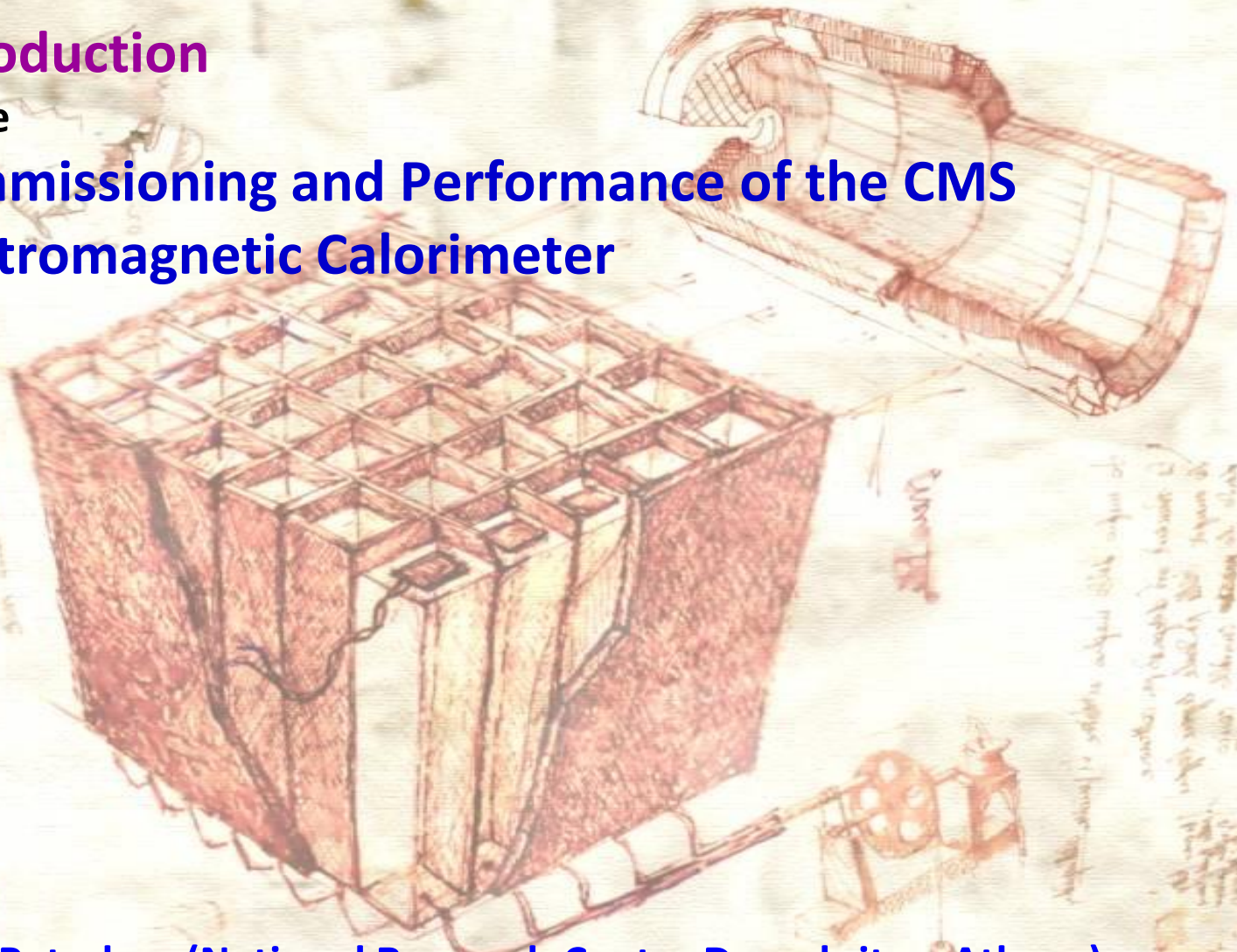


Introduction

to the

Commissioning and Performance of the CMS Electromagnetic Calorimeter



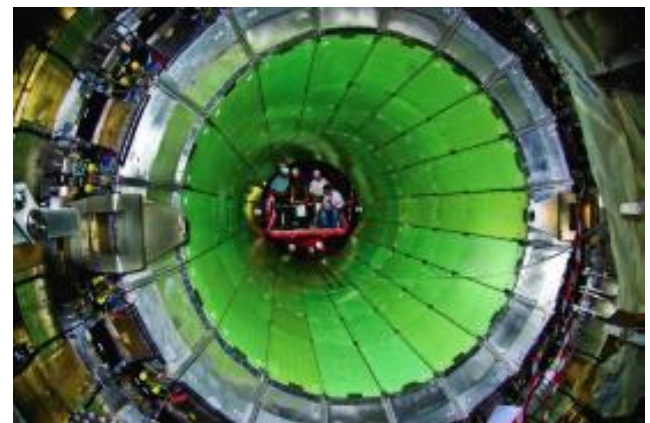
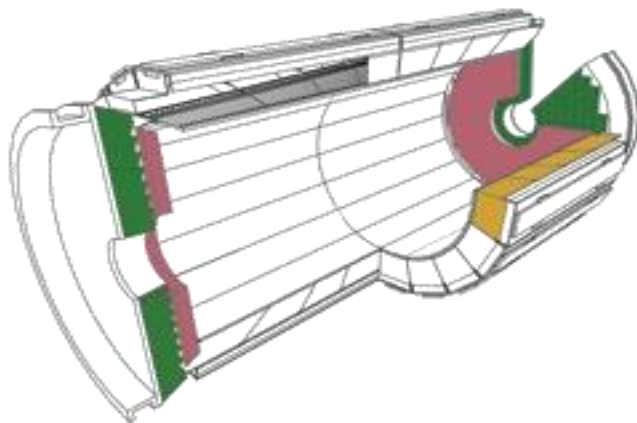
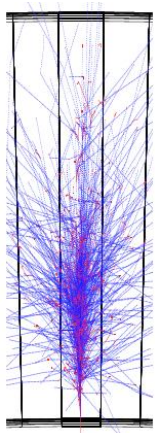
**Eleni Petrakou (National Research Centre Demokritos, Athens)
for the CMS Collaboration**

Physics in Collision 2010, Karlsruhe



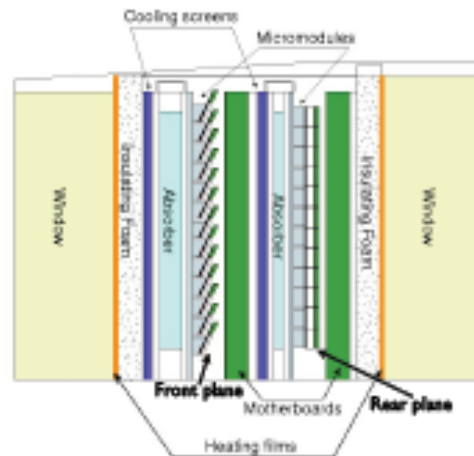
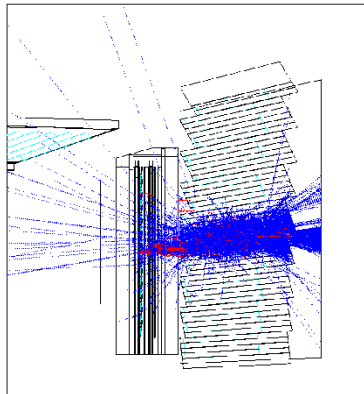
The CMS Electromagnetic Calorimeter (ECAL)

- Compact calorimeter, optimized for reconstructing photons and electrons with energy relevant for the search of the intermediate mass Higgs boson.
- 75,848 scintillating lead tungstate (PbWO_4) crystals.
- The Barrel ($0 \leq |\eta| \leq 1.48$) consists of 36 Supermodules, with 1,700 crystals each.
- The Endcaps ($1.48 \leq |\eta| \leq 3$) consist of 4 Dees, with 3,660 crystals each.
- Barrel crystals readout by Avalanche Photodiodes (APD), Endcap crystals by Vacuum Phototriodes (VPT).



