



Summary of the LNS Users Meeting 2022

Sea Infrastructure, Porto Palo di Capo Passero (SR),
December 19th, 2022

Foreword

Dear LNS Users,

here you can find a summary of the talks that were given at the 2022 LNS Users Meeting. At the beginning of September 2022 we had a telematic meeting about the organization of the Annual LNS Users Meeting. We discussed on the opportunity of focusing the 2022 edition of the meeting on the astro-particle physics activities because (a) the last year edition was mainly devoted to nuclear and applied physics researchers that could be carried out at LNS after the machine upgrades and (b) in 2022 the astro-particle physics activities at LNS, especially the ones related to the KM3NeT experiment, had a strong boost and received important fundings in the framework of the Next Generation EU project and the PNRR (*Piano Nazionale di Ripresa e Resilienza*). We then discussed on the possibility that, for the first time in the history of the Users Committee, the Annual Meeting of Users could be held in the Sea Infrastructure of the LNS, at Capo Passero (SR). We considered this possibility as a very important opportunity, since (a) the Sea Infrastructure is, for all intents and purposes, part of the LNS, even if geographically delocalized; (b) the Capo Passero site is frequented regularly by Users as well as the main LNS structure in Catania, then the Users Committee should be aware of their possible needs, according to the specificity of the site; (c) many of us have never visited the site and its laboratories. The LNS Direction and the Responsible of the Sea Infrastructure on the logistic feasibility of the meeting at Capo Passero warmly welcomed the idea once proposed the Coordinator of the UC, and we received an excellent support in the organization of the meeting from many people of LNS. We gratefully acknowledge all of them for their invaluable help.

Because of the limited space available in the Capo Passero meeting room, we opted for a hybrid meeting, with a limited number of participants attending in person and many other participants connected remotely. At the end of October, we aimed at organizing the meeting on November 25th, but due to the limited notice, it was pointed out that several users could have had difficulties in participating to the meeting. We then shifted the date to December, 19th 2022 and circulated the e-mail to all the Users with the announcement of the meeting on November 14th.

Around 100 people attended the meeting in total, of whom 60 were connected in remote. Participants on-site included the LNS Director, the Responsible of the Site, the UC members in charge, the former UC Coordinators, the present and the former Heads of Divisions, the LNS Coordinators of the Research Lines II, III, IV and V, the National Spokepersons of experimental activities based at LNS and the Local Responsibles of astroparticle physics activities. The meeting was divided into two main sessions: in the morning session, after the welcome address by the Director, the Responsible of the Sea Infrastructure and the Coordinator of the Users Committee, we had talks from the head of divisions and the coordinators of the INFN research lines at LNS. All the meeting presentations are available on the website at the link: <https://agenda.infn.it/event/33362/> . We encourage the Users to see them to find all the details discussed during the meeting.

In their talks, the Head of the Accelerator Division and the Head of the Technical Division in the morning informed us, for the first time, of an important delay in the schedule of the re-opening of the Superconductive Cyclotron due to a problem of non-conformities of magnetic coils by the external supplier. This news was the subject of an intense discussion between Users and the Director and the Heads of Division. Then, the meeting continued with the presentations by the Line II, III, IV and V Coordinators (or their delegates), followed by interesting discussions

on new possible experiments or initiatives with intersections among the different research Lines.

The afternoon session was dedicated to a scientific visit of all the laboratories and scientific infrastructures of the Capo Passero site of LNS. The visit was followed by the comprehensive talk given by the Deputy Spokeperson of the KM3NeT International Collaboration. Then, in the final discussion, some suggestions came from the Users to the Users Committee to improve the communication among the Lines, for example by sending regular messages or a short bulletin on the main news or updates occurring at LNS during a period of 3-4 months of activities. In conclusions, the Coordinator of the UC then announced that the mandate of the UC members is about to expire and that new elections are foreseen at the end of January 2023.

All the UC members acknowledge gratefully all the LNS Users for their helps and suggestions concerning all the activities performed in the last two years.

With our best regards.

Catania, February 2023

The LNS Users Committee

Chiara Guazzoni
Ivano Lombardo (Coordinator)
Lorenzo Manti
Tommaso Marchi
Sara Palmerini

MINUTES OF THE LNS USERS MEETING

(Porto Palo di Capo Passero, Siracusa, 19/12/2022)

Welcome address from the Director

(*Santo Gammino*)

The Director welcomes all the participants to the meeting. He briefly summarized the activities made at LNS in the last year, underlining the important scientific role of LNS in participating or leading several projects funded in the context of the Next Generation EU program. It was underlined that a large number of new researchers, technical and administrative staff peoples were hired in the last year, an important point to assure the continuity in the LNS activities.

