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Herschel/SPIRE

MULLARD SPACE SCIENCE LABORATORY  
UNIVERSITY COLLEGE LONDON      Author: C BROCKLEY-BLATT

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**SPIRE – STRUCTURE PFM MASS BUDGET**

Document Number: MSSL/SPIRE/TR008.01 July 2004


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## Change Record

ISSUE	Date	Brief description of change
1.0	July 2004	New document



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## Glossary

All terms are listed in the CIDL.

### 1. SCOPE OF DOCUMENT

This document presents the Mass Budget for the Spire Structure (breakdown of the product into sub-assemblies) for both design and the actual for the PFM model.

### 2. DOCUMENTS


All documents are listed in Figure 3.2 of the CIDL.

### 3. MASS BUDGET


The Structure Mass Budget are presented in the figures below. A column is given for the design, for the actual structure. The part lists are taken from the appropriate assembly drawing. Please see the drawing for further detail on the breakdown of the fasteners.

The numbers that are (\*) are taken from the complete assembly CAD models and as such may contain parts that are not MSSL's responsibility or the Calculation has been corrupted. This listing will be updated as new information becomes available. The weights in red are the figures for the MSSL parts for that particular assembly.


The numbers that are (\*\*) have under gone a design change and there are parts which have not been manufactured at the present time. These will be updated when the design has been confirmed and the parts made.

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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight
SPIRE GA (including MK2 Level 0 Thermal Straps)		5264-301			
	Photometer Cover Assembly**	5264-302	1	6733.7	6603.3
	Spectrometer Cover Assembly**	5264-303	1	5634.9	5701.3
	Spire Optical bench Assembly	5264-305	1	15881.3	15820.0
	Fixed Mount	5264-312	1	138.1	150.3
	Fasteners			318.5	318.5
		<b>TOTAL</b>		<b>28706.5</b>	<b>28593.4</b>
	Mk2 Level 0 Thermal Straps **	5264-309/301	1	268.16	261.86


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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Photometer Cover wall Assembly		5264-302	1	6740*	0
	Photometer Cover Wall	5264-302-6	1	3280	3228
	Photometer cover lid	5264-302-10	1	2500	2480
	Photometer Cover Bottom Seal	5264-302-7	1	118	125
	Photometer Cover	5264-302-8	1	118	125
	Photometer insert	5264-302-9	1	22	21.3
	H sections for PFIL	5264-302-13	1	18	17.6
	H sections for PFIL	5264-302-13	1	18	17.6
	H section for CFIL	5264-302-16	1	11	11.3
	CFIL1 Baffle Mount	5264-304-6	1	136	59.8
	CFIL1 Baffle Clamp Ring	5264-304-7	1	19	15
	PFIL2 Mount Back	5264-302-12	1	19	19
	PFIL2 Mount Clamp plate	5264-302-17	1	12	12.3
	A Frames	5264-302-1	1	115	116.5
	A Frame Support	5264-302-14	1	148	149.8
		5264-302-15	1	17	16.6
	Dowel retaining Plate	5264-302-39	1	3.4	3.4
	Tubular Dowels	5264-302-40	2	5	4.6
	Dowel - 'A' Frame support	5264-302-41	2	3.4	9
	Dowel - 'A' Frame Top	5264-302-42	1	4.8	0.75
	Special Washer - A Frame Brackets	5264-302-43	4	0	1.25
	CFIL1	CARDIFF			
	PFIL2	CARDIFF			
	Fasteners			169.5	169.5
		<b>Total</b>		<b>6737.1</b>	<b>6603.3</b>


