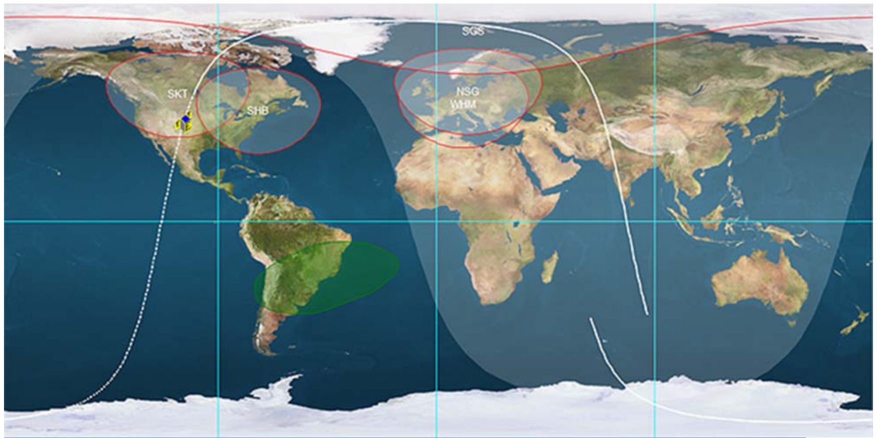
TET- the first satellite of the FIREBIRD constellation

Eckehard Lorenz
DLR OS-CV

DLR

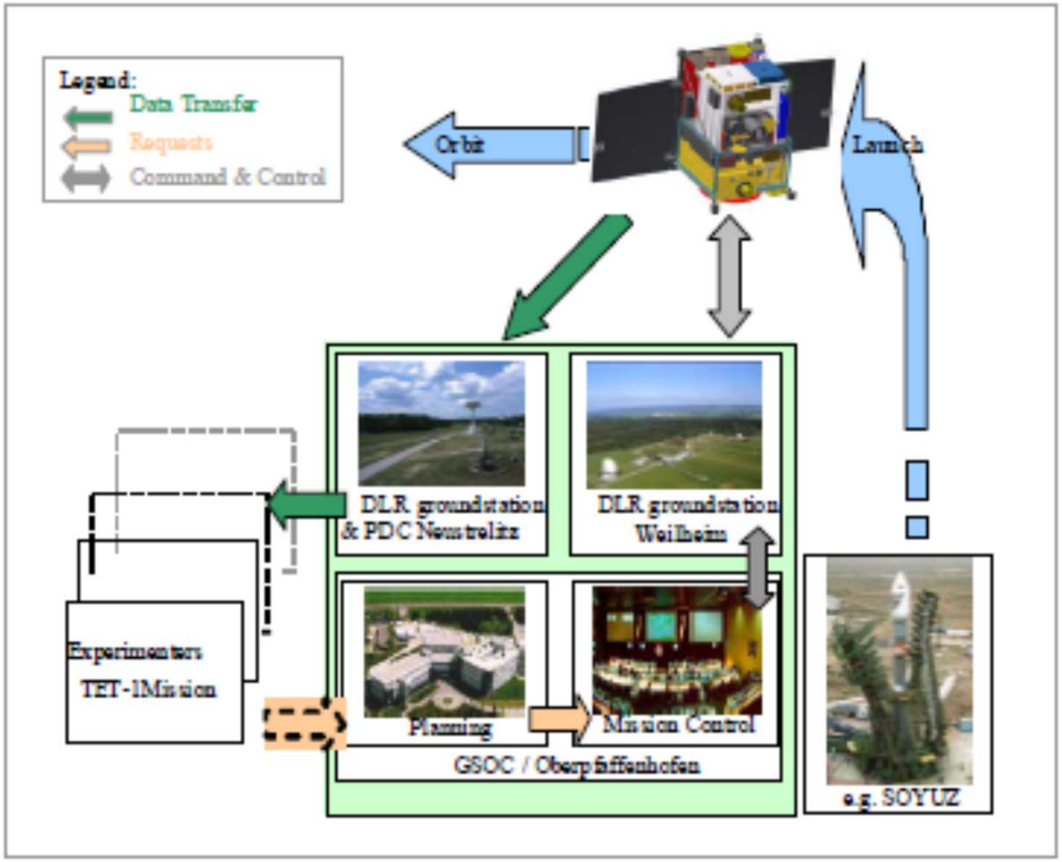
Launch of TET-1 at 22.7.2012 in Baikonur

