Status Report on $J/\psi \to e^+e^-$ Analysis (A Quick Update)

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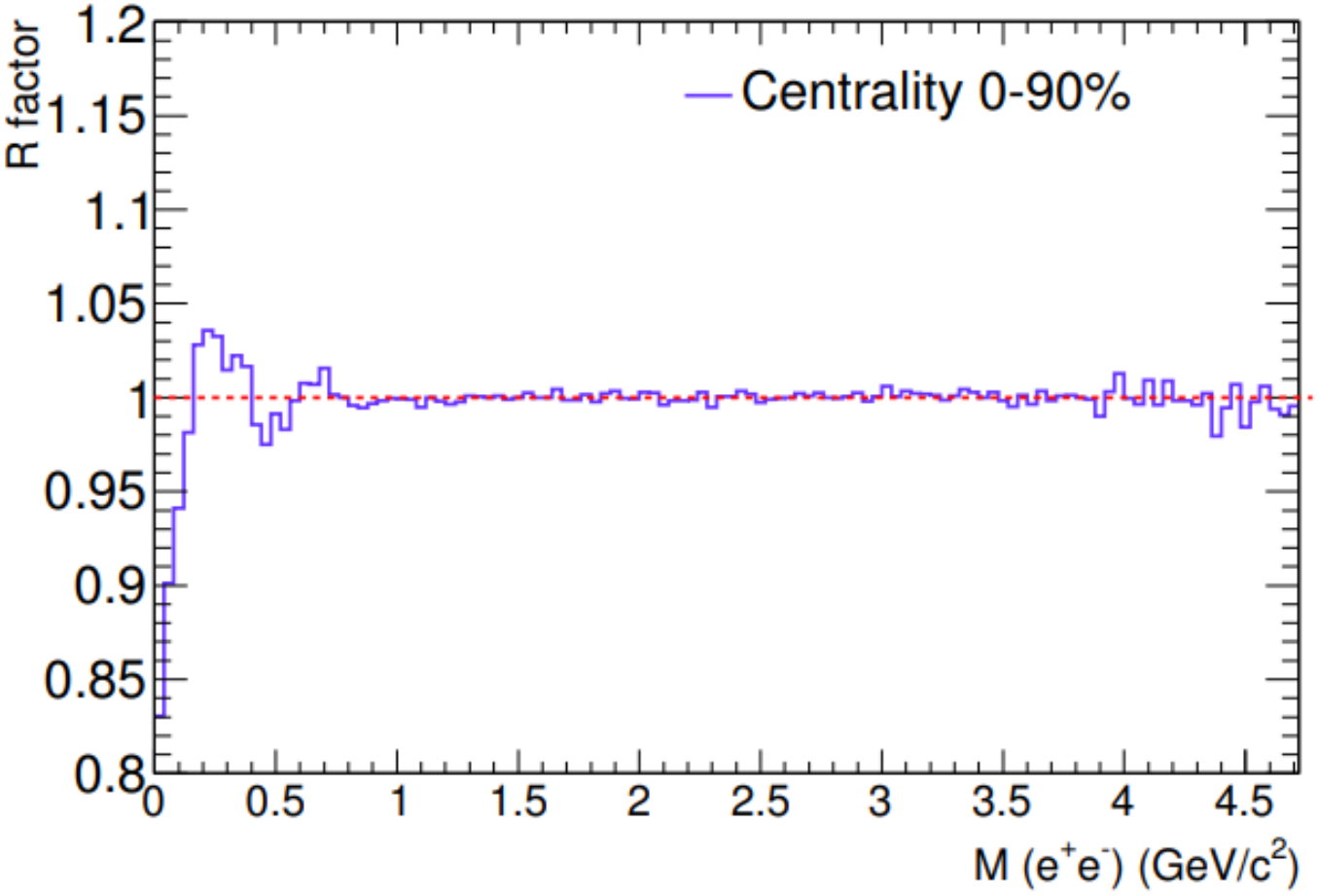
- Unlike sign pairs : superposition of signal pairs and background pairs
- $N_{+-} = S_{+-} + B_{+-}$

