

# Dark Matter and Neutrino Physics

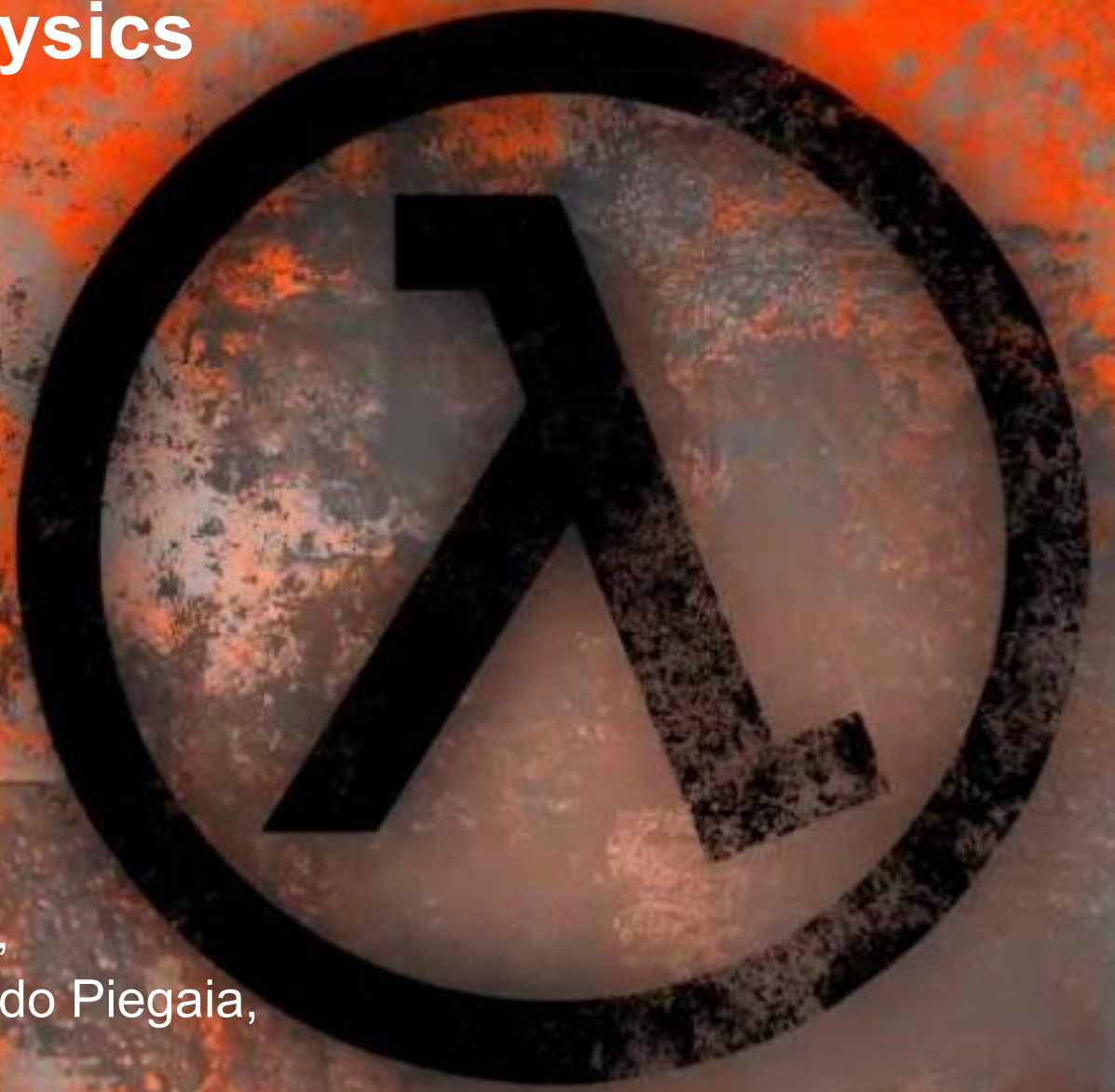
*Contribution from UBA to the LASF4RI*

## Laboratorio Argentino de Mediciones con Bajo umbral de Detección y sus Aplicaciones

Argentine Laboratory of Measurements with  
Low threshold Detection and its Applications

Ana Botti, Mariano Cababie, Florencia Daneri,  
Juan Estrada, Gustavo Otero y Garzón, Ricardo Piegaia,  
Dario Rodrigues, Javier Tiffenberg.

