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SPECTRAL EVOLUTION OF GALAXIES. II AN ATLAS OF *IUE* SPECTRA OF LATE TYPE STARS AND NEARBY EARLY TYPE STELLAR SYSTEMS

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RESUMEN

Se presentan en forma gráfica y tabular espectros de baja dispersión de estrellas tardías, cúmulos globulares y galaxias elípticas obtenidos con el satélite *IUE*. Para aquellos tipos de objetos con más de un espectro observado, se calculan espectros promedios.

ABSTRACT

Low dispersion *IUE* spectra are presented in both pictorial and tabular form for late type stars, globular clusters, and elliptical galaxies. Average spectra are computed for types of objects with more than one observed spectrum.

Key words: LATE TYPE STARS–GLOBULAR CLUSTERS–ELLIPTICAL GALAXIES–ULTRAVIOLET SPECTRA

I. INTRODUCTION

The *International Ultraviolet Explorer* satellite (*IUE*) was used to obtain ultraviolet spectra of late type stars and early type galaxies. These spectra were needed in order to complete an extensive project that involves the study of the spectral evolution of galaxies in the wavelength range from the ultraviolet to the infrared (Bruzual 1981, 1983*a*, 1983*b*, 1983*c*). The stellar data were required to complete the library of stellar spectra used in the synthesis. For spectral types earlier than G2 the *OAO-2* data of Code and Meade (1979) were used. The galaxy data were needed to define the typical early type galaxy UV spectrum to be compared with the results of the evolutionary synthesis. Due to the apparent faintness of the sources, the low dispersion mode of the *IUE* was used to maximize the signal-to-noise ratio and to make the exposure times reasonable. This mode provides enough resolution (~ 5 Å) for the synthesis program.

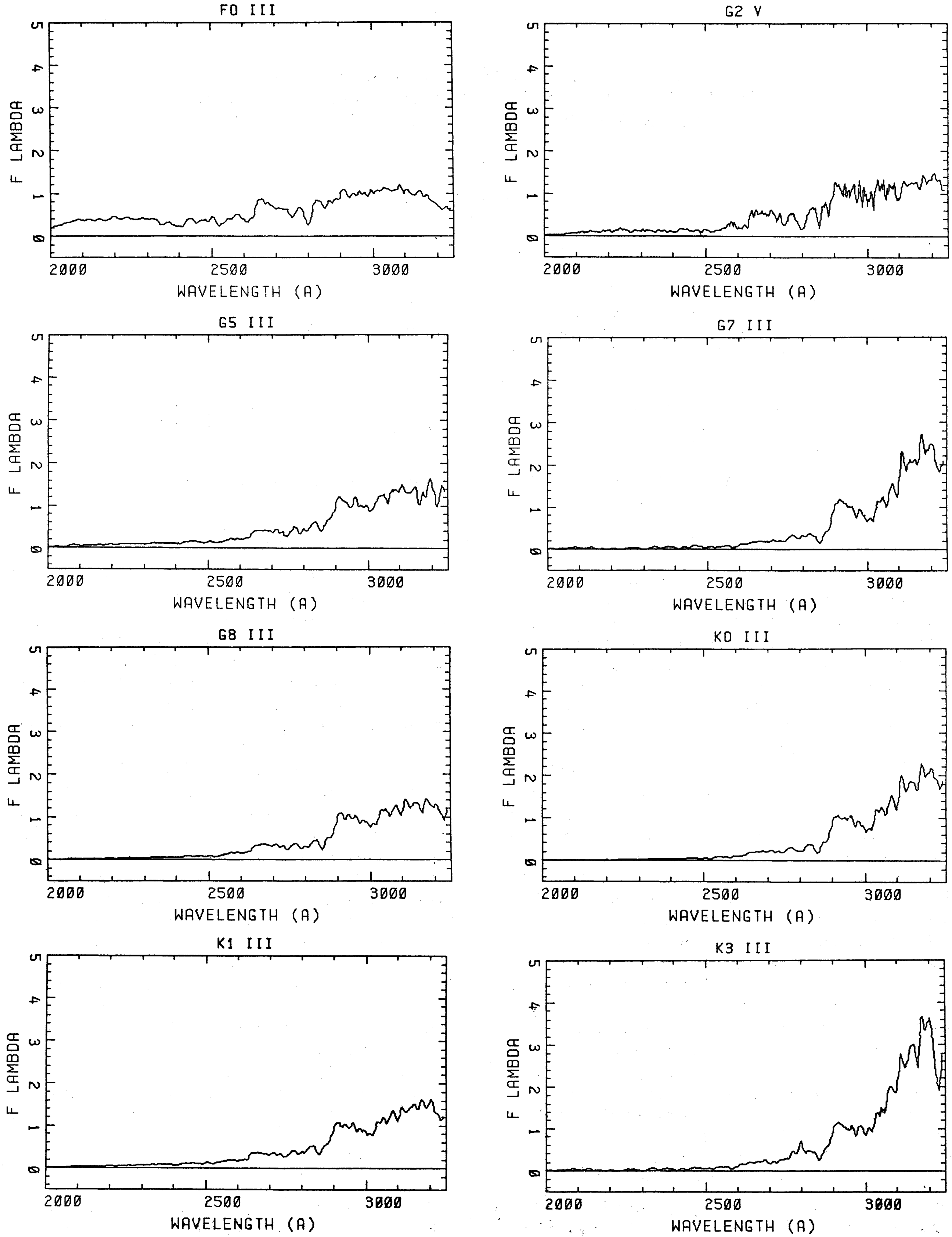
Besides the data acquired by the author, several *IUE* spectra of both stars and stellar systems were provided by the National Space Science Data Center (see Tables 1 and 2). While collecting these data it became apparent that there was a need for a uniform presentation of these spectra, similar to that given by Code and Meade (1979) for the *OAO-2* stellar data. Much of the data are dispersed throughout the literature, but the spectra have not been presented in a consistent and coherent form. In this paper I present such a compilation. All the spectra are displayed in both pictorial and tabular form in a common wavelength scale. Section II describes the details of the *IUE* data reduction performed by the author. The results are presented in section III.

II. DATA REDUCTION

The final reduction of the spectra was performed based on the files provided by the *IUE* data reduction facilities. Each spatially resolved spectral segment (line-by-line spectrum file) provided by NASA or ESA was plotted individually, as a spectrum F_λ versus λ. By visual inspection those segments with the highest signal-to-noise, i.e., with the spectral shape clearly visible, were chosen as defining the source spectrum. The spectra of extended sources typically included from eight to ten segments; in some of the exposures, the source was off-center in the large aperture. Special care was taken used to define the background level. Segments were chosen to cover most of the camera, approaching as close as possible to the source spectrum, without including segments with recognizable spectral features. The segments defining the brackground were averaged and smoothed, then normalized to the same area as the spectrum, and finally subtracted. At this stage the net counts were calibrated as usual (Bohlin and Holm 1980). This procedure improved the final spectrum considerably, especially below 2500 Å, over the standard reduction. This can be seen by comparing Figure 2*a* with Figure 1 of Bruzual and Spinrad (1981). The latter was constructed with the spectra reduced by the NASA facilities. The remaining high frequency noise in the final spectra should not be taken as spectral features. Quite often these apparent emission peaks represent particles hitting the detector at any time during the exposure.

III. RESULTS

Table 1 lists the stars, spectral type, and LWR image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G2 V
G5 III
G7 III
G8 III
K0 III
K1 III
K3 III
F LAMBDA
0
1
2
3
4
5
2000
2500
3000
WAVELENGTH (A)

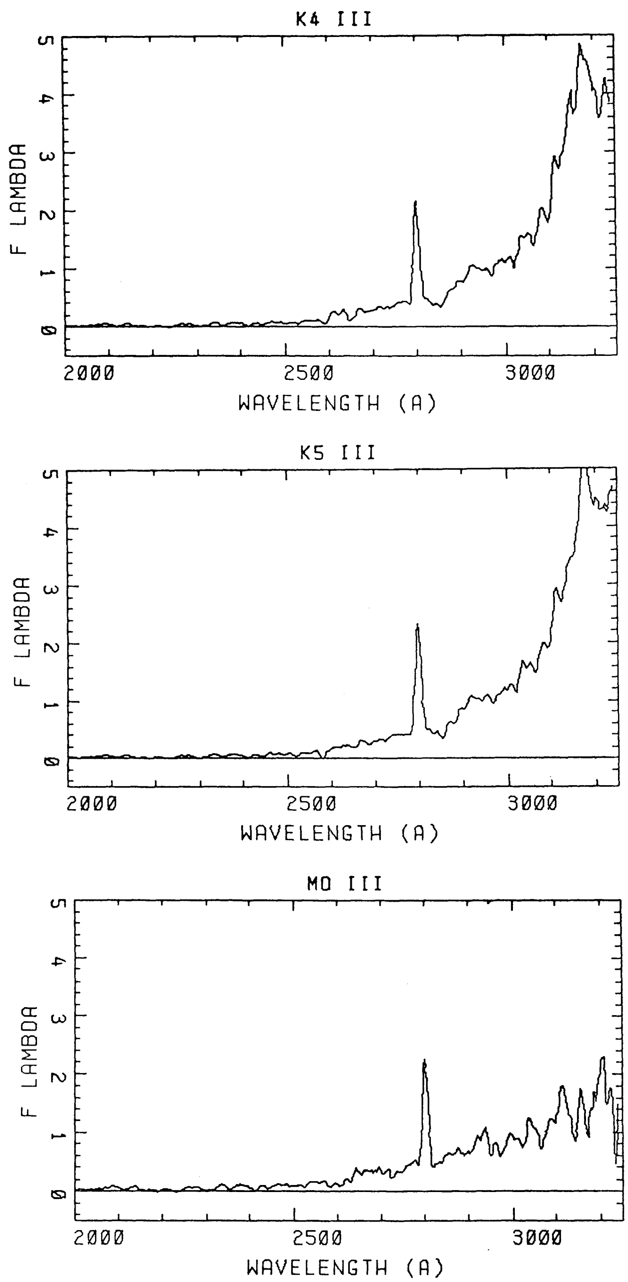

Fig. 1. (a,b,c,d,e,f,g,h,i,j,k) Ultraviolet spectra obtained with the *IUE* statellite for stars of spectral types as indicated in Table 1 and on top of each figure. For the spectral types with more than one entry in Table 1, an average spectrum was determined. All the spectra have been normalized to $F_{\lambda} = 1$ at $\lambda = 2940$ Å.

number for which *IUE* data were obtained. For spectral types of stars with more than one entry in this table an average spectrum was used after normalization at λ = 2940 Å. The spectra in the range from 2000 to 3240 Å are displayed in Figure 1 as plots of F_{λ} versus λ.

