

# HEAT FLUX CALIBRATION Updates

2018 October Materials Meeting  
Atlantic City, NJ USA

Materials Working Group

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October, 2018



Federal Aviation  
Administration



# AGENDA

- Overview of comparative testing project
- Traditional calibrator / Prototype heat flux calibrator
- Calibration procedures
- Results and observations
- Next



# Overview

- Compare calibration results and repeatability using the traditional calibrator a new prototype design.
- Heat transfer methods:
  - Traditional – Graphite plate
  - Prototype – Halogen bulbs (T3; 500W)
- 8 HFG's: 4 Vatel / 4 Medtherm
- HFG Type: 4 Gardon / 4 Schmidt-Boelter



# Heat flux gauges



# Heat flux gauges

HEAT FLUX GAUGE	MANUFACTURER	GAUGE TYPE	FULL SCALE RANGE
Transfer Standard Gauge	Vatell	Gardon	0-5 (low)
Working Gauge #1	Vatell	Gardon	0-5 (low)
Working Gauge #2			0-15 (high)
Working Gauge #3		Schmidt-Boelter	0-30 (high)
Working Gauge #4			0-15 (high)
Working Gauge #5	Medtherm	Gardon	0-5 (low)
Working Gauge #6			0-5 (low)
Working Gauge #7		Schmidt-Boelter	0-5 (low)
Working Gauge #8			0-5 (low)

