IFD2022 - INFN Workshop on Future Detectors

Report of Contributions

https://agenda.infn.it/e/31581

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

Saluti

Monday, 17 October 2022 14:00 (15 minutes)

Session Classification: Session 1

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

Introduzione

Session Classification: Session 1

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

Future sfide: acceleratori, spazio, undeground

Session Classification: Session 1

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

Discussione

Session Classification: Session 1

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

Tracciatori (stato solido) + discussione

Session Classification: Session 1

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

Tracciatori + discussione

Session Classification: Solid State Detectors

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

Fotorivelatori + discussione

Session Classification: Liquid Detectors

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

Calorimetri + discussione

Session Classification: Gas Detectors

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

Eventi rari e PID + discussione

Session Classification: Photon Detectors

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

Infrastrutture on-detector

On-detector electronics and processing
Infrastruttura
Meccanica
Cooling

Session Classification: Session 6

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

Training, TT, Industria

Session Classification: Session 7

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

Highlights & Discussione

Wednesday, 19 October 2022 11:30 (1h 15m)

Session Classification: Highlights e discussione finale

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

Tavola rotonda

Session Classification: Highlights e discussione finale

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

Chiusura e saluti

Wednesday, 19 October 2022 12:45 (15 minutes)

Session Classification: Highlights e discussione finale

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

Introduzione, Technologies for solid-state trackers

Monday, 17 October 2022 17:15 (30 minutes)

Session Classification: Solid State Detectors

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

Rapidfire talks

Monday, 17 October 2022 17:45 (1 hour)

Session Classification: Solid State Detectors

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

Discussione

Monday, 17 October 2022 18:45 (45 minutes)

Session Classification: Solid State Detectors

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

Introduzione Liquid Detectors

Tuesday, 18 October 2022 09:00 (45 minutes)

Introduzione Liquid Detectors

Session Classification: Liquid Detectors

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

Rapidfire Talks

Tuesday, 18 October 2022 09:45 (40 minutes)

Session Classification: Liquid Detectors

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

Discussione

Tuesday, 18 October 2022 10:25 (35 minutes)

Session Classification: Liquid Detectors

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

Introduzione Gas Detectors

Tuesday, 18 October 2022 16:30 (20 minutes)

Presenters: BOSCHERINI, Davide (Istituto Nazionale di Fisica Nucleare); PINCI, Davide (Istituto Nazionale di Fisica Nucleare); IENGO, Paolo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

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

The IDEA drift chamber at FCC-ee and CEPC and related elx

Tuesday, 18 October 2022 16:50 (5 minutes)

Presenter: D'ANZI, Brunella (INFN - Bari)

Session Classification: Gas Detectors

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

Discussione

Tuesday, 18 October 2022 18:15 (20 minutes)

Session Classification: Gas Detectors

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

Introduzione

Session Classification: Photon Detectors

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

Rapidfire Talks

Session Classification: Photon Detectors

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

Discussione

Tuesday, 18 October 2022 15:05 (55 minutes)

Session Classification: Photon Detectors

Contribution ID: **27** Type: **not specified**

Introduzione Photodetectors / PID

Tuesday, 18 October 2022 14:00 (15 minutes)

Session Classification: Photon Detectors

Contribution ID: **28** Type: **not specified**

Introduzione

Session Classification: Session 6

Contribution ID: **29** Type: **not specified**

Rapidfire Talks

Session Classification: Session 6

Contribution ID: **30** Type: **not specified**

Discussione

Session Classification: Session 6

Contribution ID: **34** Type: **not specified**

Trends and future applications in calorimetry

Wednesday, 19 October 2022 08:45 (15 minutes)

Presenters: CAVALLARI, Francesca (Istituto Nazionale di Fisica Nucleare); SARRA, Ivano (Istituto Nazionale di Fisica Nucleare); SISTI, Monica (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **35** Type: **not specified**

Rapidfire talks

Wednesday, 19 October 2022 09:00 (2 hours)

Session Classification: Calorimetri

Contribution ID: **36** Type: **not specified**

Discussione

Session Classification: Calorimetri

Contribution ID: **37** Type: **not specified**

Latest results on a new correlator for neutrons and charged particles with high angular and energy resolution

Tuesday, 18 October 2022 14:25 (5 minutes)

With the advent of new facilities for radioactive ion beams mainly rich in neutrons, SPES @ LNL, FRAISE @ LNS and FAIR @ GSI only to give some examples, the detection of neutrons among charged particles in Heavy radioactive Ion collisions became mandatory, with high angular and energy resolutions, and the construction of new detection systems suitable for this experimental purpose becomes both a scientific and a technological challenge.
The contribution will illustrate the results of recent tests performed on new plastic scintillator material, the EJ276, both in the "green-shifted" and in the ordinary version, coupled with PMT and SiPM. These experimental work is aimed at the construction of a prototype of a detector for neutrons and charged particles, based on a 3D cluster of scintillation units, with the technical goal of high energy and angular resolution. Recently the project has received new lymph and strength thanks to the funding of the recent PRIN project, ANCHISE which is focused precisely on the development of a first detection prototype.

Primary author: PAGANO, Emanuele Vincenzo (Istituto Nazionale di Fisica Nucleare)

Co-authors: CARDELLA, Giuseppe (Istituto Nazionale di Fisica Nucleare); CASTOLDI, Andrea (Istituto Nazionale di Fisica Nucleare); DE FILIPPO, Enrico (Istituto Nazionale di Fisica Nucleare); GERACI, Elena Irene (Istituto Nazionale di Fisica Nucleare); GNOFFO, Brunilde (CT); GUAZZONI, Chiara (Istituto Nazionale di Fisica Nucleare); LANZALONE, Gaetano (Istituto Nazionale di Fisica Nucleare); MAIOLINO, Concettina (Istituto Nazionale di Fisica Nucleare); MARTORANA, Nunzia Simona (Istituto Nazionale di Fisica Nucleare); PAGANO, Angelo (Istituto Nazionale di Fisica Nucleare); PIRRONE, Sara (Istituto Nazionale di Fisica Nucleare); POLITI, Giuseppe (CT); RISITANO, Fabio (Istituto Nazionale di Fisica Nucleare); RIZZO, Francesca (LNS); RUSSOTTO, Paolo (Istituto Nazionale di Fisica Nucleare); TRIMARCHI, Marina (CT)

Presenter: PAGANO, Emanuele Vincenzo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **38** Type: **not specified**

TPC gassose a lettura ottica per eventi di bassa energia

La possibilità di studiare eventi a bassa energia prodotti da particelle debolmente interagenti sta diventando cruciale in molti aspetti della fisica astroparticellare, dalla ricerca di possibili candidati alla Materia Oscura alla spettroscopia dei neutrini solari.
La collaborazione CYGNO sta sviluppando una TPC gassosa, operante a pressione atmosferica e temperatura ambiente, con GEM a lettura ottica mediante sistema composto da Active Pixel Sensor, con più di 4 milioni di pixel e da foto-moltiplicatori.
Questa tecnologia fornisce un insieme di informazioni (energia rilasciata e suo profilo spaziale, direzione 3D e posizione 3D) che permette di ricostruire e identificare la ionizzazione prodotta nel gas da rinculi elettronici o nucleari con energie fino a pochi keV.
L'obiettivo finale di questa fase di ricerca e sviluppo è la costruzione di un dimostratore di 1 metro cubo da installare e testare nel sottosuolo dei Laboratori del Gran Sasso.

In questa presentazione. proposta per la sessione sui gas detector, verranno illustrati i risultati ottenuti con un prototipo da 50 litri in funzione presso i Laboratori Underground del Gran Sasso e gli studi sulle sensibilità in diverse applicazioni di ricerca fisica.

Primary author: PINCI, Davide (Istituto Nazionale di Fisica Nucleare)

Presenter: PINCI, Davide (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **39** Type: **not specified**

Innovations in the design of thin silicon sensors for extreme fluences

State-of-the-art silicon sensors are able to operate efficiently up to fluences of 1E16/cm^2. Future frontier accelerators envisage the use of tracking detectors in environments with fluences exceeding 1E17/cm^2.
The possible solution to overcome the present limit in radiation tolerance is to exploit the recently observed saturation of radiation damage effects on silicon, together with the usage of thin substrates, intrinsically less affected by radiation. To cope with the small signal coming from thin sensors, the Low-Gain Avalanche Diode (LGAD) design with internal multiplication of the charge carriers represents the ideal framework.
An innovative design of the LGAD gain implant will be presented based on an acceptor-donor compensation of the dopant atoms to preserve internal gain above 1E16/cm^2 and possibly up to 1E17/cm^2.
The goal is to pave the way for a new sensor design that can efficiently perform precise tracking and timing measurements up to 1E17/cm^2 and beyond.

