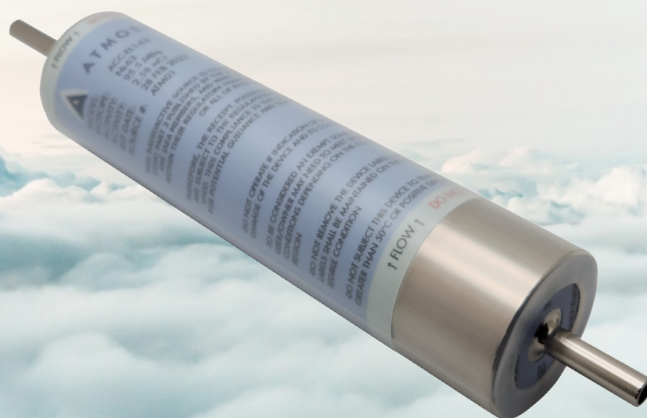


AEROSOL CHARGE CONDITIONER

ACC-EL2-63

Fast and accurate aerosol measurements – anywhere



APPLICATIONS

- Electrostatic particle classifiers – Scanning Mobility Particle Spectrometer (SMPS) and Particle Mass Analyzer (PMA)
- Ambient aerosol measurements – Source attribution and characterization
- Neutralization of charged aerosol – Regulatory measurements, filter testing and sample collection

BENEFITS

FIELD-READY



Conventional neutralizers typically use ion sources with high radioactivity, limiting their use to only specific licensed users/locations. Atmos's patent-pending ACC [1] uses an exempt* ion source without sacrificing performance. Thus, it is used without restrictions*, including roadside/mobile labs.

FAST RESPONSE



New 'fast scanning' techniques of SMPS systems conflict with the often long and uneven delays in particle transmission of conventional neutralizers, affecting measurements of transient aerosols [2]. Atmos's ACC provides consistent residence time for all particles by careful fluid dynamics design.

- Exempt from license requirements* for end-users
- Low radiation levels (similar to ambient)
- Consistent, fast response time [2]
- Known charge levels on particles

- Form compatible with TSI Kr-85 3077A applications
- Consistent ion source with a long half-life (101 yrs)
- Leverages cutting-edge measurement methodologies [3,4] and modeling [5] for particle charging

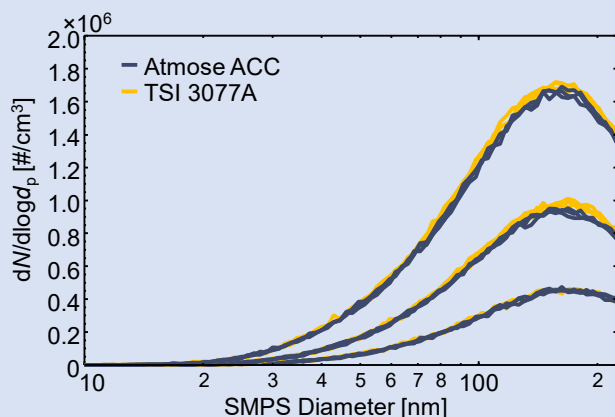


Fig 1 – SMPS scans of di-octyl sebacate (DOS) spheres at 1.5 L/min. Three repeats at each of three dilution settings.

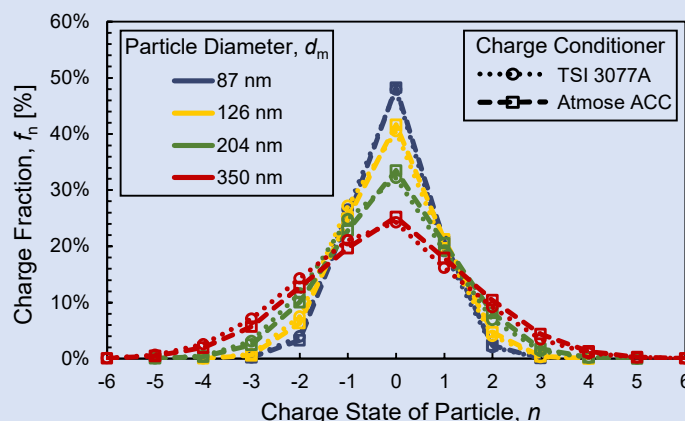


Fig 2 – Charge fractions of DOS spheres at 0.3 L/min measured using cutting-edge methodology [3,4].

