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Periodic Technical Report
Part B

Period covered by the report:
01 July 2018 – 30 October 2019

Periodic report: 1.5th

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1 Explanation of the work carried out and overview of the progress

This chapter describes the work carried out during the reporting period (01 July 2018 – 30 October 2019) in line with the Annex 1 to the Grant Agreement (Description of Action (DoA)).

1.1 Objectives (project as a whole)

The consortium defined several objectives for the project. All objectives were planned in separate work packages. The successful completion of the project was related to the successful completion of the deliverables of each work package. Each work package is on track to complete all deliverables as planned.

The primary objective of this proposal is to establish a legal entity for the KM3NeT 2.0 Research Infrastructure. The preferred implementation is that of an ERIC, a European Research Infrastructure Consortium.

The KM3NeT Collaboration is now organised through several boards. Governing rules are set in an MoU. An ERIC Working Group has been established, formed with ministerial representatives of the participating countries. They are preparing the ERIC statutes and the Service Level Agreements with the partners stay owner of equipment that they will bring as in-kind contribution.

The list of additional objectives of this proposal includes the preparations for various services which the KM3NeT Collaboration intends to provide. These preparations are logically organised in corresponding work packages (WPs) of this proposal and are accompanied with deliverables which are linked with the objectives mentioned below.

The preparations of the services that the KM3NeT Collaboration intends to provide are somewhat dependent on the status of the KM3NeT project. It is good to see that this work, which was previously difficult to organise and fund, now is getting more attention. For outreach, many activities were coordinated, completed and planned in the first half of the project. Especially the connection with arts gives nice results. On the Societal role and societal impact, a code of conduct and diversity plan have been endorsed and implemented. Environmental studies have been carried out. We worked to establish a sustainable cooperation of KM3NeT with other related science communities (astrophysics, particle physics, sea science) and thus to make available to KM3NeT their respective expertise and tools, as well as to disseminate KM3NeT data and measurement opportunities to them. The possibilities of a zero carbon infrastructure have been presented in detailed reports. The inventory of possible industry connection is showing potential. The work related to data is much more difficult, as it is highly dependent on work already ongoing in the collaboration and work where many more players are involved in the decision chain, or much more is at stake related to these decisions. Data structure and user ports need definitions and standards that will define future opportunities, so one wants to be sure not to exclude ways that might be very interesting in the future, or introduce difficulties because of standards that need to be changed later. These results are described in detail in the next section.

1.2 Explanation of the work carried out (work package specific)

1.2.1 WP1 Coordination and Management

Governance

For the overall governance of the KM3NeT – INFRADEV project there were no changes in the bodies we have established at the beginning of the project:

- Steering committee (SC)
  - Governing the overall policy and quality control.
  - Meeting at least once a year.
  - Each project beneficiary in the project has one seat and one vote in the SC.
  - To maximise the intercommunication between this project and the KM3NeT collaboration, the steering committee is composed of the same persons as the KM3NeT Resources Review Board (RRB). This committee is regularly informed about the progress in this project but no serious decisions other than endorsements were required; The chair person has been invited to the joint meeting between this project and the KM3NeT collaboration and several members have been appointed as science delegates in the ERIC working group;

- Project Management Board (PMB)
  - Executive project management and monitoring of activities in work packages.
  - Meeting every two months in a telecon or f2f at the KM3NeT collaboration meetings (three times a year).
  - Each work package leader has a seat in the PMB.

- Project Office
  - Project monitoring on a daily basis.
  - Communication between project governing bodies.
  - Communication with the KM3NeT governing bodies, Management Board, Institutes Board (IB), and Resources Review Board (RRB).
  - Communication with the PO at the EC.

Financial

In order to monitor the project finances the Steering Committee supported the proposal of the MT and delegated the execution to the project office to request all partners to provide a detailed financial overview every six months and provide an overall financial overview. Some partners have slower hiring than anticipated and will supply extra resources in the second half of the project.

Quality Assurance

All deliverables were reviewed by the PMB and most by someone of the IB.
In order to assure the quality of the deliverables and their corresponding reports, the Steering Committee supported the proposal of the PMB and delegated the execution back to the PMB to appoint for each project deliverable report an internal reviewer from the PMB (from an independent WP). To make sure the deliverables of the project are in line with the KM3NeT policy important deliverables are also reviewed by someone from the IB.

Amendment

As recommended after the mid-term project review, we requested an amendment to the Grant Agreement to extend the project by 10 months. This was needed to be able to request the ERIC status during the project period and was helpful for some other tasks in the project as they were delayed. Also some changes in the budget were requested.

1.2.2 WP2 Legal entity

Introduction

The primary objective of work package 2 is to establish a legal entity for the KM3NeT 2.0. Research Infrastructure. The preferred implementation is that of a European Research Infrastructure Consortium (ERIC), with its seat in the Netherlands at the Amsterdam Science Park. The activities in this work package cover networking and legal tasks to establish a KM3NeT legal entity.

The activities in WP2 aim to build comfort and consensus on the legal framework and the governance structure of KM3NeT with the assumption that the legal entity will be a European Research Infrastructure Consortium (ERIC). WP2 installed an ERIC working group in which KM3NeT science delegates and the representatives of the Ministries participate. WP2 will achieve its deliverables through the activities of the ERIC working group.

In this report, we describe the activities and intermediate results of the ERIC working group since the Midterm review of the project in November 2018. The final deliverable of WP2 is to develop the draft Statutes and to guide the request to the European Commission (EC) to establish an ERIC.

Extension until November 2020

The midterm review panel recommended requesting an extension for WP2. The duration has now been extended with 10 months until November 2020.

Below you will find the adapted dates for the deliverables.

Table 1: List of deliverables for WP2.

Deliverable Number	Deliverable Title	Lead beneficiary	Type	Dissemination level	Due Date (In months)
D2.1	Report providing the legal entity's legal documents and statutes;	1 – Nikhef / NWO-I	Report	Public	46
D2.2	Report of the establishment of the KM3NeT ERIC working group (submitted);	1 – Nikhef / NWO-I	Report	Public	24
D2.3	ERIC statutes;	1 – Nikhef / NWO-I	Report	Public	46
D2.4	Legal entity established;	1 – Nikhef / NWO-I	Report	Public	46

Summary of the activities and intermediate results in WP2

Deliverable 2.2. of work package 2 has been finalised and submitted in the EC portal in April 2019.

Activities in the ERIC working group since July 2018

In the timeline of WP2, the activities, dependencies, mitigation and interventions were kept updated to be sure to track the critical path towards the establishment of a KM3NeT ERIC. The most recent timeline is attached as ANNEX 1 to this report.

The activities in the ERIC working group aim to establish a KM3NeT ERIC. The KM3NeT ERIC will not govern the sea floor networks in Italy and France. The provision of the service of the sea floor networks is a very critical part for the KM3NeT detector. Therefor it has been agreed within the EWG that the service level agreements for both sea floor networks need to be part of the ERIC Statutes and will be annexed to the Statutes.

The ERIC working group has been convened on 9-10 July 2018 (EWG4 Amsterdam), on 20-21 November 2018, (EWG5 Rome) and on 21-22 March 2019, (EWG6 Paris).
In the past months the focus in the EWG was to further develop the draft ERIC statutes, a draft service level agreement for the sea floor networks and a legal analysis of the KM3NeT datacentres. The EWG6 meeting aimed to advance the ERIC statutes and to advance the first draft of a service level agreement. In addition, the partners in the Grant Agreement and the EWG members were asked to reconfirm their intent to establish a KM3NeT ERIC.

Draft KM3NeT Statutes

During preparation of the EWG6 meeting, it became clear that the KM3NeT MT and RRB would not be able to deliver the necessary and requested documents to the EWG within time. Further, the French Ministry responded that they could not reconfirm their intent to establish an ERIC, yet, due to the uncertain financial future in the KM3NeT project. However, the French Ministry would appreciate to stay agenda-member of the EWG meetings.
Without the required information from the KM3NeT MT and RRB, the discussions lacked a base of reality so it made no sense to continue the discussions. That is why the EWG6 meeting decided to wait for the deliverance of qualitative satisfying documents from the KM3NeT MT and RRB, including an updated timescale of the science ambitions and put EWG-activity on hold.

The Italian EWG delegations and the Dutch delegation reconfirmed their intention to work towards the establishment of a KM3NeT ERIC. In order to keep momentum, they decided to continue the development of the draft ERIC statutes in an informal setting. The Italian EWG delegation and the EWG chair and secretary have achieved sufficient consensus on a draft of the KM3NeT ERIC Statutes by November 2019.
The EWG agreed that once the KM3NeT MT and RRB would deliver the requested documents to the EWG and the EWG would find the documents of sufficient quality, the EWG would restart the activities. In the event of a restart, the EWG would then be able to build on the effort and input by the Italian and Dutch EWG delegations.

Draft Service Level Agreement

The service level agreement see to the provision of the operational services of the sea floor networks in Italy and France. The construction is under the responsibility of the KM3NeT Collaboration.
The service level agreement is developed by the legal support team together with the site engineers of the Italian and French site and KM3NeT MT members. In the past period, a range of meetings was organised, video and face-to-face meetings, to advance the draft agreement and the related annexes. The SLA team achieved consensus on the core of the agreement, including KPI, and is now focusing to advance the annexes, such as the costing calculation model, technical description of the sea floor network, delivery procedure of the services.
The next step would be to request the KM3NeT MT to check the alignment of the specifications for construction and KPI's for service of the sea floor networks. The SLA team makes an effort to finalise a first draft by the end of 2019.

Legal analysis of the datacentres

The Legal support team is requested by the EWG to analyse the position of the KM3Net datacentres. The datacentre service to the KM3NeT Collaboration is at the moment governed by informal arrangements. It is not clear whether the service of the datacentres are going to be delivered as an in kind contribution to the KM3NeT ERIC. The progress in this activity depends on the input from the KM3NeT MT. The legal support team awaits further information as was asked from the KM3NeT MT.

1.2.3 WP3 Outreach and communications policy

Introduction

The objectives of this work package are to promote the visibility of the KM3NeT project to the general public and inspire an interest in the KM3NeT science. This will be achieved through the many different outreach channels (web pages, social media, public presentations, exhibitions, app games, hands on experimentation, art installations, TV, radio, citizen science, etc.).

The current status of these various activities is summarised below.

Social Media

We continue to 'animate' the social media channels at a typical rate of about 1 post per week. The posts are targeted to the following themes:

- "**KM3NeT: The next generation**": scientific and technical innovations
- "**KM3NeT papers/workshop/public events**": advertise what we are doing
- "**Meet our Collaboration**": for everyone!
- "**Heroes of KM3NeT**": highlight hardware work, sea operation crews, grants/funding/awards, …
- "**Bye, bye, KM3NeT**": for PhD student graduating
- "**KM3NeT at Summer Conferences**": send us a picture of you talking about KM3NeT at a conference!

