CERN RESEARCH BOARD

MINUTES OF THE 211th MEETING OF THE RESEARCH BOARD
HELD ON WEDNESDAY 11 MARCH 2015

Present  S. Bertolucci (Chair), F. Bordry, P. Collier, F. Forti, R. Forty (Secretary), J. Garcia Perez, F. Hemmer, J.M. Jimenez, M. Kowalska, W. Lerche, L. Mapelli, E. Meschi, L. Miralles, R. Saban, C. Vallee, H. Wilkens

Apologies  K. Blaum, R. Heuer, E. Tsesmelis

Items

1. Procedure
2. Report from the REC meeting of 15 January 2015
3. Report from the LHCC meeting of 4-5 March 2015
4. Report from the SPSC meeting of 13-14 January 2015
5. Report from the INTC meeting of 12-13 February 2015
6. Any other business
1  PROCEDURE

1.1 S. Bertolucci opened the meeting, welcoming F. Forti as the new chair of the LHCC and J. Garcia Perez as the new representative of the Staff Association.

1.2 The minutes of the last meeting [1] were approved without modification. There were two matters arising, listed in the following paragraphs.

1.3 From item 1.1 of the minutes, L. Mapelli reported on the progress being made by the CLOUD collaboration to resolve their funding difficulties; this will continue to be followed up.

1.4 From item 6.1 of the minutes, concerning the possible extension of the low-energy proton run at the end of the year, progress on the preparation of HIE-ISOLDE was reported by R. Saban [2]. There are currently no significant delays compared to the expected schedule, which would give four weeks of running in 2015 without extension. The work planned for the end-of-year stop is considered to be incompressible, so in case of run extension the start-up of the overall accelerator complex in 2016 would be delayed. There is room, however, to bring forward the restart of ISOLDE in 2016 compared to the current plan. M. Kowalska explained that as it is a new facility, running an experiment on HIE-ISOLDE in 2015 was felt to be an important milestone by the community, and in principle could be achieved with two weeks run in case of minor delays. S. Bertolucci concluded that best effort would be made to ensure that HIE-ISOLDE gets physics this year, but that deciding on an extension of the run is not necessary at this point; the status will continue to be followed closely and will be re-assessed at the next Research Board.

2. REPORT FROM THE REC MEETING OF 15 JANUARY 2015

2.1 L. Mapelli reported from the latest meeting of the Recognized Experiments Committee [2]. One experiment, Planck (RE24), did not respond to the invitation to apply for extension, so no longer has Recognized Experiment status from 1 January 2015. Five experiments did respond and were all recommended for extension. The Research Board approved the extension of Recognized Experiment status at CERN.
of MAGIC (RE17), ArDM (RE18) CALET (RE25), Borexino (RE26), and NEXT (RE27), for a further three years until end-2017.

2.2 The NEXT experiment included a new request along with the extension of recognition, to test the potential of using a magnetic field for background reduction. The NEXT-DEMO prototype is being upgraded to replace the PMTs that are currently used with a plane of SiPMs, and the test would be performed at CERN operating DEMO inside a magnetic field. The TPC90 magnet previously used by the HARP experiment has been identified as being suitable for such a test, and is available. The test would imply the presence of a small team at CERN for about one year, without need for beam. Use of TPC90 magnet is subject to clarification of a suitable location for the test setup and of the costs for installation and operation, and a decision on approval was deferred to the next Research Board.

2.3 One new experiment requested Recognized Experiment status. Euclid is an ESA mission for a space telescope to map the geometry of the dark Universe. The mission will investigate the distance-redshift relationship and the evolution of cosmic structures by measuring shapes and redshifts of galaxies and clusters of galaxies out to redshifts of about 2, or equivalently to a look-back time of 10 billion years. In this way, Euclid should cover the entire period over which dark energy played a significant role in accelerating the expansion of the Universe. Their request to CERN is focused on obtaining access to software expertise and computing resources, in particular for the use of CernVM, the system developed at CERN for a virtualised analysis environment. In addition they would welcome participation of CERN personnel in technical reviews, and some use of meeting rooms. The Research Board approved the Recognized Experiment status for Euclid as RE31, for the use of CernVM. The recognition is initially for three years until end-2017.

