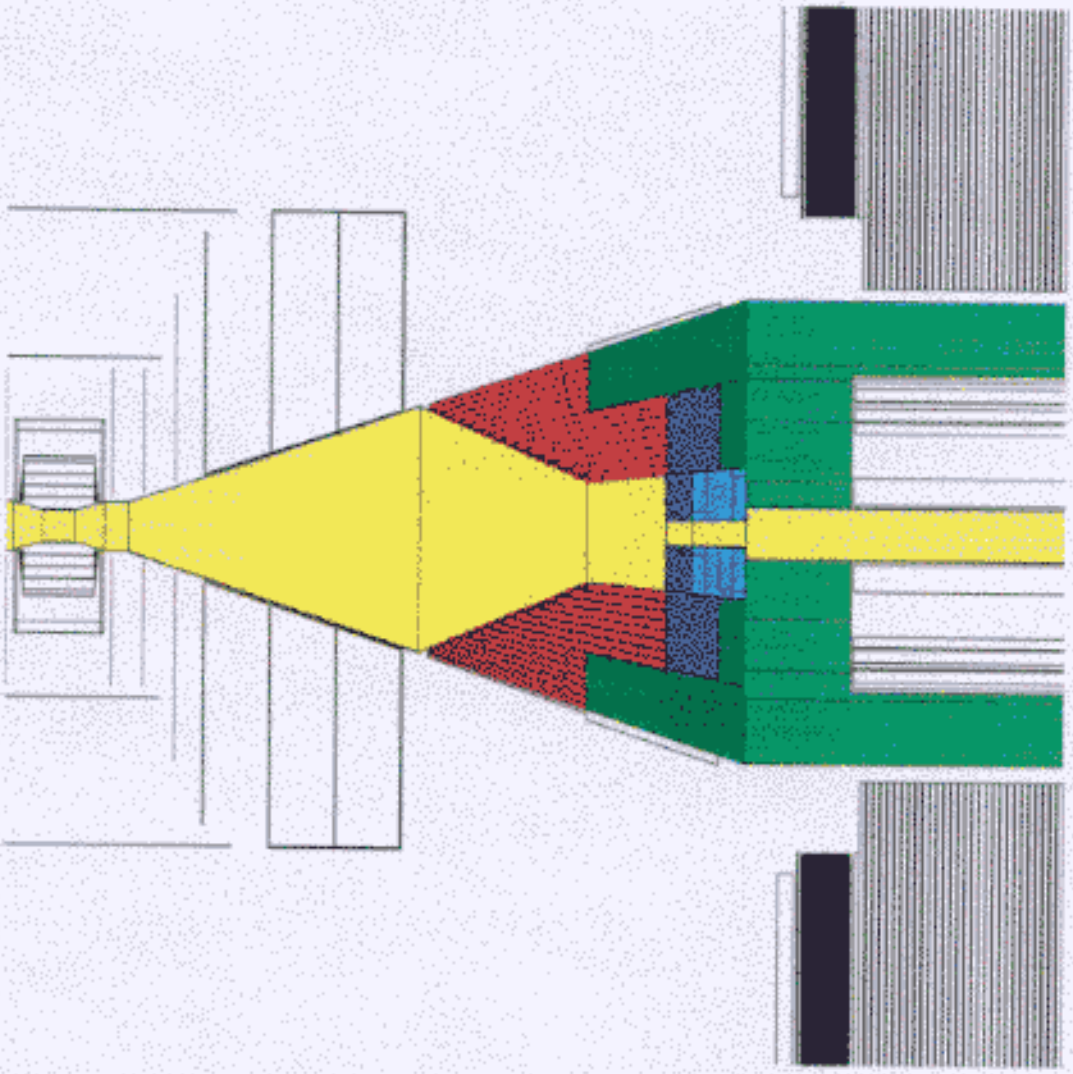
1. Design of the Mask Region
2. Instrumentation of LCAL
3. Detection of Bhabhas at small angles
4. Pair Background

