ESA'S DISCOVERY ELEMENT OF THE BASIC ACTIVITIES

OPPORTUNITIES FOR HUNGARY VIA OSIP

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Basic Activities

enablers of all other activities

roots on which missions and programmes grow

Innovation
Discover and prepare future missions & technologies

Infrastructure
Technical labs & operation infrastructure

Knowledge
Develop, preserve, disseminate, educate

ESA Transformation
Commercialisation, Digitalisation, Cybersecurity, Green Agenda

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Disruptive Ideas

- Taking risk
- Low budget
- Fast and Open
- Novelty driven
- Commercialisation
- Research, studies and tech.dev
- Outside driven (OSIP)
- Open competitive

Discovery

Future Missions

- Solid baselines
- Smart Customer
- For all domains
- (Pre-)Phase A
- MBSE, 0Debris, LCA
- Commercialisation

- ESA driven
- Open competitive

Preparation

Technology

- low TRL
- Generic
- Missions enabling technology
- 2yr Work plans
- SME focus

- ESA driven
- Open competitive

TDE

- higher TRL up to 9
- Supporst Competitiveness
- Work plans and industry-driven
- SME focus
- Delegation support
- 3 Elements: *develop*, *make*, *fly*

GSTP

THE INNOVATION PROCESS ON OSIP
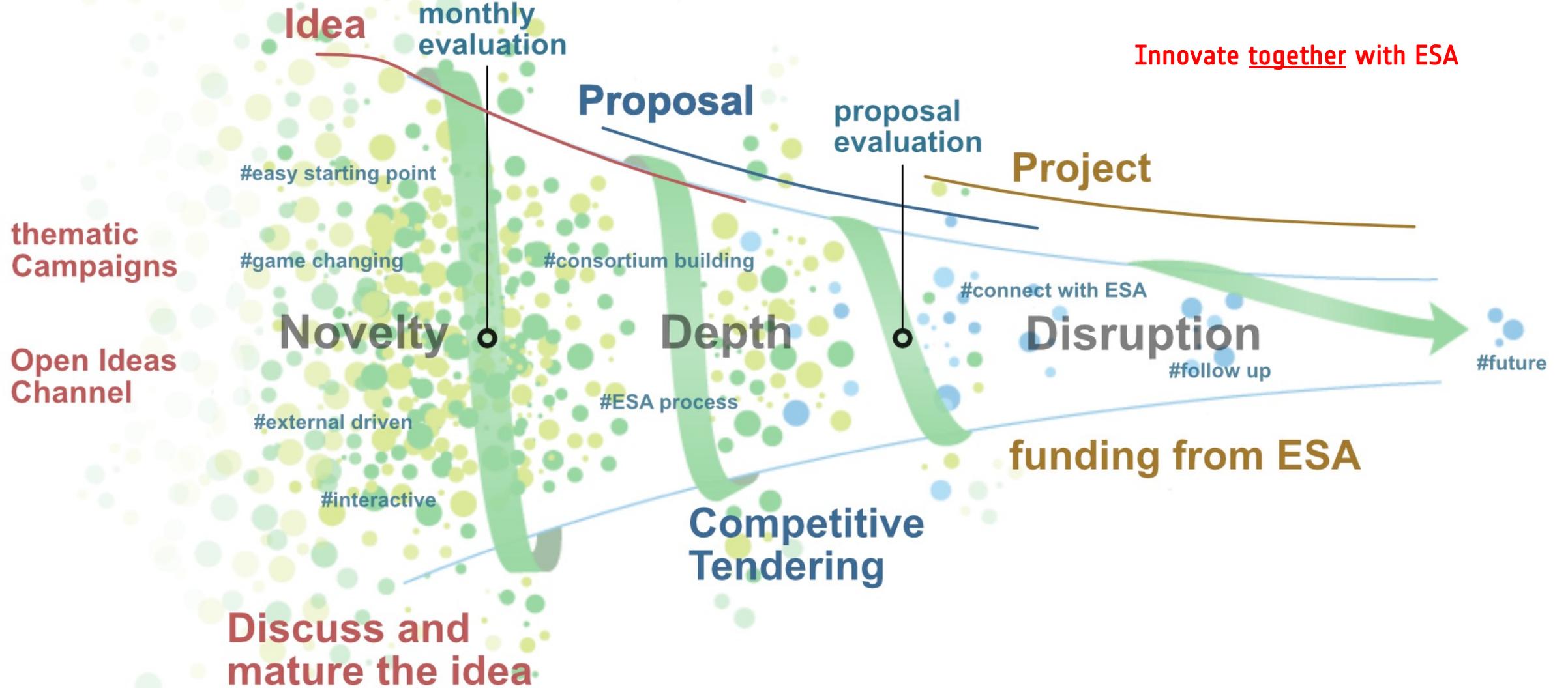
FIRST STEPS FOR NOVEL IDEAS – DISCOVERY ELEMENT PROCESS STEPS

