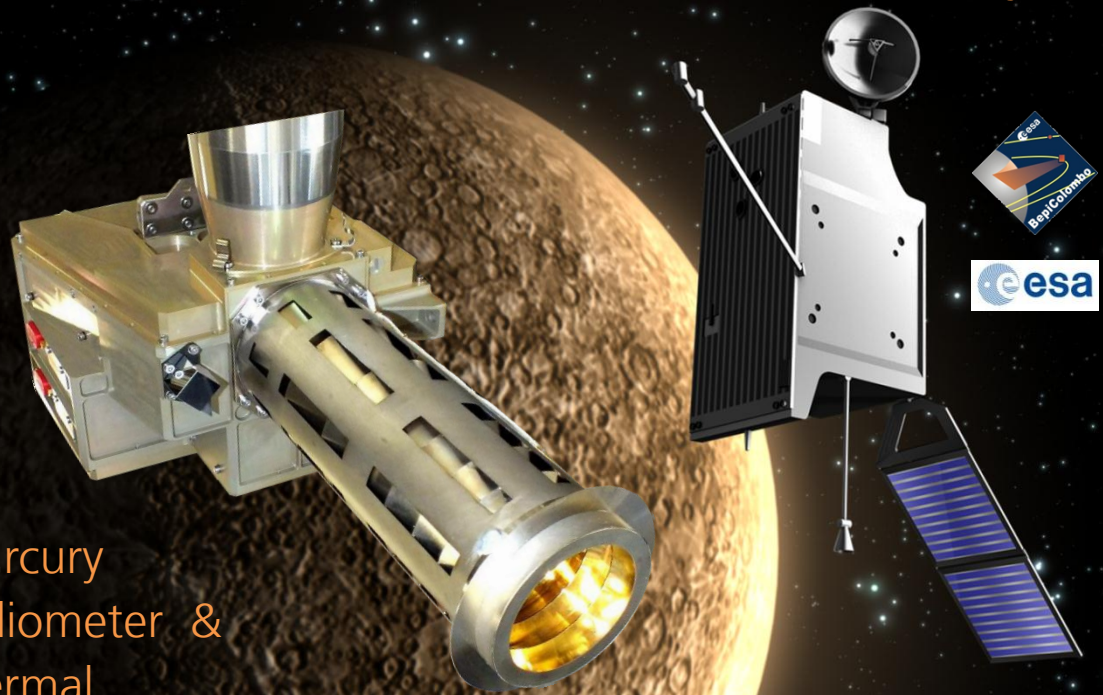
MERTIS und ESA's BepiColombo Mission zum MERKUR

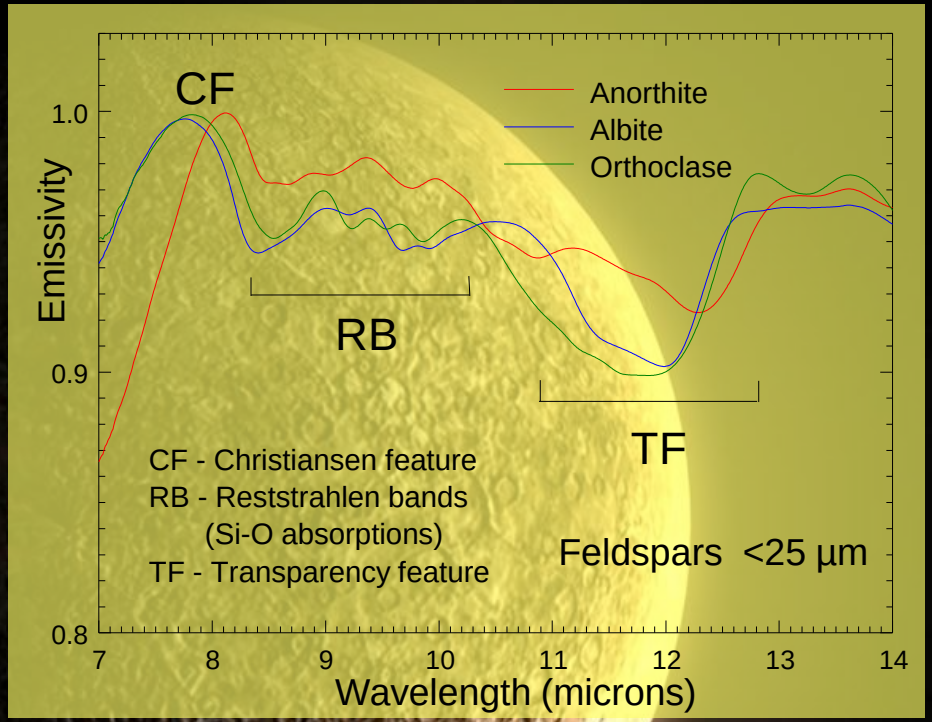
MERTIS and ESA's BepiColombo Mission to the Mercury

