Fast and Full simulation comparison with $B^0 \rightarrow D^*K$

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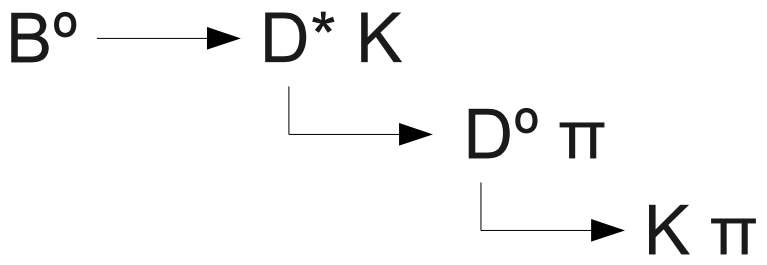
Example of FastSim

Analysis Decay Chain



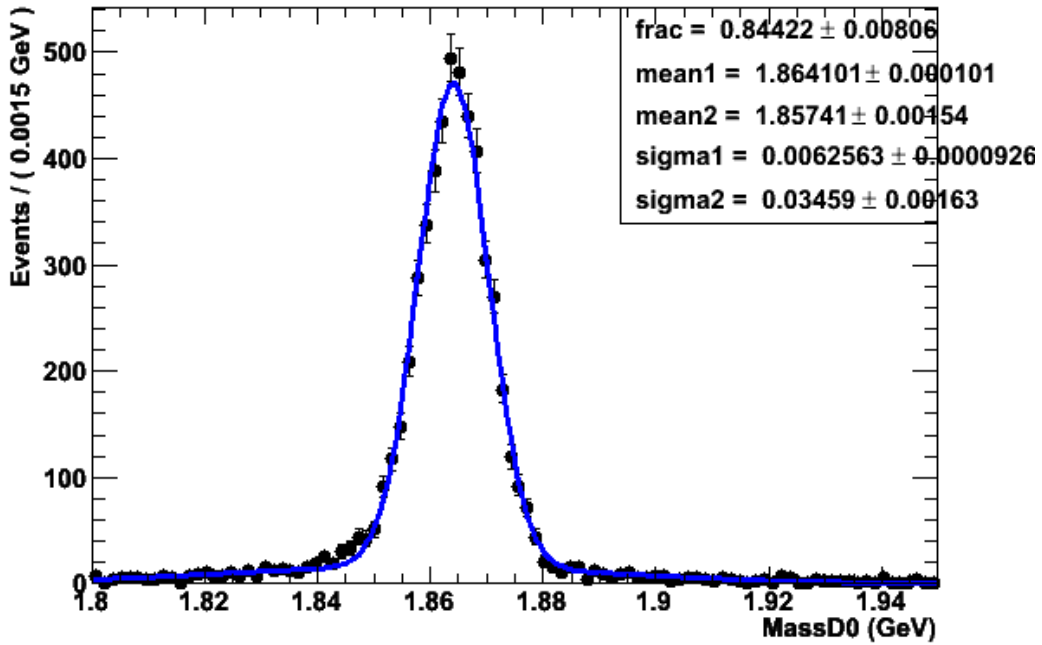
- This mode was selected to study charged track quality
- Create decay file "B0ToDstarK.dec" (set up decay chain)
- Create analysis sequence "BtoDstarKSequence.tcl"
  - Simple Composition (sets up how to build candidates from track)
  - BtuTupleMaker (sets up what to store in .root file)
- Set process variables at "example_BtoDstarK.tcl"
  - Number of event
  - Name of output file
  - To store event display information or not
- Example files can be found within PacMC package

