

OSU & NBS Round Robin

Final Results

Presented to: Materials Working Group

By: Michael Burns, FAA Tech Center

Date: March 7, 2007



Federal Aviation
Administration



2007 OSU / NBS Round Robin Participants

Participants:	Location:
AIM Aviation	Renton, WA
AIM Composites	United Kingdom
Airbus	Germany
Airbus/Lab 2	Germany
Avio Interiors	Italy
Bodycote	Canada
Boeing	Everett, WA
Boeing	Renton, WA
CD Zodiac	Huntington Beach, CA
CTA	Spain
Delsen Testing Labs	Glendale, CA
DGA	France
DLR	Germany
FAA Wm. J Hughes Tech Center	AC Airport, NJ
Heath Tecna Lab	Billingham, WA
Herb Curry Inc.	Mt. Vernon, IN
HexCel	United Kingdom
Isavolta AG	Austria
JAMCO America, Inc.	Everett, WA
Lantal Textiles	Switzerland
North West Composites	Marysville, WA
Schneller Inc.	Pinellas Park, FL
Schneller Inc.	Kent, OH
Show a Aircraft Co.	Japan
TestCorp	Mission Viejo, CA
The GovMark Organization Inc.	Farmington, NY
Yu Xinhua	China



Overview

- **27 Participating Labs**
- **Labs reported calibrations were conducted prior to testing**
- **3 Samples of 3 different materials tested by each participating lab:**
 - 5300
 - 5400
 - 5500

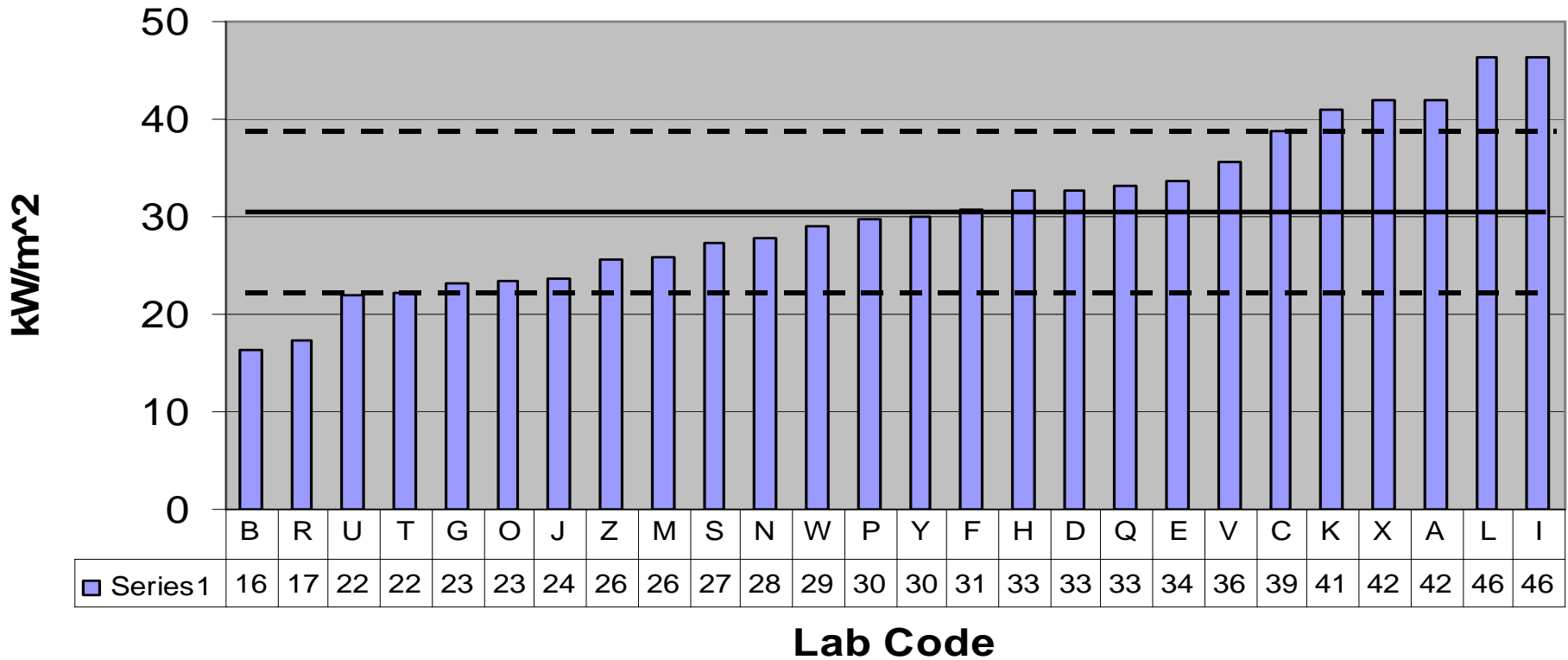
OSU Round Robin Results

- **26 Labs have reported data**
- **Test requirements:**
 - Heat flux @ 3.5 W/cm²
 - Heat Release Rate (HRR) Max Peak 65 W/cm²
 - Heat Release Rate (HR Total) 65 kW*min/m²
- **Data is presented as:**
 - Peak Heat Release Rate
 - 2 Minutes Total Heat Release Rate
 - Time to Peak Heat Release Rate