Welcome address from the Resp. of the Capo Passero Site

(*Giacomo Cuttone*)

The Responsible of the Capo Passero Site welcomes all the participants and traces back the development of the Sea Infrastructure, in connection with the multi-disciplinary research activities that are performed. Then he illustrated the important research opportunities coming from the PNRR fundings of KM3NeT activities, that are mainly based in the Capo Passero Site.

News from the LNS Users Committee

(*Ivano Lombardo*)

The Coordinator of the LNS UC welcomes all the participants and, in particular, the previous speakers for their invaluable help in organizing the meeting. After describing the motivations leading the UC to organize, for the first time, the Annual Meeting in the LNS Sea Infrastructure, he described the main activities of the UC in the last year: the production of the minute of the previous meeting, a very long document collecting all the ideas and suggestions for future experiments after the POTLNS upgrade, the participation in the organization of the Nuclear Physics Mid Term Plan workshop, the update of the mailing list, the communication of information useful for the Users activities. The Coordinator also announced that new elections for the renewal of the UC will be performed at the end of January 2023, asking for candidatures.

Research activities at LNS

(*Aurora Tumino*)

The Head of the Research division at LNS made an overview of all the activities within the User Service, the Scientific Information Service, the Computing Service and the newly instituted Service for the Development of Experimental Equipment and Apparata. Some activities of the division in 2022 concerned the KM3NeT experiment, in particular on: the design, integration, deployment, maintenance of mechanical parts and battery pack for the Autonomous Acoustic Beacon Tripods; the Calibration Base integration; the Instrument Line design and integration; the Junction Box internal frame cooling system; the DU Integration, and the so-called *Process V*, related to the DU anchor assembly and DU release system. The *Management and maintenance of the experimental apparata and equipment unit* has been involved in various support activities for LNS users: (1) the definition, design and test of the vacuum system for the TRASMA scattering chamber that will be used for future laser experiments; (2) the support in the design of the new beam line to be installed at the Singletron accelerator of Catania physics department; (3) vacuum tests and technical assistance for the RED experiment; (4) restoration of a vacuum chamber for detector tests, with the manufacturing of the new flanges with signal feedthrough connectors for the Sicilia Laboratory; (5) maintenance of the vacuum system in the Electronic lab; (6) general technical assistance to the Users during the year; (7) disassembly of the entire vacuum system of the Ciclope experimental room. The *Laboratory of Chemical-Physical Techniques* was very active in manufacturing several targets for internal and external users of LNS, and successfully performed the implementation of the new thickness measuring machine, CACTUS, that included also a new system for the energy calibration of Si detectors based on two alpha sources. The *Laboratory for Electronics and Detectors* has strongly supported users activities also in 2022; in addition to ordinary ones, the following should be noted: the maintenance of the detector test stations and the reassignment

of devices and stations; adding galvanic insulation to test stations; the design and construction of the PCB for the nToF ring detector and its related cabling; the preparation of the KM3NeT base integration laboratory for the forthcoming phase 2; the definition and implementation of the PIDwall PCB for the NUMEN experiment. The Research Division has also given support to the development of the FRAISE project (with the design of the remote handling system and control software for the production target) and the SERSE 2021 project. Some recent activities for the LNS Users of the *Computing and Information Technology Service* concerned with: the network analysis and network segmentation planning in VLAN; the logical separation of networks; the implementation of a vulnerability scanning system for computer systems; the DAMP user migration to Alfresco system and the development of a centralized authentication system for network services (mail, VPN, wifi). The *Scientific Information Service* has given its strong support to organize very intense scientific training and dissemination activities in 2022 after the pandemic phase. It is worth mentioning the re-opening of the Visitor Center with more than 1000 students from high school from March 2022. Finally, the Head of Division illustrated the proposal for new beam lines and scattering chambers for the users within the framework of the POTLNS project. In particular, the GIRA vacuum chamber could be allocated in the Punto Misura 2 (a part of the ex Ciclope hall of LNS). Currently under discussion is the possibility of lengthening the GIRA chamber to house hybrid arrays of detectors for particles and gamma rays (RIPAGA) involving also the INFN CSN III. Further technical details are available in the presentation slides.

