The 5014iQ and 5030iQ SHARP Particulate Monitors

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Introduction

Two models, both use beta attenuation for mass measurements

Model 5014iQ PM Monitor

- Beta attenuation monitor
- Provides reliable mass measurement
- Provides real-time beta measurement

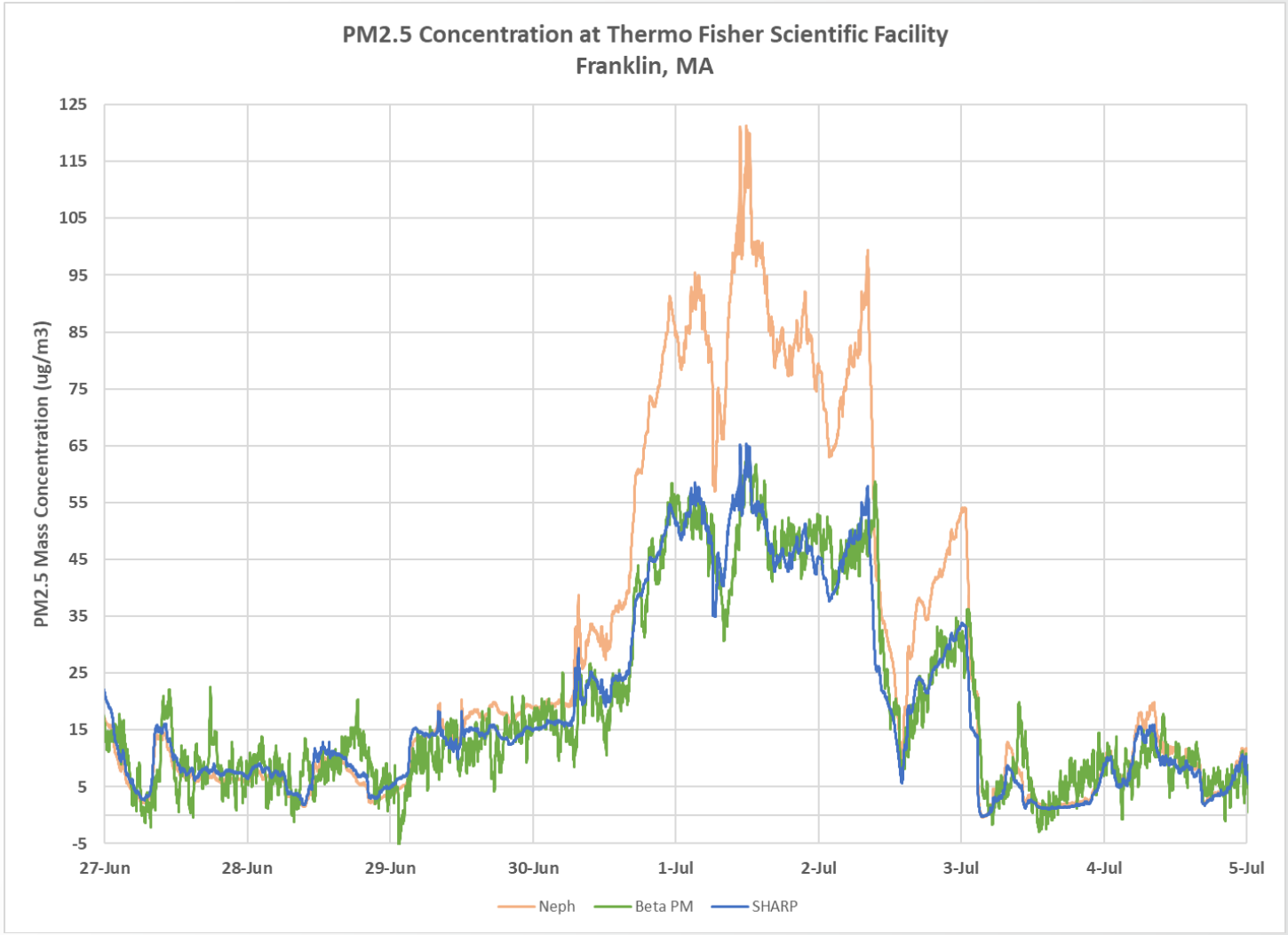
Model 5030iQ SHARP Monitor

