WaveCatcher and SAMPIC International Workshop

Report of Contributions

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Contribution ID: **1** Type: **not specified**

Conclusion

Thursday, February 8, 2018 5:15 PM (15 minutes)

Presenter: MAALMI, Jihane (CNRS-LAL)

Contribution ID: **2** Type: **not specified**

Introduction

Wednesday, February 7, 2018 9:30 AM (10 minutes)

Primary author: MAALMI, Jihane (CNRS-LAL)

Presenter: MAALMI, Jihane (CNRS-LAL)

Session Classification: Session 1

Contribution ID: **3** Type: **not specified**

WaveCatcher and SAMPIC Systems

Wednesday, February 7, 2018 9:40 AM (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.
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.
From the second version of the 16-channel boards on, 2 extra channels have been added in the back of the board. They can be digitized together with the other channels. When the board is used in standalone mode, these channels correspond to the external trigger and the external sync. Otherwise, they are equivalent to other channels.
The boards can also be used as TDCs for high precision time measurement between two signals. Sampling time precision after calibration is indeed less thans 5 ps rms at 3.2GS/s.
All the systems are currently interfaced with a 480 MBits/s USB link. A secured Gbit UDP interface is also available on the 8-channel module. An optical version of UDP is available in the 16-channel board and will soon be put into function in the other systems.
Software access to 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.
There is no low-level library.
The CAEN company distributes equivalent products in the X743 family.

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. A detailed description of the circuit and its performances will be presented in the afternoon session by Eric Delagnes.
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 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. 128- and 256-channels systems are under development.
The CAEN company will soon distribute products based on SAMPIC.

Primary author: BRETON, Dominique (CNRS-LAL)

Presenter: BRETON, Dominique (CNRS-LAL)

Session Classification: Session 1

Contribution ID: **4** Type: **not specified**

Using WaveCatcher for Quality Control

Wednesday, February 7, 2018 10:10 AM (25 minutes)

The Technological Unit of the Institute of Cosmos Science of the Universitat of Barcelona (IC-CUB) is specialized in developing microelectronics for applications in which low noise and high bandwdith are key features. We currently have different test setups equipped with both 8 and 16 channel WaveCatchers, including ASICs' tests for the Cherenkov Telescope Array (CTA) and the LHCb projects, as well as other tests for designs like the MUSIC and HRFlexToT, which are general use ASICs. The cost per channel and the flexibility that this solution provides cannot, to the best of our knowledge, be obtained with approaches based on more traditional laboratory instrumentation. In this contribution I will be presenting a selection of representative use cases. In particular, an automated Quality Assurance (QA) setup for PACTA (an ICCUB designed ASIC for the CTA project) and an onsite measurement and analysis testbench for a Beam Loss Monitor application at the ALBA synchrotron. For automated tests we build software using the wavecatcher library, and reserve the use of the wavecatcher software itself for the punctual tests. I will also be presenting how for automated tests we create our own software stack based on the static wavecatcher library, while for occasional use we directly use the software provided by wavecatcher.

Presenter: DE LA TORRE PEREZ, Oscar (University of Barcelona)

Session Classification: Session 1

Contribution ID: **5** Type: **not specified**

Wavecatcher Boards for Calorimeter Electronic readout at SuperNEMO

Wednesday, February 7, 2018 10:35 AM (25 minutes)

The SuperNEMO experiment goal is to probe the nature of the neutrino through the neutrinoless double beta decay research. It uses the so-called tracko-calo technique which allows not only to measure the energy of particle traversing the detector but also to reconstruct their track, time of flight and full kinematic.
Specific boards using Wavecatcher architechture are used for the calorimeter readout of the SuperNEMO demonstrator. Some trigger features had been implemented while the standard Wavecatcher readout
features are used. Wavecatcher boards provide us good timing and energy resolutions and also a great scalability for the 712 calorimeter channels of the SuperNEMO demonstrator.

