

L1 Processor Prototype

Requirements and Prototype Tests for IVT

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	Name	Function	Signature
Prepared by	N. Catarino	Project Engineer	
Checked by	J. Freitas	Quality A. Manager	
Approved by	J. Barbosa	Project Manager	

DEIMOS Engenharia
Av. D. João II, Lote 1.17, Torre Zen, 10º,
1998-023 Lisboa, PORTUGAL
Tel: +351 21 893 3013
Fax: +351 21 896 9099
E-mail: <mailto:deimos@deimos.com.pt>

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1. INTRODUCTION

1.1. Purpose and Scope

The purpose of this document is to present list os Deimos' requirements and Level 1 Processor Prototype (L1PP) tests plan for the Image Validation Tests (IVT).

1.2. References

The IVT schedule and planning are given in accordance with the SO-PR-CASA-PLM-1041 document, the "Image Validation Test Plan, version 1.5" (IVTP).

2. L1PP SCHEDULE

The following is the current planned IVT schedule. It is given here as in IVTP (see section 1.2), except that the External Calibration is prior to the EMC tests. This was discussed during the L1PP V3R delivery meeting (29th and 30th of March 2007) in order for the L1PP to generate a Flat Target ADF from External Calibration data (6.6) and is **still TBC at this time**.

Date	Day . task no.	Operation	Duration
IVT-Start	1.1	Installation of test Jig	1 day
	2.1	Installation of PLM in EMC chamber	2 days
	4.1	Measurements with Laser Tracker	2 hours
	4.2	Polarisation Check at 0°	0.5 hours
	4.3	Instrument Check	1 hour
	4.4	Change Probe O to 90°	1.5 hours
	4.5	Polarisation Check at 90°	0.5 hours
	4.6	Change Probe O to 45°	2 hours
	5.1	Measurement with Laser Tracker	1.5 hours
	5.2	Phase Recovery at H1 Test 1	1.5 hours
	5.3	Phase Recovery at H1 Test 2	1.5 hours
	5.4	Change Probe O to 135°	1.5 hours
	5.5	Measurement with Laser Tracker	1.5 hours
	5.6	Phase Recovery at H1 Test 3	0.5 hours
	6.1	Change Height of Test Jig to H2 and Probe O to 45°	2 hours
	6.2	Measurement with Laser Tracker	1.5 hours
	6.3	Phase Recovery at H1 Test 4	1.5 hours
	6.4	Phase Recovery at H1 Test 5	1.5 hours
	6.5	FWF Test	1 hour
		6.6	External Calibration
IVT-EMC	-	EMC TESTS	1 week
IVT-L1PP	6.7	Comparison of NIR Modes (NIR-A; NIR-LA)	0.5 hours
	7.1	Stability Test- Nominal Correlations, CMN Nom	24 hours
	8.1	Stability Test- Redundant Correlations, CMN Nom	1 hour
	8.2	Stability Test- Nominal Correlations, CMN Red	1 hour
	8.3	Stability Test- Redundant Correlations, CMN Red	1 hour

Date	Day . task no.	Operation	Duration
	8.4	Power Supply Test	0.5 hour
	8.5	X Band TX Test	1 hour
	8.6	Heater Test	1 hour
	8.7	Lamp Test	1.5 hours

Notes on the dates above (see also next table):

- In the dates above IVT-Patch stands for the delivery date for the IVT patch update to the L1PP (two weeks prior to IVT-Start);
- IVT-Start stands for the start date for IVT tests (8th of May 2007, depending on the 1st requirement), when the L1PP will be tested on the IVT data remotely;
- IVT-EMC the start date of the EMC tests (14th of May 2007, depending on the 1st requirement);
- IVT-L1PP the start date of the second period of IVT (21th of May 2007, depending on the 1st requirement), when the L1PP will be tested on site.

3. L1PP REQUIREMENTS

The next table consists of a list of L1PP requirements for IVT.

	Requirement	Company	Date Required	Status
1	L1PP G-matrix generator adaptation for IVT	DME	-	DONE
2	Measured Antenna Patterns in EEf	CASA/DME	IVT-Patch	DONE
3	IVT final schedule with dates	CASA	ASAP	TODO
4	Implement and validate Flat Target generator for IVT	DME	IVT-Patch	TODO
5	Test ssh access to GoldRake	DME	IVT-Patch	DONE
6	Install and test L1PP @ GoldRake - check ANNEX III - Test Environment for libraries' versions needed by the L1PP	DME	IVT-Patch	DONE
7	Test display forwarding from GoldRake	DME	IVT-Patch	DONE
8	Install and test Visualisation Tool at GoldRake	DME	IVT-Patch	TODO
9	Test ssh access from GoldRake to Earth2 - check if port 2250 is allowed at GoldRake	DME	IVT Patch	TODO
10	Install MatLab @ GoldRake	ESA	IVT-Start	TODO
11	Test X-band to EEf converter	DME	IVT-Start	TODO

4. L1PP TESTS

4.1. Processing before EMC tests

The following tables give a detailed description of the tests to be performed by the L1PP with the PLM's outputs from the period from *IVT-Start* until *IVT-EMC* (see chapter 2).

