OPEN SESSION – STATUS REPORTS

1. LHC Machine Status Report: Benoit Salvant
2. CMS Status Report: Juan Alcaraz
3. ALICE Status Report: Anton Andronic
4. ATLAS Status Report: Alex Cerri
5. LHCf Status Report: Oscar Adriani
6. LHCb Status Report: Michael McCann
7. TOTEM Status Report: Ken Osterberg

CLOSED SESSION:


Apologies: M. Lancaster

1. EXECUTIVE SUMMARY

Procedure

The chairman thanked the outgoing members of the LHCC, Marcel Demarteau, Cristinel Diaconu, Mark Lancaster, Blair Ratcliff, and Thomas Ullrich, for their invaluable contributions to the work of the committee and the LHC programme as a whole, and expressed his gratitude to the new referee coordinators Concettina Sfienti (ALICE), Eric Kajfasz (Upgrade), and Thomas Kuhr (WLCG), for taking on this important task. The minutes of the one-hundredth-and-twenty-seventh LHCC meeting (LHCC-2016-010 / LHCC-127) were approved.

A draft Letter of Intent for a new R&D proposal on “Development of wireless techniques in data and power transmission application for particle-physics detectors” (WADAPT) as been received. E. Kajfasz (chair), M. Demarteau, and P. Krizan will carry out an initial assessment of the project that will be discussed at the February meeting.

General

The LHCC has delivered outstanding performance throughout 2016. A very successful pp run delivered 40 fb$^{-1}$ to ATLAS and CMS, compared to an expected 25 fb$^{-1}$. The pp
run was followed by an equally successful heavy ion run, meeting the expected target
data sets for all experiments. The experiments have demonstrated their ability to cope
with high pile-up running, with values up to 60 deemed acceptable by both ATLAS and
CMS, giving important input to the planning of the 2017 running.

The upcoming EYETS will be intense for both experiments and accelerator teams,
however recent reviews have shown a very advanced state of preparations and planning,
with the remaining issues being addressed with high priority. The schedule is extremely
tight and must be monitored carefully. Any readjustment of the EYETS duration, if
needed, should be planned as early as feasible.

**Report from the LHC Programme Co-ordinator**

The LHC machine and injectors are working exceptionally well, with
excellent availability (with greater than 50% of scheduled time with stable beams), and
a very high peak luminosity (~50% higher than design).

A total of 40 fb$^{-1}$ of 13 TeV pp data was delivered to ATLAS/CMS and ~1.9 fb$^{-1}$ to
LHCb. The experiments have coped well with the high pileup conditions (with pileup
values up to ~45). A successful 4-day run with β* of 2.5 km for total cross section
measurements by ATLAS and TOTEM was completed in September with ~350 µb$^{-1}$ of
data delivered. The pPb run has also been very successful, with the delivered luminosity
exceeding expectations in all parts of the programme (running pPb at 5.02 TeV and pPb
and Pbp at 8.16 TeV). In addition a dedicated 8.16 TeV pPb fill for the LHCf experiment
was successfully completed.

The observed ~7% difference in the measured luminosity delivered to ATLAS and CMS
remains a concern. Studies suggest this could be, at least partially, due to the different
horizontal and vertical beam emittances in conjunction with the difference in crossing
planes between ATLAS and CMS. Further studies, including results from the on-going
Z-counting analysis, are needed to confirm this. If confirmed this can be compensated
for in 2017 by normalizing the crossing angle in each experiment by the emittance.

In preparation for 2017 running ATLAS and CMS have studied the available options,
and favour running with BCMS injection to give the maximum integrated luminosity,
even with increased pileup. Both experiments expect to be able to cope with a luminosity
of $2 \times 10^{34}$ cm$^{-2}$ s$^{-1}$ and pileup values of up to ~60. Luminosity levelling in
ATLAS/CMS by beam separation is expected to be operational in 2017 if needed. Both
experiments are studying if levelling at luminosities lower than $2 \times 10^{34}$ cm$^{-2}$ s$^{-1}$ would
be beneficial for their physics programme.

**Conclusions of planning session for special runs**

Forward physics offers rich physics opportunities that should be pursued as much as
possible. A good fraction can be done with standard machine optics, including ramp-up
or end-of-fill running to provide low-pileup samples to ATLAS and CMS.

Intermediate β* (90m-like) runs are required for: (1) exclusive low-mass production (e.g.
glueballs), and (2) exclusive missing mass detection (e.g. SUSY searches at low mass).
(1) has an interesting discovery potential, while (2) is exploring a region that has already
been partially excluded by ATLAS/CMS. There is consensus that this run should be
postponed to 2018, after the conclusion of the analyses of the existing data and a more
quantitative evaluation of the physics reach and luminosity requirements. For the low-mass spectroscopy part of these measurements there is competition with JLAB. The amount of required time is between 1 and 2 weeks.

Very high $\beta^*$ and low energy runs are required for precise measurements of total cross section and Coulomb interference. A precise measurement at low energy (possibly down to 900 GeV) would be sufficient to clarify existing tensions in the Tevatron data. The LHCC supports a low-energy run dedicated to the measurement of the total cross sections and the rho parameter. It may be desirable for this run to take place before the end of Run 2; its technical feasibility should be assessed by the LHC as soon as convenient. The experiments should meanwhile provide more detailed estimates of their needs in terms of statistics and beam conditions. A dedicated run to measure the total cross section will also be necessary after the LHC energy reaches 14 TeV. In view of the other needs for special runs during Run 2, this could be postponed to Run 3.

The 5 TeV pp reference data are required to publish several heavy ion results. ALICE needs about 1.5 weeks of running, mainly because of its trigger rate limitation. ATLAS and CMS could take the data in a few days. ATLAS prefers to perform the runs close to the next PbPb period in 2018 and right after a machine technical stop period, so that the ZDC could be inserted. ALICE would like to take this data as early as possible, for example at the end of the 2017 running, which could also help the machine cool down. It would be beneficial to have the reference data taken in one single period to optimize the setup time. Given the relative complexity of the 2018 run, it may be best to carry out the 5 TeV run in 2017 (order of 1.5 weeks).

The strategy for special runs should be reviewed once the performance of the machine in 2017 is established.

Test Beams

The draft injector schedule for 2017 anticipates operating the PS with high intensity proton beam from May 1st to November 20th. During this time the East Area will be operational for beam-tests, and for the CHARM and IRRAD irradiation facilities. The SPS North Area will have a 24 weeks proton fixed target run, starting May 8th, followed by 8 weeks of operation with Xenon for the NA61 physics program. Over 70 requests for beam time were received for test-beam activities, largely dominated by the requests coming from the LHC experiments for their upgrade programmes. Given the overbooking of the North Area beam lines, some beam times will have to be combined. A tentative PS & SPS user schedule has been presented, and will need to be discussed at the SPSC also, and applications not related to CERN programmes further reviewed.

