



Área de Teledetección
 Dpto. Observación de la Tierra, TD y Atmósfera
 Instituto Nacional de Técnica Aeroespacial

Subject EUFAR TA UR-TIR Flight Program
 Edition 1
 Date 2011/August/16
 File EUFAR TA UR-TIR2011.FR.E1.doc
 Replace N/A
 Ref.docs. EUFAR TA UR-TIR2011.*

EUFAR TA UR-TIR 2011 BOCHUM+MUNICH+REGENSBURG FLIGHT REPORT

SCHEDULE

UR-TIR/BOCHUM (B/D01 + B/N01)

Pre-campaing meeting Monday, July 4, 2011, place & time TBD
B/D01 Nominal date Tuesday, July 5, 2011, starting at UTC10:30 (CEST12:30)
B/D01 Back-up date TBD
B/N01 Nominal date Wednesday, July 6, 2011, starting at UTC22:00 (CEST24:00)
B/N01 Back-up date TBD

UR-TIR/MUNICH+REGENSBURG (M+R/D01 & M+R/N01)

Pre-campaing meeting Monday, July 11, 2011, place & time TBD
M&R/D01 Nominal date Tuesday, July 12, 2011, starting at UTC09:50 (CEST11:50)
M&R/D01 Back-up date TBD
M&R/N01 Nominal date Wednesday, July 13, 2011, starting at UTC22:00 (CEST24:00)
M&R/N01 Back-up date TBD

FLIGHTS PERFORMED

FLIGHT 01

Flight ID **FLIGHT B/D01** AHS (master sensor) + CASI1500i diurnal survey.
Date & time of the flight July 05, 2011. Starting measurements at UTC10:33 (CEST12:33)
Test site Bochum urban area.
Purpose AHS and CASI1500i data collection.
Flight patterns BOCHUM FP01 and BOCHUM FP02.
Weather conditions Some high clouds at the West of the study area. Soft wind blowing from the West.
Coordination With the local P.O.C. (P.I.)
Summary Take off at UTC10:15 from Köln airport (EDDK). The data record starts at UTC10:33 along P01, that is flown from the South, P02 from the North, P03 with North heading and P04 to the South, Turn to the left towards the Eastern ending of P11 (crossed line) to cover it with 270°. Later on, P05 (359°), P06 (179°) and P07 (359°) lines are flown. The survey finishes at UTC12:07. Return to Köln airport.

FLIGHT B/D01 - Flight Pattern BOCHUM FP01 (P01 – P04)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P01 AHS201107051030-18.7-P01 CASI201107051030-SPEC072-P01	HD08 FILE001	10:33	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	High clouds in the Western area. Soft wind from the West. Correction drift = 1 °
AHS+CASI P02 AHS201107051030-18.7-P02 CASI201107051030-SPEC072-P02	HD08 FILE002	10:45	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	ídem.
AHS+CASI P03 AHS201107051030-18.7-P03 CASI201107051030-SPEC072-P03	HD08 FILE003	10:59	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	ídem.
AHS+CASI P04 AHS201107051030-18.7-P04 CASI201107051030-SPEC072-P04	HD08 FILE004	11:10	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	ídem.



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FLIGHT B/D01 - Flight Pattern BOCHUM FP02 (P11)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P11 AHS201107051030-18.7-P11 CASI201107051030-SPEC072-P11	HD08 FILE005	11:25	6450FT (1966m)	270°	9.71NM(18.0km)/ 4min10s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

FLIGHT B/D01 - Flight Pattern BOCHUM FP01 (Cont'd, P05 – P07)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P05 AHS201107051030-18.7-P05 CASI201107051030-SPEC072-P05	HD08 FILE006	11:39	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	High clouds.
AHS+CASI P06 AHS201107051030-18.7-P06 CASI201107051030-SPEC072-P06	HD08 FILE007	11:50	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	
AHS+CASI P07 AHS201107051030-18.7-P07 CASI201107051030-SPEC072-P07	HD08 FILE008	12:01	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

FLIGHT 02

Flight ID

Date & time of the flight

Test site

Purpose

Flight patterns

Weather conditions

Coordination

Summary

FLIGHT B/N01 AHS night survey.

July 05, 2011. Starting measurements at UTC21:36 (CEST23:36)

Bochum urban area.

AHS data collection.

BOCHUM FP01 and BOCHUM FP02.

Some high clouds over the study area, always above the flight level. Soft wind blowing from the West at the flight level.

With the local P.O.C. (P.I.)

Take off from Köln airport (EDDK) at UTC21:10. Data recording starts at UTC21:36, following the same sequence than at the noon flight. P01 is done from the South, P02 from the North, P03 with North heading and P04 to the South. Turn to the left towards the Eastern ending of P11 (cross line). Afterwards, P05 (359°), P06 (179°) and P07 (359°) lines are flown. Finally, in the way back from the North to the South, P01 is covered again with 179° geographic heading. The survey finishes at UTC23:17.

FLIGHT B/N01 - Flight Pattern BOCHUM FP01 (P01 – P04)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P01-1 AHS201107052130-18.7-P01-1	HD08 FILE009	21:36	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	High clouds over the whole area. Soft wind from the West. Drift correction of 1-2 deg.
AHS P02 AHS201107052130-18.7-P02	HD08 FILE010	21:46	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P03 AHS201107052130-18.7-P03	HD08 FILE011	21:57	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P04 AHS201107052130-18.7-P04	HD08 FILE012	22:08	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	

FLIGHT B/N01 - Flight Pattern BOCHUM FP02 (P11)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P11 AHS201107052130-18.7-P11	HD08 FILE013	22:23	6450FT (1966m)	270°	9.71NM(18.0km)/ 4min10s	18.7 Hz	N/A	



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FLIGHT B/N01 - Flight Pattern BOCHUM FP01 (Cont'd, P01 – P04 and P01)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P05 AHS201107052130-18.7-P05	HD08 FILE011	22:37	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P06 AHS201107052130-18.7-P06	HD08 FILE012	22:48	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P07 AHS201107052130-18.7-P07	HD08 FILE011	22:59	6450FT (1966m)	359°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P01-2 AHS201107052130-18.7-P01-2	HD08 FILE012	23:11	6450FT (1966m)	179°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	P01 is repeated from the North side to allow comparison with the previous measurements.

