Contribution ID: **298** Type: **Poster**

ANTIMATTER EXPERIMENTS: FACILITIES AND RESULTS

Tuesday 3 October 2017 16:30 (1h 50m)

In 1928 Paul Dirac creates an equation that combined quantum theory and special relativity to describe the behavior of an electron moving at a relativistic speed. Dirac's equation posed a problem –it had a two possible solutions, one for an electron with positive energy and one for an electron with negative energy. Classical physics impose that the energy of a particle must always be a positive number.

As an explanation of the problem Dirac suggested that for every particle there exist a corresponding antiparticle, exactly matching the particle but with opposite charge. This has been confirmed in 1932 by Carl Anderson who observed positron (antielectron) for the first time. Since that time many scientists have dealt with subject of antimatter, asking more and more questions about its nature, properties and possible applications.

To make an answers possible it is necessary to have an appropriate research
apparatus and conduct proper and reliable tests. The first big-scale installation allowing deepening knowledge in antimatter was "Bevatron"- with its use the existence of the antiproton was confirmed. In the later years, many studies were carried out, building larger and more complex installations like SPEAR, SPS, LEP, LEAR etc. Presently the most advanced research are carried out at CERN, with the present or future use of the Antiproton Decelerator, ACE, AEGIS, ATRAP, ALPHA, ASACUSA and ELENA facilities.

Presentation includes principles of antimatter studies, description of historical, present and planned research facilities with the results obtained so far. It will also be shown how these research results can be used in various fields of science, technology and medicine.

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Session Classification: Poster session