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Progress of π^0 reconstruction and $B^0/Bs \rightarrow \pi^0\pi^0$ analysis

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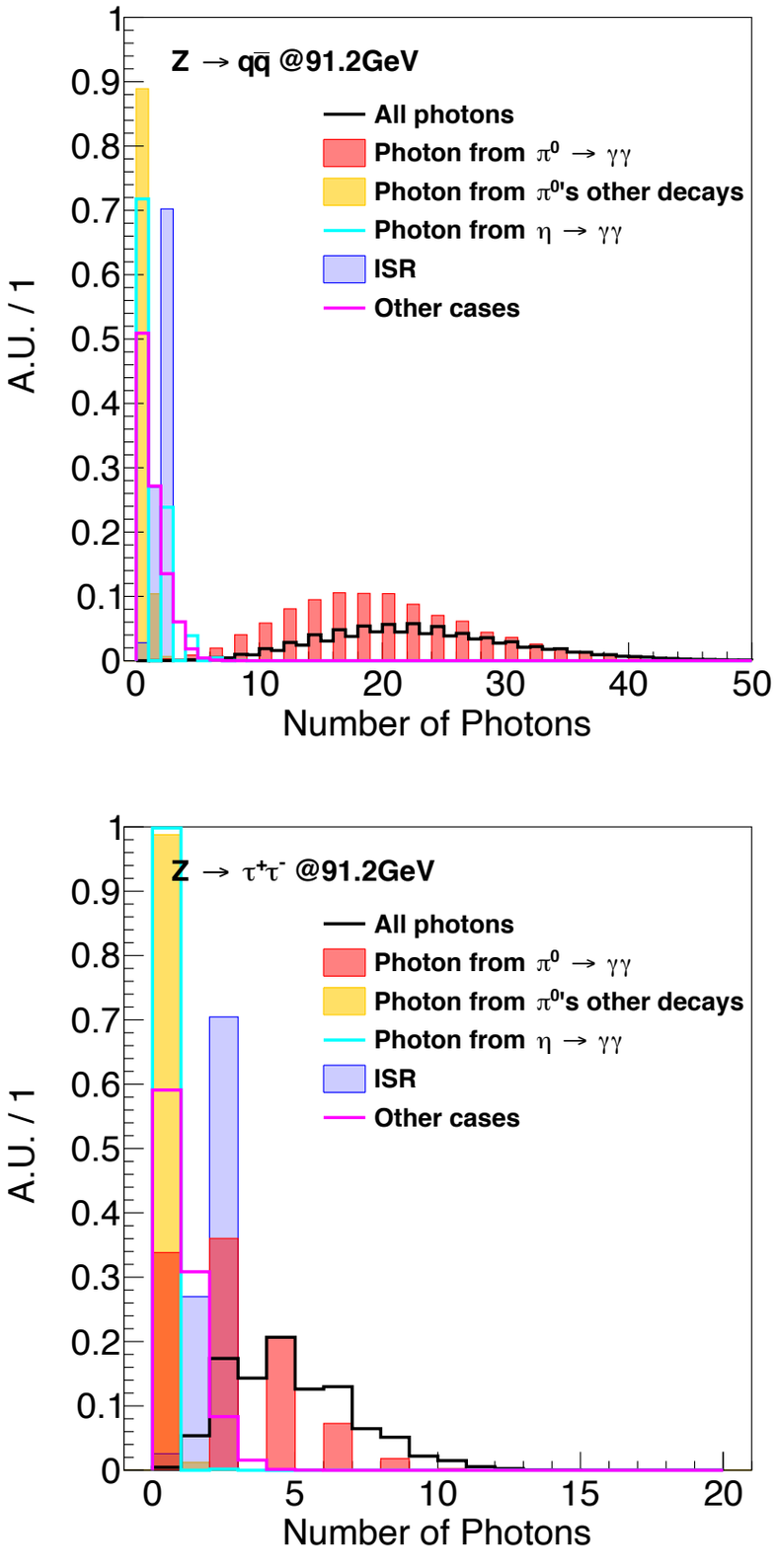
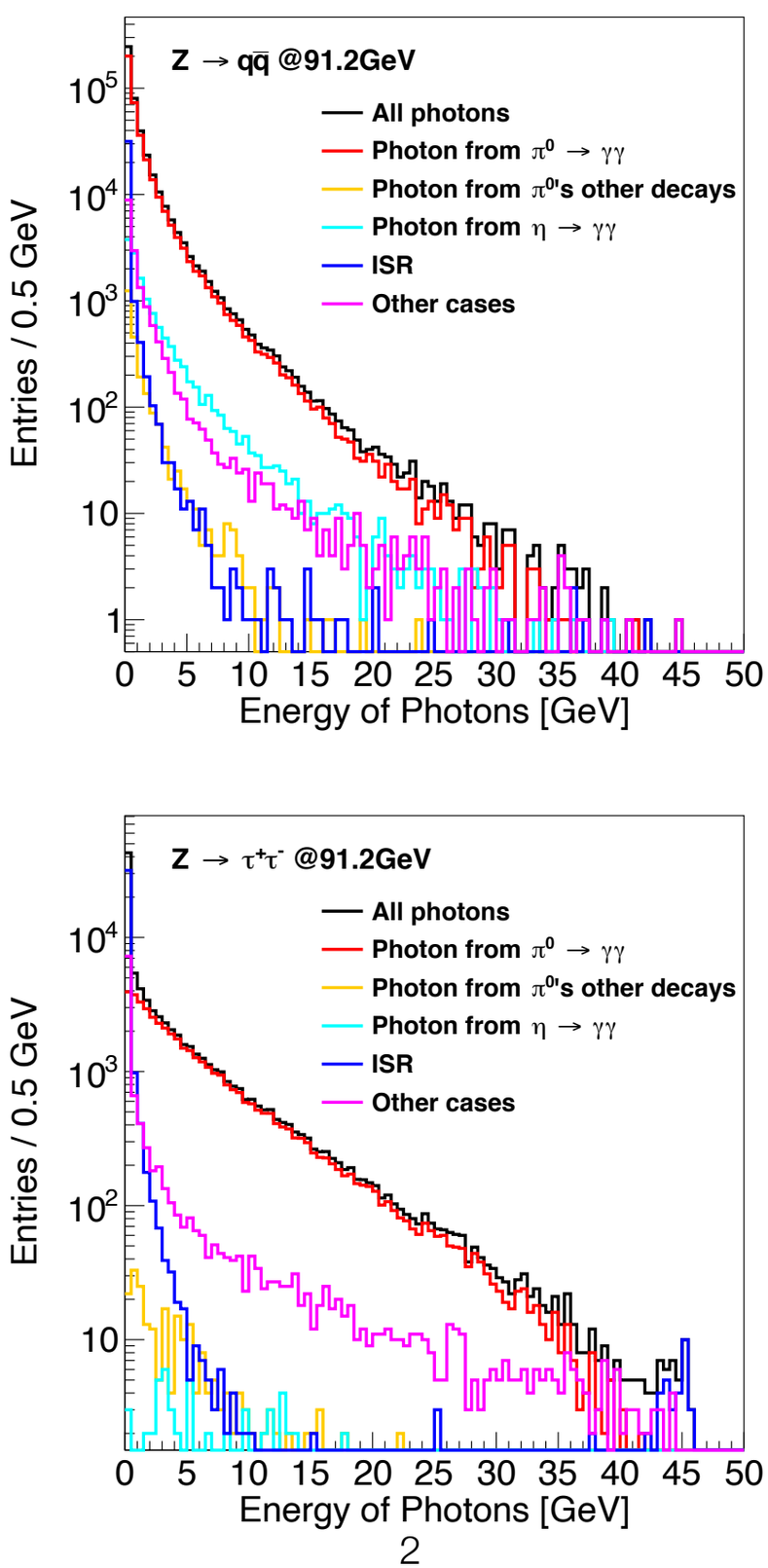
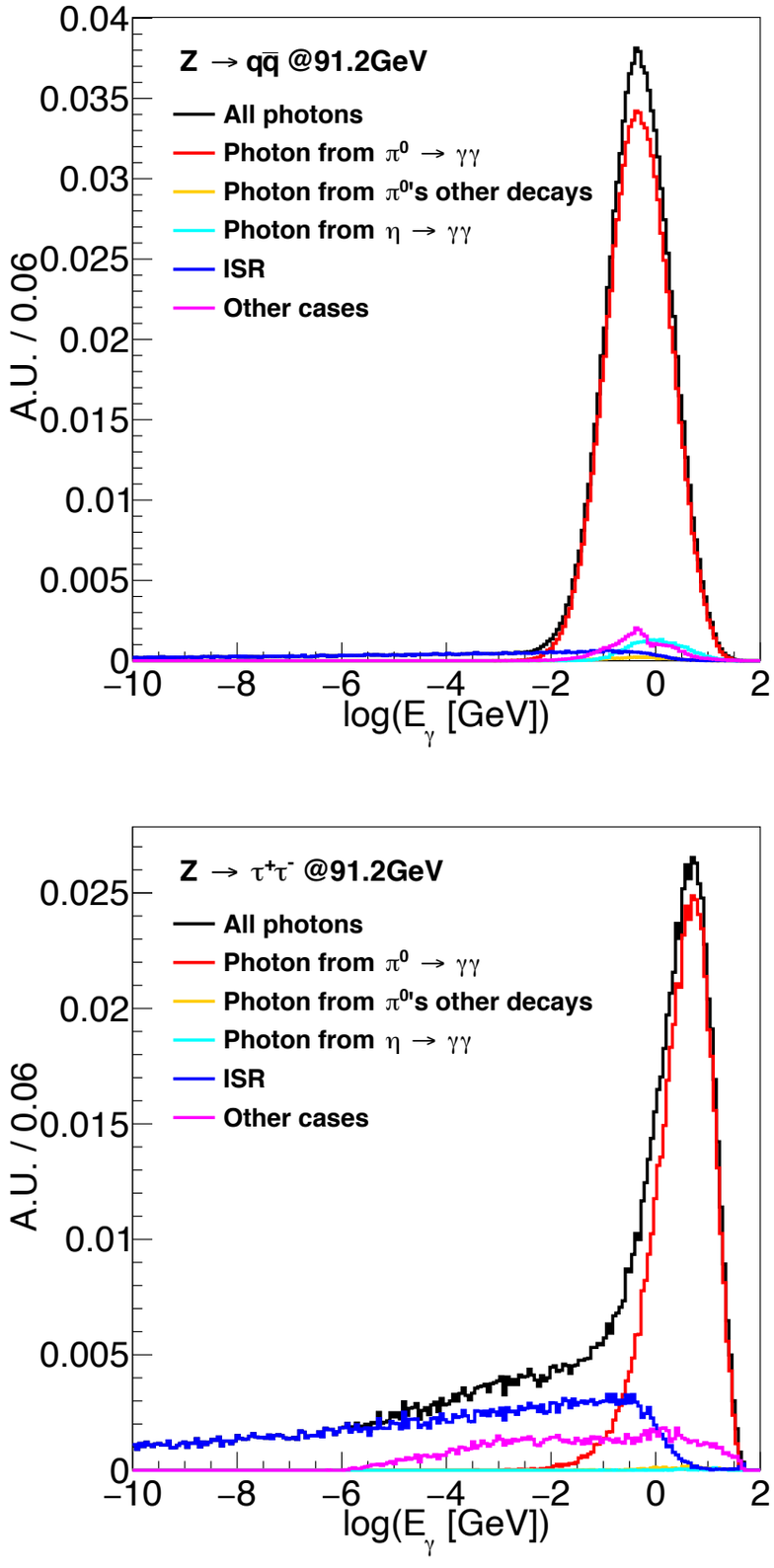
Photon distributions

