

◆ Low Profile Aperture Coupled Microstrip Antenna for Inter CubeSat Communications

Faisal Tubbal
Dr. Raad Raad
A/Prof. Kwan-Wu Chin
Mohamed Madni

School of Electrical, Computer and Telecommunications Engineering
University of Wollongong, Northfields Ave, NSW, Australia, 2522

2015

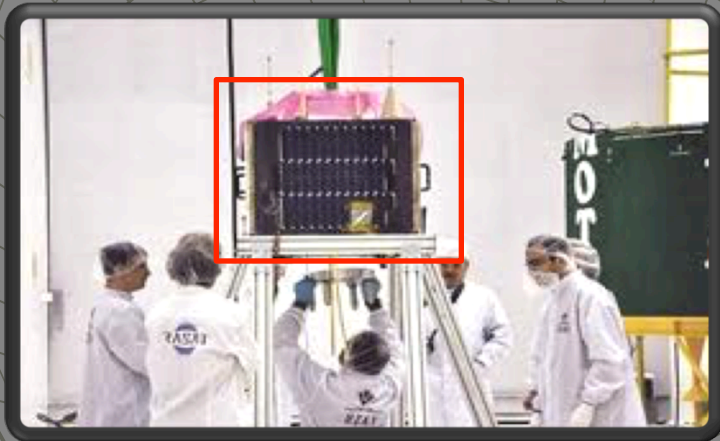
Outline

- ◆ **Background**
- ◆ **Cube satellite antenna design challenges**
- ◆ **The proposed configuration of antennas for inter CubeSat communications**
- ◆ **The design of an individual proposed Aperture coupling microstrip antenna**
- ◆ **Results**

