$B^0 \to K^* \mu^- \mu^+$ Update

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$B^0 \to K^* \mu^- \mu^+$ meeting, CERN
January 31, 2017

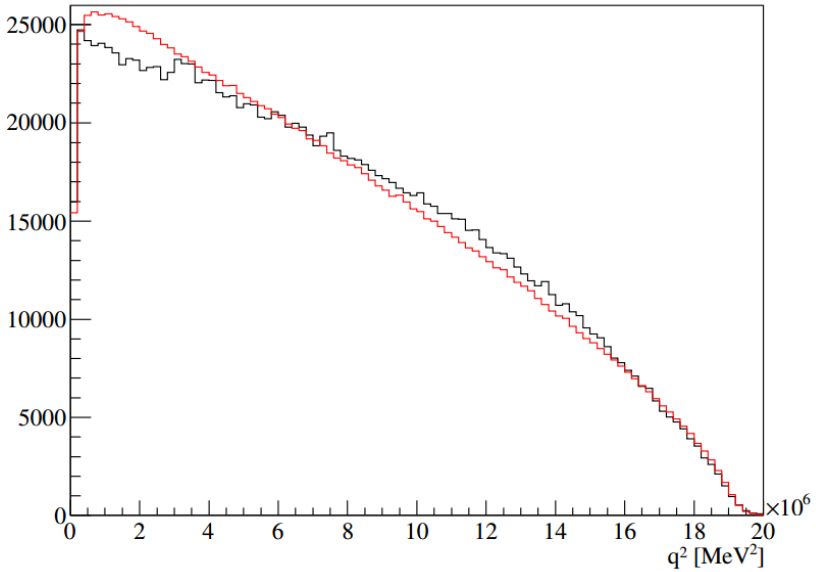
The need for MC

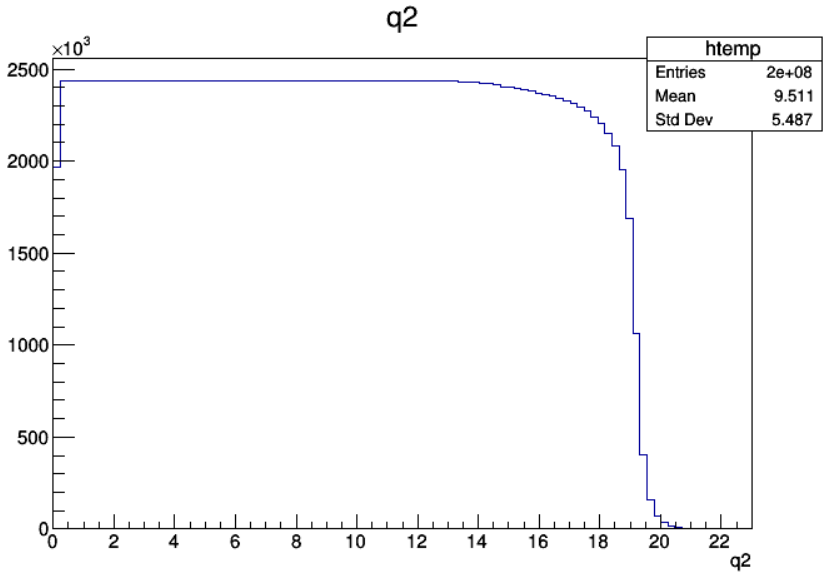
⇒ New analysis will need new/Run2 MC. Already in progress:

34950	Simulation	Active	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MU - Marcin (Kstm…	Beam6500GeV-2016-MagUp-Nu1.…	Sim09b/Trig0x6138160F/Reco16/T…	11114014	24,000,000	5,387,917	22
34947	Simulation	Active	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MD - Marcin (Kstm…	Beam6500GeV-2016-MagDown-N…	Sim09b/Trig0x6138160F/Reco16/T…	11114014	24,000,000	5,402,480	22
34942	Simulation	Active	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MU - Marcin (Kstmm)	Beam6500GeV-2016-MagUp-Nu1.…	Sim09b/Trig0x6138160F/Reco16/T…		750,000	49,561	6
34941	Simulation	Active	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MD - Marcin (Kstmm)	Beam6500GeV-2016-MagDown-N…	Sim09b/Trig0x6138160F/Reco16/T…		750,000	24,566	3
34935	Simulation	Active	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MU - Marcin (Lbmm)	Beam6500GeV-2016-MagUp-Nu1.…	Sim09b/Trig0x6138160F/Reco16/T…		300,000	49,187	16
34934	Simulation	Active	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MD - Marcin (Lbmm)	Beam6500GeV-2016-MagDown-N…	Sim09b/Trig0x6138160F/Reco16/T…		300,000	27,820	9
34933	Simulation	PPG OK	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MU - Marcin (phimm)	Beam6500GeV-2016-MagUp-Nu1.…	Sim09b/Trig0x6138160F/Reco16/T…	13114002	150,000	0	0
34932	Simulation	PPG OK	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MD - Marcin (phimm)	Beam6500GeV-2016-MagDown-N…	Sim09b/Trig0x6138160F/Reco16/T…	13114002	150,000	0	0
34927	Simulation	Done	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MU - Marcin (Kmm)	Beam6500GeV-2016-MagUp-Nu1.…	Sim09b/Trig0x6138160F/Reco16/T…	12113001	250,000	361,849	144
34923	Simulation	Done	2a	RDWG - Reconstructible Filtered - Sim09b 2016 - MD - Marcin (Kmm)	Beam6500GeV-2016-MagDown-N…	Sim09b/Trig0x6138160F/Reco16/T…	12113001	250,000	361,957	144