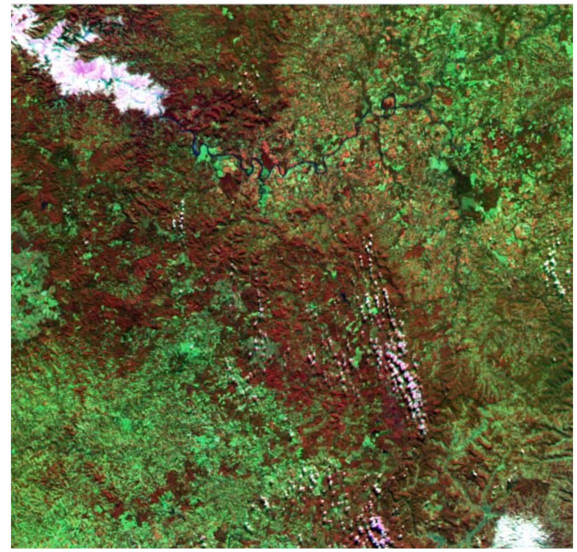


On Orbit Verification

NORAD ID: 38710
Int'l Code: 2012-039D
Perigee: 484.2 km
Apogee: 490.1 km
Inclination: 97.5 °
Period: 94.2 minutes
Semi major axis: 6858 km
Launch date: July 22, 2012
Source: Germany (GER)
Comments: TET 1 is the core element of DLR's On-Orbit Verification Program (OOV). The main aim of this program is to test new space technologies in a space environment over a period of one year. Eleven experiments will be accommodated by Kayser-Threde on-board the satellite which has a mass of 120 kg. The TET-Bus is based on the BIRD satellite

TET Mission Scenario





False color image of a scene in South Brasilia

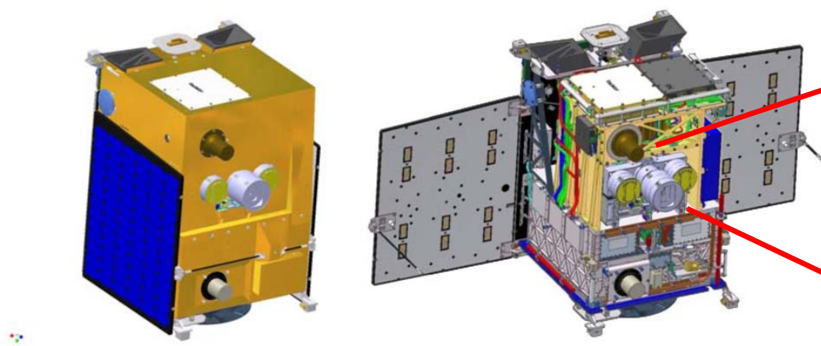
Data take at June 7. 6. 2013

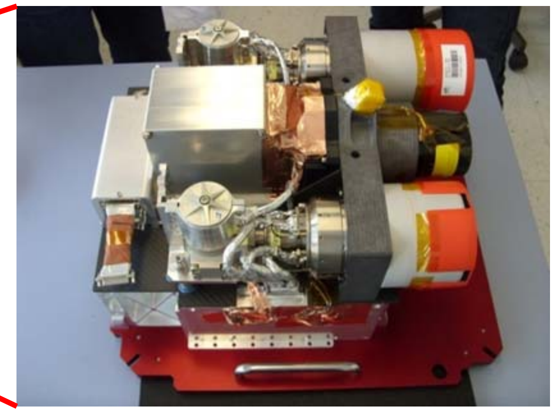
(OOV Mission Scenario)

RGB: NIR,MW, Red

General Schedule:

- July 22, 2012 up to October 30, 2013 →OOV Mission Scenario with restrictions for data takes with the IR Camera
- Starting with 1 November 2013, →FIREBIRD Mission Scenario