OSU Round Robin Results

5300 - Peak HRR
 Mean = 30.7 SD = 8.3

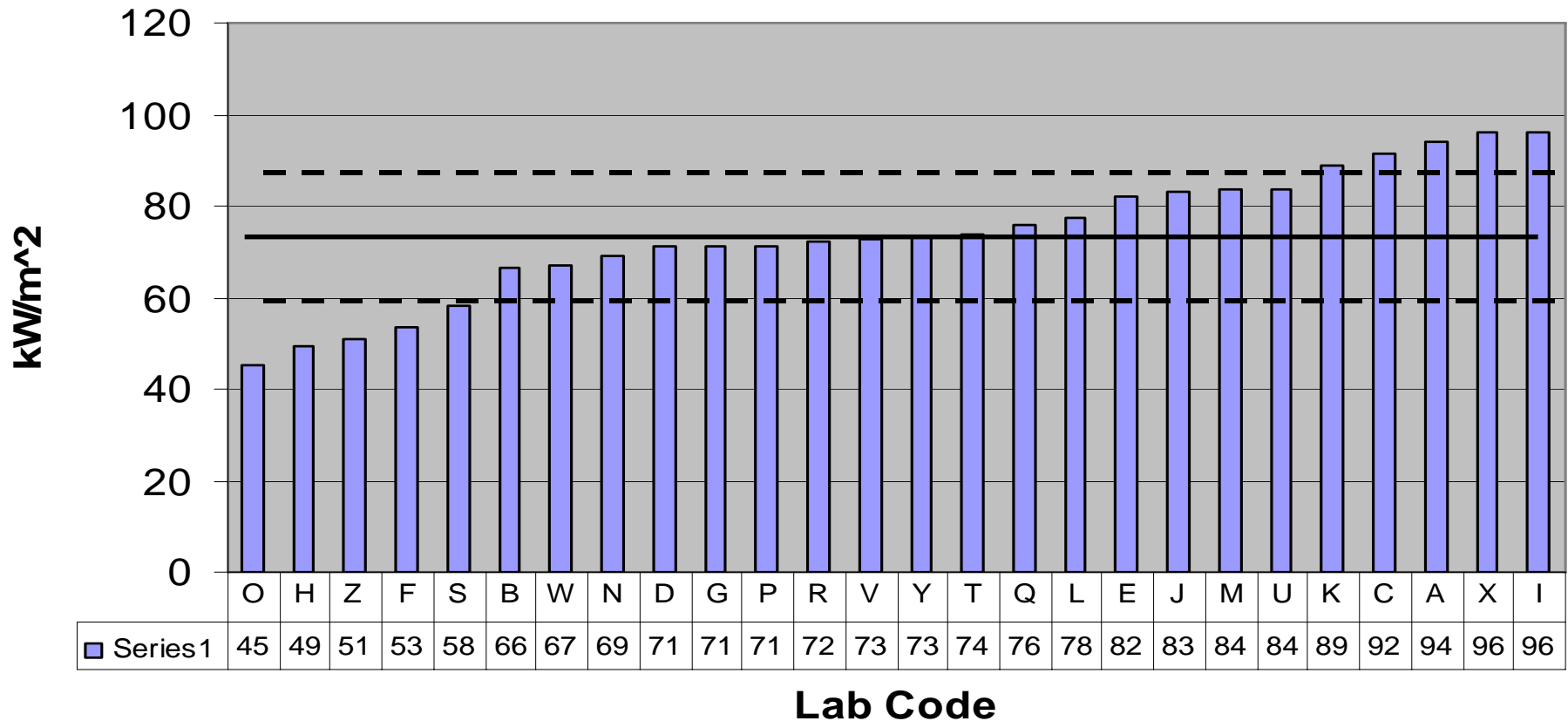
Mean +/- 1 SD



OSU Round Robin Results

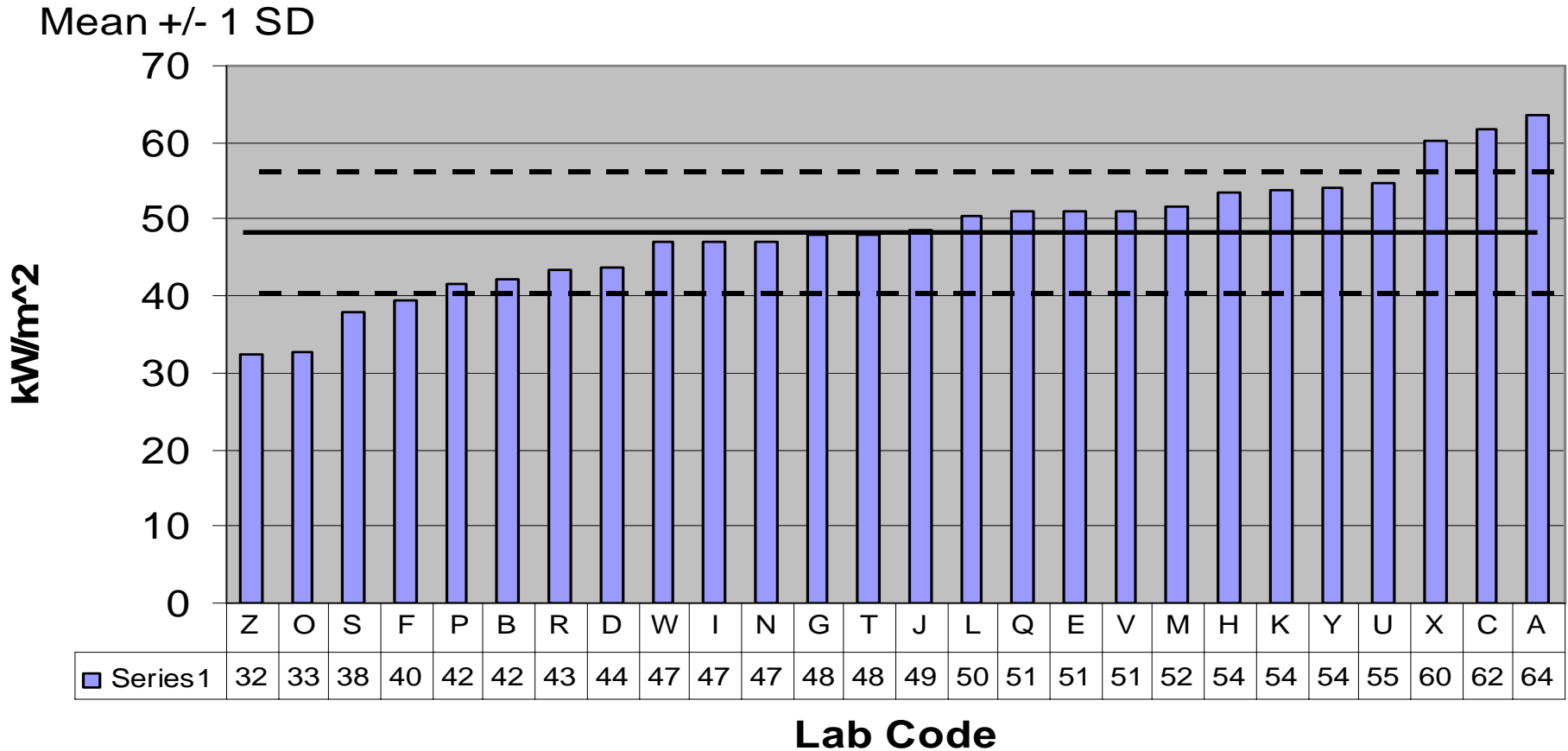
5400 - Peak HRR
 Mean = 73.4 SD = 14.3

Mean +/- 1 SD



OSU Round Robin Results

5500 - Peak HRR
 Mean = 48.3 SD = 7.9

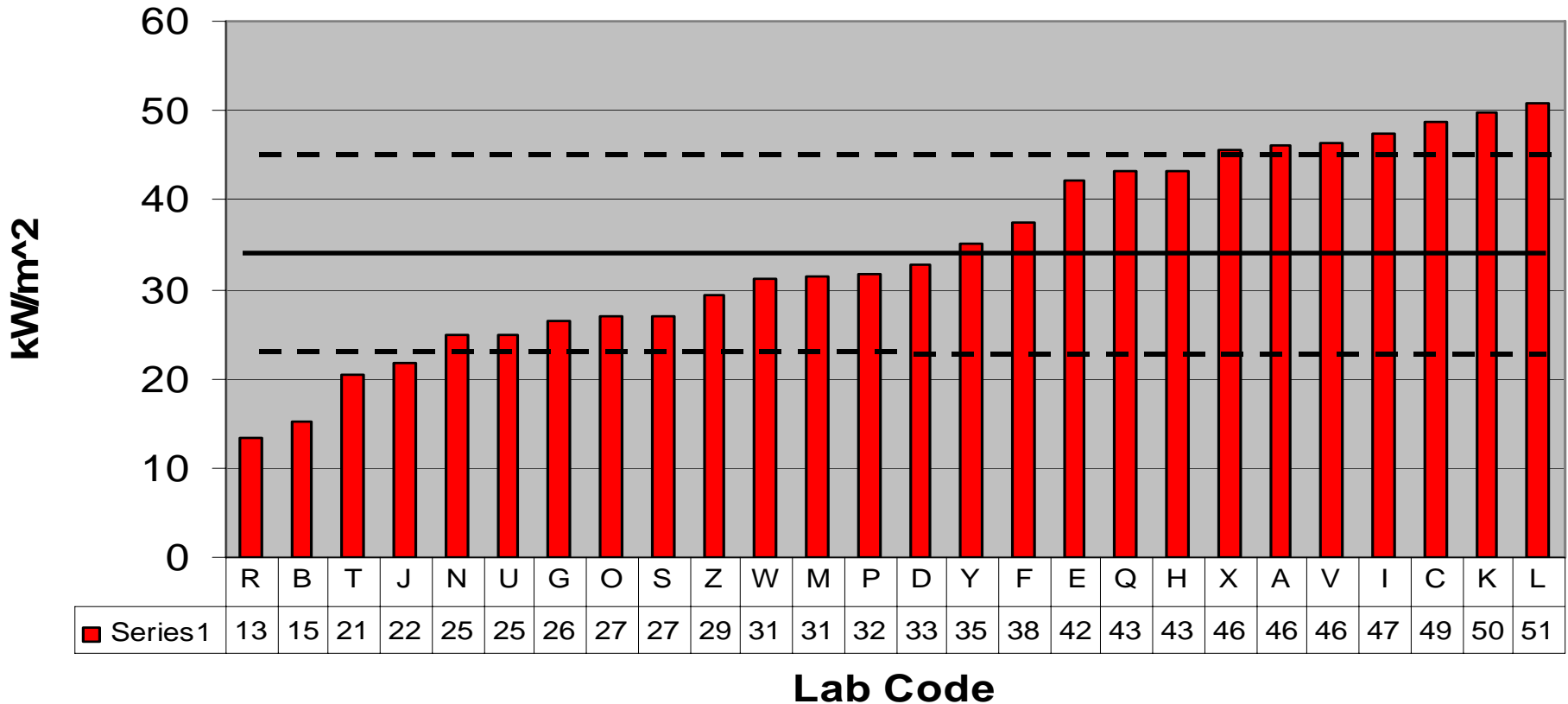


OSU Round Robin Results