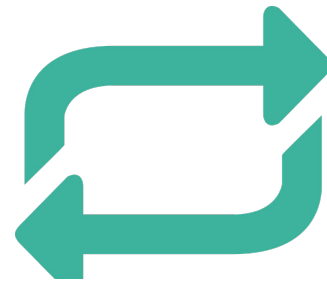
Experimental Particle Physics Group at Universidad de Buenos Aires



# Collaboration between the Physics Department at Universidad de Buenos Aires (**UBA**) and the Fermi Accelerator National Laboratory (**Fermilab**)

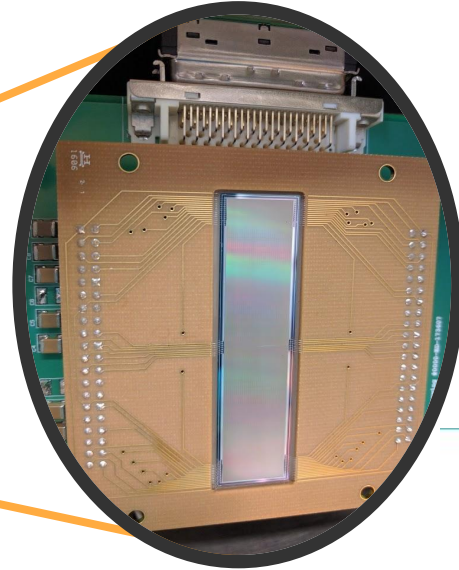
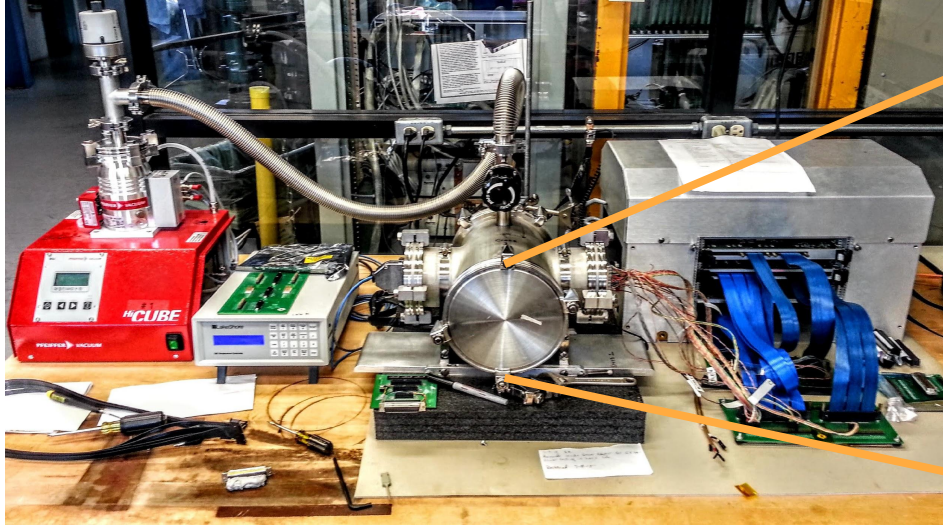


