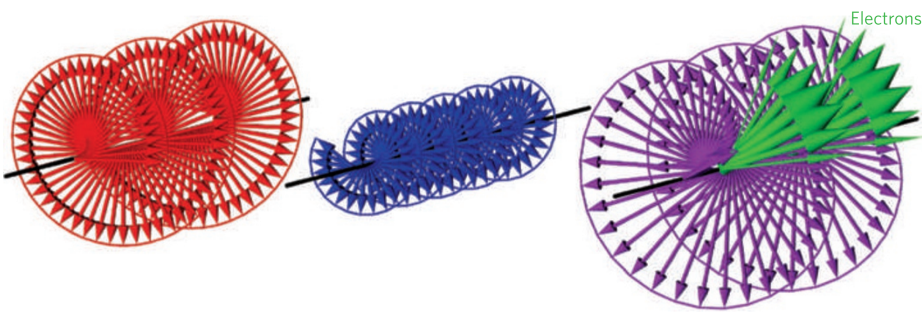

Figure 2 | The electric field strength of circularly polarized monochromatic light has the same magnitude in all directions, both for the fundamental wavelength (red) and the second harmonic (blue). This is not the case, however, for light containing both wavelengths (violet). Here, the electric field has a maximum with a position that depends on the relative phase between the fundamental and second harmonic. Because field-induced ionization of atoms is a highly nonlinear process, it occurs only near the field maximum. Ionization yields free electrons, which the electric field accelerates (green). This causes THz emission with a polarization parallel to the electric field maximum.

or intensity dependence by reducing uncertainties caused by long-term drifts.

At present, lasers with the high intensities required for this technique are limited to repetition rates of a few kilohertz and it is not possible to extend this method of polarization control to other THz generation schemes that are suitable for lower intensity (and subsequently higher repetition rate) lasers. The comparison of experimental results with theory by Dai *et al.*[4] confirms and strongly supports the field ionization model for THz generation in a plasma and will likely stimulate discussions of the theories describing field-induced phenomena. ❐

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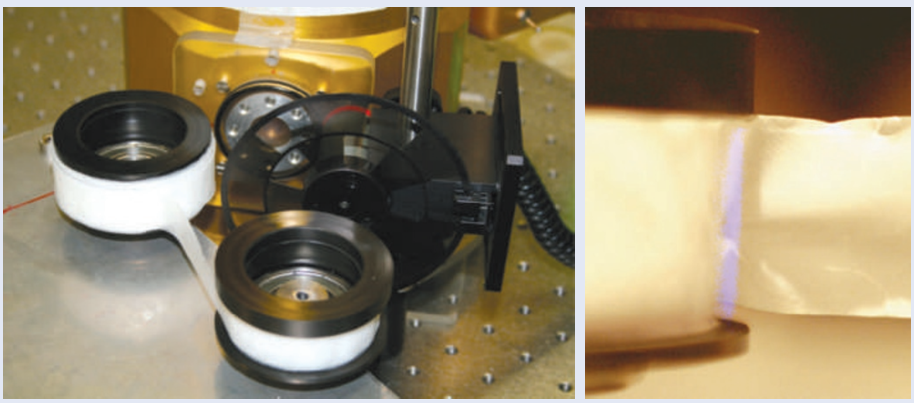
TERAHERTZ TECHNOLOGY

Sticky tape surprise

The simple act of unpeeling a roll of ‘off-the-shelf’ adhesive tape can generate terahertz radiation with a broad peak at approximately 2 THz, according to researchers in Australia (*Opt. Lett.* **34,** 2195–2197; 2009). The news follows earlier reports that peeling adhesive tape can generate radiation in other parts of the electromagnetic spectrum, including X-rays, visible light and radio waves.

Josip Horvat and Roger Lewis from the Institute of Superconducting and Electronic Materials at the University of Wollongong, Australia, used a motor to unpeel various forms of tape, including electrical tape, Scotch Magic 810 and double-sided Scotch 665. A cryogenically cooled silicon bolometer, a lock-in amplifier and digital oscilloscope recorded the intensity of the signal generated during the unpeeling process as a function of the tape unwinding speed. Optical filters and a Fourier-transform spectrometer were used to analyse the spectra of the emitted radiation.

Measurements indicate that the tapes emitted broadband terahertz radiation with a broad peak at approximately 2 THz, above which the intensity fell



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and then slowly rose with increasing frequency. The radiation was unpolarized and its power (<1 μW) rose with faster unwinding speeds.

The emission mechanism is suggested to be due to triboelectric charging — contact-induced charge separation. When the tape is peeled, its adhesive side becomes positively charged and the tape below becomes negatively charged. The resulting electric field leads to dielectric breakdown of the surrounding air, causing the accelerated charges to emit broadband Bremsstrahlung radiation. The emission peaks are a result of absorption from the surroundings. Although a vacuum is necessary for the accelerated charges to reach sufficient energy to emit X-rays, Horvat and Lewis indicate that much lower-frequency terahertz radiation can be generated in air. All measurements were made at ambient temperature and pressure.

The researchers suggest that optimization of the scheme may lead to higher output powers and result in an inexpensive source of 1–20 THz radiation.

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