

SPACE MISSION

Photek detector on SMILE mission

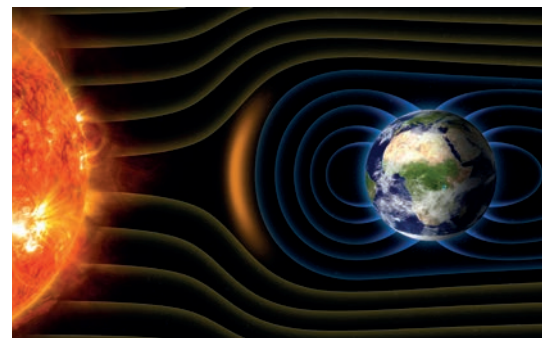
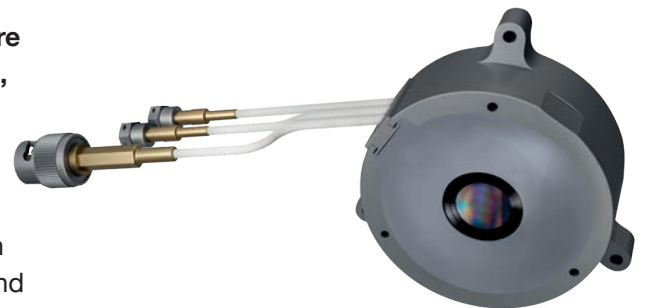
The European Space Agency and Chinese Academy of Science's SMILE Mission (Solar wind Magnetosphere Ionosphere Link Explorer) intends to constantly image, in Far-UV and Soft X-rays, the interaction region of the Sun's and Earth's magnetospheres and the north pole's Aurora Borealis.

Planned for launch October 2025 on ESA's Vega-C launch platform, SMILE will orbit the earth in a highly eccentric and inclined orbit to allow capturing a full view of the earth's magnetosheath from afar. This data will provide information for scientists to more accurately predict space weather, helping to protect satellites in orbit and ground based power networks during solar storms.

Photek's MCP118 Image Intensifier has been integrated into the flight UV telescope (SMILE-UVI instrument) as designed/built by the Chinese Academy of Science.

The image intensifier uses a CsI photocathode to provide sensitivity to the Far-UV (key wavelength around 170 nm), and a phosphor screen to convert the UV signal into the visible frequency range for capture by a CMOS sensor coupled to the intensifier's output via a relay lens. The UVI instrument offers an opportunity to capture images of the Earth from space in the Far-UV, with the exciting opportunity of new discoveries regarding Earth's magnetic field.

Photek would also like to congratulate the team working on the Soft X-ray Imager, Light Ion Analyzer and Magnetometers on their successful integration into the SMILE satellite. And wish good luck to the SMILE science and Modelling groups for the promising research opportunities.



Magnetosphere or magnetic field around Earth. The geomagnetic field, is the magnetic field that extends from Earth's interior out into space.



Photek was contracted under a programme of and funded by the European Space Agency. The view expressed herein can in no way be taken to reflect the official opinion of the European Space Agency.

APPLICATION

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SMILE facts from ESA

Name: SMILE

Solar wind Magnetosphere Ionosphere Link Explorer

How is SMILE unique?

Although numerous spacecraft observe the Sun and its effect on Earth's environment, these missions largely study localised processes and individual space weather events. SMILE will be able to view the full Sun–Earth connection, filling a big gap in Solar System science.

Our understanding of the Sun–Earth connection has been limited by the financial and technical constraints of developing the multi-satellite missions needed to obtain a global perspective of Earth's environment. However, recent discoveries have shown that Earth's outer magnetosphere can be imaged another way, which will be utilised by SMILE. The method is based on a process known as 'solar wind charge exchange' – a process detected through the X-ray light emitted when solar wind particles interact with neutral particles in Earth's upper atmosphere. This technique has been successfully demonstrated by ESA's XMM-Newton in recent years, and SMILE will gather the X-ray data needed to apply it to Earth's magnetic environment.

To complement this X-ray imaging, SMILE will continuously image the auroras in ultraviolet, with the ability to observe non-stop for more than 40 hours for the first time ever. Such data have been missing since 2008 when NASA's Polar mission stopped operations after its fuel was exhausted.

Furthermore, SMILE marks the first time that ESA and China have jointly selected, designed, implemented, launched and operated a space mission.

Normal mission lifetime:

Three years to achieve its science goals.

Orbit:

SMILE will be placed in a highly inclined, highly elliptical orbit around Earth.

Legacy:

SMILE builds upon findings and studies by ESA satellites such as Cluster and XMM-Newton.

Instruments:

Smile will make clear and quasi-continuous observations of key regions in near-Earth space with both remote-sensing and in situ instruments. The spacecraft will carry four instruments:

LIA

Light Ion Analyser

SXI

Soft X-ray Imager

MAG

Magnetometer

UVI*

Ultraviolet Aurora Imager

** featuring Photek's Image Intensifier*

Further reading:

Explore the SMILE mission in greater detail on the European Space Agency website:

[🔗 SMILE factsheet](#)

[🔗 UVI instrument](#)

[▶ Watch](#) ESA's video on the mission



Facts and resource links sourced from the European Space Agency website.