universidad de buenos aires - exactas  
departamento de Física

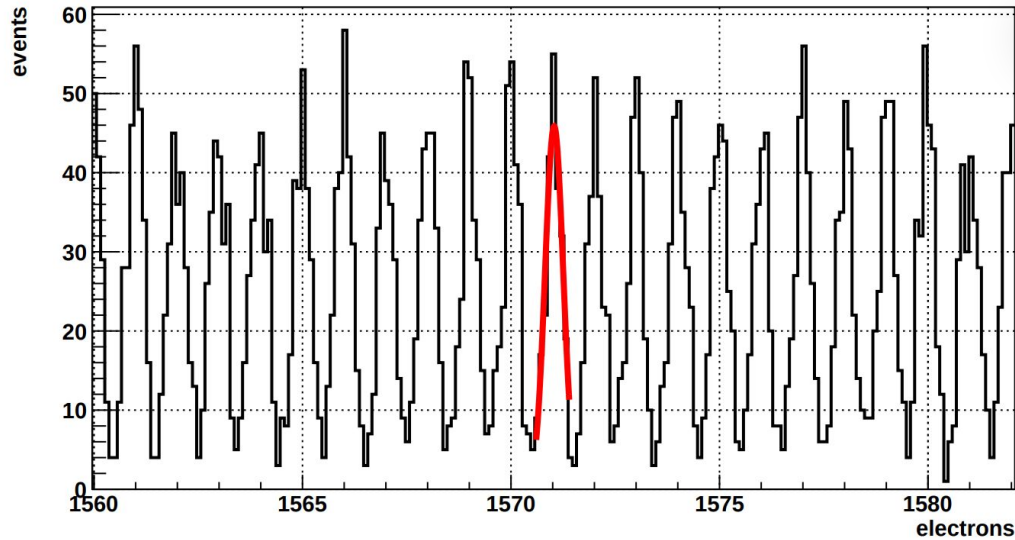




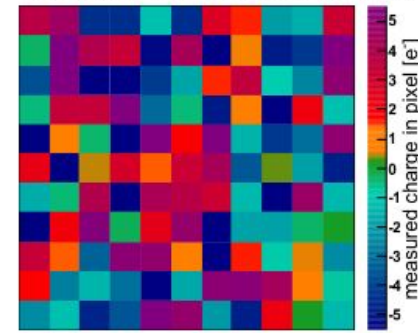
# Skipper-CCD technology



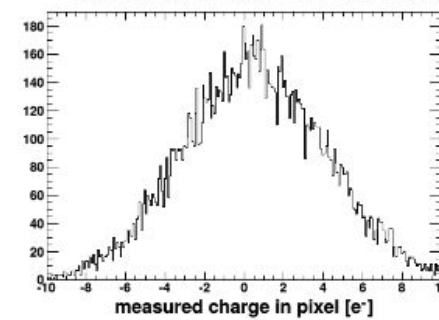
- Sub-electron readout noise
- Ultra low threshold ( $\sim$  eV)
- Excellent energy resolution
- Excellent spatial resolution ( $\mu$ m)



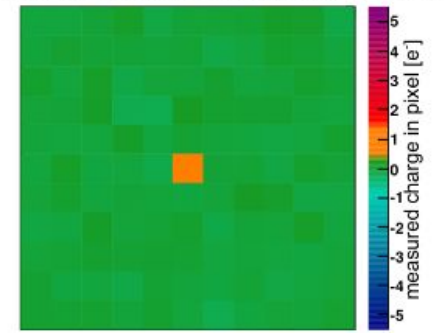
Standard CCD mode: charge in each pixel is measured once



