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EMI Filtered Switched Mode Power Supplies for Sounding Rocket Applications + SPEID CubeSats

One of the goals of this project was to test and improve a low-cost, compact (PC104 form factor), switched-mode power supply of my design meant for use in sounding rocket applications (the power converters would be responsible for converting 28V inputs into +/-15V outputs). Electromagnetic interference (EMI) filters, which help reduce the amount of conducted emissions from electromagnetically induced noise, were also developed to complement these power supplies. However, many of the characteristics of circuit board designs cannot be predicted or observed until they are physically implemented, this is especially true with EMI. As a result, the EMI conducted emission levels exceeded the allowable amounts outlined in Goddard's General Environmental Verification Standard (GEVS). Through thorough testing, analysis, and experimentation, improvements to the EMI filter and overall design were able to be achieved. Among these improvements included the use of larger common-mode chokes, inductors, and capacitors for improved noise filtering, as well as refinement of the control circuitry for more consistent performance across varying input and loading conditions. Using this knowledge, a new schematic for another converter capable of converting a 28V input into +/-28V outputs, along with linear regulation for +/-18V and +/-8V outputs, was drafted. Another goal of this project was to help further the development of the communication and ground station subsystems for the SPEID CubeSat mission, which would aim to design a fleet a CubeSats capable of supporting the OSAM-1 mission through 3D reconstruction of in-orbit video footage. At the conclusion of the project, viable communication hardware from Vulcan Wireless had been identified and a preliminary ground system architecture was designed. The proposed architecture utilizes NASA's Near Earth Network (NEN) of ground stations as well as KSAT Lite, a commercially operated back-up commonly used in LEO missions when NEN systems are out of range.