TB-213 Model 1407 Nonsequitur Bulk Etching Ion Source

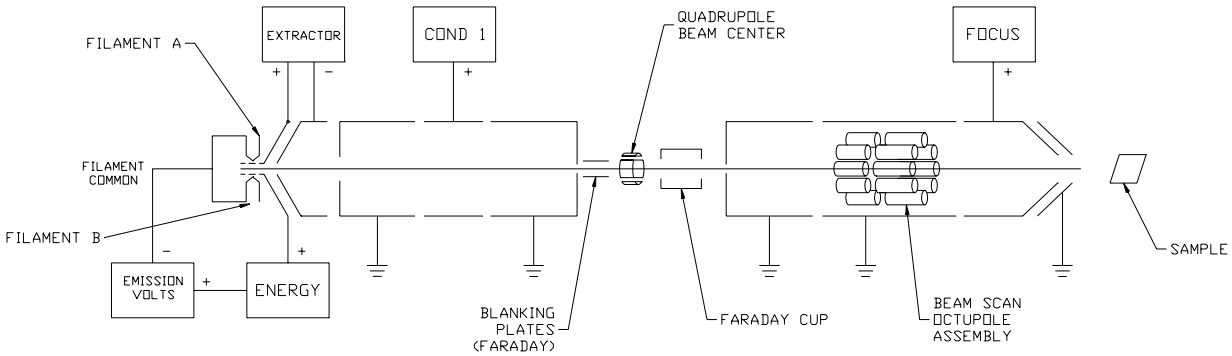
Design Features

- Duoplasmatron level performance from an electron impact source
- Adjustable spot size ≥ 15µm for spatially defined sputtering
- Emission regulated bombardment provides stable ion current with front panel adjustable dynamic range x300
- Continuously variable beam energy up to 5keV
- Dual octupole for beam scanning and astigmatism correction
- Pre-objective lens deflection for reduced spot size
- Integral beam current monitoring capability
- No direct filament to sample line of sight to avoid unwanted sample contamination
- Replaceable beam trimming aperture with typical life-time of > 500 hours
- Dual filaments provide operational backup with typical filament life-time > 500 hours
- Internal source pressure sensor permits monitoring of ion source pressure
- All UHV compatible and etch resistant materials used in fabrication
- Differential pumping to minimize main chamber gas loading
- Operates over the range of inert gas species

Guaranteed Performance: 5.0 keV Ar Ions

Mode	Spot size (µms)	Beam Current	Current Density (mA/cm^2)
Large Spot	75	20µA	450
Small Spot	15	500nA	280

Model 1407 Ion Gun Schematic

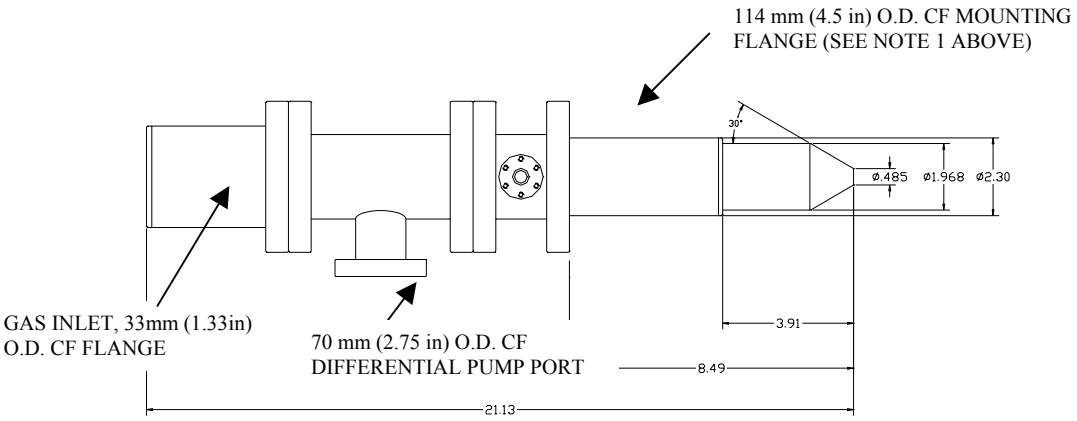


Engineering Specification

Working Distance:	10 mm
Beam energy:	≤ 5keV continuously variable
Raster Size:	3 x 3 mm (minimum)
Mounting Flange:	114 mm (4.5 in) O.D. CF see note 1 below
Differential Pumping:	70 mm (2.75 in) O.D. CF
Supply Gas Inlet:	34 mm (1.33 in) O.D. CF
Source gases:	He, Ne, Ar, Kr, Xe
Bake-out Temperature:	150 °C maximum

Note1: 150mm O.D. CF and other custom flanges optional

System Integration Details



1403A Controller Features (1407 Compatible)

- Precise and stable lens voltages
- Emission regulated electron impact supply
- Front panel raster controls with external programmability
- Power interlocks for safety and equipment protection
- Remote On/Off control for automated operation from external equipment
- Raster compensation electronics to correct for changes in sample geometry and working distance
- Comprehensive front panel system parameter monitoring

