



JetMET POG DQM

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**DQM WorkShop
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People



Ken Hatakeyama and Jared Sturdy have joined the JetMET DQM effort

Have had several discussions with MET conveners, Greg Landsberg and Filip Moortgat

Presentations made in JetMET and MET meetings

Summary of what we want to do kept in a working document...



Requirements



Need to provide quality information at the detector segmentation

Barrel, EndCap, Forward

We need to be able to determine data quality *per luminosity section* in order to be able to exclude bad data within a run

Will monitor basic Jet and MET distributions

Will rely mainly on the DPG monitoring but will use POG monitoring as a cross check



Functional Description



First we define the data quality flags that we will want to save in DBS

Layer 1	Layer 2	Layer 3
JetMET_Global	JetMET_Jet	JetMET_Jet_Barrel
		JetMET_Jet_EndCap
		JetMET_Jet_Forward
		JetMET_Jet_J20
		JetMET_Jet_J110
	JetMET_MET	JetMET_MET_All
		JetMET_MET_NoHF

Need to specify granularity at the detector level
Barrel, EndCap, Forward

Monitor Low (J20) and High (J110) jet pT triggers



Functional Description



The screenshot shows a SeaMonkey browser window with the address bar containing the URL `http://ncdf76.fnal.gov/~chlebana/CMS/DQM/JetMET/`. The page content includes several sections with green headers and descriptive text:

- JetMET_Jet**:

```
if ( (JetMET_Jet_Barrel == 1) &&
      (JetMET_Jet_EndCap == 1) &&
      (JetMET_Jet_Forward == 1) ) JetMET_Jet = 1
```
- JetMET_Jet_XXX**:
Quality flag for jets in the XXX (Barrel, EndCap, Forward) region

```
if ( (JetMET_Jet_XXX_Pt_Low_Val > 950) &&
      (JetMET_Jet_XXX_Pt_High_Val > 950) &&
      (JetMET_Jet_XXX_Eta_Low_Val > 950) &&
      (JetMET_Jet_XXX_Eta_High_Val > 950) &&
      (JetMET_Jet_XXX_Phi_Low_Val > 950) &&
      (JetMET_Jet_XXX_Phi_High_Val > 950) &&
      (JetMET_Jet_XXX_Constituents_Low_Val > 950) &&
      (JetMET_Jet_XXX_Constituents_High_Val > 950) &&
      (JetMET_Jet_XXX_HOverE_Low_Val > 950) &&
      (JetMET_Jet_XXX_HOverE_High_Val > 950) ) JetMET_Jet_Barrel = 1
```
- JetMET_Jet_XXX_Pt_YYY_Val**:
Result of KS test between current data and reference distributions for the Barrel, EndCap, and Forward region.
- JetMET_Jet_XXX_Eta_YYY_Val**:
Result of KS test between current data and reference distributions for the Barrel, EndCap, and Forward region.
- JetMET_Jet_XXX_Phi_YYY_Val**:
Result of KS test between current data and reference distributions for the Barrel, EndCap, and Forward region.
- JetMET_Jet_XXX_Constituents_YYY_Val**:
Result of KS test between current data and reference distributions for the Barrel, EndCap, and Forward region.
- JetMET_Jet_XXX_HOverE_YYY_Val**:
Result of KS test between current data and reference distributions for the Barrel, EndCap, and Forward region.
- JetMET_Jet_J20**:
Monitor the performance of the J20 trigger path. Result of KS test between current data and reference distributions.

