Biological Effects of Millimeter Waves[1]

What are mmWaves?

Millimeter (mm) waves comprise the region of the electromagnetic spectrum between 30 and 300 GHz.

How much is known about the biological effects of mmWaves?

More than 470 papers are identified by the authors[1]. A 1997[2] review covered about 50 peer-reviewed Western papers and about 300 published in the former Soviet Union[3]. This paper reviewed findings from an additional 124 papers published since 1997.

What areas have been studied?

Studies of mmWaves have already looked at the nervous and immune systems, gene expression, cell proliferation, effects on the eyes, skin heating and cancer. As was noted in an earlier paper, 'Importantly for medical applications, mmWaves do not possess sufficient photonic energy to break chemical bonds or cause ionization. Thus, they are incapable of producing chromosomal mutations and do not cause cancer[4]'.

Existing usages of mmWaves

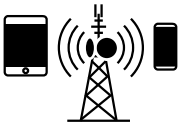
Speed Radars

Medical Treatment

Airport Screening

Accident Avoidance Systems

Mobile Communications



What did the study conclude?

'mmWaves are entirely absorbed in the epidermis and the dermis'.

The only confirmed effects relate to heating – 'high intensity mmWaves can cause overheating of the skin'. This is the same as for the lower RF spectrum.

International RF exposure standards are designed to ensure temperature increases for both the public and workers remain well below these levels.

1 Biological effects of millimeter and submillimeter waves. Alekseev SI and Ziskin MC. in *Handbook of Biological Effects of Electromagnetic Fields* (B. Greenebaum and F. Barnes, editors), 4th ed., Chapter 6, pp. 179-242, 2019, CRC Press, Boca Raton, FL].

2 Pakhomov, A. G., Y. Akyel, O. N. Pakhomova, B. E. Stuck, and M. R. Murphy. 1998. Current state and implications of research on biological effects of millimeter waves: A review of the literature. Bioelectromagnetics 19:393–413.

3 According to the authors, the Soviet Union, China and other eastern European countries have used mmWaves for the treatment of more than 30 diseases.

4 Ziskin, MC. 2013, Review Millimeter Waves: Acoustic and Electromagnetic Bioelectromagnetics 34:3-14

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