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16N - unique first-forbidden beta decay as a novel test for fundamental symmetries

As was shown in our previous work [1], the beta spectrum of unique first forbidden decays is sensitive to beta-neutrino correlation. As a test case, we decided to measure the decay of 16N, which has a spin parity of 2−. 28% of the time, it decays to the 0+ ground state of 16O with Q-value of 10.4 MeV. Other branches of the decay are pure GT decays to 1− and 3− with Q-values 3.3 and 4.1 MeV, respectively. Therefore, in order to measure only the forbidden branch the spectrum one should look for electron energies above 4.1 MeV. We are measuring the spectrum with a high purity germanium detector (HPGe). The detector was calibrated by 90Sr and 207Bi sources, and the estimated resolution was found to be roughly 50 keV. 16N is produced by 19F(n,a)16N reaction on a 100 micron thin Teflon target, which is irradiated by a 14 MeV d-t commercial neutron generator and transported between the generator and HPGe detector within 3 seconds by a uniquely designed pendulum device. The method, system and first results shall be presented.

[1] Glick-Magid, A., Mishnayot, Y., Mukul, I., Hass, M., Vaintraub, S., Ron, G., Gazit, D.: Beta spectrum of unique first-forbidden decays as a novel test for fundamental symmetries. Phys. Lett. B 767, 285–288 (2017)

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