



PART NUMBER 0405L-21A  
 ITEM NAME 405 NM SLM LASER (VBG DIODE; FREE-SPACE)

## PRODUCT DATASHEET



### DESCRIPTION

This model of single-frequency (SLM) 405 nm laser is widely used in compact Raman spectrometers. Small footprint and +5VDC (USB typical) operating voltage is exactly what's needed for handheld portable devices. Integrated precision driver electronics ensure low-noise and stable operation throughout the wide temperature range. 405 nm UV radiation features high-energy photons, therefore much lower power is enough for efficient excitation of fluorescence or Raman scattering.

This free-space laser can be supplied with an integrated clean-up filter.

#### Note:

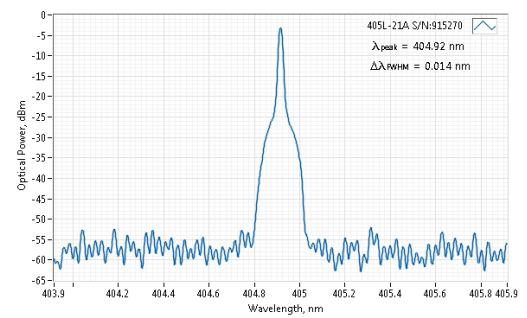
In optical systems with strong back-reflections (e.g. more than 10%), the laser must be protected by using an optical isolator with at least 20 dB isolation. Typical applications include interferometry, confocal microscopy (especially working with reflective samples), etc. Failure to comply with these requirements will render the warranty void for cases of COD (Catastrophic Optical Damage) of laser diode facets.

### SPECIFICATIONS

Specifications updated: 2 September 2021

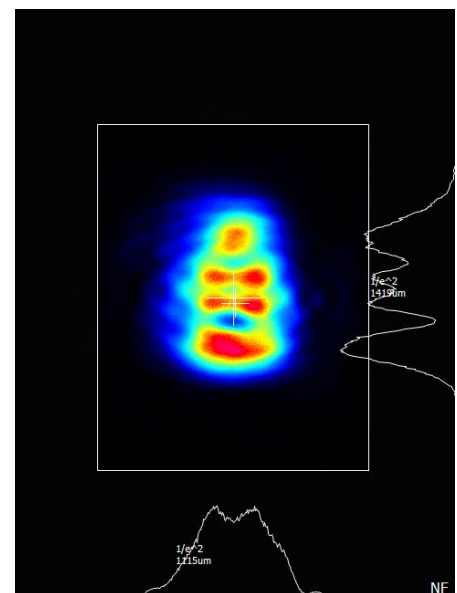
Parameter	Minimum Value	Typical Value	Maximum Value
Central Wavelength, nm	404.5	405	405.4
Spectral line width FWHM, pm	-	0.1 <sup>1</sup>	1
Output power, mW	-	50 <sup>2</sup>	70
Power stability, % (RMS, 8 hrs)	0.02	0.05 <sup>3</sup>	0.2
Power stability, % (peak-to-peak, 8 hrs)	0.1	0.3 <sup>4</sup>	1
Intensity noise, % (RMS, 20 Hz to 20 MHz)	0.1	0.25 <sup>5</sup>	0.6
Side-mode suppression ratio (SMSR), dB	40	50	60
Longitudinal modes	-	Single	-
Transversal modes	-	TEM <sub>00</sub>	-
Beam width (1/e <sup>2</sup> ), mm	-	0.9 <sup>6</sup>	1.4
Beam height (1/e <sup>2</sup> ), mm	-	1.3	1.7
Horizontal beam divergence, mrad	-	0.9	1.5
Vertical beam divergence, mrad	-	0.5	1
M <sup>2</sup> horizontal axis	-	1.2	1.4
M <sup>2</sup> vertical axis	-	1.3 <sup>7</sup>	2.0
M <sup>2</sup> effective	-	1.3	1.6
Polarization direction	-	Horizontal <sup>8</sup>	-
Polarization contrast	1000	2000	5000
Control interface type	-	UART <sup>9</sup>	-
Operation mode	-	APC (CW) <sup>10</sup>	-
Modulation bandwidth, MHz	-	N/A <sup>11</sup>	-
Input voltage, VDC	4.8	5	5.3

### TYPICAL SPECTRUM



Typical spectrum of 0405 nm diode laser. Measured with 10 pm resolution.

