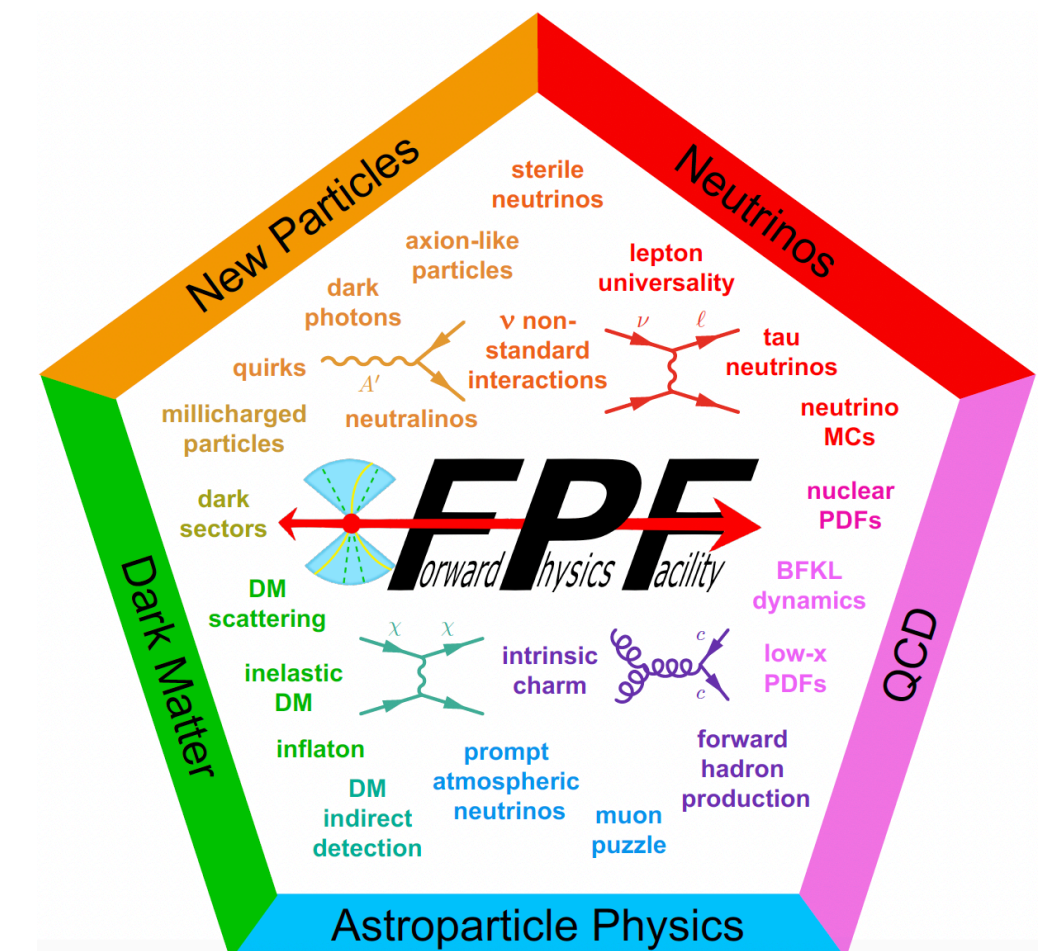
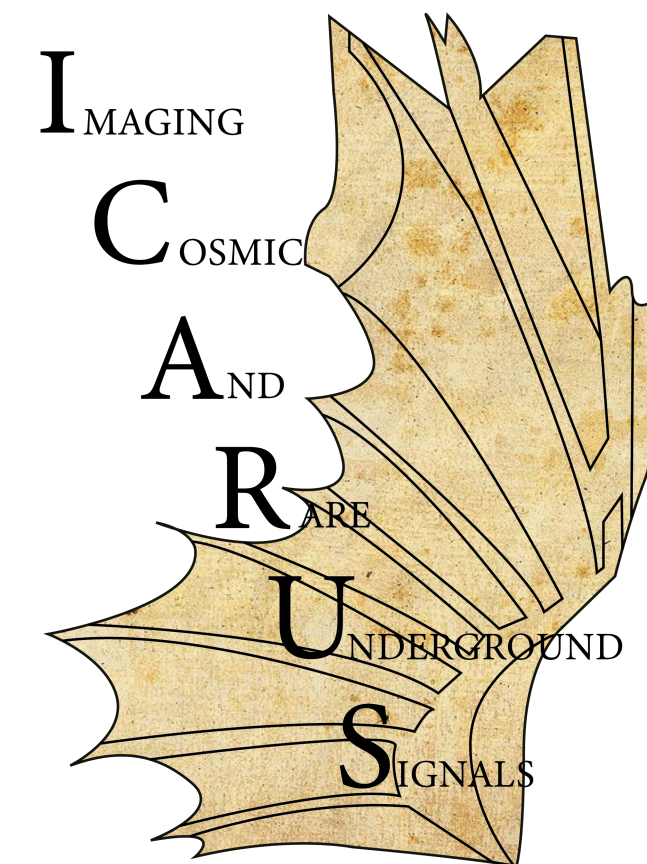


# BNL NPP Retreat for Postdoctoral Research Associates

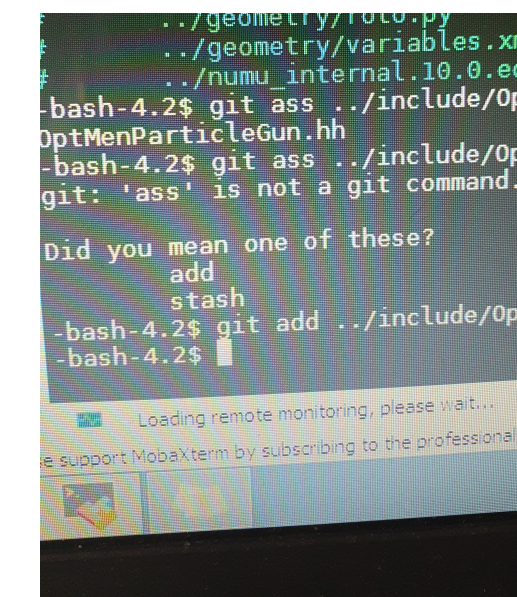
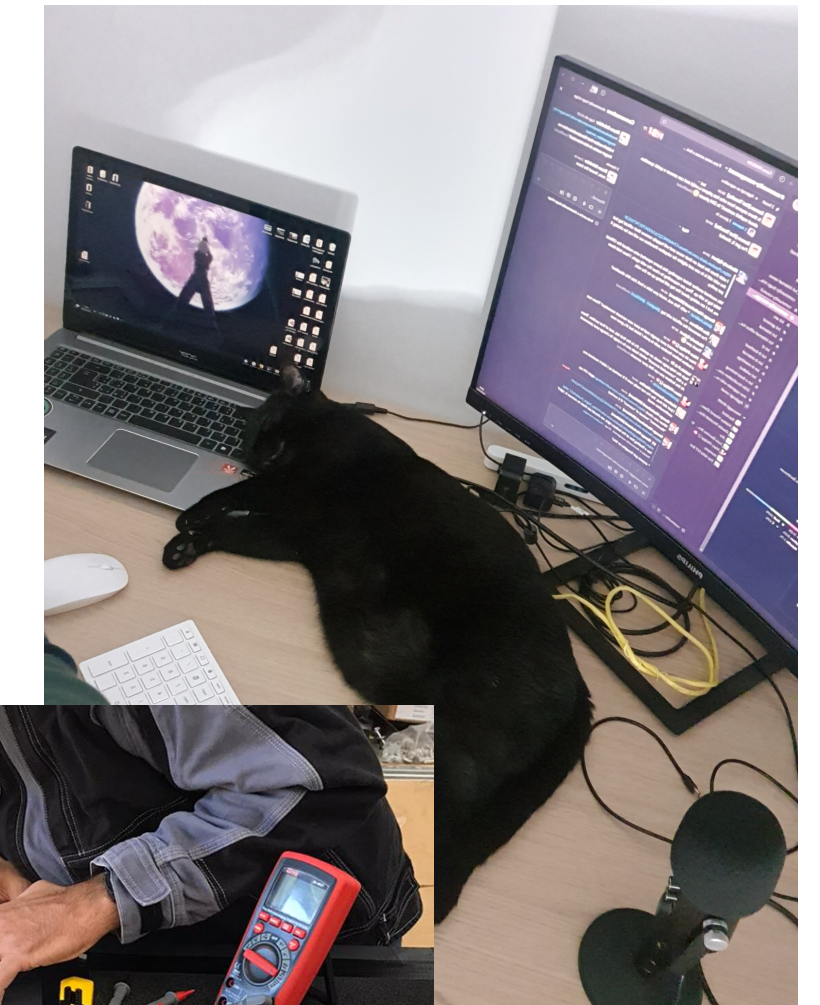
Flash Talk: Matteo Vicenzi

