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Chandrayaan-3 is India's third lunar mission to soft land on the lunar south pole region.
LVM3-M4 rocket was launched on 14 July 2023 and launched from Satish Dhawan Space Centre at Sriharikota.
Chandrayaan3 budget is around Rs 615 crores.
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ANNAMAYYA DISTRICT

Affiliated to Yogi Vemana University,

Accredited by NAAC with "C" Grade

Department of Physics

Chandrayaan-3: Lunar Exploration Triumph and Scientific Achievements

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3rd BSc [MPCs]

Introduction

- Chandrayaan-3 is India’s third lunar mission to soft land on the lunar south pole region.
- LVM3-M4 rocket was launched on 14 July 2023 and launched from Satish Dhawan Space Centre at Sriharikota.
- Chandrayaan3 budget is around Rs 615 crores.

Mission objectives

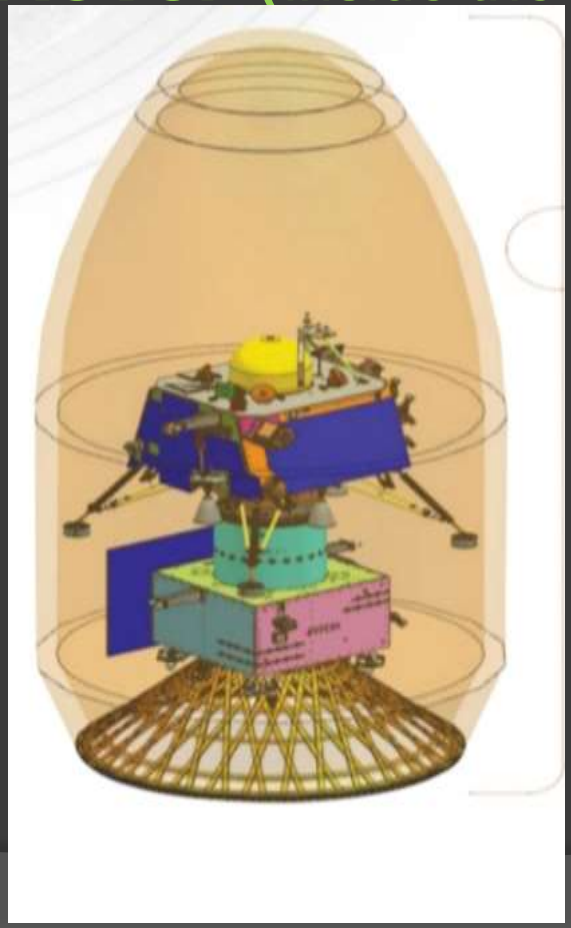
1. To demonstrate Safe and Soft Landing on Lunar Surface.

2. To demonstrate Rover roving on the moon and

3. To conduct in-situ scientific experiments.

MISSION COMPONENTS

- **Propulsion module**
- **Lander module**
- **Rover** (inside the Lander)



Propulsion Module

The propulsion module will carry the lander and rover from injection orbit to till 100km lunar orbit. It also carries a Spectro-polarimetry of Habitable Planetary Earth (SHAPE) payload to study the spectral and polarimetric measurements of earth from the lunar orbit.

The main function of Propulsion Module is to carry the Lander Module from launch vehicle injection Orbit to till Lander separation.

Major specifications of Propulsion Module

Sl.No	Parameter	Specifications
1	Lunar Polar Orbit	From 170*36500km to lunar polar orbit
2	Mission life	Carrying Lander Module &Rover upto~100*100 Km launch injection.Subsequently,operation of Experimental payload for a period of 3 to 6 months.
3	Structure	Modified version of 1-3k
4	Dry Mass	448.62kg(including pressurant)
5	Propellant Mass	1696.39kg
6	Total PM Mass	2145.01kg
7	Power Generation	738W,Summer solstices and with bias
8	Communication	S-Band Transponder (TTC)-with IDSN
9	Attitude Sensors	CASS ,IRAP ,Micro star sensor
10	Propulsion System	Bi-propellant Propulsion System(MMH+MON3)

Major Specifications of Lander (Vikram)

