



Tuning of PatForward Tracking for first Data

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Tuning of PatForward Tracking

Standard tuning of algorithms optimal for L0 triggered B events in 10 (14) TeV collisions

- Efficiency 86.4 %, (92.7% $p > 5$ GeV)

(note all pattern recognition algorithms are tuned for high **efficiencies**,
especially for high momentum tracks,
better ghost rejection feasible after refit)

- Ghost rate 10.0%; event averaged [13.0%; track averaged]

Study today:

- 2009 data (velo 15 mm open)

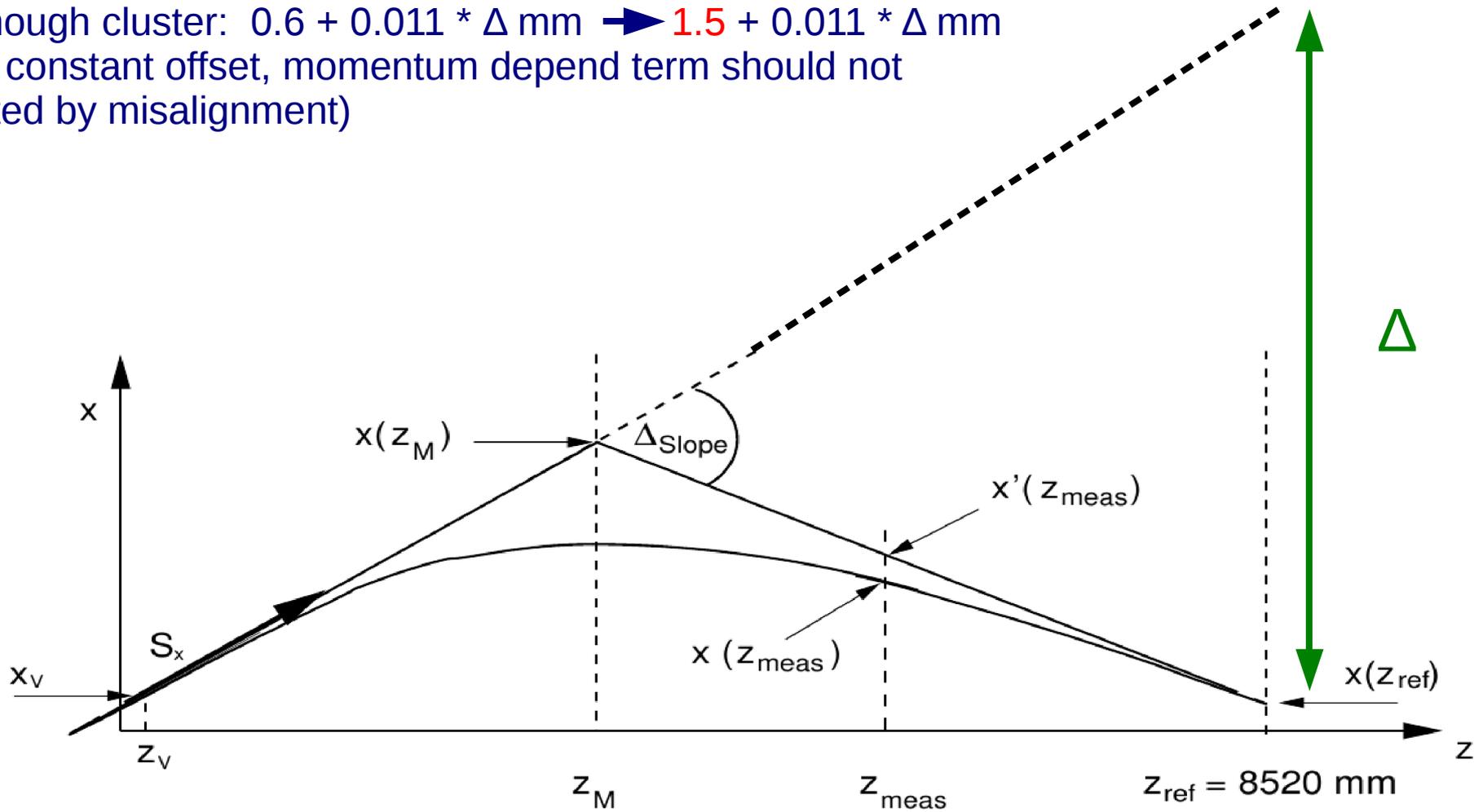
- cross-check 450+450 GeV; velo 15 mm open; L0 triggered minimum bias sample (L0 overwritten by Thomas)

- cross-check 3.5+3.5 TeV; L0 triggered minimum bias sample (velo closed, standard MC09)

Cuts sensitive to misalignments in PatForward

Search windows:

Size of hough cluster: $0.6 + 0.011 * \Delta$ mm \rightarrow $1.5 + 0.011 * \Delta$ mm
(enlarge constant offset, momentum depend term should not be affected by misalignment)



In y direction:

$1.5 + 70 * (q/p)^2$ mm \rightarrow $3.0 + 70 * (q/p)^2$ mm

Cuts sensitive to misalignments in PatForward

Hit content

- at least hits in 5 different x layers → 4
- at least $(x + u/v)$ hits in 9 different layers → 9
- at least 14 hits (16 if OT only track) → 12/14

Track quality (of pattern reco internal fit):

- max χ^2 /hit for outlier removal: 20 → 40
- χ^2 /hit cut for final track fit: 20 → 40

Optimization done by looking at number of reconstructed tracks in data and controlling ghost rate in 450 GeV MC simultaneously

Additionally check ratio of PatForward versus Match tracks in best container (standard: 2/3 Forward, 1/3 Match) “similarly loose algorithms”

Performance

Data (10.000 events ~ 6.000 physics events (5730, 5731))

container	# of tracks before tuning	# of tracks after tuning	
forward	3281	4927	+ 50%
best	4742	5522	+ 12%
forward tracks in best	~2100	~3600	
match tracks in best	~2650	~1900	

450 + 450 GeV Monte Carlo (velo 15 mm open, 10.000 events):

Forward container	before tuning	after tuning
Efficiency (p>5 GeV)	84.2 (92.7) %	87.5 (93.5) %
ghost rate (event/track av)	2.4 (2.1) %	3.6 (3.1) %

3.5 + 3.5 GeV Monte Carlo (velo closed, 10.000 events):

Forward container	before tuning	after tuning
Efficiency (p>5 GeV)	85.3 (92.6) %	88.1 (93.7) %
ghost rate (event/track av)	12.9 (10.1) %	19.9 (14.6) %

In my opinion 14.6% ghost rate affordable on new data
(cuts can be tightened once internal IT/OT alignment available)