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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Spectrometer Cover wall		5264-303	1		
	Spectrometer Cover Wall	5264-303-1(2 sheets)	1	2140	2215
	Mounting Block	5264-303-1A	1	6	6
	Spectrometer Cover Lid	5264-303-2	1	2670	2637
	Spectrometer seals top	5264-303-4	1	125	125
	Spectrometer seals	5264-303-5	1	125	125
	Spectrometer Baffle	5264-303-3 (3 sheets)	1	110	127
	A Frames	5264-302-1	1	115	116.5
	A Frame Support Plates and brackets	5264-302-15	1	17	16.6
	A Frame Support	5264-302-26	1	162.7	162.7
	Dowel retaining Plate	5264-302-39	1	0	3.4
	Tubular Dowels (8mm)	5264-302-40	2	5	4.6
	Dowel - 'A' Frame	5264-302-41	2	3.4	9
	Dowel - 'A' Frame Top	5264-302-42	1	4.8	1.25
	Special Washer - A Frame Brackets	5264-302-43	4	0	1.25
	Fasteners			151	151
		<b>Total</b>		<b>5634.9</b>	<b>5701.3</b>




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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Spectrometer Detector Box		5264-307	1	2020*	0
	Spectrometer detector box	5264-307-1	1	477	481
	Filter mount	5264-307-2	1	120.8	123
	Spectrometer Detector Box supports(3 per set)	5264-307-4	3	151.2	139.5
	BDA Adapter Plate	5264-911	2	0	0
	Bushes	5264-307-5	3	1.9	1.8
	Cold Strap Support	5264-307-13	1	0.85	0.8
	Clamp Plate	5264-307-3	2	1.6	1.6
	Detectors	JPL	2		
	SFIL -3	CARDIFF	2		
	Light Baffle	CARDIFF	1		
	Busbar Assembly	5264-307B	1	11.45	10.75
	Load Spreader	5264/307-14	1	TDB	TDB
	Thermal Pad	5264/307-15	1	TDB	TDB
	Strap Spacer	5264/307-16	1	TDB	TDB
	Strap Stud	5264/307-17	3	TDB	TDB
	Stud Plate	5264/307-18	1	TDB	TDB
	Stud Plate Outer	5264/307-19	1	TDB	TDB
	Insulating Bush	5264/306-28	1	TDB	TDB
	Fasteners			39.5	39.5
		<b>Total</b>		<b>804.3</b>	<b>797.95</b>
SCAL Box		5264-314	1	688*	0
	Scal Box	5264-314-1	1	378	362
	SCAL Cover	5264-314-2	1	68	69
	SCAL Exit Baffle	5264-314-3	1	10	9.4
	SCAL Baffle Clamp	5264-314-4	3	1	1.05
	Fasteners			15.3	15.3
		<b>Total of Parts</b>		<b>472.3</b>	<b>456.75</b>

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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Photometer Detector Box		5264-306	1	5830*	0
	Photometer detector box	5264-306-1	1	89.5	90
		5264-306-2	1	895.5	895.5
		5264-306-3	1	572	579
	BDA Adapter Plate	5264-911	3		
	Dichroic rings	5264-310-1	1	88.3	88
		5264-310-2	1	24.1	24.7
		5264-310-3	8	21.6	20
		5264-311-1	1	95	94.8
		5264-311-2	3	4.8	4.8
	Detector Box support Cone	5264-312	1	92.3	91.5
	Photometer Detector Box A frames	5234-313	2	97	95.4
	Washer	5264-313-1	2	1.24	1.2
	Bushes	5264-313-2	2	3.6	3
	Fasteners			108	108
	BDA photo connector panel	5264-302-23	1	133	133
	Sensor Harness	A2/5264/302-	3	29.4	24.9
	Plug, BDA connector	5264-302-24	2	10	10
	PM10 Support	5264-305-17	1	41	40.7
	Photometer Cold Stop Clamp PFII3	5264-306-4	1	15.5	15.5
	Photometer Cold Stop PFII3	5264-306-5	1	2.7	2.7
	Dowel - Secondary optical bench	5264-302-18	2	3	3
	Harness support	5264-302-25	2	16.6	16.6
	Mirrors	LAM	3		
	Detectors	JPL	3		
	Busbar Supports	CARDIFF	2		
	PFIL-3	CARDIFF	1		
	Busbar Assembly	5264-306B	1	52.18	52.85
	Load Spreader	5264/306-22	1	TDB	TDB
	Thermal Pad	5264/306-23	1	TDB	TDB
	Strap Stud	5264/306-25	3	TDB	TDB
	Stud Plate - inner	5264/306-26	1	TDB	TDB

