L0 Bandwidth Division Status

Eduardo Rodrigues

- Physics channels under study and set-up
- Simple model of the pile-up veto
- Effect of different pile-up veto scenarios on the L0 performance on signal events
- L0 bandwidth division for the hadron and muon triggers

Physics Channels under Study

- ✓ Physics channels studied (available lists of selected run/event numbers)

  B_s -> J/$\Psi(\mu\mu)$ ϕ (KK)

  B_d -> π π

  B_s -> $D_s(KK\pi)$ K

- ✓ Only for true single interaction events

  ➔Questions/comments to physics group:

  - can multiple interactions be used offline?

  - when will these singl. + mult. int. samples become available?

  ➔ This will have a non-negligible impact on the BwD studies …

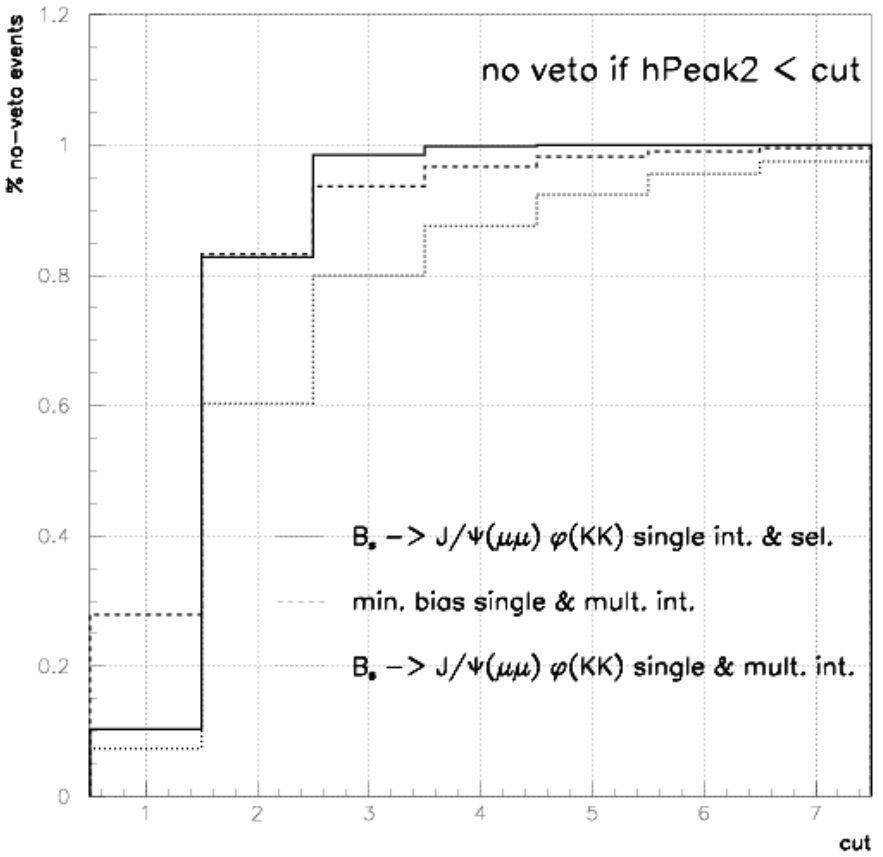
Procedure

- Main set-up:
  - single interaction events for signal events (taken from MC info)
  - h+μ triggers -> 800 kHz
    of min. bias events (single and multiple interactions)
  - other triggers -> 200 kHz

- Procedure:
  - vary the μ P_T threshold ...
  - adjust the hadron P_T threshold for h+μ = 800 kHz
    (h/μ bandwidth division changes accordingly)
  - various pile-up veto scenaros considered

Pile-up Veto Scenarios

- present pile-up veto cuts at 2
- when increasing the cut to 3:
  - 10% increase in M.B.
  - 15% increase in signal selected
- multiple interactions have an important impact