Matteo Vicenzi - August 25th, 2023



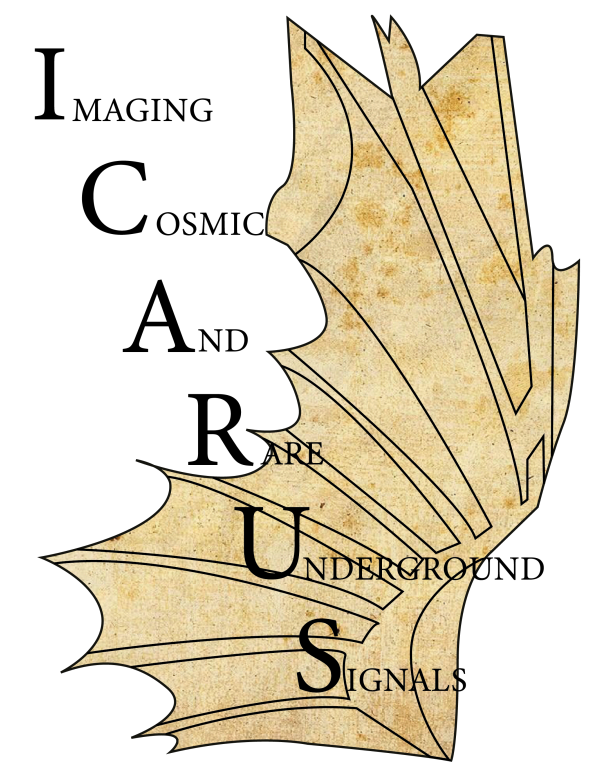
# Who am I?

- Born and raised in Genova, Italy.
- Bachelor's and Master's degree in Physics from the University of Genova.
- PhD in Physics at the University of Genova and INFN Genova.
  - Liquid Argon neutrino detectors, MC simulations for DUNE Near Detector (SAND).
  - Graduated in January 2023.
- Joined the Electronic Detector Group at BNL as a postdoc last February!
- On a personal note: huge SciFi fan (Star Wars, Star Trek, ...) and LOTR!