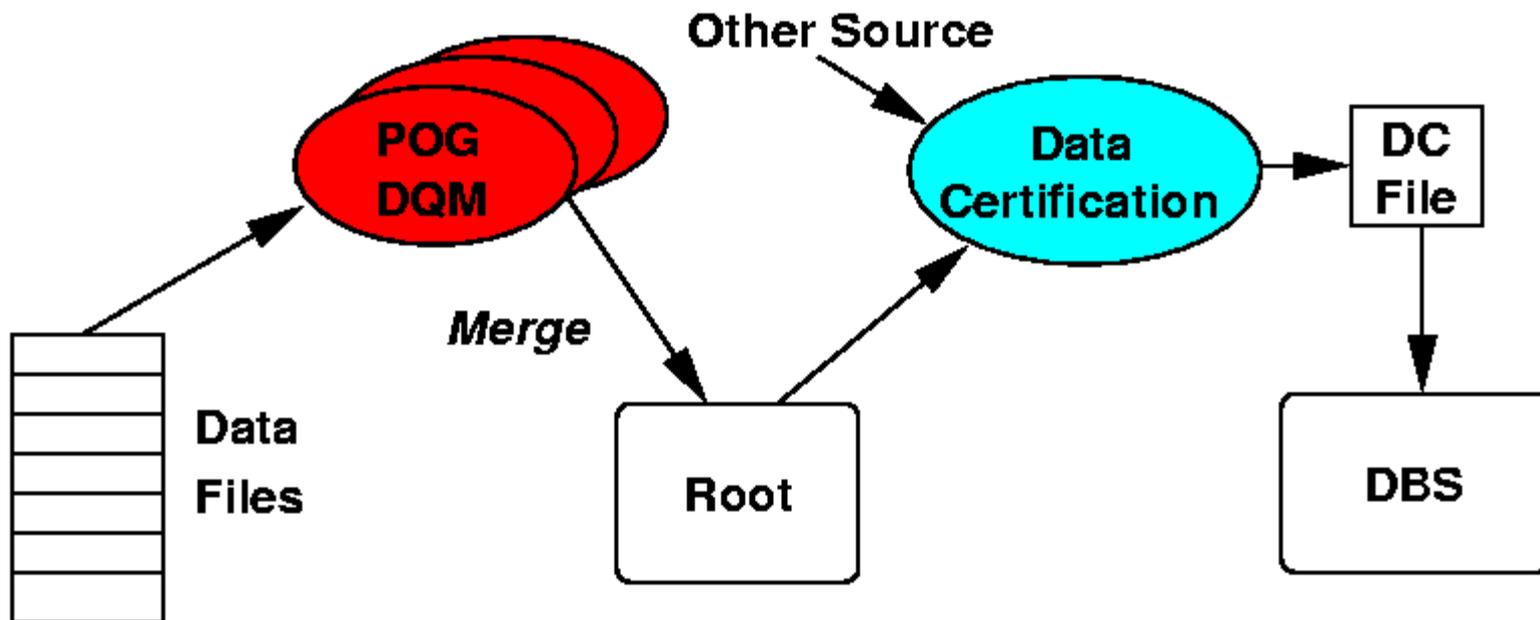
```
if ( (JetMET_Jet_J20_Pt_Val > 950) &&
      (JetMET_Jet_J20_Eta_Val > 950) ) JetMET_Jet_J20 = 1
```
- JetMET_Jet_J20_Pt_Val**:
The KS score when comparing the Pt distribution of the current data with the reference distribution.

Specify how the quality flags are determined

Have a “working document” with details

Web page is updated as our plans develop

Will move to a more official URL



POG Monitoring runs in parallel → *results merged*

Data Certification runs on the merged root file
Algorithm changes can be done in one place