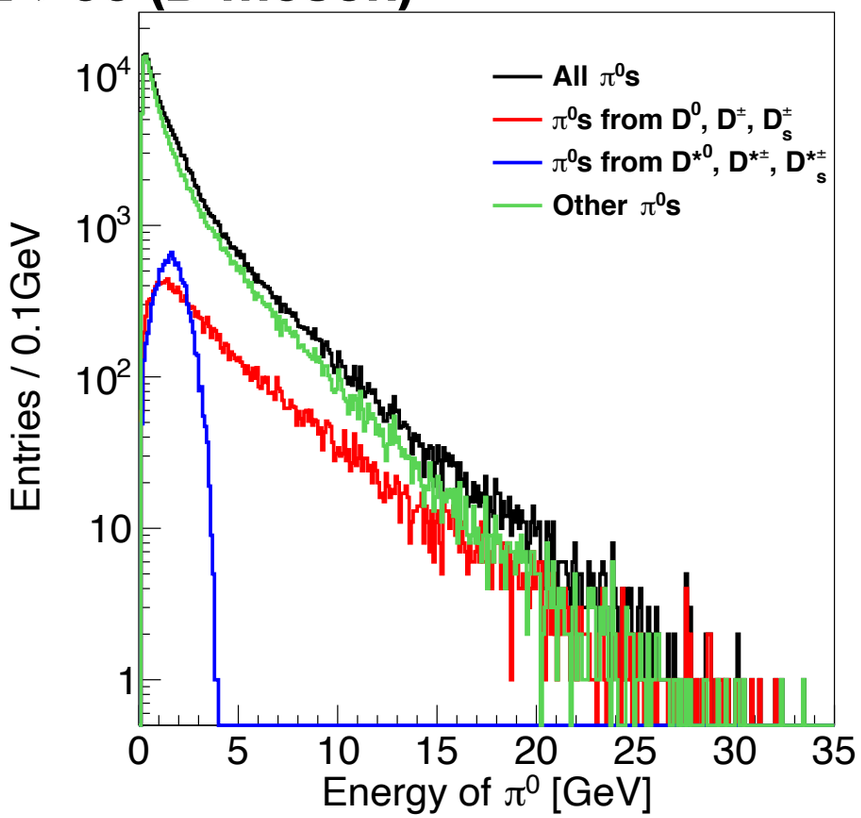


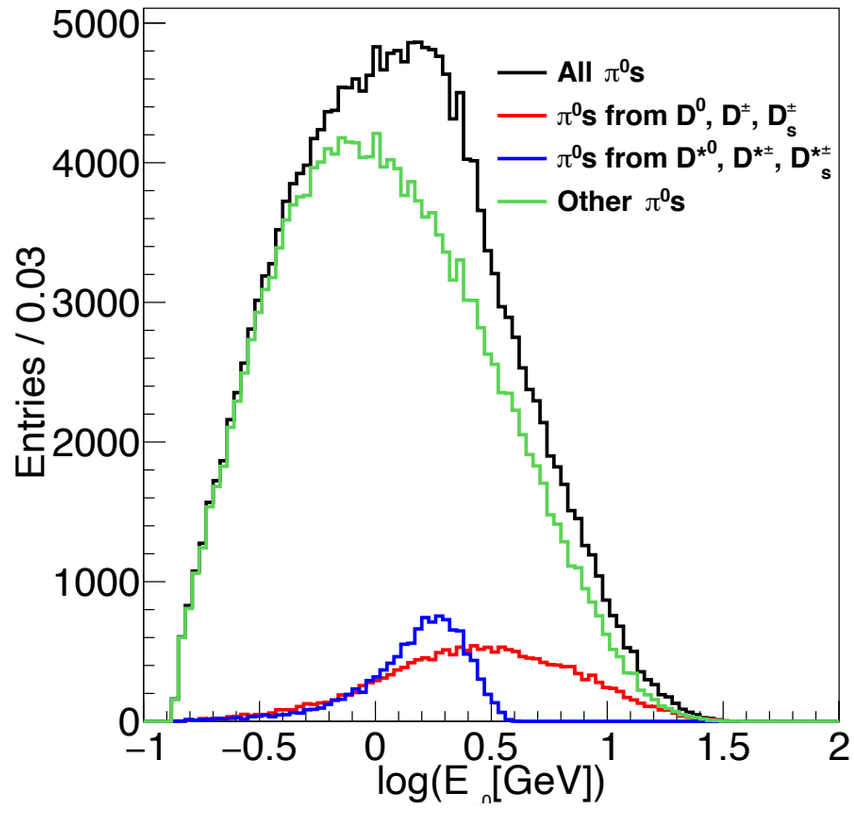




π^0 energy spectrum

Z->cc (D meson)