Accelerator's activities and perspectives at LNS

(Luigi G. Celona)

The Head of Division of the Accelerators division at LNS illustrated the status of the accelerators and ionic sources at LNS. As first point, he discussed the upgrading of the automation system and instrumentation of the TANDEM accelerator, making a detailed schedule of the actions that will be made in 2023. The first Tandem operations are expected for the end of 2023. In 2022 an extraordinary maintenance of the 450 kV pre-injection platform of the Tandem was made, and in 2023 it is planned to do a modification in the HV Distribution Rack to fulfil the present legislation. During 2022 training and skill transfer activities have been performed for the new personnel of LNS, and further developments of the NESTOR source for noble gases.

Concerning the CS status, important news was given. After discussing the new extraction system based on stripping, the Head of Division informed us that the performances of the magnetic coils of the CS that are currently manufactured by an external company, would deviate from the ideal case affecting part of the operative diagram. To minimize such deviations several actions are being taken. Beam dynamics simulations are currently in progress; also, a dedicated qualification of coils in warm conditions will permit to refine the studies. A masterplan with the sequence of all the activities that will involve the CS up to the delivery of beams to the users was shown and discussed.

Then, the coordinator discussed the status of the ECR sources SERSE and CAESAR. The upgrade of the superconducting source SERSE is a key factor to produce the beam intensities required by the Cyclotron. The refurbishment of some subsystems of SERSE were carried out in previous years (controls, gas box, insulated rack), but serious cryogenic problems arose during last operations. The Division carried out several tests in summer 2022 to investigate the possibility to revamp the cryogenic system, thanks to the addition of a third Single-Stage Pulse Tube to increase the refrigeration power of the nitrogen screen. It was also discussed a project for a new source: SC-AISHA. In fact, the ordinary AISHA ion source was conceived and realized for hadron-therapy facilities, and it has a strong limitation on a radial field (1.28 T instead of 1.55 T of SERSE) affecting HCI production. Therefore, the AISHa source will be used as a testbench for future beams development at LNS and R&D activities, while the SC-AISHa thanks fully superconducting magnetic field system will permit to overcome such limitation being ideal for the routinely beam production at LNS.

Technical Division Activities and status of the POTLNS project

(M. Musumeci)

The Responsible of the POTLNS project started the presentation by illustrating the current schedule of the CS magnet production and supply, that is the most important part of the upgrade of the accelerators. He indicated all the lags due to Covid pandemic, the +12 months lag in the delivery of superconductors, the +12 months lag for the cable supply and the +7 months lag for the supply of the new central ring

needed to mitigate the deviations due to the coils from the operative diagram of the CS. The scheduled end of the POTLNS project is foreseen in April 2024, with an overall lag of about 1.5 years.

Concerning the origin of the lags related to the magnet production, since May 2022 some new issues about some nonconformities in coil shape and size and the deformation on the cryostat subcomponents popped up; for this reason, the supplier suspended the activities (causing further lag in the supply) since May till now, during the renegotiation with the INFN Management for agreeing how to go ahead on the magnet construction using the currently available coils. A solution was found very recently and is going to be implemented. To try to mitigate the impact due to these problems with the supplier, the LNS group engaged into the CS simulation has been strengthened, both in term of FTE and of experience, in order to simulate as quick and precisely as possible the deviations from the ideal design of the magnet subcomponents and evaluate the effects on the beam acceleration. This action is crucial to guarantee prompt decisions making after receiving the actual values of the magnetic field measured by the supplier step by step during the magnet construction. After the delivery of the magnet, expected on the first half of 2024, there will be the commissioning phase of the machine (not included in the POTLNS project, but in charge of LNS structures) before to have the CS beams available to users.

The Responsible for the POTLNS also discussed the supply status of the FRAISE and MAGNEX hall radiation shielding; the progress in the delivery and displacement of the new beam lines; the status of the liner and some other extra-PON activities.

Beside the standard management and maintenance of the LNS infrastructures, the Technical Division is currently committed in leading several large projects. In particular, in 2022 a project for the renewal of UPS systems was presented; a preliminary project for a new fire detection and protection system was performed; the final project for a new fire detection and protection system construction is under finalization; the air treatment system for the experimental and accelerators areas was renewed. A strong support was also given to the EuAPS activities, with preliminary and operative projects for the new clean room and Control room for the new LNS laser facility.

