No. 166 ARIZONA-NASA ATLAS OF THE INFRARED SOLAR SPECTRUM, REPORT X

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ABSTRACT

This report concludes the series of the Arizona-NASA Infrared Solar Spectrum Atlas; it follows *LPL Comm.* No. 162 (which contains Charts B1-B9) and thereby completes the B series. The wavelength interval covered is 13350-34100 Å.

The present paper contains the second and last set of B-spectrometer records, obtained on the NASA CV-990, July 1968, with a 600-line per mm grating. There is a small overlap with the 1200 line/mm records; B9 terminates at 14098 Å, whereas the present series begins at 13350 Å. The value of the present series lies primarily in serving as reference to high-altitude planetary spectra taken with similar resolutions, 6-10,000. The 4-meter records, with their 4X higher resolution, give a more detailed and valuable description of the solar spectrum as such and, incidentally, assist in the interpretation of the intensity tracings here reproduced. Because of inherent uncertainties in spectrometer traces recorded in flight, the present records contain valuable checks on the solar and telluric spectra published before.

The wavelength scale and the classification of absorption lines are taken from the 4-meter spectra. For the interval 13350-28500 Å, two good independent B records were available and are here reproduced. For the 28500-34000 Å, mostly only one good record was available, with the second set used only to verify the set here published. For the 3.3 μ region (ν_3 of CH_4) a B-spectrometer trace had already been reproduced in *LPL Comm.* No. 125, page 223 (having slightly better resolution).

Table I contains the relevant data on each of the charts. In some spectra the continuum has a somewhat wavy appearance (e.g. on B15), due either to minor interference effects in the optical train (possibly a thin filter so oriented as to cause the double reflection to strike the detector); or else,

to minor guiding errors (guiding was on the center of the solar disk but occasional uncompensated motions of the aircraft caused the solar image on the slit to shift. An extreme case on B13 at 17500 Å has been marked "g"). On B13-16 and B19 some cases occur of lines slightly displaced and distorted (apparently due to a sharply localized defect in the grating drive that may show its appearance after one or more revolutions, some 480 Å apart); they are marked "b" and are not marked "real" (dot below) if displaced (in such a case a real solar line will be missing among the numbered lines). On B12 and B13, *a* and *b*, the 1 μ filter (Corning 2540) was used, causing a minor second-order leak near 1.8 μ, similar to that discussed for the 4-meter records, *LPL Comm.* No. 163, p. 66. Attention is drawn to P α on B13, still cut by telluric H_2O. Good records were obtained of the three telluric CO_2 bands at 2 μ and the two stronger bands at 2.69 and 2.77 μ (including isotopic components).

Identifications have been added where deemed useful. As in the other Reports, all absorptions regarded real, either solar or telluric, are indicated by dots *below* the traces, numbered consecutively for future reference. Dots *above* the traces designate telluric H_2O absorptions; open triangles, CH_4; short vertical lines, CO_2; crossed open circles, N_2O; and asterisks, CO. Solar identifications are added where known and considered appropriate. Partial contributions, in excess of ¼ of the total intensity, are placed in parentheses.

Acknowledgments — We are indebted to NASA Hq. and NASA-Ames for their support of this program; to Messrs. J. Percy and B. McClendon for assistance with the electronics during the flights; to Mrs. A. Agnieray and Mr. S. Larson for their assistance in the preparation of the charts for publication, which in this case was especially laborious. The program was supported by NASA through Grants NsG 161-61 and NGR-03-002-091.

ERRATA IN REPORTS I - IX

In the preparation of Report X ($\lambda > 13400$A), a few rather minor errata were detected in the earlier reports, which are listed below. The verification was not exhaustive but indicates very few errors among the thousands of identifications.

CHART	LINE	CORRECTION
25a	30	not H_2O
25d	30	partly H_2O
26a	5	H_2O
26a	20	H_2O
26a	77	H_2O
26a	84	H_2O
26a	97	not H_2O
27b	29	partly H_2O
27b	35	H_2O
34d	19, 21	not H_2O
34d	54	omit (:)
38a	75	add · below
39a	28	omit (|)
47c	10	add (∇)
B8c	5	add $\odot$
B9c, d	2	partly H_2O
B9c, d	22	omit ( )
B9c	39	H_2O
B9c	48	omit ( )

TABLE I

SOLAR SPECTRUM RECORDS, B-SPECTROMETER, NASA CV-990 JET
2.5 μ GRATING (600 LINES/MM), SLIT AND CELL 0.10 MM, $\tau = 0.12, 2$ μ FILTERS

FIG.	CHART	λ(Å)	1968 DATE	UT	ALT. (FT.)	OUTSIDE TEMP. (°C)	CABIN ALT. (FT.)	GAIN
1	B10 a*	13345-14200	July 17	19:52	39,000	−51	8500	4-1
	b*	13410-14200	July 17	19:39	39,000	−51	8500	4-1
	c*	14200-15033	July 17	19:55	39,000	−51	8500	4-1
	d*	14200-15033	July 17	19:43	39,000	−51	8500	4-1
2	B11 a*	15033-15850	July 17	19:58	39,000	−51	8500	4-1
	b*	15033-15850	July 17	19:46	39,000	−51	8500	4-1
	c*	15850-16664	July 17	20:01	39,000	−52	8500	4-1
	d*	15850-16664	July 17	19:48,20:06	39,000	−51, −52	8500	4-1, -1, -2
3	B12 a*	16664-17483	July 17	20:09	39,000	−52	8500	4-2
	b*	16664-17483	July 17	20:26	36,500	−52	8500	4-2
	c*	17483-18282	July 17	20:30	35,000	−50	8500	4-2
	d*	17483-18282	July 17	20:12	39,000	−52	8500	4-2
4	B13 a*	18282-19070	July 17	20:16	39,000	−52	8500	4-2
	b*	18282-19070	July 17	20:33	35,000	−50	8500	4-2
	c	19070-19800	July 15	20:15	40,000	−54	8000	4-4
	d	19070-19800	July 15	19:59	40,000	−54	8000	4-4
5	B14 a	19800-20529	July 15	20:18	40,000	−54	8000	4-4
	c	20529-21250	July 15	20:32	40,000	−54	8000	4-4
	d	20529-21250	July 15	20:06	40,000	−54	8000	4-4
6	B15 a	21250-21986	July 17	18:25	39,000	−49	8500	4-1
	b	21250-21986	July 17	18:20	39,000	−49	8500	4-1
	c	21986-22660	July 17	18:29	39,000	−49	8500	4-1
	d	21986-22660	July 15	20:39	40,000	−54	8000	4-5
7	B16 a	22660-23345	July 17	18:31,18:37	39,000	−49	8500	4-1
	b	22660-23345	July 15	20:42	40,000	−45	8000	4-5
	c	23345-24006	July 17	18:52	39,000	−49	8500	4-2
	d	23345-24006	July 17	18:41	39,000	−49	8500	4-1, 4-2
8	B17 a	24006-24645	July 17	18:44	39,000	−49	8500	4-2
	b	24006-24645	July 17	18:55	39,000	−49	8500	4-2, 4-3
	c	24645-25270	July 17	18:58	39,000	−50	8500	4-3
	d	24645-25270	July 17, 18	18:47,19:09	39,000	−49, −56	8500	4-2, 4-3
9	B18 a	25270-25873	July 18	19:02	39,000	−56	8500	4-3, 4-4
	b	25270-25873	July 18	19:11	39,000	−56	8500	4-3, 4-4
	c	25873-26440	July 18	19:05	39,000	−56	8500	4-4
	d	25873-26440	July 15	19:15	40,000	−50	8000	5-4
10	B19 a	26440-26965	July 18	19:26	39,000	−56	8500	5-5
	b	26440-26965	July 15	19:17,19:21	40,000	−50	8000	5-4, -5, -6
	c	26965-27461	July 15	19:23	40,000	−51	8000	5-6
	d	26965-27461	July 18	19:29	39,000	−56	8500	5-5
11	B20 a	27461-27990	July 15	19:25,19:39	40,000	−51, −52	8000	5-6, 5-5
	b	27461-27990	July 15	19:29	40,000	−52	8000	6-2
	c	27990-28498	July 15	19:42,19:54	40,000	−53	8000	5-5, -5, -6
	d	27990-28498	July 15	19:31,19:09	40,000	−52, −50	8000	6-2, 5-5
12	B21 a	28498-28980	July 15	19:56	40,000	−53	8000	5-6
	b†	28980-30705	July 19	19:42	39,000	−52	8500	6-2
	c†	30705-32430	July 19	19:45	39,000	−52	8500	6-2, 6-3
	d†	32430-34100	July 19	19:48	39,000	−52	8500	6-3

