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Juansher Jejelava, PhD

Education

2006-2011 **Doctor of Philosophy (Summa Cum Laude)**, ILIA STATE UNIVERSITY, Georgia
Theoretical Physics (Elementary Particle Physics and Cosmology)

2004-2006 **Master of Science with Honours**, TBILISI STATE UNIVERSITY, Georgia
Theoretical Physics (Elementary Particle Physics and Cosmology)

2000-2004 **Bachelor of Science with Honours**, TBILISI STATE UNIVERSITY, Georgia
Main field of study for qualification: **Physics**

2002-2005 **Music School**, A. Virsaladze School Of Arts, TBILISI, Georgia
Class of Classical Piano

1992-2002 **Music School**, Experimental School of Music, at Tbilisi State Conservatoire, TBILISI, Georgia
Specialized in classical piano

1999-2000 **Secondary School**, Georgian Lyceum of Science and Technology, TBILISI, Georgia
Specialized in Physics and Mathematics

PhD Thesis

Title **Spontaneously Generated Gluons and Gravitons in Vector And Tensor Field Theories.**

Supervisor Prof. J.L. Chkareuli

Description The thesis explores the Spontaneous Lorentz Violation in Yang-Mills Theories and Linearised Gravity.

Research Experience

2016-Present **Senior Researcher**, Particle Physics Department, . Andronikashvili Institute of Physics, IVANE JAVAKHISHVILI STATE UNIVERSITY, TBILISI, Georgia
Spontaneous Lorentz Violation in Gravity Theories. Study Lorentz violation scenarios in various linearized gravity models. Responsible for analytical calculations in new frameworks, including calculating the new Feynman rules, propagating functions, and defining the new gauges for tensor fields. [1], [2].

2016-2019 **Participant**, SUSY Group, ATLAS Experiment, CERN, Geneva, Switzerland
ATLAS SUSY group. In collaboration with colleagues from University of Texas at Arlington (UTA) searches for Supersymmetry in final states with two leptons. Performed the study of systematic errors of different algorithms used in Monte-Carlo data simulations. [IG/49/1/16, SR NSF grant]. [3]

2017 **Participant**, TileCal UPGRADE, ATLAS Experiment, CERN, Geneva, Switzerland
Tile Calorimeter upgrade. Using the data from the test beam studied the digital noise distribution on a detector's cell level. Analyzed the energy reconstructing performances of various algorithms used in the detector.

2012-2016 **Researcher**, TileCal Signal Reconstruction Group, ATLAS Experiment, CERN, Geneva, Switzerland

Validation of a New, Signal Reconstruction Algorithm. Tuning-up and Stress-testing the new reconstruction method (COF - Constrained Optimal Filtering) for ATLAS hadronic calorimeter.

Signal Reconstruction Algorithms Performance Analysis for Tile Hadronic Calorimeter. Studied the signal occupancy of the TileCal cells by using the Main Bias pileup Monte-Carlo samples and provided a systematic comparison of the performances of different signal reconstruction algorithms, with the goal to improve Algorithm performance in LHC Run-2 [4].

Classification and Analysis the Corrupted Data. Digital error patterns analysis in the raw digital signal coming from the scintillator detector of the calorimeter. Study includes the analysis of the corrupted data statistics across TileCal detector; investigating the cell abnormal behaviorl and the reliability of reconstruction methods by improving the digital error masking and introducing new data quality estimators.

2010-2015 **Research Associate**, Center for Elementary Particle Physics, Institute of Theoretical Physics, ILIA STATE UNIVERSITY, TBILISI, Georgia

Spontaneous Lorentz Violation in Standard Model and Gravity and its Observational Manifestations. For the linearized gravity theories developed the script (in Wolfram Mathematica) and discovered the new axial-like gauge for the tensor field graviton $\partial^\rho(\partial_\mu h_{\nu\rho} - \partial_\nu h_{\mu\rho}) = 0$. Derived the propagator function of the graviton (compatible with current experiments in contrary for example to Fierz-Pauli theory). [6].

2006-2016 **Researcher**, Particle Physics Department, Andronikashvili Institute of Physics, IVANE JAVAKHISHVILI STATE UNIVERSITY, TBILISI, Georgia

Spontaneous Lorentz Violation in Yang-Mills Theories. constructed the σ-model for the non-ablian gauge theories, including, building the Lagrangian; the Lorentz symmetry violation mechanism; calculating (on a tree level) the scattering processes.[7],[8].

