ORR Meeting: Hodoscope & NIM Trigger Subsystem

SpinQuest/E1039 Collaboration

April 14, 2023

Hodoscope & NIM Trigger Subsystem

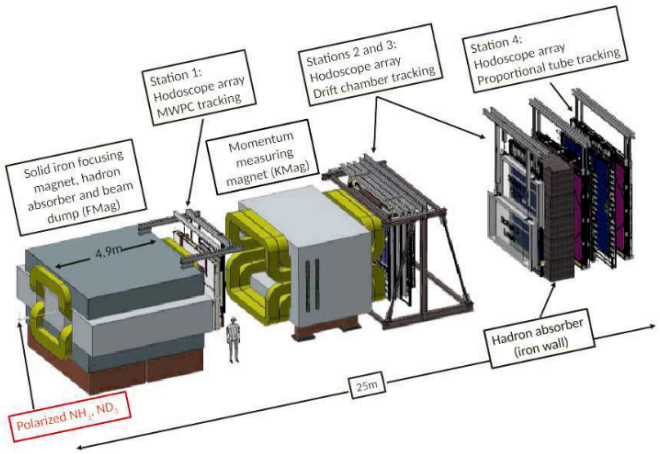


Figure 1: SpinQuest/E1039 spectrometer.

- We have four hodoscope stations in the SpinQuest/E1039 spectrometer.
- We name them as `H1, H2, H3, H4`.

Hodoscope & NIM Trigger Subsystem

- We are currently using five NIM trigger system for cosmic ray tracking.

```
NIM1: a 4 fold trigger -> H1 and H2 and H3 and H4
NIM2: a 2 fold trigger -> H1 and H2
NIM3: a random trigger
NIM4: a 2 fold trigger -> H2 and H4
MATRIX5: a 2 fold trigger -> (H1 and H2) or (H2 and H4)
```

- Timing adjustment in `MATRIX5` is reverse beam-like.
- RF timing is included in `NIM1`, `NIM2` and `NIM4` triggers.

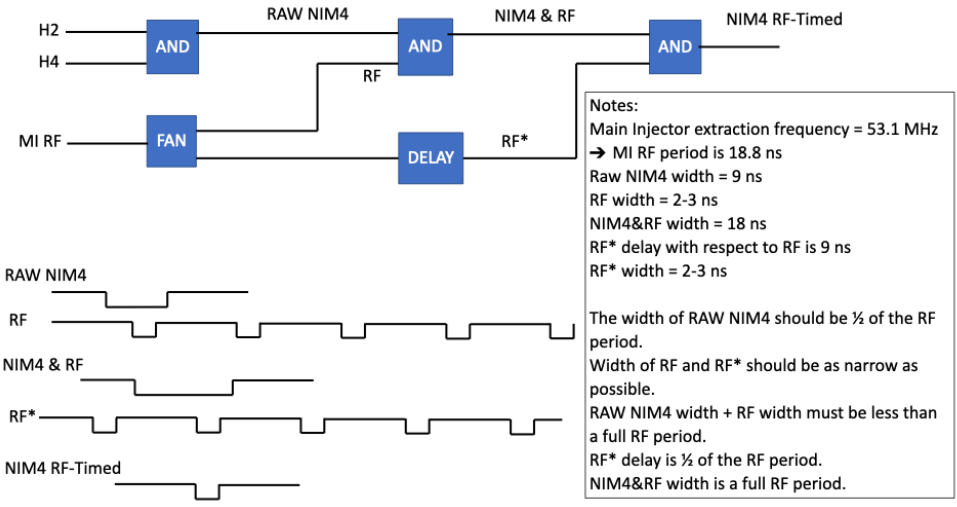


Figure 2: Trigger logic diagram used for RF timed trigger. Credit S. Pate.

Hardware and Electronics

- We are currently maintaining a 20% of the spare `NIM/CAMAC` modules for beam time.
- We have setup a test bench for electronic module testing.

