Weekly report

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Working status

Gave a report for QT:

- Signal-background comparison: no large discrimination for topo-cluster variabels.
- Data-MC comparison: model data with $Z \rightarrow llg$ and $Z + jets$ event, no large mismodelling observed.
- Required full Run2 data and MC. JIRA

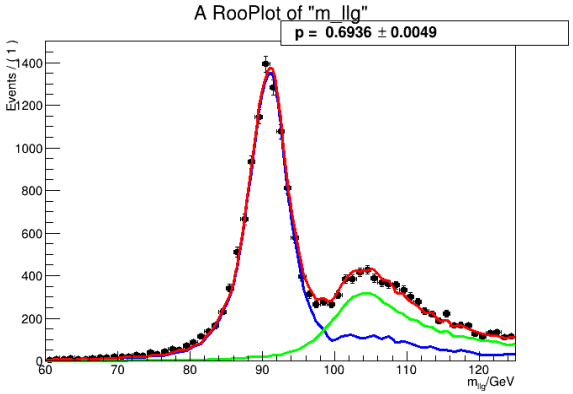
- Feedback from meeting:
  - Check the correlation between new topo-cluster variables and old photon shower variables
  - If can confirm this conclusion, the task can be finished.

Data-MC model

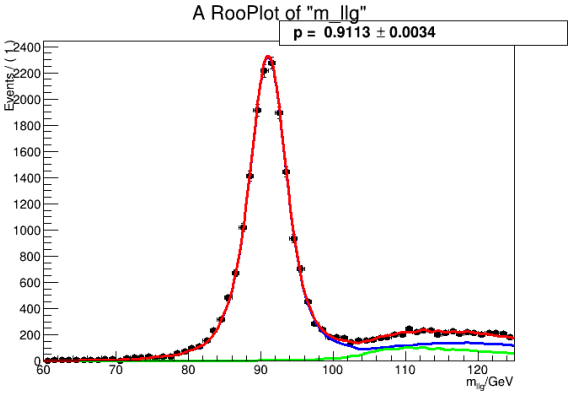
Model data with MC.

- Suppose data could be described with Z->llg and Z+jets process.
- Fit $m_{ll\gamma}$ with a histPdf to get the fraction:

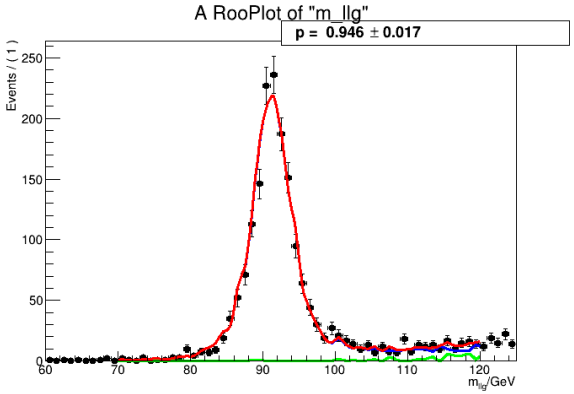
$$f(m_{ll\gamma}) = pf_s(m_{ll\gamma}) + (1-p)f_b(m_{ll\gamma})$$



$7 < pT_\gamma < 15GeV$



$15 < pT_\gamma < 30GeV$



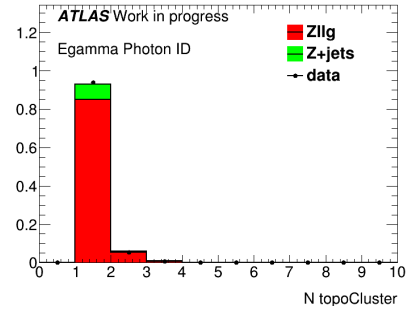
$30 < pT_\gamma < 70GeV$

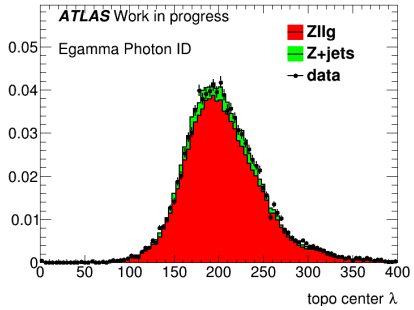
(fit in $m_{\mathrm{llg}} \in [70, 120] GeV$)