FLIGHT 03

Flight ID

Date & time of the flight

Test site

Purpose

Flight patterns

Weather conditions

Coordination Summary

FLIGHT M&R/D01 AHS (master sensor) + CASI1500i diurnal survey.

July 12, 2011. Starting measurements at UTC09:36 (CEST11:36)

Munich and Regensburg urban areas.

AHS and CASI1500i data collection.

MUNICH FP01*, MUNICH FP02, REGENSBURG FP01 and REGENSBURG FP02.

(MUNICH FP01* corresponds to a modified flight pattern to minimize the time in the area: number of lines are reduced up to six, considering an AHS side overlap of 25% between adjacent lines).

Presence of some high clouds in the South, in the limit of the study area. Wind from the West at the flight level.

With the local P.O.C.

Take off at UTC09:30 from Oberpfaffenhofen airport (EDMO). Data record starts at UTC09:36 keeping a MSL8000FT flight level (instead of the nominal at MSL7850FT) due to ATC restrictions. All the lines are started from the South due to ATC restrictions as well. Munich airport is operating in 080 configuration what facilitates the execution of the flight lines. Approach segment distances have to be reduced at minimum and, in some of the lines, data recording have to be interrupted a bit earlier than the arrival to the ending point in the North, following the instructions of the controller in charge to avoid conflicts with other traffics in the area. The most Eastern line is done first, P06 with 002° true heading, later P05 and P04, turn to the right to cover P11 following a 270° heading, and P03, P02 and P01 always from the South. At UTC11:14 the Munich area survey is over. The aircraft proceeds to Regensburg. Some pop up clouds are found at the North of city, below flight level (MSL7200FT). N-S flight lines are covered first to avoid the possible irruption of clouds, with opposite headings to speed up the survey. Afterwards, the crossed line P31 is flown from the East. The survey is finished at UTC12:00. Return to Oberpfaffenhofen airport.

FLIGHT M&R/D01 - Flight Pattern MUNICH FP01* (P06 to P04)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P06 AHS201107120950-18.7-P06 CASI201107120950-SPEC072-P06	HD08 FILE018	09:36	8000FT (2438m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. aperture	Wind from the West. Correction drift = 4° - 5°
AHS+CASI P05 AHS201107120950-18.7-P05 CASI201107120950-SPEC072-P05	HD08 FILE019	09:54	8000FT (2438m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	
AHS+CASI P04 AHS201107120950-18.7-P04 CASI201107120950-SPEC072-P04	HD08 FILE020	10:11	8000FT (2438m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

MUNICH FP01*: six parallel flight lines with a 25% of side overlap (nominal value that is increased up to 27% due to the higher flight level)



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FLIGHT M&R/D01 - Flight Pattern MUNICH FP02 (P11)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P11 AHS201107120950-18.7-P11 CASI201107120950-SPEC072-P1	HD08 FILE021	10:24	8000FT (2438m)	270°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

FLIGHT M&R/D01 - Flight Pattern MUNICH FP01* (Cont'd, P03 to P01)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P03 AHS201107120950-18.7-P03 CASI201107120950-SPEC072-P03	HD08 FILE022	10:36	8000FT (2438m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	Wind from the West. Correction drift = 4° - 5°
AHS+CASI P02 AHS201107120950-18.7-P02 CASI201107120950-SPEC072-P02	HD08 FILE023	10:52	8000FT (2438m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	
AHS+CASI P01 AHS201107120950-18.7-P01 CASI201107120950-SPEC072-P01	HD08 FILE024	11:08	8000FT (2438m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

FLIGHT M&R/D01 - Flight Pattern REGENSBURG FP01 (P21 – P23)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P21 AHS201107120950-18.7-P21 CASI201107120950-SPEC072-P21	HD08 FILE025	11:31	7200FT (2195m)	002°	6.45NM(12.0km)/ 2min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	Pop-up clouds coming from the North. Wind from the West. Few high clouds over the area.
AHS+CASI P22 AHS201107120950-18.7-P22 CASI201107120950-SPEC072-P22	HD08 FILE026	11:39	7200FT (2195m)	182°	6.45NM(12.0km)/ 2min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	
AHS+CASI P23 AHS201107120950-18.7-P23 CASI201107120950-SPEC072-P23	HD08 FILE027	11:47	7200FT (2195m)	002°	6.45NM(12.0km)/ 2min47s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

FLIGHT M&R/D01 - Flight Pattern REGENSBURG FP02 (P31)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS+CASI P31 AHS201107120950-18.7-P31 CASI201107120950-SPEC072-P31	HD08 FILE028	11:57	7200FT (2195m)	002°	4.32NM(8.0km)/ 1min51s	18.7 Hz	SPECTRAL 072 BANDS IT=12ms RS=4 Max. apert.	

FLIGHT 04

Flight ID

Date & time of the flight

Test site

Purpose

Flight patterns

Weather conditions

Coordination

Summary

FLIGHT M&R/N01 AHS night survey.

July 12, 2011 starting measurements at UTC21:20 (CEST23:20)

Munich and Regensburg urban areas.

AHS data collection.

MUNICH FP01*, MUNICH FP02, REGENSBURG FP01 and REGENSBURG FP02.

(MUNICH FP01* corresponds to a modified flight pattern to minimize the time in the area: number of lines are reduced up to six, considering an AHS side overlap of 25% between adjacent lines).

Presence of high clouds in the study area, reported by METAR to be at 15000FT. Storms in the SW with heavy lightning. Soft wind blowing from the West at the flight level.

With the local P.O.C.

Take off at UTC21:05 from Oberpfaffenhofen airport (EDMO). Data record starts at UTC21:20 keeping a flight level of MSL7850FT. P06 line is done from the South (002°), P05 from the North and P04 from the South. Then, P11 is flown with 270° and later on, turning to the left P03 is made with a 002° heading, P02 with 182° and P01 with 002°. Night AHS survey over Munich is over at UTC22:34. The airplane proceeds to Regensburg area, that appears clear of clouds below the flight level. At UTC22:52, P21 is started from the South (002°), later on, P22 is done with opposite heading, 182°, and P23 with 002°. To finish, P31, the transversal line, is done from the East. The measurements are completed at UTC23:22. The airplane comes back to EDMO.