ALICE

Scientific output and current activities:

- The physics programme of ALICE is progressing well with a total of 171 papers submitted to date. The detector is operating well and has collected data in all running modes in 2016. A total of 10 pb$^{-1}$ reference pp data at 13 TeV has been collected. In pPb running 764M minimum bias events were recorded at 5 TeV. The luminosity of nearly 40 nb$^{-1}$ delivered at 8 TeV exceeds the target by a factor of two.
- The detector systems are working well. An increased trip frequency has been
observed for the ALICE solenoid. The incidents have been traced to faulty power converter thyristors. All thyristors will be changed during the upcoming EYETS, and a consolidation programme will be undertaken to address the issue long term.

- Following the LHCC recommendations, ALICE has carried out a review of the TPC distortions including external experts. A variety of possible explanations for the distortions have been considered, and additional measurements have been suggested. ALICE will switch back to operating the TPC with Ne-CO₂ during the EYETS to investigate if this will mitigate the distortions. The expert panel supported the findings of the experiment that the distortions are very likely a result of the particular construction of the current read out chambers, and will hence not translate to the upgraded TPC.

Phase-I upgrades:

- There is good progress in all areas of the ALICE upgrade programme.
- For the O2 upgrade, ALICE is proposing to initially purchase one container to evaluate the cooling needs, pending the decision on the new computing centre. This is a relatively small fraction of the total cost and expected to be cost-neutral with respect to the final solution. A decision on this procurement should be taken in consultation with the CERN management. A prompt decision on the possibility of a new CERN computing centre in Prevessin is essential for the execution of this project.
- An area of concern is the TPC upgrade, with large ion backflow fluctuations recently observed across IROC chamber prototypes and the OROC prototype damaged by an electrical discharge during testing. In these circumstances the PRR schedule for the read out chambers early next years seems very aggressive.

- The LHCC recommends that IROC and OROC pre-production prototypes be thoroughly qualified and their performances be within the required specifications before proceeding to the PRR. Specifications on IBF fluctuation should be evaluated, motivated and documented.
- Given the critical period for the project, the LHCC encourages ALICE to strengthen the TPC project management and effort, and to include external members, for example from the distortions review panel, into the PRR.
- The LHCC encourages ALICE to pursue the thyristors replacement programme with high priority.
- The LHCC recommends that a decision on the computing centre should be taken as soon as possible by the CERN management to avoid delays on the O2 overall schedule.

ATLAS
Scientific output and current activities:

- ATLAS continues to have a rich scientific output with a total of 595 papers submitted to date.
- The detector has performed very well throughout 2016, with data taking efficiencies routinely above 93%, and above 95% in some periods. During pp running a total of 36 fb⁻¹ of data have been recorded.
- Issues observed include the failure of a low voltage power supply as a result of a cooling-related power cut, affecting one quarter of one of the two hadronic end-
cap calorimeters. This affects the pPb running only, as it occurred after the end of pp collisions, and will be addressed during the EYETS.

• ATLAS successfully participated in the pPb running. While during the 5 TeV pPb running, dedicated to ALICE, beams often did not collide in ATLAS, the delivered luminosity of ~183 nb$^{-1}$ significantly exceeds the target of 100 nb$^{-1}$ for 8 TeV pPb running. The ZDC was installed prior to the heavy ion running and is performing well.

• Shielding will be installed during the EYETS in order to protect the ALFA electronics during operation of AFP, which will remove the current limit of fewer than 600 bunches for AFP operation, and allow continuous operation of AFP during high luminosity fills.

Phase-I upgrades:

• The ATLAS Phase-I upgrade projects are on track, with major concerns only in the area of the muon New Small Wheel.

• The NSW Micromega detectors are delayed, with the production of the readout PCBs becoming a bottleneck again. For the sTGCs the cathode board production had resumed but had to be stopped again due to quality issues. An internal review of the project status and schedule options is foreseen for the beginning of 2017, followed by the in-depth LHCC Phase-I review in February.

• The LHCC strongly encourages ATLAS to carry out a full risk assessment and evaluate the possible scenarios that could evolve in case the foreseen installation schedule for the NSW cannot be kept.

Phase-II upgrades:

• The Phase II TDR preparation is proceeding according to plans.

• The LHCC has received the initial draft of the ITK strip TDR, with the full document expected to be available towards the end of January 2017. The review team of LHCC and UCG has been strengthened by three additional reviewers. The review schedule has been defined.

CMS

Scientific output and current activities:

• CMS continues to make excellent progress on its physics programme, with 556 papers submitted to date.

• CMS has recorded 38 fb$^{-1}$ of pp collision data in 2016, with an average data taking efficiency of 92%. In pPb running at 8 TeV 193 nb$^{-1}$ were delivered to CMS, nearly twice the target luminosity for this period.

• All detector systems are working well, with no significant issues reported.

Phase-I upgrades:

• An in-depth review of the CMS Phase-I upgrades, including the activities during the upcoming EYETS, was carried out in this session of the LHCC.
Impressive progress has been made on the new pixel detector to be installed during the EYETS, with a very high probability that the detector can be installed as foreseen.

The installation of the new HF calorimeter electronics is on a tight schedule, but ready to proceed. For the upgrade of the HE calorimeter electronics a failed first production run of the clock-control module and lack of full-functionality firmware to date leave the decision still open if the installation can go ahead during the EYETS.

The planned EYETS upgrade work on the Muon spectrometer and the beam telescopes are on track.

The technical coordination team has produced a very detailed and impressive planning for the upcoming very dense EYETS work. CMS has established an EYETS oversight group, which the LHCC welcomes as an excellent initiative.

The LHCC strongly encourages CMS to carry out a thorough risk assessment of the EYETS work in January before going ahead with the installation, including the need to fully commission the new systems for physics.

Phase-II upgrades:

- The CMS Phase-II upgrades are progressing well with no changes to the procedures or submission dates reported for the 4 TDRs expected to be submitted to the LHCC in 2017.
- Some of the Muon Phase II upgrades (GE1/1 and ME2,3,4/1) are planned to be installed in LS2, and preparations are progressing well, with a demonstrator for the GE1/1 project to be installed during the EYETS.

LHCb

Scientific output and current activities:

- LHCb continues to make excellent progress on its physics programme, with 346 papers published to date. More than 2 fb\(^{-1}\) of pp collisions have been recorded at \(\sqrt{s} = 13\) TeV, with a current data taking efficiency of more than 87%.
- LHCb has successfully participated in the heavy ion run, collecting 0.5\(\pm\)0.1 nb\(^{-1}\) at 5 TeV, and \(\sim 30\) nb\(^{-1}\) (20 nb\(^{-1}\) requested) of pPb and PbP collisions at 8 TeV. In addition to the pPb collisions, the SMOG system was used to inject Helium into the VELO to collect pHe data.

