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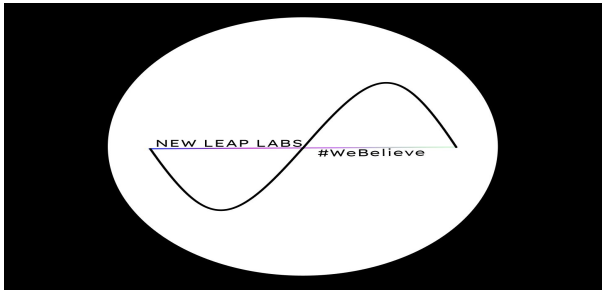


# BELIEFSAT-0

New Leap Labs
(formerly known as New Leap Initiative)
K J Somaiya Institute of Technology
Sion, Mumbai - 400022

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# Institute Details

- K J Somaiya Institute of Technology established in 2001 under the Somaiya Vidyavihar Trust
- 4 UG, 1 PG and 3 Ph. D. Programs
- Permanently affiliated to University of Mumbai
- NBA and NAAC Accreditation
- Best College under Urban region by University of Mumbai
- Best performance IIC in Western zone of India under Ministry of Education
- KJSIT positioned in the rank band  50-100 in NIRF-India ranking 2023 (Innovation category)

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# Who we are…

- New Leap Initiative (NLI) is the **student satellite** team of K. J. Somaiya Institute of Technology.
- This initiative was started in 2017 as an attempt to promote **space tech** and **product development** skills among students.
- We at NLI take pride in nurturing talent and pushing our boundaries to achieve optimal technology cost-effectively.
- Achievements:

  1. Winner at Touch Jovian Moon Lander Mission Design Contest organised by LPSC, ISRO in 2018
  2. 1st prize at UHF/VHF antenna making contest(YEAR)
  3. Developed Indigenous Upper Air Sounding System which received 3rd position at National Level Project Competition “ANVESHAN” Organised by All India University Association.
  3. Received Research Grants from The University of Mumbai

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# Broad Objectives

- Global communication among the HAM Radio operators
- Tribute to 100 years of Amateur Radio in India
- Service to the Amateur Radio community worldwide
- Satellite will perform UHF to VHF FM voice repeating and APRS digipeating in VHF.
- To gain the space history for KJSIT New Leap Lab group for future mission.

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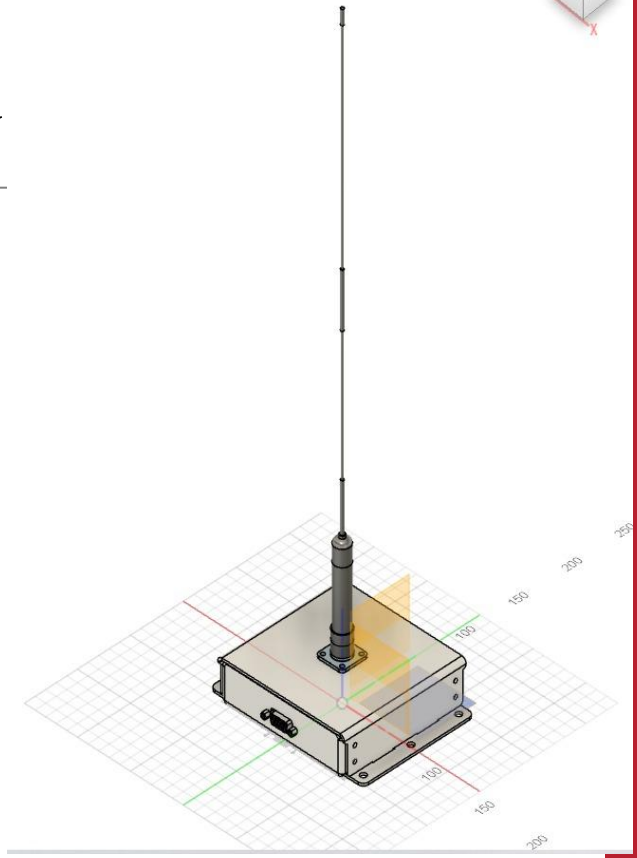
# Payload

- The payload (BeliefSat-0) is developed by the students at NLI and the faculty of K. J. Somaiya Institute of Technology to widen the reach of Amateur Radio-operators around the globe.
- It will have the following amateur radio payloads onboard:

  1. Amateur Band **UHF to VHF FM voice repeater** with 12.5 KHz max bandwidth. 67.0 Hz CTCSS tone for uplink.

  2. **VHF APRS Digipeater** with 71.9 Hz CTCSS tone on the uplink.



