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**[CINCO] [ICHEP 2014] Pablo Martinez Ruiz Del Arbol (ETH Zürich) accepted invitation to give a talk at ICHEP 2014**

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Dear Committee,

Pablo Martinez Ruiz Del Arbol (ETH Zürich) [mailto:[Pablo.Martinez@cern.ch](mailto:Pablo.Martinez@cern.ch)] just accepted to give a talk "Search for Beyond the Standard Model Physics in multi-leptonic and photonic final states with the CMS detector"

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**Certificate of Presence**

We hereby certify that Pablo Martínez Ruiz del Árbol, member of the CMS Collaboration, has given the following oral presentations at conferences, workshops, and seminars on the dates and places indicated below:

"Precision Timing with the CMS MIP Timing Detector" at "LP2019: 29th International Symposium on Lepton Photon Interactions at High Energies, 5-10 Aug 2019, University of Toronto, Toronto (Canada)".

"Dark matter at LHC" at "Split2018: 2018 LHC days in Split, 17-22 Sep 2018, University of Split - FESB and Faculty of Science, Split (Croatia)".

"Searches for BSM physics in the 2 leptons y MET final state" at "IX CPAN days: IX CPAN days, Centro Nacional de Partículas, Astropartículas y Nuclear, 23-25 Oct 2017, CPAN, Santander (Spain)".

"Review of Supersymmetry Searches at 13 TeV with the CMS experiment" at "DM2016: Dark Matter 2016: From the smallest to the largest scales, 27 Jun-1 Jul 2016, Santander (Spain)".

"CMS SUSY searches at 13 TeV" at "LPCC Seminar: CERN LPCC EP-LHC Seminar Series, 9 Feb 2016, Geneva (Switzerland)".

"Search for Beyond the Standard Model Physics in multi-leptonic and photonic final states with the CMS detector" at "ICHEP 2014: 37th International Conference on High Energy Physics, 2-9 Jul 2014, Valencia (Spain)".

"Searches for SUSY in events with two or more leptons at CMS" at "ICHEP 2012: International Conference on High Energy Physics, 4-12 Jul 2012, Melbourne, VIC (Australia)".

"Susy searches in the Z+Jets+MET final state in 7 TeV pp collisions with the jet-z balance method" at "Bienal RSEF: XXXIII Reunión Bienal de la Real Sociedad Española de Física, 19-23 Sep 2011, Universidad de Cantabria, Santander (Spain)".

"Commissioning and Performance of the CMS Detector" at "Blois2010: 22nd Rencontres de Blois on "Particle Physics and Cosmology; First Results from the LHC", 15-20 Jul 2010, Blois (France)".

"The CMS Muon System Alignment: First results from commissioning runs " at "BIENALFISICA09: XXXII Bienal de Física, 7-11 Sep 2009, Ciudad Real (Spain)".

"Muon Alignment in ATLAS and CMS" at "Detector Understanding with First LHC Data, 29 Jun-3 Jul 2009, DESY, Hamburg (Germany)".

"The CMS Muon System Alignment" at "CHEP09: International Conference On Computing In High Energy Physics And Nuclear Physics, 21-27 Mar 2009, Prague (Czech Republic)".

  
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# Search for Beyond the Standard Model Physics in multi-leptonic and photonic final states with the CMS detector

P. Martinez Ruiz Del Arbol on behalf of the CMS collaboration

*Eidgenössische Technische Hochschule Zürich (ETH Zurich)*

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## Abstract

In this talk, the latest results from CMS on searches for beyond the Standard Model physics in final states with 2, 3, 4 (or more) leptons and with photons are presented using  $20 \text{ fb}^{-1}$  of data from the 8 TeV LHC run. A variety of complementary final state signatures and methods are used to probe new physics.

**Keywords:** SUSY, Leptons, Photons, CMS, gluino

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## 1. Introduction

Supersymmetry (SUSY) is one of the most appealing extensions to the Standard Model, solving the hierarchy problem, providing a path towards Unification of the fundamental forces, and predicting dark matter candidates. The Compact Muon Solenoid (CMS) [1] collaboration has executed a complete program of SUSY searches at  $\sqrt{s} = 7 \text{ TeV}$  and  $\sqrt{s} = 8 \text{ TeV}$  inspecting a large variety of final states. SUSY models usually involve the presence of heavy supersymmetric particles decaying in long decay chains that produce high hadronic activity. In the case of R-parity-conserving SUSY, supersymmetric decay chains end with the production of an invisible, stable particle (LSP) that remains undetected producing high transverse missing energy ( $\cancel{E}_T$ ) in the event. The inclusion of leptons and photons in the final state strongly suppresses backgrounds and provides effective methods for estimating the remaining contribution, using data control regions.

This document focuses in a subset of SUSY searches performed by the CMS collaboration at  $\sqrt{s} = 8 \text{ TeV}$ , using two or more leptons, and photons. Other CMS searches using leptons are reported elsewhere in the

context of third generation production, electroweak production and R-parity-violating SUSY searches. The interpretation of the results is performed in terms of the so called simplified models (SMS)[2], with stress in gluino production for the leptonic searches.

## 2. Search with two opposite-sign leptons

This search [3] looks for SUSY signatures in events with two opposite-sign leptons (electron or muon) for both same and different flavor pairs. Events are required to contain at least five jets, where the two with higher momentum are required to be central ( $|\eta| < 1$ ), and at least two of them must be b-tagged. In addition, the event should contain  $\cancel{E}_T > 180 \text{ GeV}$ . This selection targets signatures with multi-top production and heavy invisible particles (LSP).

Background prediction is based in data control samples. In particular the centrality of the jets is inverted, and the resulting yields are multiplied by a forward-to-central factor calculated using a third sample in which two b-tagged jets are not required. Figure 1 shows the observation and the background prediction for the signal region. No significant excess is observed over the background prediction. Figure 2 shows the upper limits on a simplified model based on gluino production, with

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them agrees well with the observation and upper limits have been set in a large variety of models. This result focuses in strong production of gluinos, sbottoms and stops, where masses below 1050 GeV, 575 GeV and 380 GeV respectively have been excluded.

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Volumes 273–275, April/June 2016

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