

NISTTech

COLD ATOM BEAM CHARGED PARTICLE SOURCE

Description

This invention is a method and device for the creation of a low emittance and high brightness ion or electron beams suitable for focusing to the nanoscale. The technique should be compatible with any atomic species amenable to laser cooling. The entire apparatus is contained within a vacuum chamber evacuated to below 0^{-6} nmbar, with actual required pressure depending on the particular implementation employed.

Applications

- **Focused Ion Beam Source**
The technique should be compatible with any atomic species amenable to laser cooling.

Advantages

- **Advance the state of high-brightness ion beams**
Reduce focus beam spot size

Abstract

This invention is a system for producing a charged particle beam from a photoionized cold atom beam. A vapor of neutral atoms is generated. From these atoms, an atom beam having axial and transverse velocity distributions controlled by the application of laser light is produced. The produced atom beam is spatially compressed along each transverse axis, thus reducing the cross-sectional area of the produced beam and reducing a velocity spread of the produced beam along directions transverse to the beam's direction of propagation. Laser light is directed onto at least a portion of the neutral atoms in the atom beam, thereby producing ions and electrons. An electric field is generated at the location of the produced ions and electrons, thereby producing a beam of ions traveling in a first direction and electrons traveling in substantially the opposite direction. A vacuum chamber contains the atom beam, the ion beam and the electron beam.

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Citations

1. NIST Docket 11-018. U.S. Patent Application No. 13/282,571

References

- US Patent Application No. 13/369,008

Status of Availability

This invention is available for licensing.

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