

Plenary RRB

May 2022

Draft Minutes of the 54th Plenary Session of the LHC Resources Review Boards CERN, Geneva, 25th April 2022

Documents and slides of all presentations can be found on the RRB Indico pages, accessible via the LHC-RRB home page <u>http://cern.ch/committees/LHCRRB</u>

The minutes of the last Plenary Session, CERN-RRB-2021-113, were approved.

CERN Status and News. J. Mnich, Director for Research and Computing

Since September 2021, about 6000 individuals are entering the CERN sites every weekday. The CERN COVID-19 scale is at green mode since March 14, 2022 with some additional measures. On July 4, 2022, CERN will mark 10 years since ATLAS and CMS experiments announced the

discovery of the Higgs boson with a scientific symposium.

In March, Brazil signed an agreement to become an Associate Member State of CERN, its ratification has to be confirmed by the government.

Following the recommendations of LHCC and the HL-LHC Cost & Schedule Review, CERN management decided this January to extend Run-3 by one year and LS3 by ½ year underlining that any further shift of LS3 is technically excluded. CERN has introduced measures to consolidate the Phase-II schedule.

On March 25th, the Council decided to suspend the participation of CERN scientist in all scientific committees of institutions located in the Russian Federation and the Republic of Belarus, and vice versa, to suspend or, failing that, cancel all events jointly arranged between CERN and the institutes located in the Russian Federation and the Republic of Belarus and to suspend the granting of contracts of association as associated members of the CERN personnel to any new individuals affiliated to home institutions in Russia and Belarus. Council decided already on March 8th that CERN will not engage in new collaborations with the Russian Federation and its institutions until further notice.

Concerning the relations with the Joint Institute of Nuclear Research (JINR), the Council decided to suspend the participation of CERN scientists in all JINR scientific committees, and vice versa, to suspend or, failing that, cancel all events jointly arranged between CERN and JINR, that CERN will not engage in the new collaborations with JINR until further notice. The Observer status of JINR at the Council is suspended and CERN will not exercise the rights resulting from its Observer status at JINR, until further notice. The Council has asked for more information with a view to make a decision in June on the possible suspension of existing international cooperation agreements.

The spokespersons of the four big LHC experiments proposed a suspension of publications and then an agreement was found among the four collaborations to submit further papers for publication without an author list nor acknowledgments delaying then the final real publication to after the CERN council meeting in June and taking then afterwards the Council decision in June into account.

There were no questions following this presentation.

Status of the Accelerator Complex post LS2. M. Lamont, Director for Accelerators

Linac4 is in good shape and stable with 96% availability last week. Likewise, the booster had a 96% availability last week and all required beams (ISOLDE, n_TOF, East Area, AD, North Area and LHC variants) are in place. The PS had an availability of ~83% last week. The main faults were related to the injector complex and the power converters. The physics in the East Area started on March 28th and the main effort is ongoing now to optimise beam parameters including the implementation of new tools to facilitate the steering of the beam position. The PS is regularly providing single and 5-turn extractions to the SPS for setting up. Work on further intensity increase and beam optimisation is ongoing. AD and ELENA are seeing an 80% to 90% deceleration efficiency.

The SPS commissioning is progressing well and is on schedule, North Area physics starts today. Upcoming tests to improve the spill quality, which will not concern the LHC, are planned.

For the LHC, the main dipole training to 6.8 TeV is completed. The training of Sector 2-3 was slower than expected, there was a Cryo-RF incident on March 18^{th} and LHCb needs ~1 week stop for the VELO C-side installation. All this introduced a delay of ~ 2 weeks. LHC beam commissioning started April 22^{nd} with pilots ramped up to 6.8 TeV on the morning of 25^{th} April. In the latest LHC schedule, first stable beams is foreseen for 5^{th} July; stable beam running with greater that 1200 bunches per beam is expected around August 4^{th} .

There were no questions following this presentation.

