

TechS News- An Electronic Newsletter

No. 3, May 20

Editorial

Welcome to the 3rd issue of TechS, an electronic newsletter reporting the information and updates on the activities of the Technology Platform (TP) of PlanetS. In the current issue we have selected and invited the company ARCOPTIX to present some of their products and a project they were involved.

To make the newsletter a success, we will be relying on you, the subscribers to the newsletter, to send us news and update about something you think can be important to share within our community in terms of **Seed funding, Networking, Training, Participating, Infrastructures** and **Competences**. If you want to share information with the other subscribers to the newsletter and facilitate the exchange of information, just let us just contact the TP [here](#).

Best wishes,

The Technology Platform (TP)

General information about TP

General information about the TP activities and news from the us can be found here:

- Webpage of the TP: [link](#).
- To subscribe or unsubscribe: [link](#).

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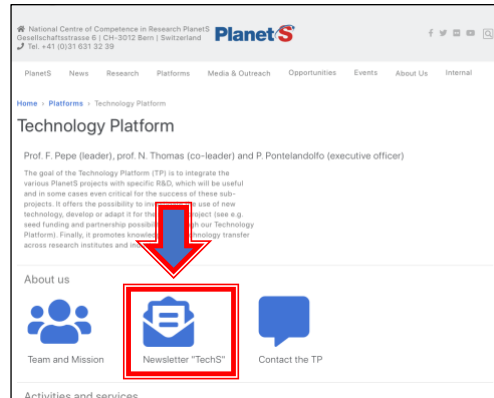
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Update of the TP web page

The TP has a new look!

The web page of the TP ([link](#)) was completely redesigned to have a more user-friendly access to the information. You will faster and easier than before find in our web page the following topics:

- **About us:**
 - The team and mission of the TP: 👤
 - The web page where you can find the previous issues of our newsletter “TechS”: 📧 (see image on the right)
 - An easy form to contact the TP (do not hesitate to use it if you would like to propose activities or simply if you have questions): 💬
- **Activities and services:**
 - A list with the facilities and infrastructures available in PlanetS is available for you: 🏢
 - A list with the competences available in PlanetS listed by contacts is proposed here: 👤
 - Few companies related to PlanetS’ projects are listed here: 🏭
 - The alumni community for possible future contacts and activities: 👤
- **KTT, IP and Start-up support:**
 - KTT support in Switzerland at local, national and international level: 🤝
 - A classification of the Intellectual property (IP) and methods to search patents are given at: 🔄
 - A web page where you can find some possible external sources of funding for your projects: 💰
- **KTT funding programmes:**
 - **Our Seed Funding (SF) programme** for new ‘high-risk high-gain’ ideas related to PlanetS Projects: 📣
 - **Knowledge transfer with a short-term project** with an external partner (STP): 📣
- **KTT applications in society through our funding programmes:**



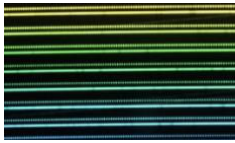
SF1: Patenting the CHEOPS super stable light source



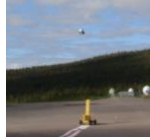
SF2: Estimating the potential of thermal ionisation cavity sources for PlanetS



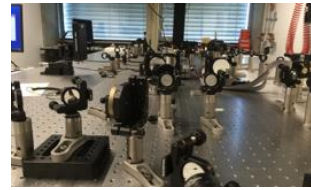
SF3: In situ mass spectrometry of planetary surfaces



SF4: Sky-Ruler



SF5: Spacetek
(commercialization of
disruptive mass
spectrometers for
terrestrial applications)



SF6: A Swiss Technology
R&D Initiative Towards
the Direct Detection of
Nearby Exoplanets



STP1: Externship within
Google Cloud



NO IMAGE

SF7: Pre-study of transit
recognition with machine
learning

- *Events & Deadlines*
- *News*

Link: <http://nccr-planets.ch/platforms/technology-transfer/>

Spotlight on a project of the TP

Spacetek AG

Spacetek AG is a swiss start-up with a unique technology in the realms of compact time-of-flight (TOF) mass spectrometry, which is implemented in Spacetek's STT-1800™: the smallest instrument of its kind which is commercially available for sale on the market.

