Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Effects of electron-heavy particle relaxation time on the initiation of laser-induced breakdown IPPEI YOKOTA, KOHEI SHIMAMURA, SHIGERU YOKOTA, Univ of Tsukuba — Laser induced discharge phenomena has been studied in various fields such as space propulsion, drag reduction of supersonic aircraft and combustion ignition. The objective of this study is to investigate the state of the immediately after laser plasma generated, and the detailed breakdown process. In atmospheric discharge of laser, free electrons absorb energy from laser by inverse Bremsstrahlung. Inelastic collisions between heavy particles and free electrons occur, and the energy is transferred from free electrons to heavy particles. The energy transfer from free electrons to heavy particles is important in considering the nonequilibrium state of initial laser breakdown process. We investigated the difference of using different species of gas such as Argon, Helium, Nitrogen, Oxygen, Air and Carbon dioxide, in the atmospheric pressure. In these conditions, 1 J TEA CO_2 laser was irradiated in the chamber with an Eschelle spectrometer. The duration time between non local thermodynamic equilibrium (LTE) state to LTE state was quantitatively obtained in the different gaseous form. The ratio between the LTE transition time and the relaxation time is approximately 0.5 to 0.810^3 in the various gaseous media. This result suggests that the time to local thermal equilibrium is simply explained by the relaxation time between electrons and heavy particles.

Ippei Yokota
Univ of Tsukuba

Date submitted: 19 Jun 2018 Electronic form version 1.4