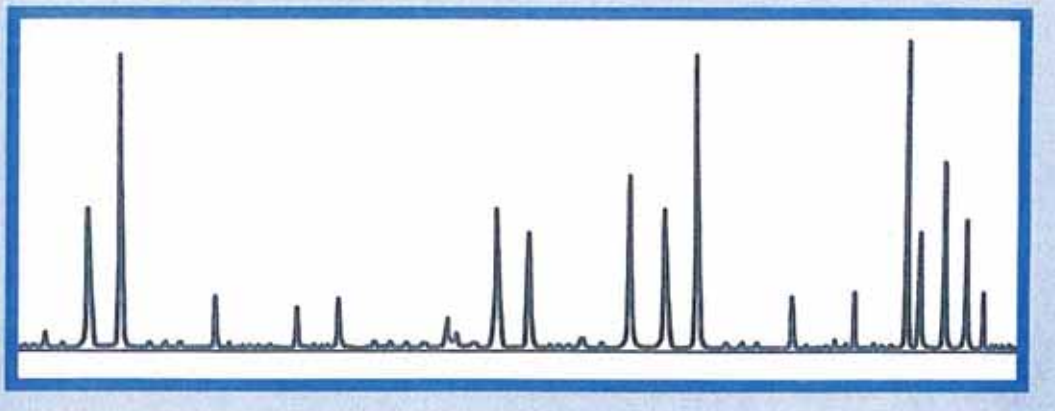
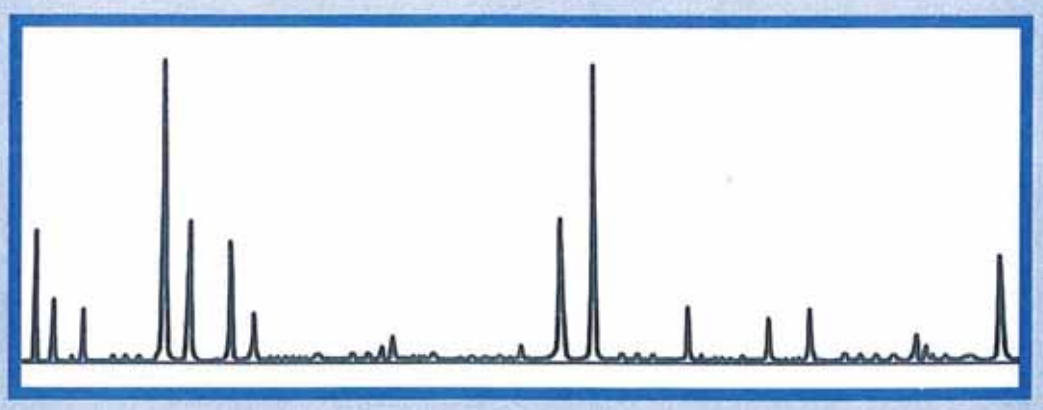
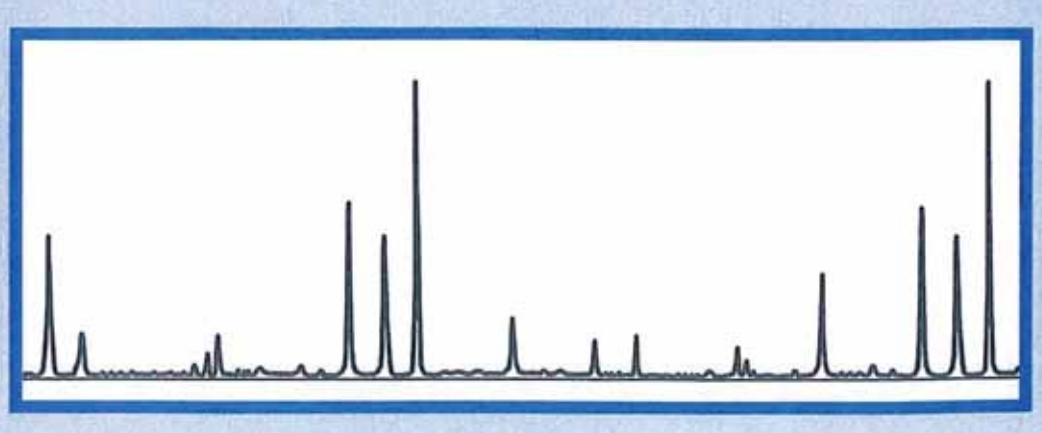
Typical Spectra of

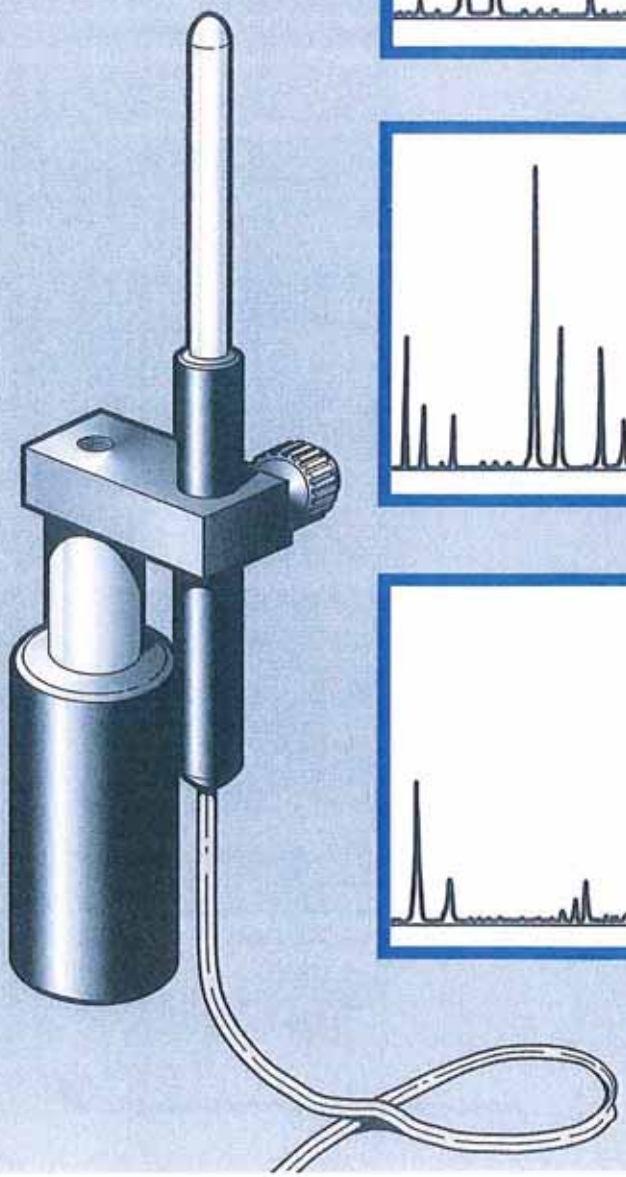
ORIEL INSTRUMENTS

Spectral Calibration Lamps









ORIEL INSTRUMENTS

TABLE OF CONTENTS

LAMP SAFETY AND CHARACTERISTICS

Our Spectral Calibration Lamps are compact and convenient to use. Both AC and DC Power Supplies are offered to run the lamps at various operating currents, and a rod mounted holder is available to support the lamps. Several lamp shields are also offered to aperture the lamps or for spectral filtering and conversion.

These lamps and their accessories are described in detail in Volume II, pages 27 to 30. This booklet contains their spectral output. We offer the following types:

- Argon
- Krypton
- Neon
- Xenon
- Mercury (Argon)
- Mercury-Neon

6035 Hg(Ar) Lamp in 63670 Lamp Holder, with 6047 Power Supply.

SAFETY

Although these are not considered powerful lamps, some of them have a strong ultraviolet output. You should avoid unneccessary exposure of the eyes or skin to shortwave ultraviolet. Apart from the possible mutagenic effects of ultraviolet radiation, you can suffer delayed corneal burns ("welder's eye") from working close to some of the mercury lamps for an hour or so. These burns are at the least extremely uncomfortable, and possibly worse.

You may not notice anything amiss (except perhaps watery eyes), while working with one of the ultraviolet emitting lamps. If you get too much exposure, and this has happened in our laboratories, several hours later you will have difficulty focusing and considerable eye discomfort. This can persist for many hours and in addition to the discomfort, it is extremely frightening. So, if you need the ultraviolet output, make sure you use goggles and gloves. (We carry these in Volume II.) If you do not need the ultraviolet, then we recommend you use the 6057 Glass Safety Filter on the lamps. The 6057 absorbs the ultraviolet while transmitting the visible and infrared calibration lines.

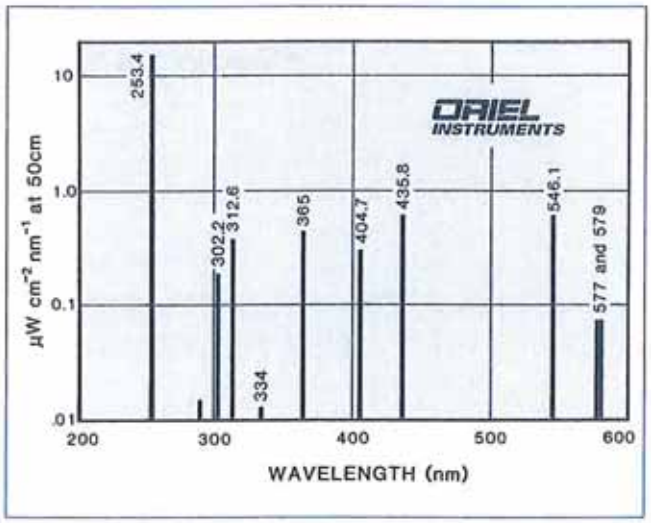


Fig. 1 Typical irradiance at 50 cm from 6035 Hg(Ar) Lamp operated at 18 mA.

LAMP CHARACTERISTICS

The Hg (Ar) and Hg-Ne lamps contain a small amount of mercury which dominates the output spectrum, and argon or neon as a starter gas. The spectral output of the 6035 Hg(Ar) lamp is effectively that of the mercury lines. These lamps are insensitive to temperature. With the 18 mA power supplies, 90% of the output is in the 253.7 nm line; with the 30 mA power supplies, intensity shifts to the visible lines and only 30% is left in the 253.7 nm line.

The Hg-Ne lamp, model 6034, is temperature sensitive. In normal lab ambient, the output is similar to the 6035, i.e. dominated by mercury lines. To produce the neon lines, forced air cooling is required. Operate the 6034 at 18 mA only.

The rare gas calibration lamps operate at 6 or 10 mA.

Table 1, on the following page, lists the useful wavelengths for our spectral calibration lamps.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203-377-8282 **Fax:** 203-378-2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

USEFUL WAVELENGTHS

Table 1 Useful Wavelengths for Spectral Calibration Lamps

Wavelength (nm)	Lamp	Model No.
184.91	Hg*	6035
194.17	Hg*	6035
226.22	Hg*	6035
237.83	Hg*	6035
248.2	Hg*	6035
253.65	Hg*	6035
265.2	Hg*	6035
275.28	Hg*	6035
280.35	Hg*	6035
289.36	Hg*	6035
296.73	Hg*	6035
302.15	Hg*	6035
312.57	Hg*	6035
313.17	Hg*	6035
334.15	Hg*	6035
336.99	Ne	6032
341.79	Ne†	6032
344.77	Ne†	6032
345.42	Ne	6032
346.66	Ne	6032
347.26	Ne†	6032
349.81	Ne	6032
350.12	Ne	6032
351.52	Ne	6032
352.05	Ne†	6032
355.43	Ar	6030
359.35	Ne†	6032
360.02	Ne	6032
363.37	Ne	6032
365.02	Hg*	6035
365.48	Hg*	6035
366.33	Hg*	6035
366.53	Kr	6031
367.96	Kr	6031
377.34	Kr	6031
394.9	Ar	6030
404.44	Ar	6030
404.66	Hg*	6035
407.78	Hg*	6035
415.86	Ar	6030
416.4	Ar	6030
418.19	Ar	6030
419.1	Ar	6030
419.8	Ar	6030
420.07	Ar	6030
425.12	Ar	6030
425.94	Ar	6030
426.63	Ar	6030
427.22	Ar	6030
427.4	Ar	6030
428.3	Kr	6031
430.01	Ar	6030
431.96	Kr	6031
432.0	Ar	6030
433.36	Ar	6030
433.92	Hg*	6035
434.52	Ar	6030
434.75	Hg*	6035
435.14	Kr	6031
435.84	Hg*	6035
436.26	Kr	6031
437.61	Kr	6031
440.0	Kr	6031
442.52	Kr	6031
445.39	Kr	6031
446.37	Kr	6031
450.1	Xe	6033
450.24	Kr	6031
452.47	Xe	6031
458.28	Xe	6033
462.43	Xe	6033
467.12	Xe	6033
469.7	Xe	6033
470.44	Ne	6032
473.42	Xe	6033
480.7	Xe	6033
482.97	Xe	6033
484.33	Xe	6033
491.6	Hg*	6035
491.65	Xe	6033
492.32	Xe	6033
502.83	Xe	6033
503.78	Ne	6032
508.04	Ne	6032
511.65	Ne	6032
514.5	Ne	6032
520.39	Ne	6032
533.08	Ne†	6032
534.11	Ne†	6032
534.33	Ne†	6032
540.06	Ne†	6032
546.07	Hg*	6035
549.09	Kr	6031
550.07	Kr	6031
556.22	Kr	6031
557.03	Kr	6031
558.04	Kr	6031
564.96	Kr	6031
565.67	Ne	6032
567.25	Kr	6031
574.83	Ne	6032
576.44	Ne	6032
576.96	Hg*	6035
579.07	Hg*	6035
580.45	Ne	6032
582.02	Ne	6032
583.29	Kr	6031
585.25	Ne	6032

*** These lines appear with the Hg(Ar) and Hg-Ne lamps.**
† These lines also appear with the Hg-Ne lamp.

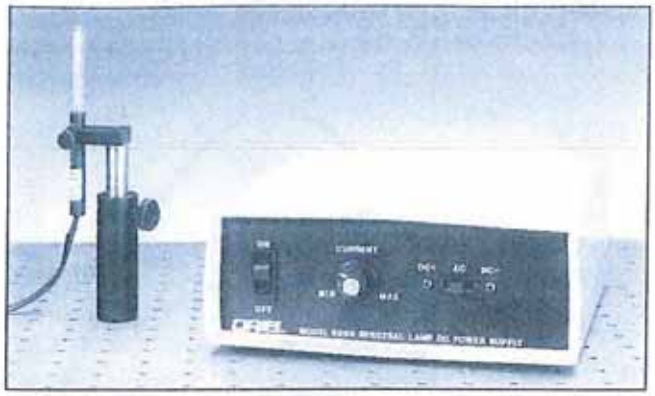
USEFUL WAVELENGTHS

Wavelength (nm)	Lamp	Model No.
587.09	Kr	6031
587.99	Kr	6031
588.19	Ne†	6032
590.25	Ne	6032
594.48	Ne†	6032
597.55	Ne†	6032
598.79	Ne	6032
599.39	Kr	6031
601.22	Kr	6031
603.0	Ne	6032
605.61	Kr	6031
607.43	Ne	6032
609.62	Ne	6032
612.85	Ne	6032
614.31	Ne	6032
616.36	Ne	6032
618.22	Ne	6032
618.24	Xe	6033
621.73	Ne	6032
626.65	Ne	6032
630.48	Ne	6032
631.81	Xe	6033
633.44	Ne	6032
638.3	Ne	6032
640.23	Ne	6032
641.63	Ar	6030
642.1	Kr	6031
645.63	Kr	6031
646.97	Xe	6033
650.65	Ne	6032
653.29	Ne	6032
659.9	Ne	6032
665.21	Ne	6032
666.89	Xe	6033
667.73	Ar	6030
667.83	Ne†	6032
669.92	Kr	6031
671.7	Ne	6032
672.8	Xe	6033
675.28	Ar	6030
681.31	Kr	6031
682.73	Xe	6033
687.13	Ar	6030
688.22	Xe	6033
690.47	Kr	6031
692.95	Ne	6032
693.77	Ar	6030
696.54	Ar	6030
702.41	Ne	6032
703.03	Ar	6030
703.24	Ne	6032
705.3	Ne	6032
705.91	Ne	6032
706.72	Ar	6030
711.96	Xe	6033
714.70	Ar	6030
717.39	Ne	6032

Wavelength (nm)	Lamp	Model No.
722.41	Kr	6031
724.52	Ne†	6032
727.29	Ar	6030
728.53	Xe	6033
728.98	Kr	6031
737.21	Ar	6030
738.4	Ar	6030
742.55	Kr	6031
743.89	Ne†	6032
747.24	Ne	6032
748.61	Kr	6031
748.89	Ne†	6032
750.39	Ar	6030
751.46	Ar	6030
753.58	Ne	6032
754.41	Ne	6032
758.47	Xe	6033
758.74	Kr	6031
760.15	Kr	6031
763.51	Ar	6030
764.2	Xe	6033
768.52	Kr	6031
769.45	Kr	6031
772.38	Ar	6030
774.68	Kr	6031
785.48	Kr	6031
791.34	Kr	6031
794.32	Ne	6032
794.82	Ar	6030
800.62	Ar	6030
801.48	Ar	6030
805.95	Kr	6031
808.25	Ne	6032
810.37	Ar	6030
810.44	Kr	6031
811.29	Kr	6031
811.53	Ar	6030
813.64	Ne	6032
819.01	Kr	6031
823.16	Xe	6033
826.32	Kr	6031
826.45	Ar	6030
828.01	Xe	6033
828.11	Kr	6031
829.81	Kr	6031
830.03	Ne	6032
834.68	Xe	6033
837.76	Ne	6032
840.82	Ar	6030
840.92	Xe	6033
841.84	Ne	6032
842.46	Ar	6030
849.54	Ne	6032
850.89	Kr	6031
877.67	Kr	6031
892.87	Kr	6031

† **These lines also appear with the Hg-Ne lamp.**

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. ***Tel:*** *203·377·8282* ***Fax:*** *203·378·2457* ***E-Mail:*** *res_sales@oriel.com*
URL: *http://www.oriel.com*



6035 Hg(Ar) Lamp in 63670 Lamp Mount, on rod and rod holder, with 6060 DC Power Supply.

Our power supplies provide a high starting voltage to ignite the lamp, then the voltage drops to the normal operating voltage. We offer 115 V, 60 Hz and 220 V, 50/60 Hz supplies.

Choose an AC supply for general calibration, and a DC supply for applications where frequency modulation is a problem.

The 6060 "DC" Supply is switchable to AC, and has a variable current adjust. Although more expensive than the AC supply it has much better performance, as shown in Fig. 2 on the right, and can operate any Spectral Calibration Lamp.

With the switch on "AC" the light output is as shown in Fig. 3. The lamp is driven by an alternating square wave current so the output consists of 30 ms "plateaus" of fairly constant output with a fast (10 µs) negative spike between plateaus. A typical spike is shown in the expanded graphic.

AC mode has the advantage of current reversal which prevents unidirectional migration of the gas. With the switch in the DC position the current is true DC, but the polarity should be reversed occasionally to change the migration.

Table 2 Spectral Calibration Lamp Power Supply Specifications

Lamp Model No.	Type	Operating Current (mA)	Rated Life* (Hrs)	AC Power Supply		DC Power Supply**	
				110V	220V	110V	220V
6034	Hg-Ne	18	500	6047	6048	6060	6061
6035	Hg(Ar)	10	5000	6045	6046	6060	6061
		18	5000	6047	6048	6060	6061
		30	4500	6049	6050	6060	6061
6030	Ar	10	500	6045	6046	6060	6061
6031	Kr	10	1000	6045	6046	6060	6061
6032	Ne	6	250	6043	6044	6060	6061
6033	Xe	6	250	6043	6044	6060	6061

* In AC operation.
** Is also switchable to AC.

