37th MEETING OF THE LNF SCIENTIFIC COMMITTEE
FINDINGS AND RECOMMENDATIONS

PRELIMINARY MATTERS

The main focus of the 37th meeting was the recent performance of the DAΦNE collider, which had greatly improved and was still rapidly improving at the time of the meeting, and allowed a fresh and hopeful look a the experimental program for 2009.

Two new participants were welcomed: Clara Matteuzzi, chair of the Beam Test Facility Committee who joins the Committee as observer, and Umberto Dosselli, INFN Vice-President, who will attend on behalf of INFN's Executive Board (Giunta Esecutiva). Sergio Bertolucci, who attended his last meeting on behalf of the Giunta, was thanked for his contributions.

This was also the last meeting for Matthew Moulson who is being replaced as Scientific Secretary by Pasquale Di Nezza. M. Moulson was warmly thanked and congratulated for his efficient and dedicated years of service and for the consistently excellent quality of the documents he provided. P. Di Nezza was welcomed in.

There was a brief round of questions about the recent worrisome developments in Italy concerning positions in Universities and INFN, LNF in particular. The situation was still evolving rapidly and while it gave grounds for grave concerns it was not deemed useful to dwell on it in this meeting.

The closed session followed the order of the open session presentations: the status of the SPARC and SPARX projects was discussed, followed by an extensive review and recommendations on the operation of DAΦNE and its experimental program in 2009. The operation of the Test Beam Facility was discussed for the first time, as well as the report on the status of the OPERA experiment.

1. STATUS OF SPARC / SPARX

The referee, Joerg Rossbach (JR) met with the SPARX representative L. Palumbo on Dec. 1. and with the SPARC project leader M. Ferrario on Dec. 2, 2008, and discussed a number of scientific, technical and management issues related to these projects. The findings are as follows:

1.1 SPARC

SPARC is now completely installed in its basic configuration and is ready for FEL commissioning. The Committee congratulates SPARC's excellent and highly motivated team for this achievement. The organization works smoothly, and the team is very well embedded into international collaborations. Progress since May 2008 occurred mainly on

1. detailed measurements of electron beam dynamics including velocity bunching, a scheme invented and pioneered at SPARC. Excellent agreement with theoretical predictions was demonstrated, which also indicates that the accelerator and the electron diagnostics tools are both adequate and well under control.
2. finalization of vacuum chamber installation in the undulator area.

Operation of SPARC was interrupted during summertime for more than two months due to the lack of air conditioning in the power supply hall. It foreseeable that this will happen again during summer 2009 if no countermeasures are taken. It is strongly suggested to install air conditioning in the power supply hall.

Plans are reported to extend the SPARC tunnel in order to provide space for an energy upgrade of the Linac and for user operations making use of the SPARC FEL radiation. This should be strongly supported, both in view of developing in-house competence on scientific applications and photon diagnostics, and to enter the UV wavelength regime which is attractive for users.

There are plans to upgrade the SPARC Linac by switching to C-band (6 GHz) technology. This is reasonable because C-band is now a mature technology which can provide even higher beam energy at SPARC. It should be clear, though, that priority should be given to gaining knowledge required for the SPARX baseline design, which does not rely on C-band.

Finally, JR still feels that a program for timing and synchronization at the fs level would be worthwhile to set up, in particular in view of SPARX.

1.2 SPARX

Finalization of the Technical Design Report for SPARX is a major milestone towards project realization on which the SPARX team should be congratulated. It contains all the facts, details and arguments needed to specify and justify the project. It demonstrates that the project is ready for a decision. However this point should be made more clearly in the Executive Summary (EX).

For its timely realization it is of the highest priority that the SPARX consortium be formally constituted. According to S. Bertolucci this took place on 30. November 2008; final approval of the project has also been given. The committee congratulates the persons responsible of this achievement which represents a real milestone for the future of LNF.