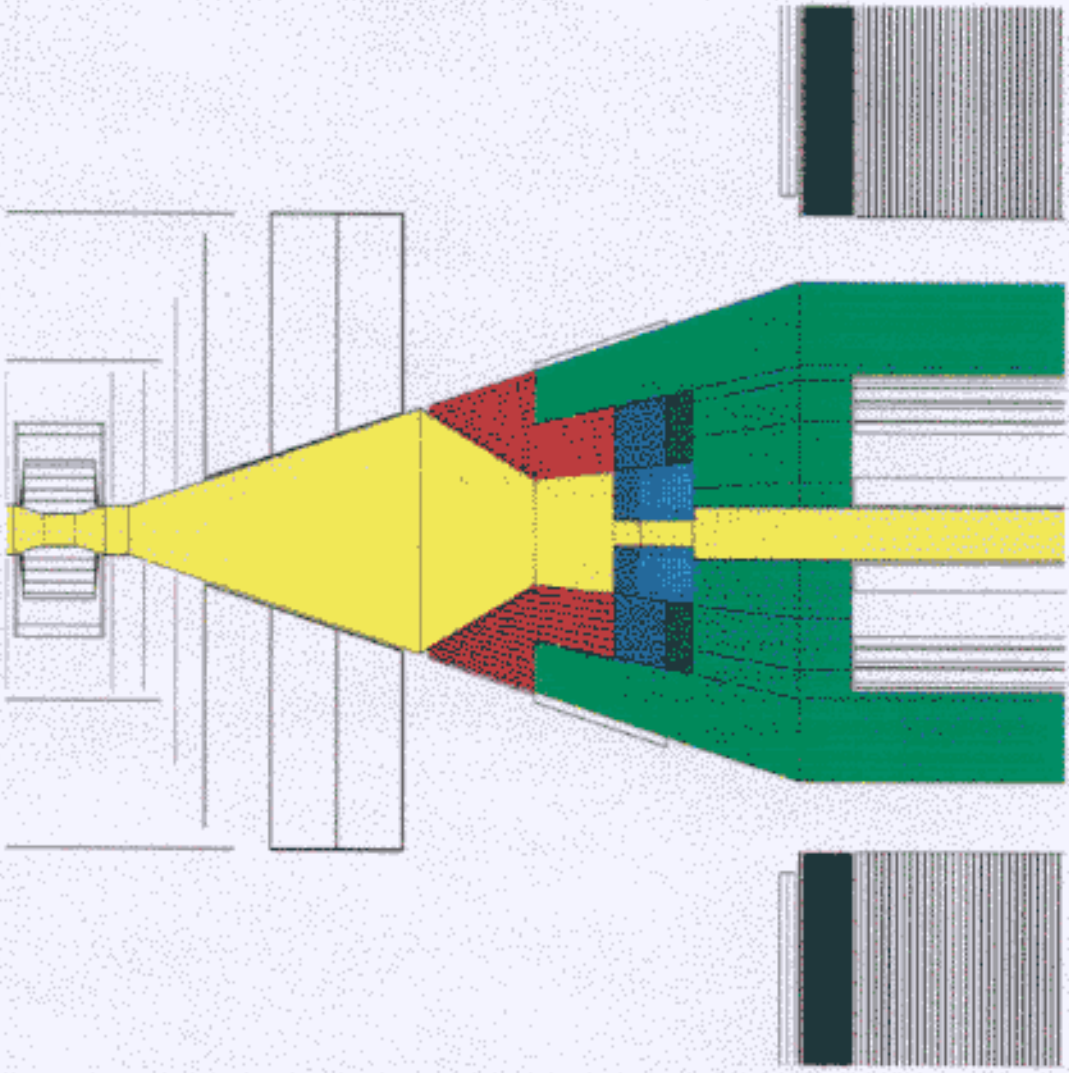
# Design of the Mask



- Tungsten shielding
- Neutron shielding (graphite)
- Low Angle Tagger (LAT): 23.5 – 83.1 mrad
- Luminosity Calorimeter (LCAL): 4.6 – 23.5 mrad

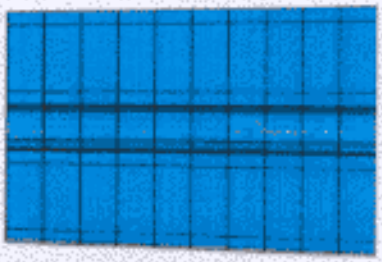
Problem: 20 cm more space are needed between quad and inner mask !

