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Properties of the Neutron

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In this lecture we present a brief description of properties of the neutron. The first part of the lecture describes its internal properties: life time, mass, charge, magnetic and electric dipole moments... Particular attention will be paid to two most important characteristics of the neutron – its life time and electric dipole moment – both of them are now studied in a few different experiments. Moreover, the measurement of the neutron life time is a subject to discussion within the scientific community because the last result published very recently is in contradiction with previous results. The second part of the lecture illustrates how this “elementary” particle can be used as a tool to study different quantum systems and different interactions. The neutron is one of rare elementary particles which is successfully used in studies of all types of known interactions (strong, electromagnetic, weak, and gravitational) as well as even in searches for new unknown interactions and “new physics”. As an illustration, we consider an example of “neutron whispering gallery” [1] – an unexpected phenomenon discovered recently and which has common origins with rainbow phenomenon well known in usual optics.

- [1] V.V. Nesvizhevsky, A.Yu. Voronin, R. Cubitt, K.V. Protasov, “Neutron whispering gallery”. *Nature Physics*. 6 (2010) 114