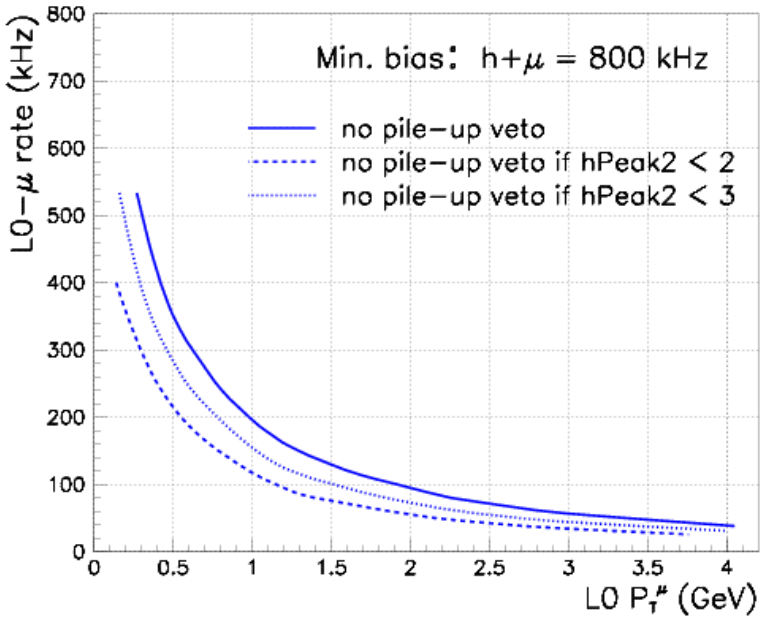
Pile-up Veto Scenarios (II)

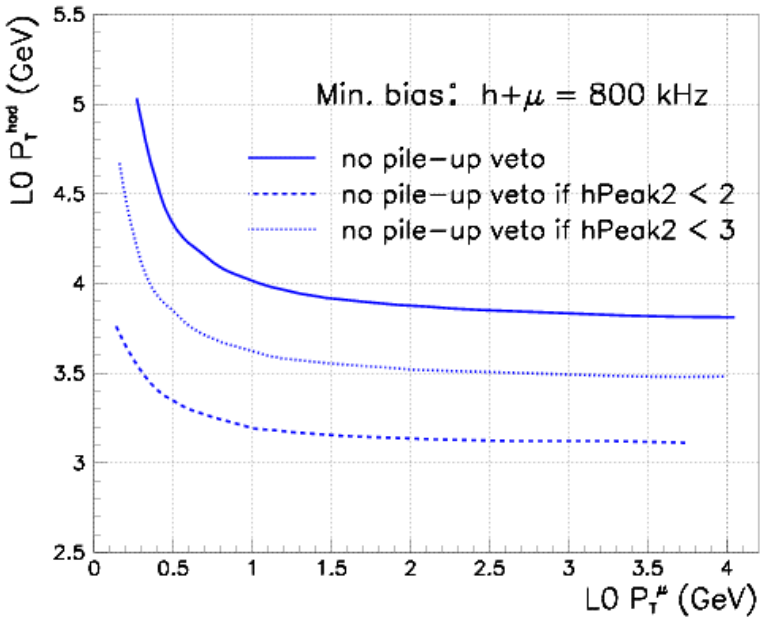
3 scenarios:

a) no pile-up veto
b) no veto if hPeak2 < 2
c) no veto if hPeak2 < 3

- μ-rates ~ 100-200 kHz in the P_T region "of interest"

