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Bremming Enhanced ALP Productions and FPF Sensisivity

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The searches of axion-like particles (ALP) are strongly motivated by the general dark sector, strong CP problem and axiom quality problem etc. We focus on the gluonic coupling to ALP which is relevant to the strong CP puzzle and is of great importance. We propose the axion as the bremsstrahlung radiation off the proton in the typical proton-proton collision which has not been incorporated in the previous studies. The splitting function is calculated for the axion emitted off the proton and then convoluted with the proton-proton non-single diffractive cross section. Due to the large scattering cross section of the proton-proton collision we may observe the axion decay signals in the FPF detectors. The inclusion of the bremsstrahlung production process significantly extends the FPF coverage for ALP in a broadclass of models.

Authors: LYU, Kunfeng (University of Minnesota); LIU, Zhen

Presenter: LYU, Kunfeng (University of Minnesota)

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