



Applications

- High-resolution spectroscopy
- Quantum technology
- Holography
- Raman spectroscopy
- Fluorescence microscopy
- Detector calibration

- Wide gap-free tuning ranges in the visible and near-infrared
510 - 750 nm, 1020 - 1500 nm and 1.7 - 3.4 μm
- Fully automated wavelength approach
- More than 20 GHz mode-hop free tuning range in the visible
- Single frequency operation with < 500 kHz typical linewidth
- Output powers up to Watt-level

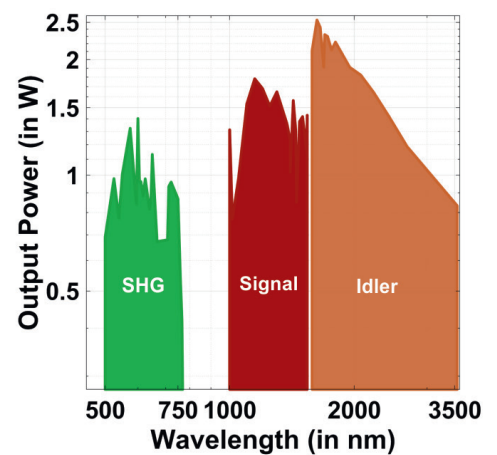
Continuous-wave laser emission – from green to red

The C-WAVE “Green-To-Red” (GTR) combines user-friendly and fully-automated handling with wide tunability in the visible. It offers Watt-level of mode-hop-free tunable single-frequency emission in a nearly perfect Gaussian beam with a beam quality factor $M^2 < 1.2$. In addition, the C-WAVE GTR covers the near-infrared spectrum between 1.0 and 3.4 μm .

The C-WAVE GTR provides outstanding spectral purity with a side-mode suppression ratio, which is typically >100 dB.

Finally, the excellent pointing stability even when tuning over hundreds of nanometers make C-WAVE GTR a flexible tool for demanding applications.

C-WAVE GTR
Typical output power



C-WAVE GTR

Specifications

	SHG (GTR)	Signal (NIR-I)	Idler (NIR-II)
Wavelength range	510 - 750 nm (typ. 500 - 760 nm)	1020 - 1500 nm (typ. 1000 - 1520 nm)	1.7 - 3.4 μm (typ. 1.6 - 3.5 μm)
Accuracy of Emission Frequency - Automated approach w/o wavemeter - Using ext. reference & AbsoluteLambda™	< 2 THz (typ. < 1 THz, corresp. < -1-2nm) < 2 MHz (depending on wavemeter)	< 1 THz < 1 MHz (depending on wavemeter)	
Output Power	> 300 mW (typ. > 500 mW)	> 600 mW* (typ. > 800 mW)	> 1W @ > 1.7 - 2.2 μm > 500 mW @ > 2.2 - 3 μm > 200 mW @ > 3 - 3.4 μm
Longterm Power Stability (typ. values over 8 hrs)	< 5 %	< 5 %	< 10 %
Noise (typ. values, 10 Hz - 10 MHz)	< 1% rms		
Beam Diameter at Aperture (1/e ² , typ. values)	1.2 mm	1 mm	1.7 mm
Beam Symmetry (typ. values)	> 0.90:1		> 0.8:1
Beam Divergence (full angle)	< 250 mrad	< 500 mrad	
Beam Polarization	linear, horizontal		
Spatial mode (TEM ₀₀)	M ² < 1.2		M ² < 1.4
Linewidth	< 1 MHz (< typ. 500 kHz)		
Mode-hop free tuning	> 20 GHz	> 10 GHz	
Warranty	12 months, unlimited hours		

* Specifications not valid from 1450 - 1500 nm.



