GET WORKSHOP : General Electronic for Physics

Rapport sur les contributions

https://indico.in2p3.fr/e/17431

ID de Contribution: **1** Type: **Non spécifié**

Implementation of GET readout system for heavy RI collision experiment with SPiRIT-TPC at RIBF

mercredi 10 octobre 2018 15:30 (30 minutes)

The SPiRIT is designed for the heavy RI collision experiment, where Time Projection Chamber(TPC) with 12k pixelized readout pads is employed as the main device of the experiment.
As TPC is located on the beam line, the readout electronic should work for detecting Z=1 particle under the environment where heavy ions, such as Z~50 ions, are passing through.
The readout system, including the electronics and DAQ, for the SPiRIT experiment will be discussed.
Owing to the high speed readout system of GET, 270 time-bucket readout with 25MHz sampling was functioned well under the DAQ rate of 60Hz.

Author: ISOBE, Tadaaki (RIKEN)

Orateur: ISOBE, Tadaaki (RIKEN)

ID de Contribution: **2** Type: **Non spécifié**

ASIC MODULE BOARD: Versatile Analog Processing

vendredi 12 octobre 2018 09:30 (30 minutes)

Presentation of frontend board for small number of channels (32/64) for gaseous detectors and silicium detectors.

Author: DRUILLOLE, FREDERIC (CENBG)

Orateur: DRUILLOLE, FREDERIC (CENBG)

ID de Contribution: **3** Type: **Non spécifié**

Integration of the GET electronics for the CHIMERA and FARCOS devices

mercredi 10 octobre 2018 14:30 (30 minutes)

A new front-end based on digital GET electronics has been adopted for the readout of the CsI(Tl) detectors of the CHIMERA 4π multi-detector and for the new modular Femtoscopy Array for Correlation and Spectroscopy (FARCOS). The integration of this system has required the development of a new first stage front-end for FARCOS, based on CMOS new pre-amplifiers for both DSSSD Silicon and CsI(Tl) detector, integrated in a single and compact ASIC board, and the design of a new dual-gain module to fit with the wide dynamical energy ranges expected for the CHIMERA CsI(Tl) and FARCOS Silicon detectors. A new project for a detector array for neutrons has also been started. With this purpose the GET electronics has been used to test the response of a plastic EJ299-33 scintillation to neutrons and light charged particles. Recent results from experimental tests and in-beam experiments by using the coupled GET+CHIMERA data acquisition will be presented

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Orateur: Dr DE FILIPPO, Enrico (INFN sez. Catania)

ID de Contribution: **4** Type: **Non spécifié**

EUSO-SPB2 Cherenkov Camera Built on SiPM With GET-based Readout

mercredi 10 octobre 2018 11:30 (30 minutes)

We plan to design, build and deploy a second generation of the Extreme Universe Space Observatory (EUSO), to be flown aboard a Super-Pressure Balloon (SBP). EUSO-SPB2 will view the night sky in the Southern hemisphere to detect cosmic rays of very high energies and pioneer the search for cosmogenic and astrophysical neutrinos from a sub-orbital platform. EUSO-SPB2 is a pathfinder for the Probe Of Extreme Multi-Messenger Astrophysics (POEMMA) mission which was selected by NASA for an Astrophysics Probe Mission Concept Study (under ROSES-2016). EUSO-SPB2 will observe a sample of cosmic rays from 0.1 to 1 EeV with the Cherenkov technique and will discriminate among the Cherenkov profiles of primary protons, heavy nuclei, and photons. It will also characterize the background for upward going showers initiated by the decay of tau leptons, which are expected to be produced by Earth-skimming tau neutrinos. The focal plane of the Cherenkov camera will utilize Silicon Photomultipliers (SiPM). Two concepts for the data acquisition system are under consideration. First one is based on a new ASIC which is under design. The second approach is based on existing GET ASICs and readout electronics. Initial compatibility tests of the SiPM sensors read out by AsAd front-end board were conducted at CEA-Saclay in April, 2018. We present the results of these measurements and conceptual design of the Cherenkov camera based on SiPM sensors and GET readout electronics.