The need for MC - improvements

⇛ If you recall in Run1 we had PHSP MC:





⇛ More flat makes our life easier and less dirty in terms of reweighing :)

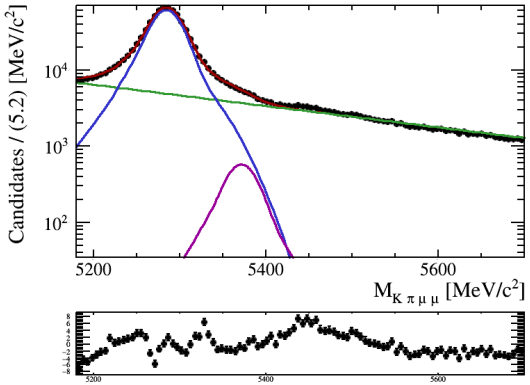
⇛ Produced 20M events so we can get the correction for small "non-flatness". (will give you links at the end).

The data

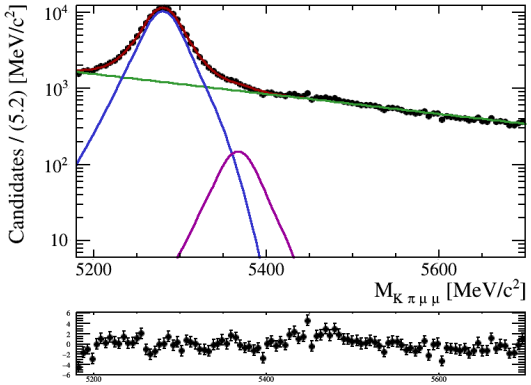
⇛ Reprocessed all the data with the same DV. Both 201(1,2,5,6) data sets.

⇛ Also reprocessed all MC for Run1. Run2 scripts are written and will be lunch as soon the production finishes

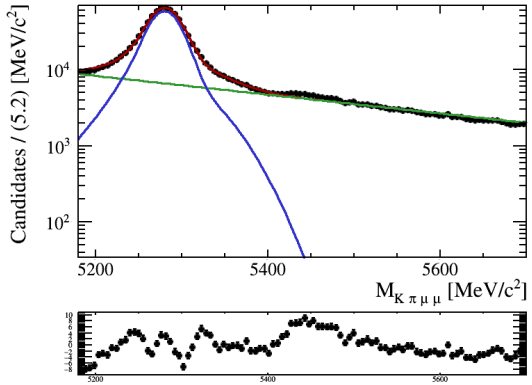
⇛ First look at data:



