IF02:Photodetectors

Mayly Sanchez, Chris Rogan, Juan Estrada

November 19, 2021

IF02: Photodetectors

- Conveners have further refined the groupings of the LOIs into categories that are technology centered/cross cutting across frontiers.
  - Each category becomes a subgroup/white paper writing team. Expect 8-10.
  - Continue to work on categories/ LOIs the need to be moved to other groups (greyed).
- Conveners are beginning to organize communications with the proponents to promote white paper teams.
  - Meeting with proponents and workshop scheduling is on-going.

	Neutrino Frontier 1	Cosmic Frontier 2	Energy Frontier 3	Rare & Precision 4
Sensors hiE(1)		●		
Sensors UV (2)	●	●		●
Sensors VIS (3)	●	●	●	●
Sensors IR (4)		●		
Sensors μwave/Radio (5)		●		
Large Area (6)	●			●
Low Background (7)				●
Fast Timing (8)	●	●	●	
Light collection (9)	●	●		●
RD facility (10)				

Juan Estrada <estrada@fnal.gov>
Chris Rogan <crogan@ku.edu>
Mayly Sanchez <mayly@iastate.edu>

New sensors visible and IR

Development of new photon sensors for visible light. Semiconductor detector (CCD, CMOS, SiPM) for use in the next generation of experiment in all frontiers in HEP. This area includes single photon imaging devices, IR semiconductor devices (like Ge imaging detectors), images with integrated processing (3D integration). Also SNSPDs.

LOI ~ 16

Status:

- Had an initial meeting with LOIs authors.
- Decided on a single WP covering single photon imagers in optical and near-IR with semiconductor (CMOS, CCDs) and superconducting technology (SNSPDs, MKIDs). Now we are checking that this works with others, not part of the initial meeting. Planning a workshop in January.
- To get involved contact: estrada@fnal.gov

Large area photodetectors and Light collection systems

Development of cost efficient solutions covering large areas for photon detection in HEP experiments, cosmic, nuclear physics and radiation therapy.Technology developments for astronomical spectrographs (fiber positioners), light collecting systems and filtering in next generation neutrino detectors.

LOI ~ 13

WP candidates:

- Light technologies for astrophysical sources - technology to be used in spectroscopic, X-Ray and other observatories (mostly CF).
- Large-area photodetectors and light collection for particle detectors - Large photodetector fabrication, new PMT technologies or accessories and light collection in at low temperatures (all mostly related to NF but also some CF).

Status:

- Reaching out to LOI proponents to organize meeting/workshop.
- To get involved reach to Mayly Sanchez <mayly@iastate.edu>

Detector for microwaves

Development of new sensor technologies for microwaves that do not have the focus on quantum techniques on quantum sensing. Sensors that do not fit into the microcalorimeter WP that the IF01 group is organizing.

We have moved the radio astronomy detectors to the new IF10 group.

LOI ~ 4

Status:

- Had a couple of discussions with Mat Pyle (IF01) to figure out the overlap
- Need to understand what are the LOI that end here,
- To get involved contact: estrada@fnal.gov

New sensors high-energy, UV and fast timing

- Development of novel photosensor technology above UV energies. This focus mainly in Gamma ray instrumentation for space. # LOI ~ 2
- Development of UV and VUV detectors sensor for noble liquids (light and charge collection), calorimetry and Cherenkov imaging (Particle ID). With some overlap in BES. # LOI ~ 4
    - Could be merged with Large-Area/Light Collection.
- Focused on the photodetector with fast timing (psec) in colliding experiments, neutrino experiments. LGAD, psec timing in sub-micron CMOS, fast timing in calorimeters. # LOI ~ 7

Status:

- Still defining the breakdown/interfaces of these internally.

Plan

- We are communicating with the LOI writers to organize meetings and white paper centered workshops in the coming months.
  - We need to reach out to frontier liaisons in addition to proponents.
  - We also need to understand what has happened over the last year to include efforts/ideas not included in the 2020 LOIs.
- We expect a photodetector workshop in February to discuss the progress on the white papers.

Summary

- We have identified 6 working areas, which could produce something 8-10 white papers. Most of the LOIs fit inside these groups, and we have done most of the work on the interface with IF01 (quantum) and IF10 (radio). Still working on the interfaces for other areas.
- There are opportunities to identify and leverage technological synergies in the different scientific frontiers to advance instrumentation needs in an efficient way.
- To get involved reach out to us:

Juan Estrada <estrada@fnal.gov>
Chris Rogan <crogan@ku.edu>
Mayly Sanchez <mayly@iastate.edu>