

Thomas,

Re: your Fax:

Ref. : SCI-PT/FINH-07592

Date : 28 March, 2000

Subject : FIRST/Planck - SPIRE AVM Definition

I do not believe we can divorce the AVM delivery from that of the CQM; We have been assured in the past that the AVM and CQM tests will be arranged such that the AVM electronics can be used to operate the CQM during all its tests. We intend, therefore, to deliver one version of each SPIRE unit to ESA, which will be used to accommodate all of the tests of these two models. Our intention is to deliver the following:

CQM units: FSFPU, FSFTB, (FSBAU, TBD), FSDRCU, FSWIH

AVM units: FSDPU, DRCU Simulator

Support Equipment: FPU Simulator, EGSE

CQM

The FSFPU and FSFTB (and FSBAU, TBD) will be manufactured to the required standard for the CQM as given in the IID part A.

The FSDRCU and FSWIH will be manufactured to the standard necessary to complete the tests foreseen for the CQM.

The FPU Simulator is provided to verify integration of the Warm Electronics (FSDPU, FSDRCU and FSWIH) in the CQM test environment. It has sufficient simulation of the FPU, FTB and BAU units to allow the electronics to be switched on and a simple functional test to be performed. This will be implemented with passive components for each subsystem, except for the FTS and BSM subsystems, which may require active simulation to test functionality of the control electronics, TBC.

AVM

We do not propose to use the DRCU and the FPU simulator as part of the AVM, as simulation of the response to an astronomical object is not possible, and because of the difficulty of simulating the high-speed analogue signals from the detectors to the DRCU. We propose therefore to provide a simulator of the DRCU+BAU+FPU for those tests that require this functionality. This simulator (the DRCU Simulator) would have a relatively simple digital interface with the FSDPU, which could be provided from a PC running suitable software.

The FSDPU will be manufactured to the standard necessary to complete the tests foreseen for the AVM (we assume the CQM tests do not imply further requirements). We believe that this, along with the DRCU simulator will provide the necessary functionality to satisfy the test objectives given in the IID Part A section 9.2.2.1. Our interpretation of these is:

- Verification of all electrical and software interfaces
 - *Electrical Interfaces: all interfaces to the spacecraft are provided, including the DRCU interface to the Power Subsystem, if necessary. It may not be possible to simulate the power consumption for all modes of the instrument.*
 - *Software interfaces:*
 - *TC reception and verification can be tested*

- *TM generation can be tested*
- Verification of subsystem and instrument functional performance within system environment
 - *Peak-up mode: it is difficult to see how we could test this operation without a simulation of the response to an astronomical source. The DRCU simulator should provide this.*
 - *Autonomy:*
 - *Simulation of failures of the FPU subsystems will be built into the DRCU Simulator, but in any case we do not expect any failures in this unit to propagate to the system level. They will be dealt with by the DPU.*
 - *Simulation of failures of the DRCU will be built into the DRCU. Again we expect these failures to be handled by the DPU.*
 - *Simulation of failures of the DPU has to be done by either OBS modification or possibly cruder methods, such as interrupting its power supply or breaking the cable to the DRCU.*
- Qualification of on-board software
 - *What specific tests are required here?*
- Verification of system performance
 - *What tests are envisioned here?*
- Verification of operational procedures.
 - *Switch-on, switch off: Should be possible, all interfaces are operational*
 - *Cooler recycle: OK, the DRCU simulator responds to commands to the cooler*
 - *Response to anomalies: Simulation of failures of the FPU subsystems will be built into the DRCU Simulator.*
 - *OBS update: OK, the DPU is now the only unit containing software and it can be updated as needed.*

The DPU will conform to the description given in the IID Part A (except where indicated)

- **Electronics:** flight standard except for parts.
We cannot use commercial parts of the 'same technology, same supplier as FM parts' because until the Common Procurement exercise is complete we do not know the provider of the parts and this will occur after the date the DPU is needed for instrument level testing.
- **Mechanisms:** flight representative for electrical actuators.
We have no actuators in the electronics, those in the FPU will be simulated.
- **Software:**
 - flight standard.
The software delivered will be that available at the time of AVM testing. It will not be the final flight software, as that will only be available after delivery of the PFM. The DPU will allow upload of the new software when available.
 - flight quality s/w shall be able to be run.
Because of the simulation of the DRCU and FPU, all flight software should run without change.
 - **Form, fit and function:** same as the flight model
This is true for the DPU. There is no DRCU as part of the AVM.
- **Redundancy:**
 - *No automatic switchover function is foreseen therefore cold redundant units or channels may not be provided.*
 - *No hot redundant units or modules are foreseen.*

Support Equipment:

SPIRE**Communication**

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The EGSE is a version of the instrument EGSE used for all system-level testing at ESTEC. We assume the interface to the test environment for CQM testing will be identical to that for later system-level tests. This equipment will remain at ESA for testing future models.

Ken