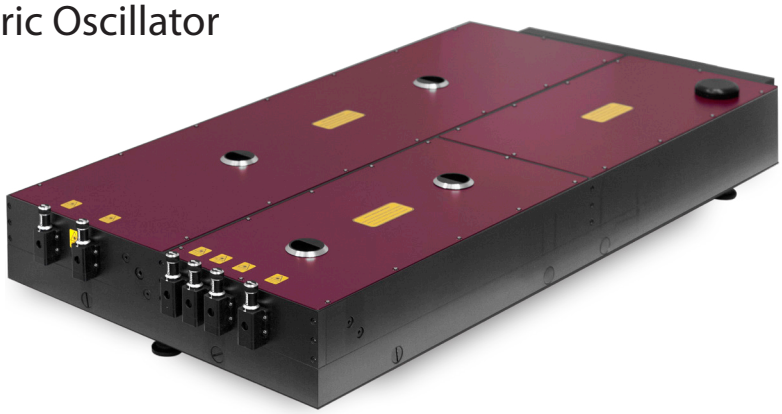
TOPOL. Femtosecond Optical Parametric Oscillator

- Possible wavelengths from 680 to 4030 nm
- Paired with SHGs down to 340 nm (optional)
- Up to 1.2 W typical average output power
- Down to 140 fs typical pulse duration
- Up to 4 simultaneous outputs
- Broad fully-automated tuning range
- TEMA-150 Yb-doped pump laser integrated in-house



The TOPOL-1050-C optical head with an integrated pump laser and control electronics

Product overview

The TOPOL series of automated femtosecond optical parametric oscillators (OPOs) offers the widest wavelength tuning range among the entire product line of our company. The TOPOL series includes three models (1050-C, 1050-D and 1050-E), each providing simple and reliable management of the system parameters with the help of an advanced control software and, if combined, covering the spectral range of 680...4030 nm, with optional external SHG add-ons extending the range down to 340 nm and DFG modules for >4000 nm coverage.

Depending on the model, a TOPOL OPO can be pumped by either the fundamental (1050-D, 1050-E) or the second harmonic (1050-C) of a mode-locked femtosecond laser with the central wavelength of 1030-1060 nm and the pulse repetition rate of about 80 MHz. By default, all TOPOL OPOs are optimized for use with the TEMA-150 femtosecond ytterbium laser system, which allows achieving high average output power of about 1 W or even more at any wavelength within the three different tuning ranges spanning across the NIR and MIR spectral regions.

The main difference between the 1050-C, 1050-D and 1050-E is the wavelength tuning range specific to each model (refer to the Specifications chart for detailed information). All three OPOs provide two separate, simultaneously functioning outputs: the signal wave output and the idler wave output. Optional outputs are also available for depleted pump radiation (@ 1030 - 1060 nm), as well as its second harmonic (@ 515 - 530 nm), which can be used simultaneously with the main outputs. High-power switchable outputs of full pump radiation are also available in certain models.

The TOPOL-1050-C model features a built-in second harmonic generator module for pump radiation as well as a thermo-stabilized breadboard, which not only provides outstanding long-term stability of the output power, characteristic to 1050-D and 1050-E models, but also ensures high pump beam conversion efficiency over extended periods of time.

The TOPOL series OPO system includes a built-in microcontroller unit and an integrated spectrometer (-C model only) bundled together with a specially designed TOPOL Control Software ('TCS') for Windows, allowing the single-click approach to wavelength tuning of the OPO. Besides providing the wavelength tuning functionality, the TOPOL Control Software allows to:

- display the spectrum and CWL of the signal wave output measured by the built-in spectrometer in real time and save it's spectrum to a file (-C model only), or display the calculated wavelengths based on factory calibration (-D and -E models);
- measure and display the real-time output power of the OPO;
- control optional signal and/or idler SHG extensions with the same software.

The TOPOL OPO grants its user convenient control over the parameters of the output radiation, providing high stability and repeatability of these parameters at the same time. Thanks to the robust design and high degree of automation, the TOPOL OPO allows the user to focus on the primary research task by minimizing the need for maintenance and manual adjustment of the OPO system itself.

