Abstract Submitted
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Chaotic compound states in atomic processes: electron, photon and atom scattering, recombination, photoionization and radiation VICTOR FLAMBAUM, JULIAN BERENGUT, VLADIMIR DZUBA, Univ of New South Wales, GLEB GRIBAKIN, Queens University, CELAL HARABATI, Univ of New South Wales, MICHAEL KOZLOV, PINP — Level density of many-body states exponentially increases with the number of excited particles. When residual interaction exceeds the interval between these levels, the eigenstates (compound states) become chaotic superpositions of of thousands, or even millions of Slater determinant basis states.This situation takes place in highly excited nuclei, rare-earth and actinide atoms, open f-shell ions excited by the electron recombination and in ultracold collisions of open f-shell atoms. We derived formulas for the resonant multi-electron recombination via di-electron doorway states leading to the many-electron compound resonances and performed numerical calculations for the electron recombination with gold (Au+25) and tungsten ions (W+1724). A recent experiment showed that the electron recombination of tungsten ion W20+exceeds the direct recombination by three order of magnitude. Our calculations agree with the experimental results for Au+25 and W20+. Other manifestation of chaos are enhancement of weak interactions and Raman photon scattering, and suppression of the photoionization. Our publications: PRL 70, 4051 (1993); PRA 50, 267 (1994); 66, 012713 (2002); 86, 022714 (2012); 88,062713 (2013); 91, 052704 (2014); 92, 062717 (2015).

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