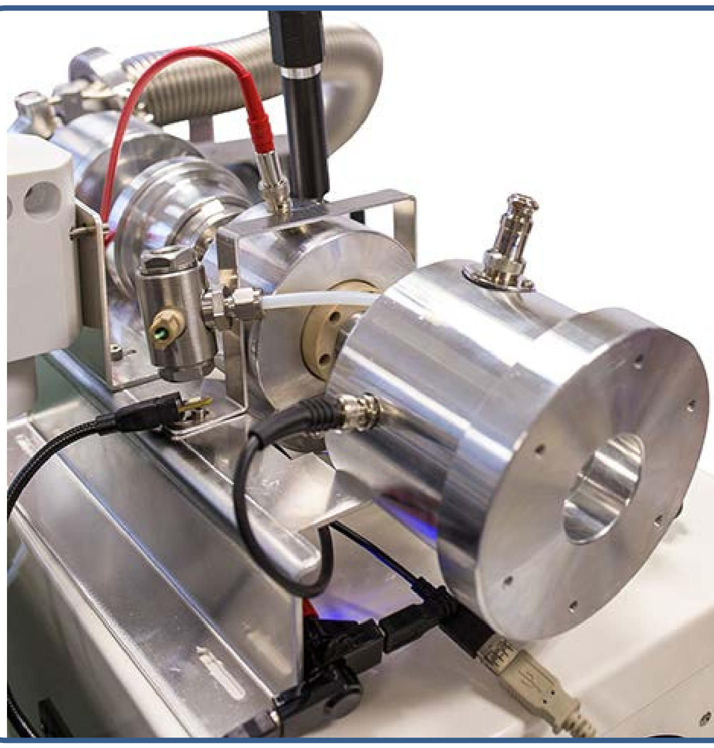
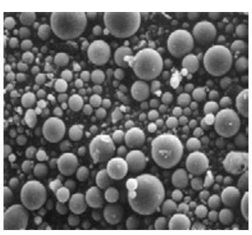
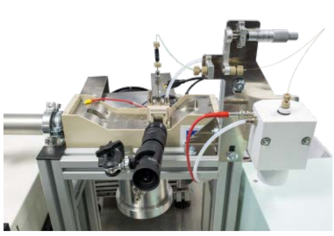
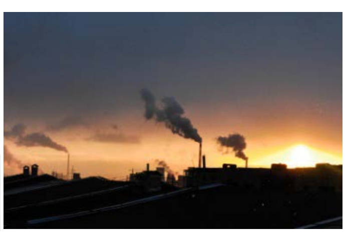
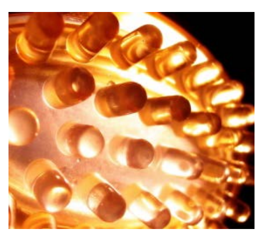
SEADM

Lynx E12

Faraday Cage Electrometer



Super-fast, ultra-low noise charge measurement

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Reference values at your fingertips: 100 ms full rise time and rms noise level of 0.1 fA

SEADM offers a Faraday cage **electrometer** (Figure 1) with exceptional noise level (~0.1 mV with 1 s of signal accumulation, Figure 2) and rise time (~22 ms; Figure 3). It operates based on capturing gas-suspended charged particles or ions on a filter, and sensing them with an amplifier circuit with **10^{12} V/A**. The long time drift of the signal is considerably less than 1 mV in several hours (Figure 4), removing the need for a zero current correction.

A faster electrometer with rise time <13 ms and amplification of 10^{11} V/A (LYNX E11) is also available.

SEADM electrometer can be supplied with accessories, including a 16-bit, quick **DAQ** system as well as **software** allowing for the programming of tests and analysis of results.

