

Report to the President of the INFN

Il Comitato di Valutazione Internazionale (CVI)

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Introduction and General Comments

The 2018 meeting of the CVI took place in Napoli the 14 through 16 October. In preparation for the meeting, INFN management provided us with the annual report of the Gruppi di Lavoro per la Valutazione (GLV), which surveyed the INFN programmes and served as reference for our evaluation of the accomplishments of the National Scientific Commissions (CSN's), Technology Transfer group, and National Laboratories. We are also grateful to the INFN central management and programme leaders for addressing our recommendations from 2017, for the interim report they provided us last summer, and their positive response to our requests and suggestions from last year. We found this exchange of information most useful, and that it improved the efficiency of this annual meeting. The meeting agenda, a list of our recommendations, and a set of requests and suggestions for next year's GLV report are attached as appendices. Finally, we should like to express our thanks to the Napoli staff for their outstanding hospitality and support for the meeting.

As described below we are delighted once again this year to report that INFN has made excellent progress in science, and in expanding its effort in technology transfer. However, we must express our concern for the 2019 budget. The proposed level would represent a significant reduction, at a time when INFN staff has increased because of mandated new appointments.

Governance and Strategy

Observations:

Budget. President Ferroni began his presentation by summarising the budget situation. In recent years, the baseline operating budget has been stable, reaching as high as 284 M€ in 2017, in addition to a 30 M€ award dedicated to International Activities. However, in 2018 reductions in funding for premium projects reduced this to 261 M€. INFN has worked hard to adjust to this new base, but the proposed 2019 budget gives great concern, as the proposed base budget of 247 M€ would represent a further serious reduction that would not be sustainable, given mandated increases in personnel.

Much of the reductions have been in “extraordinary financing:” 18 M€ in 2018 → 3 M€ in 2019. We recognise the seriousness of the situation, and hope a way can be found to restore the base budget to its 2018 level.

Staffing. Over the past year, the INFN staff has increased by ~300 people without an increase in research funds, seriously reducing the resources per researcher. Any further mandated increases in staff are not sustainable, and the restricted boundary conditions, which can change from year to

year, present a challenge to achieving an optimal mix of skills among researchers, engineers and technicians, and to long-term planning. There are also serious geographical constraints, because people won't move from their current institution to where there is a need, and/or a higher-level opening. On the bright side, publication requirements for candidates for positions have changed, now recognising that the number of publications to be expected depends on the character of the research.

Scientific directions and priorities. Participation at CERN is posing several issues for INFN, as it is important to have strong representation on site, which is very expensive, while at the same time strong groups are needed across the INFN complex to work on Phase II upgrades. When the upgrades are completed several years from now the situation will change, raising the question of what size the ATLAS and CMS activities should be as the HL-LHC reaches maturity, and what post-LHC INFN participation in CERN should look like. Perhaps as prelude, there continues to be increasing interest in non-accelerator experiments, mainly in CSN2, some of which already involve CERN.

As we commented last year, Gravitational Wave astrophysics represents a great opportunity for INFN thanks to the early success of VIRGO. However, as will be explained in the CSN2 section, VIRGO needs to enhance its detector and computing capabilities to keep up with LIGO, at a time when there is a shortage of people in INFN interested in joining. This is understandable because the expertise differs from that of the particle/nuclear science pursued by the rest of INFN, but somehow this problem should be solved. Similarly, INFN needs to resolve the tension between enhancing VIRGO and preparing for the Einstein Telescope.

We are pleased to see that INFN is actively preparing its contribution for the European Strategy planning group, concluding there have to be new options beyond experiments at the LHC. Several options for higher energy colliders are actively being studied for CERN: proton-antiproton, e^+e^- , $\mu^+\mu^-$, GW astrophysics possibilities with eLISA and the Einstein Telescope, etc.

Comments

INFN is managing the issues and programmes under its control very well. External developments, however, give concern as they affect stability, and the ability to plan. There is impressive progress across all divisions. CSN1 through CSN4 have down-selected their activities, retaining and supporting what are largely world-class programmes. We note in particular the transformational improvements in the CSN5 and Tech-Transfer programmes, which are giving outstanding payoff on INFN's investment. The national laboratory programmes have all steadily improved over the past few years, focusing on their strengths.

However, changing research interests and mandated increases in staff, combined with the policy of "freedom of movement" in research, present serious challenges to maintaining optimal programmes in a time of stagnant or decreasing budgets. For example, when people move to activities pursued by a different CSN, the research budget does not move with them. INFN needs to review its policies in view of the above.

Recommendations:

GenStr 1. To create the strongest programme reflecting available resources changing research interests, INFN should set clear research priorities, and then rebalance budgets, resources and staff across the CSNs and laboratories. If mandatory allocation of people is impossible, try to “encourage” researchers by other means (*e.g.* research funds).

GenStr 2. INFN should fight hard to win the site for the Einstein telescope. Making sure VIRGO succeeds would seem to be a strong asset here.

GenStr 3. The next accelerator will define high-energy physics for decades, so INFN should support its world-class accelerator experts in the R&D and politics leading up to this crucial decision.

Central Administration

Since the last CVI Report, there has been significant progress in the Central Administration (CA) regarding the design and implementation of a modern administration. The new organisation, approved in March 2018 by the Board of Directors, is designed along the main processes through which researchers interact with the administration. Organisation revolves around four main processes (in/out management, research services, resource management and system management). This arrangement should enable acting in a more interconnected way, assigning clear responsibilities for the integrated set of activities needed to run a process by a single, accountable unit. We praise the important progress made in the direction of a streamlined, responsive administration.

The first evaluation of the working of the new organisation is overall positive. Among the main results achieved, there are: the improvement of the procurement process, through which the interaction between researchers and central procurement offices has been greatly improved and procedures have been standardised; the online management of the hiring process; and the automation of several administrative duties and accounting procedures.

On the other hand, it must be noted that these important changes face bottlenecks. The most evident is the lack of IT personnel. In the new organisational design, information and communication technologies are a fundamental ingredient and complement of human activities. Processes must be digitalised, and routine activities automated, leaving people to address higher cognitive activities. Digitalisation, however, is proceeding slower than desirable, due to the lack of IT people. The few employees working in IT (in 2018 one less than in 2017) have to take care of the maintenance of existing software. Hiring new IT in administration seems particularly difficult, due to the wage gap between Public Administration and the private sector.

The case of IT personnel seems however only the most critical aspect of the wider issue of a dramatic staffing problem. The entire CA seems to be understaffed if compared with similar research institutions. A correct sizing of administrative staff has been delayed by the constraints put in place by past governments on hiring in the public administration. Presently, those caps have been weakened. Constraints to hire administrative personnel came now from inside, given the scarce knowledge that governing bodies have of the increasing duties of the administration. The growth of research staff, and the increasing complexity of administrative procedures requested by

law and international projects, have indeed a strong impact on the administrative duties needed to run research activities.

