F'SATI
French South African Institute of Technology

F'SATI Postgraduate Programme in **Satellite Systems Engineering**

The First African CubeSat, ZACUBE-01

7 August 2011

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Overview

- The F'SATI satellite programme
- 1U CubeSat Mission
  - Mission
  - Objectives
  - Subsystems
  - Design Challenges
- Other Projects

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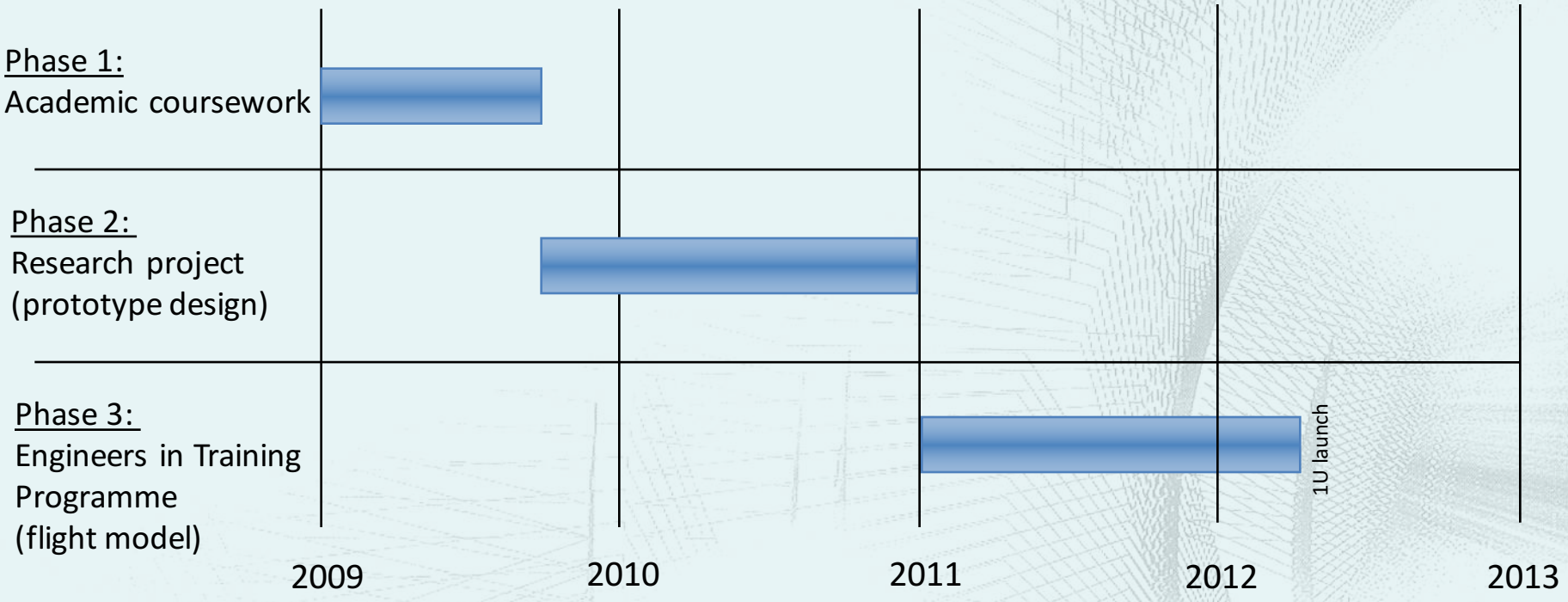
F'SATI Space



Engineers In Training Program

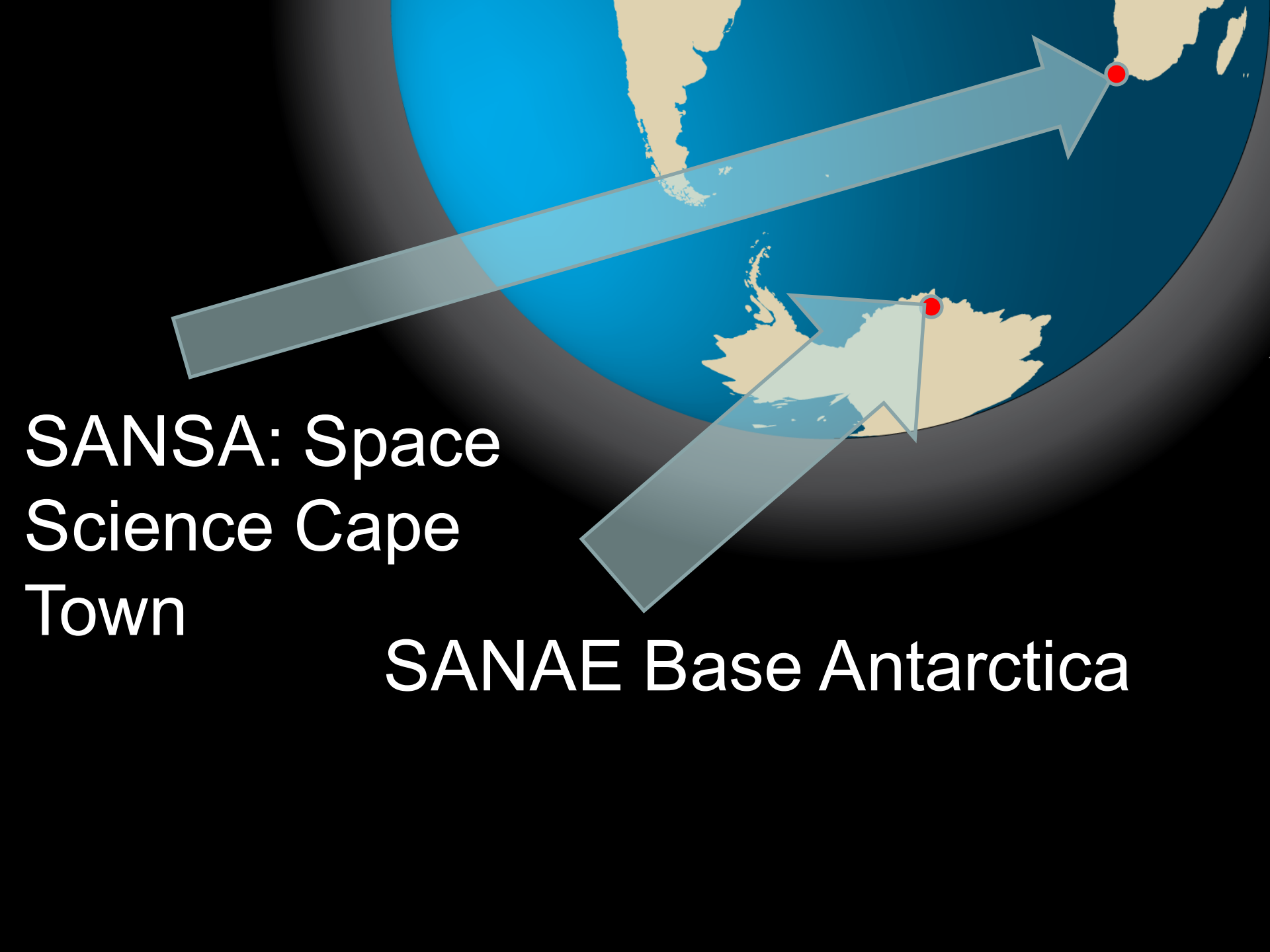
- 8 Engineers in Training
- Main Objective – Design and build a 1U CubeSat in 1 Year

Define a Mission

- SANSA: Space Science – South African National Space Agency
- Space Weather Monitoring
- Ionospheric Studies

