# Data Quality Checks for the 2017 XYZ Data

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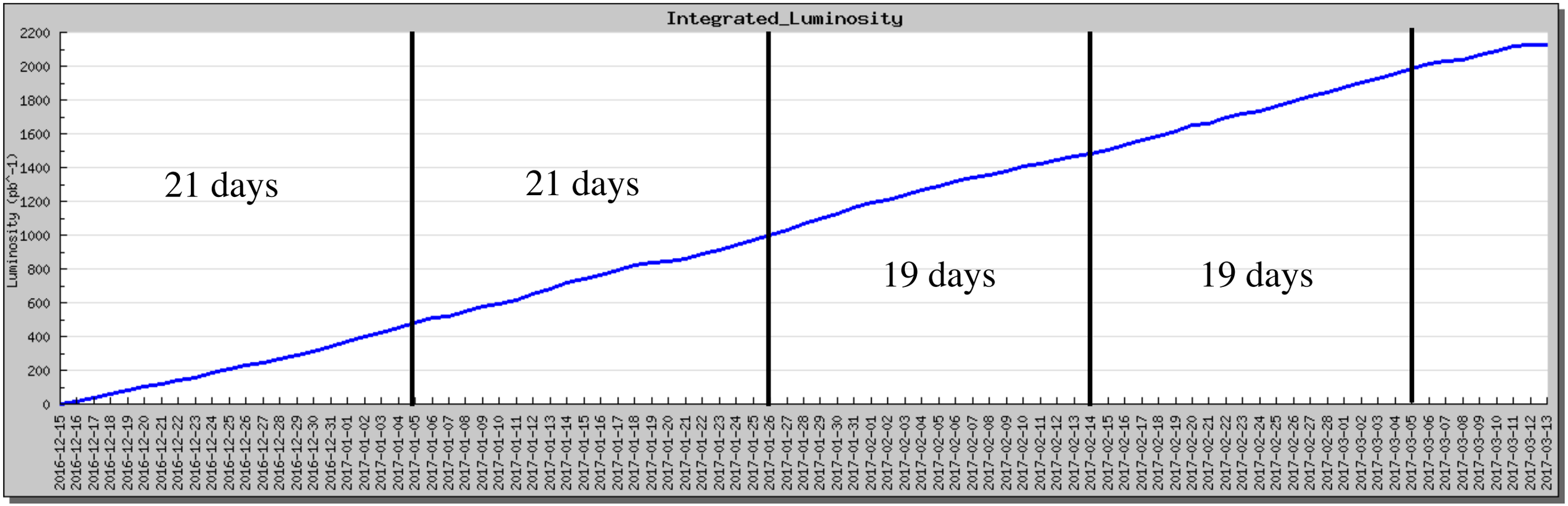
*(for the charmonium group)*

BESIII Guangzhou Workshop
March 15, 2017

# Status of the Data-Taking (I)

**Goal: 10 points total — 4190, 4200, 4210, 4220, 4240, 4250, 4270, 4280, 4290, 4300 MeV**




December 15, 2016

**4190 MeV**
runs:
47543 to
48170

January 5, 2017

**4200 MeV**
runs:
48171 to
48713

January 26, 2017

**4210 MeV**
runs:
48714 to
49269

February 14, 2017

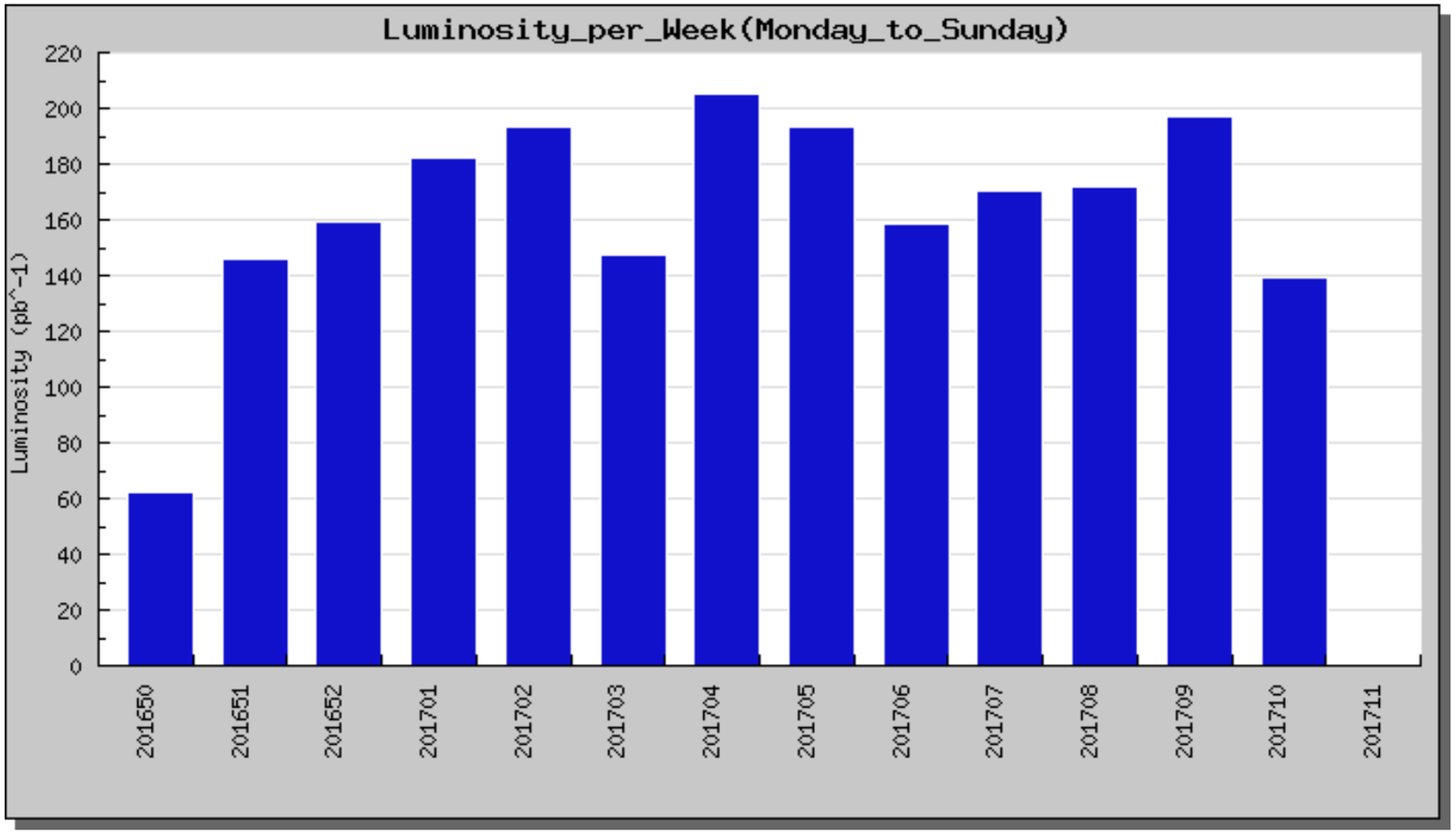
**4220 MeV**
runs:
49270 to
49787

March 5, 2017

**4237 MeV**
runs:
49783 to
…

| $E_{cms}$ | Online Luminosity | Bhabha Measurement |
|---|---|---|
| 4190 | 490.7 | 518.2 |
| 4200 | 489.7 $pb^{-1}$ | *prel.* 520.1 $pb^{-1}$ |
| 4210 | 491.0 | 509.0 |

# Status of the Data-Taking (II)



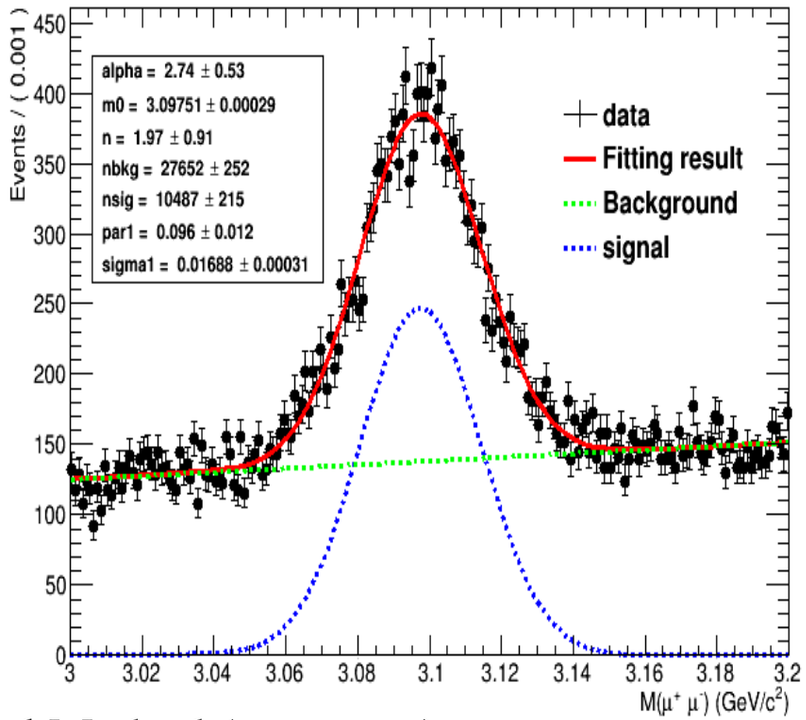

Consistent data-taking with no *major* problems.

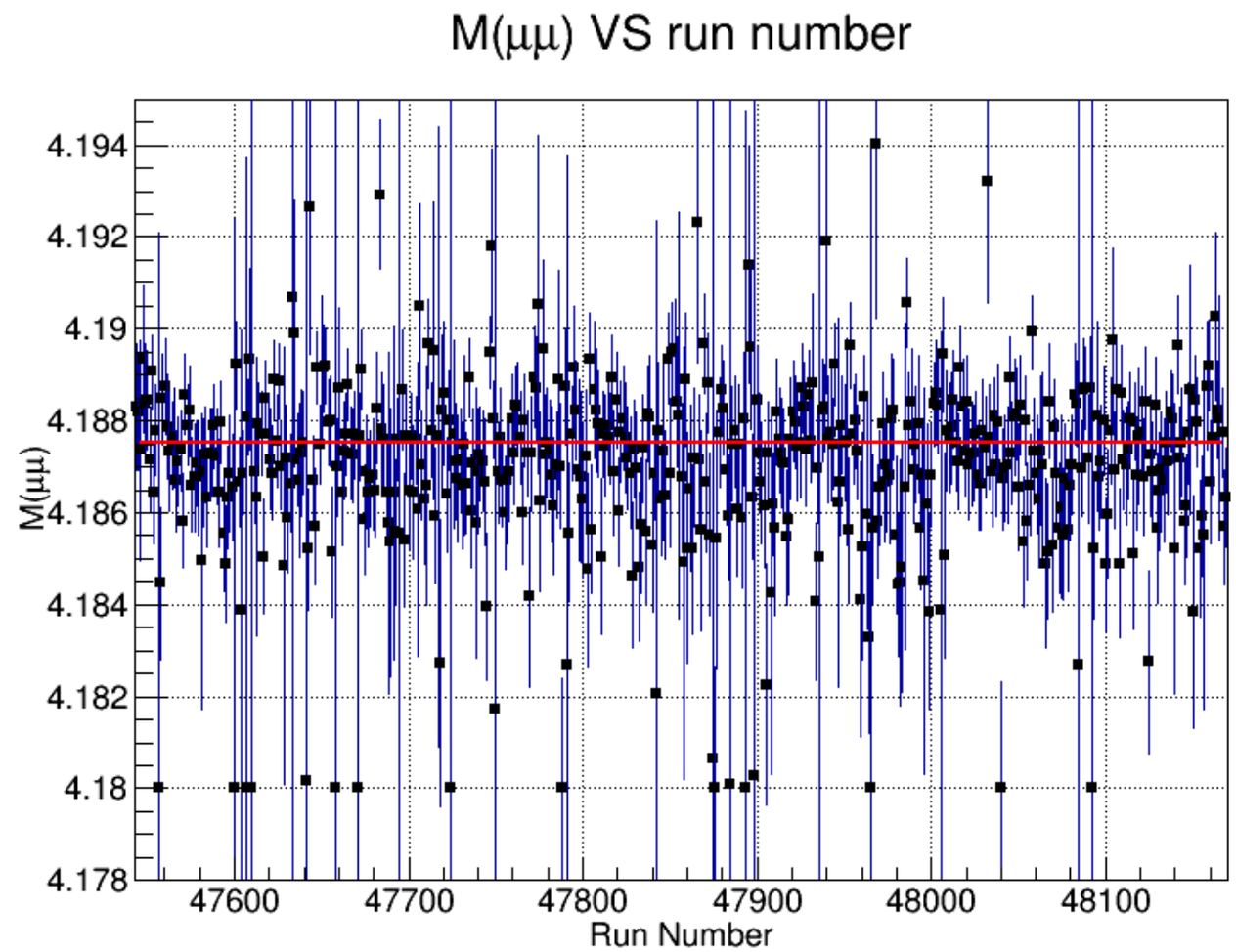
Minor problems include:

