

UCIRC3 Update

S. Meyer 2025/06/05

Summary

- Current
 - Instrument is physically complete. It is running a current version of the software.
 - Software version is currently modified to operate the thermovac system as well.
 - Instrument is in Thermovac at 0C at 1 atm.
 - Thermovac system will run at -20C continuously. Colder temperatures will be tested with short LN2 runs.
 - RF test show unacceptable EMI emission related to the power cable. New shielded cable in construction.
- Next 3 months
 - +20 to -20C thermal tests.
 - RF tests with new cables
 - Thermovac test and first full calibration run
 - Implement 3rd ethernet adapter
- Fall + winter '25
 - Analysis of calibration runs.
 - Further full calibration runs.

Cameras and Electronics Mounts

Electronics assembly includes: CPU, thermal controller, PDU, cooler pump and electronics, LAN hub.

Electronics assembly including liquid heat exchanger.

Heating resistor for fine thermal control.

Aluminum camera mount with liquid cooling channels.

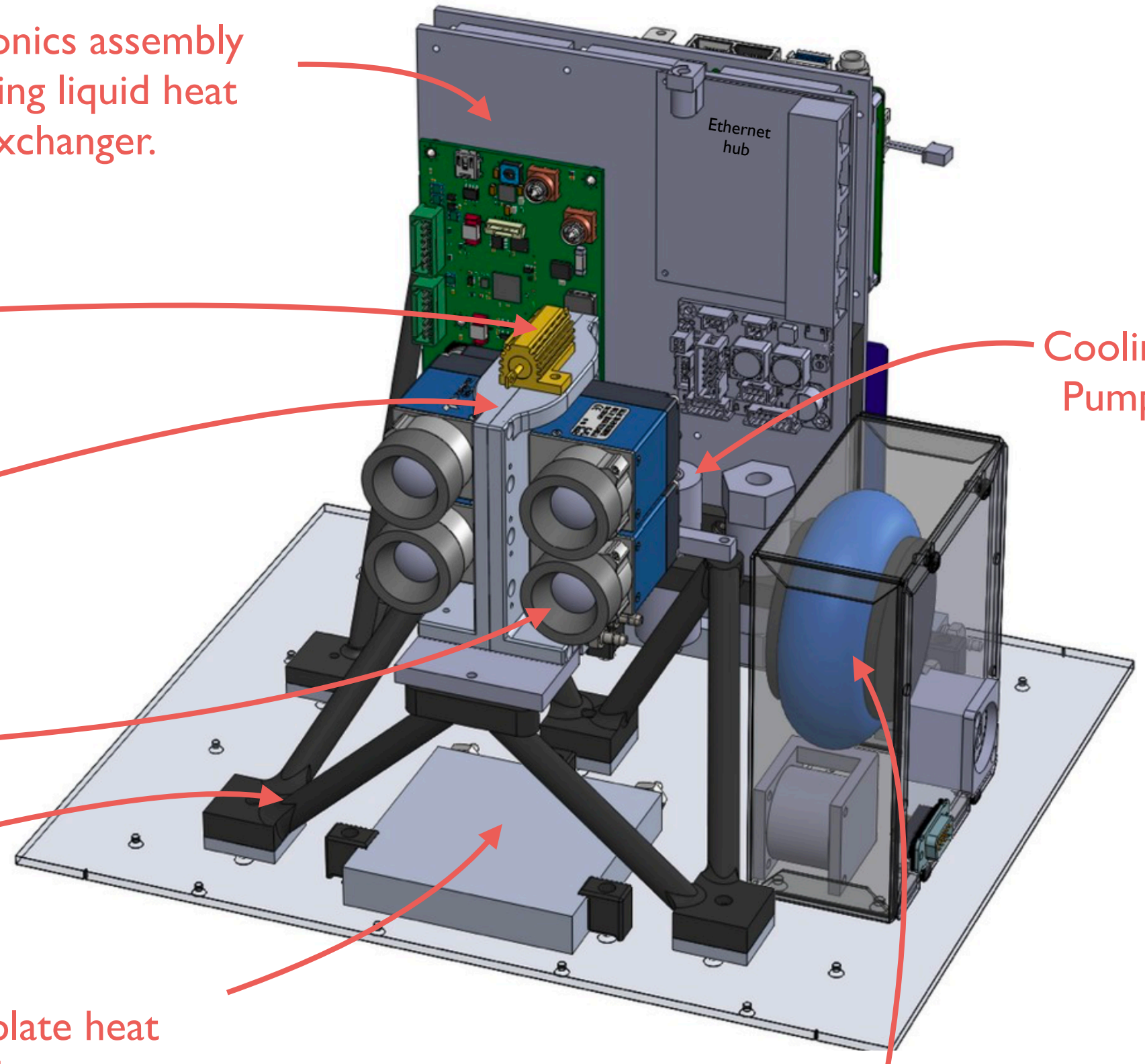
Cameras

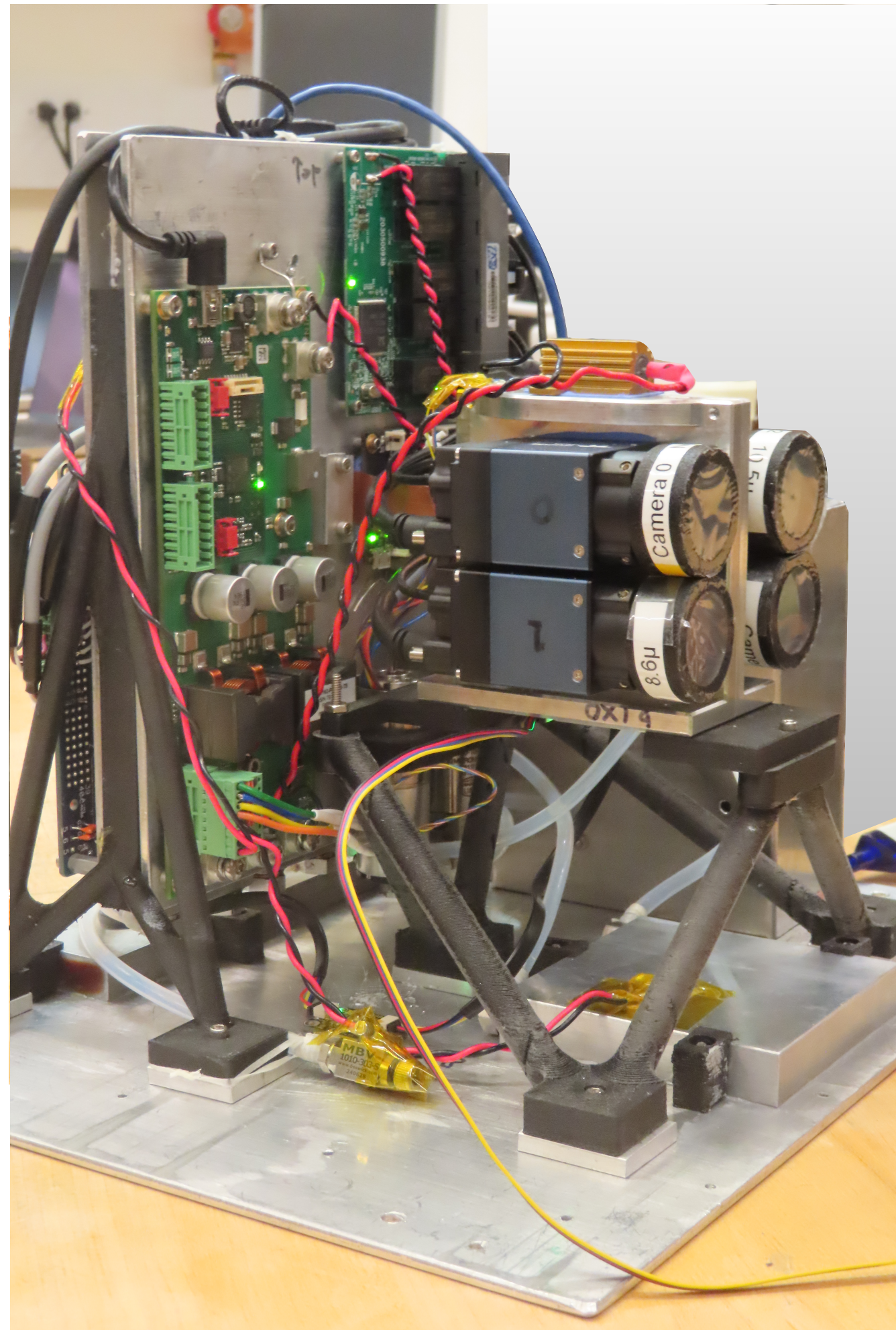
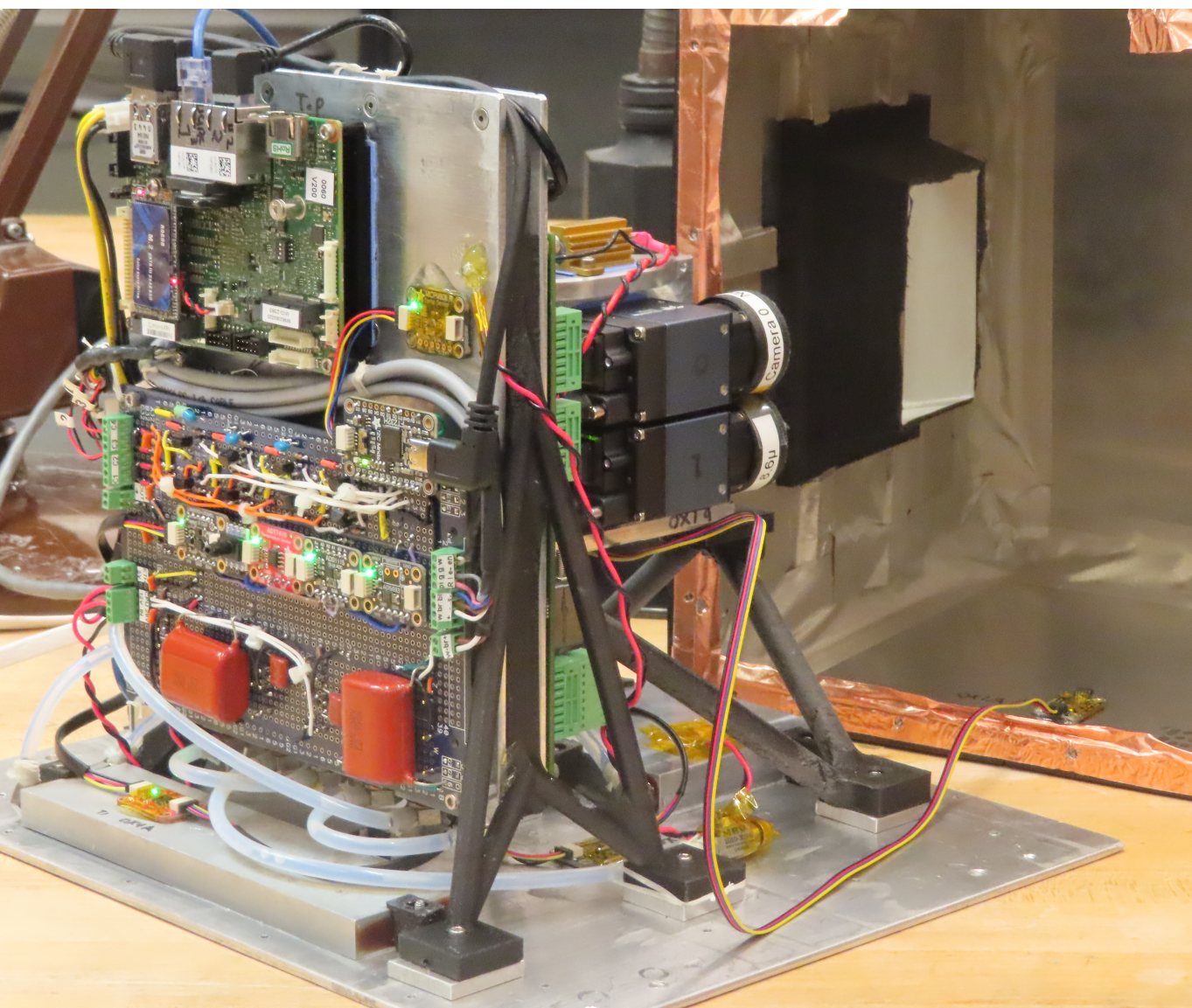
Carbon fiber reinforced hexapod stand.

Cold plate heat exchanger.

