

Challenges of Wireless Facility Siting

Land Use v. Wireless

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November 16, 2011

Demographics/Usage

- Wireless device use is growing tremendously in younger generations with 75% of 17-year-olds using a wireless device. Currently, over 200 million Americans use wireless communication devices.
- There are at least 50 million smartphone devices, which require increased capacity. Consequently, data usage has grown by 3,000% over the past three years, and is estimated to grow by another 40% by 2019.

Leaving the Landline Behind

- In the U.S., there are more wireless phones in service than wired phones.
- Almost one in three subscribers under the age of 30 utilizes a wireless device and not a traditional landline. Moreover, nearly 50% of adults between the ages of 25 and 29 live in households with only wireless communication devices.

Emergency Services

- Over 290,000 911 calls are made daily from wireless devices.
- More than 50% of all 911 calls are made from wireless devices. Accurately locating callers places greater burden on wireless networks.
- Emergency service providers (e.g., police and fire departments) rely on commercial wireless providers for citizen communication and during major events (i.e. fires, mudslides, etc.).

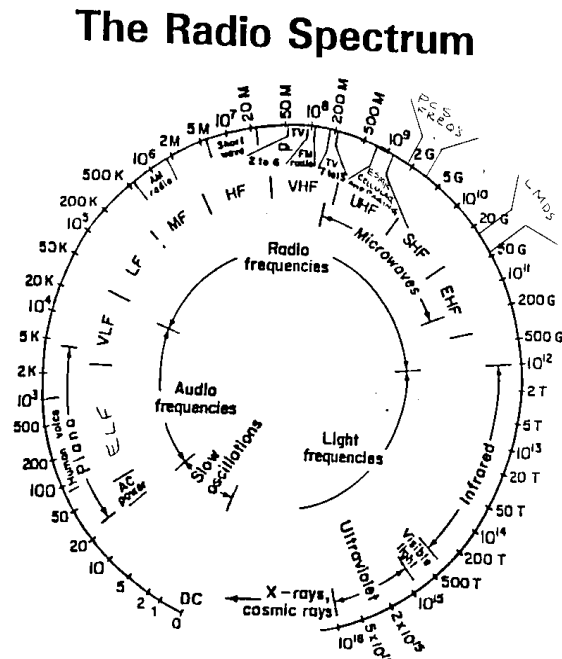
Emergency Purposes

- Provide necessary communication in times of emergency.
- Cooperate with governmental authorities to implement new technologies benefiting the public (e.g., E911, early warning detection systems).
- Platform to expand and enhance coverage to ensure consumer and emergency calls are transmitted clearly and uninterrupted.

A 3D grid of spheres on a blue background. The spheres are arranged in a regular, repeating pattern, creating a perspective effect that recedes into the distance. The background is a solid, dark blue color.

Radio Frequency

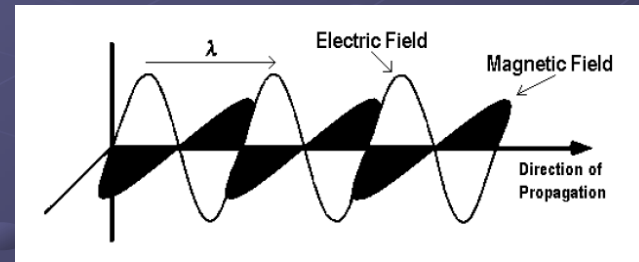
The Radio Spectrum



* A finite resource shared by all users

What are Radio Frequency Emissions?