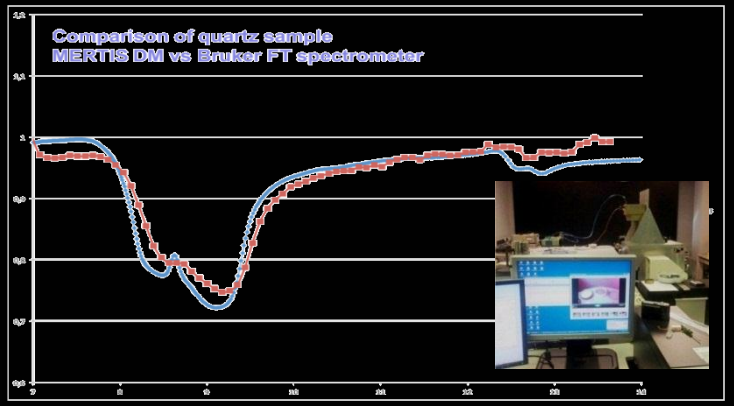


MErcury
Radiometer &
Thermal
Infrared
Spectrometer

Mission: 6+ Years
2015 … 2021 / 2022

Wissenschaft am MERKUR
Mercury Science





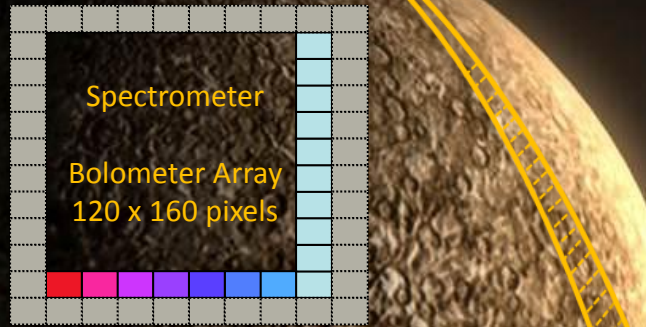
Zusammensetzung der Oberfläche
Composition of Mercury's surface

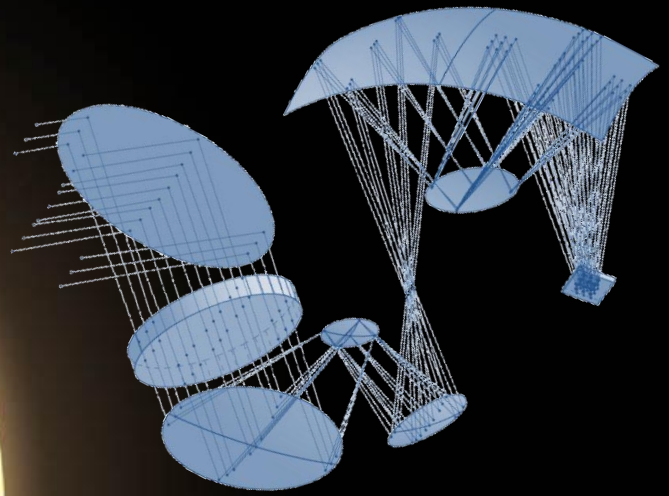
Mineralogische Kartierung
Surface mineralogy mapping

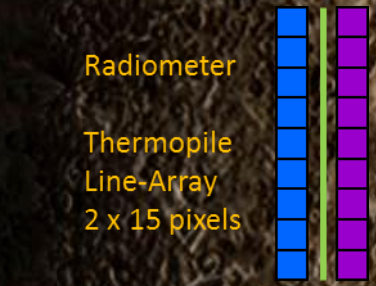
Messung der Oberflächentemperatur
Thermal characteristics determination