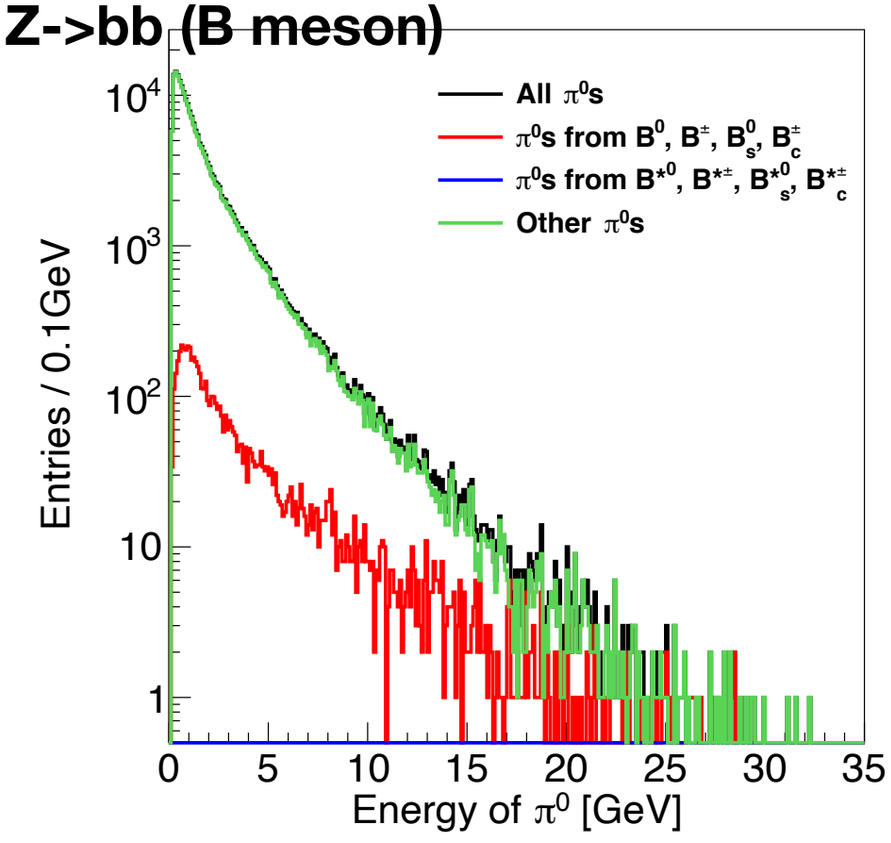
Mass difference between meson* and meson

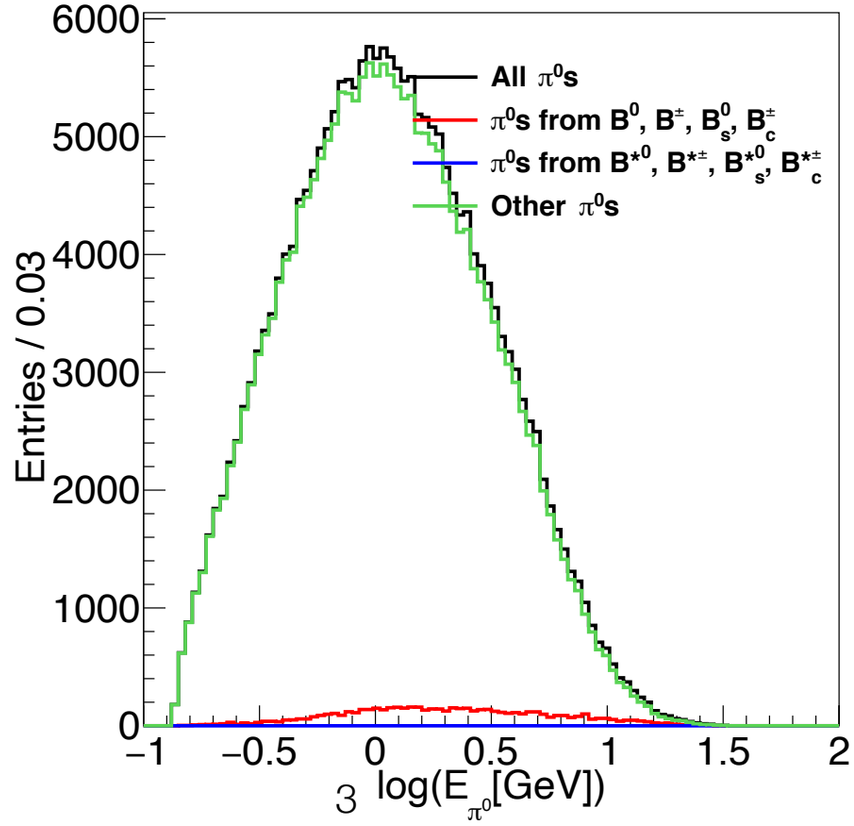
Mass $m = 2006.85 \pm 0.05$ MeV (S = 1.1)
$m_{D^{*0}} - m_{D^0} = 142.016 \pm 0.030$ MeV (S = 1.5)
Full width $\Gamma < 2.1$ MeV, CL = 90%

Mass $m = 2010.26 \pm 0.05$ MeV
$m_{D^*(2010)^+} - m_{D^+} = 140.603 \pm 0.015$ MeV
$m_{D^*(2010)^+} - m_{D^0} = 145.4257 \pm 0.0017$ MeV
Full width $\Gamma = 83.4 \pm 1.8$ keV

Mass $m = 2112.2 \pm 0.4$ MeV
$m_{D_s^{*\pm}} - m_{D_s^\pm} = 143.8 \pm 0.4$ MeV

Z->bb (B meson)

