

# SPIRE

**SUBJECT: Cold vibration test procedure  
PFM**

**PREPARED BY: E Sawyer**

**DOCUMENT No: SPIRE-RAL-PRC-002539**

**ISSUE: 2.2**

**Date: 23/11/05**

**CHECKED BY: .....**

**Date: .....**

**APPROVED BY: .....**

**Date: .....**

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## Distribution

## Change Record

ISSUE	DATE	
1	10/11/05	New issue
2	17/11/05	Reference to JFET removed Levels added to procedure Temperature sensor data updated Accelerometer table completed All the SMEC moving carriage accelerometers coded as SMECLX, instead of SMECLX, SMECLY, SMELZ The serial number of the SMECUY is 26087 instead of 26089 The type cell for the SMECBX : it is 2272.
2.1	22/11/05	Title on front page from CQM to PFM. Order of lateral axis changed Title qualification levels changed to acceptance levels Section 2 column added to indicate feed through number
2.2	23/11/05	Sine test in X axis levels changed Intermediate level above 66Hz was 5.7 g now 3.2 g Full level above 66Hz was 11.5 g now 6.4 g

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## Glossary

SPIRE      Spectral and Photometric Imaging REceiver

## References

### Applicable Documents

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

### Reference Documents

## 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'
F65	Photometer detector box	7724		PHOTX	X	1
F71	Photometer detector box	7724		PHOTY	Y	2
F53	Photometer detector box	7724		PHOTZ	Z	3
F66	FPU top of optics bench over cone	7724		FPUX	X	4
F69	FPU top	7724		FPUY	Y	5
F52	FPU top	7724		FPUZ	Z	6
F68	Spectrometer detector box	7724		SPECX	X	7
F73	Spectrometer detector box	7724		SPECY	Y	8
F54	Spectrometer detector box	7724		SPECZ	Z	9
	SMEC moving carriage 1.284pC/g	2222C	32974	SMECLX	X	10
	SMEC moving carriage 1.606pC/g	2222C	32977	SMECLY	Y	11
	SMEC moving carriage 1.627pC/g	2222C	32976	SMECLZ	Z	12
	SMEC top 1.262pC/g	2222C	32975	SMECUX	X	13
	SMEC top 1.692pC/g	2222C	26087	SMECUY	Y	14
	SMEC top 1.373pC/g	2222C	AJC49	SMECUZ	Z	15
	SMEC base plate 14.02 pC/g	2272	YG32	SMECBX	X	16
	SMEC base plate 1.618pC/g	2222C	AADN7	SMECBY	Y	17
	SMEC base plate 1.306pC/g	2222C	32978	SMECBZ	Z	18

## 3. TEMPERATURE SENSOR LOCATIONS

Sensor No	Location	CODE	Calibration Curve Prime	Calibration curve Redundant
1	RF filter	RF	X30977	<b>X31056</b>
2	Spectrometer 2K	SPEC	X29606	<b>X29592</b>
3	Photometer 2K	PHOT	X29601	<b>X29603</b>
4	Optical sub bench	OPSB	X30981	<b>X29602</b>
5	Input baffle	BAF	X29604	<b>X31033</b>
6	BSM/SOB interface	BSM	X29597	<b>X31036</b>

NB the redundant set will be used for this test as one of the prime set is faulty

**4. STEP BY STEP TEST SEQUENCE RECORD**

No	Activity	Time	Date	Run number	Comments	Resp.
1	<b>Test preparation</b>					
1.1	Unpacking from container: As per AD1  Store container until the end of the test	3 hrs	21/11/05			
1.2	Visual inspection of the FPU  Cover with cover provided while awaiting integration  Accelerometers and temperature sensors will be fitted before delivery.	2 hrs	21/11/05		Record any anomalies	

2	<b>Vibration Test in lateral axis</b>					
2.1	<p><b>Test preparation</b></p> <p>Assuming test adaptor is fitted to the shaker</p> <p>Fit FPU to test adaptor in accordance with AD1</p> <p>3 hrs</p> <p>22/11/05</p> <p>Check torque of mounting feet</p> <p>8.1 Nm plus running torque for M6 8.25 plus running torque or M8 Kaylock nut. 2.1 Nm for the JFET bolts.</p> <p>½ hrs</p> <p>Remove MGSE</p> <p>½ hrs</p> <p>Fit temporary thermal straps between FPU and fixture, 4 straps at each end of the SOB.</p> <p>Cover detector harness connectors with copper tape to provide ESD protection</p>					



