



IMPRESSIONS FROM LAST GENERATION

Tevatron Milestones

1983-2011

28 years of Tevatron....



'83

March 18, 1983
Installation of the test of 774 superconducting magnets

'83

July 3, 1983
Tevatron accelerates protons to most compact energy of 812 GeV



The Tevatron
accelerator
system is now
operating at
the highest
energy ever
achieved by
a proton-antiproton
collider.



'83

October 1, 1983
Start of the Tevatron fixed-target program at 400 GeV including the experiment that pioneered silicon detector technology

'85

October 12, 1985
First observation of proton-antiproton collisions by CDF silicon detector at 1.6 TeV

'86

May 1986
Tevatron named one of the Top Ten Engineering Achievements of the Last 100 Years

'88

June 8, 1988
CDF achieves first physics paper of the Tevatron era involving first proton-antiproton collisions at 800 GeV and 1.6 TeV

'89

October 18, 1989
President George Bush presents Helen Edwards, Oak Ridge, Rich Orr and Arlyn Teitel with the National Medal of Technology for their work in building the Tevatron



'92

May 12, 1992
CDF detector observes first proton-antiproton collisions. Tevatron Run I for CDF and D0 detectors with collisions at 1.6 TeV

'93

September 27, 1993
Tevatron's ongoing testing system is named International Historic Mechanical Engineering Landmark by the American Society of Mechanical Engineers

'95

February 2, 1995
Tevatron sets world record for number of high-energy proton-antiproton collisions

'96

November 18, 1996
Observation of anti-hydrogen atoms and exotic charm meson states in antiproton experiments



The Tevatron
accelerator
system is now
operating at
the highest
energy ever
achieved by
a proton-antiproton
collider.

'98

March 5, 1998
Discovery of B-meson, the last of the quark-antiquark pairs known to exist

'99

March 1, 1999
Fixed-target experiment ATLAS observes direct CP violation in the decay of neutral kaons

'99

June 1, 1999
Successful completion of the high injection, which dramatically increased the number of particle collisions in the Tevatron



'05

July 6, 2005
First observation of electron-positron annihilation of antiprotons in the Tevatron Ring

'06

September 20, 2006
Discovery of B-meson, another quark-antiquark pair, 2 billion times per second

'07

June 2007
Discovery of the Cascade anti-baryon, one of five baryons discovered at Tevatron experiments

'00

January 2006
End of the Tevatron fixed-target program, which provided seven to 43 experiments



'08

August 4, 2008
Tevatron experiments start harvesting the stored Higgs boson signal



The Tevatron
accelerator
system is now
operating at
the highest
energy ever
achieved by
a proton-antiproton
collider.



'09

March 3, 2009
World's most accurate measurement of the W boson mass leads to stricter Higgs limits



'09

March 3, 2009
World's most accurate measurement of the W boson mass leads to stricter Higgs limits

'09

March 3, 2009
Discovery of single top quark production

'09

March 3, 2009
Discovery of single top quark production

'10

April 16, 2010
Tevatron achieves a peak luminosity of 4.2 x 10^31 cm^-2 sec^-1



The Tevatron
accelerator
system is now
operating at
the highest
energy ever
achieved by
a proton-antiproton
collider.

'11

March 2, 2011
Tevatron results estimate the 125-126 GeV Higgs boson mass range, leaving a mass between 115-196 GeV

'11

July 20, 2011
CDF and D0 set the first quark mass with the world's first precision of 8.0 percent

'11

Sept. 10, 2011
Tevatron produces first proton-antiproton collisions; experiments have collected about 10 inverse femtobarns of data each; data analysis will continue for several years



Let's look for the
Eggs Boson...