* 1 μ filter. † 4 μ grating (300 l/mm), 2.4 μ filter, slit 0.30 mm, $\tau = 0.6$ sec.

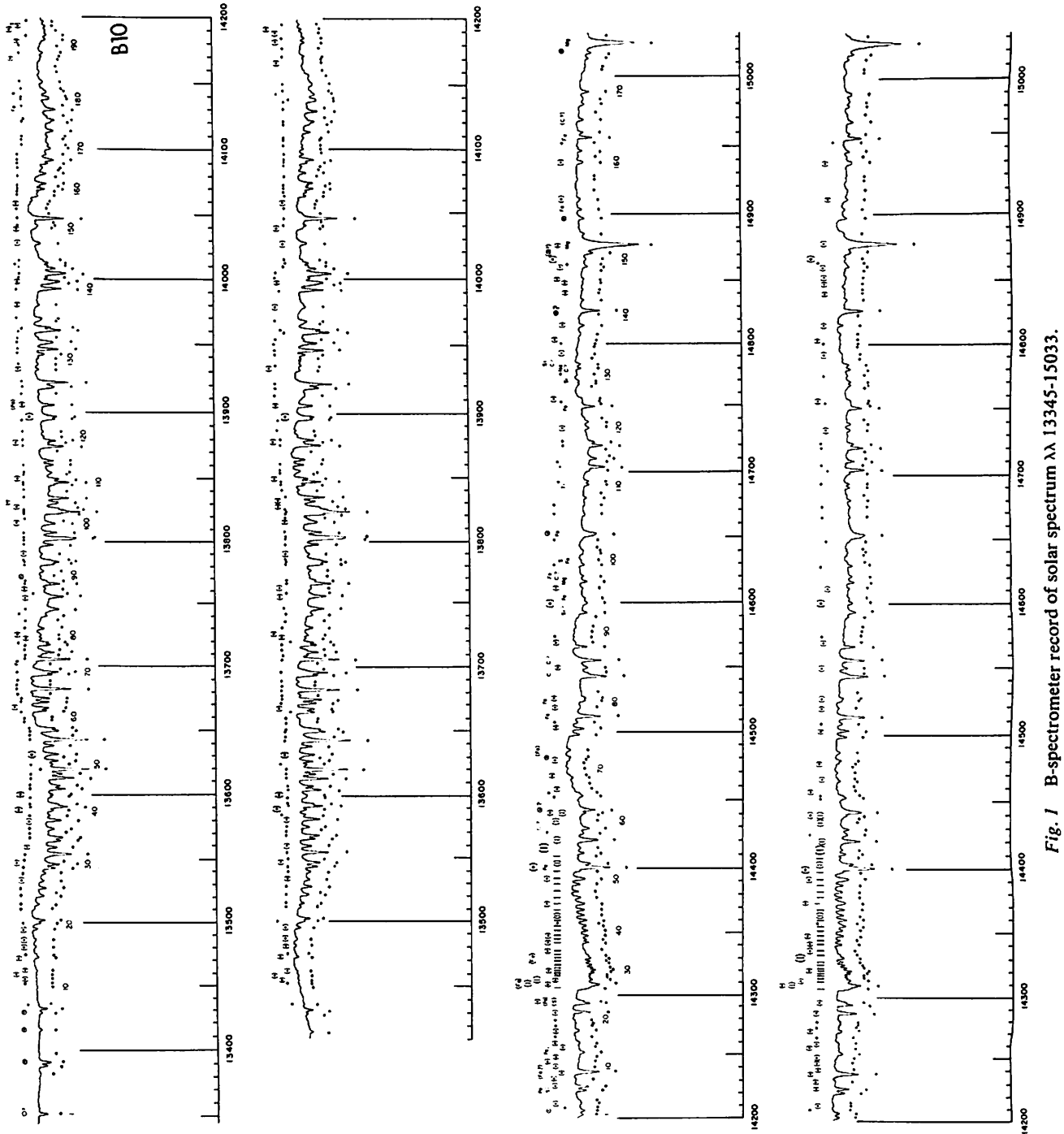

Fig. 1 B-spectrometer record of solar spectrum λλ 13345-15033.

