ABSOLUTE CALIBRATION AT HIGH RESOLUTION *

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1. Introduction

We recall that absolute fluxes can be derived from IUE high resolution spectra through:

$$F(\lambda) = S^{-1}(\lambda)\ C(\lambda)\ [FN/t] \qquad \text{ergs cm}^{-2}\ \text{s}^{-1}\ \text{A}^{-1} \qquad (1)$$

where $S^{-1}(\lambda)$ is the low resolution inverse sensitivity given by Holm et al. (1982) for the SWP and LWR cameras, by Cassatella and Harris (1983) for the LWP ITF1 and by Cassatella, Lloyd and Gonzalez Riestra (1988) for the LWP ITF2; FN/t is the high resolution ripple corrected net spectrum in FNs normalized to the exposure time in seconds; $C(\lambda)$ is the high resolution calibration function obtained as described in Cassatella, Ponz and Selvelli (1981, CPS81).

The calibration function $C(\lambda)$ is essentially independent on the data extraction software used in the spectral regions where the high resolution orders are well separated (e.g. $\lambda \gtrsim 1500$ A in the SWP and $\lambda \gtrsim 2300$ A in the LWR and LWP). This is not true at shorter wavelengths, because the spectral orders become so close to each other, that the actual position and width of the extraction slit has a non negligible influence on the resulting extracted data. Values of $C(\lambda)$ applicable to the data processed with the "old" data extraction software (i.e. processed at GSFC before Nov. 10, 1981 and at VILSPA before Mar. 10, 1982) are given by CPS81. While confirming the latter values, we present here the final version of the high resolution calibration provided in its preliminary version by Cassatella, Ponz and Selvelli (1982, 1983; CPS82 and CPS83). At the same time, we extend the high resolution calibration to the LWP camera, and provide an analytical representation of $C(\lambda)$ for the different cameras.

2. The high resolution calibration

a) calibration of data processed with the "old" software

The values of $C(\lambda)$ from CPS81 are reported in Table 1 for the SWP (Column 2) and in Table 2 (Column 2) for the LWR. No calibration is available for the LWP since it became operational on Oct. 16th, 1983, i.e. after the installation of the "new" software.

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* Reprinted from ESA IUE Newsletter, 1989, No. 31, p. 7.

b) calibration of data processed with the "new" software

The values of C(λ) are given in Table 1 (Column 3) for the SWP and in Table 2 (Column 3) for the LWR and LWP. These data are essentially the same as those reported in CPS83, but are more reliable than the latter being based on a considerably larger sample of data. Note that the calibration function C(λ) is the same for the two long wavelength cameras. Two example applications are provided in Figs. 1 and 2.

c) analytical fit to the calibration curves

The data in Tables 1 and 2 can be represented analytically by the function:

$$C(\lambda) = 10^{a1} / (\lambda - a2)^3 - a3\lambda + a4 \qquad (2)$$

where a1, a2, a3 and a4 are constants given in Table 3 for the different cameras and type of image processing used. The analytical fits in eq. 2 represent the data in Table 1 and 2 with an accuracy better than 1%. Note that eq. 2 should be used within the wavelength limits in Tables 1 and 2.

d) calibration of spectra of emission line sources

It is important to stress that high resolution spectra of emission line sources cannot be calibrated shortwards of about 1500 A in the SWP camera and 2300 A in the LWR, if the data were processed with the "old" software. Longward of the above wavelengths the same curves can be used as for the continuum sources. We also find that the better data extraction provided by the "new" software allows one to calibrate the emission line spectra with faint or no detectable continuum using the same C(λ) curve used for the continuum sources over all the wavelength range covered by Tables 1 and 2.

REFERENCES

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Table 1: C(λ) for the SWP camera

Lambda (A)	C(λ) old	C(λ) new
1250	230	216
1275	208	195
1300	193	178
1325	176	167
1350	163	156
1375	152	147
1400	143	141
1425	136	135
1450	131	130
1475	126	125
1500	122	120
1525	118	116
1550	114	113
1575	110	111
1600	108	108
1625	105	106
1650	103	103
1675	101	101
1700	100	100
1725	98	98
1750	96	96.5
1775	94	95.0
1800	92	94.0
1825	90	92.5
1850	88	91.0
1875	86	89.7
1900	84	88.2
1925	82	87.0
1950	81	85.5
1975	80	84.2