Phase-I upgrades:

- There is much progress on the upgrades, with UT, SciFi, RICH, Calorimeter & Muon upgrades now having moved to the construction phase.
- Several milestones have been delayed by up to three months. In particular the milestones on the VELO cooling substrate PRR, and the SALT chip PRR and production are now on the critical path and will be closely watched by the LHCb management and followed by the LHCC.
- For the VELO upgrade, the microchannel cooling plates remain technically
critical, with a decision expected at the beginning of February 2017 if the wafer bonding quality is good enough to proceed, or if a switch to the backup plan is necessary. The backup plan using multiple small-bore steel capillaries is pursued in parallel and is on track.

- LHCb will organize an internal comprehensive review on 30th January - 1st February 2017 with focus on critical aspects, organization of construction and preparation for installation of the upgrades.
- For the longer term LHCb is currently preparing an EoI for upgrades necessary to run at luminosities of $\sim 2 \times 10^{34}$ cm$^{-2}$ s$^{-1}$ in Run 5, with the corresponding document expected to be available in February 2017.

- The LHCC is concerned about the slippage in the schedule for several of the upgrade projects on critical items. A new risk assessment following the comprehensive internal review early in 2017 is requested.
- The LHCC recommends that the alternative approach for the VELO cooling be pursued very seriously so that it can be a viable solution in case the microchannel cooling solution cannot be implemented.

**TOTEM**

The collaboration reported steady progress on its analysis programme, with the total cross section measurement at 2.76 TeV nearly completed and the measurement at 13 TeV progressing well. Still on-going is the analysis of the joint CMS-TOTEM 2015 $\beta^* = 90$ m run, in particular the search for glueball candidates. A first look at the data of the $\beta^* = 2.5$ km run at 13 TeV from September 2016 shows good data quality, with the hope of a measurement of $\rho$ at 13 TeV with a precision of $\sim 10\%$. CT-PPS has had a very successful 2016, with the diamond timing detectors now also included in the data taking from the last week of pp running.

- The LHCC congratulates TOTEM and CMS for the successful deployment of CT-PPS, looks forward to the first analyses of the 2016 data, and invites the experiments to continue building on this success. The LHCC stresses the importance of identifying suitable optics, to optimize the low-mass acceptance without sacrificing the luminosity at IP5.
- The LHCC supports the extension of total cross section measurements to energies in the SppS/Tevatron range and at 14TeV, and confirms its support for a $\beta^* = 90$ m programme during Run 2, properly justified by a common (CMS+TOTEM) assessment of the physics potential. The LHCC encourages the LHC to explore the technical feasibility and time cost of the low-energy run, as soon as convenient, and in view of a possible operation during Run 2.
- The LHCC encourages the continuation of the R&D studies on timing detectors.

**WLCG**

LCG computing has shown very good performance across the experiments, and has reacted well to the larger than expected amount of data generated by the excellent performance of the accelerator. Much effort has been devoted to mitigate the effect on the needed computing resources. The LHCC will discuss further mitigation measures such as delayed analysis, trigger threshold tuning, and optimisation of the computing and
storage models with the experiments in the coming months, feeding the results into the discussions with the CRSG and RRB next spring. The HEP software foundation has held its first community review on the future development of GEANT, and is preparing a dedicated workshop in January 2017 on the community white paper on the future of HEP computing, with results expected mid 2017.

- The LHCC encourages the experiments to actively pursue mitigation and optimization strategies, and to elaborate a quantitative assessment of the impact of resources modulation in the physics program and science returns.
- The LHCC notes that additional resources above the pledges that can be made available by the funding agencies with an exceptional effort will be very welcome in order the address the current computing needs.

2. PROCEDURE

The chairman thanked the outgoing members of the LHCC, Marcel Demarteau, Cristinel Diaconu, Mark Lancaster, Blair Ratcliff, and Thomas Ullrich, for their invaluable contributions to the work of the committee and the LHC programme as a whole, and expressed his gratitude to the new referee coordinators Concettina Sfienti (ALICE), Eric Kajfasz (Upgrade), and Thomas Kuhr (WLCG), for taking on this important task. The minutes of the one-hundredth-and-twenty-seventh LHCC meeting (LHCC-2016-010 / LHCC-127) were approved.

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3. REPORT FROM THE DIRECTOR OF RESEARCH AND COMPUTING

The Director of Research and Computing reported on the September council session, which approved the financial plan for the upgrade of the LHC and experiments, including the proposed credit line with the European Investment Bank. Council also requested an overview of the staffing situation, which was compiled in October, and showed risks for the upgrade programme due to staff allocation. A shift of enough resources from material to personnel budgets to create around 80 limited duration (5 year) positions was agreed. On the computing side the extraordinary performance of the LHC has clearly stretched the computing systems to their limit, however the scope for additional resources is limited, and experiments are asked to put in whatever measures they can to cope with the extra data load. Another lesson to take away is that the performance of the detectors is driven by radiation damage, pointing to the need for sufficient margins of radiation tolerance in our upgrade scenarios. A decision on the new computing centre is expected by June, with a turnkey solution at Prevessin currently under investigation, as well as solutions located at ALICE and LHCb.

4. REPORT FROM THE LHC PROGRAMME COORDINATOR

The LHC machine and injectors are working exceptionally well, with excellent availability (with greater than 50% of scheduled time with stable beams), and a very high peak luminosity (~50% higher than design).
A total of 40 fb$^{-1}$ of 13 TeV pp data was delivered to ATLAS/CMS and ~1.9 fb$^{-1}$ to LHCb. The experiments have coped well with the high pileup conditions (with pileup values up to ~45). A successful 4-day run with $\beta^*$ of 2.5 km for total cross section measurements by ATLAS and TOTEM was completed in September with ~350 µb$^{-1}$ of data delivered. The pPb run has also been very successful, with the delivered luminosity exceeding expectations in all parts of the programme (running pPb at 5.02 TeV and pPb and Pbp at 8.16 TeV). In addition a dedicated 8.16 TeV pPb fill for the LHCf experiment was successfully completed.

The observed ~7% difference in the measured luminosity delivered to ATLAS and CMS remains a concern. Studies suggest this could be, at least partially, due to the different horizontal and vertical beam emittances in conjunction with the difference in crossing planes between ATLAS and CMS. Further studies, including results from the on-going Z-counting analysis, are needed to confirm this. If confirmed this can be compensated for in 2017 by normalizing the crossing angle in each experiment by the emittance.

In preparation for 2017 running ATLAS and CMS have studied the available options, and favour running with BCMS injection to give the maximum integrated luminosity, even with increased pileup. Both experiments expect to be able to cope with a luminosity of $2 \times 10^{34}$ cm$^{-2}$ s$^{-1}$ and pileup values of up to ~60. Luminosity levelling in ATLAS/CMS by beam separation is expected to be operational in 2017 if needed. Both experiments are studying if levelling at luminosities lower than $2 \times 10^{34}$ cm$^{-2}$ s$^{-1}$ would be beneficial for their physics programme.

