Road map to physics operation of INTT

RIKEN/RBRC

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To declare physics mode operation of INTT

A) 8 Felix servers in operational condition
- Intt0 and intt1 are under triggerless mode.
- Fallback solution: Disable calibration flag in Felix. No calibration possible for intt0 and intt1.

B) Fix timing and online parameters
- Inconsistent time-in condition between 8 felix servers .has to be resolved in order to finalize the timing parameters
- All felix servers are to be timed-in within 2 BCLKs (1BCLK by the end of Run23)

C) Proof of correlation with other detectors
- Attempt to synchronize w/ MBD by event counter after Martin's new decorder was unsuccessful.
- If feasible, MIP observation in conjunction with MBD's z-vertex cut.

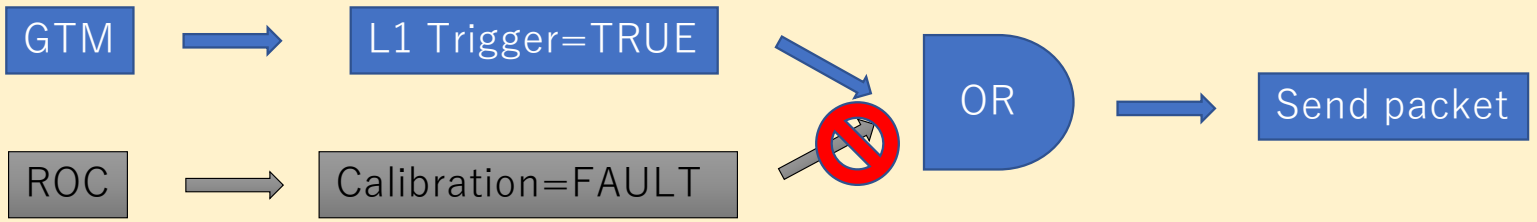
D) Online Monitor
- Need to prove the it displays known dead/hot spots (no-bias silicon region, hot chips, etc)

A) Triggerless Symptom Issue

Raul

- Intt1 has been barely operational since it tends to become triggerless (see below flow chart). Noisy condition of intt1 server has been a suspect, but no obvious abnormal grounding was found by Rachid within 6/21 access.
- The same symptom appeared to intt0 on 6/22 and all ROCs in 6/29 owl shift.
- Raul implemented new firmware which disables the trigger thru SC link from ROC in intt1 on June 29th around 23o'clock.
- We should watch if intt1 won't gets exploded with the new firmware.
- The trade off is no calibration capability for these servers.

