Seeing the world in a new light with (terahertz) eyes

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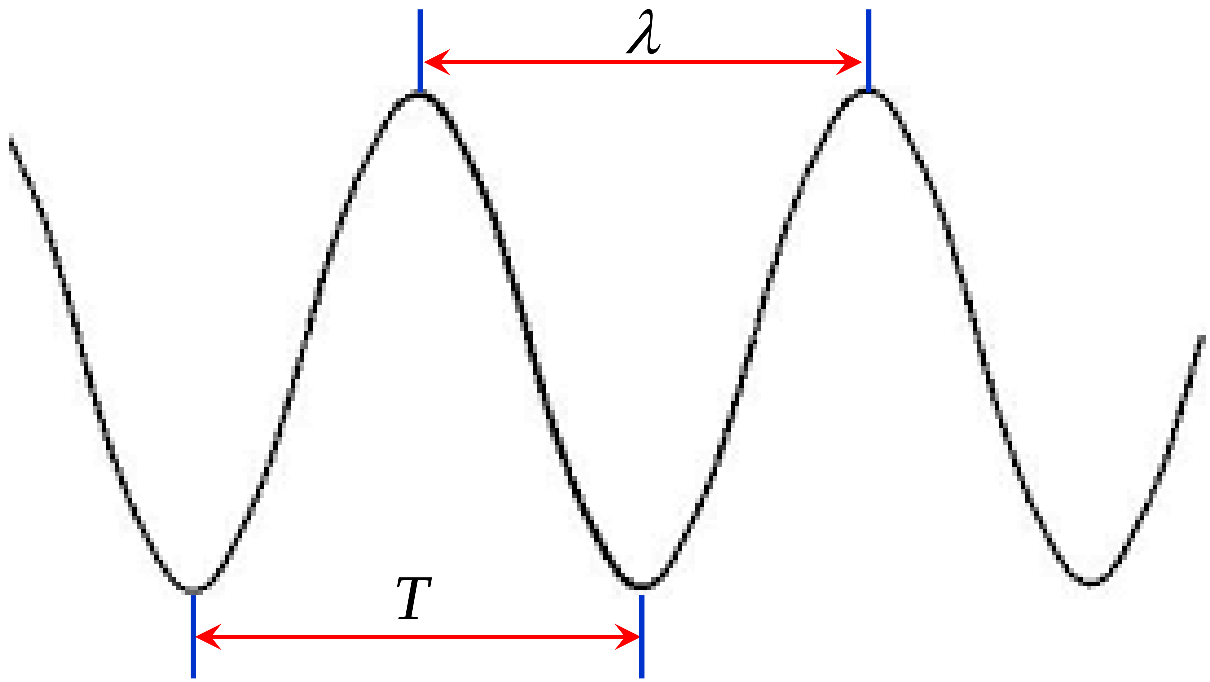
$$3\,\text{mm} < \lambda < 30\,\mu\text{m}$$

$1\,\text{THz} = 1\times10^{12}\ \text{Hz}$

$(0.1\,\text{THz})$	$(10\,\text{THz})$
$(0.414\,\text{meV})$	$(41.4\,\text{meV})$
$(3.34\,\text{cm}^{-1})$	$(334\,\text{cm}^{-1})$
$(4.8\,\text{K})$	$(480\,\text{K})$



