

Education

Ph.D. in Physics, University of Pennsylvania 05/2005

First Measurement of the Ratio of Branching Fractions $\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \mu^- \bar{\nu}_\mu) / \mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)$
Adviser: Prof. Nigel S. Lockyer

B.S. in Physics, National Taiwan University 06/1997

Positions Held

Assistant Professor, Department of Physics, National Central University (Taiwan) 08/2009–present

International Advisory Committee of International Conference on the Structure and the Interactions of the Photon 05/2009–present

Research Associate, Fermi National Accelerator Laboratory (CDF) 10/2005–07/2009

– Co-convener, Very Exotic Physics Subgroup 10/2008–present

– Convener, Photon Group 12/2007–present

Research Assistant, University of Pennsylvania (CDF) 06/1998–05/2005

Teaching Assistant, University of Pennsylvania 09/1997–05/1998

Undergraduate Research Assistant, National Taiwan University 07/1996–03/1997

Research Experience

- Physics analysis (*Here I list my major contributions for each analysis.*)
 - Measurement of the inclusive photon cross section 08/2007–present
 - * The results may provide input to the gluon distribution within protons. For the first time at CDF, the isolation (extra energy around photon candidate) measured in the calorimeter is used to estimate the fraction of isolated photons. Currently under the paper draft review, to be submitted to Phys. Rev. Lett.
 - * Major contributions: trigger efficiencies, programs for fitting the signal fractions, determination of selections which reduce non-collision background and estimation of remaining contribution, and studies of photon and electron energy scales.

- Signature-based search for anomalous production of events with a photon, b -quark, jet, and missing transverse energy ($\gamma bj E_T$) 09/2007–present
 - * Motivated by the CDF I excess. Major contribution is the development and calibration of “CES/CPR” method for estimating photon background from meson decays.
 - * The paper has been published in Phys. Rev. D.
- Signature-based search for anomalous production of diphoton and electron or muon ($\gamma\gamma e, \gamma\gamma\mu$) 12/2005–09/2006
 - * Motivated by the CDF I excess. Measured the probability for an electron to fake a photon. Background estimates are mostly data-driven.
 - * The results have been approved for public presentation. To be combined with other $\gamma\gamma + X$ searches for publication in Phys. Rev. D.
- First measurement of $\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \mu^- \bar{\nu}_\mu) / \mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)$ 01/2003–05/2005
 - * The analysis doubles the current knowledge of Λ_b^0 baryon and may test Heavy Quark Effective Theory independently from b mesons. The results have been published in Phys. Rev. D.
 - * Constructed the first evidence that the transverse-momentum distribution of Λ_b^0 baryons produced in $p\bar{p}$ collisions is significantly different from that of \bar{B}^0 mesons, which results in a modification in the production cross section ratio $\sigma_{\Lambda_b^0} / \sigma_{B^0}$ with respect to the CDF I measurement.
- Algorithm Development and Calibration
 - The “CES/CPR” method for statistical separation of signal photons and photons from decays of π^0 , η^0 , and K_s^0 02/2007–02/2008
 - * Utilized (i) shower profiles measured at the shower maximum in the CDF central electromagnetic calorimeter (CES), and (ii) conversion rates measured at the central upgraded preshower detector (CPR).
 - * Has been applied to several physics analyses, including searches for anomalous production of $\gamma bj E_T$, $\gamma + n$ jets + E_T , and the measurement of $\gamma b\bar{b}$ cross section.
 - The dE/dx measured in the drift chamber for particle identification 04/2001–12/2002
 - * Performed the first calibration using pure samples of electrons. Attempted to remove dependence on cell geometry, path length, pressure, high voltage, and electronics variation.
 - * First mapping of dE/dx as a function of particle velocity using pure samples of protons, electrons, pions, and muons.
 - * Has been applied to many physics analyses, including the observation and measurement of B_s^0 oscillations, branching ratios and CP asymmetry in $B \rightarrow hh$, measurement of the B_c^+ lifetime using $B_c^+ \rightarrow J/\psi e^+ \nu_e$, search for the decays $B_{s,d}^0 \rightarrow e\mu$ and ee , search for long-lived doubly-charged Higgs bosons.
- Hardware for the drift chamber at CDF
 - On-call expert 12/2005–present
 - Responsible for debugging and repairing of readout electronics 12/2005–present
 - Assisted University of Michigan with debugging and repairing of Time-to-Digital Converter (TDC) with broken vias 06/2000–08/2000
 - Laid out buffer boards for providing current to the readout electronics 01/2000–04/2000