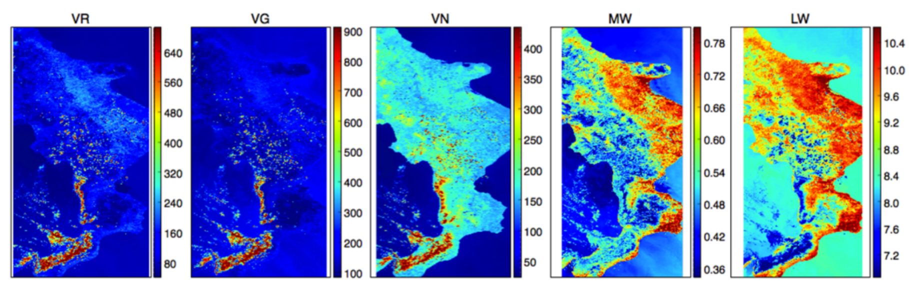


The IR Camera on TET-1

	3 line-Camera (3 line FPA)	2 Infrared- Cameras
Wave length	1 460 - 560 nm 2 565 - 725 nm 3 790 - 930 nm	MWIR: 3,4 - 4,2 µm; LWIR: 8,5-9,3 µm
Focal length	90,9 mm	46,39 mm
FOV	19,6°	19°
F-Number	3,8	2,0
Detector	CCD- Zeile	CdHgTe Arrays
Detector cooling	Passive, 20 ° C	Stirling, 80 - 100 K
Pixel size	7 µm x 7 µm	30 µm x 30 µm
Number of Pixel	3 x 5164	2 x 512 staggered
Quantization	14 bit	14 bit
Ground resolution	42,4 m [2)]	356 m [2)]
	42,4 m [2)]	178 m [2)]
Swath width	211 km [2)] km	178 km [2)]
Data rate	max 44 MBit/s nom 11,2	0,35 MBit/s
Accuracy	100m on ground	100m on ground

