A Di-electron trigger at Level-0 : first look

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I. Motivations

II. L0 Et distributions

- for "electron-dominated" channels
- for some other benchmark signal channels

III. Inclusion of the di-electron trigger in the L0DU

- possible scenarios

IV. Outlook and Future Work

Motivations

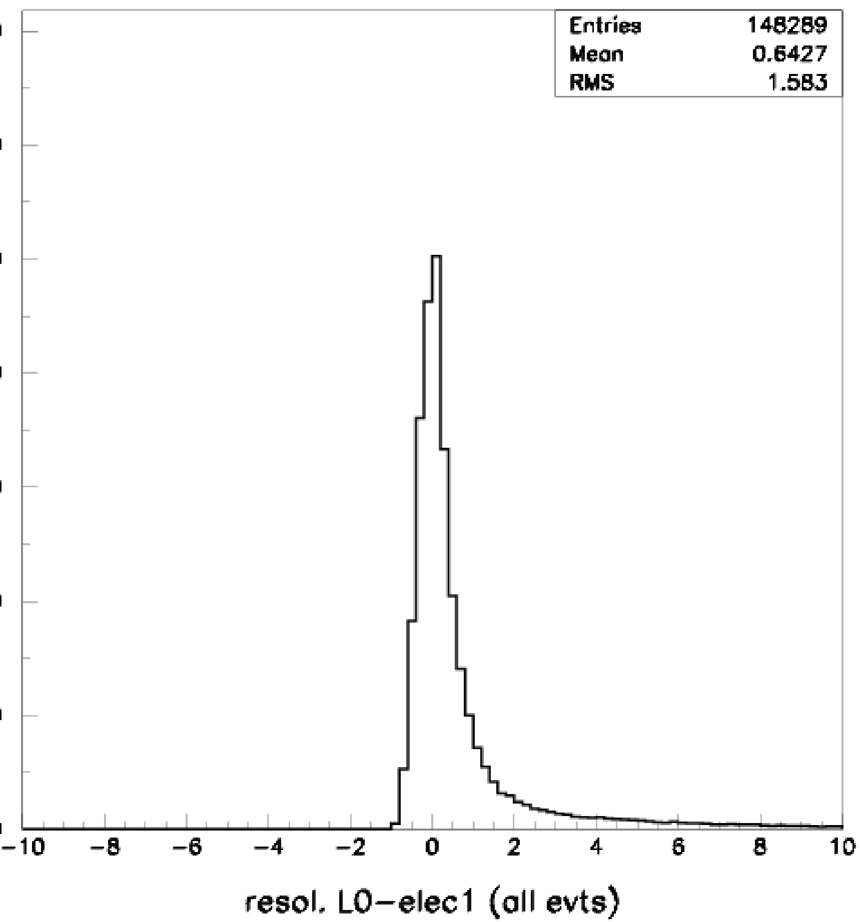
- Di-muon versus di-electron trigger:
  - di-muon trigger mainly focussed on identifying J/Ψ -> $\mu\mu$ decays from a b-hadron

    -> can we do similar for J/Ψ -> ee decays?
- Investigations of "extreme" L0DU algorithms:
  - on Hans' shopping list
  - in the near future all "possible" scenarios of L0DU algorithms need to be assessed and studied
- Studies of di-electrons at L1 have been investigated:
  - refer to the note of Aras Papadelis (summer student)