	<p>Note These sensors do not record accurate temperatures at room temperature. Accurate only below 40K.</p> <p>Individual calibration curves will be supplied by SPIRE</p>					
3	<b>TRR</b>	4 hrs	23/11/05			
4	Shrouds installation, connection of pumps and fluid lines	2 days	24/11/05 25/11/05			
5	<p><b>Evacuation</b></p> <p>Monitor pressure during evacuation and check for consistence with evacuation rate requirement in AD1 Re-pressurisation to be in accordance with AD1, max rate 50mb/min</p> <p>Note pressure values or attach record</p>		26/11/05			

6	<p><b>Cool down</b></p> <p>Monitor temperature sensor during cool down and check for consistence with cool down requirements in AD1</p> <p><b>5K/hour, between room temperature and 200K, 10K/hour, between 200K and 100K. 50K/hour below 100K</b></p> <p>Note Temperature or attach temperature record of temperature sensors</p>		<p>26/11/05 27/11/05 28/11/05</p>			
7	<p><b>Y axis test</b></p>					
7.1	<p><b>Resonance search</b></p>		<p>29/11/05</p>			

	<p>O.25 g 5 to 2000Hz 4 octaves per minute</p> <p>Check results against those expected</p> <p>Confirm levels for next test</p>	<p>1/2hr</p> <p>2hrs</p> <p>1hr</p>												
7.2	<p><b>Intermediate sine test</b></p> <p>Check results</p>	<p>1/2h</p> <p>1hrsr</p>	29/11/05		<p>Test sweep rate 4 Oct/min, the input will be limited to equivalent quasi static interface force.</p> <p><b>Y axis</b></p> <table border="1"> <thead> <tr> <th>Frequency Range Hz</th> <th></th> <th>Acceptance level</th> </tr> </thead> <tbody> <tr> <td>5 - 13.5</td> <td></td> <td>+/- 2mm</td> </tr> <tr> <td>13.5 – 100 for 1000 cycles *</td> <td>Up to 66Hz</td> <td>3.2 g</td> </tr> </tbody> </table>	Frequency Range Hz		Acceptance level	5 - 13.5		+/- 2mm	13.5 – 100 for 1000 cycles *	Up to 66Hz	3.2 g
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	Confirm go-ahead for next test	1/2hr			13.5 – 100 for remaining cycles		2.4 g TBC											
7.3	<p><b>Full level sine test</b></p> <p>As per requirements in AD1</p> <p>Check results</p>	<p>1/2hr</p> <p>2hrs</p>			<p>Test sweep rate 4 Oct/min, the input will be limited to equivalent quasi static interface force.</p> <p><b>Y axis</b></p> <table border="1"> <thead> <tr> <th>Frequency Range Hz</th> <th></th> <th>Acceptance level</th> </tr> </thead> <tbody> <tr> <td>5 - 13.5</td> <td></td> <td>+/- 2mm</td> </tr> <tr> <td>13.5 – 100 for 1000 cycles *</td> <td>Up to 66Hz</td> <td>6.4 g</td> </tr> <tr> <td>13.5 – 100 for remaining cycles</td> <td></td> <td>4.8 g TBC</td> </tr> </tbody> </table>	Frequency Range Hz		Acceptance level	5 - 13.5		+/- 2mm	13.5 – 100 for 1000 cycles *	Up to 66Hz	6.4 g	13.5 – 100 for remaining cycles		4.8 g TBC	
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7.4	<p><b>Resonance search</b></p> <p>Carry out resonance search as</p>	1/2hr	29/11/05		0.25g	5 to 2000Hz												

	before  Compare with previous results	1hrs																
7.5	<b>Low level Random test</b>  test to AD1 at -12dB  Check results	1hr  2hr	30/11/05		-12dB	<table border="1"> <thead> <tr> <th>Frequency Range Hz</th> <th>Acceptance levels</th> </tr> </thead> <tbody> <tr> <td>20-100</td> <td>+3dB/Oct</td> </tr> <tr> <td>100-150</td> <td>0.0128 g<sup>2</sup>/Hz</td> </tr> <tr> <td>150-300</td> <td>0.008 g<sup>2</sup>/Hz</td> </tr> <tr> <td>300-2000</td> <td>-12 dB/Oct</td> </tr> <tr> <td>Global</td> <td>2.0 g RMS</td> </tr> </tbody> </table>	Frequency Range Hz	Acceptance levels	20-100	+3dB/Oct	100-150	0.0128 g <sup>2</sup> /Hz	150-300	0.008 g <sup>2</sup> /Hz	300-2000	-12 dB/Oct	Global	2.0 g RMS
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7.7	<b>Acceptance level random test</b>  Carry out test to AD1  Check results	1/2hr  2hr			<table border="1"> <thead> <tr> <th>Frequency Range Hz</th> <th>Acceptance levels</th> </tr> </thead> <tbody> <tr> <td>20-100</td> <td>+3dB/Oct</td> </tr> <tr> <td>100-150</td> <td>0.0128 g<sup>2</sup>/Hz</td> </tr> <tr> <td>150-300</td> <td>0.008 g<sup>2</sup>/Hz</td> </tr> <tr> <td>300-2000</td> <td>-12 dB/Oct</td> </tr> <tr> <td>Global</td> <td>2.0 g RMS</td> </tr> </tbody> </table>	Frequency Range Hz	Acceptance levels	20-100	+3dB/Oct	100-150	0.0128 g <sup>2</sup> /Hz	150-300	0.008 g <sup>2</sup> /Hz	300-2000	-12 dB/Oct	Global	2.0 g RMS	
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7.8	<b>Resonance search</b>  Carry out resonance search as before  Compare with previous results	1/2hr  1/2hr			0.25g 5 to 2000Hz	
7.9	<b>Post test analysis</b>  Check completeness of data					

