Review of Best Practices to Improve Particulate Matter Sampling

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Presented by

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PM Emissions Overview

fPM	+	CPM	= TPM
Method 5 Method 17 Method 201A		Method 202	

Method 5 Summary (fPM)

Isokinetic Sampling

Heated Probe

Heated Filter

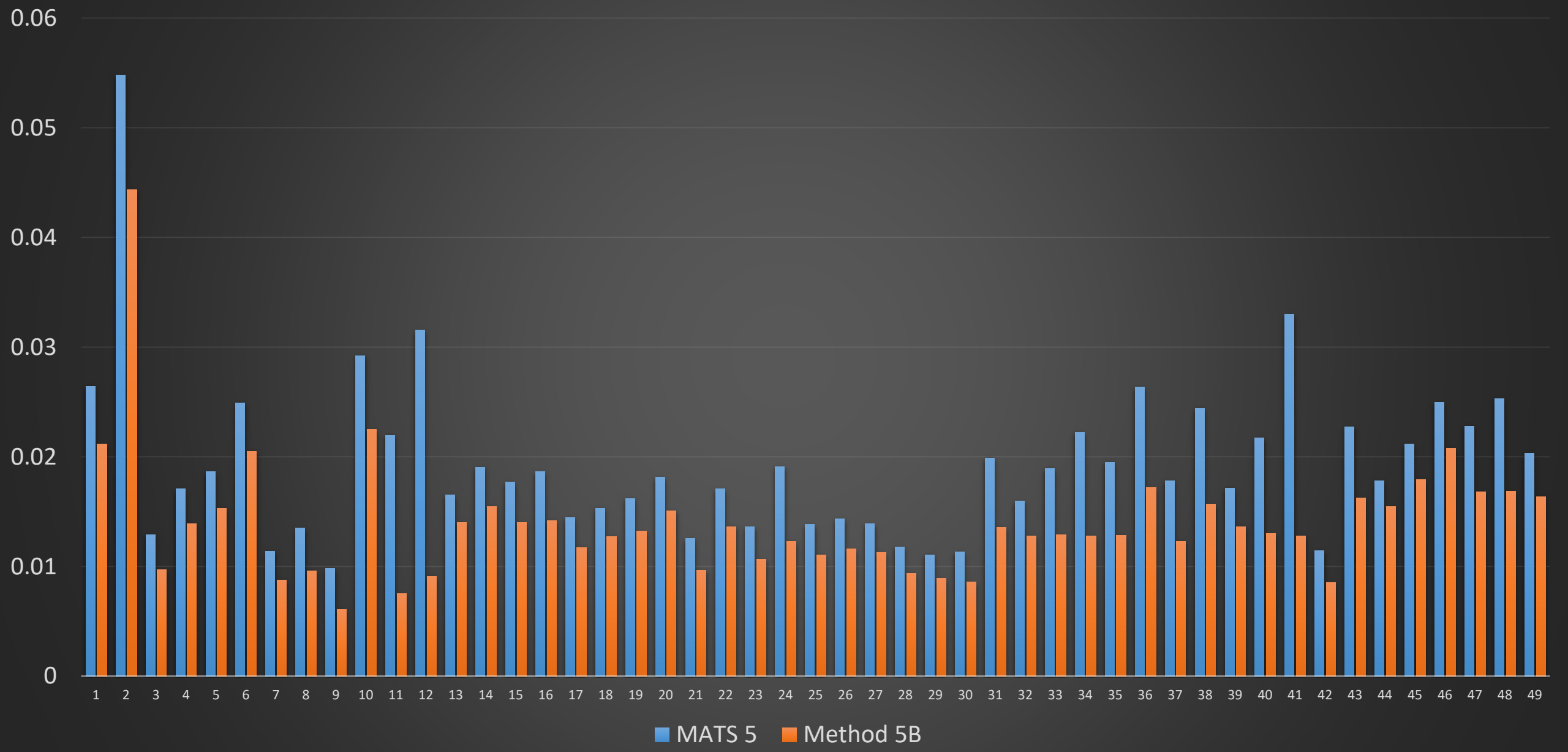
Post-Test Probe Rinse

Laboratory Gravimetric Analysis

Methodology Differences

Method	Probe & Filter Set Points	Gravimetric Procedure	Baking Temperature
Method 5	248 ± 25°F	Desiccate at room temperature until constant.	N/A
Method 5B	320 ± 25°F	Bake for 6 hours at 320°F before desiccating.	320°F
MATS Method 5	320 ± 25°F	Same as Method 5.	N/A