Primary authors: MOROZZI, Arianna (Istituto Nazionale di Fisica Nucleare); SOLA, Valentina (Istituto Nazionale di Fisica Nucleare); ARCIDIACONO, Roberta (Istituto Nazionale di Fisica Nucleare); ASENOV, Patrick (Istituto Nazionale di Fisica Nucleare); BORGHI, Giacomo (Fondazione Bruno Kessler - TIFPA); BOSCARDIN, Maurizio (Istituto Nazionale di Fisica Nucleare); CARTIGLIA, Nicolo' (Istituto Nazionale di Fisica Nucleare); CENTIS VIGNALI, Matteo (CERN); COSTA, Marco (Istituto Nazionale di Fisica Nucleare); CROCI, Tommaso (Istituto Nazionale di Fisica Nucleare); FERRERO, Marco (Istituto Nazionale di Fisica Nucleare); GIORDANENGO, Simona (Istituto Nazionale di Fisica Nucleare); LANTERI, Leonardo; MENZIO, Luca (Istituto Nazionale di Fisica Nucleare); MONACO, Vincenzo (Istituto Nazionale di Fisica Nucleare); MOSCATELLI, Francesco (Istituto Nazionale di Fisica Nucleare); MULARGIA, Roberto (Istituto Nazionale di Fisica Nucleare); PASSERI, Daniele (University and INFN Perugia); PASTRONE, Nadia (Istituto Nazionale di Fisica Nucleare); PATERNOSTER, Giovanni (Fondazione Bruno Kessler); SIVIERO, Federico (Istituto Nazionale di Fisica Nucleare); STAIANO, Amedeo (Istituto Nazionale di Fisica Nucleare); TORNAGO, Marta

Presenters: MOROZZI, Arianna (Istituto Nazionale di Fisica Nucleare); SOLA, Valentina (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **40** Type: **not specified**

ARCADIA - piattaforma INFN per FD-MAPS in tecnologia CMOS

La Collaborazione ARCADIA (INFN CSN5 Call) ha sviluppato una piattaforma per la progettazione, fabbricazione e caratterizzazione di sensori monolitici innovativi compatibili con processi CMOS standard. La tecnologia del sensore permette lo svuotamento completo del substrato per una raccolta di carica esclusivamente per drift, mentre l'uso di un sensore di raccolta di ridotte dimensioni massimizza il rapporto segnale-rumore. Le tecniche di litografia sul retro, sviluppate dall'INFN insieme alla fonderia di silicio (LFoundry), implementano strutture di terminazione che permettono lo svuotamento di substrati con spessori nell'intervallo 100-500 μm.
Per la dimostrazione della tecnologia, la Collaborazione ARCADIA ha sviluppato prototipi, usando 3 engineering run dedicati nel nodo CMOS 110nm LF110AE, di FD-MAPS "system-grade"e strutture di test a pixel e strip per l'ottimizzazione delle prestazioni del sensore ed elettronica, oltre ad implementare su substrati dedicati le migliorie necessarie per raggiungere ottime prestazioni temporali.
Questa tecnologia INFN permette di estendere l'utilizzo e beneficio dei sensori monolitici CMOS alla fisica delle alte energie, applicazioni nello spazio, imaging con raggi-X e strumentazione medica.

Primary authors: DA ROCHA ROLO, Manuel Dionisio (Istituto Nazionale di Fisica Nucleare); ON BEHALF OF THE ARCADIA COLLABORATION

Presenter: DA ROCHA ROLO, Manuel Dionisio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **41** Type: **not specified**

The IDEA drift chamber at FCC-ee and CEPC

The FCC program at CERN and the CEPC project in China combine in the same 100km infrastructure a high luminosity Higgs and Electroweak factory e+e- collider,
followed by a 100 TeV hadron collider. The IDEA project, as proposal for an experiment along then electron-positron collider, includes an ultralight
drift chamber as the main tracking device designed to provide efficient tracking, high precision momentum measurement
and excellent particle identification. One of most relevant feature of this drift chamber, fundamental for precision electroweak
physics at the Z pole and flavour physics, is the high transparency, in terms of radiation
lengths, obtained by using a novel approach adopted for the wiring and assembly procedures.
Particle identification capabilities are also particularly relevant for heavy flavour tagging and are reached by using a
cluster counting technique, expected to provide a two-times better particle separation with respect to the traditional method
based on energy loss per unit length. An overview of the status of the IDEA drift chamber project is provided in this talk,
together with the latest achievements while exploring the cluster counting technique at beam test facilities at CERN.

Primary authors: CORVAGLIA, Alessandro (Istituto Nazionale di Fisica Nucleare); MICCOLI, Alessandro (Istituto Nazionale di Fisica Nucleare); D'ANZI, Brunella (INFN - Bari); Prof. DE FILIPPIS, Nicola (BA); VENTURA, Andrea (Istituto Nazionale di Fisica Nucleare); Dr TALIERCIO, Angela (Nortwestern University); Dr CAPUTO, Claudio (Universite Catholique de Louvain); GORINI, Edoardo (Istituto Nazionale di Fisica Nucleare); CUNA, Federica (Istituto Nazionale di Fisica Nucleare); GRANCAGNOLO, Francesco (Istituto Nazionale di Fisica Nucleare); CHIARELLO, Gianluigi (INFN); TASSIELLI, Giovanni Francesco (Istituto Nazionale di Fisica Nucleare); Dr JOHNSON, Kurtis (Florida State University); PRIMAVERA, Margherita (Istituto Nazionale di Fisica Nucleare); GRECO, Matteo (Istituto Nazionale di Fisica Nucleare); ELMETENAWEE, Walaa (Istituto Nazionale di Fisica Nucleare)

Presenter: D'ANZI, Brunella (INFN - Bari)

Session Classification: Gas Detectors

Contribution ID: **42** Type: **not specified**

The cluster counting/timing techniques in drift chambers

Tuesday, 18 October 2022 14:15 (5 minutes)

The cluster counting technique represents a very promising alternative to the traditional ways of integrating the ionization charge for particle identification in drift chambers. It takes advantage of the Poisson nature of the primary ionization process and offers a more statistically robust method to infer mass information. Simulation studies prove that cluster counting allows reaching a resolution two times better than the traditional energy loss-based method over a wide momentum range in the use case of a helium-based drift chamber. It consists in singling out, in every recorded detector signal, the electron peak structures related to the arrival time of the electrons belonging to a single primary ionization act (cluster) on the anode wire. However, the search for hundreds of electron peaks and cluster recognition in real data-driven waveform signals is extremely challenging because of their superimposition in the time scale. The state-of-the-art open-source algorithms fail to reach theoretical expectations even in low-noise conditions. In this talk, we present cutting-edge methods to search for electron peaks in actual waveform time spectra and identify ionization clusters showing their application to beam test datasets collected at CERN facilities using helium-based drift tubes.

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Co-authors: DE SANTIS, Francesco (Istituto Nazionale di Fisica Nucleare); XIN, Shuiting (IHEP); CAPUTO, Claudio (Universite Catholique de Louvain); POPOV, Alexander; GRIBANOV, Sergei; SHUAIYI, Liu (Institute of High Energy Physics); GUO, Fangyi (Institute of High Energy Physics, CAS)

Presenter: CUNA, Federica (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **43** Type: **not specified**

Front-end and DAQ electronics for the IDEA drift chamber

The IDEA detector is a general purpose detector designed for experiments at future lepton colliders. The central tracker is based on a drift chamber (DCH) designed to provide an efficient tracking, a high precision momentum measurement and an excellent particle identification by exploiting the application of the cluster counting technique.\\
We present the design and the first prototype of the front-end electronics and the data acquisition (DAQ) system for the DCH readout. The front-end plays an essential role in in the acquisition of the signals from the DCH in order to have an excellent time resolution and, therefore, an excellent spatial resolution. The signals, amplified by a wide bandwidth frontend, are converted from analog to digital with the use of high bandwidth (~1 GHz) FADCs or digitizers and then processed via an FPGA on the DAQ Board. The FPGA has an important role, as it initially acquires all the signals converted, processes them with cluster counting algorithms (aimed also at reducing the data throughput) and finally sends the processed information to a back-end computer via an Ethernet interface.

