



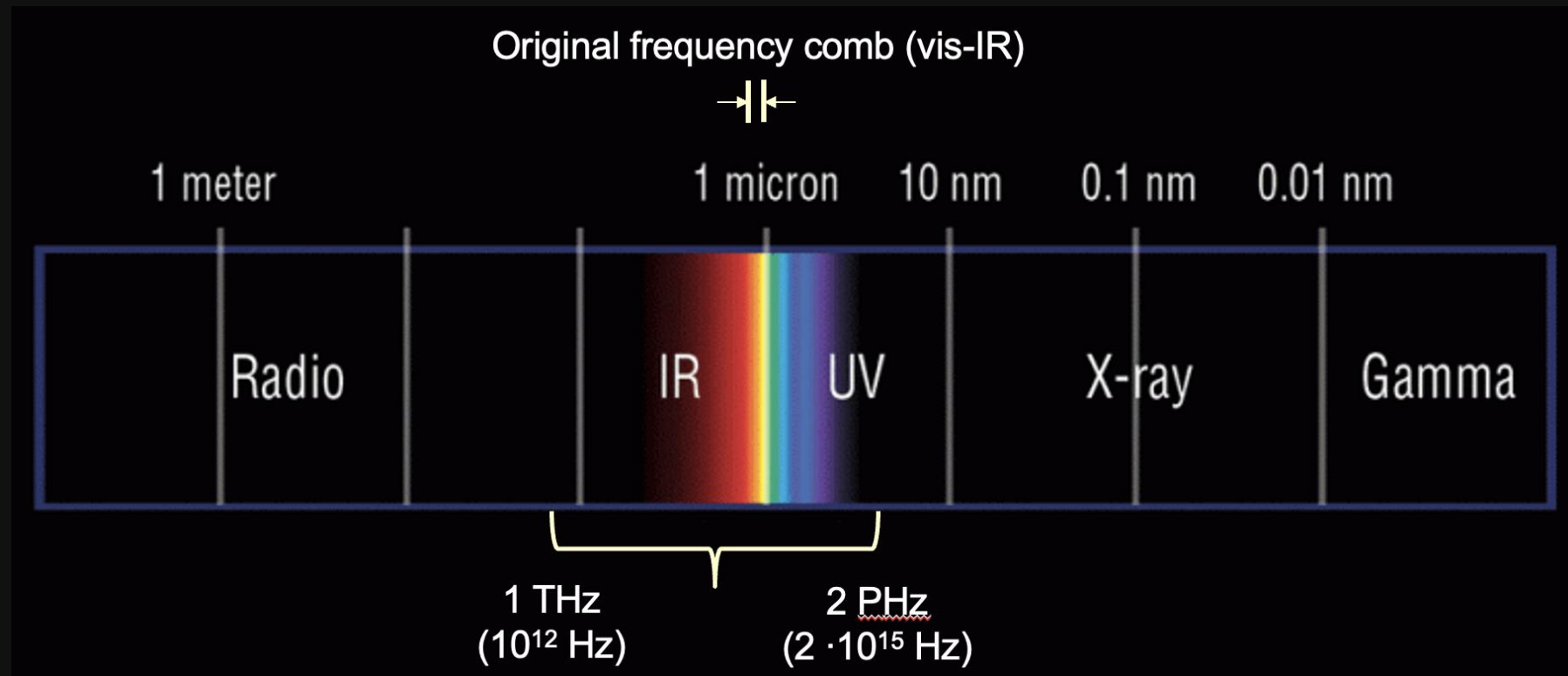
Exploring Light Across Electromagnetic Spectrum: Optical Frequency Combs from the THz to the Vacuum UV

Konstantin L. Vodopyanov

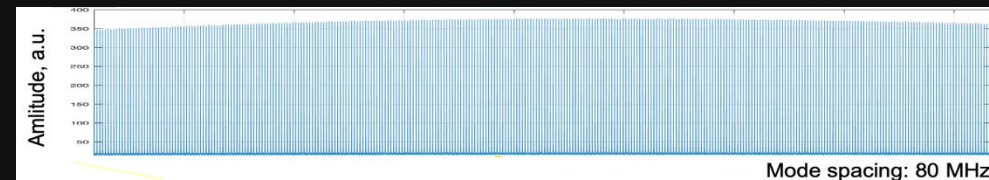
Endowed Chair & Professor
CREOL, The College of Optics & Photonics,
The University of Central Florida, Orlando, FL

Optical Frequency Combs: Nobel Prize in Physics 2005

Twenty years ago, frequency combs transformed precision measurement. Today we're pushing them into entirely new regions of the electromagnetic spectrum where almost nobody has explored.