Author: KUZNETSOV, Evgeny (University of Alabama in Huntsville)

Orateur: KUZNETSOV, Evgeny (University of Alabama in Huntsville)

ID de Contribution: **5** Type: **Non spécifié**

GET electronics for ACTAR TPC

mercredi 10 octobre 2018 15:00 (30 minutes)

The ACTAR TPC is a Time Projection Chamber developed for fundamental nuclear physics studies. It results from the joint efforts to build a second generation detector that addresses the physics for which the MAYA detector (nuclear reaction and structure studies) and the CENBG TPC (exotic decay and proton emission studies) were previously developed. In addition to specific developments concerning the ACTAR TPC collection plane and active volume, the device is equipped with the GET electronics. After the realization of demonstrator detectors, the final detectors (2 geometries for the same principles) are now almost completed.
In the presentation, we focus on the characteristics of the detector, especially with respect to what can be achieved with the GET electronics, in terms of particle tracks and energy analysis. The tests performed on the output data and applied the demonstrators test measurement will be shown. Some in-beam commissioning (at GANIL) has also been performed.
Finally, this presentation is also an opportunity to illustrate issues or problems that we are still facing with the GET electronics.

Authors: GIOVINAZZO, Jérôme (CENBG CNRS / Univ. Bordeaux); ACTAR TPC COLLABORATION

Orateur: GIOVINAZZO, Jérôme (CENBG CNRS / Univ. Bordeaux)

ID de Contribution: **6** Type: **Non spécifié**

SAM: a small GET system

mercredi 10 octobre 2018 12:00 (30 minutes)

SAM is a complete small acquisition system capable of acquiring 64 analog signals from gaseous detectors. It consists of two modules: one is based on the use of AGET circuit (ASIC for General Electronic for TPC) from the GET collaboration. The front-end module performs the amplification, the detection and the analog storage of the shaped detector signal before its digitization by an external ADC. The other module is based on a commercial module with a Zynq FPGA component.

Author: REBII, Abdel

Orateur: REBII, Abdel

ID de Contribution: **7** Type: **Non spécifié**

SMART (Sfp connectivity and Microtca for Advanced Remote Trigger)

jeudi 11 octobre 2018 12:30 (30 minutes)

SMART is a new electronic design based on a smooth upgrade of CENTRUM and GTS towards a new time stamping system with trigger option for all GANIL needs and other collaborations interested by this new solution.
Based on µTCA in terms of architecture, on Xilinx ZINQ and ZYNQ UltraScale+ in terms of FPGA interfaced with SFP/QSFP (copper/fiber) connectivity, this digital system will be able to synchronize all our existing sequencers and digitizers while easily connect to any kind of new boards.

Author: WITTWER, Gilles (GANIL)

Orateur: WITTWER, Gilles (GANIL)

ID de Contribution: **8** Type: **Non spécifié**

Si-Get Project in HKU

mercredi 10 octobre 2018 12:30 (30 minutes)

Silicon Array based on Double-sided Silicon Strip Detector (DSSD) is one of the most important detection system for Radioactive Nuclei far from stability in Modern Nuclear Experiments. Silicon array with large coverage and high granularity and related techniques are developed in major laboratories & universities around the world. In HKU's Si-GET Project, we plan to develop large Si detection array for the study of exotic decay and nuclear reaction far from stability valley. For the moment, we have successfully applied the GET system to DSSD readout, by using 2 Cobo and multiple AsAd boards with Narval DAQ. Energy resolution (FWHM) from the Si test is around 50 keV@5.15 MeV (alpha source). In future, we plan to conduct a commissioning run in @HIRFL in Lanzhou to apply GET system into a Nuclear experiment.