WARNING VISIBLE AND INVISIBLE LASER RADIATION

Avoid eye or skin exposure to direct or scattered radiation.
Class 4 Laser Product



Classified per IEC 60825-1:2014

C-WAVE GTR

Operational Environment

Power Supply	110 V / 230 V
Communication Interface	Ethernet / RJ45
Intended use environment	Laboratory, air free of dust (recommended ISO 9)
Mounting surface	Vibration-isolated optical table
Storage Temperature	10 – 40 °C
Storage Humidity (non-condensing)	0 – 90 % relative humidity
Operating Temperature Range	20 – 25 °C, constant
Operating Humidity (non condensing)	10 - 85 % relative humidity
Ambient Air Pressure	950 – 1050 mbar
Power Consumption	< 200 W

Interfaces (Backpanel)

Optical Monitor Output OPO (optional)	<20 mW of OPO Signal	FC/APC
Electrical Monitor Output (Channel 1, Channel 2)	-5V to 5V out	SMA
Electrical Trigger Output	0V to 5V, TTL out	SMA
12 VDC in	Connects with the enclosed power supply	
Common Ground	GND	Flat Plug 6.3x0.8
Aux In	0V to 5V in	SMA
Purge In	0.1 to 0.5 sccm	4mm hose, dry air or N2 gas
Interlock (Remote & Pump Laser)	Short	SMA/RKMF3

Mechanical Specifications

Dimensions (C-WAVE GTR w/o pump laser)	645 x 486 x 133 mm ³ (L x W x H)
Weight (C-WAVE GTR w/o pump laser)	44kg
Shipping Weight, incl. Pump Laser, w/o Pallet	98 kg

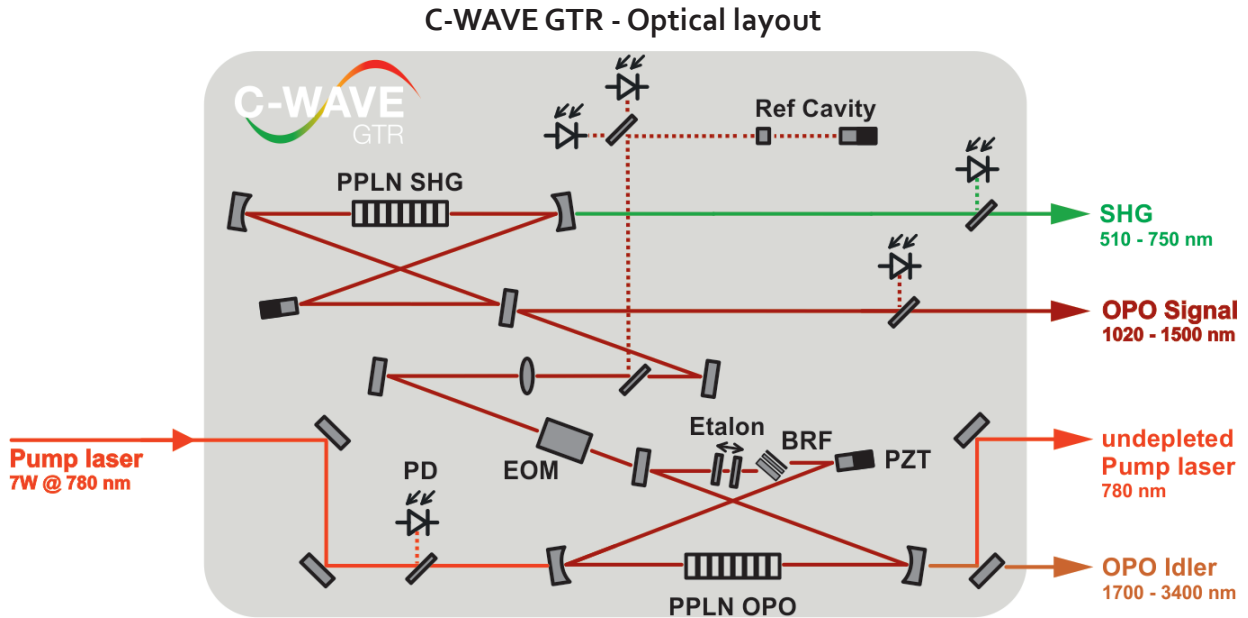
C-WAVE GTR

Operation principle

C-WAVE GTR combines two nonlinear processes to achieve its outstanding spectral coverage:

In the first step (OPO), a 780 nm laser pumps a nonlinear periodically-poled crystal (PPLN). Signal and idler photons with tunable frequencies in the near-infrared wavelength regime from 1020 nm to 1500 nm and 1.7 μm to 3.4 μm are generated.