- Assisted with commissioning of the drift chamber 09/1999–04/2001
- Optimized test parameters and wrote a *C* program to drive the test station of front-end readout chips ASDQ, ~ 6600 ASDQ chips tested 06/1998–06/1999
- R & D of dual-readout calorimeter for the future experiments 03/2006–10/2007
 - Implemented a simulation of detector with GEANT4
 - Studied the dependence of energy resolution on sampling fraction and sampling frequency
 - Developed a preliminary sampling-layer-dependent correction to improve the energy resolution of hadronic showers

Leadership/Management

- Photon Group convenership 12/2007–present
 - Identified projects which required updates, maintenance, or documentation, such as: calibrations of preshower detector and electromagnetic timing system, fake rates, and efficiency scale factors. Recruited graduate students or institutions and followed up their progress.
 - Provided technical support to physics analyses which involve photons in the final state. Examples include searches for Fermiophobic Higgs in the diphoton and multi-photon channels, $t\bar{t}\gamma$, and several signature-based searches. During my one-year convenership, ten photon-related physics analyses were approved for public presentation or publication by the Exotics, QCD, and Electroweak physics groups.
- Very Exotic Physics Subgroup convenership 10/2008–present
 - Led subgroup of Exotics group searching for new physics other than supersymmetry. Examples include signature-based searches, searches for W' , WW and ZZ resonances. Responsible for ensuring completeness and accuracy of analyses.

Teaching Experience

- Supervising a Ph.D. student from IFAE-Barcelona, Carolina Deluca, on “Measurement of inclusive central isolated photon cross section” 08/2007–present
- Supervising a Ph.D. student from Osaka City University, Atsunari Hamaguchi, on the measurement of photon fake rates 09/2008–present
- Supervised a master student from University of Trieste, Mirco Dorigo, on “Measurement of diphoton trigger efficiency in 3 fb^{-1} of data” 08/2008–09/2008
- Supervised an undergraduate student from Le Moyene College, Priyaranga Koswatta, on “Search for technicolor particles: ω_t and $\rho_t \rightarrow \gamma b\bar{b}$ ” 06/2007–08/2007
- Tour guide of Fermilab Saturday Morning Physics 10/2005–present
- Assisted undergraduate students in completing their physics laboratory assignments in the allotted time and graded their lab reports 09/1997–05/1998

References

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Dr. Richard J. Tesarek, Scientist `tesarek@fnal.gov`
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Awards

- Scholarship of National Gifted Students in Physics (1993-1997)
- Skipped the last year of high school study and entered National Taiwan University by exemplary performance on the Joint College Entrance Exam

