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INSTYTUT FIZYKI

Środowe seminarium w Instytucie Fizyki

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“New results supporting the existence of the X17 particle”

Recently, a peak-like enhancement relative to the internal pair creation was observed at 140° in the angular correlation of the e^+e^- pairs created in the 18.15 MeV ground state transition of ^8Be [1]. It turned out that this could be a first hint for a new $m_X c^2 = 17$ MeV boson, called X17 in the literature.

The data are explained by Feng et al. [2] with a 16.7 MeV, $J^\pi = 1^-$ vector gauge boson, which may mediate the fifth force with some coupling to SM particles. Ellwanger and Moretti made another possible explanation of the experimental results through a light pseudo scalar, $J^\pi = 0^-$ particle [3], while Kozaczuk et al., [4] explained it as an axial vector, $J^\pi = 1^+$ boson. There are also many more possible explanations in the literature.

Using a significantly modified and improved detector setup, we reinvestigated the anomaly observed in the e^+e^- angular correlation by using a new Tandetron accelerator of our institute and the previous data were reproduced within the error bars.

To confirm the existence of the X17 boson, we studied also the $^3\text{H}(p,\gamma)^4\text{He}$ reaction. The Q value of the reaction is very large ($Q=20.6$ MeV) and the resonant proton capture populates the wide 0^+ first excited state and the 0^- second excited state. We observed e^+e^- pairs with a smooth angular correlation,

but on top of that a peak at $\Theta \approx 115^\circ$ is clearly visible with larger than 7σ confidence, which can be described by assuming the creation and decay of the same X17 boson [5].

[1] A.J. Krasznahorkay et al., Phys. Rev. Lett. 116, 042501 (2016)

[2] J. Feng et al., Phys. Rev. Lett. 117, 071803 (2016)

[3] Ulrich Ellwanger and Stefano Moretti, JHEP 11, 039 (2016)

[4] Jonathan Kozaczuk, David E. Morrissey, and S. R. Stroberg, Phys. Rev. D 95, 115024 (2017)

[5] D.S. Firak et al., EPJ Web of Conferences 232, 04005 (2020); and references therein.