19/02/2021

$$Y(3S) \rightarrow \text{gamma chibJ}(2P) \rightarrow \text{gamma 3pi } Y(1S)$$

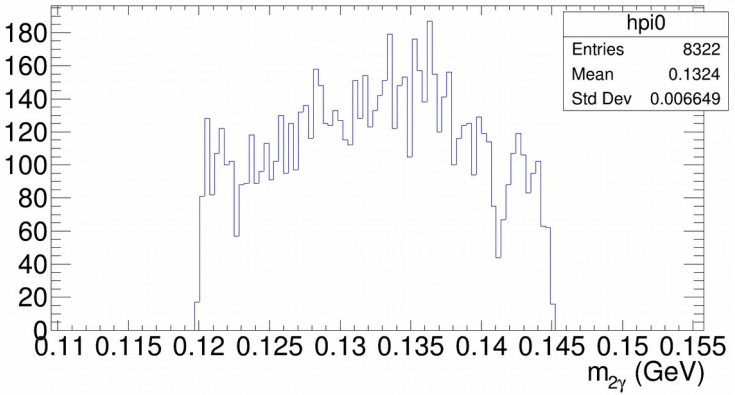
Table 4: The integrated luminosities of the on-resonance ($\mathcal{L}_{\rm on}$) and off-resonance ($\mathcal{L}_{\rm off}$) data samples recorded at and just below the Υ resonances, and the ratio between the on- and off-resonance integrated luminosities. For each entry, the first uncertainty is statistical, the second uncertainty is systematic, and the total relative uncertainty in percent is given in parentheses.

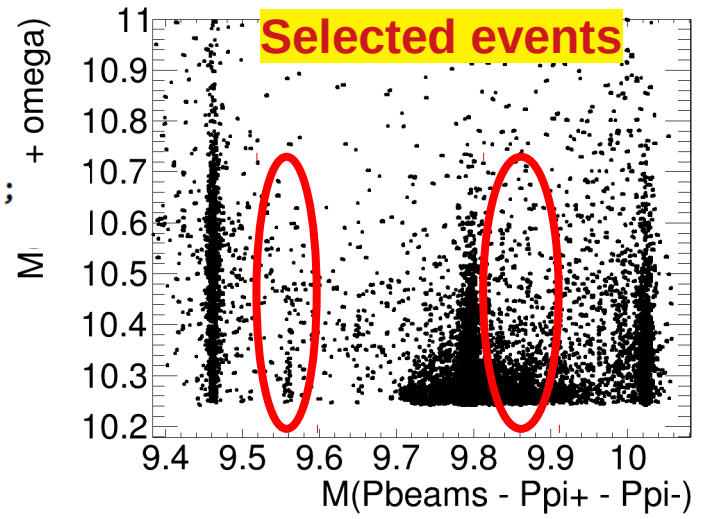
Resonance	$\mathcal{L}_{\rm on}$ (fb^{-1})	$\mathcal{L}_{\rm off}$ (fb^{-1})	$\mathcal{L}_{\rm on}/\mathcal{L}_{\rm off}$
$\Upsilon(4S)$	$424.18 \pm 0.04 \pm 1.82$ (0.43)	$43.92 \pm 0.01 \pm 0.19$ (0.43)	$9.658 \pm 0.003 \pm 0.007$ (0.08)
$\Upsilon(3S)$	$27.96 \pm 0.03 \pm 0.16$ (0.58)	$2.623 \pm 0.008 \pm 0.017$ (0.72)	$10.66 \pm 0.03 \pm 0.03$ (0.40)
$\Upsilon(2S)$	$13.60 \pm 0.02 \pm 0.09$ (0.68)	$1.419 \pm 0.006 \pm 0.011$ (0.88)	$9.58 \pm 0.04 \pm 0.04$ (0.59)

Selection

- Начальные требования на уровне сортировки нужных кандидатов
- Энергия каждого фотона из пи0 > 60 МэВ
- 0.12 < mpi0 < 0.145
- Массы omega и Y1S фкисированы