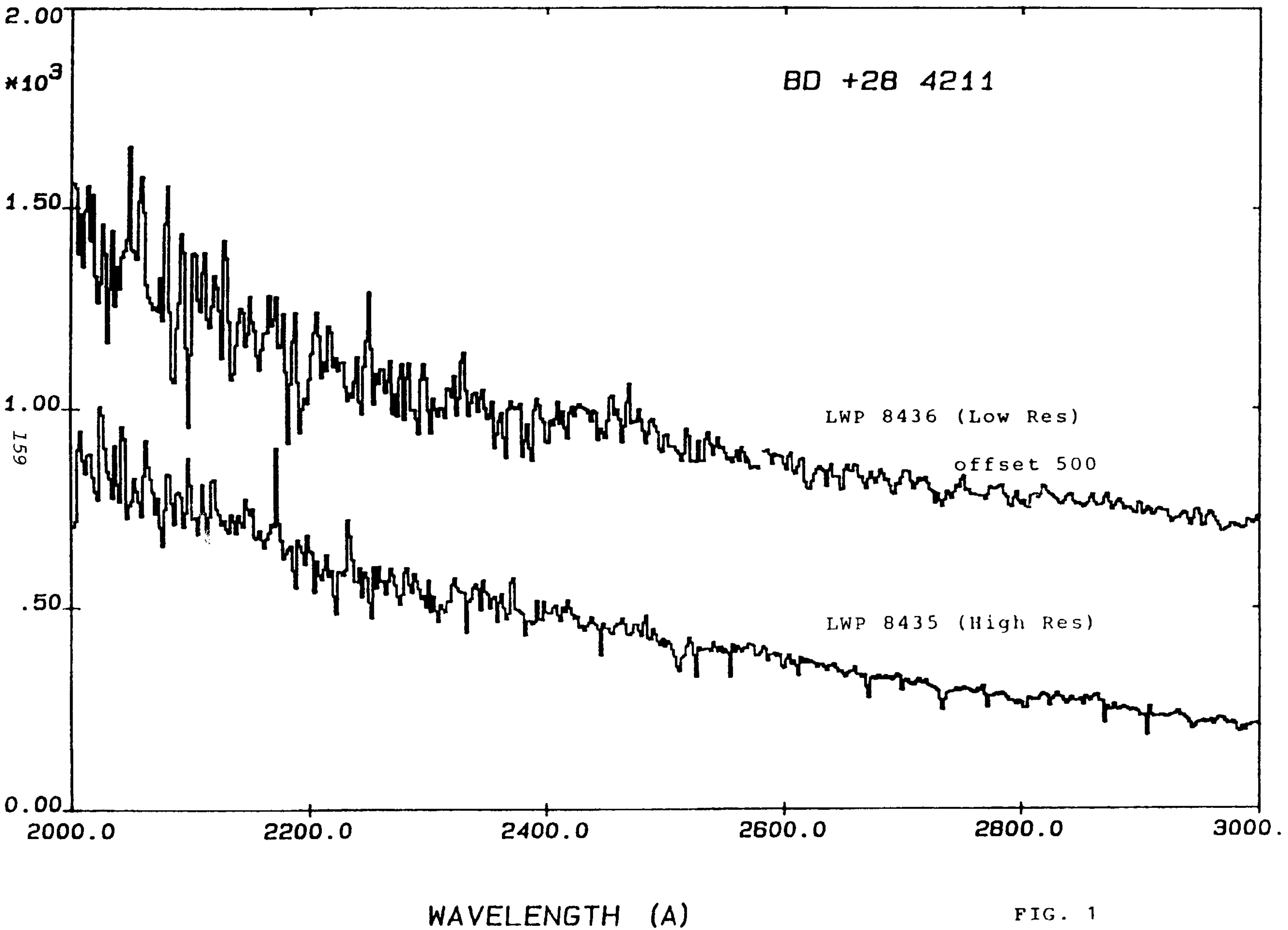
Table 2: C(λ) for the LWR and LWP cameras

Lambda (A)	C(λ) old	C(λ) new
1900		244
1925	292	220
1950	259	201
1975	229	184
2000	207	172
2025	191	163
2050	180	154
2075	171	146
2100	165	140
2125	159	135
2150	153	131
2175	149	128
2200	143	126
2225	139	124
2250	136	122
2275	132	121
2300	129	120
2325	126	119
2350	122	118
2375	120	117
2400	118	116
2425	116	115
2450	115	114.5
2475	114	113.5
2500	113	112.5
2525	112	111.5
2550	110	110.5
2575	109	109.5
2600	108	108.7
2625	107	108
2650	106	107
2675	105	106
2700	104.6	105
2725	104.0	104
2750	103.5	103
2775	103.0	102
2800	102.6	101
2825	102.0	100
2850	101.5	99
2875	100.5	98
2900	100.2	97
2925	100.0	96
2950	99.5	95
2975	99.0	94
3000	98.5	93
3025	98.0	92
3050	97.6	91
3075	97.0	90
3100	96.5	89

