DUNE Collaboration Meeting, Fermilab
Batavia, IL, USA

August 15~18, 2017

KISTI DUNE application

Kihyeon Cho
KISTI (Korea Institute of Science and Technology Information)

KiSTi www.kisti.re.kr 한국과학기술정보연구원 Korea Institute of Science and Technology Information

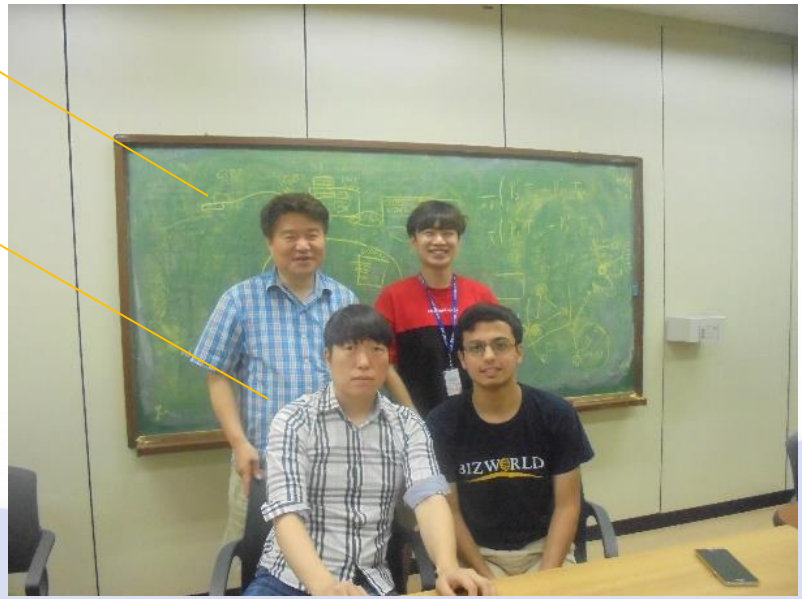
HEP Group @ KISTI (1/2)

➲ Who are we?

Name	Ph.D.	Experiences
Kihyeon Cho (Professor)	• CLEO (´96, U. of Colorado, USA)	• FOCUS (´96~´06, U. of Tennessee & KNU), • CDF (´01~ , KNU & KISTI) • Belle/Belle II (´09~ , KISTI)
Insung Yeo (Post-doc.)	• RENO (´17, JNU)	• Belle/Belle II (´17~ , KISTI)

➲ Search for Physics beyond Standard Model

- ➢ B physics
- ➢ Dark Matter



HEP Group @ KISTI (2/2)

CDF@FNAL, USA

FKPPL@IN2P3, France

Beam Simulation

@KISTI, Daejeon, Korea

Belle*/Belle II
@ KEK, Japan

DMRC

Geant4

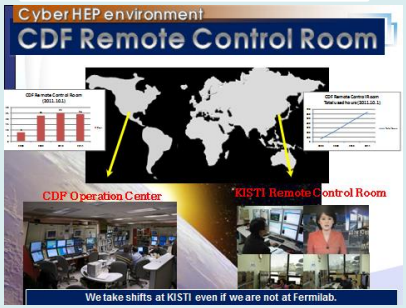
Collaborations

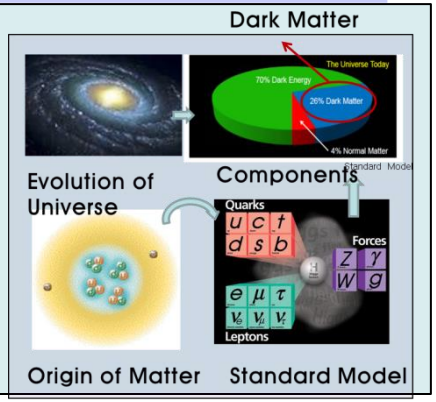
1. CDF @ Fermilab
2. Belle/Belle II @KEK
3. Geant4 Collaboration
4. FKPPL – Beam Simulation
   (France Korea Particle Physics Laboratory)
5. DMRC(Dark Matter Research Cluster) @ KISTI

KISTI has NISN(National Institute of Supercomputing and Networking).

Computational Science Center

HEP Group





Supercomputer Development Center

HEP Software

Networking Center

GLORIAD, KREONET

10Gbps between KISTI–Fermilab

Supercomputing Service Center

Supercomputer

200,000 CPU*hour for HEP

ALICE Tier1, CMS Tier3, Belle. LIGO farm

Contributions to DUNE

- For short term
  - To work on computing and data analysis
  - To generate of DUNE MC using supercomputer
- For long term
  - To work on deep learning on pattern recognition
  - To host **DUNE Data Center** at KISTI
  - To apply a funding to NST

UFSCAR Petition

F. Marinho

Background

- Instrumentation
  - Characterisation of LHCb VELO sensors
- Physics analysis
  - Rare decays (LHCb) and ED models (CMS)
- Detector devices simulation
  - Timepix: upgrade to hybrid pixel technology (LHCb)
  - Arapuca: LAr scintillation light (SBND, protoDUNE)

Scientific and Technical Interests

- Development of detector devices
  - Collection of LAr scintillation light
- Monte Carlo simulation:
  - Geometries, interaction models, wavelength shifters and dichroic materials to maximize light collection
  - Description of electronic signal response
- Prototype testing activities
- Physics data analysis

Activities

- Articulated with São Paulo groups:
  - E. Segreto (UNICAMP), A. Machado, L. Paulucci (UFABC)
  - D. Galante (LNLS - synchrotron)
- Collaboration: Andrzej Szelc (Manchester)
- Potential funding sources
  - São Paulo Research Foundation (FAPESP)
  - National Council for Research and Development (CNPq)
  - Coordination for Improvement of Higher-level Education (CAPES)

  R&D, travel expenses, student grants, fellowships
- Workshop on FAPESP, computational capabilities, conference participation, etc.

(Re-) Joining the DUNE collaboration

Roxanne Guenette
Harvard University
16 August 2017

Who we are…

- Roxanne Guenette (recently Asst. Prof. at Harvard)

- Corey Adams (Postdoc)

- Justo Martin-Albo (Postdoc, starts in October)

What have we done already in LBNE/DUNE

- Roxanne Guenette (member from 2010)
  - ✦ All numu disappearance results from 2010 to 2013 (Interim Report of LBNE, Steering committee, …)
  - ✦ First young-LBNE representative
  - ✦ Implemented the Atmospheric Neutrino generator in LArSotf
  - ✦ Deputy Convener of Installation and Integration of DUNE FD
  - ✦ Member of the APA consortium
- Corey Adams (member from 2011)
  - ✦ First author until R. Acciari joined
  - ✦ As a graduate student, performed some studies of wire spacing and supernova neutrinos in the LBNE era
- Justo Martin-Albo (member from 2015)
  - ✦ Lead the whole High-pressure gas TPC studies for the ND Task Force
  - ✦ Co-Convener of DAQ simulation

What we want to do

- Roxanne Guenette
  - ✦ Work with the APA consortium with particular interest in QA/QC
  - ✦ Perform physics studies with new Harvard graduate students (LBL physics, atmo. neutrinos, proton decay)
- Corey Adams
  - ✦ Perform physics studies with new Harvard undergraduates (LBL, atmo. neutrinos, supernova neutrinos)
- Justo Martin-Albo
  - ✦ Continue with some ND studies
  - ✦ Co-Convener of DAQ simulation

Otterbein University

The school:
Private 4-year liberal arts college.
~2000 undergraduates
Near Columbus, Ohio
(6 hours drive from FNAL)
Physics department of 4 faculty.