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Assembly	Part	Drawing	QTY	Design Weight (g)	Actual Weight (g)
Photometer Detector Box continued	Stud Plate Outer - Photometer	5264/306-27	1	TDB	TDB
	Insulating Bush	5264/306-28	3	TDB	TDB
	Strap Spacer -	5264/306-29	1	TDB	TDB
	Fasteners			118	118
		<b>Total</b>		<b>2514.32</b>	<b>2513.15</b>

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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Optical Bench Assy		5264-305	1	28.7*	
	Optical bench panel	5264-302-4	1	9860	9780
	Boss SMEC Preamp	5264-302-4A	3	15	17.5
	Optical Reference	5264-305-16	1	74	74
	Reference Cube Dowel	5264-305-27	2	0.2	0.2
	Secondary optical	5264-305-12	1	535	551.5
	Support PM6	5264-305-13	1	65.39	64.7
	Support PM8	5264-305-14	1	117.68	118.3
	Support SM6	5264-305-2	1	82.93	80.7
	Support SM7	5264-305-3	1	82.93	80.7
	Bulkhead SM6 and SM7	5264-305-15	1	184.82	185.5
	Support SM8a	5264-305-4	1	33.25	33.2
	Support SM9-10a	5264-305-6	1	112.79	111.4
	Support SM9-10b	5264-305-7	1	110.38	111.3
	Support SM11a	5264-305-8	1	47.67	47.5
	Support SM11b	5264-305-9	1	36.83	35.5
	Support SM12a	5264-305-10	1	36.84	36.8
	Support SM12b	5264-305-11	1	34.3	34.1
	SFIL2 Cold Stop	5264-305-22	1	5	1.7
	Filter Mounts - SFIL2	5264-305-20	1	23	32.7
	Filter Mount - SFIL2 clamp ring	5264-305-21	1	3	3.1
	SFIL2 dowels	5264-305-28	2	0.4	0.4
	SBS 1and 2 Filter mount (2 per set)	5264-305-23	2	0	24.5
	SBS 1and 2 Filter	5264-305-24	2	7	7
	Dowel - Secondary optical bench	5264-302-18	4	6	6
	Washer Secondary	5264-305-25	3	4.5	4.5
	Mirror mounts Dowels	5264-302-19	46	179.4	170.2
	Mirror mount anti	5264-305-26	17	8.5	8.5
	Cold Strap clamp	5264-302-33	1	3.2	3.3

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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Optical Bench Assy continued	2K interconnecting strap	5264-302-20A	1	27.5	27.5
	RFI Filter Bracket Corner Bracket	A2/5264/302-27	1	10	11
	Temporary RFI Bracket	A2/5264/302-28	1	16.8	19
	FRI Filter Frame Edge Bracket	A2/5264/302-29	1	5.7	6.3
	Cooler to Photo	A3/5264/302-	1	28.5	25
	Cooler to Spec Detector box strap	A3/5264/302-31	1	26.2	27
	Strap isolation Plate	A3/5264/302-	2	2	3.2
	Isolating Plate	A3/5264/302-	1	3	2.8
	Insulating Bush cooler	A3/5264/302-	4	0.1	0.12
	Insulating bush -	A3/5264/302-	3	0.15	0.17
	Spectrometer baffle SM12	5264-303-6	1	12.4	13.7
	SM9B/SBS1 Baffle	A2/5264/305-29	1	7	8
	SM9A/SBS1 Baffle	A2/5264/305-29	1	14.8	17
	SFIL2	CARDIFF			
	SBS1 and 2	CARDIFF			
	Mirrors	LAM			
	Photometer Detector Box Assembly	5264-306	1	2514.32	2513.5
	Spectrometer Detector Box	5264-307	1	804.3	797.95
	SCAL Box	5264-314	1	472.3	456.75
	Fasteners			266.2	266.2
		<b>TOTAL</b>		<b>15881.28</b>	<b>15819.99</b>