$\text{ps} = 1\times10^{-12}\ (\text{s})$

$$0.1\,\text{ps} < T_{vacuum} < 10\,\text{ps}$$

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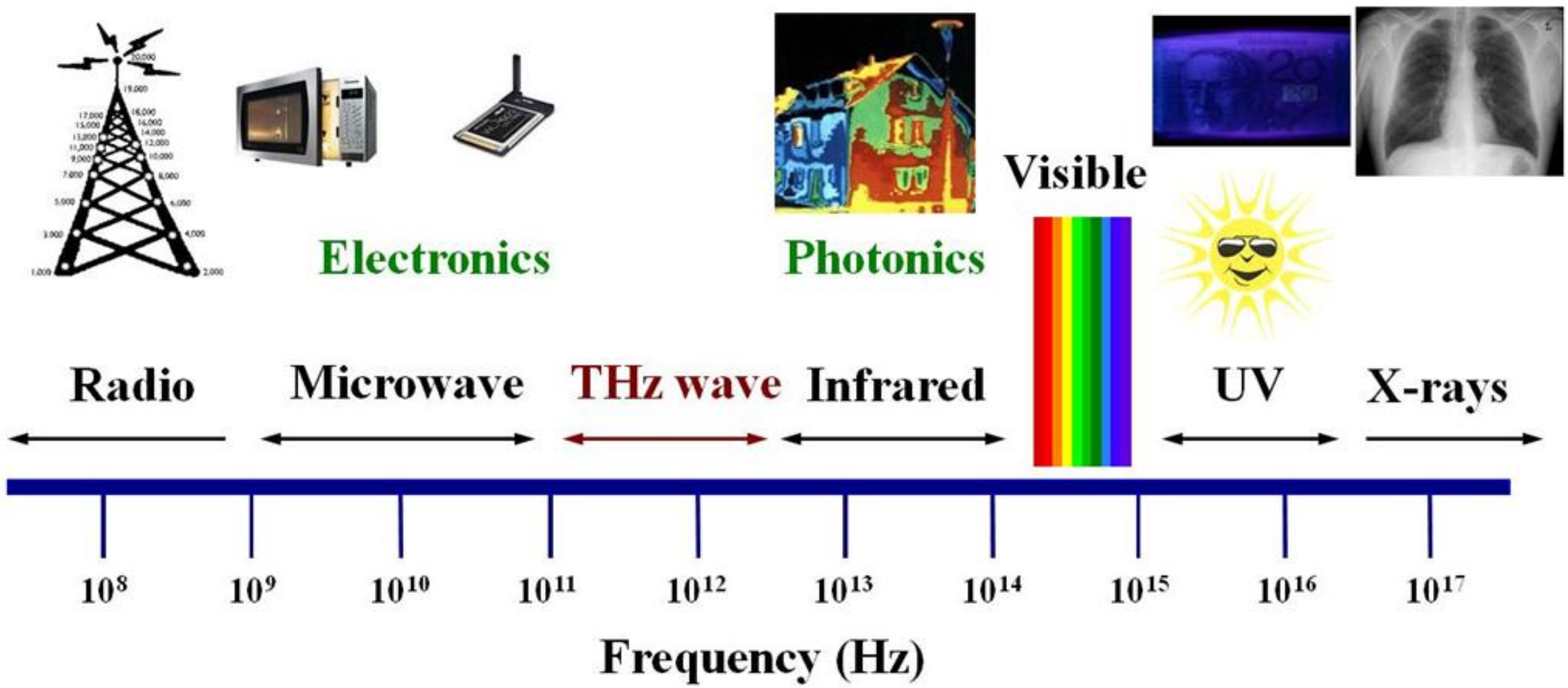
Terahertz wave



100 GHz to 10 THz or 3 mm to 30 µm
1 THz = 1 ps = 300 µm = 33 cm^{-1} = 4.1 meV = 48 K

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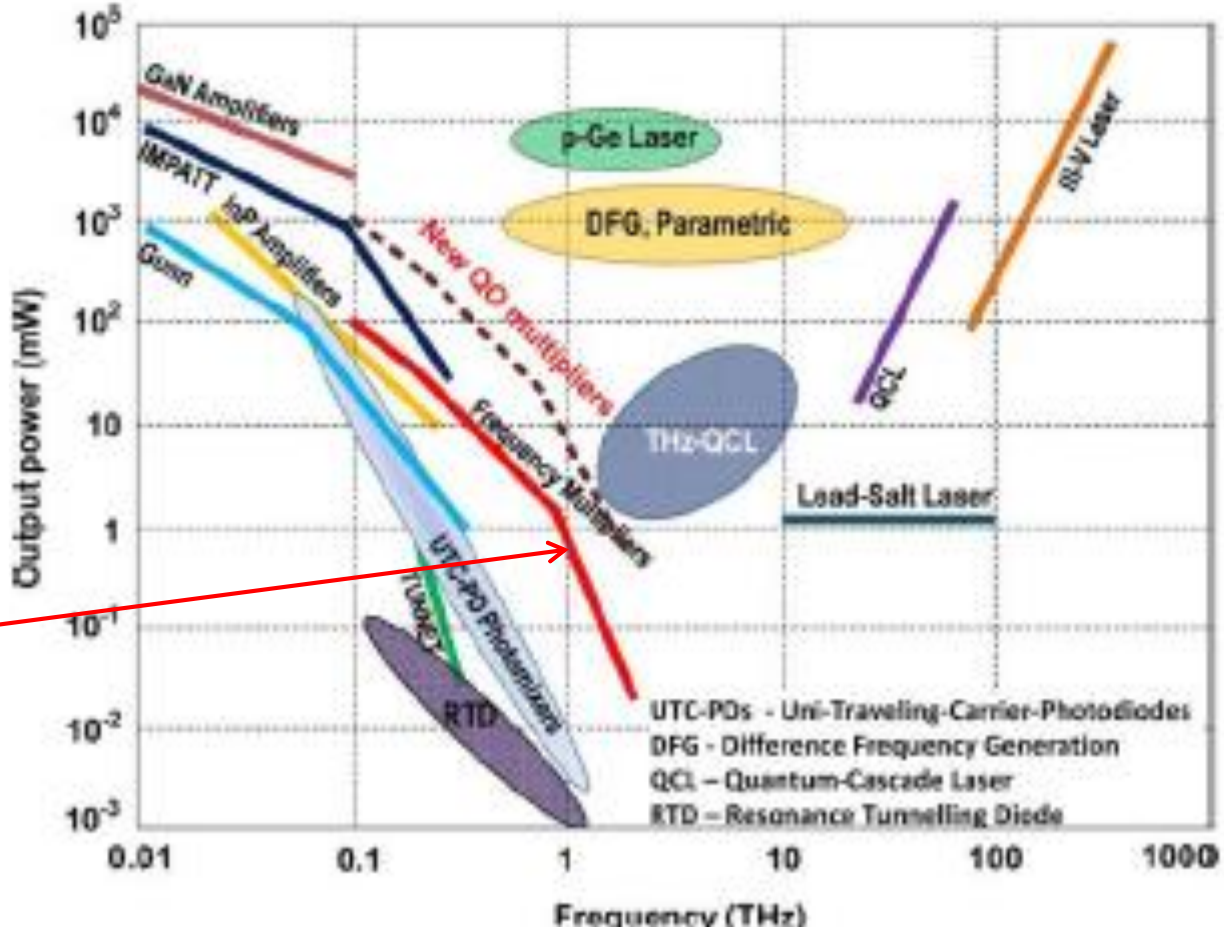
Plugging the 'THz – Gap' at QMUL

