SPIRE

SUBJECT:	Cold workmanship vibration PFM	test p	rocedure
PREPARED BY:	E Sawyer		
DOCUMENT No:	SPIRE-RAL-PRC-002598		
ISSUE:	2	Date:	17/8/06
CHECKED BY:		Date:	
APPROVED BY:		Date:	



Cold vibration test procedure

SPIRE-RAL-PRC-002598 Ref:

Issue:

Date: 17/8/06 Page: 2 of 20

Distribution



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: Date: 17/8/06 Page: 3 of 20

Change Record

ISSUE	DATE	
1	5/4/06	New issue
2	17/8/06	Section 3, new sensor allocations for SOB/BSM following the
		change of SMEC



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: Date: 17/8/06 **Page:** 4 of 20

Table of Contents

1.	SCOPE	.7
2.	ACCELEROMETER ALLOCATION	.7
3.	TEMPERATURE SENSOR LOCATIONS	.7
4	STEP BY STEP TEST SEQUENCE RECORD	8



Cold vibration test procedure

SPIRE-RAL-PRC-002598 Ref:

Issue:

17/8/06 Date: Page: 5 of 20

Glossary

SPIRE Spectral and Photometric Imaging REceiver



Cold vibration test procedure

SPIRE-RAL-PRC-002598 Ref:

Issue: Date: 17/8/06 Page: 6 of 20

References

Applicable Documents

No	Document	Ref
AD1	SPIRE PFM cold vibration test plan	SPIRE-RAL-PRC-002524

Reference Documents



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-

002598

Issue: 2
Date: 17/8/06
Page: 7 of 20

1. SCOPE

This document describes the detailed procedure to be followed during the cold vibration testing on the FPU to be carried out at CSL, Liege.

It should be used in conjunction with AD1

2. ACCELEROMETER ALLOCATION

Channel No	Location	Type	Serial no	Code	Axis	Feed thro'
	FPU top of optics bench over cone	7724		FPUX	X	4
	FPU top	7724		FPUY	Y	5
	FPU top	7724		FPUZ	Z	6

3. TEMPERATURE SENSOR LOCATIONS

Sensor No	Location	CODE	Calibration Curve Prime	Calibration curve Redundant
1	RF filter	RF	X30977	X31056
2	Spectrometer 2K	SPEC	X29606	X29592
3	Photometer 2K	PHOT	X29601	X29603
4	Optical sub bench	OPSB	X30981	X29602
5	Input baffle	BAF	X29604	X31033
6	BSM/SOB	BSM	X31032	X31047
	interface			

NB the redundant set will be used for this test



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 8 of 20

4. STEP BY STEP TEST SEQUENCE RECORD

No	Activity	Time	Date	Run number	Comments	Resp.
1	Test preparation					
1.1	Unpacking from container: As per AD1	3 hrs				
	Store container until the end of the test					
1.2	Visual inspection of the FPU	2 hrs			Record any anomalies	
	Cover with cover provided while awaiting integration					
	Fit the three accelerometers to the FPU.	1 hr				



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

1ssue: 2

Date: 17/8/06 **Page:** 9 of 20

			1	
2	Vibration Test in X axis			
2	VIDIATION TEST IN A axis			
2.1	Test preparation			
	Assuming test adaptor is fitted to			
	the shaker			
	Fit FPU to test adaptor in	3 hrs		
	accordance with AD1			
	decordance with the			
	Check torque of mounting feet			
	8.1 Nm plus running torque for			
	M6	½ hrs		
	8.25 plus running torque or M8	721115		
	Kaylock nut.			
	2.1 Nm for the JFET bolts.			
		½ hrs		
	Remove MGSE			
	Eight and a second a second and			
	Fit temporary thermal straps			
	between FPU and fixture, 4 straps			
	at each end of the SOB.			
	Cover detector harness			
	connectors with copper tape to			



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 10 of 20

provide ESD protection			
Check isolation and record results			
L1 to FPU			
FPU to fixture			
Spectrometer L0 to FPU			
Pump L0 to FPU			
Evaporator L0 to FPU			
Note JFET supports to be lifted			
from the fixture for this test			
	2 hrs		
Connect accelerometers carry out			
continuity check.			
	½ hrs		
Carry out very low level test in			
ambient			
0.25g 5 to 2000Hz			
Note			
The Kevlar suspended detectors			
will not tolerate significant levels			
when warm.			
This test is to verify the			
instrumentation only.	ı		



