

## CURRICULUM VITÆ

Name: Juan Cruz Estrada Vigil

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### Education

- (1998-2002) Ph.D. Student, University of Rochester, Rochester, NY. Degrees: Master of Arts (Summer 2000) and Ph.D. in Physics (Summer 2002).

Ph.D. Thesis: "Maximal Use of Kinematic Information for the Extraction of the Mass of the Top Quark in Single-lepton tt events at  $D\bar{0}$ .", under the direction of Prof. Tom Ferbel.

- (1994-1997) Masters Student, Carrera de Licenciatura en Ciencias Fisicas, Instituto Balseiro Universidad Nacional de Cuyo, S. C. de Bariloche, Rio Negro, Argentina. Degree: "Licenciado en Fisica" (December 1997)

Master Thesis: "Dynamical Cosmological Constant and Intergalactic Medium." Elementary Particle Physics Group at Instituto Balseiro-Centro Atomico Bariloche, under the direction of Prof. Luis Masperi.

- (1991-1994) Undergraduate Student, Carrera de Licenciatura en Fisica, Facultad de Ciencias Exactas -Universidad Nacional de Buenos Aires, Buenos Aires, Argentina. Transferred to Instituto Balseiro in 1994.

### Awards and Recognitions

- 2010 Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE Award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers. The awards was conferred at the White House for "... widely-recognized contributions to high-energy physics and particle astrophysics experiments, and his invention of a new detector concept that can extend searches for dark matter particles into a range not covered by existing experiments; and for actively involving high school science students and teachers in this research."
- 2004 Radiation and Instrumentation Early Career Recognition given by the Institute of Electrical and Electronics Engineers (IEEE) for "significant and innovative technical contributions to the science of measuring ionizing radiation". The recognition was based on the work done with the VLPC detectors at Fermilab.

- 2004 Wilson Fellowship given by Fermi National Accelerator Laboratory to work on any research area of the Fermilab program. "... the Fellowships are awarded to those who have demonstrated unusual scientific abilities at an early stage of their careers and who are expected to have significant impact in particle physics."
- 2004 Humboldt Research Fellowship given by the Alexander von Humboldt Foundation to work on research and development of frictional muon cooling at Max Planck Institute in Munich, Germany. This fellowship was not accepted in favor of the Wilson Fellowship at FNAL.
- 2003 Alvin Tollestrup Award for postdoctoral research at Fermi National Accelerator Laboratory "... the measurement of the top mass was outstanding and clearly deserving of this honor..."
- 2002 Frederick Lobkowicz Prize at University of Rochester "...in recognition of a Ph.D. degree based on exceptional experimental research in high-energy nuclear and particle physics..."
- 1998-2001 Marshak Fellowship at University of Rochester, to complete the Ph.D. degree in Physics at University of Rochester, Rochester, NY.
- (1994-1997) Scholarship of Comisión Nacional de Energía Atómica, to complete the Master in Physics degree at Instituto Balseiro, Bariloche, Argentina. Awarded to 30 students each year on the basis of a national competition.

## **Research Experience**

### (1995-1997) Student at Centro Atómico Bariloche

Particle Physics Group in Centro Atómico Bariloche, working with Prof. Luis Masperi. Studied the development of large-scale structure in the universe in the framework of a dynamical cosmological constant. Part of this work was published in Mod. Phys Letters A in 1998.

### (1998-2001) Graduate Student DØ Experiment, Fermilab

Construction of the Central Fiber Tracker (CFT) consisting of 80,000 scintillating fibers used for reconstructing charged-particle trajectories in the DØ detector. Involved in testing and characterization of the photon detectors used for this tracker (Visible Light Photon Counters, VLPC).

Developed an analysis technique for optimal use of information in proton-antiproton events at DØ. The test case for this idea was the measurement of the mass of the top quark in single-lepton top-antitop events. We demonstrated that the method could produce a significant reduction in the statistical uncertainty in the measurement of the mass of the top quark.

(2002-2004) Post-Doc at DØ Experiment, Fermilab

Top mass analysis with Run I data:

The final result in the lepton+jets channel had the same relative error in the mass as all the previous DØ and CDF measurements combined up to that moment. The result was published in the scientific journal Nature. Using the same technique measured the W-boson helicity in the single-lepton top-antitop events in collaboration with other DØ members. The result was published in Phys. Lett. B in 2005.

DØ detector upgrade:

Development of new front-end chip (TriP and TriPt) for the readout of the DØ Fiber Tracker. Performed system test of the new electronics with a prototype particle tracker. This electronics has been operating at Dzero size 2006.

Visible Light Photon Counters (VLPC) Studies:

Developed a new model for the VLPC that explained the behavior at high rates, specially interesting for the high occupancy environment at DØ. Two papers describing the model were published during 2004 and 2005 in Applied Physics Letters. This work received a recognition from the Institute of Electrical and Electronics Engineers (IEEE).