Mission life	: 1 Lunar day(14 Earth days)
Mass	:1749.86 kg including Rover
Power	: 738 W(Winter solstice)
Payloads	:3
Dimensions(mm^3)	:2000*2000*1166
Communications	:ISDN, Ch-2 Orbiter ,Rover
Landing site	:69.367621 S, 32.348126 E

Major Specifications of Rover (Pragyan)

Mission life	: 1 Lunar day
Mass	: 26 kg
Power	: 50 W
Payloads	: 2
Dimensions	: 917*750*397
Communication	: Lander

Lander Payloads

RAMBHA-LP

Langmuir Probe

To measure the near surface plasma(ions and electrons) density and its changes with time

ChaSTE

Chandra's Surface Thermo physical Experiment

To carry out the measurements of thermal properties of lunar surface near polar region

ILSA

Instrument for Lunar Seismic Activity

To measure seismicity around the landing site and delineating the structure of the Lunar crust and mantle

Rover Payloads

APXS

Alpha Particle X-Ray Spectrometer

To derive the chemical composition and infer mineralogical composition to further enhance our understanding of lunar surface

LIBS

Laser induced Breakdown Spectroscope

To determine the elemental composition (Mg ,Al ,Si ,K ,Ca Ti , Fe) of lunar soil and rocks around the lunar landing site.

Results Of Chandrayaan3 Mission

- Vikram landed near the south pole of the moon on August 23.

  August 27, 2023
- The first observations from the ChaSTE payload onboard Vikram Lander

  August 28,2023
- LIBS confirms the presence of Sulphur(S) on the lunar surface through unambiguous in situ measurements.

  August 30,2023
- APXS on-board Ch-3 rover detects the presence of minor elements.

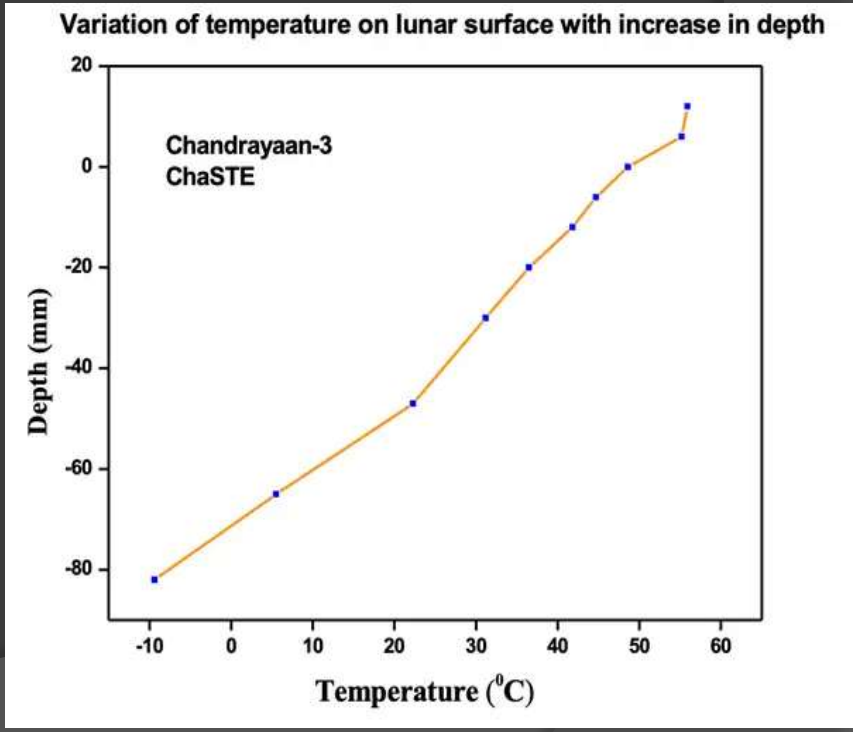
  August 31,2023
- RAMBHA-LP on –board Chandrayaan-3 measures near-surface plasma content
- ISLA listens to the movements around the landing site

August 27,2023

The first observations from the ChaSTE payload onboard Vikram Lander

ChaSTE (Chandra's Surface Thermophysical Experiment) measures the temperature profile of the lunar topsoil around the pole, to understand the thermal behavior of the moon's surface. It has a temperature probe equipped with a controlled penetration mechanism capable of reaching a depth of 10 cm beneath the surface. The probe is fitted with 10 individual temperature sensors.

