EUV Imagers (EUI) for Solar Orbiter

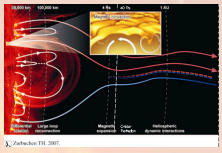
http://eui.sidc.be/

Louise Harra & the EUI team (lkh@mssl.ucl.ac.uk)

The Science

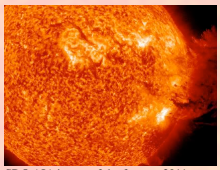
How and where do the solar wind plasma and magnetic field originate in the corona?

EUI will provide the critical context images from the Full Sun Imager which will show the location of coronal holes, and active regions and their boundaries. The High Resolution Imagers will be able to observe in sub-second time cadence and 100km resolution at perihelion in the solar atmosphere. This will allow us to search for waves and small-scale reconnection events that are triggering the outflowing plasma and magnetic field into the solar wind.



A view showing how the close perihelion orbit will facilitate understanding the linkage between the solar wind measurements and their source on the disk.

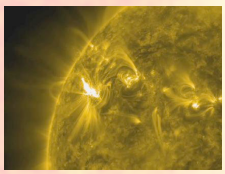
How do solar transients drive heliospheric variability?



SDO AIA image of the famous 2011 filament eruption

A critical role for EUI is to use the Full Sun Imager tracking the location of flares and Coronal Mass ejections and their evolution. EUI will have a flare trigger that will allow us to keep and download the best events in the reduced telemetry situation. This trigger will be used to communicate with the other instruments, so they can also react in terms of what data they keep or what mode they observe in. The high resolution imagers will go into high cadence mode to obtain details of what causes eruptions.

How do solar eruptions produce energetic particle radiation that fills the heliosphere?

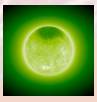


SDO AIA image of one of the recent flares

EUI will use either its own trigger or the trigger from STIX, to choose the right event in this case. EUI will provide the location, timing and motion for events that produce energetic particle radiation.

How does the solar dynamo work and drive connections between the Sun and the heliosphere?

The unique view of the poles during the out of ecliptic phase. PHI will be producing helioseismology observations during these phases, with EUI tracking the response of the atmosphere to the changes in the small-scale magnetic field.



Simulation of out of ecliptic view of the Sun from FSI

The Team

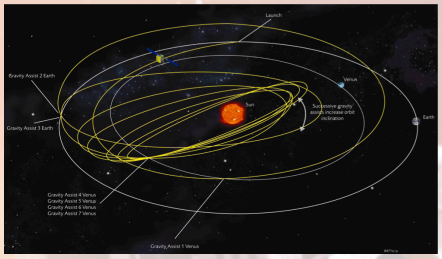
PI: Pierre Rochus (CSL), co-PIs David Bergmans (ROB), Thierry Appourchaux (IAS), Louise Harra (UCL), Udo Schuehle (MPS).

There is a team of co-Is as listed below. These include members of the hardware teams and those who will contribute to the project through simulations.

F. Auchere, K. Bocchialini, E. Buchlin, J. Buechner, Guillaume Aulanier, W. Curdt, F. Delmotte, G. Del Zanna, Samuel Gissot, Thierry Dudok de Wit, M. Haberreiter, L. Green, D. Innes, S. Kuzin, Nicolas Labrosse., Duncan MacKay, E. Marsch, S. Matthews, S. Parenti, S. Poedts, Luciano Rodriguez, S. Solanki, L. Teriaca, J. C. Vial, L. van Driel-Gesztelyi, Tom Van Doorsselaere, Andrea Verdini, D. Williams, A. Zhukov.

In addition we invite associated scientists to the team! Please contact me if you are interested.

A new way of observing



The Solar Orbiter mission is an encounter mission – this will require a completely new way of operating for solar observations.

Each orbit is 150 days. In each of these orbits the remote sensing instruments will be operating for three 10 day windows.

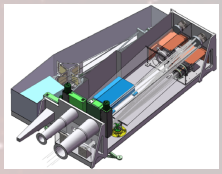
We will define a science target for each of these science windows and decide which mode to operate in.

The full Sun Imager will operate continuously throughout the science windows (and we hope throughout the orbit too!).

Due to the telemetry constraints the high resolution imagers will operate in burst mode depending on their target.

The first 4 orbits will have the maximum perihelion so get ready for the 'up close and personal' science!

The Instrument



High Resolution Imager: Lyman α

Subsec-100s cadence

Pixel=100km@ perihelion

High Resolution Imager:

Fe IX/X 17.4

1-100s cadence

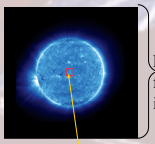
Pixel=100km@ perihelion

Full Sun Imager:

Fe IX/X 17.4 & He II:30.4

10-600s cadence

Pixel=860km@ perihelion



FSI - full Sun imager

HRI - high resolution imager

The HRI and FSI images are produced respectively by a two-mirror and a one mirror telescope working in near normal incidence.

The EUV reflectivity of the optical surfaces is obtained with specific EUV multilayered coatings providing the spectral selection, along with filters that reject the visible and IR radiation.

The UV photons reach the detectors (2kx2k for the HRI and 3kx3k for the FSI) where they are converted into an electrical signal in the front end electronics before being compressed and stored in the common electronic box (CEB). The CEB provides intelligent processing, selection and triggering software in order to deal with the reduced telemetry nature of this mission.