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Erratum: MAGIS-100 environmental characterization and noise analysis

J. Mitchell,[a,b,*] **T. Kovachy,**[c] **S. Hahn,**[d] **P. Adamson**[d] **and S. Chattopadhyay**[b,d]

[a] *Cavendish Laboratory, University of Cambridge, Cambridge, U.K.*
[b] *Department of Physics, Northern Illinois University, DeKalb, Illinois 60115, U.S.A.*
[c] *Center for Fundamental Physics, Northwestern University, Evanston, Illinois 60208, U.S.A.*
[d] *Fermi National Accelerator Laboratory, Batavia, Illinois 60510, U.S.A.*

E-mail: jm2427@cam.ac.uk

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4.2 Seismic measurement methods

In section 4.2 equations (4.3) and (4.4) are missing a factor of $\gamma(\nu)$. This was a typo that was missed in the initial submission.

*Corresponding author.

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6.2 Seismic vibration and GGN analysis

In the published version of section 6.2 the first paragraph contains a spurious clause describing a vibrational effect causing time-dependent gravity gradients. This was accidentally left in from a previous version, however, and has not been an actual consideration in the studies of gravity gradient noise presented here. It should therefore be disregarded. Additionally in the second paragraph of section 6.2 the equations of the spurious strain expected from the gravity gradient noise (GGN) were derived from an incorrect leading order form of the GGN phase shift as shown in equation (6.1). The correct form of the strain noise and magnitude, assuming a gradiometer measurement of a gravitational wave (GW) as shown in equation 6.2, are

$$\delta h_{\mathrm{GGN}} = \frac{2\pi G \gamma(\nu) \rho_0}{L \omega_{\mathrm{ggn}}^2} \langle \delta \xi_z \rangle \left(e^{-z_0 \frac{\omega_{\mathrm{ggn}}}{c_R}} - e^{-(L+z_0) \frac{\omega_{\mathrm{ggn}}}{c_R}} \right),$$

where z_0 is the depth of the interferometer closest to the surface in the gradiometer configuration with baseline L. The magnitude of this strain noise is $\sim \left(10^{-17}/\sqrt{\mathrm{Hz}}\right)$ for $L = 100\,\mathrm{m}$, $z_0 = 10\,\mathrm{m}$, a Rayleigh wave with frequency $\omega_{\mathrm{ggn}} = 2\pi \times 1\,\mathrm{Hz}$ and velocity $c_R = 210\,\mathrm{m/s}$, and a vertical surface displacement amplitude $\delta\xi_z = 1\,\mu\mathrm{m}$. The correct leading order phase shift of the atom interferometer caused by GGN, (equation (6.1)) is

$$\delta \phi_{\mathrm{GGN}} = \frac{8\pi G \gamma_\nu \rho_0}{\omega_{\mathrm{ggn}}^2} \langle \delta \xi_z \rangle \, n k_{\mathrm{eff}} e^{-k_l z} \sin^2\left(\frac{\omega_{\mathrm{ggn}} T}{2}\right) \cos\left(\phi_{\mathrm{ggn}} - \omega_{\mathrm{ggn}} T\right). \tag{6.1}$$

We also note that the leading factor of equation 6.2 should be 4 instead of 2 to be consistent with this paper's notation.

The modification of these equations does not change any of the results, plots, or conclusions of the paper and was made to correctly reflect the simulation results. The previous equations presented in the paper resulted from an incorrect simplification of the leading order term of the full calculated atomic phase shift. The results, plots, and conclusions of the paper were based on the full calculation and are therefore not affected by this correction. The final correction pertains to the Rayleigh wave speed used for the simulation and plots. A value of $c_R = 210\,\mathrm{m/s}$ is the Rayleigh wave velocity used in the plots, not $300\,\mathrm{m/s}$.

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