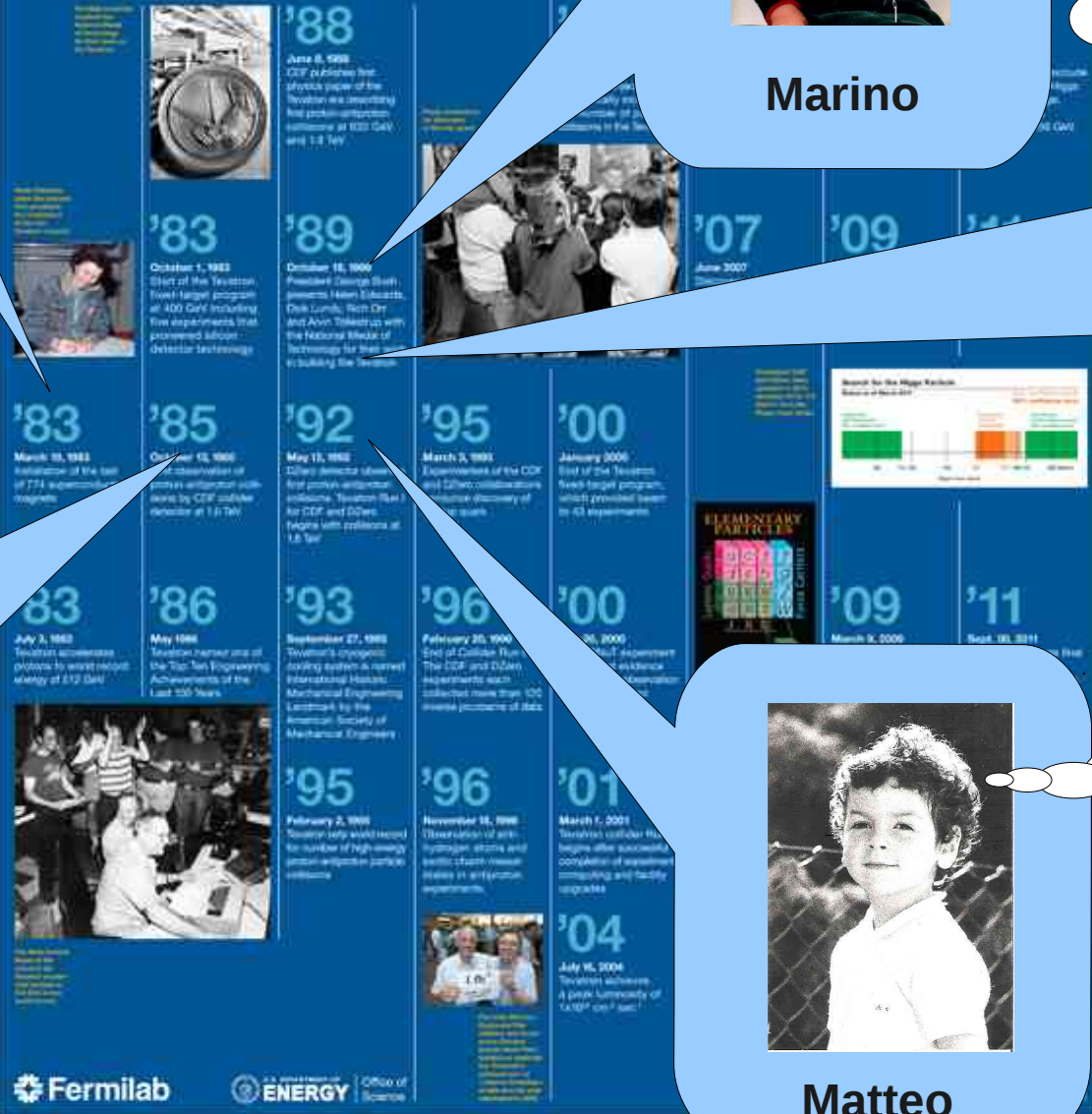
Silvia

I am ready to climb
the mountains
of physics!



Pierluigi

Tevatron Milestones 1983-2011

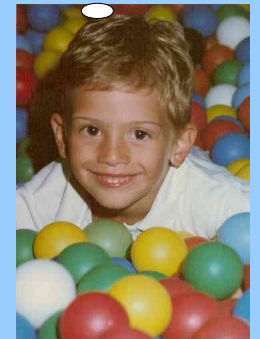


The keys of physics
are in my hands!



Marino

I love all these
colored particles!

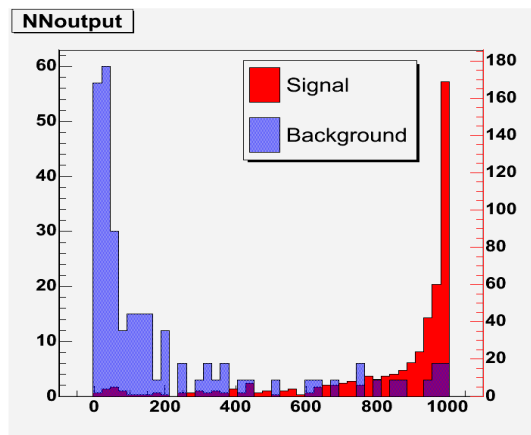


Stefano

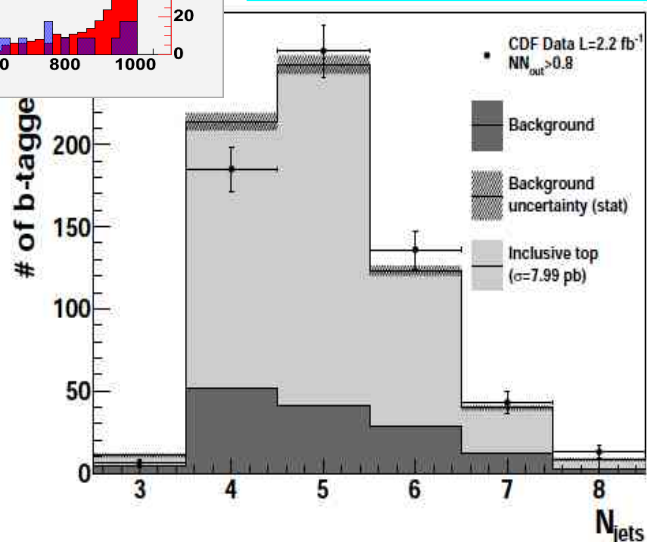
ZZ ... the 4
leptons as the 4
musketeers!



