

*Probes of new physics and technological
advancements from particle and gravitational
wave physics experiments. A cooperative
Europe - United States - Asia effort.*

Annual Meeting 2025

*Dr. Marta Borowiec
Projects Coordinator*



Funded by
the European Union

Explore the Hidden Universe



Republic
of Poland



European Union
European Regional
Development Fund



ASTROCENT

PARTICLE ASTROPHYSICS
SCIENCE AND TECHNOLOGY
CENTRE
INTERNATIONAL RESEARCH AGENDA

Photo by Greg Rakozy



Astrocent's secondments

Seconded to Partner	Seconded to Country	Starting Month	Duration	Work Package	Status
40. INNOSEIS (BEN)	Netherlands	30	2	7. Dissemination and Outreach	2,07 PMs, finished
41. QUEENS (OPE)	Canada	38	1	3. LFV Experiments: Detectors	1,1 PMs, finished
39. NAGOYA (OPE)	Japan	36	3	3. LFV Experiments: Detectors	1,53 PMs + 1,13 PMs, ongoing
26. IHEP (OPE)	China	32	1	8. Transfer of Knowledge	1,1 PMs, finished
SUMMARY			7 PMs		Full 6 PMS accomplished so far

INNOSEIS

INNOSEIS SENSOR TECHNOLOGIES BV



Seconded person: [Yuliya Hoika](#) (she, her, Astrocent, NCAC, Poland) — communication specialist at Astrocent, overseeing communication, outreach, and social media activities; communication coordinator in the Einstein Telescope Organisation.

Host: [Innoseis Sensor Technologies](#) (Netherlands), a company, renowned for its expertise in sensing technologies, particularly MEMS (Micro-Electro- Mechanical Systems) sensors. These sensors are used in scientific research (including the **Einstein Telescope**), environmental monitoring and industrial applications.

In 2026, Innoseis' space-grade MEMS seismometer *Regolith* is scheduled to fly to the Moon as part of Fleet Space Technologies' SPIDER payload on Firefly's Blue Ghost 2 mission, showcasing the robustness of its technology in the challenging lunar environment.

WP7 — Dissemination & Outreach

Period: March-May, October 2025

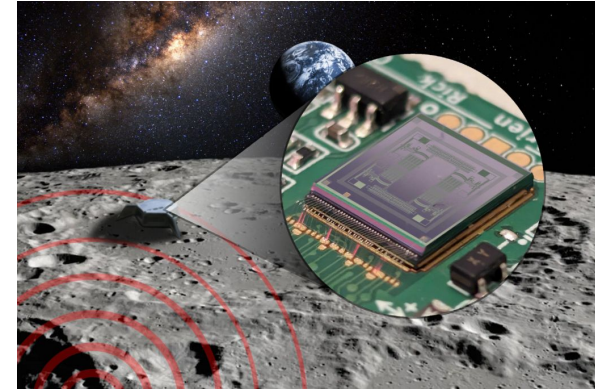


Image by Marko Kraan - Nikhef



The surface of the moon is seen in this image captured by Blue Ghost following its lunar landing. [Firefly Aerospace](#)

INNOSEIS

INNOSEIS SENSOR TECHNOLOGIES BV



Activities

- Reviewed MEMS technologies, markets and competitors; mapped applications in geophysics, aerospace, and industry.
- Ran a brand & communication audit; defined purpose, positioning, key messages and campaign directions.
- Prepared recommendations for website and social media, including content ideas and a posting calendar.
- Co-created concept, naming options and launch ideas for a new Innoseis product; took part in team's daily work.

Outcomes & impact

- **Innoseis**: clear brand strategy, communication toolkit and concrete digital-content improvements.
- **Astrocent**: deeper understanding of MEMS & seismic technologies and private-sector communication.
- **WP7**: stronger link between fundamental physics (incl. GW research) and societal impact, supporting outreach and science awareness.



Y. Hoika (Astrocent) and S. Hoost (Innoseis) at Nikhef

QUEEN'S

QUEEN'S UNIVERSITY AT KINGSTON



Queen's
UNIVERSITY

Seconded person: Prof. Marcin Kuźniak (he/him, Astrocent, NCAC, Poland) — experimental physicist, whose work focuses on astroparticle physics, direct search for dark matter, liquid argon detectors, fundamental symmetry violation searches

Host: The McDonald Institute at Queen's University at Kingston is a leading research hub in experimental astroparticle physics. The Institute fosters cutting-edge developments in detector technologies including research in cryogenic scintillation and fluorescence characterization, critical for liquid argon-based detectors. The work also includes the development of SiPM readout and DAQ systems. The Queen's research group operates a dedicated vacuum cryostat with optical access, enabling extensive sample characterization under cryogenic conditions.