	Carry out initial assessment	2hr				
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No	Activity	Time	Date	Run number	Comments	Resp.
8	<b>Test in Z axis</b>					
8.1	Reconfigure to Z axis	4hrs	1/12/05			
8.2	<b>Intermediate test readiness review, in parallel with 8.1</b>	1hr	1/12/05			

8.3	<b>Z axis test</b>					
8.4	<p><b>Resonance search</b></p> <p>Check results against those expected.</p> <p>Confirm levels for next test</p>	<p>1/2hr</p> <p>1hr</p> <p>1hr</p>			0.25g 5 to 2000Hz	
8.5	<p><b>Intermediate sine test</b></p> <p>Check results against those expected.</p>	<p>1/2h</p> <p>1/2hr</p>			<p>Test sweep rate 4 Oct/min, the input will be limited to equivalent quasi static interface force.</p> <p><b>Z axis</b></p>	

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8.6	<p><b>Full level sine test</b></p> <p>As per requirements in AD1</p> <p>Check results</p>	1/2hr			<p>Test sweep rate 4 Oct/min, the input will be limited to equivalent quasi static interface force.</p> <p>Z axis</p> <table border="1"> <thead> <tr> <th>Frequency Range Hz</th> <th></th> <th>Acceptance level</th> </tr> </thead> <tbody> <tr> <td>5 - 13.5</td> <td></td> <td>+/- 2mm</td> </tr> <tr> <td>13.5 – 100 for 1000 cycles *</td> <td>Up to 66Hz</td> <td>6.4 g</td> </tr> <tr> <td>13.5 – 100 for remaining cycles</td> <td></td> <td>4.8 g TBC</td> </tr> </tbody> </table>	Frequency Range Hz		Acceptance level	5 - 13.5		+/- 2mm	13.5 – 100 for 1000 cycles *	Up to 66Hz	6.4 g	13.5 – 100 for remaining cycles		4.8 g TBC	
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8.7	<b>Resonance search</b>	1/2hr			0.25g 5 to 2000Hz													

	Carry out resonance search as before																	
	Compare with previous results	1/2hr																
8.8	<p><b>Low level Random test</b></p> <p>test to AD1 at -12dB</p> <p>Check results</p>	1/2hr	2/12/05		-12dB	<table border="1"> <thead> <tr> <th>Frequency Range Hz</th> <th>Acceptance levels</th> </tr> </thead> <tbody> <tr> <td>20-100</td> <td>+3dB/Oct</td> </tr> <tr> <td>100-150</td> <td>0.0128 g<sup>2</sup>/Hz</td> </tr> <tr> <td>150-300</td> <td>0.008 g<sup>2</sup>/Hz</td> </tr> <tr> <td>300-2000</td> <td>-12 dB/Oct</td> </tr> <tr> <td>Global</td> <td>2.0 g RMS</td> </tr> </tbody> </table>	Frequency Range Hz	Acceptance levels	20-100	+3dB/Oct	100-150	0.0128 g <sup>2</sup> /Hz	150-300	0.008 g <sup>2</sup> /Hz	300-2000	-12 dB/Oct	Global	2.0 g RMS
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8.9	<b>Intermediate level Random test</b>	1/2hr			-6 dB													



8.11	<b>Resonance search</b>  Carry out resonance search as before  Compare with previous results	1/2hr  1/2hr			0.25g 5 to 2000Hz	
8.12	<b>Post test analysis</b>  Check completeness of data	1/2hr				