Primary authors: CORVAGLIA, Alessandro (Istituto Nazionale di Fisica Nucleare); MICCOLI, Alessandro (Istituto Nazionale di Fisica Nucleare); VENTURA, Andrea (Istituto Nazionale di Fisica Nucleare); TALIERCIO, Angela (Nortwestern University); D'ANZI, Brunella (INFN - Bari); CAPUTO, Claudio (UCLouvain); PASTORE, Cosimo (Istituto Nazionale di Fisica Nucleare); GORINI, Edoardo (Istituto Nazionale di Fisica Nucleare); CUNA, Federica (Istituto Nazionale di Fisica Nucleare); GRANCAGNOLO, Francesco (Istituto Nazionale di Fisica Nucleare); CHIARELLO, Gianluigi (INFN); TASSIELLI, Giovanni Francesco (Istituto Nazionale di Fisica Nucleare); JOHNSON, Kurtis (Florida State University); PANAREO, Marco (Istituto Nazionale di Fisica Nucleare); GRECO, Matteo (Istituto Nazionale di Fisica Nucleare); MONGELLI, Maurizio (Istituto Nazionale di Fisica Nucleare); DE FILIPPIS, Nicola (BA); ELMETENAWEE, Walaa (Istituto Nazionale di Fisica Nucleare)

Presenter: CHIARELLO, Gianluigi (INFN)

Session Classification: Gas Detectors

Contribution ID: **44** Type: **not specified**

SiPM per basse temperature

Vorrei presentare lo sviluppo di nuovi SiPM in grado di lavorare a temperature inferiori a quella comunemente segnalata dai produttori come limite inferiore, cioè -40° C. Il modello da cui siamo partiti sono i FBK NUV-HD-CRYO. Questi SiPM sono sensibili al vicino ultravioletto, regione di massimo interesse per la fisica del neutrino e materia oscura che utilizza argon o xenon liquidi.
Sono state studiate le caratteristiche di funzionamento dei dispositivi in azoto liquido e la resistenza del packaging ai cicli termici. Tale packaging realizzato con resina epossidica, infatti, è trasparente alla radiazione nel visibile (RGB) e non riduce l'efficienza quantica dei dispositivi. Ciò permette potenzialmente l'uso dei NUV anche nella regione a minore lunghezza d'onda, utile ad esempio per lo studio e il monitoraggio dei ghiacciai.

La sessione di interesse è quella dedicata ai photon detector.

Primary author: FALCONE, Andrea (Istituto Nazionale di Fisica Nucleare)

Presenter: FALCONE, Andrea (Istituto Nazionale di Fisica Nucleare)

Contribution ID: **45** Type: **not specified**

Tecnologia Power over fiber per Photon Detectors a temperature criogeniche

Si vuole presentare, nella sessione dedicata ai Photon Detector, l'idea di base del progetto CRYO-PoF. Questo progetto ha ricevuto il finanziamento Grant Giovani CSN5 2021 e ha lo scopo di disegnare e validare un sistema opto-elettronico per l'alimentazione e il controllo del bias dei SiPM in ambiente criogenico.
Questo sistema nasce dall'esigenza di sviluppare un sistema di alimentazione per il Photon Detection System del modulo a drift verticale di DUNE, in modo da poter essere posto sul catodo ad alta tensione (circa 300 kV).
Per raggiungere questo scopo, si utilizza la tecnologia del Power over fiber in cui un laser a lunghezza d'onda superiore allo spettro di assorbimento dei SiPM utilizzati, è in grado di alimentare sia i SiPM che il loro stage di amplificazione. Ciò porta ad una riduzione del rumore indotto dai cavi convenzionali e all'insensibilità ai campi elettrico e magnetico.
Verranno presentati i risultati raggiunti nella prima fase di questo progetto e i possibili sviluppi futuri.

Primary author: TORTI, Marta (Istituto Nazionale di Fisica Nucleare)

Presenter: TORTI, Marta (Istituto Nazionale di Fisica Nucleare)

Contribution ID: **46** Type: **not specified**

Design and optimization of a MPDG-based hadronic calorimeter for a future colliders

The Particle Flow calorimetry is a leading approach towards the 4D jet reconstruction and combines precise space and time information with unprecedented jet energy resolution. It is the most suitable approach for experiments at future high energy colliders. Particle-flow calorimeters, designed to combine the information from all the detector subsystems, requires high transverse and longitudinal granularity
A proposal for an innovative MPGD-based hadronic calorimeter is currently under investigation and its design is carried out with the aim to maximize the efficiency of the Particle-flow reconstruction of charged and neutral hadrons and jets. The detector consists of a sampling calorimeter exploiting MPGDs as active layers: the MPGDs offer a fast and robust technology for high radiation environments, and a high granularity for precise spatial measurements. The detector design and preliminary layout optimization performed with Geant4 will be presented.

Primary authors: ZAZA, Angela (Istituto Nazionale di Fisica Nucleare); STAMERRA, Anna (Istituto Nazionale di Fisica Nucleare); PELLECCHIA, Antonello; VENDITTI, Rosamaria (Istituto Nazionale di Fisica Nucleare); RADOGNA, Raffaella (Istituto Nazionale di Fisica Nucleare); SIMONE, Federica Maria (Istituto Nazionale di Fisica Nucleare); ERRICO, Filippo (Istituto Nazionale di Fisica Nucleare); VERWILLIGEN, Piet Omer J (Istituto Nazionale di Fisica Nucleare); COLALEO, Anna (Istituto Nazionale di Fisica Nucleare); ARUTA, Caterina (Istituto Nazionale di Fisica Nucleare)

Presenter: STAMERRA, Anna (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **47** Type: **not specified**

ANDIAMO, an innovative acoustic neutrino telescope proposal

When extremely energetic neutrinos (E > 10^{19} eV) interact in a medium produce a thermo-acoustic process where the energy of generated particle cascades can be conveyed in a pressure pulse propagating into the same medium. The kilometric attenuation length as well as the well-defined shape of the expected pulse suggest a large-area-undersea-array of acoustic sensors as an ideal observatory. For this scope, we propose to exploit the existing and no more operative offshore (oil rigs) powered platforms in the Adriatic sea as the main infrastructure to build an acoustic submarine array of dedicated hydrophones covering a surface area up to 10000 km^2 and a volume up to 500 km^3. In this work we describe the advantages of this detector concept using a ray tracing technique as well as the scientific goals linked to the challenging purpose of observing for the first time ultra-high-energy cosmic neutrinos. Great progresses in signal processing techniques and the augmented computational power of modern computers makes nowadays this project feasible respect to the previous attempts of more than two decades ago.

Primary authors: Dr SIMONELLI, Andreino (Istituto Nazionale di Fisica Nucleare); MARINELLI, Antonio (Istituto Nazionale di Fisica Nucleare); MIGLIOZZI, Pasquale (Istituto Nazionale di Fisica Nucleare)

Presenter: Dr SIMONELLI, Andreino (Istituto Nazionale di Fisica Nucleare)

Session Classification: Liquid Detectors

Contribution ID: **49** Type: **not specified**

Quantum-dot light emitters for chromatic calorimetry

Quantum technologies are establishing themselves relentlessly in a wide spectrum of applications, ranging from quantum computing, communication, simulation to imaging and sensing.
In the context of the ECFA Detector R&D roadmap process, many physics targets have been identified that could benefit from the unprecedented sensitivity and precision of quantum systems. In particular, materials based on semiconductor nanomaterials such as CdSe, InGaN/GaN or perovskite nanocrystals are being studied as scintillators and for charged particle tracking detectors. Efforts exist to develop future detectors where state-of-the-art bulk scintillators are combined with visible light-emitting nanocrystals. Such innovative scintillators can reach high time resolution, which is a demanding requirement for TOF-PET applications and future HEP experiments.
In this contribution we will discuss a blue-sky development, based on the idea of a "chromatic calorimeter"made by combining state-of-the-art bulk scintillators with nanocrystals with different emitting wavelengths into a multi-layered structure, thus providing longitudinal information.

Primary authors: COLALEO, Anna (Istituto Nazionale di Fisica Nucleare); SIMONE, Federica Maria (Istituto Nazionale di Fisica Nucleare); PELLECCHIA, Antonello (INFN Bari); RADOGNA, Raffaella (Istituto Nazionale di Fisica Nucleare)

Presenter: SIMONE, Federica Maria (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **50** Type: **not specified**

New Resistive Micromegas structures for future detectors

The developments of next-generation Micromegas detectors with new resistive structures and fine granularity pad readout comply with the ECFA detector R&D themes on gaseous detectors for particle tracking at rates up to O(10) MHz/cm^2 with a spatial resolution of O(100) μm.
The talk focuses on test of detectors with uniform or segmented resistive planes with results on rate capability, robustness, dependence on the irradiated area, tracking efficiency and energy and spatial resolution. Several of the tested detectors exploit the Diamon-Like-Carbon (DLC) as resistive protection structures.
The results show that small-pad resistive Micromegas detectors can efficiently operate at O(10^4) gain factors in high-rate environments and are valid candidates for future accelerator experiments. New studies are planned to also investigate and improve the timing performances.

