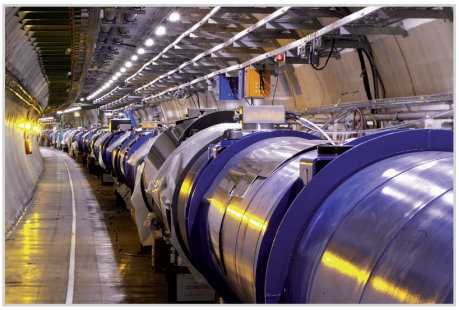

RESEARCH
A NEW PHASE FOR PROTON BEAMS AT THE LHC

LHC has started up again. On 25 March 2016, after the usual winter technical break, which began on 14 December last, at 11:33 the first two proton beams completed their first lap inside the 27 km ring of the CERN super-accelerator in Geneva. During the commissioning phase of all the systems and instrumentation of the LHC, the beams were circulated at low energy, to then increase towards an energy of 6.5 TeV per beam, with only one protons bunch and a number of protons which is around a tenth of that will be used for physics. In this way the machine operators can verify the correct functioning of the accelerator and also check during all phases whether they can keep the proton beams under control or not: this is done using bunches of intensities suitable to avoid damage to the machine in case something does not work properly. At present, the beams are circulating regularly at an energy of 6.5 TeV, always with a bunch per beam, but at the nominal intensity, that is the intensity that will be used for physics experiments. Optical measurements are currently in progress, in order to increase the stability of the beams and reduce losses. Subsequently, after establishing the ideal orbit and have aligned the collimators around it, the beams will be put into collision with one another: even in this case, collisions will be initially made with only one protons bunch. Finally, the number of bunches will progressively increase. The machine protection tests designed to verify that the machine is safe will continue in the coming weeks and within a month the performance of the LHC should reach a level close to that achieved in 2015. The first collisions for physics experiments should therefore take place towards the end of April, launching the second phase of RUN2 at an energy of 13 TeV in the mass centre, i.e. at the point of proton collision. Scientific expectations are high, because in the next few months it will be possible to collect enough data to know whether the bump, the peak at 750 GeV of mass – which is now small – corresponding to an excess of energy photon pairs, is a simple statistical fluctuation or not. If the result will be confirmed, it would open up unexpected scenarios all to be interpreted. ■