



KM3NeT INFRADEV – H2020 – 739560

KM3NeT report on working group meetings

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Abstract

The KM3NeT neutrino telescope is currently under construction in the Mediterranean Sea. It will make cutting edge observations in neutrino oscillation physics, high energy neutrinos, dark matter and sea sciences. The primary goal of this working package is to strengthen the KM3NeT collaboration by starting new working groups, organizing workshops and make external collaborators, setup a pilot exchange program, explore new physics opportunities. This report describes the activities of the H2020-Infradev working group.

I. Copyright notice

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II. Delivery slip

	Name	Partner	Date
Author(s)	T. Thakore, J. Zornoza	UVEG / WP6	17/12/2018
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III. Document log

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1.1	17/12/2018	Review	J.D. Zornoza/UVEG
1.2	18/02/2019	Final	J.D. Zornoza/UVEG

IV. Application area

This document is a deliverable for the grant agreement of the project, applicable to all members of the KM3NeT-INFRADEV project, beneficiaries and third parties, as well as its collaborating projects.

V. Terminology

- ARCA = Astroparticle Research with Cosmics in the Abyss
(KM3NeT neutrino particle physics detector)
- ORCA = Oscillation Research with Cosmics in the Abyss
(KM3NeT neutrino particle physics detector)
- WG = Working group

VI. List of figures

none



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VII. List of tables

none

VIII. Project summary

KM3NeT - INFRADEV

KM3NeT is a large Research Infrastructure that will consist of a network of deep-sea neutrino telescopes in the Mediterranean Sea with user ports for earth and sea sciences. Following the appearance of KM3NeT 2.0 on the ESFRI roadmap 2016 and in line with the recommendations of the Assessment Expert Group in 2013, the KM3NeT-INFRADEV project addresses the Coordination and Support Actions (CSAs) to prepare a legal entity and appropriate services for KM3NeT, thereby providing a sustainable solution for the operation of the research infrastructure during ten (or more) years. The KM3NeT-INFRADEV project is funded by the European Commission's Horizon 2020 framework and its objectives comprise, amongst others, the Work Package “*KM3NeT in the Global Science context*”, with the objective to establish a sustainable cooperation of KM3NeT with adjacent science communities.

IX. Executive summary

The KM3NeT neutrino telescope is currently under construction in the Mediterranean Sea. It will make cutting edge observations in neutrino oscillation physics, high energy neutrinos, dark matter and sea sciences. The primary goal of this working package is to strengthen the KM3NeT collaboration by starting new working groups, organizing workshops and make external collaborators, setup a pilot exchange program, explore new physics opportunities. This report describes the meetings of the WP6 of the H2020-Infradev project.



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1 Introduction

The Kilometer Cube Neutrino Telescope (KM3NeT) is a next generation neutrino telescope built on the proven technologies of the ANTARES telescope. It will be deployed at two sites in the Mediterranean Sea. One site is located off the coast of France and will house the low energy detector configuration, called ORCA. The other site is located off the coast of Italy and will house the high energy detector configuration, called ARCA.

The ORCA configuration aims to determine the neutrino mass hierarchy with a 3σ statistical significance with 3 years of runtime with atmospheric neutrinos. It will also make precision measurements of the atmospheric oscillation parameters and search for non-standard physics scenarios, such as Non-Standard Interaction (NSI), sterile neutrinos, Lorentz Invariance Violation and quantum decoherence. ORCA will be a complementary neutrino experiment to the forthcoming accelerator experiments DUNE, Hyper-K, as well as the reactor experiment JUNO. ARCA will observe very high energy neutrinos from astrophysical sources such as supernovae, gamma ray bursts and blazars. It will also perform indirect searches for dark matter. It will be complementary to other neutrino telescopes IceCube 2.0 and Baikal. The



technical details of the detector and main physics goal can be found in the KM3NeT 2.0 Letter of Intent [1]. The deployment of both ORCA and ARCA has begun in 2018, and the Phase-2 is expected to be completed by 2021.

In this report we describe the discussion of the meetings held during the first two years of the project. The minutes agendas and minutes of these meetings are stored in the Indico system (<https://indico.cern.ch/category/9159/> internal).

In addition to the meetings listed below, it should be mentioned that discussions related to the tasks of this WP were held during the monthly meetings of the Project Manager Board. Also, informal discussions were held during the KM3NeT collaboration meetings, where most of the people involved in this WP participate. Finally, given that most of the key players of this WP work at IFIC, discussions on an almost daily basis are held.

2 H2020 WP6 Working Group Meetings

A total of six working group meetings have been organized between 11/2017 – 12/2018.

1. April 4th, 2017
2. May 8th, 2017
3. May 3rd, 2018
4. May 9th, 2018
5. October 11th, 2018 (with external collaborators at IIHE, Brussels)
6. December 20th, 2018

List of Participants:

J. D. Zornoza, T. Thakore, R. Gozzini, U. Katz, M. Anghinolfi, A. Capone, P. Migliozzi, P. Piattelli, P. Sapienza (on the IIHE side on the fifth meeting: .A. Aguilar, N. Iovine, S. Baur)

Summary

The overall direction and progress of the Working Package 6 was discussed during these meetings. This is a summary of the issues discussed in these meetings.

T. Thakore, R. Gozzini and J. D. Zornoza planned two workshops, which included designing the academic program, inviting speakers, and working on local logistics. The first workshop was held in Brussels on November 13-14, 2018 in collaboration with IIHE, Brussels. It was focused on dark matter analyses. The second workshop was planned in Valencia on



November 28-29, 2018. It was focused on neutrino oscillations. A detailed report on the workshops can be found in D6.4 of this WP.

The possibility of an expert working group on neutrino cross section systematics is also considered in these meetings. It will be realized in the year 2019, having received experts inputs at the H2020 oscillation workshop. This expert working group will study the current developments in the field of neutrino-nucleon interactions, develop cross section systematics model, fine-tune the event generation Monte Carlo and advise on the mass production schemes.

U. Katz has prepared and circulated a questionnaire to set up a pilot exchange program. It can be found in the report for D6.1 of WP6. The funding possibilities to support such exchange program are being identified.

R.Gozzini and J. D. Zornoza are involved in dark matter searches with KM3NeT-ARCA. Dark matter sensitivity results were presented at various meetings, such as Neutrino 2018, RICAP, SUSY 2018, VLVNT 2018. T. Thakore is involved in developing event-by-event analysis, constraining Non-Standard Interactions (NSIs), cross section systematics and neutrino decay analysis for ORCA. The NSI sensitivity analysis is expected to be publicly available by February 2019. Following the workshops in November 2018, several possible external collaborations and project goals have been identified, which can benefit the KM3NeT science program. These possibilities may be realized from Task D6.2, the pilot exchange program.