Matteo

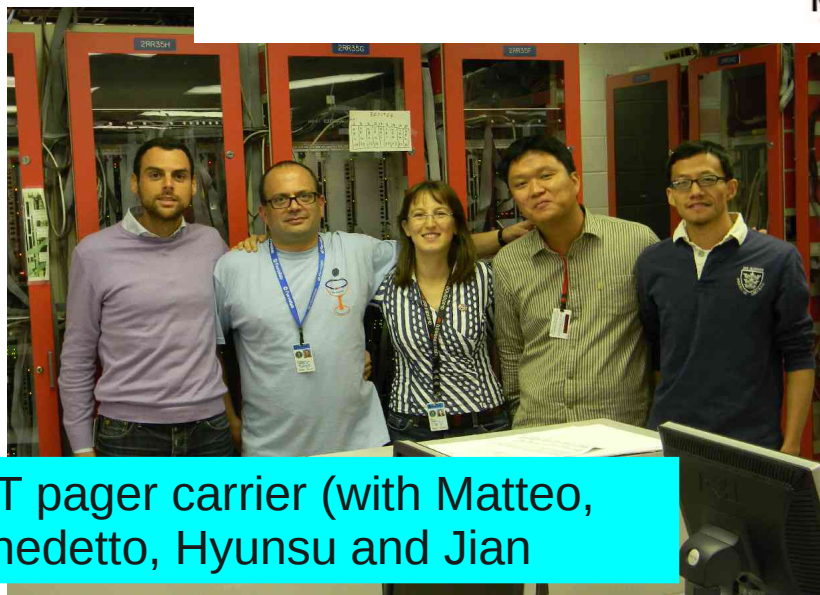


**tt pair cross section
in tau+jets and
met+jets channels
(with Gabriele)**

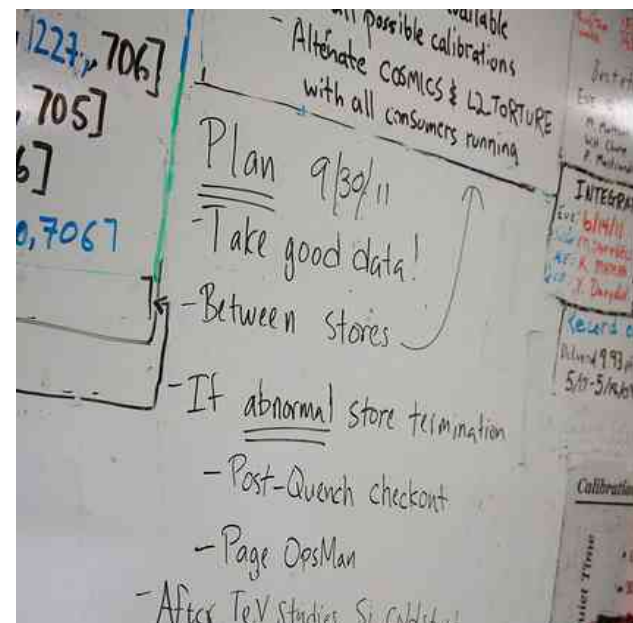


**The Gigafitter board :
upgrade of CDF online
tracking system.**

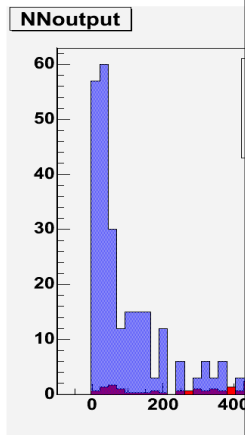
***Thanks to Marco,
Marino and the
Officina Elettronica!***



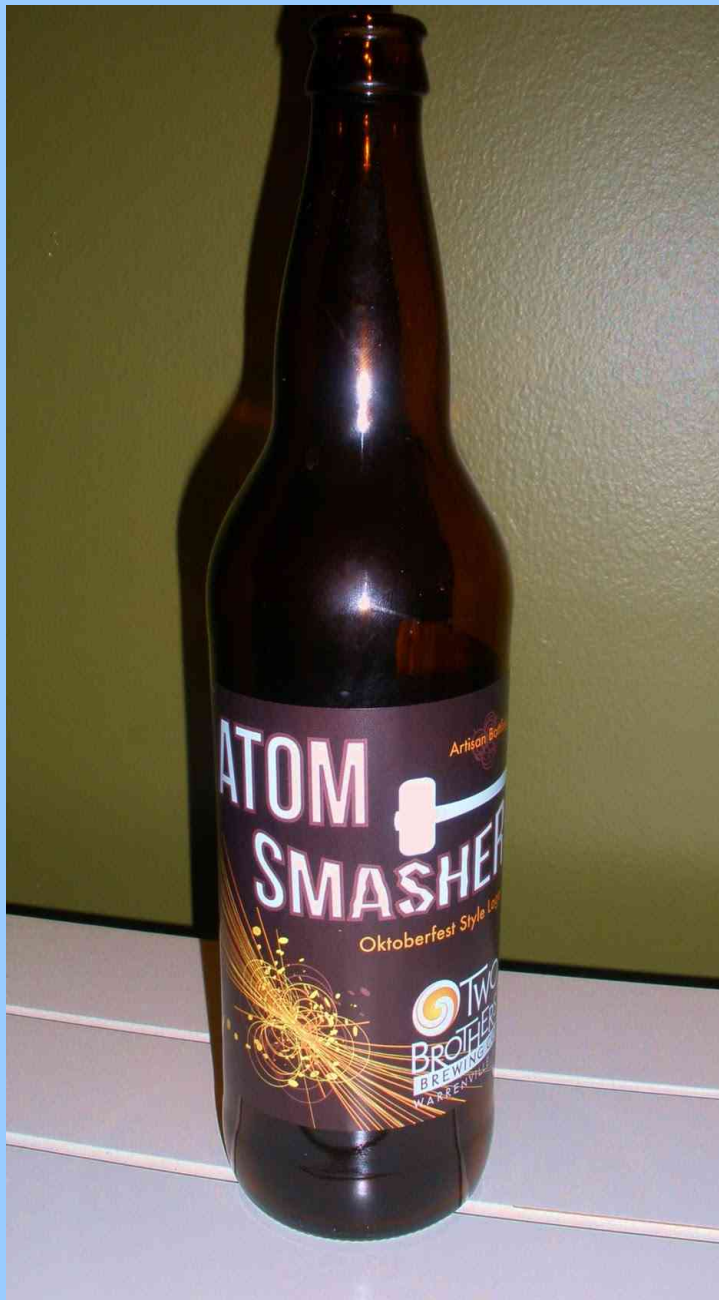
**SVT pager carrier (with Matteo,
Benedetto, Hyunsu and Jian)**



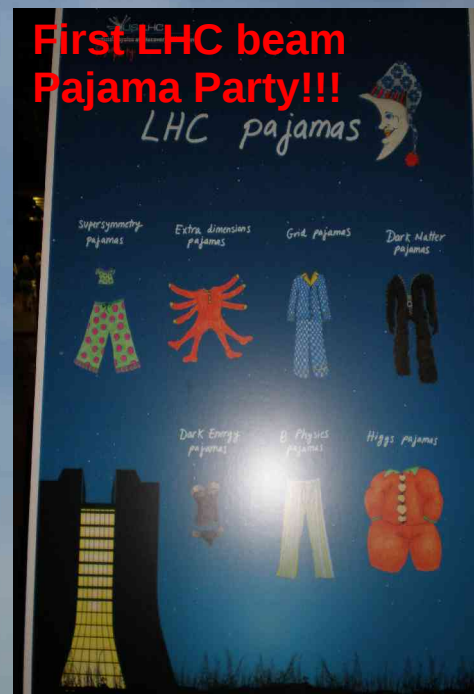
**CDF operation manager (with all CDF
operations group: thanks!!)**



SVT pager
Benedetto



Started as a Summer Student in '08...