Discussion in the morning

After the presentations of the Heads of Accelerator and Technical divisions, several comments, questions and requests come from the LNS Users to the Heads of Divisions and to the Director. The main point of the discussion was related to the lag in the supply of the CS magnet that will lead to a global delay of the date foreseen for the delivery of the new CS beams after the upgrade of the laboratories. In particular, the National Responsibles of the NUMEN experiment deeply regretted for this delay and for the prospected reduction of the CS operating diagram, that could strongly impact on future experimental activities, and asked for an extraordinary meeting between the LNS managements and the users to discuss in more details next plans, hoping for an improvement in the communications and for a deeper involvement of the community in future choices. The Responsible of the POTLNS project, in his reply, was astonished that the main point of discussion was based on the delivery time of the magnet, and not focussed on the risk associated to the reduction of the operative diagram that was run; nine months of delay are mainly due to the strong efforts made to eliminate such risk. Then, he underlined the faults of the external supplier, being at the origin of the delay: except for the small lag due to the pandemic, all the tenders were performed in due time, except for some cases not depending on actions of LNS officers and rather depending on market shortages. The Director, in his reply, underlined that the question of the delay in the supply of the CS coils and the search for a solution was carefully taken into account by the INFN management; the Director ensured that the LNS management will undertake all the possible actions to mitigate and minimize the effect of such delay. The Users Committee endorses the idea of a new users meeting to be performed in the very next months to discuss possible solutions or strategies to minimize the impact of the delay on the activity of the users. The National Responsible of the CHIRONE experiment, Paolo Russotto, asked also if previously accepted experiments by the PAC that were not performed due to Covid would have been reconsidered at the re-opening of the activities. The Director indicated that such experiment would certainly be reconsidered, but after that the PAC would have evaluated their timeliness and impact at the light of newly reported information in the meantime in the literature.

Astro-particle physics at LNS

(*Luciano Pandola*)

The deputy Coordinator of the LNS astroparticle group discussed all the activities related to the experiments on astroparticle physics involving LNS researchers (KM3NeT, Darkside/ReD, DUNE, VIRGO/ET). Members of CSN-2 at LNS are constantly growing in number and responsibilities and the role of LNS in international experiments is solid and respected.

KM3NET experiment is subdivided into two facilities: ORCA (in France, near Toulon) and ARCA (Capo Passero, Italy). The ARCA site is mainly involved in the study of neutrino astronomy; it is characterized by a 3500 m water depth, 100 km offshore and 2 building blocks with 230 units (700 m height). More details are reported in the talk of the Deputy Coordinator of the KM3NeT experiment, but it is important to underline the large number of spin-off initiatives, on several research fields (not only physics, but also oceanography, geophysics, environmental sciences etc) related to the ARCA site.

The VIRGO/ET experiment has several representatives in the LNS Group II, in connection with the Sassari University. Researchers from LNS/UniSS have the coordination of the Sardinian Site Characterization Activity: Data analysis and ET sensitivity estimation; Infrastructure design and feasibility study; Sensor Instrumentation and maintenance; Acquisition system and mechanics of the novel “Archimedes” tiltmeter. The role of LNS was recently empowered within PNRR project ETIC, especially concerning the site characterization and infrastructure design.

The DarkSide experiment at LNS is mainly linked to the ReD project for dark matter studies. The three-fold goals of the ReD experiment are: to check if a dual phase LAr TPC has sensitivity to the direction of Ar recoil; to characterize the response of the LAr TPC to very low-energy recoils ($< \text{few keV}$); to act as a test bench of the technical solutions for DarkSide-20ton TPC. The Tandem experiments at LNS and the subsequent analysis lead no indication for directionality. The LNS are also involved in the activity of the development of the new URANIA facility to extract and purify underground the Ar needed for the experiment. Researcher of LNS contributed also to the DUNE experiments on neutrino physics at FNAL; in particular, LNS has responsibilities in hardware construction and testing (far and near detector) and software (Geasigen for DUNE) and in the qualification of electronic components at cryogenic temperatures.

Nuclear Physics at LNS

(*Marco La Cognata*)

LNS hosts the largest nuclear physics division of INFN (about 60 FTE and 90 researchers/technologists) and the largest nuclear astrophysics community. The nuclear Physics Group at LNS was strongly involved, in 2022, in the organization of the Nuclear Physics Mid-Term Plan workshop, to discuss about future perspectives in the light of the new facilities that will be online in the next 5-7 years. At LNS, three out of the six CSN3 research lines are represented: Line 1 (quark and hadron dynamics) JLAB12 and EIC_NET, Line 3 (nuclear structure and reaction dynamics) CHIRONE and NUMEN_GR3, LINE 4 (nuclear astrophysics) ASFIN2, n_TOF and PANDORA.

