Aethalometer (Model: AE33)

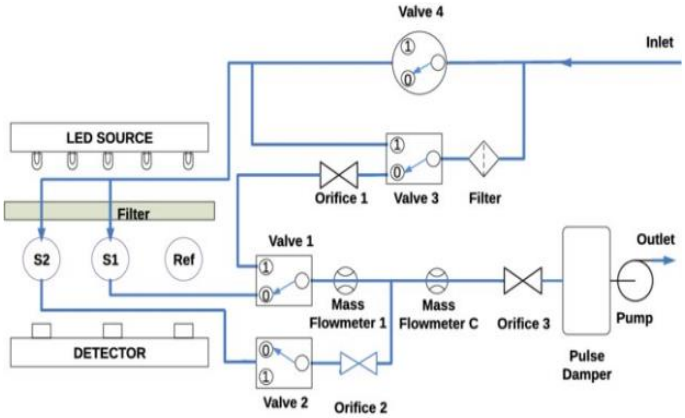
An Advanced Instrument for Real-time Monitoring and Speciation of Black Carbon

INTRODUCTION:

Black Carbon, often called **soot**, is a key pollutant with significant effects on climate change and human health.

The **Aethalometer** is an analytical instrument that measures the real-time optically-absorbing **Black Carbon** aerosol particles in an air stream (Hirdman et al., 2010a). This instrument is widely used for continuous measurements of ambient BC concentration in diverse environments (Sonbawne et al., 2021). It is a self-contained automatic device that analyses the BC by measuring the rate of change in attenuated light transmitted through the particle-laden quartz filter spot by calculating the real-time concentration of optically-absorbing aerosols. For calculation, it assumed that the particle quantity is linearly proportional to the amount of BC deposited on the filter.

FLOW DAIGRAM:



Mode	Valve 1	Valve 2	Valve 3	Valve 4
Bypass	1	1	0	1
Warm-up / clean air	0	0	1	1
Measurement	0	0	0	0
Flowmeter calibration	0	1	0	0

OBJECTIVES:

- **Urban Air quality monitoring**
- **Climate research and modeling**
- **Emissions Source Apportionment**
- **Environmental impact Assessments**
- **Understanding of aerosol dynamics**

DATA OUTPUT:

- **Black Carbon Concentration (µg/cm³)**
- **Biomass Burning Aerosol Concentration**
- **Absorption Coefficients**

KEY SPECIFICATIONS:

7-Wavelengths Operation
: 370, 470, 520, 290, 660, 880, 950 nm (UV – IR)
Measurement Range: 0.01 – 100 µg/m^3
Detection limit : < 0.005 µg/m^3 (1 hr)
Resolution : 1 ng/m^3
Flow Rate :2-5 L/min, (controlled)
Time Resolution : 1sec - 10 min (Selectable)
Display **:** TFT screen at front panel
Interfaces **:** USB, RS232, Ethernet

MEASUREMENT AND WORKING PRINCIPLE:

The **Aethalometer** works on the optical attenuation detecting technique principle collects and analyses aerosol particles continuously. It measures the attenuated light that passes through a sample spot collected on an area of 0.5cm^2 on a quartz filter tape. Simultaneously, the tape is illuminated by light: sensitive detectors measure the intensities of light transmitted through an un-exposed portion of the tape, acting as a reference; versus the collecting spot **(Dual Spot Technique)**.

It performs a continuous optical analysis while the sample air particles are depositing on the quartz filter. During this process, the spot's optical density (attenuation value) reaches its pre-defined value; the mechanism temporarily halts and advances the filter tape and re-initializes the measurement process when the new sample spot on the filter tape comes in place for the following observation. At **880 nm,** these values correspond to 4 to 6 µg/cm^3 (approx.) of BC aerosols on the collected filter spot.

KEY FEATURES:

- **High Sensitivity : Detects low concentrations of BC**
- **Real-Time Measurement: Provides immediate (online)-**
  - BC measurement at user set time-interval.
- **Compact & Portable : Ideal for field deployments**
- **Automated Calibration: Ensure data accuracy**

Principal Investigator: Dr. Sunil M. Sonbawne, Sc-E
Contact : ***sunil@tropmet.res.in***

LF No: