W Mass Measurement at CEPC

Presented by [1]Pei-Zhu Lai（賴培築）

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EW Meeting

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Outline

- The selection efficiencies of signal sample.
- Results after event selections
  - Without Btag
  - With Btag score < 0.5 for two jets
- Comparison between wi/wo Btag

(Signal)Select the Final State($\mu\nu q\bar{q}$) in V1

V1($WW \to \mu\nu q\bar{q}$)	# of event	Efficiency	Efficiency w.r.t. previous
Tot # of event	11206127	–	–
Muon Selection	9570465	85.4%	–
Detector acceptance $\|\cos(\theta_\mu)\| < 0.995$	9570465	85.4%	100%
$Pt_{Miss} > 10$ GeV	9197450	82.0%	96.1%
Visible mass > $0.5*\sqrt{s}$	8479808	75.6%	92.1%
Two jets Btag score < 0.5	7990921	71.3%	94.2%

- These selection are following Maarten's suggestions.
- The effective luminosity is 10 ab^{-1}.
- Muon selections: ID=13 & R0 < 0.01mm & E_μ >= 10 (GeV).
- Jet reconstruction: force all events to two jets

$$R0 = \sqrt{D0^2 + Z0^2}$$

Results(without Btag)

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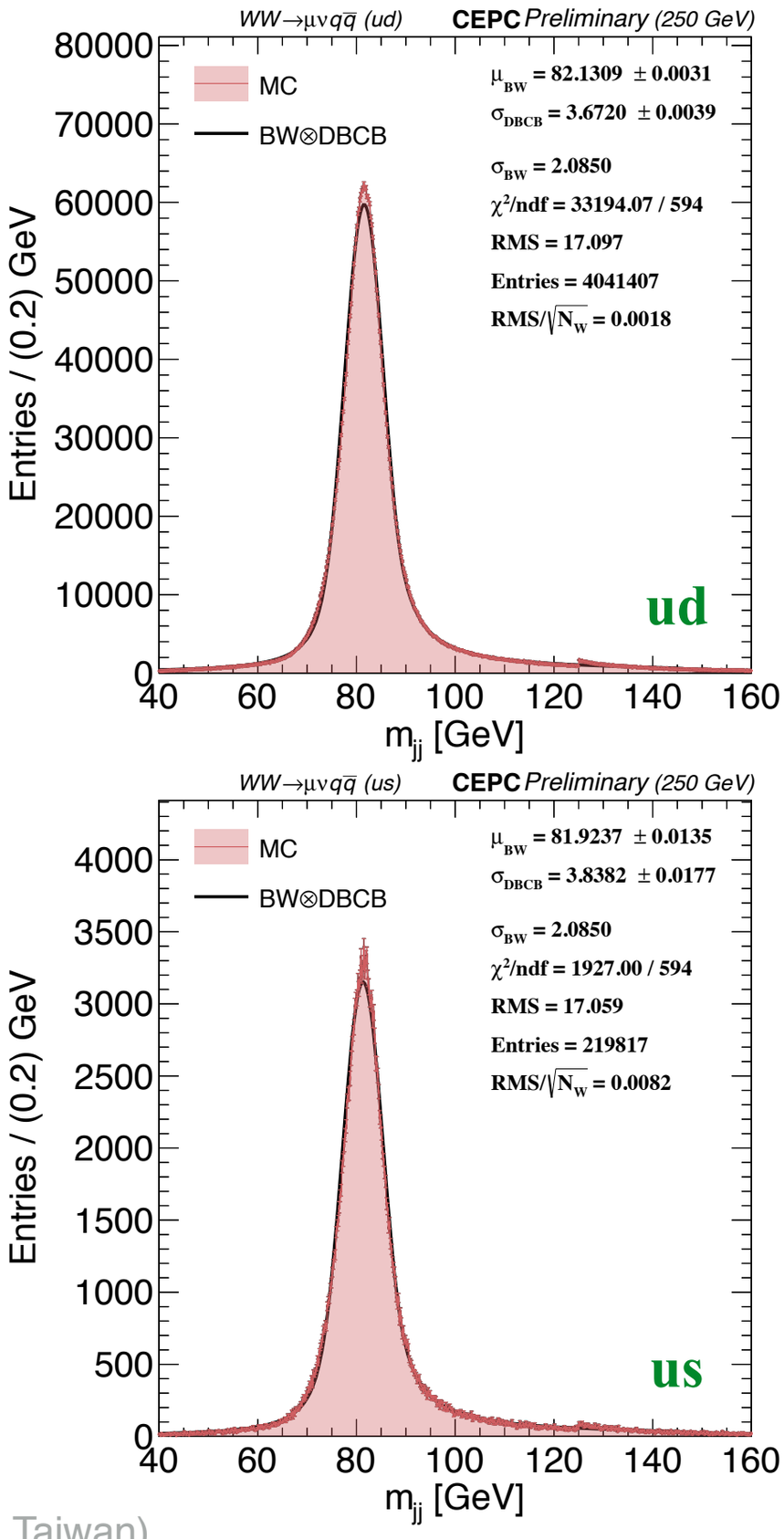

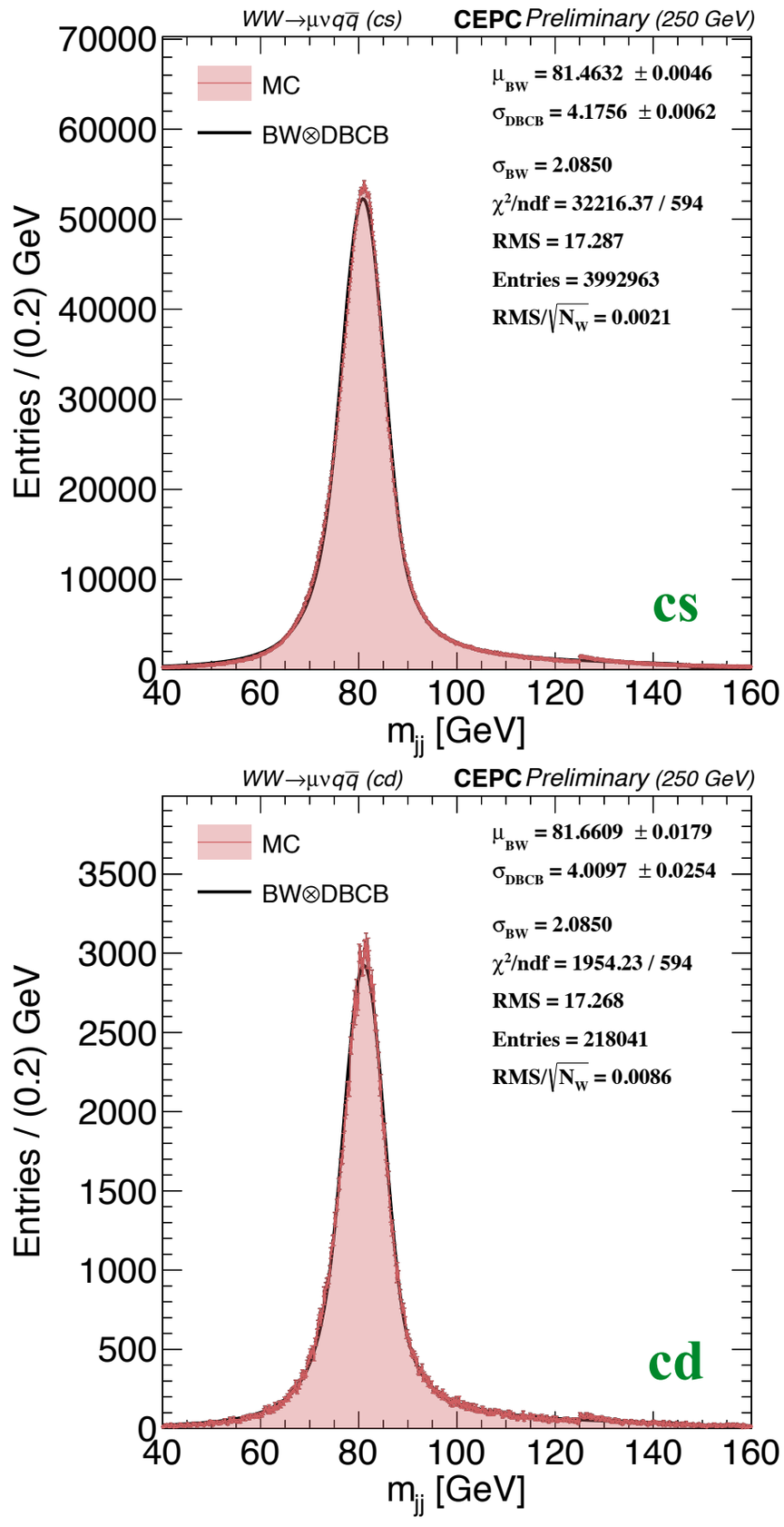

Results(without Btag)

