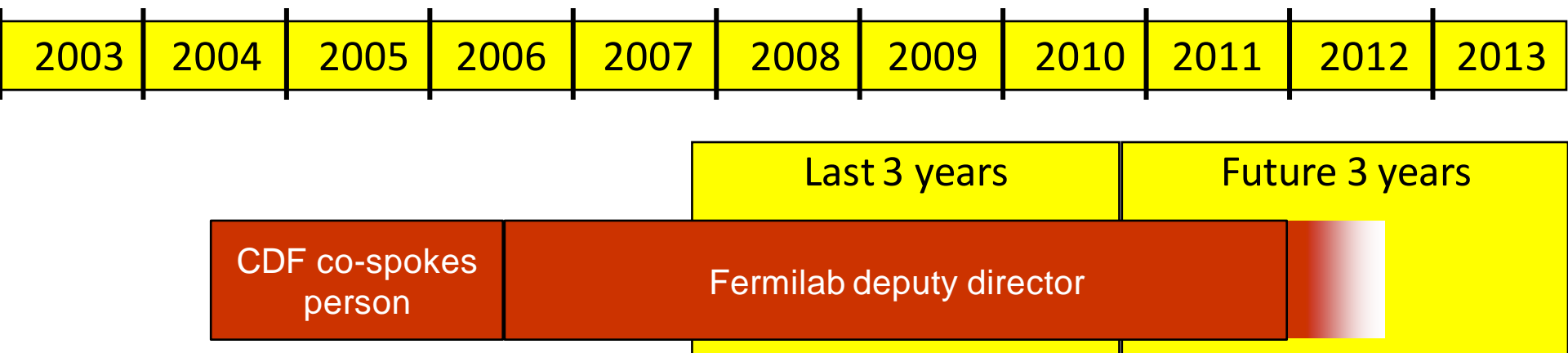


Accomplishments in the last 3 years
(2008 – 2010)

Plan for the next 3 years
(2011 – 2013)

Young-Kee Kim
University of Chicago NSF Site Visit
Nov. 2-3, 2010

YKK at U.Chicago (Jan. 2003 –)



“Research” only exists thanks to
a talented group of students and postdocs, and
Enormous/generous help from my colleagues at U.Chicago, Fermilab, and
other institutions

Research at Nutshell

CDF

ATLAS

Accelerator physics

How to handle?

- Weekly group meeting (with and without me)
 - Wednesday evening with pizza
- Weekends (Saturday morning and Sunday morning)
 - one-on-one or two-on-one meeting in person, by phone, or by skype
- Assign each student a supervisor who can help daily issues & research
 - either postdoc or scientist/faculty
- Email and phone calls
- Utilize Limo shuttle service (daily)
 - 7:15 am at UChicago → 8:30 am at Fermilab
 - 6:00 pm at Fermilab → 7:15 pm at UChicago
 - Frequent users
 - Faculty: YKK, Craig Hogan, Rich Kron, (Florencia Canelli)
 - Students:
 - Jian Tang, Ho Ling Li, Aniket Joglekar, Robert Lanza,
 - all undergraduate students
 - many Astrophysics department students



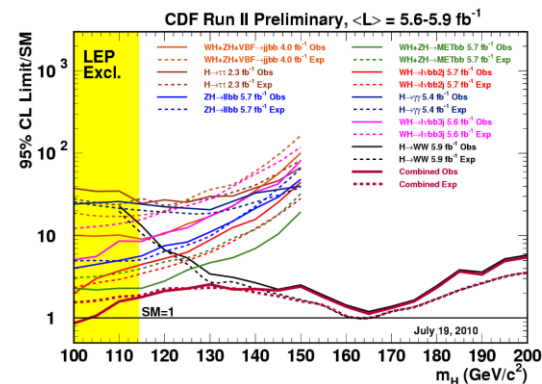
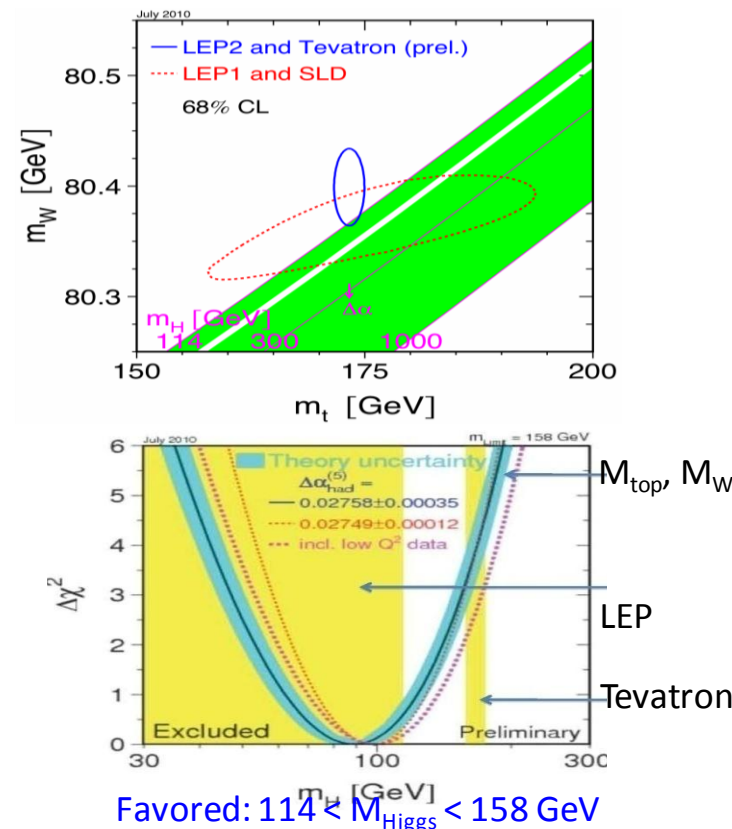
Research Focus

- Particle Physics

- Electroweak Symmetry Breaking
 - Probing Higgs indirectly
 - (M_W measurements: Run I)
 - M_{top} in lepton +jets, dilepton
 - Direct Higgs searches
 - Preparation for ZH/WH (via ZZ/WZ)
 - τ 's (ZH/WH/WW \rightarrow H, $gg \rightarrow$ H, $H \rightarrow$ WW)
 - ttH
- Other Electroweak Physics
 - Top width, top – antitop mass difference
 - ZZ/WZ
- Beyond the Standard Model
 - $D \rightarrow \mu\mu$ searches

- Accelerator Physics

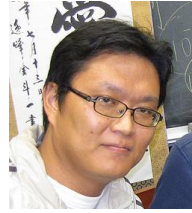
- hadron colliders (Tevatron, crystal collimation)
- laser driven accelerator (staging experiment)
- muon collider (cooling expts. and simulation)



Current group members

- Postdoc

- Hyunsu Lee



- Graduate students

- Satomi Shiraishi
- Wesley Ketchum
- Jian Tang
- Ho Ling Li
- Robert Lanza
- Tim Zolkin

GAANN
Fellowship

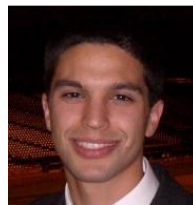
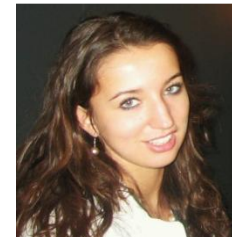


co supervisor: Wim Leemans, Vadim Rusu, Hyunsu Lee, Monica Dunford, Aaron Chou, Yagmur Torun

- (Aniket Joglekar - Chandrasekhar Fellowship: [Phys335 w/Vadim Rusu - building a Mu2e tracker prototype](#))

- Undergraduate students

- Last Feremenga
- Summer Blot
- Anastasia Belozertsev
- *Krystal Sanchez (REU)
- *Michael Zakraisek (REU)
- *Richard Ruiz
- (* ended August 2010)



Postdoctoral Fellows (2008 – 2010)

Kohei Yorita(Fermi Fellow)
Apr. 2005 – Oct. 2008
Currently faculty at Waseda
University in Japan

- CDF
SM Higgs (τ), Top Mass
Detector Operations: SVT
- ATLAS
Trigger Upgrade (Fast Tracker)

Hyun Su Lee
Jun. 2007 – Present

- CDF
Top Mass, Top Width, $t\bar{t}$ -bar mass difference
Detector Operations: L2 Cal Upgrade, SVT

Graduate Students (2008 – 2010)

Wojtek Fedorko (2004 – 2008) Currently CERN Fellow	Thesis analysis: Top mass (Template) at CDF Hardware: Level-2 Upgrade
Jian Tang (4 th year)	Thesis analysis: Top width, Top mass at CDF Hardware: SVT trigger at CDF, FTK simulation at ATLAS
Wesley Ketchum (4 th year)	Thesis analysis: ZZ/WZ and ZH/WH at CDF Hardware: SCRF cavity breakdown detection board Level 2 trigger at CDF, Trigger “GPU”
Satomi Shiraishi (4 th year)	Thesis: Staging experiment for Laser-driven accelerator Other work: publication of the top width at CDF (1 fb^{-1}) Tevatron beam dynamics, Crystal collimation
Ho Ling Li (2 nd year)	Analysis: electron identification, efficiency measurements Hardware: trigger “GPU”
Robert Lanza (2 nd year)	Prototyping Holometer experiment
Tim Zolkin (1 st year)	Muon cooling: MuCool/MICE experiment 6D cooling simulation

Undergraduate Students (2008 – 2010)

Name	Period	Topic
Zaid Alawi	2007 – 2009	$ZZ \rightarrow ee/\mu\mu + bb$ at CDF
Richard Ruiz	2007 - 2010	Muon Collider physics LHC Remote Control Operation
Mattias Jamison-Koenig	2008 – 2009	Higgs at CDF
Jon Poage	2008 – 2009	$Z + \gamma$ at CDF
Junghyun Lee	2008	$Z + \gamma$ at CDF
Derek Thompson	2008 – 2009	W Mass at CDF: electron energy calibration
Jake Whitaker	2009	$Z + \gamma$ at CDF
Michael Zakraisek	2009 REU 2010 REU	$(Z \rightarrow ee/\mu\mu) + \text{lepton}$ at CDF $ttH \rightarrow WW(l+jets) + 4 b\text{'s}$ at CDF
Last Feremenga	Summer 2010 – present	Muon Cooling / Muon Collider physics
Summer Blot	Summer 2010 – present	Muon Cooling
Anastasia Belozertsev	Summer 2010 – present	Muon Cooling
Krystal Sanchez	2010 REU	Muon Collider physics: $\mu\mu \rightarrow WW$

Publications (2008 – 2010)

1	<i>“First Simultaneous Measurement of the Top Quark Mass in the Lepton + Jets and Dilepton Channels at CDF “ (1.9 fb⁻¹), Phys. Rev. D79, 092005 (2009)</i>
2	<i>“Direct Bound on the Total Decay Width of the Top Quark at the Tevatron” (0.96 fb⁻¹) Phys. Rev. Lett. 102, 042001 (2009)</i>
3	<i>“Measurement of the Top Quark Mass in the Dilepton Channel Using m_{T2} at CDF“ (3.4 fb⁻¹), Phys. Rev. D81, 031102 (2010)</i>
4	<i>“A Direct Top-Quark Width Measurement from Lepton + Jets Events at CDF II” (4.3 fb⁻¹) Submitted to PRL, arXiv: 1008.3891 (2010)</i>
5	<i>“Updated Search for the Flavor-Changing Neutral-Current Decay D⁰ → μ⁺ μ⁻” (0.4 fb⁻¹) Accepted by PRD, arXiv:1008.5077 (2010)</i>
6	<i>“Measurement of the mass difference between top quark and anti-top quark at CDF” (5.6 fb⁻¹), PRL draft written – being reviewed by CDF (2010)</i>
7	<i>“Simultaneous Measurement of the Top Quark Mass Measurement in the Lepton+Jets and Dilepton Channels” (5.6 fb⁻¹), PRL Draft in preparation(2010)</i>
8	<i>“Search for Diboson Production in MET + bbar channel” (WZ/ZZ → missing energy + bb) ” (5.5 fb⁻¹), PRL Draft in preparation (2010)</i>
9	<i>“Search for Standard Model Higgs Boson Using Two Tau Leptons Plus Two Jets Events in 1.96 TeV p anti-p Collisions” (2fb⁻¹), Draft written</i>

Top Quark Physics (2008 – 2010)

Top Mass

Wojtek Fedorko (0.3 \rightarrow 1.9 fb⁻¹)*
Hyun-Su Lee (1.9 \rightarrow 3.4 \rightarrow 5.6 fb⁻¹)

