

STANDARD OPERATING PROCEDURE

Continuous Beta Attenuation Mass Monitor (Met One BAM 1020 / E-BAM)

DOCUMENT TITLE:	Beta Attenuation PM Monitor Servicing & Calibration SOP	DOC NUMBER:	SOP-MET-PM-002
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1. Purpose & Operating Principles

This Standard Operating Procedure (SOP) outlines field maintenance, monthly flow audits, and annual calibration procedures for continuous Beta Attenuation Monitors (Met One BAM 1020 / E-BAM) measuring PM10 and PM2.5 particulate mass concentrations. The instrument measures the attenuation of Carbon-14 beta particles passed through a glass fiber filter tape before and after hourly ambient particulate collection.

2. Required Calibration Standards & Materials

- Certified NIST-traceable volumetric flow transfer standard (e.g., BGI DeltaCal or Streamline FTS).
- Certified reference thermometer ($\pm 0.1^{\circ}\text{C}$) and digital aneroid barometer ($\pm 1.0\text{ mm Hg}$).
- Zero count reference foil membrane kit.
- Fresh Met One glass fiber filter tape roll and lint-free cleaning swabs with isopropyl alcohol.

3. Step-by-Step Field Audit & Calibration Routine

3.1 Monthly 30-Day Routine Verification: Every 30 days, verify temperature ($< \pm 2.1^{\circ}\text{C}$ difference vs. standard), barometric pressure ($< \pm 10.1\text{ mm Hg}$ difference vs. standard), and volumetric flow rate ($< \pm 2.1\%$ difference vs. transfer standard at 16.67 L/min).

3.2 Leak Check Procedure: Perform a pump leak check by placing the flow audit adapter in the CLOSED position. Verify that vacuum rises above 15 inches Hg and sample flow drops to $< 0.3\text{ L/min}$.

3.3 Nozzle & Vane Cleaning: Raise the nozzle assembly, remove the filter tape, and clean the nozzle face and beta detector vane using alcohol-dampened cotton swabs to eliminate particulate buildup.

3.4 Zero Foil Span Verification: Insert the calibration zero membrane foil into the tape slot. Run the zero count audit; confirm that the measured mass density matches the factory membrane calibration certificate within $\pm 5\%$.

3.5 Annual Multi-Point Calibration: Every 365 days, execute a 3-point temperature and pressure calibration, followed by a multi-point flow controller calibration across 14.0, 16.67, and 18.0 L/min.

4. Validation Acceptance Criteria

Parameter	Nominal Target	Acceptance Criteria	Corrective Measure
Temperature Verification	Ambient $^{\circ}\text{C}$	$< \pm 2.1^{\circ}\text{C}$ vs. transfer std	Recalibrate BAM internal AT sensor
Pressure Verification	Ambient mm Hg	$< \pm 10.1\text{ mm Hg}$ vs. std	Recalibrate BAM internal BP sensor

Volumetric Flow Audit	16.67 L/min	< $\pm 2.1\%$ of transfer std	Perform multi-point flow calibration
System Leak Check	0.00 L/min	< 0.30 L/min at 15" Hg	Inspect nozzle O-rings & tape sealing
Zero Foil Calibration	Foil density (mg/cm ²)	< $\pm 5\%$ of factory value	Clean beta detector; check C-14 source

PREPARED & APPROVED BY:	Kadeem Manning Lead Field Specialist & QA Lead	SIGNATURE: _____ —	DATE: _____ _____
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