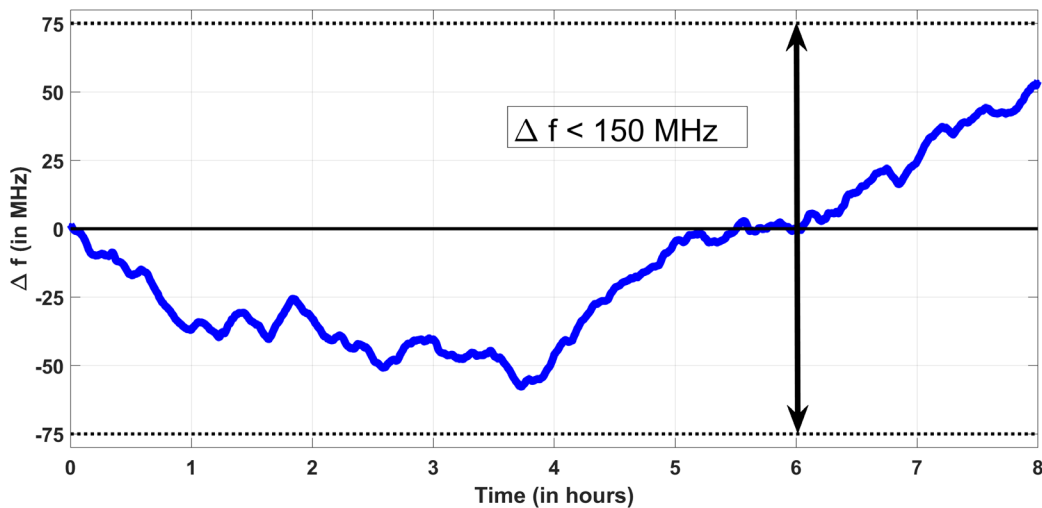
Subsequent second harmonic generation (SHG) using a frequency doubling crystal leads to conversion of the signal photons into colors from green to red (510 – 750 nm).



C-WAVE GTR delivers high quality CW output with typical linewidths of < 500 kHz corresponding to typical coherence lengths well above 100 m throughout both the visible and the near-infrared tuning range.

Thereby, a long term frequency stability of < 150 MHz over hours is routinely achieved at typical lab conditions based on the internal reference cavity and a Pound-Drever-Hall locking scheme. For applications with highest demands, the performance characteristics can be further improved by operating the system in closed-loop mode, i.e. in conjunction with an external wavelength measurement device using the AbsoluteLambda™ option for C-WAVE.

C-WAVE GTR - Typical frequency stability Using internal reference cavity at a wavelength of approx. 1100 nm



C-WAVE GTR

Tuning mechanisms

C-WAVE GTR can be tuned based on multiple mechanisms. The main three wavelength tuning mechanisms accessible are temperature tuning of the non-linear crystal (coarse tuning), intra-cavity Etalon scanning (quasi-continuous stepwise tuning), and scanning the OPO cavity length by a piezo-element (continuous mode-hop free tuning). These mechanisms can be combined and fully automated for truly continuous wavelength coverage.

