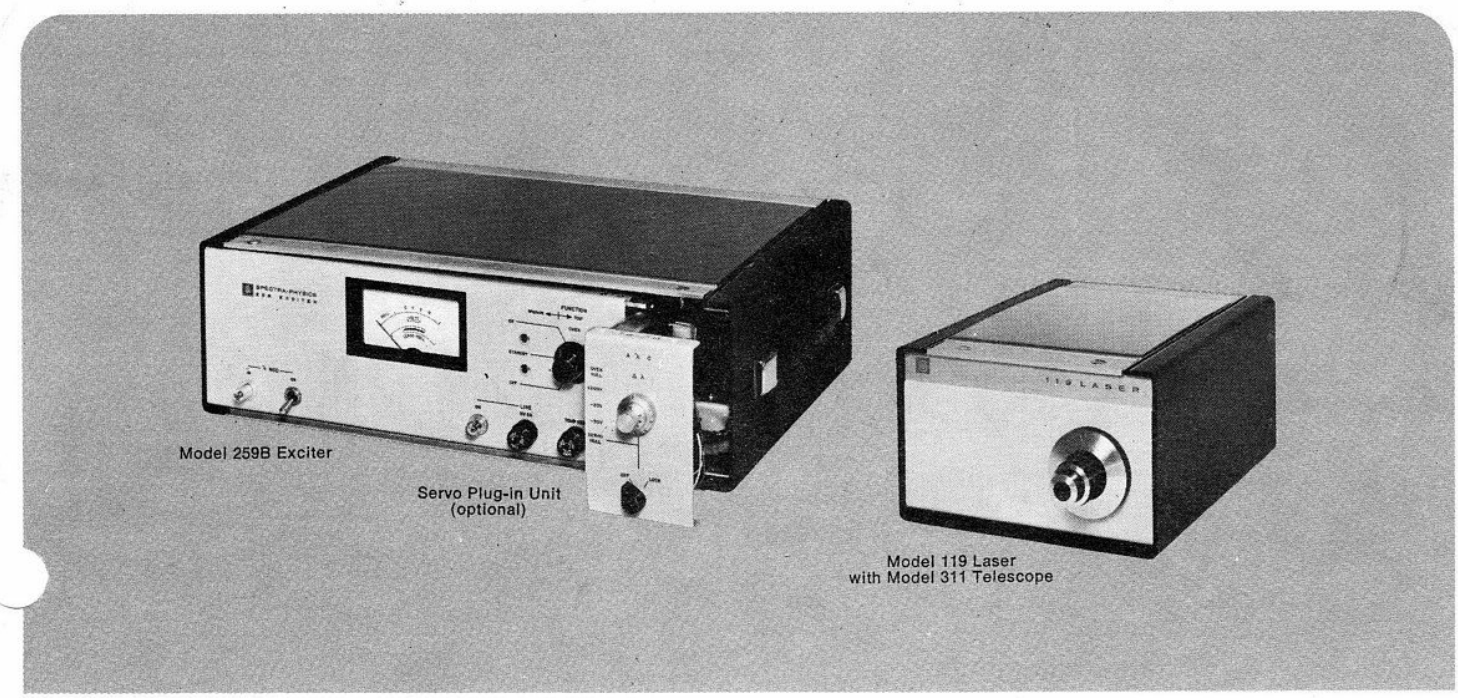
Data Sheet | Model

119

Stabilite

Single-Frequency Gas Laser

Spectra-Physics 1250 West Middlefield Road Mountain View, Calif. 94042 Telephone (415) 961-2550



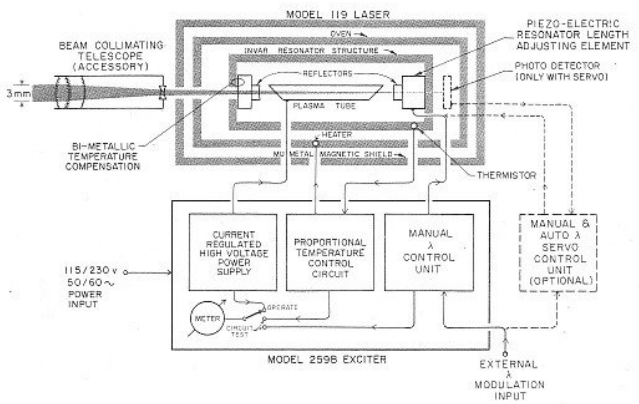
The Spectra-Physics Model 119 Gas Laser provides intense visible radiation having a high degree of both temporal and spatial coherence. A uniphase, frequency-stable source of optical radiation such as the Model 119 is useful in such applications as long path-difference, fringe-counting interferometry and optical heterodyning. The temporal coherence of the output radiation of the Model 119 is achieved by use of a stabilized optical resonator having a configuration such that only a single mode (transverse and longitudinal) is allowed to oscillate. An optional servo plug-in unit provides additional stability by locking the resonator frequency to the dip* which appears at the center of the doppler-broadened neon emission line of high-gain, CW helium-neon gas lasers.

