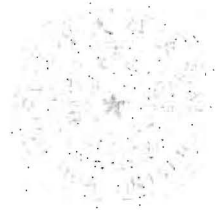


## 摘要

我們詳細的研究我們之前提出再加了兩個希格子粒子而以量子效應產生微中子質量的模型，我們把希格子粒子與微中子的各種相關的性質都仔細的探討過，我們把希格子和微中子質量和它們如何混合及各種結構都給予完善的數值結果。我們發現此理論給予微中子質量結構單一的預測結果，這與其他相關理論不同，其他理論利用調整參數能給出各種不同結構的預測顯然自由度太大了；而且理論中有很大的參數空間預測在大型強子對撞機(LHC)，理論中的雙電荷希格子能被發現，這使得這個理論能在即將啓用的大型強子對撞機(LHC)中檢測。另外，Neutrinoless Double Beta 衰變亦遠遠被此雙電荷希格子所主宰而非 Majorana 微中子質量，這使我們能將在原子核物理中低能量的 Neutrinoless Double Beta 衰變實驗實現在高能量的對撞機實驗中被分析與檢驗。



# Neutrino Masses and Neutrinoless Double-Beta Decays

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## Abstract

We investigate in detail a model that contains an additional  $SU(2)_L$  singlet and triplet scalar fields than the Standard Model (SM). This allows the radiative generation of Majorana neutrino masses at two-loop order with the help of doubly charged Higgs bosons that arise from the extended Higgs sector. The phenomenology of the Higgs and neutrino sectors of the model is studied. We give the analytical form of the masses of scalar and pseudoscalar bosons and their mixings, and the structure of the active neutrino mass matrix. It is found that the model accommodates only normal neutrino mass hierarchy, and that there is a large parameter space where the doubly charged Higgs can be observed at colliders, thereby making it testable in near future. Furthermore, the neutrinoless double beta ( $0\nu\beta\beta$ ) decays arise predominantly from exchange processes involving the doubly charged Higgs, whose existence is thus unmistakable if  $0\nu\beta\beta$  decays are observed. The production and decays of this particle are studied including pair productions through Drell-Yan annihilation processes, single same-sign dilepton productions at the Large Hadron Collider (LHC); and also the resonance effects in Möller scattering with polarized beams at the International Linear Collider (ILC).