Top Width

Satomi Shiraishi (0.96 fb⁻¹)*
Jian Tang (0.96 \rightarrow 4.3 fb⁻¹)

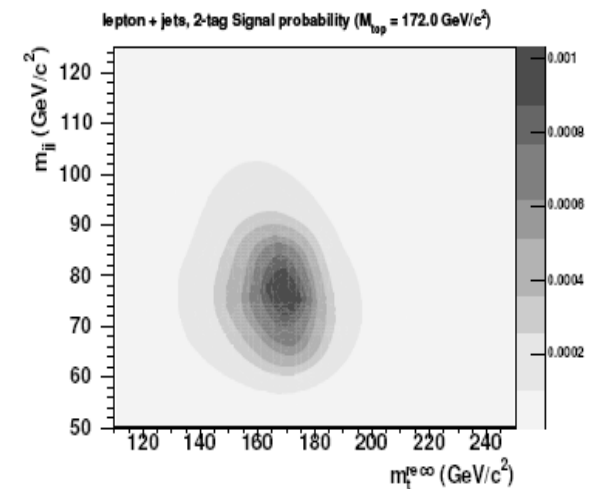
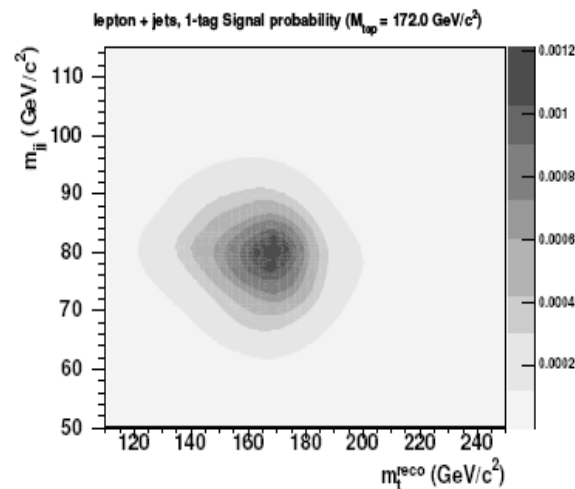
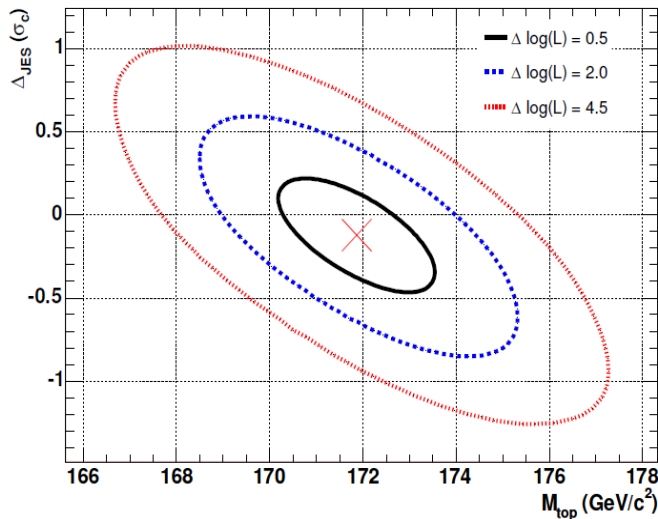
$\Delta m_{\text{top}} = m_{\text{top}} - m_{\text{anti-top}}$
(top-antitop mass difference)

Hyun-Su Lee (5.6 fb⁻¹)

*Collaborating with Shochet's group
(Brubaker, Adelman)

M_{top} (l+jets + dilepton, 1.9 fb^{-1})

Wojtek Fedorko (Ph.D. thesis: 2008)



Fully 2D probability density function

$$M_{\text{top}} = 173.0 \pm 0.7(\text{stat}) \pm 0.6(\text{JES}) \pm 0.9(\text{syst}) \text{ GeV}/c^2$$

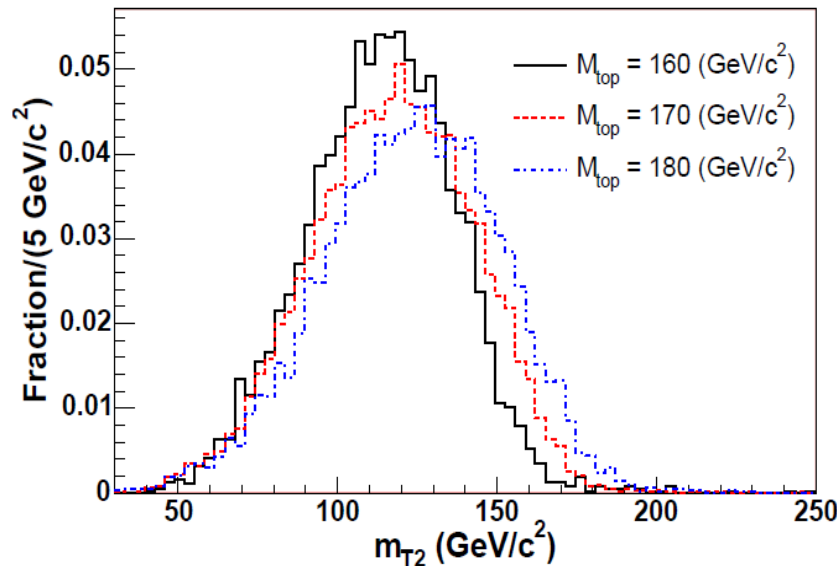
First simultaneous measurement of M_{top}
using lepton+jets and dilepton channel

Phys. Rev. D 79 112007 (2009)

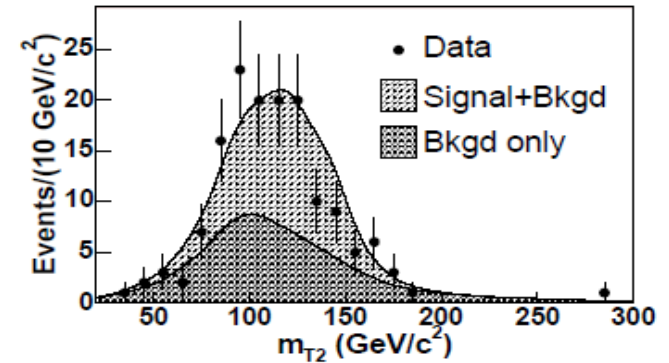
Authors: *J. Adelman, *E. Brubaker, S. Carron, T. Farooque, *W. Fedorko, *Y.K. Kim,
*H.S. Lee, *M. Shochet, P. Sinervo, G. Velez (*: U.Chicago)

M_{top} using m_{T2} (dilepton; 3.4 fb^{-1})

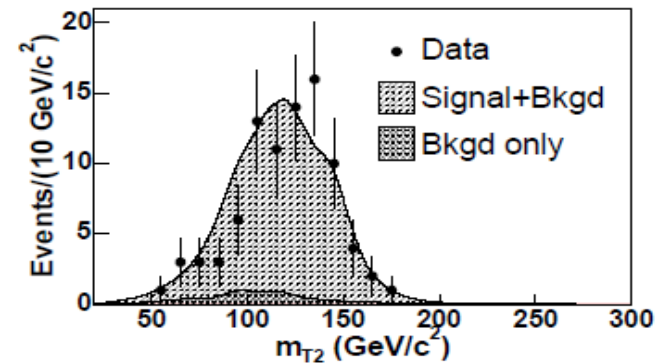
Hyunsu Lee, Jian Tang



- $m_{T2} = \cancel{E}_T$ in 2 missing particle system
 - Introduced for the mass determination of new particle at LHC
- First application to data



non-tagged m_{T2}



tagged m_{T2}

$$M_{\text{top}} = 168.0^{+4.8}_{-4.0} \text{ (stat)} \pm 2.9 \text{ (syst)} \text{ GeV}/c^2$$

Phys. Rev. D 81 031102 (2010)

Authors: *Hyunsu Lee, *Jian Tang, *Young-Kee Kim

M_{top} (l+jets + dilepton; 5.6 fb⁻¹)

- L+Jets (3D templates)
 - Introducing 3rd observable (2nd best reconstructed top quark mass ($m_t^{\text{reco}(2)}$))

$$M_{\text{top}} = 172.2 \pm 1.5 \text{ GeV}/c^2$$

- Dilepton (2D templates)

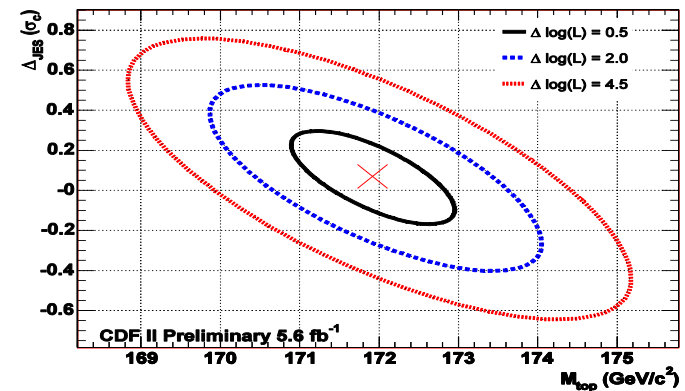
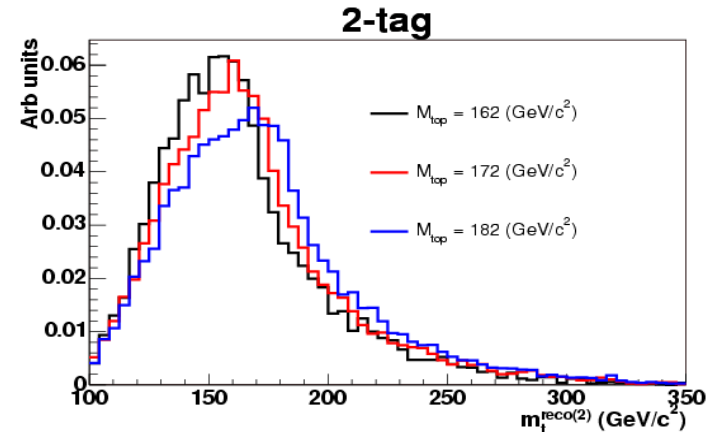
- m_t^{recon} and m_{T2}

$$M_{\text{top}} = 170.3 \pm 3.7 \text{ GeV}/c^2$$

- Simultaneous fit

$$M_{\text{top}} = 172.1 \pm 1.1(\text{stat+JES}) \pm 0.9(\text{syst}) = 172.1 \pm 1.4 \text{ GeV}/c^2$$

Hyunsu Lee, Jian Tang



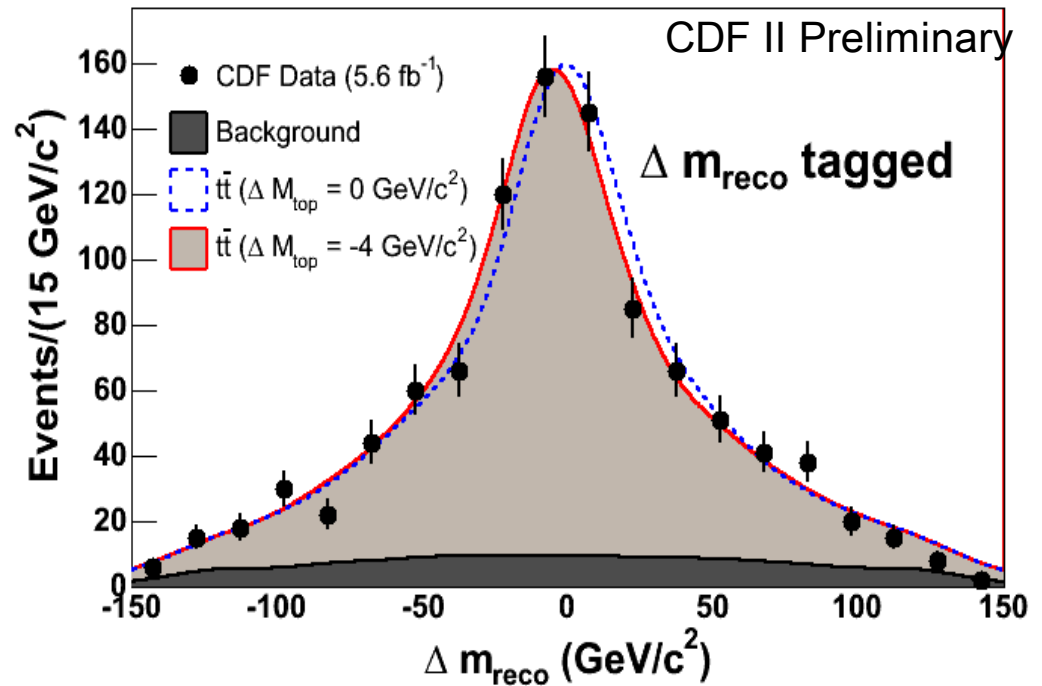
Publication: being reviewed by godparents

