CurrentRF

DSP Generated Dynamic Power and CubeSat Power System Swap Reduction, with Transceiver Sensitivity Enhancement in Interplanetary Small Satellites

(The CC-100 IC and IP Bypass Capacitor Enhancement)

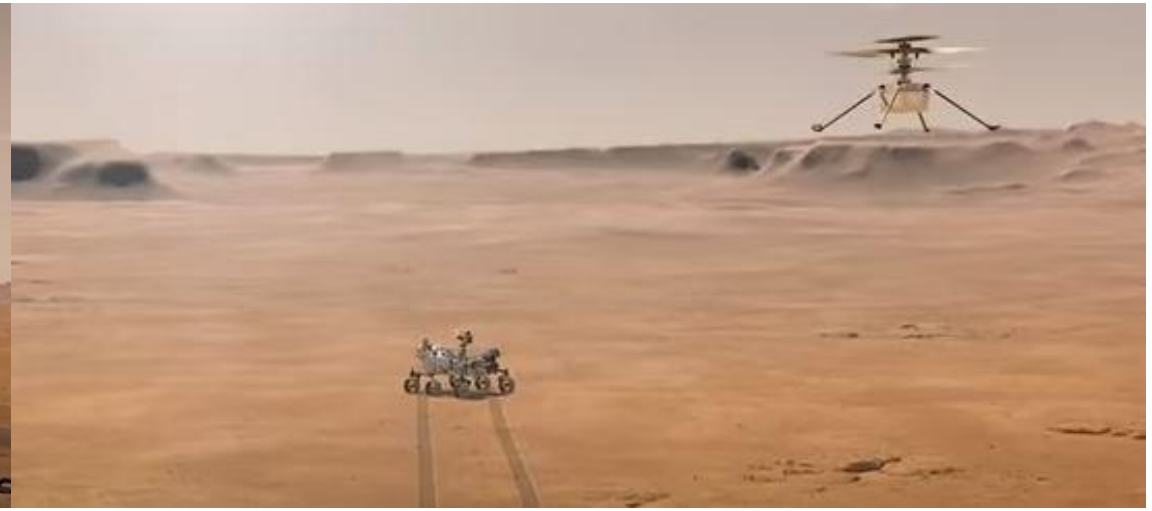
Michael Hopkins
Founder and CEO

The Problem:

ISS CubeSat Embedded DSP and Resultant Motor Drive Power Increases System Dynamic Power Dissipation, Limits Surface Mileage, and Injects High Frequency Noise into Sensitive Analog and RF Systems, Decreasing System Sensitivity

DSP Space Navigation Guidance

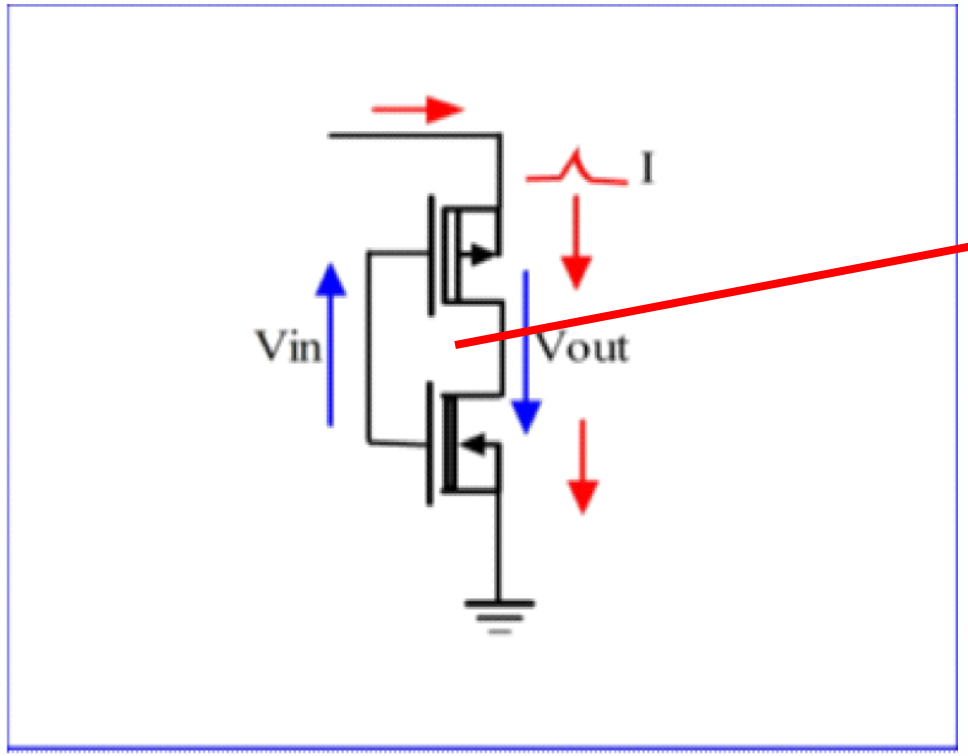
DSP Surface Navigation and Motor Drive Guidance

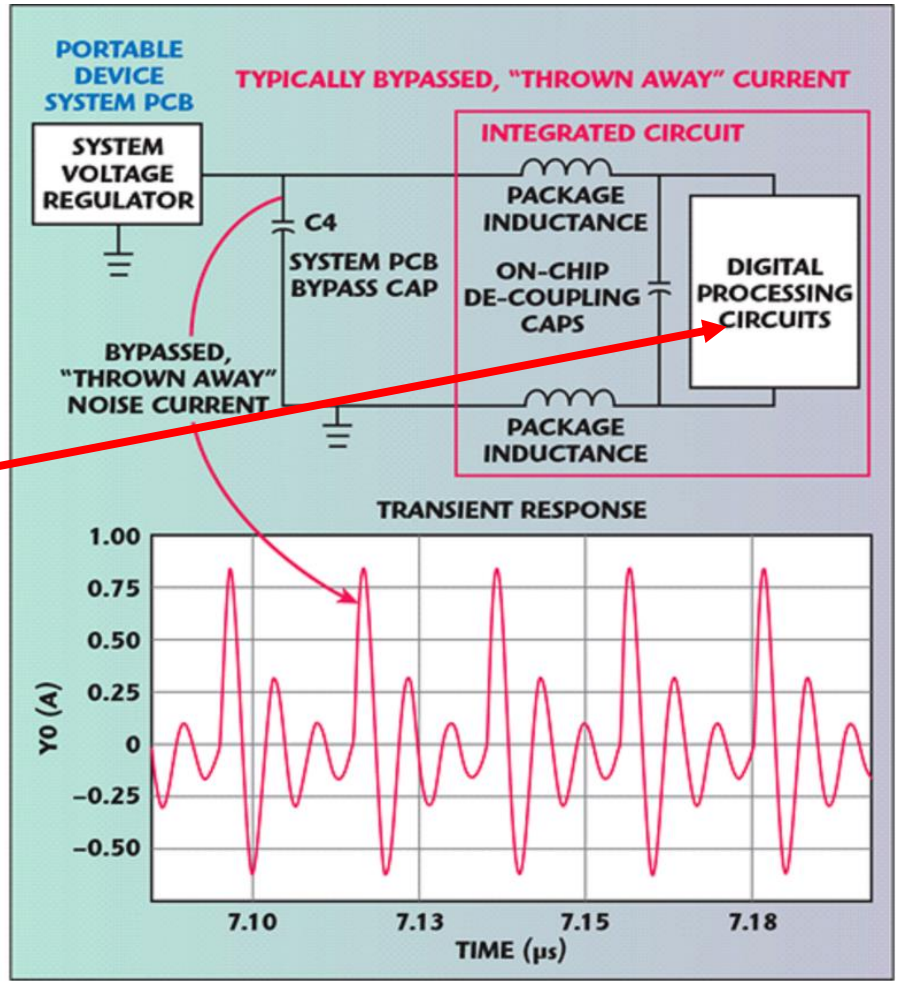


DSP Navigation and Motor Drive Guidance (ie. Integrity Mars Helicopter)

Dynamic Power Dissipation–
What is It and Why is It Important?

CMOS Inverter Based Overlap Current The Primary Source of Digital Power Dissipation





What We Do: Reduction in Dynamic Power

Dynamic Power- The Source of Wasted Energy in CubeSat Systems

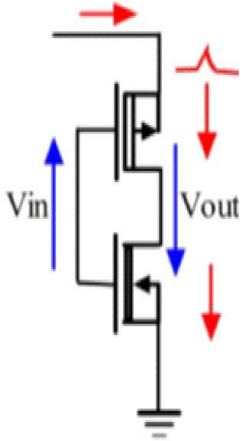
Supply Line without the CC-100 IC

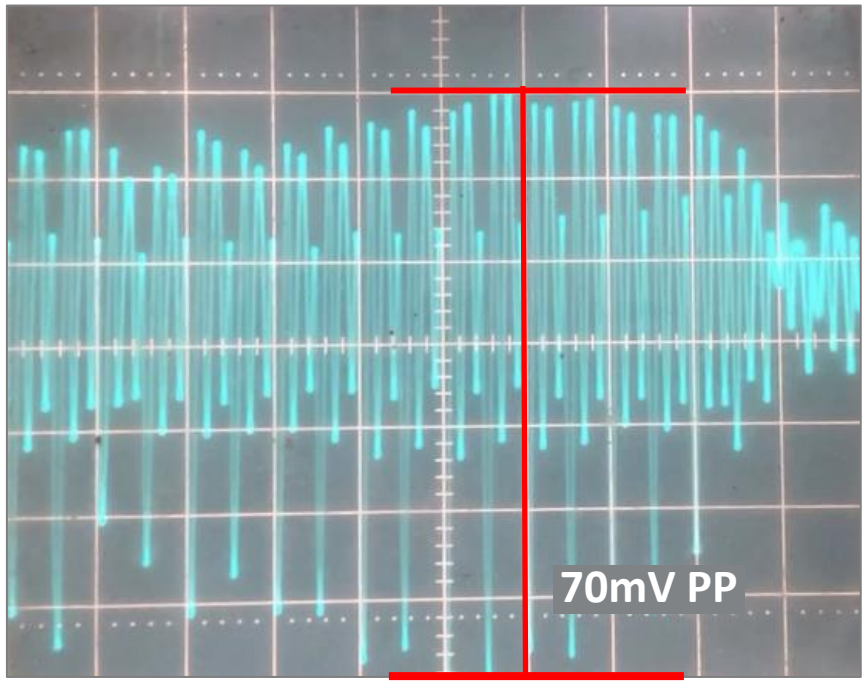
Scope Vertical Deflection-10mV per Division

