

## ***In situ* Chemistry Experiment – Microscope, Photoluminescence and Raman Observations on Europa (ICE-μPROBE)**

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### **Abstract**

One of NASA's highest priority scientific objectives is the search for life in the solar system. The community consensus is that Europa harbors liquid water beneath an icy crust (~10 km), which has raised the possibility that life, or conditions favorable for life, may exist on that moon. We have been developing “*In situ* Chemistry Experiment - μscope, Photoluminescence and Raman OBservations on Europa (ICE-μPROBE)” instrument, which will address 10 of the 23 science investigations in the Science Traceability Matrix (STM) of the Europa Lander Study 2016 Report updated science goals, as recommended by the Science Definition Team (SDT). The ICE-μPROBE instrument will carry out time-resolved Raman and photoluminescence (PL) spectroscopy, of ice samples collected from the surface to ~10 cm below the surface, to discover, if present, the types and distribution of biotic and abiotic organic compounds, measure CHNOPS containing organics and minerals and correlate them to radiolysis processed and textural features. Our instrument includes an optical microscope to provide context imaging for the spectroscopy. Our Team is currently looking into maturing and retiring technical risk of two critical ICE-μPROBE assemblies that are currently at Technology Readiness Level (TRL) -4, namely, the (i) Laser Assembly and the (ii) Detector Assembly (SpectroCam) and (iii) Spectrometer Assembly to TRL-6. We will present and discuss time-resolved Raman and fluorescence spectra of amino acids, PAHs and, hydrated sulfates minerals and sulfuric acid on the surface and subsurface of water-ice samples.