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FLIGHT M&R/N01 - Flight Pattern MUNICH FP01* (P06 to P04)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P06 AHS201107122100-18.7-P06	HD08 FILE029	21:20	7850FT (2393m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	N/A	High clouds. Wind from the west. Drift correction = 2° - 3°
AHS P05 AHS201107122100-18.7-P05	HD08 FILE030	21:29	7850FT (2393m)	182°	13.5NM(25.0km)/ 5min47s	18.7 Hz	N/A	
AHS P04 AHS201107122100-18.7-P04	HD08 FILE031	21:40	7850FT (2393m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	N/A	

MUNICH FP01*: six parallel flight lines with a 25% of side overlap (nominal value that is increased up to 27% due to the higher flight level)

FLIGHT M&R/N01 - Flight Pattern MUNICH FP02 (P11)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P11 AHS201107122100-18.7-P11	HD08 FILE032	21:54	7850FT (2393m)	270°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	

FLIGHT M&R/N01 - Flight Pattern MUNICH FP01* (P03 to P01)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P03 AHS201107122100-18.7-P03	HD08 FILE033	22:07	7850FT (2393m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	N/A	
AHS P02 AHS201107122100-18.7-P02	HD08 FILE034	22:17	7850FT (2393m)	182°	13.5NM(25.0km)/ 5min47s	18.7 Hz	N/A	
AHS P01 AHS201107122100-18.7-P01	HD08 FILE035	22:27	7850FT (2393m)	002°	13.5NM(25.0km)/ 5min47s	18.7 Hz	N/A	

FLIGHT M&R/N01 - Flight Pattern REGENSBURG FP01 (P21 – P23)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P21 AHS201107122100-18.7-P21	HD08 FILE036	22:52	7200FT (2195m)	002°	6.45NM(12.0km)/ 2min47s	18.7 Hz	N/A	Thin layer of high clouds.
AHS P22 AHS201107122100-18.7-P22	HD08 FILE037	23:00	7200FT (2195m)	182°	6.45NM(12.0km)/ 2min47s	18.7 Hz	N/A	
AHS P23 AHS201107122100-18.7-P23	HD08 FILE038	23:09	7200FT (2195m)	002°	6.45NM(12.0km)/ 2min47s	18.7 Hz	N/A	

FLIGHT M&R/N01 - Flight Pattern REGENSBURG FP02 (P31)

FLIGHT LINE ID.	AHS RECORDING ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN-RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P31 AHS201107122100-18.7-P31	HD08 FILE039	23:20	7200FT (2195m)	270°	4.32NM(8.0km)/ 1min51s	18.7 Hz	N/A	



FLIGHT DATA & SENSOR SETTINGS

AIRCRAFT

Nominal aircraft ground speed
 Altitude above ground level
 Mean ground elevation
 BOCHUM site
 MUNICH site
 REGENSBURG site

Positioning

CASA 212-200 S/N270, "Paternina" (EADS)

GS 72ms⁻¹ (140KTS)
 AGL 1839m (6033FT)

ELEV 120m (394FT)

ELEV 550m (1804FT)

ELEV 360m (1181FT)

Real-Time DGPS based in StarFire constellation.

HYPERSPECTRAL SENSOR #1

Installation
 Positioning & orientation

IMU installation

Set up lever arms

Boresight calibration flight

Scan rate

IFOV/FOV/OFFSET

Number of pixels per scan-line

Pixel size @ nadir

GSD @ nadir

Swath

Flight-line side-overlapping

AHS (S/N 001) (ArgonST)

on the main cabin floor front window

Applanix POS/AV 410 V5

(PCS S/N 2336 IMU LN200 S/N 402296)

On AHS scan head. ACTIVE

(See note 1 below)

Fulfilled on 28/April/2011 in Villacañas (Toledo)

18.7rps @ m (AGL6562FT)

2.5mrad / 1.571rad (90degrees)

750 pixels

4.6m @ 1839m&72ms⁻¹(AGL6033FT&GS140KTS)

3.9m @ 1839m&72ms⁻¹(AGL6033FT&GS140KTS)

3678m @ AGL1839m (AGL6033FT)

BOCHUM FP01 and REGENSBURG FP01 40%
 MUNICH FP01* 25%

BOCHUM FP02, MUNICH FP02 and
 REGENSBURG FP02 N/A

Along-track scan-line overlap

Internal thermal reference sources

16% @ 72ms⁻¹(GS140KTS)

FLIGHT 01-B/D01 T_{BB1}=283K(10°C) T_{BB2}=320K(47°C)

FLIGHT 02-B/N01 T_{BB1}=279K(6°C) T_{BB2}=313K(40°C)

FLIGHT 03-M&R/D01 T_{BB1}=280K(7°C) T_{BB2}=318K(45°C)

FLIGHT 04-M&R/N01 T_{BB1}=279K(6°C) T_{BB2}=313K(40°C)

Spectral configuration

80 spectral channels (VNIR, SWIR, MWIR & LWIR)

Port 1+ Port 2A + Port 2 + Port 3 + Port 4

(See note 2)

Calibration date

April 2011

(Further information about AHS can be found at www.inta.es and www.crepad.rcanaria.es/info/npoc/indexlab.html)

Note 1. "Lever Arms" for AHS scan head mounted on the front nadir-looking window.

Ref. to IMU lever arm

X(m) = -0.2961
 Y(m) = +0.2309
 Z(m) = -0.2720

Ref. to primary GPS lever arm

X(m) = -0.200
 Y(m) = -0.006
 Z(m) = -2.253

Note 2. AHS spectral configuration characterized on April 2011 after system spectral characterisation.

(Further information about AHS can be found at www.inta.es and www.crepad.rcanaria.es/info/npoc/indexlab.html)



HYPERSPECTRAL SENSOR #2

Installation
 Positioning & orientation

 IMU installation
 Set up lever arms
 Boresight calibration/bundle adjustment flight
 Operating mode
 Integration Time
 IFOV/FOV
 Number of pixels per line
 Pixel size/GSD @ nadir

 Swath
 Flight-line side-overlapping
 Calibration date

CASI-1500i (S/N 2516) (Itres Research Limited)
 on the main cabin floor rear window
 Applanix POS/AV 410 V5
 (PCS S/N 2335 IMU LN200 S/N 414187)
 In CASI-1500i sensor head unit. ACTIVE
 See note 3 below.
 28/April/2011 BAF in Villacañas (Toledo)
 SPECTral mode, 72 bands, SPEC072 (RS=4)
 12ms
 0.49mrad / 0.698rad (40degrees)
 1440 pixels (spectral mode)
 Across track 0.90m @ 1839m (AGL6033FT)
 Along track 0.86m @ $IT12ms \& 72ms^{-1}$ (GS140KTS)
 1339m @ AGL1839m (AGL6033FT)
 N/A
 June 2011