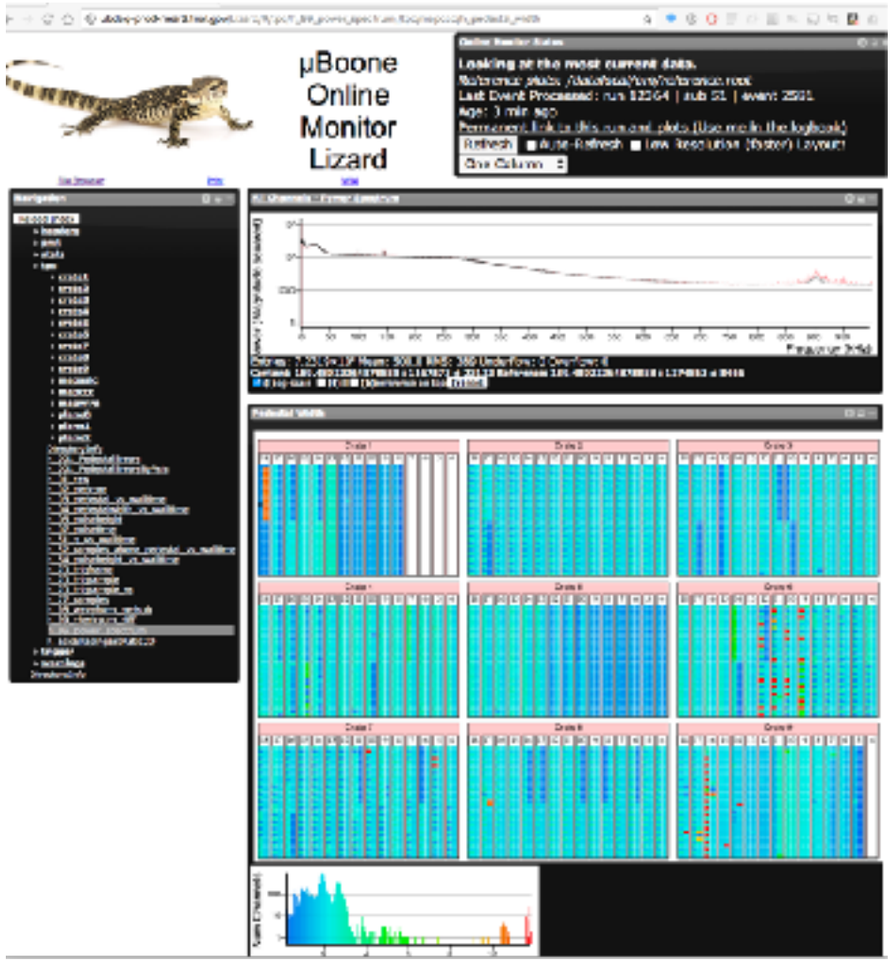
The group:
Myself plus 2-3 undergraduate students each summer.
Working on 3rd consecutive NSF grant (Exp PP RUI)

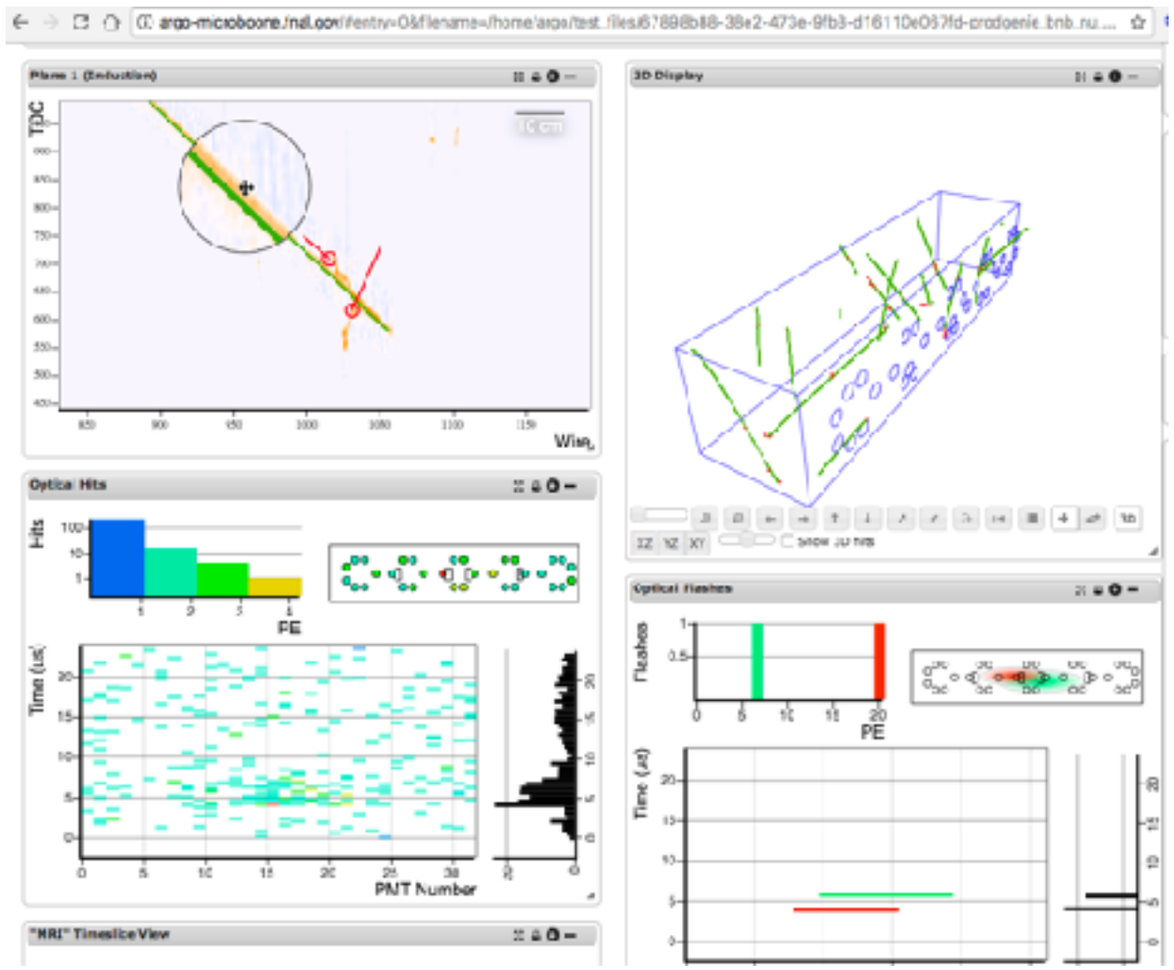
Me:
- Graduate work on Sudbury Neutrino Observatory
- Postdoctoral work primarily on MINOS, also Daya Bay
- PI on MINERvA
- PI on MicroBooNE

Some of my relevant work:

- Low-level data analysis (calibration, DAQ, monitoring, data quality)

  Example: responsible for entirety of MicroBooNE online monitor.
  (Samples data from DAQ, histograms of all channels made in real time.)