	Operation	L1PP task	Requirements
4.1	Measurements with Laser tracker (2 hours)	Generate ivtConfiguration	<ul style="list-style-type: none"> - Room dimensions - Distance from instrument to test jig - Centre of instrument (x,y,z) coordinates wrt a room corner (in mm) - Angle (ALPHA) between arm A and a given wall

	Operation	Probes	Activity	Epochs	L1PP tasks
4.2	Polarisation check at 0° (2 hours)	O=ON @ 0°	Dual-pol observation with NIR in NIR-A	50	Dual and full-pol reconstructions <ul style="list-style-type: none"> - Generate G and J matrices - Perform reconstruction Default ADFs: <ul style="list-style-type: none"> - PMS (no calibration sequences available) - PLM (no relative phases measurement available) - FTT ADF (neither room temperature nor “external target” products available)
		A=OFF @ 45°	Dual-pol observation with NIR in LICEF-A	50	
		B=OFF @ 45°	Full-pol observation with NIR in NIR-A	200	
		C=OFF @ 45°	Full-pol observation with NIR in LICEF-A	200	
		(lights OFF)			

	Operation	Activity	Epochs	LIPP tasks
4.3	Instrument check (0.5 hours)	Long calib. (sub-segment)	94	Convert calibration and science data into EEF Calibration: - Generate PMS ADF (gains and offsets) - Generate Consolidated FWF L1A product Dual and full-pol: - Generate G and J matrices - Perform reconstruction Defaults: - PLM ADF (no relative phases measurement available) - FTT ADF (neither room temperature nor “external target” available)
		Short calibration	27	
		Dual-pol observation with NIR in NIR-A	50	
		Short calibration	27	
		Full-pol observation with NIR in NIR-A	200	
		Short calibration	27	
		Long calib. (sub-segment)	94	

	Operation	Probes	LIPP tasks	Epochs	LIPP tasks
4.5	Polarisation check at 90° (2 hours)	O=ON @ 90°	Dual-pol observation with NIR in NIR-A	50	Dual and full-pol reconstructions - Generate G and J matrices - Perform reconstruction
		A=OFF @ 45°	Dual-pol observation with NIR in LICEF-A	50	
		B=OFF @ 45°	Full-pol observation with NIR in NIR-A	200	Default ADFs: - PLM (no relative phases measurement available) - FTT ADF (neither room temperature nor “external target” products available) PMS ADF (with gains and offsets) available from 4.2
		C=OFF @ 45° (lights OFF)	Full-pol observation with NIR in LICEF-A	200	

	Operation	L1PP tasks	Requirements
5.1 5.5	Measurements with Laser Tracker (1.5 hours)	Update ivtConfiguration file	- Distance from instrument to test jig at height H1

	Operation	Prb.X	Action	Epochs	L1PP tasks
			Record room temperature	94	Update ivtConfiguration file with room temperature; Generate FTT ADF using room temperature
5.2 5.3	Phase recovery at height H1 Tests 1-2 (warm + hot) - chamber lights OFF - probe X at 45°, with X=O, A, B, and C - all other probes OFF (4x14 mins)	OFF OFF OFF ON OFF ON OFF	Long calibration sub-segment Short flight calibration Dual-pol observation with NIR in LICEF-LA Dual-pol observation with NIR in LICEF-LA Dual-pol observation with NIR in LICEF-LA Dual-pol observation with NIR in LICEF-LA Short calibration extended	 28 50 50 200 200 70	Calibration: - Update PLM ADF with relative phases Dual and full-pol reconstruction
5.6	Phase recovery at height H1 Test 3 - chamber lights OFF - probe X at 135°, with X=O, A, B, and C - all other probes OFF (4x14 mins)	OFF OFF OFF ON OFF ON OFF	Long calibration sub-segment Short flight calibration Dual-pol observation with NIR in LICEF-LA Dual-pol observation with NIR in LICEF-LA Dual-pol observation with NIR in LICEF-LA Dual-pol observation with NIR in LICEF-LA Short calibration extended	 28 50 50 200 200 70	Calibration: - Update PLM ADF with relative phases Dual and full-pol reconstruction

