CDFermilab

Collider Detector at Fermilab

With 800 collaborators representing 62 institutions and 12 countries, CDF in Run 2 at the Fermilab Tevatron is challenging the standard model while searching for dark matter, supersymmetry and other exotic phenomena.

WHAT IS THE NATURE OF THE UNIVERSE AND WHAT IS IT MADE OF?

ARE THERE UNDISCOVERED PRINCIPLES OF NATURE : NEW SYMMETRIES, NEW PHYSICAL LAWS?

CAN WE PRODUCE AND DETECT DARK MATTER, WHOSE MYSTERIOUS PARTICLES FORM 25% OF THE UNIVERSE?

THE STANDARD MODEL AND BEYOND

QUARKS
LEPTONS
FORCE CARRIERS

g γ W/Z

τ ν_τ μ ν_μ e ν_e
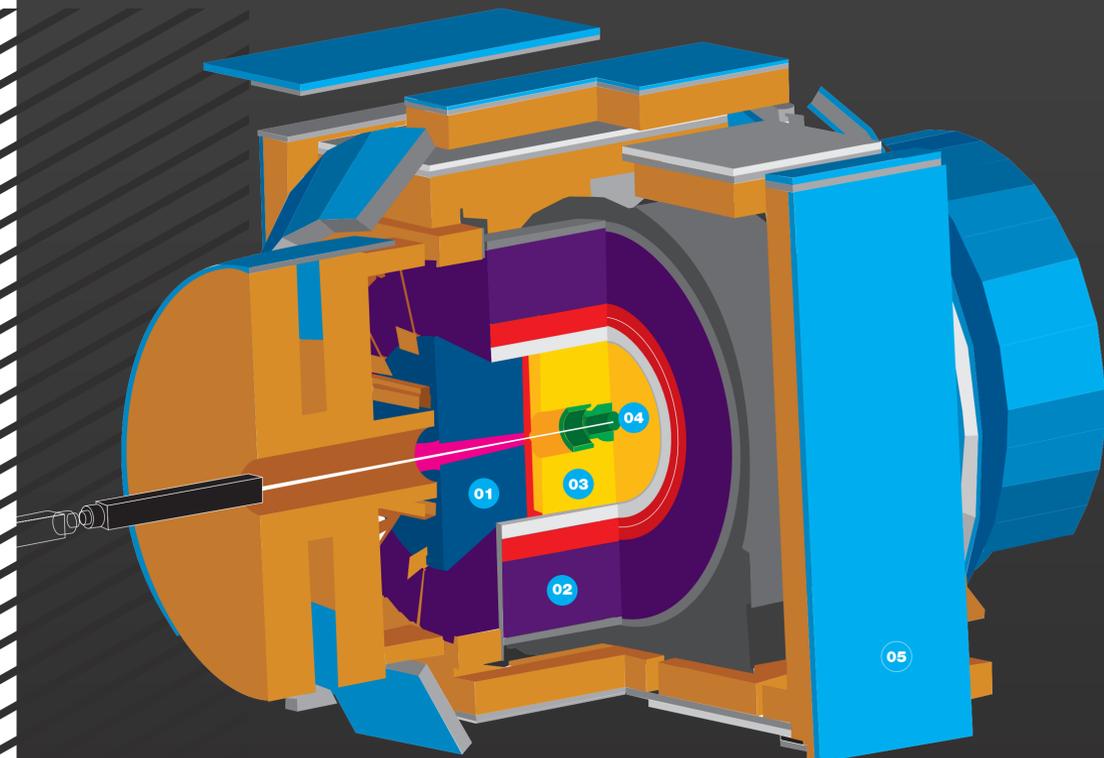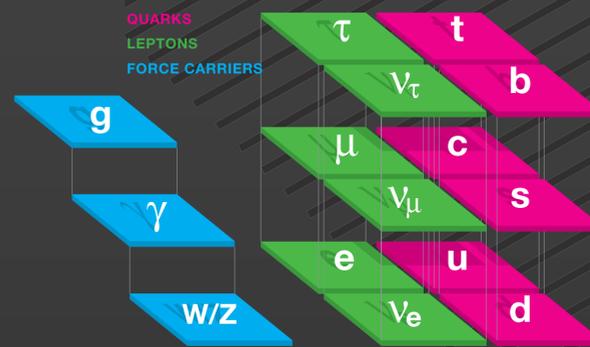
t b c s u d

DOES THIS STRIKINGLY SIMPLE PICTURE OF NATURE'S FUNDAMENTAL PARTICLES TELL THE WHOLE STORY?