$N^{Run1}_{J/\psi K^*} = 641446$



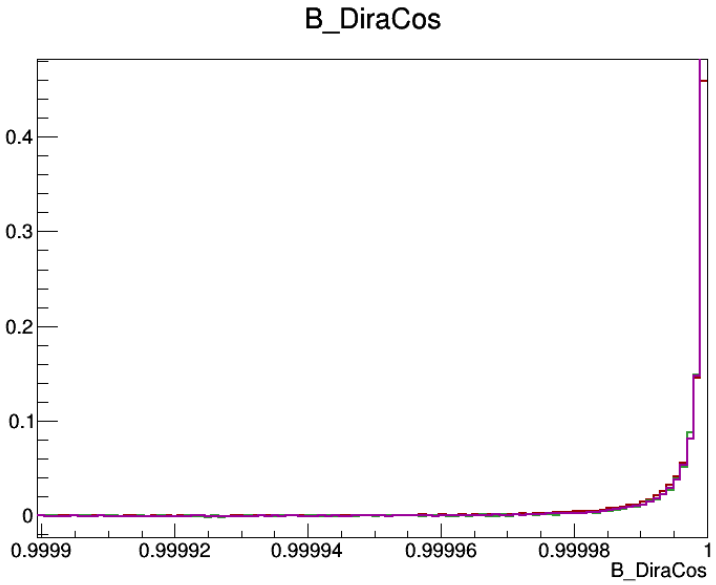
$N^{2015}_{J/\psi K^*} = 106149$

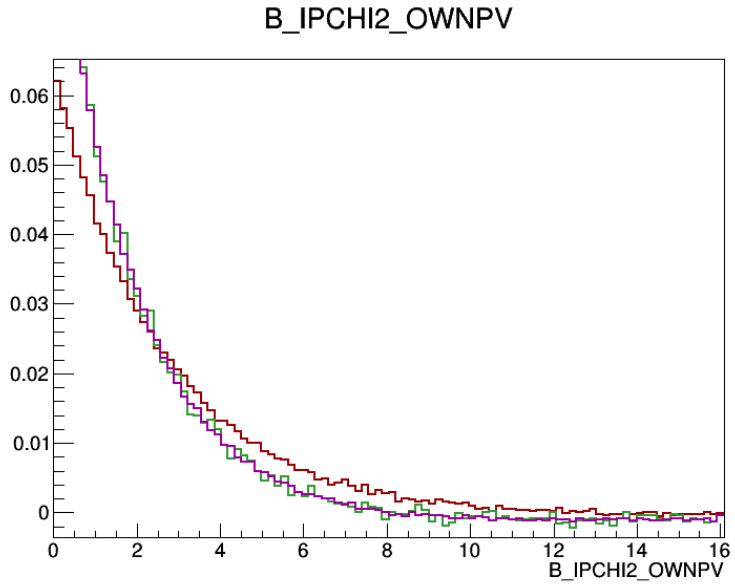


$N^{2016}_{J/\psi K^*} = 626024$

The data- comparing distributions

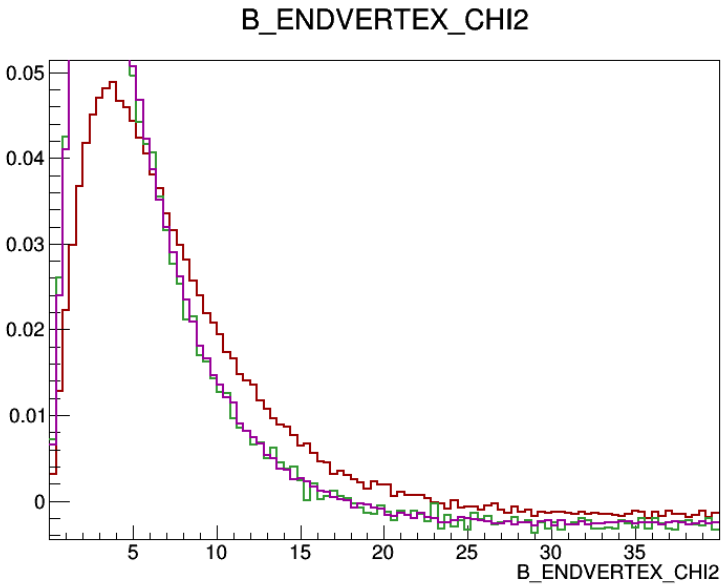
⇒ Over all we see a very good agreement between the year:

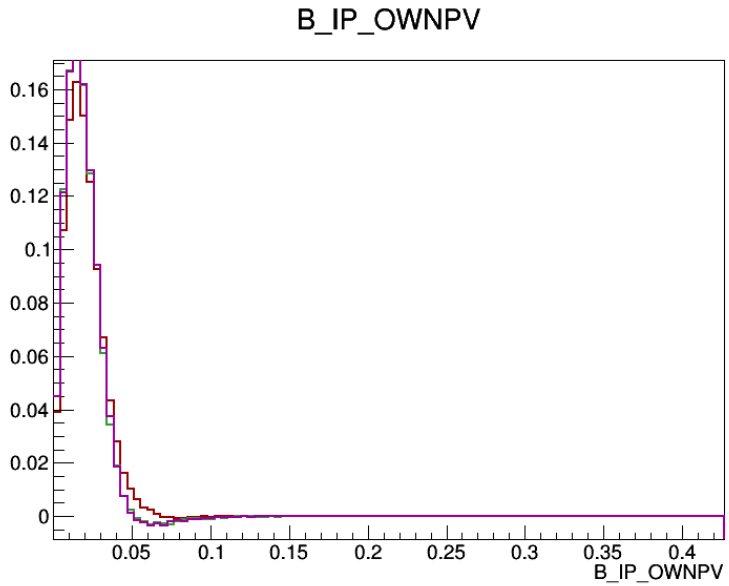


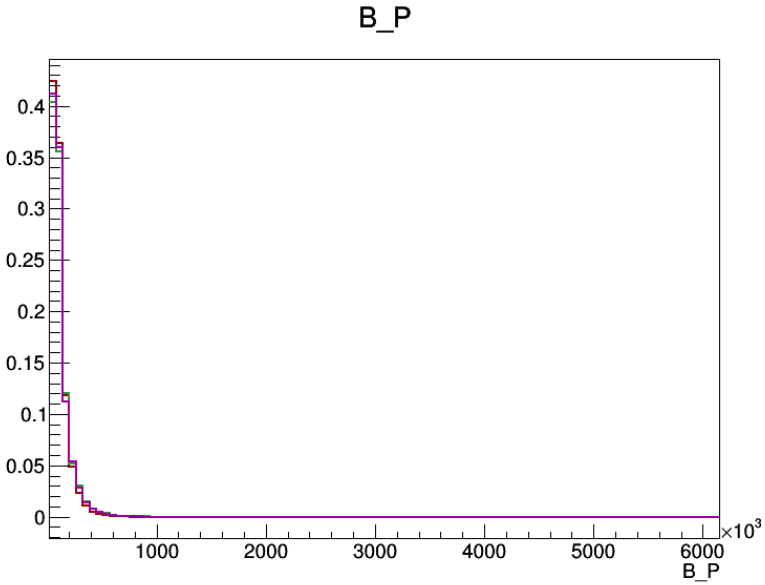


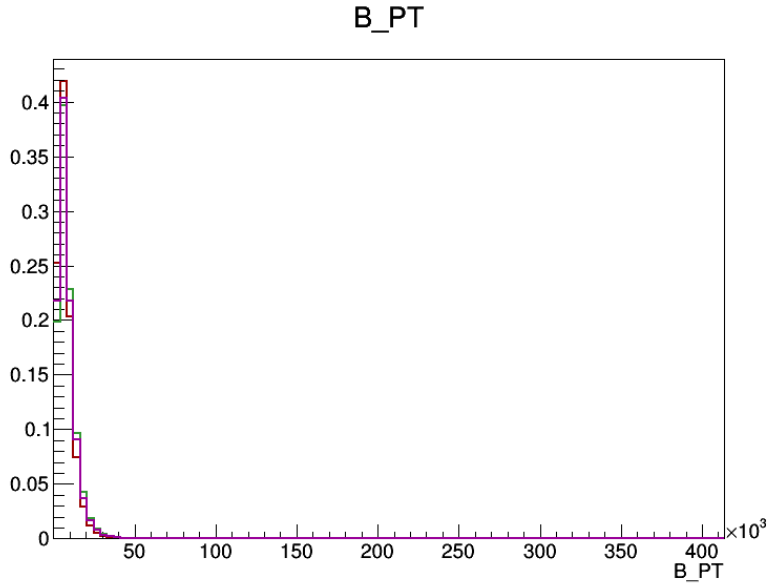
The data- comparing distributions

⇒ Over all we see a semi good agreement between the year:









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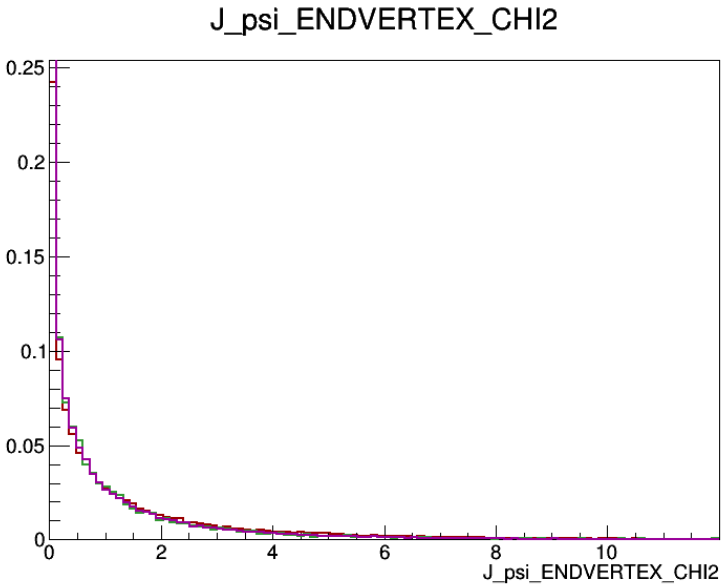