	Operation	L1PP tasks	Requirements
6.2	Measurements with Laser Tracker (1.5 hours)	Update ivtConfiguration file	- Distance from instrument to test jig at height H2;

	Operation	Prb.X	Action	Epochs	L1PP tasks
6.3 6.4	Phase recovery at height H2 Tests 4-5 (warm + hot) - chamber lights OFF - probe X at 45°, with X=O, A, B, and C - all other probes OFF (4x14 mins)	OFF	Long calibration sub-segment		Calibration: - Update PLM ADF with relative phases Dual and full-pol reconstruction
		OFF	Short flight calibration	28	
		OFF	Dual-pol observation with NIR in LICEF-LA	50	
		ON	Dual-pol observation with NIR in LICEF-LA	50	
		OFF	Dual-pol observation with NIR in LICEF-LA	200	
		ON	Dual-pol observation with NIR in LICEF-LA	200	
		OFF	Short calibration extended	70	

	Operation	L1PP tasks	Requirements
6.5	FWF Test	Generate new FWF ADF	- FWF data at -T, 0 and +T

	Operation	Epochs	L1PP tasks
6.6	External Calibration sequence - probes OFF - all lights OFF (57 mins)	2834	Generate IVT specific FTT ADF

4.2. Processing during EMC tests

During this period the L1PP will reprocess the the PLM's outputs from the period from *IVT-Start* until *IVT-EMC* (see chapter 2). **This sequence of tests is still TDB.**

4.3. Processing after EMC tests

The following tables give a detailed description of the tests to be performed by the L1PP with the PLM's outputs from the period from *IVT-Start* until *IVT-EMC* (see chapter 2).

	Operation	Activity	Epochs	L1PP Tasks
6.7	Comparison of NIR modes (NIR-A; NIR-LA)	Dual-pol observation with NIR=LICEF-LA	100	Dual-pol and full-pol reconstructions
		Full-pol observation with NIR=LICEF-LA	400	
		Dual-pol observation with NIR=LICEF-A	100	
		Full-pol observation with NIR=LICEF-A	400	

Stability Tests				
	Operation	Activity	Epochs	L1PP Tasks
7.1	Nominal Correlations, CMN Nom - repeated 125 times (24 hours 17 mins)	Long calibration segment (OBOP ID 11)	333	Calibration: - Generate PMS ADF (gains and offsets) - Generate Consolidated FWF L1A product Dual and full-pol: - Generate G and J matrices - Perform reconstruction
		Dual-pol observation	50	
		Full-pol observation	200	
8.2	Redundant Correlations, CMN Nom - repeated 5 times (58 mins)	Long calibration segment (OBOP ID 11)	333	
		Dual-pol observation	50	
		Full-pol observation	200	
8.3	Redundant Correlations, CMN Red - repeated 5 times (58 mins)	Long calibration segment (OBOP ID 11)	333	
		Dual-pol observation	50	
		Full-pol observation	200	
8.4	Redundant Correlations, CMN Red - repeated 5 times (58 mins)	Long calibration segment (OBOP ID 11)	333	
		Dual-pol observation	50	
		Full-pol observation	200	

	Operation	Activity	Epochs	L1PP Tasks
8.4	Power Supply Test - power supply at minimum value - redundant correlations and CMNs	Long calibration segment (OBOP ID 11)	333	Calibration: - Generate PMS ADF (gains and offsets) - Generate Consolidated FWF L1A product Dual and full-pol: - Generate G and J matrices - Perform reconstruction
		Dual-pol observation	50	
		Full-pol observation	200	
	Power Supply Test - power supply at minimum value - redundant correlations and CMNs	Long calibration segment (OBOP ID 11)	333	
		Dual-pol observation	50	
		Full-pol observation	200	

	Operation	Activity	Epochs	L1PP Tasks
8.5	X band TX Test - nominal TX - redundant correlations	Dual-pol observation with TX nom. OFF	250	Perform dual-pol reconstruction
		Dual-pol observation with TX nom. OFF	250	
	X band TX Test - redundant TX - redundant correlations	Dual-pol observation with TX red. OFF	250	
		Dual-pol observation with TX red. OFF	250	

	Operation	Activity	Epochs	L1PP Tasks
8.6	Heater Test - probes OFF - lamps OFF	Dual-pol observation with heaters OFF	250	Dual-pol reconstruction
		Dual-pol observation with heaters ON	250	