Nevertheless some important information is missing in the EX. It is suggested to add:

1. Aspects in which this project is unique, as seems advisable considering its scale. Among candidates are velocity bunching, single-mode operation, ultra-low bunch charge operation.
2. A convincing justification, in terms of the scientific program, for the selection of key parameters such as electron beam energy and FEL wavelengths.

3. Since seeding is considered a key feature, it needs to be mentioned and justified in the EX as well as in the chapter on Experimental Activity.
4. The existence and progress of SPARC should be advertised more aggressively, in particular in the EX. This will prove that the project is ready for decision and that an experienced team is available.
5. The section on the Linac in the EX is inadequate and needs to be improved in quality and scope. All the information is available in the main Linac chapter.

It must be pointed out that the decision to build SPARX in the vicinity, and with major involvement, of LNF will require important priority decisions to be made in terms of manpower distribution within LNF.

Finally, the committee recommends to not move SPARC hardware to SPARX at the time of SPARX installation. Keeping SPARC active on the LNF site will allow the rich SPARC program to continue in parallel to SPARX activities. Parallel SPARC operation will allow the group to continuously improve the injector performance at SPARX, to study seeding issues, to develop in-house FEL user expertise, and to run complementary programs (FLAME, etc.).

2. DAΦNE AND ITS PHYSICS PROGRAM

2.1 THE DAΦNE UPGRADE

The Committee congratulates the DAΦNE team on the recent breakthrough in performance of the collider. This followed a slow start after the summer shutdown until mid-November 2008, a worrying period in which daily luminosity rarely exceeded 4 pb^{-1}, and performance was inferior to the initial period of SIDDHARTA running discussed at our previous meeting. Stored positron currents had dropped from 1.1 A before the summer to only 0.8 A in the autumn.

Since mid-November, however, progress has been spectacular, with daily integrated luminosity quickly breaking through the $\int_{day} L = 10\ \mathrm{pb}^{-1}$ mark, significantly beyond the best achieved in previous runs with KLOE and FINUDA. On 13 November, a peak luminosity $L = 2.47 \times 10^{32}\ \mathrm{cm}^{-2}\mathrm{s}^{-1}$ was achieved, exceeding the previous record for FINUDA by 54% and showing that the machine had begun to fulfill the promise of the interaction region based on the concept of large Piwinski angle and crab-waist. The records for peak, hourly and daily integrated luminosities are now being broken regularly: on 8 December $L > 4 \times 10^{32}\ \mathrm{cm}^{-2}\mathrm{s}^{-1}$ and $\int_{day} L > 13\ \mathrm{pb}^{-1}$ despite 5 h of down-time in the evening. Daily luminosity is not even as high as it might be because the SIDDHARTA experiment prefers to have long fills. The prospects for a new phase of higher luminosity operation of DAΦNE are manifestly excellent.

Nevertheless, the machine hardware is ageing, as witnessed by frequent minor failures (power supplies, water leaks) which have an impact on integrated luminosity. Attention and resources need to be devoted to consolidation and maintenance in the next shutdown, or sooner.

A large part of the performance improvement was due to the reduction of an unwanted 50 Hz modulation of the RF phase. The new configuration of the IR with a very short bunch overlap in collisions is particularly sensitive to this. Elimination of external noise being injected into the feedback from the ground system has also played an important role. Both these noise sources can be further reduced in the next maintenance stop.

A thorough series of studies has been carried out to investigate all possible sources of the positron current limit and most potential causes have been eliminated. It is now clear that the limit on injected positron

current was due to the electron cloud effect in the dipoles and wigglers where it is not possible to act on the electron distribution with solenoid windings. The effect of orbit changes in the wigglers appears to be to change the distribution of synchrotron radiation flux between the inner part chamber and the slot leading to the ante-chamber. The electron cloud phenomenon is quite complicated, involving the collective dynamics of the coupled system of beam and electrons, but a good level of understanding is being achieved in present day simulations. This effort should be continued and international collaboration in this very active field should be maintained (there were notable DAΦNE contributions at a recent workshop on Electron Cloud Mitigation). Doubling the feedback power, essentially by implementing a second parallel feedback system, has been an effective method of mitigation.

