

Why Monitor Black Carbon?

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BC is a major contributor to global warming. Its black color indicates how well it absorbs across the visible spectrum and into the IR and UV. Some studies show BC second only to carbon dioxide as being the primary anthropogenic (man-made) pollutant contributing to global warming. In addition, although it typically accounts for only a small percentage of ambient particulate matter "PM", typically 3-5%, it is perhaps its most dangerous component. Polycyclic aromatic hydrocarbons "PAHs" can be a significant fraction of soot emanating from diesel exhaust and are known carcinogens thereby underscoring the need to be able to monitor BC in real time.

BC is the only component of PM that can be easily and inexpensively monitored in real time. And, it is the most important PM component because of its potential health and environmental risks.



BC 1054 Multi-Spectrum Carbon Monitor and BC 1060 Portable Carbon Monitor

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BC 1054

- Research grade
- Black carbon, source apportionment, Absorption Angstrom Exponent "AAE"
- Internal source apportionment computation and reporting
- Auto-diagnostics
- 10-wavelengths: 370 nm – 950 nm
- Real-time output: 1-minute time resolution
- Economic operation
- Ultra-sensitive
- On-board filter load correction
- Optional auto-dilution feature for high concentration environments
- Cloud modem compatible



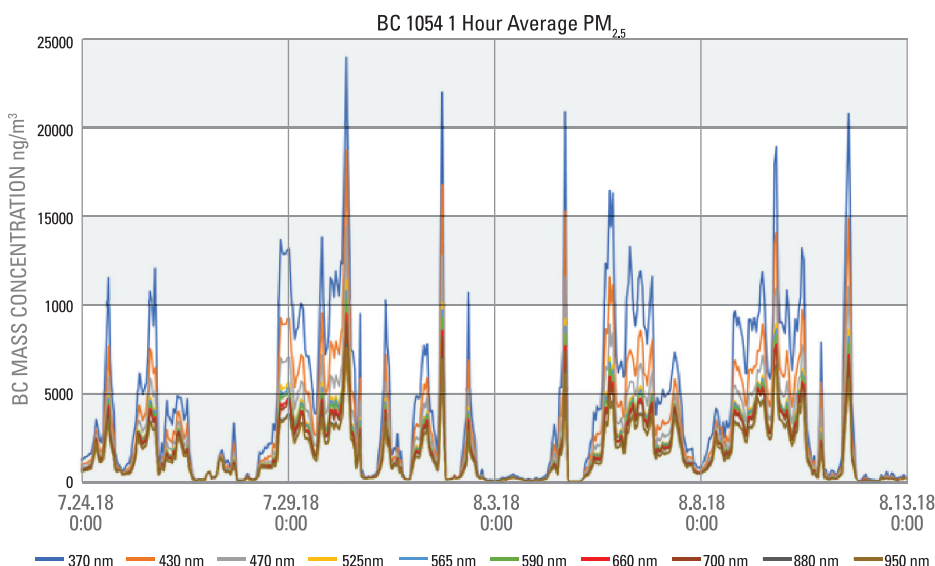
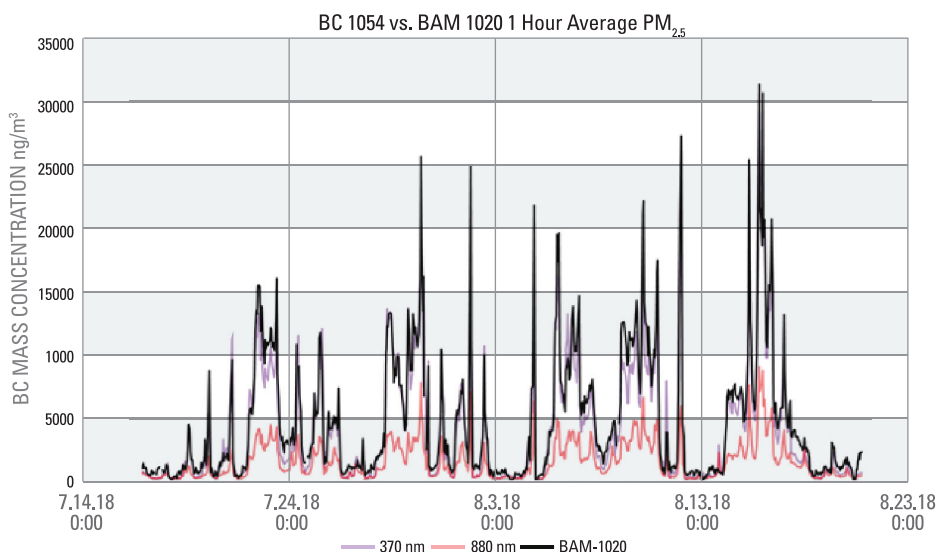
BC 1060

