# H->Photon+MET
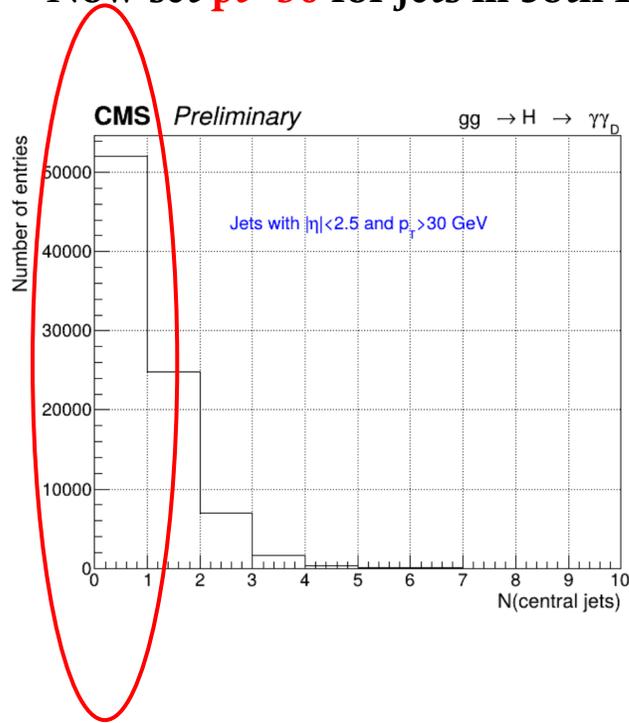
Longsheng Tan
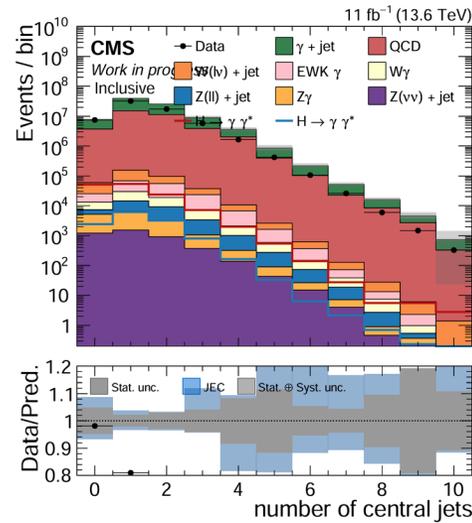
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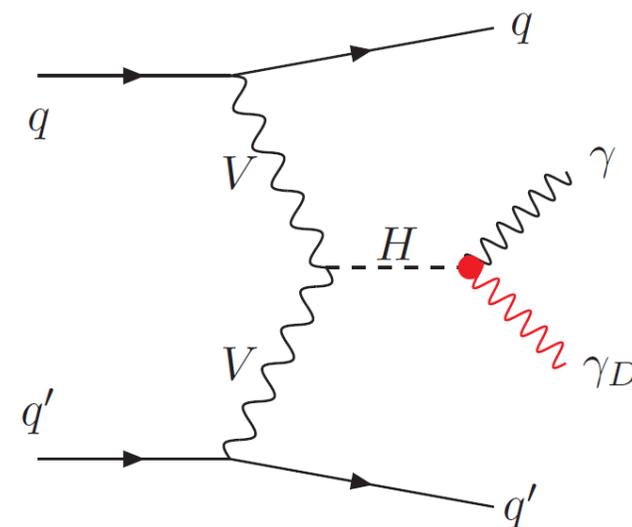
- Fixed bugs mentioned about 0 central jets peak missing in **Inclusive jets category**
  - Default jet pt **setting (pt>20) for jet clean** which pt>30 for central jets should be supplemented
  - Wrote a new model for Inclusive jets category
- Now set **pt>30** for jets in both Inclusive and VBF category



