Bengaluru's IIA built tech that'll go closest ever to peer at Sun

Coronagraph Onboard Aditya-L1 Can Send 1,400 Pics Per Day

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Bengaluru: The Indian Institute of Astrophysics (IIA), which has built the Visible Line Emission Coronagraph (VELC), the main payload for Isro's Aditya-L1, said on Friday the payload will be able to image solar corona down to as close as 1.05Ro, that is, starting from 1.05 times the solar radius.

The team said this would be the closest that any coronagraph on a space mission has been able to image the corona ever. The payload, developed at its Centre for Research and Education in Science and Technology (CREST) campus in Hoskote, some 35 km from Bengaluru, can take observations roughly three times every second and has a high pixel resolution of 2.5 arcseconds per pixel. (An arc-second is the distance of latitude or longitude travelled in one second, or 1/3600th of a degree. An arcsecond per pixel is the field of view of one pixel.)

It can send one image per minute to ground stations — more than 1,400 pictures per day. Jagdev Singh, the principal investigator (PI) of VELC, said: "This data is unique in one way — it can give clearer and detailed images that we never got before. We can combine our data with other scientists for future research."

Nagabushana S (extreme left), head of VELC technical team, and prof Jagadev Singh (second left), the principal investigator of the payload, with rest of the payload team from the Indian Institute of Astrophysics (IIA), at the campus on Friday

VELC's instruments will have to be kept at a temperature of 22°C while also radiating away enormous amounts of heat and light from the solar surface. It has 40 optical elements with an internally occulted coronagraph with a scatter of just 50 parts per million.

"...Such observation needs to be done right from the surface of the Sun (its disk) and the lower corona. VELC, which weighs 190kg, has an internal occulter which separates light from the disk and discards it. The remaining light, which is from the corona, from 1.05Ro to 3Ro (Ro is the radius of the Sun) is sent for further processing," VELC said. The IIA payload is the largest and among the most technically challenging of the seven payloads Aditya-L1 will carry.

Pointing out that one of the main puzzles in solar astrophysics was that the atmosphere of the Sun (corona) is at a temperature of about a million degrees whereas the surface of the Sun is only at about 6,000 Kelvin, IIA said answering this needs continuous observations of the corona.

Solar astronomer and VELC science team member Prof Ravindra B explained: "As the corona is hidden under the bright light of the sun it's difficult for us to explain the reason behind the sun flares, hydrogen explosions, huge amounts of energy disposed of and what is contributing to what. But now, with the Aditya-L1, we can see, observe and have clarity on the movements happening in the Sun."

Nagabushana S, engineer-F (mechanical), IIA, and the head of VLEC's mechanical team, said: "Earlier we were only able to study the corona at the time of eclipses. We got data for two to five minutes because of bad conditions, remote access, time constraints and cloudy weather. We had to construct VELC to withstand all these obstacles along with the gravitational pull from Earth along with high and low temperatures. VELC has the capability to withstand temperatures from -100°C to +250°C."