*** Break *** segmentation violation
Generating stack trace...

```
0xf7cc0759 in TObjArray::UncheckedAt(int) const + 0x13 from 0xf6689a7f in  
TGenpBlock::Particle(int) at  
asfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-kijaròoiwhef-  
ks-kasfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-  
kijaròoiwhef-ks-  
kasfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-kijaròoiwhef-  
ks-kasfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-  
kijaròoiwhef-ks-  
kasfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-kijaròoiwhef-  
ks-kasfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-  
kijaròoiwhef-ks-  
kasfdòakjfdkjaskfnlfnas.dnfkjdnskand.nds,anfjdn.s.kzjcnx.jkvznxc.jvzcbx.kjvb-kijaròoiwhef-  
ks-k
```

...it has been hard at the
beginning, but after one year....

...thanks to CDF group...

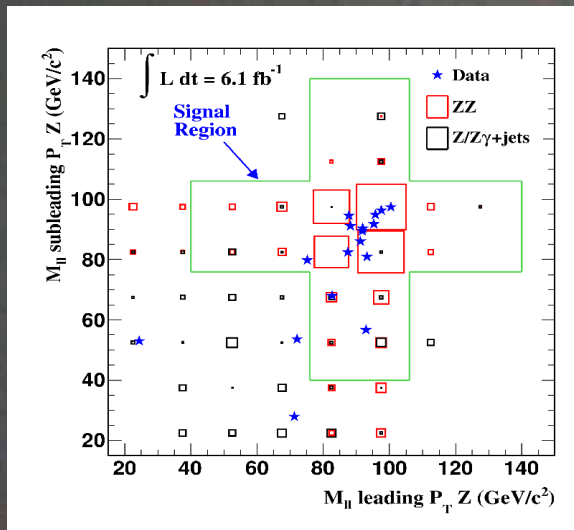
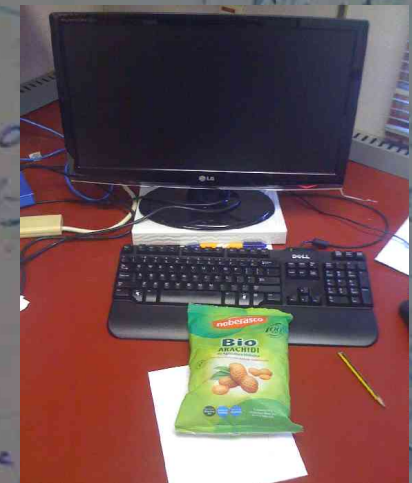
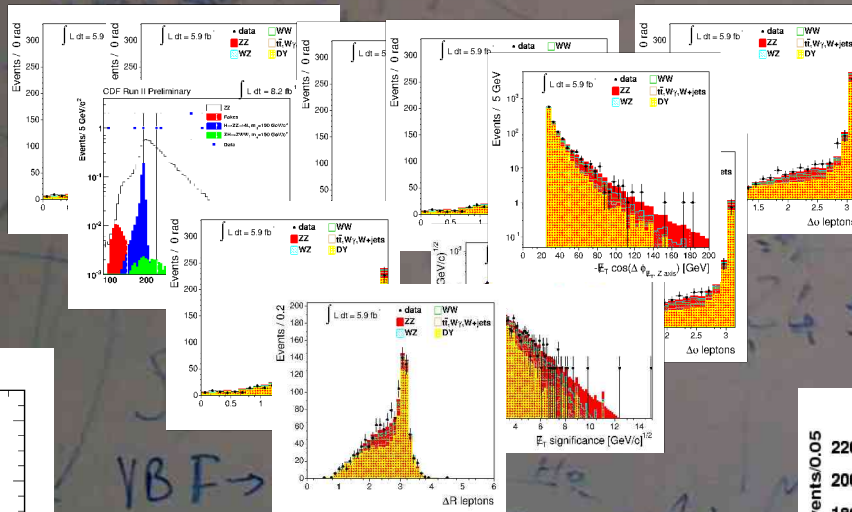


...I got my Master Degree!

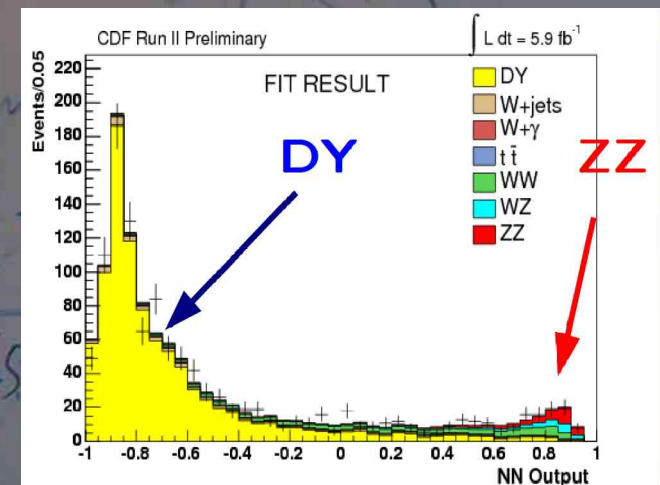
I'm spending my PhD
working on Diboson physics



With the help of some food
and many many plots...