	Operation			
8.7	Lamp Test - probes OFF - lights ON (48 mins)	Long calibration sub-segment (OBOP Id 10)	94	Calibration: - Generate PMS ADF (gains and offsets) - Generate Consolidated FWF L1A product Dual and full-pol: - Generate G and J matrices - Perform reconstruction
		Short calibration sequence	98	
		Dual-pol observation	400	
		Full-pol observation	1600	
		Long calibration sub-segment (OBOP Id 10)	94	
		Short calibration sequence	98	

ANNEX I - ADF SUMMARY

Type of Data		File Name prefix	Used	
ADF	Level 0 Configuration file	SM_XXXX_AUX_CNF_L0<ID>	L1a	D
	PMS Characterisation tables	SM_XXXX_AUX_PMS_<ID>	L1a	D
	NIR Characterisation tables	SM_XXXX_AUX_NIR_<ID>	L1a	D
	Relevant S-parameters of MIRAS (noise distribution networks and switch)	SM_XXXX_AUX_SPAR_<ID>	L1a	D
	Receivers Characterisation (ohmic efficiency and absolute phase)	SM_XXXX_AUX_LCF_<ID>	L1a	D
	Normalised power and phase patterns of all antennas (where ## indicates the receiver numbering)	SM_XXXX_AUX_PATT##<ID>	L1b	D
	Failing Components Table	SM_XXXX_AUX_FAIL_<ID>	L1	D
	Best Fit Plane	SM_XXXX_AUX_BFP_<ID>	L1c	N
	Discrete Global Grid	SM_XXXX_AUX_DGG_<ID>	L1c	N
	L1c Pixel Mask	SM_XXXX_AUX_MASK_<ID>	L1c	N
	Land/Sea Mask	SM_XXXX_AUX_LSMASK<ID>	L1c	N
	Galaxy L-band Map	SM_XXXX_AUX_GLXY_<ID>	L1c	N
	Vertical Total Electron Content Map	SM_XXXX_AUX_VTEC_<ID>	L1c	N
	Geomagnetic model	SM_XXXX_AUX_IGRF_<ID>	L1c	N
	Sun Brightness Temperature Map Model	SM_XXXX_AUX_SUNT_<ID>	L1b.FS	N
	Moon Brightness Temperature Map Model	SM_XXXX_AUX_MOONT_<ID>	L1b.FS	N
	Earth Brightness Temperature Map Model	SM_XXXX_AUX_ERTHT_<ID>	L1b.FS	N
	PLM Characterisation Table	SM_XXXX_AUX_PLM_<ID>	L1a	D
	RFI sources Map	SM_XXXX_AUX_RFI_<ID>	L1c	N
	G Matrix definition	SM_XXXX_AUX_GMAT_<ID>	L1b	G
	J Matrix Definition	SM_XXXX_AUX_JMAT_<ID>	L1b	G
	Apodisation Window Coefficients	SM_XXXX_AUX_APOD_<ID>	L1b	D
	Flat Target Transformation Measurements	SM_XXXX_AUX_FLATT_<ID>	L1b	S+G
Bistatic Scattering Coefficients	SM_XXXX_AUX_BSCAT_<ID>	L1b.FS	DX	
<p>D: Default ADF non-specific to IVT S: Specific default ADF generated for IVT G: Generated during IVT, and no default is available N: Not used during IVT, but default ADF should still be available</p>				

ANNEX II - PRODUCT FORMAT SUMMARY

L0 Products

Type of Data			File Name prefix convention		
Level 0	Measurement Mode	Science Data	Dual-Pol (APID_DUAL)	SM_XXXX_MIR_SC_D0__<ID>	A
			Full-Pol (APID_FULL)	SM_XXXX_MIR_SC_F0__<ID>	A
		External Target	Dual-Pol (APID_EXC_DUAL)	SM_XXXX_MIR_TARD0__<ID>	R
			Full-Pol (APID_EXC_FULL)	SM_XXXX_MIR_TARF0__<ID>	R
	Calibration Mode	Uncorrelated Noise Injection (APID_U_CAL)		SM_XXXX_MIR_UNCN0__<ID>	D+A
		Correlated Noise Injection (APID_C_CAL)		SM_XXXX_MIR_CORN0__<ID>	D+A
		Uncorrelated Noise Injection non-nominal pointing (APID_EXC_U_CAL)		SM_XXXX_MIR_UNCU0__<ID>	D+A
		Correlated Noise Injection non-nominal pointing (APID_EXC_C_CAL)		SM_XXXX_MIR_CORU0__<ID>	D+A
	Test Mode	APID_TEST		SM_XXXX_MIR_TEST0__<ID>	N
	Ancillary Data	APID_A		SM_XXXX_TLM_MIRA0__<ID>	N
<p>A: Available from converted X-band data R: External target products will be made available by renaming science data in order to generate FLATT ADF D: Noise injection products will not be available only on 4., so default data should be used N: Not available during IVT</p>					

