Summary of D3 Session, High Intensity Laser Plasma Science

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The technology of laser is still in progress phase after the invention of laser in 1960. There are two directions for intense laser produced plasma science. One is to use the intensity range of $10^{13-15}$ W/cm$^2$ with large energy like more than several kJoule. In this range of intensity, thermal plasma with its temperature of a few keV and density of $10^{21-22}$ cm$^{-3}$ is produced to generate tens of Mbar pressure and ablation velocity of $10^8$ cm/s. These extreme parameters are used to study EOS, dynamical phase transition such as new condensed matter physics as well as flow driven plasma phenomena such as two-stream type instability mediated nonlinear plasma physics. In combination with implosion by many beams, we can generate extreme photon source, the condition of fusion ignition and so on. All of these topics are presented in D3 sessions.

On the other hand, the intensity range of $10^{22-24}$ W/cm$^2$ will make us possible to study many challenging physics, so-called Non-linear QED plasma physics. It is vacuum polarization, pair plasma production, and finally vacuum breakdown. We must not stop studying advanced textbook on quantum electro-dynamics, quantum field theory, and particle physics, because the progress of technology never wait for us to slowly catch up the physics which becomes possible with rapid progress of technology. Mainly new computational physics is required to clarify the future scenario of such exotic and new-generation laser plasma physics. The quantitative computation for the vacuum breakdown will give strong motivation to laser technicians and experimentalists to go forward to more charming science direction.