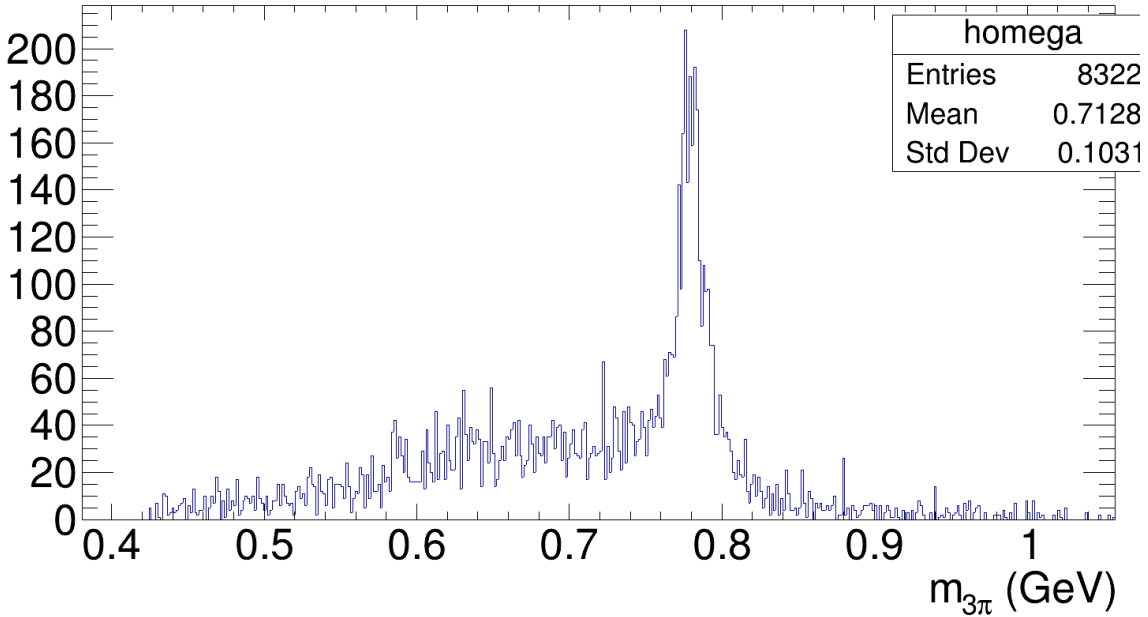
```
if((Pbeam - Pip - Pim).M() > 9.78 && (Pbeam - Pip - Pim).M() < 9.81)continue;
if((Pbeam - Pip - Pim).M() > 9.9 || (Pbeam - Pip - Pim).M() < 9.5)continue;
```