3 REPORT FROM THE LHCC MEETING OF 4-5 MARCH 2015

3.1 F. Forti reported from the latest meeting of the LHCC [2]. The physics output from all experiments is impressive, with hundreds of papers already published. The LS1
activities have been successfully completed for all experiments, which are preparing to restart data taking, and cosmic runs are ongoing. The LHC machine re-start is progressing well, with about a two-week delay compared to the original plan due mainly to the higher-than-expected number of magnet quenches. In June the LHCC will examine the requests for special runs, for 5 TeV centre-of-mass energy reference data, and for the machine fill structure for PbPb running.

3.2 Approval of the experiment **Phase-1 upgrade** Technical Design Reports is almost complete. The LHCC is in the process of reviewing TDRs for the Muon Forward Tracker (MFT) and Time Projection Chamber (TPC) of ALICE, and the Muon Endcap GEM of CMS. The LHCC expects to receive also the ALICE Online-Offline (O2) TDR and the final ATLAS Forward Physics (AFP) TDR, and will present its recommendations in June.

3.3 The definition of the approval process for the **Phase-2 upgrade** program for the experiments is progressing well. The experiments are preparing Scoping Documents for three funding scenarios and will submit them during the summer. The LHCC will present its recommendations for those documents in September, prior to the October sessions of the Resources Review Boards.

3.4 **ALICE:** Detector re-commissioning has concluded with the installation of the Transition Radiation Detector modules. The new pre-series read-out electronics for the TPC has been successfully tested; mass production is ongoing and installation is foreseen during the June Technical Stop. The sensor technology choice is still pending for the Inner Tracking System (ITS) upgrade project: there are two fully compatible CMOS chip options, one which is baseline and another which is being optimized for the detector outer layers. The MFT will add significantly to the physics capabilities of ALICE, providing primary and secondary vertexing in a challenging rapidity region matched to the muon spectrometer; its schedule is tight and there is a concern about possible interference between the MFT and ITS construction. The LHCC encourages ALICE to move forward to complete the R&D phase in 2015 and to launch the production phase for all items in 2016. The LHCC received an Addendum to the TPC TDR, and is impressed by the progress in the R&D campaign: the 4-GEM baseline has been extensively characterized, and has been shown to exceed the requirements of 1%
ion back flow and 12% energy resolution, although with only small contingency. Given the crucial role in the ALICE physics programme of a TPC capable of operating up to 50 kHz, the limited margin remains a concern. The LHCC encourages ALICE to move forward with the current baseline design and to submit the documentation for cost review, whilst in parallel continuing a vigorous R&D campaign to explore chamber configurations that could provide additional operating margin.

3.5 **ATLAS**: The Transition Radiation Tracker (TRT) xenon leaks are stable; the detector is set up to run argon in the inner barrel and the performance is good. Bowing up to 200 μm of the Inner B-Layer (IBL) staves has been observed under operating temperature changes, and is being investigated further. The physics programme for the AFP is very complementary to ALFA (large-β acceptance, all β*), with tracking detectors based on the IBL technology. The project calls for installation of a single arm in the autumn. This appears very ambitious and as a fall-back both arms could be installed together at end-2016. Updates to the LHCC are expected in the next months.

3.6 **CMS**: The Phase-1 upgrades are proceeding according to plan. A draft of the Muon Endcap GEM TDR was received, which will provide improvements to tracking and triggering; although mostly needed for High-Luminosity LHC, the project is mature and could be installed during LS2. A set of four chambers will be installed in the experiment in 2016 for a full slice test. The experiment is encouraged to submit the final version of the TDR for recommendation at the June meeting. The Technical Proposal for the Phase-2 CMS upgrade has been delayed to April in order to complete the physics studies and to conclude on the choice for the end-cap calorimeter.

