October 10, 1997
Hera-B Meeting
DESY-HH

Second & Third Level Trigger Algorithms

M. Medinnis
DESY IfH Zeuthen

Activities

- $'98$ task force studies
  (S. Erhan, M. Medinnis)
- Magnet traversal algorithm (S. Xella)
- Silicon tracking (S. Schmidt)
- Level 3 trigger studies (S. Scharein)
- $'97$ Ecal trigger (P. Kreuzer)

'98 Task force study

Trigger efficiencies (%) (L2: Slicer,Refit only)

	$J/\psi \to \mu^+\mu^-$		$J/\psi \to e^+e^-$	
Scenario	L1	L2	L1	L2
Ecal only			9	
TC1,2- PC4-	10	98	6.5	85
TC1,2±,PC4-	27	76	5	
TC1,2-,PC1,3,4-	8	97	6.5	80
full OTR-	8	97	6.5	77
full OTR(±)	33	96	23	77
full detector	55	95	37	84

- No efficiencies for Ecal-only: need Silicon tracking, RoI transport Ecal $\to$ silicon.
- Full detector efficiency for electrons much higher than previously reported.

Inner Fiber	Overlapped events	$69 \pm 4\%$
MSGC	Overlapped events	$76 \pm 4\%$
MSGC	Signal only	$84 \pm 4\%$

Oct '97: SLT Algorithm status

	June	October
slicer	working	working
refit	working	working
magnet	installed	testing
silicon	coding	testing
vertex	pending	pending
data request/reply		
SLB data server	defined	working
MAP/PAM*	coding	pending
coord. generation**	pending	pending
Buff. emulation	-	pending

*global $\leftrightarrow$ SLB channels
**clustering, drift time $\rightarrow$ distance

New target date:
algorithm integration by end October '97 Data request/reply: Dec. '97

Magnet traversal, procedure

S. Xella, NBI

Procedure

- Extrapolate RoI to first superlayer (MC01, MS01, SI08), request hits.
- If no hits found, reject track.
- Apply histogramming method to find track candidates.
- Fit found hits to a point in space, re-estimate parameters.
- If fit fails:
  - If track $>$ 5.6 cm from beam, discard
  - otherwise, accept but add no point

Performance preliminary

Efficiency

	EVENTS	FLT+Sli+ Refit	MAG.	Eff.
$\mu\mu$	400	201	201	100%
ee	200	73	71	97%
bkgd	88	18	18	100%
$\mu\mu + mb$	200	95	95	100%

Track multiplicity

	FLT	Refit	MAG
$\mu\mu$	3.7	4.1	4.5
ee	3.9	3.9	4.1
bkgd		1.7	1.8
$\mu\mu + mb$	6.	8.4	10.9

Resolutions

σ_{tx}	0.38 mrad	
σ_{ty}	0.97 mrad	
$\sigma_{1/p}$	10 MeV	
σ_x	0.24 mm	at super layer 1
σ_y	1.5 mm	at super layer 1

Silicon tracker status

S. Schmidt, NBI

- Installed and cycling.
- So far, only B $\rightarrow (J/\psi \rightarrow \mu^+\mu^-) + X$, no overlap tested.
- Efficiency (per event) $\approx$ 90%: better initial RoI estimate needed.

Very preliminary

B $\rightarrow (J/\psi \rightarrow \mu^+\mu^-) + X$, no overlap

σ_{tx}	0.056 mrad	
σ_{ty}	0.073 mrad	
σ_x	0.35 μm	at z = 0
σ_y	0.33 μm	at z = 0

Timing

	time / event	integral reduction	weighted time msec
Slicer	1.1±.2	2.6±.5	1.1 (1.0)
Refitx	3.4±.6	3.4±.8	1.3 (.75)
Refity	1.6±.2	9.1±3.	0.5 (.4)
Magnet	2.1±?	9.1±3.	.2 (.1)
Silicon	4±?	(100)	.4 (.6)
total			3.5 (2.8)

- Design numbers in red
- Magnet, silicon times measured with "$\mu\mu$ + mb" (25 events)
- MAP/PAM still missing (prototype MAP $\Rightarrow$ .2 msec for Slicer)
- Silicon time increases to 40 msec when superlayer 1 is removed.

Third level trigger studies

S. Scharein, Humboldt U.

Look for way to gain suppression for trigger types which do not have a vertex constraint such as $b \to c\ell X \to \ell X$

Procedure (roughly speaking):

- Find 3-d points in full silicon detector
- For (nearly) every point:
  - Define plane using SLT track and point
  - Search for additional points in track/point plane
  - If found, require that intersection with SLT track, be downstream of target wire

status: coding 3-d point finding

SLT$'$97: a modest exercise

P. Kreuzer, UCLA

- Pretrigger on ecal using the prototype ecal pretrigger board (one cluster with $p_t > 1.5$ GeV)
- In TLT node, look for a second cluster with $p_t > .5$ GeV

(for details see report by Rick StDenis)

SLT Algorithm: plans

- Arte integration of full (v0) SLT algorithm. (end October)
- Adaptation to '98 conditions (start November)
- MAP/PAM, buffer emulation (restart November)
- Continue study of Ecal/silicon matching using '97 data
- Simulated running on farm (early '98)