55^{th} MEETING OF THE LNF SCIENTIFIC Committee – 14-15/05/2018

1. DAΦNE, KLOE, BTF, PADME and SIDDHARTA 3
   - 1.1 DAPHNE 3
   - 1.2 KLOE 4
   - 1.3 BTF 4
   - 1.4 PADME 5
   - 1.5 SIDDHARTA 6
   - 1.6 Recommendations 8
2. SPARC_LAB activities 11
   - 2.1 Recommendations 13
3. LEMMA 13
   - 3.1 Recommendations 14
4. NA62 and JLAB_CLAS12 15
   - 4.1 Recommendations 16
5. Next Meetings 16

The chair opens the meeting by, first of all, thanking Gigi Rolandi for having chaired this committee so successfully over many years. Also Yannis Karyotakis participates for the last time, and similar thanks go to him.

The LNF director then gives a short overview of the main events and issues that arose since the last meeting of the SC. In particular, he reminds the SC that a small committee has been set up in order to study in detail the possibility of continuing operation of DAPHNE as a "facility", after data taking with SIDDARTHA-2 ends (most likely end of 2019 or early 2020). A first document (in Italian only for now), prepared by the working group, has been sent to the INFN management very recently. There a number of use cases have been identified for such a facility as a test-bed for accelerator physics. Obviously, running the facility for 7-8 months per year has its costs; besides electricity, part of the aging infrastructure would have to be renewed. If positive feedback (to be distributed to the SC) is obtained from INFN management, a dedicated workshop will be organized for more in-depth discussions.

Regarding SPARC/EUPRAXIA, the director is very happy to inform that the CDR has been completed and first printed copies will be distributed to the committee this week. The document has also been sent to INFN management that is expected to set up an international review committee as a next step. Further good news is that the INFN board and director have given green light to the project of the new building construction.

Concerning ELI-NP, unfortunately the situation has gotten worse, with no delivery of the building to the consortium at this stage and major issues discovered with the actual infrastructure. The situation has evolved into a legal case, with even highest political levels involved in order to find possible solutions.

As already reported last time, there are positive developments concerning the person-power situation in the lab: a law decree allows INFN to hire people on permanent contract who have been on non-permanent contracts for a longer period already ("stabilizzazione"). This implies that a substantial number of persons (about 30; technicians, administrative personnel and scientists), with contract durations of already >3 years, will soon be hired. The drawback of this, in principle positive, situation is that in this manner the flexibility of the lab in choosing the best personnel is somewhat limited. The director also highlights that this is personnel already working for the lab, thus the overall person-power will not increase. Furthermore, a general concern is the (sometimes) lack of timely hand-over from retiring personnel to younger new-comers, and the overall significant number of retirements expected for the coming 5 years.

Regarding scientific developments, the director briefly summarizes the most relevant recent events (that are described also in more detail in the sections below). In particular, he informs about the change of overall schedule in 2018, with the start of SIDDARTHA-2 data taking (first technical run) shifted towards the end of the year.

A general concern for the scientific activities in the lab is the continued decline in the number of theoretical physicists. The SC chair confirms that this should be an item of priority for the upcoming SC meeting, with a possible strong statement to be made by the committee.

1. DAΦNE, KLOE, BTF, PADME and SIDDHARTA

1.1 DAPHNE

KLOE-2 operation has come to an excellent end, with a final total integrated luminosity of 6.8 fb^{-1} delivered. From an accelerator perspective it was emphasized that the Crab-Waist (CW) scheme provided a 59% increase in terms of peak luminosity as evidenced by data taken by KLOE-2.

There has been a lot learnt in the operational use of the CW scheme over the years relating to: beam dynamics; background control; electron cloud and related instabilities. High current operations have been possible thanks to the scrubbing process and are strongly dependent on bunch-to-bunch feedback systems.