Table 2 indicates the identification, color excess, *IUE* image number, and exposure time for the elliptical galaxies and globular clusters for which *IUE* spectra were available. The reddening law (analytical approximation from Seaton (1979) was used to correct the observed *UV* spectra. As in the optical region, the degree of similarity between the *UV* spectra of these systems in the 2000 to 3200 Å region is very high, and it is possible to define an average *UV* spectrum for each type of stellar system considered. Different spectra were assigned weights in proportion to the observing time and in accord with spectral quality, as given in Table 3.

TABLE 1

STARS OBSERVED WITH *IUE*

Sp. Type	Star	LWR Image No.
F0 III	γ Tuc	4688
G2 V	Sun	(*)
...	16 Cyg A	1888, 1889
G5 III	ι Tuc	4689
G7 III	λ^2 Tuc	4690
G8 III	ϵ And	4670
...	η And	4671
...	λ And	4666
K0 III	α Cas	4646
...	3 And	4667, 4668
K1 III	β Cet	4672, 4687
K3 III	δ And	4669
K4 III	ϕ^3 Cet	4686
K5 III	δ Psc	4684, 4685
M0 III	β And	4683

* The data for the sun was taken from Broadfoot (1972) and Arvensen *et al.* (1969).

Table 4 lists *IUE* stellar spectra in numerical form. All the spectra presented in this atlas have been normalized to $F_{\lambda} = 1$ at $\lambda = 2940$ Å. The resulting average spectra of stellar systems in the range from 2000 to 3200 Å are shown in Figure 2 and listed in Table 5.

Finally, Figure 3 shows the average spectrum of M 31 and M 32, as well as the spectra of the globular clusters NGC 6752 and 47 Tuc in the range from 1200 to 3200 Å. These were the only systems observed down to 1200 Å. The fluxes are listed in Table 6. The fluxes from 1940 to 1995 Å are listed as zero; in this region there is no good overlap betweeen the *IUE* SWP and LWR cameras.

IV. CONCLUDING REMARKS

The *IUE* spectra of late type stars, globular clusters, and elliptical galaxies presented in section III are expected to be representative of objects of their kinds. These spectra can be used to estimate *UV* luminosities or for spectral feature identification purposes.

None of the galaxies included in this work show the rapid increase shortward of 2000 Å that has been observed in NGC 4486 (Bertola *et al.* 1980; Perola and Tarenghi 1980) and NGC 4649 (Bertola, Capaccioli, and Oke 1982). These two galaxies are thus "peculiar" with

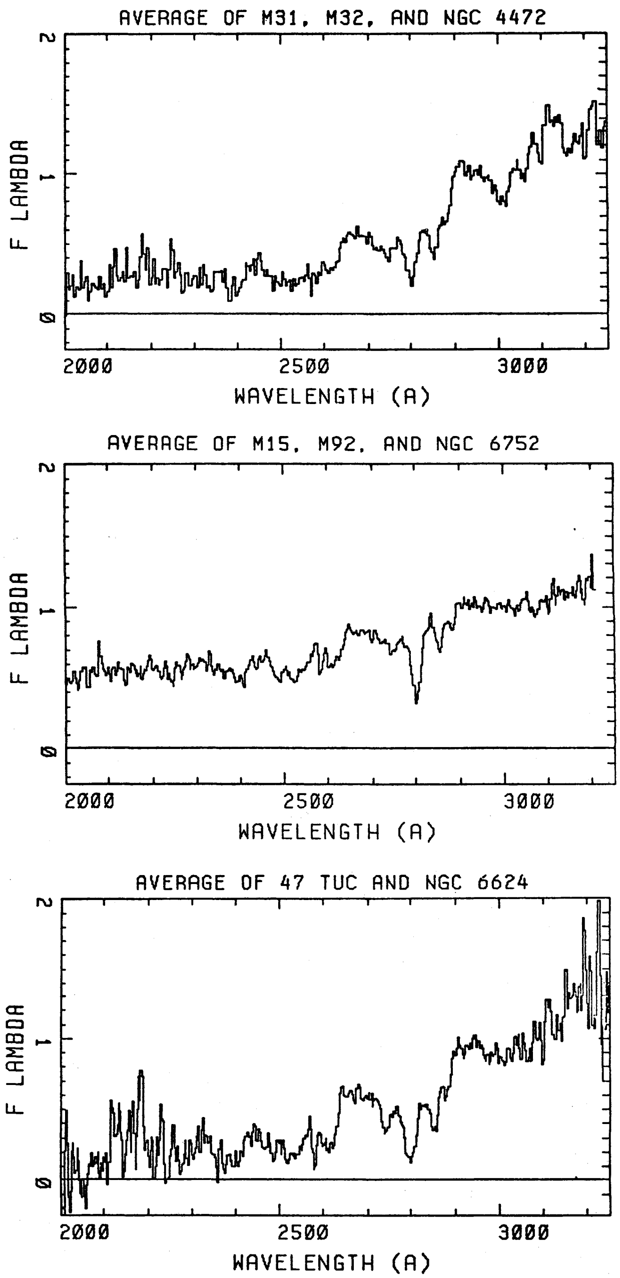

Fig. 2. Average spectral energy distributions in the range from 2000 to 3200 Å for: (a) M 31, M 32, and NGC 4472, (b) M 15, M 92, and NGC 6752, and (c) 47 Tuc and NGC 6624. Each spectrum was normalized at 2940 Å and weighted according to exposure time and spectral quality as indicated in Table 3. The high frequency structure shortward of 2600 Å is not real, being most likely due to detector noise, or particles reaching the camera during the esposures. The narrow "absorption feature" around 2580 A seen in some of the spectra is produced by a reseau mark in the camera.

respect to M31 and M32. Nor do any of these galaxies show emission lines as seen in the spectrum of M81 displayed by Peimbert and Torres-Peimbert (1981) and Bruzual, Peimbert, and Torres-Peimbert (1982).

TABLE 2

STELLAR SYSTEMS OBSERVED WITH *IUE*

Object	Type	E(B−V)	Image No.	Exposure (hrs.)
M 31 (bulge)	E – gal	0.10	SWP 3520	8.3
			LWR 3088	5.0
			LWR 4665 (*)	1.0
			LWR 4682 (*)	2.5
M 32	E – gal	0.10	SWP 3545	5.0
			LWR 3111	6.3
			LWR 4644 (*)	3.0
			LWR 4645 (*)	2.5
NGC 4472	E – gal	0.02	LWR 4520	3.0
			LWR 4521	3.5
			LWR 4664 (*)	6.0
			LWR 4681 (*)	4.5
M 15	G. C.	0.09	LWR 1457	0.2
			LWR 1820	1.0
			LWR 1821	1.2
M 92	G. C.	0.02	LWR 1448	0.5
			LWR 1881	0.7
			LWR 1882	0.7
NGC 6752	G. C.	0.04	SWP 1531	0.7
			SWP 1532	0.7
			LWR 1482	0.5
			LWR 1839	0.5
47 Tuc	G. C.	0.06	SWP 1510	3.0
			LWR 1461	0.5
NGC 6624	G. C.	0.30	LWR 1458	1.5

* Data obtained by H. Spinrad and the author.