**Conclusions of planning session for special runs**

Forward physics offers rich physics opportunities that should be pursued as much as possible. A good fraction can be done with standard machine optics, including ramp-up or end-of-fill running to provide low-pileup samples to ATLAS and CMS.

Intermediate $\beta^*$ (90m-like) runs are required for: (1) exclusive low-mass production (e.g. glueballs), and (2) exclusive missing mass detection (e.g. SUSY searches at low mass). (1) has an interesting discovery potential, while (2) is exploring a region that has already been partially excluded by ATLAS/CMS. There is consensus that this run should be postponed to 2018, after the conclusion of the analyses of the existing data and a more quantitative evaluation of the physics reach and luminosity requirements. For the low-mass spectroscopy part of these measurements there is competition with JLAB. The amount of required time is between 1 and 2 weeks.

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the next PbPb period in 2018 and right after a machine technical stop period, so that the ZDC could be inserted. ALICE would like to take this data as early as possible, for example at the end of the 2017 running, which could also help the machine cool down. It would be beneficial to have the reference data taken in one single period to optimize the setup time. Given the relative complexity of the 2018 run, it may be best to carry out the 5 TeV run in 2017 (order of 1.5 weeks).

The strategy for special runs should be reviewed once the performance of the machine in 2017 is established.

5. TEST BEAMS

The draft injector schedule for 2017 anticipates operating the PS with high intensity proton beam from May 1st to November 20th. During this time the East Area will be operational for beam-tests, and for the CHARM and IRRAD irradiation facilities. The SPS North Area will have a 24 weeks proton fixed target run, starting May 8th, followed by 8 weeks of operation with Xenon for the NA61 physics program. Over 70 requests for beam time were received for test-beam activities, largely dominated by the requests coming from the LHC experiments for their upgrade programmes. Given the overbooking of the North Area beam lines, some beam times will have to be combined. A tentative PS & SPS user schedule has been presented, and will need to be discussed at the SPSC also, and applications not related to CERN programmes further reviewed.

6. DISCUSSION WITH ALICE

Scientific output

Since the last LHCC meeting 2 papers were published and 5 submitted, bringing the total number of paper submissions to 166. All PbPb papers still report results from the $\sqrt{s_{NN}} = 2.76$ TeV run. Due to the extensive work needed to correct for the TPC distortions the reconstruction of the 5.02 TeV PbPb data was delayed. By now all PbPb data sets are reconstructed. At the upcoming Quark Matter 2017 conference, 26 ALICE abstracts were accepted for oral presentation of which 14 will be based, or include, PbPb Run 2 data. The corresponding PbPb Monte Carlo samples are expected to be completed by mid-December. Among the physics highlights of the recent studies are the measurements of W and Z boson production at forward and backward rapidities in pPb, the study of heavy-quark energy loss via the measurement of decay electrons from charm and beauty hadrons in PbPb, as well as a systematic study of hyperon production as a function of event multiplicity in pp, pPb, and PbPb collisions. The most surprising result is the observation of reduced $\circlearrowright$ suppression in 5.02 TeV PbPb collisions compared to that at 2.76 TeV.

Current activities and short-term plans

ALICE has completed data taking in 13 TeV pp collisions, with 816 M minimum bias events, 4.2 pb$^{-1}$ of high-multiplicity events and 9.7 pb$^{-1}$ of di-muon / high-$p_T$ muon triggers recorded. The data volume exceeds 5.7 PB of which 2.8 PB were stored before the TPC cluster compression in the High-Level Trigger (HLT) was activated. Such data are used as a reference for the high-$p_T$ events in heavy-ion runs. A successful optimization of the levelling procedure allowed LHC to deliver stable beams to ALICE
69% of the time, to be compared with the 33-35% obtained in previous years. The interaction rate was levelled at 100 kHz except during weeks 35-36, where rates as high as 300-550 kHz were recorded with calorimeter and muon triggers only. As a result, one fourth of all muon triggers in 13 TeV pp were collected in these 2 weeks. All detector subsystems performed well. In October, an anomalous number of trips in the solenoid power converter caused a loss of 55 hours of stable beams. Most of the trips were recovered by just ramping up the power supply, however 20% of them required a longer intervention to replace one of the six thyristors in use. The replacement of all thyristors is planned during the EYETS, while further interventions to consolidate or replace the system are being considered on a longer time scale.

During the 5.02 TeV pPb run, lasting 7 days, ALICE recorded 659 M minimum-bias triggers. At the time of the LHCC meeting, one further long 5.02 TeV fill (24h) was proposed for after the 8 TeV run, which would result in a sample closely matching the 1000 M minimum bias triggers requested by the experiment.

The TPC readout unit, RCU2, reached the expected performance of a readout rate of 1630 Hz at collision rates of 17 kHz, with stable operation but with an increasing number of errors in the FEE cards while running at the maximal throughput.

The run at 8.16 TeV (on-going during the LHCC meeting) was equally successful. Collisions in both beam directions, pPb and PbP, were recorded, levelling at 200-300 kHz of interaction rate in IP2. A total of 14.3 nb\(^{-1}\) of muon triggers had been recorded by the time of the meeting.

**pp-Reference Data**

ALICE reiterated their need for pp reference data. For hard and high-p\(_T\) probes, pQCD provides sufficient precision for an extrapolation from pp spectra taken at \(\sqrt{s} = 13\) TeV to 5.02 TeV with acceptable systematic uncertainties. Since hard cross-sections scale to first approximation with \(A^2\), to match the statistics in the anticipated 1 nb\(^{-1}\) (muon trigger) in PbPb, ALICE will require 1 nb\(^{-1}\) \times 208^2 \approx 40 pb\(^{-1}\) of 13 TeV pp data. ALICE accumulates about 10 pb\(^{-1}\) per year and hence should reach their goal at the end of Run 2.

The extrapolation from 13 TeV for low-p\(_T\) probes and minimum bias data is much less reliable, and instead pp reference data taken at \(\sqrt{s} = 5\) TeV are required. ALICE detailed their need for 1000 M minimum bias pp events at 5 TeV in a presentation to the LPC on November 21. ALICE already collected 128 M minimum bias events in the 2015 run and thus requires another 870 M in 2017. At a 1.5 kHz readout rate in stable beams this implies 5 TeV pp running for 6.7 days.

