

# HiggsTools Mid-Term Review

Nicolas Gutierrez

## Undergraduate studies at Universidad Nacional de Colombia (Bogotá) 2009

→ Model building and phenomenology

### Z-prime boson signal at Fermilab-Tevatron and CERN-LHC in a 331 model

J.G. Duenas, N. Gutierrez, R. Martinez, F. Ochoa (Colombia, U. Natl.)

Mar 2009 - 7 pages

Eur.Phys.J. C60 (2009) 653-659


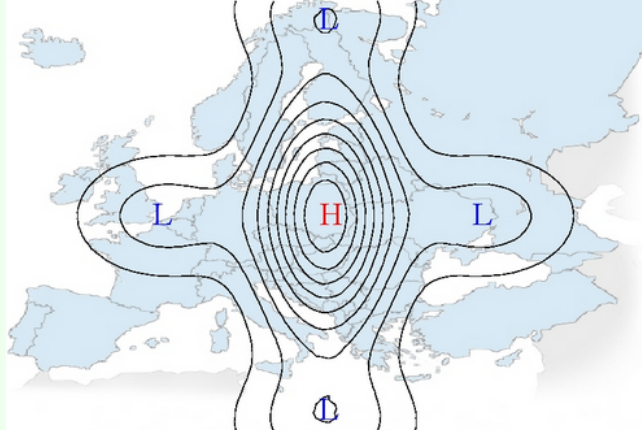
DOI: [10.1140/epjc/s10052-009-0969-3](https://doi.org/10.1140/epjc/s10052-009-0969-3)

## Master studies at Universitet van Amsterdam (NIKHEF) 2011 – cum laude

→ Supervisor: Prof. Raimond Snellings (Universiteit Utrecht)

→ Funded by ICETEX (Colombian institute for sponsoring studies abroad)

→ Experimental heavy-ion high energy physics (ALICE Collaboration)

N.G. Gutierrez Ortiz	Master programme: <a href="#">Physics - Particle and Astroparticle Physics</a>	June 5th, 2011
Institute: <a href="#">NIKHEF</a>	Research group: ALICE	Supervisor: Raimond Snellings
	<p><b>Heavy Flavour Electron Elliptic Flow</b></p> <p>First, I will review the definition of Elliptic Flow and underline the role it plays in testing the thermalisation at Ultra-High-Energy-Density systems as the 2.76 TeV Pb-Pb collisions at LHC. Subsequently, I will discuss some of the challenges one faces in measuring the flow of electrons, in particular those electrons produced by the decay of a Beauty or Charm meson (Heavy-Flavour-Electrons). The main part of the thesis will be dedicated to the challenge of extracting the Heavy-Flavour-Electron flow signal from the measured electron flow. I will close with a discussion of some of the results using data taken by the ALICE detector in the winter of 2010. Remarkably, the electron flow has all the characteristics expected from a collective correlation. This might indicate that the Beauty and Charm quarks participate more actively in the interactions within the Quark-Gluon-Plasma.</p>	
<a href="#">Scientific abstract</a> (pdf 42K) <a href="#">Full text</a> (pdf 7773K)		

## PhD studies

- University of Glasgow
- Supervisor: Prof. Anthony Doyle
- Funded by SUPA Prize Studentship
- Based at CERN 2012-2015 (Jan.)

**\* Joined HiggsTools Jan. 2015**

- Thesis submitted in April 2015
- Thesis defense at CERN on July 2015
- Enrolled for winter graduation

- Identification of hadronically-decaying top-quarks with large transverse momentum.

