

EPIC Online Technology Meeting Environmental Monitoring

Monday 15th June



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Our Business

Design and manufacture affordable and compact ultrafast lasers that span the visible to Mid-IR.

Tunable



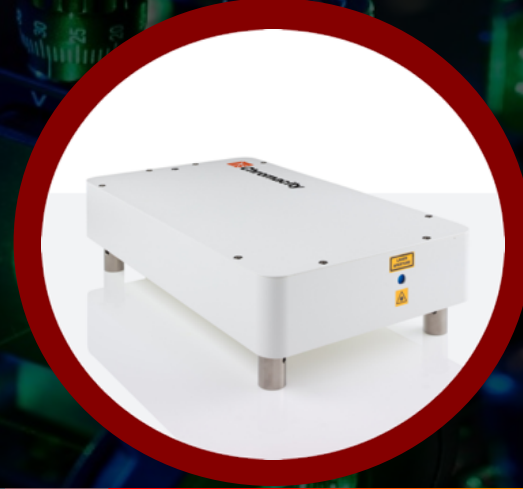
Mid-IR OPO

- Fundamental Research
- Spectroscopy (Molecular, Fingerprints and Complex Organic Compounds)

Near-IR OPO

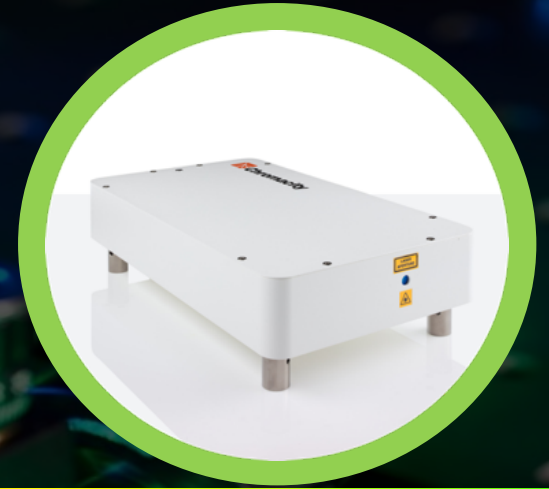
- Fundamental Research
- IR Spectroscopy
- LIDAR
- Telecoms
- Quantum Optics

Fixed



1040 nm

- Fundamental Research
- Microscopy (Two Photon, SHG)
- Pump Source for OPO and Non-Linear Optics



520 nm

- Fundamental Research
- Raman Spectroscopy
- Pump Source for OPO
- Quantum Optics

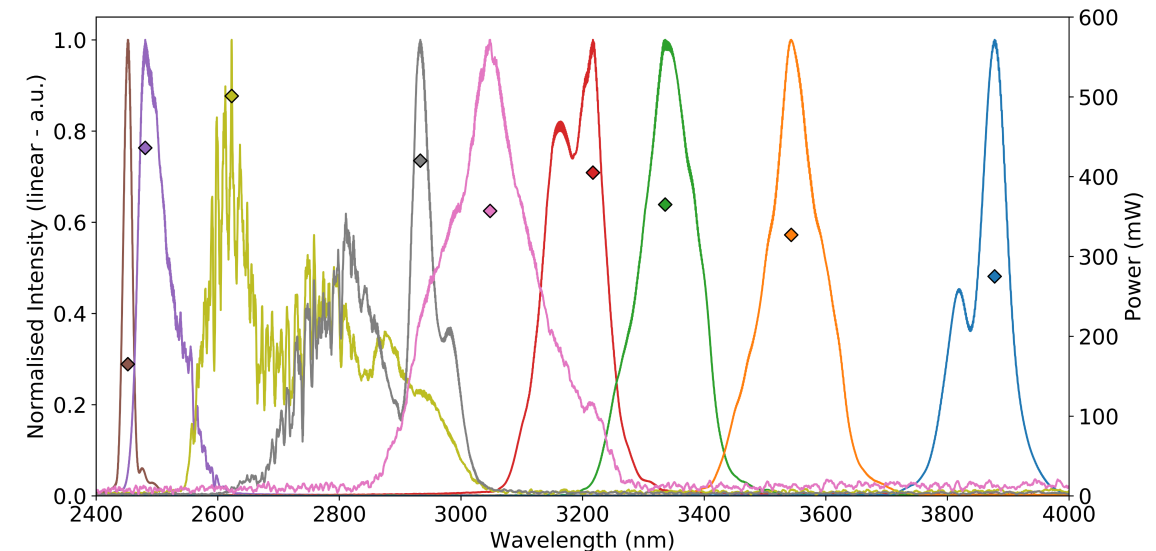
OPO for FTIR Spectroscopy

The Chromacity OPO is compact, air-cooled and a cost competitive source for IR spectroscopy

