Skysong Innovations

A unit of the Arizona State University Knowledge Enterprise

Low-Power, Compact, Microwave Radiometer for Earth Observing and Planetary Science

SI Case #M17-224P

Inventor(s):

Sean Bryan

Associate Research Scientist
School of Earth and Space Exploration

Philip Mauskopf

Professor
School of Earth and Space Exploration

Christopher Groppi

Associate Professor
School of Earth and Space Exploration

Publications:

Bryan et al., "WSPEC: A waveguide filter-bank focal plane array spectrometer for millimeter wave astronomy and cosmology" Journal of Low Temperature Physics, December 11 (2015)

Bryan et al., "A Compact Filter-Bank Waveguide Spectrometer for Millimeter Wavelengths," IEEE Transactions on THz Science and Technology ,5,4,598-605 (2015)

Che et al., "WSPEC: A Waveguide Filter Bank Spectrometer," Proceedings of the International Symposium on Space THz Technology, (2015)

Intellectual Property Status:

Patents Pending

Contact

Shen Yan

Assistant Director of Intellectual Property, Physical Sciences

Skysong Innovations (formerly Arizona Technology Enterprises, LLC)

P: 480.884.1968

F: 480.884.1984

SHEN.YAN@SKYSONGINNOVATIONS.COM

TECHNOLOGYVENTURES@AZTE.COM

Background

Earth has seen a dramatic discrepancy in climate patterns in recent years, driving professionals to use climate and weather satellites to collect information for future predictions and analysis. Microwave sounding instruments in weather and climate satellites have been the primary source of measuring atmosphere traits, surface and/or cloud temperatures to predict climate patterns. Current instruments that are capable of picking up information in this field are large in size, expensive, and energy-consuming. In recent years, several space companies have been eager to take advantage of advancements in technology for earth observation that is smaller, cheaper and consumes less power.

Invention Description

Researchers at Arizona State University have developed a system that allows satellite and space apparatus manufacturers a compact and low-power microwave instrument solution for satellite architecture. The system consists of a novel receiver design for a microwave radiometer. A cutting-edge receiver system is composed of millimeter-wave amplifiers and a custom designed millimeter-wave waveguide filter bank that selects distributed frequencies across different atmospheric sections. Furthermore, as opposed to current instruments, the system does not require a local oscillator, reducing power requirements, system complexity, and eliminates frequency drift. A forward-thinking design allows for powerful features from a compact device.

Potential Applications

- Weather and Climate Observation
- Planetary Science
- Medical Imaging
- Millimeter Wave Communication (5G)

Benefits and Advantages

- Innovative – System allows for the next generation of small satellite design and architecture
- Efficient – Low-power and minimalist design with dynamic features and capabilities
- Powerful – High instantaneous sensitivity, single-dish-class angular resolution, and moderate resolving power all from a compact design
- Simple – The system can be easily manufactured with current methods and commercial products