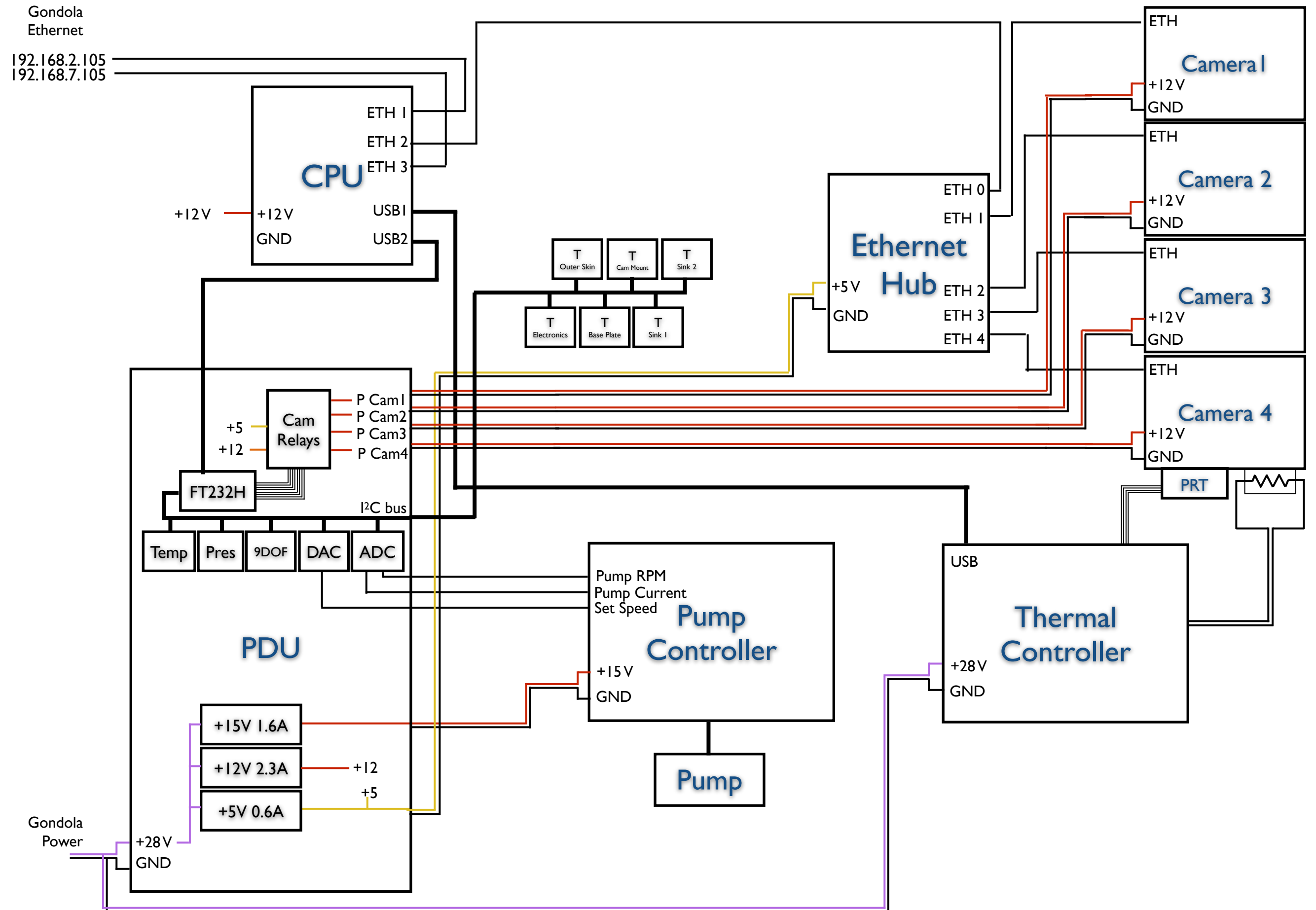
Cooling Pump

Common mode choke for both power and ethernet in isolation box

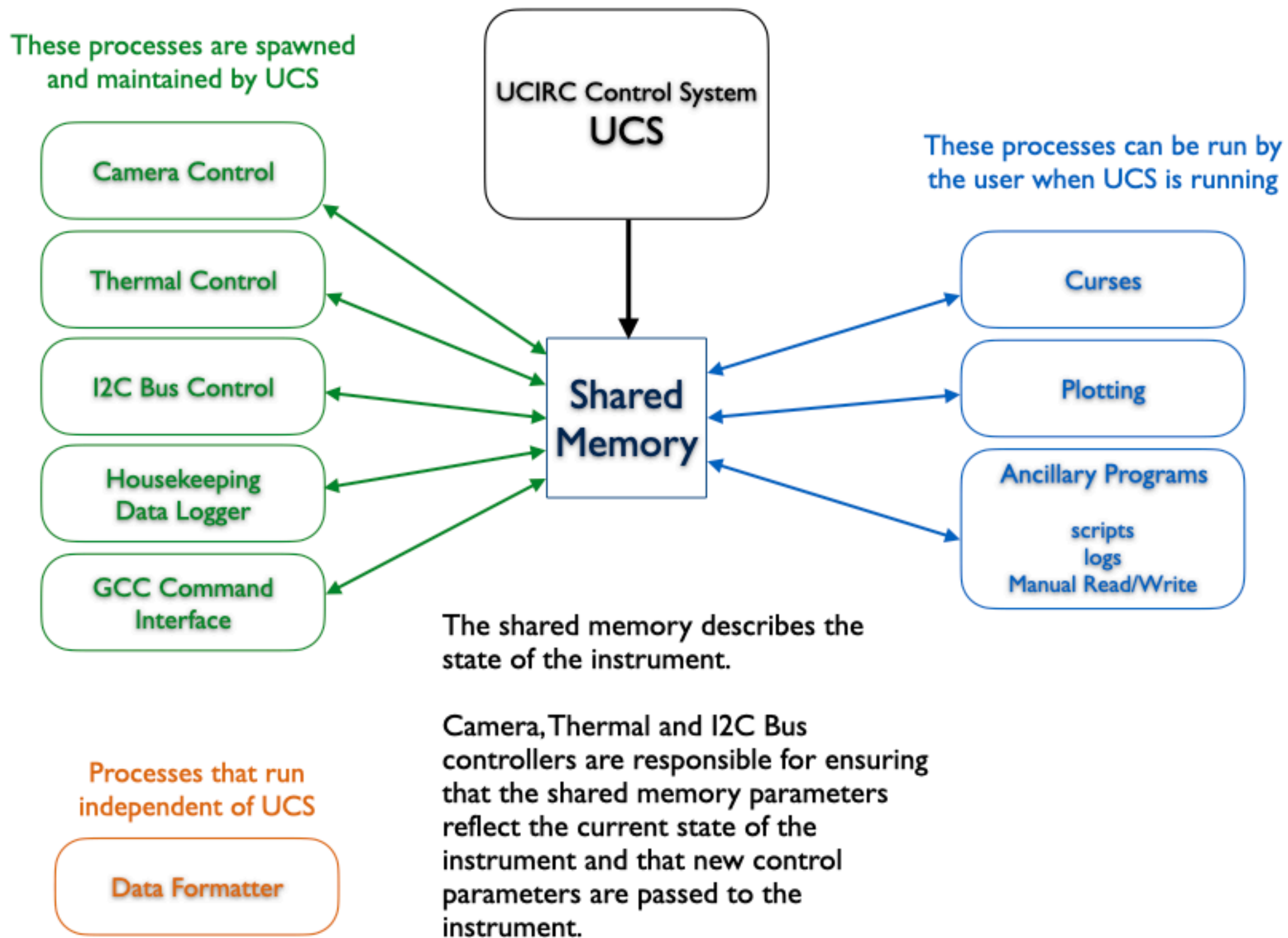




Electronics top level



IR Camera Software Overview



Thermal control

- The cameras produce about 5 W each. Need to be able to operate with any number turned on.
- The electronics is about 7 W total.
- A liquid cooling system has the flexibility to handle this changing load.
- The liquid system is driven by a gear pump with magnetic coupling and a speed controlled brushless motor.
- Fine temperature control is achieved with a PID controller and a resistor along with slow variation of the cooler pump speed.