An enormous amount of operational experience has been gained in achieving the milestones set for the KLOE-2 runs. Careful scheduling has assured the time for: maintenance; machine studies and measurements; dealing with unexpected faults even those caused by external factors. Data taking has been maximized with due attention to machine uptime, integrated luminosity trends, and the fault rate of collider subsystems.

The committee took note that it was not always plain sailing and despite the major upgrade done before starting the run, many corrective measures had to be done during data taking. Time originally allocated for machine studies and measurements was often spent for interventions caused by anomalous issues in specific subsystems, resulting in subtle effects on beam optics and beam dynamics. This approach and a considerable lack of person-power prevented the realization of DAPHNE's full potential as a collider, but did assure successful data taking and a respectable collision uptime of the order of 75%.

The preparatory phase for the SIDDHARTA-2 run is well established and the planning looks reasonable. Preparations will include work on power supplies, dump kickers, feedback systems, vacuum, cooling system, control system and machine-experiment data exchange. The roll-in of SIDDHARTA-2 is foreseen for end of November 2018.

1.2 KLOE

The KLOE experiment successfully finished data taking on March 30th 2018 and, including the initial KLOE run, has accumulated a total of 8 fb^{-1} for physics analyses. The SC wholeheartedly congratulates the KLOE collaboration for this achievement! By the end of June 2018, the KLOE detector will be rolled out of the DAPHNE beamline. Now, that the data taking has finished, the focus of the collaboration has shifted more to the reconstruction software and data analysis. A new reconstruction version (v38) has been prepared, increasing the speed by about a factor of two compared to the previous version, primarily through improved background rejection. The data reconstruction is now in progress with this version at a rate of 20/pb per day, and anticipated to take about nine months. A major effort is also being made to transfer the current data from DST format into root format in the next version (v39), in order to improve the accessibility of the data and to ensure long-term data preservation. This is done in collaboration with experts from CERN. Data analysis is also ongoing, particularly in modes containing neutral pions. The HET-tagged diphoton to pi0 process is being searched for, but while about 100 events are expected in the dataset analysed, unfortunately no signal is seen and there is no understanding of why the signal is not present. Recently an improved understanding of the HET efficiencies was achieved through a nice analysis of Bhabha scattering events. Since data taking is finished, it seems to be a good time now to make a concrete plan for the publication of the data and to present this at the next meeting of the Scientific Committee meeting. The SC encourages the collaboration to present a list of analyses envisaged, including approximate time scales and people interested (in particular highlighting the PhD students and postdocs involved).

1.3 BTF

The objectives of the ongoing BTF upgrade were clearly stated in the corresponding presentation: second beam line; photon tagging system; Linac consolidation; preparation for the PADME dark photon experiment.

The upgrade is progressing well, having waited until the end of KLOE-2 before performing any major interventions on the accelerator complex. Preparation of the 2nd experimental hall and BTF-2 are ongoing; the team expects approval from radiation authorities by summer if no further issues arise. A new control room and new controls/network infrastructure are ready for PADME operation.

There is a very tight schedule aiming to complete by June 2018: (re)installing hardware (e.g. beam splitting fast dipole); have the BTF-1 line in the final position; installing the PADME experiment. This is to be followed by beam commissioning and the start of PADME Run 1. In 2019, it is foreseen to install the BTF-2 line with photon tagging and start the BTF-2 beam commissioning.

The beam-line doubling program suffered significant delays, but bidding is now practically complete. Infrastructural work resumed after some difficulties: civil engineering is essentially completed; projects for second line plants (cooling, conditioning …) are under way.

Significant Linac consolidation has taken place (e.g. PFN charging circuits to solid state power supplies; modulator renewal) with a notable level of investment from INFN. The Linac is getting ready to restart in mid-June for warm-up and beam commissioning for the PADME run.

Beam configuration for PADME is under exploration, in particular the need for the longest possible pulse of at least 100 ns.