(Further information about CASI-1500i can be found at www.inta.es, www.crepad.rcanaria.es/info/npoc/indexlab.html and www.itres.com)

Note 3. "Lever arms" for CASI-1500i SHU mounted on the rear nadir-looking window.
 Ref. to IMU lever arm

X(m) = +0.155
 Y(m) = -0.053
 Z(m) = +0.063

Ref. to primary GPS lever arm

X(m) = +0.782
 Y(m) = +0.029
 Z(m) = -2.045

COORDINATES OF STARTING AND ENDING POINTS

WGS84/ETRS89	LAT (DMX)	LONG (DMX)	ALT MSL
P01N	N51 32.947'	E007 08.275'	6450FT
P01S	N51 22.166'	E007 08.575'	6450FT
P02N	N51 32.948'	E007 10.183'	6450FT
P02S	N51 22.167'	E007 10.484'	6450FT
P03N	N51 32.949'	E007 12.092'	6450FT
P03S	N51 22.168'	E007 12.392'	6450FT
P04N	N51 32.949'	E007 14.000'	6450FT
P04S	N51 22.168'	E007 14.301'	6450FT
P05N	N51 32.949'	E007 15.909'	6450FT
P05S	N51 22.168'	E007 16.209'	6450FT
P06N	N51 32.948'	E007 17.817'	6450FT
P06S	N51 22.167'	E007 18.118'	6450FT
P07N	N51 32.947'	E007 19.726'	6450FT
P07S	N51 22.166'	E007 20.026'	6450FT

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BOCHUM FP01 flight pattern at MSL6450FT

Flight lines co-ordinates in geographic WGS84/ETRS89 system.

WGS84/ETRS89	LAT (DMX)	LONG (DMX)	ALT MSL
P11W	N51 27.559'	E007 06.522'	6450FT
P11E	N51 27.542'	E007 22.057'	6450FT

EUFAR TA UR-TIR 2011

BOCHUM FP02 flight pattern at MSL6450FT

Flight lines co-ordinates in geographic WGS84/ETRS89 system.

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P01N	N48	13.538'	E011	30.081'	7850FT
P01S	N48	0.057'	E011	29.380'	7850FT
P02N	N48	13.540'	E011	32.309'	7850FT
P02S	N48	0.059'	E011	31.608'	7850FT
P03N	N48	13.541'	E011	34.537'	7850FT
P03S	N48	0.059'	E011	33.835'	7850FT
P04N	N48	13.541'	E011	36.766'	7850FT
P04S	N48	0.059'	E011	36.064'	7850FT
P05N	N48	13.540'	E011	38.993'	7850FT
P05S	N48	0.059'	E011	38.292'	7850FT
P06N	N48	13.538'	E011	41.221'	7850FT
P06S	N48	0.057'	E011	40.520'	7850FT

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MUNICH FP01* flight pattern at MSL7850FT

Re-designed flight pattern over Munich considering an AHS side-overlapping of 25% between adjacent flight lines to reduce the required flight time in the area (ATC constrains).

Flight lines co-ordinates in geographic WGS84/ETRS89 system.

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P11W	N48	6.796'	E011	27.170'	7850FT
P11E	N48	6.777'	E011	43.284'	7850FT

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MUNICH FP02 flight pattern at MSL7850FT

Flight lines co-ordinates in geographic WGS84/ETRS89 system.

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P21N	N49	4.086'	E012	04.595'	7200FT
P21S	N48	57.616'	E012	04.252'	7200FT
P22N	N49	4.086'	E012	06.407'	7200FT
P22S	N48	57.616'	E012	06.064'	7200FT
P23N	N49	4.086'	E012	08.219'	7200FT
P23S	N48	57.616'	E012	07.876'	7200FT

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REGENSBURG FP01 flight pattern at MSL7200FT

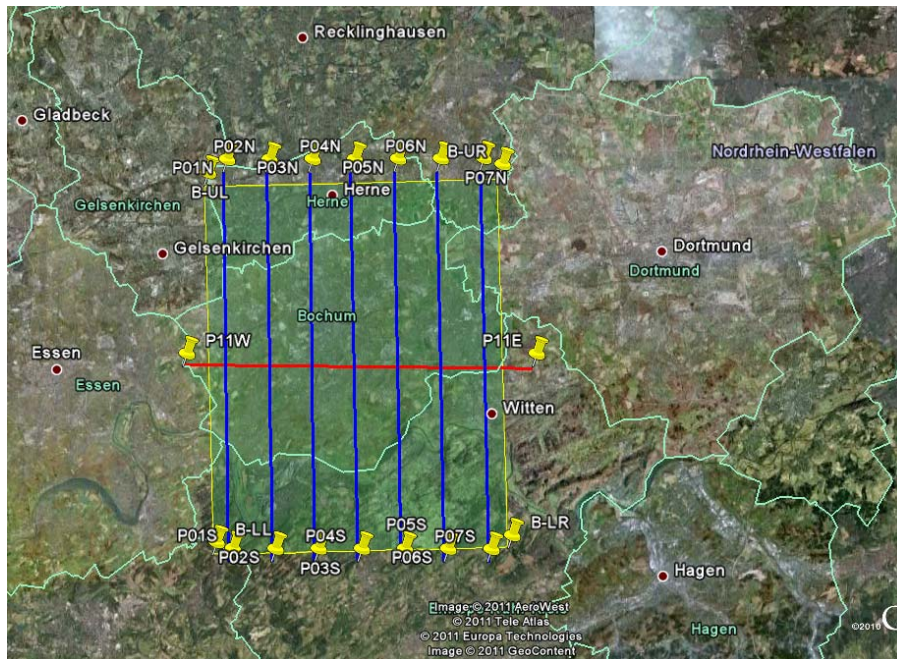
Flight lines co-ordinates in geographic WGS84/ETRS89 system.