Teaching Experience

2015-Present **Associate Professor**, *School of Natural Science and Medicine*, ILIA STATE UNIVERSITY, Calculus for bachelor students; Special and General Relativity for master students; Optics; Electrodynamics

Duties also included courses in Cosmology and Particle Physics for the first year general profile bachelors; public lecturing; various outreach activities.

2021 **Invited Professor**, *Georgian Aviation University*, CAUCASUS UNIVERSITY, Electricity, Magnetism and Optics; Mechanics, Molecular Physics; El-Technics and Electronics

Giving the basic knowledge of Physics for the international students: Avionics Engineers and Pilots.

2017-2019 **Team Leader and Experienced Juror**, *on the International Young Physicists' Tournament. Representing the team of GEORGIA at* **IYPT 2017***(Singapore),* **IYPT 2018** *(Beijing, China) and* **IYPT 2019** *(Warsaw, Poland)*

Organizing selection process of Georgian national team. Organizing the local (Georgian) tournament. Reorganize and promote the local (national) tournament. Initiated the formal scoring system for selecting the national team.

2010-2012 **Assistant Professor**, *Caucasus School of Technology*, CAUCASUS UNIVERSITY, Physics II (Electricity and Magnetism); Electronics

In the beginning, the course targeted the basics of electronics for students interested in the computer science, but in the second-semester students showed some interest towards the electronic so the syllabus was rewritten and in the end, students were able to build and maintain some primitive robots.

2009-2014 **Assistant Teacher**, *School of Arts and Sciences*, ILIA STATE UNIVERSITY, Optics; Electrodynamics; Cosmology for bachelors; Elementary Particle Physics for Bachelors.

Teaching, tooting, assisting.

2009-2010 **Assistant Trainer**, *Georgian Team at International Physics Olympiad* **IPHO**, (Annual Competition for Secondary School Students in Physics), was hired by GEORGIAN NATIONAL SCIENTIFIC FOUNDATION, to be an Observer and assistant of team leaders at **IPHO 40th** and **IPHO 41th**

Responsibilities include: concocting unique problems for the Georgian national team in physics; helping students build up the skill necessary for participating in the International Physics Olympiad; at the actual event translating physics problems (from English to Georgian); helping students to appeal their scores.

2009-2010 **Coordinator's Assistant**, *National Examinations Center #3*, MINISTRY OF EDUCATION AND SCIENCE OF GEORGIA
Responsibilities included: helping to organize the delivering of examination problems in a secure and redundant way; collecting and sending fulfilled tests, complains etc. Dealing with urgencies and emergencies.

Communication Skills

2022-2023 Lecturer at International Masterclasses Organized by International Particle Physics Outreach Group, CERN

2020 Scientific adviser and co-creator of the animation video for the pro Covid-19 vaccination campaign: https://www.facebook.com/ForSet.ge/videos/240880164601352/

2020 Founder of Educational entertainment YouTube channel, in Georgian language, https://www.youtube.com/channel/UCx_jQeVsEwNw_BuVy-nCbiw

2018 Founder of The first scientific-entertaining podcast, in Georgian language, RSSfeed of Audio Stream
https://soundcloud.com/science_for_everyone
http://georgianscience.blogspot.com

2015 Finalist of FameLab Competition, CERN final, Geneva, Switzerland.

2014 Presenter at the Signal Reconstruction Group activity during the TileWeek, CERN, Geneve.

2007 The Semi Finalist of National Georgian Piano Competition, TBILISI, Georgia.

2004 Solo Piano Performer at the Classical Music Concert (Bach, Busoni, Beethoven, Liszt, Chopin), TBILISI, Georgia.

Computer Skills

Programming C++; Root; LaTeX; Git; Shell; Bash; Awk; Python; Wolfram Mathematica; Visual Basic.

Frameworks Ms Office; Adobe Creative Suite (Photoshop, Audition, Premiere Pro); Autodesk Inventor; TVpaint.

OS Windows, Linux.

Other Skills

2022 **Pipe Organ Technician:** Maintaining the pipe organ in the Tbilisi State Conservatoire's concert hall.