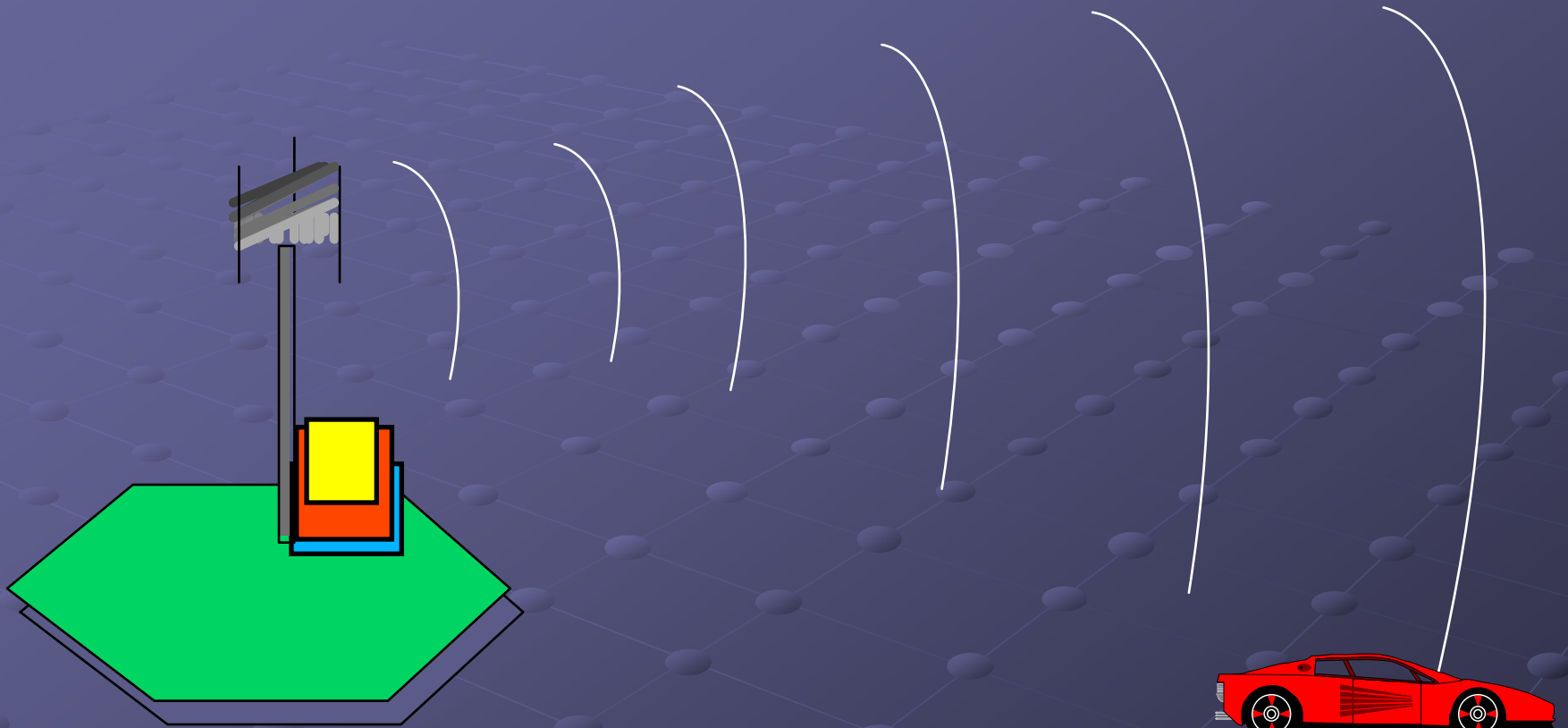
- Waves of electro-magnetic energy moving through the air.
- In wireless communications, waves (signals) are generated by alternating waves of current fed to the antenna.
- There are many sources of electro-magnetic energy
 - Computers, Wi-Fi cards
 - Televisions
 - Cordless phones
 - Baby monitors
 - House hold wiring
 - Compact fluorescent lamps
 - Virtually anything that is AC/DC powered