	Carry out initial assessment	2hrs				
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No	Activity	Time	Date	Run number	Comments	Resp.
9	<b>Warm up</b>  Heating rate to be in accordance with AD1  <b>Note</b> <b>5K/hour, between room temperature and 200K,</b> <b>10K/hour, between 200K and 100K.</b> <b>50K/hour below 100K</b>		3/12/05 4/12/05 5/12/05			

	Record any anomalies during warm up					
10	<b>Return to ambient pressure</b>  Re-pressurisation to be in accordance with AD1, max rate 50mb/min	2hrs	6/12/05			
11	<b>Remove vacuum vessel and shrouds</b>  In preparation for instrument removal	1.5day	6/12/05 7/12/05			
12	<b>Instrument removal</b>  Remove instrument and store temporarily in its container in accordance with AD1	1/2day	7/12/05			
13	<b>Reconfigure vibration facility</b>	1day	8/12/05			
15	<b>Test preparation</b>  Assuming test adaptor is fitted to the shaker  Fit FPU to test adaptor in accordance with AD1	3 hrs	9/12/05 9/12/05			

	<p>Check torque of mounting feet</p> <p>8.1 Nm plus running torque for M6 8.25 plus running torque or M8 Kaylock nut. 2.1 Nm for the JFET bolts. 2.5 nm for the L3 straps to JFETS</p> <p>Remove MGSE</p> <p>Fit temporary thermal straps between FPU and fixture, 4 straps at each end of the SOB.</p> <p>Cover detector harness connectors with copper tape to provide ESD protection</p> <p>Check isolation and record results</p> <p>L1 to FPU FPU to fixture Spectrometer L0 to FPU Pump L0 to FPU Evaporator L0 to FPU</p> <p>Note JFET supports to be lifted from the fixture for this test</p> <p>Connect accelerometers carry out continuity check.</p>	<p>½ hrs</p> <p>½ hrs</p> <p>½ hrs</p>				
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	<p>Connect temperature sensors</p> <p>Note These sensors do not record accurate temperatures at room temperature. Accurate only below 40K.</p> <p>Individual calibration curves will be supplied by SPIRE</p> <p>2 hrs</p> <p>Carry out very low level test in ambient 0.25g 5 to 2000Hz</p> <p>Note The Kevlar suspended detectors will not tolerate significant levels when warm. This test is to verify the instrumentation only.</p>					
16	Installation of shrouds, connections of pumps and fluid lines	1day	10/12/05			

17	<p><b>Evacuation</b></p> <p>Monitor pressure during evacuation and check for consistence with evacuation rate requirement in AD1</p> <p>Not to exceed 50mb/min</p> <p>Note pressure values or attach record</p>	1/2day	11/12/05			
18	<p><b>Cool down</b></p> <p>Monitor temperature sensor during cool down and check for consistence with cool down requirements in AD1</p> <p><b>5K/hour, between room temperature and 200K, 10K/hour, between 200K and 100K. 50K/hour below 100K</b></p> <p>Note Temperature or attach temperature record of temperature</p>	2.5days	11/12/05 12/12/05 13/12/05			

	sensors					
19	<b>Intermediate Test readiness review</b>	1hr	14/12/05			
20	<b>X axis test</b>					
20.1	<b>Resonance search</b>	1/2hr	14/12/05		0.25g 5 to 2000Hz	