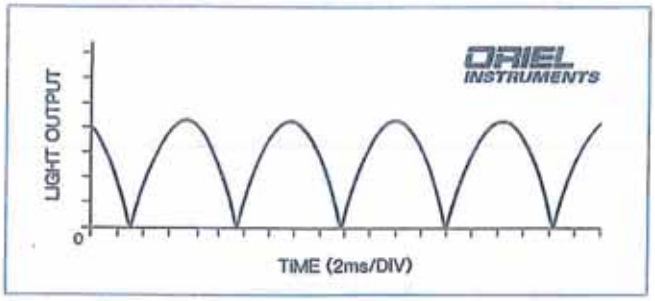


Fig. 1 Output intensity variation of 6035 Lamp operated by 6047 Power Supply.

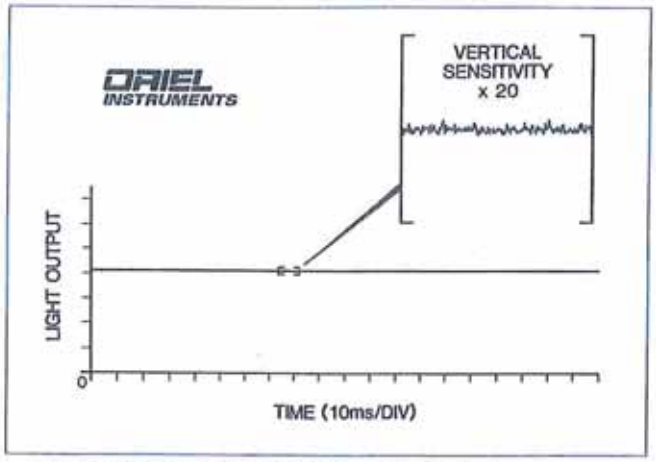


Fig. 2 Output intensity variation of 6035 Lamp operated by 6060 Power Supply with the switch set on "DC". The 20X expanded sensitivity scale shows the low ripple.

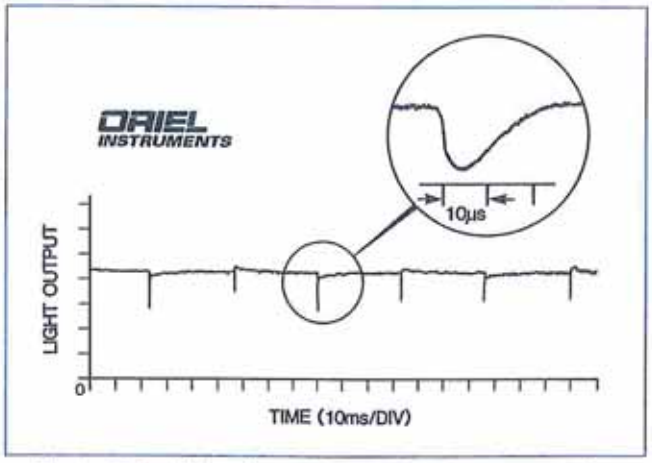
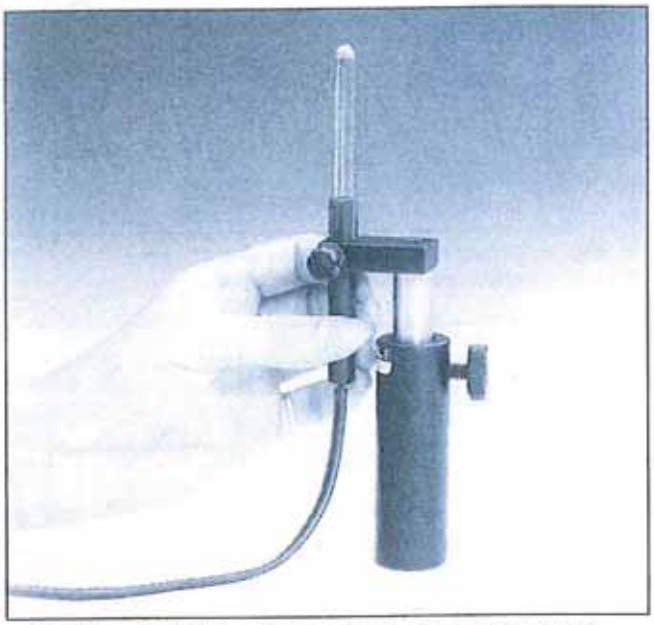


Fig. 3 Output intensity variation of 6035 Lamp operated by 6060 Power Supply with switch set on "AC".

LAMP HOLDER



6035 Spectral Calibration Lamp being inserted in 63670 Lamp Holder, on rod and rod holder.

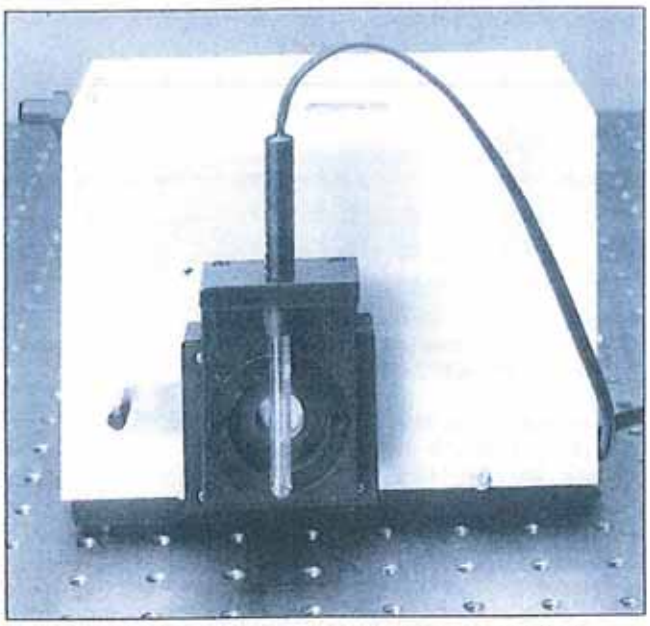
The 63670 is a convenient and inexpensive rod mount that holds any of our spectral calibration lamps in a vertical position. A 1.75 inch (44.5 mm) long optical rod is included. See Volume II, page 29 for ordering information for the 63670.

SPECTRAL CALIBRATION LAMP SETS

These sets include the following:

- 6030 Argon Lamp
- 6031 Krypton Lamp
- 6032 Neon Lamp
- 6033 Xenon Lamp
- 6035 Mercury (Argon) Lamp
- 6040 Shield
- 6043 115 V Power Supply or 6044 220 V Power Supply
- 6045 115 V Power Supply or 6046 220 V Power Supply
- Carrying Case and Booklet of Spectra

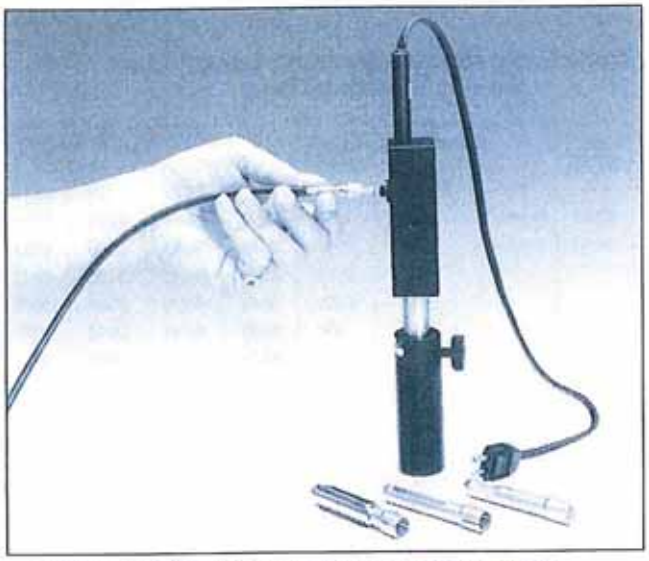
LAMP HOLDER TO CALIBRATE ORIEL MONOCHROMATORS



77251 Calibration Lamp Holder with lamp mounted to 77250 1/8 m Monochromator.

The 77251 holds a spectral calibration lamp in front of the entrance slit of our 1/4 m or 1/8 m monochromators to calibrate the monochromator. See Volume II, page 201.

LAMP SHIELDS/FILTERS AND FIBER OPTIC ADAPTER



6058 Fiber Optic Adapter on rod and rod holder with Spectral Calibration Lamps and various Lamp Shields.

Lamp shields to aperture the radiating region and filters to absorb the ultraviolet lines while transmitting the visible are offered for these lamps. The 6058 Fiber Optic Adapter lets you collect and carry a portion of the lamp output via an SMA terminated single fiber. See Volume II, page 29 for information on these accessories.

ARGON LAMP: SPECTRAL OUTPUT

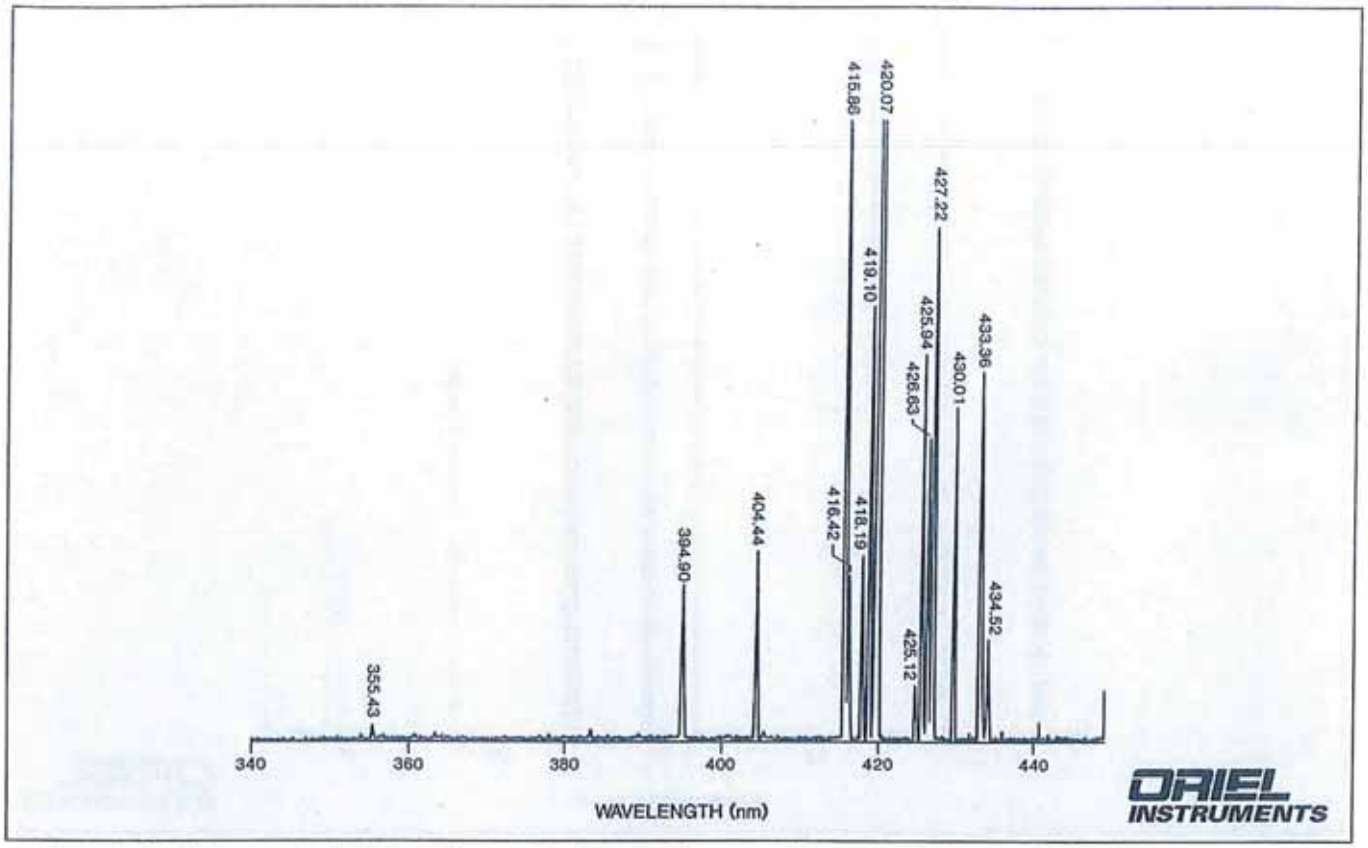


Fig. 1 Typical line output of 6030 Argon Lamp. Relative intensities vary with operating conditions.

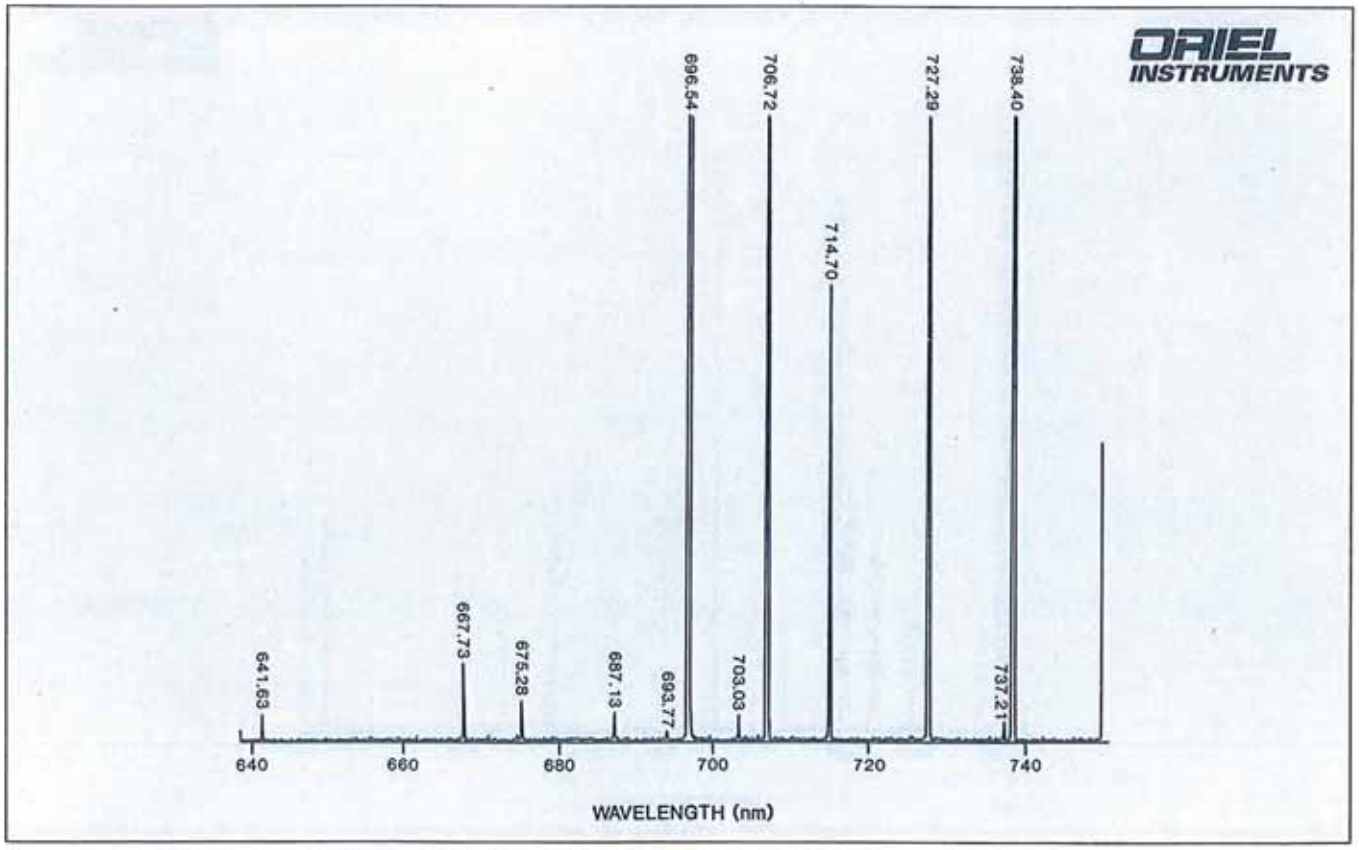


Fig. 2 Typical line output of 6030 Argon Lamp. Relative intensities vary with operating conditions.

ARGON LAMP: SPECTRAL OUTPUT

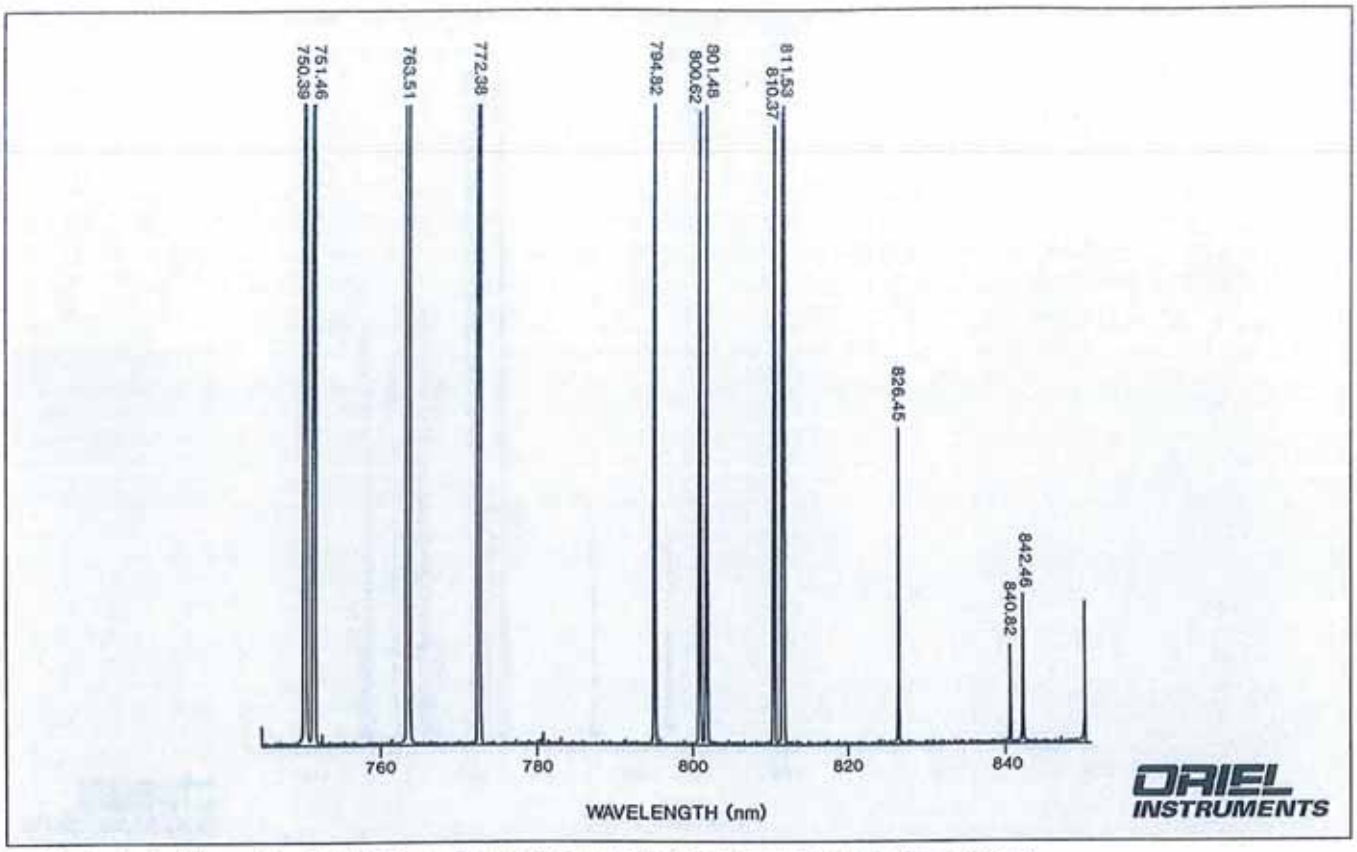


Fig. 3 Typical line output of 6030 Argon Lamp. Relative intensities vary with operating conditions.

