Low EMI Power Supply Design for Nanosatellites

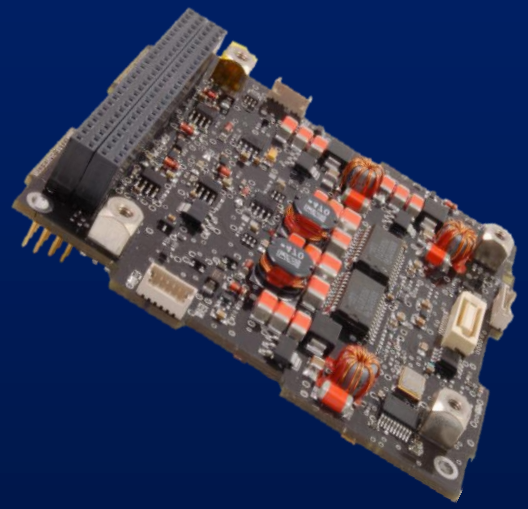
Craig Clark | CEO | 27th April 2017

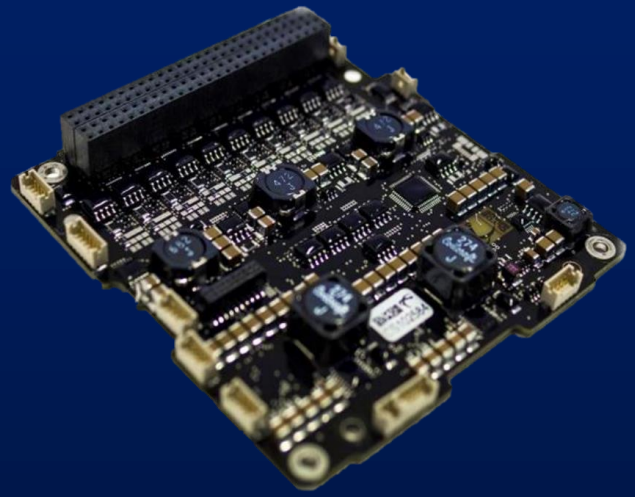
Why a low noise EPS?

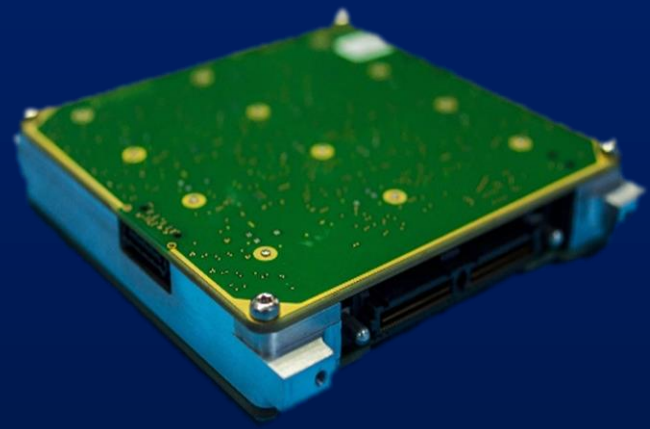
- Increasing range of CubeSat communications and RF sensing applications.
  - AIS
  - ADS-B
  - M2M
  - IoT
- These applications in turn are driving the next generation CubeSats in order to meet operational requirements.

Development based on heritage designs

The world’s most flown NanoSatellite Power System based on decades of experience aggregated across multiple missions.