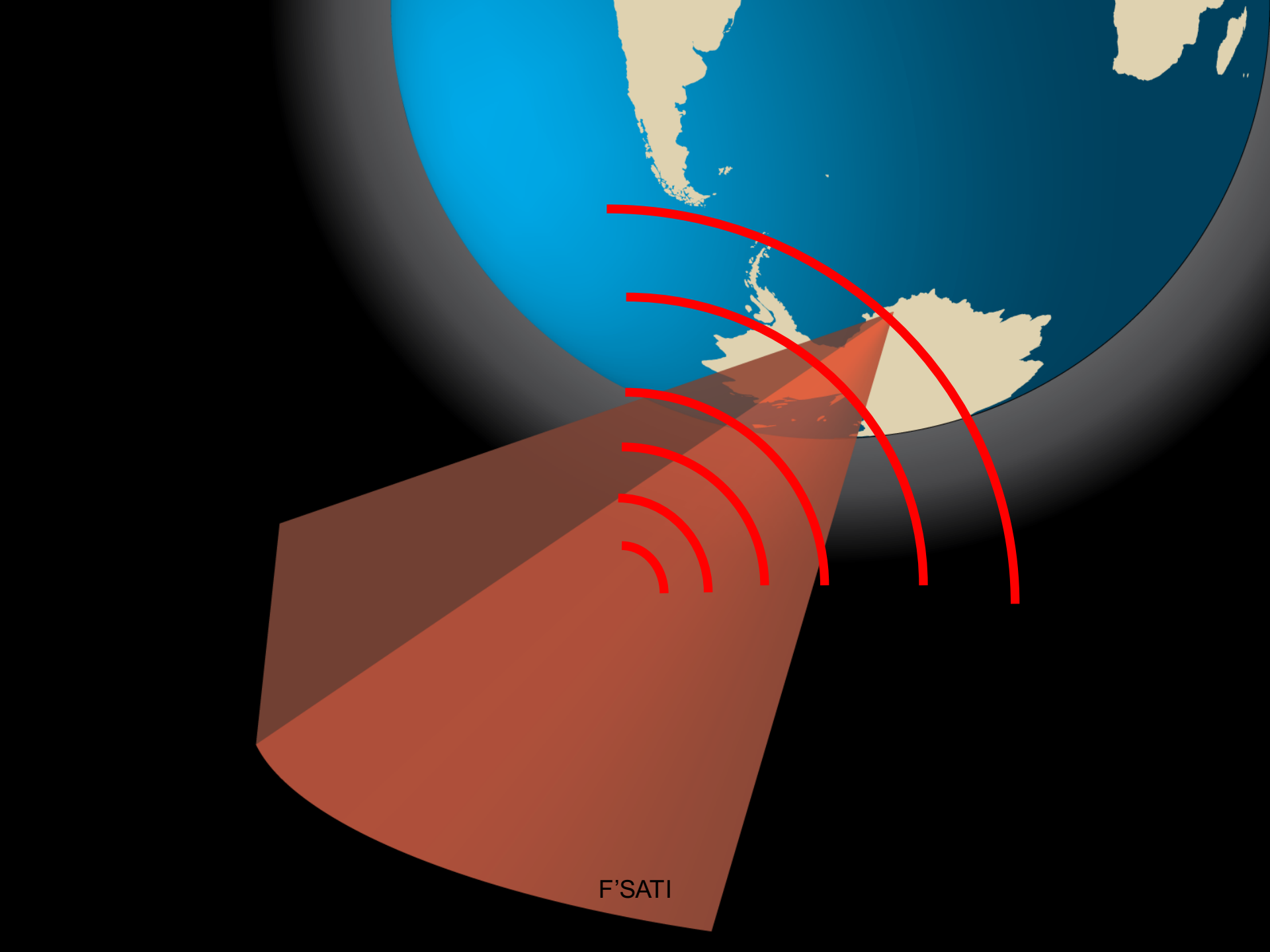
SuperDARN Radar System

- Super Dual Auroral Radar Network
- Ionospheric Studies
- Radars in Northern and Southern Hemisphere
- HF Frequency Bands (8 to 22 MHz)
- Calibration of SANAE Base Radar System


