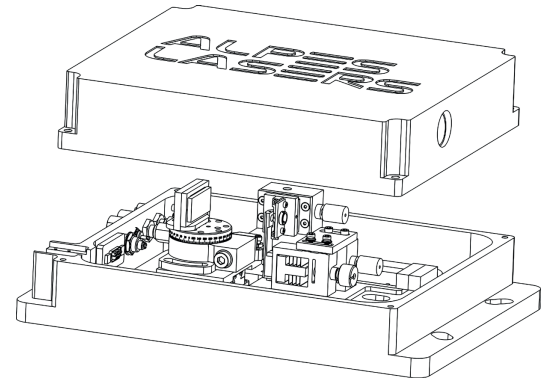


## External Cavity Laser Kit

Alpes Lasers introduces the External Cavity Laser Kit. The kit contains a mount for a QCL chip and a grating on a rotation mount to allow for wavelength selection, a driver and a temperature controller. The optical output is a single-beam of light whose wavelength can be selected within a typical range of  $\sim 200 \text{ cm}^{-1}$ , a considerable advantage over the typical DFB range of  $10 \text{ cm}^{-1}$ .



### Key Features

- Large scanning range
- Pulsed operation (CW in some cases)
- Modular
- Highly Customizable
- Graphical interface
- Direct access to system possible

### Key Applications

- System development
- Teaching
- Gain material validation



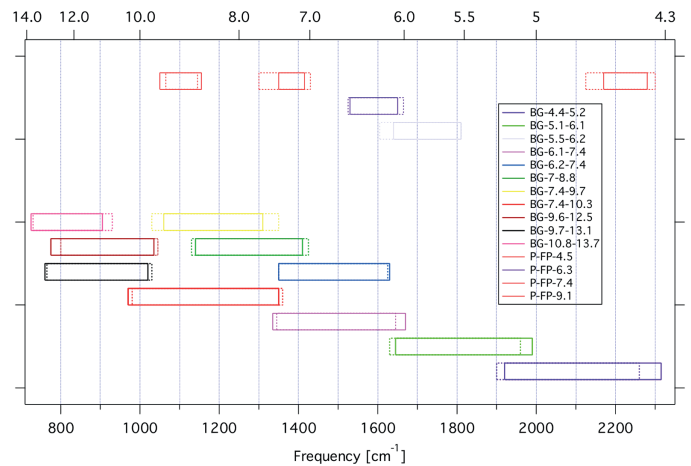
## Specifications

PARAMETER NAME	MINIMUM VALUE	TYPICAL VALUE	MAXIMUM VALUE	UNIT	NOTE
Spectral Linewidth		1	2	$\text{cm}^{-1}$	May be degraded in case of sub-optimal Alignment.
Gapless tuning range	50	200	300	$\text{cm}^{-1}$	These values may not be achieved by all gain media, the actual values for tuning range, peak power and average power are dependent on the selected gain medium.
Grating period	100	-	450	$\text{mm}^{-1}$	The optimal grating for the selected chip will be included in the ECLK. If the user needs to operate the kit with chips of incompatible wavelength ranges it is possible to purchase additional gratings.
Sweep rate	$< 0.3$	-	$> 2700$	$\text{cm}^{-1}/\text{s}$	The values for a specific configuration will depend on wavelength and grating selected. Specific devices will have a fixed angular sensitivity taking a value between $7.5 \text{ cm}^{-1}/^\circ$ and $36.7 \text{ cm}^{-1}/^\circ$ . The sweep rate of the motor can be varied by the user from $0.008^\circ/\text{s}$ to $360^\circ/\text{s}$ .
Spectral Accuracy / Repeatability	0	0.5	2	$\text{cm}^{-1}$	As the system does not contain a wavelength reference, the accuracy is fixed by the calibration that must be obtained from an external reference such as an FTIR or a Wavemeter. The numbers given take only into account the repeatability.
Maximum peak power	40	100	400	mW	Tuning range, peak power and average power are dependent on the selected gain chip, the values given here are typical for most chips.
Average power	1	5	20	mW	Tuning range, peak power and average power are dependent on the selected gain chip, the values given here are typical for most chips.
Power stability	-	-	5	%	
Pulse width	200	300	CW	ns	Not all chips are capable of CW operation. 300 ns is the typical test pulse length used when qualifying the kit.
Pulse repetition frequency	-	0.17	1	MHz	170 kHz is the typical PRF used for qualification tests of the kit.
Duty cycle	0.1	5	100	%	Not all chips are capable of CW operation. 5% is the typical duty cycle used for qualification tests of the kit.
Beam quality	1.2	1.5	2.0		
Beam diameter	-	-	4	mm	
Beam divergence	-	-	6	mrad	
Pointing stability	-	-	6	mrad	
Operation temperature	0.1	20	30	$^\circ\text{C}$	Cold temperatures require water cooling. Temperatures below the dew point require a purging of the cavity.
Cooling	-	Passive	Water		Performances will depend on cooling options chosen. At low duty cycle typically passive cooling is sufficient. Beware that when operating below the dew point, purging is Necessary.
TEC current	-	-	5	A	
TEC voltage	-	-	6	V	
Dimensions		308*220*100		$\text{mm}^3$	This comprizes only the Optical engine. The electronics comes additional.
Delivery time			20	weeks	