* high MDC noise during the first three points
  *(solved with shielding and grounding improvements)*
* DAQ crashes *(reboot)*
* abnormal ETOF diagnostic plots *(restart run)*
* *etc.*

# Using di-Muon Events to Calculate the Beam Energy

Calibrate using the ISR $J/\psi \rightarrow \mu^+\mu^-$:



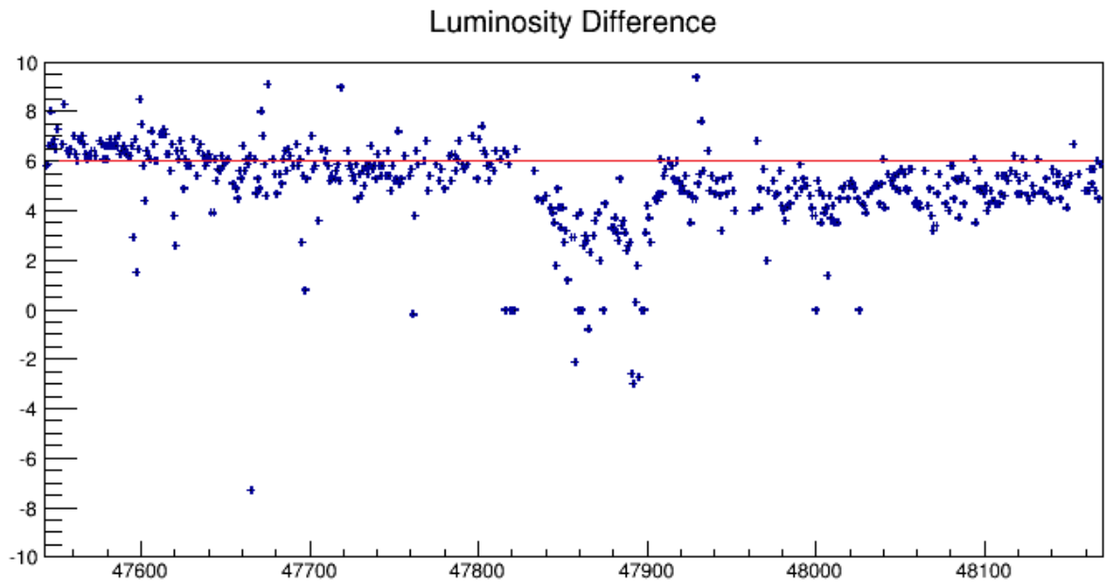

Usual Method (summary):

(1) Fit the ISR $J/\psi$;
(2) Correct for FSR using MC;
(3) Compare to PDG to get a momentum calibration;
(4) Measure the di-muon mass;
(5) Correct for ISR using MC.

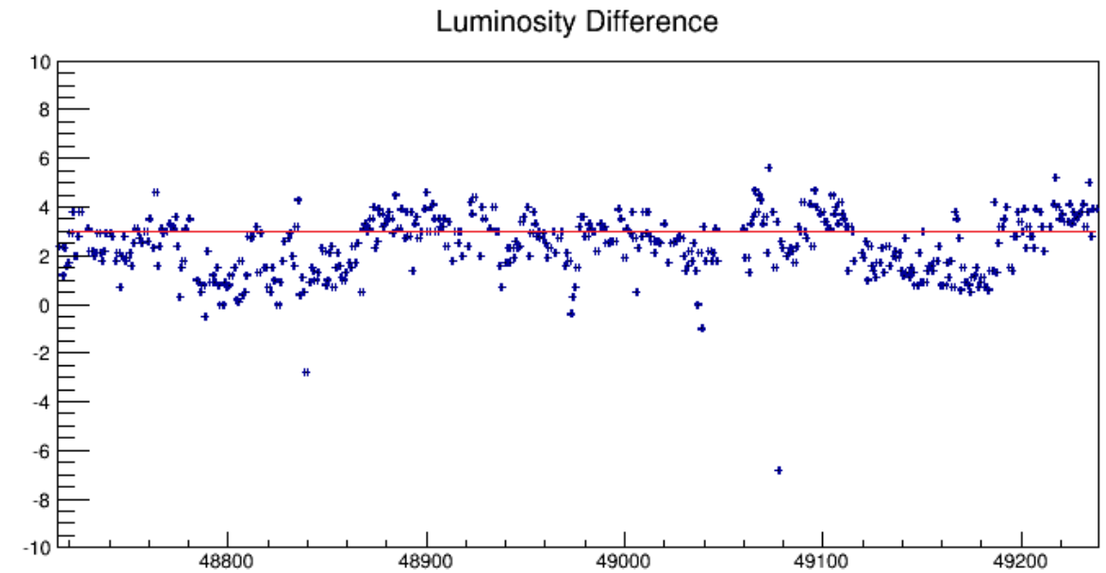
| Energy (MeV) | Momentum calibration | Radiation correction | M(μμ) | Ecm |
|---|---|---|---|---|
| 4190 | 1.15+/-0.38 | 3.04+/-0.12 | 4187.26 +/- 0.06 | 4.189.15+/-0.40 |
| 4200 | 1.56+/-0.38 | 3.03+/-0.12 | 4197.61 +/- 0.06 | 4199.08+/-0.40 |
| 4210 | 0.37+/-0.39 | 2.98+/-0.12 | 4207.01 +/- 0.05 | 4209.62+/-0.41 |

# Luminosity Calculation Using Bhabha Events

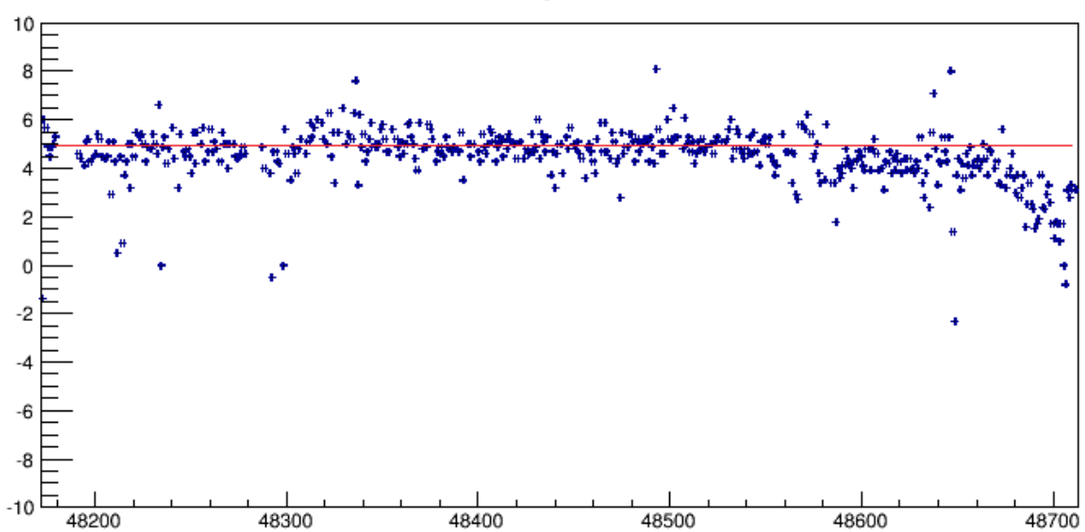
4190




4210




4200




| $E_{cms}$ | Online Luminosity | Bhabha Measurement |
|---|---|---|
| 4190 | 490.7 | 518.2 |
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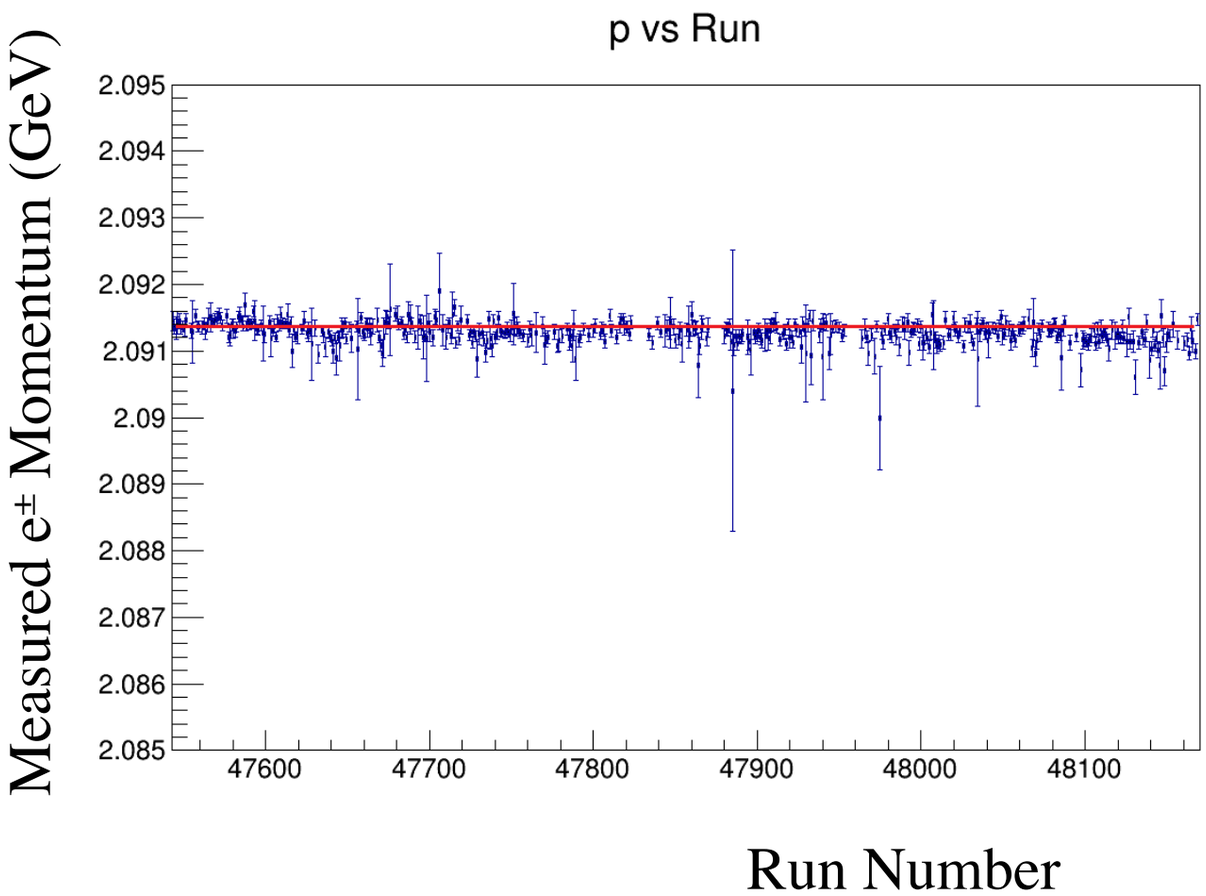
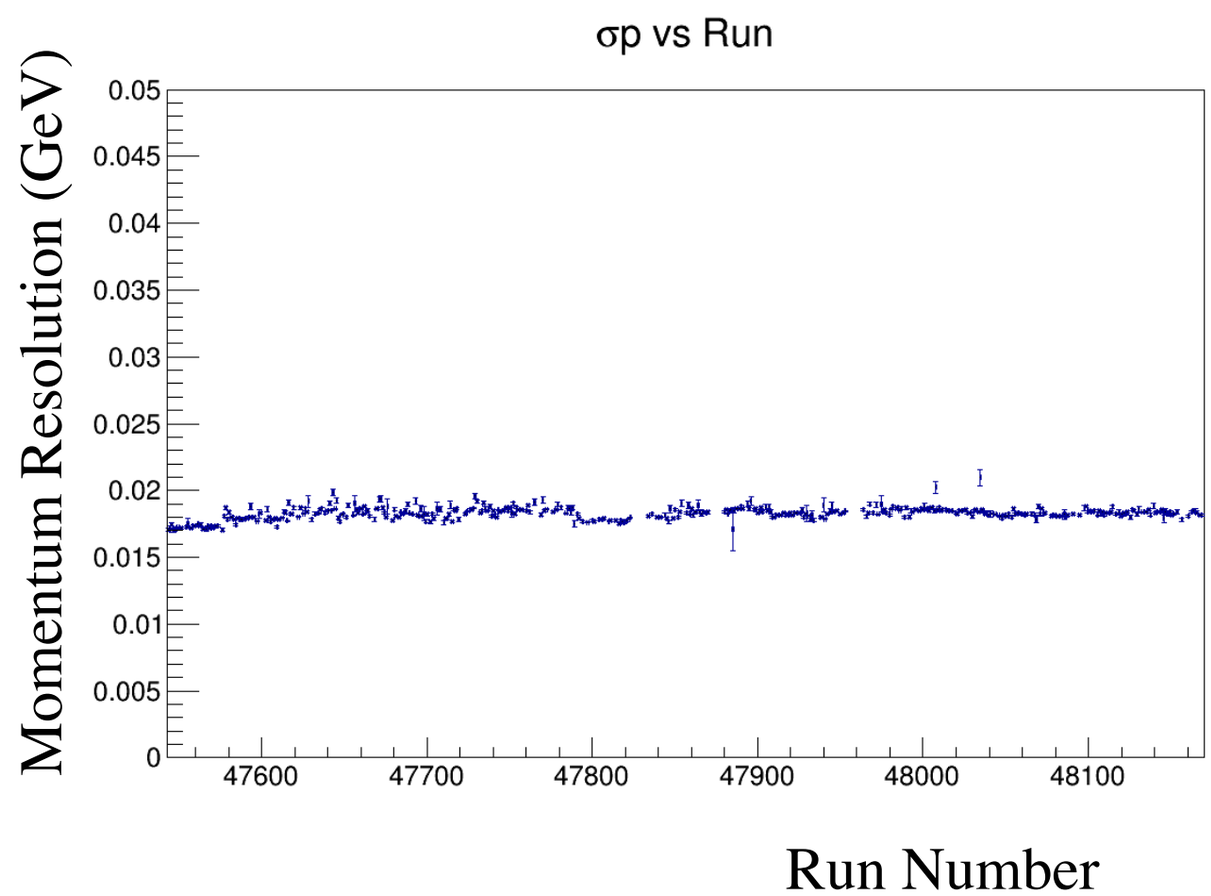
*(See Yifan's talk for updated numbers.)*