- Adds nephelometer for fast response

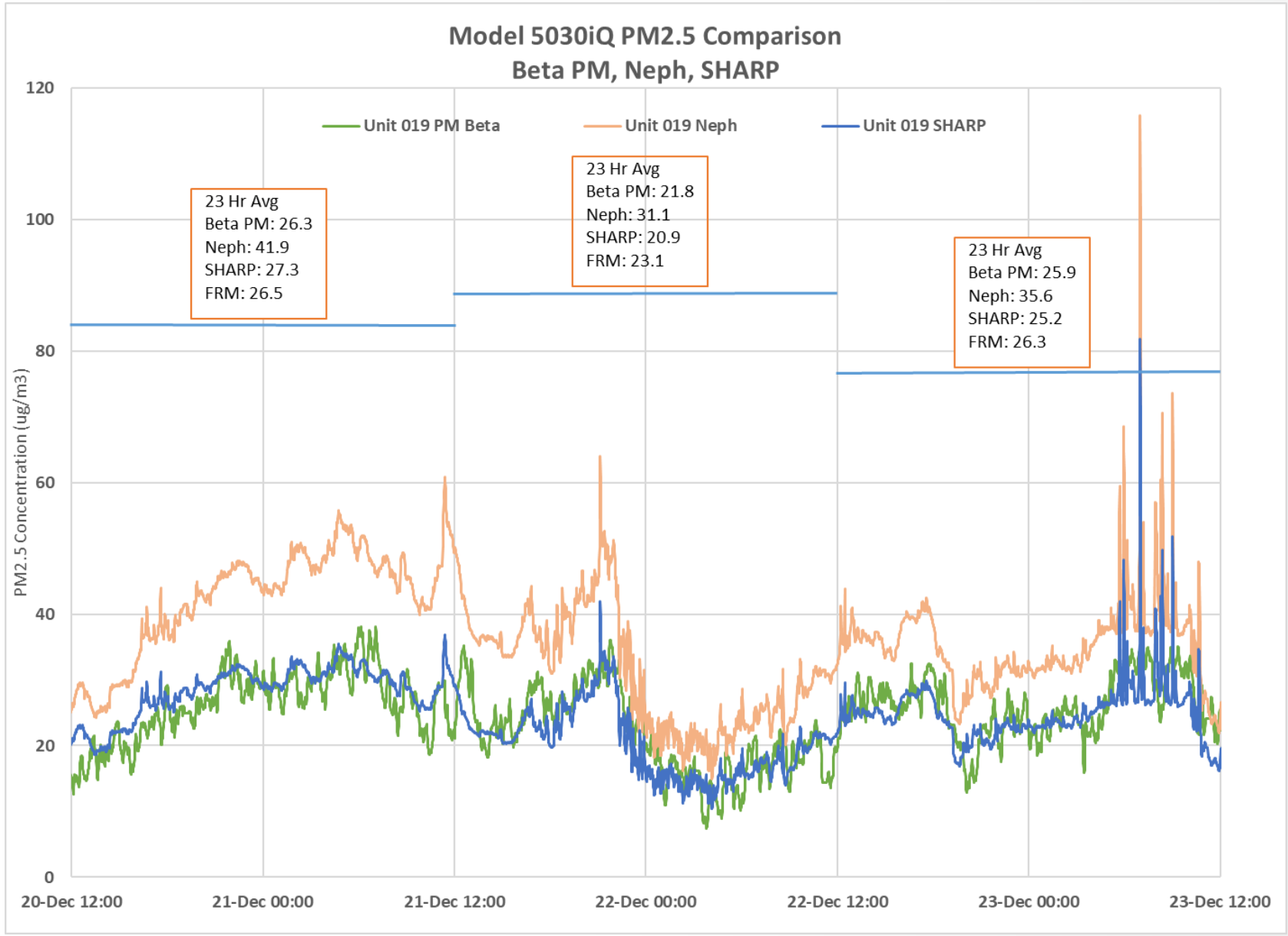
Operating Principal of SHARP Monitor

SHARP: Synchronized Hybrid Ambient Real-time Particulate

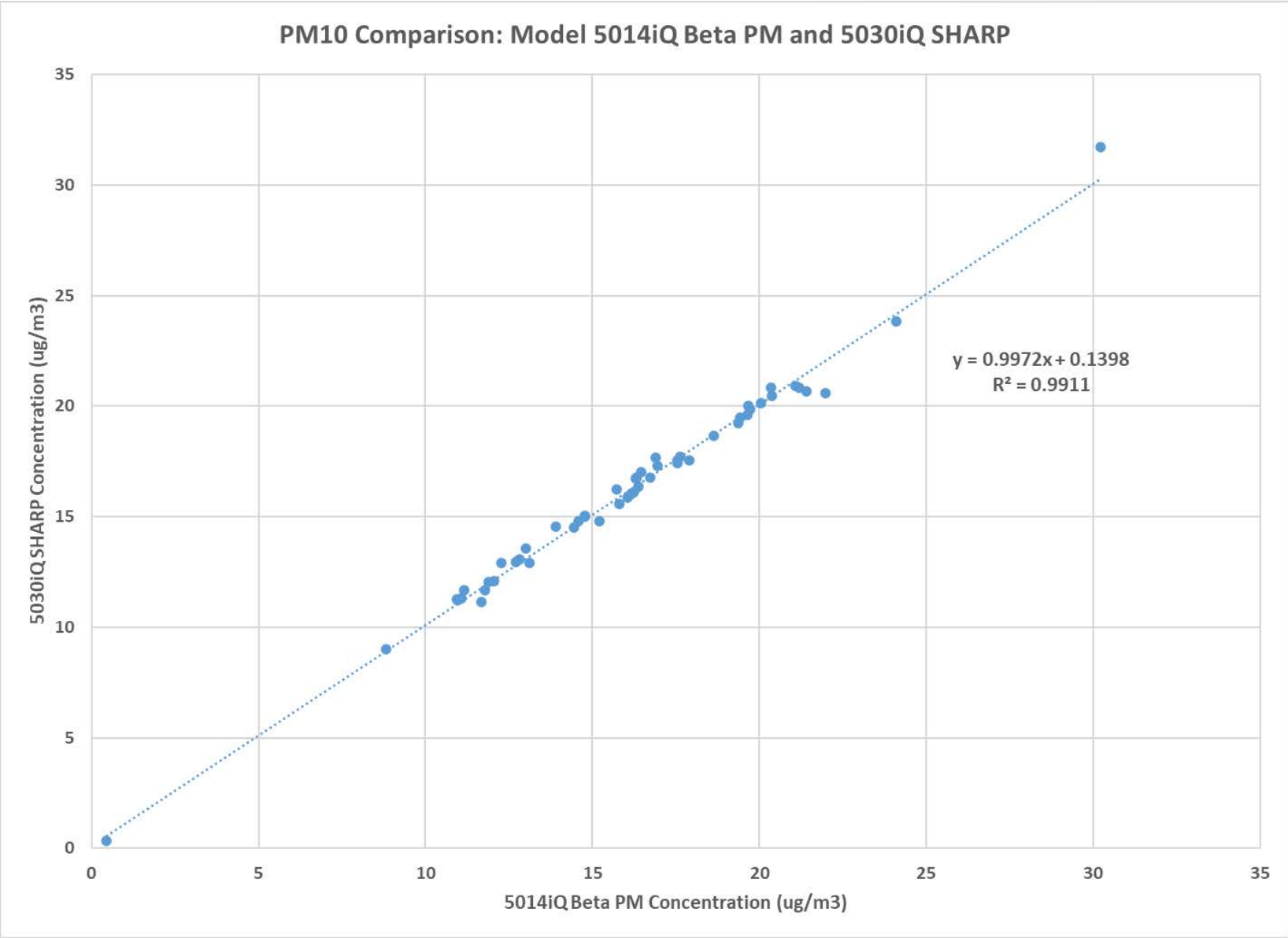
- Combines Beta Attenuation measurement with nephelometer
- Nephelometer is continuously corrected to mass using beta mass measurements



