# Construction of readout system for SPiRIT-TPC

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SPiRIT Time Projection Chamber (TPC) is being constructed for the study of density dependent symmetry energy using heavy RI collision at RIKEN-RIBF[1]. A novel readout system, General Electronics for TPC (GET)[2], for the signal coming from the TPC has been employed for the SPiRIT-TPC[3].

At the end of summer 2015, 48 AsAd boards for the amplification and digitization of signal were mounted on the TPC as shown in the Picture 1. During the installation of AsAd boards, the performance of the system was carefully checked. After we mounted half of the electronic components, we found that there were large gain deviations between different pads. This was a serious problem for the TPC, as TPC needs a uniform gain so that it can achieve good tracking and proper triggering. The reason for this was the instability in the power that was provided to the AGET ASIC chips on the readout board, which can be improved by changing the components on the AsAd board. After this modification, we mounted all the boards on the TPC again and checked the uniformity of gain by pulsing the ground wire, which generates a potential around the amplification region. As shown in Fig. 2, the uniformity of the gain is good enough for the reconstruction of charged particle trajectories.



Fig. 1. GET electronics mounted on SPiRIT TPC. Each AsAd board is shielded with Al cover.

The GET system employs NARVAL[4] as DAQ system, GANIL run control (RC), and GANIL user interface (UI). We employ the GANIL RC and graphical UI for controlling SPiRIT system. In order to control RIBF-DAQ along with GET in the same frame-
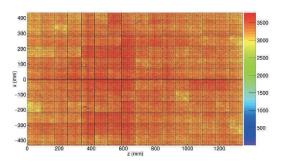


Fig. 2. Gain uniformity of TPC pads. 5.3V signal is pulsed through the ground wire of TPC. Out of $108\times112=12096$ pads, 3 pads show lower gain while other pads show good gain uniformity.

work, a software of the SOAP server that communicates with GANIL RC was developed. As demonstrated in the graphical UI shown in Fig. 3, a user can control the CoBo boards, which are back-end electronics of GET, as well as RIBF-DAQ system named Babirl/GTO. Fig. 3 also demonstrates the DAQ data throughput on the disk of $\sim$100 MB/s/CoBo, which corresponds to 1.2 GB/s in total.
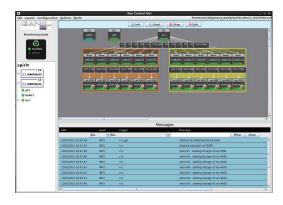


Fig. 3. Graphical UI of SPiRIT DAQ. Babirl, which is RIBF common DAQ system, and GTO can be controlled through this UI.

The commissioning of the readout system including SPiRIT-TPC was carried out during 2015 fall as reported in this annual report.

## References

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