

T 79: Higgs: Supersymmetrie

Zeit: Mittwoch 16:45–19:00

Raum: P10

T 79.1 Mi 16:45 P10

Search for Light NMSSM Higgs Boson Production in bb Final States with the CMS experiment — ●GREGOR HELLMIG¹, RAINER MANKEL¹, ALEXEI RASPEREZA¹, CHRISTIAN SANDER², DANIEL TRÖNDLE², and ROBERVAL WALSH¹ — ¹Deutsches Elektronen-Synchrotron — ²Universität Hamburg

On July 4th, 2012 the discovery of a Higgs boson compatible with the Higgs boson of the Standard Model of Particle Physics was announced. However, the precise structure of the Higgs sector still needs to be investigated. A very important question is whether additional Higgs bosons exist, as they are predicted e.g. by various extensions of the Standard Model.

In the Next-to-Minimal Supersymmetric Standard Model (NMSSM), scenarios are possible in which one of the Higgs bosons has a mass below that of the Z boson. Due to reduced couplings to the electroweak gauge bosons, such a particle may have evaded the previous searches at the LEP collider.

This work presents the status of a search for such light NMSSM Higgs bosons decaying in the bb channel with the CMS experiment at the LHC. This presentation discusses the elements of the analysis, including the data-driven background estimation, the extraction of the signal, and the interpretation within the NMSSM framework.

T 79.2 Mi 17:00 P10

Suche nach supersymmetrischen Higgs-Teilchen am LHC in Events mit vier b-Quarks — ●PHILIPP MOGG, FLORIAN WEISER, STEFAN WAYAND, YASMIN ANSTRUTHER, FELIX FRENSCH, WIM DE BOER, FEDOR RATNIKOV und CONNY BESKIDT — EKP KIT Karlsruhe Deutschland

Ein attraktiver Ansatz für Elementarteilchenphysik jenseits des Standardmodells ist die Supersymmetrie. Eine Alternative zum einfachsten supersymmetrischen Modell, dem MSSM (Minimal Supersymmetric Standard Model), ist das erweiterte NMSSM (Next-to-Minimal Supersymmetric Standard Model). Dieses hat einen erweiterten Higgs-Sektor, so dass es drei skalare Higgs-Bosonen gibt. Das schwerste Higgs Boson könnte in die zwei leichteren Higgs Bosonen zerfallen. Es wird eine Methode vorgestellt, diese "doppelte" Higgs Produktion mit dem CMS-Detektor nachzuweisen.

T 79.3 Mi 17:15 P10

Searching further Higgs bosons in $2b+2\tau$ final states — ●YASMIN ANSTRUTHER, CONNY BESKIDT, WIM DE BOER, FELIX FRENSCH, PHILIPP MOGG, FEDOR RATNIKOV, STEFAN WAYAND, and ROGER WOLF — EKP, Karlsruhe, Deutschland

After the great success of the discovery of a Higgs boson at the LHC, it is now time to look for further Higgs bosons in order to verify or falsify extensions of the Standard Model. Currently, I am focusing on the NMSSM which predicts seven Higgs bosons in total, the three lightest ones of which are neutral and CP even. The explored signal contains a via gluon-gluon fusion produced heavy H_3 of 300 GeV. The latter decays into the SM-like H_2 (126 GeV) and an even lighter H_1 having a mass of 100 GeV. These then decay into two tau leptons and two b quarks, respectively.

