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MULTISPECTRAL INFRARED LARGE BAND SPACE CAMERA CORE FOR EARTH OBSERVATION

Abstract

New commercial space players now focus on collecting thermal infrared data from space for different applications. Multispectral Infrared bands provide key intelligence for agriculture, climate and environment related issues. For instance, it allows for ground and sea surface temperature measurement, wildfire detection and monitoring as well as water resource management for agriculture optimization.

INO, a Canadian innovation center in optics and photonics, has been engaged in the development of custom uncooled bolometric detectors, focal plane arrays, cameras, as well as instruments for more than twenty-five years. INO developed custom microbolometric imagers for a series of CSA, NASA, and ESA instruments and missions including the NIRST instrument for the CONAE/NASA SAC-D Aquarius satellite and the Broadband Radiometer (BBR) instrument for the ESA's Earthcare mission.

We will report on a unique solution to address the Earth observation commercial space market based on an infrared broadband multispectral microbolometer sensor.

HDISCC, standing for "High-Definition Infrared Space Camera Core" is a submodule of a space thermal imaging camera. The detector package contains an INO IRM1024 focal plane array with 1024x768, 14μm pitch VOx microbolometer pixels.

The Camera Core contains the interface and proximity electronics to power the detector, and to read out and digitize image data from the FPA. An optional thermistor readout electronic digitizes and multiplexes up to 4 optional external thermistors to monitor the temperature for radiometric correction.

Thanks to the broadband spectral range from 3μm to 14μm and up to 100μm with a gold black coating, we offer the capability to customize the camera core to select different spectral regions. The package cavity accommodates optical filters mounted on top of the detector die, a few hundred microns above the pixels, for multispectral detection.

The package includes a TEC located under the FPA's routing circuit for thermal stabilisation of the FPA and of the integrated spectral filters. The Space Camera Core Subsystem contains the interface and proximity electronics to power the detector, and to read out and digitize image data from the FPA. The packaging has been designed to follow a guideline to withstand a 10-year lifetime, in a low-Earth orbit environment.

With more than 700 satellites for earth observation to be launched per year by 2031, this new camera core design will provide a powerful solution to reduce lead-time and cost for commercial customers requiring custom multispectral infrared capability for Earth observation applications.