OSU & NBS Updates
2009 March Materials Meeting

Federal Aviation Administration

Materials Working Group

Michael Burns, FAA Tech Center

March 4th & 5th, 2009

Agenda

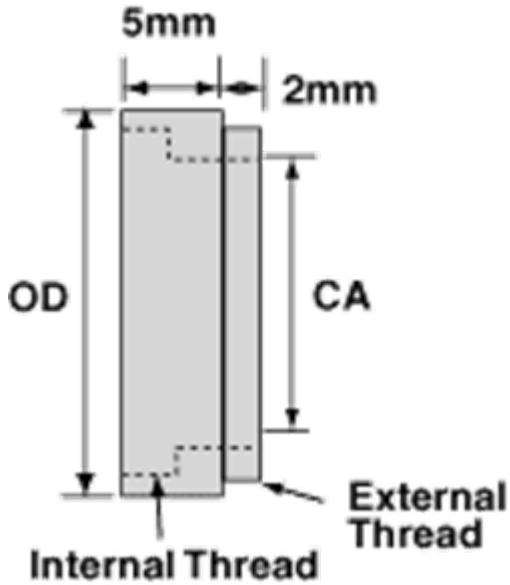
1. NBS Update
   - Photometric System Round Robin
   - Experimental Furnace
   - NIST Release Sale Of Standard Material For NBS
2. Heat Flux Gages
   - Calibration Results “Ramp Up” vs. “Cool Down”
   - Water Temperature Effects
   - Visit To Medtherm Corp.
     - Calibration Method
3. New FAA Equipment Update
4. Maintenance Tips & Reminders / Next Steps

Discussion:

Heat Flux Gage Calibration Methods Used For Calibrating The Reference or “Standard” Gage

NBS Photometric System Round Robin

- FAA Is Currently Conducting A Round Robin Check Out Of The NBS Photometric System Using Neutral Density Light Filters.
- These Filters Provide A Linearity Check Of Five Data Points.



NBS Photometric System Round Robin

- No Furnace Heat Or Pilot Burner Required
- Zero Then Span System
  - Gradually Slide Filter Over Lower Glass Window
- 17 Labs Have Participated To Date
- Filter Information:
  - Edmund Optics
  - http://www.edmundoptics.com/onlinecatalog/DisplayProduct.cfm?productid=1523
- Filters Are Currently Available For International Lab Testing (Presently, Filters Are Located In England)

NBS Furnace

- NBS Furnace Upgrade
  - Longer Service Life Of Heating Element
- Experimental Furnace Endurance Testing Progress
  - Incoloy Vs. Inconel
  - Approx. 1094 Hours Of Operation
  - 59 Cycles
  - 42 Samples

NIST Smoke Density Reference Material

- NIST Released Sale Of NBS Standard Reference Material P/N 1007 (B) – Plastic, Flaming Mode
  - https://www-s.nist.gov/srmors/view_detail.cfm?srm=1007B
  - Material Was Withheld By NIST To Study Potential Problems With Material
  - None Were Found
- NIST Also Has Available For Sale NBS Standard Reference Material P/N 1006 (D) – Cellulose Paper, Non-Flaming Mode
  - https://www-s.nist.gov/srmors/view_detail.cfm?srm=1006D
- Orders Can Be Placed By Calling (301) 975-2200