V1(WW→$\mu\nu q\bar{q}$)	ud	cs	us	cd
μ_{BW}	82.13 ± 0.0031	81.4632 ± 0.0046	81.9237 ± 0.0135	81.6609 ± 0.0179
σ_{DBCB}	3.6720 ± 0.0039	4.1756 ± 0.0062	3.8382 ± 0.0177	4.0097 ± 0.0254
Entries	4041407	3992963	219817	218041
RMS	17.097	17.287	17.059	17.268
RMS/$\sqrt{N_W}$	0.0018	0.0021	0.0082	0.0086

- First, after passing event selection, the should on the high mass region disappear.
- There is a bump on 125 GeV. I think it is caused by "Visible mass > 0.5*$\sqrt{s}$".
- Actually, RooFit cannot fit the distribution well around the right boundary. I don't know why and I think it doesn't effect on W mass measurement.
- Since there is a bump on 125 GeV I change the mass window from 50 to 125 GeV.

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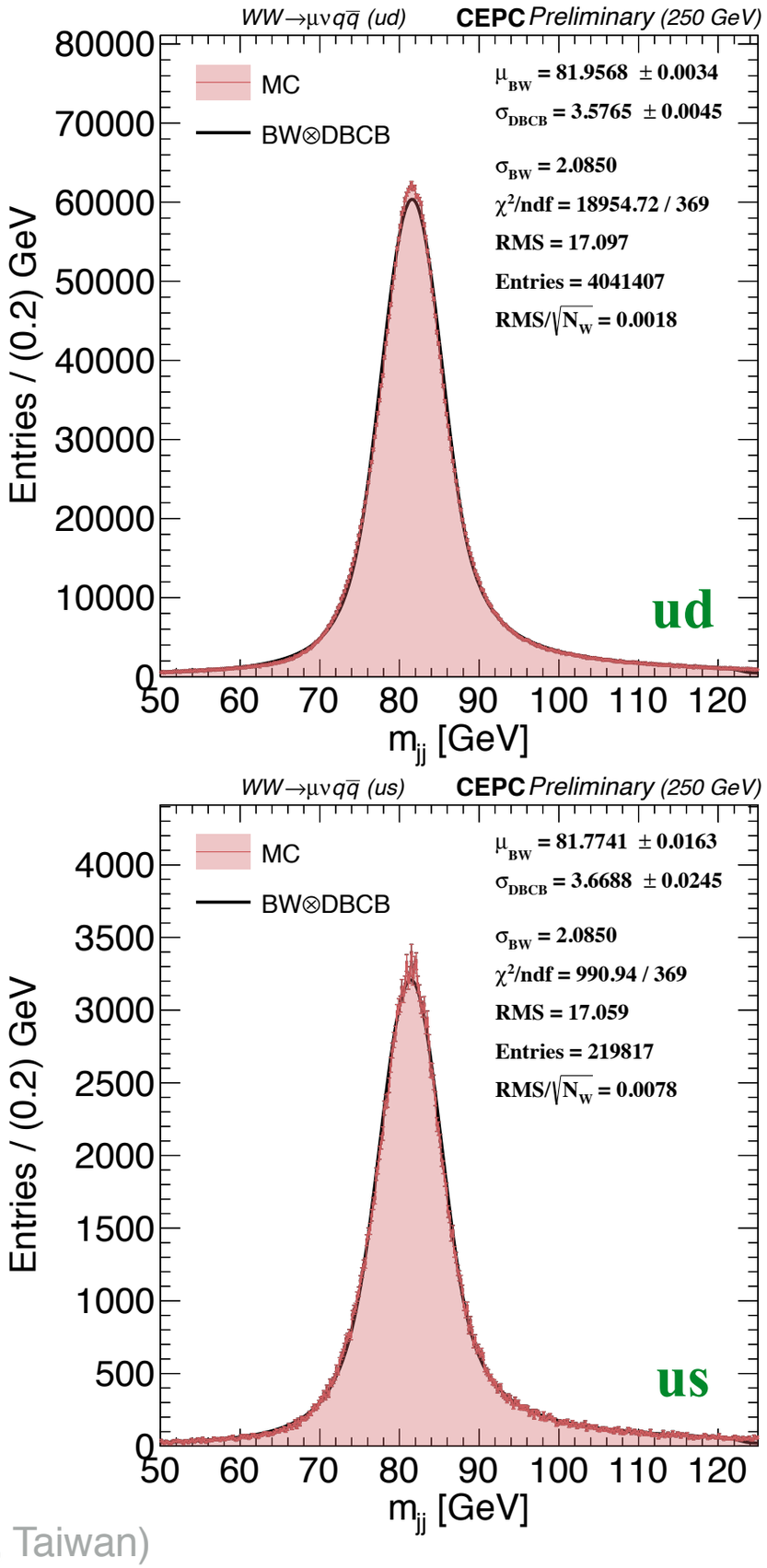

