OPTICAL PARAMETRIC OSCILLATOR
C-WAVE

Ideas taking shape – worldwide.
In alliance with the Fraunhofer Institute for Physical Measurement Techniques IPM we now also evolve the field of photonics. Thus we are able to build intelligent and pathbreaking products which will let you experience true added values – such as the new C-WAVE.

We expand the capabilities of your laser light – for research as well as for industrial application. As a highly traditional system supplier of technical industrial products HÜBNER is developing innovative technology to meet demands of the global market.

“Visible, widely tunable, continuous-wave” – for a long time this was equivalent to the handling of toxic dyes, to change laser media or resonator mirrors or the restriction to narrow tuning ranges. HÜBNER has teamed up with Fraunhofer IPM to develop a widely tunable, easy-to-operate single source for applications such as spectroscopy, quantum optics and photochemistry.

Here we present C-WAVE, a new type of light source: The principle of continuous-wave (cw) optical parametric oscillators is combined with intra-cavity frequency doubling to generate coherent light across the whole visible range.

While this wide tunability was our primary concern for the first generation of C-WAVE, it is easily adapted to the needs of your experiment: for an emission range shifted towards UV or NIR, for narrow linewidth, for higher power, for a fast switching between particular wavelengths.

C-WAVE by HÜBNER Photonics – the first cw source allowing you to tune from blue to red without any change of materials or components.

**VISIBLE, WIDELY TUNABLE CONTINUOUS-WAVE**

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<td>Dye laser (several dyes)</td>
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The concept of C-WAVE allows to build sources for tunable continuous-wave emission from the near UV into the infrared. The bright window indicates the tuning range of the first C-WAVE version. Other wavelength ranges are available upon request.
“Two in one” – for a clearly visible result

Optical parametric oscillators produce widely tunable emission from powerful, fixed-frequency sources. However, the new light has always wavelengths larger than the one emitted by the pump laser. For the generation of continuous-wave light this poses a severe challenge: How to cover the whole visible range from a green cw pump laser?

The C-WAVE combines two nonlinear processes within one cavity. In the first step, a 532-nm laser pumps a periodically-poled nonlinear crystal. Signal and idler waves with tunable frequencies in the near-infrared are generated, controlled by the crystal’s poling period and temperature. In the second step, these waves pass through a frequency doubling crystal: Second harmonic generation of the signal wave leads to colors from blue to green, while the idler wave is converted into colors from green to red.

Easy Tuning

No components need to be changed in order to cover the visible spectrum. The desired wavelength can be simply set at the computer and the C-WAVE adjusts itself automatically. Careful design of the cavity and mounting in a compact and robust frame guarantee a high beam quality and output stability across the whole tuning range.

The C-WAVE: Continuous-wave light throughout the visible spectral range. Without the use of toxic chemicals – finally all-solid-state.

**Technical data**

- Resonator configuration: Doubly-resonant OPO with intra-cavity SHG
- Pump wavelength: 532 nm
- Required pump laser: 5 W, TEM$_{00}$, single-frequency
- Spectral coverage*: 450-650 nm
- Output power: > 100 mW
- Output mode: TEM$_{00}$
- Beam polarisation: Upon request: single-frequency Linear, > 100:1
- Dimensions (L x W x H): 560 mm x 280 mm x 180 mm
- Computer interface: USB

*Other wavelength ranges upon request Patent depending
About HÜBNER
As a comprehensive system supplier, the HÜBNER Group manufactures key components and systems for the transportation industry (e.g. for rail vehicles, buses, airport technology, automotive) as well as products for medical technology, life quality, public security and other branches.
Recently we are deeply involved in the exploration of the Terahertz technology. This pioneering work enables us to develop innovative solutions for various applications, such as quality management or the detection of hazardous substances.

HÜBNER products have been standing out for more than 65 years through their safety, high-quality workmanship, outstanding comfort and convenience and long service life. Many of these products are inhouse developments. HÜBNER provides impulses again and again for technical process, since research and development are firmly established in the corporate culture. More than 1,900 employees bring good ideas, commitment and perfect service to life every day — worldwide.

About Fraunhofer IPM
The Fraunhofer Institute for Physical Measurement Techniques IPM develops tailor-made measuring techniques, systems and materials for industry. Many years of experience with optical technologies and functional materials form the basis for high-tech solutions in a wide variety of fields:

Developments ranging from laser imaging technology, via optical measuring techniques, spectroscopy and terahertz measuring technology, to thermoelectrics and integrated sensor systems.
Fraunhofer IPM has some 225 employees who work in the fields of science, technology and administration at the institutes located in Freiburg and Kaiserslautern.