

# STYLIANOS ANGELIDAKIS

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Sex: Male, Nationality: Hellenic

Military Obligations: Served (2008 – 2009)

## Research Interests

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- Searches for new physics phenomena* Excited about searches for phenomena beyond the Standard Model of particle physics which address open issues, such as the understanding of the unbalance between matter and anti-matter or the nature of dark matter.
- Interested in searches for new resonances decaying to jets or leptons. Heavy gauge bosons or Higgs-like bosons predicted by beyond the Standard Model scenarios could be such candidates.
- Detector work* Eager to engage in reconstruction and detector work, including the development, production and commissioning of new detector technologies to be installed at the LHC upgrade, in 2018.

## Research Experience

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- ATLAS Experiment** 2011 –Today Member of the ATLAS Collaboration (since 13/07/2012)
- Since 2011 I have been involved in the search of the Higgs boson(s) among the products of the proton-proton collisions at the Large Hadron Collider (LHC), at CERN. I have the privilege of having contributed to the Higgs boson's discovery, which was announced in July 2012 by the collaborations of both ATLAS and CMS, the two largest experiments at the LHC (Phys. Lett. B716 (2012) 1–61).
- Properties of the Higgs boson* My current study focuses on the measurement of the off-shell Higgs boson signal strength, in the high mass region ( $\geq 200$  GeV), which is required in order to constrain the total Higgs boson width. This study exploits the  $H \rightarrow ZZ \rightarrow ll\ell\ell$  decay mode which provides excellent sensitivity and hence is appropriate for measurements in the particular Higgs boson mass range. In the study of this decay mode, I have further contributed with the data driven estimation of the reducible background.
- Search for Higgs bosons* Until 2015, my research concentrated on the investigation of the Higgs boson decay mode  $H \rightarrow ZZ^{(*)} \rightarrow llqq$ . This final state, with two leptons and two quarks, has the highest branching ratio among the fully reconstructable final states of the Higgs boson. I was one of the main contributors to this analysis having scanned the Higgs boson mass spectrum from 120 GeV up to 1 TeV.
- Due to specific approaches being required according to the hypothesized Higgs mass, the search was initially divided into the low mass range ( $m_H < 200$  GeV) and the high mass range ( $m_H \geq 200$  GeV) searches. After the discovery of the Higgs boson, priority was given to the high mass range, in search of additional, heavy Higgs bosons, predicted by theories Beyond the Standard Model of particle physics.
- In the study of the  $H \rightarrow ZZ^{(*)} \rightarrow llqq$  decay mode in the low Higgs-mass range I explicitly carried out all steps of the analysis and thereby obtained expertise on subjects such as:
- event selection optimization,
  - separation of categories according to the Higgs production mechanism (Vector Boson Fusion, gluon-gluon fusion and VH associated production, where V is a W or Z boson) and final states (0, 1 or 2 b-tagged jets),
  - techniques for improving the mass resolution for the hadronic decay of the Z-boson,
  - techniques for data-driven background estimation,
  - analysis of systematic uncertainties,
  - multivariate analysis,
  - statistical interpretation of the results,
  - delivery of results and authorship of publications.
- In the scan of the high mass range, I contributed to all of the steps throughout the analysis and had personal responsibility for the study of the Vector Boson Fusion production mechanism as well as the statistical interpretation of the results. For the latter, I developed software tools, which were also used by various ATLAS subgroups, covering all the aspects of the statistical interpretation, including the evaluation of systematic uncertainties, simultaneous fitting of different analysis channels to the observed data and calculation of exclusion limits with various profiling strategies.

Work on the  
ATLAS detector

Significant part of my activity within ATLAS was dedicated to the performance of the detector's Cathode Strip Chambers (CSC). I have worked with the ATLAS CSC performance group for two years, during which I provided the group with several software tools and carried out studies such as:

- measurement of the efficiency for track segment reconstruction (by identifying missing hits in track segments) and improvement of the charge cluster reconstruction algorithms,
- measurement of the internal alignment of the CSC layers (by measuring the alignment of charge clusters in track segments) and calculation of corrections for the chambers internal coordinate systems,
- measurement of gain-variations among the CSC readout channels and derivation of high voltage corrections in order to establish uniform average gain among the CSC layers.

Furthermore, I have participated in two test-beams for the development of the Micromegas detectors at CERN where I took shifts and conducted preliminary data analysis.

For the scopes of the above tasks I spent about eight months residing at CERN.

**MINERvA Experiment**  
2007-2008

Member of the MINERvA Collaboration (until 03/03/2008)

During the construction of the MINERvA detector at FermiLab, I contributed to the development of a fully automated testing-station, at the University of Athens in Greece, for the characterization of the Hamamatsu M64 multi-anode PhotoMultiplier Tubes (PMTs). During this project I acquired hands-on experience in hardware, instrumentation and data acquisition. Furthermore, I developed the software that was used for the characterization of the PMTs and ran tests for the first ~100 PMTs.

**MINOS Experiment**  
2005 – 2007

I analyzed the data taken with the MINOS detectors in order to observe the disappearance of atmospheric  $\nu_\mu$ , and measure the neutrino mass splitting and flavor mixing. This study of the neutrino oscillatory mechanism was conducted within the scopes of my undergraduate thesis.

## Teaching Experience

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2011-2014 Teaching of laboratory nuclear physics methods and instrumentation to undergraduate students at the University of Athens.

2011-Today Member of the Particle Physics Outreach team of the University of Athens.

Speaker and instructor in many of the *IPPOG Masterclasses*, both at the University of Athens and the University of Crete. During these courses several hundreds of high-school students, along with their teachers, become "scientists for a day". Moreover, I have run local Masterclasses in various remote regions of Greece.

