Lab meeting

Yonsei University

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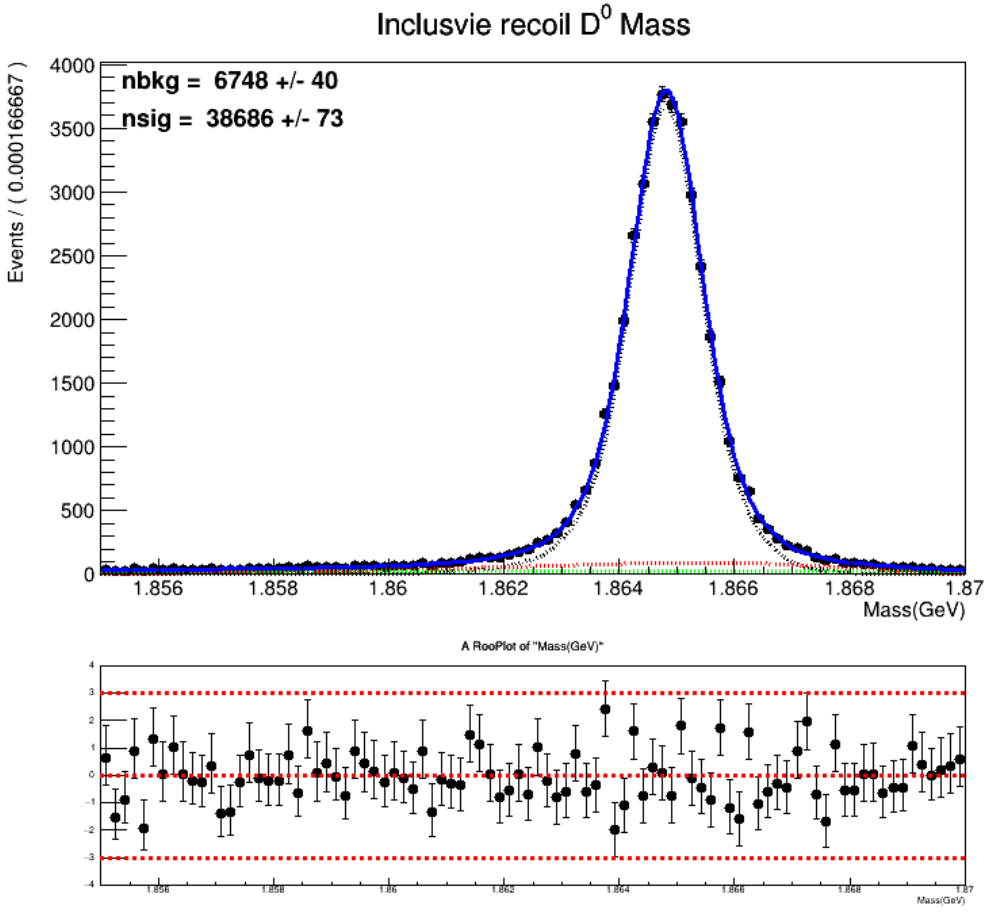
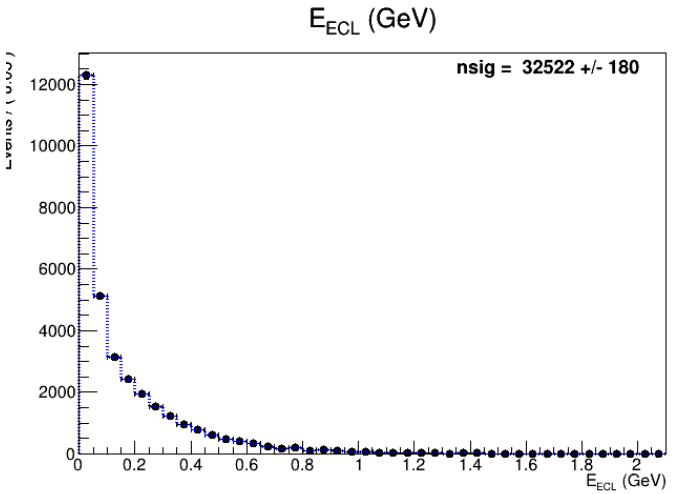
2024-11-13