"Triggerless Mechanism" in the present felix firmware

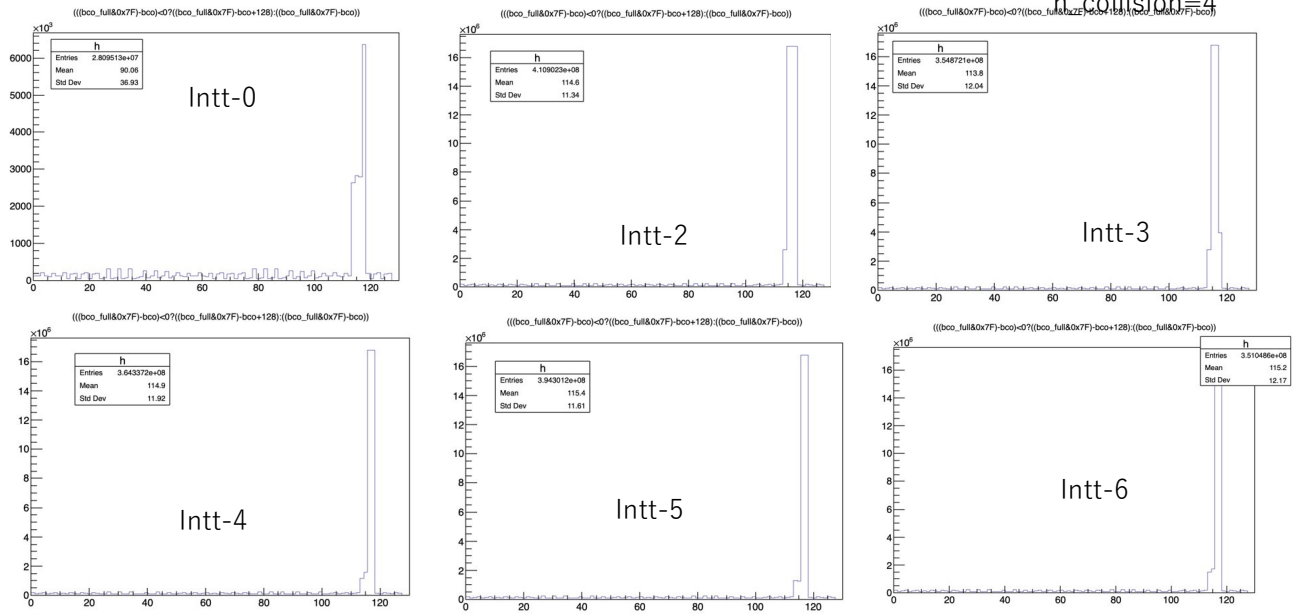


But somehow it becomes TRUE status
SC TLK malfunction?

B) Inconsistent time-in between 8 felix servers

bco_full – bco distribution on other felixs (Run#9328)

n_collision=4



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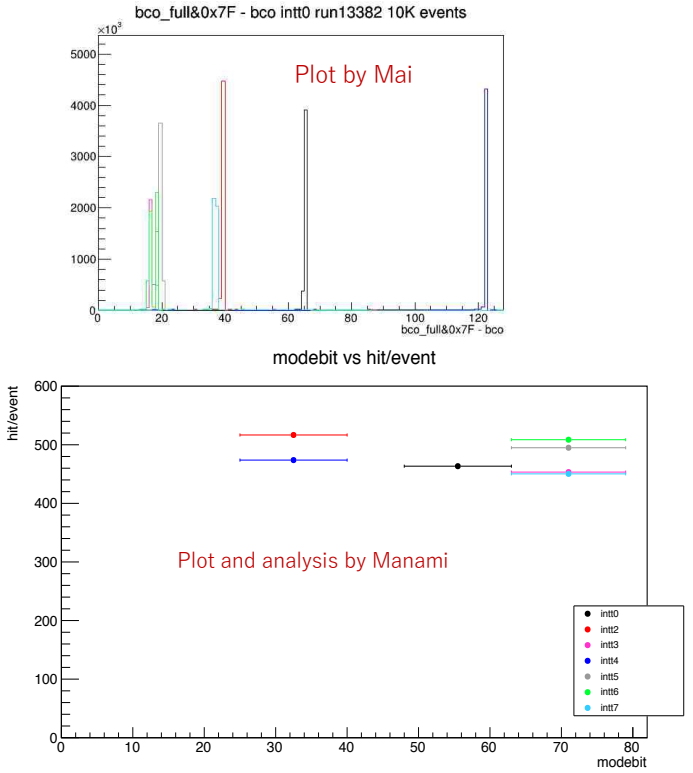


Above plots made by Maya demonstrate peaks in the same location i.e. horizontal axis around ~116 implies all 6 servers were timed-in with the same modebit delay setting

Time-in Scan results of 6/19 (data taking by Mai). This implies we lost timing control of each servers. The question is when and how come?

B) Optimization of Timing Parameters

Jaein, Cheng-Wei

- Once all 8 servers are timed-in, then execute BCO phase scan to accommodate all hits within 1~2BCLKs. (To fit in 1BCLK for all servers, clock synchronization between inttX serves has to be established by Raul).
- A simple script to set delay set# and save log.
- To be executed by onsite crews (Jaein, Cheng-Wei, Rachid, …)

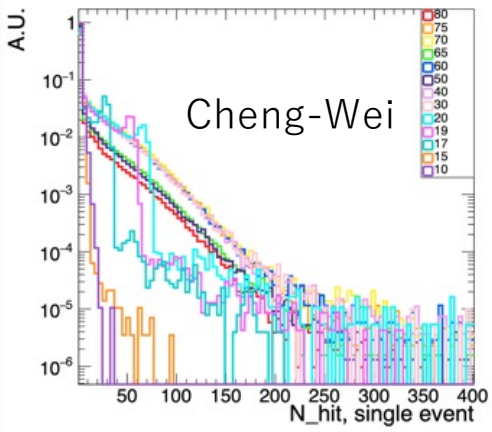
Delay Set #	1	2	3	4	5	6	7	8	9	10	11	12	13
L1 Coase Delay	147	147	148	148	149	149	150	150	151	151	152	152	153
Fine Delay	0	111	0	111	0	111	0	111	0	111	0	111	0
Total Delay [BCLK]	24.50	24.58	24.67	24.75	24.83	24.92	**25.00**	25.08	25.17	25.25	25.33	25.42	25.50
Total Delay [ns]	2606.38	2615.26	2624.11	2632.99	2641.84	2650.72	2659.57	2668.44	2677.30	2686.18	2695.04	2703.92	2712.77

