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## Development of a high-gradient thermionic electron gun for a future X-ray free-electron laser

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The 500-kV pulsed DC thermionic electron gun with a single-crystal CeB<sub>6</sub> cathode is being used for the X-ray free-electron laser (XFEL) SACLA in Japan. In order to increase brightness of the gun beam for higher XFEL output, we are developing high-gradient accelerating electrodes to increase the surface and gap electric fields because they are indispensable to increase emission density of the electron beam and to avoid the space charge effect which can deteriorate the beam emittance. Recently, we have succeeded to achieve more than 40-MV/m surface field in a few micro-second pulse. The electrodes were made of ultra-pure titanium with hot-isostatic-pressure process and final surface treatment using chemical etching. Such high field have never been achieved in our gun by using clean-stainless steel and molybdenum. We will present the R&D status of the gun, especially experimental results of the high voltage performances.

**Please choose topic that matches most closely your research**

Applications

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**Session Classification:** Applications