The number of followers on the social media continues to slowly increase. The current status is:

- Facebook: 644 followers
- Twitter: 1147 followers
- Instagram: 315 followers
- YouTube: 114 followers

Media Interviews

We have participated to a number of media interviews:

- **Interview EOS**, https://eos.org/articles/an-underwater-telescope-to-study-sky-and-sea
- **Interview NUMERAMA**, https://www.numerama.com/tech/529580-ce-telescope-en-mediterranee-nous-permettra-t-il-de-comprendre-les-neutrinos-et-lunivers.html
- **Interview ApPEC newsletter**, https://www.appec.org/news/km3net-is-growing-recent-deployment-in-the-mediterranean-sea

Outreach Activities

We have participated in a number of outreach events this year. They were also supported via the social media posts:

- Prix Cristal Collectif CNRS awarded to CPPM (4 July 2019)
- Science and Innovation Festival, Tbilissi (24 Sept 2019)
- Thessaloniki International Fair (25 Sept 2019)
- Open day Nikhef, Amsterdam (5 Oct 2019)
- Researchers night, Bari (4 Oct 2019)
- Le stelle in fondo al mare, Catania (21 Aug 2019)
- European research night, LNS and Sezione di Catania (27 Sept 2019)
- Inauguration of LNS visitor centre (27 July 2019)
- Fete de la science at La Seyne sur Mer (6 Oct 2019)

We have some events planned for the rest of 2019:

- **Archipelagos:** the art/science collaboration with Thierry Poquet is proceeding. Contacts with various high schools in cities (La Seyne, Valencia, Athens, Lille, Ankora) associated to KM3NeT have been established.
- **'Draw me a Neutrino' Competition:** we are organising a national and international competition based around the idea of visualising a neutrino, http://wos.ba.infn.it
- An Art collaboration with **Donald Fortescue** (http://www.donaldfortescue.com) has obtained some funding.
- **AIS3:** The installation of the Astroparticle Immersive Synthesiser at the Vasarely Foundation, Aix en Provence is planned for early Dec 2019.
- **Citizen science:** in collaboration with some other astroparticle and particle physics experiments we obtained funding for a H2020 project REINFORCE, which will provide manpower to implement two citizen science projects (Sea Hunter) within KM3NeT based on acoustic and optical signal classification within the Zooniverse framework.

Outreach Material

We continue to develop the pool of outreach material:

- **Wiki/Google Drive**: The internal KM3NeT outreach wiki and google drive have been updated.
- **Virtual Reality**: many groups in KM3NeT have now purchased the Oculus Rift hardware needed to present the the virtual reality experience app.
- **CNRS video**: An english version of the CNRS video of the first KM3NeT/ORCA deployment is now available.
- **Balloons**: Some inflatable DOM balloons have been developed and have been a popular tool for outreach displays.
- **Brochure**: the KM3NeT brochure has been finalised.
- **KM3NeT App**: a beta of the KM3NeT app has been released within the KM3NeT Collaboration for testing.
- **Information package**: an information package targeted to stakeholders is been prepared.

1.2.4 WP4 Open Data Access

Objectives:

The goal of this work package is to set up the tools, procedures, documentation and rules to make the KM3NeT data available to the scientific communities concerned (in particular particle, astroparticle and astrophysics as well as marine sciences) and to the broader general public. In this, close cooperation with the H2020 ASTERICS project and its successor project ESCAPE is sought, which will establish common standards for open data access amongst astrophysics research infrastructures.

Organisation:

The work in WP4 is organised in six tasks, which were originally scheduled for the months indicated below. With the extension of the contract and the new deadlines, in particular for the deliverables 4.8, 4.9 and 4.11, all tasks with the exception of task 6 are extended to month 46, while task 6 is extended to month 43.

1. Generating public data (months 1-36, extended to 46)
2. Monitoring and data quality control (months 12-36, extended to 46)
3. Data archives and access (months 1-36, extended to 46)
4. Documentation (months 18-36, extended to 46)
5. Rules of data usage (months 18-36, extended to 46)
6. Education and training (months 12-36, extended to 43)

So far, most of the resources deployed for WP4 come from FAU (the lead institution for this WP). This is consistent with the fact that the emphasis during the first program year was on task 1 with a strong FAU commitment, which needs to provide the basic tools and strategies that are then taken up by the other tasks.

Meetings of the WP4 group were held during the KM3NeT Collaboration meetings (Feb 2017, Athens; June 2017, Bari; Oct. 2017, Marseille; Feb. 2018, Rabat; May 2018, Granada; Oct. 2018, Caserta; Feb. 2019, Tbilisi; June 2019, Nantes; Oct.2019, Warsaw). In addition, the work progress was regularly discussed in meetings at FAU and documented in a working document.

Work performed and progress achieved:

In **task1**, the deliverables **D04.01** (data management plan), **D04.02** (report on ASTERICS liaison) and **D04.03** (Report on the conceptual design of the open data generation, archiving, test programs and access) have been submitted in the first reporting period.

Work is now focussing on the implementation of the open data system, to be described in **D04.08** (month 46). Also, a liaison has been established to the ESCAPE project (European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures), which can be seen as a successor to ASTERICS. This was facilitated by the fact that Dr. Kay Graf (FAU) is a work package leader in ECSCAPE.

Task 2 targets the monitoring of the performance of the program chain and the quality of the output. It started in month 12 with a first investigation of the current data quality control mechanisms in ANTARES and KM3NeT and the identification of elements that can be used for KM3NeT public data, and needs for additional automation and improvement. A conceptual design of the monitoring and quality control processes has been worked out and described in deliverable **D04.05** (*Report on monitoring and quality control setup*, month 31).

Task 3 targets the identification of suitable data archive and access methods, and of an appropriate user environment. The work in task 3 builds on the example of ANTARES, where the data are made public in the GAVO (German Astrophysical Virtual Observatory) framework.

Issues addressed so far include

- The embargo period (i.e. the time span after data taking for which the data is reserved for the KM3NeT Collaboration, both for processing, calibration and quality control, and for a first scientific analysis. This period is necessary for generating the public data, and compensates the KM3NeT Collaboration for the effort to design, construct, operate and maintain the RI. Currently, an embargo period of 2 years is assumed; a definite decision by the Collaboration is targeted for end-2019. Not subject to embargo will be multi-messenger alerts (see WP7).
- The licensing method (i.e. the terms and conditions, under which external users are permitted to access the data), where technical issues are addressed in task 3 and legal issues in task 5.

Some of the related considerations and results have been documented as part of deliverable **D04.03.** Work is now focussing on the rules and conditions for data access which will be described in deliverable **D04.07** (month 36).

Task 4 targets the documentation of the open data system, including descriptions of the data themselves and the relevant metadata, the access methods, example programs and further relevant software, and the scientific background. In many cases, self-documenting environments such as the Virtual Observatory will be employed, easing the documentation and at the same time providing sustained long-term support. The documentation strategies will be described in deliverable **D04.06** (*Report on documentation strategy, environment, and software*), which is about to become available. Based on this report, manuals for all major components of the open data access system will be subject of deliverable **D04.09** (month 46).

Task 5 is about the rules under which the KM3NeT open data can be accessed. This includes issues such as licensing and also rights and obligations concerning publication resulting from the use of KM3NeT open data (e.g. authorship and acknowledgements, quality control, etc.). These rules are currently under development; they require detailed discussions and finally an endorsement by the KM3NeT Institutional Board. This process in ongoing but not yet concluded. A conceptual report on rules and conditions for data access will be subject of deliverable **D04.07** (month 36); the actual regulations for cooperation models, authorship rights and intellectual property rights to be applied for external users will be described in deliverable **D04.10** (month 40).

In reply to the remark on p. 10 of the Report of the mid-term review (Ref. Ares(2019)1327119 - 27/02/2019): *"Setting up a virtual facility to facilitate reaching a wider audience is of utmost importance for an RI like KM3NeT. Not only this will facilitate the correct use of available data in research by more scientists, helping the RI to show the importance of the research it supports and affirming itself in Europe and beyond. Even though data from KM3NeT detectors is not available yet, the use of neutrino data in the virtual observatory is explained through data from existing neutrino telescopes. A first internal training meeting was held. No data related to the number of participants or their feedback is given, nor a planning for future meetings"*, we note:

The concept of the virtual education centre has been pursued further. From the first iteration as laid out in D04.04, we now adopted a Wordpress-based solution that is more flexible. This solution has been intensively tested in the KM3NeT Bootcamp 2019 which was held 23-25 Oct 2019. Though the focus was KM3NeT-internal education of newcomers, the concepts of the virtual education centre could be tested and developed further. The feedback of the 35 participants was very positive, though some more courses have to be added to service the needs and requirements set by this peer group. It also became clear that the concept of the virtual education centre and attached training meetings itself, and using open data also within the collaboration is valid and sustainable.

Task 6 targets the production of material (information sheets, flowcharts, movies, presentation slides, virtual guided tours, etc.) for the virtual educational centre, as well as the setup and test of this virtual education centre. The technical implementation has been studied and a suitable solution identified, which has been reported in deliverable **D04.04** (*Report on virtual education centre and training meetings: Setup, material, tools*, month 24) The implementation and the user tests of a virtual education centre and the procedures for training workshops are currently being set up and will be reported in deliverable **D04.11** (month 43).

Deliverables:

So far, the following deliverables have been submitted:
D04.01: Data management plan
D04.02: Report on the ASTERICS liaison
D04.03: Report on conceptional design of open data generation, archiving, test programs and access
D04.04: Report on virtual education centre and training meetings: Setup, material, tools
D04.05: Report on monitoring and quality control setup

For these deliverables, delays of typically 1-2 months occurred due to difficulties in the reviewing and endorsement process, due to small delays in the authoring phase and due to vacation periods.

Six more deliverables are due between months 34 and 46. We expect that they will be submitted without undue delays.

Milestones:

None specific for WP4 in RP-1.5.

1.2.5 WP5 Societal role, societal impact

The overall objective of this work package is to formalize aspects of the role of KM3NeT as a responsible organisation and to investigate possible key performance indicators of the societal impact of KM3NeT.
Since introduction of the deliverables of WP5 is intimately related to the governance and management of the KM3NeT Collaboration and required their consent, the progress of the work has been regularly presented to the KM3NeT Institute Board and the KM3NeT Management Team.