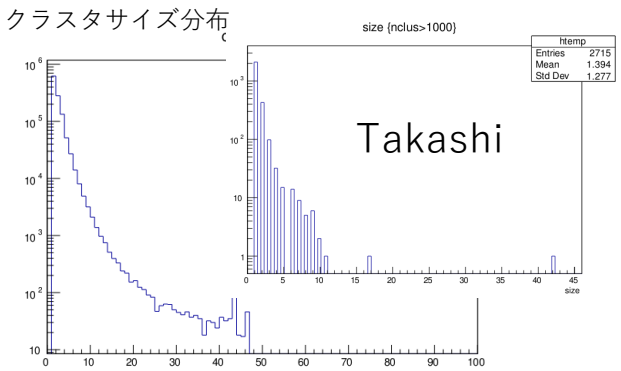
B) Optimization of Timing Parameters

Cheng-Wei

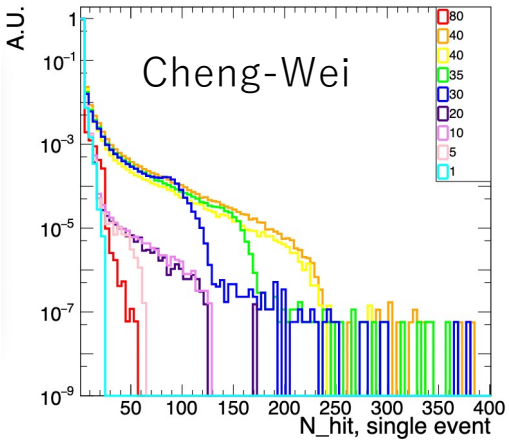
- The 2nd open time scan was executed to confirm present open_time=35 is sufficient.
- The analysis results appeared inconsistent with the first scan result, may because of rootfiles are produced by Martin's wrong decorder.
- Re-process Run#9545 ~ 9558 with Martin/Takashi's new decorder and to be re-analyzed. Genki/Itaru

First Open Time Scan Result





2nd Open Time Scan Result



/home/inttdev/data/IR_DAQ_server/INTT_study_run/BCO_window/data_analysis/8020_Time_5min_L1Delay00_Ncollision127_Opentime120

DAC0 Scan

Jaein

- Data was taken in 6/11 Run#10472 ~10481
- Root files are to be reprocessed after Martin's new decorder and to be re-analyzed. Genki/Itaru
- Noise hit rate has to be evaluated under the beam circumstances and renew the present mask list which was evaluated from calibration and pedestal data.
- Evaluate the variation of chip-by-chip hit rates. Consider raising threshold for hot chips to make OnlineMonitor hit maps reasonably uniform.

B) Inconsistent time-in condition between 8 felix servers

Raul

- One of the hypothesis to explain this symptom is screwed up timing of modebits commands delivered to inttX servers from GTM.
- Direct observation of modebits signal timing at Felix servers using oscilloscope is to be done to observe the cause.

