

# SEMPARIS – Séminaires en région parisienne

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## Soutenance de thèse

**Jeudi 12 Septembre 2019, 14 :00**

LPTHE, Library 4th floor

Domaines : hep-ph

Titre : *Phenomenology and collider constraints of Supersymmetric models in the Run 2 era of the LHC*

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Résumé : *It has long been thought that the Standard Model (SM) is an incomplete description of our universe, yet experimental results thus far do not confirm anything beyond it. This thesis defence will discuss minimal and non-minimal supersymmetric extensions to the SM and associated collider searches, within the context of the LHC Run 2. Minimal supersymmetry, embodied by the minimal supersymmetric standard model (MSSM), is a competitive extension of the SM and has been well investigated, especially within the scenario of simplified models, at colliders. However, current search techniques may not be making optimal use of the collider's ability to test the accessible parameter space. Instead of using a static veto on jet momentum to minimise undesirable background processes in signal searches, it can be shown that employing a dynamic jet veto constructed out of several measures of hadronic and leptonic activity can heighten the discovery potential of simplified MSSM scans. At the same time, it cannot be denied that the limits placed on simplified models are not a true representation of more complex scenarios - especially non-minimal supersymmetry models where decay signatures are altered by a more complex chargino and neutralino spectrum. Dirac gauginos (DG) are a well-motivated non-minimal extension that restore the naturalness being lost by the ever more stringent constraints on the MSSM. Here this work looks down two avenues : it (1) investigates how the enlarged particle content of DG models can lead to altered bounds on current gluino and squark mass limits from Run 2 of the LHC, and (2) makes an in depth study of the Higgs sector in such models, which is automatically aligned owing to extended supersymmetry that links the Yukawa couplings to the gauge couplings in the electroweak sector. The work discussed in this defence is based on : [arXiv :1801.08849](#), [arXiv :1812.09293](#) and [arXiv :1901.09937](#).*

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