**Checked by colleague**
**Original nanoaod**

**Given by framework**
**All basic selections applied**
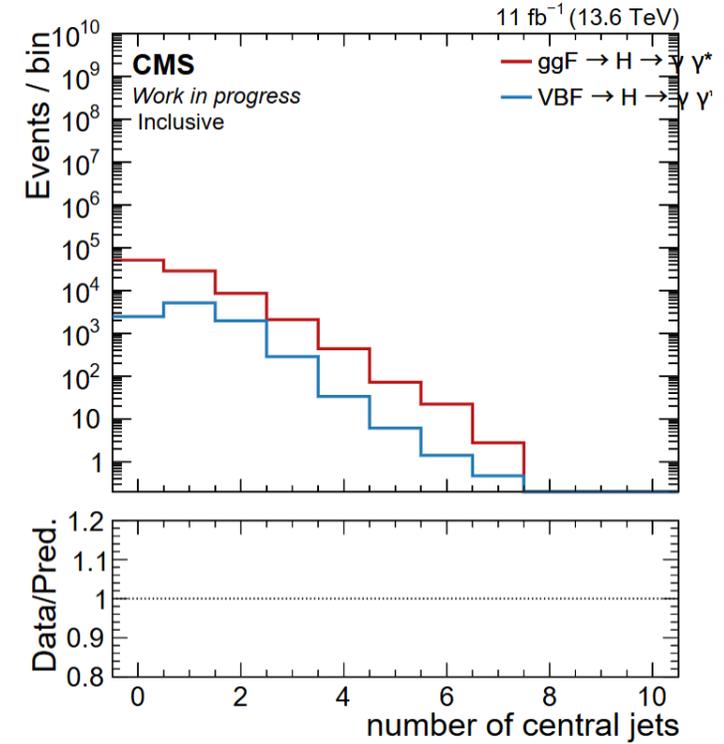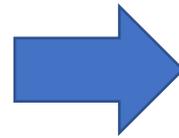
**Given by framework**
**All basic selections applied**

| Integral | | MT | Nevents |
|---|---|---|---|
| **signal** | **ggF** | 138.75766 | 138.75766 |
| | **VBF** | 656.38236 | 656.38641 |
| **background** | **QCD_23Gjet** | 31484.367 | 31484.428 |
| | **QCD_24Gjet** | 21878.434 | 21878.426 |
| | **QCD_Zjet** | 13.863205 | 13.863209 |
| | **QCD_Wjet** | 151.83769 | 151.83765 |
| | **QCDJets** | 17228.552 | 17228.551 |
| | **QCD_Znunu** | 6.0990074 | 6.1130838 |
| | **EWK_Gjet** | 404.90241 | 404.90137 |
| | **Zgamma** | 9.9396641 | 10.230591 |
| | **Wgamma** | 51.214951 | 51.427971 |

Gamma pt

MET
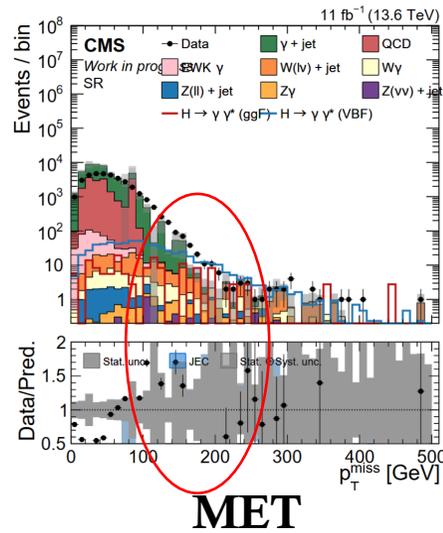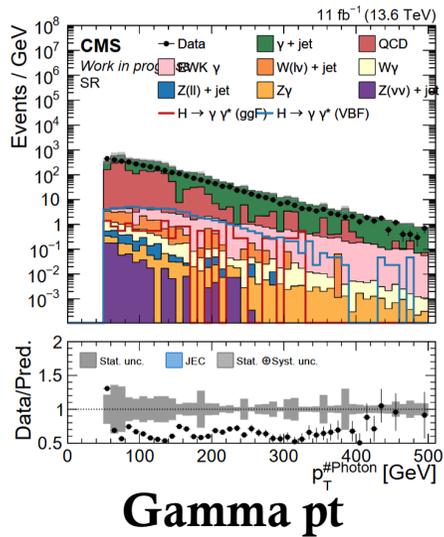
23 Gjets  VS  24Gjets