Infrarot Spektrometer & Radiometerkonzept

Infrared Spectrometer & Radiometer Concept







Bodenspur 2D – Abtastung

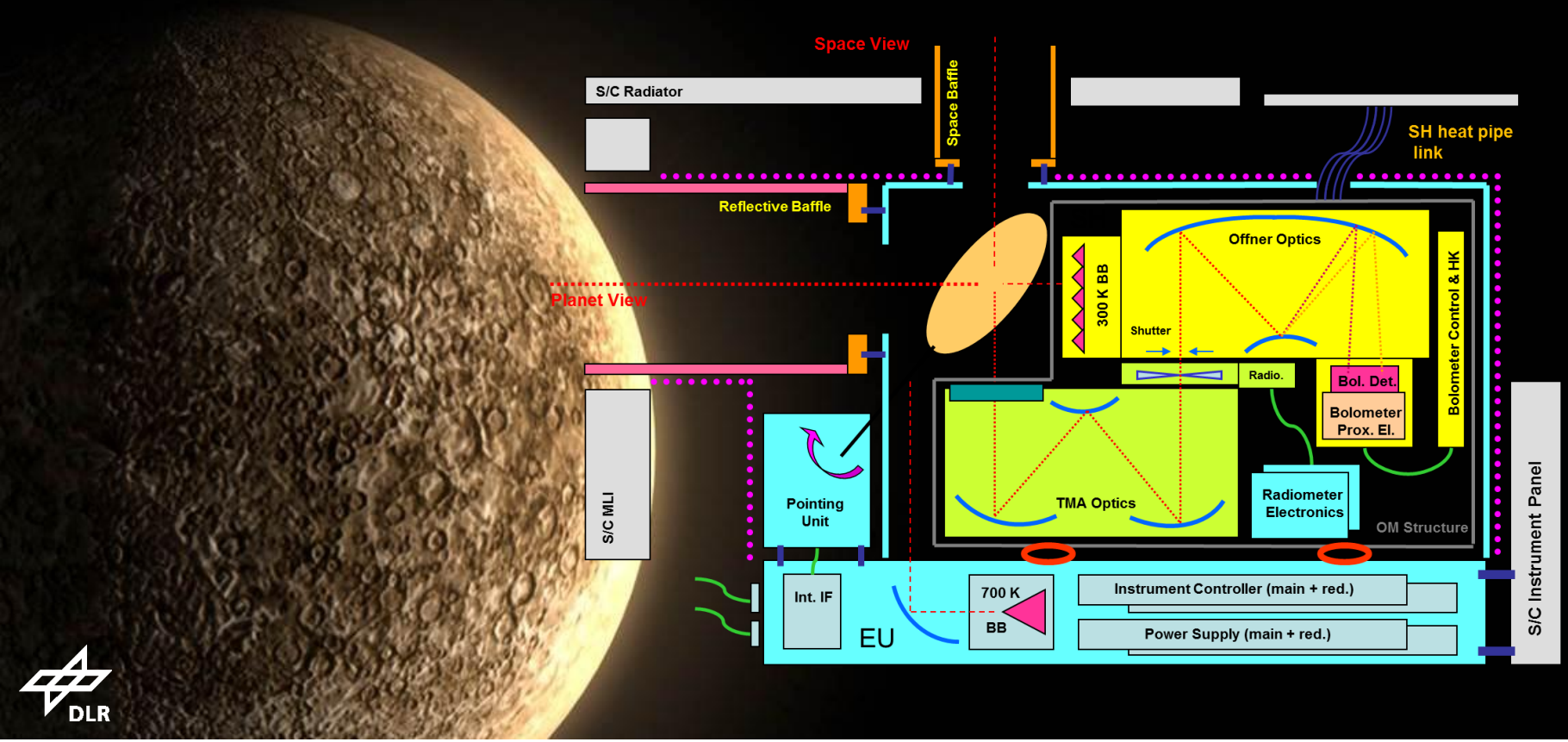
2D Pushbroom Scanner

Zweifach – Sensor – Fokalsystem

Dual sensor focal plane system

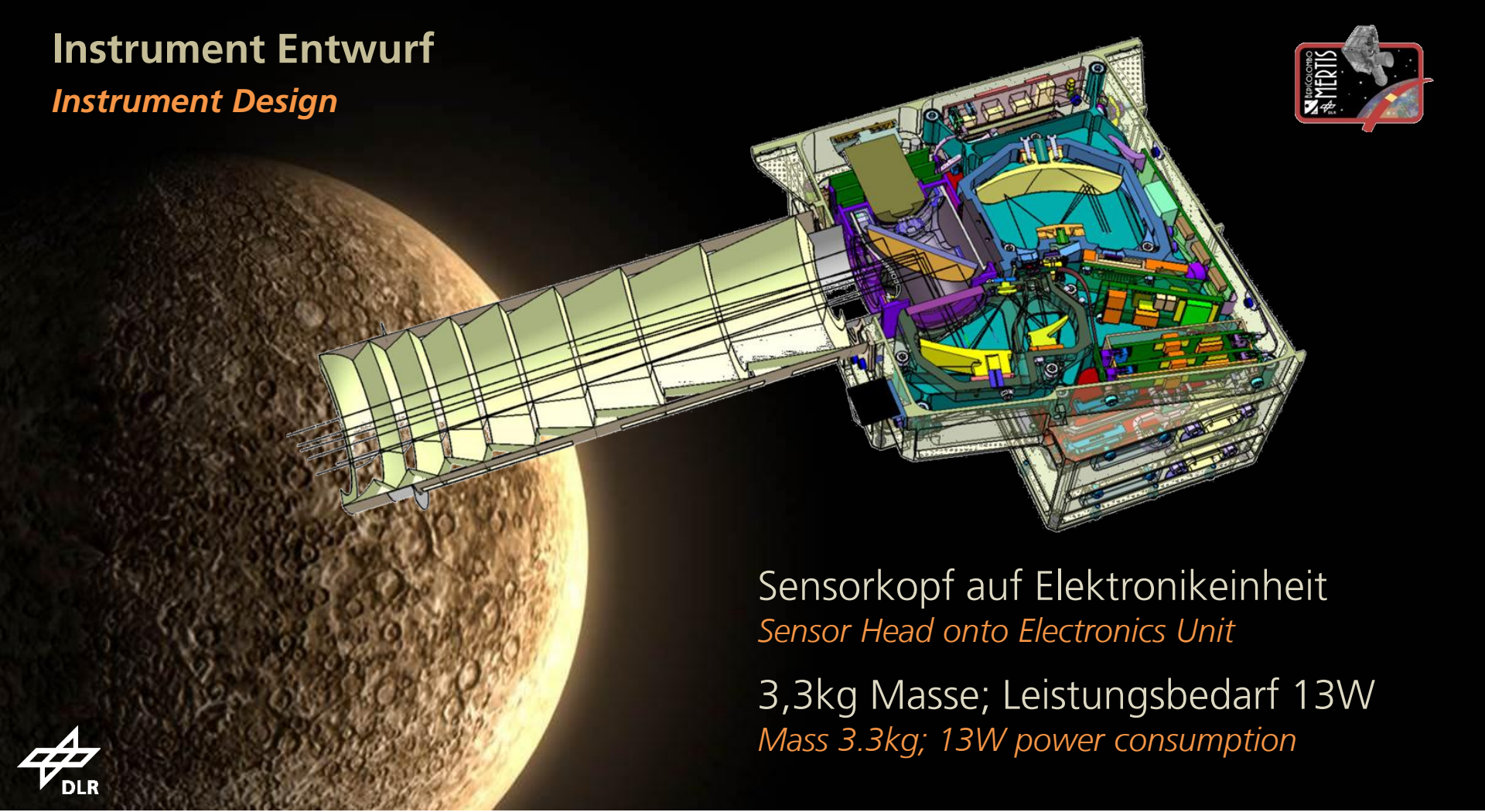
Instrument Architektur

Instrument Architecture



Instrument Entwurf

Instrument Design



Sensorkopf auf Elektronikeinheit

