	SPIRE	Ref: SPIRE/RAL/N/0046
	Power profiles for SPIRE operating modes Prepared by: Bruce Swinyard	Issue: .10 Date: 15 Oct.-98 Page: 1 of 4

Introduction

The operating modes envisaged for the SPIRE instrument are laid out in section 6.1 of the proposal. Briefly they are:

1. *Observe.*
2. *Standby*
3. *Real time commanding*
4. *Commissioning/calibration mode*
5. *Cooler Recycle*
6. *On*
7. *Off*

In order to provide input into the cryostat design study we have been asked to specify the power consumption profiles during each of our observing modes (ESA action AI-SPIRE-7 in PT-MM-05719). This note sets out typical operation sequences for the observe; cooler recycle and standby modes and associates some estimated power profiles to each phase of the operation. All power dissipation figures are quoted in **mW except where explicitly stated.**

Observe

In the proposal several sub-modes of the observe mode were identified. For the present exercise we will take only 2: photometer and spectrometer.

Photometer

Table 1 gives the time line for a typical 10-minute integration on a portion of sky. If a sub-system is not explicitly denoted as off at the end of the observation it is assumed that it is left on as part of the standby mode. Figure 1 shows the profile for the estimated average power dissipation versus time at the 4-K stage in the focal plane unit. We assume that the power dissipation at the other temperature stages will be constant.

Time (mm:ss)	Sub-system	Status	Temp.	Power for detector option	
				CEA/TES	JFET
00:00	Cold Read-out Electronics	On	2/31-K	2.5/3.4	TBD
00:00	Buffer Amplifier Unit	On	CVV	2.5/0 W	TBD
00:00	Detector Read-out and Control Unit	On	SVM	26/TBD W	TBD
00:00	Signal Processing Unit	On	SVM	15 W	15 W
00:00	Digital Processing Unit	On	SVM	10 W	10 W
00:00	Calibration Source	On – stabilising	4-K	2	2
00:10	Calibration Source	On – set to 5 Hz square wave modulation	4-K	0.75	0.75
01:10	Calibration Source	Off	4-K	0	0
01:10	Chopper	On – set to 5 Hz chop	4-K	2	2
11:10	Chopper	Off	4-K	0	0
11:10	Calibration Source	On – stabilising	4-K	2	2
11:20	Calibration Source	On – set to 5 Hz square wave modulation	4-K	0.75	0.75
12:20	Calibration Source	Off	4-K	0	0

Table 1: Operations time line for a typical photometer observation.

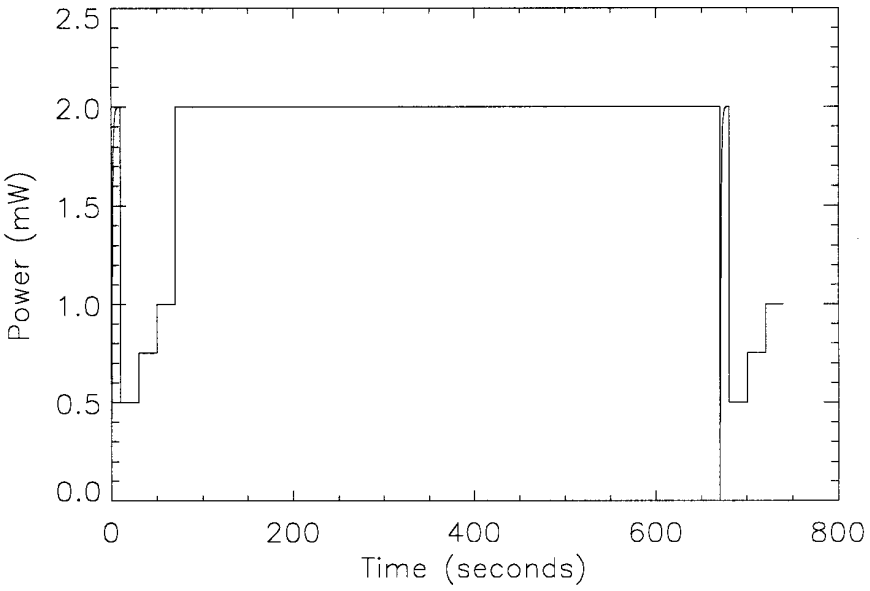

Figure 1: Estimated average power dissipation at the 4-K stage during a typical photometer observation. In addition there will be a steady load of about 1.2 mW due to the thermal conduction by the wiring.