T 79.4 Mi 17:30 P10

Suche nach neutralen Higgs-Bosonen im MSSM im Kanal $h/H/A \rightarrow \tau\tau \rightarrow lh$ bei ATLAS — ●FELIX FRIEDRICH, ARNO STRAESSNER und WOLFGANG MADER — Institut für Kern- und Teilchenphysik, TU Dresden

Das Minimale Supersymmetrische Standardmodell (MSSM) postuliert die Existenz von fünf Higgs-Bosonen: h^0, H^0, A^0, H^\pm . Bei dem Nachweis dieser spielen Tau Leptonen eine bedeutende Rolle, da der τ -Zerfallskanal zu den Dominierenden gehört. In diesem Vortrag wird die Suche nach neutralen Higgs-Bosonen im $\tau\tau$ Endzustand vorgestellt, wobei ein Tau leptonisch und das andere Tau hadronisch zerfällt ($h/H/A \rightarrow \tau\tau \rightarrow lh\nu\nu$). Der Fokus des Vortrags liegt dabei auf der Presentation der aktuellen Ergebnisse und deren statistischer Interpretation. Die vorgestellte Analyse basiert auf Daten des ATLAS Detektors, die im Jahr 2012 am LHC mit einer Schwerpunktsenergie von $\sqrt{s} = 8$ TeV aufgenommen wurden.

T 79.5 Mi 17:45 P10

Neutral Higgs searches in the fully hadronic di-tau decay mode in the context of the MSSM — ●SEBASTIAN WAHRMUND, DIRK DUSCHINGER, MARCUS MORGENSTERN, WOLFGANG MADER, and ARNO STRAESSNER — Institut für Kern- und Teilchenphysik, Technische Universität Dresden, Deutschland

Although the properties of the newly discovered Higgs boson with a mass around 125 GeV are in agreement with Standard Model (SM) predictions, it still leaves an open parameter space for physics beyond the SM. In this talk the search for additional neutral Higgs bosons is presented in the context of the minimal supersymmetric extension of the Standard Model (MSSM). Within the MSSM the existence of two Higgs doublets is predicted, leading to two charged Higgs states, H^\pm , and three neutral Higgs states: CP-even h and H , and a CP-odd A . Of particular interest is the decay channel involving tau leptons, since the tau lepton provides the strongest fermion coupling to the Higgs boson among the lepton families. The di-tau decay channel of these neutral Higgs bosons will be discussed, in particular the final state in which both tau leptons decay hadronically. The presentation will provide an overview about the analysis techniques and results for the 2011/2012 searches with the ATLAS experiment.

T 79.6 Mi 18:00 P10

Search for the neutral MSSM Higgs bosons in the final state with hadronically decaying τ pairs at the ATLAS experiment — ●FEDERICO SCUTTI, WILL DAVEY, and JOCHEN DINGFELDER — University of Bonn, Bonn, Germany

The Minimal Supersymmetric Standard Model (MSSM) requires the existence of five Higgs bosons, two charged (H^\pm) and three neutral (h, H, A). Two independent parameters determine their properties at tree level: the mass of the CP-odd Higgs boson m_A , and the vacuum expectation values of the two Higgs doublets $\tan\beta$. At large values of $\tan\beta$ the couplings to b quarks or τ leptons is significantly enhanced. In this talk the search for the neutral MSSM Higgs bosons (h, H, A) is presented in the di- τ decay channel, where both τ leptons decay hadronically. This specific channel is particularly sensitive for high Higgs mass hypothesis. The dominant background processes are di-jets, Drell-Yan and W +jets production.

To separate the signal from these backgrounds the selection is optimized in two independent categories, with best sensitivities in complementary mass regions, based on different trigger decisions.

T 79.7 Mi 18:15 P10

Search for Neutral MSSM Higgs Bosons in the decay mode $H \rightarrow \tau^+\tau^- \rightarrow \tau_e\tau_\mu + 4\nu$ with the ATLAS Detector. — ●ALESSANDRO MANFREDINI¹, SANDRA KORTNER¹, HUBERT KROHA¹, and MATTHEW BACKINGHAM² — ¹Max-Planck-Institut fuer Physik, Muenchen, Deutschland — ²University of Washington, Washington D.C. US

