StangSat

LAUNCH SERVICES PROGRAM

Inter-CubeSat Wi-Fi Communication During Launch

Purpose of Presentation

- Share risk mitigation efforts associated with Wi-Fi telemetry during flight

  - To eliminate the concern that Wi-Fi telemetry poses a risk to:

    1. Rocket telemetry
    2. Range safety
    3. Primary mission payload

Agenda

- The StangSat Team
- Mission Overview
- Risk Mitigation Efforts

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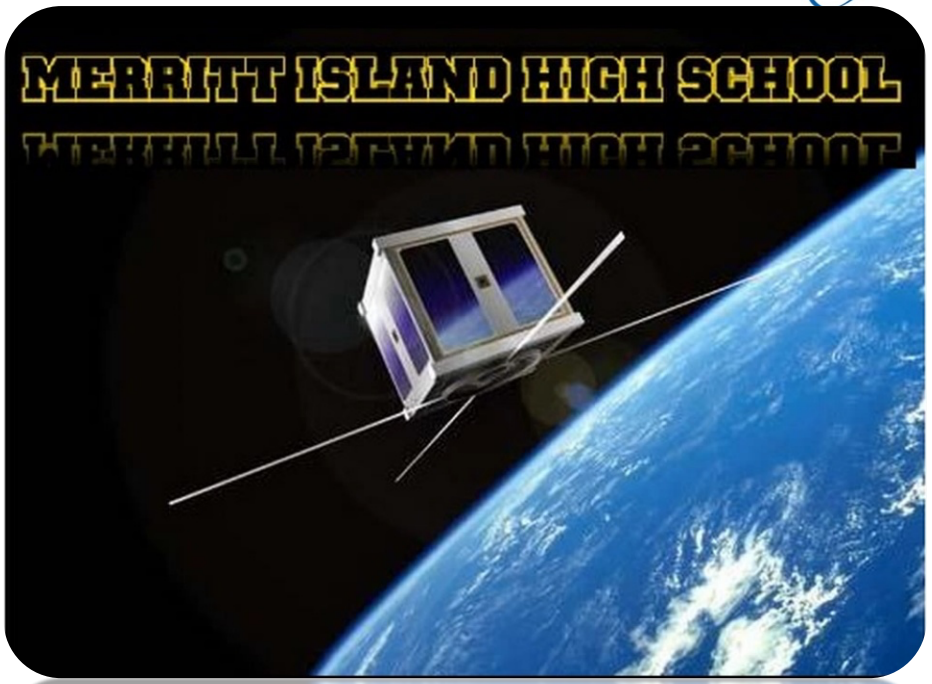
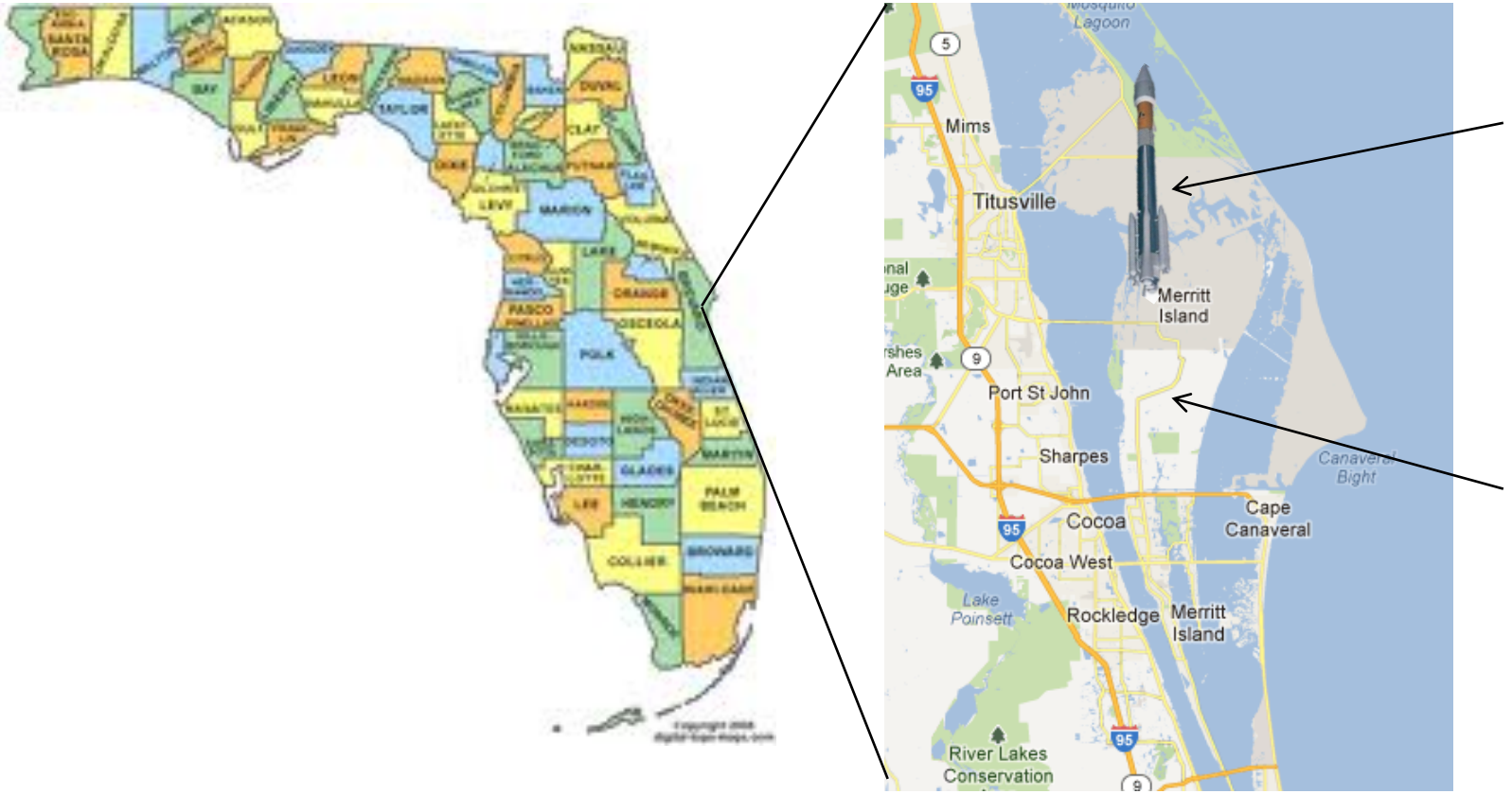