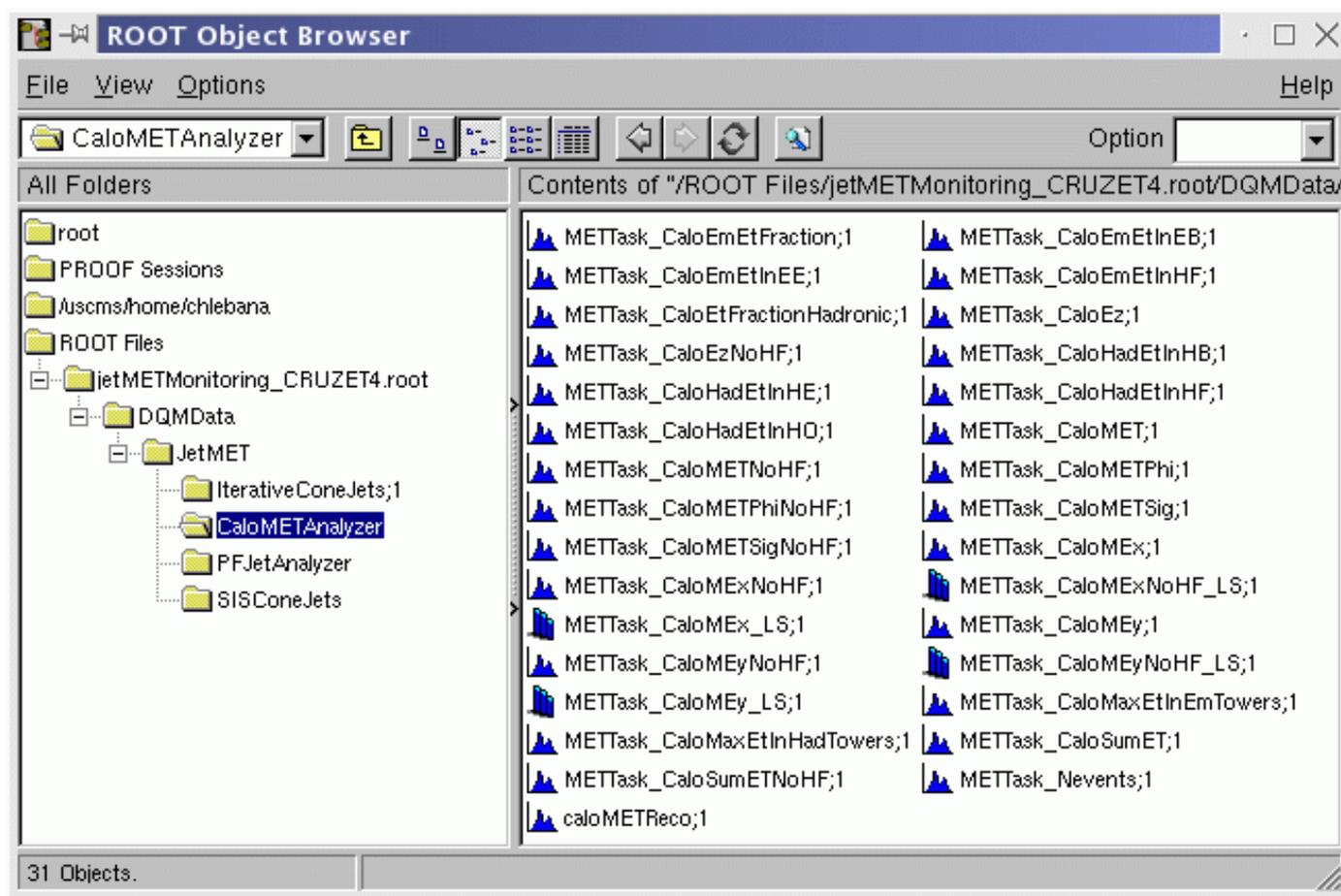
Results written to a “Data Certification” file



JetMET POG Histograms



MET: CaloMET
JETS: SIScone, IterativeCone, PFJets





Data Certification Algorithm



Data Certification runs off of the **merged root file**

Algorithm runs as a separate process (root script)
Able to modify algo without rerunning DQM

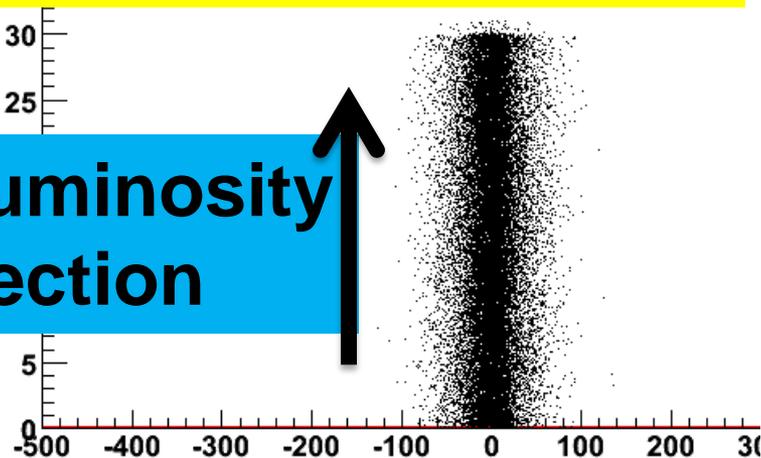
Produces a text file (DC File) with the results
Need to define the DBS table...