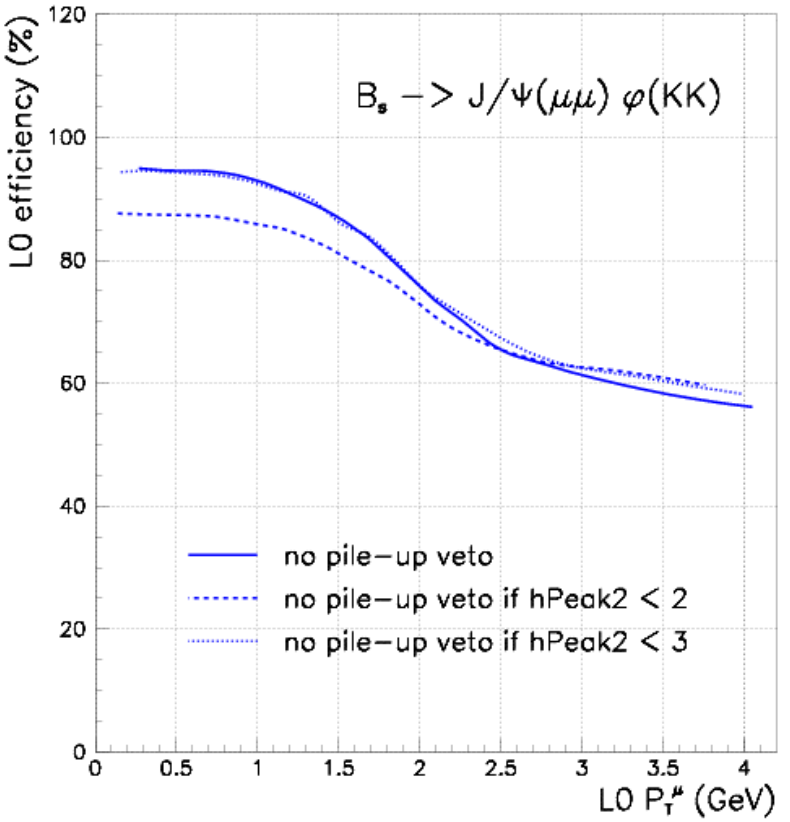
- hadron thresholds vary significantly depending on the veto cut





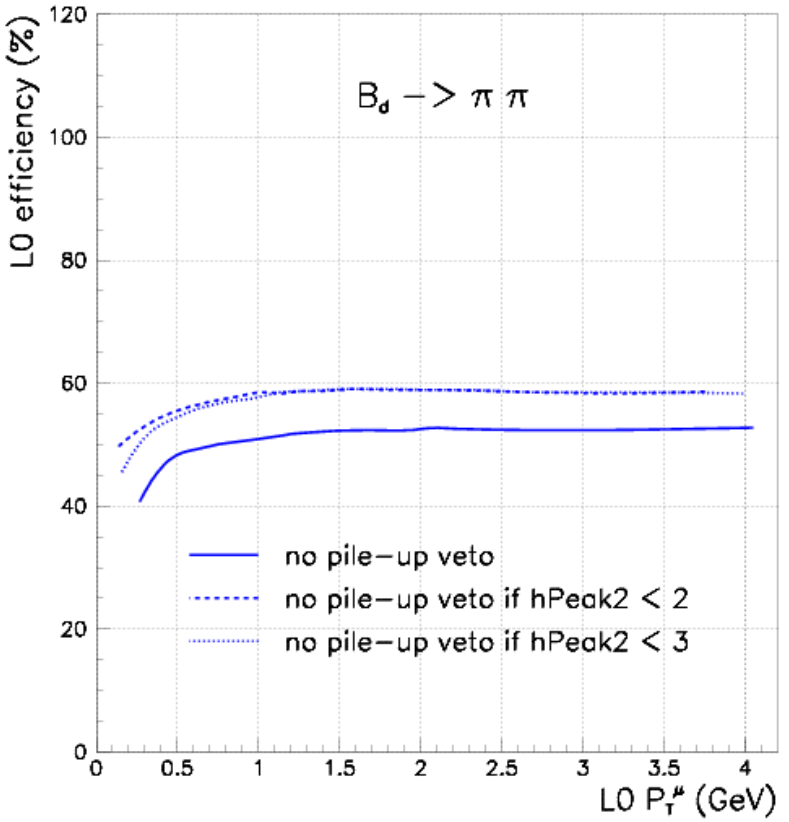
Pile-up Veto and B_s -> J/$\Psi(\mu\mu)$ ϕ (KK)

- with a pile-up veto cut at 3 the efficiency is "at its best"
- efficiency ~ 95% !