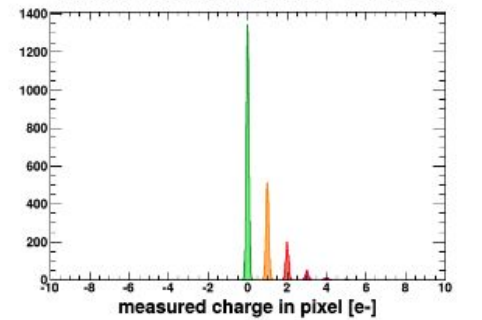
Readout-noise: 3.5 e RMS



New Skipper CCD: charge in each pixel is measured multiple times



Readout-noise: 0.06 e RMS

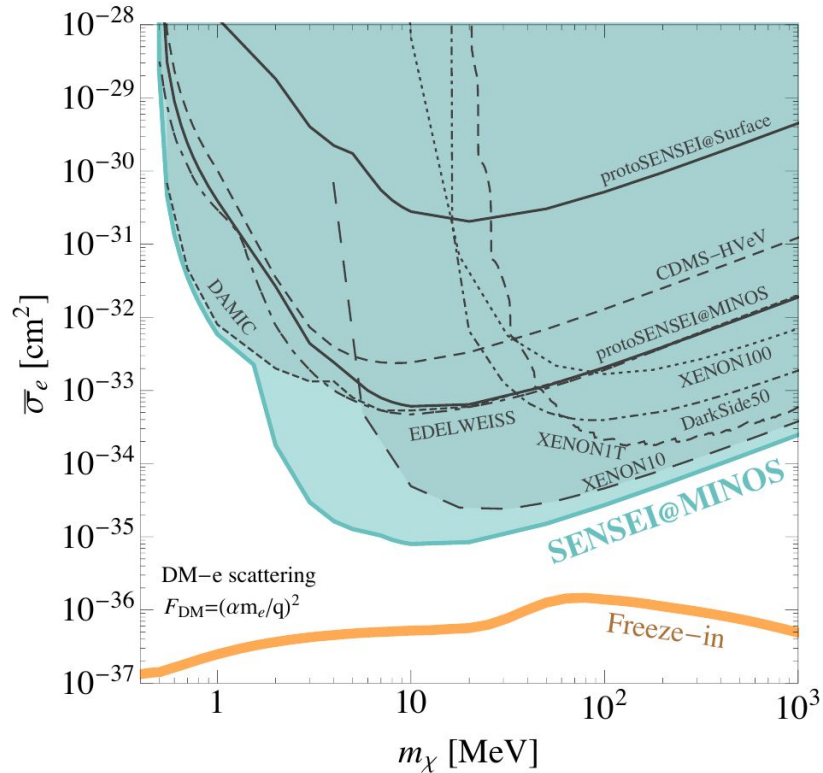


# Skipper-CCD for Dark Matter and Neutrino Physics

## SENSEI: Direct-Detection Results on sub-GeV Dark Matter from a New Skipper-CCD

The SENSEI Collaboration:

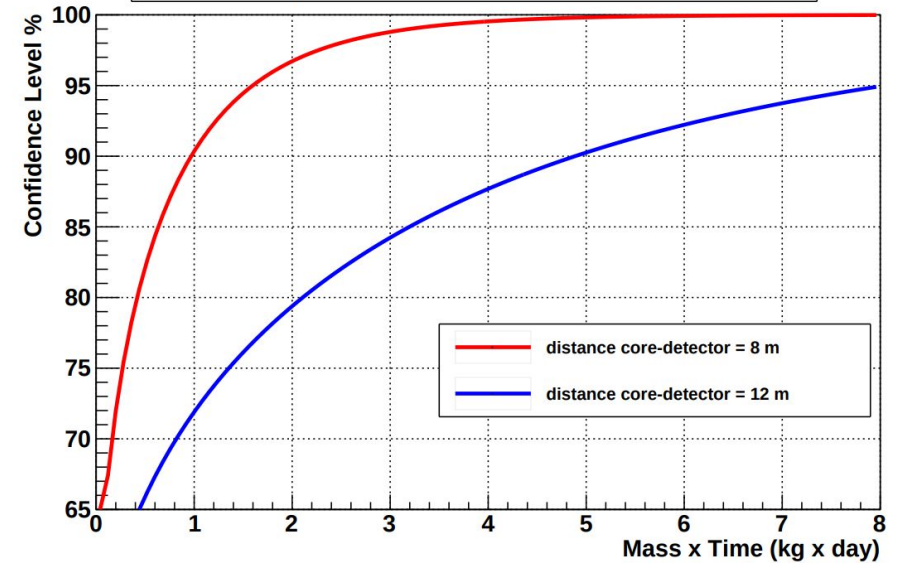
Liron Barak,<sup>1</sup> Itay M. Bloch,<sup>1</sup> Mariano Cababie,<sup>2,3</sup> Gustavo Cancelo,<sup>3</sup> Luke Chaplinsky,<sup>4,5</sup> Fernando Chierchie,<sup>3</sup> Michael Crisler,<sup>3</sup> Alex Drlica-Wagner,<sup>3,6,7</sup> Rouven Essig,<sup>4</sup> Juan Estrada,<sup>3</sup> Erez Etzion,<sup>1</sup> Guillermo Fernandez Moroni,<sup>3</sup> Daniel Gift,<sup>4,5</sup> Sravan Munagavalasa,<sup>4,5</sup> Aviv Orly,<sup>1</sup> Dario Rodrigues,<sup>2,3</sup> Aman Singal,<sup>5</sup> Miguel Sofo Haro,<sup>3,8</sup> Leandro Stefanazzi,<sup>3</sup> Javier Tiffenberg,<sup>3</sup> Sho Uemura,<sup>1</sup> Tomer Volansky,<sup>1</sup> and Tien-Tien Yu<sup>9</sup>