Possible applications of the TOPOL series parametric oscillators :

- Multiphoton Microscopy (TPE)
- Three-photon imaging (3-photon)
- SHG/THG (second/third harmonic generation) microscopy
- Time-Resolved Ultrafast Studies
- Fluorescence Upconversion Spectroscopy
- Fluorescence Spectroscopy of Biological Markers
- Raman Spectroscopy
- Pump-Probe Spectroscopy
- 2D IR Spectroscopy
- Conversion of Laser Radiation
- Parametric Generation
- Laser Systems Design, Integration and Amplification
- Seed Oscillator for Ultrafast Amplifiers
- Semiconductor Device Characterization
- Telecommunication Components Characterization
- Optical Switching
- Optical High-Speed Sampling
- Semiconductor Material Studies

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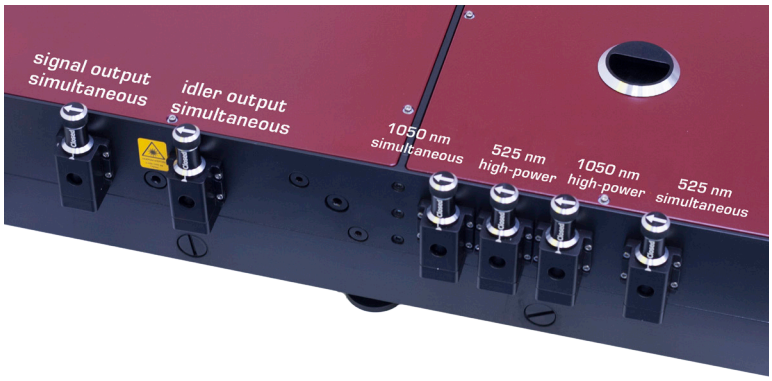
Avesta Project Ltd.,
11 Fizicheskaya Street
Troitsk, 108840, Moscow, Russia
Tel.: +7 (495) 241-00-92

fs@avesta.ru
www.avesta.ru

	TOPOL-1050-C	TOPOL-1050-D	TOPOL-1050-E
Optical parametric oscillator specifications			
Wavelength tuning range* (fully automated USB tuning)	680-1000 nm (signal) 1100-2300 nm (idler, optional)	1700-2000 nm (signal) 2200-2740 nm (idler, optional)	1420-1700 nm (signal) 2750-4030 nm (idler, optional)
Average output optical power (simultaneous outputs unless noted otherwise)	**signal** 680 nm: >450 mW 690 nm: >600 mW 700 nm: >680 mW 750 nm: >830 mW 800 nm: >850 mW 850 nm: >870 mW 900 nm: >820 mW 950 nm: >670 mW 1000 nm: >530 mW **idler (optional)** 1105 nm: >620 mW 1170 nm: >560 mW 1260 nm: >510 mW 1370 nm: >450 mW 1530 nm: >420 mW 1750 nm: >350 mW 1970 nm: >290 mW 2100 nm: >220 mW 2200 nm: >150 mW 2300 nm: >120 mW **1050+/-5 nm (fixed)****: >1.7 W (>7 W switchable) **525+/-2 nm (fixed)**: >130 mW (>3 W switchable)	**signal** 1700 nm: >400 mW 1800 nm: >800 mW 1900 nm: >600 mW 2000 nm: >650 mW **idler (optional)** 2225 nm: >250 mW 2260 nm: >480 mW 2300 nm: >500 mW 2420 nm: >400 mW 2600 nm: >330 mW 2660 nm: >280 mW 2730: nm >170 mW **1050+/-5 nm (fixed)****: >1.5 W (>4.5 W switchable)	**signal** 1420 nm: >520 mW 1450 nm: >610 mW 1500 nm: >680 mW 1550 nm: >700 mW 1600 nm: >660 mW 1650 nm: >580 mW 1700 nm: >490 mW **idler (optional)** 2750 nm: >180 mW 2890 nm: >220 mW 3050 nm: >270 mW 3250 nm: >300 mW 3500 nm: >280 mW 3810 nm: >250 mW 4030 nm: >200 mW **1050+/-5 nm (fixed)****: >1.5 W (>4.5 W switchable)
Pulse duration (FWHM)	<200 fs (typical 140-180 fs depending on exact wavelength)	<250 fs (signal or idler) <200 fs (1050 nm)	<250 fs (signal) <300 fs (idler) <200 fs (1050 nm)
Pulse repetition rate	80+/-5 MHz (fixed)		
Dimensions (WxLxH, laser head includes integrated pump laser and control electronics)			
Laser head	1060x520x152 mm	962x482x152 mm	
Closed-loop stabilized water-to-air chiller unit	443x484x176 mm (19" 4U)		
Power supply and control unit specifications			
Power supply	single-phase; 100-240 V, 50/60 Hz, <1.5 kW		
Control	USB interface, integrated 680-1000 nm spectrometer (TOPOL-1050-C only); Windows PC software is included; a PC is required (not included)		

