RESEARCH ABSTRACT

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As data comes in from the LHC, the relevant theoretical structures to explain the data will ned to be developed and verified. Large Hadron Collider (LHC) data and its theoretical implications is thus the focus of the work in my PhD program at UCD High Energy Frontier Theory Initiative (HEFTI). In particular, I mainly focus on the theories or topics related to Higgs bosons, supersymmetry and dark matters in the content of minimal supersymmetric standard model (MSSM) and next-to-minimal supersymmetric standard model (NMSSM).

I am now working on the phenomenological aspects of the different constrained version of NMSSM: the fully constrained NMSSM (cNMSSM) with the universal boundary conditions for gauginos and all soft scalar masses and trilinear couplings and the phenomenological NMSSM (pNMSSM) with the universal boundary conditions for the first/second generation sfermions and the third generation sfermions individually. After imposing the constraints on B-factory physics, anomalous magnetic moment of the muon and the relic density and including the first LHC and XENON100 data, I expect to find the phenomenologically viable region of the parameter space and study the particle spectrum of the models.

In the future I will study the spectrum and couplings of Higgs bosons in the NMSSM (including the cNMSSM and pNSSM) to distinguish signatures such as the lower bound on Higgs mass, enhanced branching ratios in some channels or Higgs-to-Higgs decay from those in the MSSM. I, together with my supervisor Prof J. Gunion anticipate that Higgs bosons and supersymmetric particles will be found, but LHC data may suggest that alternative theories are natures choice.