The Dirac one-electron atom in a multipole electric field: Application of the Sturmian expansion of the generalized Dirac-Coulomb Green function

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For many physical problems, the knowledge of the Dirac-Coulomb Green function is required. Among several well-known representations of that function, a particularly convenient one is that in the form of the Sturmian expansion constructed in [1]. It was already used to derive closed-form expressions for various electromagnetic properties of the relativistic hydrogen-like atoms in electric or magnetic dipole field [2-7].

Using the Sturmian expansion of the generalized Dirac-Coulomb Green function [1],
we derive a closed-form expression for multipole electric polarizabilities of the ground state of Dirac one-electron atom placed in a weak, static, multipole electric field. The formula contains a generalized hypergeometric series with the unit argument. We show that analogous formulas and numerical results in [8] contained mistakes.

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