Authors: Dr JENNY, Lee (HKU); Dr XINXING, Xu (HKU); PENGJIE, Li (HKU); Dr SIDONG, Chen (HKU); JIAJIAN, Liu (HKU); TARAS, Lokotko (HKU); PENGFEI, Liang (HKU); QINGQING, Zhao (HKU)

Orateur: PENGJIE, Li (HKU)

ID de Contribution: **9** Type: **Non spécifié**

Present and future of the GET system at NSCL/FRIB

mercredi 10 octobre 2018 09:50 (50 minutes)

In this talk I will present recent results obtained with the Active Target Time Projection Chamber (AT-TPC) at the NSCL, and discuss the performance and functionalities of the GET electronics. I will also discuss future plans for using the GET system with other detectors and devices at the NSCL/FRIB laboratory.

Author: Dr BAZIN, Daniel (NSCL)

Orateur: Dr BAZIN, Daniel (NSCL)

ID de Contribution: **10** Type: **Non spécifié**

Application of GET System for J-PARC HypTPC Experiments

vendredi 12 octobre 2018 14:30 (30 minutes)

The GET system has been adopted for the readout of a newly developed time projection chamber (HypTPC) at J-PARC. The high rate secondary beam up to 10^6 Hz from the world highest intensity proton beam at J-PARC should be taken into account in design of the detector system. The HypTPC has the octagonal drift volume defined by the field cage, the cathode plane at the top and the amplification region at the bottom. The drift length is 55 cm and the target is located inside the drift volume for a large acceptance. The outermost gas vessel is filled with P-10 gas. When charged particles pass through the gas volume, ionized electrons along the track drift downward to meet the gating grid plane and triple layered GEMs, which are utilized to reduce ion back-flow in high rate beam environment. The amplified electron signals from GEM are read out by a total of 5768 pads, which are connected to the GET electronics via the conversion board at the bottom of the chamber. To cope with the high trigger rate, the partial readout mode with the zero suppression has been tested. Also, the GET system will run with the existing J-PARC K1.8 beam line DAQ system (HDDAQ) via an HUL module, which is under development, to share the trigger and busy signal and the event tag information. In this talk, the GET electronics implemented in HypTPC system will be summarized and the preliminary results of the commissioning of HypTPC with the GET system at HIMAC will be presented.

Author: KIM, Shin Hyung (Korea University)

Orateur: KIM, Shin Hyung (Korea University)

ID de Contribution: **11** Type: **Non spécifié**

Low channel density MicroMEGAS detectors for decay and reaction studies

vendredi 12 octobre 2018 11:00 (30 minutes)

The explosive hydrogen burning in classical novae and x-ray bursts proceeds through radiative proton capture reactions involving proton rich nuclei close to the drip-line. Many of the reactions involved are dominated by resonant capture and the properties of the key resonances are based on limited experimental information. The properties of the key resonances need to be studied through indirect methods, such as allowed beta-decay and transfer reactions.

Over the past decade we have developed novel MicroMEGAS based detector setup, called AstroBox, for beta-delayed proton decay measurements at Texas A&M University. This detector is currently in its second generation version. Furthermore, based on the experiences from AstroBox development we have upgraded the old MDM spectrometer focal plane detector with a MicroMEGAS based energy-loss elements.

Both setups have relatively low channel density of few tens of channels and have been instrumented using standard analogue electronics. This has allowed rapid prototyping and development of the detectors themselves. However, the future improvements will likely involve digital readout to take full advantage of the possibilities of even such simple setups. In this presentation I will give an overview of the results so far and discuss the future possible directions.

Author: Dr SAASTAMOINEN, Antti (Cyclotron Insitute, Texas A&M University)

Orateur: Dr SAASTAMOINEN, Antti (Cyclotron Insitute, Texas A&M University)

ID de Contribution: **12** Type: **Non spécifié**

beta-Delayed Charged Particle Detector for Studies of Novae and X-ray Bursts

vendredi 12 octobre 2018 11:30 (30 minutes)