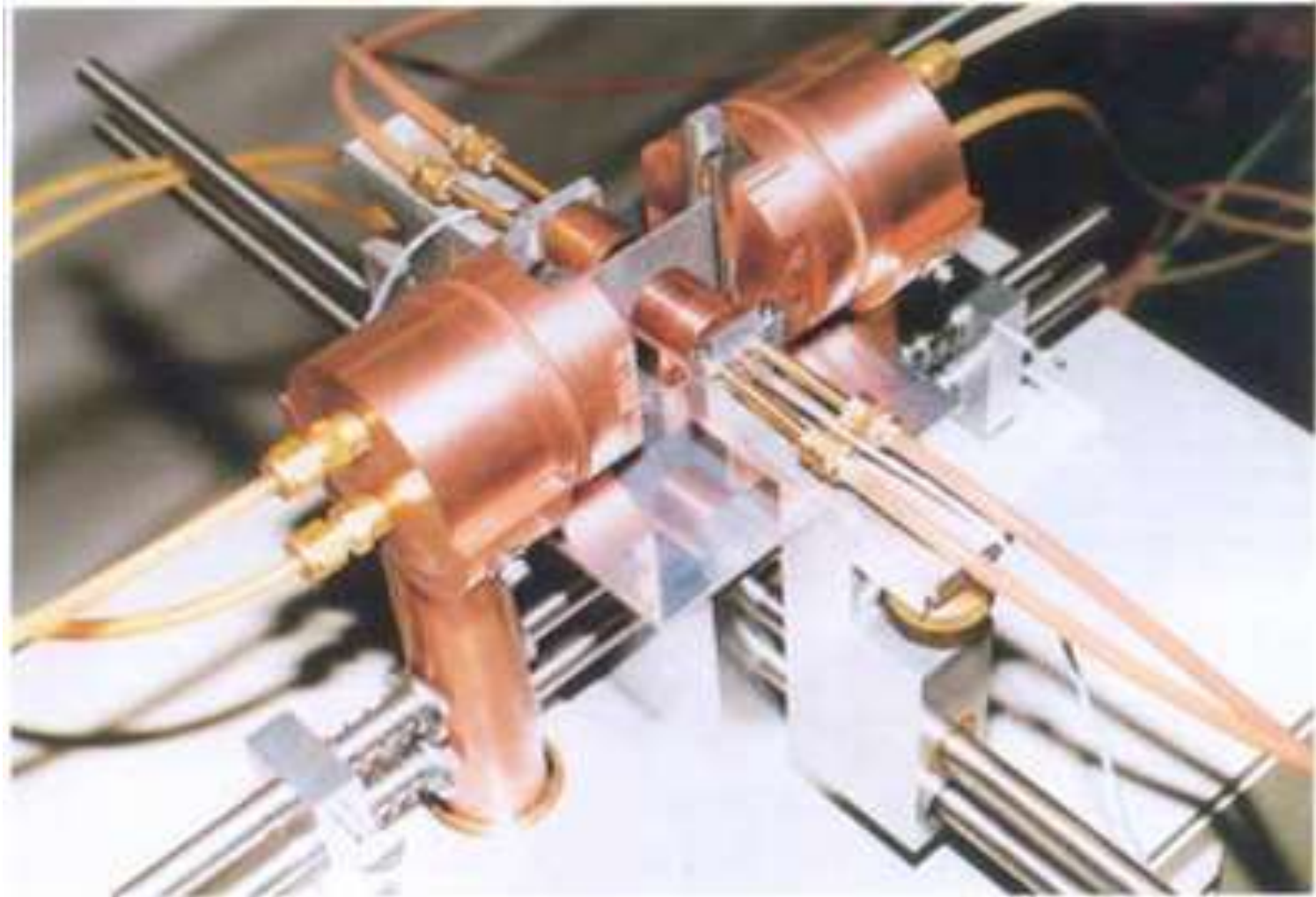


# Heat transfer methods

