Object definition

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Xiaonan Hou

Outline

Object definition

1. Muon definition
2. Electron definition
3. Tau definition
4. Jets definition
5. B jets definition

Sources

Sources for this slide:

- 1. the analysis of ttH: AN-19-111
- 2. the analysis of 4top SS: AN-18-062
- 3. Muon POG: https://twiki.cern.ch/twiki/bin/view/CMS/MuonPOG
- 4. Egamma POG: https://twiki.cern.ch/twiki/bin/view/CMS/EgammaPOG
- 5. Tau POG: https://twiki.cern.ch/twiki/bin/view/CMS/Tau
- 6. JME POG: https://twiki.cern.ch/twiki/bin/view/CMS/JetMET
- 7. BTV POG: https://twiki.cern.ch/twiki/bin/view/CMS/BtagPOG
- 8. Variable list: https://cms-nanoaod-integration.web.cern.ch/integration/cms-sw CMSSW_10_6_X/mc106Xul17_doc.html

Muon

WP:

loose, fakeable, tight (4top SS)

Kinematic:

$P_T > 10 \quad |\eta| < 2.4$ (Muon POG)

ID:

looseId, mediumId (Muon POG)

ISO:

MiniIsoLoose, MiniIsoTight (Muon POG)

IP:

$d_0 < 0.05\ cm,\ d_z < 0.1\ cm\ (for\ all\ WP)$ (4top SS)

3D impact parameter:

$ip3d < 4cm$ (fakeable, tight) (4top SS)

The quality of the charge reconstruction:

$tightCharge = 2$ (fakeable, tight) (4top SS)

Variables	Loose (WP)	Fakeable (WP)	Tight (WP)
ID	looseId	mediumId	mediumId
Isolation	MiniIsoLoose	MiniIsoTight	MiniIsoTight
d_0	0.05 cm	0.05 cm	0.05 cm
d_z	0.1 cm	0.1 cm	0.1 cm
ip3d		<4	<4
tight charge		yes	yes

02 Electron

WP:

loose, fakeable, tight (4top SS)

Kinematic:

$P_T > 10 \quad |\eta| < 2.5$ (Egamma POG)

ISO:

Electron_mvaFall17V2Iso_WP90 (Egamma POG)
(MVA Iso ID V2 WP90)

IP:

$d_0 < 0.05\ cm,\ d_z < 0.1\ cm\ (for\ all\ WP)$ (4top SS)

3D impact parameter:

$ip3d < 4cm$ (fakeable, tight) (4top SS)

Variables	Loose (WP)	Fakeable (WP)	Tight (WP)
Isolation	Electron_mvaFall17V2Iso_WP90		
d_0	0.05 cm	0.05 cm	0.05 cm
d_z	0.1 cm	0.1 cm	0.1 cm
ip3d		<4	<4
tight charge		yes	yes
Missing inner hits	<=1	0	0
Pass conversion veto	yes	yes	yes

The quality of the charge reconstruction:

$tightCharge =?$ (fakeable, tight) (4top SS)

(0:none, 1:isGsfScPixChargeConsistent, 2:isGsfCtfScPixChargeConsistent)

Number of missing inner hits:

lostHits<=1 (for looseWP) lostHits=0 (for fakeable and tight WP) (4top SS)

Pass conversion veto:

Electron_convVeto = true (4top SS)

Tau

WP:

loose, fakeable, tight (ttH)

Kinematic:

$P_T > 20 \quad |\eta| < 2.3$ (Tau POG)

IP:

$d_z < 0.2\ cm\ (for\ all\ WP)$ (ttH)

Algorithm:

DeepTauv2 (ttH)

Decay mode:

decayModeFindingNewDMs (used for high Pt tau) (ttH)

Overlap removal:

$\Delta R < 0.4\ (any\ muon\ and\ electron\ should\ pass\ the\ loose\ lepton\ selection)$ (ttH)

Variables	Loose (WP)	Fakeable (WP)	Tight (WP)
DeepTau vs. muons		Vloose (WP)	Vloose (WP)
DeepTau vs. electrons		VVVLoose (WP)	VVVLoose (WP)
DeepTau vs. jets	VVLoose (WP)	VVLoose (WP)	Medium (WP)

(ttH)

Jets

Green means the one is different among different years!

Jets:

PFJetID:

loose(2016), tight(2017/2018) (ttH)

Kinematic:

$P_T > 25 \quad |\eta| < 2.4$ (ttH)

Overlap removal:

$\Delta R < 0.4$ $(muon\ and\ electron\ should\ pass\ the\ fakeable\ lepton\ selection\ and\ \ tau\ should\ pass\ lose\ selection)$ (ttH)

Forward Jets:

PFJetID:

loose(2016), tight(2017/2018) (ttH)

Kinematic:

$P_T > 25 \quad 2.4 < |\eta| < 5$ (ttH) $\quad P_T > 60 \quad 2.7 < |\eta| < 3$ (suppress the noise in the ECAL-HCAL transition region)

Overlap removal:

$\Delta R < 0.4(muon\ and\ electron\ should\ pass\ the\ fakeable\ lepton\ selection\ and\ \ tau\ should\ pass\ lose\ selection)$ (ttH)

B Jets

B Jets:

Tagger:

DeepJet=DeepFlavour (Jet_btagDeepFlavB) (BTV POG)

WP:

loose medium tight (BTV POG)

Year	Loose (Discr cut)	Meidum	Tight
2016APV	0.0508	0.2598	0.6502
2016	0.0480	0.2489	0.6377
2017	0.0532	0.3040	0.7476
2018	0.0490	0.2783	0.7100

https://twiki.cern.ch/twiki/bin/view/CMS/BtagRecommendation106XUL16preVFP
https://twiki.cern.ch/twiki/bin/view/CMS/BtagRecommendation106XUL16postVFP
https://twiki.cern.ch/twiki/bin/view/CMS/BtagRecommendation106XUL17
https://twiki.cern.ch/twiki/bin/view/CMS/BtagRecommendation106XUL18

Overlap removal:

$\Delta R < 0.4(muon\ and\ electron\ should\ pass\ the\ fakeable\ lepton\ selection\ and\ \ tau\ should\ pass\ lose\ selection)$ (ttH)

Thanks