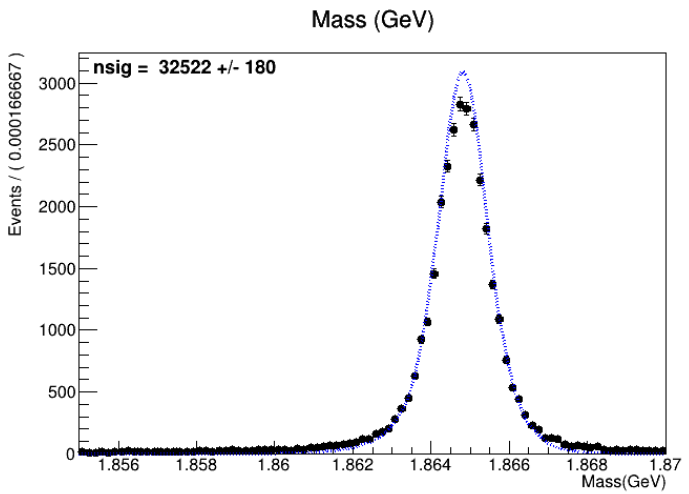
Check on new skim & new-training

- Check on signal efficiency
- Check tagging efficiency on inclusive D0
- Go through UL of signal
- Check about background events about control sample & BF measurement of control sample