Classical novae and type I X-ray bursts are energetic and common thermonuclear astrophysical explosions. However, our ability to understand these events is limited by the lack of comprehensive nuclear data on proton-rich nuclei. Specifically, constraining the ^{30}P$(p,\gamma)^{31}$S and ^{15}O$(\alpha,\gamma)^{19}$Ne reaction rates has been found to be crucial to the understanding of nucleosynthesis and energy generation in these events. As direct measurements of these reactions are not technically feasible at the present time, indirect measurements of dominant resonance strengths by β-delayed protons and alpha particles are proposed. A previous measurement at NSCL identified a new ^{31}S state at $E_x = 6390$ keV to be a key resonance for ^{30}P proton capture at peak nova temperatures. A significant feeding of 3.38\% from ^{31}Cl $\beta\gamma$ decay was observed, which enables the determination of the resonance strength by measuring the corresponding 259 keV β-delayed protons. Similarly, a previous measurement at NSCL observed a 0.0156\% feeding of the ^{19}Ne state at 4034 keV, a key resonance for the ^{15}O$(\alpha,\gamma)^{19}$Ne reaction, by the ^{20}Mg(βp) sequence. This feeding is sufficient to determine the resonance strength by measurement of the proton-α pairs.
A gas-filled detector of β-delayed charged particles has been designed and built to measure the aforementioned decays at NSCL. The detector is coupled with the Segmented Germanium Array (SeGA) to enable coincidence γ detection as an additional probe of the decay scheme and for normalization purposes. The first phase of the detector functions as a proton calorimeter, and was successfully commissioned with ^{25}Si$(\beta p)^{24}$Mg and ^{23}Al$(\beta p)^{22}$Na in May 2018. We will report on the performance of the detector and present preliminary β-delayed proton spectra.We will all discuss the upgrade of the detector into a TPC by increasing the granularity of the Micromegas pad plane for the measurements of the ^{20}Mg(βp) sequence.

Authors: Dr FRIEDMAN, Moshe (NSCL); BUDNER, Tamas (NSCL); Dr CORTESI, Marco (NSCL); HARRIS, Madison (NSCL); JANASIK, Molly (NSCL); Dr PEREZ-LOUREIRO, David (NSCL); POLLACCO, Emanuel (IRFU/DPhN, CEA Saclay); ROOSA, Michael (NSCL); SAASTAMOINEN, Antti (Cyclotron Institute, Texas A&M University); STOMPSA, Jordan (NSCL); TIWARI, Pranjal (NSCL); Prof. WREDE, Chris (NSCL); Dr YURKON, John (NSCL)

Orateur: Dr FRIEDMAN, Moshe (NSCL)

ID de Contribution: **13** Type: **Non spécifié**

MUTANT Status

mercredi 10 octobre 2018 17:00 (30 minutes)

This short presentation will show what is the status of MUTANT
in terms of:
- Latest firmware (with new options)
- New documentation
- Level 2 trigger usage (tools and example)

Author: WITTWER, Gilles (GANIL)

Orateur: WITTWER, Gilles (GANIL)

ID de Contribution: **14** Type: **Non spécifié**

FEANICS : A High Dynamic Range, High Energy resolution multi-detector integrated Circuit and its generic test bench

jeudi 11 octobre 2018 15:00 (30 minutes)

The GES project stands for "Generic Electronics System". It is aimed at developing a chain of generic electronics, comprising hardware, firmware and software modules to be assembled for the purpose of data acquisition on particle detectors. The modules include ASIC chips, electronics boards, and firmware or software components. The range of applications of the GES modules typically covers nuclear physics experiments, but can naturally extend beyond these to reach other domains such as particle physics, medical imaging and treatments, astrophysics, etc. Many aspects of the GES project can be considered as a follow-up or a spin-off of the GET project (General Electronics for Time Projection Chambers) as they might partly rely on GET hardware, firmware and software designs.
In order to fulfill the demanding requirements in terms of dynamic range and at the same time to ensure a high genericity, we have designed a new multi-channel ASIC called FEANICS (Front-End Adapative gaiN Integrated CircuitS) based on a floating-point Charge Sensitive Amplifier FPCSA architecture. This architecture is based on automatic gain switching during the rise time of the pulse. By default, the CSA is configured in a high gain mode. If the charge exceeds a specific value, the CSA automatically switches to a low gain value. Thanks to this basic principle, one can reach high dynamic range and high energy resolution.