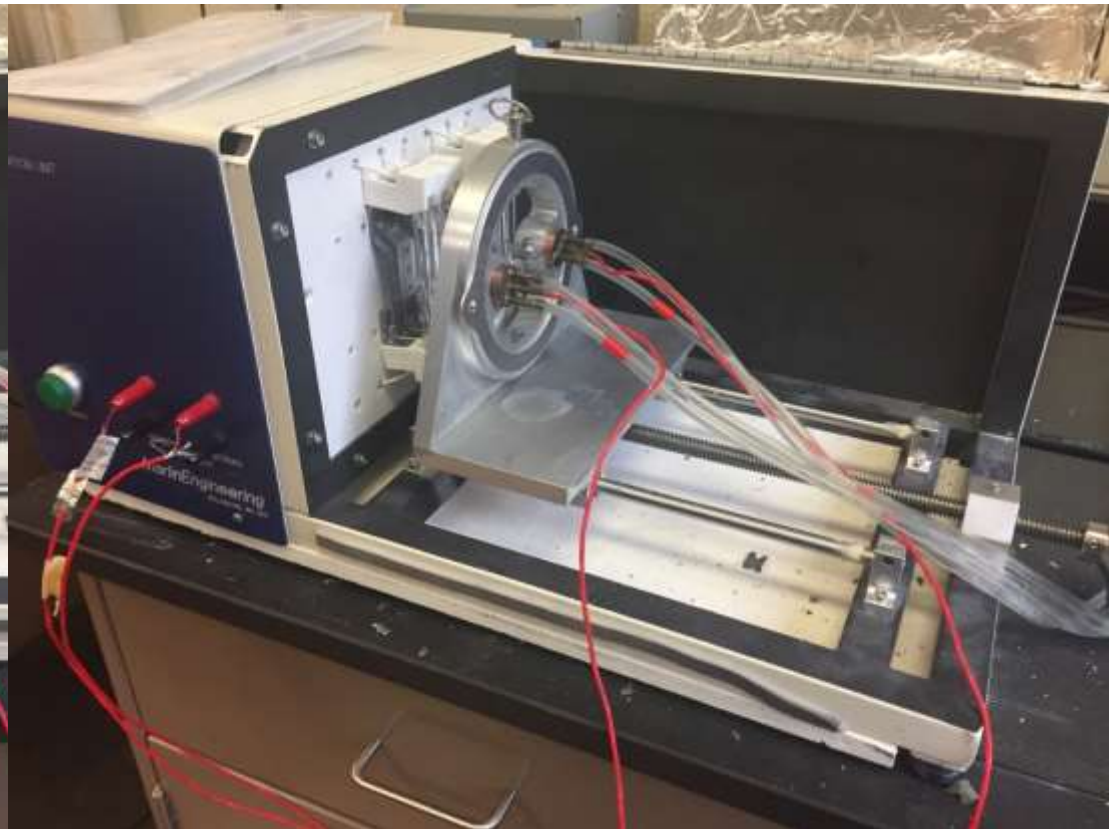
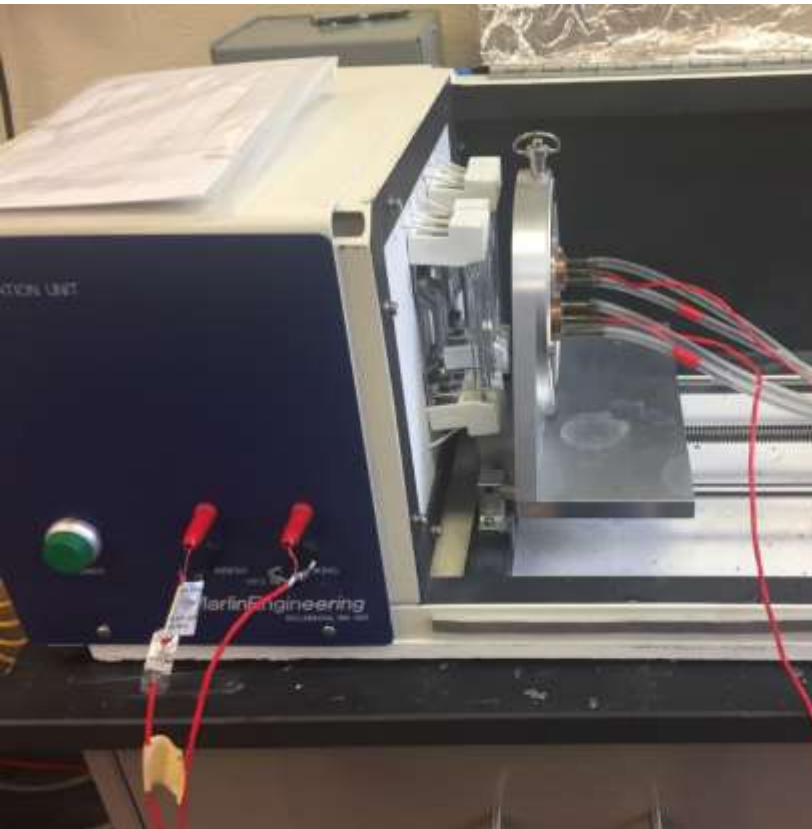