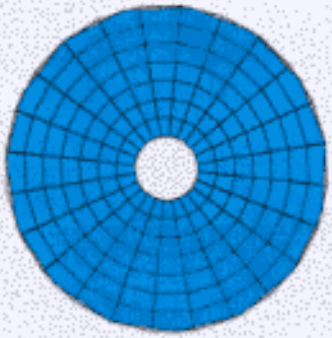
# Modified Design of the Mask



- Mask moved 20 cm closer to IP
- LAT: 27.5 – 83.1 mrad
- LAT is shorter now (but $\geq 60\ X_0$)
- LCAL: 4.6 – 27.5 mrad

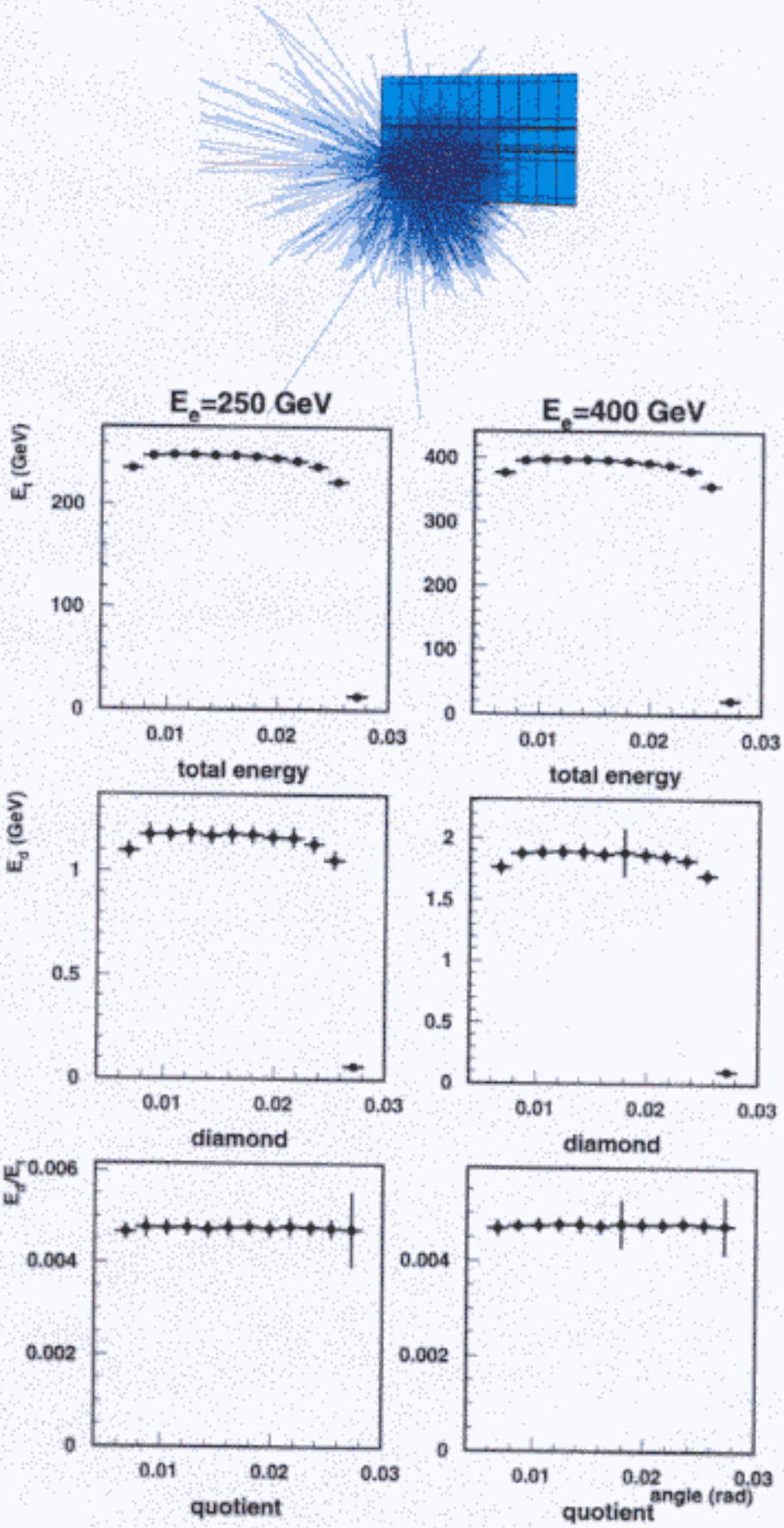
# Instrumentation of the LCAL



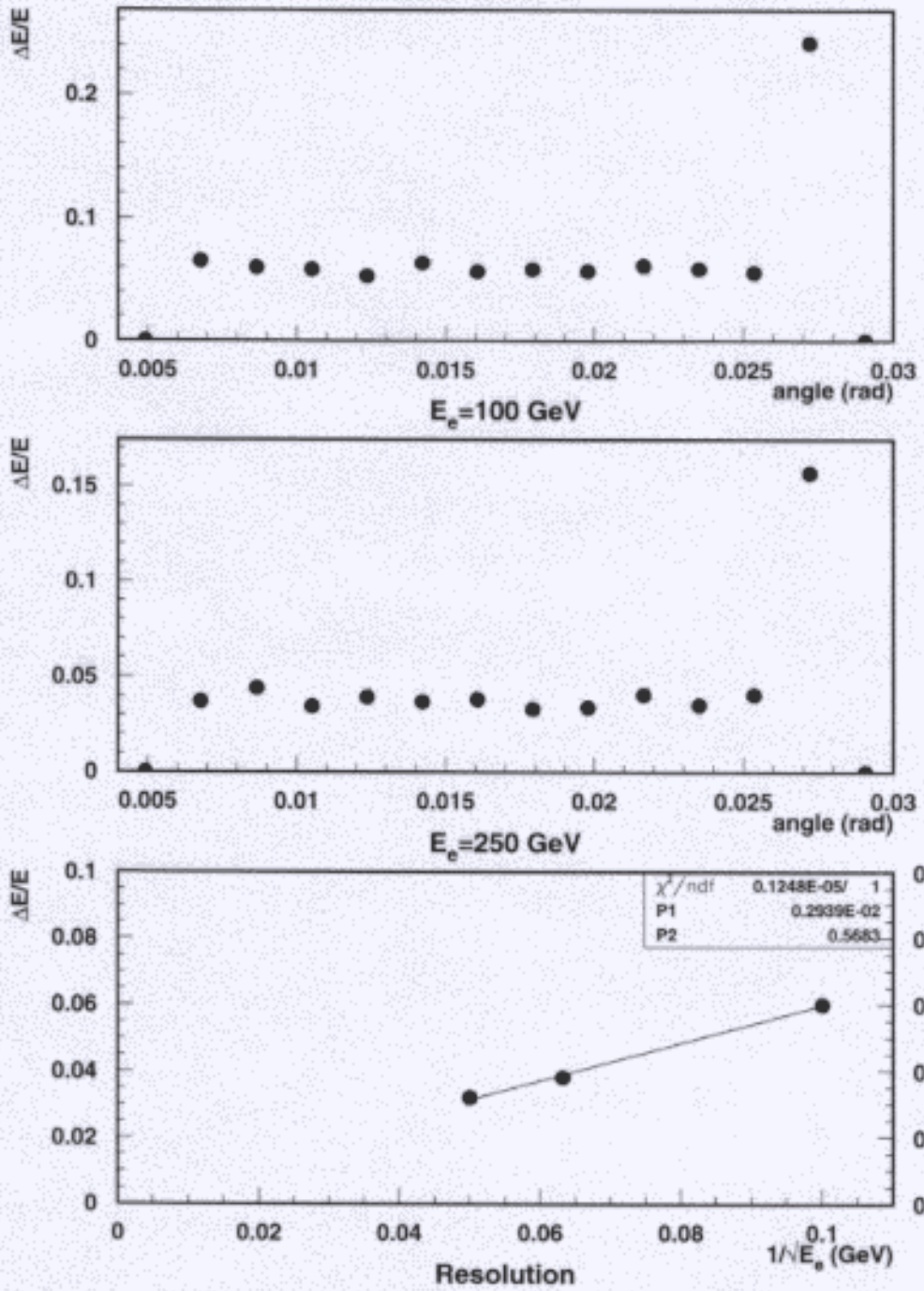


- 20 layers of diamond/tungsten
- first layer is diamond
- $\Delta\theta \approx 3.3$ mrad
- $\Delta\phi = 15$ deg

