The L0 Muon Trigger and Offline Selected Events

- Present relevant questions:
  - How the muon trigger affects the offline selection of interesting physics channels?
  - What are the present L0 efficiencies (normalised to offline selection)?
    - ➔ For physics channels with available lists of selected run/event numbers

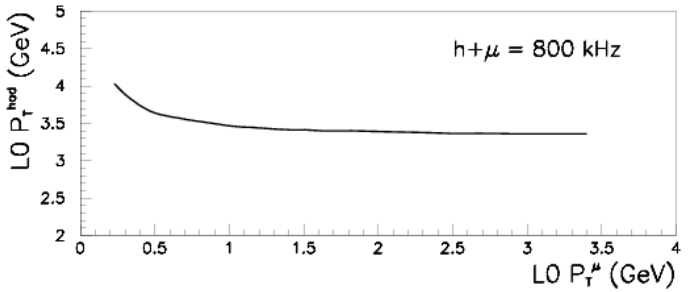
      B_s -> J/$\Psi(\mu\mu)$ ϕ (KK)

      B_d -> π π
    - ➔ inclusion of other channels as they become available ...

      B_s -> Ds($KK\pi$) K, B_d -> K* γ
  - First hints on the L0 bandwidth division with LHCb-light setup ...
  - Effects of multiple interaction events and the pile-up veto

Details of the Study

- Main set-up:
  - single interaction events (taken from MC info)
  - pile-up veto ignored
  - h+μ triggers -> 800 kHz
  - other triggers -> 200 kHz



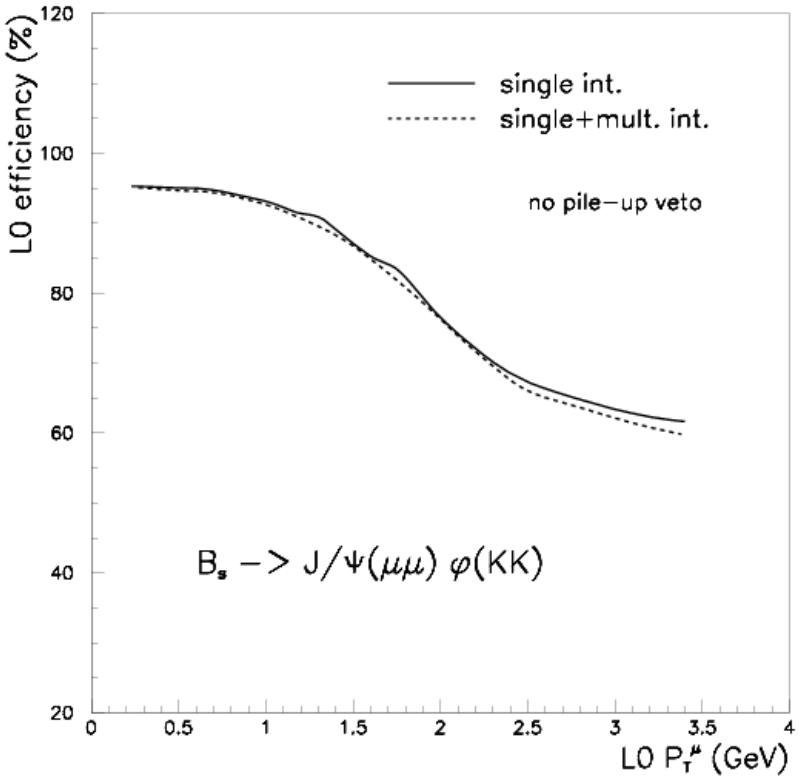
- Procedure:
  - vary the μ P_T threshold ...
  - adjust the hadron P_T threshold for h+μ = 800kHz
    (h/μ bandwidth division changes accordingly)
  - Repeat all including also true multiple interaction events

L0 Efficiency for B_s->J/Ψ(μμ) φ (KK) Offline Selected Events

Results encouraging!

- ☑ In the range 0.5-1 GeV
  (relevant for studies of muon group)
  the efficiency is rather constant
- ☑ At high P_T the eff. flattens off
  as the hadron trigger dominates
- ☑ Inclusion of multiple interactions
  has little effect

(efficiency calculated wrt offline selected events!)

