



Instrumentation

Radiation Hardened Gain Digitizer

Digitizes a wide range of signals without introducing excessive offset and noise, and has accurate and variable gain even in when total ionizing dose (TID) is high.

NASA Goddard Space Flight Center has developed a digitizer that can process a wide range of low level signals in the presence of ionizing radiation. A unique feature of this innovation is the combination of autozero/chopping with a discrete time integrator in the main path. This integrator allows for variable gain and, when combined with the linear amplifiers, can also generate very high and accurate gain. Further, the discrete time integrator can be placed in hold mode after the desired number of integrations has occurred.

BENEFITS

- Low cost, high accuracy variable gain digitizing
- Operates in high total ionizing dose (TID) environments
- All of the components reside on a single CMOS silicon chip
- Users can choose low gain, high gain with autozero, high gain with chopping or high gain with autozero and chopping before the amplified signal is digitized

technology solution



THE TECHNOLOGY

This novel digitizer overcomes the disadvantages of current technology including limited gain of the front-end amplifier circuits to fixed values, and amplifier saturation from the use of bandpass filtering rather than autozero.

Advantages of the technology include flexible and low cost variable gain digitizing with high accuracy which can be implemented in radiation hardened by design sub-micron CMOS (complementary metal-oxide semiconductor). The autozero in combination with the chopper adapts and adjusts the offset of the linear amplifiers in the presence of radiation induced threshold voltage changes in the MOSFET devices in the amplifiers. Since chopping alone would not prevent this amplifier saturation caused by large offsets, the addition of autozero makes the amplifier chain a lot more robust in high TID environments.

APPLICATIONS

The technology has several potential applications:

- Medical Equipment
- Satellites
- Robotics for power plants

PUBLICATIONS

Patent No: 10158335

National Aeronautics and Space Administration

Strategic Partnerships Office

Goddard Space Flight Center

Code 102
Greenbelt, MD 20771
301-286-5810
techtransfer@gsfc.nasa.gov

<http://technology.nasa.gov/>

www.nasa.gov

NP-2016-11-2251-HQ

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GSC-16944-1
GSC-TOPS-157

