Generation of quasi-monoenergetic high energy positrons based on laser wakefield accelerated electrons

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Great progress has been made on laser wakefield accelerators (LWFA) [1], more than 8 GeV electron beam from LWFA has been reported recently. Such energetic electron beam from LWFA is proposed to produce energetic positrons recently. A new scheme for generating energetic positron beam by irradiating LWFA (Laser wakefield Accelerator) electrons on solid targets is studied both theoretically and experimentally. In our simulations, the process is studied by PIC code PLASIM [2] and Monte-Carlo Code Fluka. Based on our simulations, corresponding experiments has been designed and conducted on the 200 TW laser facility in Shanghai Jiaotong University. For the first time in China to the best of our knowledge, energetic positrons produced by LWFA electrons have been observed in our experiments [3]. Simulation results are in good agreement with the experimental ones.

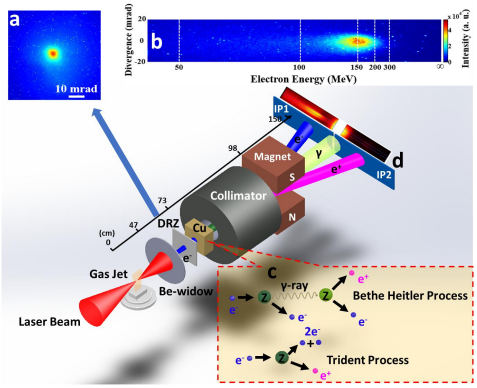

Figure 1 *Experimental setup for generation and detection of positron beams based on laser-plasma accelerated electron beams impinging on a Cu target. (a) Typical profile of the laser wakefield-accelerated electron beams. (b) Typical measured spectrum of electron beam without the Cu target. (c) Two physical mechanisms for positron generation. (d) Raw signal of positron and secondary electron, as recorded by the two IPs, by accumulating 120 laser shots*

References

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