Authors: *Hyunsu Lee, *Jian Tang, *Young-Kee Klum

$$\Delta M_{\text{top}} = m_{\text{top}} - m_{\text{anti-top}} \quad (5.6 \text{ fb}^{-1})$$

Hyunsu Lee

Use reconstructed mass difference (Δm_{reco})



$$\Delta M_{\text{top}} = -3.3 \pm 1.4 \text{ (stat)} \pm 1.0 \text{ (syst)} = -3.3 \pm 1.7 \text{ GeV/c}^2$$

$\sim 2\sigma$ deviation from Standard Model

Publication: Draft written. Being reviewed by Godparents

Authors: *Hyunsu Lee, *Young-Kee Kim

Top Width

- SM at NLO Prediction

- 1.3 GeV at $m_{\text{top}} = 172.5$ GeV

- Decay before hadronization is assumed for all top analyses

- CDF analysis

- 0.96 fb⁻¹: $\Gamma_{\text{top}} < 13.1$ GeV @95% CL

- PRL 102, 042001 (2009)

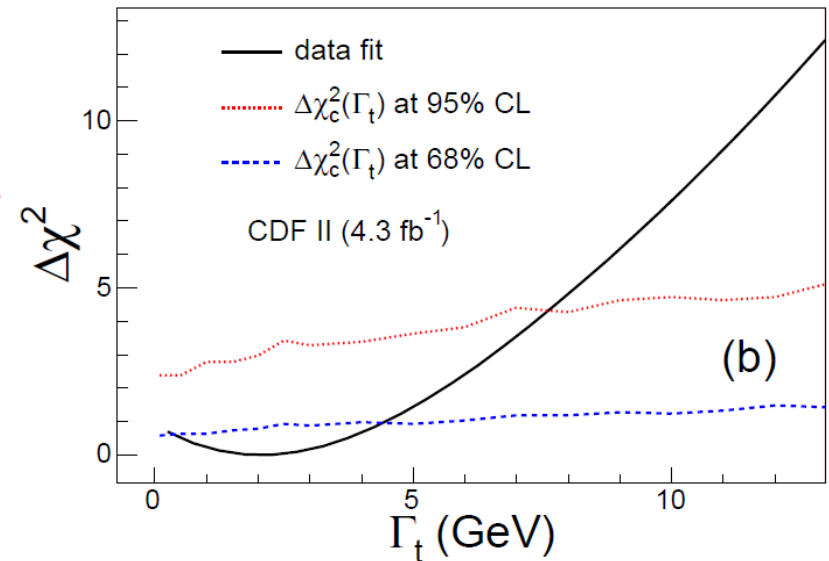
- 4.3 fb⁻¹ analysis

- $\Gamma_{\text{top}} < 7.6$ GeV @95% CL

- $0.3 < \Gamma_{\text{top}} < 4.4$ GeV @68% CL

0.96 fb⁻¹: Satomi Shiraishi
(undergrad. senior thesis)

4.3 fb⁻¹: Jian Tang, Hyunsu Lee



Publication: 0.96 fb⁻¹: PRL 102, 042001 (2009)

Authors: *Satomi Shiraishi, * Erik Brubaker, *Jared Adelman, *YKK

4.3 fb⁻¹: submitted to PRL (arXiv:1008.3891v1)

Authors: *Jian Tang, *Hyunsu Lee, *YKK

Standard Model Higgs Searches

ttH

Michael Zakrajsek
Wes Ketchum
Hyunsu Lee

ZH/WH $\rightarrow \cancel{E}_T + bb$
ZH $\rightarrow \ell^+\ell^- + bb$

Wesley Ketchum

taus:

ZH / WH
WW $\rightarrow H$
gg $\rightarrow H$
H $\rightarrow WW$

Kohei Yorita

ZZ/WZ $\rightarrow \cancel{E}_T + 2 \text{ jets}$
ZZ/ZW $\rightarrow \ell^+\ell^- + 2 \text{ jets}$

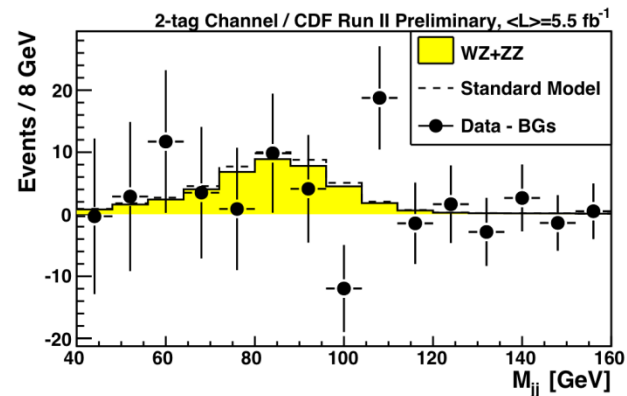
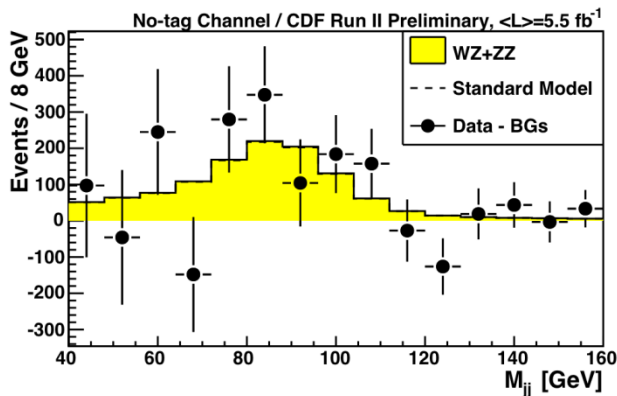
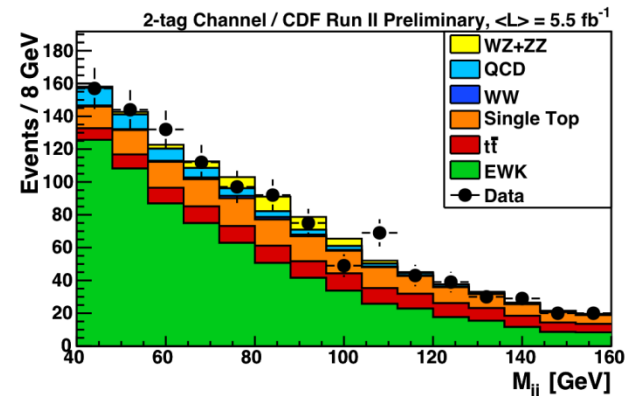
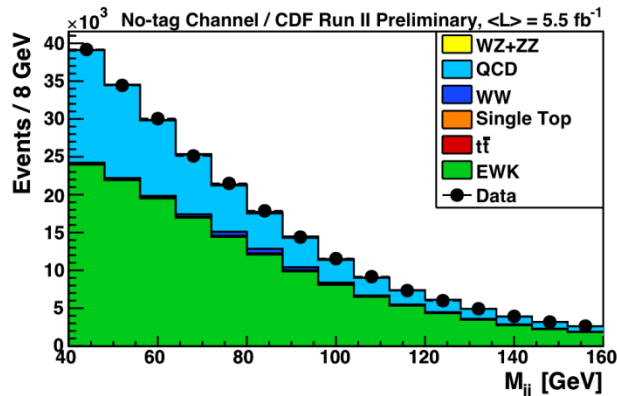
Wesley Ketchum
Zaid Alawi

$\ell^+\ell^-$ Acceptance improvements
Quark-gluon separation

Wesley Ketchum

$WZ/ZZ \rightarrow \cancel{E}_T + bb$ towards $WH/ZH \rightarrow \cancel{E}_T + bb$

- Developed **new neural network b-tagger** Wes Ketchum
- Set limit $\sigma_{WZ/ZZ} < 13 \text{ pb @95\% CL}$



Publication: paper draft written, GP being formed

Authors: John freeman, *Wes Ketchum, Stephen Poprocki, Sasha Pronko, Vadim Rusu, Peter Wittich

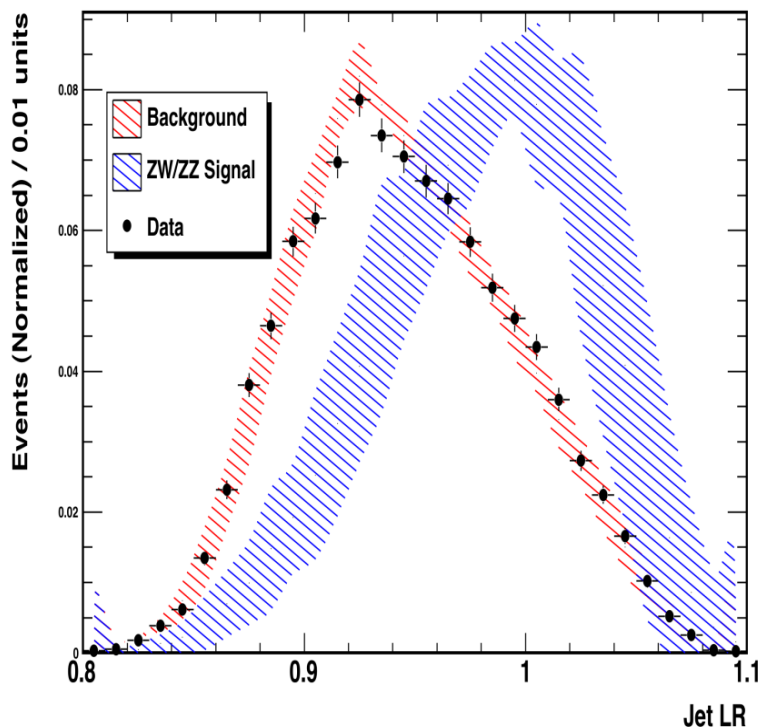
ZW/ZZ $\rightarrow l^+l^- + qq$ towards ZH $\rightarrow l^+l^- + bb$

- WZ/ZZ not yet observed in this channel
- New quark / gluon discriminant jet likelihood ratio developed

Wes Ketchum

Likelihood Ratio of 2nd Jet

CDF Run II Preliminary (4.8 fb⁻¹)



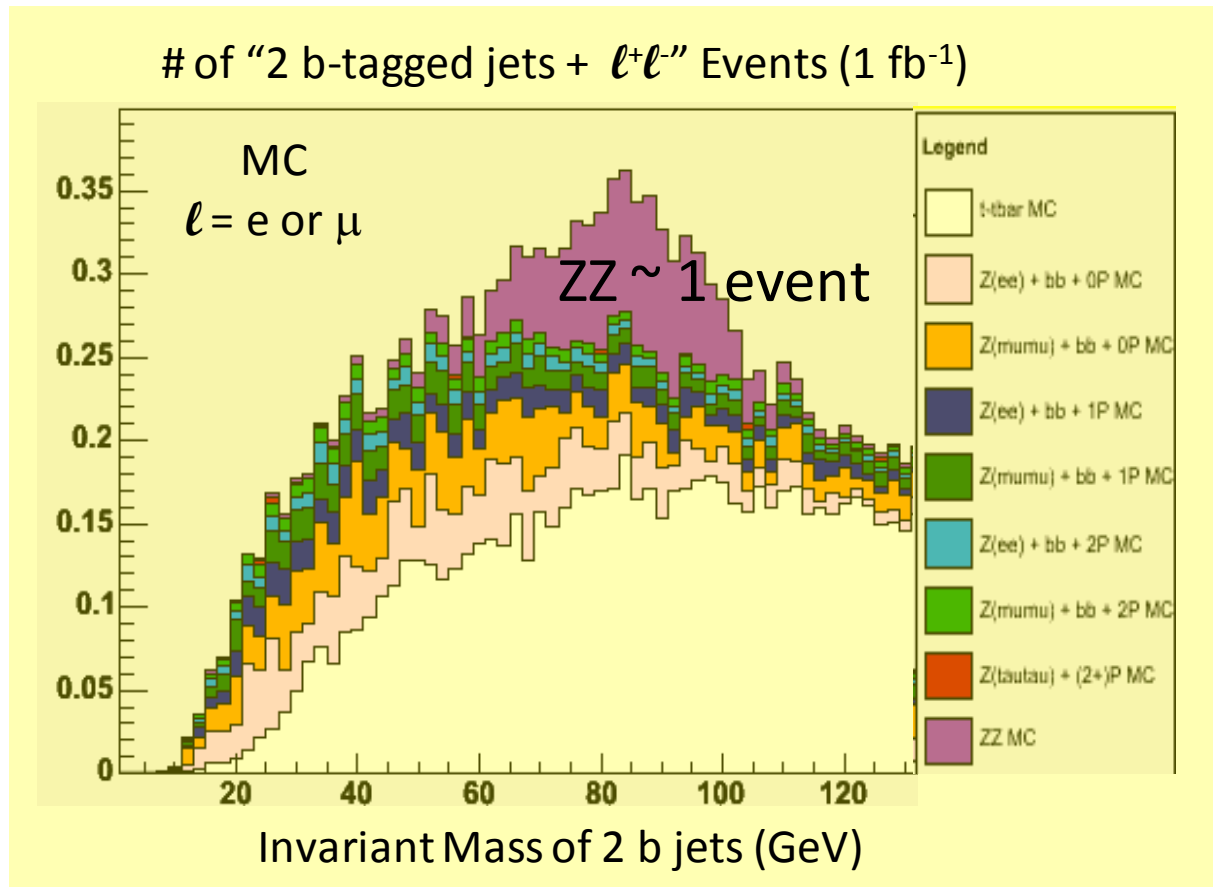
CDF Run II Preliminary (4.8 fb⁻¹)