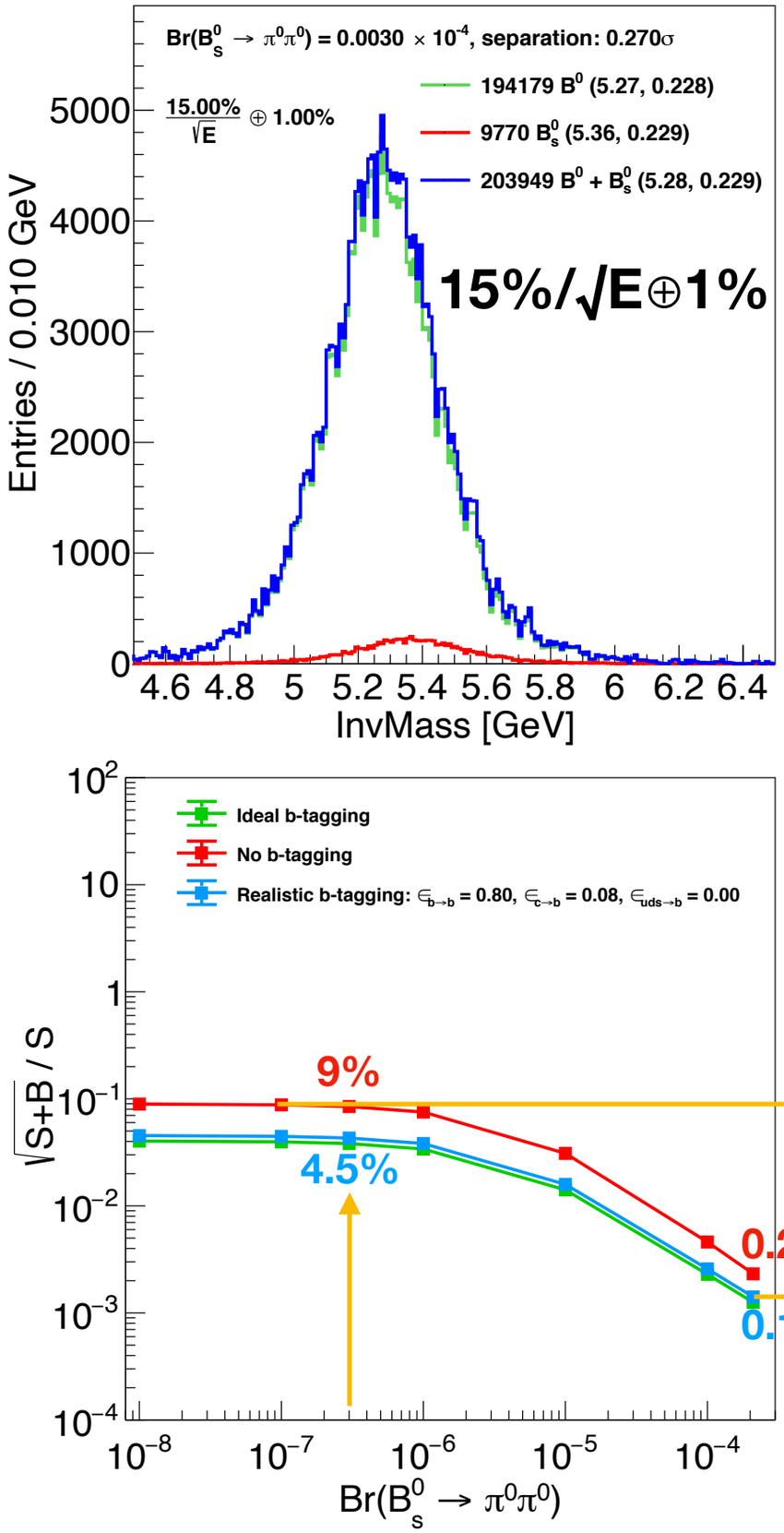


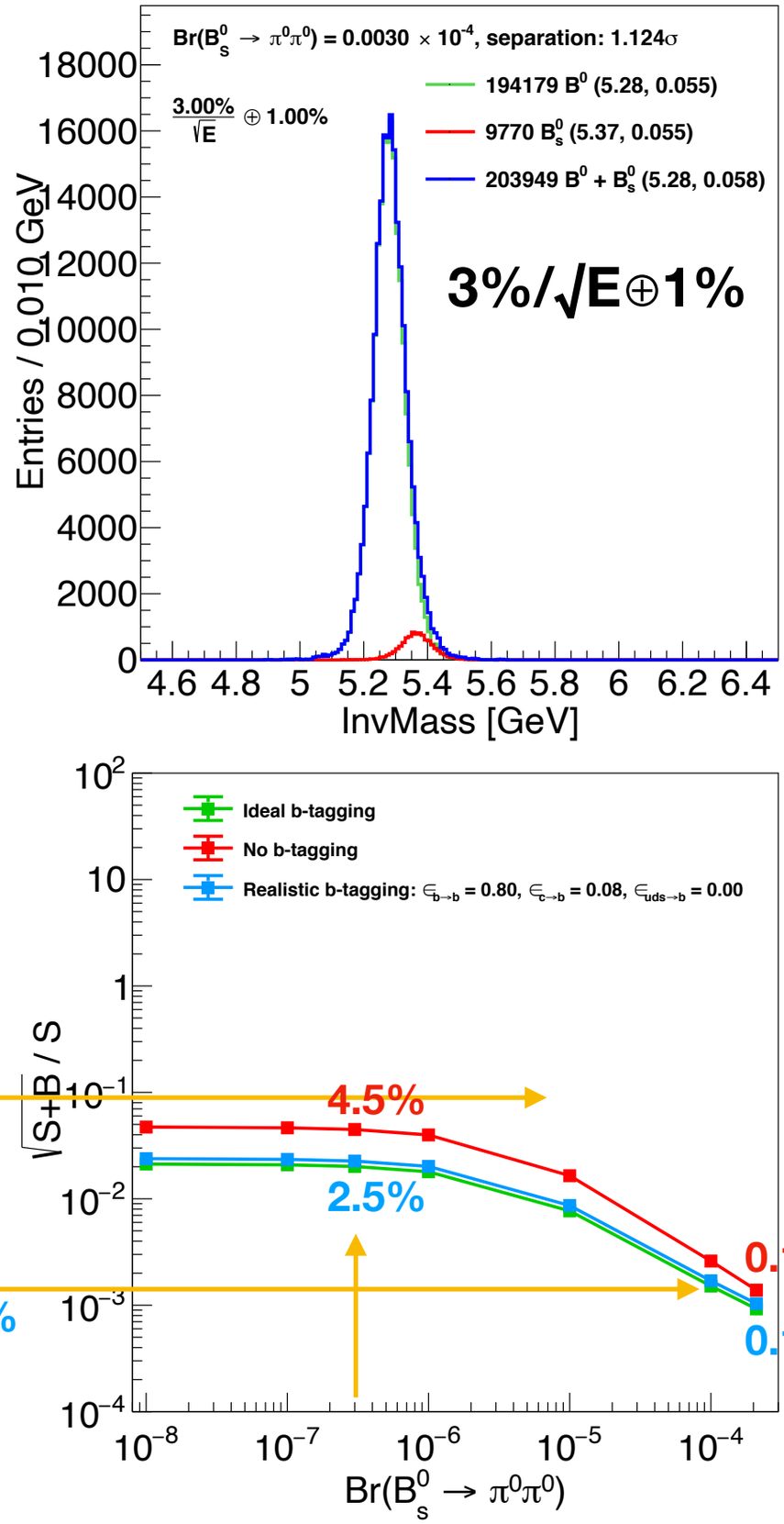


Mass $m_{B^*} = 5324.65 \pm 0.25$ MeV
$m_{B^*} - m_B = 45.18 \pm 0.23$ MeV
$m_{B^{*+}} - m_{B^+} = 45.34 \pm 0.23$ MeV