Presenter: OLIVIERO, Guillaume (LPC-Caen)

Session Classification: Session 1

Contribution ID: **6** Type: **not specified**

Proton flux monitor(s) for the UA9 Experiment

Wednesday, February 7, 2018 11:45 AM (25 minutes)

The possible use of bent crystals for beam-manipulation in particle accelerators is currently investigated by the UA9 collaboration at CERN. One application could be the upgrade of collimation system for hardron colliders such as LHC - with an improved cleaning efficiency of the beam halo and a reduced impedance of the machine.
Investigation of this channeling process close to a circulating beam requires detectors which could be located inside the vacuum pipe itself. The CpFM –Cherenkov detector for proton Flux Measurements –is a calibrated detector fitting these requirements, with the aim of counting the mean number of deflected protons or ions with a precision of about 15% for incoming particles,
A first version of the CpFM has been developped at LAL and installed in the Super Proton Synchrotron (SPS) at CERN. This detector integrates Cherenkov light produced by relativistic charged particle penetrating a quartz radiator. The readout of the signal produced by the photodetector is performed by a WaveCatcher module integrated with the SPS DAQ. Calibration results obtained with this detector will be presented, as well as our conclusions and observed limitations after two years of operation.
In parallel, and after a first bunch of results, new requirements from the UA9 experiment triggered the development of a new detection chain, with an increased sensitivity able to resolve the single particle. New geometries for quartz radiators have been simulated and tested, and a new detector fully calibrated, ready to be installed in SPS within coming days. We'll present it, as well as future ways of optimization / improvement to fully comply with UA9 requirements

Presenter: DUBOS, Sebastien (CNRS-LAL)

Session Classification: Session 2

Contribution ID: **7** Type: **not specified**

WaveCatcher analysis software development and aplications

Wednesday, February 7, 2018 11:20 AM (25 minutes)

Within this work we shortly represent analysis software for WaveCatcher raw data treatment. The software is based on C++ and root libraries, bash is used to run analysis scrips.
Different modules are developed for binary/ASCII and/or measurements/rates/waveform treatment.
The analysis path have tree main steps :
1) Conversion of WaveCatcher raw data into the root format.
2.1) waveform analysis (if needed).
2.2) Off-line merging the data into a common root file with data from another subsystems : translation stage, temperature or other sensors (if needed).
3) Histograming.
An important progress report is given about running of the WaveCatcher with MATLAB which open a large possibilities for on-line linking of different subsystems (translation stage for example).

Primary author: BURMISTROV, Leonid (CNRS - LAL)

Co-author: NATOCHII, Andrii (CNRS-LAL)

Presenters: NATOCHII, Andrii (CNRS-LAL); BURMISTROV, Leonid (CNRS - LAL)

Session Classification: Session 2

Contribution ID: **8** Type: **not specified**

Linux WaveCatcher Interface at IPN and its future developments

Wednesday, February 7, 2018 12:10 PM (25 minutes)

The institute of Nuclear Physics of Orsay is a leader laboratory for the developpement of silicon detectors devoted to ion detection. A main approach of its researches is related to the use of the current signal shape to identify the particle. For the purpose of putting together testing means for the AGAT experiment and the GASPARD project, the IPN and the CSNSM have created a LINUX interface for the WAVECATCHER. During this presentation, I will talk about the processing and visualization tools already implemented and those which will be implemented

Presenter: ID BARKACH, Tijani (IPNO)

Session Classification: Session 2

Contribution ID: **9** Type: **not specified**

Use of a diamond-detector and Wavecatcher for real-time monitoring of gamma beams

Wednesday, February 7, 2018 12:35 PM (25 minutes)

We are developing a real-time monitoring system using a diamond-detector and a Wavecatcher to characterise the gamma source at ELI-NP, a new nuclear research facility in Romania. The main technological challenge is to obtain the necessary information from 32 consecutive pulses of gammas separated from one another by 16 ns. Two preliminary experiments have been performed at existing Compton Interaction Sources, Higs in the USA and newSubaru in Japan. This presentation covers the results obtained so far as well as the needs for the final design of our system.