Talk to 'Rost'



(EPSRC), Dr. Dubrovka (PI), Donnan (CI), Parini (CI), Kreouzis (PI), Active Quasi-Optics for High Power THz Science, £465,158, Co-Investigator, 03/02/2014 - 02/02/2017

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Applications of THz sources/receivers at QM range from:

The very big

The entire sky mapped by the ‘Planck’ telescope

High Frequency Instrument (HFI)
HFI is an array of 52 bolometric detectors that is also placed in the focal plane of the Planck telescope. HFI images the sky at six frequencies between 100 GHz and 857 GHz.

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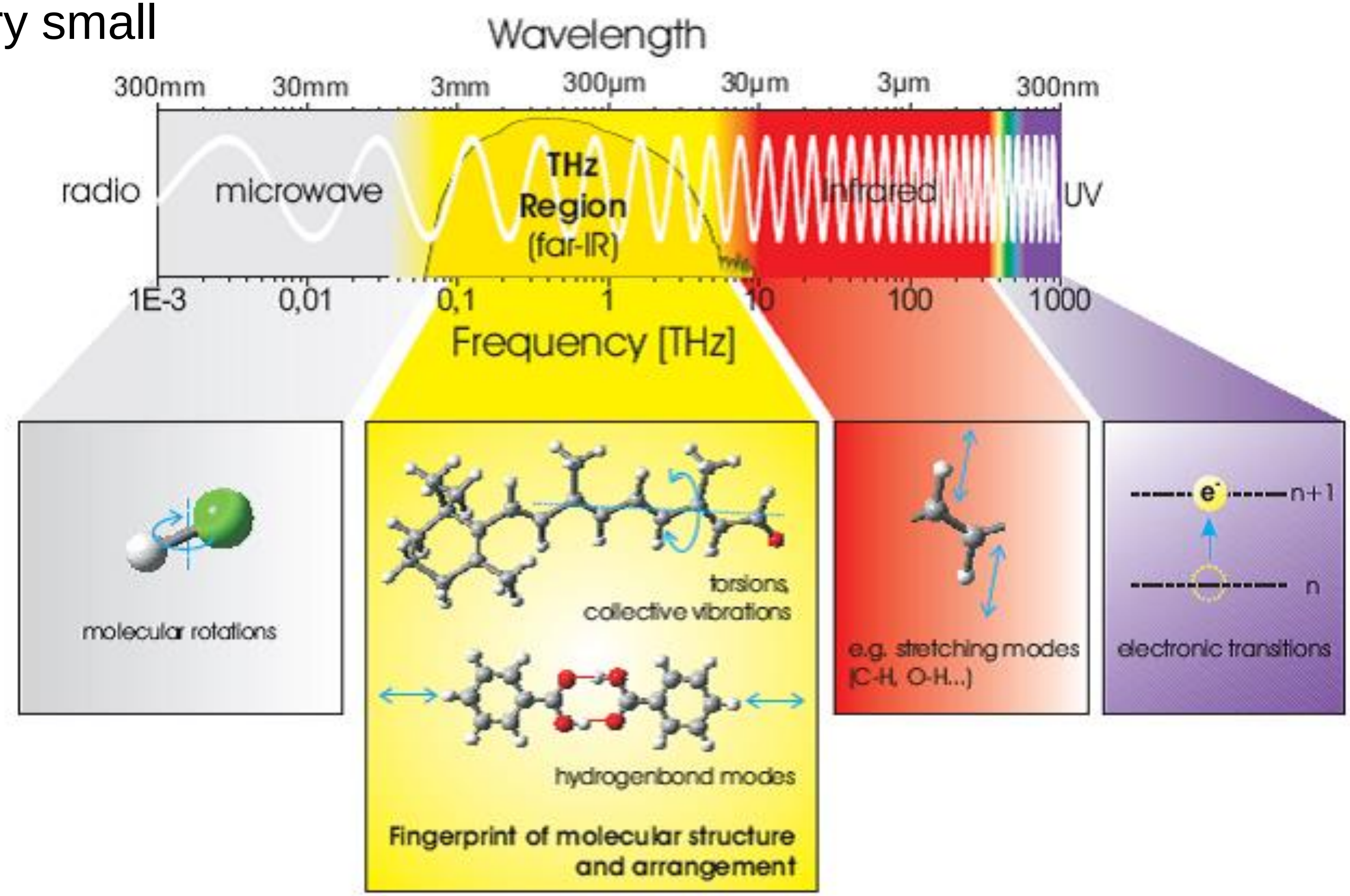
Applications of THz sources/receivers at QM range from:

The very small



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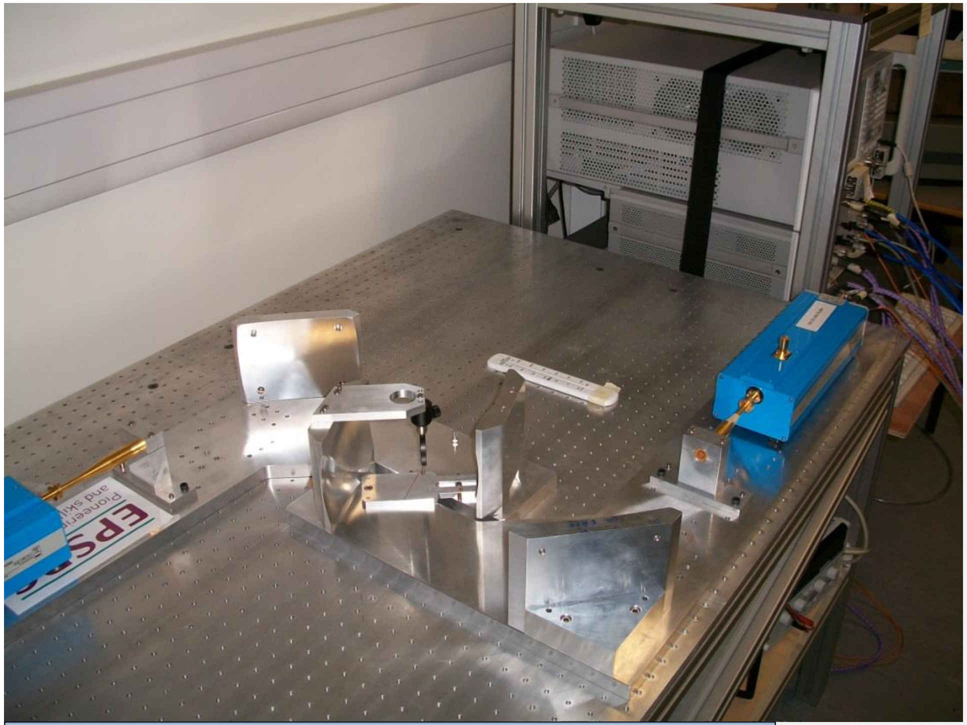