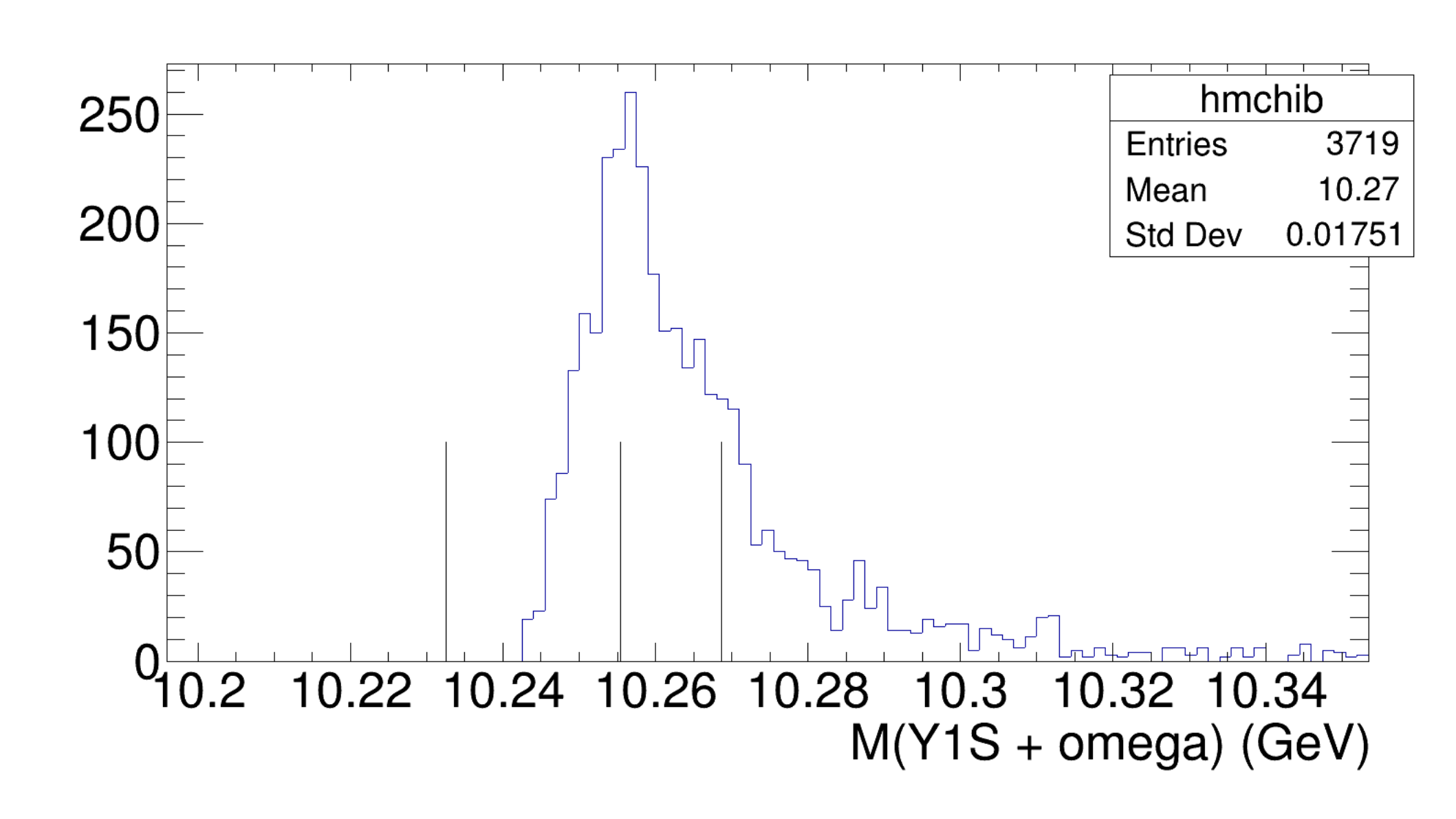




Selection

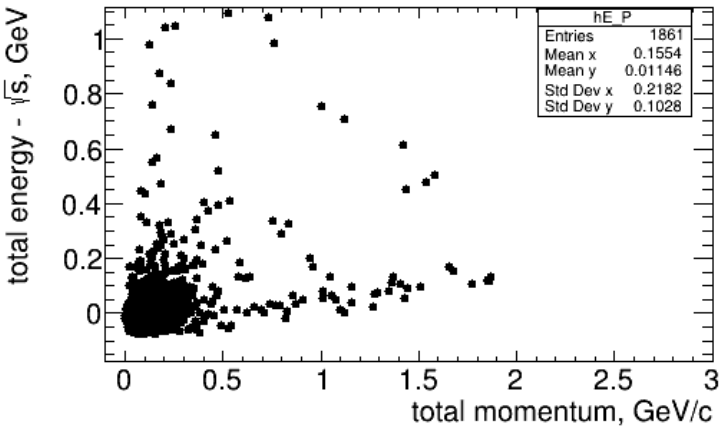
- 0.72< m_3pi < 0.8

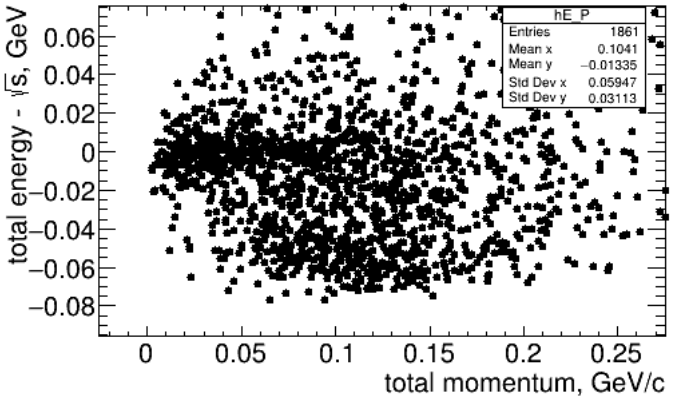



hmchib
Entries 3719
Mean 10.27
Std Dev 0.01751
250
200
150
100
50
0
10.2
10.22
10.24
10.26
10.28
10.3
10.32
10.34
M(Y1S + omega) (GeV)