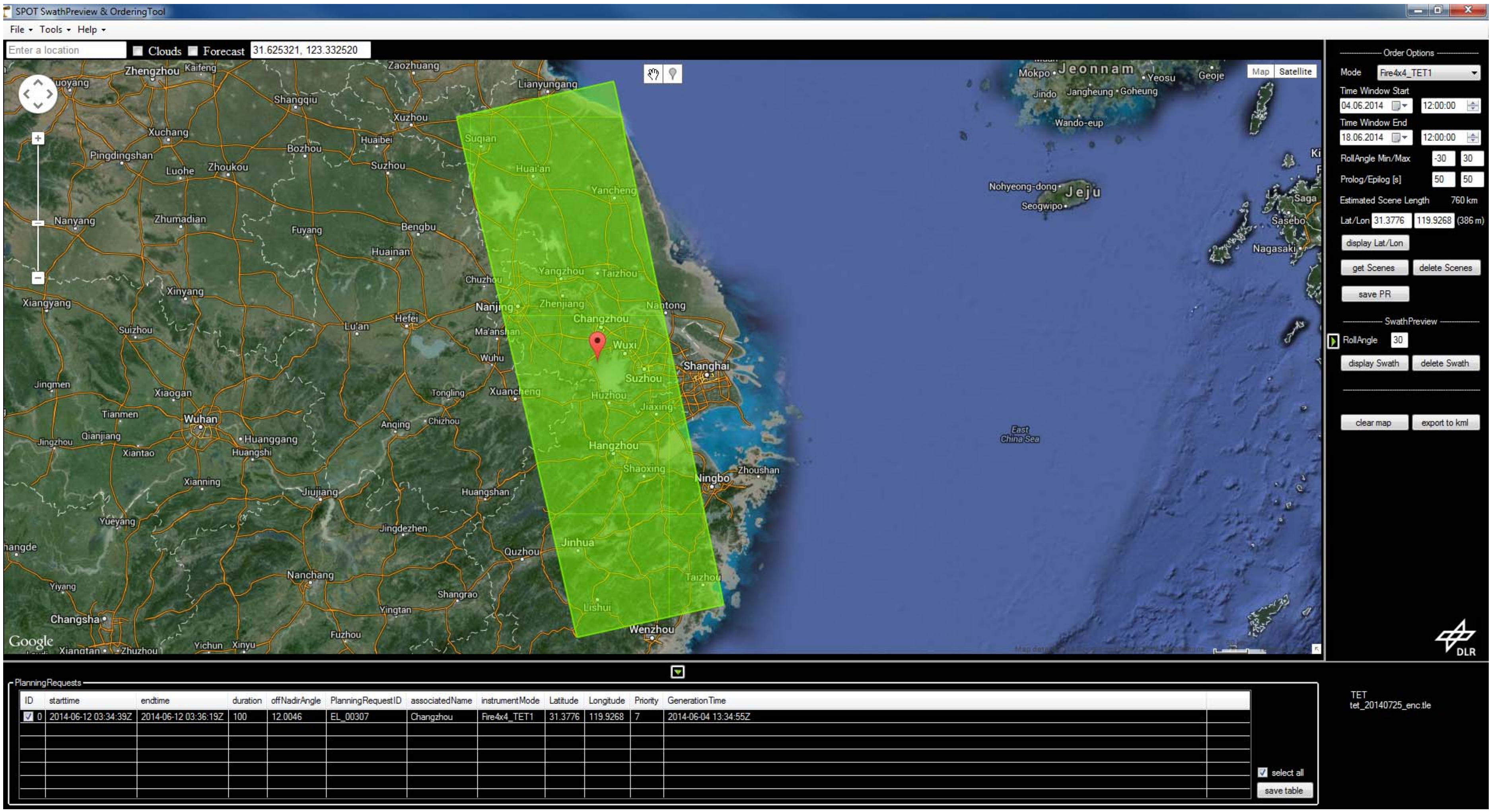
FIREBIRD Mission Scenario

is based on the IR Camera on TET-1



FIREBIRD Mission Scenario

The Ordering Tool



FIREBIRD Mission Scenario

The Standard Camera Modes

Mode	MWIR	MWIR-CAL	LWIR	LWIR-CAL	VISN	VISR	VISG	AOCS	Remarks
Fire4x4_TET1	x	x	x	x	x	x	x	x	VIS with ~160m Ground Resolution
FireNight_TET1	x	x	x	x				x	
VIS1_backward_TET1	x	x	x	x	x			x	VIS with ~40m Ground Resolution
VIS1_forward_TET1	x	x	x	x			x	x	VIS with ~40m Ground Resolution
VIS1_nadir_TET1	x	x	x	x		x		x	VIS with ~40m Ground Resolution
VIS3_TET1	x	x	x	x	x	x	x	x	VIS with ~40m Ground Resolution
SystemOrder_TET1	x	x	x	x	x	x	x	x	VIS with ~40m Ground Resolution

Name	Erw.	Größe	Datum	Attr.
[..]		<DIR>	17.07.2014 07:39	—
FBI_TET1_20140715T112546_20140715T112706_L1B_C_EL-00345_VISR_QL	png	6.679.382	17.07.2014 00:49	-a-
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FBI TET1 20140715T112334 20140715T112906 L1A C EL-00345 AOCS	ascii	113.389	17.07.2014 00:49	-a-