Comments

The CVI applauds the impressive work done in the directions highlighted in previous reports by the CA. Reaping low-hanging fruit has been a valuable strategy enacted by the DG. At the same time, we are particularly worried by the workload that the administration has to face only to attend to ordinary duties. Lack of personnel risks jeopardising the project of reorganisation, but can also damage ordinary work, delaying procedures or increasing errors. CVI suggests to the President and the Board to tackle quickly this issue in order to avoid damaging a long-term project, and demotivating employees who have accepted the new client- and process-oriented approach promoted by the DG. It is also important to enhance transparency and communication at all levels.

Recommendations

CA-1. CA and science should be allies, instead of CA being perceived as a burden. The CA needs to communicate clearly to scientists and researchers and increase awareness of the administrative work needed to support research activities in a complex organisation like INFN. To this aim, we suggest that a survey be conducted periodically on the perceived quality of services. This could help to recognise and answer the more urgent requests, and highlight the role played by a timely and efficient administration.

CA-2. A clear plan for resource development, over a horizon of a few years with priorities clearly documented and justified, can help decision-making bodies assess needs for staff on the basis of evidence.

CSN1 – Accelerator-based Particle Physics

CSN1 coordinates INFN particle physics activities at accelerators and R&D for future projects. It is a large sector with 816 assigned FTEs, a 1% increase compared to the previous year, the same trend being expected next year including new engineers. The year 2018 was a data-taking year with many experiments in full operation. The LHC delivered 160 fb^{-1} of pp collisions at 13 TeV during Run 2, fulfilling and somewhat surpassing its goal. The detectors performed well and produced a wealth of results. Highlights from ATLAS and CMS include the measurements of the Higgs Yukawa couplings to fermions: b and t quarks, μ and τ leptons. So far, the Standard Model prediction that the coupling is proportional to mass is confirmed. The experiments also performed increasingly precise electroweak measurements and carried out a wide spectrum of searches for new physics at the energy frontier. LHCb recorded 9 fb^{-1} of data in Runs 1+2, providing precise measurement of CP violation parameters, e.g., the CKM matrix angle γ with a precision of 5° . They also measured many rare processes in the Standard Model, where deviations could signal new physics. One interesting case, among others, is the measurement of the ratio of $B \rightarrow K^0 \ell^+ \ell^-$ decays between muon and electron final states, which indicates a departure from lepton universality at the 3-sigma level. The detectors LHCf and TOTEM provided new results in forward physics. The fixed target experiment COMPASS presented new results on the structure of the proton and NA62 observed the first $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ candidate, with ~ 20 events expected in the full

dataset. At FNAL, the $g-2$ experiment is taking data, while $\mu 2e$ is being built. At LNF, the KLOE experiment has now concluded its programme, while PADME started. Other running experiments are BESIII at BEPC, and Belle II at SuperKEKB. Belle II registered its first collision data and the new vertex detector with strong INFN contribution is ready to be integrated in the detector. The MEG detector at PSI is now completed and is preparing for data-taking in 2019. New experiments at CERN like SHIP (Beam Dump Facility), MuONe (measurement of the muon anomalous magnetic moment) and UA9 (crystal beam collimation) are under preparation.

We congratulate CSN1 for their rich and successful programme and critical contributions to many experiments. Their leadership continues to be widely recognised; for example, the spokespersons of CMS and LHCb are from INFN.

The LHC experiments have devised important upgrade programmes to cope with the challenge of the High Luminosity LHC (HL-LHC). The coming long shutdown LS2 in 2019-2020 will be used for Phase-I upgrades, while the main part of the upgrade, the Phase-II projects for ATLAS and CMS, will take place during LS3 (2023-25). INFN commits a large effort in manpower and infrastructure. The main concern currently is to finish construction of the ATLAS New Small Wheel in time for installation during LS2. The goal of LHCb is to collect 50 fb^{-1} during Runs 3 and 4. This requires essentially a new detector, for which an intense effort of construction is ongoing, so far according to plan, with various contributions from INFN.

We appreciate the important effort that INFN has put in carefully planning their Phase II upgrade contribution. During 2018, the INFN ATLAS/CMS Phase II contribution was fully quantified, and the 3-year R&D programme (RD_Fase2) is now coming to an end. Useful input was provided for the TDRs that describe the CORE cost (cost of deliverables, no contingency). The experiments expect the countries to contribute to the CORE at the level of their “fair share” (share of PhD or equivalent) in the collaboration, (for Italy ATLAS 9.1%, CMS 12.6%). INFN’s 56 M€ total contribution includes CORE (85% of their CORE fair share = 44.5 M€), a contingency fund (20% of the CORE = 8 M€), as well as the costs of pre-prototypes (5 M€), additional temporary technical manpower (4.5 M€) and infrastructure (2 M€). CSN1 will contribute 25 M€ from its budget, while 31 M€ + 8 M€ contingency will come from the general INFN budget. Priority is now to get ready for construction, to be completed by 2026. We note the difficulty (not unique to INFN) in hiring the additional technical manpower required. This problem is being addressed on the short term by hiring postdoctoral researchers, but a long-term solution remains elusive.

CSN1 is also looking towards the longer-term future, together with the RD_FA collaboration within INFN dedicated to R&D on future accelerators. CSN1 and RD_FA are active members of the international committees preparing various reports on scientific benefit and technical aspects of potential future colliders, which serve as input for updating the EU Strategy. The options studied are High Energy LHC (HE-LHC), a 100 km circumference Future Circular Colliders (FCC), a Circular electron-proton Collider (CepC). Special emphasis is put on a source for a muon collider (LEMMA), based on muon-pair production at threshold with an intense positron beam.

Another aspect that requires attention in the future is computing, because the LHC experiments are already consuming a large fraction of the resources and the current model cannot be extrapolated to the High-Luminosity phase, when experiments will need even larger amounts of resources. INFN is strongly involved in an intensive R&D effort underway to study distributed computing, use of HPCs, GPUs, optimal dataflow, etc. It has set up a ten member committee

“Comitato di Coordinamento del Calcolo Scientifico” (C3S) and a specific 1M€ programme with 12 postdocs and 6 to be hired. C3S members are involved in Italian and international initiatives. They participate at high-level in four H2020 projects funded with 3.5 M€. Workshops involving researchers and industrial partners have been organised. In summary, we congratulate CSN1 for its rich and successful experimental programme and the important steps being taken to address the coming challenges and shape the future.

