

Readout Rates for the “Others”

What other limitations are there?

- EVB Rate
- Front End Readout
- Down Stream Limitations
- Other Worries...

MVME5500 Status

DSP V65 Readiness

Chicago TDC Integration Into RC

EVB Rate

The current rate limit of the EVB is about 400 Hz compared with the design goal of 300 Hz.

400 Hz limit comes from message passing latencies

The upgraded EVB has a design goal of 1000 Hz.

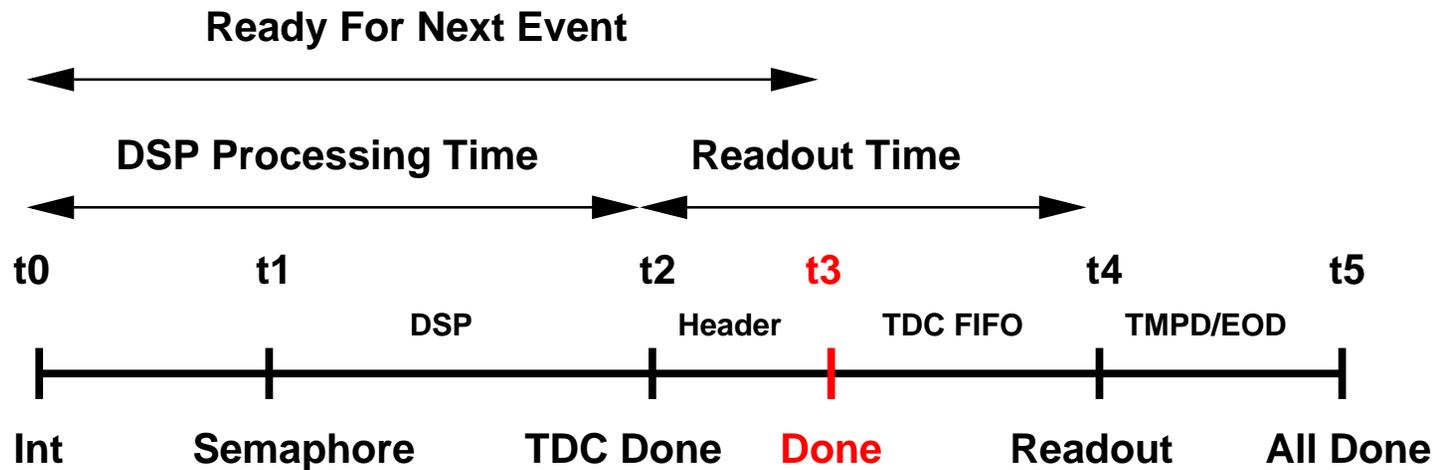
Changes:

- Use a GigE switch instead of ATM
- Replace scramnet with GigE for message passing → greatly improves the message passing latency
- Replace SCPU with linux (rewrite TM code)

→ *New limit comes from VME readout times...*

We do not have an estimate for the actual rate... *but* initial measurements indicate we will be able to achieve the 1000 Hz goal...

Front End Readout



Maximum of “Time to set TRACER done” and readout sets the overall readout rate

After reading out formatting the data the TMPD diagnostic bank is created and sent out (small overhead).

The Trigger Supervisor can issue the next trigger for a given L2 buffer only after it receives a “Done” for that buffer.

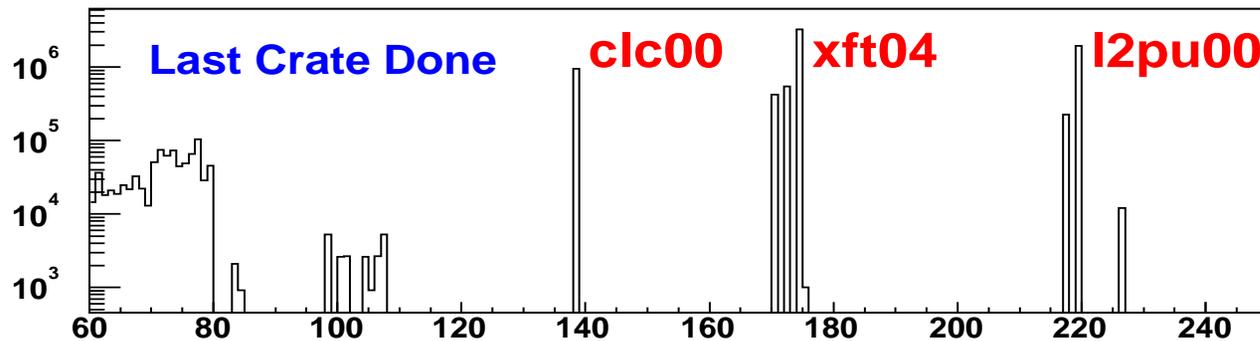
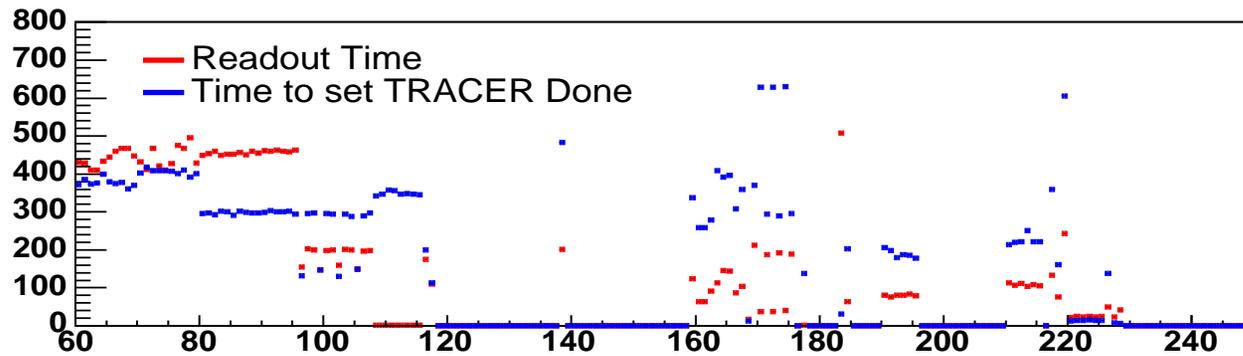
The Front End crate sets the TRACER done.