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P31W	N49	0.848'	E012	03.179'	7200FT
P31E	N49	0.845'	E012	09.740'	7200FT

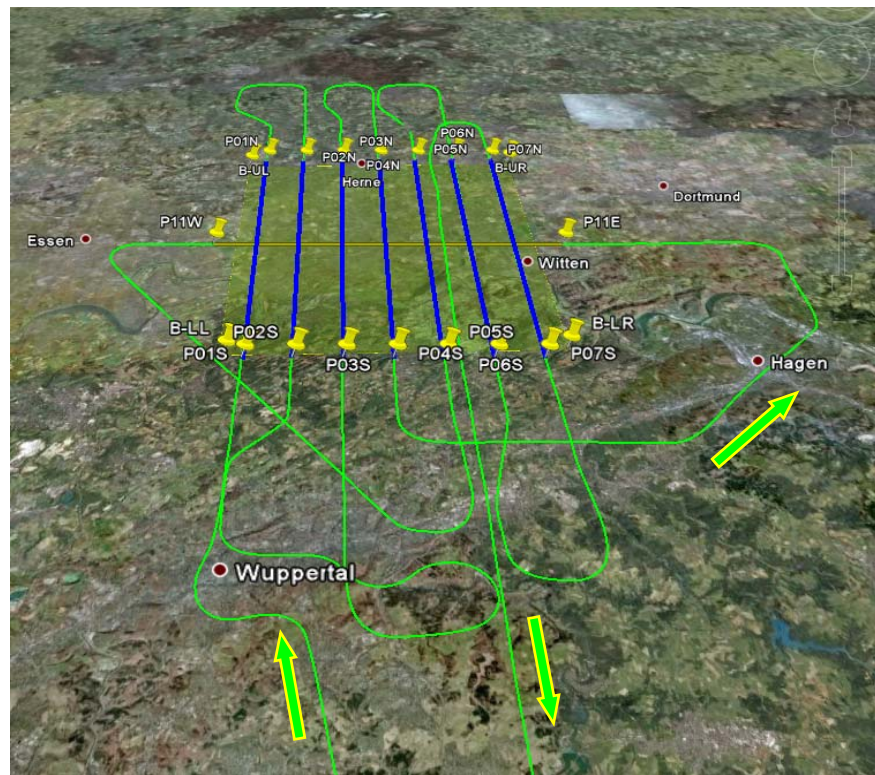
EUFAR TA UR-TIR 2011

REGENSBURG FP02 flight pattern at MSL7200FT

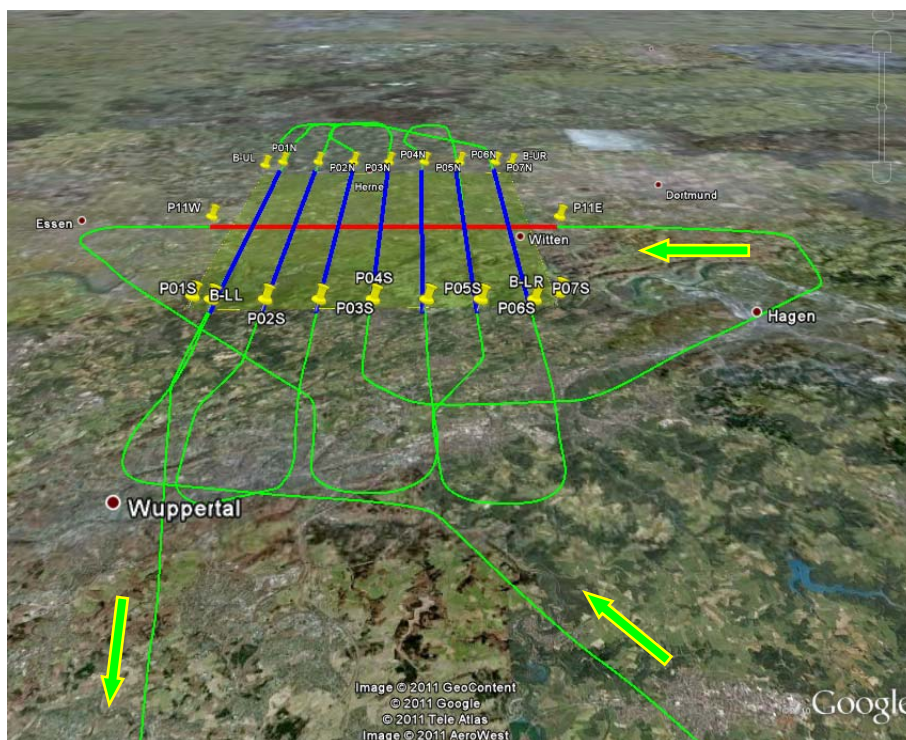
Flight lines co-ordinates in geographic WGS84/ETRS89 system.



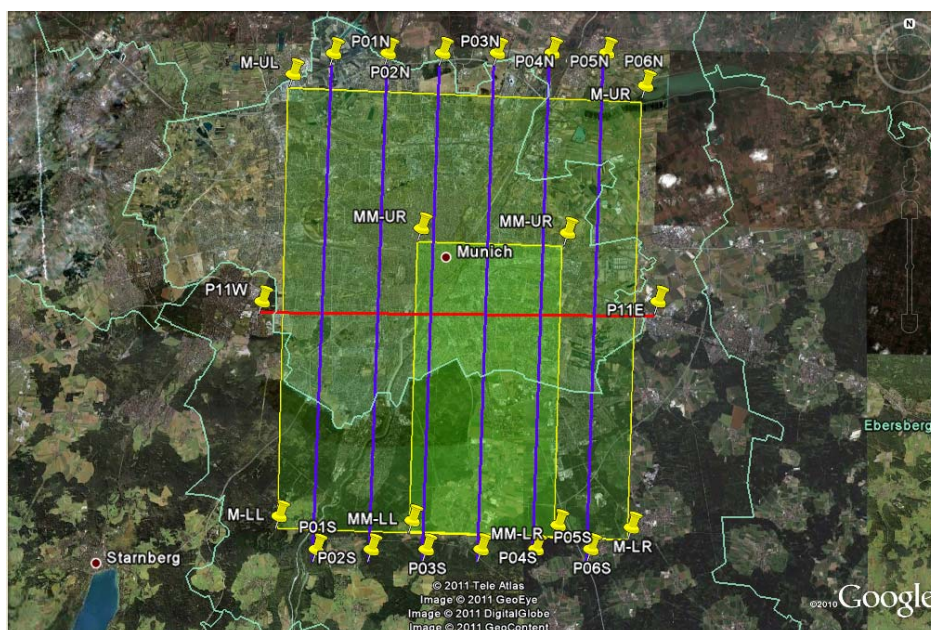
EUFR TA UR-TIR 2011.
BOCHUM test site (rectangle in yellow).
BOCHUM FP01 flight pattern (lines P01-P07 in blue colour)
and BOCHUM FP02 flight pattern (line P11 in red colour) at MSL6450FT
(Imaged in Google Earth)