**Efforts to Understand TPC Distortions**

Following LHCC recommendations, ALICE held an in-depth review of the distortions in TPC cluster positions seen in the 2015 run, including a panel of external experts. These distortions are corrected in the reconstruction pass, but uncertainties in the corrections have led to a degradation of the matching efficiency with the ITS and the momentum resolution of the reconstructed tracks. The panel consisted of G. Rolandi, L. Ropelewski, F. Sauli, R. Settles, J.H. Thomas, R. Veenhof, and H. Wieman, and met on 17 Nov. 2016. The panel focused on attempting to find a consistent and complete explanation of the physical origin of the distortions, and suggested a number of further
tests to both isolate the source and potentially mitigate the size of the distortions, most of which ALICE plans to carry out before the EYETS. As the size of the increase in the distortions in switching from Ne-CO$_2$ to Ar-CO$_2$ is still unexplained, ALICE plans to switch the operating gas of the TPC back to Ne-CO$_2$ during the EYETS, which will either return the distortions to previous levels or shed further light on the physical origin of the distortions. The panel agreed with the collaboration that the distortions are very likely a result of the particular construction of the current readout chambers, and hence will not directly translate to the upgraded TPC readout.

The unexpectedly large distortions in the 2015 run have given an opportunity to test and deploy the software framework for distortion corrections that will be necessary for the upgraded sectors, especially since the 2015 distortions are due to charge sources with large gradients in the transverse plane. Non-uniformity in ion backflow (IBF) across the surface of the upgraded sectors can also create such gradients.

**Phase-I Upgrades**

Good progress in almost all areas of the upgrade program was reported. The tests on the MPW2 of SAMPA have been successful so far and a rate test is currently on-going. Debugging is underway for the known issues of the chip. The manpower has tremendously increased thanks to the hiring of six temporary engineers in Brazil. The EDR and submission of the MPW3 are foreseen for the beginning of the new year.

Unfortunately, the production of the PCIe40 of the CRU has been delayed and up to now only two boards are available for testing both in ALICE and LHCb. Completion of the firmware is foreseen for the end of 2016.

The O2 upgrade is on the critical path and it becomes increasingly urgent for CERN to confirm its plans for a new computing centre in Prevessin for ALICE and LHCb. ALICE proposes the purchase of one container to proceed with the evaluation of the cooling needs. This decision is expected to be cost-neutral with respect to the final solution.

The ITS upgrade (as well as the MFT upgrade using the same ALPIDE sensors) is on track: the milestone of ALPIDE’s PRR has been successfully met in November. Production and tests will begin by the end of December 2017, with a delay of five months with respect to the original schedule. Many ITS EDRs are foreseen during December 2016.

The PRR of the TOF DRM2 has been postponed by at least one month. The exact timing is yet unknown since it depends on the test with the CRU. Contingency at the moment allows for this delay.

In the presented schedule, the PRR for the upgraded TPC sectors is planned for January 2017, with production starting soon afterwards. The status of the pre-production prototypes is a concern. The OROC prototype was unable to be tested with beam, as electrical discharge issues, specific to the test setup, led to severe damage. The IROC prototype is currently undergoing testing and qualification, including an examination of uniformity of gain and IBF across the sector surface. The GEM foil production proceeds and the obtained yield of good foils will be presented at the next LHCC.

7. **DISCUSSION WITH ATLAS**

**Scientific output**
ATLAS continues to have a rich scientific output with a total of 595 papers submitted to date. Analyses utilising the full Run 2 data sample are being prepared for the winter conferences. The detector performed very well throughout 2016, with data-taking efficiencies routinely above 93%, and above 95% in some periods. During pp running a total of 36 fb$^{-1}$ of data have been recorded. The reported luminosity difference w.r.t. CMS has been studied and is thought to be substantially due to beam emittance and crossing-angle effects.

**Current activities and short-term plans**

Some issues with detector operations were observed, including the failure of a low voltage power supply as a result of a cooling-related power cut, affecting one quarter of one of the two hadronic end-cap calorimeters. This affects the pPb running only, as it occurred after the end of pp collisions, and will be addressed during the EYETS. A detailed programme for opening the detector and performing inspections and repairs to all detector subsystems has been planned for the EYETS.

The trigger/DAQ and offline data processing systems worked well and coped with the high-pileup conditions. ATLAS is preparing for luminosities up to $2 \times 10^{34}$ cm$^{-2}$s$^{-1}$ and average pileup as high as 50 during 2017/18 operations; at these levels the tracking performance should not be impacted. The anticipated large data samples expected in 2017/18 pose significant challenges for the computing system. CERN will provide additional Tier-0 processing and storage to help cope with the data volume.

ATLAS successfully participated in the pPb running. While during the 5 TeV pPb running, dedicated to ALICE, beams often did not collide in ATLAS, the delivered luminosity of $\sim 183$ nb$^{-1}$ significantly exceeds the target of 100 nb$^{-1}$ for 8 TeV pPb running. The ZDC was installed prior to the heavy ion running and is performing well. Shielding will be installed during the EYETS in order to protect the ALFA electronics during operation of AFP, which will remove the current limit of fewer than 600 bunches, and allow continuous operation of AFP during high luminosity fills.

**Phase-I upgrade**

The ATLAS Phase-I upgrade projects are on track, with major concerns only in the area of the muon New Small Wheel. The NSW Micromega detectors are delayed, with the production of the readout PCBs becoming a bottleneck again. For the sTGCs the cathode board production had resumed but had to be stopped again due to quality issues. An internal review of the project status and schedule options is foreseen for the beginning of 2017, followed by an in-depth LHCC Phase-I review at the February meeting.

**Phase-II upgrades**

The Phase-II TDR preparation is proceeding according to plan. The LHCC has received the initial draft of the ITk Strip TDR, with the full document expected to be available towards the end of January 2017. The review team of LHCC and UCG has been strengthened by three additional reviewers. The review schedule has been defined.

8. **DISCUSSION WITH CMS**
Scientific output

The total number of papers submitted by CMS is 556 with an additional 46 ready for internal review. Run 2 data provided 195 public results, including 56 submitted or soon to be submitted papers. CMS demonstrated smooth transition from Run 1 to Run 2 analyses. A large number of new 13 TeV results are expected for the winter 2017 conferences.

Highlights of the recent results include a number of high precision standard model measurements and MSSM Higgs searches with tau leptons in the final states. Many new physics searches, including supersymmetry, have been performed by CMS using 2016 data. None of them, for now, indicate the presence of new physics in 13 TeV data. One new full member group, one new cooperating group and one new associate group have joined CMS since last LHCC meeting.

Current activities and short-term plans

Data collection at 13 TeV was smooth with ~92% data taking efficiency for the full pp data collection period in 2016. All CMS detectors performed well with more than 96% of channels operating in each sub-system. The CMS magnet is performing smoothly at full field. Data certification efficiency for 2016 is ~96%. The total integrated luminosity available for physics studies from the 2016 run is 36.2 fb\(^{-1}\).

CMS efficiently integrated new elements, some of them part of the Phase-I upgrade, into the data collection, including the upgraded Level 1 trigger, new readout for hadron calorimeters, as well as CT-PPS. This enhanced CMS ability to collect data with high efficiency up to luminosities of 1.5 x 10\(^{34}\) cm\(^{-2}\)s\(^{-1}\). Various special runs have been collected during 2016. The pPb run was in progress at the time of the LHCC meeting and CMS collected data with high efficiency.

