Structure of superheavy ^7H

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While the foundations of our current knowledge in nuclear physics are based on the properties of stable isotopes, the new phenomena that appear as we move away from stability, in systems with unbalanced neutron–to–proton ratios, are key to improve the nuclear models and thus our understanding of nuclear matter. In this respect, the most extreme neutron–to–proton ratio is found in the ^7H resonance, the heaviest of the hydrogen isotopes and, so far, the last of the longest isotopic chain of nuclei outside the binding limits of the nuclear chart. The description of its basic properties, even its sheer existence, is still a challenge for current theoretical models and experimental efforts. Here we discuss the first measurement of the characteristics and structure of the ^7H ground state. These new and comprehensive experimental results, including the differential cross section, depict a low–lying, almost bound resonance with a relatively long half–life. The measured properties are consistent with a ^3H core surrounded by an extended dineutron condensate that decays through a unique four–neutron emission, showing the cohesive effect of neutron pairing within an almost–pure neutron environment. These properties are unique inputs and a stringent test for models dealing with extreme nuclear scenarios such as neutron condensates, the possible existence of a tetra–neutron system or the conditions of nuclear matter in the crust of neutron stars."