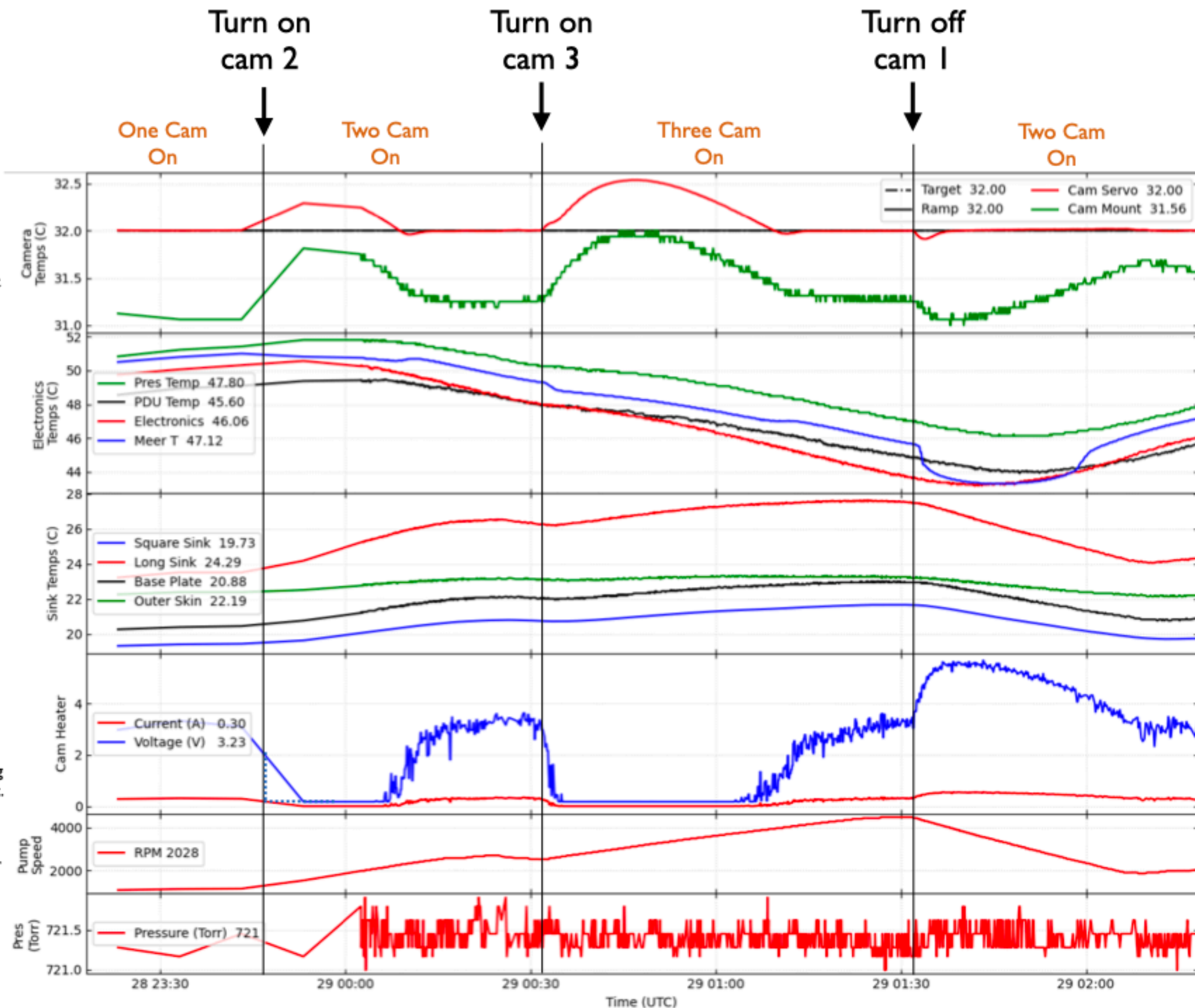
Camera temperature reacts to change in total power on camera mount

Electronics stage slowly reacts to changing pump speed and cam temp.

Base plate and thermal sinks react to increased pump speed.

Thermal controller maintains 1 Watt power after reacting to changing power on camera mount.

Pump speed slowly tries to get thermal controller to have 1 Watt output.