A joint group investigated the reported ~7% difference between ATLAS and CMS luminosities. At least partially this effect is due to the different beam sizes in horizontal and vertical planes and the fact that the crossing angle is achieved in different planes at ATLAS and CMS. This effect could be corrected by a small adjustment of crossing angles in 2017 and beyond. Final results as well as the plan for 2017 are expected by the time of February 2017 LHCC meeting.

CMS currently operates up to luminosities of 1.5 x 10\(^{34}\) cm\(^{-2}\)s\(^{-1}\) with high efficiency and individual sub-detectors are expected to operate up to luminosity of 2.0 x 10\(^{34}\) cm\(^{-2}\)s\(^{-1}\) without serious issues. Triggering, reconstruction, and data analysis at such high luminosities are a concern. CMS has formed a group evaluating potential issues for operating at the very high luminosities expected in 2017. Luminosity levelling is under consideration. A joint working group with representatives from CMS and ATLAS and the LHC machine experts is expected to develop the luminosity delivery strategy by May 2017.

Detailed planning and preparations are underway for the EYETS activities, which include the installation of the new pixels detector, installation of various HL-LHC upgrade prototypes, as well as repairs to the detector elements where issues (such as water leaks) have occurred or systems need to be consolidated. CMS plans to be ready for the LHC beam after EYETS on time for the first beam on May 1\(^{st}\), 2017, however there is very little contingency in the plan.
CMS computing is operating well in 2016, with the beyond expectations LHC performance this year putting extra stress on the system. All 2016 data were reprocessed with a recent reconstruction version (including updated calibrations) starting on September 23, 2016. These data will be used for winter 2017 conferences. The final data reprocessing with further improvements in calibrations for 2016 data is expected in March-April 2017. Monte Carlo reconstruction for winter 2017 conferences started late November and is expected to be finished in January 2017. HL-LHC simulations are progressing to provide results for HL-LHC TDRs.

**Phase-I Upgrade (in-depth review)**

The LHCC carried out an in-depth review of the CMS experiment, covering the Phase-I Upgrades being carried out during the current EYETS, other EYETS activities, the Phase-I upgrade elements for LS2 and infrastructure activities for the EYETS and LS2.

**Phase-I Upgrades during EYETS**

A key activity during the EYETS is the replacement of the pixel detector. The barrel pixel detector has an impressive near 100% channel yield. The disks are all at CERN with some issues remaining to be resolved, most notably some damaged cables. These issues will be investigated in the coming weeks. The installation has been exercised and all resources for the installation have been secured. Although the schedule is very tight, the collaboration is confident that the pixel detector can be installed as scheduled. The installation of the pilot blades during the previous YETS has been very beneficial exercising the DAQ system. The DAQ hardware is ready to be installed and all software elements, both online and offline, have been validated. The LHCC congratulates the experiment for the impressive progress over the last year and, even though a backup plan is ready, is confident that the experienced team will install the detector as scheduled.

The upgrades of the front-end for the HE and HF were presented. The HF front-end upgrade is effectively ready for installation, benefitting tremendously from the installation of the pilot system during LS1. For the HE upgrade, the new generation clock-control module is experiencing difficulties. Modules of the second production run are being assembled and tested, but the firmware has not reached all functionalities and the required stability. The decision on its installation is still open and the schedule is very tight. The collaboration is strongly encouraged to have an honest risk assessment at the end of January to evaluate its readiness for proceeding with the installation. The calorimeter software has gone through a major update to accommodate the 2017 HE/HF configuration and is well advanced.

**Other EYETS Activities**

The BRIL activities scheduled for the shutdown are all well motivated and do not interfere with other high priority events. The proposal to install 5 GEM super-chambers on the YE-1 endcap disk during EYETS as pilot for the GE1/1 upgrade follows the highly successful strategy of installing pilot modules to gain installation and integration experience, commission the trigger and study performance and is strongly supported by the committee.
Upgrade Tasks during LS2

The HB Phase-I upgrade, which is conceptually identical to the HE Phase-I upgrade, will benefit significantly from the lessons learned during the current HE upgrade. A key aspect of the HB upgrade is SiPMs with high radiation tolerance and operation at lower temperatures. Pre-production samples have been ordered from two vendors with about one year available for testing before HB SiPM procurement needs to take place.

The muon GE1/1 upgrade is an “early” Phase-II upgrade in the high-$\eta$ region $1.5 < |\eta| < 2.2$, aimed at creating a large lever arm with the CSC ME1/1 chambers to maintain low L1 $p_T$ thresholds. The main elements of the chamber production process and quality control steps are in place and well understood; foil production has started and the front-end electronics, using the VFAT-3 ASIC, is progressing well. This upgrade project is well on track and the collaboration is encouraged to keep the current momentum.

The muon ME 2,3,4/1 upgrade will replace the CSC electronics in the most forward regions ($\eta > 1.6$) to address the data loss rate and the slow speed of the data transmission. Although the project is officially a Phase-II project, the early on-chamber electronics replacement is well motivated and supported by the committee. Access to the CMS endcap disks during LS2 provides a very good opportunity for the early installation of the ME 2,3,4/1 electronics upgrade. The scope of the work, encompassing new digital cathode FEBs, new mezzanine cards on the anode local charge track boards, a new low-voltage distribution system and new optical trigger mother boards, is well understood and a natural evolution of the current system. The work during LS2 to extract and refurbish all 108 ME chambers has been scheduled with adequate contingency. The designs of the front-ends and low voltage distribution have been proven in Run 2 and are ready for production now. The upgrade of the off-chamber electronics, the ODMBs and FEDs, which provide a higher bandwidth DAQ, will be completed in LS3.

Integration, Scheduling, Resource Management and Infrastructure

The choreography of the daunting number of tasks to be completed during the EYETS and LS2 is truly intimidating. The committee lauds the establishment of an EYETS oversight group. The level of detail of the technical schedule that the collaboration has worked out is impressive. It is noted that the schedule has little contingency and depends on “single point failure” individuals in several projects. The committee applauds the effort to offload the pressure on the Phase-II upgrades by moving as many tasks forward in time to LS2 and YETSs, and to parallelize tasks wherever possible. It strongly encourages CMS to be vigilant about succession planning of key expertise.

Phase II Upgrade

CMS is actively working on Phase II TDRs expected for LHCC review in 2017. Dates for the TDRs to be available for the LHCC referees are: tracker – May, barrel calorimeter and muons – September, endcap calorimeter – November. Interim documents for Level 1 trigger, DAQ/HLT and Common infrastructure are expected in September 2017 with TDRs to follow in 2019 and 2020.

