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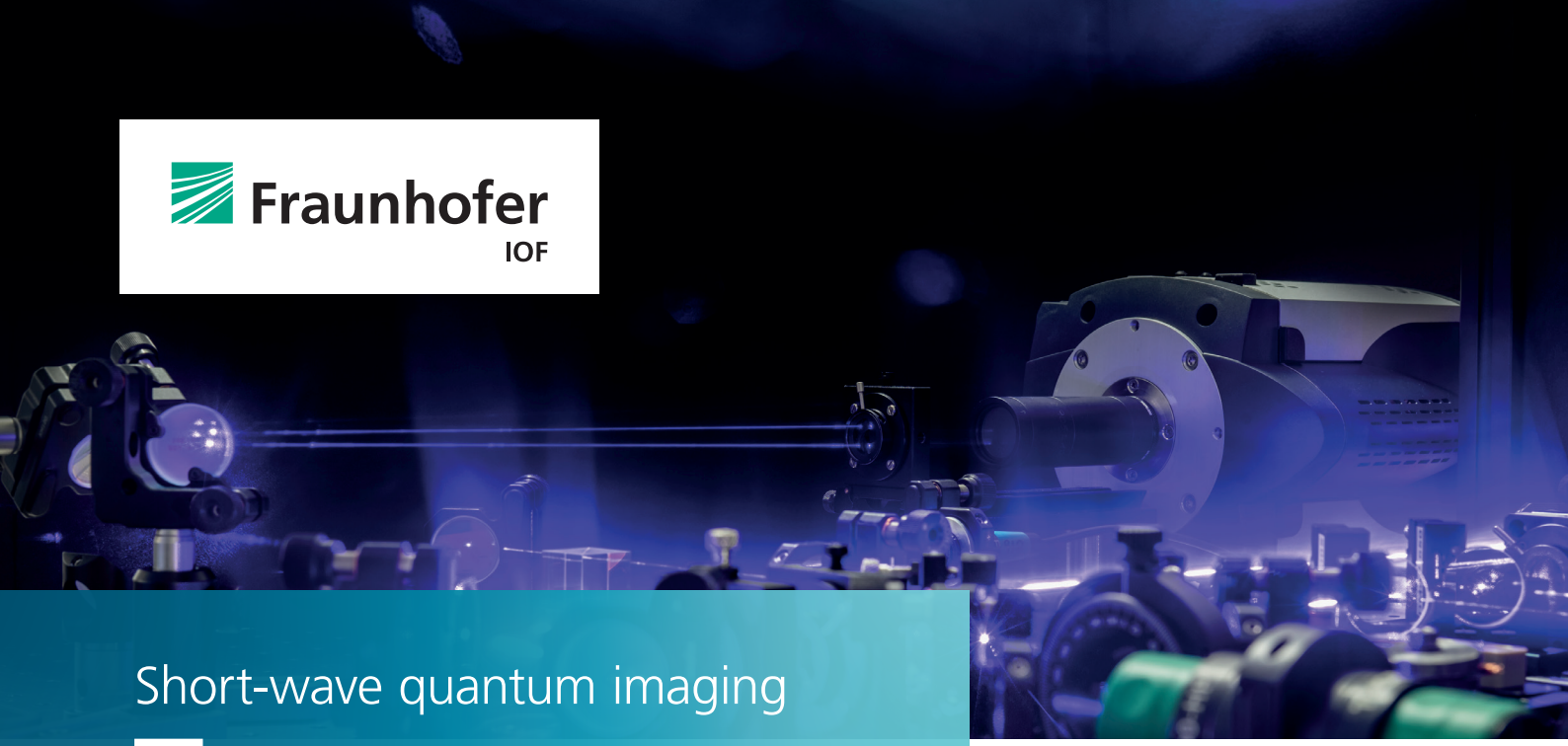
# Short-wave quantum imaging

## Quantum-enhanced imaging devices



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## Quantum-enhanced imaging devices

*Cover/Top: Quantum imaging based on entangled photon pairs – source of entangled photon pairs: ppKTP crystal pumped at 405 nm (pump), yielding entangled photon pairs at 910 nm (detected) + 730 nm (object interaction).*

**Nowadays, quantum physics has transformed from a purely fundamental science to a research field with real-life applications. In particular, quantum photonics promises novel approaches for quantum-enhanced imaging.**

For instance "quantum imaging with undetected photons" was first implemented by the Zeilinger group in Vienna /1/. Based on Mandel's induced coherence, it becomes possible to image an object with light that never interacted at all with the object. In stark contrast to (quantum) ghost imaging, neither any coincidence detection is necessary nor any detection of the light that interacted with the object. By exploiting non-degenerate spontaneous parametric down conversion, photon pairs with large wavelength difference can be harnessed.

The obvious advantage of this technique is that the wavelength of the idler photons can be tailored to match the interesting spectral range of the object (e.g. far IR, THz, deep UV). At the same time, the signal photons, which are actually detected, can stay in the VIS range where, e.g., Si-based detectors are optimized.

Fraunhofer IOF has revised an implementation of this imaging scheme /2,3/. Our approach aims at a robust, miniaturized, and mobile realization, by employing a single crystal scheme. Besides the application for biomolecules, fundamental aspects like the influence of spatial correlation vs. momentum correlation on the imaging properties are under investigation.


*References:*
*/1/ Lemos et al., Nature 512, pages 409-412 (2014).*
*/2/ Gilaberte et al., Laser & Photonics Reviews Vol. 15, Issue 6 (2021) (https://onlinelibrary.wiley.com/doi/10.1002/lpor.202000327).*
*/3/ Töpfer et al., ScienceAdvances Vol 8, Issue 2 (2022) (https://www.science.org/doi/10.1126/sciadv.abl4301).*


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