CERN, Geneva recent 02’56’’08 natural sound and English speech.

Final LHC Synchronisation Test a Success

Shotlist:

00’00’’00 Black

00’03’’00 Starting from a view of Earth from space, zoom in to an aerial view of the Geneva, Switzerland area, with the 27-kilometer-long Large Hadron Collider (LHC) superimposed.

00’09’’22 Animation of the various accelerators involved in creating the LHC’s high-energy beams superimposed on an aerial view of the Geneva area. First the Proton Synchrotron (PS), then the Super Proton Synchrotron (SPS), then the LHC drop from above onto the aerial view. An animation of beam particles traveling along the accelerator chain follows.

00’18’’00 Aerial footage of part of the CERN complex in Meyrin, Switzerland. The aboveground buildings of the ATLAS experiment can been seen on the left, the Globe of Science and Innovation in the center, and the buildings of the CERN Meyrin site on the right-hand side. (natural sound)

00’23’’00 Animation of the full LHC accelerator chain. LHC proton beams start from a bottle of hydrogen (label “Protons”). Electrons are removed from the hydrogen, leaving only the protons, which are accelerated first in a linear accelerator (Linac), then in the Proton Synchrotron Booster (PSB), the Proton Synchrotron (PS), and Super Proton Synchrotron (SPS), gaining more energy at each step in the acceleration process. The last step is to inject the particles into the LHC from the SPS in two directions, where they are accelerated to their final energy of 7 TeV. The creation of an LHC beam takes four minutes and 20 seconds, and once in the LHC they are accelerated for 20 minutes to their final energy of 7 TeV. Also shown in the diagram are the Linac and Leir, two pre-accelerators for the LHC’s heavy-ion beams.

00’28’’02 Wide shot of the LHC beam line in its tunnel, 100 meters underground. Each blue dipole magnet is 15 meters long, and 1232 such magnets are used in the LHC to steer the beams of particles around the ring. (natural sound)

00’31’’09 Travelling shot along the LHC beam line in its tunnel. (natural sound)

00’36’’09 Medium shot of a road sign for the CERN Control Centre (“Salle de controle”), from which all CERN accelerators are controlled and monitored. The CERN Control Centre is located on the CERN site in Prevessin, France. (natural sound)

00’41’’03 Wide shot panning from right to left along the building housing the CERN Control Centre. Also seen are cars with the CERN logo and the CERN Control Centre sign on the building. (natural sound)

00’52’’16 Closeup of the CERN Control Centre sign. (natural sound)

00’55’’07 Wide shot of the inside of the CERN Control Centre on the evening of 8 August, when the synchronization of the LHC’s clockwise beam transfer system was successfully

achieved. A single bunch of a few particles was taken down the transfer line from the SPS accelerator to the LHC, and after a period of optimization one bunch was kicked up from the transfer line into the LHC beam pipe and steered about 3 kilometres clockwise around the LHC itself on the first attempt.

00'59''11 Starting with a view of the SPS beam on a computer screen, zoom out to view of LHC personnel at work in the CERN Control Centre during the second, counter-clockwise synchronization test on the evening of 22 August. On the computer screen, the peak on the right-hand side shows particles being sent to the LHC.

01'06''04 View of LHC personnel in the CERN Control Centre at the moment when particles were successfully sent from the SPS to the LHC in the counter-clockwise direction on the evening of 22 August.

01'18''21 Shot of a computer screen in the CCC on the evening of August 8. The red spots show a bunch of a few particles in the LHC. (natural sound)

01'23''07 Medium shot, panning left to right, showing activity in the CERN Control Centre during the first synchronization test on 8 August. (natural sound)

01'29''19 Shot of computer screen in the CERN Control Centre during the clockwise synchronization test on 8 August. The screen shows particles being accelerated in the Super Proton Synchrotron (SPS). (natural sound)

01'34''05 Various shots of the activity in the CERN Control Centre during the counter-clockwise synchronization test on 22 August. Shown are accelerator operators and other LHC personnel at work in the CCC. (natural sound)

01'48''10 Traveling at high speed in two directions along the completed LHC beamline. (natural sound)

01'51''11 Animation of protons traveling through the LHC beam pipe. Inside the protons can be seen three quarks and the gluons that hold the quarks together. When the LHC is operating at full energy and intensity, about 600 million proton-proton collisions will occur every second. (natural sound)

01'57''01 Various shots of LHC personnel at work in the CCC during the counter-clockwise synchronization test on 22 August. (natural sound)

02'06''14 Closeup of a computer screen showing the passage of a bunch of particles through a section of the LHC during the clockwise synchronization test. The bright white spot indicates the passage of the bunch. (natural sound)

02'12''13 Interview with LHC Project Leader Lyn Evans in the CERN Control Centre on the evening of 22 August. Evans discusses the necessity for testing the synchronization between the SPS and LHC accelerators, and the astonishing success of both tests. In both the clockwise and counter-clockwise directions, particles were injected from the SPS into the LHC and traveled 3.5 kilometers on the very first attempt. (English speech)

02'49''15 Wide shot of the outside of the CERN Control Centre on the evening of 22 August during the counter-clockwise synchronization test. (natural sound)

02’53’’01 Close up CERN Control Centre sign with rainbow above on the evening of 22 August. (natural sound)

02’56’’08 End