More in detail the objectives of the work package are:

- *Publish a written code of conduct and ethical behaviour in building and operating the KM3NeT Research Infrastructure and conducting KM3NeT-related science. The code will serve both as an internal guideline and as a reference for public scrutiny.*

  Since July 2018 the final version of the Code of Conduct has been prepared. The Code of Conduct was presented to the Management Team and endorsed by the Institution Board in October 2018, after the endorsement the implementation phase started. Regular progress reports by the WP5 leaders at the meetings of the Institutes Board (IB) of KM3NeT, the support expressed by the KM3NeT management at the plenary session of the Collaboration meetings and the WP5-report on the KM3NeT/INFRADEV Joint Meeting and Collaboration meetings ensured the transparency of the process towards a well-accepted and supported Code of Conduct and Ethical Behaviour for KM3NeT.
  This led to the following concrete achievements: (i) a written Code of Conduct and Ethical Behaviour; (ii) publication of the Code of Conduct at the public KM3NeT website[1]; (iii) written 'Guidelines in case of inappropriate conduct in KM3NeT' and (iv) the decision of the IB to establish an Ethics Committee with external members.
  An internal KM3NeT wiki-page has been setup to inform the Collaboration on the Code of Conduct and Ethical Behaviour. At this page, the integral Code is available together with FAQ and '*Guidelines in case of inappropriate conduct in KM3NeT*'. The Guidelines are considered internal documents. A printed version of the Code, the Guidelines and quick introductions to both have been handed out to Collaboration members at a Collaboration meeting in Nantes, June 2019.
  End of September 2019, a survey on the professional well-being in the KM3NeT Collaboration has been performed. The results of the survey will be included in the report covering deliverable D5.1 after scrutiny for privacy of the respondents.

[1] https://www.km3net.org/about-km3net/code-of-conduct-and-ethical-behaviour/

- *Implement a Gender Equality Plan (GEP) for KM3NeT aiming at an inclusive working environment of KM3NeT and improving the gender balance in leading positions in the KM3NeT community.*

  Within the scope of this objective, a *Policy for Equality, Diversity and Inclusion (EDI) in KM3NeT* was developed, which includes deliverable D5.2[2], but is broader in its ambition.
  After a thorough preparatory phase, the EDI-policy has been presented for discussion to the KM3NeT Management. The Institutes Board (IB) endorsed the EDI-policy in October 2018 and requested WP5 to take care of the implementation. The following concrete achievements were established: (i) the acceptance of a five-year Policy for EDI in KM3NeT with measurable performance indicators; (ii) publication of a statement on diversity and inclusion at the KM3NeT website[3]; (iii) the installation of the EDI-Committee of two senior scientists with the mandate to support the KM3NeT management in the execution of the EDI-Policy; and (iv) the election of two representatives of early-career scientists in the IB.

  The first election of representatives of early-career scientists in the IB took place in April 2019; the first EDI-session was at the Collaboration meeting in Nantes in June 2019. At the EDI-session, the EDI-Committee was introduced to the Collaboration and the new early-career scientists in the IB presented themselves. The second EDI-session dedicated to ECFA Survey on the Recognition of Individual Achievements in Large Collaborations took place in October 2019 at the Collaboration meeting in Warsaw. Beyond the KM3NeT-INFRADEV project, it is the responsibility of the Collaboration to continue with the execution of the EDI-Policy. To this end, the mandate of the EDI-Committee is included in the new draft Memorandum of Understanding of KM3NeT.

  The above mentioned survey on professional wellbeing in the KM3NeT Collaboration included questions to poll diversity in the Collaboration. These results of the survey has been shared with the EDI-Committee and will be included in the report covering deliverable D5.2 after scrutiny for privacy of the respondents.

- *Investigate the potential of the role and impact of KM3NeT in human capacity building and formulate recommendations for a sustainable future of KM3NeT. In particular, monitor and assess the impact of KM3NeT on the professional careers of the KM3NeT doctoral students and young post-doctoral students.*

  In June 2019, for the first time two early-career members of the KM3NeT Collaboration have been elected in the KM3NeT Institutes Board. Since then the two elected persons have already participated in two Institute Board meetings. They have taken the initiative to setup an Early Career Scientist (ECS) meeting which has already formulated several proposals for discussion by the Collaboration and the Institute Board.
  Early October, a survey has been performed on the knowledge among KM3NeT team leaders on the career choices of PhD students and postdocs beyond their time in KM3NeT. The results of the survey will be included in deliverable D5.3.

[2] D5.2 – A Gender Equality Plan for KM3NeT
[3] ttps://www.km3net.org/about-km3net/diversity-in-km3net/

- *Perform environmental impact studies for each of the three KM3NeT installation sites as required by national and international legislation.*

  The institutes hosting the KM3NeT detectors are responsible for conducting environmental impact studies at their respective site. Impact studies are required to gain access to the sites for installing the detectors and for laying the main cable between the detectors and the shore stations. The KM3NeT Installation Site Managers are responsible for taking actions accordingly, following procedures of the relevant authorities. In October 2017, this was confirmed in a meeting with the three Site Managers. Although the situation varies per site, the main items for the environmental studies can be identified as:
  - Cultural heritage and the landscape;
  - Flora, fauna and their balance in the ecosystem;
  - Interaction with human activities (e.g. fishing);
  - Natural resources (use of marine environment).

  French site
  For the French site, an environmental study was carried out in different phases. Deliverable D5.4 will be ready by the end of 2019.

  Italian site
  Early Summer 2019, the position of Installation Site Manager has been taken by a new staff member of LNS. The transition of work is in progress. Currently, it is not clear whether the deliverable D5.5 will be ready by the end of 2019.

  Greek (proposed) site
  For the Greek (proposed) site, environmental research has been carried out. Deliverable D5.6 will be ready by the end of 2019.

1.2.6 WP6 KM3NeT in the global science context

The science objectives of KM3NeT are linked to a variety of different fields of expertise which in turn are represented by different science communities, each with their individual tools, procedures, communication and dissemination channels, and research cultures. Major examples are astrophysics, particle physics, and marine sciences. Even smaller subfields, however, tend to develop their peculiarities. Examples are atmospheric neutrino simulation and modelling, experimental neutrino oscillation studies, dark matter searches, or theoretical high-energy astrophysics. The objective of this WP is to establish a sustainable cooperation of KM3NeT with these communities and thus to make available to KM3NeT their respective expertise and tools, as well as to disseminate KM3NeT data and measurement opportunities to them.

During the period 1/7/18 – 31/10/19, there has been progress in the three tasks of this working package:

Task 6.1: Institutionalising scientific cooperation with other science communities

We have organized two international workshops to promote the potential of KM3NeT in two key science topics: the search for dark matter and the study of neutrino oscillations. The first workshop, Dark Ghosts 2018, was organized in Brussels in cooperation with the IceCube group in the Université Libre de Bruxelles. It was the second edition of a series, which started in Valencia in 2014, and got together experts (theoreticians and experimentalists) on the detection of dark matter with neutrino telescopes. There were also reviews about other experimental searches. The second workshop was organized at IFIC with the name HOW2018. The topic of this meeting was the discussion about the capabilities of KM3NeT on oscillation studies with other experts and theoreticians of the field, including accelerators, reactors and other neutrino telescopes. It should also be mentioned, the coordinator of this WP is also participating, as a member of the Scientific Committee, in the organization of a third workshop to be held in Marseilles in December 2019 focused on multi-messenger astronomy (cf. section on WP7).

As part of the effort to demonstrate the robustness of the claimed potential of KM3NeT, complementary studies about the impact of several systematic effects have been carried out. This has been in cooperation with experts of the GENIE code, which is a neutrino generator widely used in the neutrino physics field. This activity is also connected with Task 6.2, since these experts have stayed for one month at IFIC (see more information later).

In addition to this there has been a very active participation of several members of the group in conferences, to show and discuss the potential of KM3NeT in these fields. This includes PPNT10 (Uppsala), RICAP 2018 (Rome), Astromatera 2019 (Matera), ICRC2019 (Madison), VLVnT 2018 (Dubna), among others.

Task 6.2: Establishing a scientific exchange program for KM3NeT

The foreseen stays of several researches in KM3NeT institutes have taken place. As described in the previous report, several steps were taken before: a questionnaire to gather information about logistics and legal aspects in each involved country, a selection committee was established to evaluate and endorse candidates, and the selection criteria were set. Moreover, it should be also mentioned that publicity to this program was given in the workshops mentioned in the description of the previous task.

At IFIC, four researchers have stayed for a total of one month each. Nadège Iovine, PhD student from the Université Libre de Bruxelles and member of the IceCube experiment, stayed during June 17th – July 19th 2019. She worked together with Rebecca Gozzini on the topic of the combination of data of KM3NeT, IceCube and ANTARES. Part of the results of this work were presented in the ICRC conference in 2019. Moreover, a paper related to this studies has been prepared and is now under internal revision by the respective experiments.

The following experts on the GENIE code, from the University of Liverpool, have stayed at IFIC: Prof. Costas Andreopoulos, Dr. Marco Roda and the PhD student Julia Vidal-Tena. The stay of the former two were funded by the H2020 program, while the stay of Ms. Vidal-Tena was funded by the Universtiy of Liverpool. They have split their stay in two parts: July 8 – July 19, 2019 and October 21- October 31, 2019. The goal of the visit has been to run ORCA simulations with different GENIE model tunes in order to identify the dominant parameters for the systematics in the cross-section of the neutrino interactions.

At the group of INFN-Genova, two master students also participated in the exchange: Andrey Romanov, from the Moscow State Univeristy (June 10th - July 12th 2019) and Godofroy Vannoye, from ENS Lyon (May 20th - August 2nd 2019). The topics of their work include the analysis of the Moon shadow and hardware/calibration tasks.

More information will be available in the deliverable D6.5.

Task 6.3: Exploring new physics opportunities for KM3NeT

The work of the postdoc Rebecca Gozzini, hired under this project, has produced several results on the capability of KM3NeT for detecting dark matter. Given the fact that only a few lines of KM3NeT are already installed, the work has been focused on the estimation of the sensitivity of this detector, both for Phase I and Phase II. Among these results we can mention the first estimation of the sensitivity of ARCA for the Galactic Centre. Also, the coordinator of this WP has supervised the estimation of the sensitivity of ORCA for the Sun. These results have been presented in several conferences, as mentioned before.

Another activity related to this task has been the studies carried out together with the group of IceCube at the Université Libre de Bruxelles to combined data of IceCube and ANTARES and KM3NeT, as mentioned before. For this, the stay of Nadège Iovine at IFIC was instrumental, which has been described in the previous task.

In addition to the studies on dark matter, it should be also mentioned that the expertise of Tarak Takhore, the other postdoc hired under this project, on neutrino oscillation studies has allowed to go beyond our initial plans concerning the exploration of “new physics opportunities”. In particular, he and two students of our group have estimated the sensitivity of KM3NeT for non-standard interactions and neutrino decay. The results from this work have been presented in conferences.

