Short Summary of CERN Scientific Policy Committee Meeting 12-13 June 2017

by R. Keith Ellis on behalf of the members

1 Matters arising from SPSC

The main items discussed at the April SPSC Meeting were reviews of the Neutrino Platform experiments, and reviews of progress of NA62 (*Kaon Factory*) and RD52, (*Dual-Readout Calorimetry for High-Quality Energy Measurements*). Comments on the Neutrino Platform will be deferred to later in this summary.

NA62 ($K^+ \to \pi^+ \nu\bar{\nu}$ search) presented a preliminary analysis of the first 5% of their data from 2016. They expect of order 1-2 events from their entire 2016 data, and so far have no candidate events from the first analysis. In 2017 they will run at higher intensity, and according to the standard model should observe about 10 events.

2 LHC Matters – Status report on the Accelerator Complex

The report by the Director of Accelerators concentrated on the startup of the full chain of machines, PS, PSbooster, Isolde, SPS, AD, Elena and LHC. The INTC also reports that the startup of the ISOLDE and the n-TOF facilities has been smooth, and that physics data taking has been ongoing since late April and early May.

An item of note is the new SPS internal beam dump with an innovative design, which went from design to realization and installation in only eight months. Also noteworthy is fact that the LHC physics run began about 1.5 weeks ahead of schedule, which speaks to the orderly startup of the whole accelerator chain. The committee also notes that the magnets in sector 1-2 achieved the requisite current for 6.5 TeV operation after thermal cycling with only two quenches.

For the longer term future the committee notes the laying down of a schedule for prototypes and production models of 11T Nb_3Sn accelerator magnets. This activity has been running for more than two years both in Europe and the USA. The committee takes note of the 4th Workshop on Energy for Sustainable Science, which is of clear importance for reducing the environmental and economic impact of energy consumption by research infrastructures, such as CERN. The committee notes the successful tests of the superconducting crab cavities needed for HL-LHC.

3 Report on LHC experiments, computing and from the LHCC

3.1 Run 2

After a very successful extended year-end technical stop the experiments are ready to take data and able to withstand an instantaneous luminosity of $2 \times 10^{34} \mathrm{cm}^{-2}\mathrm{s}^{-1}$. The computing

resources seem to be reasonably in place, although according to the LHCC there is some difficulty for ALICE, especially in 2018 and the experiment may need additional computing resources.

3.2 Phase I upgrades

The Phase I upgrades are progressing, and in the main on schedule for installation during LS2. The committee notes the LHCC report that there are issues with the development of application-specific integrated circuits (ASICs) for ALICE, ATLAS and LHCb and that there are retention issues for the highly skilled electronic engineers who perform this work. The SPC heard that the LHCC strongly endorses the ramp-up of efforts to complete the ATLAS New Small Wheel in time for installation in LS2, however the schedule remains a major concern despite the recent progress reported.

3.3 Phase II upgrades

There is intense activity of Technical Design Report (TDR) preparation for the Phase II upgrades. The LHCC has concluded the review of the first one, which concerns the ATLAS ITk-strip TDR and its 64m^2 of silicon. Nine more TDRs are expected in the next 6 months. The primary reason for this challenging schedule is the strong desire on the part of the Funding Agencies to know the total cost of the phase-2 detector upgrades by April 2018. To cope with this intense workload of reviews, several panels have been setup involving current LHCC members, former LHCC members, and external experts. The panels will be augmented by members of the Upgrade cost group to review the cost, schedule, and management part of the TDRs.

There is also effort to define the computing model and software infrastructure for the HL-LHC era. Initial documents are expected in 2017, while the TDR is targeted for 2020.

4 Annual Progress Report

The Committee has received the final version of the Annual Progress Report for 2016. Overall 2016 was a great year for the organization. The SPC notes with pleasure the extremely successful running of the LHC, delivering about 60% more data than foreseen to the general purpose detectors. We also note the positive financial results for the organization. This is the result, *inter alia*, of management efforts to optimise the use of resources. Good progress has been made in many other scientific areas too numerous to mention in this brief report.

We gratefully acknowledge the efforts made to improve the readability of the document, namely the long executive summary, the summary tables showing revenues and expenses and the key performance indicators. The SPC is happy to see that the sugggestions made by the committee on the draft document have been implemented. We thank the management for the inclusion of the data on the occupational accidents over the past thirty years. We note that the accident frequency rate over the past thirty years shows a generally downward trend. The SPC look forward to receiving more information on this important topic.