** - optional harmonic extensions are available down to 340 nm;*
*** - may be used to pump an additional TOPOL-1050-D or TOPOL-1050-E system.*



TOPOL-1050-C outputs
simultaneous: signal, idler, depleted 1050 nm, low-power 525 nm
switchable from PC: high-power 1050 nm, high-power 525 nm

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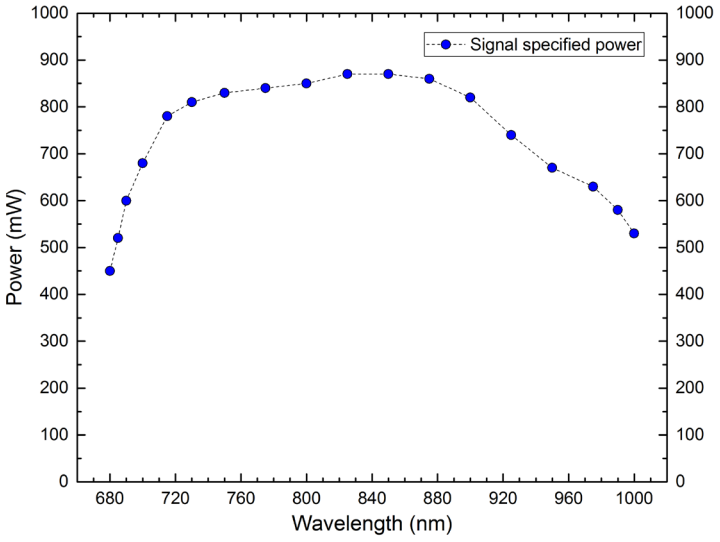
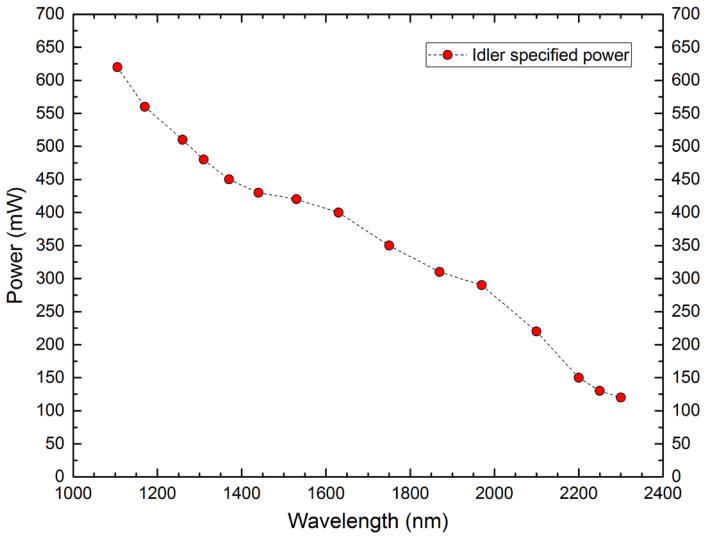
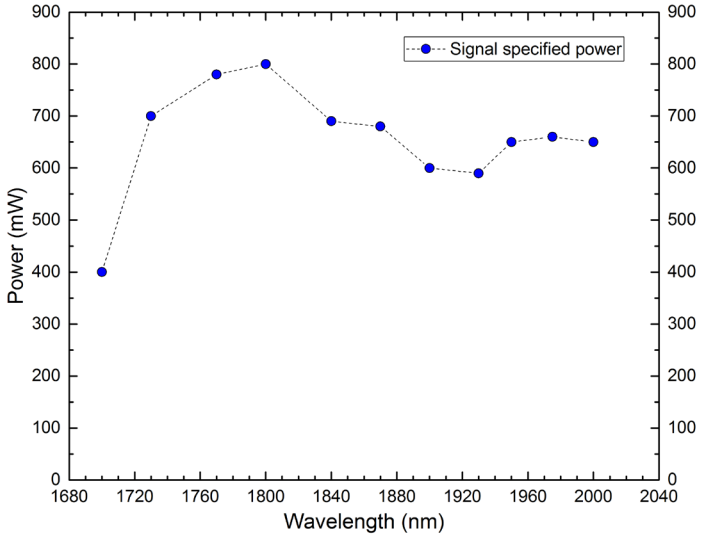
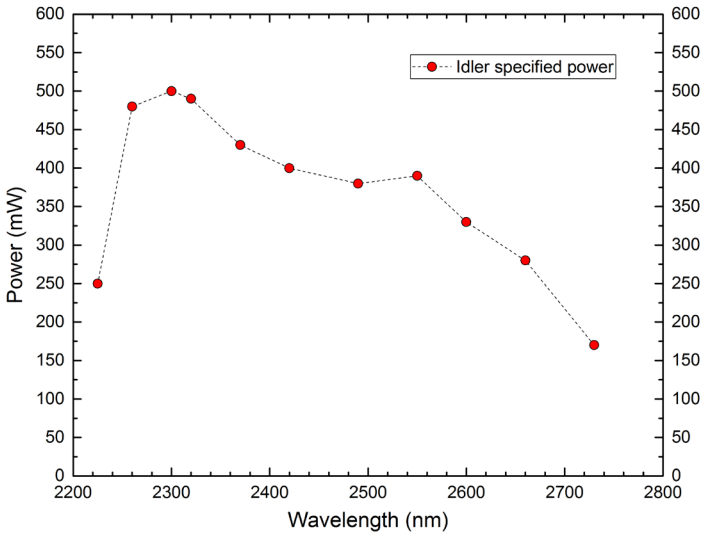