The StangSat Team

Merritt Island High School



Space Act Agreement

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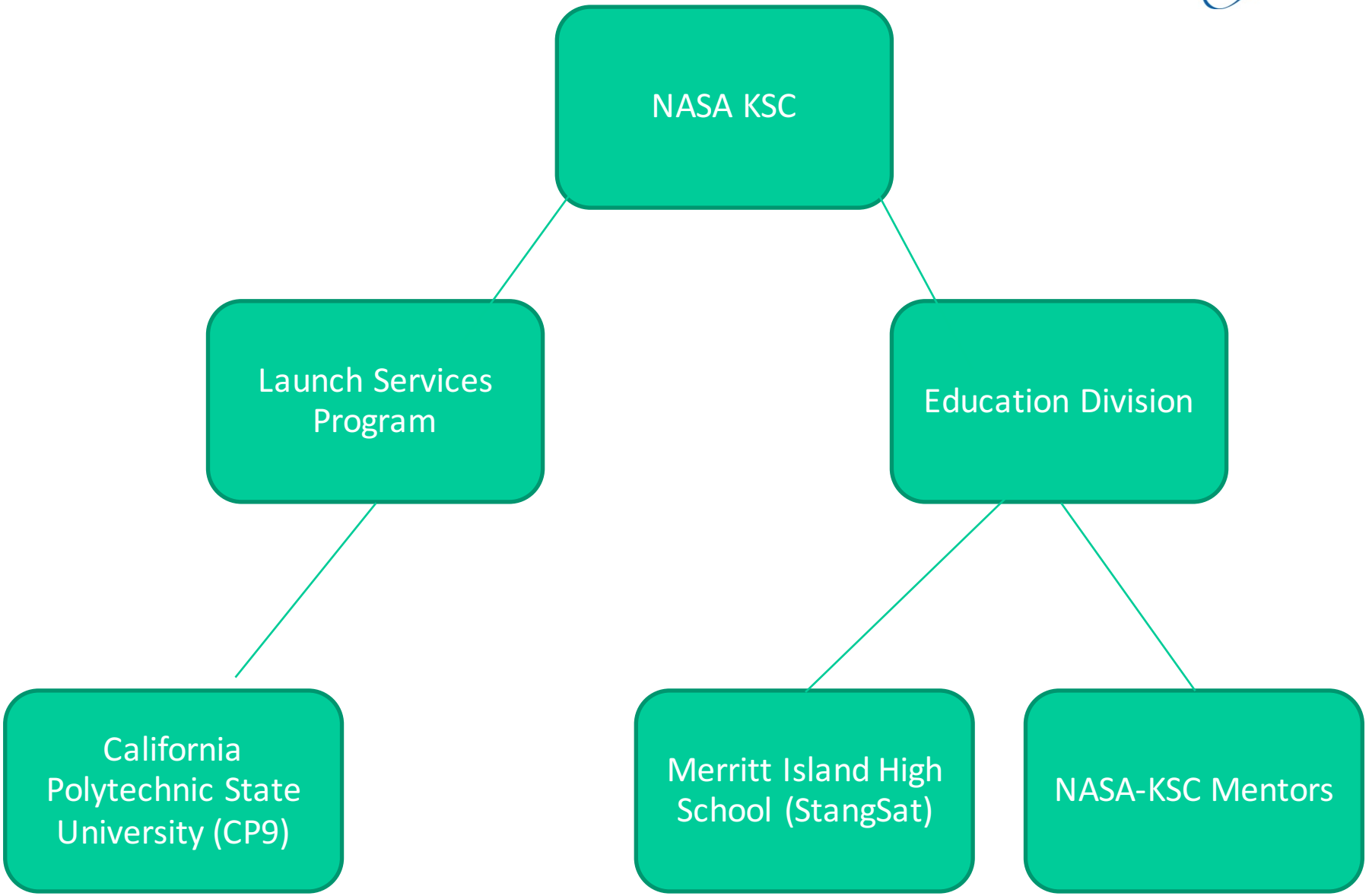
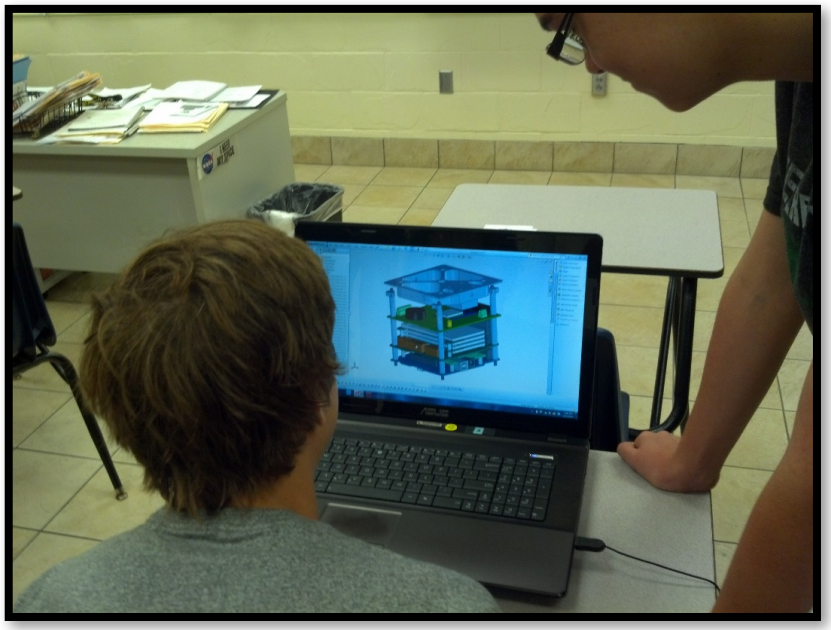
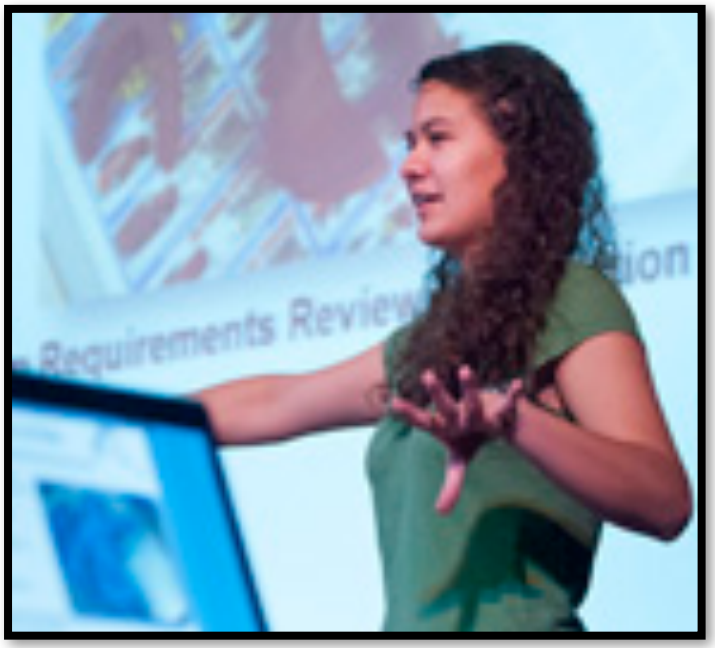
Joint Organizational Structure