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Presenter: CAMERLINGO, Maria Teresa (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **51** Type: **not specified**

Organic thin films as flexible, large area X-ray and proton detectors

We report on novel, fully organic detectors for a real-time beam and dose monitoring over a large area, that permit, as an example application, to verify the actual dose delivered during medical radiotherapy (both with X-ray- or proton- beams), improving the quality of patients care and preventing long-term toxic effects. The use of organic semiconductors as active detection layers allows to implement devices that achieve two key goals: i) their thin, flexible and large area structure permits their comformable use directly on the patient during therapy; ii) their organic composition results a tissue-equivalent devices, a very relevant advantage for medical dosimeters.
We will discuss two different device geometries developed in the FIRE INFN-CSN5 project: one operates in the direct mode (direct conversion of the X-ray or proton beam into an electron-hole pair collected by the organic thin film device) and the other in the indirect mode (an organic scintillator coupled to an organic phototransistor). To date, there is no example of fully organic semiconductor detectors used as proton beam dose monitoring systems.

Primary author: FRABONI, Beatrice (Istituto Nazionale di Fisica Nucleare)

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Presenter: FRABONI, Beatrice (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **52** Type: **not specified**

Novel ionizing radiation detectors based on perovskite films

Hybrid organic/inorganic perovskites (HOIPs) represent a breakthrough in the direct detection of ionizing radiation thanks to their solution processability, and their scalability over large areas on flexible plastic substrates. Flexible perovskite X-ray detectors are lightweight devices that can be operated at low-voltages and strongly limit the use of toxic materials and precursors. Polycrystalline films are thus preferred to foresee the implementation of the technology.
Recent results on direct X-ray detectors fabricated with solution-grown polycrystalline 2-dimensional (2D) layered perovskites films will be reported. Perovskites films are directly deposited onto pre-patterned electrodes on flexible substrate by low-temperature solution process. The films provide excellent opto-electrical properties, stability, and ultra-fast response. As a result of high X-ray stopping power and ultra-low dark current, the performances of the devices as ionizing radiation detectors exhibit remarkable sensitivity, excellent Limit of Detection, and ultra-stable response under continuous operation.
We will present the design and characterization of mixed 3D/2D perovskite films-based direct proton beam detector. The work has been carried on in the framework of the experiment INFN-CSN5 ANEMONE, that aim to develop the first perovskite film-based real-time direct detector for protons and ions, as beam monitor for hadron therapy.

Primary authors: CIAVATTI, Andrea (Istituto Nazionale di Fisica Nucleare); FRABONI, Beatrice (Istituto Nazionale di Fisica Nucleare); BASIRICÒ, Laura (Istituto Nazionale di Fisica Nucleare)

Presenter: CIAVATTI, Andrea (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **54** Type: **not specified**

Silicon Photonics high speed links for HEP and space

Optical transceivers have rapidly become essential components in the readout sub-systems of high-energy physics (HEP) experiments. Given the ever-increasing radiation hardness requirements for next-generation colliders, existing readout systems based on directly modulated laser diodes, e.g., VTRx+, will rapidly become ineffective. Properly engineered silicon-based photonics modulators have been shown to sustain higher radiation tolerance than current VCSEL-based devices. In addition, silicon photonics (SiPh) solutions could enable higher data rates and lower power consumption with further possibilities of data aggregation, e.g., wavelength division multiplexing (WDM). A full-custom photonics integrated circuit (PIC) in IMEC's iSiPP50G silicon-on-insulator technology has been designed in the context of the INFN projects PHOS4BRAIN and FALAPHEL aiming to the development of a radiation-tolerant 4-lane SiPh WDM transmitter driven by custom-designed electronic integrated circuits (EICs) to implement an aggregated 100 Gb/s transmission bandwidth. The PIC includes different flavours of SiPh optical modulators (Mach-Zehnder, ring or silicon-germanium electro-absorption modulators) to understand those which may best fit as building blocks in a future radiation-hard integrated optoelectronic readout module. This contribution will present recent developments and preliminary device characterisations of the SiPh modulators designed to target total ionising doses (TIDs) up to 1 Grad.

Primary authors: PALLA, Fabrizio (Istituto Nazionale di Fisica Nucleare); CAMMARATA, Simone (INFN Pisa and University of Pisa); FARALLI, Stefano (Istituto Nazionale di Fisica Nucleare)

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Contribution ID: **56** Type: **not specified**

The Demonstrator of the instrumented decay tunnel for the ENUBET monitored neutrino beam

The NP06/ENUBET project is designing a facility with unprecedented control on the neutrino flux for high precision ($\mathcal{O}(1\%)$) cross section measurements. The key part of the facility is an instrumented decay tunnel that measures large angle charged leptons from kaon decays, thus constraining the associated neutrino fluxes. It is based on a sampling calorimeter for e/μ/π separation and on rings of plastic scintillators in the inner part of the calorimeter for the rejection of photons coming from π^0. An intense prototyping activity led to the final configuration of the calorimeter readout: WLS fibers running on the frontal faces of the tiles bring the light to SiPMs placed above a borated polyethylene layer, providing a shielding against radiation damage of the sensors. A 1.65 m long section of the instrumentation with 45° azimuthal coverage is being built to demonstrate the viability and effectiveness of this approach and will be tested in the renovated East Area at CERN-PS. This contribution will report a summary of the prototyping activities, an overview of the Demonstrator design and construction and preliminary results of the test beam campaign on ENUBINO, a small azimuthal sector of the instrumentation tested at CERN as a bemchmark for the concept.

Primary authors: IACOB, Fabio (Istituto Nazionale di Fisica Nucleare); PUPILLI, Fabio (Istituto Nazionale di Fisica Nucleare)

Presenter: IACOB, Fabio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **57** Type: **not specified**

Greening Resistive Plate Chamber detectors for HEP applications.

Resistive Plate Chambers (RPCs) are among the most widely used gaseous detectors for High Energy Physics applications, especially in trigger and muon identification systems. At present, they are typically operated in avalanche mode, with a large fraction of fluorinated gases whose use and availability have been drastically limited by the European Union given their high Global Warming Potential.
An intense R&D activity is ongoing to improve RPC technology in view of future HEP applications and to investigate the detector performance when operated with eco-friendly gas mixtures. Highlights of these performance studies, carried out at the CERN Gamma Irradiation Facility (GIF++), will be given in this talk.

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Presenter: RPC ECOGAS@GIF++ COLLABORATION

Session Classification: Gas Detectors

Contribution ID: **58** Type: **not specified**

Studio e caratterizzazione di nuovi dispositivi per la rivelazione di particelle basati sull'uso di magneti a singola molecola nell'esperimento NAMASSTE

L'esperimento NAMASSTE (finanziato da INFN - Gruppo V) ha come obiettivo lo sviluppo di nuovi dispositivi di rivelazione basati sull'utilizzo di magneti a singola molecola (MSM), oltre che lo studio di nuovi MSM come memorie ad alta densità.
I MSM sono materiali cristallini composti da molecole magnetiche identiche e magneticamente isolate che, a temperature molto basse in un campo magnetico esterno, mostrano uno stato metastabile regolabile per essere altamente sensibile all'azione di una "perturbazione"esterna, quale quella dovuta all'interazione con una particella incidente. I MSM possono perciò essere potenzialmente impiegati come sensori quantistici su cui basare nuove tecniche di rivelazione, eventualmente applicabili nella progettazione di esperimenti innovativi (ad esempio per la ricerca di materia oscura).
In NAMASSTE l'effetto di sorgenti radioattive sui MSM è indagato mediante tecniche NMR ed EPR su singolo cristallo oltreché con magnetometria SQUID. L'approccio innovativo con NMR ed EPR è atteso essere più sensibile delle tecniche di rivelazione magnetometriche, recentemente riportate in letteratura e basate su un "effetto valanga", che comporta variazioni di magnetizzazione sull' intero sensore.
Inoltre, dalla collaborazione con teorici del campo è previsto lo sviluppo di una modellizzazione dell'interazione particella-MSM, su cui non esiste al momento alcun lavoro in letteratura.

Primary authors: CINI, Alberto; CELARDO, Giuseppe; CINTI, Fabio; FITTIPALDI, Maria; LATINO, Giuseppe; SORACE, Lorenzo; AROSIO, Paolo; BRERO, Francesca; FRASSINETI, Jonathan; GIROLETTI, Elio; LASCIALFARI, Alessandro; MARIANI, Manuel; ORSINI, Francesco; RETTORI, Angelo; SANNA, Samuele; VILLA, Ilaria; PORRU, Margherita; SANTINI, Paolo

Presenter: CINI, Alberto

Session Classification: Quantum primer

Contribution ID: **59** Type: **not specified**

Compact calorimeter based on oriented crystals.