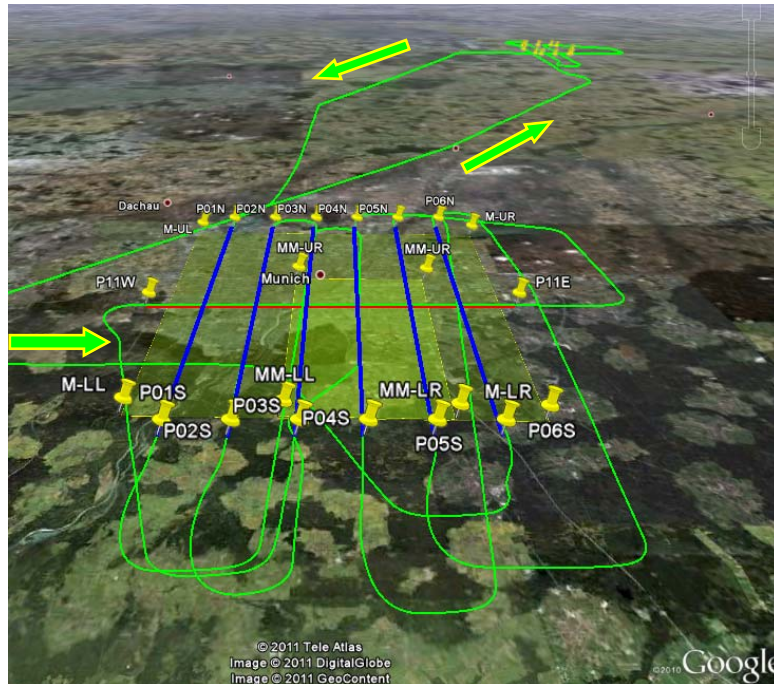
EUFR TA UR-TIR 2011.
BOCHUM test site. FLIGHT 01 B/D01
Flight track in green colour
(Imaged in Google Earth)



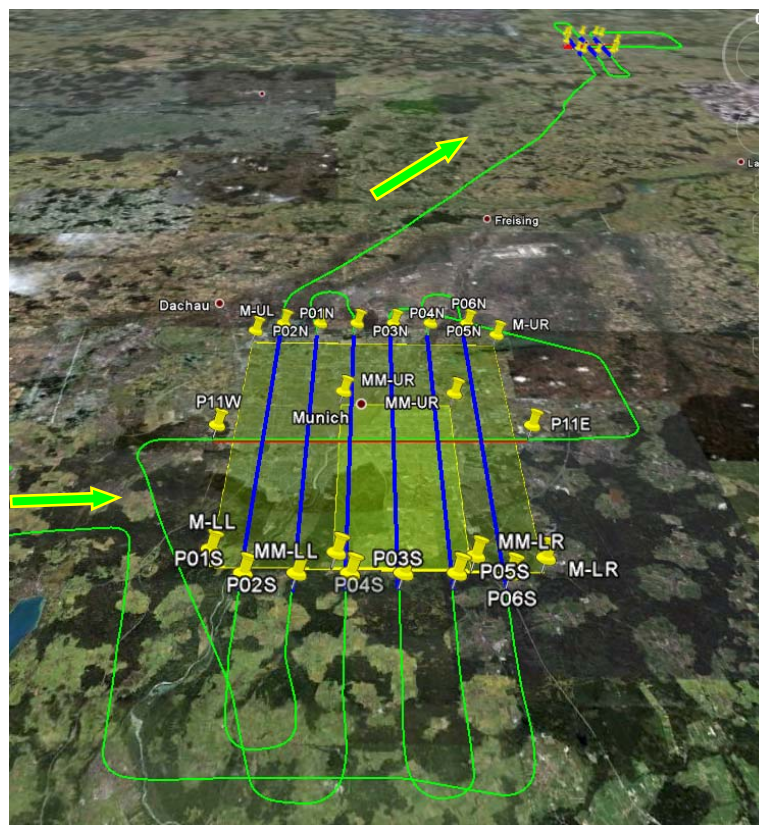
EUFAR TA UR-TIR 2011.
BOCHUM test site. FLIGHT 02 B/N01
Flight track in green colour
 (Imaged in Google Earth)



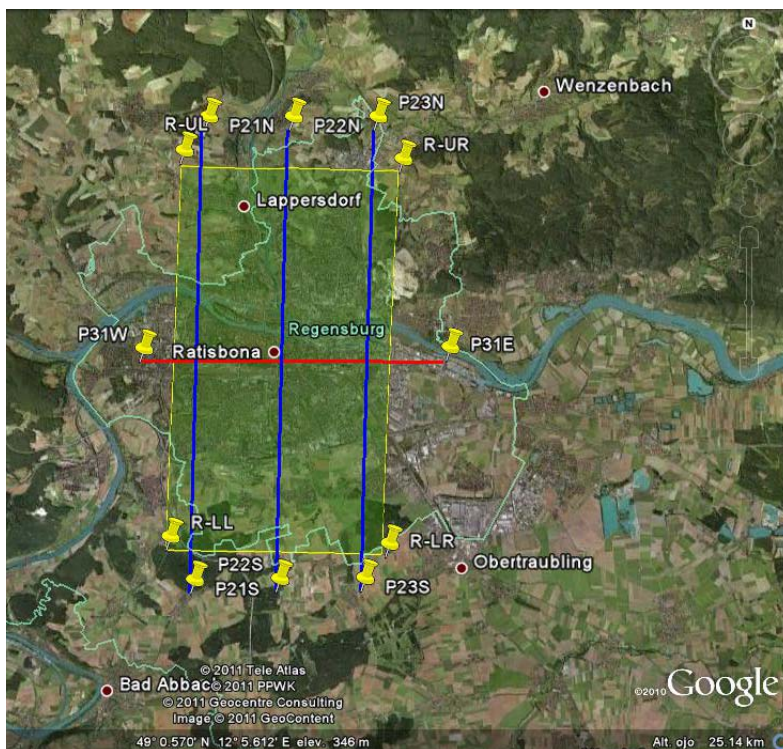
EUFAR TA UR-TIR 2011.
MUNICH test sites (rectangles in yellow).
MUNICH FP01 flight pattern (lines P01-P08 in blue colour)
and MUNICH FP02 flight pattern (line P11 in red colour) at MSL7850FT
 (Imaged in Google Earth)