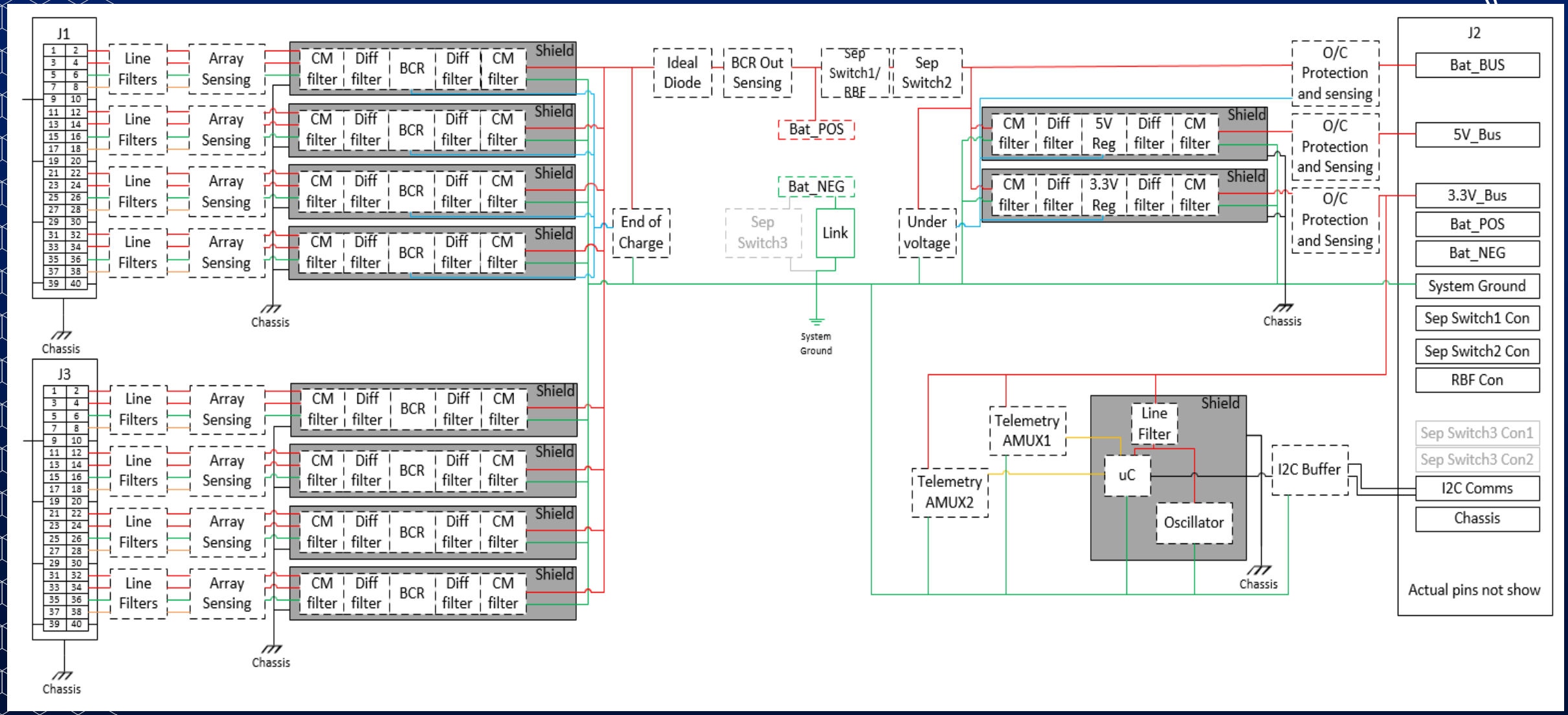






- Encompassing 3.3V (4.5A), 5V (4.5A), and 12V (1.5A) regulated buses and an unregulated battery voltage bus (4.5A)
- Designed for high-power missions – our EPS is designed to deliver power across its four buses, at their maximum currents, simultaneously providing up to 90W
- 10x Latching Current Limit (LCL) switch-controlled power buses
- Maximum Power Point Tracking (MPPT) of solar arrays
- Protections include over-current, battery over-voltage and under-voltage, and a watchdog timer