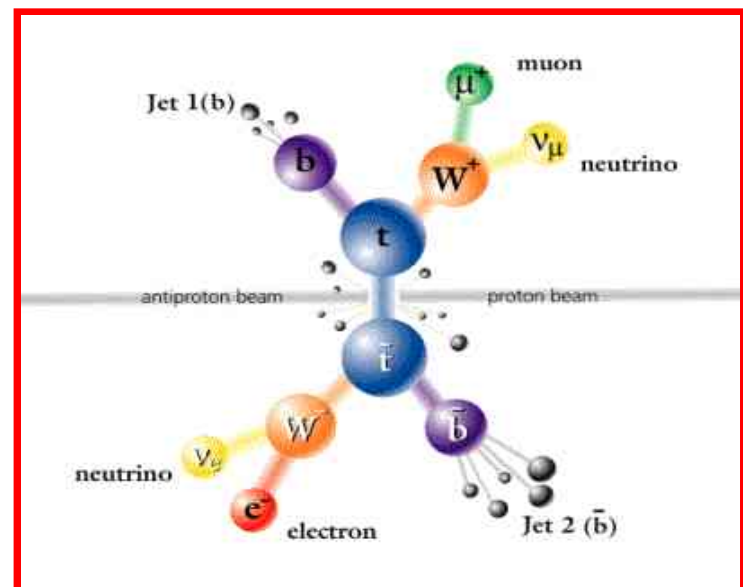
Measured ZZ
production cross
section in leptonic
decay channel
(just submitted to Review)



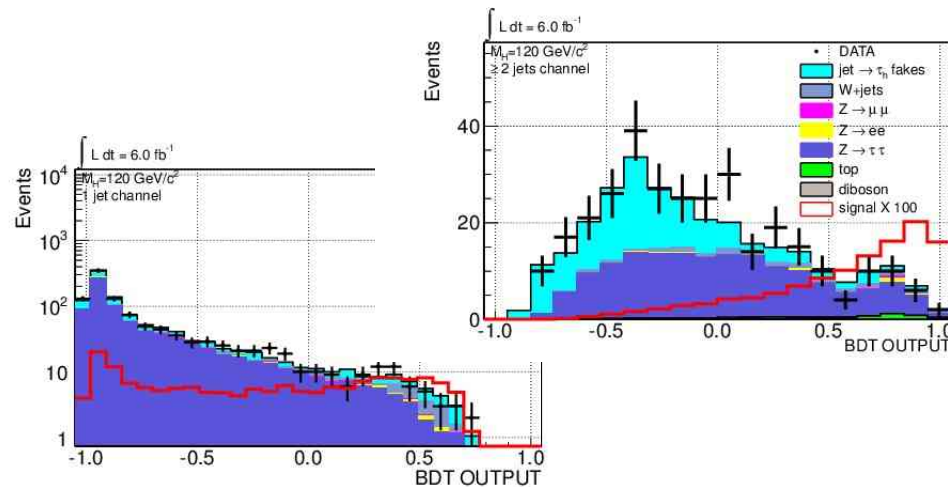
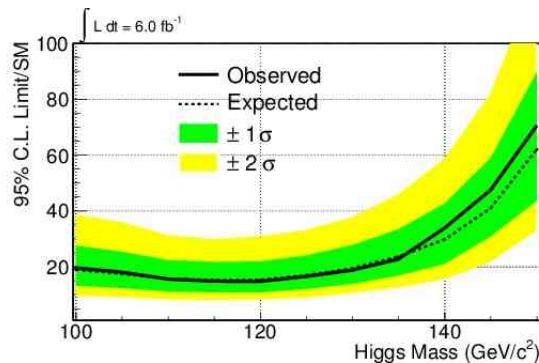
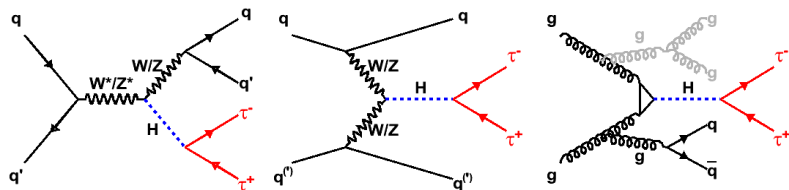
My first days at Fermilab as a Summer Student, in 2005



From gastronomy, ethology, static studies,
up to Top Quark Physics



My Ph.D. Activity, in **2007-2010**: Higgs boson search in the di-tau decay channel



Results are going to be submitted to PRL

2011: working with Padova group in the measurement of $Z \rightarrow b\bar{b}$ cross section and in the $H \rightarrow b\bar{b}$ search

And a very new generation of young physicists is ready to help!
The future is in his hands!