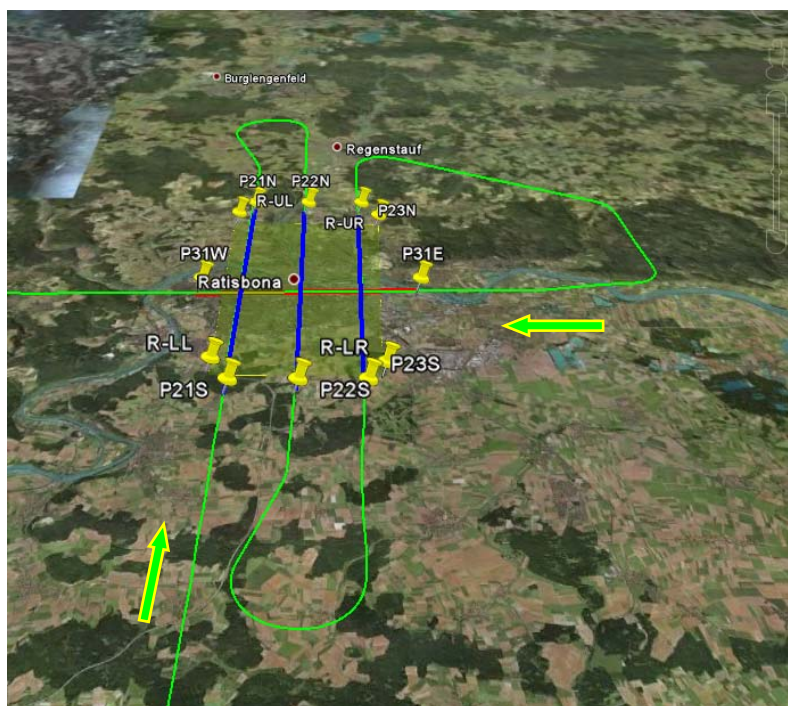
EUFAR TA UR-TIR 2011.
MUNICH test sites. FLIGHT 03 M&R/D01
Flight track in green colour
 (Imaged in Google Earth)



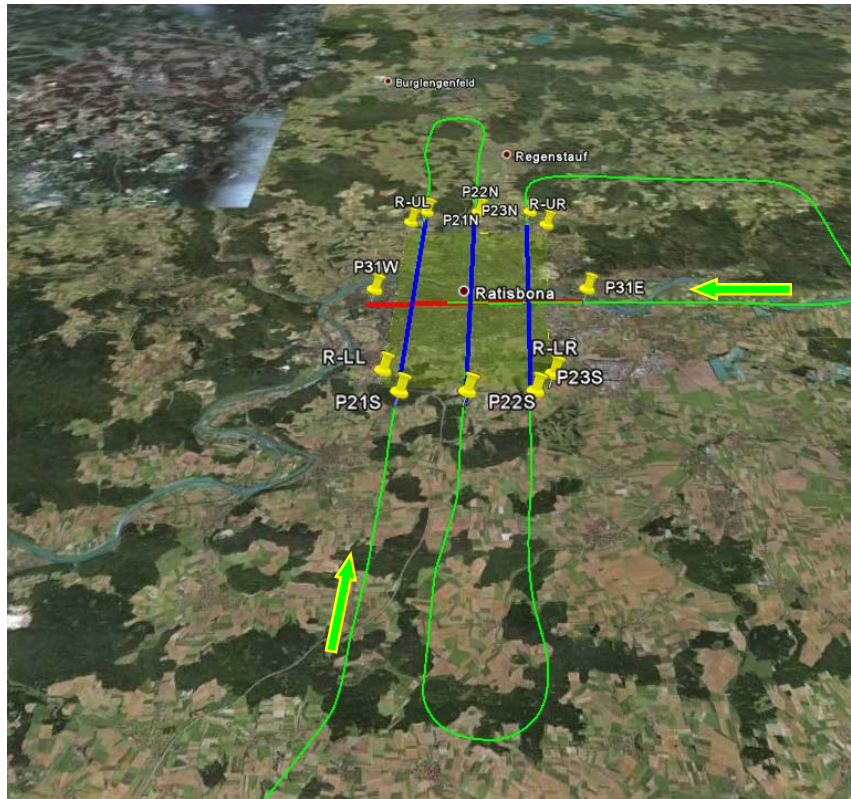
EUFAR TA UR-TIR 2011.
MUNICH test sites. FLIGHT 04 M&R/N01
Flight track in green colour
 (Imaged in Google Earth)



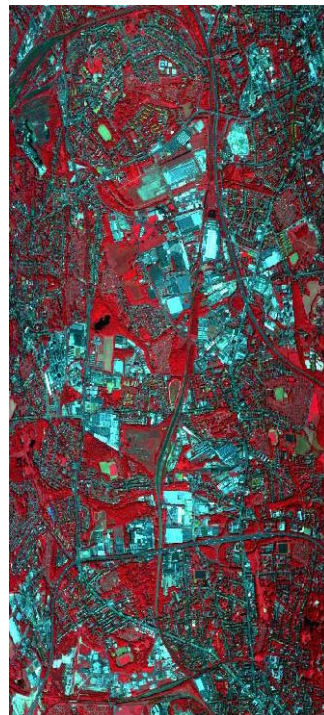
EUFAR TA UR-TIR 2011.
REGENSBURG test site (in yellow).
REGENSBURG FP01 flight pattern (lines P21-P23 in blue colour)
and REGENSBURG FP02 flight pattern (line P31 in red colour) at MSL7200FT
 (Imaged in Google Earth)



EUFAR TA UR-TIR 2011.
REGENSBURG test site. FLIGHT 03 M&R/D01
Flight track in green colour
 (Imaged in Google Earth)



