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Generic Technologies for Nano/Pico Platforms (6B)

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ENHANCED SMALL SATELLITE COMMUNICATION SYSTEMS FOR REMOTE PLANETARY EXPLORATION

Abstract

It is anticipated that the demand and use of small satellites will increase tremendously in the next decade. A recent report forecasts 510 small satellites launches over the next five years. Part of the reason for this increase is the shrinking of technology that enables these spacecraft to complete missions that previously required larger spacecraft. Their small size also allow more of them to be launched on one launch vehicle, enabling them to collaborate and work together to complete a mission. Small Satellites and the ability to collaborate provides the benefit of enhanced observation and redundancies in numbers; however the constraint of size technological limits of aperture systems such as antennas and sensors can inhibit the amount of data that can be sent back to the earth or in the future, remote planetary base stations. Large format camera and video systems will place a large increase in bandwidth and total data volume which will require high speed communication links. Today's small satellite communication systems use low frequency S-band antennas however, this work will discuss new innovative enabling technologies and concepts that will allow for the use of higher frequencies in small satellites and cubesats. Additionally, this work will introduce solutions to address the aperture size concerns that are current constraints faced today. The proposed deployable communication system technology can be used for deep space exploration vehicles such as planetary balloons, terrestrial balloons and airships. The ability to package antennas in a small volume and be lightweight and deployable proves ideal for exploring places with atmospheres thus could enable technologies like steerable communications systems for Titan, Venus and Mars. This work will address the market analysis and the business case derived to determine technological requirements, ground station capabilities and infrastructure considerations unique to the environment. Additionally, prototype design, ground testing and certification will be discussed. Data analysis techniques will be addressed and the results will be presented. Recommendations for proposed validation testing in space will be provided. This innovative use of technology will enhance – enable collaboration and communication; critical requirements, as we explore and transcend the gateway of space.