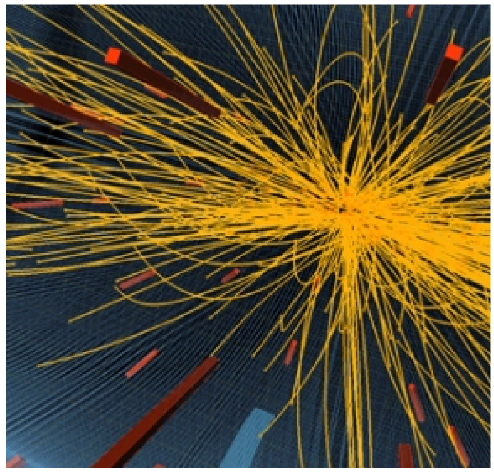
A step closer to Big Bang conditions?

More study is needed to confirm the latest findings from the L Hadron Collider, reported by CERN physicists last week.

Anne Trafton, MIT News Office

September 29, 2010



Proton-proton collisions at the Large Hadron produce hundreds of particles. Some of thos form pairs that display an unexpected correl Image: CERN

Since December, the Large Hadron Collider (LHC) has been smashing particles together at record-setting energy levels. Physicists hope that those high-energy collisions could replicate the conditions seen immediately after the Big Bang, shedding light on how our universe came to be. Now, data from collisions that took place in July suggests that the LHC may have taken a step toward that goal.

The finding, which has been submitted to the Journal of High Energy Physics from proton-proton collisions that occurred in the LHC in July, each of which 100 or more charged particles. One of the two large, general-purpose detect the Compact Muon Solenoid (CMS) experiment, measured the path that eacl particles took after the collision.

The CMS physicists observed a surprising new phenomenon in some pairs o particles: They appeared to be associated together at the point of collision. T some pairs of particles fly away from each other after the collision, their resp directions appear to be correlated. Such correlations between particles that r from each other at near the speed of light had not been seen before in collis protons.

“As soon as the measurement came out — first within the experiment and the publicly — there was a lot of debate about the possible explanation,” says Gu Roland, a physicist in the MIT heavy-ion group who was one of the leaders o analysis of the data along with MIT postdoctoral associate Wei Li.

Some of the proposed explanations are based on subtle effects in the scatte quarks that make up the colliding protons, which may not be described by cu of these interactions. Others assume that the effect is the result of the high c particles in the early stages of the collision, says Roland, an associate profe physics at MIT.

At the Relativistic Heavy Ion Collider at Brookhaven National Laboratory, phy observed similar phenomena following collisions of heavier particles such as gold ions. One explanation for the observation at Brookhaven is that the qua gluons were forced together at such high densities that they were freed, beco quark-gluon plasma — the hot soup of elementary particles that existed for a millionths of a second after the Big Bang and that subsequently cooled and f

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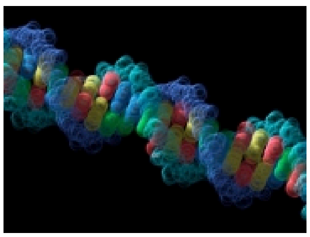

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protons and neutrons, the building blocks of matter.

In the upcoming months, physicists plan to increase the intensity of LHC prot
providing at least 100 times more data that can be used to further study this
phenomenon. They also plan to run beams of heavier ions, such as lead. Ba
these studies, it will be possible to eliminate many of the proposed explanatic
study if the effects in proton-proton and heavy ion collisions are related.

Comments

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Sylwester Kornowski 2010-10-

The first phase transition of the Einstein spacetime (in the ground state it is field c
the non-rotating binary systems of neutrinos; pressure is about 10^44 Pa so i
leads to the massive core of protons having electric charge and spin the s
positron. Its mass is 727.44 MeV and it consists of the binary systems of neutrin
torus with mass in its centre. Due to the strong interactions, relativistic neutral pic
this core. Between these two elements is exchanged relativistic electron what lea
that the two elements have the fractional electric charges similarly as the quark
very energetic nucleons collide, there appears the liquid-like plasma compo