SANSA: Space Science Cape Town
SANAE Base Antarctica

SANAE Base Antarctica

SuperDARN Radar Antennas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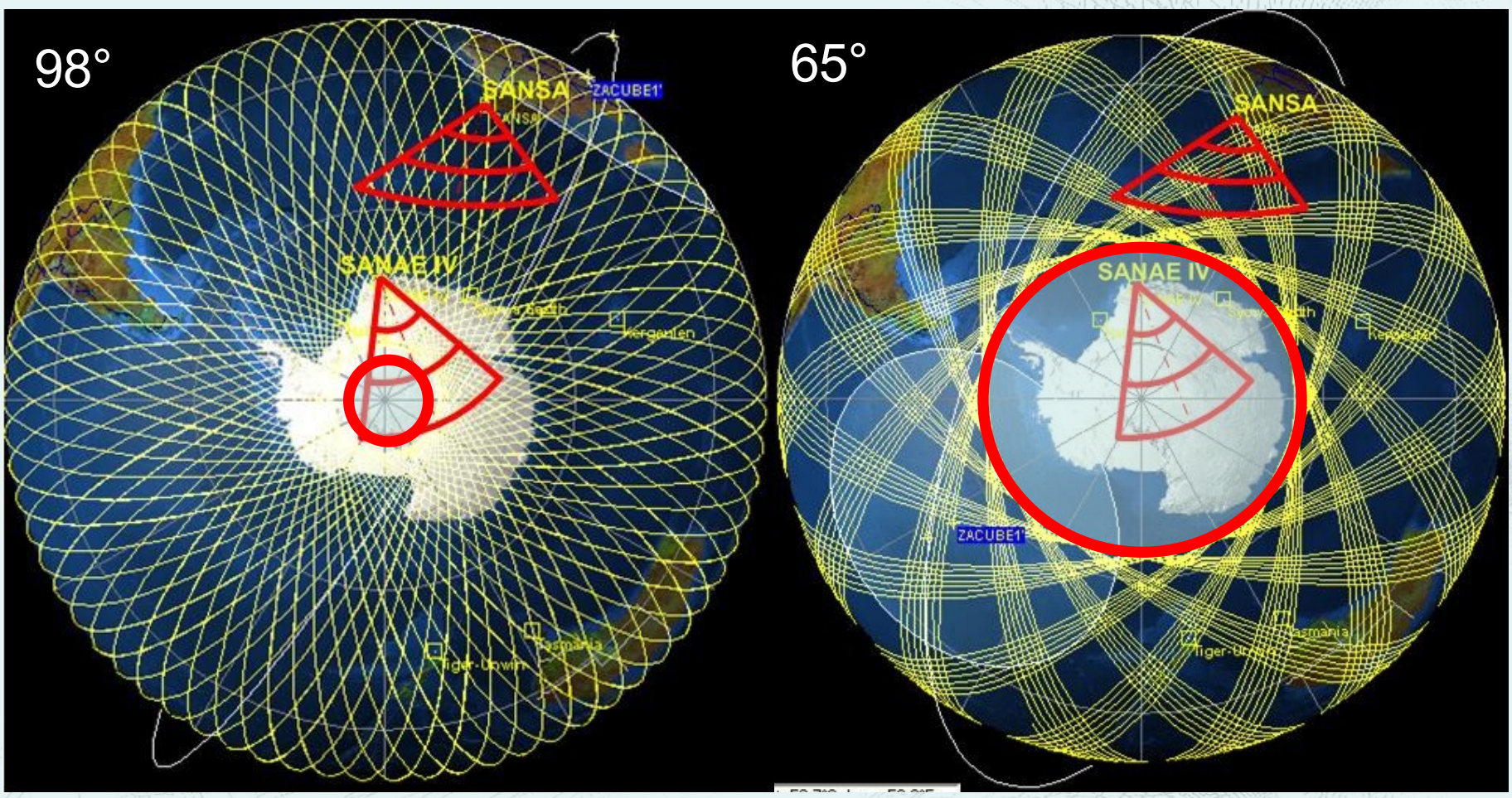
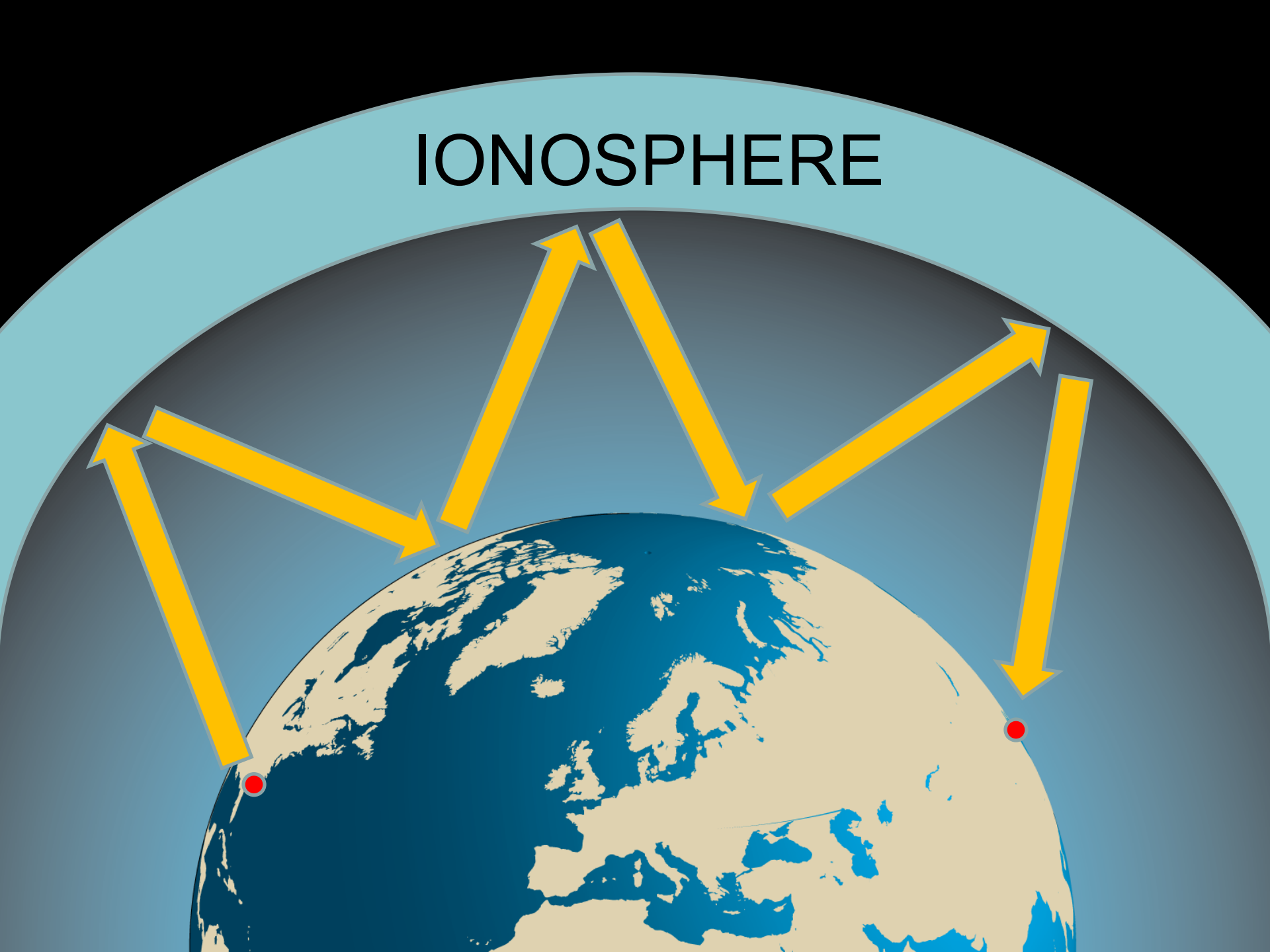
Mission Challenges

