

SPACE DEBRIS SYMPOSIUM (A6)
Hypervelocity Impacts and Protection (3)

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ELECTRICAL PHENOMENA CAUSED BY HYPERVELOCITY IMPACT

Abstract

Existence of space debris has been recognized as serious threat of human utilization of the space environment. We have been studying phenomena caused by hypervelocity impact focused on the electric aspect such as radiation of electro-magnetic waves, plasma generation and variation potential of the target in order to mitigate the damage and to detect the impact event and the size of the destruction by the space debris. We carried out the impact experiment using a two-stage light gas gun and simultaneous observations of the electromagnetic wave, impact plasma, light emission, and electrical potential variation of the target. Also, we recorded the impact phenomena using the high-speed video camera with a frame speed of 2 microseconds. We compared the impact phenomena in terms of the materials of the target and the projectile, thickness of the target, sizes of the projectile and impact energy, respectively. Several kinds of the metal plate and glass blocks were used as targets. The projectiles with a diameter of 7 mm and 3.2 mm were used. We used linear polarized antennas and heterodyne receivers in order to measure the electromagnetic wave with frequencies of 300 MHz, 2 GHz, 5.8 GHz, and 20 GHz. RF signals were observed after the impact. Duration time and bandwidth of the electromagnetic waves were analyzed. The impact plasma was measured by the double probe system. Also, we measured the electrical potential of the target. Detailed results and evaluation, correlation among electrical phenomena by the impact will be presented.