



Legislative Council Staff

Nonpartisan Services for Colorado's Legislature

Memorandum

Room 029 State Capitol, Denver, CO 80203-1784
Phone: (303) 866-3521 • Fax: (303) 866-3855
lcs.ga@state.co.us • leg.colorado.gov/lcs

September 12, 2019

TO: Interested Persons

FROM: Julia Group, Research Analyst, 303-866-4780

SUBJECT: Overview of 5G Technology

Summary

This memorandum provides background on 5G technology, an overview of the current regulations governing wireless service facilities and radio frequency (RF) transmissions, and the current scientific evidence of the health effects of exposure to RF transmissions.

Background

5G stands for fifth-generation cellular wireless. It is the next upgrade of wireless technology which relies on new infrastructure, called small cells. Small cells are low-powered cellular sites that collect and transmit signals over a short range. They are installed in closer proximity to each other than traditional cellular towers in order to increase connectivity.

Federal Regulations Concerning Wireless Service Facilities

The Federal Communications Commission (FCC) is responsible for authorizing and licensing telecommunications services, facilities, and devices used by the public, industry, and state and local governmental organizations. According to the federal Telecommunications Act of 1996 (TCA), state and local governments generally have authority over decisions regarding the placement, construction, and modification of FCC-licensed telecommunication facilities.¹

There are a few exceptions to state and local authority over telecommunication facilities, including that state and local governments may not regulate telecommunication facilities on the basis of the environmental effects of the radio frequency (RF) transmissions, to the extent that such facilities comply with the FCC's regulations concerning such transmissions.² Exposure to RF energy is considered an environmental factor and therefore is regulated by the FCC.

¹47 U.S.C. § 332(c)(7).
²47 U.S.C. § 332(c)(7)(B).

FCC Regulations on RF Transmissions

The FCC is responsible for setting limits for human exposure to RF transmissions from wireless service facilities. RF transmissions are a type of electromagnetic energy used in telecommunications services such as radio and television broadcasting, cellular phone technology, and in microwaves and radar. In 1996, the FCC adopted recommendations from the National Council on Radiation Protection and Measurements regarding maximum permissible exposure (MPE) limits for field strength and power density for transmitters of RF transmissions. The most restrictive limits occur in the frequency range of 30 to 300 megahertz (MHz) where whole body absorption of RF energy by human beings is most efficient.³ These limits are intended to prevent human absorption of RF transmissions at potentially hazardous levels. Cellular facilities typically transmit frequencies above the 600 MHz spectrum.⁴ In 2019, the FCC released a statement saying it would maintain the existing radio frequency exposure limits.⁵

The FCC excludes certain facilities from having to determine compliance with RF exposure regulations. This exclusion is due to FCC's analysis which shows these facilities are highly unlikely to generate RF exposures in excess of the guideline limits. Cellular sites are typically excluded from the evaluation for RF exposure.⁶

Health Effects of RF Transmissions from Telecommunication Facilities

Scientific evidence of significant health impacts from human exposure to RF levels below the FCC regulations is generally inconclusive. The World Health Organization (WHO) acknowledges the existence of electromagnetic hypersensitivity (EHS), a condition that consists of nervous system symptoms with exposure to electromagnetic fields below the limit of international standards, but notes that the cause of EHS is not scientifically proven.⁷ The WHO also reports that the only health effect identified in scientific reviews from RF emitting telecommunication stations is an increase in body temperature from exposure at very high intensity found only in certain industrial facilities. The levels of RF exposure from telecommunication stations are so low that the temperature increases are insignificant and do not affect human health.⁸ However, the WHO's International Agency for Research on Cancer classified RF fields as possibly carcinogenic to humans, a category which means a causal association is considered credible.⁹ This classification is based on an increased risk of brain cancer that may be associated with cell phone use.¹⁰ The American Cancer Society states that there is little evidence to support the idea that cellular phone towers cause cancer.¹¹

Both the U.S. Food and Drug Administration and the federal Occupational Safety and Health Administration reference the WHO reports in regard to the health effects of RF transmissions.^{12,13}

³*Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields.* Federal Communications Commission Office of Engineering & Technology, August 1999.

⁴*RF Safety FAQ.* Federal Communications Commission, November 2015.

⁵*Chairman Pai Proposes to Maintain Current Radiofrequency Exposure Safety Standards.* Federal Communications Commission. <https://docs.fcc.gov/public/attachments/DOC-358968A1.pdf>

⁶*A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance.* Federal Communications Commission, June 2000.

⁷*Electromagnetic Hypersensitivity.* World Health Organization, December 2005.

⁸*Base Stations and Wireless Technologies.* World Health Organization, May 2006.

⁹*Electromagnetic Fields and Public Health: Mobile Phones.* World Health Organization, October 2014.

¹⁰*IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic to Humans.* World Health Organization, May 2011.

¹¹*Cellular Phone Towers.* American Cancer Society, November 2018.

¹²*Radiation-Emitting Products: Current Research Results.* U.S. Food and Drug Administration. <https://www.fda.gov/radiation-emitting-products/cell-phones/current-research-results>

¹³*Radiofrequency and Microwave Radiation.* Occupational Safety and Health Administration. <https://www.osha.gov/SLTC/radiofrequencyradiation/healtheffects.html>