EPFL joins the giant radio telescope SKA for the Swiss Community

The *Square Kilometre Array*, or SKA, will be the biggest radio telescope ever built. Thanks to this ambitious tool, some of the universe's greatest mysteries will be resolved. EPFL became a member of the SKA Organisation (SKAO) beginning of April 2020 and will coordinate the contributions to this project on behalf of the Swiss academic community (*).

This is one of the biggest and most ambitious scientific tools of the XXIst century. The *Square Kilometre Array*, or SKA, is an impressive radio telescope project, which will build an array of 130 15m-diameter dish antennas in South Africa and an array of 130'000 TV-like antennas in Western Australia in the coming years. Thanks to it, some of the Universe's greatest mysteries will be studied with a whole new level of precision. Along with thirteen countries officially involved, Switzerland is considering participating in this huge adventure. As an initial step, EPFL was just granted special member status of the SKA Organisation (SKAO) and will be the lead institution coordinating the contributions to the SKA on behalf of the Swiss academic community (*).

Most telescopes we readily think of use optical light similar to what we see with our eyes. The SKA will capture light of celestial objects at radio waves, similar to the light used by our smartphones to communicate together. At radio waves, the sky is much different that the one we see in optical light.

"This new high-performance radio telescope will open a new view of the whole Universe. " commented Prof. Jean-Paul Kneib of EPFL leading the consortium of Swiss Scientists interested in the SKA project, "SKA will detect the formation of planetary system around distant stars, the cold Hydrogen gas around galaxies, the nuclei of distant galaxies harbouring an active super-massive blackholes"

"SKA will also measure the magnetic field in galaxies and at larger scales and map the fluctuation of the Hydrogen distribution in the first billion year of the beginning of the Universe" added Prof. Daniel Schaerer from University of Geneva, "SKA will allow us to address some key questions on our Universe, such as the nature of the Dark Matter and the Dark Energy, or explore the Cosmic Dawn the period of time when the first stars and first galaxies formed".

As outlined in the white paper *Swiss Interests and Contribution to the SKA*, published end of February 2020, Swiss scientific institutions(*) and high-tech industry partners are extensively involved in SKA-related science and technology, contributing in research and development in the fields of distributed radio frequency systems, high performance computing, machine learning and artificial intelligence.

"A huge challenge"

"SKA is faced with a huge challenge, in signal processing" explained Prof. Jean-Philippe Thiran of EPFL, a specialist of image processing techniques, "the data flow that will come out of the many antennas will need to be combined efficiently and likely with new algorithms to extract the complete astrophysical information".

"I am delighted to welcome EPFL to the SKA Organisation as our newest member," said Chair of the SKA Board of Directors Dr Catherine Cesarsky. "This renowned research institution and its partners have brought valuable expertise to the SKA, and we look forward to working ever more closely with

our Swiss colleagues as we enter this exciting phase of the project, completing the very last steps before construction."

Switzerland has held observer status within the Organisation since 2016, with many Swiss research institutions and industry partners contributing to various aspects of the SKA. The country has a history of world-class research and development in science and astronomy, including leading the recent CHEOPS mission to study exoplanets and developing instrumentation for the future European-Extremely Large Telescope (ELT) in Chile, among other things. And for five years now, the Swiss SKA Days bring together national and international representatives of academia, industry and government, showcasing the breadth of opportunities for Swiss institutions and companies to be involved in the SKA. The location rotates each year to reflect the various contributions of different Swiss institutions. It is due to be held at the University of Zurich later this year.

"SKA is a very ambitious infrastructure in astrophysics, and Switzerland has a lot to offer and benefit from it", said Olivier Küttel, Head of International affairs at EPFL. It is not just about physics, but also about the handling and analysis of large data sets, something Switzerland is good at. It remains the goal of EPFL that Switzerland should become a member of the SKA."

First EPFL, then Switzerland!

EPFL is now a member of the SKAO, which has been responsible for overseeing the telescope design phase, until the process of transitioning into the SKA Observatory is completed. The Observatory is due to come into being in 2020. Switzerland's Federal Council recently triggered the first political debate in Parliament regarding the possible participation of Switzerland as a member state in the future.

"As the dream of building SKA is about to become a reality, SERI welcomes and supports the EPFL decision to join the SKA Organisation as a special member", stated Xavier Reymond, Deputy Director General for International Research Organisations at the State Secretariat for Education, Research and Innovation SERI, and in charge of the relationships between Switzerland and SKAO. "The accession of the EPFL will benefit to the Swiss scientific community as a whole and will open business perspectives to Swiss companies. Switzerland is the proud Seat of CERN and a dedicated Member of the European Southern Observatory and of the European Space Agency. Therefore, we all look forward to assessing the opportunity to complement with the SKA Observatory this portfolio of successful participations in disruptive intergovernmental endeavours dedicated to the fundamental understanding of the Universe."

SKA Director-General Prof. Philip Diamond also welcomed EPFL to the SKAO, noting the importance of the country's involvement so far. "Swiss institutions have been a vital part of the SKA's design phase and bring with them a well-deserved reputation for excellence in science and astronomy, as well as being involved with some of today's most exciting projects," he said. "As we move ever closer to SKA construction, EPFL's membership serves to highlight the broad range of expertise that the SKA can count upon in this next phase."

*: the Swiss Academic Community includes:
Universities of Geneva, Zurich, Bern, ETHZ, CSCS, FHNW, HES-SO, and Verkehrshaus der Schweiz

To know more about this:

Swiss participation in SKA:

https://www.epfl.ch/labs/lastro/scientific-activities/ska/swiss-participation/

Swiss Interest and Contribution Document:
https://www.epfl.ch/labs/lastro/wp-content/uploads/2020/02/White-paper_Swiss-interest-and-contribution-in-SKA.pdf

Contacts:

- Jean-Paul Kneib, Director of EPFL Laboratory of Astrophysics, jean-paul.kneib@epfl.ch, tel: +41 79 733 21 11.
- Olivier Küttel, Head of International Affairs at EPFL, olivier.kuttel@epfl.ch, tel: +4179 428 29 18
- SKAO: William Garnier, Direktor für Kommunikation, w.garnier@skatelescope.org, Tel: +44 7814 908 932
- UNIGE: Daniel Schaerer, Professor of Astrophysics, daniel.schaerer@unige.ch, tel: +33 7 50 91 67 22

Academic partners contacts:

- University of Geneva: Daniel Schaerer daniel.schaerer@unige.ch
- University of Bern: Suzanne Wampfler susanne.wampfler@csh.unibe.ch
- University of Zurich: Romain Teyssier romain.teyssier@uzh.ch
- ETH Zurich: Alexandre Refregier alexandre.refregier@phys.ethz.ch
- FHNW: André Csillaghy andre.csillaghy@fhnw.ch
- HES-SO: evelina.breschi@hes-so.ch
- ETH Zürich /Swiss National Supercomputing Centre CSCS: Thomas Schulthess schulthess@cscs.ch
- Planetarium - Verkehrshaus der Schweiz: Marc Horat marc.horat@verkehrshaus.ch