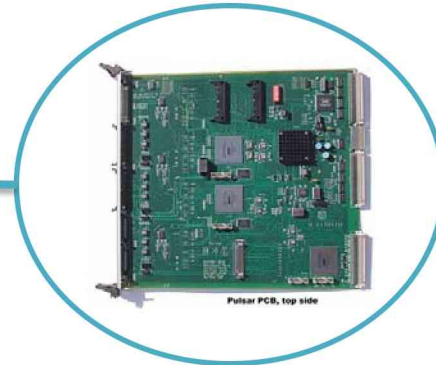


Performance Study of a GPU in Real-Time Applications for HEP Experiments

Trigger level 2 of CDF



PULSAR Board



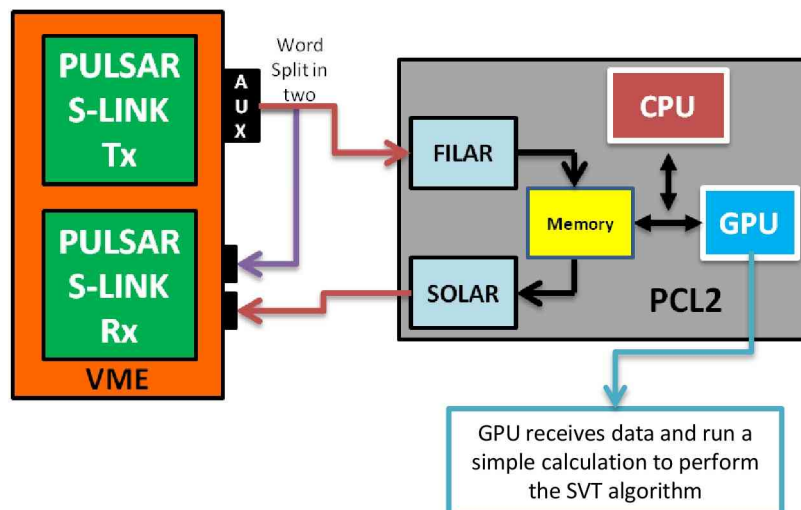
Can commercial device
replace dedicate hardware
to develop online selections in a
low-latency environment?

Commercial GPU
(Graphics Processing Unit)



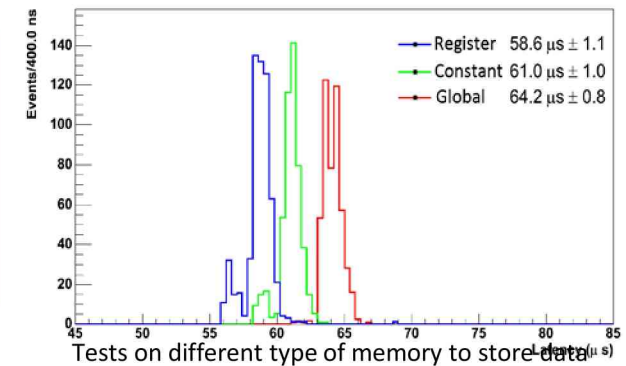
Preliminary studies: Latency Tests and Microbenchmarking on GPU

For very low latency (μs) it's necessary have a high precision Time-Detection setup



We have investigated:

- GPU structure and workability
- Type of Memories
- Communication PC-GPU
- Data-access



This technology is promising!
Works are still in progress



A great
work experience
in CDF ...

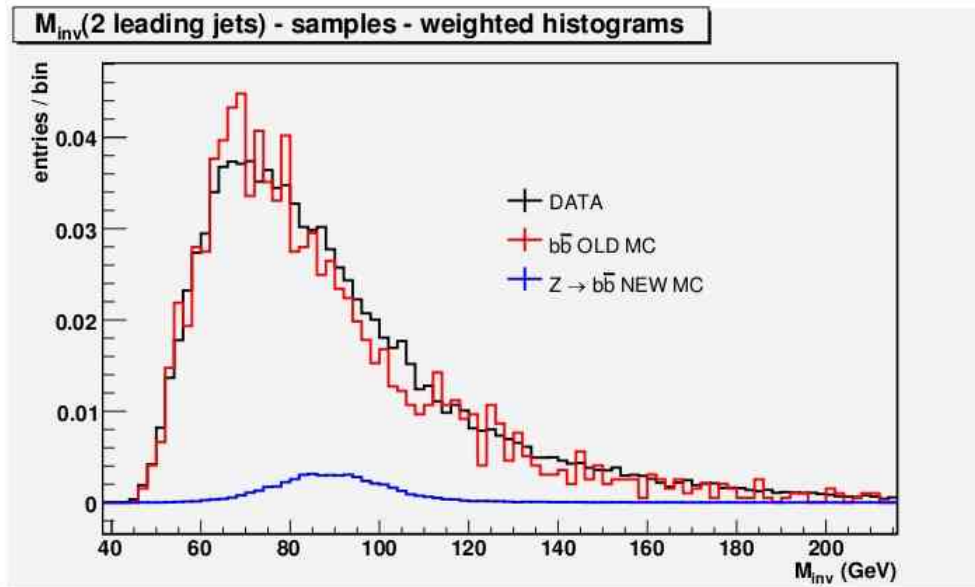
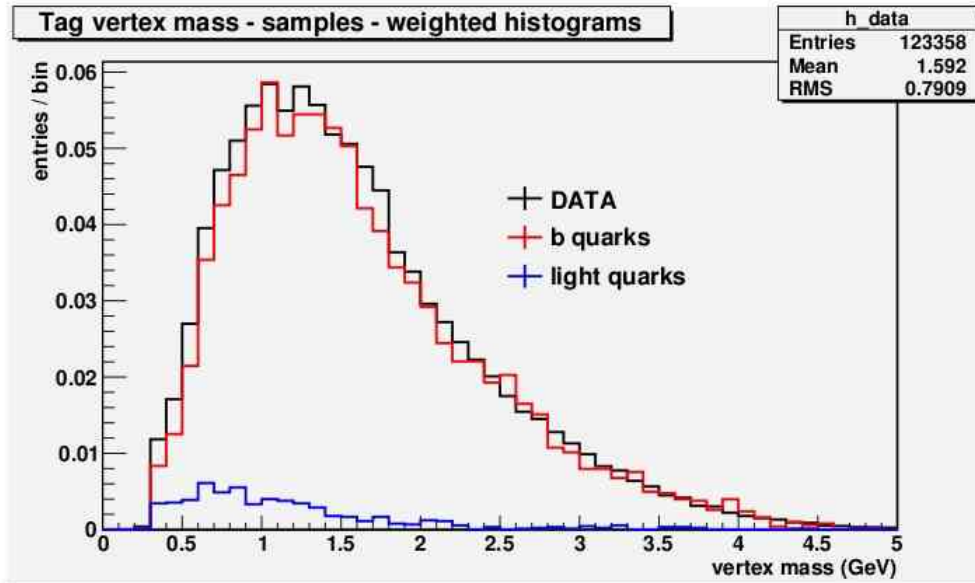


