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## DISCHARGE ON PSEUDO SOLAR CELLS DUE TO HYPERVELOCITY IMPACT

**Abstract**

Satellites are facing a new risk related with the high velocity impact of space debris, those debris collisions represent an important risk because it can produce a considerable structural damage and the energy transferred from the impact is enough to melt and ionized the materials involved. The ionized gas represents a low resistance path and it can trigger an ESD, defined as the accumulation of charges particles and then the movement between the two bodies with different potential. On this research the discharge current waveform was measured, but also the plasma crated due to the impact was characterized using a triple Langmuir Probe. To reproduce the conditions of the HVI a pseudo solar cell was used, to accelerate the projectile up to 5km/s a two station light gas gun was selected, lastly an electric circuit was connected to the pseudo solar cell to simulate the operation conditions(simulate 192V). The triple probe tip design consists in a metal cylinder made of cooper and plastic insulator, and it has 1cm length and diameter.

When the impact occurs on the hot cell (192V positive terminal) it was called normal impact, on the other hand, when the projectile hits the gap between the hot cell and the cold cell it was called critical conditions. It was found that impact triggers an ESD and create plasma as a consequence of the melting and ionizing of the projectile and part of the target, however, a sustained arc was not found. The current during the discharge was 30 times bigger that the current flowing at the begging, this current rise can burn the solar cell and destroy the satellite. The results obtained from the impact on the hot cell and on the critical conditions differ in a considerable way, on the hot cell the plasma obtained has similar conditions to the one existing on the LEO orbits, however, for the critical condition the plasma temperature is around 10 times bigger, and density grows 10000. The impact on the hot cell generates a discharge that mostly involves the current flow from the hot cell to the substrate, the impact on the middle of the target produces a discharge on the three elements of the target with a bigger current flow from the hot cell to the cold cell.