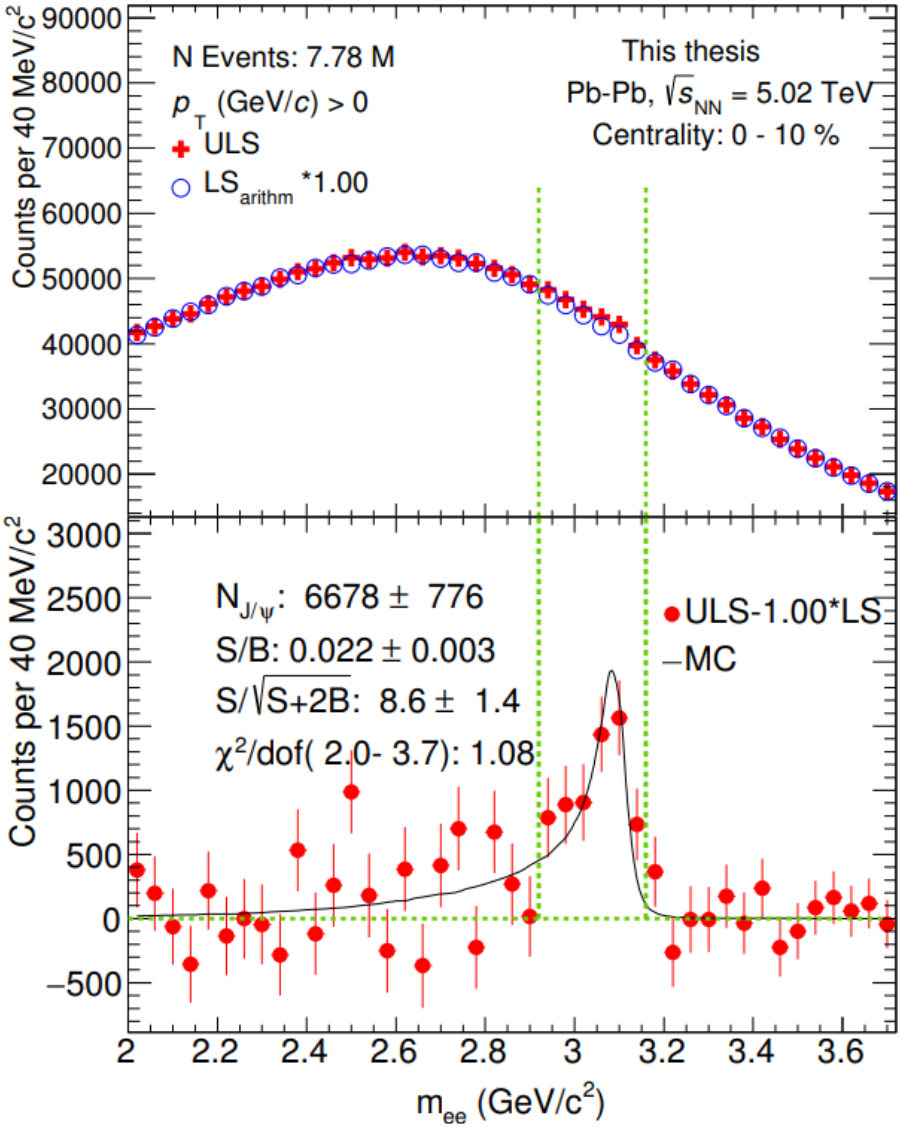
Removing Background :