Signal efficiency – signal event

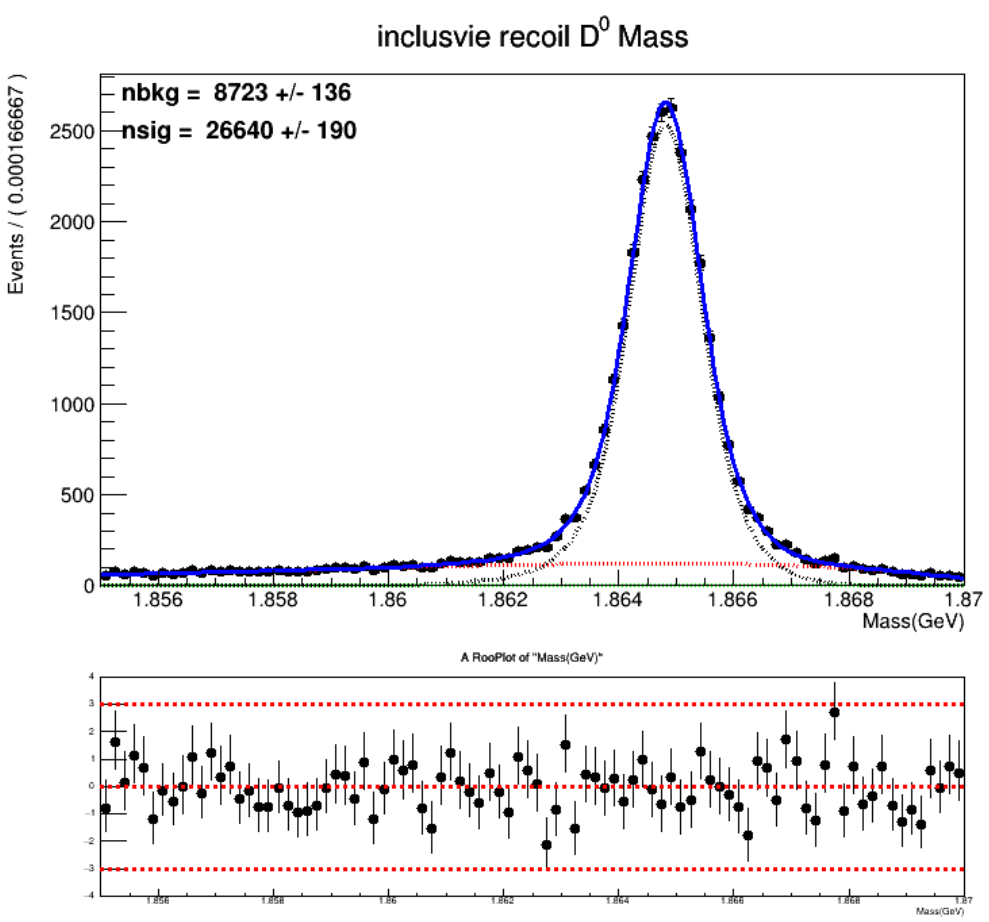


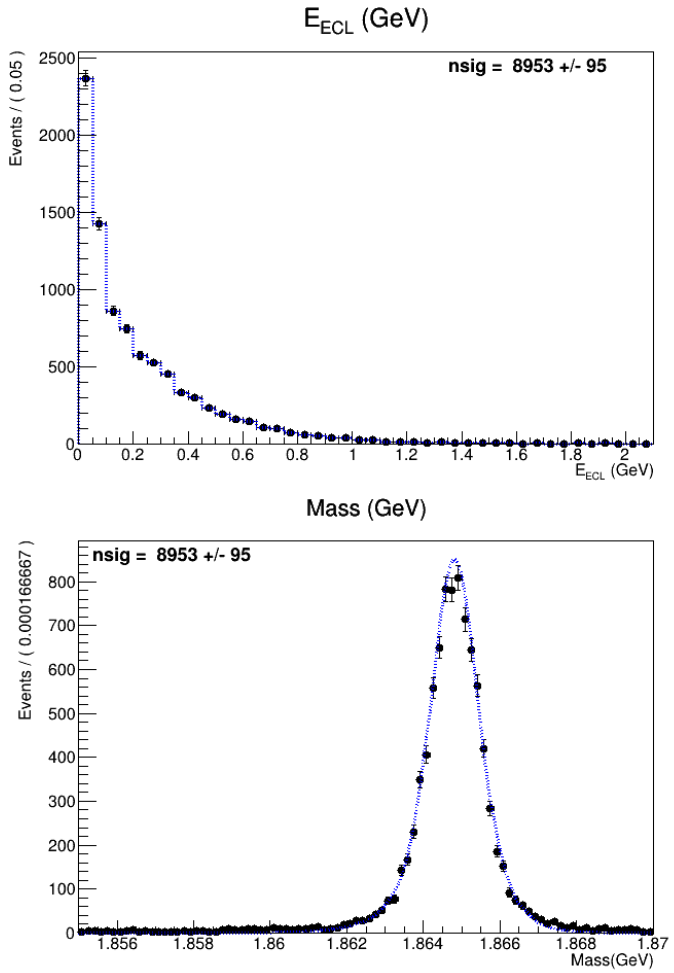




Sig eff : 0.84067 +/- 0.00492

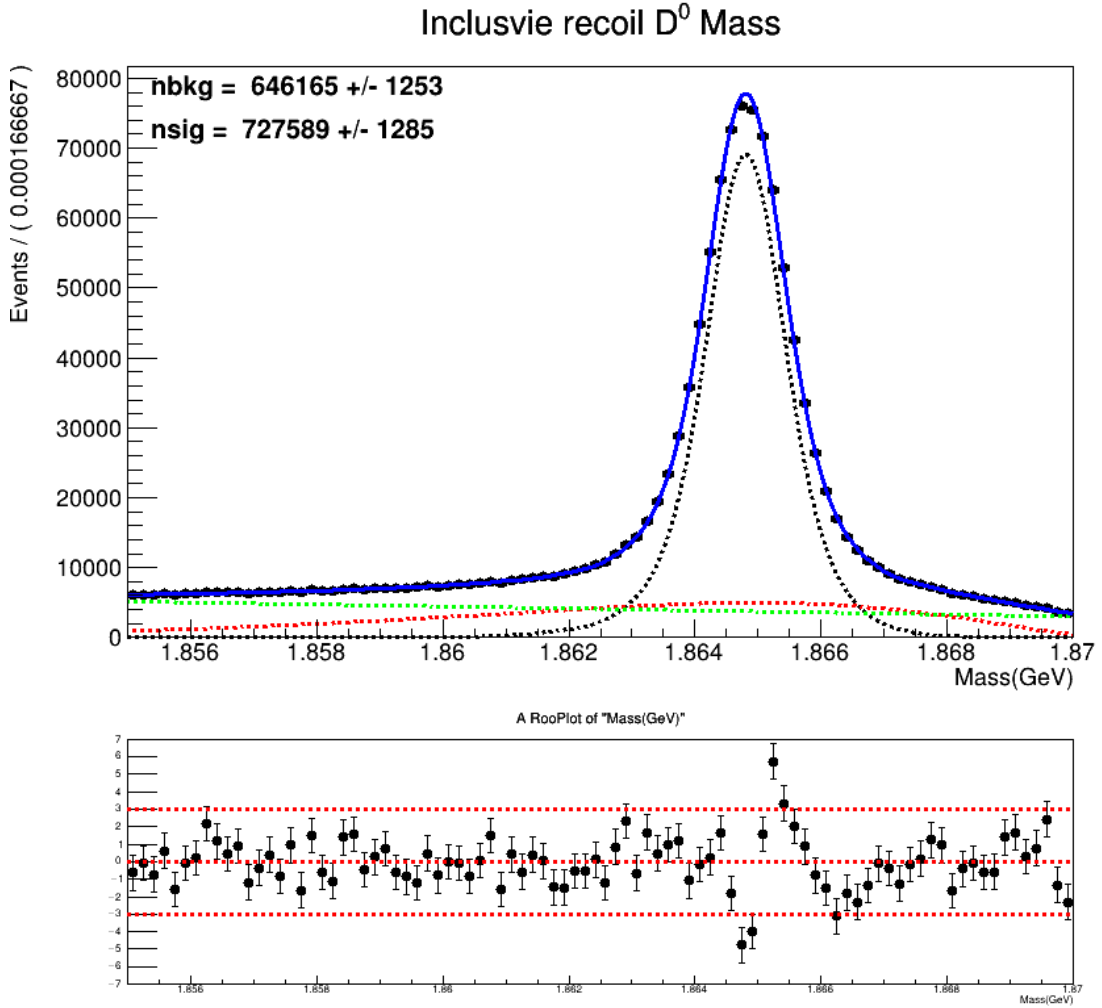
Signal efficiency – control sample





Sig eff : 0.33607 +/- 0.00430