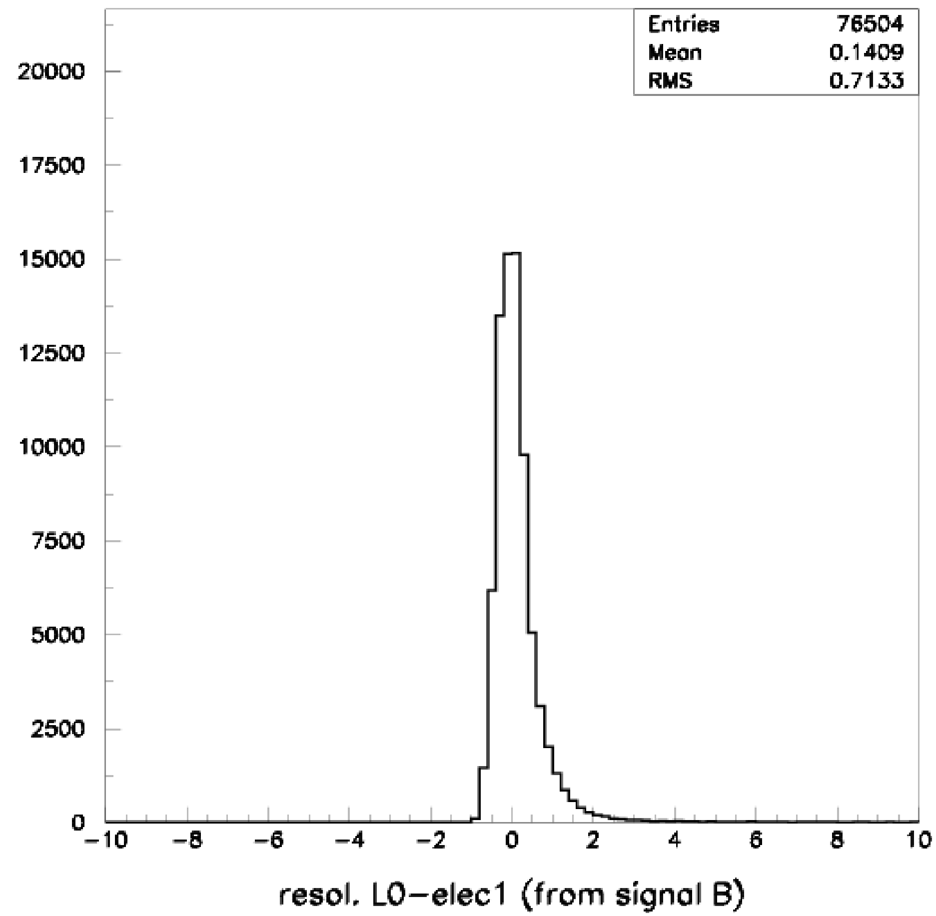
    -> can the situation be improved by improving the input to L1?

