



## HAMVENTION 2019

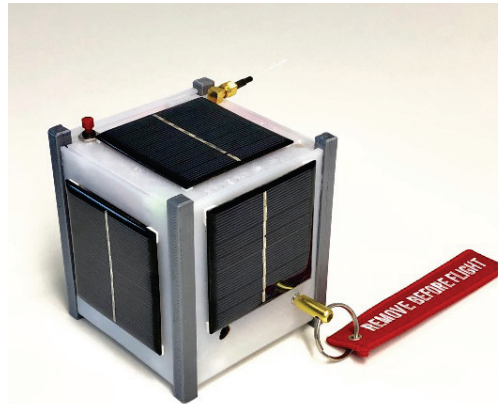
Announcing the New

# AMSAT® CubeSat Simulator



Introducing the new AMSAT CubeSat Simulator: a tool for satellite and space technology education and demonstrations. Designed for educators, students, hams and the general public to help demystify and explore how a real satellite works in Low Earth Orbit.

The CubeSat Simulator is a low cost satellite emulator that runs on solar panels and batteries, transmits UHF radio telemetry on 70cm band, has a 3D printed frame, and can be extended by additional sensors and modules.



## A Satellite in Your Hand!

A series of descriptions are published in the *AMSAT Journal* starting in the Nov/Dec 2018 issue and continuing to the present.

A variety of educational activities can be performed with the CubeSat Simulator including the activities of the original ARRL ETP CubeSat Simulator from ten years ago, as described by Mark Spencer, WA8SME, in his *AMSAT Journal* articles.

STEM (Science Technology Engineering, and Math) principles can be demonstrated including power, efficiency, and data analysis.

You can **BUILD** your own AMSAT CubeSat Simulator using the Wiki instructions and published code – the design is fully open source. AMSAT has four built CubeSat Simulators available to **BORROW**. See Alan KU2Y or Pat N8PK at the AMSAT Booth for a demo and to learn about how to bring a satellite into your classroom or your next club meeting! **EXPLORE STEM!**

### LINKS

Step-by-Step Instructional Wiki: <http://cubesatsim.org/wiki>

Open Source Software: <http://cubesatsim.org/code>

Paper: <http://cubesatsim.org/paper>

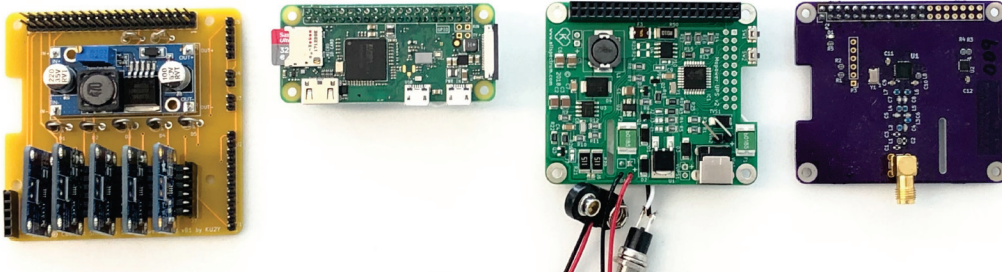
### LINKS

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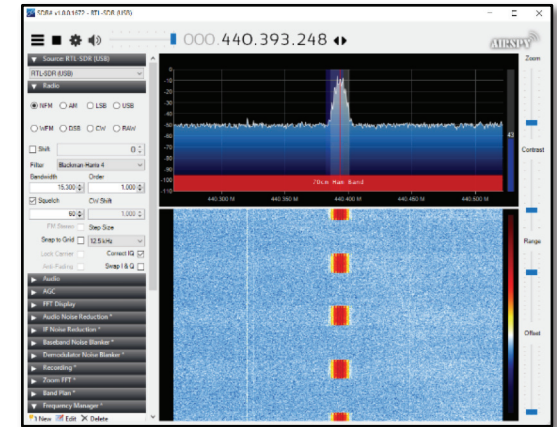


# AMSAT<sup>®</sup> CubeSat Simulator – Under the Hood

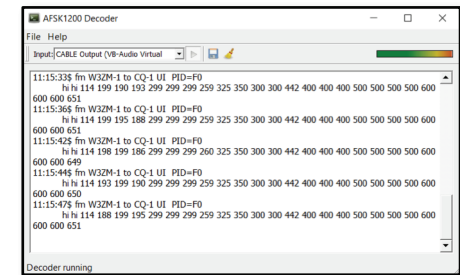


<b>Solar Power Management (part of EPS)</b>	<b>Command &amp; Data Handling (C&amp;DH)</b>	<b>Battery Management (part of EPS)</b>	<b>Communications (Transmitter)</b>
<b>Custom Circuit Board (Can get from AMSAT)</b>	<b>Raspberry Pi Zero W</b>	<b>MoPower UPS V2</b>	<b>Brandenburg Tech Digital Transceiver for the Raspberry Pi</b>
Monitors solar panel current and voltages for telemetry. Boosts voltage to 15 V to charge batteries. Switches between DC input power and solar power.	Runs software to control simulator. Controls and communicates with other boards using the GPIO connector.	Manages charging of 9 V NiMH battery. Provides power on/reboot/shutdown button and automatically shuts down Pi if battery voltage is too low.	Transmits telemetry signal on 70 cm band using different modulation schemes.

One Custom Circuit Board and Three Off-The-Shelf Boards



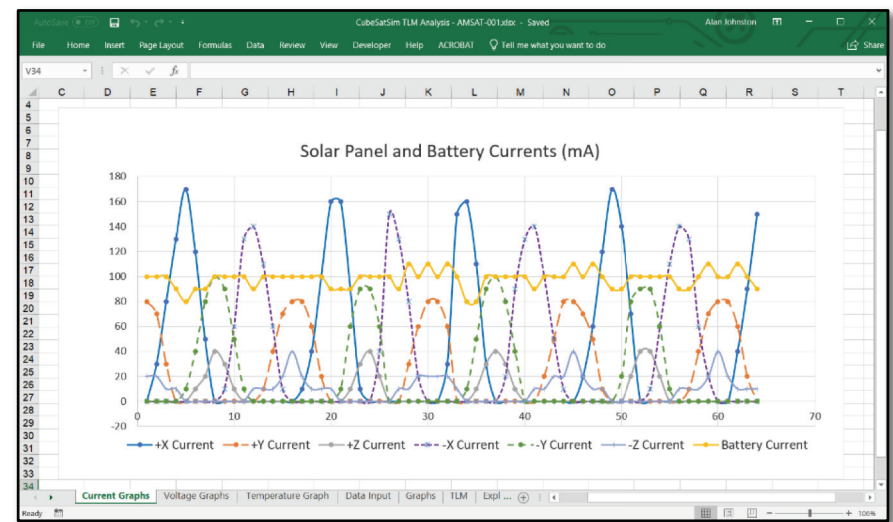
SDR# PC Ground Station using RTL-SDR



AX.25 Telemetry Decoding using AFSK 1200 Decoder



Turntable and Lamp used to Simulate On Orbit Rotation



Telemetry Analysis and Plotting using a Spreadsheet