MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

Author: Dr. Rui Li
Beijing Institute of Control Engineering, China Academy of Space Technology, China,
rliz9805@hotmail.com

Dr. Meng Zhang
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
4655574@qq.com
Mr. Feng Guo
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
icqguo@163.com
Dr. Jinjiang Zhang
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
ewindzjj@163.com
Mr. Yu He
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
leolions@126.com
Mr. Chunxu Yu
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
hit.yuchunxu@foxmail.com
Mr. Zhuang Ye
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
yezhuang0305@gmail.com
Mr. Shuai Yuan
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST), China,
yuans002@163.com

STUDY ON THE MIGRATION OF SLIPRING DEBRIS IN SPACE ENVIRONMENT–AN IN-FLIGHT EXPERIMENT ONBOARD SPACE STATION

Abstract

As a crucial component of many spacecraft instruments, slipring is widely used to transfer electrical power or signal between rotary and stationary parts. Typical examples include the power and signal transfer slipring of Solar Array Drive Assembly (SADA) and signal transfer slipring of Control Momentum Gyro (CMG).

As slipring rotates, debris is generated as a result of mechanical wear between the brushes and rings of the slipring. The amount of debris increases rapidly as the spacecraft and their onboard instruments keep functioning. As a result of the exposure to the electromagnetic fields of space environment and electrical circuit of slipring itself, as well as the friction of rotating parts, the debris generated tends to be charged. Under the weightless, vacuum, and electromagnetic environment, the charged debris may move and accumulate on the exposed surface inside instrument and result in malfunctions such as shorting or discharging. In response to this potential threat, the migration of slipring debris needs to be studied seriously.

The space station provides an ideal platform to carry out the experimental studies, because it can provide the necessary long-term weightless, vacuum, electromagnetic, and thermal environment which is hard to simulate on ground. The experiment design, procedure and setup of the in-flight experiment to be carried out onboard Chinese first space station is summarized in this paper.