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Search for periodic varioations of nucleus weak decay parameters

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Possible temporal variations of nucleus decay parameters studied extensively in the last years, their observation can be the signal of unknown physical effects. Earlier, several experiments reported the annual and daily decay rate oscillations in alpha and beta-decays of some nuclides of the order .05 % [1,2]. Also, correlation of Mn-54 weak decay rate with Sun activity, in particular, with solar flares was reported, which can have important practical applications [1]. BSTU - PhIAN collaboration studies the decay rate variations in inverse beta-decay (e-capture) of Fe-55 isotope in Moscow lab.. In this process K-shell electron absorbed by nuclei and electron neutrino emitted; it accompanied by X-ray with energy 5,9 or 6,4 KeV which in our set-up detected by cooled Si-Pin detectors. Measurements of decay rate performed in 2016 -2019 , demonstrate that together with observed Fe-55 decay exponent with life-time 1004 days, annual oscillation component value is present at the level (.11 +/- .02)%. Another period 29.5 +/- 1.5 days corresponding to moon month is found with amplitude (.22 +/- .04)% . Possible influence of electromagnetic Sun activity was studied during 2017 – 2019 for Fe-55 decay rate, simultaneously with Co-60, Cs-137 beta-decay rate measured by germanium detector in Novosibirsk INF at the distance 2800 km from Moscow. The deviations of similar form and size from exponential decay low at the average level (.55 +/-.004)% were detected in both experiments during October-December 2018 . Supposedly they can be related to the Sun transition to solar activity minimum started in the beginning of 2019.

1. E. Fischbach et al. , Rev. Space Sci. 145, 285 (2009); Astrop. Phys. 59,47 (2014)

2. E. Alekseev et al. , Phys. Part. Nucl. 47, 1803 (2016); ibid. 49, 557 (2018)

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