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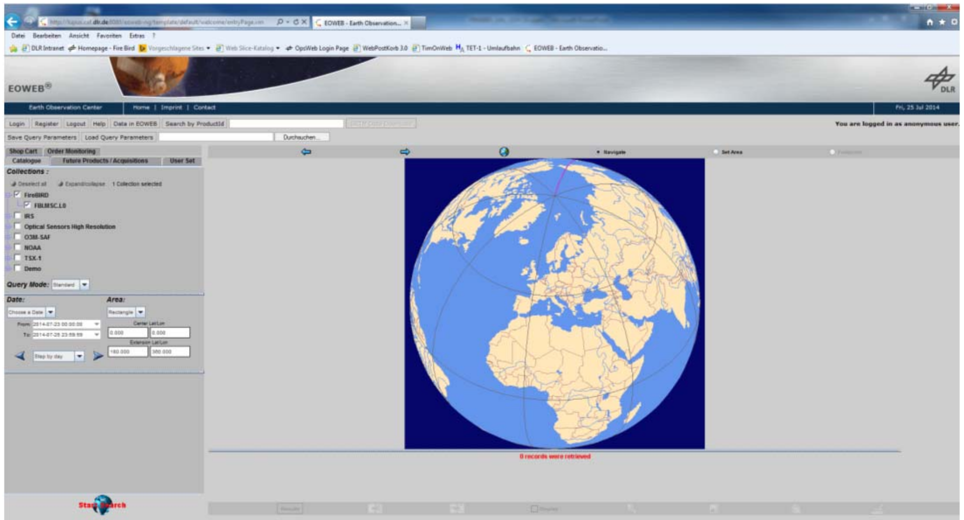
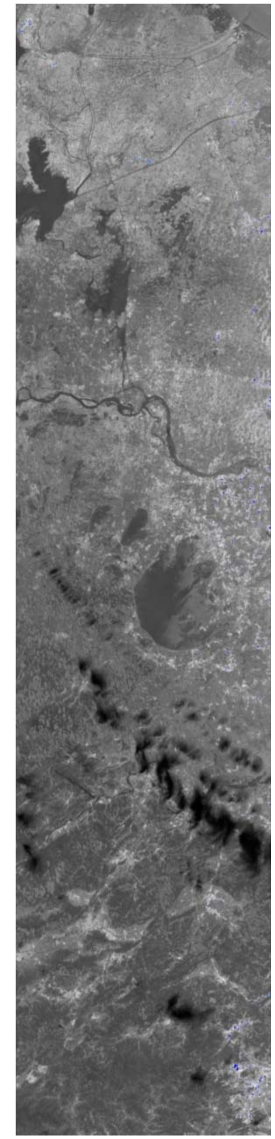
FIREBIRD Mission Scenario

The L1b Products



The EO-Web Portal

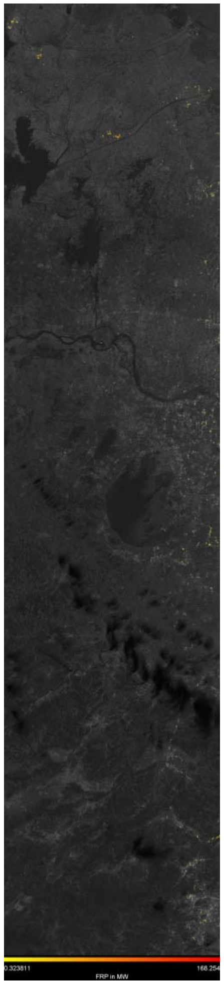
-ENVI
-file type = ENVI Standard
-acquisition time = 2014-06-12-T03:34:33.022000
-description = {FireBIRD MSC IPF V"000.014" / L1B}
-sensor type = OOV-TET1 / MSC
-bands = 1
-lines = 4532
-samples = 1023
-header offset = 0
-data type = 4
-interleave = BSQ
-byte order = 0
-coordinate system string =
- GEOGCS["GCS_WGS_1984",
- DATUM["D_WGS_1984",
- SPHEROID["WGS_1984", 6378137.0, 298.257223563]]
- PRIMEM["Greenwich", 0.0],
- UNIT["Degree", 0.01745329251994]]
-geo points = {
- 1, 1, 28.192673, 121.346534,
- 1, 4532, 34.490867, 119.758996,
- 1023, 4532, 34.239608, 117.909453,
- 1023, 1, 27.962020, 119.615899}
-pixel size = { 167.5, 149.6}
-band names = {MWIR}
-wavelength = {3.825000}
-fwhm = {0.850000}
-wavelength units = {micrometers}
-data gain values = 1.000000
-data offset values = 0.000000
-radiometric processing = 4
-geometric processing = 16
-orbit direction = Ascending
-flight orientation = Forward
-summary quality = 0