Recommendations: None

CSN2 – Astroparticle Physics

Like the previous year, 2018 was successful and rich for CSN2. Notable are the record limits set by XENON1T on dark matter cross sections, and GERDA on double-beta decay partial lifetimes. LEGEND, the 200-kg successor of GERDA, has been approved. CUORE has joined GERDA and started operation in its full configuration (although yet with a rather low duty cycle). We observe swift progress towards XENON1T’s successor XENONnT. The Borexino experiment has published its final precision data on solar neutrinos in Nature. In a spectacular multi-messenger campaign, both Fermi and MAGIC observed a flare from a 4 billion light years distant blazar, which coincided with a neutrino observed by IceCube. Italy’s space activities are delivering rich scientific results from Fermi, AMS and DAMPE, while planning of INFN contributions to the Chinese HERD programme are well advanced. We congratulate our colleagues from INFN for these results.

Regrettably, the cosmic neutrino detectors Borexino and LVD in LNGS have to close down by 2020 for environmental reasons. Also, the SOX experiment to search for sterile neutrinos had to be cancelled because the ^{144}Ce source cannot be delivered. We also note with regret that the progress of SABRE – a project planned to scrutinise DAMA-Libra’s hints to dark matter – is much slower than expected, and hope the possible managerial problems can be solved.

The central INFN astroparticle projects for the next years are DarkSide20T, Virgo and KM3NeT. DarkSide20T is a key experiment in searching for dark matter, using argon depleted in the radioactive ^{39}Ar isotope, obtained from underground sources. It is also the next strategic goal of the Global Argon Dark Matter Collaboration (now including Canada and CERN). Good progress is reported: A first column of the ARIA facility for final purification of argon is being tested, the technology to produce low-radioactivity silicon photomultipliers (SiPM) is perfected and better methods of neutron tagging for background detection are under development. However, the present lack of funding for the Urania facility in Colorado for extracting the ^{39}Ar -depleted underground argon threatens the timely realisation of this extraordinary project. While in the very long term the liquid argon technology is perhaps the only way to go to the 100-ton scale and beyond, the competition with next generation xenon detectors requires speed. The funding questions on DarkSide20T should be clarified as soon as possible and explicit MoUs should be signed.

Now that Virgo has joined LIGO in observing gravitational waves, the main goal is to become – at least for distant objects – more than just the third antenna for better direction measurement. It is critical, therefore, to improve the Virgo detector as quickly as possible. Unfortunately, we observe that the hardware work is going slower than expected, apparently largely due to a lack of qualified personnel. At the same time, we note that with the start of KAGRA/Japan in 2020 or 2021, the unique situation of Virgo as the third antenna to pinpoint the direction of gravitational waves may be gone. This underlines the necessity for Virgo to speed up in sensitivity. Simultaneously, the European efforts towards the next-generation interferometer ET (Einstein Telescope) broaden. Therefore, if Italy wants to compete with alternative sites as those in the Netherlands or Germany, it is important to work hard and secure full support right now. We acknowledge the decision to formally separate Virgo and ET to prevent any possible conflicts.

KM3NeT is in a phase that can be characterised as critical and promising at the same time, both for the ARCA site off Catania and the ORCA site off Toulon. At the Catania site operations will resume at the end of this year, with a restart of ARCA Phase-1 construction (24 strings) planned for 2019, and for 2022, 72 strings are planned. With only 24 strings (ARCA Phase-1) there are marginal chances to see the IceCube diffuse flux, but with 100 strings (72 POR, 28 PON financed), ARCA could do excellent physics, comparable to IceCube. As in our 2017 report, we note that KM3NeT is not yet “out of the woods”, but the prospects are clearer and better defined than one year before. INFN should continue to support the project. The technical progress towards full deployment of Phase-1 should be carefully and continuously monitored.

Recommendations:

CSN2 1. Gravitational waves: Prioritise the support for upgrading Virgo, with the goal to quickly approach a similar sensitivity like the LIGO antennas. Intensify work towards ET in Italy.

CSN2 2. High-energy universe: Keep strong support for KM3NeT in view of its high discovery potential and its strategic importance.

CSN2 3. Rare processes: Clarify financial and managerial problems in DarkSide20T and give full support to the project.

CSN3 – Nuclear Physics

In general, CSN3 is doing very well in all its four lines of research, with a stable budget and good publication record. The number of publications has decreased slightly last year, but considering the rapid increase in the number of publications in the last few preceding years this does not seem highly significant. Furthermore, the total number of FTEs in CSN3 has stabilised after a positive trend in the last few years driven by personnel increase in Line 3 (Nuclear Structure and Reaction Dynamics) and Line 4 (Nuclear Astrophysics and Interdisciplinary Research). Finally, the gender balance is very good relative to other European countries.

The sector **Quarks and Hadron Physics**, which is strongly involved in JLAB research, has contributed significantly to building equipment for the recently completed 12 GeV upgrade and will now be able to pursue its research there. This sector has also started working with groups in ALICE (CSN3) and COMPASS (CSN1) to prepare the proposal for the electron-ion collider (EIC) project in USA. This will proceed via a single network (EIC-NET) in CSN3, a structure among

groups from CSN1 and CSN3 we find adequate at present. Furthermore, CSN3 has approved recently the new experiment JEDI, to measure the electric dipole moment of the deuteron.

The sector **Phase Transition in Hadronic Matter** has successfully performed experiments with ALICE in the last year concluding the data-taking campaign for pp collisions at two different energies. The ALICE physics results had several highlights, which raised high interest in the community and made strong impact evidenced by the high citations and the many contributions to and invited presentations at international conferences. The ALICE upgrade is progressing well and the ALICE collaboration is preparing now the installation of the Inner Tracking System (ITS).

The research activities of the **Nuclear Structure and Reaction Dynamics** group have been pursued at the national labs LNL and LNS, and also in large collaborations at European and international labs such as GANIL Caen, GSI Darmstadt, IPN Orsay, IFIN Bucharest, ILL Grenoble, Argonne National Lab and RIKEN Tokyo. A long successful campaign at GANIL with the state-of-the-art gamma-ray spectrometer AGATA and ancillary equipment, was carried out. Experiments in nuclear structure, nuclear astrophysics and nuclear reactions were performed, which yielded many interesting results that have been published in high-impact journals. At present, an MoU for extending the coverage of AGATA by adding new modules is being negotiated by the laboratories/institutes LNL (SPES), GANIL (SPIRAL2) and GSI-FAIR. This effort should be strongly supported because of its high impact on the research programmes of the Nuclear Structure and Reaction Dynamics Group. Another important achievement of this sector was the additional results on the feasibility of the proposed double-charge-exchange experiments obtained at LNS by the collaboration NUMEN with the aim of shedding light on the nuclear matrix element for neutrino-less double-beta decay.

