



Simulations of Ds semileptonic decay

Lu Cao

30-04-2014

Fast simulation vs. full simulation

- no fitting issues here
- take care of PID

PID Algorithms

Full:	PidAlgoIdealCharged	: true $P=1$; others $P=0$	} combine all
	PidAlgoMvd	: MVD	
	PidAlgoMdtHardCuts	: MUO	
	PidAlgoDrc	: DRC	
	PidAlgoDisc	: DISC	
	PidAlgoStt	: STT	
	PidAlgoEmcBayes	: EMC	

Fast:	PidChargedProbability	: combination of all
	ScEmcPidFSProbability	: EMC forward spectrometer
	ScEmcPidFwCapProbability	: EMC forward endcap
	ScEmcPidBarrelProbability	: EMC barrel
	ScEmcPidBwCapProbability	: EMC backward endcap
	DrcBarrelProbability	: Barrel DIRC
	DrcDiscProbability	: Disc DIRC
	MvdPidProbability	: MVD
	SttPidProbability	: STT
	RichProbability	: RICH
	ScMdtPidBarrelProbability	: MUO barrel
	ScMdtPidForwardProbability	: MUO endcap

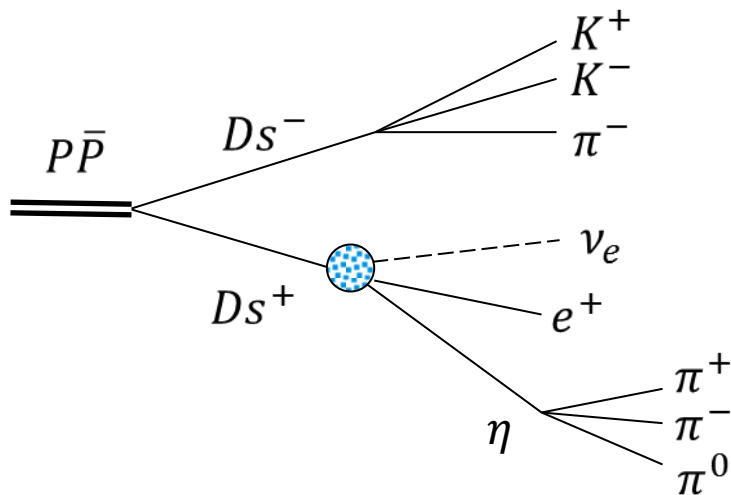
Various PID Criteria

- All - $P \geq 0.0$ required
- VeryLoose - $P \geq 0.0$ required
- Loose - $P \geq 0.25$ required
- Tight - $P \geq 0.5$ required
- VeryTight - $P \geq 0.9$ required
- Best - $P_i > P_j$ for all j to accept type i