- Data visualization. Arachne (MINERvA) and Argo (MicroBooNE): real-time high-resolution responsive web applications which can display raw or reconstructed data.

  Example:
  http://argo-microboone.fnal.gov/live

Universidad Nacional de Asuncion (UNA)

Jorge Molina

Brief presentation of the UNA group to the DUNE collaboration

Aug 16, 2017

Persons interested in joining the DUNE experiment

- Jorge Molina — Dr. in Physics - Senior - Institutional representative
- Juan Gonzalez-Cuevas — MSc. Computer Sciences - Senior
- Claudio Chávez — Electronic engineer (MSc student)
- Carlos Romero — Electronic engineer (MSc student)
- Esteban Cristaldo — Mechatronics Engineering student
- Leonardo Yoshimura — Mechatronics Engineering student
- Victor Espinola — Mechatronics Engineering student

We wish to join the Photon Detection System Consortium of the SP consortia to work on the development of the ARAPUCA SYSTEM

Deliverables proposed

We want to participate in the hardware deliverables, specifically in the list distributed by the collaboration (DUNE DocDB #4466), we would like to contribute to the Read-out Electronics, in the following subjects:

i. Design

iv. Testing

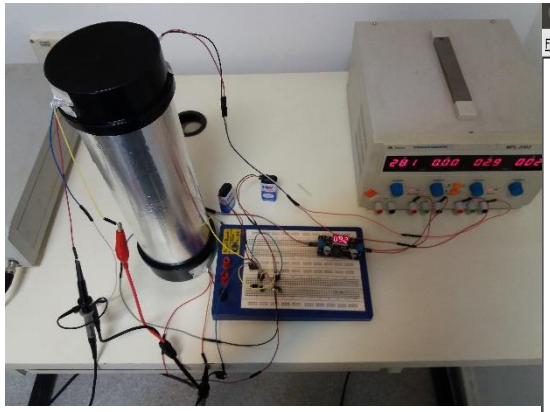
v. Firmware programming

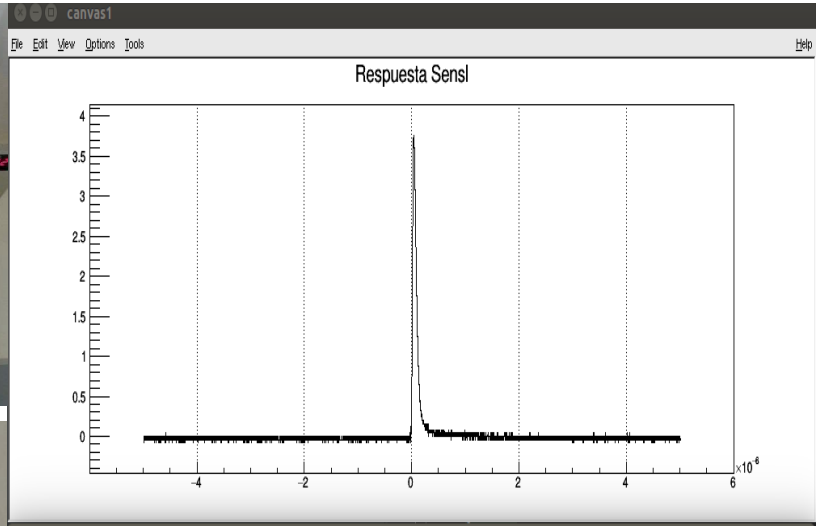
Besides these topics, we previously requested to participate in some deliverables that are not appearing in that list, that was:

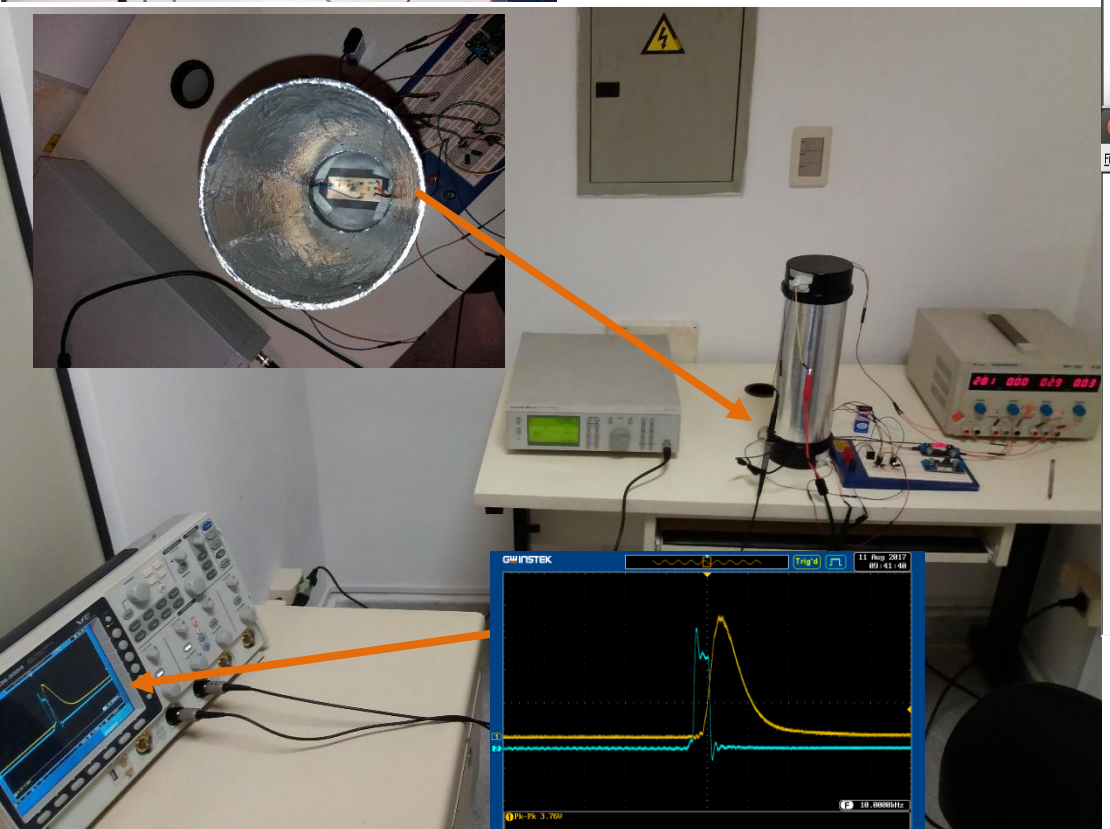
- Slow control system
- Integration of the PDS signals in the DAQ