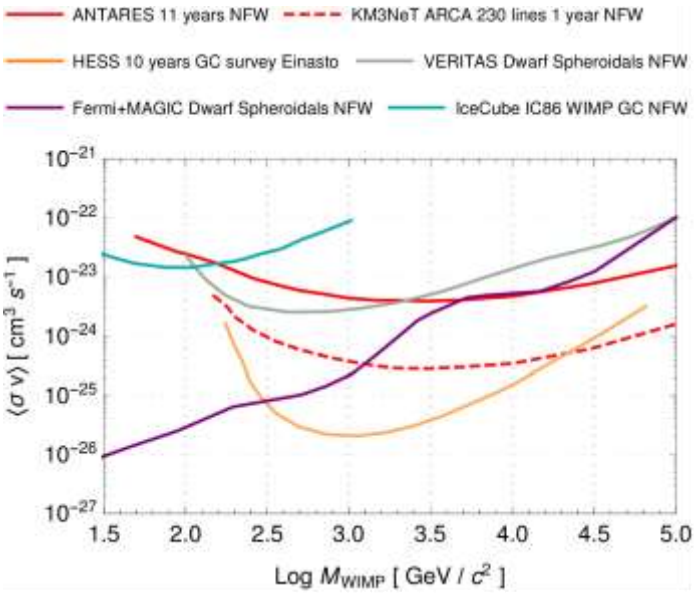

Figure 1: Sensitivity to dark matter annihilation cross-section of ARCA 230 lines, compared to other experiments.

1.2.7 WP7 Multi-messenger astronomy

The aim of work package 7 is to fully integrate KM3NeT as an indispensable partner of the Multi-messenger astroparticle community. This will necessitate that KM3NeT can swiftly generate and distribute real-time alerts of interesting neutrino detections to the partner observatories, is able to receive real-time alerts from partner observatories and use them to enhance the KM3NeT detection sensitivity. The work of WP7 is fully integrated in the multi-messenger group of the KM3NeT Collaboration. WP7 is divided in 5 main tasks: establishment of Memorandum of Understanding (MoU) with external partners, implementation of the reconstruction algorithms in the real-time framework, implementation of the alert sending system and on the real-time time-dependent analysis of external alerts and development of a core-collapse supernova (CCSN) analysis. Figure 2 shows a scheme of the real-time framework of KM3NeT.

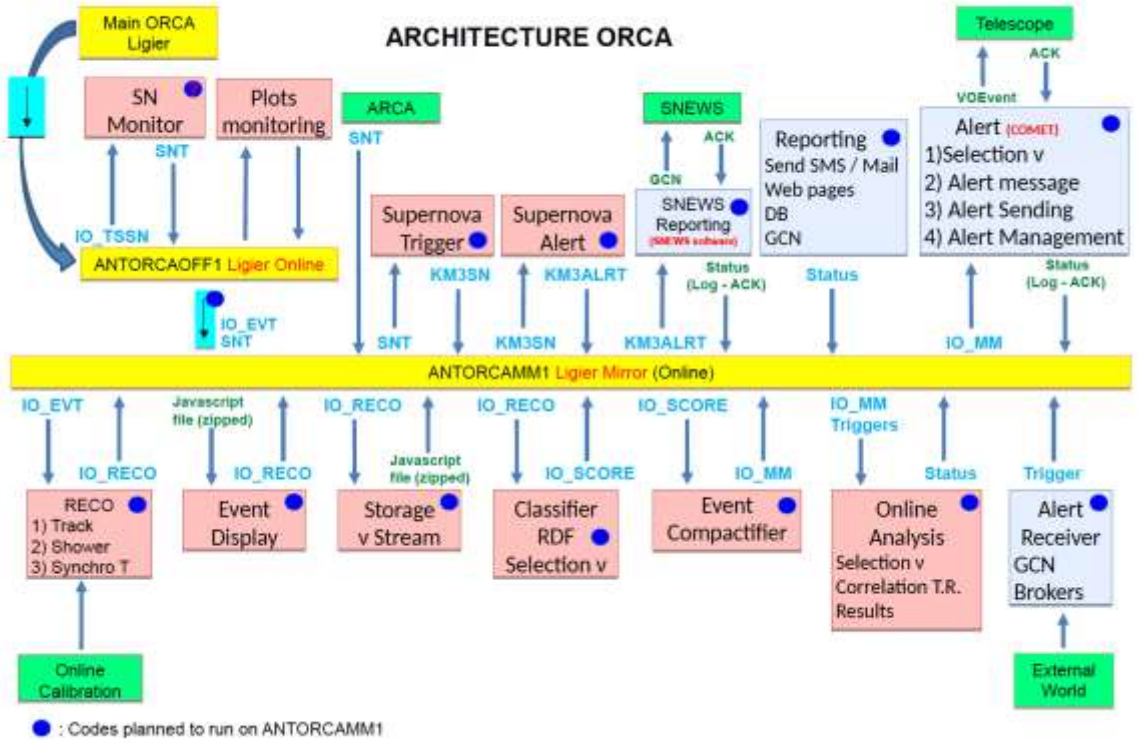

Figure 2: Architecture scheme of the KM3NeT real-time framework (ORCA site).

Here is the summary of the activities performed during the 3-year work of WP7:

- Advanced discussions with future partner experiments (template of the MoU agreement available in deliverable D7.1)
- Implementation of a complete online analysis framework
    1. Implementation of the online framework in link with the standard DAQ (deliverable D7.2)
    2. Real-time track and cascade reconstructions, already running with ORCA4 and ARCA1 (deliverable D7.2)
    3. Online neutrino selection (Deliverable D7.5)
    4. Development of the alert sending system (Deliverable D7.3)
    5. Real-time supernova analysis and SN alert sending + establishment of a solid SN science case. Official participation of KM3NeT in SNEWS and active participation to the upgrade (SNEWS 2.0). This activity is described in Deliverable D7.4.
        - Participation to the writing of the SNEWS 2.0 white paper
        - Development of a triangulation code (paper in preparation) that will be implemented in the new upgrade.
- Organisation of a Town Hall KM3NeT workshop to promote its multi-messenger programs to the astronomy and astrophysics communities.

The first report of the negotiation of the MoUs with external partners is reported in the deliverable KM3NeT-INFRADEV-WP7_D7.1_v1.3 (January 2018). A template has been written and approved by the Institute Board of KM3NeT. It is a standard agreement with the EM partners to follow the KM3NeT neutrino alerts in real-time.

We have performed the adaptation of the offline track and cascade reconstruction algorithms for the online framework. We have tested the performances of theses reconstruction tools: CPU time needed to reconstruct one event, angular and energy resolutions, usage of online charge/time calibration instead of the most precise calibration set-up, non-use of the dynamical positioning of the DOM with the acoustic system…. Specifications for the online analysis have also been written and provided to the main developers. The first version of the online framework is already running with the ORCA and ARCA first detection lines.

For the alert sending system, we are currently upgrading the tool used by ANTARES to send their alerts since 2009. It consists of using the most recent standard defined by IVOA (VO Event, Comet as broker, STARALT, OVAP, OLAP…), use of CDS (Centre de Données astronomiques de Strasbourg) softwares (Simbad, Aladin, Aladin-Little, VizieR, Xmatch…) and ASTERICS softwares (ROAst). We have defined a standard format of the VO Event used for the KM3NeT alert transport. We have well advanced in the implementation of an open public alert (OPA) for KM3NeT. It consists in defining a policy for the distribution of these alerts (Number of alerts, type of alerts, quality, p-values neutrino/astro, purity (false alarm rate), latency…), deciding of the tools for the alert information dissemination, providing a tool to report external observations and promoting the KM3NeT OPA. The first version is actually on test with ORCA detector.

For a Galactic CCSN, the KM3NeT ORCA and ARCA detectors in the Mediterranean will observe a significant number of neutrinos via the detection of Cherenkov light, mostly induced from inverse beta decay interactions over a large instrumented seawater volume. We have computed the KM3NeT sensitivity for the detection of a galactic CCSN and the potential to resolve the neutrino time profile have been estimated exploiting detailed MC simulations covering the event generation and the detector response. Finally, we have set the monitoring of the sky with first lines of ORCA/ARCA and we have officially included KM3NeT in the SNEWS global alert network and are participating to the SNEWS 2.0 upgrade.

Finally, to conclude the WP7 activities, we are organizing the KM3NeT Town Hall meeting to review the most up-to-date neutrino production models and to present KM3NeT performances and to promote its multi-messenger programs to the astronomy and astrophysics communities. The agenda of this workshop is available here: https://indico.cern.ch/event/848390/overview

1.2.8 WP8 User ports

This Work Package is working towards providing the Earth and Sea Science community with opportunities to perform real-time and long-term experiments and to test novel technologies in the extreme environment of the deep-sea. It aims at defining the schemes through which the KM3NeT infrastructure may provide 'plug and play' user ports to install instrumentation other than the neutrino telescope to measure oceanographic, acoustic and optical properties of the deep-sea sites.

During months 18-34 of the project the following work has been carried out:

Task 8.1
A second edition of the KM3NeT-ESS workshop was planned in autumn 2019. However, for practical organizational matters it had to be postpone and will be organized in spring 2020. It will also foresee a session dedicated to explaining and training ESS scientist at the use of KM3NeT data.

Task 8.2
A scheme for a data acquisition architecture to provide external users with full access to the acoustic data acquired by KM3NeT for calibration purposes has been presented in Deliverable D8.2.
The implementation of such an access point has turned out to be more difficult than expected and will need more resources than are presently available. However, such design will be further developed to allow its implementation in the future.
The modalities to make public a subset of acoustic and optical data is under study with the aim to exploit at maximum the synergy with WP4.

Task 8.3
Based on the experience of KM3NeT the design of an access point to connect environmental instrumentation has been developed. The aim is to provide an infrastructural facility that can allow to install deep-sea instrumentation on the KM3NeT sites. Schematically this will consist of a so called Calibration Base, permanently connected to one of the junction boxes of the KM3NeT infrastructure via an electro-optical cable, and a recoverable Instrumentation Unit, carrying the scientific equipment and connected to the Calibration Base through a long electro-optical cable.

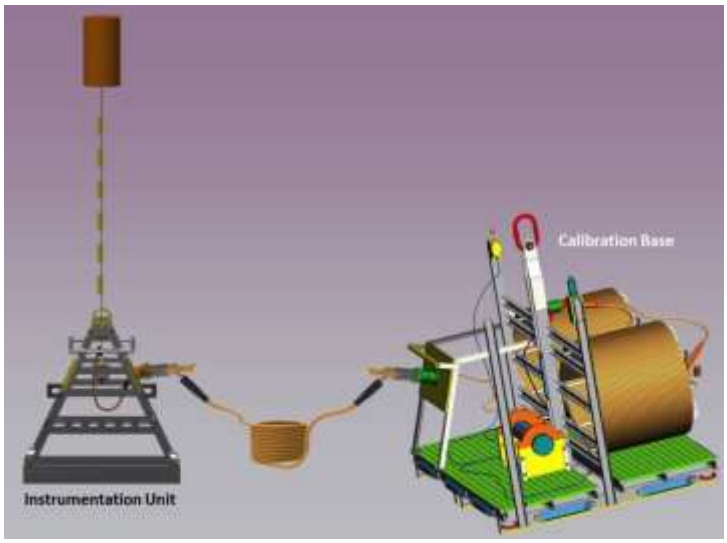

Figure 3: Scheme of the Calibration Base – Instrumentation Unit system

Due to the differences between the seafloor infrastructure at the KM3NeT-It and KM3NeT-Fr sites the design of the Calibration Base for each one of the sites needed to be tailored to the specific infrastructure.
The design of the calibration bases has been completed and is under revision.