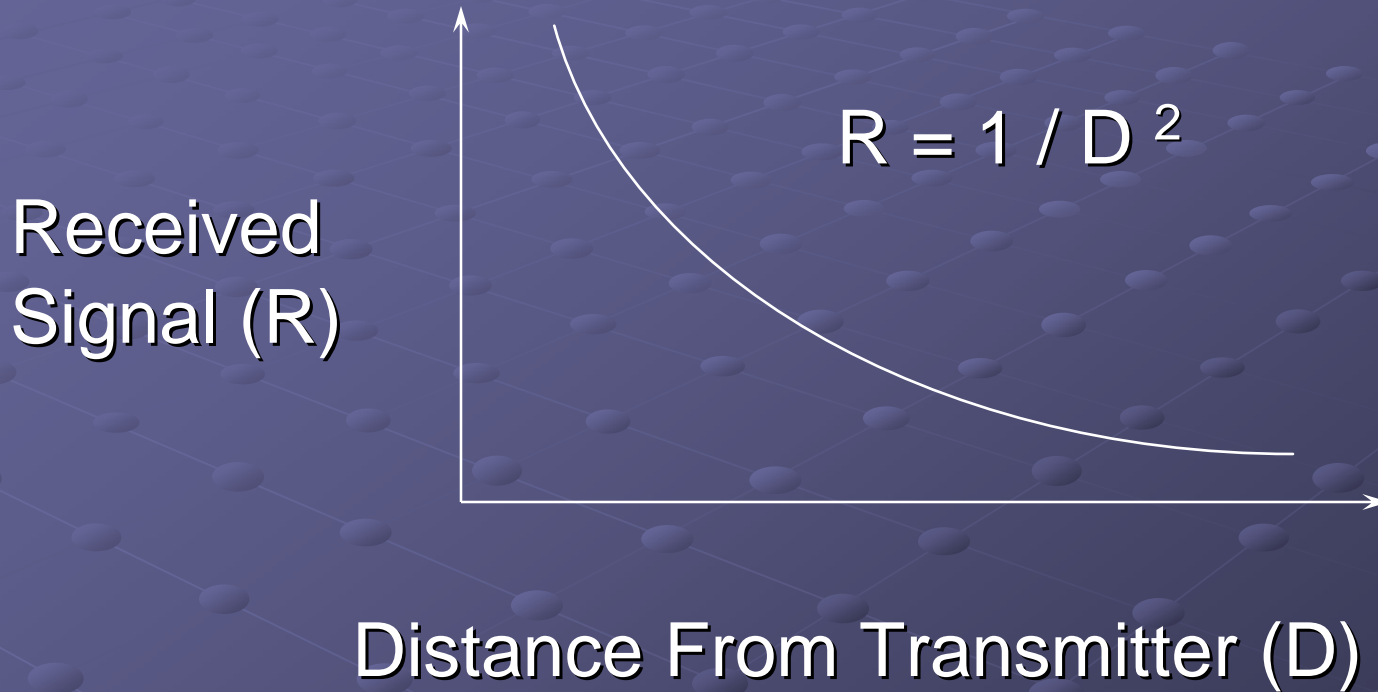
Characteristics of Radio Frequency

- Signals travel in straight lines and weaken with distance and power levels
- Are reflected or refracted by natural and man-made objects
- Signals do not propagate through mountains or solid buildings

