

Scientific Highlights

Collider experiments

The Tevatron's collider program began proton-antiproton collisions in 1985 and has led to about 1,000 Ph.D. degrees and about a paper a week through work on the CDF and DZero experiments.

Discovered:

- the top quark and determined its mass to a high precision
- two distinct production mechanisms for the top quark: pair and single production
- five B baryons (2 cascade, 1 omega and 2 sigma_b)
- B_c meson
- Y(4140), a new quark structure
- B_s oscillations

Observed:

- strongest evidence yet for violation of matter-antimatter symmetry in particles containing bottom quarks.
- evidence for CP violation in neutral B mesons

Measured:

- the bottom quark and defined its properties
- precise lifetimes of charm particles
- magnetic moments of particles containing strange quarks
- leading constraints on Higgs boson
- most precise measurement of W boson mass by a single experiment and overall
- strong coupling constant and other parameters related to the strong force

Fixed-target experiments

About 400 Ph.D. degrees and more than 300 papers were generated through work on the Tevatron's 43 fixed-target experiments operating periodically from 1983 to 2000. Many experiments involved more than 100 physicists and engineers.

Discovered:

- tau neutrino

Observed:

- direct CP violation in kaon decays
- antihydrogen atoms
- some of the earliest evidence of particle jets

Measured:

- quark content, structure of proton and neutron