The JLAB12 group is mostly involved in experiments using the CEBAF (Continuous Electron Beam Accelerating Facility) electron beam (1-11 GeV) at the JLAB (Hall B) for the search of A' dark photon.

The EIC_NET collaboration at LNS is mainly focused on R&D activities on the dual Ring Cherenkov radiators for hadron identification, reporting a successful commissioning of the DRICH prototype in 2021.

The CHIRONE collaboration, using the CHIMERA and FARCOS array for structure and dynamics experiments at intermediate energy nuclear reactions, highlighted the win of a PRIN (ANCHISE) whose activities started in 2022, on the development of new neutron detectors fully integrated with particle detectors for Fermi energy reactions. Furthermore, the ASY-EOS experiments at GSI obtained by the collaboration were cited in a paper on Nature and used to constrain the nuclear matter EoS both from heavy ion collision experiments and from astrophysics observations.

The NUMEN collaboration has recently performed several consistent studies (both on the experimental and theoretical sides) of all the reaction channels competing with the double charge exchange, to obtain a reliable description of the reaction mechanism and structure of this mechanism, at the basis of the NUMEN project. The collaboration is strongly involved in the construction of the new focal plane detector,

the new wall of telescopes SiC-CsI for the ion identification (PID-wall) and the development of a new gamma array calorimeter of LaBr₃ (G-NUMEN).

The ASFIN collaboration has been active in the field of experimental nuclear astrophysics since 90's allowing one to shed light on several astrophysical problems (BBN, stellar nucleosynthesis, explosive nucleosynthesis...). During the years, ASFIN applied THM but also ANC and Thick Target Inverse Kinematic (TTIK) methods for extracting nuclear reaction cross sections of interest for astrophysics. In particular, in 2022 the collaboration investigated p+Al reactions, determining a new rate for the $^{27}\text{Al}(p,\alpha)^{24}\text{Mg}$ reaction due to the contribution of a low energy state, and promoted a new experiment at TRIUMF to measure the $^{26}\text{Al}+n$ reactions channels with the THM.

The activities of the n_TOF collaboration at LNS are related to the analysis of data of neutron-induced reactions useful for nuclear astrophysics and applications and to the development of complex detection arrays able to detect charged particles in such hostile environments. Recent activities of the LNS group in the collaboration are linked to the first measurements of the $^{235}\text{U}(n,f)$ cross sections in the high-energy regime, from 10 MeV to 1 GeV (no data were present in the literature above 200 MeV), and the analysis of the $^{140}\text{Ce}(n,\gamma)$ reaction at very low energies, that is relevant for the s-process.

The activities of the PANDORA collaboration at LNS are related to the development of a new Superconducting Magnetic Plasma Trap containing a plasma made of multiply charged radioisotopes. The collaboration is also involved in the construction of a HPGe array made by 14 detectors to measure the gamma rays emitted after beta-decays (collaboration agreement with the GAMMA group). The Plasma Diagnostics System will consist of RF, optical and X-ray spectrometers allowing direct correlation of β -decay rate to plasma density and temperature and ion charge-state distribution. This new experimental setup will allow, for the first time, beta-decay measurements in plasmas; plasma opacity measurements in conditions similar to kilonova ejecta; an unprecedented setup for applications studies (fusion, archaeometry, etc.)

Theoretical activities supporting the experiments at LNS

(D. Gambacurta)

The coordinator of the Theoretical group discussed all the activities supporting the experimental research at LNS. The research activities of the LNS theoretical group fit within *two specific initiatives* of the INFN CSN IV (theoretical physics): MONSTRE (MOdeling Nuclear STructure and REactions) and SIM (Strongly Interacting Matter at high density and temperature). Research activities strongly linked with experiments at LNS involve the study of: collective nuclear excitations (especially in neutron-rich and exotic nuclei); the EoS of asymmetric matter (symmetry energy) and modelling of neutron stars; Charge exchange excitations (Gamow-Teller, Fermi, etc.); Beta Decay (single and double, with or without neutrinos); Proton-Neutron pairing in nearly symmetric nuclei; dynamical evolution of nuclear reactions at Fermi energies; direct reactions (transfer, charge exchange, probing spin-isospin channel); fragmentation reactions, also for medical applications; Impact of EoS on nuclear reactions; Reactions of astrophysics interest (light systems, cluster structures). Among the results obtained in 2022 by the theoretical group, there are the study of double charge exchange reactions by double meson exchange theory, DWBA studies of low energy nuclear reactions of astrophysical interest, proton-neutron pairing in nuclei close to the N=Z line, the study of quenching of Gamow-Teller strengths in medium mass nuclei.

