Custom Application Specific Integrated Circuit for Detector Control and Data Acquisition

ASIC interface between cryogenic detectors and the warm instrument electronics

Focal Plane Arrays (FPAs) typically require cryogenic operation that necessitates thermal isolation from warm detectors. However, the cryogenic temperatures negatively affect the signal integrity of the detectors. To solve this problem, current hybrid detectors utilize a Read-Out Integrated circuit (ROIC) that control system and data acquisition. However, their power dissipation presents an undesirable system-level thermal trade-off. NASA Goddard Space Flight Center has innovated a custom Application Specific Integrated Circuit (ASIC) that communicates between cold and warm electronics to maximize signal integrity without comprising cooling.

BENEFITS
- Low noise analog to digital conversion
- Simple digital control and timing
THE TECHNOLOGY

The ASIC receives signals from the detector via an analog-to digital converter (ADC). This ADC includes a full analog front-end with signal routing and pre-amplification. The digital signals are then routed through an Output Data Formatter and are directed to warm electronics. A digital Control component provides clocking for the detector and external serial control. The BIAS component provides quiet voltages to the detector. This electrical architecture minimizes thermal stress loads while maximizing signal integrity. The processing functions are performed at the highest allowable temperatures minimizing the number of components that require cooling.

APPLICATIONS

The technology has several potential applications:

- Medical devices
- Imaging
- Detector control and data acquisition

PUBLICATIONS

Patent No: 10502622