Addendum to "Effects of retardation on electromagnetic self-energy of atomic states"*

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We present electromagnetic self-energy shifts for the $2S$ states of hydrogenic ions for $Z = 10$, 20, 30, 40, 50, 60, and 70. The results are computed nonrelativistically and with retardation according to a recent prescription of ours.

In this note, we wish to state some results showing the electromagnetic self-energy shift of the 2S states of hydrogenic ions of higher Z, computed nonrelativistically and with retardation according to a prescription given in a recent paper of ours[1] and as amended in an Erratum.[2] The mass renormalization is corrected for as given by Eq. (3) in the Erratum.[2] Other effects such as magnetic-moment and vacuum-polarization corrections, etc., have not been taken into account.

We define a Lamb constant for $n = 2$ states by

$$L = \frac{\alpha^4}{6\pi}\frac{1}{a} = 135.6 \text{ MHz}.$$

Our results are summarized and compared to those of Erickson[3] and Mohr[4] in Table I.

It is seen that the nonrelativistic Lamb shift computed with the alternative mass-renormalization prescription gives a fairly accurate value for all Z.

TABLE I. $2S$ shift in MHz after mass renormalization.

Z	Energy shift (in MHz) $\tilde{W}_{2S}$	$\tilde{W}_{2S}/Z^4L$ This calculation	Reference 3	Reference 4
10	4.646 (6) [a]	3.42	3.5	3.67
20	5.237 (7)	2.41	2.5	2.63
30	2.073 (8)	1.89	2.0	2.13
40	5.354 (8)	1.54	1.6	1.84
50	1.093 (9)	1.29	1.45	1.67
60	1.921 (9)	1.09	1.3	1.57
70	3.048 (9)	0.94	1.2	1.53

[a] Numbers in parentheses indicate power of 10 to be multiplied.

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[1] C. K. Au and G. Feinberg, Phys. Rev. A 9, 1794 (1974).
[2] C. K. Au and G. Feinberg, Phys. Rev. A 12, 1733(E) (1975) (this issue).
[3] G. W. Erickson, Phys. Rev. Lett. 27, 780 (1971).
[4] P. J. Mohr, Phys. Rev. Lett. 34, 1050 (1975).