

# Sputnik Product Development Specification

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## Requirements

### Must

- Environment
  - Have a radiation tolerant watchdog system
  - Be able to operate in an Industrial Operating Temperature Range (-40C to 80C)
  - Acceleration: must handle 15g in the "Z" axis
- Communication block ("radio")
  - Operate in the 70 cm band (436 to 438 MHz)
    - \* Use IARU specified frequency for RF comms and make appropriate changes if necessary
  - Meet FCC Amateur Radio Licensing requirements (Title 47 CFR part 97)
  - Meet 400km ISS orbit link budget by a margin of 6 dB
  - Have bidirectional communication interface to Payload and System Controller
  - Local storage for communication in/out queues
- Energy Switching/Control
  - Be able to seamlessly switch energy sources to the load
- System controller
  - Radiation tolerant "system watchdog" controller

- Power switches to turn other blocks on and off
- Monitor energy storage and energy harvesting systems
- Communication link with communication block
- CubeSat requirements
  - Conforms to latest CubeSat specification where applicable
  - Fits in 1/4 1U CubeSat
  - Weighs less than 250 g

### **Should**

- In general
  - Use as many COTS (Commercial Off The Shelf) parts as possible
- Environment
  - Operate in Automotive Operating Temperature Range (-40C to 125C)
- Communication block ("radio")
  - Use a frequency of 436.5 MHz for RF communication

### **May**

- Environment
  - Operate in Military Operating Temperature Range (-55C to 125C)

## Deliverables

- Hardware
  - 2 fully working Sputnik boards in the CubeSat 0 form factor (determined by PSAS)
  - UART to Sputnik radio adapter for test/debug
- Firmware
  - Basic Sputnik functionality for KW0x microcontroller
  - Drivers
    - \* Timers and Interrupts
    - \* SPI
    - \* UART
    - \* Radio (600 kbps bi-directional communication using GFSK)
  - System Controller
    - \* Simple monitoring of power system
    - \* Simple watchdog system to turn on and off other system blocks
- System Level
  - Radio works: 600 kbps bi-directional communication, using GFSK demonstrated over 10 km
  - System controller can turn other blocks on and off