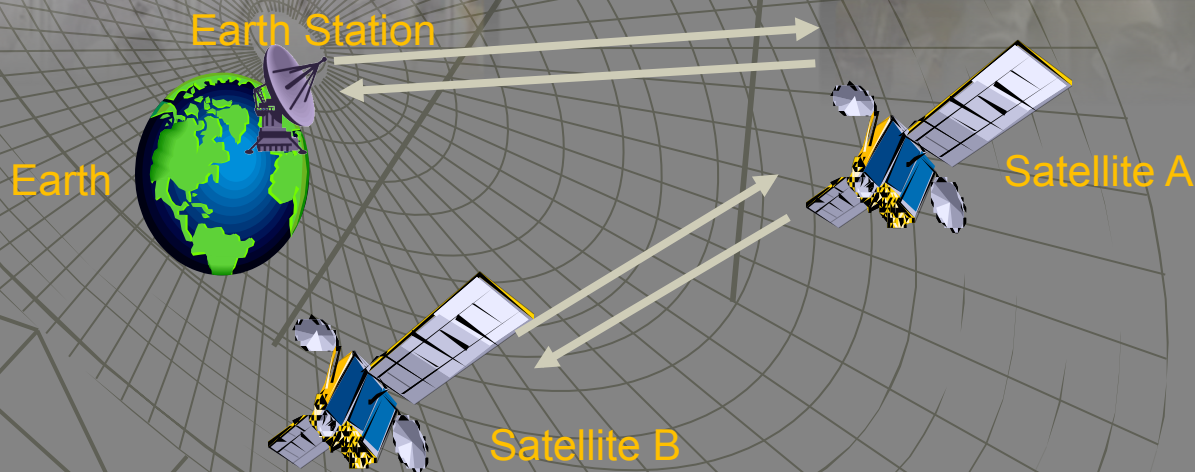
Background

Sun synchronies (Low Earth Orbit) Satellites

Large Satellite
Weight = > 80 Kg
Power = 1000 W



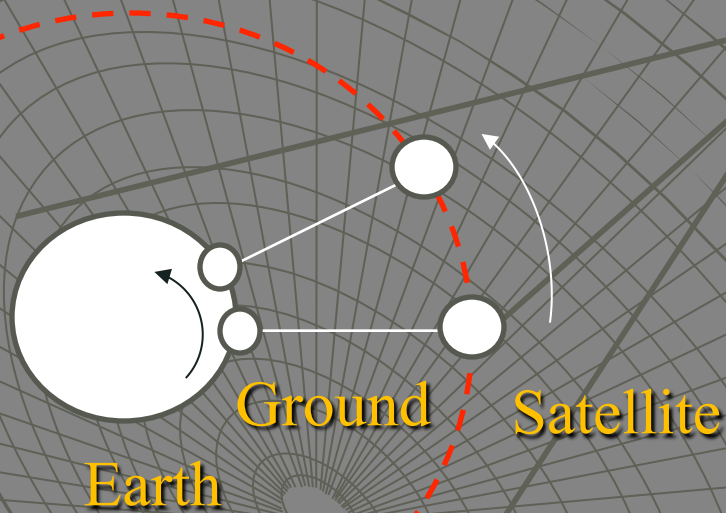
Pico Satellite (Cube Sate)
Weight = 1 Kg
Power = 2 W



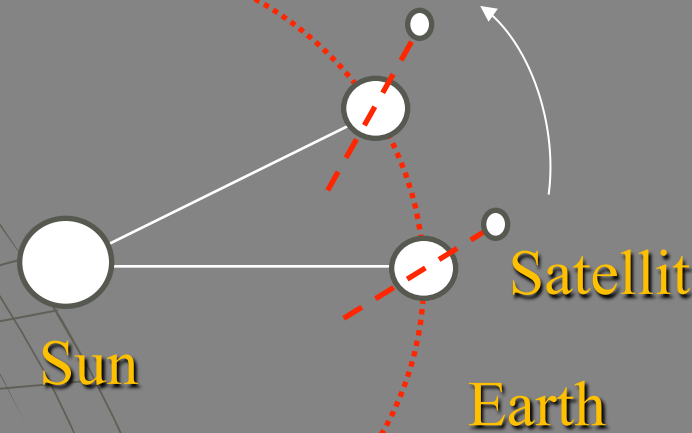
Background

Satellites

Geosynchronous Orbit (GEO)