The fast-paced development and deployment of this technology was enabled by both the PlanetS Technology Platform and the European Space Agency's Business Incubator programs, which were completed in May 2019 and May 2020, respectively. These programs were key to equip Spacetek with the necessary resources, expertise, and network to build not only a high-performance product, but also a high-performance organization to commercialize it.

With a past experience in space instruments development, the Spacetek's team is now looking with interest at the possible implementation of its technology on a CubeSat constellation, for the real-time monitoring of the upper layers of the Earth's atmosphere from low-orbital space. The near-vacuum conditions at these altitudes are very similar to those of vacuum processes for the manufacturing of semiconductors and the coating of glasses and other materials. Therefore, there is a clear synergy between ground- and space-based applications for opportunities of technology transfer in both directions.

The Science Case for a Space Product

An accurate knowledge of the composition and dynamics of the upper layers of the Earth's atmosphere, particularly the thermosphere, ionosphere, and exosphere, is important for correlating models of climate change and space weather. Moreover, it may allow to develop new models that could relate variations of the concentration of the ionosphere with geological phenomena, such as earthquakes.

The thermosphere and ionosphere are heavily influenced by the diurnal variation of solar irradiance, solar rotation and cycle, magnetic storms, and climate change. So there is a strong need for not only accurate but also real-time and continuous knowledge of the chemical composition of neutrals and ions to understand the evolution of the Earth's atmosphere and its relationship with the sun.

In-situ investigations of the thermosphere started in the 60s but were interrupted in 1983. So the last extensive investigation with a mass spectrometer was performed with ~40 years old technology. Therefore, new measurements of both the spatial distribution and the temporal evolution of the upper atmosphere with sensitive, state-of-the-art mass spectrometers are needed. A network of CubeSats represents a cost-effective and powerful solution to deploy a real-time monitoring system. The mission would fit in the strategic roadmaps of the University of Bern and could have synergies with the Constellation of High-Energy Swiss Satellites (CHESS), which is a mission concept designed to analyse the upper atmosphere.

In addition to Earths' atmosphere monitoring, the same technology is well suited for deep space missions or lander missions, such as those proposed to look for resources (e.g., water and volatiles) on the Earth's moon, and those aiming to investigate the composition of Europa, an icy moon of Jupiter, in search for signs of extinct or extant life.

Company and Current Commercial Product

Spacetek Technology AG is a spin-off of the University of Bern, founded in 2018 by engineers experienced in space instruments development for ESA and NASA missions. The company already commercializes the world's smallest Time-of-Flight Mass Spectrometer (TOF-MS): the STT-1800™, see Figure 1. This instrument delivers a unique combination of size, measurement speed, resolution, and sensitivity that makes it an ideal tool for real-time in-line product and process control application in industrial settings.