- Orbit Inclination

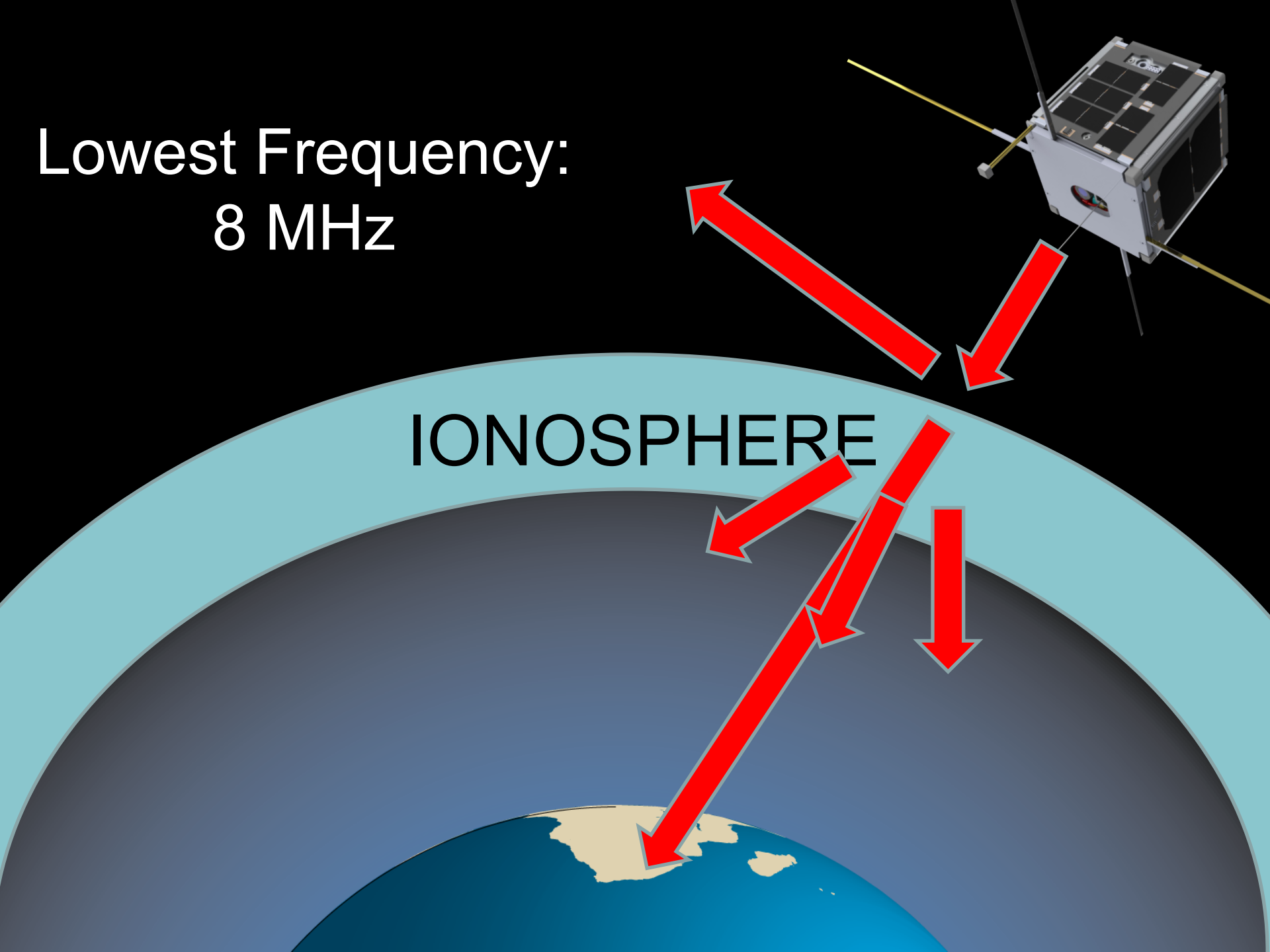


Mission Challenges

- HF Frequency Range


IONOSPHERE

Lowest Frequency:
8 MHz



Mission Challenges

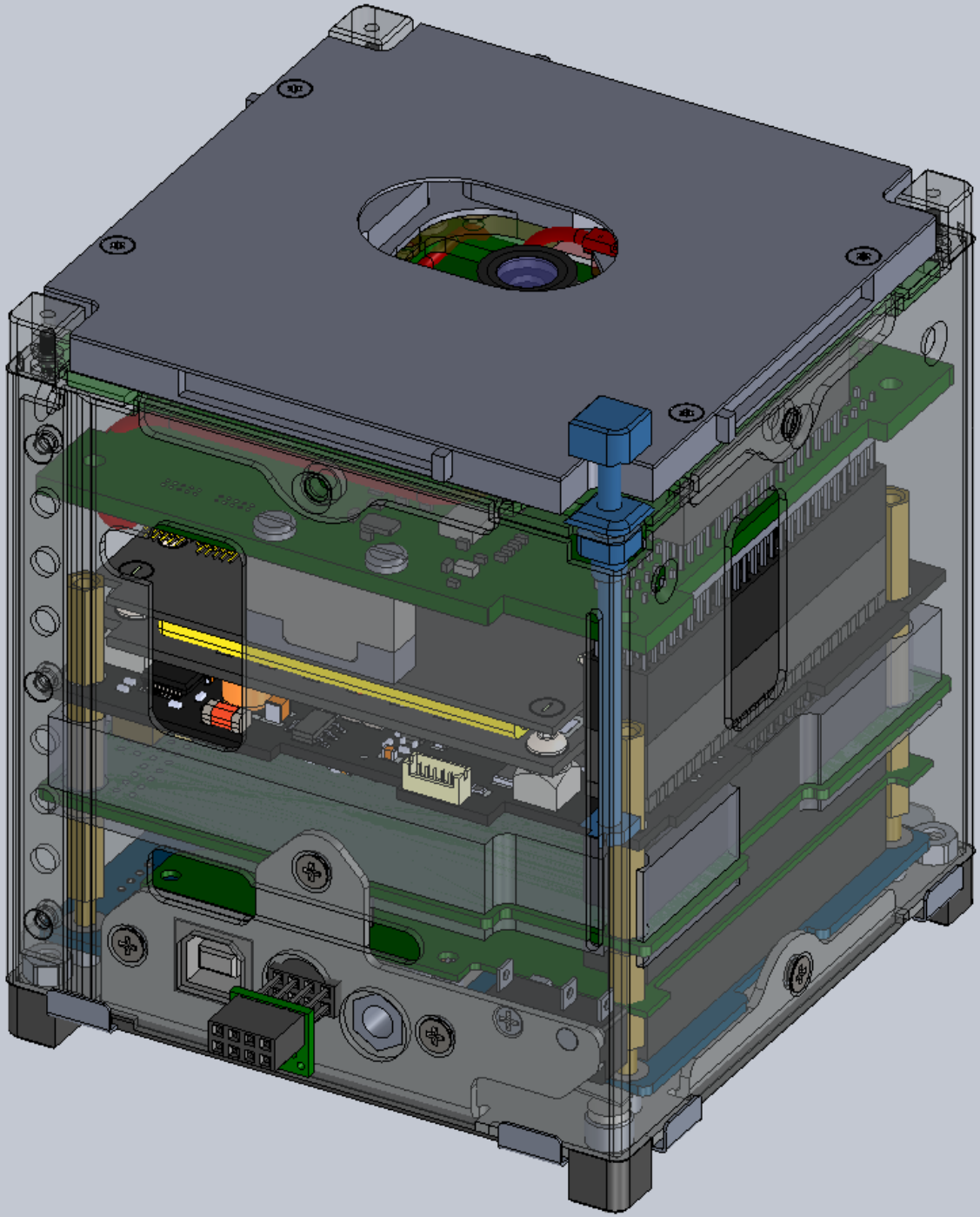
- HF Frequency Range
  - Received Licensing for 14.099 MHz
- Antenna
  - 14.099 MHz
  - Full Wavelength: 21.28 m or 69.81 ft
  - Monopole Length: 5.32 m or 17.45 ft

ZACUBE-01 Specifications

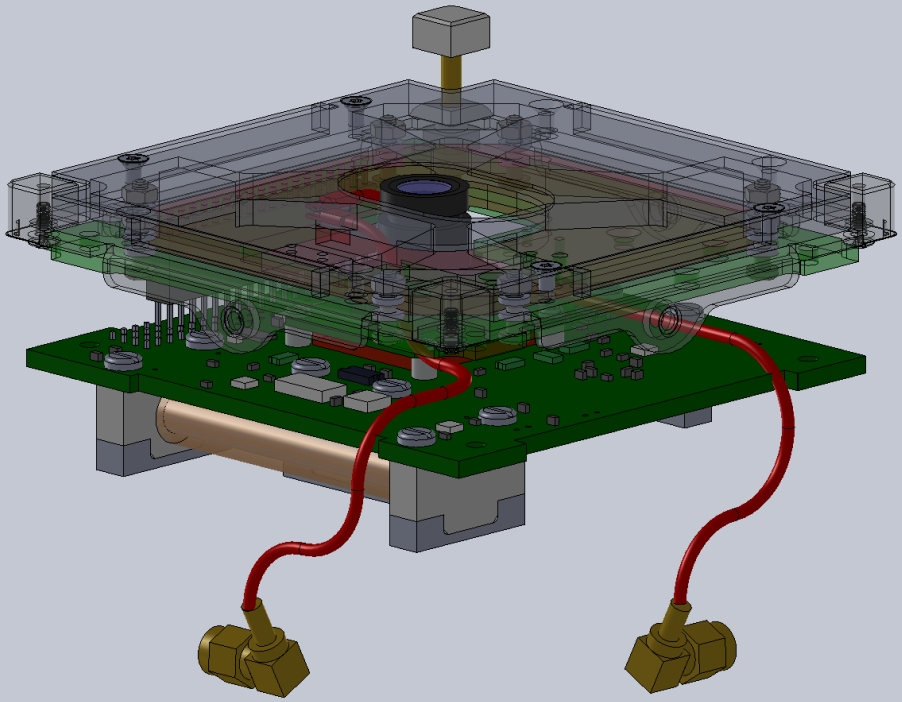
- Bought in Items:
  - 1U Structure
  - Clyde Space EPS, Battery & Solar Panels
  - ISIS VHF/UHF Antenna
  - Pumpkin OBC