Model 5030iQ PM2.5 Comparison, Bakersfield, CA



PM10 Comparison: 5014 iQ Beta PM and 5030iQ SHARP



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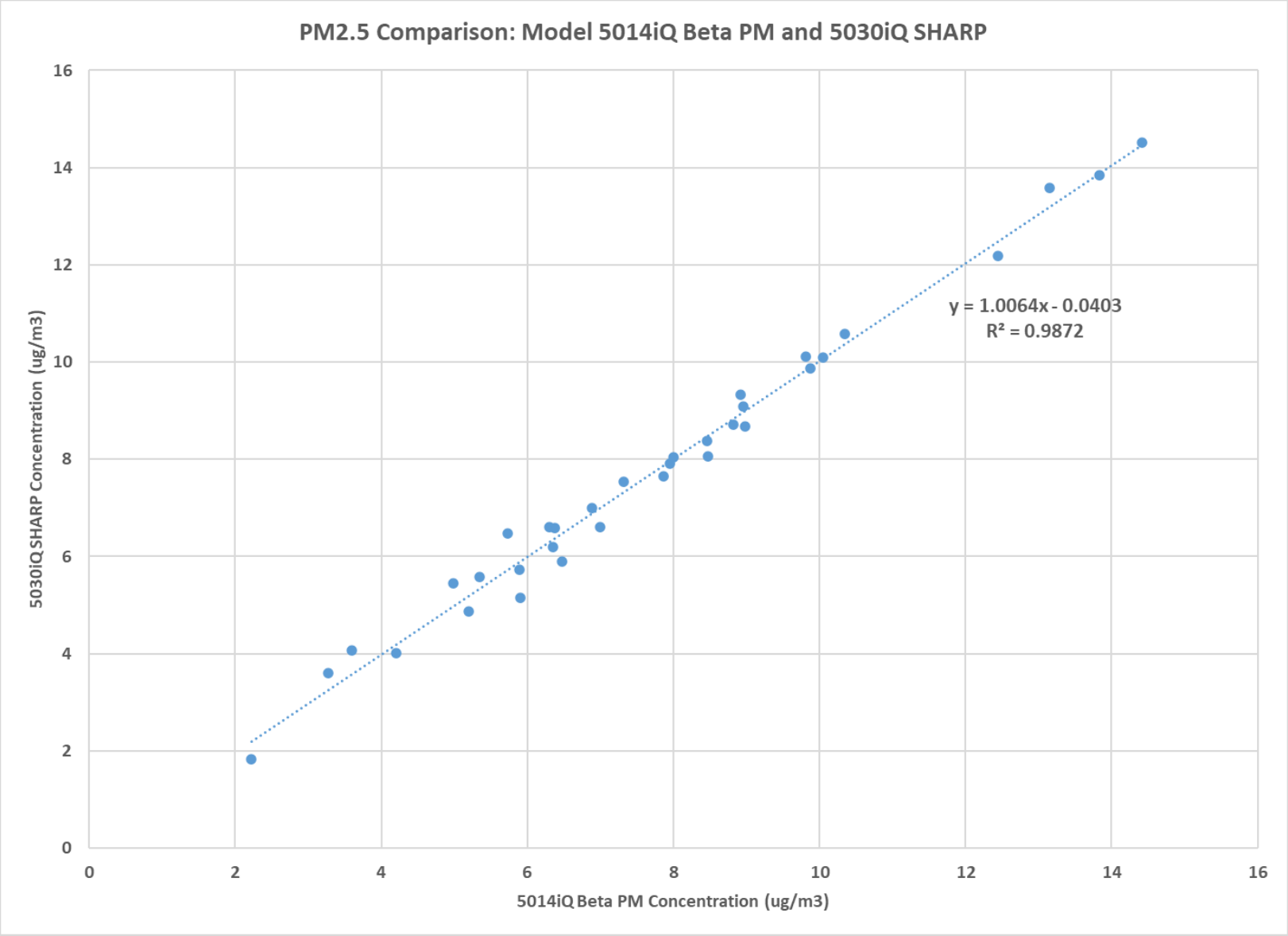
PM2.5 Comparison: 5014iQ Beta PM and 5030iQ SHARP



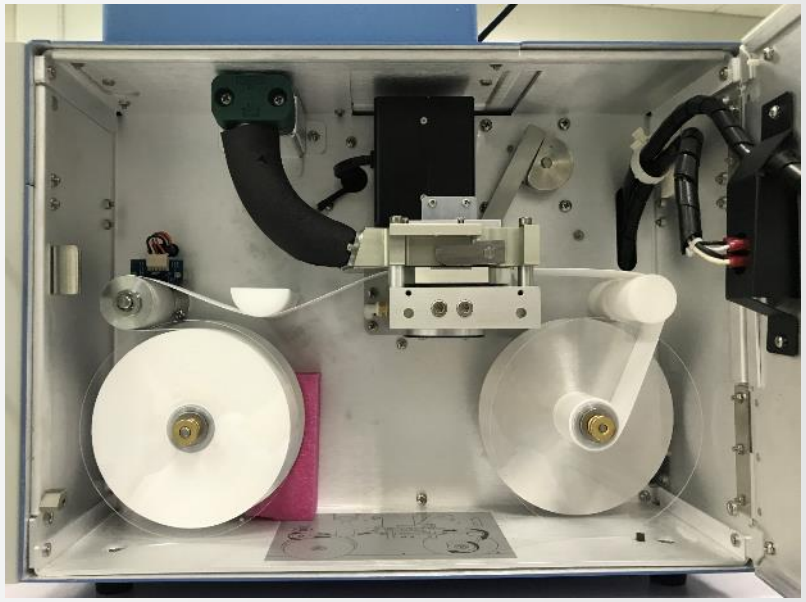
Appearance Redesign and Tape Position

Moved the filter tape access from the side to the front

Redesign to realize simpler operation and maintenance

Features:

1. Front door access for filter tape replacement and maintenance
2. Larger tape spool for up to 12-months operation
3. Window to view tape spool
4. Sample inlet X-Y position compatible with iSeries and legacy

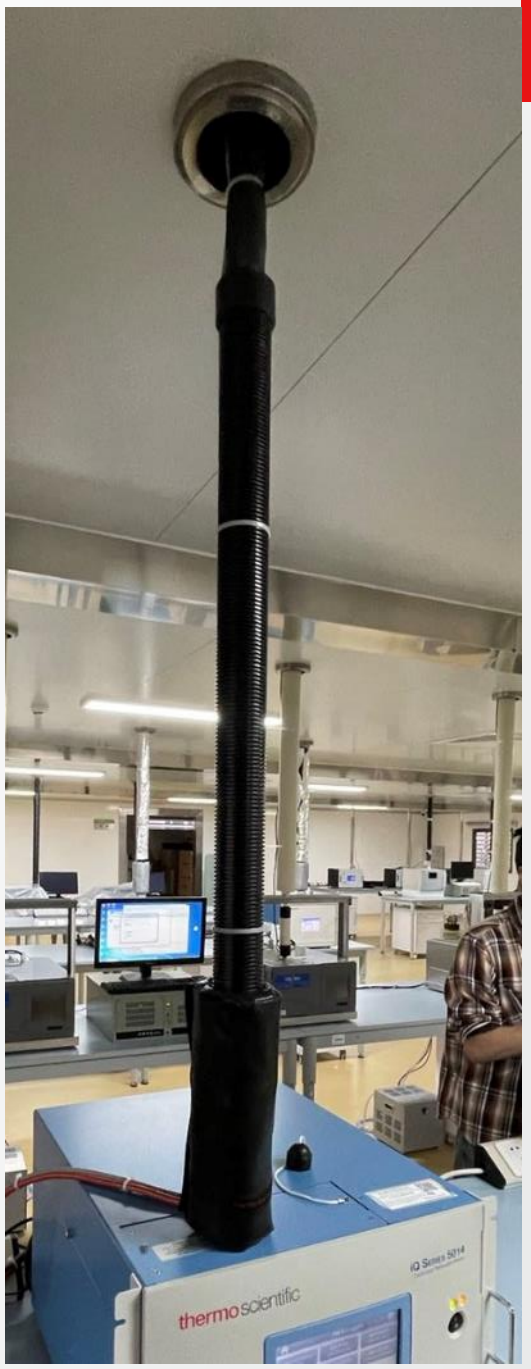


Upgraded Heating Tube

Redesign the heating tube to achieve better heating performance.

