Search for $e^+e^- \to \eta_b(1S)\omega$ at $\sqrt{s}$ = 10.745 GeV

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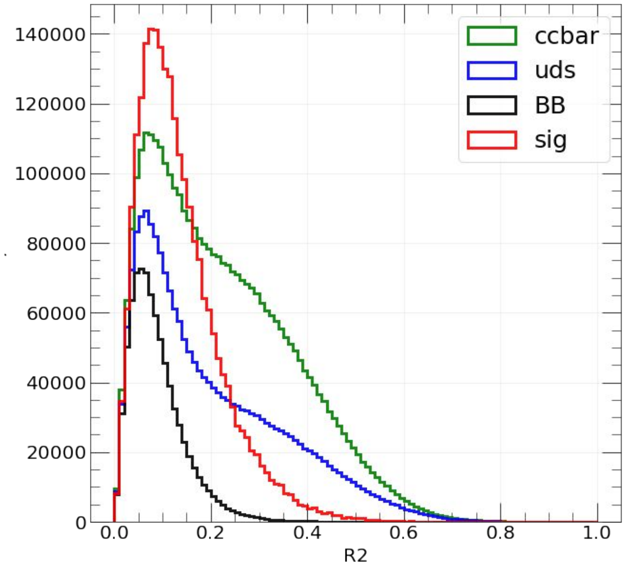
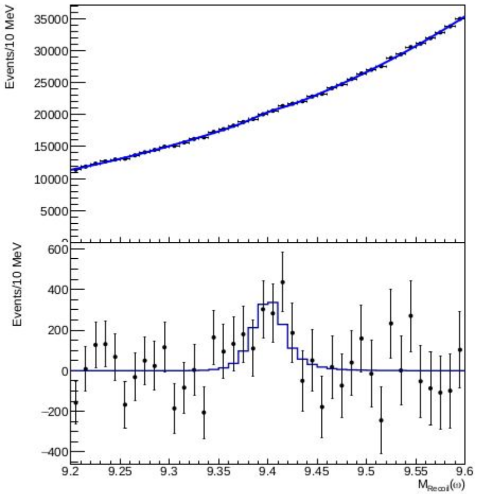
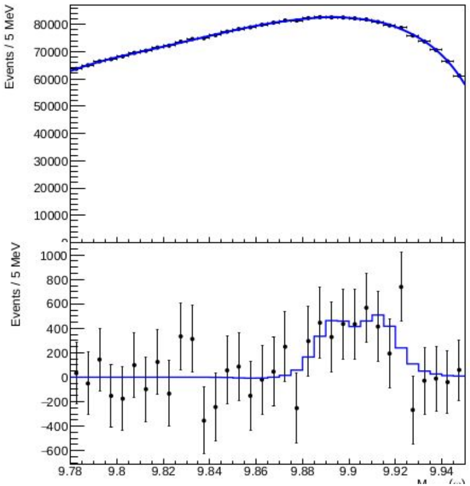
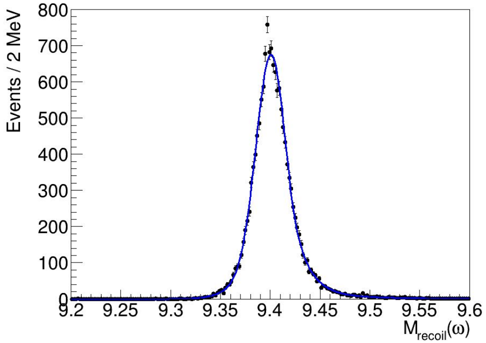
(IJCLab) (HSE) (IJCLab)

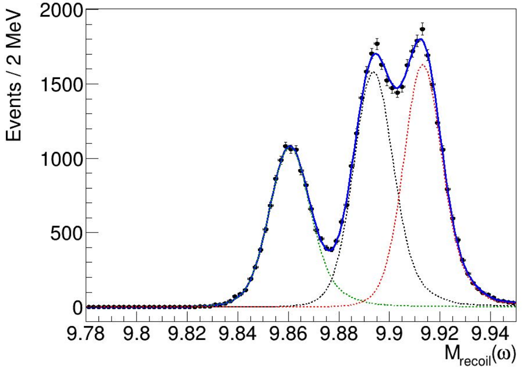
Challenge: suppress the background from real B decays and increase the resolution