Sun-Synchronous Orbit Low Earth Orbit (800-1000 km)

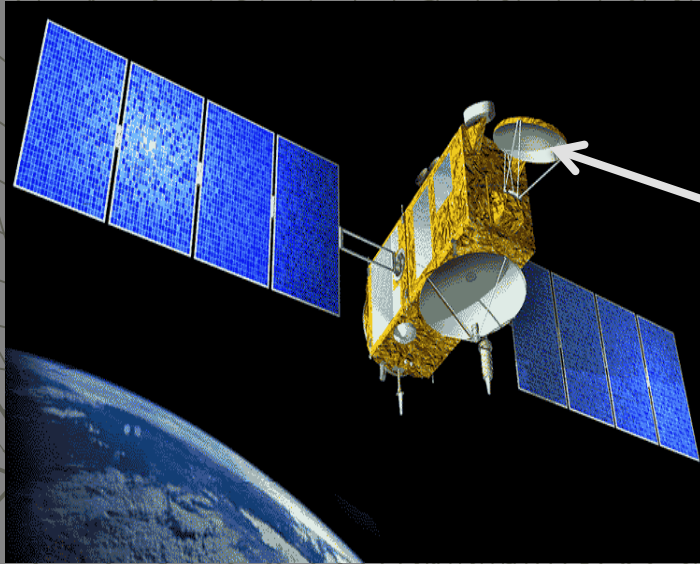


- True Anomaly Synchronous with Ground
- Useful for Communications
- Altitude = 35,786 km

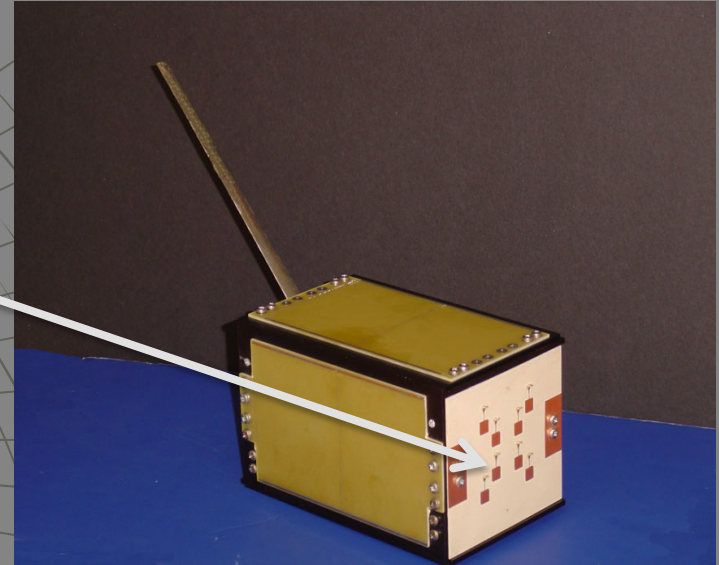
- RAAN Synchronous with Sun
- Useful for remote sensing
- To Simplify Satellite Design