PID algorithm + PID criteria

FullSim

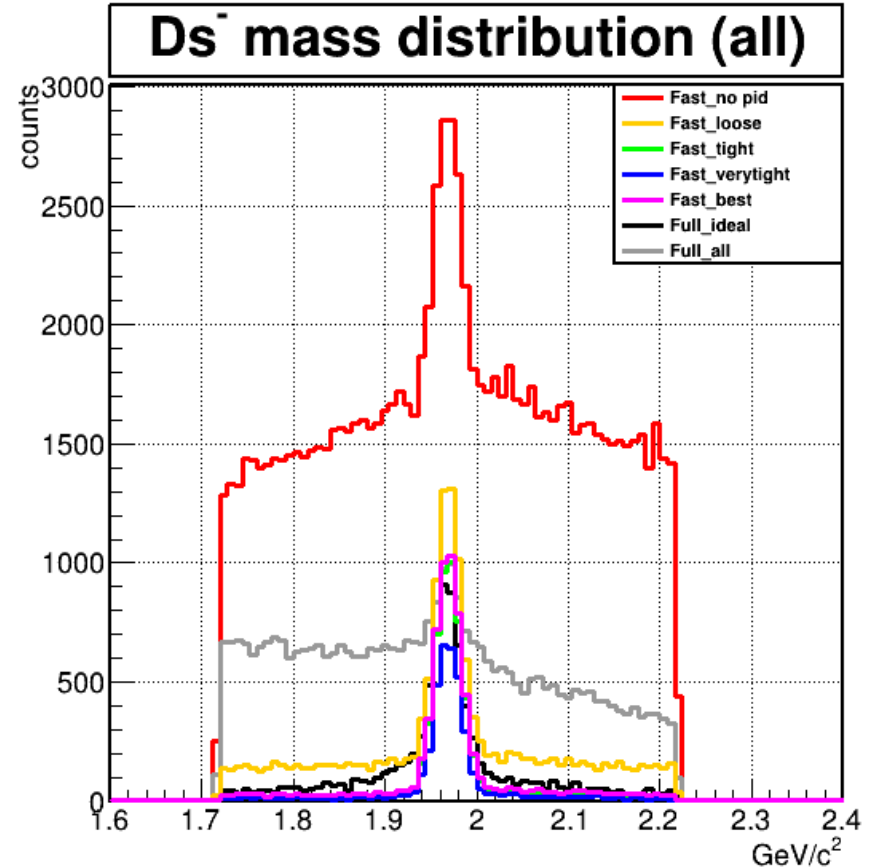
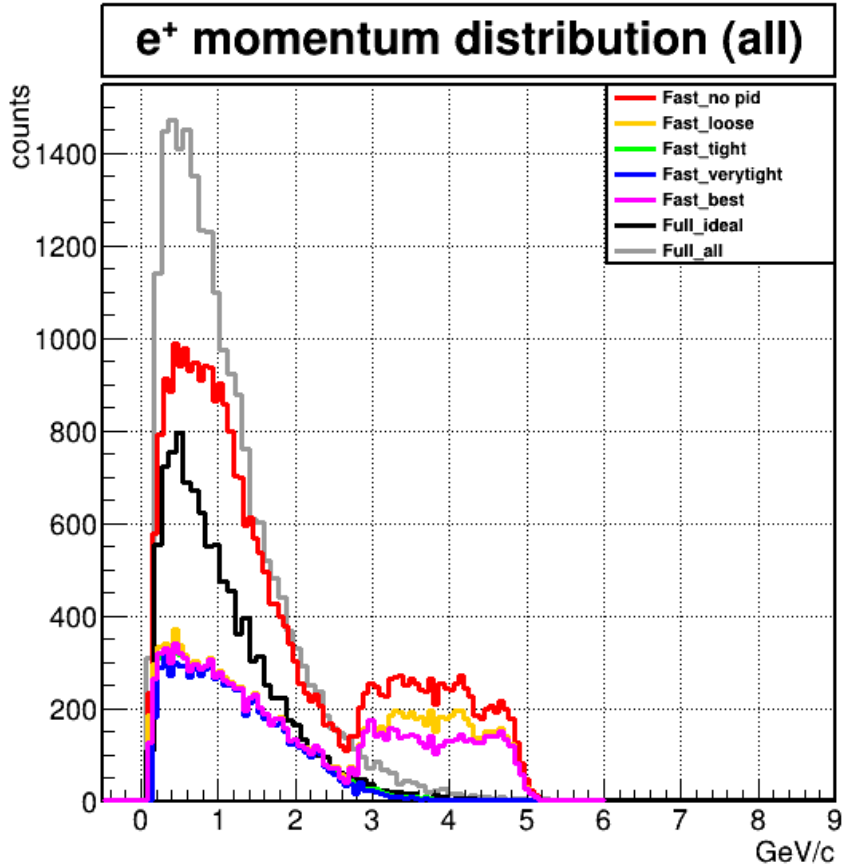
1. Ideal PID + All
2. all PID + All
Ideal PID + Loose doesn't work in #24697 ?!



