CYGNO Collaboration Meeting 2021

Monday, 20 December 2021 - Tuesday, 21 December 2021

GSSI

Book of Abstracts

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Direct detection for CYGNO

Author: Giovanni Grilli di Cortona[1]

[1] *INFN - LNF*

I will review the concepts of direct detection of dark matter, for both spin independent and spin dependent interactions, relevant for the CYGNO experiment. In particular, I will discuss the possibility to improve the sensitivity exploiting the Migdal effect.

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Sensor Dark Noise Studies

Authors: Rafael Nóbrega[1]; Herman Lima Jr.[2]

[1] *UFJF*

[2] *CBPF*

Corresponding Authors: hlima@cbpf.br, rafael.nobrega@ufjf.edu.br

A summary of the activities carried out by the UFJF (Universidade Federal de Juiz de Fora) and CBPF (Centro Brasileiro de Pesquisas Físicas) institutions within the CYGNO Collaboration will be presented and future plans will be discussed.

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Background simulations for CYGNO detector

Author: Giulia D'Imperio[1]

[1] *INFN Roma*

Corresponding Author: giulia.dimperio@roma1.infn.it

A review of the simulations for the background estimation of CYGNO experiment is presented. External background from environmental gamma and neutrons at LNGS is simulated for different shielding options. Internal background from the various parts of the setup is calculated assuming the radioactivity measurements made by the collaboration (if available), or from literature and public databases.

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Electroluminescence and gas studies with MANGO

Author: Giorgio Dho[1]

[1] *GSSI*

I will talk about general status of electroluminescence and gas studies focusing on MANGO

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LIME clustering and energy response

Author: Emanuele Di Marco[1]

[1] *INFN Roma1*

Corresponding Author: emanuele.dimarco@roma1.infn.it

The current cluster reconstruction algorithm, event selection, energy reconstruction and corrections, together with results on data with X-rays calibration sources at different energies will be presented and discussed.

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LIME: calibration with 55Fe source

Authors: Davide Pinci[1]; Donatella Tozzi[2]

[1] *INFN - Sezione di Roma*

[2] *Sapienza University*

Corresponding Author: davide.pinci@roma1.infn.it

The study of the response of LIME prototype to 5.9 keV photons produced by a ⁵⁵Fe source as a function of the interaction position and the operating condition of the detector will be presented and discussed.

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Detector simulation and saturation

Author: Fabrizio Petrucci[1]

[1] *University Roma Tre & INFN*

Corresponding Author: fabrizio.petrucci@uniroma3.it

The status of the simulation of the detector response (digitisation), including the saturation effect, will be presented together with preliminary comparisons between simulation and real data.

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Background simulation in LIME

Author: Flaminia Di Giambattista[1]

[1] *GSSI, INFN*

Corresponding Author: digiambattista.flaminia@gmail.com

I will present a summary of the results of the Monte Carlo simulation of the expected background in LIME for underground operation.

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Directionality of low energy electron recoil

Author: Samuele Torelli[1]

[1] *GSSI*

Corresponding Author: samuele.torelli@gssi.it

In this talk, I will expose the latest results in directionality reconstruction of low energy electron recoil with LIME detector

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Molecular sieve-based gas recycling system with radon reduction for rare-event gaseous detectors

Authors: Robert Renz Marcelo Gregorio[1]; Neil Spooner[None]; Kentaro Miuchi[2]; Hiroshi Ogawa[None]

[1] *University of Sheffield*

[2] *Kobe University*

Corresponding Authors: miuchi@phys.sci.kobe-u.ac.jp, ogawa.hiroshi@phys.cst.nihon-u.ac.jp, n.spooner@sheffield.ac.uk, robert.gregorio@sheffield.ac.uk

A new molecular sieve-based gas recycling system is presented that provides for simultaneous removal of both radon and common impurities from SF_6:CF_4:He gases in TPCs, hence minimising the total amount of gas required. Removal of internally-produced radon and associated progeny is important for background suppression whilst removal of outgassing and leaked-in contaminants such as water, oxygen and nitrogen is required to suppress capture of interaction-produced electrons which causes gain suppression. The system utilises a Vacuum Swing Adsorption (VSA) technique, allowing continuous long-term operation. Studies are presented of a new low radioactive molecular sieve, developed for this work and found to emanate radon up to 98% less per radon captured than commercial material.