MATS 5 vs. Method 5B (g)



MATS Limits

Subcategory	fPM (lb/MWh)	fPM (lb/MMBtu)	fPM (mg/dscm)
Existing – Low Rank Virgin Coal	0.3	0.03	49.1
Existing – Other	0.3	0.03	48.7
Existing IGCC	0.3	0.04	65.5
Existing – Solid Oil-Derived	0.08	0.008	14.0
New – Low Rank Virgin Coal	0.09	0.009	14.7
New – Other	0.09	0.009	14.6
New IGCC (Syngas Duct Burners)	0.07	0.007	11.5
New IGCC (Natural Gas Duct Burners)	0.09	0.009	14.7
New – Solid Oil-Derived	0.03	0.003	5.2
New – Liquid Oil Continental	0.3	0.03	52.3
New – Liquid Oil Non-Continental	0.2	0.02	34.9

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What impacts data quality?

Laboratory Practices

Test Crew Training

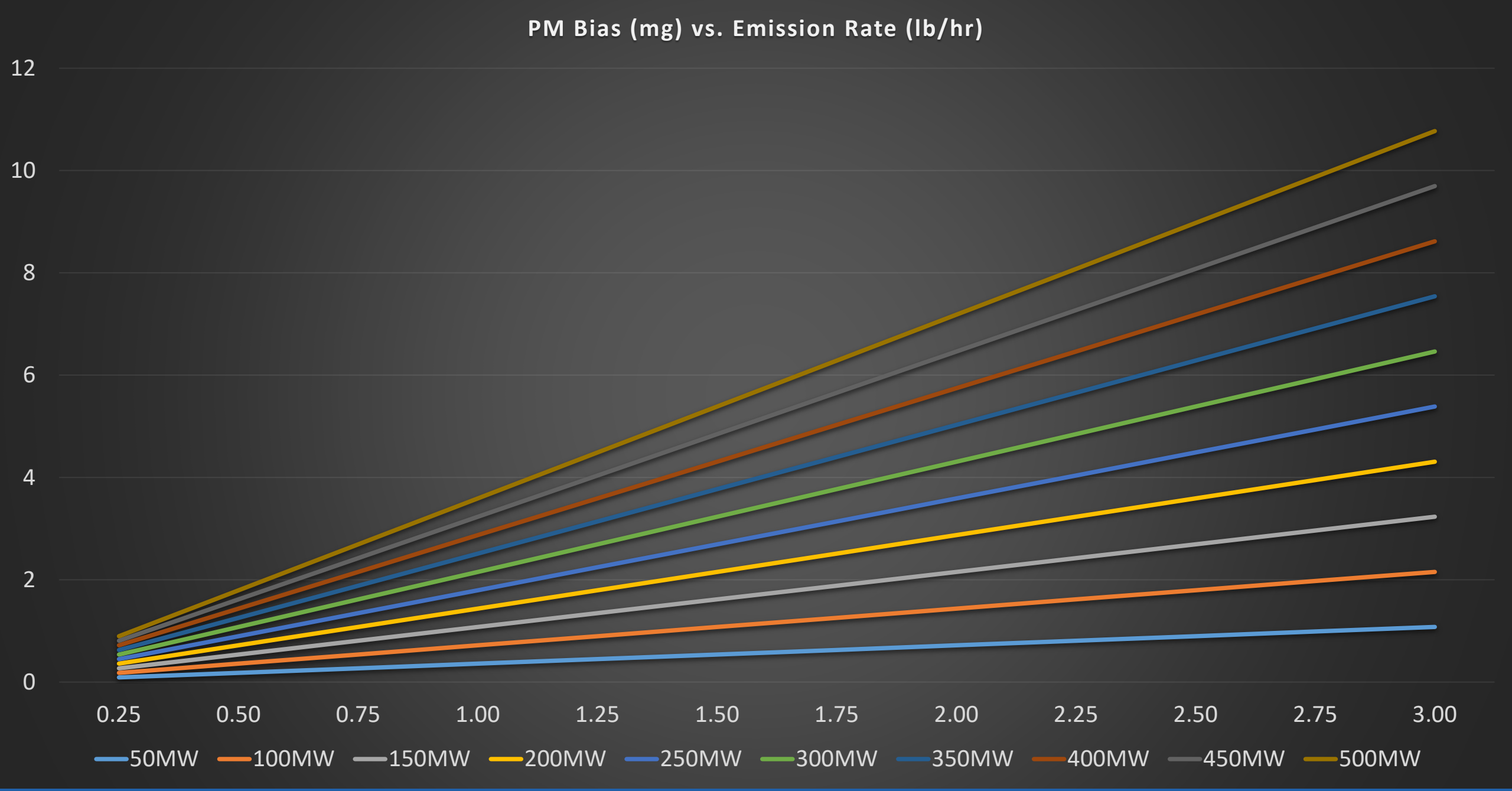
Sampling Specifications

Laboratory Detection Limit

Field Blanks/Proofs

Field Lab Procedures

Analytical Specifications


PM Bias (mg) vs. Emission Rate (lb/hr)
12
10
8
6
4
2
0
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
50MW
100MW
150MW
200MW
250MW
300MW
350MW
400MW
450MW
500MW

