



PHYSICS AND ASTRONOMY SEMINAR

Kayla McLean,
UVic

“Searching for dark matter in events with missing transverse momentum and a Z boson in the ATLAS detector at the LHC”

Abstract

“Astronomical measurements show that dark matter exists in our universe, but its nature is unknown. A number of theories attempt to explain dark matter, with many models predicting it can be produced via the interaction of Standard Model particles. Some models predict that dark matter is a weakly interacting massive particle (WIMP) that may be produced in pairs via the decay of a dark matter mediator, or through an invisible decay of the Higgs boson. These types of models are studied at the Large Hadron Collider where protons collide at 13 TeV centre-of-mass energies. The ATLAS detector is one of the two multipurpose detectors at the LHC and has an extensive dark matter search programme. Due to the invisible, non-interacting nature of dark matter, it is predicted that, if produced, it would leave the detector without producing a signal; however, its presence could be inferred by measuring the momentum imbalance (or missing transverse momentum) of the collision event. A subset of models predict that dark matter can be produced in events in conjunction with a Z boson, and since it can be reliably identified using a reconstructed lepton pair, the Z boson is a powerful tag for potential dark matter events.

This seminar will provide an overview of dark matter searches at the LHC, with a focus on the ATLAS search for WIMP dark matter that is produced alongside a Z boson decaying to either e^+e^- or $\mu^+\mu^-$. The strategy for the ongoing full Run II analysis will be covered in detail, including an overview of the signal models studied, Standard Model background estimation techniques, and the statistical analysis and limit setting procedure.”

Thursday, October 24, 2019

9:00 a.m.

ELL Building – Room 105