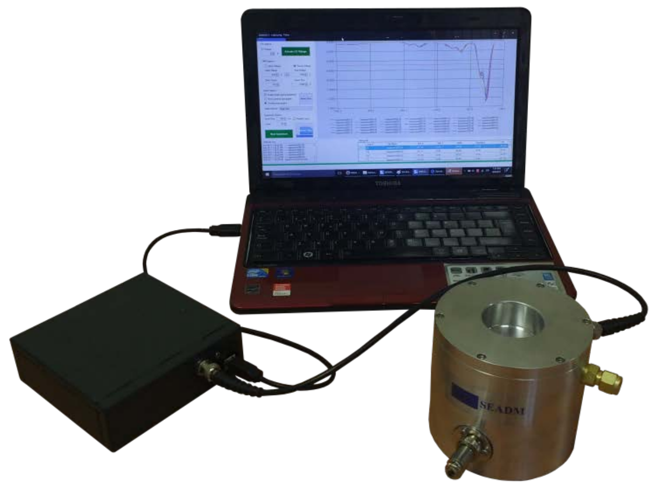

Figure 1*: Lynx E12 electrometer (bottom, right) and system accessories (available under request): DAQ system and laptop with control software. (Battery charger not shown)*

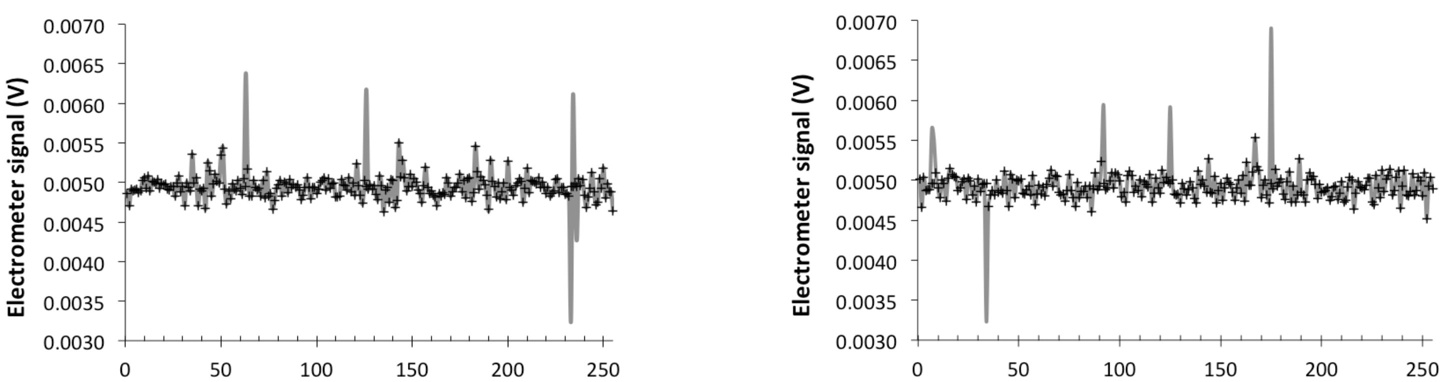

Figure 2. *Time dependence of amplified background signal for two data series containing 255 data, each accumulating signal for 1 s. Both series include 5 isolated events points departing drastically from the general trend. These events are isolated and readily distinguished from the rest of the signal. The standard deviation s is 0.23 mV and 0.13mV, including or excluding these five events, respectively.*

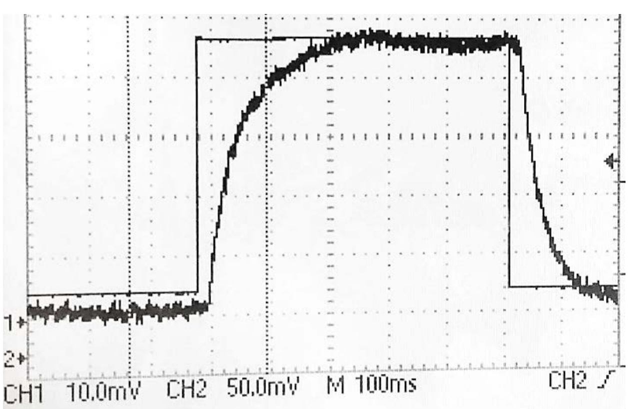

Figure 3. *Oscilloscope trace for the electrometer showing a half rise time of approximately 22 ms. An initial 20 ms time delay with no response is primarily due to the aerosol pulse generator.*