DC file can be read by perl script that fills DBS
Agree on format of Data Certification File

METTask_CaloMEyNoHF_LS

Filled in POG Monitor

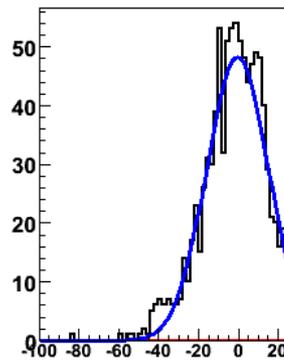
Luminosity Section



Fill a 2d histogram

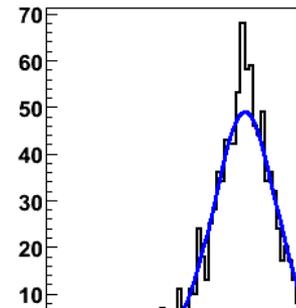
Take projection and fit to get mean and chi2

METTask_CaloMEx_LS



CaloMEx_0028	
Entries	1000
Mean	-0.686
RMS	17.06
χ^2 / ndf	62.17 / 50
Prob	0.1158
Constant	48.35 ± 2.18
Mean	-0.3872 ± 0.5200
Sigma	15.52 ± 0.49

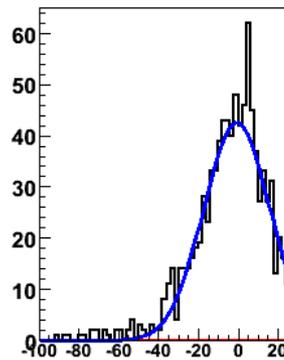
METTask_CaloMEy_LS



CaloMEy_0028	
Entries	1000
Mean	-0.728
RMS	16.68
χ^2 / ndf	53.52 / 51
Prob	0.3778
Constant	49.08 ± 2.22
Mean	-0.01653 ± 0.51130
Sigma	15.41 ± 0.49

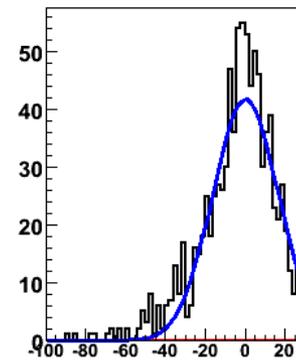
Fit by DC Algorithm

METTask_CaloMExNoHF_LS



CaloMExNoHF_0028	
Entries	1000
Mean	0.034
RMS	22.82
χ^2 / ndf	113.2 / 72
Prob	0.00141
Constant	42.6 ± 2.0
Mean	-0.8155 ± 0.5613
Sigma	16.63 ± 0.53

METTask_CaloMEyNoHF_LS



CaloMEyNoHF_0028	
Entries	1000
Mean	0.364
RMS	22.45
χ^2 / ndf	134.8 / 70
Prob	5.381e-06
Constant	41.81 ± 2.04
Mean	0.2366 ± 0.5687
Sigma	16.52 ± 0.58



Determining Data Quality in a LS



$$\text{JetMET_MET_XXX} = \text{JetMET_MET_MEx_XXX} * \text{JetMET_MET_MEy_XXX}$$

```
run, lumi-sec,      tag name, output
1    0           JetMET_MET      1
1    0           JetMET_MET_All    1
1    0           JetMET_MET_NoHF   1
1    1           JetMET_MET      1
1    1           JetMET_MET_All    1
1    1           JetMET_MET_NoHF   1
1    2           JetMET_MET      1
1    2           JetMET_MET_All    1
1    2           JetMET_MET_NoHF   1
1    3           JetMET_MET      1
1    3           JetMET_MET_All    1
1    3           JetMET_MET_NoHF   1
1    4           JetMET_MET      1
1    4           JetMET_MET_All    1
1    4           JetMET_MET_NoHF   1
1    5           JetMET_MET      1
1    5           JetMET_MET_All    1
1    5           JetMET_MET_NoHF   1
1    6           JetMET_MET      1
1    6           JetMET_MET_All    1
```

