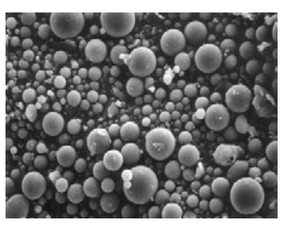
SEADM

Half Mini (p) model
Differential Mobility Analyzer

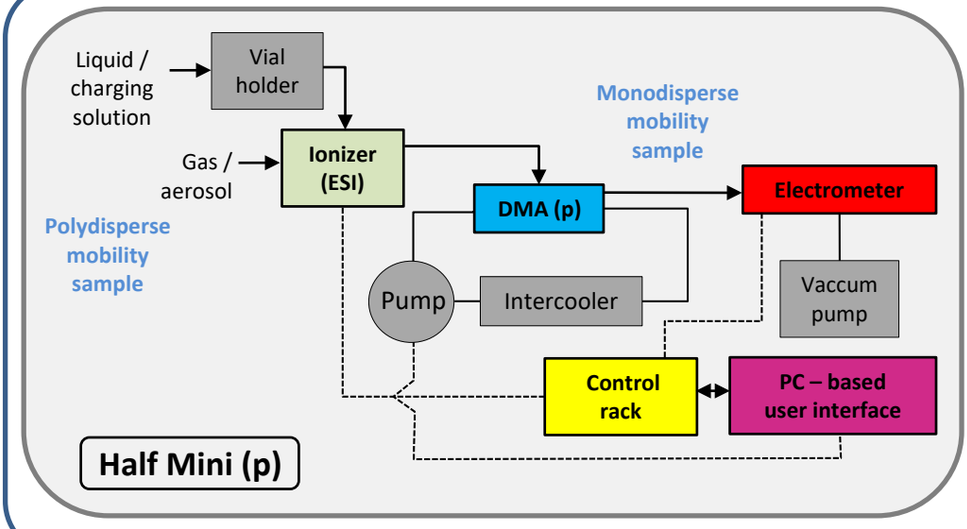
High resolution analysis of nanoparticles and molecules

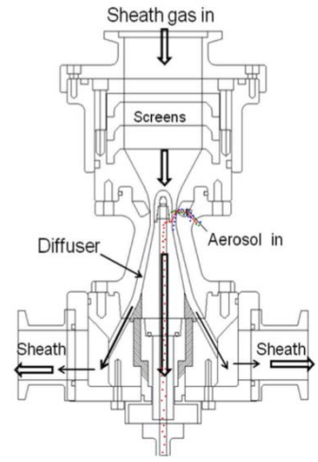



Half Mini (p) model

A portable DMA for high-resolution classification of 0-30 nm particles

The **Half-Mini DMA** is the most recent and lightest (3.2 kg) member of a class of Yale-developed supercritical DMAs, later improved by SEADM, able to isolate with high resolution aerosol particles smaller than 1 nm (including molecular ions). Its broad range of particle sizes (0-30 nm) is achieved with a single DMA configuration (2 cm long working section), greatly simplifying operation.





Ref. Fernández de la Mora J., 2013

In the **Half Mini** system, the molecules or particles are ionized in an electro-spray ionization chamber and then submitted simultaneously to a gas flow and an electric field within the cylindrical **D**ifferential **M**obility Analyzer (**DMA**). Only the particles or ions with a specific mobility are transmitted into the DMA outlet.

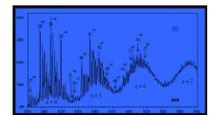
What makes the **Half Mini** system unique is its laminar flow even in the presence of high flow rates (high Reynolds numbers), which avoids undesirable effects (such as diffusion broadening and turbulence-related effects), delivering unrivalled resolutions.

New Half Mini (p) model

The new **Half mini (p) model DMA** [Fernandez de la Mora, J Aer Sci Tec, 2016] introduces substantial flow improvements over the prior (**m) model.** It operates under near ideal flow conditions over a much wider range of aerosol and sheath gas flow rates, enabling classification of 30 nm particles with a resolving power close to the ideal. This improvement relies on a new scheme for injecting the aerosol sample flow into the sheath gas flow with greatly improved axisymmetry. A comprehensive summary of the new improvements is available at our Half Mini Cells page.

Acquisition of fast size spectra: A key advantage of the **Half Mini** DMAs, either (p) or (m) models, over other existing DMAs is its ability to complete mobility spectra exceptionally fast without distortion of the size distribution. This advantage is due in part to the minimal particle residence time in the classification region (0.2 -2 ms), as well as to the high resolving power of the instrument (which yields almost the same residence time to all particles over the whole size range). Undistorted size spectra from 1 nm to 30 nm can therefore be obtained every 2 s [Fernandez de la Mora, Aer. Sci. Tec., accepted, Jan-2017].

