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Experimental observation of strong radiation reaction in the field of an ultra-intense laser G. SARRI, Queen's University Belfast, University Road, Belfast BT7 1NN, UK, K. PODER, Blackett Laboratory, Imperial College London, London SW72BZ, UK, M. TAMBURINI, A. DI PIAZZA, C. H. KEITEL, Max-Planck-Institut fur Kernphysik, Saupfercheckweg 1, D-69117 Heidelberg, Germany, M. ZEPF, Queen's University Belfast, University Road, Belfast BT7 1NN, UK — Describing radiation reaction in an electromagnetic field is one of the most fundamental outstanding problems in electrodynamics [1]. It consists of determining the dynamics of a charged particle fully taking into account self-forces (loosely referred to as radiation reaction) resulting from the radiation fields generated by the particle whilst it is accelerated. Radiation reaction has only been invoked to explain the radiative properties of powerful astrophysical objects, such as pulsars and quasars [2]. From a theoretical standpoint, this phenomenon is subject of fervent debate [1, 3] and this impasse is worsened by the lack of experimental data, due to extremely high fields required to trigger these effects. Here, we report on the first experimental evidence of strong radiation reaction during the interaction of an ultra-relativistic electron beam with an intense laser field, beyond a purely classical description.

[1] R. T. Hammond et al., Phys. Rev. A 81, 062104 (2010).
[2] R. Ruffini et al., Phys. Rep. 487, 1 (2010).
[3] A. Di Piazza et al., Rev. Mod. Phys. 84, 1177 (2012).

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