TABLE 3

AVERAGE S. E. D. OF DIFFERENT STELLAR SYSTEMS

Object	Range (A)	Ingredients	Weight
E – gal	1250-3200	M 31 (bulge)	0.50
		M 32	0.50
	2000-3200	M 31 (bulge)	0.30
		M 32	0.40
		NGC 4472	0.30
G. C. (metal poor)	2000-3200	M 15	0.55
		M 92	0.30
		NGC 6752	0.15
G. C. (metal rich)	2000-3200	47 Tuc	0.75
		NGC 6624	0.25

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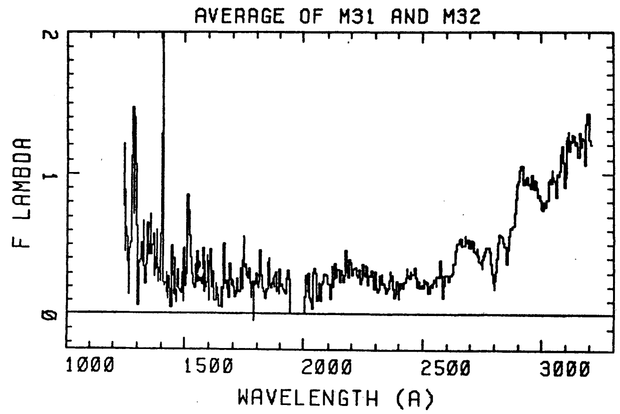

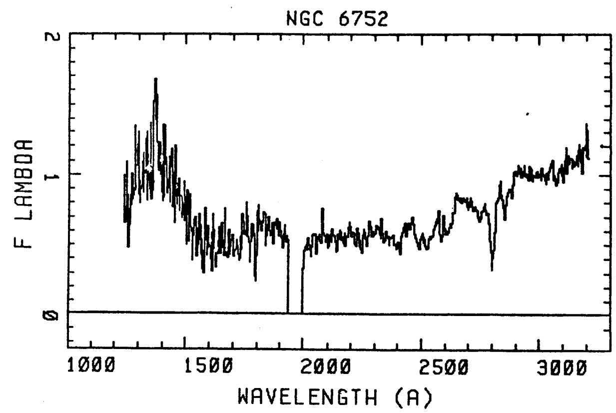

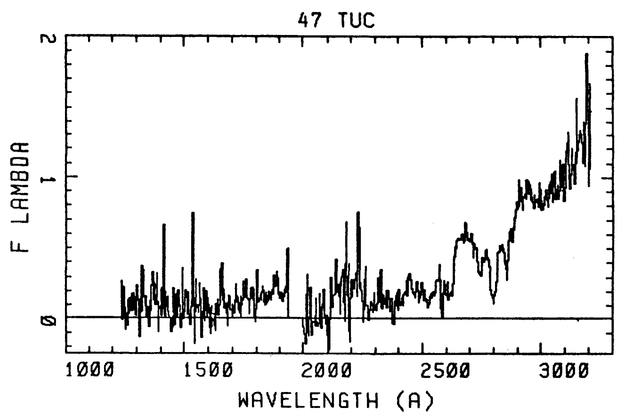

Fig. 3. Spectral energy distributions in the range from 1250 to 3200 Å for: (a) average of M 31 and M 32. Both galaxies were assigned equal weights. (b) Metal poor globular cluster NGC 6752. (c) Metal rich globular cluster 47 Tuc. Each spectrum was normalized at 2940 Å. The discontinuity below 2000 Å is due to a lack of overlapping in the short wavelength (SWP) and long wavelength (LWR) *IUE* images.

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TABLE 5

IUE SPECTRA OF STELLAR SYSTEMS (2000-3200 A)

λ(A)	E-GAL F_λ	MP-GC F_λ	MR-GC F_λ
2000	-. 109	0. 203	-. 098
2005	0. 140	0. 410	-. 207
2010	0. 234	0. 484	-. 290
2015	0. 202	0. 436	0. 508
2020	0. 278	0. 556	-. 128
2025	0. 145	0. 505	-. 079
2030	0. 204	0. 529	0. 269
2035	0. 183	0. 535	0. 047
2040	0. 342	0. 577	0. 232
2045	0. 216	0. 541	-. 002
2050	0. 256	0. 523	-. 126
2055	0. 146	0. 528	-. 120
2060	0. 147	0. 557	-. 208
2065	0. 222	0. 534	0. 044
2070	0. 210	0. 546	0. 102
2075	0. 191	0. 560	0. 096
2080	0. 207	0. 605	0. 116
2085	0. 233	0. 628	0. 128
2090	0. 205	0. 601	0. 048
2095	0. 151	0. 546	0. 124
2100	0. 156	0. 515	0. 162
2105	0. 356	0. 472	0. 191
2110	0. 216	0. 490	-. 032
2115	0. 362	0. 589	0. 498
2120	0. 401	0. 574	0. 523
2125	0. 264	0. 538	0. 336
2130	0. 255	0. 578	0. 338
2135	0. 304	0. 580	0. 560
2140	0. 254	0. 517	0. 349
2145	0. 478	0. 529	0. 025
2150	0. 267	0. 518	0. 182
2155	0. 275	0. 543	0. 362
2160	0. 289	0. 560	0. 357
2165	0. 256	0. 558	0. 465
2170	0. 233	0. 519	0. 344
2175	0. 398	0. 602	0. 318
2180	0. 566	0. 582	0. 757
2185	0. 434	0. 624	0. 802
2190	0. 362	0. 688	0. 734
2195	0. 428	0. 730	0. 216
2200	0. 241	0. 629	0. 287
2205	0. 343	0. 602	0. 088
2210	0. 285	0. 613	0. 315
2215	0. 265	0. 601	0. 015
2220	0. 221	0. 540	0. 306
2225	0. 263	0. 587	0. 176
2230	0. 333	0. 636	0. 549
2235	0. 298	0. 602	0. 432
2240	0. 264	0. 622	0. 023
2245	0. 460	0. 569	0. 014
2250	0. 491	0. 541	0. 023
2255	0. 319	0. 597	0. 229
2260	0. 310	0. 635	0. 403
2265	0. 365	0. 653	0. 137
2270	0. 283	0. 633	0. 250
2275	0. 161	0. 692	0. 041
2280	0. 228	0. 709	0. 117
2285	0. 285	0. 591	0. 189
2290	0. 227	0. 614	0. 161
2295	0. 251	0. 669	0. 204
2300	0. 279	0. 637	0. 268
2305	0. 264	0. 659	0. 153
2310	0. 215	0. 635	0. 236
2315	0. 295	0. 663	0. 284
2320	0. 288	0. 661	0. 208
2325	0. 321	0. 668	0. 365
2330	0. 209	0. 666	0. 268
2335	0. 208	0. 627	0. 322
2340	0. 163	0. 634	0. 272
2345	0. 202	0. 621	0. 321
2350	0. 314	0. 638	0. 183
2355	0. 312	0. 592	0. 167
2360	0. 315	0. 634	-. 021
2365	0. 269	0. 615	0. 230
2370	0. 321	0. 644	0. 127
2375	0. 218	0. 609	0. 080
2380	0. 104	0. 581	0. 117
2385	0. 128	0. 596	0. 176
2390	0. 225	0. 611	0. 140
2395	0. 213	0. 599	0. 103
2400	0. 154	0. 580	0. 147
2405	0. 189	0. 600	0. 134
2410	0. 236	0. 586	0. 139
2415	0. 252	0. 631	0. 210
2420	0. 370	0. 674	0. 203
2425	0. 343	0. 701	0. 321
2430	0. 328	0. 743	0. 346
2435	0. 382	0. 723	0. 319
2440	0. 341	0. 673	0. 349
2445	0. 373	0. 713	0. 396
2450	0. 449	0. 729	0. 291
2455	0. 399	0. 726	0. 366
2460	0. 319	0. 785	0. 278
2465	0. 295	0. 756	0. 236
2470	0. 314	0. 707	0. 240
2475	0. 280	0. 661	0. 305
2480	0. 227	0. 671	0. 270
2485	0. 252	0. 660	0. 150
2490	0. 247	0. 646	0. 151
2495	0. 224	0. 634	0. 222
2500	0. 227	0. 682	0. 267
2505	0. 306	0. 717	0. 187
2510	0. 241	0. 674	0. 291
2515	0. 224	0. 664	0. 155
2520	0. 246	0. 615	0. 123
2525	0. 185	0. 602	0. 151
2530	0. 241	0. 655	0. 186
2535	0. 214	0. 662	0. 191
2540	0. 231	0. 675	0. 183
2545	0. 264	0. 699	0. 189
2550	0. 260	0. 722	0. 236
2555	0. 271	0. 737	0. 258
2560	0. 336	0. 752	0. 320
2565	0. 280	0. 786	0. 323
2570	0. 156	0. 798	0. 467
2575	0. 304	0. 823	0. 231
2580	0. 276	0. 680	0. 079
2585	0. 254	0. 508	0. 115
2590	0. 304	0. 644	0. 331
2595	0. 345	0. 736	0. 332
2600	0. 368	0. 723	0. 247
2605	0. 328	0. 693	0. 274
2610	0. 309	0. 728	0. 222
2615	0. 336	0. 752	0. 208
2620	0. 330	0. 775	0. 274
2625	0. 355	0. 772	0. 251
2630	0. 385	0. 786	0. 332
2635	0. 448	0. 830	0. 481
2640	0. 515	0. 889	0. 633
2645	0. 553	0. 896	0. 685
2650	0. 531	0. 911	0. 611
2655	0. 582	0. 897	0. 614
2660	0. 597	0. 887	0. 634
2665	0. 583	0. 900	0. 641
2670	0. 564	0. 853	0. 585
2675	0. 611	0. 865	0. 617
2680	0. 589	0. 872	0. 702
2685	0. 580	0. 878	0. 632
2690	0. 571	0. 892	0. 596
2695	0. 563	0. 885	0. 608
2700	0. 536	0. 862	0. 601
2705	0. 589	0. 868	0. 638
2710	0. 541	0. 849	0. 633
2715	0. 491	0. 854	0. 578
2720	0. 492	0. 847	0. 597
2725	0. 472	0. 837	0. 571
2730	0. 504	0. 839	0. 525
2735	0. 472	0. 833	0. 428
2740	0. 442	0. 802	0. 341
2745	0. 410	0. 790	0. 363
2750	0. 439	0. 808	0. 386
2755	0. 483	0. 822	0. 476
2760	0. 490	0. 834	0. 487
2765	0. 492	0. 868	0. 487
2770	0. 560	0. 862	0. 527
2775	0. 533	0. 847	0. 462
2780	0. 497	0. 883	0. 403
2785	0. 432	0. 830	0. 316
2790	0. 369	0. 731	0. 190
2795	0. 293	0. 616	0. 171
2800	0. 216	0. 535	0. 131
2805	0. 274	0. 598	0. 206
2810	0. 393	0. 720	0. 244
2815	0. 475	0. 848	0. 450
2820	0. 558	0. 918	0. 558
2825	0. 610	0. 904	0. 546
2830	0. 609	0. 912	0. 538
2835	0. 615	0. 907	0. 533
2840	0. 585	0. 897	0. 520
2845	0. 493	0. 843	0. 459
2850	0. 451	0. 817	0. 365
2855	0. 435	0. 821	0. 394
2860	0. 539	0. 849	0. 474
2865	0. 642	0. 903	0. 647
2870	0. 687	0. 917	0. 674
2875	0. 669	0. 914	0. 678
2880	0. 681	0. 893	0. 616
2885	0. 736	0. 893	0. 687
2890	0. 820	0. 950	0. 766
2895	0. 947	0. 991	0. 888
2900	1. 018	0. 999	0. 910
2905	1. 061	0. 990	0. 965
2910	1. 087	0. 993	0. 985
2915	1. 115	0. 990	0. 964
2920	1. 114	1. 018	0. 894
2925	1. 018	0. 997	0. 983
2930	1. 052	1. 003	0. 975
2935	1. 068	1. 011	0. 999
2940	1. 000	1. 000	1. 000
2945	1. 031	0. 992	1. 052
2950	1. 057	0. 974	1. 017
2955	1. 025	1. 008	1. 017
2960	1. 076	1. 043	0. 985
2965	1. 001	1. 034	0. 911
2970	0. 983	0. 992	0. 868
2975	1. 006	0. 998	0. 921
2980	1. 000	1. 009	0. 861
2985	0. 927	1. 018	0. 910
2990	0. 923	1. 017	0. 920
2995	0. 909	1. 006	0. 963
3000	0. 834	1. 018	0. 853
3005	0. 808	1. 015	0. 895
3010	0. 853	1. 018	0. 866
3015	0. 814	0. 994	0. 857
3020	0. 851	1. 001	0. 956
3025	0. 919	0. 998	0. 933
3030	1. 003	1. 017	0. 864
3035	1. 063	1. 028	1. 041
3040	1. 062	1. 041	0. 986
3045	1. 119	1. 026	1. 062
3050	1. 039	1. 014	0. 883
3055	1. 004	1. 038	1. 073
3060	0. 994	0. 995	0. 942
3065	1. 035	0. 975	0. 874
3070	1. 149	0. 985	0. 961
3075	1. 223	1. 003	0. 879
3080	1. 319	1. 063	1. 164
3085	1. 252	1. 067	1. 031
3090	1. 229	1. 048	1. 034
3095	1. 156	1. 058	1. 020
3100	1. 106	1. 028	0. 878
3105	1. 297	1. 041	1. 166
3110	1. 424	1. 077	1. 315
3115	1. 528	1. 143	1. 315
3120	1. 410	1. 112	1. 213
3125	1. 414	1. 107	1. 025
3130	1. 392	1. 091	1. 121
3135	1. 429	1. 108	1. 093
3140	1. 433	1. 113	1. 143
3145	1. 419	1. 160	1. 188
3150	1. 238	1. 080	1. 302
3155	1. 190	1. 112	1. 251
3160	1. 163	1. 120	1. 373
3165	1. 203	1. 184	1. 329
3170	1. 195	1. 164	1. 436
3175	1. 281	1. 109	1. 339
3180	1. 287	1. 081	1. 239
3185	1. 256	1. 129	1. 435
3190	1. 300	1. 223	1. 346
3195	1. 389	1. 117	1. 824
3200	1. 136	1. 171	1. 291

