Curriculum Vitae

Abraham Tishelman-Charny

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EXPERIENCE

Brookhaven National Laboratory, Upton, NY USA Postdoctoral Researcher

EDUCATION

Northeastern University, Boston, MA USA Ph.D Physics

- Dissertation Topic: Probing the Higgs via pair production in the two W boson two photon channel at CMS: Past, present, and future [1]
- Advisor: Professor Toyoko Orimoto

Northeastern University	2016 - 2018
Master of Science	
Physics	
Stony Brook University	2012 - 2016
Bachelor of Science	
Physics	
Cum laude	

• Advisor: Professor Abhay Deshpande

AWARDS AND RECOGNITIONS

BNL spotlight award (2023)	In recognition of exceptional job performance.
Dissertation Completion Fellowship (2022)	Awarded final semester of funding to complete dissertation.
CMS Award (2020)	For outstanding contributions to the ECAL trigger group in preparation for LHC Run 3.
Northeastern University Lawrence Award (2017)	For excellence in teaching.



Sep. 2022 - present

Jul. 2016 - Sep. 2022

SEMINARS AND COLLOQUIA

- 2 April 2024: SLAC FPD seminar Inner tracking for inner beauty [2]
- 7 March 2024: Union College, Physics Astronomy Department, Colloquium series Searching for beauty with beauty in the Higgs sector [3]
- 21 September 2023: Particle Physics Seminars at BNL Searching for beauty with beauty in the Higgs sector [4]
- 27 July 2022: Thesis defense Probing the Higgs via pair production in the two W boson two photon channel at CMS: Past, present, and future
- 16 May 2022: QFT research seminar, Institute for theoretical physics, University of Munster [5] Higgs Pair Production: An experimental overview [6]
- 7 April 2022: Searching for Higgs Pair Production with the CMS Electromagnetic Calorimeter [7]

RESEARCH ACTIVITIES

ATLAS ITk strips Phase II tracker upgrade

- Working on various tasks related to the ATLAS phase II tracker upgrade, specifically the strips barrel, at Brookhaven National Laboratory
- Responsible for all ITk strips barrel module testing at BNL. This responsibility involves the technical ability to run DAQ and coldbox software, and a strong understanding of the related software and hardware in order to train newcomers, and help troubleshoot testing problems.
- Part of ITk strips barrel module QC (Quality Control) is the use of a coldigi: a setup comprising necessary temperature control, DAQ, and monitoring of hardware. Served as US contact of the coldjig software.

ATLAS Legacy Run 2 HH \rightarrow bb $\gamma\gamma$ analysis

- Participated in the ATLAS Legacy Run 2 HH $\rightarrow \gamma\gamma$ bb analysis, ATLAS analysis number HDBS-2021-10.
- Wrote instructions to run full analysis chain, to be used by newcomers to the analysis, and serve as documentation for how to run the analysis.
- Contributor in producing results for Higgs Effective Field Theory interpretation of analysis
- Presented the ATLAS internal approval talk of the analysis.

FCC feasibility studies

• Working on Future Circular Collider (FCC) feasibility studies - estimating the sensitivity of measuring the Higgs self-coupling during the $\sqrt{s} = 240$ GeV phase of FCC-ee via a precision measurement of the ZH cross section.

CMS Nonresonant HH \rightarrow WW $\gamma\gamma$ analysis

- Analysis contact of the search for nonresonant HH \rightarrow WW $\gamma\gamma$, with CMS (Compact Muon Solenoid) analysis number HIG-21-014.
- Developed a new event tagger, and multiclassifier deep neural network for separation of signal, resonant background and continuum background in the most sensitive WW $\gamma\gamma$ channel, WW $\gamma\gamma \rightarrow qq\ell\nu\gamma\gamma$.
- Led a working group of 13 members from three institutes and served as analysis contact for review within the Higgs physics analysis group and Higgs to gamma gamma subgroup. This role included the organization and chairing of weekly meetings to coordinate and plan various analysis activities.

Sep. 2022 - present

2019 - 2022

Sep. 2022 - present

Sep. 2022 - present

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• Developed various analysis tools written in Python and C++

CMS ECAL Run Coordinator

- Served as CMS ECAL (Electromagnetic Calorimeter) run coordinator for a period of one year.
- Responsibilities included coordinating the running activities of the ECAL operations teams, and serving as the point of contact between the ECAL operations teams and CMS run coordinators.
- This position required a comprehensive knowledge of the CMS ECAL operations, and the ability to communicate well between various detector operations teams.
- This position also included the support and training of on-call ECAL shifters.
- Coordinated ECAL operational activities at the end of 2021, during periods of cosmic data taking and the 2021 LHC beam test.
- Coordinated CMS ECAL operations during the 2022 commissioning period, and coordinated the training of new ECAL shifters.