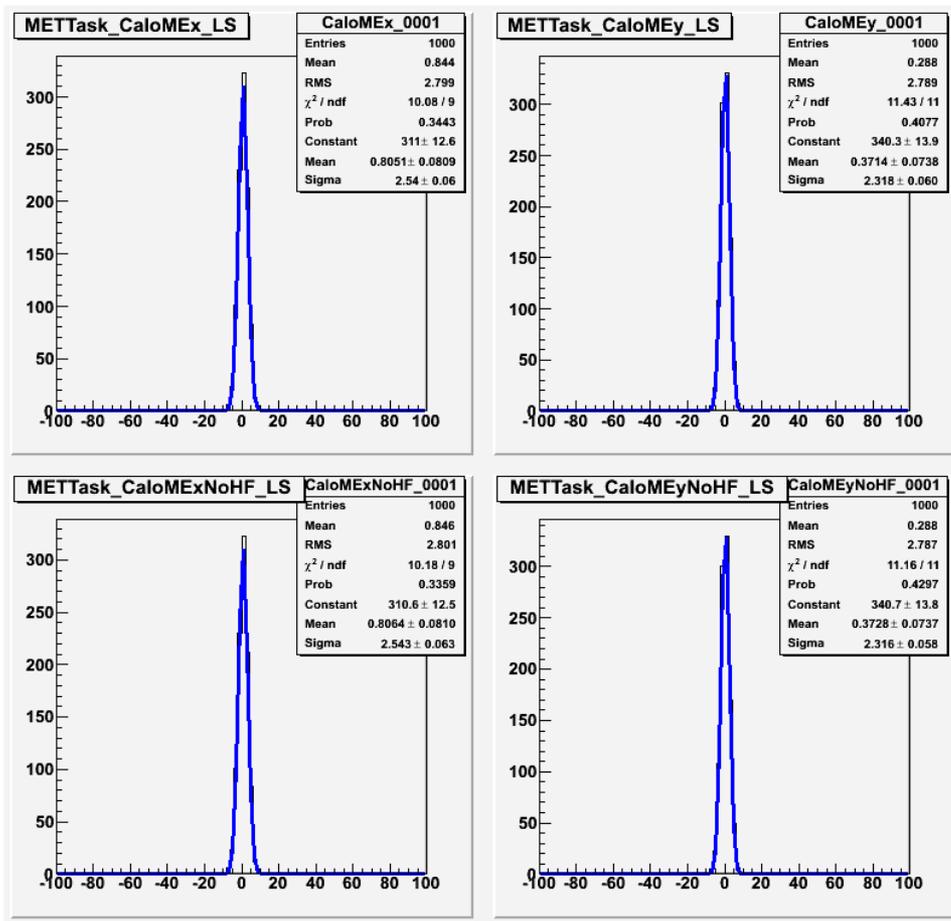
JetMET_MET_MEx_XXX
XXX = All, NoHF

**Distribution fit with a
double Gaussian**

**If mean and chi2 are within
tolerance then set = 1**

Actual output of Data Certification Algo (using MC)

We also ran the JetMET DQM on CRUZET4 data



Produced a root file

Ran the Data Certification script

Produced a DC File

For this test:
LS = nevent/1000



Other Possibilities



Could do the fitting in POG monitoring but need to propagate the information to the merged root file

Can we use a ntuple-like structure?

Keep the structure simple and agree on rules to make maintenance easy

Run, LumiSection, Histold, Mean, Chi2

What other options are available?

