HESSI Instrument Mass Budget

HSI_SYS_010G | 06/22/99 | David Pankow

UCB/GSFC SPECTROMETER (or cryostat)

	ICD Mass	ITEM MASSES (kg) current ma	Best Est.	Last Est.	contingency (kg)	percent	ITEM CG (meters) X	Y	Z
Cryostat Housing Components	**42.79**	**41.790**	**37.300**	**36.851**	**4.490**	**11%**	Z datum is bottom		
> Bottom Plate/Radiator for Cooler		10.950	9.630	10.300	1.320	12%	0.005	0	0.008
> Cryocooler housing and interface		1.100	0.980	0.700	0.120	11%	-0.08	0	0.070
> Cryostat lower preamp ring & flanges		5.100	4.560	4.330	0.540	11%	0	0	0.086
> Cryostat upper detector ring & flanges		2.000	1.756	1.840	0.244	12%	0	0	0.219
> Cryostat top plate w/ Be windows		4.800	4.310	3.214	0.490	10%	0	0.002	0.306
> Cryostat Main Mounting Legs		3.700	3.260	3.076	0.440	12%	0	0	0.076
> Cryocooler (Sun Power M77)		4.620	4.403	4.403	0.217	5%	-0.07	0	0.061
> HV&CSA's (1eax9) boxes & 1 util box		3.600	3.200	3.144	0.400	11%	0	0	0.064
> External MLI Blankets on Cryostat		0.820	0.681	0.681	0.139	17%	0	0	0.216
> Hi-Z Attenuators (Thin Shutter)		0.250	0.225	0.604	0.025	10%	0	0.013	0.335
> Hi-Z Attenuators (Thick Shutter)		0.350	0.310	0.000	0.040	11%	0	0.013	0.335
> Hi-Z Attenuators (non-moving supports)		1.100	0.985	0.000	0.115	10%	0	0.013	0.335
> Graded-Z Shield, top only ..all sky science)		3.000	2.650	4.130	0.350	12%	0	0	0.218
> External Vacuum Piping		0.400	0.350	0.430	0.050	13%	0	0	0.137
Cryostat Suspended Components	**30.79**	**29.790**	**26.467**	**26.377**	**3.323**	**11%**			
> Cold Plate (internal)		3.450	2.590	2.590	0.860	25%	0	0	0.161
> Thermal Mounts for Cold Plate		1.650	1.280	1.280	0.370	22%	0	0	0.168
> Outer Thermal Shield ..for blankets		0.600	0.496	0.496	0.104	17%	0	0	0.241
> ~12 MLI Layers on Outer Shield (taller)		0.300	0.253	0.253	0.047	16%	0	0	0.241
> Inner GeD / Thermal Shield		0.460	0.413	0.413	0.047	10%	0	0	0.246
> ~5 MLI layers on Inner Shield		0.270	0.227	0.227	0.043	16%	0	0	0.246
> Bottom Thermal Shield		0.270	0.248	0.248	0.022	8%	0	0	0.114
> ~12 MLI Layers on Bottom Shield		0.170	0.127	0.127	0.043	25%	0	0	0.110
> Thermal Standoffs for Shields		0.050	0.045	0.045	0.005	9%			0.194
> Cold Finger ..now includes sapphire		0.600	0.550	0.500	0.050	8%	0	0	0.094
> LN2 piping & port to Dewar (flight parts)		0.700	0.567	0.567	0.133	19%	0	0	0.187
> Cryosorb Capsule (2)		0.180	0.150	0.110	0.030	17%	0	0	0.161
Ge Detectors Subset									
> GeD's basic 71ϕ x 85 Ge blanks only		15.740	14.650	14.650	1.090	7%	0	0.011	0.207
> Detector Mounting ..Malone hardware		4.140	3.780	3.780	0.360	9%	0	0	0.213
> Beryllium Scattering Target		0.090	0.080	0.080	0.010	11%	0	0	0.203
> Detector shields & masks		1.000	0.910	0.910	0.090	9%	0	0	0.257
> Internal Harness (flex prints +)		0.120	0.100	0.100	0.020	17%	0	0	0.121

