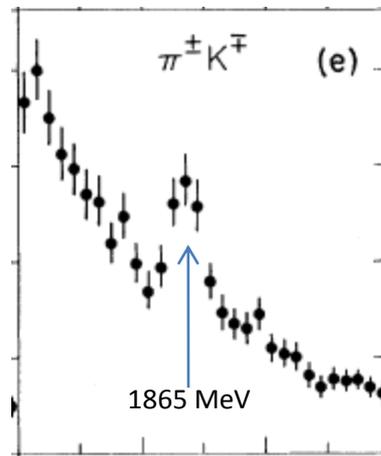
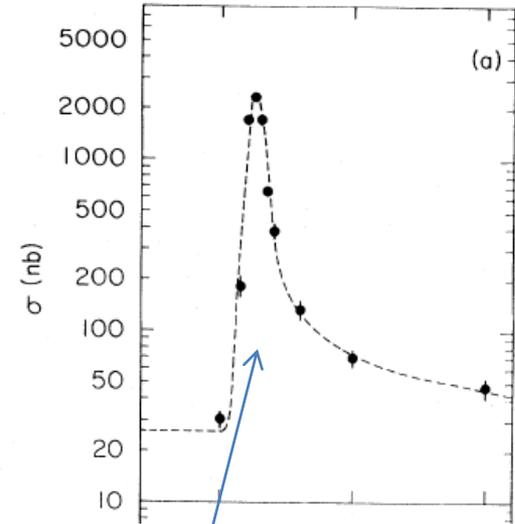


State of Physics in U.S. in Late 1970's and CDF as a Pillar of the Collaboration

Alvin Tollestrup

Machines and Events --- Truncated View of 1960-1996

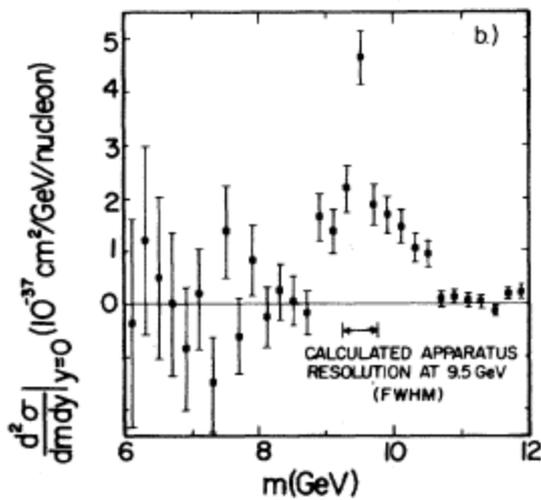
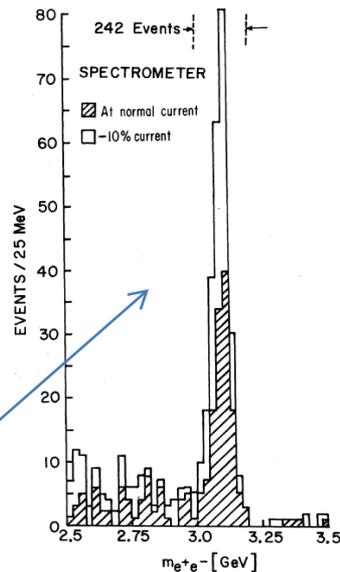
1960-1970	ADA VEP1 ee VEP2	AGS-BNL PS-CERN	Start of collider rings Strong Focusing	
1971-1975	CEA ADONE SPEAR DORIS	MR-FNAL ISR CERN	First evidence stochastic Cooling at ISR	Neutral currents J/Psi
1976-1980	VEP4 CESR PETRA	SPS-CERN ICE CERN	Electron cooling Stochastic cooling	Charm, tau, gluon Upsilon
1981-1985	PEP	TEVATRON PBAR-P CERN	PBARP CERN CDF Start	b
1986-1990	BEPC Tristan LEP SLC	PBAR-P TEVATRON	FIRST COLL. CDF	B _s mixing UA1
1991-1996			D0 DET TEV	t quark, b-physics starts at CDF/DO