Filling 2d histograms allows greater flexibility



Data Certification File



Agree on format of the Data Certification File

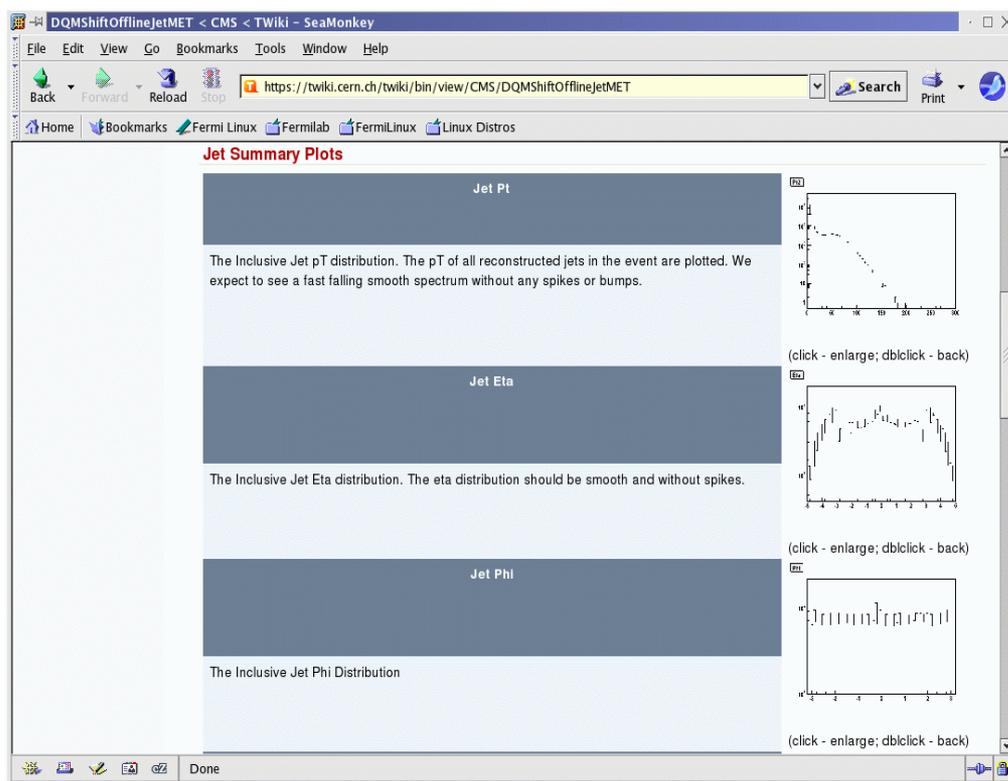
Initial conditions written out for LumiSection=0

Write out condition whenever there is a change

Run	LumiSection	TagName	TagValue
1	0	JetMET_Global	1
1	0	JetMET_Jet	1
...			
1	56	JetMET_Jet	0
1	108	JetMET_Jet	1

Filled in the template for Shifter Instructions

Used MC to provide reference histograms



*Not very useful for
CRUZET data*

Need to:
Specify trigger path
Provide *bad examples*
Review histograms
Enhance descriptions



Common Issues



Determine Data Quality per Luminosity Section
Best way to save info in merged root file?

Interface between DC and Offline DBS
Format of Data Certification File
Make sure all special cases are handled...

Keeping track of versions
How/where do we redo data certification?

Archiving merged root files



Next Steps



Finalize DBS contents

Define DBS table

Specify how to carry forward Lumi Section information

2d histogram, ntuple, other...

Agree on format of Data Certification File

Monitoring should run on data from specific triggers

Calculate additional Data Quality Flags

Compare to reference plots...

Test Filling DBS and extract good runs...

JetMET will rely on HCAL and ECAL DPG DQM

```

Run          |-----1-----|
File         |----1----|---2---|---3---|-
Run Section  |-1-|-2-|-3-|-4-|-5-|-6-|-7-|-
DAQ          |-1-|-1-|-1-|-1-|-1-|-1-|-1-|-
DCS-HB       |-1-|-1-|-1-|-1-|-0-|-0-|-1-|-
HB           |-1-|-1-|-1-|-1-|-1-|-1-|-1-|-
DCS-HO       |-1-|-1-|-0-|-0-|-0-|-1-|-1-|-
HO           |-1-|-1-|-0-|-0-|-0-|-1-|-1-|-
DCS-EB       |-1-|-1-|-1-|-1-|-1-|-1-|-1-|-
EB           |-1-|-1-|-1-|-1-|-0-|-1-|-1-|-

Returns

Files        |----1----|          |---3---|-
Run Section  |-1-|-2-|-0-|          |-0-|-7-|-
    
```

Have been in contact
with HCAL DPG

*Important to have
detector granularity*

*Now have a DataBase
query which returns
the DCS conditions
for a run*



Summary



We developed a fully working *start to end* example
Tested on MC and CRUZET data

Produces a Data Certification File which can be
used to fill DBS

Some details still need to be settled...

JetMET POG monitoring is useful for physics data
and not really appropriate for CRUZET runs

Need universal solutions to common problems