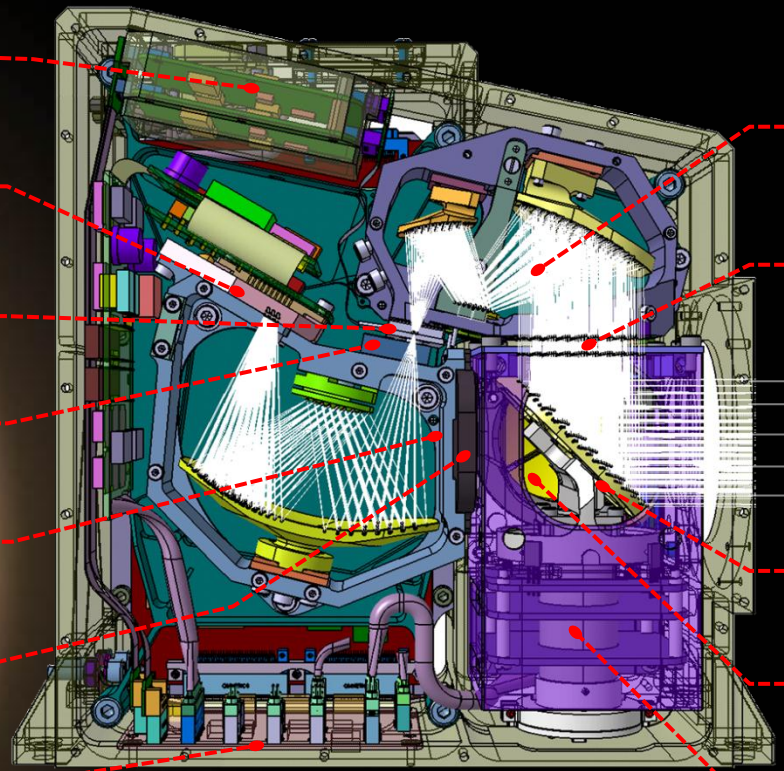
Sensor Head onto Electronics Unit

3,3kg Masse; Leistungsbedarf 13W

Mass 3.3kg; 13W power consumption

Funktionelle Einheiten

Sub-systems



- Radiometer Electronics
- Bolometer Detector & Electronics
- Radiometer Detector
- Shutter
- Spectrometer Optics
- 300 K Black Body
- Harness Board
- Entrance/ TMA Optics
- IR Entrance Filter
- Planet View Aperture
- Pointing Mirror
- 700 K Black Body
- Pointing Motor