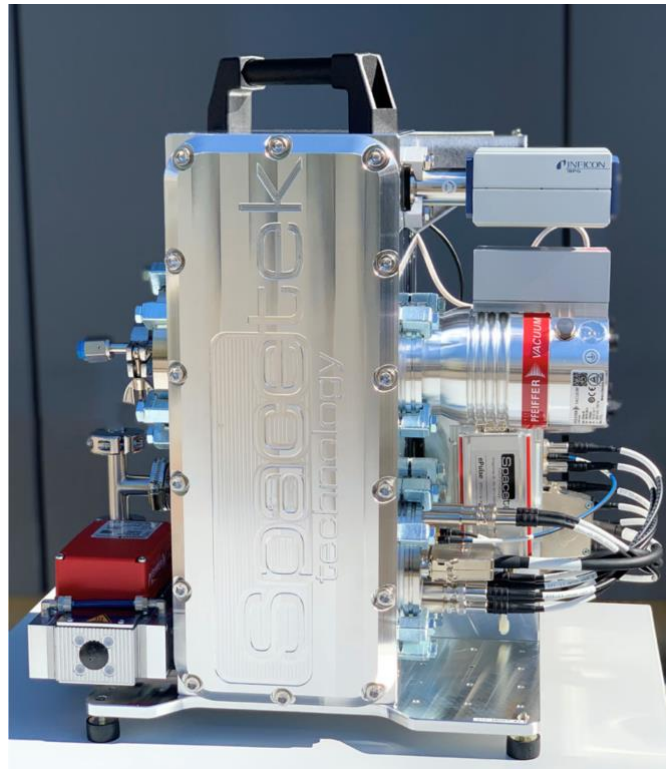


Figure 1: The STT-1800™ TOF-MS inclusive of the vacuum system, which is only necessary for operation on Earth but not in space.

A TOF-MS measures the time that it takes for ions accelerated to the same kinetic energy to pass through an ion optics, where ions are reflected and focused similarly as in an optical system, but using electric fields instead of the optical phenomena of reflection and refraction. Because all ions are accelerated to the same kinetic energy, their time of arrival at the detector is proportional to their mass-to-charge ratio, so a spectrum in time allows to extract chemical composition by relating the time of arrival to the mass of a specific atom, molecule, or fragment of a molecule.

Making a small TOF-MS is challenging because the smaller the instrument, the shorter the flight path of the ions, hence the shorter the time differences between ions with different m/q ratio. To measure these short times, special design solutions of the mass analyser and a very fast and stable electronics is required to acquire detector signal and process the large amount of data that is generated by the instrument. This is one of the core skills of Spacetek, which allowed to fit the electronics of the instrument and the mass analyser in a very compact volume without any compromise on performance. Examples of high-resolution spectra acquired with the instrument are shown in Figure 2.

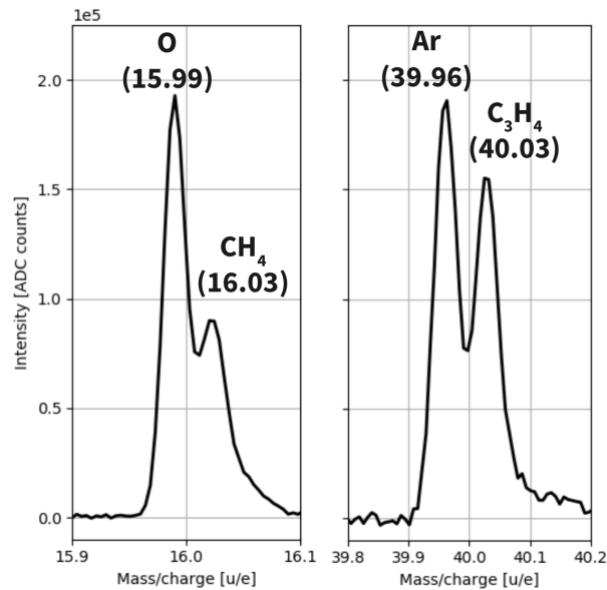


Figure 2: High-resolution spectra showing the capability of Spacetek's STT-1800™ to resolve isobaric species in a mass spectrum.

The current design of the commercial product is only marginally bigger than what would have to be implemented to fit in the size and power constraints of a CubeSat. Therefore, Spacetek Technology is optimally positioned to deploy in a 1U (10 x 10 x 10 cm) CubeSat module the existing and proven technology of the STT-1800™.

Synergies Between the Space and Industrial Products

There is a market demand for small instruments that can continuously measure the composition of a process reaction chamber, or a gas or liquid to detect anomalies from the nominal composition. Plasma processes, for example, used in the manufacturing of semiconductors and vacuum coating of various materials, operate at similar pressures than those of the thermosphere. Therefore, the technological solutions developed for a CubeSat-type mission in Low Earth Orbit have an immediate transferability to a very compact process monitor for these industries and of course vice versa. Another example is the real-time contamination control of drinking water directly on the water distribution infrastructure using a compact TOF-MS with a membrane inlet.