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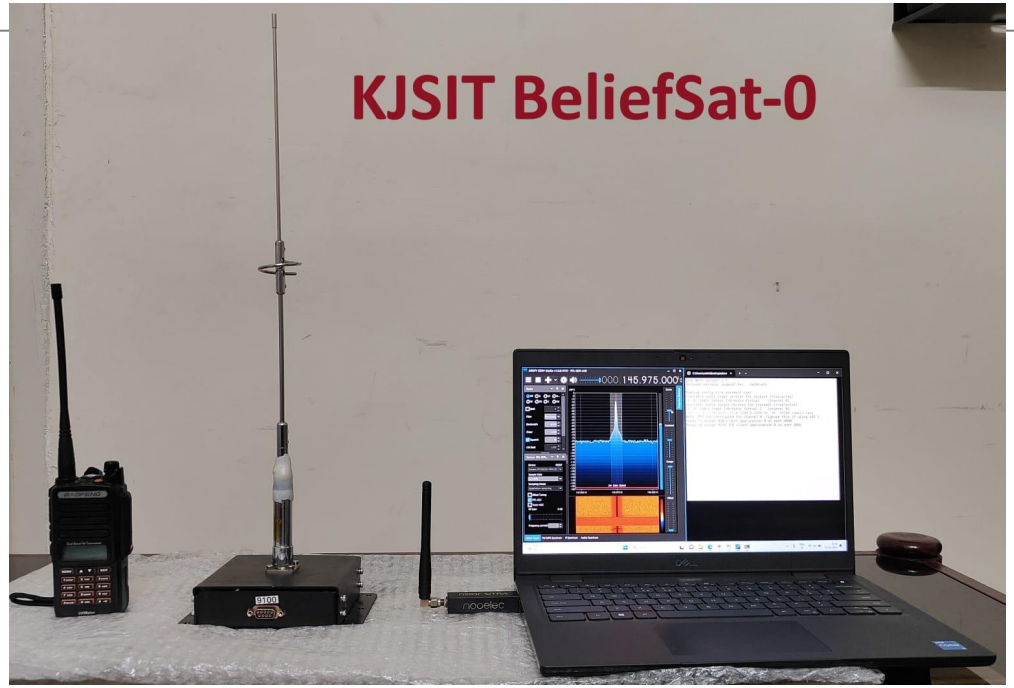
# Payload


Payload




Payload with Test Setup

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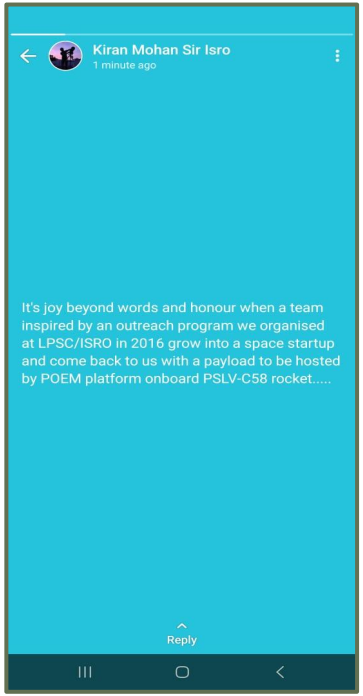
We were also appreciated by our mentor and guide from ISRO





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# Payload Specifications

| Parameter | Specification |
|---|---|
| Mechanical | |
| Maximum Estimate Mass of the payload | 691.1 g |
| Payload Volume (Including Antenna) | 150x118x512 $mm^3$ |
| Antenna Length | 480 mm |
| Payload mechanical interface | 6x M5 HEX steel bolt |

| Parameter | Specification |
|---|---|
| Electrical | |
| Payload electrical interface | On Payload:<br>M24308/23-25F<br>D-Sub Mil Spec<br>Connectors R/A RCP<br>ASSY 9 POS SER 109 |
| Power requirement from PS4-OP | Nominal: 2 W<br>Peak: 4 W |

