Erratum: Bragg Spectroscopy of a Bose-Einstein Condensate
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The Doppler broadened line shape in a Bose-Einstein condensate reflects its momentum distribution. We calculated the distribution $f(x)$ of momenta $p_x$ along the $x$ axis as the square of the Fourier transform of the condensate wave function

$$ f(p_x) \sim \left[ \int d^3 \vec{r} \ e^{-ip_x \vec{r}} \Psi(\vec{r}) \right]^2, \tag{1} $$

where $\Psi(\vec{r})$ is the condensate wave function. However, this above expression is incorrect because we calculated $|\Psi(p_x,0,0)|^2$ instead of $\int dp_y dp_z |\Psi(p_x, p_y, p_z)|^2$. These two expressions agree only for separable wave functions.

Instead of Eq. (3) in our paper, we obtain the correct distribution in the Thomas-Fermi limit as

$$ f(p_x) \sim \int dp_y dp_z \left| \int d^3 \vec{r} \ e^{-ip_x \vec{r}} \Psi(\vec{r}) \right|^2 $$

$$ \sim \{2(4 + \kappa^2)J_1(\kappa)J_2(\kappa) + \kappa J_0(\kappa)[5\kappa J_1(\kappa) - 16J_2(\kappa) + 3\kappa J_3(\kappa)]\}/\kappa^2, \tag{2} $$

where $\kappa = p_x x_0/\hbar$, $x_0$ is the Thomas-Fermi radius of the condensate in the $x$ direction, and $J_i$ denotes the Bessel function of order $i$. This distribution is similar to a Gaussian, but its rms width is undefined. We therefore fitted a Gaussian function to the distribution and extracted an effective rms width for the distribution, $\Delta p_x \approx 1.58\hbar/\kappa$, which differs from our earlier value by only 2.5%. Since the uncertainties of the experiment were about 10%, the key results of the paper are not affected. Our new calculation agrees with other work [1].

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