TABLE 6

IUE SPECTRA OF STELLAR SYSTEMS (1250-3200 A)

λ(A)	E-GAL F_λ	N6752 F_λ	47TUC F_λ
1250	0.479	1.045	0.187
1255	0.589	0.572	-.055
1260	0.424	0.654	0.035
1265	0.294	0.841	-.038
1270	0.519	0.881	0.101
1275	0.768	0.848	0.059
1280	1.315	0.910	0.067
1285	0.857	1.256	0.156
1290	1.458	1.061	0.089
1295	0.658	1.133	0.149
1300	0.411	1.096	0.135
1305	0.344	0.828	0.153
1310	0.403	0.895	0.004
1315	0.535	0.989	0.131
1320	0.432	1.072	0.131
1325	0.618	1.000	0.067
1330	0.229	1.188	0.279
1335	0.273	0.946	0.124
1340	0.391	0.967	0.013
1345	0.509	0.943	0.038
1350	0.516	1.347	0.078
1355	0.627	0.842	-.046
1360	0.483	1.044	0.105
1365	0.563	1.629	0.326
1370	0.500	1.425	0.256
1375	0.334	1.459	0.246
1380	0.637	1.164	0.154
1385	0.246	1.100	0.247
1390	0.345	1.127	0.025
1395	0.265	0.955	0.145
1400	0.913	0.803	0.026
1405	1.770	0.854	0.068
1410	0.236	1.259	0.524
1415	0.243	0.936	0.062
1420	0.246	0.878	0.187
1425	0.172	0.945	0.063
1430	0.243	1.126	0.156
1435	0.140	1.097	0.038
1440	0.256	1.081	-.005
1445	0.424	0.764	-.098
1450	0.238	0.899	0.015
1455	0.338	1.047	0.073
1460	0.235	0.847	-.048
1465	0.187	0.911	0.115
1470	0.250	0.819	0.088
1475	0.194	0.908	0.159
1480	0.229	0.804	0.054
1485	0.241	0.773	-.065
1490	0.187	0.745	0.110
1495	0.391	0.871	0.280
1500	0.228	0.769	0.055
1505	0.314	0.851	0.196
1510	0.823	0.716	0.216
1515	0.690	0.720	0.130
1520	0.645	0.635	0.050
1525	0.354	0.554	-.037
1530	0.347	0.488	0.070
1535	0.270	0.677	0.768
1540	0.246	0.685	0.135
1545	0.358	0.465	-.177
1550	0.416	0.592	0.277
1555	0.276	0.695	0.088
1560	0.393	0.572	0.159
1565	0.303	0.541	0.209
1570	0.281	0.499	0.106
1575	0.481	0.365	0.031
1580	0.247	0.579	0.080
1585	0.268	0.575	0.006
1590	0.254	0.495	0.146
1595	0.436	0.517	0.006
1600	0.159	0.493	0.140
1605	0.464	0.450	0.017
1610	0.281	0.536	0.040
1615	0.268	0.385	0.010
1620	0.229	0.603	0.002
1625	0.098	0.357	-.037
1630	0.157	0.350	0.078
1635	0.194	0.472	0.115
1640	0.058	0.461	0.130
1645	0.058	0.529	0.040
1650	0.158	0.542	0.315
1655	0.111	0.511	0.305
1660	0.372	0.521	0.301
1665	0.348	0.673	0.210
1670	0.236	0.487	0.108
1675	0.239	0.422	0.051
1680	0.242	0.522	0.014
1685	0.172	0.459	0.173
1690	0.309	0.526	0.149
1695	0.232	0.547	0.065
1700	0.230	0.534	0.079
1705	0.196	0.414	0.096
1710	0.149	0.457	0.080
1715	0.165	0.497	0.178
1720	0.261	0.463	0.136
1725	0.176	0.413	0.122
1730	0.282	0.460	0.121
1735	0.287	0.560	0.028
1740	0.193	0.644	0.152
1745	0.476	0.643	0.247
1750	0.368	0.588	0.191
1755	0.358	0.575	0.187
1760	0.304	0.706	0.303
1765	0.282	0.548	0.161
1770	0.336	0.478	0.130
1775	0.236	0.474	0.117
1780	0.176	0.642	0.237
1785	0.161	0.609	0.208
1790	0.067	0.584	0.228
1795	0.240	0.272	0.011
1800	0.302	0.498	0.131
1805	0.226	0.763	0.338
1810	0.217	0.599	0.135
1815	0.459	0.635	0.165
1820	0.300	0.612	0.179
1825	0.211	0.639	0.144
1830	0.169	0.705	0.239
1835	0.125	0.715	0.160
1840	0.166	0.495	0.102
1845	0.173	0.627	0.195
1850	0.400	0.673	0.140
1855	0.225	0.602	0.184
1860	0.196	0.564	0.200
1865	0.240	0.643	0.179
1870	0.258	0.509	0.188
1875	0.227	0.572	0.247
1880	0.294	0.648	0.301
1885	0.174	0.680	0.282
1890	0.204	0.597	0.297
1895	0.224	0.618	0.230
1900	0.276	0.621	0.205
1905	0.227	0.564	0.184
1910	0.213	0.527	0.148
1915	0.176	0.529	0.181
1920	0.162	0.614	0.227
1925	0.230	0.546	0.231
1930	0.280	0.521	0.310
1935	0.327	0.388	0.441
1940	0.000	0.000	0.000
1945	0.000	0.000	0.000
1950	0.000	0.000	0.000
1955	0.000	0.000	0.000
1960	0.000	0.000	0.000
1965	0.000	0.000	0.000
1970	0.000	0.000	0.000
1975	0.000	0.000	0.000
1980	0.000	0.000	0.000
1985	0.000	0.000	0.000
1990	0.000	0.000	0.000
1995	0.000	0.000	0.000
2000	0.053	0.331	-.063
2005	0.213	0.453	-.115
2010	0.267	0.496	-.056
2015	0.190	0.458	0.345
2020	0.302	0.544	-.105
2025	0.145	0.499	0.010
2030	0.087	0.415	0.143
2035	0.050	0.488	-.123
2040	0.324	0.573	-.024
2045	0.331	0.573	-.049
2050	0.289	0.524	0.159
2055	0.150	0.437	-.053
2060	0.134	0.550	-.056
2065	0.230	0.577	0.079
2070	0.118	0.526	0.090
2075	0.229	0.514	-.067
2080	0.249	0.762	0.117
2085	0.272	0.605	0.085
2090	0.305	0.562	0.015
2095	0.299	0.520	0.031
2100	0.245	0.579	-.010
2105	0.226	0.481	-.075
2110	0.133	0.559	-.007
2115	0.247	0.531	0.319
2120	0.304	0.548	0.104
2125	0.237	0.571	0.134
2130	0.334	0.559	0.188
2135	0.296	0.517	0.454
2140	0.327	0.448	0.207
2145	0.336	0.577	0.265
2150	0.252	0.537	0.171
2155	0.308	0.598	0.068
2160	0.320	0.558	0.260
2165	0.272	0.553	0.381
2170	0.276	0.533	0.128
2175	0.453	0.500	0.099
2180	0.354	0.530	0.736
2185	0.287	0.549	0.180
2190	0.408	0.619	0.429
2195	0.410	0.664	-.173
2200	0.339	0.564	0.292
2205	0.316	0.573	0.196
2210	0.345	0.587	0.291
2215	0.353	0.546	0.245