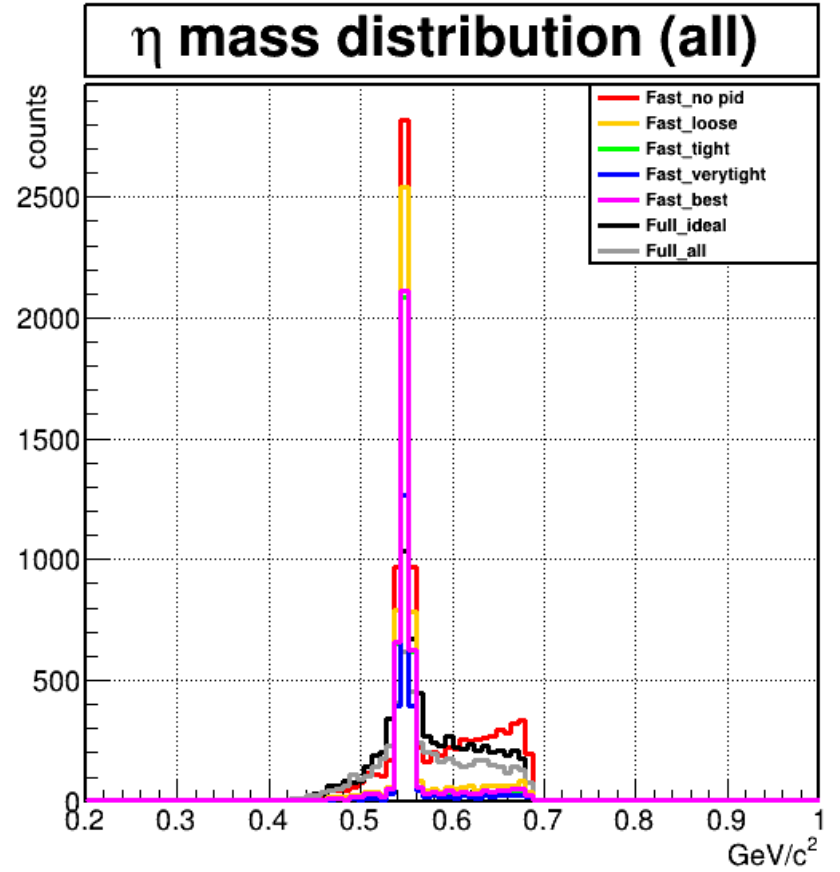
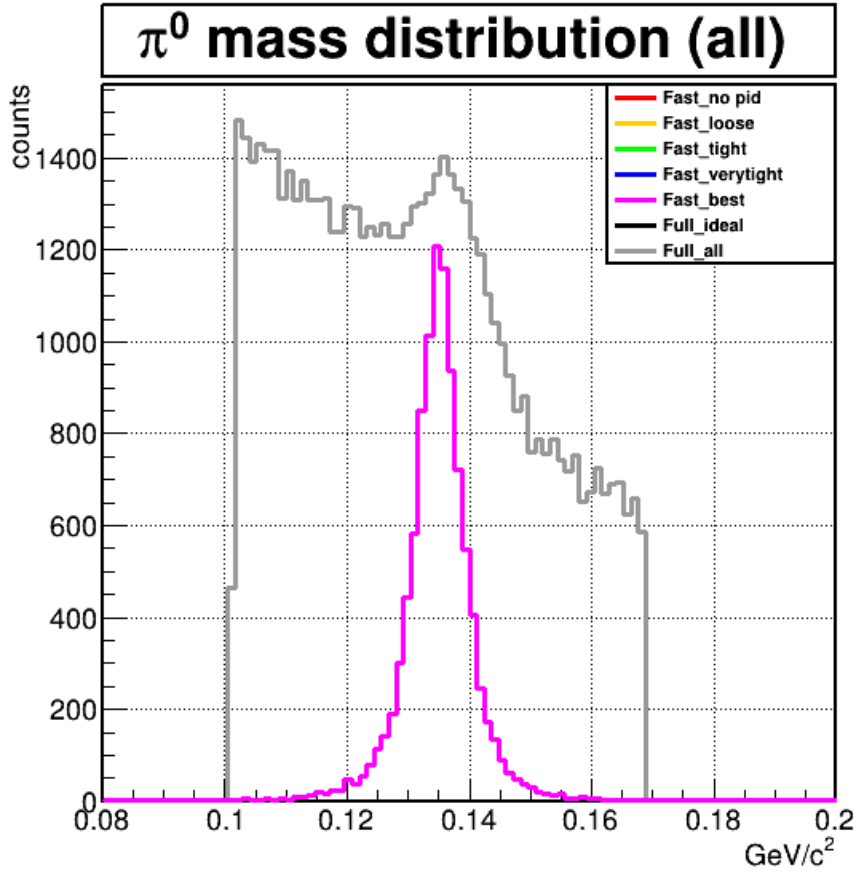
FastSim

1. all PID + All
2. all PID + Loose
3. all PID + Tight
4. all PID + VeryTight
5. all PID + Best

