

Abstract Submitted
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Vectorial Bell-Bloom atomic magnetometer using spin procession modulation¹ HAICHAO HUANG, XUYANG HU, HAIFENG DONG, Beihang University — We present an experimental study of a vectorial Bell-Bloom atomic magnetometer, which can measure two transverse magnetic fields and the total magnetic field at the same time. The light scheme is the same with the detection part in spin co-magnetometer of Princeton university [1], where a bias field is added perpendicular to the pumping light and a probe light is added parallel to the bias field. When there is transverse magnetic field, the probe light will be modulated by the spin procession. As there is a phase difference of $\pi/2$ between the x transverse field and y transverse field, we obtain the two transverse magnetic fields signal through the in-phase and out-of-phase of a lock-in amplifier. The total field is measured using resonance of the pumping light. Once the output signal is feedbacked to the coil, the bias field is locked to a constant value, and the transverse magnetic fields are locked to zero. In this way we obtain the three-dimensional magnetic fields by the current in the coils. The dynamic range can be adjusted through the bias field, so this method can be used both in the magnetic shield and in the geomagnetic field range.

[1] D. Sheng, A. Kabcenell, and M. V. Romalis, Physical Review Letters 113, 163002 (2014).

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