Readout/Reformatting is done after setting the TRACER done.

VME cards can process the next event while the current event is being readout

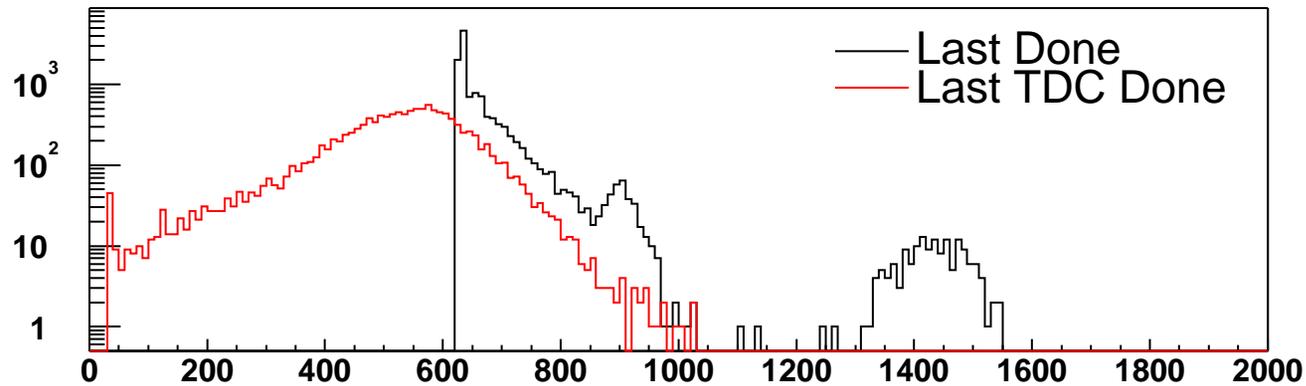
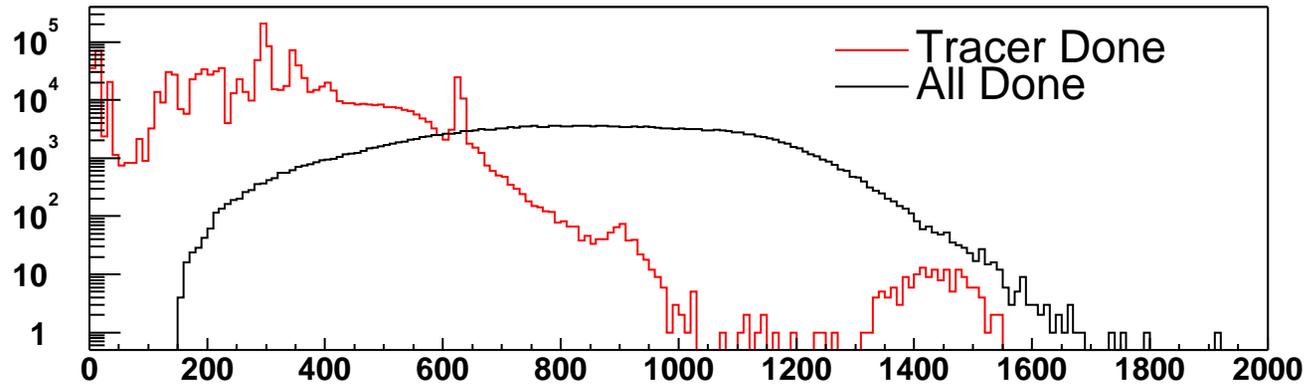
Processor needs to handle the current event before reading out the next.

Comparison of Readout time and the time to set TRACER done. Plotted as a function of the crate's IP address...