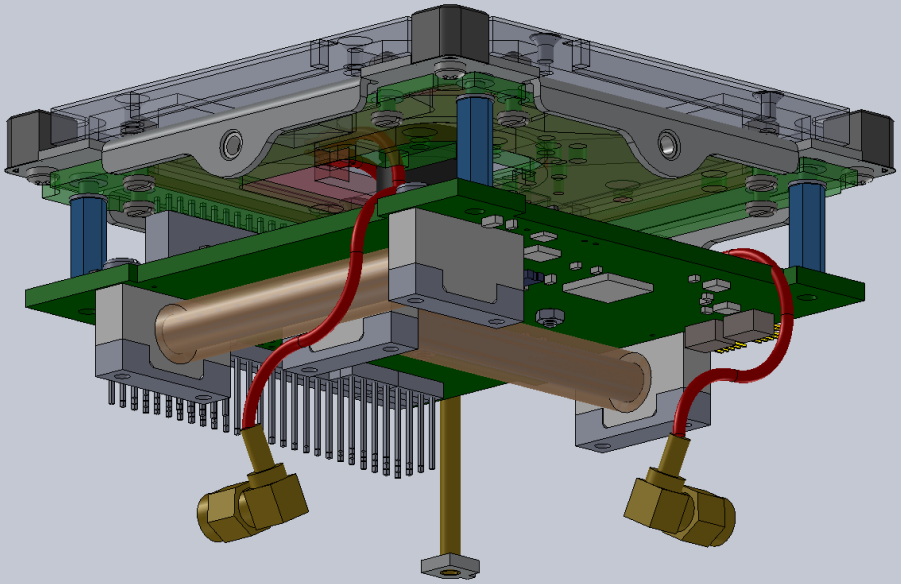
ZACUBE-01 Specifications

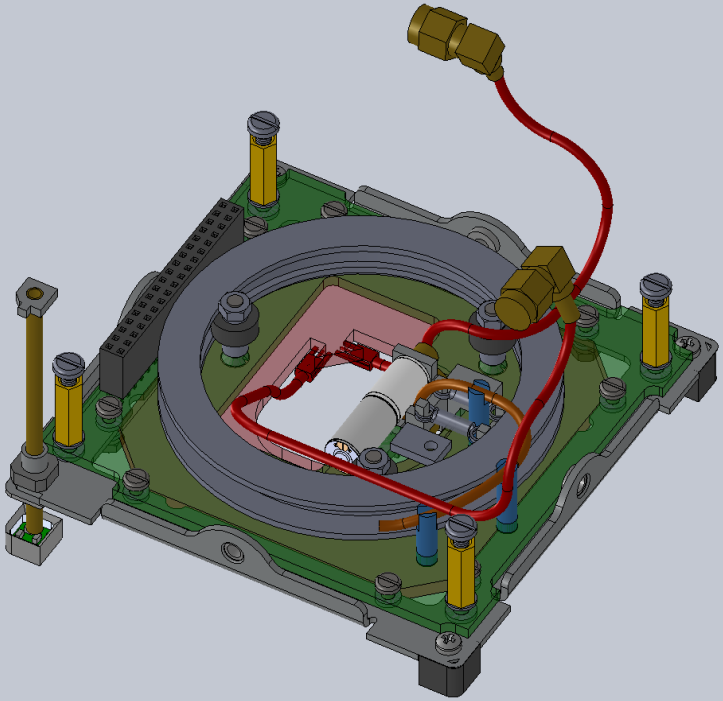
- In-House Developed Subsystems:
  - VHF/UHF Transceiver
    - 145.86 MHz Uplink
    - 437.345 MHz Downlink
  - Payload Board
    - HF Beacon Transmitter
    - ADCS
    - Camera Payload
  - HF Antenna Deployment Mechanism

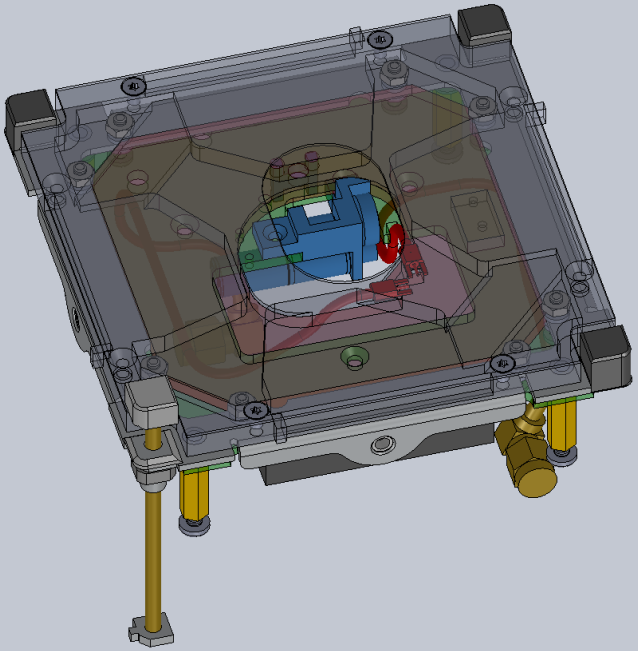


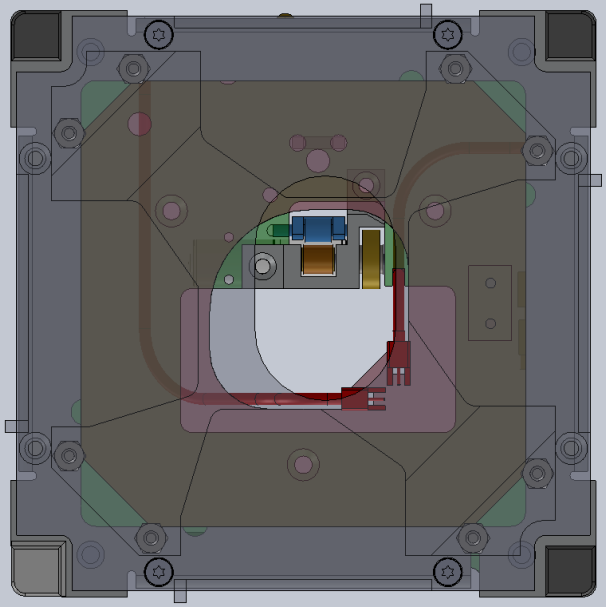
- VHF/UHF Antenna
- Antenna Deployment Mechanism
- ADCS/camera/HF Beacon
- EPS & Battery
- VHF/UHF Transceiver
- OBC
- Deployable Magnetometer