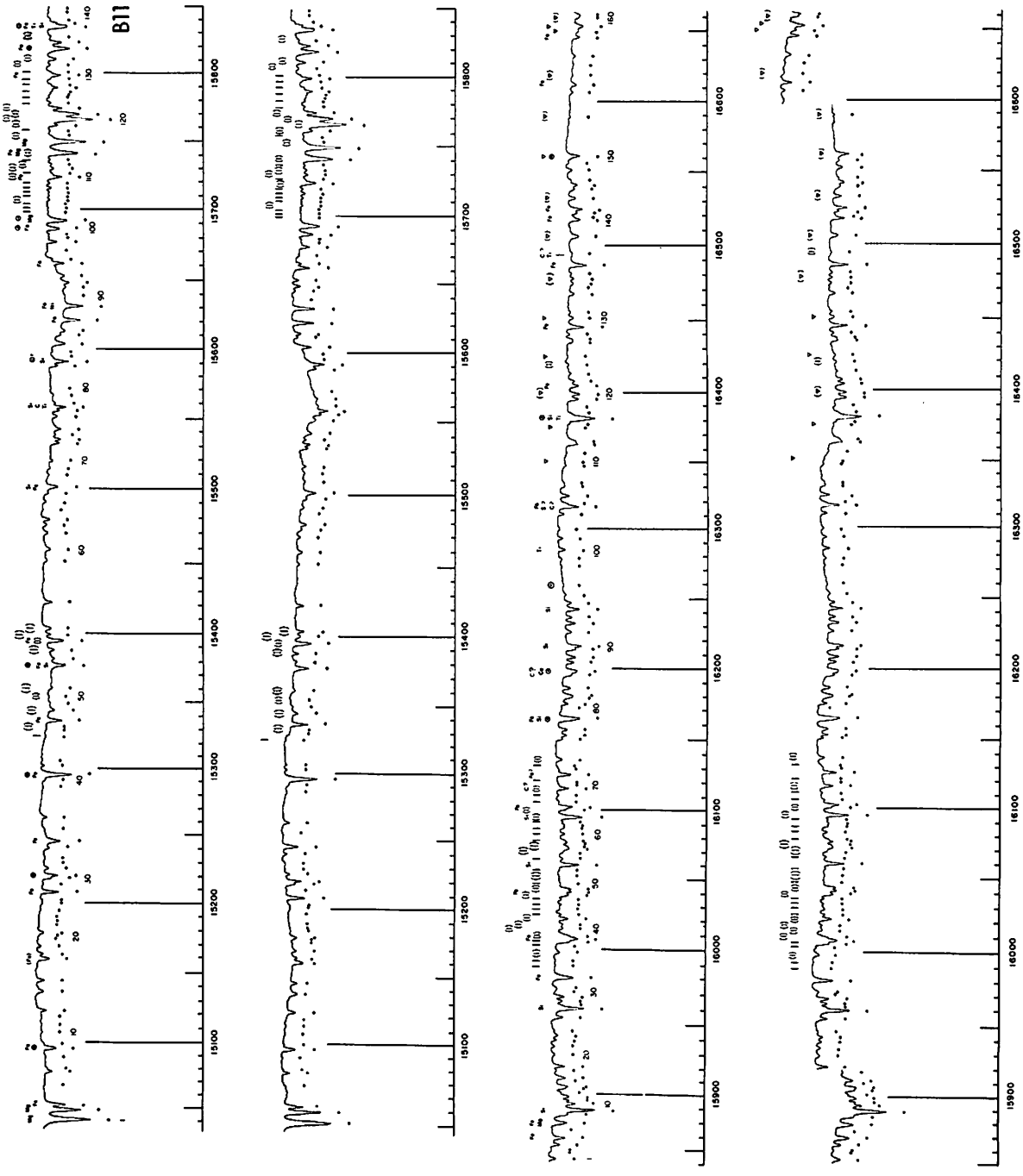

Fig. 2 B-spectrometer record of solar spectrum λλ 15033-16664.

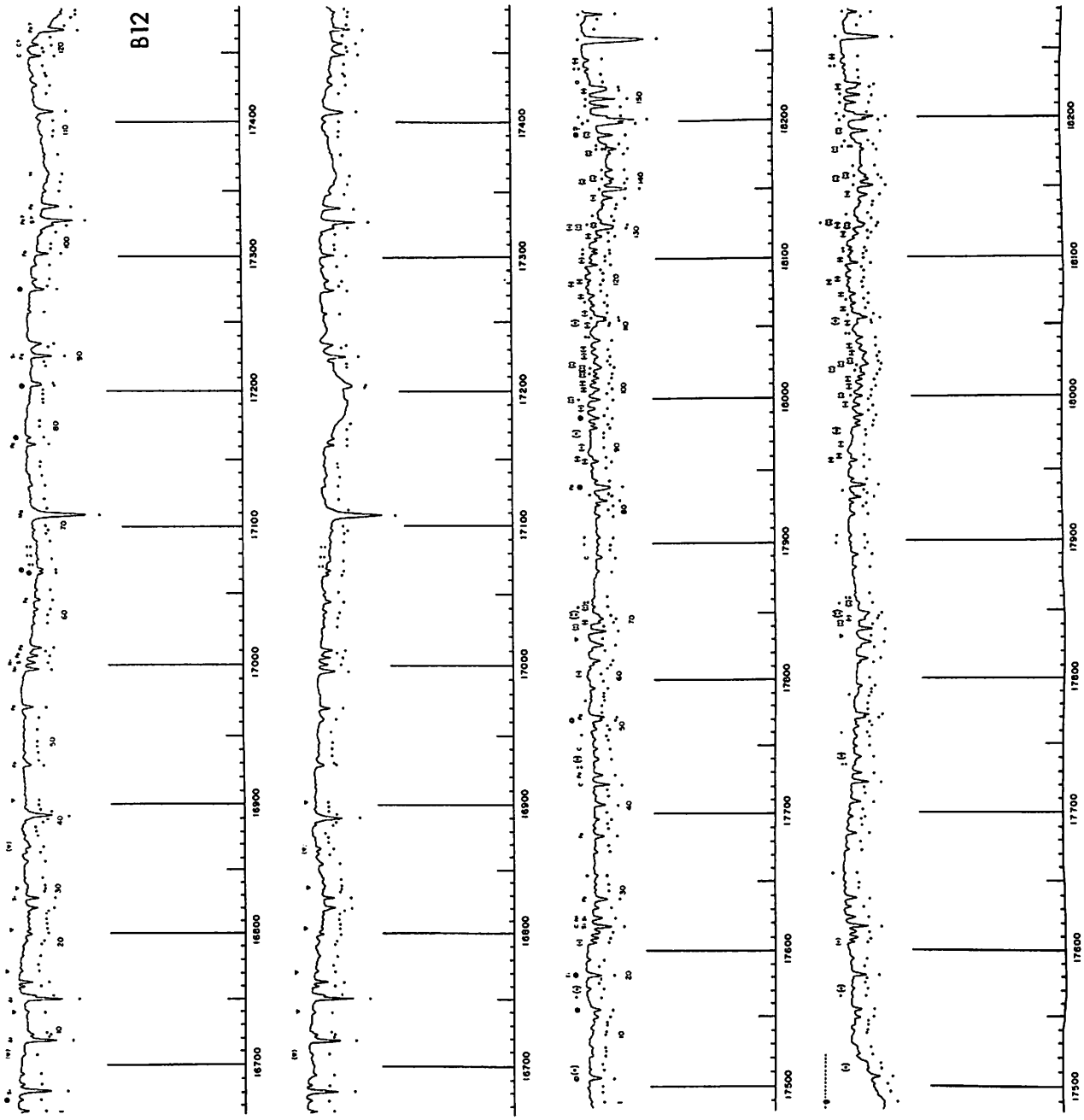

Fig. 3 B-spectrometer record of solar spectrum λλ 16664-18282.