Best sensitivity for light dark matter  
arXiv:2004.11378

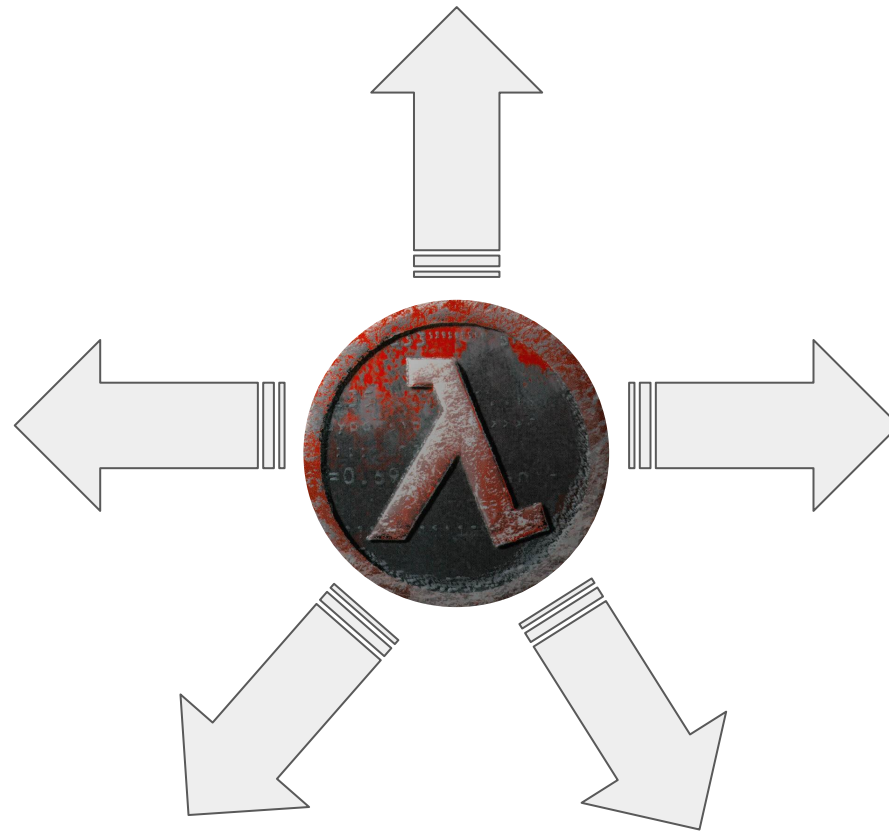
## $\nu$ IOLETA: Neutrino Interaction Observation with a Low Energy Threshold Array

Sensitivity for CEvNS at Power Plant Atucha II





Human resources training  
(undergraduates, PhDs and postdocs)