Automation of the injection switching procedure has also been very useful in colliding larger currents and increasing integrated luminosity. In a machine with a short filling cycle, better controls and automation can often improve integrated luminosity. While it is not immediately obvious that there are other gains of this nature to be made, new developments in controls and diagnostics (such as automated coupling compensation or continuous tune-monitoring) could help performance. However new control development might require more manpower.

The positron current is now mainly limited by the injection rate from the Linac and the number of pulses in the accumulator ring. The Linac cathode is now 12 years old and its performance has degraded significantly over the years. It may be worth replacing the cathode and other components in the next long shutdown. However this could be more difficult than it was for SPARC; in particular it should be checked whether the necessary components are still available.

Overall machine parameters are now rather close to the design values presented at the 35th meeting of the Committee. Further reduction of β^* can increase the luminosity by at most a few percent, as will the increase from 105 to 110 bunches per ring and the remaining steps in noise reduction mentioned above. As previously mentioned, we encourage the increase of the available crab sextupole strength in order to test the prediction of an optimum regime by the simulations.

The machine's performance is best in continuous running. Recovery from shutdowns and maintenance stops take days to weeks. Any measures (perhaps in the controls and settings software) improving on this limitation would be well worth while.

Beam currents are now so high that beam lifetimes are a concern. Normally the beams are still very flat with an emittance ratio around 0.6% (a confirmation that the orbit is well-centred vertically in the crab sextupoles). Increases in lifetime are sometimes observed as the electron beam is blown up by ion effects. The lifetime is generally attributed to the Touschek effect, but it is observed to be a factor of 2 less than calculated. This missing factor may be attributed to lattice non-linearities and/or beam-beam effects as often before in DAΦNE.

There is still scope for measures to reduce background (e.g., the use of collimators suggested at the last meeting). The programme of gradual shimming of the wigglers to reduce non-linearities may also help. Real-time background signals from SIDDHARTHA in the DAΦNE control room would be a valuable aid to the operators in optimizing conditions.

We strongly encourage the DAΦNE team to write an accelerator physics paper on the experience with the large Piwinski angle plus crab-waist. This will require some beam time devoted to completing a clear set of measurements in controlled conditions in order to clearly show which part of the recent luminosity gain is due to the new scheme. While we appreciate that it is difficult to optimize the many variables entering into the operating conditions at every data point, a review of existing machine studies and operational data would be a good basis to establish a specific target set of measurements needed to support a short "letter"-style paper.

New Interaction Region Design for KLOE

Good progress is being made with the adaptation of the crab-waist interaction region to the KLOE chamber and detector solenoid field. Now that KLOE's magnetic field value has been fixed, a good solution for the orbit, taking account of the measured quadrupole field profiles and incorporating additional dipoles has been established. Detailed modeling of the optics has started and it should be possible to match it properly to the rest of the ring. Potential gains in aperture in the interaction region doublet may help to the extent that the present background is due to scraping in that region.

Higher-order-mode calculations for the new chamber should be carried out with high priority to verify that there are no impedance or heating problems.

One coordination meeting between the Accelerator Department and KLOE has been held so far. This is a good start to the important process of detailed integration of the new chamber.

2.2 SIDDHARTA

The committee was pleased to see the continuing progress in the installation of the SIDDHARTA detector and the advanced preparations for the dedicated running of the experiment. The cryogenic target and SDD detector setup were moved to DAΦNE and tested during August and September. A problem with latch-up of SDDs due to high backgrounds, mainly during injection, was controlled by additional shielding and by adapting SDD electronics for fast recovery. Reliability and performance of the SDDs are well within expectations. Systematic degrader optimization studies were carried out and a perfect X-ray calibration spectrum was produced.

A successful test run with a He gas target and kaon trigger generated a high-quality kaonic helium X-ray spectrum, obtained with an integrated luminosity of only about 15 pb^{-1}. The $3d \rightarrow 2p$ transition line in this spectrum is already almost as precise as the kaonic ^{4}He spectrum measured recently at KEK with a liquid target. The K^-He measurement of the yield and position of the L_α and L_β lines should be finished by mid December. A comparison of these results with those from the KEK experiment will be of great interest and should be published as soon as possible.