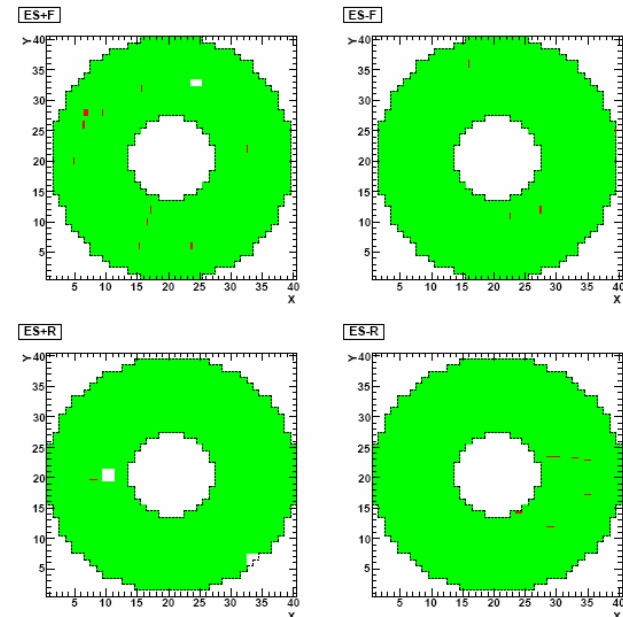
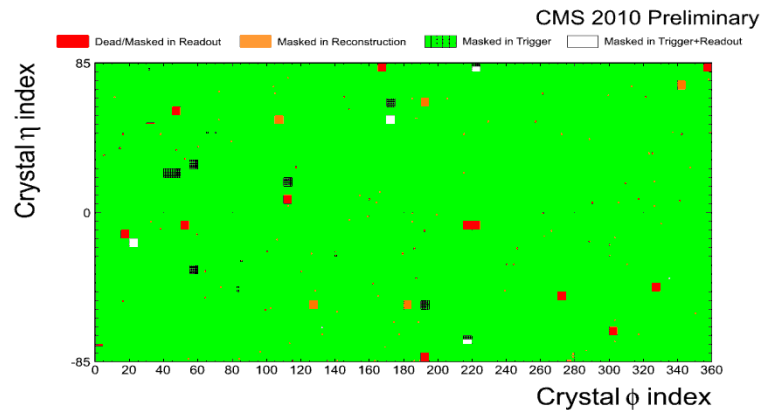
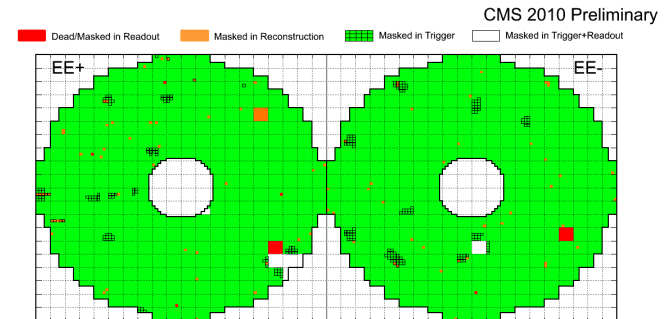
The CMS Preshower Detector (ES)

- Sampling calorimeter, designed for γ/π^0 discrimination at the CMS Endcaps.
- Two lead radiators ($2+1 X_0$) and two orthogonal active planes of silicon strips in front of each Endcap ($1.65 < |\eta| < 2.6$).
- 137,216 channels.
- On-detector full electronics chain.



Channels status

- ECAL Barrel fully functional channels: 99.30%
 - » unrecoverable: 0.1%
- ECAL Endcap fully functional channels: 98.94%
 - » unrecoverable: 0.7%
- * recovery from trigger measurements
- Preshower fully functional channels: 99.79%



Pre-calibration

Methods:

- **Laboratory measurements** of crystal light yield and photo-detector gain during the construction phase (all Barrel and Endcap channels),
- **Test-beam** electrons (9 Barrel supermodules and about 500 Endcap crystals),
- **Cosmic ray** muons after installation (all Barrel channels),
- **Beam dump** events for Endcaps (circulating proton beams stopped in collimators 150 m away from CMS),
- **Cosmic rays** prior to installation (all Preshower modules).