Recently, a test has been performed by the INFN-STORM collaboration on the H2 line at CERN SPS North Area with a hundred-GeV electron beam on two PWO samples, which confirmed the acceleration of electromagnetic shower, and thus the reduction of the radiation length, in axially oriented crystals.
We measured directly, for the first time ever, the light produced by the energy deposited inside the crystals. It has been found that the energy deposited when the beam is aligned with the crystal axes is much larger than the one in the random condition. Moreover, the reduction of the radiation length experienced by the electrons in the strong field has been evaluated.
In the near future, the experiment INFN-OREO will test a calorimeter prototype with an oriented layer of PWO.
The reduction of the radiation length in oriented crystals, caused by the acceleration of the electromagnetic shower development, open the way to the development of compact electromagnetic calorimeter with a wide range of applications, such as in accelerator based
fixed target experiments at high energy or in the astrophysical field, for instance
in satellite-based γ-telescopes.

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Presenter: SELMI, Alessia (Università degli Studi dell'Insubria)

Session Classification: Calorimetri

Contribution ID: **60** Type: **not specified**

Toward single-photon detector based on Josephson effect for dark matter search

Dark matter (DM) is one of the most challenging problems of modern physics. Nowadays, its nature remains elusive and multiple theoretical models have been proposed to explain DM phenomenology. A DM candidate that has attracted increasing attention is the axion, a hypothetical elementary particle postulated to solve the strong CP problem in quantum chromodynamics. One of the possible ways to detect axions is to observe their conversion into photons as they interact with a strong magnetic field. The axions conversion events are expected to be very rare and therefore a photon detector sensitive to a single light quantum has to be emploied. Josephson junctions (JJ) based single-photon detectors are ideal for this purpose since they are extremely sensitive to external stimuli. We present our latest results obtained using superconducting qubit network (SQN) as a photon detector. We exploit the coherent collective excitation of the SQN as a mechanism for detection of microwave photons in a three-ports device [1–3] (Supergalax project, founded by the European union through Horizon2020, grant number 863313).

1. Brehm, J. D. et al. npj Quantum Mater. https://doi.org/10.1038/s41535-021-00310-z.
2. Navez, P. et al. Phys. Rev. B (2021) https://doi.org/10.1103/PhysRevB.103.064503
3. Zagoskin, A. M. et al.(2013) https://doi.org/10.1038/srep03464

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Presenter: D'ELIA, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Quantum primer

Contribution ID: **61** Type: **not specified**

Fast Timing MPGD

The present generation of Micro-Pattern Gaseous Detectors (MPGDs) are radiation hard detectors,capable of dealing with rates of several MHz/cm2, while exhibiting good spatial resolution (≤ 50 μm) and modest time resolution of 5–10 ns, which satisfies the current generation of experiments (High Luminosity LHC upgrades) but is not sufficient for Future Collider detectors. The application of thin resistive films (e.g.Diamond Like Carbon - DLC) allowed for na hybrid detector concept: the Fast Timing MPGD (FTM). In the FTM the drift volume of the detector has been divided in several layers each with their own amplification structure. The use of resistive electrodes makes the entire structure transparent for electrical signals. After some first initial encouraging results, progress has been slowed down. Currently the production of such detector is limited by the quality of the base material (DLC and Cu depositions on kapton foil). In the recent years R&D has been concentrated on higher quality base material through alternative production techniques. We will compare results on the performance of the latest resistive and conductive foils. A major break-through is expected from in-house production of DLC foils at CERN through the common INFN-CERN magnetron sputtering deposition facility at CERN MPT workshop.

Primary authors: PELLECCHIA, Antonello (INFN Bari); VERWILLIGEN, Piet Omer J (Istituto Nazionale di Fisica Nucleare); RANIERI, Antonio (Istituto Nazionale di Fisica Nucleare); SIMONE, Federica Maria (Istituto Nazionale di Fisica Nucleare); MAGGI, Marcello (Istituto Nazionale di Fisica Nucleare)

Presenter: VERWILLIGEN, Piet Omer J (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **62** Type: **not specified**

NOA: a new reality for novel SiPM-based detector production

Tuesday, 18 October 2022 14:50 (5 minutes)

Silicon Photo Multipliers aim to be a promising technology in the next generation experiments, based on ultra-low background large volume detectors searching for rare events. Novel photosensors with high performance at cryogenic temperature have been developed by Fondazione Bruno Kessler and integrated by Laboratori Nazionali del Gran Sasso in large area photodetectors, thus opening the frontiers toward the realization of scalable liquid Argon experiments probing dark matter. A large-scale production of SiPM-based detectors can be achieved in the Nuova Officina Assergi infrastructure, a clean room of 420 m2 soon operative at Laboratori Nazionali del Gran Sasso, hosting the most advanced packaging and electronic test facilities for the integration of large arrays of radiopure SiPM photodetectors.

Primary author: CONSIGLIO, Lucia (Istituto Nazionale di Fisica Nucleare)

Presenter: CONSIGLIO, Lucia (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **63** Type: **not specified**

RPC with Gallium Arsenide electrodes, a solution for medium sized high-rate detectors

Different materials have been studied and proposed for the realization of RPC detectors for high rate environments. This study demonstrates how the semi-insulating gallium arsenide wafers currently on the market represent an optimal solution for high-rate RPCs. The measurements carried out show an intrinsic rate capability higher than 40 kHz/cm^2 with a gamma rejection of about 10^{-3}.

Primary authors: ROCCHI, Alessandro (Istituto Nazionale di Fisica Nucleare); CARDARELLI, Roberto (Istituto Nazionale di Fisica Nucleare)

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Presenter: ROCCHI, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **64** Type: **not specified**

The Resistive Cylindrical Chamber, a new detector based on the generalization of the RPC detectors to the quasi-planar field

The Resistive Cylindrical Chamber, is a new device consisting of two coaxial electrodes of resistive material with a cylindrical geometry. The principle underlying the operation of the device consists in the natural extension from the concept of planar field to that of quasi-planar field, whose gradient is defined by the cylindrical electrodes radii and by the gas gap thickness. This new configuration allows to introduce many fundamental innovations, mainly the pressurization of the gas target (with consequent increase of efficiency for thin gaps) and the acceleration or quanching effect of the gas discharge by the field gradient.

Primary authors: ROCCHI, Alessandro (Istituto Nazionale di Fisica Nucleare); CARDARELLI, Roberto (Istituto Nazionale di Fisica Nucleare)

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Presenter: ROCCHI, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **65** Type: **not specified**

Thin monolithic pixel sensors with fast operational amplifier output in a 65 nm imaging technology.

This work presents results on the Analog Pixel Test Structure (APTS), a 4 x 4 pixel matrix prototype equipped with fast individual OPAMP-based buffering of analog pixel signals to output pads for exploration of pixel timing performance. The work was framed in the ALICE ITS3 upgrade and the CERN-EP R&D on monolithic sensors to explore the TPSCo 65-nm imaging technology. This upgrade will replace the inner layers of the ALICE Inner Tracking System at CERN with ultra-thin flexible wafer-scale monolithic silicon sensors. They will improve the material budget in this region, the tracking precision and the efficiency at low transverse momentum.
The presentation will show the gain of the signal chain in the APTS and its speed as a function of the configuration parameters, including calibration results with a 55Fe source. Two different pixel structures will be compared to demonstrate the possibility of enhancing the performance in terms of timing and charge collection efficiency by implant modifications in the epitaxial layer. Finally test beam results planned at the Super Proton Synchrotron at CERN will provide full spatial and time resolution of the APTS OPAMP structures.

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Presenter: SAVINO, Umberto (Istituto Nazionale di Fisica Nucleare - Università di Torino)

Session Classification: Solid State Detectors

Contribution ID: **66** Type: **not specified**

Detection of Cherenkov light in liquid scintillators

Liquid organic scintillators are widely used in experimental nuclear and particle physics thanks to their relatively high light yield and good timing properties. Along with scintillation light, a charged particle moving in the scintillator can produce a certain amount of Cherenkov light, if its speed is sufficiently high. Since Cherenkov light is emitted instantaneously as the charged particle moves in the medium and has a spectrum that extends well above fluorescence light, it can be distinguished from this latter thanks to its timing and spectral properties.
SHELDON is a small-scale setup with high time-resolution aimed to study the separation of Cherenkov light in liquid scintillators. It will improve the reconstruction of the direction of incoming particles based on the detection of Cherenkov light in JUNO. The same setup can also help to optimize the performances of novel water-based liquid scintillators that could be used in future experiments and new detection technologies.