5300 - 2 Minute Total HRR

Mean = 34.4 SD = 11.1

Mean +/- 1 SD

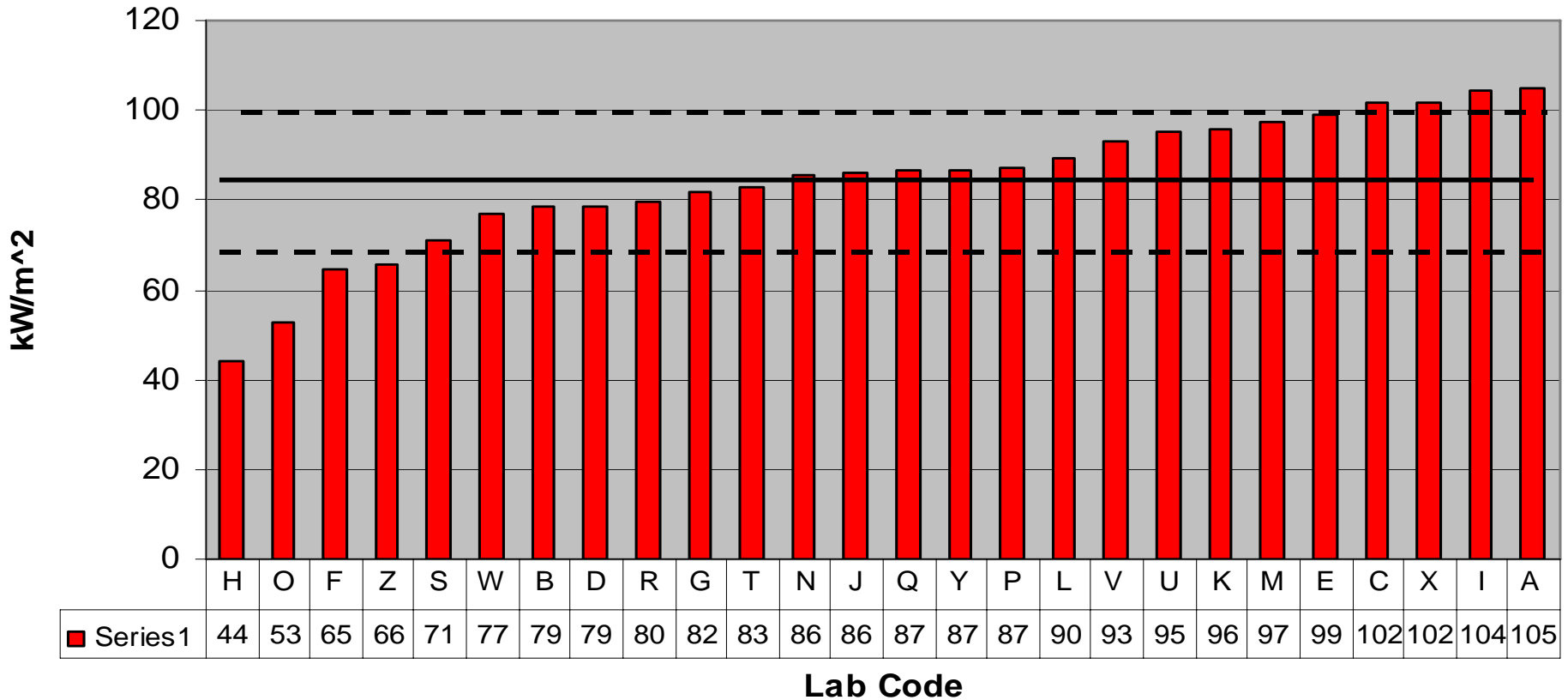


OSU Round Robin Results

5400 - 2 Minute Total HRR

Mean = 84.3 SD = 15.4

Mean +/- 1 SD

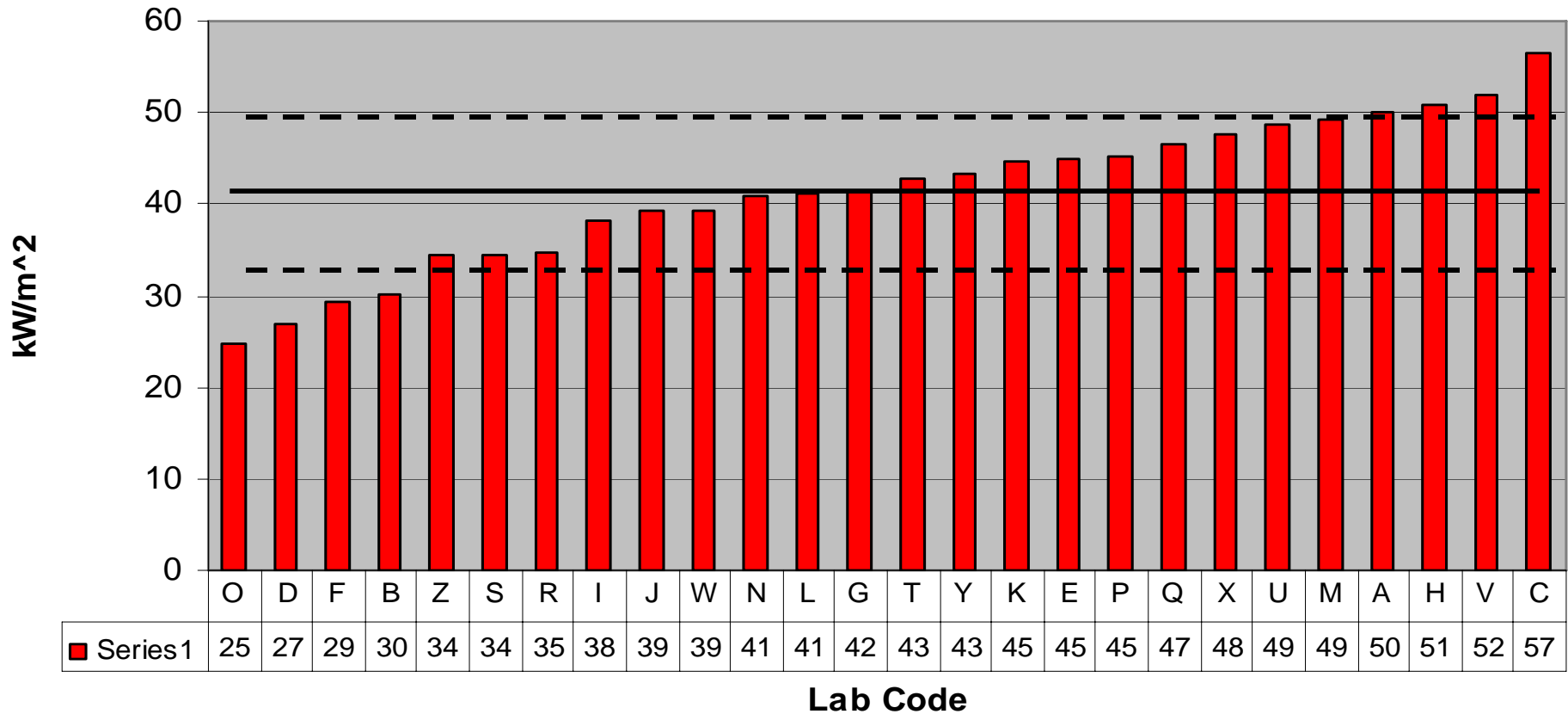


OSU Round Robin Results

5500 - 2 Minute Total HRR

Mean = 41.4 SD = 8.1

Mean +/- 1 SD

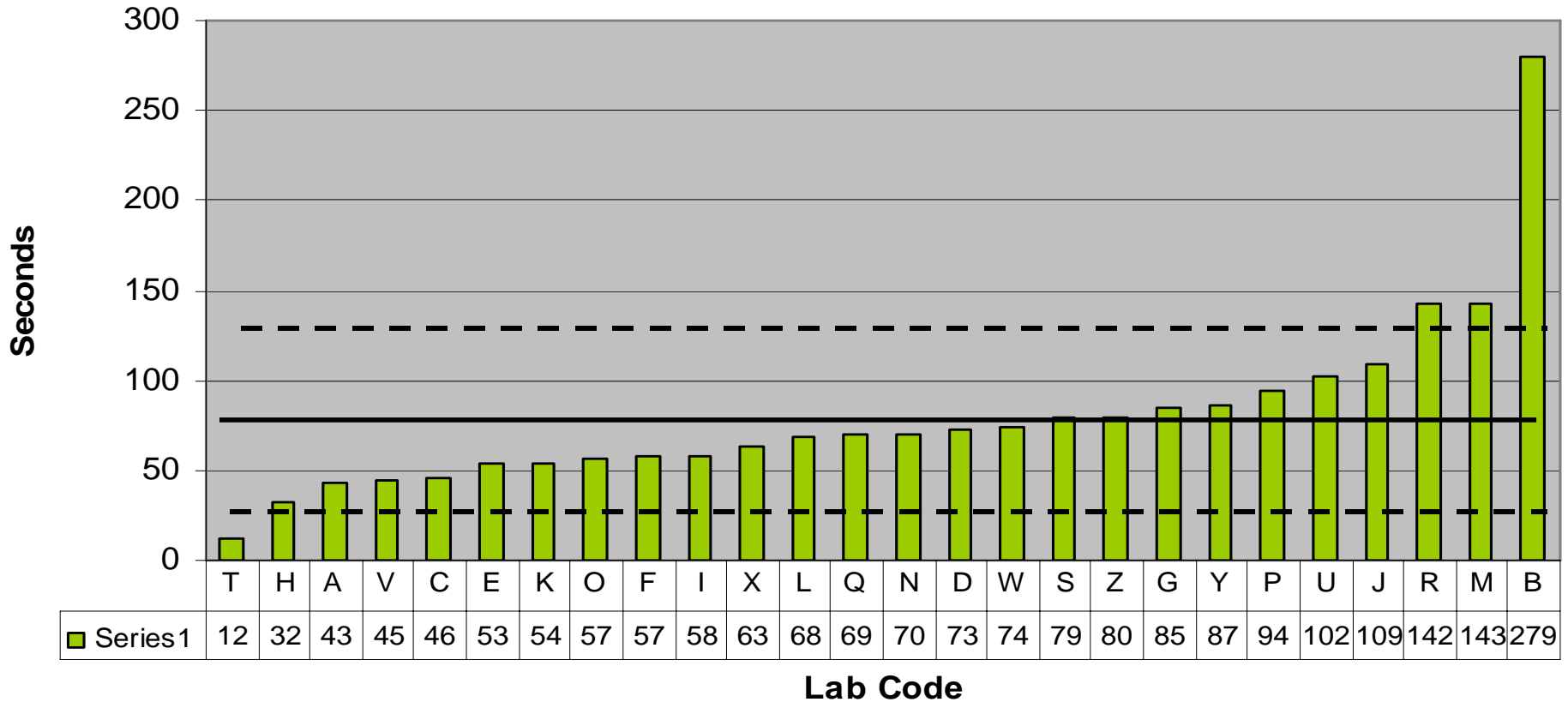


