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Probing dark photons with plasma haloscopes[1] ALEXANDER MILLAR[2], Stockholm University , GRACIELA GELMINI, VOLODYMYR TAKHISTOV, EDOARDO VITAGLIANO, UCLA — Dark photons (DPs) produced in the early Universe are well-motivated dark matter (DM) candidates. We show that the recently proposed tunable plasma haloscopes are particularly advantageous for DP searches. While in-medium effects suppress the DP signal in conventional searches, plasma haloscopes make use of metamaterials that enable resonant absorption of the DP by matching its mass to a tunable plasma frequency and thus enable efficient plasmon production. Using thermal field theory, we confirm the in-medium DP absorption rate within the detector. This scheme allows us to competitively explore a significant part of the DP DM parameter space in the DP mass range of $6 - 400$ μeV. If a signal is observed, the observation of a daily or annual modulation of the signal would be crucial to clearly identify the signal as due to DP DM and could shed light on the production mechanism.

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