TNO Science and Industry

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TNO Science and Industry
P.O. Box 155
2600 AD Delft
The Netherlands
www.tno.nl

Bryan de Goeij
bryan.degoeij@tno.nl

Johan Leijtens
johan.leijtens@tno.nl

How to use MST to see a spectrum of possibilities

MIcroBolometer Spectrometer(MIBS)

MIBS is a thermal infrared spectrometer based on a microbolometer detector array. MIBS was originally designed to detect the thermal radiation emitted by earth and the atmosphere, as part of the MSI detector designed during the phase A study for the EarthCARE mission of ESA which will be flown in 2012.

Advantages of a microbolometer detector array:

- Works at room temperature so there is no need for cryogenic cooling system. This saves mass and power and makes it possible to use a 2D detector array.
- The microbolometer is sensitive to all wavelengths in the 3-5 μm and the 8-25 μm range, giving it a wide application range.

Disadvantages of a microbolometer detector array:

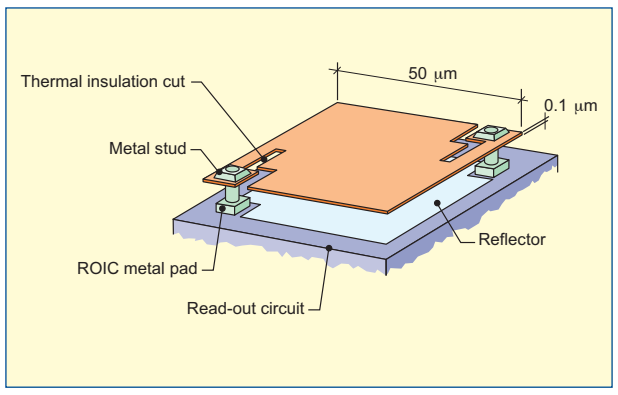
- The bolometer detector is an energy balancing devise which measures the balance between incom ing and outgoing energy. The detector will also mea sure a temperature change of its own surrounding. To keep this influence low the temperature needs to be stabilised with a 10 mK precision.

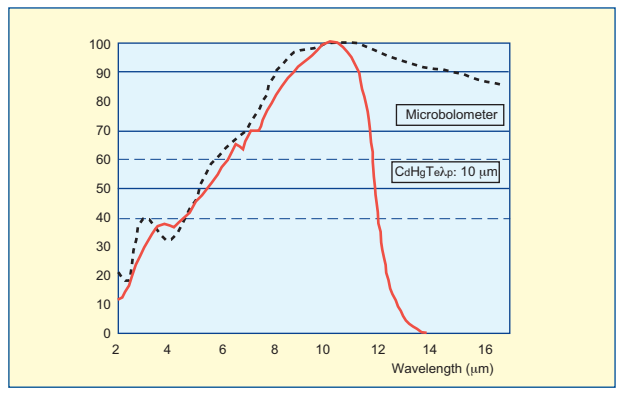
Advantages of the MIBS system:

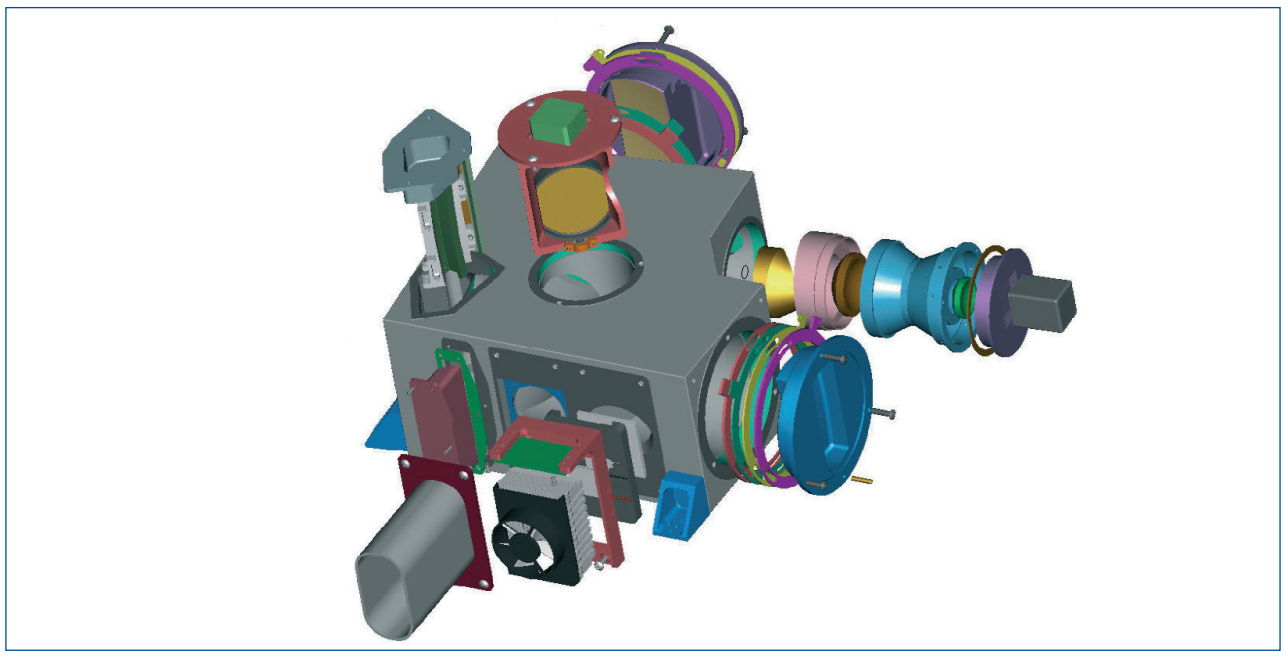
- Excellent stray light rejection due to the use of a slit.
- High spectral purity.
- No spectral filtering required due to the use of a prism.
- No external calibration system is needed during operation.
- High co-registration is achieved by using one telescope for all bands.
- By using a 2D array there is no need for a scanning mechanism.

Future possible applications:

- Flame analysis for rocket exhausts
  By detecting the thermal infrared spectrum profile of a flame it is possible to determine the constituents of the gas.
- Military application
  Spectral imaging can be used to increase target detection and recognition.
- Interplanetary missions
  The development in microbolometer detectors will make these devices more sensitive, making it possible to detect smaller wavebands at higher NETD. This makes MIBS the ideal fine thermal spectral imager for interplanetary missions.







Flying instruments	Wavelength μm	BW μm	NETD @300K K	Volume m³	Mass kg	Power W	Detector pixels
ATSR	10,8 and 12	1	0.13	2	98	106	2
AATSR	10,8 and 12	1	0.1	2	100	100	2
AVHRR	10.8 and 12	1	0.12	0.06	33	29	2
MODIS	7.3...14.2	0,5..0,3	0.05..0.35	1.6	229	163	2D
In design	Wavelength μm	BW μm	NETD @300K K	Volume m³	Mass kg	Power W	Detector pixels
MSI	8,8/10,8/12	0.9	0.25	0.04	30	55	300
LCI	12	0.5	0.25	0.1	36	61	2D
VIRI-M	6.7..13.4	0,3..1	0,1..0,35	0.26	70	80	2D
MIBS	7,5...15	0,3	0.45	0.03	25	40	2D