Accelerator beam studies:

During 2003 performed analysis of the data collected by the beams division to monitor the performance of the accelerator complex. Produced measurements of the beam shape in the Dzero interaction point using the silicon detector, this became an important tool for the beam experts to optimize the operation of the Tevatron.

(since 2004) Scientist at DES Experiment, Fermilab

Dark Energy Survey

Joined the Dark Energy Survey (DES) group at Fermilab in 2004. The project consists on building a wide field (3 square degrees) CCD camera (DECam) for an existing 4m telescope (the Blanco telescope in Cerro Tololo, Chile). The experiment will perform a galaxy survey and a supernovae survey optimized for the study of Dark Energy. The instrument will be delivered in 2011.

Worked on testing and characterization of the photon detectors for the DECam focal plane. These are optical CCD developed by LBNL with an extremely high sensitivity in the near infrared. Established a powerful CCD testing lab in the Silicon Detector facility (SiDet) at Fermilab to demonstrate that the detector satisfied the technical requirements for DES and to complete the characterization of all the scientific CCDs for the project. Also heavily involved in the integration testing of the instrument. Level 2 project Co-manager for the Focal Plane Detectors in the DECam project.

SDSS giant gravitational arcs:

Systematic search for gravitational arcs in galaxy cluster images from SDSS data, in collaboration with Fermilab's Experimental Astrophysicist Group (EAG). Completely automated survey was done with a new tool to detect the arcs in the cluster images. The results were published in The Astrophysical Journal during 2007. Follow up studies were carried out as part of the SOAR Gravitational Arc Survey (SOGRAS) in collaboration with group from Brazil.

SDSS galaxy cluster correlation function:

Using the galaxy cluster sample observed in SDSS data (maxBCG catalog) calculated the spatial correlation function for massive galaxy clusters in a photometric survey (no spectral information). The measurement showed for the first time a hint of the signature of the BAO in a galaxy cluster sample, and demonstrated the potential of the 3D correlation function as a probe for cosmology parameters in a photometric survey like DES. Developed a new method for including the redshift uncertainty in the model of the correlation function. Results published in Astrophysical Journal early in 2009.

CCD experiment at low background.

The low electronic readout noise (7.2 eV RMS) of the DECam detectors and relatively large mass makes them good candidates for a low threshold dark matter detector. Started an R&D project to understand the potential of CCDs for a low threshold dark matter search. Initial underground tests are being performed at NuMI near detector underground hall at Fermilab. This work received the PECASE award in 2010.

## Teaching Experience

- T.A. University of Rochester Fall (1998), Supervised three sessions of elementary physics labs for undergraduate students.
- Supervision of Undergraduate Students at FNAL (2001-20010)
- Supervisor of Ph.D. student Julia Campa from CIEMAT (Madrid, Spain), working on analysis of DES data (since 2008)
- Co-advisor of Ph.D. student Guillermo Fernandez Moroni from Universidad del Sur (Bahia Blanca, Argentina). Working on the development of a low noise readout system for CCD detectors (since 2009)

## Recent Presentations at Conferences

- "Opportunities in the Cosmic Frontier at Fermilab" , talk at the annual meeting of Mexican network for High Energy Physics, REDFAE 2011, Tlaxcala, Mexico, Jan 2010.
- "Opportunities in the Cosmic Frontier at Fermilab" , talk at the SILFAE 2010 conference in Valparaiso, Chile, Dec 2010.
- "Low Threshold Dark Matter Search with CCDs" , talk at the TeVPA 2010 conference in Paris, France, July 2010.

- “Focal Plane Detectors for the Dark Energy Camera” , talk at the SPIE 2008 conference in San Diego, California, June 2010.
- “Dark Matter Search with CCDs” , talk at the Taup 2009 conference in Rome, July 2009
- “Dark Energy Survey and Direct Dark Matter Search with CCDs”, talk at the ”Understanding the Dark Sector: Dark Matter and Dark Energy” conference, January 2009, Aspen, CO.
- “The Dark Energy Survey”, Acatualizacion en la Ensenanza de la Fisica, Universidad de Narino, August 2007.
- “Physics Results with Sloan Digital Sky Survey”, Fermilab User’s Meeting, June 2007, Batavia, IL.
- “The Dark Energy Survey”, XXI Annual meeting of the Mexican Division of Particles and Fields, June 2007, Mexico City, Mexico.
- “The Dark Energy Survey”, 210th Meeting of the American Astronomical Society, May 2007, Honolulu, Hawaii.
- ”Galaxy Clusters Correlation Function in SDSS”, Cluster of Galaxies as Cosmological Probes, Feb 2007, Aspen, Colorado.
- “Focal Plane Detectors for the Dark Energy Survey”, SPIE Astronomical Telescopes and Instrumentation, May 2006, Orlando Florida.
- The Dark Energy Survey”, UCLS Symposium on Sources and Detection of Dark Matter Dark Energy in the Universe, February , 2006. Marina del Rey, California.
- “Cosmology with supernovae type Ia in Sloan Digital Sky Survey (SDSS) and Dark Energy Survey (DES)”, Meeting of the American Physical Society (APS), Tampa, Florida, USA, April 2005.