L1 Products

Type of Data				File Name prefix convention		
Level 1a	Measurement Mode	Science Data	Dual-Pol	SM_xxxx_MIR_SC_D1A <ID>	G	
			Full-Pol	SM_xxxx_MIR_SC_F1A <ID>	G	
		External Target	Dual-Pol	SM_xxxx_MIR_TARD1A <ID>	G	
			Full-Pol	SM_xxxx_MIR_TARF1A <ID>	G	
	Calibration Mode	Uncorrelated Noise Injection Calibration		SM_xxxx_MIR_UNCN1A <ID>	G	
				SM_xxxx_MIR_UNCU1A <ID>	G	
		Correlated Noise Injection Calibration		SM_xxxx_MIR_CORN1A <ID>	G	
				SM_xxxx_MIR_CORU1A <ID>	G	
	NIR Calibration		SM_xxxx_MIR_NIR_1A <ID>	G		
	Fringe Wash Calibration		SM_xxxx_MIR_FWAS1A <ID>	G		
			SM_xxxx_MIR_FWAU1A <ID>	G		
	Consolidated Calibration Mode	Consolidated Uncorrelated Noise Injection Calibration		SM_xxxx_MIR_AUNN1A <ID>	G	
				SM_xxxx_MIR_AUNU1A <ID>	G	
		Consolidated Correlated Noise Injection Calibration		SM_xxxx_MIR_ACNN1A <ID>	G	
				SM_xxxx_MIR_ACNU1A <ID>	G	
	Consolidated NIR Calibration		SM_xxxx_MIR_ANIR1A <ID>	G		
Consolidated Fringe Wash Calibration		SM_xxxx_MIR_AFWS1A <ID>	G			
		SM_xxxx_MIR_AFWU1A <ID>	G			
Instrument & Spacecraft (AOCS, PVT) HKTM				SM_xxxx_TLM_MIRA1A <ID>	G*	
Level 1b	Measurement Mode	Science Data	Dual-Pol	SM_xxxx_MIR_SC_D1B <ID>	G	
			Full-Pol	SM_xxxx_MIR_SC_F1B <ID>	G	
		External Target	Dual-Pol	SM_xxxx_MIR_TARD1B <ID>	G	
			Full-Pol	SM_xxxx_MIR_TARF1B <ID>	G	
Level 1c	Measurement Mode	Science Data	Land	Dual-Pol	SM_xxxx_MIR_SCLD1C <ID>	X
				Full-Pol	SM_xxxx_MIR_SCLF1C <ID>	X
			Sea	Dual-Pol	SM_xxxx_MIR_SCSD1C <ID>	X
				Full-Pol	SM_xxxx_MIR_SCSF1C <ID>	X
		Browse Data	Land	Dual-Pol	SM_xxxx_MIR_BWLD1C <ID>	X
				Full-Pol	SM_xxxx_MIR_BWLF1C <ID>	X
			Sea	Dual-Pol	SM_xxxx_MIR_BWSD1C <ID>	X
				Full-Pol	SM_xxxx_MIR_BWSF1C <ID>	X
<p>G: Generated during IVT</p> <p>G*: All telemetry will be generated during IVT except PVT and AOCS, which will not be needed by the L1PP in IVT mode</p>						

Type of Data	File Name prefix convention	
	X: L1c data will not be available during IVT	

ANNEX III - TEST ENVIRONMENT

The following tables describe the complete Hardware and Software environment used to run the tests:

Machine	Goldrake: IBM Machine Dual Processor
Processors	AMD Opteron 248 (64 bits)
Disk	146 GB
RAM	2 GB
Cache	1 Mb L2
Operating System	RedHat Enterprise Linux WS 3 for AMD 64

Table 1 - Hardware Characteristics

Software / library	Version
Mandatory library & versions	
L1PP	1.3.1
Gcc	4.1
Java J2SE SDK	1.5.0
Earth Explorer CFI	3.5
Binxml-fh	3.3
Xerces	2.7.0
log4c	1.0.12
Lapack	3.0
Atlas	3.6.0
Fftw	3.1.2
Mandatory libraries, recommended versions	
glibc	2.4
Gdb	6.3.0.0
Libxml2	2.6.23