Features:

1. Better heat preservation
2. Outer hard nylon shell to eliminate the risk of carbonization
3. Real-time temperature monitoring: temperature sensor tube outlet provides better control
4. Eliminates safety concern of overheating



Upgraded Beta Measurement Module

Photomultiplier Tube (PMT) beta detector

Upgraded to resolve issues with proportional counter:

1. Improved performance compared to previous detector
2. Elimination of high noise amplifier
3. Reduced start-up time: < 30 minutes compared to > 12 hours

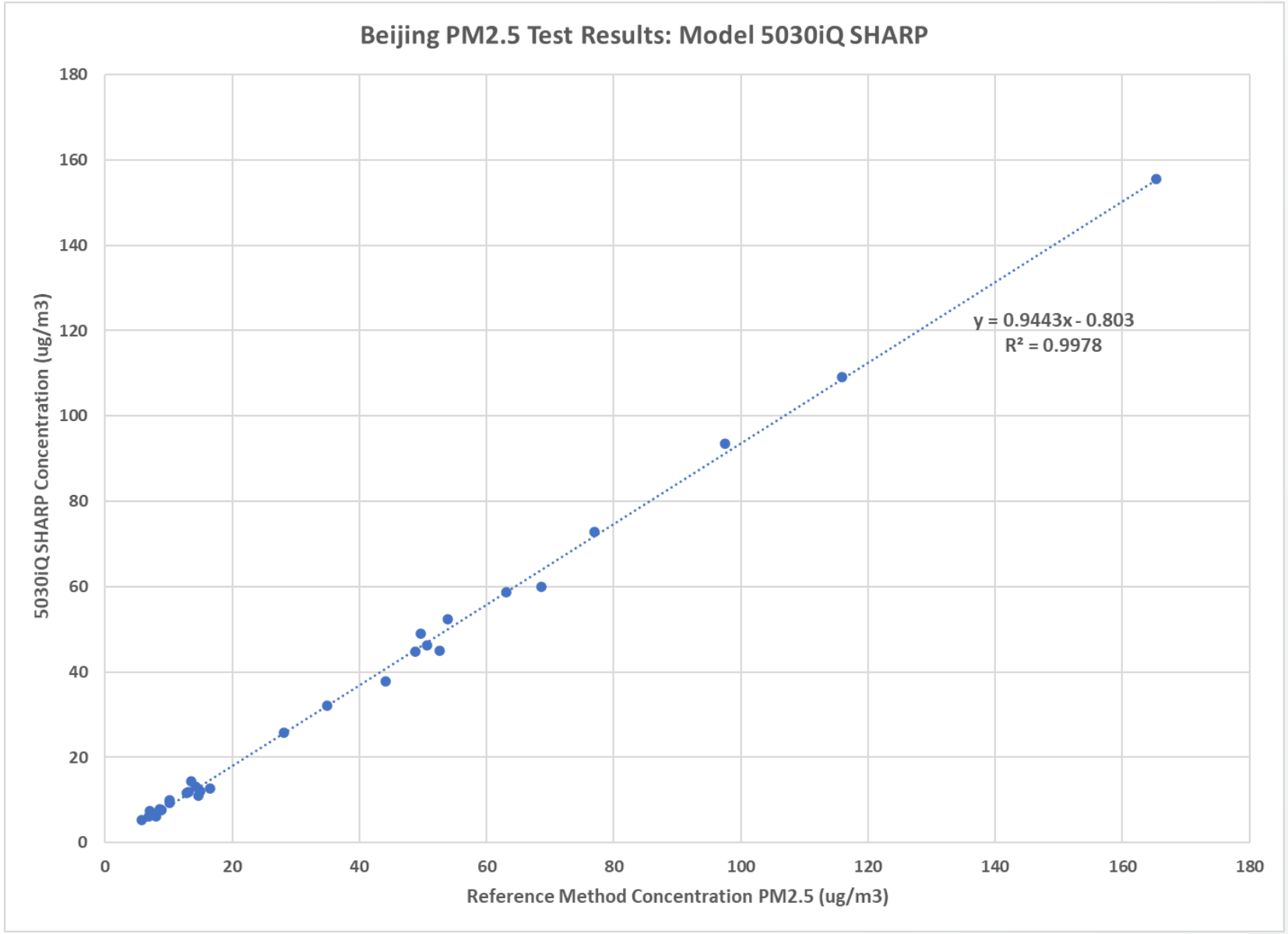
Field Test Performance

- Test campaigns in China
  - Beijing
  - Shenzhen
- Test campaigns in US
  - Bakersfield
  - St. Louis
  - Ft. Collins
  - New Haven

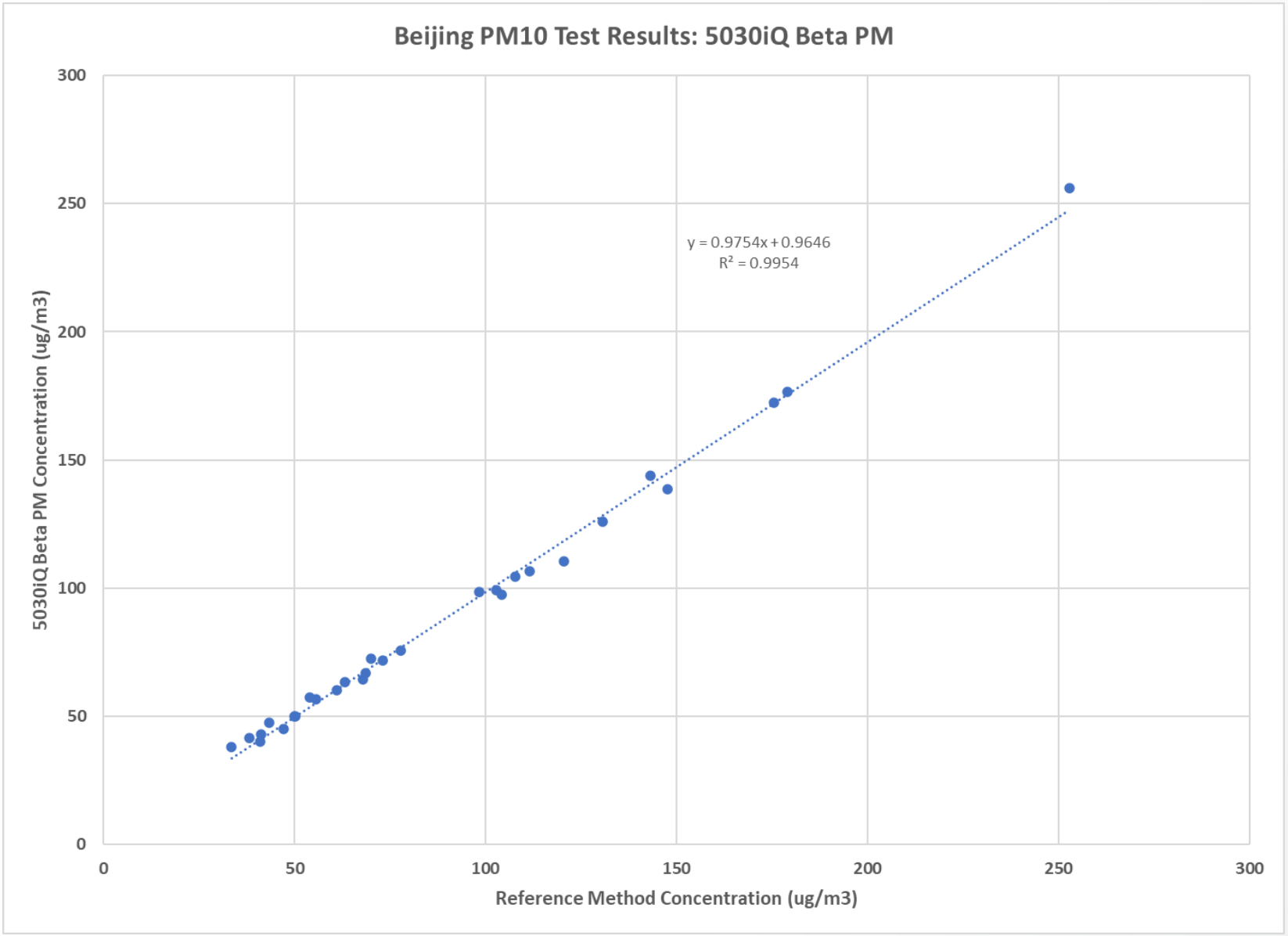
Regulatory Approvals

- China – CCEP complete
- U.S. EPA Approvals complete
  - 5014iQ
    - PM-10 EQPM-1102-150
    - PM-2.5 EQPM-0609-183
  - 5030iQ
    - PM-2.5 EQPM-0609-184
    - PM-10 EQPM-0423-260