Gamma pt

MET
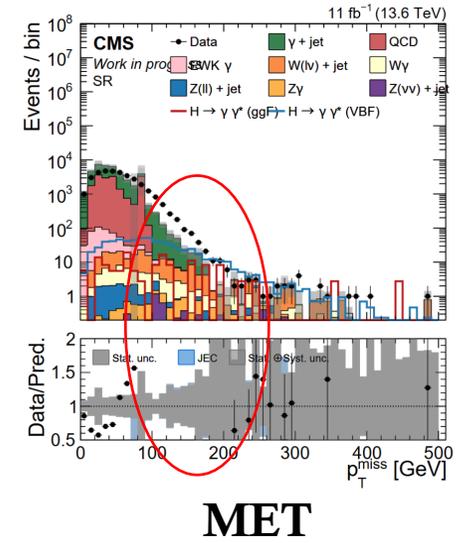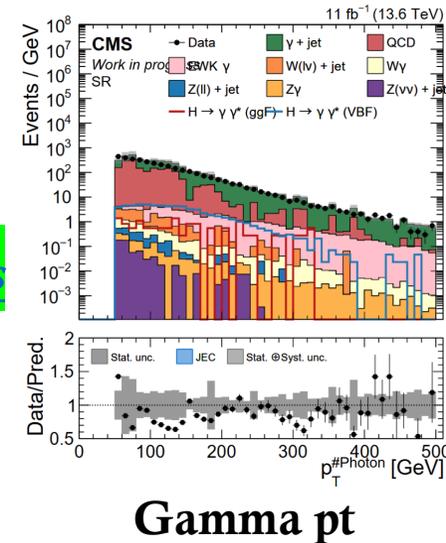
- **Most background : Gjets**
  - **24 Gjets better than 23 Gjets in whole gamma pt region**
    - **However**
      - **23 Gjets better than 24 Gjets in Mid-high MET region**
      - **k-factor can be applied to 23 Gjets to achieve the same gamma pt matching as that of the 24Gjets**
  - **Gjets has overlap with QCD, remove Gjets from QCD contribution  maybe will improve data/MC agreement?**

- Now ABCD method is planned to apply to QCD samples
  - Photon purity study
    - The leading source of fake photons is from QCD multijet events, where jets are misidentified as a photon
    - Fake photons exhibit a less pronounced peak (from photons inside jets) and a broader tail at larger $\sigma_{i\eta i\eta}$ values (from hadrons interacting in the ECAL
  - Investigating 2d distribution of Photon_pfChargedIso and Photon_sieie (uncorrelated variables)
    - Photon_pfChargedIso: PF absolute isolation dR=0.3, charged component with dxy,dz match to PV
    - Photon_sieie: sigma_IetaIeta of the supercluster, calculated with full 5x5 region
  - Write new model photon_purity_for_darkphoton and implement it in channel_selections as hinvisible did
    - Configs.update(create_module_config(name="PhotonPurityForDarkphoton", photons="Photon"))
    - Only for leading photon

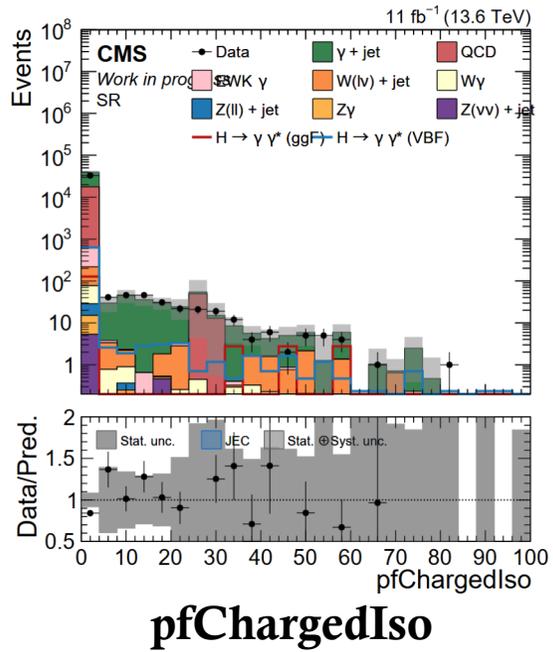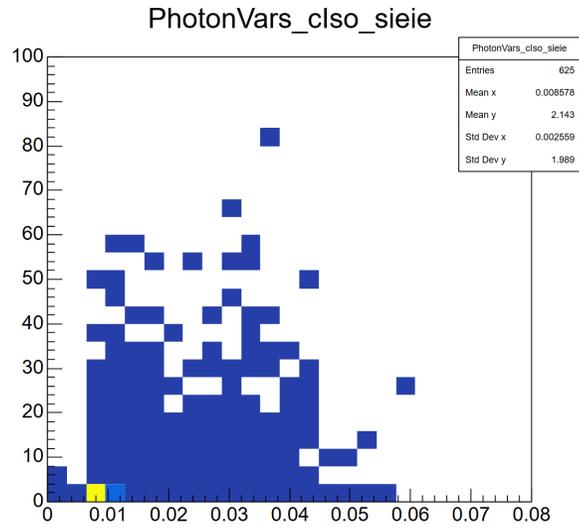- **Remove** singlePhoton_**medium_id**_selection now
  - **Only few number of events changed**