Discovering the mechanism responsible for electroweak symmetry-breaking and the origin of mass for elementary particles has been one of the major goals of the physics program at the Large Hadron Collider. The recent discovery of a Higgs boson at the LHC is also compatible with several extension of the Standard Model, in particular with Supersymmetric scenarios. In the Minimal Supersymmetric extension of the Standard Model (MSSM) the Higgs sector is composed of two Higgs doublets of opposite hypercharge resulting in five observable Higgs bosons, two charged and three neutral. In this talk a search for neutral MSSM Higgs bosons with the ATLAS detector at the LHC is presented based on proton-proton collisions at a center-of-mass energy of 8 TeV corresponding to an integrated luminosity of 20 fb^{-1} . We consider Higgs decays into τ lepton pairs with subsequent decays of the τ leptons into electron or muon. Due to the reduced QCD background this search can compete with searches in hadron-hadron and lepton-hadron final states and is of particular importance for low-mass Higgs searches.

T 79.8 Mi 18:30 P10

Search for MSSM Higgs Bosons in the bb channel — JOERG BEHR¹, WOLFGANG LOHMANN^{1,2}, RAINER MANKEL¹, ●IHAR MARFIN^{1,2}, ALEXEI RASPEREZA¹, ALEXANDER SPIRIDONOV³, ROBERVAL WALSH¹, MATTHIAS SCHROEDER¹, and CLEMENS LANGE⁴ — ¹DESY,Hamburg,DE — ²BTU, Cottbus, DE — ³ITEP, Moscow, RU

— ⁴UZH, Zurich, CH

We present a search of neutral Higgs bosons produced in association with b-quark(s) and decaying into b-quark pairs at the LHC data of 8 TeV (2012) recorded with the CMS detector. This process is a potential signature for heavy Higgs bosons as anticipated within the minimal supersymmetric model (MSSM), whose production is strongly enhanced for large values of the parameter $\tan\beta$. The signal of a Higgs boson would arise as an excess in the mass spectrum of the two jets with the highest transverse momentum. Multi-jet QCD events constitute the dominant background that is derived from data. In this presentation the first results for the analysis of 8 TeV data (2012) are shown.

T 79.9 Mi 18:45 P10

Suche nach neutralen MSSM-Higgsbosonen im Zerfallskanal $h/H/A \rightarrow \tau^+\tau^- \rightarrow lh$ bei ATLAS — •TAN WANG, JÜRGEN KROSEBERG und JOCHEN DINGFELDER — Physikalisches Institut, Universität Bonn

Im Minimalen Supersymmetrischen Standardmodell (MSSM) wird die Existenz von fünf Higgsbosonen h, H, A und H^\pm vorausgesagt. Es wird eine Suche nach dem Zerfall $h/H/A \rightarrow \tau^+\tau^-$ vorgestellt, bei der ein τ -Lepton hadronisch und das andere leptonisch zerfällt. Die selektierten Ereignissen werden in Ereignisklassen mit und ohne b -Jets unterteilt, um zwischen bb -assoziierter Produktion und der Produktion durch Gluonfusion zu unterscheiden. Zusätzlich wird eine weitere Ereignisklasse speziell für die Suche nach Higgs-Bosonen bei hohen Massen eingeführt und ihre Schnitte getrennt optimiert. Die Analyse basiert auf einem Datensatz von rund 20 fb^{-1} pp -Kollisionen, die im Jahr 2012 mit dem ATLAS Detektor am LHC aufgenommen werden. Der Vortrag stellt die Methoden und Ergebnisse der aktuellen Datenanalyse vor. Ein Schwerpunkt liegt hierbei auf den Verfahren zur datenbasierten Bestimmung der Untergrundbeiträge aus $Z \rightarrow \tau\tau$, W +Jets, Top- und Multijet-Produktion. Für die jeweiligen Ereignisklassen werden die erwarteten Signal-Sensitivitäten unter Berücksichtigung der systematischen Unsicherheiten bestimmt und kombiniert.