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U.S. DEPARTMENT OF
ENERGY

Powerboard Mass Tester Updates

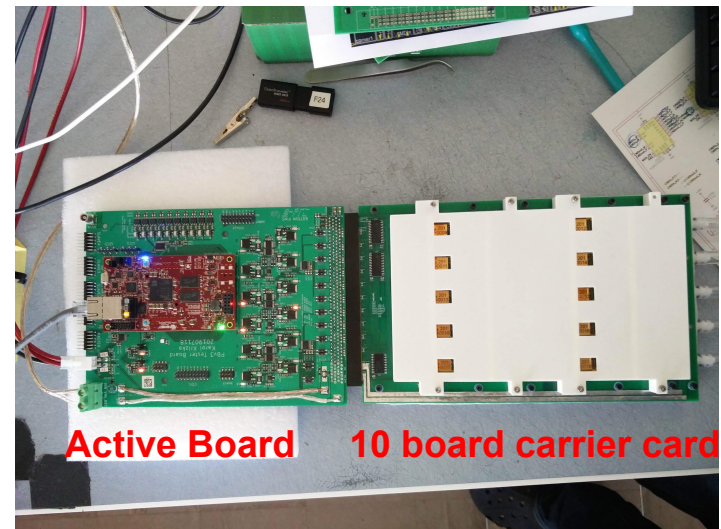
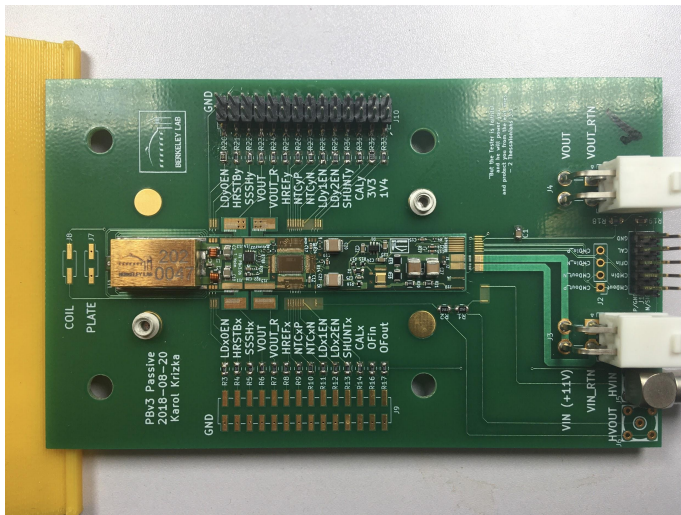
Evan Mladina, Karol Krizka, Timon Heim

