Bose et al. Reply: Our papers [1,2] propose an experiment in which the observation of Ramsey fringes would evidence a spatial superposition. We analyzed this as a magnetic effect creating a Stern-Gerlach (SG) like spin dependent separation of the center of mass (c.m.) states in conjunction with a gravitational effect imparting a relative phase between the states. The preceding Comment [3] points out that this could be interpreted in a different way. It contends that the interference manifested in the spin states is not due to the separation of the center of mass (c.m.) states in conjunction with spin states being not entangled at all. Despite the fact that the SG-like separation of coherence in the c.m. motion (which could be due to a lower $\omega_c$ or free flight) [6]. The time varying spatial separation between $|\beta(t, +1)\rangle$ and $|\beta(t, -1)\rangle$ can also be inferred from the spin state alone through a time modulation of the visibility of $\phi_+(t) - \phi_-(t)$ [7,8].

The pitfalls of a purely Zeeman interpretation of the relative phase development between $|\beta(t, +1)\rangle + 1$ and $|\beta(t, -1)\rangle - 1$ in the presence of gravity can be highlighted by considering the following case. Suppose we start with $\theta = \pi/2$ so that there is no gravitational term in the Hamiltonian and evolve till time $t = T/2$ to obtain a spatial separation $\Delta z(T/2)$ between the superposed coherent states $|\beta(T/2, \pm 1)\rangle$. At time $t = T/2$ we instantaneously switch off the magnetic field (for practical purposes by mapping electronic spin states to nuclear spin states) and then apply a gravitational pulse by changing $\theta$ from $\pi/2$ to 0 for a very short time $\delta t \ll T$. The off diagonal component of the spin part of the density matrix evolves as [9]

$$
\langle +1 | \rho_S(T/2) | -1 \rangle \rightarrow e^{-i [mg\delta z(T/2)/\hbar]} \langle +1 | \rho_S(T/2) | -1 \rangle.
$$

We still see that a phase $[mg\delta z(T/2)/\hbar]$ develops although there is no Zeeman term.

S. Bose,1 C. Wan,2 M. Scala,2 G. W. Morley,3 P. F. Barker1 and M. S. Kim2

1Department of Physics and Astronomy
University College London
Gower Street, London WC1E 6BT, United Kingdom
2QOLS, Blackett Laboratory
Imperial College London
London SW7 2BW, United Kingdom
3Department of Physics
University of Warwick
Gibbet Hill Road, Coventry CV4 7AL, United Kingdom

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