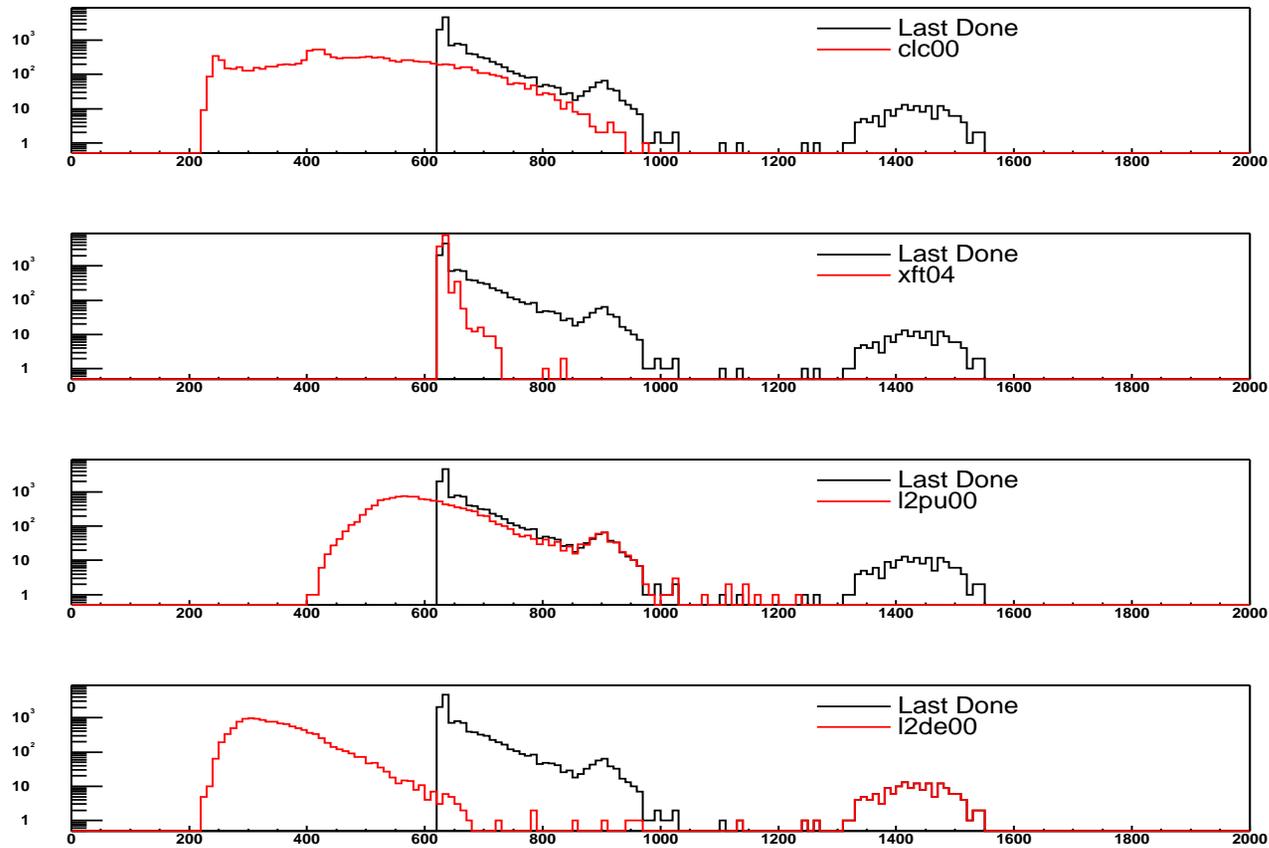
- *The last crate to set TRACER done is clc00, xft and l2pu00*
- *See that the WCAL crates were set in synchronous mode...*
- *Can improve the "Readout Time" for the CCAL crates by using faster processors...*

Total time compared with the time to set TRACER done



See that the COT crates are sometimes the slowest crate - but at these luminosities they are not the dominant contribution...