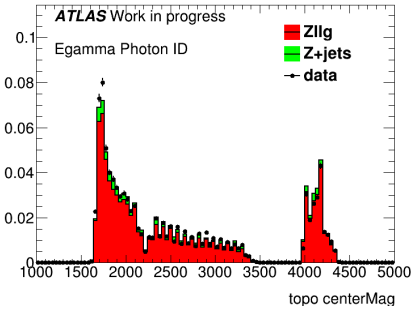
Data-MC model

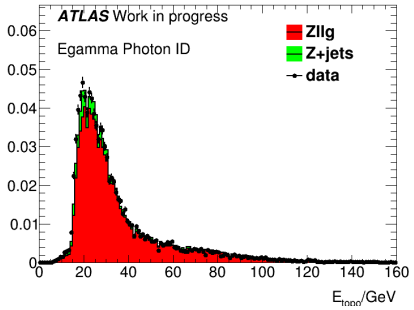
data vs. MC

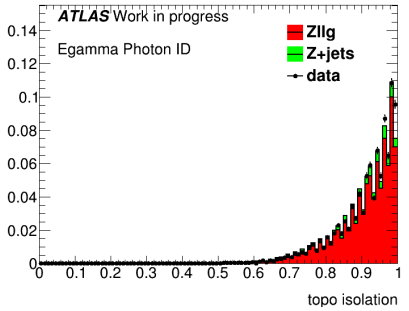
- Shapes are normalized.
- ee+gamma, $15GeV < pT_{\gamma} < 35GeV$.