Status of the Experiments, including Phase-II Upgrades. J. Mnich, Director for Research and Computing

Summary:

Several physics highlights from the LHC experiments have been presented: the result on Anti ³He absorption in ALICE, the Higgs Boson couplings results of ATLAS, the search for paired Di-jet resonances in CMS and the semi-leptonic lepton Flavour test of LHCb.

LS2 activities:

ALICE has finished the installation of the new and upgraded detectors and completed the maintenance activities. The magnet was restarted on March 7th.

ATLAS finished all Phase-I upgrades including the installation of both NSWs, the digital LAr trigger and the new Trigger & DAQ boards, which are all now in the commissioning phase. Both magnets are now ON.

CMS is ready for collisions, all detectors, including HF, are participating in the global runs.

LHCb has completed all installations of upgraded detectors with exception of the second half of VELO, where the installation is foreseen in the next weeks with minimal effect on the LHC schedule. The upstream tracker, which is not essential for the initial operation and which will be installed at a later stage.

WLCG is ready for Run-3, a final commissioning campaign was happening in March with excellent results so far.

Risks associated with the war against in Ukraine:

~7% of the members of the LHC collaborations are from institutes in Russia (incl. JINR and Belarus). More than 110 Russian scientists, engineers and technicians are essential for the construction and operation of the experiments of very critical detectors at present and as well in the past. Russia is providing ~6% of the total M&O A+B contributions (without electricity) for the four big experiments. ~5.8% of the CORE contributions to the current four big experiments including Phase-I has been granted by Russian institutes including JINR and Belarus. Almost 140

students from Russia are working for the four experiments. Russia participates in the Worldwide LHC Computing Grid and has two Tier-1 centres comprising ~10% of the total Tier-1 resources, with a specially high exposure to risk for CMS with ~30%. In addition, there are 8 Tier-2 centres in Russia. Ukraine supports two Tier-2 centres in Kiev and Kharkiv. ~30 Russian experts contribute to the development and operation of WLCG software and services for the experiments. For the Phase-II upgrades, very significant contributions are expected from Russian institutes with ~20 MCHF CORE contributions, some of which are in-kind. The workforce and the expertise of many Russians collaborators are almost not replaceable. All this leads to a significant budget and schedule risk.

There were no questions following this presentation

Accelerator R&D Roadmap. D. Newbold, Chairperson, Lab Directors Group (LDG)

The European Strategy contains clear recommendations on accelerator R&D: ramp up the R&D effort focused on advanced accelerator technologies, intensify accelerator R&D and sustain it with adequate resources, produce a roadmap, define the deliverables for this decade in a coordinated way and in a timely fashion. Five key areas for the accelerator R&D have been defined in the European strategy: High-Field Magnet R&D, Laser/Plasma Acceleration Techniques, RF Structures, Muon beams and Muon Colliders and Energy Recovery Linac Technologies.

Key questions during the strategy update progress were: What R&D is necessary? Priorities? Dependencies, conflicts or choices between activities? What science can be done with demonstrators, or intermediate-scale facilities? The goal is to provide concrete evidence to support decision-making by the field at future strategy updates over the coming five years. The content of a roadmap has been set up which should provide information, motivation and priorities. The process to define the roadmap included many expert panel meetings and workshops, consultations, interim reports, planning and SPC reviews. As an example, an R&D plan for the RF structures was presented, where there is a draft high-level resource loaded plan in place. General recommendations include acceptance of the collective view of the communities, governance structures should oversee the R&D, a broad front of R&D should be maintained, provisions for 'blue skies' R&D and novel developments, priority to continue of existing funding, environmental sustainability, emphasis on scientific exploitation, practical considerations like engagement of industry, close cooperation between Europe and other labs, key factor for success is the training and professional development of personnel. A 'lightweight' coordination structure was proposed. LDG is planning in detail for the implementation stage with the approval of the final mandate by the Council in order to receive a backing up by the FAs. A Q&A session for April 28 is planned.

