



Semion™ System

Retarding Field Energy Analyser (RFEA)

Ion Energy and Ion Flux Measurement System

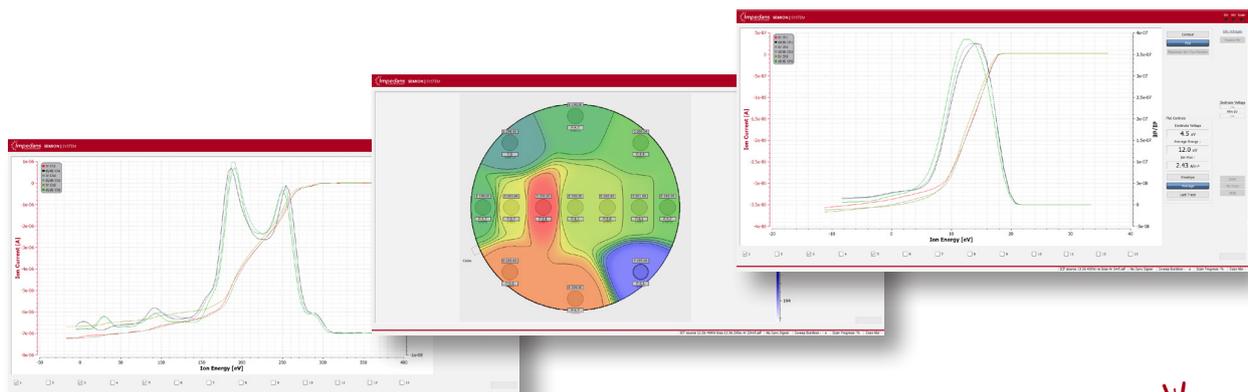
The Semion Retarding Field Energy Analyser (RFEA) system measures the ion flux and ion energy distribution hitting a surface in real-time using an imitation substrate (holder plate) with integrated sensors. The Semion Multi Sensor system can have up to 13 sensing elements distributed around the imitation substrate, which is primarily used to investigate the uniformity of ion energy and ion flux at the substrate in industrial plasma applications. A range of replaceable sensing elements with different signal sensitivities are available to probe a wide range of plasma ion current densities. This is the industry standard for substrate level measurement of the ion energy distribution, used in over 100 publications for fundamental research and plasma process development.

Key Features

-  Measure the Ion Flux and Ion Energy Distribution with energy range up to 2000eV (process dependant).
-  Suitable for grounded, floating and RF biased conditions.
-  Up to 13 sensors integrated into a single holder allowing uniformity measurements.
-  Holders with different shapes and designs available upon request.
-  Fully automated software analysis of the IEDF and automatic DC bias potential measurement.
-  Replaceable sensor elements with different sensitivities ranging from 0.001 Am⁻² to 700 Am⁻².
-  Sensor elements and holder available in anodised aluminium, bare aluminium or stainless-steel options.

Key Benefits & Applications

-  Portable system allowing analysis in multiple chambers using a single system.
-  Provides in-situ measurement of Ion Energy Distribution (IED) under plasma processing conditions.
-  Automatically generates contour maps of energy and flux uniformity over the wafer area.
-  High pressure Button Probes extend the pressure ranging to 1.5 Torr (limited to 150 eV energy range).
-  Provides insight for fundamental research and for plasma model validation.
-  Generate process data for customer escalations or product marketing.
-  Correlate process performance with the key plasma process drivers (ion energy and ion flux).



Electronic Control Unit Specifications

# Voltage channels	3
Voltage range	-2000 V to +2000 V
Current range	100 pA to 60 mA
Connectivity	USB 2.0
Synchronization	TTL Input

RFEA Probe Specifications

Number of Sensors (Button Probes)	1 to 13 (depending on holder)
Probe configuration	4-grid
Button Probe diameter (sensing element)	33 mm
Holder diameter	50 – 450 mm diameter options (custom available)
Holder thickness	5 mm
Max. operating temperature	150° C
Button Probe material	Aluminium, anodised aluminium, stainless steel, ceramic
Holder material	Aluminium, anodised aluminium, stainless steel, ceramic
RFEA Probe cable length	650 mm (custom available)
Flange Type	CF40 as standard, KF40 and custom options available

Semion System Specifications

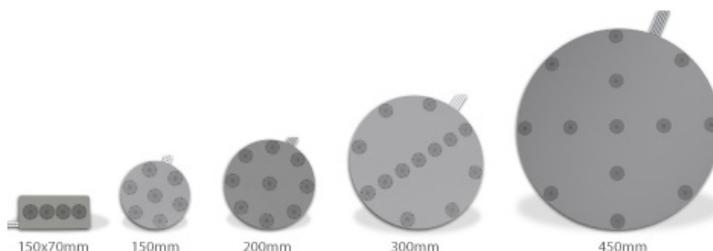
Ion Energy Range	0 to 2000 eV (standard/low density Button Probe) 0 to 150 eV (high pressure Button Probe)
Ion Flux	0.001 to 3 Am ⁻² (low density Button Probe) 0.01 to 50 Am ⁻² (standard Button Probe) 0.1 to 700 Am ⁻² (high density Button Probe)
Pressure Range	≤ 300 mTorr (standard Button Probe) ≤ 1.5 Torr (high pressure Button Probe)
IEDF Resolution	±1 eV nominal
Ion Density Range	10 ¹² to 10 ²⁰ m ⁻³ (Button Probe dependant)
Max. RF Bias Voltage (applied to probe)	1 kV** (peak to peak)
Max. DC Bias Voltage	-1940 V
Bias Frequency Range	100 kHz to 80 MHz
Sync Frequency Range (Time Resolved)*	4 Hz to 100 kHz
Time Resolved Method*	Boxcar integration
Time Resolution*	100 μs

*for pulsed plasmas with Semion mounted on grounded electrode

**at 13.56 MHz. Reduces to 0.3 kV at 60 MHz

RFEA Holder Plate Assembly

The Holder Plate Assembly can be mounted on a grounded or biased electrode and is used to hold the replaceable button probe sensor(s). The holder is available in a number of materials including aluminium, anodised aluminium and stainless steel with custom materials also available.



Electronic box



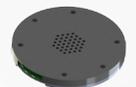
Feedthrough with single sensor holder



Feedthrough with multi sensor holder



Button Probes



Button Probe - front side



Button Probe - back side