1.4 PADME

The PADME experiment is currently in the end-phase of the experimental setup and has gone through an impressive transformation in the past months. The magnet will be installed in the coming weeks and will be connected to the infrastructure with first tests started shortly afterwards. The diamond target has been finalized and is ready to be moved to the BTF area. Almost all BGO crystals and PMTs for the ECAL have been delivered, 250 PMTs have been tested (with a low failure rate), the stand is ready and the ECAL will be assembled in the BTF hall. The forward photon counter has all 25 PbF_2 crystals and PMTs delivered, and the assembly is being finalized. The charged particle counters and electronics are ready to be mounted in the vacuum chamber. The DAQ is essentially ready, with the final firmware development for the trigger board ongoing. The only major part that is currently being manufactured is the vacuum chamber, which is being machined and welded at an external company. The vessel is expected to be delivered at the end of June. The TimePix beam monitor is delayed to September. However, since it is mounted externally, it can be included straightforwardly into the setup once it arrives; it is not necessary for the initial beam.

The collaboration identifies the GEANT4-based MC simulation as a potential risk, due to uncertainties in the Bremsstrahlung because of nuclear field effects in the implementation at energies of O(100 MeV). The other potential risk is the operation of the Mimosa beam monitor in vacuum due to thermal issues. This is currently being studied and the collaboration is optimistic that there is sufficient time to mitigate potential problems. A backup solution is to use the TimePix beam monitor that will be operated outside of the vacuum chamber.

The schedule driver is the delivery of the vacuum chamber. Once it arrives at LNF, several pieces will have to be mounted: the charged particle veto, cable feedthroughs and the carbon fiber flange, before the final vacuum tests can commence. The collaboration expects to be able to do all these tasks "realistically" within a week, which means that a few weeks of beam could be used in July for first beam and commissioning. A detailed installation plan is being prepared. However, this leaves little margin before the summer break and the schedule could slip into September. The SC recognizes that not much can be done to speed up this schedule and encourages the collaboration to continue preparing all other systems. Once the experiment is ready and the beam arrives, the collaboration is well-prepared to commission the detector, start shifts and the physics program.

Part of the researchers in the PADME collaboration are in the NA62 collaboration as well, which also has a dark sector program: one more reason to strongly suggest that both collaborations show their exclusion plots superimposed. The region in the parameter space that PADME can really probe should be compared to those covered by NA64 and BaBar. It should be made as clear as possible in which region of mass and couplings PADME is superior to competing experiments. It is suggested to also include a discussion on PADME, comparing it to competing experiments, in the upcoming update of the European Strategy. This is done with the purpose of improving on the international visibility of the PADME experiment that could certainly benefit from more feed-back from the community.

1.5 SIDDHARTA

The SIDDHARTA-2 team is ready to mount the experiment and perform the technical run in late 2018 or beginning of 2019. The delay of a few months with respect to the schedule presented at the last SC meeting in November 2017, caused by some slippage in the overall schedule for PADME-BTF-LINAC-DAPHNE complex, does not appear to be worrisome, as long as the data taking for SIDDARTA-2 can start by mid-2019 (latest) and continue until a total required luminosity of 800 pb^{-1} is accumulated. This will guarantee that LNF is the first facility to measure Kaonic-deuterium, since the experiment planned in Japan will come later. The measurement of the Kα line of kaonic deuterium is very much awaited for by the community, as it will tightly constrain the kaon-nucleon interaction models, which predict energy shifts and widths that are several times larger than the expected SIDDHARTHA-2 uncertainties of 30 eV and 75 eV, respectively.

The target setup and related cooling system are ready in Vienna for being shipped in June. Vacuum tests are being carried out at LNF; a new and better beam pipe (aluminum with carbon-fibre enforcement) is ready. The DAQ and trigger systems are also basically ready. During the early phases of data taking, only 8 SDDs will be installed for testing (these might even include spare SDDs), before then installing the full system. By now, 46 SDD modules have been assembled, bonded and tested. As an important part of the commission step, the collaboration plans to repeat and compare to the 2010 measurement of kaonic He-4. The significant improvements of the SIDDARTHA-2 setup in terms of veto counters, compared to the 2010 version, are expected to result in a factor ~10 improvement in terms of signal to noise ratio. The machine luminosity (determined from Bhabha scattering) will be cross checked by a direct measurement of the Kaon luminosity (Kaon pair production) using dedicated counters.