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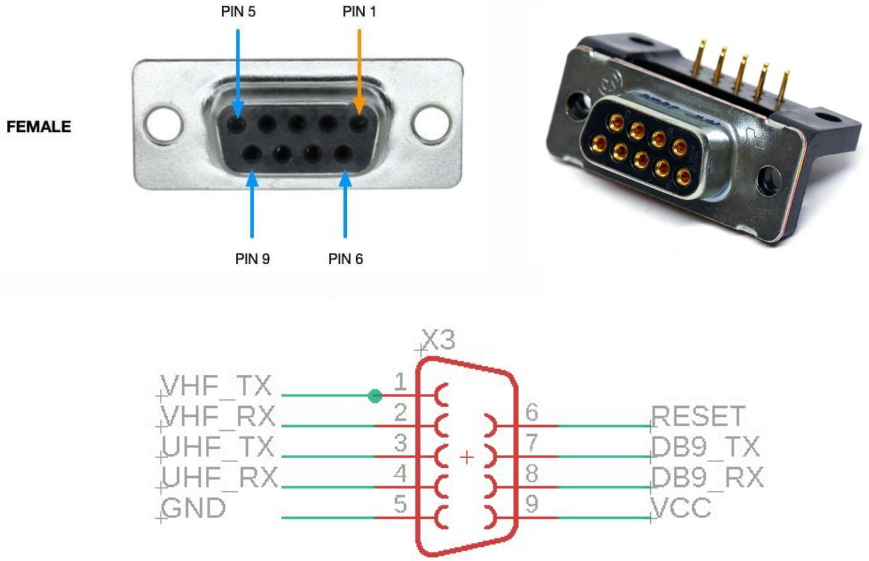
# Electrical Interface

**DB9 connector:**

| | |
|---|---|
| **CONNECTOR TYPE** | D-sub 9 Pin Connector |
| **On payload** | RECEPTACLE-TYPE (female) M24308/23-25F D-Sub Mil Spec Connector |
| **On Launch Vehicle** | PIN-TYPE (male) |
| **Location** | On the side plate, which is situated in the XZ plane (along negative Y axis) |



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# Electrical Interface

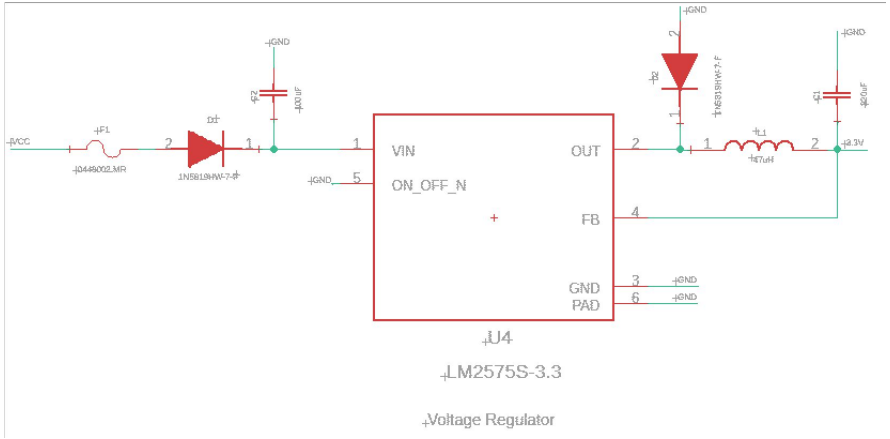
**Power Circuit Design:**

1. Input Power Range: The power supplied ranges from 24 to 36 volts.
2. LM2575S DC to DC Buck Converter:

- Purpose: This component efficiently converts the input power into a stable 3.3-volt output.
- Maximum Current Output: 2 amperes

3. Protective Components:

- Fuse:To effectively prevent short-circuits.
- Schottky Diode:Provides reverse polarity protection