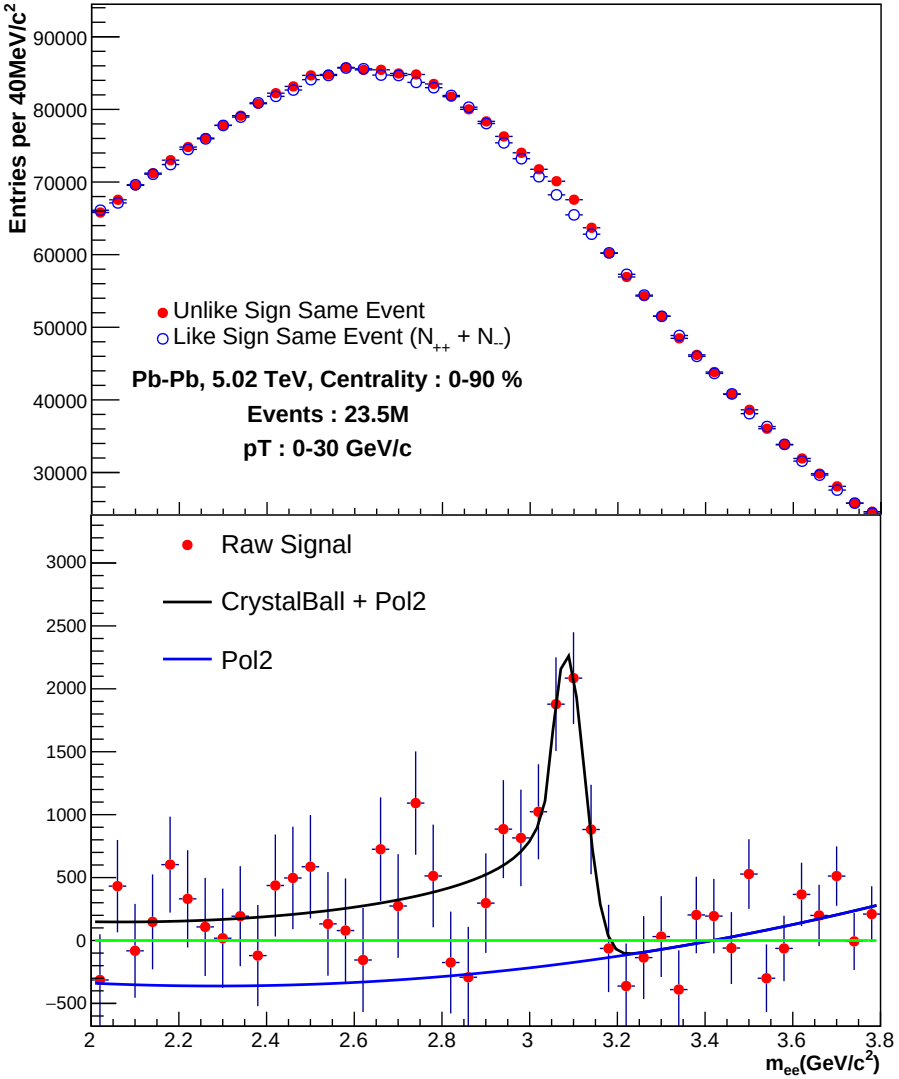
- Like-sign method :
  - To describe the combinatorial bkg in invariant mass distribution, like-sign (N_{++} or N_{--}) *ee*-pairs are used from the same event.
  - $N^{AM}_{like-sign} = \mathrm{R}\times\ (N_{++} + N_{--})$
  - $N^{GM}_{like-sign} = 2\mathrm{R}\sqrt{(N_{++} \times N_{--})}$
  - R depends on invariant mass, but for the pairs > 1 GeV$/c$ R$\rightarrow 1$
- In this, I used AM of the N_{++} and N_{--} distribution and R $= 1$, because $m_{J/\psi} \simeq 3.1\ GeV/c$.
  PDG Value of J/ψ Mass $\rightarrow$ 3.096 GeV$/c$.