Our frequency combs range



Our Laboratory

We work with

- Ultrafast lasers
- Atomic clocks
- Frequency combs
- Nonlinear optical crystals
- Optical parametric oscillators
- Multipass gas cells
- Vacuum systems

We do:

- Produce frequency combs in new frequency domains
- Precision spectroscopy
- Electronics design
- Custom instrumentation
- Crazy experiments like measuring breath of mosquitos with laser spectroscopy



We Do Things Nobody Has Done Before

Our mission is to build the world's most precise and most broadband laser spectrometers—from one terahertz to one petahertz.

Why Does It Matter?

- Fundamental Spectroscopy
- Human health
- Quantum technology
- Space exploration
- Exoplanets study

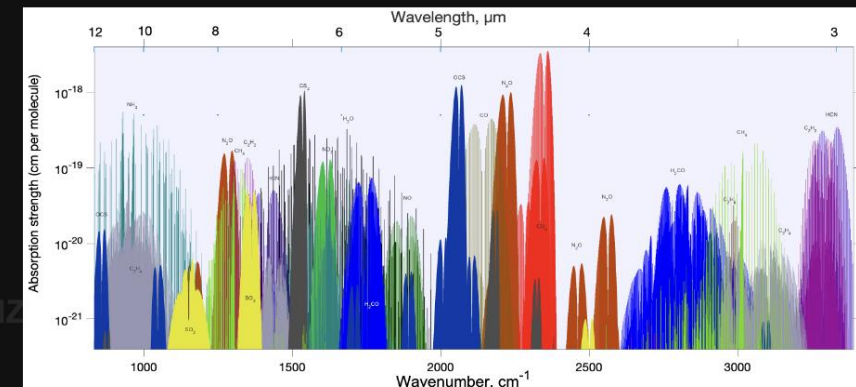
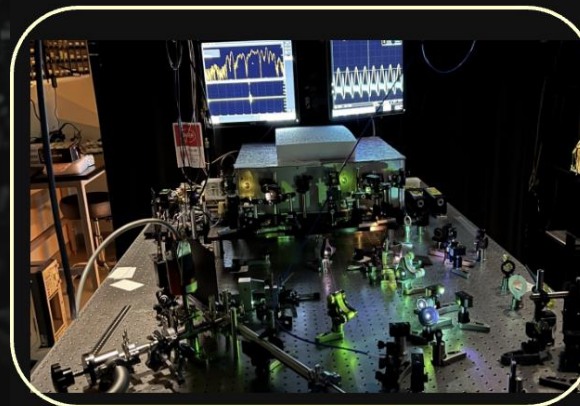
Our frequency-comb technology allows us to identify molecules with extraordinary precision.