Heat Flux Gage Calibration Study

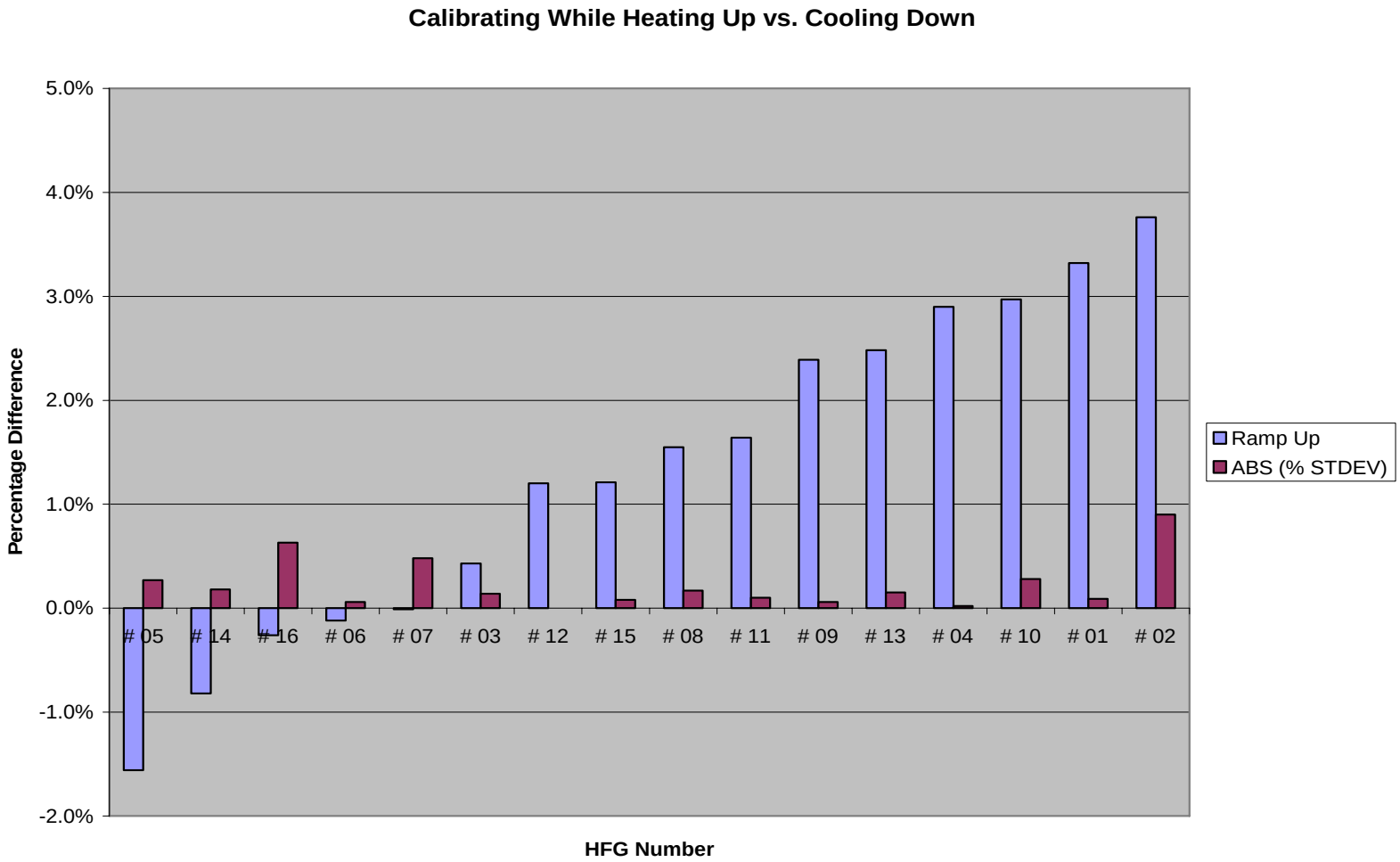
- During a Recent Visit To Vatell It Was Noted That The FAA Had Collected Calibration Data While Heating A Graphite Plate
- Vatell Captures Data During Cool Down
- Study Of Effects Of Up vs. Down Methods Has Been Completed

Heat Flux Gage Calibration Study

Observation:

1. 11 Out Of 16 Times The Slope Was Higher When Calibrating While Ramping Heat Up
2. Slope Values Were Typically 0.7% Higher On Average When Calibrating Upward
3. Test Repeatability Does Not Seem To Be A Factor (% Standard Deviation)
4. FAA Will Calibrate Using The “Cool Down” Method As Recommended By Vatell Corp.

