High-quality electromagnetically induced absorption resonances in a buffer-gas-filled vapour cell

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We present an experimental and theoretical study of magneto-optical subnatural-linewidth resonances of electromagnetically induced absorption (EIA) in alkali vapour cell. It has been shown [1] that the pump-probe scheme and polarization control can lead to the formation of an EIA resonance with high contrast, without compromising its linewidth. Our observation configuration includes using two counter-propagating pump and probe light waves with mutually orthogonal linear polarizations, exciting an open optical transition in the ^{87}Rb D_1 line in the presence of argon buffer gas (12 Torr). The EIA signals registered in a probe-wave transmission reach a contrast of about 135% with respect to a wide "Doppler" absorption pedestal and 29% with respect to a level of background transmission signal [2]. These contrast values correspond to a relatively small resonance FWHM of about 7.2 mG (5.2 kHz). The width of the narrowest EIA resonance observed is about 2.1 mG (1.5 kHz). The work shows that the magneto-optical scheme used has good prospects for various quantum technologies.

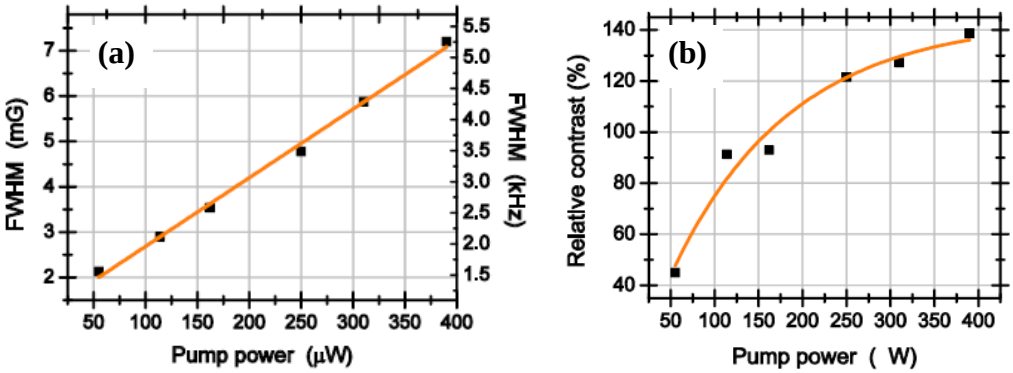

Figure 1. (a) Full width at half maximum of the EIA resonance vs. pump-wave power. (b) Contrast of the central EIA resonance with respect to (a) the contrast relative to the wide "Doppler" pedestal amplitude. P_{probe} = 3.5 μW.

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[2] D. Brazhnikov, S. Ignatovich, V. Vishnyakov, M. Skvortsov, C. Andreeva, V. Entin, and I. Ryabtsev, High-quality electromagnetically induced absorption resonances in a buffer-gas-filled vapour cell, Las. Phys. Lett. 15, 025701 (2018).