$$R(m) = \frac{N_{+-}(m)}{\sqrt{N_{++}(m)N_{--}(m)}},$$



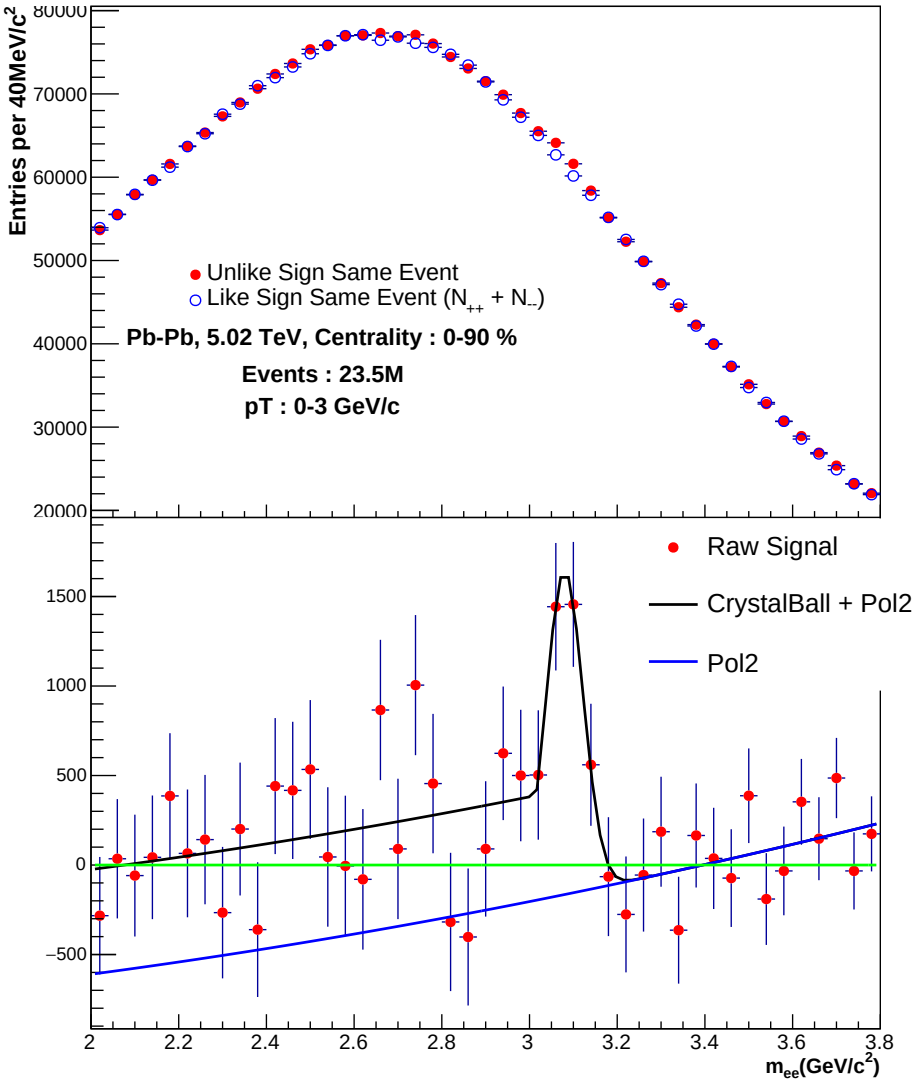
Taken from this note

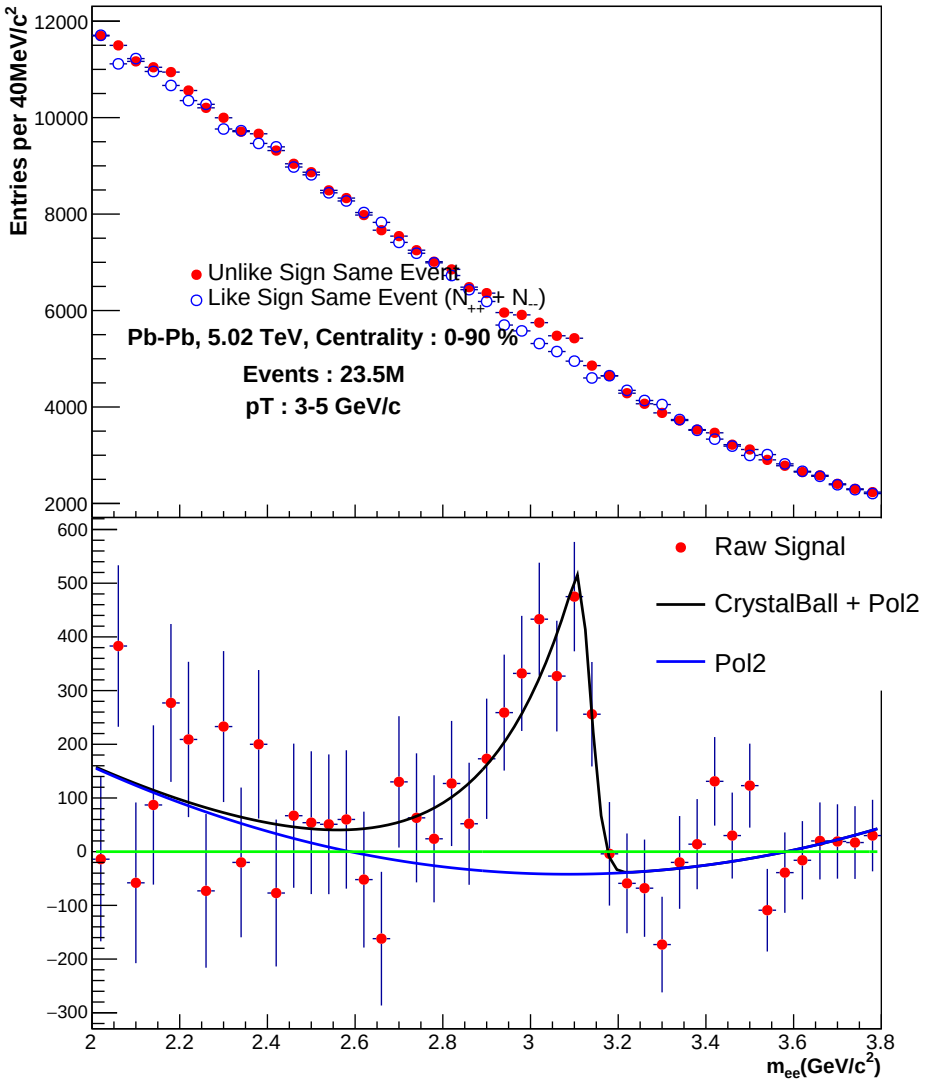

N Events: 7.78 M
p_T (GeV/c) > 0
ULS
LS_{arithm} *1.00
This thesis
Pb-Pb, $\sqrt{s_{NN}}$ = 5.02 TeV
Centrality: 0 - 10 %
Counts per 40 MeV/c^2
$N_{J/\psi}$: 6678 ± 776
S/B: 0.022 ± 0.003
S/$\sqrt{S+2B}$: 8.6 ± 1.4
χ^2/dof(2.0- 3.7): 1.08
ULS-1.00*LS
MC
m_{ee} (GeV/c^2)