SPECIFICATIONS

Mode of operation	Bipolar diffusion charging	Ion Source	Ni-63
Flow rate range [†]	0.3 – 5 L/min	Half-life	101 years
Housing Material	Aluminum or Stainless Steel	Radioactivity [†]	92.5 MBq (2.5 mCi)
Particle Penetration [§]	>99%	Temperature	0°C to 50°C
Internal Pressure	Negative gauge pressures only	Humidity	0%-95% RH (non-condensing)

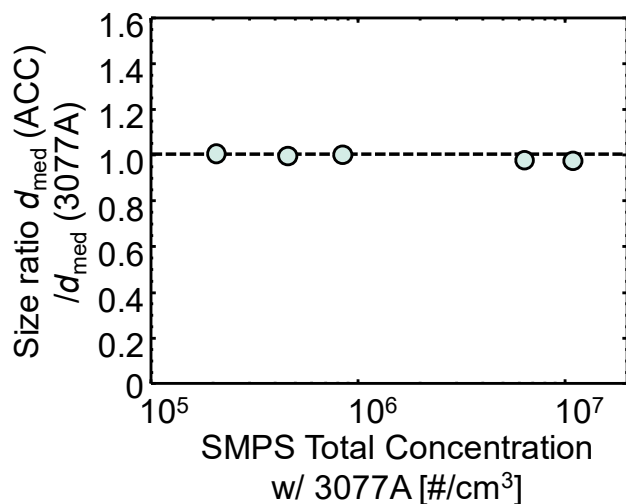


Fig 3 – Ratio of median diameter of SMPS Scans found using Atmos ACC over TSI 3077A charger.

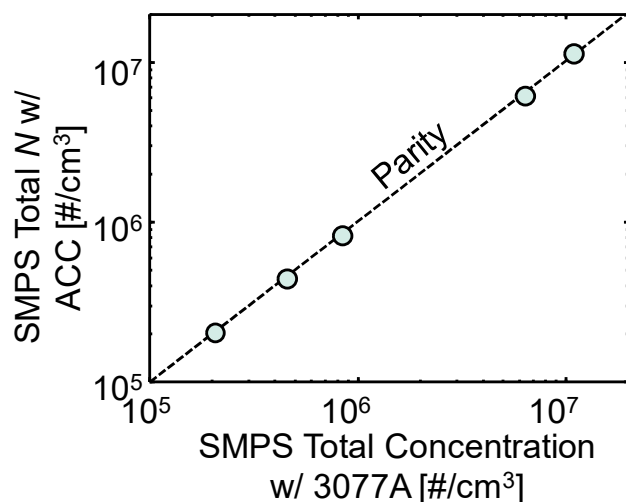


Fig 4 – Total concentration from SMPS Scans found using Atmos ACC compared with TSI 3077A charger.

- These results demonstrate the ACC's suitability for electrostatic particle classifiers, such as SMPS/PMA systems.
- Size distributions of spherical particles were measured over a range of dilution settings using the SMPS (see Fig 1). Particles were initially neutral, di-octyl sebacate spheres. Three repeat scans were performed at each dilution setting.
- Charge fractions conditioned on particles by the Atmos ACC and TSI 3077A also show high agreement (see Fig. 2)
- Median diameters measured by SMPS at 1.5 L/min using the Atmos ACC or TSI 3077A agree within 3% (see Fig 3).
- Similarly, the total number concentration was within 5% over a wide range of number concentrations (see Fig 4).

REFERENCES

- [1] Johnson and Nishida (2023). Patent Application GB2303960.5
- [2] Woo, Nishida, Johnson et al., in preparation
- [3] Johnson, Nishida et al. (2020). DOI: [10.1016/j.jaerosci.2020.105526](https://doi.org/10.1016/j.jaerosci.2020.105526)
- [4] Johnson, Nishida et al. (2021). DOI: [10.1016/j.jaerosci.2020.105705](https://doi.org/10.1016/j.jaerosci.2020.105705)
- [5] Woo, Nishida et al. (2022). DOI: [10.1016/j.cpc.2022.108399](https://doi.org/10.1016/j.cpc.2022.108399)
- [6] IAEA (2014). URL: www.iaea.org/publications/8930

NOTES

*This source is exempt under Schedule I of the General Safety Requirements (GSR) Part 3 [6] published by the International Atomic Energy Agency (IAEA). 177 countries are members of IAEA and many of them have incorporated these exemption guidelines within their regulatory framework. However, the requirements for radioactive sources can still vary between countries and regions. A list where the ACC-EL2-63 is compliant and license-exempt is available from Atmos on request.

[†]Target radioactivity of ion source. The true radioactivity of the ion source may vary by up to ±10% from target, depending on the procurement date.

[‡]Similar to other aerosol neutralizers, the flow rate and volume downstream of the charger affect the charge state of the particles [3].

[§]Determined using monodispersed, spherical particles with mobility diameters of 55, 240 and 1045 nm at 0.3 L/min sample flow, and 55 and 1045 nm at 1.5 L/min sample flow.

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