Event Selection

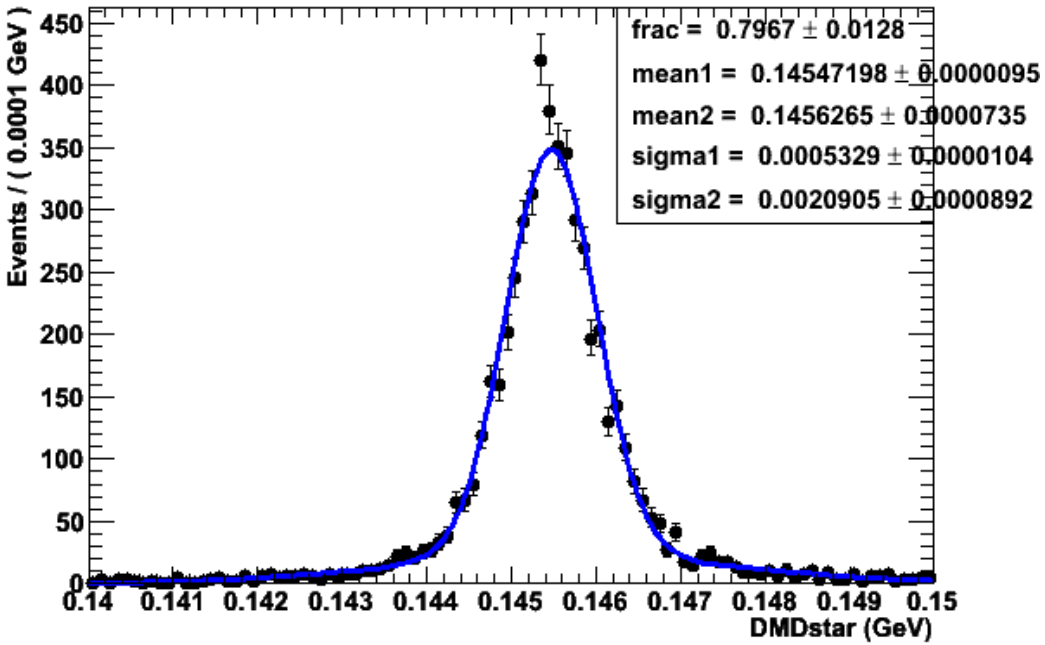
- Events without B^0 candidate is removed
  - 31.5% removed for FastSim
  - 43.2% removed for FullSim
- For events that have more than one B^0 candidate
  - Candidate with smallest $|\Delta E|$ was selected
  - 4.5% of events had multiple candidates for FastSim
  - 6.6% of events had multiple candidates for FullSim

Comparison between FastSim and FullSim

babarsim MassD0 DGauss



babarsim DMDstar DGauss



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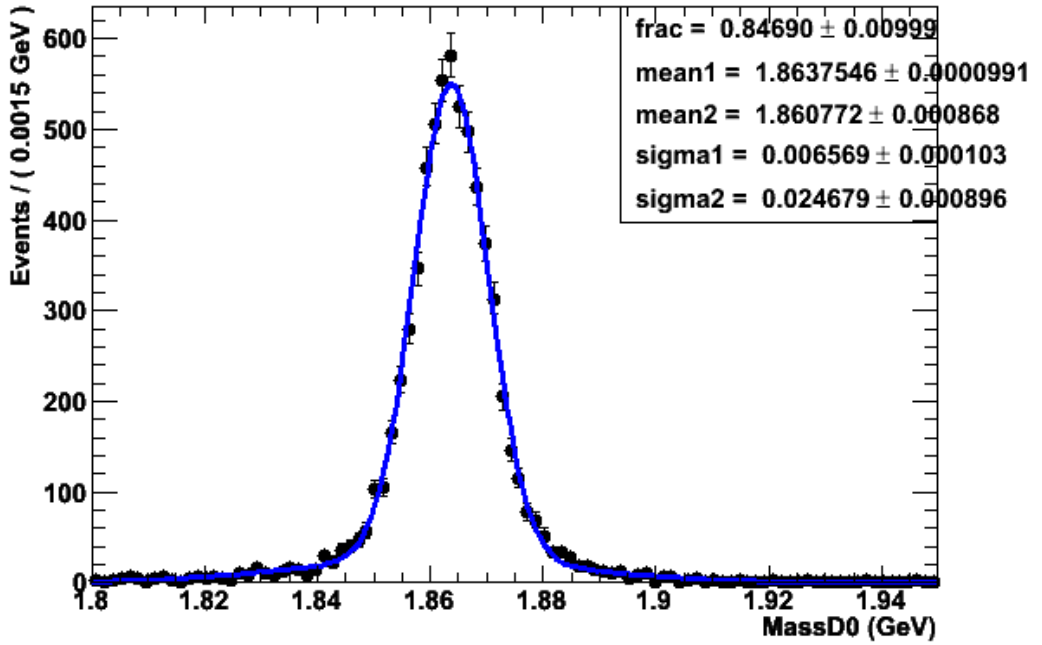