- Search for physics beyond the Standard Model of particle physics



PH. D. THESIS

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Top-Tagging with Shower  
Deconstruction and Search for Single  
Production of Vector-Like Quarks at  
ATLAS

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## John G Rutherglen Prizewinners

<i>Name of Winner</i>	<i>Institution</i>	<i>Year</i>
Callum Wilkinson	University of Sheffield	2014
Nicolas Gutierrez Ortiz	University of Glasgow	

# ATLAS Week (Lecce)

chaired by Dave Charlton (University of Birmingham (GB))

from Sunday, 4 October 2015 at 17:30 to Friday, 9 October 2015 at 16:45 (Europe/Zurich)

Hotel Tiziano, Lecce, Italy

12:10 Paper presentations 20'

12:10 Search for single production of a vector-like T-quark decaying into  $Wb$  in pp collisions at  $\sqrt{s} = 8$

TeV with the ATLAS detector 4'

Speaker: Nicolas Gilberto Gutierrez Ortiz (UCL)

**Part of the UCL ATLAS group as a post doc**



Paper draft



Recording



Slides\_Nicolas\_VLQ...

## Paper-presentation during ATLAS Week

- N.G. paper co-editor
  - \* responsible for text, figures and message
  - \* carrying the paper through ATLAS approval
- First draft of this paper was sent for circulation on the 1<sup>st</sup> of October
- Celebrating with Editorial Board chair (left) and co-editor (center) the positive reception by the collaboration of our paper





# Open Presentation of the Search for single production of a vector-like T-quark decaying into Wb in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector

chaired by Paul De Jong (Nikhef National Institute for subatomic physics (NL))

Thursday, 15 October 2015 from 16:30 to 18:00 (Europe/Zurich)

CERN ( 40-4-C01 )

Thursday, 15 October 2015

16:30 - 16:50

Presentation of the analysis 20'

Speaker: Nicolas Gilberto Gutierrez Ortiz (University College London (UK))



Nicolas\_VLQ.pdf



## Presentation of analysis to ATLAS publication committee

- Discussion at the highest level of the collaboration
- Aiming for second circulation this week
- Working on processing comments and requests made by the collaboration

Search for single production of a vector-like  $T$ -quark decaying into  $Wb$  in pp collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector

Nicolas Gutierrez



## Contributions to the University College London (UCL) ATLAS group

→ The group:

- > Leading contributions to ATLAS efforts on  $H \rightarrow b\bar{b}$

**Context:** no  $5\sigma$  observation of the Higgs boson decay into b-quarks yet

- > Outgoing b-tagging convener, incoming jet-substructure convener ..

- > PhD theses in b-tagging, jet-substructure, search for  $H \rightarrow b\bar{b}$ , modelling of backgrounds relevant to  $H \rightarrow b\bar{b}$

**Context:** must alleviate large uncertainties on the background modelling

- > Searches for physics beyond the standard model with several b's in the final state

→ N.G. contributions:

- > Supporting PhD students
- > ATLAS-wide co-responsible for modelling of V+jets
  - \* Background to  $H \rightarrow b\bar{b}$
  - \* Considerable UCL expertise in MadGraph5+Pythia8





Update on MG5+Py8 V+jets  
Nicolas Gutierrez



## Physics Modelling Group Plenary

chaired by Monica D'Onofrio (University of Liverpool (GB)), James William Monk (Niels Bohr Institute, University of Copenhagen)

 Tuesday, 20 October 2015 from 15:30 to 18:00 (Europe/Zurich)

 CERN ( 42-3-002 )

15:55 - 16:15

Followup from Last Week;s MG+Py8 V+jets Update 20'

Speaker: Nicolas Gilberto Gutierrez Ortiz (University College London (UK))



## $H \rightarrow b\bar{b}$ phenomenology

- Working with Michael Spannowsky and Dorival Goncalves (IPPP), and Jon Butterworth (UCL)
- Searching for clever ways to circumvent the challenges of searches for  $H \rightarrow b\bar{b}$

### **What's missing on the current search strategies?**

- \* large systematic uncertainty on the modelling of the backgrounds
  - \* small acceptance → large statistical fluctuations
- Aiming at publishing results very soon!
  - Long-term project: carrying out our ideas within ATLAS



- Focused mainly on the problem at hand
- Start to look for a another post-doc on the first half of 2016
- Individual fellowship at the UCL
  - > develop on-going projects
  - > learn the trade of securing and managing science funding
- Experience working within the private sector (last quarter 2016)