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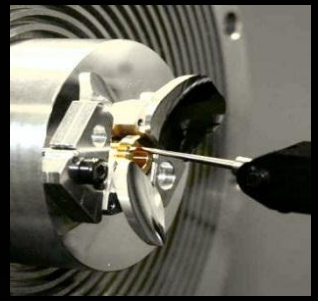
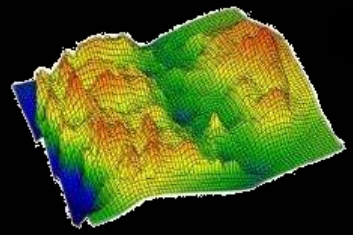
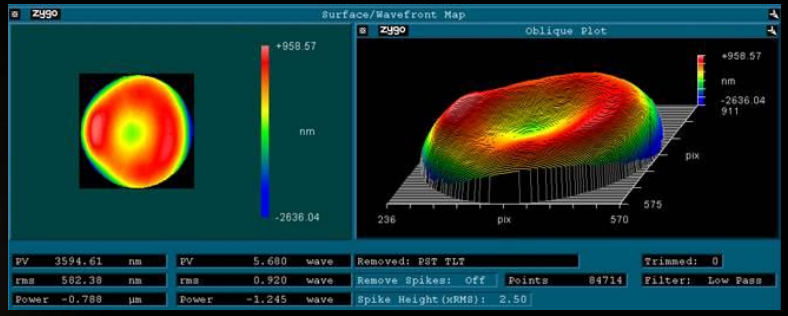
Reflektives Optiksystem

Reflective Optics System







TMA-Eingang mit Offner-Anordnung

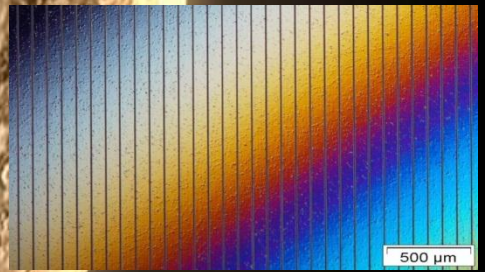
TMA entrance optics with Offner design

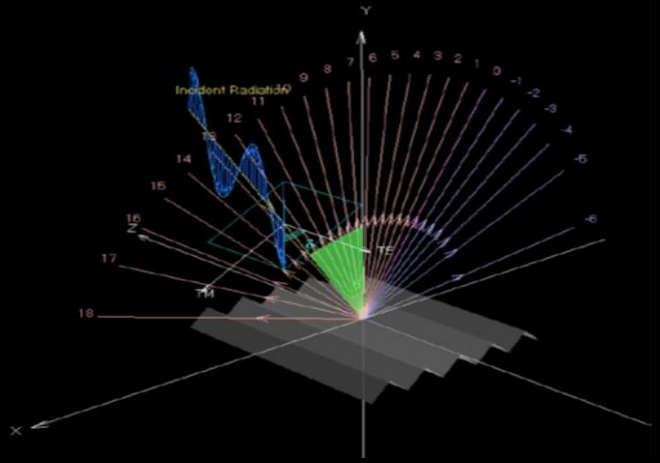
Diamant-gedrehte Al-Spiegel

Diamond turned Al mirrors

Konvexes Blaze-Gitter

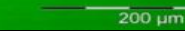
Convex blazed grating





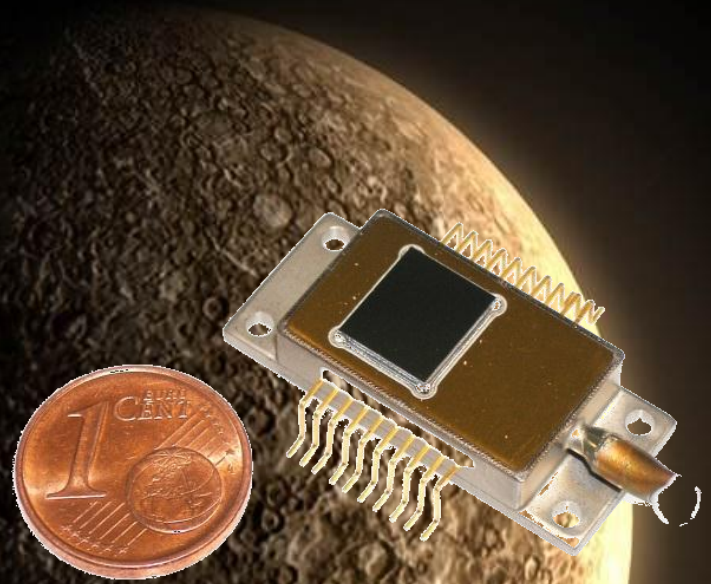
Abbildungs- und Beugungs-funktion (1. Ordnung)

