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Title:Terahertz imaging system using high-T<sub>c</sub>/I<sub>c</sub> superconducting oscillation devices

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Abstract:Microwatt power oscillation devices at sub-terahertz frequency region between 0.3 and 1.0 terahertz (THz) were fabricated from high-T<sub>c</sub>/I<sub>c</sub> superconducting single crystalline Bi<sub>2</sub>/Sr<sub>2</sub>/CaCu<sub>2</sub>O<sub>8+δ</sub> and used as a source of the transmission terahertz imaging system. As test examples, terahertz images of coins and a razor blade placed inside the brownish paper envelopes with the spatial resolution of 1 mm are presented. The signal-to-noise ratio exceeds 130 in these images. Using a simple wedge-shaped interferometer and analysing the interference fringe pattern, the wavelength of the terahertz wave is calibrated within 0.1% accuracy. This interferometer also provides a simple method to measure the absorption coefficient of the liquid sample. Two test measurements for distilled water and ethanol are demonstrated and their absorption coefficients are obtained with 99.2% accuracy. This suggests that our terahertz imaging system can be applied to many practical applications, such as biological and biomedical imaging, environmental monitoring, microanalysis of impurities, structure and dynamical analyses of large molecules and ions in solution. © 2012 American Institute of Physics.

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Main heading:Superconducting devices

Controlled terms:Ethanol - Imaging systems - Interferometers - Medical imaging - Superconductivity - Terahertz waves

Uncontrolled terms:Absorption coefficients - Biomedical imaging - Distilled water - Dynamical analysis - Environmental Monitoring - Frequency regions - High-T - Interference fringe pattern -

Liquid sample - Molecules and ions - Power oscillations - Razor blades - SIMPLE method - Single-crystalline - Spatial resolution - Terahertz - Terahertz imaging systems - Test examples - Test measurements

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