

STAR Trigger 2003 and Beyond

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For the Trigger Group

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How Good is it Now?

Timing tests at Level 0, Level1, Level2
10 MHz pipeline, 64k deep, 4k in play
(16 GB/s throughput, scalable)

What percentage of triggers are:
used in event reconstruction?
of min bias? of Central triggers?
rejected as background?

Afterpulsing limits us to - ~1 MHz in CTB

New for 2003

Level 1 and 2 aborts -- selection within loose L0 triggers

J/Psi or Υ invariant Mass (M_{inv}), Δ , p_T calculation

Killer bits, Beam-Gas signatures

New Network - no bottleneck at Level 1 -> 2

BBC - close 2 $< \Delta < 5$ gap

BEMC (HEMC) - localized energy for M_{inv}
expect to check M_{inv} for EVERY AuAu event

1.4 kHz < max rate for TPC grid opening

expect to check M_{inv} in $< 500 \mu s$

(FPD - π^0 for structure function)

How Good Does it Have to Be?

1.4kHz AuAu design L -> 6 kHz with 1st upgrade

-> 50kHz with RHIC II

=> 2.5 hadronic ints per 50 μ s (drift time)!

For pp : 10^{31} * 40 mb = 400 kHz = 1 int./25 xings

L (design) = 2.4×10^{32} -> 10 MHz

L (RHIC II) = 4×10^{32} -> 16 MHz

□ >1 interaction per crossing

Future Upgrade => $40 \times 10^{32} = 160$ MHz => 15/xing

“Taping” at 500 Hz

Reading the TPC at >2 KHZ

Can be accomplished using Alice FEE

Need to do minor R&D on chips to fit
into STAR system at board level

Total cost ~\$1M

- Fast triggers reduce 50kHz x 25
- L3 reduces 2kHz x 4 for 500 Hz tapping

Expanding Level 0 Capabilities

We can increase the detector-to-detector correlation analysis by making more parallel paths available. This means making copies of DSM output and adding intermediate DSMs to take copies of , e.g., EMC and CTB to make comparisons.

This may be accomplished w/o more time required, or we may need to add a tick or two depending on the complexity of the correlation.

Optical interconnects

One problem in increasing the parallelism of the DSM tree is cable mass.

We could simplify the interconnect using new optical fiber transmission schemes.

This would mean new interface cards, but not New DSMs.

Afterpulsing - Eliminate

Why? - Limits livetime of CTB (and other dets?)
killer bits in UPC trigger

Solution: TOF with RPCs??

Or Replace PMTs or Detectors
requires R&D on PMT replacement

VPPD?

We know how to build it - needs prototype and then full fab

Our new TAC may be usable

=> May just need good detector to feed it

Do we need vertex resolution better than ZDC?

Yes, for M_{inv} at Level 2

For SVT?

Inclusive Event Selection?

Prescaling inclusive events - paradigm shift

Can be accomplished using DSMs -

Do we need this?

Do we want this?

EGJ -- “There is always a hole”

FM - “This would be a challenge in bookkeeping”

Scaler Experiments

Parts of the spin program can be accomplished
using just scalers on the different detectors
perhaps the d-Au structure function also

Should we fab a standalone system for use at IP12
and another at STAR to run continuously
independent of the rest of STAR?

Do we need new Trigger Detectors?

High pt?

expect EMC to go to 30 GeV

Do we want separate muon identifier?

Better granularity?

EMC matched to showers now

Better PID?

electrons vs hadrons in EMC?

Conclusions

Present trigger amenable to increased Luminosity

However, pp will be >10 interactions/xing

AuAu ~ 2.5 int/drift time

Easy, not cheap, to add new detectors

Some R&D required