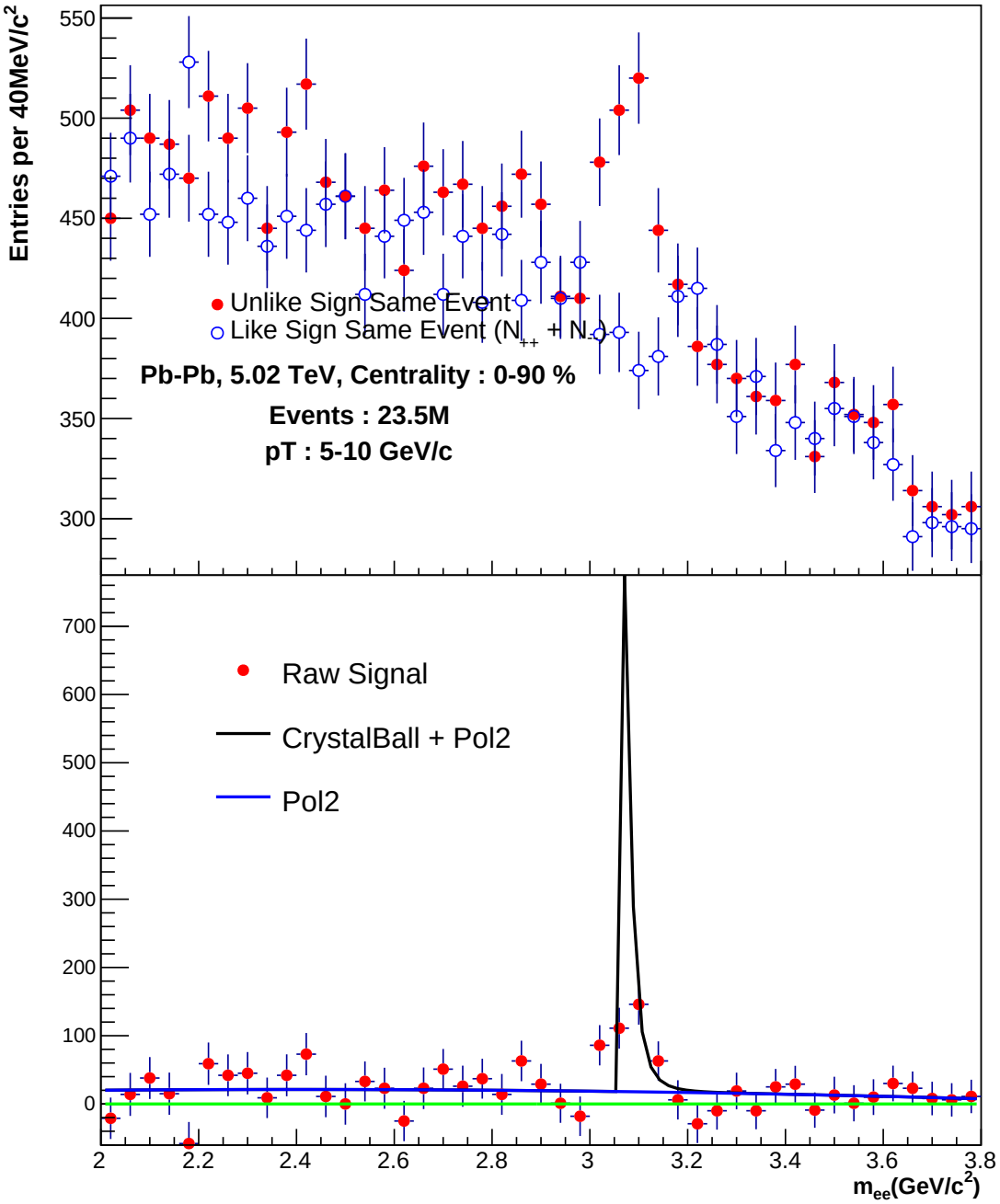

Entries per 40MeV/c^2
Unlike Sign Same Event
Like Sign Same Event (N_{++} + N_{--})
Pb-Pb, 5.02 TeV, Centrality : 0-90 %
Events : 23.5M
pT : 0-30 GeV/c
Raw Signal
CrystalBall + Pol2
Pol2
m_{ee}(GeV/c^2)

These are just values of integrals of the functions in range (2.92,3,16), they are not normalized by # of events
Crystal ball + Pol2 (2.92,3,16) = 279.168
Pol2 (2.92,3,16) = -47.8453
Crystal ball (2.92,3,16) = 327.013

In Different p_T bins


Entries per 40MeV/c²
Unlike Sign Same Event
Like Sign Same Event (N++ + N--)
Pb-Pb, 5.02 TeV, Centrality : 0-90 %
Events : 23.5M
pT : 0-3 GeV/c
Raw Signal
CrystalBall + Pol2
Pol2
mee(GeV/c²)


Entries per 40MeV/c²
Unlike Sign Same Event
Like Sign Same Event (N++ + N--)
Pb-Pb, 5.02 TeV, Centrality : 0-90 %
Events : 23.5M
pT : 3-5 GeV/c
Raw Signal
CrystalBall + Pol2
Pol2
mee(GeV/c²)


Entries per 40MeV/c^2
Unlike Sign Same Event
Like Sign Same Event (N_{++} + N_{--})
Pb-Pb, 5.02 TeV, Centrality : 0-90 %
Events : 23.5M
pT : 5-10 GeV/c
Raw Signal
CrystalBall + Pol2
Pol2
m_{ee}(GeV/c^2)

