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Atomic Collapse and Quasi-Rydberg States in Graphene[1] ANDREY SHYTOV, Brookhaven National Laboratory, LEONID LEVITOV, MIT, MIKHAIL KATSNELSON, Radboud University of Nijmegen — We demonstrate that graphene opens a way to investigate in the laboratory a fundamental quantum relativistic phenomenon, that is, atomic collapse in a strong Coulomb electric field, long-sought for, but still inaccessible in high-energy experiments. We consider charged impurities in graphene and show that an impurity can host an infinite family of Rydberg-like resonance states of massless Dirac particles. Strong coupling of these states to the Dirac continuum via Klein tunneling leads to striking resonance effects with direct signatures in transport and local properties.

[1]preprint Arxiv.org:0708.0837

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