Volunteered at the CERN *Open Days*, in September 2013, where thousands of visitors got acquainted with the interactive data analysis tools and teaching scenaria of the various European Projects in which the University of Athens is participating.

Employed by the *Pathway FP7* project for 2  $\frac{1}{2}$  years in order to train teachers in analysis tools so that they could introduce the subject of interactive analysis of real events from the LHC to their schools.

During the academic year 2011-2012, the CERN mini expo visited seven cities in Greece and I spent considerable time as a guide to the school visits.

## Awards & Honors

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2013 "The 2013 High Energy and Particle Physics Prize for an outstanding contribution to High Energy Physics" Prize awarded by the European Physics Society to ATLAS and CMS collaborations for the discovery of a Higgs boson, as predicted by the Brout-Englert-Higgs mechanism.

2011-2015 "Antonios Papadakis" bequest scholarship for postgraduate studies, National and Kapodistrian University of Athens.

## Education

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### 2011 - 2016 **Doctor of Philosophy (Ph.D.)**

*Concentration* Nuclear and Particle Physics

*Thesis Title* Search for Higgs bosons in the final state  $ZZ^{(*)} \rightarrow llqq$  with the ATLAS detector at the LHC.

*Supervisor* Assoc. Prof. Dimitrios Fassouliotis

*Institution* National and Kapodistrian University of Athens

### 2007 - 2010 **Master of Science (MSc)**

*Concentration* Nuclear and Particle Physics

*Thesis Title* Precision neutrino interaction measurements with the MINERvA experiment. Testing and characterization of photomultiplier tubes for the MINERvA detector.

*Supervisor* Prof. George Tzanakos

*Institution* National and Kapodistrian University of Athens

### 2001 - 2007 **Bachelor's degree**

*Concentration* Nuclear and Particle Physics

*Thesis Title* Experimental study of neutrino flavor oscillations with the MINOS experiment.

*Supervisor* Prof. George Tzanakos

*Institution* National and Kapodistrian University of Athens

## Personal Skills

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**Mother Tongue** Greek

**Other Languages** English (Certificate of Proficiency in English, University of Cambridge, June 1997)

**Computing Skills** Programming languages: C, C++, Visual Basic, Java, Pascal, Fortran.  
Scripting languages: Python, Bash.  
Specialized frameworks: ROOT.  
Other: Grid Computing, Latex, LabView, MS Windows and Office applications.

## Selected Conference Talks

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*"Study of the  $H \rightarrow ZZ \rightarrow llqq$  decay mode with the ATLAS detector"*

Workshop on Recent Developments in High Energy Physics and Cosmology (Hellenic HEP 2014), 08-10 May 2014, Naxos, Greece.

*"VBF Analysis Techniques. Vector Boson Modes with hadronic decays ( $lvqq, llqq$ )"*

ATLAS Higgs Workshop, 14-18 April 2014, Rome, Italy.

*"Status of the low mass  $H \rightarrow ZZ^{(*)} \rightarrow 2l2q$  analysis"*

ATLAS Higgs-HSG2 Workshop, 16-19 April 2013, Rome, Italy.

*"Study of the decay channel  $H \rightarrow ZZ^{(*)} \rightarrow l^+l^-qq(\text{bar})$  with the ATLAS detector"*

Workshop on Recent Developments in High Energy Physics and Cosmology (Hellenic HEP 2013), 25-28 April 2013, Chios, Greece.

*"Study of the decay channel  $H \rightarrow ZZ \rightarrow llqq$  with the ATLAS detector"*

Workshop on Recent Developments in High Energy Physics and Cosmology (Hellenic HEP 2012), 5-8 April 2012, Ioannina, Greece

*"Search for the Higgs boson in the channel  $H \rightarrow ZZ^{(*)} \rightarrow llqq$  with the ATLAS detector"*

Workshop on Recent Advances in Particle Physics and Cosmology (Hellenic HEP 2011), 14-16 April 2011, Patras, Greece

## Selected Publications & Conference Notes

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I have co-signed 324 publications in international physics journals. In addition to the list of publications, which I enclose in a different document, I present a list of selected publications and conference notes that best facilitate my work.

*"Measurements of the Higgs boson production cross section at 7, 8 and 13 TeV centre-of-mass energies and search for new physics at 13 TeV in the  $H \rightarrow ZZ^* \rightarrow l^+l^-l^+l^-$  final state with the ATLAS detector".* By ATLAS collaboration. ATLAS-CONF-2015-059.

*"Search for an additional, heavy Higgs boson in the the  $H \rightarrow ZZ$  decay channel  $\sqrt{s} = 8$  TeV in pp collision data with the ATLAS detector."* By ATLAS Collaboration (Georges Aad et al.). Eur.Phys.J. C76 (2016) 45. [arXiv:1507.05930 \[hep-ex\]](https://arxiv.org/abs/1507.05930).

*"Study of the channel  $H \rightarrow ZZ^* \rightarrow l^+l^-q\bar{q}$  in the mass range 120–180 GeV with the ATLAS detector at Sqrt(s) = 7 TeV".* By ATLAS Collaboration. ATLAS-CONF-2012-163.

*"Search for a heavy Standard Model Higgs boson in the channel  $H \rightarrow ZZ \rightarrow llqq$  using the ATLAS detector".* By ATLAS Collaboration. Phys.Lett. B707 (2012) 27-45. [arXiv:1108.5064 \[hep-ex\]](https://arxiv.org/abs/1108.5064).

*"Search for a Standard Model Higgs Boson in the Mass Range 200-600 GeV in the Channels  $H \rightarrow ZZ \rightarrow ll\nu\nu$  and  $H \rightarrow ZZ \rightarrow llqq$  with the ATLAS Detector".* By ATLAS Collaboration. ATLAS-CONF-2011-026.