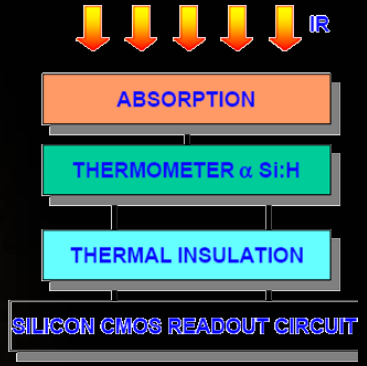
Imaging and diffraction function (1st order use)

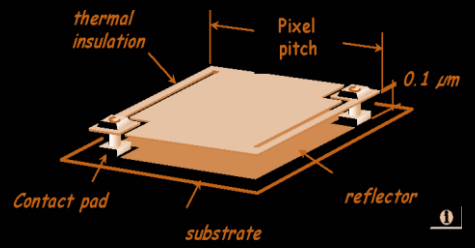


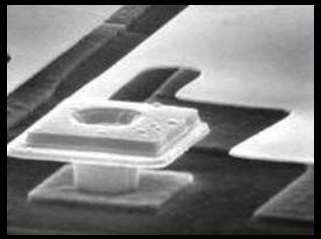
Spektrometer-Detektor

Spectrometer-Detector









Ungekühltes MEMS Mikro-Bolometer

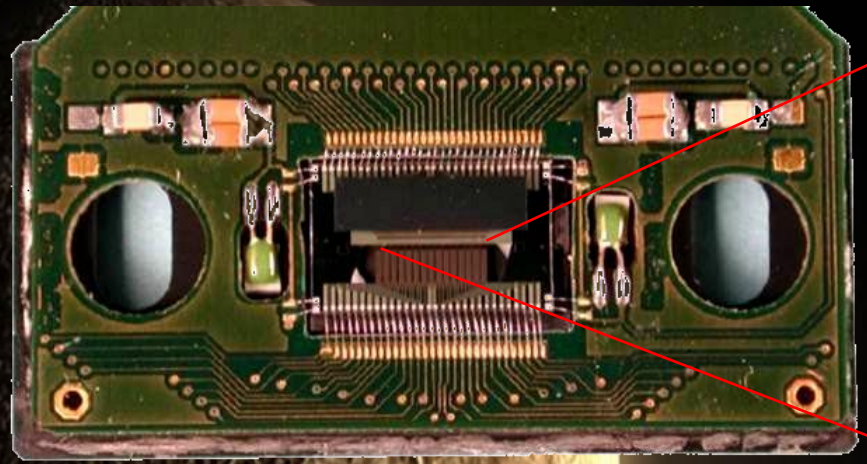
Un-cooled MEMS µ-Bolometer

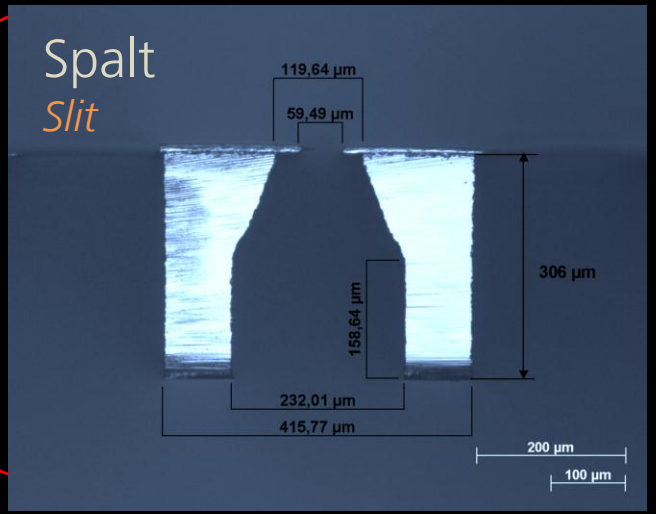
Temperatur-Stabilisierung mit Peltier

TEC temperature stabilization

Radiometer-Detektor

Radiometer-Detector



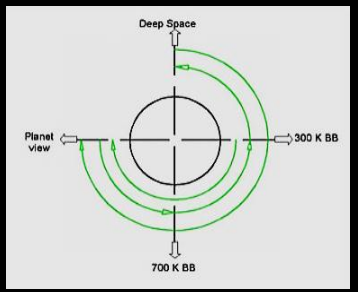


Dünnschicht-Zeilenanordnung aus Micro-Thermosäulen

Line - array of thin film µ-thermo piles

Drehspiegeleinheit

Pointing Unit