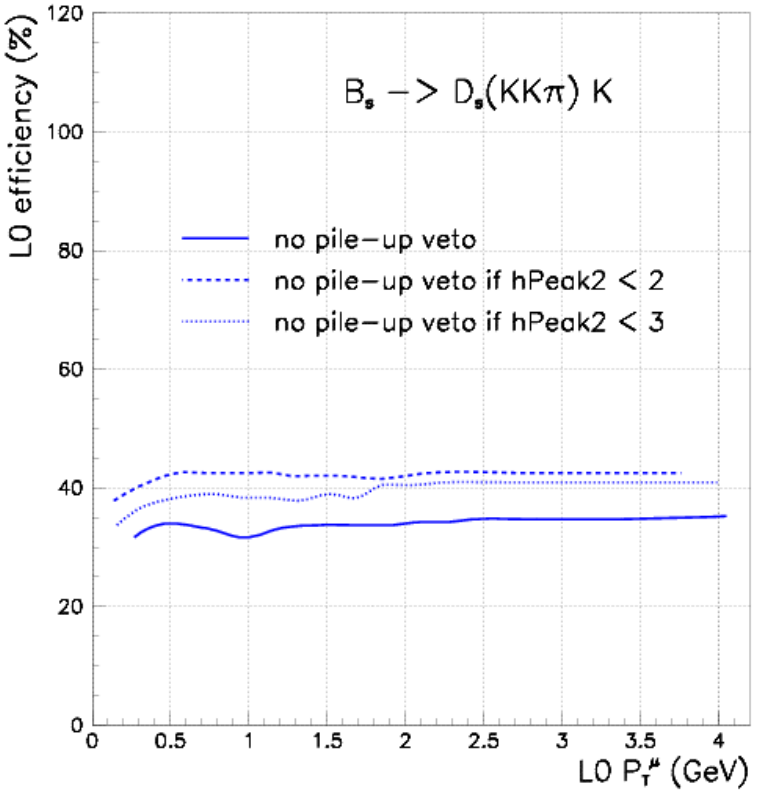
Pile-up Veto and B_d -> $\pi\pi$

- pile-up veto helps considerably:
  increase of ~ 10%
  in efficiency
- efficiency ~ 55-60%
- channel dominated by hadron trigger
  (nearly flat evolution)