CMS and LHCC/UCG agreed on the structure and information to be provided in the TDRs and interim documents including technical and funding details. The majority of
the HL-LHC project milestones expected to be completed since the September LHCC have been met, while a few slipped by 3-4 months. While there is no immediate impact on the upgrades due to these delays, such substantial delays soon after defining milestones are worrisome. However overall there is good progress in all areas of the CMS HL-LHC upgrade including R&D, procurement of prototypes, and market surveys.

9. DISCUSSION WITH LHCb

Scientific output
LHCb submitted 12 papers since the last LHCC week yielding 346 submitted papers in total. In addition, 20 papers are in the editorial board. Basically, the Run 1 program is completed and new analyses will focus on Run 2 data. The LHCb physics output remains very rich and diverse. New results include \( CP \) violation measurements in \( B^+ \rightarrow J/\psi K^+ \), \( B_s \rightarrow D_s K \), \( B \rightarrow \pi \pi \), \( B_s \rightarrow K K \) and \( B^+ \rightarrow D^0 K^{*-} \) and the first observation of baryonic \( B_s \) decay, charmless \( X_b \) decay and non-tree \( B_c \) decays.

Current activities and short term plans
The LHCb detector operates very well. In 2016 pp running, LHCb recorded an integrated luminosity of 1.7 fb\(^{-1}\) yielding a total integrated luminosity of 2.0 fb\(^{-1}\) for Run 2; the data taking efficiency is 87\%. All choices made for Run 2 (HLT1-HLT2 splitting, online calibrations, Turbo streams) worked as expected. Maximum disk usage was about 60\% during pp running decreasing to about 10\% during the heavy-ion run for which trigger processing is much lighter. Due to a power cut, LHCb was switched off for one day requiring some minor repairs.

LHCb took pPb data at 5 TeV (0.5±0.1 nb\(^{-1}\)) and pHe collisions in parallel by injecting He\(^+\) into the VELO. More than 20 nb\(^{-1}\) of pPb and PbP data were collected at 8 TeV as requested, using the pp trigger with looser requirements, running B physics lines as full stream and using Turbo processing for open charm and di-muon states.

During EYETS minor routine work is planned (install cooling lines, repair broken Si tracker bonds, exchange RICH HPDs and change Herschel scintillators) in addition to software improvements (finalize the \( \pi^0 \) online calibration, use Turbo calibration for CALO, set up data quality for simulation and install new online monitoring tools).

No change of running strategy is planned for 2017. The number of days for pp physics is the same as in 2016 but the integrated luminosity can be increased by colliding more bunches, having longer fills, and optimizing the use of HLT disk buffers.

Phase-I Upgrades
The phase-I upgrades are generally progressing well. UT, SciFi, Calo, RICH and muon system upgrades have entered the construction phase. Areas of concern are the UT and the VELO. The slippage in the UT schedule means that the SALT128 production is now on the critical path. The issues related to the microchannel cooling of the VELO are still unsolved. LHCb has scheduled a comprehensive review for 30/01/17-01/02/17 with focus on critical aspects, organization of construction and preparation for installation.

The UT project is progressing, although with some concern about the SALT128 ASIC production. While the test beam data analysis of the sensor is on-going, a working design
was submitted to HPK to produce 10 sensors by the end of 2016, which will undergo various tests including a beam test (05/17) before production starts. The SALT128 ASIC completed irradiation tests (10/16). Extensive tests are on-going. Small issues were spotted that will be fixed in the final version. Power consumption is fine. The PRR is scheduled for (01/17), the critical engineering run is moved to Q1 2017 and production is planned for Q2 2017. A PRR for the flex cables is scheduled for (05/12/16). The SALT128 hybrids are well advanced, planning EDR for (05/12/16) and PRR for (01/17). The pigtail design is nearly completed.

The SciFI is making good progress. Tests of 3000 km received fibres show higher attenuation lengths and light yields than the specs. The number of bumps is fine. With an expected production rate of 16 mats/week in 04/17, the project remains on schedule. Module mass production has started.

The RICH upgrade is progressing well. 250 MaPMTs were tested and are all within specs. Tenders for the CLARO ASIC, frontend board and backboards were launched; production is expected for 2017-2018. Tests of the digital board and irradiation tests of passive mechanical, optical components and FPGAs are on-going.

Progress on the CALO is good. The ICECALv3 ASIC successfully completed a PRR (10/16). A multi-project run is confirmed before the end of 2016. Electronics board prototypes were produced and tested.

Computing is on track. A very successful computing workshop was held in Paris. The first version of the task parallel framework is close to completion. Computing profits from the upgrade work in the sub-systems by back-porting the work into the 2017 production branch.

Progress on the VELO is still mixed and the revised schedule looks very tight. The HPK sensors are under test postponing the PRR to (15/12/16). First tests of the VeloPix look very promising, by Q1 2017, LHCb will decide if a second submission is necessary. The mechanical design has made excellent progress after hiring a new FTE and a new engineer. The EDR moved to Feb/Mar 2017. The production of the microchannel cooling plates is split into three steps after validation with LETI: 1) non-recurrent engineering and production of one batch of bonded wafers; 2) final process step of first batch to get ~20 working devices; 3) launch of production lots. Expected delay is five months per lot. Production advances to step two only if the bonding quality is satisfactory. In addition, plan B is fully pursued in parallel, with cooling using multiple small-bore steel-capillaries embedded in an aluminium-ceramic substrate, or sandwiched between two Si layers. Results look very promising. In case of poor bonding quality, plan B becomes the default solution.

10. DISCUSSION WITH TOTEM

TOTEM and CT-PPS had a successful completion of the 2016 data taking, following the last LHCC. The $\beta^* = 2.5$ km run at 13 TeV delivered an excellent data sample to TOTEM, both in terms of statistics and of quality. The analyses have started, and promise a measurement of $\rho$ at 13 TeV with a precision of ~10%. At the restart of low-$\beta^*$ operations, CT-PPS ran with the new set of silicon strip detectors, installed during TS2. Still unresolved firmware issues, however, prevented the immediate inclusion in the run of the available diamond timing detectors. The crash programme put in place during the summer to fix this was eventually successful, and after deployment and commissioning of the improved firmware the detectors were allowed into the global runs.
of the last week of data taking. The complete CT-PPS detector then collected 2.5 fb⁻¹ of data, in addition to the 12.8 fb⁻¹ integrated without diamonds. Further work, in particular dedicated to the possibility of uploading remotely future updates of the diamonds DAQ firmware, is planned.

The first analysis of the CT-PPS data is on-going, proving for example the matching between the kinematics of exclusive di-muon pairs reconstructed in the CMS detector and in the roman pots. The data have also signalled a 2 mm vertical displacement, with respect to the beam axis, of the new roman pot hosting the diamond sensors. It will be repositioned after the re-levelling of the beam line, which will happen – possibly magnetically via a suitable optics -- during the EYETS.

