Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **187** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Using machine learning techniques to search for magnetic monopoles in ATLAS

Thursday 10 June 2021 16:20 (10 minutes)

Among the outstanding questions of particle physics, proof of the existence of a magnetic monopole is still one of great interest. Not only would the observation of a magnetically charged particle grant symmetry between electric and magnetic fields in Maxwell's equations, but it would also explain the quantization of the electric charge. We are searching for TeV-mass magnetic monopoles in the ATLAS detector using the full set of data collected from 13 TeV pp collisions during Run 2 of the LHC. Detection is based on the particles' characteristic high ionization, penetration distance and lack of calorimeter shower. The increase in the average number of collisions per bunch crossing during the last 2 years of Run 2 brought the challenge of isolating the monopole high energy depositions in the inner detector. In order to overcome this challenge, we introduce a random forest classifier trained on region of interest wedges of the transition radiation tracker (TRT) against a random wedge of the TRT in the same event - same pileup conditions. We achieve discrimination power equivalent to that of the traditional cut-and-count method applied in previous searches.

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Session Classification: R3-7 Machine learning in HEP & Novel reconstruction techniques II (PPD) / Apprentissage automatique en PHE et nouvelles techniques de reconstruction II (PPD)

Track Classification: Particle Physics / Physique des particules (PPD)