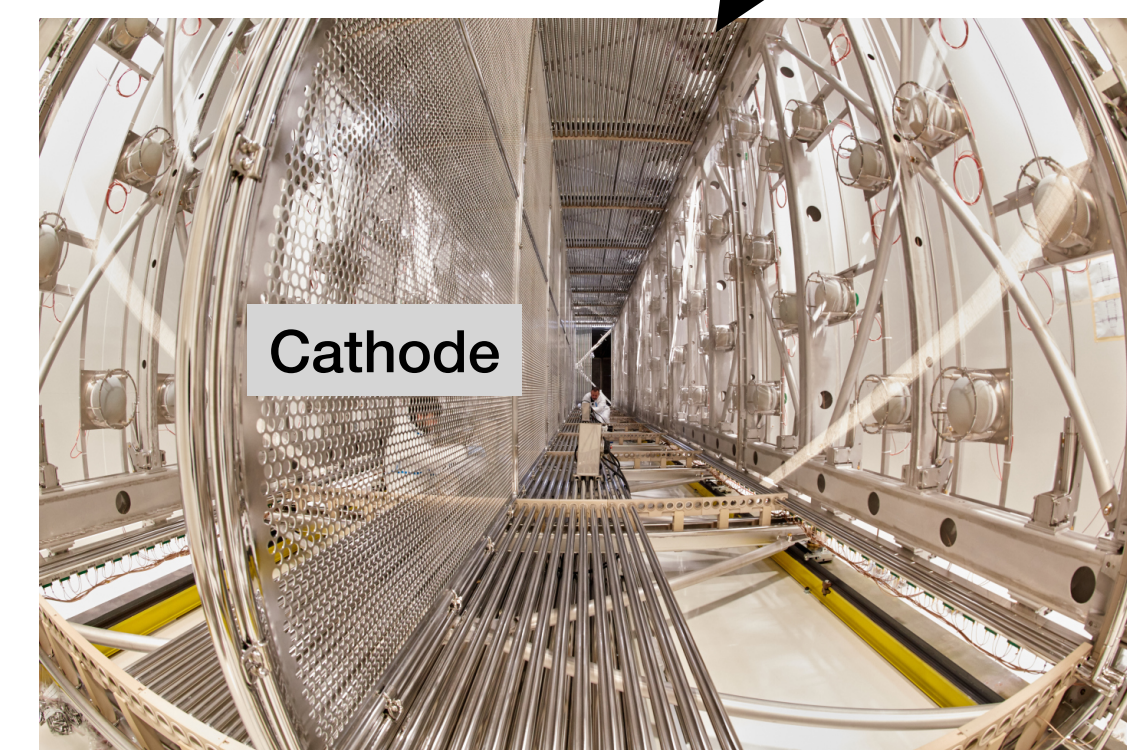
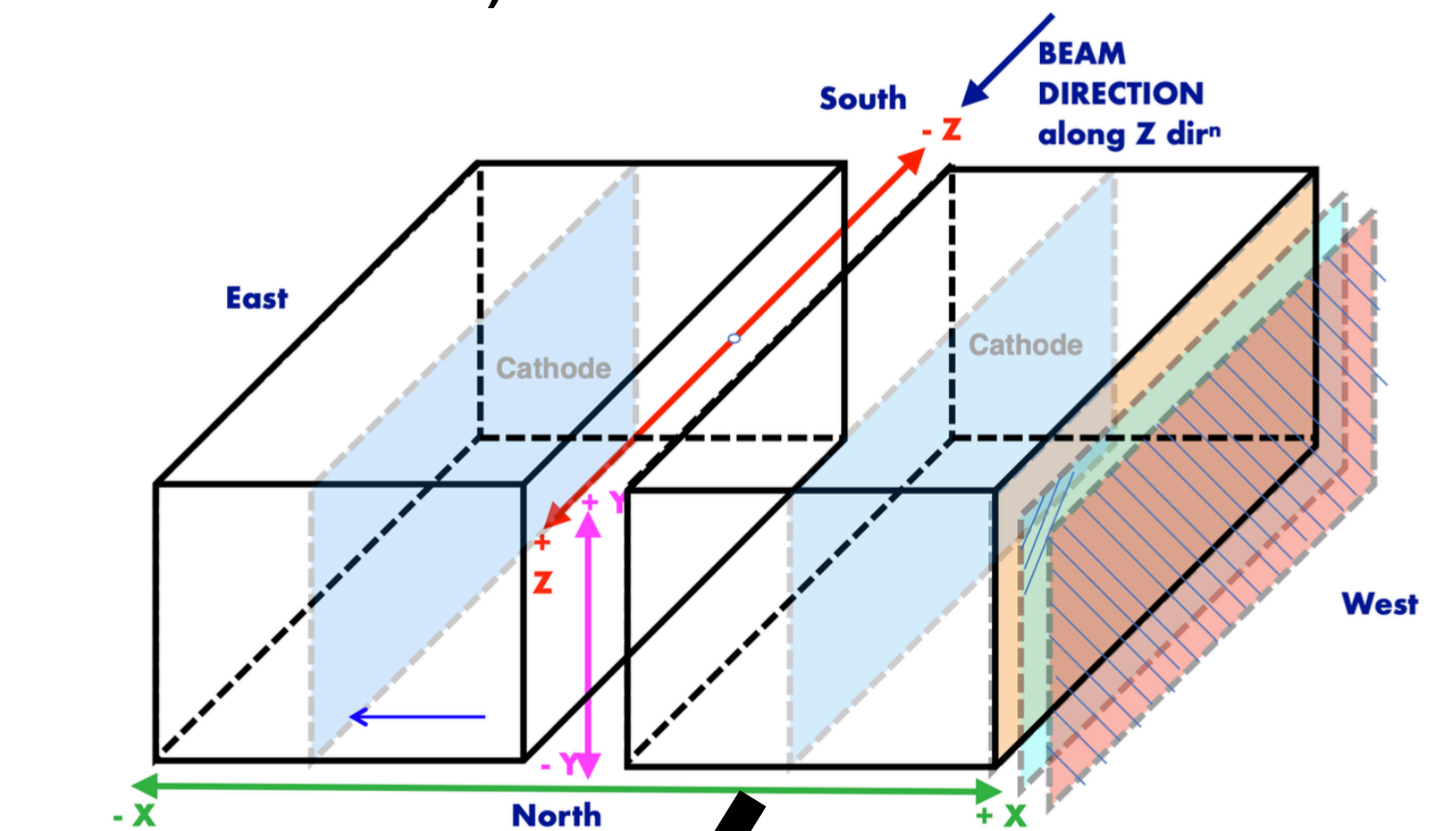
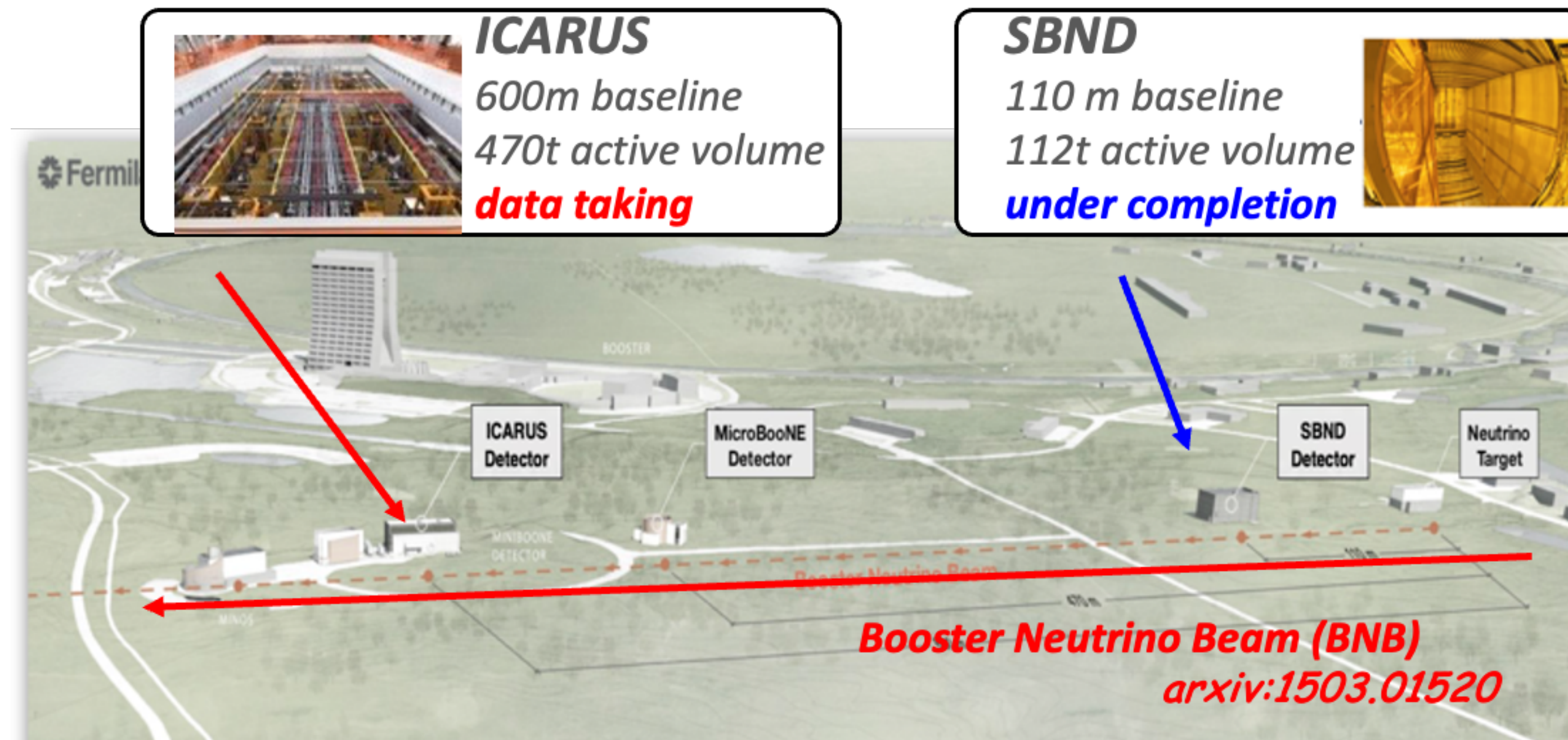