Primary author: Dr FERRARO, Federico (Istituto Nazionale di Fisica Nucleare)

Presenter: Dr FERRARO, Federico (Istituto Nazionale di Fisica Nucleare)

Contribution ID: **67** Type: **not specified**

Gd-loaded water Cherenkov detector as neutron veto for rare event searches.

One of the most dangerous background for Dark Matter and other rare event searches comes from neutrons generated by the radioactivity of the detector materials.
We recently designed, constructed and operated a neutron veto for the XENONnT experiment at LNGS, with the novel technique of a Gd-loaded water Cherenkov detector.
In this talk we will present the performances of the detector, operated so far with demineralised water only, and its prospects with the addition of Gd, to increase the neutron capture cross-section.
We will also describe the main characteristics of the new plant dedicated to purify the Gd-loaded water to keep a high transparency of the medium, while keeping the proper Gd concentration in solution.

Primary authors: Mr MANCUSO, Andrea (Istituto Nazionale di Fisica Nucleare); SARTORELLI, Gabriella (Istituto Nazionale di Fisica Nucleare); SELVI, Marco (Istituto Nazionale di Fisica Nucleare)

Presenter: Mr MANCUSO, Andrea (Istituto Nazionale di Fisica Nucleare)

Session Classification: Liquid Detectors

Contribution ID: **68** Type: **not specified**

ALICE ITS3: the first truly cylindrical inner tracker

The ALICE ITS3 project is planning to build a new vertex tracker based on truly cylindrical wafer-scale MAPS sensors, with <0.05% X0 per layer and as close as 18 mm to the interaction point. This will be possible exploiting the stitching technique and the natural property of 50 um thick silicon chips to be flexible. Furthermore, implementation of 65 nm CMOS technology will allow to reduce powering consumption and improve radiation hardness. This contribution will summarise the main technological innovations of this project and the corresponding advantages.

Primary author: COLELLA, Domenico (Istituto Nazionale di Fisica Nucleare)

Presenter: COLELLA, Domenico (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **69** Type: **not specified**

Dark matter search with liquid argon

A great number of astrophysical observations point to the existence of an abundant form of matter interacting almost exclusively through gravity. A potential candidate is a weakly interacting massive particle (WIMP) produced in the early Universe. Thanks to its excellent ionization response and unique scintillation light characteristics, Liquid Argon (LAr) detectors can provide great sensitivity for WIMP nuclear collisions and strong background suppression. DEAP-3600 single phase LAr detector has demonstrated, thanks to pulse shape discrimination, to reject the dominant beta/gamma background at the 10-7 level. DarkSide-50 has demonstrated a two-phase detection measuring direct light output together with electroluminescence from acceleration of electrons into a gaseous region above the liquid, providing excellent position resolution for fiducialization. By using low-radioactivity argon from underground wells, in 532 days run, a zero background has been obtained. The two-phase method also enables sensitivity for lower WIMP masses using the electroluminescence signal alone: a leading sensitivity below 10 GeV/c2 has been obtained by DarkSide-50. The next step forward is represented by the Darkside-20k experiment that, featuring 50 tonnes LAr, pursues a series of enabling technologies: target obtained with underground argon depleted in 39Ar; light detection via large-area cryogenic custom-designed silicon photomultipliers; active veto with atmospheric LAr.

Primary author: DI CAPUA, Francesco (Università Federico II di Napoli)

Presenter: DI CAPUA, Francesco (Università Federico II di Napoli)

Session Classification: Liquid Detectors

Contribution ID: **70** Type: **not specified**

Status and perspectives

Tuesday, 18 October 2022 11:30 (30 minutes)

Presenters: CESTELLI GUIDI, Mariangela (Istituto Nazionale di Fisica Nucleare); IOVENE, Alessandro (CAEN)

Session Classification: Training & TT

Contribution ID: **71** Type: **not specified**

Discussione

Tuesday, 18 October 2022 12:00 (30 minutes)

Session Classification: Training & TT

Contribution ID: **72** Type: **not specified**

New ideas on Photosensors & Electrodes for DARWIN, the Next-Gen LXe TPC

Xenon double-phase TPCs have proven so far to be one of the best techniques for direct dark matter and other rare event search. The success of this technology has been demonstrated by many experiments in the last two decades, the most recent example being the results of XENONnT and LZ presented in July 2022.
INFN groups, while fully committed to the successful operation of the XENONnT experiment at LNGS, are also looking towards the next generation xenon-based dark matter experiment, DARWIN, with an O(50 t) in the Xe active target.
There are in particular two main experimental challenges: electrode and photosensor technology. Electrodes must be designed by optimizing their performance when high voltage values are applied while maintaining high transparency, qualities that together guarantee excellent resolution and low threshold on the detected light signals.
Photosensors must be sensitive to the Xenon scintillation light, and have low radioactivity and low occurrence of spurious events, such as after-pulses and dark current, to allow reaching low thresholds.
In this talk, we will briefly present the R&D activities that we plan to carry out on photosensors and electrodes.

Primary authors: RAZETO, Alessandro (LNGS); FERELLA, Alfredo Davide (Istituto Nazionale di Fisica Nucleare); SELVI, Marco (Istituto Nazionale di Fisica Nucleare); MACOLINO, Carla (Istituto Nazionale di Fisica Nucleare)

Presenter: FERELLA, Alfredo Davide (Istituto Nazionale di Fisica Nucleare)

Session Classification: Liquid Detectors

Contribution ID: **73** Type: **not specified**

Introduzione

Monday, 17 October 2022 14:15 (15 minutes)

Presenter: RADICIONI, Emilio (INFN)

Session Classification: Session 1

Contribution ID: **74** Type: **not specified**

SiPM development for the TOP detector upgrade of the Belle II experiment

Tuesday, 18 October 2022 14:45 (5 minutes)

The Time-Of-Propagation (TOP) is the particle identification detector in the barrel region of the Belle II experiment. The detector uses quartz bars acting as Cherenkov radiators and Micro-Channel-Plate PMTs as photodetectos. Three generations of MCP-PMT are currently installed in the TOP detector. The SuperKEKB accelerator shutdowns of 2023 and 2027 will be used to upgrade the detector with the last generation of MCP-PMT. Many improvements in SiPM production technology have been achieved in the last years. Using SiPM as a photodetector is the backup plan for the 2027 upgrade and the primary option for following upgrades with higher luminosity and higher background. The characterization of SiPMs from several producers is ongoing at the INFN/Univ. Padova laboratory at different temperatures down to -50 degrees. The selected SiPMs are the last available generation with 1x1 mm2 and 3x3 mm2 dimensions and different cell sizes. Characterized SiPMs will be irradiated in 2022 and in 2023 at INFN-LNL and tested again to measure the degradation of their characteristics. Plans of SiPM development in collaboration with FBK have been included in the AIDAinnova project, task 8.4.1 and inside a PRIN 2022 proposal recently submitted by Univ. of Ferrara, Univ. of Padova and INFN.

Primary authors: TORASSA, Ezio (Istituto Nazionale di Fisica Nucleare); DAL CORSO, Flavio (Istituto Nazionale di Fisica Nucleare); STROILI, Roberto (Istituto Nazionale di Fisica Nucleare)

Presenter: TORASSA, Ezio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **75** Type: **not specified**

Combining Dual-Readout Crystals and Fibers in a Hybrid Calorimeter for the IDEA Experiment

Crystal calorimetry has a long history of pushing the frontier of high energy resolution measurements for EM particles. Recent technological developments in the fields of crystal manufacturing and photodetector developments (SiPMs) have opened new perspectives on how a segmented crystal calorimeter with dual-readout capabilities could be exploited for particle detectors at future collider experiments. In this contribution, we will discuss how a EM crystal calorimeter can be cost-effectively integrated with the fiber-based calorimeter of the IDEA detector to achieve an energy resolution of 3%/√⊠ for EM particles and about 27%/√⊠ for neutral hadrons. Simulation studies have also shown that dedicated particle flow algorithms exploiting the dual-readout method in such a longitudinally segmented hybrid calorimeter can achieve an energy resolution close to 5\% for 50 GeV jets. Such a detector has the potential to expand the landscape of precision physics studies at future e+e- colliders exploiting its state-of-the-art resolution for low energy photons.

