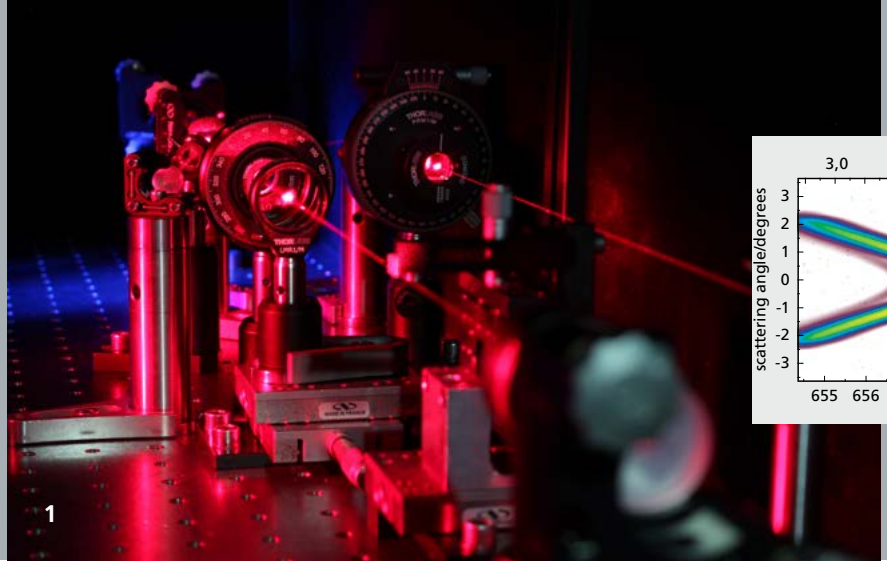

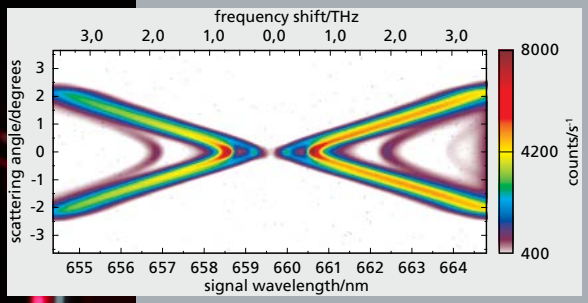

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QUILT – QUANTUM OPTICS IN THE TERAHERTZ SPECTRAL RANGE

1 *Experimental setup to verify photons generated by quantum optics*

2 *Angular spectrum recorded in the context of the project as indirect proof of quantum optical generation of terahertz photons*

Fraunhofer has a flagship project known as QUILT to conduct research on imaging processes in the terahertz spectral range based on quantum optics. "Schrödinger's Cat" has developed from a thought experiment to an exciting and practical reality. With our first experimental successes achieved in 2018, we are breaking new ground in the field of terahertz research.

Classical imaging in the visible spectral range benefits from the wide availability of good detectors. Whether in digital cameras, PCs, or smartphones: the majority of households own several optical imaging systems with millions of detectors.

Imaging difficulties using terahertz waves

However, imaging in the terahertz spectral range is still a major technical challenge. Often, we are forced to rely on scanning methods since only a single or just a few detectors can be operated. In practice that means the scenes to be recorded are scanned with a single detector and these traces, subsequently, have to be put together.

Quantum optics provides a solution

Using the phenomena of quantum optics, we can transfer the properties of photons (light particles) to other photons. If we succeed in transferring the properties of difficult detectable photons over to the easier to detect photons, for example, those in the visible range, we can identify them and avoid the detector availability problem.

Initial success

Inspired by outstanding basic research on the subject of quantum optics, the aim of our flagship project is to transfer these concepts to the terahertz spectral range. The first experimental challenge was to generate suitable photon pairs, something we achieved last year.

The next steps mean entering into uncharted scientific territory. The interaction of photons in the terahertz range with visible photons must be verified. For this, we take advantage of the good detectability of visible photons to indirectly detect and utilize terahertz waves. If this step succeeds, a new access to the terahertz spectral range and its many applications will be made possible.