Cube Satellite Antenna Design Challenges

- 1- Weight and size
- 2- Power consumption
- 3- Antenna Gain
4. Deployment mechanism

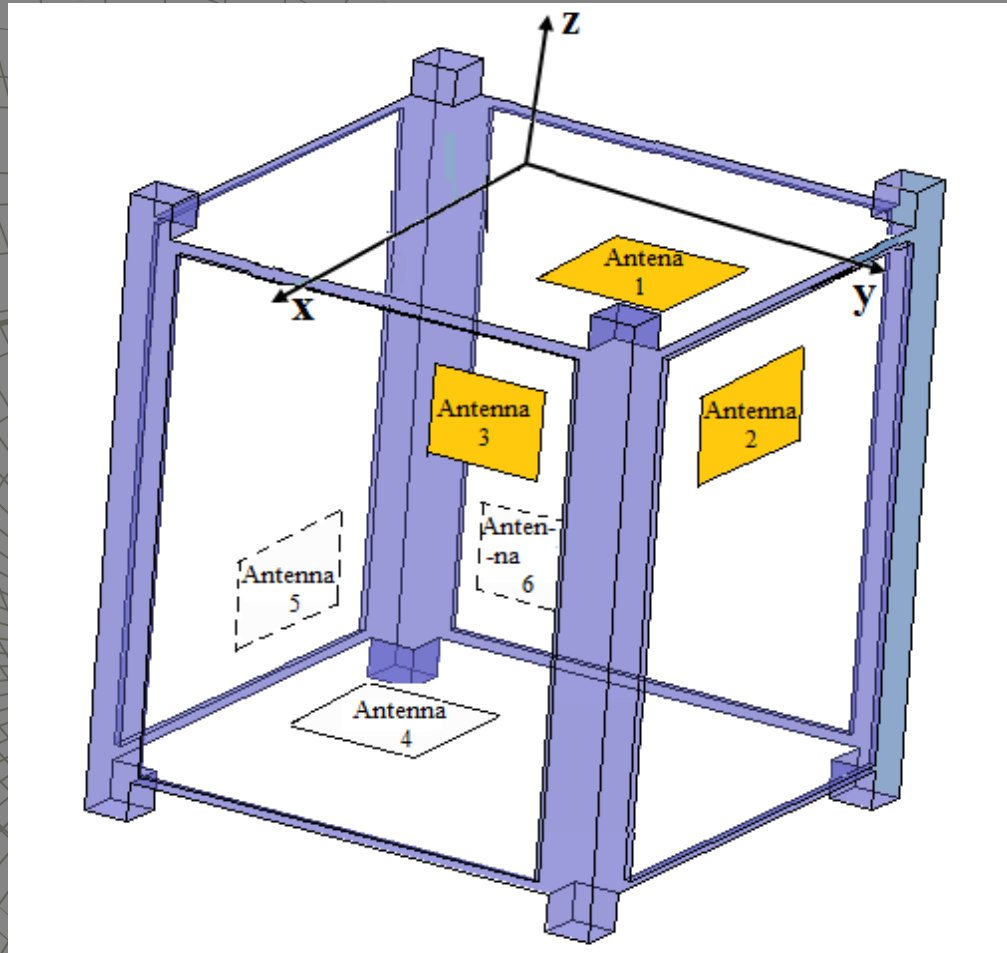


**Large satellite
Horn Antenna**