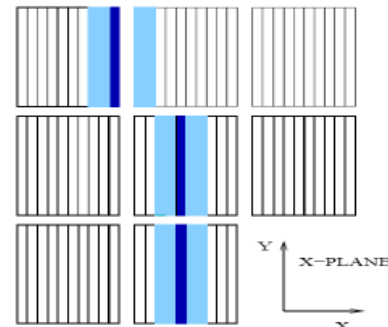
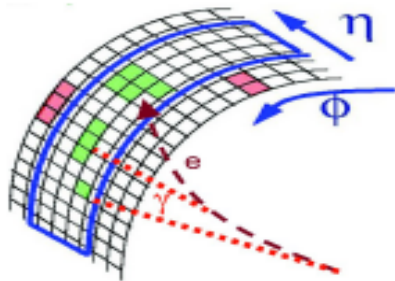
Estimated pre-calibration precision:

- Barrel: $\sim 0.5\%$ for the 9 supermodules calibrated with test beams and 1.5%-2.2%, depending on pseudorapidity, for the other 27 supermodules;
- Endcaps: below 1% in the ~ 500 crystals calibrated with beam and about 5% elsewhere;
- Preshower: about 2.5% everywhere.

Clustering

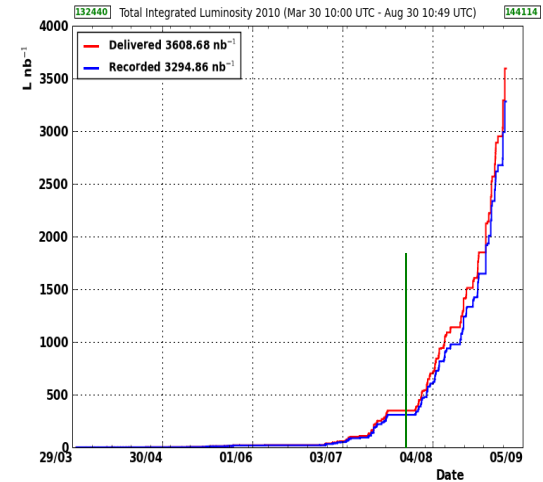
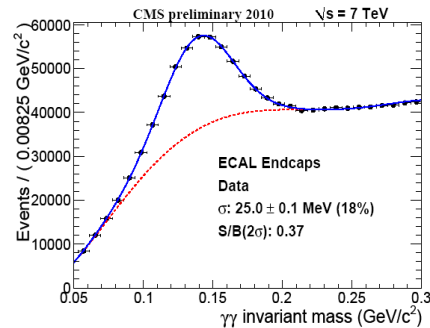
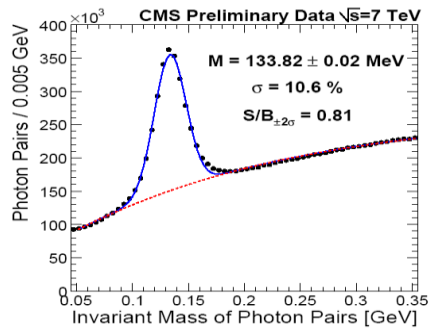
Clustering of the energy deposits:

1. In both Barrel and Endcaps, “basic clusters” of groups of crystals are formed around seed crystals.
2. In each Preshower plane, clusters are formed around seed strips.
3. For the Endcaps, the positions of basic clusters are extrapolated to the Preshower, and the energy of geometrically matching clusters is added to the basic clusters energy.
4. The Barrel and Endcap clusters are further grouped into “superclusters”, which are extended in ϕ , thus minimizing the containment variations due to the strong magnetic field.

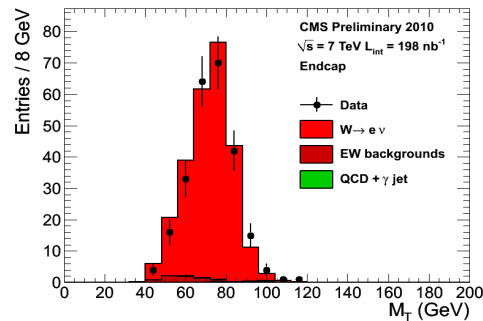
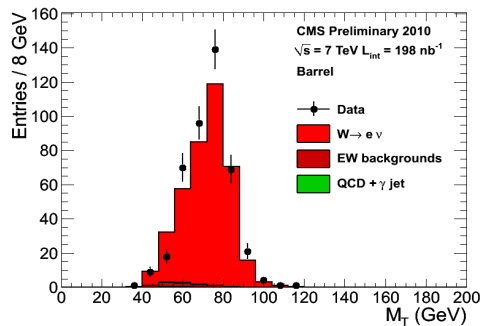


Operation at 7 TeV

- Outlook: more data!



- Π^0 resonance from diphotons



- peak around W mass from electron+missing tr. energy