# Using Bhabha Events for Detector Checks (MDC)

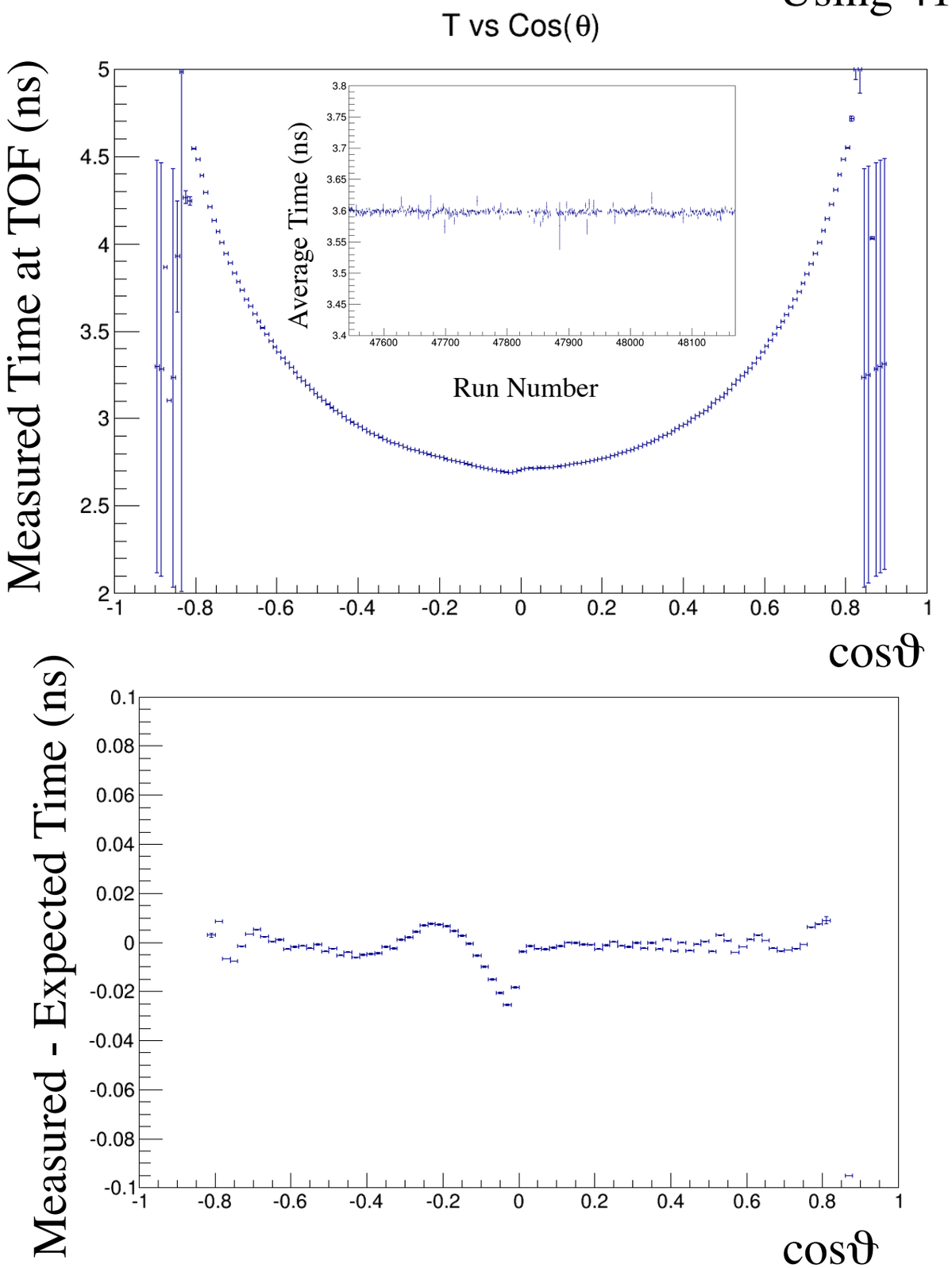
Using 4190 MeV data.

