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Development of Mercury Dust Monitor (MDM) Onboard BepiColombo Mission (II)

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A Mercury Dust Monitor (MDM) will be installed on the BepiColombo MMO space craft. The MDM is characterized by the 10 cm square piezoelectric lead-zirconate-titanate (PZT) plate. It can determine the impact dust momentum, incoming direction and velocity. The scientific interest is to reveal the origin of interplanetary meteoroid complex near-Mercury. In order to avoid complexities of the impact signals from the PZT, we have been interested in the output response immediately after collision, because the effects of disturbances by the reflection wave from the edge of the PZT could be negligible. As for information on velocity, it was studied by using hypervelocity iron particles in the range from 5km/s to 63km/s. We found evidence that the waveform was explicitly velocity dependent. In particular, the signal form changed from oscillating wave to solitary pulse. It is proposed an empirical formula to determine the velocity at collision with an ambiguity about 6km/s by a single PZT element. The present work is concerned with a detector sensitivity and velocity measurement by the Van de Graaff dust accelerator based on waveform analysis.