



Distribution

RAL

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1 Scope of Document

This document describes in detail how the SPIRE AIV facility will be integrated and tested in preparation for the STM and CQM testing, in particular the test cryostat and harness. It describes the step-by-step sequence of activities, high-level procedures, organisation, resources and facilities required. It does not describe the general facility build and telescope simulator integration and testing which will have been completed as separate tasks.

2 Documents

2.1 Applicable Documents

	Title	Author	Reference	Date
AD 1	SPIRE Data ICD	K.J. King	SPIRE-RAL-PRJ-001078, issue 1.0	15/01/2003
AD2	MCU/DCU Command list ICD an user manual	Didier Ferrand	LAM/ELE/SPI/011011, issue 3.0	15/01/2003
AD3	DRCU/DPU ICD	Pinsard, Ferrand, Mur	Sap-SPIRE-Cca-076-02, issue 1.0	14/02/2003

2.2 Reference Documents

	Title	Author	Reference	Date
RD 1	EGSE specification			
RD 2				
RD 3				



3 Acronyms

AD	Applicable Document
AIV	Assembly Integration and Verification
AVM	Avionics Model
BSM	Beam Steering Mechanism
CQM	Cryogenic Qualification Model
DCU	Detector Control Unit
DPU	Digital Processing Unit
DRCU	Detector Readout and Control Unit
EGSE	Electrical Ground Support Equipment
FTS	Fourier Transform Spectrometer
HOB	Herschel Optical Bench
ILT	Instrument Level Test
MCU	Mechanism Control Unit
MGSE	Mechanical Ground Support Equipment
N/A	Not Applicable
PCAL	Photometer Calibrator source
PFM	Proto-Flight Model
RAL	Rutherford Appleton Laboratory
RD	Reference Document
SCAL	Spectrometer Calibrator source
SCU	Subsystem Control Unit
SMEC	Spectrometer Mechanism
SPIRE	Spectral and Photometric Imaging Receiver
STM	Structural Test Model
TBC	To Be Confirmed
TBD	To Be Defined
TFCS	Test Facility Control System

4 Test Summaries

(Characterisation test are in *italic*)

4.0 SCU-00

Check the integrity of the SCU science data. Also check that the number of frames generated matches the number commanded.

4.1 SCU-01

Check the integrity of the SCU science data. Check that content of science frames matches that in HK telemetry.

4.2 SCU-02

Switch on thermometers and check values – could have different short and full functional tests.

4.3 SCU-03

Switch on PCAL, set a current and check voltage and current, then switch off.

4.4 SCU-04

Switch on SCAL, set a current and check voltage, current and temperature changes, then switch off.

4.5 SCU-05

Switch on AC thermometers and check values.

4.6 SCU-06

Switch on heaters, check voltage and temperature.

4.7 SCU-07

Load test pattern and check content of packets. Perform test for each type of packet (SMEC, BSM, ENG).

4.8 MCU-01

Power on MCU from SCU, check all voltage, check threshold flags, check if DSP booted. Check HK.

4.9 MCU-02_0

Check that the number of frames generated matches the number commanded. Perform test for each type of packet. (SMEC, BSM, ENG).

4.10 MCU-02

Check of integrity of MCU science data. Perform test for each type of packet. (SMEC, BSM, ENG).

4.11 MCU-03

Load test pattern and check contents of packets. Perform test for each type of packet (SMEC, BSM, ENG).

4.12 MCU-04

Open launch latch, move SMEC short distance and check response.

4.13 SMEC-01

Switch on LVDT, fringe encoder and motor. Check encoder signal, status bits, and current.

4.14 SMEC-02

Initialise SMEC. Check LVDT, fringe encoder and current.

4.15 SMEC-03

Move to set positions and measure read back position, currents, back emf.

4.16 SMEC-04

Move to number of set positions and measure positions, current, back emf – repeat for different scan speed.

4.17 SMEC-05

Scan over range (saw tooth) and measure positions, current, back-emf – repeat for different scan speed.

4.18 SMEC-06

Scan over range (triangular) and measure positions, current, back-emf – repeat for different scan speed

4.19 BSM-01

Check telemetry responses, consumed power.

4.20 BSM-02

Move BSM to set positions. Check telemetry responses, consumed power.

