ADVANCED ION MASS SPECTROMETER FOR GIANT PLANET IONOSPHERES, MAGNETOSPHERES AND MOONS. E. C. Sittler Jr.[1], J. F. Cooper[2], N. Paschalidis[3], E. A. MacDonald[4], A. Ali[5], M. A. Coplan[6], D. Chornay[7], M. Sarantos[8], S. J. Sturner[9], F. B. Bateman[10], D. Fontaine[11], C. Verdeil[12], N. Andre[13], A. Fedorov[14] and P. Wurz[15], [1]NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, edward.c.sittler@nasa.gov, [2]NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, john.f.cooper@nasa.gov, [3]NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, Nikolaos.paschalidis@nasa.gov, [4]NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, elizabeth.a.macdonald@nasa.gov, [5]University of Maryland, College Park, MD/NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, ashraf.ali-1@nasa.gov, [6]University of Maryland, College Park, MD/NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, coplan@umd.edu, [7]University of Maryland, College Park, MD/[5]NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, dennis.j.chornay@nasa.gov, [8]University of Maryland, Baltimore County (UMBC), Baltimore, MD/[8]NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, Menelaos.sarantos-1@nasa.gov, [9]University of Maryland, Baltimore County (UMBC), Baltimore, MD/NASA Goddard Space Flight Center, Code 673, 8800 Greenbelt Road, Greenbelt, MD, 20771, steven.j.sturner@nasa.gov, [10]National Institute of Technology and Standards, Gaithersburg, MD, fred.bateman@nist.gov, [11]Laboratoire de Physique des Plasmas (LPP), Ecole polytechnique, FR, Dominique.fontaine@lpp.polytechnique.fr, [12]Laboratoire de Physique des Plasmas (LPP), Ecole polytechnique, FR, christophe.verdeil@lpp.polytechnique.fr, [13]IRAP, Centre National de la Recherche Scientifique, Toulouse, FR, Nicolas.andre@irap.omp.eu, [14]IRAP, Centre National de la Recherche Scientifique, Toulouse, FR, andrey.fedorov@irap.omp.eu, [15]University of Bern, Physikalische Institut, Bern, Switzerland, peter.wurz@space.unibe.ch.

Introduction: The Advanced Ion Composition Spectrometer (AIMS) has been under development from various NASA sources (NASA LWSID, NASA ASTID, NASA Goddard IRADs) to measure elemental, isotopic, and simple molecular composition abundances of 1 eV to 25 keV hot ions in the 1 – 60 amu mass range at mass resolution $M/\Delta M \leq 60$ over a wide dynamic range of intensities and penetrating radiation background from the inner magnetospheres of Jupiter and Saturn to the outer magnetospheric boundary regions and the upstream solar wind. Outer planet mission applications are Io Observer, Jupiter Europa Orbiter/Europa Clipper, Enceladus Orbiter, and Uranus Orbiter as described in the decadal survey, but would also be valuable for inclusion on other missions to outer planet destinations such as Saturn-Titan and Neptune-Triton and for future missions to terrestrial planets, Venus and Mars, the Moon, asteroids, and comets, and of course for geospace applications to the Earth. We will present a broad spectrum of designs that include many of the AIMS innovations, starting from the least capable and lowest resource requirements with major ion detection emphasis but applicable, for example, to support magnetometer measurements of Europa's ocean, to the most capable higher resource option for which ion composition has the greatest emphasis with both major ion and minor ion detection capabilities along with wide dynamic range for measurements of the more tenuous magnetospheric plasmas to the denser plasmas within planetary ionospheres. The design of AIMS can be optimized for science operations in extreme radiation environments as would be encountered at Io and Europa, while also allowing full measurements in more quiescent environments of the outer magnetospheric boundary regions and the upstream solar wind.