Applied physics at LNS

(Salvatore Tudisco and Giuseppe P. Cirrone)

The coordinator of the Applied Physics Group of LNS, S. Tudisco, discussed the main activities linked to the CSN V research line at LNS: biophysics research with in-vivo and in-vitro experiments, irradiation studies, improvements and research on proton-therapy for cancer treatments, development of Monte Carlo tools (Geant4), non-destructive analyses on artworks, development of new detectors, project and development of new ionic sources. Four project directly funded by the PNRR of the Italian Government are related to Applied Physics activities at LNS: the EuAPS initiative on advanced photon sources with lasers; the SAMOTHRACE project with the INFN-Spoke5-MADE4IS initiative (Micro-Accelerator and DETectors for Innovation and Sustainability); the ANTHEM project (AdvaNced Technologies for Human-

centrEd Medicine); the ITINERIS project (ITalian INtegrated Environmental Research Infrastructures System). Then, G.A.P. Cirrone, former Coordinator, described in more details the irradiation facilities at LNS, including the new station for X-rays irradiation. He described in detail the plan for the new I-LUCE facility of LNS for laser induced acceleration, the characteristics of the expected beams and an overview of some of the possible experimental activities (both fundamental and applied) that could be performed when the new facility will be operative. For example, direct measurements of ion stopping power in plasma would be possible with the new installations. Among the applied physics topics that could be performed we find also: radioisotope production; hydrogen production; very intense neutron and gamma sources; space applications; cultural Heritage.

KM3NeT experimental activities

(Rosa Coniglione)

The Deputy Spokeperson of the KM3NeT experiment described the layout and the main experimental activities linked to the detector installed very close to the Capo Passero Site. KM3NeT is a research infrastructure hosting two neutrino detectors in the Mediterranean Sea: KM3NeT/ARCA (Astroparticle Research with Cosmics in the Abyss) for the observation of high energy (GeV ÷ PeV) neutrino sources with a telescope offshore Capo Passero at a depth of 3500m; KM3NeT/ORCA (Oscillation Research with Cosmics in the Abyss), for the determination of the neutrino mass hierarchy with a detector offshore Toulon (France) able to detect neutrinos of tens of GeV. The detector in the ARCA site is made by two blocks of 115 units (the DUs), with an average distance of 90 m. The DOM (Digital Optical Module for the Cherenkov light) are displaced with vertical distances of 36 m. Finally, the detectors would cover an effective volume close to 1 km³ of water. After discussing the principle of neutrino detection and identification in the KM3NeT experiment, the technology of DOM, DU, and of the Junction Box (JB) for the feed-through of power and signals was highlighted, together with the architecture of the whole apparatus.

In 2022 there were two important campaigns of deployment (June and November): globally, in 2022, 11 DU, 2 JB and a new main cable were deployed. The KM3NeT4RR funds by the PNRR, obtained in 2022, will allow the completion of the first block and the construction of about 15 DUs of the second block of the ARCA detector (125 DUs funded so far on a total of 230). Then the main experimental activities performed at LNS were shown; they concern in particular: the preparation of sea campaign (logistics and customs documents); the upgrade of DAQ hardware and software at the Capo Passero Shore station; the Sea Network upgrade (JBs + interlink cables); the DU Integration; the Base Module integration; the procurement and detector operations. An interesting discussion on the implementation of the JB was also shown to the users. Finally, the presentation showed also the future KM3NeT challenges; they are related to: constantly increasing costs of electricity, transportations, sea campaigns, components; shortage of components as titanium (a fundamental component of the detector) and semi-conductors (piezos, FPGAs, etc); the need for further human resources for integration: in this framework, the KM3NeT4RR helped a lot for Italy, while the French side needs a further reinforcement. In the next future, to allow the completion of the detector as planned, a constant support of the different LNS departments is needed.

Discussion in the afternoon

In the short discussion of the afternoon, the National Responsibles of the CHIRONE experiment, Sara Pirrone and Paolo Russotto, also endorsed the idea of a meeting in short time to discuss of future perspectives for the users considering the delay in the arrival of the new cyclotron beams. The former LNS Users Coordinator, Giuseppe Cardella, suggested to improve the communications of news concerning the activities and updates of potential interest for LNS Users by means of periodic e-mail updates from the Users Committee to the Users. The suggestions have been positively considered by the Users Committee. The workshop ended at 5:00 PM.