

# CYGNO Collaboration Meeting 2021



## Report of Contributions

Contribution ID: 1

Type: **not specified**

## Direct detection for CYGNO

*Tuesday, 21 December 2021 14:40 (20 minutes)*

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.

**Primary author:** GRILLI DI CORTONA, Giovanni (INFN - LNF)

**Presenter:** GRILLI DI CORTONA, Giovanni (INFN - LNF)

Contribution ID: 2

Type: **not specified**

## Sensor Dark Noise Studies

*Monday, 20 December 2021 17:00 (20 minutes)*

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.

**Primary authors:** Prof. NÓBREGA, Rafael (UFJF); Dr LIMA JR., Herman (CBPF)

Contribution ID: 3

Type: **not specified**

## Background simulations for CYGNO detector

*Tuesday, 21 December 2021 16:20 (20 minutes)*

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.

**Primary author:** D'IMPERIO, Giulia (INFN Roma)

Contribution ID: 4

Type: **not specified**

## Electroluminescence and gas studies with MANGO

*Monday, 20 December 2021 16:00 (20 minutes)*

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

**Primary author:** DHO, Giorgio (GSSI)

Contribution ID: 5

Type: **not specified**

## LIME clustering and energy response

*Monday, 20 December 2021 15:40 (20 minutes)*

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.

**Primary author:** DI MARCO, Emanuele (INFN Roma1)

Contribution ID: 6

Type: **not specified**

## LIME: calibration with $^{55}\text{Fe}$ source

*Monday, 20 December 2021 15:00 (20 minutes)*

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

**Primary authors:** PINCI, Davide (INFN - Sezione di Roma); TOZZI, Donatella (Sapienza University)

**Presenter:** PINCI, Davide (INFN - Sezione di Roma)

Contribution ID: 7

Type: **not specified**

## Detector simulation and saturation

*Tuesday, 21 December 2021 15:00 (20 minutes)*

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.

**Primary author:** PETRUCCI, Fabrizio (University Roma Tre & INFN)

Contribution ID: 8

Type: **not specified**

## Background simulation in LIME

*Tuesday, 21 December 2021 16:00 (20 minutes)*

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

**Primary author:** DI GIAMBATTISTA, Flaminia (GSSI, INFN)

Contribution ID: 9

Type: **not specified**

## Directionality of low energy electron recoil

*Tuesday, 21 December 2021 15:20 (20 minutes)*

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

**Primary author:** Mr TORELLI, Samuele (GSSI)

Contribution ID: 10

Type: **not specified**

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

*Tuesday, 21 December 2021 14:20 (20 minutes)*

A new molecular sieve-based gas recycling system is presented that provides for simultaneous removal of both radon and common impurities from  $\text{SF}_6:\text{CF}_4:\text{He}$  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.

**Primary authors:** MARCELO GREGORIO, Robert Renz (University of Sheffield); SPOONER, Neil; MIUCHI, Kentaro (Kobe University); OGAWA, Hiroshi

Contribution ID: **11**

Type: **not specified**

## **Status of the data acquisition and trigger system**

*Monday, 20 December 2021 17:40 (20 minutes)*

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

**Primary author:** MESSINA, andrea

Contribution ID: **12**

Type: **not specified**

## Gas system status

*Tuesday, 21 December 2021 14:00 (20 minutes)*

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

**Primary author:** Dr RENGA, Francesco (INFN Roma)

Contribution ID: **13**

Type: **not specified**

## Electron and Nuclear Recoil Discrimination Studies

*Tuesday, 21 December 2021 15:40 (20 minutes)*

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

**Primary author:** Mr PRAJAPATI, Atul (GSSI)

Contribution ID: **14**

Type: **not specified**

## **it could work! (cit.)**

*Monday, 20 December 2021 14:30 (20 minutes)*

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

**Primary author:** MAZZITELLI, Giovanni (LNF-INFN)

Contribution ID: 15

Type: **not specified**

## Further studies on He-CF<sub>4</sub>-isobutane mixtures for the CYGNO TPC and studies of the P/T detector response

*Monday, 20 December 2021 16:20 (20 minutes)*

Following the former studies on He-CF<sub>4</sub> (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 CF<sub>4</sub>-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 CF<sub>4</sub> 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 CF<sub>4</sub>.

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.

**Primary authors:** Mrs ROQUE, Rita J C (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal); Mr MANO, R Daniel P (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal); Prof. DOS SANTOS, Joaquim M. F. (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal); Dr AMARO, Fernando D. (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal); Dr MONTEIRO, Cristina M B (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal)

**Presenters:** Mrs ROQUE, Rita J C (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal); Mr MANO, R Daniel P (LIBPhys, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal)

Contribution ID: **16**

Type: **not specified**

## **Studies on LIME performance stabilities**

*Monday, 20 December 2021 15:20 (20 minutes)*

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

**Primary author:** ANTONIETTI, Rita

Contribution ID: 17

Type: **not specified**

## Welcome & Introduction

*Monday, 20 December 2021 14:00 (10 minutes)*

**Presenter:** Prof. BARACCHINI, Elisabetta

Contribution ID: **18**

Type: **not specified**

## Discussion

*Monday, 20 December 2021 14:50 (10 minutes)*

Contribution ID: **19**

Type: **not specified**

## Status and Plans of the CYGNO

*Monday, 20 December 2021 14:10 (20 minutes)*

The status and plans of the CYGNO project will be presented

**Primary author:** PINCI, Davide (INFN - Sezione di Roma)

Contribution ID: **20**

Type: **not specified**

## Discussion

*Monday, 20 December 2021 18:00 (20 minutes)*

Contribution ID: **21**

Type: **not specified**

## Discussion and Goodbyes

*Tuesday, 21 December 2021 17:00 (15 minutes)*

Contribution ID: 22

Type: **not specified**

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

*Monday, 20 December 2021 16:40 (20 minutes)*

**Presenter:** Prof. BARACCHINI, Elisabetta

Contribution ID: 23

Type: **not specified**

## Cygn0 PubComm Activity

*Tuesday, 21 December 2021 16:40 (20 minutes)*

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.

**Primary author:** Dr MACCARRONE, Giovanni (INFN - LNF)

**Presenter:** Dr MACCARRONE, Giovanni (INFN - LNF)