Mass $m = 5415.4^{+1.8}_{-1.5}$ MeV (S = 2.9)
$m_{B_s^*} - m_{B_s} = 48.5^{+1.8}_{-1.5}$ MeV (S = 2.8)

Mixed measurement of B^0/Bs → $\pi^o\pi^o$





Extrapolated results of Bs → π⁰π⁰

combined with the measurement of B⁰ → π⁰π⁰ in Belle

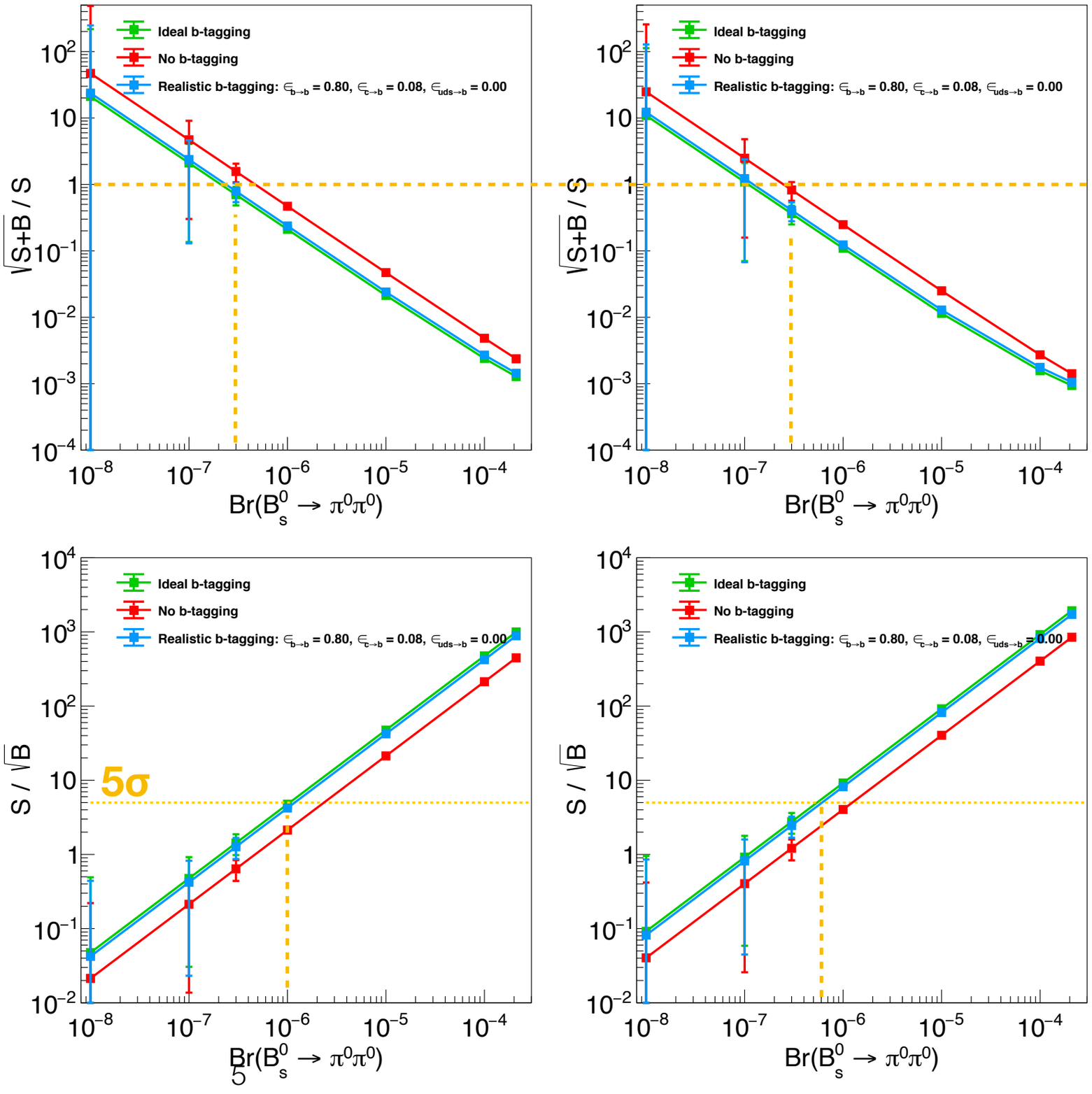
https://journals.aps.org/prd/abstract/10.1103/PhysRevD.96.032007

In this paper, we present new measurements of $B^0 \to \pi^0\pi^0$ based on a 693 fb^{-1} data sample that contains $752 \times 10^6 B\bar{B}$ pairs, collected with the Belle detector at the KEKB asymmetric-energy e^+e^- (3.5 on 8.0 GeV) collider [13] operating near the $\Upsilon(4S)$ resonance. In addition, we employ an 83.5 fb^{-1} data sample recorded from runs where the center-of-mass (CM) energy was 60 MeV below the $\Upsilon(4S)$ resonance (off-resonance data) to characterize backgrounds.