The main activities of the sector **Nuclear Astrophysics and Interdisciplinary Research** are centred on nuclear astrophysics with programmes at LUNA, ERNA, n_TOF, LNS and LNL, and on several interdisciplinary projects. The latter range from determination of the electron-antiproton mass ratio through a study of antihydrogen; to a study of the first-excited level of ^{229}Th , which has the potential to provide a very accurate nuclear clock; and last but not least to research benefitting medical applications and particle therapy. Highlights include the measurement of the $^{12}\text{C}+^{12}\text{C}$ reaction at stellar temperatures making use of the Trojan Horse Method (THM), which has been published in Nature. The Nuclear Astrophysics community has been active in writing the “white book” on nuclear astrophysics, a step in the good direction. The LUNA Collaboration is busy preparing the new facility LUNA-MV, but involvement of international groups is progressing very slowly and steps should be taken to speed up this process.

In conclusion we make two general comments:

- CSN3 is doing well following the recommendations in the NuPECC Long-Range Plan 2017, which ensures a high standing within the European nuclear physics community.
- The budget of CSN3 is already heavily committed, with little room for undertaking new technical projects. This is slightly worrisome and should be addressed in the near future.

Recommendation:

CSN3-I. The international collaboration on LUNA-MV should be strengthened, beginning with the organisation of workshops dedicated to that aspect.

CSN4 – Theory

INFN continues to provide strong support for the theoretical physics programme. The vibrancy of the community is demonstrated by the bibliometric data and by the range of topics that is addressed by the publications produced by INFN-supported authors. A particular strength of Italian theoretical research is the close relationship with experiment, as evidenced by the works in precision standard-model physics, physics beyond the standard model, flavour physics and neutrino physics, dark matter and cosmology.

The composition of the CSN4 collaborators is as follows: INFN Staff (12%), University Staff (48%). The remaining 40% are PhD students and Post-docs. The largest two INFN sections as measured by the FTEs working there are Trieste (TS) and Torino (TO), followed by a roughly equal number of FTEs in BO, FI, MI, MIB, NA, PD, RM1 and RM2.

The research covers six different lines of scientific enquiry: String and Field Theory (30%), Particle Phenomenology (17%), Hadronic and Nuclear Physics (10%), Mathematical Methods (12%), Astroparticle Physics and Cosmology (20%), and Statistical and Applied Field Theory (11%). The composition and weight of the various scientific lines is evolving slowly -- the percentages differ from those reported in 2017 by at most one percentage point. It will be important to monitor whether these lines of enquiry are well matched with the updated goals of the INFN. We note that the majority of the FTEs supported by CSN4 are not direct employees of the INFN, but rather have associate status in a particular INFN section. This means that the tools to manage the research directions are only the funding of the “Iniziativa specifiche” and the post-doctoral positions.

The INFN runs a post-doctoral programme that provides important opportunities for young scientists. For the 2018/2019 period, the INFN will award 7 fellowships. In addition, Post-doctoral fellowships will be supported by a ERC-Horizon 2020 co-fund scheme FELLINI, which in 2018/2019 will support 15 fellows for three-year appointments, some of whom will work on topics covered by CSN4. For these co-fund positions, a twelve-month paid internship to a different research institution or to a high-tech private company is expected.

Recommendation:

CSN4-1. The INFN should record and report the professional departure destinations of INFN post-docs at the end of their stay in Italy. If data is reported over a number of years, it will help to monitor the effectiveness of the post-doctoral programme.

CSN4-2. When making new appointments, INFN should make sure the balance of theoretical research is well-matched to the experimental program.

CSN5 – Technological and Interdisciplinary Research

CSN5 promotes technological and interdisciplinary research. Its core mission is to coordinate advanced technological research for INFN research activities and to promote the application of advanced equipment and techniques to other scientific fields, and for societal benefit. Its mission is therefore central to INFN, cross-linking technical activities of INFN labs, committees and groups in an interdisciplinary approach. CSN5 has been very successful in that respect and in the

last few years has increased significantly its output in terms of publications in high-impact journals, invitations to international workshops and conferences, and graduations at bachelor, master and PhD levels. This has been accompanied by an increase in staff in all the three sectors of research: i) Detectors, Electronics and Computing, ii) Accelerators and Related Technologies and iii) Interdisciplinary Physics. We commend CSN5 for establishing its call system for proposals and grants, which has been very successful in encouraging young researchers, and we strongly encourage INFN to maintain this call system. The gender balance in CSN5 is very good at all levels and is excellent at the PhD young researcher level. Furthermore, it can be remarked that the externally acquired budget of CSN5 for the last five years of about 25 M€ is almost equal to that of its INFN budget. This is a great success compared to other sections in INFN, but possibly difficult to maintain. The question is whether CSN5 can develop a strategy to maintain such high-level of external funds. CSN5 is involved in many high-tech projects, for which it should be applauded, as many of these have been very successful and several highlights were achieved, most prominently CALOCUBE, CHIPIX65 and MAGIX. Clearly, a close collaboration with INFN committees and labs is essential. Therefore, CSN5 should keep and strengthen this successful structure and continue working within the interdisciplinary approach both in the research activities and in the application aspects in connection with industry.

Recommendation: None

Technology Transfer

The INFN is certainly doing a great effort to improve and structure its Technology Transfer activities; in particular the organisation of committees, its internal network, the definition of a new regulation for Industrial Property, and action to create spin-offs. Another positive innovative action is the Research4innovation programme. The idea to develop networks of specific technologies will certainly help to rationalise and improve critical mass. Good results in TT activities are linked to procurements in the experimental stage but still some concern derives from the capacity to assure the right economic evaluation of patents and spin offs. From INFN's description, it emerges how TT actions are based primarily on internal organisation. However, it still seems to be missing a structural link with industrial organisations, with the possible risk of duplication (e.g., database) and not reaching enterprises. We consider it important to define a clear strategy for TT actions, with particular reference to IP and to spin-off, in order to gain maximum results and strengthen the national R&I system.

Recommendations:

TT-1. Include industrial experts in the national TT Committee and in the selection process for Research4innovation projects.

TT-2. We propose again the recommendation raised in the 2017 CVI Report: To reach large numbers of enterprises rapidly and more effectively, we strongly urge INFN to develop a strategy to enhance structural links with industrial networks. To strengthen such links (TT, R&I projects, industrial PhD, placement) it could be useful to define framework agreements with the main enterprise organisations (e.g. Confindustria, Confapi).

TT-3. Evaluate whether incentives for pursuing TT activities should be implemented.

TT-4. Develop industrial PhDs via collaborations with enterprises.

Laboratori Nazionali di Frascati (LNF)

LNF is the largest and oldest INFN National Laboratory with more than 60 years experience in two main activities: the development, construction and operation of accelerators, and the design and construction of forefront particle detectors for particle, nuclear and astroparticle experiments. We are pleased to see that the new strategy for the future of the laboratory is steadily deployed and refined. It encompasses a broad spectrum of activities, based in part on new use of existing accelerator facilities and in part on new facilities. We now take note of some of the highlights.