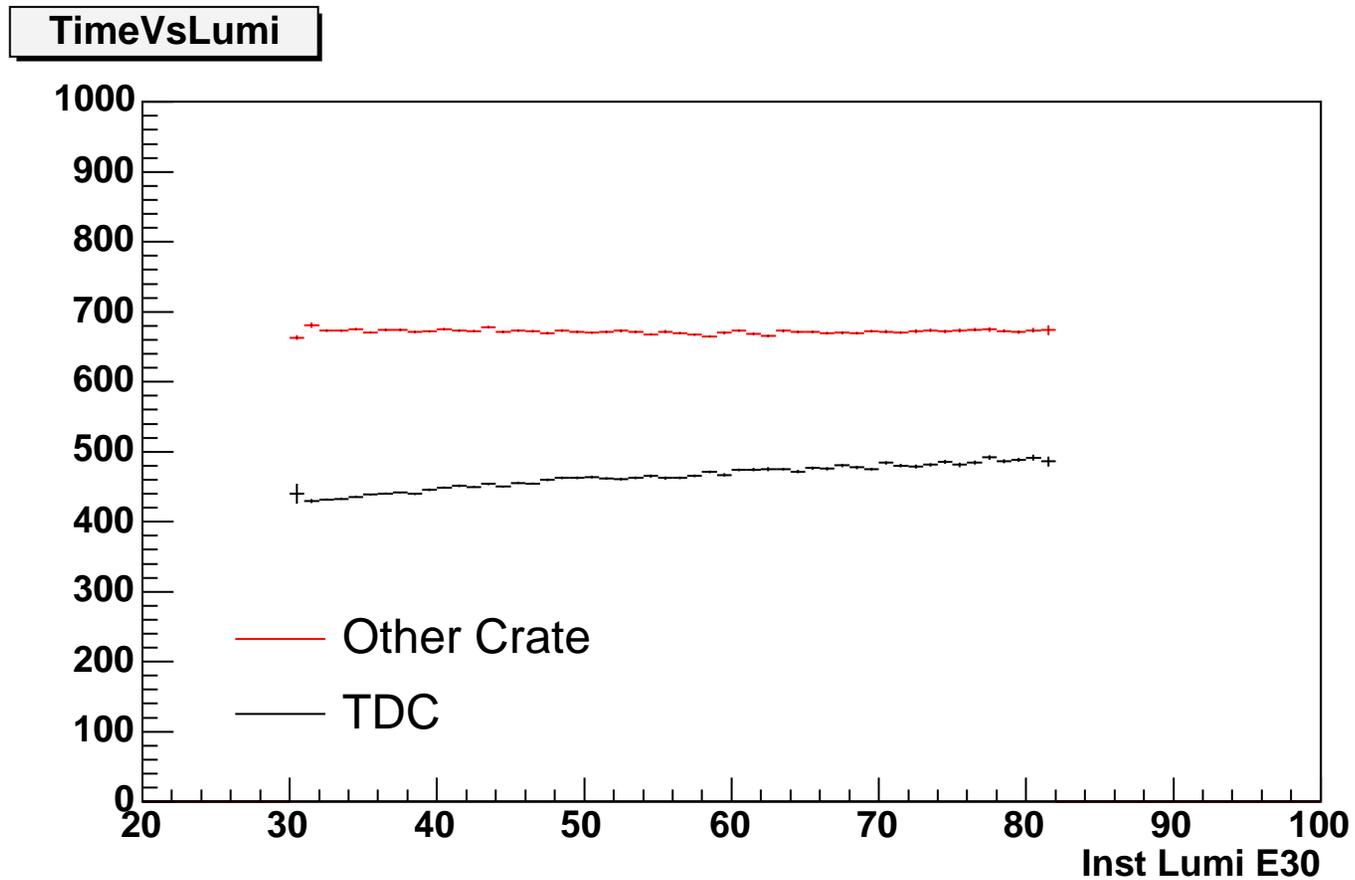
The CLC, XFT and L2PU are the slowest crates in the system



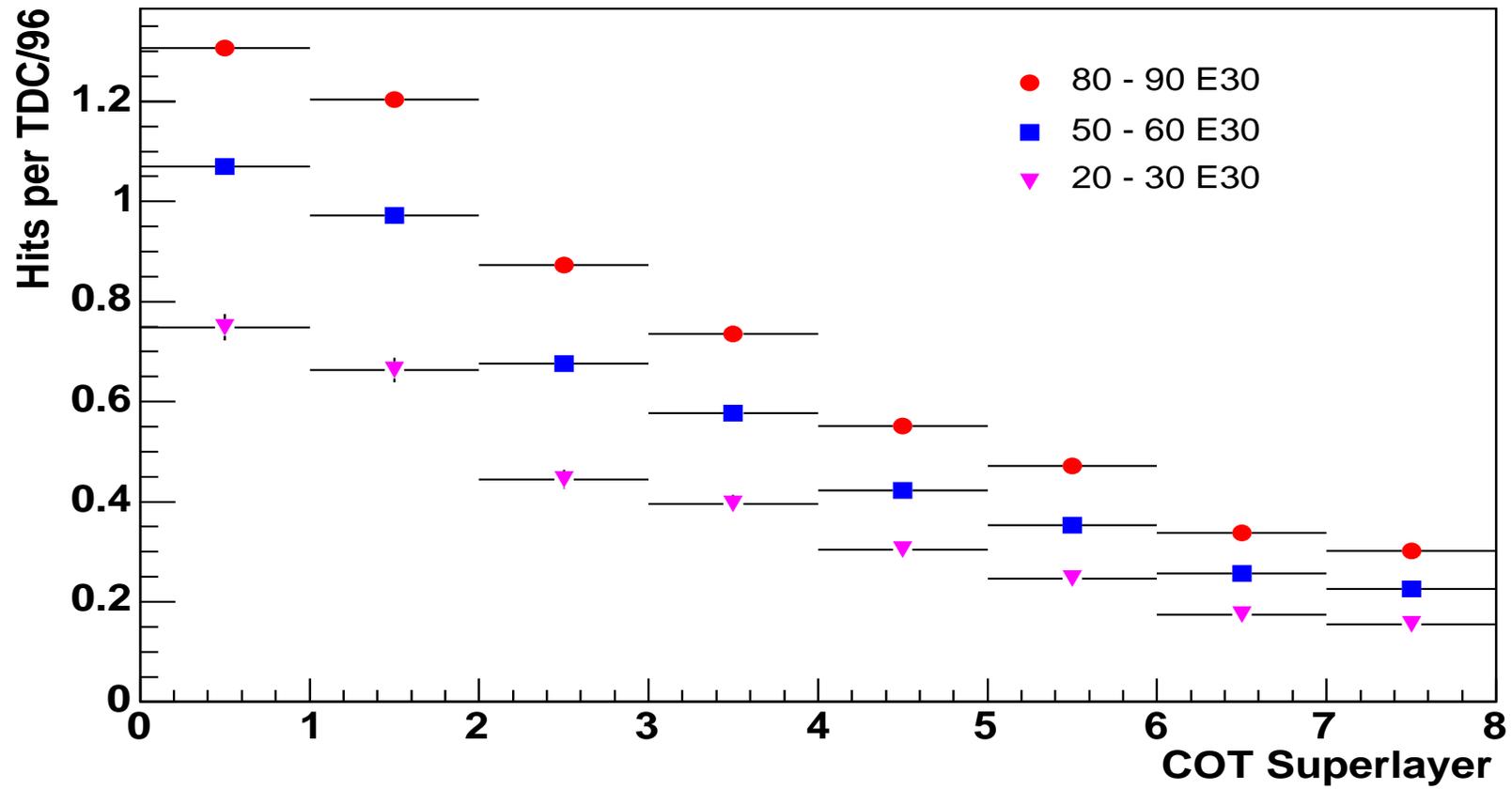
Large times are the result of reading out diagnostic information
→ *Diagnostic readout can be reduced by using "readout lists"*