PROPAGATION



RADIO SIGNALS DIVERGE



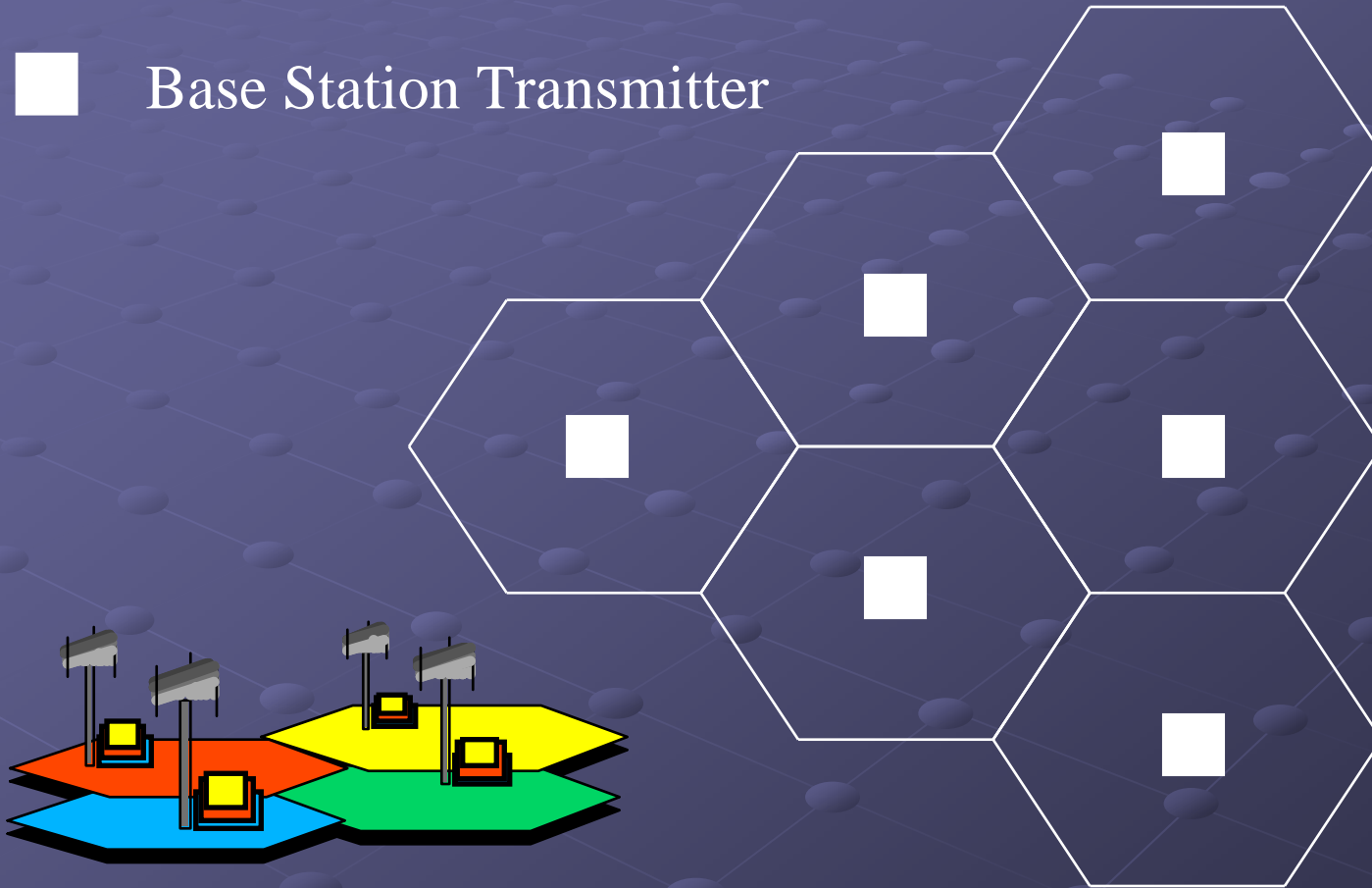
However, due to terrain influences, signal loss in the mobile environment is much more rapid ($1 / D^4$).