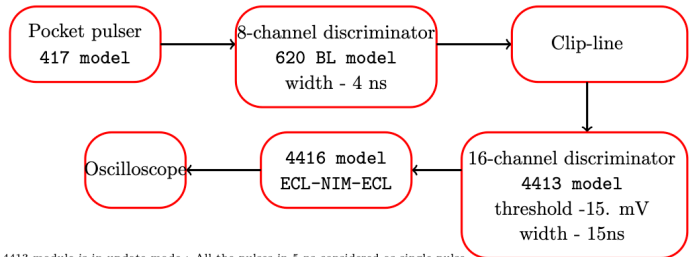
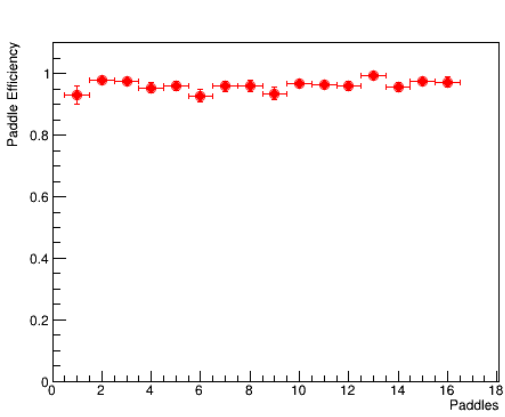


Figure 3: Block diagram of the test bench set up.

Hodoscope Efficiencies

- We use `NIM2` and `NIM4` triggers to calculate the hodoscope efficiencies.
- We use runs taken from 04-05-2023 to 04-09-2023 days.

Hodoscope Efficiencies



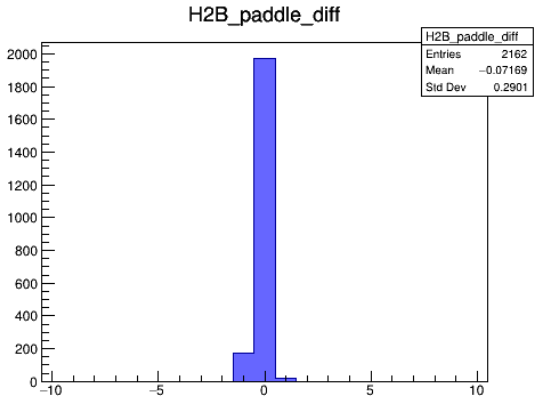
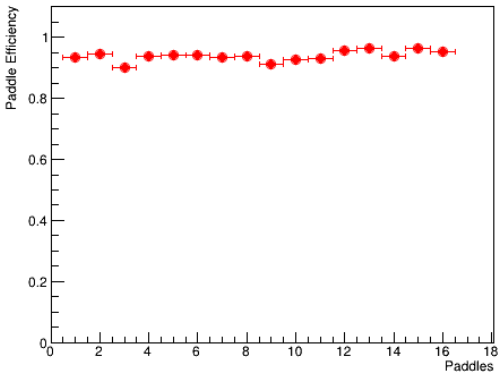


Figure 4: H2B paddle efficiency.

Hodoscope Efficiencies



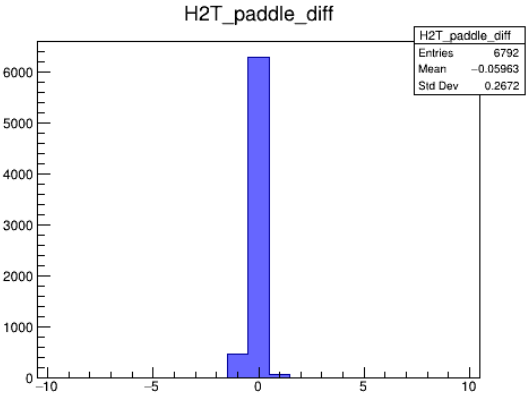
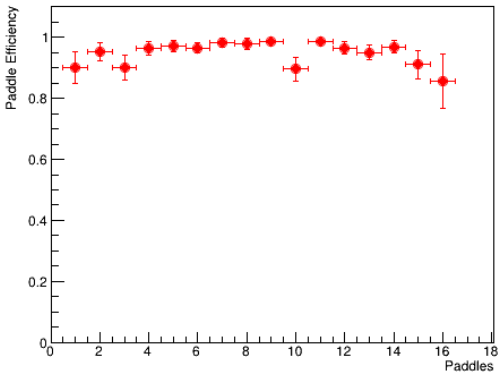


Figure 5: H2T paddle efficiency.