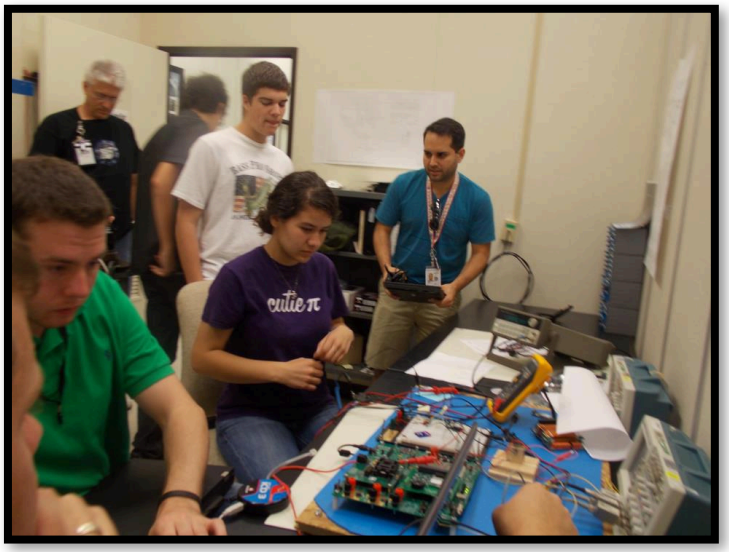
Education & Experience

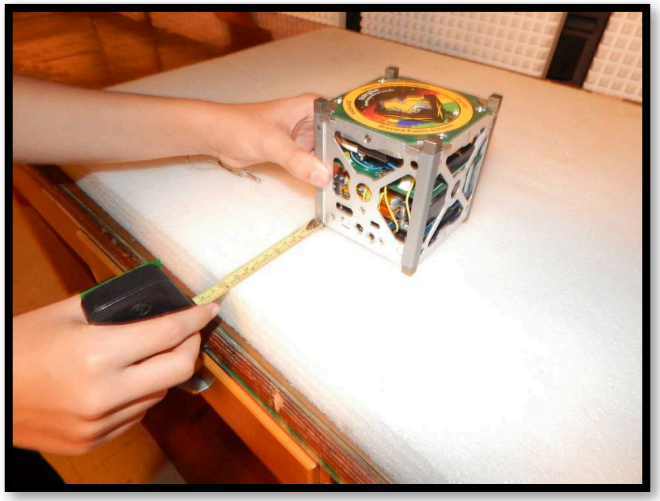




StangSat Lab

- StangSat lab at the Kennedy Space Center





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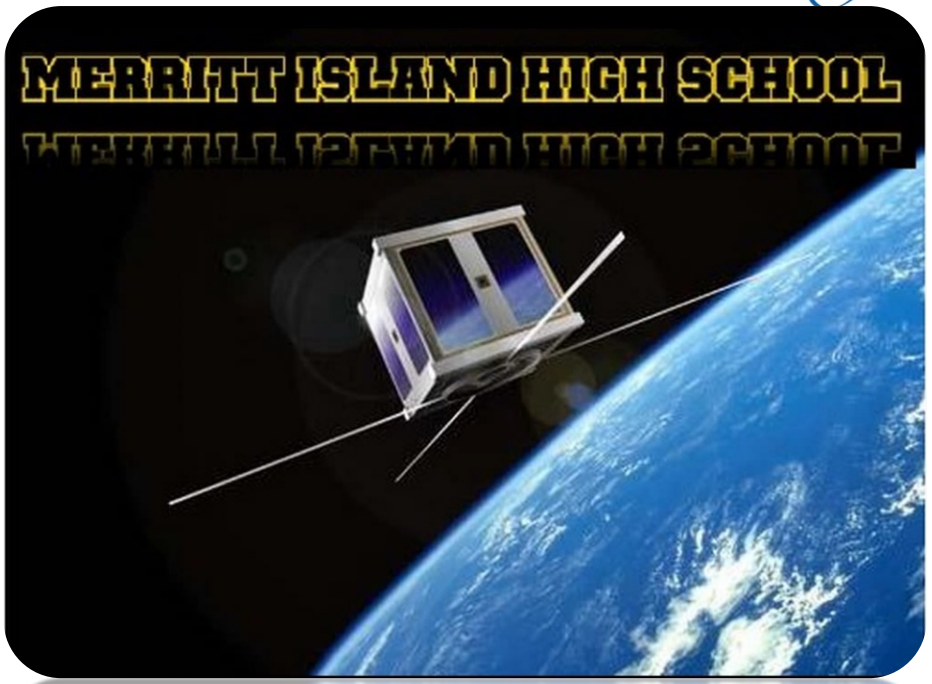


Mission Overview

Mission Overview

- Merritt Island High School and California Polytechnic State University will work to:
  - Qualify Environmental Flight Data
  - Measure shock and vibration environments for a CubeSat inside of a Poly Pico-satellite Orbital Deployer (P-POD) in order to better quantify flight environments