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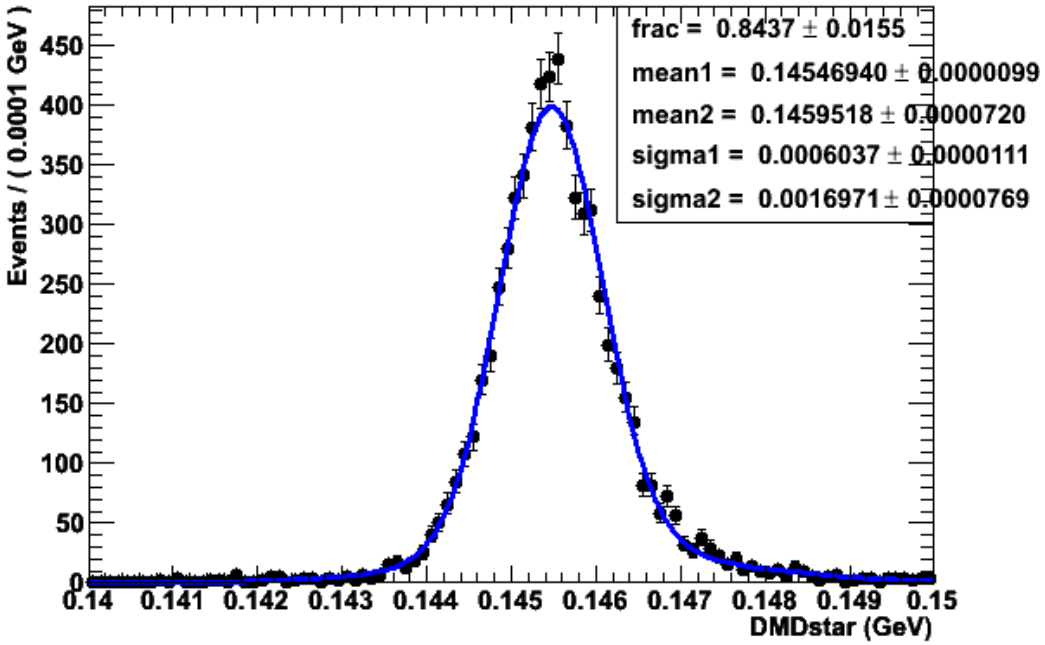