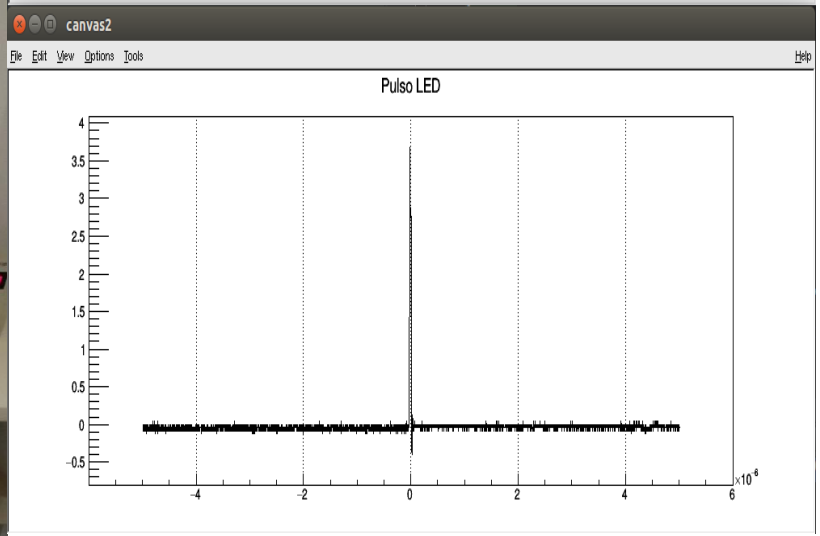
We would like to continue working in these subjects if is possible

We already started to work with the integration of the PD signal in the DAQ





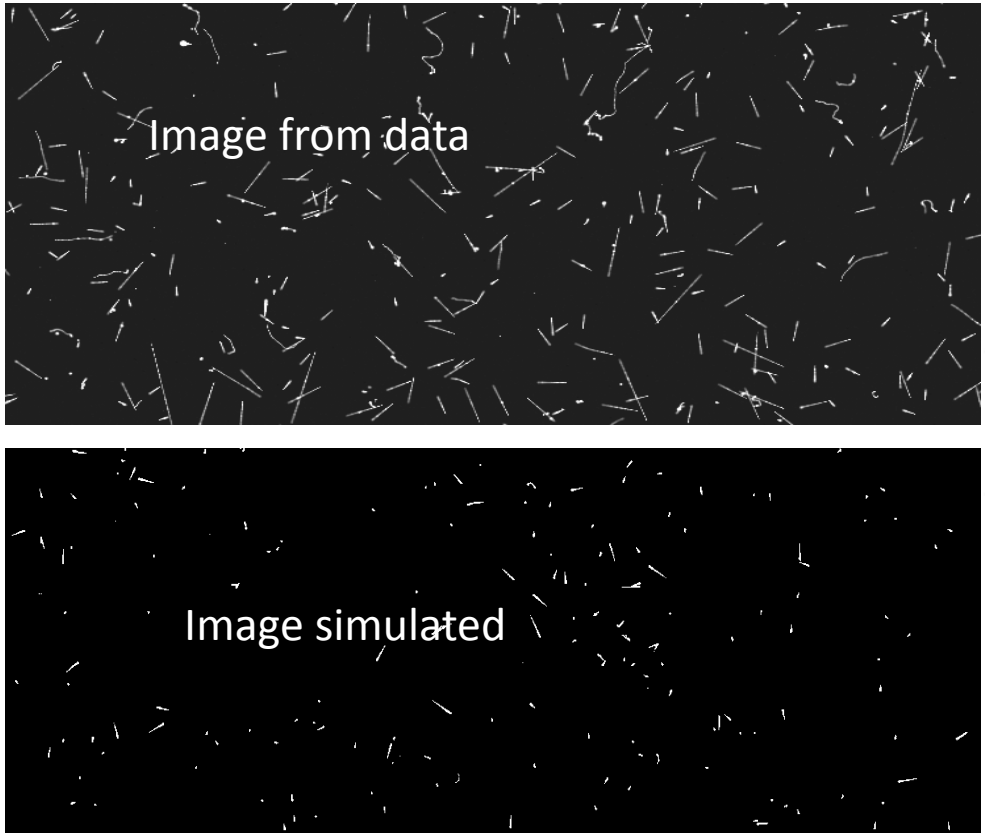


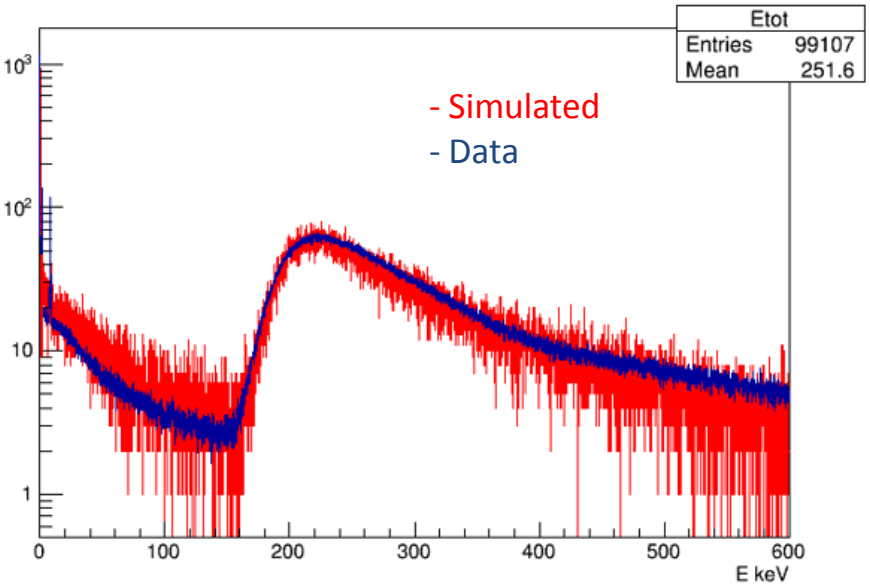


Now creating the libraries for the artDaq (already installed)

