NEUTRINOLESS DOUBLE ELECTRON CAPTURE STIMULATED BY X-RAYS

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The possibility of exposure of electromagnetic radiation on the nuclear processes is considered on an example of a neutrinoless double-electron capture - 0ν2ec. Expected lifetimes of the 0ν2e capture are several orders of magnitude longer than those of the 0ν2beta-decay that strongly retards development of experiments, requiring many tons of the bulk target matter. Hence, any way of acceleration of the 0ν2ec would be of great interest. For cases of X-ray free electron lasers – X-ray FEL and/or inverse Compton X-ray sources it is shown that such a decay can be significantly enhanced due to tuning the system to the resonant conditions through an absorption and/or emission of a photon with the decay resonance defect energy Δ. In this case the 0v2ec decay rate Γ2eX of nuclide Z grows linearly with field intensity - S/Sz - up to the X-ray flux power Sm Z6, while Sz Z6 $(\Gamma/\Delta)2$ with decay width Γ of a daughter atom. For a case of ^{78}Kr $\rightarrow$ ^{78}Se - 0ν2ecL1L1 capture we find Sz $\sim$ 108.5 W cm-2 and Sm $\sim$ 1017.5 W cm^{-2} which indicate a possibility of increasing decay rate to ten orders of magnitude or even larger.