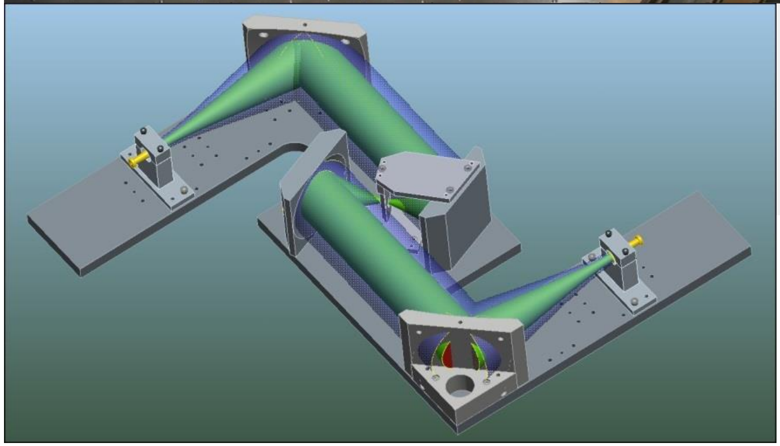

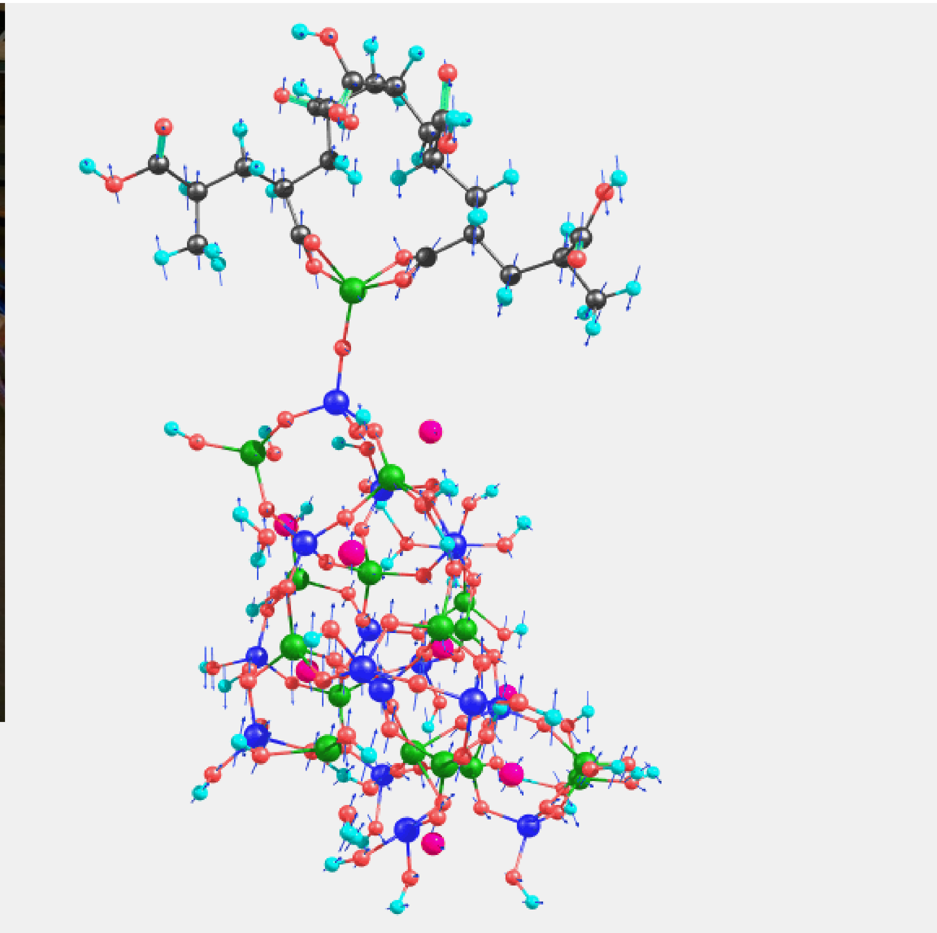

Dr. Greg Chass (SBCS): Density Function Theory modelling of bio-cement collective THz vibrational modes

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Key observation to date

VNA-QO spectroscopy reveals that proteins influence the properties of water out to greater distances than previously detected by

1) NMR
2) X-ray diffraction
3) Neutron scattering
4) Molecular dynamics simulations
5) THz-TDS

Sushko O.; Dubrovka R.; Donnan R. "Sub-Terahertz spectroscopy reveals that proteins influence the properties of water at greater distances than previously detected", Journal of Chemical Physics (submitted)

Sushko O.; Dubrovka R.; Donnan R. S. "Terahertz Spectral Domain Computational Analysis of Hydration Shell of Proteins with Increasingly Complex Tertiary Structure." J. Phys. Chem. B117, 16486−16492 (2013)