# Traditional heat flux calibration apparatus



# Prototype heat flux calibration apparatus



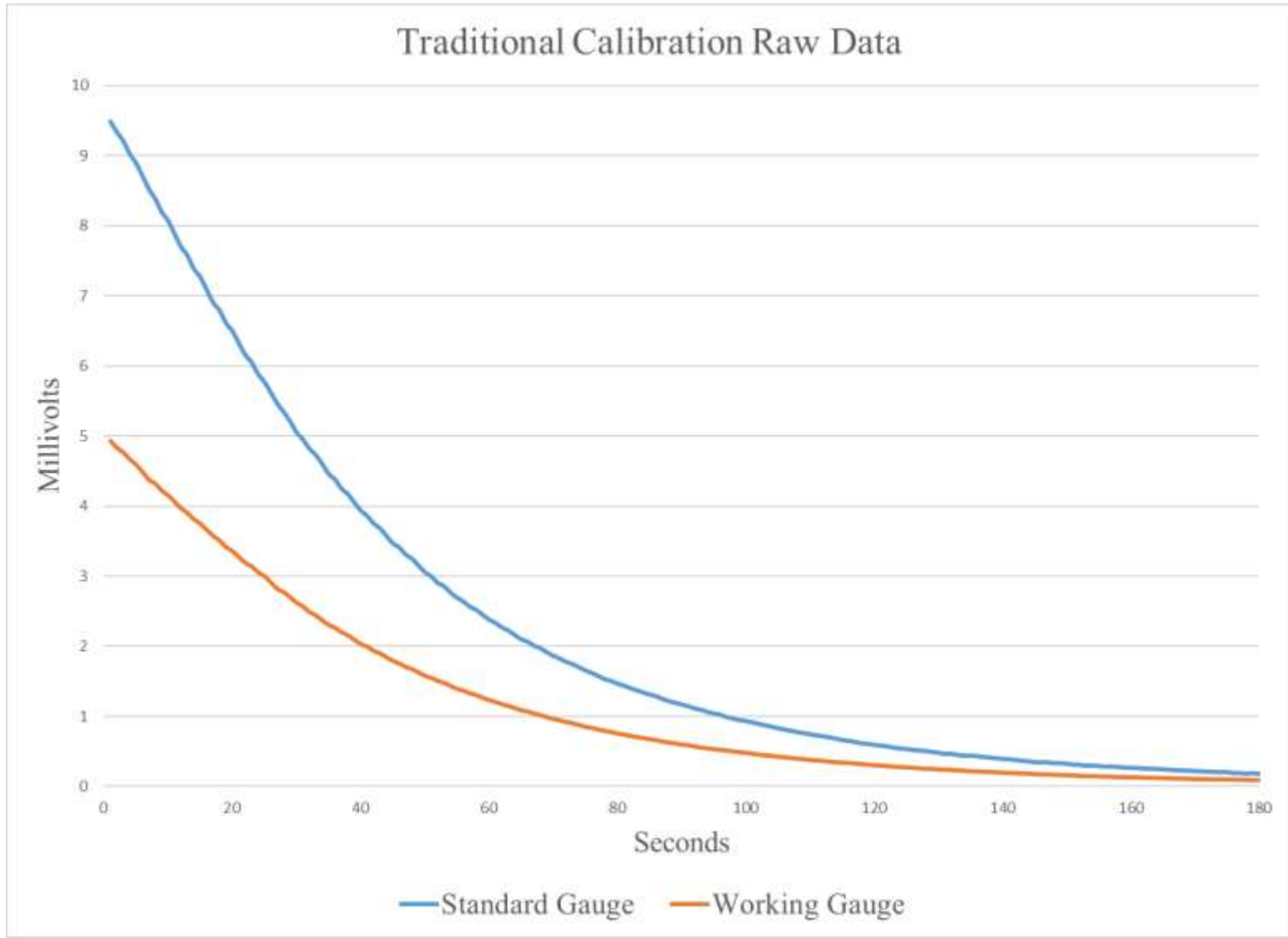


# Calibration Procedures – Traditional Unit

- The Reference Gage was calibrated by NIST.
- Traditional unit uses a Graphite plate heat transfer method.
- Power is ramped up to maximum output of standard gage.
  - Approximately 45 seconds
- Power is turned off and recorder started.
- Data is recorded for approximately 3 minutes during cool down (uncontrolled cooling rate)
- Linear fit of data points is used to calculate the calibration factor.



# Traditional Heat Flux Calibrator



# Calibration Procedures – Prototype Unit

- The same Standard Gage is used.
- Prototype unit uses Halogen bulbs as heat transfer method.
- Recorder is started and power is ramped up to maximum output of standard gage.
  - Approximately 45 seconds
- Power is ramped down at a controlled rate.
- Data is recorded between 4 and 1 W/cm<sup>2</sup>.
  - Approximately 90 seconds
- Linear fit of data points is used to calculate the calibration factor.