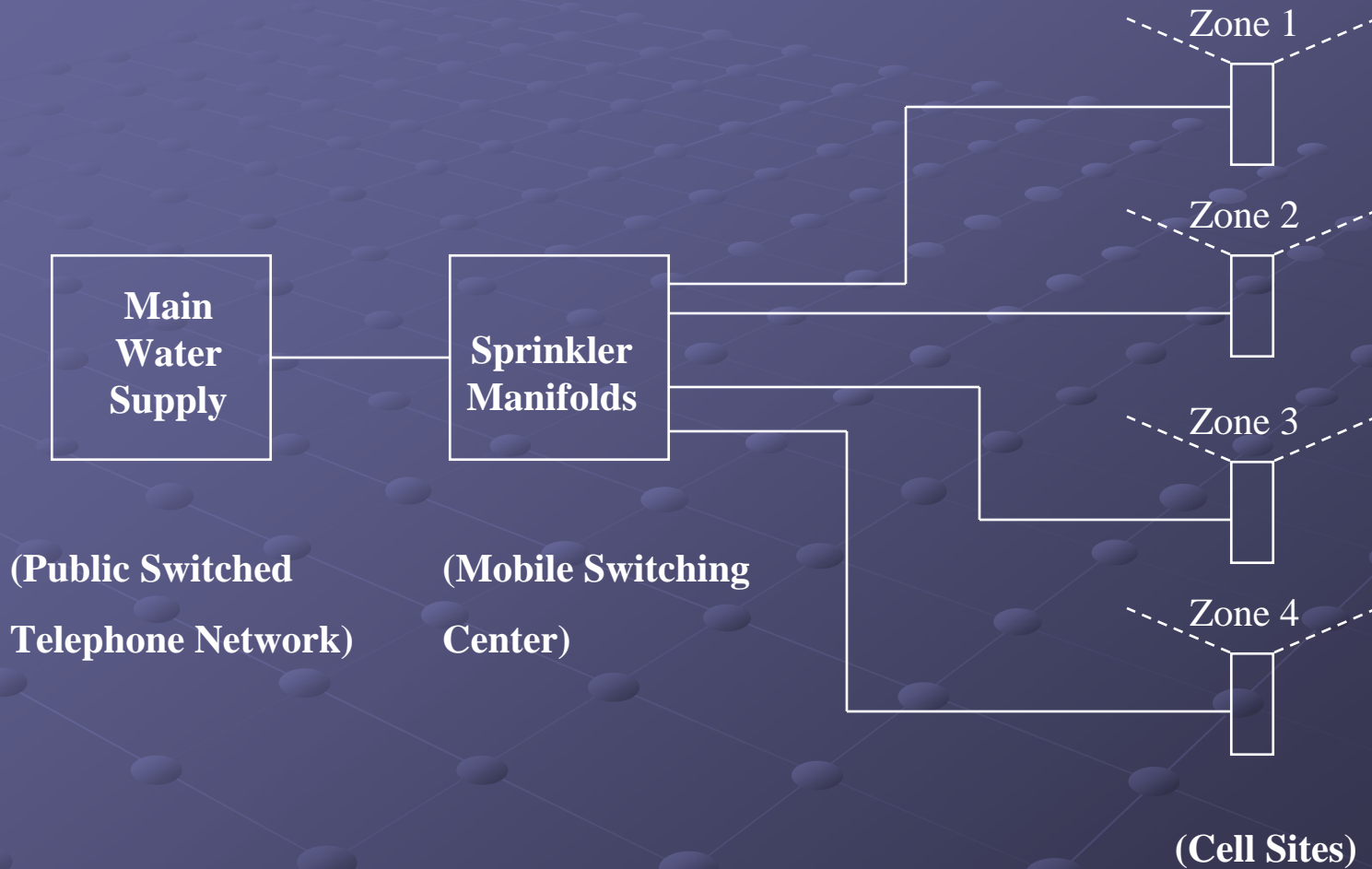
Wireless Facility Fundamentals

THE SYSTEM

■ Base Station Transmitter

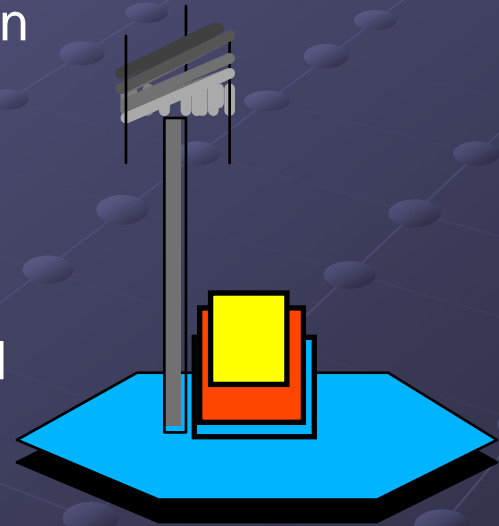


SPRINKLER ANALOGY



Wireless Facility Characteristics

- Wide range of Wireless Facility diameters
 - Approximately 0.5 miles diameter in a busy metropolitan center
 - Up to several miles diameter in suburban and rural areas
- Antennas typically located on raw ground or building tops
- Cell density can be increased as usage increases (capacity [customer demand] and coverage drive number of sites required)
- Multiple channels within each cell site increase capacity, but are finite due to reuse.



Cell Site Design Methodology

- Assess Need
 - Coverage requirement
 - Capacity requirement
 - Demand from users
- Modeling Phase
 - CellCAD propagation model
 - Determine minimum antenna height required prior to field testing
- Drive test alternatives
- Leasing and zoning issues

Attributes of a Good Cell Site

- Placed so that Line-Of-Sight (LOS) exists with hand held device and intended coverage areas
- Is located near major roads and populated areas
- Site fits in well with existing system
 - Hand-off is possible with neighbor cells
 - Minimal coverage overlap
- Minimize number of sites; maximize coverage and capacity; create minimal visual impact to property based upon system development needs

Wireless Facilities

Wireless Facilities are located on either:

- Vertical Facilities – Designed for a variety of wireless applications, including cell phone antennas, microwave systems, paging systems, law enforcement, etc.
- Existing Structures – typically on commercial or mixed-use buildings.