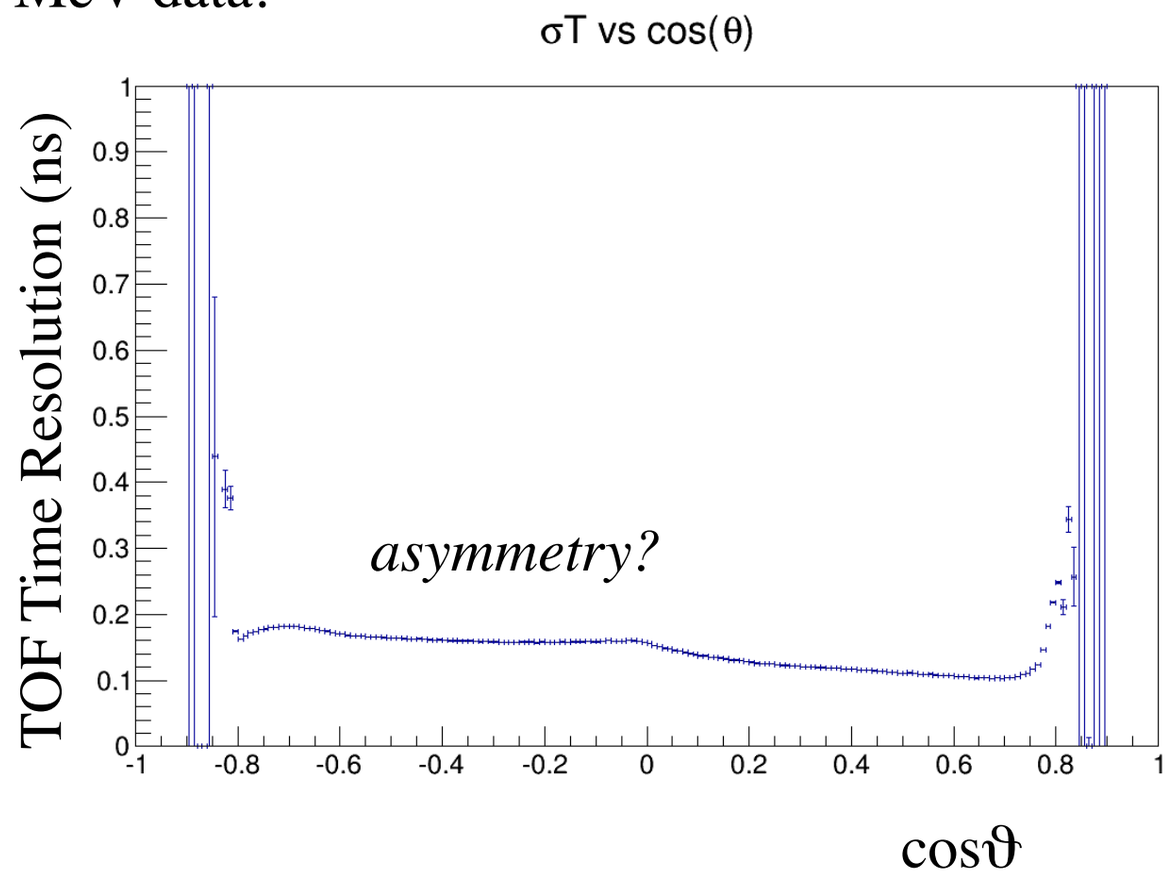


# Using Bhabha Events for Detector Checks (TOF)

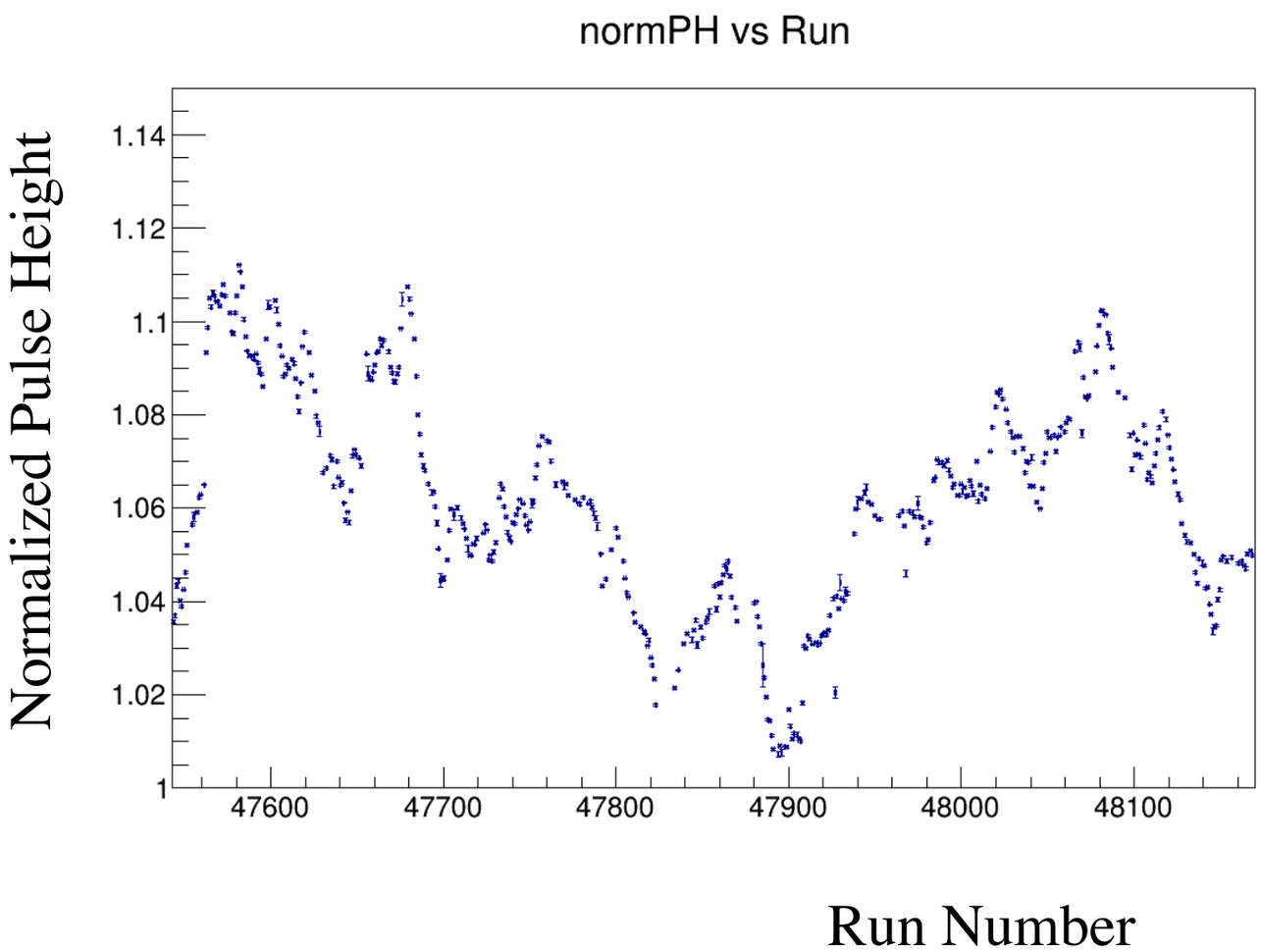
Using 4190 MeV data.



# Using Bhabha Events for Detector Checks (dE/dx)

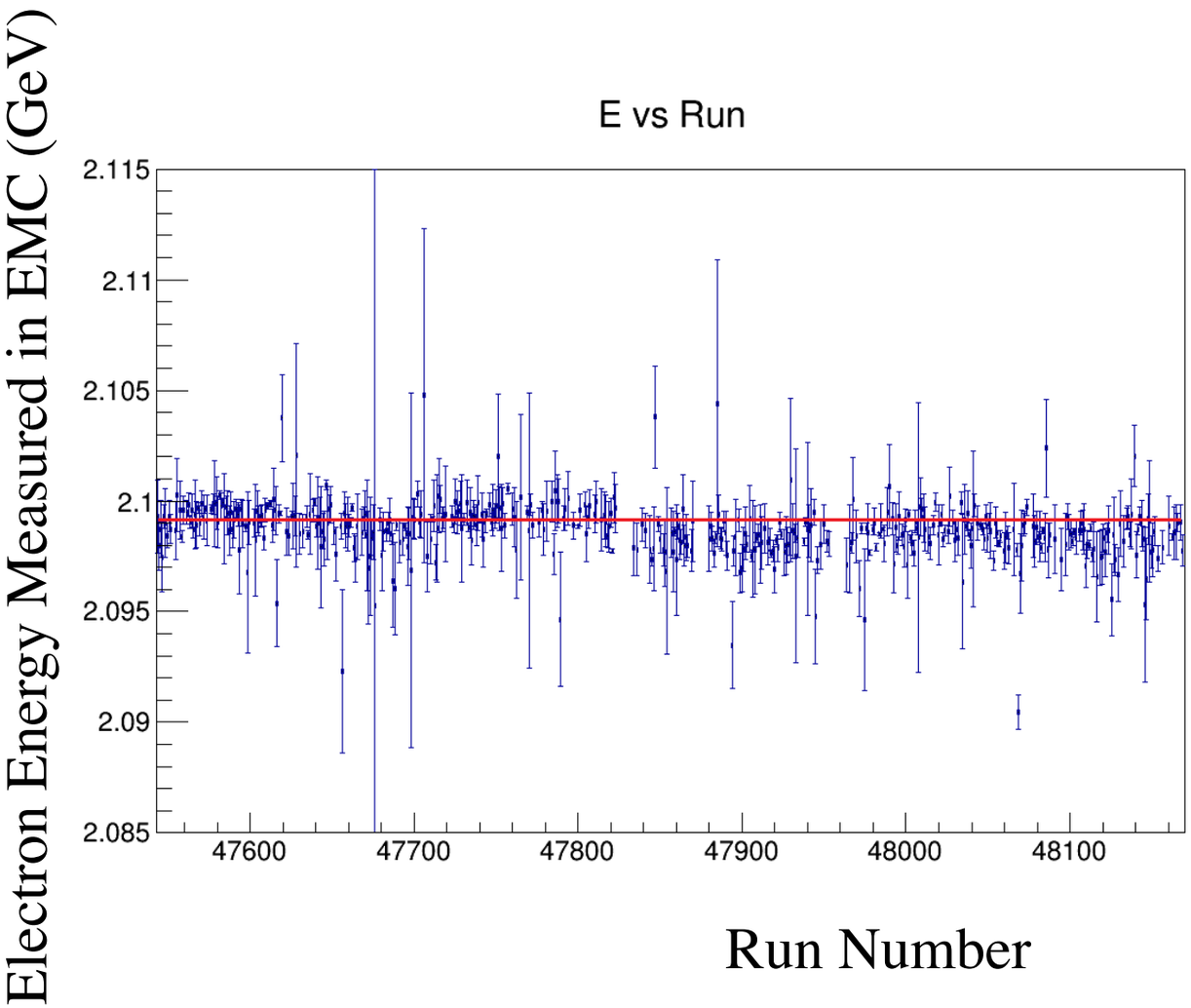
Using 4190 MeV data.

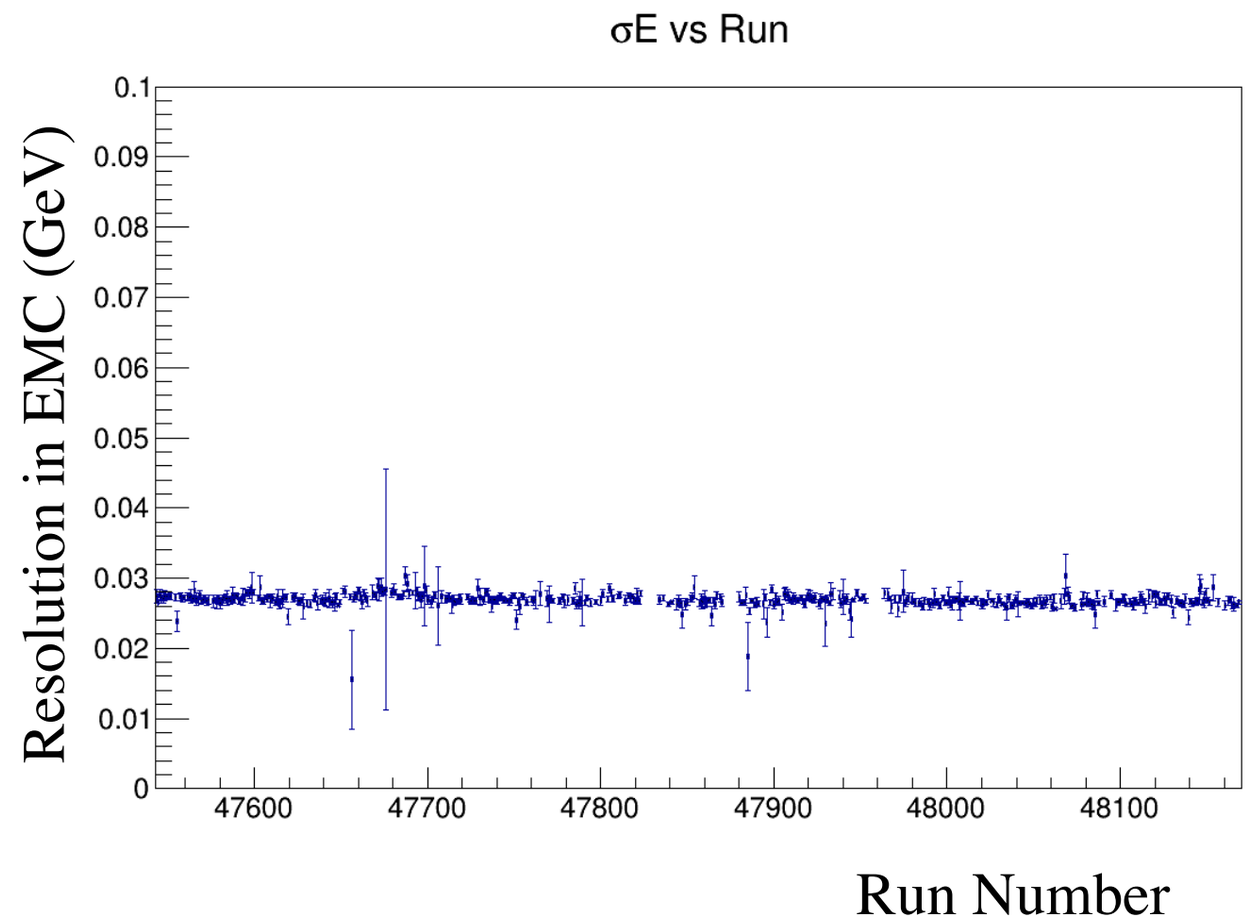



Wrong calibration constants were initially used.

Data will be re-reconstructed.

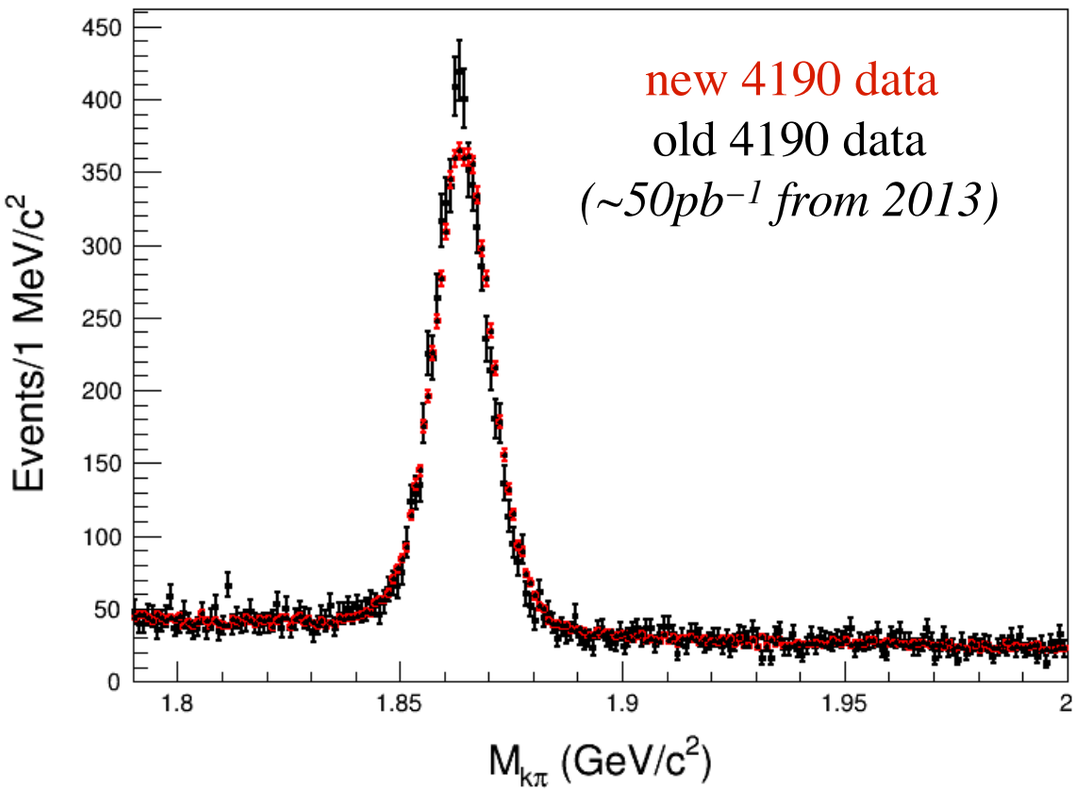
# Using Bhabha Events for Detector Checks(EMC)