- Good beam quality
→ high resolution, long path length
- High brightness
→ long path length, high sensitivity
- Broad bandwidth
→ can probe multiple species simultaneously
- Tunable from 1.4 – 4 μm

These points make it well suited to remote, stand-off detection of gases relevant to environmental monitoring. e.g. hydrocarbons, CO_2

We also provide bespoke solutions for the 5-12 μm wavelength range utilizing other non-linear crystals



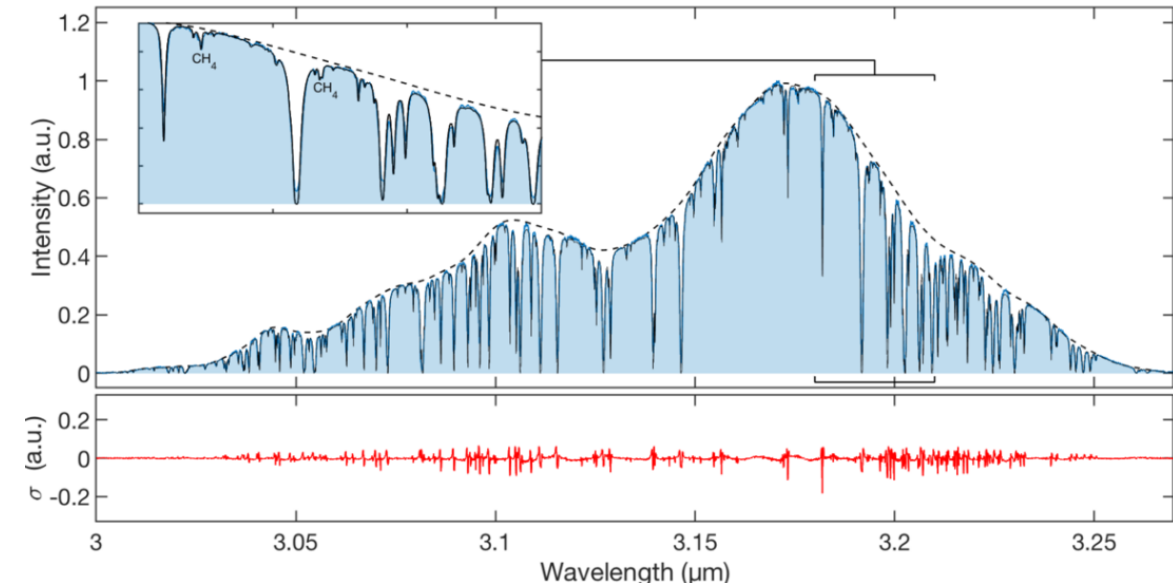
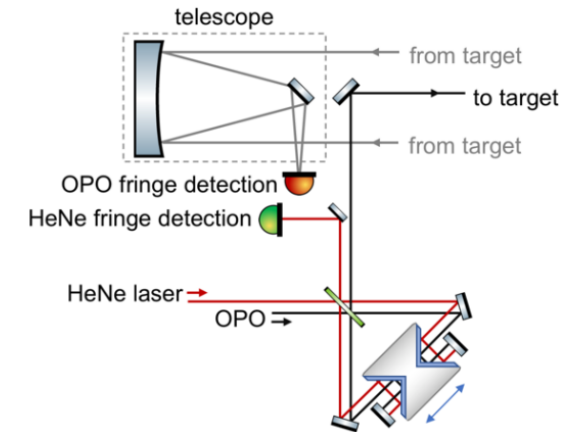
Environmental Monitoring

Remote hydrocarbon detection

- Simple solution: OPO coupled into Michelson interferometer before sending to distant target
- Light scattered back is collected by telescope and Fourier transformed to give spectrum, including absorption features from gases present in light path
- Demonstrated for simultaneous methane and ethane quantification, but applicable to all molecules with absorptions in wavelength range e.g. CO_2 , NO_2
- Shown for range of 70m with no need for precision retro-reflector target (scattering from rough foil) but applicable to km lengths with retro-reflector
- Methane detection with a precision (Allan deviation) of 40ppb for 5 min averaging

