Terahertz Applications Beyond Space Science

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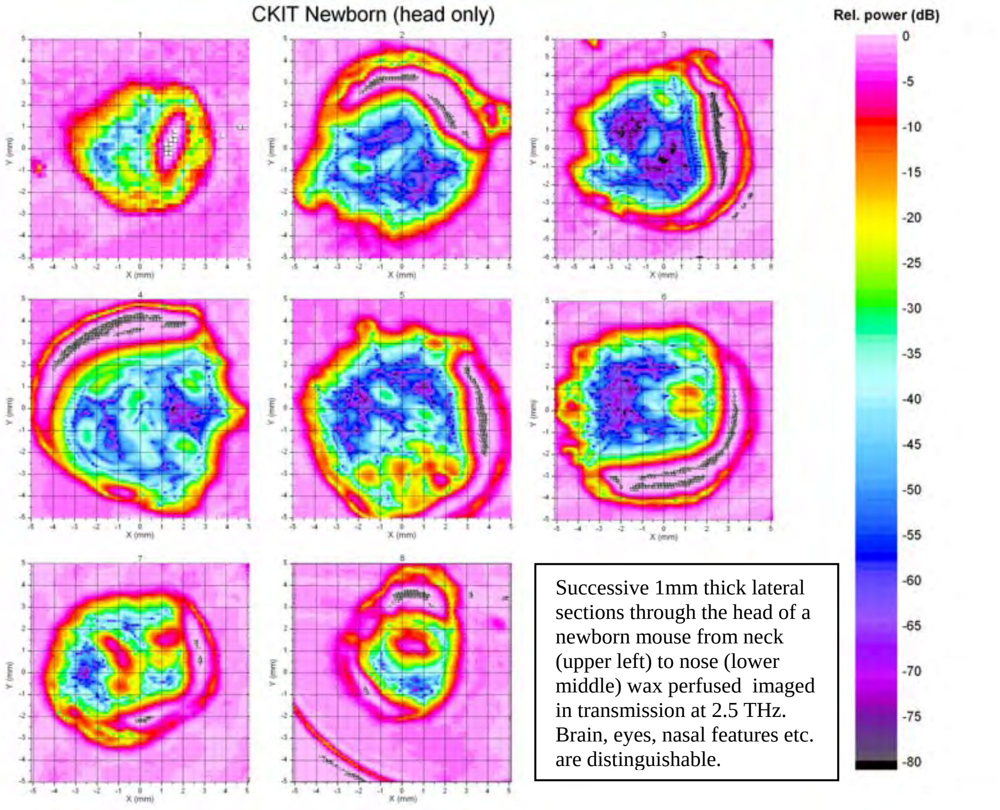
Abstract:

After more than 30 years of focused applications in the space sciences area, Terahertz Technology is experiencing a true Renaissance. While major strides continue to be made in submillimeter wave astronomy and spectroscopy, the past few years have seen an unprecedented expansion of terahertz applications, components and instruments targeted *outside* of the space sciences. Broad popular interest in this unique frequency domain has emerged for the first time[1], spanning applications as diverse as biohazard detection and tumor recognition. Already there are groups around the world who have applied specialized Terahertz techniques to disease diagnostics[2], recognition of protein structural states[3], monitoring of receptor binding[4], performing label-free DNA sequencing[5] and visualizing contrast in otherwise uniform tissue[6]. A commercial terahertz imaging system has recently started tests in a hospital environment and new high sensitivity imagers with much deeper penetration into tissue have begun to emerge[7]. Solicitations for more sophisticated instruments and enabling terahertz components have filtered into US agency proposal calls from DoD and NASA, to NSF and NIH, and many new research groups have sprung up, both in the US and in Europe and Asia. This talk will broadly survey terahertz applications that may be less familiar, but equally interesting to a space scientist, with the hope of stimulating some crossover into Earth-based life sciences.



Successive 1mm thick lateral sections through the head of a newborn mouse from neck (upper left) to nose (lower middle) wax perfused imaged in transmission at 2.5 THz. Brain, eyes, nasal features etc. are distinguishable.

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