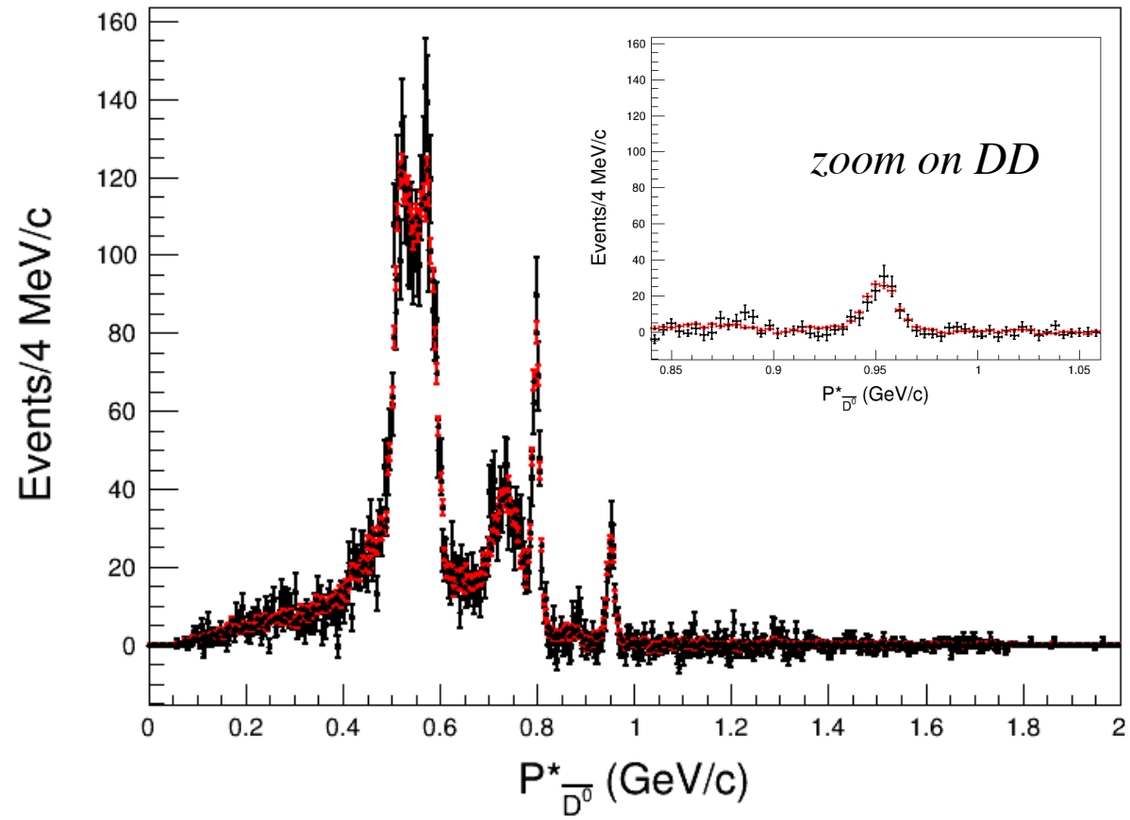



# Reconstructed D → Kπ at 4190 MeV

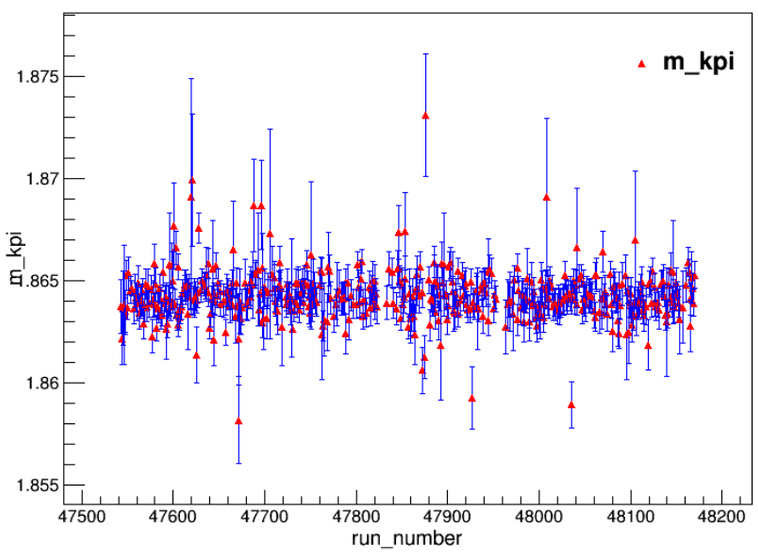
D Mass




D Momentum




Stability of D Mass vs. Run Number

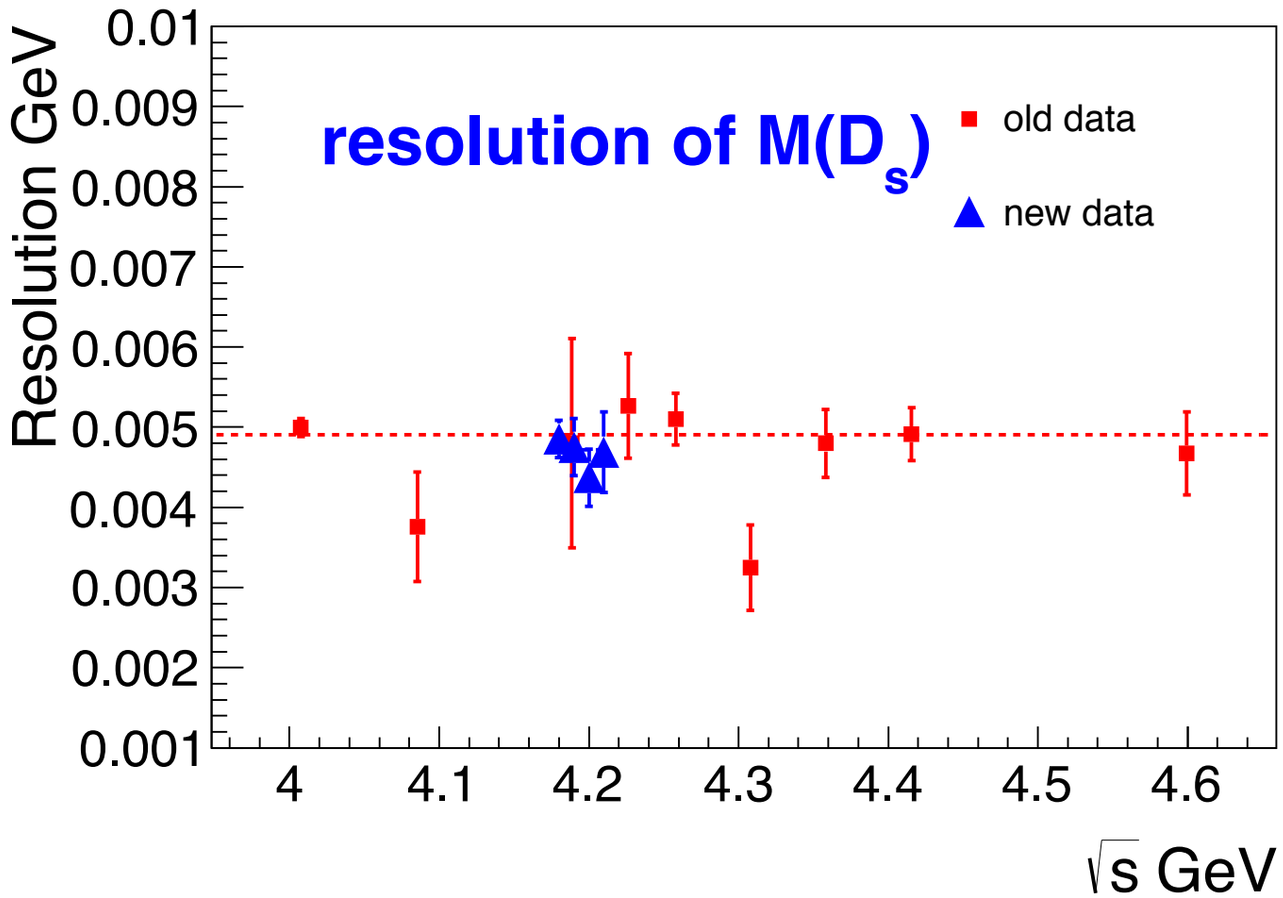


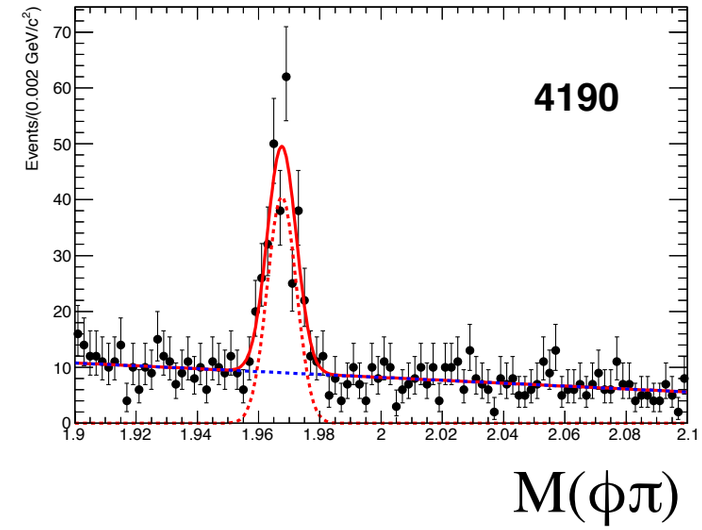

Old data fitted value :1.86372 +- 0.0001096
sigma: 0.006451 +- 0.0001032

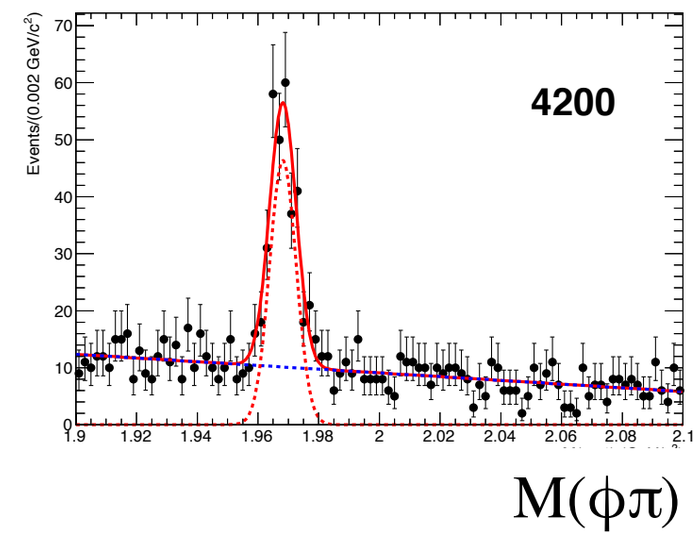
New data fitted value :1.86422 +- 0.0000357
sigma: 0.006955 +- 0.0000365