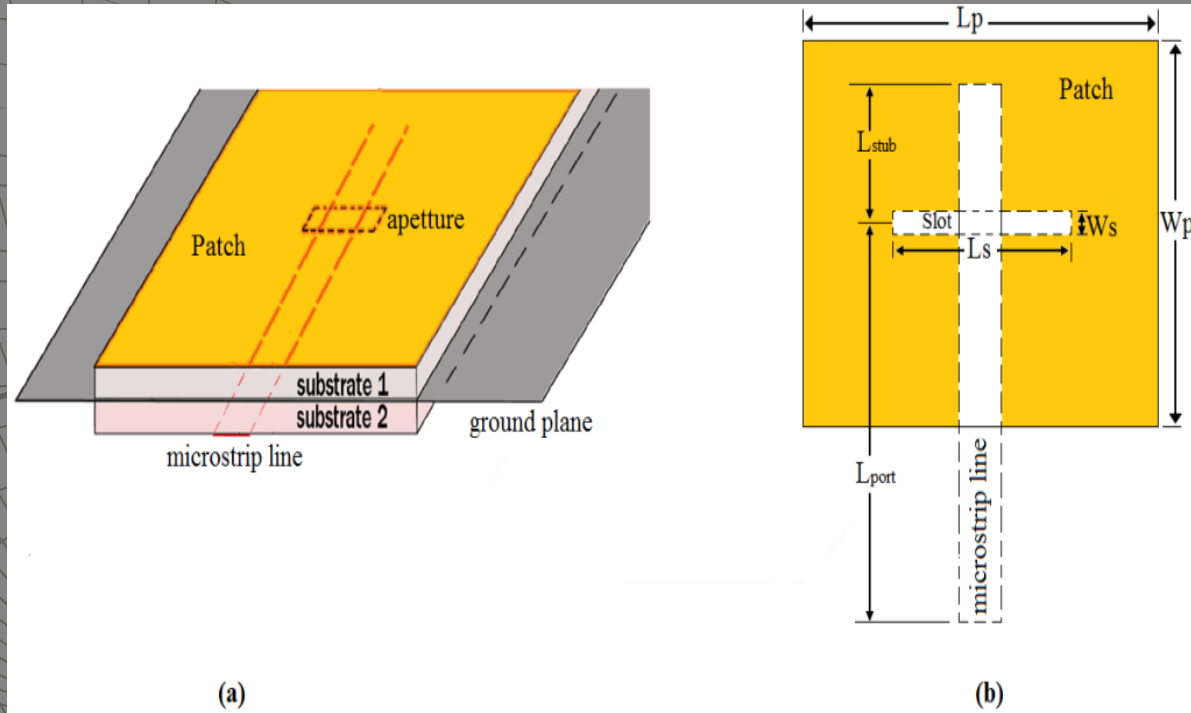


**Small satellite (Cube satellite)
Planar antenna (patch)**

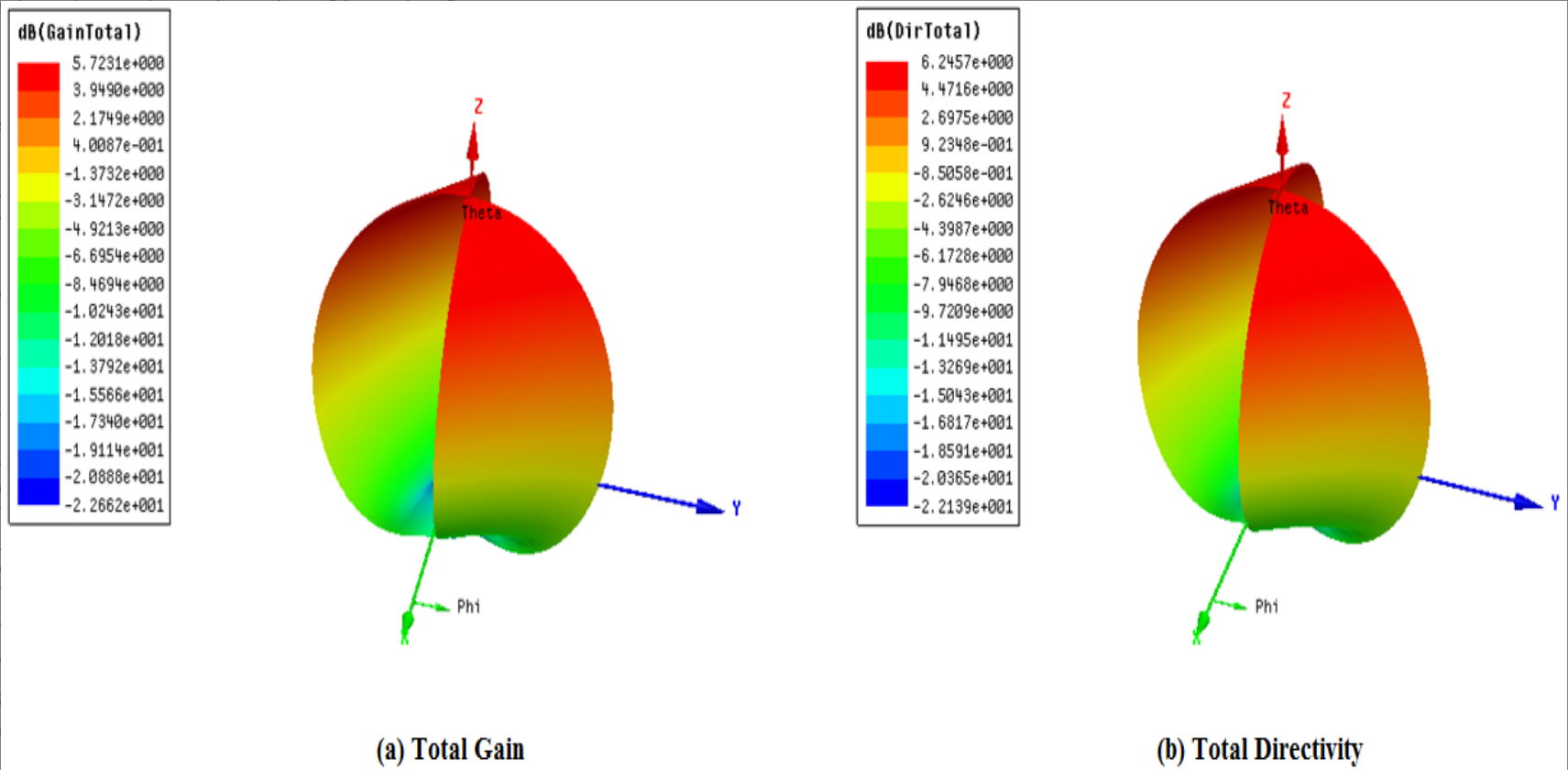
The proposed configuration of six planar antennas