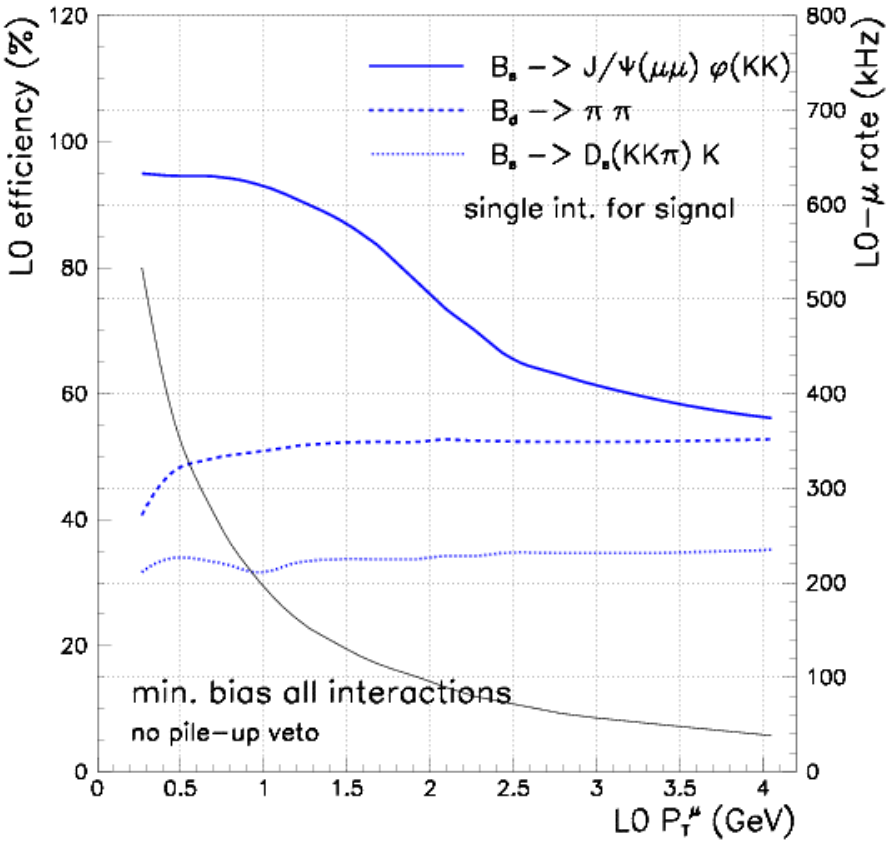


Pile-up Veto and B_s -> D_s(KKπ) K

- pile-up veto also helps
- efficiency ~ 40%
- channel dominated by hadron trigger
- low statistics at present …



L0 Efficiencies without Pile-up Veto



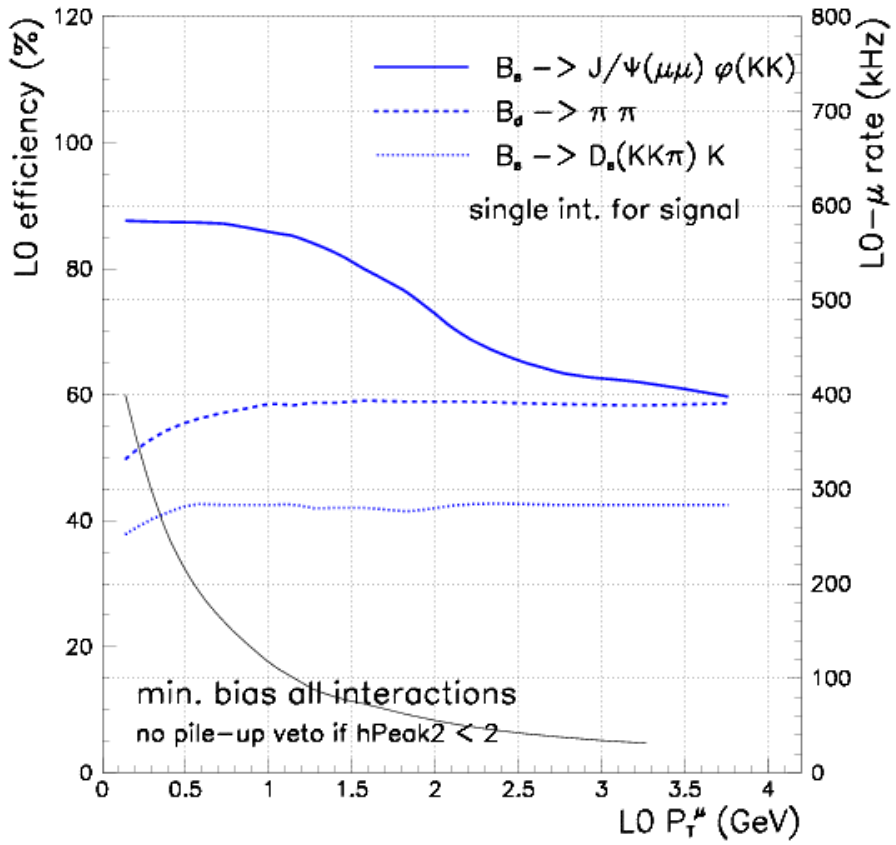
"μ-enriched" channel has opposite behaviour to hadron-dominated channels