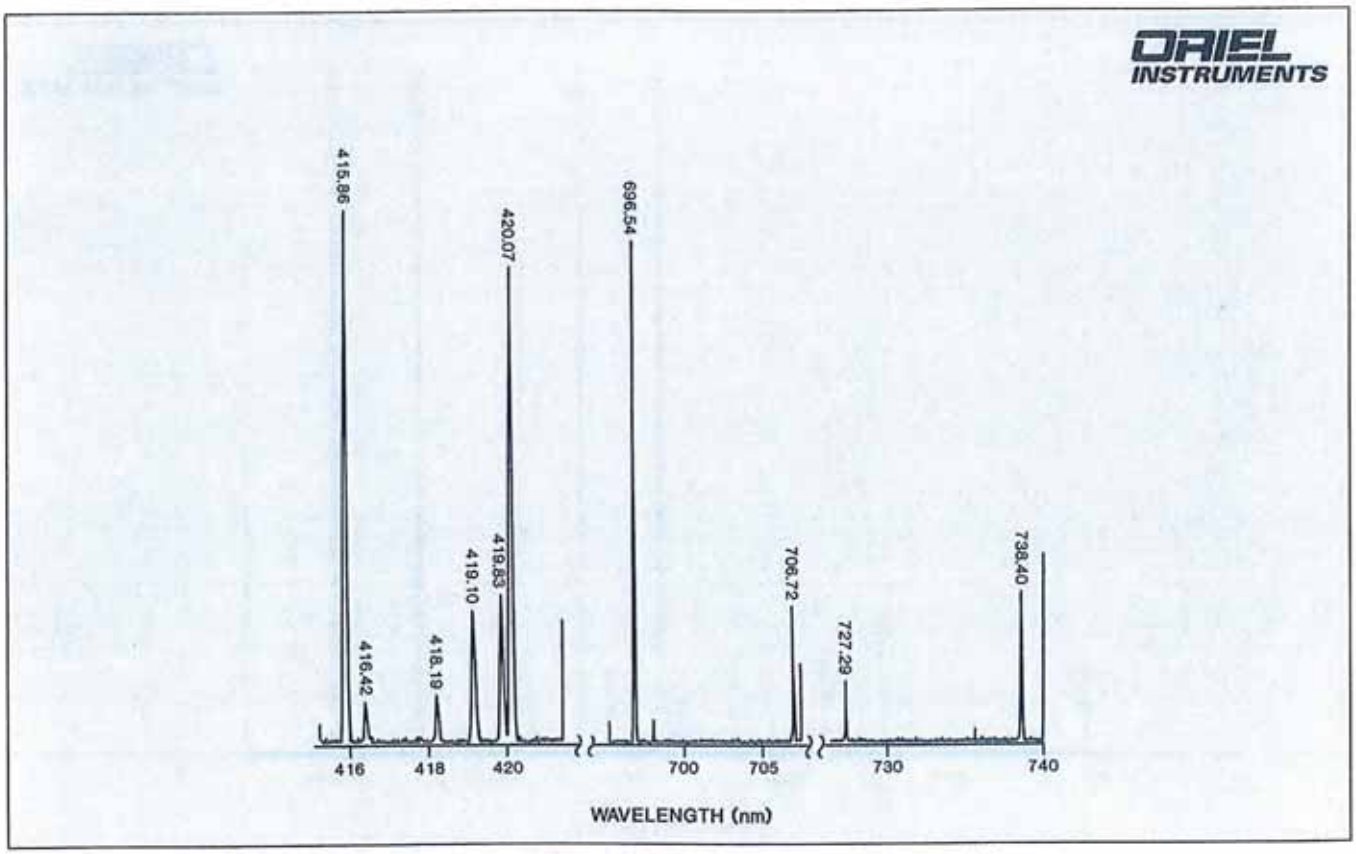


Fig. 4 Typical line output of 6030 Argon Lamp. Relative intensities vary with operating conditions.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203·377·8282 **Fax:** 203·378·2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

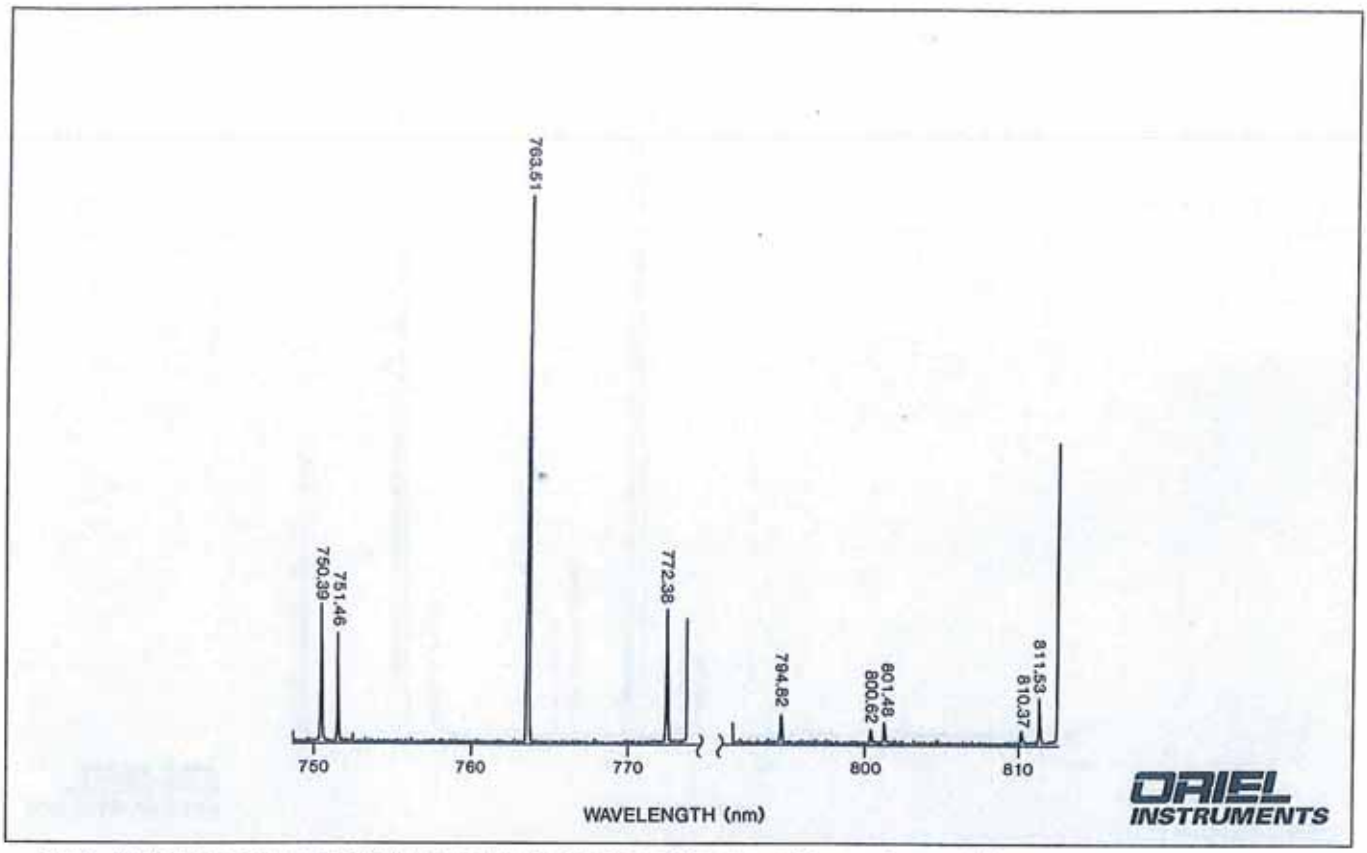


Fig. 5 Typical line output of 6030 Argon Lamp. Relative intensities vary with operating conditions.