CLC crate may be more problematic...

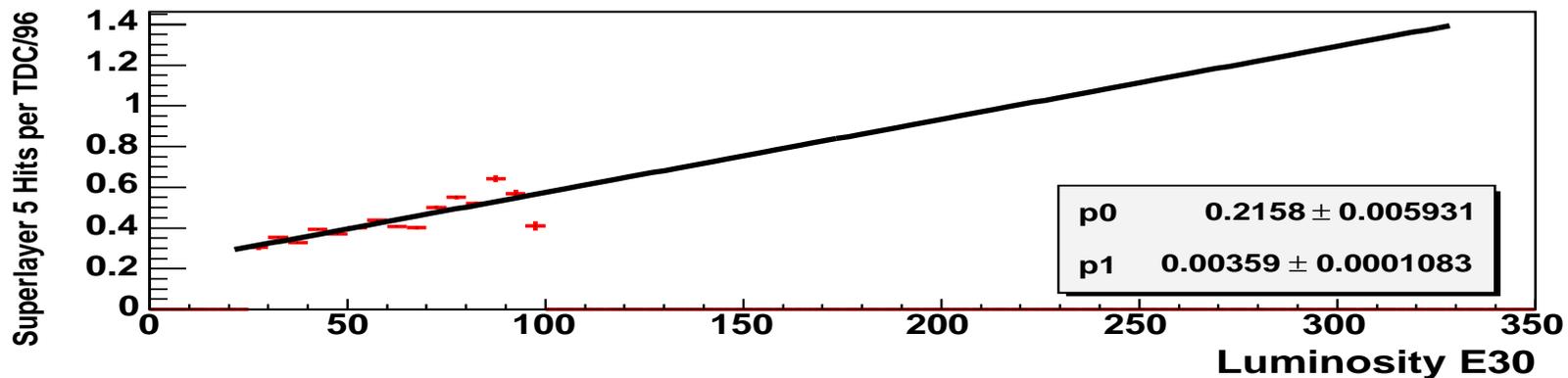
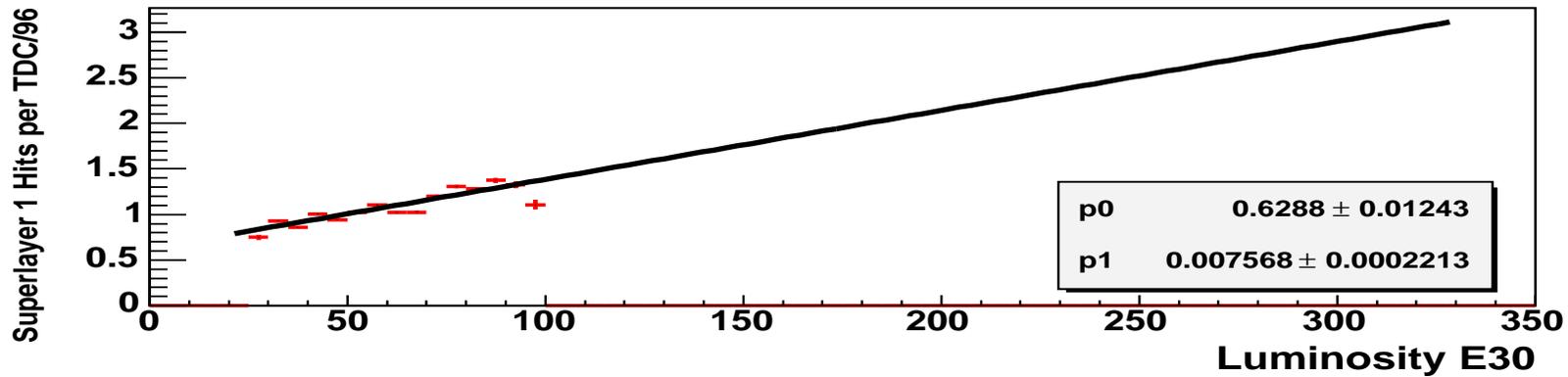
Time to set TRACER done is relatively constant for the “other crates”, growing for the TDC crates with increasing occupancies