The individual ACM antenna design

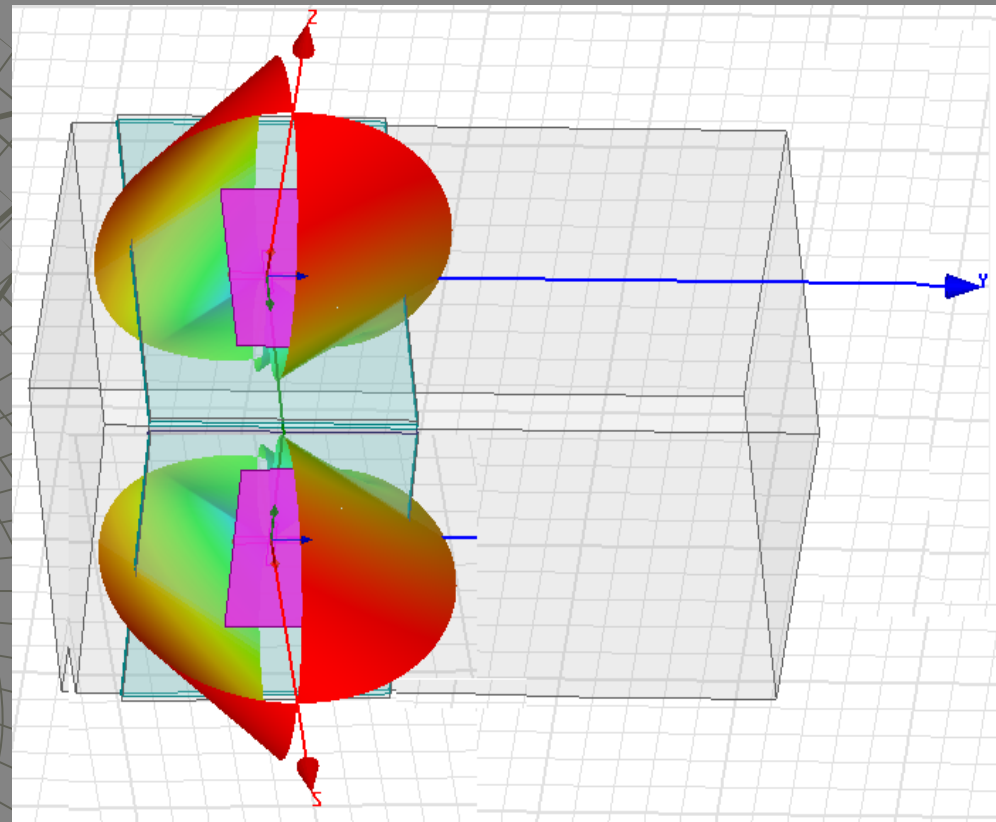
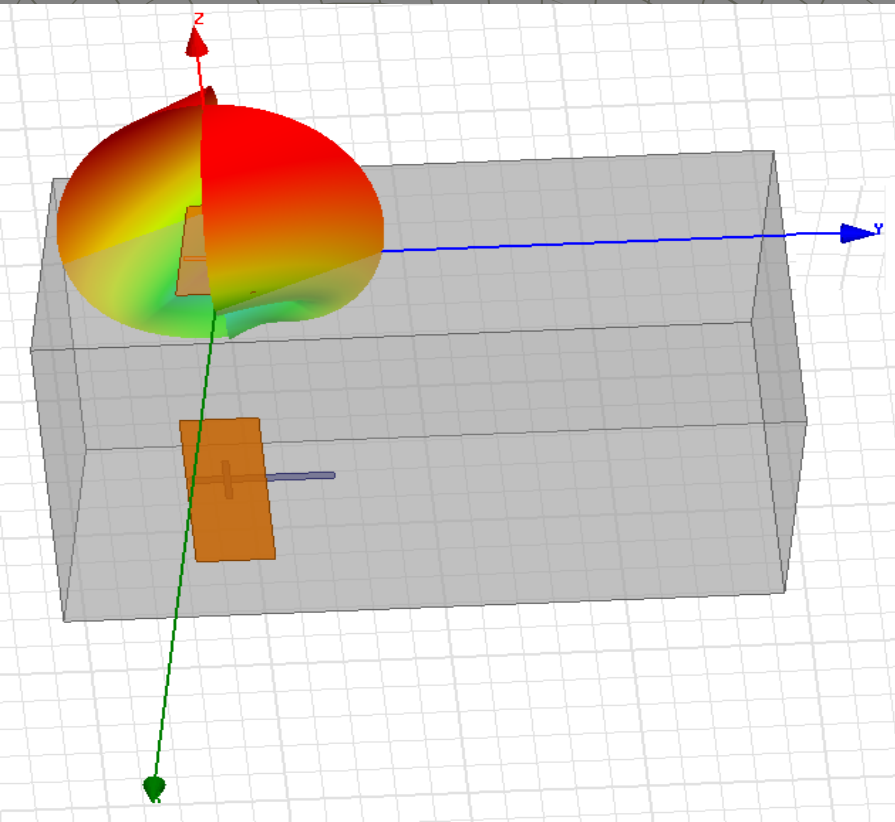