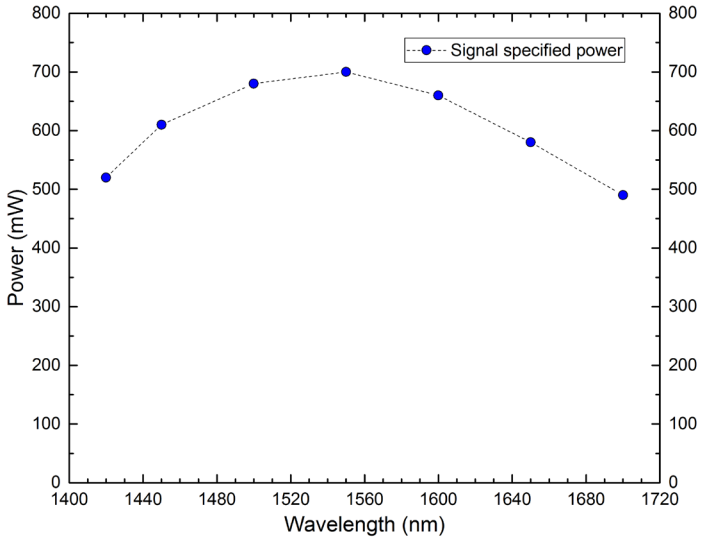


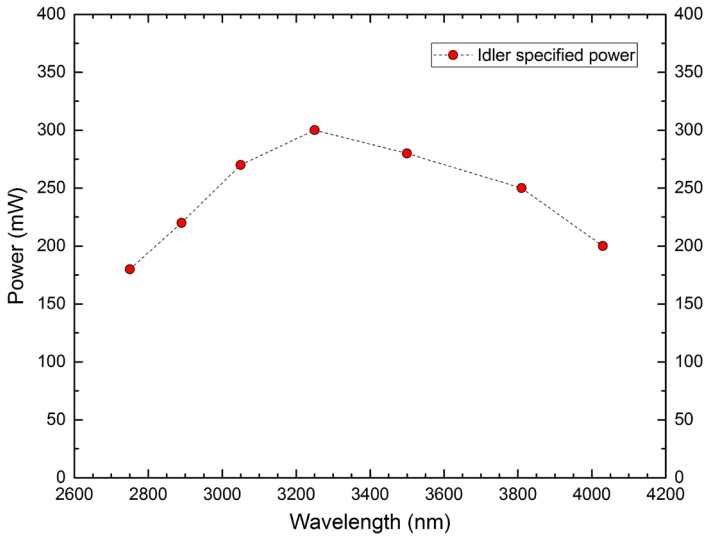
TOPOL-1050-C specified tuning curves





TOPOL-1050-D specified tuning curves





TOPOL-1050-E specified tuning curves

Note: exact tuning profile may vary depending on a system configuration and may typically exceed the given values; please obtain a quotation or offer from us for firmly quoted values