Your Novel Idea

Your action

- You focus on describing your idea in form of an abstract
- No need for formalities
- Submit any time to Open Discovery Channel on OSIP
- Ideas for future commercially viable activities welcome
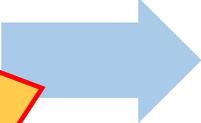
OSIP (ideas.esa.int)

- ESA gives you feedback
- ESA channels ideas to best implementation path
- Monthly evaluation for Discovery channel ideas
- Best ideas invited to be matured into proposals
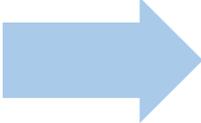
Discovery Contracts

- Following competitive evaluation
- Co-sponsored research (<90k)
- Study (<100k)
- Early Technology Development (<175k)

OSIP Channel
- Permanently open
- All novel space ideas welcome

OSIP Campaigns
- Time limited
- ESA defined challenges / topics
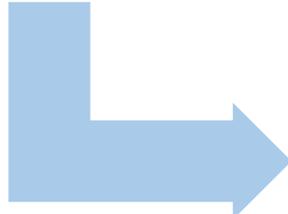
GSTP, InCubed, ARTES, NAVISP …
- Programme specific

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TYPE OF ENTITIES FOR COMMITMENTS IN 2023

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DISCOVERY ELEMENT
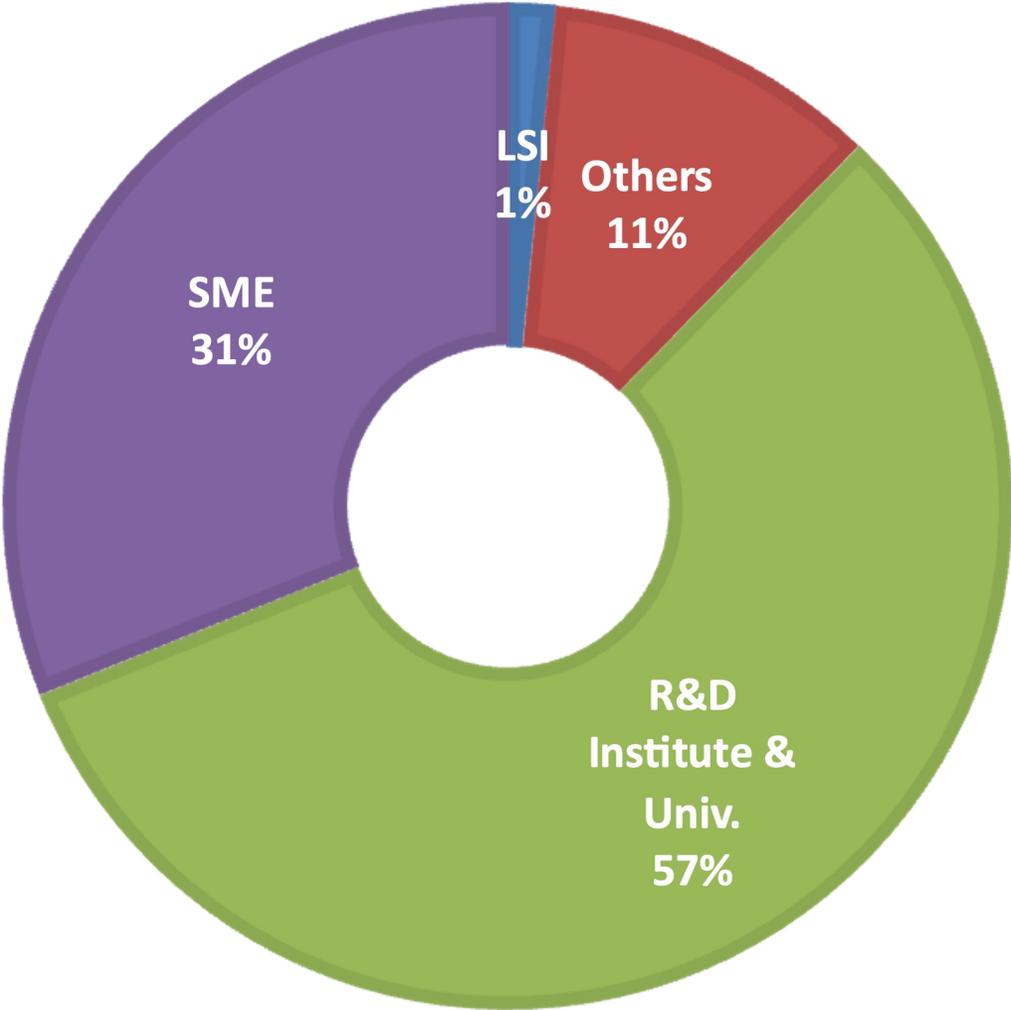
Few and rather poor quality ideas from Hungary