Future Outlook

Spacetek is actively working to startup a project to build a 1U CubeSat TOF-MS by adapting the current technology of its STT-1800™ instrument. Collaborations and partnerships with institutions working on mission concepts for the monitoring of the thermosphere and ionosphere with other complementary technologies are sought to propose a compelling science and mission case to be accomplished by 2022.

Focus on a company

As every month, this section wants to present an overview of a selected company which is active in domains related to the PlanetS' activities. This month we want to present the company ARCOPTIX, which is located in Neuchâtel.

ARCOPTIX

ARCOptix is a manufacturer FTIR (Fourier-Transform Infrared) spectrometers and Liquid-Crystal systems. Founded in 2006, the company currently employs 13 people. ARCOptix FTIR spectrometers are among the most compact and rugged available on the market. ARCOptix mainly supplies FTIR engines as OEM (Original Equipment Manufacturer) components for larger corporations, but also provides laboratory spectrometers to end users. The company offers R&D services as well, mainly for integrating its FTIRs into application-specific instrumentation. ARCOptix has already been involved in a few space-related projects so far, involving both liquid crystal and FTIR products.

ESA TRP project "InSpectA"

ARCOptix has been prime contractor for the ESA TRP project "InSpectA" (Infrared Spectroscopy for Astrochemistry) with Micos Engineering GmbH (Dübendorf, Switzerland) and University of Vigo (Spain) as subcontractors. The project involved the development of an Elegant Breadboard (EBB) payload for a 6U CubeSat.

The CubeSat should be launched into a highly elliptical orbit around Earth. This will be needed to expose organic molecule samples to intense solar UV and energetic particle radiation. The payload includes a miniature FTIR spectrometer and two sample carousels that carry a total 60 samples. Each sample can be sequentially placed in the probing infrared beam of the on-board FTIR spectrometer, for measuring the photochemical degradation of the sample molecules under the space radiation [1].

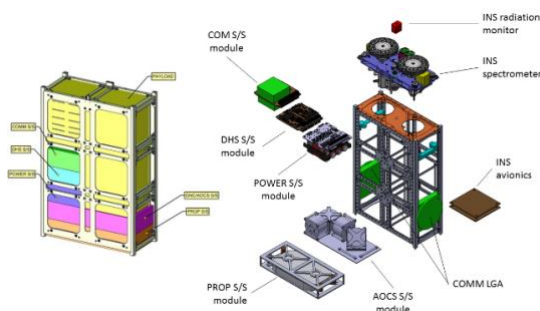


Figure 3: Exploded view of the SpectroCube 6U CubeSat, showing the different sub-systems. Reproduced from [1].

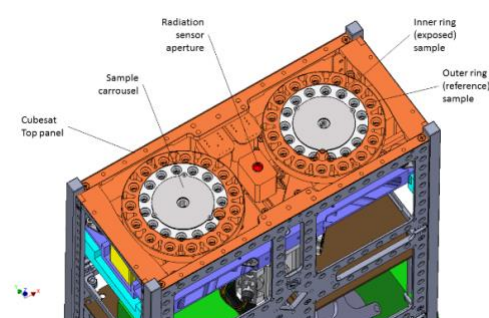


Figure 4: Payload mounted at the top of the Cubesat. Reproduced from [1].

Following a careful optical, mechanical and thermal design, the instrument was assembled then submitted to a series of tests. Launch environment vibration tests were performed at the facility Bern University (Figure 5), shock tests at the Fachhochschule Nordwestschweiz (FHNW) and a thermal-vacuum test in the TVAC chamber of Micos Engineering (Figure 6). It survived the vibration and shock tests without measurable loss of performance, and operation in vacuum was also successful.

