

SPIRE BSM Project Manager hand over meeting  
SPIRE-RAL-MOM-001613  
ATC – Tuesday 22 April 2003

#### Distribution

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#### Purpose:

- A. Plan the handover of Project Management and PA from Ian Pain to Phil Parr-Burman.
- B. Review the status of the readiness of the BSM to go into PFM

### 1. Lab Demonstration

The DM2 BSM with a EM BSM card from LAM being driven by a D-Space implementation of the MAC card was demonstrated. A cryoharness simulator was connected in the BSM harness.

- A laser illuminated the BSM and was reflected onto the wall of the lab
- The Chop and Jiggle axes were commanded to follow a saw tooth pattern
- The amplitude was limited as the BSM was at room temperature

The demonstration was successful. It was noted that the mirror was not able to achieve the full throw in one direction of chop. This may be due to misalignment of the flex pivots? There may be cold dissipation consequences from this.

### 2. Overview of Subsystem Test Plan

I have read David's document and I am generally happy with the plan. I would like to discuss the testing of the mirror with the warm electronics. For example, is the BSM long-term stability still guaranteed when the BSM is subjected to temperature drifts? How are the electrical interfaces going to be tested? Could we go over the configuration we have set up in the lab at the moment?

### 3. Brian Stobie's presentation

- A. There is the issue that the BSM achieves only 98% of the chop throw and 91% of the jiggle. The problem is to be solved with a two-pronged approach:
  1. Increase the thickness of the permanent magnet in the "paddles" from 2mm to 3mm. This should theoretically increase the torque on the flex pivots by 25%
  2. Increase the specification on the maximum current from the BSM board from 40mA to 50mA. ATC to formalise this change.
- B. Position sensor resolution
  1. Sensor has demonstrated five time the requirement
- C. Drift.
  1. The short-term drift has been demonstrated.
  2. The stability of the OGSE limits the ability to demonstrate the long-term drift. Need to think about this.
- D. Repeatability 0requirement .004 deg. achieved 0.0002 deg.
- E. Settling time:

1. The jiggle requirement is within spec but the chop is out of spec (25mS vs. 20mS requirement). This should be resolved by the increase in the motor torque with larger magnet and higher motor current. And possible optimisation of the control algorithm.
- F. Power dissipation:
1. The requirement is 4mW average in any operating mode of the instrument
  2. Currently, the dissipation is 5.5mW. One of the motor coils showed a higher cold resistance than others. This was not evident warm. It could be on the Zeiss side of the interface or the ATC.
  3. The power requirement may also be due to the magnetic stiffening of the flex pivots.
  4. The dissipation characteristics should be included with the PFM and FS EIDPs so that the dissipation can be calculated
  5. The nominal chop throw is  $\pm 63''$  (sky). This should be the main parameter used in calculating the average dissipation.
  6. This problem will also be mitigated if the larger paddle magnets are included.
- G. Measurement of large mirror angles
1. Currently ATC are using a linear array to measure the BSM throw angle. The array can accurately measure a reduced portion of the Chop travel but cannot accurately measure the entire range with high accuracy.
  2. There are two possible methods being investigated that would enable this measurement to be carried out.
  3. It would be possible to carry out this measurement at Instrument level. This is not the preferred scenario.
- H. Magnetic stiffening of Flex Pivots
1. It is believed that there is cross coupling between the motor coils, which manifests in a higher effective spring rate for the flex pivots.
  2. This may worsen with the larger paddle magnets!

#### 4. Test Plan Compliance Matrix

- A. The plan should cross reference the requirements in the SSSD
- B. One major outstanding test that needs to be conducted is the cryogenic life testing. I have concluded after consulting <http://www.estec.esa.nl/ecss/admin/download/e/ecss-e-30part3A.pdf> that the testing has to be carried out on a non-flight model. C-Flex did some batch testing prior to delivery.
- C. There was no report on the outcome from the vibration testing done at RAL. A report should be written to show that not only did the unit survive the test but also that it performed in an expected manner.

#### 5. Discussion on Flight Manufacture readiness

Three requisites were identified for entry into Flight model manufacture; viz.; PA, Testing and Design.

1. PA
2. Testing
3. Design

Regarding PA: The most important item here is to get sign off on the following documents:

1. PA Plan
  - i. Vivienne to carry this out
2. SSSD
  - i. Ian has made most of the mods and updates and will be sent out for issue prior to his departure

3. Development Plan
  - i. This needs almost complete re-writing as the SPIRE Instrument AIV plan is somewhat fluid at the moment.
  - ii. Current deliveries to RAL
    1. STM/CQM: As already received. CQM does not have to move!
    2. PFM
    3. FS
  - iii. The testing of the interfaces with the BSM needs to be planned.
4. ICD
  - i. There is a shadow of doubt about the optical interface. DKG to liaise between MSSL and ATC to ensure that this is fixed

Cleanliness:

ATC have reviewed the new SPIRE plan and will have some difficulty in meeting the requirement in the lab.

Bruce Swinyard has indicated that CO<sub>2</sub> cleaning is possible but undesirable. A better approach would be to make sure that the instrument is covered at all times except when it needs to be exposed.

Regarding Design: The CTD (Change to Drawing) list was reviewed. This was all “normal” work.

Thermistor mounts will be as per RAL design. The thermistors will be placed on the outside of the BSM.

Regarding Testing:

The new magnet will be tested with the DM over the next several weeks  
 A solution to the issue of BSM position measurement needs to be worked out.

It is anticipated that in three to four weeks, these issues should have been resolved and formal start of the PFM manufacture could start.

### 5. STM Alignment

It was made evident that the previously agreed scheme of aligning the BSM via machining the alignment shoe will not be possible for the instrument Cold Alignment Verification. ATC advised that the amounts to be removed from the shoe to make it nominal are indicated on the EIDP. It is obvious that the alignment of the BSM cannot be guaranteed by ATC without the previously agreed procedure.

Issues

Number	Description	Who
1	Make a <u>formal</u> submission to LAM to increase the maximum motor current from the BSM board. RAL also has to have a copy of this ECR and pass it to ESA as it will impact the cryoharness.	ATC
2	Sort out the compliance to the long term drift requirements	ATC
3	Chop settling time out of spec. Should be resolved if the chop angle requirements are sorted out	ATC

4	Include the measured motor coil parameters in the PFM and FS EIDPs to allow the calculation of the cold dissipation under various operating scenarios	ATC
5	Demonstrate compliance to mirror position with large chop angles.	ATC
6	The ECR to remove the Launch-lock has to be raised	ATC
7	Issue PA Plan	ATC
8	Issue SSSD	ATC
9	Issue Dev Plan	ATC
10	Issue ICDs	ATC
11	Clear up optical interface plus establish clear line of responsibility for optical interfaces.	DKG
12	Assistance in the meeting of the particulate contamination spec	DKG/BMS
13	Tolerance on P-Cal position	DKG/BMS
14	Torque values for fasteners with Apiezon grease instead of MoS <sub>2</sub>	ATC
15	Tolerance on the offset of the Jiggle and Chop Axis	DKG/BMS