The key parameters of the FEANICS chip are listed below:

• 16-channel ASIC in standard CMOS AMS 0.35µm technology.
• High input dynamic range (40pC max) with anti-saturation option for both polarities of input signal
• High resolution
• Optional shaper with tunable peaking time (60ns-10µs)
• Fully programmable ASIC thanks to embedded SPI protocol.
• Self trigger option
• 50 ohms output buffer with baseline adjustment for versatility (AGET-compliant)
• Auto-calibration, temperature probe, offset compensation circuit⋯

The FEANICS chip is tested and validated using a generic multi-asic board. The purpose of this board is to be able to test different kinds of ASICs with little or no modifications of the firmware and software used to readout the chip.
The multi-asic board and the ASIC card are connected to a digital subsystem based on a COTS "Picozed Zynq"module and its evaluation motherboard. The Zynq FPGA will implement all the firmware needed to control, configure and readout the multi-asic board and the Zynq double core processor will run the acquisition software over a an embedded Linux operating system. Firmware module are developed with generic features allowing them to be reused within different contexts such as different kinds of ASICs.

Author: BOUYJOU, Florent (CEA Saclay - DRF/IRFU/DEDIP)

Co-auteurs: GEVIN, Olivier (CEA/IRFU); DELAGNES, eric (CEA/IRFU)

Orateur: BOUYJOU, Florent (CEA Saclay - DRF/IRFU/DEDIP)

ID de Contribution: **15** Type: **Non spécifié**

ASTRE: an upgraded version of AGET ASIC

mercredi 10 octobre 2018 16:30 (30 minutes)

The HARPO (Hermetic ARgon POlarimeter) detector is a demonstrator of the performance of a TPC for measuring polarised ɣ rays. It was designed for a validation on the ground in a photon beam. It is the first phase of an ambitious program of a space telescope for which it is necessary to protect the electronic against the effect of radiations and particularly against Single Event Latchups (SEL). This electronic called ASTRE (Asic with SCA1Trigger for detector Readout Electronics) is based on AGET ASIC with high improvement on the logic gate layout for SEL protection purpose. We take also the opportunity in this chip to change some features as the range of peaking time value (up to 8 µs) or the unity value of multiplicity signal (factor 2, 4 or 8).
All these new features will be described during this talk.

Authors: BARON, Pascal (CEA IRFU); BAUDIN, David (CEA/IRFU); DELAGNES, Eric (CEA/IRFU)

Orateur: BARON, Pascal (CEA IRFU)

ID de Contribution: **16** Type: **Non spécifié**

ELITPC detector with GET electronics for ELI-NP

jeudi 11 octobre 2018 12:00 (30 minutes)

The ELITPC, an active-target TPC to measure cross-sections for nuclear photo-disintegration reactions, is being developed at the University of Warsaw in collaboration with ELI-NP/IFIN-HH and the University of Connecticut. The detector will be installed in the monochromatic and linearly polarized gamma-ray beam line in the Extreme Light Infrastructure - Nuclear Physics (ELI-NP) located in Bucharest-Magurele, Romania.
The ELITPC detector will be equipped with triple-GEM structure for gas amplification and will work at lower-than-atmospheric pressure. The data acquisition system will employ 1024 channels of customized GET electronics (z-CoBo). The physics programme, design and current status of R&D will be discussed.

Orateur: CWIOK, Mikolaj

ID de Contribution: **17** Type: **Non spécifié**

Reduced GET system based on ZYNQ FPGAs

jeudi 11 octobre 2018 14:30 (30 minutes)

The University of Warsaw has developed a new reduced GET system (z-CoBo) for the ELITPC detector - an active-target TPC foreseen for the Gamma Beam System at the Extreme Light Infrastructure - Nuclear Physics (ELI-NP) facility in Bucharest-Magurele, Romania. The new system is based of Xilinx ZYNQ processors. Currently the z-CoBo platform is available in three sizes for reading-out: 1, 2 and 4 AsAd boards. The present status of R&D and perspectives for advanced signal processing will be discussed.