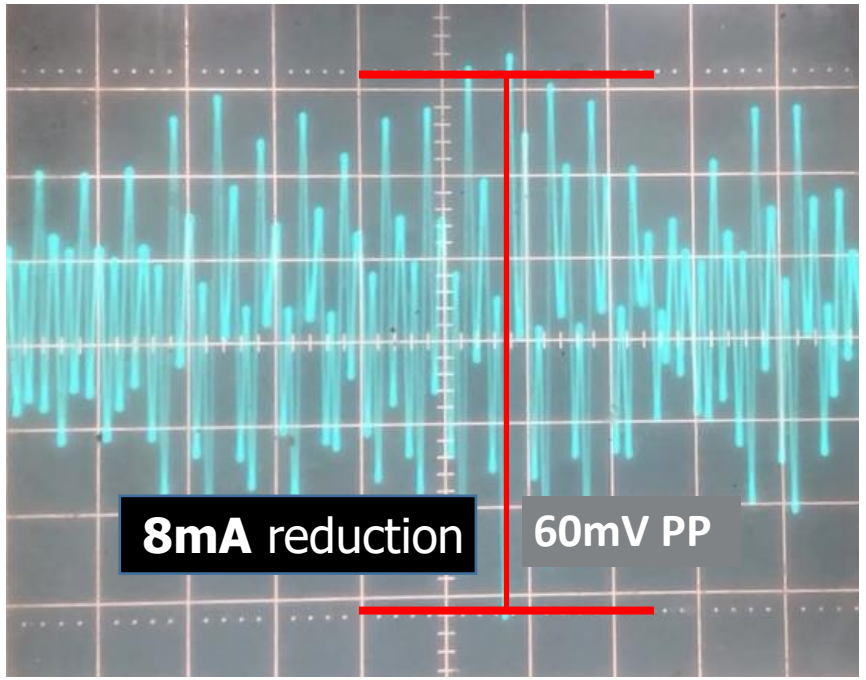
Supply Line with the CC-100 IC

Scope Vertical Deflection-10mV per Division

Voltage Supply Line Time Domain Plots





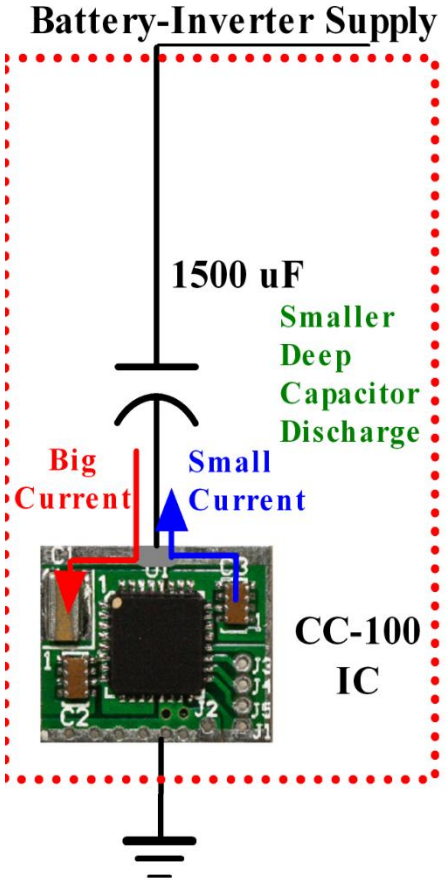


70mVpp – 40mV Average
210mA Supply Current

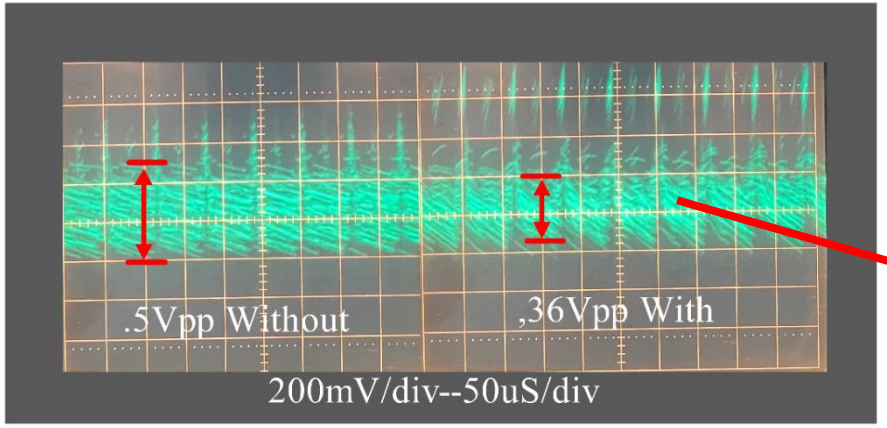
60mVpp – 20mV Average
202mA Supply Current

What We Do: Reduction in Dynamic Power

Dynamic Power- The Source of Wasted Energy in CubeSat System Motor Drives-Limited Mileage

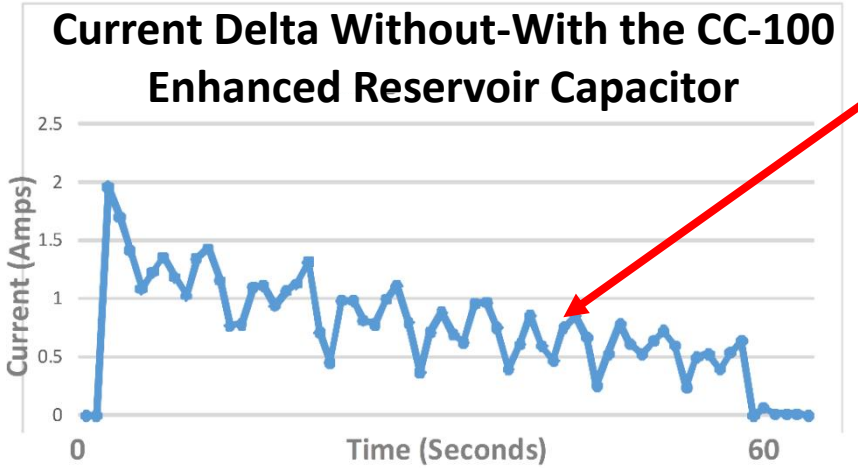


Controller Reservoir/DC-Link Capacitor Ripple Without and With the CC-100 Enhanced Reservoir Capacitor



$$\frac{.5V - .36V}{.1\ Ohm} = \mathbf{1.4A}$$

Average Saved Current

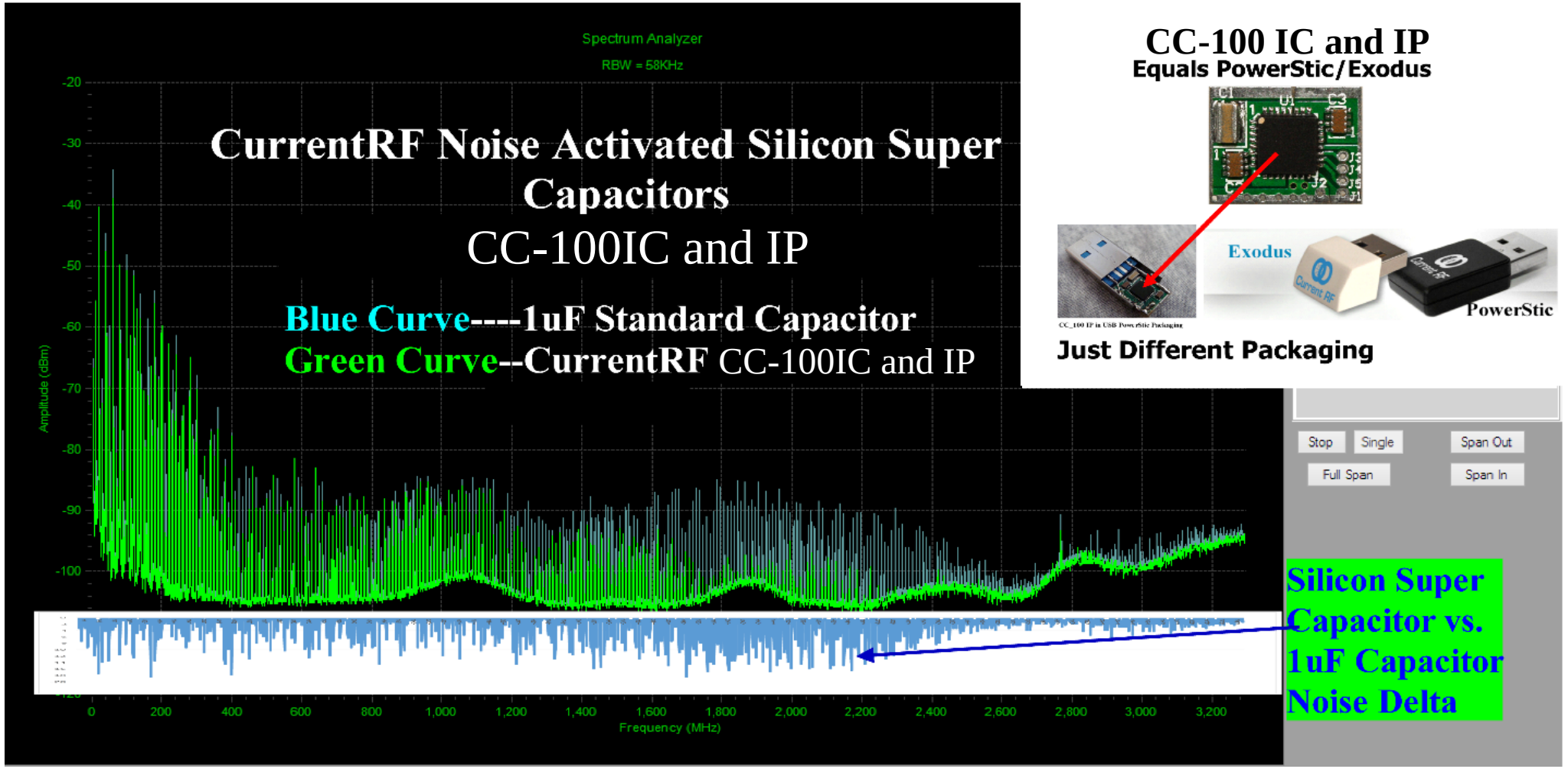


Patent # 10,666,089

What We Do: System RF and Analog Sensitivity Enhancement

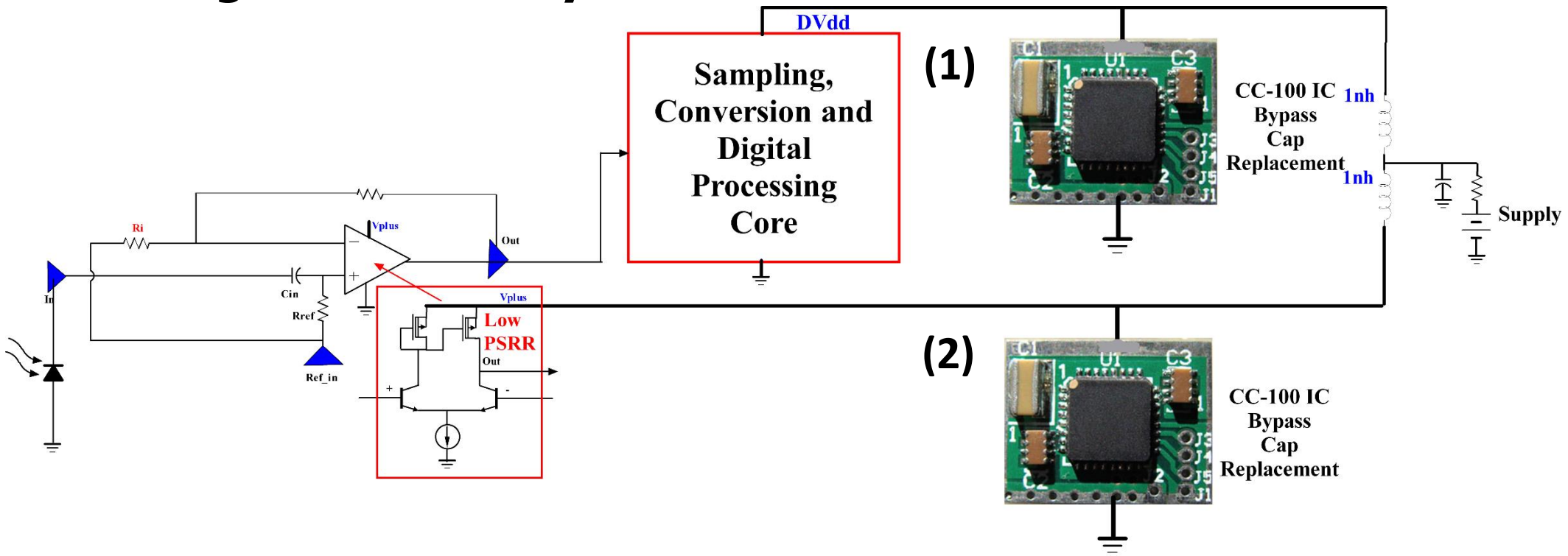
Dynamic Power- The Source of Analog/RF Signal Contamination

