Paper ID: 30783
student

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

Author: Mr. Christoph Montag
Institute of Space Systems, University of Stuttgart, Germany, christoph_montag@yahoo.de

Dr. Rene Laufer
Baylor University, United States, rene_laufer@baylor.edu
Mr. Michael Dropmann
Institute of Space Systems, University of Stuttgart, Germany, dropmann@irs.uni-stuttgart.de
Prof.Dr. Georg Herdrich
Institute of Space Systems, Germany, herdrich@irs.uni-stuttgart.de
Dr. Olaf Przybilski
TU Dresden, Germany, olaf.przybilski@tu-dresden.de
Mr. Truell Hyde
Baylor University, United States, Truell_Hyde@baylor.edu
Prof. Hans-Peter Roeser
University of Stuttgart, Germany, roeser@irs.uni-stuttgart.de

INTEGRATION OF A DUST ACCELERATOR INTO THE IPG6-B FACILITY FOR MATERIAL IMPACT TESTS

Abstract

The effect of high velocity particle impacts to material samples which are simultaneously subjected to high thermal loads are of great interest for space applications, e.g. investigation of components of spacecraft entering an atmosphere. Especially, in the evolving era of space tourism where spacecraft are going to enter an atmosphere multiple times in relatively short intervals, the investigation of material behavior in the long run is of interest. The velocity of a spacecraft entering the atmosphere on its suborbital trajectory can reach from a few 100 m/s to over 1000 m/s. Furthermore, the analyses of material probes subjected to similar loads are of interest for terrestrial applications. In order to simulate high thermal loads when investigating material samples an existing Inductively heated Plasma Generator (IPG6-B facility) is used. The system is a collaborative project of the Center for Astrophysics, Space Physics and Engineering Research (CASPER) at Baylor University, Waco, Texas, USA and the Institute of Space Systems (IRS) of the University of Stuttgart, Germany set up at the CASPER Space Science Lab. To subject material samples to high velocity micron sized particles a single stage gas driven dust particle accelerator (light gas gun) is designed and developed. The so called modified Light Gas Gun (mLGG) is based on an early existing stand-alone light gas gun breadboard model and to be connected to the IPG6-B facility. In addition of connecting the light gas gun to the IPG it is possible to use the device independently as a stand-alone system. Due to this the long term influence of high-speed impacting dust particles and micro meteorites can be investigated. This paper will describe project objectives and requirements as well as design challenges and solutions. Furthermore, initial mLGG performance results are discussed.