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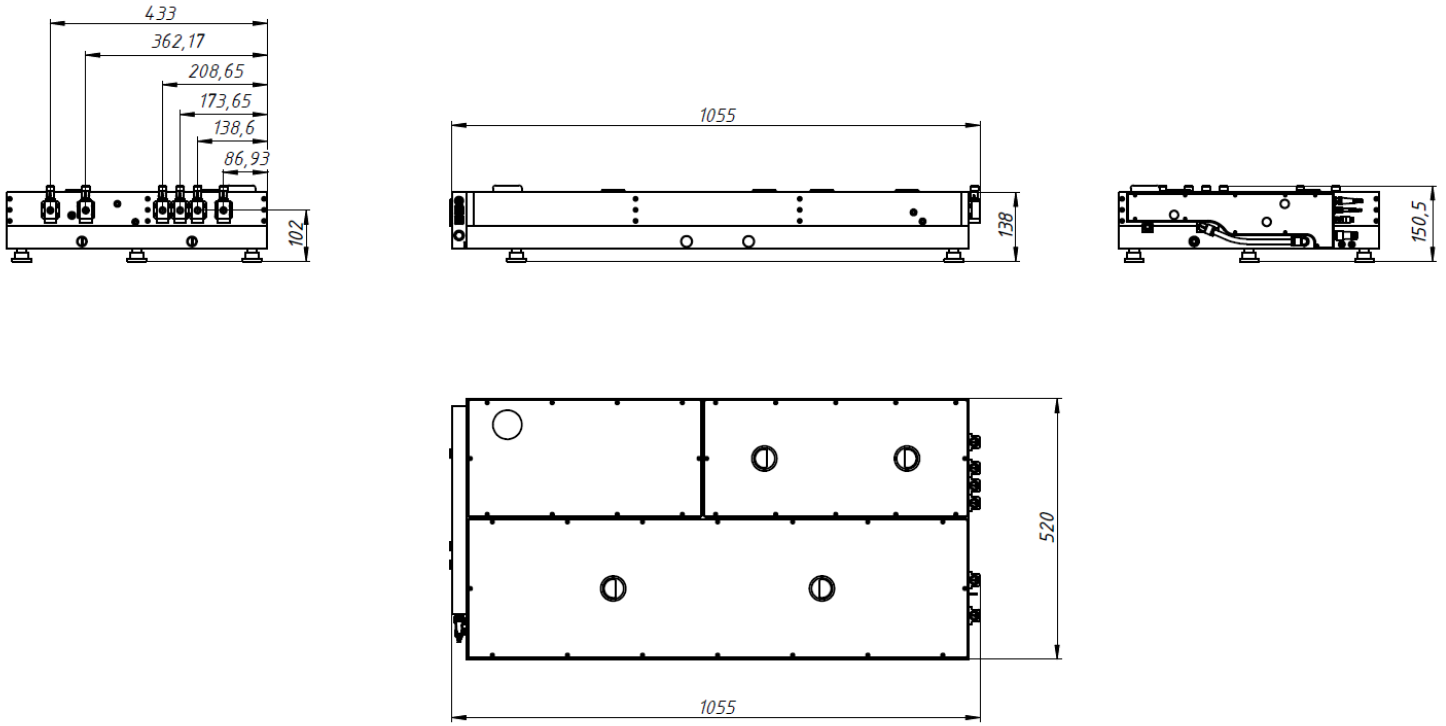
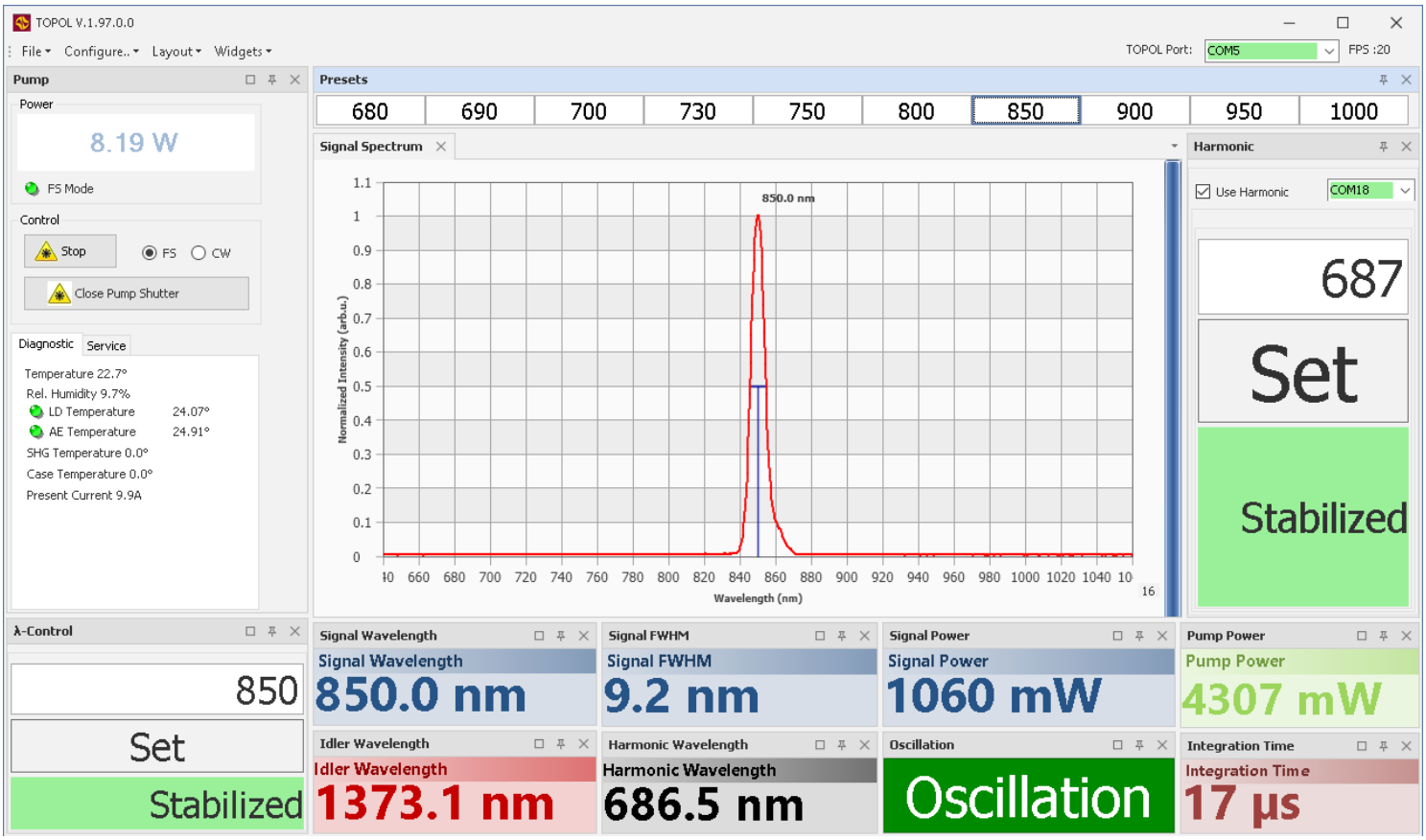


TOPOL-1050-C laser head dimensions
(exact output positions may vary with options)



TOPOL control software screen-shot
(The TOPOL-1050-C and an external idler SHG unit (optional) are controlled by the same software)

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