Supply Line Spectral Plots



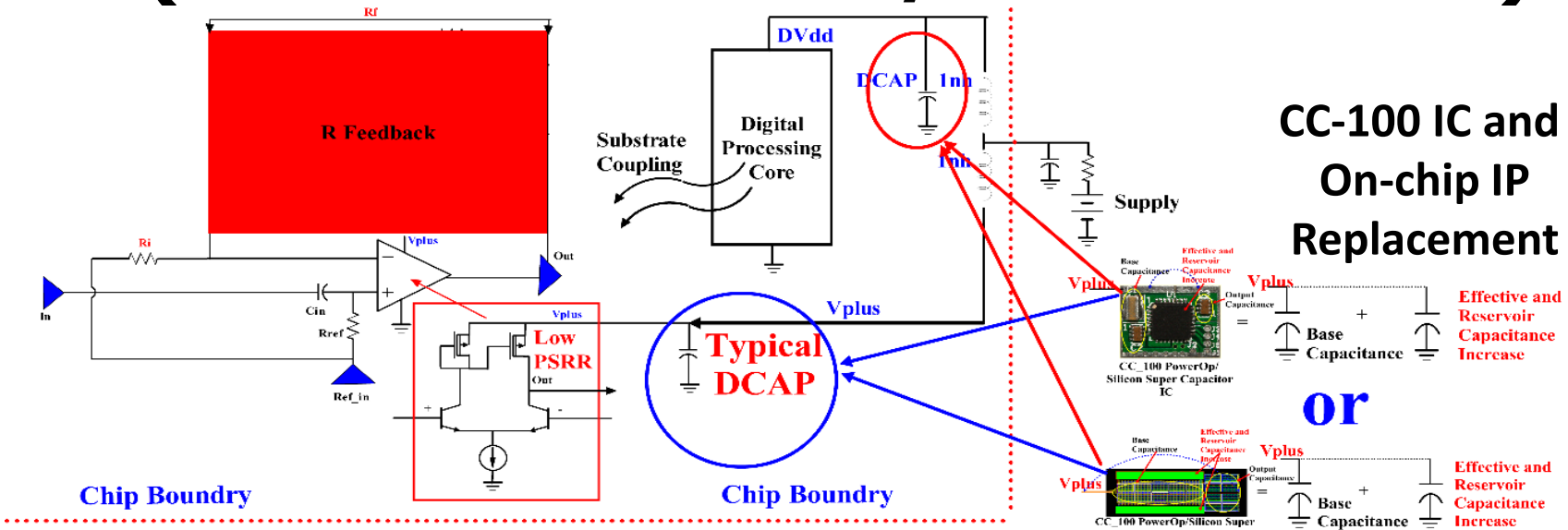
Our Solution: Replace and Enhance System Bypass Caps with Something Better-The CC-100 IC (TRL6)

1) Better Supply Bypassing with a 36% Power Grid SWaP Reduction
2) Enables Higher Sensitivity ISS CubeSat Sensors and Transceivers

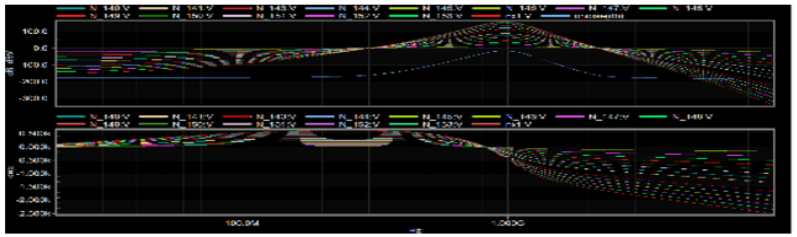


Patent # 10,666,089

Where We Fit: Integration into New ISS CubeSat Systems System Capacitors->CC-100 IC and IP Replacement in Analog/RF Frontends and Digital Systems (Same Form Factor/Size as DCAPs)

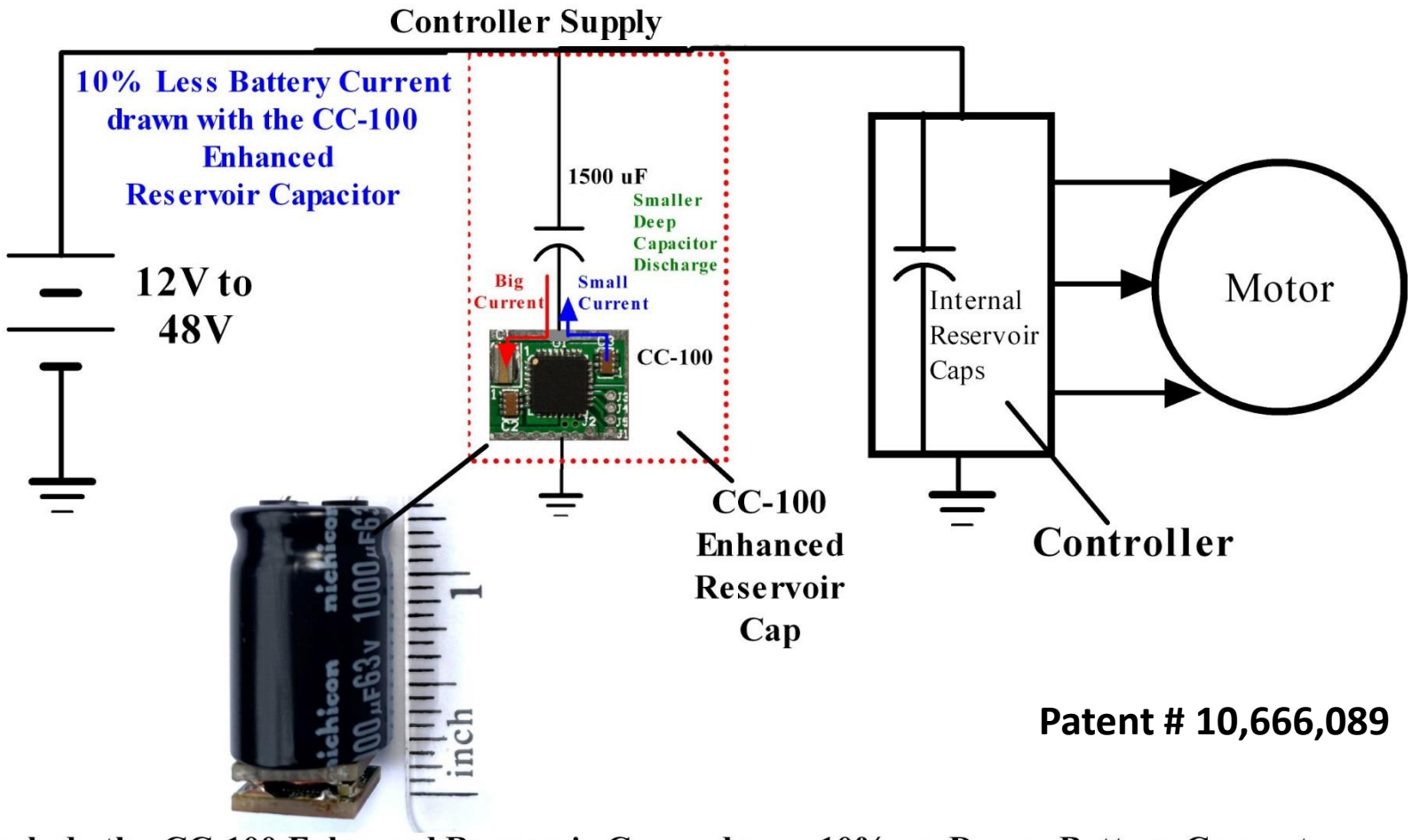


CC-100 IC and On-chip IP Replacement



Patent # 10,666,089

Where We Fit: Integration into New ISS CubeSat Systems
CC-100 Enhanced Reservoir Capacitors (TRL6)
(Same Form Factor/Size as DCAPs)



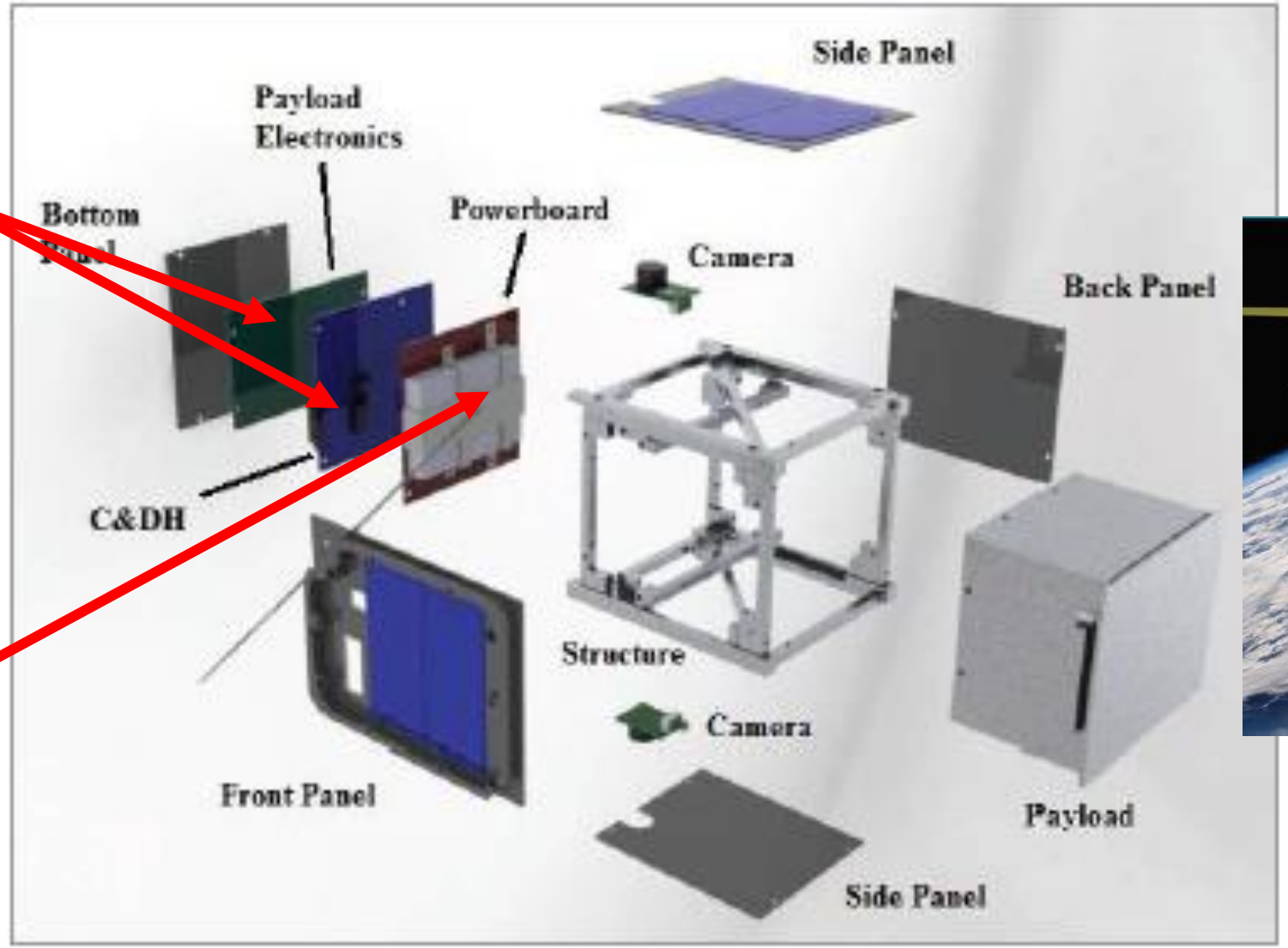
Patent # 10,666,089

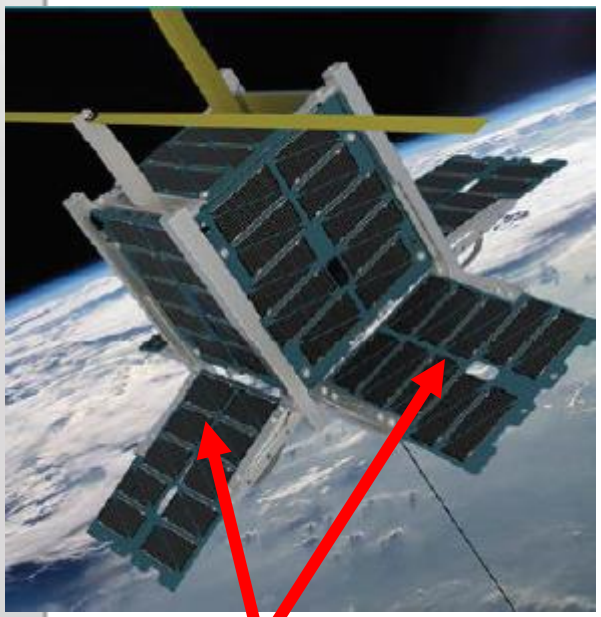
Include the CC-100 Enhanced Reservoir Cap and save 10% on Drawn Battery Current