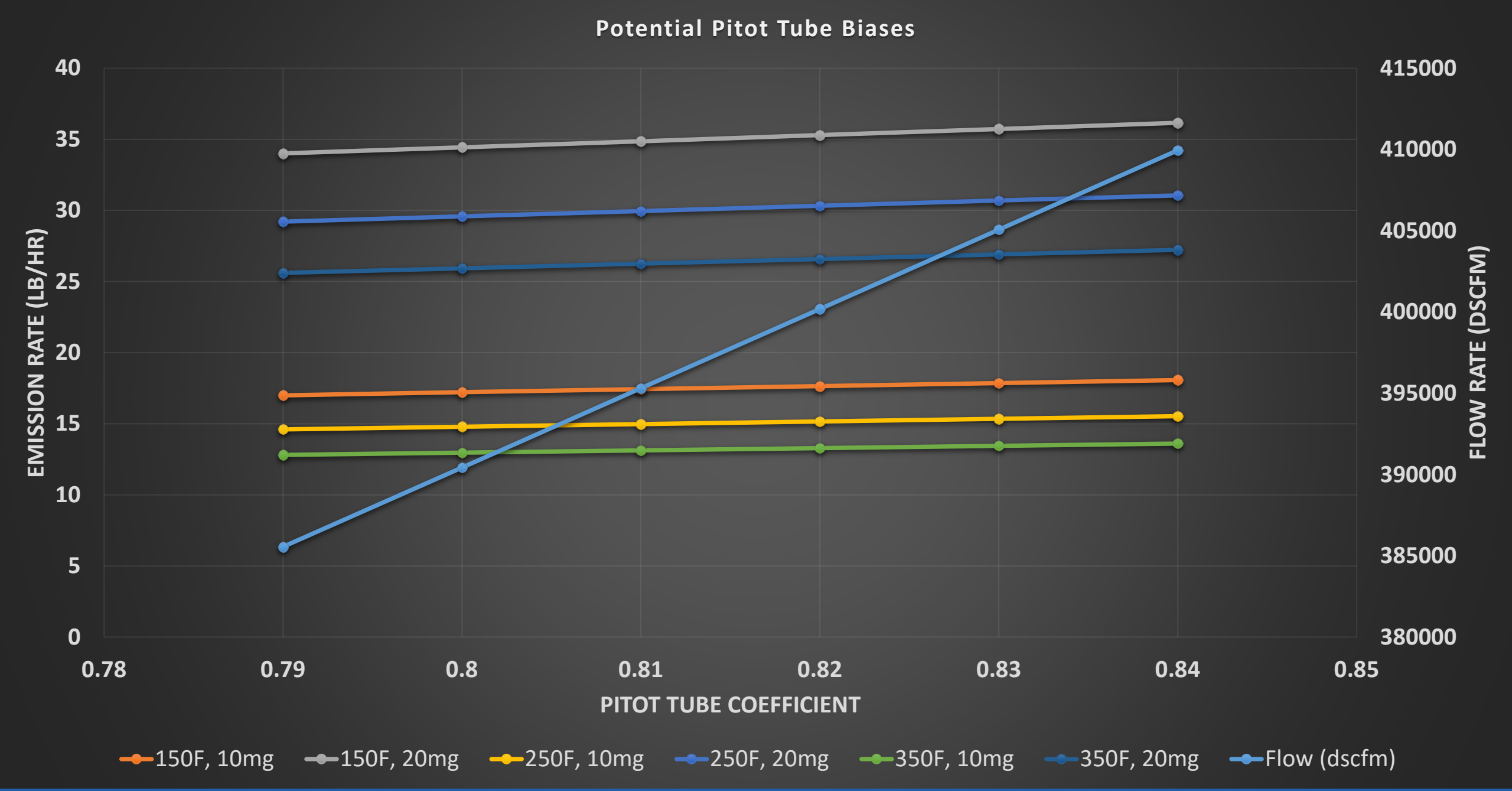
Detection Limit Uncertainties

Laboratory Detection Limit (mg)	Mass Required for 10% Uncertainty	Mass Required for 10% Uncertainty @95% Confidence	Mass Required for 10% Uncertainty @99% Confidence
0.1	0.67	1.67	3.33
0.2	1.33	3.33	6.67
0.3	2.00	5.00	10.00
0.4	2.67	6.67	13.33
0.5	3.33	8.33	16.67
0.6	4.00	10.00	20.00
0.7	4.67	11.67	23.33
0.8	5.33	13.33	26.67
0.9	6.00	15.00	30.00
1.0	6.67	16.67	33.33

