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Novel challenge to understand off-shell dressed photons: An initiative taken at newly established institute RODREP

As the outcomes of our intensive research efforts, multitudes of remarkable accomplishments have been made in the field of nanophotonics. We can say, however, that almost all of such researches have a feature of application in the sense that we no longer inquire a fundamental question of what is light during the course of such researches, but we just use or apply to our problem conventional knowledge on electromagnetism (either classical or quantum mechanical) which seems to be firmly established in such a degree that there is no room to improve it. But, is it actually true that the conventional electromagnetic (EM) theory is versatile in doing application researches? The main issue we address here is on the above question from the viewpoint of our ongoing cutting-edge research of off-shell dressed photon (DP) to be explained in my talk. My answer to this basic question is negative, because we now know that experimentally-verified DP serves as a concrete example of an EM phenomenon which defies the interpretation based on the conventional theory. I think that the significance of issue on DP is two-fold: the one is on application studies in which several innovative accomplishments, including the latest high-power silicon laser, have become available now, which is expected to open up an important new realm of nanophotonics, and the other is on its conceptual impact upon the applicability range of off-shell phenomena. So far, we think that off-shell phenomena free from Einstein causality become important only in a sub-atomic quantum world. But a closer inspection derived from a general result of mathematical formulation of quantum field shows that off-shell phenomena are ubiquitous for quantum field interactions at large and they are not restricted to sub-atomic scales.

Speaker Biography

Mr. Hirofumi Sakuma is currently working at the Center for Better Living (CBL), Japan. His research interests are Nanophotonics, conventional theory, quantum world etc.

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