

Logo Will Go Here	<b>SPIRE</b>	<b>Ref: SPIRE-RAL-NOT-000167</b> <b>Issue: .10</b> <b>Date: 09/02/99</b> <b>Page: 1 of 3</b>
	<b>Outline Requirements for the SPIRE Shutter.</b> B. Swinyard	

**Purpose:**

The photon background present in the FIRST cryostat during system testing on the ground is likely to be very much higher than that from the 80-K telescope. This is because the lid that closes the cryostat vacuum vessel will not be cooled and, even if it were a mirror, the ambient radiation background will be that of a ~30 K blackbody with high emissivity. The SPIRE detectors will therefore be operated in background conditions very far from their design values. In the case of the TES option this may prevent them from being operated at all.

It is therefore highly desirable that a shutter is fitted to the SPIRE instrument that will block the ambient radiation from outside the instrument and will, further, be capable of being heated to give a background close to that expected from the telescope alone.

**Outline Operational Requirements:**

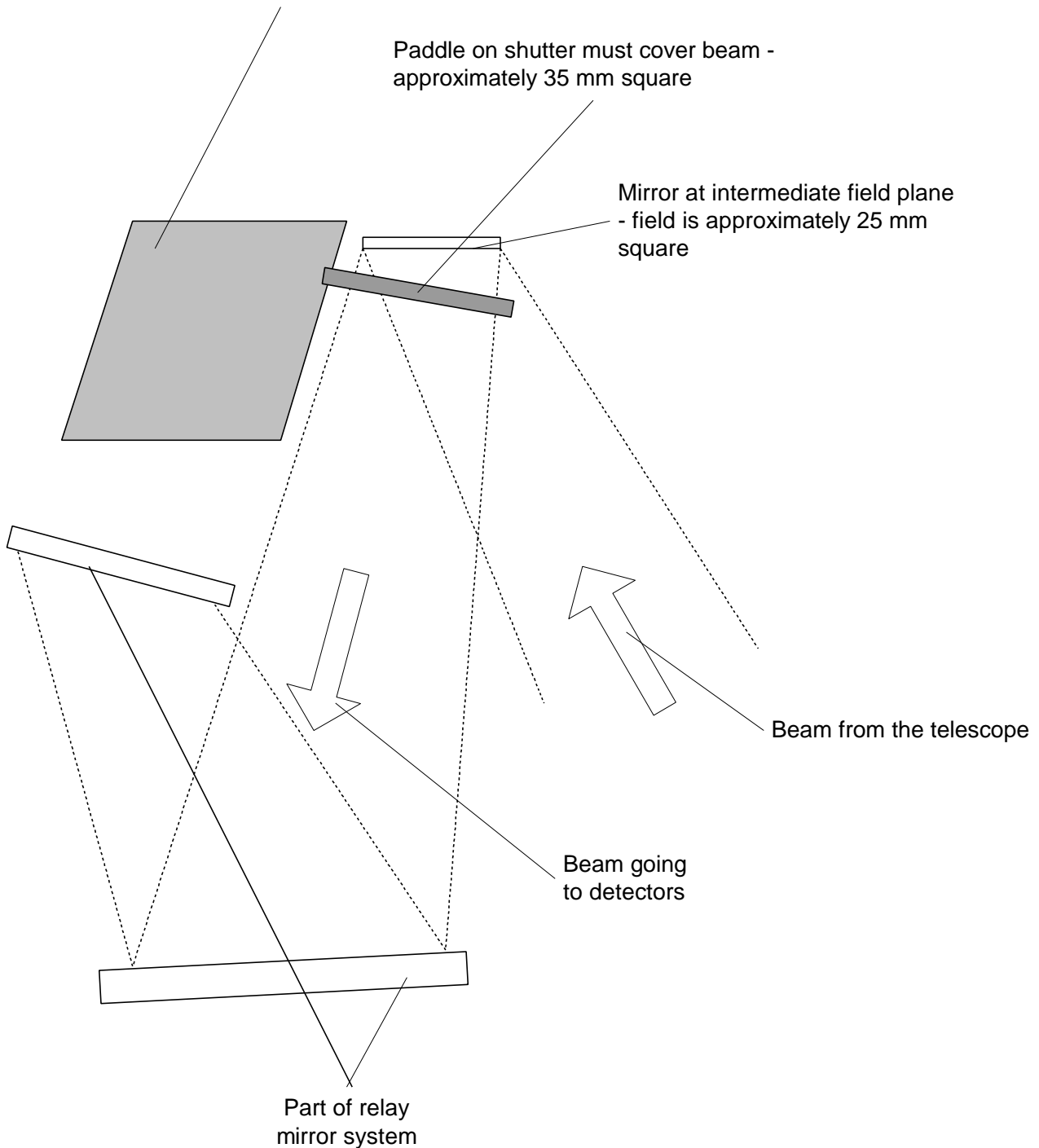
1. The shutter will be positioned close to the 4-K intermediate field plane in the photometer channel – see diagram (TBC).
2. The field at this point is approximately 25 mm square (TBC). The shutter vane will need to be approximately 35-40 mm square to adequately cover the beam at this point.
3. The vane will be orientated perpendicular to the beam coming from the detectors.
4. The vane will be coated in a black surface to stop reflection of the input beam into the relay optics. The black material will be provided by QMW.
5. The vane will have a heater fitted that will allow it to be heated from 4 K to 20 K.
6. The vane will be thermally isolated from the actuating mechanism and support structure so that it does not heat the surrounding structure and the actuating mechanism does not heat it.
7. The actuating mechanism will operate at 4 K.
8. In the case of failure of the actuating mechanism, the shutter must fail with the vane out of the beam

**Outline System Requirements:**

1. Thermal dissipation of actuator in operation of ~1 mW.
2. Thermal dissipation of heater of no more than 5 mW.
3. Resistance of the heater typically 10 kΩ.
4. Thermistors are required on the actuator and the vane.
5. Permanent magnets are allowed for the actuator but EMI shielding may be required if SQUID readout electronics are used for the detectors (TBD).
6. Number of operations will typically be a few hundred.
7. Space envelope for the actuator is about 45x45x45 mm (TBC).
8. Mass to be no more than 200 g with 100 g as a target (the lighter the better).
9. Default is to operate only during ground operations.
10. Non-flight grade electronics for ground operations are to be provided.
11. If it is decided to have the ability to operate the shutter in orbit, the electronics will be provided by CEA Saclay.
12. The number of wires and their specification must be identified as part of the systems design (see appended template for wiring specification).

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Space available for 4 K actuator is approximately a 45 mm cube



**Figure 1: Sketch showing approximate position of shutter in SPIRE optical train. The actual position and space envelope will be confirmed when the SPIRE opto-mechanical design is finalised.**

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**Appendix:**

All the wires required for the shutter subsystems should be specified using the template given below. The type of wire to be employed is to be determined by ESA and is likely to be either stainless steel for low current operations or brass for high current operations. Enter NA for specifications which do not apply to the shutter subsystem.

Table N: Connections from 4 K to the warm electronics

ID	Description	Name	No. of Conductors	No. of Shields	Max. Allowed Impedances			Current (A)	Duty Cycle	Max. Volts (V)	Wire Type
					R ( $\Omega$ )	C (F)	L(H)				
1	Detector Signals	DSIG	120	30	1000	$10^{-9}$	$10^{-6}$	$10^{-9}$	1	1	SST