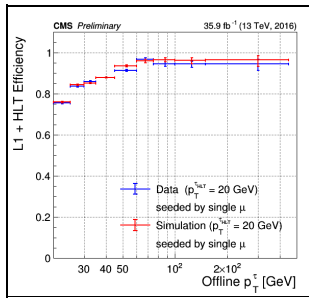


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Tau Lepton Run 2 trigger Performance (CMS DP-2019/012).....	1
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# Tau Lepton on Run 2 trigger Performance (CMS DP-2019/012)

The trigger efficiency is estimated using Tag and Probe (TnP) method in  $Z \rightarrow \tau\tau \rightarrow \mu\tau_h$  events. Details about the procedure and the fully enabled tau HLTs recommended for Run 2 data taking period can be found in the DP note.

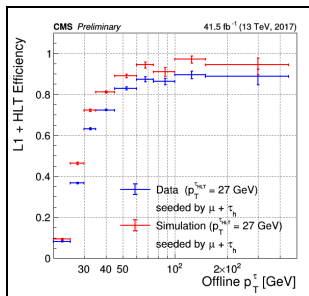


## $\mu\tau_h$ trigger efficiency

The hadronic tau leg efficiencies of  $\mu$ -tau triggers are shown below as a function of offline tau pt for 2016 data taking. The shown efficiencies correspond to the combined L1 and HLT efficiency. HLT pt thresholds and L1 seeds are represented on the legend.

Caption [Get pdf version]

Contact: Hale Sert

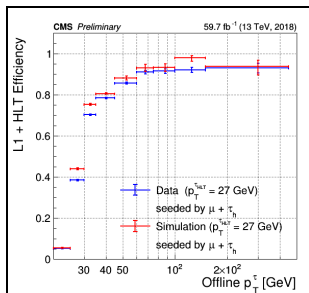


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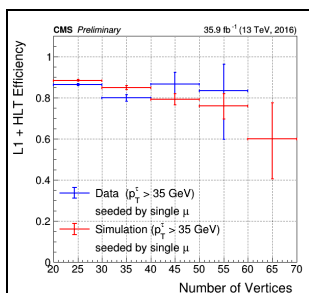


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Contact: Hale Sert

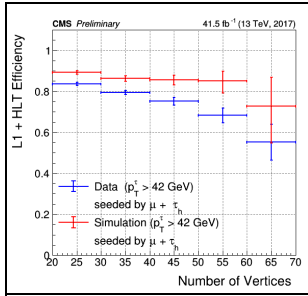


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Contact: Hale Sert

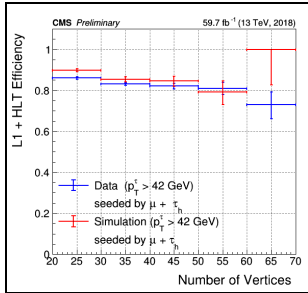


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Caption [Get pdf version]

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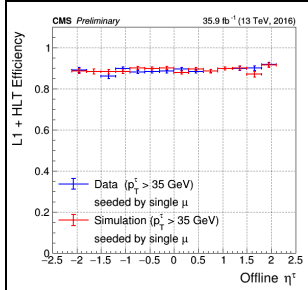


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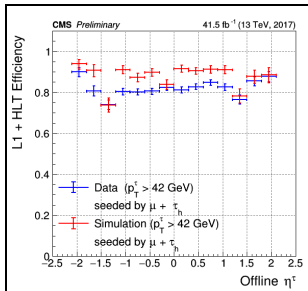


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Caption [Get pdf version]

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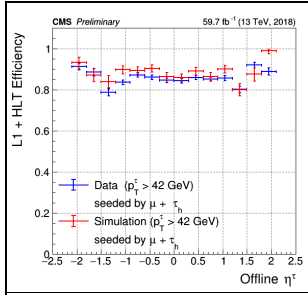