➔ need for a

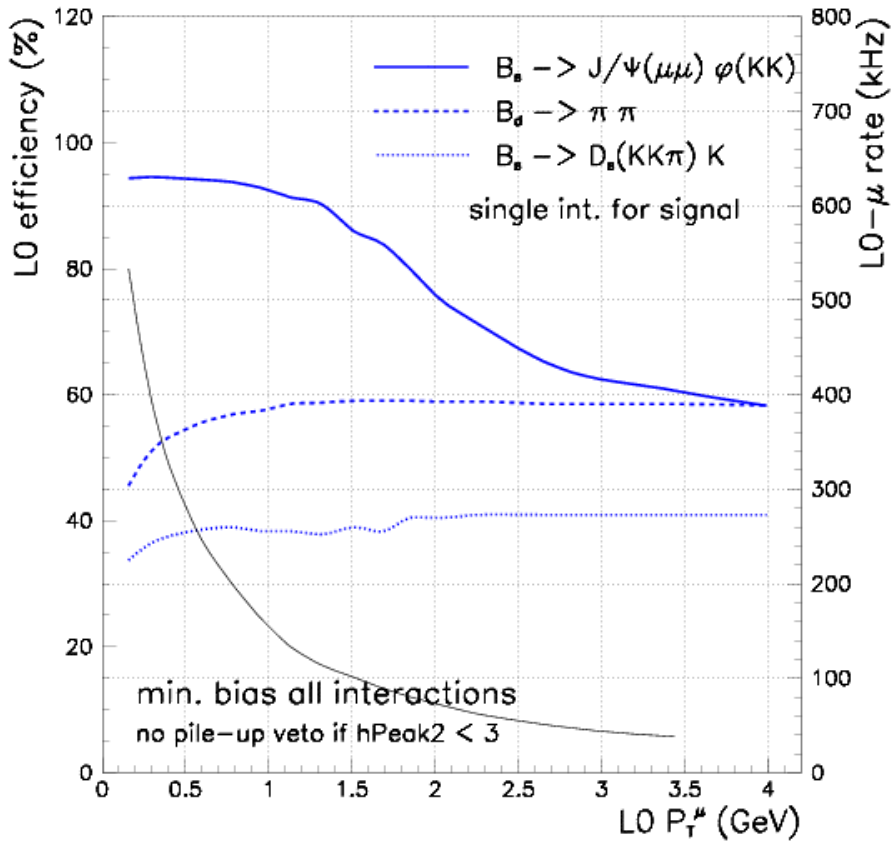
bandwidth optimisation

(L0 μ-rate given by black & thin solid line)