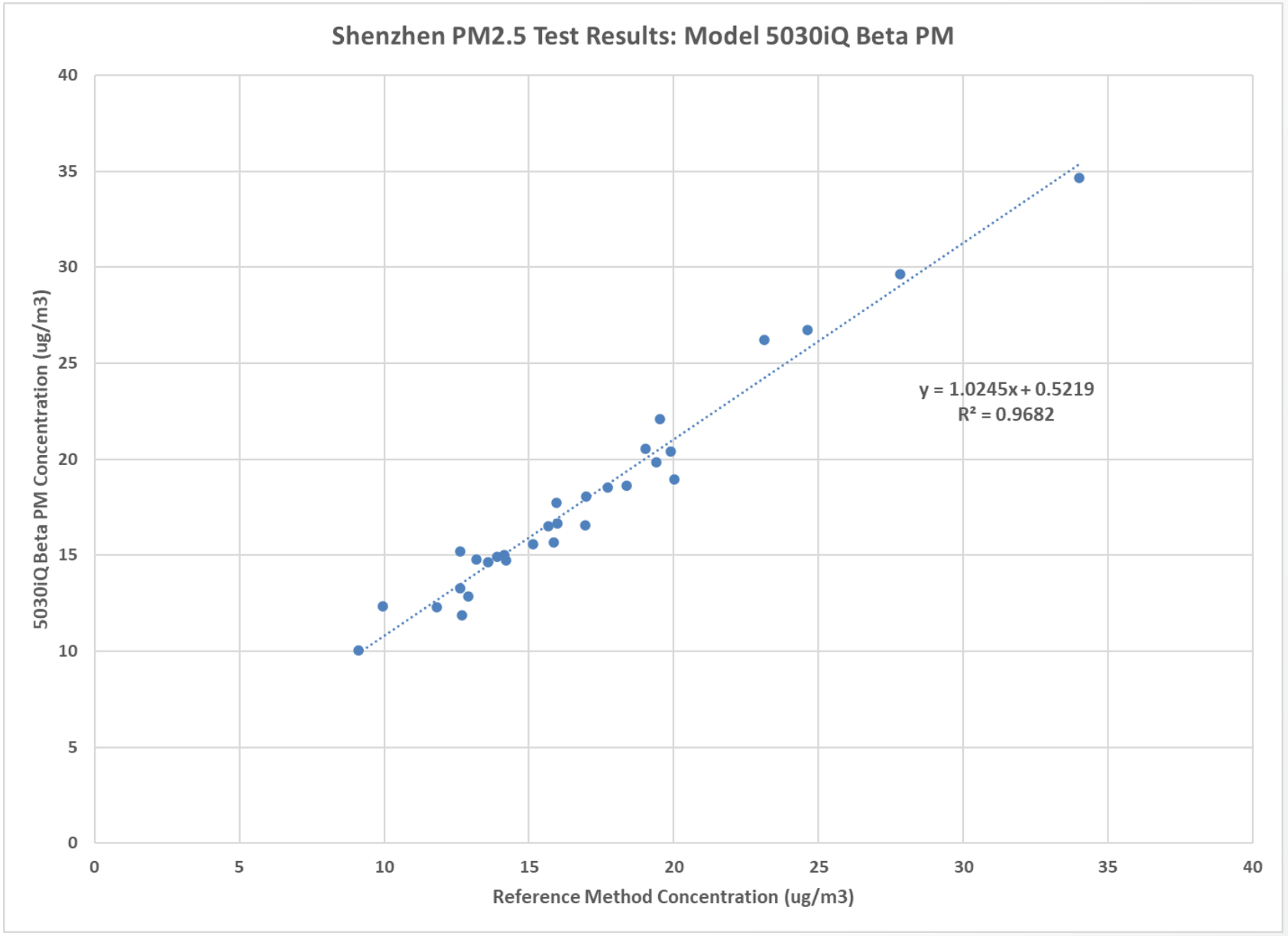
Beijing PM2.5 Test Results: Model 5030iQ SHARP