Read our customer review for the Half Mini at: http://www.seadm.com/customer-reviews/



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Advantages and features

• Unmatched size range for a high resolution instrument, recently extended beyond 30 by the (p) model (Fernandez de la Mora, 2017)

• Highest resolutions available in the market (see results of independent studies on the right)

• Excellent transmission for enhanced sensitivity, see right (internal semiconducting tube bringing the classified particles to the grounded outlet)

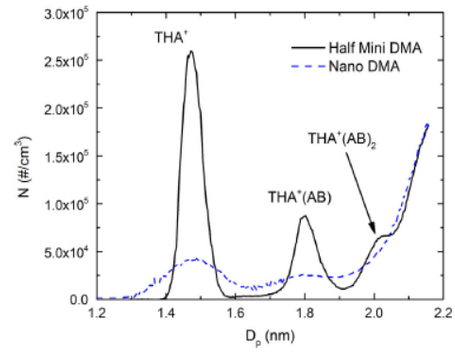
• Exceptionally fast delivery of mobility spectra without distorsion of the size distribution

• Optimized flow dynamics technology to ensure laminarity even at high (Re > 20,000) flow

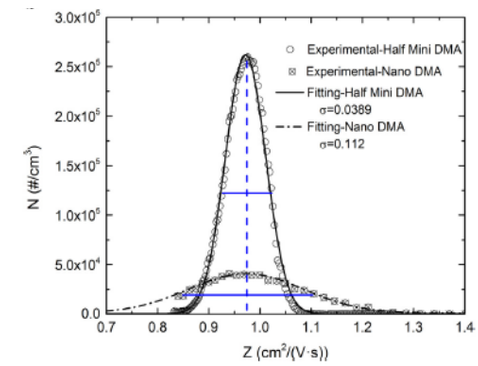
• Diffusion broadening minimized

• Robust architecture, mirror polishing, total thermal control

• Stand alone operation (control and monitorization units built-in) directly connected to PC-USB.



Size distributions of T.H. Ammonium Bromide (THAB) ions obtained with **Half Mini** and Nano-DMA in an indepedent study (Wang et Al, see Ref. 2014). Note the higher resolution of Half Mini enabling to identify all ions present in the sample.



Mobility spectra of the THA+ monomer measured with the **Half Mini** and with Nano DMA. The resolution, defined as the ratio Full Range/FWMH is almost three times bigger for the Half mini

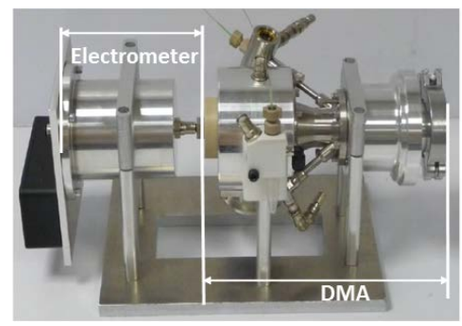
Applications and sectors

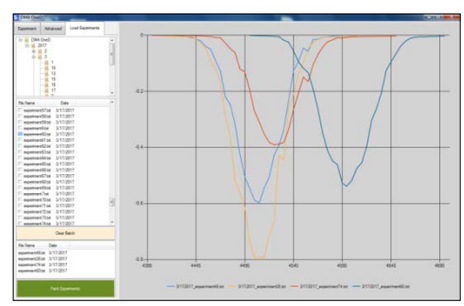
The instrument has been widely used for studies of Condensation Particle Counters (CPCs) sensitive to particles smaller than 3 nm, and other investigations involving pure nanometer size standards.

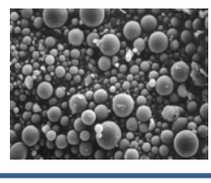
For users having a charge-reduction component (also available from SEADM), the increased size range of this DMA (relative to earlier supercritical DMAs) permits high resolution analysis of charge-reduced biomolecules and small viruses produced by electrospray.

Range of **applications** include:

+ Real-time **exhaust** analysis (as done in SUREAL-23 project)
+ **Environmental**/pollution research
+ **Atmospheric**/climate research (Kangasluoma, 2014)
+ **Nucleation** and reaction **kinetics** studies (Wang, 2015)
+ **Combustion** studies (Carbone, 2016)
+ **Synthesis** of nano-particles via gas or wet techniques (Wang, 2014 and 2015).
+ **Nano-materials** development (Wang, 2014)
+ Nano-particles applications (**medical** imaging, drug delivery, catalysis)
+ Generation of **particle standards** (Attoui, 2013)








Half Mini (p) model

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Wang Y., Liu P., Fang J., Wang W.N., Biswas P., "Kinetics of sub-2 nm TiO_2 particle formation in an aerosol reactor during thermal decomposition of titanium tetraisopropoxide". Journal of Nanoparticle Research March (2015), 17:147.

Specifications

Ionization methods: secondary electrospray ionization (gas samples); nano-ESI for liquid samples

DMA type: cylindrical

Particle size range: 1 -30 nm

Resolution: 30 at 2 nm, (peak voltage)/FWMH.

Operational time: 5 minutes (for start up)
≈2 seconds for 1-30 nm scan.

Sheath flow rate: 30-700 lpm

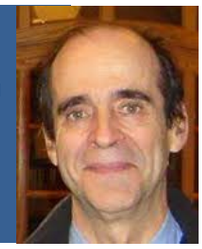
Clean gas supply for sample gas: 0.2-10 Lpm.

Power supply: 0-5000 V (incl. voltage control unit)

Cylindrical DMA dimmensions: 220 (length) x 105 (diameter) x 135 (width)

Weight: 3.2 Kg (only the cylindrical DMA)

Developed in collaboration with Juan Fernandez de la Mora (Yale University)

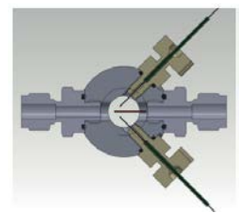


Related products

Cylindrical DMA cell

DMA P5 SYSTEM

Faraday cage electrometer



Bipolar Chamber

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