Experience

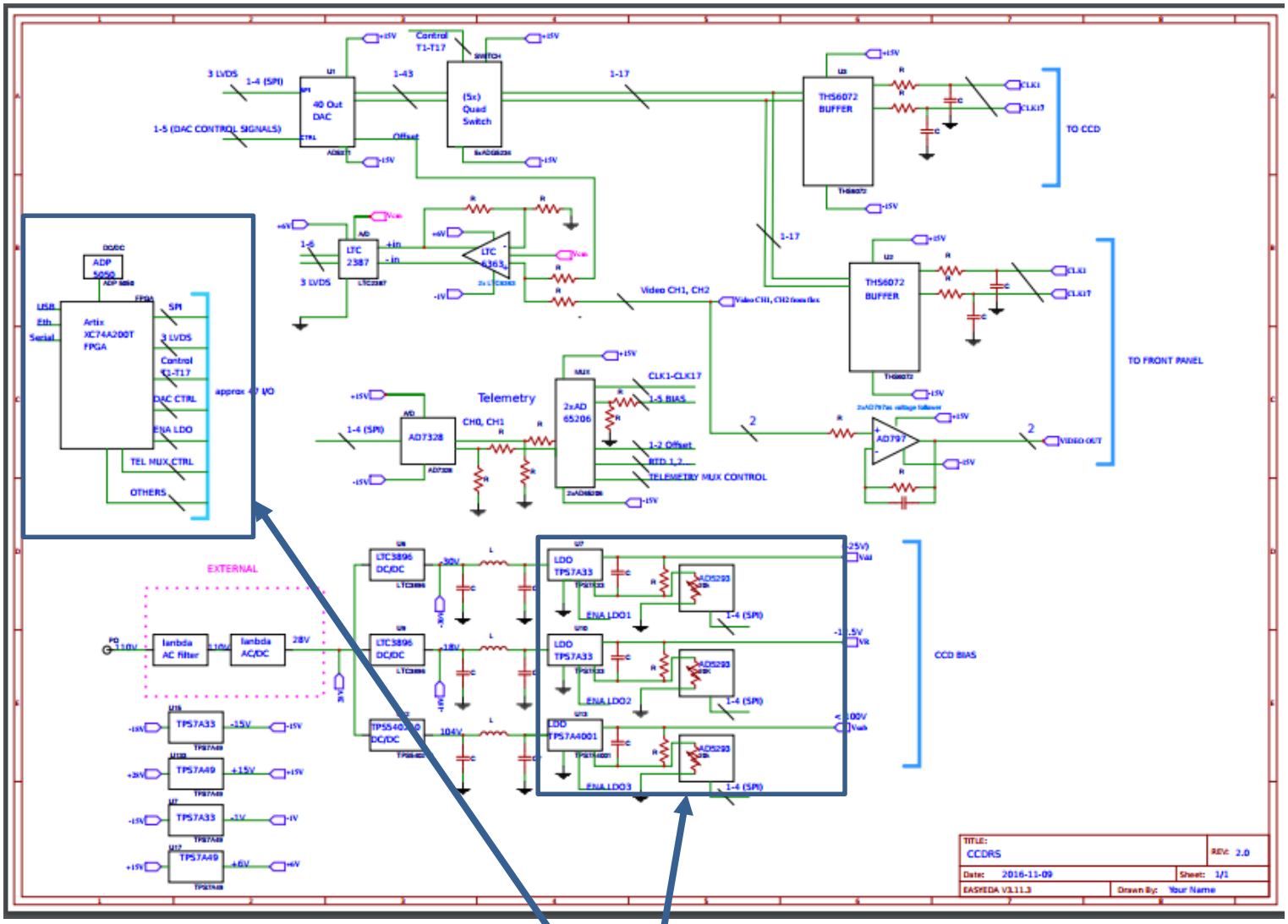
We have experience working mostly in simulations and electronic engineering





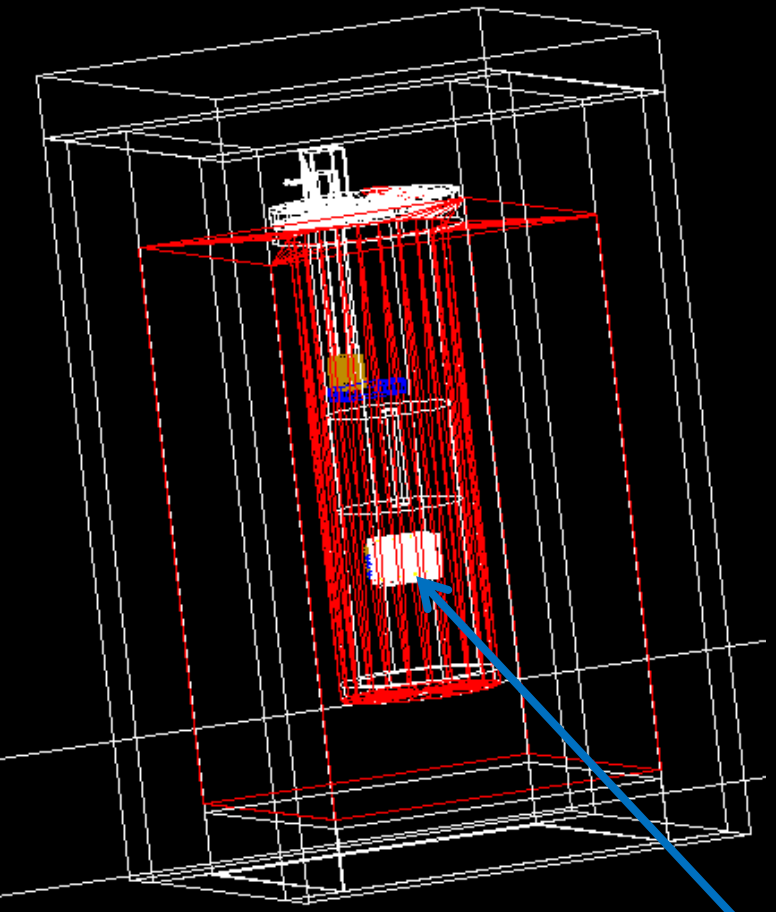
Simulation of an image with it´s spectrum generated in Connie (Coherent Neutrino Nucleus Interaction Experiment) compared to real data