Orateur: ZAREMBA, Marcin

ID de Contribution: **18** Type: **Non spécifié**

WaveCatcher

jeudi 11 octobre 2018 10:00 (30 minutes)

The WaveCatcher systems are a family of powerful and low cost digitizers. Their number of channels currently ranges between 2 and 64 (+8) channels. They all make use of the SAMLONG analog memory chips which permit sampling the input signal between 400 MS/s and 3.2 GS/s over 12 bits and with a signal bandwidth of 500 MHz. They can also be used for high precision time measurement between signals since their sampling time precision is better than 5 ps rms at 3.2GS/s.
There are 4 different types of systems:
• 2-channel, USB-powered handy module
• 8-channel (autonomous desktop), composed of a motherboard equipped with two 4-channel mezzanines
• 16-channel (6U board or autonomous desktop module)
• 64-channel (mini crate). This crate can actually house between 1 and 4 16-channel boards, thus providing 16, 32, 48 or 64 channels.
The systems are interfaced via USB and a secured version of Gbit UDP (copper or optical).
Software control of the WaveCatcher systems can be performed in two ways:
1. Via a high-level software library, available on Windows or Linux.
2. Via a dedicated powerful software running on Windows.
About one hundred WaveCatcher systems are already in use worldwide.
The CAEN company distributes equivalent products in the X743 family.

Orateur: BRETON, Dominique

ID de Contribution: **19** Type: **Non spécifié**

SAMPIC

mercredi 10 octobre 2018 11:00 (30 minutes)

SAMPIC is a Waveform and Time to Digital Converter (WTDC) 16-channel chip designed in the AMS 0.18-µm CMOS technology which directly measures the arrival time of fast analog signals without the need of any external discriminator. It samples the zone of interest of the signal between 0.8 and 8.5 GS/s and precisely measures its time of arrival.
A set of boards and DAQ system has been developed to record data with detectors in a real environment. This setup, including a powerful software with an original interactive graphical interface, has also permitted the characterization of the chip, and the measurements of its time resolution which is as good as 3 to 4 ps rms after a simple correction, itself based on a very simple calibration. The raw time resolution before calibration is already better than 15 ps rms. This calibration remains very stable with time.
The current range of modules offer compact solutions with 16, 32, 48 and 64 channels. They are already used in many experiments or detector test benches. 128- and 256-channels systems are under development.
The CAEN company will soon distribute products based on SAMPIC.

Orateur: MAALMI, Jihane (LAL Fr)

ID de Contribution: **20** Type: **Non spécifié**

The VMM front-end integration in the Scalable Readout System: On the way to a next generation readout system for generic detector R&D and experiment instrumentation

jeudi 11 octobre 2018 16:00 (30 minutes)

Orateur: LUPBERGER (CERN), Michael

ID de Contribution: **21** Type: **Non spécifié**

CAEN Tools for Discovery

Orateur: M. DI MAIO, Gianni

ID de Contribution: **22** Type: **Non spécifié**

The R2D2 project

Orateur: M. MEREGAGLIA, Anselmo

ID de Contribution: **23** Type: **Non spécifié**

Status of the ELI-NP GBS instrumentation at ELI-NP and possible future upgrades

Orateur: M. BALABANSKI, Dimiter

ID de Contribution: **24** Type: **Non spécifié**

GET Workshop

Orateur: M. POLLACCO, Lolly

ID de Contribution: **25** Type: **Non spécifié**

GREENFIELD TECHNOLOGY

Orateur: M. MONNIER-BOURDIN, Dominique

ID de Contribution: **26** Type: **Non spécifié**

GET at IMPCAS Lanzhou

Orateurs: CHENGUI LU; HONGYUN ZHAO, Limin Duan; YI QIAN, Tianlei Pu

ID de Contribution: **27** Type: **Non spécifié**

CENBG

Orateur: PIQUEMAL, Fabrice

ID de Contribution: **28** Type: **Non spécifié**

Development of novel tracking concepts at NSCL

Orateur: CORTESI, Marco

ID de Contribution: **29** Type: **Non spécifié**

MPGDs

Orateur: DE OLIVEIRA, Rui