Inclusive D0 on generic udsc MC



c-quark decays

$\Gamma(c \to \ell^+ \text{anything})/\Gamma(c \to \text{anything}) = 0.096 \pm 0.004$ [a]

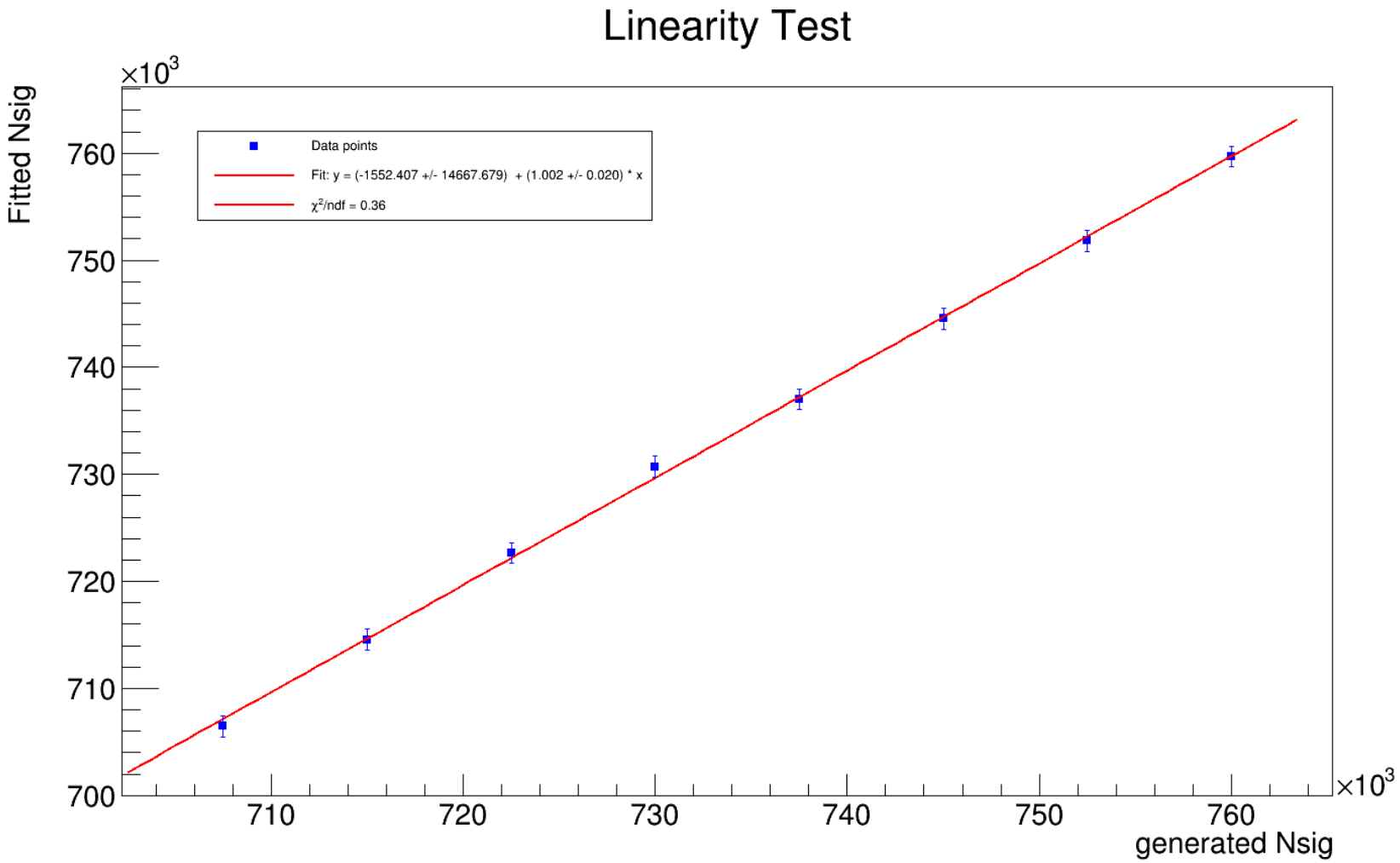
$\Gamma(c \to D^*(2010)^+ \text{anything})/\Gamma(c \to \text{anything}) = 0.255 \pm 0.017$

