HSP ISR #016
HSP 2912 CALIBRATION REPORT
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2912 is a photometric calibration program which was meant to run repeatedly (every 2 months) on the HSP to measure and monitor filter bandpasses. The test has run four times on dates 03-Mar-1992 and 29-Apr-1992, 30-Jun-1992 and 23-Aug-1992. This report is for these four runs. The test measures the throughput of the HSP for the object BD+75D325 which is an O subdwarf star on the first, second and fourth runs, and the star BD+28D4211 for the third run. The third run was a subset of just the testing for the UV1 bandpasses. The bandpasses measured are:

- UV1: F135W, F218M, F220W, and the PRISM bandpasses F248M and F135W.
- UV2: F145M, F184W, F218M, F248M, F278N, F284M, F140LP and the PRISM bandpasses F262M and F145M.
- VIS: F551W, F160LP, F320N, and the PRISM bandpasses F551W and F240W.
- POL: F327M, F277M, F237M, F216M in all polarizer orientations.

In addition the flux from the target was measured through the finding aperture which is insensitive to effects from pointing or the PSF of the telescope. The bandpasses are F140LP for the UV detectors and F160LP for the VIS and POL detectors.

The measured count rates were compared between runs as well as against prelaunch calibration curves through a simulator. First was a comparison of the flux rate between the three runs with the target BD+75D325. The count rates as seen in the finding apertures are as follows:

det	First(Temp)	Second(Temp)	Third(Temp)	ratio12(dT)	ratio13(dT)
UV1:	956.52(-5.06)	995.35(-7.70)	957.57(-5.34)	1.04(-2.64)	1.00(-0.28)
UV2:	1172.97(-4.39)	1189.84(-6.66)	1157.37(-3.75)	1.01(-2.27)	0.99(0.64)
VIS:	970.53(-1.21)	1039.92(-3.44)	699.96(-0.89)	1.07(-2.23)	0.72(0.32)
POL:	2142.86(-1.83)	1979.25(-4.07)	2041.95(-2.33)	0.92(-2.24)	0.95(-0.50)

As mentioned about, these data are insensitive to both pointing effects and PSF effects. Therefore the fluxes can be compared directly and related to either changes in target flux or detector sensitivity. The change in count rates between the two runs is difficult to interpret but would seem to be due to the target. The change in temperature is not enough to explain the differences. In other similar data for a different target (NGC188-998), hints of temperature dependancies are at a much lower level, corresponding to about 1% for 2.25 degrees for the POL and VIS cathodes, and about 1/3 that for the UV detectors. This change is more significant. Also the fact that the count rates rise for the later observations (except for POL) indicates that the change is not from contamination or degredation of the HSP/HST optics.

Why POL is different from the other detectors is of concern, although the third data set seems to indicate that the detector is responding similarly to the UV detectors. Also earlier data showed that the VIS detector was losing sensitivity slowly with time. These data show that the response of the VIS detector was stable between the first and second runs, indicating that the sensitivity losses had stopped or slowed down. However, the third run indicates that the detector lost about 1/4 of it's sensitivity between the first two runs and the last run. Carefull monitoring of the detectors is definitely called for, and will be started with a new calibration test.

comparison with models: Ratios are predicted/observed count rates

det	First(Ratio)	Second(Ratio)	Third(Ratio)	Fourth(Ratio)
UV1:	956.52(1.427)	995.35(1.371)	437.04(1.450)	957.57(1.425)
UV2:	1172.97(1.164)	1189.84(1.147)		1157.37(1.179)
VIS:	970.53(2.171)	1039.92(2.026)		699.96(3.010)
POL:	2142.86(0.983)	1979.25(1.065)		2041.95(1.032)

The difference in count rates for the same object and the two UV detectors has been noticed before and is relatively stable. The ratio of count rates of ~1.23 has seen in earlier data from the 3152/3233/3362 tests. This ratio is maintained in these data sets with ratios of 1.23 for the first data set, 1.20 for the second set, and 1.21 for the third. The prediction of count rates for the POL detector is quite good at nearly unity, and the factor of two difference between it and the VIS detector with the same bandpass is the loss in VIS detector sensitivity mentioned earlier and reported on elsewhere. Unfortunately, with the third run on BD+75D325 the loss of sensitivity has continued and now indicates a factor of three loss.

