TOFp / pVPD / TOFr in Run-III

W.J. Llope for the STAR TOF group
STAR Collaboration Meeting, BNL, 2/26/2003

outline:

Run-III  (d+Au)
  hardware...
  chronology for days 19 - 55...
  hit patterns
  integrated #’s of events and TOFx hits....
  hit patterns movie...
  preliminary pVPD performance...
    efficiency & Nhits...
    preliminary start resolution...
  early results from the stop side

Run-II  (Au+Au)
  see talk in spectra PWG tomorrow
TOFp Detectors for Run III

pVPD and TOFp as in Run-2
first run for MRPC TOFr in STAR

pVPD at run-2 pp gain set
local trigger 1. and 1

TOFp

pVPD East

pVPD West

TOFr

east TPC

~60°

41 slats
~80 cm²/slat
~3.2k cm² total

28 modules
168 MRPC chs
72 digitized
~20 cm²/cell
~1.4k cm² total

~60 cm²
~3.2k cm² total
TOF Systems Event Totals (days 24-55)

(*) day number is that when localmon data are saved to specific file names. 
*i.e.* gaps in the above don’t imply tof was down (probably machine was though)...

local trigger efficiency ~28% (stable).

so far:  
→ ~5.5M pVPD “physics” events  
→ ~1M total TOFp hits  
→ ~0.5M total TOFr hits  

individual ADC and TDC distributions are generally fine - some scattered bad chs

(all freon-only)
Hit Patterns to date

days 25-55
localmon sampling rate = 10%

TDC Hit Pattern, w/ ADC hit

ADC Hit Pattern, w/ TDC hit

so far ~40k hits per TOFp slat
~10k hits per TOFr cell
the usual handful of sick TOFp chs
3-4 TOFr chs w/ problems
(not all necessarily detector problems)
<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 19</td>
<td>19</td>
<td>Run 4018026, first test of TOF-DAQ communication in a test run. TOF systems now under Shift Control and involved in running. Trouble w/ TOFr HV tripping at beginnings of fills, lost TOFr for some spills...</td>
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<td>Jan 20</td>
<td>20</td>
<td>TOFr “Mapping Problem” seen, (re)maps defined to fix problem in software.</td>
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<td>Jan 23</td>
<td>23</td>
<td>pVPD now at correct gain set and controllable from SC GUIs (Dennis Reichold et al.)</td>
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<td>Jan 27</td>
<td>27</td>
<td>TOFr “Re-Ramp” functionality implemented. TOFr never misses spills now...</td>
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<td>Jan 28</td>
<td>28</td>
<td>TOFp chokes - FEE failure...</td>
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<tr>
<td>Jan 30</td>
<td>30</td>
<td>Scheduled Access w/ East Pole-Tip off. TOFp fixed. all signal paths strobed... (mapping problem) detailed study of all TOFr cabling - no problems seen!</td>
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<tr>
<td>Feb  6</td>
<td>37</td>
<td>TOFp ADC #2 dies, replaced w/ one w/out preset pedestals...</td>
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<tr>
<td>Feb 12</td>
<td>43</td>
<td>First integration of TOFp HV, TOFr HV, and TOFr Gas Monitor in STAR SC GUIs...</td>
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<td>Feb 13</td>
<td>44</td>
<td>TOFp “current limit problem”” appears - fixed same day in surprise access... TOFr Mapping problem traced to two bad TDCs - replaced. Mapping problem gone.</td>
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<tr>
<td>Feb 21</td>
<td>52</td>
<td>Starting to implement local logic for pVPD- and TOFr-based triggers... timing tests...</td>
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<td>Feb 23</td>
<td>54</td>
<td>Data looks wierd (hear lots going on re: L2 and DAQ...)</td>
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<tr>
<td>Feb 24</td>
<td>55</td>
<td>Data looks better (no local changes), but now seeing more L2 timeouts than expected... increased local L2 time-out delay from 0.1s to 0.5s - huge improvement. TOFr TDC #7 dies..</td>
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<tr>
<td>Feb 26</td>
<td>57</td>
<td>Scheduled access.... (replaced 1 TOFr plat disc, 1 TOFp ADC, 1 TOFr TDC, tests)</td>
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</table>

Hit Pattern Movie
pVPD in d+Au

pVPD **East** sees Gold ring  \(\rightarrow\) **sees Au** fragmentation

pVPD **West** sees Blue ring  \(\rightarrow\) **sees d** fragmentation

local trigger condition is “1.and.1”....

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<th>No. Lit PMTs East</th>
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</table>

these are “localmon totals”
multiply by ten to get actual evt totals so far (days 24-55)...

- East chs should outperform West chs

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on average

1.3 hits West hits per event  \(\rightarrow\) primarily single-particle timing... (ouch)

2.4 hits East hits per event  \(\rightarrow\) multi-particle timing...

East chs should outperform West chs

(vastly different environment on the start side as compared to Run 2’s symmetric beams!)
pVPD resolution in minbias d+Au

"1-<2>" vs ADC

East 1

pass 1

East 2

pass 2

East 3

pass 3

pass 4
σ(1-⟨2⟩) is ~2.7 TDC chs, or ~135ps
→ single detector resn on the East is ~104-110 ps
  → σ⟨2⟩ ~ 74ps
  → σ⟨3⟩ ~ 65ps
  → σ⟨4⟩ ~ 58ps

pVPD start resolution is better than expected
i.e. more forward hits than expected
may be harder to get the West calibrated to this level...
d+Au Production underway (hurray!)
production of TOF miniDST underway (FG),
so-called Match Ntuple for TOFp few days later
full calibration of pVPD and TOFp then starts (few days)
work also started on similar software for TOFr:

PID

- Entries: 461
- Mean: 0.4973
- RMS: 0.5183

(Lijuan Ruan)
very preliminary
no stop side corrections...

first fully calibrated d+Au results from TOFp+pVPD in ~1 week...
Summary

**pVPD, TOFp, TOFr up and running well since Day ~24...**

no trips or other “emergencies” for the shift crew to deal with...

**various intermittent detector/electronics problems** throughout but overall

- ~5.5 M pVPD physics triggers (corresponds to 22M STAR events)
- ~1M total TOFp Hits
- ~0.5M total TOFr Hits (all freon-only)

~40k hits/slat in TOFp
~10k hits/cell in TOFr

(add’l penalties: ~0.7 good starts * ~0.3 primaries * Zvtx cut)

a pVPD+TOFr trigger would be immense boost to TOFr data set (see following talk)

**pVPD timing resolution in d+Au is better than expected....** in range from 50-80ps minbias...

- ~1.3 hits/event on West
- ~2.4 hits/event on East

  East will outperform West...

**Production data becoming available**

expect fully calibrated $1/\beta$ vs $p$ spectra from pVPD+TOFp in ~1-2 weeks...

pVPD+TOFr spectra soon thereafter...

**Plans for rest of run.**

- TOFp and pVPD no changes - just take data...
- TOFr

  Want to switch to Freon + ~5% isobutane in less than ~1 week...

  Want pvpd+tofr triggered data runs for both gas mixtures...