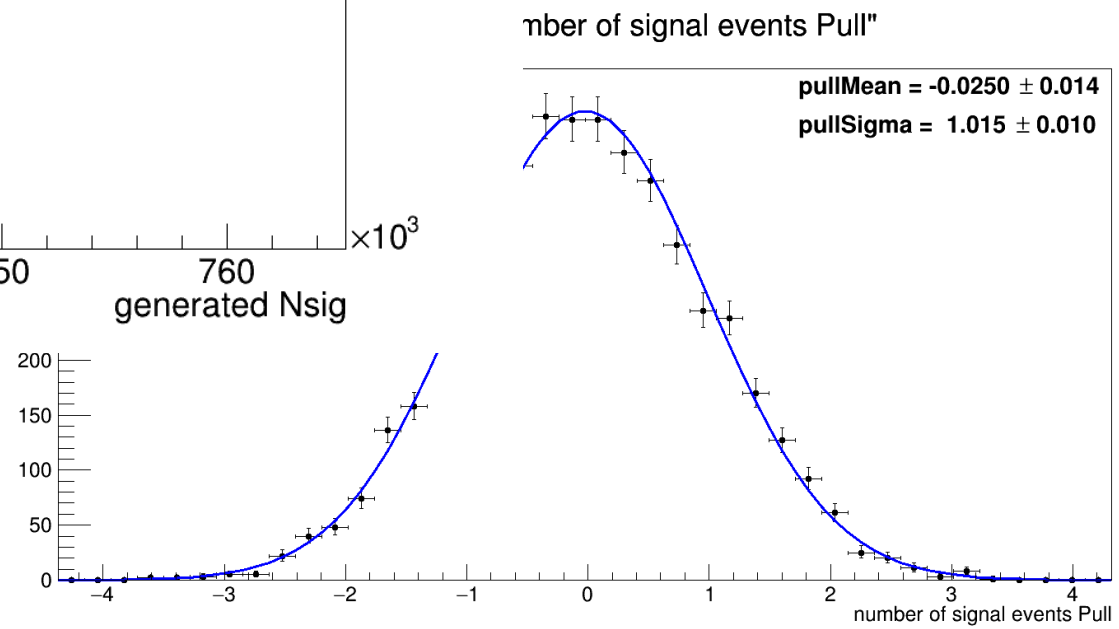
$D^{*+} \to D^0\pi^+$: 67.7%

Tagging efficiency :