The Physical Advantages of Using the TRL6 CC-100 IC and IP

Increased RF and Analog Sensor Signal Sensitivity

20% to 36% Reduction In Size, Weight, and Power (SWaP) (Batteries, Solar Panels)





20% to 36% Reduction In SWaP (Solar Panels)

CC-100 IC and IP Tested Performance

Performance-Time Domain Dynamic Power Reduction (10% SWaP Reduction in ISS CubeSats)

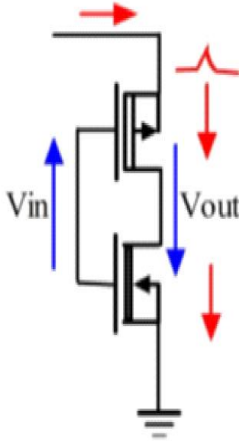
Supply Line without the CC-100 IC

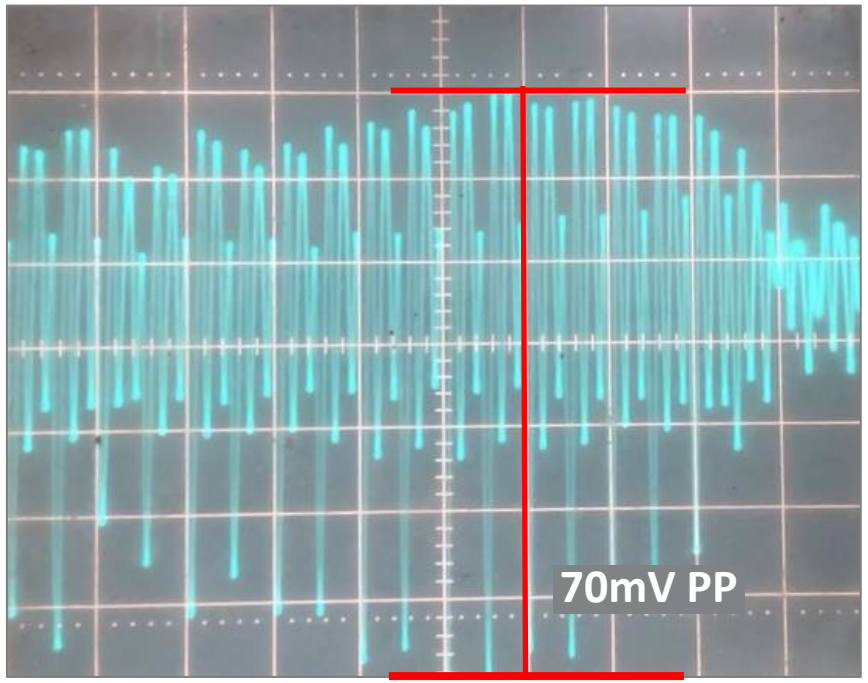
Scope Vertical Deflection-10mV per Division

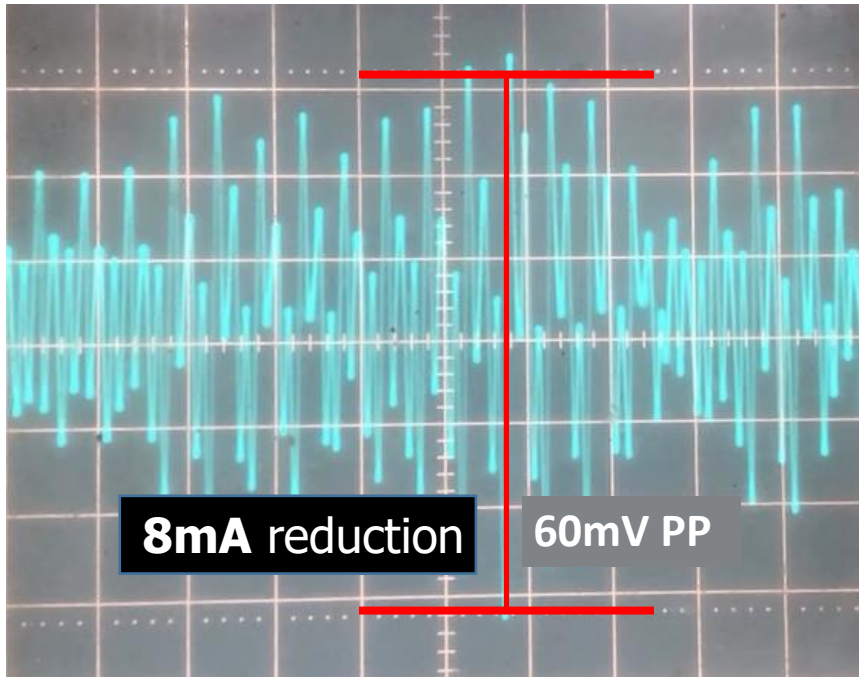
Supply Line with the CC-100 IC

Scope Vertical Deflection-10mV per Division

Voltage Supply Line Time Domain Plots







70mVpp – 40mV Average
210mA Supply Current

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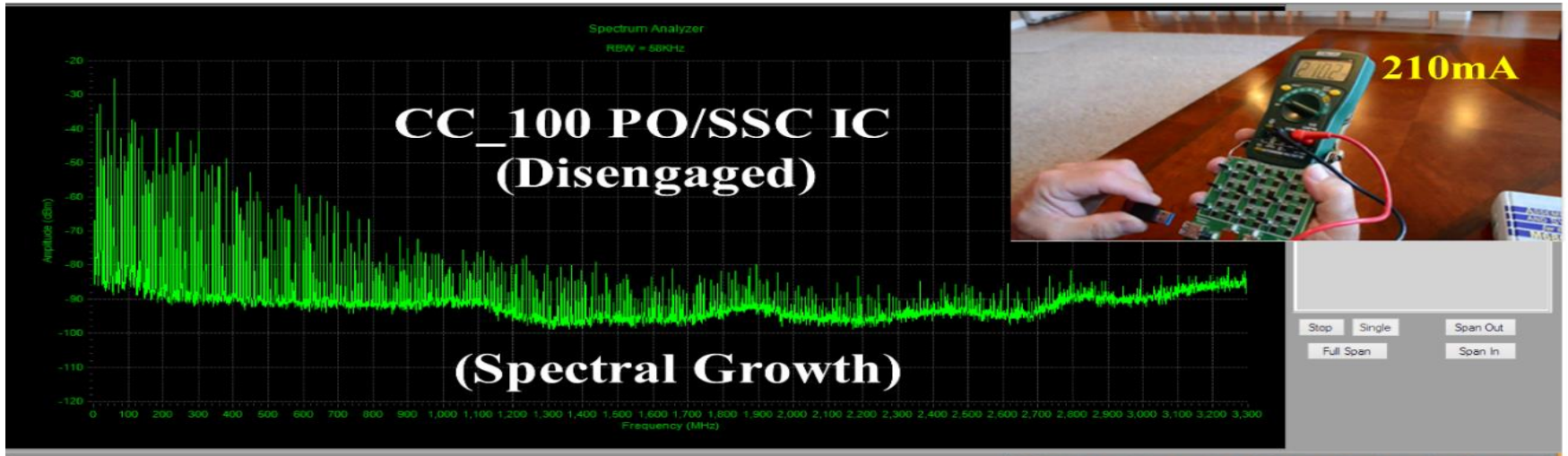
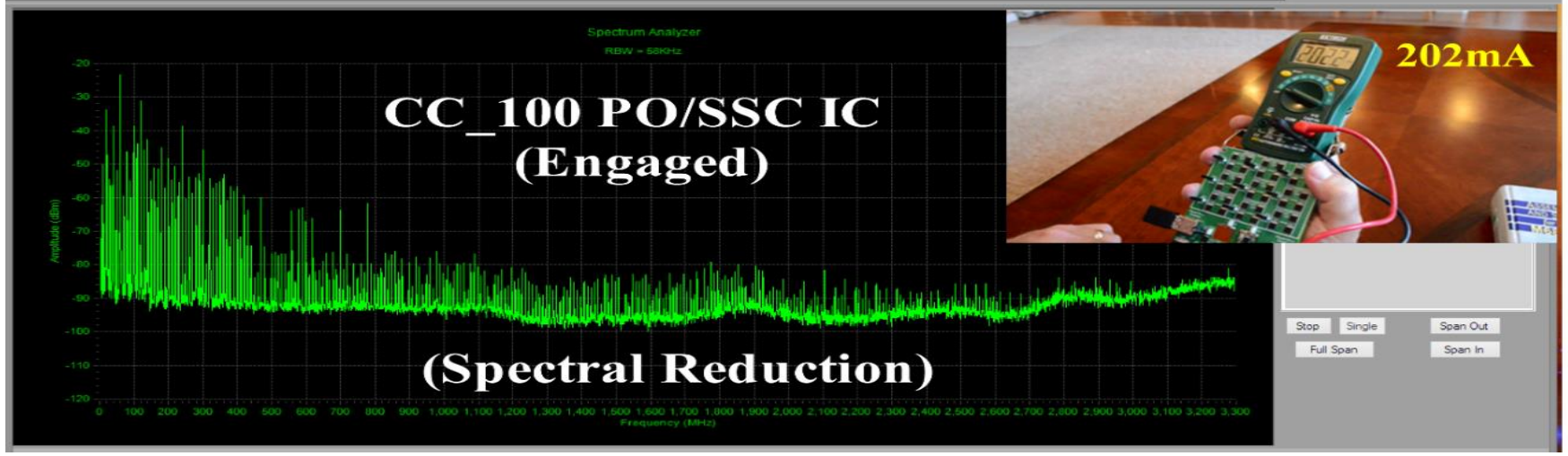
202mA Supply Current

Performance-Dynamic Spectral and DC Power Reduction (10% SWaP Reduction in ISS CubeSats)

Spectral Plot of Dynamic Power Reduction

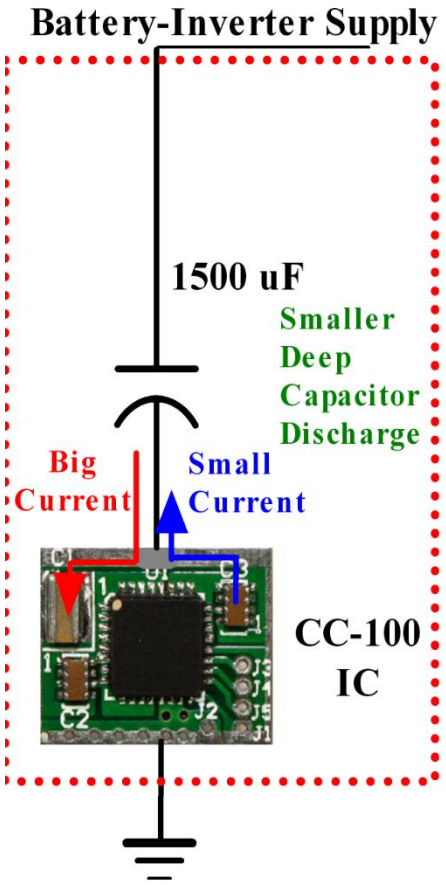
Supply Line Spectral Plots





Performance-Reduction in Dynamic Power

(10% SWaP Reduction in Motor Drive in ISS CubeSats, 10% Surface Mileage Increase)