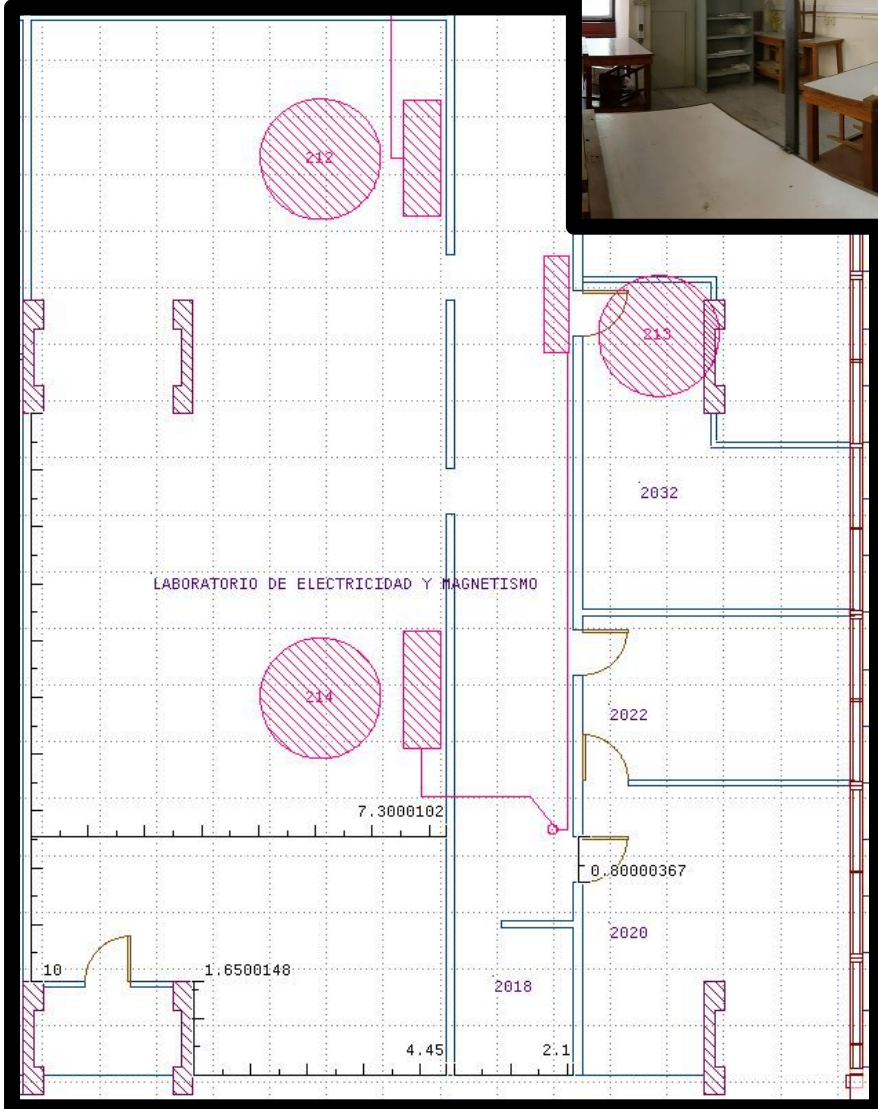
Research and  
Development in CCD  
technology  
(IIE-CAB-Fermilab)

Data analysis as part of  
international collaborations  
(SENSEI, OSCURA,  
CONNIE, vIOLETA)

*Pit crew* for a big neutrino experiment  
with Skipper-CCDs (vIOLETA)

Quantum Imaging experiments  
with Skipper-CCDs

# Our laboratory space at the Physics Department - UBA



- Two cryo refrigerators (10 kW each) reaching 4K
- Three turbomolecular vacuum stations
- Three high purity vacuum chambers
- Several Skipper-CCD Detectors
- Ultra Low Readout Noise electronics

Area: 50 m<sup>2</sup>