Table 3: Coefficients of the analytical fit in eq. 2

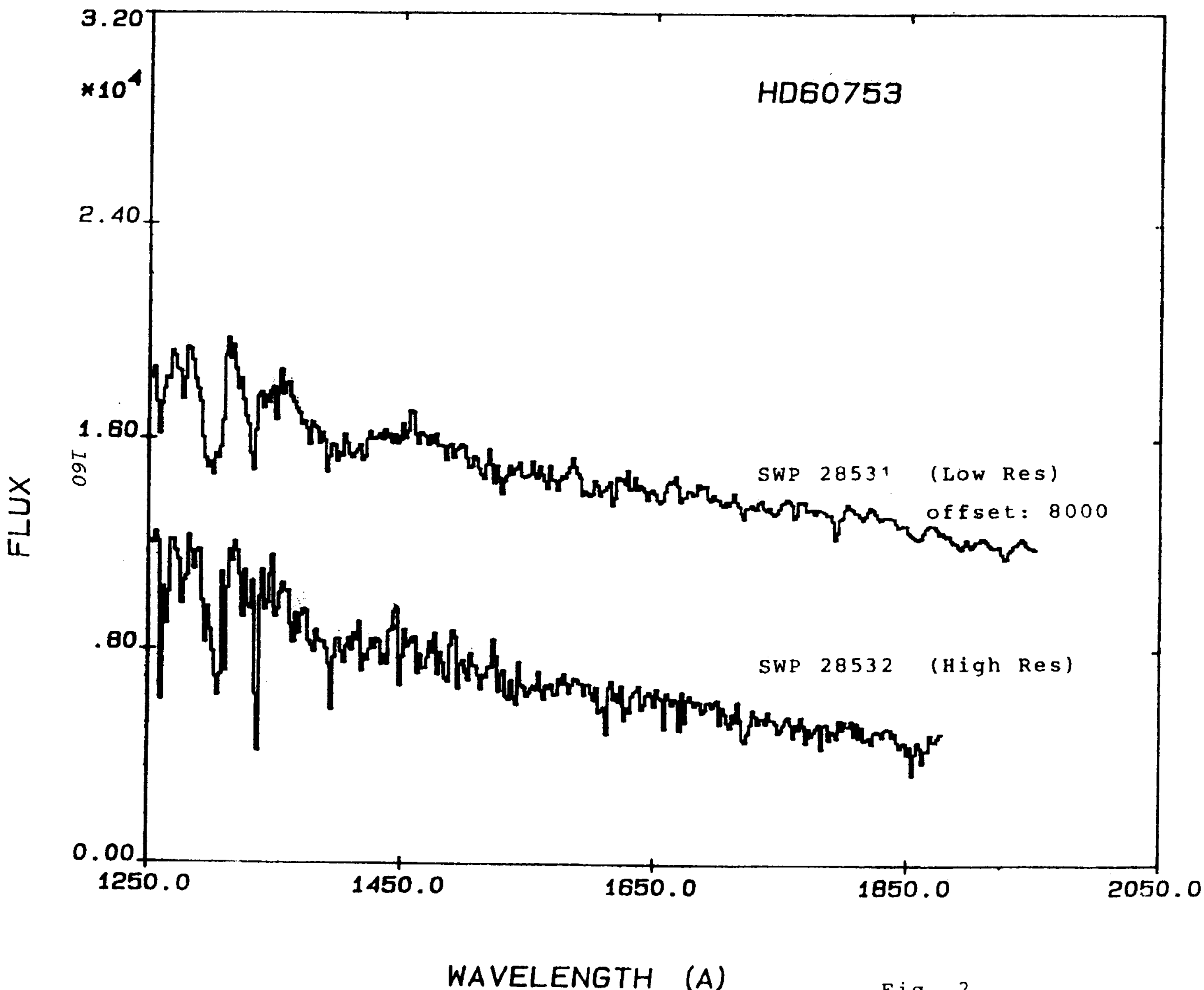
CAMERA	a1	a2	a3	a4	type of S/W
SWP	9.791	868.3	0.0335	146.1	new
	9.665	914.1	0.0480	171.0	old
LWR &	9.334	1642.0	0.0284	178.7	new
LWP	10.020	1535.0	0.0131	134.1	old

Note: The same constants hold for LWP and LWR spectra processed with the "new" software.



2.00
$\times 10^3$
1.50
1.00
.50
0.00
BD +28 4211
LWP 8436 (Low Res)
offset 500
LWP 8435 (High Res)
2000.0
2200.0
2400.0
2600.0
2800.0
3000.0
WAVELENGTH (A)

FIG. 1



3.20
*10^4
HD60753
2.40
1.60
.80
0.00
FLUX
SWP 28531 (Low Res)
offset: 8000
SWP 28532 (High Res)
1250.0
1450.0
1650.0
1850.0
2050.0
WAVELENGTH (A)

Fig. 2