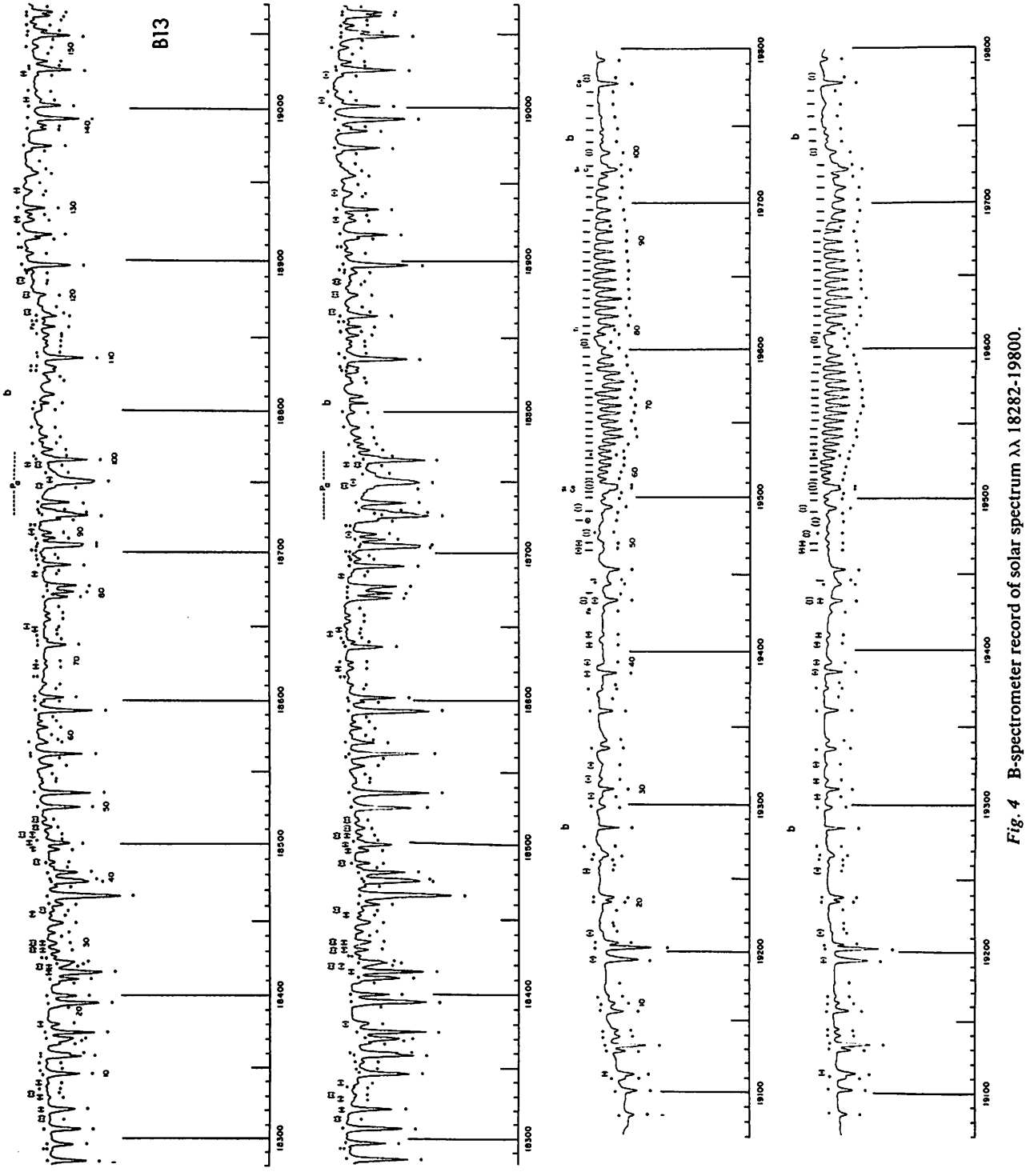

Fig. 4 B-spectrometer record of solar spectrum λλ 18282-19800.

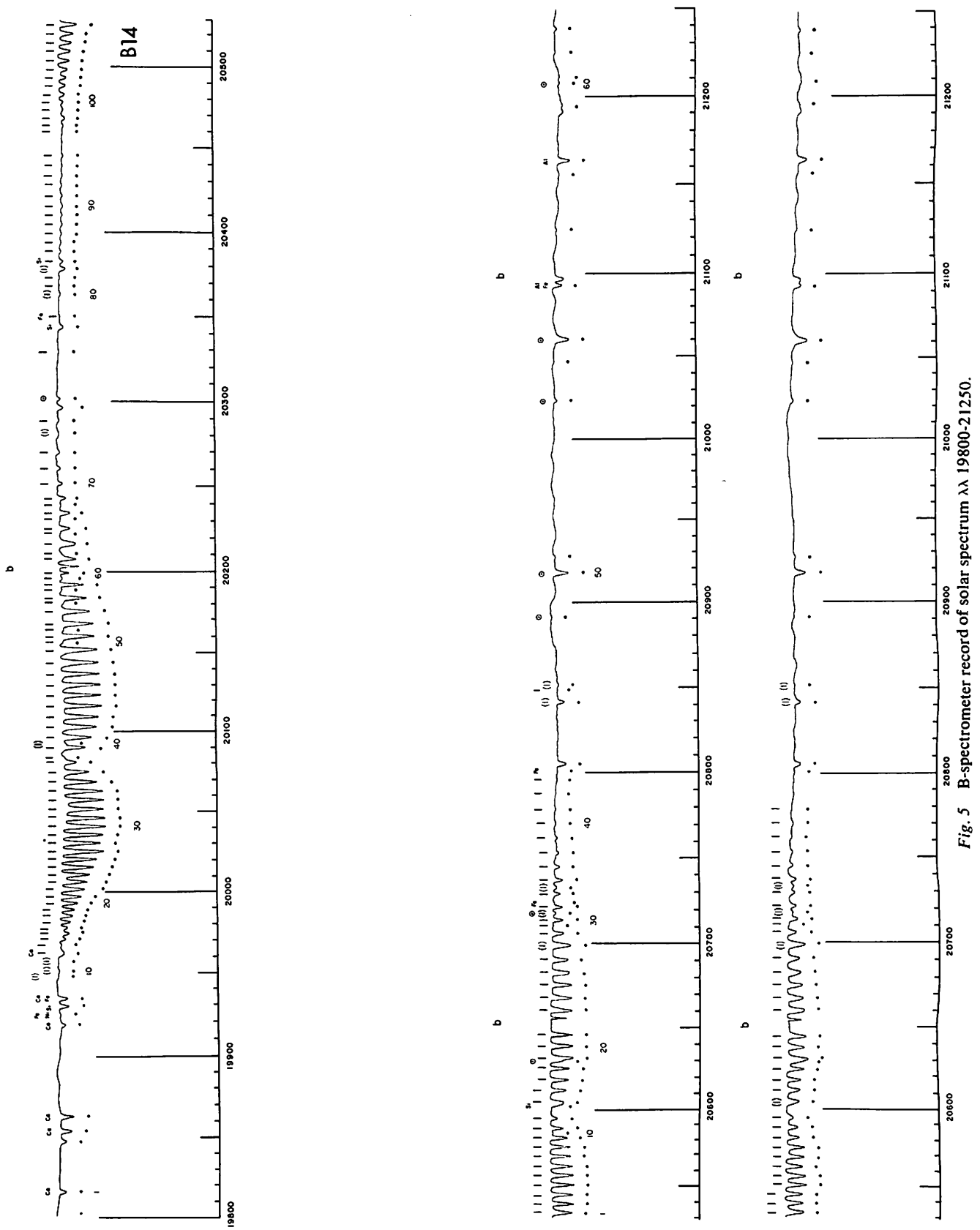

Fig. 5 B-spectrometer record of solar spectrum λλ 19800-21250.