Hodoscope Efficiencies



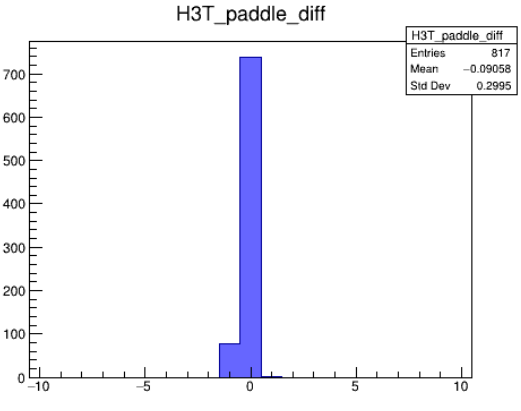


Figure 6: H3T paddle efficiency.

Hodoscope Efficiencies

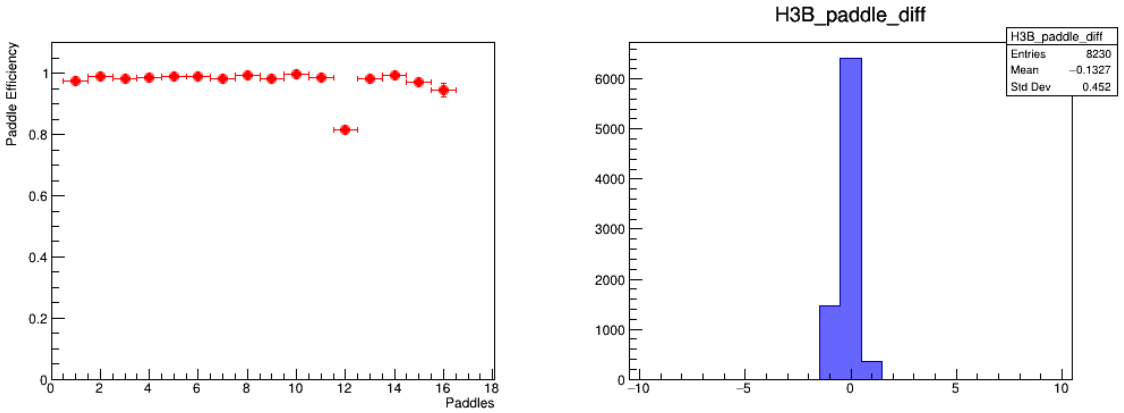


Figure 7: H3B paddle efficiency.

