

Atom made from charged elementary black hole

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It is believed that there may have been a large number of black holes formed in the very early universe. These would have quantised masses. A charged “elementary black hole” (with the minimum possible mass) can capture electrons, protons and other charged particles to form a “black hole atom”. We have found the spectrum of such an object with a view to laboratory and astronomical observation of them, and have estimated the lifetime of the bound states. There is no limit to the charge of the black hole, which gives us the possibility of observing $Z > 137$ bound states and transitions at the lower continuum. Negatively charged black holes can capture protons. For $Z > 1$, the orbiting protons will coalesce to form a nucleus (after β -decay of some protons to neutrons), with a stability curve different to that of free nuclei. In this system there is also the distinct possibility of single quark capture. This leads to the formation of a coloured black hole that plays the role of an extremely heavy quark interacting strongly with the other two quarks. Finally we have considered atoms formed with much larger black holes.