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Effects of Dark Matter in atomic and nuclear phenomena

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We investigate effects of axion (pseudoscalar), dilaton (scalar), dark photon (vector) and dark Z (pseudovector) which may be observed in atomic, molecular and solid state experiments.

Interaction with dark matter may lead to the variation of the size of the solid state resonators which may be observed using laser interferometry and resonance frequencies measurements [1].

Dark matter may affect Big Bang Nucleosynthesis and explain the Li abundance puzzle [2].

We investigated possibilities to detect linear effects in the axion interaction constants using interference between axion and photon atomic capture amplitudes and coherent axion-photon transformations in the forward scattering on atoms [3-5]. Similar effects have been calculated for the dark photon and photon.

Possible effect of finite photon mass due to magnetic interaction in plazma on galaxy rotation curve have been studied [6]. Slowly varying vector potential A of a low-mass photon field provides negative pressure P=-E/3 in the electromagnetic stress tensor (E is the magnetic field energy density), imitates gravitational pull and may contribute to the observed distribution of the rotational velocities in the Galaxy. Similar effects have been considered for other cosmic phenomena.

We have calculated [7] and measured [8] parity violating effects of low-mass Z'boson (dark boson) and effects of exchange by axion and other hypothetical particles in atoms, molecules and solids [9-17].

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