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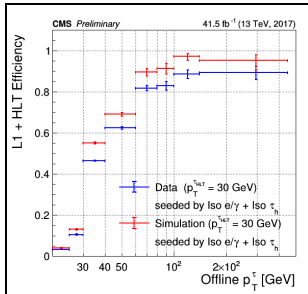


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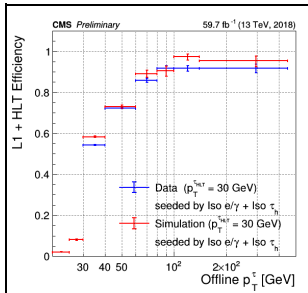


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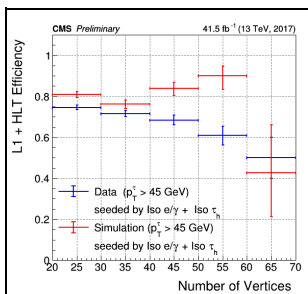


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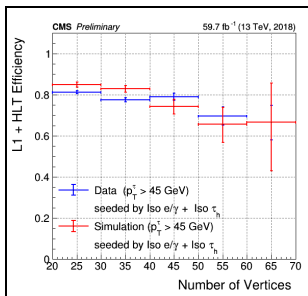


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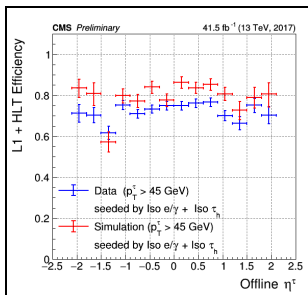


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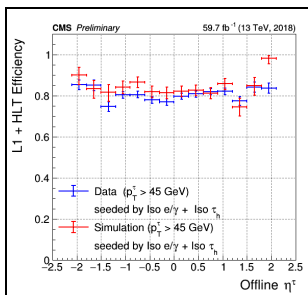


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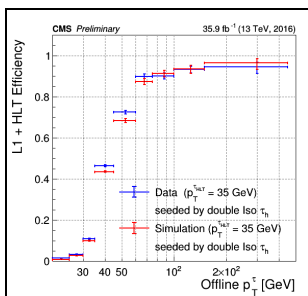


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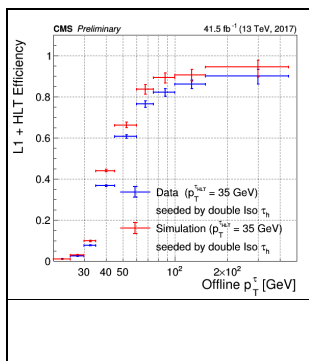


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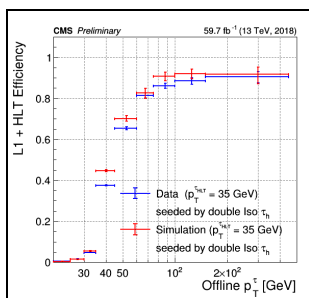


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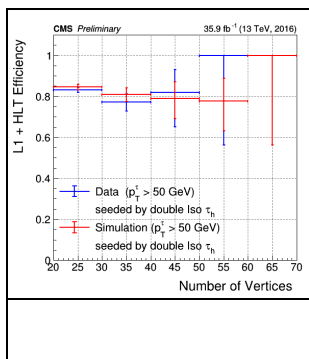


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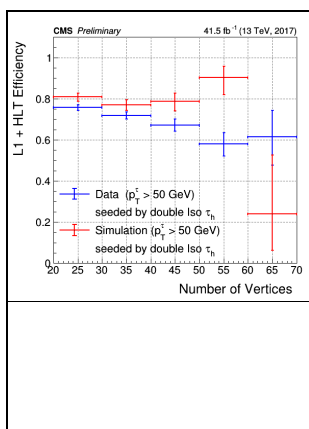