10k evt
#24697



10k evt
#24697

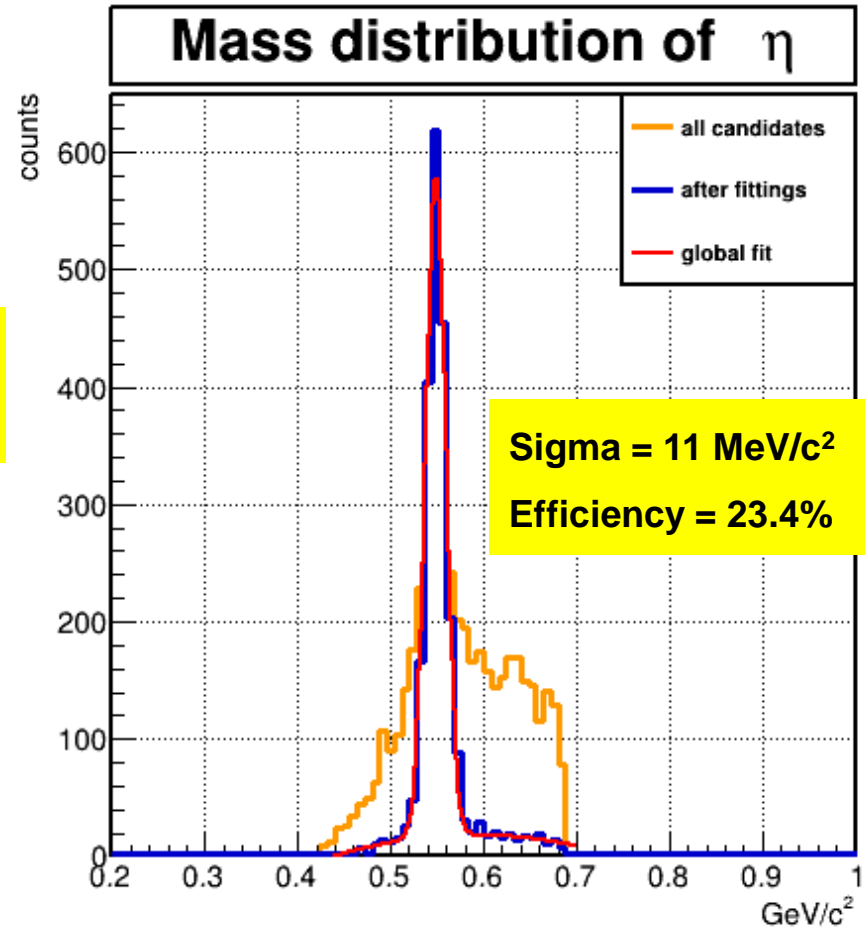
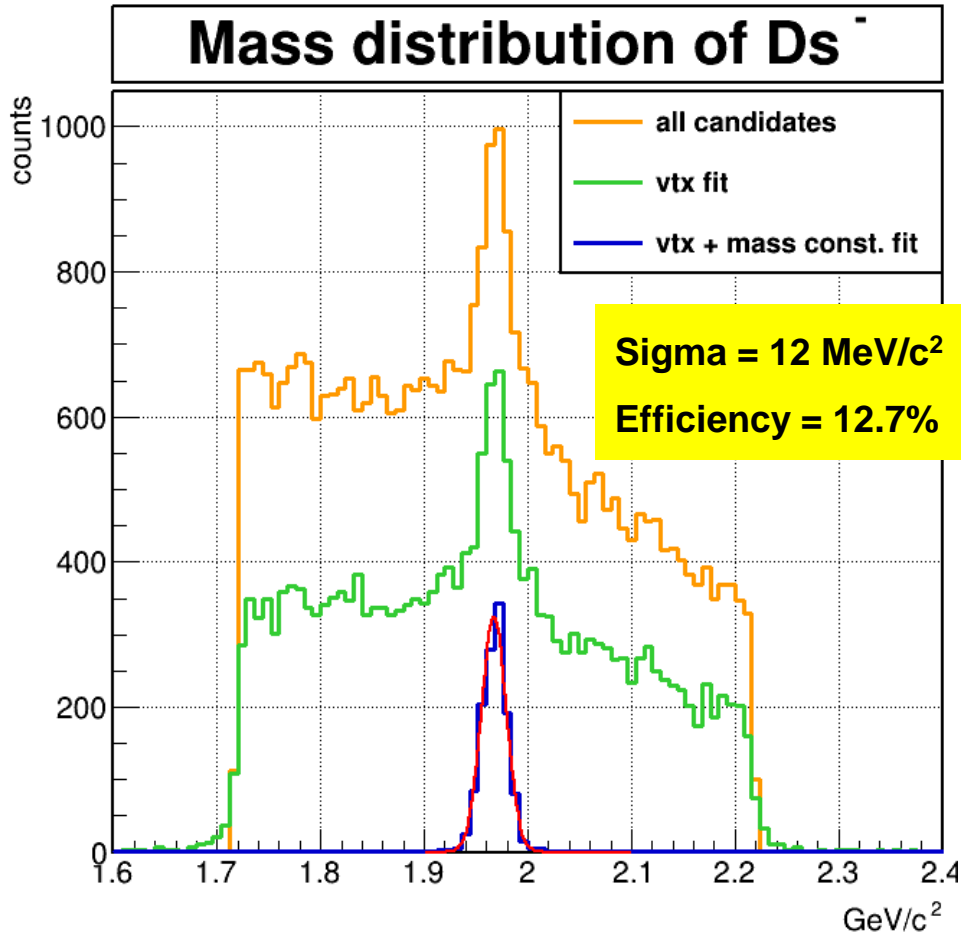