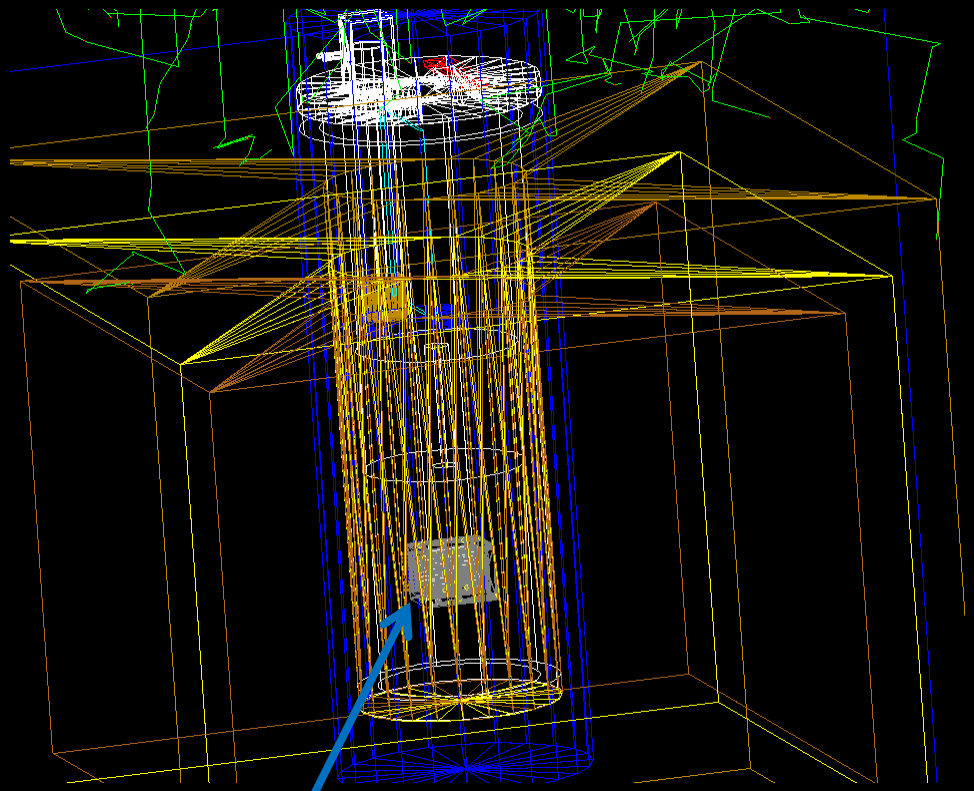
CCD readout board



Firmware and hardware contribution for the CCD readout board

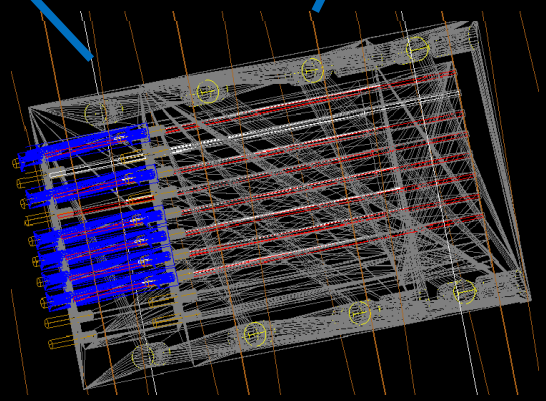
Backup slides





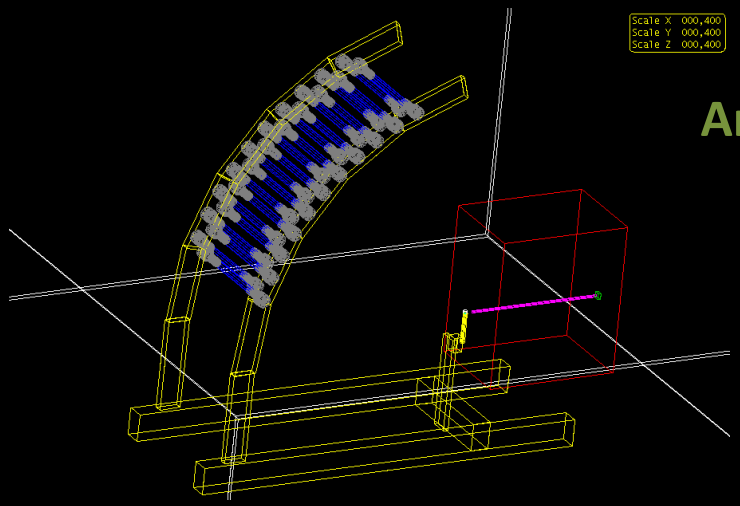
Damic

Connie

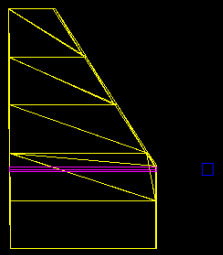


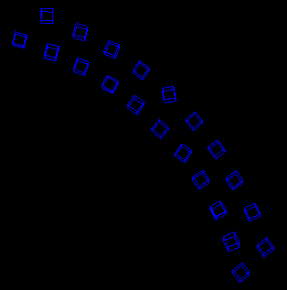
Same system used
used in both experiments.
Only change in the outer shield

Another experiments using CCDs

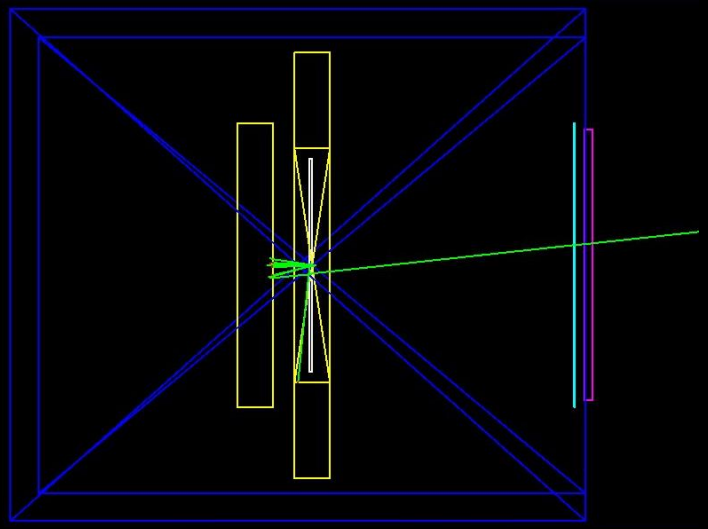


Antonella experiment

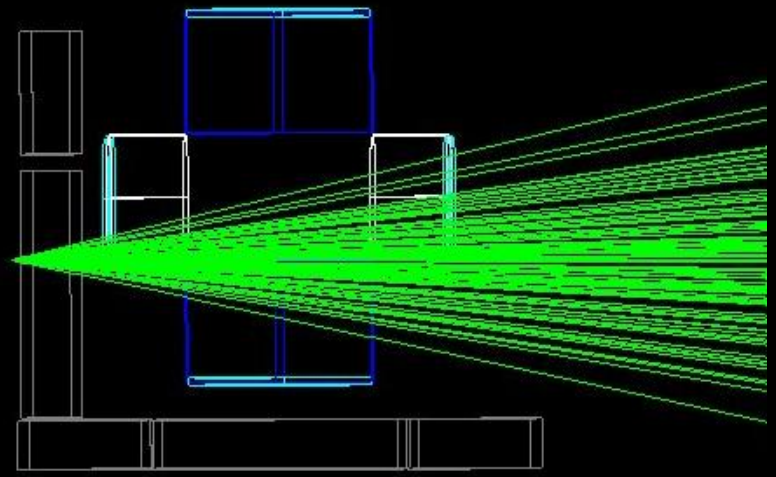




Compton scattering



Neutron scattering



UF | UNIVERSITY of FLORIDA

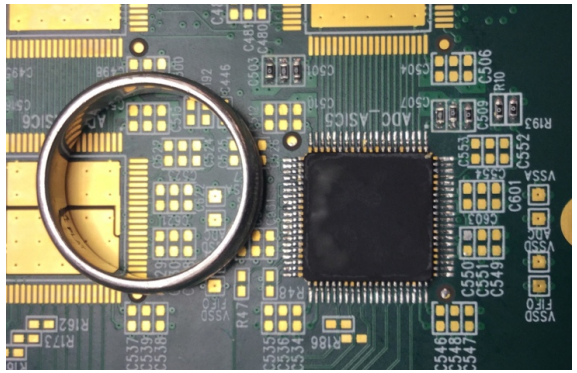
UF Liquid Argon TPC Group

- Group members: Ivan Furić [also DUNE IB representative]
- Should UF be admitted to DUNE, open a postdoc search
  - also recruit graduate student(s) during the Fall semester

- IKF: Associate Professor [tenured]
- Previously LHC / CMS:
  - Physics: Cosmic-ray charge measurement, underlying event studies, Z' -> mu mu search, H -> bb search
  - Hardware expertise: CMS endcap muon trigger [digital logic: high throughput electronics boards, fast pattern recognition, fast & precise p_T measurement]
  - Management: Level-3 manager for the Phase 1 endcap muon trigger upgrade through the DOE Critical Decision process

- UF @ DUNE physics interests:
  - Sterile neutrinos, CP violation, supernovae

- UF @ DUNE construction project / consortium interests:
  - Cold electronics, Electronics Quality Assurance / Quality Certification
  - Spent the summer at BNL testing electronics, learning how to build and run a testing center
  - Requested dedicated lab space in UF physics building