# My research at BNL

## Short Baseline Neutrinos at ICARUS



- Anomalies in short baseline neutrino oscillations (MiniBooNE, LSND, BEST, Neutrino-4, ...) could be explained by a new sterile neutrino state ( $\Delta m^2 \sim 1eV^2$ )

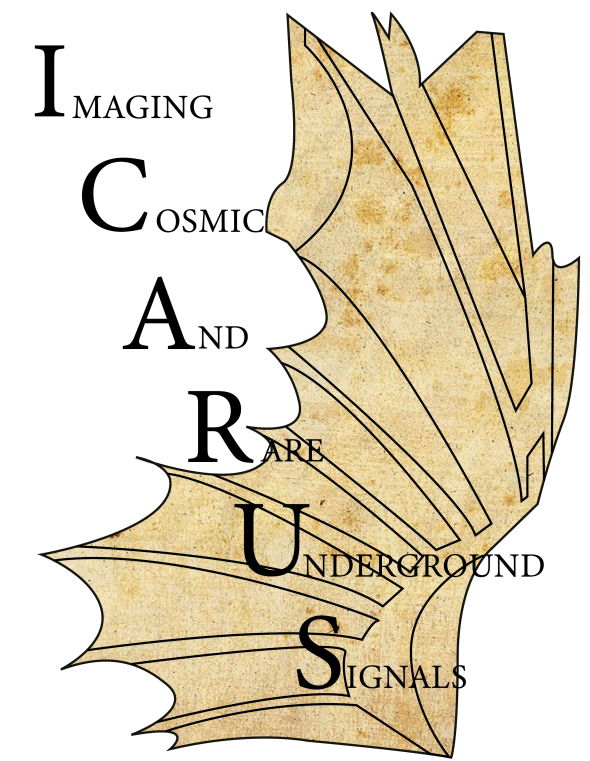


Two identical cryostats (3.6 x 3.9 x 19.6 m<sup>3</sup>), housing 2 TPCs each

**ICARUS is the largest liquid Argon detector currently in operation!**

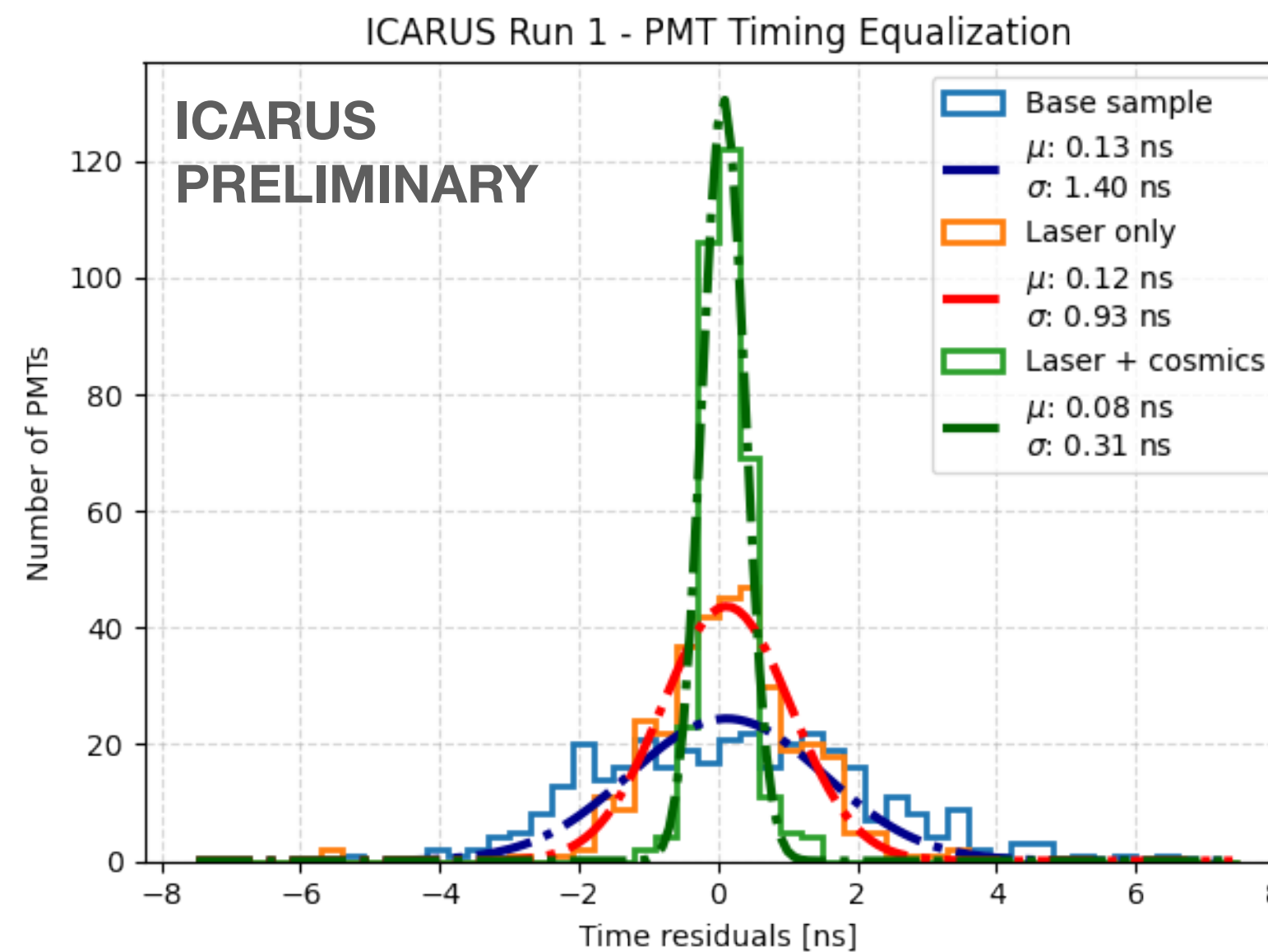
