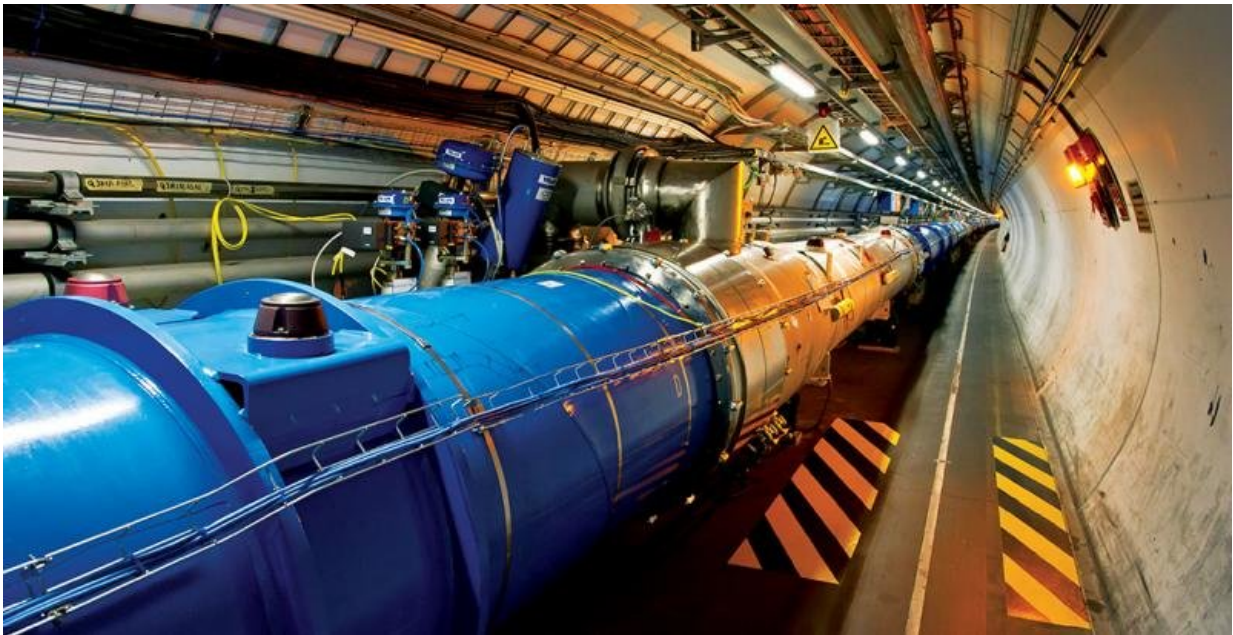


# The four LHC experiments are getting ready for pilot beams

October 18 2021, by Cristina Agrigoroae

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The Large Hadron Collider is the world's largest and most powerful particle accelerator. Credit: CERN

Since 2019, many places at CERN have been operating like beehives to complete the scheduled upgrades for the second long shutdown (LS2) of the accelerator complex. This period of intense work is now coming to an end with the injection of the first pilot beams into the LHC. This major milestone will be featured during a live event on CERN's social media channels on 20 October at 4 pm (CEST).

The pilot beams are part of the commissioning of the LHC machine in preparation for its Run 3, starting in 2022. With an integrated luminosity equal to the two previous runs combined, the four LHC experiments will be able to perform even more precise measurements. Yet, to stay apace with the accelerator's improved vigor, all of them had to undergo a series of upgrades and transformations.

After the refurbished Time Projection Chamber (TPC) and the revamped Miniframe joined the ALICE detector in the cavern, the reinstallation of its new Muon Forward Tracker subdetector followed. In May, a new Inner Tracking System (ITS), the largest pixel detector ever built, took the seat of the previous one, between the beam pipe and the TPC. The final piece of the ALICE puzzle—the Fast Interaction Trigger (FIT)—was installed in July.

At ATLAS, among the ongoing works, the muon spectrometer was upgraded, notably with the installation of one of the two New Small Wheels, which uses new technologies such as the novel small-strip Thin Gap Chambers (sTGC) and the Micromegas detectors. Its twin will be lowered into the detector's cavern in November.

In 2020, the CMS experiment completed the installation of the first GEM (Gas Electron Multiplier) station, the brand new sub-detector system for detecting muons in the region closest to the beam pipe. This year, a new, redesigned beam pipe with a new vacuum pumping group was installed. Over the summer, after its design was improved and its innermost layer replaced, the Pixel Tracker was installed at the center of the CMS detector, followed by the Beam Radiation, Instrumentation and Luminosity (BRIL) sub-detectors.

As for the LHCb experiment, an important metamorphosis happened during these two years. A new scintillating-fiber particle-tracking detector (SciFi) and upgraded ring-imaging Cherenkov detectors,

RICH1 and RICH2, were installed this year, before the recommissioning of the beam pipe. The installation of a faster Vertex Locator (VELO) is planned for the coming months.

The first proton beams circulated in CERN's accelerator chain in December last year, with the first beam being injected into the PS Booster (PSB), connecting it for the first time to the new Linac4. The Proton Synchrotron followed, accelerating its first beam in March, while the Super Proton Synchrotron (SPS) saw its first beams accelerated in May.

**More information:** [www.youtube.com/c/CERN](https://www.youtube.com/c/CERN)

Provided by CERN

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