**HIGGS DECAYS IN ASSOCIATION WITH MISSING TRANSVERSE ENERGY AT CMS**

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**BACKGROUND**
- Existence of DM is well established, not much is known about its underlying.
- Collider searches for dark matter, mainly mono-X searches feature a large amount of missing transverse energy (MET) and the recoiling SM particle the X object $\gamma$, $j$, $Z$ boson, etc.
- In the analysis presented here, the Higgs boson is the SM particle that recoils. This process is examined in the decay channel where the Higgs goes to two taus.
- This is the first search for Mono-Higgs in the di-$\tau$ decay channel that CMS has produced.

**Cross Sections**

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<th>Zprime \ A0=300 GeV</th>
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**Mono-H→BB**
Mono-H → $bb$ split up their search into two main categories:
- **resolved** 2 AK4 jets with $|\eta| < 2.4$ and $p_T > 30$ GeV. MET $> 170$ GeV.
- **boosted** 1 AK8 jet with $|\eta| < 2.4$ and $p_T > 200$. MET $> 200$ GeV.

Extra lepton vetos are added.

Figure 2: Resolved Category $H \rightarrow bb$

**Mono-H→\tau\tau**
How can we look for Mono-H → $\tau\tau$?
- 3 different channels in a Mono-Higgs → $\tau\tau$ search: $\mu\tau$, $e\tau$, and $\tau\tau$.
- Mono-H → $\tau\tau$ is not dependent on a MET Trigger, so the phase space can be extended to lower MET ranges.

Figure 7: in the $H \rightarrow \tau\tau$ system we expect the MET to be reduced due to the presence of neutrinos in the tau decay.

**Mono-H→\tau\tau** mass reconstruction

Figure 5: The total transverse mass is used for limit extraction. $Z+$Jets peaks near 90 GeV. MET is included in the mass estimation.

Figure 6: The mass of the 125 GeV Higgs cannot be fully reconstructed using the SVFit method used in the Standard Model Analysis. A comparison between the 125 GeV higgs mass and the $Z \rightarrow \tau\tau$ in fig. shows that when using the visible mass as an extraction the $m_{\tau\tau,vis} < 125$ GeV for the 125 GeV boson.

**REFERENCES**

CMS-PAS-EXO-16-012  
HIG-13-004  
CMS-PAS-HIG-16-037

**FUTURE RESEARCH**

Mono-H → $\tau\tau$ analysis in progress on 2016 Data.

**CONTACT INFORMATION**

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