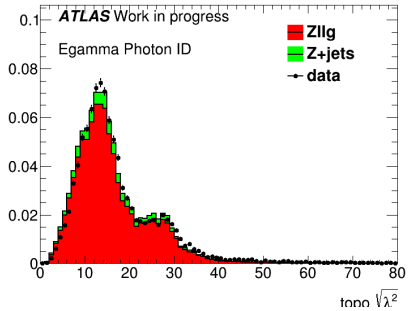


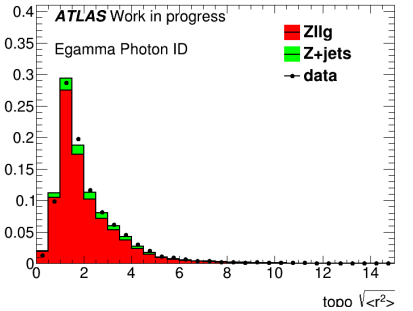


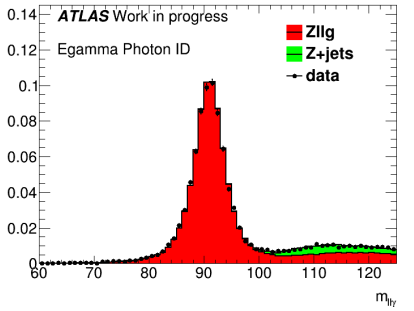












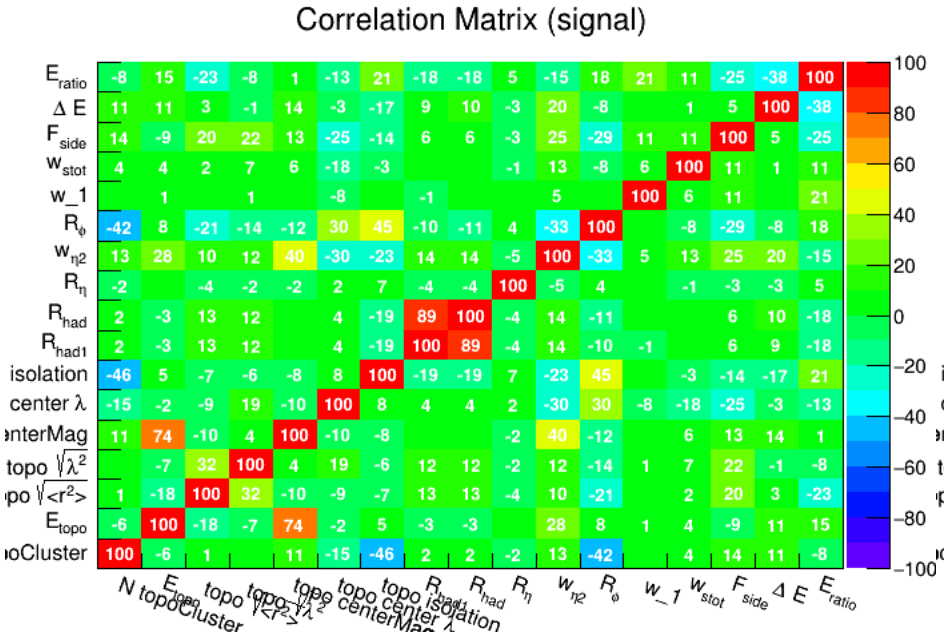
Correlation check

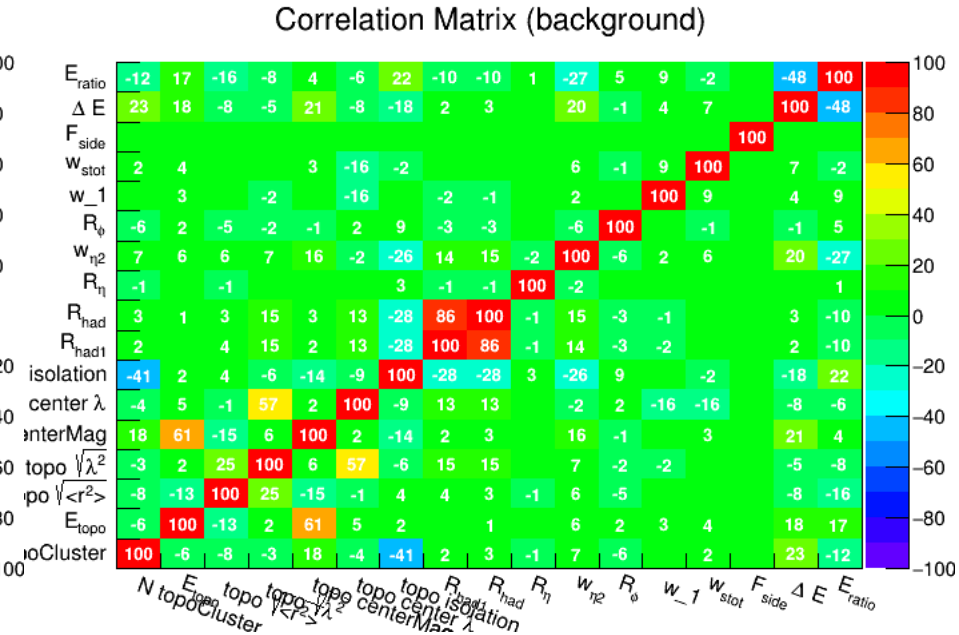
Shape variables used in photon ID:

Category	Description	Variable	loose	tight
Acceptance	$\|\eta\| < 1.37 \cup 1.52 < \|\eta\| < 2.37$		✓	✓
Hadronic leakage	Ratio of E_{T} in the first layer of the hadronic calorimeter to E_{T} of the EM cluster (used over the range $\|\eta\| < 0.8$ and $\|\eta\| > 1.37$)	R_{had1}	✓	✓
	Ratio of E_{T} in the hadronic calorimeter to E_{T} of the EM cluster (used over the range $0.8 < \|\eta\| > 1.37$)	R_{had}	✓	✓
EM Middle layer	Ratio of 3×7 $\eta \times \phi$ to 7×7 cell energies	R_{η}	✓	✓
	Lateral width of the shower	$w_{\eta 2}$	✓	✓
	Ratio of 3×3 $\eta \times \phi$ to 7×7 cell energies	R_{ϕ}	✓	✓
EM Strip layer	Lateral shower width calculated from three strips around the strip with highest energy deposit	w_{s3}		✓
	Total lateral shower width	w_{tots1}		
	Energy outside the core of 3 central strips but within 7 strips divided by energy within 3 central strips	F_{side}		✓
	Difference between the energy associated with the second maximum in the strip layer and the energy energy reconstructed in the strip with minimum value found between the first and second maxima	ΔE		✓
	Ratio of energy difference associated with the largest and second largest energy deposits to the sum of these energies	E_{ratio}		✓

Table 2: Discriminative shower shape variables used for *loose* and *tight* photon identification.