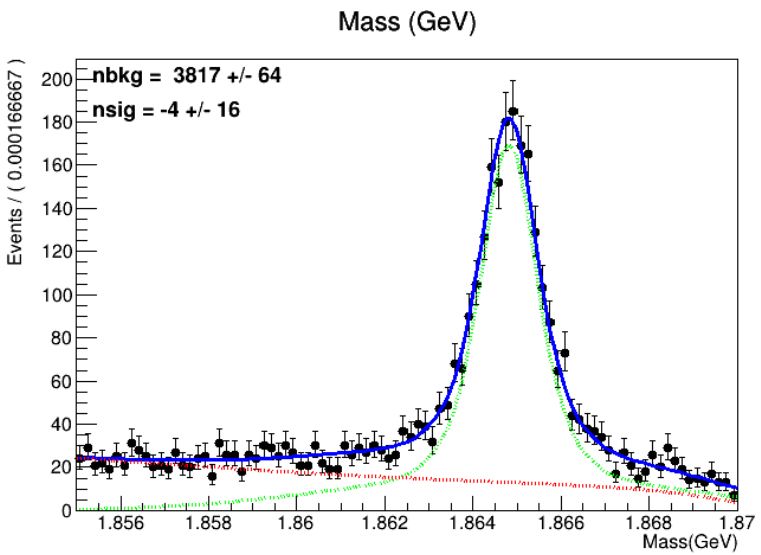
1 ab^-1
=> 1,300,500,000 (ccbar events)

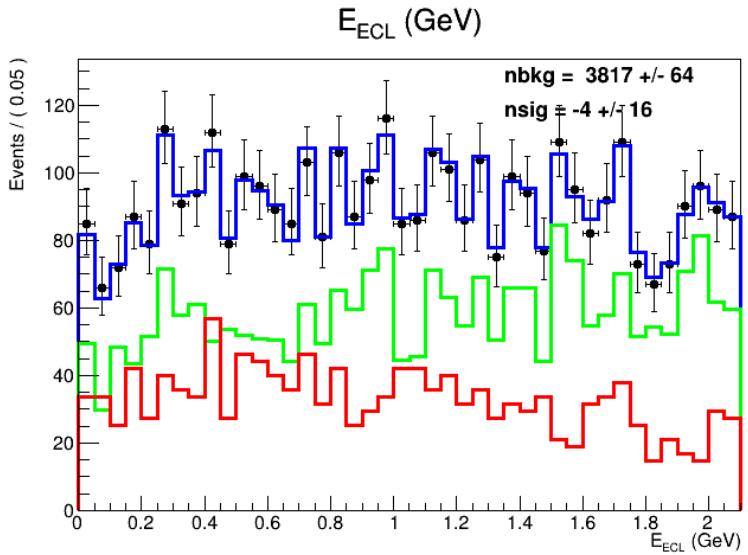
tagging efficiency
= 100 * 727,589/(1,300,500,000*0.255*0.677*2)
= 0.162%

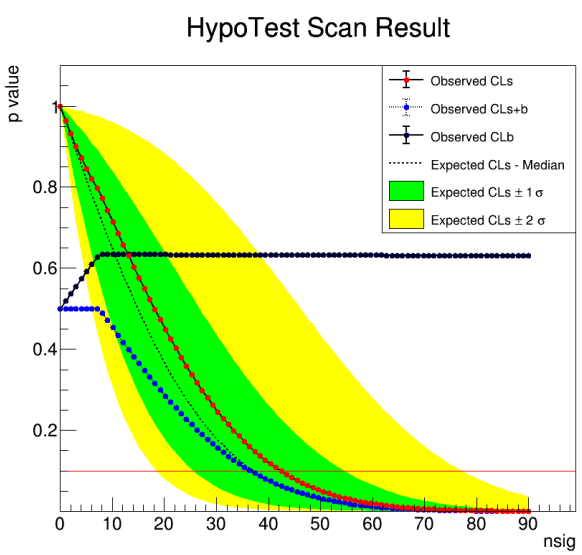

Linearity Test
Fitted Nsig
×10^3
760
750
740
730
720
710
700
Data points
Fit: y = (-1552.407 +/- 14667.679) + (1.002 +/- 0.020) * x
χ²/ndf = 0.36
710
720
730
740
750
760
×10^3
generated Nsig


mber of signal events Pull"
pullMean = -0.0250 ± 0.014
pullSigma = 1.015 ± 0.010
200
150
100
50
0
−4
−3
−2
−1
0
1
2
3
4
number of signal events Pull

UL of signal decay (D^0 to invisibles)