Presenter: WILLIAMS, Themis (CNRS-LAL)

Session Classification: Session 2

Contribution ID: **10** Type: **not specified**

Almost all about SAMPIC

Wednesday, February 7, 2018 2:15 PM (30 minutes)

The SAMPIC chip is based on the concept of the Waveform Time to Digital converter introduced in 2013. It permits performing high precision timing measurements on detector signals computed from the waveform digitized at a several GSamples/s rate over a window defined by a trigger which can be defined internally or sent from outside. Since the first version of SAMPIC that proved the WTDC concept, new versions, each integrating 16 independent channels, have been developed,
1) to fix bugs,
2) to introduce new functionalities like complex triggers, ancillary measurements or interfacing with digital signals
3) and above all to make its integration easier in a low power compact system by reducing the number of required external components and minimizing the digital electronics to drive it. After a general introduction on SAMPIC and on the mini DAQ system designed to operate it, the talk will focus on the new possibilities offered by the latest chip version and will report its performance measured in the laboratory.

Presenter: DELAGNES, Eric (CEA)

Session Classification: Session 3

Contribution ID: **11** Type: **not specified**

Sampling the signal from timing detectors for Totem at LHC

Wednesday, February 7, 2018 2:45 PM (25 minutes)

Totem and CMS have developed sensors for timing measurements in the forward region.
Two different sensor technologies are actually employed, sCVD diamond and UFSD (Ultra Fast Silicon Detectors).
In both cases we have signals with edge time in the range 0.5-1 ns. In the joint CT-PPS detector, used in standard LHC run, the signals are readout by means of a fast discriminator (NINO) coupled to a high precision TDC (HPTDC). For a special low-luminosity run foreseen in late 2018 the SAMPIC chip will be instead used, integrating the SAMPIC mezzanine card in our readout motherboard. As tested in 2015 in a real data taking with the LHC beam, the use of a fast sampler will allow to achieve the best timing performance(few tens of ps). I will show the preliminary results obtained with the SAMPIC readout chain. Moreover I will describe how the raw data are formatted and matched with the L1 trigger signal in an external FPGA to cope with DAQ requirements. For the future high luminosity LHC run it will be necessary to implement an efficient trigger handshake system within the chip, in order to sustain input rates up to 5 MHz per channel.

Presenter: BOSSINI, Edoardo (CERN)

Session Classification: Session 3

Contribution ID: **12** Type: **not specified**

Application of WaveCatcher/SAMPIC digitizers for the readout of a plastic scintillator based ToF detector

Wednesday, February 7, 2018 3:10 PM (25 minutes)

Plastic scintillator detectors have been extensively used in particle physics experiments for decades. In large-scale experiments, they are typically arranged as an array of staggered long bars covering a large surface and provide a fast trigger signal or particle identification.
This technology is proposed for the timing detector of the SHiP experiment at CERN SPS. Results of test-beams are presented.
In this study the scintillating light was read out at both ends of
a long scintillator bar by photosensors (either photomultiplier tubes or array of large-area SiPMs) whose pulse shapes were recorded by waveform digitizers.
Results obtained with the WaveCatcher and SAMPIC digitizers are analyzed and compared. A discussion of the various factors affecting the timing resolution the bar is presented.

Presenter: KORZENEV, Alexander (University of Geneva)

Session Classification: Session 3

Contribution ID: **13** Type: **not specified**

Experience form the HGTD timing application on laboratory and test beam environmen

Wednesday, February 7, 2018 3:35 PM (25 minutes)

Using a 16 channel 8Gs/s Sampic board, a study of the achieved time resolution limit is performed for a reference Low Gain Avalanche Diode Setup. Using constant fraction linear extrapolation, a 42 psec time resolution is achieved for a pair of identical sensors and without any single fitting technics. Calibration and trigger corrections are applied while comparison with a 20Gs/s oscilloscope setup is performed as an indication of sampling rate limitations. An off-line triggering and coincidence algorithm is used for multi0channel coincidences. The case of a test beam implementation of the device is also studied.

