Contribution ID: **66** Type: **Oral talk (15 min + 5 min questions)**

Search of periodical and aperiodical variations of nucleus decay parameters

Thursday, 14 July 2022 18:10 (20 minutes)

Possible temporal variations of nucleus decay parameters were studied extensively in the last years, their observation can be the signal of unknown physical effects. Several experiments reported the annual and daily decay rate oscillations in alpha and beta-decays of some radioactive nuclides at the level of .05 % [1,2]. Also, correlation of Mn-54 e-capture decay rate with electromagnetic solar activity was reported [1]. BSTU - PhIAN collaboration studies decay rate variations in inverse beta-decay (e-capture) of Fe-55 isotope. 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 -2021 , demonstrate that together with observed Fe-55 decay exponent with life-time 1004 days, oscillation period 29.5 +/- 1.5 days corresponding to moon month is found with amplitude (.22 +/- .04)% ;
possible model of such decay rate deviations considered in [3,4].
Possible influence of electromagnetic solar activity was studied during 2015 – 2020 for Fe-55 decay rate, simultaneously with Co-60 beta-decay rate measured by germanium detector in Novosibirsk INF at the distance 2800 km from Moscow [5]. 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 solar activity minimum started in the beginning of 2019. In addition, six decay rate dips of the order 1 % of decay rate and with duration from 40 to 208 hours were found. It is shown that their occurrence correlate with x-ray solar flare events with significant reliability, existence of such correlation can have important practical applications [4]. SOLARIS project of our collaboration plans to perform simultaneous measurements of Fe-55, Co-60 decay parameters on International Space Station and Earth lab.
to study their correlations with X-ray solar activity.

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)

3. S. Mayburov Int. J. Theor. Phys. 60, 630 (2021)

4. S. Mayburov Phys. Part. Nucl. 51, 458 (2020)

5. S. Bogachev et al. J. Phys.: Conf. Series 1690, 012028-012035 (2020)

The speaker is a student or young scientist

No

Section

1. Neutrino physics and nuclear astrophysics

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