Primary authors: LUCCHINI, Marco (CERN); LUCCHINI, Marco Toliman (INFN & University of Milano-Bicocca)

Presenter: LUCCHINI, Marco Toliman (INFN & University of Milano-Bicocca)

Session Classification: Calorimetri

Contribution ID: **76** Type: **not specified**

LHCb RICH Upgrade

Tuesday, 18 October 2022 14:30 (5 minutes)

Hadron particle identification (PID) in LHCb is performed by two Ring Imaging Cherenkov (RICH) detectors. The system consists of an upstream detector, the RICH1, and a downstream detector, the RICH2, which use different radiators to provide PID to particles with momentum in the range 2-100GeV. In Run3 the photon detectors are composed by Multi-Anode Photo-Multipliers planes, which have good single photon response and very high active area. For Long Shutdown 3 an upgrade of the current electronics is planned in order to achieve a time resolution of approximately 200 ps to better reject the background. For High Luminosity LHC the RICH detectors will have a very high occupancy and improvements will be needed for the Cherenkov resolution (chromatic dispersion, optical aberrations, pixel size). Having a time-resolute RICH will play a fundamental role and studies are ongoing to improve all these aspects. A good option to replace the MaPMTs are the Silicon Photo-Multipliers: an R&D program is in progress to improve their intrinsic radiation hardness, operating them at a temperature less than -50℃. Another possibility is to develop an hybrid MCP, which would allow a really high time resolution.

Primary author: BORGATO, Federica (Istituto Nazionale di Fisica Nucleare)

Presenter: BORGATO, Federica (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **77** Type: **not specified**

Picosec Micromegas: a fast-timing gaseous detector for MIPs

Picosec is a novel micropattern gaseous detector (MPGD) proposed by the RD51 collaboration to overcome the limitations of classical MPGDs in terms of timing performance. The concept is based on detecting Cherenkov light emitted by an impinging particle in a proper radiator. A photocathode converts such light into electrons, and a double amplification stage MicroMegas detector detects them. The Picosec RD51 collaboration has already demonstrated the standalone functionality of this technology, reaching an excellent time resolution of 24 ps.
This technology opens the timing sector on tens of picoseconds to gaseous detectors, making them competitive with other fast-timing technologies but with the traits of MPGD. We aim to build and develop a robust and reliable standard for this detector technology capable of operating in next-generation facilities. This goal can be reached by searching for radiation-hard photocathodes, new eco-friendly gas mixtures and robust Cherenkov radiators.
In particular, the Picosec technology is currently proposed for the Muon Collider detector as a muon timing station where it can contribute to the enhancement of the quality of the muon tracks.

Primary author: FIORINA, Davide (Istituto Nazionale di Fisica Nucleare)

Presenter: FIORINA, Davide (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **78** Type: **not specified**

R&D for innovative calorimeters with optical readout

We report on two R&D projects being carried out in AIDAinnova to develop innovative calorimeters with optical readout.

CRILIN is an extremely fast, highly granular calorimeter made of dense, inorganic crystals with both longitudinal and transverse segmentation, proposed as a candidate for the electromagnetic calorimeter for the Muon Collider experiment; a similar design was independently proposed for the HIKE/KLEVER small-angle calorimeter. The main features of CRILIN are extremely fast response (well under 100 ps time resolution) and excellent mip/em/hadron separation. CRILIN will use small crystals (4x1x1 cm3) of PbF2 (a Cerenkov radiator) or an ultra-fast scintillator such as third-generation PWO.

Nanocomposite scintillators, obtained by dispersing semiconducting nanocrystals (quantum dots) in a polymer matrix, are an alternative to conventional plastic scintillators offering potentially better time resolution and increased radiation resistance, as well as a high degree of optimization for particular uses (tunable emissions spectra, loading fraction, etc.). The NanoCal project will construct a prototype shashlyk calorimeter with nanocomposite scintillator as one of the first attempts to use these innovative materials in practical detectors for high-energy physics.

Primary authors: SARRA, Ivano (Istituto Nazionale di Fisica Nucleare); MOULSON, Matthew David (Istituto Nazionale di Fisica Nucleare)

Presenter: SARRA, Ivano (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **79** Type: **not specified**

The Mu2e and MEG electromagnetic calorimeters

The Mu2e and MEG/MEG-II projects stand in the landscape of Intensity Frontier experiments searching for Charged Lepton Flavour Violation in the muon sector.

The Mu2e experiment will search for the conversion of a negative muon into a mono-energetic electron with a 104.97 MeV energy, and aims to improve the current experimental limit by a factor 10^4.
The calorimeter will provide particle identification, a standalone trigger, and track-seeding, while granting $\sigma_E < 10\%$ and $\sigma_T < 500$ ps for 100 MeV electrons. It consists of two annular disks, each one containing 674 un-doped CsI crystals, readout by two large-area custom UV-extended SiPMs. The apparatus will have to sustain high particle rates (50 kHz/cm^2) in a 10^{-4} Torr vacuum, a 1T magnetic field, 100 Gy/y ionizing doses and 2×10^{11} $\mathrm{n}_{1_{MeV}}$
/cm^2 y.

On the other hand, the MEG-II experiment, designed to search for the $\mu+ \rightarrow e\gamma$ decay, will improve by 1 order of magnitude the MEG sensitivity.
The MEG-II experiment features the same MEG liquid xenon calorimeter, improved with a highly granular readout realized with 4092 custom VUV-extended SiPMs. The calorimeter is expected to have a $\sigma_E \sim 1\%$ and a $\sigma_T \sim 50$ps for the 52.8 MeV γ-rays emitted in the decay.

Primary author: GARGIULO, Ruben (Istituto Nazionale di Fisica Nucleare)

Presenter: GARGIULO, Ruben (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **80** Type: **not specified**

Highly sensitive, low-temperature sensors

Low-temperature detectors rely on phonon counting, which is made possible thanks to the conversion, performed by highly sensitive temperature sensors, of temperature variations into electrical signals. In this contribution I'll give a brief overview of the most commonly used sensors along with their main present limitations and the foreseeable prospects for the future.

Primary author: FAVERZANI, Marco (Università & INFN Milano - Bicocca)

Presenter: FAVERZANI, Marco (Università & INFN Milano - Bicocca)

Session Classification: Calorimetri

Contribution ID: **81** Type: **not specified**

Absorber crystals for cryogenic detectors: status and challenges

Several compounds can be utilised as cryogenic detectors; the main requirement is a small thermal capacitance, which allows an high sensitivity and a fast thermalisation time. Depending on the physics applications, several challenges have to be faced. The pileup between events depositing energy in a time interval faster than the thermalisation time can be non negligible when the source is implanted inside the crystal. For rare events physics, the radiopurity of the crystal is also crucial; scintillating compounds can offer the possibility to distinguish alpha from beta/gamma and nuclei/neutron events, thus allowing the identification and rejection of bulk and external contaminants. In this contribution, I will give a brief report on the mentioned topics, their current status and future perspectives.

Primary author: NUTINI, Irene (Istituto Nazionale di Fisica Nucleare)

Presenter: NUTINI, Irene (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calorimetri

Contribution ID: **82** Type: **not specified**

Single photon detection with MPGDs

Tuesday, 18 October 2022 14:20 (5 minutes)

After the realization of the MWPCs with CsI PC for the RICH detector of the COMPASS experiment at CERN SPS, the COMPASS RICH was upgraded with four novel gaseous Photon Detectors (PD) based on MPGD technology, never used before in RIChes, for a total active area of 1.5 m2. The new PDs consist of two layers of THGEMs, the first also acting as a reflective PC thanks to CsI coating, and a bulk Micromegas on a pad-segmented anode; the signals are read-out by analog APV-25-based F-E. The status of the technology is summarized, the possible developments and improvements are described.

Primary authors: D'AGO, Daniele (Istituto Nazionale di Fisica Nucleare); TESSAROTTO, Fulvio (Istituto Nazionale di Fisica Nucleare); LEVORATO, Stefano (Istituto Nazionale di Fisica Nucleare); DALLA TORRE, Silvia (Istituto Nazionale di Fisica Nucleare)

Presenter: D'AGO, Daniele (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **83** Type: **not specified**

PARTICLE IDENTIFICATION IN SPACE EXPERIMENTS WITH SCINTILLATORS DETECTORS

Tuesday, 18 October 2022 14:55 (5 minutes)

Particle identification is a crucial aspect of most particle physics experiments.
In particular for space experiments, due to the limited downlink bandwidth and to the necessity to stimulate multimessenger observations, it is of paramount importance to design an experiment which is able to apply online triggers to identify the impinging particles.
Currently, we are living in extraordinary times in space science with plenty of novel and ambitious missions, anticipating a scientific knowledge revolution. Most of them exploit ambitious designs, which are possible thanks to the use of SiPMs as readout of organic and inorganic scintillators.
In this talk some basic strategies for particle identification in space experiments will be presented and the influence they have in the design of new space missions.