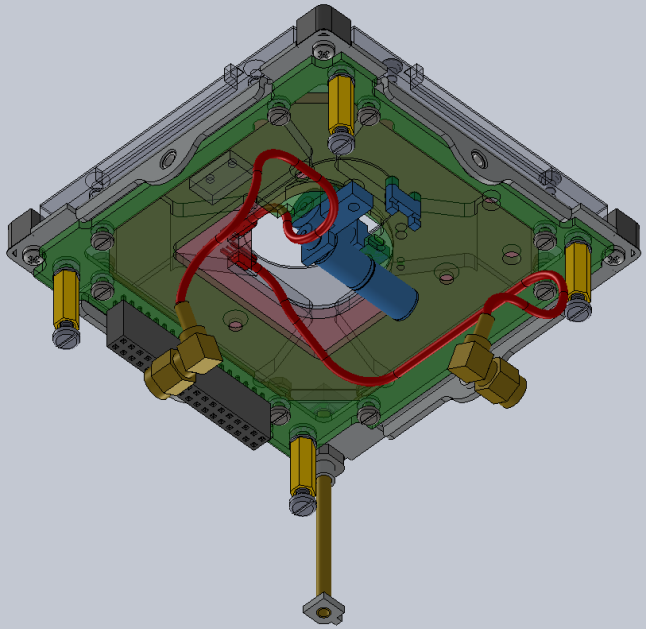


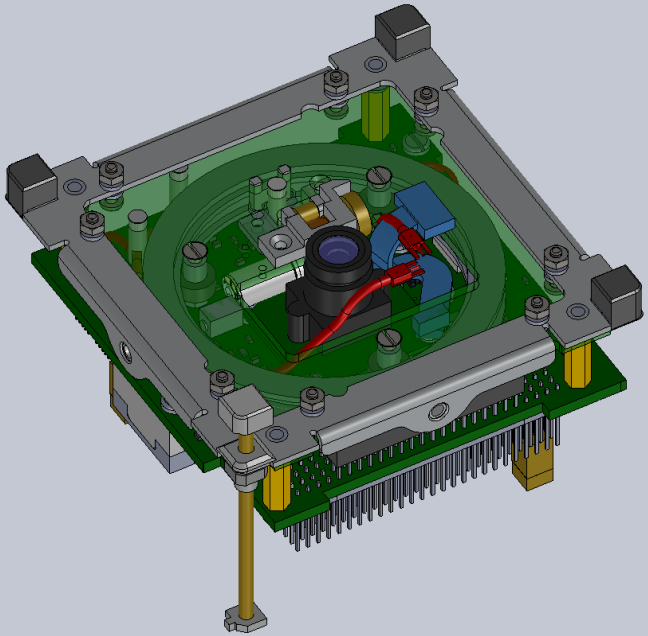


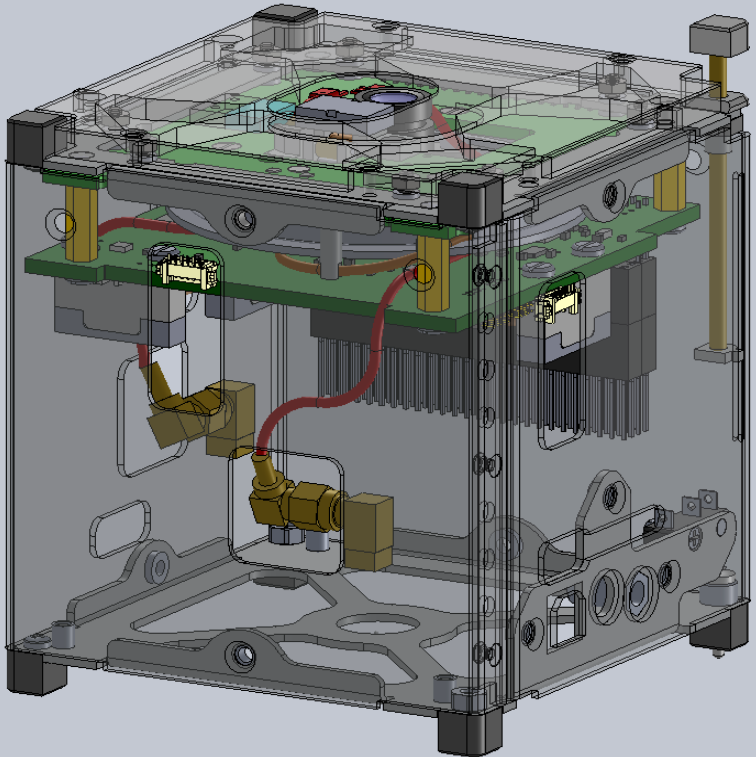


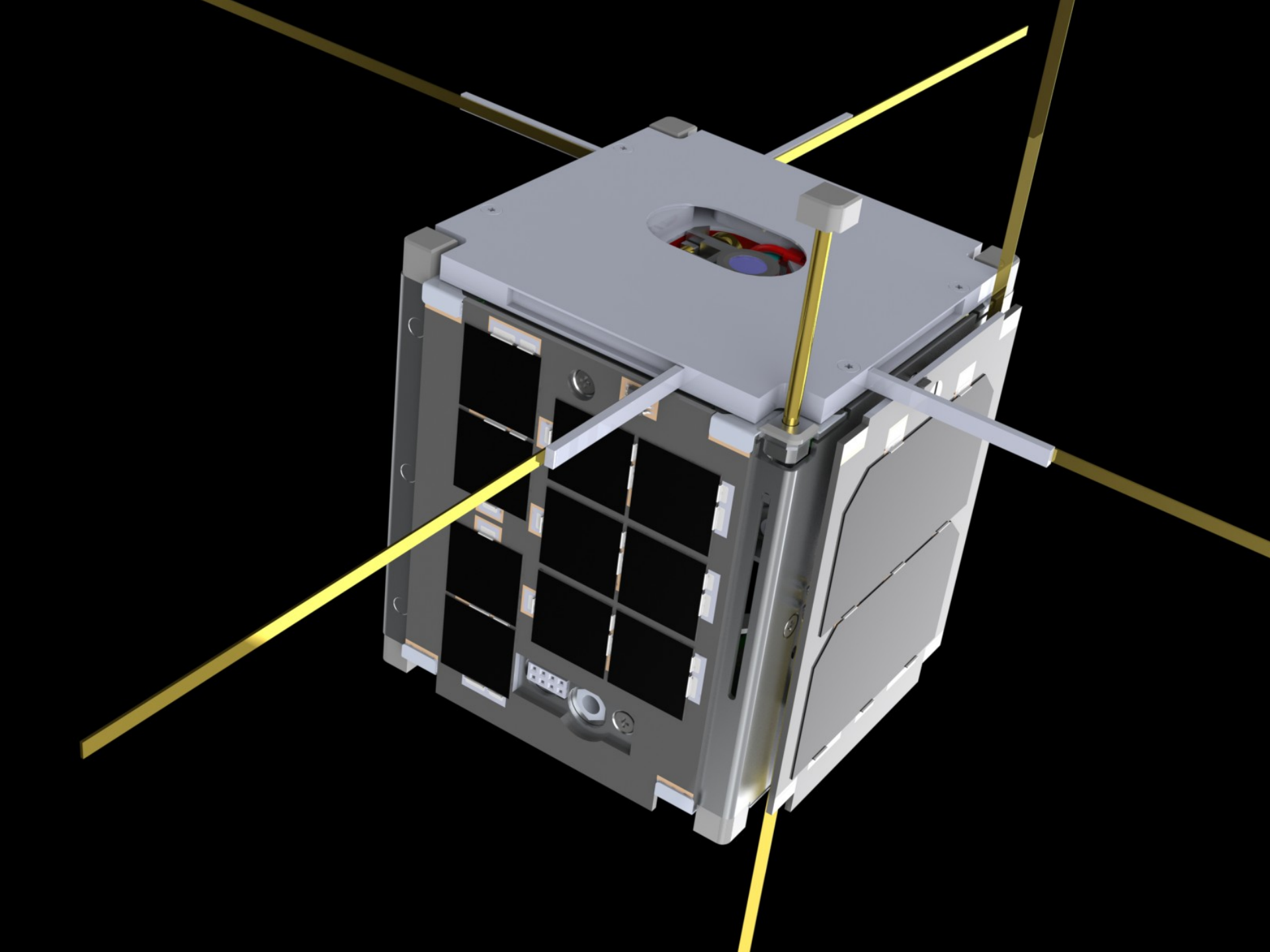












Subsystem Progress

- Completed:
  - Camera, HF Beacon, ADCS
- Work in Progress:
  - Mechanical Manufacturing
  - VHF/UHF Transceiver
  - Flight Software
- Launching 2012