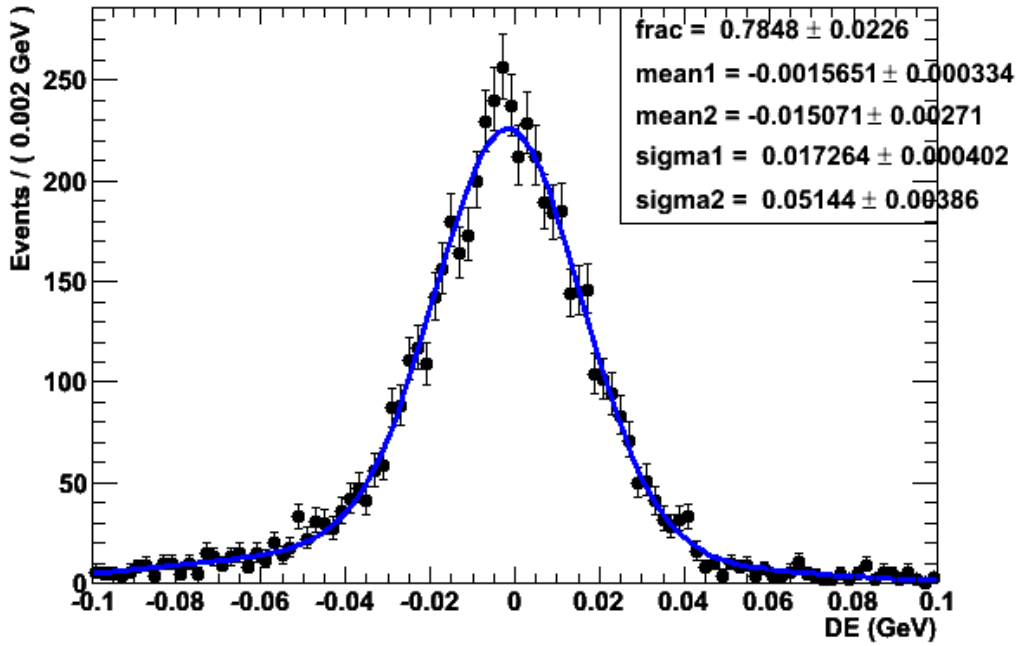
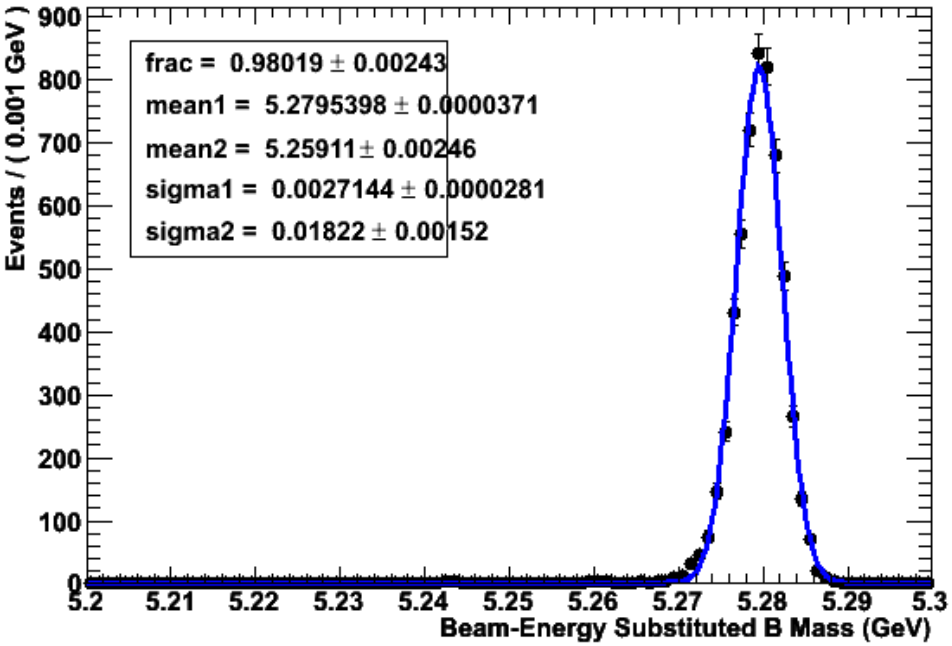