All ESA MS

3146 IDEAS

1573 IDEAS — Disc. & Prep. CAMPAIGNS

1573 IDEAS — OPEN DISCOVERY CHANNEL

OPEN SPACE INNOVATION PLATFORM

PREPARATION ACTIVITIES

225 CO-SPONSORED RESEARCH ACTIVITIES

127 STUDIES

187 EARLY TECHNOLOGY DEVELOPMENTS

Hungary

15 IDEAS

7 IDEAS — Disc. & Prep. CAMPAIGNS

8 IDEAS — OPEN DISCOVERY CHANNEL

OPEN SPACE INNOVATION PLATFORM

PREPARATION ACTIVITIES

0 .. CO-SPONSORED RESEARCH ACTIVITIES

0 STUDIES

0 EARLY TECHNOLOGY DEVELOPMENTS

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SUBSTANTIAL UNTAPPED POTENTIAL IN HUNGARY

Institute for Nuclear Research (ATOMKI)
Institute for Earth Physics and Space Science
Budapest University of Technology and Economics (BME, global)
Budapest University of Technology and Economics (BME, Faculty of Civil Engineering)
Budapest University of Technology and Economics (BME, Department of Mechatronics, Optics))
Budapest University of Technology and Economics (BME, Department of Broadband Infocommunications)
Research Center for Astronomy and Earth Sciences (ELKH, Institute for Geochemical Research)
Research Center for Astronomy and Earth Sciences (ELKH, Konkoly Observatory)
Research Center for Natural Sciences Institute of Cognitive Neuroscience
University of Debrecen (UD, global)
University of Miskolc, Materials Science Research Group
Eszterházy Károly University