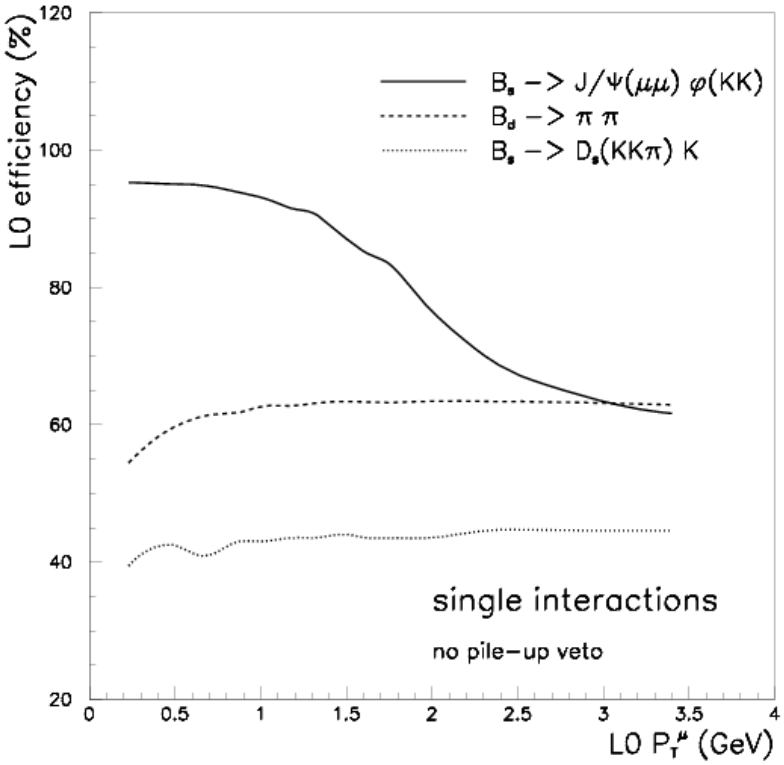


Antagonistic Trigger Behaviours:
B_s->J/Ψ(μμ) φ (KK) and
B_d->ππ , B_s->D_s(KKπ) K

- Procedure repeated for other channels …
  - single interaction events
  - pile-up veto ignored

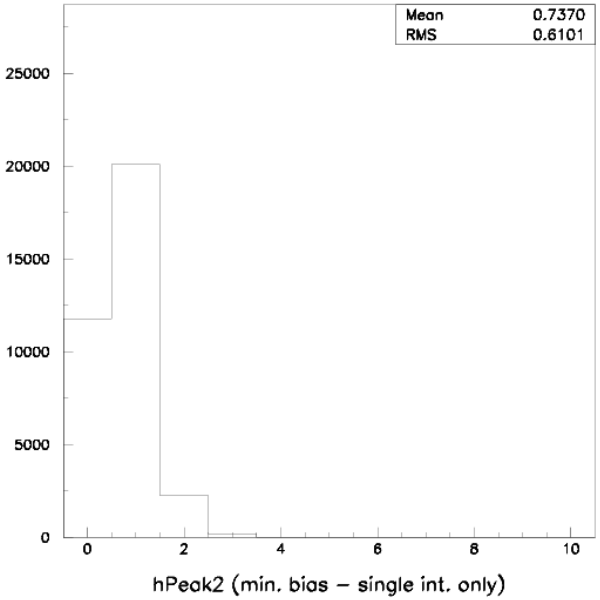
- B_s->J/Ψ(μμ) φ (KK) eff. ➡ P_T of μ
- B_d->ππ eff. ↗ P_T of μ at low end
- B_s-> D_sK eff. ↗ P_T of μ at low end

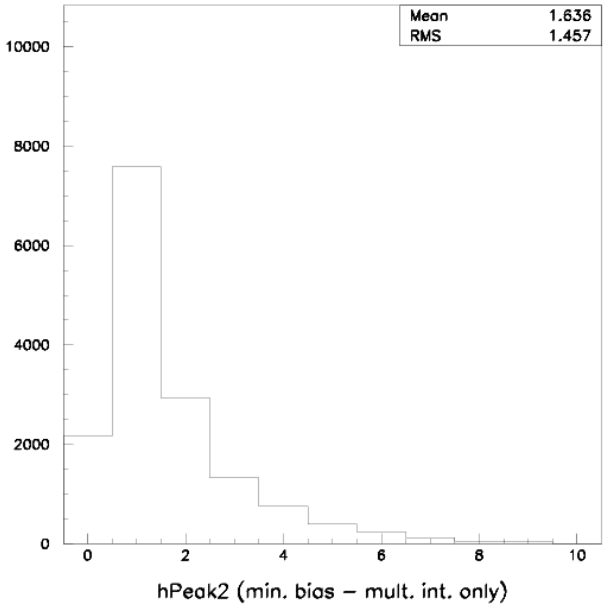
- Bandwidth division has net effect!
- P_T of μ ~ 0.8–1 GeV preferred …



