$\tau \to \gamma\mu$ at STCF

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Double Tag

- signal side: $\tau^- \to \gamma\mu^-$

- tag side: τ^+
  - $e^+\nu_e\bar{\nu}_\tau$
  - $\mu^+\nu_\mu\bar{\nu}_\tau$
  - $\pi^+\bar{\nu}_\tau$
  - $\pi^+\pi^0\bar{\nu}_\tau$
  - $\pi^+\pi^0\pi^0\bar{\nu}_\tau$
  - total tag efficiency 80.78%

- 根据 e^+, μ^+, π^+, γ 数来决定是哪个 tag 道

Initial event selection

- good charged tracks
  - nGood = 2, nCharge = 0
- good photons
  - nGamma >= 1
  - 0.3 <= Eγmax <= 1.8 GeV
- PID
  - n(mu−) = 1
    n(e+) + n(mu+) + n(pi+) = 1

- 0.3 <= Pμ <= 1.9 GeV
- $M_{miss,leptonic}^2$ <= 7
  $M_{miss,hadronic}^2$ <= 5
- 1.6 <= M(γμ) <= 1.95

Initial event selection

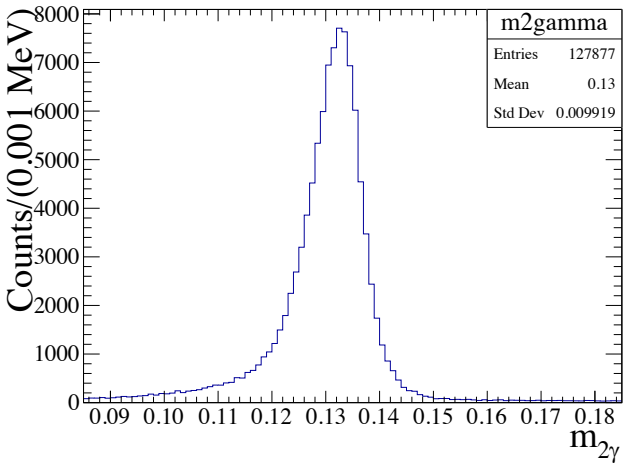
Run 10% of inclusive MC (6.5% of dimu because some jobs are killed (exceeding the time limit)

after initial event selection:

- bhabha: 0
- digam: 0
- dimu: 0
- ditau: 805638
- hadrons: 131513

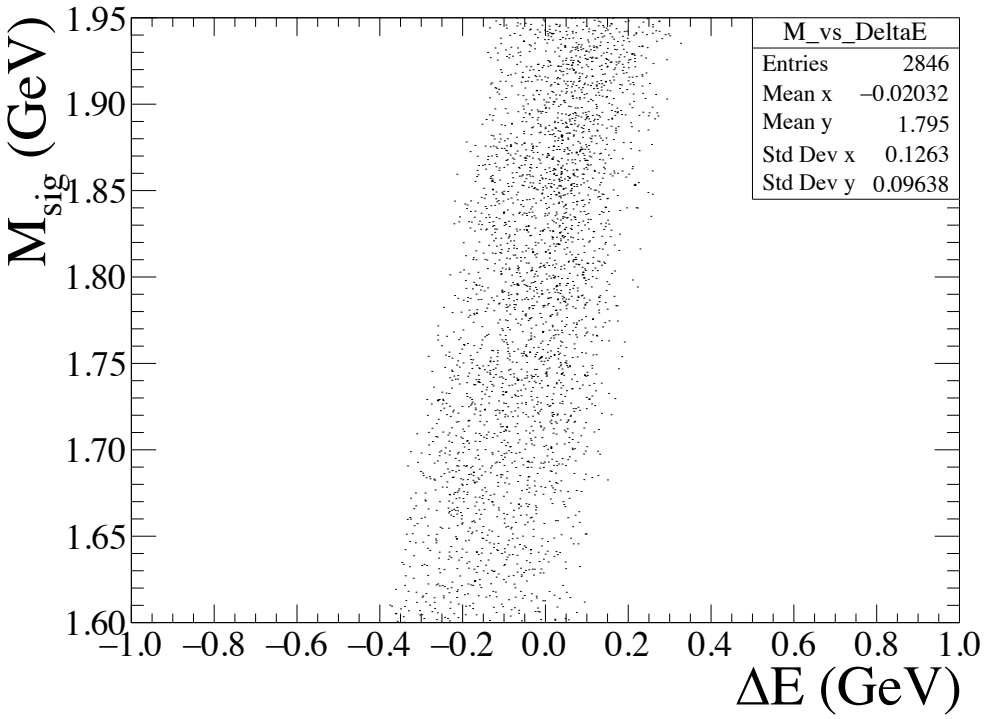
Reconstruct π0

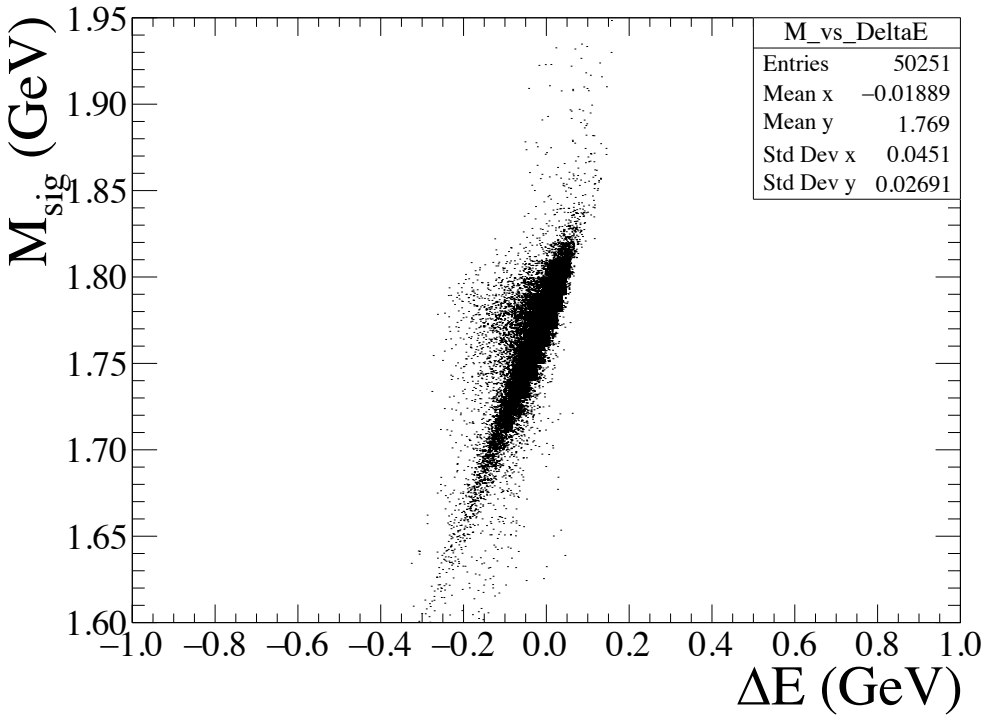
- 确定质量窗：
  - 将 signal MC 的光子两两组合，按与 π0 质量接近程度排序
  - 根据 truth 信息得到 pi0 数目
  - 选取相应数量的不重复的组合，看其分布，
    确定质量窗 [0.12 GeV, 0.14 GeV]
- 重建 pi0：
  - 将光子两两组合，按与 π0 质量接近程度排序
  - 选取在质量窗内的、不重复的组合，作为重建的 pi0
  - 剩余光子中能量最大者视为信号



Final event selection

- p_mu in [0.5, 1.65] GeV
- 要求重建 pi0 后只剩下一个光子
  E_gamma in [0.45, 1.65] GeV
  E_gamma > 1.2 GeV（比较 signal MC 和 inclusive MC 得到）
- cos_theta_gamma_mu <= –0.35
- m_miss_leptonic <= 1
- m_miss_hadronic <= 0.5





Signal region: M in [1.75, 1.8] GeV, ΔE in [-0.05, 0.05] GeV
Signal MC: 35642
Inclusive MC: 155, ditau: 27, hadrons: 128

Next to do

- 优化选择条件（尤其是对于 hadrons inclusive MC）
- 设上限