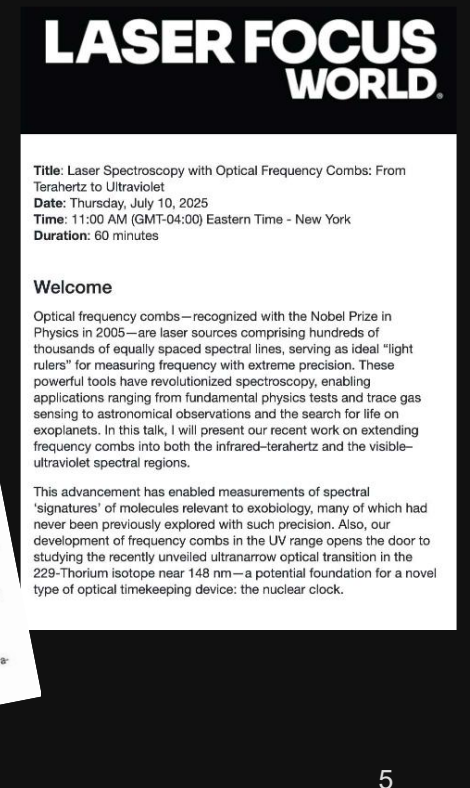
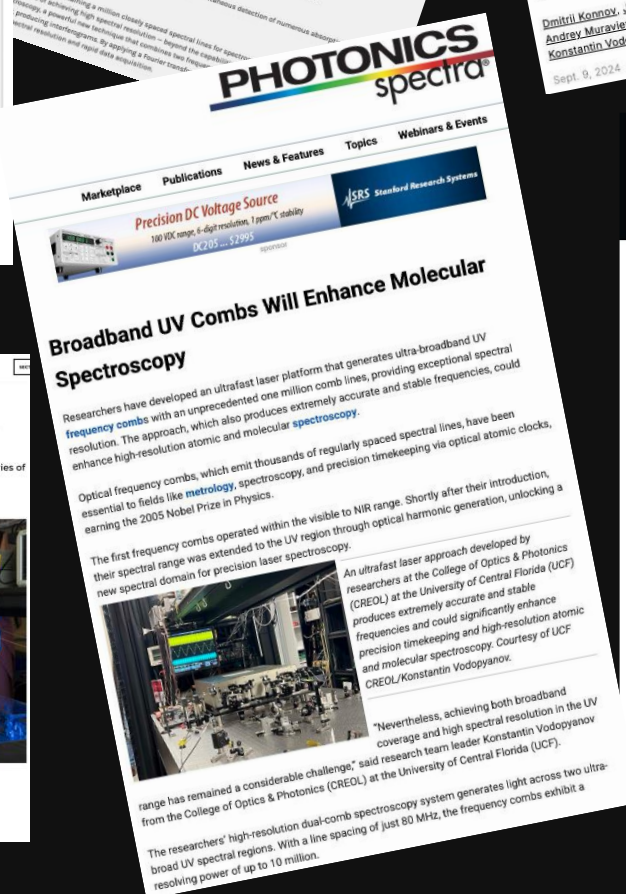
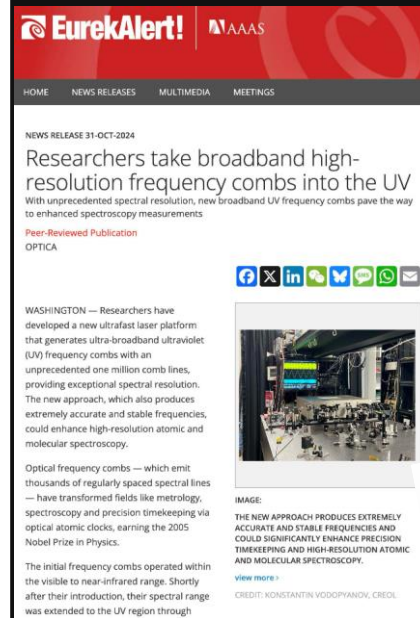
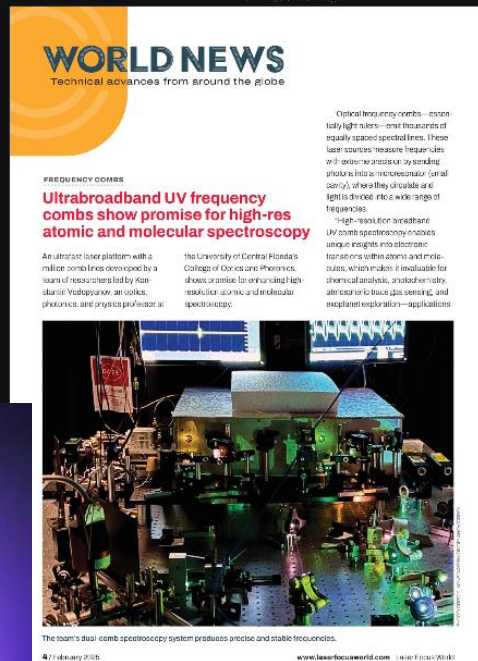
Examples:

- Greenhouse gases
- Cancer biomarkers in human breath
- Atmospheric chemistry
- Quantum sensors
- Nuclear clocks

Doing Things Nobody Has Done Before

- First million-line UV frequency comb
- Dual-comb spectroscopy from THz to UV
- Simultaneous THz + Mid-IR spectroscopy
- New nonlinear crystals for UV–VUV generation
- Molecular spectra that no one has seen before







Collaboration with other labs and future career



Our Collaborators

Internal:

UCF College of Medicine

External:

NASA (Cape Canaveral)

NIST (Colorado)

DOE Labs (Brookhaven)

International:

Univ. of Konstanz, Germany

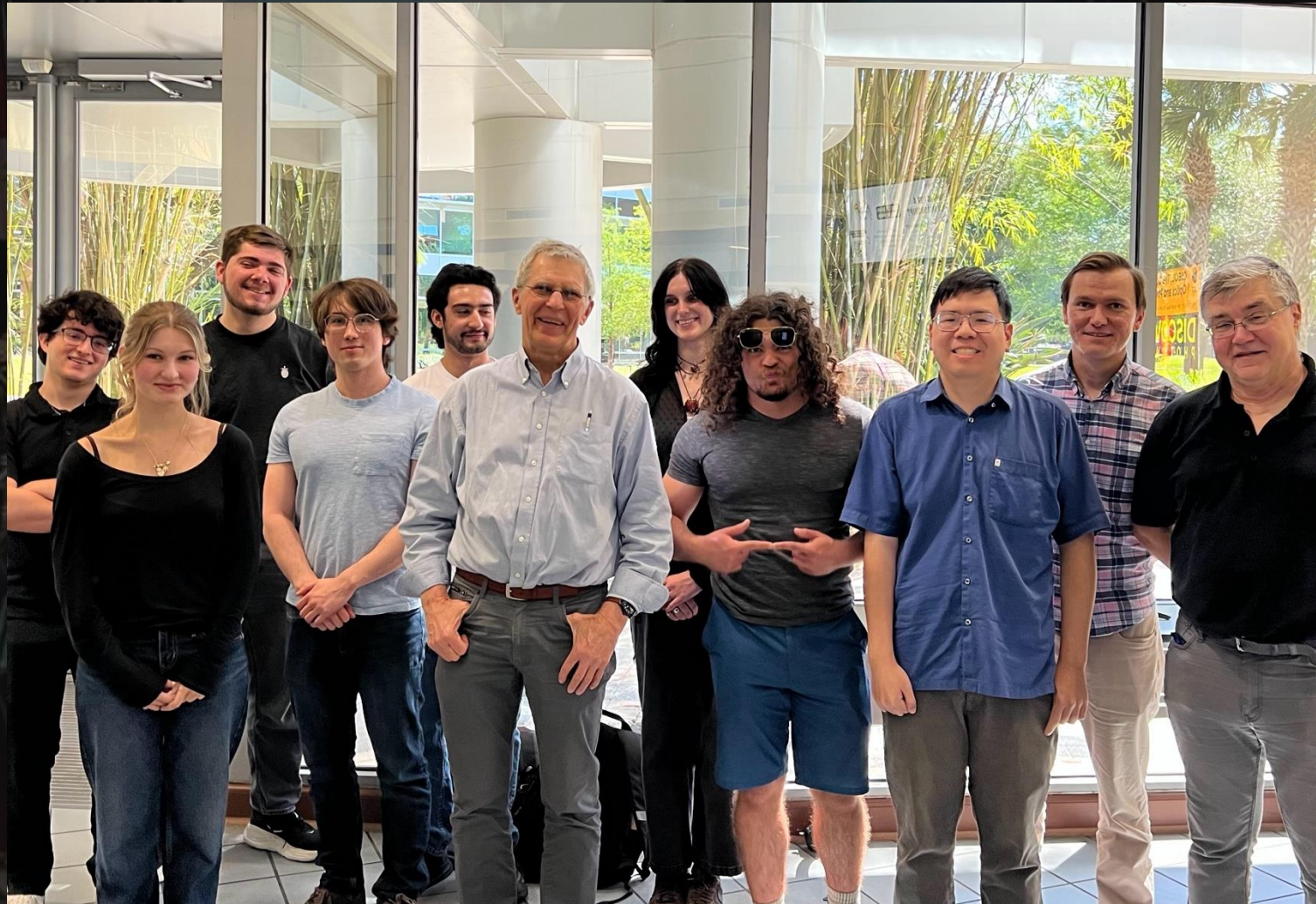
Technical Univ. Munich, Germany

Univ. of Helsinki, Finland

Univ. of Vienna, Austria

Where Can This Take You?

- Industry
- National laboratories
- Academia
- Startups
- NIST
- NASA
- Defence labs (Lockheed, Northrop Grumman)



We are looking for curious students who enjoy solving difficult problems and building instruments that have never existed before.

Email: vodopyanov@creol.ucf.edu