UNIVERSIDAD SERGIO ARBOLEDA

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To:
IB Chair
Professor Robert Wilson, Colorado State University, USA.
DUNE Collaboration Spokespersons
Professor Mark Thomson, University of Cambridge.
Professor Edward Blucher, University of Chicago.
Fermi National Accelerator Laboratory
Batavia IL, 60510-5011
USA

The Faculty of Exact Sciences and Engineering of the University Sergio Arboleda in Bogotá Colombia, would like to join the DUNE collaboration. On behalf of the Faculty, I submit this application letter to the Institutional Board, in accordance with §2.2 of the *Governance of the DUNE Collaboration*.

I Persons wishing to join:

1 Dr. Luz Gómez (Permanent Professor. Major experience in Nuclear and Particle Physics, Experimental High Energy Physics, Data Analysis, MC-Simulation, and the ATLAS Experiment)

2 Dr. Hermes Martínez (Permanent Professor. Major experience in Math Modelling and Data Analysis)

3 Dr. Carlos Peña (Permanent Professor. Major experience in Physics Modelling and Data Analysis)

4 Nestor Pachón (Student - Mathematics Department)

II Planned Institutional Board (IB) representative:

Prof. Luz Gómez

III Science and technical experience of the group

Experience in data analysis, as well as in nuclear and particle physics. Expertise within international projects about experimental high energy physics. In particular, I have worked on the ATLAS Experiment at the Large Hadron Collider at CERN. I contributed in the operation, trigger performance, upgrades and physics analysis of ATLAS. I had direct participation in the first observation of the Higgs Boson with the ATLAS detector. My work was also concerned with the search for new physics models, by analyzing large amounts of the experimental data on distributed computing systems. In this context, I have developed an analysis software framework, which deploys various statistical and machine learning techniques. These has been adopted by several researchers for their own analyses. My main physics contribution to the ATLAS collaboration was a new analysis method, which uses correlations between different search channels; the sensitivity to new physics phenomena is thereby improved. In addition, I have worked on the pattern recognition software for finding particle tracks in the detector and developed algorithms for the reconstruction.
On the other side, Professors Martínez and Peña have a broad background in physics and applied mathematics, with strong capabilities in programming, statistics and data analysis. They are currently applying machine learning algorithms on data, in order to analyze several factors affecting the local airports. These methods are also used to determine landslide risks in many regions of the country.

IV Proposed science and technical contributions to DUNE

We are interested in the full physics program of DUNE. The intended contributions are listed as follow:

- Short term contributions (Luz Gómez - Nestor Pachón):
  - Photon detection system: studies based on simulation to better tie technical requirements to scientific requirements
  - Calibration and commissioning of the time projection chamber, TPC.
- Long term contributions (All members):
  - MC simulations to optimize aspects of the detector, trigger strategies and beam data taking strategy.
  - Reconstruction and identification studies based on MC-Simulations
  - Development of analysis software to search for heavy neutral leptons
  - Development of analyses to measure interaction kinematics and cross-sections
  - Service work: shifts
- Contributions at every stage (Luz Gómez):
  - TPC hardware installation/integration
  - Data acquisition, timing and trigger. DAQ simulation

V Potential sources of funding

If we are accepted as members of the DUNE collaboration, we will apply for fundings from certain government entities. These are dedicated to support scientific projects in Colombia. We also should continuously present results to motivate the forward support of the University towards our research.

The DUNE collaboration is an international organization. We would like to contribute with this project, as its physics program is very exciting and fits very well with our experience, our interests and long term plans. DUNE represents a major opportunity to expedite the scientific development of Colombia. Belonging to the DUNE collaboration will bring together talented people from our country, making up an excellent scientific collaboration visible around the world. We would very much look forward to working with all of you. Thank you very much for your attention.

Sincerely yours,

Luz Gomez