- Lightweight, portable
- Self-contained: no shelter/enclosure necessary
- Black carbon, source apportionment
- 2-wavelengths: 370 nm and 880 nm
- Real-time output: 1-minute time resolution
- >1,000 spots per roll of tape
- Ultra-sensitive
- Auto-diagnostics
- On-board filter load correction
- Auto-dilution standard
- Cloud-modem compatible



BC 1054 Multi-spectrum Carbon Monitor

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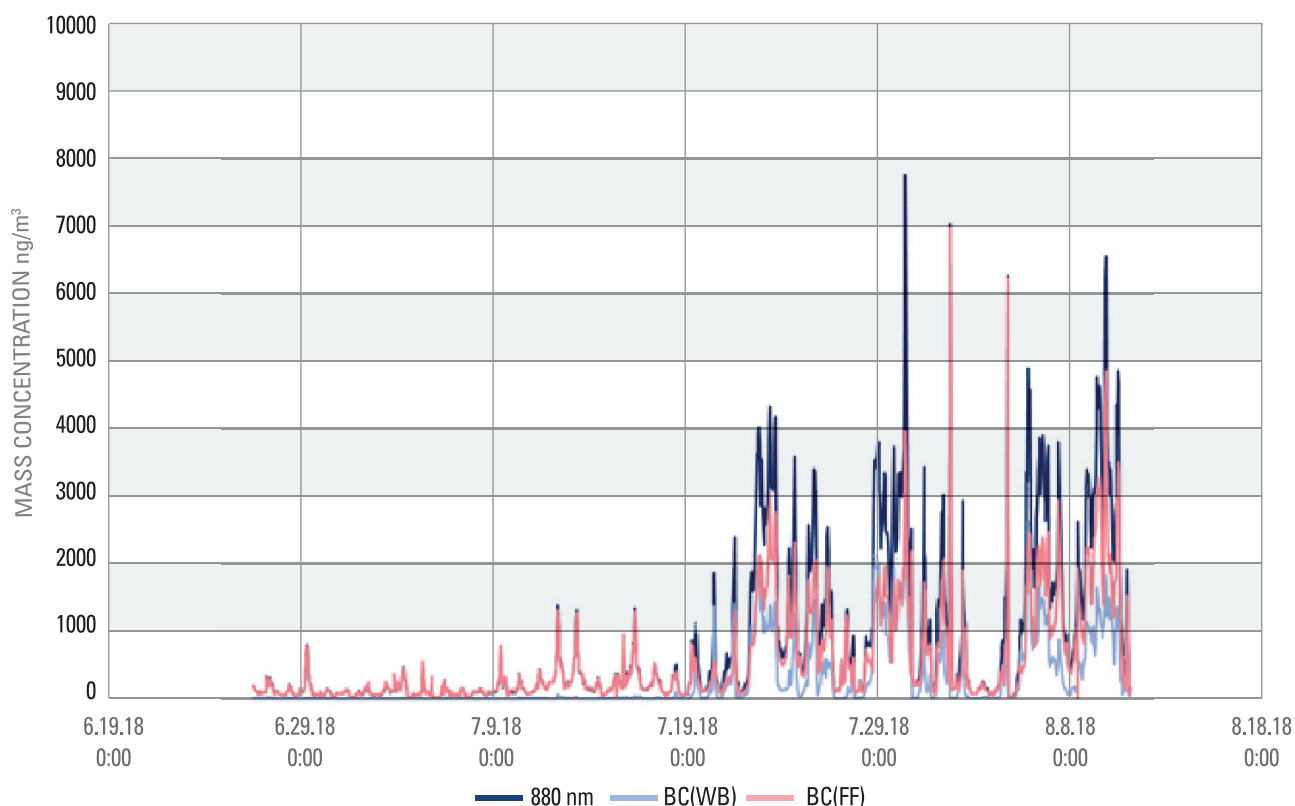


Met One Instruments, Inc. BC 1054 measures and reports the concentration of both black carbon “BC” and brown carbon “BrC” in real time. In addition to performing the standard “DC” and Sandradewi-type source apportionment calculations, the additional short wavelength illumination for the BC 1054 allows the user to perform more sophisticated analyses. In addition to quantifying BC and determining source apportionment in real time its extended illumination range allows for concise determination of Absorption Angstrom Exponents. This research grade device incorporates many of the features used in our regulatory-grade beta attenuation monitors.