*W. E. Lamb, Jr., "Theory of an Optical Maser," Phys. Rev., Vol. 134, pp 1429–1450; June 15, 1964.

Model 119 Specifications

Wavelength	6328 Å (See Wavelength determination discussion.)
Output Power	Greater than 100 microwatts, uniphase, single frequency.
Long-term Stability	(Output frequency deviation from the center of the neon-twenty emission line, after warm-up and assuming a maximum ambient temperature variation of ±one degree C.) Without servo control: ±75 Mc/day With servo control: ±1 Mc/day
Warm-up	Without servo control: Three hours maximum from "off" condition. Thirty minutes maximum from "standby" condition. With servo control: 45 minutes max. from "off" condition. None required from "standby" condition.
Beam Diameter (at 1/e² points)	Approximately one millimeter at laser aperture. (With optional beam collimating telescope; three millimeters.)
Beam Divergence	Approximately 10 milliradians. (With optional beam collimating telescope; <0.3 milliradian.)
External Modulation	Maximum deviation; 1200 Mc peak-to-peak, 10 to 3000 cps; 200 Mc peak-to-peak at 20,000 cps. Modulation sensitivity; ~12 Mc/volt.
Servo Fm Deviation	<5 Mc peak-to-peak at a 5 Kc rate.
Repeatability of Servo Lock	Within 5 Mc of Ne^{20} line center.
Input Power	50/60 cps; 115/230 volts; 250 VA max.
Dimensions	Model 119; 8½″ deep x 6¾″ wide x 4½″ high. Model 259; 12″ deep x 16¾″ wide x 5″ high. (Optional brackets provide standard rack mounting)
Weight	Model 119: Approx. 10 pounds. Model 259: Approx. 25 pounds.

Model 119 System Block Diagram



The Model 119 Laser consists of: a cold cathode dc excited plasma tube containing isotopically pure helium-three and neon-twenty; an invar resonator structure having bi-metallic temperature compensation; and two dielectric resonator reflectors, one of which is mechanically coupled to a piezo-electric element for fine resonator tuning. A photo-detector for monitoring output level is included when using optional servo control. The resonator and plasma tube are contained in a temperature-controlled oven which is further housed in a mu-metal cover to shield the invar resonator from magnetostrictive modulation effects caused by external magnetic fields.

The Model 259B Exciter contains: a regulated dc high-voltage power supply; a thermistor bridge temperature-sensing circuit coupled to a proportional oven temperature-controller; a manual wavelength-control circuit which operates the piezo-electric element; an input for external modulation of laser frequency; and monitoring circuitry providing front-panel meter indication of overall system performance. Provision is also made on the front panel of the Model 259B to allow direct plug-in of the optional Servo Control Plug-In Unit.

Discussion of Wavelength Determination The output wavelength of the Model 119 Gas Laser has not been compared directly with a primary standard of length. However, it is believed to be very close to a value obtained for a helium-neon laser at the National Bureau of Standards[1]:

λ = 6328.1983 Å in air at 20°C, 760 torr atmospheric pressure, 59% relative humidity, and 0.03% CO_2,

or

λ = 6329.9146 Å in vacuum[2].

The Model 119 Gas Laser operates at the center of the emission line of the isotope Ne^{20}, whereas the NBS measurement was made at the peak of the emission profile for natural neon which contains approximately 9% Ne^{22}. Because of isotope shifts, we believe that the Model 119 Gas Laser operates at a wavelength not more than 6 parts in 10^8 longer than the NBS value. However, this estimate is not supported by any measurements and we therefore recommend use of the NBS values pending comparison of the Model 119 Laser with a primary standard.

[1] K. D. Mielenz, H. D. Cook, K. E. Gillilland, and R. B. Stephens, Science 146, 1672 (1964).

[2] For the refractive index of air under various conditions, see National Bureau of Standards Monograph No. 3: Tables of Wavenumbers, or The American Institute of Physics Handbook, 2nd ed., pages 6–96 (dry air only).

Prices and specifications subject to change. Export prices slightly higher.
Contact home office or local representative for current price information.

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5M — 6/73

Printed in U.S.A.