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Research Interests:

Experiments at the Large Hadron Collider

The experiments at the Large Hadron Collider (LHC) at CERN are at the energy frontier of particle physics, searching for answers to fundamental questions of nature. In particular, dark matter (DM) presents strong evidence for physics beyond the standard model (SM). However, there is no experimental evidence of its non-gravitational interaction with SM particles. The LHC provides an opportunity to probe this interaction, by producing DM particles in proton-proton collisions. While the DM particles would not produce an observable signal in the detector, they may recoil with large transverse momentum against visible particles radiated from the initial state resulting in an overall transverse momentum imbalance in the collision event. Search for DM particles in such final states is the primary focus of my research program at the Compact Muon Solenoid (CMS) experiment.

I am also deeply involved in the development of CMS object reconstruction algorithms and in the monitoring of their performance. I am currently the convener of the jet and missing transverse momentum physics group.

By 2025, the LHC will be upgraded with a goal to increase the integrated luminosity by a factor of 10 beyond the original design. This new design, known as the High Luminosity LHC (HL-LHC), will increase the discovery potential for new particles beyond the SM such as DM. For the HL-LHC, the CMS experiment will need new readout electronics to fully exploit the demanding operating conditions and the delivered luminosity. In this regard, in coordination with the Electronics Design Facility at BU, I am leading the development of the inner tracker (pixel) Data, Trigger and Control (DTC) readout boards

which will be based on Advanced Telecom Computer Architecture. The pixel detector is an essential component of CMS and it is used in the reconstruction of nearly every object, and thus nearly every physics analysis. Therefore, efficient and error free readout of the pixels is crucial for the success of the CMS physics program. We will deliver approximately 70 boards for the full system and all will be extensively tested in the lab environment.

Selected Publications:

"Search for new physics in nal states with an energetic jet or a hadronically decaying W or Z boson and transverse momentum imbalance at \sqrt{s} = 13 TeV," Phys. Rev., vol. D97, no. 9, p. 092005, 2018.

"Search for invisible decays of the Higgs boson produced through vector boson fusion at √s = 13 TeV, submitted to Phys. Letters, vol. B

"Search for dark matter produced with an energetic jet or a hadronically decaying W or Z boson at √s = 13 TeV," J. High Energy Phys., vol. 07, p. 014, 2017.

"Searches for invisible decays of the Higgs boson in pp collisions at √s=7, 8, and 13 TeV," J. High Energy Phys., vol. 02, p. 135, 2017.

"Search for exotic decays of a Higgs boson in to undetectable particles and one or more photons", Phys. Lett. B 753 363-388, 2016