Figure 1 shows the signal-enhanced projections of the fits to data in $M_{\rm bc}$, ΔE and T_c. We obtain a signal yield of 217 ± 32 events. Assuming the $\Upsilon(4S)$ decays to charged and neutral B modes equally, and a final detection efficiency after all selections and corrections of 22%, we determine the branching fraction to be

$$\mathcal{B}(B^0 \to \pi^0\pi^0) = (1.31 \pm 0.19 \pm 0.19) \times 10^{-6}, \quad (8)$$

where the quoted uncertainties are statistical and systematic, respectively. The systematic uncertainties include contributions due to the continuum background parameterization in T_c (11.0%), π^0 detection efficiency (4.4%), single continuum parametrization for $M_{\rm bc}$ and ΔE (4.0%), assumed $\mathcal{B}$ for $B^+ \to \rho^+\pi^0$ (4.0%), off-resonance continuum background (3.0%), assumed $\mathcal{B}$ for other rare decays (3.0%), determination of $f^c_{i,d}$ fraction(1.8%), the choice of fitted region (1.5%), $f^{\rho\pi}_{i,d}$ and $f^r_{i,d}$ fractions equal to $f^s_{i,d}$ (1.5%), luminosity (including assumption of equal branching fraction for charged and neutral modes) (1.4%), fit bias (1.0%), recovery of converted photons (1.0%), and timing cut (0.5%). Adding these in quadrature gives a total systematic uncertainty of 14.2%.



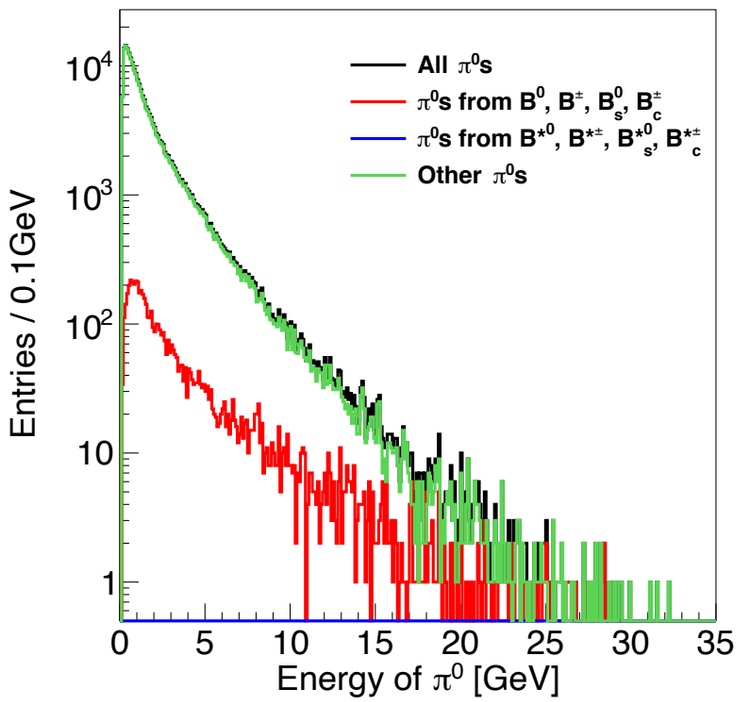
Next step…

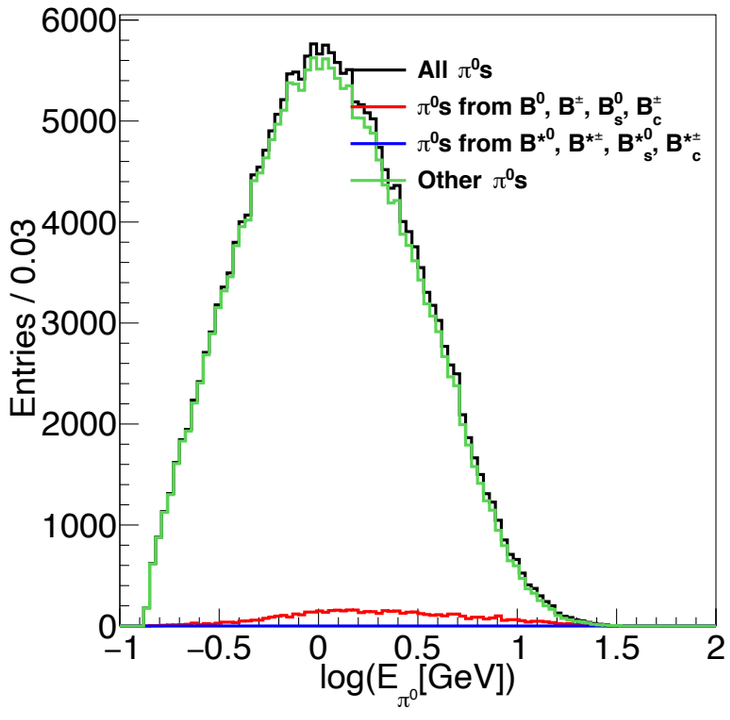
- Using kinematic fit to improve π^0 mass resolution…