- UF @ DUNE Funding:
  - awarded partial funding in FY 2017 DOE comparative review
  - will be re-applying this Fall to complete the group funding

- Future UF @ DUNE:
  - Heather Ray will be joining the DUNE effort ~in the next year. Primary involvement in supernovae trigger/DAQ/ID, and incorporating DIS measurements from MINERvA into sim

INFN Bologna

MEMBERS:

Bertolucci Sergio	Professor, University of Bologna and INFN
Cervelli Alberto	Staff INFN Researcher
Guerzoni Marco	Staff PHD Engineer/Technologist
Laurenti Giuliano	PhD Engineer/Technologist (retired from INFN, Associated to INFN)
Mandrioli Gianni	Associate (retired from INFN, Associated to INFN)
Mauri Nicoletta	Tenured University Researcher
Moggi Niccolo'	Tenured University Researcher
Montanari Alessandro	Senior INFN Researcher
Patrizii Laura	Senior INFN Researcher
Pozzato Michele	Staff INFN Researcher
Sirri Gabriele	Senior INFN Researcher
Stanco Luca	Senior INFN Researcher
Tenti Matteo	INFN postdoc
Travaglini Riccardo	Staff INFn Researcher
Zucchelli Stefano	Associate Professor, University of Bologna and INFN

INFN Istituto Nazionale di Fisica Nucleare
Sezione di Bologna

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA A.D. 1088

Bologna and the US neutrino program

As all the other INFN sections, Bologna is currently engaged in both SBN and LBN program at Fermilab

In the SBN:

- Construction (with Cern) of the Cosmic Ry Tagger roof for ICARUS (with CERN)
- Participation to the construction of the SBND cryostat (with CERN)
- Participation to the realization of the Slow Control system.

In DUNE:

- Interested in contributing to the design and construction of the ND
- Continuing the study of the (re)use of the KLOE solenoid and e.m. calorimeter for the ND
- Doing R&D on a novel concept of liquid argon detector with optical readout
- Participating to the study groups on ND

UNIVERSITÀ DEL SALENTO

INFN LECCE

Paolo Bernardini
Associate Professor,
Dipartimento di Matematica e Fisica,
Università del Salento, Lecce, Italy

Antonio Surdo
Researcher, 2nd level
Istituto Nazionale di Fisica Nucleare, Lecce, Italy

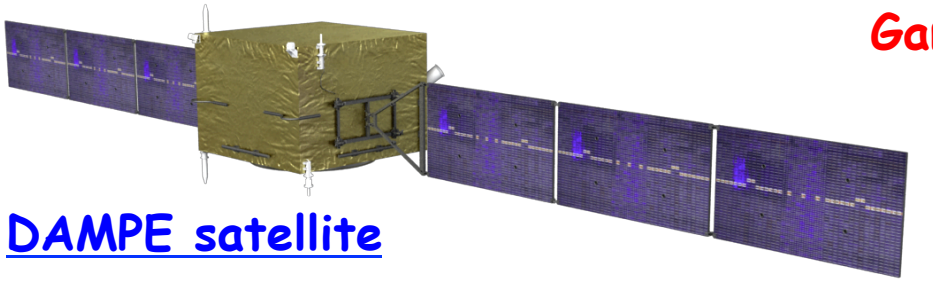
Past and present activities

MACRO at Gran Sasso

Analysis of
neutrino-induced events

ARGO-YBJ in Tibet

Cosmic Rays
Gamma Astronomy



DAMPE satellite

Cosmic Rays
Dark Matter

NESSiE concept

Short-Baseline
Neutrino Oscillation

NOW

Neutrino Oscillation Workshop

Since 2000, 8 editions
in Otranto (Italy)

Possible contributions to DUNE

- MC simulation of near detector and its physics reach

- contribution to SBL program at FNAL,
  mainly simulation and data analysis

- partecipation to the activities required to install
  and operate the detector components that will be
  contributed by INFN

GROUP EXPERIENCE

- A significant experience in underground experiments
  - BOREXino: the group has built or contributed to build key-components of the experiment (scintillator, front end and digital electronics, triggering system) and has plaid a major role throughout the whole experiment (M.P. has been co-spokeperson since 2011 and G.T. is Physics Coordinator)
  - CUORE: Members of the group have worked on low radioactivity cryogenic suspension, daq, digital electronics and data analysis
  - LUNA: Members of the group have experience in low energy accelerators operated underground
  - DARKSIDE: the group is involved in the operation of DARKSIDE-50 and is a member of DARKSIDE-20k, the largest dark matter detector based on liquid argon at Gran Sasso.

Alessio Caminata - Researcher at INFN
Stefano Davini - Researcher at INFN
Sergio Di Domizio - RTDA Unige
Federico Ferraro - Post Doc
Marco Pallavicini - Full Professor
Gemma Testera - Senior Researcher at INFN

Stefano

Sergio

Gemma

Marco

Alessio

Alessio Caminata
Ric. III - INFN

Born in Genoa, Italy, November 19th, 1986.PhD in physics in 2014. 2014-2017 Postdoc INFN Genova, Italy: I was involved in the Borexino-SOX experiment (solar neutrinos and sterile neutrinos studies using a liquid-scintillator-based experiment) being responsible for the simulation code of the experiment. In this period I was involved in the refactoring of the code and on data analysis using montecarlo methods. In parallel I contributed to the CUORE experiment (neutrinoless double beta decay with bolometric technique) being involved in the DAQ code development and in the cryostat commissioning. In 2017 I won a permanent research position at INFN Genoa and I am currently part of the Borexino Steering Committee.

Stefano Davini
Ric. III - INFN

"Ricercatore 3° livello" within INFN Genova. My research activities include the DarkSide experiment at LNGS, focused on the detection of high mass WIMPs recoils in Argon, and the solar neutrino experiment Borexino. Within DarkSide I have been in charge of the DAQ and analysis of the liquid scintillator neutron detector of the 50-kg prototype. Within Borexino I focused mainly on the simulation and data analysis which lead to the first detection of the rare "pep" solar neutrinos.

Sergio Di Domizio
RTDA Unige

Temporary researcher (RTDA) at the Physics Department of the Genova University.
Member of the CUORE neturinoless double beta decay experiment, currently responsible of the data acquisition system and member of the Physics Coordination Board.
Also working on CALDER, an R&D project for the development of high energy resolution cryogenic light detectors based on superconducting kinetic inductance sensors (KIDs).

Federico Ferraro
Assegno

Born in Genoa, Italy, on March 22nd, 1989. PhD in Physics in 2017. Now postdoc at University of Genoa.
During my PhD I designed and realized a beam calorimeter and the interaction chamber for the gas target at LUNA (Laboratory for Underground Nuclear Astrophysics). Subsequently, I characterized the differential pumping, extended gas target and I studied the systematics on the calorimetric reading of the beam current. I operated the single-ended electrostatic accelerator at LUNA and I used both semiconductor and scintillating detectors to study nuclear reactions of astrophysical and cosmological interest, taking care of the different phases of the experiment, from simulations to data taking and analysis.I am now developing a method for the precise measurement of the beam current at LUNA-MV.

