Impedans
PLASMA MEASUREMENT

Vertex™ System

Retarding Field Energy Analyser (RFEA)

Measures Ion Energy Distributions For Configurable Aspect Ratios

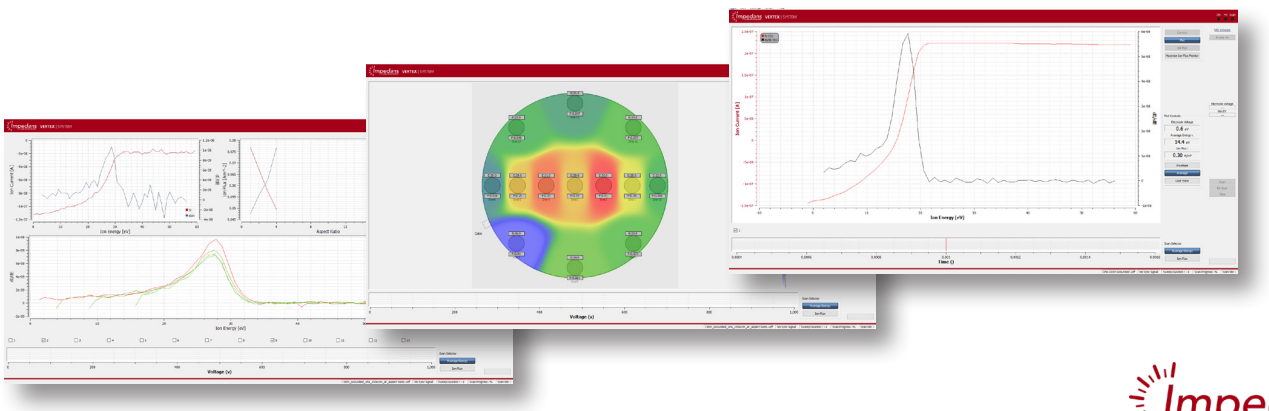
The Vertex Retarding Field Energy Analyser (RFEA) system measures the Ion flux and Ion energy distribution (IED) incident on a surface in real time using an imitation substrate with replaceable, integrated sensors. The Vertex Multi sensor system can have up to 13 sensing elements distributed around the imitation substrate, primarily to investigate the uniformity of the ion energy and ion flux at the substrate in industrial plasma applications. The Vertex system can also measure these parameters for a range of configurable Aspect Ratios (ARs) ranging from 0.5 to 20, with a resolution of 0.5, to understand their influence on deep trench etching. A variety of replaceable sensing elements are available with different sensitivities for compatibility with a wide range of plasma densities and discharge pressures.

Key Features

- Measure the Ion Flux and Ion Energy Distribution energy range up to 2000eV (process dependant).
- Aspect Ratio scans ranging from 0.5 to 20. Suitable for grounded, floating and RF biased conditions.
- Up to 13 sensors integrated into a single holder allowing uniformity measurements.
- Holders with different geometries 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.
- Provides insight for fundamental research and for plasma model validation.
- Generates process data for customer escalations or product marketing.
- Correlates process performance with the key plasma process drivers (ion energy and ion flux).



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Electronic Control Unit Specifications

# Voltage channels	3
Voltage range	-2000 V to +2000 V
Current range	10 nA to 60 μA
Connectivity	USB 2.0
Synchronisation	TTL Input

Electronic box

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
Holder material	Aluminium, anodised aluminium, stainless steel
RFEA Probe cable length	650 mm (custom available)
Flange type	CF40 as standard, KF 40 (custom available)

Feedthrough with single sensor holder

Vertex System Specifications

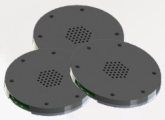
Aspect ratio range	0.5 to 20
Aspect ratio resolution	0.5
Ion energy range	0 to 2000 eV (standard/low density Button Probe)
Ion flux	0.001 to 3 Am^{-2} (low density Button Probe) 0.01 to 50 Am^{-2} (standard Button Probe) 0.1 to 700 Am^{-2} (high density Button Probe)
Pressure range	≤ 300 mTorr ≤ 1.5 Torr (limited to 150 eV Energy
IEDF resolution	±1 eV nominal
Ion density range	10^{12} to 10^{18} m^{-3} (Button Probe dependant)
Max. RF bias voltage (applied to probe)	1 kV[1] (peak to peak)
Max. DC bias voltage	-1940 V
Bias Frequency Range	100 kHz to 80 MHz
Sync frequency range (Time Resolved)[2,3]	5 Hz to 100 kHz
Time resolved method[2,3]	Boxcar integration
Time resolution[2,3]	5 μs

Feedthrough with multi sensor holder

[1]At 13.56 MHz. Reduces to 0.3 kV at 60 MHz

[2,3]For pulsed plasmas with Vertex sensor mounted on a grounded electrode.

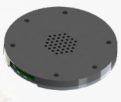
[2,3]Aspect ratio scan not available in time resolved mode.



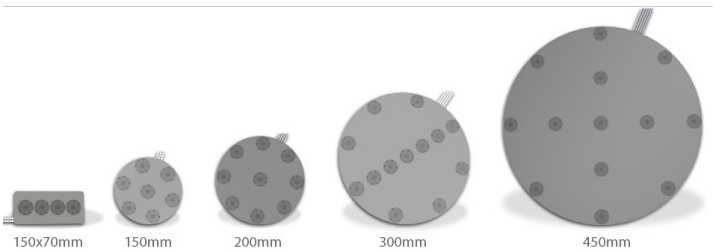
Button Probes

RFEA Holder Plate Assembly

The Holder Plate Assembly can be mounted on a grounded or biased or floating 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.



Button Probe - front side



Button Probe - back side