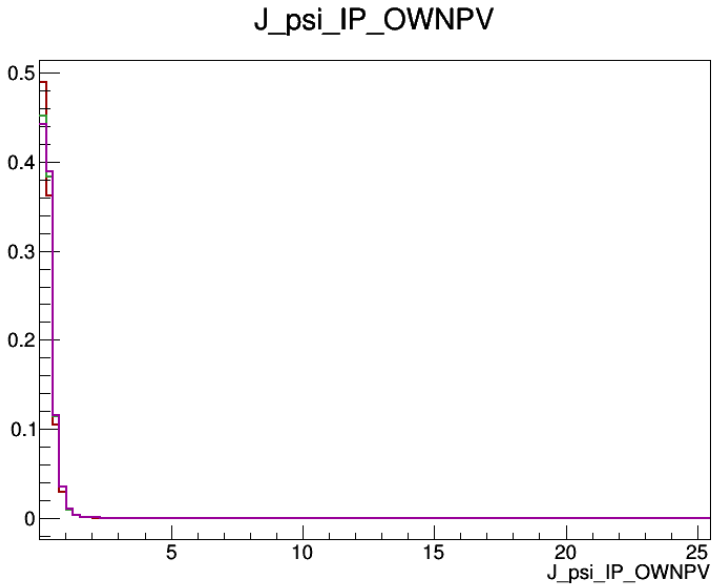

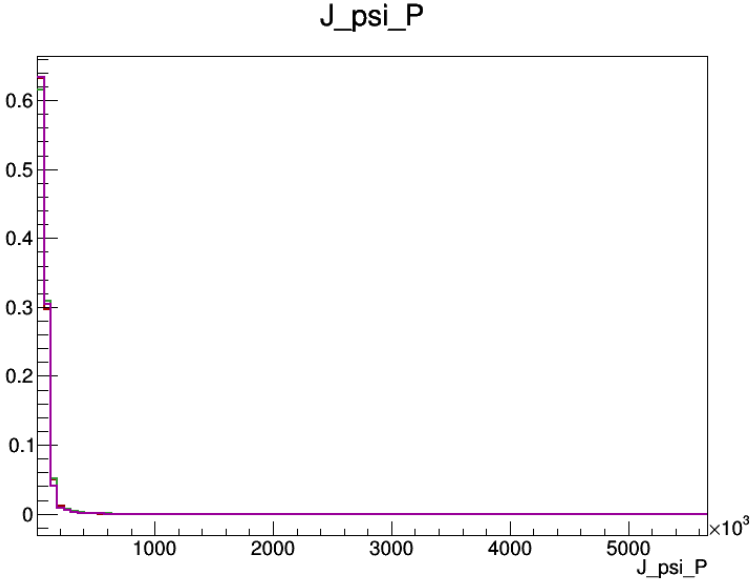

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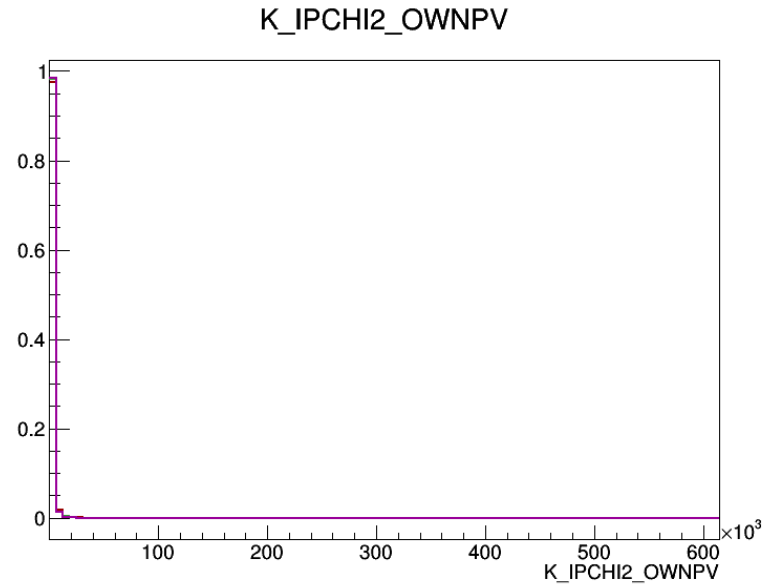