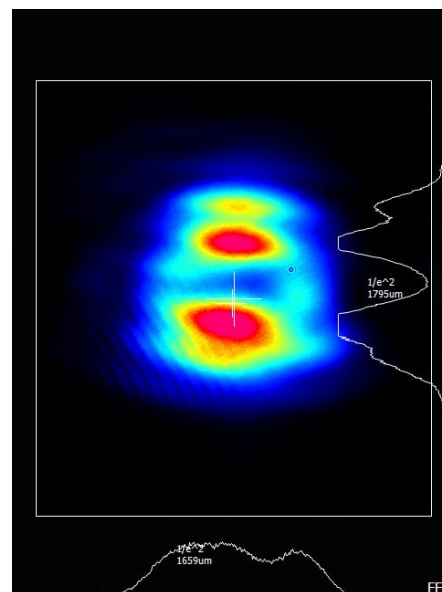
### TYPICAL NEAR FIELD



Typical near field (0.45 m from output aperture) beam profile. Non-circularized beam of a 0405 nm direct diode laser.

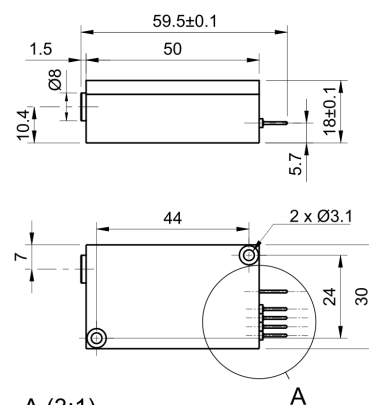
Input current, A	-	1.5	-
Max. power consumption, W	0.4	2	10
Heat-sinking requirement, °C/W	-	1	-
Optimum heatsink temperature, °C	15	20	30
Warm up time, mins (cold start)	0.2	1	2
Temperature stabilization	-	Internal TEC	-
External fan control	-	Yes	-
Overheat protection	-	Yes	-
Storage temperature, °C (non-condensing)	-10	-	50
Beam height from the base, mm	9.9	10.4	10.9
Dimensions (WxDxH), mm	-	50 x 30 x 18 <sup>12</sup>	-
Net weight, kg	0.1	0.12	0.14
Laser Safety Class	-	3B	-
RoHS	-	Yes	-
CE compliance	-	- General Product Safety Directive (GPSD) 2001/95/EC - (EMC) Directive 2004/108/EC	-
OEM lasers are not compliant with	-	IEC60825-1:2014 (compliant using additional accessories)	-
Warranty, months (op. hrs)	-	14 (10000) <sup>13</sup>	-
Country of origin	-	Lithuania	-

## TYPICAL FAR FIELD



Typical far field (1 m from output aperture) beam profile. Non-circularized beam of a 0405 nm direct diode laser.

## DRAWING



MatchBox  
Free-Space

<sup>1</sup> Measured with a scanning Fabry-Perot interferometer having 7.5 Mhz resolution, with scanning frequency of about 10 Hz. Interferometer testing is not provided for each laser being manufactured, the standard test is OSA measurement with 10-20 pm resolution instead.

<sup>2</sup> The output power of SLM lasers shall not be tuned and SLM performance is not guaranteed at power ratings other than factory preset. However, the power setting capability is not disabled. External attenuators are recommended instead.

<sup>3</sup> The long term power test is carried out at constant laser body temperature (+/-0.1 °C) using an optical power meter with an input bandwidth of 10 Hz. The actual measurement rate has a period of about 20 seconds to 1 minute.

<sup>4</sup> The long term power test is carried out at constant laser body temperature (+/-0.1 °C) using an optical power meter with an input bandwidth of 10 Hz. The actual measurement rate has a period of about 20 seconds to 1 minute.

<sup>5</sup> Noise level is measured with a fast photodiode connected to an oscilloscope. The overall system bandwidth is from 2 kHz to 20 MHz.

<sup>6</sup> Beam width and height are measured at 0.45 m from output aperture.

<sup>7</sup> The beam of this laser usually contains small artifacts, which make the  $M^2_y$  measurement worse. The beam quality improvement on Y-axis (vertical) is possible by sacrificing some output power (up to 30% loss of power). However, in applications where SM fiber coupling is needed, even at  $M^2_y = 2.0$  we guarantee that 50% of radiation will be coupled into the fiber.

<sup>8</sup> For lasers without integrated optical isolators.

<sup>9</sup> Break-out-boxes AM-C8 and AM-C3 can be used for conversion of UART communication to either USB or RS232.

<sup>10</sup> APC - Automatic Power Control.

<sup>11</sup> SLM lasers shall not be modulated - use external modulators instead.

<sup>12</sup> Excluding control interface pins and an output window/fiber assembly.

<sup>13</sup> Whichever occurs first. The laser has an integrated operational hours counter.

Note: Product specifications are subject to change without prior notice to improve reliability, function or design or otherwise.