3.7 **LHCb**: The LHCC carried out an in-depth review of the LHCb Phase-1 upgrade, where good progress is being made in all projects. For the Scintillating Fibre Tracker, bumps in the fibre diameter are still an issue, but are now understood. A delay in production of final read-out chip for the RICH, due to change from the IBM process to TSMC, has caused a schedule delay of about 8 months; the planning has been adjusted with no significant impact on the overall LHCb schedule. The vertex locator (VELO) half-planes have been rotated by 45° compared to the configuration presented in the TDR, to mitigate tight tolerances during insertion; this required a new foil design, and machine impedance studies are ongoing—the LHCC encourages the experiment to prepare a
Design of the VeloPix ASIC is proceeding at full speed and with a rather aggressive schedule; its availability will drive the VELO project schedule. R&D on sensors, readout ASIC, and flex circuit for the Upstream Tracker is progressing, although some milestones have been missed due to technical problems. The LHCC expressed concern on the tight schedule for this project and will monitor the progress closely.

3.8 **LHCf:** Data taking is planned during the LHC start-up period just before the first Technical Stop for a combined physics analysis programme with ATLAS. To avoid radiation damage the LHCf detectors must be removed before the LHC delivers 500 pb$^{-1}$ of integrated luminosity. The LHCC supports the LHCf physics programme and encourages the experiment to develop back-up plans with the machine that would allow the experiment to carry out their physics measurements even in case unexpected problems prevent the execution of the baseline plan.

3.9 **TOTEM:** Roman Pots have been installed; T1 is ready for installation and T2 installed, despite suffering some damage and with one quarter of the telescope removed from the control loop, the impact on the physics is minimal. Vertical Roman Pot timing detectors are on schedule for installation in September. The sensors for the CMS-TOTEM Precision Proton Spectrometer (CT-PPS) are delayed due to a change of producer.

3.10 **WLCG:** During the shutdown the experiments have undertaken an ambitious programme of software and computing updates, implementing in some cases frontier technologies (multi-thread, virtual computing). The computing models have been renovated to take into account the experience gained during the first data-taking period and to further optimize the resources. Common work across the experiments becomes increasingly important and beneficial; in this context, the HEP Software foundation is a timely initiative and the LHC experiments and WLCG are active partners during this initial phase. The longer term is now being prepared in all experiments and the LHCC will follow the process closely to ensure that the computing models fit the specifications enabled by the ambitious detector upgrades. The Research Board took note.
4 REPORT FROM THE SPSC MEETING OF 13-14 JANUARY 2015

4.1 C. Vallee reported from the latest meeting of the SPSC [2], including annual reviews of experiments at the AD: BASE, ATRAP, ALPHA, ASACUSA, AEGIS and GBAR, discussed in the following paragraphs. He also reported on the successful start-up of NA62 and COMPASS, and of NA61 with argon ions. The Research Board took note.

4.2 BASE: Rapid progress has been made by the experiment at CERN, and the SPSC notes with pleasure the good prospects for a new measurement of the antiproton magnetic moment during 2015.

4.3 ATRAP: A new Ioffe trap and improved magnetic moment apparatus have been successfully commissioned at CERN, and the SPSC looks forward to the first antihydrogen and magnetic moment results in 2015.

4.4 ALPHA: The ALPHA2 setup with improved performance has been commissioned, and operated successfully with antihydrogen trapping. The SPSC looks forward to the demonstration of resonant laser excitations of trapped antihydrogen.

4.5 ASACUSA: Measurement of the one-photon transitions in spectroscopy of antiprotonic helium has been completed, and the result has been included in the value of the antiproton-to-electron mass ratio issued by CODATA14. The SPSC congratulates the collaboration for successfully commissioning the hyperfine structure spectroscopy apparatus with hydrogen and for detecting antihydrogen in the final experimental setup. The committee looks forward to the first attempts of antihydrogen spectroscopy, to the studies of two-photon transitions in antiprotonic helium and to antiproton collision experiments at 5.3 MeV.

4.6 AEGIS: The SPSC acknowledges the progress achieved by the AEGIS collaboration since the last annual review, and is looking forward to their first antihydrogen formation in 2015.

4.7 GBAR: Progress has been made in the development of components of the apparatus, and the SPSC encourages the collaboration to continue their efforts to solve remaining
issues, including those related to the ELENA beam divergence. The committee is pleased with the recent agreement for the funding and construction of the positron linac, and looks forward to receiving a resource plan and detailed schedule for the development and installation of the key components of the apparatus.

