

FIRST PHYSICS WITH ALICE: FROM pp TO Pb–Pb COLLISIONS

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The initial physics programme of the ALICE experiment at LHC will be discussed. ALICE¹ is the dedicated heavy-ion detector preparing for data taking with the first pp collisions at LHC, foreseen for the middle of 2008. The physics results will come progressively with the commissioning of the detector. The first few 10^4 minimum-bias pp events will be used for determination of the charged-particle density and multiplicity distribution. The same data sample will be used to align the tracking detectors in order to proceed with momentum measurements. The next results will be the p_t and pseudo-rapidity spectra, and the mean- p_t dependence on multiplicity. During the first month of running we aim to collect a few 10^7 pp events, the statistics needed for the calibration of different particle-identification systems. This data will be used to measure momentum spectra of different particle species, strange-particle production (also identified by decay topology), and the baryon–antibaryon asymmetry at mid-rapidity. The estimated statistical and systematic precision of these measurements will be presented and compared to the status of available predictions. In addition to the minimum-bias trigger we plan to collect data at high multiplicity (up to 10 times the average one) and to measure the particle composition and the p_t -spectra in such events, which may be affected by the parton saturation more than the average pp events. Early physics with the muon trigger in the forward region is also envisaged, we will measure the dimuon-mass spectrum and J/ψ yield. Finally, in the first pp run we want to trigger on photons with different energy thresholds in order to measure π^0 - and direct γ -spectra. After accomplishing the pp run we will be ready to record the first Pb–Pb data. We will benefit from pp running not only for the first physics results, but also from having well aligned and calibrated detectors, taking the advantage of low-particle density environment during commissioning. The heavy-ion programme will start with the determination of the basic event characteristics: charged-particle density, particle composition and spectra, and their centrality dependence. A few days, even at very low luminosity $\mathcal{L} = 5 \times 10^{25} \text{ cm}^{-2}\text{s}^{-1}$, will be sufficient to obtain significant results for elliptic-flow measurement, two-particle correlations, resonance production, event-by-event fluctuations. We will take data both with the minimum-bias and for central Pb–Pb collision triggers. The first data sample will also make it possible to get an estimate of the charm-production rate thanks to the high significance of $D^0 \rightarrow K\pi$ signal and to measure the p_t -spectra of light hadrons up to 10 GeV/c. Data will be taken with the muon trigger aiming to measure the J/ψ yield in Pb–Pb collisions and to get an independent estimate for heavy-flavour production. The photon trigger will also be used to make a first measurement of π^0 - and γ -spectra.

References

- [1] ALICE collaboration, Physics Performance Report, Volume 1, *J. Phys. G* **30** (2004) 1517, Volume 2, *J. Phys. G* **32** (2006) 1295.