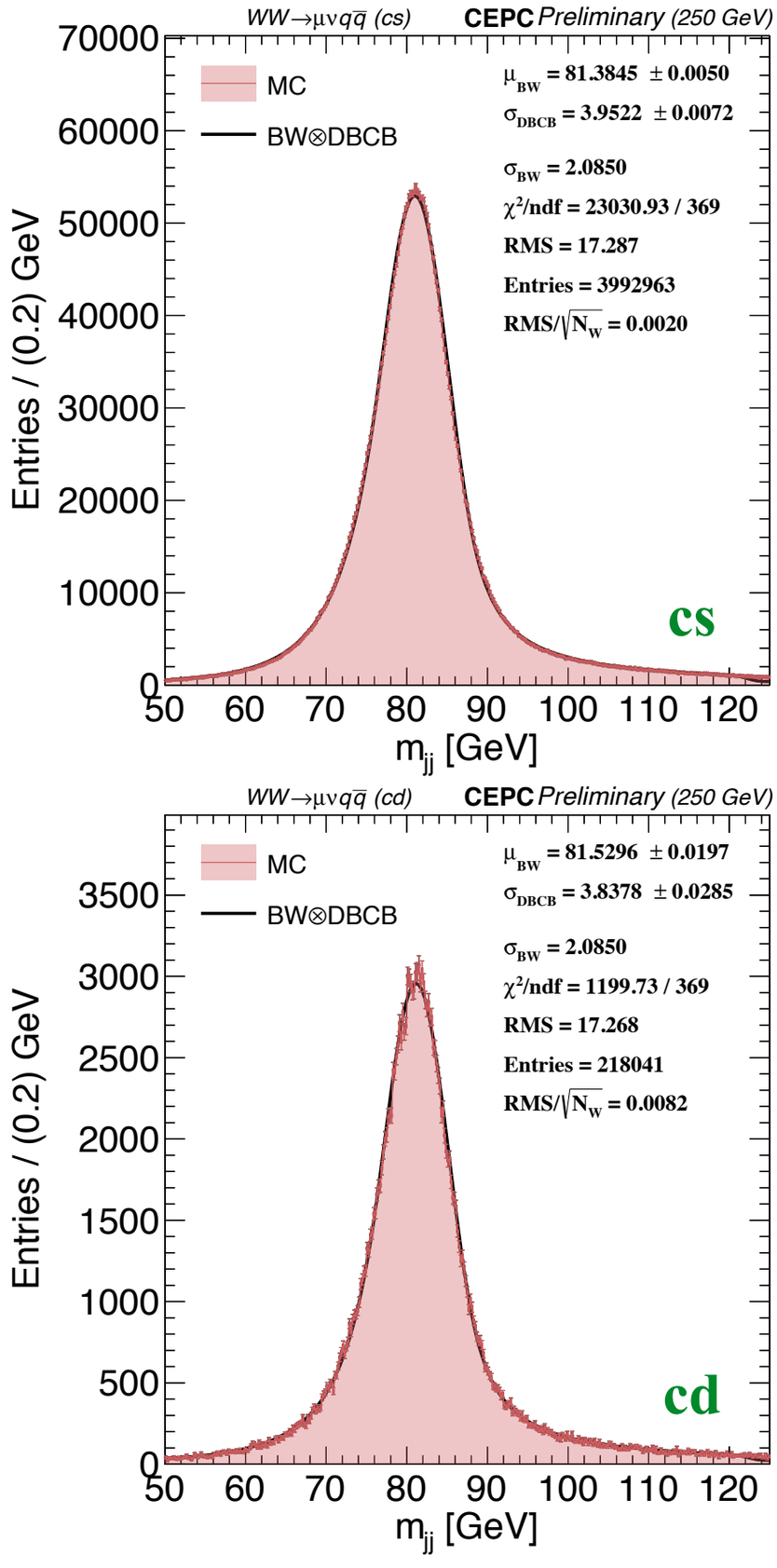

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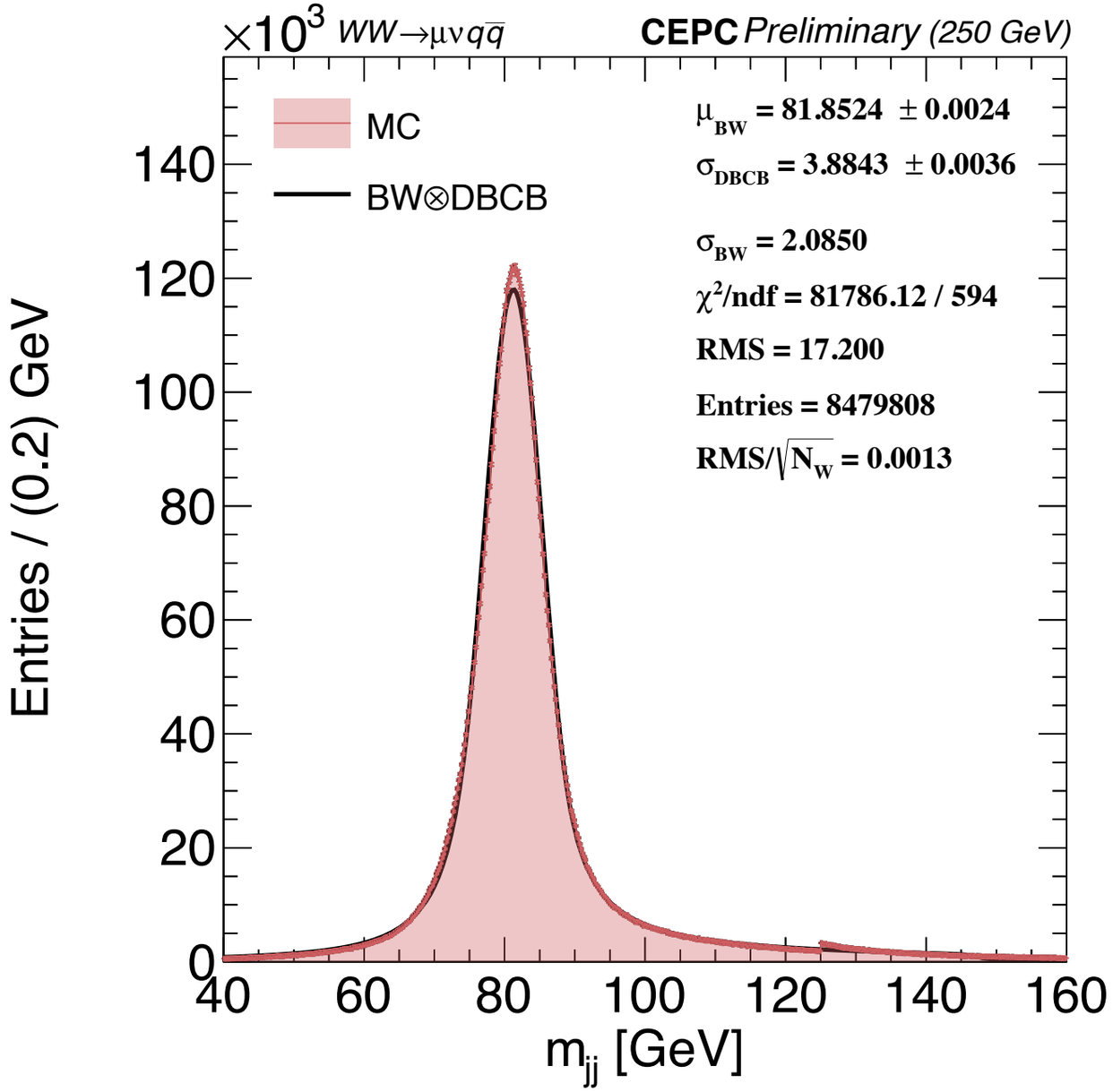

