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14TH IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and Development (3)

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APPLICATIONS OF SPINTRONICS IN FUTURE SPACE EXPLORATION ENDEAVOURS

Abstract

Design and development of spacecraft has long been driven by requirements for small size, low power and capability to withstand the harsh environment of space. In spite of such requirements being taken into account in the design of space systems, there have been instances of subcomponent failure stemming from electronics.

For many years, physicists have been working on spintronics [1-5], the next generation of electronics which relies on not just using the charge degree of freedom of electrons in functional devices, but also their spin degree of freedom. Low power use, resilience to environmental stimuli (such as temperature changes, and radiation) and their nanoscale size have garnered interest in spintronic technology as a replacement for some electronic and electromechanical devices currently in use. These properties also make spintronic devices suitable replacements for many electronic components used in space.

Spintronics has been studied for applications in sensing, logic and storage devices [6-10]. Devices are already on the market and in use in different sectors which rely on spintronic phenomena, with more devices envisioned and under study in the lab.

In this work, after providing a short primer on spintronics, we will highlight some of the spintronic devices currently on the market (such as the MRAM) and then discuss some of the potential space applications of new devices being developed by different research groups. These applications include data storage and environmental and health monitoring.

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