L0 Efficiencies without Pile-up Veto if hPeak2 < 2

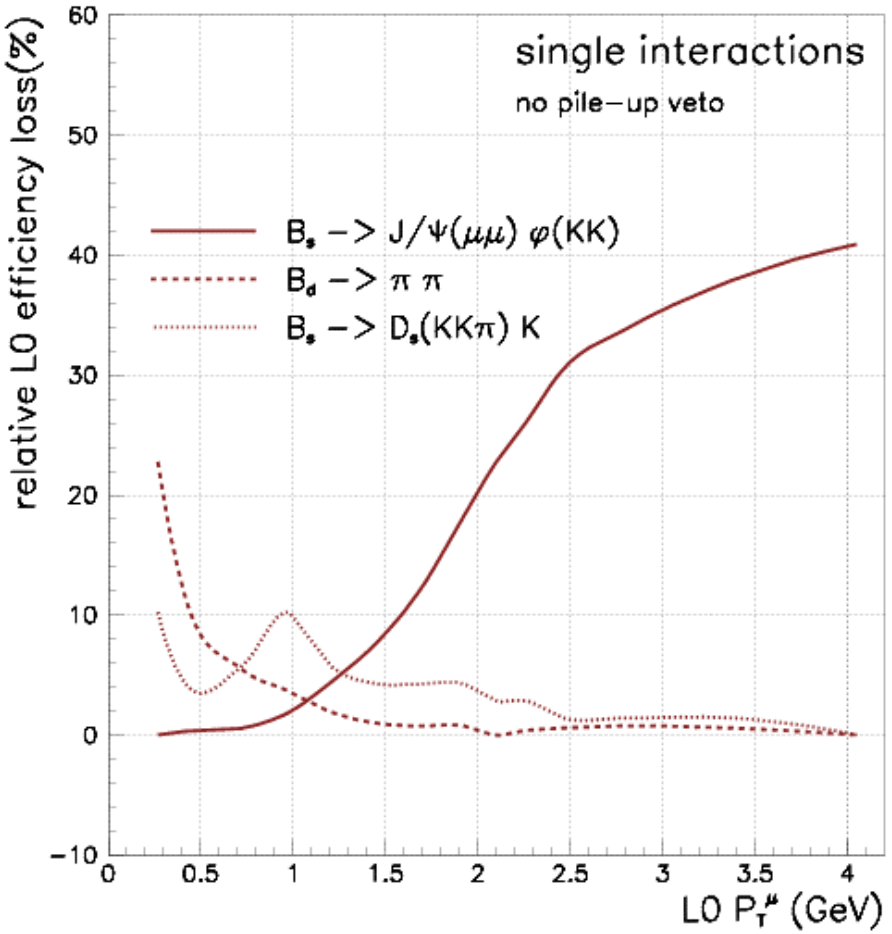


L0 Efficiencies without Pile-up Veto if hPeak2 < 3



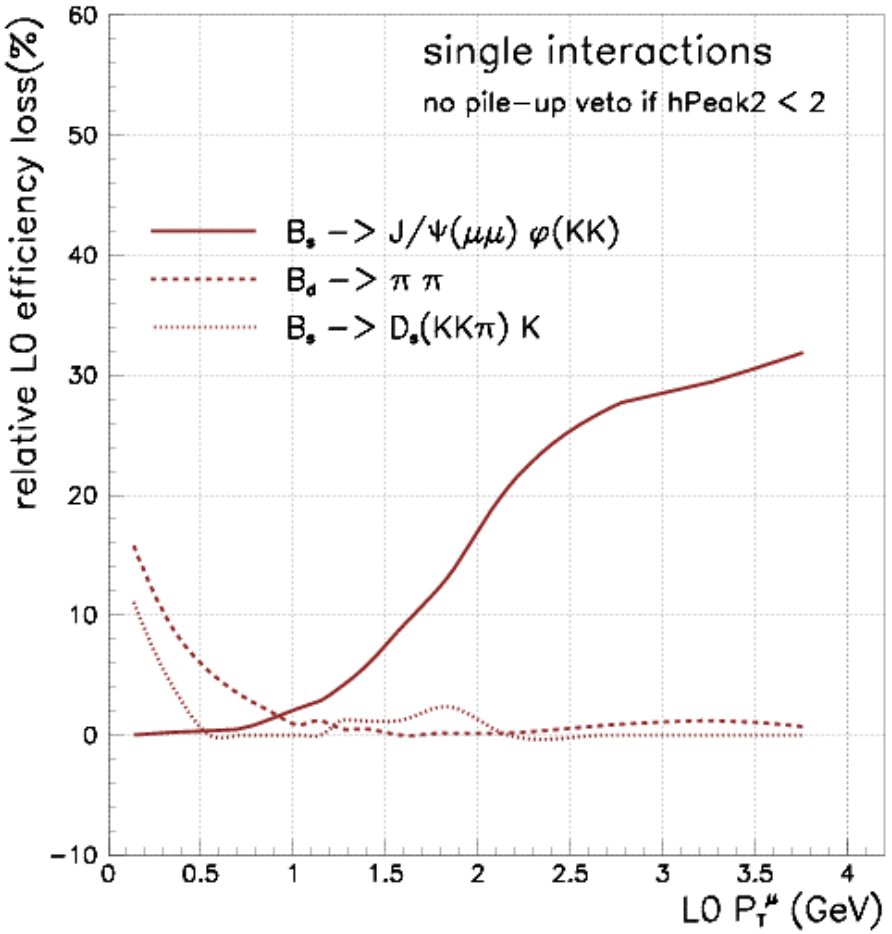
Bandwidth Division without Pile-up Veto

- Relative losses in L0 efficiencies wrt the maximum over the P_T range:
  - Losses ~ few % only in region of interest
  - B_s -> J/Ψ(μμ) φ (KK) favours low μ thresholds
  - Hadronic channels prefer higher thresholds