Primary author: GKOUGKOUSIS, Vagelis (University of Barcelona)

Presenter: GKOUGKOUSIS, Vagelis (University of Barcelona)

Session Classification: Session 3

Contribution ID: **14** Type: **not specified**

Digital Readout Board for CMS and TOTEM Precision Proton Spectrometer Timing Upgrade Project

Wednesday, February 7, 2018 4:30 PM (25 minutes)

For the CMS and TOTEM Precision Proton Spectrometer Project, a digital readout board was designed to take front-end data of the Diamond and Ultra-Fast Silicon Detectors, reformat the data timing packets, and transmit them to the CMS and TOTEM data acquisition systems through optical data links. This board is capable of having SAMPIC or HPTDC mezzanines for high-resolution timing measurement of the leading and trailing edges in the hit pulses with the resolution of 10 - 20 ps.

Primary author: ANTCHEV, Gueorgui (CERN)

Presenter: ANTCHEV, Gueorgui (CERN)

Session Classification: Session 4

Contribution ID: **15** Type: **not specified**

Synchronization of multiple V1743 digitizer boards

Wednesday, February 7, 2018 4:55 PM (25 minutes)

It is often necessary to perform a full synchronisation of multiple digitizer boards. This talk will present the way to:
- distribute the same clock to the boards
- make simultaneous start of the acquisition
- distribute the trigger signal in triggered or trigger-less systems
- keep the events synchronized across the boards

Presenter: TINTORI, Carlo (CAEN SPA)

Session Classification: Session 4

Contribution ID: **16** Type: **not specified**

The WaveCatcher in the DAQ of the UA9 Experiment

Wednesday, February 7, 2018 5:20 PM (25 minutes)

The UA9 Experiment investigates the use of components based on bent crystals in particle accelerators to improve the performance of beam steering and beam collimation.
The main installation of the experiment is in the CERN Super Proton Synchrotron and is composed of a dozen of beam-intercepting devices, few tens beam loss monitors and few beam-intercepting Cherenkov and pixel detectors.
In the last years, the acquisition system of the beam loss monitors and the Cherenkov detectors has been completely redesigned using WaveCatcher boards.
Dedicated control software has been developed to operate the boards from the CERN Control Center and to integrate the data stream with the Accelerator Logging Service.
The design and the characteristics of the system are presented.
Lessons learnt, advantages of this implementation and possible improvements for a future system are discussed

Primary author: MONTESANO, Simone (CERN)

Presenter: MONTESANO, Simone (CERN)

Session Classification: Session 4

Contribution ID: **17** Type: **not specified**

Using Narval for the DAQ of the WaveCatcher for GASPARD

Thursday, February 8, 2018 4:50 PM (25 minutes)

After a quick description & history of DCOD (Narval+ENX, next
generation) acquisition & slow control system,
we will address its application to GASPARD/Wavecatcher, how it helps addressing the increasing of channel and data throughput, how it integrates within various experimental setup. We will also address how it eased the reuse of CORTO setup for GASPARD/Wavecatcher

Primary author: LAFAGE, Vincent (IPNO)

Presenter: LAFAGE, Vincent (IPNO)

Session Classification: Session 7

Contribution ID: **18** Type: **not specified**

Use of the WaveCatcher as a standalone and portable acquisition system in a reactor building during a radiation protection detector R&D

Thursday, February 8, 2018 9:30 AM (20 minutes)

In the framework of the development of a radiation protection detector, the Wavecatcher acquisition board was used as a portable system with a battery and a laptop. The oscilloscope, the scaler counter, and the waveform recording features were used.