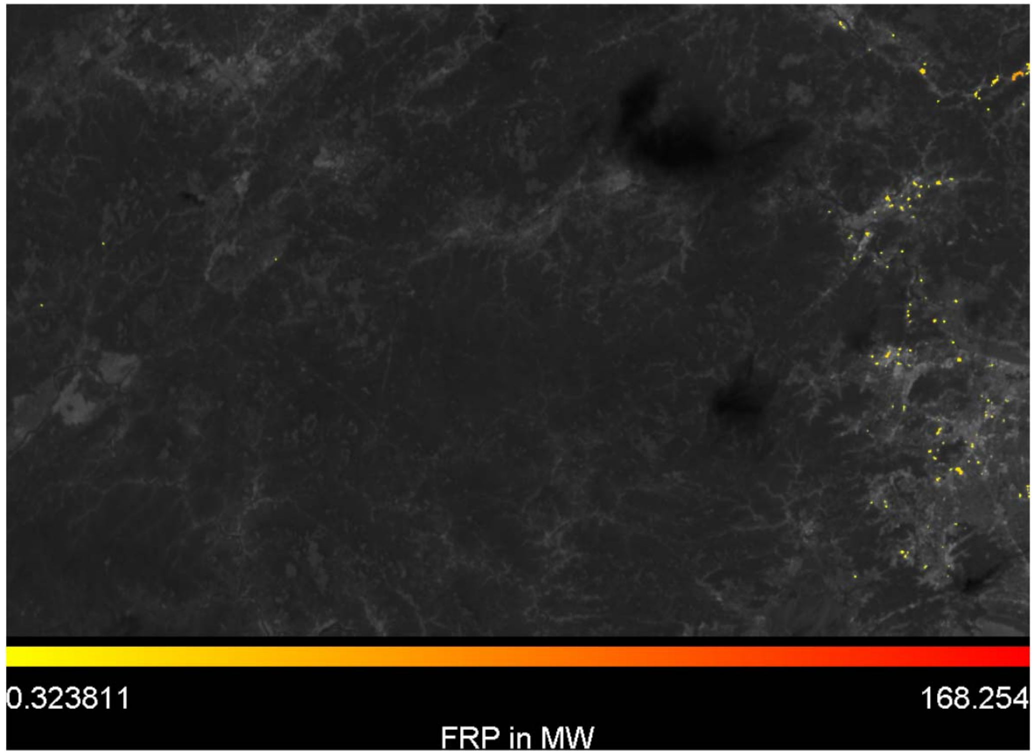


TET1_20140612T033433EL-00307_MWIR

FIREBIRD Mission Scenario

The Fire Detection Products





#size	x	y	lat	lon	sunzenith	sunglint	frp	Tmin	T	Tmax	Amin	A	Amax
4	849,418358	59,4662805	28,6939876	119,668811	8,17740114	8,17740114	4,12547816	511,252926	566,362778	686,085778	218,868998	707,104953	1462,07768
1	942	60	28,6954111	119,668451	8,17851349	8,17851349	0,51586675	626,880917	1500	1500	1,79705307	1,79705307	65,727922
5	919,737822	69,1753827	28,7082225	119,665216	8,18852947	8,18852934	3,55578922	558,446837	648,535649	973,249109	49,5544027	354,477761	914,075813

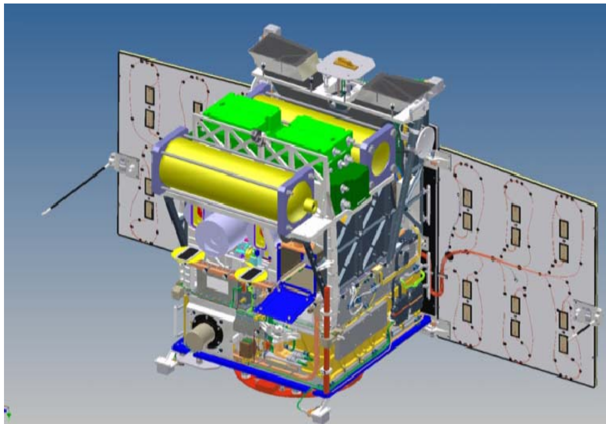
FRP Table with 580 items

TET1_20140612T033433EL-00307_FRP

Federal Ministry of Education and Research

What is FireBird ?