4.21 BSM-03

Move BSM to multiple set positions. Check telemetry response, consumed power.

4.22 BSM-04

Set BSM to each mode (Chop, jiggle...). Check telemetry response, consumed power.

4.23 PCAL-01

Step through each setting and measure telemetry response.

4.24 SCAL-01

Set current and record temperatures.

4.25 SCAL-02

Set temperatures and record temperatures.

5 Test Specifications

5.0 SCU-00 (SCU Science packet generation check)

ID:	SCU-00
Test name:	SCU Science Packet Generation Check
Description of test:	Check the integrity of the SCU science data. Also check that the number of frames generated matches the number commanded.
Test Type:	Integrity Check
Instrument Models:	AVM/CQM/PFM
Redundancy:	Prime and Redundant Units
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required
Test Conditions:	Warm or Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. In SCOS, select the appropriate display (<i>DPU and OBS PARAMETER</i>) 2. Send request for N SCU science packets 3. Wait for packets to be generated 4. Check that N SCU science packets were generated, i.e. that parameter TM5N (sequence count of TM packets for SCU Science) increases until N
Success/Failure Criteria:	Test passed if number of packets generated = number requested If not?

5.1 SCU-01 (SCU Science Data Check)

ID:	SCU-01
Test name:	SCU Science Data Check
Description of test:	Check the integrity of the SCU science data. Check that content of science frames matches that in HK telemetry
Test Type:	Integrity Check
Instrument Models:	AVM/CQM/PFM
Redundancy:	Prime and Redundant Units
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required QLA may be required
Test Conditions:	Warm or Cold
Constraints:	SCU thermometry needs to be switched on – see test SCU-02
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Send a request for N SCU science packets. 2. Wait for packets to be generated 3. Use either QLA or “Packet display” with SCOS to see the content of the frames 4. Compare it with the HK parameters <p>Example of parameters to compare:</p> <ul style="list-style-type: none"> – <i>TempOnOff</i> – <i>ScuCHTp05</i> – <i>ScuCHTp09</i> – <i>PCALV</i> – <i>SCAL2V</i> – <i>SCAL2Temp</i> – ...
Success/Failure Criteria:	<p>Test passed if values in the science frame are identical to those in the HK nominal report.</p> <p>If not?</p>

5.2 SCU-02 (SCU DC Thermometry Check)

ID:	SCU-02
Test name:	SCU DC Thermometry Check
Description of test:	Switch on thermometers in-turn and check values
Test Type:	Integrity Check
Instrument Models:	CQM/PFM
Redundancy:	Prime and Redundant Units
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required
Test Conditions:	Warm or Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select the appropriate display (<i>SCU PARAMETER</i>) 2. Send command to switch on SCU thermometer channel TBD 3. Wait 5 seconds (allow time for sensor to activate) 4. Check values of the parameters <ul style="list-style-type: none"> if Warm, $T > 290K$ if Cold, $T < 4.2K$ 5. Repeat steps 1 to 4 for other thermometer channels <p>Parameters to check: <i>CPHPtemp, CPHStemp, CEHStemp, CSHTtemp, SOBtemp, SLOtemp, PLOtemp, SUBtemp, BAFtemp, BSMStemp, SCL2temp, SCL4temp, SCSTtemp, FTSStemp, FTSMtemp, BSMMtemp</i></p>
Success/Failure Criteria:	<p>Test passed if all thermometer channels are reading expected values.</p> <p>If not – raise a NCR and proceed to next test.</p>

5.3 SCU-03 (SCU PCAL)

ID:	SCU-03
Test name:	SCU PCAL
Description of test:	Switch on PCAL, set a current and check voltage and current, then switch off
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Switch on PCAL 2. Select the appropriate display (<i>SCU PARAMETER</i>) 3. Send a command to set a current value 4. Check values of the parameters (<i>PCALV</i> and <i>PCALCURR</i>). 5. Switch off PCAL.
Success/Failure Criteria:	Test passed if value of current read = current set and voltage has value expected