OSU Round Robin Results

5300 - Time to Peak HRR

Mean = 79.8 SD = 50.4

Mean +/- 1 SD

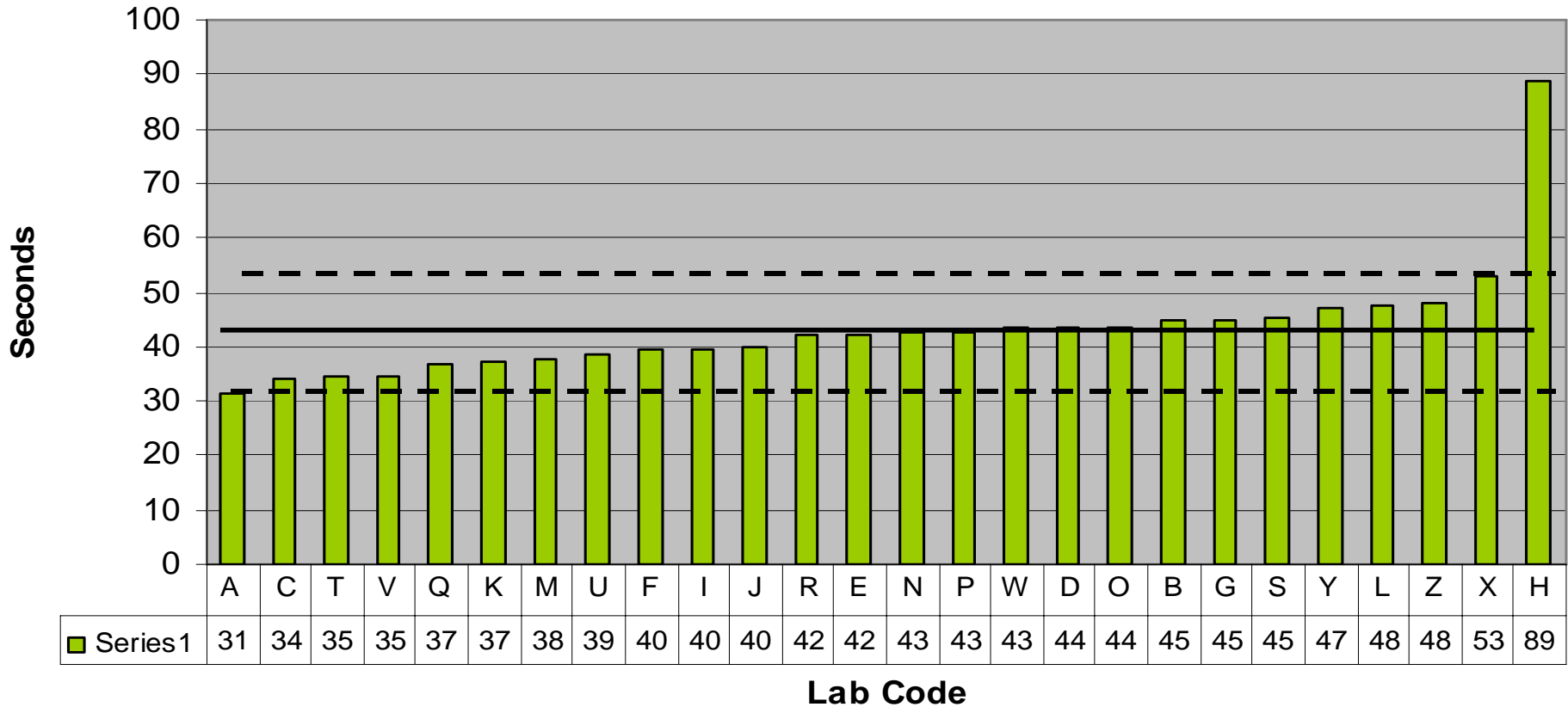


OSU Round Robin Results

5400 - Time to Peak HRR

Mean = 43.2 SD = 10.5

Mean +/- 1 SD



OSU Round Robin Results

- **Sample 5500 is a double Peak Panel with both Peaks Similar in Height**
- **Due to the varying times and values for these two peaks, a meaningful comparison is not possible.**
- **Factors that may affect Peak Time:**
 - Starting Sequence Technique
 - Pilot Flame Position
 - Pilot Flame Aggressiveness

OSU Round Robin Results

- **Factors that may influence Peak and Total Heat Release Rate:**
 - Thermocouple Bead Size
 - Metal Gauges
 - Soot Build Up
 - Air Flow
 - Heat Loss