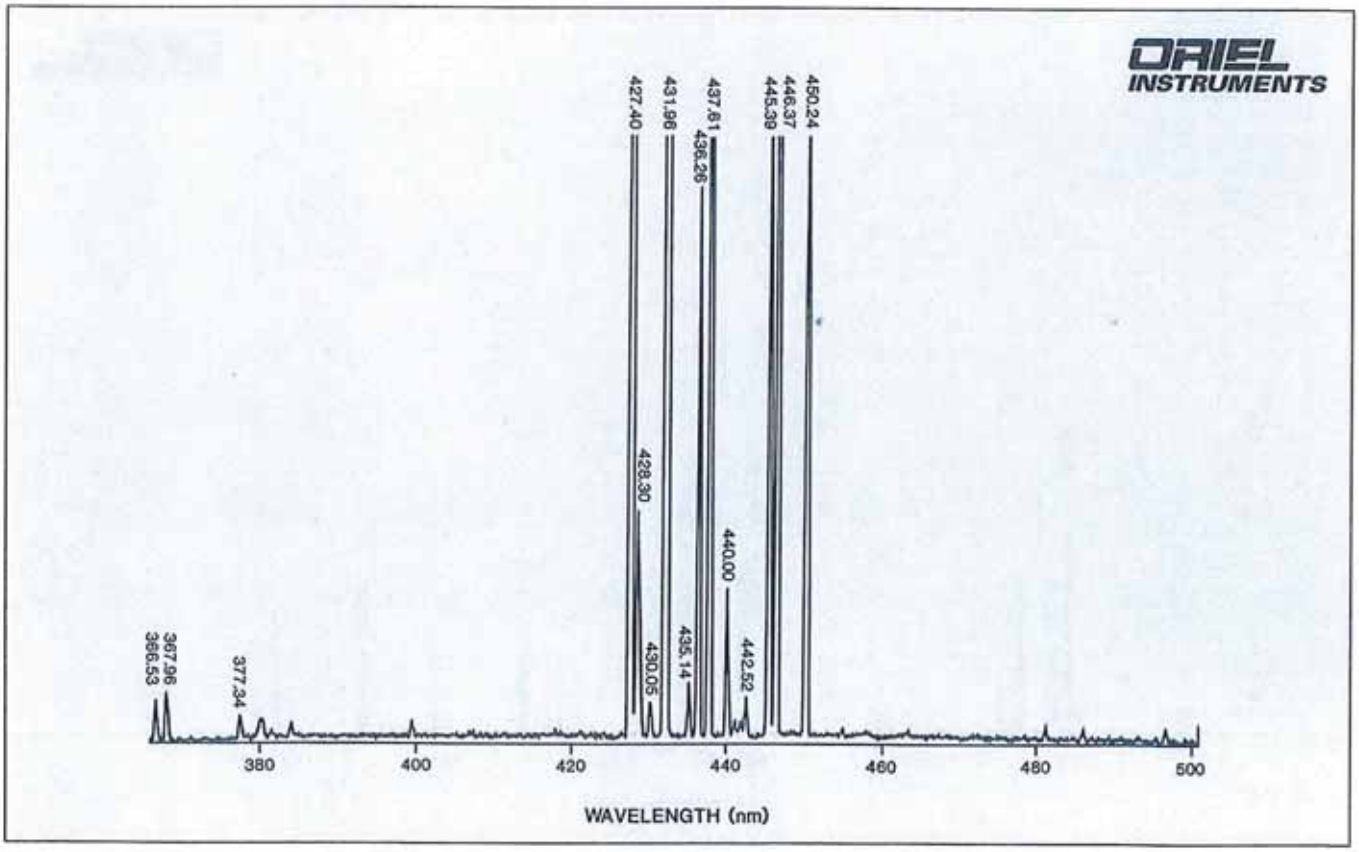


Fig. 6 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

KRYPTON LAMP: SPECTRAL OUTPUT

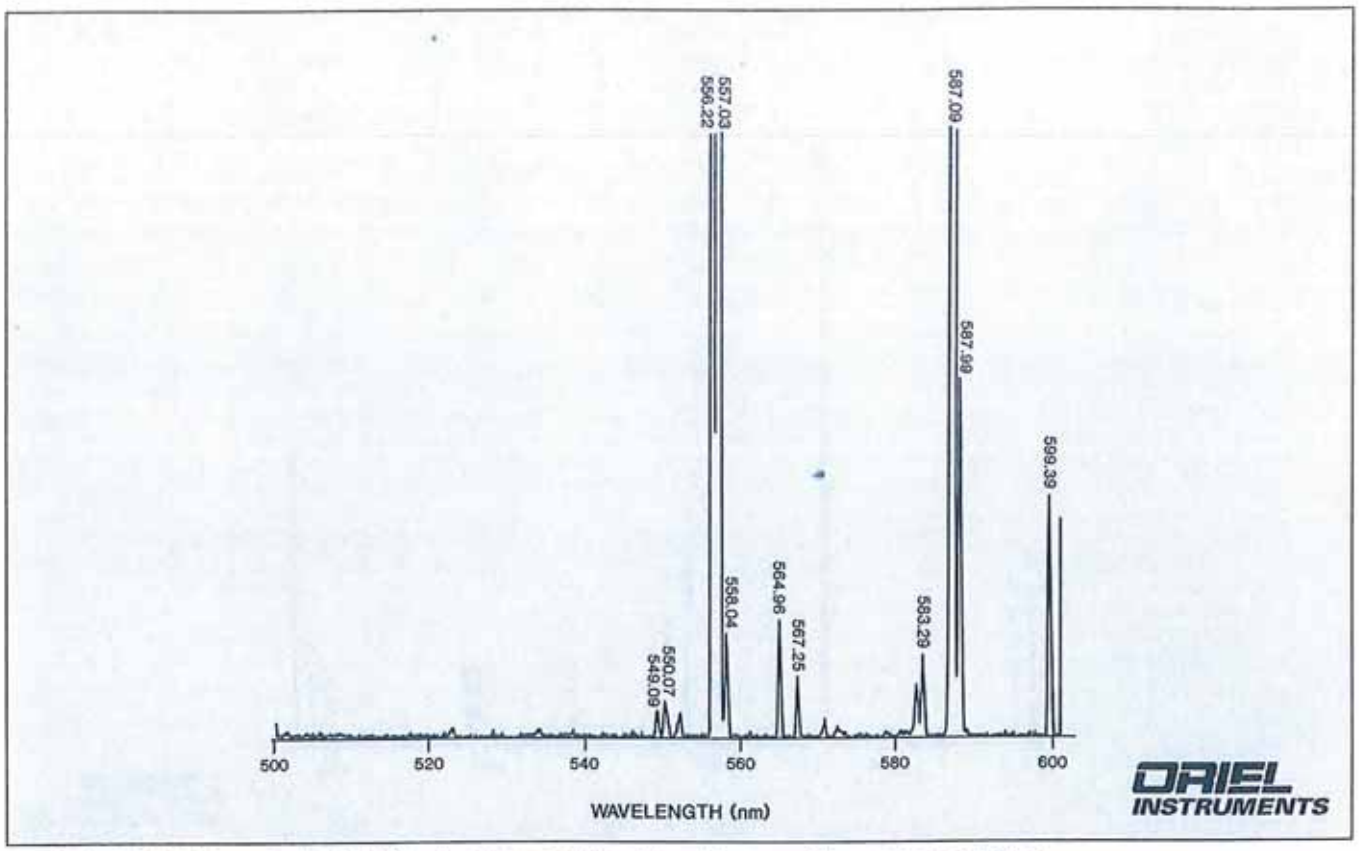


Fig. 7 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

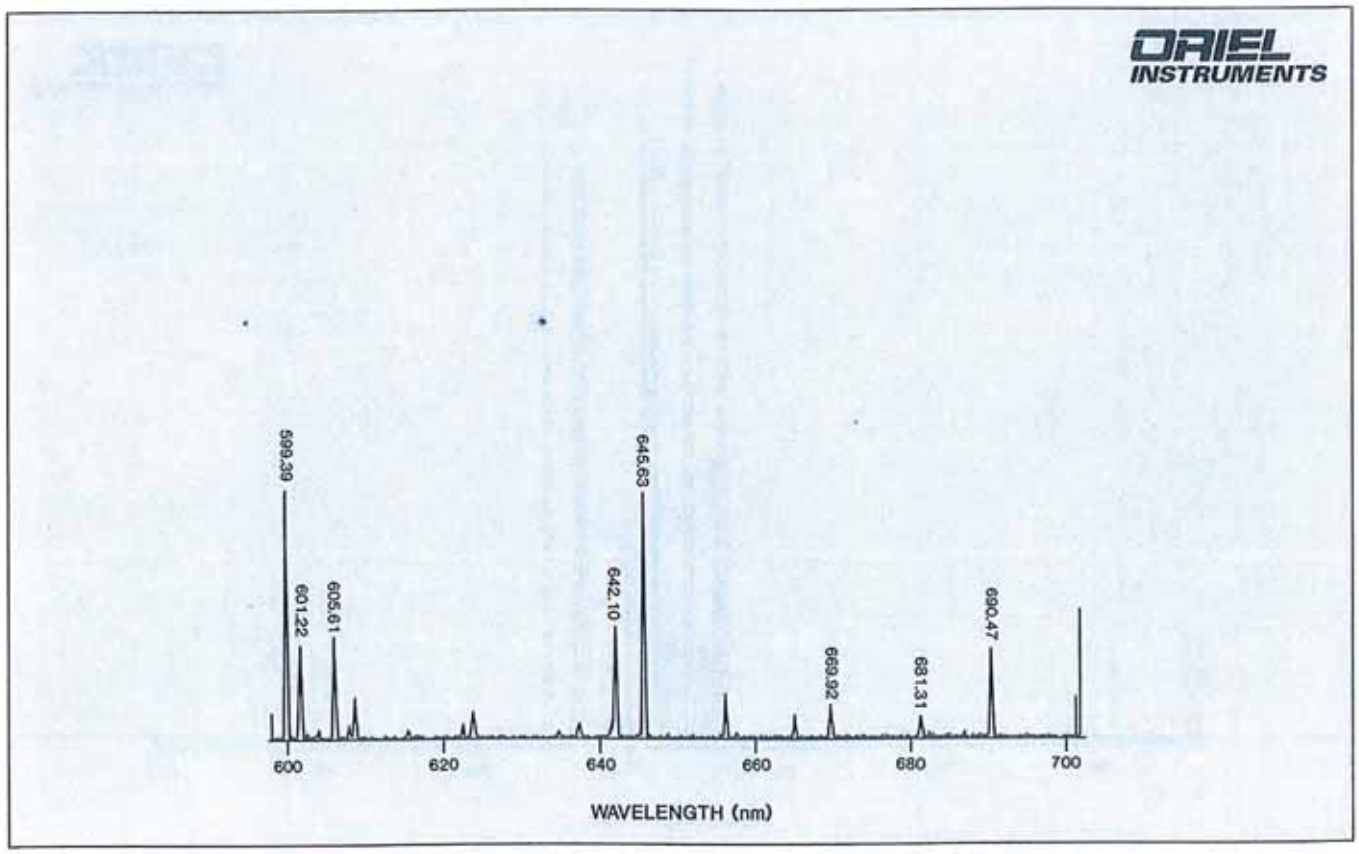


Fig. 8 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

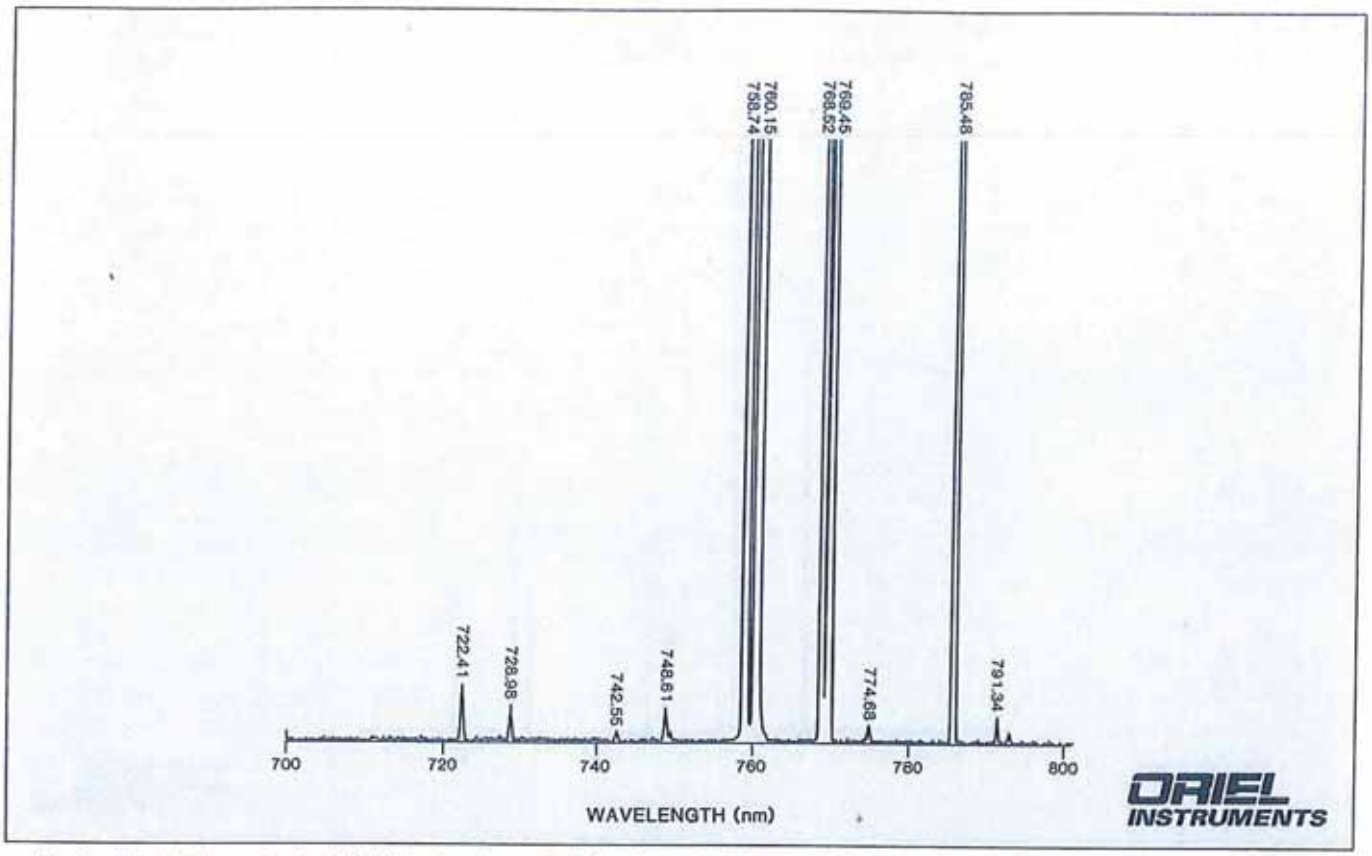


Fig. 9 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

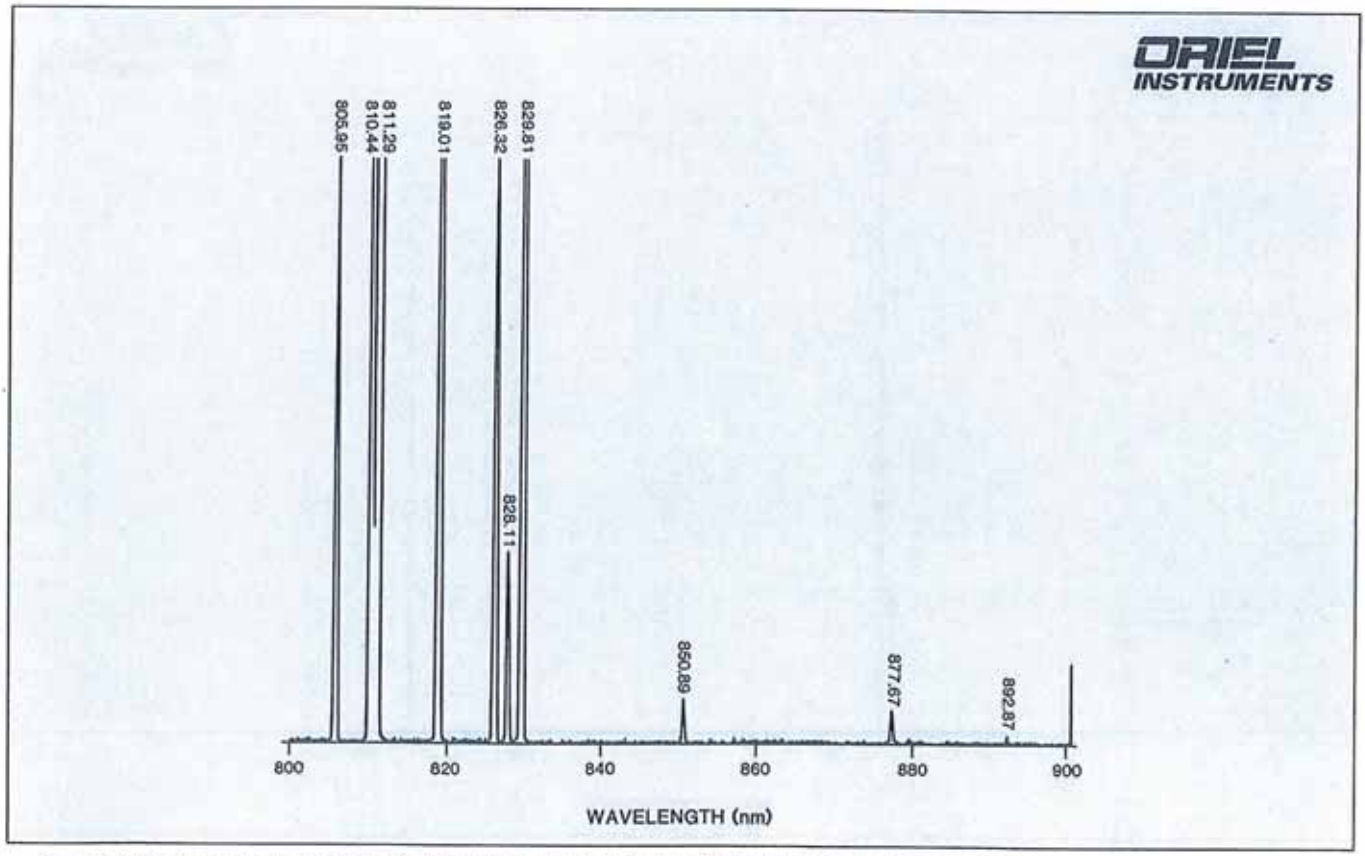


Fig. 10 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

KRYPTON LAMP: SPECTRAL OUTPUT

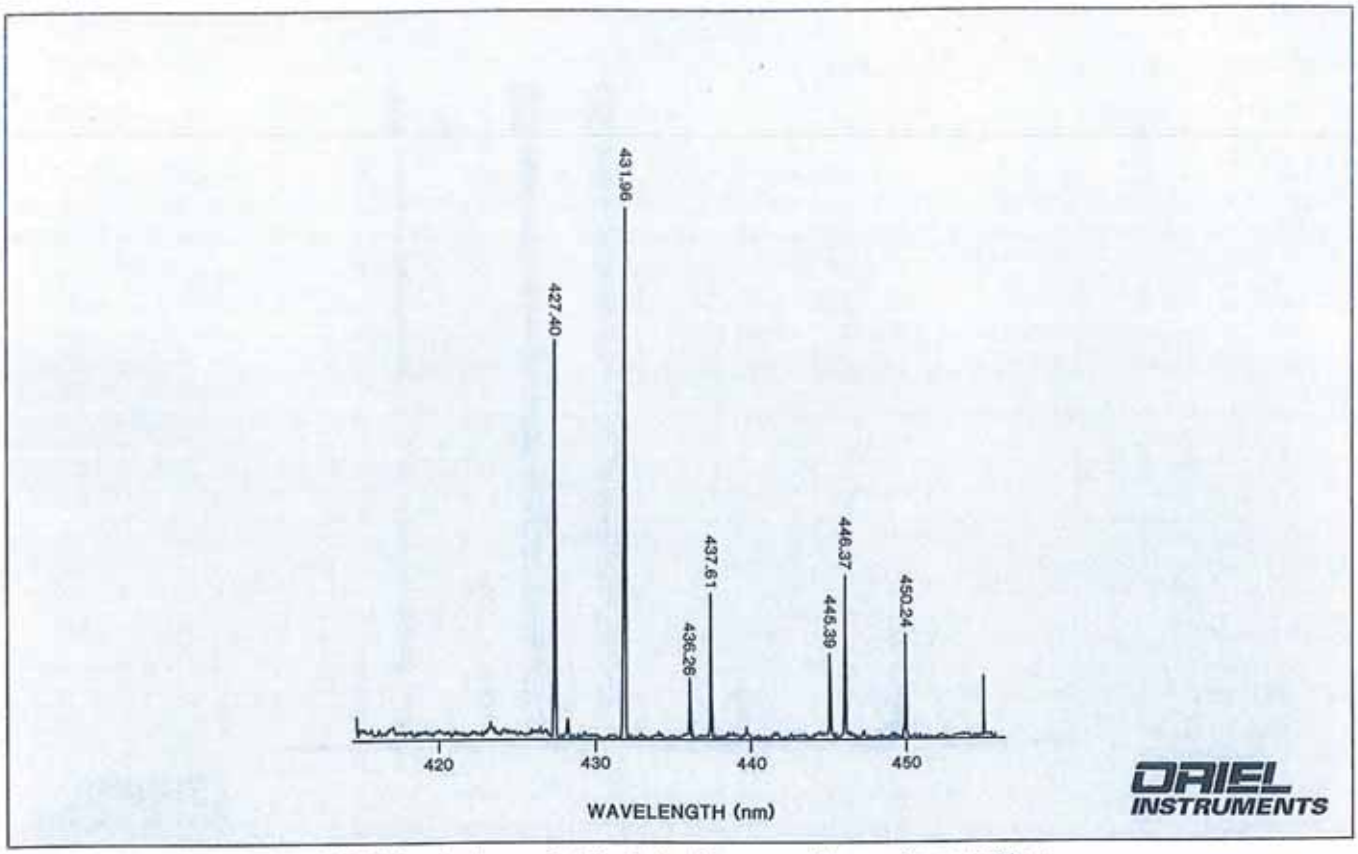


Fig. 11 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

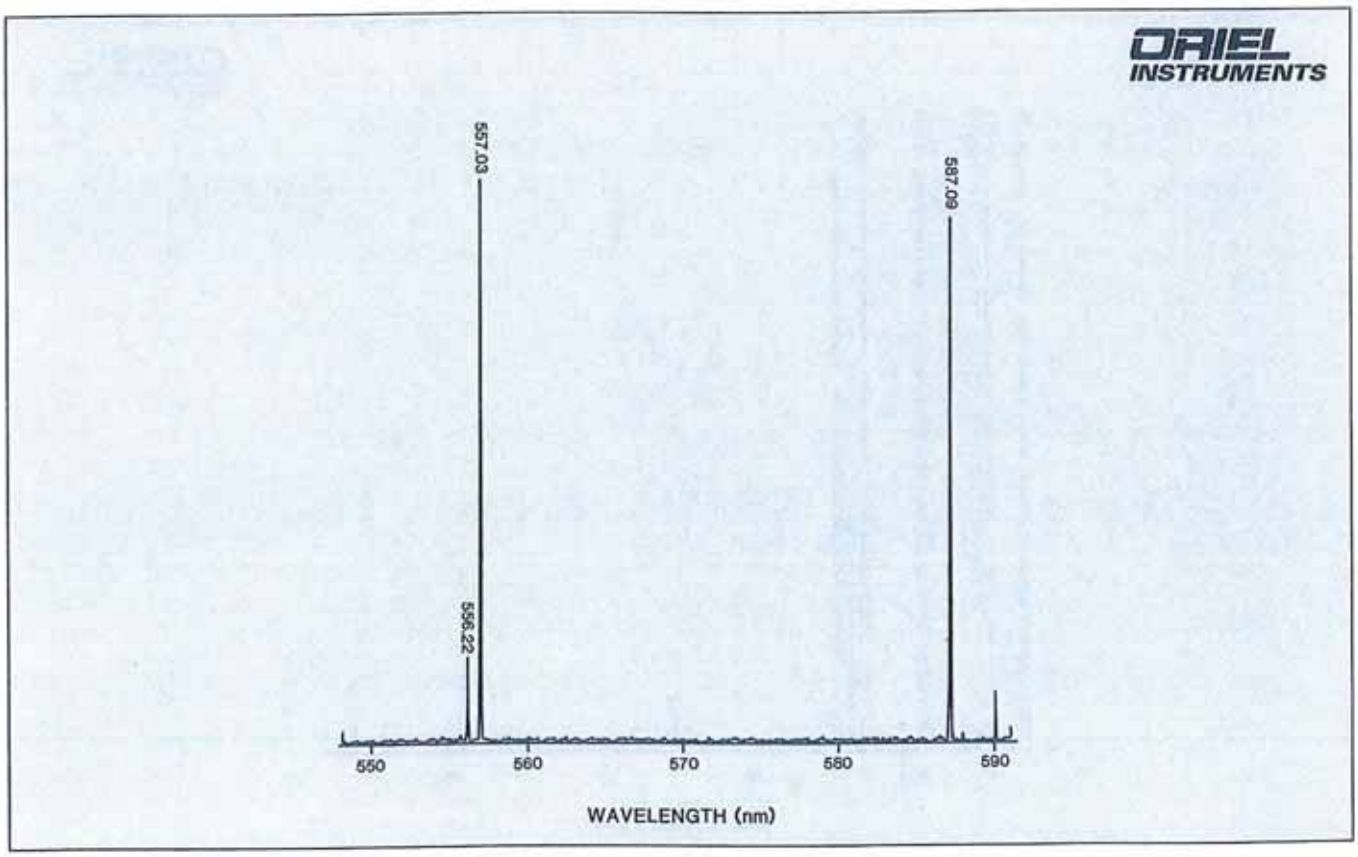


Fig. 12 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

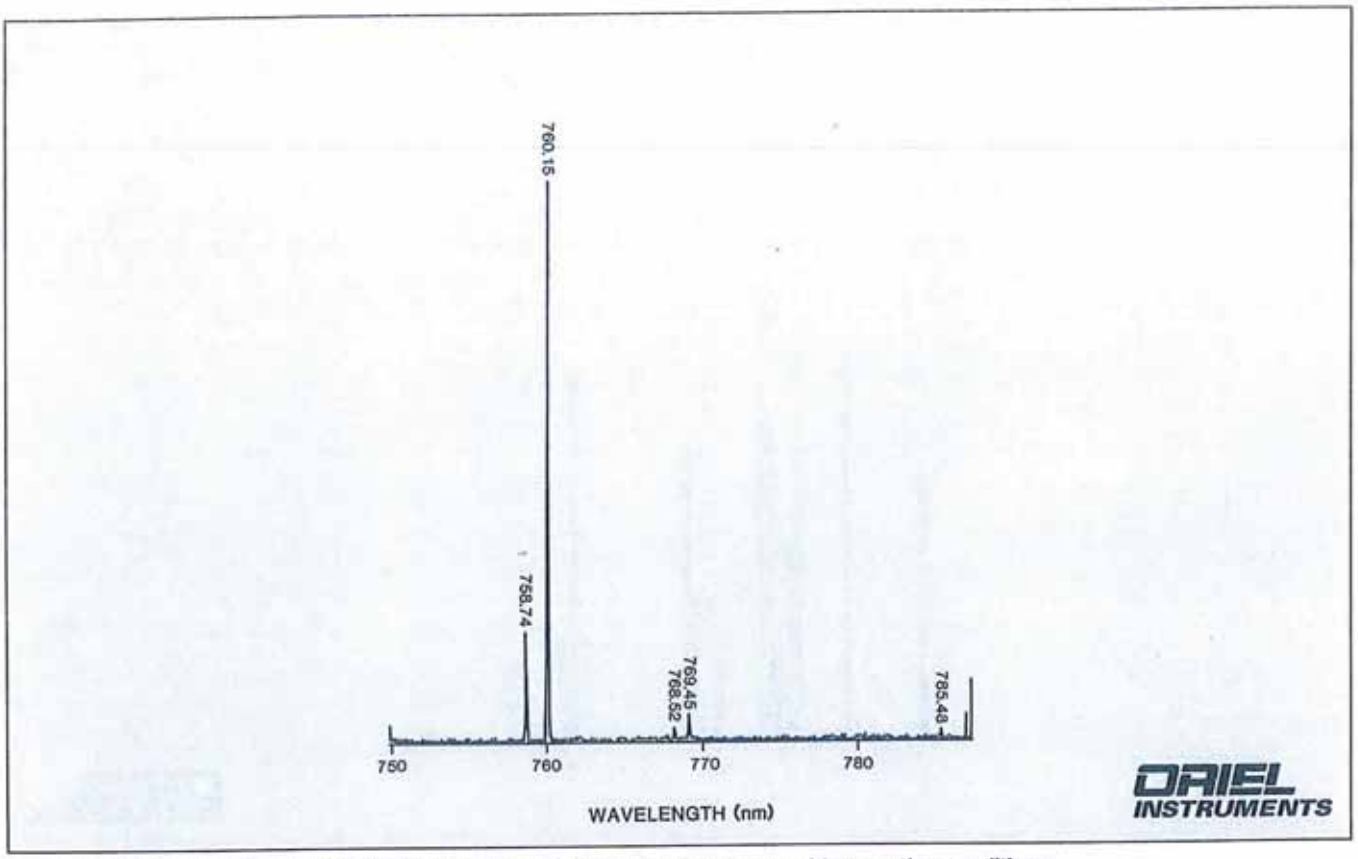


Fig. 13 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

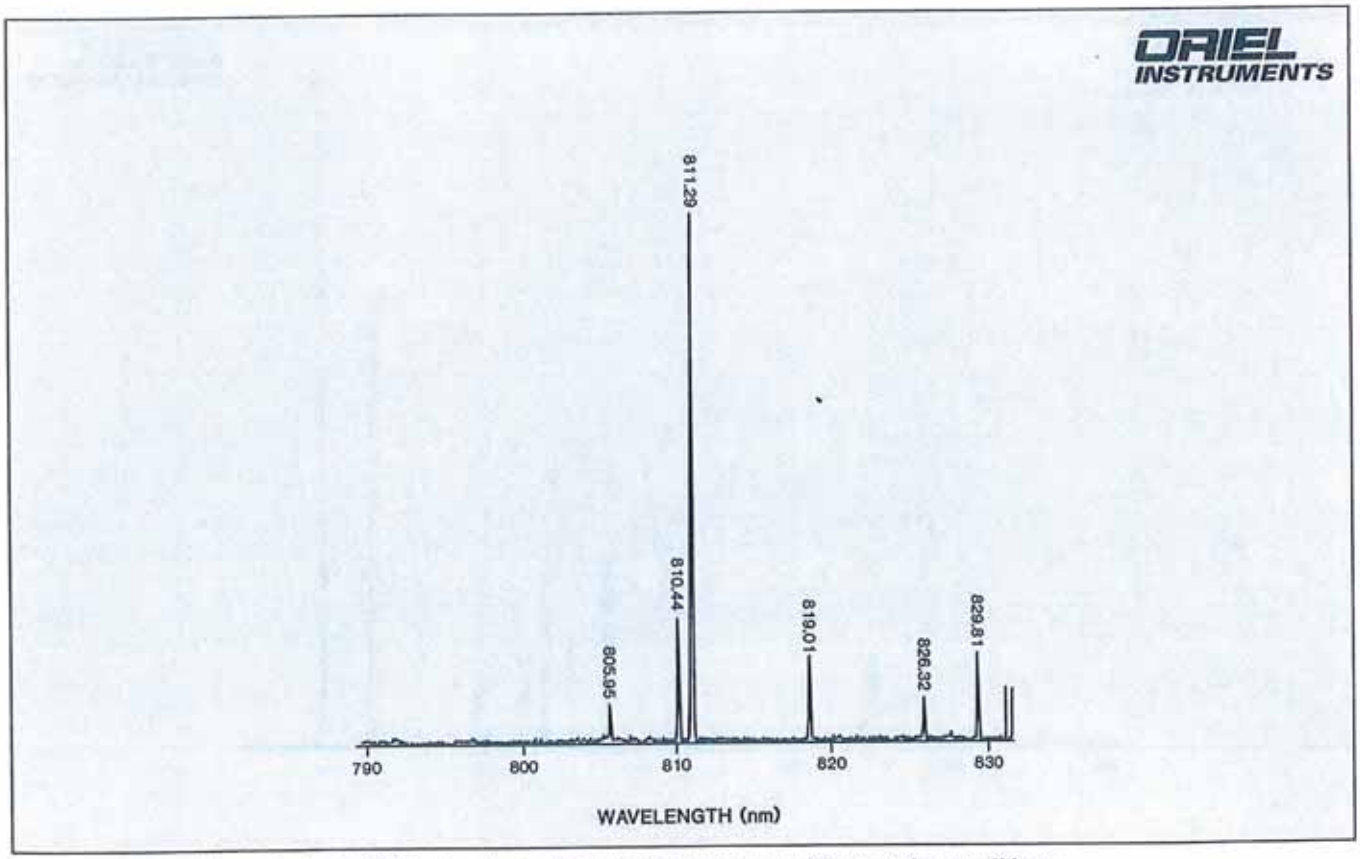


Fig. 14 Typical line output of 6031 Krypton Lamp. Relative intensities vary with operating conditions.

