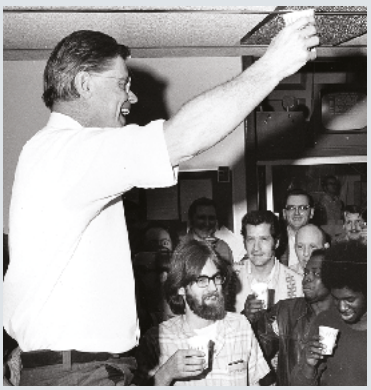
A selection of Fermilab's greatest hits

1967
National Accelerator Laboratory (NAL) approved

1972
Main Ring achieves 200 GeV design energy



High-energy neutrino interactions observed (enabling technologies: neutrino beam creation; massive detectors)

1977
E288 discovers b quark (high-luminosity 400 GeV accelerator)

Neutron therapy used in cancer treatment (secondary neutron beams; use of medical radiology)

1981
Charm observed in hadronic production (high-energy proton beams; silicon-vertex detectors; and trigger processors)

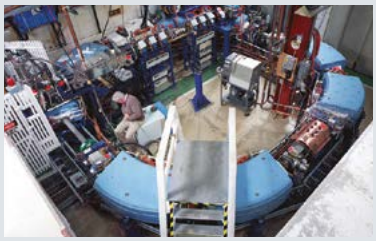
1983
Tevatron sets 512 GeV energy record (superconducting cable and magnet manufacture; world's largest cryogenic facilities)

1985
First proton–antiproton collisions in the Tevatron (lithium lenses; antiproton cooling techniques; low-beta focusing quadrupoles)

Measurement of the magnetic moments of strange hyperons (creation of charged and neutral hyperon beams)

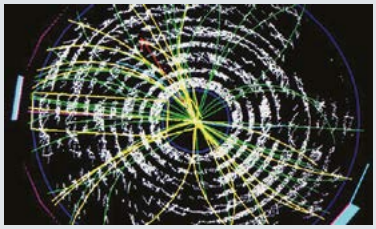
CP violation in K decays (intense neutral kaon beams; precision electromagnetic calorimetry)

1990
Proton therapy demonstrated at Loma Linda University Medical Center (cyclotron design and extraction of proton beams)



1991
Fixed-target experiment detects b decays (emulsion targets; downstream particle detectors)

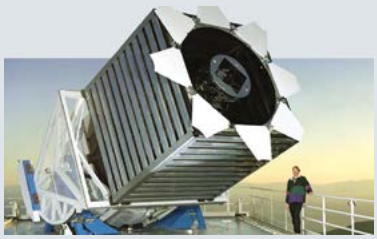
1995
CDF and DØ discover top quark (scintillating-fibre and silicon-vertex detectors; Tevatron technology)



1996
US agrees to contribute to LHC accelerator and detectors

1998
Discovery and measurements of the B_s meson (first silicon-vertex detector in a hadron collider)

Sloan Digital Sky Survey sees first light (Fermilab built data acquisition and other systems)



1999
Dedication of the Main Injector

2000
DONUT directly observes tau neutrino (emulsion-vertex detector; very short-baseline neutrino beam)

2010
MINERvA begins operations (fine-grained scintillator; short-baseline neutrino beam)

2009
Single-top production at Tevatron (multivariate techniques; computer farms)

2008
The LHC starts up at CERN (low-beta quadrupoles; detector expertise provided by Fermilab)

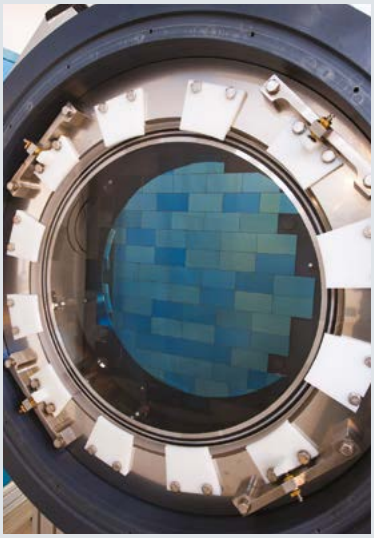
First dark-matter search with Chicagoland Observatory for Underground Particle Physics (bubble-chamber technology)

2007 CMS Remote Operations Center and LHC Physics Center at Fermilab dedicated

2006
Cryogenic Dark Matter Search sets new limits on dark matter (Fermilab provided detector technology and project management)

MINOS begins neutrino observations (long-baseline neutrino beam from Main Injector; near and far detectors)

2012
Dark Energy Survey begins (Fermilab led construction of DECam, the world's largest CCD camera for astrophysics)



Precise W and top-mass measurements by CDF and D0 (world's first permanent magnet accelerator; slip-stacking techniques; electron lens; antiproton recycler)

Fermilab shares in the LHC's discovery of the Higgs boson

2013
Magnet for Muon g-2 experiment arrives from Brookhaven

2017
ICARUS cryostat arrives from CERN (joining SBND and MicroBooNE for the short-baseline neutrino programme)

Neutrino-beam power record of 700 W set by Main Injector

2016
South Pole Telescope launches improved CMB study (Fermilab responsible for detector cryostat)

2015
CERN and US sign co-operation agreement for the HL-LHC and neutrino programmes (powerful low-beta quadrupoles; large liquid-argon neutrino detectors)

MicroBooNE begins operations (large liquid-argon neutrino detectors)

2014
Mu2e experiment approved (superconducting solenoids operating within a strong radiation field)

NOvA experiment begins data-taking (powerful long-baseline neutrino beamline; liquid-scintillator detector)

US CMS upgrade programme approved (project management; technical infrastructure; and detector expertise)

Timeline representing a subset of Fermilab's milestones (a full list of Fermilab achievements can be found at 50.fnal.gov/timeline). All image credits: Fermilab.

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