

# Curriculum Vitae

## Abraham Tishelman-Charny

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### EDUCATION

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**Northeastern University**, Boston, MA USA  
Ph.D. Candidate  
Physics

*Jul. 2016 - Jul. 2022*

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

**Northeastern University**  
Master of Science  
Physics

*2016 - 2018*

**Stony Brook University**  
Bachelor of Science  
Physics  
Cum laude

*2012 - 2016*

- Advisor: Professor Abhay Deshpande

### AWARDS AND RECOGNITIONS

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**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.

### PUBLIC SEMINARS

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- April 2022: *Searching for Higgs Pair Production with the CMS Electromagnetic Calorimeter* - [ref.]
- May 2022: *Higgs Pair Production: An experimental overview* - [ref.]

### RESEARCH ACTIVITIES

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

*2019 - present*

- 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,  $WW\gamma\gamma \rightarrow q\bar{q}\ell\nu\gamma\gamma$ .

- Leading a working group of 13 members from three institutes and serving as analysis contact for review within the Higgs physics analysis group and Higgs to gamma gamma subgroup. This includes organizing and chairing weekly meetings to coordinate and plan various analysis activities.
- Developed various analysis tools written in Python and C++

### **CMS ECAL Run Coordinator**

*Sep. 2021 - Sep. 2022*

- Appointed CMS ECAL (Electromagnetic Calorimeter) run coordinator for a period of one year.
- Responsibilities include coordinating the running activities of the ECAL operations teams, and acting as the point of contact between the ECAL operations teams and CMS run coordinators.
- This position requires an excellent knowledge of the CMS Electromagnetic Calorimeter operations, and the ability to communicate well between various detector operations teams.
- This position also includes 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.
- Coordinating current CMS ECAL running activities for the 2022 commissioning period and training new ECAL shifters.

### **CMS ECAL trigger optimization for Run 3**

*2018 - Sep. 2022*

- 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-of-time signal identification, a previously unused electronics feature at the CMS ECAL.
- Made significant contributions to an ECAL analyzer tool written in python and C++ [ref.] 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 [ref.]

### **CMS Run Field Manager**

*April 2022 - June 2022*

- Performed CMS Run Field Manager shifts for two weeks during April 2022 beam splashes, and two weeks during the first 2022 900 GeV collisions in May/June 2022
- Through this role, I set the daily and weekly run plan according to the strategic goals set by CMS Run Coordinators, and facilitated the execution of this plan with the shift leaders and the rest of the shift crews.
- This role requires a strong understanding of CMS operations and the interconnected nature of the many subsystems, and the ability to plan tests around the experiment's constraints.

### **CMS control room shifter**

*2020 - present*

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

### **ECAL on-call shifter**

*2018 - 2022*

- 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.

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

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

*Apr. 2021 - Mar. 2022*

- 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: [ref.]
- 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
- Performed initial significance extraction results using the CMS Higgs combine tool.

### **CMS HH MC generator validation and production**

*March 2021 - present*

- Produced and validated HH MC generators using MadGraph5\_aMC@NLO. These generators are used for Monte Carlo production requests made by di-Higgs analysis working groups at CMS
- Requires the creation and testing of pull requests to the central CMS generator productions repository [ref.]

### **Photon ID with a Convolutional Neural Network**

*April 2020 - June 2020*

- Performed studies aimed at differentiating prompt and nonprompt (from jets,  $\pi_0 \rightarrow \gamma\gamma$ ) photon signatures using a CNN (Convolutional Neural Network).
- The images used for training and evaluation of the network are 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**

*Spring 2022*

- 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**

*Fall 2018*

- 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

### **CMS tour guide**

*2019 - present*

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

## **CONFERENCE TALKS AND POSTERS**

### **APS April Meeting 2022**

*May 2021*

- Chosen as speaker for the talk: “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). [ref.]

## TIPP 2021

May 2021

- Presented the 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

29 July 2019 - 2 August 2019

- 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

27 February, 2019

- Presented the 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

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- 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>
- (*Accepted, to be published*) **A. 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* 877 (2021)
- **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

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### Northeastern university: CMS experiment research

Oct. 2021 - present

- Mentoring a PhD student in the Northeastern University research group
- Guiding the student in performing research on the optimization of the CMS ECAL for LHC Run 3

### Northeastern University: Introductory Physics Laboratory

2016 - 2018

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

### Physics II for science students

Spring 2018

- Taught recitation class, graded quizzes and homeworks.