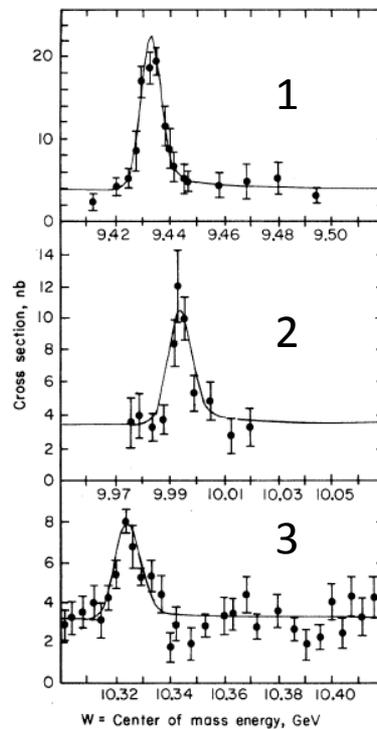
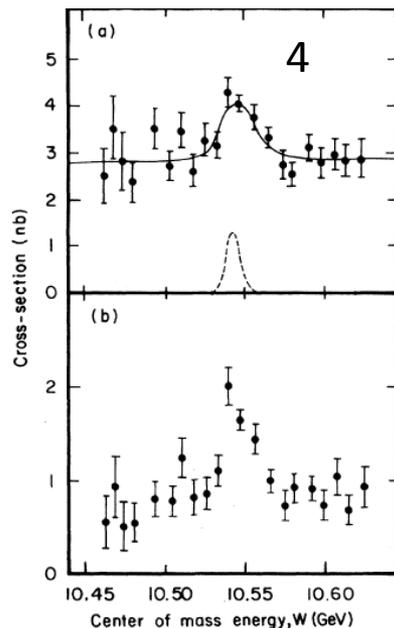
Bare Charm SPEAR 1976

Ψ 1974
SLAC

J
AGS



Y FNAL 1977



CLEO 1980
Y 1, 2, 3, 4

The U. S. Laboratories 1970-1995

Foundations of the Standard Model being established

1. Exciting period: tau, QUARKS, charm, beauty, gluon, neutral currents, W, Z.
 - Stochastic cooling
 - Electron cooling
 - Electron colliders
2. NbTi superconductor raises possibility of dipoles with $B > 2T$.
 - ESCAR test ring at LBNL
 - ISABELLE at BNL
 - ENERGY DOUBLER / SAVER at FNAL
3. SCRF being developed at Carnell and many other places.

THE AGREEMENT

May 1978 Summit meeting. Prime Minister Fukuda and Pres. J. Carter.

May 2, 1979 the “Agreement” was signed by Schlesinger, Sec. Energy and Sonoda, Minister of Foreign Affairs. Covered a long list of items. HEP not explicitly mentioned!

But the HEP community had been very busy! Even in late 1978 a plan was being discussed for cooperation between US and Japan HEP communities.

May 28, 1979 Meeting in DC to discuss the 1979 effort and layout the 1980 plan.

U.S.

JAPAN

Birge	Sandweiss	Nishikawa
Lederman	Hildebrand	Fujii
Ozaki	Leiss	Kitgaki
Pief	Wallenmeyer	Ueki
Rau	Metzler	Nagasue

TEVATRON AUTHORIZED JULY 1979

1979: Sho Ohnuma and R. Yamada indicated that K. Kondo and several other Japanese we in the U. S. looking for ways to collaborate in HEP. I met them at a Conference at BNL and told them about our plans for a colliding beams experiment at FNAL. They came to visit and met with Lederman. The collaboration with CDF was finalized at the end of the year!



...Prof. Kunitaka Kondo (second from right) visits with (L-R) Hans Jensen, Alvin V. Tollestrup and Ryuji Yamada, all with the Fermilab Colliding Detector Facility. On the table before them is a model of the colliding detector...

Fermi News: Dec 1979

1980: Italians joined CDF

1981: Conceptual Design Document

1982, July 1. CDF Construction Begins!
Start construction of pbar source.

1983, July 3. First Beam in Tevatron!