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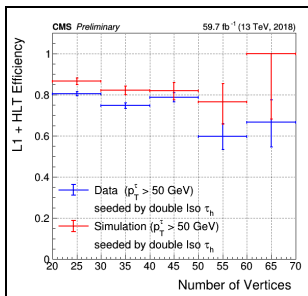


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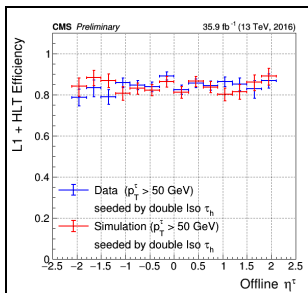


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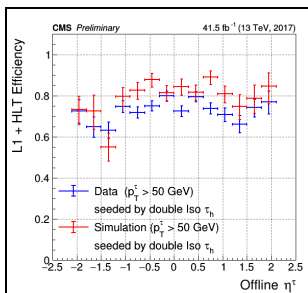


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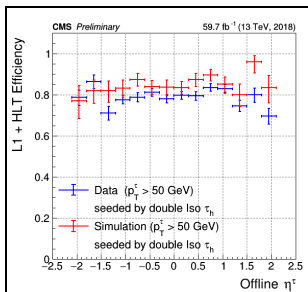


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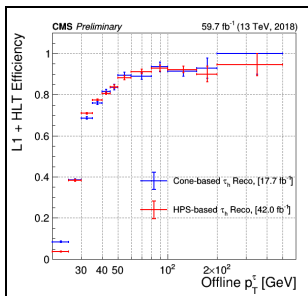


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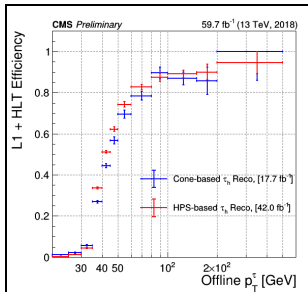
Contact: Hale Sert



**HPS based and Cone based tau reconstruction comparison (mu-tau<sub>h</sub> trigger)**

HPS tau reconstruction was deployed at HLT in the beginning of 2018 data-taking. The efficiency of hadronic tau leg of the mu-tau trigger is shown as a function of offline tau p<sub>T</sub> for the 17.7 fb-1 data taken with the cone-based tau reconstruction and for 42.0 fb-1 data collected with the HPS-based algorithm in 2018. The combined L1 and HLT efficiency of the tau<sub>h</sub>-leg is shown. The HPS-based tau<sub>h</sub> reconstruction algorithm has a rate of 4.6 Hz for mu-tau trigger at average PU = 50, while the rate for cone-based algorithm was 5.2 Hz for mu-tau trigger. So, the HPS reduces the rate by 10% for mu-tau trigger [Ref: CMS DP-2018/035].

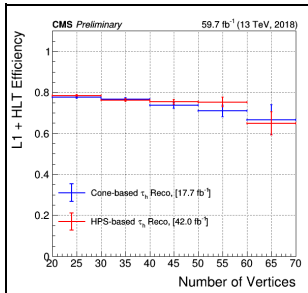
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Caption [Get pdf version]  
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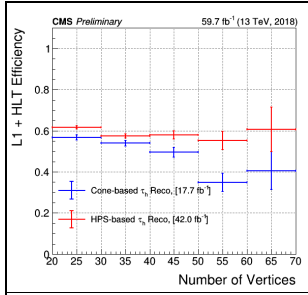


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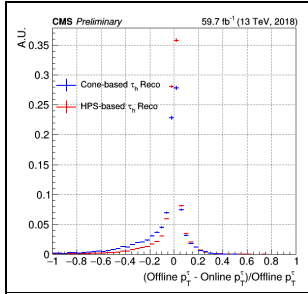




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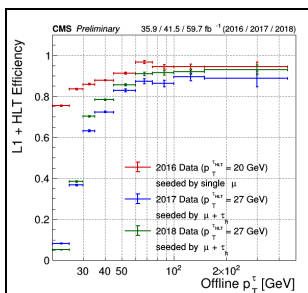
Caption [Get pdf version]  
Contact: Hale Sert



