2016 ISS Proposal Abstracts

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NH 14ISS-EPSCoR-0014

Time Course of Microgravity-Induced Visual Changes

Approach: A demonstration of just the computer technology (no avionics) on the ISS will achieve TRL-9 with minimal effort and in less time (<1 year) than a stand-alone, low-earth-orbit mission and will greatly increase the possibility of adoption into future NASA programs.

Scientific Merit: In collaboration with JSC, gather currently unavailable information on the time course of eye refraction changes, and hence axial length changes, in space.

Technical Description: Track refraction changes using an autorefractor (NetraG) that mounts to a smartphone and with the focus knob on the Heidelberg Spectralis Optical Coherence Tomography (OCT) device currently onboard the ISS.

Physical Description: The focus knob on the OCT compensates for refraction in the cornea and lens to focus the OCT machine on the retina. UNH will validate these two techniques in 1-G for measuring changes in refraction. Then, in collaboration with flight medicine at NASA, make refraction measurements on the ISS.

Objectives: 1) to create and validate simple technologies to make eye length measurements in space; 2) monitor the changes in eye length that occur early in flight during long-term microgravity exposure; and 3) use these in the UNH numerical model.

Implementation: Use two technologies to measure this change in refraction: 1) the handheld NetraG autorefractor and 2) the focus knob on the Heidelberg Spectralis OCT on the ISS.

OK 14ISS-EPSCoR-0002

Demonstration of the OSU Tissue Equivalent Proportional Counter for Space Crew Dosimetry aboard the International Space Station

Approach: The space radiation environment consists of charged particles including protons, He ions and heavy ions, ranging in energy from tens of MeV to tens of GeV, in the form of galactic cosmic rays and solar energetic particles.

Scientific Merit: Demonstrate the OSU Tissue Equivalent Proportional Counter (TEPC) design in the actual space radiation environment by adapting and then operating the TEPC aboard the International Space Station (ISS).

Technical Description: This low-cost, self-contained, and portable TEPC is sensitive to ionization radiation of the types and energies encountered in space and can provide real time dosimetric data on space crew radiation exposure.

Physical Description: Fabricate a flight hardware version of the OSU TEPC based on the prototype Version shown in the graphic to the right.

Objectives: Produce a TEPC for space dosimetry that can be flown on a variety of spacecraft including satellites, interplanetary space probes, and surface landers and rovers.

Implementation: Conduct tests in various locations on-board the ISS. Compare results to current ISS system. The JSC SRAG would like to co-locate the instrument with Medipix and ISS RAM passive dosimeters, for at least a portion of the mission, in order to be able to intercompare measurements from these different detector systems.

PR 14ISS-EPSCoR-0008

Certification at the International Space Station of a Single Board Computer that was Designed and Developed for the CubeSat Platform

Approach: The quad-core flight computer capable of performing multiple specific tasks such as to process digital and/or analog data, to process the sensors data, to control actuator systems, to manage camera data, and to transmit/receive data from/to a ground station.

Scientific Merit: Design, develop and certify a single-board quad-core computer for the CubeSat platform that can be transitioned into an application-specific integrated circuit (ASIC)

Technical Description: Currently, data processing, communications, flight control and attitude determination are CubeSat functions that require separate boards. Propose to combine these functions into a single board

Physical Description: A flight computer designed as a quad-core system containing four microprocessors executing code in parallel

Objectives: The CARLO will be used to test the capability of the quad-core flight computer to perform parallel processing and data managing

Implementation: The package that will be delivered to the ISS will contain a scientific instrument developed by NASA Marshall Space Flight Center called the Charge Analyzer Responsive to Local Oscillations (CARLO)