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Multidimensional effects on relativistic electrons in an oblique shock wave MIEKO TOIDA, Nagoya University, KENTA SHIKII — Particle simulations have revealed [1] that prompt electron acceleration to ultrarelativistic energies can occur in a magnetosonic shock wave propagating obliquely to an external magnetic field with the propagation speed of the shock wave $v_{\rm sh}$ close to $c\cos\theta$, where θ is the propagation angle of the shock wave. In such a wave, some electrons are reflected near the end of the main pulse of the shock wave, get trapped and are energized in the main pulse region. Once electrons are trapped, they cannot readily escape from the wave because of the electromagnetic fields they themselves produce [2]. Although the extensive studies have examined electron trapping and acceleration by a shock wave, the theory and simulations were one-dimensional. In this study, we investigate multi-dimensional effects using two-dimensional (two spatial coordinates and three velocities), particle simulations. It is found that some electrons can be detrapped from the main pulse because of magnetic fluctuations propagating along the shock front. It is furthermore demonstrated that after detrapping, some electrons can be accelerated to much higher energies because they can enter and exit the shock wave several times as a result of their gyromotions. The generation of magnetic fluctuations due to whistler waves is also discussed.
[1] N. Bessho and Y. Ohsawa, Phys. Plasmas **6** 3076 (1999).
[2] M. Toida and K. Shikii, Phys. Plasmas **16** 112305 (2009).

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