**p<sub>T</sub> resolution of HPS-based and cone-based tau reconstruction**

p<sub>T</sub> resolution of the HPS based and cone-based tau reconstruction is shown on the right. The resolution is calculated for mu-tau<sub>h</sub> trigger by comparing p<sub>T</sub> of the online and offline tau leptons. It is calculated using the first 17.7 fb<sup>-1</sup> of data taken with the cone-based tau reconstruction, where the trigger paths with HPS based algorithm was included for the purpose of testing. The HPS-based tau<sub>h</sub> reconstruction has better p<sub>T</sub> resolution compared to the cone-based reconstruction.

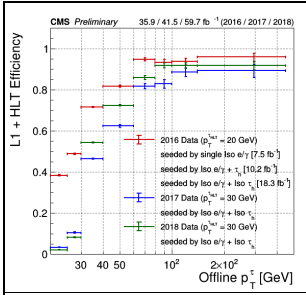
Caption [Get pdf version]  
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**Performance of mu-tau<sub>h</sub> triggers in Run 2**

The hadronic tau leg efficiencies of mu-tau<sub>h</sub> triggers are shown below as a function of offline tau p<sub>T</sub> for 2016, 2017 and 2018 years overlaid with each other. The shown efficiencies correspond to the combined L1 and HLT efficiency. HLT pt thresholds and L1 seeds are represented on the legends. The different HLT thresholds and differences on L1 seed result in higher efficiencies in 2016 and differences in shapes of the 2016 efficiencies compared to 2017 and 2018. The low pileup in 2016 has also an impact for the higher efficiencies.

Caption [Get pdf version]  
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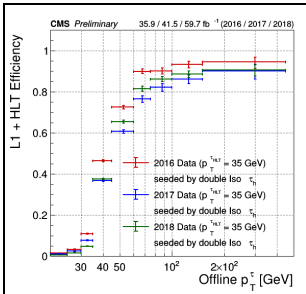


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Caption [Get pdf version]

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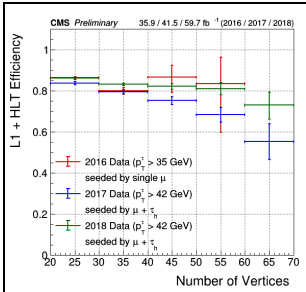


**Performance of di-tau<sub>h</sub> triggers in Run 2**

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Caption [Get pdf version]

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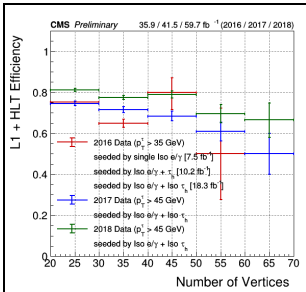


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Caption [Get pdf version]

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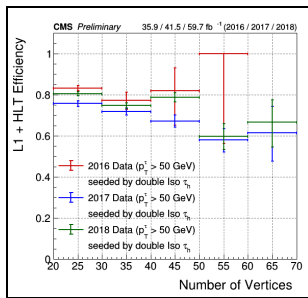


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Caption [Get pdf version]

Contact: Hale Sert



### Performance of di- $\tau_h$ triggers in Run 2

The hadronic tau leg efficiencies of di- $\tau_h$  triggers are shown below as a function of number of vertices for 2016, 2017 and 2018 years overlaid with each other. The shown efficiencies correspond to the combined L1 and HLT efficiency. In these plots an offline cut on the tau  $p_T$  is applied to be above the trigger thresholds. The corresponding cuts and L1 seeds are represented on the legends.

Caption [Get pdf version]

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-- ElisabettaGallo - 2019-06-18

This topic: CMSPublic > HLTTauAlI Run2

Topic revision: r4 - 2019-08-21 - ElisabettaGallo



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