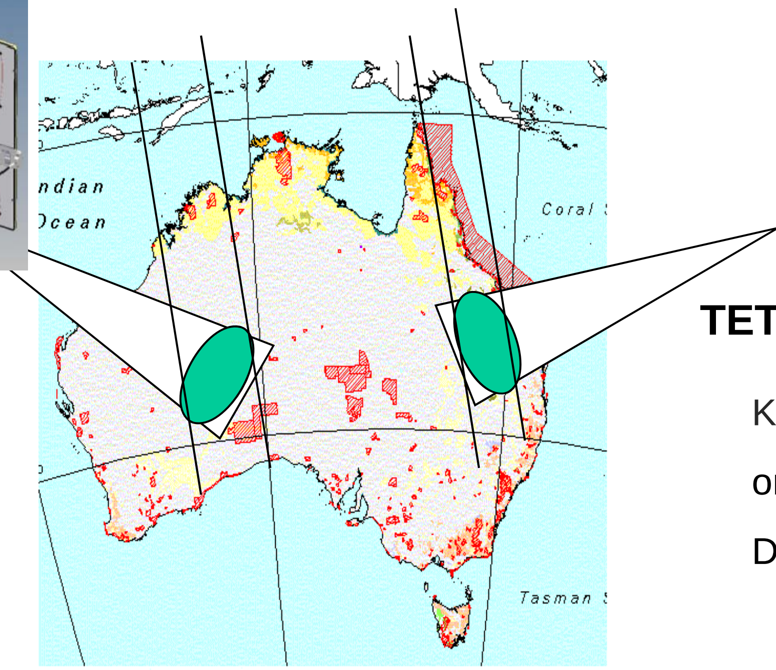
A scientific DLR mission

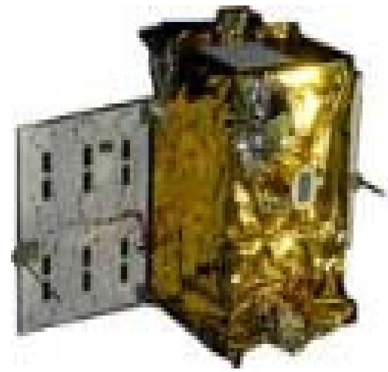


BIROS

DLR “R&D”

(4 DLR Institutes under the lead of the
Robotic and Mechatronics Cluster)