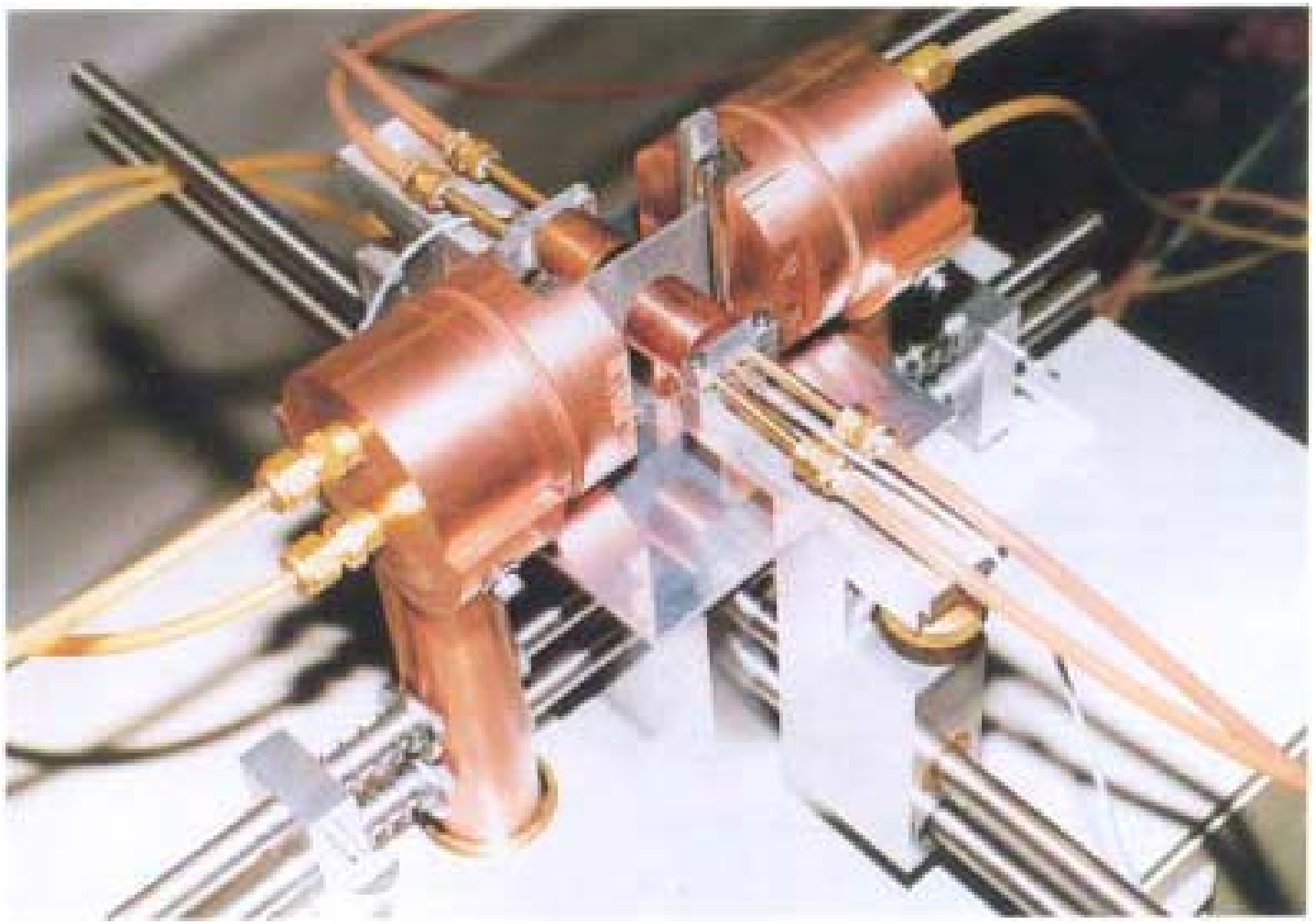
Heat Flux Gage Calibration Study



Heat Flux Gage Water Temperature Effects

- On one side of a 2” x 3” graphite plate was mounted a NIST calibrated gage and on the other side a test gage.
- Both gages were the same range of 5 Watts/cm2 and mounted 1/8" from the graphite plate.
- Graphite plate voltage/current set to give 5 millivolt signal on NIST gage (around mid-range or about 2.5 watts/cm2).
- For each test the NIST gage was cooled using room temperature water (approx. 70 Degrees F).
- Cold Test
  - Test gage was plumbed to cold tap water reading a steady 45 degrees F.
- Hot Test
  - Test gage plumbed to hot water source reading a steady 132 degrees F.

Heat Flux Gage Water Temperature Effects



Heat Flux Gage Water Temperature Effects

Results:

	COLD (45 degF)	HOT (132 degF)
NIST Gage	5.40 mv	5.40 mv
Test Gage	4.96 mv	4.96 mv

- As Anticipated, There Was Negligible Effect Varying Heat Flux Gage Cooling Water Temperature At This Heat Flux Setting

Visit To Medtherm Corp.