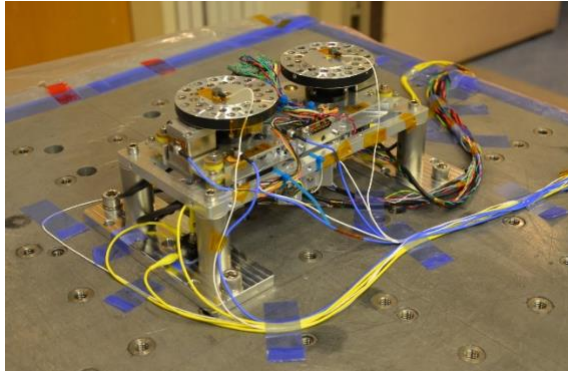


Figure 5: Vibration testing at the shaker facility of Bern University

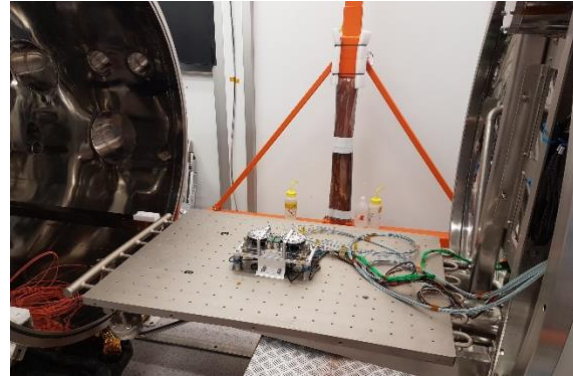


Figure 6: TVAC testing at Micos Engineering GmbH

The project now seeks funding under ESA's General Support Technology Programme (GSTP) for developing a flight instrument. Upcoming challenges include the development of control electronics and their dedicated shielding to survive the intense radiation expected for this type of orbit, and integration of the payload into the CubeSat platform.

References

- [1] Elsaesser et al. (2020). SpectroCube: a European 6U nanosatellite spectroscopy platform for astrobiology and astrochemistry. *Acta Astronautica*. 170. 10.1016/j.actaastro.2020.01.028.



ARCOptix) FT Spectrometers &
Switzerland Liquid Crystal Elements

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Breaking news

Venture Kick



Venture Kick : CHF 5,000,000 to kick Swiss startups to global markets

The philanthropic initiative Venture Kick provides up to CHF 150,000 in seed funding to Swiss startups. In addition, it offers a well-structured entrepreneurial path towards building a winning business. Startups pitch to expert juries at three stages to obtain funding, gaining direct feedback, and access to an international network of successful entrepreneurs and investors. Venture Kick was launched in 2007 with the vision to double the number of spin-offs from Swiss universities, to accelerate their speed-to-market and to raise the attractiveness of these young companies among professional investors and industry partners. Selected members from a [jury pool](#) with more than 150 leading startup experts in Switzerland evaluate 20 [startup projects](#) at different stages [at three sessions every month](#). The need and utility of Venture Kick pre-seed program was demonstrated again, as alumni companies raised CHF 3.5 billion in capital, created 7,000 new jobs by end of 2019, and represent 54 companies ranked in the TOP 100 Swiss Startups 2019. They kick startup ideas to global success with all the necessary support for the founders to advance their business. This entrepreneurial mindset applies equally to Venture Kick as an initiative. In 2019, they implemented a new model offering convertible loans of up to CHF 150,000 per startup and increased the financial support to CHF 4.35 million. The new model was very well perceived, as it simplified and accelerated the process for startups. More information in the [Venture Kick annual report](#).

Venture Kick Life Science vertical

In 2020, they will not only increase the total support amount for startups to CHF 5 million, which enable them to boost 80 new projects. Also, with a pilot project they aim to strengthen the startup and innovation ecosystem in Switzerland. 'Venture Kick Life Science' is a special track for biotech and medtech, both key assets of our country. This track allows them to leverage the support, network and visibility for life science projects. Starting the year with specific jury sessions for stages 2 and 3, this pilot will evolve over time. On top of this they also plan to give more visibility to deep tech startups that provide relevant technological solutions for a sustainable environment and the nutrition of tomorrow.

