



BEAM HANDLING COMPONENTS

National Electrostatics Corp.

Electrostatic Microprobe Lens

APPLICATIONS

The NEC electrostatic quadrupole quadruplet microprobe lens is designed to be part of a materials analysis system to provide elemental analysis of small structures.

When part of a complete accelerator system, including energy analysis and beam limiting aperture, this lens allows the use of non-destructive techniques, such as RBS, to analyze surface structures that are only 20 microns across. Although the electrostatic lens is mass independent, it is presently in use on instruments designed primarily for proton and helium beams. These beams are typically used for PIXE and RBS analysis.

These analysis techniques can now be done with a spacial resolution of a few tens of microns. This provides quantitative elemental analysis which is often non-destructive on very small structures.

DESIGN

The microprobe lens is designed to mount in the position typically occupied by a beam collimator on an analysis endstation. As with most microprobe systems, it requires a rather long object distance with a relatively short image distance. The NEC microprobe lens will produce a 10 to 1 demagnification at the target if located about 4.2m from the object with the image position (sample) at 150mm beyond the lens exit.

The microprobe lens consists of four alternating polarity electrostatic quadrupoles. It is a "Russian Quadruplet"¹ with common voltages applied to the two 75mm long inner quadrupoles. The outer quadrupoles, each 41mm long, are similarly paired in voltage. The bore diameter is 5.5mm.

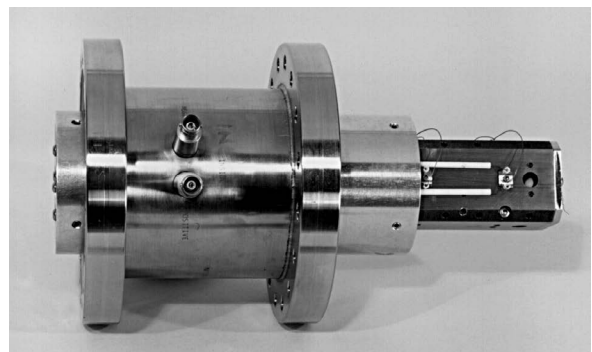
As with most NEC components, this lens is of all-metal and ceramic construction with no organic compounds in the vacuum volume. Its 4" (10cm) diameter housing is equipped with four coaxial MHV electrical connectors for a voltage rating of 5kV.

PERFORMANCE

Performance when used on Pelletron[®] accelerator systems is typically a beam diameter of 10 to 20 μ m for a 3MeV He⁺ beam when used with a beam limiting aperture of 200 μ m at the object position. Currents are typically 2-4 particle nA of He⁺ beam on target. Demagnifications of -10 to -13 have been measured.

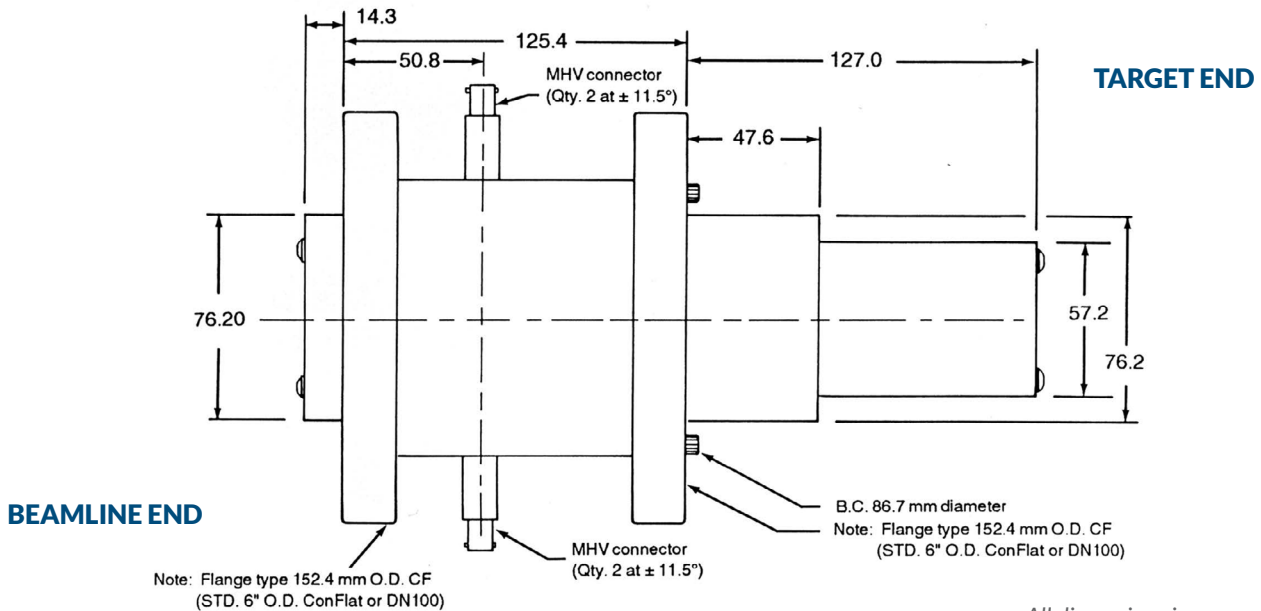
The overall design of the microprobe and its performance is discussed in the article by Klody et. al. published in Nuclear Instruments and Methods in Physics Research B56/57 (1991) 704-707. In addition to individual components such as the microprobe lens, limiting aperture and other beamline subsystems, NEC can provide the complete analysis instrument. Please contact NEC for details.

¹ S.H. Sie and C.G. Ryan, Nucl. Instr. and Meth. B15 (1986) 664.



SPECIFICATIONS

| | |
|---------------------------|--|
| Type: | Electrostatic quadrupole quadruplet |
| Number of Element Groups: | Four, alternating polarity |
| Element Length: | Inner two groups: 75mm Outer two groups: 41mm |
| Bore: | 5.5mm diameter |
| Voltage Rating: | 5KV |
| Electrical Connectors: | Quantity 4, coaxial MHV |
| Housing: | Nominal 4" diameter |
| Flanges: | 6" O.D. CF standard (other flanges available on request) |



All dimensions in mm.

ORDERING INFORMATION

Catalog No.: **2EA061190** (with CF flanges)

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