

T 91: BSM Suchen VI

Zeit: Donnerstag 16:45–19:00

Raum: VMP5 SR 0077

T 91.1 Do 16:45 VMP5 SR 0077

Model Unspecific Search in CMS - Results at 8 TeV —

•ANDREAS ALBERT, DEBORAH DUCHARDT, THOMAS HEBBEKER, SIMON KNUTZEN, JONAS LIEB, ARND MEYER, TOBIAS POOK, and JONAS ROEMER — III. Physikalisches Institut A, RWTH Aachen University

In the year 2012, CMS collected a total data set of approximately 20 fb⁻¹ in proton-proton collisions at $\sqrt{s} = 8$ TeV.

Dedicated searches for physics beyond the standard model are commonly designed with the signatures of a given theoretical model in mind. While this approach allows for an optimised sensitivity to the sought-after signal, it may cause unexpected phenomena to be overlooked.

In a complementary approach, the Model Unspecific Search in CMS (MUSiC) analyses CMS data in a general way. Depending on the reconstructed final state objects (e.g. electrons), collision events are sorted into classes. In each of the classes, the distributions of selected kinematic variables are compared to standard model simulation. An automated statistical analysis is performed to quantify the agreement between data and prediction.

In this talk, the analysis concept is introduced and selected results of the analysis of the 2012 CMS data set are presented.

T 91.2 Do 17:00 VMP5 SR 0077

Model Unspecific Search in CMS - First Results at 13 TeV —

•JONAS ROEMER, ANDREAS ALBERT, DEBORAH DUCHARDT, THOMAS HEBBEKER, SIMON KNUTZEN, JONAS LIEB, ARND MEYER, and TOBIAS POOK — III. Physikalisches Institut A, RWTH Aachen University

Following an upgrade in center of mass energy from $\sqrt{s} = 8$ TeV to 13 TeV, the LHC delivered first proton-proton collisions at this unprecedented energy in 2015. The CMS experiment recorded data corresponding to an integrated luminosity of 3.7fb⁻¹. Since many theoretical models predict signal cross sections to increase strongly with the center of mass energy, the data taken at $\sqrt{s} = 13$ TeV are competitive to the previous data taking period even with a lower recorded integrated luminosity.

The Model Unspecific Search in CMS (MUSiC) searches for physics beyond the standard model independent of theoretical models. Using an automatic method, kinematic distributions of the data are compared with the standard model expectation in every final state. Therefore, MUSiC reduces the chance of overlooking new physics, since even distributions not covered by dedicated analyses are investigated.

This talk outlines changes to the analysis made necessary by the increased center of mass energy and first results with lepton triggered events.

T 91.3 Do 17:15 VMP5 SR 0077

Model Unspecific Search in CMS - Treatment of Insufficient Monte Carlo Statistics —

•JONAS LIEB, ANDREAS ALBERT, DEBORAH DUCHARDT, THOMAS HEBBEKER, SIMON KNUTZEN, ARND MEYER, TOBIAS POOK, and JONAS ROEMER — III. Physikalisches Institut A, RWTH Aachen University

In 2015, the CMS detector recorded proton-proton collisions at an unprecedented center of mass energy of $\sqrt{s} = 13$ TeV. The Model Unspecific Search in CMS (MUSiC) offers an analysis approach of these data which is complementary to dedicated analyses: By taking all produced final states into consideration, MUSiC is sensitive to indicators of new physics appearing in final states that are usually not investigated.

In a two step process, MUSiC first classifies events according to their physics content and then searches kinematic distributions for the most significant deviations between Monte Carlo simulations and observed data.

Such a general approach introduces its own set of challenges. One of them is the treatment of situations with insufficient Monte Carlo statistics.

Complementing introductory presentations on the MUSiC event selection and classification, this talk will present a method of dealing with the issue of low Monte Carlo statistics.

T 91.4 Do 17:30 VMP5 SR 0077

Model Unspecific Search in CMS - Model Unspecific Limits —

•SIMON KNUTZEN, ANDREAS ALBERT, DEBORAH DUCHARDT, THOMAS HEBBEKER, JONAS LIEB, ARND MEYER, TOBIAS POOK und JONAS

ROEMER — III. Physikalisches Institut A, RWTH Aachen University

The standard model of particle physics is increasingly challenged by recent discoveries and also by long known phenomena, representing a strong motivation to develop extensions of the standard model. The amount of theories describing possible extensions is large and steadily growing.

In this presentation a new approach is introduced, verifying if a given theory beyond the standard model is consistent with data collected by the CMS detector without the need to perform a dedicated search. To achieve this, model unspecific limits on the number of additional events above the standard model expectation are calculated in every event class produced by the MUSiC algorithm. Furthermore, a tool is provided to translate these results into limits on the signal cross section of any theory.

In addition to the general procedure, first results and examples are shown using the proton-proton collision data taken at a centre of mass energy of 8 TeV.