2220	0.304	0.493	0.356
2225	0.279	0.511	0.172
2230	0.298	0.614	0.814
2235	0.309	0.490	0.432
2240	0.247	0.525	0.278
2245	0.328	0.467	0.228
2250	0.330	0.487	-.023
2255	0.293	0.609	0.185
2260	0.363	0.592	0.406
2265	0.340	0.540	0.107
2270	0.226	0.517	0.090
2275	0.286	0.579	-.001
2280	0.302	0.667	0.075
2285	0.307	0.627	0.132
2290	0.208	0.592	0.051
2295	0.269	0.565	0.211
2300	0.322	0.578	0.112
2305	0.189	0.606	0.126
2310	0.172	0.619	0.145
2315	0.227	0.630	0.279
2320	0.280	0.612	0.141
2325	0.287	0.546	0.268
2330	0.242	0.687	0.078
2335	0.237	0.586	0.175
2340	0.207	0.516	0.125
2345	0.163	0.557	0.222
2350	0.183	0.598	0.089
2355	0.226	0.555	0.225
2360	0.292	0.567	0.124
2365	0.295	0.500	0.060
2370	0.295	0.543	0.156
2375	0.202	0.554	-.029
2380	0.125	0.547	0.024
2385	0.173	0.530	0.113
2390	0.243	0.508	0.180
2395	0.179	0.482	0.107
2400	0.156	0.479	0.138
2405	0.220	0.501	0.137
2410	0.234	0.432	0.123
2415	0.201	0.565	0.154
2420	0.234	0.585	0.138
2425	0.255	0.624	0.211
2430	0.297	0.646	0.217
2435	0.321	0.578	0.290
2440	0.300	0.570	0.235
2445	0.281	0.650	0.346
2450	0.324	0.612	0.307
2455	0.309	0.623	0.305
2460	0.313	0.693	0.210
2465	0.344	0.645	0.190
2470	0.306	0.584	0.187
2475	0.248	0.572	0.253
2480	0.231	0.519	0.218
2485	0.247	0.505	0.133
2490	0.212	0.482	0.189
2495	0.219	0.505	0.187
2500	0.207	0.558	0.223
2505	0.260	0.581	0.143
2510	0.245	0.515	0.198
2515	0.240	0.500	0.135
2520	0.236	0.488	0.136
2525	0.177	0.469	0.090
2530	0.209	0.513	0.129
2535	0.231	0.555	0.194
2540	0.215	0.540	0.211
2545	0.240	0.554	0.193
2550	0.256	0.587	0.181
2555	0.233	0.610	0.244
2560	0.257	0.638	0.296
2565	0.276	0.659	0.304
2570	0.357	0.732	0.419
2575	0.404	0.744	0.296
2580	0.257	0.578	0.081
2585	0.148	0.537	0.082
2590	0.238	0.615	0.275
2595	0.277	0.710	0.262
2600	0.296	0.617	0.190
2605	0.290	0.589	0.260
2610	0.255	0.595	0.151
2615	0.300	0.589	0.190
2620	0.303	0.651	0.213
2625	0.318	0.622	0.192
2630	0.358	0.656	0.271
2635	0.433	0.725	0.476
2640	0.513	0.777	0.543
2645	0.528	0.845	0.596
2650	0.530	0.860	0.618
2655	0.562	0.821	0.612
2660	0.562	0.803	0.602
2665	0.542	0.842	0.646
2670	0.515	0.799	0.637
2675	0.557	0.818	0.597
2680	0.556	0.831	0.739
2685	0.542	0.805	0.664
2690	0.555	0.820	0.608
2695	0.516	0.835	0.620
2700	0.509	0.753	0.592
2705	0.551	0.803	0.652
2710	0.529	0.813	0.575
2715	0.489	0.782	0.579
2720	0.470	0.746	0.537
2725	0.459	0.757	0.545
2730	0.493	0.773	0.472
2735	0.435	0.743	0.395
2740	0.399	0.696	0.352
2745	0.364	0.667	0.337
2750	0.379	0.696	0.391
2755	0.429	0.700	0.448
2760	0.467	0.747	0.452
2765	0.483	0.762	0.461
2770	0.502	0.796	0.532
2775	0.495	0.716	0.458
2780	0.460	0.722	0.398
2785	0.403	0.689	0.307
2790	0.344	0.590	0.193
2795	0.267	0.446	0.162
2800	0.193	0.320	0.126
2805	0.247	0.410	0.181
2810	0.333	0.475	0.230
2815	0.452	0.705	0.437
2820	0.555	0.803	0.503
2825	0.594	0.826	0.562
2830	0.582	0.849	0.549
2835	0.577	0.958	0.527
2840	0.542	0.856	0.542
2845	0.514	0.783	0.486
2850	0.413	0.752	0.394
2855	0.413	0.679	0.385
2860	0.521	0.785	0.450
2865	0.625	0.874	0.667
2870	0.648	0.883	0.673
2875	0.641	0.900	0.682
2880	0.664	0.858	0.654
2885	0.671	0.847	0.689
2890	0.777	0.927	0.773
2895	0.902	1.017	0.839
2900	0.987	1.022	0.843
2905	1.010	0.989	0.945
2910	1.057	1.018	0.989
2915	1.101	1.026	1.001
2920	1.049	1.021	0.838
2925	0.978	0.984	0.933
2930	0.983	1.020	0.939
2935	1.005	1.068	0.960
2940	1.000	1.000	1.000
2945	0.999	1.003	1.052
2950	0.958	0.979	1.026
2955	0.974	0.980	0.945
2960	1.032	1.059	0.963
2965	0.977	1.043	0.895
2970	0.951	0.965	0.853
2975	1.001	0.993	0.949
2980	0.971	0.991	0.891
2985	0.904	0.979	0.903
2990	0.886	1.014	0.863
2995	0.860	0.987	1.041
3000	0.798	1.001	0.843
3005	0.781	0.997	0.883
3010	0.841	1.018	0.866
3015	0.826	0.999	0.893
3020	0.831	0.989	0.985
3025	0.882	0.961	0.916
3030	0.970	0.987	0.861
3035	1.009	0.968	1.030
3040	0.987	1.021	0.966
3045	1.068	1.045	1.108
3050	1.018	1.053	0.891
3055	1.002	1.103	1.128
3060	0.929	0.976	1.035
3065	0.985	0.997	0.935
3070	1.037	0.937	1.032
3075	1.063	0.947	0.979
3080	1.113	0.985	1.218
3085	1.205	1.040	1.063
3090	1.211	1.032	1.039
3095	1.062	1.049	1.015
3100	0.999	0.998	0.899
3105	1.212	0.960	1.158
3110	1.317	1.101	1.346
3115	1.354	1.190	1.429
3120	1.216	1.006	1.182
3125	1.292	1.142	1.023
3130	1.295	1.078	1.204
3135	1.332	1.117	1.145
3140	1.293	1.051	1.173
3145	1.275	1.103	1.273
3150	1.245	1.061	1.325
3155	1.182	1.094	1.283
3160	1.179	1.141	1.419
3165	1.327	1.063	1.432
3170	1.263	1.170	1.422
3175	1.307	1.177	1.343
3180	1.202	1.128	1.300
3185	1.121	1.012	1.467
3190	1.395	1.193	1.490
3195	1.480	1.206	1.882
3200	1.365	1.131	1.246