Backup

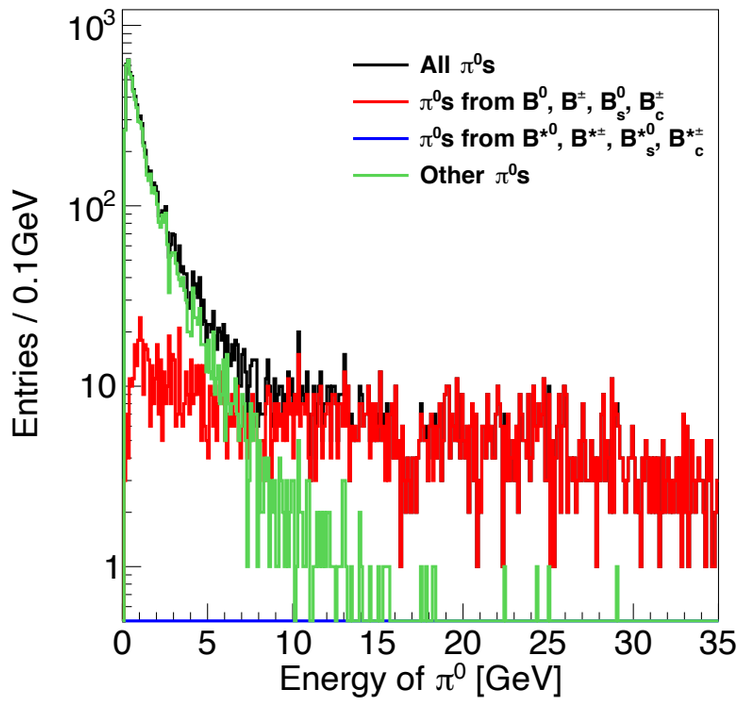
π^0 energy spectrum in Z->bb

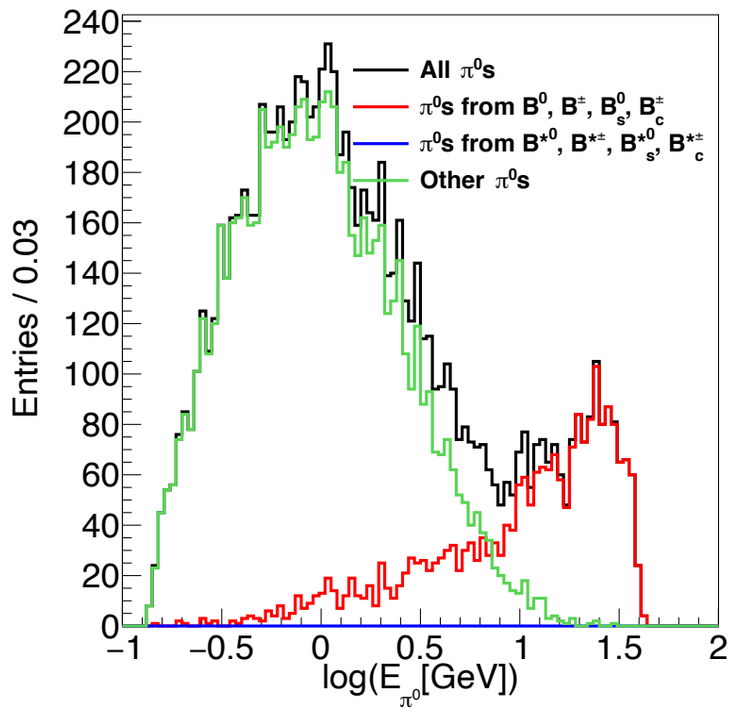
Z->bb



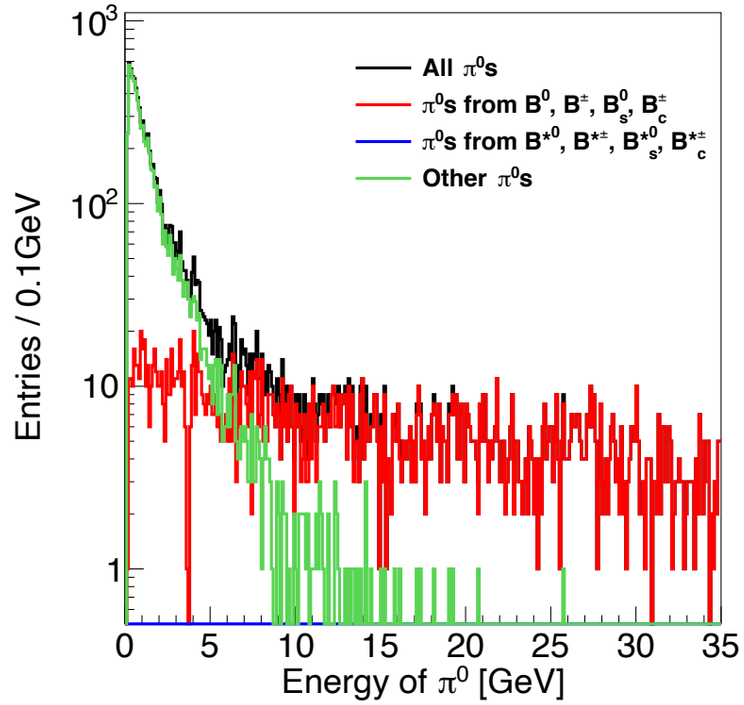


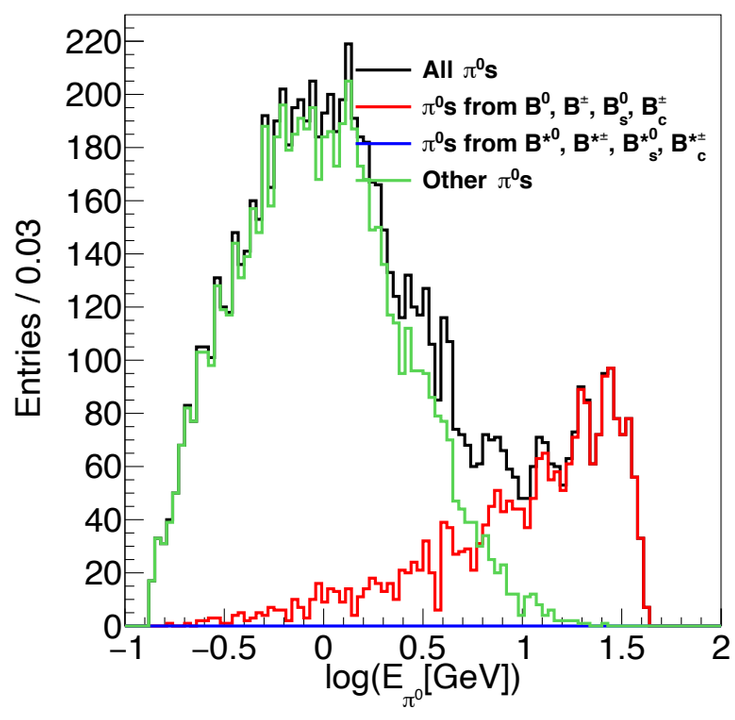
B0->2Pi0





Bs->2Pi0





几乎没有从 B* 来的 pi0，再细分一下 others 里的情况……