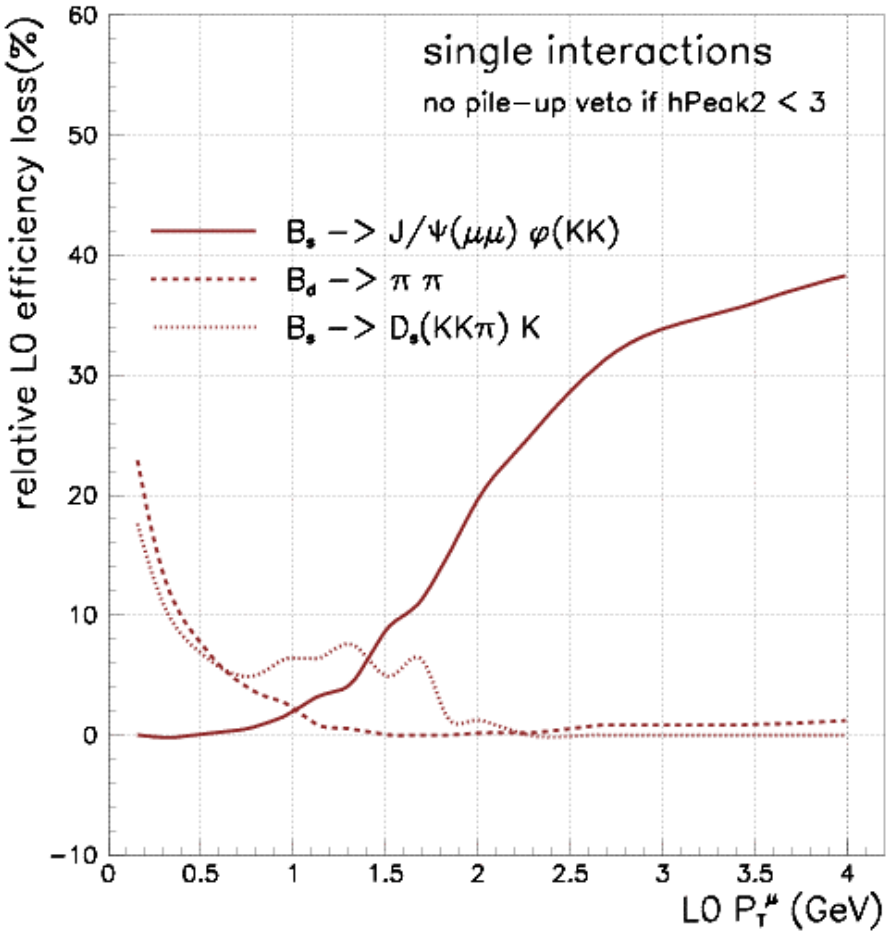
Bandwidth Division without Pile-up Veto if hPeak2 < 2

- Similar conclusions
- L0 thresholds roughly "converge" to same range of values …
- … though the bandwidth division changes slightly (cf. page 5)



Bandwidth Division without Pile-up Veto if hPeak2 < 3

- Again similar conclusions …
  for this scenario
- μ P_T ~ 1 GeV corresponds to
  μ-rate ~ 150 kHz



Outlook

Given the present status AND samples of (only) true single offline selected events:

- Pile-up veto cut: no veto if height 2nd peak < 3 is preferred
- "μ-enriched" channels (e.g. B_s -> J/$\Psi(\mu\mu)$ ϕ (KK)) favour low-ish L0 μ P_T cuts
- Hadronic channels favour μ P_T cuts ~ 1-1.5 GeV
- L0 μ-rate ~ 150-200 kHz favoured
  (for 800 kHz allocated to h+μ triggers in min. bias)