Primary author: CERNA, Cédric (CNRS / CENBG)

Presenter: CERNA, Cédric (CNRS / CENBG)

Session Classification: Session 5

Contribution ID: **19** Type: **not specified**

High speed time-resolved MOKE experiment for the investigation of ultrafast magnetic dynamics

Thursday, February 8, 2018 9:50 AM (25 minutes)

Presenter: VODUNGBO, Boris (CNRS / UPMC)

Session Classification: Session 5

Contribution ID: **20** Type: **not specified**

WaveCatcher based machine protection tools for the commissioning of the ELI-NP gamma beam system

Thursday, February 8, 2018 10:15 AM (25 minutes)

The new Gamma Beam System (GBS), within the ELI-NP project, under installation in Magurele (RO) by INFN, as part of EuroGammaS consortium, can provide gamma rays that open new possibilities for nuclear photonics and nuclear physics.
ELI-GBS gamma rays are produced by Compton back-scattering to get monochromaticity (0,1% bandwidth), high flux (1013 photon/s the highest in the world), tunable directions and energies up to 19 MeV. Such gamma
beam is obtained when a high-intensity laser collides a high-brightness electron beam with energies up to 720 MeV with a repetition rate of 100 Hz in multi-bunch mode with trains of 32 bunches.
In this work, I will present safety tools, based on WaveCatcher digitizers, which have been developed as part of the Machine Protection System (MPS) for the commissioning of the accelerator.
A WaveForm Mask real-time interlock system has been developed in order to acquire, through an 8ch WaveCatcher, RF reflected signals from the 13 RF sources to detect breakdown events during the conditioning and commissioning of accelerating structures. A distributed Cherenkov fiber Beam Loss Position Monitor (BLPM), acquired through solid-state detectors, involves two 8ch WaveCatchers to compute time-of-flight of Chrenkov photons and localize the electron beam losses along the whole
accelerator.
A new LabView driver for WaveCatchers were implemented to process waveform data and communicate with EPICS channel access.

Primary author: PIOLI, Stefano (INFN / Frascati)

Presenter: PIOLI, Stefano (INFN / Frascati)

Session Classification: Session 5

Contribution ID: **21** Type: **not specified**

Precise Timing - the route to better PET images

Thursday, February 8, 2018 2:15 PM (25 minutes)

PET imaging relies on the detection of two back-to-back 511 keV gamma photons. A line is constructed connecting the detection points of these two gamma (known as the line of reaction (LOR)). The image is constructed by analysing all these lines. If the time-of-arrival of the two gamma photons is precisely measured, this line is shortened to be just a line segment, with more precise timing resulting in a shorter line segment. These short line segments allow much speedier image reconstruction and reduce the background images. This presentation will focus on the techniques used to precisely measure the position and time of the photoelectric interaction and the requirements of the timing system.

Primary author: WILLIAMS, Crispin (CERN)

Presenter: WILLIAMS, Crispin (CERN)

Session Classification: Session 6

Contribution ID: **22** Type: **not specified**

Use of SAMPIC for PET development at IRFU

Thursday, February 8, 2018 2:40 PM (25 minutes)

Authors: V. Sharyy, C. Canot, P. Abbon and D. Yvon

CaLIPSO group at IRFU investigates the feasibility to use the Cherenkov radiation
to enhance the TOF performance of the PET scanners.
Two projects are under development. CaLIPSO project investigates the possibility to build the brain
and pre-clinical PET device with a high spatial resolution of the order of 1 mm3.
It uses an innovative liquid, TriMethyl Bismuth, as the photon conversions media and the Cherenkov radiator.
The second project, PECHE, develops the full body PET scanner with the enhanced TOF resolution and uses as a
Cherenkov radiator the crystalline lead fluoride.
In both project we are using the micro-channel-plate PMT read-out with the SAMPIC module to detect the Cherenkov photons.
We present the experimental results on the time resolution using the 511 keV photon from 22Na radioactive source.
We also report the details of the MCP-PMT time calibration and signal treatment with SAMPIC module.