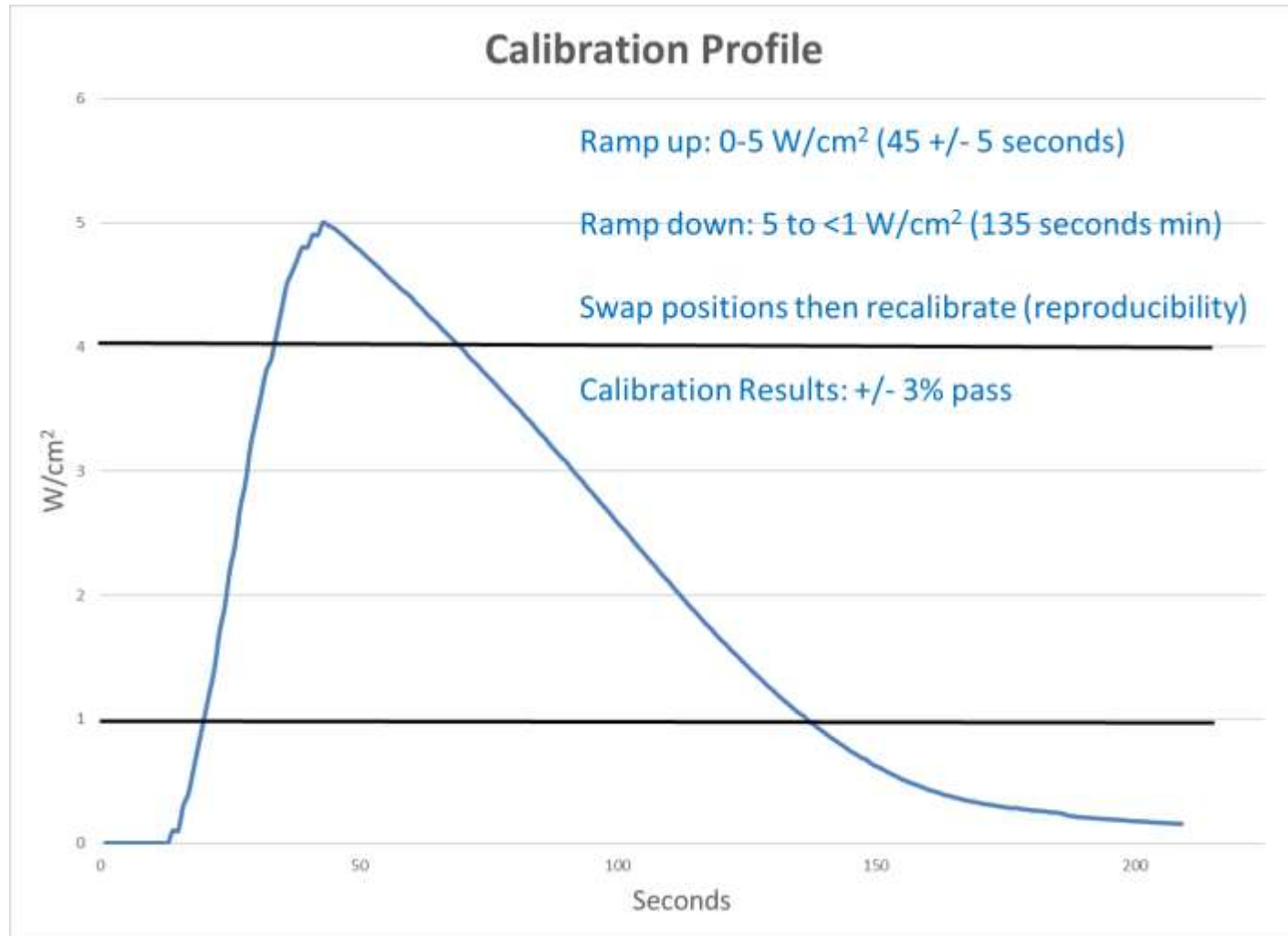


# Prototype Heat Flux Calibrator Status

- Balance of radiant heat (adjustment of lights) **COMPLETE**
- Pass/Fail criteria change ( $\pm 3\%$  then average) **COMPLETE**
- Fix ‘blip’ in data **COMPLETE**
- Software punch list issues **COMPLETE**