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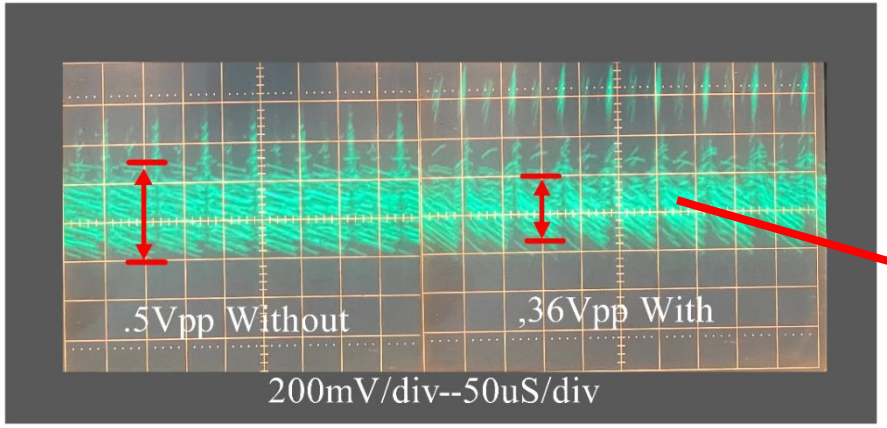
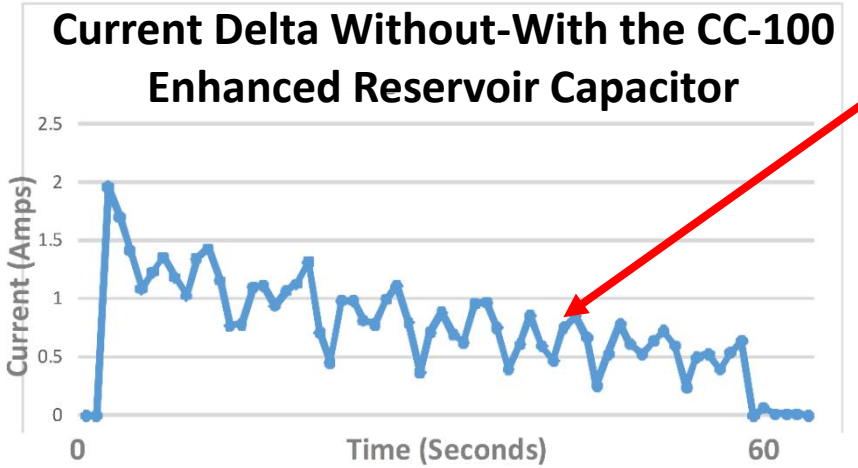


$$\frac{.5V - .36V}{.1\ Ohm} = \mathbf{1.4A}$$

Average Saved Current



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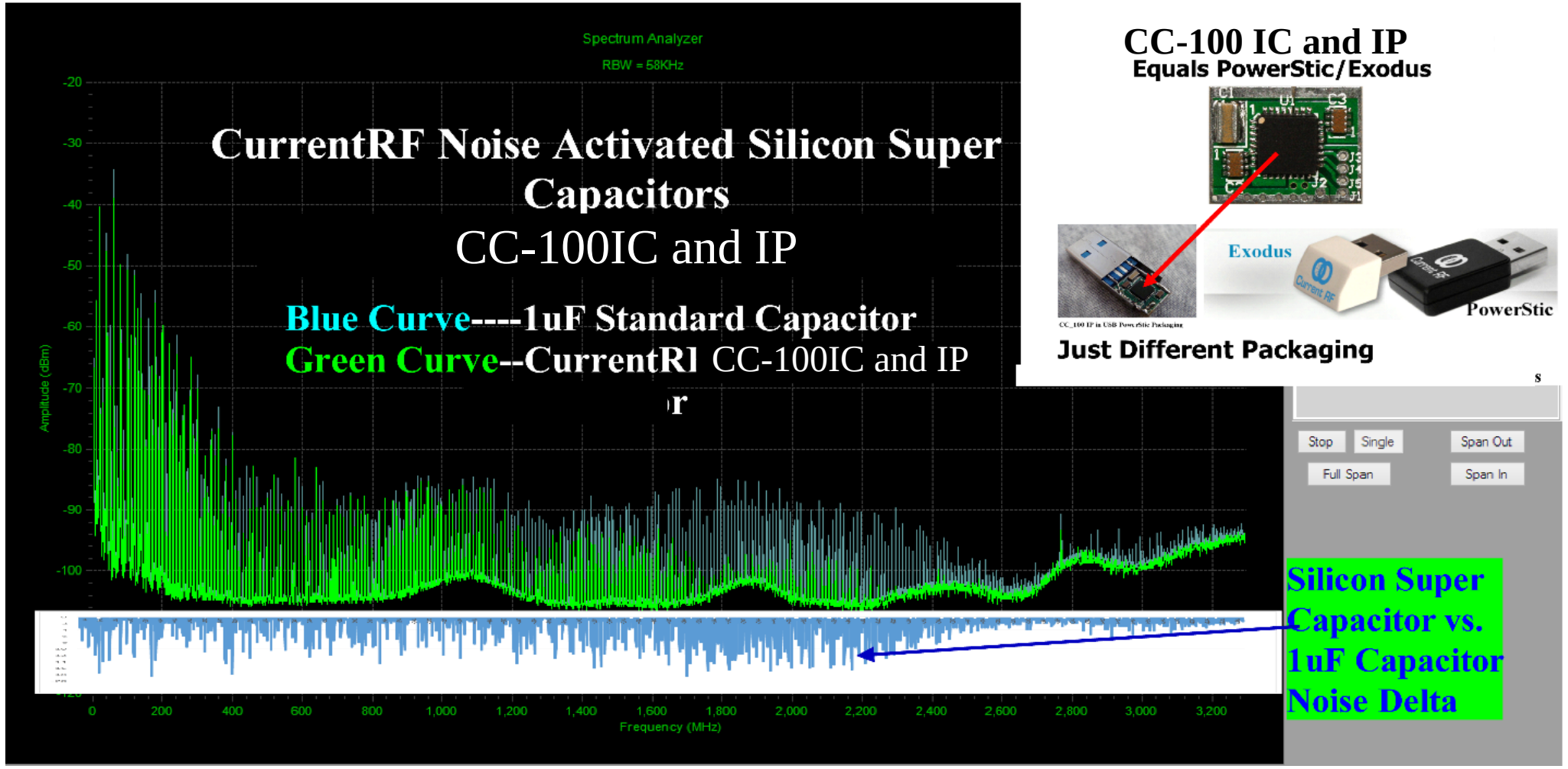
Performance-System RF and Analog Sensitivity Enhancement (A 3dB increase in Analog and RF Frontend Sensitivity)

-143 dBm to -146 dBm RF Front End Increase in Sensitivity

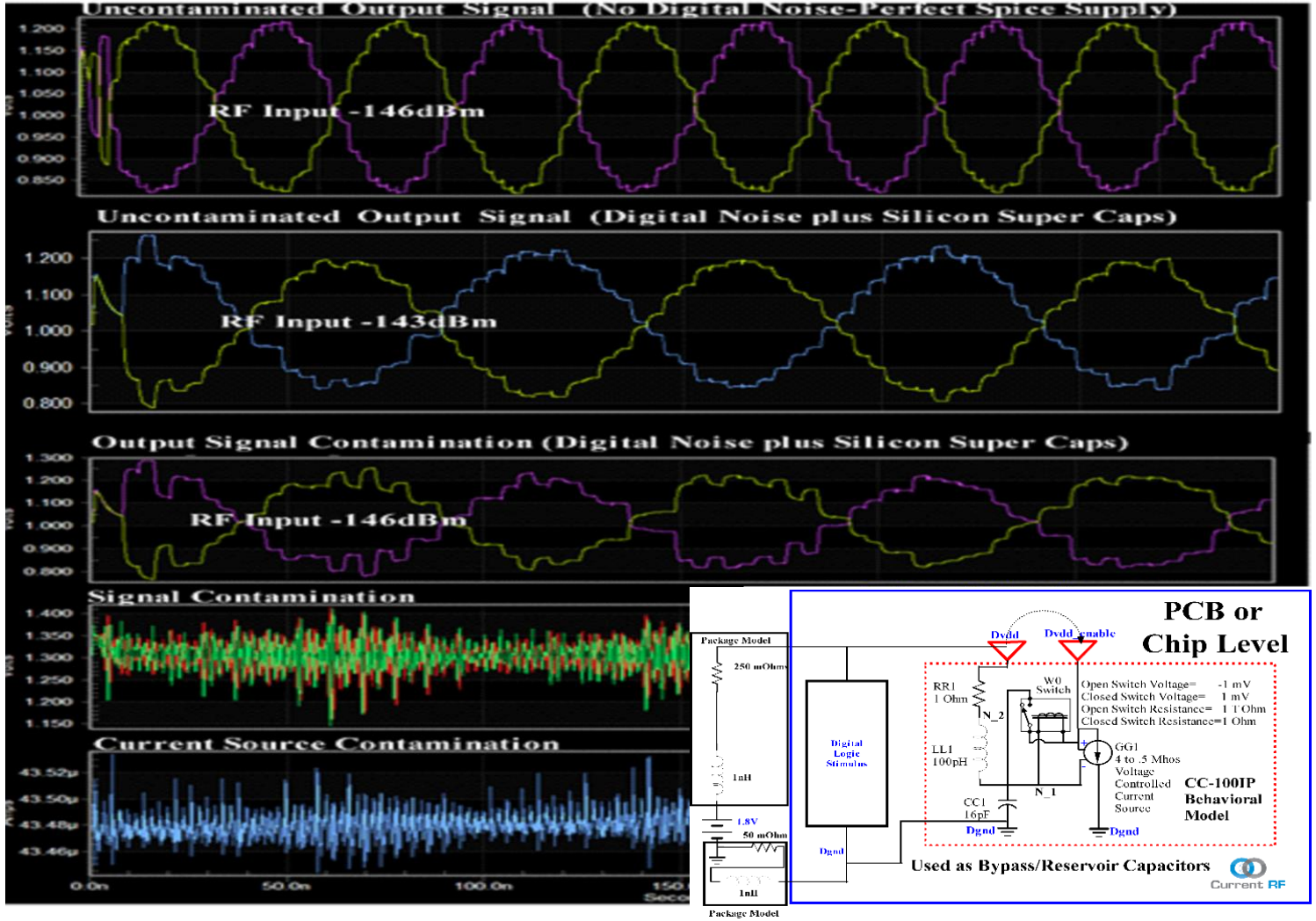
Supply Line Spectral Plots



Performance-System RF and Analog Sensitivity Enhancement (A 3dB increase in Analog and RF Frontend Sensitivity)