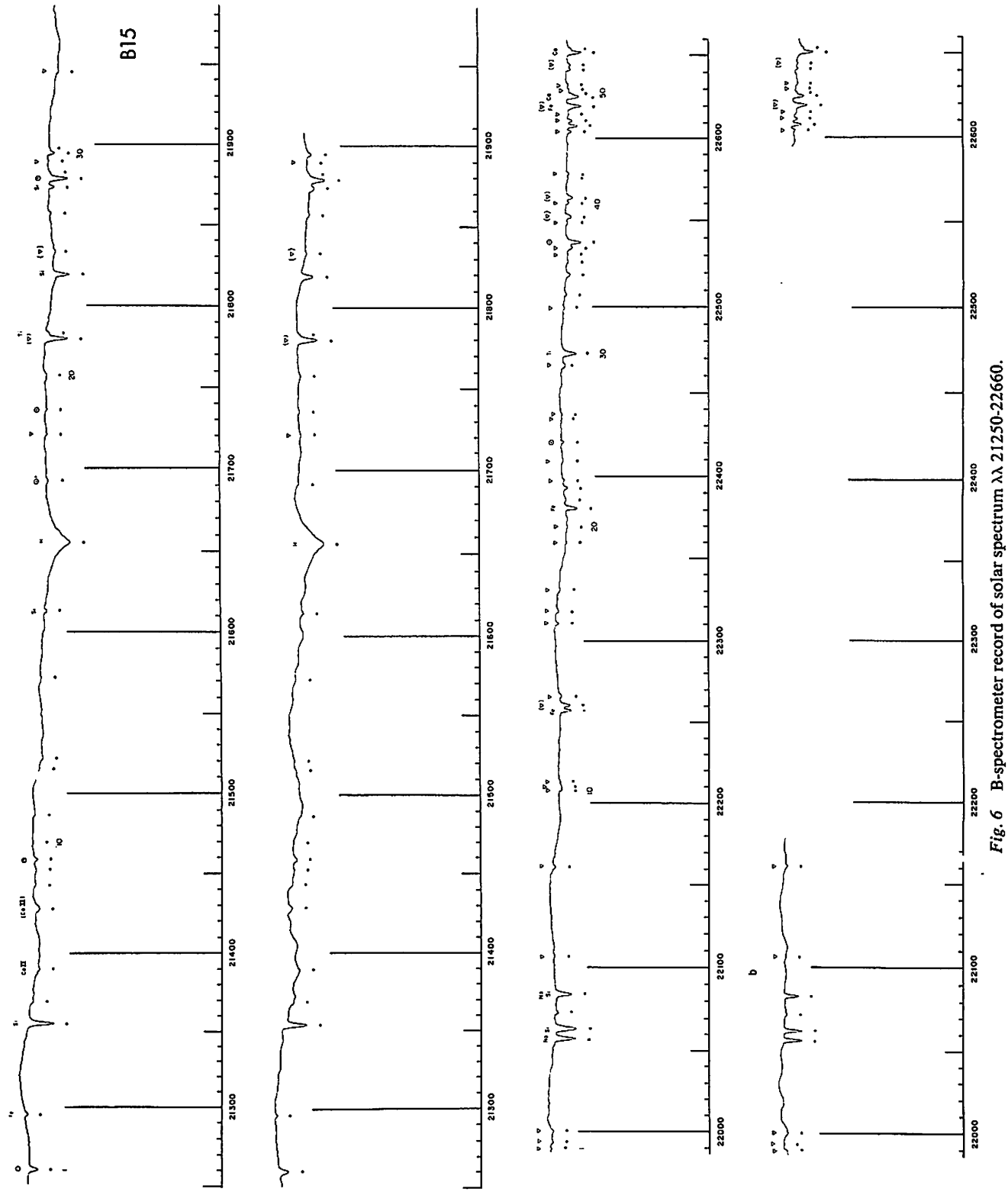

Fig. 6 B-spectrometer record of solar spectrum λλ 21250-22660.

