

Negative Surface Ionization Source Equipped with a Spherical Geometry Lanthanum Hexaboride Ionizer for Production of Negative Halogens for RIB Generation†

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A versatile, efficient, simple surface ionization source has been designed, fabricated, and initially tested for on-line use in generating radioactive ion beams of members of the group VII A elements (F, Cl, Br, I, and At) for the Holifield Radioactive Ion Beam Facility research program. The source utilizes a solid, spherical geometry, low work function LaB₆ ionizer ($\phi \cong 2.3$ to 3.2 eV)[1] for ionizing highly electronegative atoms and molecules. Despite its widely publicized propensity for being easily poisoned [2], no evidences of this effect were experienced during testing of the source. Off-line evaluation in terms of ionization efficiency for generating beams of Br⁻ by feeding AlBr₃ vapor at low feed rates into the source proved that the source is reliable, stable and easy to operate. The results indicate nominal efficiencies of 15% for Br⁻ beam generation when taking into accounts the fractional thermal dissociation of the AlBr₃ carrier molecule. The design features of the source are illustrated in Figure 1. Principles of operation of the source, initial performance, operational parameter and beam quality data (emittance) are discussed in this report.

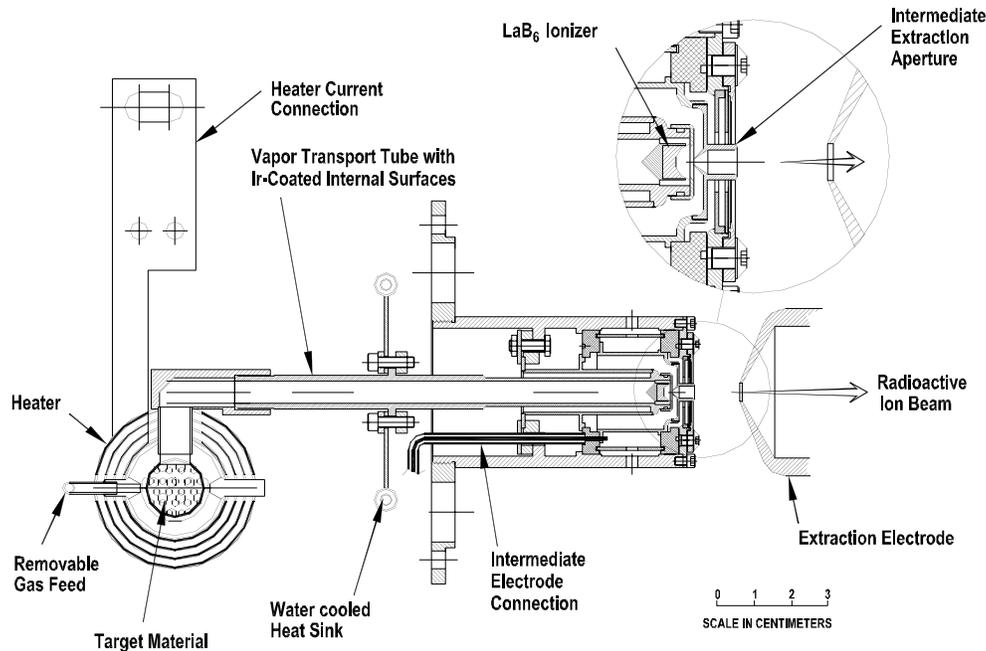


FIG. 1. Schematic drawing of the negative surface ionization source equipped with the spherical geometry LaB₆ ionizer.

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[2] A. Avdienko and M. D. Malev, Vacuum 27 (1977) 583.