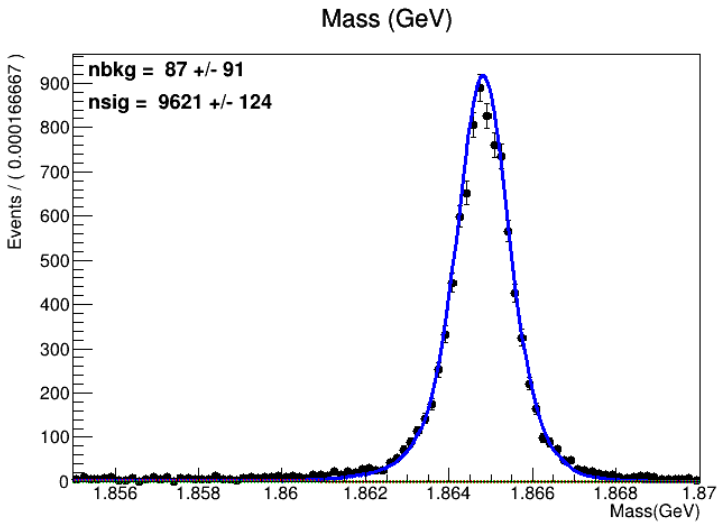


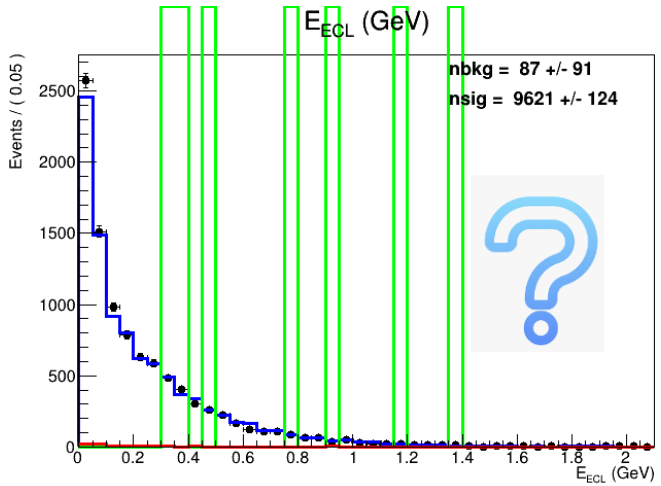


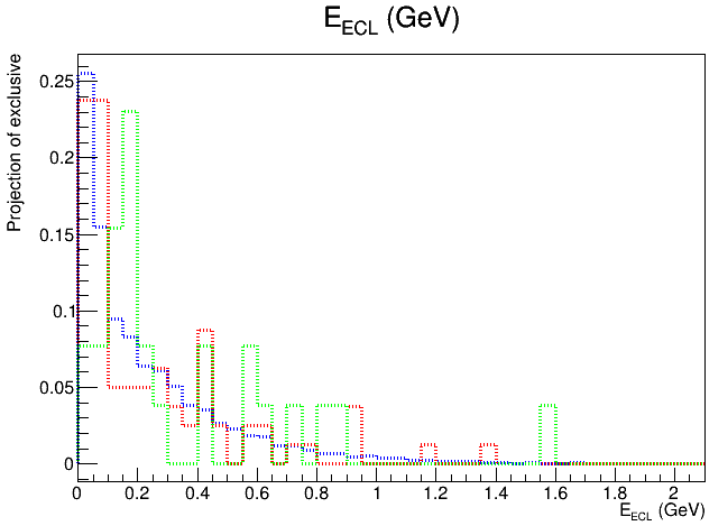


UL of Nsig : 42.3444
UL of BF : 6.92×10^{-5}

$D^0 \to K^-\pi^+$ control sample event



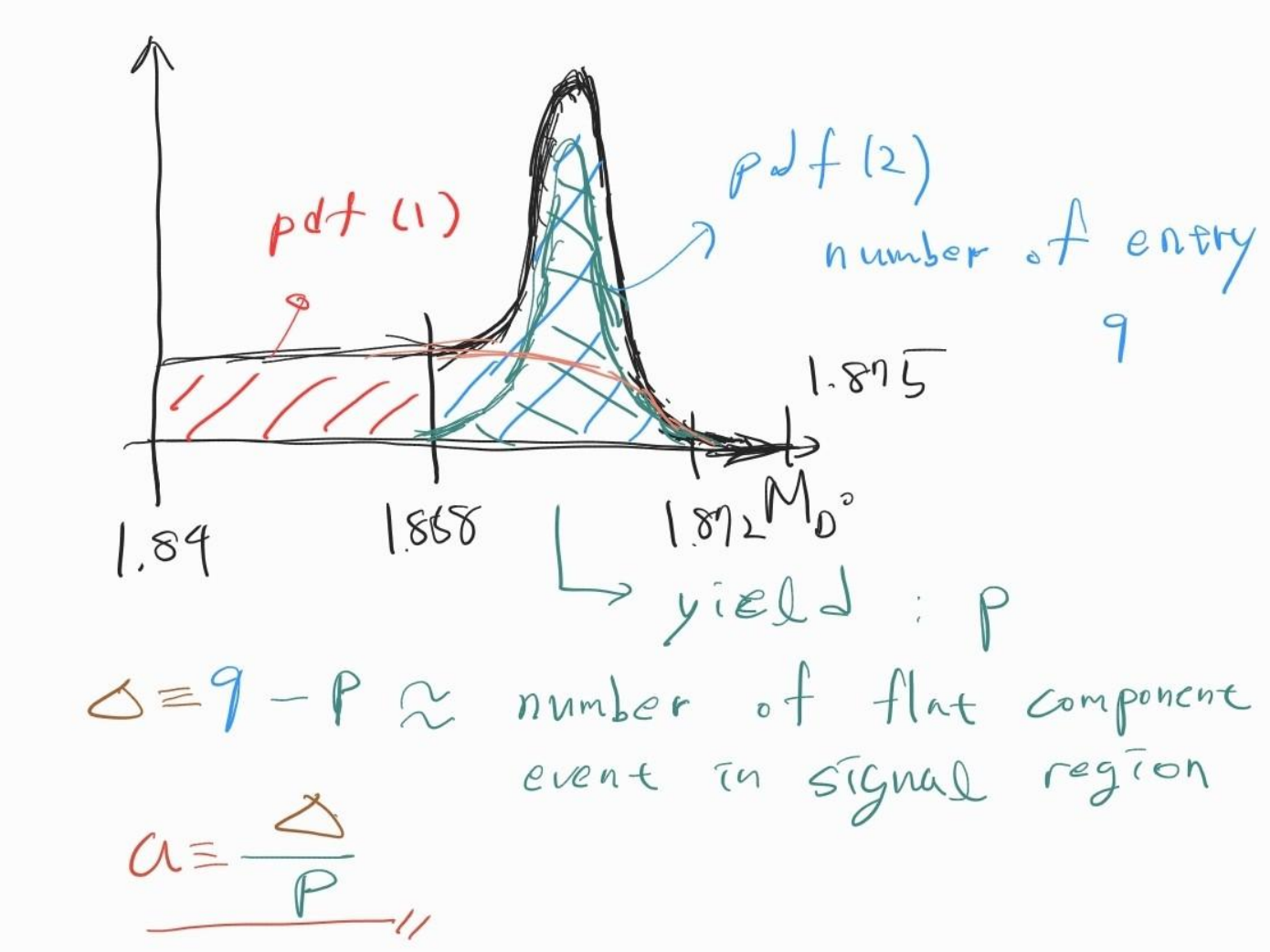




$$Br(D^0 \to K^-\pi^+) = \frac{9{,}621 \pm 124}{(727{,}589 \pm 1{,}285) * (0.33607 \pm 0.00430)} = 0.03935 \pm 0.00072$$

Reminder : Histogram PDF with variable a

- The value of a can be roughly estimated
- a is floating number with small range around the estimated value



Check again about background events about control sample

- D0 -> K- pi+ pi0 (BF : 0.144) => 15 events
- D0 -> K+ pi- (BF : 0.00015) => 41 events
- D0 -> K+ K- (BF : 0.00408) => 11 events
- total BF : 0.14823
  => totally 67M D0 decays like these
  among 450M inclusive D0(anti-D0) in $1ab^{-1}$ generic ccbar MC
- with my exclusive selections, the number of these is just 67 from 67M events
  => about 80% among background events

- Asked DP liaison for run-dependent MC samples about these (400M size)

- I'm now producing these MC events of 100M events size personally with apptainer
  it is now working properly and can produce 50000 events without failure
  Thanks to Jaeyoung ☺

Backup : Decfile for product of background MC

```
Alias   myD0        D0

Decay vpho
1.000          c      anti-c          PYTHIA 91;
Enddecay

Decay D*+
1.0000         myD0   pi+     VSS;
Enddecay

Decay myD0
0.971460000      K-   pi+  pi0            D_DALITZ; # [PDG2019]
0.001010000      K+   pi-                 PHSP; # [PDG2019]
0.027520000      K+   K-                  PHSP; # [PDG2019]
Enddecay

End
```