Updates in full simulation

- PID-All
- decay length
- invariant mass squared of lepton-neutrino system (regarding to semileptonic form factor)

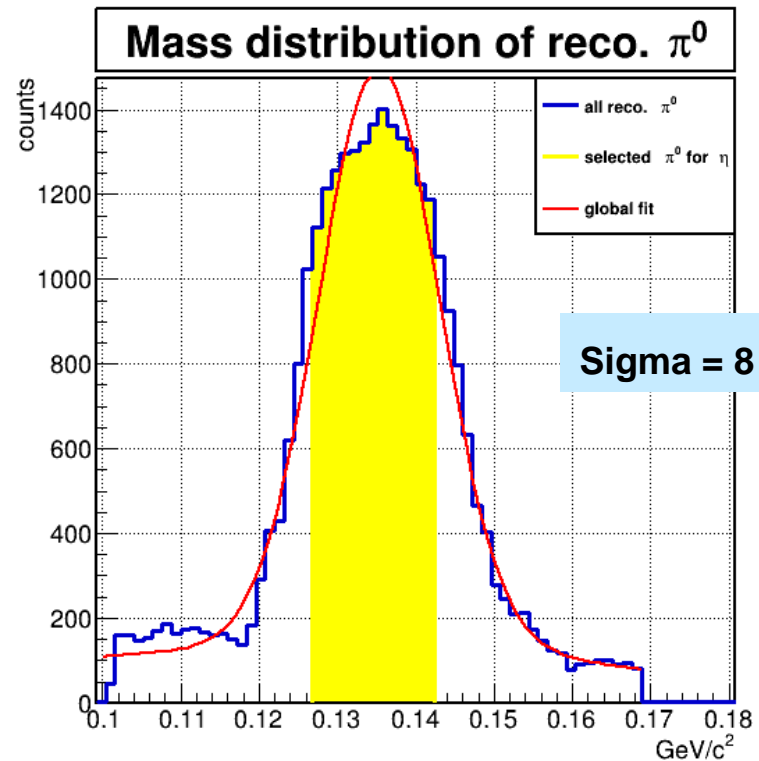
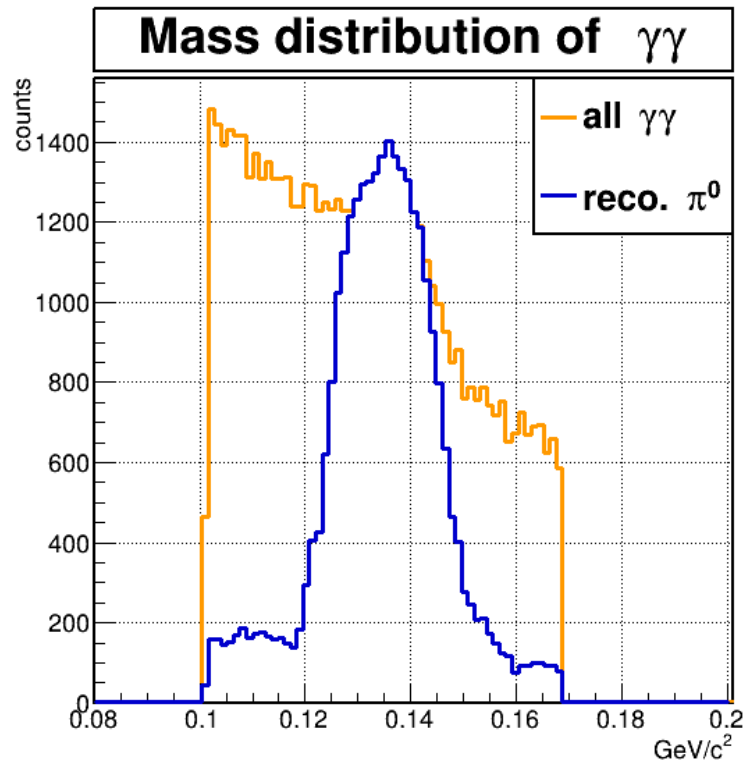
Full Simulation

