

The 24th IOPP Seminar : 孙小虎 (Xiaohu Sun) 研究员, 北京大学 (Peking University), June 24th 2021, Thursday, 10:00am (Beijing time)

Speaker: 孙小虎 (Xiaohu Sun) 研究员, 北京大学 (Peking University)

Title: Probing the Higgs self-coupling at the LHC
在 LHC 上探索希格斯粒子的自耦合

The discovery of the Higgs boson at the Large Hadron Collider (LHC) in the summer of 2012 has experimentally confirmed the Brout-Englert-Higgs (BEH) mechanism of electroweak symmetry breaking and mass generation. The BEH mechanism not only predicts the existence of a massive scalar particle, the Higgs boson, but also requires this scalar particle to couple to itself, which is not observed yet. Therefore, searching for the production of double Higgs bosons and measuring the Higgs boson self-coupling is a crucial examination of the BEH mechanism. Any deviation from the Standard Model predictions opens a window to new physics. Moreover, the form of the Higgs field potential, which generates the Higgs boson self-coupling after electroweak symmetry breaking, can have important cosmological implications for the early evolution of the Universe, involving, such as the predictions for vacuum stability and the models in which the Higgs boson acts as the inflation field. This talk will discuss the current status of probing the Higgs self-coupling with double Higgs boson searches and single Higgs boson electroweak correction measurements at the LHC.

大型强子对撞机 LHC 上希格斯粒子的发现在实验上基本确立了电弱对称破缺和质量起源的 Brout-Englert-Higgs (BEH) 机制。BEH 机制不仅预测了希格斯粒子, 也要求该粒子与自身有耦合, 而后者尚无直接实验观测。因此, 寻找双希格斯粒子和测量希格斯自耦合是对 BEH 机制的深度检验。任何超出标准模型的迹象都暗示新物理的存在。希格斯自耦合是希格斯场势能结构的关键参数, 对预期的真空稳定至关重要, 并通过 inflation field 等模型对宇宙学的早期演化有重要启示。本报告介绍 LHC 上双希格斯粒子的实验探索、单希格斯粒子电弱修正的测量以及对希格斯自耦合的观测约束。

报告人简介:

Xiaohu SUN, graduated from Shandong University, started his journey of particle physics at Shandong University, and got his PhD from the University of Grenoble. He performed postdoctoral researches at CAS/IHEP, the University of Alberta, and the University of Manchester. Now he is working as a researcher at Peking University. He has been working at the LHC with the ATLAS and CMS detectors for more than 10 years. His work ranges from single top-quark measurements, Beyond-the-Standard-Model Higgs searches, electroweak new physics studies, the searches of double Higgs bosons, to detector developments for the luminosity measurement, whose publications have been cited more than 700 times. His recent highlights include: the first search of double Higgs and the precision measurement of the Higgs electroweak correction at 13 TeV, which provides the most precise measurements of the double Higgs cross section limits and the Higgs self-coupling measurements at that moment. He delivered a plenary talk with these high-quality results on behalf of the ATLAS and CMS collaborations at the LHCP conference. He has been assigned as many important roles including analysis responsible person, LHCHXSWG subgroup convener and the run coordinator of the forward detector.

孙小虎, 毕业于山东大学, 在山大高能物理组开始了粒子物理的探索, 在格勒诺布尔大学获得博士学位, 先后在中科院高能物理研究所、阿尔伯塔大学和曼彻斯特大学做博士后, 现为北京大学研究员。孙小虎在高能物理实验方面有十余年的研究工作, 涉及单顶夸克的测量、超出标准模型希格斯粒子的寻找、电弱物理的研究、双希格斯粒子的探索, 以及亮度探测器的刻度研究等, 文章引用数 700 余次。当前亮点工作包括: 13TeV 首次双希格斯粒子的探索和单希格斯粒子电弱修正的精确测量, 这两方面研究发表了当时实验上最精确的双希格斯粒子截面上限和希格斯自耦合测量。孙小虎以此为专题, 代表 ATLAS 和 CMS 合作组在 LHCP 大会上作 plenary 报告, 并曾担任 ATLAS 合作组多个分析的负责人、前向探测器运行协调人和跨 ATLAS-CMS 实验合作 LHCHXSWG 的三级召集人。