Eötvös Loránd University, Department of Astronomy
Eötvös Loránd University, Space Research Group
Centre for Energy Research
Lechner Knowledge Centre, Satellite Geodetic Observatory
Lechner Knowledge Centre, Remote Sensing Division
Óbuda University, Institute of Geoinformatics
Hungarian Meteorological Service
University of Szeged, Non-linear Dynamics and Kinetics Group
University of Szeged, Department of Aviation and Space Medicine
Wigner Research Centre for Physics, Institute for Particle and Nuclear Physics
Wigner Research Centre for Physics, Institute for Solid State Physics and Optics
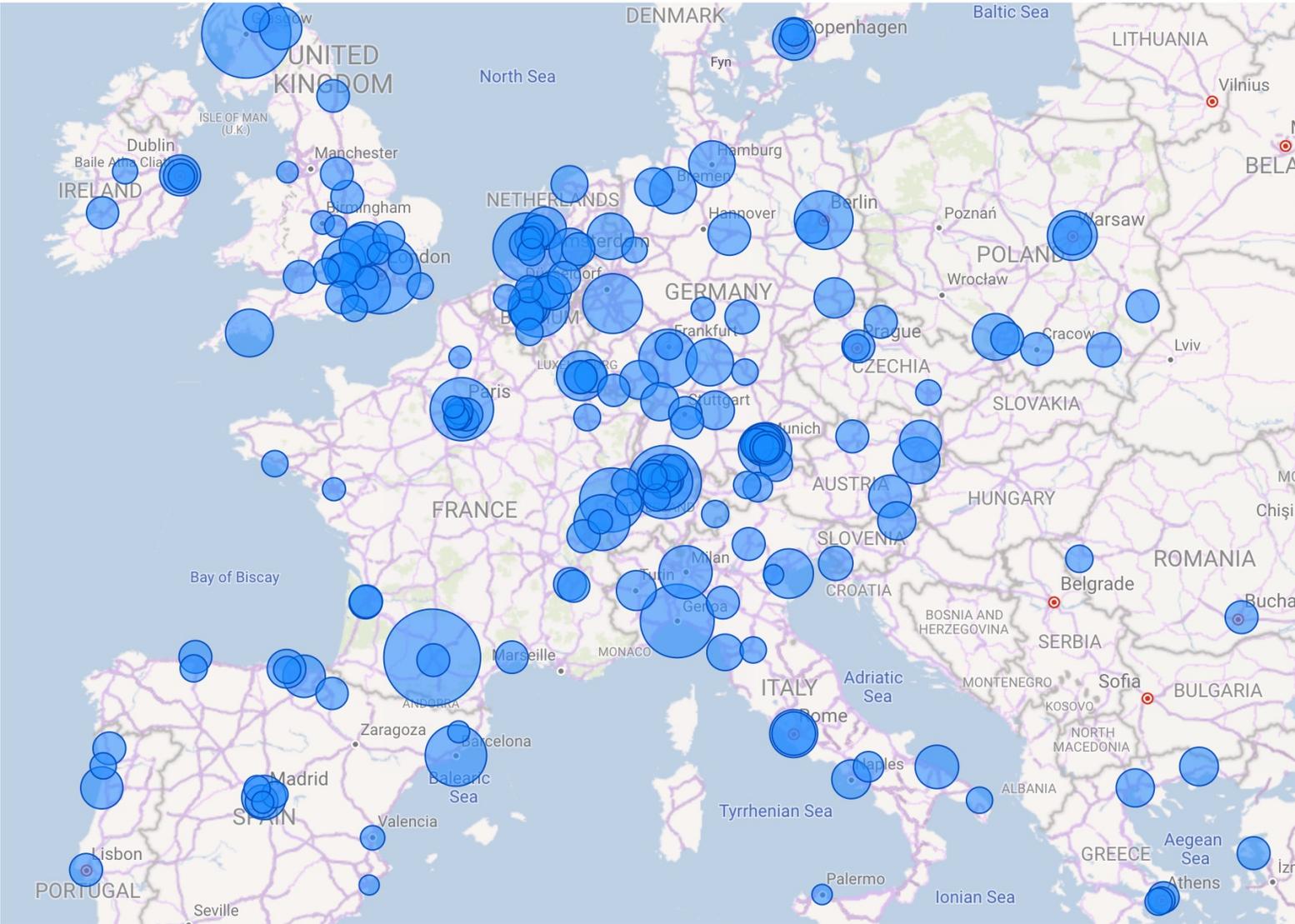
Discovery activities serving space sector at large – not ESA need driven

Activities serving all directorates and followed by experts from all directorates

Demand from industry and academia

https://activities.esa.int

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Search Activities

579 results found

Search

▶ Prime contractor
▼ Activity Type
  ☐ co-sponsored Research
  ☐ Early technology development
  ☐ Study
▶ Organisational Unit
▶ Country
▼ Main application area
  ☐ EO
  ☐ Exploration
  ☐ Generic for multiple space applications
  ☐ Navigation
  ☐ NEW
  ☐ Operations
  ☐ Science
  ☐ Space Safety
  ☐ Space transportation
  ☐ Telecom
▼ Status
  ☐ Running
  ☐ Closed
▶ Related OSIP Campaign
▶ CD Area
▶ Topical cluster

