

deltaEmerald

Dual Color SRS Imaging

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The new deltaEmerald allows simultaneous SRS imaging of two vibrational bands with its revolutionary dual color SRS (DC-SRS) scheme. It is aimed for users at the forefront of SRS microscopy, given the best signal-to-noise performance and the capability of background subtraction as well as simultaneous imaging of two vibrational bands. Two Stokes pulses, separated by 85 cm^{-1} and modulated at different frequencies are overlapped with the tunable Pump pulse.

The pulse length of about 1 ps, $10 \text{ cm}^{-1} \dots 15 \text{ cm}^{-1}$ bandwidth and several 100 mW output power in each beam are ideal parameters for Coherent Raman imaging.

The pulses of all three beams are shot noise limited due to solid state laser design and proven OPO technology. The shot noise limited -162 dBc/Hz above 1 MHz (limited by the noise measurement setup with 4.8 mA) allows for fast image acquisition and superior signal-to-noise ratio.

Fully automated tuning, power control and temporal overlap of all three beams are given.

Additional a $\sim 100 \text{ fs}$ -output at 1030 nm is provided for efficient SHG and two-photon imaging.



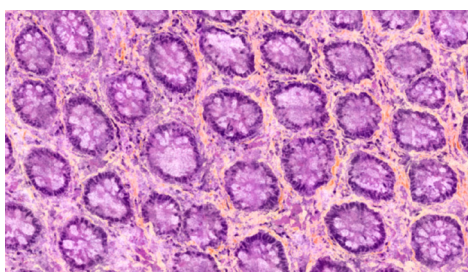
- Innovative SRS scheme for simultaneous excitation of two vibrational band
- Tunable Pump and both Stokes pulses are spatially and temporally overlapped
- Spectral distance of Stokes 85 cm^{-1}
- Proven OPO technology with shot noise limited performance with -162 dBc/Hz above 1 MHz
- Additional femtosecond output at 1030 nm for optimum SHG and TPF excitation

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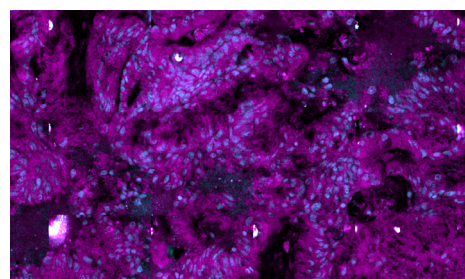
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Applications

1. Simultaneous imaging of CH₂ & CH₃ for nondestructive and fast Coherent Raman histology. The 85 cm⁻¹ difference is chosen to address CH₂ & CH₃ with 2845 cm⁻¹ and 2930 cm⁻¹ at their peak position.
2. Background removal of non-resonant artefact's, especially important for weak signals in the fingerprint region.
3. Cosmetics / pharmaceutical imaging and further applications.



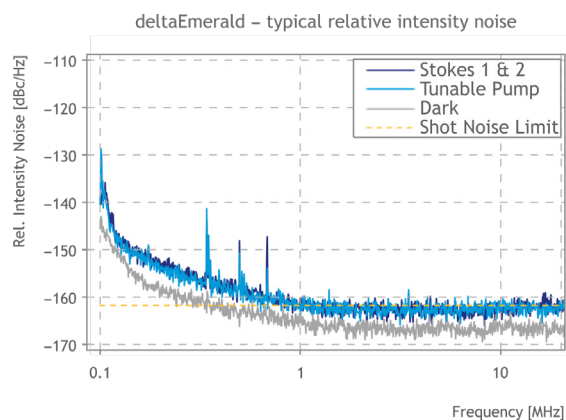
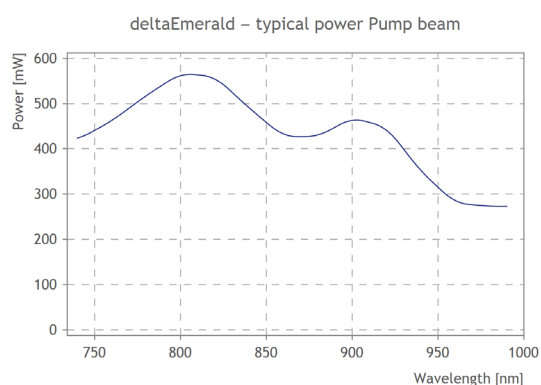
Colon, courtesy of LightCore Technology



