

Updates on $\eta \rightarrow \gamma\gamma\pi^0$

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U.S. DEPARTMENT OF
ENERGY

Table of contents

1 Introduction

2 Selection criteria

Introduction

Testing new low-level-object code on 2017-01 run period REST files version 4, looking at two class of events for $E_\gamma \geq 8.3$ GeV

- Exclusive: all photons in FCAL and recoil proton is detected
- Inclusive: all photons in FCAL and recoil proton not detected

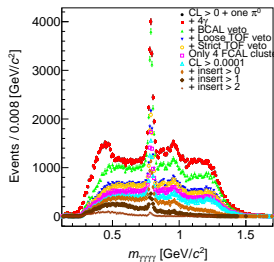
Selection criteria

- 4 “photon” hypotheses DNeutral_Shower with

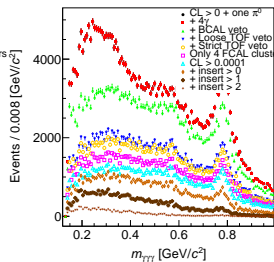
- ▶ $|t_{\gamma}^{\text{BCAL}} - t_{\text{RF}}| \leq 6 \text{ ns}$ & $|t_{\gamma}^{\text{CAL}} - t_{\text{RF}}| \leq 3 \text{ ns}$
- ▶ $E_{\text{cluster}} \geq 250 \text{ MeV}$

- χ_{test}^2 to select best $\gamma\gamma\pi^0$ combination and discriminate other possible final states ($\pi^0\pi^0$, $\pi^0\eta$, $\eta\eta$, $\pi^0\eta'$, $\eta\eta'$, $\eta'\eta'$)
- χ_{test}^2 to select best track coplanar to $\gamma\gamma\pi^0$

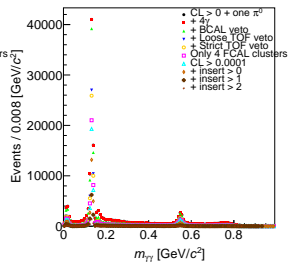
- $m_{\gamma\gamma\gamma\gamma}$



- $m_{\gamma\gamma\gamma}$



- $m_{\gamma\gamma}$



- $\pi^0\pi^0$, ω , and η' (?) background
- $\mathcal{B}(\eta' \rightarrow \gamma\omega) \sim 2 \times 10^3$ for $\omega \rightarrow \gamma\pi^0$, good candidate for a reference channel

Large background => boost is NOT reducing the background

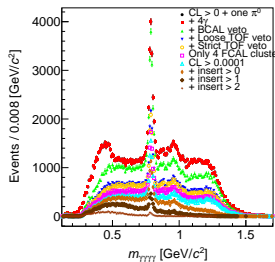
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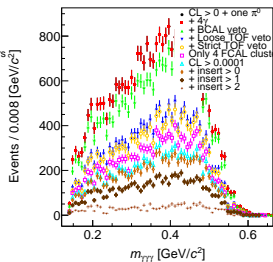
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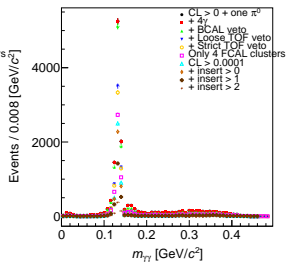
- $m_{\gamma\gamma\gamma\gamma}$



- $m_{\gamma\gamma\gamma}$ w/ η mass cut



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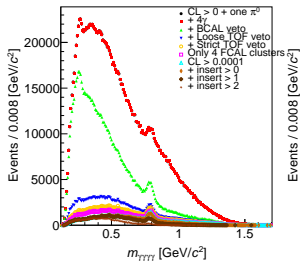
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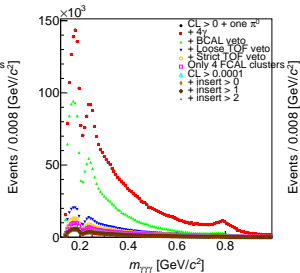
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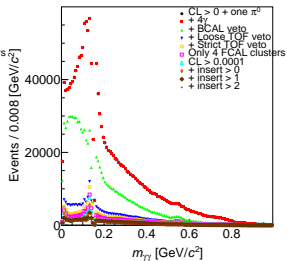
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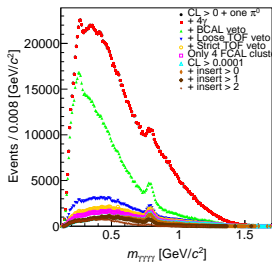
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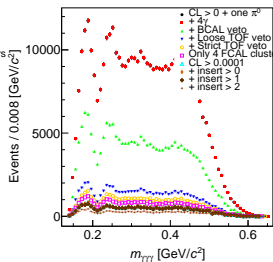
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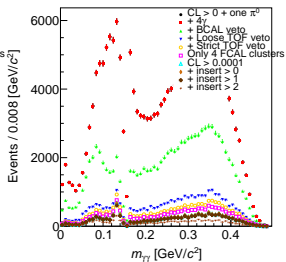
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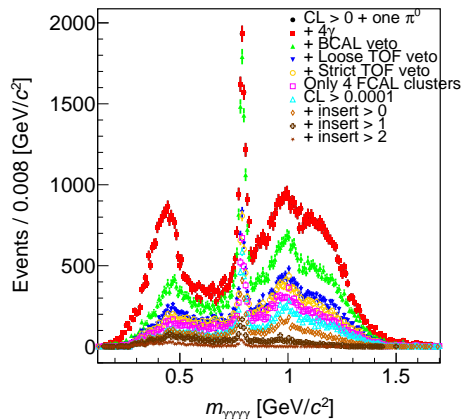
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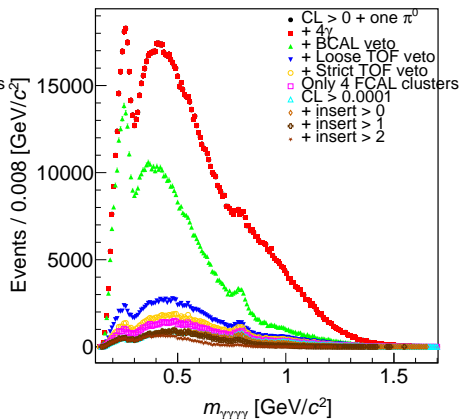
Selection criteria