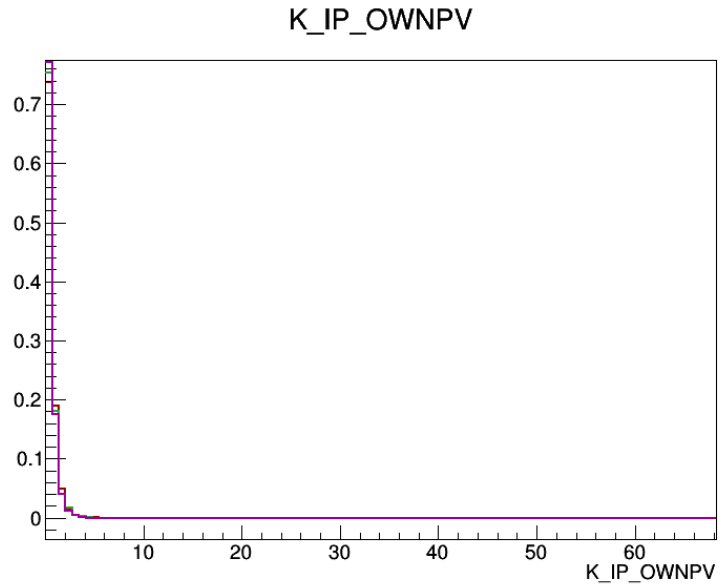

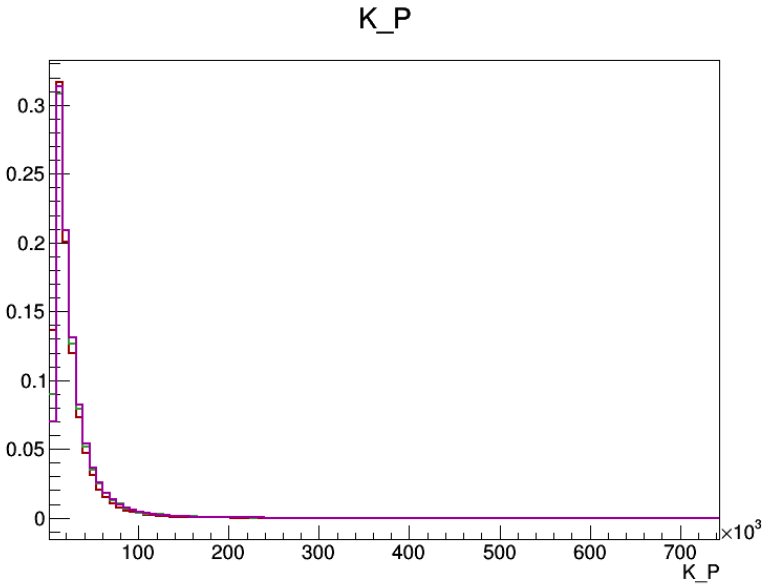

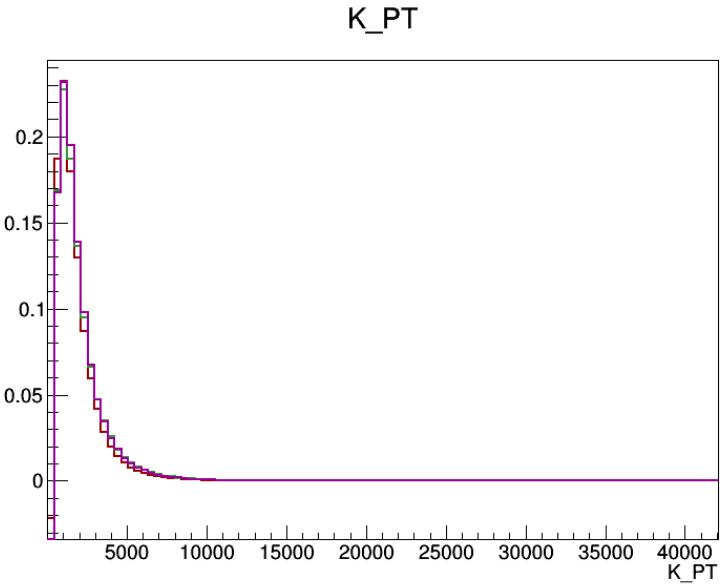

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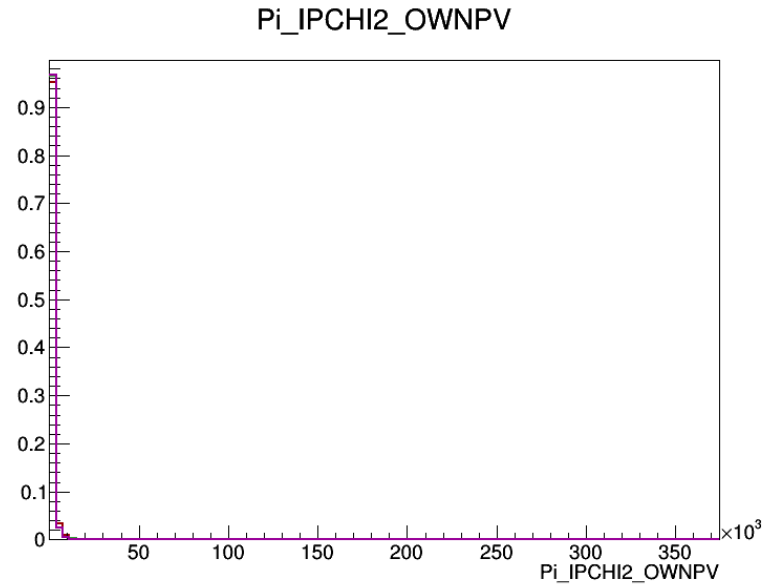