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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
MK1 Level 0 Thermal Straps					
	BDA spec connector panel	5264-302-22	1	46.7	46.7
	Light baffles	5264-309-1	3	53.4	49.5
		5264-309-2	3	55.8	53.4
		5264-309-3	3	52.5	52.5
		5264-309-5	3	58.5	58.5
		5264-309-6	12	1.11	1.11
		5264-309-7	18	0.15	0.15
	Diagonal length of Spectrometer MK2	5264/302-45	3	TBD	TBD
	Pump MK2 Level 0	5264/302-46	3	TBD	TBD
	Evaporator MK2 Level 0 Strap Inner	5264/302-47	3	TBD	TBD
	Evaporator MK2 Level 0 Strap Inner	5264/302-48	2	TBD	TBD
	Joining Plate Evaporator Outer	5264/302-49	1	TBD	TBD
	Upper Flex Pump	5264/302-50	1	TBD	TBD
	Upper Flex Evaporator	5264/302-51	1	TBD	TBD
	Lower Flex Spec Outer	5264/302-52	1	TBD	TBD
	Lower Flex Pump Outer	5264/302-53	1	TBD	TBD
	Lower Flex Evaporator Outer	5264/302-54	1	TBD	TBD
	Level 0 Coldstrap Evaporator Outer	5264/302-56	1	TBD	TBD
	Joining Plate Evaporator Inner	5264/302-57	1	TBD	TBD
	Joining Plate	5264/302-58	4	TBD	TBD
	Upper Flex Spec	5264/302-59	1	TBD	TBD
	Cold Strap Support	5264/301-10	6	TBD	TBD
	Cold Strap Support	5264/301-11	6	TBD	TBD
				TBD	TBD
	Insulating Bush	5264/301-12	15		
	Fasteners		0	TBD	TBD
		<b>TOTAL</b>		<b>268.16</b>	<b>261.86</b>

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Assembly	Part	Drawing	QTY	Design Weight (g)	Actual Weight (g)
Fixed Mount					
	Fixed Mount Cone	5264-302-5	1	105	115.5
	Insulating Bush	5264-302-2	24	6.72	7.2
	Special Washer	5264-302-3	12	26.4	27.6
		<b>TOTAL</b>		<b>138.12</b>	<b>150.3</b>

Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Photometer Thermal Busbar Assembly		5264-306B		89.5*	
	Bus Bar Upper	5264-306-7	1	10	11.5
	Busbar Lower	5264-306-8	1	8.4	9.1
	BDA-Busbar Flange	5264-306-9	2	3.64	3.4
	Bus Connector PLW	5264-306-10	1	5.4	5.4
	Bus Junction ans PMW Connector	5264-306-11	1	3.5	3.6
	Bus Junction Clamp	5264-306-12	1	3.5	4
	Light Trap to Bus	5264-306-13	1	6.2	5.8
	Bus Connector PSW	5264-306-14	1	2	1.6
	BDA-Busbar Flange	5264-306-15	1	2	1.7
	PLW Bus Strap	5264-306-16	1	0.53	0.3
	PMW Bus Strap	5264-306-17	1	0.3	0.1
	PSW Bus Strap	5264-306-18	1	0.46	0.1
	End stop Photometer	5264-306-19	1	0.4	0.4
	Light Trap Feed	5264-306-20	1	4.8	4.8
	Stop Bush -Bus Bar	5264-306-21	1	0.6	0.6
	Bush inner Spectrometer light trap	5264-307-11	1	0.3	0.3
	Bush outer Spectrometer light trap	5264-307-12	1	0.15	0.15
		<b>Total</b>		<b>52.18</b>	<b>52.85</b>

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Assembly	Part	Drawing Number	QTY	Design Weight (g)	Actual Weight (g)
Spectrometer Thermal Busbar		5264-307B		12.1*	
	Light Trap Feedthrough spect.	5264-307-6	1	3.4	3.3
	Light Baffle Junction	5264-307-7	1	1.6	1.6
	SSW Spect. BDA to light trap strap	5264-307-8	1	0.4	0.2
	SLW Spect. BDA to	5264-307-9	1	1	0.8
	BDA Cold Interface Spectrometer	5264-307-10	2	4.6	4.4
	Bush inner	5264-307-11	1	0.3	0.3
	Bush outer	5264-307-12	1	0.15	0.15
		<b>Total</b>		<b>11.45</b>	<b>10.75</b>