5.4 SCU-04 (SCU SCAL Check)

ID:	SCU-04
Test name:	SCAL check
Description of test:	Switch on SCAL, set a current and check voltage, current and temperature changes, then switch off
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Switch on SCAL 2. Send a command to set a current value 3. Use the appropriate display (<i>SCU PARAMETER</i>) and check values of the parameters for voltage, current and temperature (<i>SCAL2V</i>, <i>SCAL4V</i>, <i>SCAL2CURR</i>, <i>SCAL4CURR</i>, <i>SCAL2TEMP</i>, <i>SCAL4TEMP</i>). 4. Switch off SCAL
Success/Failure Criteria:	Test passed if value of current read = current set and voltage and temperature have values expected

5.5 SCU-05 (SCU AC thermometry check)

ID:	SCU-05
Test name:	AC thermometry check
Description of test:	Switch on AC thermometers and check values
Test Type:	integrity
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select the appropriate display (<i>SCU PARAMETER</i>) 2. Send command to switch on SCU thermometer channel TBD 3. Wait 5 seconds (allow time for sensor to activate) 4. Check values of the parameters <ul style="list-style-type: none"> if Warm, $T > 290K$ if Cold, $T < 1K$ <p>Parameter to check: <i>CEVTemp</i></p>
Success/Failure Criteria:	<p>Test passed if thermometer channel is reading expected value</p> <p>If not – raise a NCR and proceed to next test.</p>

5.6 SCU-06 (SCU Cooler Heaters check)

ID:	SCU-06
Test name:	SCU Cooler Heater Check
Description of test:	Switch on heaters, check voltage and temperature
Test Type:	integrity
Instrument Models:	CQM/PFM
Redundancy:	prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	Instrument Level Tests (ILT) SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	SCU-05 should work first
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select the appropriate display (<i>SCU PARAMETER</i>) 2. Execute command list to switch on the heaters 3. Send a command to set a value of current 4. Check values of parameters (<i>SPHSCURR, EVHSCURR, TCHTRCURR, SPHTRCURR...</i>) <p><i>...what about parameters for voltage? (in SCU science but not in HK nominal report?)</i></p> <p><i>parameters for temperatures?</i></p>
Success/Failure Criteria:	Test passed if voltage and temperature are read and have the values expected.

5.7 SCU-07 (SCU Test pattern test)

ID:	SCU-07
Test name:	Test pattern test
Description of test:	Load test pattern and check content of packets. Perform test for each type of packet (SMEC, BSM, ENG)
Test Type:	integrity
Instrument Models:	AVM/CQM/PFM
Redundancy:	prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at SCU test pattern packet 2. Request N test pattern packet. 3. Check content. 4. Repeat for each type of packet (SMEC, BSM, ENG)
Success/Failure Criteria:	test passed if the test pattern is properly generated

5.8 MCU-01 (MCU Power On)

ID:	MCU-01
Test name:	MCU Power On
Description of test:	Power on MCU from SCU, check all voltage, check threshold flags, check if DSP booted. Check HK
Test Type:	integrity
Instrument Models:	AVM/CQM/PFM
Redundancy:	prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select the appropriate display (<i>MCU PARAMETER</i>) 2. Send command to power MCU from SCU 3. Wait 10 seconds 4. Check that all voltage come up and are in range (parameters <i>MCUP15V, MCUM15V, MCUP13V, MCUM13V, MCUP5V</i>) and check threshold flag 5. Check boot status register (<i>MCUBOOT STAT</i>) to see if DSP booted 6. Switch off MCU
Success/Failure Criteria:	if DSP not booted, then OBS should cope with this

5.9 MCU-02_0 (MCU Science Packet generation check)

ID:	MCU-02_0
Test name:	MCU Science packet generation check
Description of test:	Check that the number of frames generated matches the number commanded Perform test for each type of packet. (SMEC, BSM, ENG)
Test Type:	integrity
Instrument Models:	AVM/CQM/PFM
Redundancy:	prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required QLA may be required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. In SCOS, select the appropriate display (<i>DPU and OBS PARAMETER</i>) 2. Send request for N SMEC science packets 3. Wait for packets to be generated 4. Check that N science packets were generated, i.e. that parameter TM5N (sequence count of TM packets for SCU Science) increases until N 5. Repeat steps 2 to 4 for BMS and ENG science packet
Success/Failure Criteria:	Test passed if number of packets generated = number requested. If not?