20.3	<p><b>Full level sine test</b></p> <p>As per requirements in AD1</p> <p>Check results</p>	<p>1/2hr</p> <p>1/2hr</p>			<p>Test sweep rate 4 Oct/min, the input will be limited to equivalent quasi static interface force.</p> <p>X axis</p> <table border="1" data-bbox="1301 528 1910 810"> <thead> <tr> <th>Frequency Range Hz</th> <th></th> <th>Acceptance level</th> </tr> </thead> <tbody> <tr> <td>5 - 20.1</td> <td></td> <td>+/- 2mm</td> </tr> <tr> <td>20.1 – 100 for 1000 cycles *</td> <td>Up to 66Hz</td> <td>14.4 g</td> </tr> <tr> <td>20.1 – 100 for remaining cycles</td> <td></td> <td>6.4 g</td> </tr> </tbody> </table>	Frequency Range Hz		Acceptance level	5 - 20.1		+/- 2mm	20.1 – 100 for 1000 cycles *	Up to 66Hz	14.4 g	20.1 – 100 for remaining cycles		6.4 g	
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20.5	<p><b>Low level Random test</b></p> <p>test to AD1 at -12dB</p> <p>Check results</p>	1/2hr			<p>-12dB</p> <table border="1" data-bbox="1464 440 1910 692"> <thead> <tr> <th>Frequency Range Hz</th> <th>Acceptance levels</th> </tr> </thead> <tbody> <tr> <td>20-100</td> <td>+3dB/Oct</td> </tr> <tr> <td>100-150</td> <td>0.032 g<sup>2</sup>/Hz</td> </tr> <tr> <td>150-300</td> <td>0.0128 g<sup>2</sup>/Hz</td> </tr> <tr> <td>300-2000</td> <td>-12 dB/Oct</td> </tr> <tr> <td>Global</td> <td>2.77 g RMS</td> </tr> </tbody> </table>	Frequency Range Hz	Acceptance levels	20-100	+3dB/Oct	100-150	0.032 g <sup>2</sup> /Hz	150-300	0.0128 g <sup>2</sup> /Hz	300-2000	-12 dB/Oct	Global	2.77 g RMS	
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20.6	<p><b>Intermediate level Random test</b></p> <p>test to AD1 at -6dB</p> <p>Check results</p>	1/2hr	15/12/05		<p>-6 dB</p> <table border="1" data-bbox="1464 1023 1910 1275"> <thead> <tr> <th>Frequency Range Hz</th> <th>Acceptance levels</th> </tr> </thead> <tbody> <tr> <td>20-100</td> <td>+3dB/Oct</td> </tr> <tr> <td>100-150</td> <td>0.032 g<sup>2</sup>/Hz</td> </tr> <tr> <td>150-300</td> <td>0.0128 g<sup>2</sup>/Hz</td> </tr> <tr> <td>300-2000</td> <td>-12 dB/Oct</td> </tr> <tr> <td>Global</td> <td>2.77 g RMS</td> </tr> </tbody> </table>	Frequency Range Hz	Acceptance levels	20-100	+3dB/Oct	100-150	0.032 g <sup>2</sup> /Hz	150-300	0.0128 g <sup>2</sup> /Hz	300-2000	-12 dB/Oct	Global	2.77 g RMS	
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20.8	<b>Resonance search</b> Carry out resonance search as before  Compare with previous results	1/2hr  1/2hr	15/12/05		0.25g 5 to 2000Hz	
20.9	<b>Post test analysis</b>  Check completeness of data  Carry out initial assessment	1/2hr  2hrs				

21	<b>TRR</b>					
22	<p><b>Post Test Activities</b></p> <ul style="list-style-type: none"> <li>• check completeness of test data</li>   <li>• <b>Warm up</b>                      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</li>   <li><b>5K/hour, between room temperature and 200K,                      10K/hour, between 200K and 100K.                      50K/hour below 100K</b></li> </ul>		<p>16/12/05                      17/12/05                      18/12/05</p>			

	<p><b>Venting</b>                  Monitor pressure during venting and check for consistence with evacuation rate requirement in AD1                  Note pressure values or attach record</p> <p><b>Max rate 50mb/min</b></p>	4hrs	19/12/05			
23	<p><b>Dismount</b>                  dismounting of shrouds</p> <ul style="list-style-type: none"> <li>• Visual inspection of test specimen</li> <li>• Removal of instrument (TBC) and cleanliness inspection with UV light</li> </ul>	4hrs  1hr 2hr	19/12/05 20/12/05 20/12/05			

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	• Installation of the instrument inside its own container in accordance with AD1	2hr	20/12/05			
24	<b>Transport</b>		21/12/05			



PFM build

As Built Configuration List

23-Nov-05

SPIRE-RAL-DOC-002326

Issue 2.4

Date	Issue	Sheet	Change	Reason for change
28/06/2004	0.1D	All		First draft
21/09/2004	2.0		column added for PFM1 reqd	
03/02/2005	2.1	all	updated for PFM1 test campaign	
17/08/2005	2.2	all	updated for PFM 2 test campaign	
09/11/2005	2.3	FPU	Updated for PFM Cryo-vibration test	
22/11/2005	2.4	FPU	SMEC was CQM now DM	Updated for the PFM cryo-vibration test