M. Titov asked to which extent the sustainability is taken care of in the roadmap and in which particular area of the roadmap the sustainability has been covered. D. Newbold mentioned that there are two aspects to sustainability in the roadmap. The first is the development of technologies, which allows the creation of the new facilities in a more power and resource efficient way, e.g. better performance of magnets at lower running cost also for the RF and then the technique of energy recovery. This is a first-class consideration in the whole program. A second point is the measurement of sustainability and how one defines being sustainable.

ECFA Detector R&D Roadmap. K. Jakobs, Chairperson, ECFA

In the European Strategy for Particle Physics it was clearly pointed out, that the success of particle physics experiments relies on innovative instrumentation and state-of-the-art infrastructures. Therefore, a strong focus on instrumentation has to be maintained. Detector R&D programmes and associated infrastructures should be supported at CERN, national institutes, laboratories and universities. A global detector R&D roadmap should be used to support proposals at the European and national levels.

As a consequence, an ECFA Detector roadmap was developed and released in December 2021, after presentation to the Council. The Council has mandated ECFA to work out a detailed implementation plan in close collaboration with the SPC, the FAs and the relevant research organisations in Europe and beyond. First concepts have been presented recently to Council and the next steps are the discussions with FAs and research organisations.

In the roadmap nine major areas, for six different detector technologies and three transversal areas on electronics, integration and training, were considered. The implementation plan consists of, first, to establish R&D collaborations at CERN and then to implement the general strategic recommendations. For the first point, the proposal is to organise long-term R&D efforts into newly established R&D collaborations. Larger Collaborations for the six detector technologies should be considered to guarantee a critical mass of institutes and people involved. For the cross-cutting themes like electronics and integration further collaborations for specific topics should be anticipated. All those collaborations should be anchored at CERN not implying that CERN has to participate in all. Any new structure should take full account of the existing and successful ongoing R&D collaborations e.g., for RD50 and RD51. Integration with other existing activities like the CERN EP R&D programme, some EU funded initiatives and collaborations, such as CALICE, is important. The formation of those collaborations should be community-driven. The overall goal is to establish appropriate collaborations with well-defined scopes, goals and milestones for the next five years and help them to receive the required person-power and infrastructures. The ECFA Detector Panel should review the scope, goals and milestones and the alignment with the ECFA detector roadmap. An CERN-based committee (DRDC) should review all activities including resources and make recommendations to the CERN RB for approval, before finally a special resources review board, where the FAs are as well involved, would sign off. It should also be possible to adapt research topics, based on the results achieved, or to inject new ideas resulting from new developments. A dedicated discussion meeting with funding agencies this week was announced.

M. Titov wanted to have more details about the financial issues of the future DRD collaborations. In the past the existing RD collaborations were never in full control of the funding. Different FAs were given funds based on the request of particular institutes. Is it foreseen for the new proposed scheme to change this financial model? K. Jakobs pointed out that over many past years there was no solid funding line for detector R&D. The idea of the new scheme would be to set up the DRD collaborations in an institute-based way. All institutes, which would like to participate in these DRDs would have to discuss with their FAs to get their support, similar to pledges for the Phase-I or -II construction, where institutes decide to take responsibilities for components and commit to those and would be ready to sign a MoU. In that sense, an MoU would give more stability for the funding lines over many years. At the end, the funding would be based in the institutes and the FAs, but those would commit to contribute to these DRD lines. Therefore an RRB is foreseen, where the FAs would have control over the whole program via their fundings.

C. Parkes expressed his concern about the tension with the current program. A ramp up of this new process, which would be too fast, could distract resources and potentially slow down the time scales of the upgrade projects of the experiments. K. Jakobs shared his concern. The construction of the Phase-II and other near upgrade projects must be the highest priority. Therefore, he stressed that it should be a gradual ramp up. On the other hand, there are some projects decoupled to a large extent from ongoing construction work for Phase-II, such as the liquid detector R&D and those have consequently a different time scale. Further, for the RD50 and RD51 projects, one should not disturb too much those successful programs, it must be an adiabatic transition.

Summary. J. Mnich

There being no further questions, the Chairperson closed the meeting. The dates for the next RRB are 24-26 October 2022.

Reported by: W. Funk