10k evt
#24697



Full Simulation

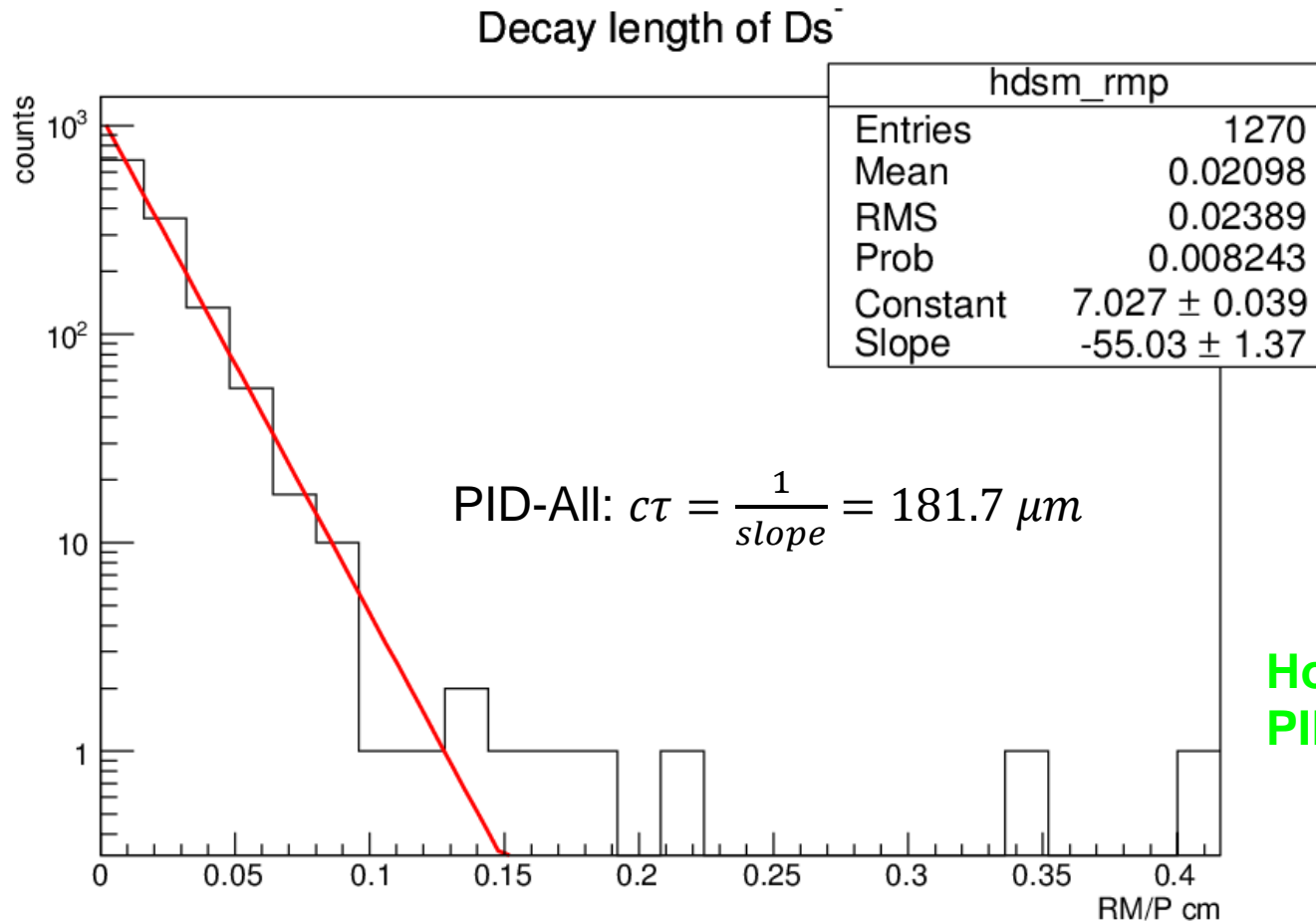
10k evt
#24697



Problems of too-small-Chi2 are still here: mass constraint fit of π^0 and η .

Full Simulation

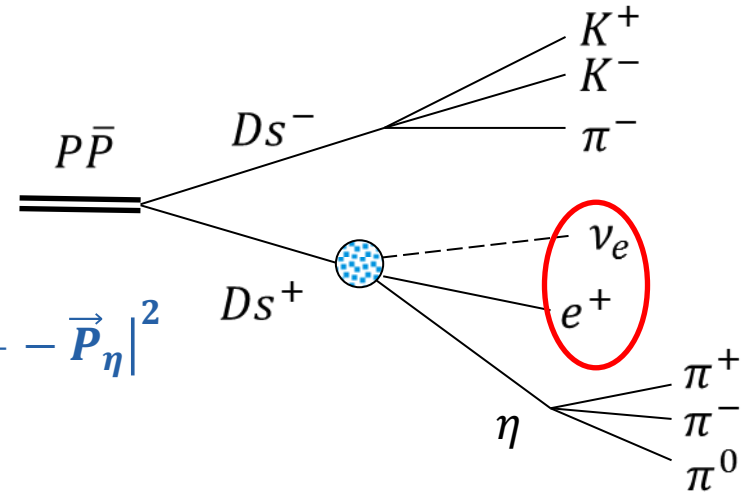
PDG: $c\tau (D_s^-) = 150 \mu m$



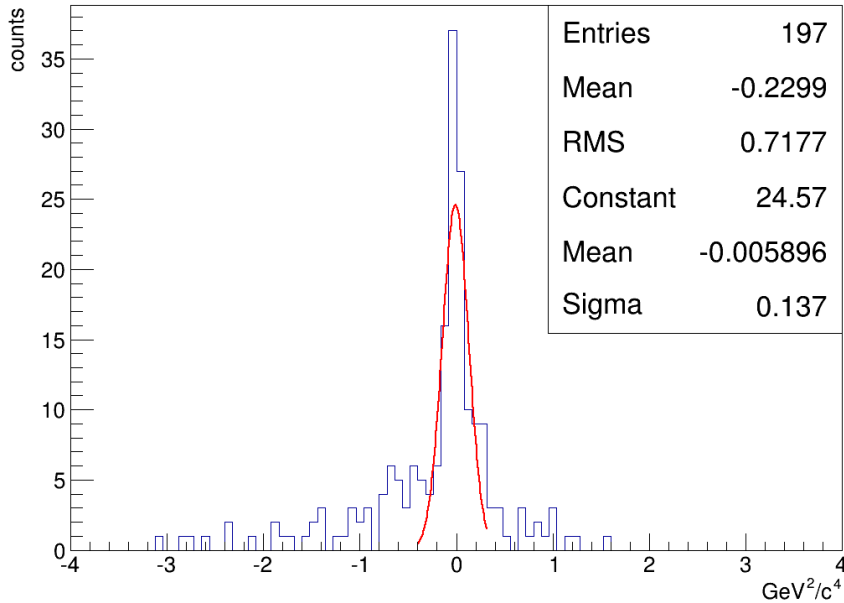
How's it with Ideal PID + Loose?

Full Simulation

- 10k evt
- Ideal PID + Loose (#24300)
- $q^2(e^+ \nu_e) = (E_{P\bar{P}} - E_{Ds^-} - E_\eta)^2 - |\vec{P}_{P\bar{P}} - \vec{P}_{Ds^-} - \vec{P}_\eta|^2$
- $\text{eff.}(e^+ \nu_e) \sim 2\%$



Invariant mass squared of ν_e



Invariant mass squared of $(e^+ \nu_e)$