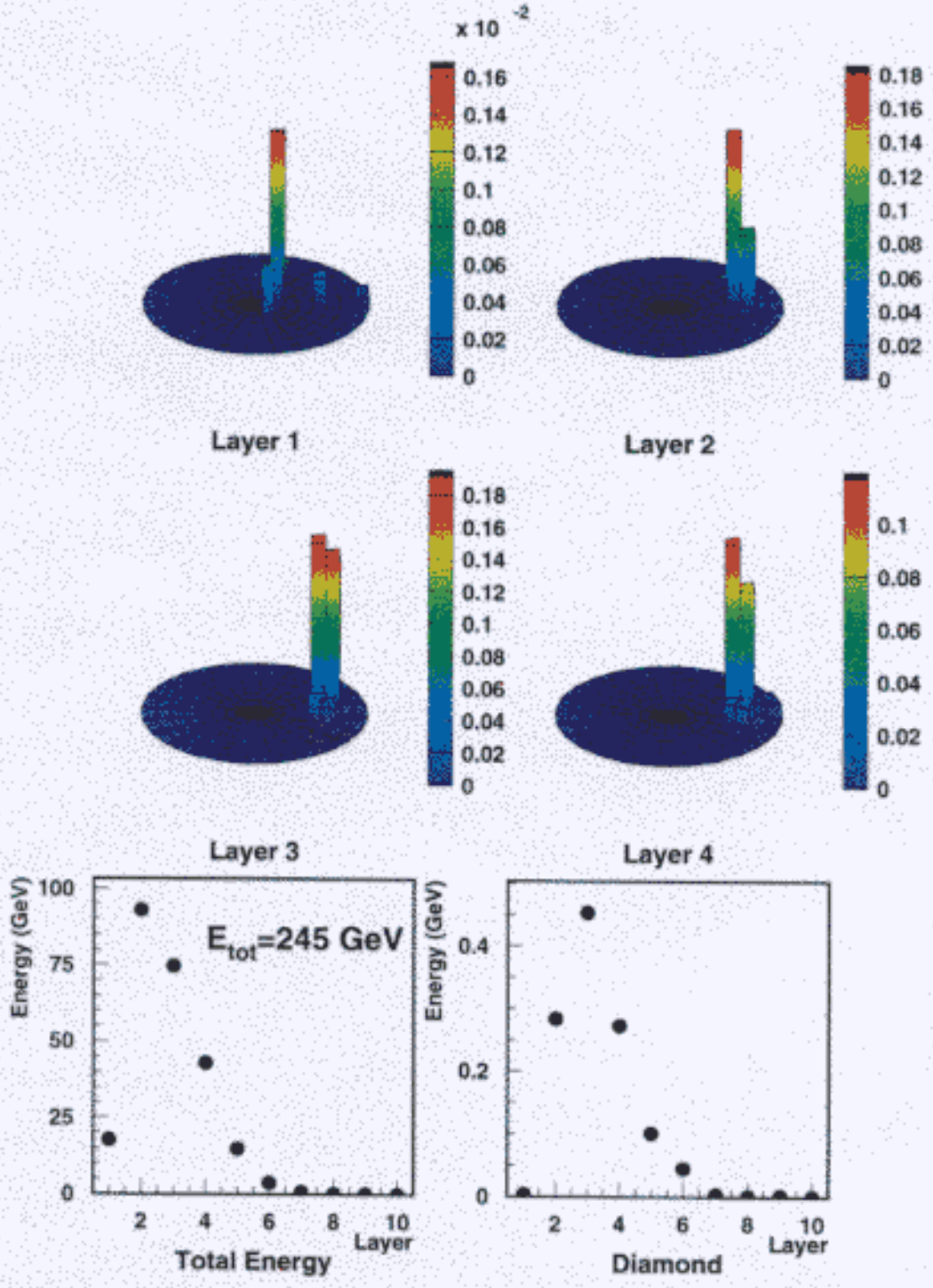
# Performance of the LCAL – Detection of Bhabhas