	Observed (Fitted) Events	Expected Events
WZ/ZZ	86 ± 108	202
Background	13600 ± 840	13540

- Blessed. In process of optimizing the analysis with ~6 fb⁻¹
- Authors: *Zaid Aalawi, *Wesley Ketchum, Vadim Rusu, *Young-Kee Kim

$ZZ \rightarrow \ell^+\ell^- + bb$ towards $ZH \rightarrow \ell^+\ell^- + bb$

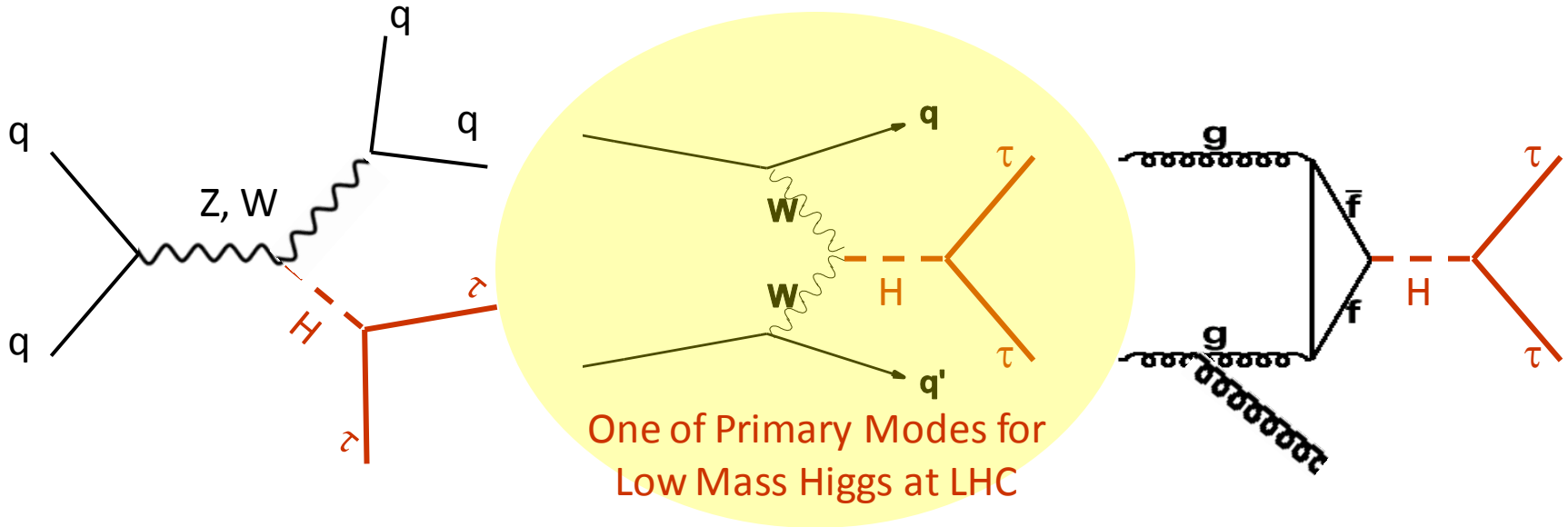
Zaid Alawi's Undergrad. Senior Thesis



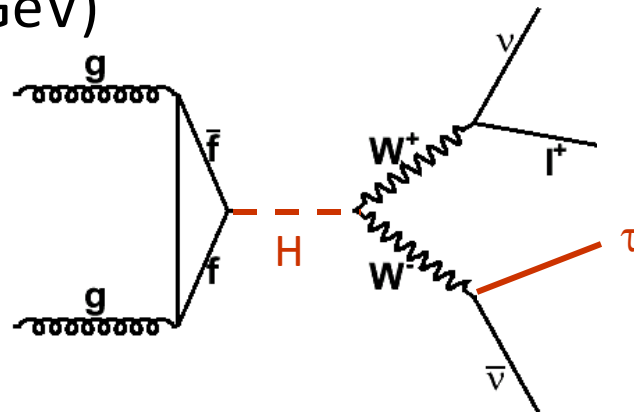
SM Higgs with Taus

Kohei Yorita

Low Mass Higgs ($M < 130$ GeV)

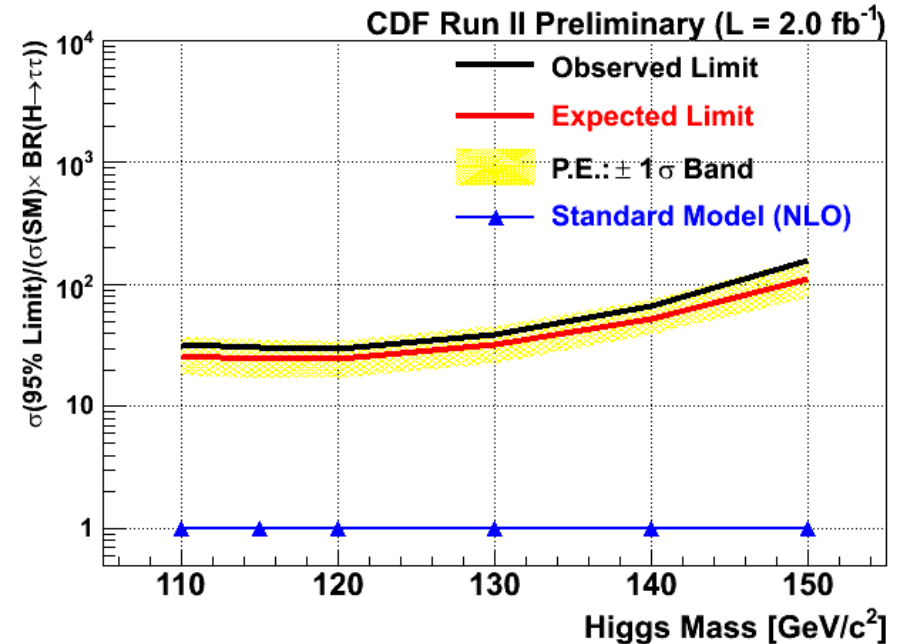
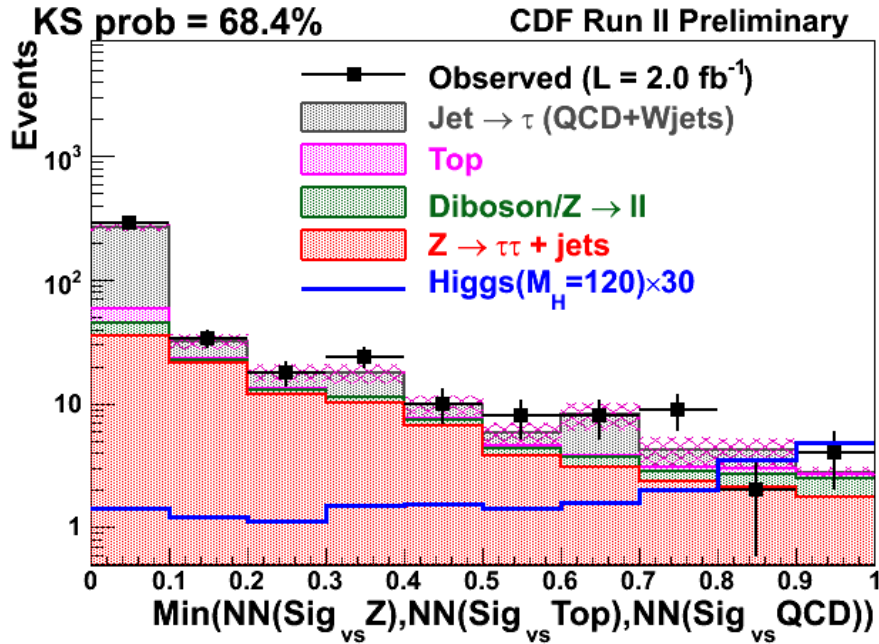


High Mass Higgs ($130 < M < 180$ GeV)



Low Mass SM Higgs with Taus

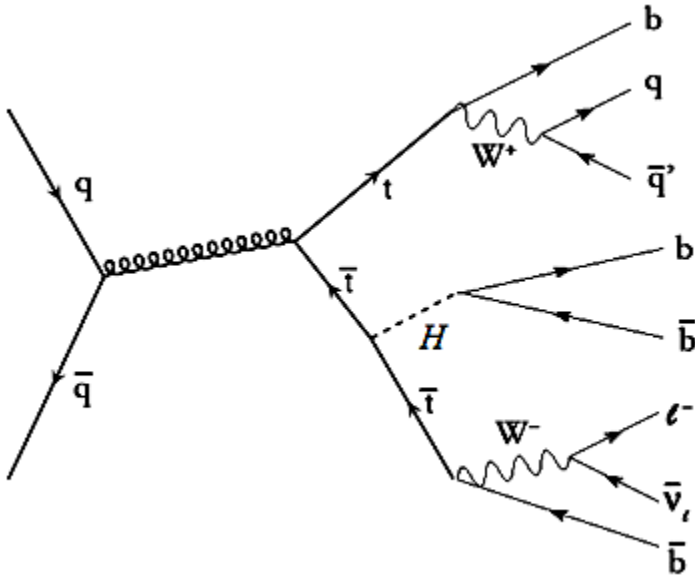
Kohei Yorita



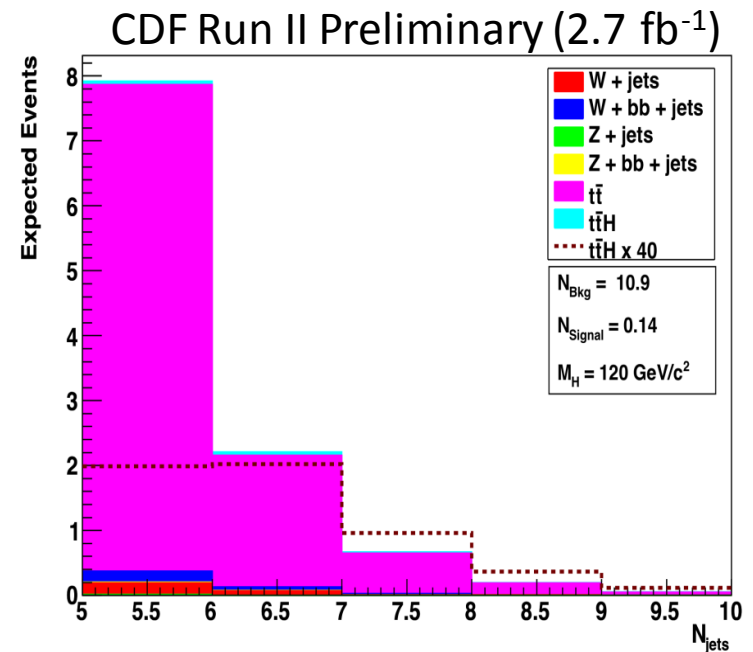
- Sensitivity: much better (x5) than expected.
- Publication: Godparents formed, paper draft written
 - Authors: *Kohei Yorita, *Young-Kee Kim
- 6 fb⁻¹ analysis with the same technique is being done with Yorita and his students at Waseda University.