... And something else



FNAL summer school 2011 — data analysis: $Z \rightarrow b\bar{b}$

Looking for the Z resonance selecting back-to-back central b -tagged jets using the new DIJET_BTAG trigger



Sample composition

$b\bar{b}$	$94.1 \pm 2.0 \%$
$q\bar{q}$	$5.9 \pm 1.4 \%$
χ^2 / ndf	36.8 / 48
Prob	0.88

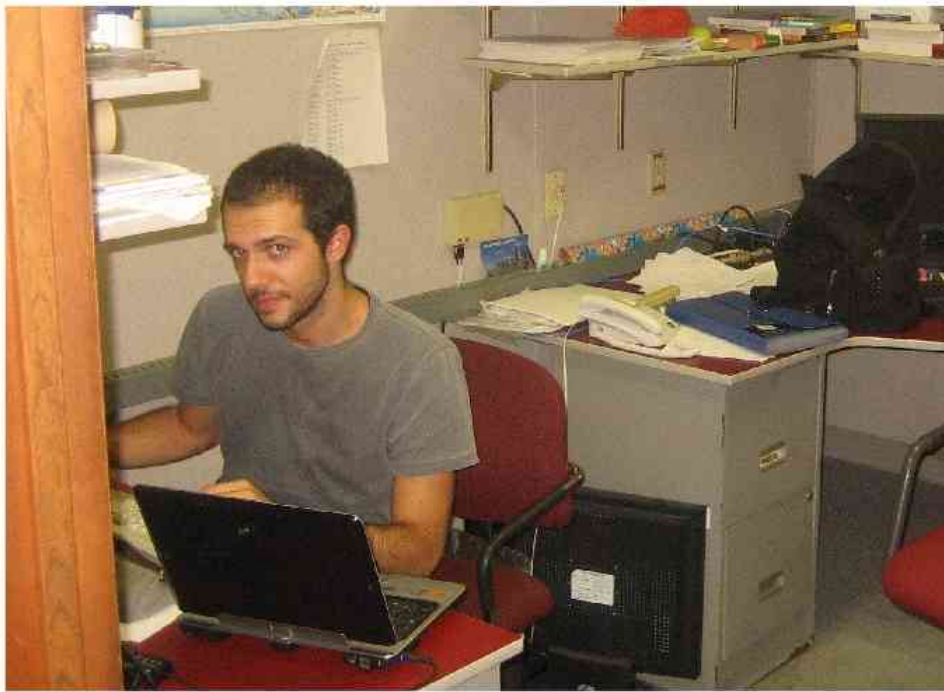
\Rightarrow background \sim QCD $b\bar{b}$

M_{inv} : fitting MC vs DATA

QCD $b\bar{b}$	$95.1 \pm 3.0 \%$
$Z \rightarrow b\bar{b}$	$4.9 \pm 2.4 \%$
χ^2 / ndf	78.4 / 74
Prob	0.34

First results are ENCOURAGING

... work in progress ...

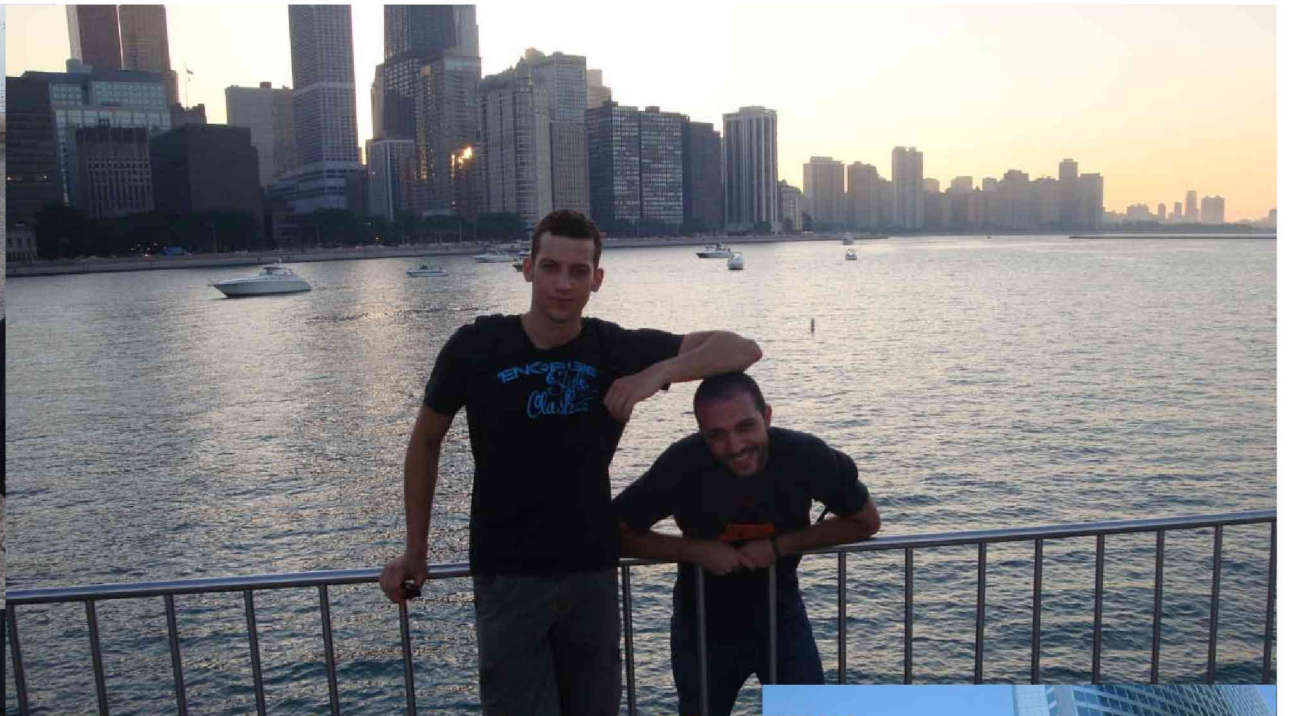
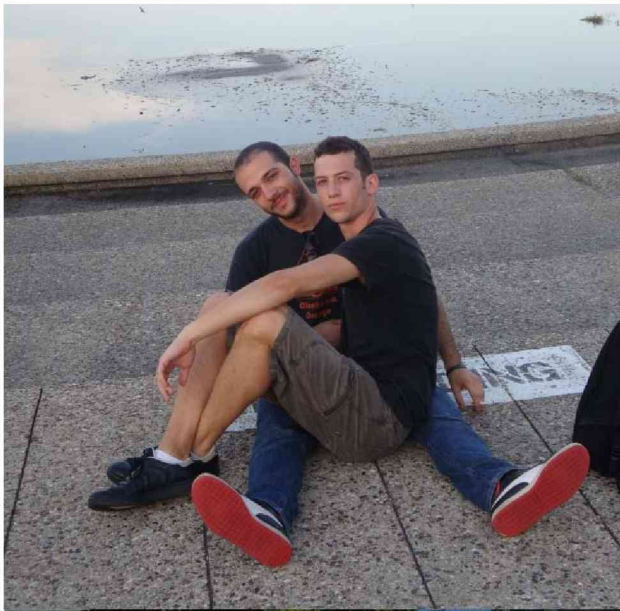