-143 dBm to -146 dBm RF Front End Increase in Sensitivity

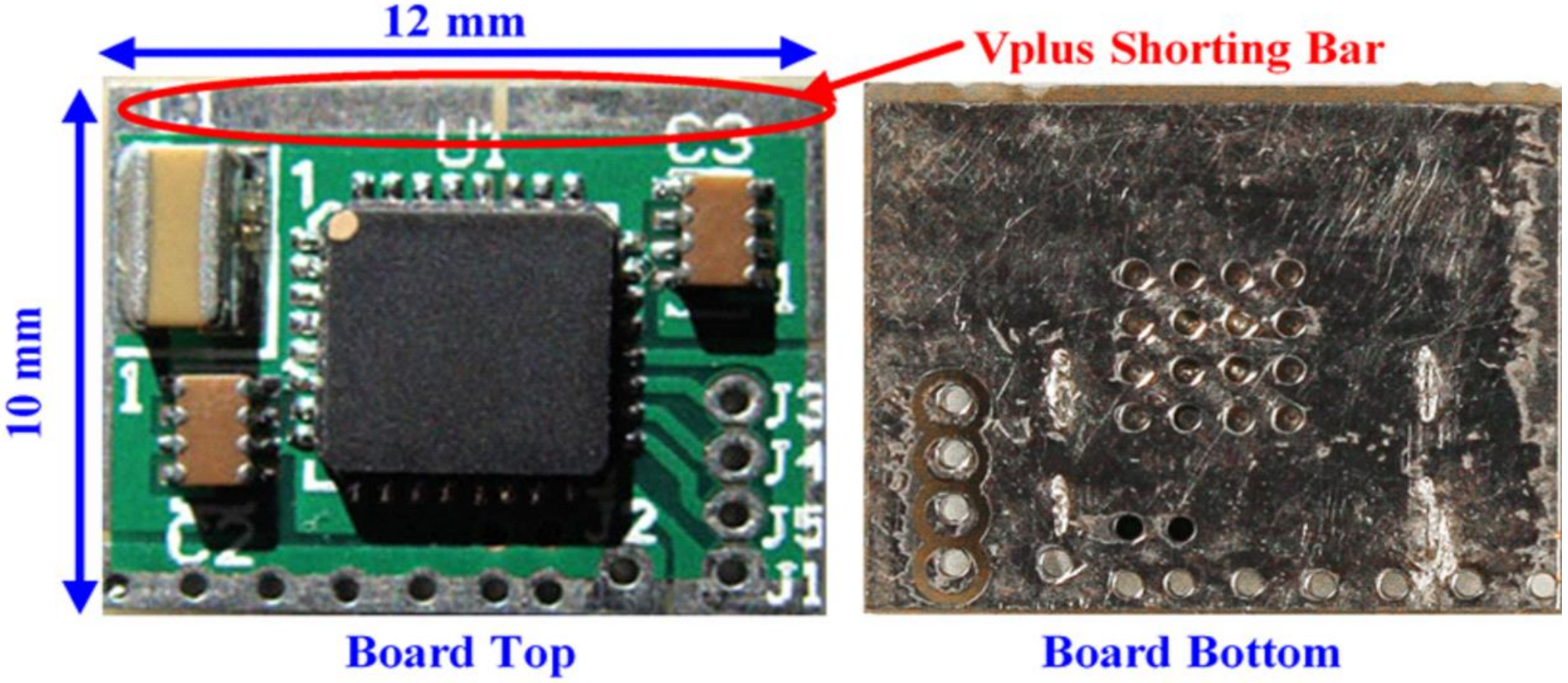
ADC Time Domain Plots



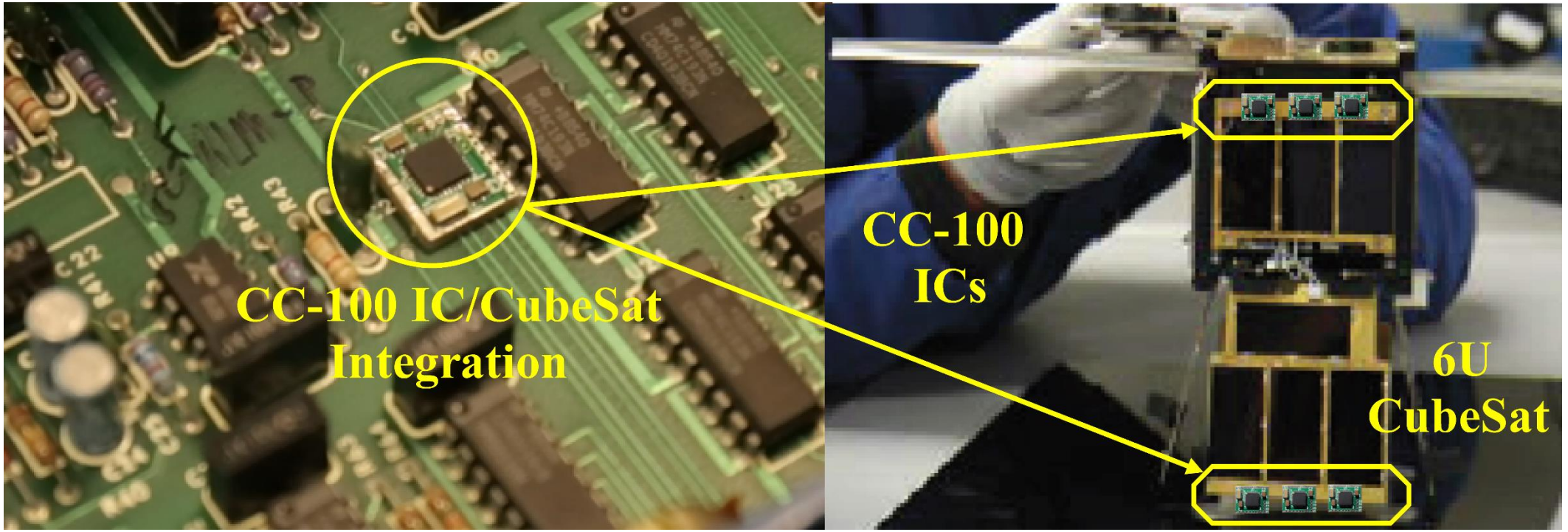
CC-100 IC and IP Ease of Integration

Ease of Integration into Existing ISS CubeSat Designs
The CC-100 IC and Reference Design Module

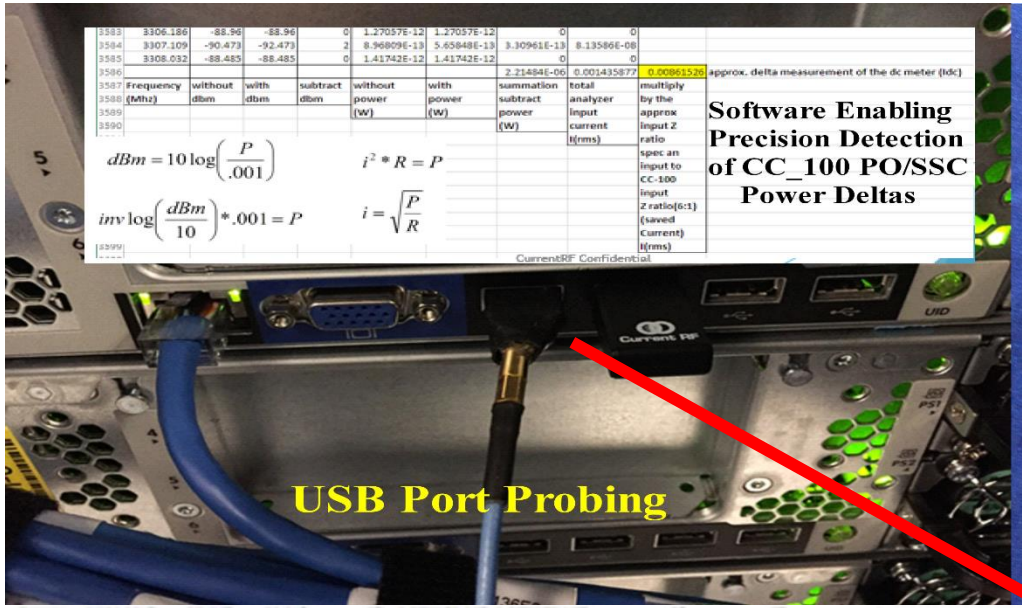
2 Connections- Power (Vplus Shorting Bar) and Ground (Board Bottom onto an existing Ground Plane)

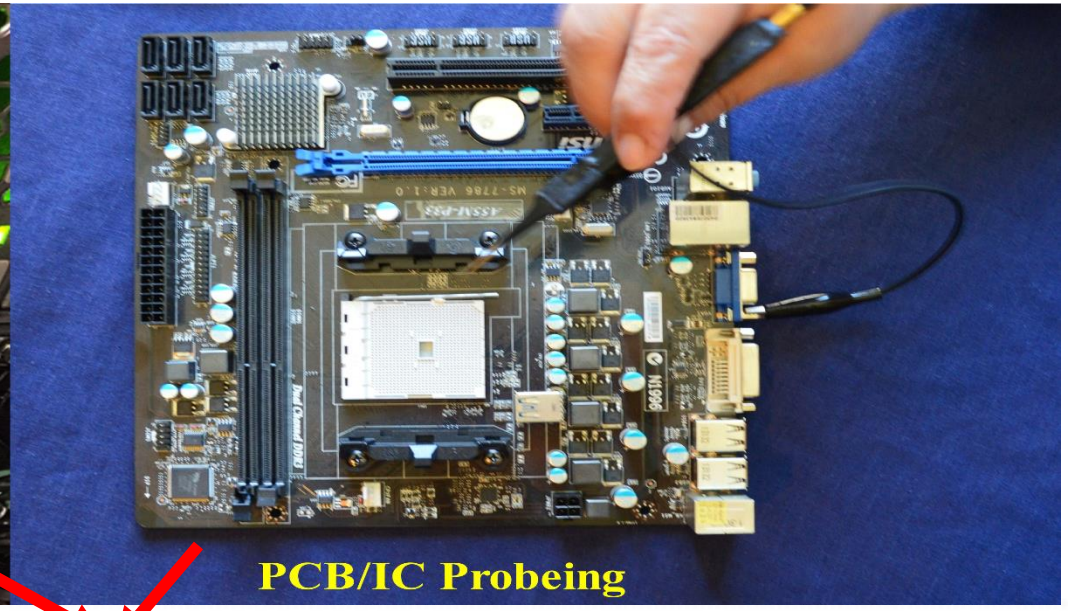


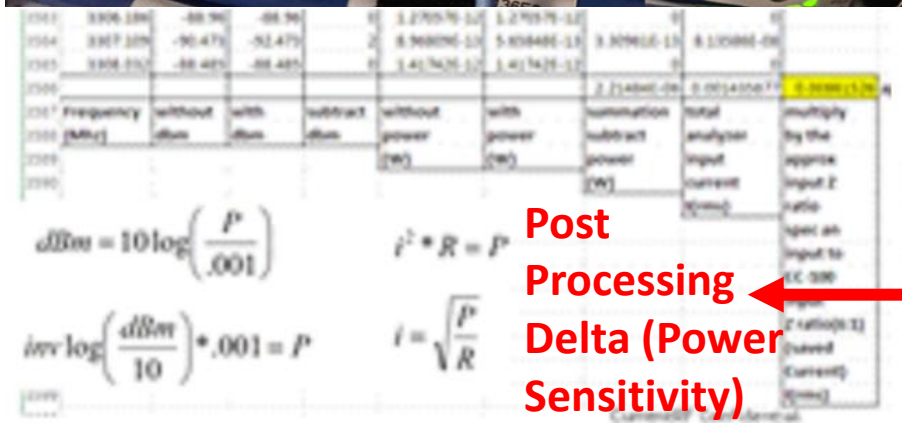
Easy to Integrate into Existing ISS CubeSat Designs
2 Connections- Power and Ground Anywhere in the System

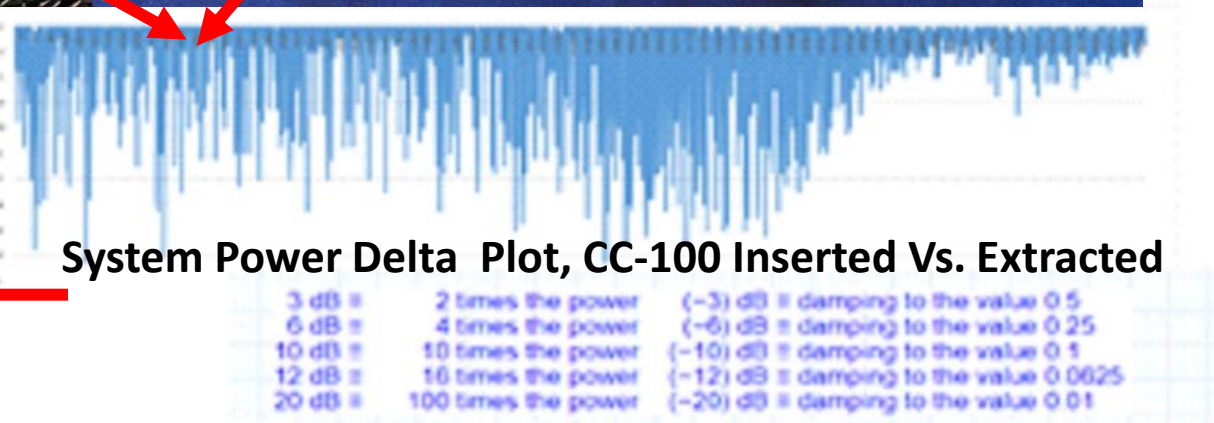


ISS CubeSat Probing & Post Processing Capabilities for CC-100 IC Integration into Existing ISS CubeSat Design & Placement Optimization