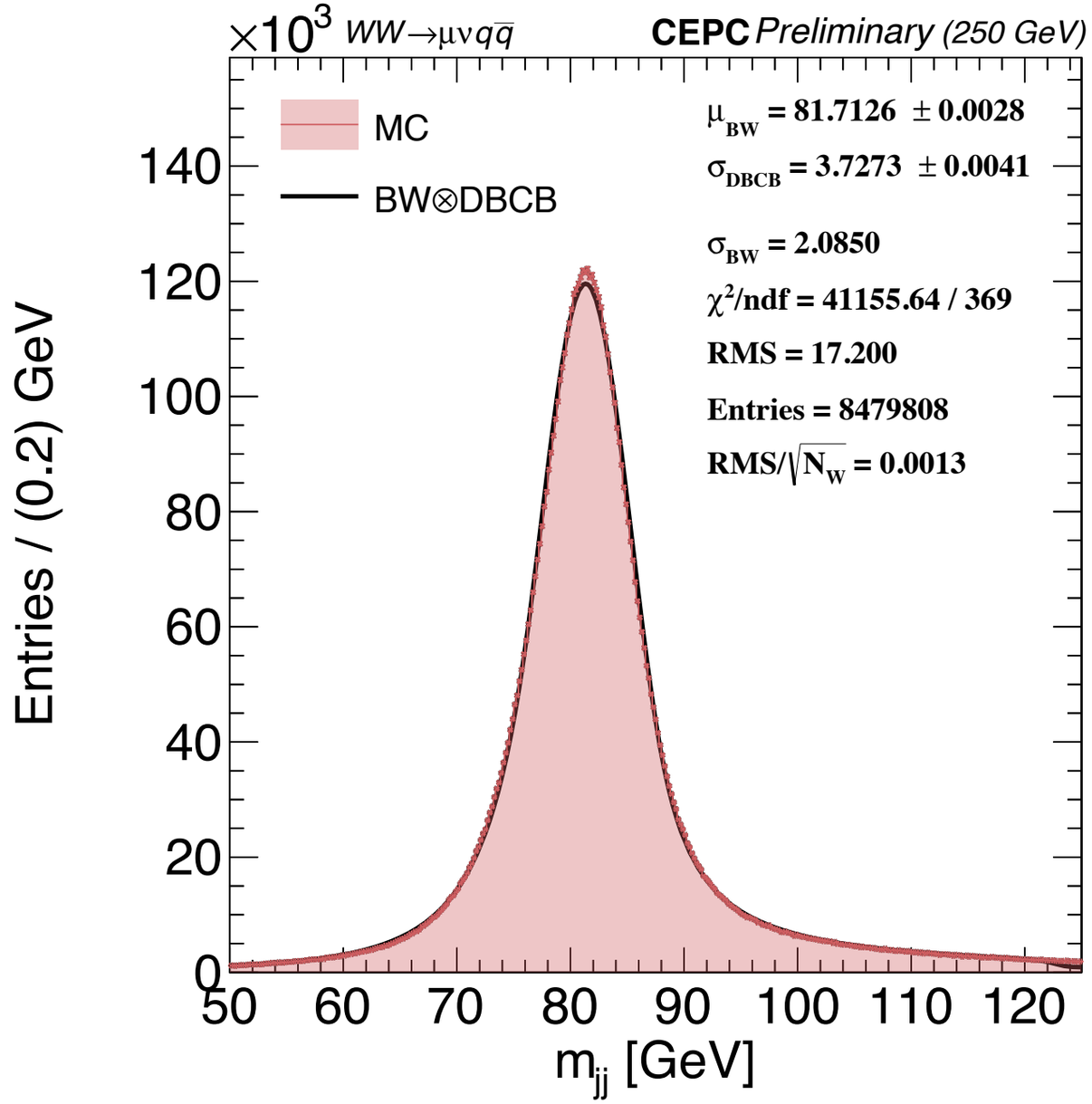

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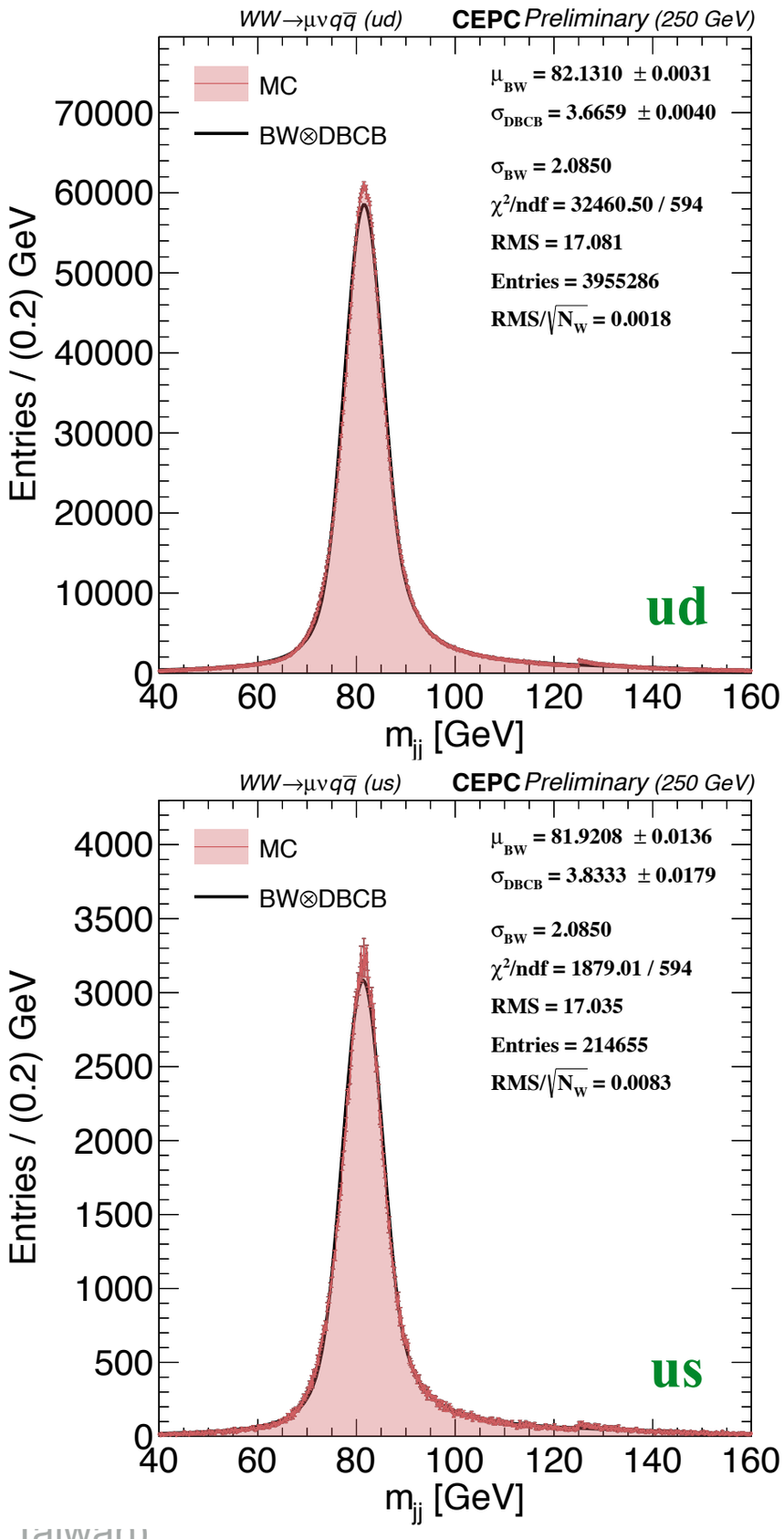