GeV

# Resolutions in $D_s^+D_s^-$ (I)

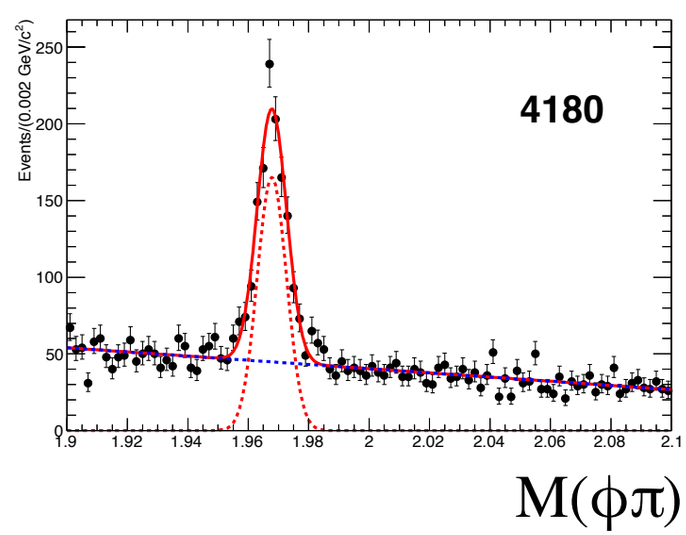


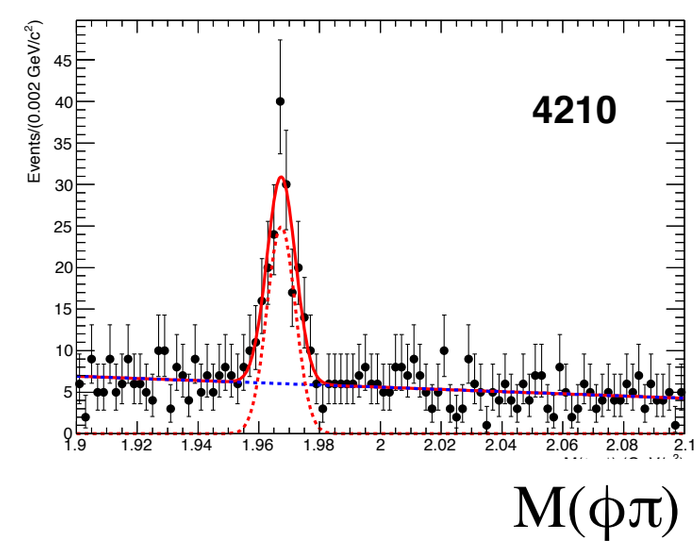



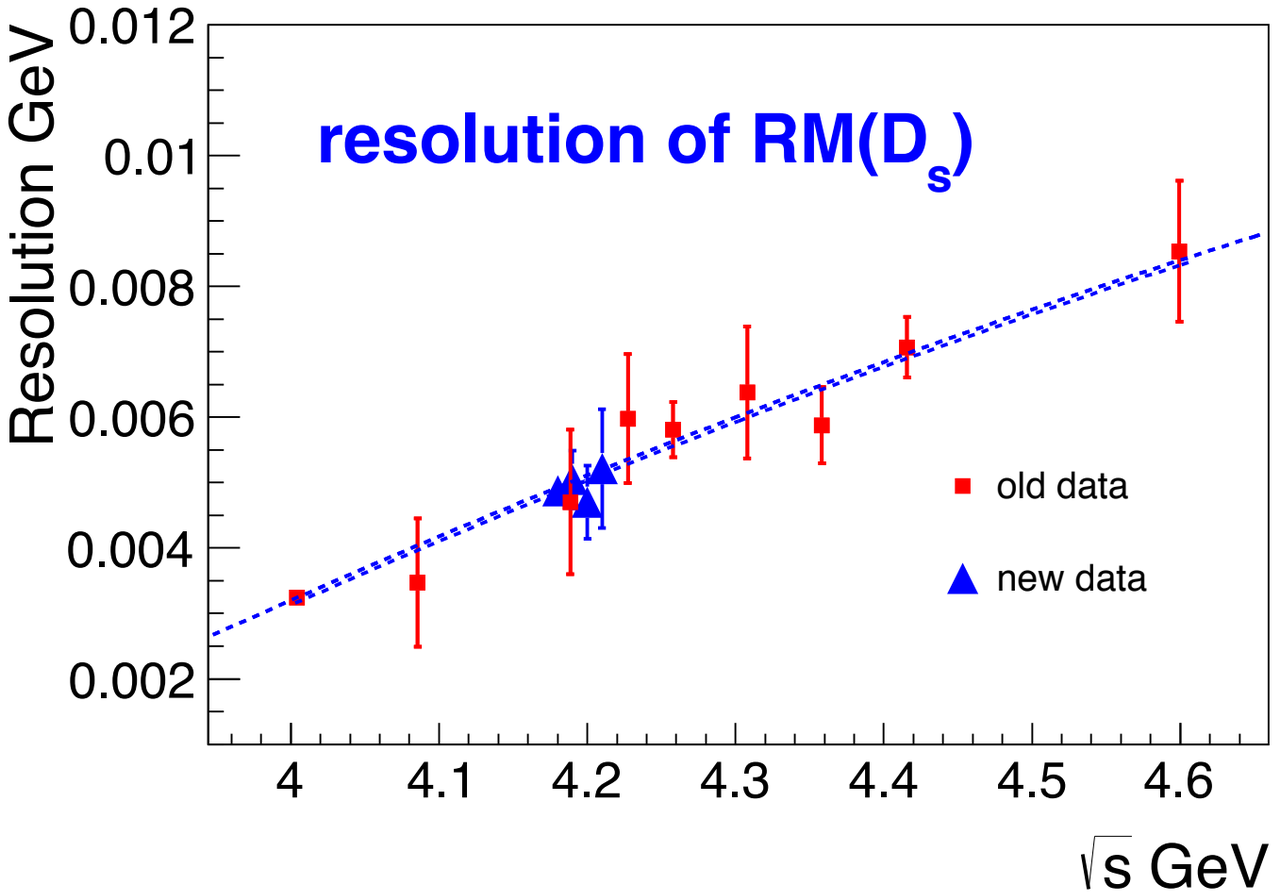

Reconstruct $D_s \to \phi\pi$.