Simple Model for the Pile-up Veto

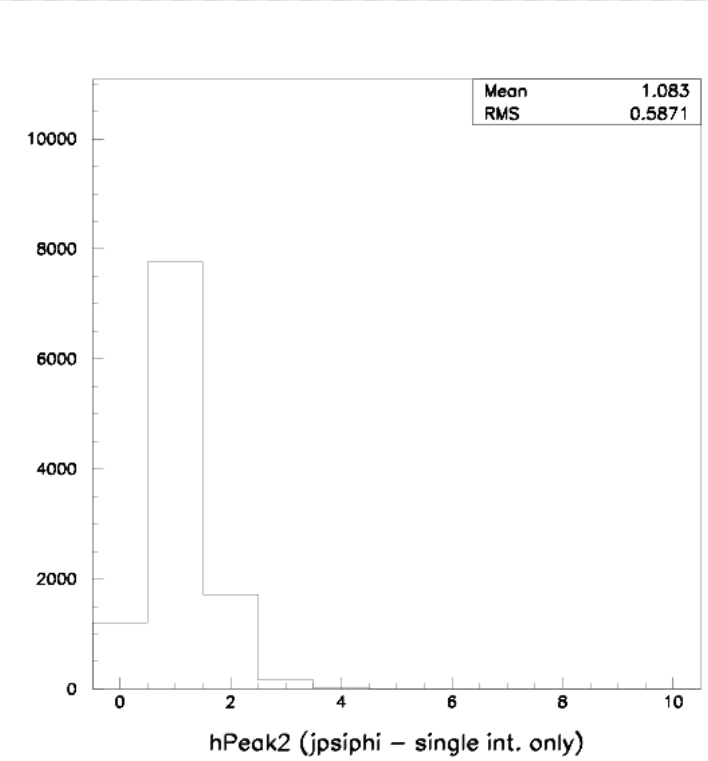
- Present pile-up veto is known to be vetoeing too much
- ➔ use simple model: veto if height of 2nd peak of algorithm > 2

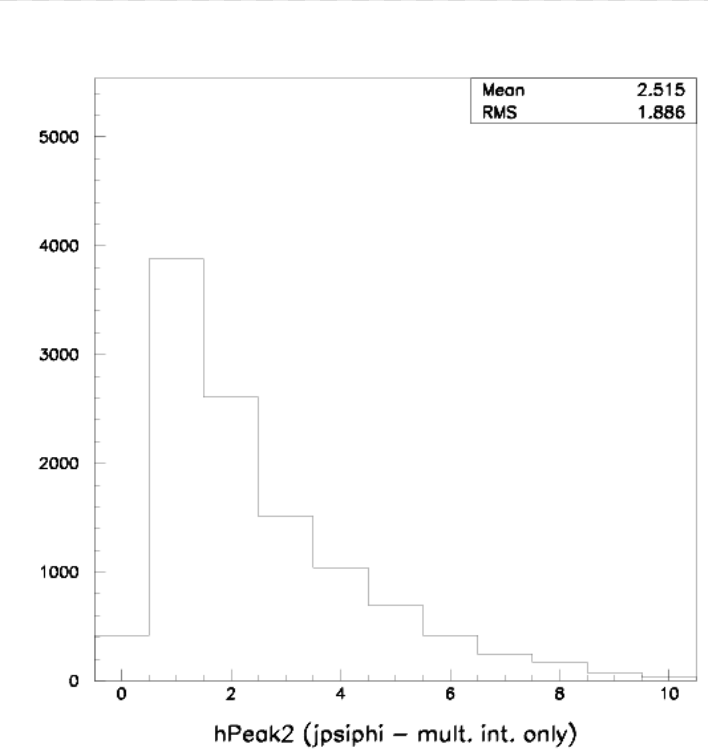




Simple Model for the Pile-up Veto (II)

- recovers ~ 15% of signal events (from hPeak2 cut at 2 -> 3)





Simple Model for the Pile-up Veto : effect on B_s->$J/\Psi(\mu\mu)\ \phi\ (KK)$

- A “softer” pile-up veto has a small effect on the L0 efficiency for selected events
- Data seems to indicate that we can cope (to a certain extent) with multiple Interaction events
- same conclusion can be drawn for (at least) B_d->$\pi\pi$