The DAFNE complex comprises an e^+e^- collider unique in Europe running mainly at the Phi-meson centre-of-mass energy, a Beam Test Facility (BTF) and a Synchrotron Light Laboratory (DAFNE-Light). The DAFNE collider will complete its scientific programme in 2019. From November 2014 to March 2018 DAFNE delivered 6.0 fb^{-1} of integrated luminosity to the KLOE2 experiment, which recorded 5.5 fb^{-1} of good data, more than the 5.0 fb^{-1} needed to achieve the scientific goals of the experiment. The full set of data is now being processed. The Committee supports the plan to create a legacy database with KLOE2 data for open (regulated) access analysis. The BTF facility was equipped during 2018 with a second beam line to deliver a positron beam to the PADME experiment searching for Dark Photons, while serving other users in parallel. PADME completed its installation in July 2018 and started data taking in September. The SIDDHARTA2 experiment will run in 2019 at the DAFNE collider to study exotic kaonic atoms. Plans to extend the physics programme of PADME allowing running in parallel with SIDDHARTA2 during 2019 are being finalised. The DAFNE-Light laboratory currently operates 7 synchrotron beam lines used by 40 national and international teams.

As the High-Energy Physics programme comes to an end, LNF has prepared a plan to transform DAFNE into an accelerator test facility (DAFNE-TF) with interesting possibilities, including technological tests on targets for muon colliders (LEMMA), an e^+ resonant extraction (POSEYDON) or the study of electron cloud for HL-LHC, FCC. A workshop dedicated to DAFNE-TF will be held at LNF in December 2018, and DAFNE-TF could be potentially ready to accept proposals in 2021.

SPARC_LAB integrates the SPARC accelerator and the high power FLAME laser to develop innovative radiation sources and test new particle acceleration techniques. In 2018, it started working on electron acceleration with Plasma Wake Field Acceleration technique with encouraging results. This activity supports LNF participation in the H2020 EuPRAXIA project, to design the future European Infrastructure for demonstrating the usability of plasma acceleration techniques for 1-5 GeV high-brightness beams. LNF is a key player in that project and a candidate to host the future facility. To put this candidature on solid ground a new infrastructure laboratory, EuPRAXIA@SPARC_LAB, will be built on the LNF site. An enlargement of the laboratory premises by 4000 m^2 to hold the facility is on-going. A preliminary project of the building has been prepared and the bid for proposals for the definitive project is out. An extended version of EUPRAXIA@SPARC_LAB Conceptual Design Report that shows the feasibility of an X-band electron driver (up to 1 GeV), and a plasma cell accelerator (up to 5 GeV) coupled to an FEL (in the 3 nm region @ 1 GeV) was presented to INFN management and the LNF scientific committee in May 2018. An agreement has been signed with CERN to develop an X-band facility that should be ready in one year from now.

Discussions are underway to define EuPRAXIA Collaboration governance and milestones, and how to select the site. The plan is to write a CDR, inspired by the EUPRAXIA@SPARC_LAB CDR, with plans for the machine(s), the site(s), the cost and the governance of the collaboration. It will be submitted to ESFRI in 2020. Reflecting the strong role of Italy and DESY, a two-sites proposal will be discussed at the end of 2018 with Italy being the site for beam driven plasma acceleration, and DESY for laser-driven.

LNF is engaged in technology transfer, winning a grant, LATINO (Laboratory in Advanced Technologies for Innovation) from Regione Lazio, which paid 2/3 of the 2.5 M€ upgrades of four INFN facilities. They attracted the interest from more than 20 companies, and various collaboration agreements with ELLETRA, CERN, etc., were signed.

LNF has a rich outreach programme reaching many schools and the general public: [Edu]kids, OPENLABS, Pomeriggi di Scienza, among others. The new LNF visitor centre hosting an exhibition on accelerators, detectors and their impact on society has been completed and is now in use.

We note the hiring-by-law process that brought 36 new staff in key services, bringing the laboratory back to the level of 2011 before the cut. However, INFN as a whole grew 10% in the same period. It is important to have a good strategy to cover future retirements to guarantee availability of expertise in the future, including new areas for the laboratory as may be needed for the EuPRAXIA project.

In conclusion, we congratulate LNF for the successful operation of the DAFNE complex and the achievements of the experiments. As the DAFNE physics programme is coming to an end, plans are put in place for DAFNE BTF and DAFNE-TF that will ensure an interesting future for the complex. EuPRAXIA@SPARC_LAB showed significant progress last year and good prospects for the coming milestones. We note also the good contacts established with the local government of Regione Lazio when defining the future of the laboratory.

Recommendation:

LNF-1. INFN should give its strong support to LNF in advancing the EUPRAXIA project.

Laboratori Nazionale del Sud (LNS)

The KM3NeT experiment, a major activity of LNS, is discussed in section CSN2 above, and some of the LNS nuclear physics activities are covered in the CSN3 section.

LNS science is focused on its two operating accelerators: a Tandem Van de Graaff with a maximum terminal voltage of 15 MV, and a K800 Superconducting Cyclotron (SC). The two accelerators accelerate heavy-ion beams in a very wide range of mass and energy allowing studies of nuclear structure, nuclear reactions and nuclear astrophysics, as well as applications of nuclear physics techniques in particle therapy, cultural heritage and other multidisciplinary activities. The facility upgrade involving cyclotron, spectrometer MAGNEX, etc. (POTLNS project) seems to be on track with expectations that the funding will become available soon.

The NUMEN project has successfully formed an extensive collaboration that involves experimentalists and, essentially, theorists who could describe the complex reaction mechanism to

deduce the matrix elements relevant to neutrino-less double-beta decay. Preliminary data obtained are encouraging.

The PANDORA project is an excellent project, but needs some simple clarifications on how the goals will be achieved. Delivery of the beamline to ELI-Beamlines (ELIMED project) has been done and installation completed. Question is: will LNS staff be involved in the research on beams induced by laser light? The work on GEANT4 with respect to hadron-therapy applications is complementary to the work done by SATNURSE group and communication between groups exists in order not to duplicate work.

Recommendation:

LNS-I. Define the PANDORA collaboration and the tasks of the different participant institutions/groups.

Laboratory Nazionale del Gran Sasso (LNGS)

(The status and physics of several LNGS experiments are covered in the CSN 2 section above.)

This has been a challenging year for LNGS because of new laws restricting the amounts of inflammables, and environmental concerns by local prefectures, including possible contamination of water supplies. As a result LVD and Borexino will terminate in 2020, and plans for scintillator-based veto systems for future experiments have to be changed. An agreement with the authorities is ready to be signed. As a consequence, new experiments and facilities cannot start until the process has been completed, and the laboratory's fire safety will not be certified until the scintillator is gone. The Luna MV facility is a prime example. The laboratory has been exceedingly responsive to the safety concerns raised recently in part due to new laws. We hope the delays and any new conditions on operations can be resolved soon, as great science is waiting.