CMS ECAL trigger optimization for Run 3

- Studied the optimization of the ECAL trigger for LHC (Large Hadron Collider) Run 3. Studies included the re-optimization of ECAL Level-1 (L1) finite impulse response weights for updated electronic signal shapes and pileup, and the investigation of double ECAL L1 weights for out-oftime signal identification, a previously unused electronics feature at the CMS ECAL.
- Made significant contributions to an ECAL analyzer tool written in python and C++ [8] used to analyze ECAL data
- Worked on ECAL electronics emulator development and had multiple pull requests to the CMSSW repository (CMS software) reviewed and merged [9]

CMS Run Field Manager

- Performed CMS Run Field Manager shifts for two weeks during April 2022 beam splashes, two weeks during the first 2022 $\sqrt{s} = 900$ GeV collisions in May/June 2022, and two weeks in August 2022 during the LHC intensity ramp-up period of LHC Run 3.
- Through this role, I was responsible for forming the daily and weekly run plan according to the strategic goals set by the CMS Run Coordinators, and facilitated the execution of this plan with the shift leaders and the rest of the shift crew.
- This role required a strong, comprehensive understanding of CMS operations and the interconnected nature of the many CMS subsystems, and the ability to plan tests around the experiment's technical and time-sensitive constraints.

CMS control room shifter

- Performed CMS shift leader and technical shifter duties during LHC Long Shutdown 2 to commission CMS for LHC Run 3.
- During shifts, was responsible for the safety and success of the CMS detector and its members.

ECAL on-call shifter

• Performed Prompt Feedback Group, Detector on Call, Detector Guru Lieutenant, Data acquisition, and trigger expert shift duties for the CMS ECAL during LHC Run 2 and commissioning for Run 3.

April 2022 - August 2022

2018 - 2022

Sep. 2021 - Sep. 2022

2018 - Sep. 2022

2020 - 2022

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• During each shift, was responsible for the smooth running of ECAL operations, and minimization of dead time.

Phase II HH $\rightarrow \gamma \gamma + (WW, \tau \tau)$ projection studies

- Participated in studies aimed at projecting HL-LHC results in the HH $\rightarrow \gamma \gamma + (WW, \tau \tau)$ channels, as a part of the Snowmass scientific study.
- CMS analysis number FTR-21-003 public result: [10]
- Shared strategy and lessons learned from the Run 2 HH \rightarrow WW $\gamma\gamma$ analysis
- Worked on analysis strategy, including the determination of simulated signal and background processes to use based on experience from Run 2 analysis.
- Validated and formed requests for multiple MC (Monte Carlo simulation) backgrounds
- Aided in computing signal significance results using the CMS Higgs combine tool.

CMS HH MC generator validation and production

- Produced and validated HH MC generators using MadGraph5_aMC@NLO. These generators were used for Monte Carlo production requests made by di-Higgs analysis teams at CMS
- Required the creation and testing of pull requests, merged to the central CMS generator productions repository [11]

Photon ID with a Convolutional Neural Network

- Performed studies aimed at differentiating prompt and nonprompt (from jets, $\pi_0 \to \gamma \gamma$) photon signatures using a CNN (Convolutional Neural Network).
- The images used for training and evaluation of the network were ECAL reconstructed energy hits. The shapes of these images are slightly different due to the different ECAL energy spreads produced from prompt and nonprompt photons.

ECAL GPU studies

• Investigated the potential gain of running CMS ECAL reconstruction code at HLT (High Level Trigger) on GPUs rather than CPUs, to see if computational time can be reduced.

Development of ECAL monitoring tool

• Developed a payload monitor for ECAL electronics, whose purpose is to monitor any anomalous amounts of data processed by ECAL electronics. Written in Javascript, using Node JS

TALKS AND POSTERS

43rd International Symposium on Physics in Collision, NCSR Demokritos October 2024

• Plenary talk: "Higgs measurements from CMS and ATLAS" [12]

LHCP, Northeastern University, 2024

• Poster: "Mitigation strategies for sensor fracturing in the ITk Strip Detector" [13]

Second US FCC workshop, MIT, 2024

• Plenary lightning talk session: "What can we say about the Higgs self-coupling with the hadronic ZH process at FCC-ee?" [14]

Spring 2022

Fall 2018

March 2024

June 2024

Apr. 2021 - Mar. 2022

March 2021 - 2022

April 2020 - June 2020

TWEPP 2023

• Poster: "The quality control programme for ITk strip tracker module assembly" [15]

Multi-Boson Interactions 2023

• "Studies of new Higgs boson interactions through nonresonant HH production in the $bb\gamma\gamma$ final state in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector" [16]

Inaugural US FCC workshop, BNL, 2023

• "Improving the Higgs self-coupling measurement with Z(cc)H" [17]

APS April Meeting 2022

• "The L1 Trigger of the CMS Electromagnetic Calorimeter: Implementing a new timing feature for LHC Run 3" at the April 2022 Meeting of the American Physical Society (APS2022). [18]

TIPP 2021

• Poster: "ECAL trigger performance in Run 2 and improvements for Run 3" at the International Conference on Technology and Instrumentation in Particle Physics (TIPP2021).