Correlation check





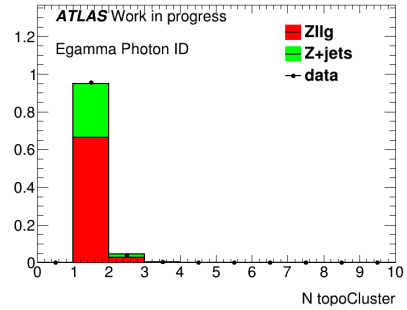
Correlation matrix shows low correlation between topo-cluster variables and old shower shape variables.
Need further confirmation.

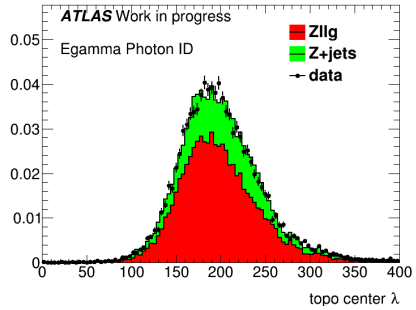
backup

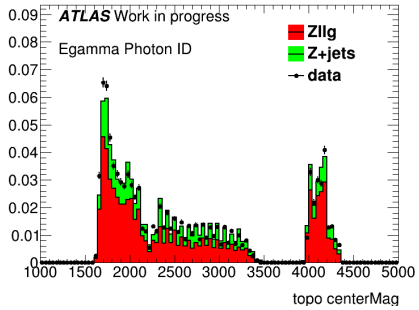
Data-MC model

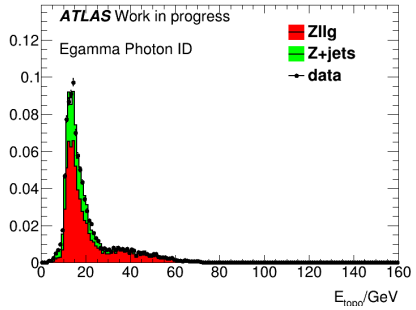
data vs. MC

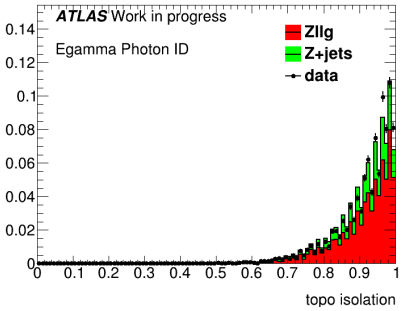
- Shapes are normalized.
- ee+gamma, $7GeV < pT_{\gamma} < 15GeV$.

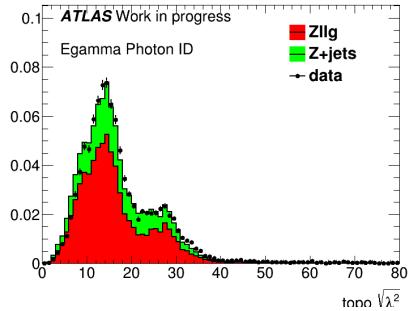


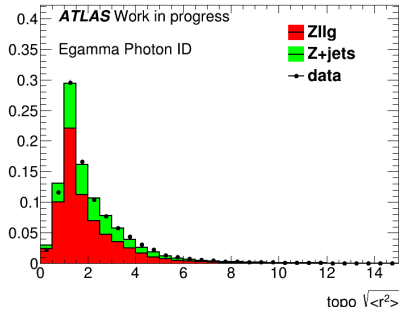


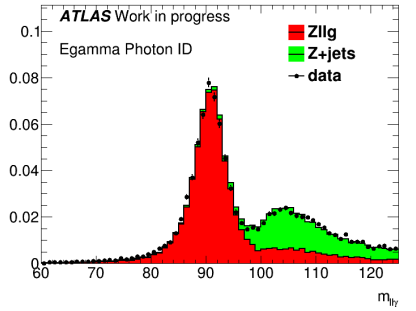












Data-MC model

data vs. MC

- Shapes are normalized.
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