$B^0 \to K^*\mu^-\mu^+$ EvtGen Model

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MC meeting, CERN
November 1, 2016

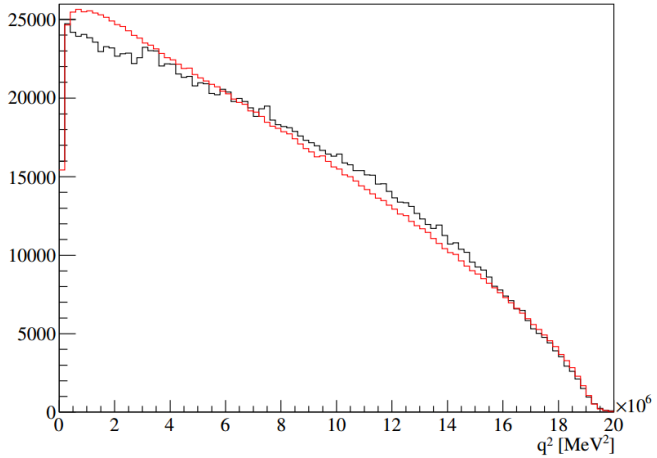
Acceptance correction

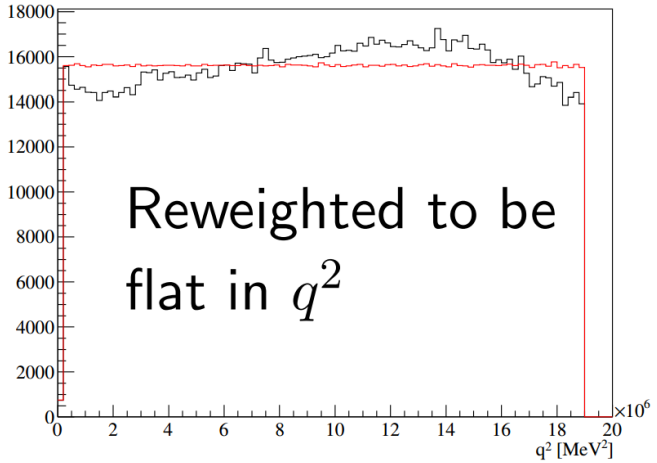
⇛ The decay of $B^0 \to K^* \mu^- \mu^+$ is described by 3 helicity angles and the invariant mass squared of two leptons (q^2).

⇛ In order to model the detector acceptance we have used a large MC sample of PHSP simulated events.

⇛ There is a caveat: the q^2 distribution.

⇛ We had to reweight it to make it flat.





Can we optimize it?

⇛ It would be nice if we could generate not only the flat angle distributions but also a flat q^2.

⇛ There exists already a model for it: `FLATQ2`.

⇛ It basically reweighs the distribution by $1/p_T^{\mathrm{had}}$.

⇛ The problem is that it was design to generate the flat distribution of decays $B \to X\ell\nu$:

