

Concepts for a Fourth Generation ECR Ion Source^{*}

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Abstract To go beyond the present and planned third generation ECR ion sources operating at microwave frequencies between 20 and 30GHz to a fourth generation of sources operating above 50GHz offers new opportunities and challenges. Based on the experimentally demonstrated frequency scaling, a doubling in operating frequency could provide more intense high charge state beams with higher charge states. The technical challenges include the development of magnetic structures capable of producing 8T solenoid field and 4T sextupole fields, production and coupling of high power microwave power to heat the plasma, extraction of intense multiple charge ion beams from a region of strong magnetic field and shielding of bremsstrahlung from the hot electrons. In this paper, the status of high field superconducting magnets now under development for accelerator applications, gyrotrons for microwave power and other technical aspects that would be incorporated into a fourth generation ECR ion source are explored and applied to a conceptual design.

Received 20 April 2007

* Supported by U.S. Department of Energy under Contract No. DE-AC02-05CH11231