Greetings from the Chair

T. Tajima(May 2, 2012)

I am thrilled to report to you this year that the high intensity laser (HIL) laboratories are rapidly ever expanding with increasing membership around the world with many reaching the threshold intensity of 10^{19}W/cm^2. Numerous facilities have entered our ICUIL Worldlab Map from Asia, America, and Europe. Not only this, many labs are increasing their peak intensity by a large factor beyond this threshold. APRI of Korea is surpassed the PW mark while SIOM of China is now looking at the 10PW regime. Lawrence Berkeley Laboratory just received a new PW laser for laser wakefield acceleration. The University of Munich (LMU) ATLAS laser has recently entered a new building (for CALA) to accommodate ajump into 3PW power. And much much more… In order to fully recalibrate this rapidly expandingHIL community, we need to collect up-to-date data of its vibrant state-of-HIL at the upcoming ICUIL Conference 2012 at Constanza, Romania (Sept. 17-21, 2012), as we traditionally update our statusat this biennial event.

This year marks the beginning of the Delivery Consortium of Extreme Light Infrastructure (ELI), the largest ultrahigh intensity project of the world (www.extreme-light-infrastructure.eu/). This project is an inspiration to the world and ICUIL in the sense that it boldly goes into the uncharted waters beyond 10PW and the science of the highest intensity frontier such as in accelerator beams, attosecond science, and nuclear photonics, all driven by ultrahigh intensity lasers. Even though ELI has three base camps (in Prague, Szeged, and Bucharest), the fundamental ultrahigh intensity science concept of ELI unites the three tightly and we are pleased that ICUIL is poised to help insure this integration. It goes without saying that ELI is the first large-scale infrastructure pan-European scientific project that has its infrastructure all located in East Europe since the fall of the Iron Curtain. The world is expectant of its extraordinary historic unification spirit that could soothe the rifts of centuries. For example, ELI-Nuclear Pillar (Bucharest) will lead the utilization of laser-driven high-energy gamma beams for investigating nuclear physics and engineering. It so happens that such an approach is extremely helpful to assist the disastrous nuclear calamity of Fukushima. Such an energy-specific directed gamma beam can detect specific isotopes of the molten core of Fukushima reactors through the nuclear resonant fluorescence without ever touching the radioactive material. It is encouraging that our Japanese colleagues at JAEA are spear-heading such a project in assisting the process of putting the molten core into isolation. ICUIL encourages and supports this endeavor.

We have witnessed ever closer convergence between the communities of ICUIL and ICFA (International Committee for Future Accelerators) initiated in late 2008 between the Chairs of ICUIL and ICFA. Over the last year this has culminated into the formation of a document that describes the recommended future course of actions of ICUIL and ICFA communities to address the challenges that the laser acceleration project will face.This document has been complied by the Joint task Force (JTF) of ICUIL-ICFA, collecting the works throughits two workshops, and was published in the ICFA Newsletter**#56**(2011). It pointed out that the laser driven acceleration approach is paving a way to help a variety of high-energy accelerator physics issues such as the future high-energy collider, ion beam sources, electron beam source for FEL, and compact ion beam cancer therapy application. It concluded that the scientific case for the laser based accelerator physics is compelling and proven, and yet the community needs to come to grip with the technological requirements. One of the most urgent and glaring needs for development, it states, is to realize the efficient high-average power laser technology.

In order to meet these recommendations and challenges, a project called ICAN (International Coherent Amplification Network) between the laser and accelerator communities was launched last year and is now funded by the European Community (EC). This network has identified the fiber laser as the primary candidate for achieving highly efficient, high-average power lasers in the future.Meanwhile, EC has launched a new initiative centered at CERN by formingEuroNNAc (European Network for Novel Accelerators) encompassing a few dozen accelerator and laser institutions worldwide. It had its first inaugurating workshop last year and recently held its second workshop in May 2012.

Since 2011 a new noteworthy movement has been launched to harness world's largest energy lasers for the purpose ofhighest intensities. At NIF the systematic and coordinated experimental campaign toward laser fusion ignition is under way and perhaps in the next few years may mark an important milestone toward this goal. Meanwhile, we suggested (Tajima and Mourou, 2002) that if we wish to go far beyond PW into EW and ZW, we have to employ kJ and MJ lasers. This is now ongoing with the LMJ lasers such as PETAL under the organization of IZEST (International Center for Zetta- and Exawatt Science and Technology) to apply these lasers to ultrahigh intensities for fundamental science exploration. Shown is a snapshot of us at the first IZEST launching workshop in Nov. 2011.

How do we see the future of ultrahigh intensity lasers and ICUIL? There are many forward-looking cross currents in our community. We see ultrafast optics ranging from fs to now as and perhaps to zs. Discussed above, we also see large energy lasers join the high intensity frontier. I do not have a crystal ball to foretell the future. Instead, let me refer to the Pulse Duration-Intensity Conjecture Gerard Mourou and I stumbled into back in 2011: In order to make ever shorter radiation pulses, we must increase the intensity of the driving laser. This Conjecture promotes a confluence of ultrafast optics, large energy lasers, and ultrahigh intensity science.It was originally seen in all solid-state lasers,but we begin to see its reach even in free electron lasers. We also sense that the extension of the Conjecture may hold even for beams of charged particles, thus making the scientific confluence of lasers and accelerators even closer.