B) Inconsistent time-in condition between 8 felix servers

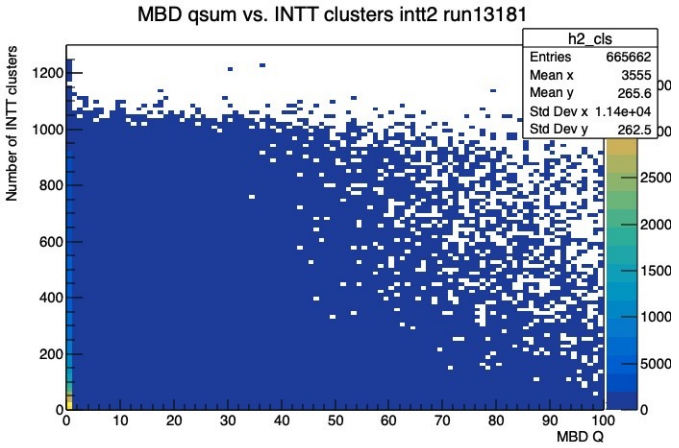
Mai

- Was consistent in 6/11 Run#10483. All servers (except for intt1 were timed-in)
- Lost consistency at some point.
- To be traced back when we lost the timing consistency. On of the suspect is the GTM firmware upgrade to version 41 on 6/16.
- Check the consistency of each servers of BCO_FULL-FPHX_BCO before/after the version 41 upgrade.
- Example) Run#11929 (6/13) vs. Run#13053 (6/16)
- This will be a hint for Raul to debug this issue.

C) Correlation Study w/ Other Subsystem

Maya

- INTT vs. MBD correlation study after Martin's new decorder was by synchronizing event counter wasn't successful, although the data (Run#13181) demonstrated satisfactory correlation between intt5 and intt6.
- Debugging is now underway.
- Possibly to lose sync in the middle of run?
- May be worthy to correlate with HCal instead. Run#14114 (only Hcal East was running)



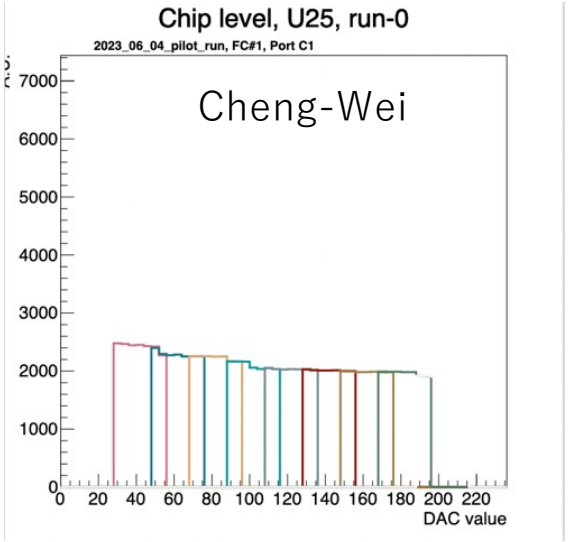
C) Correlation Study w/ Other Subsystem

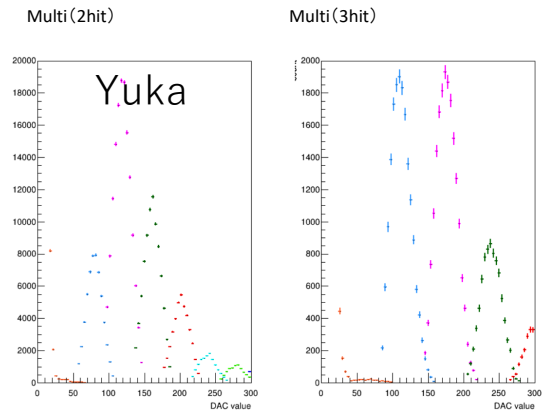
Cheng-Wei & Yuka

- Cheng-Wei and Yuka are making the first round analysis of the DAQ scan took on 6/5. The MIP peak has not yet established.
- The data were taken between Raul's firmware upgrade and Martin's decorder upgrade.
- Root files are to be reprocessed after Martin's new decorder.

Genki/Itaru

- Should execute DAC scan again once the correlation w/ MBD is established so that we can classify by z-vertex.
- However further analysis and feedback are welcome to make the next round data taking successful.





