Abstract

Laser-Induced Plasma Radiation with gigahertz frequency could be used as an input energy source for a photocathode RF gun to replace the conventional input process. The resonant frequency of our target photocathode RF gun is 2.856GHz which means, a plasma radiation with a frequency of 2.856GHz has to be used in order to achieve the resonance condition.

Radiation frequency within the range of 2.3-2.6GHz had been successfully detected with a 1064 nm fundamental wave at pulse duration of 460 picoseconds, and a second harmonic wave (wavelength = 532mn) is generated from the fundamental wave with a LBO at a shorter pulse duration of 330 picoseconds. It is expected that, with a shorter pulse width, higher frequency radiation (hopefully can be near 2.856GHz) in the S-band region could be achieved.

Due to detection limitation of our ring-antenna, we cannot actually measure such a high frequency of plasma radiation created by a second harmonic wave. But if what we predicted is true, by replicating our current experiment with an enhanced ring-antenna, a kilowatt or even megawatt radiation power with an S-band frequency may be able to achieve and could possibly be recognized as a perfect substitution for the tradition powering method of a photocathode RF gun