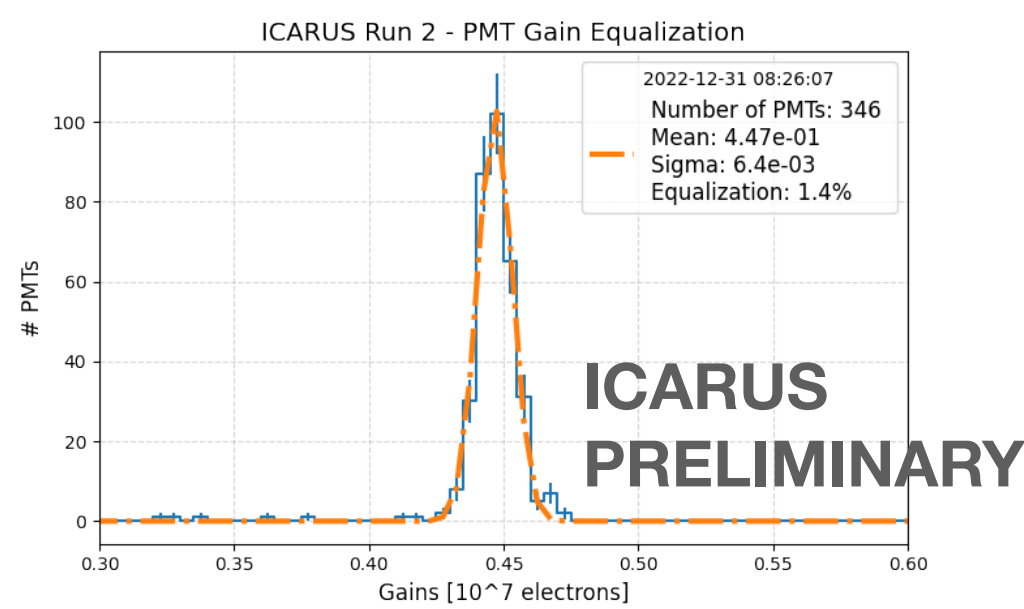
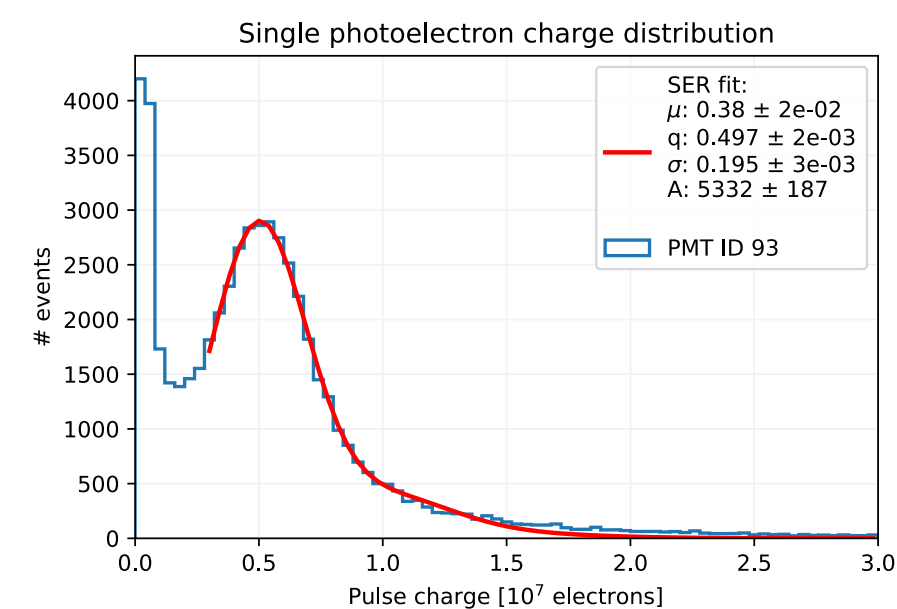
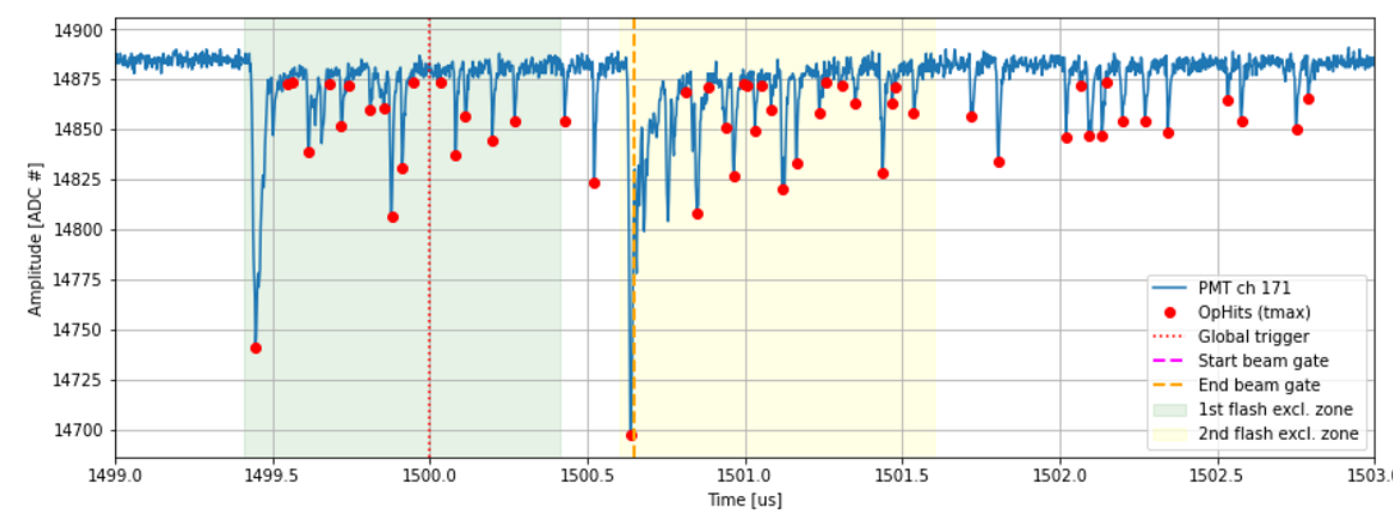
# My research at BNL

## Short Baseline Neutrinos at ICARUS



- My activity is focused around the photon detection system (360 Hamamatsu PMTs, 180 per cryostat), from calibration to reconstruction.
- Aiming to exploit the  $<1\text{ns}$  timing resolution for a light-only reconstruction of the events.
- Routinely involved in detector operations as DAQ expert.