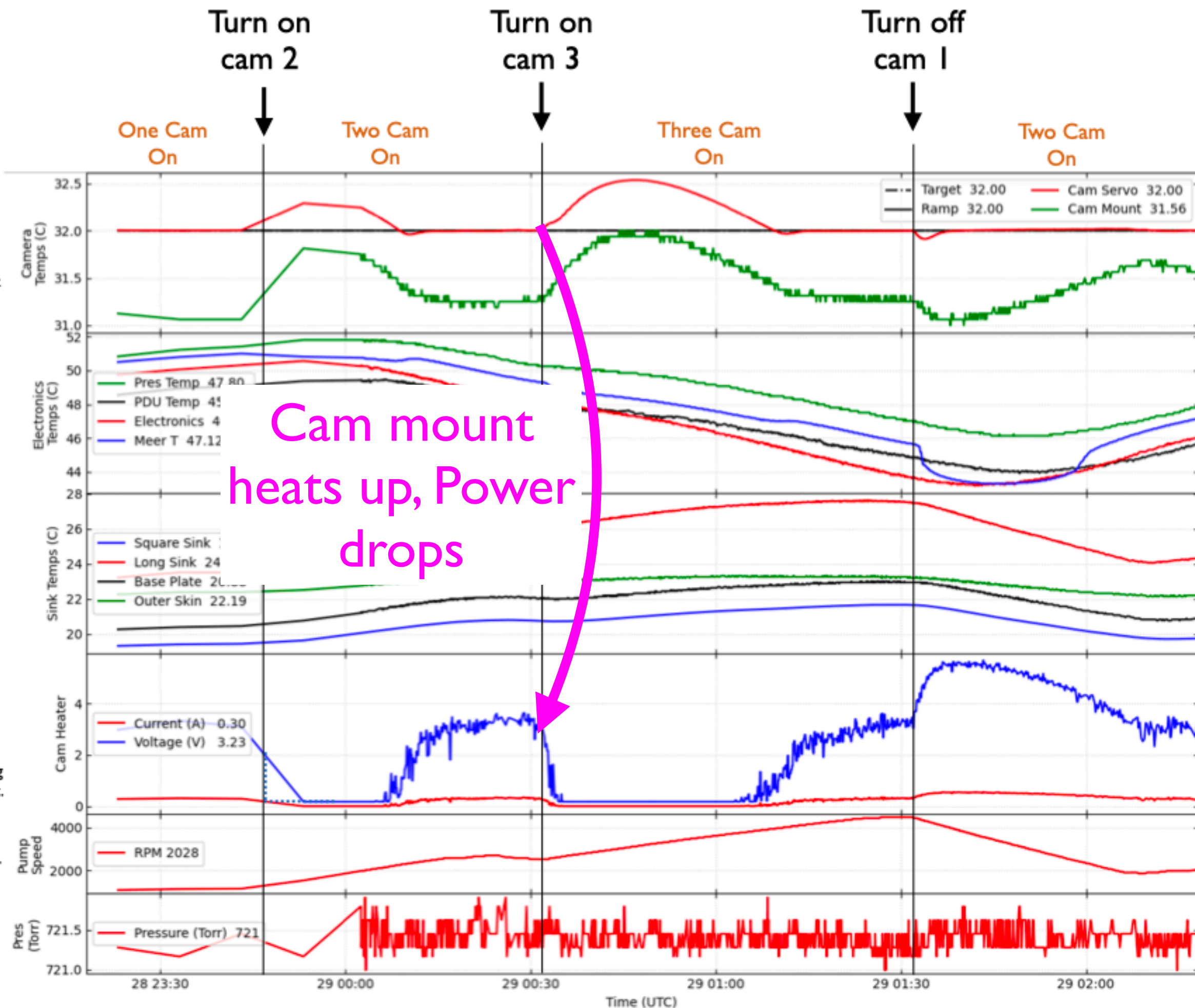
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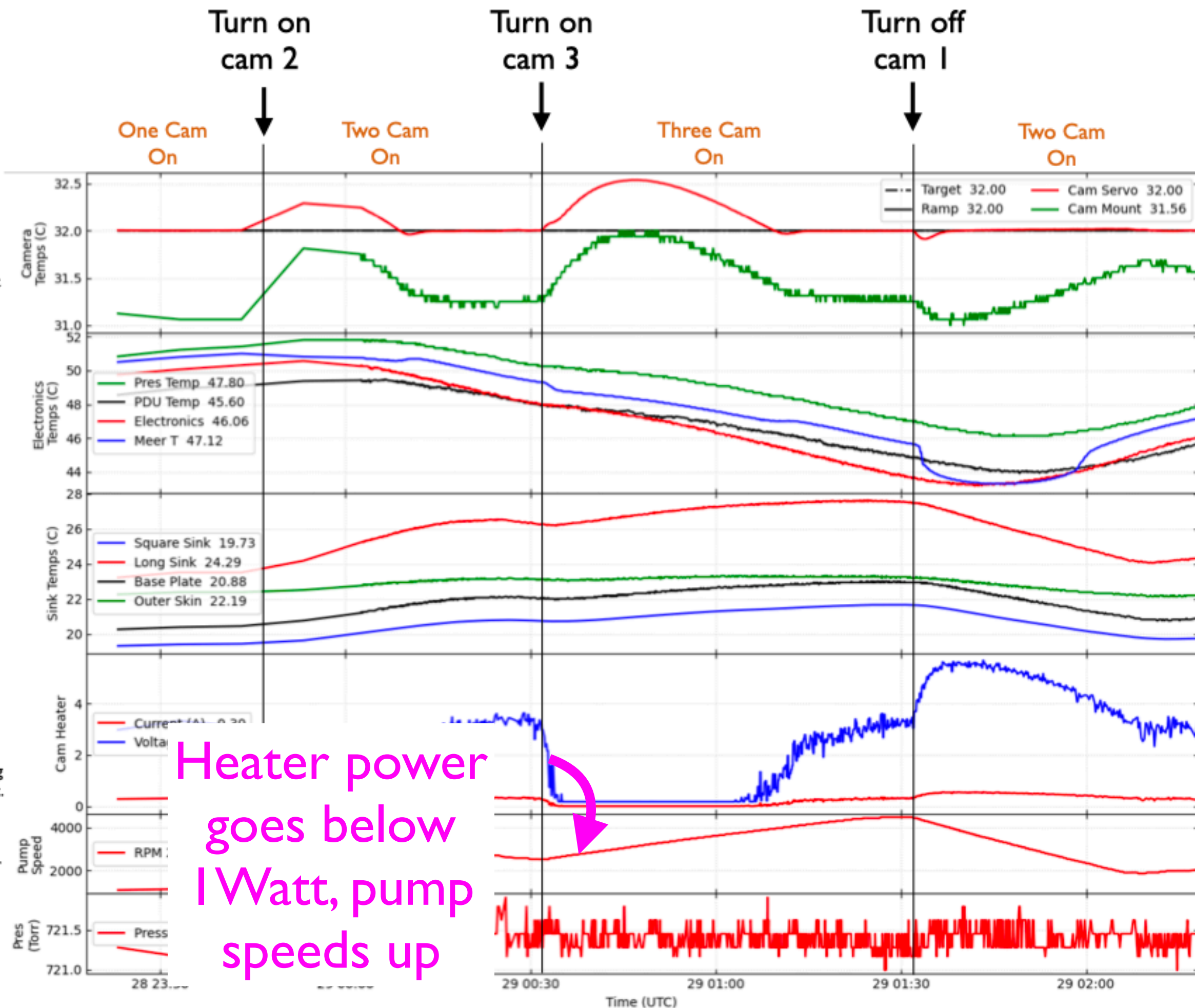
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