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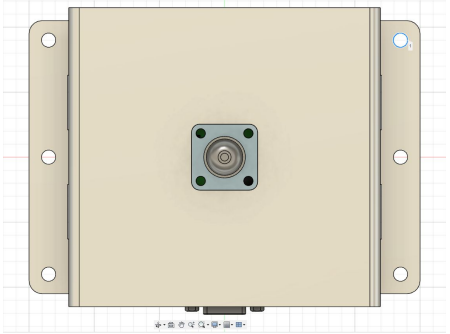
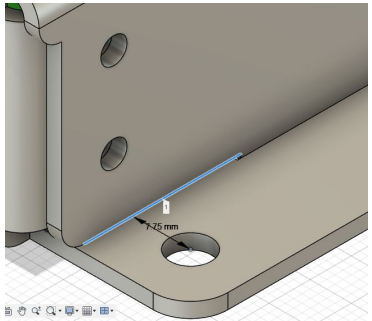
# Mechanical Interfaces

**Mechanical Interfaces:**

1. The external structure is constructed using Aluminum 8011. The payload is to be mounted on the platform with the help of 6 x M5 HEX steel bolts
2. The distance between the center of the mounting hole to the side-wall of the payload is 7.75 mm
3. Thermal insulating sheet, typically made from material like PEEK,will be employed to separate the base from the platform.





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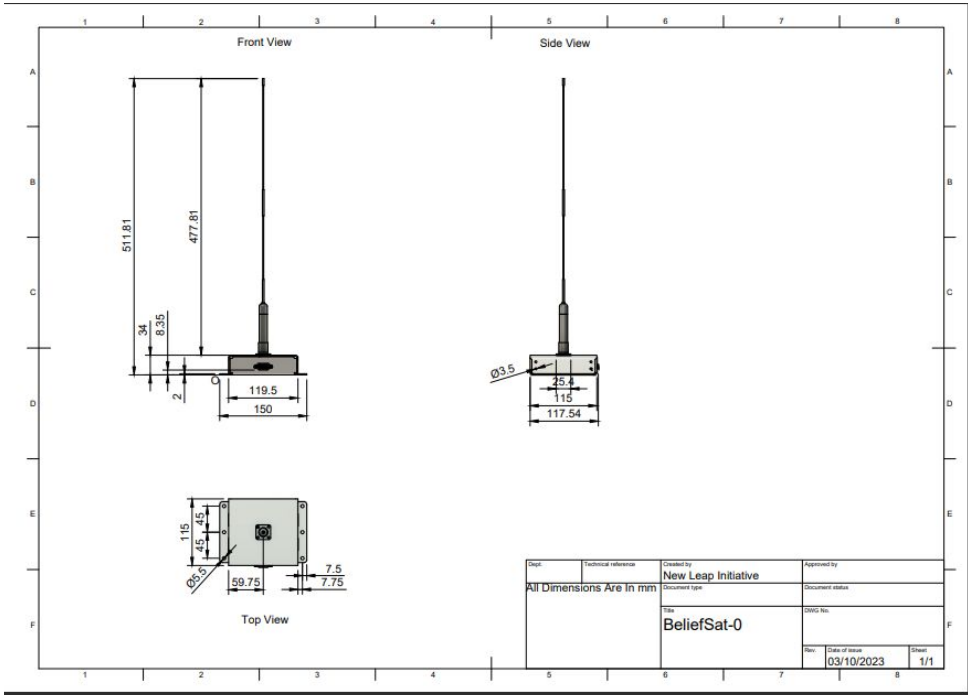
# Structure Dimensions



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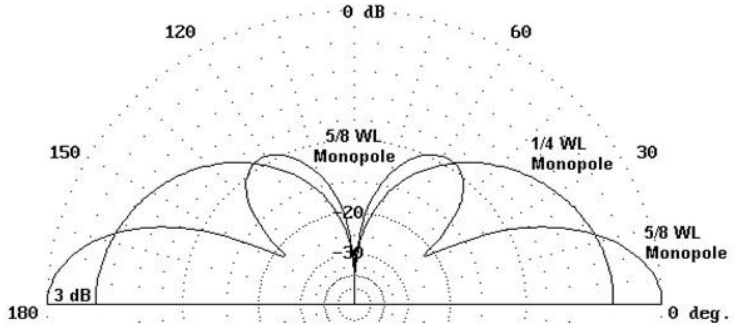
# Antenna

Antenna Used: NAGOYA-NL-770S


Antenna Type: Monopole Antenna
Radiation Pattern: Omnidirectional
Connector type: UHF pl259