1985, Oct. 13. First Collisions at CDF

Some Pictures



1976 model magnet

1983 Real



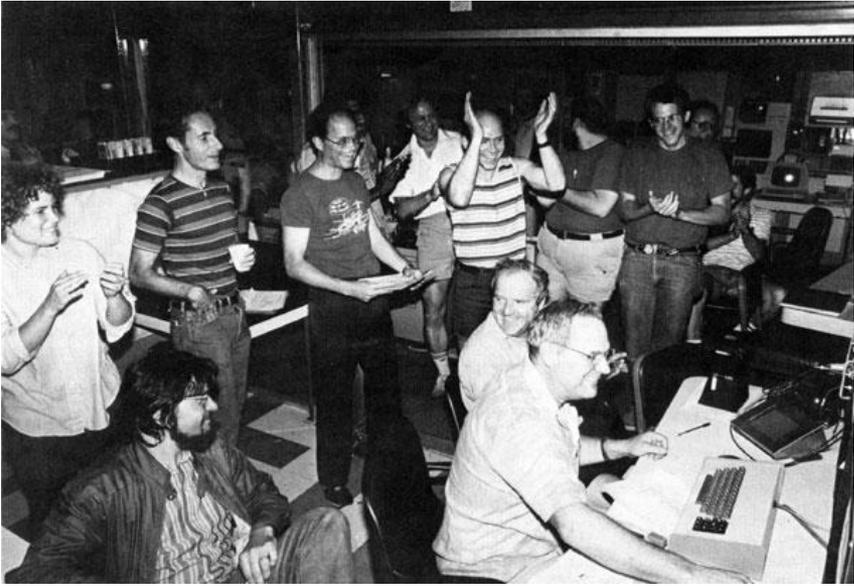
July 3 1983
It Works!

1976: Director winding model magnet



10/19/2010

Alvin Tollestrup, Hawaii, Japan-US Accord





1981



1982



1982



1982

Sequence of pictures showing progress in the construction of the collider.

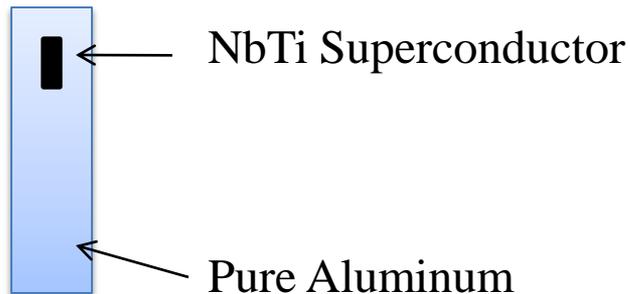
1. Before construction.
2. Collision Hall CDF.
3. Central hadron Cal Shell.
4. Wedge, CEM,CHA cal.

CDF Central Tracker

The heart of precision spectroscopy at CDF

The solenoid was constructed in Hitachi under supervision of Shigeki Mori/Tsukuba University. The design was unique:

1. Constructed in 1983 it was the largest solenoid built—3.0 m x 5.0 m long, 1.5 T. It stores about 30 MJ.
2. Indirectly cooled outer shell of aluminum
3. New conductor developed. 3mm x 20mm Al co-extruded around NbTi SC.



- Thin in X_0 leads to better particle identification.
- This was only one example where a new technology was brought into CDF by a Collaborator resulting in a major upgrade to the properties of the detector.

CDF Solenoid Hitachi 1983



10/19/2010

Alvin Tollestrup, Hawaii, Japan-US Accord

10



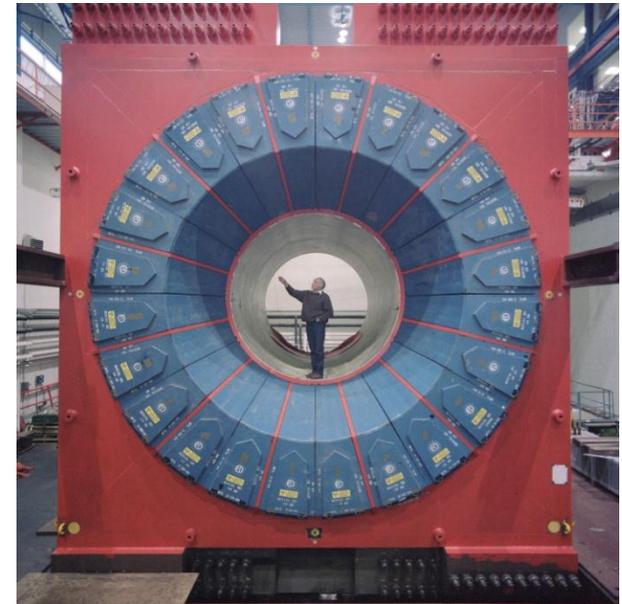
Arrived in 1984!