$ttH \rightarrow bbl\nu jj + bb$

Michael Zakrajsek (REU student)
Wes Ketchum
Hyunsu Lee

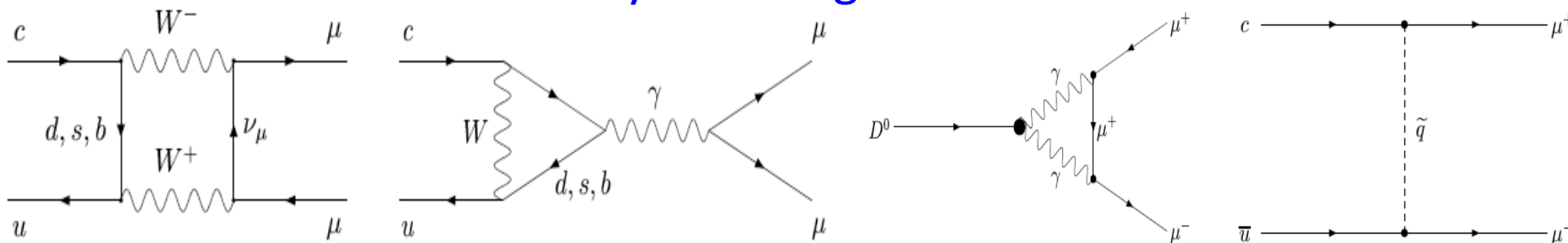


- Vary rare process
 - $\sigma_{ttH} \sim 4.4 \text{ fb}$ at $M_H = 120 \text{ GeV}$
 - $\text{Br}(ttH \rightarrow bbl\nu jj + bb) \sim 20\%$
- Potential discovery channel at LHC
- **New neural network b-tagger**
- Preliminary work shows promising result \rightarrow currently optimizing the analysis with $\sim 6 \text{ fb}^{-1}$



$D^0 \rightarrow \mu\mu$ Searches (w/ B Hadronic Trigger)

Edmund Berry's Undergrad. Senior Thesis



Dimuon Mass Region = 1.845 – 1.890 GeV

Source for Background	CMU-CMU	CMU-CMX	CMX-CMX
Combinatorial Background	0.040 ± 0.007	0.008 ± 0.001	0.0007 ± 0.0001
$D^0 \rightarrow \pi\pi$ Double Tags	0.53 ± 0.005	0.057 ± 0.001	0.012 ± 0.002
$D^0 \rightarrow K\pi$ Double Tags	< 0.01	< 0.01	< 0.01
Semileptonic D^0 Decays	< 0.36	< 0.20	< 0.10
Single-Muon B Decays	0.54 ± 0.06	0.13 ± 0.03	0.07 ± 0.02
Di-muon B Decays	3.8 ± 1.32	2.54 ± 0.96	0.96 ± 0.48
Total Background	4.9 ± 1.3	2.7 ± 1.0	1.0 ± 0.5
Observed	3	0	1

$Br(D \rightarrow \mu\mu) < 3 \times 10^{-7}$ at 95% CL

Publication: Accepted by PRD, arXiv:1008.5077 (2010)

Authors: *Edmund Berry, *Ivan Furic, Robert Harr, *Young-Kee Kim

ATLAS Activities

- Collaborating with / heavily relying on the ATLAS group at Chicago
 - FTK
 - Collaborating with Mel's and Florencia's groups, and Ted Liu (Fermilab)
 - Kohei Yorita (now at Waseda University), Jian Tang
 - Algorithms, objects, physics
 - Jointly working with Mel's and Florencia's groups and Monica Dunford (now at CERN)
 - Current focus: high P_T electrons and electroweak physics with electrons → complementary to expertise at Chicago and to strengthen physics capabilities of UofC ATLAS group
 - Ho Ling Li

ATLAS at Fermilab (not an official institution)

- People

- Ted Liu, Scientist II
- Florencia Canelli, Scientist I (50%)
- Marco Verzocchi, Wilson Fellow
 - DZero Physics Coordinator, small fraction at ATLAS
- Bjoern Penning, Lederman Fellow
 - Primarily DZero, small fraction at ATLAS
- Postdoc position open
 - (funds = 1/3 FNAL, 1/3 Florencia, 1/3 YKK)
- YKK

- Activities

- Primary effort: FTK
 - Small support from DOE indirectly
 - Small support from UChicago's "UChicago-Fermilab scientific initiative grants"
- Analysis
 - Small engagement

ATLAS at Fermilab

Created a “virtual” hallway with real-time video for better connection among Fermilab, Argonne, and UChicago ATLAS groups

Fermilab



Thursday, Oct. 8, 2009



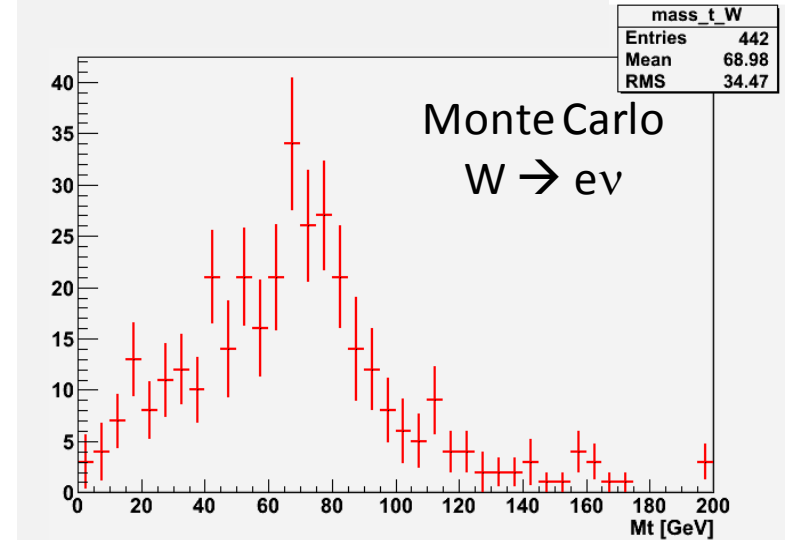
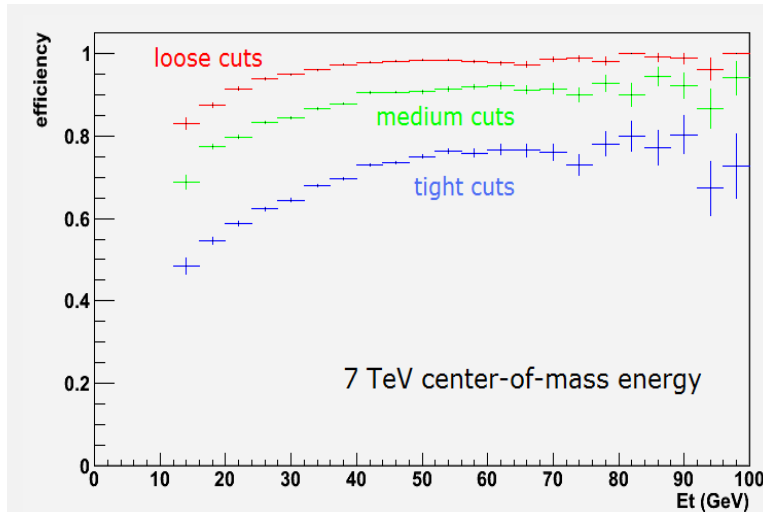
UofC



Possibility is to connect to CERN (ATLAS) in the future

ATLAS: Electron Studies

- Electron efficiencies measurements with Z or $Z' \rightarrow e^+e^-$ MC
- $Z \rightarrow ee, W \rightarrow ev, tt\text{-bar}, \dots$ in the electron channel Ho Ling Li



Electron efficiencies with $E_T > 50$ GeV

	LHC at 7 TeV	LHC at 10 TeV
loose cuts	98%	99%
medium cuts	91%	93%
tight cuts	76%	85%

Triggers: CDF, ATLAS, R&D

UChicago e-shop played a critical role.

CDF: Level-1 Calorimeter
Operations
Wesley Ketchum

CDF: SVT Operations
Kohei Yorita
Hyunsu Lee
Jian Tang

CDF: Level-2 Decision Crate
Wojtek Fedorko
Wesley Ketchum

ATLAS: FTK simulation
Kohei Yorita
Jian Tang

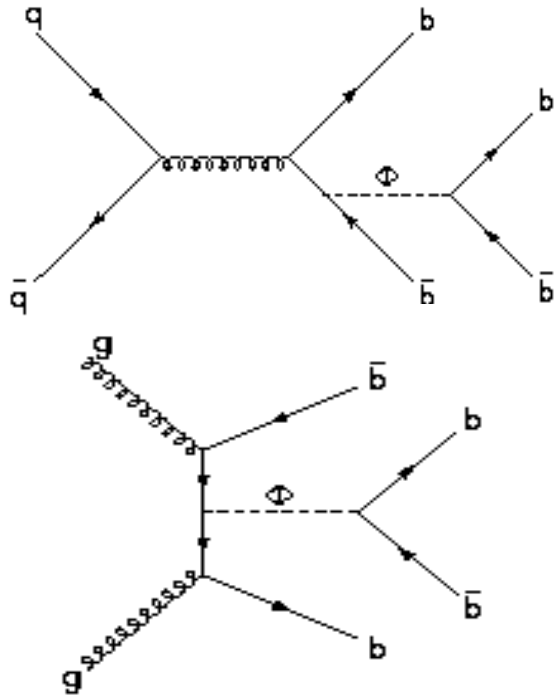
Track trigger R&D in CPU/GPU
Ho Ling Li
Wesley Ketchum

Hyunsu Lee has been leading the SVT system

ATLAS: Track Trigger Upgrade – FTK

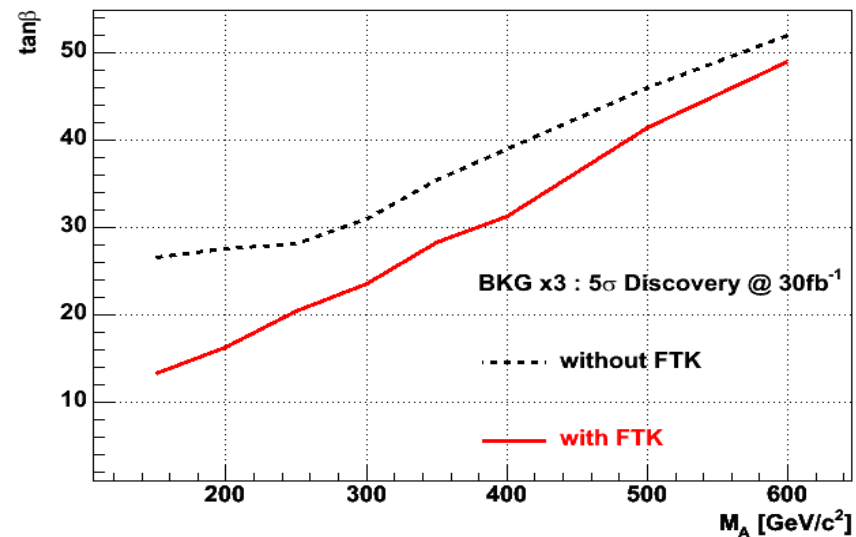
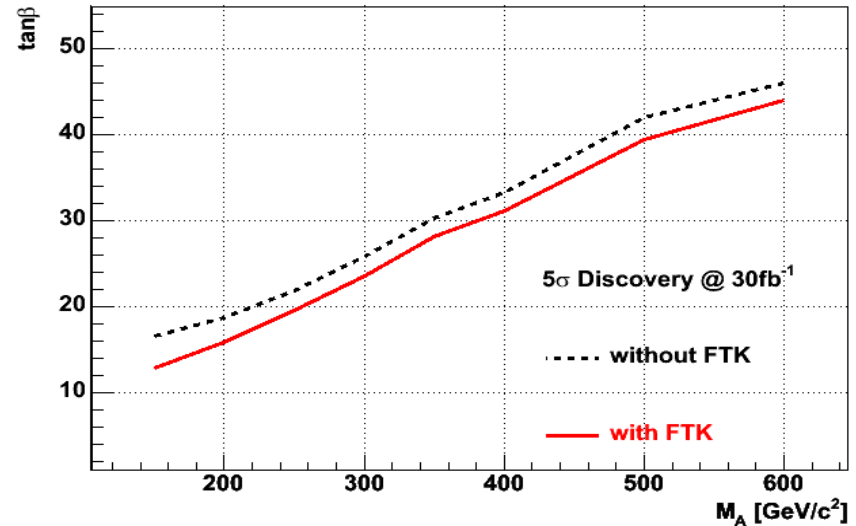
MSSM: $Hbb, Abb \rightarrow 4b$ quarks