Selected Publications

- [1] T. Aaltonen *et al.* (CDF Collaboration), “Search for Anomalous Production of Events with a Photon, b -quark, Jet, and Missing Transverse-energy,” *Phys. Rev. D* **80**, 052003 (2009)
- [2] T. Aaltonen *et al.* (CDF Collaboration), “First Measurement of the Ratio of Branching Fractions $\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \mu^- \bar{\nu}_\mu)/\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)$,” *Phys. Rev. D* **79**, 032001 (2009).
- [3] T. Aaltonen *et al.* (CDF Collaboration), “Measurement of the Inclusive Isolated Photon Cross Section at CDF,” in preparation for *Phys. Rev. Lett.*
- [4] T. Aaltonen *et al.* (CDF Collaboration), “Search for Anomalous Production of Diphoton + X,” in preparation for *Phys. Rev. D*.
- [5] A. Para, N. Saoulidou, H. Wenzel, S.S. Yu, T. Zhao, “A Study of A New Concept of Compensating Calorimeter,” 2006 IEEE Nuclear Science Symposium Conference Record.
- [6] T. Affolder *et al.* (CDF Collaboration), “CDF Central Outer Tracker,” *Nucl. Instrum. Meth. A* **526**, 249 (2004).
- [7] C. Deluca, M. Martinez, R. Culbertson, and S. S. Yu (CDF Collaboration), “Measurement of the Inclusive Isolated Photon Cross Section at CDF,” arXiv:0810.0553.
- [8] S. S. Yu, D. Krop, S. Wilbur, R. Culbertson, H. Frisch, C. Pilcher, A. Loginov, I. Shreyber (CDF Collaboration), “Search for Anomalous Production of Photon, b -jet, and Missing Transverse Energy at CDF,” arXiv:0808.1325.
- [9] S. S. Yu (CDF and D0 Collaborations), “Other Beyond Standard Model Searches at the Tevatron,” arXiv:0807.3523.
- [10] S. S. Yu (CDF and D0 Collaborations), “Search for New Physics with Photons at the Tevatron,” *J. Phys. Conf. Ser.* **110**, 072049 (2008).
- [11] S. S. Yu (CDF Collaboration), “Search for Higgs at CDF,” *AIP Conf. Proc.* **903**, 113 (2007).
- [12] S. S. Yu, Ph.D. thesis, University of Pennsylvania, arXiv:hep-ex/0504059 (2005).
- [13] A. Pronko, S.S. Yu, R. Culbertson, “The Probability of an Electron Faking an Isolated Prompt Photon in CEM,” CDF public note **8220** (2006).
- [14] S.S. Yu, J. Heinrich, N. Lockyer, D. Ambrose, and P. Wittich, “COT dE/dx Measurement and Corrections,” CDF public note **6361** (2003).

Selected CDF Internal Notes

- [1] S.S. Yu, “What You Need to Know as a COT Calibration Expert,” CDF note **9828** (2009).
- [2] S.S. Yu *et al.*, “Studies of Electron and Photon Energy Scales,” CDF note **9591** (2008).
- [3] C. Deluca, S.S. Yu, R. Culbertson, M. Martinez, and S. Grinstein, “Measurement of the inclusive and isolated prompt photon cross section at CDF,” CDF note **9590** (2008).
- [4] M. Dorigo, S.S. Yu, “Diphoton Trigger Efficiency in 3 fb^{-1} of Data,” CDF note **9533** (2008).
- [5] S.S. Yu *et al.*, “The Fraction of Non-collision Background in the Inclusive Central Photon Sample,” CDF note **9389** (2008).
- [6] S.S. Yu *et al.*, “How to use CES and CPR Methods,” CDF note **9240** (2008).
- [7] S.S. Yu *et al.*, “An Alternate methods to obtain $\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \mu^- \bar{\nu}_\mu) / \mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)$,” CDF note **9222** (2008).
- [8] S.S. Yu, R. Culbertson, “A New Method to Extract Pure Photon Sample from the $W\gamma$ and $Z\gamma$ Candidates,” CDF note **9053** (2008).
- [9] S.S. Yu, R. Culbertson, “Search for Anomalous Production of Upsilon and W or Z,” CDF note **8602** (2006).
- [10] S.S. Yu *et al.*, “Evaluation of the Λ_b absolute branching fractions,” CDF note **8508** (2006).
- [11] S.S. Yu, R. Culbertson *et al.*, “Search for $\gamma\gamma + e$ or μ in the 1 fb^{-1} of Data,” CDF note **8462** (2006).
- [12] D. Litvintsev, S.S. Yu, R.J. Tesarek, “Measurement of the $\Lambda_b^0 P_T$ spectrum in the TTT data using fully reconstructed decay to $\Lambda_c^+ \pi^-$,” CDF note **8156** (2006).
- [13] S.S. Yu, R. Tesarek, “User Guide of the $\Lambda_b^0 P_T$ Spectrum,” CDF note **8111** (2006).
- [14] S.S. Yu, R.J. Tesarek, D. Litvintsev, J. Heinrich, N.S. Lockyer, “Ratio of $\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \mu^- \bar{\nu}_\mu)$ to $\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)$ in the two track trigger,” CDF note **7559** (2005).
- [15] S.S. Yu, R.J. Tesarek, D. Litvintsev, J. Heinrich, N.S. Lockyer, “Correction of Λ_b to B^0 Production Cross Section Ratio,” CDF note **7558** (2005).
- [16] D. Litvintsev, S.S. Yu, R.J. Tesarek, “Observation of Λ_c^* and Σ_c in semileptonic Λ_b decays,” CDF note **7546** (2005).
- [17] R.J. Tesarek, D. Litvintsev, S.S. Yu, “ Λ_b semileptonic backgrounds,” CDF note **7545** (2005).

