Medellín, May 8, 2019

To:
DUNE Institutional Board Chair
Professor Robert Wilson, Colorado State University
DUNE Collaboration Co-spokespersons
Professor Edward Blucher, Univeristy of Chicago
Professor Stephan Soldner Rembold, University of Manchester
DUNE Collaboration

Dear Sir,

The purpose of this letter is to present an application to participate in the DUNE experiment. At Universidad EIA we have a qualified team conformed by specialists and students, able to take an active part in high energy physics experiments. We recognize the potential of the DUNE experiment and the Long Base Neutrino Facility to do forefront physics and express the intention of our group to take part in this collaboration.

Our objectives:

1. Experiment: We are interested in collaborating with other Colombian and South-America institutions in the creation of the Warm Interface Boards (WIB) for the photon detection system (PDS) for the (single phase) SP project of the DUNE far detector. Concretely, we are interested in the design of the prototypes, their testing in beam conditions and, in case of being approved by the collaboration, the interaction with companies for the mass production of the WIBs. We are also interested in the development of the firmware for the WIBs.

2. Phenomenology: In this area, we have experience in building models that address new physics problems such as dark matter and neutrino masses. In these models, the new physics arises from simple extensions of the Standard Model in the fermionic, scalar and/or gauge group sector. We then find possible signals and restrictions arising from direct and indirect detection as well as collider experiments. In order to obtain such signals, we implement the models in FeynRules or SARAH and the phenomenology is studied through packages such as Spheno, micrOmegas, MadGraph, FeynArts, and LoopTools. This model building and phenomenology perspective allow us to propose new physics models that could be studied and constrained by the detectors of the DUNE experiment. For instance, models with low dark matter mass have interesting potential for direct detection at the near detector. Moreover, due to the particle and/or symmetry extensions, it is possible to study non-standard interactions that arise from the models at DUNE.

Our team is comprised of three Ph. D. in Physics high energy and, in neutrino physics and four undergraduate students.

1. **Juan Guillermo Suarez. Ph. D. in Physics.**
More than 20 years of experience in high energy physics. I collaborated with the E-158 experiment at SLAC (2002-2004). From 2005 member of the CMS experiment at CERN. Experience in data analysis for the measurement of single and double Drell-Yan cross sections, the forward-backward asymmetry for the Drell-Yan process and the search of Z' with a pair muon anti-muon. Member of the CMS generator group (earn more than 15 points for pledges within this group) and the CMS muon physics object group. Collaboration with the muon trigger group. Experience as shifter (DQM- detector quality monitoring). From 2016 till 2018 team leader of the Institute for Nuclear Problems of the Belarusian State University in the CMS Collaboration (one of the founder institutes of the CMS Collaboration). Member of the CMS institution board, representative of Belarus institutes at CERN. juan.suarez47@eia.edu.co

2. **Amalia Betancur. Ph. D. in Physics**.

MSc. from the University of Florida with experience working in experimental condensed matter physics. Ph.D. in Physics at the Universidad de Antioquia working in high energy physics phenomenology. Her research has been oriented in building models with WIMP dark matter candidates as well as neutrino masses and constraining them with observables at experiments such as direct detection, indirect detection, and colliders. Additionally, she has worked in multivariate analysis to constrain physics beyond the standard model at collider experiments. amalia.betancur@eia.edu.co

3. **Guillermo Palacio, Ph. D. in Physics.**
From the Universidad de Antioquia, with experience working in high energy physics phenomenology, model building, neutrino physics, dark matter and collider physics. His theoretical work focuses on the building of minimal models beyond the Standard Model (minimal in particle content and additional symmetries) that can account for dark matter and relate to the mechanism of neutrino mass generation. The phenomenological research is based on the exploration of the available parameter space of the proposed model(s) using dark matter detection experiments (direct, indirect and colliders), neutrino oscillation data and collider processes at the LHC. guillermo.palacio38@eia.edu.co

Amalia Betancur

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Assistant Professor, Universidad EIA