Marco Pallavicini
P.O.

Full Professor of Fundamental Interactions at the University of Genova. I have worked on charmonium physics in p-pbar collisions at Fermilab (experiments E760-E835), CP violation studies on B meson system at SLAC (BaBar experiment), solar neutrino physics at Gran Sasso (neutrino oscillations, solar physics and Geo-Neutrinos with BoreXino and search for neutrinoless double beta decay with CUORE) and search for sterile neutrinos with SOX.
I am currently the chair of INFN Astroparticle Physics commission 2 and President of Genova Science Festival.

Gemma Testera
Ric. II - INFN

Born on in Genova on 1963 and graduated in Physics on 1986 at the University of Genova. where I obtained the phd in Physics in 1991. I have a position as INFN researcher since the year 1991. In 2003 I become First Researcher. In 2012 I obtained the l'Abilitazione Scientifica Nazionale for a profile of Full Professor in the sector 02/A1; (ref. bando 2012 (DD n. 222/2012)). I always worked (and I'm presently working) on experimental particle physics in the framework of INFN projects. The main scientific topics are two: 1) verification of fundamental simmetries (CPT and WEP) using low energy antimatter and anti-hydrogen 2) solar neutrino physics, geo-neutrinos and dark matter. I am currently the Physics Coordinator of the Borexino experiment and INFN P.I. of the AeGIS project at CERN.

Piera Sapienza
Laboratori Nazionali del Sud (LNS)

DUNE IB, 16th August 2017

LNS group

- Piera Sapienza - Researcher II
- Simone Biagi - Researcher III
- Carla Distefano - Researcher III
- Riccardo Papaleo Tec III
- Giorgio Riccobene - Researcher II

Past and present activities

- Experiments in Nuclear Physics with heavy ions at GANIL (France), GSSI (Germany) and LNS (Italy) accelerator
- Present and future underwater experiments for high energy neutrino detection
  - Antares (Toulon, France)
  - KM3NeT/ARCA (Capopassero, Italy) – High energy neutrino astronomy
  - KM3NeT/ORCA (Toulon, France) Neutrino Mass Hierarchy determination

LNS possible contributions to DUNE

- MC simulations
- participation to the construction and installation of the CRT @ SBL
- participation to Near Detector activities
- …

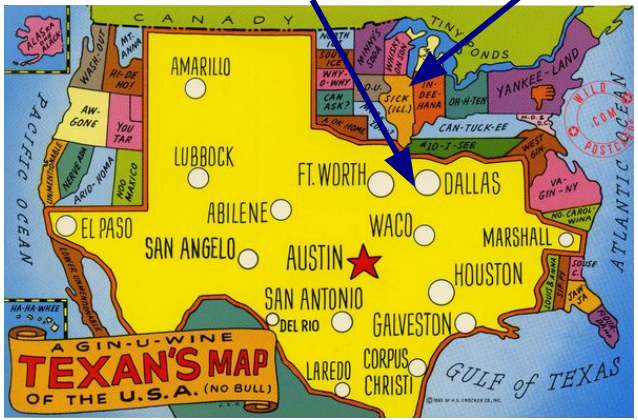
University of Dallas application to join DUNE

Will Flanagan
August 16, 2017

About UD

- 50 undergraduate physics majors
  - UD excels at connecting students with research and preparing students for grad school.
- No graduate physics program

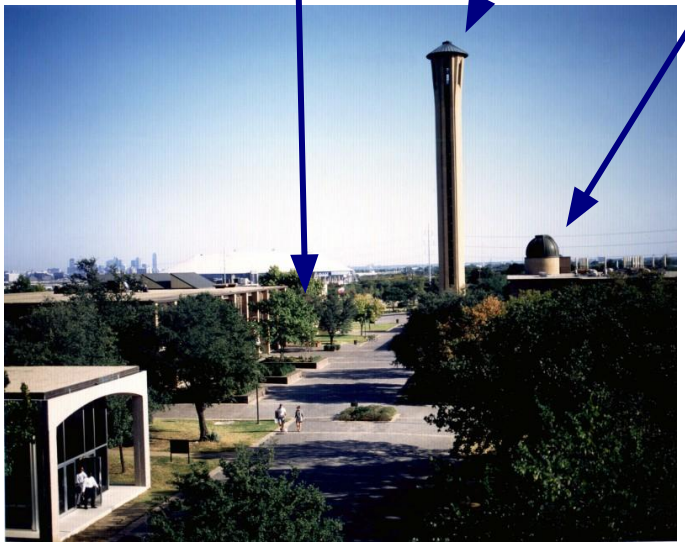
University of Dallas Fermilab



Cappuccino Bar

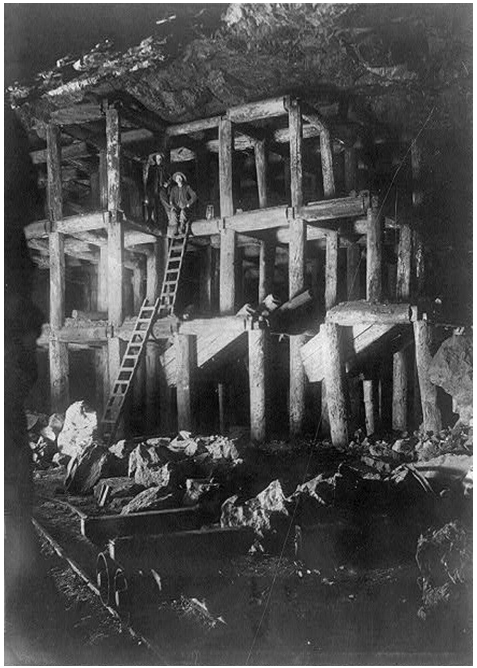
Braniff Memorial Tower

Physics Department



Going Forward

- Focused contribution: assembly and commissioning of portions of the dual phase CRP.
- Analysis of protoDUNE data in short term.
  - Excellent opportunity to get talented UD students involved.
- Questions, comments to will.flanagan@utexas.edu



Homestake circa 1906

- Thank You!

Backup

Funding and Time

- I will be applying for DOE funding this Fall.
  - Any suggestions are warmly appreciated.
- May also apply for summer support from the Fermilab Visiting Faculty Program
  - http://ed.fnal.gov/interns/programs/vfp/index.shtml
- In the short-term, I plan to spend a small portion of time on DUNE related activities, with a focused effort on the dual-phase charge readout plane.
  - Envision ramping up our DUNE FTE as NOvA winds down.

My Brief CV

- PhD from Texas A&M
  - CMS Experiment
- Postdoc at University of Texas at Austin (with Karol Lang)
  - MINOS+
    - Muon neutrino disappearance, Monte Carlo production, software librarian
  - Also LArIAT test beam and MINER reactor experiments
  - As MINOS+ and LArIAT wind down, ramping up on NOvA
    - DAQ coordinator for NOvA test beam
- Faculty at the University of Dallas starting this week

Other Interests

- I have experience commissioning cold amplification for SiPMs in LArIAT and TallBo.
- Though I find the topic interesting, I don't propose any light collection tasks at the moment.