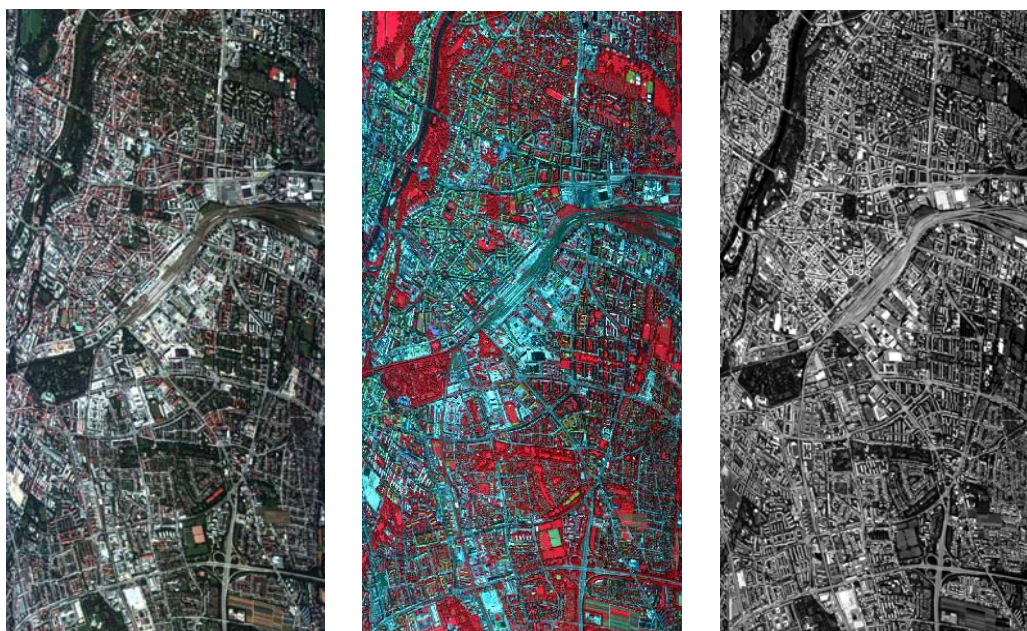
EUFAR TA UR-TIR 2011.
REGENSBURG test site. FLIGHT 04 M&R/N01
Flight track in green colour.
 (Imaged in Google Earth)



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BOCHUM test site. FLIGHT 01 B/D01 (20110705)

Set of AHS quicklooks of data recorded along P03 (true heading = 359°)

Left: RGB real colour combination. Centre: RGB infrared composition. Right: thermal channel AHS#75

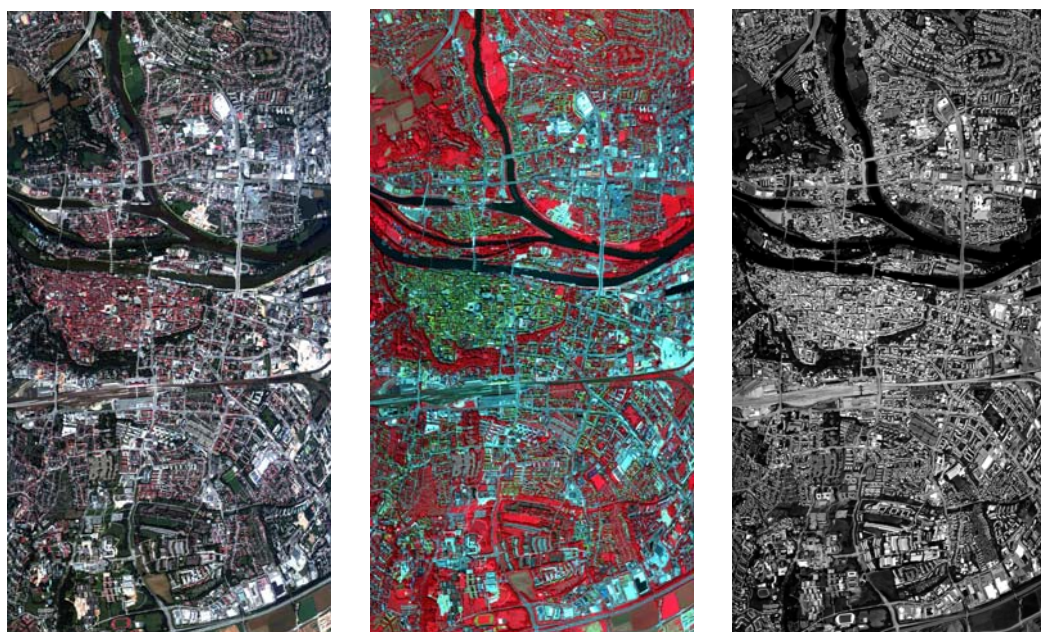


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MUNICH test site. FLIGHT 03 M&R/D01 (20110712)

Set of AHS quicklooks of data recorded along P04 (true heading = 002°)

Leftt: RGB real colour combination. Centre: RGB infrared composition. Right: thermal channel AHS#75



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REGENSBURG test site. FLIGHT 03 M&R/D01 (20110712)

Set of AHS quicklooks of data recorded along P22 (true heading = 182°)

Left: RGB real colour combination. Centre: RGB infrared composition. Right: thermal channel AHS#75



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ABBREVIATIONS & ACRONYMS

AGL	Above Ground Level	LWIR	Long-Wave Infra-Red
AHS	Airborne Hyperspectral System	MIR	Mid Infra-Red
BAF	Bundle Adjustment Flight	MSL	Mean Sea Level
BB	Black-Body	MWIR	Mid-Wave Infra-Red
BKN	Broken sky (5/8 a 7/8)	N	North
CASI	Compact Airborne Spectrographic Imager	N/A	Not Available
CEST	Central European Summer Time	OVC	Overcast sky (8/8)
DGPS	Differential GPS	PCS	POS Computer System
E	East	POS	Position and Orientation System
ELEV	ELEVation	RS	Rows Summed (CASI-1500)
ETRS89	European Terrestrial Reference System 1989	S	South
FEW	Scarse clouds (1/8 a 2/8)	SHU	Sensor Head Unit
FOV	Field Of View	S/N	Serial Number
FT	Foot/FeeT	SCT	Scattered clouds (3/8 a 4/8)
GPS	Global Positioning System	SKC	Clear sky (0/8)
GS	Ground Speed	SWIR	Short-Wave Infra-Red
GSD	Ground Sample Distance	TBC	To Be Confirmed
ICU	Instrument Control Unit	TBD	To Be Defined
IFOV	Instantaneous Field Of View	UTC	Universal Time Coordinated
IMU	Inertial Measurement Unit	UTM	Universal Transverse Mercator
INS	Inertial Navigation System	VNIR	Visible & Near Infra-Red
INTA	Instituto Nacional de Técnica Aeroespacial	W	West
IT	Integration Time	WGS84	World Geodetic System 1984
KTS	KnoTS	XTE	Cross Track Error