China Launches Applicable Deep UV Laser Devices

Eight deep ultraviolet (DUV) solid-state laser devices, invented by scientists from the Chinese Academy of Sciences, have recently passed testing, making China the only country in possession of such technology.

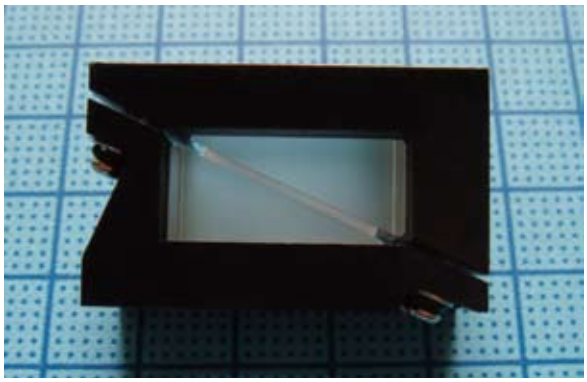
"This is a successful example of China independently developing a sophisticated scientific instrument", said the panel who acknowledged the achievement on September 6, 2013.

CAS President BAI Chunli said the success embodied the Academy's "dedication to major innovation and breakthrough in seeking development". The use of potassium beryllium fluoroborate (KBBF) once bottlenecked the project. KBBF is a non-linear optical crystal that can transform laser light from near IR into DUV for use in solid state lasers. Nonetheless, it is very difficult to cut KBBF crystal along the phase-matching angle because it has a strong layer habit along the c-axis.

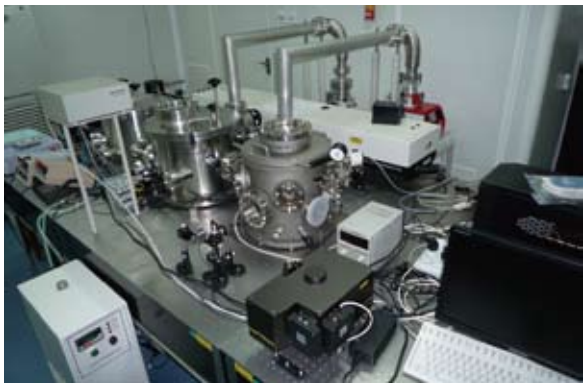
Prof. CHEN Chuangtian, a CAS member, joined hands with Prof. XU Zuyuan, a member of the Chinese Academy of Engineering, and turned to the Hong Kong University of Science and Technology for laser experiments.

"We were allowed to use their labs because Chinese mainland research institutes did not have similar laser conditions at that time", XU said, adding that they eventually, after many strenuous efforts, invented a KBBF prism coupling device.

The device marks the world's first-ever output of 1,064-nanometer's six-harmonic frequency multiplication, shortening the diode-pumped solid-state laser (DPL)'s wavelength to 177.3nm.



The potassium beryllium fluoroborate (KBBF) is a key material for DUV laser devices. (Photo courtesy Dr. LIU Lijuan)



The DUV laser photochemical reaction apparatus developed by the Technical Institute of Physics and Chemistry.

Scientists working on high-power solid-state lasers in an ultra clean laboratory.

Based on the achievement, the pair later managed to develop an applicable DUV-DPL.

A DUV wave refers to the light wave whose wavelength is shorter than 200nm and is coherent. Synchrotron radiation and gas discharge are among the main non-coherent light sources to produce DUV lasers. A KBBF prism coupling device-based DPL source features a smaller size, higher energy resolution and higher photon influx density compared with the synchrotron radiation and gas discharge. (Based on a report by Chen Boyuan, China.org.cn; photo courtesy of the Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)