



Plenary RRB

April 2023

Draft Minutes of the 56th Plenary Session of the LHC Resources Review Boards CERN, Geneva, 24th April 2023

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

The minutes of the last Plenary Session, CERN-RRB-2022-087, were approved.

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

It was reminded that the Council will have to decide and to announce its decision on the termination or continuation of the International Cooperation Agreements (ICAs) with the Russian Federation (expiration date December 2024), the Republic of Belarus (expiration date June 2024) and the Joint Institute for Nuclear Research (JINR) (expiration date January 2025) at least 6 months before the expiration dates.

A unified solution between the four large LHC experiments for a new author list format for the publications has been established. The collaborations are gradually starting publishing again. The CERN management strongly encourages all other CERN experiments to adopt the same procedure.

The Science Gateway is nearing completion with a planned inauguration on October 7th, 2023.

The LHC run 2023 started and the first 13.6 TeV collisions were recorded last Friday.

P. Van Mechelen asked about the consequences for LHC that Switzerland has left the European Horizon programme. J. Mnich answered that Switzerland is still member of CERN, is even a host state, and the Swiss groups get sufficient support from Swiss resources. But there is an impact in particular for young Swiss people.

Status of the Accelerator Complex post LS2. R. Steerenberg, on behalf of the Director for Accelerators

Following the 2023 injectors schedule, by now, most fixed target experiments are taking beam and SPS EHN2 and ECN3 are being commissioned with beam. AD/ELENA are delayed due to a broken magnet that is now under repair and we are considering a partial compensation.

For LHC, the start of the beam commissioning was delayed by one day due to a broken crystal collimator that was removed for repair. The TS1 is extended by one day to re-install this collimator, which is required for the Pb-Pb physics run at the end of the year. The LHC beam time accounting in 2023 is practically unchanged with only two additional days of stop. The 2023 luminosity goal is to reach slightly above 75 fb⁻¹, depending largely on the machine availability and the stable beam time ratio. The new Run 3 baseline schedule indicates 100 weeks of physics, to be compared to the older schedule without any energy crisis related measures with 104 weeks of physics.

After the first stable beam at 13.6 TeV last Friday, the following week-end was used to validate first intensity increase steps with physics in parallel. This week-end, e-cloud scrubbing is scheduled to prepare the machine for longer bunch trains. The injectors are ready for an optimised LHC filling. A new filling scheme reduces the heat load in S78 by 15%, which is made possible thanks to the huge versatility and flexibility of the injector chain and its experts. Following incidents last year, new RF rupture discs were installed, but on April 2nd during beam commissioning, two rupture discs burst below the specified pressure. Only 2.5 days of recovery, which were absorbed in the commissioning period, were required. The burst disc task force will further investigate. Next for LHC, is to complete the intensity ramp-up step with 75 bunches interleaved with commissioning activities, then scrubbing and finally interleaved intensity ramp-up and commissioning with physics in parallel until ~ 1200 bunches.

There were no questions following this presentation.

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

In 2022, $\sim 40 \text{ fb}^{-1}$ have been delivered to ATLAS and CMS. To help mitigating the energy crisis, the run was shortened by two weeks. The run consisted of almost only pp, no significant HI run was performed, which will be compensated in 2023.

Some new physics results have been presented: Improved $H \rightarrow \gamma\gamma$ analysis by ATLAS, improved measurement of the W mass by ATLAS, measurement of the τ Polarization in $Z \rightarrow \tau\tau$ decays by CMS, new measurement of $R(K)$ and $R(K^*)$ by LHCb, observations of new Heavy Baryons by LHCb, the melting and regeneration of Charmonia in $\Psi(2S)$ versus J/Ψ by ALICE and the simultaneous production of four Top Quarks by ATLAS and CMS.

After the completion of several YETS activities, ALICE had a smooth restart of the operations in 2023. During the YETS, CMS repaired successfully the ECAL water leak and HCAL completed the replacement of faulty front-end components. LHCb was performing commissioning and installed the Upstream Tracker. For the LHCb VELO, on January 10th, 2023 an incident occurred due to a failure of its vacuum system and the RF foil has undergone a plastic deformation. The LHCb physics programme in 2023 is affected as the VELO cannot be fully closed. The replacement of the foil is foreseen in the shutdown at the end of 2023.