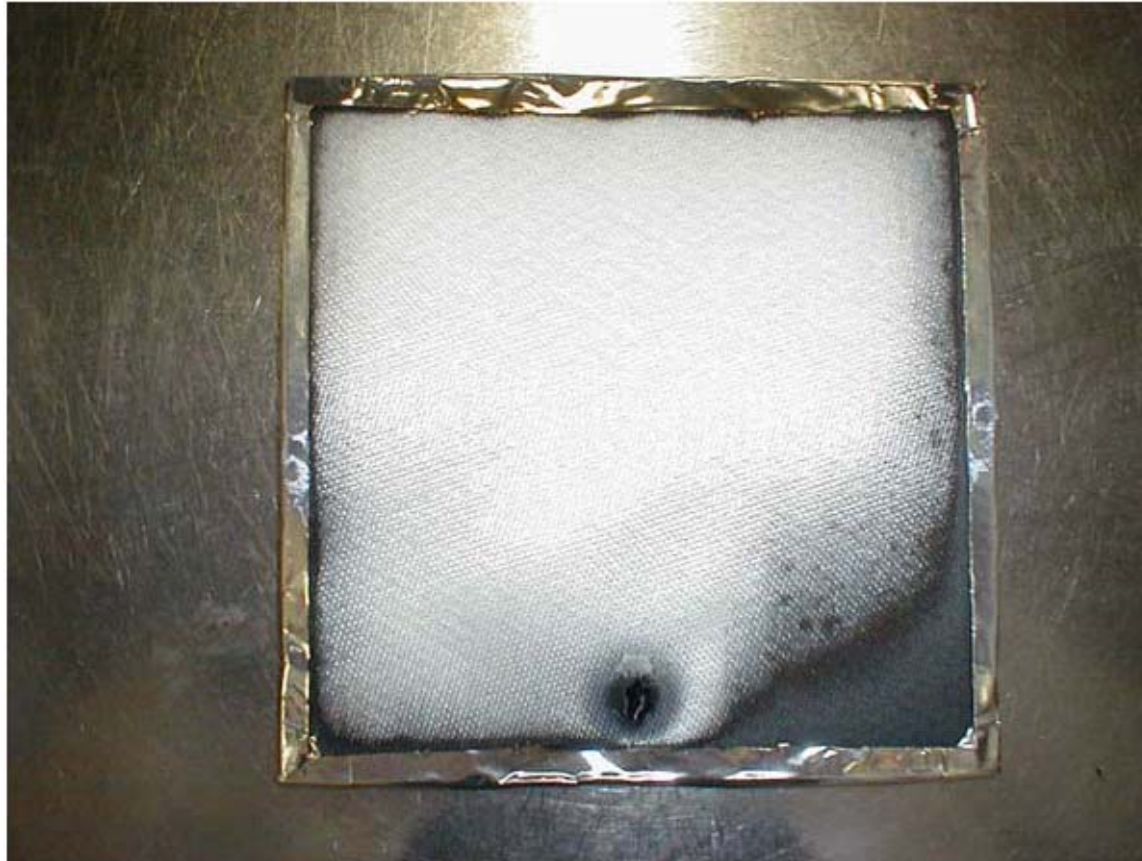
OSU Round Robin Results



Specimen 5300 before the test



OSU Round Robin Results



Sample 5300 after testing

OSU Round Robin Results



- **Difference in starting sequence may have been the reason for a reduction of Total heat by 12% and a delay in Time to Peak by 100% between these two tests.**

NBS Round Robin Results

- **27 Labs have reported data**
- **Test requirements:**
 - Heat flux @ $2.5 \text{ W/cm}^2 \pm 0.05 \text{ W/cm}^2$
 - Smoke density factor in flaming conditions:
Max. Ds @ 4 min <200 (Ds)
- **Data is presented as:**
 - Maximum Optical Smoke Density observed during the 4 minutes.

NBS Round Robin Results

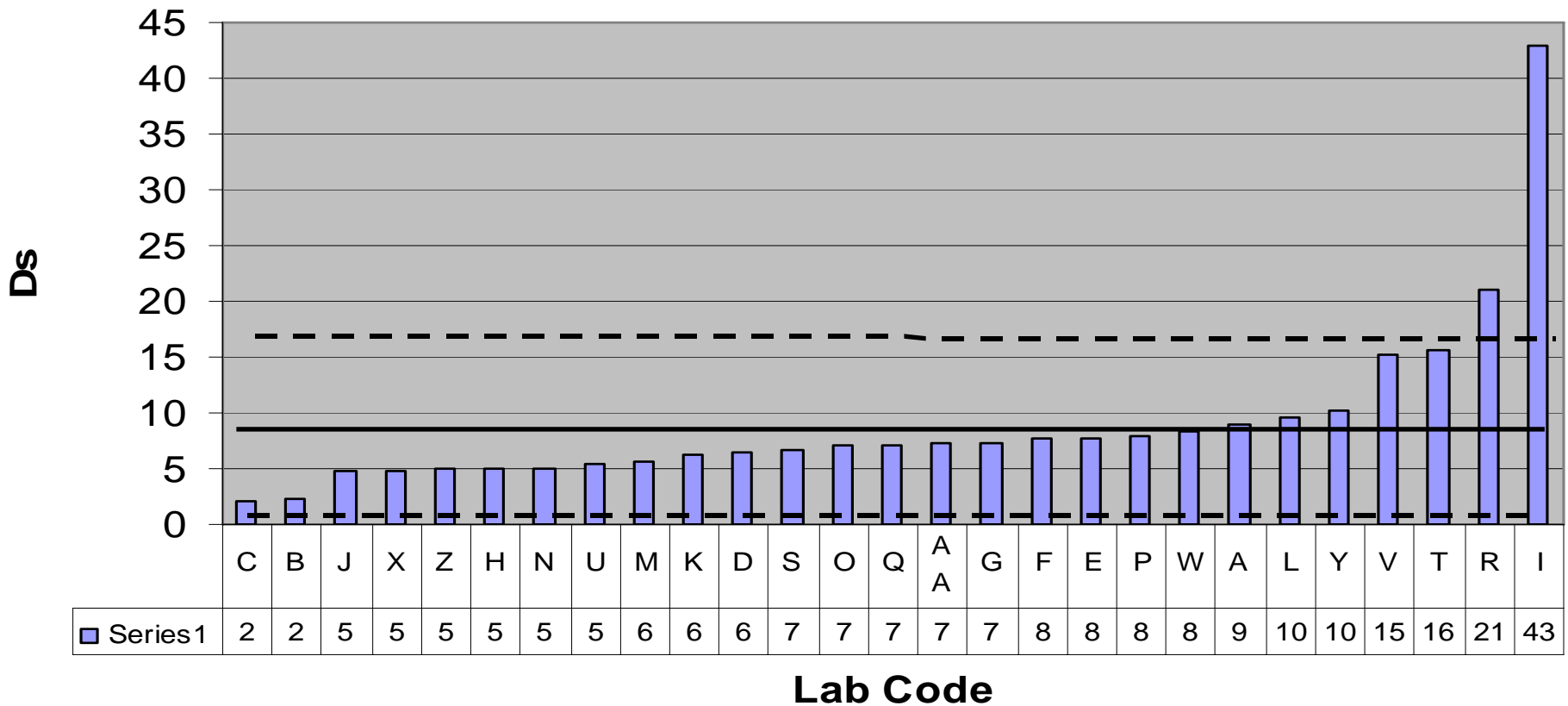
- Some labs have only reported data for observed Smoke Ds at 4 minutes.
- Reported data contains some ambiguity with regard to observed Smoke Ds at 4 minutes and the Maximum Smoke Ds observed during the 4 minutes.