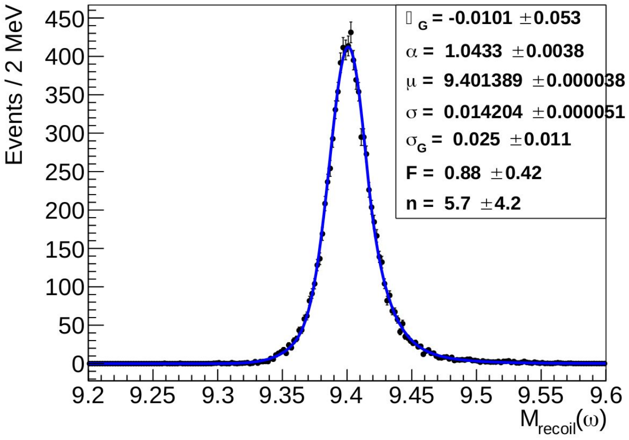


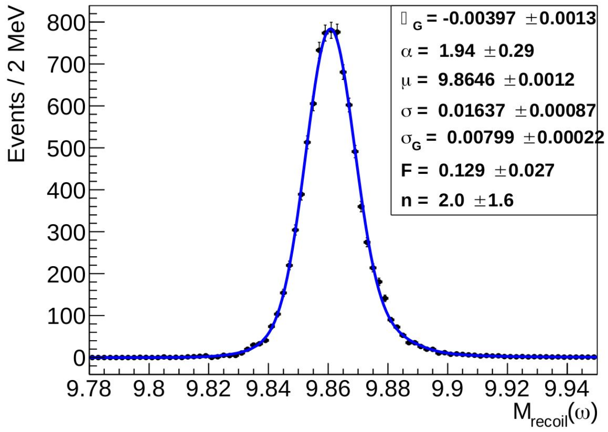


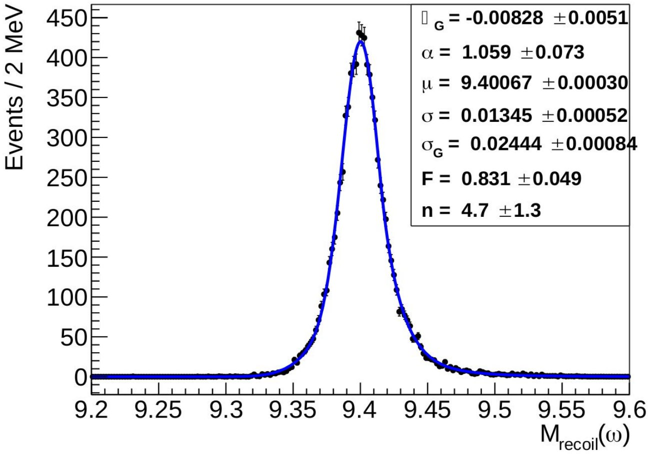


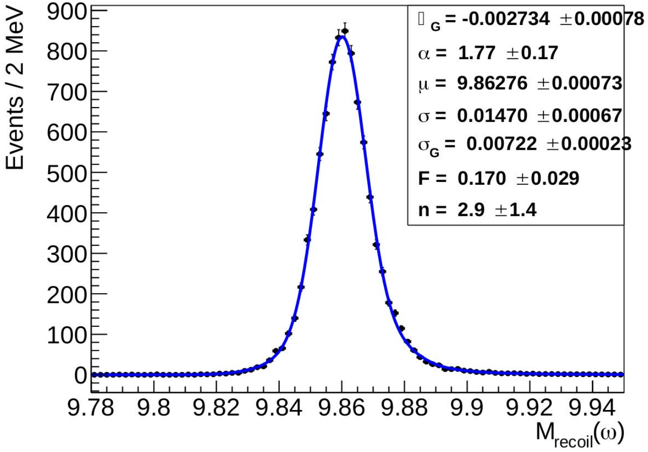


$\omega \to \pi^+\pi^-\pi^0$ mass vertex fit

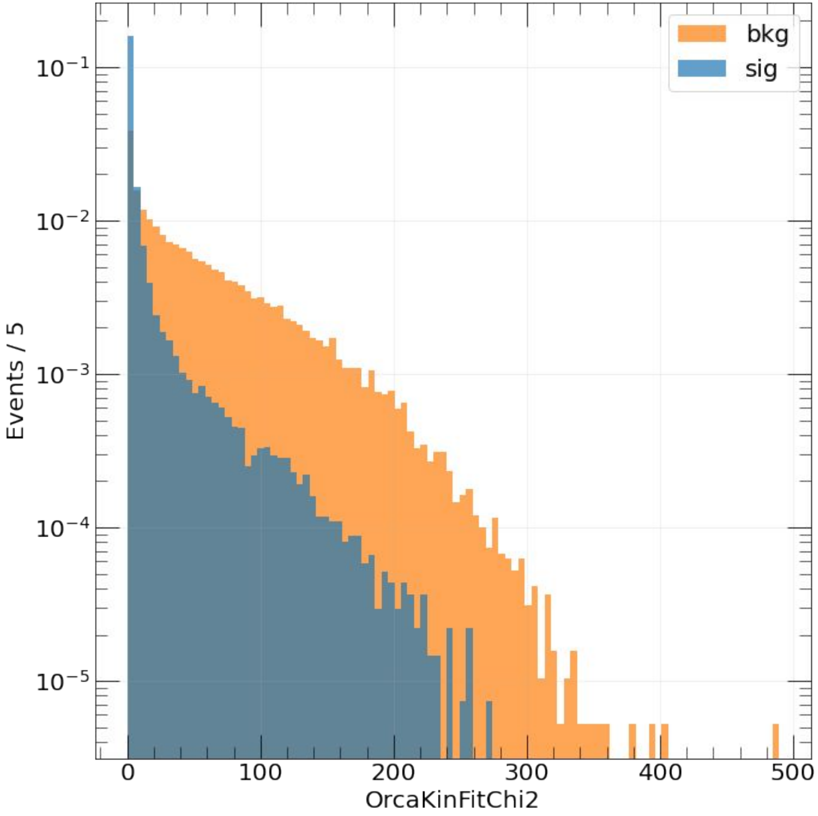


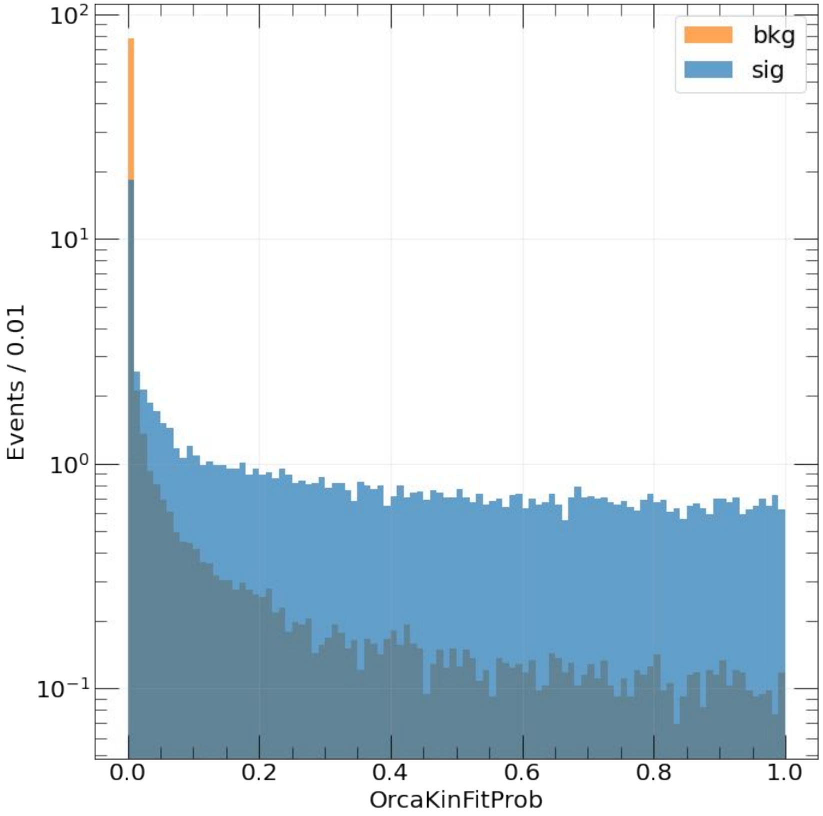




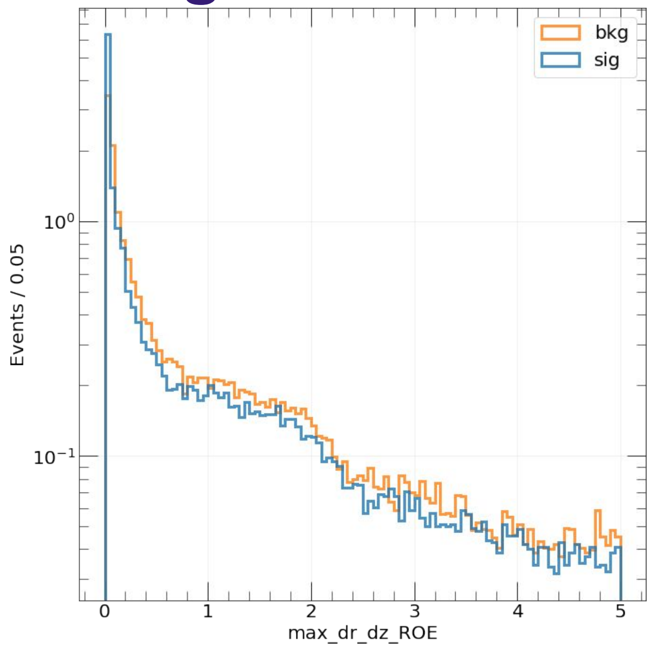


$M_{recoil}(\omega)$ kinematic fit with OrcaKinFit





Max flight distance of charged particle from ROE



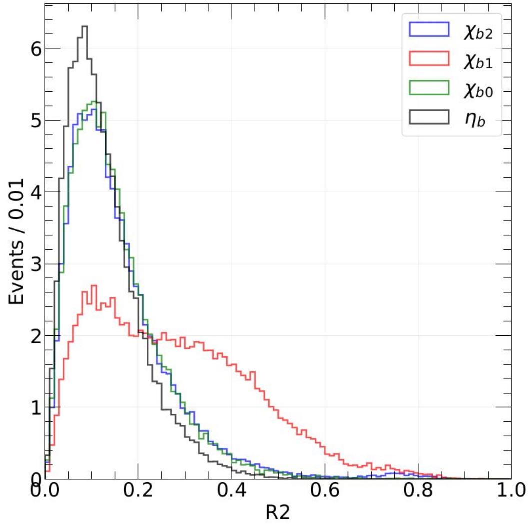

```
Decay vpho
1.0  omega  eta_b  PHSP;
Enddecay

Decay eta_b
1.0  g  g  PHOTOS PYTHIA 91;
Enddecay

Decay omega
1.0  pi+  pi- pi0 OMEGA_DALITZ;
Enddecay

Decay pi0
1.0  gamma gamma  PHSP;
Enddecay

End
```




```
Decay chi_b0