SEARCH   CLEAR

Running — Characterisation of Single Chip Adaptable Radio Platform
15/03/22 | IROC TECHNOLOGIES SA | Study | FR

Running — Distributed, scalable and reliable onboard system software based on commercial off-the-shelf (COTS) onboard computers (OBCs)
18/04/23 | University of Strathclyde | co-sponsored Research | UK

Running — Tackling the next generation of debris hiding in orbit: Carbon fibres
02/01/20 | TECHN UNIV BRAUNSCHWEIG | co-sponsored Research | DE

Running — Non-invasive vestibular prosthetics for use in altered gravity: Ascertaining practical utility and neuronal integrity
02/12/22 | Karolinska Institutet | co-sponsored Research | SE

Running — Definition of a European Lunar Materials Handling and Geotechnics Payload
10/12/20 | Cranfield University | Study | UK

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Activities Portal

This activities portal is in a beta development stage. It provides basic information of running ESA activities being implemented under different ESA programmes and domains. For the time being, these include only activities funded by the Discovery Element of ESA's Basic Activities. These have been initially submitted as ideas to the Discovery Channel on OSIP or any of the Discovery element topical campaigns on OSIP.

Activities are searchable, and grouped into Topical Clusters. Based on user needs and feedback, ESA intends to add further information and functionalities to the portal.

341 Running Activities
15% Study
29% Early Technology Development
55% Co-Sponsored Research

Topical Cluster

Topical clusters group activities. For the time being, these are activities that come from the Discovery element campaign on OSIP with the same title.

Quantum Technologies | Marine litter | Off-Earth Manufacturing
Solar Power Satellites and WPT | Cubesats | Zero Space Debris

show more

ENABLING LUNAR IN-SITU AGRICULTURE BY PRODUCING FERTILISER FROM BENEFICIATED REGOLITH

https://activities.esa.int/4000140280

MARSCROP - MARTIAN REGOLITH SALIX CO-CROPPING FOR PERCHLORATE

PASSIVE PROTECTIVE SHIELDS FOR LUNAR AND MARTIAN OUTPOSTS

https://activities.esa.int/4000141524

HIGH TEMPERATURE LEAD FREE SOLDER FOR INTERNAL SOLDERING OF EEE PARTS

https://activities.esa.int/4000137479

DEEP-SPACE FOOD PRODUCTION BASED ON SINGLE-CELL PROTEIN PRODUCTION BY MEANS OF GAS FERMENTATION

https://activities.esa.int/4000140412

RUNNING DISCOVERY ELEMENT ACTIVITIES – ACTIVITIES.ESA.INT PLATFORM

Some running activities in the field of quantum, cubesats and off-earth manufacturing

Search (Quantum Technologies) — 22 results found

Filters: Prime contractor, Activity Type, Organisational Unit, Country (Austria, Czech Republic, France, Germany, Greece, Italy, Netherlands, Poland, Spain, Switzerland, United Kingdom), Main application area, Status, Related OSIP Campaign, CD Area, Topical cluster ☑ Quantum Technologies