Other Bandpasses

Filter	effect wavel	set	#	Observed Counts/S	Predicted Counts/S	Ratio Pre/Obs	Ratio 1st/nth
VF135U1_C	1513	01	03	10829.3091	18293.1	1.68922	
VF135U1_C	1513	0D	03	9826.7686	18293.1	1.86156	1.102
VF135U1_C	1513	11	03	9713.1861	18293.1	1.88333	1.115
VF135U1_C	1488	5P	03	6620.3481	11141.1	1.68000	0.994
VF218U1_A	2172	01	04	48385.7645	87267.7	1.80358	
VF218U1_A	2172	0D	04	44365.3097	87267.7	1.96703	1.091
VF218U1_A	2172	11	04	43746.0000	87267.7	1.99487	1.106
VF218U1_A	2168	5P	04	20615.8333	38579.7	1.87003	1.037
VF220U1_A	2181	01	05	86782.1555	170300.0	1.96238	
VF220U1_A	2181	0D	05	82953.4151	170300.0	2.05296	1.046
VF220U1_A	2181	11	05	81926.1667	170300.0	2.07870	1.059
VF220U1_A	2175	5P	05	37036.6667	54433.0	2.03000	1.034
VF145U2_C	1545	02	03	8830.3469	17009.2	1.92622	
VF145U2_C	1545	0E	03	8604.9909	17009.2	1.97667	1.026
VF145U2_C	1545	12	03	8030.5845	17009.2	2.11805	1.100
VF184U2_A	1905	02	04	72350.0000	175900.0	2.43124	
VF184U2_A	1905	0E	04	72217.6883	175900.0	2.43569	1.002
VF184U2_A	1905	12	04	68756.5000	175900.0	2.55830	1.052
VF218U2_A	2172	02	05	52441.2281	87267.7	1.66410	
VF218U2_A	2172	0E	05	49893.2174	87267.7	1.74909	1.051
VF218U2_A	2172	12	05	47556.0000	87267.7	1.83505	1.103

VF248U2_A	2448	02	06	87134.1463	128220.0	1.47152	
VF248U2_A	2448	0E	06	85853.2174	128220.0	1.49348	1.015
VF248U2_A	2448	12	06	83749.8333	128220.0	1.53099	1.040
VF278U2_A	2762	02	07	14047.5046	14160.5	1.00804	
VF278U2_A	2762	0E	07	13684.8366	14160.5	1.03476	1.027
VF278U2_A	2762	12	07	13125.7812	14160.5	1.07883	1.070
VF284U2_A	2709	02	08	54303.1646	63086.5	1.16175	
VF284U2_A	2709	0E	08	54668.0832	63086.5	1.15399	0.993
VF284U2_A	2709	12	08	53777.7778	63086.5	1.17310	1.010
VCLRU2_A	2150	02	09	678048.1293	1365100.0	2.01328	
VCLRU2_A	2150	0E	09	675994.1480	1365100.0	2.01940	1.003
VCLRU2_A	2150	12	09	640846.3333	1365100.0	2.13015	1.058

VF551V_C	5675	03	03	7134.4233	34226.4	4.79736	
VF551V_C	5675	0F	03	7263.8413	34226.4	4.71189	0.982
VF551V_C	5675	13	03	5066.2326	34226.4	6.75579	1.408
VCLRV_A	2194	03	04	816057.1675	2107200.0	2.58217	
VCLRV_A	2194	0F	04	851905.9337	2107200.0	2.47351	0.958
VCLRV_A	2194	13	04	608107.0000	2107200.0	3.46518	1.342