The close, solid and productive collaboration between the SIDDHARTA-2 and DAPHNE teams towards the preparation and running of the experiment for more than a year is a key issue for achieving the goals of the measurement. This fruitful synergy is very much acknowledged by the committee.

The personnel need for installing SIDDHARTA-2 on DAPHNE and performing the technical run are secured, with all specific tasks having been distributed among the different institutions contributing to the SIDDHARTA-2 experiment. A concern was raised about having enough person power for the entire data-taking phase of the experiment, which will now extend from April 2019 onwards. Personnel support from the LNF management, together with that of the collaborating institutions, is expected be ensured until the end of the 800 pb^{-1} data-taking.

1.6 Recommendations

The SC congratulated the DAPHNE team for the excellent performance during Run IV, which culminated in a total of 6.8 fb^{-1} delivered to KLOE-2.

The SC takes note that the machine studies time was sacrificed in the interest of remedial actions – understandable in the last year(s) of operations but unfortunate nonetheless. The teams' own observation about lack of manpower should be noted.

The SC highlights that, from an accelerator physics perspective, the KLOE-2 run is clearly marked by the effective integration of the CW scheme in the presence of a high field detector solenoid. The fact that the CW scheme has proven to be a viable approach to increase luminosity in a circular collider is of wider interest to the international community.

The SC recommends capturing the experience – positive and negative – in a definitive report on the use of the CW scheme at DAPHNE.

The SC notes that SIDDHARTA-2 requirements include the same signal/background ratio as SIDDHARTA-1 and an integrated luminosity of 800 pb^{-1}, and that the Operations team are targeting the same beta and crossing angle as used in the KLOE-2 run.*

The SC recommends to consider and establish, during commissioning if appropriate, a more relaxed set-up, as possibly favoured by aperture considerations.

The SC takes note of the costed list of proposed consolidations that was presented. If budget constraints preclude full execution, then careful prioritization should take place to ensure maximum availability over the coming years, bearing in mind the reduced demands during the proposed use of DAPHNE as a test facility.

The SC recommends the standard cold-checkout, beam commissioning, scrubbing run required as a pre-cursor to the SIDDHARTA run to be *carefully planned and tracked. Appropriate technical support during the run should be assured, with due regard to the other activities being pursued at LNF.*

The SC recommends to carefully scrutinize the outcome of the workshop on DAPHNE as a test facility planned for this autumn, and to establish a detailed roadmap.

The SC wholeheartedly congratulates the KLOE collaboration for the successful end of data taking on March 30th 2018; including the initial KLOE run, this has led to an accumulated data set of a total of 8 fb^{-1} for physics analyses.

The SC invites the KLOE collaboration to prepare a concrete plan for the publication of the data and to present this at the next meeting of the SC. The SC encourages to present a list of analyses envisaged by the KLOE collaboration, including approximate time scales and people interested (in particular highlighting the PhD students and postdocs involved).

The SC commends the BTF team for having established a well solicited facility, as evidenced by user publications.

The SC appreciates that the general principles of the BTF upgrade, namely to minimize the stop and impact on experiments, have been respected thus far. However, the SC notes that the short-term planning looks very tight and close monitoring and prompt follow-up will be required.

The SC agrees that the move to enable Italian SMEs to bid for new components (magnets, vacuum, mechanics…) is necessary, but it has to be noted that this brings the possibility of delays. Therefore, the SC recommends that appropriate quality control under time constraints must be guaranteed.

The SC has noted that, while the Linac consolidation activities are on-schedule, the same core team is working on operations and on the upgrade. Thus, again lack of manpower is identified as a potential issue.

The SC notes that the PADME run is well motivated from a physics perspective and recommends that flexibility in scheduling should be anticipated, in order to allow full delivery of the requested dataset.

