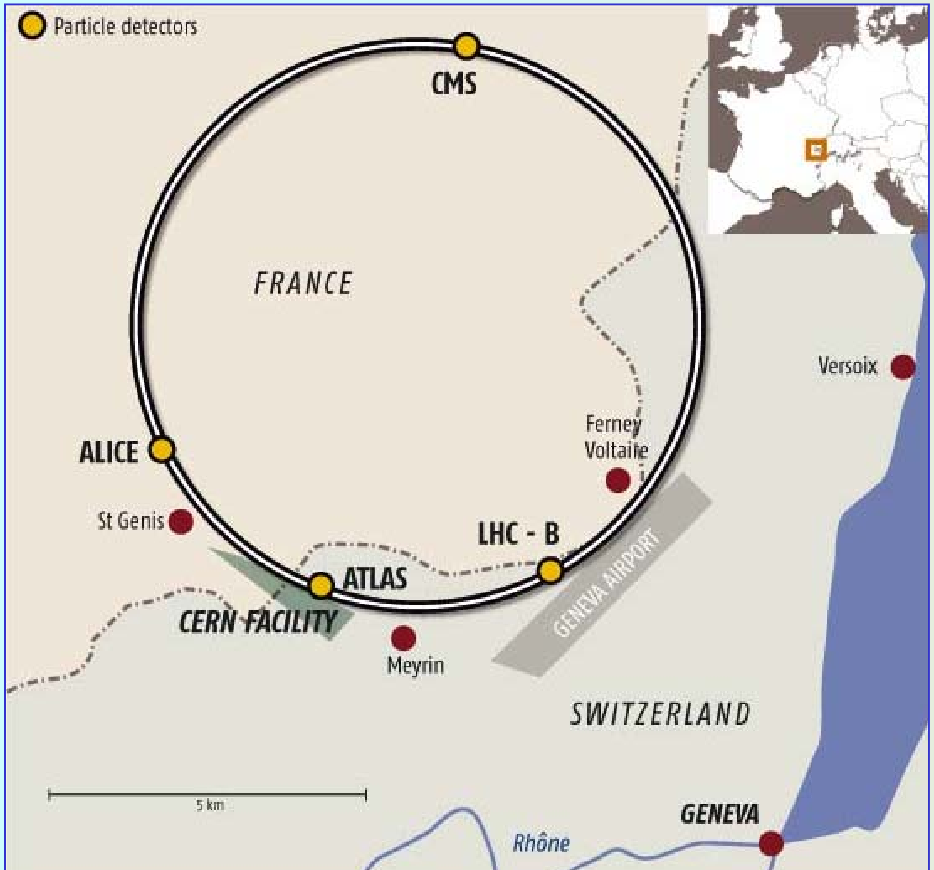
Rafa Muñoa
Lizardi Institutua
Zarautz

LHC (Large Hadron Collider)

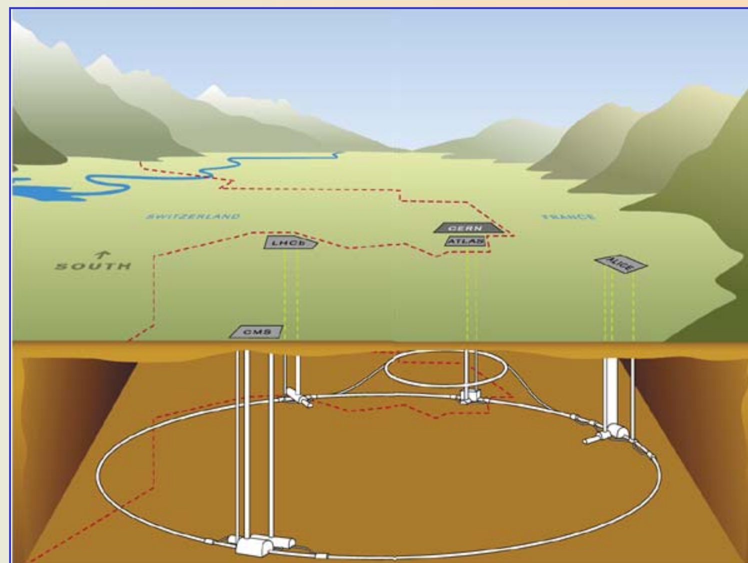
Introduction



http://www.newscientist.com/data/images/archive/2500/25005101.jpg

From now on, physicists are going to come closest to seeing what the universe was like a split-second after the big bang.