Subsystem	Unit	Item	Drawing/Ref	Supplier	Required for PFM Cryo-vibration test
Structure	Optical Bench Panel	Optical bench panel	5264-302-4	MSSL	yes
					yes
	Photometer Cover	Photometer Cover Wall	5264-302-6	MSSL	yes
		Photometer cover lid	5264-302-10	MSSL	yes
		Photometer Seal- Top	5264-302-7	MSSL	yes
		Photometer Seal- Bottom	5264-302-8	MSSL	yes
	Spectrometer Cover	Spectrometer Cover Wall	5264-303-1	MSSL	yes
		Spectrometer Cover Lid	5264-303-2	MSSL	yes
		Spectrometer seals top	5264-303-4	MSSL	yes
		Spectrometer seals bottom	5264-303-5	MSSL	yes
FPU Supports (CFRP)	A Frames	A Frames	5264-302-1	MSSL	yes
		Fixed Mount Cone	5264-302-5	MSSL	yes
		A Frame Support Plates and brackets (both sides)	5264-302-14	MSSL	yes
			5264-302-15	MSSL	yes
			5264-302-26	MSSL	yes
		Insulating Bush	5264-302-2	MSSL	yes
		Special Washer	5264-302-3	MSSL	yes
		Dowel retaining Plate	5264-302-39	MSSL	yes
		Tubular Dowels (8mm)	5264-302-40	MSSL	yes
		Dowel - 'A' Frame support	5264-302-41	MSSL	yes
		Dowel - 'A' Frame Top	5264-302-42	MSSL	yes
		Special Washer - A Frame Brackets	5264-302-43	MSSL	yes
		Photometer Box	Photometer detector box		5264-306-1
	5264-306-2			MSSL	yes
	5264-306-3			MSSL	yes
BDA Adapter Plate (5 off)	5264-911			MSSL	yes
Dichroic rings	5264-310-1			MSSL	yes
	5264-310-2			MSSL	yes
	5264-310-3			MSSL	yes
	5264-311-1			MSSL	yes
	5264-311-2			MSSL	yes
Detector Box support Cone	5264-312			MSSL	yes
Photometer Detector Box A frames supports(2 per set)	5234-313			MSSL	yes
Washer	5264-313-1			MSSL	yes
Bushes	5264-313-2			MSSL	yes

<b>Spectrometer Box</b>	Spectrometer detector box		5264-307-1	MSSL	yes
		Filter mount	5264-307-2	MSSL	yes
		Spectrometer Detector Box supports(3 per set)	5264-307-4	MSSL	yes
		BDA Adapter Plate	5264-911	MSSL	yes
		Bushes	5264-307-5	MSSL	yes
<b>SCAL</b>		Scal Box	5264-314-1	MSSL	yes
		SCAI Cover	5264-314-2	MSSL	yes
		SCAL Exit Baffle Ring	5264-314-3	MSSL	yes
		SCAL Baffle Clamp	5264-314-4	MSSL	yes
		SCAL source	PFMB-000	UWC	yes
<b>Mirror Mounts</b>		Secondary optical Bench	5264-305-12	MSSL	yes
		Support PM6	5264-305-13	MSSL	yes
		PM6 Support Spare	5264-305-19	MSSL	yes
		Support PM8	5264-305-14	MSSL	yes
		PM10 Support	5264-305-17	MSSL	yes
		Support SM6	5264-305-2	MSSL	yes
		sm6 Support Spare	5264-305-18	MSSL	yes
		Support SM7	5264-305-3	MSSL	yes
		Bulkhead SM6 and SM7	5264-305-15	MSSL	yes
		Support SM8a	5264-305-4	MSSL	yes
		Support SM9-10a	5264-305-6	MSSL	yes
		Support SM9-10b	5264-305-7	MSSL	yes
		Support SM11a	5264-305-8	MSSL	yes
		Support SM11b	5264-305-9	MSSL	yes
		Support SM12a	5264-305-10	MSSL	yes
		Support SM12b	5264-305-11	MSSL	yes
<b>Other Optics</b>		SFIL2 Cold Stop	5264-305-22	MSSL	yes
		Photometer Cold Stop Clamp PFII3	5264-306-4	MSSL	yes
		Photometer Cold Stop PFII3	5264-306-5	MSSL	
		CFIL1 Baffle Mount	5264-304-6	MSSL	yes
		CFIL1 Baffle Clamp Ring	5264-304-7	MSSL	yes
		PFIL2 Mount Back Plate	5264-302-12	MSSL	yes
		PFIL2 Mount CLamp plate	5264-302-17	MSSL	yes
		Filter Mounts - SFIL2	5264-305-20	MSSL	yes
		Filter Mount - SFIL2 clamp ring	5264-305-21	MSSL	yes
		SFIL2 dowels	5264-305-27	MSSL	yes
		SBS 1and 2 Filter mount (2 per set)	5264-305-23	MSSL	yes
		SBS 1and 2 Filter Clamp	5264-305-24	MSSL	yes
		Clamp Plate SFIL -3	5264-307-3	MSSL	yes

