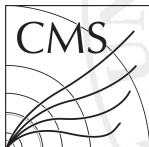# EGM Recommendations, August 2017

**Caleb Fangmeier**
Georgios Krintiras
Till Arndt

August 8, 2017

# Introduction

- EGM issues recommendations for
  - Identification, both cut-based and MVA
  - Efficiency scale factors
  - Energy Calculation (Regression)
  - Energy scale factors and smearing for MC
- 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.

# ELECTRON IDENTIFICATION - CUT BASED

- ▶ Four available working points
  - ▶ Veto (eff. ∼ 95%)
  - ▶ Loose (eff. ∼ 90%)
  - ▶ Medium (eff. ∼ 80%)
  - ▶ Tight (eff. ∼ 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_sigmaIetaIeta < | 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_sigmaIetaIeta < | 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,
- twiki.cern.ch/twiki/bin/view/CMS/MultivariateElectronIdentificationRun2
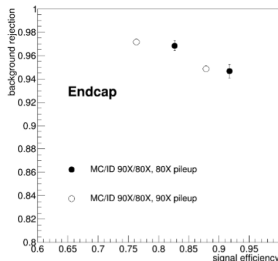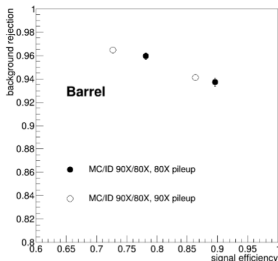
# Electron Identification - HEEP (high energy)

- 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

# 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

# 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