The SC congratulates the PADME collaboration for having made major steps forward in the past months, towards setting up the experiment for first data taking.

The SC takes note of the risks identified by the collaboration, related to the accuracy of the MC simulation in the low energy regime and the operation of the Mimosa beam monitor in vacuum, and encourages the team to pursue their studies of these issues together with possible back-up solutions.

The SC takes note of the fact that the overall schedule driver is the delivery of the vacuum chamber and recognizes that not much can be done to speed up this schedule. The SC encourages the collaboration to continue preparing all other systems, in order to be well-prepared to commission the detector, start shifts and the physics program, once beam arrives.

The SC strongly recommends the PADME and NA62 collaborations to show their exclusion curves superimposed. In particular, the region in the parameter space that PADME can really probe should be compared to those covered by NA64 and BaBar, and the parameter regions where PADME is superior to competing experiments should be clearly highlighted.

The SC suggests to submit a discussion on PADME and its complementarity to other experiments to the upcoming update of the European Strategy. This should also help improving the international visibility of the PADME experiment and thus provide more feed-back from the community.

The SC congratulates the SIDDHARTA-2 team for the successful continuation of all preparations necessary towards a successful start of run.

The SC is happy to note the very constructive, close and fruitful collaboration between the SIDDHARTA-2 and DAPHNE teams and encourages to pursue this during the further upcoming preparatory, commissioning and running phases.

The SC takes note of the concern raised by the SIDDHARTA-2 team about the continued LNF support in terms of person-power, in case the run extends beyond 2019; however, the SC understands that the LNF management is well motivated to secure the already provided resources until the end of data taking.

2. SPARC_LAB activities

The SC has followed presentations by Massimo Ferrario on (1) the completion of the EuPRAXIA@SPARC_LAB conceptual design report (CDR) and (2) the status of work at SPARC_LAB.

(1) Completion of the CDR for EuPRAXIA@SPARC_LAB:

The CDR for EuPRAXIA@SPARC_LAB describes the design of a 1 GeV electron beam that drives a FEL in the water window. The 1 GeV electron beam in the EuPRAXIA@SPARC_LAB design can be produced by an X-band RF linac or a plasma accelerator driven by electron bunches or laser pulses. The time line is to complete the building by 2022 and serve the first users in 2025. A review committee for the CDR report will be put in place later in 2018.

Start-to-end simulations of the 1 GeV PWFA-driven FEL process have been performed, from the photo-cathode to the X-ray delivery with less than 30m undulator length. The simulations indicate that a number of photons similar to that produced by the X-band linac beam may be generated with the plasma accelerated beam. The X-band RF development is based on a collaboration with CERN for the main components, CERN providing the klystron and cavities, LNF providing the modulator. The FEL aims at becoming a user facility providing radiation for the regional as well as national and international communities. The bidding for the new building will occur over the next six to nine months.

The EuPRAXIA@SPARC_LAB effort aims at proposing LNF as the site for the EuPRAXIA European research infrastructure. EuPRAXIA is presently being designed by a consortium of 40 institutes in the framework of a Horizon2020 funded EU design study. The EuPRAXIA CDR will be published in October 2019 and targets a 5 GeV beam and user facility. Massimo Ferrario explains that the possibilities to generate a 5 GeV electron beam within the available space at Frascati are being studied. The EuPRAXIA@SPARC_LAB project has obtained funding from INFN for the building and from the Regione Lazio (LATINO) for setting up the X-band R&D laboratory.

The committee congratulates the SPARC_LAB team on the successful completion of the CDR and the success of acquiring funding for the first steps in the project. The document shows excellent progress towards EuPRAXIA@SPARC_LAB. There is a balance between technical ambition and risk, performance estimates are attractive and risk mitigation strategies have been included. A cost estimate has been included but operating costs have not yet been specified. A short science case has been prepared. The European context of EuPRAXIA@SPARC_LAB has not yet been defined.