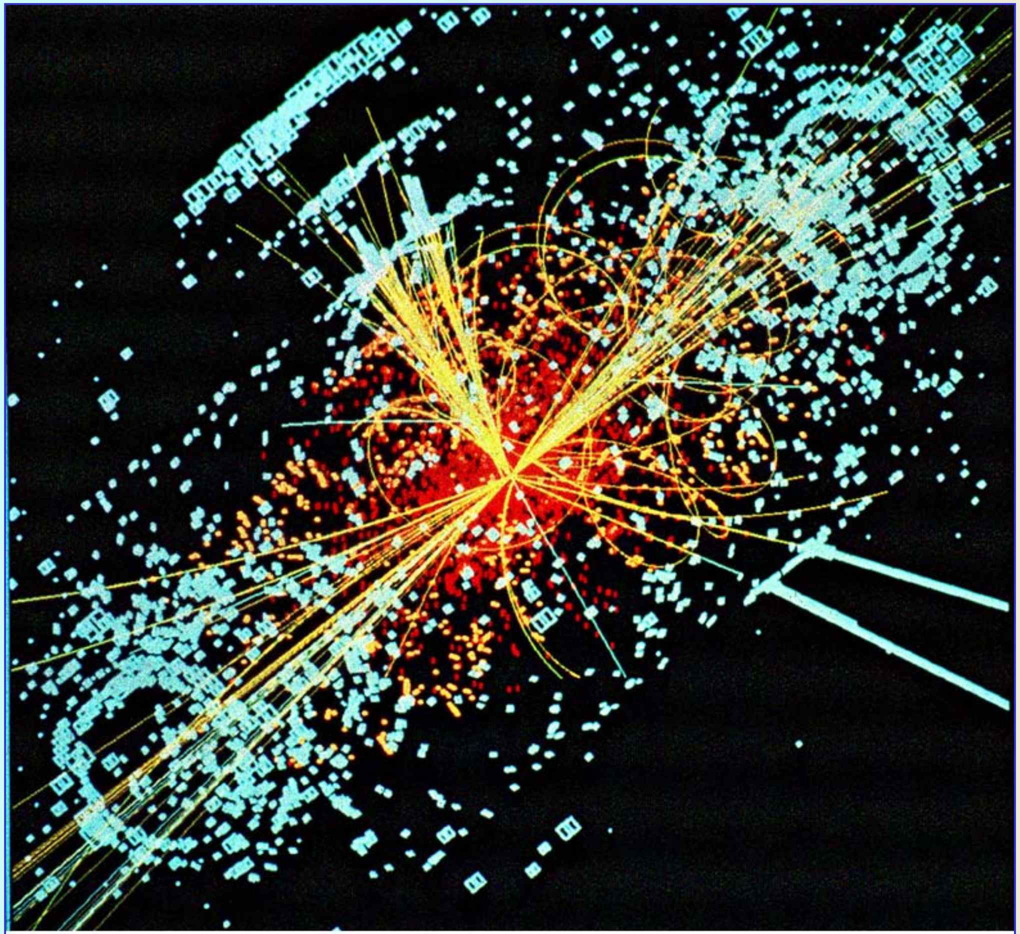
Inside a 27-kilometer-long circular tunnel that straddles the border of France and Switzerland 100 metres underground, the Large Hadron Collider will push protons to almost the speed of light and smash them head-on at energies never before created on Earth.



http://www.symmetrymagazine.org/images/200608/article13_image01.jpg

Rafa Muñoa
Lizardi Institutua
Zarautz

LHC (Large Hadron Collider)


http://isjtar.org/img/lhc_particlemovement.jpeg

Simulation of Big Bang

At each collision vast amounts of energy will be squeezed into a microscopic volume, reproducing the conditions inside the hot fireball that filled the universe just a million-millionth of a second after the big bang.

