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PRINCIPAL LHCC DELIBERATIONS

32ND MEETING OF THE ALICE RESOURCES REVIEW BOARD

25 APRIL 2012

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GENERAL

This document summarizes the principal LHCC deliberations concerning ALICE at the Committee's sessions in December 2011 and March 2012.

The LHCC considers that ALICE has made excellent progress in all aspects of the experiment and the Committee congratulates the ALICE Collaboration on its achievements.

CONCERNS FROM THE PREVIOUS ALICE RESOURCES REVIEW BOARD

SUB-SYSTEM	CONCERN	STATUS
Silicon Pixel Detector (SPD)	Loss of pixel channels due to failures in the cooling.	The cooling problem of the SPD has been resolved during the 2011-2012 Technical Stop. The SPD efficiency improved from 62.5 % to 94 % after remotely drilling holes into clogged filters.

STATUS OF THE EXPERIMENT

TECHNICAL STOP

The major achievements during the year-end 2011-2012 Technical Stop include the resolution of the Silicon Pixel Detector (SPD) cooling problem and the installation of two Electromagnetic Calorimeter (EMCal) modules and three Transition Radiation Detector (TRD) modules. The SPD efficiency improved from 62.5 % to 94 % after remotely drilling holes into clogged filters which were only accessible via the thin cooling pipes themselves. As a consequence, the relocation of the Time Projection Chamber (TPC) for access to the Inner Tracking System (ITS) during the upcoming long shutdown is no longer foreseen.

SUB-DETECTORS

The LHCC discussed additional technical issues including a new problem with the V0 detectors hampered by signal loss. The muon detector alignment continues to be considerably worse than expected in spite of significant efforts by the sub-detector group in charge.

PHYSICS

New proton-proton physics results include measurement of the inclusive J/ψ production cross-section at 2.76 TeV centre-of-mass energy (CME), measurement of J/ψ polarisation at 7 TeV CME, inclusive D-meson production cross sections at 7 TeV CME, the observation of Λ_c at 7 TeV CME and J/ψ production versus charged particle multiplicity in proton-proton collisions at 7 TeV CME. First results from the Pb-Pb running show that J/ψ statistics will be sufficient for a measurement of the elliptic flow. Increased statistics for open charm will provide an improved measurement of the nuclear modification factor R_{AA} and of the elliptic flow v_2 for heavy flavours.

ALICE UPGRADES

The LHCC is reviewing the ALICE upgrade plans. The Committee received the documents: (i) "Upgrade Strategy for ALICE at High Rate", and (ii): "Conceptual Design Report (CDR) for the Upgrade of the ALICE ITS". The LHCC acknowledges the effort made by the ALICE Collaboration to engage the Committee in this early phase of the discussion of the upgrade.

The proposed upgrades improve the vertex and momentum reconstruction capability with a new ITS and dramatically increase the data-taking rate whilst maintaining the particle identification capabilities. The upgraded experiment would be run without a trigger bias and maintain high efficiency at low transverse momenta. The physics topics for the upgrade include heavy flavour and quarkonia, especially at low transverse momentum, low-mass di-leptons, jet and jet-γ studies, as well as searches for exotica like hyper-nuclei and di-baryons.

The proposed upgrade of ALICE would facilitate read-out at 50 kHz, which necessitates a major upgrade of the TPC, namely the replacement of the existing read-out chambers with Gas Electrode Multiplier (GEM) detectors. All central detectors will require an (electronics) upgrade by switching to a fully pipelined read-out complemented by a new event selection system with improved filtering.

The LHCC welcomed the studies detailed in the ITS CDR and appreciated the effort of the Collaboration. The LHCC concentrated on the physics aspects of the report, which also contains a detailed discussion on the Si-detectors and the read-out. The main objective of the ITS is to improve by a large factor (of at least two and varying with transverse momentum) the resolution of the impact parameter measurement and to boost particle reconstruction even at low momenta. Such a detector provides the resolution for example charmed baryon reconstruction with good statistical significance even on a background of typically 10^{10} particles. The LHCC remains concerned about the experimental uncertainties of such a measurement and encourages further R&D with respect to the ITS upgrade as well as more detailed studies on the physics performance, in particular with respect to the systematic errors expected for the proposed open charm measurements.

The upgrade strategy is largely founded on particle identification and the superb resolution at low momenta provided by the upgraded ITS, a region where the two general-purpose detectors ATLAS and CMS suffer from their higher material budget. The LHCC would like to understand how this advantage eventually translates into an improved and realistic physics analysis capability both at low integrated luminosities of 1 nb^{-1} with the current TPC and beyond together with the upgraded read-out. The considerations should address the complementarity to ATLAS and CMS.

For the high-luminosity option the Committee recommends identifying a set of 5-10 unique benchmark physics processes for ALICE showcasing the need for running beyond an integrated luminosity of 1 nb^{-1}. The fundamental significance of the chosen examples should be outlined and contrasted with quantitative theoretical predictions where applicable. For each of the processes the actual threshold statistics should be indicated together with a realistic assessment of the associated systematic uncertainties. The uniqueness and complementarity should be demonstrated by indicating the reach of the experiments ATLAS, CMS and LHCb expected until Long Shutdown 2 (LS2). The role and need for further proton-proton collision reference data should also be commented on.

The Committee stresses the importance to engage in a broader discussion on future perspectives of high-energy heavy-ion physics, including with the other LHC experiments, and to contrast the programme with that of lower-energy experiments.