L0 Electromagnetic Triggering on Hadronic Channels

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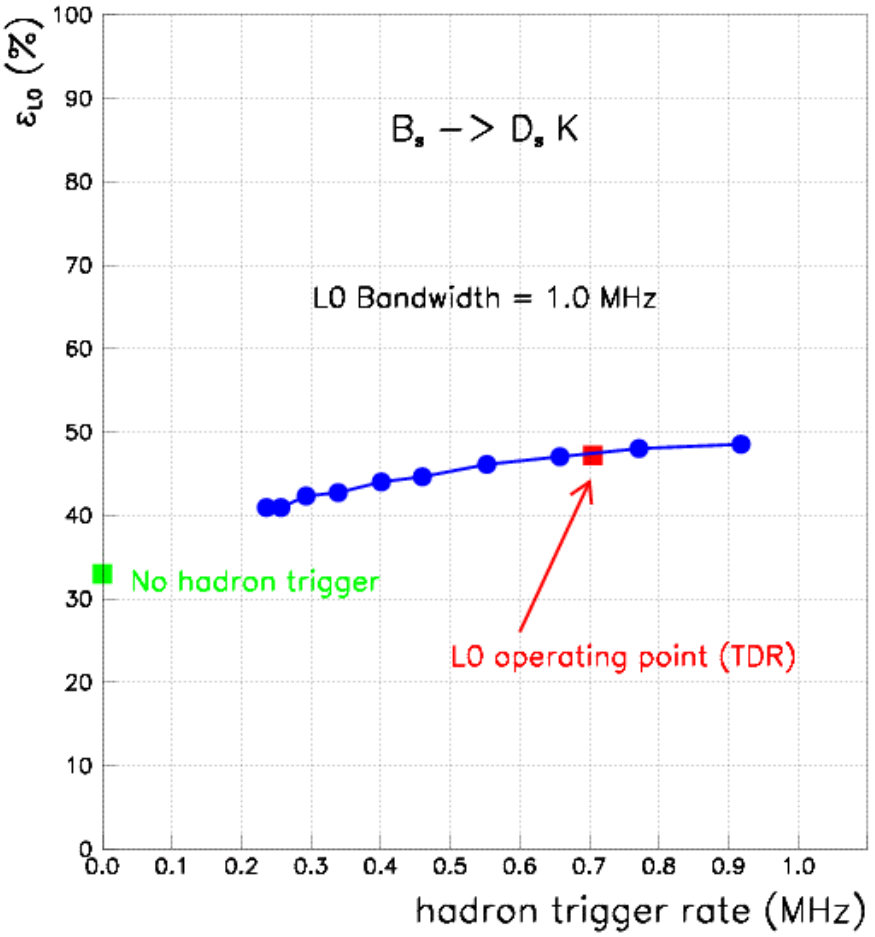
Puzzle:
electromagnetic triggers can account for 2/3 of the L0 efficiency even without the hadron trigger !

- ➔ why ?
- ➔ what is "recovering the" events ?



Procedure:

