

## Expansion of Microbial Monitoring Capabilities on the International Space Station (ISS)

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Microbial monitoring is one of the tools that the National Aeronautics and Space Administration (NASA) uses on the International Space Station (ISS) to help maintain crew health and safety. In combination with regular housekeeping and disinfection when needed, microbial monitoring provides important information to the crew about the quality of the environment. Rotation of astronauts, equipment, and cargo on the ISS can affect the microbial load in the air, surfaces, and water. The current ISS microbial monitoring methods are focused on culture-based enumeration during flight and require a significant amount of crew time as well as long incubation periods of up to 5 days there by proliferating potential pathogens. In addition, the samples require return to Earth for complete identification of the microorganisms cultivated. Although the current approach assess the quality of the ISS environment, molecular technology offers faster turn-around of information particularly beneficial in an off-nominal situation. In 2011, subject matter experts from industry and academia recommended implementation of molecular-based technologies such as quantitative real-time polymerase chain reaction (qPCR) for evaluation to replace current, culture-based technologies. The RAZOR EX (BioFire Defense, Inc, Salt Lake City, UT) a ruggedized, compact, COTS (commercial off the shelf) qPCR instrument was tested, evaluated and selected in the 2 X 2015 JSC rapid flight hardware demonstration initiative as part of the Water Monitoring Suite. RAZOR EX was launched to ISS on SpaceX-9 in July 2016 to evaluate the precision and accuracy of the hardware by testing various concentrations of DNA in microgravity compared to ground controls. Flight testing was completed between September 2016 and March 2017. Data presented will detail the hardware performance of flight testing results compared to ground controls. Future goals include additional operational ground-based testing and assay development to determine if this technology can meet spaceflight microbial monitoring requirements.