ATLAS US Strips Technical Meeting --- January 24th 2020

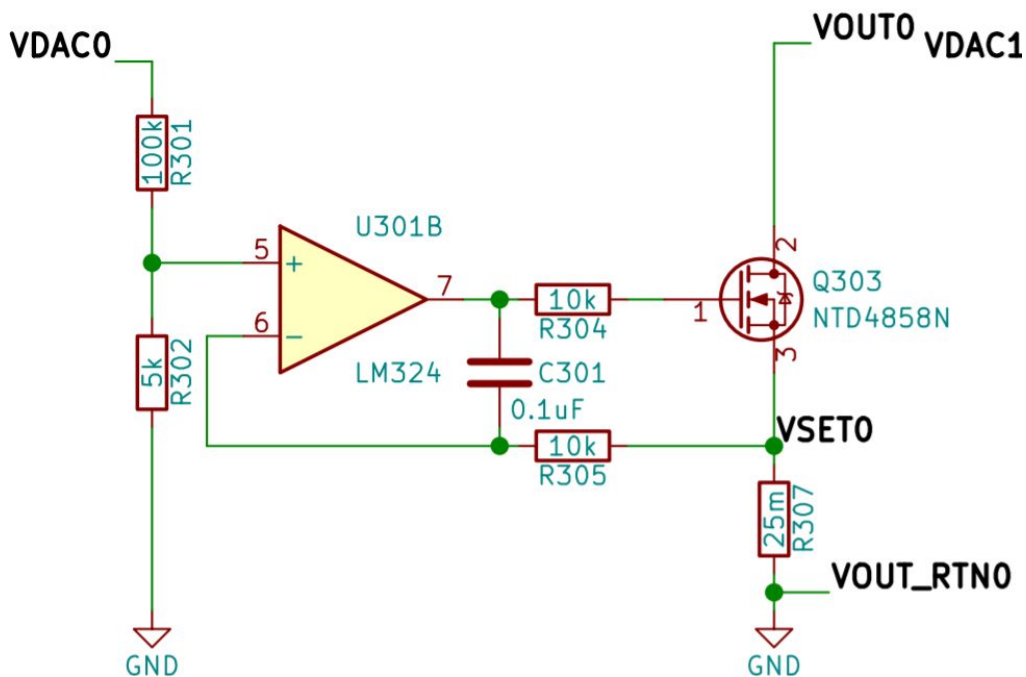


Powerboard Testing Station

- Currently working on porting over all tests from single board test station to mass test system.
- Mass test system allows us to test up to 10 boards at a time.



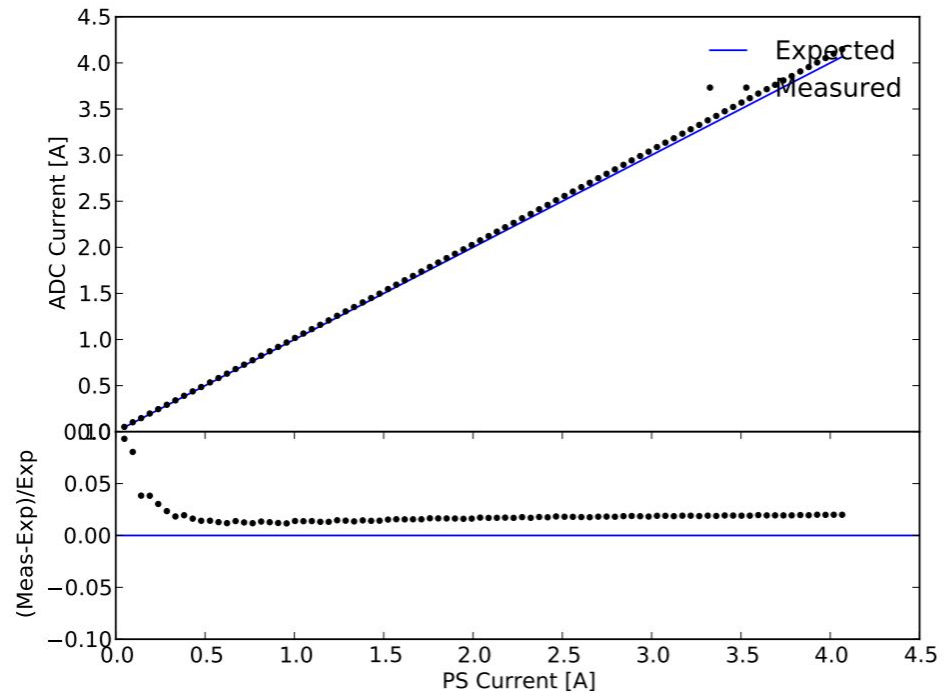
Load Circuit



- In single test setup, load is varied externally.
- In mass test setup, load is controlled by load circuits on the active board.
- One circuit per powerboard.
- Current set by varying DAC at VDAC0.
- Current measured by ADC by measuring current through R307 at VSET0.