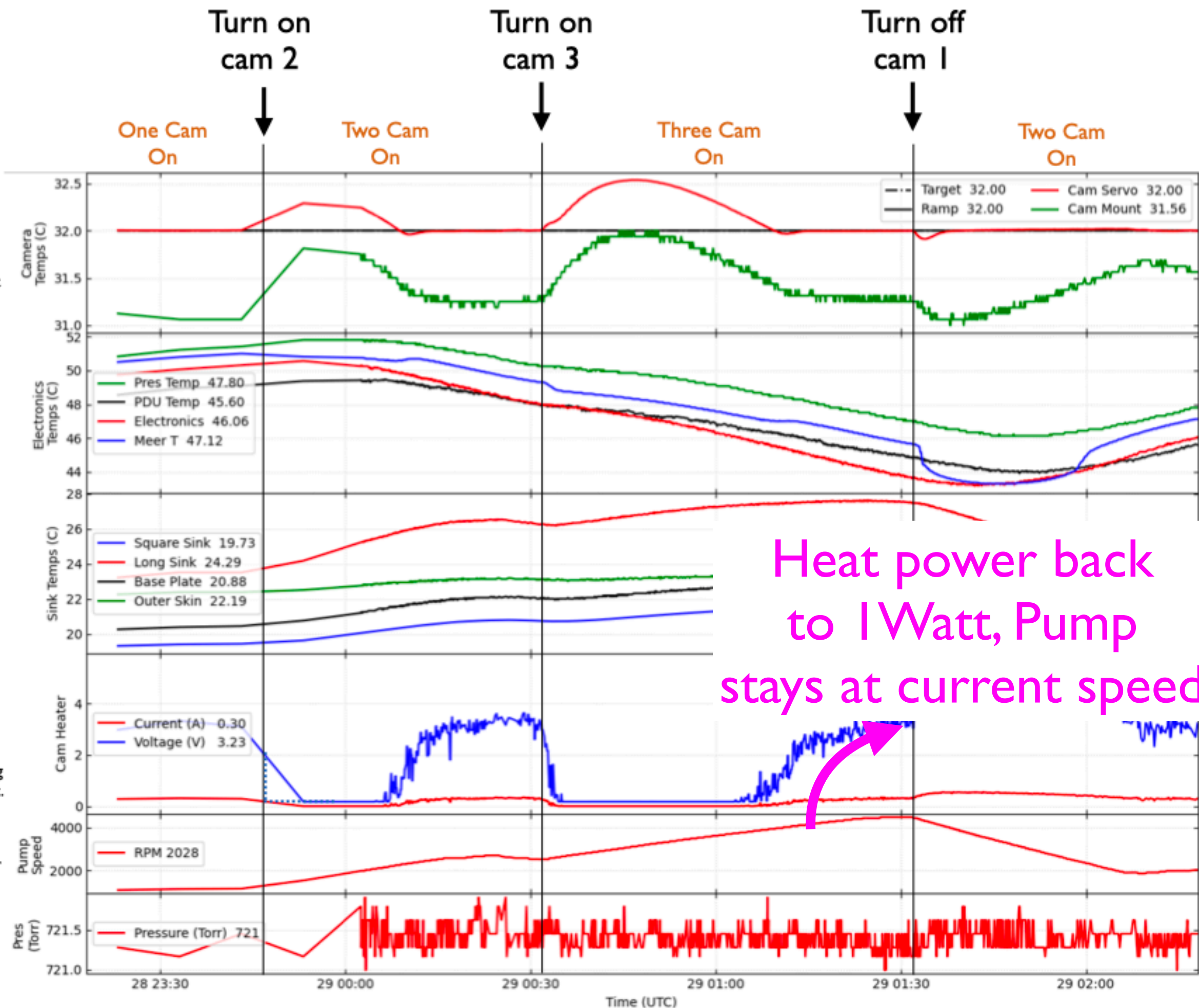
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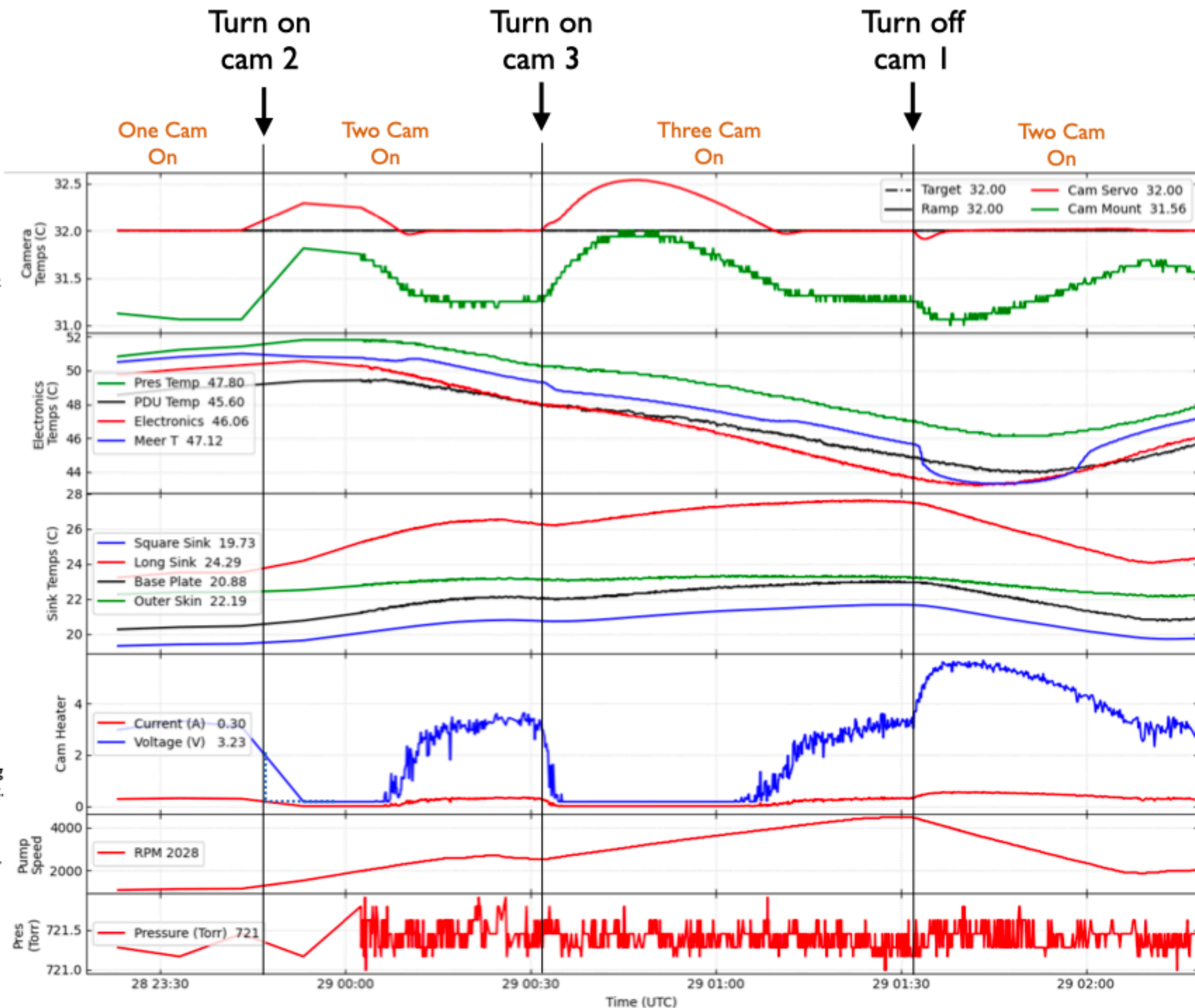
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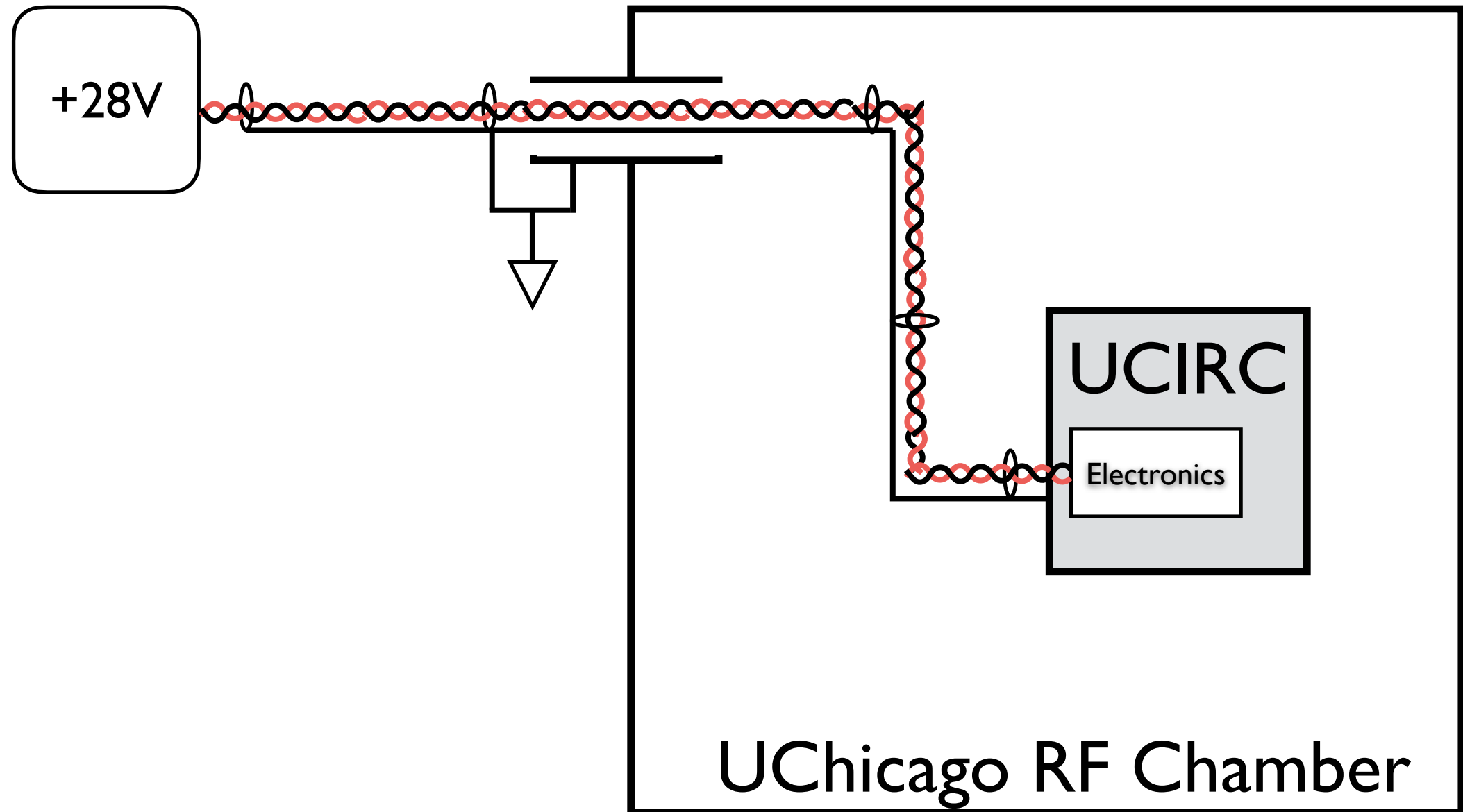