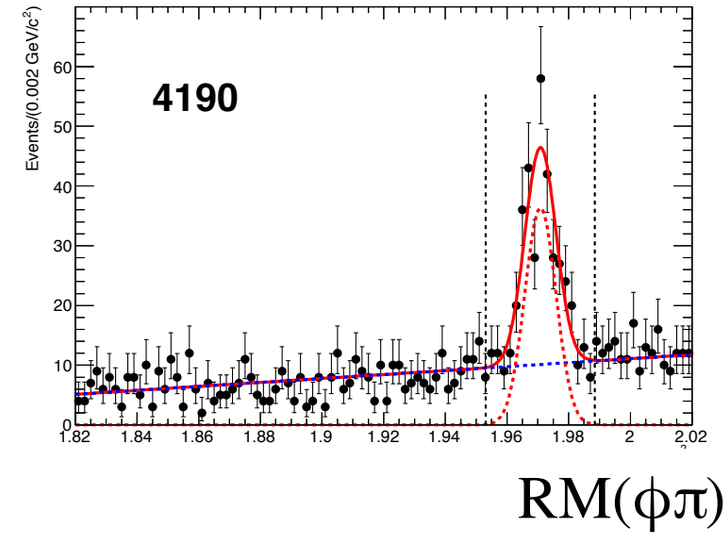
*(also cutting on recoil Ds)*

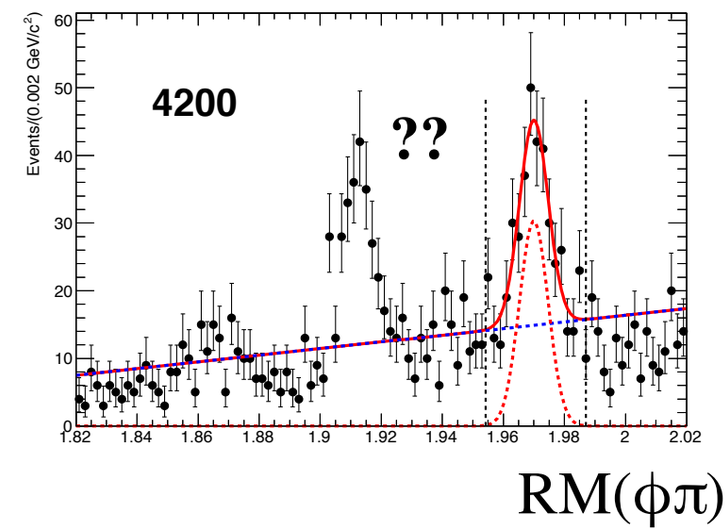


# Resolutions in $D_s^+D_s^-$ (II)

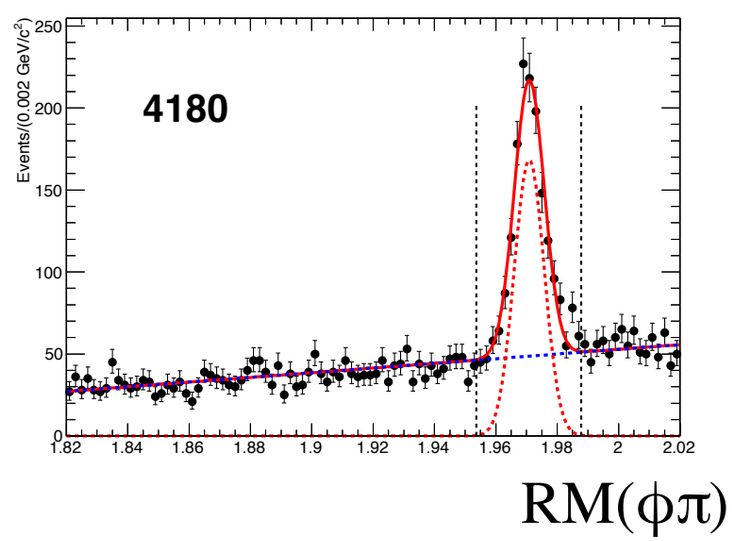


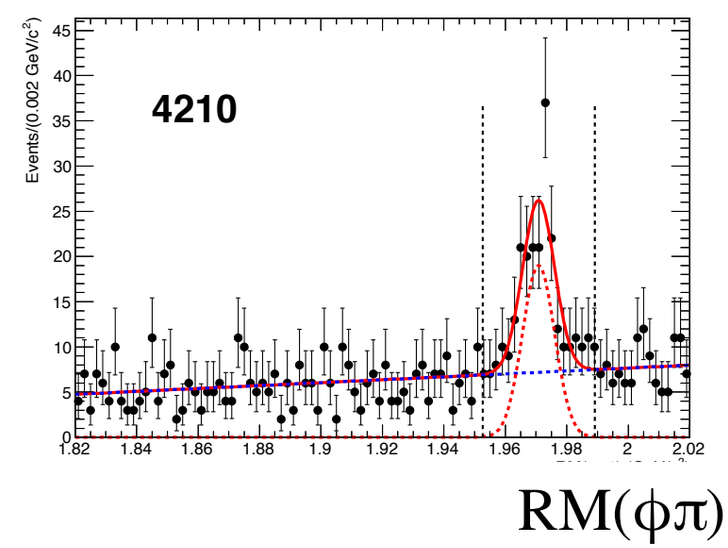



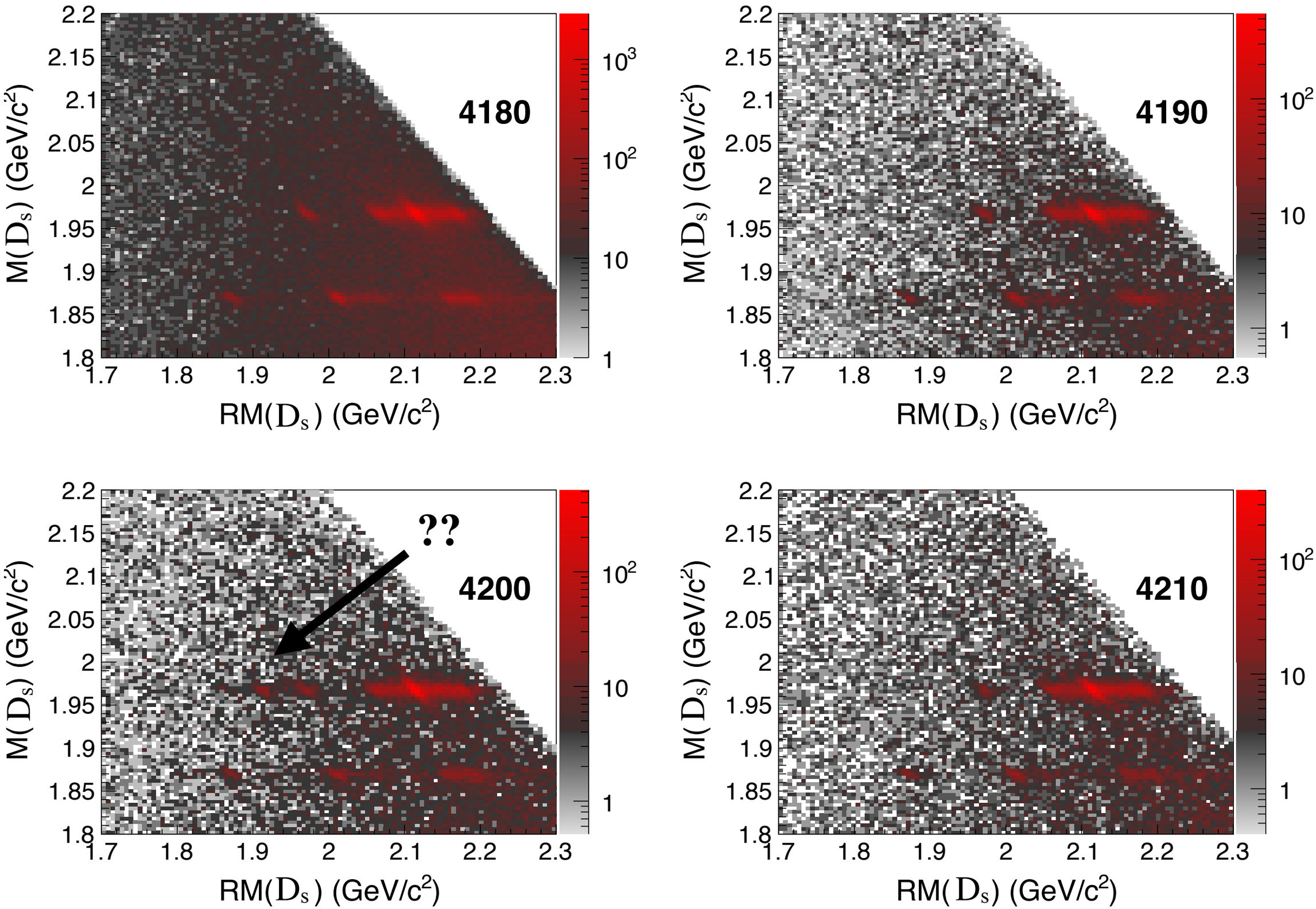

Look at the $D_s$ recoil mass.

*(cutting on the Ds)*

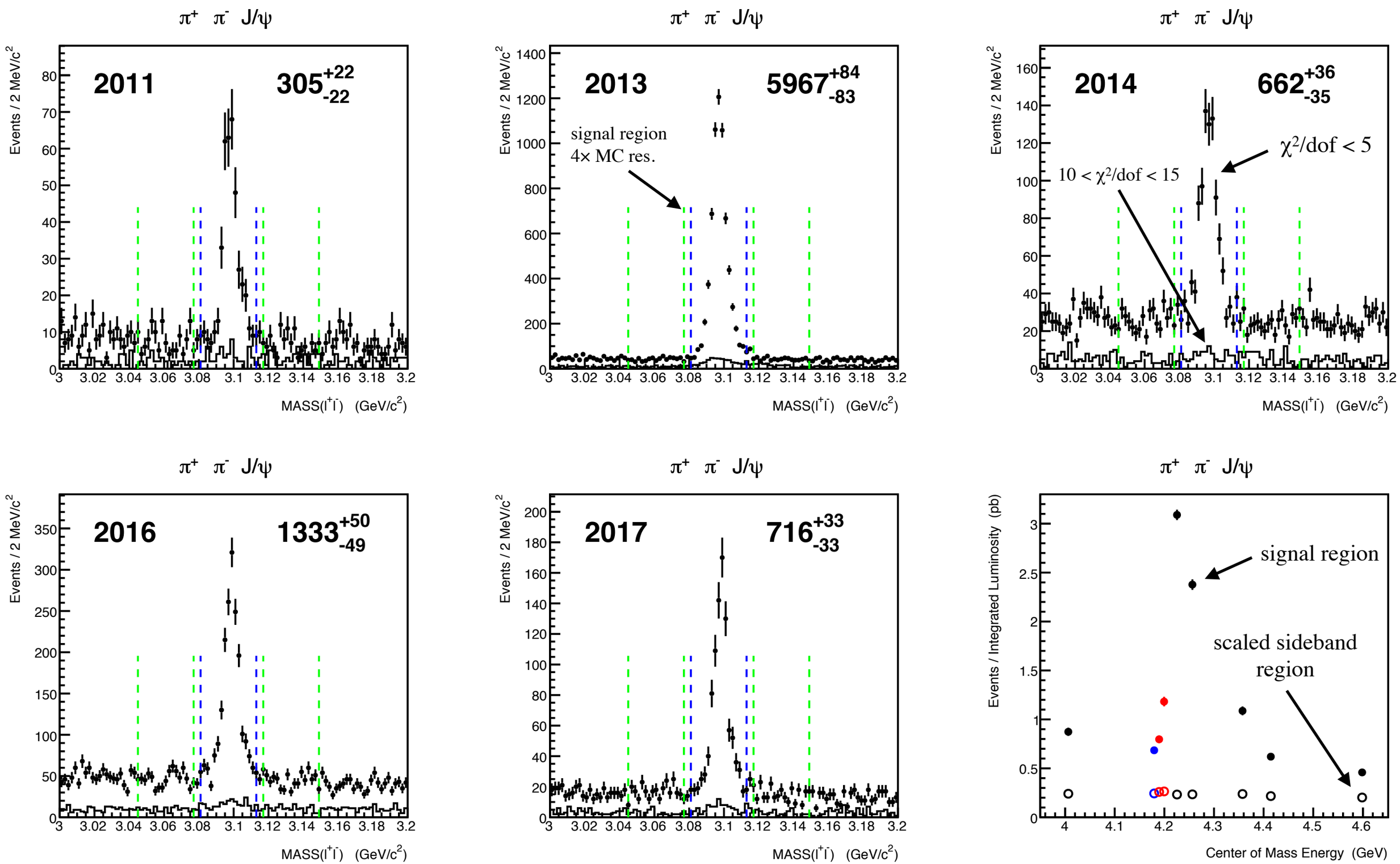


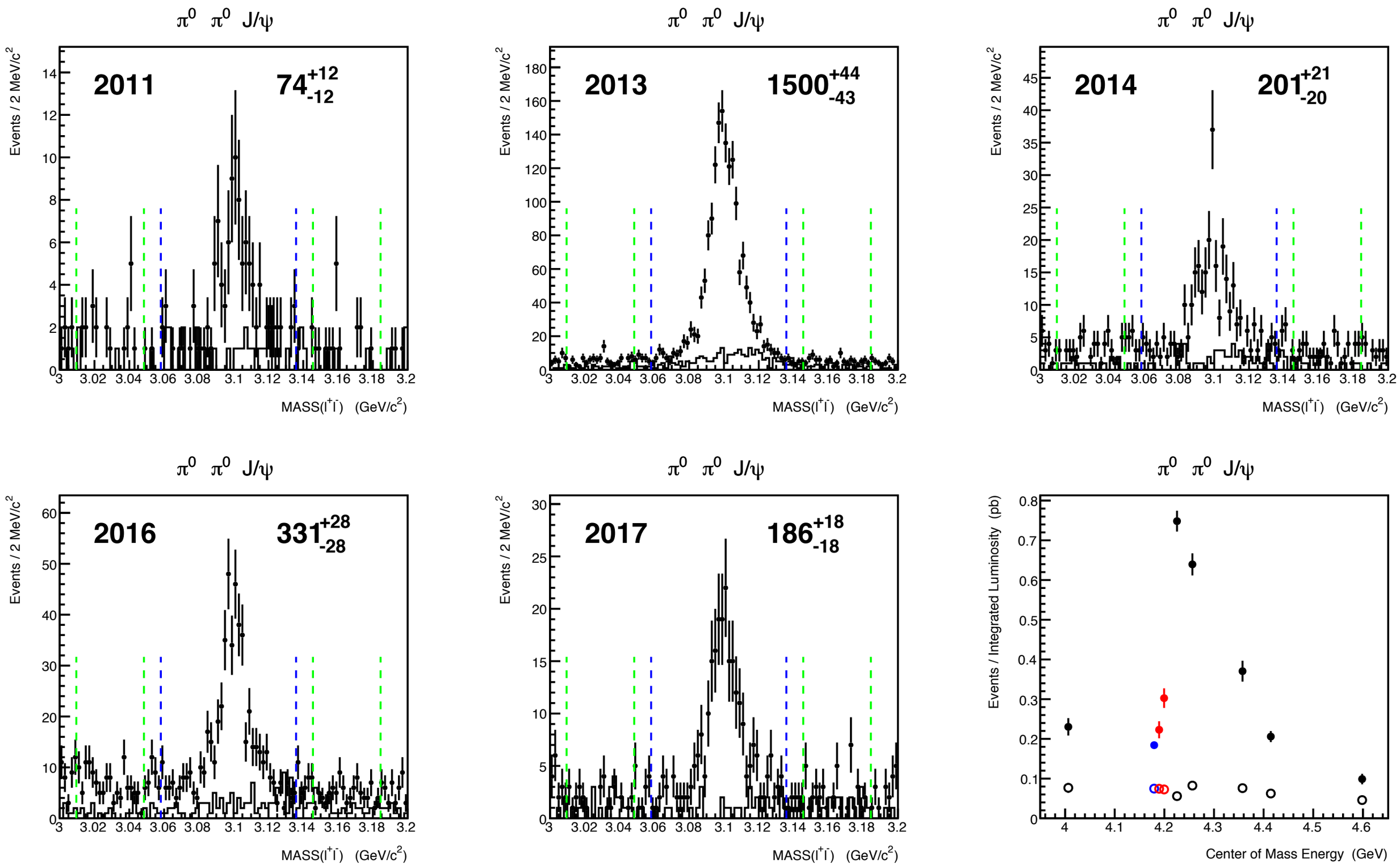
# Resolutions in $D_s^+D_s^-$ (III)



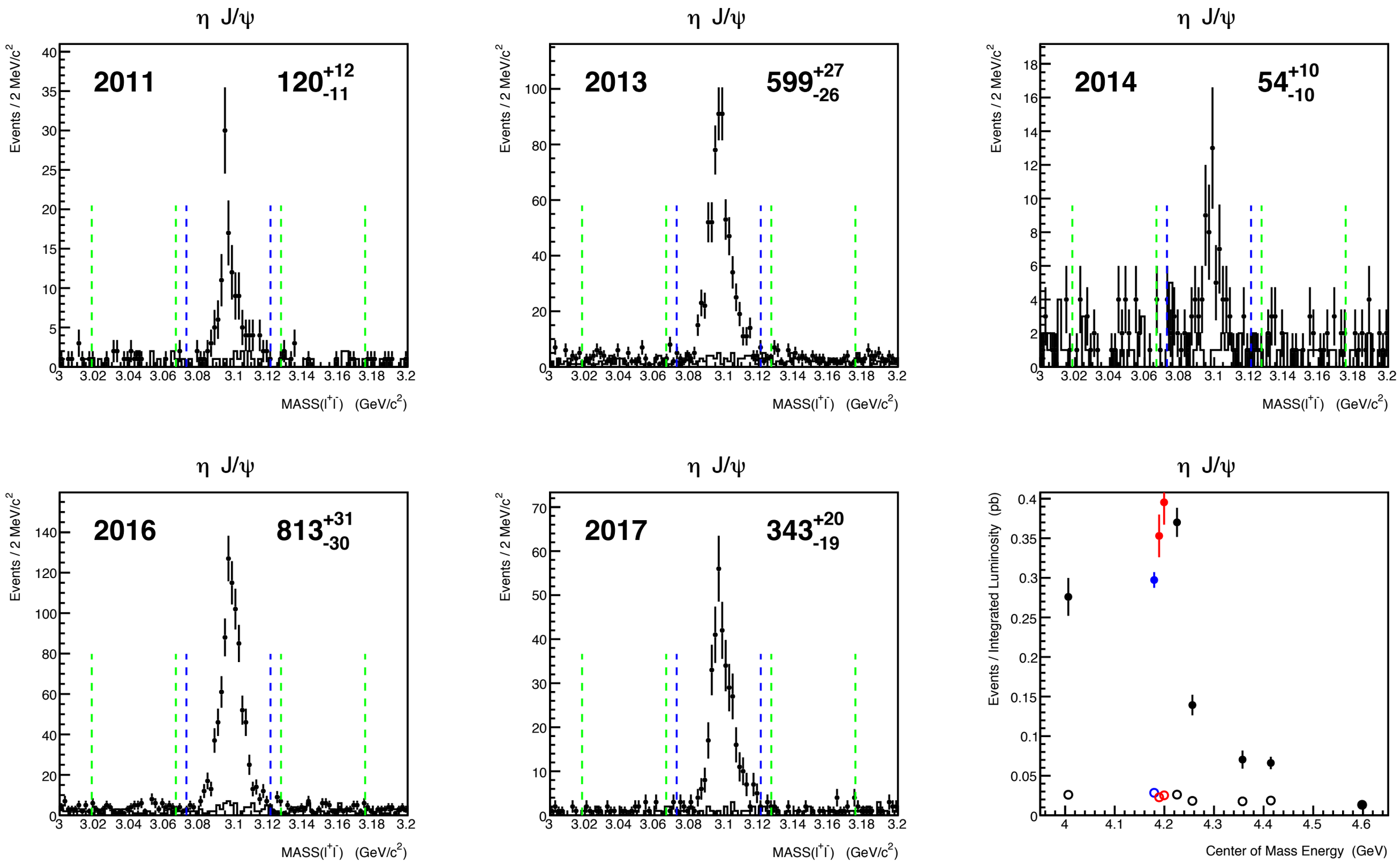
# Checks Using XJ/ψ (I)



