APPENDIX : SOME ELECTRON AND ATOM DIMENSIONS AND THE EVANS ECKARDT RADIUS.

In this appendix some electron and atom dimension are given and compared with the Evans Eckardt (EE) radius defined by Eq. (80) of the text.

The classical electron radius (the Compton radius or Thomson scattering radius) is:

$$r(classical) = \frac{1}{4\pi \epsilon_0} \frac{e^2}{mc^2} = 2.818 \times 10^{-15} \ m \quad - (1)$$

where m is the mass of the electron. In quantum electrodynamics the electron is a point particle with no radius or volume, in direct contradiction of general relativity:

$$r(QED) = 0. \quad - (2)$$

The ECE volume of the free electron in the Dirac limit {1-12} is:

$$V_{ECE} = \frac{k \hbar^2}{mc^2} = 8\pi \ r_c \ r_p^2 \quad - (3)$$

where k is Einstein's constant, and where r_c and r_p are respectively the Compton wavelength of the electron:

$$r_c = \frac{\hbar}{mc} = 3.86 \times 10^{-13} \ m \quad - (4)$$

and the Planck length:

$$r_p = \left(\frac{G \hbar}{c^3} \right)^{1/2} = 4.05 \times 10^{-35} \ m \quad - (5)$$

where G is Newton's constant.

Assuming a spherical electron its ECE radius may be found from:

$$V_{ECE} = \frac{4}{3} \pi \ r_{ECE}^3 = 1.59 \times 10^{-80} \ m^3 \quad - (6)$$

so the ECE radius of the free electron is:

$$r_{ECE} = 3.35 \times 10^{-27} \text{ m} \quad - (7)$$

in the Dirac limit of the ECE wave equation {1-12}. In the text it has been shown that the

Evans Eckardt radius is:

$$r_{EE} = 1.12 \times 10^{-20} \text{ m} \quad - (8)$$

and the 2s - 2p$_2$ Lamb shift for H at $\cos \theta = 1$ gives the change in radius:

$$\Delta r (vac) = 4\pi^{1/2} \frac{r_{EE}^2}{r_c} = 2.30 \times 10^{-27} \text{ m}. \quad - (9)$$

Comparing Eqs. (7) and (9) it is seen that the vacuum affects the electron by the same order of magnitude (10^{-27} m) as the ECE radius in Eq. (7). From a causal relativistic point of view, quantum electrodynamics gives the nonsensical result (2). A volume for the QED electron has to be created on a number of dubious assumptions: there must be unobservable virtual photons which create unobservable virtual electrons and virtual positrons; virtual particles are allowed to violate the Einstein equation of special relativity; to prevent divergence the techniques of mass regularization and re-normalization must be used; a perturbation theory with divergences must be used, giving a series sum of thousands of terms, a sum which is not known to converge. As we have seen in the text, the claims of QED to precision do not stand up to the most basic tests, and there is internal inconsistency in the standards laboratories.

So by Ockham's Razor ECE is preferred over QED. The former theory does not make unjustifiable claims about precision, and deduces the Evans Eckardt radius from experimental Lamb shift data.