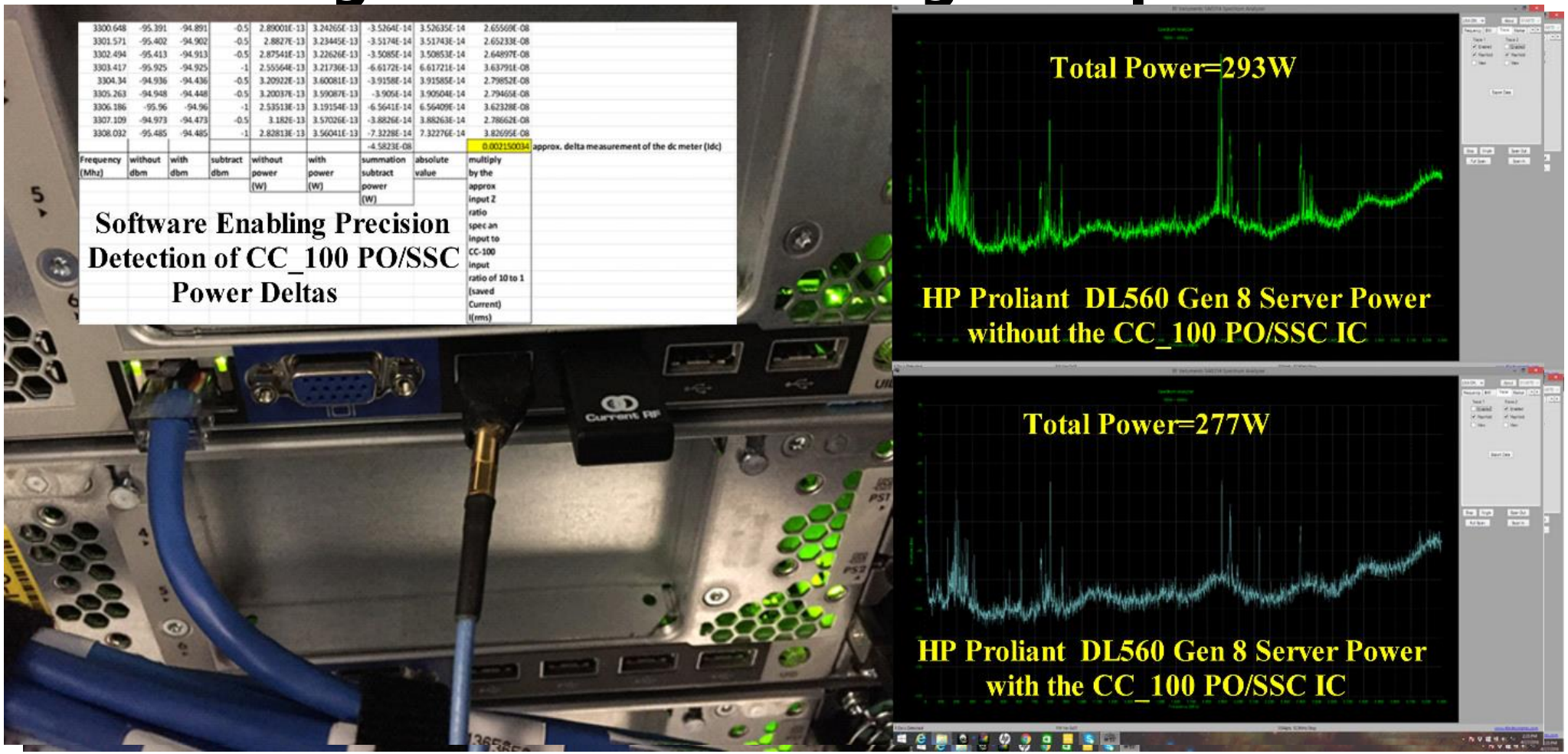






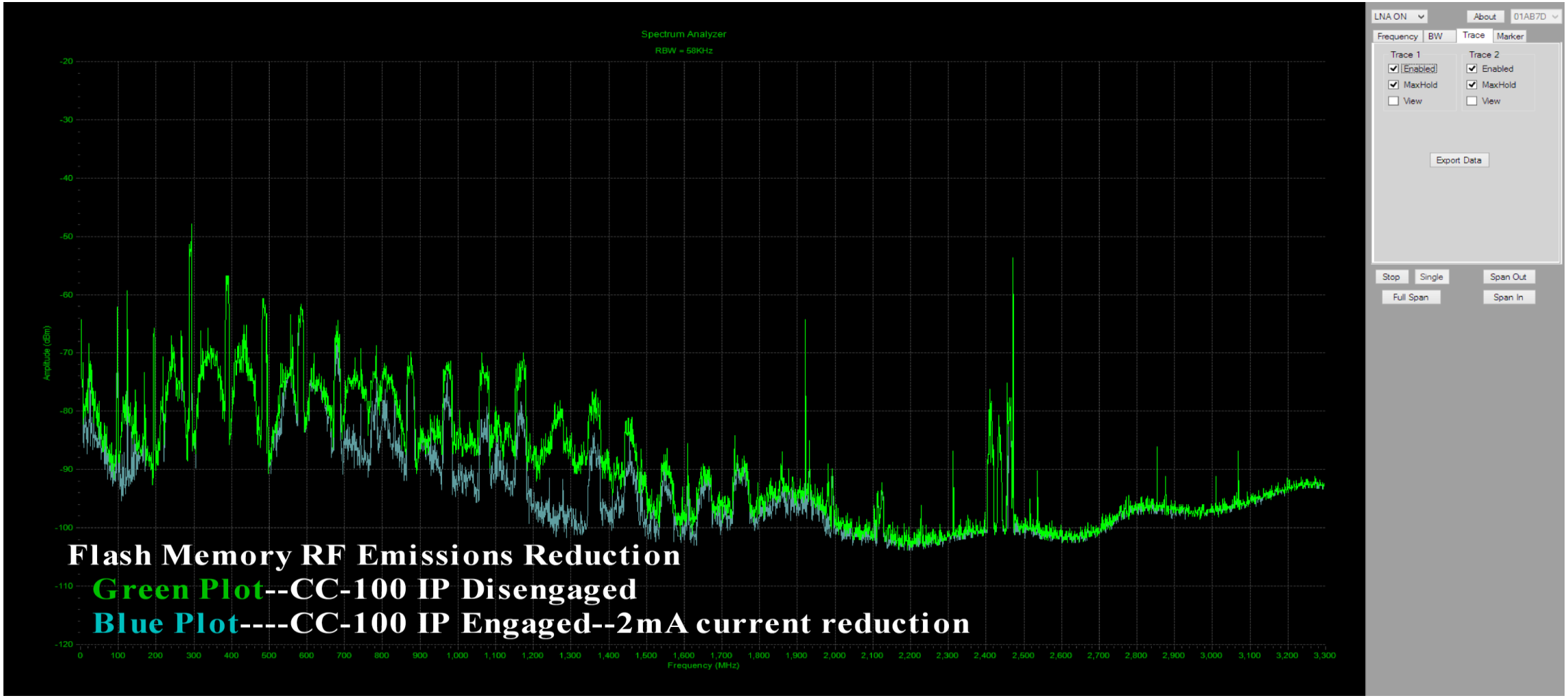


ISS CubeSat Probing & Post Processing Capabilities for CC-100 IC and PowerStic Integration into Existing ISS CubeSat Design & Optimization



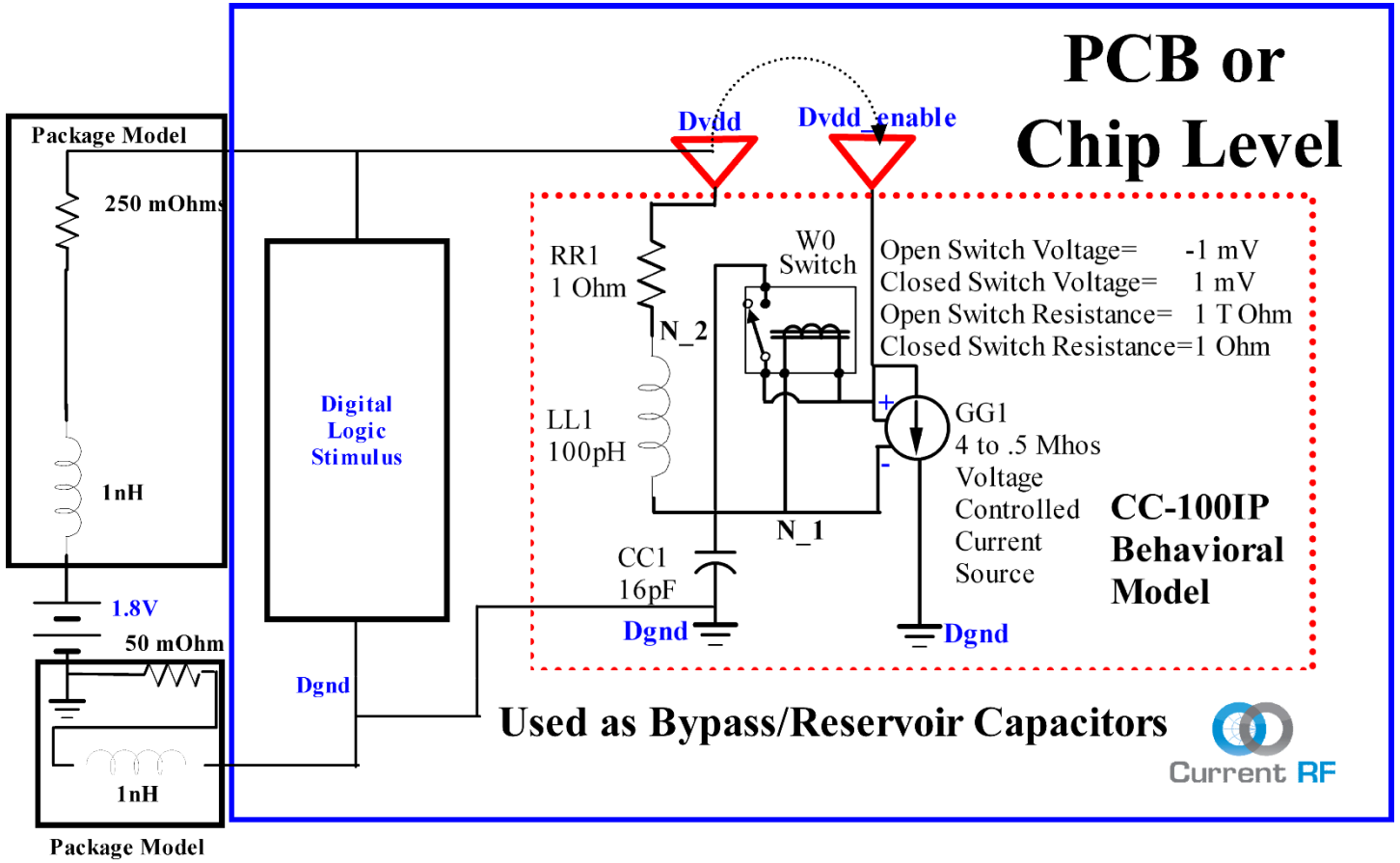
CC-100 IC and IP Integration into New Designs

Integration into New System Designs:
CC-100 IC and IP Flash Memory Power and Emissions Reduction