In spite of these problems the laboratory is carrying out an outstanding scientific programme, with 12 running experiments, two of which (Xenon 1T and GERDA) are approved for major upgrades. Luna-MV and DarkSide20T are under construction, but are being slowed down until the safety situation is resolved. We also note that an excellent set of R&D activities is in progress. The laboratory will decide soon on the mode of operation for LUNA-MV. Likely it will be run as a facility with a 5-year physics programme, in which case LNGS will have to invest in a 2nd beam line and in operations, with instrumentation to be provided by the FA's. A major SiPM packaging facility is being planned on the LNGS site, beginning with production for DarkSide and expected to become a seed for cutting-edge industrial technology. They have applied for ~18 M€ infrastructure grant, but no funding yet for the workforce.

The reorganisation discussed at the 2017 CVI meeting began in January 2018, bringing the technical divisions in touch with large experiments, with a Technical Coordinator (TC) in charge. The laboratory's emphasis is on the main technical systems, especially those having impact on safety. Meeting monthly with the experiments the TC will have a central role in working out rules, compliance, inspections and investigations, and inspections. Inspections have been a large drain on lab resources over the past 2 years, exacerbating staff shortages in the laboratory that make it hard to meet expectations of experiments.

Looking at the work underway toward new experiments and upgrades, we are pleased to note the swift progress of XENONnT. DarkSide is also making progress, but open questions remain on funding for extracting and purifying the underground argon (URANIA and ARIA projects), which may impact the realisation of DarkSide 20T.

We were disappointed to learn that SABRE, an important project for the laboratory, is developing slower than expected, in part because of management issues.

The laboratory has noticed with concern that several small experiments are not able to provide the resources and expertise required to meet safety standards. In particular this may compromise small R&D experiments because of limitations of LNGS capability to help out. A pot of money to assist them would seem a good investment. It has also become a problem that experiments receive funding for upgrades without input from the lab, and then require and/or expect support for these projects from the laboratory. LNGS needs to make it understood that no LNGS support is guaranteed until lab has evaluated them.

Recommendation:

LNGS-1. The laboratory should set up a stepwise “gateway” process for approving and supporting proposed new experiments and upgrades, going beyond assessment of the physics potential to make sure the safety issues and impact on LNGS resources are understood and covered.

Laboratory Nazionale del Legnaro (LNL)

The work performed at LNL is an interesting mix of pure and applied research, which can be categorised under three main headings: 1) Nuclear Physics and Astrophysics; 2) Applied physics: development and production of radioisotopes for nuclear medicine; and 3) Technology: development and construction of accelerators and accelerator components.

The first two topics are addressed using a suite of accelerators, the TANDEM-ALPI-PIAVE complex (TAP), comprising a 15 MV Tandem accelerator, two superconducting LINACs (ALPI and PIAVE) and two small electrostatic accelerators, CN and AN2000. The main new accelerator at LNL is a dual-exit high-current cyclotron that delivers proton beams of energies between 35 MeV and 70 MeV. This accelerator was delivered in 2015 and commissioning of the cyclotron was completed in March 2018.

The double-extraction cyclotron is the main component of the SPES (Selective Production of Exotic Species) project, which is the flagship project of the laboratory. SPES will produce a radioactive ion beam for the study of neutron-rich unstable nuclei of interest for nuclear physics and astrophysics. In parallel, it will produce radioisotopes for study and practical applications in nuclear medicine. As noted the cyclotron is now fully commissioned, but the overall project is still in a construction phase. The official programme calls for installation of the Isotope Separation On-Line (ISOL) system and the charge breeder in the next two years, primarily during the period September 2019 to July 2020. The completion of the 1^+ beam will allow experiments with non-accelerated beams to commence in 2020. The current schedule calls for physics with low-energy non re-accelerated beams in 2020-2021 and physics with re-accelerated beams in 2021-2022. The Committee endorses the programme of experiments with non-accelerated beams, which will increase the research activity at the laboratory.

The second exit of the cyclotron will be used for radioisotope production for medical purposes. The research fraction of this work will take place in RILAB, where cross section measurements and radioisotope production will be studied. The RIFAC facility will be used in collaboration with the private partner for research and production radioisotopes. The laboratory is signing a contract with Best Theratronics for the supply of beam and the lease of lab space. For reasons of radioprotection and contractual obligations, in the future SPES will operate with about 5000 hours per year devoted to ISOL targets and 5000 hours for applications.

The Laboratory also undertakes construction of accelerator components for use in important international projects. Notable here is the (RFQ) Radiofrequency Quadrupole, constructed for the International Fusion Material Irradiation Facility (IFMIF) together with further equipment to be installed at Rokkasho in Japan. The aim of IFMIF is the production of very high intense fluxes of high-energy mono-energetic neutrons, which are needed for testing the structural resistance of materials to be employed in Nuclear Fusion Reactors. LNL will also supply the Drift Tube Linac (DTL) for the European Spallation Source (ESS) in collaboration with Italian industry and INFN (Turin).

We note that the laboratory has followed the recommendation of the 2017 CVI report and established milestones to monitor progress on the SPES project. To date all the milestones have been met with one exception, (the setup of the technical components of the ISOL laboratory has a six-month delay). We also note with concern the staffing shortages in the Technical division, and that key positions are filled by post-docs.

Recommendations: None

Trento Institute for Fundamental Physics and Applications (TIFPA)

The INFN collaborative centre for transnational physical research TIFPA (Trento Institute for Fundamental Physics and Applications) has flourished since its establishment in 2013, exploiting strong collaborations with University of Trento and the Bruno Kessler Foundation. Under its first director Marco Durante (April 2015-August 2018), the number of permanent staff increased significantly from two to eight. The number of temporary fixed-term staff has increased as well, with INFN providing positions for 11 postdocs (including two foreign) and one young researcher. Furthermore, there is a large number of INFN associated staff from the CSNs, which allows TIFPA to be involved in a large number of INFN experiments. The transition at TIFPA in the period August-September 2018 from Marco Durante to the new director Giuseppe Battistoni proceeded smoothly. TIFPA now possesses technical facilities of very high standards that cover many fields, and during this period of growth the scientific and technical programmes have increased to cover all fields of research within INFN and beyond. It goes without saying that TIFPA needs to carefully maintain the high performance of these facilities on which its success depends.

Recommendations:

TIFPA-1. A programme advisory committee (PAC) for APSS (Azienda Provinciale Servizi Sanitari) has been established and has been useful in selecting proposals for experiments at APSS, in particular for medical physics and radiobiology. This should be internationalised.

