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A method to measure the residual magnetic field in the magnetic shields of a compact nuclear spin co-magnetometer¹ YUCHEN JIA, XIAOYANG LIANG, WENFENG WU, BINQUAN ZHOU, Beihang University — The compact co-magnetometers are widely used because of its advantage to suppress the error induced by magnetic field fluctuation. The measurement of the residual magnetic field is valuable in the development of co-magnetometers. However, it is difficult to put external sensors into the small magnetic shields, and the direct in-situ measurement is affected by light shifts and nuclear polarization. In this paper, we put forward a method to eliminate these effects and obtain the real magnetic field in the magnetic shields. Firstly, the measured residual magnetic field orthogonal to the pump beam has linear relationship to the probe intensity, and the real residual field is the intercept on y axis. Then this field can be compensated to zero, and finally we get the residual magnetic field parallel to the pump beam by measuring the resonance frequency shift when the main magnetic field and pumping light are flipped simultaneously. The experiment is implemented on a set of compact cylinder magnetic shields, and the results show that the axial and radial residual magnetic field is 58 nT and 8.5 nT, respectively. This method can obtain the real residual magnetic field in the compact magnetic shields, which is useful for the research of magnetic shields design and demagnetization.

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