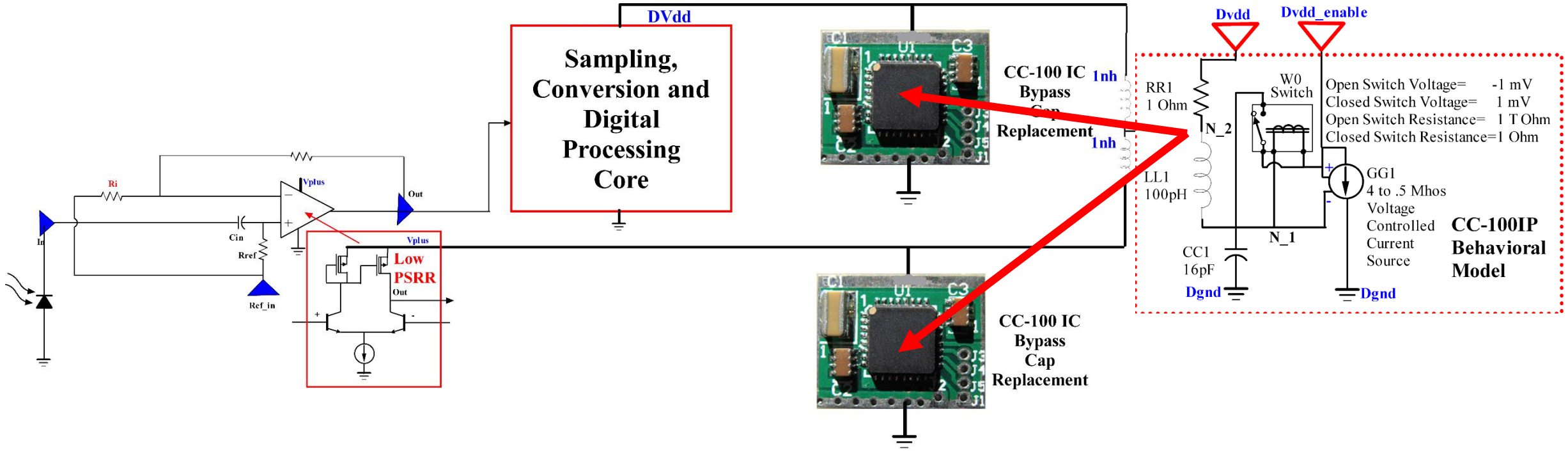
Integration into New ISS CubeSat Designs:

CC-100 IC and IP Behavioral Model and Test Bench for ISS CubeSat Simulation Saving up to 36% in Dynamic Power & Enhancing ISS CubeSat Sensitivity with the CC-100 IC and IP



Integration into New ISS CubeSat Designs:

CC-100 IC Behavioral Model for ISS CubeSat Simulation Saving up to 36% in Dynamic Power and Enhancing ISS CubeSat Sensitivity with the CC-100 ICs



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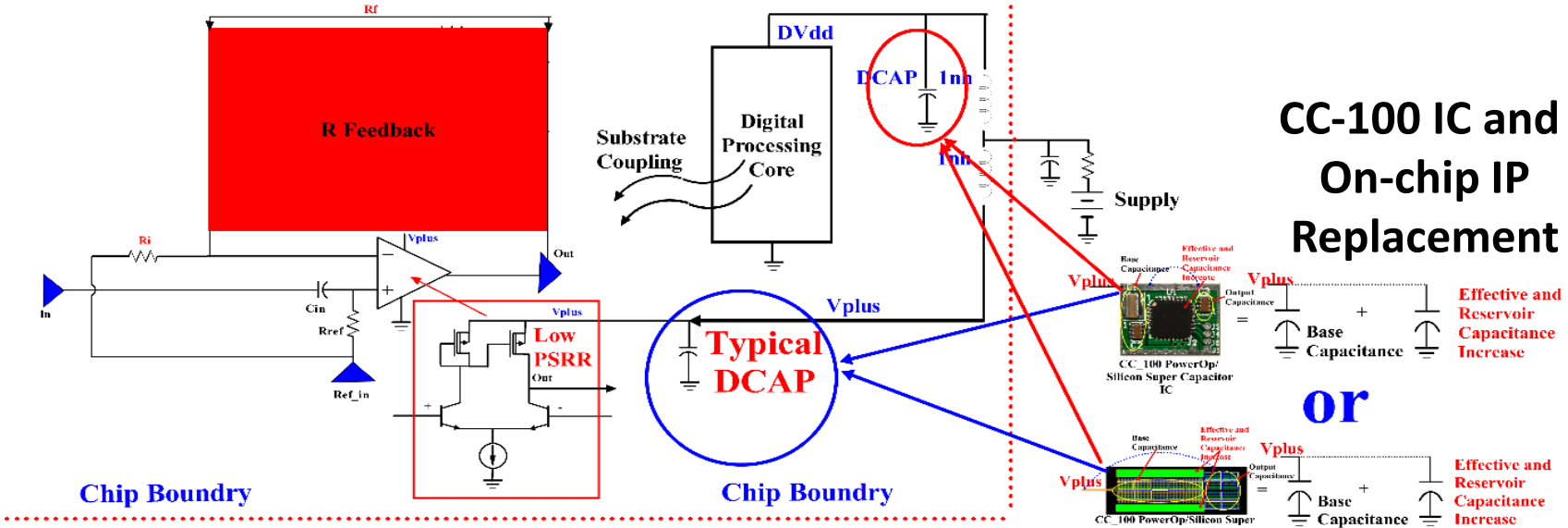
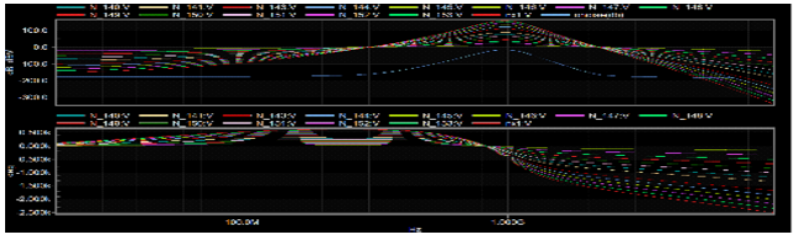
Integration into New ISS CubeSat Designs: System Capacitor->CC-100 IC and IP Replacement (Same Form Factor/Size)





CC-100 IC and On-chip IP Replacement

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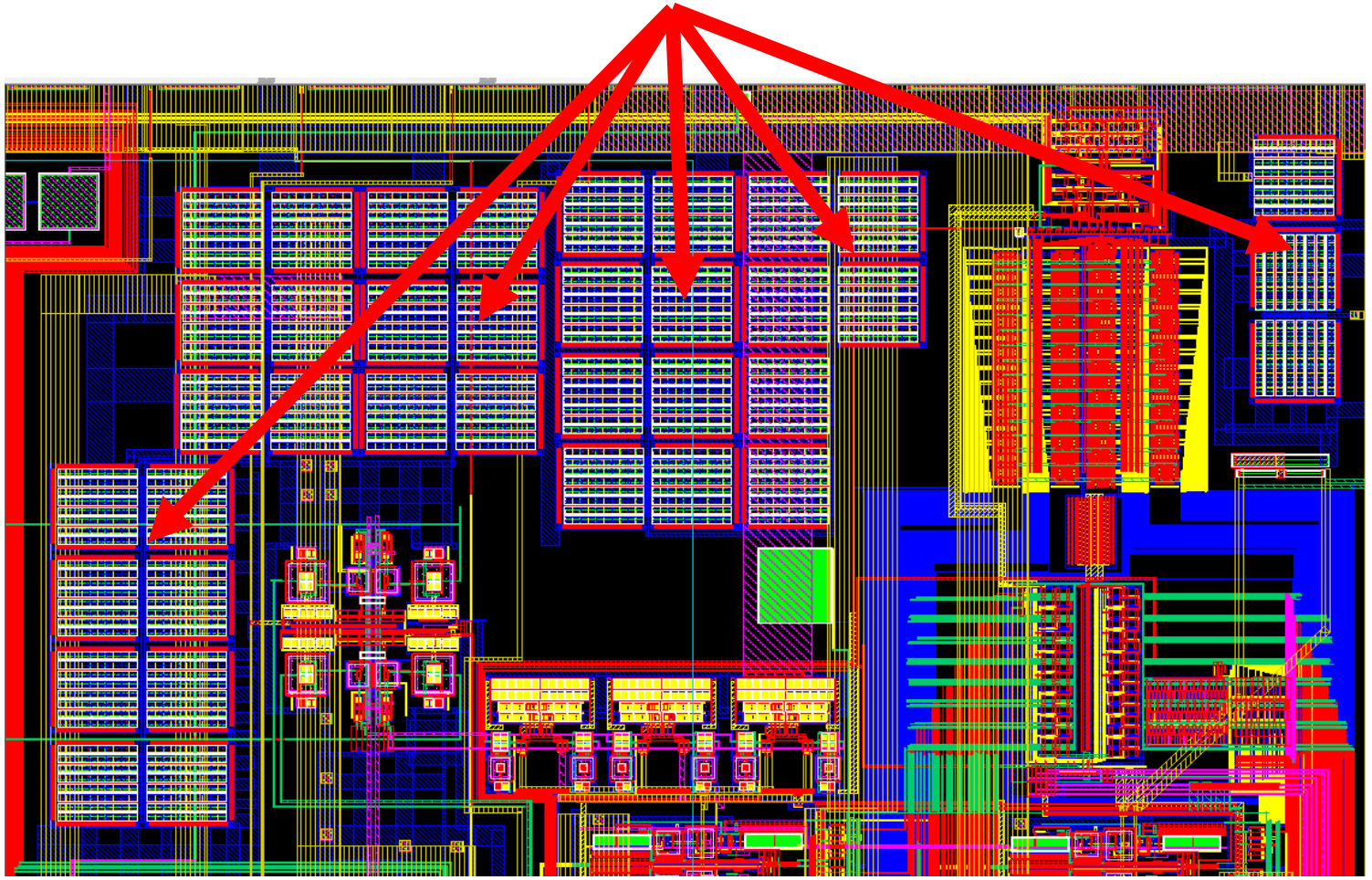
Integration into New ISS CubeSat Designs:
Silicon Super Capacitor->On-Chip DCAP Replacement (Same Form Factor/Size)



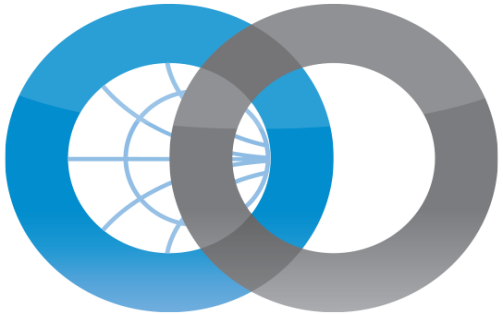
Commercialization Expertise & Strategy

Using a Design Services and IP Strategy Targeted at Both Military and Commercial Entities:

- Promote the use of the CC-100 IC and IP in Power Saving, Mileage Extension, and Sensitivity Enhancement Applications.
- Present the CC-100 IC and IP Power Saving, Mileage Extension, and Sensitivity Enhancement Applications at Trade Shows and Conferences.
- Promote and Design the CC-100 IC Devices into PCB efforts at the System Level (CubeSats, etc.).
- Promote and Design the CC-100 IP and IP Devices into IC efforts at the Integrated Circuit Level.

CurrentRF Logistics

- Key Personnel:
- Mr. Michael Hopkins: PI and CurrentRF CEO
- Ms. Tami Hopkins: CurrentRF CFO
- Dr. Peter Gize: PhD Advisor and Sales/Marketing
- Mr. Jonathan Hopkins: IT Manager– CurrentRF
- Ms. Savannah Hopkins: Media Specialist—CurrentRF
- MidStreet Marketing: Sales and Marketing
- No Foreign Citizens
- No Sub-Contractors/Consultants
- No Prior, Present, or Pending Support
- Facilities: Office, Development, and Testing Facilities—Huntington Beach, Ca.



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