1^{st} L0-Electron : Resolutions

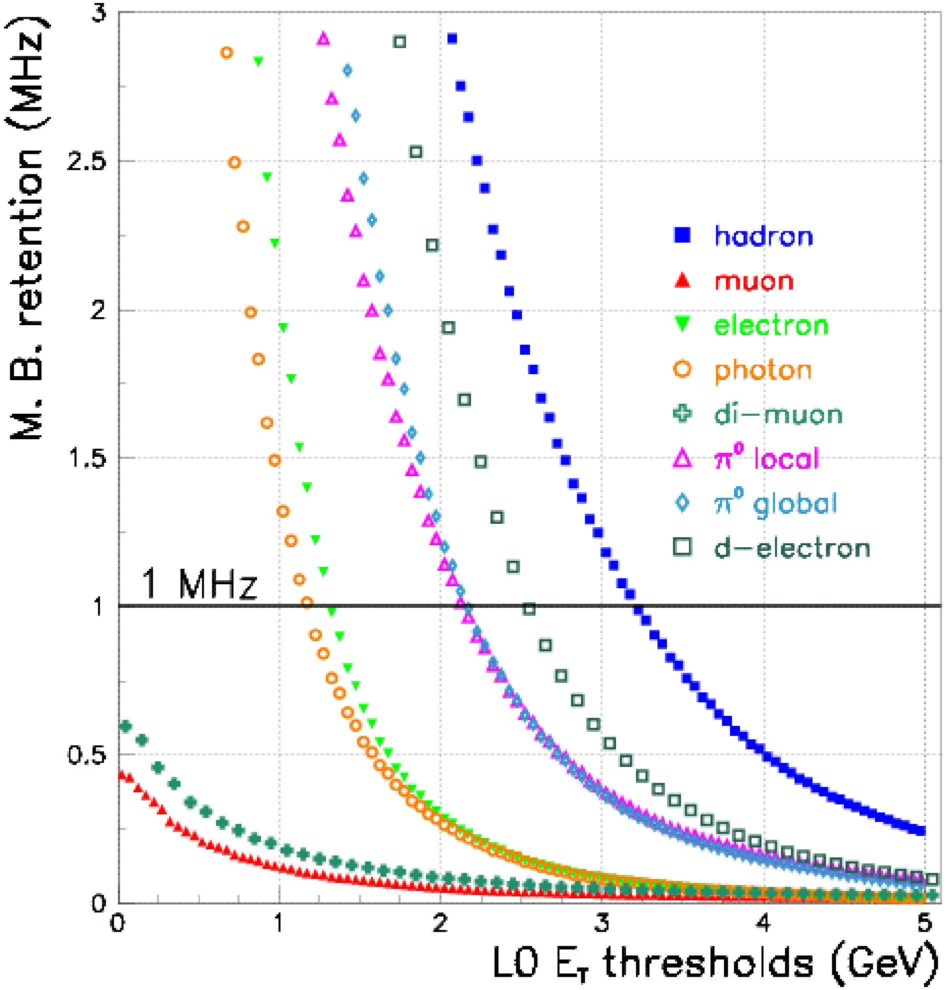
Resolutions in E_T



B_d -> $J/\Psi(ee)$ K_s



L0 Retention Rate



⇨ Using a di-electron trigger "à la di-muon trig
(cf. next transparencies)

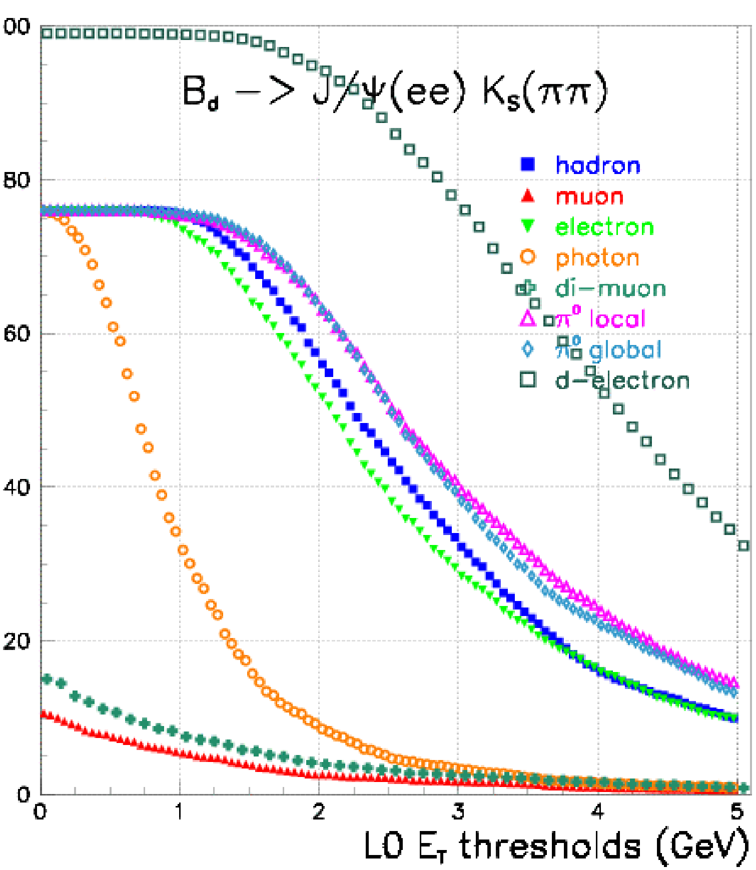
L0 E_t Distributions (I)