Controller Specification

Input Power:	115/230VAC 50/60Hz auto-select operation. Fused at 3.3/1.8A.
Beam Energy:	0 - 5000V, 1mA switch mode supply continuously variable. Output capacitance: 0.0047µF.
Dual Condenser Focus:	150 - 5000V, 1mA switch mode supplies independently and continuously variable through front panel three position rotary switches and trim-pots. Output voltages scale with energy. Output capacitance: 0.0047µF
Objective Focus:	0 - 5000V, 1mA switch mode supply continuously variable. Output voltage scales with energy. Output capacitance: 0.0047µF
Filament Power:	Emission regulated supply with front panel selectable filaments providing 5V@ 5A max.
Electron Bombardment	Electron accelerating voltage internally adjustable to 150V. Seven settings of electron emission current selectable from front panel rotary switch.
Ion Extraction:	Internally adjustable to 1500V.
Faraday Collector:	Front panel momentary switch permits beam current monitoring through panel mounted display.
Deflection:	Variable bi-polar 350VDC supply for +X, -X, +Y and -Y deflection. Remaining octupole elements are supplied from a resistive divider network.
Interlocks:	HV cable disconnection turns off HV supplies. Adjustable high pressure interlock switches off HV supplies in the event of system overpressure. System and Auxiliary interlocks provide total shutdown in the event of system or auxiliary equipment failure.
Front Panel Monitoring:	Digital panel meters provide precision monitoring of all critical parameters including; lens voltages ($4^1/_2$ digits), ion source pressure and beam current ($3^1/_2$ digits), filament current and voltage ($3^1/_2$ digits), emission current ($3\ ^1/_2$ digits).
Chassis Dimensions:	483(W)x132.5(H)x435.4(D) mm. 19 inch rack-mountable desktop case 3U high.

Typical Performance Data

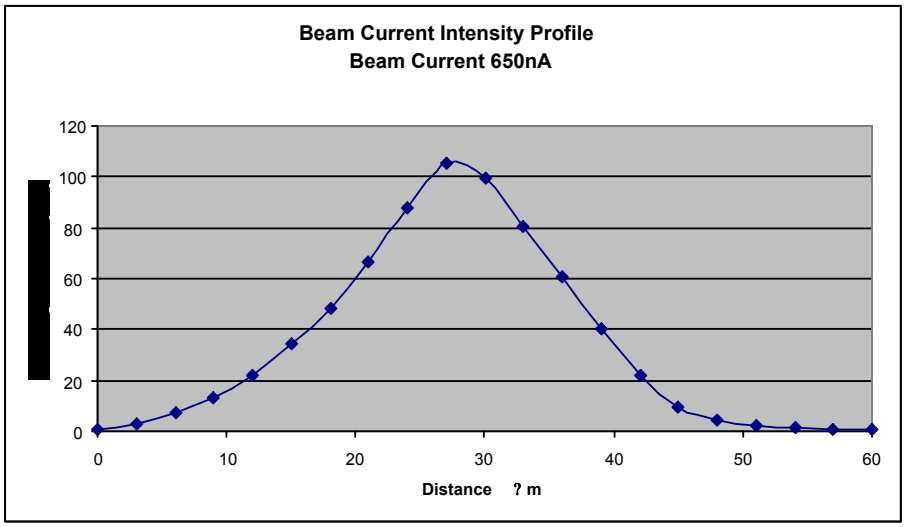


Figure 1. Beam intensity profile at 650nA beam current, 5keV Ar ions. The Faraday cup used for these measurements had pinhole diameter ≈ 10μm.

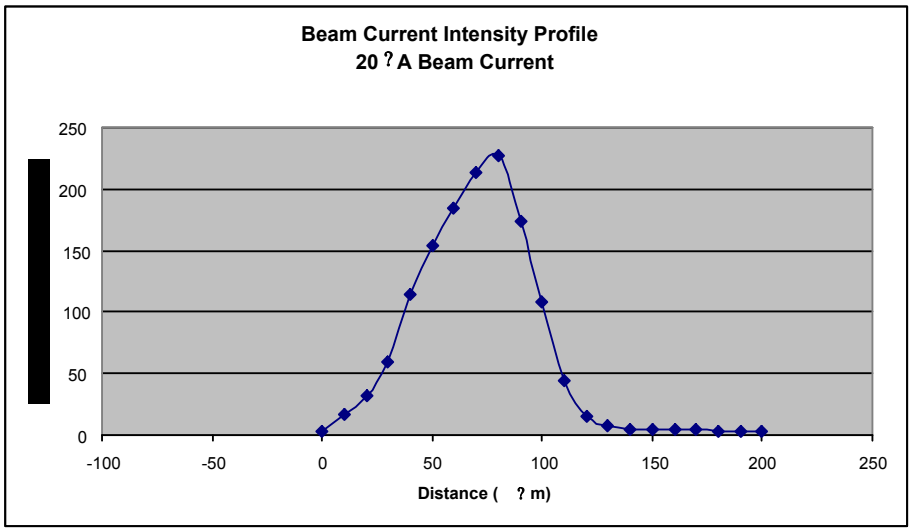


Figure 2. Beam intensity profile at 20μA beam current, 5keV Ar ions. Faraday cup pinhole diameter ≈ 10μm.