NEON LAMP: SPECTRAL OUTPUT

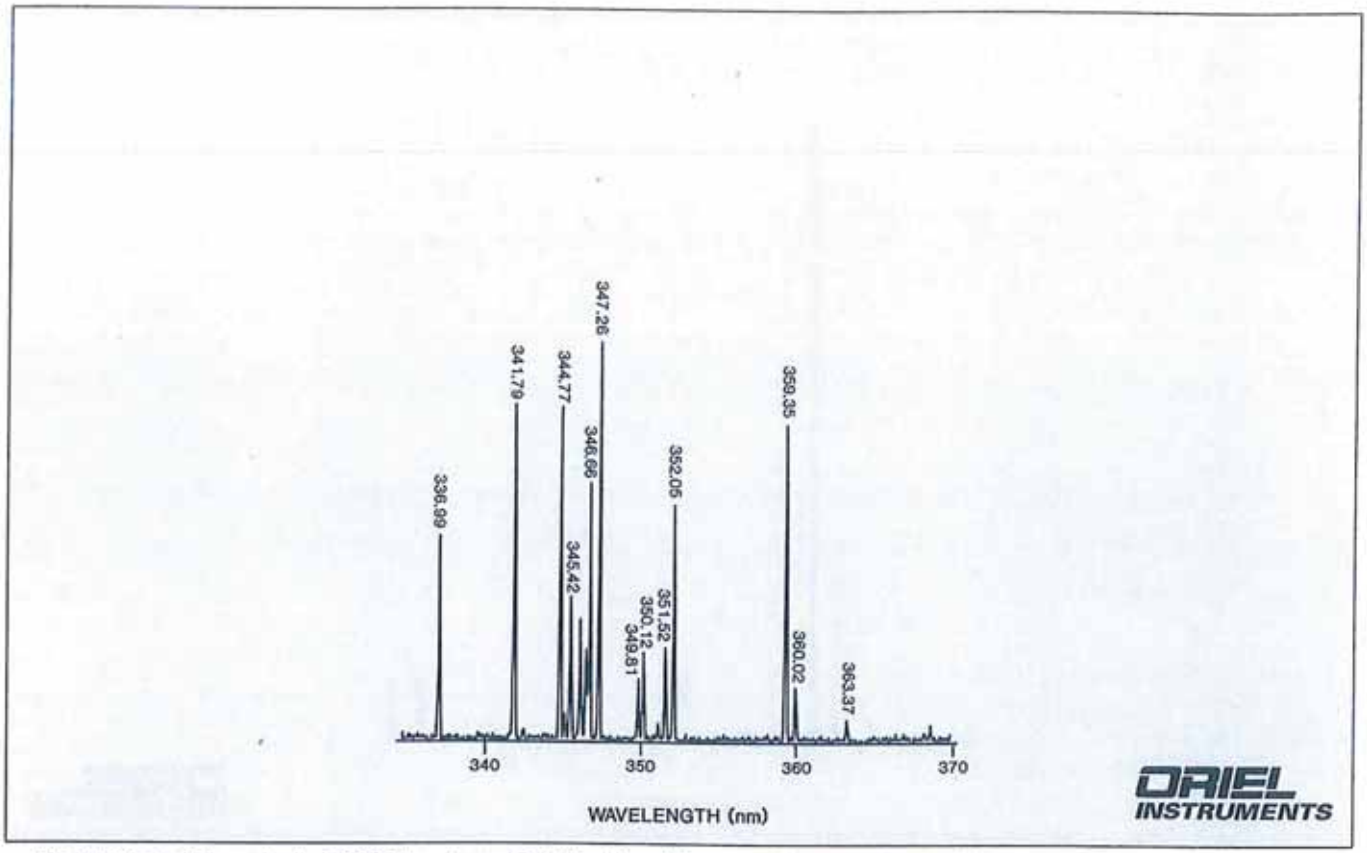


Fig. 15 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

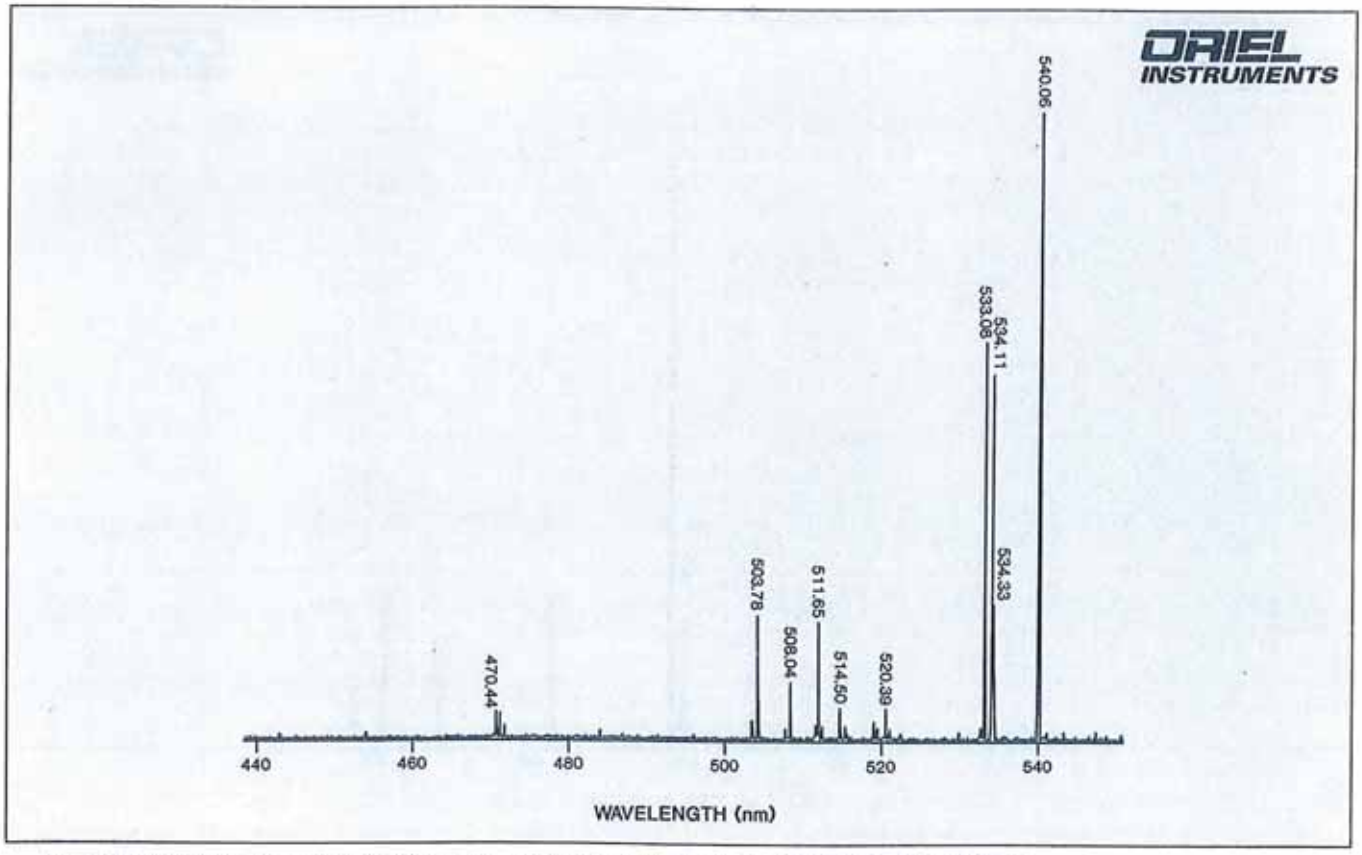


Fig. 16 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203·377·8282 **Fax:** 203·378·2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

