

# $Z\gamma\gamma$ Event Selection

## Electrons

Trigger: HLTIndex = 9  
Cut-base loose electron ID

- $\text{fabs(dEtaIn)} < 0.007$  (0.009)
- $\text{fabs(dPhiIn)} < 0.15$  (0.10)
- $\sigma_{\eta\eta} < 0.01$  (0.03)
- $H/E < 0.12$  (0.10)
- $\text{fabs(d0)} (\text{vtx}) < 0.02$
- $\text{fabs(dZ)} (\text{vtx}) < 0.2$
- $\text{fabs}(1/E - 1/p) < 0.05$
- $\text{PF iso} / p_T < 0.15$  (0.15/0.10)
- Vertex fit probability  $< 10^{-6}$
- Missing hits  $\leq 1$

Number of ele = 2  
 $M(\text{ele}, \text{ele}) > 40$   
 $p_T(\text{electron}) > 20 / 10 \text{ GeV}$   
 $|\eta_{\text{SC}}| < 2.5$

## Muons

Trigger: HLTIndex = 13 or 14  
Tight muon ID

- Global and PF Muon
- Global Track Fit  $\chi^2 < 10$
- Muon system hits  $> 0$
- Muon stations  $> 1$
- $D0 < 0.2$
- $z0 < 0.5$
- pixel hits  $> 0$
- Tracker layer  
with measurement  $> 5$
- PT Iso  $< 0.12$

Number of muon = 2  
 $M(\text{mu}, \text{mu}) > 40$   
 $p_T(\text{muon}) > 20 / 10 \text{ GeV}$   
 $|\eta| < 2.4$

## Photons

Medium photon ID

- Conversion Safe Electron Veto
- $H/E < 0.05$
- $\sigma_{\eta\eta} < 0.011$  (0.033)
- Charged Hadron Isolation  
 $< 1.5$  (1.2)
- Neutral Hadron Isolation  
 $< 1.0$  (1.5) +  $0.04 * p_T$
- Photon Isolation  
 $< 0.7$  (1.0) +  $0.005 * p_T$

$\Delta R(\ell, \gamma) > 0.4$

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$p_T(\text{photon}) > 15 \text{ GeV}$

$|\eta_{\text{SC}}| < 2.5$

Reject gap-region:

$1.44 < |\eta_{\text{SC}}| < 1.57$

At least two photons