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Author: Mr. Pedro Javier Fernández  
Spain

Mr. Ignacio Serrano  
LEEM-UPM, Spain

DESIGN OF A HARDWARE PROTECTION FOR RASPBERRY PI TO WITHSTAND SEU FROM  
SOLAR WINDS ON THE MOON SURFACE DURING LONG-TERM MISSIONS

**Abstract**

The lunar surface is far from being a friendly environment for the different electronic devices found in a typical space mission. Due to the lack of atmosphere and the relatively close distance to the Sun, it is critical to ensure that there will be no problems arising from the impact of solar winds, or other disruptions, on the surface of the Moon. In the upcoming years, the interest of the scientific community towards lunar missions will increase thanks to the Artemis programme from NASA, among others. The objective of this project is to develop affordable hardware and software systems to emulate similar conditions in the laboratory. This simplifies the work of small research groups with reduced budgets, who may not have the capability nor the resources to design their systems and protections, while extensively testing them for the harsh and real environmental scenarios these will face in space. The testing device is able to generate strong localized magnetic fields, exploiting the electromagnetic Induction phenomenon to introduce subtle voltage variations into circuits and conductors inside the microcontrollers. This way, we inject SEU into the system, as the ones that may occur spontaneously in space. The protection system will be implemented for the popular Raspberry Pi family of embedded computers, as it is a rather common COTS used as a microcontroller for space missions among university research groups. With the implementation of this system, not only the overall cost of the mission will decrease, but also a complex problem is addressed without the need of expensive laboratory equipment. It will make it easier to fulfill any safety requirements regarding the microcontroller lifespan and reliability, helping towards the objective of democratizing space research and making it more accessible to all the community.