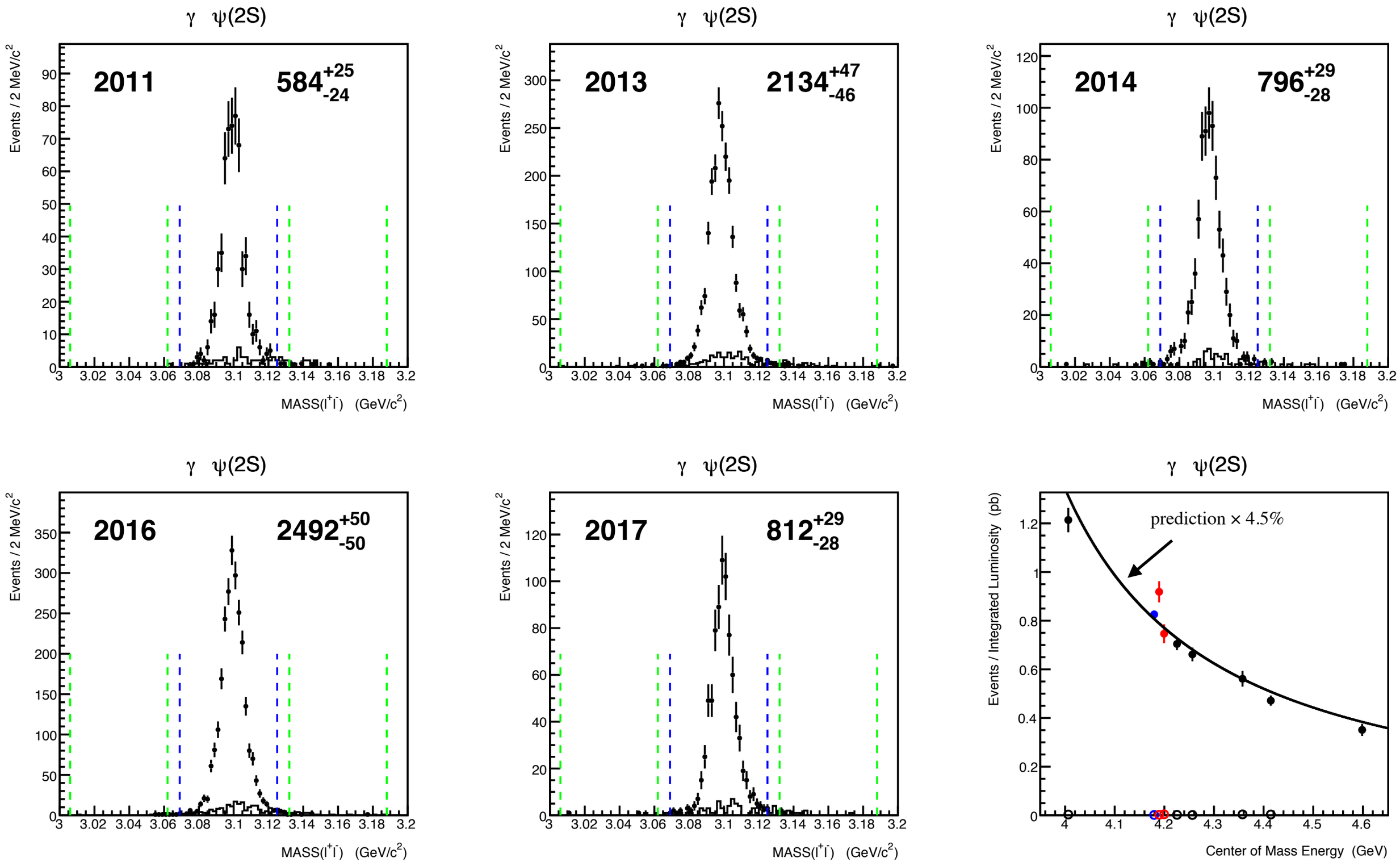
# Checks Using XJ/ψ (II)



# Checks Using XJ/ψ (III)

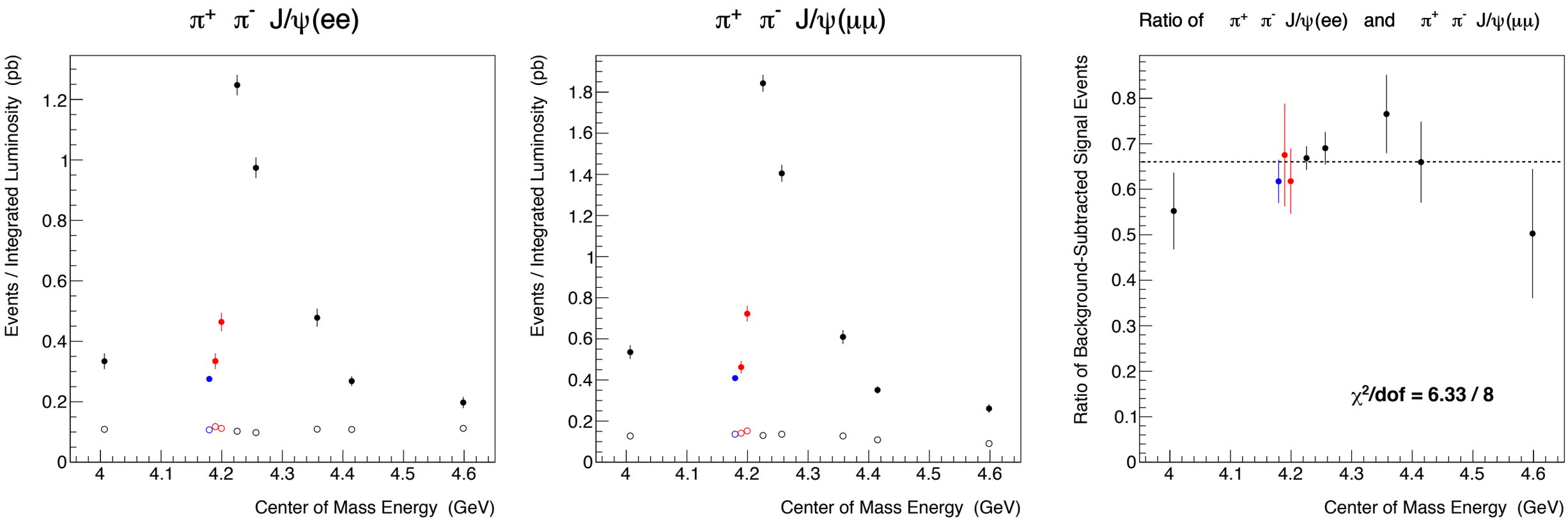


# Checks Using XJ/ψ (IV)



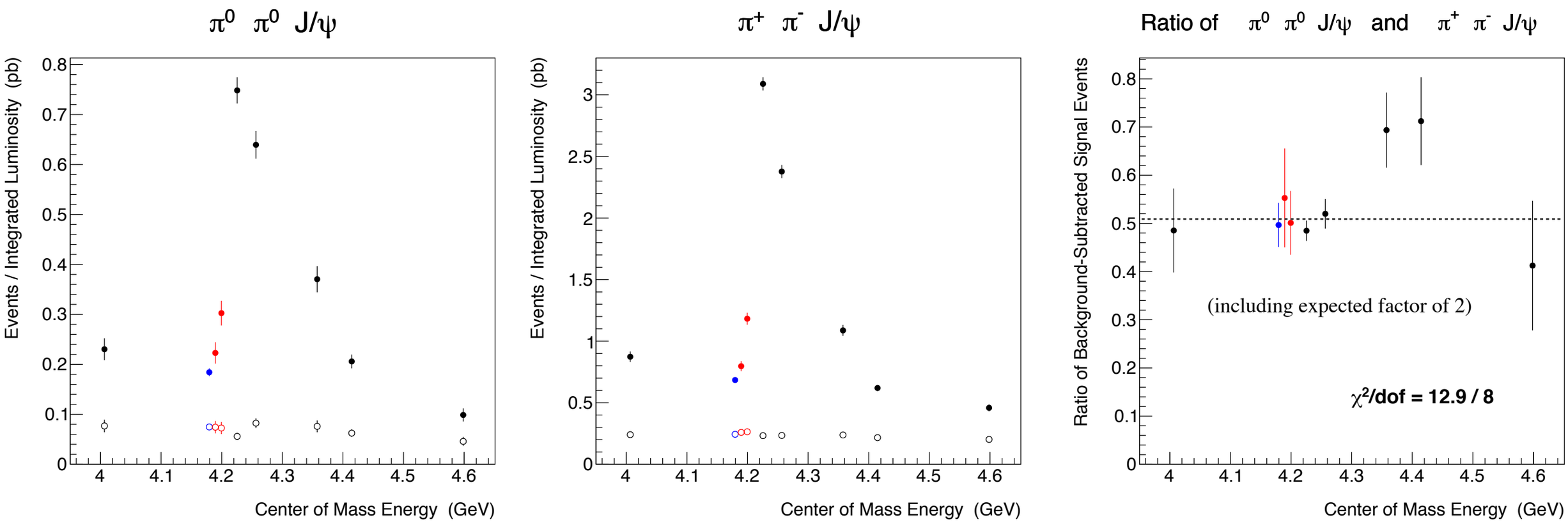
# Checks Using XJ/ψ (V)

Ratio of $\pi^+\pi^-J/\psi$ with $J/\psi \rightarrow e^+e^-$ and $\pi^+\pi^-J/\psi$ with $J/\psi \rightarrow \mu^+\mu^-$.



# Checks Using XJ/ψ (VI)

Ratio of $\pi^0\pi^0 J/\psi$ and $\pi^+\pi^- J/\psi$.




*⇒ $\pi^0$ efficiency is the same as before (with large uncertainty)*

# Summary

- We have so far collected ~500 $pb^{-1}$ at four $E_{CM}$:
  **4190**, **4200**, **4210**, and **4220 MeV**.

- We are currently taking the fifth point: **4240 MeV**
  *(really 4237 MeV, since the 2013 4230 MeV point was shifted low)*.

- Data-taking has been going smoothly, with only minor problems.

- Each 500 $pb^{-1}$ point is taking ~20 days.

- Data-quality checks have shown a few interesting features, but resolutions and efficiencies are consistent with previous years.

- More checks are needed *(nothing for MUC yet, follow-up on strange features, try to find higher-statistics channels…)*.