

# Study of the crystal transparency changes of ECAL CMS

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# Outline

- CMS
- Higgs  $\rightarrow \gamma\gamma$  decay
- ECAL
- ECAL Crystals
- My Project
- Achievements
- Future work

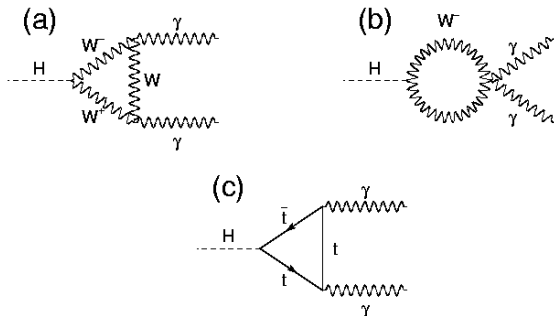


# The Compact Muon Solenoid

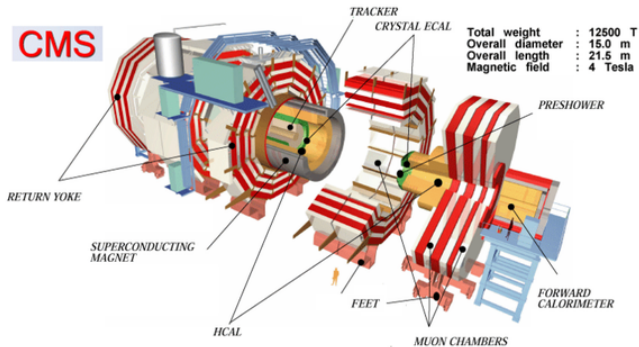


# Higgs $\rightarrow \gamma\gamma$ decay

- Most promising channel for mass between 114 and 130 GeV.



# ECAL



# ECAL Crystals

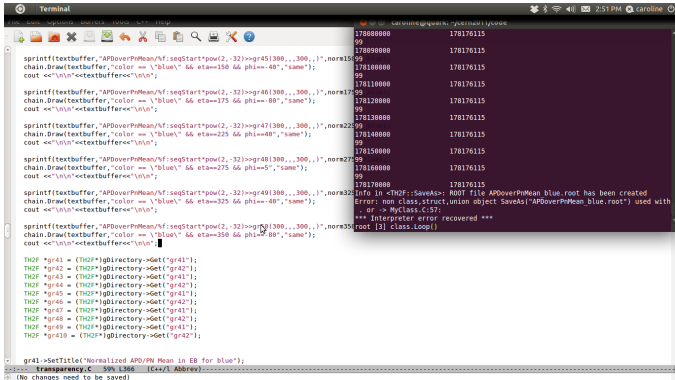
- Tungstate crystals ( $\text{PbWO}_4$ )
- EB region: 61,200 crystals
- EC region: 7,324 crystals
- Readout: APD
- Reference system: PN diodes
- LED light injection system

# My Project

- Study the transient transparency change of the ECAL crystals.
- Goal: Resolution  $<0.5\%$  for energies above 100 GeV.