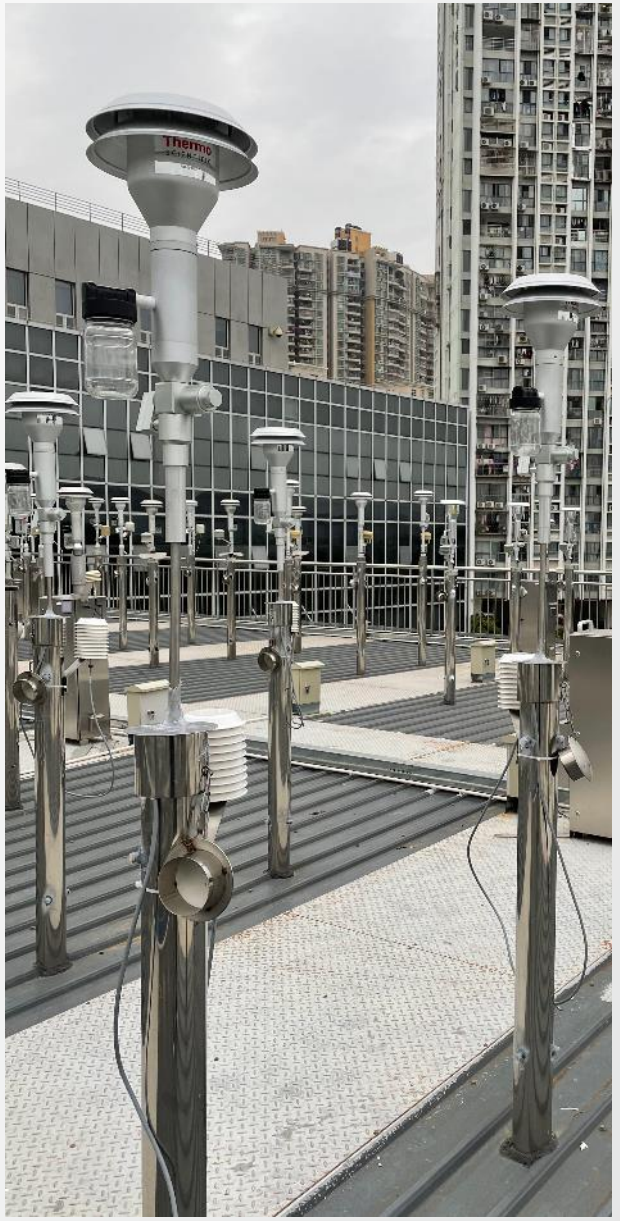


Beijing PM10 Test Results: Model 5030iQ Beta PM

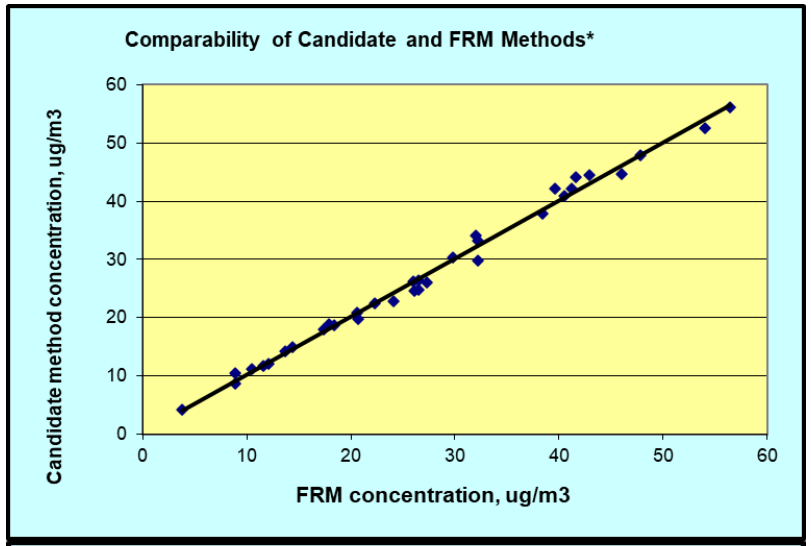


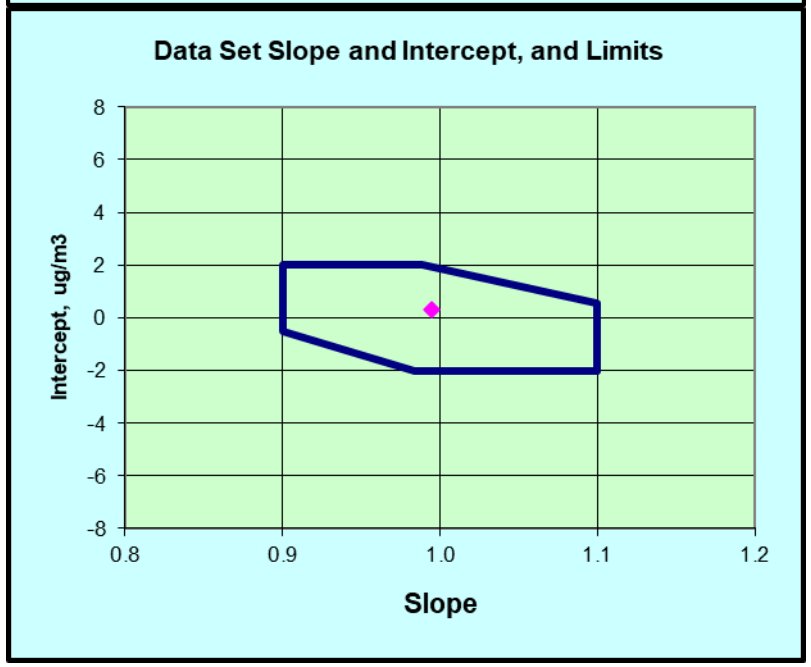
Shenzhen PM2.5 Test Results: Model 5030iQ Beta PM





Bakersfield Test Results: Model 5030iQ SHARP

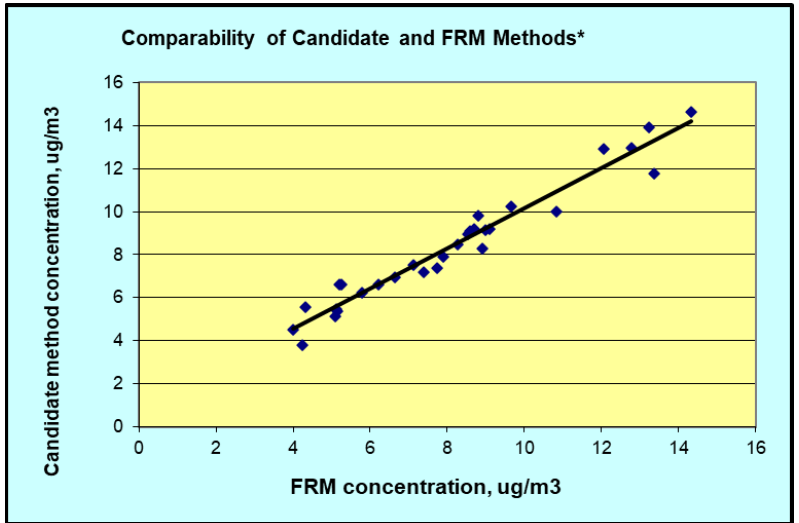


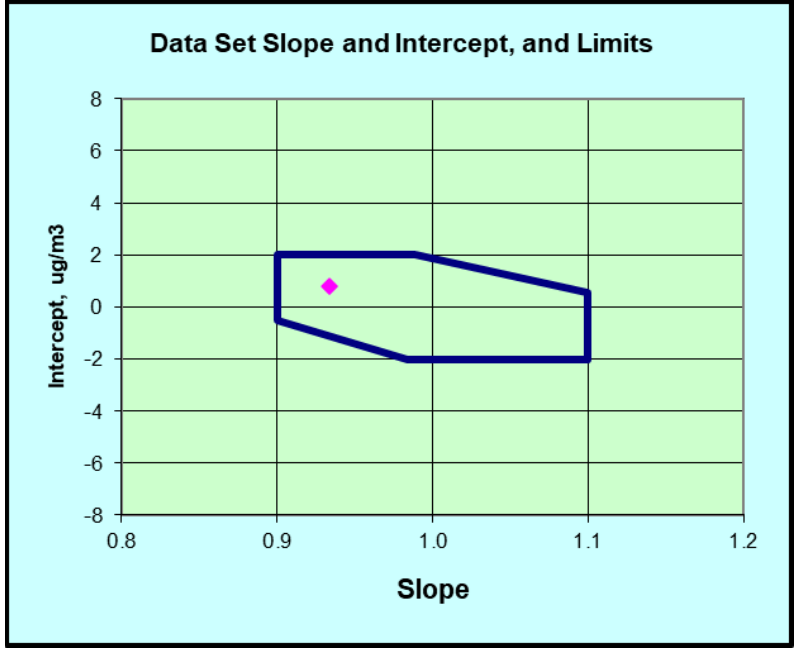


Precision	Data set mean, µg/m³		Data set precision, µg/m³		Relative precision (CV)	
	FRM	Candidate	FRM	Candidate	FRM	Candidate
Mean:	**27.4**	**27.6**	**0.3**	**0.5**	**1.6%**	**2.6%**
Maximum:	56.4	56.1	0.9	1.4	5.8%	10.3%
Minimum:	3.8	4.2	0.1	0.1	0.2%	0.2%
Candidate / FRM Ratio:		100.6%		149.0%		164.4%
RMS Relative Precision for this site:					**2.0%**	**3.8%**
Test requirements - PM2.5 Class III:					**10.0%**	**15.0%**
Precision Test Results for site:					**OK**	**PASS**