TET-1

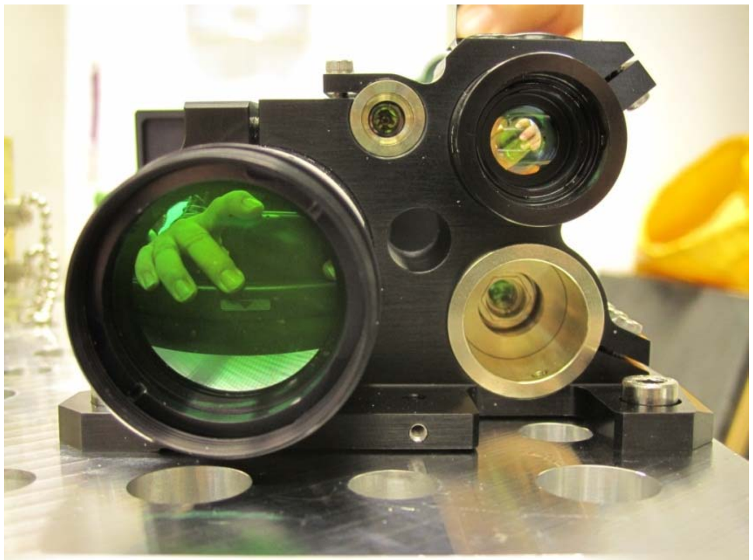
Kayser- Threde

KAYSER-THREDE

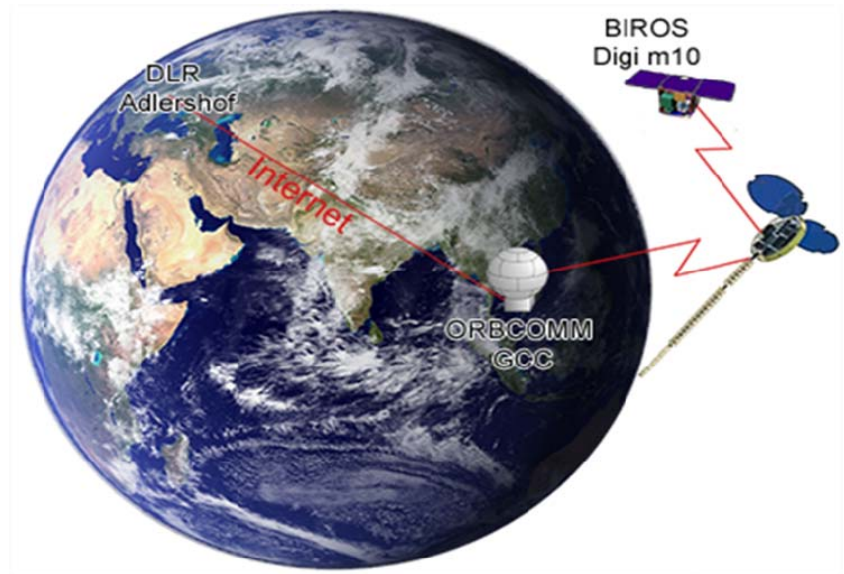
on behalf of the

DLR Space Administration

Secondary Payloads and experiments of BIROS

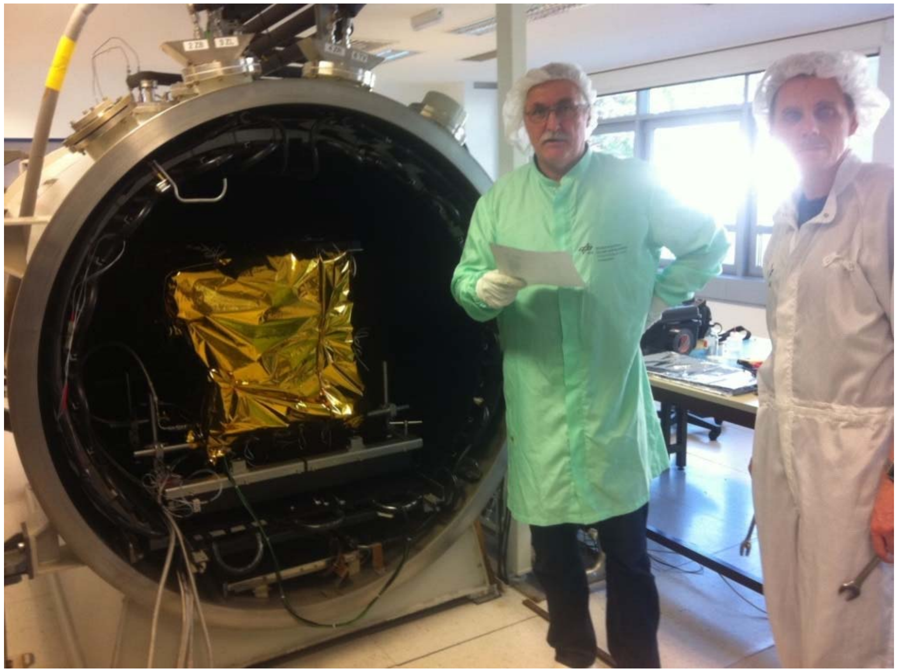


Test of a new optical downlink for data rates up to Gbit/s (named OSIRIS)



ORBCOM Modem can support the operational Downlink of low rate information like actual Fire Maps

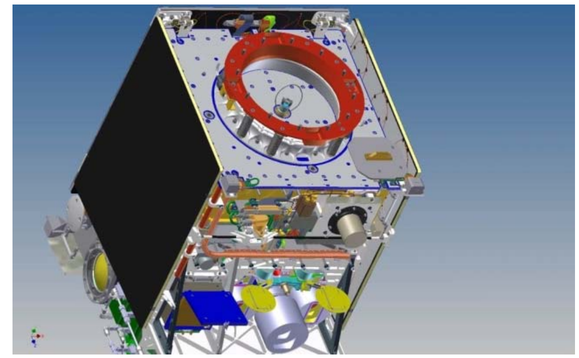
System Integration and Thermal Vacuum Verification



Payload -Integration-Room

Space Simulation Chamber

Launch of BIROS in 2015



Separation Mechanism

Preparation of Piggy-back launch on Indian PSLV C3 in 3th Quarter of 2015