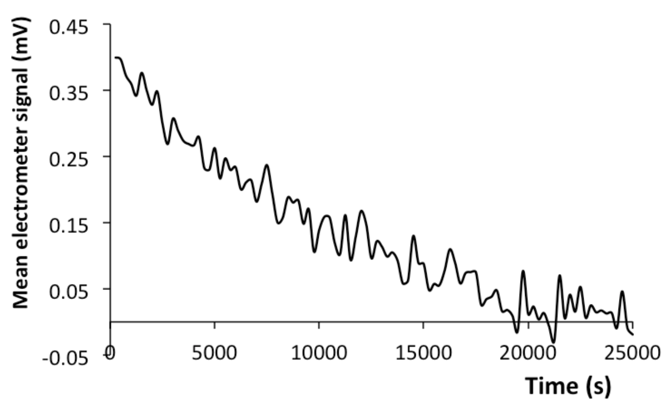

Figure 4: *Long time drift signal of electrometer. Each datum is accumulated for 250 s.*

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Operation and basic architecture

The electrometer includes a Swagelok **inlet** connecting to a ¼" tube for entry of the charged particles to be sensed. An identical fitting at the **outlet** is normally used (whenever inlet pressure is higher than atmospheric) for sample disposal. The analog inverted amplified signal is delivered through an **output BNC**, for direct reading or connection to a computer. The saturation voltage is ±2 V, corresponding to ±2 pA. The amplifier is **powered** by an internal rechargeable Li-ion battery. Due to security transport reasons the battery is not included; recommended model is Nitecore 18650 3400mAh. Battery charger (Nitecore D2) is included.

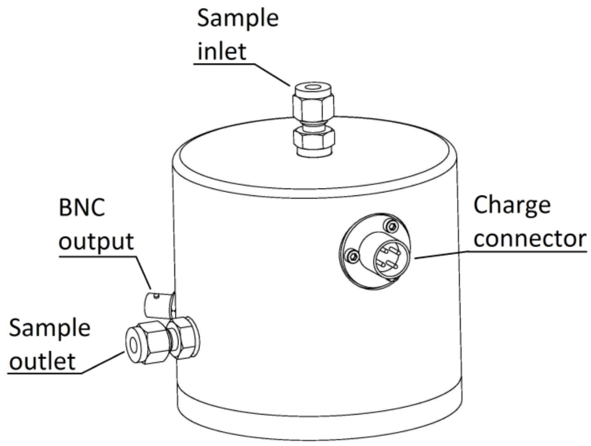


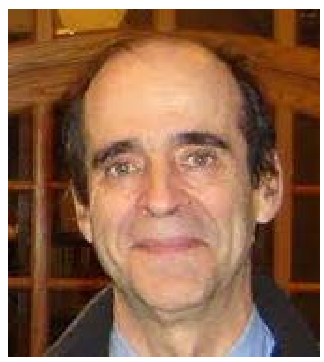
***Figure 5**: Lynx electrometer schematics (applies both to E11 and E12 models)*

Technical characteristics

- Dimensions: 113 mm box diameter; 134 mm box cover diameter; height: 104 mm; excluding connectors
- Weight: 4 lb
- Power: Internal 3.7 V Li rechargeable battery (battery not included)
- Risetime: ≈22 ms
- Rms noise: 0.1 fA (with event suppression)
- Drift current: less than 1 mV/hour after initial stabilization. The base signal may increase by up to 0.5% of the maximum signal attained following a large current input
- Amplification: -10^{12} V/A±10% (inverting amplifier). May vary by ±10% from model to model. Precise calibration is available upon request
- Measurement range: from ±0.1 fA to ±2000 fA
- Sample inlet and outlet ports: ¼" tube Swagelok connectors with nylon ferrules.
- Amplified output signal range: ±2 V
- Display in charger shows battery charge level.

For more information

Fernandez de la Mora J., Perez-Lorenzo L.J., Arranz G., Amo-Gonzalez M., Burtscher H., "Fast high-resolution nanoDMA measurements with a 25 ms response time electrometer" Aerosol Science and Technology, accepted for publication (Jan 2017).



Professor Juan Fernandez de la Mora

Developed in collaboration with Yale Professor Juan Fernandez de la Mora

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