Regression statistics		Slope[1]	Intercept[2]	Correlation (r)
Statistics for this test site:		**0.995**	**0.307**	**0.99639**
Limits for	**Upper:**	**1.100**	**1.916**	
PM2.5 Class III	**Lower:**	**0.900**	**-2.000**	**0.95000**
Test Results (Pass/Fail):		**PASS**	**PASS**	**PASS**

East St. Louis Test Results: Model 5030iQ SHARP

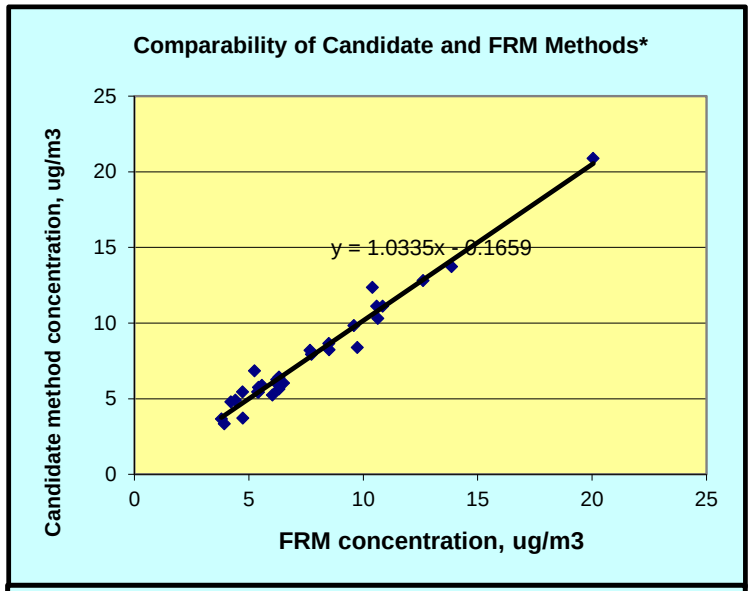


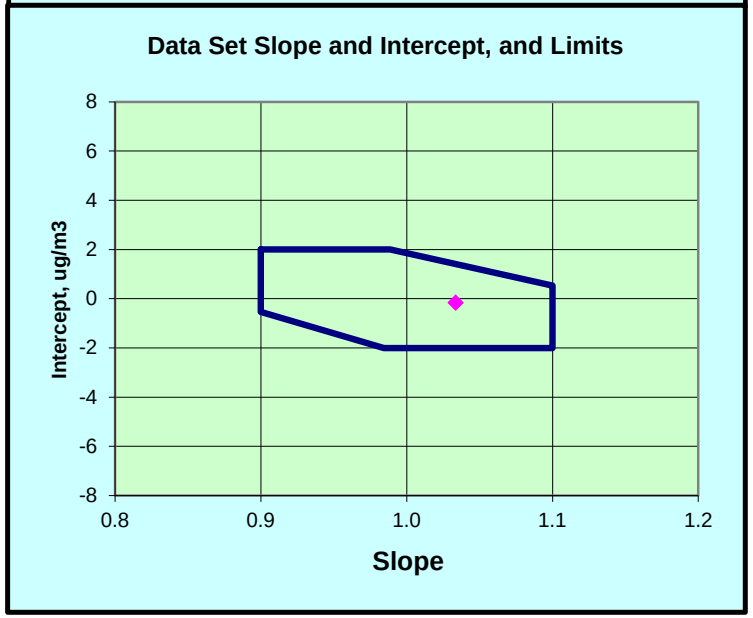


Precision	Data set mean, µg/m³		Data set precision, µg/m³		Relative precision (CV)	
	FRM	Candidate	FRM	Candidate	FRM	Candidate
Mean:	**8.1**	**8.4**	**0.3**	**0.5**	**3.4%**	**5.8%**
Maximum:	14.3	14.6	0.9	1.2	9.6%	11.6%
Minimum:	4.0	3.8	0.1	0.1	0.5%	1.5%
Candidate / FRM Ratio:		103.4%		195.3%		171.1%
	RMS Relative Precision for this site:				**3.9%**	**6.3%**
	Test requirements - PM2.5 Class III:				**10.0%**	**15.0%**
	Precision Test Results for site:				**OK**	**PASS**

Regression statistics		Slope[1]	Intercept[2]	Correlation (r)
Statistics for this test site:		**0.933**	**0.814**	**0.97593**
Limits for	**Upper:**	**1.100**	**2.000**	
PM2.5 Class III	**Lower:**	**0.900**	**-1.117**	**0.93000**
Test Results (Pass/Fail):		**PASS**	**PASS**	**PASS**

Ft. Collins Test Results: Model 5030iQ SHARP

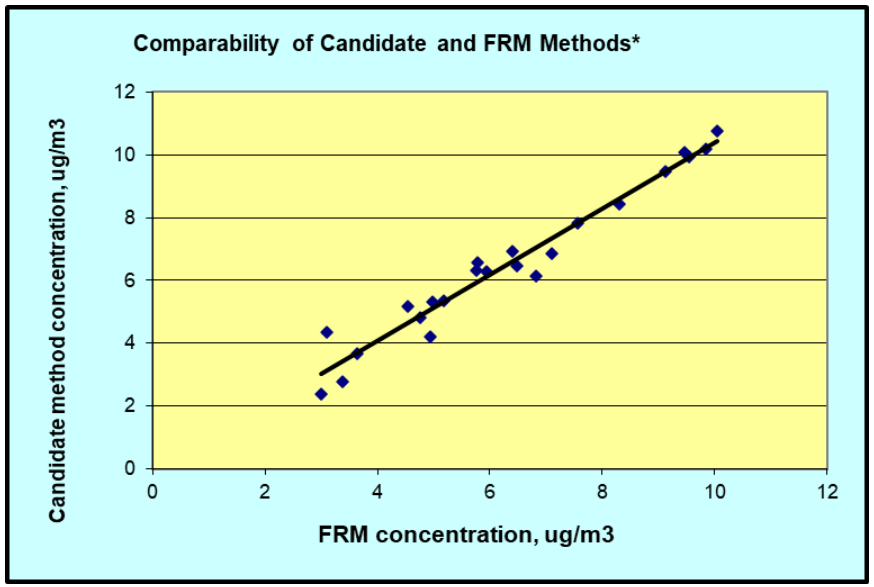




Precision	Data set mean, µg/m³		Data set precision, µg/m³		Relative precision (CV)	
	FRM	Candidate	FRM	Candidate	FRM	Candidate
Mean:	**7.7**	**7.8**	**0.4**	**0.6**	**5.4%**	**7.1%**
Maximum:	20.1	20.9	0.8	3.6	9.4%	22.7%
Minimum:	3.8	3.3	0.0	0.0	0.2%	0.8%
Candidate / FRM Ratio:		101.2%		143.0%		131.6%
	RMS Relative Precision for this site:				**5.9%**	**8.8%**
	Test requirements - PM2.5 Class III:				**10.0%**	**15.0%**
	Precision Test Results for site:				**OK**	**PASS**