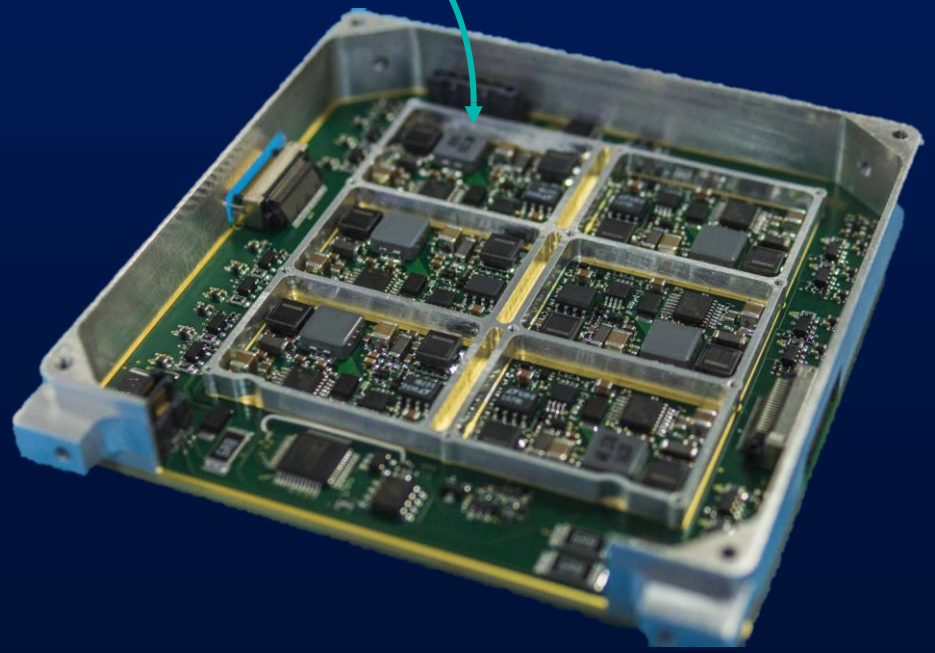
Architecture

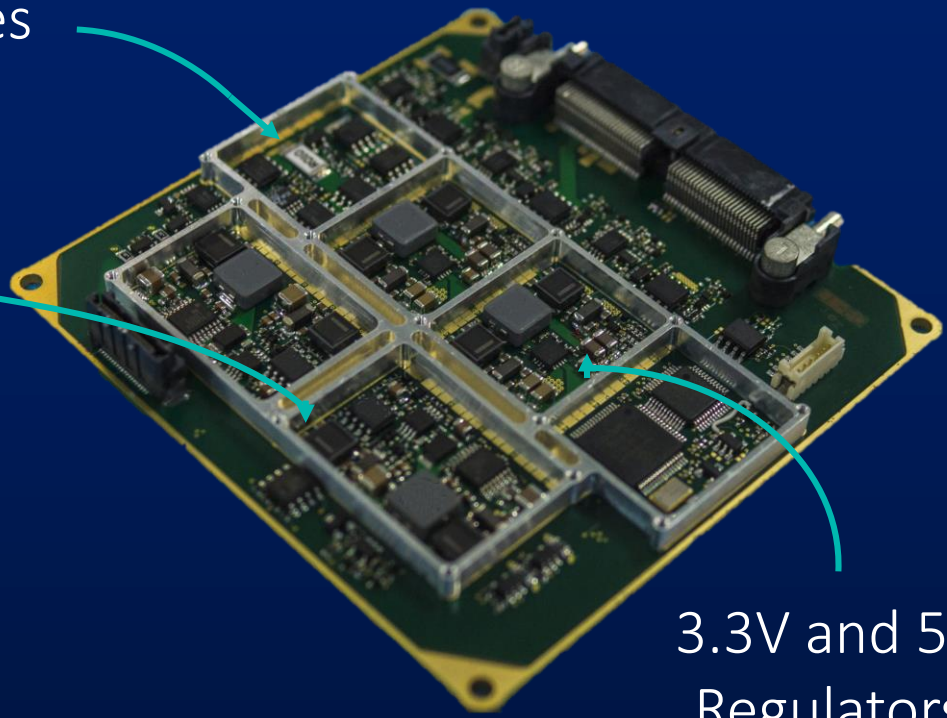


Modular approach

Flight Switches

13W BUCK BCRs x8