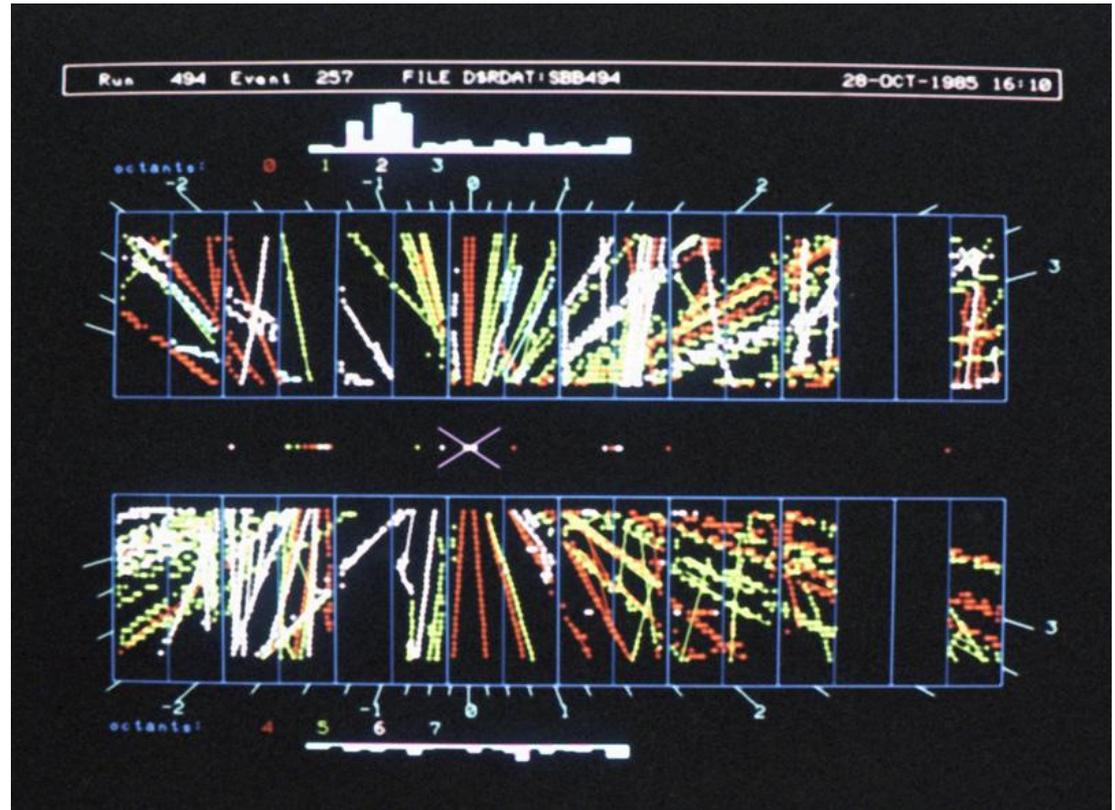
Coil installed 1984



Yoke and coil
1984



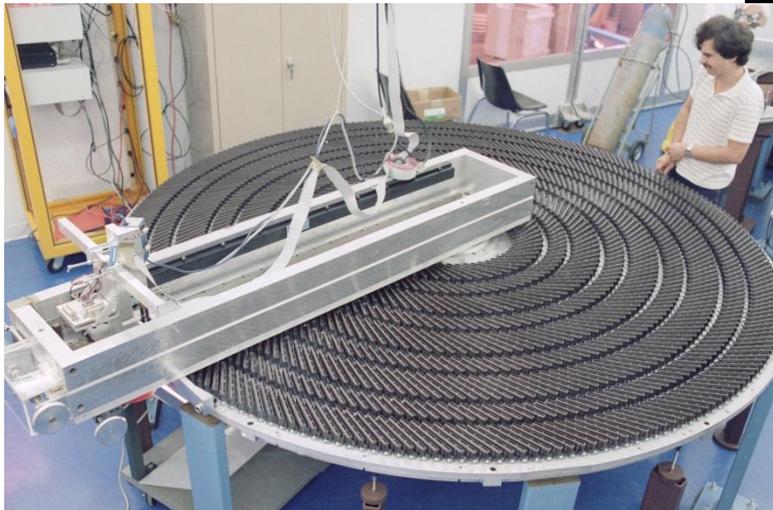
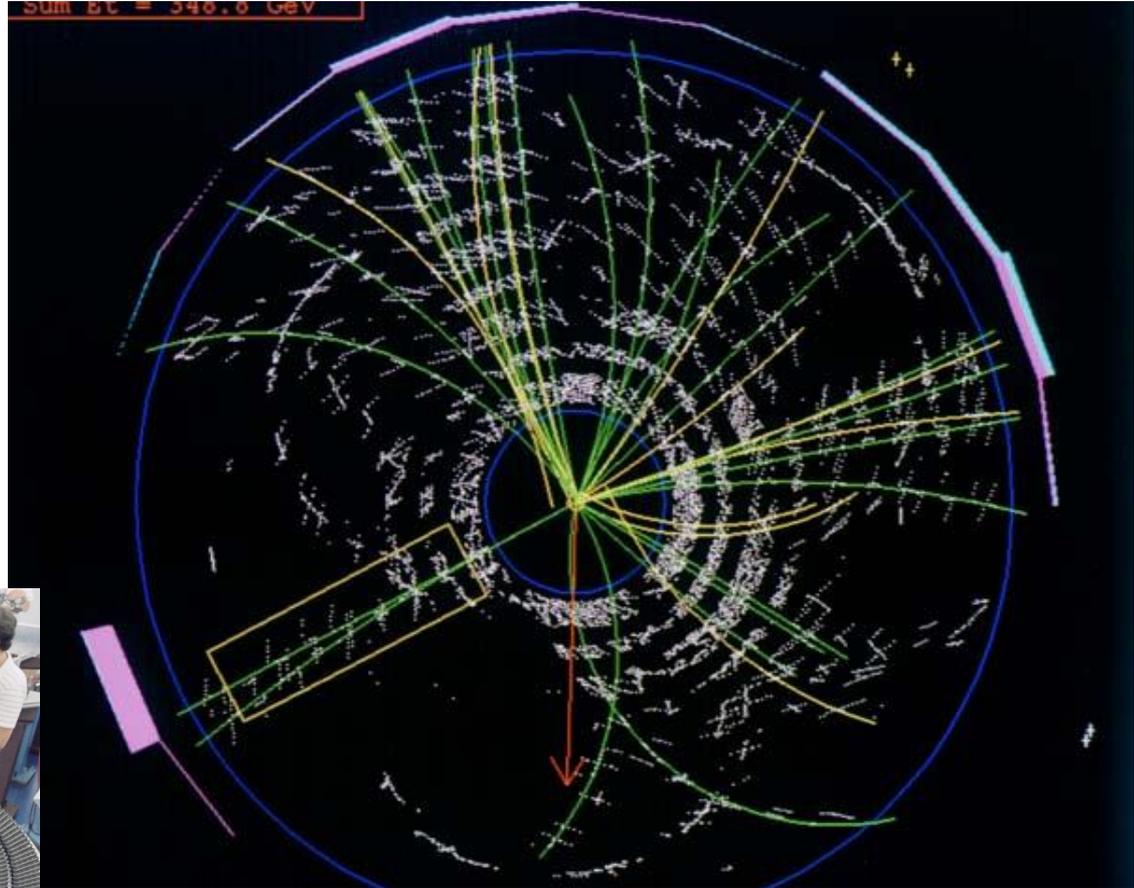
First Collisions: October 13, 1985



“First Collisions” ~20 events!
1987: 29 nb⁻¹ . First physics!
88-89: 4 pb⁻¹. W & Z mass, sin²q_w
Evidence for top, Start on B physics