✓ each curve corresponds to considering separately the combination

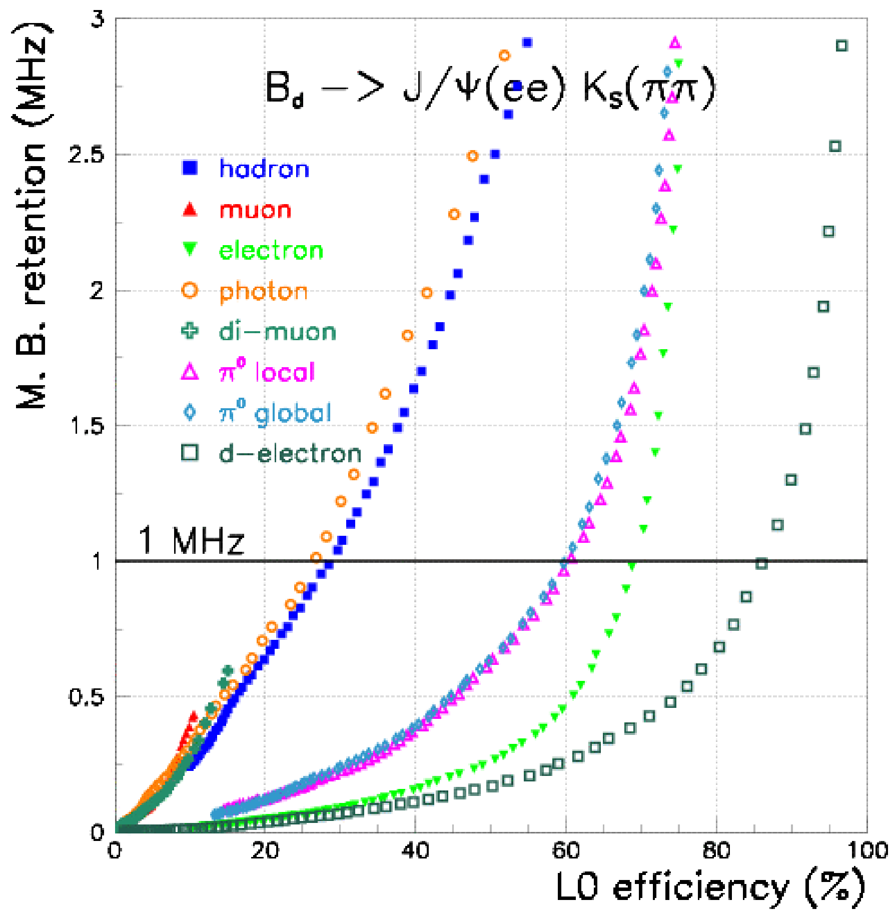
L0 trigger = sub-trigger + pile-up veto & multiplicity Cuts

-> it shows how much one could in principle obtain independently from each trigger

x. efficiency obtainable inclusively by each trigger!