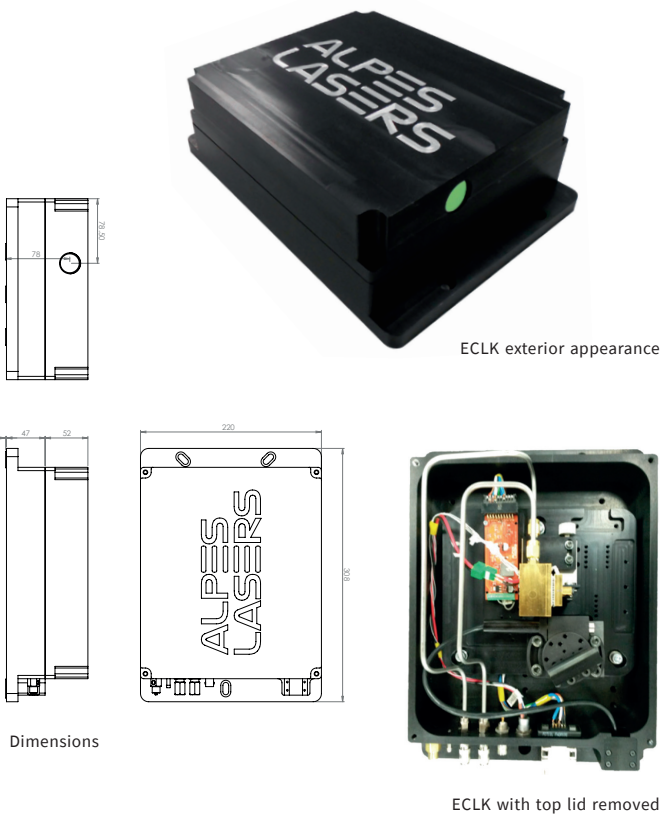
## Available BG chips

LASER CHIP NAME	MINIMUM TUNING RANGE	MIN. POWER OVER RANGE
BG-3.2-3.6	2820 – 3070 $\text{cm}^{-1}$	> 2 mW
BG-4.4-5.2	1970 – 2230 $\text{cm}^{-1}$	> 4 mW
BG-5.1-6.1	1660 – 1930 $\text{cm}^{-1}$	> 5 mW
BG-5.5-6.2	1635 – 1780 $\text{cm}^{-1}$	> 7 mW
BG-6.1-7.4	1375 – 1615 $\text{cm}^{-1}$	> 0.8 mW
BG-6.2-7.4	1380 – 1595 $\text{cm}^{-1}$	> 0.1 mW
BG-7-8.8	1160 – 1395 $\text{cm}^{-1}$	> 1.2 mW
BG-7.4-9.7	1060 – 1320 $\text{cm}^{-1}$	> 2.5 mW
BG-7.3-10.2	1010 – 1345 $\text{cm}^{-1}$	> 8 mW
BG-9.6-12.5	830 – 1015 $\text{cm}^{-1}$	> 0.1 mW
BG-9.7-13.1	795 – 1000 $\text{cm}^{-1}$	> 0.25 mW
BG-10.8-13.7	760 – 900 $\text{cm}^{-1}$	> 0.25 mW

Partial list of available Broad Gain laser chips that can be integrated into the ECLK. A more complete lists can be found on our website, including narrower gain options and more recently developed options.



Tuning ranges of some available chips



Alpes Laser's line of External Cavity Laser Kit (ECLK) is designed for single-mode operation with wide spectral tunability. The ECLK consists of a quantum cascade laser (QCL) gain chip, a grating-tuned extended optical cavity in Littrow configuration, driver electronics and control software. The kit is delivered assembled and may require alignment before use. Alignment documentation and training courses (in Switzerland) are available. Additional gain chips with different wavelength coverage and/or output power can be purchased from Alpes Lasers and installed in the instrument by the user. The ECLK is compatible with the Alpes Lasers line of Broad Gain QCLs which tune over up to 25 % of their center wavelength.

The system is entirely documented and open. It can easily be modified and customized for a specific purpose. The system comes with a controller providing a Web based graphical user interface allowing to access all the functionalities of the system.