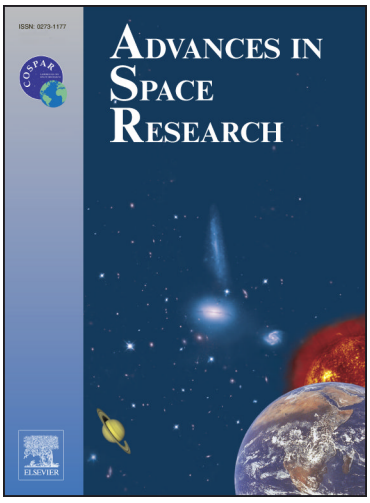

Determination of impact position on an impact ionization detector by electrostatic induction

Yanwei Li, Sebastian Bugiel, Heiko Strack, Jonas Simolka, Zoltan Sternovsky, Sascha Kempf, Mihály Horányi, Eberhard Grün, Xingji Li, Ralf Srama

PII: S0273-1177(18)30440-X
DOI: https://doi.org/10.1016/j.asr.2018.05.026
Reference: JASR 13772

To appear in: *Advances in Space Research*

Received Date: 1 March 2018
Accepted Date: 18 May 2018

Please cite this article as: Li, Y., Bugiel, S., Strack, H., Simolka, J., Sternovsky, Z., Kempf, S., Horányi, M., Grün, E., Li, X., Srama, R., Determination of impact position on an impact ionization detector by electrostatic induction, *Advances in Space Research* (2018), doi: https://doi.org/10.1016/j.asr.2018.05.026

Determination of impact position on an impact ionization detector by electrostatic induction

Yanwei Li[a,*], Sebastian Bugiel[a], Heiko Strack[a], Jonas Simolka[a], Zoltan Sternovsky[c], Sascha Kempf[c], Mihály Horányi[c], Eberhard Grün[c], Xingji Li[d], Ralf Srama[a,b]

[a] *Institut für Raumfahrtsysteme, Universität Stuttgart, Pfaffenwaldring 29,70569 Stuttgart, Germany*
[b] *Baylor University, Waco, TX 76706, USA*
[c] *LASP, University of Colorado, Boulder, Colorado 80309, USA*
[d] *Harbin Institute of Technology, 150001 Harbin, China*

Abstract

The application of impact ionization for the measurement of micrometeoroids in space are a sensitive and established method for particles in the size range between a few nanometer and a few micrometer. For the measurement of micrometeoroid trajectories, the knowledge of the velocity vector and the related impact position is required. A typical impact ionization detector employs a hemispherically shaped conductive metal target, and a hemispherical grid electrode. The impact charge is dependent on the particle mass, particle speed and incident angle. For a collimated particle flux which is parallel to the symmetry axis, the impact direction and its related impact angle relative to the target normal varies with the radial distance from the symmetry axis. It is therefore essential to consider the impact position during calibration of impact ionization detectors. Furthermore, the induced charge signal shape varies with impact position. We perform simulations with the Coulomb software package and we do compare the results with experimental data. An empirical formula is derived to determine the impact location of the particle from the target and grid induction signals.

Keywords:
dust, instrumentation, impact ionization detector, charge induction

*Corresponding author, Tel.: +49 711 68569653.
Email address: li@irs.uni-stuttgart.de (Yanwei Li)