T 91.5 Do 17:45 VMP5 SR 0077

Search for new physics in final states with one tau and missing transverse energy with CMS —

•KLAAS PADEKEN, KERSTIN HOEPPNER, VIKTOR KUTZNER, and THOMAS HEBBEKER — III Phys. Inst. A, Aachen

The first search for new physics beyond the Standard Model in $\sqrt{s} = 13$ TeV pp events with one hadronically decaying tau and missing transverse energy is presented. The tau channel is of theoretical interest in light of the huge difference in mass of taus w.r.t. electrons and muons.

For this search the tau reconstruction has been extended to high energies and the first taus with TeV energies have been reconstructed and observed.

The results will be interpreted in terms of a new heavy charged vector boson W' , which decays into a tau and a neutrino and in the framework of a non-universal gauge interaction model with the aim to explain the heaviness of the third generation fermions, with respect to the light first and second generation. The analysis is performed with the 2015 dataset recorded with CMS at a center of mass energy of $\sqrt{s} = 13$ TeV.

T 91.6 Do 18:00 VMP5 SR 0077

Search for new physics in the final state of a lepton and missing transverse energy with the ATLAS experiment —

STEFAN TAPPROGGE and •MARKUS ZINSER — Institut für Physik, Johannes Gutenberg-Universität Mainz, Staudingerweg 7, 55099 Mainz

Some extensions of the Standard Model (SM) predict new massive charged spin-1 gauge bosons, like the W' boson. These bosons can decay into a lepton and neutrino. Such new particles can be searched for by looking for an excess of the data with respect to the SM backgrounds in the transverse mass spectrum. Since 2015 protons collide at a new record energy of $\sqrt{s} = 13$ TeV at the Large Hadron Collider at CERN. Data recorded by the ATLAS experiment from these collisions, corresponding to an integrated luminosity of about 3.3 fb⁻¹, has been analysed to search for such new heavy gauge bosons. No significant excess has been observed and limits on the mass of a W' boson in the context of the Sequential Standard Model (SSM) W' are presented.

T 91.7 Do 18:15 VMP5 SR 0077

Search for new physics, focused on W' production, in the single electron plus missing- E_T final states using pp collision data at $\sqrt{s} = 13$ TeV —

•FABIAN BISPINCK, THOMAS HEBBEKER, KERSTIN HOEPPNER, KLAAS PADEKEN, and VIKTOR KUTZNER — III. Physikalisches Institut A, RWTH Aachen

A search for new physics in the electron + missing transverse energy channel is presented based on proton-proton collisions measured with the CMS detector at the LHC, using 2015 CMS data with an integrated luminosity of 2.1 fb⁻¹ recorded at a center of mass energy of 13 TeV.For this search the focus is set on the potential production of a W' boson, as described by the Sequential Standard Model (SSM).

T 91.8 Do 18:30 VMP5 SR 0077

Search for High-Mass Resonances of Electron-Positron Pairs at $\sqrt{s} = 13$ TeV with ATLAS —

•HOLGER HERR and STEFAN

TAPPROGGE — Universität Mainz

Several extensions of the Standard Model predict new, massive neutral spin-1 bosons. In 2015 the Large Hadron Collider at CERN started to collide protons at $\sqrt{s} = 13$ TeV. These new bosons might show up as narrow resonances in the invariant-mass spectrum of electron-positron pairs. 3.2 fb^{-1} of Data measured by the ATLAS experiment is used. To compare data to Standard Model predictions, the expected background is determined. Contributions of electron-positron pairs which originate from Standard Model processes are estimated using simulation. Background contributions from misidentified objects are calculated using data driven methods. The status of the analysis and results of the search will be presented.

T 91.9 Do 18:45 VMP5 SR 0077

Auswirkungen von Interferenzbeiträgen bei der Suche nach einem W' -Boson mit dem ATLAS-Experiment am LHC —

•JULIAN FISCHER, MARKUS ZINSER und STEFAN TAPPROGGE — Institut für Physik, Johannes Gutenberg-Universität, Mainz

Verschiedene Theorien zur Erweiterung des Standardmodells sagen einen schweren Partner des W -Bosons, in der Regel als W' -Boson bezeichnet, voraus.

Betrachtet man die gleichen Endzustände z.B. im leptonischen Zerfall ($W/W' \rightarrow \ell\nu$), so sind prinzipiell auch auftretende Interferenzeffekte zu berücksichtigen. Im Vortrag wird Bezug zum *Sequential Standard Model (SSM)* genommen, bei dem das W' -Boson die gleichen Kopplungen besitzt wie das dominant erzeugte W -Boson des Standardmodells.

Anhand simulierter Ereignisse für die Erzeugung von W -Bosonen und W' -Bosonen (des *SSM*) wird die Sensitivität der Suche mit pp -Kollisionen im ATLAS-Detektor am LHC bei $\sqrt{s} = 13$ TeV bestimmt. Insbesondere wird die Frage diskutiert, wie sich Interferenzeffekte auf eine Ausschlussgrenze bzw. auf das Entdeckungspotential eines W' -Bosons auswirken.