Primary author: BARBATO, Felicia (Gran Sasso Science Institute)

Presenter: BARBATO, Felicia (Gran Sasso Science Institute)

Session Classification: Photon Detectors

Contribution ID: **84** Type: **not specified**

Gamma-ray identification with Imaging Atmospheric Cherenkov Telescopes

Tuesday, 18 October 2022 15:00 (5 minutes)

The Imaging Atmospheric Cherenkov Telescopes (IACTs) represent one of the most successful detection techniques to observe gamma rays of astrophysical origin with energy above few tens of GeV. This technique is based on the detection of Cherenkov light emitted in atmosphere by particle showers which allows the reconstruction of energy and direction of the incoming particles. Fast and high resolution cameras consisting of arrays of thousands of photosensors, are ideal to capture particle shower images. Silicon Photomultipliers (SiPMs) are at the core of novel designs, especially for future IACT experiments, such as the Cherenkov Telescope Array (CTA), allowing improved performance with respect to standard Photomultiplier Tubes (PMTs). An overview of the photon detection technologies implemented in current and future experiments will be presented.

Primary author: DI VENERE, Leonardo (INFN Bari)

Presenter: DI VENERE, Leonardo (INFN Bari)

Session Classification: Photon Detectors

Contribution ID: **85** Type: **not specified**

Timespot results on CMOS 28nm electronics

Ovevrview of Timespot results on CMOS 28nm electronics and outlook for future developments.

Primary author: PICCOLO, Lorenzo (Istituto Nazionale di Fisica Nucleare)

Presenter: PICCOLO, Lorenzo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **86** Type: **not specified**

Timespot timing performance from 3D trenches sensors

Overview of Timespot 3D trenches sensors timing performance and outlook for future developments

Primary author: LOI, Angelo (Istituto Nazionale di Fisica Nucleare)

Presenter: LOI, Angelo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Solid State Detectors

Contribution ID: **87** Type: **not specified**

The micro-RWELL: from the R&D to the technology transfer towards Industry

The use of resistive layers, primarily introduced in MPGD to improve spatial resolution via charge dispersion, has been one of the major trends in the recent years thanks to their spark amplitude quenching feature.
Among resistive-MPGDs the micro-RWELL, exhibiting excellent tracking performance (<100 μm) and good time resolution (5 ns) at very high particle rate (up to 20 MHz/cm2), is a reliable, easy to build and cost effective technology. The detector, proposed for the upgrade of the muon system of the LHCb experiment and the muon tracker at future high luminosity large leptonic colliders, can be exploited for applications beyond HEP.
The challenge for the next decade is the transfer of the technology to PCB industry: a big effort in this direction is performed in the framework of AIDAinnova. Key-point of the industrialization of the technology is the acquisition of a DLC magnetron sputtering machine co-funded by CERN and INFN that will start the operation in the 2023.
Taking into account the involvement of private industries, the technology can positively affect all those fields of applications (from HEP to industrial, medical and homeland security applications) where large area tracking systems with excellent space resolution, together with rad-hard characteristics are required.

Primary authors: MORELLO, Gianfranco (Istituto Nazionale di Fisica Nucleare); Dr BENCIVENNI, Giovanni (LNF); FELICI, Giulietto (Istituto Nazionale di Fisica Nucleare); POLI LENER, Marco (Istituto Nazionale di Fisica Nucleare); GIOVANNETTI, Matteo (Istituto Nazionale di Fisica Nucleare); GATTA, Maurizio (Istituto Nazionale di Fisica Nucleare); DE OLIVEIRA, Rui (CERN)

Presenters: Dr BENCIVENNI, Giovanni (LNF); POLI LENER, Marco (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **88** Type: **not specified**

A SiPM-based optical readout system for the EIC dual-radiator RICH

Tuesday, 18 October 2022 14:40 (5 minutes)

Silicon photomultipliers (SiPM) are candidates selected as the potential photodetector technology for the dual-radiator Ring-Imaging Cherenkov (dRICH) detector at the future Electron-Ion Collider (EIC). SiPM optical readout offers several advantages being cheap, highly efficient and insensitive to the high magnetic field (~ 1.5 T) expected at the sensor plane in the experiment. On the other hand, SiPM are not radiation tolerant and despite the moderate integrated radiation level (< 10^{11} 1-MeV neq/cm2), single photon-counting capabilities and the Dark Count Rate (DCR) must be kept under control to maintain the optimal dRICH detector performance across the years. Several options are available to maintain the DCR to an acceptable rate (below ~100 kHz/mm2), namely by reducing the SiPM operating temperature and by recovering the radiation damage with high-temperature annealing cycles.

Presenter: RIGNANESE, Luigi Pio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **89** Type: **not specified**

SiPM studies for the ALICE 3 RICH detector

Tuesday, 18 October 2022 14:35 (5 minutes)

The ALICE collaboration is proposing a new apparatus, ALICE 3, to investigate the Quark Gluon Plasma
(QGP) properties, exploiting precise measurements of heavy-flavour probes as well as electromagnet-

ic radiation. In this context, conceptual studies for the development of a RICH detector for ALICE 3 are ongoing. The proposed baseline layout is a proximity-focusing RICH, using aerogel (n = 1.03 at lph = 400 nm) as Cherenkov radiator and a layer of Silicon Photomultipliers (SiPM) for the photon detection, with an area of about 40 m^2. The proposed detector represents the largest one using this technology. If sufficient time resolution can be achieved in the SiPM photons detectors, they can be able to identify charged hadrons via TOF measurements. The ongoing R&D studies on the SiPM sensors will be presented.

Primary author: VOLPE, Giacomo (Istituto Nazionale di Fisica Nucleare)

Presenter: VOLPE, Giacomo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **90** Type: **not specified**

Single photon detection with MPGDs

Presenter: D'AGO, Daniele (Istituto Nazionale di Fisica Nucleare)

Session Classification: Photon Detectors

Contribution ID: **91** Type: **not specified**

RPC with Gallium Arsenide electrodes, a solution for medium sized high-rate detectors

Tuesday, 18 October 2022 17:00 (5 minutes)

Presenter: ROCCHI, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **92** Type: **not specified**

TPC gassose a lettura ottica per eventi di bassa energia

Tuesday, 18 October 2022 18:10 (5 minutes)

Presenter: DI GIAMBATTISTA, Flaminia (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **93** Type: **not specified**

The Resistive Cylindrical Chamber, a new detector based on the generalization of the RPC detectors to the quasi-planar field

Tuesday, 18 October 2022 17:10 (5 minutes)

Presenter: ROCCHI, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **94** Type: **not specified**

Greening Resistive Plate Chamber detectors for HEP applications.

Tuesday, 18 October 2022 17:20 (5 minutes)

Presenter: PASTORE, Alessandra (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **95** Type: **not specified**

Fast Timing MPGD

Tuesday, 18 October 2022 17:30 (5 minutes)

Presenter: VERWILLIGEN, Piet Omer J (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **96** Type: **not specified**

Picosec Micromegas: a fast-timing gaseous detector for MIPs

Tuesday, 18 October 2022 17:40 (5 minutes)

Presenters: FIORINA, Davide (INFN & UNiversità Pavia); FIORINA, Davide (Istituto Nazionale di Fisica Nucleare); FIORINA, Davide (Università & INFN Pavia)

Session Classification: Gas Detectors

Contribution ID: **97** Type: **not specified**

The micro-RWELL: from the R&D to the technology transfer towards Industry

Tuesday, 18 October 2022 17:50 (5 minutes)

Presenter: BENCIVENNI, Giovanni (LNF)

Session Classification: Gas Detectors

Contribution ID: **98** Type: **not specified**

New Resistive Micromegas structures for future detectors

Tuesday, 18 October 2022 18:00 (5 minutes)

Presenters: CAMERLINGO, M Teresa; CAMERLINGO, Maria Teresa (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gas Detectors

Contribution ID: **99** Type: **not specified**

Quantum primer

Monday, 17 October 2022 15:45 (40 minutes)

Presenters: BRAGGIO, Caterina (Istituto Nazionale di Fisica Nucleare); LOBINO, Mirko (UniTn)

Session Classification: Quantum primer

Contribution ID: **100** Type: **not specified**

Rapidfire talks

Monday, 17 October 2022 16:25 (10 minutes)

Session Classification: Quantum primer

Contribution ID: **101** Type: **not specified**

Discussione

Monday, 17 October 2022 16:35 (10 minutes)

Session Classification: Quantum primer