- Governmental pollution monitoring networks
- Climatology research
- Pollution/emissions research

Source Apportionment

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Source apportionment is the ability to tell whether the measured signal originates from the combustion of fossil fuels or from the combustion of biomass. When the outputs of the shorter wavelength channels on the BC 1054 (370-470nm) are higher than the outputs of the longer wavelength channels (525 – 950 nm) it usually signals the presence of organic compounds (sometimes called Brown Carbon “BrC”). The same is true when the 370 nm output of the BC 1060 is greater than 880 nm output.

The BC 1054 and BC 1060 are factory calibrated so that when aerosol carbon only coming from the combustion of fossil fuels is present all channels will read the same. When biomass is burned certain organic compounds may also be produced which will cause the 370-470 nm channels to produce higher readings than the longer wavelength channels (525 nm - 950 nm on BC 1054 and 880 nm on BC 1060)

The BC 1054 employs two commonly used approaches for BrC vs BC determination. The first, referred to as the delta-C “DC” method, tracks the difference between the UV output at 370 nm and the IR output at 880 nm. The BC 1054 reports this as “DC”. The second, commonly referred to as the “Sandradewi” method (after the researcher first proposing it), is more complex and relies on user selectable inputs for a UV and IR illumination wavelength and user selectable inputs for Absorption Angstrom Exponents for both fossil fuel combustion and for biomass combustion. The BC 1054 reports BC(FF): Equivalent BC from fossil fuels, and BC(WB): Equivalent BC from biomass combustion.

BC 1060 Portable Carbon Monitor

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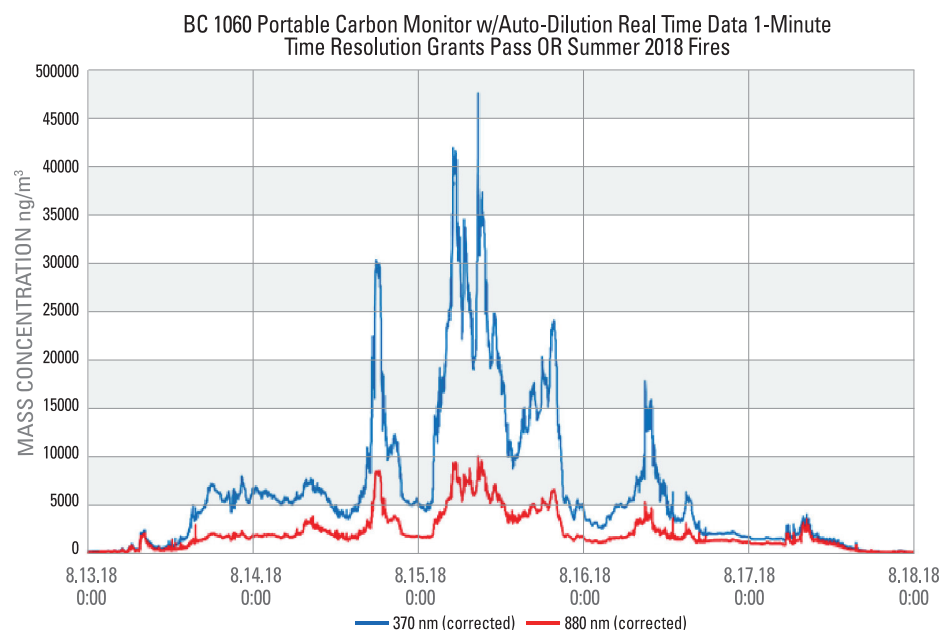


Met One Instruments, Inc. BC 1060 is portable, lightweight, and is suitable for many roadside, community-monitoring, and saturation studies. It is also a suitable substitute for more expensive carbon monitors for applications requiring only BC and/or BrC measurement. It is self-contained, requiring no weatherproof enclosure for operation. Sampling at 2 LPM, coming standard with an auto-dilution system which can dilute the sampled air by up to 80% and using economically-priced filter media coming standard in 20-m rolls, it has the capacity to sample over 1,000 independent filter spots between tape replacement.