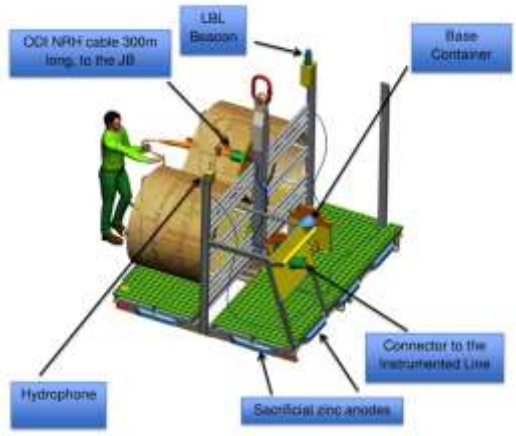

Figure 4: The Calibration Base for the KM3NeT-It site

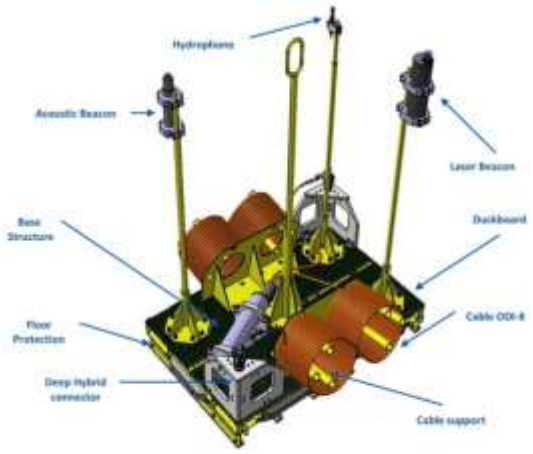

Figure 5: The Calibration Base for the KM3NeT-Fr site

The design of the instrumentation line, which can be in principle identical for both sites, will be developed and finalized in the first half of 2020. In this first version they will carry a set of instruments aimed at acquiring environmental data that are also relevant for the calibration of the KM3NeT neutrino telescope and can be made available for oceanography. Further versions of the Instrumentation Lines, carrying other instrumentation installed on demand of the Earth and Sea science users, can be envisaged in the future.
No major problems toward the completion of the design of such an infrastructure are foreseen.

1.2.9 WP9 Technology transfer and innovation

This work package is working towards establishing a methodology for following technological advancement in key areas of interest to KM3NeT. It also aims to expose KM3NeT developed/adopted technological choices and innovative solutions to interested parties in other institutions and in the industrial sector.

During months 19-34 of the project, the following has been implemented or achieved:

- Regarding the development of the exhibition material for the participation of KM3NeT in (multipurpose) technology exhibitions, the panel members had developed (during the first 18 months - included in the deliverable D.9.1.) a presentation and 2 posters, exposing both the scientific goals of KM3NeT as well as the technological challenges and the adopted solutions. Following the midterm report (month 18), the presentation and the posters have been updated. Four leaflets have also been prepared by the members of the panel, for the exposure and promotion of the technological achievements and solutions provided by KM3NeT. A digital optical module (DOM) was prepared with a fully integrated lower hemisphere to be used for exhibition purposes. Only test components, not usable for the integration of KM3NeT DOMs, were used for this purpose.
- We participated in the Very Large Volume Neutrino Telescopes Workshop (VLVnT 2018) in October 2018 with an invited talk on KM3NeT Knowledge and Technology Transfer. Interested participants of this Workshop could be informed about the technological achievements and solutions provided by KM3NeT from three leaflets that were prepared by the members of the panel. These leaflets formed the basis for the final layout of our leaflets (mentioned above).
- We participated in the Thessaloniki International Fair for technology and innovation in September 2019. The KM3NeT kiosk was equipped with: 2 large TV screens on which videos were launched showing the most impressive snapshots from the deployment of KM3NeT Detection Units; the posters providing information both on the physics goals and the status of KM3NeT, as well as the on the technical aspects (technical solutions and achievements) of the experiment; a Virtual Reality experience allowing visitors to “dive” to the abyssal depth of the Mediterranean sea and “observe” sea life as well as detection elements of the experiment; a projector and a laptop on which the slide show was launched; and the digital optical module prepared for exhibition purposes. KM3NeT souvenir pencils and wristbands were given to the visitors. More than 500 visitors among which University students, academics and tech experts were introduced by our team to the KM3NeT physics objectives and technology.

- Regarding the development of water optical properties measurement services, the work has started in month 13 as planned. It has been realized that in order to be able to provide a service of the measurement of the optical properties of water, it is important to optimize and, to a certain extent, automate the existing device (LAMS). The existing device was revived and a number of modifications have been considered in order to achieve the optimization and automation desired. The original LAMS device that was used to measure the transmission length in deep sea during the sea campaigns in 2008 and 2009 took measurements at distances of 10m, 15m (or 17m) and 22m. In order to achieve optical paths of different length, needed for the different measurements, parts of the frame were added or removed appropriately on board before each deployment and measurement and three consecutive deployments were necessary. For the water properties measurement service, we decided to construct a new version of the LAMS device keeping the same idea of measuring the transmission length, but simplifying the process by performing in a single

deployment, simultaneous measurements at all three different distances between emitter and receiver. The modifications are detailed in the deliverable D.9.5. (month 24). The light emitter and the support structure of the original LAMS device are utilised, while three autonomous receiver units have been redesigned. The new receivers are housed in cylindrical stainless-steel cases to be mounted inside the metal frame supporting the LAMS at distances of 10m, 14m (or 16m) and 20m.

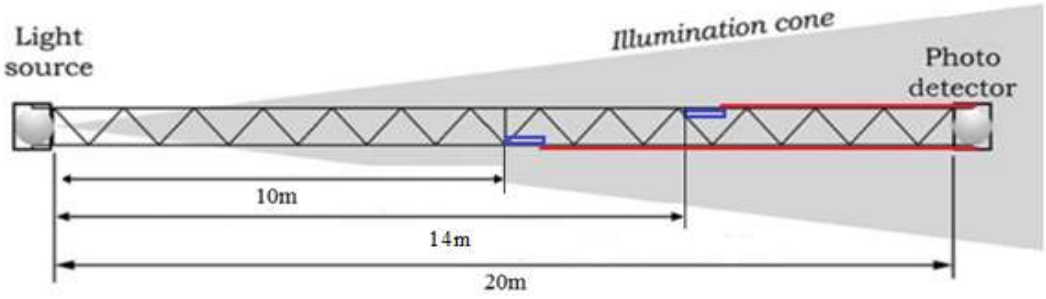

Figure 6: Rough schematic showing the placement of light receivers and light source

- The prototype electronics board was delivered in January 2019. The dark current rate of the prototype board was measured, both with and without the photodiodes attached to the board. The dark rate is very low. The output stability was measured in a custom made dark box, built specifically to test the LAMS PD boards. The Photodiode board was also checked for the region of linear response, using light attenuation filters to reduce the intensity of the light source. The board was powered from a power supply unit for the first tests before using batteries. Once the prototype board was finalised, we proceeded with the manufacturing of the three final boards, which underwent the same tests for dark current, stability and linearity.
- We are currently running sets of the complete system with 3 photodiodes placed in the pressure casings and the light source mounted on the titanium frame. Also, the internal support structures that will hold the boards and batteries and all associated cabling has been finalised and is currently tested. In parallel with the board testing/manufacturing the pressure casings, which house the electronics and battery packs, have also been manufactured. Four casings were manufactured comprising of a steel tube on one end of which a 30mm thick stainless steel plate is attached and on the other end a 70mm thick plexiglass to allow the photodiodes to measure the light coming from the light source. On the steel plate, holes have been drilled for one electrical connector, a vacuum port and on two of the casings a pressure sensor. Two casings have successfully been tested to withstand pressure up to 300 atm and the process is currently ongoing. The tubular steel frame that will hold the light source and sensor modules have been transported to Athens and have been connected to run full system tests.

- Current/immediate future actions comprise the pressure testing of the remaining two casings, a firmware update in the electronics boards, completing the internal support/cabling system for all 4 casings, painting the casings and titanium frame with matte black paint to minimise potential reflections that could affect the measurements, installing the mounts that will hold the pressure casings onto the titanium frame and change the BENTHOS glass sphere of the point source.

- Regarding Task 9.4, the preliminary study was continued, analysing the different FPGA available in the market that could be used in the switch and evaluating improvements of the oscillator system, implementing some of the proposed solution in one of the KM3NeT White Rabbit nodes for

evaluation. (White Rabbit is a protocol for control and data acquisition that provides nanosecond synchronization and data transfer at the same time using optical links). Regarding this last point, 4 prototypes of this improved node (see Figure 7) have been produced and the evaluation of the oscillator system is in progress (Figure 8). In addition, an analysis has started of the stability of the Serializer- Deserialised SERDES latency. This feature determines the time synchronization that can be obtained and it is being evaluated in both, long operation and after reset or power cycle.

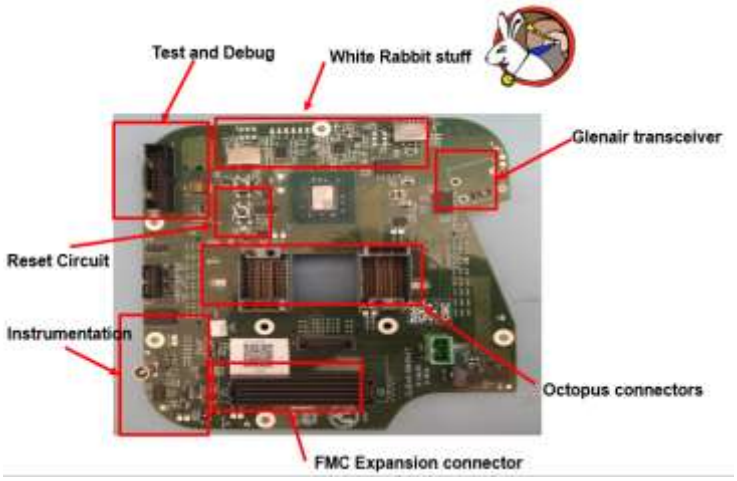

Figure 7: KM3NeT new Whiter Rabbit node where the new oscillator system has been implemented. Currently under tests.

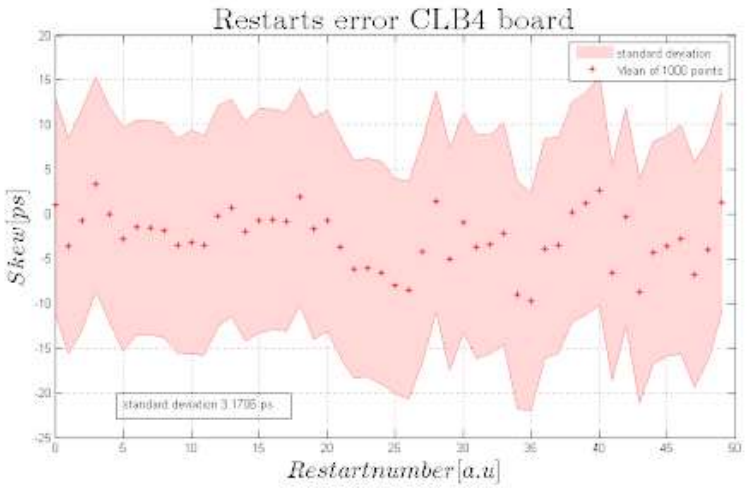

Figure 8: Restart synchronization tests. The stability of the synchronization achieved after multiple restarts can be observed.

