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Physics news on the Internet (based on electronic preprints)

1. A new particle

A new particle, the exotic meson, has been detected at the National Brookhaven Laboratory's accelerator after 5 years of searching in the framework of the E852 experiment using a multiparticle spectrometer to study the reaction products of particle collisions with a liquid hydrogen target. The meson is a gluon-string-held quark-antiquark pair. While in ordinary mesons the string is in its non-oscillating ground state, exotic mesons with an oscillating string have been predicted which are now believed to have been detected. Alternatively, a ground-state 4-quark model may account for the new particle. The finding will serve as a further check on the Standard Model of elementary particles and will set the mathematical scales for future studies. An international team including Russian physicists from the Institute of High Energy Physics and Moscow State University reports the discovery.

Source: http://www.pubaf.bnl.gov/

2. A rare decay

On the same accelerator, a rare kaon decay is detected for the first time in the E787 experiment. In contrast to the ordinary kaon decay, involving either the W- or Z-boson exchange, in this case both these particles take part. The decay, sought for since the 1960s, has a probability of about 10^{-10} and is detected due to a new apparatus, introduced in 1995, which is sensitive enough to analyse 10^6 decays per second.

Source:: http://www.pubaf.bnl.gov/

3. Light creates matter

Electron-positron pair formation due to the collision of real (rather than virtual) photons have been observed for the first time at Stanford Linear Accelerator Center (SLAC). The process is opposite to the annihilation of electron-positron pairs. While intermediate-state virtual photons participate in many known reactions producing e^+e^- pairs, this is the first time their real counterparts are found to be involved. To obtain a high-intensity electromagnetic field, high-power laser light is sent into a 47-GeV electron beam with the result that part of the scattered photons convert into high-energy gamma quanta which, in turn, are scattered by the laser light giving rise to electron-positron pairs. Light-on-light scattering processes are important in gamma astronomy because high-energy gamma quanta are believed to be scattered by the relict radiation that fills the Universe.

Source: *Physics News Update*, Number 337
http://www.hep.net/documents/newsletters/pnu/

4. Plasma streams inside the Sun

Plasma streams beneath the surface of the Sun have been discovered using the Solar Heliospheric Observatory (SOHO) spacecraft equipped with a new apparatus enabling the Sun's deeper layers to be studied. Following Doppler velocimetry at a set of points near the visible surface, the sound wave propagation pattern in the solar interior was reconstructed using standard seismological techniques. Of particular interest are polar flow features at about 75° latitude, which are totally inside the Sun and cannot be seen at the surface. These are oval regions about 30×10^3 km across, where the material moves 10% faster than its surroundings. Also observed were plasma motions similar to the Earth's trade-winds, which relate to solar layers' differential rotation and extend for at least 20×10^3 km inward. The features observed are assumed to have a relationship to the cyclic sunspot formation activity.

Source: http://sohowww.nascom.nasa.gov/

5. Radio observation of a gamma burster

As previously reported, in the cosmic gamma bursts of February 28 and May 8, 1997, along with gamma radiation also x-ray and optical radiation and radio waves are present. Further observations of the May 8 object using the VLA and VLBA radio telescopes revealed some characteristics of the source. It is found that it expands at a rate very close to the speed of light and that its current size is about one-tenth of a light year, or 170 times the distance between the Sun and Pluto. The observations employ the twinkling effect that accompanies signal propagation through the interstellar medium and depends on the angular dimension of the source. The source is believed to be an extending plasma sphere formed by a collision of two neutron stars in a far-away galaxy.

Source: http://unisci.com/

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