Instrument-Orientierung: Planet, Weltraum, interne Kalibration

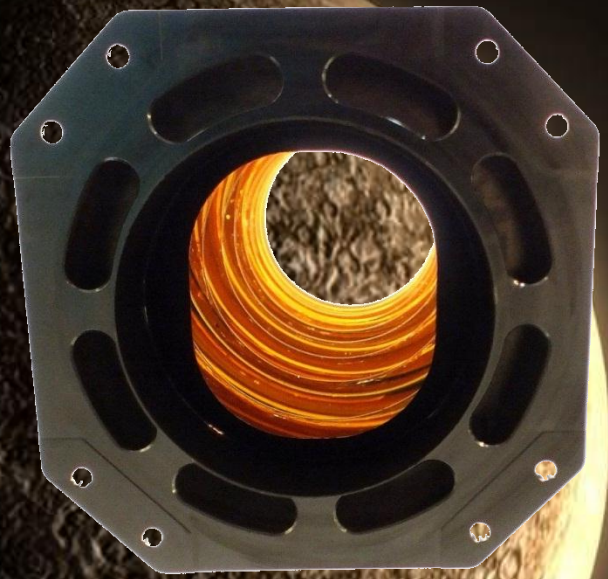
Instrument pointing towards planet, space & internal calibration sources

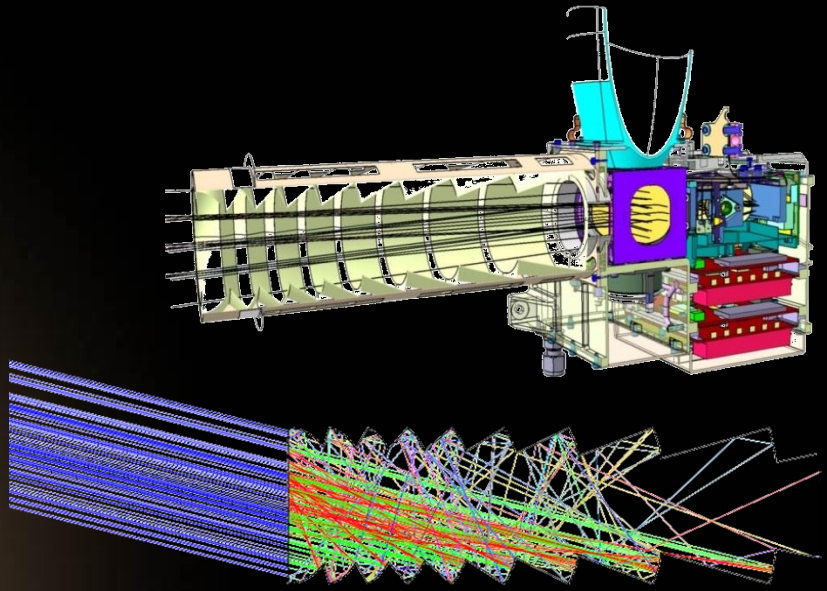
Schrittantrieb mit CSiC-Spiegel

CSiC mirror on stepper motor

Reflektive Streulichtblende

Reflective Stray-light Baffle





Leichtbaublende aus Elektroformteilen mit hoch-reflektiver Geometrie

Electro-formed light-weight baffle with high-reflective geometry

DLR

KAYSER-THREDE

An-Bord Kalibration

On-Board Calibration

Trennung Nutz- / Störsignal mit schnellem Verschluß

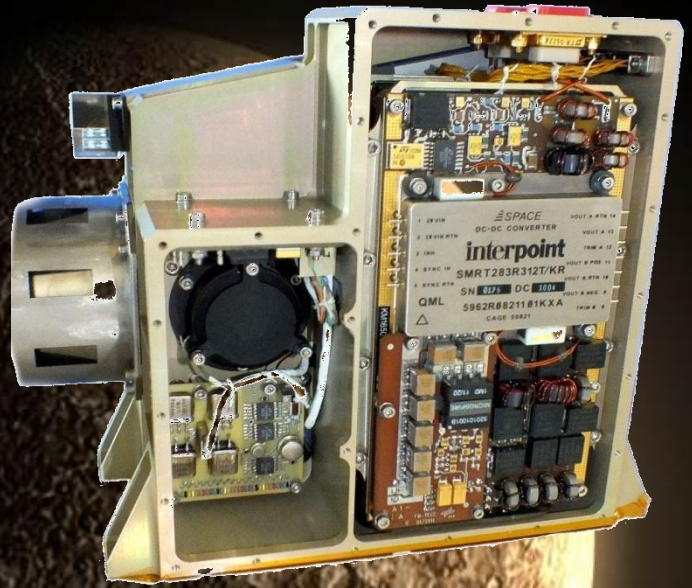
Distinguish scene from noise signals with short term shutter