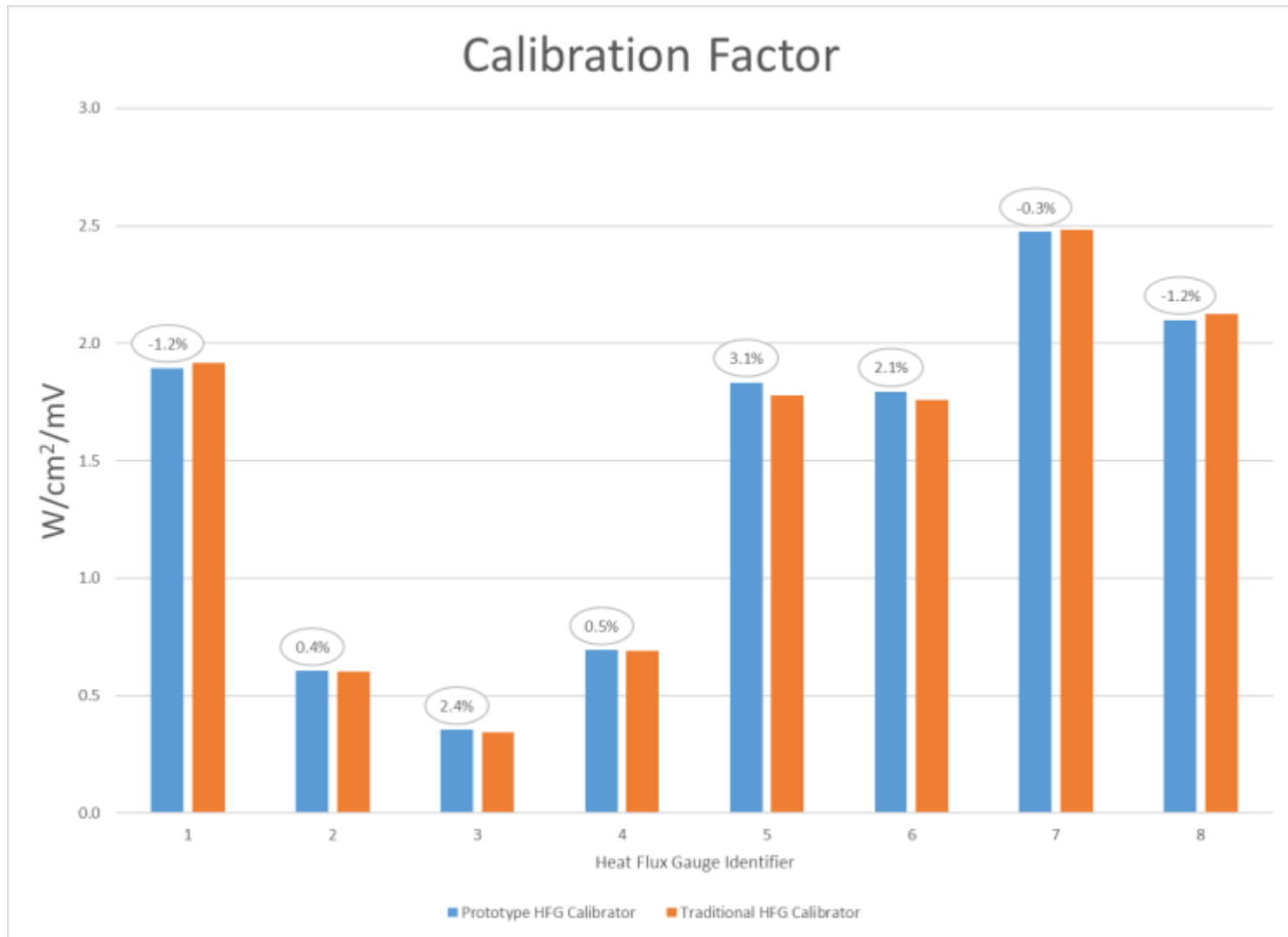


# Prototype Heat Flux Calibrator

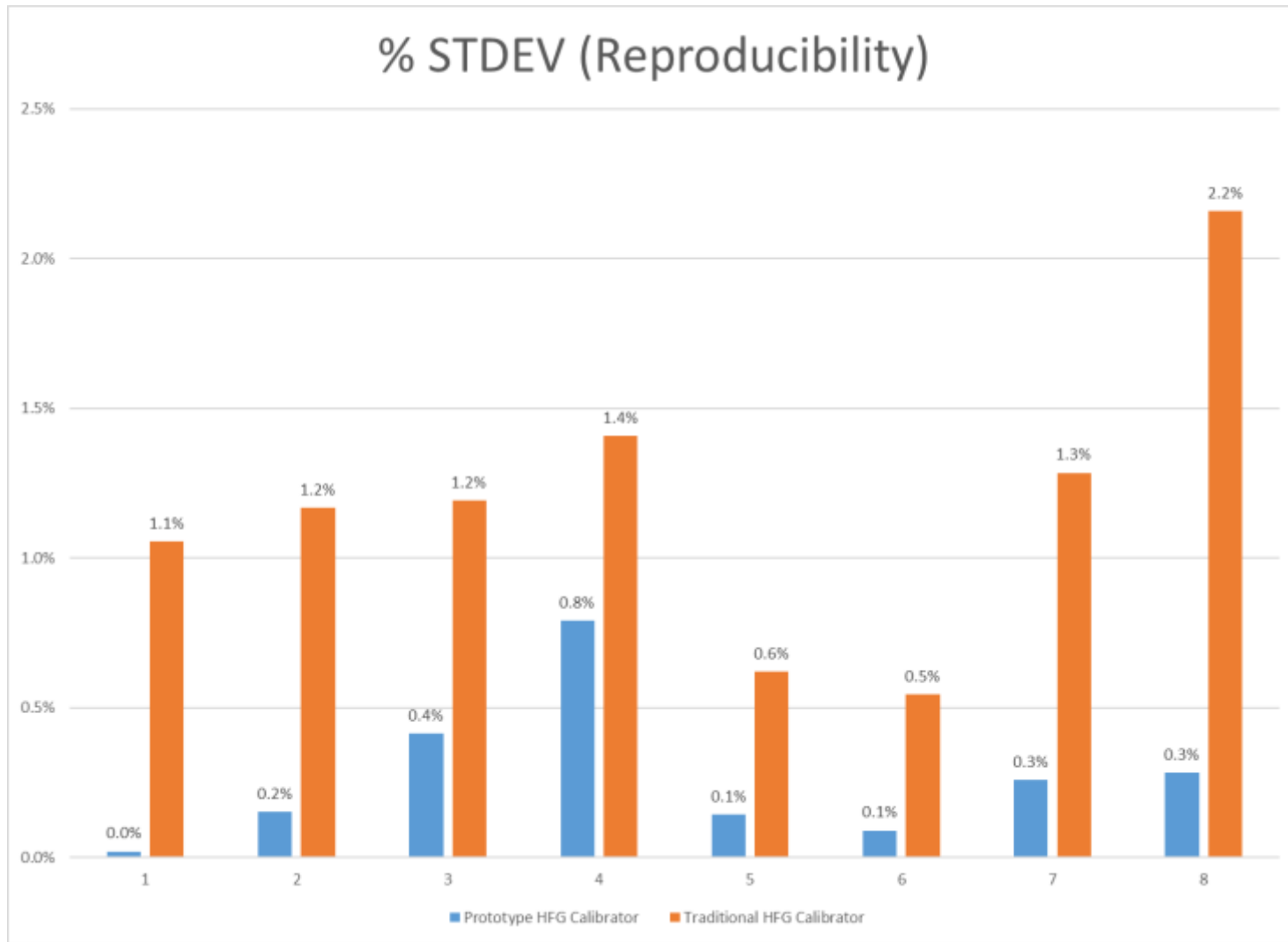




# Comparative Test Results



# Comparative Test Results



# NEXT

- Task group discussions as needed
- Continue working hardware/software changes as needed
- Input requested developing HFG RR using the new calibration apparatus



# Questions?