5.10 MCU-02 (MCU Science Data check)

ID:	MCU-02
Test name:	MCU Science Data Check
Description of test:	Check of integrity of MCU science data. Perform test for each type of packet. (SMEC, BSM, ENG)
Test Type:	integrity
Instrument Models:	AVM/CQM/PFM
Redundancy:	prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required QLA may be required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Send a request for N SMEC science packets. 2. Wait for packets to be generated 3. Use either QLA or "Packet display" with SCOS to see the content of the frames 4. Compare it with the HK parameter. 5. Repeat steps 1 to 4 for BSM and ENG science packet <p>parameters to compare:</p> <ul style="list-style-type: none"> • SMEC: <i>Optical encoder coarse position, fine position, LVDT DC signal, Motor BEMF</i> • BSM: <i>Chop position, Chop motor current, chop BEMF, jiggle position, Jiggle motor current, Jiggle BEMF</i> • ENG: <i>SMEC encoder signal 1/2/3, SMEC LVDT AC/DC signal, SMEC motor current/voltage, chop/jiggle magneto resistor, chop/jiggle motor current, chop/jiggle servo error.</i>
Success/Failure Criteria:	<p>Test passed if values in the science frames are identical to those in the HK nominal report</p> <p>If not?</p>

5.11 MCU-03 (MCU Test Pattern test)

ID:	MCU-03
Test name:	MCU Test Pattern test
Description of test:	Load test pattern and check contents of packets. Perform test for each type of packet (SMEC, BSM, ENG)
Test Type:	Integrity
Instrument Models:	AVM/CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at MCU test pattern packet 2. Request N test pattern packet. 3. Check content. 4. Repeat for each type of packet (SMEC, BSM, ENG)
Success/Failure Criteria:	test passed if the test pattern is properly generated

5.12 MCU-04 (MCU launch latch check)

ID:	MCU-04
Test name:	MCU launch latch check
Description of test:	Open launch latch, move SMEC short distance and check response
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT LAM EGSE only
Test Conditions:	Warm and cold
Constraints:	Can only be performed in cryostat configuration
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select appropriate display (<i>SMEC PARAMETERS</i>) 2. Send command to open launch latch 3. Send command to move SMEC by a short distance 4. Check response (parameter <i>SMECLVDTPOSN</i> ?)
Success/Failure Criteria:	Test passed if SMEC moves.

5.13 SMEC-01 (SMEC Switch On)

ID:	SMEC-01
Test name:	SMEC Switch On
Description of test:	Switch on LVDT, fringe encoder and motor. Check encoder signal, status bits, current
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select appropriate display (<i>SMEC PARAMETERS</i>) 2. Send command to switch on LVDT 3. Send command to switch on fringe encoder 4. Send a command to switch on motors 5. Check LVDT position (<i>SMECLVDTPOSN</i>) 6. Check encoder signals (<i>SMECSINE000SIG SMECSINE120SIG, SMECSINE240SIG</i>) 7. Check status bit (<i>SMECSTAT</i>) and current (<i>SMECMOTORCURR</i>)
Success/Failure Criteria:	Test passed if values read are values expected

5.14 SMEC-02 (SMEC Initialisation)

ID:	SMEC-02
Test name:	SMEC initialisation
Description of test:	Initialise SMEC. Check LVDT, fringe encoder and current
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Send command to initialise SMEC 2. Check LVDT position (<i>SMECLVDTPOSN</i>) 3. Check encoder signals (<i>SMECENCPOSN</i>, <i>SMECSINE000SIG</i>, <i>SMECSINE120SIG</i>, <i>SMECSINE240SIG</i>) 4. Check current (<i>SMECMOTORCURR</i>)
Success/Failure Criteria:	Test passed if values read are values expected

5.15 SMEC-03 (SMEC Position test)

ID:	SMEC-03
Test name:	SMEC position test
Description of test:	Move to set positions and measure read back position, currents, back emf
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select appropriate display (<i>SMEC PARAMETERS</i>) 2. Send command to move SMEC to a chosen position 3. Read position (<i>SMECENCPOSN</i>, <i>SMECLVDTPOSN</i>) 4. Check current (<i>SMECMOTORCURR</i>) and back emf (<i>SMECMOTORBEMF</i>)
Success/Failure Criteria:	Test passed if SMEC moves to the set position and current and back emf have expected values