Comparison between FastSim and FullSim

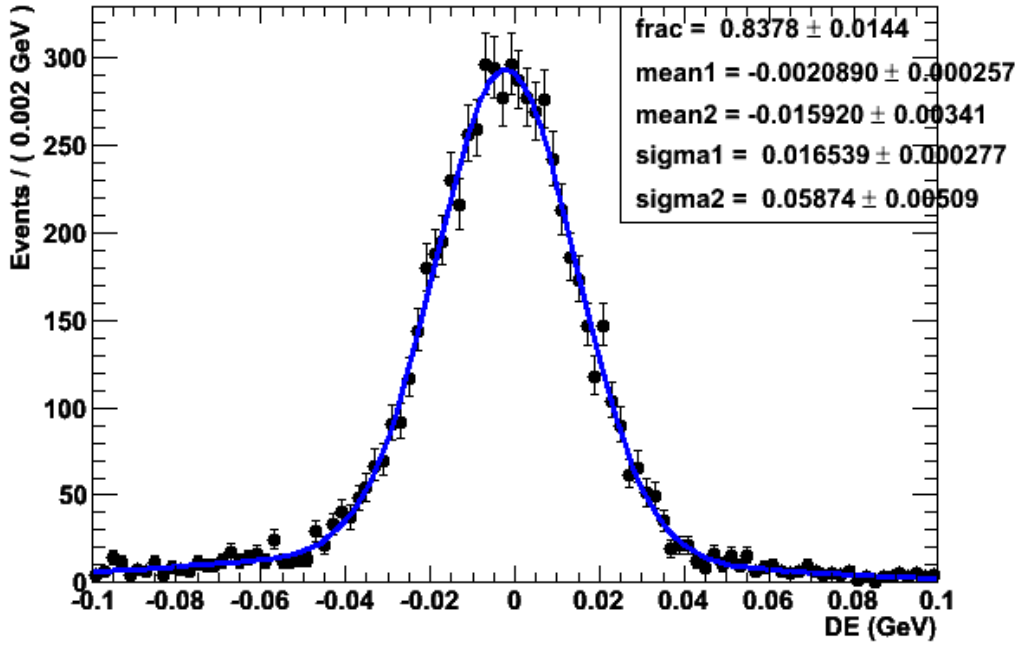
babarsim DE DGauss



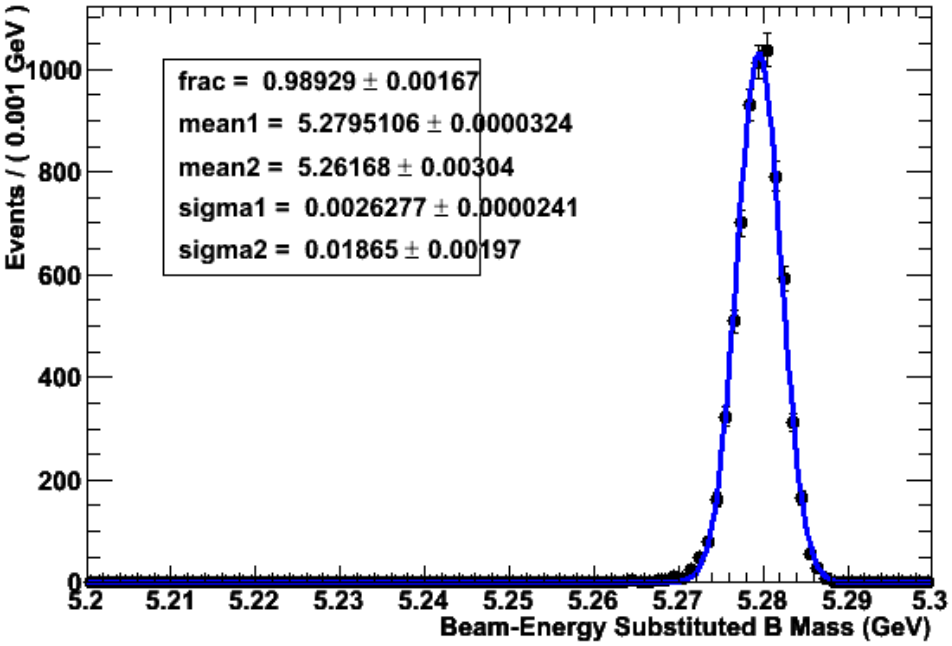
babarsim MES DGauss



pacsim DE DGauss



pacsim MES DGauss



Conclusion

- PDF from FastSim shows agreement with FullSim PDF.
  - Core mass resolutions agree within 5%
  - Tail resolutions are 5->40% narrower in FastSim
  - Tail fraction is roughly the same
- Efficiency showed some discrepancy (~10% absolute)

Future Plan

- Verify more variables on FastSim against FullSim
  - Vertexing
  - Neutral Track
  - etc
- Understand efficiency discrepancy
- Study various detector configuration