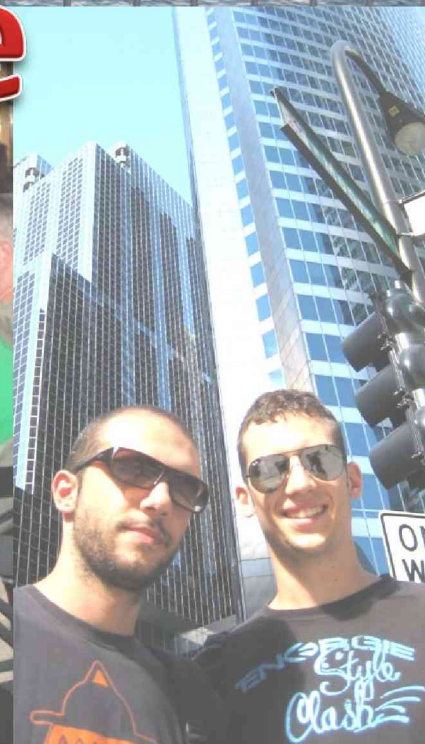
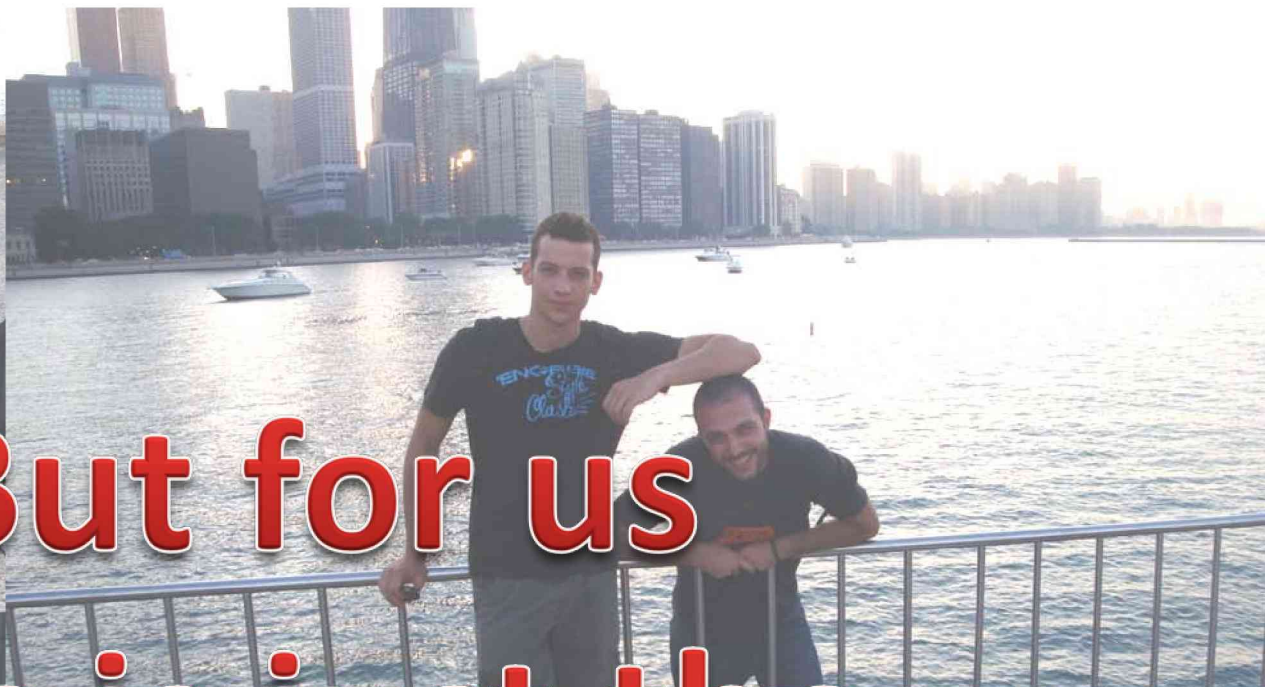
Besides numbers...

This experience at CDF gave me the chance to work in a wonderful research group...

... and in a very interesting environment







But for us
this is just the
beginning...

grazie