  - Use Wireless Data Transmission
    - Demonstrate Radio Frequency transmission between CubeSats within a P-POD with less than 1 Watt during vehicle ascent

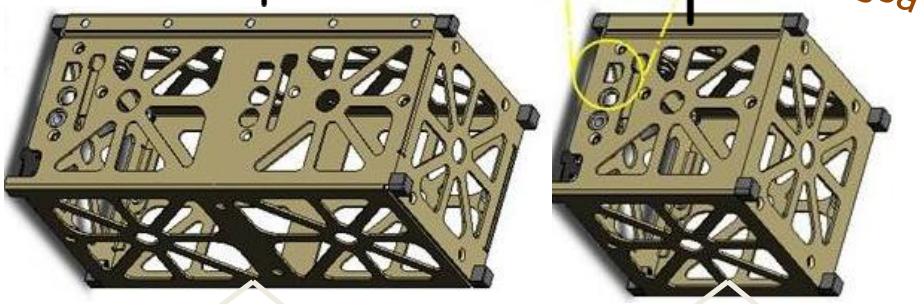
Concept of Operations – In Flight

P-POD

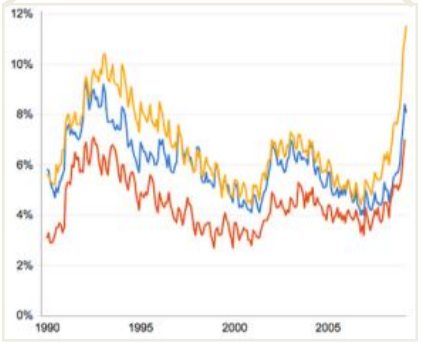
Data transferred using 802.11 Wi-Fi

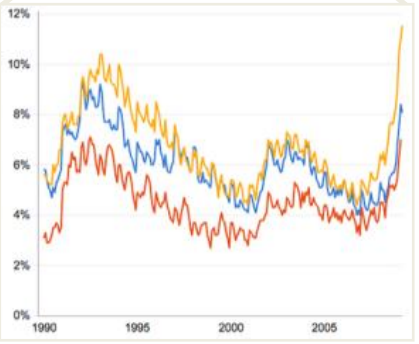
CalPoly- CP9

Merritt Island- StangSat



Measure Shock & Vibration

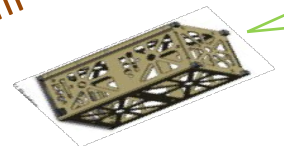




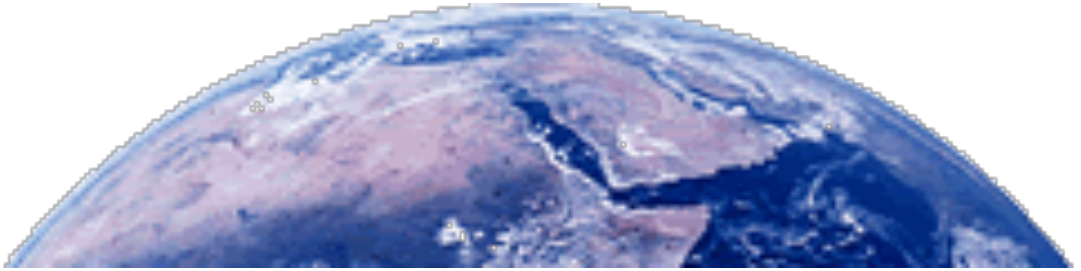
Concept of Operations- Photo Documentation