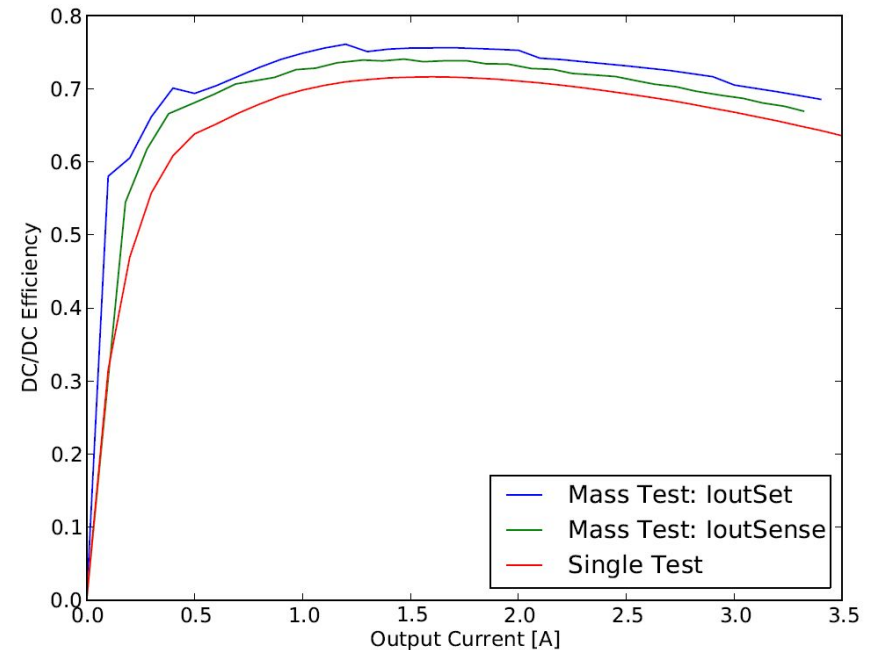
Current Load Calibration

- Calibrate output current set by DAC by comparing to both the current measured on the power supply as well as the current measured through the ADC in the load circuit.



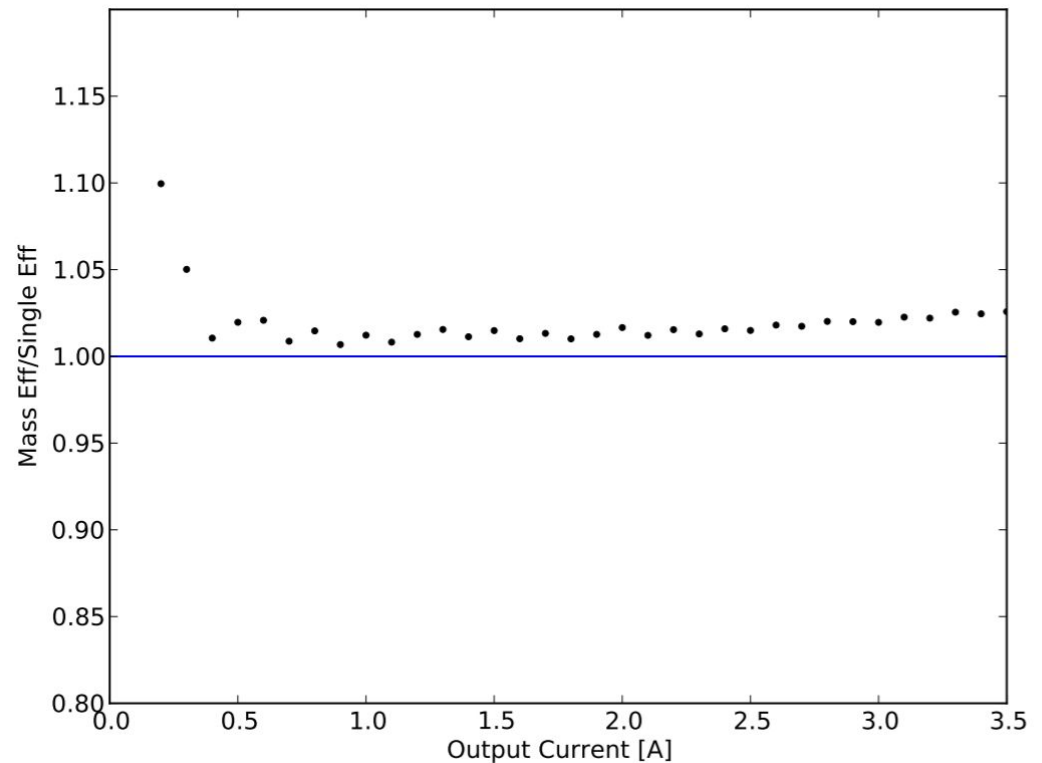
Efficiency scan comparison

- Efficiency defined as Power Out/Power In.
- Vary load current and measure input current, input voltage, and output voltage.
- Performed on powerboard number 2020047.
- Mass test results include uncalibrated set load current and measured load current read through ADC.
- Expect better fit with calibrated load.
- Better performance possibly due to increased temperature performance but more investigation is needed.
- loutSet: Set load current on uncalibrated DAC.
- loutSense: load current measured through ADC in load circuit.