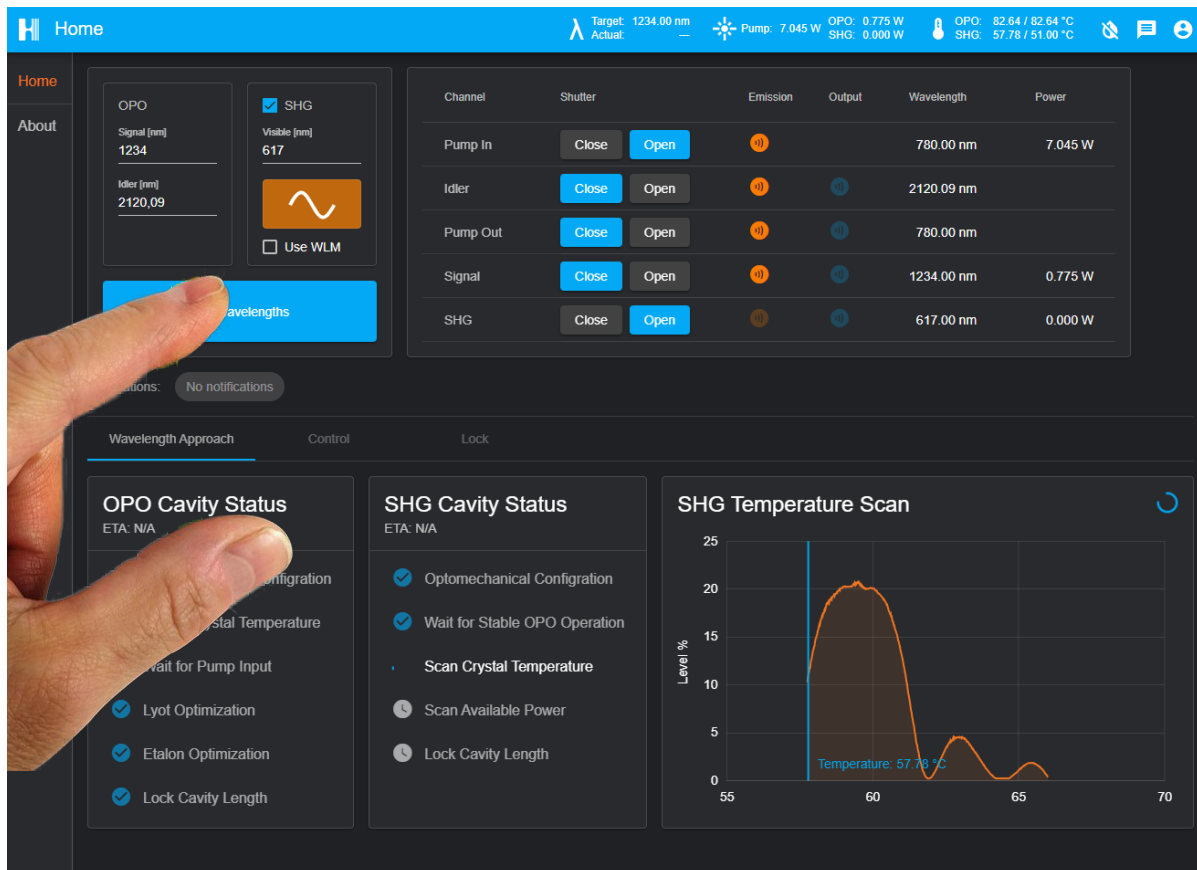
Tuning Mechanism	Parameter	Range*	Resolution*
Coarse	Crystal Temperature	Full System Range	< 1 THz
Stepwise	Intracavity Etalon Position	50 GHz	< 3 GHz
Continuous, (Mode-hop free)	Intracavity Piezo Voltage	10 GHz	100 kHz / mV

* Specifications refer to the NIR wavelength range. Numbers double for the GTR range.

Control software

C-WAVE GTR can be controlled via the intuitive user interface on a web browser from any device within your network. The user interface provides fundamental functionalities, such as automated wavelength approaches by the click of a button. The “advanced mode” gives comprehensive access to control actuators and parameters of the C-WAVE GTR. The user interface comprises real-time monitoring of all internal sensor readings making the control of C-WAVE GTR highly responsive and user-friendly.