pfChargedIso



sieie

**Add ID selection**



pfChargedIso



sieie

**pfChargedIso**

**sieie**

**data**

**mc**
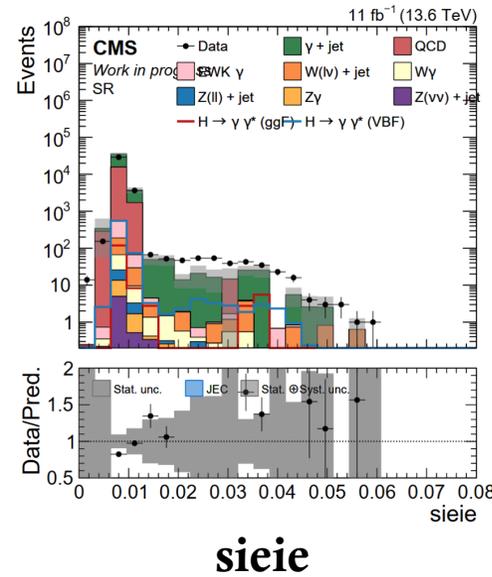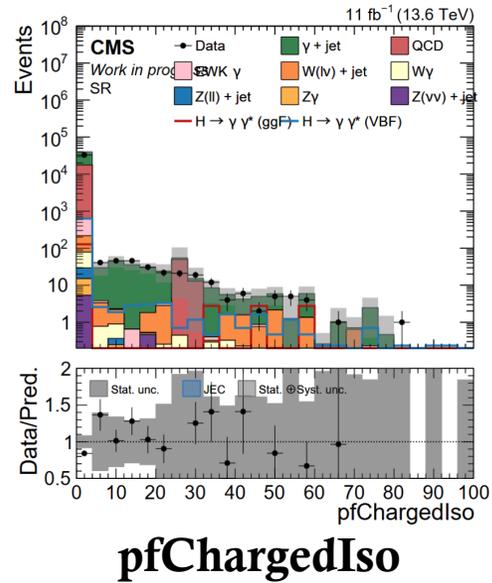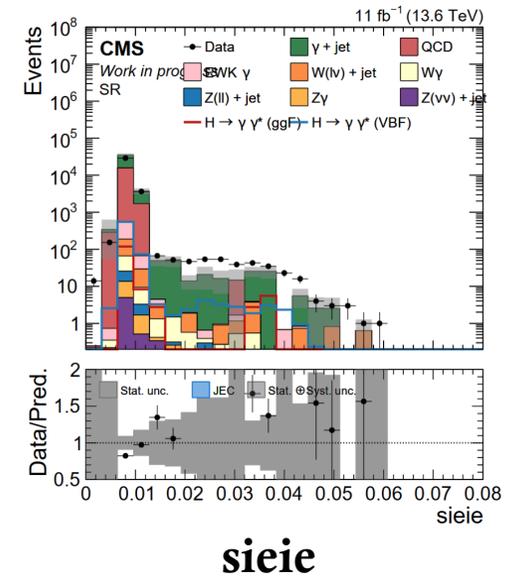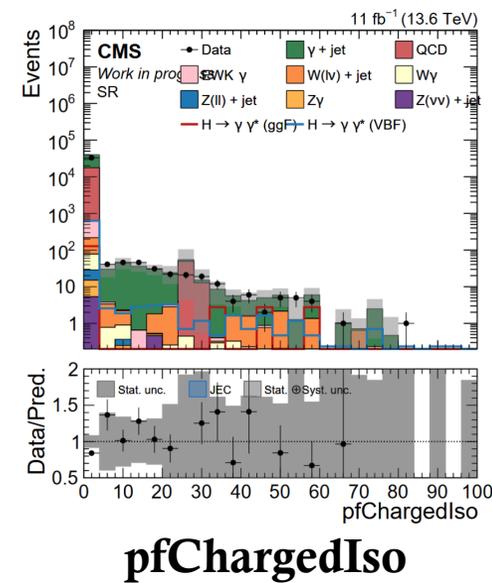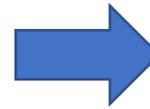