Supporting Slides

Comparison between FastSim and FullSim

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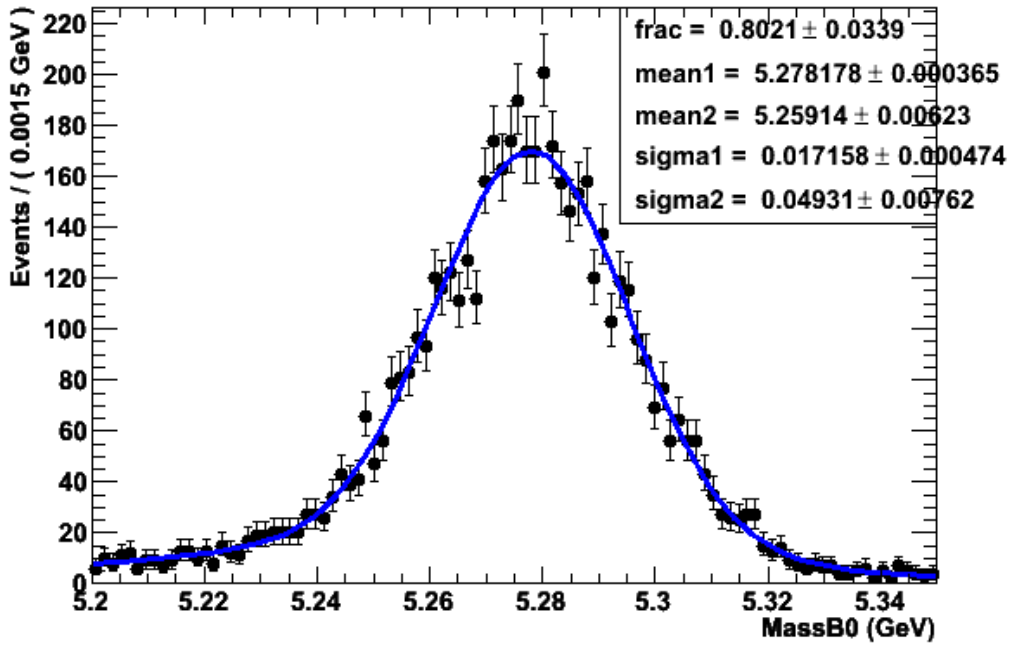
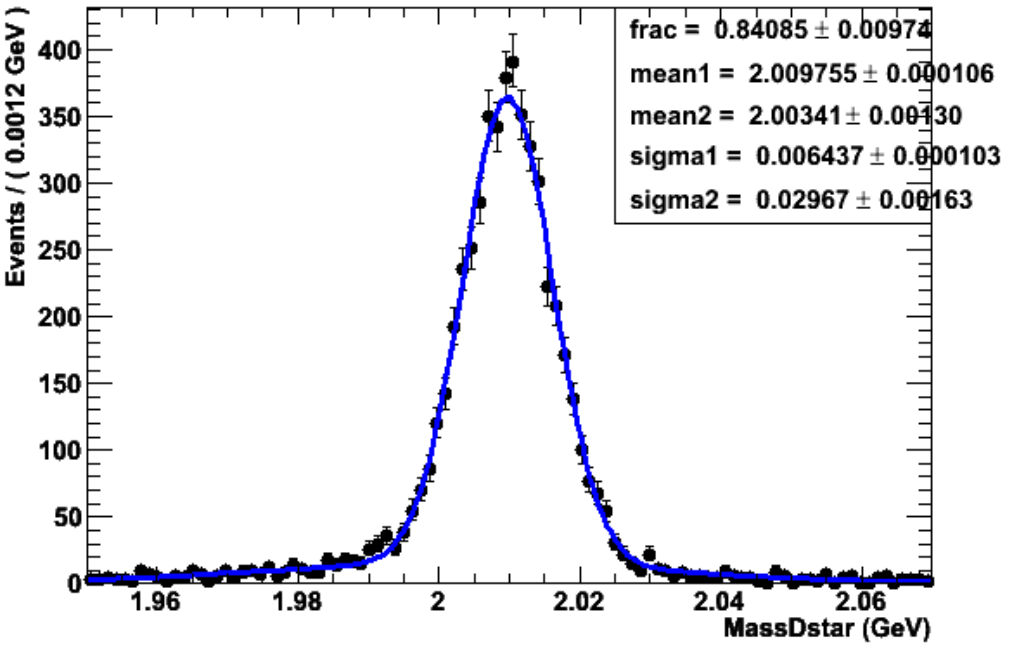


