

## **Terahertz investigation at BESSY of collective behaviors in condensed matter: from superconductors to protein aggregates**

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Vibrational spectroscopy in the Terahertz range is sensitive to collective excitations with rather long spatial coherence, in particular the hydrogen bond within small and large molecules that builds the condensed phases of soft matter. At the same time, superconductors display their most interesting spectroscopic features related to Cooper pair condensates in the same Terahertz range of frequencies (0.1-3.0 THz).

BESSY-II has developed a unique coherent Terahertz emission mode, which can be achieved in the "low-alpha" mode of the storage ring. The bandwidth, stability and bunch-to-bunch coherence of this unique THz source have been thoroughly characterized at the IRIS beamline in the last two decades. We discuss the main results that have been achieved on novel superconducting materials in the past, and we propose a perspective extension to the THz range of the more recent near-field nano-spectroscopy studies on pathological protein aggregates performed by us at the IRIS beamline.