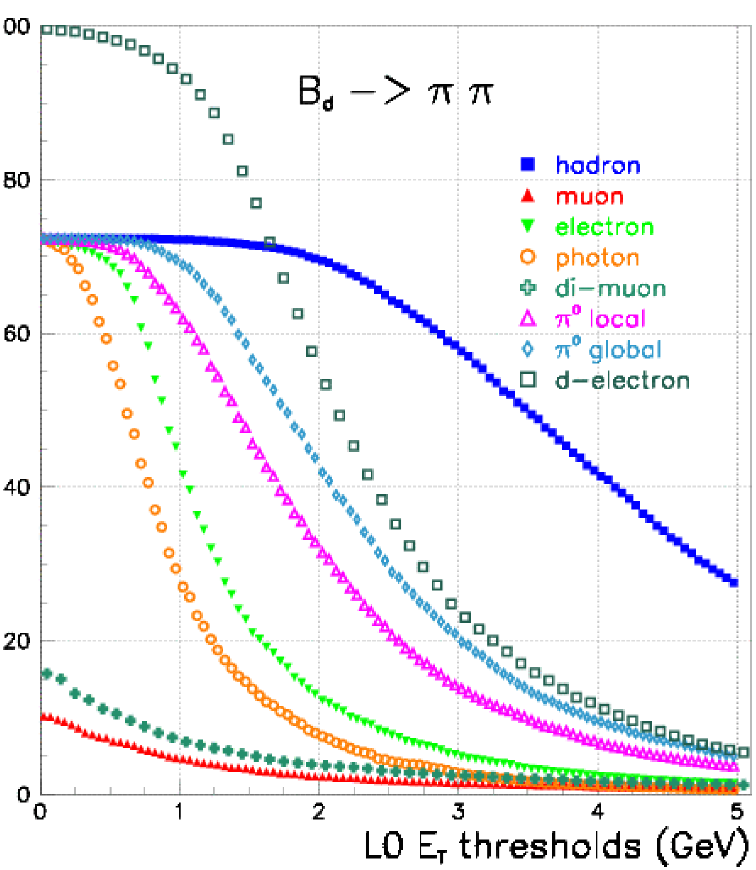


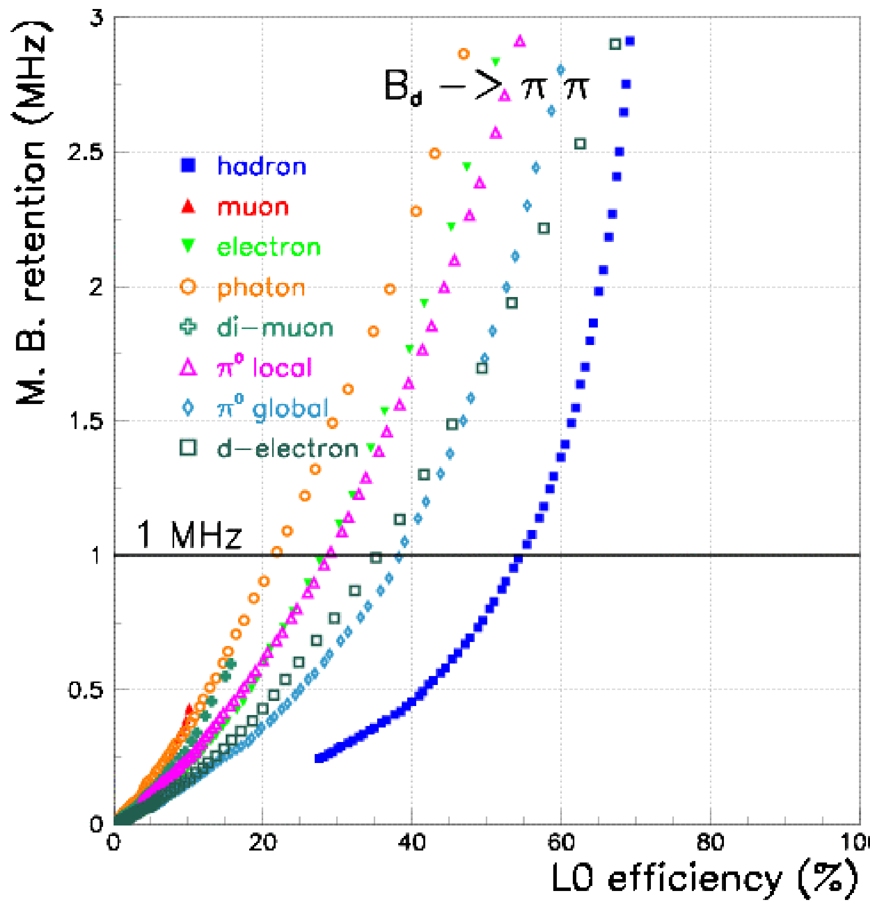
Trig



L0 E_t Distributions (II)

x. efficiency obtainable inclusively by each trigger!