Optics	Mirrors	CM3		LAM	yes	
		CM5		LAM	yes	
		PM6		LAM	yes	
		PM7		LAM	yes	
		PM8		LAM	yes	
		PM9		LAM	yes	
		PM10		LAM	yes	
		PM11		LAM	yes	
		SM6		LAM	yes	
		SM7		LAM	yes	
		SM8A		LAM	yes	
		SM9A		LAM	yes	
		SM10A		LAM	yes	
		SM11A		LAM	yes	
		SM12A		LAM	yes	
		SM8B		LAM	yes	
		SM9B		LAM	yes	
		SM10B		LAM	yes	
		SM11B		LAM	yes	
		SM12B		LAM	yes	
		SCCA1		LAM	yes	
		SCCA2		LAM	yes	
		SCCB1		LAM	yes	
	SCCB2		LAM	yes		
		Filters	CFIL1		UWC	yes
			PFIL-2		UWC	yes
			PFIL-3		UWC	yes
			PDIC-1		UWC	yes
			PDIC-2		UWC	yes
			PFIL-4S		UWC	yes
			PFIL-5S		UWC	yes
			PFIL-4M		UWC	yes
			PFIL-5M		UWC	yes
	PFIL-4L			UWC	yes	
	PFIL-5L			UWC	yes	
	PFIL-6L			UWC	yes	
	SBS1			UWC	yes	
	SBS2			UWC	yes	
	SFIL2			UWC	yes	
	SFIL3S			UWC	yes	
	SFIL3L			UWC	yes	
	SFIL4S			UWC	yes	
	SFIL5S			UWC	yes	
	SFIL6S		UWC	yes		
	SFIL4L		UWC	yes		
	SFIL5L		UWC	yes		
	SFIL6L		UWC	yes		

<b>Beam steering mirror</b>				ATC	yes
<b>3He Cooler</b>		Cooler s/n 1	2000-14B-000	SBT	yes
<b>300 mK thermal straps and supports</b>		Bus Bar Upper	5264-306-7	MSSL	yes
		Busbar Lower	5264-306-8	MSSL	yes
		BDA-Busbar Flange	5264-306-9	MSSL	yes
		Bus Connector PLW	5264-306-10	MSSL	yes
		Bus Junction ans PMW Connector	5264-306-11	MSSL	yes
		Bus Junction Clamp Plate	5264-306-12	MSSL	yes
		Light Trap to Bus Junction	5264-306-13	MSSL	yes
		Bus Connector PSW	5264-306-14	MSSL	yes
		BDA-Busbar Flange	5264-306-15	MSSL	yes
		PLW Bus Strap	5264-306-16	MSSL	yes
		PMW Bus Strap	5264-306-17	MSSL	yes
		PSW Bus Strap	5264-306-18	MSSL	yes
		End stop Photometer Light Trap	5264-306-19	MSSL	yes
		Light Trap Feed Through - Photometer	5264-306-20	MSSL	yes
		Stop Bush -Bus Bar Mountings	5264-306-21	MSSL	yes
		Light Trap Feedthrough spect.	5264-307-6	MSSL	yes
		Light Baffle Junction	5264-307-7	MSSL	yes
		SSW Spect. BDA to light trap strap (5N Cu not annealed)	5264-307-8	MSSL	yes
		SLW Spect. BDA to Light Trap Strap (5N Cu not annealed)	5264-307-9	MSSL	yes
		BDA Cold Interface Spectrometer	5264-307-10	MSSL	yes
		Bush inner Spectrometer light trap	5264-307-11	MSSL	yes
		Bush outer Spectrometer light trap	5264-307-12	MSSL	yes
		Cold Strap Support	5264-307-13	MSSL	yes
		Photometer Baffle	LTS PFM-300	UWC	yes
		Spectrometer Baffle	LTS PFM-400	UWC	yes
<b>L0 Thermal Straps</b>		Detector Box I/F		RAL	no
		Cooler Pump I/F		RAL	no
		Cooler Evap I/F		RAL	no
<b>300 mK Thermal control system</b>		PTC system s/n 2	10217660-1	JPL	yes

<b>BDA</b>	Photometer LW array	10209800-1	s/n 14	JPL	yes
	Photometer MW array	10209800-2	s/n 12	JPL	yes
	Photometer SW array	10209800-3	s/n 13	JPL	yes
	Spectrometer SW	10209800-5	s/n 09	JPL	yes
	Spectrometer LW array	10209800-4	s/n 08	JPL	yes
<b>SMEC</b>	DM	LAM.SSP.SPI.ADP.041020		LAM	yes
<b>PCAL</b>				UWC	yes
<b>FPU RF Filters</b>	Box				yes
		RFI Filter Bracket Corner Bracket	A2/5264/302-27	MSSL	yes
		Tempory RFI Bracket	A2/5264/302-28	MSSL	yes
		RFI Filter Frame Edge Bracket	A2/5264/302-29	MSSL	yes
	RF Filter Modules	RF-13	10209780-1	JPL	yes
		RF-14	10209780-2	JPL	yes
		RF-15	10209780-3	JPL	yes
		RF-16	10209780-4	JPL	yes
		RF-17	10209780-5	JPL	yes
		RF-18	10209780-6	JPL	yes
		RF-19	10209780-7	JPL	yes
		RF-21	10209780-8	JPL	yes
		RF-22	10209780-9	JPL	yes
		RF-23	10209780-10	JPL	yes
		RF-24	10209780-11	JPL	yes
		RF-25	10209780-12	JPL	yes