NBS Round Robin Results

5300 - MAX Ds DURING 4 MINUTES

Mean = 9 SD = 7.9

Mean +/- 1 SD

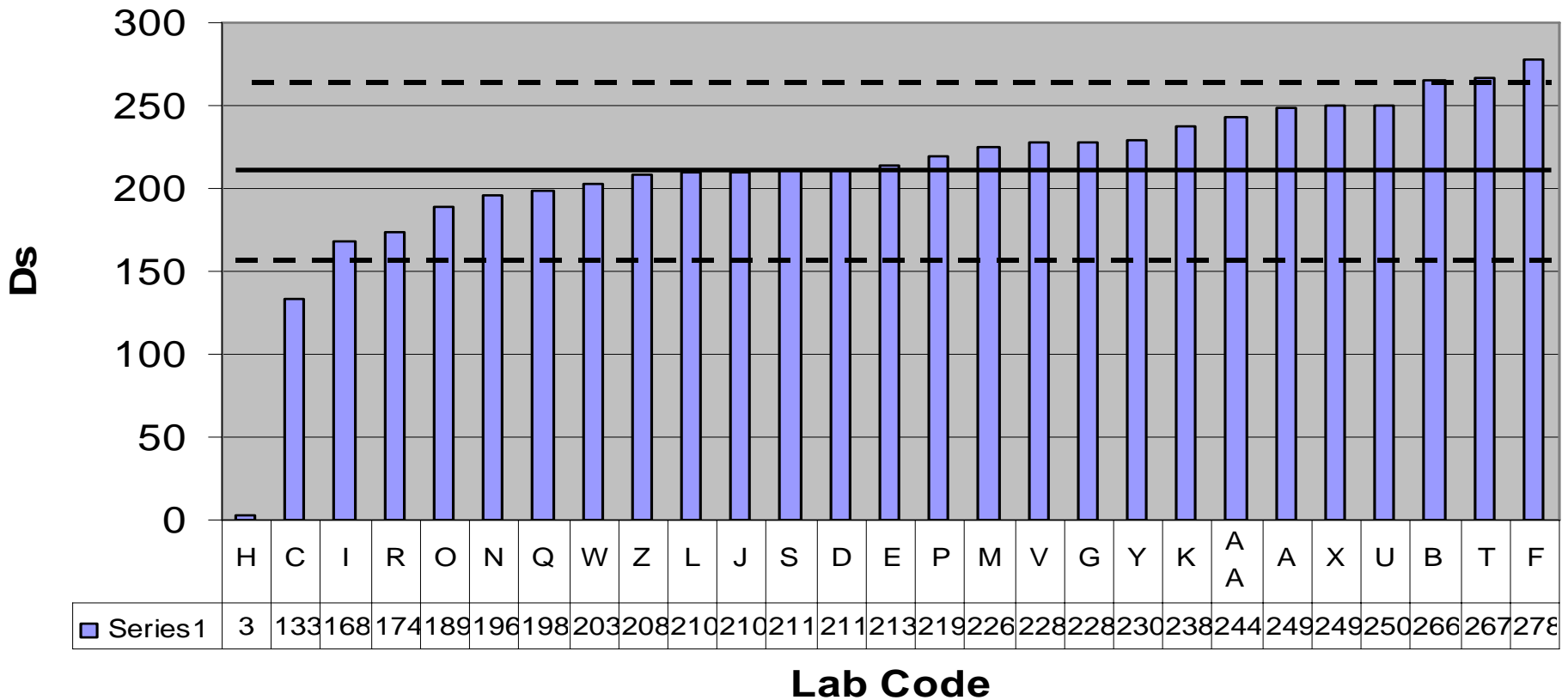


NBS Round Robin Results

5400 - MAX Ds DURING 4 MINUTES

Mean = 211 SD = 52.5

Mean +/- 1 SD

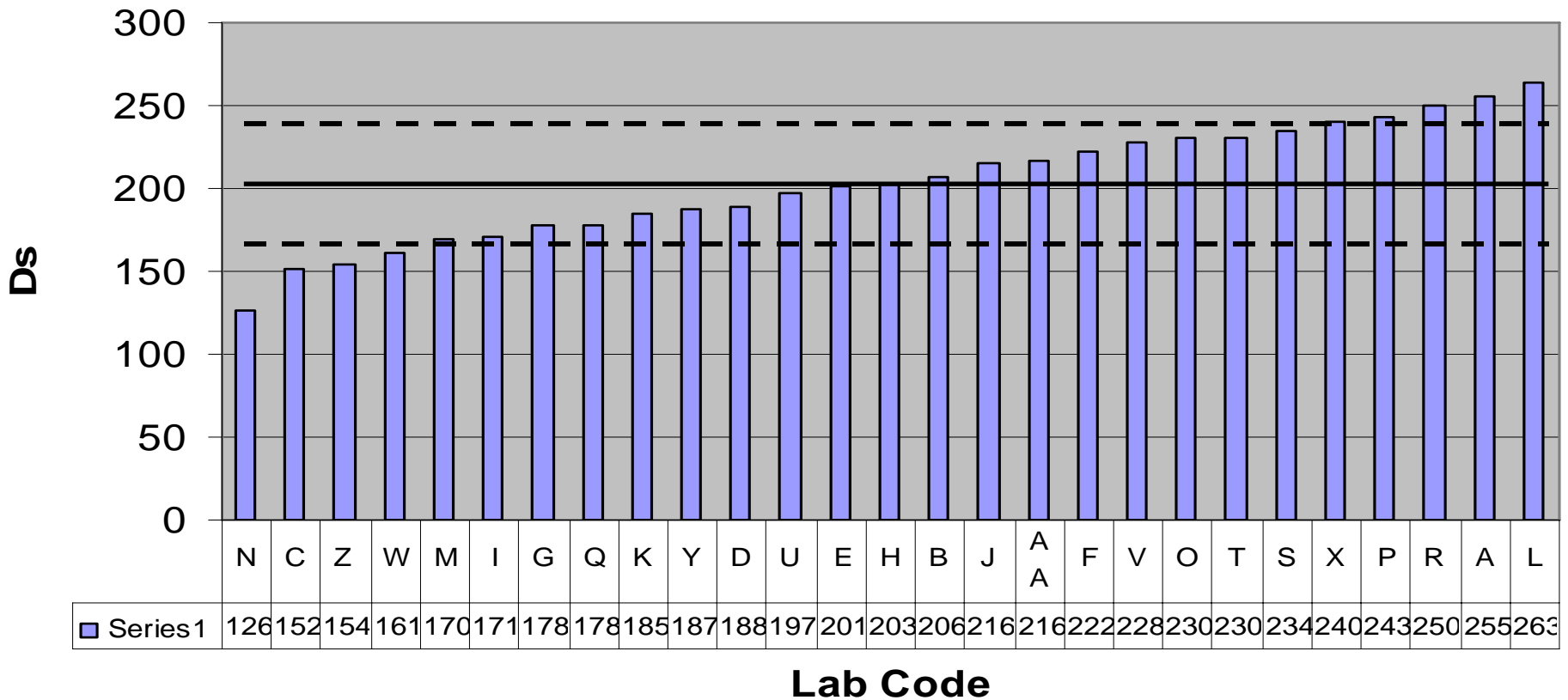


NBS Round Robin Results

5500 - MAX Ds DURING 4 MINUTES

Mean = 203.2 SD = 35.3

Mean +/- 1 SD



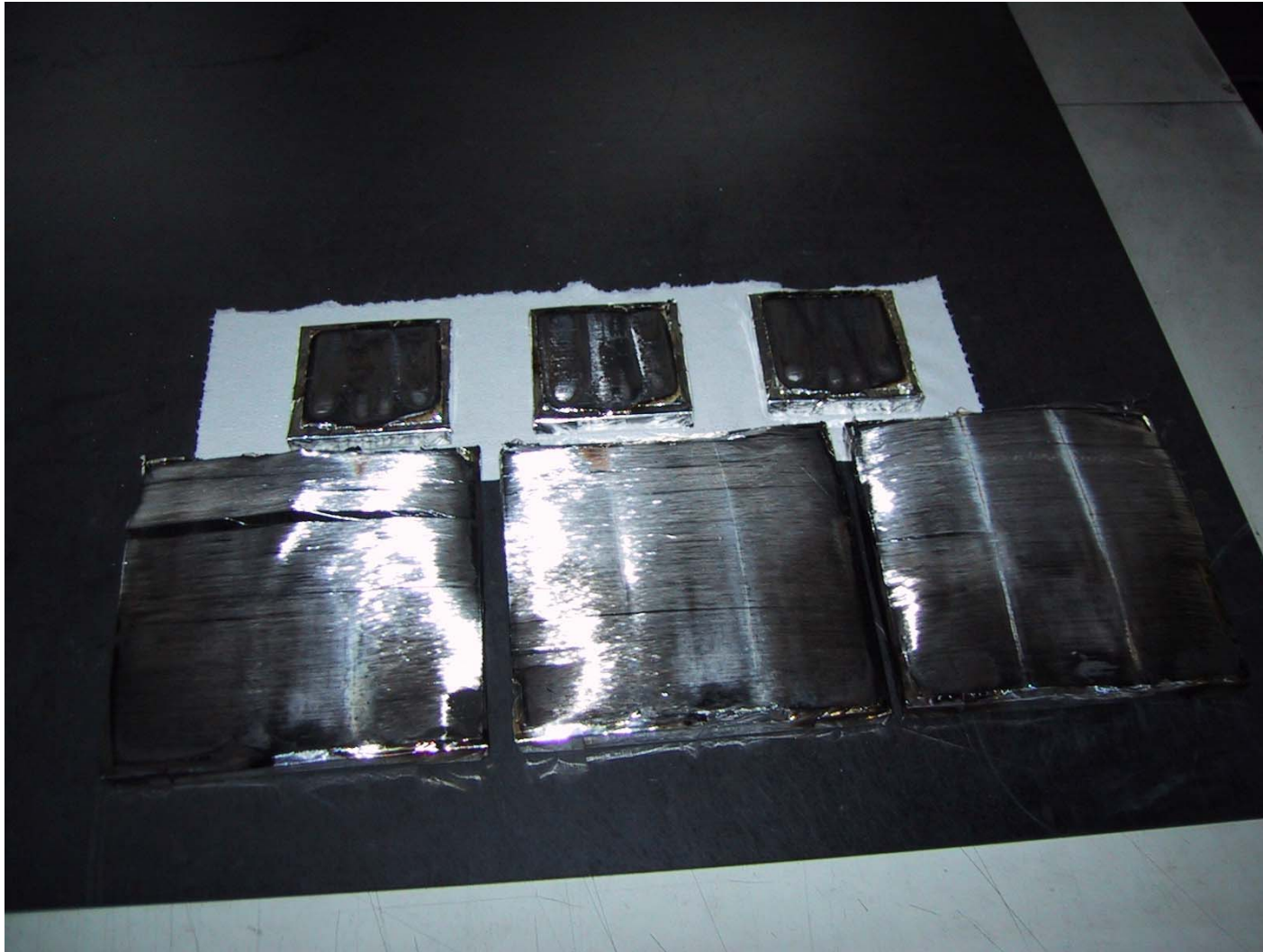
OSU Round Robin Results



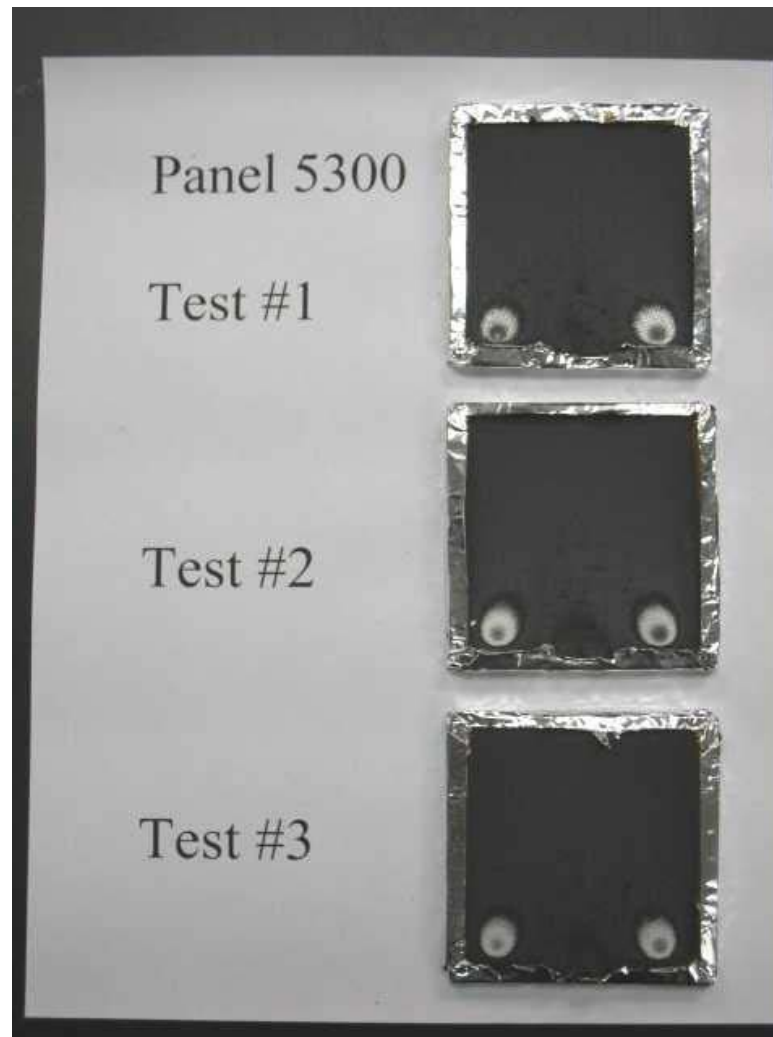
OSU Round Robin Results



OSU Round Robin Results



OSU Round Robin Results



OSU Round Robin Results

- **Pass / Fail results based on Population Average**

Sample	Peak HRR (W/cm ²)	Total HRR (W/cm ²)	Optical Smoke Density (Ds)
5300	Pass	Pass	Pass
5400	Fail	Fail	Fail
5500	Pass	Pass	Fail

• Labs with Passing Results

Sample	Peak HRR (W/cm ²)	Total HRR (W/cm ²)	Optical Smoke Density (Ds)
5300	All Passed	All Passed	All Passed
5400	F,H,O,S,Z	F,H,O,Z	C,H,I,N,O,Q,R
5500	All Passed	All Passed	C,D,G,I,K,M,N,Q,U,W,Y,Z

Closing Remarks

- **I just inherited this project from Richard Johnson who recently retired.**
- **Lab codes are available for anyone present who has not received one**
- **We are currently evaluating how to proceed due to the varying results among participating labs.**