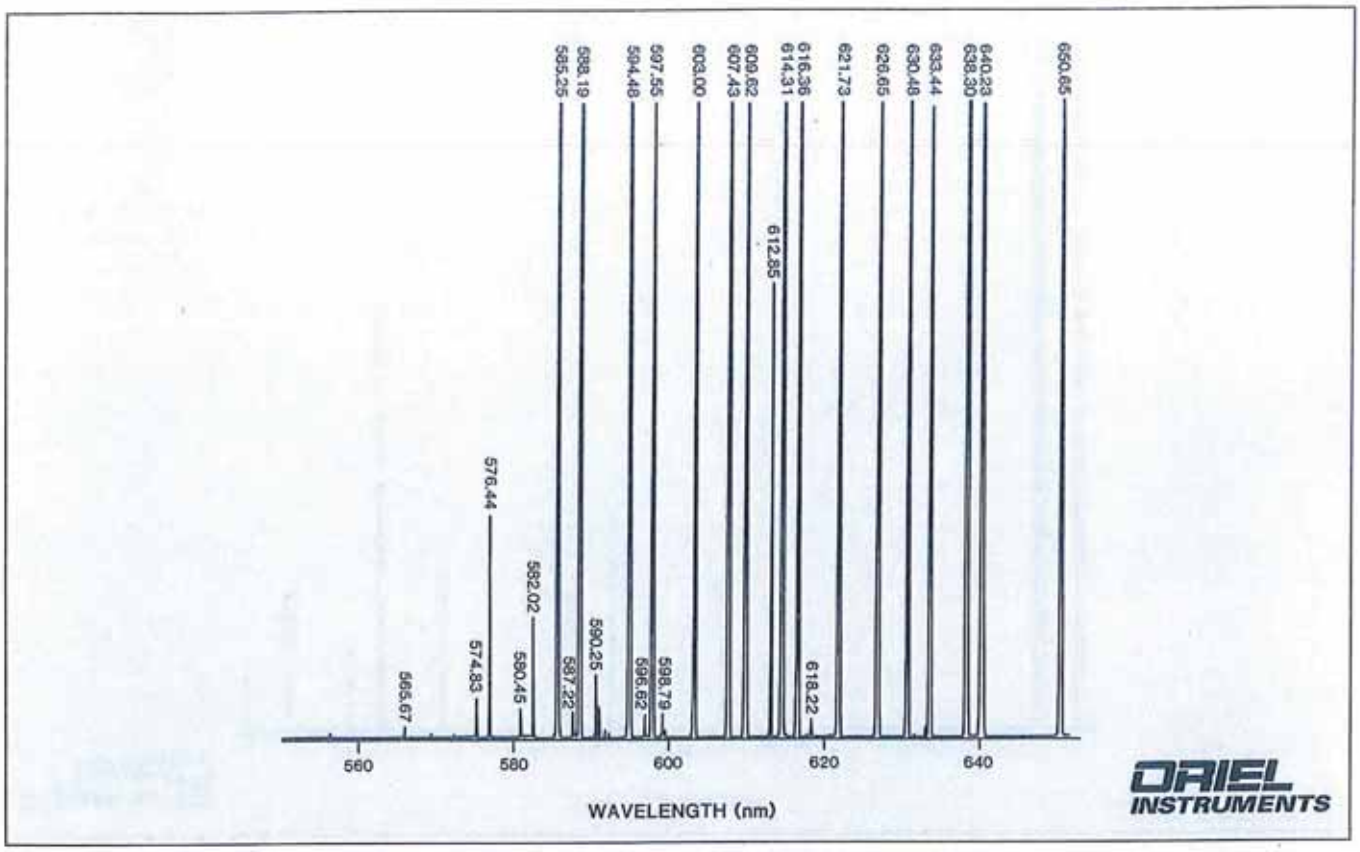


Fig. 17 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

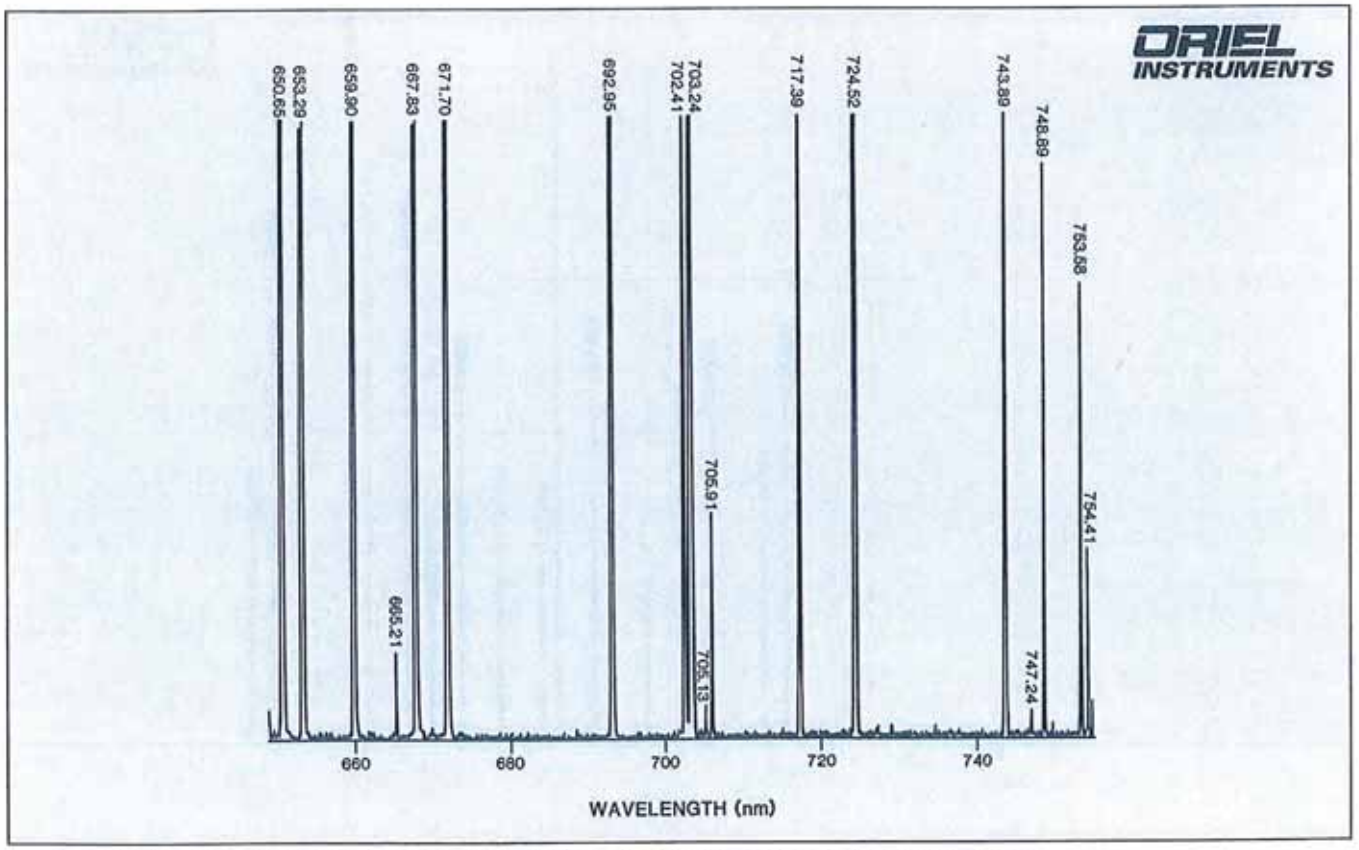


Fig. 18 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

NEON LAMP: SPECTRAL OUTPUT

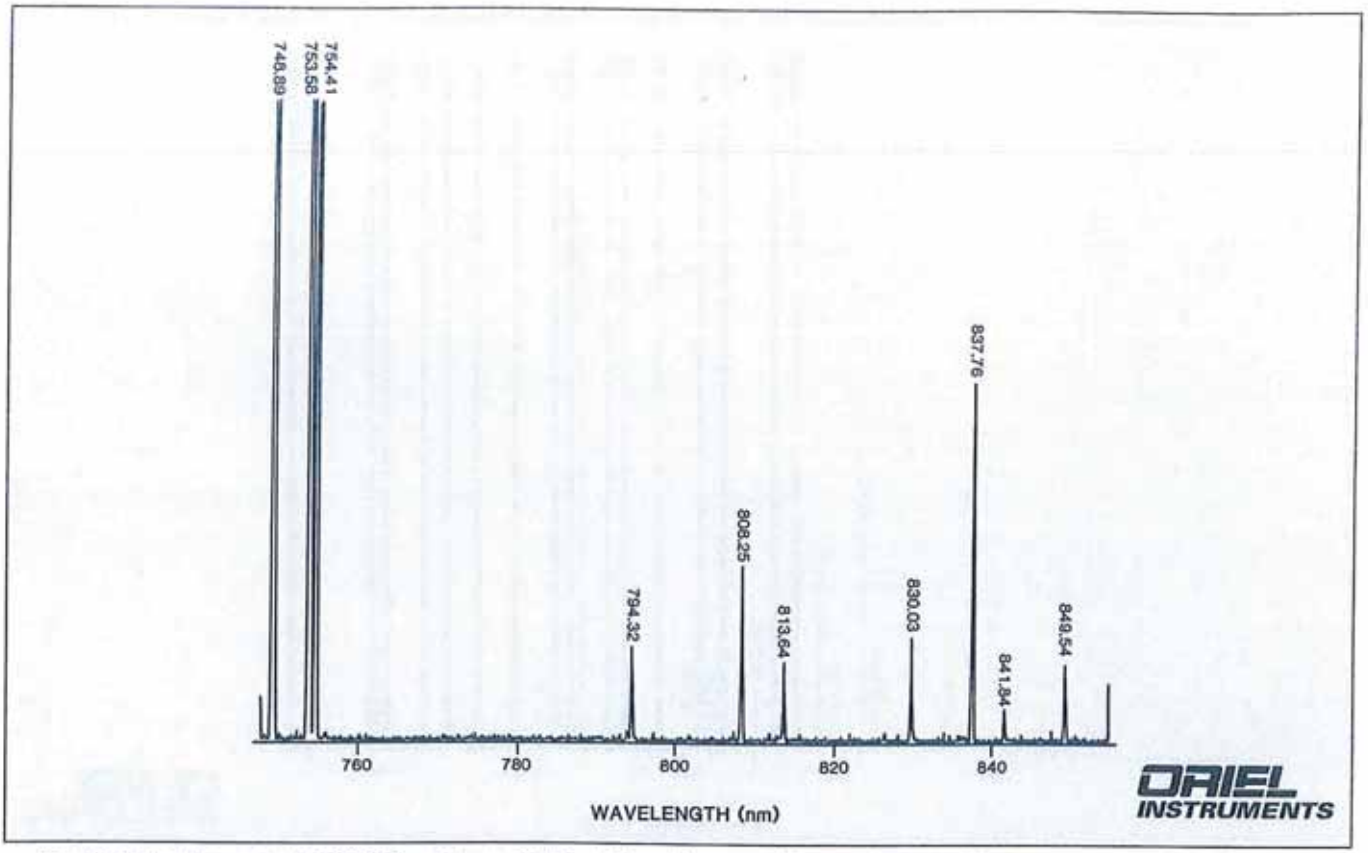


Fig. 19 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

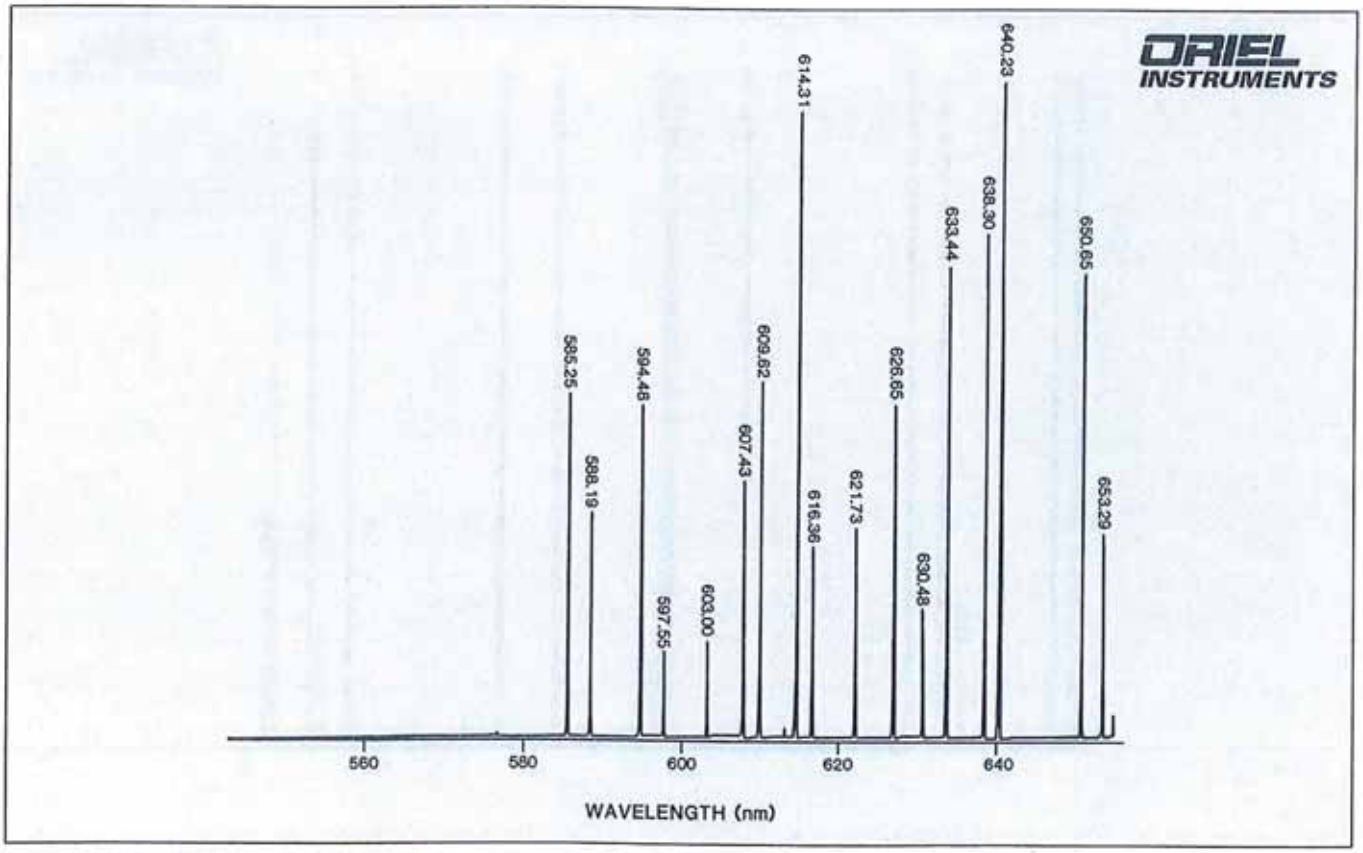


Fig. 20 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. Tel: 203·377·8282 Fax: 203·378·2457 E-Mail: res_sales@oriel.com
IRL · http://www.oriel.com

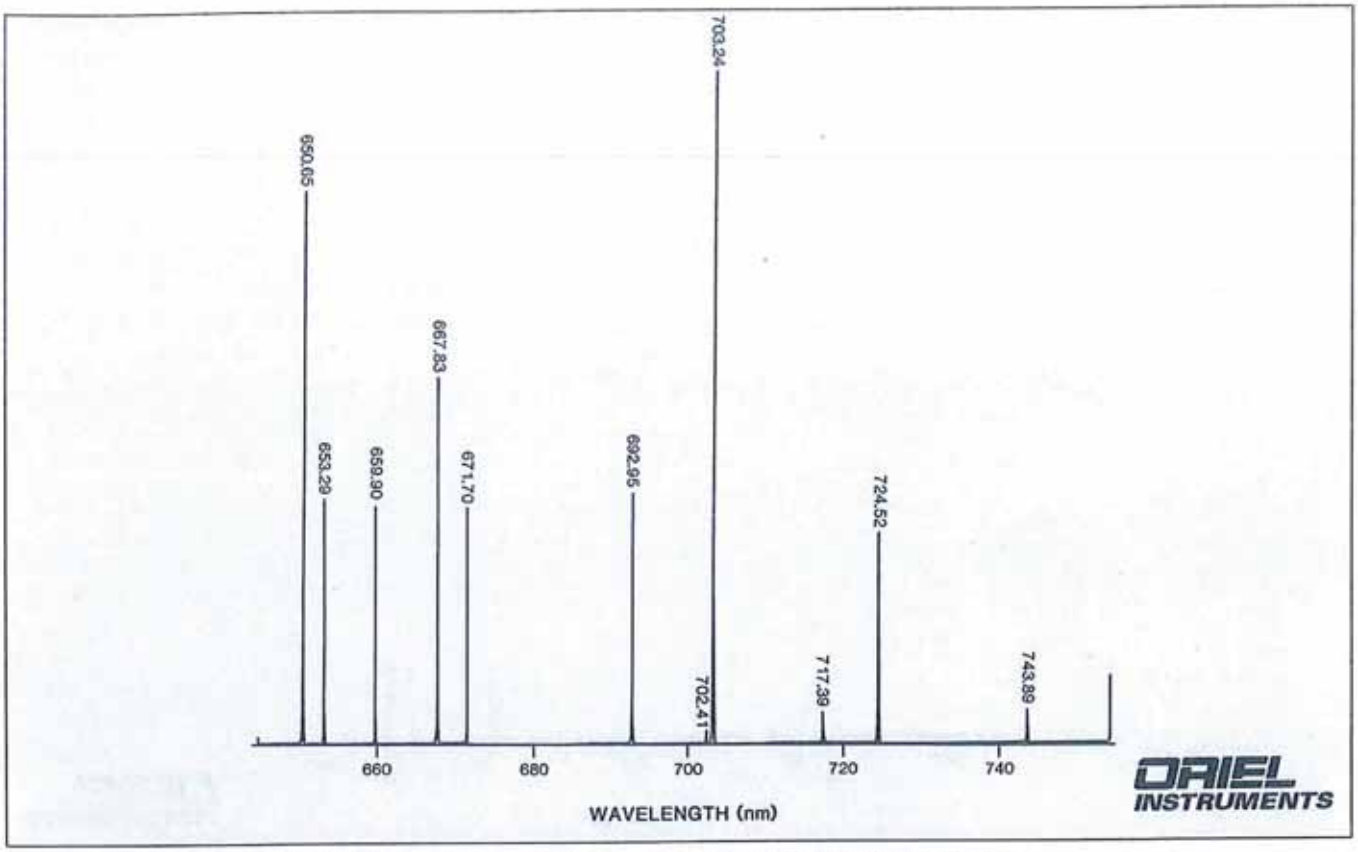


Fig. 21 Typical line output of 6032 Neon Lamp. Relative intensities vary with operating conditions.

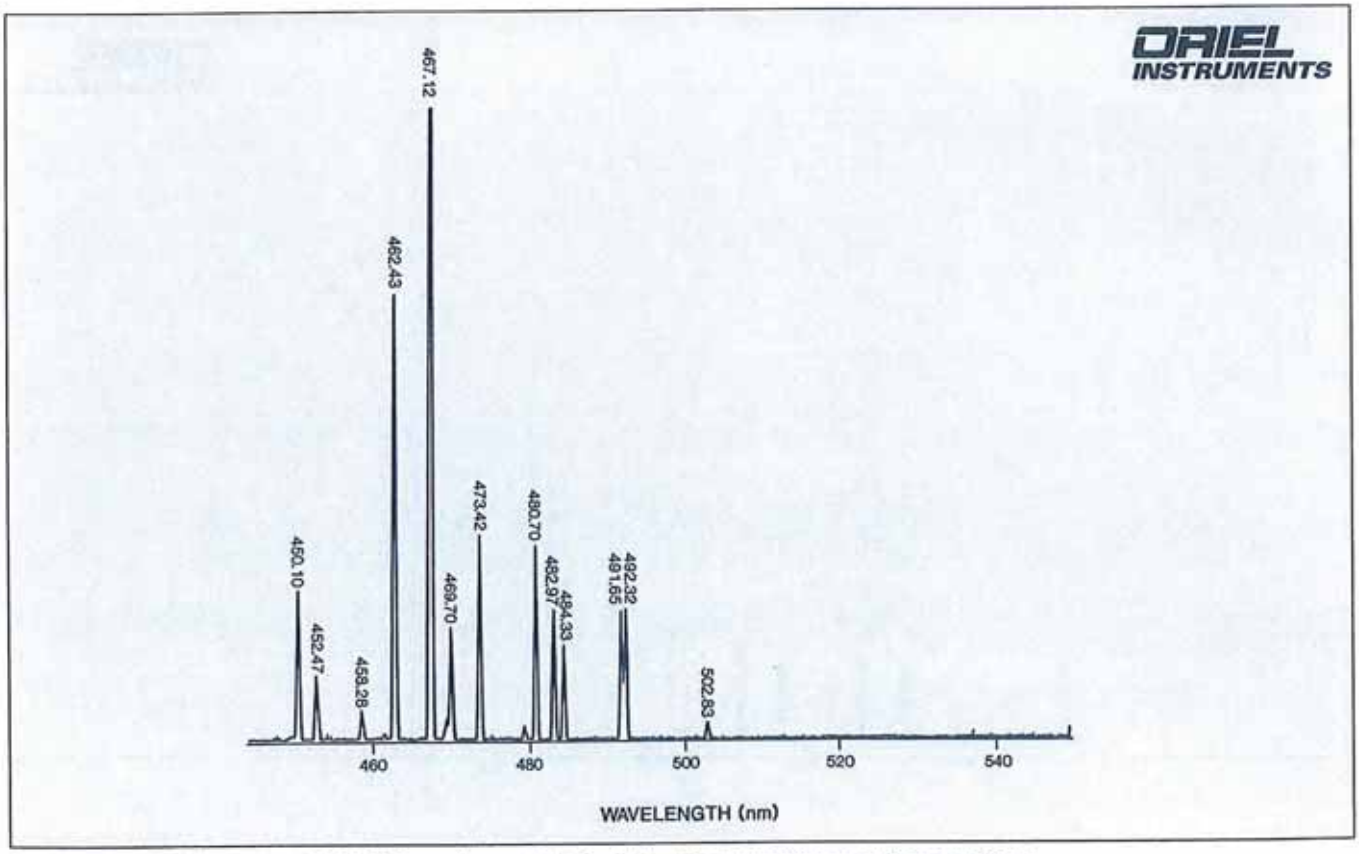


Fig. 22 Typical line output of 6033 Xenon Lamp. Relative intensities vary with operating conditions.

XENON LAMP: SPECTRAL OUTPUT

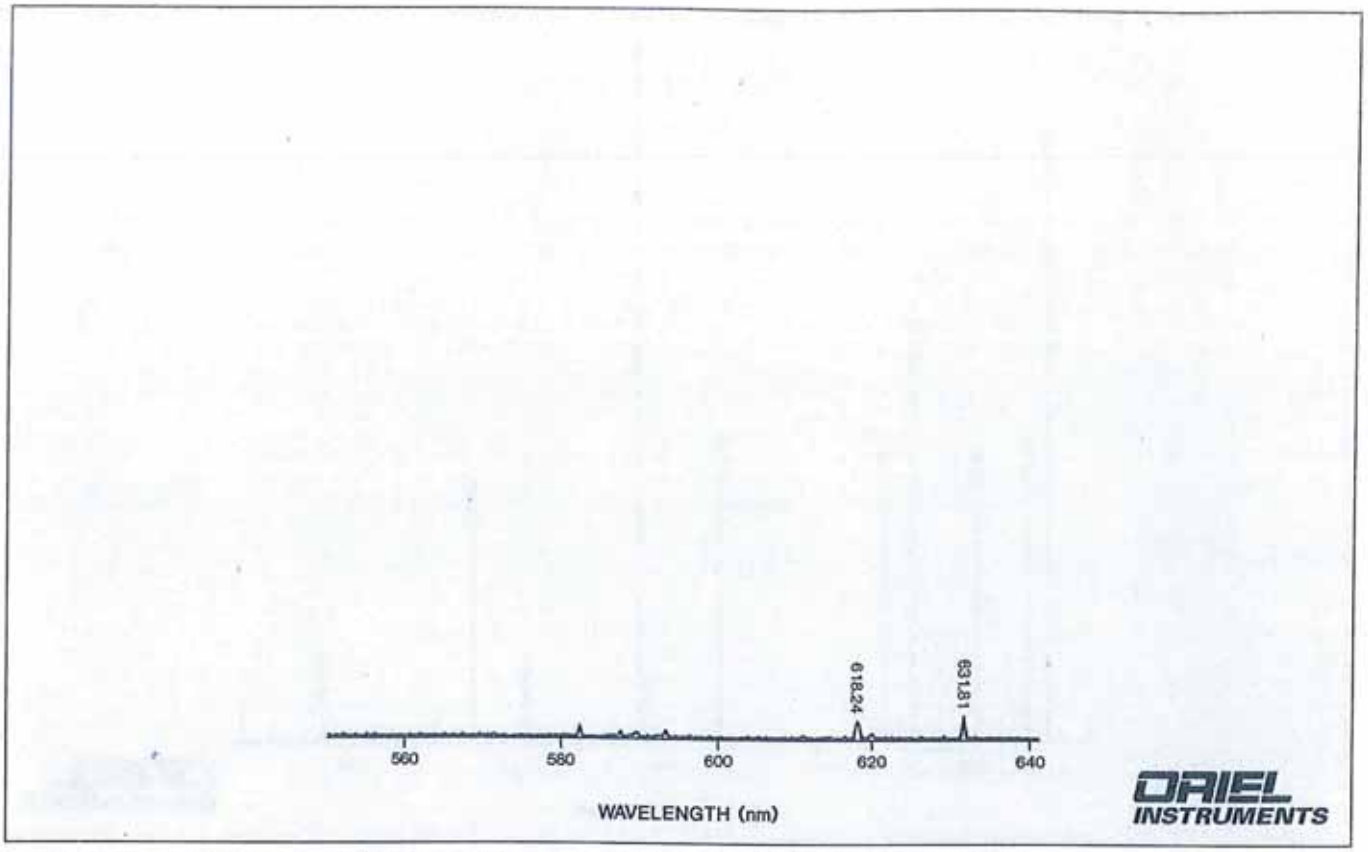


Fig. 23 Typical line output of 6033 Xenon Lamp. Relative intensities vary with operating conditions.

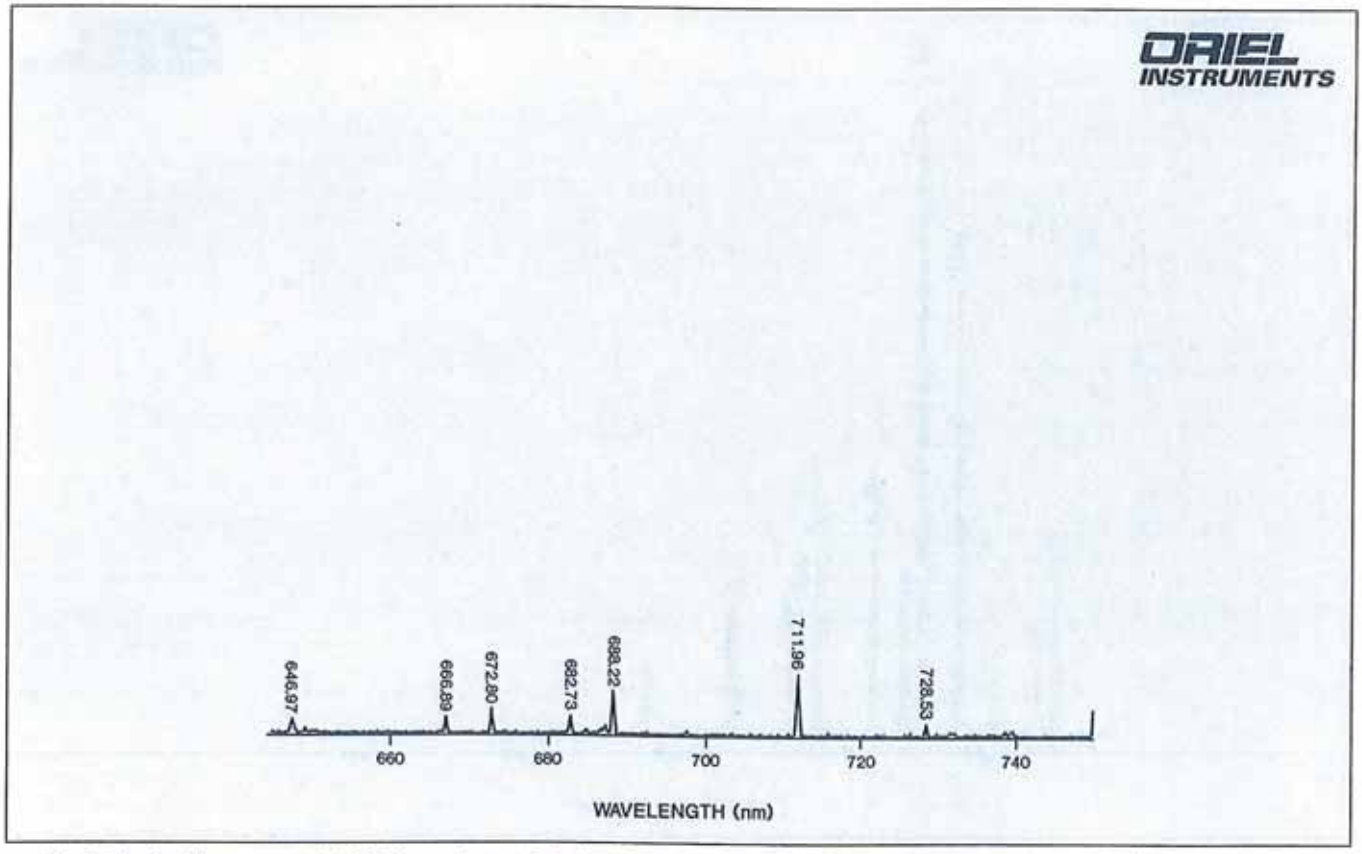


Fig. 24 Typical line output of 6033 Xenon Lamp. Relative intensities vary with operating conditions.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203·377·8282 **Fax:** 203·378·2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

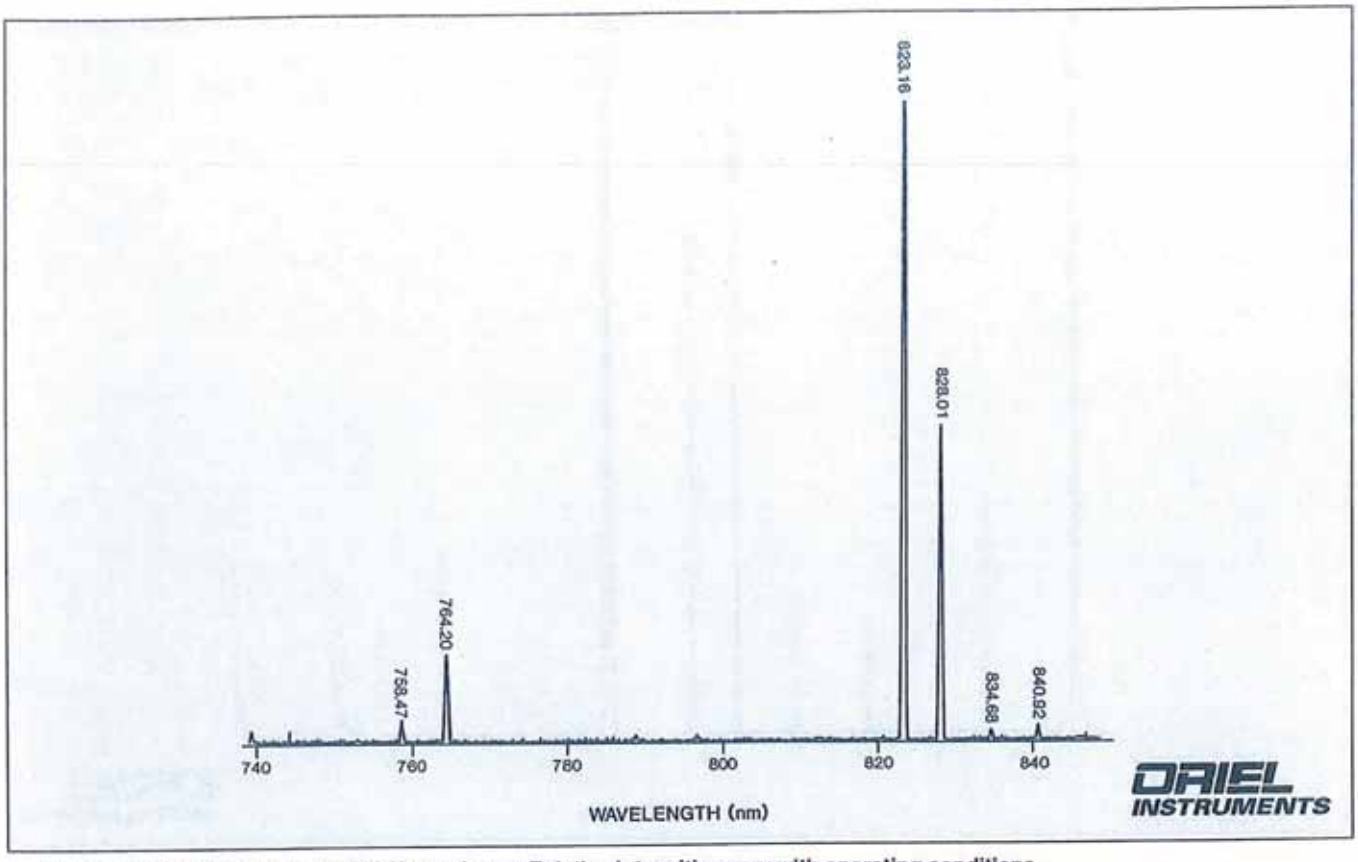


Fig. 25 Typical line output of 6033 Xenon Lamp. Relative intensities vary with operating conditions.

