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# Enhanced photon coupling of ALP dark matter adiabatically converted from the QCD axion

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We revisit the adiabatic conversion between the QCD axion and axion-like particle (ALP) at level crossing, which can occur in the early universe as a result of the existence of a hypothetical mass mixing. This is similar to the Mikheyev-Smirnov-Wolfenstein effect in neutrino oscillations. After refining the conditions for the adiabatic conversion to occur, we focus on a scenario where the ALP produced by the adiabatic conversion of the QCD axion explains the observed dark matter abundance. Interestingly, we find that the ALP decay constant can be much smaller than the ordinary case in which the ALP is produced by the realignment mechanism. As a consequence, the ALP-photon coupling is enhanced by a few orders of magnitude, which is advantageous for the future ALP and axion-search experiments using the ALP-photon coupling.

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