TIFPA-2. Considering the broad scientific and technical interests within TIFPA, it would be advisable to establish a technical advisory committee (TAC) to advise the director on the very broad topics pursued at TIFPA.

TIFPA-3. It is advisable to join the large international network on biophysical research (led by GSI) as this will help in exchange of knowledge, experience and good practices. Try to join as well the activities supported financially by EC.

TIFPA-4. INFN could help in creating more lab and office space at TIFPA after the large increase in personnel of the last few years.

Laboratorio Acceleratori e Superconduttività Applicata (LASA)

LASA is currently a part of INFN Sezione Milano with a staff of 39 people, 26 of whom are permanent. The laboratory brings several highly valuable, and in some cases unique, competences to INFN, including superconducting cavities and cryostats, SC magnets for high intensity, photocathodes, laser light-ion acceleration, medical applications, etc. LASA's expertise, facilities, and close connection to industry allow it to make important contributions to the European XFEL, ESS, HiLumi LHC, and other projects. The programme is extremely broad and successful, and the experience in superconducting cavities is unique.

We urge INFN to do everything possible to maintain LASA at a high level. This will require substantial investments in infrastructure, and the rejuvenation of an aging staff. We also are persuaded that LASA would function better as an independent INFN centre.

Recommendation:

LASA-1. INFN should strongly consider transforming LASA into an individual INFN centre with its own budget.

INFN data processing & computer technology research centre (CNAF)

CNAF is the main data-processing and computer-technology research centre of INFN. Their common mission comprises Scientific Computing, Research and Innovation, Technology Transfer, and Information and Communication Technology (ICT) services for the whole INFN.

There are three Scientific Computing facilities at CNAF based on High-Throughput Computing (HTC), High-Performance Computing (HPC) and Cloud technologies, respectively. The HTC centre serves as Tier-1 for the Worldwide LHC Computing Grid with 390 kHS06 of CPU, 30 PB of disk and 60 PB of tape. The LHC experiments are the main customers consuming about 2/3 of the resources, followed by 30 astroparticle experiments and Virgo, then other CSN1 experiments. The Tier-1 ran smoothly and efficiently during Run 1 and Run 2 delivering the expected resources, except for an interruption of 6 months from November 2017 to April 2018 due to a severe flooding of the underground installation as a result of a broken city aqueduct. This caused huge damage, however most of the data could be recovered. INFN also counts on 10 Tier-2 centres distributed in the country, which sum up to about half of the Tier-1 capacity. The Tier-1 is well connected to other facilities: 1 Tbps link via a 20 km dark fibre to CINECA, 10-100 Gbps network provided by GARR to the Tier-2 centres and to various Cloud facilities. This allows dynamic expansion in case

of peak demand and access to commercial Cloud providers. The very fast connection to CINECA enables the use of 180 kHS06 of the Marconi HPC computer assigned to INFN under an agreement between INFN and CINECA signed in 2017. The fast connection to CINECA is the first step towards a strategic integration between HTC and HPC to address future computing needs of INFN. In general, HPC systems are crucial to address the societal challenges and will further expand in the future. We take good note of the efforts to integrate both systems.

Research and Innovation is dedicated to Distributed Systems (Cloud and Grid), and Software Developments for experiments. The Cloud is the new paradigm and migration from Grid to Cloud is mandatory. We note that participation in many large European H2020 projects provides substantial funding, about 3 M€ in total. Experiments are already able to profit from Cloud services. Data management will also change its paradigm to “Data-lake”, a concept under development that should address the much-increased future needs of the HL-LHC.

The External projects and Technology Transfer (PETT) division is handled by a collaboration between INFN-Bologna, INFN-Ferrara and INFN-CNAF, coordinated by CNAF. Technology Transfer is dealt with via the INFN Technology Transfer Lab (INFN TTLAB), an Industrial Research Laboratory accredited by the Region Emilia Romagna and part of *Emilia Romagna High Technology Network*. The Committee values the TTLAB initiative that allows combining skills of various INFN centres, and shaping and accessing regional funding programmes. Indeed TTLAB focuses on the skills of the three centres: big data and ICT services, computing, radiation detectors, nuclear technologies for diagnostics, material analysis etc. It targets the industrial sectors related to health, cultural heritage, and ICT innovative services among others. CNAF offers platforms to store and manage data for the private sector, in areas like biomedicine and genomics. It obtained the ISO certification required to operate in that sector. This enabled, for example, CNAF to act as the data platform for the Harmony Alliance, a European Network combining private and public sector to exploit Big Data in Haematology. The PETT division provides also support to external projects in diverse areas like recruitment, outreach, etc.

The CNAF personnel are formed by 52 FTEs, a stable level in the last few years. During the same period, the fraction of permanent staff has increased to 64%. The fraction of temporary personnel is 13% and of postdocs is 23%. Half of the manpower is dedicated to the data centre, 23% to research and innovation, 6% to PETT and 23% to INFN ICT services.

The future presents new challenges. The LHC Run 4, with an expected factor 4 increase in CPU and 7 in data storage, needs an upgrade of the infrastructure, while Run 3 could, in principle, be handled with the present one. There were, however, two important caveats in this consideration: the flooding risk and the maximum power available of 1.5 MW that would limit further expansion. The recent flood incident has forced revisions of the situation, and fortunately, a timely opportunity appeared with the decision of the European Centre for Medium-Range Weather Forecasts to host its new facility in the Bologna Tecnopolo. INFN-CNAF and CINECA used the opportunity and will move jointly to Tecnopolo supported by MIUR. The project takes into account the needs for

Run 4 of the order of 10 MW of power and 2000 m² of space for CNAF, and of a possible pre-exascale machine funded by EuroHPC for CINECA. Time is pressing, so a preliminary engineering project should be ready by end 2018, and the tenders launched a few months later to ensure that the halls will be ready to receive the computers by end 2020. The Committee considers that this project represents an excellent opportunity to take advantage of a very powerful HPC system to cover a significant part of the computing power needs, and to allow INFN-CNAF to become potentially a data centre for the Data-lake era.

Recommendation:

CNAF-1. Follow-up closely the progress of the new facility at Tecnopolo to be ready to deliver services for LHC Run 3. Develop a plan, with contingency in case of delay, for the transfer of resources from the “old” to the “new” centre.

Appendix I. Recommendations

GenStr 1. To create the strongest programme reflecting available resources changing research interests, INFN should set clear research priorities, and then rebalance budgets, resources and staff across the CSNs and laboratories. If mandatory allocation of people is impossible, try to “encourage” researchers by other means (e.g., research funds).

GenStr 2. INFN should fight hard to win the site for the Einstein telescope. Making sure VIRGO succeeds would seem to be a strong asset here.

GenStr 3. The next accelerator will define high-energy physics for decades, so INFN should support its world-class accelerator experts in the R&D and politics leading up to this crucial decision.

