Binding Energy of a Hydrogen Atom Interacting with Photon Field

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The talk is based on a joint work with J.M.Barbaroux, Th.Chen and V.Vougalter. We determine the exact expression for the hydrogen ground state energy in the Pauli-Fierz model up to the order $\mathcal{O}\left(\alpha^5 \log \alpha^{-1}\right)$, where α denotes the fine structure constant. As a consequence we prove that the ground state energy is not a real analytic function of α, and verify the existence of logarithmic corrections to the expansion of the ground state energy in powers of α.