CDF Central Tracker

1985

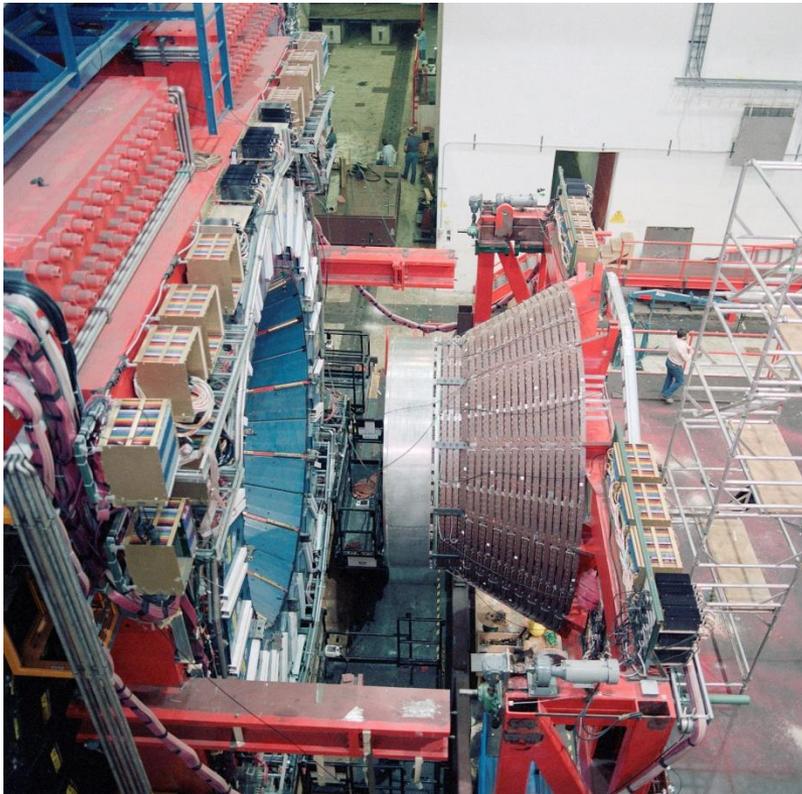


← 1985

↑ 1987

1988-89 Run: Fully functional detector. 4 pb^{-1}

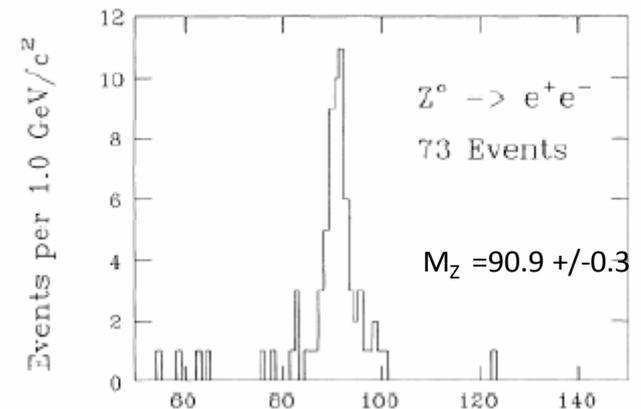
Detector complete as described in
1981 Design Report.



W & Z mass, $\sin^2 q_w$
Limits for top mass
Start on B physics
QCD physics
Defined path for upgrade