Methane and ethane detection with Chromacity OPO

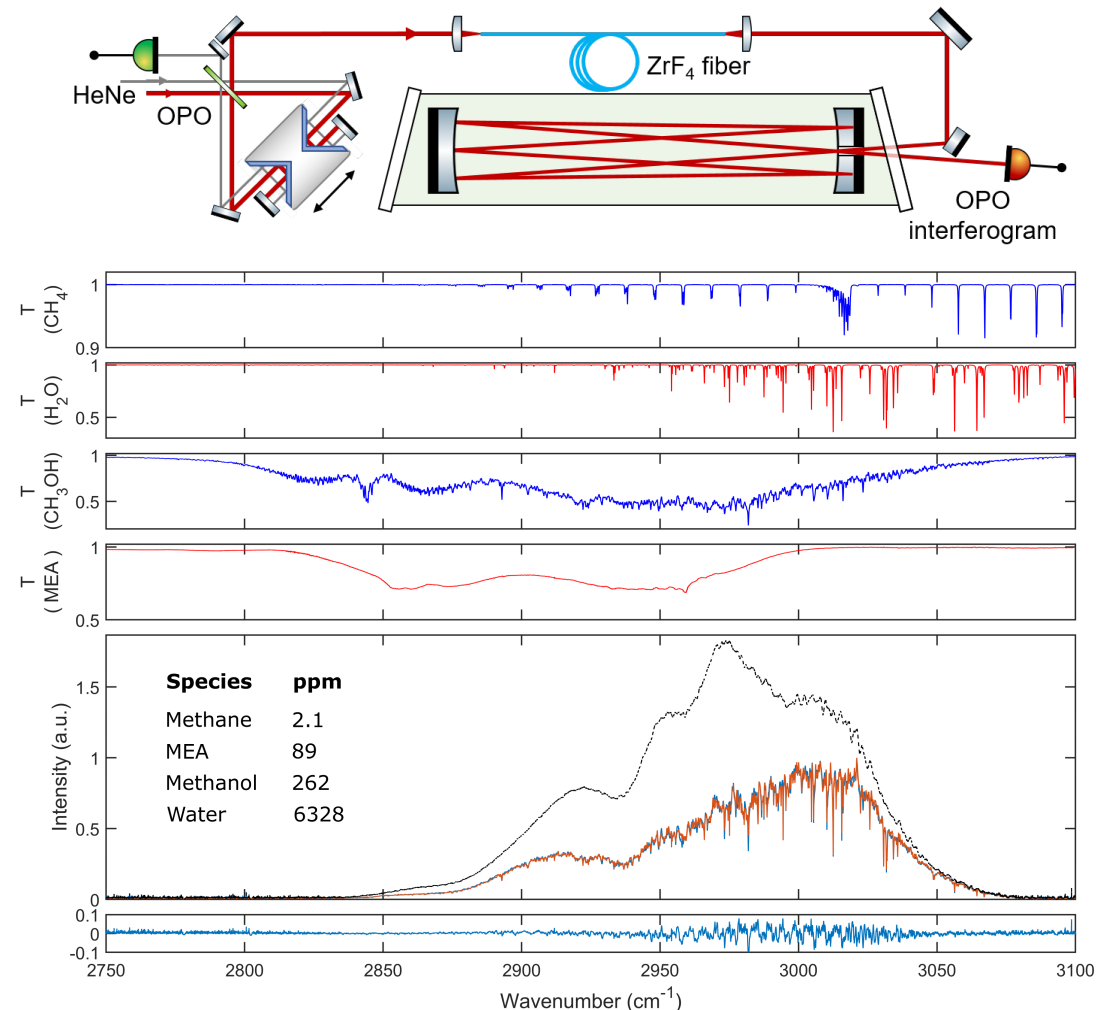
Kara O., Sweeney F., Rutkauskas M., Farrell C., Leburn C.G., Reid D.T. "Open-path multi-species remote sensing with a broadband optical parametric oscillator", Optics Express, 27, 21358-21366 (2019)



Inaccessible Environments

Fiber delivered multi-species spectroscopy

- Can also fiber deliver the OPO light to environments which are inaccessible or hazardous e.g. reaction vessels, pipelines, exhaust flues
- Chromacity OPO coupled into Michelson interferometer before launching into fiber
- Output of fiber enters environment of interest (here a gas cell) and detector at distal end of fiber measures spectrum
- Demonstrated quantitative, simultaneous detection of multiple hydrocarbons in a spectroscopically cluttered environment.
- Highlights that the technique can be used for a combination of simple and complex hydrocarbons



Interested in integrating our ultrafast lasers into your solution?
Contact sales@chromacitylasers.com



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