5.16 SMEC-04 (SMEC Multiple position test)

ID:	SMEC-04
Test name:	SMEC Multiple position test
Description of test:	Move to number of set positions and measure positions, current, back emf – repeat for different scan speed
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for SMEC position 2. Record position sensor signal, motor current, back emf 3. Send command to move SMEC to a chosen position 4. Check SMEC movement (length, velocity and stability of the scan) 5. Set a new scan speed, a new position and repeat steps 1 to 4 <ul style="list-style-type: none"> • Parameters present in an “Engineering” frame: <i>Servo error, Encoder signal 1/2/3, LVDT AC/DC signal, motor current, motor voltage</i> • Parameters present in a “SMEC” frame: opt. enc. coarse position, opt. enc. fine position, LVDT DC signal, Back EMF
Success/Failure Criteria:	Test passed if SMEC moves to the set position with the requested scan speed, and current and back emf have expected values

5.17 SMEC-05 (SMEC Saw tooth scan test)

ID:	SMEC-05
Test name:	SMEC Saw tooth scan test
Description of test:	Scan over range and measure positions, current, back-emf – repeat for different scan speed
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for SMEC position 2. Record position sensor signal, motor current, back emf 3. Send command for SMEC to do a saw tooth scan 4. Check SMEC movement (length, velocity and stability of the scan) 5. Set a new scan speed, a new position and repeat steps 1 to 4 <ul style="list-style-type: none"> • Parameters present in an “Engineering” frame: <i>Servo error, Encoder signal 1/2/3, LVDT AC/DC signal, motor current, motor voltage</i> • Parameters present in a “SMEC” frame: <i>opt. enc. coarse position, opt. enc. fine position, LVDT DC signal, Back EMF</i>
Success/Failure Criteria:	Test passed if SMEC does the requested scan and current and back emf have expected values

5.18 SMEC-06 (SMEC triangular test)

ID:	SMEC-06
Test name:	SMEC triangular scan test
Description of test:	Scan over range and measure positions, current, back-emf – repeat for different scan speed
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	Prime and redundant
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for SMEC position 2. Record position sensor signal, motor current, back emf 3. Send command for SMEC to do a triangular scan 4. Check SMEC movement (length, velocity and stability of the scan) 5. Set a new scan speed, a new position and repeat steps 1 to 4 <ul style="list-style-type: none"> • Parameters present in an “Engineering” frame: <i>Servo error, Encoder signal 1/2/3, LVDT AC/DC signal, motor current, motor voltage</i> • Parameters present in a “SMEC” frame: <i>opt. enc. coarse position, opt. enc. fine position, LVDT DC signal, Back EMF</i>
Success/Failure Criteria:	Test passed if SMEC does the requested scan and current and back emf have expected values

5.19 BSM-01 (BSM Power on motors and sensors)

ID:	BSM-01
Test name:	BSM Power on motors and sensors
Description of test:	Check telemetry responses, consumed power
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select appropriate displays (<i>CHOP PARAMETERS</i> and <i>JIGGLE PARAMETERS</i>) 2. Send command to switch on BSM motors 3. Check parameters: <i>MCUBSMTEMP</i>, <i>CHOPSENSPOSNO</i>, <i>CHOPSENSPOSN1</i>, <i>CHOPMOTORCURR</i>, <i>CHOPBEMF</i>, <i>JIGGSENSPOSNO</i>, <i>JIGGSENSPOSN1</i>, <i>JIGGMOTORCURR</i>, <i>JIGGBEMF</i>
Success/Failure Criteria:	test passed if BSM is switched on and parameters have the values expected

5.20 BSM-02 (BSM Move to position)

ID:	BSM-02
Test name:	BSM Move to Position
Description of test:	Move BSM to set positions. Check telemetry responses, consumed power
Test Type:	Integrity
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	ILT SCOS-2000 required
Test Conditions:	Warm and cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Select appropriate displays (<i>CHOP PARAMETERS</i> and <i>JIGGLE PARAMETERS, TBC</i>) 2. Send command to move BSM to set positions 3. Check parameters: <i>MCUBSMTEMP, CHOPPOSN, CHOPPOSNERR, CHOPSENSPOSNO, CHOPSENSPOSNI, CHOPMOTORCURR, CHOPBEMF, JIGGPOSN, JIGGPOSNERR, JIGGSENSPOSNO, JIGGSENSPOSNI, JIGGMOTORCURR, JIGGBEMF</i>
Success/Failure Criteria:	test passed if BSM moves to the requested position and parameters have the values expected