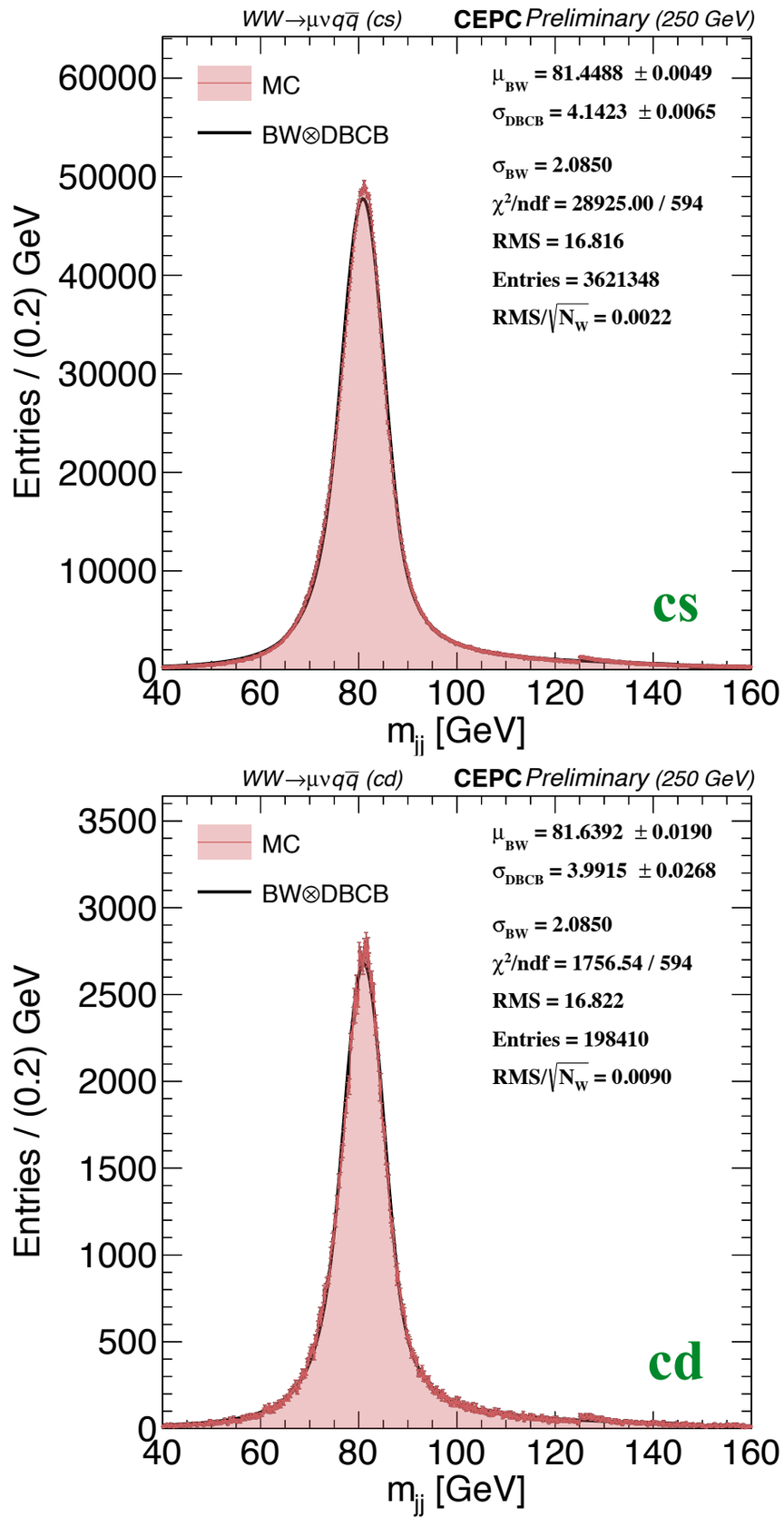

Results(with Btag score < 0.5)

V1($WW \to \mu\nu q\bar{q}$)	ud	cs	us	cd
μ_{BW}	82.13 ± 0.0031	81.4488 ± 0.0049	81.9208 ± 0.0136	81.4488 ± 0.0049
σ_{DBCB}	3.6659 ± 0.0040	4.1423 ± 0.0065	3.8333 ± 0.0179	3.9915 ± 0.0268
Entries	3955286	3621348	214655	198410
RMS	17.081	16.816	17.035	16.822
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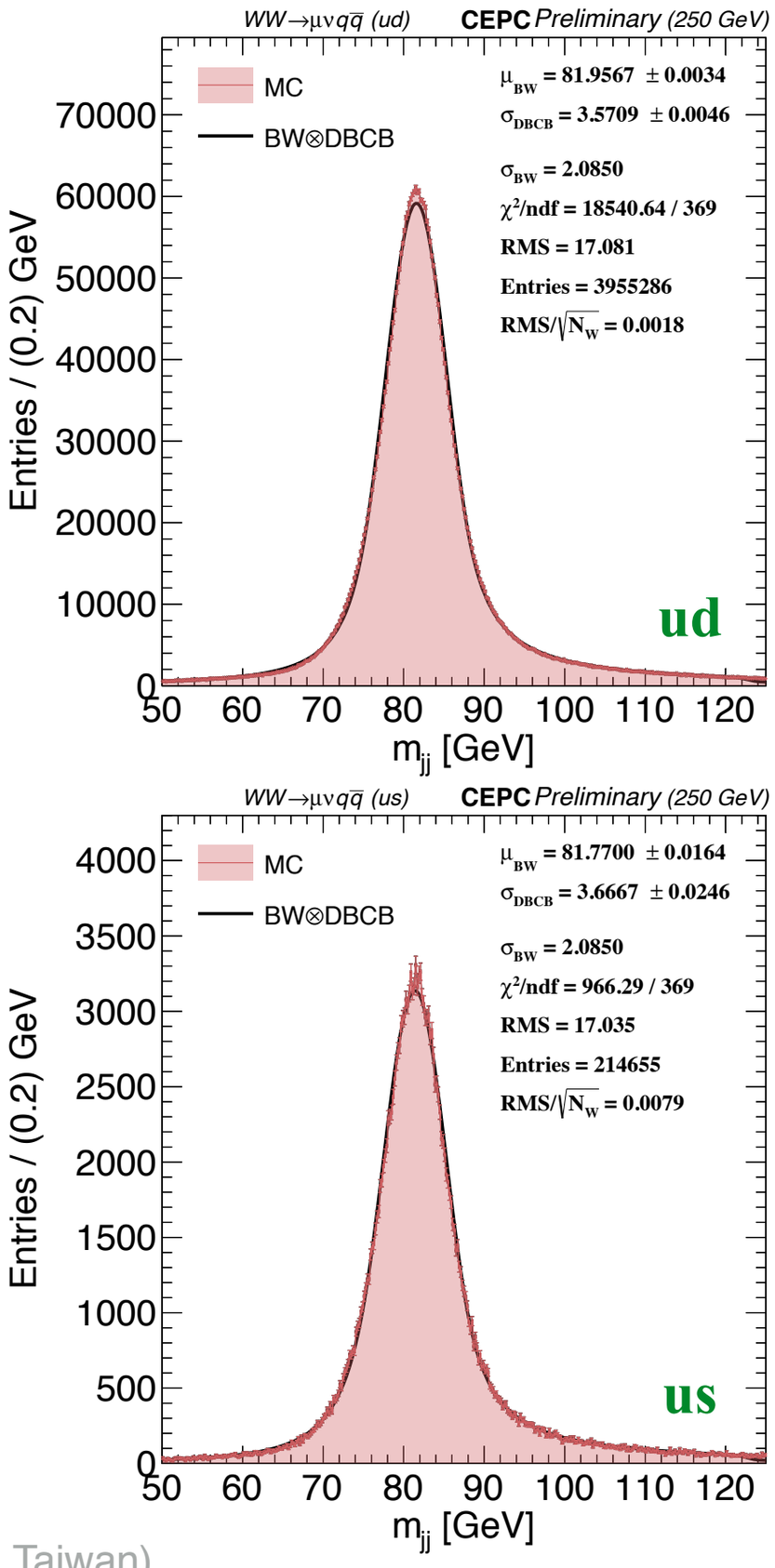