Merritt Island- StangSat

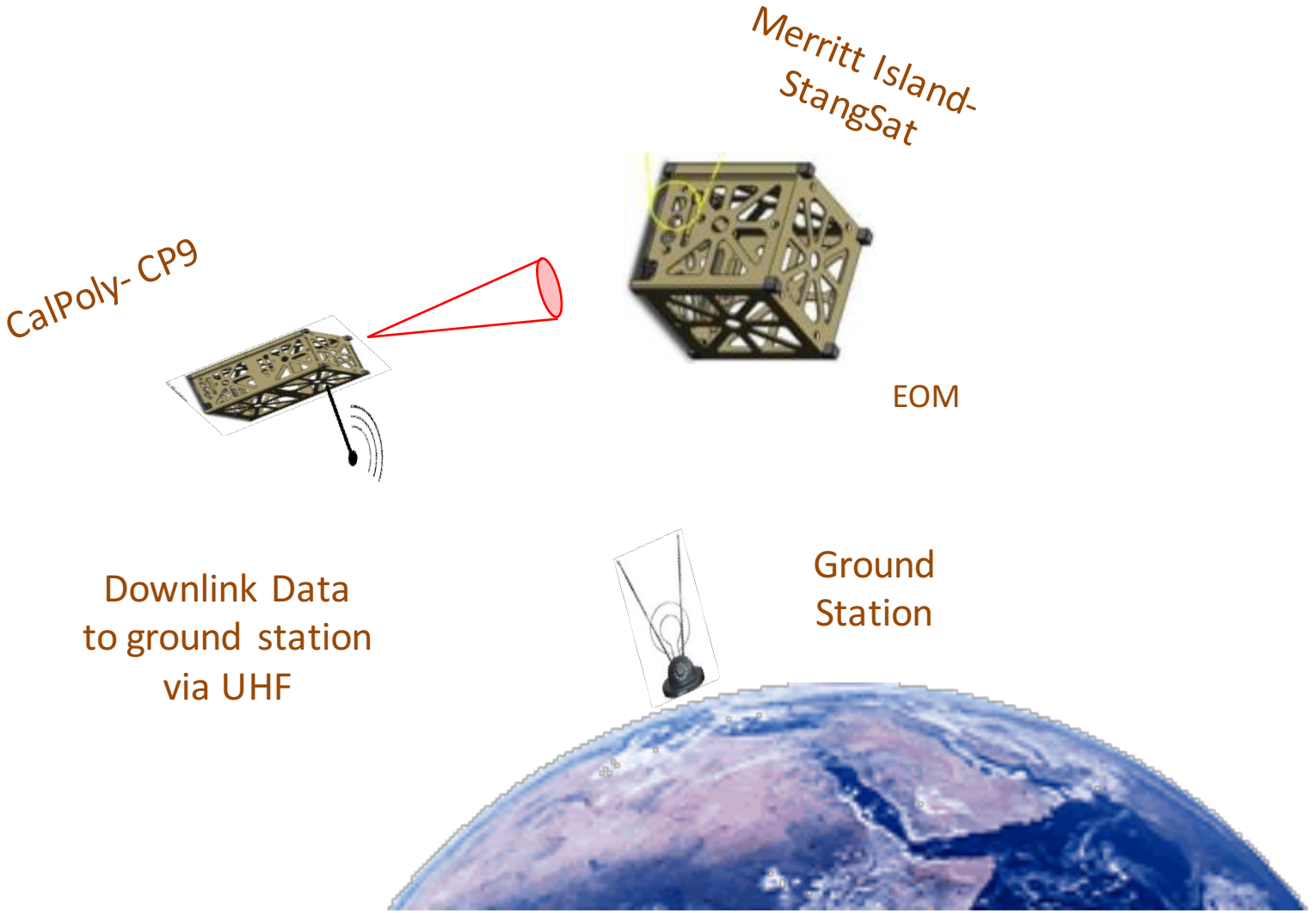
CalPoly- CP9



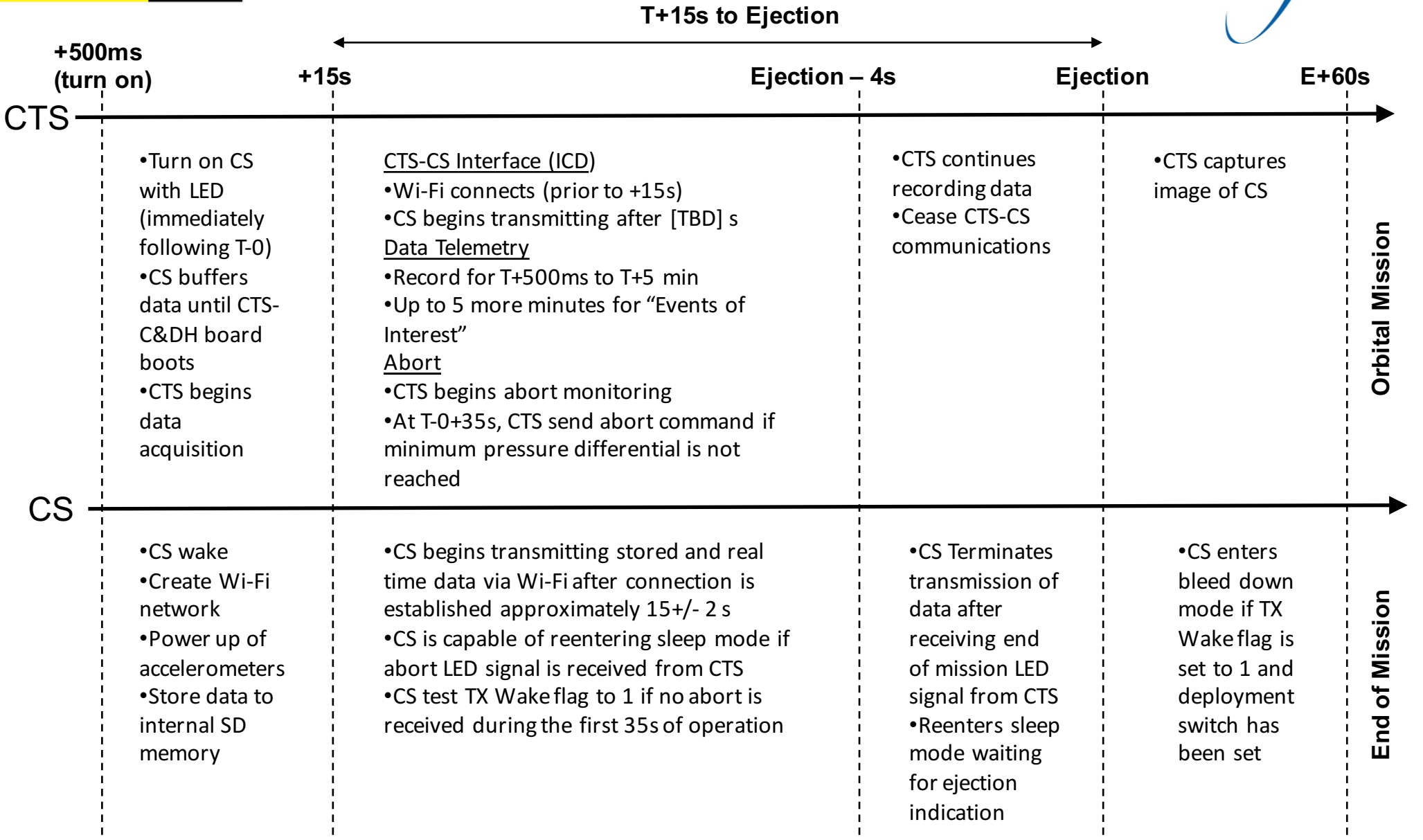
Record image of the aft face and StangSat



Concept of Operations – Downlink



StangSat Mission Timeline

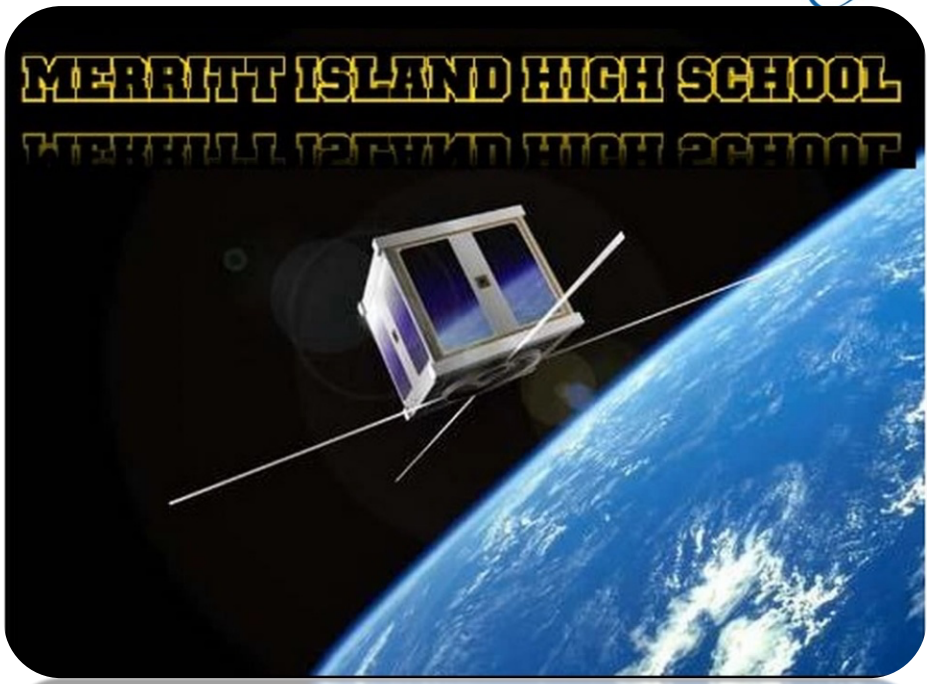


Current Status

- Phase A: Concept exploration
  - Completed: March, 2011
- Phase B: Design
  - Completed: August, 2012
- Phase C: Build and Test
  - Estimated Completion: May, 2014
- Phase D: Final Verification
  - Estimated Completion: Pending Manifest assignment