0.0192    gamma  Upsilon          HELAMP 1. 0. 1. 0.;  #best values from BBR 2014,
using B(Y2S->gamma chib)
0.9808    g      g                PYTHIA 91;
Enddecay

Decay chi_b1
0.349    gamma  Upsilon          HELAMP 1. 0. 1. 0. -1. 0. -1. 0.;   #best values fr
om BBR 2014, using B(Y2S->gamma chib)
0.16275          d       anti-d  PYTHIA 91;
0.16275          u       anti-u  PYTHIA 91;
0.16275          s       anti-s  PYTHIA 91;
0.16275          c       anti-c  PYTHIA 91;
Enddecay

Decay chi_b2
0.187    gamma  Upsilon       HELAMP 1. 0. 1.7320508 0. 2.4494897 0.          2.449
4897 0. 1.7320508 0. 1. 0.;  #best values from BBR 2014, using B(Y2S->gamma chib)
0.813          g       g       PYTHIA 91;
Enddecay
```

What do we know about χ_{bJ}(nP) and η_b(nS) fragmentation?

BF(χ_{b1}(1P) $\rightarrow$ gg, $q\bar{q}g \rightarrow D^0X$) = 12.59 +- 1.94 %

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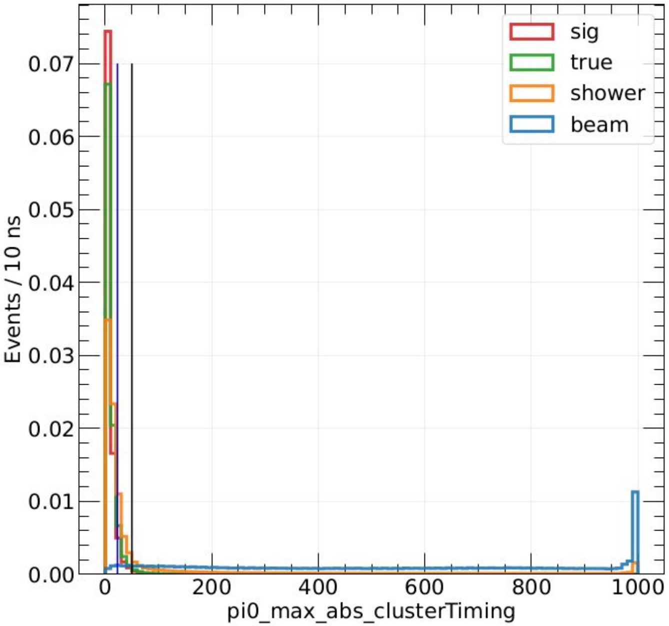
Conclusion and even more questions

- How χ_{bJ}(nP) and η_b(nS) states decay?
- How PYTHIA decays g g and g g* final state and what is included?
- How to suppress B and not to suppress D (give up on this and try to absorb the background with polynomial)?
- How bad gamma variables simulated in Belle II?

From search for $B \to \pi^0\pi^0$

γ selections	Signal (10
photonMVA > 0.2	5,922,633
E > 0.03 GeV	5,857,703
abs(clusterTiming) < 200 ns	5,839,798
clusterNHits > 1.5	5,839,401
0.2967° < clusterTheta < 2.6180°	5,793,481



How kinematic fits affect on the background distributions?