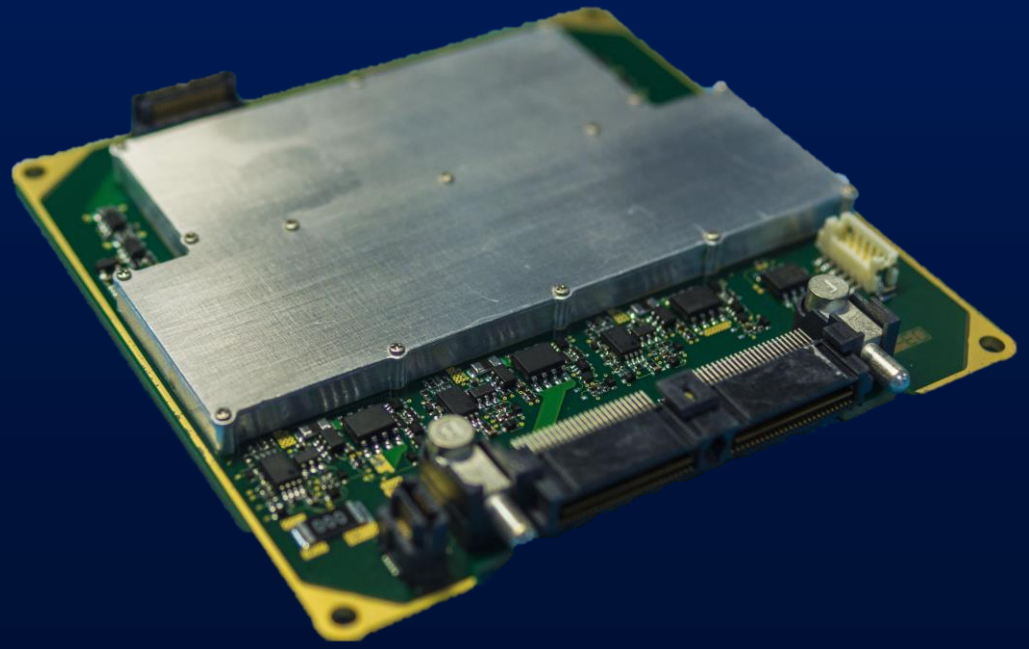




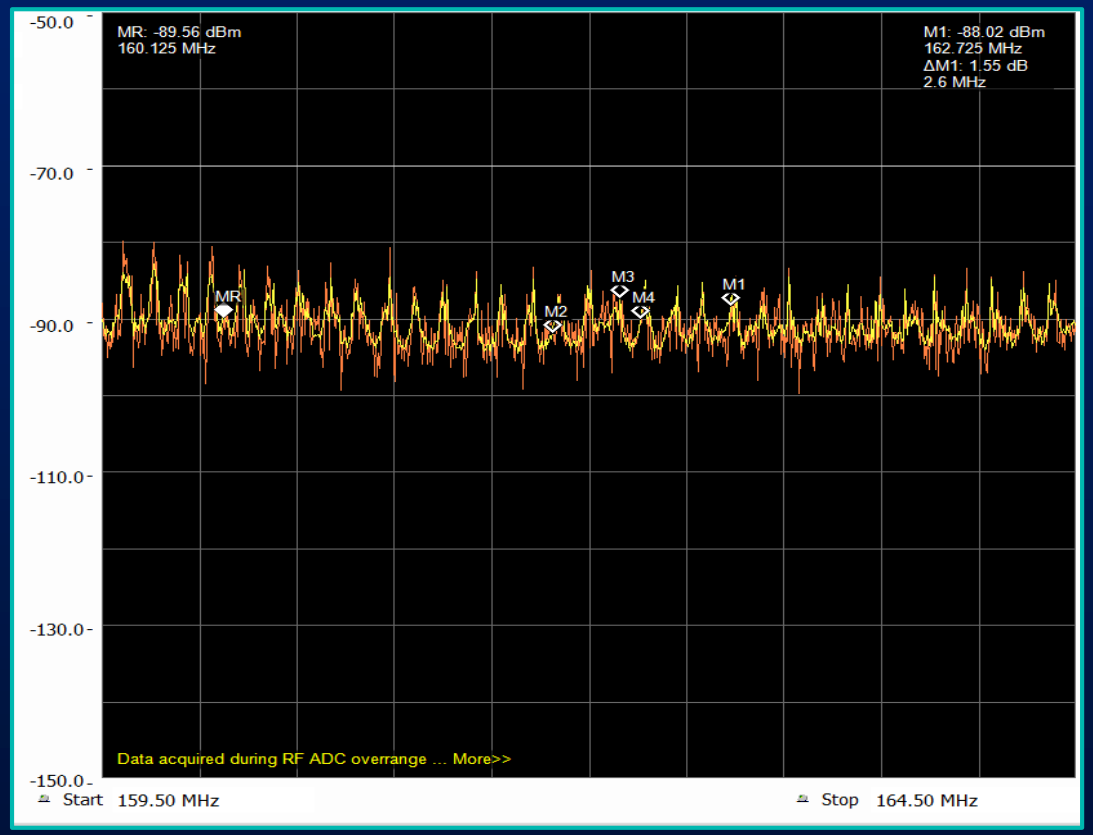
3.3V and 5V Regulators

Performance

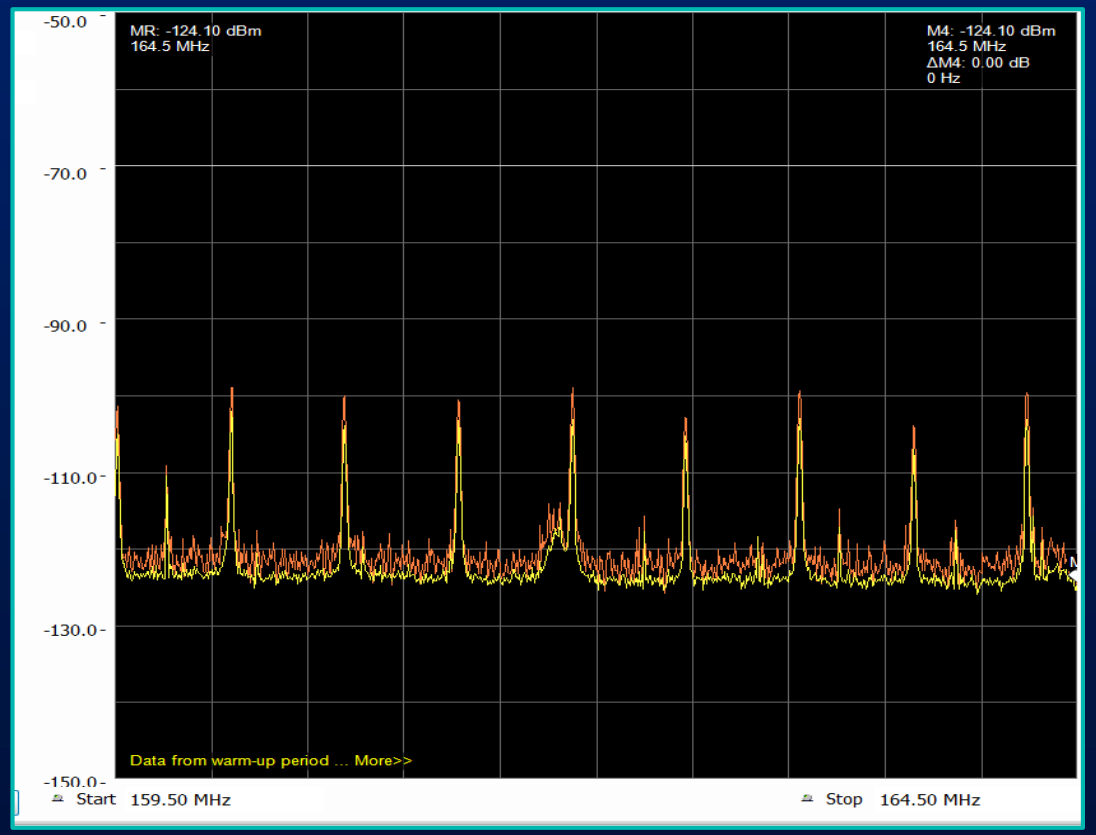
	Output Current (A)	Efficiency (%)	Switching Frequency
BUCK BCR	N/A	87	592.8kHz
3V3 Bus	4.5	Testing ongoing	881kHz
5V Bus	4.5	Testing ongoing	881kHz
BATV Bus	4.5	N/A	N/A
I2C Node	N/A	N/A	20MHz