Plans for December in preparation of the kaonic hydrogen experiment include testing the collimator for the kaon monitor. An additional background reduction by a factor of two is foreseen. Further optimization of the electron injection appears to be possible. Based on the experience with the K^-He measurement and given the recent improvements of machine performance, the signal-to-background ratio for the upcoming K^-H measurement is expected to be between 1/3 and 1/5. This is considered to be sufficient for yielding a precision of 6-8 eV on the kaonic hydrogen energy shift. Before the Christmas shutdown SIDDHARTA plans to collect some data with the hydrogen target in order to have a benchmark S/B point to be reproduced or improved once DAΦNE starts up again in 2009.

With stable working conditions, a dedicated SIDDHARTA K^-H run of 400 pb^{-1} in 2009 will require between two and three months, assuming 10 pb^{-1} per day and 70% duty cycle. (A shorter time will be required, of course, it luminosity and running conditions turn out to be better than this assumption). In order to meet the high-precision goals of the K^-H measurement, regular calibration runs are important. The referees endorse a scheme, presently being implemented, allowing remote control of calibration foils. This, in particular, permits calibration runs with beams in DAΦNE and also eases the load on the machine operators, by avoiding the need of frequent accesses.
To optimize the mutual feedback that will lead to optimal running conditions, the committee recommends maximal communication between machine control and SIDDHARTA on background matters.

Once more, the Committee emphasizes the importance of the first kaonic deuterium measurement, which is an integral part of the SIDDHARTA core physics program. The minimal requirement of 600 pb^{-1} is maintained. Securing a sufficient amount of deuterium data within the 2009 running schedule constraints may require some flexibility. In this context it is pointed out by the group that the technical procedures necessary for changing between hydrogen and deuterium are manageable typically within one day.

The committee congratulates the SIDDHARTA group for the excellent progress achieved.

2.3 KLOE2 AND KLOE ANALYSIS

The KLOE-2 collaboration is now fully in favour of a roll-in in 2009, and preparations are underway.

There is an increased emphasis on $\gamma\gamma$ physics. An inner and an outer set of $\gamma\gamma$ taggers are foreseen. The inner set, the Low Energy Taggers (LET), are PbWO crystals read by SiPM and placed about 0.7 m from the interaction point behind the innermost quadrupoles. They measure electrons (positrons) in the region 160-230 MeV. These detectors will be tested in the BTF in the near future. The LET were originally foreseen for phase 1, but are now planned for phase 0, i.e. in 2009. The outer set, the High Energy Taggers (HET), are Silicon microstrips plus plastic scintillators placed behind the first dipole magnets, and will measure electrons (positrons) in the region 345 - 460 MeV. The HET was always planned for phase-0. The $\gamma\gamma$ tagger system is foreseen to be reviewed in April.

A design solution for the beam pipe in the interaction region (IR) has been found that can be fabricated locally; it uses the existing beam pipe with a smaller radius insert. The existing beam pipe in the IR has been extracted.

One important point is the need for close regular interactions between the KLOE collaboration and the accelerator team. The referees were happy to hear that such meetings have started and are planned to take place on a regular basis.

KLOE-2 has prepared a schedule for next year. Accordingly, the $\gamma\gamma$ tagger will be designed in March 2009 and reviewed in April; the beam pipe should be ready in May 2009; the dipoles should be available during summer. KLOE will be rolled in during summer; beam pipe would be inserted (with the low energy $\gamma\gamma$ tagger) and magnet cooling started in September 2009. DAΦNE commissioning with KLOE will then begin in November 2009.

There is a computing plan compatible with this schedule.

