VIRGINIA SPACE GRANT CONSORTIUM
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Hampton University Proton Therapy Institute Helps Virginia Students Prepare for Space Flight

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For Release: December 5, 2017

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The Hampton University Proton Therapy Institute (HUPTI) is working with the Virginia Space Grant Consortium (VSGC) to test components of student satellites bound for orbit. The Institute's proton beam, which offers cutting edge cancer treatments, is being used to simulate the impact of radiation encountered in the space environment on space hardware developed by the students.

HUPTI was founded in 2005 by Hampton University President Dr. William R. Harvey. Opening in 2010, HUPTI became just the eighth proton therapy cancer treatment facility in the US and the only one in Hampton Roads. Proton therapy is a type of radiation treatment that uses protons, positively charged particles, which at high energy can destroy cancer cells. The targeted, non-invasive beam is configured to the exact size and shape of tumors, sparing more healthy tissue and reducing side effects.

The Virginia CubeSat Constellation is a NASA and VSGC-funded mission that will place three very small satellites in orbit as a constellation from the International Space Station as part of the NASA Undergraduate Student Instrument program. The student-led mission is a Virginia Space Grant Consortium project and a joint effort among four member universities: University of Virginia, Virginia Tech, Old Dominion University and Hampton University. More than 100 students across the universities have been working on the project.

The Constellation has been selected for launch to the International Space Station in the third quarter of 2018 or early 2019 with orbital insertion to follow from the Station. Students must deliver their satellites to NASA for integration in July 2018. The ODU satellite, which has a drag brake to intentionally cause orbital decay, is expected to remain in orbit for up to four months. The other two satellites should orbit for up to two years. The satellites will communicate data

to ground stations at Virginia Tech, University of Virginia and Old Dominion University for subsequent analysis using an analytical tool being developed by Hampton University.

The mission seeks to obtain measurements of the orbital decay of a constellation of satellites to develop a database of atmospheric drag and the variability of atmospheric properties. It will also evaluate and demonstrate a system to determine and communicate relative and absolute spacecraft position across an orbiting constellation. Called CubeSats, these very small satellites, about 10 centimeters (4 inches) on each edge, take advantage of microminiaturization of sensors and other components to undertake relatively inexpensive studies and demonstrations in space.

Student Project Manager Nathan Gaul notes, "This opportunity to use the proton beam at Hampton University Proton Therapy Institute is extremely important for our mission since it will let us test the space-worthiness of critical sensors and components on our CubeSats before their actual launch into space." VSGC Director Mary Sandy notes, "We are very pleased that Hampton University, a Consortium member, is generously making this unique facility available to our students and assisting them with the test set up."

For Vahagn Nazaryan, Ph.D., the Institute's Executive Director, it is all about education and helping students. "HUPTI is a genuine national resource that provides highly conformal, targeted treatments and has treated thousands of patients with brain, head and neck, breast, lung, CNS, pediatric, prostate and other cancers. Our advanced technologies are also a unique research resource. We are happy to provide this testing opportunity at HUPTI, and help students as part of an educational process that can contribute to our nation's technological knowledge."

On December 1 at HUPTI, members of the team tested the IMU (inertial measurement unit) for their satellites and the radio that will be used for communication between satellites in the constellation. According to David Khannan, UVA student test coordinator, the tests revealed that the radio performed well, but there were issues with the IMU that will require some potential changes.

The students have named their satellites after the Roman goddesses on the back of the Virginia State Seal who represent the blessings of freedom and peace. UVA has chosen Libertas, the goddess of individual liberties; Virginia Tech selected Ceres, the goddess of agriculture; and Old Dominion University chose Aeternitas, the goddess representing eternity.

Learn more about the Hampton University Proton Therapy Institute at http://www.hamptonproton.org and about the Virginia Space Grant Consortium at http://www.vsgc.odu.edu