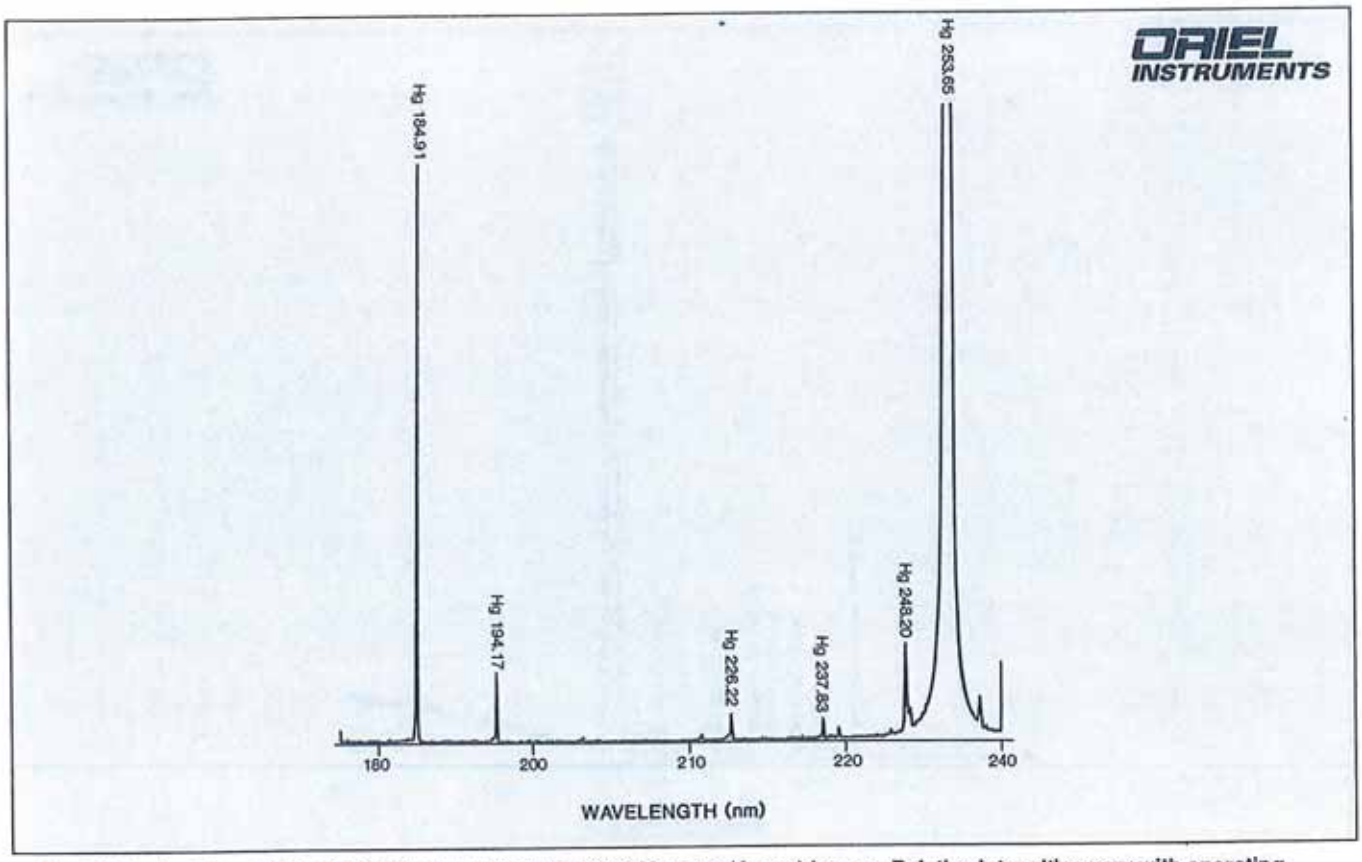


Fig. 26 Typical line output of 6034 Mercury-Neon and 6035 Mercury (Argon) Lamps. Relative intensities vary with operating conditions.

MERCURY-NEON LAMP: SPECTRAL OUTPUT

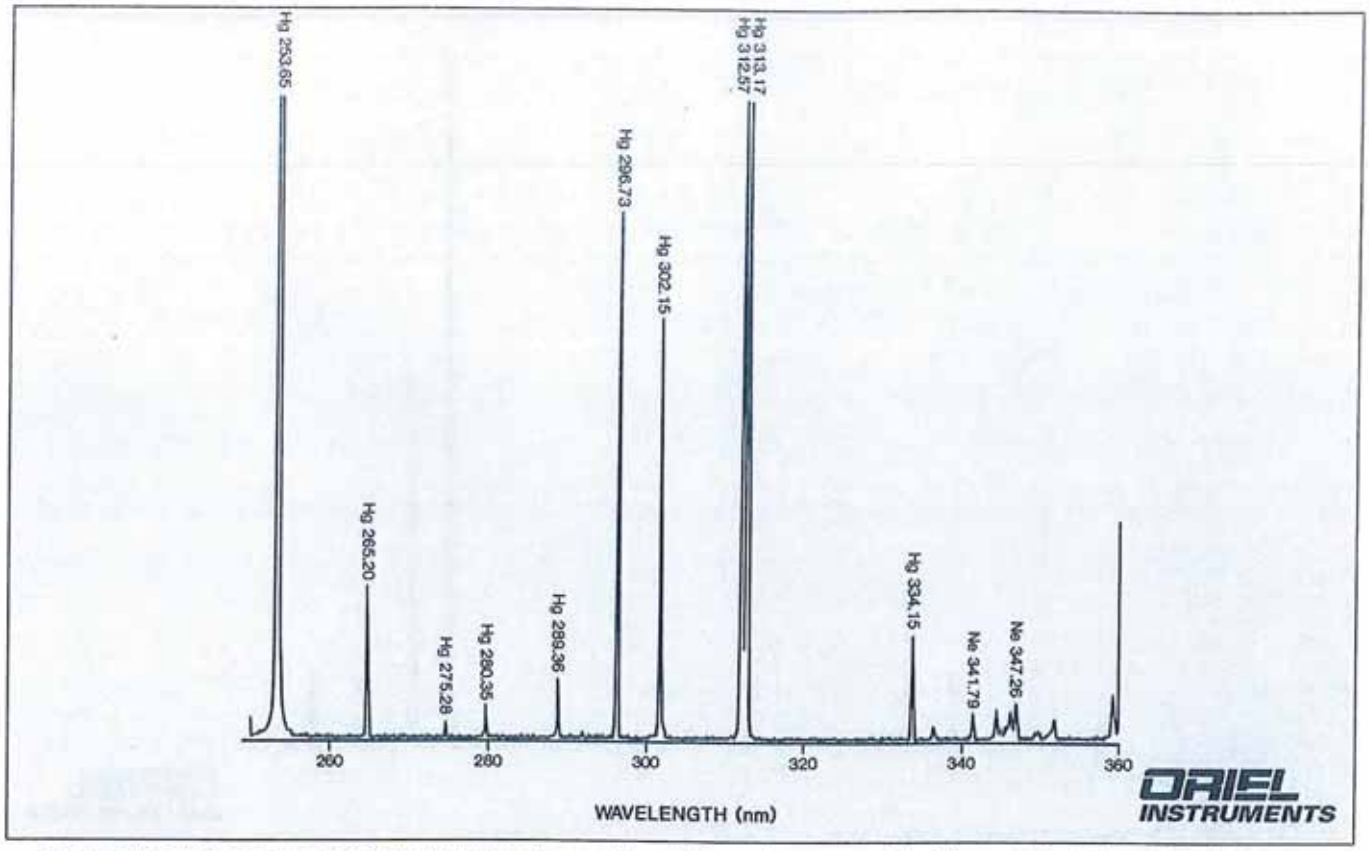


Fig. 27 Typical line output of 6034 Mercury-Neon Lamp. (Forced air cooling was used to bring out the Ne lines.) The Hg lines are present in the output of the 6035 Mercury (Argon) Lamp. Relative intensities vary with operating conditions.

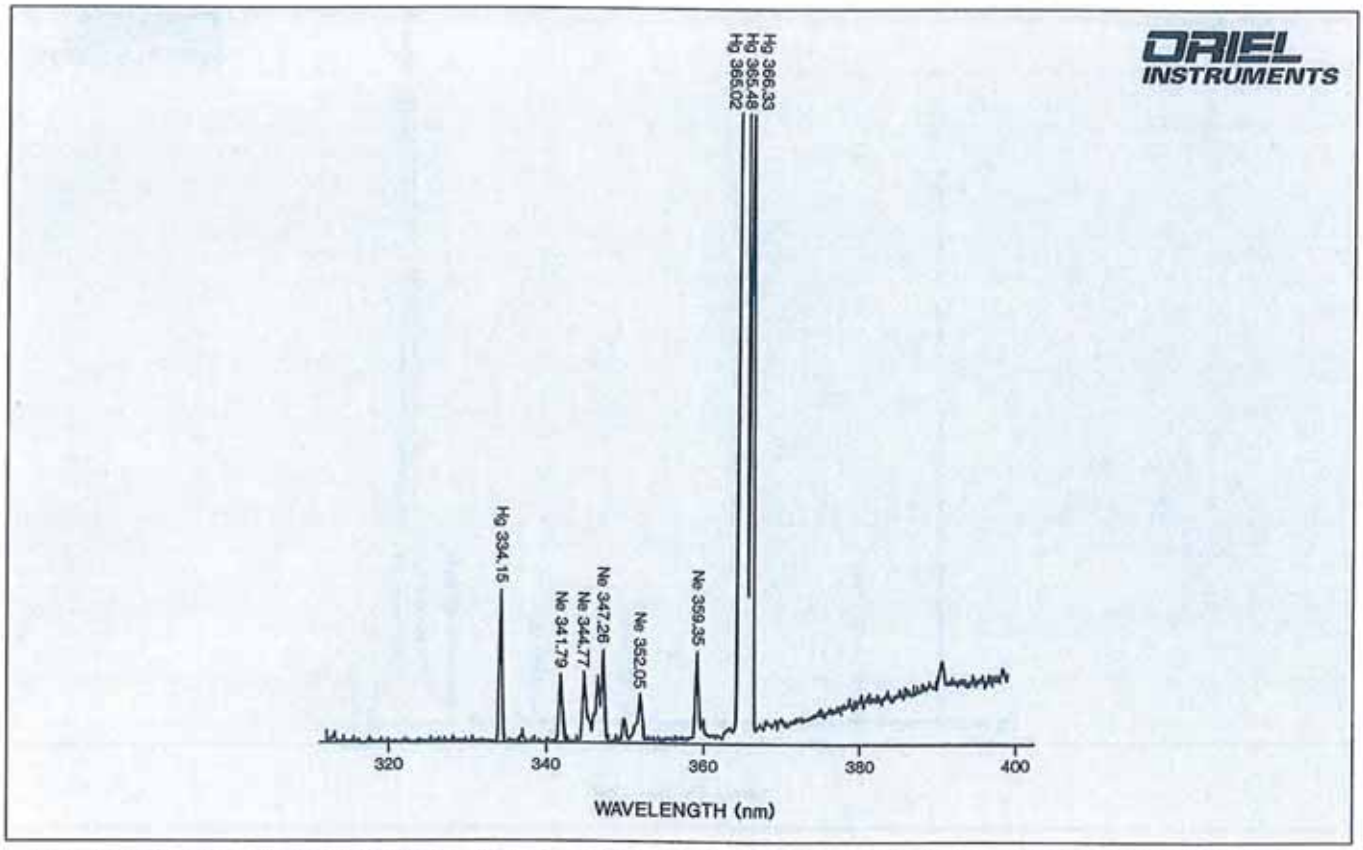


Fig. 28 Typical line output of 6034 Mercury-Neon Lamp. (Forced air cooling was used to bring out the Ne lines.) The Hg lines are present in the output of the 6035 Mercury (Argon) Lamp. Relative intensities vary with operating conditions.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203·377·8282 **Fax:** 203·378·2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

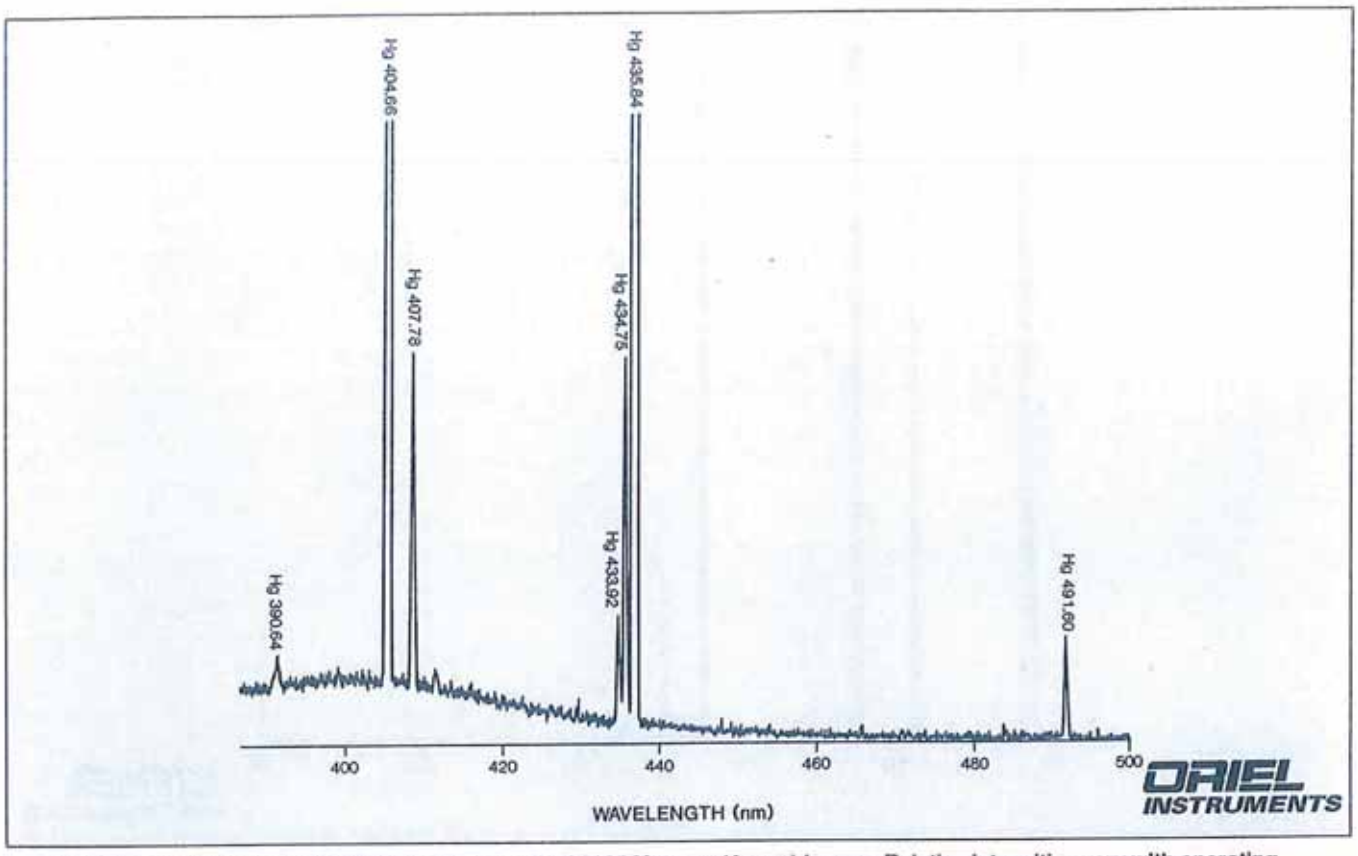


Fig. 29 Typical line output of 6034 Mercury-Neon and 6035 Mercury (Argon) Lamps. Relative intensities vary with operating conditions.

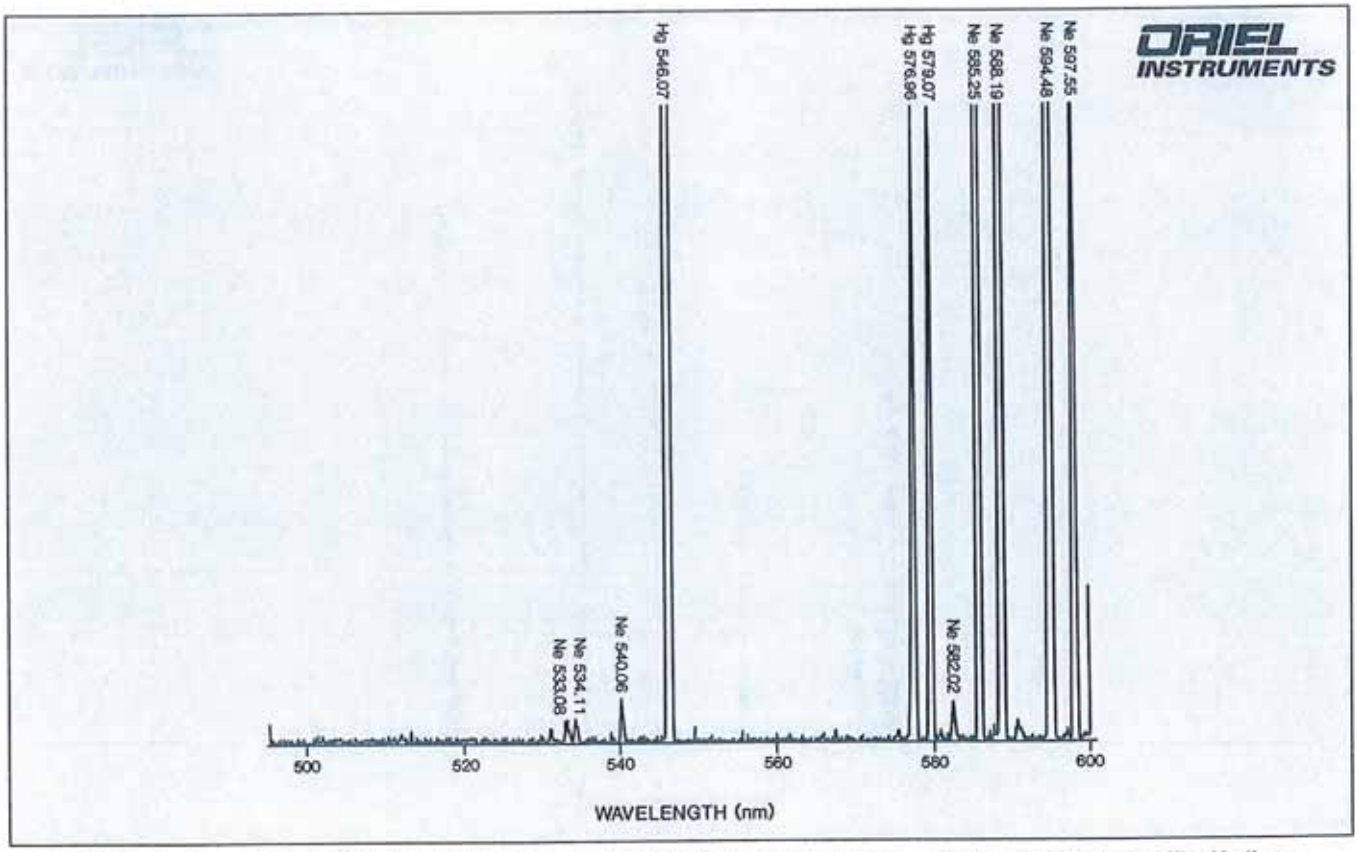


Fig. 30 Typical line output of 6034 Mercury-Neon Lamp. (Forced air cooling was used to bring out the Ne lines.) The Hg lines are present in the output of the 6035 Mercury (Argon) Lamp. Relative intensities vary with operating conditions.