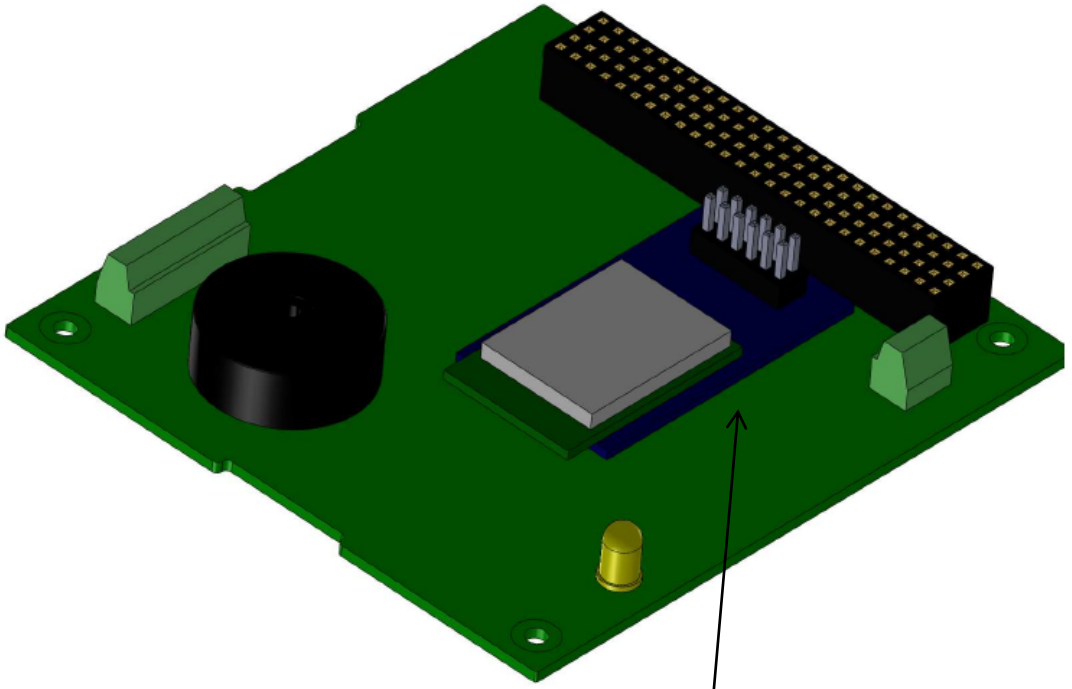
StangSat

LAUNCH SERVICES PROGRAM

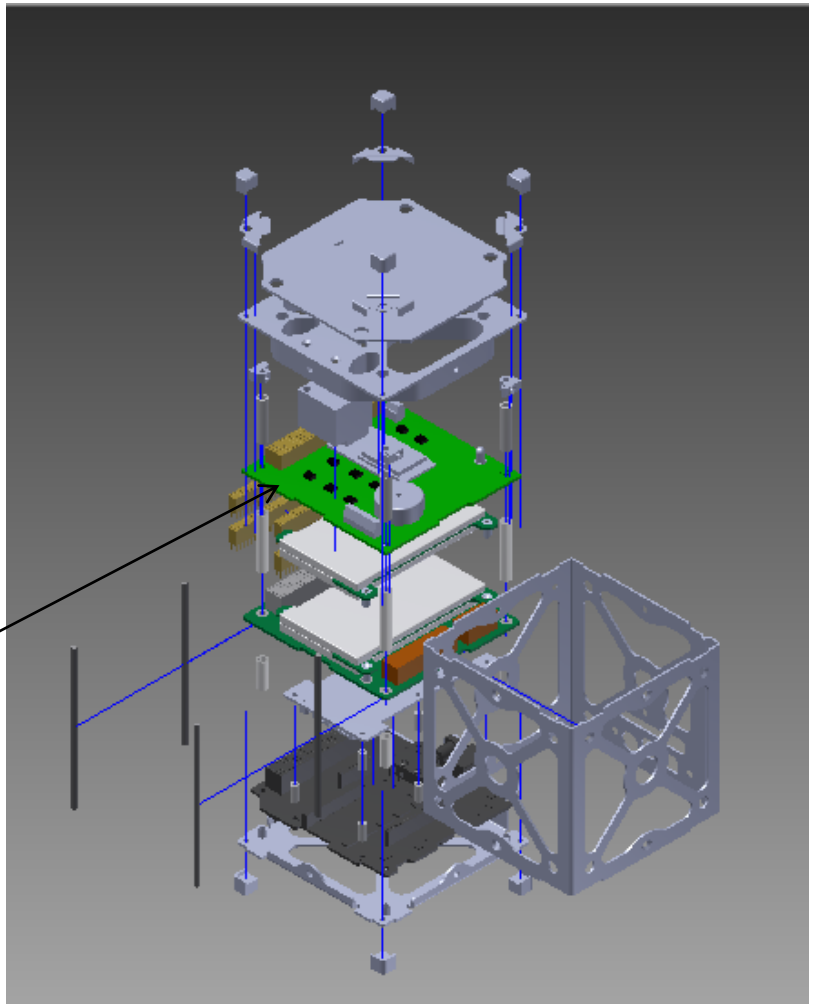


Risk Mitigation Efforts

Telemetry Board



Wi-Fi Module



Digilent Pmod Wi-Fi

- 802.11-compliant RF transceiver
- 1 to 2 Mbps data rate
- 400m (1300ft) range
- Integrated PCB antenna

EMI Testing
7/15/13

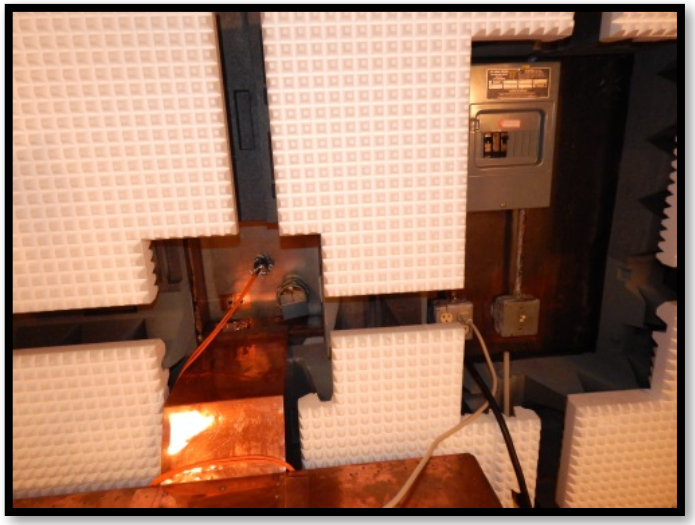
Purpose- Characterize and quantify electromagnetic emittance and interference