Signalabgleich mit internen Schwarzkörpern

Cross calibration with black-bodies

Bordelektronik

On-Board Electronics



Instrumentensteuerung mit FPGA

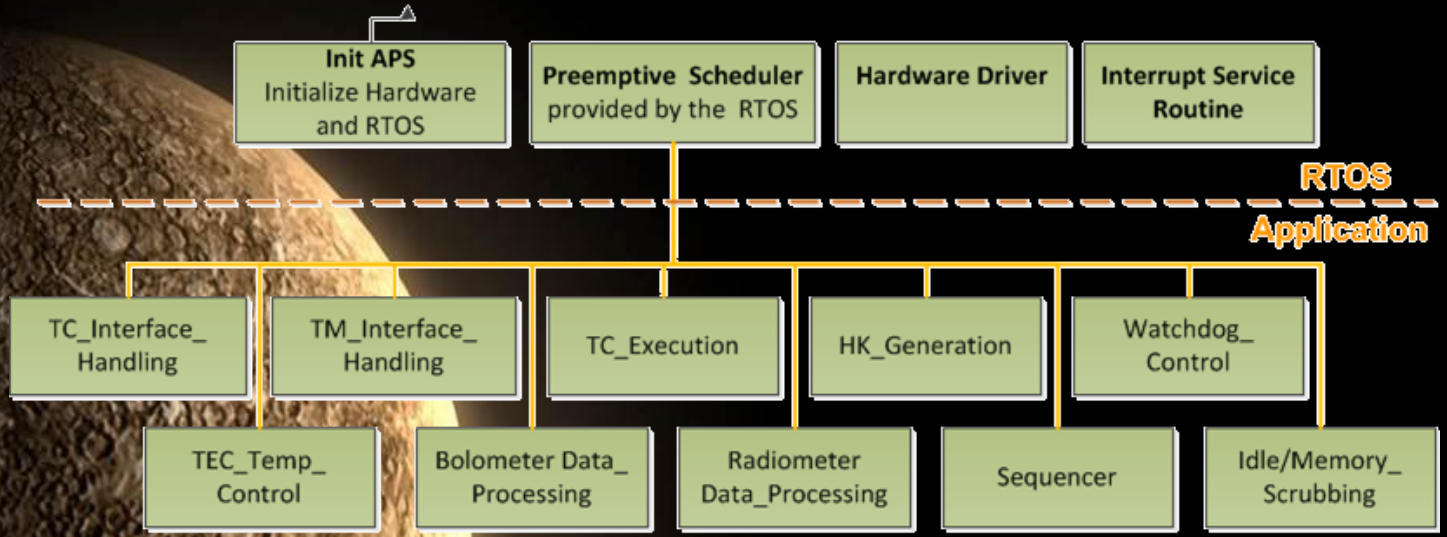
FPGA-based instrument control

Redundante Bordcomputer und Stromversorgung

Main & redundant control electronics & power supply

An-Bord Software

On-Board Software



Steuerung und Datenverarbeitung

Control and data processing

Echtzeitbetriebssystem RTEMS

Real Time Operating System RTEMS

DLR IBU

Technische Daten

Instrument Parameter

MERTIS	Spectrometer	Radiometer
Focal length	50 mm	
F-number	2	
Optical efficiency	0.54	
Detector technology	Bolometer matrix array	Thermopile line array
Number of pixel/size	160 x 120 at 35 µm (100 spatial, 80 spectral)	2 x 15 at 250 µm
Spectral range	7-14 µm	7-40 µm
Spectral channel width	90 nm/pixel	Line array 1: 7-14 µm Line array 2: 7-40 µm
Spectral resolution (λ/Δλ)	78-156	-
Detectivity	NEP < 15 pW	NEP ~ 150 pW
FOV (field of view)	4°	4°
Power consumption	8-13 W	
Instrument dimensions	180 x 180 x 130 mm^3 excl. external baffles	
Mass	3.3 kg	

DLR

ESA Raumfahrzeug

ESA Spacecraft

MERTIS - eines von 11 Instrumenten auf dem MPO (Mercury Planetary Orbiter)

MERTIS - one of 11 instruments on the MPO (Mercury Planet Orbiter)

Start August 2015 / Ariane 5

Launch August 2015 / Ariane 5