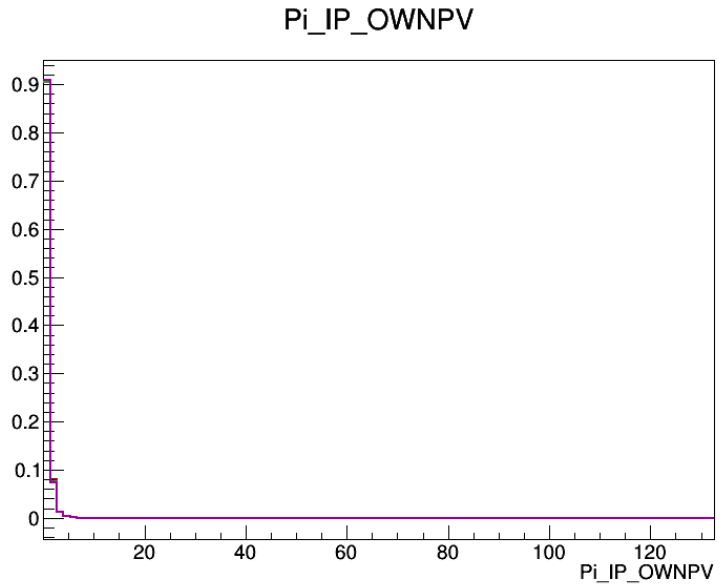

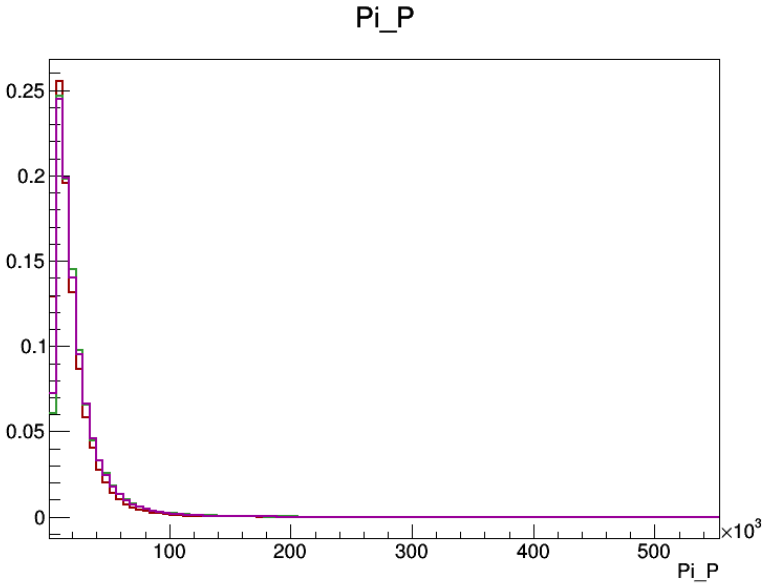

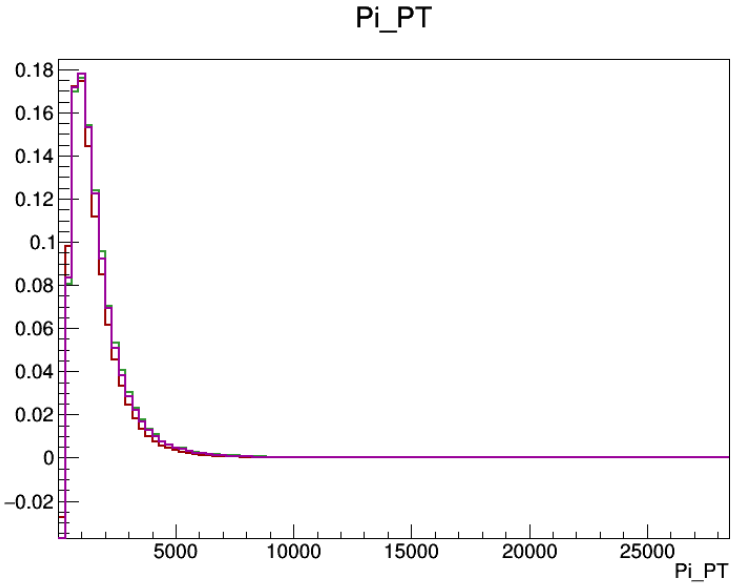

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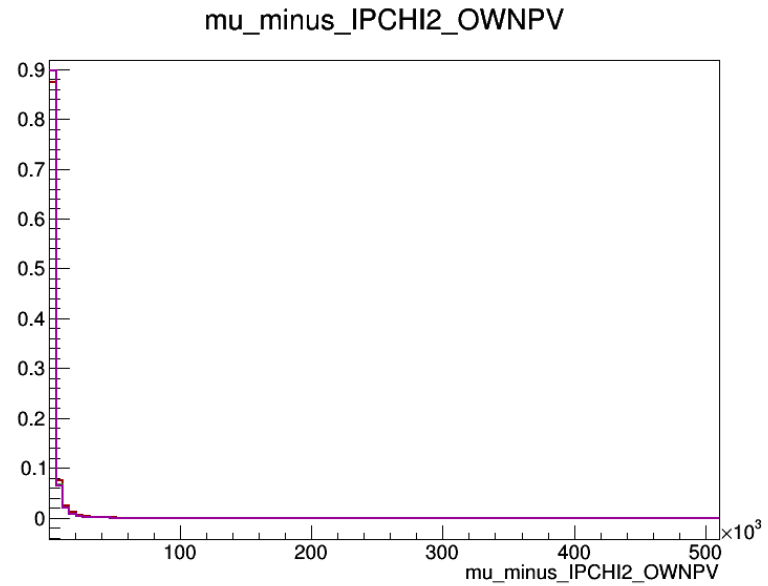
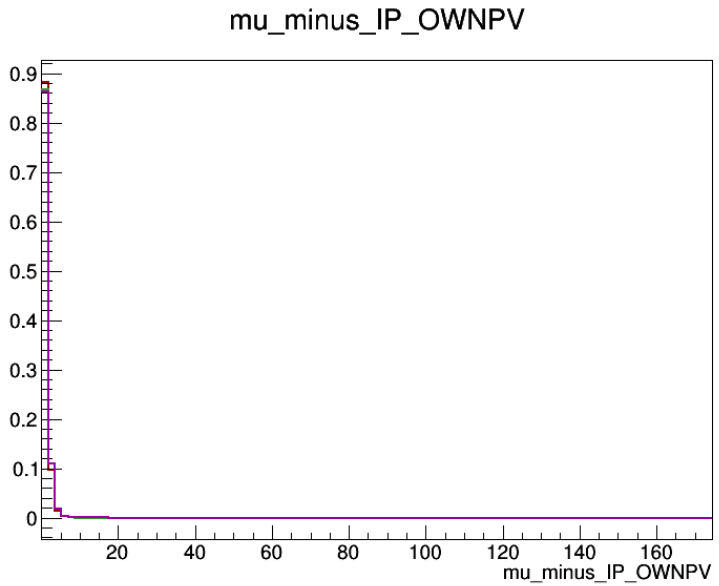
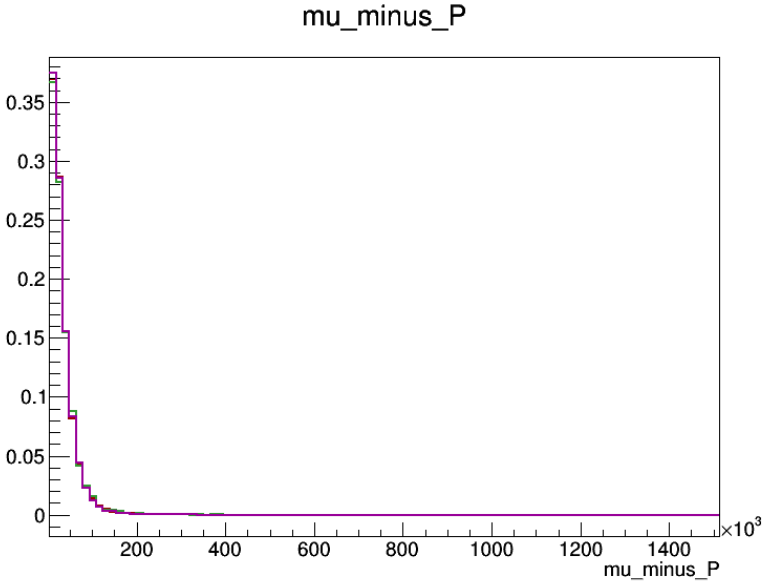
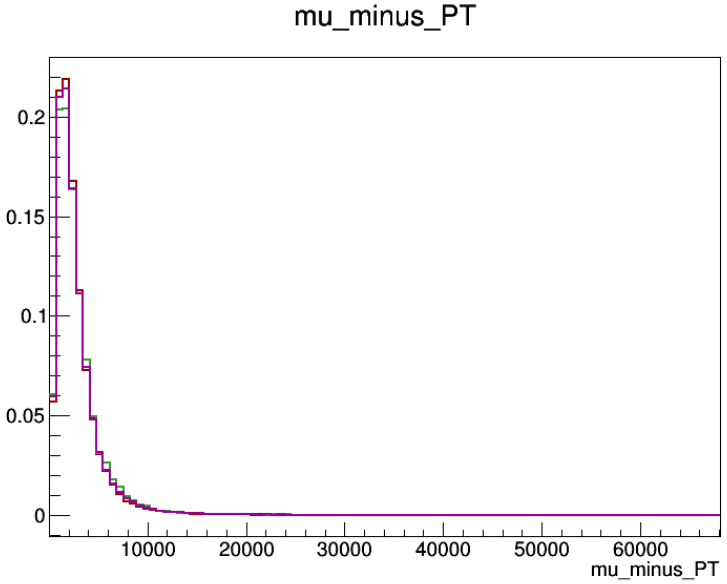