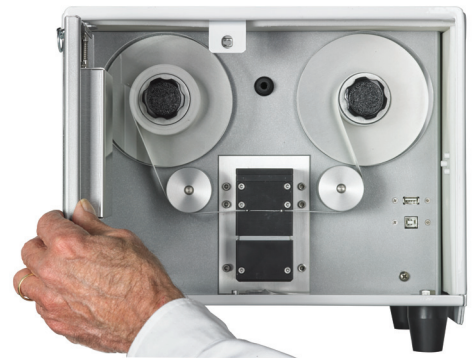
Emergency Responder Applications

Forest fires, structure fires, or industrial accidents can lead to the release of massive amounts of particulate matter including BC and BrC into the air. Because of the unplanned nature of such events it is often impossible to quickly set up air quality monitoring equipment in order to accurately assess health threats to the surrounding community. The BC 1060 may be set up at these sites in a few minutes as it is self-contained and portable.



BC 1060 Portable Carbon Monitor

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Community and Fence-line Monitoring

Communities in close proximity to stationary emission sources such as petroleum refineries, petrochemical plants, waste incineration facilities, or ports may be subjected to pollutant levels higher than is seen at air quality monitoring stations located in the surrounding areas. A portable carbon monitor could be useful in identifying fugitive emissions and easily identifying local sources of pollution.

Roadside Monitoring



Often there is an interest in monitoring mobile-source emissions originating from motor vehicle exhaust in close proximity to heavily traveled roadways. For these applications it is generally important to measure only BC which suggests multi-wavelength carbon monitors might not be cost effective. In addition, at such sites often external power is limited thereby making the deployment of air quality monitors requiring an environmental shelter impractical. For these applications, the BC 1060 could track in real-time BC levels in a convenient, cost effective manner.

BC 1054 & BC 1060

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Parameter	BC 1054	BC 1060
Illumination Wavelengths	10: 370, 430, 470, 525, 565, 590, 660, 700, 880, 950 nm	2: 370, 880 nm
Range (ng/m ³)	< 1 to > 100,000 (effective)	< 1 to > 100,000 (effective)
Display Resolution (ng/m ³)	0.1	0.1
Measurement Interval	1 min (standard)	1 hour (standard) 1 min (user selectable)
Sampling rate	2 LPM or 5 LPM user selectable	2 LPM
Auto-dilution	Optional 50% or 80%	Standard 50% or 80%
Pump type	External reciprocating piston	Internal diaphragm
Tape Type	20 m x 30 mm reinforced glass fiber (>1,000 spots)	20 m x 30 mm reinforced glass fiber (>1, 000 spots)
Inlets	PM ₁ , PM _{2.5} , PM ₁₀ , TSP (2 or 5 LPM)	PM ₁ , PM _{2.5} , PM ₁₀ , TSP (2 LPM)
Communications	Modem, RS-232, USB, Ethernet	Cloud-based modem, RS-232, USB
Dimensions	10.5" (26.7 cm) x 17" (43 cm) x 15.8" (40 cm)	12" (30.5 cm) x 14" (35.6 cm) x 14.5" (36.8 cm)
Weight	40 lb (18 kg)	35 lb (16 kg)
Mounting Options	Bench top or equipment rack mount	Optional stand

BC 1054 Options

82480	BC 1054 dilution flow system for high concentration environments
82336	PM _{2.5} cyclone for 5 LPM flow rate
SCC 110	PM ₁₀ cyclone for 2 LPM flow rate
SCC 112	PM _{2.5} cyclone for 2 LPM flow rate
BCX-502	BC 1054 wind speed and direction
BCX-921	BC 1054 cell modem

BC 1060 Options

BCX-801	BC 1060 rooftop extention kit
BCX-901	BC 1060 stand
BCX-501	BC 1060 wind-speed direction
BCX-902	BC 1060 CCS Modem 2
BCX-911	BC 1060 cell modem