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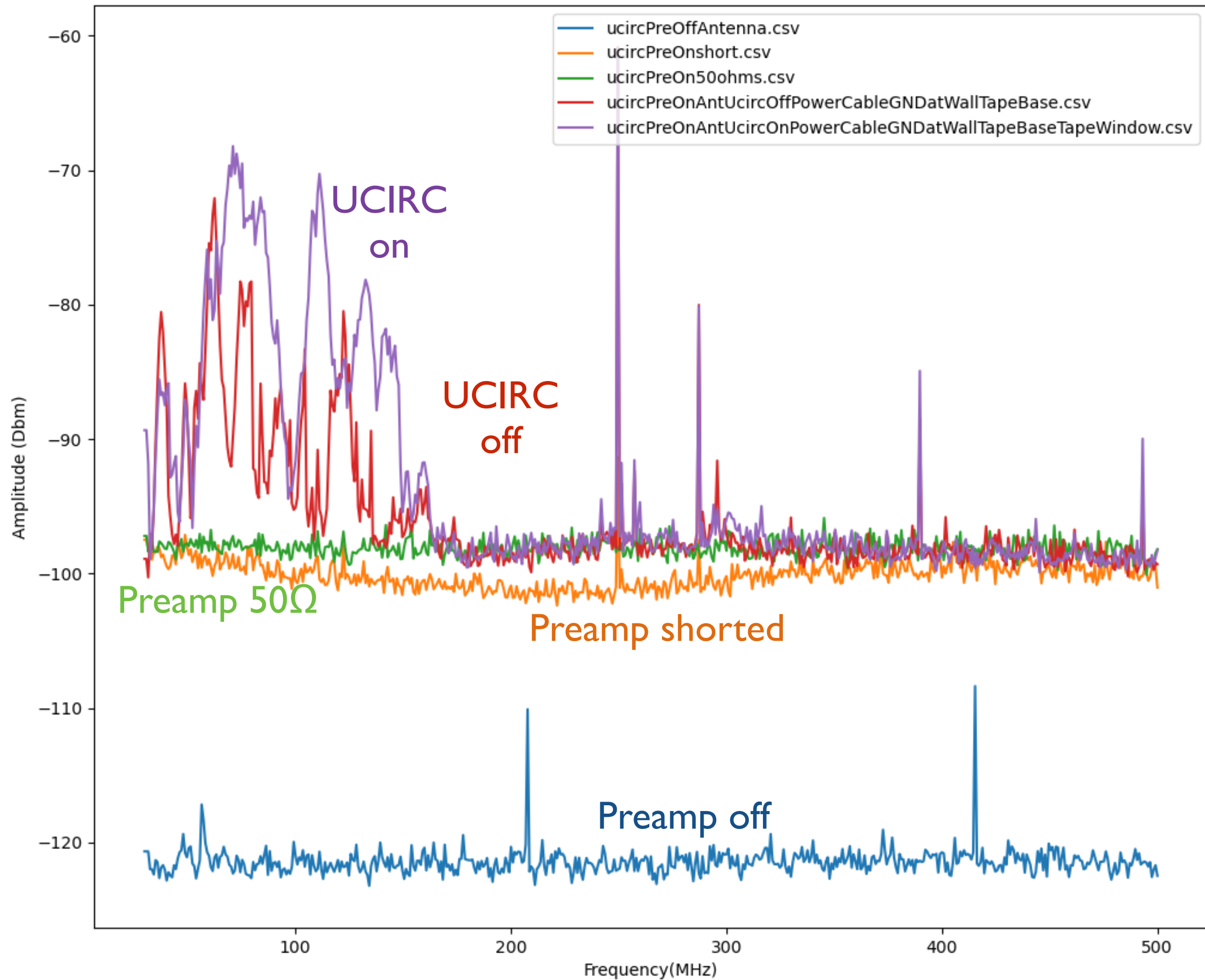
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Tested EMI Configuration

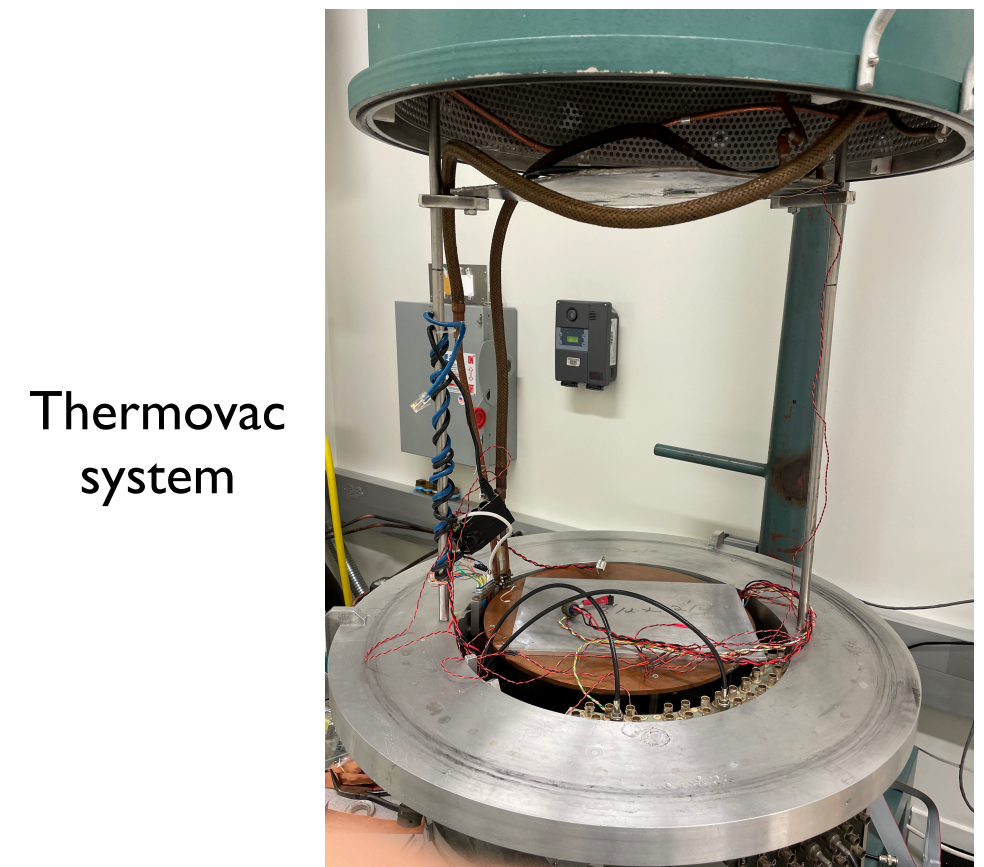
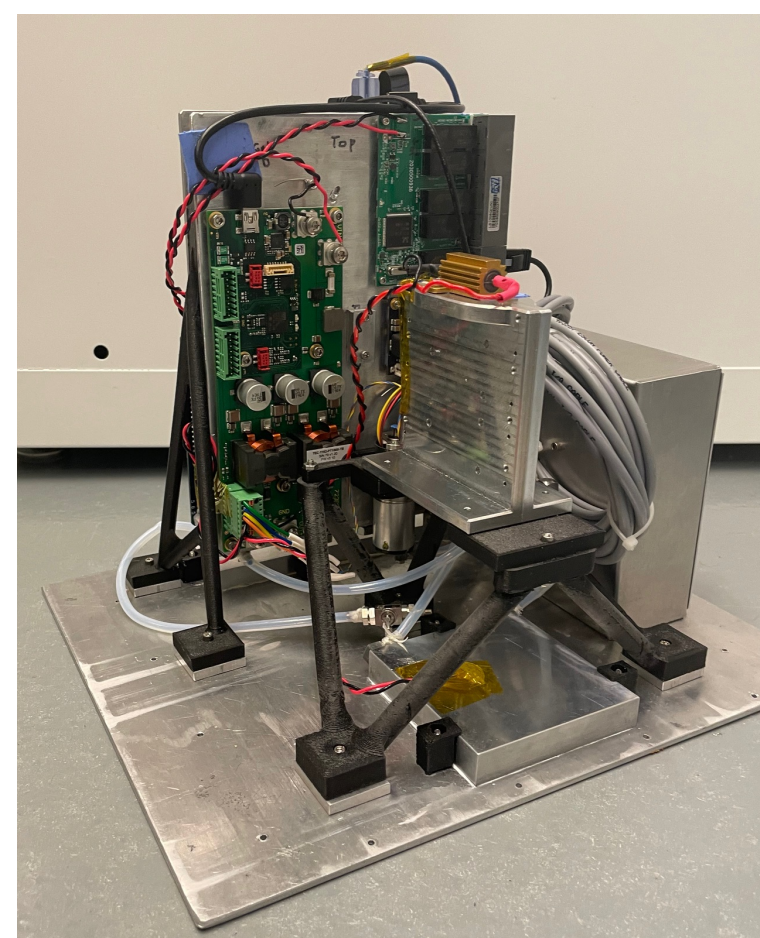


2025 April 25 EMI tests in ERC LL123 RF room



Schedule Milestones

- Fall 2024
 - ✓ - Flight pumps arrive
 - ✓ - Construction of prototype system
 - ✓ - Thermovac testing of prototype
 - ✓ - PDU construction (nearly complete)
 - ✓ - EMI testing of some subsystems
- Winter 2024/2025
 - ✓ - Full system EMI testing
 - ✗ - EMI mitigation as necessary
- Spring 2025
 - ✓ - Flight unit construction, testing
 - ✓ - Full system has been running for 4 months
- Summer 2025
 - Add 3rd ethernet adapter
 - Full system thermovac and calibration
 - Shielded Power cable and EMI testing
- ...
 - Calibrate



Thermovac
system