Selection

⇛ Now we had the pre selection developed for Run1!

⇛ Known VETOS:

- Swaps with $B \longrightarrow K^* J/\psi$
- Λ_b
- Random pion in $B \longrightarrow K\mu\mu$.
- $B_s^0 \longrightarrow \phi\mu\mu$.

⇛ The same triggers as Run1. Need MC to check it for Run2. Have script read to calculate everything so next week we will have numbers.

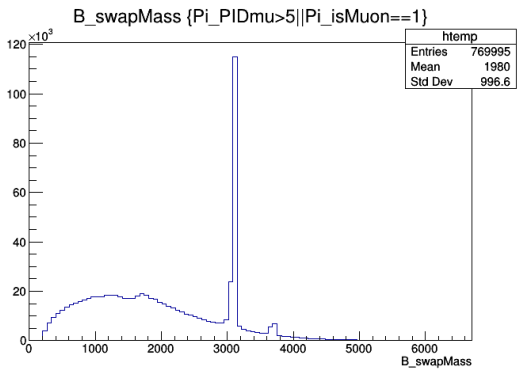
Selection

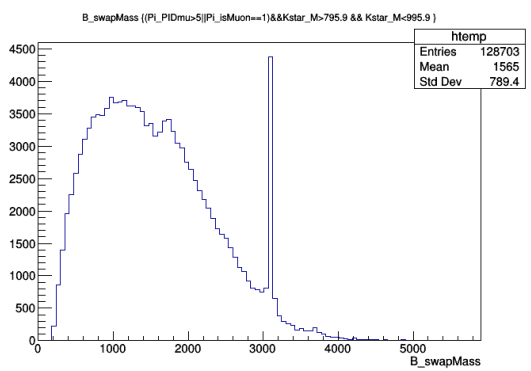
⇛ We have missed one cut unfortunately.

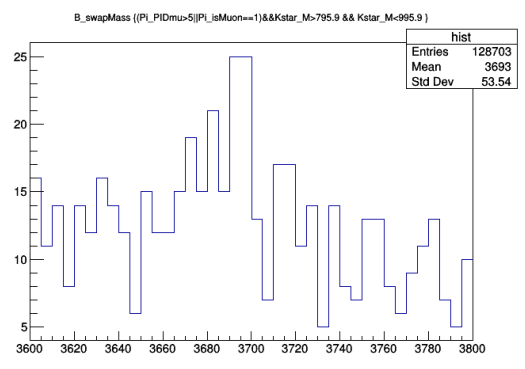
⇛ Normally we have the swap for J/ψ:

```
"!((B0_swapMass>3036) and (B0_swapMass<3156) and
(Pi_PIDmu>5||Pi_isMuon==1)) and !((B0_kmuswapMass>3036)
and (B0_kmuswapMass<3156) or (K_PIDmu>5||K_isMuon==1))"
```

⇛ We forgot about the $\psi(2S)$:







⇛ Impact for the Pwave analysis minimal but let's veto just to be sure :)

⇛ The $m_{K\pi}$ preseleciton cut increased to $1530\ \mathrm{MeV}$ to cover the future moments analysis.

EOS

PID

Ongoing

$\Rightarrow$ Downloaded all the needed PIDCalib samples for re sampling. First re sampled distributions should be ready next week.
$\Rightarrow$ EOS TOYS generated. Need to calculate the integrated observables.
$\Rightarrow$ BDT strategies: Keep varaibles as they are and don't spend to much time on this. Run2 needs separate BDT: small studies planned MC vs DATA training.

What we have

$\Rightarrow$ All ntuples are on eos:
`/eos/lhcb/user/m/mchrzasz/KstarMuMu`

- data w/o selection
- data after selection
- TOY MC: EOS + FlatQ2
- Run1 MC
- Run MC(will be copied once it's ready)
- PIDCalib samples.

Backup