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**Completeness of the Coulomb eigenfunctions** AKRAM MUKHAMEDZHANOV, Cyclotron Institute, Texas A&M Univeristy, MYLES AKIN[1], Cyclotron Institute, Texas A&M University and University of Georgia — Completeness of the eigenfunctions of the two-body Hamiltonian has been proved only for short-range interactions. In this work we present the first proof of completeness of solutions of the two-body Schrödinger equation with repulsive Coulomb potential for arbitrary orbital angular momentum. We use Newton's contour integral containing the Coulomb Green function [1]. The proof is based on the analyticity of the Coulomb regular and singular solutions in the complex momentum plane. The most difficult part is to investigate the behavior of the integral around k=0. The presented proof allows one to apply the Berggren's method [2] to include resonant states into the complete set of eigenfunctions for particles interacting via the sum of Coulomb and nuclear potentials. It makes legitimate the usage of the so-called Gamow Shell Model [3] for nuclei with valent protons. The inclusion of the resonant states into the complete set calls for an extension of the Hilbert space, in which the norm of the resonant states is determined. We demonstrate that the scalar products containing the resonant states for charged particles can be well defined using Zel'dovich regularization factor. [1] R. G. Newton, J. Math. Phys. 1, 319 (1960), [2] T. Berggren, Nucl. Phys. A109, 265 (1968) [3] N. Michel et al., Nucl. Phys. A752, 335c (2005).

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