Discoveries at CDF—the 175 GeV top quark in 1995, the precision measurement of B mesons and W bosons—have helped to shape the Standard Model, the theory that embodies our most profound understanding of the particles and forces of matter.

Today, CDF measurements of the masses of the W boson and the top quark probe the origin of mass itself and the nature of the Higgs boson.

Exploring B mesons will help unlock the mystery of matter-antimatter asymmetry.

CDF scientists look for signals for new particles using characteristic signatures, like those of the tau, the heaviest lepton, and the top, the heaviest quark.

B QUARK JET

JETS

1000 GEV ANTIPROTON

HIGH-ENERGY ELECTRON AND NEUTRINO FROM W

JETS

1000 GEV PROTON

B QUARK JET

JETS

DETECTOR UPGRADES

01 NEW SCINTILLATOR TILE ENDCAP CALORIMETER

02 NEW CALORIMETER FRONT END ELECTRONICS

03 NEW CENTRAL OUTER TRACKER FOR CHARGED PARTICLE MOMENTUM

04 NEW SILICON MICROSTRIP VERTEX DETECTOR— THE WORLD'S LARGEST

05 IMPROVED MUON DETECTOR COVERAGE

NEW DATA ACQUISITION SYSTEM

NEW TRIGGER ELECTRONICS, INCLUDING TRIGGER FOR SECONDARY VERTICES

NEW RECONSTRUCTION AND SIMULATION SOFTWARE
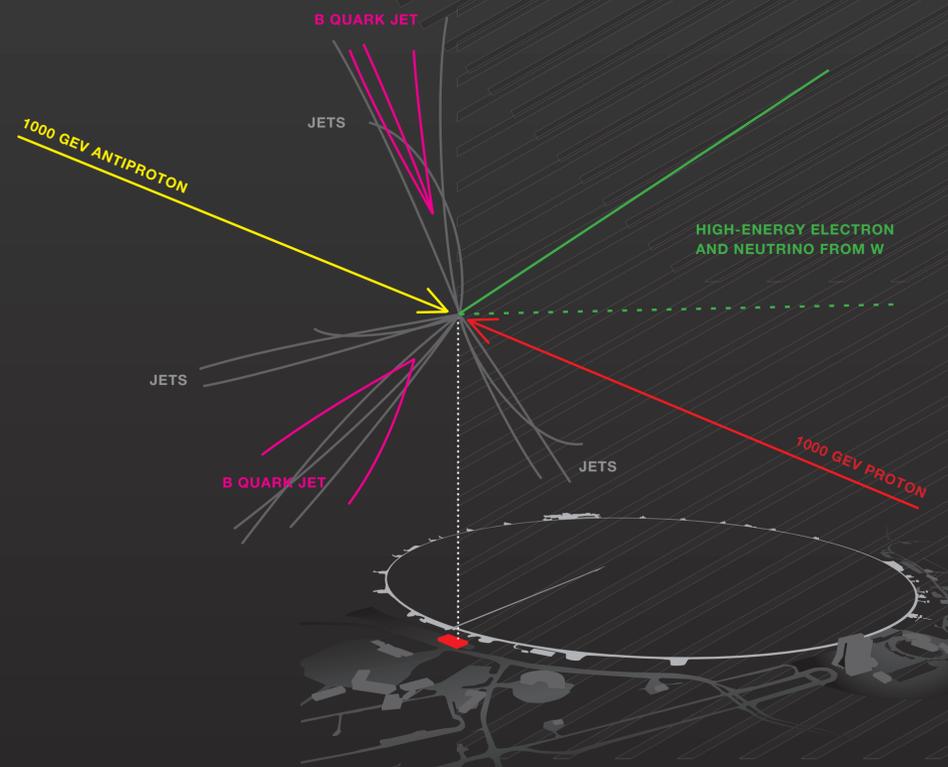
LEFT TO RIGHT

CDF SILICON VERTEX DETECTOR BEING INSTALLED AT B-ZERO

CDF CONTROL ROOM

SIMULATION OF HIGGS EVENT

PHYSICIST WITH SILICON BARREL

THE FERMILAB TEVATRON,

in Batavia, Illinois, (above) is the world's highest energy proton-antiproton collider. The six kilometer ring has 1,000 superconducting magnets cooled with liquid helium.

The Tevatron produces several hundred thousand proton-antiproton collisions per second in the center of CDF.

CDF will record thousands of top pair events, like the one pictured above, in Run 2.

Fermilab   Office of Science / U.S. Department of Energy