

NEXT GENERATION PLASMA AND PARTICLE INSTRUMENTS FOR PLANETARY MISSIONS. M. I. Desai^{1,2}, K. Ogasawara¹, R. W. Ebert¹, D. J. McComas^{1,2}, F. Allegrini^{1,2}, S. A. Livi^{1,2}, S. A. Fuselier^{1,2}, and S. Bolton¹ ¹Southwest Research Institute, Space Science & Engineering Division, 6220 Culebra Road, San Antonio, Texas, 78238: Email: mdesai@swri.edu), ²Department of Physics & Astronomy, University of Texas at San Antonio, One UTSA Circle, San Antonio, Texas 78249

Abstract: Planetary magnetospheres and environments evolve in time and space through the dynamic transfer of mass, momentum, and energy between the embedded electromagnetic fields and the constituent plasma and energetic particle populations. Thus, a complete characterization of the in-situ plasma and particle environments covering the energy range from a few eV up to tens of MeV is a critical objective of NASA's numerous ongoing missions e.g., Cassini, Juno. While the exploration of planets and their satellites has been identified as a top priority in the 2012 Planetary Science Decadal Survey, future mission cost increases will constrain the resources (mass and power) available for scientific payloads and for in-situ instruments in particular. To ensure that resource-limited planetary missions can maximize their science return by continuing to make high quality plasma and particle measurements, the Southwest Research Institute with support from NASA's various instrument development programs has developed a set of novel, miniaturized sensors that can be tailored to measure the plasma, suprathermal, and energetic particle populations over a wide energy range in a variety of environments throughout the solar system. This talk will focus on four such novel concepts whose designs were optimized using detailed 3D Simion modeling. We then built laboratory prototypes for each and validated their designs using ion and electron beams in SwRI's vacuum chambers. Each sensor design concept has now reached a sufficient level of maturity and therefore provides a low-risk option that can be readily flown on upcoming missions such as the Europa Clipper, Enceladus Orbiter, Trojan Tour and Rendezvous, Uranus Pathfinder etc.