Spectrometer

Table 2 gives the time line for a six scan (~ 4 minute) observation. This represents the shortest integration that is likely in the highest resolution mode.

Time (mm:ss)	Sub-system	Status	Temp.	Power for detector option	
				CEA/TES	JFET
00:00	Cold Read-out Electronics	On	2/30-K	2.5/3.4	270
00:00	Buffer Amplifier Unit	On	CVV	2.5/0 W^{+}	TBD
00:00	Detector Read-out and Control Unit	On	SVM	26/TBD W	TBD
00:00	Signal Processing Unit	On	SVM	15 W	15 W
00:00	Digital Processing Unit	On	SVM	10 W	10 W
00:00	Calibration Source	On - stabilising	4-K	5	5
00:30	Mirror Drive	On – one full scan takes ~35 seconds.	4-K	2.4*	2.4*
04:30	Mirror Drive	Off	4-K	0	0
04:30	Calibration Source	Off	4-K	0	0

Table 2: Operations time line for a typical spectrometer observation.

*This figure is based on an extrapolation from the ISO LWS grating mechanism. It is hoped that this will be reduced when the mechanism for SPIRE is developed.

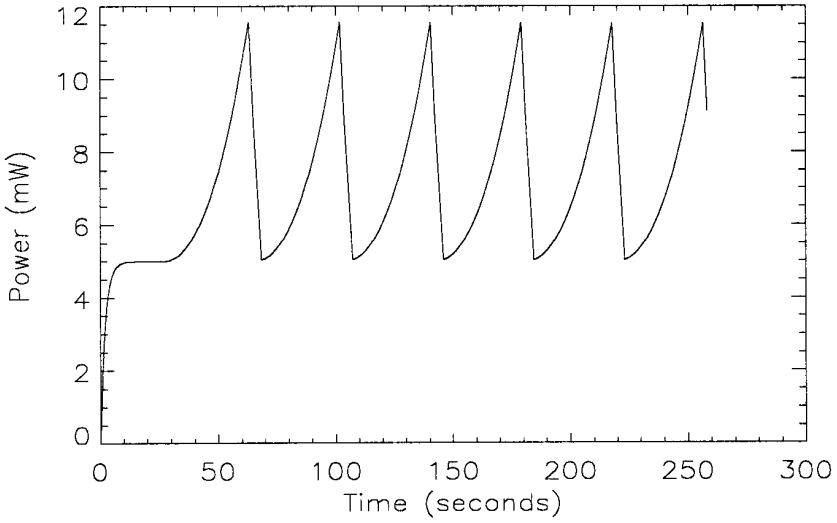

Figure 2: Estimated power dissipation at the 4-K temperature stage during a typical spectrometer observation. In addition to this there will be a steady load of about 1.2 mW due to thermal conduction by the wiring.

Standby

When the SPIRE instrument is not being used as the prime instrument, it will be switched to standby. In this mode the detectors will be left switched on and data will be collected as in observe mode. No other FPU sub-system will be activated. Table 3 gives the estimated average power dissipations for the sub-systems that are left on; the dissipations for the "warm" electronics units may be lower than this in practice as the mechanism drive electronics are not switched on. The power dissipation in standby mode is assumed to be constant for all sub-systems.

Time (mm:ss)	Sub-system	Status	Temp.	Power for detector option	
				CEA/TES	JFET
00:00	Cold Read-out Electronics	On	2/30-K	2.5/3.4	TBD
00:00	Buffer Amplifier Unit	On	CVV	2.5/0 W	TBD
00:00	Detector Read-out and Control Unit	On	SVM	26 W	26 W
00:00	Signal Processing Unit	On	SVM	15 W	15 W
00:00	Digital Processing Unit	On	SVM	10 W	10 W

Table 3: Estimated average power dissipation in standby mode

Cooler Recycle

The ^{3}He cooler will be recycled once every 48 hours. The recycle time will be of the order of 2 hours. The average dissipation for the cooler will be about 2.9 mW over the whole cycle time. This is made up of a conducted load of about 1 mW during 46 hours of normal operation and a load of about 47 mW over the two hours of the recycle operation. These figures include a 20% margin. Note that there may also be a instantaneous peak power of order of a Watt at the end of the recycling as the heat switches are operated.