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Search for dark photons around 34.4 μeV using direct excitations of superconducting qubits

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We present the results of the search for dark photons using superconducting qubits based on the method which has been recently proposed (Moroi+, Phys. Rev. Lett.'23). Wave-like dark matter such as axions and dark photons can induce an electric field via the small kinetic mixing with ordinary photons. This electric field excites a superconducting qubit when it is in resonance. Thus, a particular qubit frequency corresponding to the dark matter mass exhibits a sharp peak in the excitation rate when the frequency is swept. In this talk, we will show the result of the search for the dark photon around at 8.33GHz corresponding to the unexplored mass around 34.4 μeV, using a superconducting qubit fabricated in our group. This result opens the path towards a wide band search or axion search under a strong magnetic field performed in the near future.

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