For Phase II, the production of the large structures has started, like the ATLAS ITk Strip Barrel layer 3 shell. For ITk Pixel, the time contingency is now reduced to a few months, although excellent progress has been made in other areas. For the CMS HGCal, the silicon sensors are arriving and the HGCal ECON-D ASIC, which is on the critical path, has been submitted for production. In general, despite of good progress, the projects with insufficient contingency are the ATLAS Pixel and Strip Tracker and the CMS Tracker and HGCal. To address missing deliverables from Russia and Belarus, the collaborations have started to re-distribute some deliverables to other institutes. HGCal is the most exposed project for this issue. To regain contingency on the most critical projects during the production phase, workshops with external experts from Fraunhofer Institute will be organised.

For WLCG, due to energy saving measures and the subsequent partially lower experiment's activity, some reduction of processing activities at the WLCG sites in the last months of 2022 has been recognised. The WLCG sites are ready for the 2023 run. To save energy, several measures have been followed, like the procurement of power efficient h/w, the extension of h/w lifetime, improving the s/w efficiency and using the new data centre in Preveessin, where the first steps

towards the full exploitation are foreseen at the end of this year and beginning of next year, with its efficient cooling and heat recovery.

R. Tenchini asked if the role of the Fraunhofer institute will only be performed during the workshops or if the institute will follow up the experiments also over a longer period. J. Mnich explained that, first, there will be a three-day workshop where CERN explains the project, then they go back for a few weeks and then they come back for a second workshop, where they will propose potential measures and discuss those with us if they are feasible or not.

G. Hou asked why it took so long time for the updated result for the $R(K)/R(K^*)$ discrepancy and if the 2021 Nature Physics article on this analysis should be withdrawn. J. Mnich explained that effects, which are on a 3σ level are statistical fluctuations and may disappear if you do a more precise re-analysis. To his knowledge, there is no plan to retract previous papers, they are superseded by the new publication.

Computing Resources Scrutiny Group Report. P. Sinervo, Chairperson, CRSG

Summary:

Since the last meeting, two new members of the Computing Resources Scrutiny Group have been nominated: Eric Fede replacing Nadine Neyroud and Markus Schulz replacing Jan van Eldik. For the four LHC experiments, the computing activities in 2022 continued according to the plans. The CPU utilization is dominated by simulation and analysis. All collaborations have taken advantages of opportunistic CPU well above the pledged values. The revised 2023 and 2024 LHC schedule has impacted the computing plans for those years, especially for ALICE and LHCb. For 2023, data collection and processing are continuing, with increased focus on Run 3 analysis. ALICE expects to acquire a large dataset. LHCb is making best use of the 2023 detector configuration.

For 2024, an increase by $\sim 10\%$ for CPU, by $\sim 18\%$ for disk and by $\sim 25\%$ for tape is expected, for disk and tape mainly for Run 3 data-taking and physics analysis of ALICE, ATLAS and CMS. The potential loss of Russian and Belarusian resources will be challenging, but they are being mitigated in short term and possibly longer term.

C. Meroni recognised that there is an increase of requests for pledges on CPU and disk for most of the experiments for next year. In addition, in 2025 there will be an increase of integrated luminosity compared to the years before. Is it therefore foreseen to have another increase of pledges in 2025? Then, it will be followed by a long shutdown. What is the perspective over a longer time how much computing will be needed and are there saving strategies which one could put in place? P. Sinervo answered that it is always very difficult to make predictions for several years in advance, the C-RSG is trying to predict normally up to two years in advance. In 2025, there will be certainly more data. As the data storage is the most precious resource, ATLAS and CMS are trying to move forward to smaller data formats to mitigate this. And the C-RSG recommends that the experiments should use more and more in the analysis the usage of those small data formats. S. Campana added that it depends to what precision those predictions should be made. The C-RSG is trying to make very precise predictions to the FAs, but this is very difficult for longer time periods. This depends also on the exact schedule of LHC and the parameters of the run. To establish only trends, there is some information, e.g. LHCb produced a estimation for several years ahead. For ATLAS and CMS, there are predictions for HL-LHC.

Summary. J. Mnich

There being no further questions, the Chairperson closed the meeting.

The dates for the next RRB are 23-25 October 2023, having the block of RRB meetings back within three days. For 2024, the proposed dates are April 22 to April 24 and October 28 to October 30.

Reported by: W. Funk