Erratum: Interaction-Driven Relaxation of Two-Level Systems in Glasses [Phys. Rev. Lett. 97, 165505 (2006)]

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In our Letter [1] we considered the relaxational dynamics induced by elastic interaction of two or three two-level systems. As pointed out by Burin and Polishchuk [2], our criterion for the existence of resonant triples is too weak, and thus overestimates their number.

We correct the number of resonant triple configurations W_3. Changing the variable $dV \to dJ$ in the probablity distribution $P_0 dV dE$ of neighbor two-level systems, one finds the distribution in terms of the energy splitting E and the elastic coupling $J = U_0/r^3$,

$$P_0 dV dE = \frac{4\pi}{3} P_0 U_0 \frac{dJ}{J^2} dE, \tag{1}$$

and the number of resonant pair configurations [2],

$$W_2 = \frac{4\pi}{3} P_0 U_0 \int \frac{dJ_{ij}}{J_{ij}^2} \int dE_j \mathcal{R}_{ij} \approx \frac{8\pi}{3} P_0 U_0 \ln \frac{k_B T}{\hbar \gamma_{\rm ph}}, \tag{2}$$

where the resonance condition $\mathcal{R}_{ij}$ requires $|E_i - E_j| \leq J_{ij}$ and results in $\int dE_j \mathcal{R}_{ij} = 2J_{ij}$. With the notation of [1] one obtains

$$W_3 = \left(\frac{4\pi}{3} P_0 U_0\right)^2 \int \frac{dJ_k}{J_k^2} \int \frac{dJ_{ij}}{J_{ij}^2} \int dE_k \int dE_j \mathcal{R}_{ijk}. \tag{3}$$

As pointed out in [2], the condition $\mathcal{R}_{ijk}$ used in [1], $|E_i \mp E_j \mp E_k| \leq J_k$, is not sufficient for hybridization of three-particle states; the correct criterion reads $|E_i \mp E_j \mp E_k| \leq J_{ij} J_k / E_k$ [2]. Proceeding as above for W_2, one has $\int dE_j \mathcal{R}_{ijk} = 2J_{ij} J_k / E_k$. The weak-coupling condition and the restriction to thermal systems are summarized as $\hbar \gamma_{\rm ph} \leq J_{ij} \leq J_k \leq E_k \leq k_B T$. Inserting these boundaries in the above integrals and summing over permutations of i, j, k, one finds the expression

$$W_3 \approx \left(\frac{4\pi}{3} P_0 U_0\right)^2 \left(\ln \frac{k_B T}{\hbar \gamma_{\rm ph}}\right)^3, \tag{4}$$

which corrects Eq. (7) of [1]. With the numbers given in [1] one finds at $T = 10$ mK the value $W_3 \sim \frac{1}{10}$, implying that resonant triples are less frequent.

The modification of W_3 affects the criterion for the onset of triple relaxation, whereas the memory function M_4 and the rate $\gamma_{\rm tr}$ are unchanged; i.e., Eqs. (6) and (8) of [1] remain valid where W_3 is of the order of unity. Yet interaction-driven relaxation is expected to be relevant even for systems where W_3 is moderately smaller than unity.

In this range, higher-order terms of the perturbation series may contribute significantly to the memory kernel

$$M = M_2 + M_4 + M_6 + \ldots, \tag{5}$$

thus requiring partial resummation of the series. Even if the probability W_n to find an n cluster is smaller than unity, the sum of all contributions M_{2n-2} to the memory function may result in relaxation.

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[1] D. Bodea and A. Würger, Phys. Rev. Lett. **97**, 165505 (2006).
[2] A. L. Burin and I. Ya. Polishchuk, arXiv:0707.2596.