babarsim MassDstar DGauss



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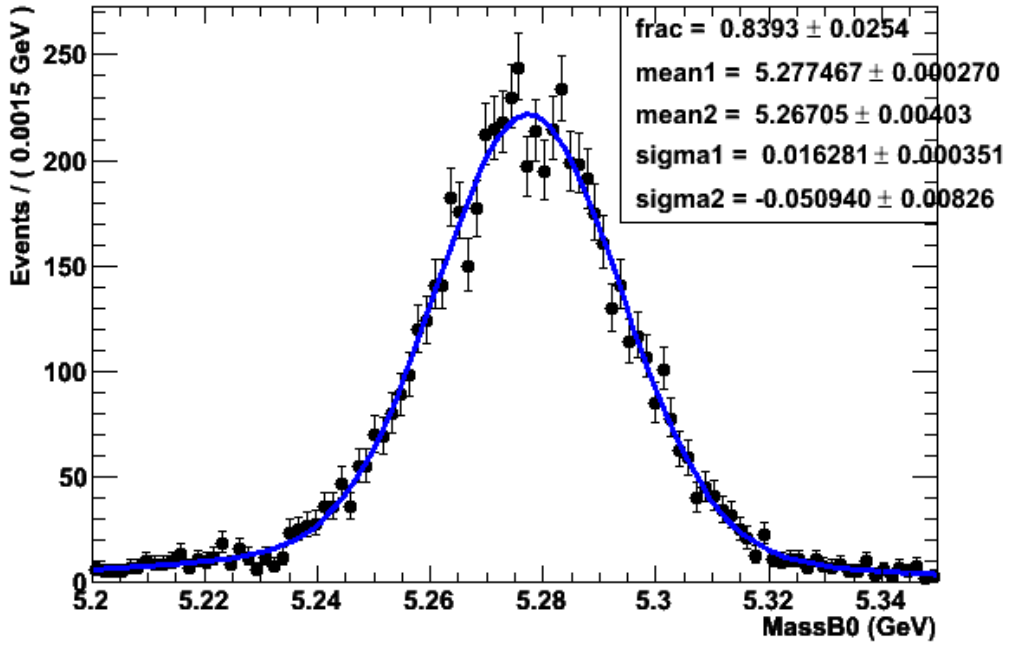

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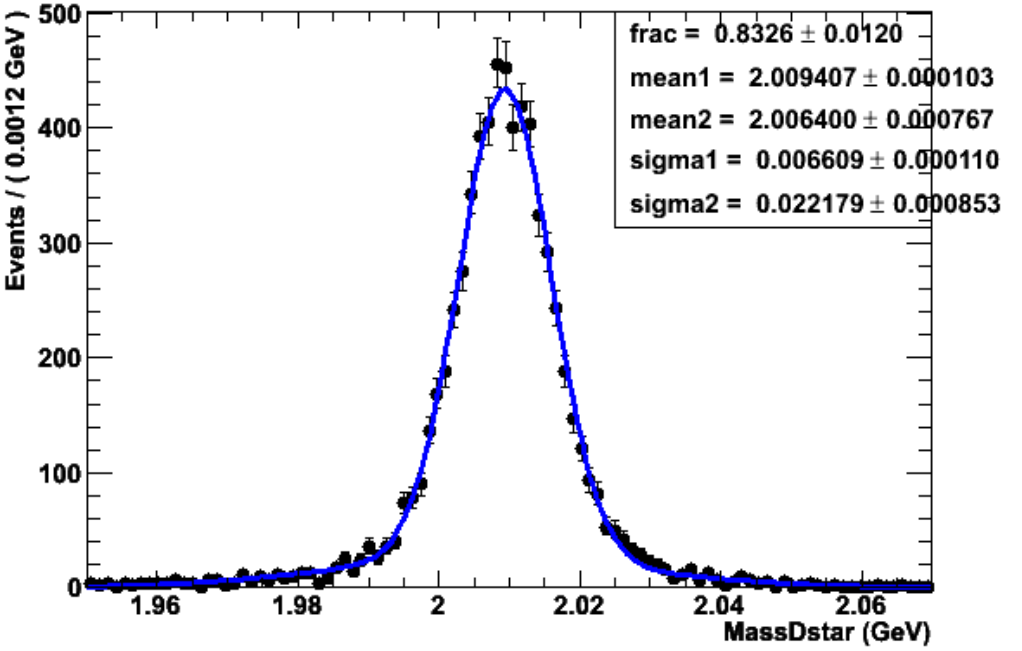

