Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Self force and radiation reaction from a uniformly accelerated charge TEYOUN KANG, MIN SUP HUR[1], Ulsan National Institute of Science and Technology — In 1938, Dirac had derived an equation of motion for charged particles, which is called 'Lorentz-Abraham-Dirac (LAD) equation.' However, due to its causality violation, the classical electrodynamics (CED) is still insufficient to explain the exact 'dynamics' of point charges which must be the basic elements of the CED system. Especially, the hyperbolic (or uniformly accelerated) motions of charged particles have not been successfully described by LAD or its modification such as Landau-Lifshitz equation, because their radiation reaction terms vanish, apparently violating the energy conservation. Recently, this old problem is getting interest owing to the emergence of ultra-intense laser facilities, which can generate laser pulses with 10^{24} W/cm^2 intensity. In such a strong field regime, the radiation reaction from the particles is expected to be observed. Hence, an uncontradictory theory model to explain the exact motions of point charges is now required. In this talk, we present a unique charge distribution that we named 'point-like conductor (PLC),' which vanishes its electromagnetic field inside, but generates the same field outside as that from a uniformly accelerated point charge. We show that the self-force exerting on the PLC leads to the radiation reaction.

[1]Corresponding author.

Teyoun Kang
Ulsan National Institute of Science and Technology

Date submitted: 02 Jul 2019 Electronic form version 1.4