2019 APS DPF

• Presented the talk: "Optimizing the performance of the CMS ECAL trigger for Runs 2 and 3 of the CERN LHC" at the 2019 Meeting of the Division of Particles and Fields of the American Physical Society.

2019 Winter LHCC meeting

• Poster: "The CMS ECAL upgrade for precision crystal calorimetry and timing at the HL-LHC" at the 2019 Winter LHCC meeting.

PUBLICATIONS AND PUBLIC RESULTS

- A. Tishelman-Charny on behalf of the ATLAS ITk collaboration. "Mitigation strategies for sensor fracturing in the ATLAS ITk strips detector". In: Proceedings of Science (2024). URL: https://pos.sissa.it/478/215/pdf
- A. Tishelman-Charny et al. "An extreme thermal cycling reliability test of ATLAS ITk Strips barrel modules". In: Journal of Instrumentation 19 (2024). arXiv: 2407.06370. URL: https: //iopscience.iop.org/article/10.1088/1748-0221/19/10/P10002
- A. Tishelman-Charny on behalf of the ATLAS ITk Collaboration. "The quality control programme for ITk strip tracker module assembly". In: Journal of Instrumentation 19 (2024). arXiv: 2401.17054. URL: https://iopscience.iop.org/article/10.1088/1748-0221/19/03/C03015
- Studies of new Higgs boson interactions through nonresonant HH production in the $bb\gamma\gamma$ final state in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. Tech. rep. CERN, 2023. URL: https: //atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/CONFNOTES/ATLAS-CONF-2023-050/ATLAS-CONF-2023-050.pdf
- Abraham Tishelman-Charny on behalf of the CMS Collaboration. "ECAL trigger performance in Run 2 and improvements for Run 3". In: Journal of Physics: Conference Series 2374.1 (2022), p. 012088. URL: https://dx.doi.org/10.1088/1742-6596/2374/1/012088
- Search for nonresonant Higgs boson pair production in the WWyy channel in pp collisions at $\sqrt{s} = 13$ TeV. Tech. rep. CERN, 2022. URL: https://cds.cern.ch/record/2840773

October 2023

April 2022

April 2023

August 2023

May 2021

27 February, 2019

29 July 2019 - 2 August 2019

- The CMS collaboration. "Prospects for HH measurements in the WW $\gamma\gamma$ and $\tau\tau\gamma\gamma$ final states in proton-proton collisions at $\sqrt{s} = 14$ TeV at the High Luminosity-LHC". in: (2022). URL: http://cds.cern.ch/record/2804003
- A. Tishelman-Charny, on behalf of the CMS collaboration. "Optimizing the Performance of the CMS ECAL Trigger for Runs 2 and 3 of the CERN LHC". in: 2019. arXiv: 1910.06232 [physics.ins-det]
- K.G. Capobianco-Hogan, R. Cervantes, A. Deshpande, N. Feege, T. Krahulik, J. LaBounty, R. Sekelsky, A. Adhyatman, G. Arrowsmith-Kron, B. Coe, K. Dehmelt, T. K. Hemmick, S. Jeffas, T. LaByer, S. Mahmud, A. Oliveira, A. Quadri, K. Sharma, and A. Tishelman-Charny. "A magnetic field cloak for charged particle beams". In: Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 877 (2018), pp. 149-156. arXiv: 1707.02361. URL: http://dx.doi.org/10.1016/j.nima.2017.09.034

TEACHING AND MENTORING

BNL: ATLAS ITk and HH

- Mentored and worked with various students based at BNL:
 - Mounia Laassiri (BNL): Mentored in the ITk strips module testing software, specifically coldig software development for environmental monitoring.
 - Emily Duden (PhD student, Brandeis University): Mentoring in ITk strips module testing. Trained in testing procedures, troubleshooting, and documentation methods.
 - Fatima Bendebba (PhD student): Mentoring the student in setting up Stave DCS system, and Run 3 ATLAS Higgs pair production analysis.