(2) Progress at SPARC_LAB:

During the last year, a better plasma chamber has been installed on the linac beam line. It satisfies the gun vacuum requirements. A new plasma chamber for LWFA experiments has also been built. A new capillary power supply delivering higher current was developed. Higher plasma current may lead to hotter and thus more uniform radial plasma densities, yielding better focusing characteristics for active plasma lens experiments. Progress with experiments has been hampered by various technical problems with the linac or the FLAME laser. Their respective uptime was only 33% and 25%. Experimental plans for the near future include PWFA experiments with the drive, witness and drive and witness beams together. These are essential for gaining experience towards FEL-driving experiments and for demonstrating readiness for EuPRAXIA@SPARC_LAB.

The committee is worried about the slow progress with SPARC_LAB and the significant delays. It notices that the foreseen writing of a EuPRAXIA@SPARC_LAB TDR at the same time as the running of experiments at SPARC_LAB may be a real challenge for the team. While support from the management has increased over the last few years, the source of major delays in repair and absence of problem prevention may be the lack of perception, particularly among the scientific staff, that SPARC_LAB is a major project of the laboratory. Involvement of beam operators to operate SPARC_LAB on a 24h-basis (experiments during the day, training and reliability tests at night) would help for increasing the importance of SPARC_LAB uptime and operation and determining weaknesses of the systems in preparation for transition towards a user facility status.

2.1 Recommendations

The SC congratulates the EuPRAXIA@SPARC_LAB team and LNF for the successful completion of the CDR.

The SC recommends that the CDR review panel should include potential users of the facility to assess the interest of the photon science community in the EuPRAXIA@SPARC_LAB FEL.

The SC recommends that the EuPRAXIA@SPARC_LAB project be aligned as well as possible to the EuPRAXIA technical goals and time scales to maximize the chances to be selected as site for the EuPRAXIA research infrastructure.

The SC suggests that work on the following topics should be continued:

- *Explaining the unique points of the EuPRAXIA@SPARC_LAB plasma FEL (new performance reach? cost-effective?)*
- *Expanding the scientific case*
- *Defining the EU context (access? users?)*
- *Defining the operating costs*
- *Studying realistic performance (unavoidable imperfections)*

The SC strongly recommends an internal review to be conducted, in order to analyze the problems that have occurred at SPARC_LAB, the state of the infrastructure and the effectiveness of the work organization. The review should also investigate if more frequent meetings between the laboratory service, operational teams, maintenance groups and experimental groups would be useful.

The SC recommends to implement with priority measures to increase the uptime of the experiments.

3. LEMMA

The SC has followed a report on LEMMA, the "Low EMittance Muon Accelerator" project. Muon beams have a factor 200 higher energy reach for circular colliders than achievable with electron and positron beams. This is due to the reduced energy loss from synchrotron radiation in storage rings of the same size. The concept is intriguing and theoretical progress in developing muon collider solutions has been very good. However, the experimental progress in muon beams is so far quite slow. This is due to the required front-end for muon capture and cooling, which is technically difficult and highly expensive to demonstrate. Only modest experimental progress was possible in the last decades with the available resources. LEMMA is following up on a new approach for generating a low emittance muon beam without the need of large aperture capturing magnets and strong cooling. This Italian idea generates two muon beams out of a 44 GeV positron beam hitting a target. Inside the target, the 44 GeV positrons react with electrons at rest to produce two low divergence and low energy spread beams of positively and negatively charged muons. Several detailed physics and radiation aspects were presented. The muon flux with LEMMA is lower by several orders of magnitude than in the conventional muon collider approach. An international study group is being set up and a workshop within ARIES planned during Summer 2018. Experimental tests at CERN and at DAPHNE are planned and were described. The short-term goal is to produce a CDR and a white paper for LEMMA.