<b>FPU internal harnesses</b>		F1 PSW BDA J01 to HSJFP J29	relabeled J31	Tekdata	yes
		F2 PSW BDA J02 to HSJFP J30	relabeled J32	Tekdata	yes
		F3 PSW BDA J03 to HSJFP J31		Tekdata	yes
		F4 PSW BDA J04 to HSJFP J32		Tekdata	yes
		F5 PSW BDA J05 to HSJFP J33		Tekdata	yes
		F6 PSW BDA J06 to HSJFP J34		Tekdata	yes
		F7 PLW BDA J01 to HSJFP J35		Tekdata	yes
		F8 PLW BDA J02 to HSJFP J36		Tekdata	yes
		F9 PMW BDA J01 to HSJFP J37	relabeled J39	Tekdata	yes
		F10 PMW BDA J02 to HSJFP to J38	relabeled J40	Tekdata	yes
		F11 PMW BDA J03 to HSJFP to J39		Tekdata	yes
		F12 PMW BDA J04 to HSJFP to J40		Tekdata	yes
		F13 SSW BDA J05 to HSJFS J11		Tekdata	yes
		F14 SSW BDA J06 to HSJFS J12		Tekdata	yes
		F15 SLW BDA J01 to HSJFS J13 (plus PTC Cold harnessing – F28)		Tekdata	yes
		F16 COOLER-P to FPU J19A		Tekdata	yes
		F17 COOLER-R to FPU J20A		Tekdata	yes
		F18 SCal-P to FPU J21A		Tekdata	yes
		F19 SCal-R to FPU J22A		Tekdata	yes
		F20 THERM-P to FPU J23A		Tekdata	yes
		F21 THERM-R from FPU J24A		Tekdata	yes
		F22 BSM-P to FPU J25A		Tekdata	yes
		F23 BSM-R to FPU J26A		Tekdata	yes
		F24 SMEC Launch (Prime) connected to FPU J27A		Tekdata	yes
		F25 SMEC Control (Prime) connected to FPU J29A		Tekdata	yes
		F26 SMEC Launch (Red.) connected to FPU J28A		Tekdata	yes
		F27 SMEC Control (Red.) connected to FPU J30A		Tekdata	yes

Thermometers					
FLIGHT					
<b>Level 1</b>					
Acronym	Location	Type	Serial No.	Cal Curve	Range (K)
EMCFIL_1	HSFPU Harness Filter Bracket	CX-1030	X30977		3>100K
T_SUB_1	M3,5,7 Optical Sub Bench	CX-1030	X30981		3>100K
T_BAF_1	Input Baffle	CX-1030	X29604		3>100K
T_BSMS_1	BSM/SOB I/F (SOB side)	CX-1030	X29597		3>100K
T_SCST_1	SCAL Structure	CX-1030	X28264		10>100K
T_SCL4_1	SCAL 4%	CX-1030	X29754		10>80K
T_SCL2_1	SCAL 2%	CX-1030	X29758		10>80K
T_BSMM_1	BSM	CX-1030	X31060		3-20K
T_FTSM_1	SMEC	CX-1030	X31075		3-20K
T_FTSS_1	SMEC/SOB I/F	CX-1030	X29752		3-100K
<b>Level 0</b>					
Acronym	Location	Type	Serial No.	Cal Curve	Range (K)
T_CPHP_1	Cooler Pump	CX-1030	X29559		3>100K
T_CSHT_1	Cooler Shunt	CX-1030	X29577		0.2>5K
T_CEV_1	Cooler Evap	CX-1030	X29558		0.2>5K
T_CPHS_1	Cooler Pump Heat Switch (sieve)	CX-1030	X29554		1>50K
T_CEHS_1	Cooler Evap Heat Switch (sieve)	CX-1030	X29546		1>50K
T_PL0_1	Photometer Level 0 Enclosure	CX-1030	X29606		1-10K
T_SL0_1	Spectrometer Level 0 Enclosure	CX-1030	X29601		1-10K