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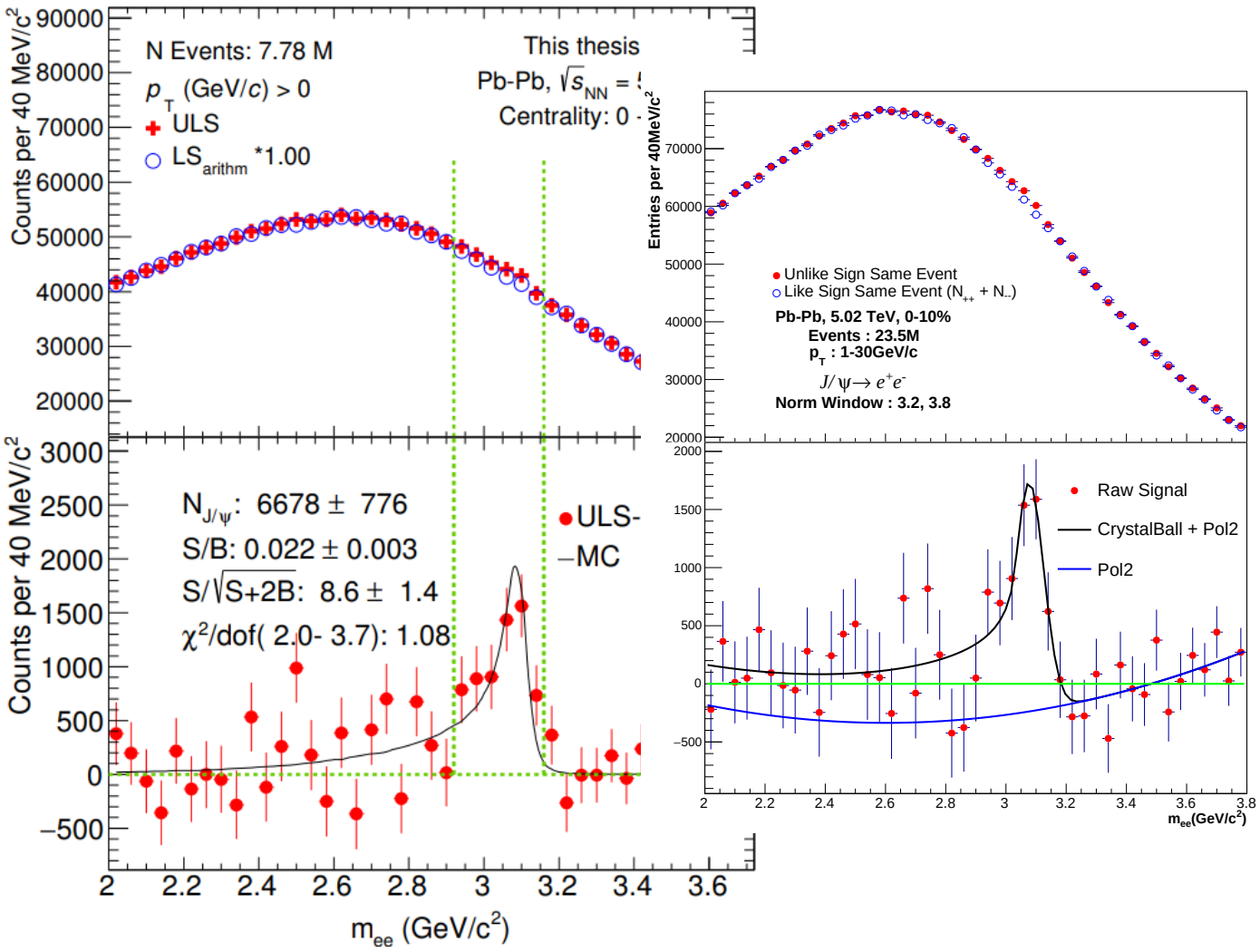
Warning in <TFile::Append>: Replacing existing TH1: Pa
Warning in <Fit>: Abnormal termination of minimization
 FCN=30.8458 FROM MIGRAD    STATUS=FAILED        1064 C
                      EDM=-nan    STRATEGY= 1  ERROR MA
  EXT PARAMETER                  APPROXIMATE        STEP
  NO.   NAME      VALUE            ERROR            SIZE
   1  p0           1.50347e+00          nan
   2  p1           2.78075e-06          nan
   3  p2           3.07951e+00          nan
```

Might be something related to fitting parameters

Information from Analysis Notes

- For LHC18 data, for p_T bin study, they used 71M events (but Now I used only 23M !!) 0-10% centrality

In R_{AA}-Analysis