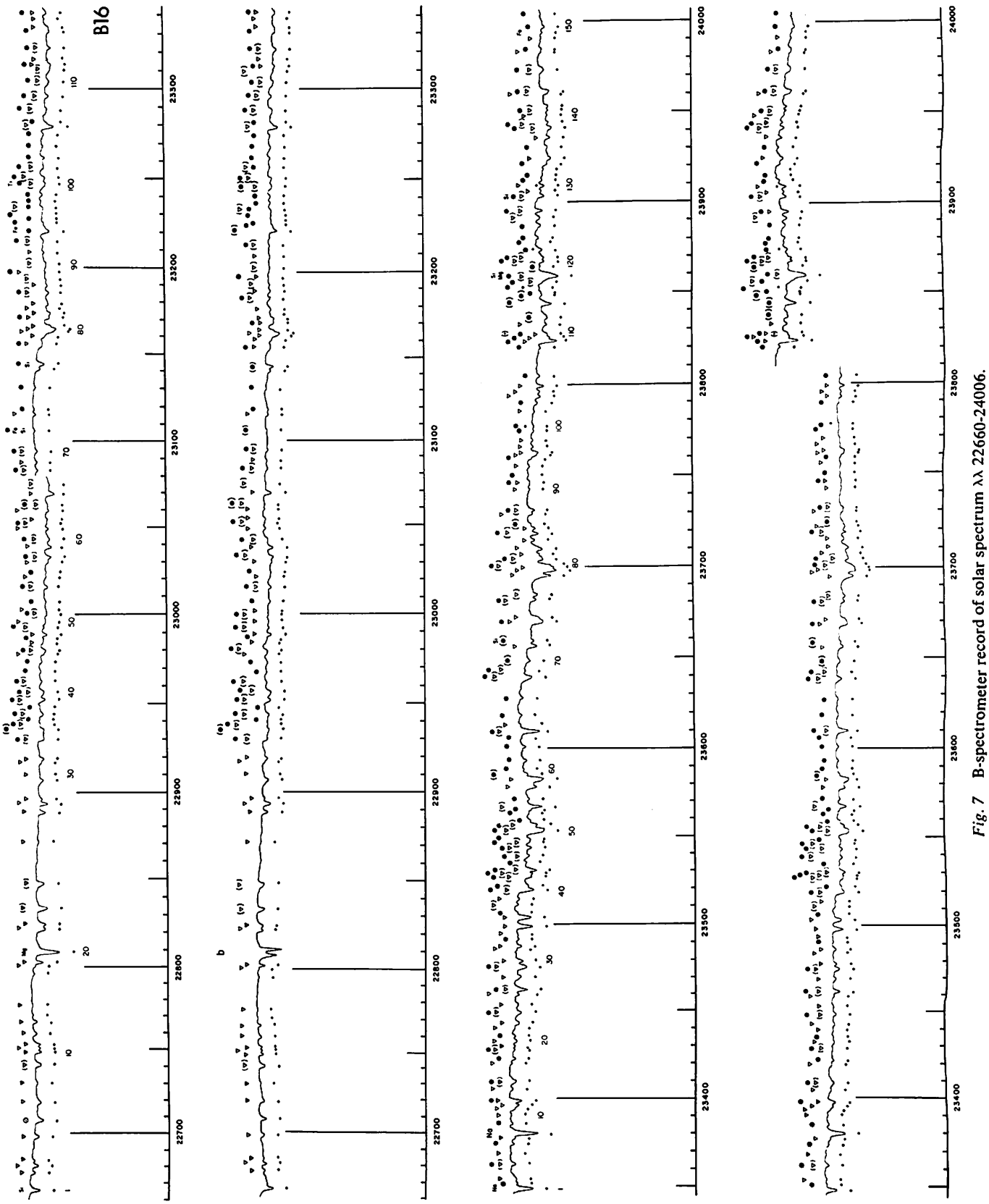

Fig. 7 B-spectrometer record of solar spectrum λλ 22660-24006.

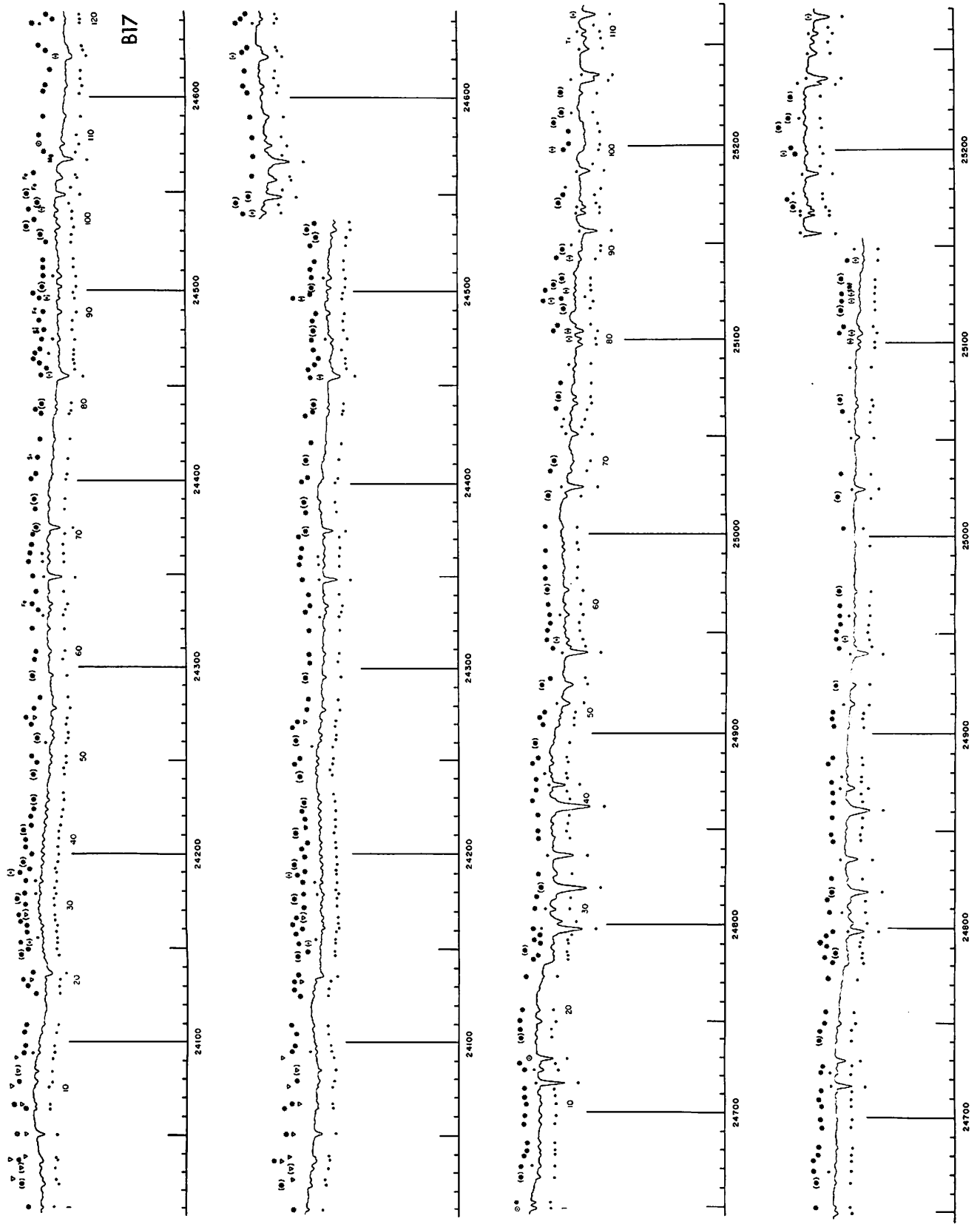

Fig. 8 B-spectrometer record of solar spectrum λλ 24006-25270.