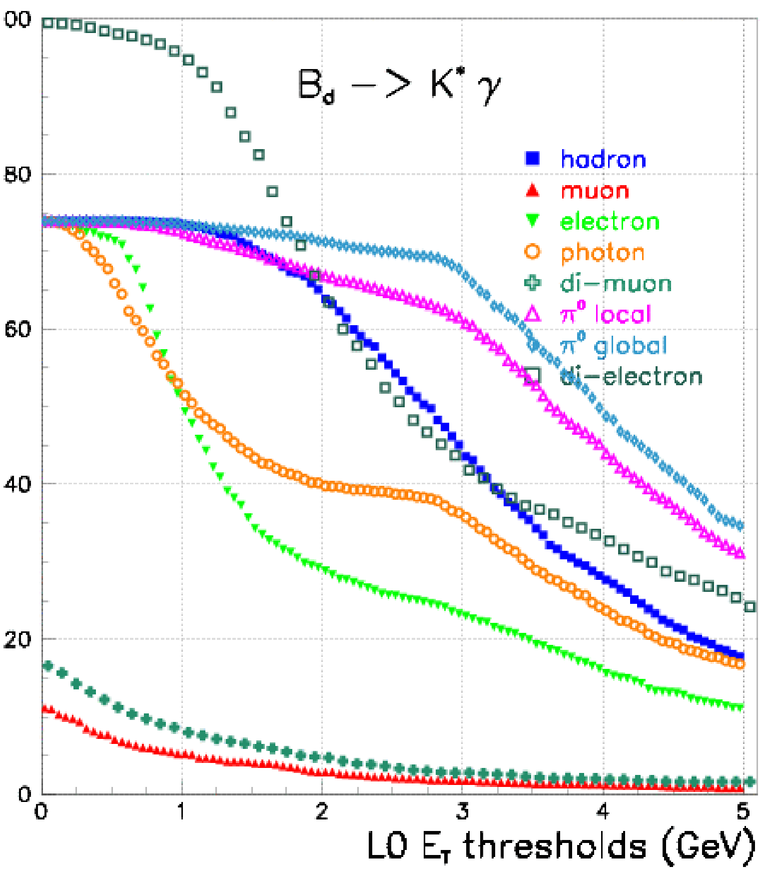




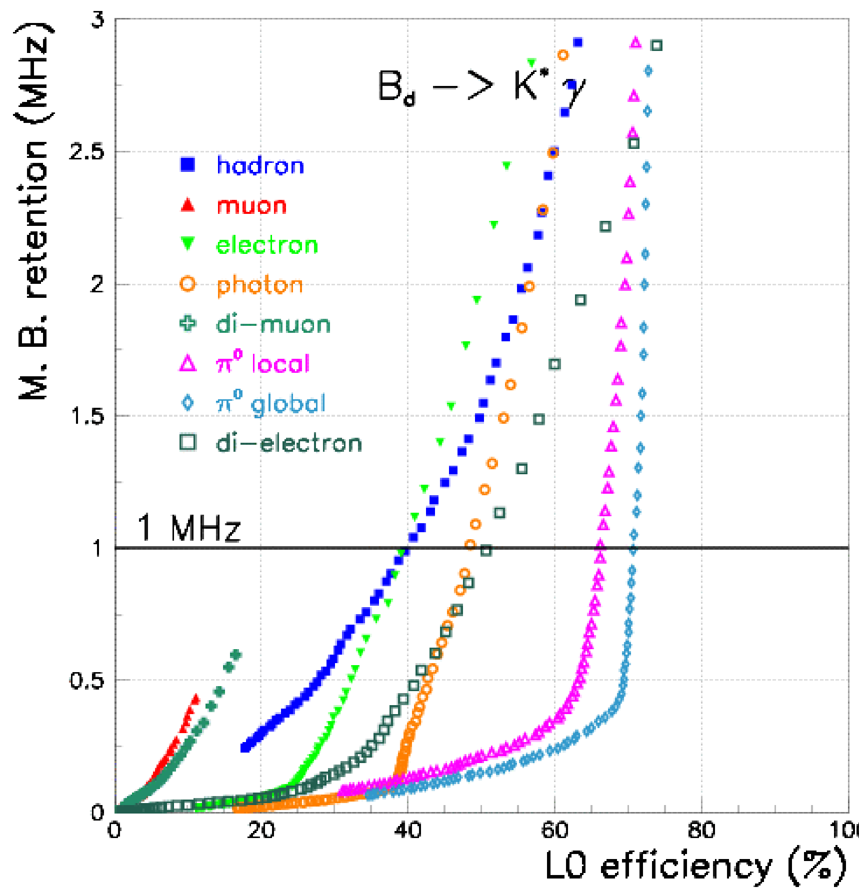
Trigg

L0 E_t Distributions (III)

x. efficiency obtainable inclusively by each trigger!



Trigge



Origin of L0 Electrons

B_d -> J/Ψ(ee) K_s

Channels	All events	L0-pass	Offline selected	L0-pass & offline selected
L0-elec1 from signal B	52 %	62	86	89
L0-elec2 from signal B	28	34	60	60
L0-elec3 from signal B	16	17	27	27
L0-elec1&2 from signal B	19	25	52	53
L0-elec1&3 from signal B	10	11	21	22

L0DU with a Di-electron Trigger

III. Possible scenarios:

- di-electron trigger "à la di-muon trigger"

  ($E_T^{ee} = E_T^{e1} + E_T^{e2}$ with $E_T^{e2} = 0$ possible)
- a real di-electron trigger
- other "exotic" variations …

➢ investigation of the simplest implementation:

- a di-electron trigger "à la di-muon trigger"
- overrides the global event cuts

➔ L0 optimization with all E_T thresholds free …

L0 optimization with Di-electron Trigger

1. Optimizing each channel separately on the L0 efficiency ...

Channels	L0 eff. (%) TDR settings	L0 eff. Max. (%) TDR settings	L0 eff. Max. (%) with di-elec. Trig.
$B_d \to J/\Psi(ee)\ K_s$	48.3	**69.7**	**85.0**
$B_d \to K^*\ \gamma$	72.9	**77.6**	**86.7**
$B_d \to J/\Psi(\mu\mu)\ K_s$	89.3	93.0	93.2
$B_d \to \pi\pi$	53.6	54.7	56.7

Max. eff. obtained with separate optimization of each channel

(eff. calculated on independent sample)

Outlook and Future Work

- First results are encouraging …
- Need to investigate exact origin of the L0-electrons
- Need to investigate a true di-electron trigger
- How well can one do re-optimizing L0 with a di-electron trigger?

  -> do we loose a lot for other channels (e.g. hadronic channels)?