- The work on the failure analysis for reliability improvement of the White Rabbit Switch hardware is detailed in the (final) deliverable D.9.3. which has been recently submitted.

1.2.10 WP10 Zero-carbon footprint

In WP10 we explore the possibility and methodologies for KM3NeT to become a carbon neutral research facility in the operation phase. In the 1st reporting period, two separate studies have been performed: The first one set the stage by identifying the basic assumptions, the possible ways of approaching the problem, the available cooperation paradigms and the identification of possible partners. It soon became evident that in each of the three KM3NeT sites, a different implementation strategy must be pursued. The basic pillars of the possible approach strategies were identified and laid out in the first deliverable of WP10. The second deliverable, which was submitted in month 18, contained a detailed review of the National and European legislation concerning the creation of Renewable Energy infrastructures in a context suitable for KM3NeT, i.e. a research facility funded by public spending within the European Union legislature. The main result was that no conflict was found in either the national or the European legal system that would hinder the creation of REI by KM3NeT and/or the Institutions participating in the collaboration. The second report was submitted in time by the end of the 1st reporting period on month 18.

Months 19-33 (summary)

On month 19, work started on the 3rd deliverable of WP10, namely a technical-economic study for the establishment of Renewable Energy infrastructure in each of the 3 sites of KM3NeT. As CNRS in France had already stated that for legal and practical reasons, the establishment of a REI in France would not be possible, but rather the option of purchasing energy from a certified “green” energy supplier would be the only possible solution, the study concentrated on the 2 other sites, namely Capo Passero in Sicily and the area close to Kalamata-Pylos in SW Peloponnese in Greece. With the aim to present the techno-economic assessment of grid-connected Photovoltaic (PV) and wind energy technologies in the 2 sites, the objectives could be summarized as follows:

- Review the available meteorological databases and simulation software programs
- Analyze the weather data that are used in this analysis for the two locations
- Present the technical characteristics of the systems and their designs
- Predict the annual and long-term energy yield of the systems
- Present the systems’ life cycle cost and analyze their long-term finance
- Combine the systems’ technical and economic results.

Detailed studies using extensive meteorological data for both sites were used as input to detailed simulations using the specifications and technical characteristics of PV and wind turbine systems currently available in the market. A compilation of meteorological data from the 2 sites is shown in Figure 9 and Figure 10 below.

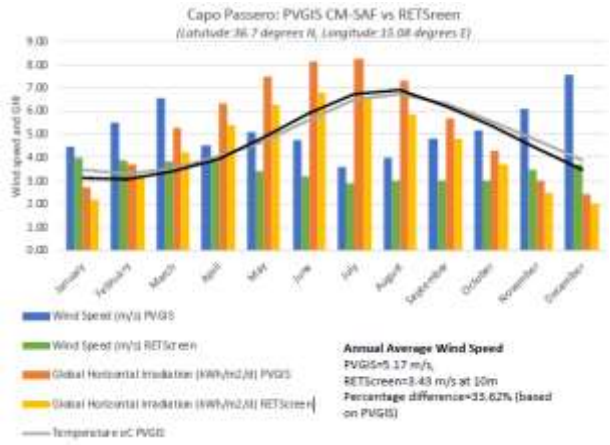

Figure 9: Wind speed at Capo Passero

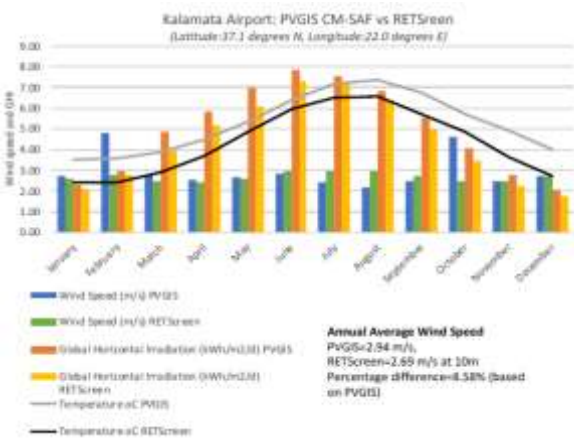

Figure 10: Wind speed at Kalamata Airport

Several scenarios concerning the various ways for fulfilling the energy requirements in the KM3NeT sites have been studied, in order to balance the distinct environmental characteristics with the different purchase and installation costs in each case.

One scenario example for Greece and Italy are given below.

Kalamata:

1) One large-scale horizontal axis wind turbine (HAWT) of 2.35 MW installed capacity
2) PV plant of around 400 kW installed capacity
3) PV façades of around 40 kW total installed capacity
4) Small-scale vertical axis wind turbines (VAWT) of 60 kW total installed capacity

Capo Passero:

5) One HAWT of 3 MW of installed capacity
6) PV plant of around 100 kW installed capacity
7) PV façades of around 40 kW total installed capacity
8) VAWT of 60 kW total installed capacity

The total installed capacity is 2.85 MW for Kalamata while it is 3.2 MW for Capo Passero.

The study conclusions can be summarized as:

- Capo Passero receives slightly more solar irradiation and has higher wind speed annually than Kalamata according to all databases.
- The extrapolated wind speed values to 50 m height were sufficiently lower than the one provided by HOMER
- The annual average wind speed in both locations is from low to medium levels.
- It might be more profitable for Kalamata to replace the HAWT with a PV plant of similar installed capacity
- The range of the LCOE for the PV plants is €0.030-0.042/kWh in Kalamata and €0.027-0.037/kWh in Capo Passero.

- The range of the LCOE for the HAWT is €0.045-0.064/kWh in Kalamata and €0.034-0.048/kWh in Capo Passero.

The study contains detailed analysis of several different scenarios integrated with the actual costs as they are reported in the relevant communications with the manufacturers of the RE systems.

The study was completed and submitted in July 2019, and can serve as a detailed blueprint of the next steps.

On month 31 of the project, work on the 4th and final deliverable of WP10 started. This corresponds to a study of the possible funding sources and schemes that can be exploited in order to realise the REI for KM3NeT. The said report is due in month 36 of the project, and no deviation from the planned schedule is foreseen.

1.2.11 WP11 Ethics requirements

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

The work on the ethics requirements was completed in the first half of the project.

1.3 Impact (project as a whole)

Towards the end of the original project period, we still expect the same impact as at the proposal writing stage. One place where the impact might even be bigger is in the establishment of the legal entity. Although the collaboration expressed the wish to create a legal entity, preferably an ERIC, when asked for input to the statutes, this was more difficult than expected. The work in the ERIC working group has made a large impact as the collaboration is now really moving towards the necessary steps. It was not just defining and preparing the step to get to the final destination, but it was also preparing the collaboration to be ready to take these steps.

2 Update of the plan for exploitation and dissemination of results (project as a whole)

The plan for dissemination and exploitation of the results of the project is still valid. We followed it throughout the project and we will continue doing as planned in the extension to the project.

3 Update of the data management plan

The Data management plan was presented as deliverable 4.1 in June 2017. No updates to the plan or implementation have been reported. An update of the DMP is planned after deliverable 4.7, *Report on rules and conditions for data access* is available (month 36).

4 Follow-up of recommendations and comments from previous review (16/11/2018)

Below are the follow-up actions taken in relation to the recommendations from the first periodic review on 16 November 2018, report available 26 February 2019.

Recommendation	***Action or comment***
1) Clearly address the challenges identified to developing the ERIC governance model and implementation. Strong leadership and negotiation capacity, development of a clear identity that is not only well understood by the scientific community but also by policy makers and societal stakeholders, especially industry. The main KPI for success would be ensure that the countries that host the sites and, especially, the country that will host the headquarters of the infrastructure, put in at least 60% to 80% of the financial needs.	In the framework of work package 2 (WP2) of this project, regular meetings of the ERIC working group are organised, during which the financial status is monitored and commented. Although we agree to the general spirit of this recommendation, it should be noted that the management of the construction and operation of the KM3NeT Research Infrastructure is not part of this project. As such, the quoted KPI for success should apply to KM3NeT at large and not be limited to this project. Of course , this recommendation will be communicated to the corresponding KM3NeT bodies through this project.
2) the ERIC statutes should provide for a lean administration and decision making structures, leaving no room for doubt that there will be a strong head-office;	Such an ERIC lies at the heart of the ERIC working group. The realisation thereof is the priority of WP2. The draft statutes comply with this recommendation; the challenge is to reach consensus on the draft statutes.

Recommendation	*Action or comment*
3) a clear perspective of the local/national contributions to their own labs and sites vs the contribution for maintaining the central management structure should be provided together with the ERIC statutes;	To this end, a Memorandum of Understanding (MoU) between the partners in the KM3NeT Collaboration is being prepared by the management of the KM3NeT Collaboration (which is outside the scope of this project). In this, cost estimates for the construction and operation of the research infrastructure, (in-kind) contributions of the partners to the project and a balanced budget are presented. This MoU should be endorsed by the corresponding funding authorities. It will then serve as input to the KM3NeT ERIC statutes (which brings it inside the scope of this project).
4) Specific issues like those related with EEZ and other constraints related to component ownership are strictly political and administrative, respectively and should be dealt with the help of experts;	We acknowledge that an earlier involvement of experts would have been beneficial. Within the ERIC working group, expertise is available. For the drafting of the service level agreements additional experts have been consulted. This resulted in drafts of service-level agreements (SLA's) for the operation of the sea-floor networks in France and Italy. These drafts include a description of the use of the sea-floor networks by the KM3NeT ERIC, key-performance indicators (KPI's) for the monitoring thereof and an implementation for the compensation of the loss of operation time due to non-compliances. The two sites in EEZ of France and Italy will legally be protected under maritime law. In France, the site is a military protected zone. The optimal conditions for construction and operation are being negotiated. In Italy, the application procedure for a so called "marine area protecto" has been prepared by a maritime lawyer and has been submitted to the authorities.
5) Better integration of the different work packages aims and activities;	We would like to clarify that this project is structured to execute the work as much as possible in parallel, with a minimal number of interdependencies between the work packages. The common factor of the work packages is the support for the KM3NeT legal entity with its value added services. In doing so, intermediate results are already shared with and implemented by the KM3NeT Collaboration. We have started to transfer the results of the work packages that will finish soon to the KM3NeT collaboration, where the suggested integration will be possible and we will continue to do so with the other work packages till the end of the project.