Kohei Yorita



With FTK, discovery sensitivity

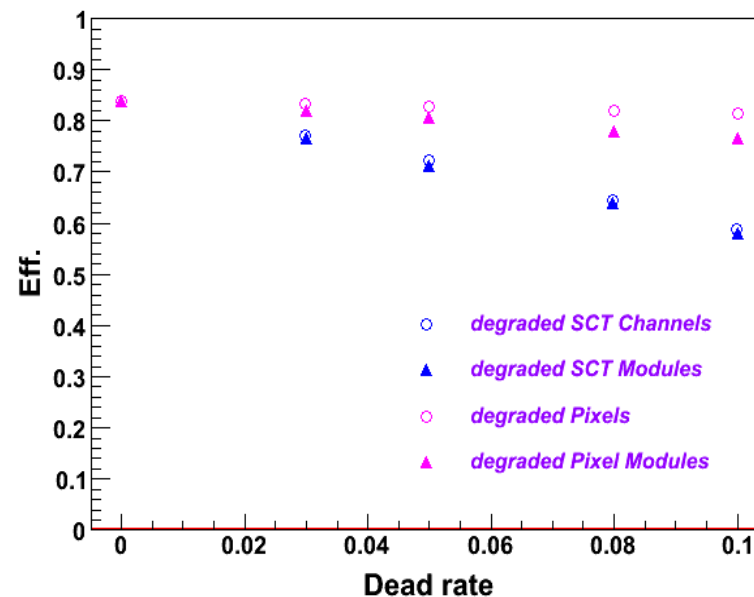
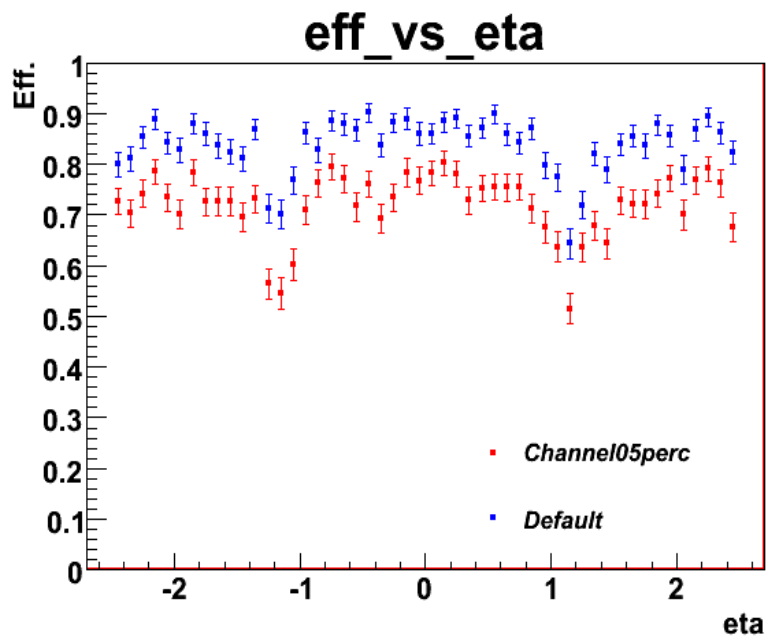
- improved
- robust against background



ATLAS: Track Trigger Upgrade – FTK

Jian Tang

- Performance studies with dead cells

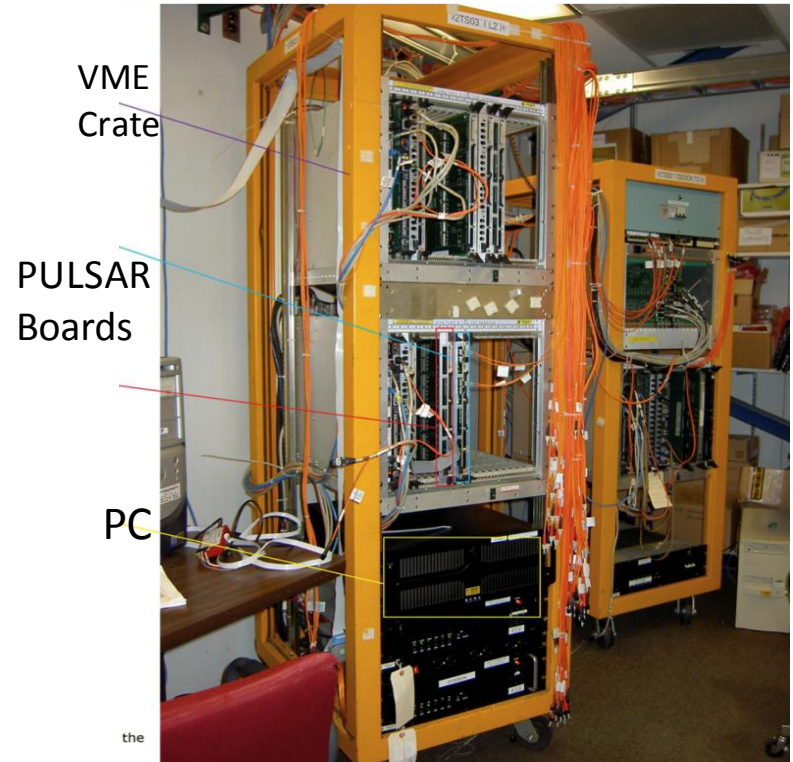
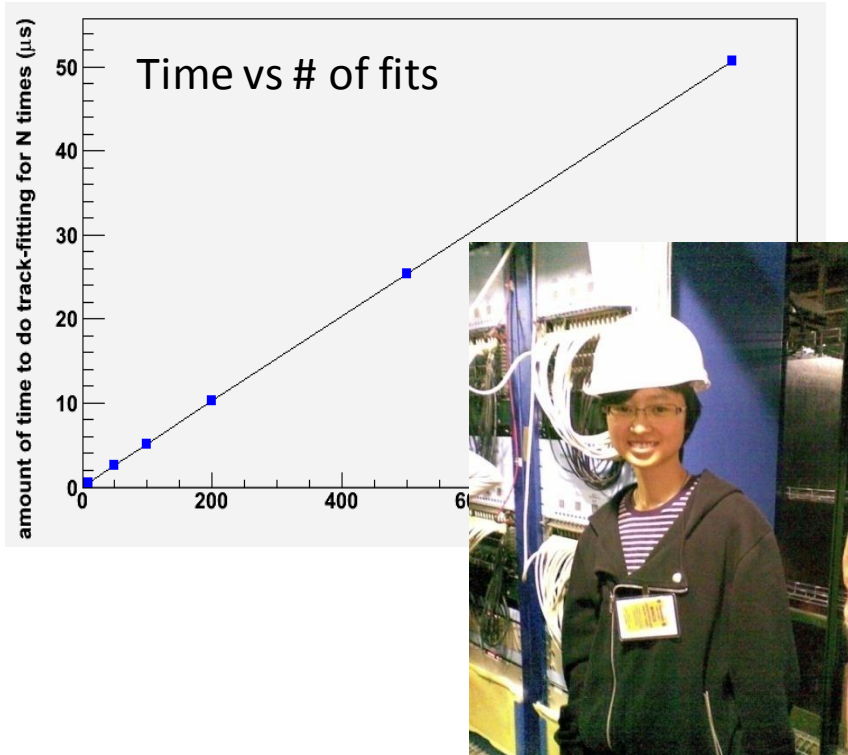


Silicon Track Trigger R&D in CPU

- High occupancy makes silicon track triggers very challenging
- CDF's silicon vertex trigger track fitting in CPU at CDF test stand → enable latency measurements of CPU track fitting
- Measurement of latency of CPU track fitting
 - $(5.073 \pm 0.004) \times 10^{-2} \mu\text{s} / \text{fit}$

Ho Ling Li

(with Ted Liu + Wes Ketchum)



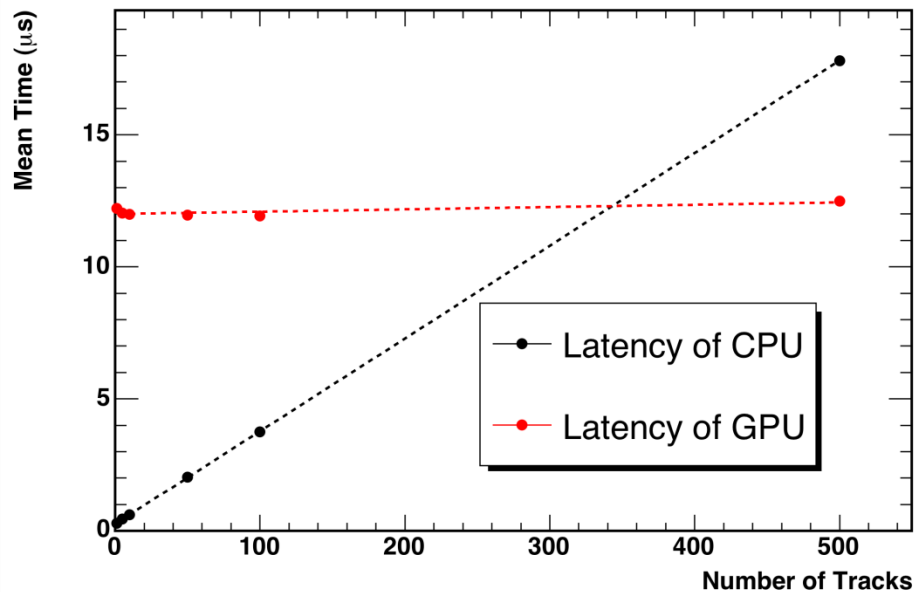
Silicon Track Trigger R&D in GPU

- GPUs (graphics processing units) can provide increased performance for parallelizable computations
 - Potential application to finding and fitting tracks in real-time
- Using test stand setup for CPU tests to investigate performance of GPU

Very preliminary latency measurements using internal software timing functions.

Wes Ketchum

Track Fitting Algorithm Timing Measurements



Accelerator Physics

Muon Collider / Neutrino Factory

- MICE: Summer Blot
- MTA: Anastasia Belozertseva, Last Feremenga, Tim Zolkin
- 6D Cooling: Tim Zolkin

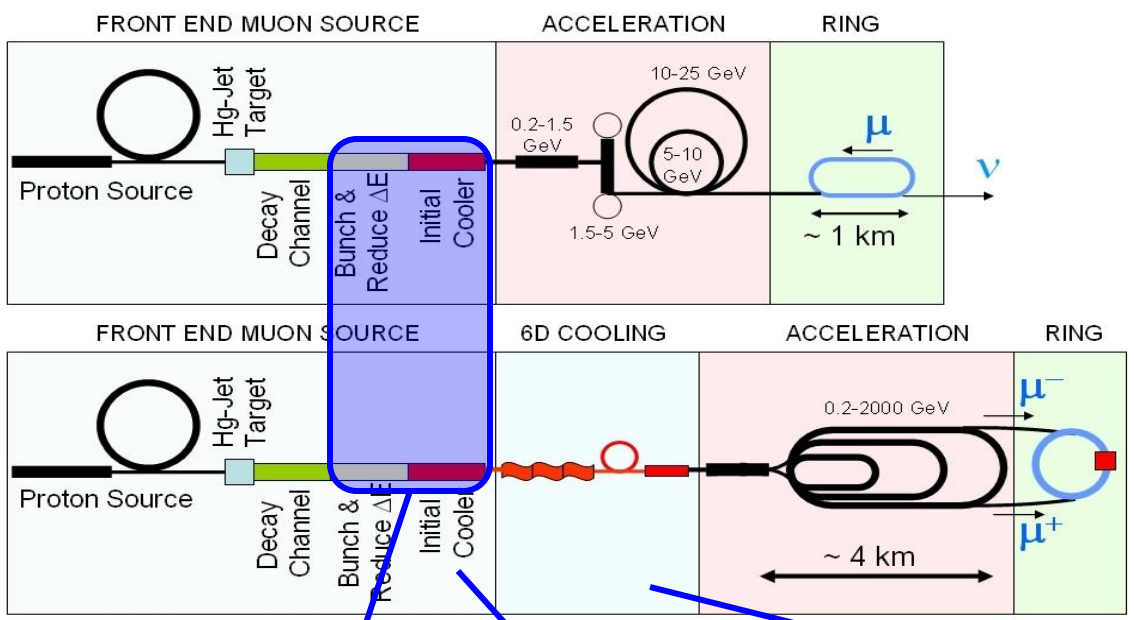
Laser driven accelerator
Satomi Shirashi

