Enhancing the Science Return of Landed X-ray Spectrometers on the Mars Rovers

Scott VanBommel\(^1\) and Ralf Gellert\(^2\)

\(^1\)McDonnell Center for the Space Sciences, Department of Earth and Planetary Sciences, Washington University in St. Louis, St. Louis, Missouri, United States of America

\(^2\)Department of Physics, University of Guelph, Guelph, Ontario, Canada

Alpha Particle X-ray Spectrometers (APXS) have flown on the Mars Exploration Rovers (MER) Spirit and Opportunity as well as the Mars Science Laboratory (MSL) rover Curiosity. The APXS was designed and calibrated for in situ interrogation of solid martian samples through the use of complementary particle-induced X-ray emission and X-ray fluorescence analysis techniques. Its compact and robust design, combined with low power and data demand, further suit the APXS instrument and method for lengthy missions to the surface of rocky bodies in our solar system. Since their three respective landings, the science derived from the latest APXS instruments has been expanded beyond its original scope through the integration of computational techniques and modest changes to how the instrument is utilized on Mars. We will discuss these new methods, operational considerations, as well as the enhanced science achieved, with a particular focus on the relevance and future application on the surface of Mars.