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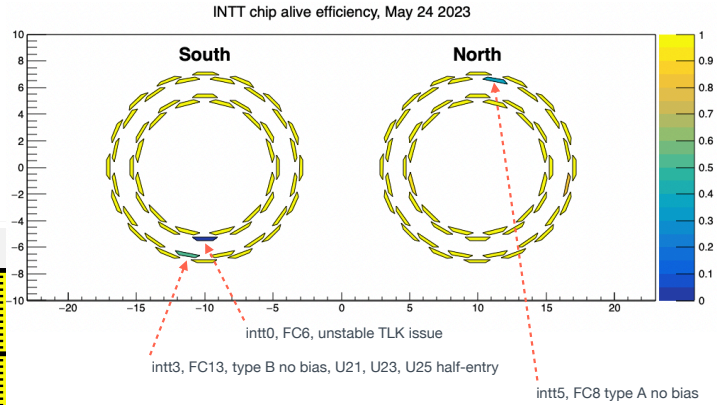
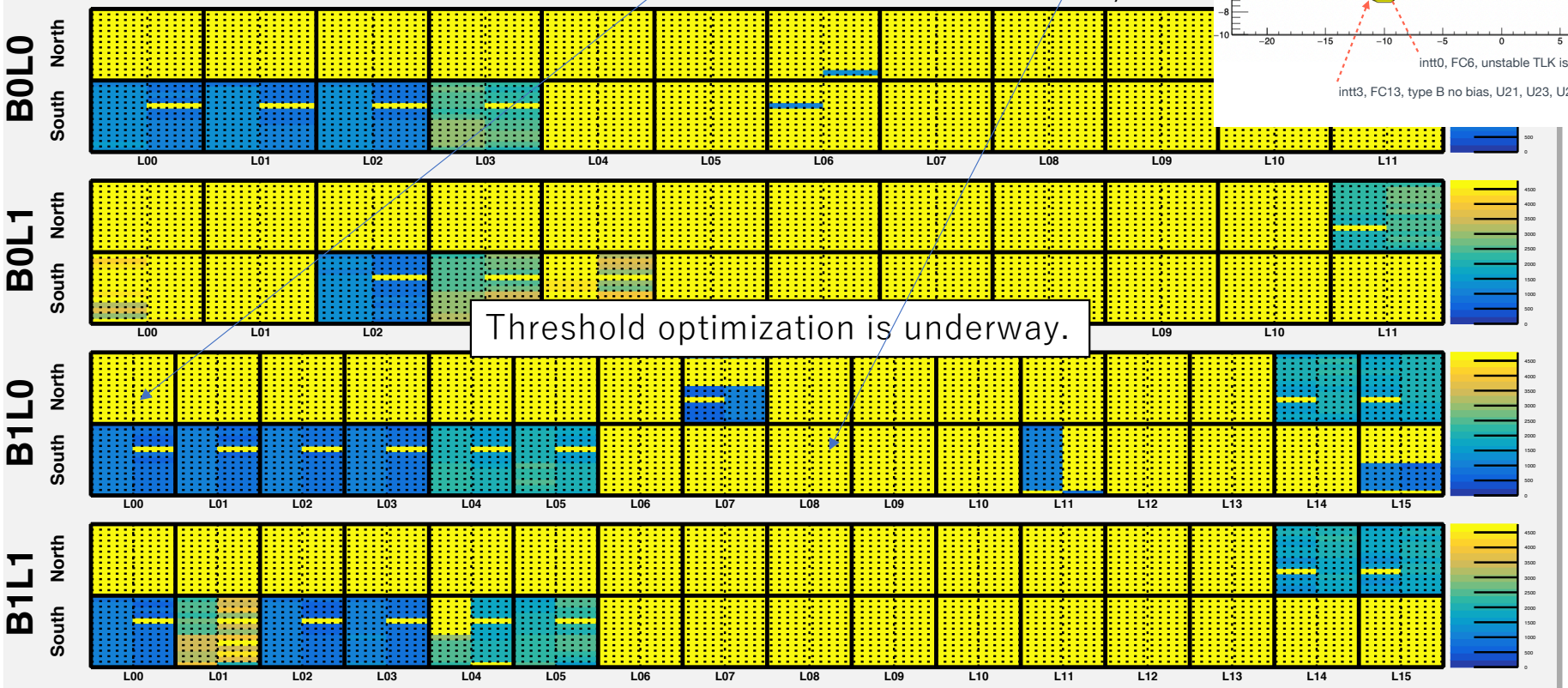
D) Online Monitor

S-B1L008 type-B no bias

N-B1L000 type-A no bias

Online Monitor for INTT has been available for shift takers since 6/14





Threshold optimization is underway.

Joseph

Quality of INTT data can be monitored by shift takers run-by-run basis

Further developments

Further development Lists

- Automation of data file transfer to SDCC and data process (Milan)
  - Run analysis
  - Upload plots on the web.
- Setup database of online parameter in sphnxdbmaster (Genki/Cheng-Wei when they are back in BNL)
- Event display (Manami)
  - Implement necessary libraries to the code
  - Debug DST files produced by Joseph and feedback