INSTRUMENT ELECTRONICS

	ICD Mass	ITEM MASSES (kg) current ma	Best Est.	Last Est.	Contingency (kg)	percent	ITEM CG (meters) X	Y	Z
IDPU Subsystem	**13.97**	**13.970**	**9.480**	**9.480**	4.490	32%	0.135	0.145	0.097
> VME Chassis …13 slots by Spectrum		3.750	3.440	3.440	0.310	8%			
> VME Backplane		0.370	0.300	0.300	0.070	19%			
> 1/8" Covers for all Board Slots		0.500	0.400	0.400	0.100	20%			
> Data Controller Card		0.750	0.420	0.420	0.330	44%			
> Power Controller Card		0.750	0.420	0.420	0.330	44%			
> Nine Analog Front End Boards		6.750	3.780	3.780	2.970	44%			
> ADP Board by PSI		0.750	0.420	0.420	0.330	44%			
> Particle Detector (flight SAA sensor)		0.350	0.300	0.300	0.050	14%	T.B.S.	T.B.S.	T.B.S.
> Power Converter/Controller & HVPS	**3.60**	**3.600**	3.000	3.000	0.600	17%	0.133	0.057	0.057
> Cryocooler Power Converter	**3.60**	**3.600**	4.000	3.500	-0.400	-11%	0.089	0.044	0.089
UCB Harnessing Allocations	**2.15**	**2.245**	**2.538**	**2.252**	-0.293	-13%			
> IDPU Analog to Spectrometer		1.100	1.075	1.062	0.025	2%			
> Misc IDPU To Spectrometer		0.390	0.468	0.362	-0.078	-20%			
> IDPU to LV/HV Supply		0.200	0.375	0.308	-0.175	-88%			
> IDPU to Cooler Supply		0.065	0.080	0.066	-0.015	-23%			
> Heavy power cables to Cooler		0.140	0.258	0.167	-0.118	-84%			
> IDPU to Particle Detector		0.100	0.082	*0.087*	0.018	18%			
> Harness clamps, ties. lacing		0.250	0.200	0.200	0.050	20%			

PSI IMAGER ASSEMBLY

	ICD Mass	ITEM MASSES (kg) current ma	Best Est.	Last Est.	contingency (kg)	percent	ITEM CG (meters) X	Y	Z
TUBE ASSEMBLY	**24.20**	**22.320**	**16.787**	**17.787**	**5.533**	**25%**	datum is +lower tray		
> ~ 3mm GRE basic Tube		9.000	7.933	7.933	1.067	12%	0	0	0.770
>Ti Tube End Ring (upper)		1.400	1.335	1.335	0.065	5%	0	0	1.475
>Ti Tube End Ring (lower)		1.400	1.330	1.330	0.070	5%	0	0	0.065
>Ti Center Ring		3.750	3.015	3.015	0.735	20%	0	0	0.770
>Tube Vibration Damper Ring		1.100	...deleted	1.000			0	0	0.150
> Imager to S/C flex links & brackets		3.350	1.776	1.776	1.574	47%	0	0	0.685
> S/C Mounting Interface & bolts		0.860	0.228	0.228	0.632	73%	0	0	0.600
> Cylinder Thermal Blankets		1.460	1.170	1.170	0.290	20%	0	0	0.785
Upper Imager Tray Assembly	**18.07**	**18.070**	**13.779**	**13.779**	**4.291**	**24%**			
> Tray Structure		3.000	2.832	2.832	0.168	6%	0	0	1.535
> 3 Tray Flex Link Mounts		0.200	0.260	0.260	-0.060	-30%	0	0	1.510
> Grid Mounts (9 x 3 + 30 screws)		1.700	1.270	1.270	0.430	25%	0	0	1.570
> Imaging Grids		11.260	8.090	8.090	3.170	28%	0	0	1.590
> Tray heater, sensor & harness		0.370	0.300	0.300	0.070	19%	0	0	1.515
> SAS Optics		0.750	0.600	0.600	0.150	20%	0	0	1.600
>Blanket Scaffolding		0.400	0.197	0.197	0.203	51%	0	0	1.600
> End Thermal Blanket		0.390	0.230	0.230	0.160	41%	0	0	1.580
> Sun Sensor (SPECTRUM ..for ref only)	0.500	0.500	0.403	0.403	0.097	19%	T.B.D	T.B.D	T.B.D
> Fwd Antenna (SPECTRUM ..for ref only)	0.570	0.570	0.195	0.195	0.375	66%	T.B.D	T.B.D	T.B.D.
> Fwd Antenna (SPECTRUM ..for ref only)	0.570	0.570	0.195	0.195	0.375	66%	T.B.D	T.B.D	T.B.D
Lower Imager Tray Assembly	**19.25**	**19.250**	**14.602**	**14.602**	**4.648**	**24%**			
> Tray Structure		3.000	2.832	2.832	0.168	6%	0	0	-0.010
> 3 Tray Flex Link Mounts		0.200	0.260	0.260	-0.060	-30%	0	0	0.035
> Grid Mounts (9 x 3 + 30 screws)		1.700	1.270	1.270	0.430	25%	0	0	0.020
> Imaging Grids		11.260	8.090	8.090	3.170	28%	0	0	0.040
> Tray heater, sensor & harness		0.370	0.300	0.300	0.070	19%	0	0	-0.030
> SAS Sensors		1.930	1.500	1.500	0.430	22%	0	0	0.040
>Blanket Scaffolding		0.400	0.120	0.120	0.280	70%	0	0	-0.025
> End Thermal Blanket		0.390	0.230	0.230	0.160	41%	0	0	-0.005