Status	Title	Date	Prime contractor	Activity Type	Country
Running	Short-wave infrared high power laser for long-distance satellite communication based on a compact laser system using Ho:YAG thin disk emitting in the 2.1 um wavelength region	10/06/22	CRYTUR	Early technology development	CZ
Running	PRESTO: a Photonically Referenced Extremely STable Oscillator	15/05/23	Cycle GmbH	Early technology development	DE
Running	Tools for Laser Stabilization for Space-Based Atom Quantum Sensors	22/09/23	FORTH	co-sponsored Research	GR
Running	Simulation toolbox for unconditionally secure on-chip satellite quantum communication networks operating in the telecom wavelength range	25/08/22	Karl-Franzens University of Graz	co-sponsored Research	AT
Running	Noise rejection in optical communication systems using quantum pulse gating	14/09/23	Quantum Optical Technologies sp. z o.o.	Study	PL
Running	Generation of entangled photon pairs from nonlinear metasurfaces	03/10/23	Silicon Austria Labs GmbH	Early technology development	AT
Running	Miniaturized all optical ultracold atom source for quantum sensors in Space	20/06/22	Institut d'Optique Graduate School	co-sponsored Research	FR
Running	Light-shift reduction of two-photon rubidium atomic clock	24/03/22	CSEM SA. Centre Suisse d'Electronique et...	co-sponsored Research	CH
Running	Quantum receivers for efficient deepspace optical communications	16/05/22	Quantum Optical Technologies sp. z o.o.	Study	PL
Running	Extracting information from quantum signals with near-term programmable and self-calibrating quantum devices	23/09/21	Universitat Autònoma de Barcelona	co-sponsored Research	ES
Running	High-speed integrated electro-optic modulator for the visible range	10/11/21	Eidgenössische Technische Hochschule Zürich -...	co-sponsored Research	CH

Search (Cubesats) — 10 results found

Filters: Prime contractor, Activity Type, Organisational Unit, Country, Main application area, Status, Related OSIP Campaign, CD Area, Topical cluster ☑ Cubesats, Zero Space Debris, Solar Power Satellites and WPT

Status	Title	Date	Prime contractor	Activity Type	Country
Running	An Inventive High-Thrust Micro-Propulsion System Compatible with Small-Satellites' Safety and Budget Requirements	01/05/23	Sirin Orbital Systems AG	Early technology development	CH
Running	Swarms of CubeSats for kW scale Space-Based Solar Power (16U4SBSP)	02/10/23	Sirin Orbital Systems AG	Study	CH
Running	HydroSwarm increasing GNSS Reflectometry instantaneous coverage to address flood monitoring and soil moisture with cooperative GNSS-R CubeSats	02/10/23	SURREY SATELLITE TECHNOLOGY LIMITED	Study	UK
Running	AltiCube+ - An Aggregated CubeSats Swarm for Long Fixed-baseline Radar Altimetry	02/10/23	TU DELFT	Study	NL
Running	COMCUBE-S: A swarm of CubeSat_x0002_sized Compton telescopes for all-sky detection and polarisation measurements of gamma-ray bursts	14/09/23	University College Dublin	Study	IE
Running	Dynamic 3D mapping with CubeSats	08/11/22	Aarhus University	co-sponsored Research	DK
Running	Autonomous Guidance for Deep-Space CubeSats	30/09/21	Politecnico di Milano	co-sponsored Research	IT
Running	Development of innovative EMC lean testing techniques for very small satellites (cubesats)	26/11/21	Politecnico di Milano	co-sponsored Research	IT
Closed	CUBE (CME Catcher carusel) Nanosatellites for Space Weather Monitoring	17/03/22	IST NAZIONALE DI ASTROFISICA	Study	IT
Closed	Autonomous trustworthy monitoring and diagnosis of CubeSat health	26/05/21	UNIVERSITE DU LUXEMBOURG	co-sponsored Research	LU

Search (Off-Earth Manufacturing) — 42 results found

Filters: Prime contractor, Activity Type, Organisational Unit, Country, Main application area, Status, Related OSIP Campaign, CD Area, Topical cluster ☑ Off-Earth Manufacturing, Solar Power Satellites and WPT, Zero Space Debris