- Visit To Medtherm Corp. Completed
  - Discussions Included:
    - Calibration Method
      - ❖ Calibrates “Standard” Gage Using 3 Different Methods To Validate Calibration Accuracy
      - ❖ Neither Of The 3 Methods Are The Same As The NIST Heat Flux Calibration Method
      - ❖ Transfer of “Standard” Values To “Working” Gage Method Differs From FAA / Vatell
    - Gardon Gage vs. Schmidt-Boelter Type Gage
  - Part Number 64-5-20 (0-5 Watts, Lower Range, Most Common Gardon Gage)
    - Does Not Contain 3m Black Velvet Coating (Different Product)
  - Higher Ranges Available Upon Request

New FAA Equipment

- FAA Has Recently Purchased A New:
  - OSU Heat Release Rate Apparatus
    - – Fire Test Technology Ltd.
  - NBS Smoke Chamber
    - – Newport Scientific, Inc.
- Facility Painting Has Been Completed
- NBS Smoke Chamber Has Arrived And Is Currently Installed and Operational
- Original Equipment Will Remain Available For Special Testing And Occasional Training

Maintenance Tips & Reminders

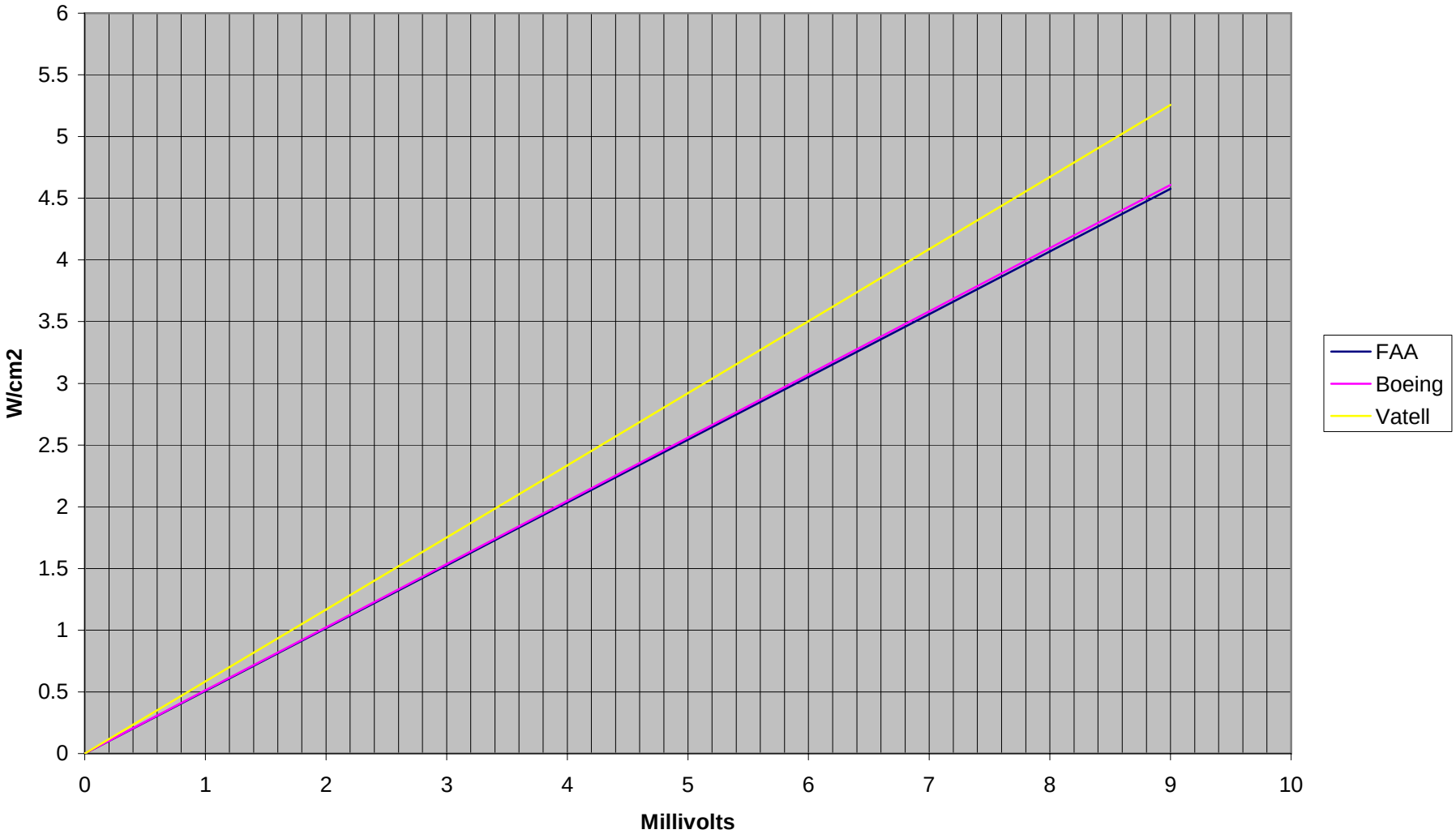
- **OSU**
  - Clean Upper Thermocouple Beads After Each Set Of 3 Test Samples As A Minimum
  - Make Sure To Maintain Inlet Air Temperature @ 70 Deg F +/- 5 Deg F

