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Required laser system toward laboratory search for low-mass Dark Matter and Dark Energy candidates

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Probing the nature of the quantum vacuum is indispensable to resolve the crucial problems in contemporary physics; dark matter and dark energy in the universe. Probing the vacuum to date has been limited to either the macroscopic space-time via astronomical observations or microscopic space-time points at high-energy particle collisions. With high-intensity lasers, however, we anticipate to be able to unveil the different aspects of the quantum vacuum at different space-time scales based on analogous observables in quantum optics [1-4]. We present the new approach to realize the laboratory search for low-mass and weakly coupling particles which can be light Dark Matter / Dark Energy candidates by detecting four-wave mixing of two-color laser fields in the vacuum. This can be interpreted as a kind of quasi-parallel photon-photon collider[5]. We emphasize the advantage to utilize high-rep rate and high-intensity laser systems such as ICAN.

References

- [1] "Probing vacuum birefringence by phase-contrast Fourier imaging under fields of high-intensity lasers" by K. Homma, D. Habs, and T. Tajima
Applied Physics B 104 (2011) 769–782 (DOI: 10.1007/s00340-011-4568-2),
arXiv:1104.0994[hep-ph].
- [2] "Probing the semi-macroscopic vacuum by higher-harmonic generation under focused intense laser fields" by K. Homma, D. Habs, and T. Tajima
Applied Physics B 106 (2012) 229–240 (DOI: 10.1007/s00340-011-4567-3),
arXiv:1103.1748 [hep-ph].
- [3] "An approach toward the laboratory search for the scalar field as a candidate of Dark Energy" by Y. Fujii and K. Homma,
Prog. Theor. Phys. 126 (2011) 531–553,
arXiv:1006.1762 [gr-qc].
- [4] "FUNDAMENTAL PHYSICS EXPLORED WITH HIGH INTENSITY LASER",
by T. Tajima and K. Homma, International Journal of Modern Physics A, Vol. 27, No. 25 (2012) 1230027,
arXiv:1209.2822[hep-ph].
- [5] "Sensitivity to dark energy candidates by searching for four-wave mixing of high-intensity lasers in the vacuum" by K. Homma, Prog. Theor. Exp. Phys. (2012) 04D004.

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