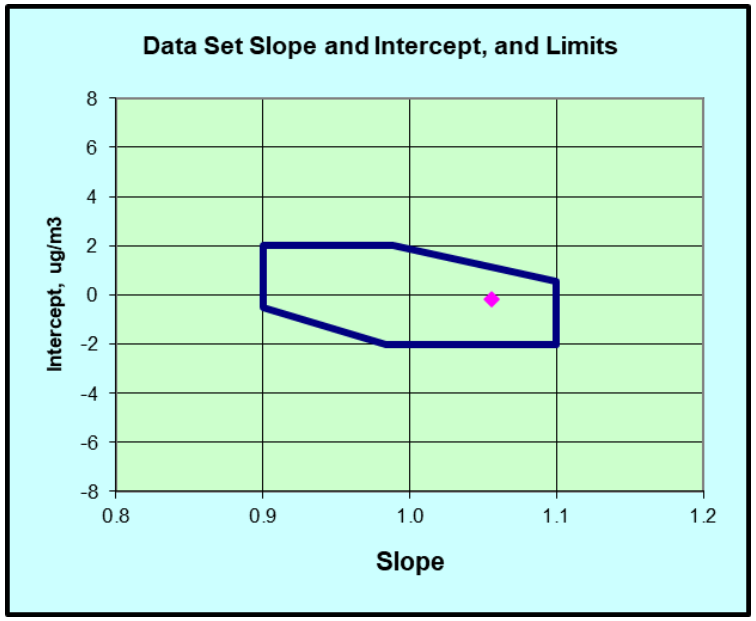
Regression statistics		Slope[1]	Intercept[2]	Correlation (r)
Statistics for this test site:		**1.033**	**-0.166**	**0.98334**
Limits for	**Upper:**	**1.100**	**1.408**	
PM2.5 Class III	**Lower:**	**0.900**	**-2.000**	**0.94222**
Test Results (Pass/Fail):		**PASS**	**PASS**	**PASS**

New Haven Test Results: Model 5014iQ Beta PM

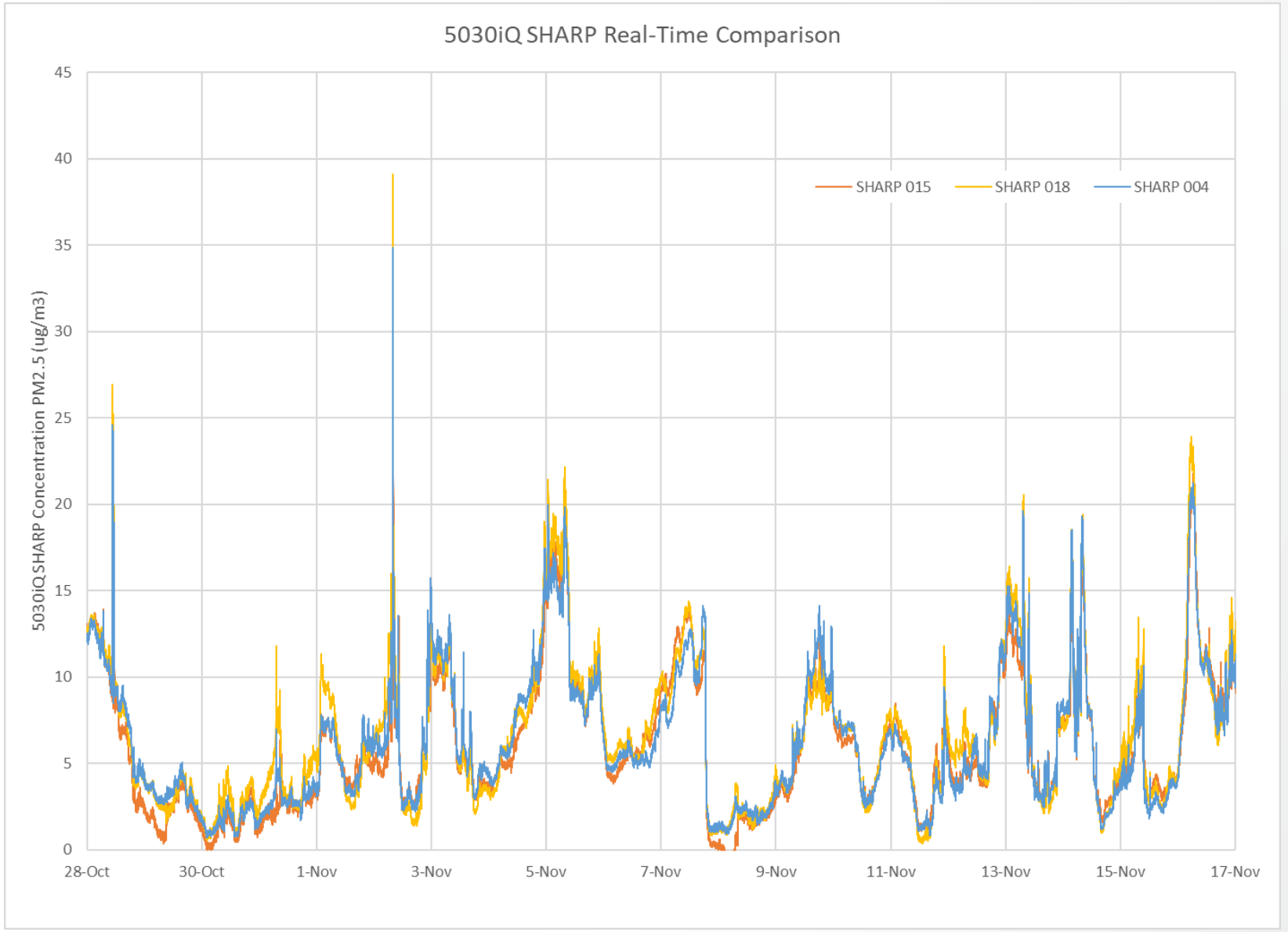


Precision	Data set mean, µg/m³		Data set precision, µg/m³		Relative precision (CV)	
	FRM	Candidate	FRM	Candidate	FRM	Candidate
Mean:	6.3	6.5	0.2	0.4	2.9%	7.7%
Maximum:	10.0	10.8	0.6	1.1	9.3%	30.0%
Minimum:	3.0	2.4	0.0	0.1	0.6%	0.7%
Candidate / FRM Ratio:		103.2%		248.4%		262.8%
RMS Relative Precision for this site:					3.7%	10.2%
Test requirements - PM2.5 Class III:					10.0%	15.0%
Precision Test Results for site:					OK	PASS

Regression statistics		Slope[1]	Intercept[2]	Correlation (r)
Statistics for this test site:		1.056	-0.154	0.97850
Limits for	Upper:	1.100	1.112	
PM2.5 Class III	Lower:	0.900	-2.000	0.93000
Test Results (Pass/Fail):		PASS	PASS	PASS



Instrument Comparison Results: Model 5030iQ SHARP



Thank You