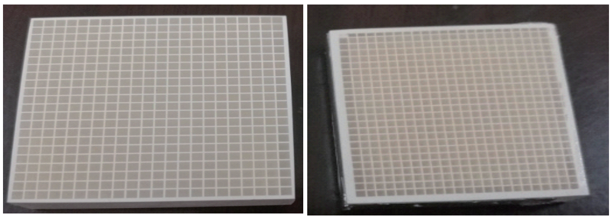

Fig. 1 The different size of the CsI(Tl) crystal array.

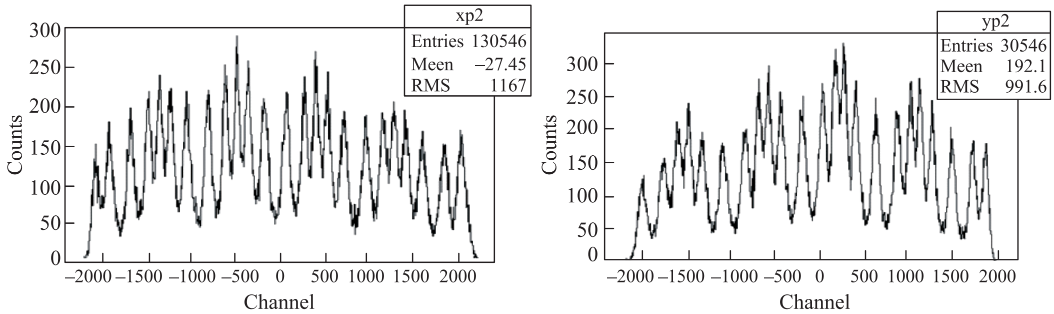

Fig. 2 One-dimensional position resolution spectrum on X and Y direction.

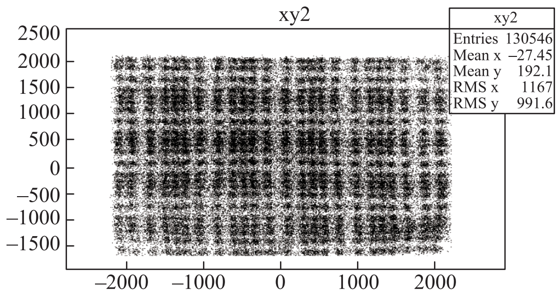

Fig. 3 The two-dimensional scatter spectrum of the CsI(Tl) crystal array.

References

[1] Renyuan Zhu, Nuclear Physics B(Proc.Suppl), 78(1999)203.

[2] B. Aubert, Nucl. Instr. and Meth.A, 479(2002)1.

[3] A. Abashian, K. Abe, P. K. Behera, et al., Nucl. Instr. and Meth. A, 479(2002)117.

5 - 8 Recent Progress of High Energy Electron Radiography Research Platform in Lanzhou

Cao Shuchun, Zhang Ziming, Xu Junkui, Liu Ming, Shen Xiaokang, Zong Yang, Zhu Yunliang, Zhou Youwei, Wang Yanru, Li Zhongping, Zhao Quantang, Xiao Rongqing, Jing Yi and Wei Gai

High Energy Electron Radiography (HEER) is a new method suitable for High Energy Density Physics (HEDP) research that uses a high energy electron beam as a probe for time resolved imaging measurements of high energy density processes in materials[1]. A High Energy Electron Radiography Research Platform (HEERRP) based on a 50 MeV Electron Linac (e-Lianc) which was designed for experimental research of HEER has been proposed by Electron Accelerator Group in IMP. This e-Linac has two injection beam lines, one is a thermionic RF gun with Alpha Magnet and Quadrupole magnets, and the other is a photo-cathode RF gun with emittance compensation Solenoid, see the Fig. 1, and parameters details see the Table 1. The experimental terminals of this e-linac have been designed for HEER and the Thick Target X-ray imaging.