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TABLE 4

IUE STELLAR SPECTRA

λ(A)	FOIII	G2 V	G5III	G7III	G8III	KOIII	K1III	K3III	K4III	K5III	MOIII
2000.	0.202	0.021	0.019	0.011	0.002	0.005	0.012	0.013	0.014	0.015	0.020
2005.	0.220	0.027	0.023	0.014	0.015	0.005	0.015	0.013	0.014	0.020	0.024
2010.	0.226	0.030	0.021	0.020	0.010	0.005	0.015	0.026	0.017	0.026	0.036
2015.	0.246	0.030	0.026	0.022	0.008	0.005	0.016	0.023	0.024	0.026	0.038
2020.	0.252	0.030	0.029	0.020	0.006	0.006	0.018	0.012	0.026	0.016	0.035
2025.	0.258	0.030	0.038	0.004	0.006	0.007	0.019	0.009	0.024	0.009	0.007
2030.	0.266	0.031	0.030	0.011	0.005	0.006	0.020	0.013	0.005	0.016	0.020
2035.	0.271	0.036	0.024	0.015	0.010	0.006	0.021	0.025	0.014	0.021	0.027
2040.	0.291	0.040	0.026	0.019	0.009	0.005	0.020	0.018	0.018	0.022	0.034
2045.	0.308	0.041	0.021	0.016	0.008	0.004	0.019	0.020	0.023	0.023	0.028
2050.	0.320	0.042	0.019	0.022	0.008	0.004	0.019	0.028	0.019	0.029	0.039
2055.	0.331	0.043	0.026	0.026	0.006	0.004	0.019	0.026	0.027	0.027	0.046
2060.	0.332	0.043	0.033	0.018	0.007	0.005	0.019	0.023	0.032	0.025	0.031
2065.	0.341	0.047	0.042	0.025	0.014	0.007	0.022	0.039	0.021	0.038	0.044
2070.	0.356	0.050	0.053	0.039	0.013	0.008	0.025	0.036	0.030	0.042	0.069
2075.	0.365	0.054	0.060	0.029	0.016	0.008	0.026	0.033	0.048	0.039	0.052
2080.	0.380	0.060	0.069	0.037	0.020	0.009	0.030	0.050	0.035	0.050	0.065
2085.	0.389	0.068	0.066	0.047	0.019	0.008	0.032	0.053	0.045	0.054	0.083
2090.	0.385	0.068	0.055	0.042	0.019	0.008	0.034	0.044	0.057	0.048	0.074
2095.	0.379	0.071	0.047	0.037	0.018	0.009	0.036	0.040	0.051	0.043	0.065
2100.	0.375	0.071	0.040	0.034	0.016	0.010	0.036	0.032	0.045	0.036	0.059
2105.	0.365	0.077	0.032	0.024	0.013	0.009	0.035	0.023	0.041	0.024	0.042
2110.	0.375	0.073	0.040	0.014	0.012	0.009	0.035	0.006	0.029	0.015	0.025
2115.	0.389	0.087	0.057	0.009	0.017	0.009	0.037	0.019	0.017	0.017	0.016
2120.	0.391	0.097	0.055	0.019	0.021	0.010	0.038	0.025	0.011	0.029	0.034
2125.	0.383	0.070	0.058	0.029	0.023	0.010	0.039	0.040	0.023	0.042	0.052
2130.	0.373	0.083	0.057	0.041	0.024	0.011	0.040	0.049	0.036	0.053	0.072
2135.	0.364	0.083	0.053	0.046	0.025	0.012	0.039	0.054	0.049	0.057	0.082
2140.	0.369	0.097	0.050	0.048	0.023	0.010	0.039	0.045	0.056	0.049	0.084
2145.	0.386	0.113	0.054	0.029	0.021	0.010	0.039	0.017	0.058	0.026	0.051
2150.	0.399	0.102	0.059	0.009	0.023	0.010	0.040	0.011	0.035	0.013	0.016
2155.	0.398	0.100	0.061	0.012	0.023	0.010	0.041	0.014	0.011	0.012	0.021
2160.	0.388	0.089	0.061	0.006	0.023	0.011	0.039	0.003	0.014	0.012	0.011
2165.	0.371	0.089	0.069	0.013	0.025	0.010	0.039	0.019	0.008	0.018	0.022
2170.	0.368	0.086	0.059	0.017	0.026	0.011	0.038	0.017	0.015	0.019	0.030
2175.	0.381	0.087	0.061	0.014	0.027	0.011	0.040	0.013	0.020	0.015	0.024
2180.	0.394	0.123	0.069	0.010	0.030	0.011	0.043	0.011	0.017	0.011	0.017
2185.	0.423	0.115	0.067	0.008	0.031	0.011	0.045	-0.001	0.011	0.005	0.014
2190.	0.455	0.110	0.076	-0.002	0.035	0.012	0.050	0.002	0.010	0.002	-0.003
2195.	0.472	0.126	0.079	0.006	0.035	0.013	0.052	0.011	-0.002	0.012	0.011
2200.	0.470	0.128	0.080	0.015	0.033	0.014	0.052	0.022	0.007	0.021	0.027
2205.	0.454	0.133	0.069	0.019	0.030	0.013	0.049	0.022	0.018	0.023	0.034
2210.	0.429	0.090	0.070	0.020	0.027	0.012	0.046	0.019	0.023	0.019	0.035
2215.	0.408	0.100	0.068	0.010	0.028	0.011	0.042	0.012	0.024	0.012	0.018
2220.	0.395	0.121	0.071	0.010	0.030	0.010	0.043	0.005	0.012	0.007	0.017
2225.	0.419	0.127	0.077	0.001	0.032	0.011	0.046	-0.001	0.012	-0.001	0.001
2230.	0.443	0.138	0.083	-0.002	0.035	0.013	0.052	-0.003	0.001	-0.001	-0.004
2235.	0.458	0.181	0.088	-0.000	0.036	0.016	0.056	0.002	-0.003	0.001	-0.001
2240.	0.456	0.151	0.083	0.002	0.036	0.018	0.058	0.007	-0.000	0.010	0.003
2245.	0.439	0.143	0.088	0.016	0.040	0.021	0.060	0.024	0.002	0.024	0.029
2250.	0.413	0.146	0.090	0.024	0.044	0.022	0.060	0.031	0.020	0.033	0.042
2255.	0.401	0.130	0.089	0.032	0.046	0.023	0.061	0.046	0.029	0.044	0.057
2260.	0.384	0.123	0.090	0.043	0.043	0.023	0.062	0.044	0.039	0.048	0.076
2265.	0.388	0.098	0.086	0.036	0.041	0.022	0.061	0.038	0.052	0.043	0.063
2270.	0.391	0.084	0.085	0.035	0.040	0.021	0.059	0.042	0.043	0.044	0.062
2275.	0.404	0.098	0.085	0.040	0.039	0.021	0.060	0.048	0.042	0.048	0.070
2280.	0.424	0.127	0.089	0.040	0.040	0.020	0.061	0.040	0.048	0.043	0.070
2285.	0.433	0.135	0.086	0.030	0.042	0.020	0.061	0.027	0.048	0.029	0.053
2290.	0.427	0.118	0.083	0.017	0.043	0.019	0.063	0.016	0.037	0.018	0.030
2295.	0.420	0.124	0.080	0.013	0.042	0.018	0.064	0.010	0.020	0.013	0.022
2300.	0.407	0.104	0.077	0.007	0.040	0.017	0.066	0.008	0.015	0.010	0.013
2305.	0.395	0.144	0.081	0.009	0.043	0.018	0.066	0.012	0.009	0.012	0.015
2310.	0.400	0.119	0.080	0.011	0.041	0.018	0.066	0.013	0.010	0.015	0.019
2315.	0.414	0.125	0.086	0.013	0.043	0.020	0.069	0.018	0.013	0.020	0.023
2320.	0.404	0.124	0.091	0.021	0.047	0.023	0.071	0.034	0.016	0.036	0.037
2325.	0.391	0.135	0.099	0.042	0.052	0.027	0.075	0.055	0.025	0.058	0.075
2330.	0.372	0.117	0.108	0.056	0.056	0.032	0.079	0.069	0.051	0.071	0.098
2335.	0.336	0.113	0.108	0.063	0.057	0.033	0.081	0.066	0.067	0.072	0.111
2340.	0.279	0.100	0.107	0.055	0.055	0.033	0.076	0.058	0.076	0.060	0.096
2345.	0.275	0.083	0.105	0.043	0.053	0.033	0.076	0.034	0.066	0.042	0.075
2350.	0.276	0.119	0.098	0.023	0.052	0.032	0.079	0.021	0.052	0.026	0.040
2355.	0.286	0.138	0.103	0.020	0.053	0.033	0.080	0.026	0.028	0.031	0.035
2360.	0.318	0.115	0.103	0.034	0.052	0.033	0.086	0.043	0.024	0.044	0.060
2365.	0.331	0.112	0.104	0.039	0.055	0.034	0.091	0.052	0.041	0.054	0.068
2370.	0.335	0.131	0.104	0.054	0.056	0.035	0.088	0.059	0.047	0.065	0.095
2375.	0.285	0.122	0.101	0.054	0.057	0.035	0.086	0.072	0.065	0.069	0.095
2380.	0.274	0.098	0.101	0.062	0.058	0.035	0.084	0.064	0.065	0.070	0.109
2385.	0.258	0.099	0.096	0.053	0.056	0.035	0.082	0.057	0.075	0.063	0.094
2390.	0.240	0.120	0.095	0.051	0.056	0.035	0.079	0.057	0.064	0.061	0.089
2395.	0.239	0.102	0.100	0.051	0.055	0.035	0.077	0.053	0.061	0.051	0.090
2400.	0.251	0.106	0.097	0.030	0.055	0.033	0.075	0.030	0.062	0.035	0.054
2405.	0.228	0.090	0.094	0.028	0.052	0.032	0.072	0.021	0.037	0.021	0.050
2410.	0.233	0.095	0.088	0.003	0.051	0.031	0.072	0.009	0.034	0.009	0.005
2415.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