Primary author: SHARYY, Viatcheslav (CEA / IRFU)

Presenter: SHARYY, Viatcheslav (CEA / IRFU)

Session Classification: Session 6

Contribution ID: **23** Type: **not specified**

Ultra-fast timing with diamond detectors for online ion range verification in hadrontherapy

Thursday, February 8, 2018 3:05 PM (25 minutes)

Authors; S Curtoni, A Bes , G Bosson , J Collot , D Dauvergne , M Fontana, L Gallin-Martel , M-L Gallin-Martel , J-Y Hostachy, A Lacoste, S Marcatili, J Morse , J-F Muraz , F.E. Rarbi , M Salomé, E Testa , M Yamouni

Hadrontherapy can be defined as radiotherapy by means of proton or light ion beams. This alternative technique enables a highly localized dose deposition and better organ-at-risk protection, compared to conventional photon radiotherapy. Therefore, the treatment quality strongly relies on the control of the effective ion range in the patient body. In this context, the French CLaRyS collaboration (Contrôle en Ligne de l'hAdronthérapie par Rayonnements Secondaires) aims to develop various online ion range verification techniques by detecting secondary particles emitted by the patient following nuclear interactions along the ion path. Prompt-Gamma Imaging (PGI) is one of these techniques. It consists in the detection of prompt-gamma photons by either a collimated- or a Compton-camera [1]. It has been shown that their emission profile is spatially correlated to the ion range. The performances of such detection systems can be improved by Time-of-Flight discrimination. A high-count-rate beam hodoscope may be necessary to measure the arrival time of ions on the patient. The MoniDiam project at LPSC is developing an ultra-fast beam tagging hodoscope, based on CVD (Chemical Vapor Deposition) diamond sensors [2]. CVD diamonds exhibit a fast time response, high resistivity and radiation hardness that make them good candidates for such a detector concept. We have characterized polycristalline (pc), single crystal (sc) and heteroepitaxially grown on Iridium (DoI) diamond samples with full planar metallization, under different irradiation conditions (α and β radioactive sources, 95 MeV/u 12C ions at GANIL, 8.5 keV photons pulsed micro beam at ESRF and 68 MeV protons at ARRONAX). During all these tests, we performed data acquisition using a 8-channel WaveCatcher digitizer, reaching a sampling speed of 3.2 GS/s. We investigated the charge collection properties of these diamond sensors and their time-, spatial- and energy-resolutions. We will present characterization results demonstrating time resolution below 100 ps, energy resolution between 7% and 10% and a good charge collection efficiency. In order to build a 2D position tagging hodoscope, we are also developing double-side stripped diamond sensors. Our first samples'performances were tested at the micro-diffraction end station (in air) of the ID21 beamline at ESRF. We will present the current mapping and time resolution we measured for these detectors.

References
[1] J Krimmer et al., Nucl. Instr. Meth. A 787, 98-101(2015) doi:10.1016/j.nima.2014.11.042
[2] ML Gallin-Martel et al, EPJ Web of Conferences 170, 09005 (2018). doi :https://doi.org/10.1051/epjconf/201817009005

Primary author: CURTONI, Sébastien (CNRS / LPSC)

Presenter: CURTONI, Sébastien (CNRS / LPSC)

Session Classification: Session 6

Contribution ID: **24** Type: **not specified**

WaveCatcher electronics for the Very-High-Energy Gamma-Ray large field observatory ALTO: from tests to prototypes and implementation possibilities

Thursday, February 8, 2018 4:00 PM (25 minutes)