The main concern is future employment of personnel on time-limited contracts. Both the KLOE analysis and the KLOE-2 preparations depend on people who do not have secure long-term employment. This is an issue beyond the mandate of this Committee, for such measures are decided at government level. Nevertheless the committee would like to point out that KLOE is particularly fragile in this respect since the experiment relies to a very large extent on LNF-personnel with time-limited contracts. Unlike many current large collaborations, it is not realistic to assume that these responsibilities can be taken over by personnel from institutions from other countries, nor are there possibilities that this LNF-personnel could be employed by other institutions in KLOE.

New KLOE results were among the most pleasant news of the meeting. In addition, the quality of the talks (both in the general session and in the session with referees) was excellent; reflecting the high standards of the experimental group.

Since the last Scientific Committee meeting several new results were published, dealing with:

1. the K^+ lifetime (direct measurement; important for all K^+ branching ratios),
2. the semileptonic K_L form factor,
3. the branching ratio for $K^+ \rightarrow \pi^0 e^+ \nu$,

4. V_{us} with KLOE data ,
5. $K_S \to \gamma\gamma$ (chiral perturbation theory test),

while on the other hand

6. an accurate determination of the branching ratio for $K^+ \to \pi^+\pi^0$ has been submitted for publication

This latter measurement will allow a new K^+ lifetime measurement to be obtained by adding all the other experimental K^+ branching ratios.
The first four items listed above contribute to an accurate determination of V_{us}. Therefore the KLOE experimental effort to test CKM unitarity at few *per mille* level has reached its target. This is a very notable milestone.
Further advances deserve to be emphasized:

● An upper limit for $K_S \to e^+ e^-$ has been measured with the whole data sample.
● The analysis of $\eta \to \pi^+\pi^-e^+e^-$ is very advanced. Here the study of the di-lepton invariant mass spectrum allows a vector form factor contribution to be disentangled from that due to internal bremsstrahlung.
● Results from the study of the hadronic cross section, useful for the evaluation of the anomalous magnetic moment of the muon, have recently been accepted for publication. A previous discrepancy with the other experiments, SND and CMD-2, has now been resolved.
● A preliminary analysis in the off peak region of the cross section $\gamma\gamma \to \pi^0\pi^0$ has been presented at several conferences. Here KLOE looks for possible evidence of the σ enhancement: after an accurate subtraction of the background, evidence for this effect is shown. These results have been presented at the Italian Physical Society.
● The ratio $\Gamma(K^+ \to e^+\nu)/\Gamma(K^+ \to \mu^+\nu)$ is helicity-suppressed in the SM; however supersymmetry may enhance the effect through charged Higgs exchange for large values of the ratio of Higgs vacuum expectation values, tan β. Using the whole data sample, KLOE has presented preliminary exclusion plots in the $M(H^+)$- tan β plane.
● Branching ratios and charge asymmetries in $K_S \to \pi l\nu$ with the full integrated luminosity are being studied.

The Scientific Committee congratulates the KLOE group for the excellent results and their determination to achieve important goals as V_{us} and the accurate measurement of $BR(K_S \to \gamma\gamma)$. This is even more important since it is obtained with the indispensable contribution of young scientists: these valuable human resources must be supported by all appropriate means.

2.4 FINUDA

Since the last Scientific Committee meeting the FINUDA Collaboration has made important progress in analyzing the data from their 1 fb^{-1} run of 2007.
In particular, the Committee notes that the collaboration is getting ready to publish papers on hypernuclear decays where the π^- from the hypernuclei formation is correlated to :

● the proton from Non Mesonic Weak Decays . Here, a comparison of the spectrum and of the rates with theoretical models has been done
● the low momentum π^- from Mesonic Weak Decays . In this case the low momentum threshold of the experiment allows to study the final state interactions with various nuclei.

On the front of hyperon-nucleons and hyperon-pions final states, FINUDA recently published a paper on Λt production. Soon, a new paper on Λd will be submitted.
The collaboration also identified Σ^+ and Σ^- in $n\pi^+\pi^-$ events. Here the goal is to disentangle contributions from different processes (production on one nucleon, on two nucleons, etc.) .
An inclusive Λ spectrum was also shown.