Interests

Classic Piano Playing	3D printing	Podcast Creating
Public Lecturing	Animation Creating	WoodWorking

Languages

Georgian: Native **Russian:** Bilingual Proficiency **English:** Full Professional Proficiency

Awards

2014 The Pascal Prize (Ilia State University)

Grants

2022-2023 Checking Lorentz Invariance of neutral weak bosons on ATLAS/CERN detector. **STEM-22-26041, Shota Rustaveli National Science Foundation.**

2022-2023 Science in everyday live: Energy efficiency and safety. **SPG-22-392, Shota Rustaveli National Science Foundation.**

2016-2017 Search for SuperSymmetry in proton-proton collisions produced at Large Hadron Collider (LHC/CERN), in collaboration with ATLAS group. **IG/49/1/16, Shota Rustaveli National Science Foundation.**

2014-2017 Spacetime Symmetries in Particle Physics and Cosmology - New Aspects and Applications. **DI/12/6-200/13, Shota Rustaveli National Science Foundation.**

2014-2015 Data Quality and Signal Reconstruction Algorithms study, in collaboration with ATLAS/Tile Calorimeter group at LHC/CERN. **YS/80/6-200/14, Shota Rustaveli National Science Foundation.**

2013-2014 Development and implementation of novelmethods for the signal reconstruction and processing of ATLAS hadronic calorimeter in collaboration with ATLAS/TileCalorimeter group at LHC/CERN. **YS/64/6-200/13, Shota Rustaveli National Science Foundation.**

2008-2010 Symmetry Patterns in Unified Theories of Quarks and Leptons: Their Origin and Spontaneous Violation. **07/462/4-270, Shota Rustaveli National Science Foundation.**

Workshops & Certificates

2020 (CERN software tutorial) Extended PxAOD Code and Common Analysis Framwork (CAF) Tutorial, GENEVA, Switzerland.

2019 (Team Leader and Experienced Juror) The 32th International Young Physicists' Tournament, IYPT 2019, Warsaw, Poland.

2018 (Team Leader and Experienced Juror) The 31th International Young Physicists' Tournament, IYPT 2018, Beijing, China.

2017 (Team Leader and Juror) The 30th International Young Physicists' Tournament, IYPT 2017, Singapore.

2017 (CERN Safety Training Courses) First Aider - Level 1 - Initial, *EDH:6637171, 10-Mar-17*, GENEVA, Switzerland.

2017 (CERN Safety Training Courses) Radiation Protection - Controlled Area, *EDH:6636269, 01-Feb-17*, GENEVA, Switzerland.

2017 (CERN Safety Training Courses) Fire Extinguisher, *EDH:6637189, 14-Mar-17*, GENEVA, Switzerland.

2017 (CERN Safety Training Courses) Self-Rescue Mask - Initial, *EDH:6637359, 19-Jan-17*, GENEVA, Switzerland.

2016 (Participant) The 54th Course of the International School of Subnuclear Physics: "THE New Physics Frontiers in the LHC-2 Era", ERICE, Italy.

2015 (Speaker) The Poster Session During the ATLAS Week, at CERN: "Recent development and signal reconstruction performance", GENEVE, Switzerland

2014 (Participant) The 52th Course of the International School of Subnuclear Physics: "Status of Theoretical Understanding and of Experimental Power for LHC Physics and Beyond", ERICE, Italy.

2012 (Team Leader) The 8th International Zhautykov Olympiad in Physics, Almaty, Kazakhstan.

2011 (Participant) The Joint ISTC-CERN-JINR Summer School on High-Energy Physics and Accelerator Physics, CERN, Switzerland.

2010 (Participant) The Joint ISTC-CERN-JINR Summer School on High-Energy Physics and Accelerator Physics, ASTANA, Kazakhstan.

2010 (Participant) The 48th Course of the International School of Subnuclear Physics: "What Is Known And Unexpected At LHC", ERICE, Italy.

2010 (Observer) The 41th International Physics Olympiads, IPHO 2010, ZAGREB, Croatia

2009 (Speaker) International Conference 'Physics at the Future Colliders', TBILISI, Georgia.

2009 (Observer) The 40th International Physics Olympiads, IPHO 2009, MERIDA, Yukatan, Mexico.

2008 (Participant) "Introductory School on Gauge Theory/Gravity Correspondence" SMR Number: 1943 ICTP (International Centre for Theoretical Physics), TRIESTE, Italy.

