EGM Recommendations, August 2017

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Introduction

- EGM issues recommendations for
  - Energy Calculation (Regression)
  - Energy scale factors and smearing for MC
  - Identification, both cut-based and MVA
  - Efficiency scale factors
- For 2016 Data, "Ultimate" recommendations are available.
- For 2017 Data, there are initial recommendations but many have not yet converged.
- As this is just a 10 min talk, I'll mostly just be pointing to various talks/TWikis with more information.

Energy Regression, & MC Energy Scale Correction & Smearing

- Latest recommendation for 2016 data is still the Moriond 2017 recommendation. (See TWiki)
- Still unavailable for 2017 data, stay tuned for announcements.
- In mean time, recommendation for 2017 data is to use electrons and photons from standard collections.
- twiki.cern.ch/twiki/bin/viewauth/CMS/EGMRegression
- twiki.cern.ch/twiki/bin/viewauth/CMS/EGMSmearer

Electron Identification - Cut Based

- Four available working points
  - Veto (eff. $\sim 95\%$)
  - Loose (eff. $\sim 90\%$)
  - Medium (eff. $\sim 80\%$)
  - Tight (eff. $\sim 70\%$)
- The 80X-tuned ID is recommended for 2016 data.
- For now, the same holds for 2017 data. New IDs will be tuned when more data is available. (expected by end of the year)
- See Ilya's talk for more information on 2016 IDs with 2017 MC.
- twiki.cern.ch/twiki/bin/view/CMS/CutBasedElectronIdentificationRun2

80X-tuned selection, barrel cuts (|eta supercluster| <= 1.479)

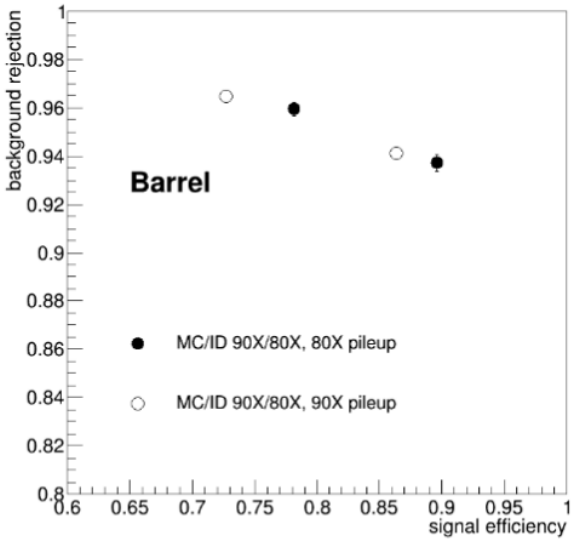
	Veto	Loose	Medium	Tight
full5x5_sigmaletaleta <	0.0115	0.011	0.00998	0.00998
abs(dEtaInSeed) <	0.00749	0.00477	0.00311	0.00308
abs(dPhiIn) <	0.228	0.222	0.103	0.0816
H/E <	0.356	0.298	0.253	0.0414
Rel. comb. PF iso with EA corr <	0.175	0.0994	0.0695	0.0588
abs(1/E-1/p) <	0.299	0.241	0.134	0.0129
expected missing inner hits <=	2	1	1	1
pass conversion veto	yes	yes	yes	yes

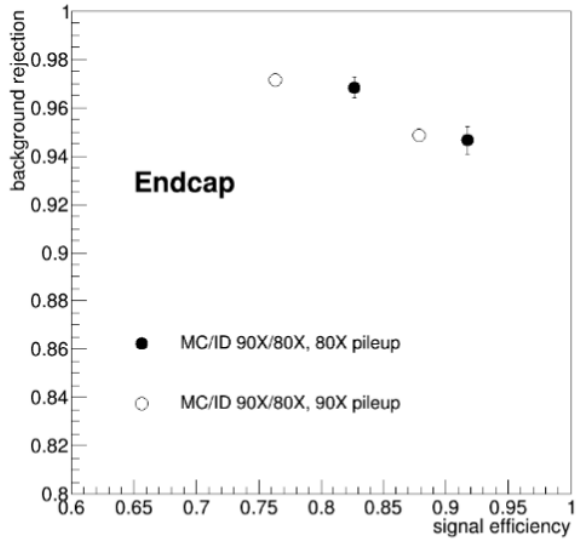
80X-tuned selection, endcap cuts (|eta supercluster| > 1.479) |

	Veto	Loose	Medium	Tight
full5x5_sigmaletaleta <	0.037	0.0314	0.0298	0.0292
abs(dEtaInSeed) <	0.00895	0.00868	0.00609	0.00605
abs(dPhiIn) <	0.213	0.213	0.045	0.0394
H/E <	0.211	0.101	0.0878	0.0641
Rel. comb. PF iso with EA corr <	0.159	0.107	0.0821	0.0571
abs(1/E-1/p) <	0.15	0.14	0.13	0.0129
expected missing inner hits <=	3	1	1	1
pass conversion veto	yes	yes	yes	yes

Electron Identification - MVA

- For most analyses, the "General Purpose MVA" is recommended.
- There is also a more specialized "HZZ MVA" developed for the ICHEP 2016 HZZ result specialized for running at very high efficiencies. ($\sim 98\%$)
- Two specified working points
  - WP80 (eff. $\sim 80\%$)
  - WP90 (eff. $\sim 90\%$)
- Tested on 2017 MC samples and shows reasonable performance,
- However, stated WP efficiencies tend to be shifted along the ROC curve.
- twiki.cern.ch/twiki/bin/view/CMS/MultivariateElectronIdentificationRun2





Electron Identification - HEEP (high energy)

- Specialized ID for very high energy ($\sim$ 1TeV) electrons.
- As of August 1, HEEP V70 is the recommended version
- Implemented in the VID (versioned identification) Framework. See TWiki for instructions on usage/integration.
- twiki.cern.ch/twiki/bin/view/CMS/HEEPElectronIdentificationRun2

Photon Identification

- Recommendations are similar to electrons.
- See relevant TWiki pages for details.
  - twiki.cern.ch/twiki/bin/view/CMS/CutBasedPhotonIdentificationRun2
  - twiki.cern.ch/twiki/bin/view/CMS/MultivariatePhotonIdentificationRun2

Starting in 9_2_2, all 2016 IDs (for electrons *and* photons) are in CMSSW (no private branch merges!)

Efficiency and Scale Factors

- Available for 2016 data for all mentioned IDs.
- Moriond 2017 recommendations are most current for 2016 data.
- For 2017 data, scale factors will likely be different. EGM will publish updated numbers shortly after 2017 IDs are finalized.
- Instructions:
  twiki.cern.ch/twiki/bin/viewauth/CMS/EgammaIDRecipesRun2
  Under **Electron/Photon efficiencies and scale factors**
- More Details:
  twiki.cern.ch/twiki/bin/view/CMS/ElectronScaleFactorsRun2

Summary

- For now, keep using 2016 recipes and constants (fully in CMSSW since 9_2_2).
- *Be mindful that oddities are possible since these have not been exercised on real data so far*.
- New recommendations are expected late fall once sufficient data for Z calibrations are collected
- Any questions can be directed new contact Caleb Fangmeier caleb@fangmeier.tech.