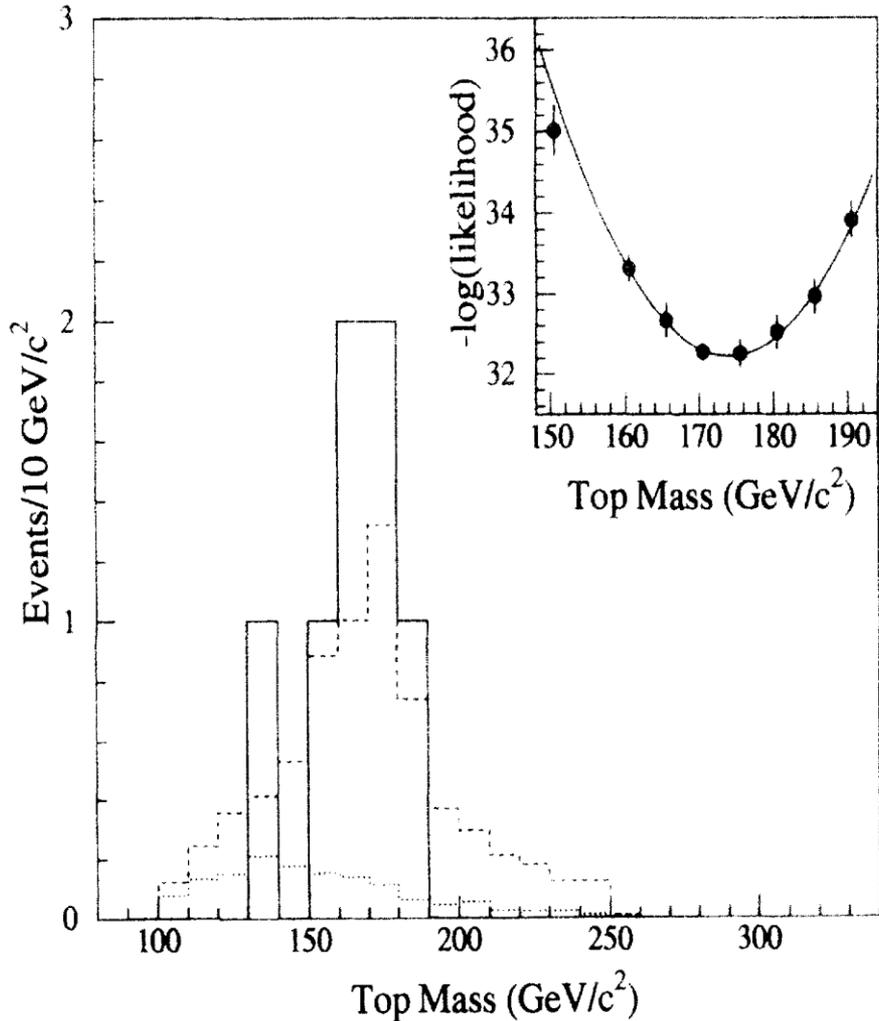
VIEW LETTERS

14 AUGUST 1989



We discovered the
accuracy of the CTC¹⁴

Top Evidence 1994



PRL **73** 225(1994):
 “Evidence for Top Quark
 Production in pp
 Collision
 at $\sqrt{s}=1.8$ TeV”

$$M=174.0 \pm 10^{+13-12} \text{ GeV}/c^2$$

— CDF Data
 - - - Background
 - · - Background+Signal

Some Comments

1. This has been a very successful collaboration for 30 years. CDF and D0 have defined the tools used at hadron colliders: Multi level trigger systems, precision tracking, and silicon vertex detectors.
2. The detector has benefited from:
 1. New technology for SC solenoids.
 2. Scintillator that had 2 x the light output.
 3. Resistive plastic developed industrially specifically for us.
 4. Special photo tubes.
3. Impact on many parts of the detector:
 1. Central EM calorimeter
 2. Plug EM calorimeter
 3. TOF counters
 4. Solenoid

4. The has also been valuable contributions during data analysis. Prof. Kondo developed the DLM method for fitting data using weighting from the matrix element to help select events. A post doc from D0 received a prize for exploiting this technique!

The most valuable product is 60 Japanese who received their PhD so far.
16 hold professorial appoints at universities.



Japanese Rice Pounding Party
New Years 1993?

Pre-physics run : 3

Hitoshi Miyata Professor, Niigata University	Tsukuba	June 1984
Yoshio Hayashide	Tsukuba	Feb 1986
Teruki Kamon Professor, Texas A&M University	Tsukuba	June 1986
1987 run: 4		
Masayuki Shibata	Tsukuba	June 1988
Akihiro Yamashita Physicist, Spring-8 photon factory, RIKEN	Tsukuba	June 1988
Masaki Sekiguchi	Tsukuba	Oct 1988
Youhei Morita Associate Professor, KEK, Public Relations Department	Tsukuba	Jan 1989

1988-89 run : 8

Shun-ichi Kanda	Tsukuba	June 1990
Toshihiro Mimashi Assistant Professor, KEK Accelerator Laboratory	Tsukuba	Sept 1990
Fumihiko Ukegawa Professor, University of Tsukuba	Tsukuba	Sept 1991
Mariko Ninomiya	Tsukuba	Jan 1992
Yoshihiro Seiya Professor, Osaka City University	Tsukuba	Jan 1992
Satoru Ogawa Professor, Toho University	Tsukuba	Jan 1992
Mikio Takano	Tsukuba	June 1994
Takashi Ino Assistant Professor, KEK, Institute of Materials Structure Science	Tsukuba	June 1996