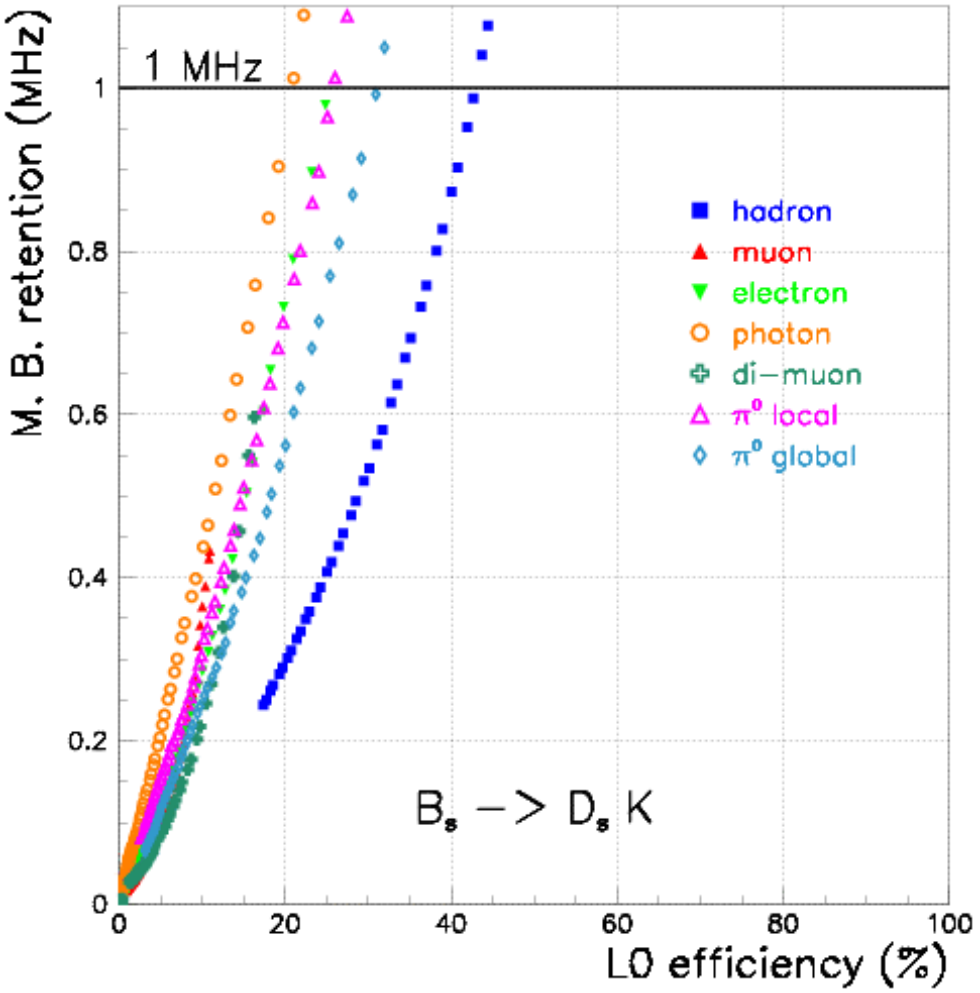
- fix the hadron trigger to a certain bandwith
- let all other thresholds free, to fill the 1.0 MHz bandwidth, and optimize L0
- scan from "no hadron trigger" to "hadron trigger = full bandwidth"

Sub-triggers "importance": B_s -> D_s K Example

Max. efficiency obtainable inclusively by each trigger!

➔ dominance of the hadron trigger

➔ other triggers seems to perform rather well also …



Sub-triggers Performance: B_s -> D_s K Example

Configuration	L0 efficiency (%)
TDR Efficiency	~ 47
ECAL+HCAL triggers only	~ 47
HCAL trigger only	~ 46
no HCAL trigger	~ 35
ECAL triggers only	~ 33
π^0 triggers only	~ 33
e + γ triggers only	~ 28
muon triggers only	~ 15

(one possible setting …)

L0 trigger	E_t^{had}	E_T^{μ}	E_T^{e}	E_T^{γ}	$E_T^{\mu\mu}$	π^0_{global}	π^0_{local}	Veto Cut	Spd Mult. Cut	Pile-up Mult. Cut
TDR Thresholds (GeV)	3.6	1.1	2.8	2.6	1.3	4.0	4.5	3.0	280	112
"no HCAL" Thresholds (GeV)	infinity	1.9	3.3	2.5	1.0	2.3	3.3	3.0	280	112

Bandwith divisions …

With the TDR settings …

% L0-pass for:	h	e	γ	π^0 local	π^0 global	μ	μμ
All events	28	3	3	0	5	5	7
L0-pass events	74	10	9	10	15	15	22
Offline selected events	39	5	3	4	7	6	7
L0-pass events & off. sel. events	84	10	7	9	16	12	16

"no HCAL" trigger …

% L0-pass for:	h	e	γ	π^0 local	π^0 global	μ	μμ
All events	0	2	3	0	21	3	9
L0-pass events	0	8	12	28	74	11	31
Offline selected events	0	3	4	10	29	3	9
L0-pass events & off. sel. events	0	8	11	29	80	9	25

Bandwith divisions … (II)

How is the bandwidth divided in these 2 examples used … ?

L0 Inclusive efficiency	HCAL	ECAL	Muons
TDR settings	39	11	8
"no HCAL" trigger	0	29	9

B_s -> D_s K Events not triggered by the Hadron TRigger

- How do the other sub-triggers recover the "no hadron trigger" setting?

  - muons:
    - some events (~ a few percent) recovered (= pass L0 either with the muon or di-muon tirgger)
    - most often these triggering muons are the highest Pt muon of the event, and do not come from the signal B-meson
  - electrons:
    - small contribution to the "efficiency recovery"
    - these electron do not come from the signal B-meson (sometimes highest Et electron in the event)
  - photons:
    - similar as for electrons
  - pi0 local:
    - this trigger allows a good recovery of the efficiency
    - often photons or electrons (and the highest Et in the event)
    - particles rather rarely coming from the signal B-meson
  - pi0 global:
    - main actor of the "efficiency recovery"
    - a "jet trigger": picks up 2 closely spaced energetic clusters/deposits (2 photons, charged pions, electrons, etc.)
    - particles rarely coming from the signal B-meson