The committee finds the LEMMA idea very interesting. It offers a new approach and brings new life into the Muon collider field. Muon colliders would open a new horizon for the HEP energy frontier. The SC appreciates the efforts to set up LEMMA as an international project. The committee notes that the LEMMA concept requires a high average power positron beam at 45 GeV and a positron storage ring, therefore a billion Euro scale investment for muon production. Therefore, LEMMA does not seem to overcome the problem of the expensive initial front-end. In particular, a strongly focused CERN involvement and significant CERN resources will be required to develop muon colliders for science. Without this the potential and return of investment of LEMMA (beyond accelerator science) would be unclear.

3.1 Recommendations

The SC congratulates the laboratory and the involved team for having revived the interest in the muon collider option thanks to a very original proposal for low-divergence muon beam production.

The SC recommends to study if the muon flux achievable with LEMMA is sufficient for muon collider physics needs.

The SC asks the goals of the proposed experimental tests at CERN and DAPHNE to be described in more detail. It should be clarified to what extent new insights and feasibility demonstrations for LEMMA are achieved.

The SC suggests to continue the efforts to include LEMMA as much as possible into the international context and to include experts from UK and US past/present efforts.

The SC recommends to carefully consider radiation effects and limits and to study the implications on possible and realistic sites.

4. NA62 and JLAB_CLAS12

The Frascati group is involved in the NA62 experiment at CERN. The primary goal of the NA62 experiment is to make a 10% measurement of the branching ratio of $K^+ \rightarrow \pi^+ \nu \nu$. The main contributions of the group have been the fabrication of the photon veto detectors, and their operation during data taking, data quality monitoring and work on the L1 trigger. Based on the 2016 data, the first search for the $K^+ \rightarrow \pi^+ \nu \nu$ decay was performed. One event was observed, consistent with the background expectation and an upper limit was set. Based on this analysis it is estimated that with the 2017+2018 data about 20 SM events may be observed, which should lead to the world's most precise measurement. The Frascati group contributes to aspects of the analysis related to the photon veto. In addition, the Frascati group is playing a leading role in "exotic" searches, i.e. searches for dark photons, heavy neutrinos and axion-like particles. In all cases a good sensitivity is expected with the run-2 dataset. The group is also engaged in a proposal for a new experiment at the SPS, called KLEVER, with the goal to observe and measure the $K^0 \rightarrow \pi^0 \nu \nu$ decay mode. This proposal is being prepared as part of the "Physics beyond Collider" effort at CERN for the European Strategy update.

An LNF team has made a significant contribution to the upgrade of the CEBAF Large Acceptance Spectrometer (CLAS) at JLAB, that recently has started its new run using a 12 GeV electron beam. In particular, LNF has proposed, designed, constructed (in collaboration with other institutions), tested and installed the RICH detector that will be an essential tool for the Kaon program of the JLAB_CLAS12 experiment. Data taking has started in January 2018, with no major failures of the RICH system reported after the first 4 months of data taking. Some very first promising data quality plots have been presented this time, and further results are expected to be shown at the next meeting of the SC. At the same time, the construction of a second RICH module (in order to extend the particle ID coverage) has started, with installation in CLAS12 foreseen for 2020. This second module is mostly identical to the first one, with the exception of replacing the multi-anode photomultipliers with SiPMs for reasons of cost reduction; therefore, it is anticipated that this 2nd module construction will not impose significant requirements in terms of engineering personnel to the lab.

4.1 Recommendations

The SC congratulates the NA62 team for its important hardware contributions to the experiment, the successful first data run and the first interesting and promising results presented at recent major conferences.

The SC suggest to consider a stronger involvement of the LNF NA62 team also in the main-stream physics analysis (rare Kaon decay), besides their important contributions to the "exotica" searches.

The SC congratulates the LNF team working on the JLAB_CLAS12 experiment for the successful delivery and start of operations of the RICH detector.

The SC takes note that the construction of the 2nd RICH module will be rather light-weight in terms of engineering person-power requirements, being mostly identical to the first (now installed) module.

5. Next Meetings

56th SC 5-6 November 2018
57th SC 6-7 May 2019