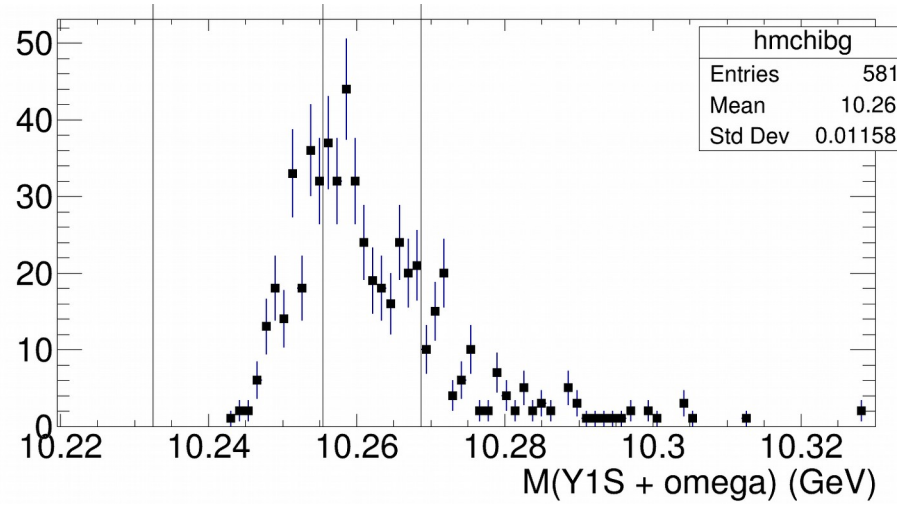
Selection

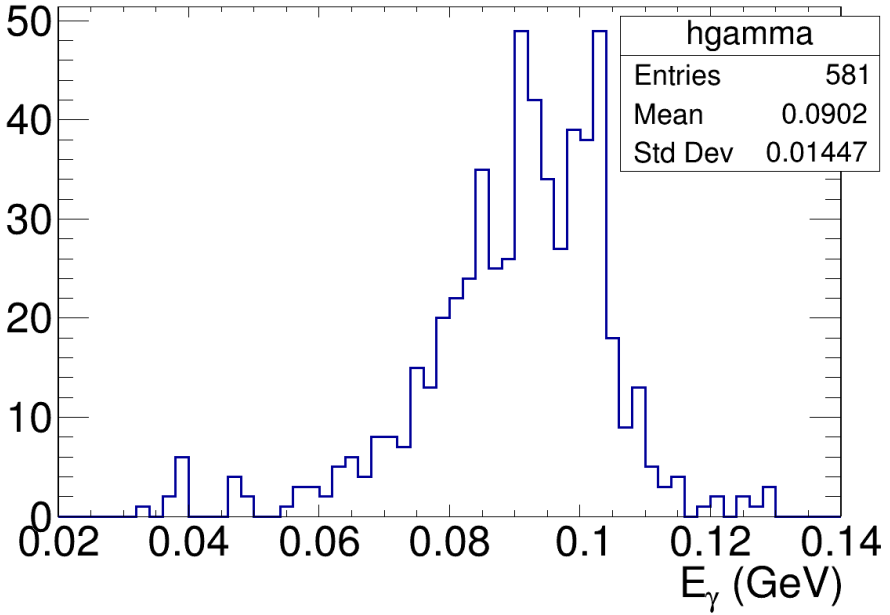
- Требуем наличие фотона из распада Υ(3S)

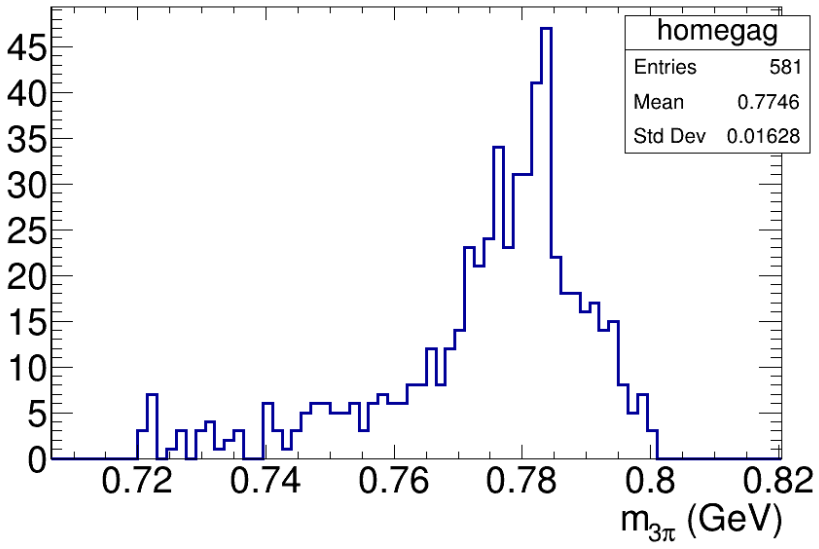




- if((Omega + Gamma + Y1S).P() > 0.1 || fabs((Omega + Gamma + Y1S).E() - sqrts) > 0.03)continue;


hmchibg
Entries 581
Mean 10.26
Std Dev 0.01158
M(Y1S + omega) (GeV)


hgamma
Entries 581
Mean 0.0902
Std Dev 0.01447
E_γ (GeV)


homegag
Entries 581
Mean 0.7746
Std Dev 0.01628
$m_{3\pi}$ (GeV)