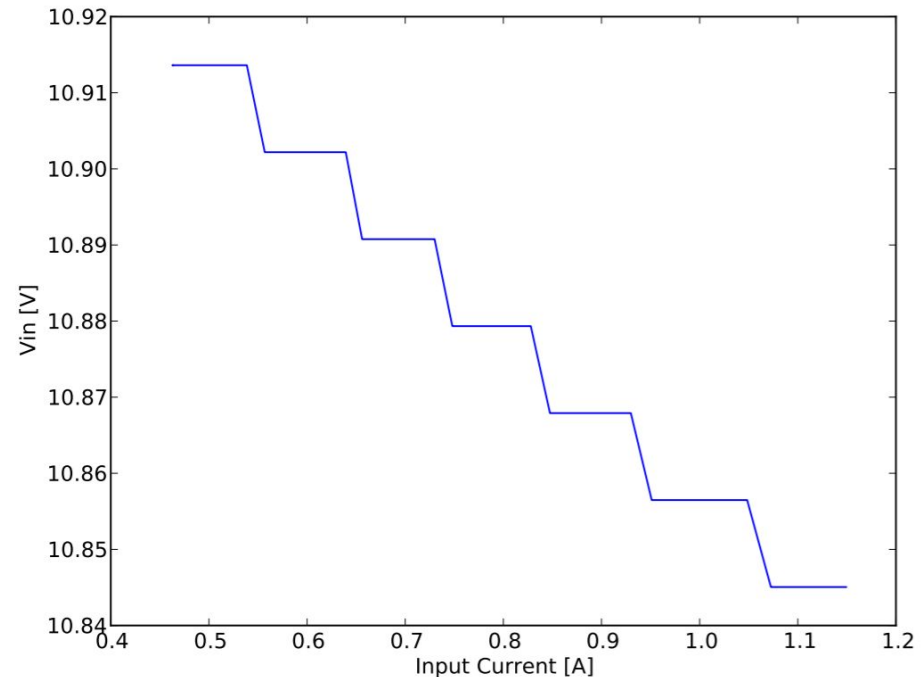
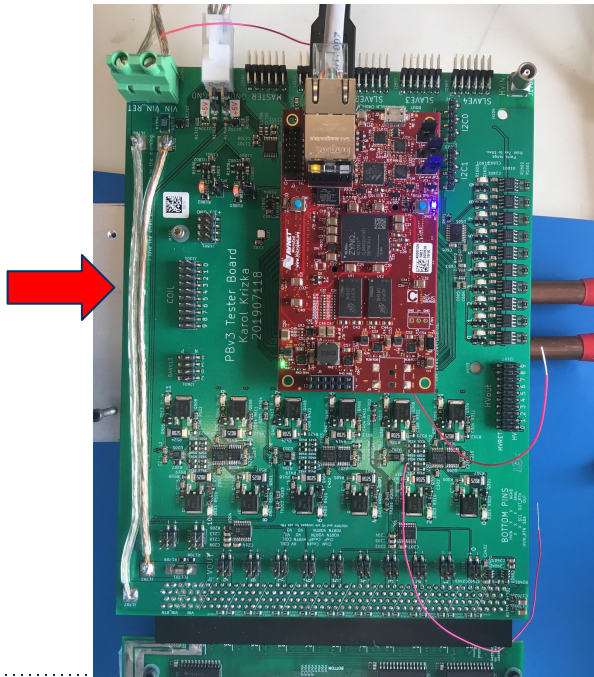
Efficiency Ratio

- Ratio of Mass test to single test shows increase in efficiency.
- Slight upward trend with increased output current possibly due to better thermal contact on mass tester.



- Current ADC used to measure input voltage has a 10 bit resolution.
- Causes “jumpy” behaviour in efficiency results.
- Considering switching to 12 bit ADC in next iteration of active boards.
- Currently attain 11mV precision. Switching to 12bit ADC would give us 7mV precision.
- Plot at right shows voltage drop across large wires on active board shown on the left.

Resistance across these cables leads to voltage drop of about 70mV.





Backup

PTAT (Temperature) Readings

- Lower PTAT readings (left) between mass test and single board test setup is possible cause of increased efficiency. (Note: Not sure if these PTAT results are reliable!)
- At right: Efficiency readings at various temperatures done by Neha. (See Sai Neha Santpur's March 25th, 2018 LBL Student Instrumentation presentation for full report.)

