

Observation of Ultra-Slow Antiprotons with Micro-Channel Plate

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Our group ASACUSA-MUSASHI has succeeded in accumulating several million antiprotons and extracting them as monochromatic ultra-slow antiproton beams (10 eV-1 keV) at CERN AD [1]. Recently, we have performed atomic collision experiments [2] and have obtained some preliminary results to be presented in another talk of this workshop [3]. In these experiments, we have observed some unexpected background signals decaying on the various time constants triggered by the antiproton annihilations using micro-channel plates (MCP). The integrated pulse area of the output signals generated when the MCP was irradiated by ultra-slow antiprotons was 6 times higher than that by electrons. As a long-term effect, we also observed an increase in the background rate presumably due to the radioactivation of the MCP surface. We focus in the present study on these unexpected events accompanying ultra-slow antiprotons detection. One of the distinct features of the new monochromatic ultra-slow antiproton beam is extremely short range of the antiprotons in matter. Irradiating the antiproton beams on the MCP induces antiproton-nuclear annihilations only on the first layer of the surface. Low-energy and short-range secondary particles like charged nuclear fragments caused by the “surface nuclear reactions” would be the origin of our observed phenomena. In the talk, the observation of ultra-slow antiprotons in recent experiments from the viewpoint of the “surface nuclear reactions” will be discussed.

References

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