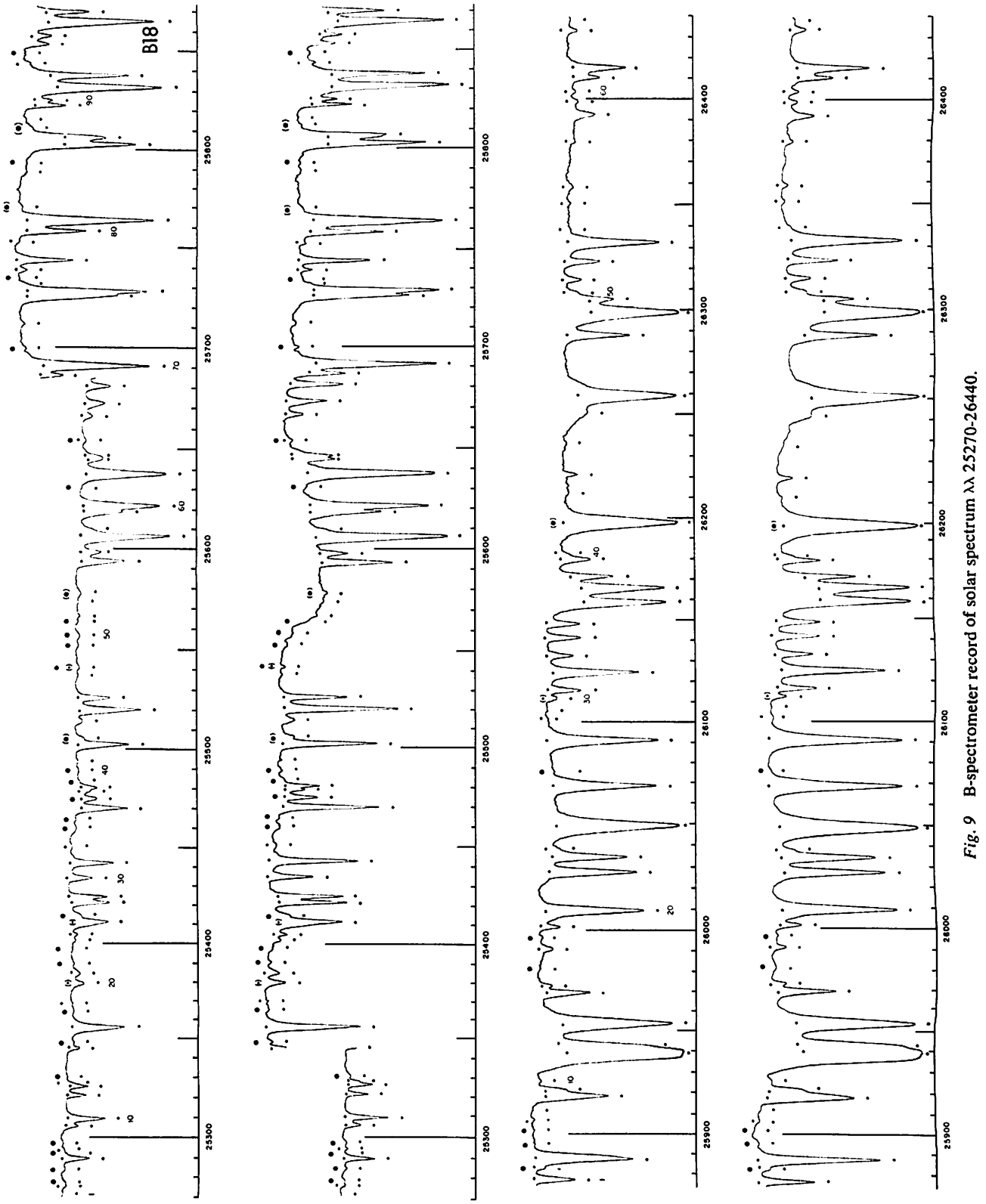

Fig. 9 B-spectrometer record of solar spectrum λλ 25270-26440.

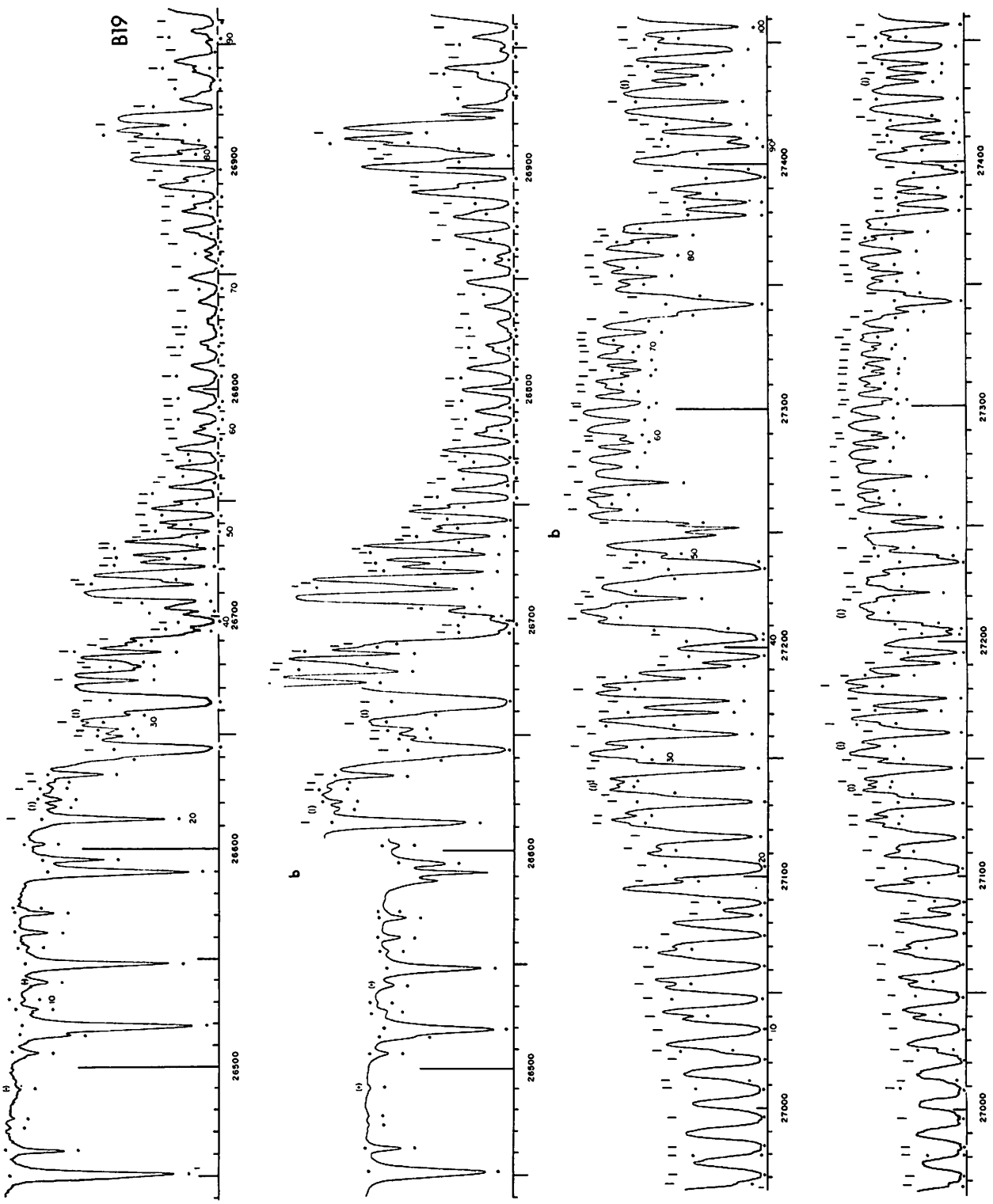

Fig. 10 B-spectrometer record of solar spectrum λλ 26440-27461.

