Erratum: Axion stars in the infrared limit

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In eq. (2.5), the first expectation value should read $2 N R(r)^2$ rather than $2 N^2 R(r)^2$. The correct expression was used in the calculations.

In eq. (2.7), there is an errant minus sign on the right hand side of the second equation; it should read

$$\frac{B'}{A B r} - \frac{A-1}{A r^2} = \frac{f_a^2}{M_P^2} \left[\frac{E^2 N R^2}{B f_a^2} + \frac{N R'^2}{A f_a^2} - m^2 [1 - J_0(X)] \right].$$

The correct expression was used in the calculations.

In eq. (3.1), the first equality has an errant factor of 3 in the denominator, and should read

$$M = -4\pi \int_0^\infty T_{00} r^2 dr.$$

As a result, eq. (3.2) contains the wrong prefactor as well; it should read

$$V(y) = \pi \int_0^y Y(x)^2 x^2 dx.$$

This error was carried into the calculations of the total mass, and causes us to overestimate the masses in table 1 by a consistent factor of 3/2. A corrected version of table 1 and figure 2 are below:

λ	M (kg)	R_{99} (km)	d (kg / m ³)	δM (kg)
0.1	1.00×10^{18}	115	155	125000.
0.3	3.45×10^{18}	386	14.3	46300.
0.4	5.08×10^{18}	593	5.81	33500.
0.5	6.33×10^{18}	854	2.43	16300.
0.54	6.56×10^{18}	972	1.70	8350.
0.58	6.63×10^{18}	1076	1.27	1170.
0.62	6.61×10^{18}	1183	.951	−5370.
0.8	5.98×10^{18}	1652	0.317	−23200.
1	5.14×10^{18}	2145	0.124	−33100.
2	2.78×10^{18}	4499	0.00729	−53400.
4	1.42×10^{18}	9062	0.000457	−88700.
10	5.74×10^{17}	22849	0.0000115	−267000.

Table 1. Mass, radius, average density, and δM , as defined in (3.13), as a function of $\lambda = f_a / (M_P \Delta)$.

Figure 2. The mass M , scaled by the factor $m_a / (f_a M_P)$, as a function of λ . Stable (unstable) stars are represented by the solid (dashed) line. The dotted line connects sample states with identical numbers of axions. The mass difference of these stars is a small fraction of the mass.

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