4.8 P. Collier mentioned that the current planning for ELENA involves moving transfer lines before LS2, which would impact on the AD physics programme; it might be preferable to delay this work until the shutdown. C. Vallee responded that this and other issues related to the configuration of the AD with ELENA will be discussed at the next SPSC.

5 REPORT FROM THE INTC MEETING OF 11-12 FEBRUARY 2015

5.1 M. Kowalska reported from the latest meeting of the INT [2]. Since the November meeting the ISOLDE experiments have collected very good data. Most of the runs in 2014 were devoted to nuclear structure, with some on astrophysics, fundamental studies, and applications. The average number of 8-hour shifts delivered in 2014 was similar to previous years (1.5/day), showing that the facility was used efficiently in spite of some technical problems. There are over 1500 shifts remaining. The nTOF experimental campaign of 2014 took place after substantial work during LS1. A total of \(9 \times 10^{18}\) protons were taken, a little below the target. The commissioning of Experimental Area 2 (EAR2) and re-commissioning of EAR1 were successful. The increased neutron flux in EAR2 (due to its shorter distance) and in EAR1 (due to LS1 improvements) was as expected, with over 30 times larger flux at EAR2. After commissioning, successful physics runs took place at both facilities. The Research Board took note.

5.2 Six experiments at ISOLDE were recommended for approval, for a total of 76 shifts, and two experiments at nTOF for a total of \(6.0 \times 10^{18}\) protons. They are listed in the following paragraphs.

5.3 P317 Add.2 Mass spectrometry of neutron-rich nuclides into the \(N = 40\) island of inversion [3] was approved for 6 more shifts and will continue to be known as IS532.
5.4 **P412 (CLL-019)** Beta-delayed neutron spectroscopy of $^{130-132}$Cd isotopes with the ISOLDE Decay Station and the VANDLE array [4] was **approved for 13 shifts** and will be known as **IS600**.

5.5 **P426 (CLL-020)** Measurement of the $\beta$ asymmetry parameter in $^{35}$Ar decay with a laser polarized beam [5] was **approved for 13 shifts** and will be known as **IS601**.

5.6 **P427 (CLL-021)** Cu(I), Ag(I), Cd(II), Hg(II), and Pb(II) binding to biomolecules studied by Perturbed Angular Correlation of gamma-rays (PAC) spectroscopy [6] was **approved for 22 shifts** and will be known as **IS602**.

5.7 **P430** The $(n,\alpha)$ reaction cross section measurement for light isotopes [7] was **approved for $2.0 \times 10^{18}$ protons** and will be known as **nTOF38**.

5.8 **P431** Neutron-induced fission cross-section of $^{237}$Np obtained with two different detection systems [8] was **approved for $4.0 \times 10^{18}$ protons** and will be known as **nTOF39**.

5.9 **P432** Measurement of the super-allowed branching ratio of $^{10}$C [9] was **approved for 21 shifts** and will be known as **IS603**.

5.10 **P435** An implanted $^{228}$Ra source for response characterization of bolometers [10] was **approved for 1 shift** and will be known as **IS604**.

6 **ANY OTHER BUSINESS**

6.1 The **next meeting** of the Research Board will be held on 10 June 2015.

6.2 The subsequent meeting was originally scheduled on 9 September, but would have fallen before the LHCC of 23-24 September. Since there are expected to be important discussions of the LHC experiments’ Phase 2 upgrade funding at that time, in preparation for the RRB of October, the Research Board meeting was rescheduled to **30 September**.
ENCLOSURES

1. Minutes of the 7th REC meeting held on 15 January 2015.

2. Draft Minutes of the 121st LHCC meeting held on 4-5 March 2015 (LHCC-2015-005/LHCC-121).


REFERENCES


[6] Cu(I), Ag(I), Cd(II), Hg(II), and Pb(II) binding to biomolecules studied by Perturbed Angular Correlation of gamma-rays (PAC) spectroscopy (CERN/INTC-2015-026).


[8] Neutron-induced fission cross-section of $^{237}$Np obtained with two different detection systems (CERN/INTC-2015-007).