Awarded by the Swiss Biotech Association

Each year, the Swiss Biotech Association awards companies or individuals in recognition of outstanding achievements. The award winners for 2020 are Actelion, Debiopharm, Helsinn, Venture Kick, >>Venture>>, Venturelab, and the noble prize-winner Professor Werner Arber. [Read more here](#).

The Venture Kick Foundation is supported by Gebert RUF Stiftung, Ernst Göhner Stiftung, Hauser-Stiftung, André Hoffmann, Hansjörg Wyss, Martin Haefner, Igor Fisch, Fondation Pro Techno, ESA BIC Switzerland, Engagement Migros, and Swisscom.

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Hauser-Stiftung

André Hoffmann

Hansjörg Wyss

Martin Haefner

Igor Fisch



Find more information on venturekick.ch, with [all startup projects supported by Venture Kick](#), and follow the success stories of their startups on [Facebook](#), [Twitter](#) and [LinkedIn](#).

Venture Kick takes applications at any time! [Apply now here to Get the Kick!](#)



675 startup projects supported

29,250,000 francs start capital from Venture Kick

7,000 active jobs created

3,500,000,000 francs raised by supported startups

73% survival rate

46% have women in founding team

Joint CNES/ESA Announcement of Opportunity: Space environmental effects on materials using the "Euro Material Ageing" facility

The European Space Agency ESA has recently released the Joint CNES/ESA Announcement of Opportunity: Space environmental effects on materials using the “Euro Material Ageing” facility.

This joint Announcement of Opportunity by the French Space Agency (CNES) and European Space Agency (ESA) solicits proposals to expose material samples on the external platform to the International Space Station, using the Euro Material Ageing facility. This is a remarkable opportunity for material scientists, experimenters and engineers to test materials for space applications in the full spectrum of the low Earth orbit environment.

Save the following dates:

- Address the Letter of Intent (non-binding): prior the workshop at material_ageing@esa.int
- Announcement of Opportunity workshop: 11 June 2020
- Deadline for submission of Proposals: 17 July 2020

You can find the information on the research announcements website: https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Research/Research_Announcements

More detailed information material:

- [Download the main announcement of opportunity text in PDF format.](#)
- [Download the proposal submission template in Word format.](#)
- [Download the Letter of Intent template in Word format.](#)

