

# The Bees

**Bees are vital for humanity  
and all life on our planet.**



75%



This fascinating animal helps us produce around 75% of the world's food, over 90 of the crops we consume worldwide.





During the last couple of decades, the bee population has declined. **The reasons for this are multiple, and, according to studies, electrosmog could be one of them.**







**Bees are naturally oriented following the earth's magnetic field, and this type of pollution may be affecting their ability to sense it properly, thus making their navigation more difficult.**





**Also, some scientists have pointed out how this environmental factor could also be affecting their "waggle dance", a typical bee communication method that is vital for their survival.**





75%



Most people still do not understand the huge importance of this little yet vital animal, which plays a huge role in our sustainability.





Every day, we do our part by **raising awareness on this matter and contributing to protecting them with our technology against one of those many factors that endanger them.**









## Colony Collapse Disorder (CCD) in Honey Bees Caused by EMF Radiation

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### Abstract

Honey bees are one of the treasures in the world. An increase of waveform communication leads to good information exchange of mankind. In the biological view, it causes a lot of side effects and lifestyle changes in other living organisms. The drastic changes are causing the natural imbalance in the ecosystem and become a global issue. There are significant reasons for bee colony collapse disorder (CCD) like pesticides, disease and climate change. Recent studies reveal that a cell phone tower and mobile phone handset are also causing side effects to honey bees due to radiation emission. Most of the researchers concentrated on biological and behavioral changes in a honey bee due to radiation effects. For that, the real-time radiation emission levels, handset radiation emission levels, and the effect of radiation on honey bees are studied. This study aimed to provide possible research directions.

**Keywords:** Electromagnetic radiation, cell tower, radiation, honey bees.

### Background

Honey bees are small insects which play a vital role in agriculture. Honeybees are essential partners of pollination in agriculture. Recent declines in honey bee populations are increasing demand for insect-pollinated crops and pollinator shortages. It happens due to pesticides, crop practices etc. [1]. The recent study on

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## SCIENTIFIC REPORTS

### OPEN

## Extremely Low Frequency Electromagnetic Fields impair the Cognitive and Motor Abilities of Honey Bees

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Extremely low frequency electromagnetic field (ELF EMF) pollution from overhead powerlines is known to cause biological effects across many phyla, but these effects are poorly understood. Honey bees are important pollinators across the globe and due to their foraging flights are exposed to relatively high levels of ELF EMF in proximity to powerlines. Here we ask how acute exposure to 50 Hz ELF EMFs at levels ranging from 0.8–100  $\mu\text{T}$ , found at ground level below powerline conductors, to 1000–7000  $\mu\text{T}$ , found within 1 m of the conductors, affects honey bee olfactory learning, flight, foraging activity and feeding. ELF EMF exposure was found to reduce learning, alter flight dynamics, reduce the success of foraging flights towards food sources, and feeding. The results suggest that 50 Hz ELF EMFs emitted from powerlines may represent a prominent environmental stressor for honey bees, with the potential to impact on their cognitive and motor abilities, which could in turn reduce their ability to pollinate crops.

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## SCIENTIFIC REPORTS

### OPEN

## Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz

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Arno Thielens<sup>1,2</sup>, Duncan Bell<sup>3</sup>, David B. Mortimore<sup>4</sup>, Mark K. Greco<sup>5</sup>, Luc Martens<sup>2</sup> & Wout Joseph<sup>1</sup>

Insects are continually exposed to Radio-Frequency (RF) electromagnetic fields at different frequencies. The range of frequencies used for wireless telecommunication systems will increase in the near future from below 6 GHz (2 G, 3 G, 4 G, and WiFi) to frequencies up to 120 GHz (5 G). This paper is the first to report the absorbed RF electromagnetic power in four different types of insects as a function of frequency from 2 GHz to 120 GHz. A set of insect models was obtained using novel Micro-CT (computer

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difference time-domain  
power on the frequency.  
Hz, in comparison to the  
of the incident power  
over between 3–370%.

tion between billions of users  
Hz and 6 GHz'. Wireless tel-

### OPEN

## Radio-Frequency Electromagnetic Field Exposure of Western Honey Bees

Arno Thielens<sup>1,2\*</sup>, Mark K. Greco<sup>3</sup>, Leen Verloock<sup>1</sup>, Luc Martens<sup>2</sup> & Wout Joseph<sup>1</sup>

Radio-frequency electromagnetic fields (RF-EMFs) can be absorbed in all living organisms, including Western Honey Bees (*Apis mellifera*). This is an ecologically and economically important global insect species that is continuously exposed to environmental RF-EMFs. This exposure is studied numerically and experimentally in this manuscript. To this aim, numerical simulations using honey bee models, obtained using micro-CT scanning, were implemented to determine RF absorbed power as a function of frequency in the 0.6 to 120 GHz range. Five different models of honey bees were obtained and simulated: two workers, a drone, a larva, and a queen. The simulations were combined with *in-situ* measurements of environmental RF-EMF exposure near beehives in Belgium in order to estimate realistic exposure and absorbed power values for honey bees. Our analysis shows that a relatively small shift of 10% of environmental incident power density from frequencies below 3 GHz to higher frequencies will lead to a relative increase in absorbed power of a factor higher than 3.

Wireless communication is a widespread and growing technology. Most of the wireless networks and personal devices operate using Radio-Frequency (RF) electromagnetic fields (EMFs). The current networks rely on frequencies between 0.1 GHz and 6 GHz<sup>1</sup>. These EMFs can be absorbed in dielectric media and can cause dielectric



4.00"

0.05"

4.00"



4.00"

4.00"

Length	4.00 inch
Width	0.05 inch
Height	4.00 inch
Weight	1.2 OZ

**SPIRO® Filtering Power:** 2,3 (7 SPIRO® Films)

**Power Density RFR:** 1,67 mW/cm<sup>2</sup>

**AC Electrical Field Capacity:** 2.48 v/m (ELF)

**AC Magnetic Flux:** 69 mG / 6.9 uT

**Durability:** 7 years (test in process)

**Range of Action Radius:** 7.87 ft / 2.4 m (Spherical)

**Range of Action Diameter:** 15.75 ft / 4.8 m (Spherical)

**General Area of Influence:** 194.58 ft<sup>2</sup> / 18.08 m<sup>2</sup>

**Film Frequency Range:** 0 Hz to 3 x 10<sup>12</sup> Hz (300 GHz)

**Films Curie Temperature:** 1011.2 °F (544 °C)

**Made for Telecommunications from 0.3 GHz to 12.5 GHz**



# We're still on time!

Do your part and educate others too.