# Achievements



```
Terminal
...
sprintf(textbuffer, "APDoverPMean/Nf:seqStart*pow(2,-32)>>gr45(300,,300,,1)",nora15);
chain.Draw(textbuffer,"color == \"blue\" && eta==150 && phi==40,\"same\");
cout << "\n\n" << textbuffer << "\n\n";

sprintf(textbuffer, "APDoverPMean/Nf:seqStart*pow(2,-32)>>gr46(300,,300,,1)",nora17);
chain.Draw(textbuffer,"color == \"blue\" && eta==175 && phi==80,\"same\");
cout << "\n\n" << textbuffer << "\n\n";

sprintf(textbuffer, "APDoverPMean/Nf:seqStart*pow(2,-32)>>gr47(300,,300,,1)",nora22);
chain.Draw(textbuffer,"color == \"blue\" && eta==225 && phi==40,\"same\");
cout << "\n\n" << textbuffer << "\n\n";

sprintf(textbuffer, "APDoverPMean/Nf:seqStart*pow(2,-32)>>gr48(300,,300,,1)",nora27);
chain.Draw(textbuffer,"color == \"blue\" && eta==275 && phi==5,\"same\");
cout << "\n\n" << textbuffer << "\n\n";

sprintf(textbuffer, "APDoverPMean/Nf:seqStart*pow(2,-32)>>gr49(300,,300,,1)",nora32);
chain.Draw(textbuffer,"color == \"blue\" && eta==325 && phi==40,\"same\");
cout << "\n\n" << textbuffer << "\n\n";

sprintf(textbuffer, "APDoverPMean/Nf:seqStart*pow(2,-32)>>gr50(300,,300,,1)",nora35);
chain.Draw(textbuffer,"color == \"blue\" && eta==350 && phi==80,\"same\");
cout << "\n\n" << textbuffer << "\n\n";

TH2F *gr41 = (TH2F*)gDirectory->Get("gr41");
TH2F *gr42 = (TH2F*)gDirectory->Get("gr42");
TH2F *gr43 = (TH2F*)gDirectory->Get("gr41");
TH2F *gr44 = (TH2F*)gDirectory->Get("gr42");
TH2F *gr45 = (TH2F*)gDirectory->Get("gr41");
TH2F *gr46 = (TH2F*)gDirectory->Get("gr42");
TH2F *gr47 = (TH2F*)gDirectory->Get("gr41");
TH2F *gr48 = (TH2F*)gDirectory->Get("gr42");
TH2F *gr49 = (TH2F*)gDirectory->Get("gr41");
TH2F *gr410 = (TH2F*)gDirectory->Get("gr42");

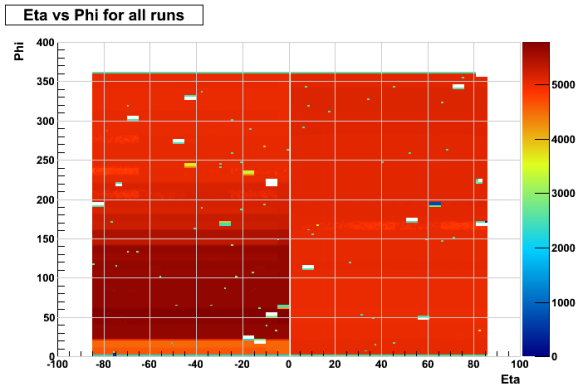
gr41->SetTitle("Normalized APD/PW Mean in EB for blue");
-----
transparency.C 59% L366 (C++1 Abbrev)
(No changes need to be saved)

178080000 178176115
99
178090000 178176115
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178100000 178176115
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178110000 178176115
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178120000 178176115
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178130000 178176115
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178140000 178176115
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178150000 178176115
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178160000 178176115
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178170000 178176115
99
[Info in <TH2F::SaveAs>: ROOT file APDoverPMean_blue.root has been created
Error: non class,struct,union object SaveAs["APDoverPMean_blue.root"] used with
.or -> MyClass.C:57:
*** Interpreter error recovered ***
root [3] class.Loop]
```

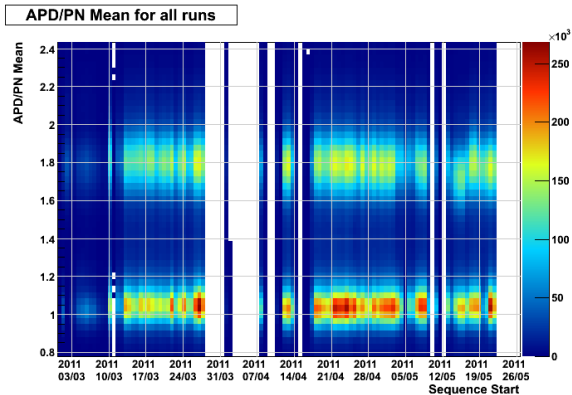




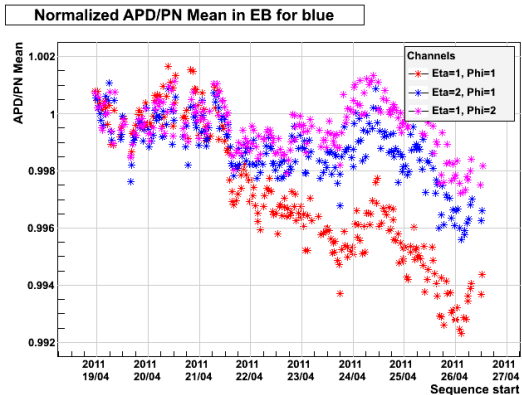
# Achievements



# Achievements



# Achievements



## Future work

- Analyze the behavior of all crystals in EB.
- Develop a method to quantify the behavior.
- Extend the analysis to EE.
- Determine the best way to optimize the data resolution.
- Implement an upgraded correction algorithm.

# And while we're looking for the Higgs...