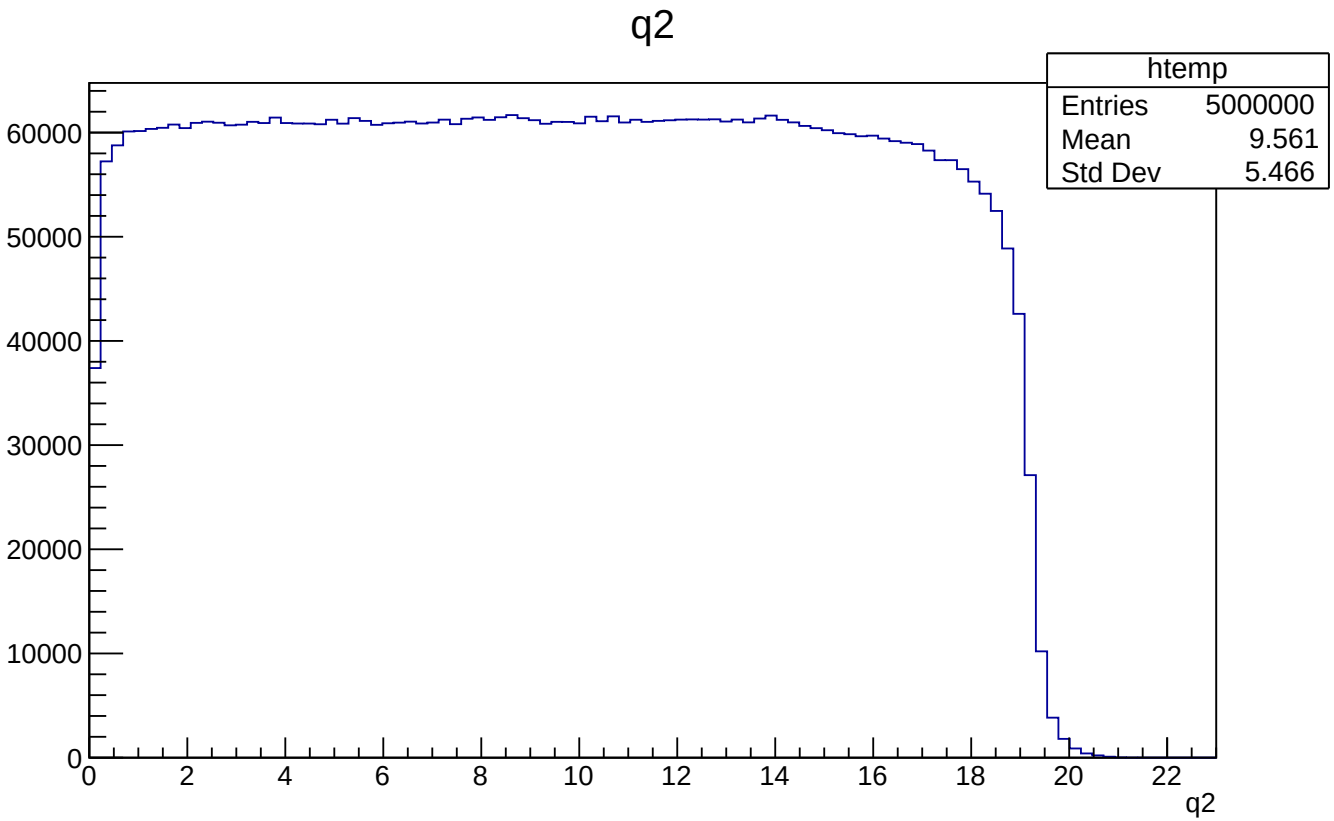
```
void EvtFlatQ2::init(){

  // check that there are 0 arguments
  checkNArg(0);
  checkNDaug(3);

  //We expect B->X l nu events
  checkSpinParent(EvtSpinType::SCALAR);
  checkSpinDaughter(1,EvtSpinType::DIRAC);
  checkSpinDaughter(2,EvtSpinType::NEUTRINO);

}
```

⇛ Will not work in current version for $B \to K^*\mu\mu$.

Modifying the FLATQ2 1

⇛ I wrote a mirror model that requires that the two leptons are DIRAC, and called it FLATQ2EWP.

⇛ And improves the situation a lot:

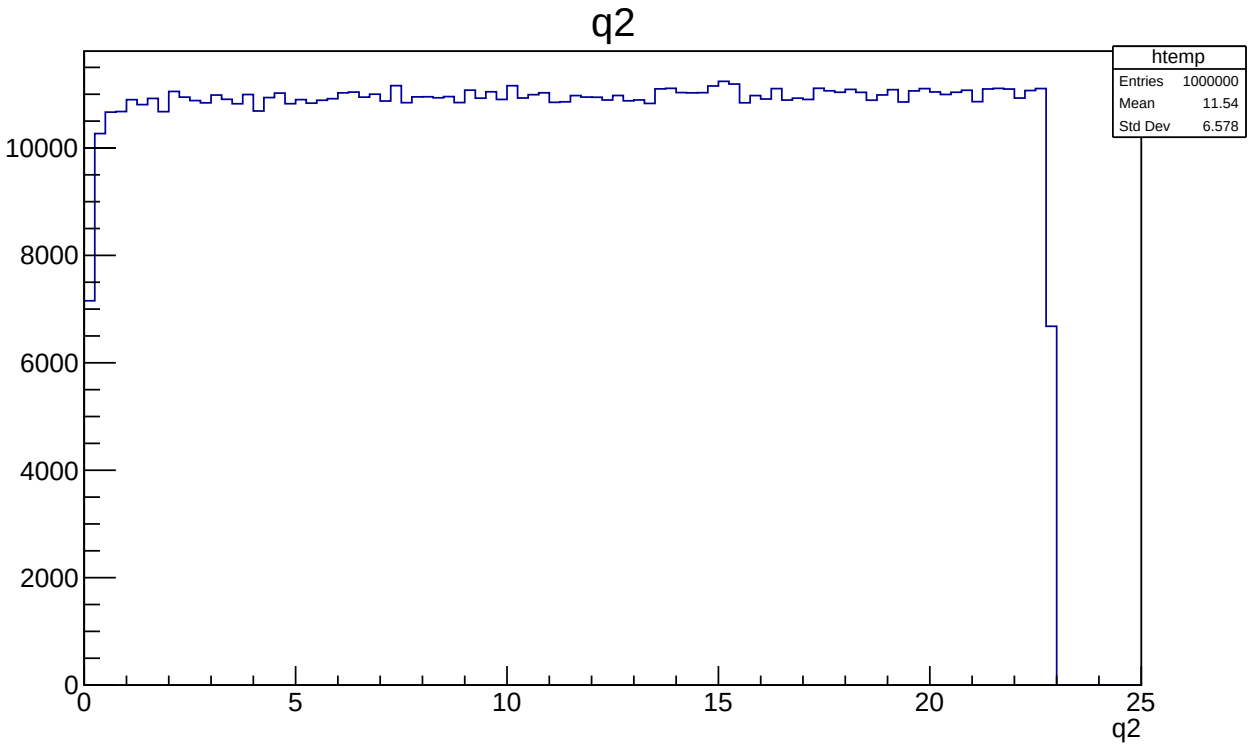


⇛ So much flatter but the and and the begging still not flat.

