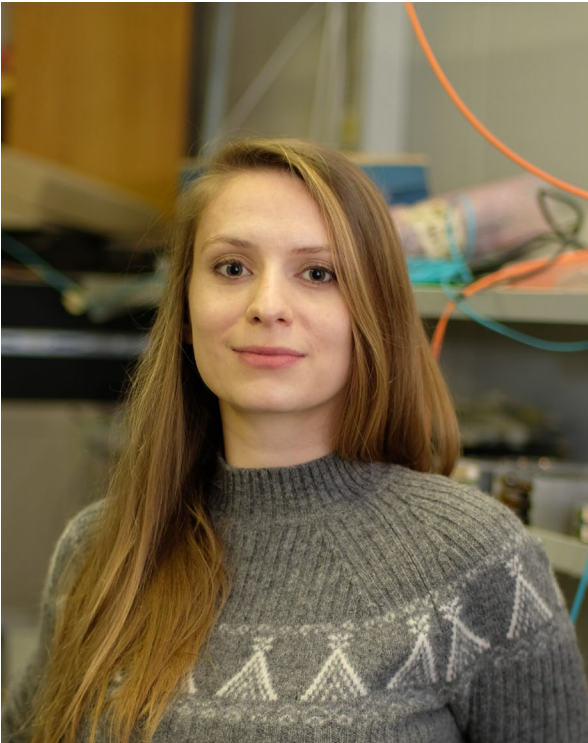


# When They Go Low, We Go Lower: Extending the Reach of Collider Experiments with Low-Level Detector Information

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Even in the time of streaming and industrial big-data, the experiments at the Large Hadron Collider still produce data of staggering size and rate. To combat this, low-level detector information is often removed, reduced, or recast; however, the lowest-level detector information holds exciting phase space for both beyond the Standard Model searches and precision measurements. I will present the Compact Muon Solenoid (CMS) experiment's most recent search for heavy stable charged particles (HSCPs) in the tracker using  $dE/dx$  information. Characterized by anomalously large ionization energy loss, HSCPs are a signature driven search enabled by the inclusion of low-level information in the readout of the silicon pixels and strips. Looking toward future colliders, the Particle Physics Project Prioritization Panel (P5) recommendation of a Higgs factory demands precision detectors. To meet this challenge, we are developing high resolution homogenous crystal calorimetry through the measurement and separation of scintillation and Cherenkov light -- information that currently is lost in calorimeters like those in CMS. This talk will review our first proof-of-principle measurements collecting Cherenkov and scintillation light in homogeneous crystals preparing for the precision electromagnetic calorimeter layers of the future.

**Speaker bio:** Grace Cummings received her PhD at the University of Virginia in 2022. During that time, Grace was primarily based at CERN, in Geneva, Switzerland, working on the Hadronic Calorimeter Phase I Upgrade of the CMS Detector and searches for beyond the standard model particles. Grace now is a Lederman Fellow at Fermi National Accelerator Laboratory outside of Chicago, IL. Grace's CMS research entails searches for long-lived particles, a convenership of the Vector-like Quark search program at CMS, and front-end ASIC radiation testing for the High Granularity Calorimeter Phase II Upgrade. Grace is leading detector development for future colliders as the leader of the Dual Readout Calorimetry subgroup in the DOE's Higgs Factory Coordination Committee, and is an active participant in the CalVision consortium for homogenous optical calorimetry R&D.