BNL: FCC feasibility studies

- Mentored an undergraduate student (Phillip Ionkov, Columbia University) in FCC feasibility studies at BNL as part of the BNL Summer Undergraduate Laboratory Internships program (SULI -Jun - Aug 2023).
- Currently mentoring the student in continuation of FCC studies during the Fall 2023 semester

Northeastern University: CMS experiment research Oct. 2021 - Sep. 2022

- Mentored a PhD student, Amrutha Krishna, in the Northeastern University research group on CMS ECAL Monitoring and Calibration work.
- Mentored a PhD student, JP Dervan, in performing research on the optimization of the CMS ECAL for LHC Run 3.

Northeastern University: Introductory Physics Laboratory

- Taught laboratory courses for physics undergraduate courses:
 - Physics for Life Sciences
 - Physics for Engineering

Physics II for science students

• Taught recitation class, graded quizzes and homeworks.

Sep 2022 - present

Jun 2023 - present

2016 - 2018

Spring 2018

OUTREACH AND COMMITTEES

BNL bb $\gamma\gamma$ workshop

- Main organizer of this small workshop of 8 in-person participants from multiple institutes.
- Organized the agenda, invited in-person and remote speakers, planned and led facility tours.

HEP advocacy trip

- Traveled to Washington DC as part of a group of 71 physicists from universities and laboratories around the US to advocate for HEP funding.
- Led 3 meetings in congressional offices where I explained the goals and status of HEP, the recent P5 report, how HEP impacts the office's congressional district, and shared our ask for FY25 (\$1.385B within the DOE/NSF budgets).
- Served as secondary in 7 meetings. During these meetings, focused on taking notes to be used to produce detailed meeting reports and keep track of follow-up items to share with staffers.
- Participated in Executive meeting at DOE HQ, sharing my experience from meetings with congressional offices during the week.

SLAC bb $\gamma\gamma$ workshop

- Helped organize, and participated in, a small $bb\gamma\gamma$ workshop at SLAC about 10-15 participants total. This included developing and creating the workshop agenda, inviting speakers, sending announcements.
- Led the analysis framework tutorial, gave report on status of the Run 2 + (partial) Run 3 resonant bb $\gamma\gamma$ analysis.

FCC week 2023 ECR panel

• Served on a panel of early career researchers at FCC week 2023 to answer questions and share thoughts on the future of HEP

FCC workshop local organizing committee

- Was part of the local organizing committee for the first US FCC workshop, hosted at BNL.
- Organized tours of BNL facilities for guests of the workshop.

CMS tour guide

• Led tour groups through the surface buildings at LHC point 5, and through the underground experimental cavern to view the CMS detector.

8-12 April, 2024

Jun - Aug 2023

June 2023

3-5 April 2024

2019 - 2022

30 September 2024 - 2 October 2024

EXTERNAL LINKS

- [1] http://cds.cern.ch/record/2824863
- [2] https://indico.slac.stanford.edu/event/8828/

[3] https://atishelmanch.github.io/Documents/7_March_2024_Searching_For_Beauty_Wit h_Beauty_In_The_Higgs_Sector.pdf

[4] https://indico.bnl.gov/event/20453/

[5] https://www.uni-muenster.de/Physik.TP/en/teaching/courses/research_seminar_qu antum_field_theory_ss2022.html

[6] https://atishelmanch.github.io/Documents/16_May_2022_Higgs_Pair_Production_An_ Experimental_Overview.pdf

[7] https://indico.slac.stanford.edu/event/7185/

[8] https://github.com/CMS-ECAL-Trigger-Group/ETTAnalyzer

[9] https://github.com/cms-sw/cmssw/pulls?q=is%3Apr+is%3Aclosed+author%3Aatishelmanch

[10] http://cds.cern.ch/record/2804003

[11] https://github.com/cms-sw/genproductions/pulls?q=is%3Apr+is%3Aclosed+author% 3Aatishelmanch

[12] https://indico.cern.ch/event/1414470/contributions/6172142/

[13] https://indico.cern.ch/event/1253590/contributions/5849131/

[14] https://indico.mit.edu/event/876/contributions/2602/attachments/1073/1790/26 _March_2024_MIT_USFCC_WS_Selfcoupling.pdf

[15] https://indico.cern.ch/event/1255624/contributions/5445339/

[16] https://indico.cern.ch/event/1263917/timetable/?view=standard#8-studies-of-n
ew-higgs-boson-i

[17] https://indico.cern.ch/event/1244371/contributions/5318805/attachments/26350 11/4558438/25_April_2023_FCCworkshopTalk%20(2).pdf

[18] https://meetings.aps.org/Meeting/APR22/Session/E12.1