5.21 BSM-03 (BSM Scan test)

ID:	BSM-03
Test name:	BSM Scan test
Description of test:	Move BSM to multiple set positions. Check telemetry response, consumed power.
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for BSM 2. Record motor current, position sensor signal 3. Send command to move BSM to a chosen position 4. Repeat for a TBD set of position 5. Derive characteristics from <i>Position vs Time</i> (scan velocity and stability, consumed power...) <ul style="list-style-type: none"> • Parameters present in an “Engineering” frame: <i>Magneto resistor signal, Motor current, Servo Error (for chopper and jiggle)</i> • Parameters present in a “BSM” frame: <i>magneto resistor signal, Motor setting current, motor measured voltage (for chopper and jiggle)</i>
Success/Failure Criteria:	test passed if BSM moves to the set positions, if characteristics are as expected

5.22 BSM-04 (BSM Operating mode test)

ID:	BSM-04
Test name:	BSM Operating mode test
Description of test:	Set BSM to each mode (Chop, jiggle...). Check telemetry response, consumed power
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for BSM 2. Record motor current, position sensor signal 3. Send command for BSM to chop 4. Derive characteristics from <i>Position</i> vs <i>Time</i> (period, amplitude, velocity, stability...), check consumed power. 5. Repeat for a TBD set of chop throws, TBD set of chop periods 6. Repeat for the jiggle mode <ul style="list-style-type: none"> • Parameters present in an “Engineering” frame: <i>Magneto resistor signal, Motor current, Servo Error (for chopper and jiggle)</i> • Parameters present in a “BSM” frame: <i>Magneto resistor signal, Motor setting current, motor measured voltage (for chopper and jiggle)</i>
Success/Failure Criteria:	test passed if BSM behave as requested, if characteristics are as expected

5.23 PCAL-01 (PCAL Characterisation test)

ID:	PCAL-01
Test name:	PCAL characterisation test
Description of test:	Step through each setting and measure telemetry response
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for PCAL 2. Set a current 3. Record temperatures, current and voltage 4. Repeat for a TBD set of currents 5. Derive PCAL characteristics (stability, consumed power) <p>Parameters present in a SCU science packet: <i>PhCalCur</i>, <i>PhCalVolt</i> ...<i>PhCal temp</i> ??</p>
Success/Failure Criteria:	Test passed if PCAL characteristics are as expected

5.24 SCAL-01 (SCAL Characterisation test)

ID:	SCAL-01
Test name:	SCAL Characterisation tests
Description of test:	Set current and record temperatures
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for SCAL 2. Record temperatures and voltage 3. Set a current (Heaviside step) 4. Derive time constant from Tp vs Time 5. Repeat for a TBD set of currents 6. Set current to 0 7. Derive cooling time constant from Tp vs Time 8. Derive other characteristics? (Consumed power...) <p>Parameters present in a SCU science packet: <i>Scal2Temp, Scal4Temp, Scal2curr, Scal4curr, Sca2V, Scal4V</i></p>
Success/Failure Criteria:	Test passed if SCAL characteristics are as expected

5.25 SCAL-02 (SCAL PID test)

ID:	SCAL-02
Test name:	SCAL PID tests
Description of test:	Set temperatures and record temperatures
Test Type:	Characterisation
Instrument Models:	CQM/PFM
Redundancy:	
Instrument Configuration:	SPIRE in READY mode
EGSE Configuration:	QLA required
Test Conditions:	Cold
Constraints:	
Outline procedure and analysis:	<ol style="list-style-type: none"> 1. Set-up QLA to look at the parameters for SCAL 2. Set temperature 3. Record temperatures and voltages 4. Repeat for a TBD set of temperature 5. Derive stability from Tp vs Time <p>Parameters present in a SCU science packet: <i>Scal2Temp, Scal4Temp, Scal2curr, Scal4curr, Sca2V, Scal4V</i></p>
Success/Failure Criteria:	Test passed if SCAL characteristics are as expected, if the stability is within requirement