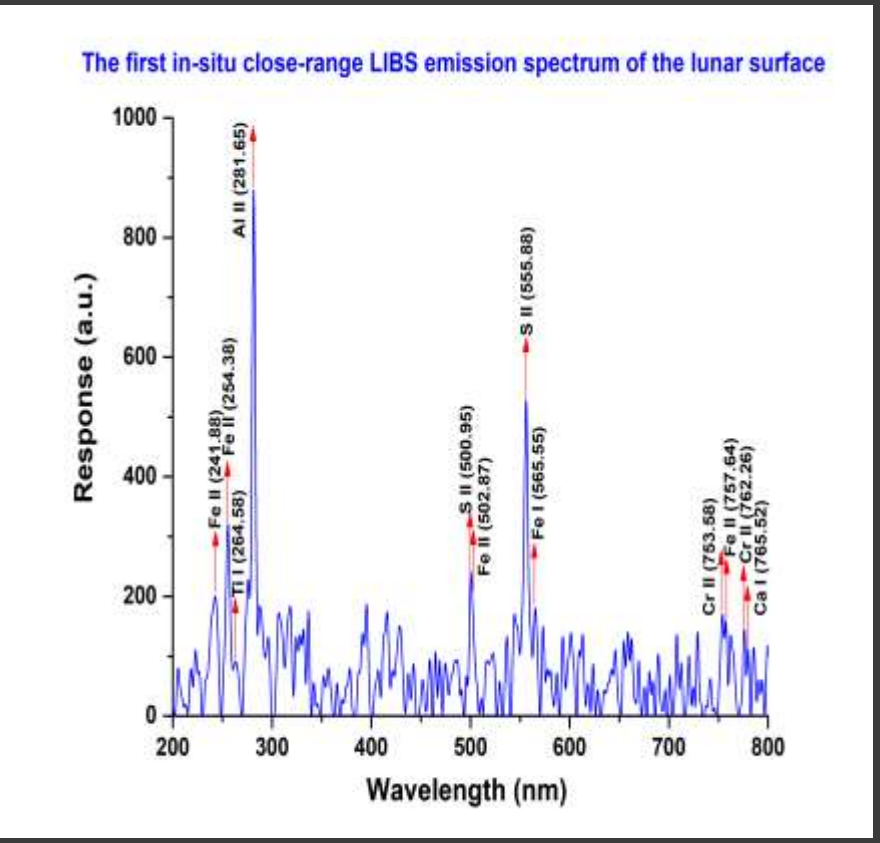
The presented graph illustrates the temperature variations of the lunar surface/near-surface at various depths, as recorded during the probe's penetration.
This is the first such profile for the lunar south pole.



The payload is developed by a team led by the **Space Physics Laboratory (SPL), VSSC** in collaboration with **PRL Ahmadabad.**

August 28,2023

LIBS confirms the presence of Sulphur (S) on the lunar surface through the unambiguous in-situ measurements



Laser- induced Breakdown Spectroscope (LIBS) instrument onboard the Rover unambiguously confirms the presence of Sulphur (S) in the lunar surface near the south pole , through first-ever in-situ measurements.

Al ,Ca , Fe, Cr, Ti, Mn, Si, and O are also detected as expected. Search for Hydrogen (H) is underway.

LIBS instrument is developed at the Laboratory for Electro-Optics System (LEOS) / ISRO. Bangalore.

August 31, 2023

ILSA listens to the movements around the landing site.

•The Instrument for Lunar Seismic Activity (ILSA) payload on the Chandrayaan 3 Lander is the first instance of a Micro Electro Mechanical Systems (MEMS) technology-based instrument on the moon