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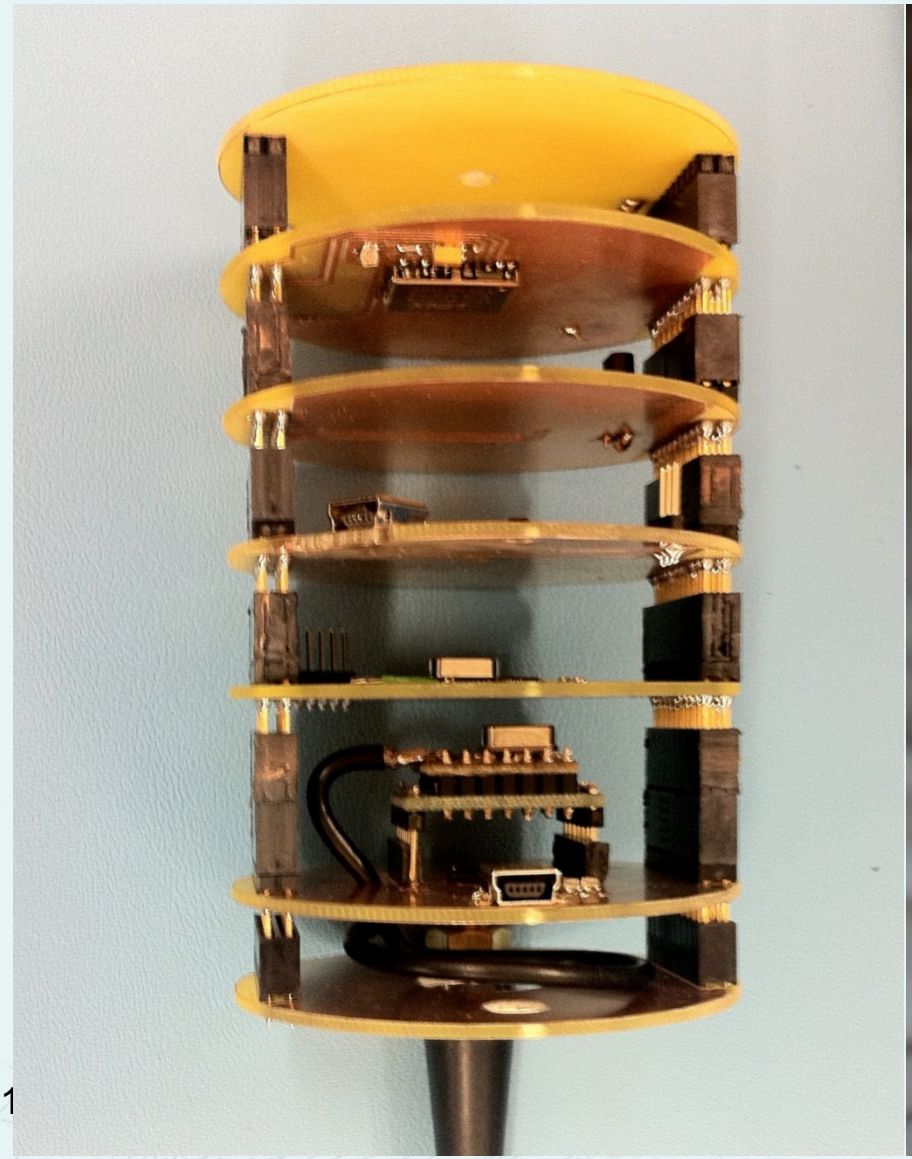
Other Projects: CanSats




CANSAT
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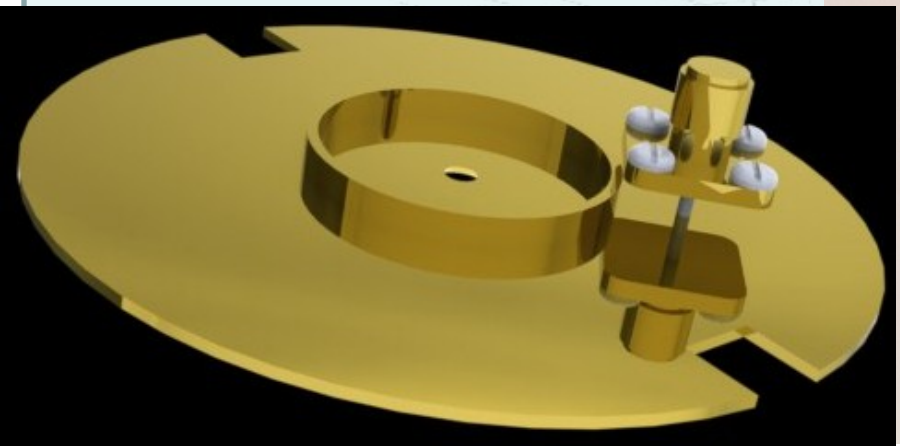
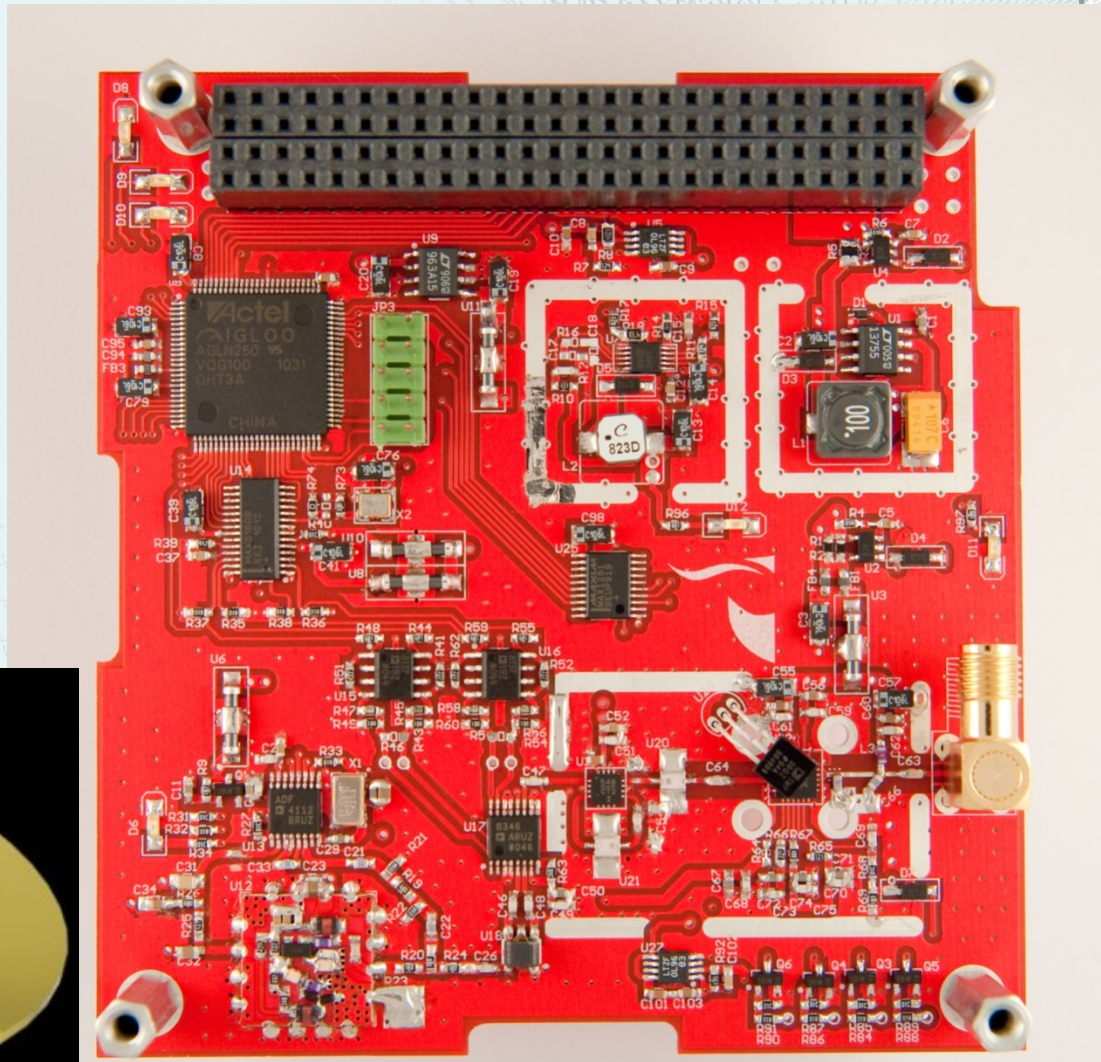
Other Projects - STX

- 2.4 – 2.48 GHz
- 1 Watt RF Power
- 2 Mbps Data Rate
- 6 W Power Consumption
- QPSK Modulation