ALTO is a wide field-of-view air shower array for very-high-energy (VHE) gamma-ray astronomy, proposed to be installed in the Southern Hemisphere at an altitude of ˜ 5 km above sea level. The current project is an array of 1248 Detection Units (DU) distributed in 208 clusters of 6 DUs. A DU consists in 2 detectors separated by a concrete layer serving as electron/gamma shielding: above the layer, a 2.5m height, 3.6m flat-to-flat hexagonal water tank equipped with one large-area central PMT will serve as a Cherenkov detector, while below the concrete layer, a thin (O(10cm)) aluminum tank will detect essentially muons, in order to tag hadronic showers. Two solutions are investigated for the detection principle in the Al tank: either scintillation (LAB+PPO+POPOP) or Cherenkov (water), with a large area central PMT in both cases. This design will require 2 readout channels per DU, so then 12 per cluster. For this purpose, a 12-channel WaveCatcher would be well-suited, allowing to set a trigger pattern at the level of a cluster, and recording the waveforms. The relative time between clusters would be accurately time-stamped at the nanosecond level thanks to White-Rabbit-based technology.
A prototype with 2 DUs is currently being built in VÃ¤xjÃ¶ (Linnaeus University, Sweden), and will allow to test the design. Especially, the readout with an 8-channel WaveCatcher, connected via UDP to a linux computer, will be used. The White-Rabbit timestamping technology will also be tested.
In this contribution, we will present the role of the WaveCatcher in the ALTO design, the prototypes, as well as in the preliminary tests made in the lab.

Primary author: PUNCH, Michael (APC-CNRS/Linnaeus University)

Presenter: PUNCH, Michael (APC-CNRS/Linnaeus University)

Session Classification: Session 7

Contribution ID: **25** Type: **not specified**

Pulse shape analysis in highly segmented Silicon detectors with WaveCatcher

Thursday, February 8, 2018 4:25 PM (25 minutes)

The GASPARD-GRIT (Granularity Resolution Identification Transparency) international project is aiming at developing a four pi Silicon array to be coupled with the new generation of gamma arrays, like AGATA and PARIS. Constraints on compactness and transparency to gamma make it very challenging. In particular, new techniques based on pulse shape analysis (PSA) have been implemented in order to identify the light particles. Digital electronics is being developed by the collaboration in order to fit these requirements.
In this talk, I will introduce the project aims and show the detectors and electronics designs. I will also present the first in-beam results for the trapezoidal highly segmented Silicon detector of GRIT coupled with the first version of the front-end electronics. The effect of capacitance on the discrimination of light particle will be presented.

Presenter: GRASSI, Laura (CNRS / IPNO)

Session Classification: Session 7

Contribution ID: **26** Type: **not specified**

An instrumented absorber detector for hadronic interaction measurements

Wednesday, February 7, 2018 5:45 PM (25 minutes)

A new generation of parasitic beam extraction of high energy particles from an accelerator is proposed in CRYSBEAM. Instead of massive magnetic kickers, bent thin crystals trapping particles within the crystal lattice planes are used. This type of beam manipulation opens new fields of investigation of fundamental interactions between particles and of coherent interactions between particles and matter.
An experiment in connection to Ultra High Energy Cosmic Rays study in Earth's high atmosphere can be conducted. Several TeV energy protons or ions are deflected towards a chosen target by the bent lattice planes only when the lattice planes are parallel to the direction of the incoming particle.
A smart absorber, which simulates the Earth's atmosphere, where particles are smashed and secondary showers are initiated, is an essential part of CRYSBEAM. This device has been designed and built with alternating layers of carbon or tungsten and fused silica Cherenkov radiators. This sets the path to measure hadronic cross sections at a relevant energy for cosmic rays investigation.
A 64 channels digitizer system, based on WaveCatcher boards, connected via 480-Mbits/s USB interface to a PC running the WaveCatcher's acquisition software, is the readout of the system and enable to perform coincidences between the layers of Smart Absorber.
A first, simplified version of the detector, with only 3 Cherenkov layers, was used on the first LEMMA (Low EMittance Muon Accelerator) test beam, at the H4 beamline at CERN North experimental area, to discern electrons and muons.

Primary author: IACOANGELI, Francesco (INFN / Roma)

Presenter: IACOANGELI, Francesco (INFN / Roma)

Session Classification: Session 4