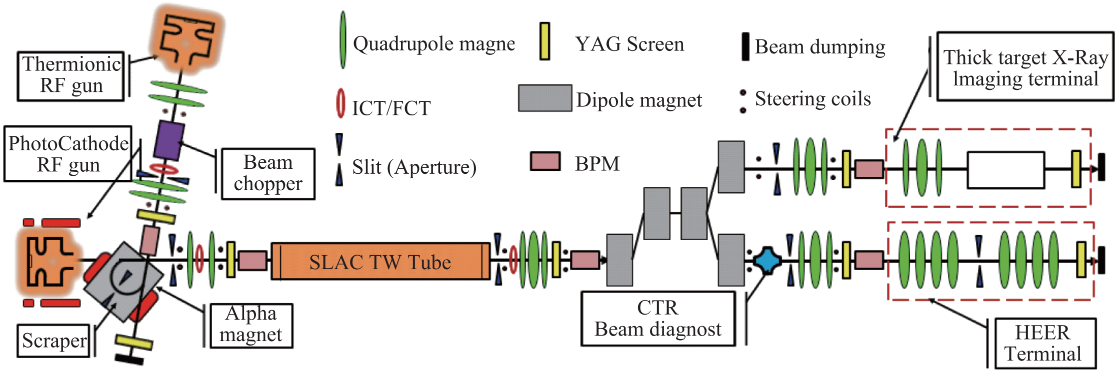

Fig. 1 (color online) Sketch of HEERRP based on a 50 MeV Electron Linac.

Table 1 Parameters of the 50 MeV Electron Linac.

Parameters	Beam energy /MeV	Single-bunch Charge /nC	Macro-bunch beam Current /mA	Repetition rate /Hz	Operating frequency/MHz	Average current/μA
Photo cathode	50	1	2	50	2 856	0.4
Thermionic cathode	50	0.1	300	50	2 856	0.12

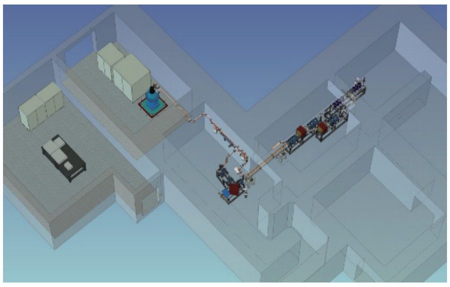

Fig. 2 (color online) Lab distribution of HEERRP.

The first stage of the e-Linac planned to utilize the thermionic RF gun injection and a SLAC type 3 meters Travel-Wave (TW) Accelerating Tube to accelerate the electron energy up to 50 MeV. The past year we had completed the physical design of the beam line and some critical components of the HEERRP[2]. This year the entire mechanical design of the beam line and the radiation protect bunker layout have been completed, see the Fig. 2. Now the Lab building modification for radiation protection is under construction. This beam line of HEERRP will be commissioning in the end of 2017.

References

[1] Shuchun Cao, Zimin Zhang, Xiaokang Shen, et al., IMP & HIRFL Annual Report, (2014)268.
[2] Shuchun Cao, Zimin Zhang, Xiaokang Shen, et al., IMP & HIRFL Annual Report, (2015)323.

5 - 9 Progress of High Energy Electron Radiography Experiment Designed by IMP&THU&ANL

Zhu Yunliang, Zhang Zimin, Yuan Ping, Cao Shuchun, Liu Ming, Xiao Jiahao, Zong Yang, Zhou Youwei, Zhao Quantang, Shen Xiaokang and Wang Yanru

In 2013, Institute of Modern Physics (IMP) proposed a new diagnostic method for high energy density state/thick target diagnostics[1]. The first verification experiment was done by IMP, Tsinghua University (THU) and Argonne National Laboratory (ANL), the spatial resolution reached 10 μm[2]. In 2016, a new beam line was designed by IMP&THU&ANL and some new results was obtained from the experiments.

Fig. 1 shows the layout of the newly designed[3] beam line. This beam line was based on photo-injector linear accelerator systems (LINAC) in THU. The LINAC provides 44 MeV electron beam with 10 ps pulse-width and the rms energy spread is about 0.3%[4].

When a TEM grid was put at the object plane, the image at the image plane is shown in Fig. 2. The spatial resolution in this experiment is about 6.5 μm.

$$\sigma\,(\mu\mathrm{m}) \cong 5.09\ \mathrm{pixel} \times \frac{90\ \mu\mathrm{m}}{(1185-1115)\ \mathrm{pixel}} = 6.5\ \mu\mathrm{m}$$

For logo target, the thickness of the target is 300 μm and depth is 100 μm. When the magnification is 1, a distinct image of the logo target could be gotten at the image plane. Fig. 3 shows the picture of the logo target and image at the plane.