1)

83(1): Orthopositronium Problem

Positronium is an electron and positron bound together by an electrostatic force. In orthopositronium (TPs) the spins are parallel so the total spin is 1. It therefore quickly breaks apart into an odd number of photons with some total spin 1. The rate of decay of TPs is ten times greater than that predicted by QED, and QED has no explanation for this phenomenon.

The ECE explanation is built up firstly at the Schrödinger level, without considering spins and transmutation into photons. Then the solution is extended to the Dirac level, introducing half integral spins and emitted γ quanta (photons).

1) Schrödinger Level

The Schrödinger equation is defined for a positron interacting electrostatically with an electron with the Coulomb law of ECE theory. On this level spins and transmutation are not considered, except insofar as to use the Pauli exclusion principle. The mathematics are the same as those of the H atom, except that the proton is replaced by a positron. It is shown at spin conversion resonance (SCR) the system is broken apart by repulsion. The wave-function of positron plus electron is defined by the Pauli exclusion principle, so the two half integral spin particles cannot occupy the same state. They break apart rapidly.

2) Dirac Level and Transmutation

In order to fully describe an anti-particle the Dirac equation is needed, and in order to describe transmutation the photon wave-function is needed. So we must proceed as in chapter 21 of volume 1, using simultaneous ECE equations. The Hamiltonian must include a contribution from the ECE Coulomb law. This will provide a first explanation of the orthopositronium anomaly. This will be a qualitative explanation. In order to make it quantitative a modelling of the rate of decay must be introduced, using well known methods other than those of QED.

Notes

The positron and electron have equal mass, while the proton is 1760 times heavier than the electron. The proton is not an anti-particle, but the positron is an anti-particle. So care must be taken at the Schrödinger level because the Born-Oppenheimer approximation of proton-electron (Hydrogen) may not be valid for positron-electron. Strictly speaking, the Schrödinger equation cannot be applied to anti-particles, but well known methods in chemistry introduce half-integral spin for use with orbitals for the Schrödinger equation.