λ(A)	FOIII	G2 V	G5III	G7III	G8III	KOIII	K1III	K3III	K4III	K5III	MOIII
2620.	0.414	0.256	0.247	0.121	0.172	0.108	0.211	0.151	0.218	0.192	0.218
2625.	0.436	0.256	0.247	0.124	0.176	0.114	0.209	0.149	0.226	0.227	0.197
2630.	0.468	0.198	0.259	0.137	0.192	0.128	0.216	0.182	0.291	0.221	0.157
2635.	0.616	0.344	0.315	0.144	0.249	0.146	0.270	0.205	0.277	0.243	0.225
2640.	0.774	0.558	0.369	0.165	0.302	0.182	0.342	0.213	0.199	0.209	0.380
2645.	0.838	0.606	0.394	0.169	0.320	0.191	0.355	0.206	0.094	0.203	0.346
2650.	0.857	0.452	0.409	0.168	0.325	0.193	0.355	0.201	0.114	0.179	0.318
2655.	0.885	0.614	0.416	0.167	0.335	0.198	0.359	0.214	0.146	0.186	0.272
2660.	0.839	0.565	0.424	0.178	0.349	0.210	0.368	0.224	0.201	0.248	0.350
2665.	0.786	0.522	0.420	0.187	0.358	0.222	0.359	0.232	0.286	0.302	0.347
2670.	0.778	0.530	0.423	0.179	0.364	0.215	0.356	0.221	0.316	0.316	0.343
2675.	0.789	0.591	0.429	0.171	0.358	0.212	0.348	0.230	0.291	0.287	0.349
2680.	0.743	0.523	0.417	0.174	0.346	0.213	0.342	0.247	0.247	0.258	0.313
2685.	0.728	0.543	0.420	0.174	0.338	0.223	0.339	0.264	0.266	0.248	0.350
2690.	0.708	0.491	0.389	0.171	0.324	0.217	0.330	0.251	0.268	0.261	0.320
2695.	0.679	0.486	0.416	0.173	0.312	0.211	0.313	0.203	0.272	0.293	0.412
2700.	0.663	0.588	0.374	0.193	0.323	0.217	0.322	0.170	0.283	0.287	0.328
2705.	0.669	0.617	0.384	0.232	0.349	0.233	0.348	0.192	0.287	0.314	0.294
2710.	0.675	0.548	0.435	0.235	0.358	0.245	0.363	0.229	0.332	0.323	0.326
2715.	0.663	0.492	0.450	0.205	0.334	0.233	0.337	0.232	0.340	0.329	0.371
2720.	0.626	0.335	0.369	0.193	0.299	0.204	0.315	0.192	0.326	0.294	0.259
2725.	0.636	0.417	0.360	0.206	0.302	0.208	0.321	0.219	0.308	0.322	0.239
2730.	0.637	0.557	0.380	0.213	0.319	0.229	0.339	0.255	0.335	0.362	0.258
2735.	0.625	0.400	0.373	0.190	0.307	0.224	0.332	0.274	0.326	0.383	0.346
2740.	0.543	0.296	0.296	0.191	0.268	0.197	0.294	0.274	0.323	0.401	0.324
2745.	0.478	0.282	0.285	0.221	0.244	0.192	0.272	0.281	0.349	0.402	0.325
2750.	0.455	0.311	0.304	0.250	0.265	0.213	0.270	0.292	0.381	0.415	0.336
2755.	0.492	0.351	0.354	0.272	0.308	0.242	0.310	0.304	0.403	0.405	0.405
2760.	0.549	0.524	0.412	0.305	0.341	0.272	0.341	0.293	0.409	0.410	0.453
2765.	0.623	0.549	0.449	0.331	0.358	0.293	0.367	0.371	0.432	0.400	0.456
2770.	0.676	0.518	0.514	0.328	0.369	0.308	0.399	0.433	0.436	0.409	0.479
2775.	0.680	0.518	0.493	0.310	0.356	0.303	0.410	0.470	0.438	0.419	0.512
2780.	0.633	0.367	0.449	0.273	0.314	0.286	0.395	0.426	0.393	0.426	0.522
2785.	0.549	0.359	0.345	0.256	0.265	0.251	0.348	0.400	0.402	0.635	0.459
2790.	0.425	0.246	0.362	0.267	0.256	0.234	0.337	0.540	1.096	1.350	0.784
2795.	0.318	0.172	0.412	0.306	0.288	0.226	0.354	0.635	1.762	2.114	1.465
2800.	0.258	0.166	0.463	0.322	0.317	0.230	0.385	0.713	2.154	2.210	2.270
2805.	0.349	0.204	0.403	0.306	0.294	0.225	0.357	0.512	1.534	1.602	1.893
2810.	0.489	0.345	0.424	0.308	0.292	0.253	0.385	0.464	0.929	0.833	1.098
2815.	0.692	0.479	0.449	0.345	0.329	0.301	0.417	0.442	0.542	0.544	0.490
2820.	0.798	0.572	0.525	0.368	0.387	0.357	0.488	0.483	0.493	0.522	0.407
2825.	0.837	0.625	0.561	0.352	0.437	0.374	0.513	0.472	0.472	0.496	0.468
2830.	0.830	0.683	0.601	0.322	0.457	0.372	0.525	0.464	0.415	0.439	0.491
2835.	0.825	0.644	0.622	0.312	0.462	0.368	0.533	0.443	0.360	0.443	0.481
2840.	0.797	0.671	0.588	0.289	0.415	0.339	0.496	0.455	0.377	0.480	0.510
2845.	0.736	0.524	0.520	0.226	0.345	0.276	0.429	0.410	0.386	0.436	0.592
2850.	0.667	0.230	0.420	0.142	0.240	0.185	0.319	0.299	0.347	0.354	0.630
2855.	0.688	0.302	0.420	0.152	0.264	0.174	0.325	0.263	0.346	0.360	0.659
2860.	0.776	0.629	0.468	0.228	0.359	0.238	0.401	0.312	0.400	0.482	0.618
2865.	0.823	0.728	0.555	0.348	0.480	0.353	0.493	0.413	0.504	0.616	0.623
2870.	0.800	0.731	0.607	0.412	0.524	0.430	0.532	0.465	0.564	0.649	0.640
2875.	0.783	0.746	0.672	0.437	0.520	0.436	0.549	0.534	0.616	0.618	0.748
2880.	0.847	0.466	0.700	0.461	0.524	0.453	0.574	0.575	0.644	0.618	0.671
2885.	0.884	0.749	0.747	0.544	0.590	0.518	0.646	0.612	0.674	0.699	0.660
2890.	0.880	0.824	0.801	0.736	0.701	0.640	0.747	0.716	0.735	0.828	0.604
2895.	0.889	0.962	0.892	0.896	0.837	0.766	0.821	0.859	0.777	0.883	0.659
2900.	0.965	1.206	1.049	1.049	0.970	0.929	0.963	0.998	0.776	0.864	0.685
2905.	1.061	1.259	1.163	1.085	1.066	1.009	1.028	1.097	0.764	0.881	0.671
2910.	1.090	1.181	1.211	1.112	1.082	1.029	1.069	1.130	0.829	0.976	0.750
2915.	1.067	1.140	1.182	1.187	1.056	1.052	1.064	1.161	0.919	1.065	0.892
2920.	1.000	1.132	1.152	1.165	0.988	1.040	1.030	1.133	0.993	1.067	0.948
2925.	0.917	0.949	1.110	1.128	0.952	0.990	0.964	1.089	1.039	1.036	0.867
2930.	0.924	1.153	1.101	1.083	1.018	0.991	1.022	1.057	1.027	1.028	0.963
2935.	0.976	1.108	1.059	1.072	1.044	1.001	1.027	1.031	1.006	1.030	1.035
2940.	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2945.	0.961	1.085	0.968	1.012	0.963	0.953	0.993	1.005	0.974	1.009	0.766
2950.	0.975	1.011	0.977	1.005	0.973	1.005	0.971	0.970	0.959	1.068	0.605
2955.	1.009	1.108	1.144	0.998	1.034	1.040	1.030	1.063	0.978	1.107	0.787
2960.	1.042	1.218	1.209	0.909	0.998	1.028	1.057	1.038	0.986	1.044	0.826
2965.	0.990	0.955	1.141	0.760	0.907	0.873	0.953	0.938	0.904	0.962	0.755
2970.	0.993	0.844	0.989	0.820	0.855	0.789	0.856	0.843	0.869	0.990	0.586
2975.	1.010	1.132	1.007	0.932	0.904	0.892	0.921	0.943	0.998	1.059	0.642
2980.	0.967	1.096	1.001	0.942	0.912	0.934	0.934	1.044	1.061	1.108	0.711
2985.	0.952	0.697	0.970	0.844	0.882	0.870	0.900	1.043	1.132	1.151	0.833
2990.	1.000	1.154	0.988	0.796	0.883	0.812	0.895	1.026	1.123	1.183	0.948
2995.	1.076	0.945	1.019	0.761	0.850	0.808	0.898	0.947	1.146	1.211	0.981
3000.	1.023	0.707	0.961	0.668	0.775	0.719	0.828	0.849	1.086	1.188	0.910
3005.	1.006	0.885	0.884	0.690	0.773	0.676	0.780	0.886	1.141	1.242	0.882
3010.	1.051	0.940	0.903	0.738	0.832	0.743	0.819	1.010	1.198	1.270	0.905
3015.	1.068	1.005	0.936	0.695	0.830	0.756	0.796	0.978	1.128	1.194	0.861
3020.	1.050	0.618	1.001	0.667	0.819	0.727	0.780	0.928	1.002	1.145	0.756
3025.	1.064	1.015	1.078	0.820	0.924	0.816	0.847	1.008	1.179	1.327	0.778
3030.	1.119	1.240	1.187	1.073	1.107	1.088	1.041	1.349	1.327	1.619	1.005
3035.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

