Contribution ID: **103** Type: **Invited talk in the parallel session**

Variation of the fundamental constants, violation of the fundamental symmetries and dark matter

Tuesday 6 July 2021 09:30 (30 minutes)

Interaction between the standard model matter and low mass scalar dark matter field may be presented as variation of the fundamental constant while interaction with an axion-like field leads to oscillating effects of violation of the fundamental symmetries including electric dipole moments. New interactions mediated by hypothetical particles produce effects, which may be observed in atomic experiments. Our aim is to find enhanced effects, perform their calculations, motivate new experiments and provide interpretation of their results.

Another direction is accurate relativistic atomic many-body calculations of the effects of dark matter produced in underground laboratories. Our recent calculation of the ionization of atoms by absorption of scalar particles gives cross section, which is several orders of magnitude smaller than that calculated by other authors. The reason is that the traditional plain wave approximation for outgoing electron violates orthogonality condition with bound electron wave function which plays crucial role in the zero multipolarity transtions. Such plain wave non-relativistic approximation also gives wrong result (strongly underestimate cross section) for electron ionization by WIMP scattering.

Finally, we consider quark nugget model of dark matter and observable effects of quark nuggets.

New results of our group on these topics published recently in PRL, PRD, PRA, JHEP and arxiv papers will be presented.

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