CA-1. CA and science should be allies, instead of CA being perceived as a burden. The CA needs to communicate clearly to scientists and researchers and increase awareness of the administrative work needed to support research activities in a complex organisation like INFN. To this aim, we suggest that a survey be conducted periodically on the perceived quality of services. This could help to recognise and answer the more urgent requests, and highlight the role played by a timely and efficient administration.

CA-2. A clear plan for resource development, over a horizon of a few years, with priorities clearly documented and justified, can help decision making bodies assess staffing needs on the basis of evidence.

CSN2 1. Gravitational waves: Prioritise the support for upgrading Virgo, with the goal to quickly approach a similar sensitivity like the LIGO antennas. Intensify work towards ET in Italy.

CSN2 2. High-energy universe: Keep strong support for KM3NeT in view of its high discovery potential and its strategic importance.

CSN2 3. Rare processes: Clarify financial and managerial problems in DarkSide20T and give full support to the project.

CSN3-1. The international collaboration on LUNA-MV should be strengthened, beginning with the organisation of workshops dedicated to that aspect.

CSN4-1. The INFN should record and report the professional departure destinations of INFN post-docs at the end of their stay in Italy. If data is reported over a number of years, it will help to monitor the effectiveness of the post-doctoral programme.

CSN4-2. When making new appointments, INFN should make sure the balance of theoretical research is well-matched to the experimental program.

TT-1. Include industrial experts in the national TT Committee and in the selection process for Research4innovation projects.

TT-2. We propose again the recommendation raised in the 2017 CVI Report: To reach large numbers of enterprises rapidly and more effectively, we strongly urge INFN to develop a strategy to enhance structural links with industrial networks. To strengthen such links (TT, R&I projects, industrial PhD, placement) it could be useful to define framework agreements with the main enterprise organizations (e.g. Confindustria, Confapi).

TT-3. Evaluate whether incentives for pursuing from TT activities should be implemented.

TT-4. Develop industrial PhDs via collaborations with enterprises.

LNF-1. INFN should give its strong support to LNF in advancing the EUPRAXIA project.

LNGS-1. The laboratory should set up a stepwise “gateway” process for approving and supporting proposed new experiments and upgrades, going beyond assessment of the physics potential to make sure the safety issues and impact on LNGS resources are understood and covered.

TIFPA-1. A programme advisory committee (PAC) for APSS (Azienda Provinciale Servizi Sanitari) has been established and has been useful in selecting proposals for experiments at APSS, in particular for medical physics and radiobiology. This should be internationalised.

TIFPA-2. Considering the broad scientific and technical interests within TIFPA, it would be advisable to establish a technical advisory committee (TAC) to advise the director on the very broad topics pursued at TIFPA.

TIFPA-3. It is advisable to join the large international network on biophysical research (led by GSI) as this will help in exchange of knowledge, experience and good practices. Try to join as well the activities supported financially by EC.

TIFPA-4. INFN could help in creating more lab and office space at TIFPA after the large increase in personnel of the last few years.

LASA-1. INFN should strongly consider transforming LASA into an individual INFN centre with its own budget.

CNAF-1. Follow-up closely the progress of the new facility at Tecnopolo to be ready to deliver services for LHC Run 3. Develop a plan, with contingency in case of delay, for the transfer of resources from the “old” to the “new” centre

Appendix II: Requests and suggestions for next year’s report.

We were most appreciative of INFN’s efforts this year, and would like to have them continued into the 2019 cycle.

- i. Please send us a mid-year report, including documentation of INFN’s response to our recommendations along with significant highlights (and any lowlights..).
- ii. At next year’s meeting we would like once more to have results of a “competitive assessment” of its more risky or questionable experiments. The exercise should be aimed at ranking these experiments with competitive ones, both to assess the chances of winning the race, given the resources and steps already done by competitors, and to look for complementarities.

Appendix III. Agenda

CVI Annual Meeting

chaired by Stewart Smith

from Monday, 15 October 2018 at 08:45 to Tuesday, 16 October 2018 at 20:00 (Europe/Rome)
at Napoli

[Manage](#)

Description Riunione Annuale Comitato di Valutazione Internazionale

[Go to day](#)

Monday, 15 October 2018

- 08:45 - 09:15 F.Ferroni/S.Smith: brief introduction and charge to CVI 30'
Speakers: Prof. Fernando Ferroni (ROMA1), Prof. Arthur John Stewart Smith (Princeton University)
- 09:15 - 10:15 Report from CSN2 1h0'
Speaker: Marco Pallavicini (GE)
- 10:15 - 10:45 coffee break
- 10:45 - 11:45 Report from CSN3 1h0'
Speaker: Mauro Gino Taiuti (GE)
- 11:45 - 12:45 Report from CSN5 1h0'
Speaker: Valter Bonvicini (TS)
- 12:45 - 13:15 Report from TIFPA 30'
Speaker: Giuseppe Battistoni (MI)
- 13:15 - 14:30 Lunch Break-closed session
CVI in closed session
- 14:30 - 15:15 INFN and Technological Transfer 45'
Speaker: Speranza Falciano (ROMA1)
- 15:15 - 16:15 Report from LNGS 1h0'
Speaker: Stefano Ragazzi (MIB)
- 16:15 - 16:30 coffee break-short
- 16:30 - 16:55 Report from LNL 25'
Speaker: Diego Bettoni (FE)
- 16:55 - 17:20 Report from LNF 25'
Speaker: Pierluigi Campana (LNF)
- 17:20 - 17:45 Report from LNS 25'
Speaker: Giacomo Cuttone (LNS)
- 17:45 - 18:15 CVI in closed session 1h30'
- 20:15 - 22:15 Dinner (TBA)

Tuesday, 16 October 2018

- 08:30 - 09:30 Report from CSN1 1h0'
Speaker: Nadia Pastrone (TO)
- 09:30 - 10:30 INFN and The new European Strategy for Particle Physics 1h0'
Speaker: Prof. Fernando Ferroni (ROMA1)
- 10:30 - 10:55 Coffee Break
- 10:55 - 11:55 Report from CSN4 1h0'
Speaker: Alberto Lerda (TO)
- 11:55 - 12:35 Laboratory for Accelerators and Applied Superconductivity (LASA) 40'
Speaker: Paolo Michelato (MI)
- 12:35 - 13:15 Report on the INFN Tier1 40'
Speaker: Gaetano Maron (LNL)
- 13:15 - 14:45 Lunch break- CVI Closed Session
Closed Session of CVI (lunch continues in room)
- 14:45 - 15:45 Report from AC 1h0'
Speaker: Bruno Albino Alain Quarta (AC)
- 15:45 - 17:15 CVI in executive session
- 17:15 - 17:45 Closeout with INFN: management, heads of the CSN's, etc.