Erratum: Multipole Love relations [Phys. Rev. D 89, 043011 (2014)]

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In Sec. V A of this paper, we claimed that the magnetic-type tidal perturbation does not affect the conservative sector of binary dynamics for nonrotating bodies, but this was incorrect. Using [1], one finds the radial acceleration due to the tidally-induced ℓth magnetic-type multipole moment as $a_r \propto \bar{\sigma}_\ell v^2/r^{2\ell+3}$, which gives a $2\ell+2$ post-Newtonian (PN) contribution. Comparing this with the 3ℓ PN dissipative contribution, one finds that the two contributions enter at the same PN order for $\ell = 2$ while the conservative contribution dominates the dissipative one for $\ell \geq 3$. Such a feature is same as the electric-type tidal perturbation case.

Such a conservative contribution changes how $\bar{\sigma}_2$ enters in the gravitational waveform phase discussed in Appendix A2 of this paper as follows. First, using [1], one finds the radial acceleration due to the tidally-induced quadrupole moment of the 1st body $S^T_{ij,1}$ as

$$a_r^{\bar{\sigma}_2^1} = \frac{m}{r_{12}^2}\left[1 + 8\epsilon_{jmn} v_m \frac{S^T_{in,1} n_{ij}}{m_1 r_{12}^2}\right] = \frac{m}{r_{12}^2}[1 + 48\bar{\sigma}_2^1 \eta X_1^3 x^6], \tag{1}$$

where we correct the tidally-induced quadrupolar current multipole moment as

$$S^T_{ij,1} = 12\frac{m_2}{r_{12}^3}\sigma_2^1 \epsilon_{k\ell(j} n_{i)k} v_\ell, \tag{2}$$

using Eq. (6.10) in [1]. This then yields the Kepler's third law and binding energy as

$$r_{12} = \left(\frac{m}{\omega^2}\right)^{1/3}[1 + 16\bar{\sigma}_2^1 \eta X_1^3 x^6], \tag{3}$$

$$E = -\frac{1}{2}\eta m x[1 - 88\bar{\sigma}_2^1 \eta X_1^3 x^6], \tag{4}$$

respectively. This binding energy can also be derived from the tidal interaction Lagrangian in [2].

The above conservative contribution propagates to the dissipative sector. Taking into account corrections to the mass quadrupole moment of a binary system given by [3]

$$M^{ab} = \eta m r_{12}^2 n^{\langle ab\rangle} + \frac{8}{9}\frac{m_2}{m}[2v^i \epsilon^{ij\langle a} S_1^{b\rangle j,T} - \epsilon^{ij\langle a}\dot{S}_1^{b\rangle j,T} n^i r_{12}],$$

that was missing in this paper, the luminosity of gravitational waves given in Eq. (A11) in this paper is corrected to

$$\dot{E} = -\frac{32}{5}\eta^2 x^5\left[1 - \frac{2}{3}\bar{\sigma}_2^1 X_1^4 (X_1 - 113X_2) x^6\right]. \tag{5}$$

With these expressions at hand, we finally arrive at the gravitational waveform phase including the contribution of $\bar{\sigma}_2^1$ and Eq. (A12) in this paper is corrected to

$$\Psi(f) = \frac{3}{128}\frac{1}{\eta}x^{-5/2}\left[1 + \frac{20}{21}\bar{\sigma}_2^1 X_1^4 (X_1 - 1037X_2) x^6\right]. \tag{6}$$

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[2] T. Abdelsalhin, L. Gualtieri, and P. Pani (in preparation).
[3] J. E. Vines and E. E. Flanagan, Phys. Rev. D **88**, 024046 (2013).