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 11 of 20

	Note These sensors do not record accurate temperatures at room temperature. Accurate only below 40K. Individual calibration curves will be supplied by SPIRE				
3	TRR	4 hrs			
4	Shrouds installation, connection of pumps and fluid lines	2 days			
5	Evacuation				
	Monitor pressure during evacuation and check for consistence with evacuation rate requirement in AD1 Evacuation and re-pressurisation to be in accordance with AD1, max rate 50mb/min				
	Note pressure values or attach				



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 12 of 20

	record			
6	Cool down			
	Monitor temperature sensors during cool down and check for consistence with cool down requirements in AD1			
	Max rate of change of			
	BSM sensor is:- Ambient to 200K 5K/hour 200K to 100K 10K/hour Below 100K 50K/hour			
	Maximum delta T between BSM and LTA			
	is:- Ambient to 200K 35K 200K to 100K 40K. Below 100K, No restriction			
	Note Temperature or attach temperature record of temperature sensors			



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 13 of 20

20.1	Resonance search	1/2hr	0.25g 5 to 2000Hz		
	Check results against those expected.	1hr			
	Confirm levels for next test	1hr			
20.5	Low level Random test	1/2hr	10.JD	Evil lovel is	
20.3	Zow ic to Rundom test	1, 211	-12dB	Full level is Frequency Range Acceptance Hz levels	



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 14 of 20

	test to AD1 at -12dB Check results	1/2hr			20-100 100-150 150-300 300-2000 Global	+3dB/Oct 0.032 g ² /Hz 0.0128 g ² /Hz -12 dB/Oct 2.77 g RMS	
20.6	Intermediate level Random test	1/2hr		6 dD	Full loyal is		
20.0	test to AD1 at -6dB Check results	1/2hr		-6 dB	Full level is Frequency Range Hz 20-100 100-150 150-300 300-2000 Global	Acceptance levels +3dB/Oct 0.032 g ² /Hz 0.0128 g ² /Hz -12 dB/Oct 2.77 g RMS	



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2 Date: 17/8/06 **Page:** 15 of 20

20.7	Acceptance level random test	1/2hr	Full level			
			2 0.22 20 / 02	Frequency Range	Acceptance	
	Communication AD1			Hz	levels	
	Carry out test to AD1			20-100	+3dB/Oct	
				100-150	$0.032 \text{ g}^2/\text{Hz}$	
				150-300	$0.0128 \text{ g}^2/\text{Hz}$	
				300-2000	-12 dB/Oct	
				Global	2.77 g RMS	
	Check results	1/2hr				
20.8	Resonance search		0.25g 5 to 2000Hz			
	Corry out reconence courch as	1/2hr				
	Carry out resonance search as before	1/2111				
	DETOTE	1				



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 16 of 20

	Compare with previous results	1/2hr		
20.9	Post test analysis			
	Check completeness of data	1/2hr		
	Carry out initial assessment	2hrs		
21	TRR			
22	Post Test Activities			



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 17 of 20

• check completeness of test data		
• Warm up Monitor temperature sensor during warm up and check for consistence with cool down requirements in AD1 Note Temperature or attach temperature record of temperature sensors		
Max rate of change of BSM sensor is:- Ambient to 200K 5K/hour 200K to 100K 10K/hour Below 100K 50K/hour		
Maximum delta T between BSM and LTA is:- Ambient to 200K 35K 200K to 100K 40K. Below 100K, No restriction		



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 18 of 20

	Venting Monitor pressure during venting and check for consistence with evacuation rate requirement in AD1 Note pressure values or attach record Max rate 50mb/min	4hrs			
23	Dismount				
	dismounting of shrouds	4hrs			
	Visual inspection of test specimenRemoval of instrument (TBC) and	1hr 2hr			



Cold vibration test procedure

Ref: SPIRE-RAL-PRC-002598

Issue: 2

Date: 17/8/06 **Page:** 19 of 20

	cleanliness inspection with UV light			
	• Installation of the instrument inside its own container in accordance with AD1	2hr		
24	Transport			



Cold vibration test procedure

SPIRE-RAL-PRC-002598 Ref:

Issue:

17/8/06 Date: Page: 20 of 20

Annex 1 PFM build standard