Hodoscope Efficiencies

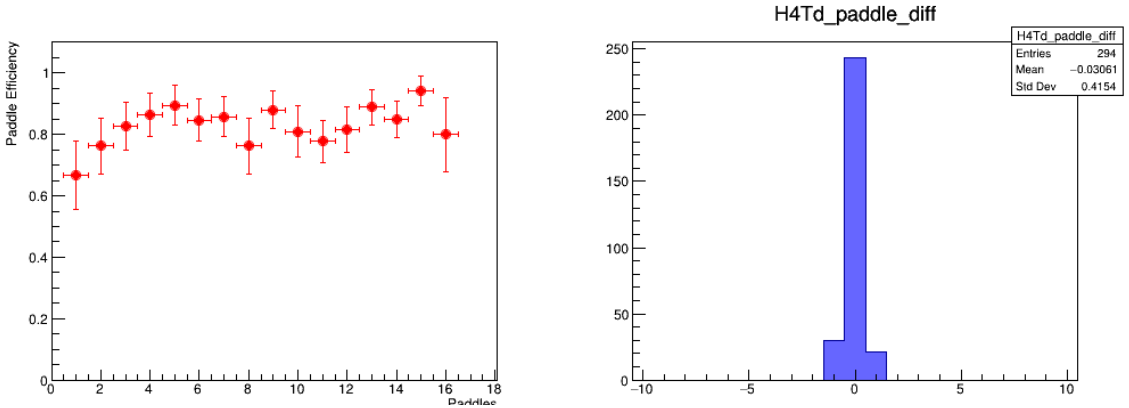


Figure 8: H4Td paddle efficiency.

Hodoscope Efficiencies

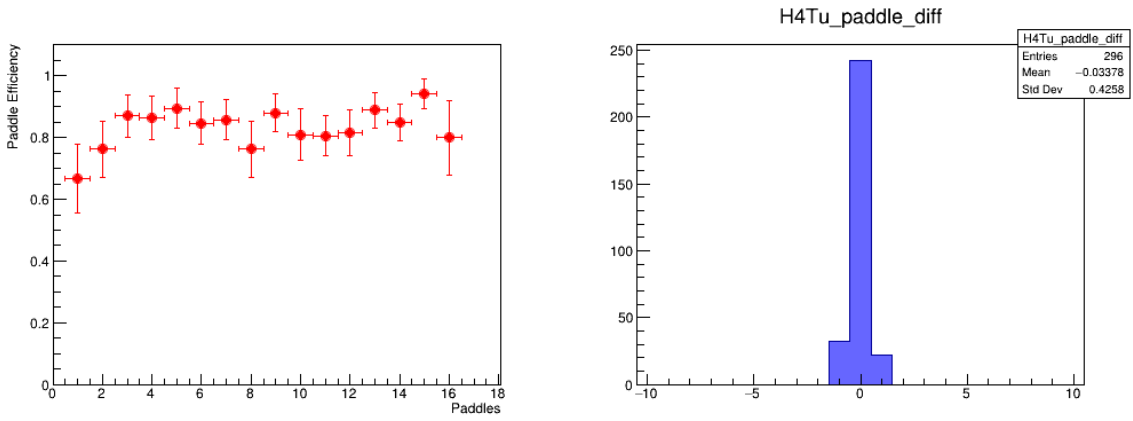


Figure 9: H4Tu paddle efficiency.

Monitoring the Hodoscope Subsystem Remotely

- We have prepared a GUI/CL tools to easy debugging the hodoscopes without accessing the experimental hall.
- This tool will be useful during the beam-time to debug hodoscope.

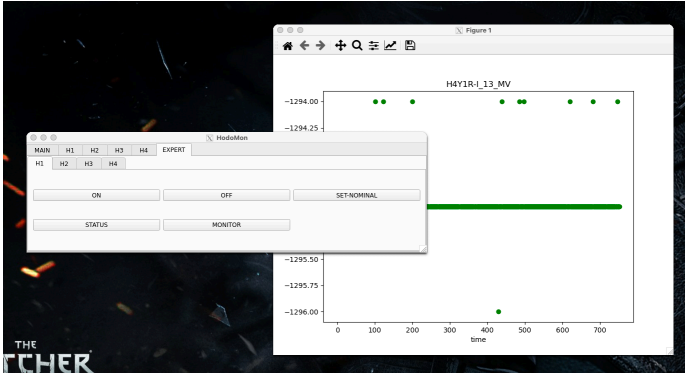


Figure 10: Hodoscope monitoring GUI.

Plan for Spectrometer Commissioning

- We plan to fine tune the detector efficiencies during the spectrometer commissioning.
- For this we plan to use 4 fold trigger similar to `NIM1`.
- We have prepared a handbook for Hodoscope/NIM subsystem. This can be used during the shifts. Link
- We have developed software to calculate hodoscope efficiencies and remote debugging.