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Hyperpolarized ^3He gas production by metastability exchange optical pumping for magnetic resonance imaging

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Keywords

hyperpolarized ^3He , lung imaging, low field MRI

Abstract

A portable ^3He gas polarizer based on metastability exchange optical pumping is described. It produces 75 ml of highly polarized ^3He gas at the pressure of 100 mbar, by implementing a non-magnetic peristaltic compressor, which transfers the ^3He gas from the low-pressure optical pumping cell to the storage cell. About 30% polarization at 1 mbar is achieved in the optical pumping cell in a single run, and 20 compression cycles are needed to reach the final pressure in the storage cell. After adding a buffer gas up to the atmospheric pressure, the mixture is used in magnetic resonance imaging (MRI) experiments. Preliminary images of phantoms and of the rat lungs *in vivo* confirm the usefulness of the ^3He gas polarizer in MRI applications.



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