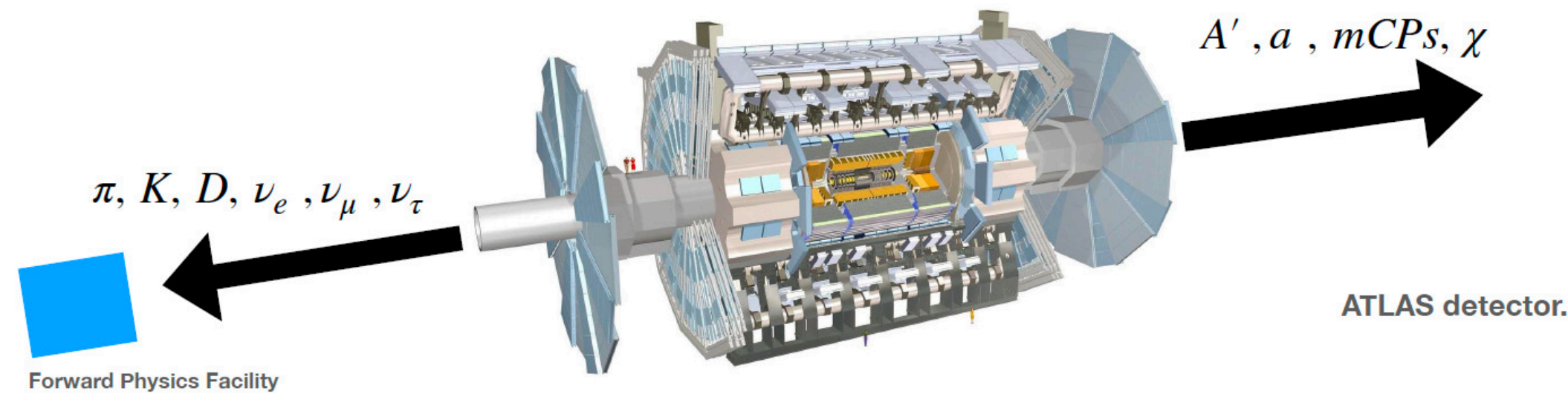
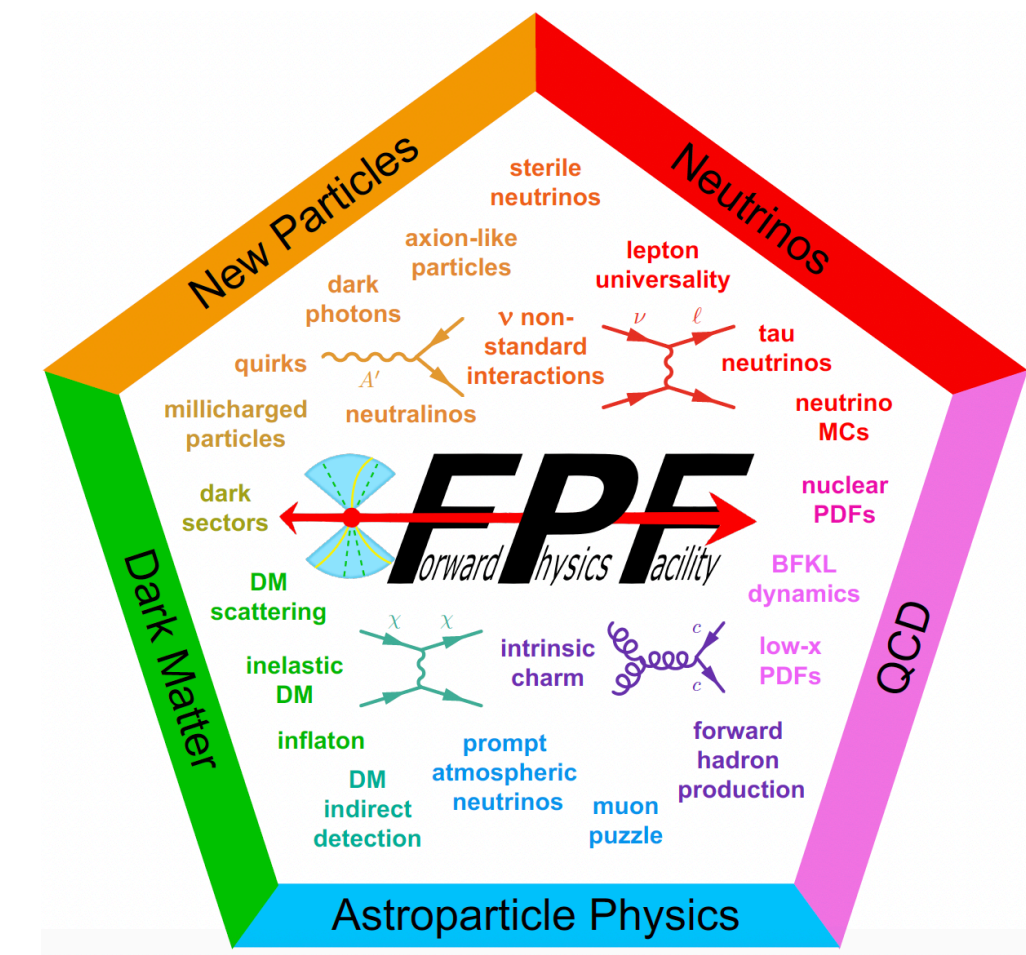
ICARUS Photo Multiplier Tubes (PMTs) on