Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

A similarity relation of the coupled equations for RF waves in a tokamak[1] JUNGPYO LEE, MIT Plasma Science and Fusion Center, DAVID SMITHE, Tech-X, ERWIN JAEGER, LEE BERRY, XCEL Engineering, R. W. HARVEY, CompX, PAUL BONOLI, MIT Plasma Science and Fusion Center —
The propagation and damping of RF waves in plasmas are modeled kinetically by solving the coupled equations between Maxwell's equation and Fokker-Planck equation. When the plasmas are magnetized, the wave dielectric tensor strongly depends on the background magnetic field, which can be calculated using Grad-Shafranov equation in a toroidally symmetric geometry. We found a similarity in the solutions of the coupled equations above, which keep the several dimensionless parameters constant. By changing plasma density and pressure, machine geometry (major radius), and RF wave frequency and power according to the similarity rule, there exists a set of solutions that show the consistent change in the background magnetic fields in the Grad-Shafranov equation, the electric and magnetic fields in the Maxwell's equation, and the distribution function of the Fokker-Planck equation. By investigating the numerical errors of the solutions from the expected results by the similarity rule, we verify the coupled numerical code for the RF waves in a tokamak (e.g. TORIC or AORSA/CQL3D/ECOM).

[1]This work was supported by US DoE Contract No. DE-FC02-01ER54648 under a Scientific Discovery through Advanced Computing Initiative.

Jungpyo Lee
MIT Plasma Science and Fusion Center

Date submitted: 17 Jul 2017 Electronic form version 1.4