TDC Occupancy for Each Superlayer



Projected COT occupancy vs luminosity



Extrapolation to Run IIb luminosity (330×10^{30})

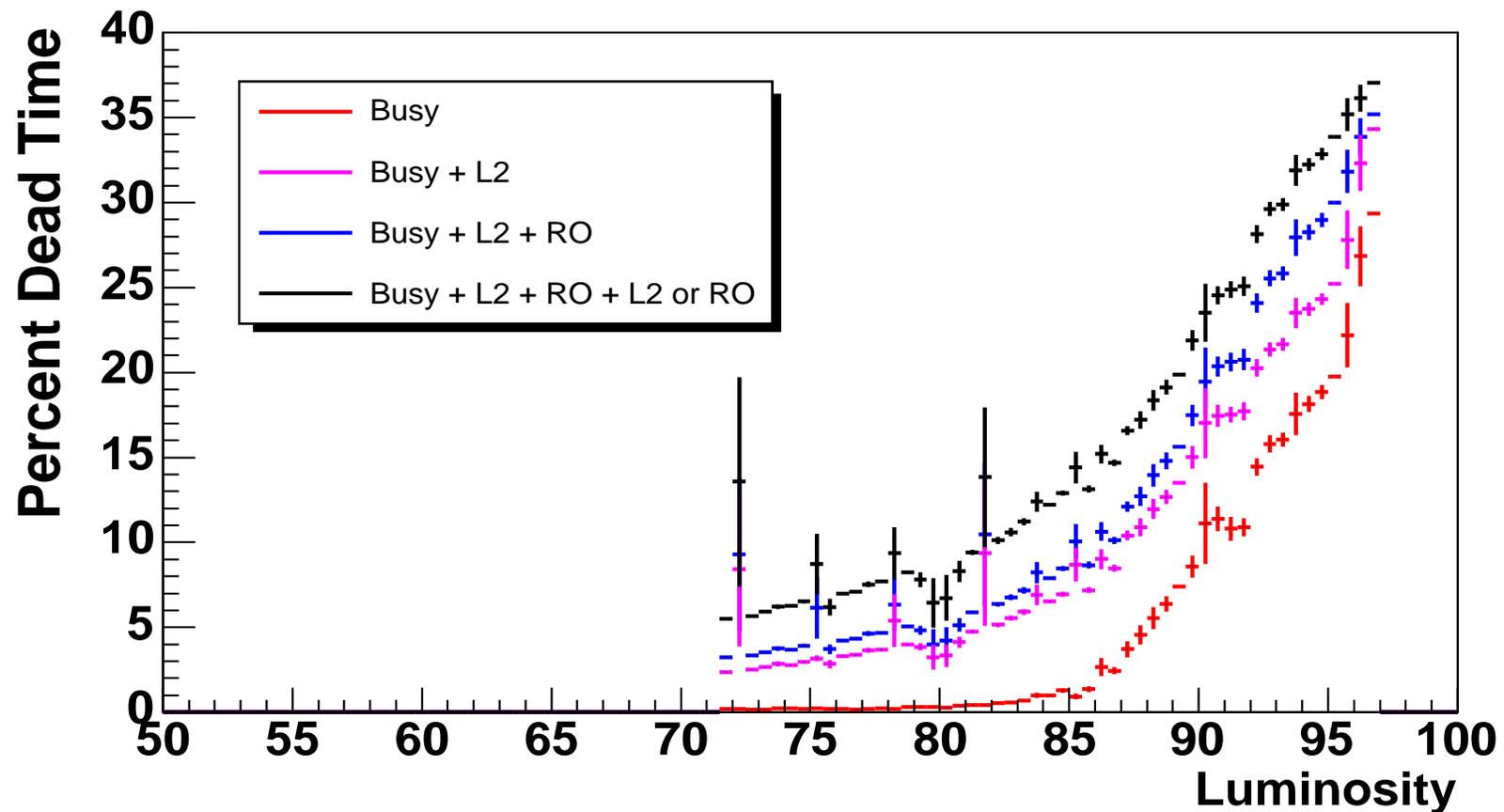
$$SL1 : 0.6288 + 0.007568 \times 330 = 3.1 \quad \text{hits/channel}$$