one of the walls



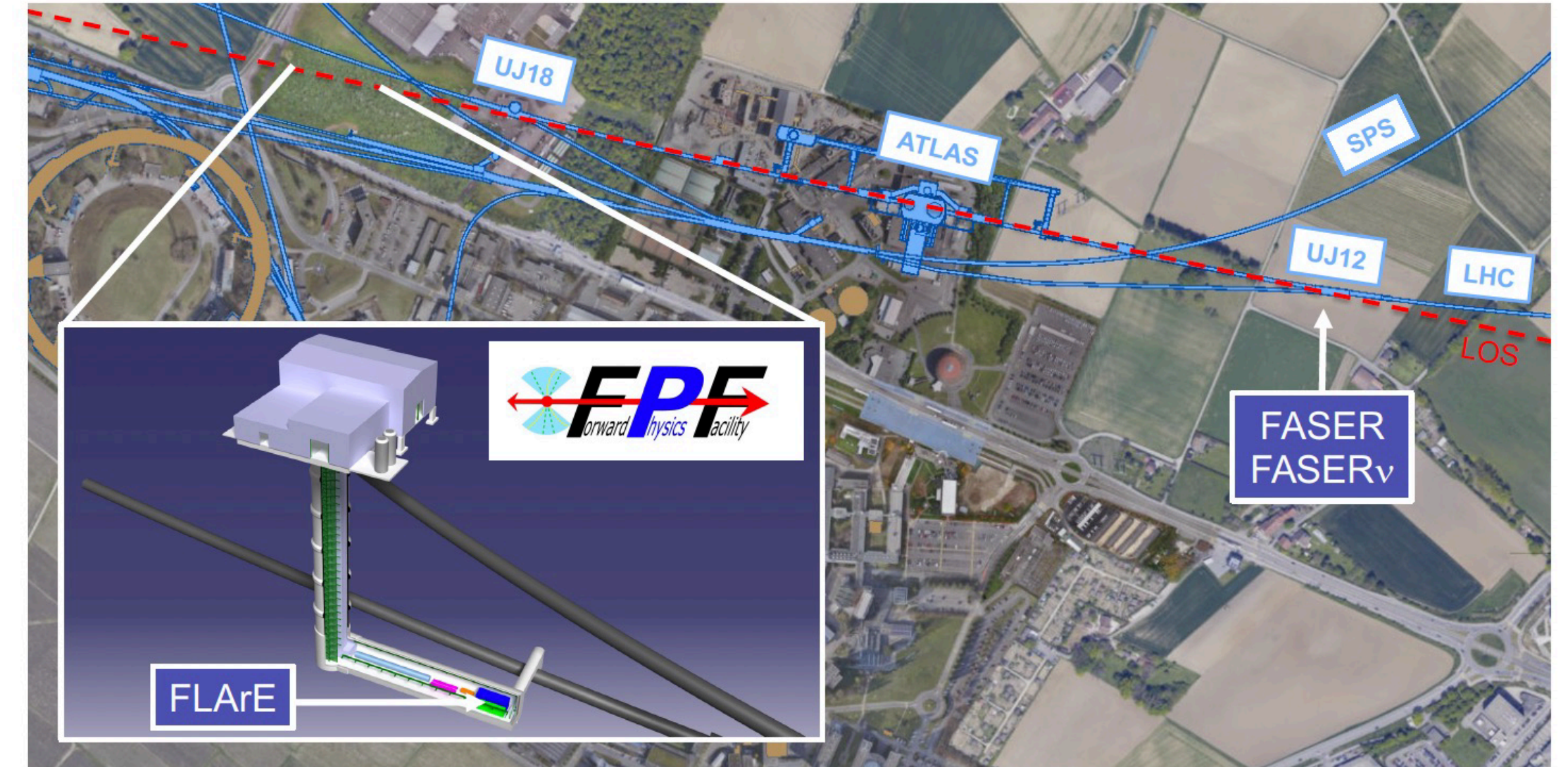
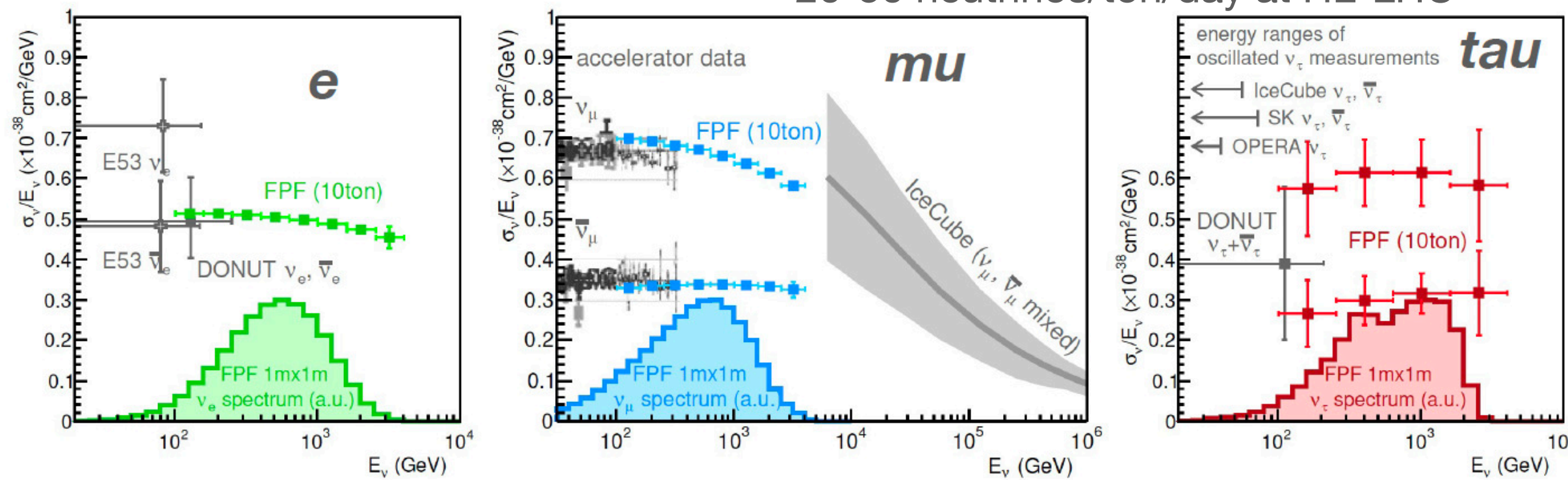
# My research at BNL