	ICD Mass	ITEM MASSES (kg) current ma	Best Est.	Last Est.	contingency (kg)	percent	ITEM CG (meters) X	Y	Z
ROLL ANGLE SENSOR (RAS)	**2.99**	**2.320**	**1.800**	**1.800**	**0.520**	**22%**			
> Lens and CCD Housing		1.000	0.750	0.750	0.250	25%	-0.02	-0.01	-0.010
> Sun / Earth Shade		0.620	0.500	0.500	0.120	19%	0.12	0	0.030
> RAS Isolation mount & MLI		0.700	0.550	0.550	0.150	21%	0	0	0.000
PSI Harnessing Allocations	**1.10**	**1.100**	**1.105**	**1.380**	**-0.005**	**0%**			
> RAS to IDPU Data Cabling		**0.110**	0.265	0.141	-0.155	-141%			
> SAS to IDPU Data Cabling		**0.480**	0.514	0.822	-0.034	-7%			
> Imager Houskeeping (heaters & sensors)		**0.380**	0.226	0.317	0.154	41%			
> Harness clamps, ties. lacing		**0.130**	0.100	0.100	0.030	23%			

red only indicates that previous estimate was carried

ACCUMULATED SUBSYSTEM TOTALS

	ICD Mass	ITEM MASSES (kg) current ma	Best Est.	Last Est.	contingency (kg)	percent	Additional Margin for Impliementation
> UCB/GSFC Cryostat Housing	42.790	41.790	37.300	36.851	4.490	11%	2%
> UCB Cryostat Suspended Components	30.790	29.790	26.467	26.377	3.323	11%	3%
> IDPU Assembly in VME Chassis	13.970	13.970	9.480	9.480	4.490	32%	0%
> Instrument Power controller (IPC)	3.600	3.600	3.000	3.000	0.600	17%	0%
> Cryocooler Power converter (CPC)	3.600	3.600	4.000	3.500	-0.400	-11%	0%
> Collected UCB Harnessing	2.150	2.245	2.538	2.252	-0.293	-13%	-4%
> PSI Imager Tube Assembly	24.200	22.320	16.787	17.787	5.533	25%	8%
> PSI Upper Imager Tray Assembly	18.070	18.070	13.779	13.779	4.291	24%	0%
> PSI Lower Imager Tray Assembly	19.250	19.250	14.602	14.602	4.648	24%	0%
> PSI Roll Angle Sensor (RAS)	2.990	2.320	1.800	1.800	0.520	22%	22%
> Collected PSI Harnessing	1.100	1.100	1.105	1.380	-0.005	0%	0%
INSTRUMENT TOTALS	**162.510**	**158.055**	**130.858**	**130.809**	**27.197**	**17%**	3%
Spacecraft Items (for reference only)	1.640	1.640	0.793	0.793	0.847	52%	

NOTES

1. ICD controlled masses such as the Imager Upper and Lower Tray Assemblies are listed seperately to also define the mass moments.
2. C.G. information (in spacecraft or instrument coordinates) is also provided to better define the mass moments.
3. Contingencies are listed at the component level. Additional subsystem impliementation margins are listed in italics with the ICD masses.
4. Subsystem mounting hardware is included in the mass listings, if not seperately identified.