Contributions

2022 · High Energy Physics and LHC experiments, CERN International Masterclasses

2018 · UTA plans, https://indico.cern.ch/event/689379/

2017 · Pedestal Noise Analysis (New electronics of TileCal), https://indico.cern.ch/event/633267/contributions/2565641/

· Systematic Uncertainties (Hard Scatter Generation; Fragmentation/Hadronization model), https://indico.cern.ch/event/616053/

2016 · Jets with OF1 and OF2, http://indico.cern.ch/event/486143/

· Validation of Jets, http://indico.cern.ch/event/486141/

2015 · Validation of COF, http://indico.cern.ch/event/437291/

· Jet reconstruction with COF and OF2, http://indico.cern.ch/event/437290/

· Validation of COF method with MC15, http://indico.cern.ch/event/437287/

· Status of COF/OF2 MC15 samples, http://indico.cern.ch/event/437284/

· Status of MC15 reconstruction, http://indico.cern.ch/event/385203/

· Updates on COF validation and public plots, http://indico.cern.ch/event/378600/

· Wrap up on COF validation, http://indico.cern.ch/event/378600/

· Public plots: Energy reconstruction COF performance, http://indico.cern.ch/event/364991/

· Wrap up on COF validation, http://indico.cern.ch/event/367598/

· First look at OF1 weights, DB tools (TBC), http://indico.cern.ch/event/361884/

2014 · TileCal signal reconstruction, http://indico.cern.ch/event/298118/

· Occupancy studies of E-cells using MB pileup MC, http://indico.cern.ch/event/294615/

· Updates on performances studies of different algorithm in MB-pileup environment with the Pulse Simulator, http://indico.cern.ch/event/294615/

2013 · Reconstruction performances with Pulse Simulator, http://indico.cern.ch/event/277072/

· MB pileup distributions for Pulse Simulators, http://indico.cern.ch/event/277071/

· Corrupted data and QF studies, http://indico.cern.ch/event/224902/

· Quality factor studies updates, http://indico.cern.ch/event/238223/

· Corrupted Data Analysis Update, http://indico.cern.ch/event/238208/

· Statistics of corrupted events during 2012, http://indico.cern.ch/event/211596/

· Corrupted data statistics, http://indico.cern.ch/event/205647/

· Corrupted data masking statistics, http://indico.cern.ch/event/204818/

· Preliminary studies on negative amplitude tail, http://indico.cern.ch/event/184305/

Publications

1. J. L. Chkareuli, J. Jejelava and Z. Kepuladze, "Emergent photons and gravitons," Bled Workshops Phys. **19** (2018) no.2, 74-89 [arXiv:1811.09578 [physics.gen-ph]].
2. J. L. Chkareuli, J. Jejelava and Z. Kepuladze, "Lorentzian Goldstone modes shared among photons and gravitons," Eur. Phys. J. C 78 (2018) no.2, 156 doi:10.1140/epjc/s10052-018-5647-x [arXiv:1709.02736 [hep-th]].
3. M. Aaboud et al. [ATLAS Collaboration], "Search for direct top squark pair production in final states with two leptons in $\sqrt{s} = 13$ TeV pp collisions with the ATLAS detector,"

arXiv:1708.03247 [hep-ex].

4. J. Jejelava, "Comparison of Different Reconstruction Methods with the PulseSimulator", https://cds.cern.ch/record/1976207/files/ATL-COM-TILECAL-2014-086.pdf (for ATLAS internal circulation, only).
5. **Since 2014 in ATLAS AUTHOR LIST**.
6. J. L. Chkareuli, J. G. Jejelava and G. Tatishvili, "Graviton as a Goldstone boson: Nonlinear Sigma Model for Tensor Field Gravity," Phys. Lett. B 696 (2011) 124 [arXiv:1008.3707 [hep-th]].
7. J. L. Chkareuli, C. D. Froggatt, J. G. Jejelava and H. B. Nielsen, "Constrained gauge fields from spontaneous Lorentz violation," Nucl. Phys. B 796 (2008) 211 [arXiv:0710.3479 [hep-th]].
8. J. L. Chkareuli and J. G. Jejelava, "Spontaneous Lorentz Violation: Non-Abelian Gauge Fields as Pseudo-Goldstone Vector Bosons," Phys. Lett. B 659 (2008) 754 [arXiv:0704.0553 [hep-th]].