Integrating Lithium Polymer Charging and Peak Power Tracking on a CubeSat Class Satellite

Dan Kaste, Dan Brinks, Jim Moore, Hugh White Zach Palmer and Will Holmes
Presentation Overview

• Students Involved

• Mission Summary
  – Design for Assembly
  – Mesh Network
  – Science Instruments

• Power System
  – Design Principles

• Summary / Conclusion
Students Involved

• Dan Kaste
• Hugh White
• Dan Brinks
• Jared Sutter
• Jim Moore
• Zach Palmer
Mission Objectives

• Demonstrate a functional wireless mesh network in orbit
• Take concurrent multipoint measurements of space plasma density
• Detect Very Low Frequency (VLF) “Whistler Waves” with spatial and temporal resolution.
• Langmuir Plasma probe and VLF must be able to interface into Boston University’s BUSAT
• Satellite must Demonstrate a high level of modularity, allowing subsystems to be reused on future missions and on BUSAT
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Langmuir Plasma Probe

- **Purpose:**
  Measure low energy, thermal electrons (0 to 6 eV) (L1-2)
- **Returns both Density and Energy (Temperature)**
VLF Receiver

• Detect “Whistler Waves.”

Image from Stanford website
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- Maintain Downlink Capability
  - Available power always above 2 watt hours
  - Charge batteries correctly
- Maximize Power Flow into Satellite
- Distribute Power to Satellite
- Have an efficiency greater than 80%
Status

• Implementation of Peek Power Tracking / Li Battery Charging not Complete
  – First Iteration of Circuit Board Complete
  – Software awaiting Hardware
  – Look for Testing Results at Booth at Next Year’s Conference

• Satellite Subsystems Developed
  – VLF, Plasma, Communications (Mesh Network), System
Lessons Learned / Summary

• Pay Attention to Assembly and Systems Engineering from the beginning of a Project.

• Make sure that Complexity does not increase.

• While satellite not delivered, six students were trained.