Hundreds or thousands of particles will spray out from each collision, and large fraction of these will have to be tracked and identified.

"Each collision will reproduce the conditions inside the hot fireball that filled the universe just after the big bang"

Rafa Muñoa
Lizardi Institutua
Zarautz

LHC (Large Hadron Collider)

http://msnbcmedia.msn.com/i/msnbc/Components/Photo_StoryLevel/080215/080215-large%20hadron%20collider-718p.jpg

How it works

Two beams of subatomic particles called 'hadrons' – either protons or lead ions – will travel in opposite directions inside the circular accelerator, gaining energy with every lap.

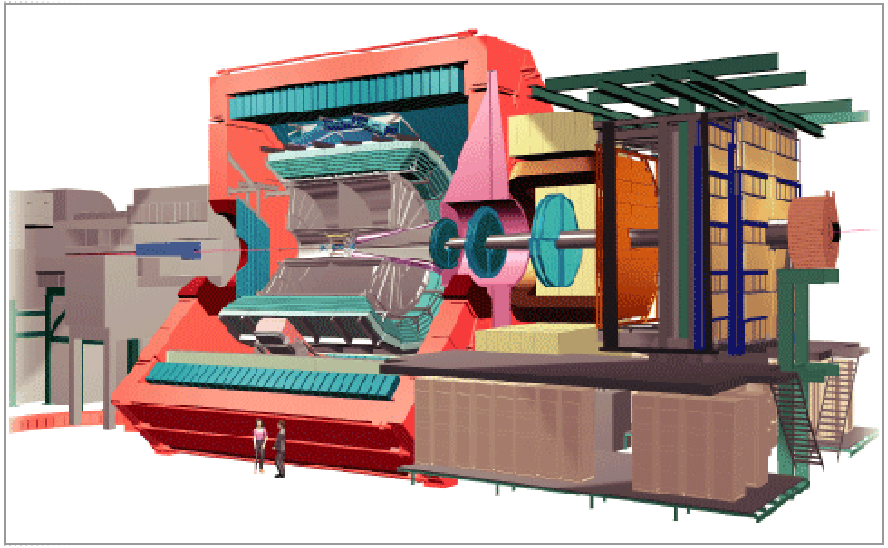
Physicists will use the LHC to recreate the conditions just after the Big Bang, by colliding the two beams head-on at very high energy.

Teams of physicists from around the world will analyse the particles created in the collisions using special detectors in a number of experiments dedicated to the LHC.

http://public.web.cern.ch/public/Objects/LHC/LHCtunnel1.jpg

LHC (Large Hadron Collider)

Rafa Muñoa
Lizardi Institutua
Zarautz



ALICE detector

- Size: 26 m long, 16 m high, 16 m wide
- Weight: 10 000 tonnes
- Design: central barrel plus single arm forward muon spectrometer
- Location: St Genis-Pouilly, France. See ALICE in Google Earth.

ALICE detector

Collisions in the LHC will generate temperatures more than 100 000 times hotter than the heart of the Sun.

Physicists hope that under these conditions, the protons and neutrons will 'melt', freeing the quarks from their bonds with the gluons.

This should create a state of matter called quark-gluon plasma, which probably existed just after the Big Bang when the Universe was still extremely hot.

The ALICE collaboration plans to study the quark-gluon plasma as it expands and cools, observing how it progressively gives rise to the particles that constitute the matter of our Universe today.

A collaboration of more than 1000 scientists from 94 institutes in 28 countries works on the ALICE experiment