# Performance of the LCAL – Energy Resolution

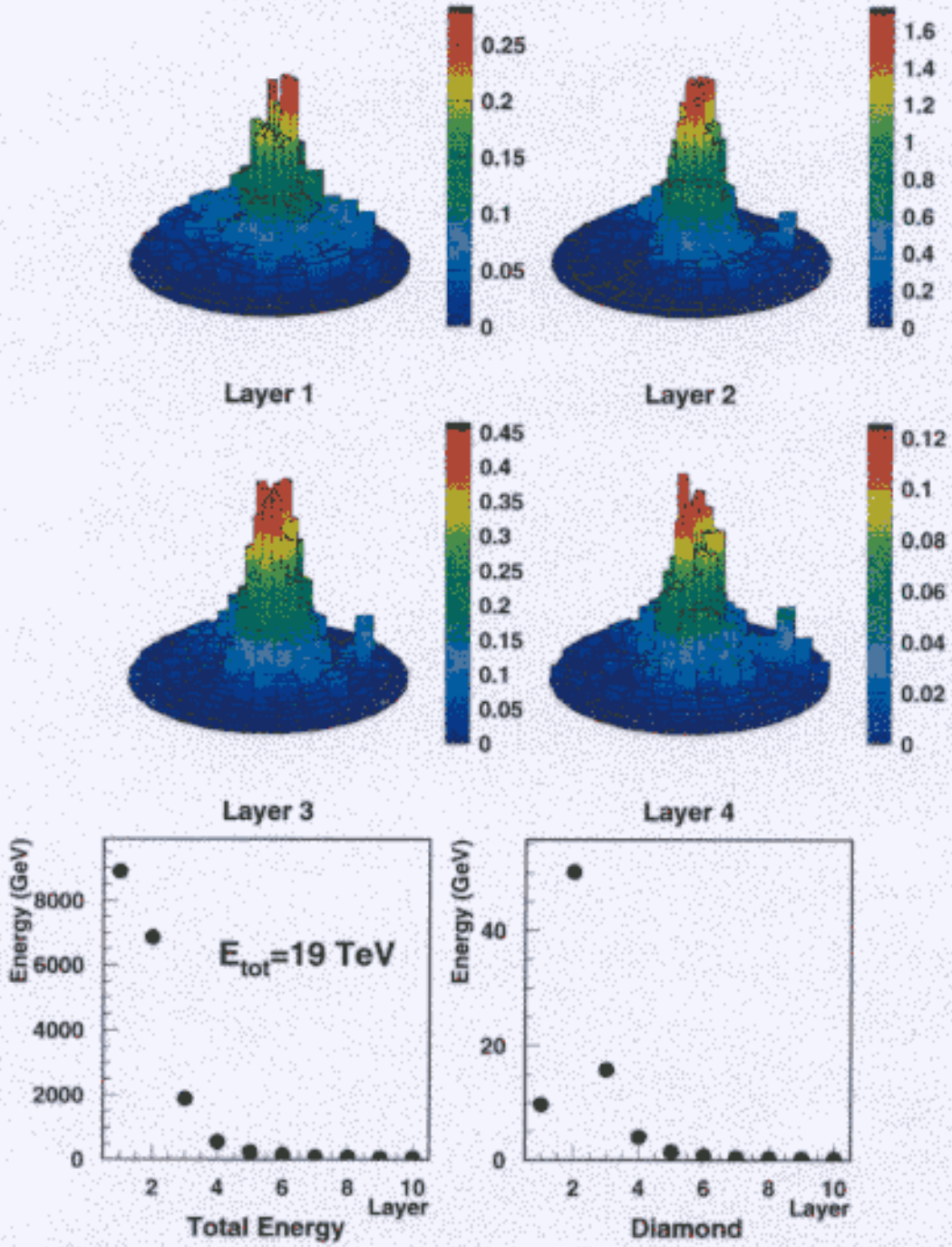


# Performance of the LCAL – Electron Signal



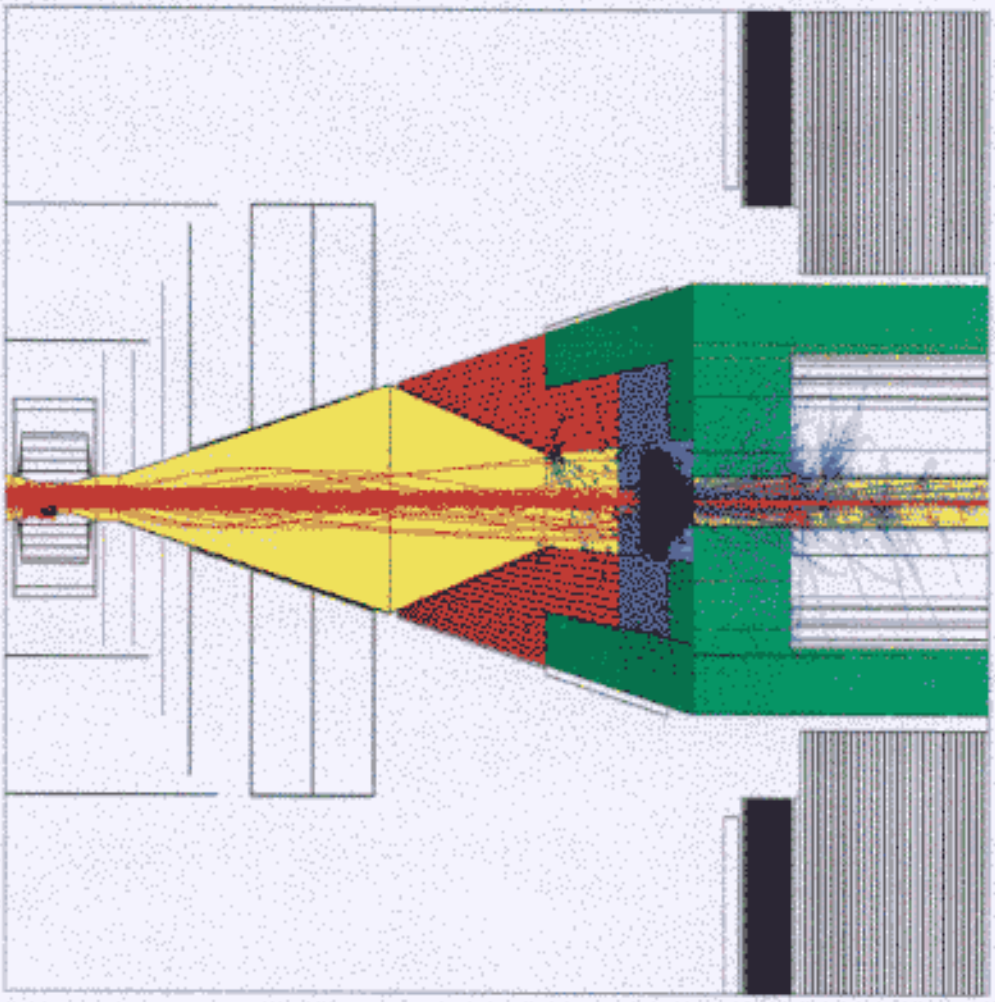
# 100 GeV Electron and Background

$$\theta = 20mrad$$



# Background: Pairs in the Mask

≈ 0.1% of one bunchcrossing @ 500 GeV , 3T

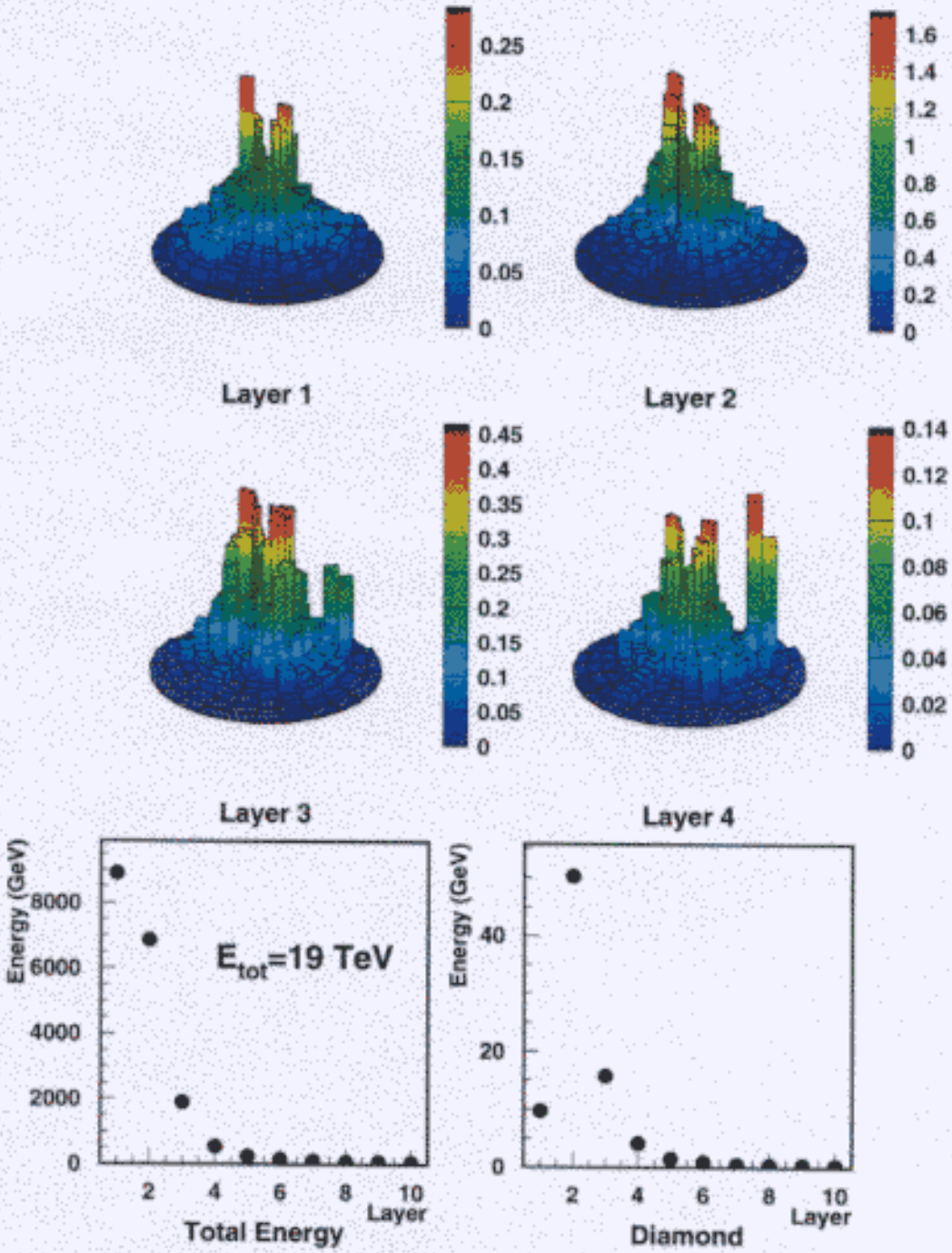


Pairs on one side ($z \geq 0$)

| Energy | # produced | Total E | # on LCAL | E on LCAL |
|---|---|---|---|---|
| 500 | 60000 | 150 TeV | 110000 | 21 TeV |
| 800 | 90000 | 490 TeV | 170000 | 35.5 TeV |

Every channel of LCAL fires !!

# Electron and Background



# Conclusion and Outlook

## Conclusion

- First iteration of a detailed design of the mask and it's instrumentation is done
- Load from beamstrahlung pairs in the mask is huge $\longrightarrow$ mask detectors must be fast and radiation hard
- LCAL design as W/Diamond calorimeter
- Electrons from Bhabha scattering can be separated from background at small angles (LCAL)

## Outlook

- Final design of LAT and LCAL has to be found (segmentation etc.)
- Performance of LAT and LCAL has to be quantified
- Hardware R&D for radiation hard calorimetry has started