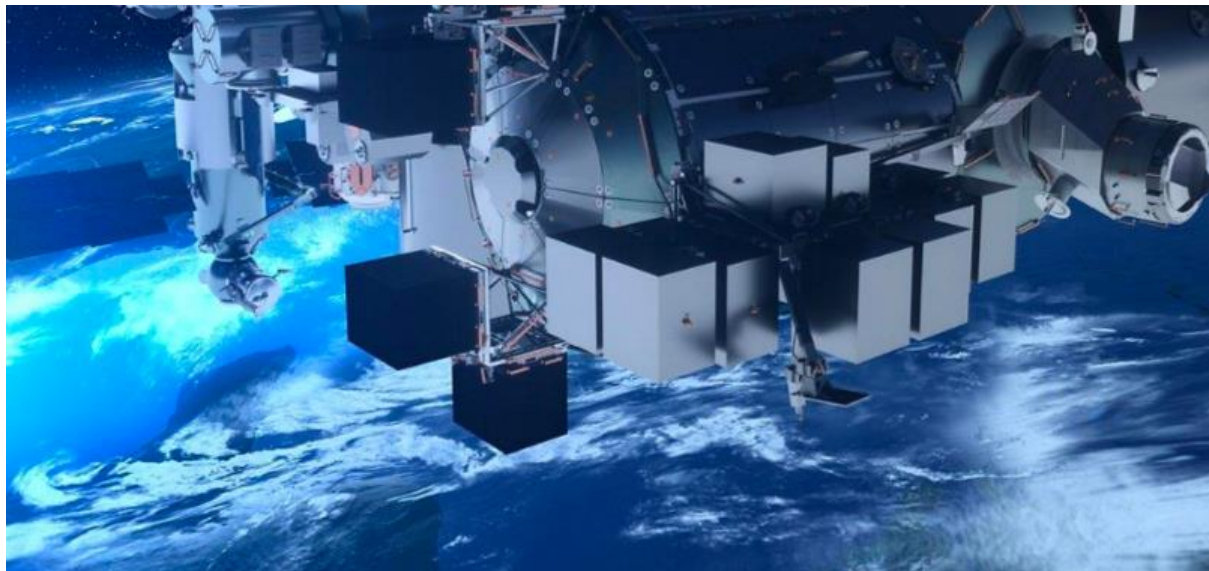


Figure 7: Bartolomeo platform on-board the International Space Station ISS (Airbus)

Upcoming events and deadlines

External

- Venture Leaders Fintech brings 10 innovative Swiss fintech start-ups to Hong Kong from November 1st to 7th, 2020 for a **week of intensive networking, business development and investor pitching**. The participation at the Hong Kong Fintech week will also be included. An exclusive opportunity to get to know investors and international industry experts as a member of the “Swiss National Startup team”. Deadline: July 15th, 2020. [Link](#) and [Post](#).
- **AO: Euro Material Ageing**. Deadline: 17 July 2020. [Link](#) and [Post](#).
- **SPIE: Astronomical Telescopes + Instrumentation**, 13-18 December 2020 (new dates!) in San Diego, California, USA. Topics: Telescopes and Systems and Technology Advancements. [Link](#) and [Post](#).

Look regularly at the TP's web page where you can find the upcoming events ([events](#)).

Funding programmes of the TP

Permanent call for seed funding

The TP proposes a permanent call for seed funding called “Call for Ideas”. The call promotes activities and strategies that aim at strengthen the knowledge and technology transfer between PlanetS Members, industry, technical universities and other research laboratories.

The call is open to every company, institute or research laboratory, and the rules have been kept as simple and flexible as possible.

Would you like to know more about the call? Have a look [here](#).

Knowledge transfer with a short-term project

The TP proposes program for PlanetS Member or Associate (PhD-student, postdoc or engineer) who developed competences or ideas that maybe applied to areas outside your specific research activities. The PlanetS TP provides support with up to 3 months of financial support (salary compensation) in order to pursue your project. Would you like to know more about the opportunity? Have a look [here](#).

Short projects are available for PlanetS people:

- With [Micro-Cameras & Space Exploration SA, MCSE](#).
MCSE develops specific systems in the field of scientific instrumentation for space exploration.
 - Project 1: JUICE monitoring camera calibration. The proposed project concerns the characterization and calibration of a colour camera that is currently being developed for the JUICE mission to Jupiter.
 - Project 2: BRDF data collection. A full straylight analysis requires data of bidirectional reflection function (BDRF) measurements for the respective materials and surfaces used in an optical system. The goal of the project is to define a BRDF database for typical materials and coatings.
- With [Sercalo Microtechnology](#).
Sercalo Microtechnology supplies customers with high quality and top performance MOEMS (Micro-Opto-Electro-Mechanical Systems) components.
 - Project 1: Sercalo is moving into autonomous vehicle market supplying micromirrors for beam steering in LIDAR. This market has high reliability standards (shock, vibrations, humidity, temperature...). Sercalo needs to further develop and automatize its testing equipment. The person who will be selected for the programme will interface with the automotive norm, micromirror production, test equipment to provide an automatized testing equipment.

If you are the industry or the research laboratory which would like to propose a project, let us know about your interest and fill out the following: [proposal of a short-term project with for the external partner](#).