$$SL5 : 0.2158 + 0.00359 \times 330 = 1.4 \quad \text{hits/channel}$$

Down Stream Limitations

- EVB limits us to 400 Hz → 1000 Hz by 2005
- L3 replacing 64 PCs expected to be in use coming out of the shutdown *850 - 1000 Hz PCs replaced with 3 GHz PCs*
 - Old PCs had the motherboard defect that resulted in a corrupted disk when file system check was performed...
 - Also replacing PCs with chronic problems...
 - Increase in about 3× processing power for the replaced PCs and greater reliability...
- CSL using parallel logger, coming out of the shutdown 20 → 30 MB/s *New hardware 40 MB/s by 2005 and 60 MB/s by 2006*

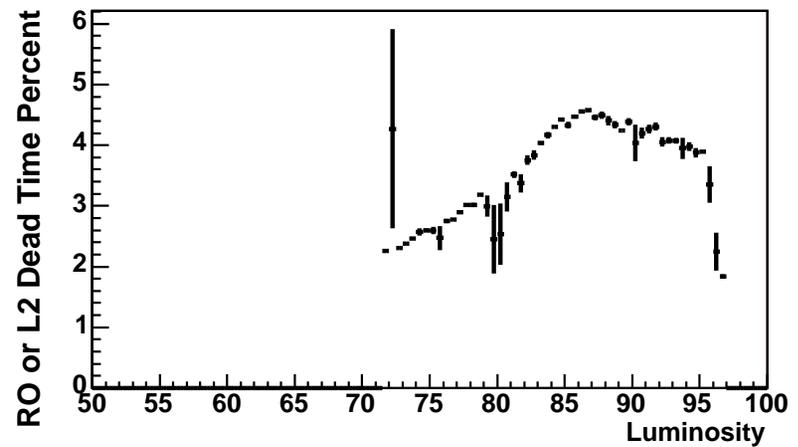
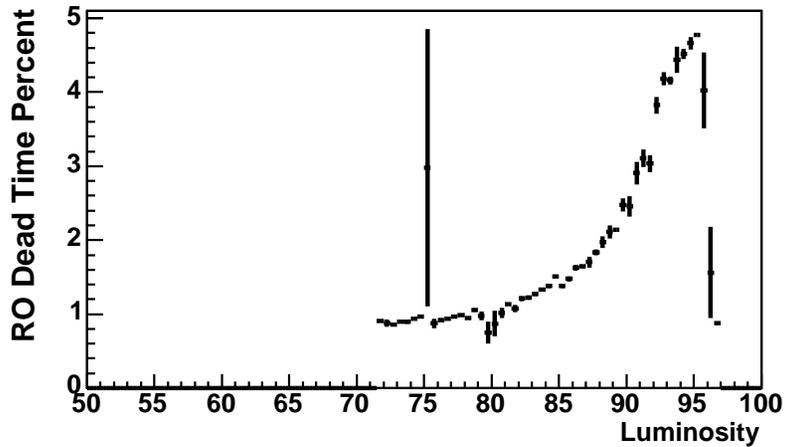
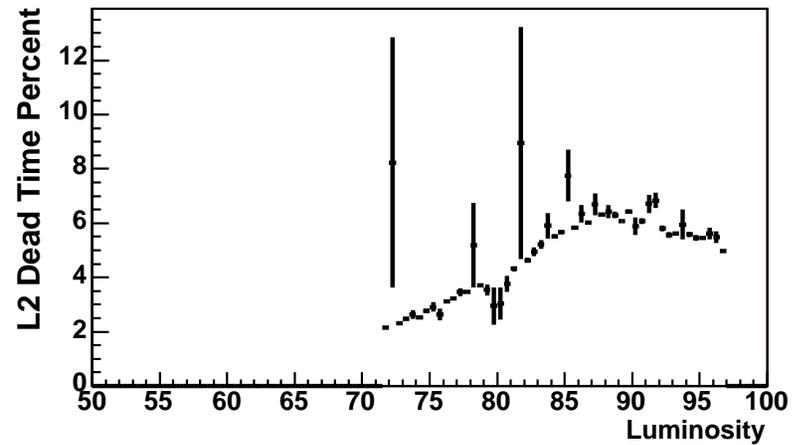
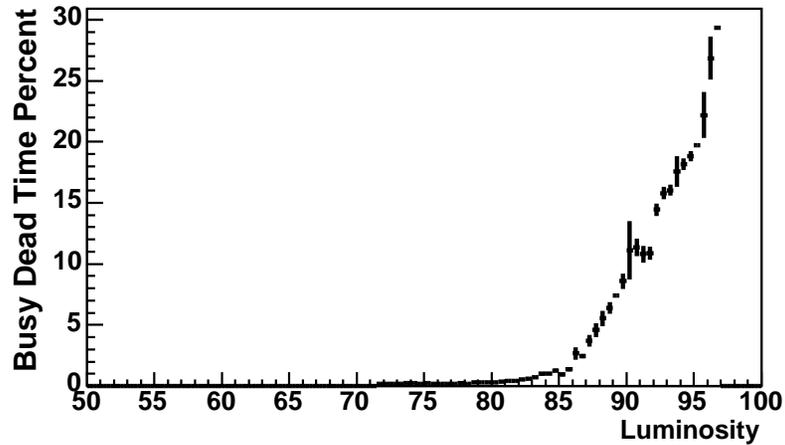
Other Worries



Busy deadtime is the main source of deadtime (400 Hz EVB)

Need to control the L2 rate with new trigger tables...