WP3 — LFV Experiments: Detectors

Period: July-August 2025



Prof. M. Kuzniak giving a seminar at Queen's University

QUEEN'S

QUEEN'S UNIVERSITY AT KINGSTON



Queen's
UNIVERSITY

Activities

- Prepared samples for fluorescence measurements of acrylic additives under cryogenic conditions
 - Joint study with the Queen's University group
- Planned collaborative research on polymeric scintillators, wavelength shifters, and surface backgrounds in liquid-argon detectors
 - With Queen's and Carleton
- Supported optical modelling, wavelength shifter coating work, and planned measurements with a liquid-argon cryostat with SiPM arrays.
 - Collaboration with McDonald Institute partner institution: Carleton University (Ottawa)
- Identified strategic topics for future joint large grant applications



Prof. M. Kuzniak and Prof. Art McDonald



*Prof. M. Kuzniak with collaborators at the COLD Lab
(Carleton University)*

NAGOYA

Nagoya University Kobayashi-Maskawa Institute For The Origin Of Particles And The Universe

Seconded person: **Prof. Masayuki Wada** (he/him, Astrocent, NCAC, Poland)
— expert in cryogenic (liquid argon) systems and photosensors at cryogenic temperatures

Host: The Kobayashi-Maskawa Institute for the Origin of Particles and the Universe (KMI) at Nagoya University is a leading research hub dedicated to exploring fundamental questions in particle physics and cosmology. The experience and well-equipped laboratories allow participation in characterizing VUV-sensitive SiPMs from different manufacturers at cryogenic temperatures and in developing cryogenic readout electronics

WP7 — Dissemination & Outreach

Period: December 2024; April-May 2025; August-September 2025;
December 2025 - January 2026



Kobayashi-Maskawa Institute
for the Origin of Particles and the Universe



Nagoya University

NAGOYA

Nagoya University Kobayashi-maskawa Institute For The Origin Of Particles And The Universe

Activities

- Characterization of VUV-sensitive SiPMs, such as photon detection efficiency, and development of a new type of photosensor

Benefits

- **Nagoya:**
 - manpower, the availability of a specific SiPM, and knowledge of a clod amplifier.
- **Astrocent:**
 - access to the system with a VUV light source at cryogenic temperature.
 - new ideas on photosensors with a large surface area with a low dark count rate



IHEP



Institute of High Energy Physics
Chinese Academy of Sciences

INSTITUTE OF HIGH ENERGY PHYSICS CHINESE ACADEMY OF SCIENCES

Seconded person: *Dr. Azam Zabihi* (she/her, Astrocent, NCAC, Poland)
— experimental particle physicist, whose work focuses on cryogenic detectors and liquid noble gas scintillation for rare-event searches.

Host: Institute of High Energy Physics (IHEP), a University conducting a research that includes the design and operation of cryogenic systems essential for cooling sensitive detectors to ultra-low temperatures, enabling high-precision measurements of rare astrophysical signals.

WP8 — Transfer of Knowledge

Period: July 2025



Image provided by Azam Zabihi

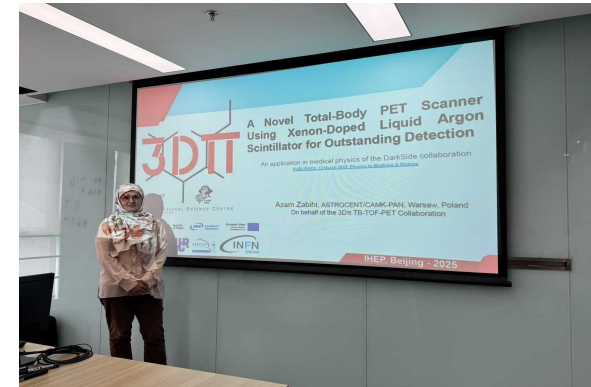
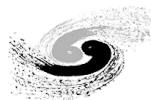


Image provided by Azam Zabihi

IHEP



Institute of High Energy Physics
Chinese Academy of Sciences

INSTITUTE OF HIGH ENERGY PHYSICS CHINESE ACADEMY OF SCIENCES

Activities

- Collaborated with Prof. Yi Wang on assembling/testing cryogenic systems, including TPCs and SiPM-based readout electronics.
- Contributed to XAr-T project on xenon-doped liquid argon scintillation to improve light yield for dark matter detection.
- *Additional outcome:* Delivered seminar on novel total-body PET scanners using xenon-doped liquid argon technology.

Outcomes & impact

- **IHEP:**
 - shared Astrocent expertise in noble liquid detectors and scintillation readout;
 - provided input for XAr-T project improvements;
- **Astrocent:**
 - hands-on experience with cryogenic detector technologies and readout systems;
 - exposure to advanced detector design and international experimental techniques

