

**Modelling, Performance Evaluation and Field Testing of the Huygens  
HASI/PWA Mutual Impedance (MI) Probe**

R. Trautner (1), P. Falkner (1), R. Grard (1), S. Albrecht (1),  
I. Jernej (2), M. Hamelin (3)

(1) Space Science Department, ESA/ESTEC, Noordwijk, The Netherlands

(2) Space Research Institute, Austrian Academy of Sciences, 8010 Graz, Austria

(3) CETP, 94107 Saint Maur des Fossés Cedex, France

[rtrautne@estec.esa.nl](mailto:rtrautne@estec.esa.nl) / Fax: +31 71 565 4697

The HASI/PWA MI probe will determine the electric properties of the atmosphere of Titan, Saturn's largest moon, during the descent of the Huygens probe. After landing, the instrument will provide data on the properties of Titan's surface materials. The MI experiment and its actual implementation as part of the Huygens Atmospheric Structure Instrument on the Huygens probe are described.

Systematic errors of the MI measurement are shown and methods for correcting them are described; computer models for simulating the transmitter / receiver electrode system and the analogue electronics (boom / electrode geometry, coupling circuits, high impedance preamplifiers) are presented.

The measurement range and precision of the HASI/PWA MI probe are derived based on computer models and Huygens FM test data. The simulation model output is compared with results from a number of recent field test campaigns conducted at ESA/ESTEC, which employed a dedicated MI test probe similar to the Huygens probe. Methods for reducing potential error sources and improving the performance of MI instrument designs for both space and terrestrial applications are described, and technology requirements for future MI experiments are discussed.