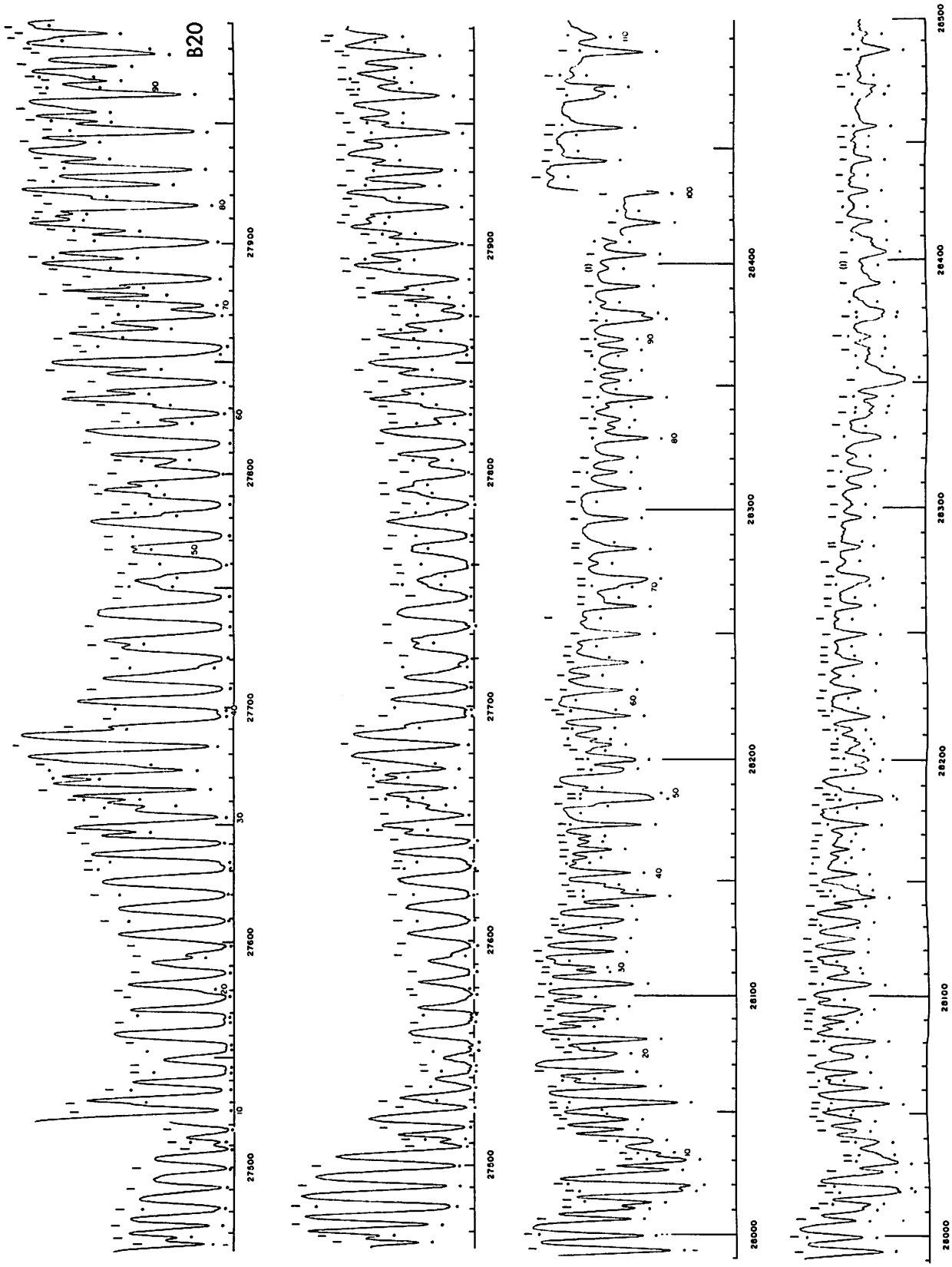

Fig. 11 B-spectrometer record of solar spectrum λλ 27461-28498.

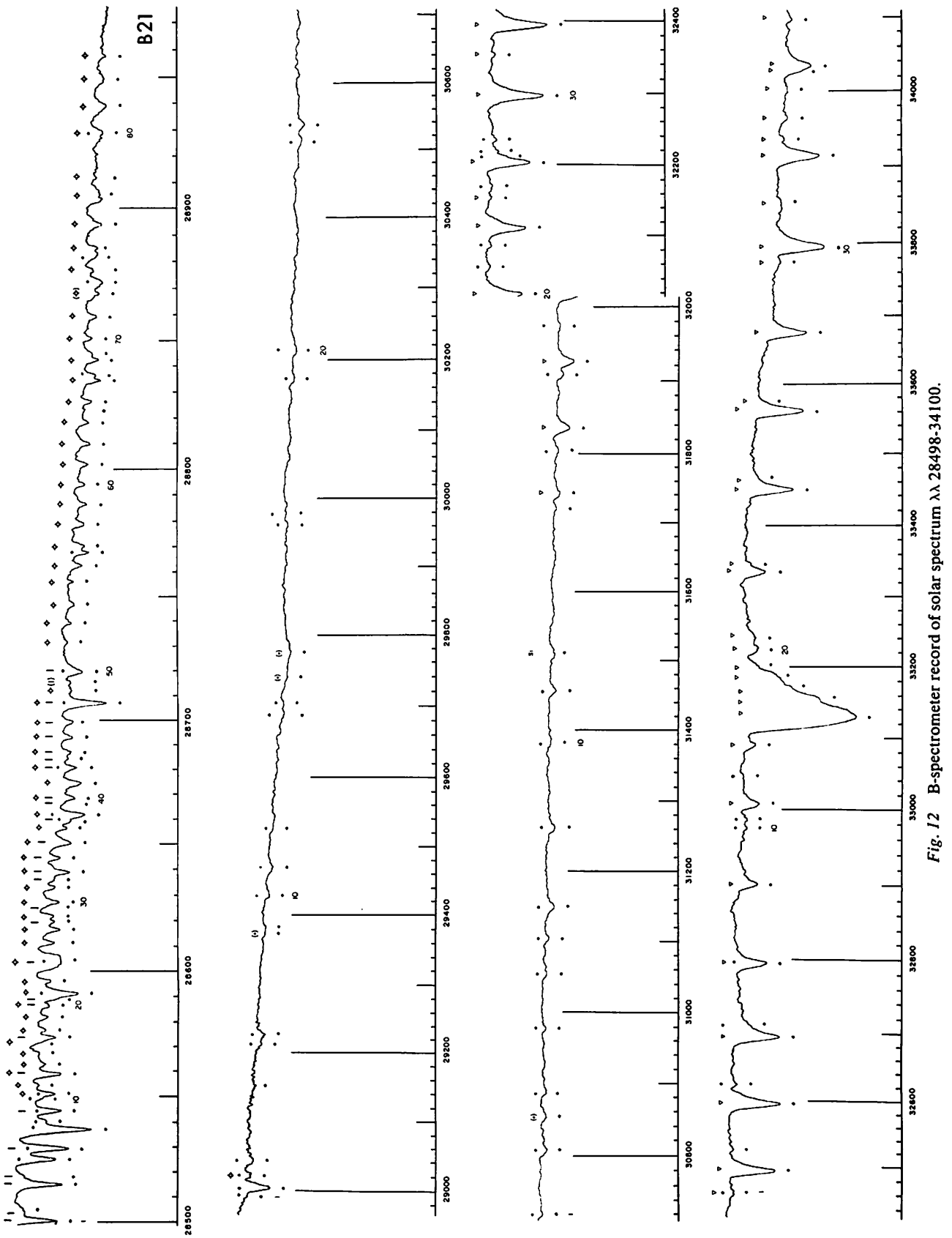

Fig. 12 B-spectrometer record of solar spectrum λλ 28498-34100.