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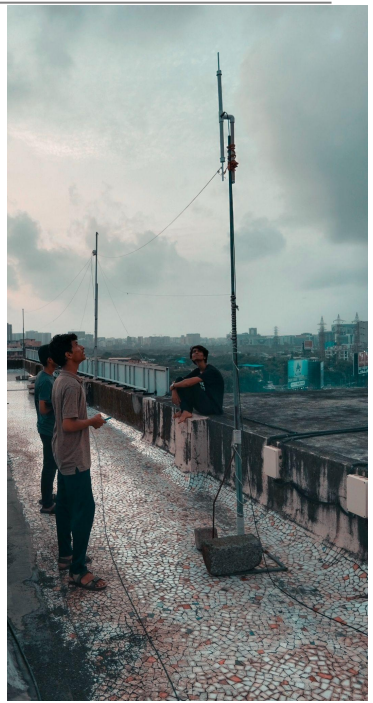
# Ground Station

- CROWN is an Amatuer Radio Club which aims to spread knowledge and awareness about radio fundamentals.
- The Groundsation consists of an antenna setup placed on the terrace of our college building.
- It connects with a dual band radio transceiver in our lab.


*CROWN (VU2CWN)*



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# Operational Modes

The operational modes of the payload are:

1. **Safe mode** (initial mode) : Telemetry once every 30 seconds

2. **Digipeater-only mode**: Telemetry once every 60 seconds and digipeater functionality active

3. **Full function mode** : Telemetry once every 60 seconds, both digipeater and voice repeater active

Table 1 : Commands for operation mode

| Sr. No. | Commands | Description |
|---|---|---|
| 1. | !MODE_CHANGER@<ModeNumber> | Changes mode between 0,1,2 |
| 2. | !VHF_RX_FREQ_CHANGER #<FREQUENCY> | Changes RX frequency of VHF |
| 3. | !VHF_TX_FREQ_CHANGER %<FREQUENCY> | Changes TX frequency of UHF |

**Note:**
**Detailed command and telemetry formats would be published during frequency coordination.**

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# Operation requirement and Success Criteria

1. Operation Requirement from the platform:
   a. Power supply (24-36V)
   b. Payload mounting using M5 Steel Bolts
   c. No other communication requirement

2. Success criteria:
   a. Successful communication of the satellite with the ground station
   b. Voice repeating over cross band frequencies

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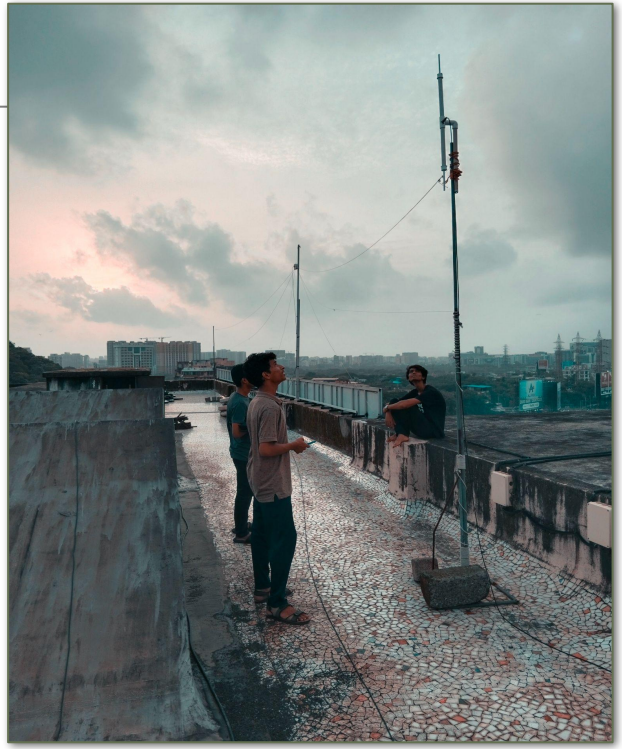
# Payload Tests

Payload functional test



Ground station

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# Launch Day

*Satish Dhawan Space Centre, Sriharikota (AP) - January 1st, 2024*

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# Launch Day


*Inside Launch Control Room, with ISRO Chairman Dr. S Somanath - January 1st, 2024*

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# Launch Day

*Current and Former Principals of KJSIT interview with DD News Reporter*

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# Launch Day

*Before Launch Meeting - December 14th, 2023*

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# Launch Day


*Project Manager and Project Leader at Rohini, Sriharikota (AP)*

# THANK YOU!