

Backscatter Cloud Probe (BCP)



The Back-Scatter Cloud Probe (BCP) measures cloud droplet size distributions from $5\mu\text{m}$ to $75\mu\text{m}$, which are then used to derive the total number concentrations, liquid water content (LWC), median volume diameter (MVD), and effective diameter (ED). The BCP's non-intrusive optical housing allows use in a range of ground-based or airborne applications with no contamination from ice crystal shattering and no airflow distortion.

Advantages

- Classification of particles by size in histogram form
- User-programmable sample rates and bin thresholds
- Size distributions accumulated in the probe, with serial transmission to computer via any standard RS-232 or RS-422 communications port
- Monitoring of multiple variables, e.g. total particles, average transit time, over-range particles, and various probe health indicators



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Sleek, Non-Intrusive Design

The BCP's aerodynamic design minimizes airflow disturbance and allows for undisturbed particle measurement.

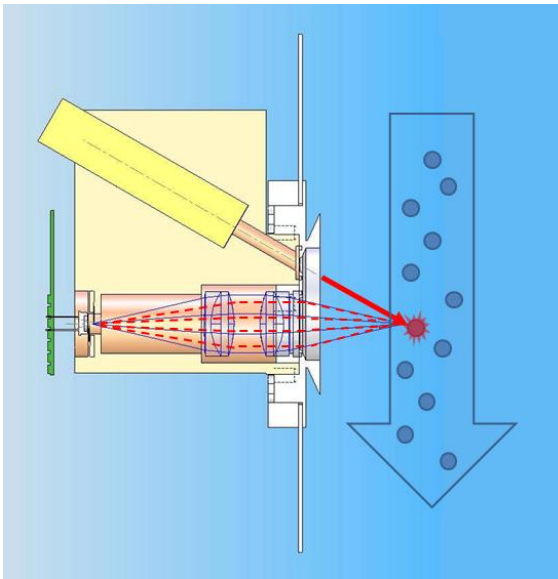
Photo at right: The backscatter cloud probe embedded in simulated aircraft skin.



Applications

- Cloud particle research
- Climate studies
- Fluid contamination detection (e.g., gas in a pipe)

The BCP is suitable for both airborne and ground-based applications.



Top View of the BCP

Principle of Operation

Particles passing through the laser beam scatter light in all directions, but only those photons that transmit within a cone subtending angles between 143° and 169° are collected and directed onto a photodetector (see figure). The photodetector converts the photon pulses into electrical pulses that are transmitted to a signal processor that amplifies and digitizes them. The peak amplitude of the scattering signal is related to the cloud particle size by Mie theory. A size distribution that relates number concentration to each particle's optical diameter is accumulated at programmable time intervals and stored along with information that monitors the data quality and health of the system.

Calibration

The BCP is calibrated at DMT with precision glass beads.

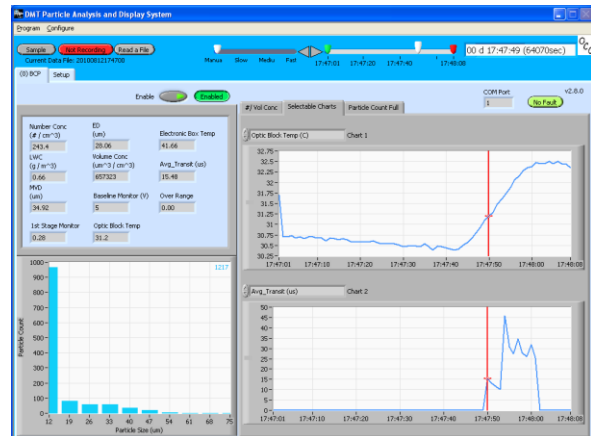


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Software

The Particle Analysis and Display System (PADS) is optional software that provides a user-friendly virtual instrument panel for the control, data display, and data logging of the BCP instrument. For instance, the program enables the user to do the following tasks:

- Start data recording and sampling
- View a size histogram of particles measured by the BCP
- View particle volume and number concentrations, as well as Liquid Water Content (LWC), Median Volume Diameter (MVD) and Effective Diameter (ED)
- Monitor instrument operational parameters like optic block temperature, electronic box temperature, and the baseline monitor voltage



PADS Software

Specifications

Measured Parameters	Single particle light scattering
Auxiliary Parameters	Temperature Pressure
Derived Parameters	Particle diameter Particle number concentration Liquid water content (LWC) Effective diameter (ED) Median volume diameter (MVD)
Size Range	5µm to 75 µm
Number of Size Bins	10, with user-selectable boundaries
Number Concentration Range	0 - 1,000 particles/cm ³
Air Speed Range	10 - 250 m/sec
Sampling Frequency	Selectable, 0.04 sec to 20 sec
Light Collection Angles	Center-line: 156°, +/- 13°
Laser	658 nm
Laser Power	50mW or less



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Data System Interface	RS-232 or RS-422 serial interface
Additional components	Electronics box, 1 m connecting cable
Calibration	Glass beads
Routine Maintenance	Optics cleaning before every field campaign
Recommended Service	Annual cleaning and calibration at DMT service facility
Software	Optional Particle Analysis and Display System (PADS) software – see below
Environmental Operating Conditions: Temp RH Altitude	-40 to +40 °C 0 - 100%, non-condensing 0 - 50,000 feet
Weight	1.5kg
Probe Dimensions	11.7 cm x 10.7 cm x 4.5 cm, with 5.9 cm diameter mounting flange
Electronics Box Dimensions	21.6 cm x 12 cm x 5.7 cm
Power Requirements	28 VDC, 5 A for system and heaters

Specifications are subject to change without notice. The BCP is a Class 3B Laser Product.

CAUTION: The requirement for the BCP to be non-intrusive to aircraft operations (i.e., no external components) dictates that there be no laser beam-stop mechanism. The laser beam will project unimpeded from the optical window. The laser is not eye-safe, so precautions must be enforced for operation on the bench or ground.

Components and Accessories

- Electronics box and cable (near right)
- Shipping case (far right)
- PADS software, purchased separately



How to Order

For more information or to obtain a sales quote, contact DMT at 303.440.5576 or customer-contact@dropletmeasurement.com.



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