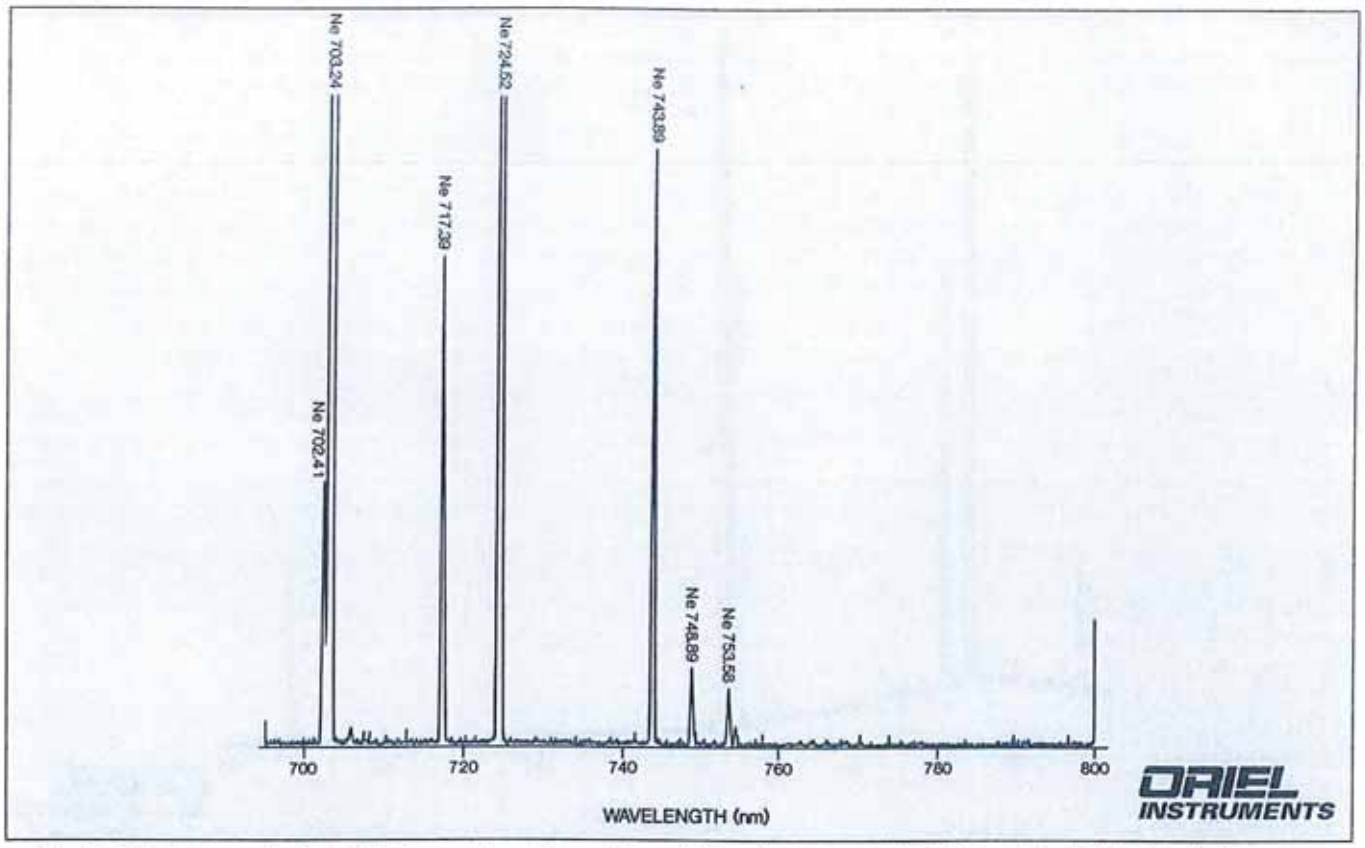


Fig. 31 Typical line output of 6034 Mercury-Neon Lamp. (Forced air cooling was used to bring out the Ne lines.) Relative intensities vary with operating conditions.

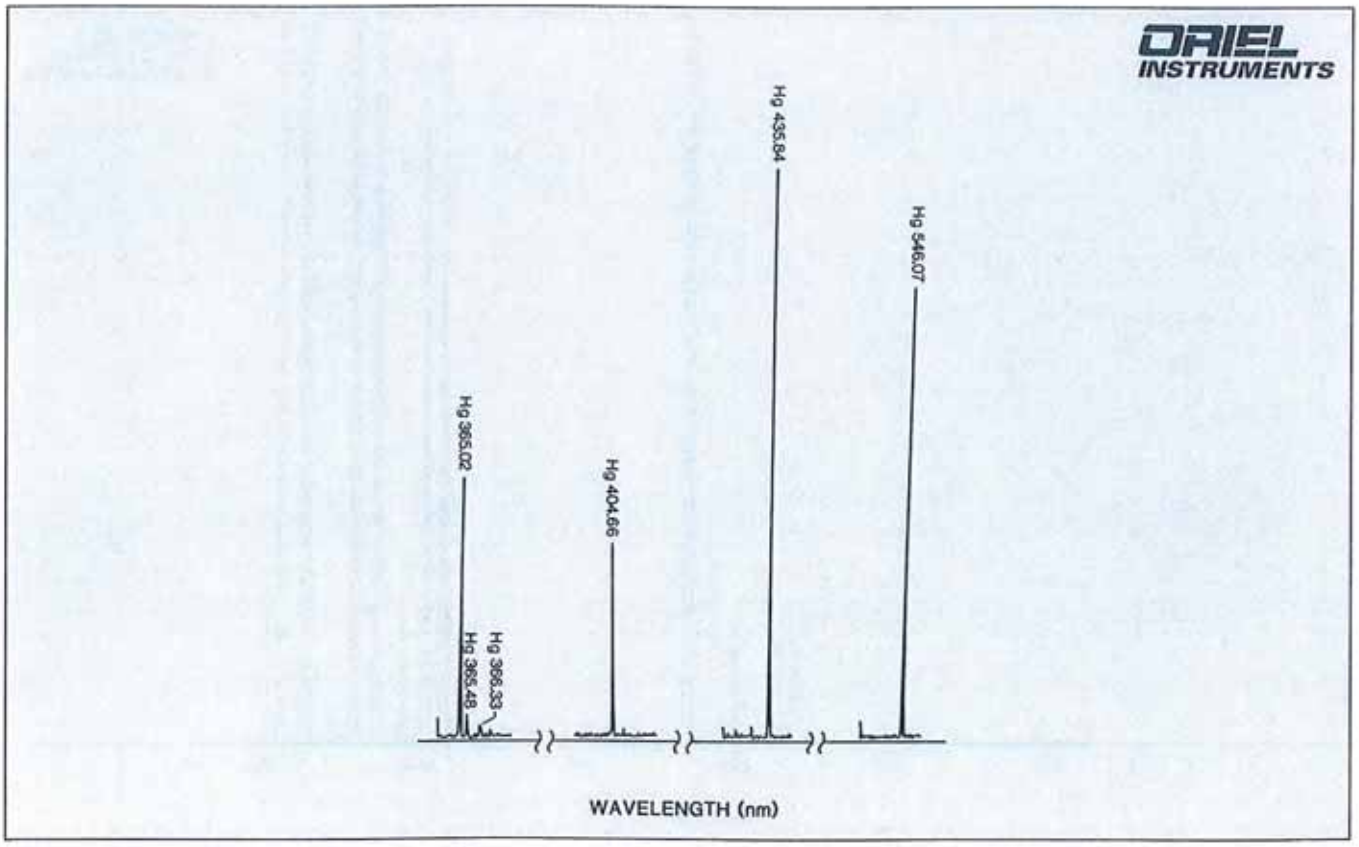


Fig. 32 Typical line output of 6034 Mercury-Neon and 6035 Mercury (Argon) Lamps. (Forced air cooling was used to bring out the Ne lines.) Relative intensities vary with operating conditions.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203·377·8282 **Fax:** 203·378·2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

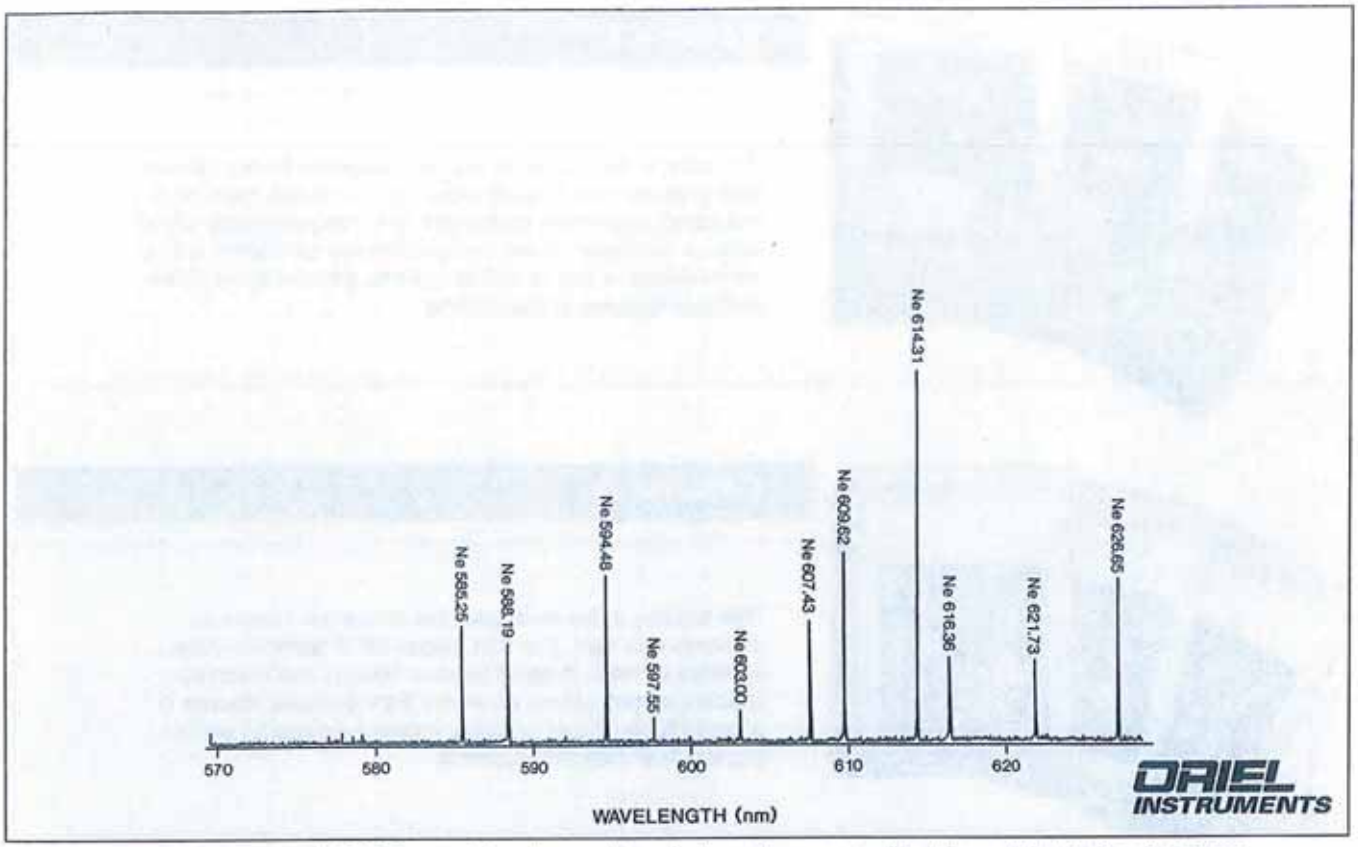


Fig. 33 Typical line output of 6034 Mercury-Neon Lamp. (Forced air cooling was used to bring out the Ne lines.) Relative intensities vary with operating conditions.

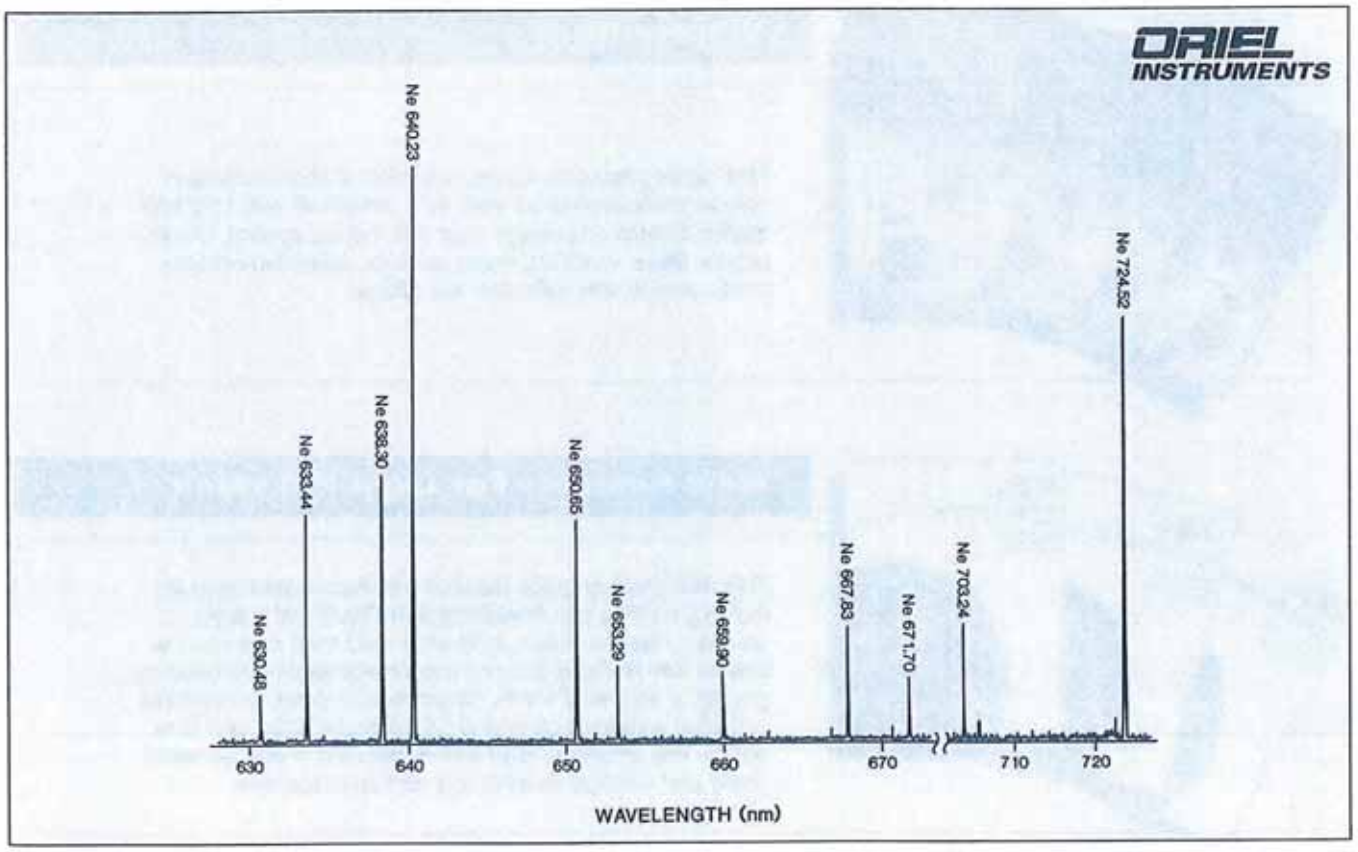
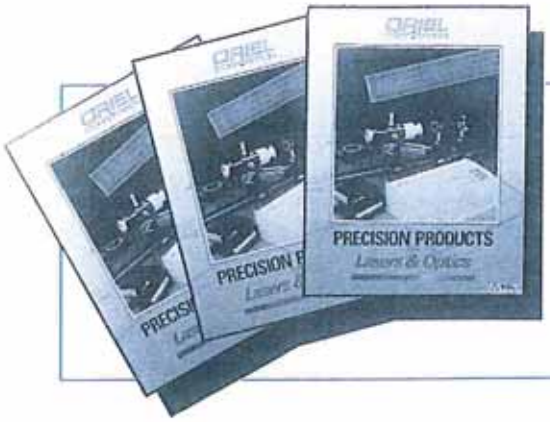
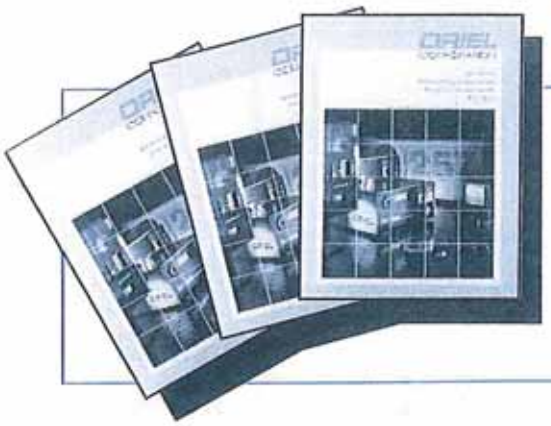


Fig. 34 Typical line output of 6034 Mercury-Neon Lamp. (Forced air cooling was used to bring out the Ne lines.) Relative intensities vary with operating conditions.



Volume I

This volume describes the support hardware for our electro-optical equipment. Optical tables and benches, manual and motorized positioning equipment, fully programmable stand alone or computer driven micropositioning controllers, and a comprehensive line of optical mounts are just some of the products featured in this catalog.



Volume II

This catalog is the most valuable reference source for research with light. It is 528 pages full of technical data, application notes, detailed product listings, and complete spectral output curves on all our light sources. Volume II covers UV to IR light sources, monochromators/spectrographs, and detection systems.

Volume III

This catalog features a large selection of fiber optics and optical components as well as a wealth of practical information to help you design your own optical system. UV-IR lenses, filters, windows, beam splitters, polarizing components, prisms, and reflectors are offered.

New Products For Light Research

This new product guide features the latest instruments for making, moving and measuring light. You'll find pulsed sources, nitrogen lasers, calibrated irradiance sources, low cost to fully featured imaging monochromators and spectrographs, a full line of UV-IR detectors and detection systems including a digital lock-in and CCDs and ICCDs, and fiber optics. The catalog is filled with application notes, technical notes and detailed descriptions and specifications.

250 Long Beach Boulevard, Stratford, CT 06497-0872 U.S.A. **Tel:** 203·377·8282 **Fax:** 203·378·2457 **E-Mail:** res_sales@oriel.com
URL: http://www.oriel.com

Making Light

Moving Light

Measuring Light

ORIEL INSTRUMENTS

250 Long Beach Blvd., Stratford, CT, U.S.A. **Tel:** (203)377-8282 **Fax:** (203)378-2457 **E-Mail:** res_sales@oriel.com **URL:** http://www.oriel.com