Status	Title	Date	Prime contractor	Activity Type	Country
Running	Fused Fiber Layer Deposition (FFLD) of Lunar regolith	05/05/23	Aalen University	Early technology development	DE
Running	Fluorinated Plasma Based Oxygen Extraction from Lunar Regolith (FLU-ORE)	28/03/23	Dublin City University	Study	IE
Running	Control of spherical robots for lunar cave exploration using telescopic linear actuators for locomotion	07/06/23	Julius-Maximilians-University of Würzburg	co-sponsored Research	DE
Running	MARSCROP - Martian Regolith Salix Co-cropping for Perchlorate	10/07/23	University College Dublin	co-sponsored Research	IE
Running	Enabling lunar in-situ agriculture by producing fertiliser from beneficiated regolith	22/12/22	Solsys Mining	Study	NO
Running	Recycling enhanced additive manufacturing processes under Martian environmental conditions (RAMMEC)	25/11/22	FOTEC Forschungs- und Technologietransfer Gmb...	Early technology development	AT
Running	Development of metal selective laser melting (3D printing) technology for microgravity environment with colloid-like feedstock	10/02/22	Progresja Space sp. z o.o.	Early technology development	PL
Running	Vibrations as a novel tool for particle self-assembly and regolith vibro-fluidization in space environments	30/06/22	University of Strathclyde	co-sponsored Research	UK
Running	LAMOR - Laser Assisted mining of Oxygen from Regolith	18/11/22	Microelectronica Semiconductoare SRL	Early technology development	RO
Running	CARLAH, an innovative crystalline silicon solar cell architecture for cost-effective space compliant photovoltaic devices (LEO applications)	01/07/22	CEA - Commissariat a l'Energie Atomique	Early technology development	FR

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NEBULA
FINISHED DISCOVERY ELEMENT ACTIVITIES

All finished activities available on nebular studies database:

https://nebula.esa.int

Ongoing addition of also TDE and GSTP publicly available deliverables.

Integrated in ESA KM Environment

API ready

"One of the best accessible databases for final deliverables"

ACT RESEARCH AREAS

Fundamental Physics
Impact of new ideas in physics

Artificial Intelligence
Engineering of intelligent computer systems

Advanced Energy Systems
Innovating energy systems

Molecular Engineering
Manipulate and control the properties of molecules for space

Advanced Propulsion
Explore and review break-through propulsion concepts

Nanotechnology
Benefitting from control at micro/nano scale

Biomimetics & Bioengineering
Benefitting from Darwinian evolution to solve engineering problems

Neuroscience
Brain, sleep and microgravity

Mission Analysis
Mathematical techniques for future mission analysis

Computer Science & Applied Mathematics
Fast, efficient and parallel optimisation techniques

Space economics/Space architecture
Novel architecture & economic concepts for space sector

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OPEN SCIENCE AND COMPETITIONS
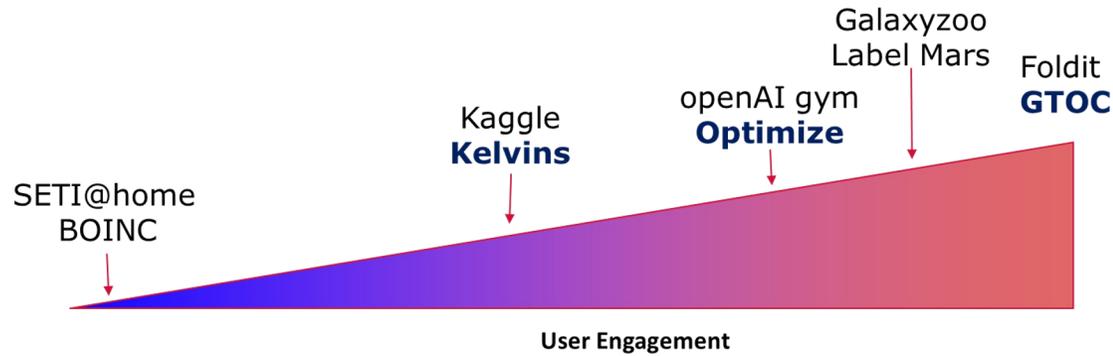
- Promoting **Open-Source** Paradigm **->** Culture change
- Creating and managing ESA' GitHub and GitLab open accounts
- **Open collaboration** and **competitions** for scientific research
- **Web platforms** to organize innovation on space problems
  - Kelvins (data driven) -> https://kelvins.esa.int/
  - Optimize (gym) -> https://optimize.esa.int
  - Open Space Innovation Platform-> https://ideas.esa.int
- **10+ competitions** organized since 2016
- **500+ international teams** participating
- **Pushing the boundaries** of research

https://optimize.esa.int

SpOC 3: Orbital Megastructures

Your objective is to propose and implement metaheuristic algorithms to solve the proposed optimisation problems.

To validate your solutions, we will provide you with Python validation code for each of the three problems.