Recommendation	*Action or comment*
6) Build on the excellent work being developed under WP10 regarding mapping and interactions with regional authorities to guarantee extra funding for specific project activities during the period of transition towards the ERIC, so that the momentum is not lost;	Although there exists no direct link between the deliverables of this project (in particular those of WP10) and KM3NeT funding activities, we note that more funds for investment and personnel have been acquired for KM3NeT since the start of this project.
7) Concentration of deliverables in the final stretch of the project paired with underspending and delays in hiring are a clear indication of the need for an extension of the project period. Moreover, this will be beneficial for diminishing the transition period between the infradev project and the ERIC signing. An extension cannot, however, mean that further delays are acceptable. On the contrary, the EC services should maintain a close monitoring effort until the decision for extension is granted.	A designated amendment to the Grant Agreement has been submitted to and has been approved by the EC. In short, the deadlines of various deliverables in work packages 2, 4, 8 and 9 have accordingly been changed.
8) Other specific recommendations or appreciations concerning communication, data management and technology transfer are provided in the remaining part of the review text.	
a. In sum, even if partially the recommendations from previous assessment of KM3NeT were taken into account, many were not or were not mentioned in the context of the Infradev project review. Overall, as mentioned in the ESR of the Infradev project, 'the proposed methodology lacks details to convince that the work will contribute towards realizing the main goal of becoming a legal and sustainable entity.'.	Although there is a consensus that KM3NeT should become a legal entity and that the ERIC is a suitable implementation thereof, the main challenge is to convince the funding authorities (which should contribute the bulk of the human resources and finance the bulk of the operational costs) that the ERIC is timely. As a remedy, a sequence of informal discussions between key persons in the ERIC working group and representatives from the funding authorities have started in 2019. The outcome of these discussions will be used to streamline the ERIC process.
b. Broader links to industry were mentioned and it is highly recommended that these are followed up and that mapping and identification of other potential companies continues. The supply of potential solutions to technical problems identified along the development of KM3NeT research infrastructure could also be supported by diverse public funding instruments at national and regional level, such as structural funds. If these solutions can then be rolled out and used by a broader set of companies, high impact (in its limited universe of specialised companies) would certainly be achieved.	The remainder of this project will primarily be used to ensure that the links with industry will be maintained by the KM3NeT Collaboration. As an example, the established links to industry combined with the large number of components being procured by the KM3NeT Collaboration has led to a change in paradigm. Previously, the primary sensor –a so-called photo-multiplier tube (PMT)– was integrated with its high-voltage supply and readout electronics by the customer. Now, it will be integrated by the PMT supplier(s). As a result, the problem of large-area photon detection at the quantum level is reduced to a plug-and-play device which is operated at low voltage and low power. The latter is due to a previous development within the KM3NeT collaboration.

Recommendation	*Action or comment*
c. The reviewer did not have access to these documents and it is recommended that these are shared with the European Commission services and possibly discussed in a future review period.	We will communicate with the project officer to ensure that all documents that are part of this project are available for review.
d. Communicating fundamental science is a challenge, but the CERN experience is an inspiration and a has a very professional office with whom it is recommended that the communication officer of KM3NeT liaises. Of course the level of financial and other resources is incomparable, but there are low cost or free processes, as well as notions of graphic design that can be learnt. This is very useful and helps the project build a robust identity both towards its direct collaborators and towards external partners. The communications plan submitted already starts to explore this broader approach to communication but the feeling that was left throughout the hearing is that communication is underrated or seen as mere support activity.	The outreach plan for KM3NeT, which was developed in the framework of this project has already been adopted by the KM3NeT Collaboration. In addition, several ways to improve the communication of the KM3NeT science have been identified and followed-up by the KM3NeT collaboration (e.g. drawing contest, art exhibitions and outreach events).
e. A second recommendation is that the project efforts in communication should better liaise with the remaining work packages. Not in a supportive perspective, but in helping to think and build the rationale for their development. Communication is central, for example, when one thinks the impact on society, the environmental impact and others. There are interesting and innovative ways of approaching these issues in communication terms. This would also help the project revamp its conventional visibility and outlook.	We take to heart this recommendation but with the remaining time available after receiving the report, we will focus on transferring the message to the KM3NeT Collaboration.
f. It is recommended that the consortium further develops the DMP in line with state of the art procedures for international alignment of data management and seeks integration in the European Open Science Cloud initiative. This presents itself as a unique opportunity for KM3NeT to establish itself as a reference in the RI domain regarding open access and data management.	The DMP has been established in Deliverable D4.1. The intention is to evolve this with new insights. These developments in the EOSC will be followed through the ESCAPE project (*"European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures"*) in which KM3NeT participates. This project is running since February 2019 and FAU is an active partner in the project, representing KM3NeT.
9) It is highly recommended that the team adopts a more pragmatic management style, not allowing for unnecessary long delays in a project that has a short time span until it finishes.	

Recommendation	*Action or comment*
a. It is highly recommended that the project coordination effectively takes the lead and establishes a connection between hiring at project level and hiring for the research infrastructure. Further own resources may have to be committed by several partners, not only in hiring but in other activities too to ensure the critical phase the project and the RI are entering into are effectively overcome.	The hiring of personnel beyond the Grant Agreement is not in the mandate nor in the scope of this project. Nonetheless, clear recommendations have been made by the ERIC working group regarding the central management of the KM3NeT project. The implementation of these recommendations are being negotiated between representatives of the funding authorities and the KM3NeT management. A consensus is instrumental for the establishment of the KM3NeT ERIC. As stated above, informal discussions have started between key persons in the ERIC working group and representatives from the funding authorities.

5 Deviations from Annex 1 and Annex 2

As recommended after the mid-term project review, we requested an amendment to the Grant Agreement to extend the project by 10 months. This was needed to be able to request the ERIC status during the project period and was helpful for some other tasks in the project as they were delayed. Also some changes in the budget were requested.

5.1 Tasks (work package specific)

WP2

During preparation of the EWG6 meeting, it became clear that the KM3NeT MT and RRB would not be able to deliver the necessary and requested documents to the EWG within time. Further, the French Ministry responded that they could not reconfirm their intent to establish an ERIC, yet, due to the uncertain financial future in the KM3NeT project. However, the French Ministry would appreciate to stay agenda-member of the EWG meetings.
Without the required information from the KM3NeT MT and RRB, the discussions lacked a base of reality so it made no sense to continue the discussions. That is why the EWG6 meeting decided to wait for the deliverance of qualitative satisfying documents from the KM3NeT MT and RRB, including an updated timescale of the science ambitions and put EWG-activity on hold. The EWG agreed that once the KM3NeT MT and RRB would deliver the requested documents to the EWG and the EWG would find the documents of sufficient quality, the EWG would restart the activities. In the event of a restart, the EWG would then be able to build on the effort and input by the Italian and Dutch EWG delegations. The EWG keeps the pressure on the external parties to make sure progress can be made soon.

WP4

The first five deliverables have been submitted with typical delays of 1-2 months, caused by slow turn-around in the iteration after internal reviewing and by vacation periods. With the amendment four deliverables were moved into 2020.Deliverable 4.6 is in the works and will be made available to the KM3NeT Collaboration by beginning of November 2019. Of the remaining five deliverables, 4.7 and 4.11 are in the works and the work towards the other three is progressing.

Milestone MS3, *Establish common standards for open data access among astrophysics research infrastructures*, is due in month 42 (June 2020) and its objective is being pursued in the ESCAPE framework.

WP5

WP5 had no deviations, although at this moment in time, the status of D5.5 is not clear due to a transition of work toward a newly appointed Site Manager at the KM3NeT-It site.

WP6

The fact that the number of lines of KM3NeT installed has been smaller than expected, which has limited the capability to set limits on dark matter as foreseen in Task 6.3. However, estimations based on the sensitivity have been provided.

WP8

The discussion on the access to the infrastructure by third parties and a discussion as to what of this should be covered in the deliverable D8.1 and D8.2 has delayed the completion of these reports until November 2019. Work on the other tasks and deliverables has continued and will complete following the new schedule, as described in the amendment to the GA of this summer.

WP9

With the amendment one deliverable has been moved to 2020. Work package 9 involves technology transfer and innovation. The harsh environment of the deep sea and the high cost of maintenance of the research infrastructure have been a driving force for design innovations. At the same time, these pose challenges on the prototyping and quality assurance. Some delays in the commissioning phase of the KM3NeT project have occurred which have impacted the timelines of this work package. The extension requested takes into account the current planning of the commissioning and operation of the research infrastructure. For the KM3NeT participation at upcoming technology exhibitions, two options have been identified. One technology exhibition takes place in September 2019 and the other one in December 2019. We would like to keep both options open. Postponing the deliverable D9.7 to month 39 would make this possible.

5.2 Use of resources (work package specific)

WP4

There was a significant underspending in the first project phase, where in particular at FAU the hiring of personnel for WP4 was impeded due to two unexpected contract terminations and in general by significant difficulties in identifying suited candidates on short notice. These difficulties are now mostly overcome, with hiring Dr. Jutta Schnabel (1.4.2019-31.10.2020), Dr. Rebecca Gozzini (1.1.-31.10.2020), Dr. Rodriguez Ruiz 15.5.-31.8.2019), Dr. Alba Domi (1.12.2019-30.4.2020), Susanne Raab (15.12.2019-31.10.2020) and Dipl.-Phys. Tamas Gal (1.9.2019-31.10.2020) on full-time positions as well as M.Sc. Johannes Schumann (1.11.2019-31.10.2020) on a part-time position. We thus have secured the human resources to finalise the work in WP4 within the timeline adapted to the extended project end at 31.10.2019. It seems likely that the travel money will not be full used until the project terminates. We suggest to use ca. 20 k€ for co-financing the KM3NeT town meeting in Marseille, organised in the framework of WP7.

WP6

Contrary to what it seemed and informed in the previous report, the bulk of the funds initially devoted to the pilot ex-change program were finally spent as initially foreseen, so there was no need to relocate these funds for bringing experts to the workshops organized.

It should be also mentioned that the available funding foreseen for personnel have allowed to extend for one extra month the contract of Rebecca Gozzini. This will allow to continue a bit further the studies on the capability of KM3NeT for dark matter.

5.2.1 Unforeseen subcontracting

There was no unforeseen subcontracting.