⇛ End of the spectrum is due to K^* width? ↠ Lets test it with B →

Modifying the FLATQ2 1

⇛ FLATQ2EWP use to simulate the $B \to K \mu\mu$:

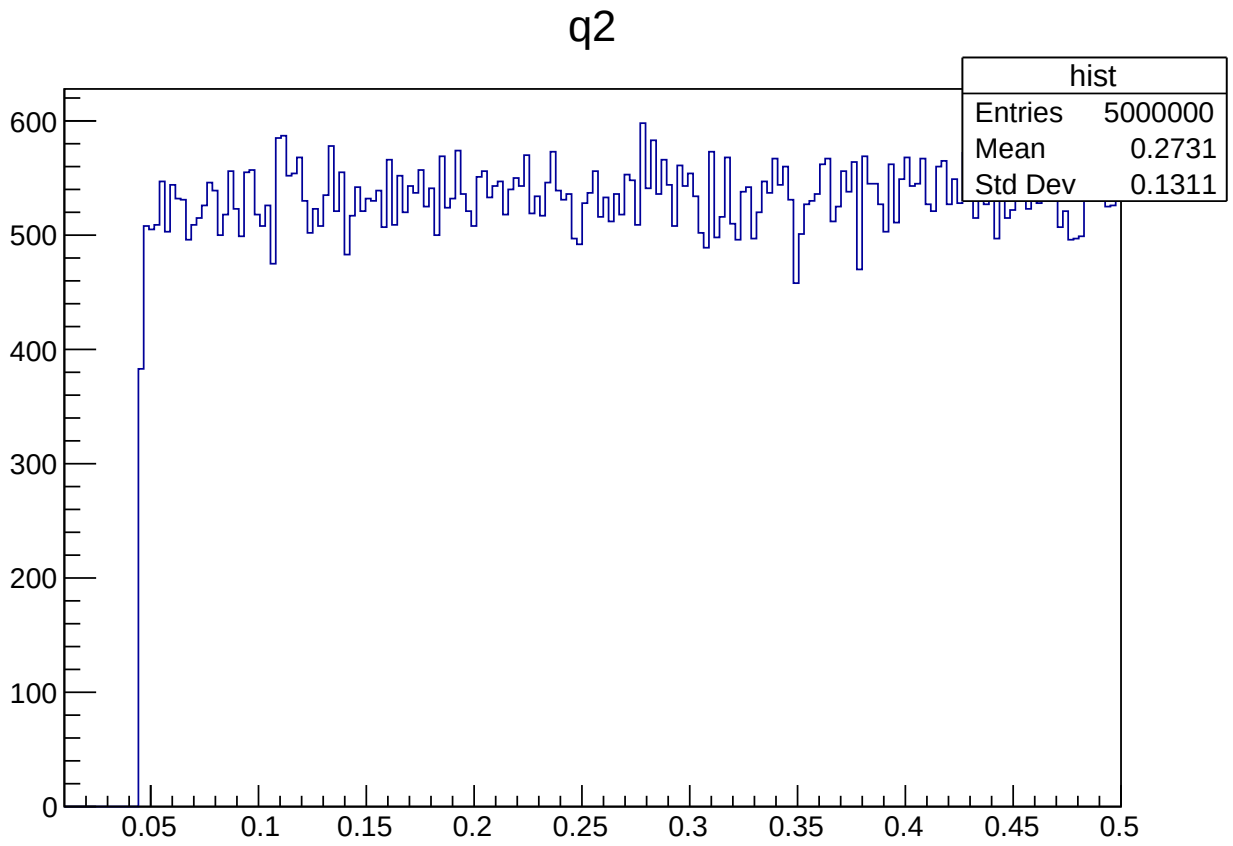


⇛ Oki so end of the spectrum is understood and not much can be done there.

⇛ Now the low q^2: Can this be just Phase space suppression: $\sqrt{1 - 4m_\ell^2/q^2}$

Modifying the FLATQ2 2

⇛ FLATQ2EWP with phase space suppression factor.



⇛ Now it's perfect.

FLATQ2 Conclusion

⇛ We prepared a new EvtGen model that would optimize the MC production for EWP angular analysis.
⇛ The model is a extension of existing model with PHSP correction.
⇛ Could this model be put inside LHCb simulation?
⇛ All the feedback is welcome!

Backup