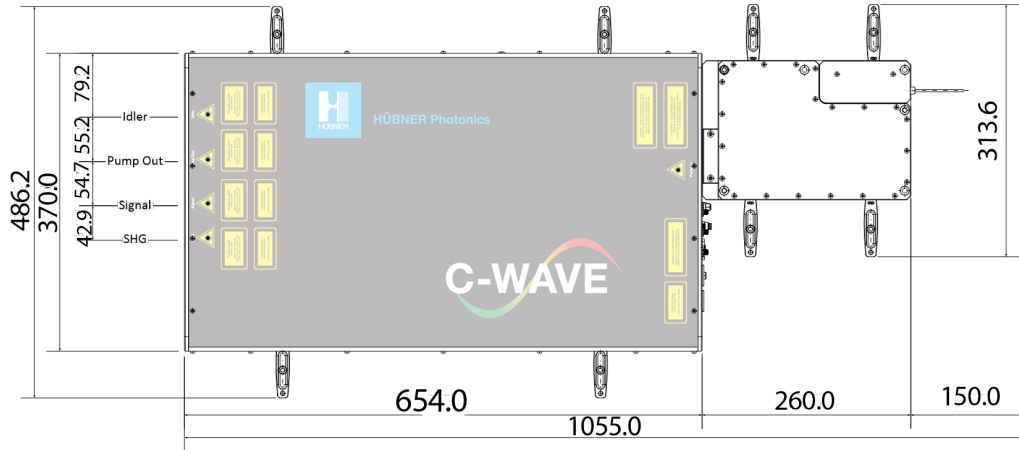
Communication with the C-WAVE GTR is based on websockets, allowing for flexible integration of the system into your software environment. Python bindings and example code are included.



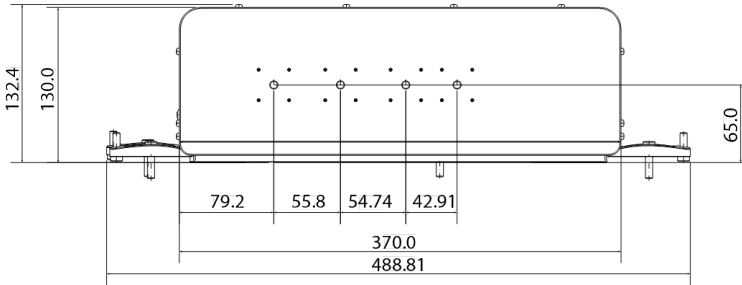
Specifications and technical data are subjects to change without notice due to technical developments.

C-WAVE GTR

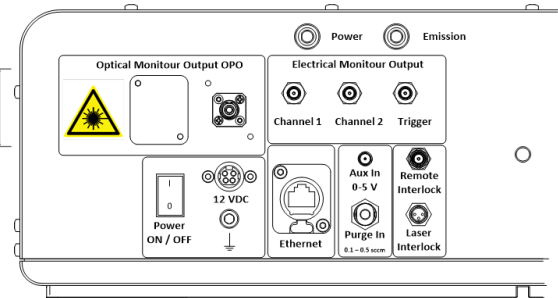
Top view



Front view



Rear view



All dimensions are given in mm.

Our Locations

Cobolt AB, a part of HÜBNER Photonics
(Sales in Norway, Sweden, Finland and Denmark)
Solna, Sweden
Phone: +46 8 545 912 30
Fax: +46 8 545 912 31
E-mail: info@coboltlasers.com

HÜBNER Photonics GmbH
(Sales in Germany, Switzerland and Austria)
Kassel, Germany
Phone: +49 561 994 060 - 0
Fax: +49 561 994 060 - 13
E-mail: info.de@hubner-photonics.com

HÜBNER Photonics Inc.
(Sales in USA, Canada and Mexico)
San Jose, California, USA
Phone: +1 (408) 708 4351
Fax: +1 (408) 490 2774
E-mail: info.usa@hubner-photonics.com

HÜBNER Photonics UK
(Sales in UK & Ireland)
Derby, Great Britain
E-mail: info.uk@hubner-photonics.com

Find local sales representatives at www.hubner-photonics.com

Australia, Benelux, Brazil, China, Estonia, Latvia, Lithuania, France, India, Israel, Italy, Japan, Poland, Russia, Belarus, Singapore, Malaysia, Thailand, South Korea, Spain and Portugal, Taiwan