2420.	0.338	0.165	0.110	0.030	0.065	0.033	0.085	0.050	0.017	0.046	0.053
2425.	0.388	0.164	0.135	0.049	0.073	0.036	0.098	0.057	0.036	0.060	0.086
2430.	0.405	0.166	0.138	0.051	0.079	0.040	0.106	0.058	0.059	0.055	0.089
2435.	0.416	0.146	0.134	0.040	0.078	0.043	0.109	0.035	0.061	0.040	0.070
2440.	0.408	0.156	0.138	0.025	0.080	0.044	0.107	0.032	0.048	0.031	0.045
2445.	0.367	0.149	0.145	0.035	0.078	0.045	0.105	0.044	0.031	0.037	0.058
2450.	0.311	0.120	0.145	0.068	0.074	0.048	0.105	0.054	0.039	0.051	0.080
2455.	0.305	0.117	0.143	0.085	0.074	0.050	0.110	0.063	0.055	0.075	0.090
2460.	0.340	0.116	0.146	0.090	0.077	0.050	0.112	0.073	0.061	0.095	0.106
2465.	0.362	0.117	0.137	0.087	0.078	0.047	0.108	0.078	0.073	0.077	0.121
2470.	0.374	0.132	0.129	0.073	0.076	0.046	0.102	0.061	0.083	0.075	0.107
2475.	0.381	0.138	0.126	0.069	0.079	0.047	0.102	0.067	0.073	0.065	0.102
2480.	0.385	0.121	0.119	0.076	0.082	0.046	0.101	0.072	0.070	0.087	0.104
2485.	0.355	0.105	0.113	0.063	0.074	0.043	0.098	0.063	0.071	0.069	0.122
2490.	0.341	0.089	0.109	0.037	0.071	0.039	0.093	0.057	0.084	0.055	0.076
2495.	0.382	0.149	0.123	0.032	0.077	0.044	0.106	0.051	0.052	0.066	0.088
2500.	0.456	0.146	0.136	0.044	0.089	0.046	0.123	0.059	0.060	0.076	0.080
2505.	0.459	0.131	0.144	0.052	0.093	0.048	0.126	0.060	0.055	0.083	0.092
2510.	0.406	0.133	0.140	0.064	0.086	0.048	0.116	0.067	0.063	0.070	0.099
2515.	0.319	0.096	0.135	0.069	0.077	0.044	0.107	0.061	0.068	0.048	0.105
2520.	0.261	0.104	0.122	0.051	0.067	0.039	0.099	0.046	0.072	0.043	0.078
2525.	0.265	0.100	0.112	0.040	0.067	0.041	0.105	0.051	0.053	0.059	0.066
2530.	0.288	0.108	0.119	0.050	0.076	0.054	0.116	0.077	0.045	0.084	0.098
2535.	0.300	0.127	0.130	0.056	0.089	0.072	0.127	0.091	0.067	0.087	0.132
2540.	0.330	0.132	0.132	0.051	0.097	0.076	0.129	0.091	0.091	0.081	0.144
2545.	0.360	0.142	0.136	0.069	0.103	0.080	0.134	0.097	0.098	0.083	0.148
2550.	0.401	0.149	0.151	0.075	0.112	0.084	0.147	0.093	0.101	0.089	0.149
2555.	0.419	0.196	0.166	0.079	0.120	0.084	0.155	0.088	0.102	0.097	0.140
2560.	0.409	0.209	0.177	0.077	0.130	0.078	0.161	0.094	0.096	0.112	0.138
2565.	0.425	0.215	0.200	0.084	0.143	0.079	0.170	0.105	0.094	0.127	0.154
2570.	0.478	0.298	0.232	0.084	0.162	0.086	0.188	0.102	0.106	0.099	0.166
2575.	0.521	0.245	0.229	0.058	0.155	0.082	0.191	0.071	0.114	0.044	0.137
2580.	0.523	0.342	0.207	0.045	0.152	0.072	0.186	0.048	0.094	0.012	0.090
2585.	0.507	0.234	0.207	0.041	0.160	0.070	0.188	0.053	0.062	0.064	0.073
2590.	0.465	0.327	0.223	0.071	0.166	0.089	0.182	0.082	0.050	0.115	0.107
2595.	0.411	0.237	0.226	0.075	0.158	0.098	0.169	0.096	0.074	0.123	0.127
2600.	0.405	0.173	0.215	0.107	0.149	0.101	0.169	0.109	0.142	0.158	0.121
2605.	0.363	0.213	0.209	0.121	0.153	0.101	0.174	0.131	0.232	0.177	0.079
2610.	0.336	0.197	0.216	0.120	0.156	0.101	0.178	0.153	0.258	0.193	0.099
2615.	0.334	0.204	0.228	0.116	0.165	0.104	0.193	0.155	0.246	0.192	0.146

3045.	1.105	1.235	1.246	1.195	1.153	1.168	1.077	1.353	1.531	1.577	1.080
3050.	1.102	1.279	1.269	1.238	1.177	1.254	1.191	1.466	1.599	1.649	1.063
3055.	1.064	1.107	1.189	1.149	1.129	1.210	1.187	1.455	1.587	1.626	1.027
3060.	1.050	0.996	1.097	0.998	1.019	1.100	1.110	1.387	1.454	1.501	0.812
3065.	1.060	1.004	1.139	1.062	1.039	1.071	1.069	1.574	1.377	1.476	0.724
3070.	1.084	1.225	1.289	1.304	1.109	1.227	1.147	1.834	1.527	1.674	0.849
3075.	1.088	1.151	1.391	1.484	1.218	1.381	1.256	2.016	1.776	1.885	1.026
3080.	1.127	1.135	1.335	1.542	1.263	1.483	1.327	2.011	1.975	1.971	1.065
3085.	1.203	1.249	1.390	1.472	1.250	1.506	1.363	1.961	2.038	1.972	1.224
3090.	1.120	0.964	1.373	1.344	1.137	1.393	1.279	1.887	1.940	1.901	1.218
3095.	1.030	0.900	1.340	1.217	1.049	1.206	1.152	1.860	1.832	1.933	1.182
3100.	1.063	0.860	1.379	1.548	1.088	1.272	1.142	2.100	1.775	2.191	1.268
3105.	1.101	1.037	1.475	1.996	1.253	1.591	1.291	2.425	2.239	2.625	1.490
3110.	1.091	1.215	1.466	2.318	1.423	1.951	1.414	2.776	2.726	2.914	1.792
3115.	1.014	1.286	1.363	2.151	1.383	1.969	1.423	2.629	2.904	2.860	1.801
3120.	0.982	1.211	1.305	1.915	1.279	1.766	1.344	2.518	2.760	2.714	1.571
3125.	0.960	1.193	1.310	1.929	1.211	1.626	1.327	2.470	2.802	2.755	1.365
3130.	0.970	1.228	1.300	2.018	1.239	1.661	1.371	2.576	2.947	2.931	1.288
3135.	0.992	1.245	1.323	2.121	1.297	1.794	1.419	2.739	3.075	3.259	1.101
3140.	1.029	1.254	1.372	2.063	1.323	1.866	1.444	2.948	3.267	3.393	0.883
3145.	1.050	1.233	1.435	2.078	1.323	1.854	1.484	2.995	3.748	3.471	1.040
3150.	1.029	1.268	1.432	2.123	1.300	1.839	1.518	2.999	3.954	3.506	1.541
3155.	0.954	1.266	1.219	2.061	1.218	1.766	1.478	2.858	3.865	3.677	1.742
3160.	0.938	1.125	1.029	2.014	1.146	1.658	1.402	2.642	3.693	3.942	1.568
3165.	0.967	1.124	1.083	2.423	1.157	1.758	1.427	2.613	3.914	4.381	1.184
3170.	0.957	1.308	1.264	2.715	1.316	2.087	1.603	3.079	4.556	4.958	1.015
3175.	0.888	1.430	1.270	2.653	1.422	2.283	1.624	3.634	4.846	5.206	1.213
3180.	0.824	1.314	1.211	2.312	1.365	2.118	1.531	3.527	4.571	5.118	1.395
3185.	0.806	1.226	1.316	2.259	1.335	2.005	1.452	3.378	4.580	4.940	1.696
3190.	0.792	1.289	1.526	2.344	1.273	2.014	1.436	3.335	4.537	4.637	1.530
3195.	0.765	1.337	1.642	2.403	1.242	2.055	1.509	3.534	4.344	4.416	1.908
3200.	0.722	1.329	1.534	2.495	1.229	2.112	1.579	3.567	4.137	4.440	2.036
3205.	0.698	1.455	1.398	2.487	1.285	2.161	1.617	3.506	4.088	4.483	2.283
3210.	0.654	1.441	1.207	2.286	1.219	2.078	1.440	3.130	3.860	4.266	2.031
3215.	0.617	1.332	1.015	2.104	1.176	1.928	1.330	2.782	3.569	4.304	1.484
3220.	0.659	1.305	1.051	1.946	1.064	1.916	1.287	2.298	3.658	4.322	1.661
3225.	0.690	1.314	1.276	1.870	1.031	1.848	1.269	2.202	4.045	4.348	1.731
3230.	0.692	1.191	1.456	1.874	0.927	1.718	1.174	1.908	4.262	4.373	1.145
3235.	0.633	1.082	1.445	1.969	1.023	1.701	1.146	2.148	4.038	4.568	0.469
3240.	0.661	1.102	1.354	2.082	1.207	1.859	1.217	2.770	3.854	4.681	1.487