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Urbanization and the increasing use of wireless technologies are contributing to elevated levels of radiofrequency electromagnetic field (RF-EMF) emissions in populated areas. Cities often have a high density of wireless devices operating on microwave frequencies, such as the commonly used 2.4 and 5.8 GHz bands of wireless technologies. This anthropogenic electromagnetic radiation is an integral part of our daily lives, but represents a form of environmental pollution and poses a potential stressor for bees and other flying insects. Debates circulate on whether this anthropogenic radiation negatively influences key fitness parameters or disrupts important habitats and refugia of pollinators, especially in highly developed areas where such fields are ubiquitous.

We aimed to study the effects of these frequencies on different pollinators, while meeting the challenge of a defined and realistic radiation exposure required for such experiments. To generate this defined radiation, we used a novel and high-quality technical setup that generates consistent and realistic electromagnetic radiation, developed for these experiments by the Communications Engineering Lab (CEL) at the Karlsruhe Institute of Technology. We tested the effects of 2.4 and 5.8 GHz on I) brood development, longevity and homing ability of free-flying honey bees, and on II) flower visitation rates of different pollinators under field conditions.

The results of this interdisciplinary work show significant effects of long-term exposure on the homing ability of foraging honey bees, but no effects on brood development and adult worker longevity. In addition, we found no effect of this radiation on honey bee visitation rates on pollinator-attractive plants, but the number of foraging bumble bees decreased significantly when plants were subjected to RF-EMF exposure. We continue to explore the effects of RF-EMF exposure on other parameters of bee health.

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