SLT 2002 POTENTIAL

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Hamburg, July 22, 2001
Hera-B Physics Meeting

- Current SLT performance
- Algorithm upgrade plans
- 2001/2 trigger strategy and commissioning plans

Current SLT performance

1) J/Psi efficiency on FLT seeding (MC)

Algorithm	MC-2000 (mask)		MC-2000 (ideal)	
	e^+e^-	$\mu^+\mu^-$	e^+e^-	$\mu^+\mu^-$
SLICER	0.99	0.99	1.00	1.00
REFIT-X	0.92	0.91	0.94	0.96
REFIT-Y	0.93	0.97	0.97	0.99
L2MAGNET	1.00	1.00	1.00	1.00
L2SILI	0.93	0.93	0.92	0.94
L2VERTEX	0.98	0.98	0.97	0.98
TOTAL	0.77	0.80	0.81	0.88

Current SLT performance (ctnd)

- SLT efficiencies on FLT input are satisfactory and are being fine-tuned
- Standard cuts have been loosened to cope with 2000 detector conditions
  - Input RoI sizes $\geq \pm 2.5$cm
  - SLICER/REFIT allow for 1 Empty Super-layer
  - SLICER requires 9 / 18 hits
  - REFIT allows for 2 holes in series and $\frac{\chi^2}{nHits} \leq 5$
- Not much can be gained from algorithmic point of view
- Final cuts and performance will depend mainly on detector 2002 quality

Current SLT performance (ctnd)

2) J/Psi efficiency in PRE-trigger seeding mode (MC 2000)

Algorithm	MC-2000 (mask)		MC-2000 (ideal)	
	e^+e^-	$\mu^+\mu^-$	e^+e^-	$\mu^+\mu^-$
FLTemu	1.00	0.17	1.00	0.34
SLICER	0.95	0.60	0.95	0.68
REFIT-X	0.92	0.73	0.92	0.93
REFIT-Y	0.88	0.83	0.93	0.90
L2MAGNET	1.00	1.00	1.00	1.00
L2SILI	0.93	0.93	0.95	0.95
L2VERTEX	0.98	0.98	0.98	0.98
TOTAL SLT	0.70	0.33	0.76	0.53
Overall eff	0.70	0.056	0.76	0.18

note: the 2000 geometrical acceptances are not included: 32% for MUONs and 67% for ELECTRONs (the kinem. acc. for ELECTRONs was 12%).

Current SLT performance (ctnd)

- J/ψ rates from 2000 data are in agreement within errors
- FLT efficiencies partially transfered to SLICER/REFIT
- SLICER suffers from "seeding" mode (intrinsic pt $\geq$ 0.7 GeV)
- Very large RoI's in SLT/REFIT affect ghost rate and timing
- FLTm (MUON tracking) code has low efficiency due to
  - Isolation cut $\geq$7cm in MU3
  - Double hit requirement in MU2

  $\Rightarrow$ see next chapter for upgrade plan

3) The $FLT_{single}/SLT_{double}$ mode

- In order to cover large X_F range in absence of inner-FLT tracking, seed SLT with FLT_{Single} lepton; the second lepton is seeded via PRE-trigger-TDU and reconstructed in SLT stand-alone mode
- Besides the upgrade of existing MUON-slt algo, need to upgrade SLT seeding code
- This trigger mode is also useful for debugging of FLT_{pair} mode
- The potential of this trigger is so far only known from extrapolation and combination of the FLT and Stand-alone efficiencies 2000:

Current SLT performance (ctnd)

3) J/Psi efficiency in $FLT_{single}/SLT_{double}$ mode

SLT_1=FLT-seed, SLT_2= PRE-trigger seed

Algorithm	SLT 2002 Minimal		SLT 2002 Potential	
	e^+e^-	$\mu^+\mu^-$	e^+e^-	$\mu^+\mu^-$
SLT_1	0.90	0.94	0.90	0.94
SLT_2	0.87	0.42	0.87	0.52
$DETECTOR$	0.93	0.75	0.97	0.87
TOTAL	0.73	0.30	0.76	0.43

- The "potential" == "probable" scenario of last Hera-B report
- This corresponds to a J/ψ rate of
  400/hour (min) to 1500/hour (potential) in the MUON channel and
  650/hour (min) to 900/hour (potential) in the ELECTRON channel
- Reconstruction efficiencies of 97% (MUON) and 85% (ELECTRON) are assumed

Current SLT performance (ctnd)

4) SLT Background Rejection and Latency

(estimates from 2000 MUON data)

- In FLT-seeding mode: factor ~9-10 rejection per track
- In SLT-stand-alone mode: factor ~50 rejection per track
- Additional factor ~2 from J/ψ vertex requirement

$\Rightarrow$ in standard FLT_{pair} mode, factor ~200 achievable

$\Rightarrow$ in $FLT_{single}/SLT_{double}$ mode, factor ~2000 achievable (add. factor 2 from 2nd muon).

- CPU power due to SLT latency $\leq$10KHz in 2000 FLT_{pair} mode
- SLT code optimization ongoing (L2Sili,MAP,Refit)
- CPU upgrade ? (300MHz $\rightarrow$ 900MHz)

$\Rightarrow$ in $FLT_{single}/SLT_{double}$ mode, we are confident to achieve $\geq$ 20KHz

$\Rightarrow$ precise evaluation needed on first 2001 background data (also for electron channel) !

Algorithm upgrade plans

1) the MUON-SLT project(s)

Both MUON efficiency and MUON-trigger projects have some overlap, at least in CnA and hit-preparation.

It takes 1 full-time task in each SLT and MUON groups.

The steps for the MUON-trigger project are (Pads+Tubes+Pixels):

- introduce MUON Geo and Buffmap in SLT via CnA
- write PAM-like hit-preparation, first using full MUON-FED
- introduce FLT-like MUON seeding
- re-write MUON-SLT (RoI based) tracking code
- introduce MAP RoI-hit request scheme

⇒ we are aiming for a running prototype by mid-September 2001

Algorithm upgrade plans (ctnd)

2) the FLT-SLT interface upgrade

$\Rightarrow$ needed for the $FLT_{single}/SLT_{double}$ mode, both in MUON and ELECTRON channels

3) Upgrade of the MC-CnA scheme

$\Rightarrow$ needed for systematic and user-friendly analysis with SLTsim in ARTE

4) MARVIN (ITR/VDS) upgrade to chip level

$\Rightarrow$ needed to avoid SLT latency bottleneck. Alternative solution would be upgrade of L2Farm CPUs.

2001/2 trigger strategy and commissioning plans

Overall strategy:

- Start commissioning (production) FLT_{single}-$SLT_{single/double}$ mode
- Test pair trigger mode
- Move to pair-trigger production as soon as FLT-inner available and tested
- Consider SLT impact cut for single-lepton (Charm) trigger

Important commissioning steps:

- detailed break-down and tuning of SLT efficiencies on 2002 FLT_{pair} MC
- test new ITR sparsification code
- get ready for $FLT_{single}/SLT_{double}$ seeding at begin of run period
- acquire enriched MUON samples and/or single-track trigger runs to test SLT-MUON trigger, evaluate SLT efficiencies on data
- evaluate and tune trigger reduction/timing using PRE/FLT data
- uniquely tag executables for future reproducibility