**Erratum: Rotationally Cold OH[−] Ions in the Cryogenic Electrostatic
Ion-Beam Storage Ring DESIREE
[Phys. Rev. Lett. **119**, 073001 (2017)]**

H. T. Schmidt, G. Eklund, K. C. Chartkunchand, E. K. Anderson, M. Kamińska, N. de Ruelle, R. D. Thomas,
M. K. Kristiansson, M. Gatchell, P. Reinhed, S. Rosén, A. Simonsson, A. Källberg, P. Löfgren, S. Mannervik,
H. Zettergren, and H. Cederquist

(Received 29 June 2018; published 14 August 2018)

DOI: [10.1103/PhysRevLett.121.079901](https://doi.org/10.1103/PhysRevLett.121.079901)

We have discovered an error in our analysis of the data in this Letter. The correct relation between the measured effective photodetachment cross section and the rotational level populations $P(J)$ is [1,2]:

$$\sigma_{\text{eff}}^{\text{ph}}(h\nu) \propto \sum_{J=0}^2 \frac{P(J)I_J}{2J+1} (h\nu - \epsilon_J)^p + C, \quad (1)$$

in which J is the rotational quantum number of the OH[−] ion, ϵ_J is the corresponding energy threshold, $p = 0.28$ is an empirically determined exponent [3], and C represents a small ¹⁷O[−] contamination in the stored beam. Finally, I_J are J -dependent intensity factors extracted from Ref. [4]. In this Letter, we had left out the factor $2J + 1$ in the denominator of Eq. (1) due to a misunderstanding of the exact definition of the I_J parameters in Ref. [4].

Using Eq. (1), we find the correct populations of the three lowest rotational levels for different times after injection, and these are given in Table I. Furthermore, the equilibrium $J = 1$ population deduced from the repopulation measurements (see Fig. 3 of the Letter) is now $18.1 \pm 0.9\%$ corresponding to a temperature of 20.6 ± 0.5 K, and the lowest equilibrium $J = 1$ population reached with the depletion laser on is $3.6 \pm 0.3\%$. The latter corresponds to a temperature of 12.3 ± 0.2 K, which is slightly below the macroscopic temperature, $T = 13.5 \pm 0.5$ K, of the storage ring itself.

TABLE I. Relative populations $P(J)$ (in %) in the lowest three rotational levels after different storage times, $t(s)$, in DESIREE. The temperatures are the ones that would give the measured $P(J = 0)$ in thermal equilibrium. No temperature values are given for the distributions at 50 s and 100 s, which are too far from thermal equilibrium for temperature assignments to be meaningful.

$t[s]$	$P(J = 0)$	$P(J = 1)$	$P(J = 2)$	$T[K]$
50	5.5 ± 3.2	82.8 ± 2.9	11.7 ± 0.6	...
100	28.9 ± 2.7	68.8 ± 2.6	2.3 ± 0.1	...
150	44.4 ± 2.0	54.3 ± 2.0	1.3 ± 0.08	50.6 ± 3.0
300	67.0 ± 1.3	32.2 ± 1.3	0.85 ± 0.05	29.2 ± 0.9
600	79.2 ± 0.5	20.3 ± 0.5	0.51 ± 0.06	22.0 ± 0.3

We deduce the spontaneous lifetime of the $J = 1$ level from the measured repopulation curves. The effective rate extracted from the data is unaffected by the mistake in the original analysis discussed here, but corrections due to excitation and de-excitation processes are related to the measured equilibrium rotational level distribution. We note that the rotational distribution for $J = 0-2$ found after 600 s storage (see Table I) is close to that of a thermal equilibrium at $T = 22.0 \pm 0.3$ K, and we use Eq. (4) of the Letter to deduce a new Einstein A value and a new spontaneous $J = 1$ lifetime of 183 ± 35 s, which is in agreement with the value of Meyer *et al.* [2].

- [1] E. S. Endres, G. Egger, S. Lee, O. Lakhmanskaya, M. Simpson, and R. Wester, Incomplete rotational cooling in a 22-pole ion trap, *J. Mol. Spectrosc.* **332**, 134 (2017).
 [2] C. Meyer *et al.*, Radiative Rotational Lifetimes and State-Resolved Relative Detachment Cross Sections from Photodetachment Thermometry of Molecular Anions in a Cryogenic Storage Ring, *Phys. Rev. Lett.* **119**, 023202 (2017).

- [3] P. C. Engelking, Strong electron-dipole coupling in photodetachment of molecular negative ions: Anomalous rotational thresholds, *Phys. Rev. A* **26**, 740 (1982).
- [4] F. Goldfarb, C. Drag, W. Chaibi, S. Kröger, C. Blondel, and C. Delsart, Photodetachment microscopy of the P, Q, and R branches of the OH^- ($v = 0$) to $\text{OH}(v = 0)$ detachment threshold, *J. Chem. Phys.* **122**, 014308 (2005).