Several operations are foreseen during the EYETS. Separate vacuum lines and cooling for the CT-PPS RP detectors will be installed, to allow for operations with different temperature and pressure conditions. In addition, TOTEM’s far-side horizontal pot will be equipped with the Faraday RF shields and ferrites developed for the near side pots, to qualify it for operation at high luminosity. Several steps of this operation are delicate and will require particular care and time. The improvement is however judged worth the challenge, as the new RP will increase the CT-PPS acceptance at low mass. Extending acceptance to masses as small as possible for the centrally produced exclusive systems is an important goal, to maximize the statistics and the potential reach of the physics programme.

Activities continue on the new detectors for CT-PPS. A sufficient number of pixel tracking sensors (RPIX) have been qualified to replace the silicon strips during the EYETS. New irradiation studies indicate that a uniform pre-irradiation of the sensors can equalize the difference in time response that was reported during the last LHCC. Tests will take place in H8 for two weeks in December, with two assemblies of detector packages and full readout chain. Further test beam measurements, carried out by several independent groups, have confirmed the 15 ps time resolution (3 planes) of the UltraFast silicon detectors (UFSD). It is expected that one out of the four current diamond planes will be replaced with UFSDs during the EYETS, to start their evaluation in real beam conditions in 2017.

R&D efforts on timing detectors are continuing. TOTEM is now exploring a double-diamond option, which would double the signal-to-noise and improve the time resolution from 100 ps to 60 ps / plane. Irradiation tests are being carried out on diamonds provided by a new vendor. Finally, TOTEM is studying the possibility of using UFSDs in its vertical pot, to replace the diamond timing sensors. The diamond electronics has been adapted to the UFSDs, first tests have shown a 30 ps resolution for a 1.5 mm² sensor, and a module is almost ready for integration in TOTEM.

The future run requirements by TOTEM have been discussed at length in a dedicated session. The priority is the continued regular operation of CT-PPS, with the request of a suitable optics that would optimize the low-mass acceptance. Optics similar to those used in 2016, and in presence of the new far-side horizontal pot, could allow reaching 250 GeV. TOTEM is also interested in special runs at low energy and high β*, to measure total cross section and ρ parameter in the SppS or Tevatron region. A β* = 90 m setup is requested during Run 2, with a goal of ~50 pb⁻¹, to continue the search and characterization of glueball candidates in the 1.5-4 GeV mass region, to study charmonium exclusive production, and to explore the search for missing-mass events. Finally, TOTEM is interested in a special run at β* = 90 m and 14 TeV, to measure the total cross section, whenever this energy will be reached.
11. REPORT ON LHCf

The analysis of $\pi^0$ spectra in the very forward region from pp collisions at 2.76 and 7 TeV and from the pPb run at 5.02 TeV has been published. Preliminary results on photon spectra from the 13 TeV pp data, showing good agreement with the EPOS-LHC generator for photon energies below 3.5 TeV, have been presented. For the neutron spectra on the other hand the agreement is poor, the most relevant feature being the neutron production enhancement found at $\eta > 10.76$, which could explain the muon excess in HECR data measured at Pierre Auger Observatory.

The study of ATLAS-LHCf common triggers aiming to separate the diffractive from non-diffractive scattering contribution on the basis of the number of tracks reconstructed by central detectors is in progress. Monte Carlo generators used for cosmic ray analyses give different predictions for the diffractive and non-diffractive contribution to the total cross section in the very forward region and the joint ATLAS-LHCf results can improve the hadronic shower modeling especially for the low-mass diffraction processes.

During TS3, one of the LHCf calorimeters (Arm2) was installed in the cavern as planned. Joint data with ATLAS were recorded with four low-luminosity fills at full LHCf trigger rate of 500 Hz. Good-quality data from pPb collisions were successfully acquired, for a total of 26 M and 20.5 M common triggers recorded at 5 TeV and 8 TeV, respectively.

The LHCC congratulates LHCf for the successful run, and encourages the collaboration to take a more proactive role in promoting the revision of the Monte Carlo generators for cosmic ray physics, fully exploiting the results provided by the experiment.

12. REPORT AND DISCUSSION WITH THE LCG REFEREES

LCG computing has shown very good performance across the experiments, and has reacted well to the larger than expected amount of data generated by the excellent performance of the accelerator. Much effort has been devoted to mitigate the effect on the needed computing resources. The LHCC will discuss further mitigation measures such as delayed analysis, trigger threshold tuning, and optimisation of the computing and storage models with the experiments in the coming months, feeding the results into the discussions with the CRSG and RRB next spring. The HEP software foundation has held its first community review on the future development of GEANT, and is preparing a dedicated workshop in January 2017 on the community white paper on the future of HEP computing, with results expected mid 2017.

13. CLOSEOUT WITH THE DIRECTOR GENERAL

The LHCC chairman summarized the meeting and informed and discussed with the Director General the status of the LHC experiments and their plans for future upgrades. The DG congratulated all involved for the superb performance of accelerator and experiments in 2016, pointing out that the EYETS will still pose significant challenges in order to prepare for a similar performance in 2017. There are still several possible running scenarios for 2017 being considered, with the initial set of the machine parameters expected to be fixed after the Chamonix meeting in January. The DG reported on the review held on the LHC injector upgrade in October, leading to a consolidated schedule and reduced planning uncertainty. A significant amount of resources has already been committed. As already reported by the DRC, around 80 additional limited
duration positions will be made available to cope with shortages in staffing levels that would otherwise put the upgrade projects at risk. A large number of TDRs is expected in 2017 from the experiments, which will need all our attention to arrive at technically viable solutions that can deliver the physics programme of the HL-LHC while staying in the foreseen funding frame. The DG also reported on Council discussions on the European Strategy for particle physics, currently deriving the broad time lines beyond the HL-LHC programme.

14. REFEREES

The LHCC referee teams for this session are as follows:

ALICE: C. Bloise, J. Dunlop, P. Newman, C. Sfienti, T. Ullrich (Co-ordinator)
ATLAS: P. Burrows (Co-ordinator), F. Kunne, M. Lancaster, B. Ratcliff
CMS: M. Demarteau, D. Denisov (Co-ordinator), E. Kajfasz, A. Kuzmin, H. Yamamoto
LHCb: C. Diaconu, G. Eigen (Co-ordinator), T. Kuhr
LHCf, MoEDAL, TOTEM: C. Bloise, A. Kuzmin, M. Mangano (Co-ordinator),
                             P. Newman
LCG: C. Diaconu (Co-ordinator), T. Kuhr, M. Lancaster, H. Yamamoto

15. The LHCC received the following documents:

CERN-LHCC-2016-010 Minutes of the one hundred and twenty-seventh meeting of LHCC held on 21 and 22 September 2016

DATES FOR LHCC MEETINGS

Dates for 2017
22-23 February
10-11 May
13-14 September
29-30 November

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