Comparison between FastSim and FullSim

Efficiency and Multiplicity Statistics

	PacMC	Babar Sim
Processed	10000	10000
0 B0Cand	3154	4322
1 B0Cand	6394	5022
>1 B0Cand	452	656

PDF parameters (All PDF was fitted with Double Gaussian)

Mass B0	PacMC	Babar Sim
Mean Core	5.28e-00 +/- 2.70e-04	5.28e-00 +/- 3.65e-04
Sigma Core	1.63e-02 +/- 3.51e-04	1.72e-02 +/- 4.74e-04
Mean Tail	5.27e-00 +/- 4.03e-03	5.26e-00 +/- 6.23-e03
Sigma Tail	5.09e-02 +/- 8.26e-03	4.93e-02 +/- 7.62e-03
Fraction of Core	8.39e-01 +/- 2.52e-02	8.02e-01 +/- 3.39e-02

Comparison between FastSim and FullSim

PDF parameters (All PDF was fitted with Double Gaussian)

Mass Dstar		PacMC		Babar Sim
Mean Core	2.01e-00	+/- 1.03e-04	2.01e-00	+/- 1.06e-04
Sigma Core	6.61e-03	+/- 1.10e-04	6.43e-03	+/- 1.03e-04
Mean Tail	2.01e-00	+/- 7.67e-04	2.00e-00	+/- 1.30e-03
Sigma Tail	2.22e-02	+/- 8.53e-04	2.97e-02	+/- 1.63e-03
Fraction of Core	8.33e-01	+/- 1.20e-02	8.41e-01	+/- 9.74e-03

Mass D0		PacMC		Babar Sim
Mean Core	1.86e-00	+/- 9.91e-05	1.86e-00	+/- 1.01e-04
Sigma Core	6.57e-03	+/- 1.03e-04	6.26e-03	+/- 9.26e-05
Mean Tail	1.86e-00	+/- 8.68e-04	1.86e-00	+/- 1.54e-03
Sigma Tail	2.47e-02	+/- 8.96e-04	3.46e-02	+/- 1.63e-03
Fraction of Core	8.47e-01	+/- 9.99e-03	8.44e-01	+/- 8.06e-03

ΔM D*		PacMC		Babar Sim
Mean Core	1.45e-01	+/- 9.90e-06	1.45e-01	+/- 9.52e-06
Sigma Core	6.04e-04	+/- 1.11e-05	5.33e-04	+/- 1.04e-05
Mean Tail	1.46e-01	+/- 7.20e-05	1.46e-01	+/- 7.35e-05
Sigma Tail	1.70e-03	+/- 7.70e-05	2.09e-03	+/- 8.92e-05
Fraction of Core	8.44e-01	+/- 1.55e-02	7.97e-01	+/- 1.28e-02

Comparison between FastSim and FullSim

PDF parameters (All PDF was fitted with Double Gaussian)

ΔE	PacMC	Babar Sim
Mean Core	-2.09e-03 +/- 2.57e-04	-1.57e-03 +/- 3.34e-04
Sigma Core	1.65e-02 +/- 2.77e-04	1.73e-02 +/- 4.02e-04
Mean Tail	-1.59e-02 +/- 3.41e-03	-1.51e-02 +/- 2.71e-03
Sigma Tail	5.87e-02 +/- 5.09e-03	5.14e-02 +/- 3.86e-03
Fraction of Core	8.38e-01 +/- 1.44e-02	7.85e-01 +/- 2.26e-02

Mes	PacMC	Babar Sim
Mean Core	5.28e-00 +/- 3.24e-05	5.28e-00 +/- 3.71e-05
Sigma Core	2.63e-03 +/- 2.41e-05	2.71e-03 +/- 2.81e-05
Mean Tail	5.26e-00 +/- 3.04e-03	5.26e-00 +/- 2.46e-03
Sigma Tail	1.86e-02 +/- 1.97e-03	1.82e-02 +/- 1.52e-03
Fraction of Core	9.89e-01 +/- 1.67e-03	9.80e-01 +/- 2.43e-03