Crystal collimation for LHC
Satomi Shiraishi

Tevatron beam evolution
Satomi Shiraishi

Superconducting RF
Wes Ketchum

Muon Cooling for Muon Collider, Neutrino Factory



Neutrino Factory

Muon collider

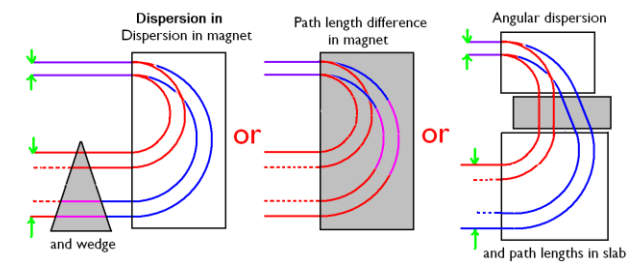
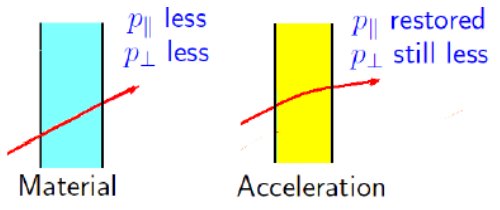
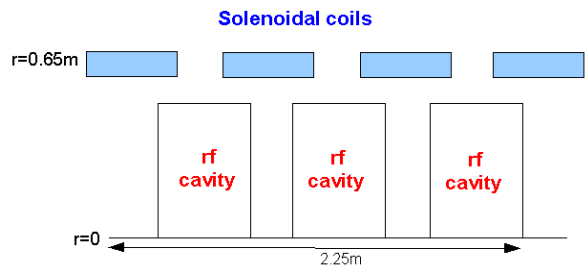
MuCool Test Area (MTA)

Buncher, rotator, cooler requires high gradient RF cavities in $B \sim 6T$

MICE

Proof-of-principle cooling demonstration experiment

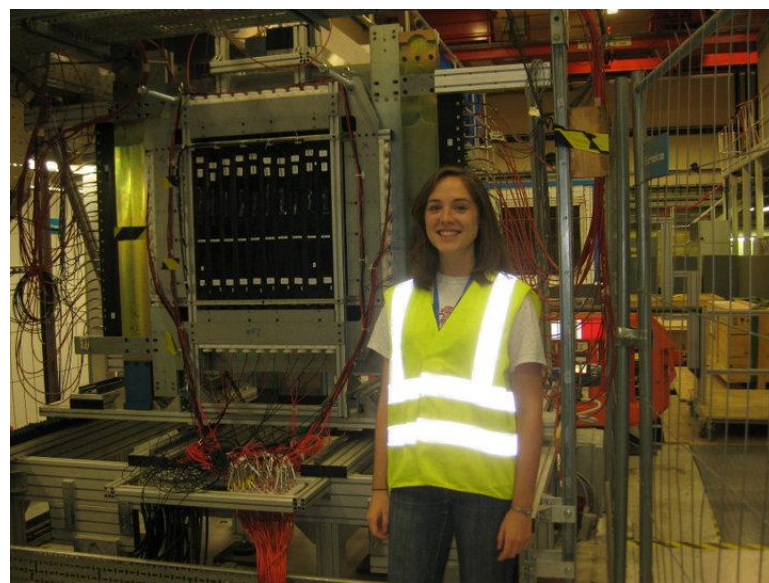
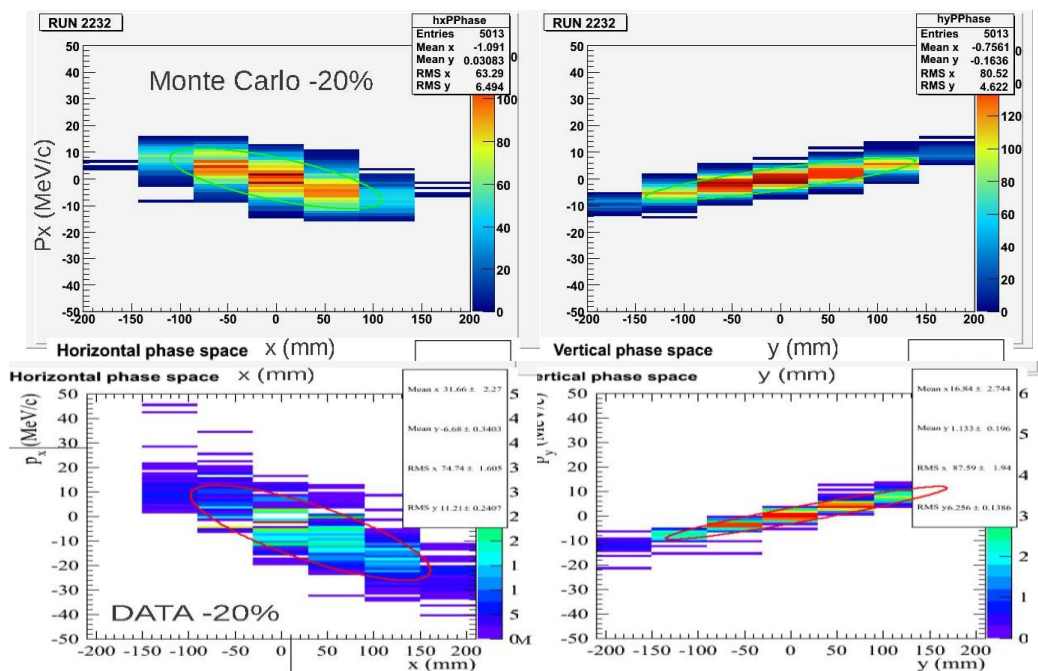
6D Cooling simulation



Muon Cooling: MICE experiment

Summer Blot

- Demonstrate transverse beam cooling
- First beam data (summer 2010)
- Summer Blot
 - participated in entire data taking period
 - have been analyzing data
 - presented at the MICE collaboration meeting (Oct. 4-7, 2010), Sofia, Bulgaria

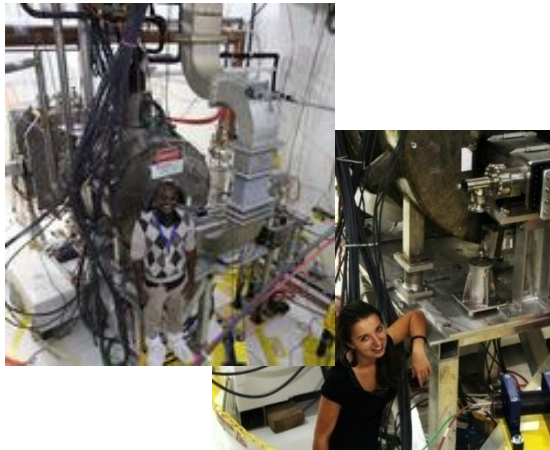
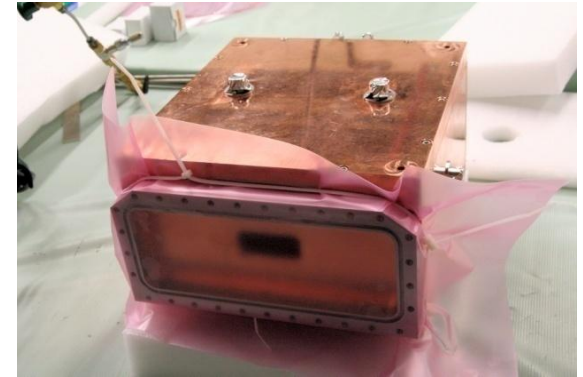
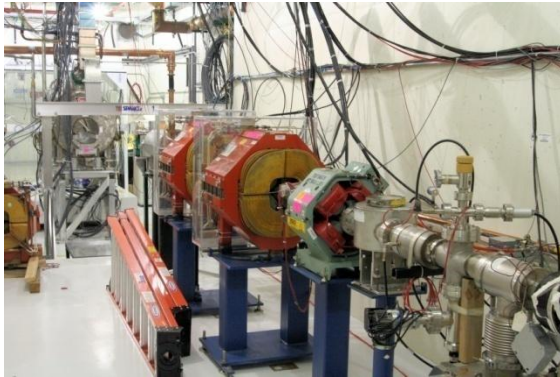


MuCool Test Area: RF performance in B field

Last Feremenga, Anastasia Belozertseva, and Tim Zolkinat

Help set up the system (cavity ...)

Map the magnetic field in the RF cavity structure; Simulate / calculate magnetic field

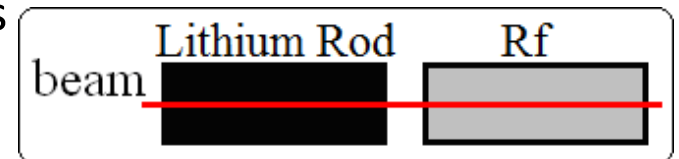


Muon Cooling

- MuCool Test Area Last Feremenga, Anastasia Belozertseva



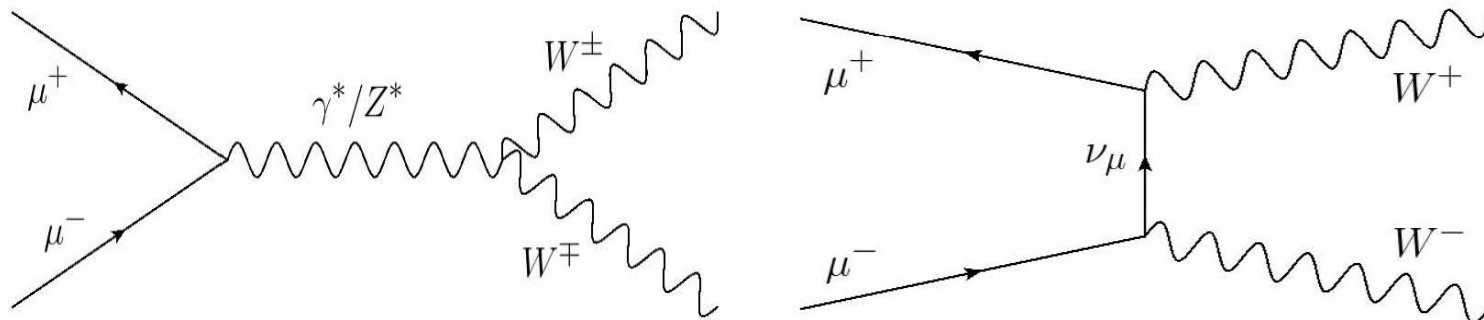
- Muon 6D cooling simulation Tim Zolkinat
 - Combination of transverse cooling and emittance exchange
 - Design of cooling channel based on Li-rods
 - Development of simulation code
 - Simulation of cooling process
 - Estimation of main technical parameters and limitations



Muon Collider Physics

Richard Ruiz, Last Feremenga, Krystal Sanchez
(Summer 2010)

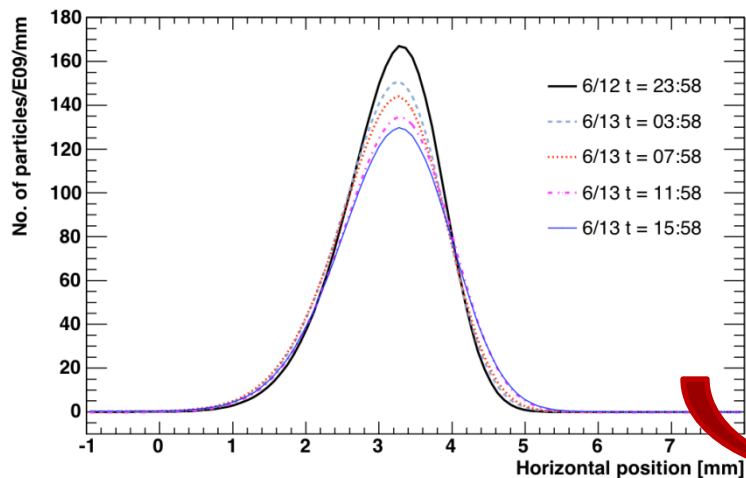
- $\mu\mu \rightarrow WW, Z', \dots$
 - Validate event generation codes, fast simulation, ...