See that the L2 deadtime is also significant..



In order to get a more clear picture of the deadtime from the trigger we would need an updated simulation...

MVME5500 Status

The motivation for using the MVME5500 is that it has two ethernet interfaces (fast and GigE).

We intended to use the GigE interface to transfer data to the “virtual VRB”

With the new data format we expect a maximum rate of about 7 MB/s (assuming 4 hits/channel and 1000 Hz) which is below the 12 MB/s limit of the TRACER.

Using the virtual VRB may reduce congestion further downstream

→ new TDC data format will also help with this

The MVME5500 is the product of the future and Motorola has announced the end of life for some older processors:

MVME147	EOL	2377	MVME177	EOL	2373
MVME162	EOL	2372	MVME2304	EOL	2382
MVME172	EOL	2372	MVME2603	EOL	2378
MVME167	EOL	2373	MVME2700	EOL	2379

There has been a lot of work done in order to get the MVME5500 working with our existing code

- Tests were done measuring the transfer rate over GigE.
- Board was installed in one of the muon crates and run during regular data taking.

Found to freeze up once per shift.... Did not respond to remote VME reset, needed to press the reset button on the front panel

Engineering Change Notification for Motorola MVME5500.

“The MVME5500 is being revised to incorporate an 82554 Gigabit Ethernet Controller SROM change. Due to the Intel 82554 errata 22 – Packet Reception with APM enabled before Driver Load – the ethernet controllers receiver can lockup during a powerup/initialization sequence. For this to occur the APM [Advanced Power Management] enable bit must be set and a non-wakeup packet must arrive at the receiver before the software driver has enabled the receiver in the device. We currently set the APM enable bit. This change disables that bit.”

We have sent one MVME5500 back to get this fix implemented.

We are still investigating the freeze up problem

→ See what effect disabling the GigE interface has...

→ See if the errata fix helps...

DSP V65 Readiness

DSP Code and front end readout is ready and tested. V65 is loaded in the database and we can switch between versions...

Offline bank accessor has been updated and tested. In development - not tagged in any release...

→ *Calibration consumer needs to be updated for new t_0 and max width (minor)*

→ *TDC Test code needs to be updated (Texas AM?)*

→ *Need to update hit unpacking routine used at L3 (Aseet). Mostly done, still a bug or two...*

Want to have this in place so that we can come up out of the shutdown using the new format.

New format will reduce in event size of a factor of $2\times$, *helps with readout times...*

Chicago TDC Integration Into RC

Work has started on integrating the readout and configuration of the Chicago TDC into Run Control.

Michele Rozzi (Italian summer student) has worked on setting up a template that has the callout routines that are used by RC.

The format of the teststand code (NuTDC) and the library needed by RC is very different. Can use the code as a guide...

Bill Badgett setup a new configuration message that will be used for the new TDCs

Bill has initialized the board and read out the new TDC in spy mode with the HEVB. *“Works to first order”*

→ This is a Run Iib project and we do not have people officially assigned for this work...

Spy Mode Readout...

Data captured by TRACER and send to the VRB as it is being readout.

Options:

→ Use spymode with new TDCs, VME transfer becomes the limiting factor...

→ Use VME64 - readout TDCs then write back to TRACER, lose the benefit of SPY mode

→ Use VME64 - readout TDCs then write over GigE to virtual VRB

Need to characterize each option...

So far we have not done any work on the virtual VRB...

Expect that optimizing the new TDC readout will take considerable effort...

Summary

Currently the TDCs are not the limiting factor, but will be as the luminosity increases.

Identified other crates that require work (CLC, XFT, L2PU00...)

→ *Can use Readout Lists in some cases (L2PU00, XFT?)...*

→ *Use faster processors, CCAL TSI03*

→ *CLC may be more challenging...*

Want to use DSP V65 coming out of the shut down.

→ *Readout has been tested*

→ *New L3 code almost ready*

→ *Calibration consumer needs minor updates*

→ *TDC test code needs to be updated*

New data format will result in a maximum of 7 MB/s which can be accommodated by the TRACERs

→ Will not need to use the virtual VRB (no GigE data path...) *or do we?*

Still have problems with the MVME5500. Want to resolve these issues so that we can use this board in crates that require a faster CPU and in order to keep open the virtual VRB option...

Integration of new TDCs progressing well and spy mode readout working to first order....