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A Low-power Large-capacity Storage Method for Deep-sea In-situ Radiation Measurement

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Deep-sea in situ radiation detection equipment is designed to work at the deep seafloor for half a year. During the period of running, the equipment will generate large volume of data. Besides, this equipment is powered by batteries. So design challenge of large capacity storage with low power is met in the equipment development. This paper proposes a low-power large-capacity storage solution based on the combination of static random-access memory (SRAM) and Flash. The detected data is recorded in two 128 GB embedded multi-media card (eMMC) Flash. However, if the eMMC Flash keeps running, its high power consumption will reach to about several hundred milliwatts, which will shorten the batteries'life. In order to reduce the power consumption, a storage method combining SRAM and Flash is designed. During every data recording cycle, data is first buffered into the SRAM chip and then written into the Flash chip before the SRAM is almost full. In this way, Flash almost stays in sleep mode most of the time except for the data transfer period. Besides, a low-power FPGA based on Flash technology is adopted as the control center of the circuit to further reduce the power consumption. Preliminary results show that this low-power storage solution reduces power consumption by more than 90% compared to the way Flash working alone. The estimated total power consumption can reach down to 6.6 mW. The proposed storage solution significantly reduces power consumption and satisfies the long time running requirements for the deep-sea in-situ equipment.

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