- **NBS**
  - Ensure Furnace Rim Is 1 ½" Away From Sample Face (Left, Right, Top and Bottom)
  - Monitor Supply Voltage For Any Fluctuations Observed Throughout The Day While In Use

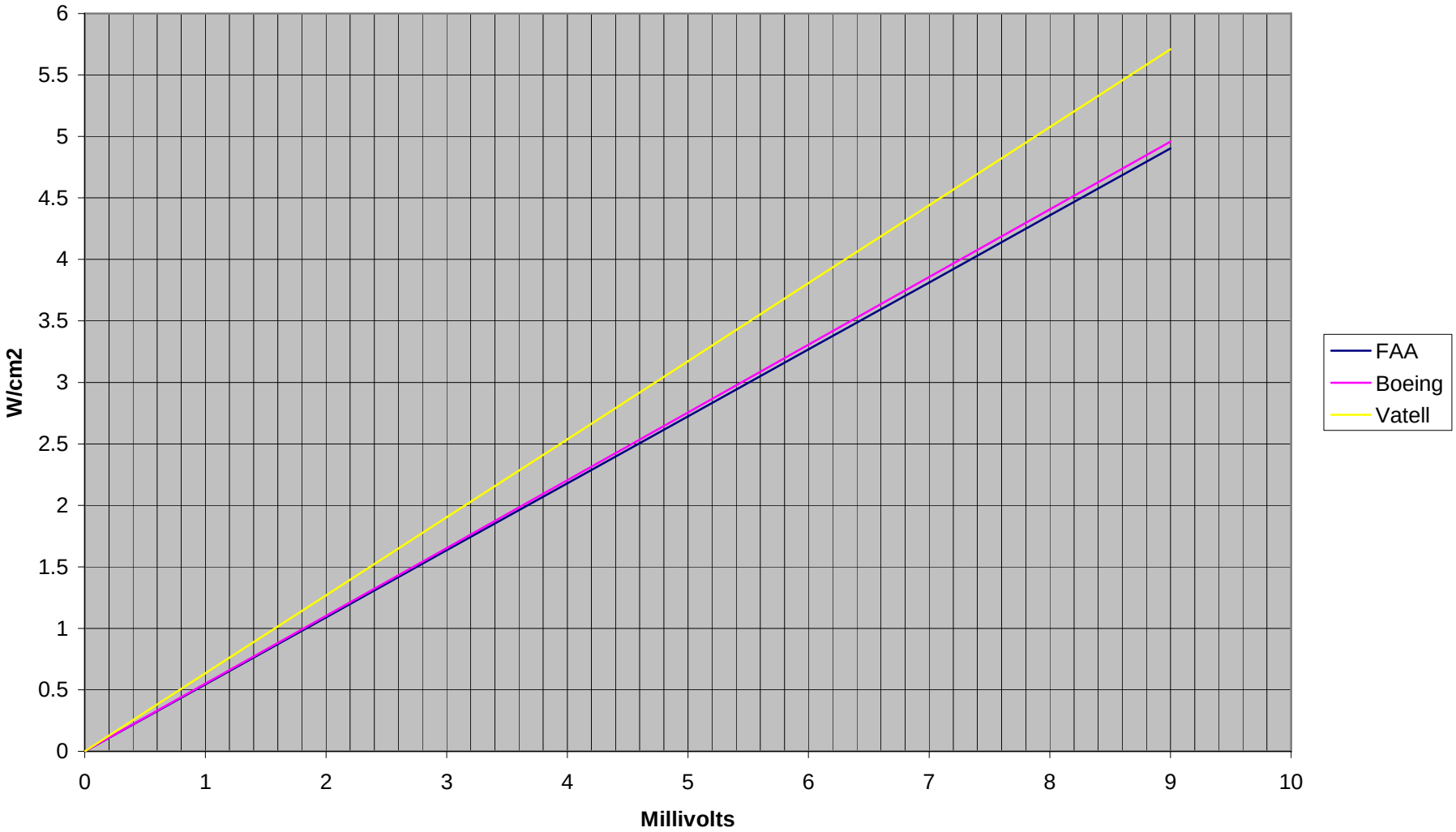
Discussion

- Heat Flux Gage Calibration Methods Used For Calibrating The Reference or “Standard” Gage