KLEO

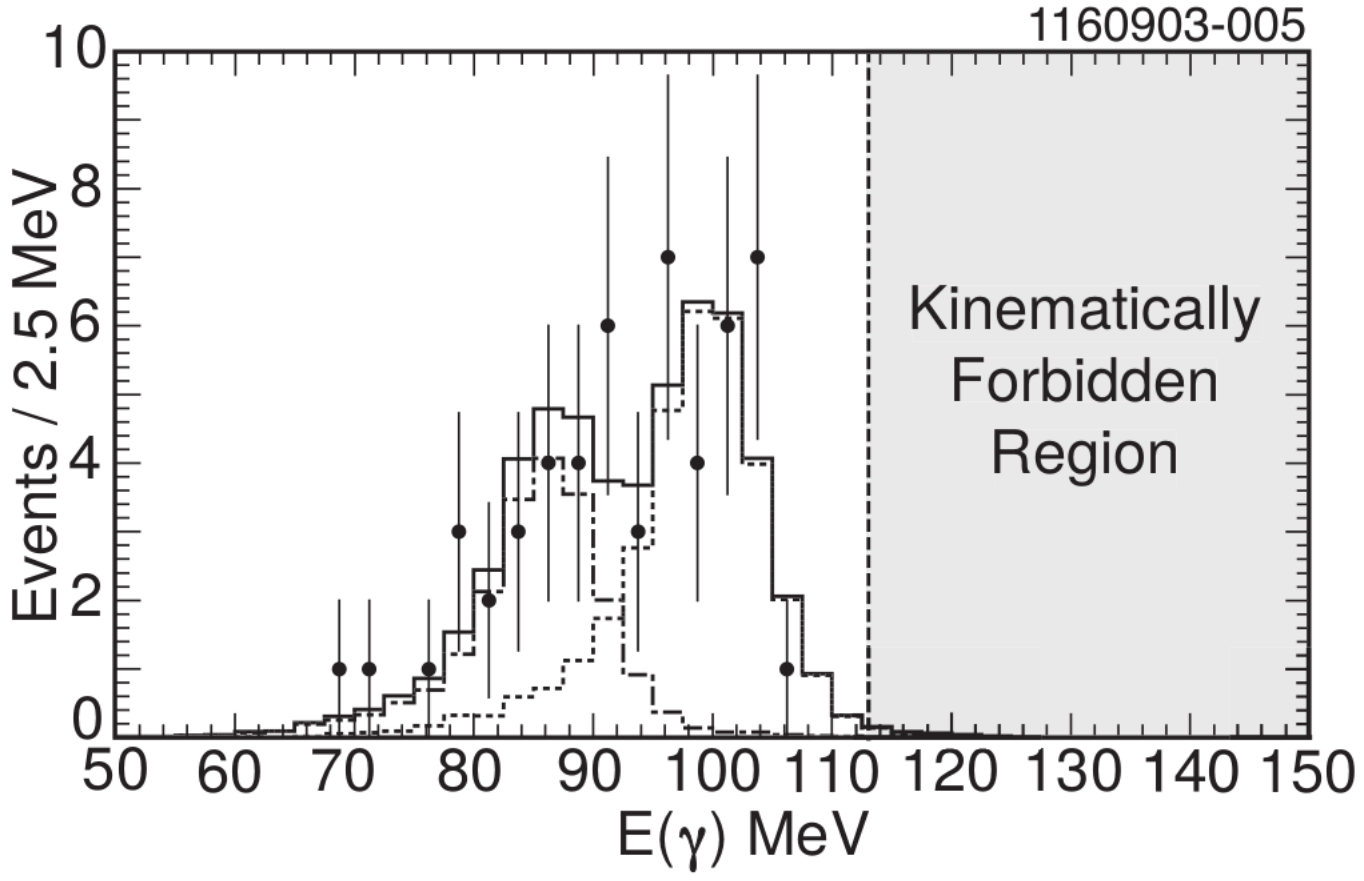


FIG. 4: Fitted photon energy spectrum for the final selection of events. The solid histogram shows contributions for both $\chi_{b1}(2P)$ and $\chi_{b2}(2P)$, while the dotted and dashed histograms show the individual $\chi_{b1}(2P)$ and $\chi_{b2}(2P)$ contributions, repsectively. The dotted line indicates the region above which γ energies are disallowed for lack of phase space.