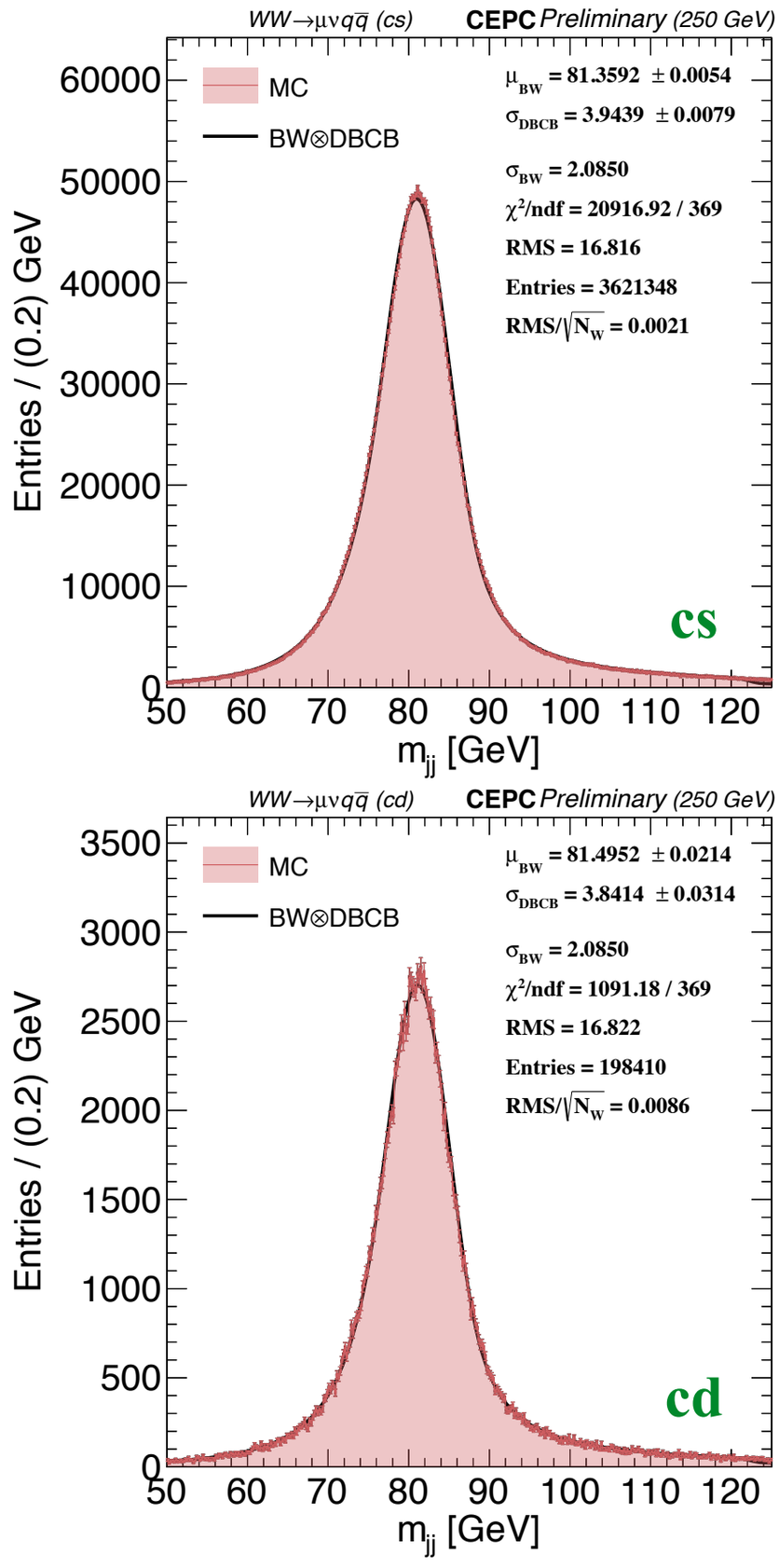

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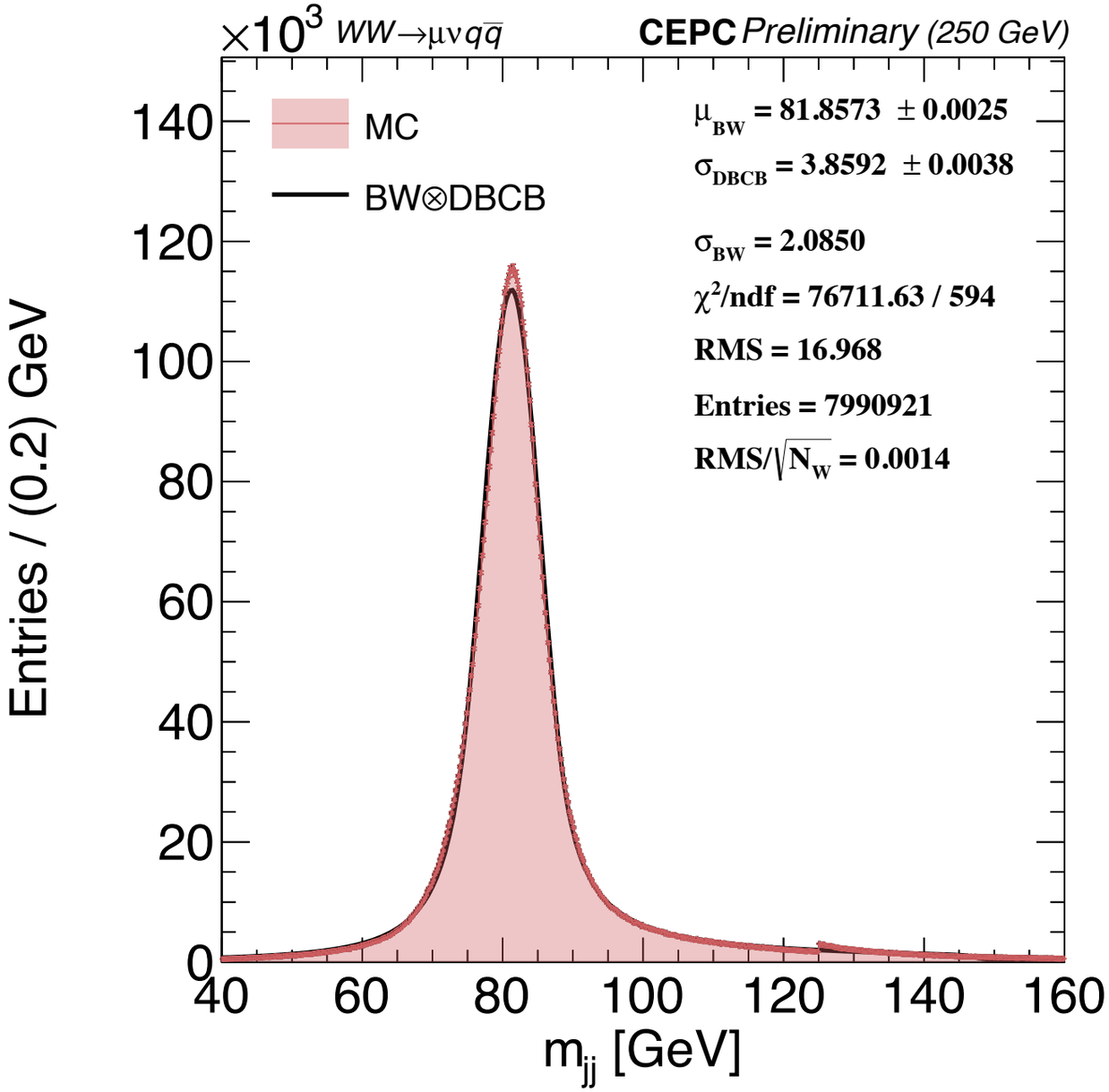