This code includes problem definitions in the Pygmo user-defined problem (UDP) format, examples of solutions, and visualisation tools.

You have until 30 June 2024 to submit your entries via the dedicated portal Optimise.

SpOC 3.0 contains three distinct problems centered around a futuristic space mission.
Starting from 1 April 2024 you have three months to tackle these challenges to secure a spot on the leaderboard.

esa

Mars Express Power Challenge
Get the data, model and predict the thermal power consumption.

PROBA-V Super Resolution
Enhance the vegetation payload performances

GTOC9: the Kessler run
Can you do it in less than 12 parsecs?

https://kelvins.esa.int
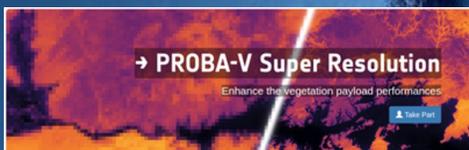
- Open science to foster competitive spirit and healthy scientific competitions

- Dedicated competition portal: Kelvins, reach the absolute zero (error)

- Importance of asking the right questions

- Started 2015

- Competitions:

  Mars Express Power Consumption

  Star tracker Identification

  Space Debris Removal Tugs (GTOC9)

  Proba V Superresolution

 Satellite Pose Estimation

- weblink

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HERA
Planetary Defense

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Backup slides
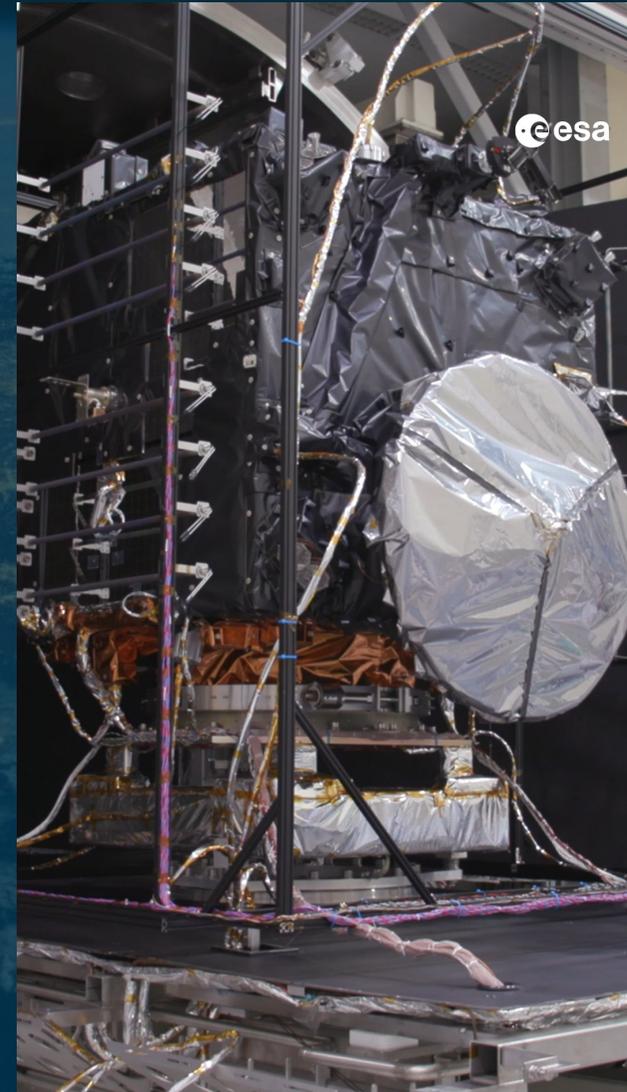
DISCOVERY ELEMENT - RESOURCES

Open Space Innovation Platform OSIP: https://ideas.esa.int

Running Activities Platform (beta version):   https://activities.esa.int

Finished Activities reports: https://nebula.esa.int

Discovery and Preparation ESA pages: https://www.esa.int/discovery

Discovery pages on TEC B2B website: https://technology.esa.int/program/discovery

Monthly news stories on new activities:

https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/Ideas_implemented_through_the_Open_Space_Innovation_Platform

ESA Advanced Concepts Team pages: https://www.esa.int/act