

Advanced Negative Ion Source

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We describe new low maintenance and low noise plasma source for production cylindrical axial symmetric negative ion beams with moderate energy. The results of emission efficiency investigation of advanced negative particles (H^-) source with combined discharge of hollow cathode type, as well as one in crossed electric and magnetic fields, are presented. Cylindrical beam of negative hydrogen ions is extracted by applied potential of 10 kV with current density of about 5 A/cm^2 at the source emission aperture. The total beam current was up to 200 mA for negative hydrogen ions and up to 1,5 A for electrons. The beams have high divergence after the source. The ion beam downstream at 50 cm distance provided the current of 20 mA onto 10 cm diameter collector. Current density measurements were performed by means of two types sectioned collectors. It is shown that the extracted current value is comparable with that inherent for known cold cathode type negative ion sources. Calculated H^- ion current density exceeds a couple of amperes. This can be explained by the effect of surface-plasma mechanism of ion formation due to cesium presence in the source. The elaborated ion source has simple and compact design, and provides stable gas discharge with low noise level. The source tests have demonstrated high efficiency of intense hydrogen negative ion production under low enough gas pressure in drift chamber. The presented source can be also attractive for creation of compact efficient plasma electron source.

References

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