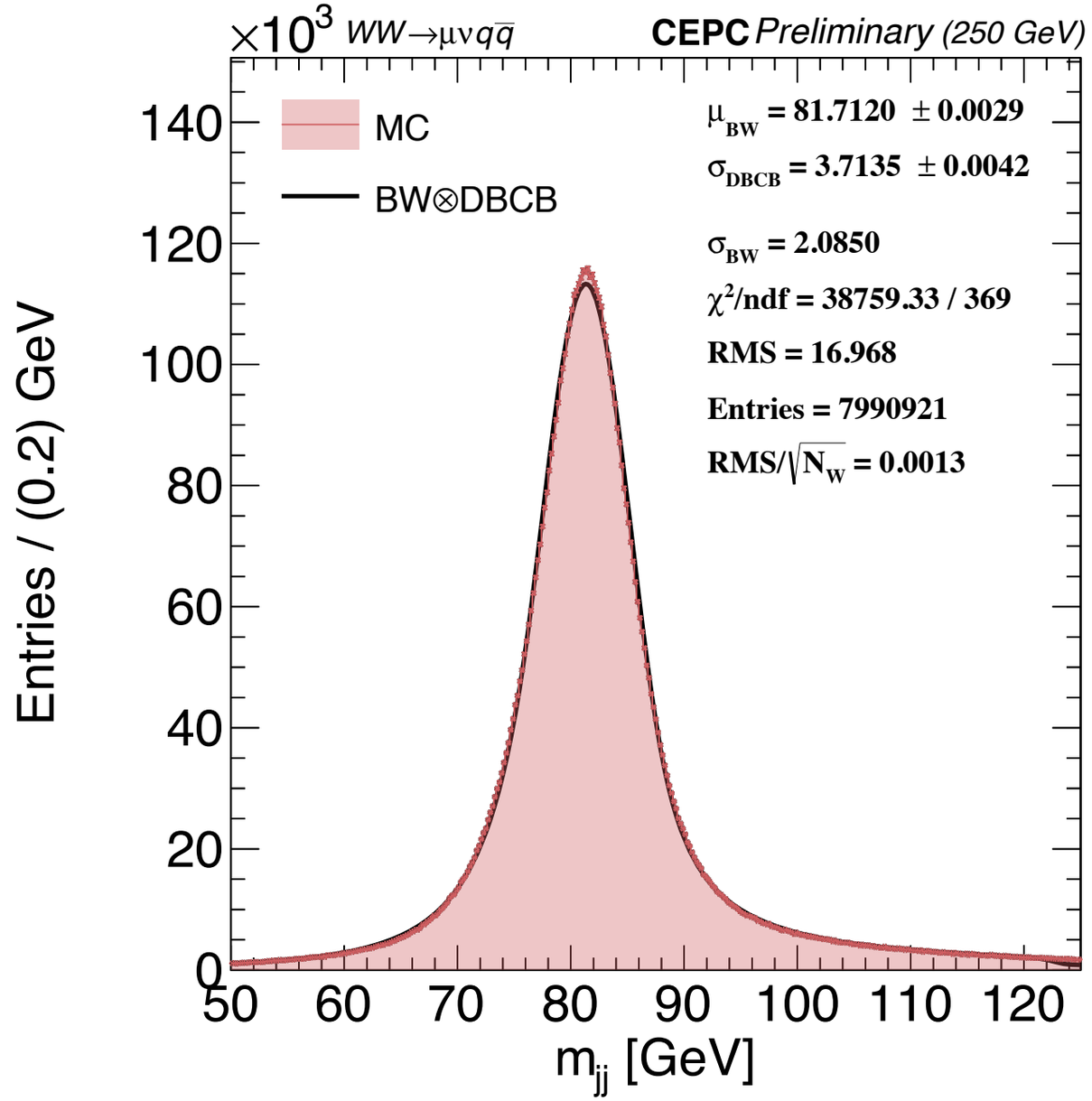

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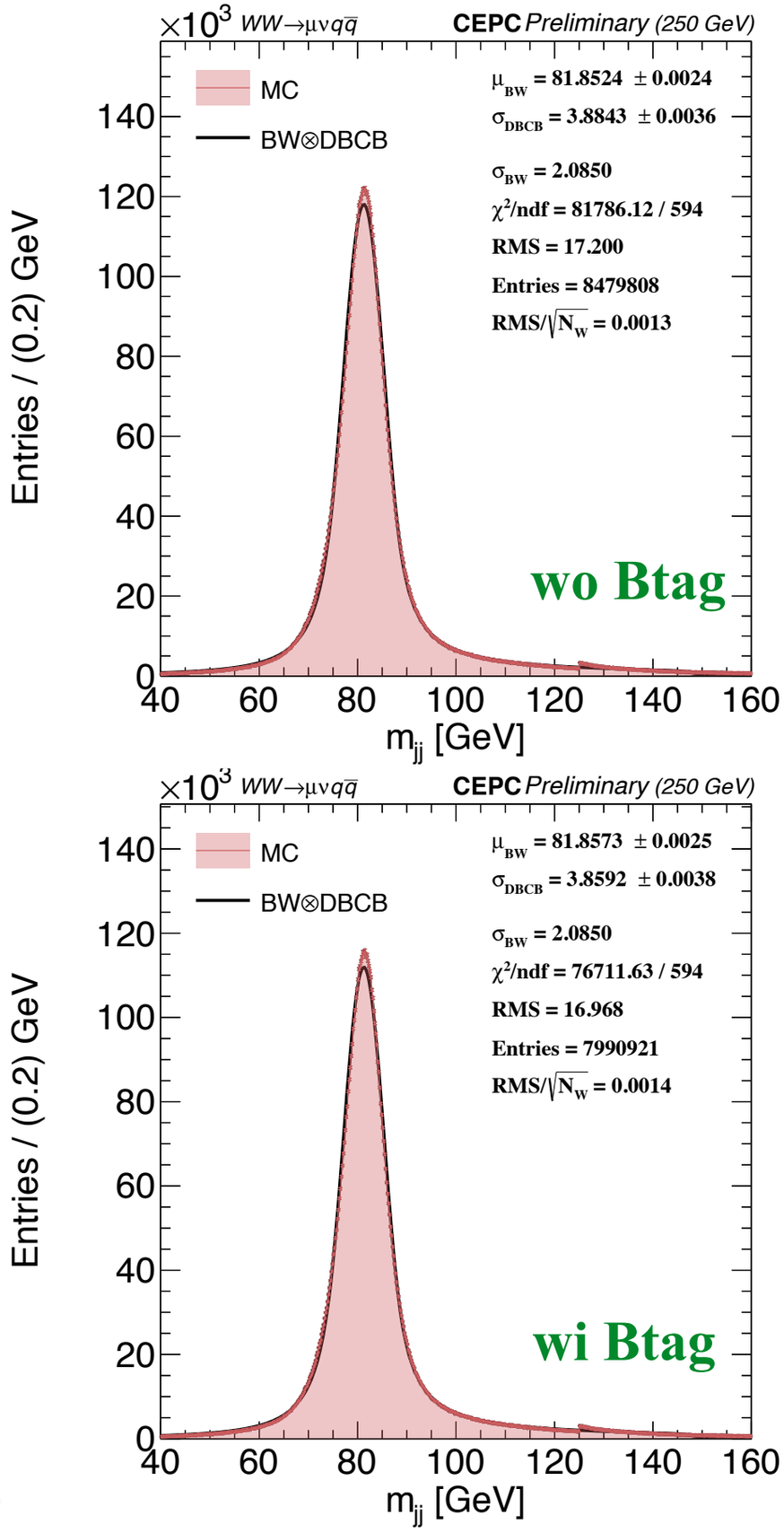
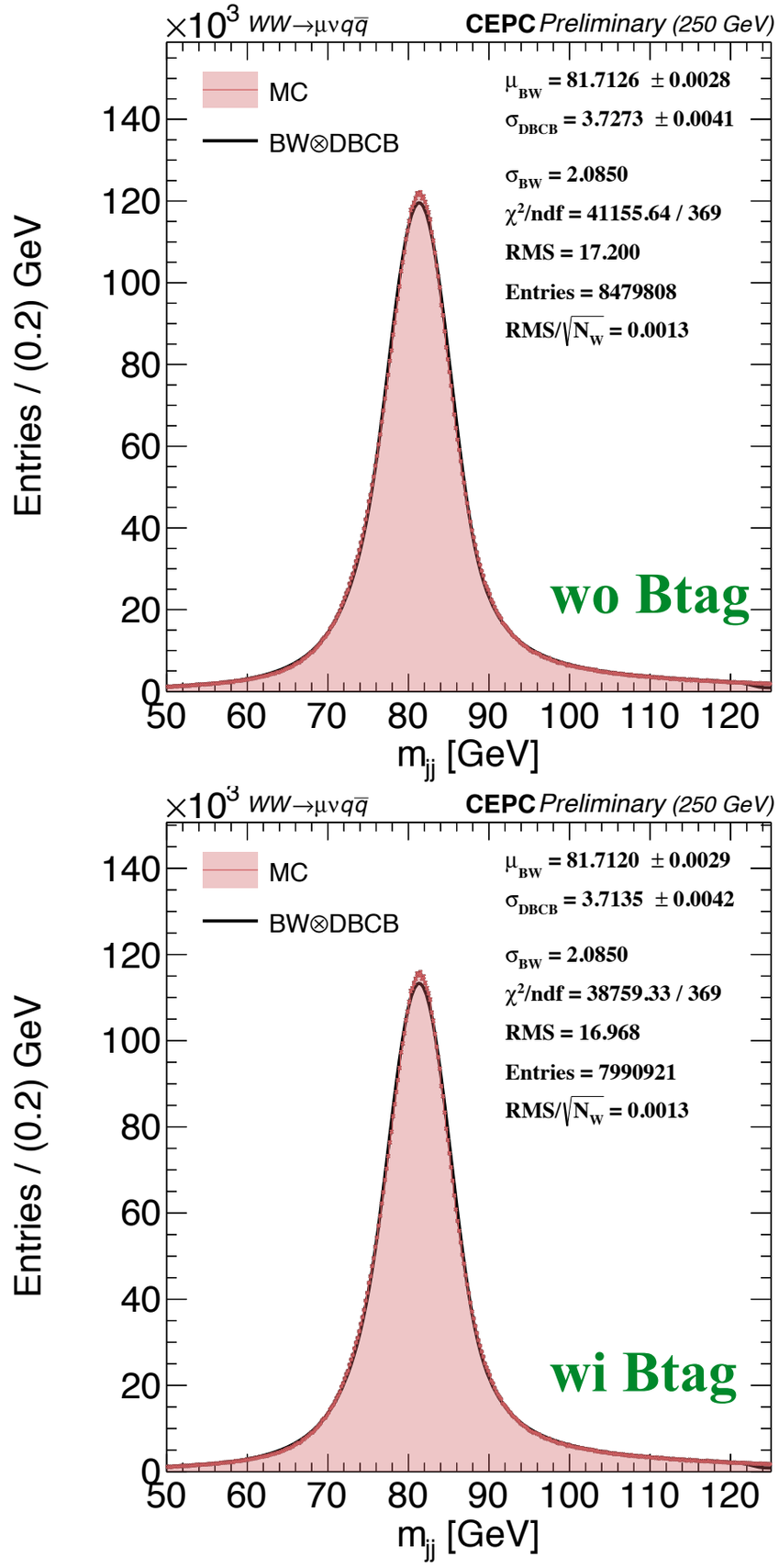
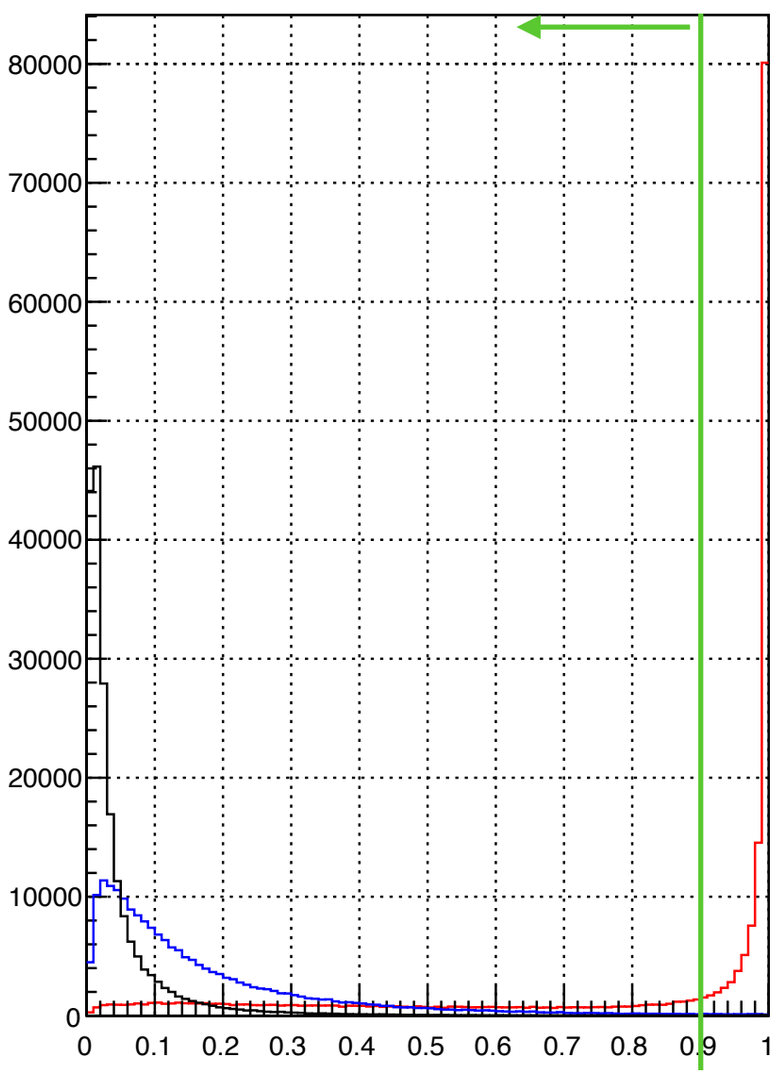
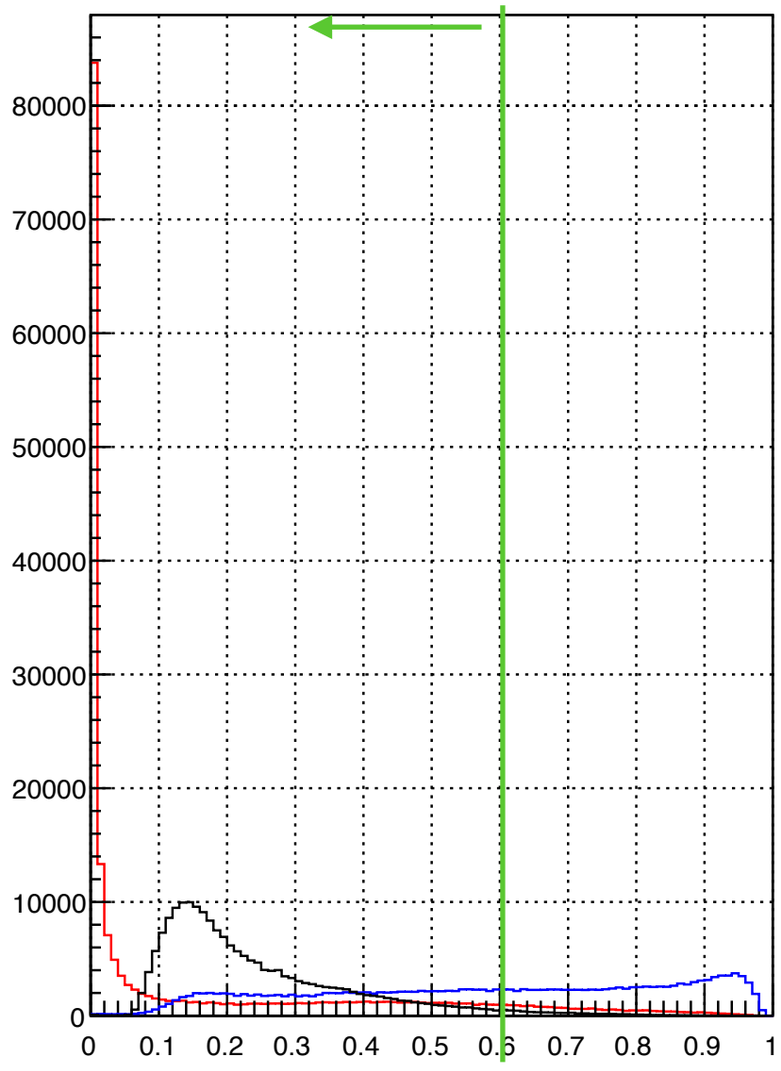




Back up

b-/c- tagging plots





- **Red line is for b-jet, blue line is for c-jet, and black line is for light-jet.**
- **According to left plot, if want to reject b-jet, the score is recommended less than 0.9; if want to select b-jet, the score is recommended greater than 0.8.**
- **According to right plot, if want to reject c-jet, the score is recommended less than 0.6; if want to select c-jet, the score is recommended greater than 0.4.**