VF216P0	2239	04	03	3444.0977	4787.2	1.38997	
VF216P0	2239	0G	03	3211.8611	4787.2	1.49048	1.072
VF216P0	2239	14	03	3448.4375	4787.2	1.38822	0.999
VF216P45	2239	04	04	3658.4040	4787.2	1.30855	
VF216P45	2239	0G	04	3387.4737	4787.2	1.41321	1.080
VF216P45	2239	14	04	3560.8507	4787.2	1.34440	1.027
VF216P90	2239	04	05	3667.8884	4787.2	1.30517	
VF216P90	2239	0G	05	3478.1204	4787.2	1.37638	1.055
VF216P90	2239	14	05	3642.0790	4787.2	1.31441	1.007
VF216P135	2239	04	06	3498.6035	4787.2	1.36832	
VF216P135	2239	0G	06	3337.0292	4787.2	1.43457	1.048
VF216P135	2239	14	06	3650.2170	4787.2	1.31148	0.958
VF237P0	2431	04	07	8952.8829	7420.8	0.82887	
VF237P0	2431	0G	07	8591.4369	7420.8	0.86374	1.042
VF237P0	2431	14	07	8895.4485	7420.8	0.83422	1.006
VF237P45	2431	04	08	9264.4042	7420.8	0.80100	
VF237P45	2431	0G	08	8781.7265	7420.8	0.84503	1.055
VF237P45	2431	14	08	9332.5301	7420.8	0.79515	0.993
VF237P90	2431	04	09	8829.7694	7420.8	0.84043	
VF237P90	2431	0G	09	8748.1754	7420.8	0.84827	1.009
VF237P90	2431	14	09	8655.4217	7420.8	0.85736	1.020
VF237P135	2431	04	0A	8886.1789	7420.8	0.83509	
VF237P135	2431	0G	0A	8500.8866	7420.8	0.87294	1.045
VF237P135	2431	14	0A	8888.9224	7420.8	0.83484	1.000
VF277P0	2856	04	0B	16115.6693	12383.9	0.76844	
VF277P0	2856	0G	0B	14938.0742	12383.9	0.82902	1.079
VF277P0	2856	14	0B	16150.4340	12383.9	0.76678	0.998
VF277P45	2856	04	0C	14762.9244	12383.9	0.83885	
VF277P45	2856	0G	0C	14210.6505	12383.9	0.87145	1.039
VF277P45	2856	14	0C	14762.9244	12383.9	0.83885	1.000
VF277P90	2856	04	0D	16462.6031	12383.9	0.75224	
VF277P90	2856	0G	0D	15209.2691	12383.9	0.81423	1.082
VF277P90	2856	14	0D	16148.0469	12383.9	0.76690	1.019
VF277P135	2856	04	0E	16936.5998	12383.9	0.73119	
VF277P135	2856	0G	0E	15376.0525	12383.9	0.80540	1.101
VF277P135	2856	14	0E	17037.9774	12383.9	0.72684	0.994

VF327P0	2945	04	0F	18588.1818	8828.2	0.47494	
VF327P0	2945	0G	0F	18289.3062	8828.2	0.48270	1.016
VF327P0	2945	14	0F	18888.8220	8828.2	0.46738	0.984
VF327P45	2945	04	0G	17412.7451	8828.2	0.50700	
VF327P45	2945	0G	0G	16535.0265	8828.2	0.53391	1.053
VF327P45	2945	14	0G	17540.6627	8828.2	0.50330	0.993
VF327P90	2945	04	0H	17709.5002	8828.2	0.49850	
VF327P90	2945	0G	0H	15743.6970	8828.2	0.56075	1.125
VF327P90	2945	14	0H	18264.2905	8828.2	0.48336	0.970
VF327P135	2945	04	0I	18486.5939	8828.2	0.47755	
VF327P135	2945	0G	0I	15477.3438	8828.2	0.57040	1.194
VF327P135	2945	14	0I	19166.9679	8828.2	0.46059	0.965

Prism Bandpasses

Filter	effect wavel	set	#	Observed Counts/S	Predicted Counts/S	Ratio Pre/Obs	Ratio 1st/nth
VF248U1_A	2462	11	06	3472.4571	32924.3	9.48156	
VF248U1_A	2460	5P	06	1145.7714	13960.9	12.18472	
VF135U1_A	1549	11	06	1748.5714	10508.1	6.00953	
VF135U1_A	1521	5P	06	1096.0286	6293.4	5.74200	
VF262U2_A	2606	12	0A	2866.4634	20168.1	7.03588	
VF145U2_A	1556	12	0A	1171.7073	10372.8	8.85272	
VF551V_A	5482	13	05	1112.2857	19377.6	17.42142	
VF240V_A	2192	13	05	55473.5000	185830.0	3.34989	

Items of note:

In the above tables the observation set numbers 01,02,03,04,11,12,13 and 14 correspond to observation with the star BD+75D325. The observation set 5P correspond to the star BD+28D2411.

First, and of most interest, is that there seems to be a relationship between effective wavelength and correction factor, that peaks at between 1600 and 2000 angstroms. It is not know what the origin of this problem is at this point, but indications are that the curve is fairly stable, and may reflect differences between the pre-launch calibration curves and actual filter bandpasses for HSP filters.

The second item of note is the differences between the predicted and observed count rates with the POL detector. The observed count rates are higher that predicted. In addition the effect seems to be strongly correlated with wavelength. This effect is unique and the only substantive difference between the models for the POL and UV detectors is the addition of the Polacoat calibration curve, which may well be the source of the differences.

Lastly, the measurements for the PRISM filters have not been included in this report for the first two runs on BD+75D325. The PRISM apertures did not have good positions before these runs, which resulted in very low count rates for these filters. Since this was a known problem with unknown effect on the data, those results were excluded. New positions have been updated to the PDB since, and the third and fourth runs of this proposal provided a useable calibration of those filters and are included.