Results

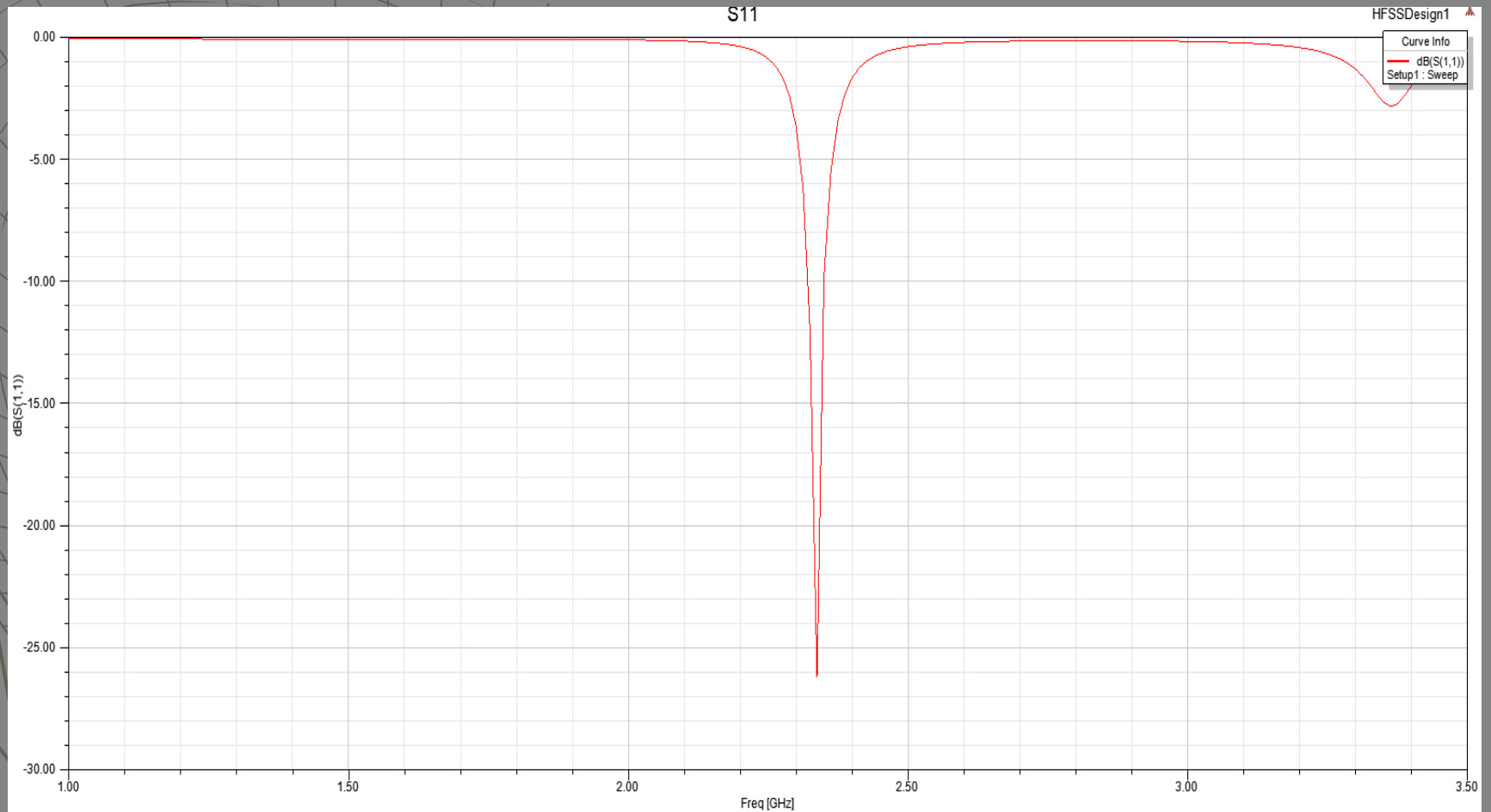


Simulated results of (a) the total gain, and (b) total directivity of the individual ACM

Using HFSS for simulating the antenna on 2U cubesat



The Quasi Newton method works on the basis of finding the minimum or maximum of a cost function by varying the variables to meet the constraints.



S11 of ACM antenna design

A cartoon illustration of a character with a large, open mouth and a red tongue, emerging from an open envelope. The character is holding a rectangular sign that says "Thank you for your attention" in yellow text. The character is wearing a black suit jacket and a white shirt. The envelope is drawn with simple black lines, and the character's body is also simple, with a large head and a small body.

Thank you
for your attention

A stylized, partial view of a clock face. The clock has a white face with a thick red border. The text "Time for QUESTIONS" is written across the top half of the clock face. "Time for" is in black, and "QUESTIONS" is in red. The clock hands are black, and there is a red line extending from the center. The background is white with a faint watermark of a speech bubble.

Time for QUESTIONS