

ERRATUM: “THE COSMIC COALESCENCE RATES FOR DOUBLE NEUTRON STAR BINARIES”
 (ApJ, 601, L179 [2004])

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In our original Letter, we calculated the likely size of the Galactic double neutron star (DNS) population in two stages. First, we simulated the DNS distribution in the Galaxy. At this stage, in addition to storing the spatial properties and luminosities of the model pulsars, we also computed their expected dispersion measures and pulse scatter broadening times using a model for the electron density distribution. This information was stored to an intermediate file for subsequent analysis by our simulation code, in which the simulated population was “searched” using detailed models of the various pulsar surveys. Unfortunately, while the scatter-broadening times created in the first part of the calculation were saved in units of milliseconds, the survey simulation code assumed them in units of seconds. This error led to an underprediction of the number of pulsars in the model observed samples, which in turn resulted in an overestimate of the true number, and hence in-spiral rate, of DNS binaries in the Galaxy.

We have now repeated these calculations using the correct unit conversion and find the Galactic DNS in-spiral rate \mathcal{R} to be $83.0^{+209.1}_{-66.1} \text{ Myr}^{-1}$ at a 95% confidence interval (model 6), a factor of ~ 2.2 smaller than in the original paper. The corresponding detection rates for the initial and advanced LIGO are $\mathcal{R}_{\text{det,ini}} = (34.8^{+87.6}_{-27.7}) \times 10^{-3} \text{ yr}^{-1}$ and $\mathcal{R}_{\text{det,adv}} = 186.8^{+470.5}_{-148.7} \text{ yr}^{-1}$, respectively. For all models we consider, the estimated DNS in-spiral rates range between ~ 4 and 224 Myr^{-1} . We show the revised result for our reference model in Figure 1. Table 1 summarizes the revised calculations for all models in our original paper. However, we note that the increase rate factor (IRF) due to the discovery of J0737–3039 remains essentially unaffected, since the unit error cancels out, the IRF being a measure of *relative* changes in rate. The IRF is found to be in the range 6–7 for all models under consideration. The exact values of IRF are shown in Table 1.

This error also propagates through to our predictions for future DNS discoveries in the Parkes multibeam survey. Repeating the analysis in § 4 of our original Letter, we find that the average number of DNS with properties similar to those currently known to be detected using full acceleration search processing is ~ 4 . The revised probability distribution of expected detections is shown in Figure 2.

TABLE 1
 ESTIMATES FOR GALACTIC IN-SPIRAL RATES AND PREDICTED LIGO DETECTION RATES (AT 95%
 CONFIDENCE) FOR DIFFERENT POPULATION MODELS

MODEL ^a	\mathcal{R}_{tot} (Myr^{-1})	IRF	\mathcal{R}_{det} of LIGO ^b	
			Initial (kyr^{-1})	Advanced (yr^{-1})
1	$23.2^{+59.4}_{-18.5}$	6.4	$9.7^{+24.9}_{-7.7}$	$52.2^{+133.6}_{-41.6}$
6	$83.0^{+209.1}_{-66.1}$	6.3	$34.8^{+87.6}_{-27.7}$	$186.8^{+470.5}_{-148.7}$
9	$7.9^{+20.2}_{-6.3}$	6.6	$3.3^{+8.4}_{-2.6}$	$17.7^{+45.4}_{-14.1}$
10	$23.3^{+57.0}_{-18.4}$	5.8	$9.8^{+23.9}_{-7.7}$	$52.4^{+128.2}_{-41.3}$
12	$9.0^{+21.9}_{-7.1}$	6.0	$3.8^{+9.2}_{-3.0}$	$20.2^{+49.4}_{-15.9}$
14	$3.8^{+9.4}_{-2.8}$	5.8	$1.6^{+3.9}_{-1.2}$	$8.5^{+21.1}_{-6.2}$
15	$223.7^{+593.8}_{-180.6}$	7.1	$93.7^{+248.6}_{-75.6}$	$503.2^{+1336.0}_{-406.3}$
17	$51.6^{+135.3}_{-41.5}$	6.9	$21.6^{+56.7}_{-17.4}$	$116.1^{+304.4}_{-93.4}$
19	$14.6^{+38.2}_{-11.7}$	7.0	$6.1^{+16.0}_{-4.9}$	$32.8^{+86.0}_{-26.3}$
20	$89.0^{+217.9}_{-70.8}$	6.2	$37.3^{+91.2}_{-29.6}$	$200.3^{+490.3}_{-159.3}$

^a Model numbers correspond to KKL. Model 1 was used as a reference model in KKL. Model 6 is our reference model in this study.