5 Medium-term Plan

Overall we find the medium term plan to be coherent and well presented and we acknowledge the efforts of the staff to make the complicated plan comprehensible.

The MTP introduces a number of new items that were not present, or only partially funded in the previous year's version of this document. The SPC is generally positive about these changes but will comment explicitly on just a few where the SPC has special competence.

The recruitment of the 80 limited duration staff (65MCHF over 5 years) was presented to the SPC in December 2016, (CERN/SPC/1079/RA) and the SPC has already expressed its strong support for this initiative. The flexibility to reprogram funds between the Material budget and the Personnel budget is important to respond to the varying demands in the different phases of large projects.

On another staffing matter, the SPC is pleased to support the efforts by the management to preserve the central budget for fellows. The introduction of fellows (currently 750) into the workforce does much to preserve the vitality of the program and train for the future.

The SPC has already commented favourably in our March report on the plan to refurbish the bypass diode boxes, and we continue to endorse this action now that the financial implications of that decision have been spelled out in the MTP (10MCHF in total).

The SPC finds the case for the planned extra expenditures and the identification of the extra cost savings to be convincing.

6 Strategy and framework applicable to knowledge transfer by CERN for the benefit of medical applications.

The SPC appreciates the move to organize a disparate series of activities into a coherent framework and the self-imposed limitations on the type of work carried out at CERN. The SPC considers the investment (3.87MCHF in 2018) in seeding these activities to be appropriate. The SPC notes the potential of this activity to aid medical progress and to generate goodwill for the organization.

7 Higher Energy at the LHC (May SPC meeting)

Already at the May meeting we heard about the limited number of magnet quenches in sector 1-2 after thermal cycling. This, together with the projected completion of the work on diode boxes, gives confidence to plan to increase of the LHC energy to 14 TeV in Run 3. We also heard about the initial stages of planning to raise the energy beyond 14 TeV. Although the relationship between the value of higher energy and higher luminosity is dependent on the type of physics to be investigated, for the production of the highest mass objects, an increase of energy is of paramount importance. The committee takes note of the working group in the accelerator division whose remit has three phases,

1. Preparation of an implementation plan to go to 14 TeV.
2. Report by the end of 2017 on the possibility of going to 15 TeV (with the current magnets operated at higher field) late in Run 3.

3. Report by the end of 2018 on the feasibility and cost of substituting some fraction of the magnets, (say 1/3), with higher field magnets to go beyond 15 TeV.

The SPC would like to be kept informed of the planning to achieve higher energy at the LHC.

8 Neutrino Platform

We thank Marzio Nessi for his report on the progress of the neutrino platform and we offer our congratulations for what has been achieved. The work on Baby-MIND and ICARUS has been completed; the former is ready for shipping and the latter is in transit to Fermilab. The $3 \times 1 \times 1$ detector has provided useful lessons for the later cryostats and is now being readied to act as a double phase demonstrator. The single phase and double phase ProtoDUNE cryostats and TPCs are making good progress. However the schedule to have the ProtoDUNE detectors cooled by April 2018, and ready to take data in the beam before the LS2 shutdown, is very ambitious.

The SPC was gratified to hear of the recognition of the important role played of CERN staff in neutrino physics. The committee is of the opinion that it is important that the neutrino platform act as a focus for European experimental and theoretical work. This will help European and CERN scientists to take ownership of the physics of neutrino oscillations, in addition to the design and construction of detectors.

9 NuPECC Long range plan

We thank Prof Bracco for her report on the NuPECC long range plan. The committee was pleased to see the important role played by CERN in the future plans of the Nuclear Physics community. Contributing CERN facilities are LHC (ALICE and the general-purpose LHC detectors), ISOLDE, n-TOF and AD.

10 Closed and Restricted session

During the closed session the SPC formulated its recommendations detailed above. During the restricted session the SPC chose three new members for submission to Council. These individuals will be contacted to see if they are available to serve and their CV's forward to Council for approval.

11 Agenda for future meetings

The following items will be considered for the agenda for the September meeting,

- Report on progress of the FCC studies and FCC meeting in Berlin;
- Report on the Highlights of the summer conferences.

The following items will be held over for the agenda of future meetings:- a report on Knowledge Transfer, a report on Physics Beyond Colliders, a detailed report from the INTC, a status report on the Theory Department, a progress report on CLIC/ILC and a general report on the safety at CERN.