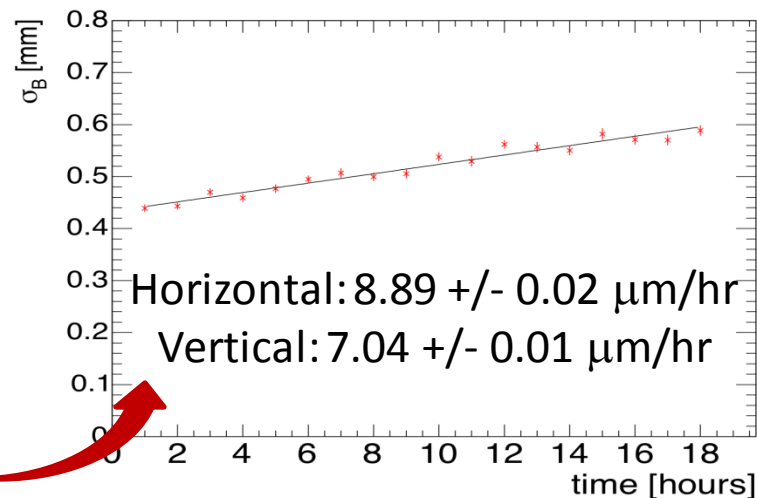
- Wrote the muon collider tutorial
 - anyone with a basic ROOT/C++ background
 - http://home.fnal.gov/~rruiz/Documents/Muon/2010_1019_MuonSimTut.pdf

Tevatron Beam Diffusion Rate Measurement

Tevatron beams become wider with time



beam width with time



new method for interpreting flying wire
beam profile monitor data

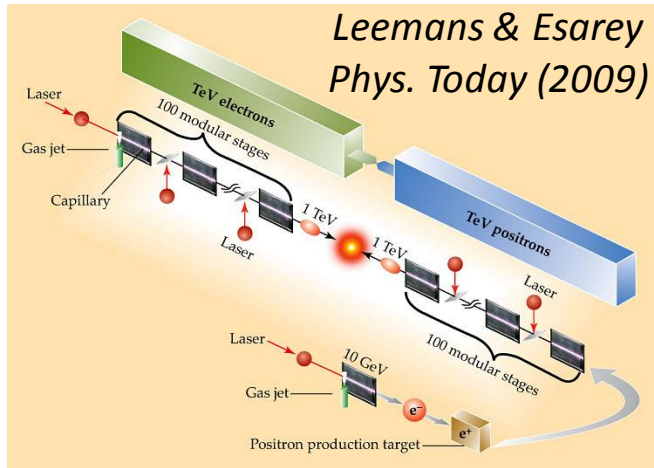


Satomi Shiraishi

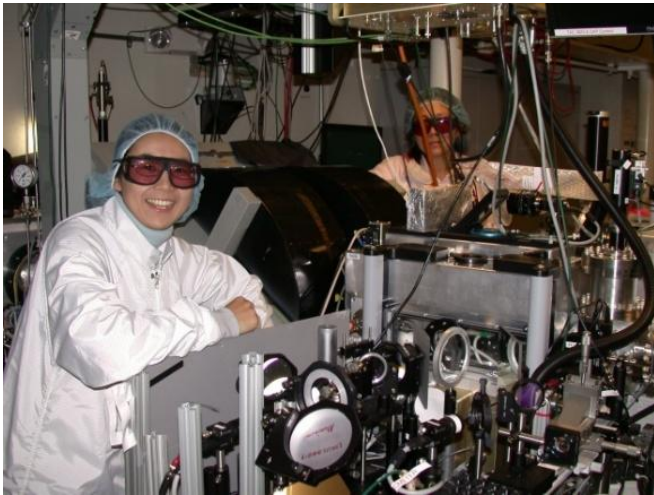
Top width at CDF (0.96 fb^{-1} , PRL):
U.Chicago undergraduate senior thesis

Student Poster Award
Particle Accelerator Conference 2009
Vancouver, Canada

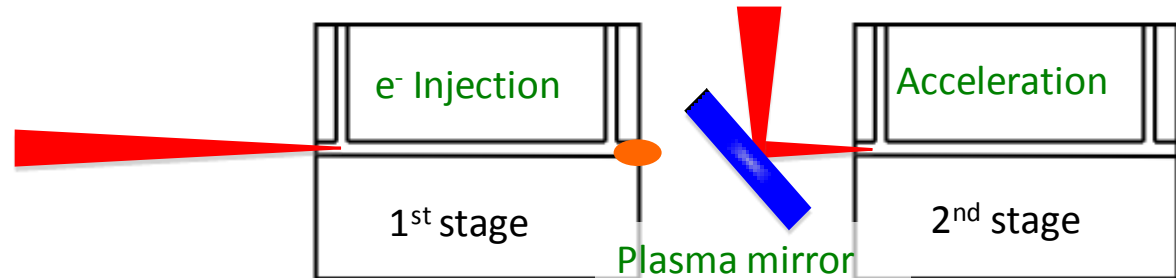
Staging of Laser Plasma Accelerators



- LPA for ultrahigh accelerating gradient
 - ~ 100 GV/m
- Future LPA based collider
 - requires staging of acceleration modules
- Staging experiment
 - to demonstrate the staging of acceleration units to produce higher energy electrons



Satomi Shiraishi (July 2010 – present)
(with Wim Leemans at LBNL)



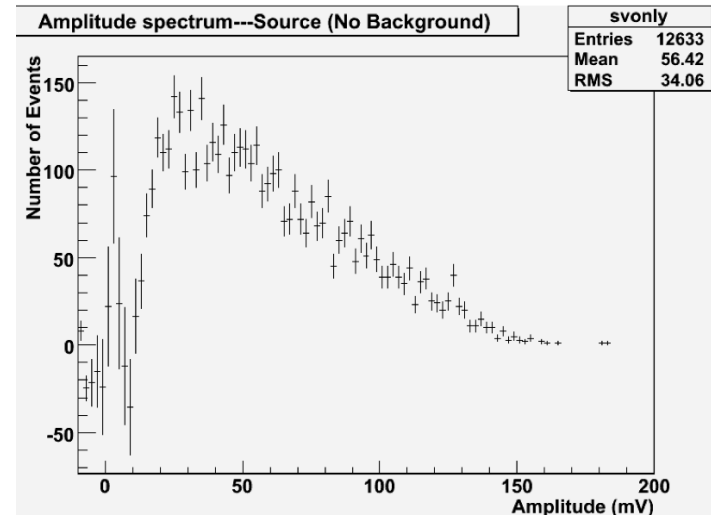
Student Poster Award, Advanced Accelerator Concepts 2010, Annapolis, MD

X-Ray Detection in Superconducting RF Cavities

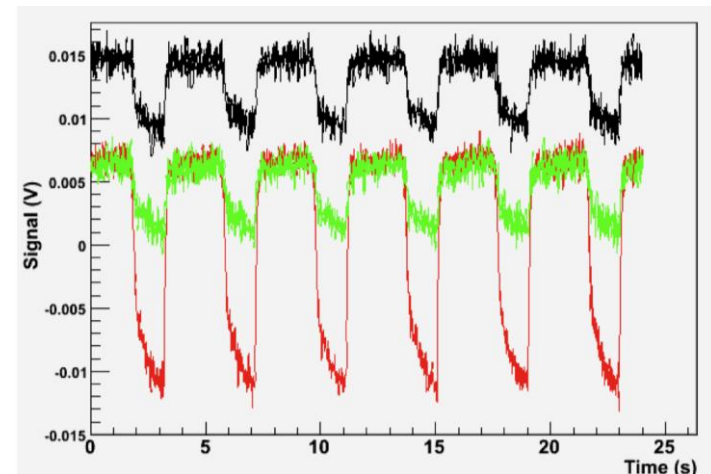
- Use silicon photodiodes (in cryogenics) to detect x-rays originating from origin of quench in SCRF cavity
- Single-photo detection system
 - Tested on ^{137}Cs source
 - Observed expected Compton scattering spectrum

Wes Ketchum

photodiode



- 12-channel detection array
 - Designed to simultaneously read 12 photodiodes
 - Signal from quench of test cavity at 3 different photodiode locations

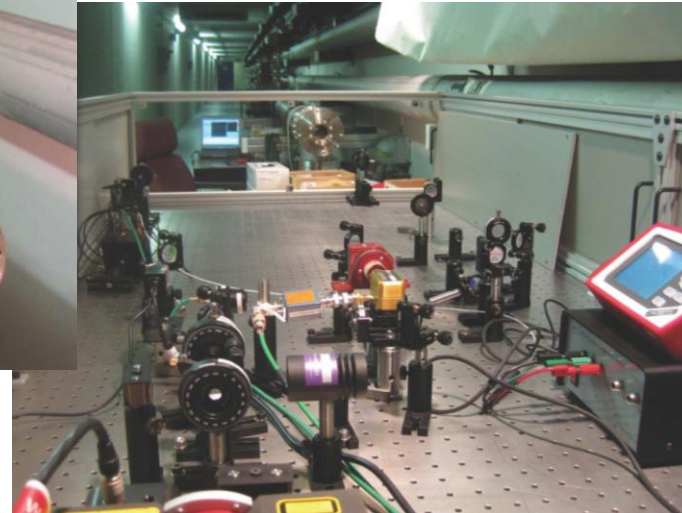


Fermilab Holometer experiment

- The idea that spacetime may not be entirely smooth.
- Experiment to measure the smallest intervals of space and time

Bobby Lanza

(with Aaron Chou at Fermilab)



Interferometer prototyping stage

Public Outreach by YKK (2008 – 2010)

1st African School of Physics

to build capacity to harvest, interpret, and exploit the results of current and future physics experiments with particle accelerators, and to increase proficiency in related applications and technologies.

August 1 – 21, 2010, South Africa



YKK: Organizing Committee member, Gave a lecture via video

Promoting Women in Science

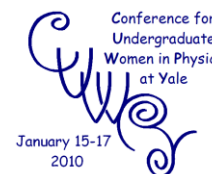
- Keynote speaker
 - the 3rd IUPAP International Conference on Women in Physics
 - October 8-10, 2008, Seoul, Korea (<http://www.icwip2008.org/>)



- APS meeting presentations
 - Women in Physics: Challenges and Opportunities in a Physics Career (April meeting 2008, St. Louis)
 - Women in Physics (March meeting, 2009, Pittsburgh)

Promoting Women in Science

- Conference for Undergraduate Women in Physics
 - Northeast conference at Yale, January 15-17, 2010
 - Keynote speaker: “My Adventures in Particle Physics” (televised to west and mid-west conferences)
- University of Chicago Undergraduate Women in Physics
 - Informal advisor
- Greater Chicago Higher Education Recruitment Consortium
 - Founding member, Executive board member
- Women in Science Symposium 2010: Building an Identity
 - Chicago, April 14, 2010
 - organizing committee, gave an introductory speech
 - Currently preparing next year’s symposium
- Physics REU Program at U.Chicago (for Woman and Minorities) – Co-PI since 2003
- 5 lectures at Rosary “all girls” high school (May 2010, Aurora)



Korean Community

- Science High School Students from Korea
 - Twice a year (Spring and Fall) since 2005. Program includes
 - Visit U.Chicago (physics labs), Fermilab and Argonne
 - Visit IMSA (Illinois Math and Science Academy)



- Korean-Americans to Fermilab
 - organized together with JoongAng Ilbo (Korean News paper, US Branch)
 - Once or twice a year since 2007 (from kids to adults)
 - Program includes YKK's lecture and tour of Fermilab
- Presentations at Korean Physics Society meetings
 - Apr. 2010, and Oct. 2010

Other Activities

- Promoting higher education in South Dakota
 - Fermilab Internship programs for senior high school students + freshman students since 2009
 - Visit South Dakota universities to promote Ph.D. programs
- Public lectures
 - Sigma Pi Sigma Conference (Nov. 7, 2008, Fermilab)
 - Searching for the Baby Universe (Oct. 7, 2008, Seoul, Korea)
 - Vaden Miles Lecture (April, 1, 2010, Wayne State University)
 - International school fo scientific journalism and communication (May 9-13, 2010, Erice, Sicily, Italy)
- Colloquia
 - Argonne, Rutgers (2010)
 - Cornell, Los Alamos (2009)
 - JLab (2008)
- A numerous seminars and conference talks

Plan for the Next 3 Years (2011 – 2013)

Next Three Years (2011 – 2013)

- CDF:
 - Top quark precision measurements: mass, width, $m_{\text{top}} - m_{\text{anti-top}}$
 - Diboson towards Higgs, and Higgs searches: ZZ/WZ, ZH/WH, ttH
 - Trigger operations: Level-1, Level-2, SVT trigger operations
- ATLAS:
 - Trigger Upgrade: Fast Track Trigger
 - Electrons and electroweak physics
 - Acceptance/efficiency studies, $Z \rightarrow ee$, $W \rightarrow ev$, tt-bar physics
 - Higgs Searches
- Track trigger R&D
- Lepton collider physics studies
- Accelerator Physics
 - Muon cooling: MICE, MuCool, 6D simulation
 - Laser driven accelerator
- Public Outreach