Preliminary testing results: 162MHz

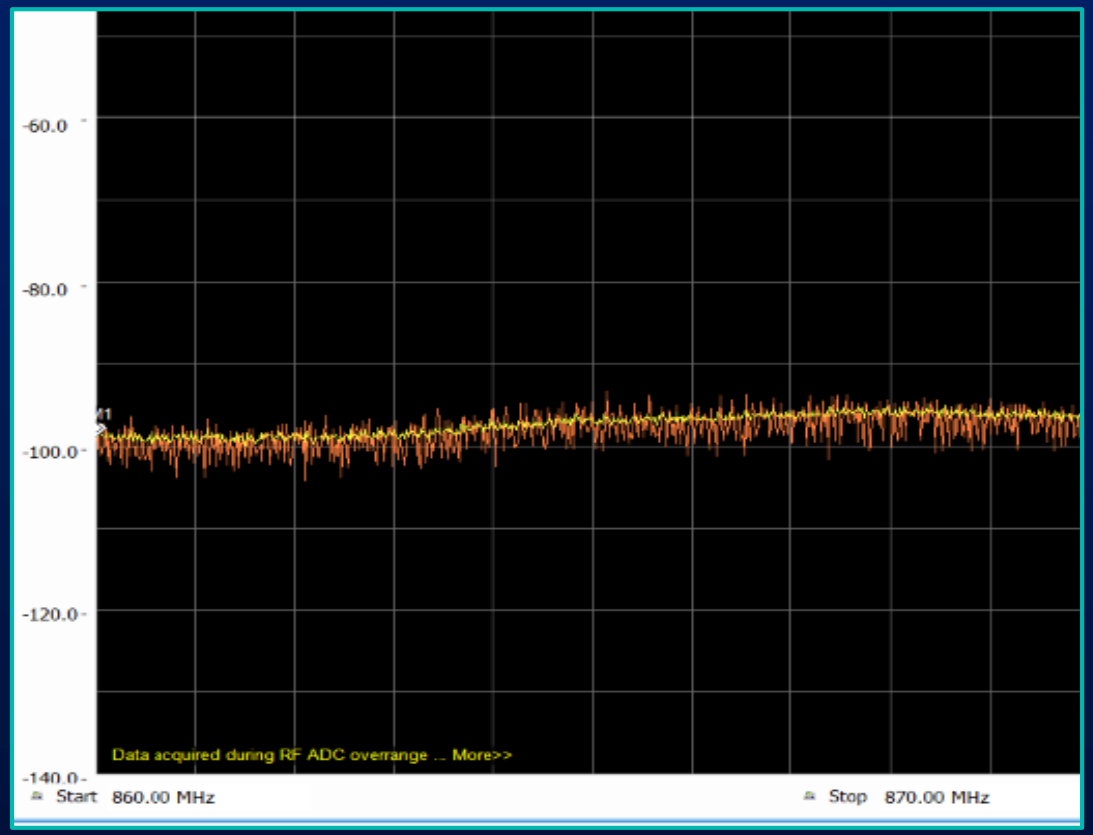


3rd Generation EPS

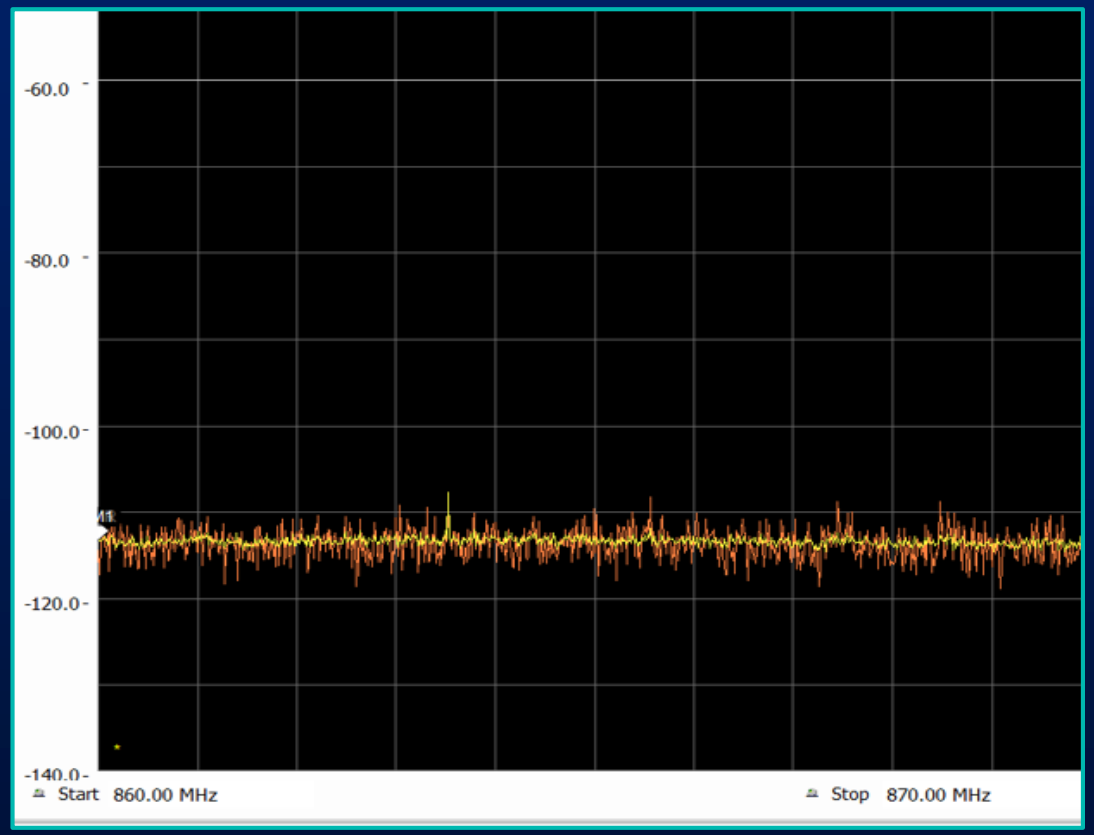


Low-noise Prototype EPS

Preliminary testing results: 865MHz

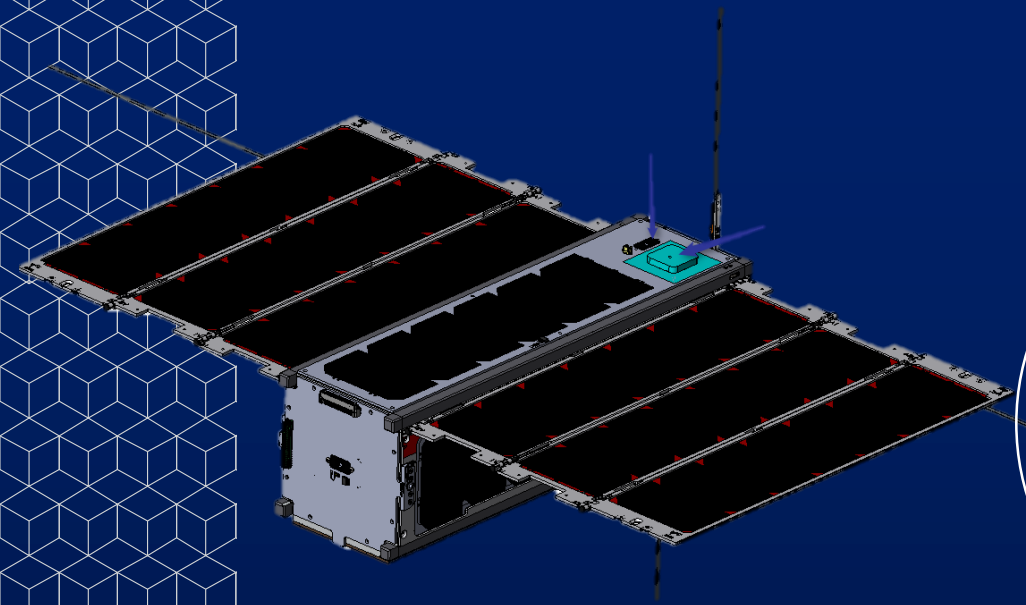