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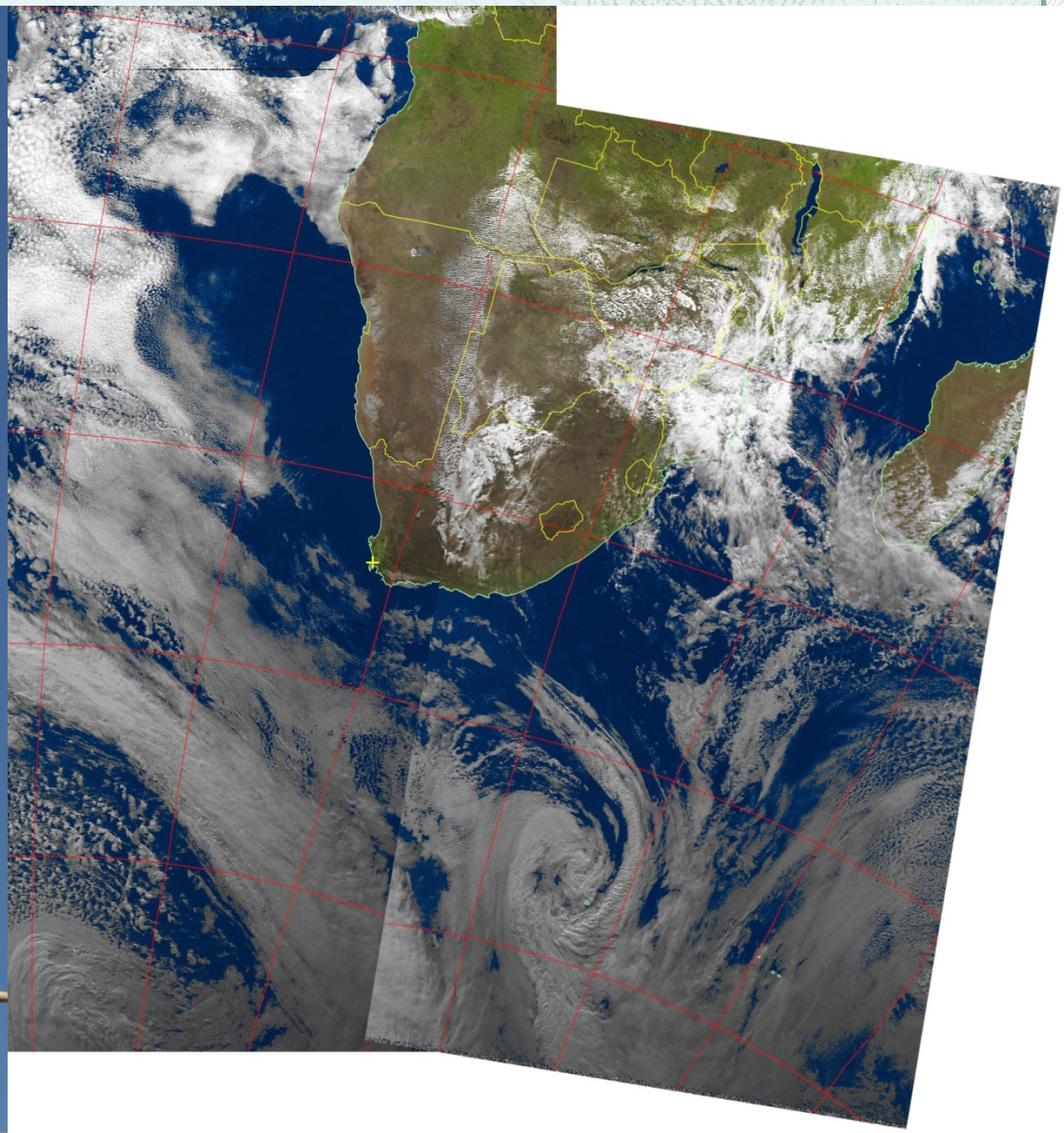
Ground Station



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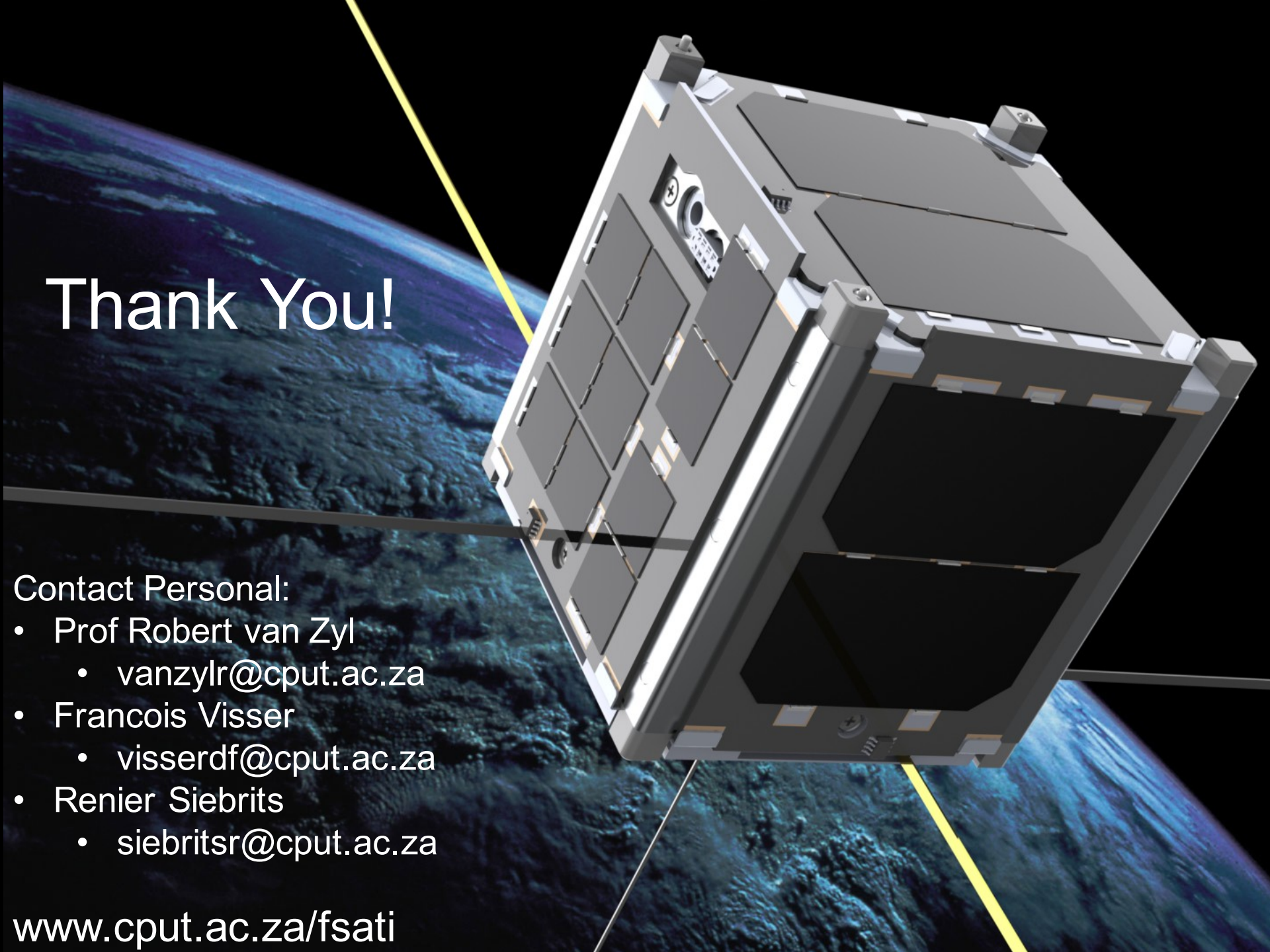
IAC and CubeSat Workshop

- International Astronautical Congress
  - Cape Town International Convention Centre
  - 3 - 7 October 2011

- 1st International African Cubesat Workshop
  - 30 September to 2 October



Thank You!

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