Add $\pi^0\pi^0$ veto

● Exclusive case



● Inclusive case

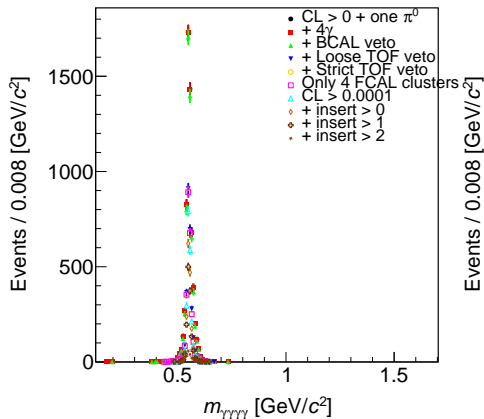


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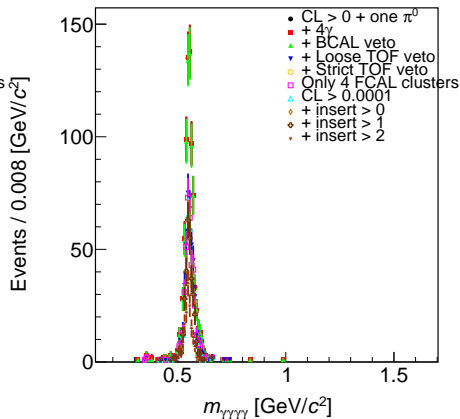
$\eta \rightarrow \gamma\gamma$ background

39.31M genEtaRegge events simulated

● Exclusive case



● Inclusive case

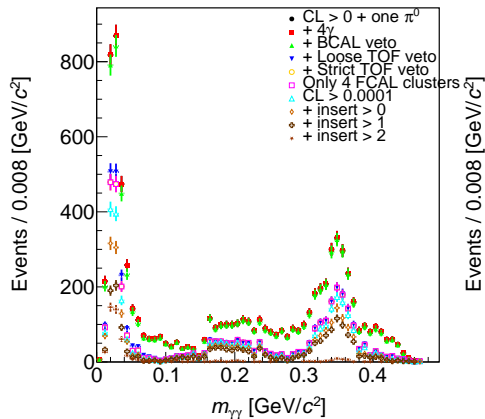


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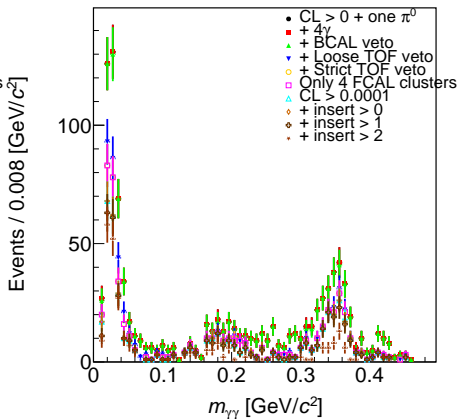
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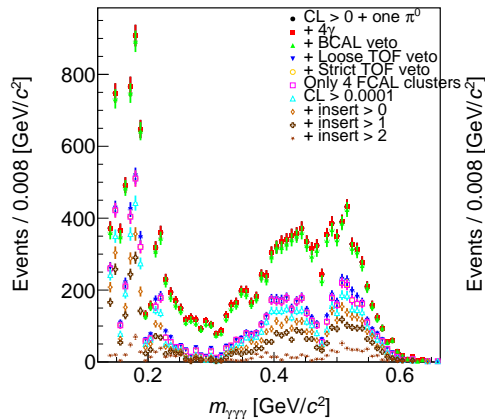


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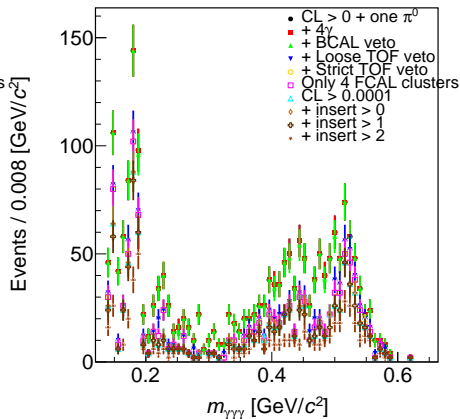
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