^b Increase rate factor compared to previous rates reported in KKL. $\text{IRF} \equiv \mathcal{R}_{\text{peak,new}}/\mathcal{R}_{\text{peak,KKL}}$.

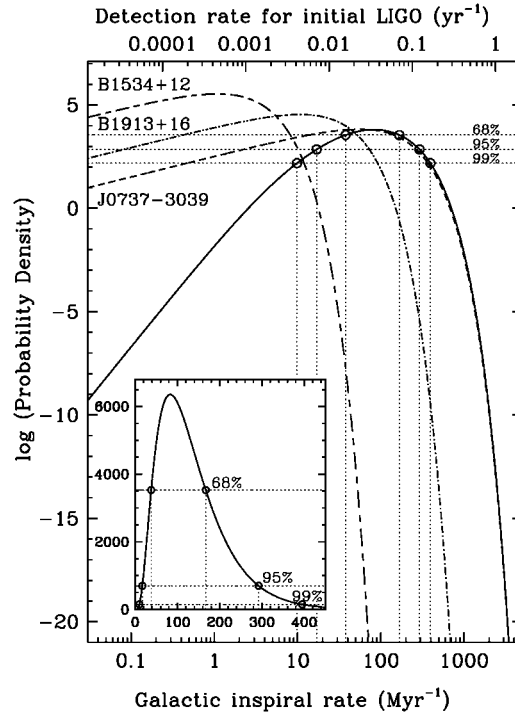


FIG. 1.—Probability density function that represents our expectation that the actual DNS binary merger rate in the Galaxy (*bottom axis*) and the predicted initial LIGO detector rate (*top axis*) take on particular values, given the observations. The curves shown are calculated assuming our reference model parameters (see text). The solid line shows the total probability density, along with those obtained for each of the three binary systems (*dashed lines*). *Inset*: Total probability density, and corresponding 68%, 95%, and 99% confidence limits, shown in a linear scale. Revised from original figure.

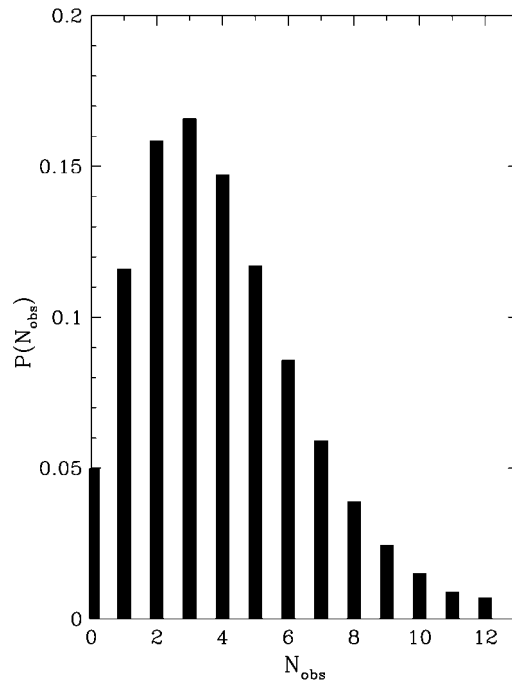


FIG. 2.—Probability density function of the predicted number of observed DNS binary systems N_{obs} for the PMB survey, for our reference model (model 6 in C. Kim, V. Kalogera, & D. R. Lorimer, ApJ, 584, 985 [2003], KKL). The mean value is estimated to be $\langle N_{\text{obs}} \rangle = 3.6$. Revised from original figure.