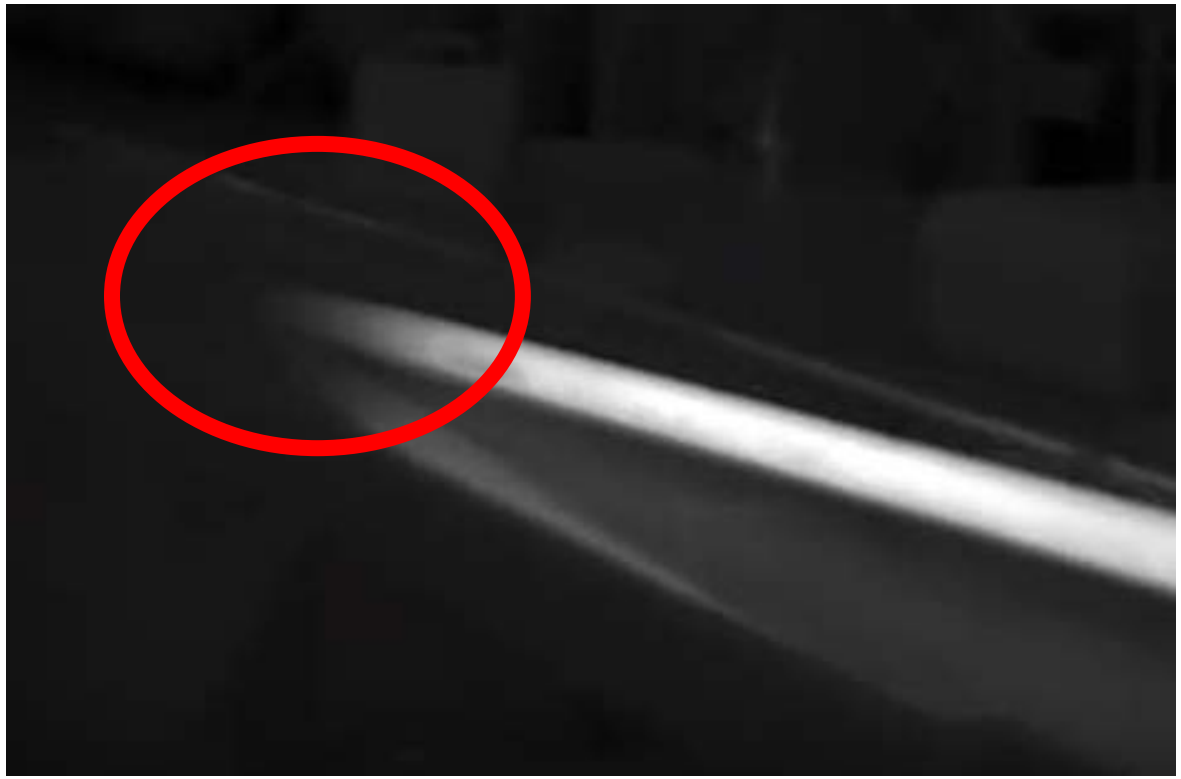
CleanAir

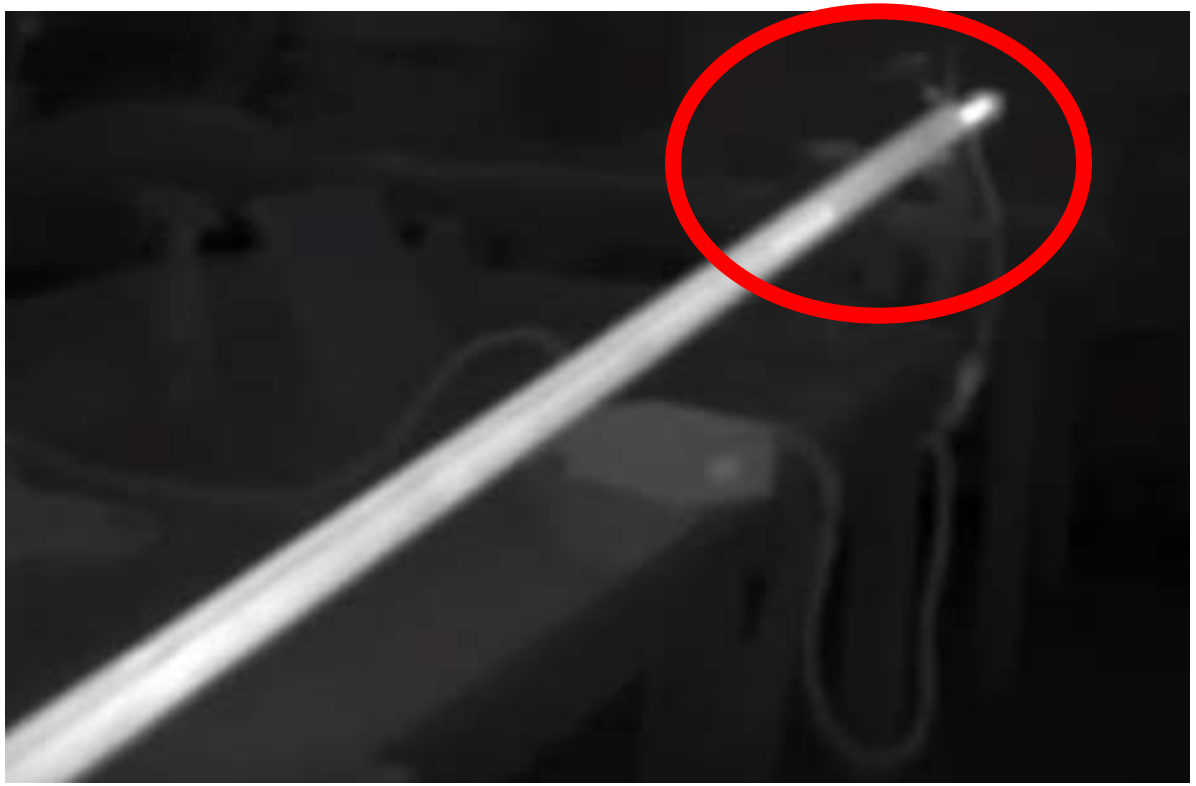
Sampling Uncertainties

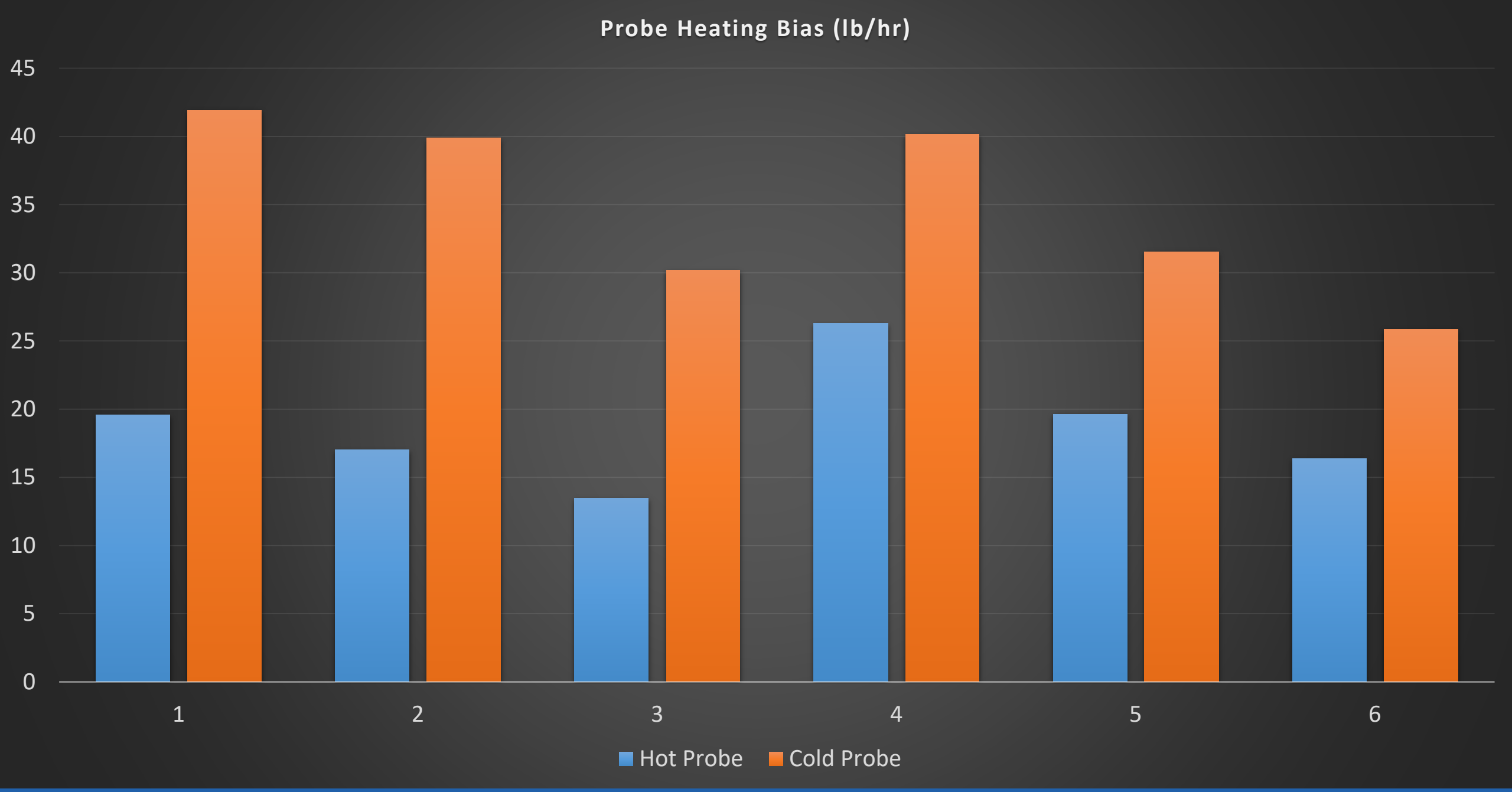
CleanAir


Potential Pitot Tube Biases
EMISSION RATE (LB/HR)
FLOW RATE (DSCFM)
PITOT TUBE COEFFICIENT
0
5
10
15
20
25
30
35
40
380000
385000
390000
395000
400000
405000
410000
415000
0.78
0.79
0.8
0.81
0.82
0.83
0.84
0.85
150F, 10mg
150F, 20mg
250F, 10mg
250F, 20mg
350F, 10mg
350F, 20mg
Flow (dscfm)

Probe Heating Bias






Probe Heating Bias (lb/hr)
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
6
Hot Probe
Cold Probe

Final Overview

Laboratory Practices

Project Planning

Reduce Systematic Biases

Analytical Enhancements

Sampling Enhancements

Questions…