The committee appreciates the results shown by the FINUDA collaborators, and congratulates S. Bufalino upon the prize she received for her thesis on Non-Mesonic and Mesonic Decays of Hypernuclei. It would like to encourage the collaboration to complete rapidly the alignment of the drift chambers, which is necessary to obtain the final results on hypernuclear spectrosopy. It also suggests that it would be useful to organize the remaining analysis efforts in view of a comprehensive review paper on the overall contributions of this experiment.

2.5 AMADEUS

The referees discussed with AMADEUS representatives the status of the KLOE drift chamber data analysis and the detector R&D and planning for AMADEUS-1 and AMADEUS-2.

KLOE drift chamber data analysis

The excellent progress of the analysis attests to the talent of the young analyzer, O. Vázquez Doce, and the good communication with KLOE. The 1.1 fb^{-1} analyzed data sample will be enlarged to about 2 fb^{-1} in the coming months, leaving aside an additional 0.5 fb^{-1} of somewhat inferior quality.

The Λ mass measurement is proceeding very well. Asymmetries in the mass distribution have been removed by limiting analysis to Λdecays within the fiducial volume. The statistical accuracy is already a factor of two better than the PDG value. The systematic error is under study. This includes substantial work on the momentum scale calibration using charged kaon decays. The referees recommended to aim for submission of a publication by the next Committee meeting in spring 2009.

The reaction channel $K^-+{}^4He \rightarrow n + (K^-ppn)$, where the $K^-ppn \rightarrow \Lambda d$ decay might show evidence of the hypothetical DBKN state, consists of 66 events, all of them now visually scanned. Detailed reconstruction has been performed of the different decay vertices as well as the incoming K^-. Neutron reconstruction is still a question mark - only about 20% neutron reconstruction efficiency is expected, giving only about 13 events. The interesting Λd invariant mass distribution must be corrected for acceptance to allow comparison with FINUDA and KEK results.

The results on the $\Lambda(1405)/\Lambda(1420)$ states decaying into $\Sigma^0\pi^0$ (with $\Sigma^0\rightarrow\Lambda\gamma$ and $\pi^0\rightarrow\gamma\gamma$) are of high quality. Further improvements are expected by accounting separately for the Λ and Σ^0-decay vertices, eventually allowing proper assignments of the photons to the π^0- and Σ^0-decays. It is also desirable to include the $\Sigma^+\pi^-$ and the $\Sigma^-\pi^+$ channels. The collaborators are strongly encouraged to work towards rapid publication of these results.

There are still issues that need to be addressed, such as whether kaon capture occurs on ^4He or isobutane, as well as the best strategy for measuring the neutron's energy, either by TOF or by the energy in the calorimeter.

The obvious recommendation in summarizing this analysis is that more than one person should be involved in it.

AMADEUS PLANNING

Detector R&D funds have already been granted and work is progressing well. This includes:

- the target cell, where the collaboration counts on the best possible expertise
- the trigger, based on SiPM readout of fiber detector. Test are in progress.

● the GEM-based TPC R&D is proceeding. There is useful synergy with developments for experiments at FAIR.

The funding request for AMADEUS detector construction must be submitted in June 2009. For its approval, advice from the LNF Scientific Committee would be useful. Such advice should be formulated in the spring meeting of the Committee, based on an AMADEUS proposal updated with the results of the KLOE drift chamber data analysis.

The AMADEUS collaboration has been iterating with KLOE on the text of a MoU regarding collaboration in DAΦNE. The referees remarked that publication of the analysis of the KLOE drift chamber data should strengthen the case of the first phase of AMADEUS.

2.6 KAIUM

In the open session, the Scientific Committee listened to preliminary ideas on the possibility of producing K^+e^- atoms ("Kaium") and detecting their Balmer lines using kaons from the Φ decay stopped in a helium target. The concept is illustrated in note LNF-08/21 (IR).

This cannot be considered yet as a proposal, because no quantitative estimate is given of the number of photons that could be detected in the relevant wavelength interval, for a given luminosity. In addition, the eventual setting up of the apparatus on an IR at DAΦNE would be subordinated to approval and funding of the initiative by National Scientific Committee 3 (CSN3).