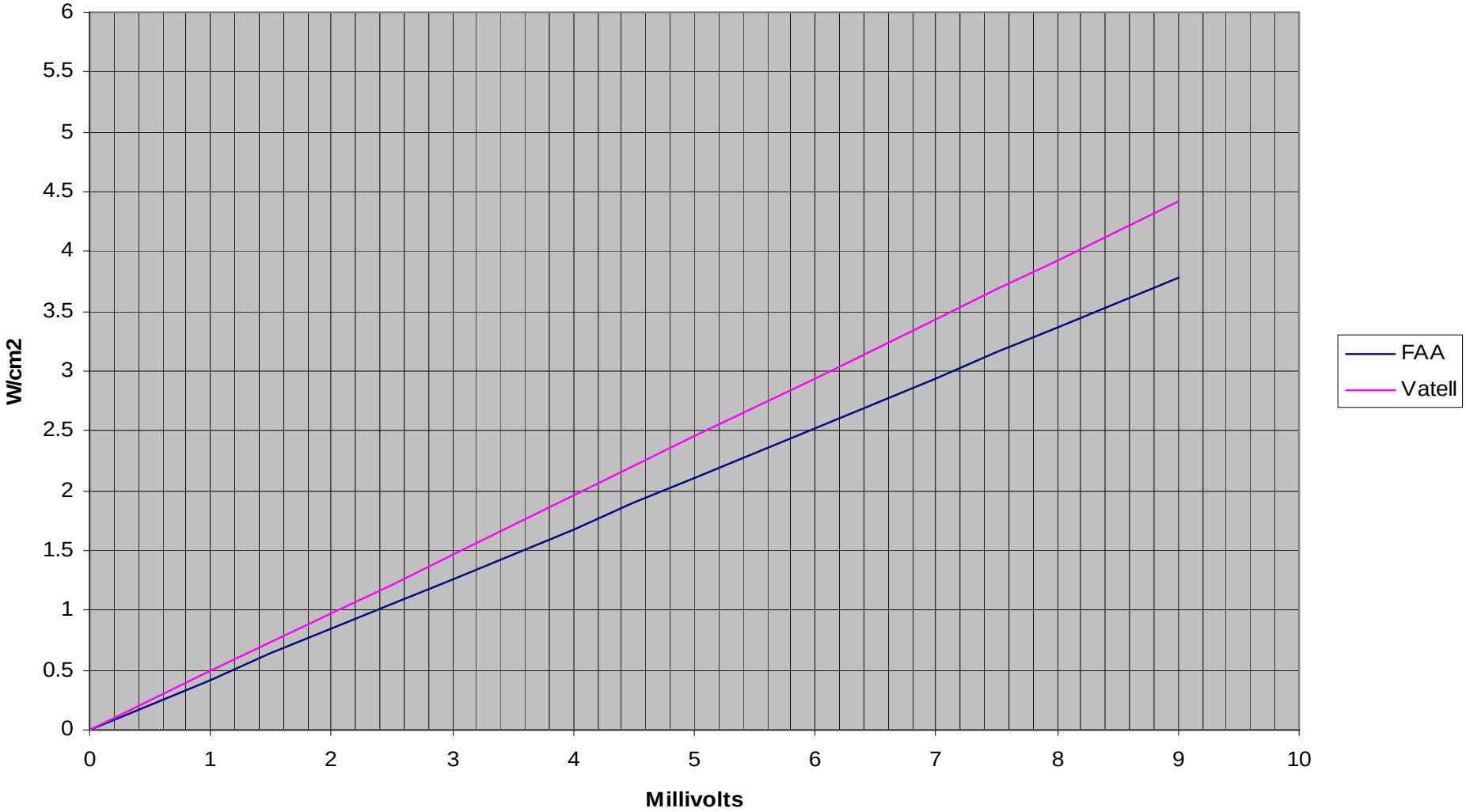
HFG Calibration Curve
S/N 8664



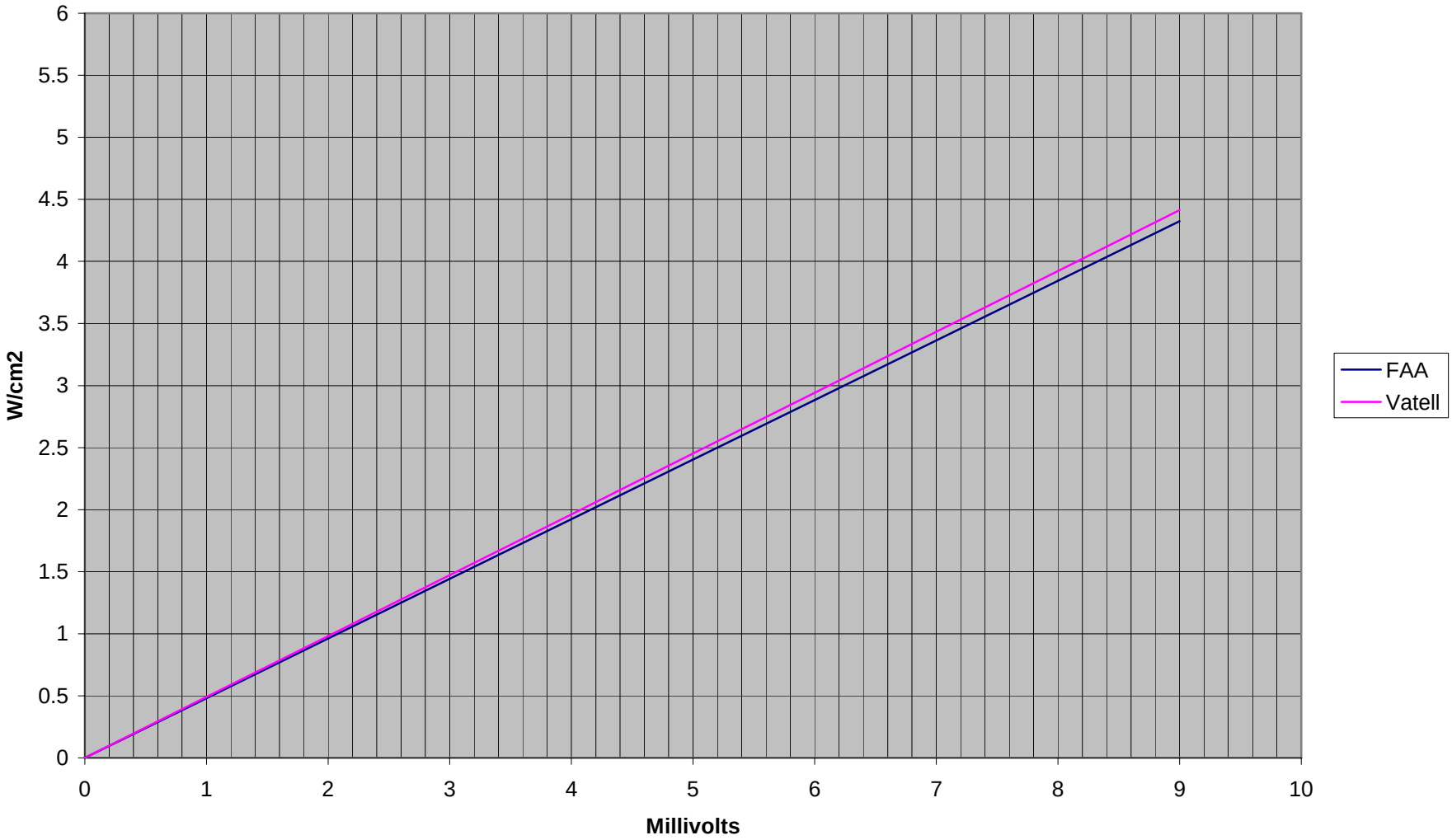
HFG Calibration Curve
S/N 8665



HFG Calibration Curve
S/N 8174



HFG Calibration Curve
S/N 8175



Next Steps

- International Labs Who Would Like To Participate In The NBS Photometric System Round Robin Please Contact The FAA
- Continue To Work HFG Calibration Discrepancy Issue
- FAA Remains In The Process Of Updating Chapter 6 Of The FAA Handbook (NBS)
- FAA Contact Information:

  Michael Burns At mike.burns@faa.gov

  +1 (609) 485-4985