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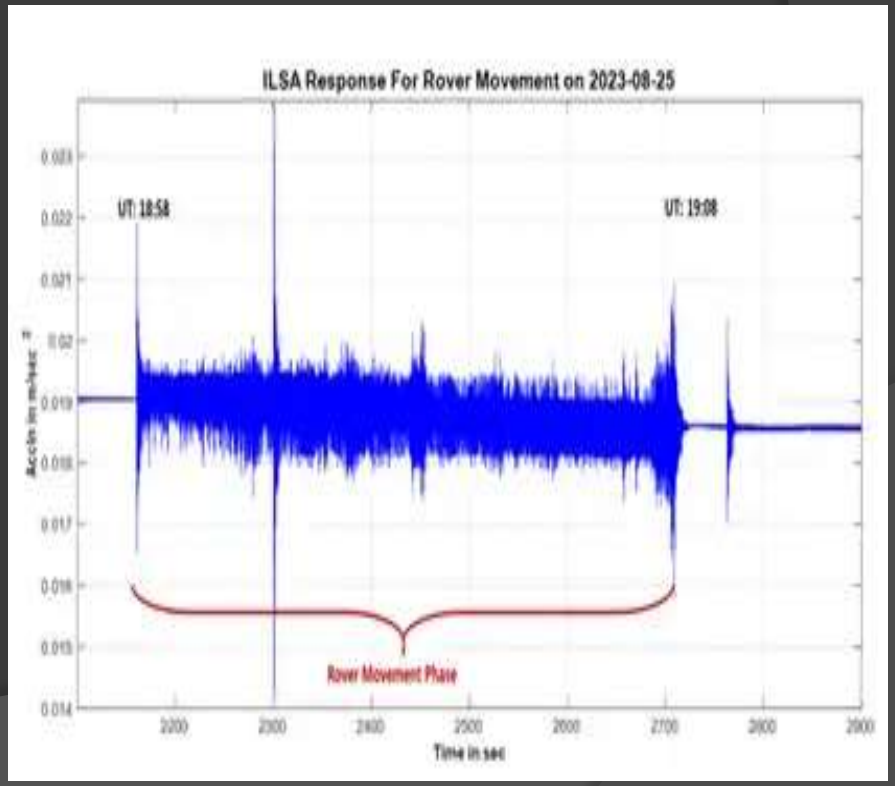
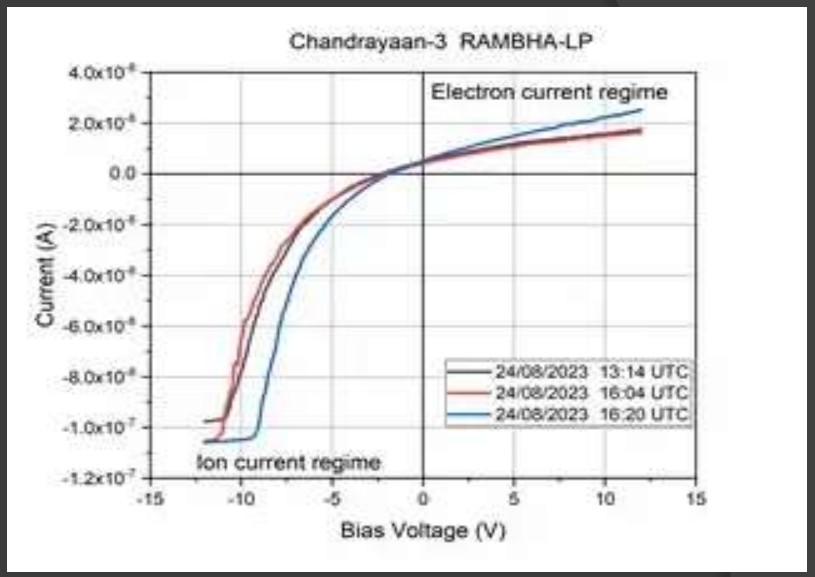
• It has recorded the vibrations occurring due to the movements of Rover and other payloads

•ILSA's primary objective is to measure ground vibrations generated by natural quakes, impacts, and artificial events



RAMBHA-LP on-board Chandrayaan-3 measures near-surface plasma content



First in-situ measurements of the surface-bound Lunar plasma environment over the south polar region have been carried out by the Radio Anatomy of Moon Bound Hypersensitive ionosphere and Atmosphere - Langmuir Probe (RAMBHA-LP) payload onboard Chandrayaan-3 Lander.

The initial assessment indicates that the plasma encompassing the lunar surface is relatively sparse, characterized by a number density ranging from approximately 5 to 30 million electrons per cubic meter.


THANK
You