Biospie, courtesy of LightCore Technology

Specifications

| | |
|------------------------------|--|
| Wavelength Stokes 1 | 1034 nm |
| Wavelength Stokes 2 | 1025 nm |
| Wavelength Pump (OPO Signal) | 740 nm ... 990 nm |
| $\Delta\nu$ Pump - Stokes | 350 cm ⁻¹ ... 3800 cm ⁻¹ |



Specifications

| | |
|-------------------------|---|
| Power Stokes 1 | > 300mW (unmodulated), >150 mW modulated (20 MHz) |
| Power Stokes 2 | > 300mW (unmodulated), >150 mW modulated (13 MHz) |
| Power Pump (OPO Signal) | > 400 mW at 800 nm |

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Specifications

| | |
|--|--|
| Spectral bandwidth Pump and Stokes beams | 10 cm ⁻¹ ... 15 cm ⁻¹ |
| Pulse width | 1 ps |
| Repetition rate | 80 MHz |
| Noise | Shot noise limited (-162 dBc/Hz) > 1 MHz (Pump and Stokes) |



Beam Parameters

| | |
|---------------------|---|
| Pointing stability | < 100 µrad per 100 nm |
| M ² | < 1.2 (Pump and Stokes) |
| Ellipticity | < 20% |
| Polarization | Linear; horizontal > 100:1 |
| Beam divergence | 0.9 (± 0.2) mrad (at 800 and Stokes) |
| Beam waist diameter | 1.3 (± 0.2) mm at 800 nm; 1.7 (± 0.2) mm Stokes beams |

Additional Femtosecond Output

| | |
|-----------------|----------------|
| Wavelength | 1030 nm ± 3 nm |
| Power | 300 mW |
| Pulse width | < 200 fs |
| Beam divergence | < 1.5 mrad |

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Features

| | |
|--|---|
| Integrated modulators for Stokes beams | Built-in EOM with resonant fixed frequency of 20 MHz and 13 MHz |
| Power attenuators | Integrated for Pump and Stokes, independent for each beam |
| Delay management | Automated compensation for microscope dispersion |
| Remote control | Ethernet TCP/IP |

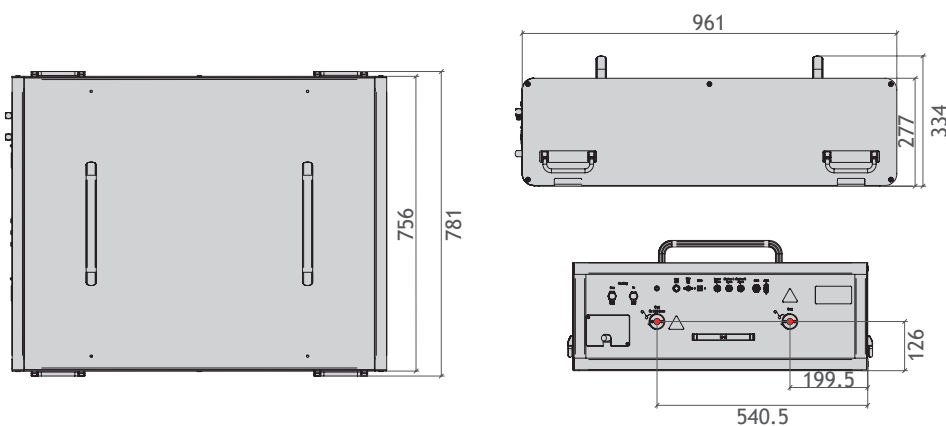
Mechanical dimensions (L x W x H) / weight:

| | |
|--------------------|--|
| deltaEmerald | 961 mm x 781 mm x 277 mm (see drawing for details) // 130 kg |
| Laser control unit | 19 inch / 4U // 10 kg |
| Chiller | 19 inch / 4U // 14 kg |

Further requirements:

| | |
|-----------------------|--|
| Power consumption | 100 V ... 240 V, 50 Hz ... 60 Hz, max. 10 A (at 100 V) |
| Operating temperature | 20°C ... 25°C, air conditioning (stability $\pm 1^\circ\text{C}$) recommended |
| Relative humidity | < 60% |

dimensions in mm



Contact

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