IIA readies centre for data processing

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In February 2024, when the first batches of data from Aditya L-1's primary payload are expected to reach the ground stations, a team of Indian Institute of Astrophysics (IIA) scientists will sit together to process large volumes of information on the unexplored outer edges of the sun's surface.

The IIA-developed Visible Emission Line Coronagraph (VELC), the primary payload on Aditya L-1, can image the corona – the sun's outermost layer – as close as 1.05 times the solar radius. The data VELC sends to the ground stations will be extensive.

V Muthu Priyal, who leads the development of the VELC data pipeline, said Isro's Indian Deep Space Network will transfer nine hours of raw data to the VELC Payload Operations Centre (POC) in IIA's Koramangala campus, every day.

"We will convert this to science-ready data and send it to ISSDC (Indian Space Science Data Centre) from where it will be disseminated to the science community," she told *DH*.

Muthu Priyal is responsible for writing and creating the software pipeline to process the raw data from VELC into usable scientific material.

1,440 images a day

The continuum line (as visible through the telescope), one of the payload's four observation channels, can on its own generate 1,440 images a day (at an image per minute). The spectroscopic channels that observe the corona at different wavelengths are also equipped to generate significant amounts of data. VELC can image the corona with high spatial resolution, at about three times a second.

A project scientist with the Aditya L-1 team, Muthu Priyal started as a junior research fellow (atmospheric science) at the Isro headquarters. She has been working on the Aditya L-1 programme since 2020.

"From the continuum channel, we get images of the corona that can give us an idea about events like CMEs (Coronal Mass Ejections, or large expulsions of coronal matter, at times directed towards the earth). The spectra can tell us about the corona's physical and dynamic nature," she said.

Aditya L-1: 1st VELC data expected by February-end

'Nominal life of satellite is estimated at 5 yrs but payload could last longer'

BENGALURU, DHNS

The Visible Emission Line Coronagraph (VELC) on the Aditya L-1 spacecraft is expected to start sending images of the sun by the end of February 2024, scientists and engineers at the Indian Institute of Astrophysics (IIA) said on Friday.

IIA has developed VELC, one of the seven payloads on board Isro's solar mission which is scheduled to take off from Sriharikota on Saturday.

The spacecraft is expected to be placed on L-1 (the first Lagrange point in the sun-earth system) by the middle of January. The smaller instruments will be tested first and data from VELC could be expected by the end of February, Professor Jagdev Singh, the founder Principal Investigator of the VELC programme, told reporters here.

VELC, weighing 190 kg, is aimed at studying the solar corona, the sun's outermost layer, and the dynamics of large expulsions of plasma and magnetic fields from this layer, known as Coronal Mass Ejections.

The nominal life of the satellite is estimated at five years but the payload could last longer, the scientists said.

Uninterrupted view

The payload was integrated, tested, and calibrated at IIA's Centre for Research and Education in Science Technology (CREST) campus in Hosakote. With 40 optical elements including mirrors aligned inside, VELC can cut out the extremely bright light from the surface of the sun — its photosphere — and observe the corona without interruption.

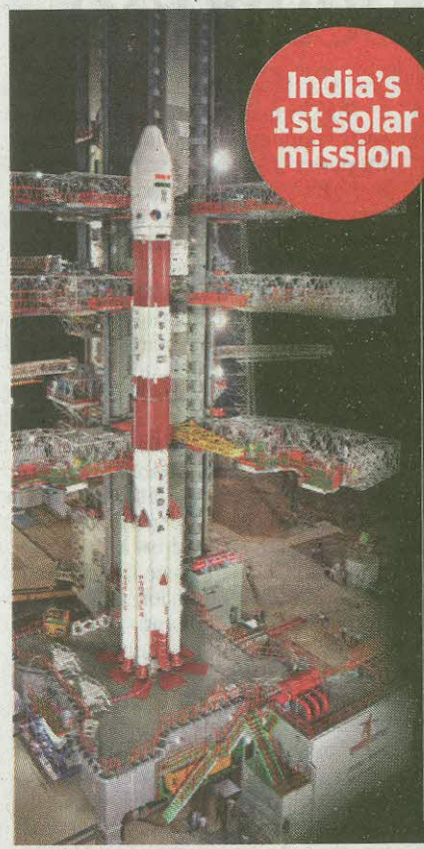
The extremely polished primary mirror on VELC, developed by Isro's Laboratory for Electro-Optics Systems, reduces light scatter inside the payload. Some of the earth's atmospheric gases present in the other payloads may form deposits on this 19 cm-diameter primary mirror and result in light scatter.

The shutter on VELC will be opened last to avoid this.

Indigenous parts

More than 90% of the payload's components are indigenously developed, S Nagabhushana, a member of the programme's engineering team, said.

Four of the seven Aditya L-1 payloads, including Visible Emission Line Coronagraph, are telescopes that observe the sun in visible, infrared, ultraviolet, low & high-energy X-rays while the three in-situ payloads will measure the plasma properties of solar wind and the magnetic field at the spacecraft's location.



India's 1st solar mission

Aditya L-1 will be placed in a halo orbit around the Lagrange point-1 (L-1) of the Sun-Earth system. It will carry 7 payloads for the space-based mission.

FUNCTIONS OF PAYLOADS

Visible Emission Line Coronagraph (VELC):

Developed by: The Indian Institute of Astrophysics, Bengaluru

Prime payload onboard Aditya L-1

To study solar corona and dynamics of coronal mass ejections

Solar Low Energy X-ray Spectrometer and High Energy L-1 Orbiting X-ray Spectrometer (SoLEXS & HE10S)

Developed by: Isro

Will study X-ray flares from the sun over a wide X-ray energy range

Solar Ultraviolet Imaging Telescope (SUIT)

Developed by: Inter-University Centre for Astronomy and Astrophysics, Pune, in collaboration with Isro

To image the Solar Photosphere and Chromosphere in near-ultraviolet (UV) environment and measure the solar irradiance variations in the surroundings

Aditya Solar Wind Particle Experiment and Plasma Analyser Package for Aditya (ASPEX & PAPA)

Developed at: Physical Research Laboratory, Ahmedabad & Space Physics Laboratory, Vikram Sarabhai Space Centre, Thiruvananthapuram

Designed to study the solar wind and energetic ions, as well as their energy distribution

Magnetometer (MAG):

Developed at: Laboratory for Electro-Optics Systems, Bengaluru

To measure interplanetary MAG magnetic fields at the L-1 point

COMPILED BY: E T B SIVAPRIYAN