Run I (1992 - 1995) : 23

Takeshi Chikamatsu Professor, Miyagi Gakuin Women's University	Tsukuba	April 1994	Masakazu Okabe	Tsukuba	Jan 1998
Ryutaro Oishi	Tsukuba	Jan 1995	Takanobu Handa	Hiroshima	Jan 1999
Hisafumi Mitsushio	Tsukuba	Jan 1996	Hirofumi Ikeda	Tsukuba	March 1999
Takashi Asakawa	Tsukuba	Feb 1996	Hiroyuki Minato	Tsukuba	March 1999
Yukihiro Kato Associate Professor, Kinki University	Osaka City	June 1996	Toshiaki Kikuchi, University of Tsukuba, Decei	Tsukuba	Dec 1999
Ei-ichiro Hayashi	Tsukuba	Sept 1996	K. Terashi Assistant Professor, University of Tokyo	Tsukuba	Jan 2000
Shin Aota	Tsukuba	Jan 1997	Masashi Tanaka Postdoctoral Fellow, KEK, Institute of Particle and Nuclear Studies	Tsukuba	Jan 2001
Makoto Shimojima Professor, Nagasaki Institute of Applied Science	Tsukuba	Jan 1997	Hosai Nakada	Tsukuba	Jan 2001
Tomoko Kuwabara	Tsukuba	June 1997	Koichi Kurino	Hiroshima	Sept 2002
Hiroyuki Sato	Tsukuba	June 1997	Yoshiyuki Miyazaki Postdoctoral Fellow, Nagoya University	Osaka City	Sept 2002
Takeshi Takano	Tsukuba	Sept 1997	Hideaki Takano	Tsukuba	May 2003
Jun-ichi Suzuki	Tsukuba	Jan 1998			

Run II (2001 -) : 22

Soshi Tsun ϵ Tsukuba Jan-04 W + jets pr QCD
Assistant Professor, KEK, Institute of Particle and Nuclear Studies

Ai Nagano Tsukuba Feb-08 W + photon EWK

Koji Ikado Waseda Mar-04 Search for τ Exotics

Tatsuya Ma ϵ Tsukuba Feb-08 Search for τ Higgs
Project Researcher, University of Tokyo

Koji Sato Tsukuba Mar-05 Top quark τ Top
Assistant Professor, University of Tsukuba

Taichi Kubo Tsukuba Feb-08 Top quark τ Top

Hirokazu Ki Tsukuba Mar-05 Search for τ Higgs

Junji Nagar Waseda Mar-08 Top pair pr Top
Postdoctoral Fellow, Waseda University

Takashi Og Waseda Mar-05 Search for τ Exotics

Naoki Kim ϵ Tsukuba Feb-09 Top quark τ Top
Postdoctoral Fellow, Waseda University

Naho Tanir Okayama Mar-05 W + photon EWK

Kohei Yorit Waseda Mar-05 Top quark τ Top
Associate Professor, Waseda University

Koji Nakam ϵ Tsukuba Feb-09 Single top τ Top
Project Researcher, University of Tokyo

Satoru Uoz Tsukuba Jul-05 B $^+$, B 0 , B $_s$
Assistant Professor, Kyungpook National University, Korea

Takayuki W Osaka City Jun-09 Search for τ Higgs
Postdoctoral Fellow, Osaka City University

Yoshio Ishi ϵ Tsukuba Sep-05 Search for τ Higgs

Yoshikazu I ϵ Tsukuba Feb-10 Search for τ Higgs
Postdoctoral Fellow, University of Tsukuba

Tomohiro Y Okayama Mar-06 J/ ψ and b-B

Masato Ao ϵ Tsukuba Apr-06 B $_c$ meson B
Postdoctoral Fellow, Fermilab

Ryo Tsuchi ϵ Waseda May-06 Top quark τ Top

Yoshiaki Ku Waseda Dec-06 Search for τ Higgs

Takashi Aki Tsukuba Feb-07 Search for τ Exotics

	≤ 1	Run 2	Total
Det	3	0	3
EWK	8	2	10
QCD	14	1	15
Top	4	7	11
B	5	3	8
Exotics	4	3	7
Higgs	0	6	6
total	38	22	60