### **Recent Invited talks**

- “Searching the Universe for Signs of Dark Energy”, Duke Distinguished Speaker at University of North Carolina - Charlotte, March 2011.
- “The accelerated expansion of the universe and the tools we are building to understand it”, HEP seminar at University of Rochester, Rochester, NY, February 2011.
- “The Dark Energy Survey” , keynote speaker for the meeting of the Society of Physics Students Zone-9, University of Wisconsin-Platteville, April 2010, Platteville, Wisconsin.
- “Dark Energy/Astrophysics” Summer lecture for Fermilab interns, July 2009, Batavia IL.
- “Why Math?” talk to minority students at the “High Energy - High Ambitions” program at Fermilab, March 2009
- “Dark Energy Survey”, seminar at University of Chicago, February 2009, Chicago, IL.
- “Dark Matter Search with CCDs”, Seminar at University of Illinois at Urbana-Champaign, December 2008.
- “The Dark Energy Survey”, Seminar at Pontificia Universidad Catolica de Chile, October 2008, Santiago, Chile.

- “The Dark Energy Survey”, Seminar at University of Rochester, January 2008, Rochester, NY.
- “The Dark Energy Survey”, Seminar at Centro Atomico Bariloche, Sept 2006, Bariloche, Argentina.
- “The Dark Energy Survey”, Seminar at Centro Brasileiro de Pesquisas Fisicas, Sept 2005, Rio de Janeiro, Brazil,

## **Selected Papers**

- “Focal plane detectors for Dark Energy Camera (DECAM)”, J. Estrada et al, Proc. SPIE, Vol. 7735, 77351R (2010).
- “Direct Dark Matter search using CCDs”, J. Estrada, Journal of Physics: Conference Series, Volume 203, Issue 1, pp. 012033 (2010), arXiv:0911.2668
- “The Correlation Function of Optically Selected Galaxy Clusters is the Sloan Digital Sky Survey”, J. Estrada, E. Sefusatti and J. Frieman, arXiv:0801.3485, The Astrophysical Journal, 692:265–282, 2009
- “Prospects for a direct dark matter search using high resistivity CCD detectors”, Estrada et al, 0802.2872.
- “Measurements of charge diffusion in deep-depletion CCDs by optical diffraction”, Cease, H.; Diehl, H. T.; Estrada, J.; Flaugher, B.; Scarpine, V., Experimental Astronomy (2007).
- A Systematic Search for High Surface Brightness Giant Arcs in a Sloan Digital Sky Survey Cluster Sample, J. Estrada, J. Annis, H.T. Diehl, P. B. Hall, T. Las, H. Lin, M. Makler, K. W. Merritt, V. Scarpine, S. Allam, D. Tucker, The Astrophysical Journal, Volume 660, Issue 2, pp. 1176-1185
- “Gain dispersion in Visible Light Photon Counters as a function of counting rate, A. Bross, V. Buescher, J. Estrada, G. Ginther and J. Molina, Fermilab-Pub-05-047-e, Appl. Phys. Lett. 87, 214102 (2005)
- “Helicity of the W Boson Lepton + jets tt events”, The DØ Collaboration, hep-ex/0404040, accepted for publication in Phys.Lett. B617 (2005).
- “Localized field reduction and rate limitations in Visible Light Photon Counters, A. Bross, J. Estrada, P. Rubinov, C. Garcia and B. Hoeneisen, Appl. Phys. Lett. (85), 2004, 6025.
- “An improved measurement of the top quark mass”, The DØ Collaboration, Nature (429) 2004, 638, hep-ex/0406031, Fermilab-Pub-04/083-E.
- “Tevatron Run II Luminosity, Emittance and Collision Point Size”, J. Slaughter, J. Estrada, K. Genser, A. Jansson, P. Lebrun, J. C. Yun and S. Lai, Proceedings of the Particle Accelerator Conference 2003.
- “Optimal Use of Information for Measuring Mt in lepton+jets tt Events”, Juan Estrada, Proceedings of 14th Topical Conference on Hadron Collider Physics (HCP2002).
- “Cosmic Ray Tests of the Preshower Detector”, P. Baringer et al., FERMILAB-Pub- 00/159-E, hep-ex/0007026, Nucl.Instrum.Meth. A469 (2001) 295-310

- “Dynamical Cosmological Constant and Relations Among Pseudo-goldstone Bosons”, Juan Cruz Estrada Vigil and Luis Masperi. Mod. Phys. Lett A14 (1998) 423-428.
- Co-author of 50 articles as member of the Dzero Collaboration, for more information visit <http://www-d0.fnal.gov/results/index.htm>