3rd Generation EPS

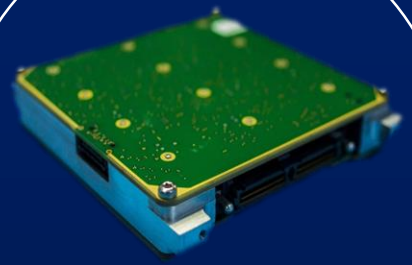


Low-noise Prototype EPS

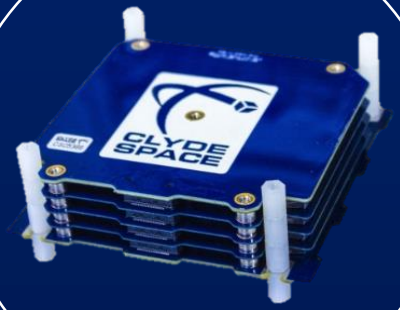
Clyde Space IoT Bus



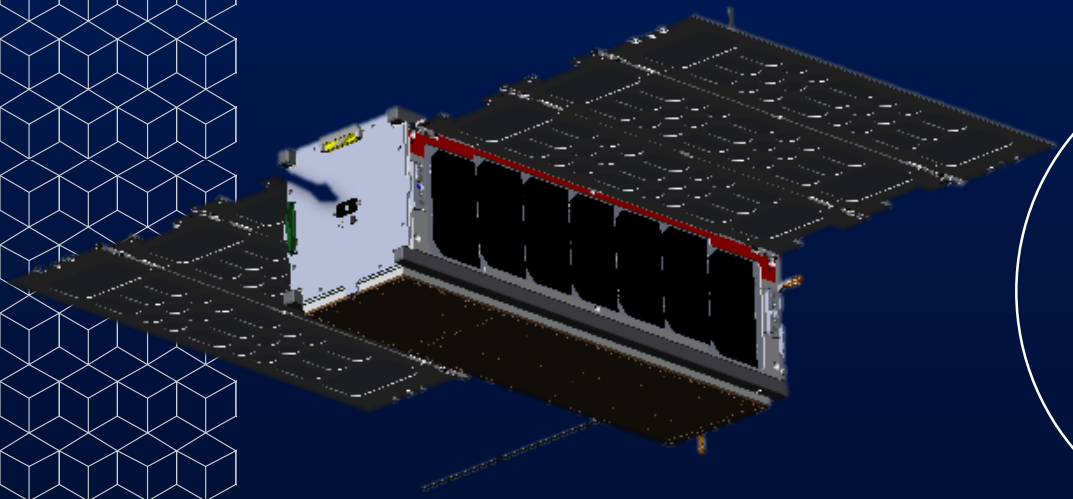
OBC w/ GPS

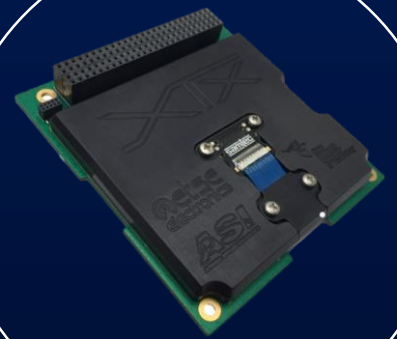


EPS



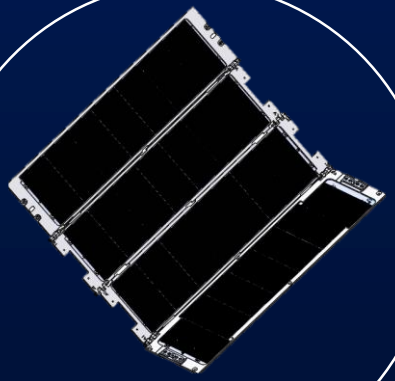
>80Whr





100Mbps

<0.05° ADCS



>50W per 3U

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Thanks for listening....

#SpaceIsAwesome