Conferences

- Selected Talks

- “Review of Jet, W/Z +Jets, and Heavy Flavor Production at the Tevatron”
Photon 09, DESY, Germany (May 2009)
- “Searches in Photon and Jet States”
Rencontres de Moriond EWK 2009, La Thuile, Italy (March 2009)
- “Other Beyond Standard Model Searches at the Tevatron”
Hadron Collider Physics, Galena, IL, USA (May 2008)
- “Search for New Physics with Photons at the Tevatron”
The Europhysics Conference on High Energy Physics, Manchester, England (July 2007)
- “Search for Higgs at CDF”
SUSY06, Irvine, CA, USA (June 2006)
- “ Λ_b Physics at CDF”
Frontiers In Contemporary Physics, Nashville, TN, USA (May 2005)
- “Particle ID with dE/dx Measurement from CDF Central Outer Tracker”
Annual APS Meeting, Albuquerque, NM, USA (April 2002)
- “ASDQ Performance”
CDF COT Workshop, Philadelphia, PA, USA (April 1999)

- Posters

- “Search for Anomalous Production of Photon, b -jet, and Missing Transverse Energy at CDF”
ICHEP, Philadelphia, PA, USA (July 2008)
- “Measurement of Λ_b Branching Ratios in Modes Containing a Λ_c ”
Lepton/Photon, Batavia, IL, USA (August 2003)

Colloquia and Seminars

- “Invisible Light from the Unknown”
Colloquium, National Central University, Taoyuan, Taiwan (March 2009)
- “Invisible Light from the Unknown”
HEP Seminar, National Tsing Hua University, Hsingchu, Taiwan (February 2009)
- “Invisible Light from the Unknown”
Colloquium, National Taiwan University, Taipei, Taiwan (February 2009)
- “Invisible Light from the Unknown”
Colloquium, Kansas State University, Manhattan, KS, USA (January 2009)
- “Searches for New Physics with Photons at CDF”
National Taiwan University High Energy Physics Journal Club, Taipei, Taiwan (March 2008)
- “Searches for New Physics with Photons at CDF”
National Cheng-Kung University High Energy Physics Seminar, Tainan, Taiwan (March 2008)
- “Measurement of Λ_b Branching Fractions and Search for Diphoton + e/μ ”
Academia Sinica High Energy Physics Seminar, Taipei, Taiwan (January 2007)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
Lawrence Livermore High Energy Physics Seminar, Livermore, CA, USA (August 2005)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
SLAC Experimental High Energy Physics Seminar, Menlo Park, CA, USA (August 2005)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
Yale University High Energy Physics Seminar, New Haven, CT, USA (July 2005)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
Fermi National Laboratory High Energy Physics Seminar, Batavia, IL, USA (June 2005)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
Brookhaven National Laboratory High Energy Physics Seminar, Upton, NY, USA (June 2005)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
Johns Hopkins University High Energy Physics Seminar, Baltimore, MD, USA (June 2005)
- “Measurement of the Λ_b Relative Branching Fractions at CDF II”
Chicago Flavor Seminar, Batavia, IL, USA (June 2005)