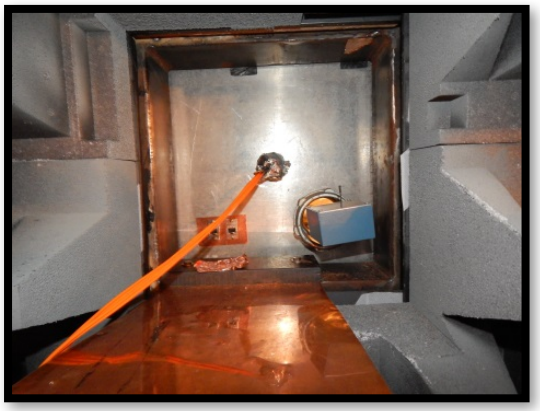
Use data to make changes to our code to accommodate any exceedances to meet regulations

Confirmed known spike at 2.4GHz due to Wi-Fi

EMI Lab

- Electromagnetic Interference Lab at KSC





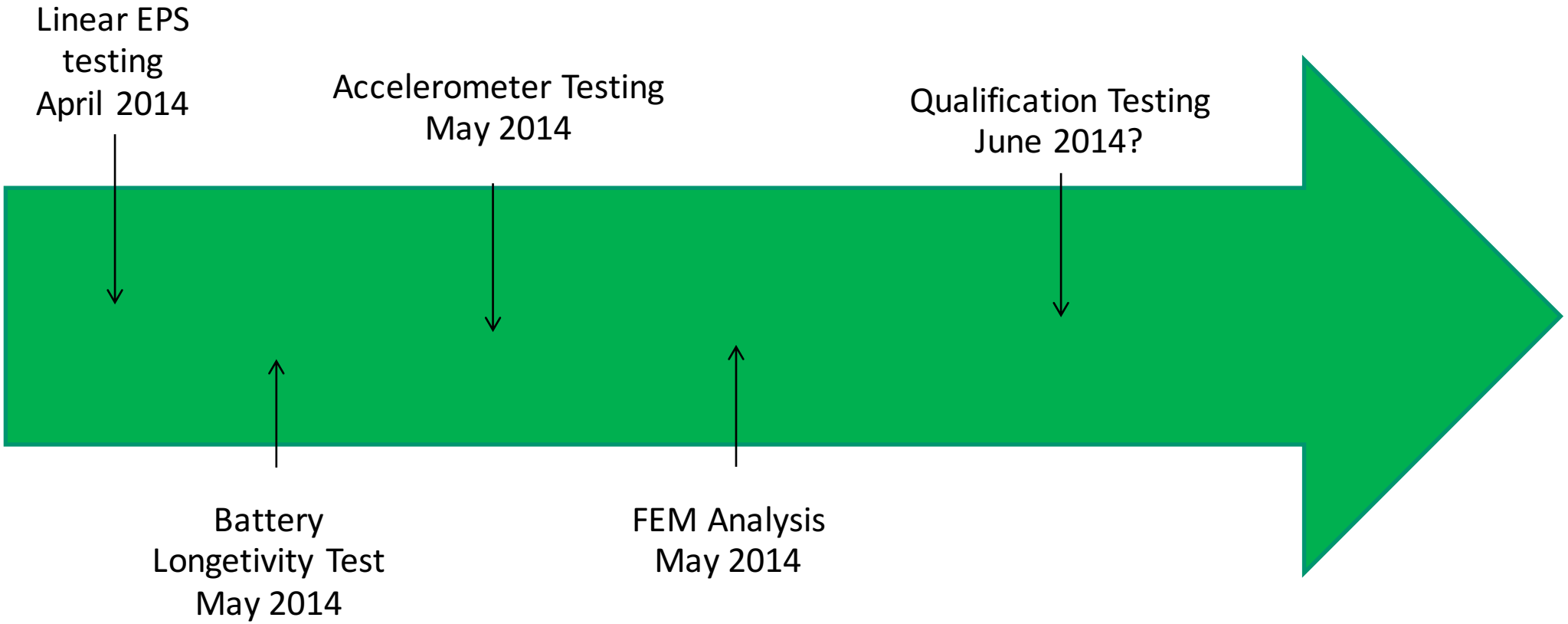
Code Modification

- Modified code to lower the amplitude of the Wi-Fi module frequency
  - Additional testing to be performed for confirmation

Integrated Testing with CalPoly

- CP9 tested with StangSat at KSC
  - LED Command Bench and P-POD Tests
    - -Confirmed LED commands from CP9 are successfully detected by StangSat outside and inside P-POD
    - -Confirmed that StangSat executes proper functions after LED detection
  - Wi-Fi Bench and P-POD Tests
    - -Confirmed wireless communication between CP9 and StangSat outside and inside P-POD
    - -Verified data rates and packet format
  - Simulated Mission Test
    - -Verified that configuration can successfully complete a simulated mission
    - -Verified abort and re-triggering of CP9 and StangSat
    - -Verified data acquisition and storage at mission completion

Additional Testing



Thank you