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On the discovery of a new light particle in high energy nuclear transitions

Dark matter is currently one of the greatest unsolved mysteries in physics. Recently we have observed an anomaly in the internal e+e- decay of 8Be [1]. It turned out [2] that this could be a first hint for a 17 MeV X-boson (X17), which may connect our visible world with dark matter. The possible relation of the X17 to the dark matter problem as well as the fact that it might explain the (g-2)μ puzzle, triggered an enormous theoretical and experimental interest in the particle, hadron and atomic physics community. Zhang and Miller discussed in detail any possible explanations with nuclear physics origin without any success [3].

Using a significantly modified and improved experimental setup, recently we reinvestigated the anomaly observed in the e+e- angular correlation by using the new tandetron accelerator of our institute. This setup has different efficiency curve as a function of the correlation angle, and different sensitivity to cosmic rays resulting practically independent experimental results. In this experiment, the previous data were reproduced within the error bars. The 8Be anomaly was a strong motivation for further experiments to study possible signals of a new force interacting with nuclei and electrons.

I am going to discuss the preliminary results of a few follow-up experiments. We obtained new results for high energy transitions in 4He and 12C, which also supports the existence of the X17 particle. The γγ-decay of X17 boson was also studied in order to distinguish between the vector and pseudo scalar scenario suggested recently by theoretical group [4,5]. According to the Landau-Yang theorem, the decay of a vector boson is forbidden by double γ-emission, however a pseudoscalar one is allowed. The possibilities of further nuclear physics studies of the X-boson in small laboratories will also be discussed.

REFERENCES
[1] A.J. Krasznahorkay et al., Phys. Rev. Lett. 116 042501 (2016)
[2] J. Feng et al., Phys. Rev. Lett. 1 17, 071803 (2016)
[3] Xilin Zhang and Gerald A. Miller, Phys. Lett. B773 159 (2017)
[4] Ellwanger and Moretti, JHEP 11 039 (2016)
[5] J. Kozaczuk, et al, Phys. Rev. D 95, 115024 (2017)

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