## FLArE at the Forward Physics Facility

- Large flux of high energy (>100 GeV) light particles in the forward direction from the ATLAS interaction point at LHC!



20-50 neutrinos/ton/day at HL-LHC



New cavern is planned along the line of sight from ATLAS, shielded by ~600m of rock

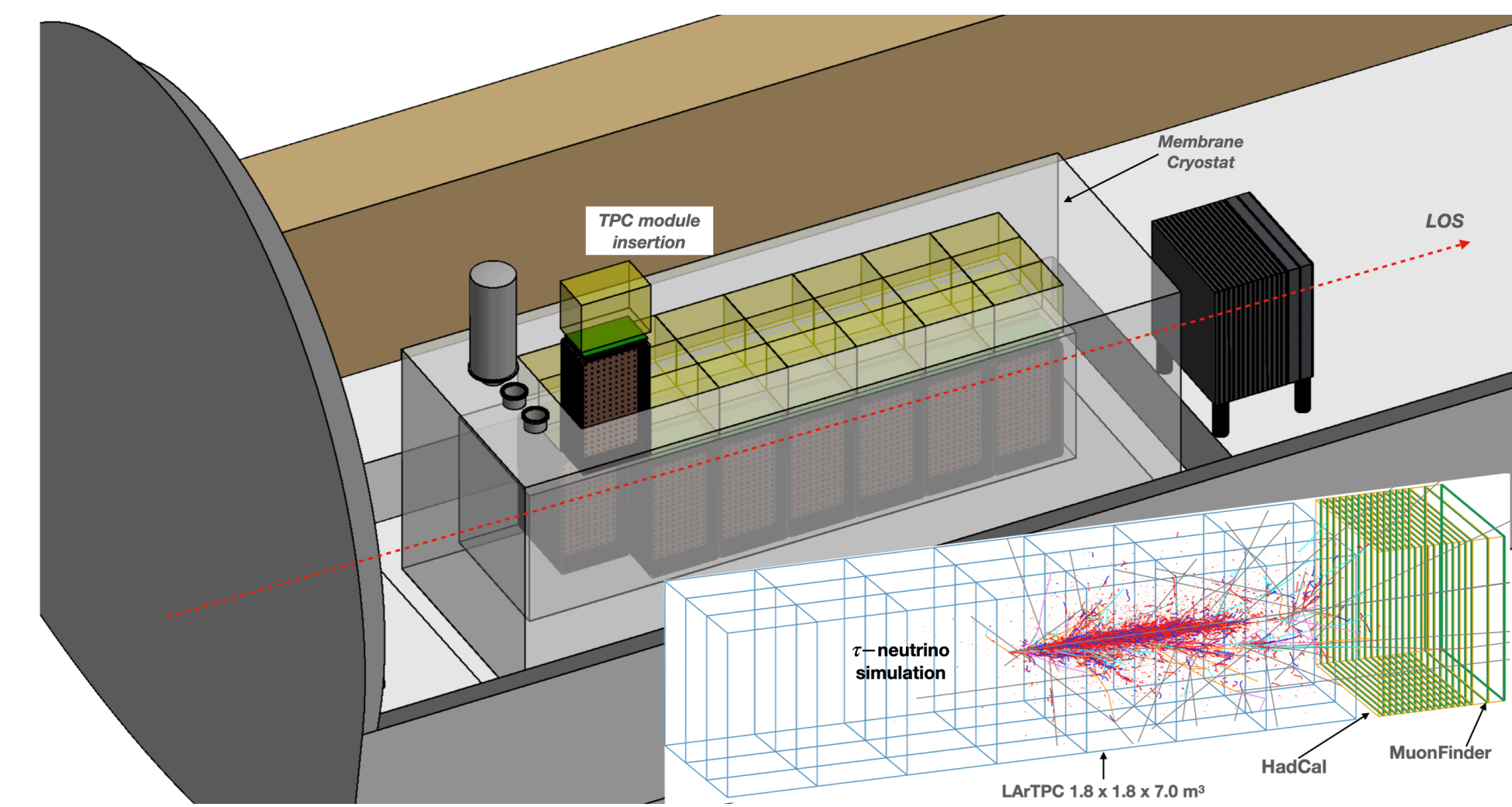
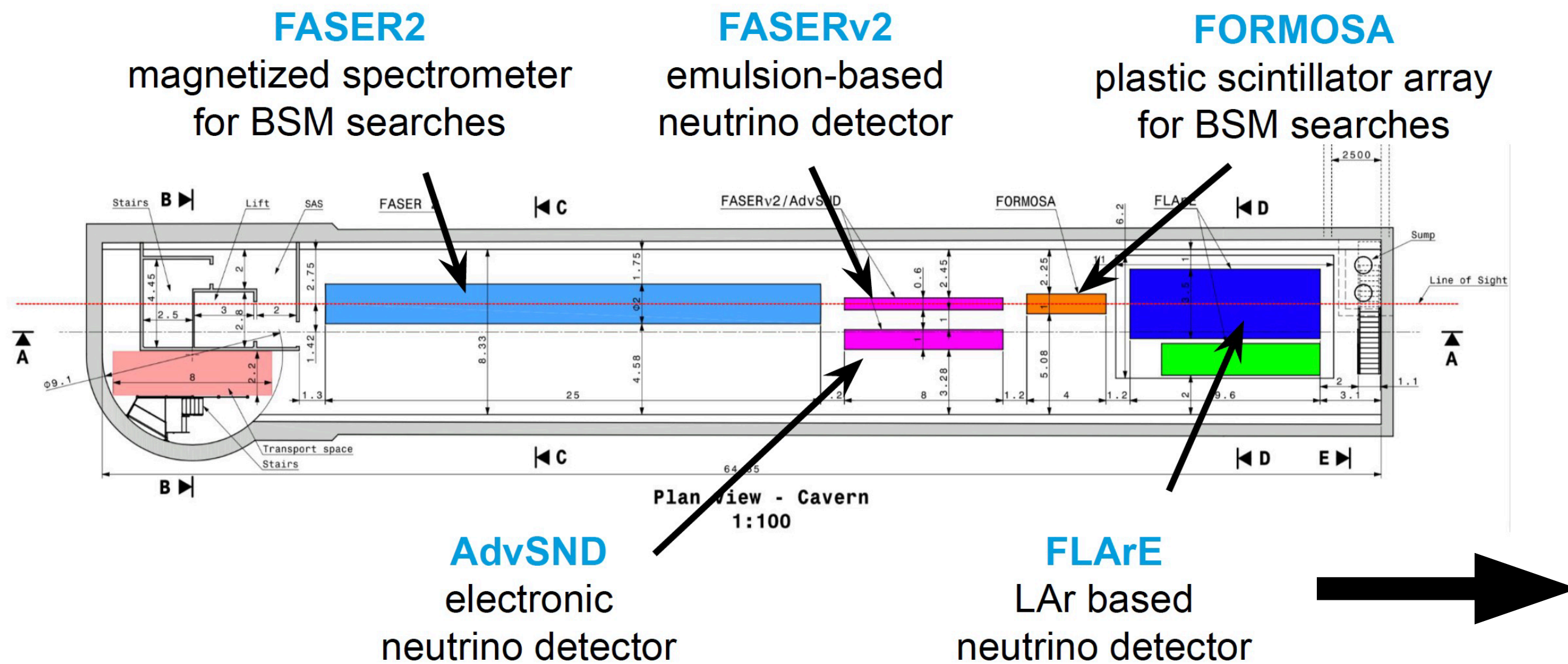
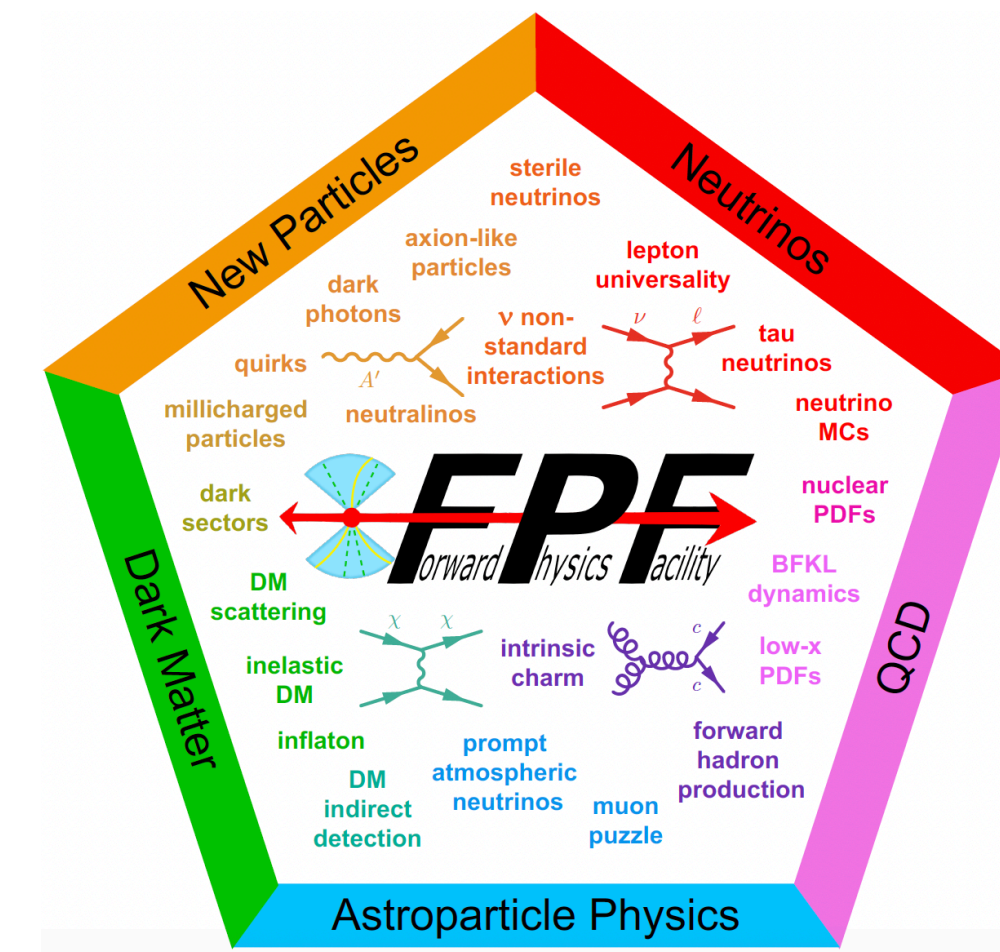
LAr detector in the FPF: **FLArE**

**Neutrinos ... but also light Dark Matter!**  
**Great physics potential!**

# My research at BNL

## FLArE at the Forward Physics Facility

- Working on Geant4 simulations of FLArE and the FPF cavern to study different detector configurations and evaluate their performance.



Simulations need to drive the design of FLArE by establish technical requirements to achieve physics goals.

Modular TPC design for FLArE, followed by hadronic calorimeter and magnetized muon spectrometer catcher.

**Thank you!**