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Status of the data acquisition and trigger system

Author: andrea messina[None]

Corresponding Author: andrea.messina@uniroma1.it

We report on the current status and future upgrades of the data acquisition and trigger system.

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Gas system status

Author: Francesco Renga[1]

[1] *INFN Roma*

Corresponding Author: francesco.renga@roma1.infn.it

I will review the status of the gas system for the underground operations

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Electron and Nuclear Recoil Discrimination Studies

Author: Atul Prajapati[1]

[1] *GSSI*

Corresponding Author: atul.prajapati@gssi.it

I'll talk about track reconstruction and particle identification studies using multivariate analysis in the CYGNO experiment.

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it could work! (cit.)

Author: Giovanni Mazzitelli[1]

[1] *LNF-INFN*

Corresponding Author: giovanni.mazzitelli@lnf.infn.it

Status of LIME installation at LNGS, present and future plans for LIME and CYGNO setup.

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Further studies on He-CF4-isobutane mixtures for the CYGNO TPC and studies of the P/T detector response

Authors: Rita J C Roque[1]; R Daniel P Mano[2]; Joaquim M. F. dos Santos[2]; Fernando D. Amaro[2]; Cristina M B Monteiro[2]

[1] *LIBPhys, Deparment of Physics, University of Coimbra, 3004-516 Coimbra, Portugal*

[2] *LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal*

Corresponding Author: cristinam@uc.pt

Following the former studies on He-CF4 (60/40) mixtures with the addition of isobutane percentages from 1- 5%, on the search for the gas mixture that at best enhances the electroluminescence (EL) gain while minimizing the detector operation instabilities owing to the addition of isobutane, we varied

the ratio of CF4-to-He for two different isobutane contents, namely 2% and 5% and studied the EL yield, charge gain and energy resolution while monitoring the detector instabilities as we were increasing the electric field.
These studies were motivated by the knowledge that CF4 favors scintillation production while isobutane increases detector operation instability, limiting this way the ultimate voltage applied and, thus, limiting the maximum achievable EL gain. Our goal is to compensate for this EL limitation due to isobutane with the increase of the added amount of CF4.
For this part of the work we have placed a borosilicate filter upon the photosensor window to cut off the VUV and UV part of the scintillation emission, to match closely the response of the ORCA camera used in CYGNO; this procedure enables a closer comparison of our results and the results obtained with LEMON and LIME.
Furthermore, we report on PTN studies that we had done to study the detector stability as a response to P and T variations in the environment and if those variations influence the detector response and how.

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Studies on LIME performance stabilities

Author: Rita Antonietti[None]

Corresponding Author: rita.antonietti@roma3.infn.it

In this talk I'll present the studies on LIME performance stability

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Welcome & Introduction

Corresponding Author: elisabetta.baracchini@gssi.it

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Discussion

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Status and Plans of the CYGNO

Author: Davide Pinci[1]

[1] *INFN - Sezione di Roma*

Corresponding Author: davide.pinci@roma1.infn.it

The status and plans of the CYGNO project will be presented

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Discussion and Goodbyes

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INITIUM: an Innovative Negative Ion Time projection chamber for Underground Dark Matter searches…..it could really work?????

Corresponding Author: elisabetta.baracchini@gssi.it

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Cygno PubComm Activity

Author: Giovanni Maccarrone[1]

[1] *INFN - LNF*

Corresponding Author: giovanni.maccarrone@lnf.infn.it

The PubComm take care of the Paper writing/review and the Conference participation.
A summary of the 2021 activity is presented; a remind of the general guidelines; the wiki repository and the paper Author list.