LUMINOUS

LUNAR **U**TILIZATION FOR
MONITORING **IN**TERACTIONS
OF THE **OU**TER SOLAR
STRUCTURES

Executive Summary

PROBLEM STATEMENT

Sun's atmosphere most external part, the **corona**, is still far from being comprehended, even after decades of **space observation**. In particular, **heating processes** of the solar wind at coronal level are one of the biggest loose ends of modern astrophysics; theories to explain such phenomena **can not be validated** with actual platforms. This lack of knowledge poses a serious threat for every human activity in space, both **robotic** and **manned.**

PROPOSED SOLUTION

The **LUMINOUS orbiter** will be capable to study the solar corona up to the unprecedented limit of **1.002 Sun radii** thanks to the exploitation of the **Moon** as coronograph occulter, which will boost data resolution to **0.7 arcsec/pixel**, namely two order of magnitude better than any actual space platform for Sun observation.
LUMINOUS will be placed in a **High Circular Lunar orbit (HCLO)** to optimise **observation time** and **orbit maintenance duty**. The robust design, based on **TRL>7 heritage** components and **redundancy** in sensible components, will allow the system to be ready to launch **from 2027** on and to operate for a designed **lifespan of 6 years** to track evolutions during the 11 year solar cycle. Observations of up to **two hours** for the **whole solar corona at more than 20 Sun radii** will be granted every three days ca for a single orbiter.

VALUE

The LUMINOUS mission will be fundamental to the understanding of solar corona heating mechanism. This will have a direct effect on **human presence in space**, for instance for the prediction of **solar storms**, but also in on-ground technological development, such as in the **nuclear fusion material containment**.
As a platform in HCLO, it will be a main character in **lunar dust physics, planetary defense** (identification of Potential Hazardous Objects with perihelion between Earth and the Sun, thanks to secondary payload) and **space weather systems**. Moreover, it will be capable to act as **relay satellite** for other missions.

CONCLUSION

With the LUMINOUS orbiter we will be capable to help Sun physicists answer the main **unsolved questions** surrounding the solar corona.
The mission concept is consistent for a single orbiter; however, the implementation of a **constellation** around the Moon with sequential launches and multiple, updated orbiters would increase both **corona coverage** (in terms of time and space) and **mission lifetime**, opening to the fascinating scenario of a **constant corona monitoring system.**