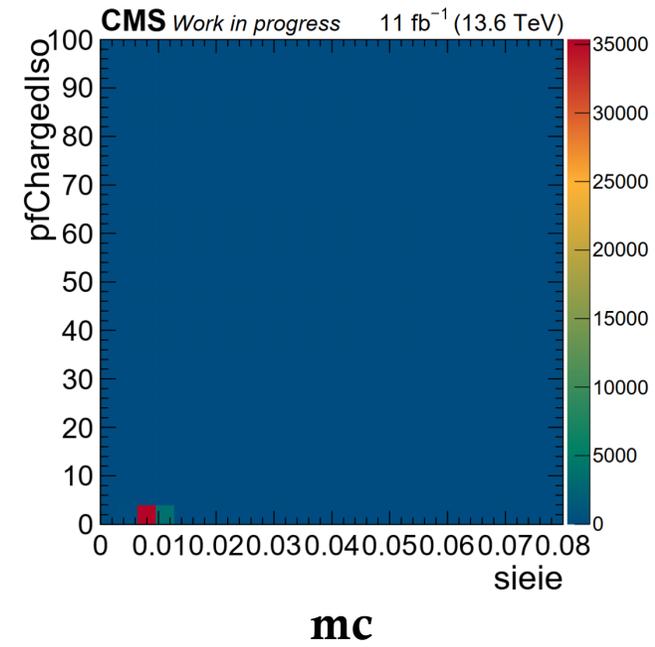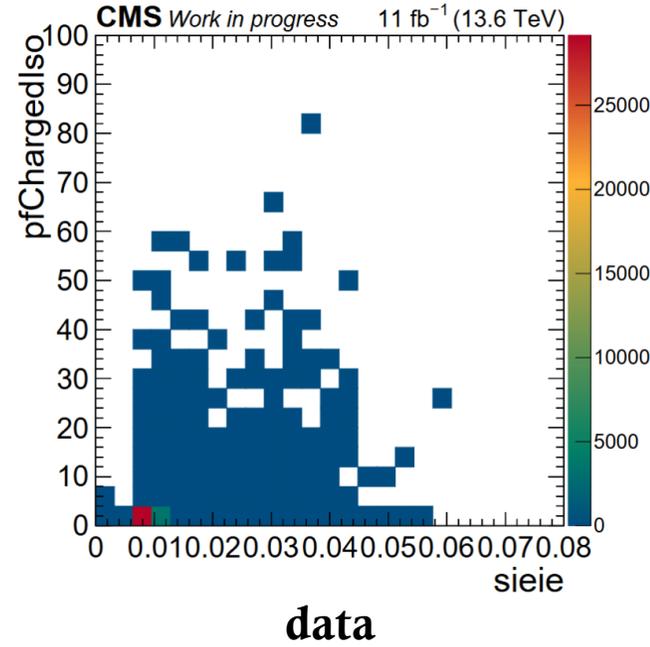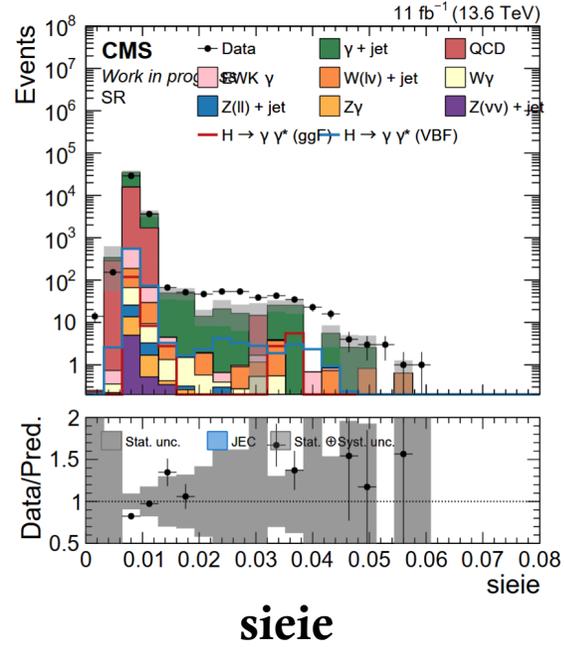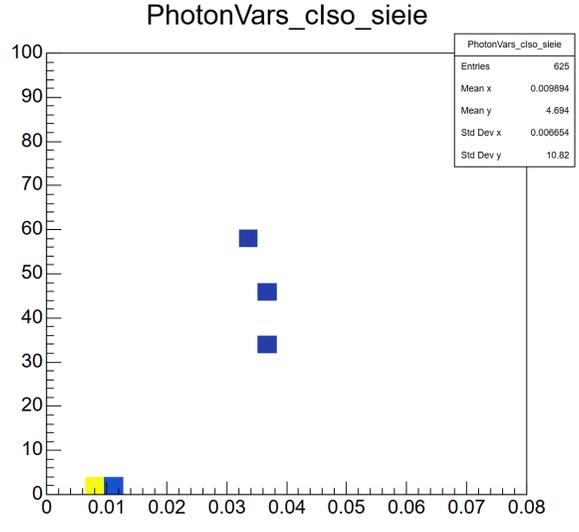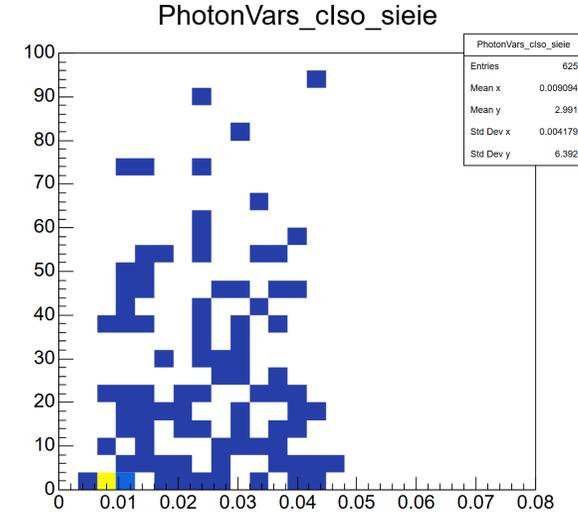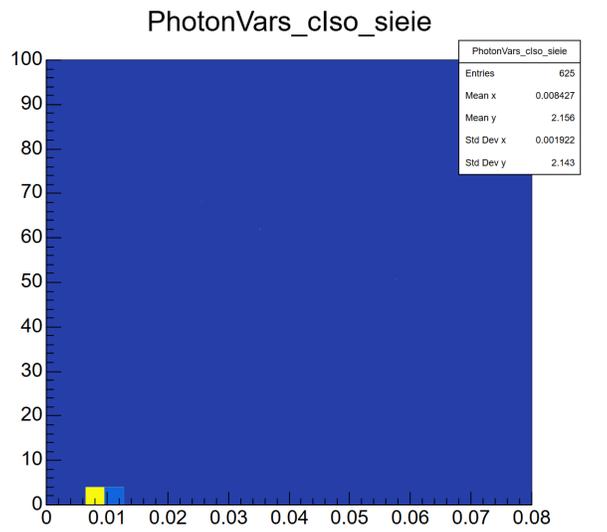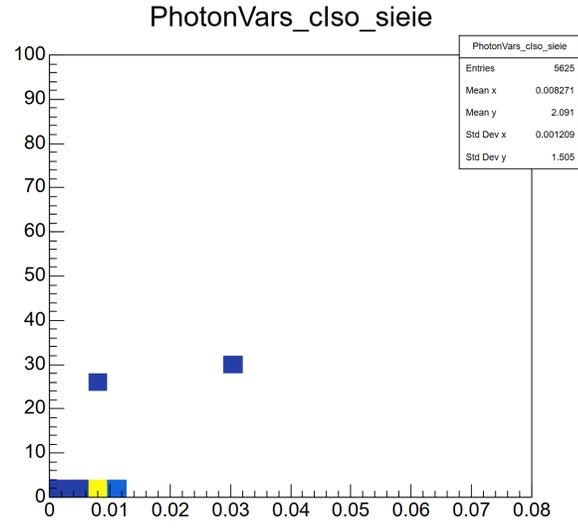
data

ggf

vbf

Gjets

QCD

- Uncorrelated variables

- Data wide distribution is suitable for use in ABCD

- Most of the ggF/VBF are in the region of low pfChargedIso and
  low sieie(~0.01)

- QCD samples make significant contributions in the signal region
  with low isolation and low $\sigma_{i\eta i\eta}$ and have a tail around 0.03