Annex 1 Summary for publication

Project Periodic Report
739560 (KM3NeT - INFRADEV)
Reporting Period : [16 November 2018 – 31 October 2019]

Summary for publication
The summary for publication should be written as a "stand-alone" text, in a language easily understandable by a broader public and must not contain any confidential data The summary should not exceed a total of 7400 characters (example length given)
1. Summary of the context and overall objectives of the project (For the final period, include the conclusions of the action)
This section should include information on: *1.1. What is the problem/issue being addressed?* *1.2. Why is it important for society?* *1.3. What are the overall objectives?*
This H2020 KM3NeT – INFRADEV project addresses the coordination and support actions to prepare a legal entity for the KM3NeT research infrastructure which currently is under construction. KM3NeT will be a distributed research facility hosting a network of neutrino telescopes deployed in the deep waters of the Mediterranean Sea, which is pursued by a large international collaboration comprising about 250 persons from 15 different countries. The main objectives of the KM3NeT Collaboration are *i*) the discovery and subsequent observation of high-energy neutrino sources in the Universe and *ii*) the determination of the mass hierarchy of neutrinos. There are two countries that will each host part of the infrastructure (in the future this may become three), one country that developed a new cost-effective technology and a number of other countries that contribute key elements to the research infrastructure (e.g. human resources, components and computing). This deviates from the traditional picture in which a single host country takes the lead (strategically, financially and/or logistically) and invites other countries to join. Furthermore, the finances are being acquired from national, regional and other funding. The availability and constraints of these funds have led to a phased implementation (funding is secured for phase 1 and a significant fraction of the funds for phase 2 have been committed). Finally, there exist no umbrella organisation such as CERN or ESO for research facilities of this kind. In this context, a sustainable central organisation has been sought and an European Research Infrastructure Consortium (ERIC) has been identified as the preferred solution. This project constitutes a second preparatory phase for KM3NeT. It will be carried out

within the context of the KM3NeT Collaboration. The primary objective of this project is to establish a legal entity for the KM3NeT research infrastructure (i.e. a KM3NeT ERIC). The list of additional objectives of this project includes the preparations for various services that the KM3NeT Collaboration intends to provide, including open access to (future) data and to the deep-sea infrastructure. With this project, a sustainable way of cooperation between KM3NeT and other science fields will be prepared and the interaction with other telescopes strengthened.

In itself, this project carries no direct importance to society but it will provide a basis to augment the impact of KM3NeT on society. KM3NeT is positioned in the heart of fundamental, curiosity driven, research. The harsh environment of the deep sea and the high cost of maintenance of the deep-sea infrastructure have been a driving force for design innovations. This project will provide for an outreach and communication plan, a scheme for (bidirectional) transfer of technology & knowledge, a gender equality plan and a code of conduct and ethical behaviour for KM3NeT. The envisaged open access to (future) data and to the deep-sea infrastructure which are being prepared through this project will provide invaluable opportunities for the wider astrophysics, astro-particle physics and particle physics communities and other sciences such as oceanographic, marine biology and climate research. Within this project, the possibility to make KM3NeT a CO_2-neutral research facility will be explored. This could serve as an example within the ESFRI landscape to prevent global heating.

[3341]

2. Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far (For the final period please include an overview of the results and their exploitation and dissemination)

As previously reported, we have set up an ERIC working group, composed of representatives of the ministries of the countries participating in the KM3NeT – INFRADEV project. These are conveniently accompanied by science delegates. To establish a close link with the KM3NeT Collaboration, the spokesperson of the KM3NeT Collaboration and the chairperson of the board of institutes are formally invited to the meetings of this working group.

Although there is a long standing consensus that KM3NeT should become a legal entity and that the ERIC is a suitable implementation thereof, the main challenge is to convince the funding authorities (which should contribute the bulk of the human resources and finance the bulk of the operational costs) that the ERIC is timely. As a remedy, a sequence of informal discussions between key persons in the ERIC working group and representatives from the funding authorities have started in 2019. The outcome of these discussions will be used to streamline the ERIC process.

The project management board is composed of the work package leaders and the secretary of this project and meets monthly by video and three times per year face-to-face during each KM3NeT Collaboration meeting (see photo). The coordinator of this project

and -by invitation- one (or more) work package leaders regularly report to the board of institutes of the KM3NeT Collaboration. The coordinator also reports to the whole KM3NeT Collaboration.

The envisaged exchange program took off last year. In this, several experts in the field of science joined this project and thereby the KM3NeT Collaboration to exchange know-how. Furthermore, a workshop is planned this year in Marseille on 17–19 December to which external experts in the growing field of multi-messenger astronomy have been invited.

[1808]

3. Progress beyond the state of the art, expected results until the end of the project and potential impacts (including the socio-economic impact and the wider societal implications of the project so far)

Since the project is not conducting research, progress beyond the state of the art is not to be expected but the progress in awareness and understanding of the ERIC policy, realized at the joint meeting are beyond what was expected a few months ago.

To overcome the inaccessibility of the deep sea, various 3D animations of the deep-sea research infrastructure have been developed including a cool VR animation. Also, various activities together with artists have been initiated. These activities stimulate the general awareness of (the vulnerability of) the deep sea, the interplay between fundamental research and industry and the values of fundamental research.

Through this KM3NeT – INFRADEV project, KM3NeT actively contributes to discussions on gender equality and diversity and interacts with other research projects about the code of conduct and ethical behaviour. As an example, a gender equality plan and a code of conduct and ethical behaviour have been prepared which were subsequently adopted by the KM3NeT Collaboration. Corresponding flyers (see figure) have been distributed to all members of the KM3NeT Collaboration and will be presented to all newcomers as well. Data on the composition of committees, contributions to conferences, etc. are systematically collected. Personal feedback is regularly obtained from the members of the KM3NeT Collaboration in real-time interactive Q/A sessions during meetings using designated apps. Eventually, these data and feedback can complement other data from industry, NGO's, etc.

Finally, the idea of a making KM3NeT a CO_2-neutral research facility has matured. This could represent a cost saving for the operation of KM3NeT. It could also set an example.

[1708]

4. Address (URL) of the project's public website

https://www.km3net.org/km3net-infradev/

5. Images attached to the Summary for publication

Photo of the KM3NeT Collaboration and the members of the management board of this project taken during the joint meeting in Warsaw, Poland, 7–11 October 2019.

Covers of the “Code of Conduct and Ethical Behaviour” (left) and the “What to do in cases of inappropriate behaviour” (right) flyers.

Annex 2 ERIC Working Group timeline

Table 2: Overview of activities and estimated timeline for 2019/2020, the finale of INFRADEV WP2

	Q1 March 2019	**Q2 June 2019**	**Q3 September 2019**	**Q4 December 2019** **Restart EWG?**	**January-October 2020**
Aims	**Discussion on:** **1. Draft Statutes and required annexes** **2. Continuation EWG**	**Consensus on draft Statutes, annexes, and first draft SLA**	**Consensus on draft Statutes, annexes, and first draft SLA**	**Consensus on draft Statutes, annexes and draft SLA**	**1. Finalisation of draft Statutes, draft SLA** **2. Preparation of informal request** **3. Informal request ERIC** **4. Formal request ERIC** **WP2 Del. 2.1. + 2.3. + 2.4.**

Activity	**EWG6, Paris**
	Aim:
	- Draft Statutes and following required annexes:
	  - draft Total Costbook;
	  - draft Common Fund;
	  - draft S&T;description;
	  - draft SLA.
	
	Reconfirmation of EWG members, Italy and Netherlands, to establish a KM3neT ERIC
		'EWG Sleeping mode'
		IT/NL
		• Advancing the Statutes
		
		SLA team
		• Advancing the SLA and annexes
		
		Consultation IB:
		- IB has been invited to comment on draft Statutes;
		- IB has been invited to provide feedback on key-topics SLA
		
		Legal Support team:
		- analysis of the service of the datacentres (Lyon and Bologna) to the KM3NeT ERIC
		
		KM3NeT bodies:
		- build support within Collaboration on Statutes, annexes, and SLA
			'EWG Sleeping mode'
			IT/NL
			• Advancing the Statutes
			
			SLA team
			• Advancing draft SLA and annexes
				'EWG Sleeping mode'
				IT/NL
				• Advancing the Statutes
				
				SLA team
				• Advancing draft SLA and annexes
				• Seeking advice from product assurance and project engineer
				• Request to KM3NeT to approve the final draft SLA with annexes
					Finalisation of the draft Statutes and draft SLA with required annexes
					
					tbd:
					Prepare Informal request:
					- Reconfirmation of EWG members to establish an ERIC
					  - legal scrub of documents;
					  - preparation of the forma-lities.
					tbd:
					- Request to the EC/DG research
					
					  - Statement by the host country (statutory seat)
					  - Invitation to other Member States to join the ERIC
					tbd:
					  - Request to the EC
					  - Signature by the minimum of 3 Member States

Dependency	Progress and input by RRB/MT: • Total Costbook; • Common Fund; • S&T description; - Reconfirmation of EWG members of the intent to establish a KM3NeT ERIC - Result and progress in KM3NeT project	**Restart of EWG activities' by RRB/MT:** Based on the provision of the draft required annexes: • Total Costbook; • Common Fund; • S&T;description. • Provision of updated timescale and science ambitions for KM3NeT (ORCA and ARCA) - Input KM3NeT MT to legal support team (datacentres) - Result and progress in KM3NeT project - Result consultation IB on Statutes and SLA	**Restart of EWG activities by RRB/MT:** Based on the provision of the draft required annexes: • Total Costbook; • Common Fund; • S&T;description. • Provision of updated timescale and science ambitions for KM3NeT (ORCA and ARCA) - Input KM3NeT MT to legal support team (datacentres) - Result and progress in the KM3NeT project	**Restart of EWG activities by RRB/MT:** Based on the provision of the draft required annexes: • Total Costbook; • Common Fund; • S&T;description. • Provision of updated timescale and science ambitions for KM3NeT (ORCA and ARCA) - Input KM3NeT MT to legal support team (datacentres) and SLA team - Result and progress in the KM3NeT project - Final draft SLA needs approval of the EWG, once the EWG restarts	**Restart of EWG activities by RRB/MT:** Based on the provision of the draft required annexes: • Total Costbook; • Common Fund; • S&T;description. • Provision of updated timescale and science ambitions for KM3NeT (ORCA and ARCA) - Intention by the minimum of the Member States (3) to establish an ERIC. - Timely responses to questions and comments EC. - Result informal request - Assessment procedure EC
Intervention	KM3NeT MT + RRB meetings; build consensus on financial commitments, minimum technical configuration SLA meetings; discussion with experts and MT on key-topics and content of the service level agreement for Sea Floor network	KM3NeT MT + RRB meetings; build consensus on financial commitments, minimum technical configuration RRB/MT continue discussion and information exchange with IB and Collaboration Legal Support team send reminders to KM3NeT MT	KM3NeT MT + RRB meetings; build consensus on financial commitments, minimum technical configuration RRB/MT continue discussions and build support for ERIC request, in bilaterals with the institutes and Ministries Legal Support team send reminders to KM3NeT MT All institutes should interact with their Ministries and try to convince them to join the ERIC	KM3NeT MT + RRB meetings; build consensus on financial commitments, minimum technical configuration RRB/MT continue discussions and build support for ERIC request, in bilaterals with the institutes and Ministries Legal Support team send reminders to KM3NeT MT All institutes should interact with their Ministries and try to convince them to join the ERIC	RRB/MT continue discussions and build support for ERIC request, in bilaterals with the institutes and Ministries All institutes should interact with their Ministries and try to convince them to join the ERIC