

# High energy density sciences activities with high power lasers in Asia

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Recently, we see several new activities in high energy density science in Asian countries. A new free-electron x-ray laser has been started in Korea[1]. It is the third XFEL in the world. In Asia there are now two facilities and another is under construction in China[2]. The new science of high-intensity, ultra-short-pulse hard x-ray lasers (XFEL) will now make rapid progress. Especially, new research results on quantum optics[3] with hard x-rays are being achieved in the SACLA XFEL facility[4] in Harima, Japan.

To check the possibility of the fast ignition scheme for inertial confinement fusion, intense investigation is underway in the ILE in Osaka University. ILE is also using super high magnetic fields[5] to control high-energy electrons. That scientific activity has expanded to a broader area of high magnetic fields. Research on laser acceleration of particle beams is still active in Asian countries.[6] This research is not only competition for the highest acceleration energy, but also for stability of electron beams suitable for actual application of the e-beams. There are also several programs to construct ultra-high power lasers aimed at strong-field QED experiments.

Transient plasma devices have successfully been used for high power laser systems, and very high contrast ultra-short pulse lasers are obtained in many laboratories. Use of the transient optics in high power laser system will be extended to other functions such as dispersion control and phase correction of the lasers.[7] For applications of big laser systems, laboratory astrophysics and high pressure material sciences are active around the world. The largest laser systems are needed to simulate astrophysical phenomena with scaled-down parameters in the laboratory and to achieve the slow compression needed to determine the equation of state with high accuracy.[8] However for checking new ideas or to seek parameters for the phase transitions in new materials, multi-shot experiments in medium-size laser systems are now becoming important.

High energy science with high power lasers covers a very broad scientific area and we can expect real industrial activities to apply quantum beams generated by the lasers.

## References

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