Nonetheless referees from the Committee met with the proponents and the Committee discussed this concept, because the time window to test out this idea on the interaction point currently taken by SIDDHARTA could be very narrow and therefore it was felt that the proponents should get timely feedback on their prospects.

At this time, the Committee does not see what physics program could be carried out once the Kaium atom had been detected. In lack of this motivation, even if a suitable apparatus were readied before the IR switch, the Committee could not recommend to make room in the DAΦNE program for the observation of K^+e^- atoms.

2.7 THE DAΦNE PROGRAM: CONCLUSIONS AND RECOMMENDATIONS.

The excellent performance of DAΦNE and its positive derivative remove some of the uncertainties that were part of the recommendations made at the 36th meeting of the Scientific Committee. A clearer tentative plan for the DAΦNE program in 2009 can now be recommended:

1. the FINUDA collaboration was placed in stand-by, until the uncertainties on the roll-in of KLOE (entailing the switch of the IR) could be removed. It now appears clear that the roll-in of KLOE in late 2009 will take place, which suppresses the time window that FINUDA could have used.

2. The SIDDHARTA collaboration should make the best use of a run that in a favorable INFN budget scenario should last several months. It is recommended that in planning how to share time between H and D data they protect D running against possible worst-case scenarios. In any case, SIDDHARTA should assume a schedule compatible with KLOE installation by late 2009.

2.8 THE BEAM TEST FACILITY (BTF)

The open session presentation of the Beam Test Facility stressed the flexibility of the current setup, which can run parasitically at any time during DAΦNE operation, providing from 1 to 10^{10} particles in a tight 2 mm spot, over a time spread of 1 to 10 ns, with a repetition rate of up to 50 Hz, and over a broad range of energies up to 750 MeV. The operation requires powering only a few bending magnets, therefore its cost is negligible compared to that of operating the Linac. It is a multipurpose facility, in which measurements of the properties of detectors and calibrations can be performed – examples are the MEG and AGILE experiments. Simultaneous usage of the beam by more than one user is possible. Adding up all days of usage by separate experiments, the facility has totaled from 220 to 360 days a year. The number of used days has been at the lower end in 2007, partially because of the completion of LHC-oriented tests, but also because of long periods of maintenance necessary for Linac operation.

One purpose of the presentation was to alert the Committee to the existence of the facility. There is also the possibility of adding to the BTF an ISO-standard neutron production facility, using photoproduction to excite nuclear resonances. R&D towards this project has been funded.

The BTF is one of the few such facilities still available; its usefulness and excellent standards were clearly established in the view of the Committee. The Laboratory management is encouraged to keep it up and develop it as opportunities arise.

3. THE EXTERNAL PROGRAM

Because of the lack of LHC collisions it was decided to have no presentation of LHC-related work done at LNF at this meeting. A presentation of the status of the OPERA experiment at CNGS was the only item of the extramural program presented in the open session.

3.1 OPERA

As shown in a past meeting of the Committee, LNF has given very substantial contributions to the OPERA experiment. 2008 has been the first year of operation with the full detector. The operation chain, from trigger through extraction of the hit “bricks” to scanning of the emulsions and analysis of the results appears to be well under control.

The number of charged- and neutral- current neutrino interactions observed is in agreement with expectations. The events found in bricks allow consistent estimates of scanning efficiencies, albeit still with low statistics. Two charm production candidates have been found, also as expected.

The expected number of produced τ leptons in the event sample is 0.7, and no such candidates have been found yet. The delivered POTs (Protons On Target) in 2008 is $1.8 \cdot 10^{19}$, short of the CERN-approved plan. For 2009, $3.5 \cdot 10^{19}$ POTs are scheduled, versus the nominal $4.5 \cdot 10^{19}$ that would reach the goal of 10 to 15 τ leptons in 5 years. This slower rate of POTs delivery is a concern.

The local group is comprised of a few very experienced physicists but also of young and very active members. They are to be congratulated for their work, and encouraged to continue as they are doing now.