Coverage

- Many of today's communication facilities differ greatly than those of the past. Today's facilities are extremely low power and are intended to cover very small, finite areas.
- Subscribers are increasingly demanding greater access to personal wireless services near their homes for voice and data. In order to meet this demand, providers must expand the number of wireless facilities in residential areas.
- Wireless facilities require line-of-sight between each other to maintain coverage and seamless handoffs between sites.

Governing Federal Law

- Telecommunications Act of 1996 governs federal, state and local regulation of the siting of personal wireless service facilities.
- State and local governments are prohibited from unreasonably discriminating among “providers of functionally equivalent services.” 47 U.S.C. §332(c)(7)(B)(i)(I).
- State and local governments are further prohibited from adopting policies that prohibit or have the effect of prohibiting the provision of personal wireless services. 47 U.S.C. §332(c)(7)(B)(i)(II); *see also* 47 U.S.C. §253(a).

Case Law

- Recent federal cases interpreting these sections of the Act:
 - *Sprint Telephony PCS, L.P. v. County of San Diego*, 543 F.3d 571 (9th Cir. 2008);
 - *T-Mobile USA Inc. v. City of Anacortes*, 572 F.3d 987 (9th Cir. 2009);
 - *Omnipoint Holdings, Inc. v. City of Cranston*, 586 F.3d 38 (1st Cir. 2009).

Federal and State Standards

- Wireless Facility operators must already comply with standards set forth by the FAA, FCC, SHPO, OSHA, and NEPA.
- Work with the FCC, FAA, EPA, ACHP and many other regulatory entities at the state and federal levels.

Radio Frequencies

- The FCC has the exclusive power to set the standards for radio frequency emissions. 47 U.S.C. § 332(c)(7)(B)(iv) (“No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission’s regulations concerning such emissions.”)
- Courts have enforced this provision of the Telecom Act and have noted that “concern for health risks due to the emissions may not constitute substantial evidence in support of denial.” *Telespectrum, Inc. v. PSC of Kentucky*, 227 F.3d 414 (6th Cir. 2000).
- Wireless providers operate within strict frequencies and guidelines established by the Federal Communications Commission. The FCC established these limits in association with a number of science-based organizations.

Health and Safety

FCC preemption has been affirmed by the U.S. Court of Appeals. *Telespectrum, Inc. v. PSC of Kentucky*, 227 F.3d 414 (6th Cir. 2000); see also *Illinois RSA No. 3, Inc. v. County of Peoria*, 963 F. Supp. 732, 745 (C.D. Ill. 1997)(stating that allowing state law regulations to place their own restrictions on RF emission levels could “impair the efficiency of the wireless market” and pose an obstacle to the accomplishment and execution of the congressional mandate).

Health and Safety (cont.)

- Wireless providers operate within strict frequencies and guidelines established by the Federal Communications Commission. The FCC established these limits in association with a number of science based organizations (i.e., American National Standards Institute, The Institute of Electrical and Electronics Engineers, Incorporated (IEEE), and the American Cancer Society).
- The FCC established Maximum Permissible Exposure (MPE) limits (47 C.F.R. § 2.11310, and Table 1) and all wireless facilities must comply with these standards. 47 C.F.R. §§ 1.1307(b)(1), 24.50, 24.51, and 24.52. The FCC further provided that certain wireless facilities are categorically excluded from the obligation to demonstrate routine evaluations of compliance with the FCC's Maximum Permissible Exposure limits because the FCC determined, after detailed review, that such RF sources pose little potential for causing exposures in excess of the MPE limits.

Health and Safety (cont.)

- Most wireless facilities are classified as “low power” and emit less than 5% of the FCC standards allowable.
- Wireless facilities near homes and schools result in exposure levels on the ground that are typically thousands of times less than safety limits.

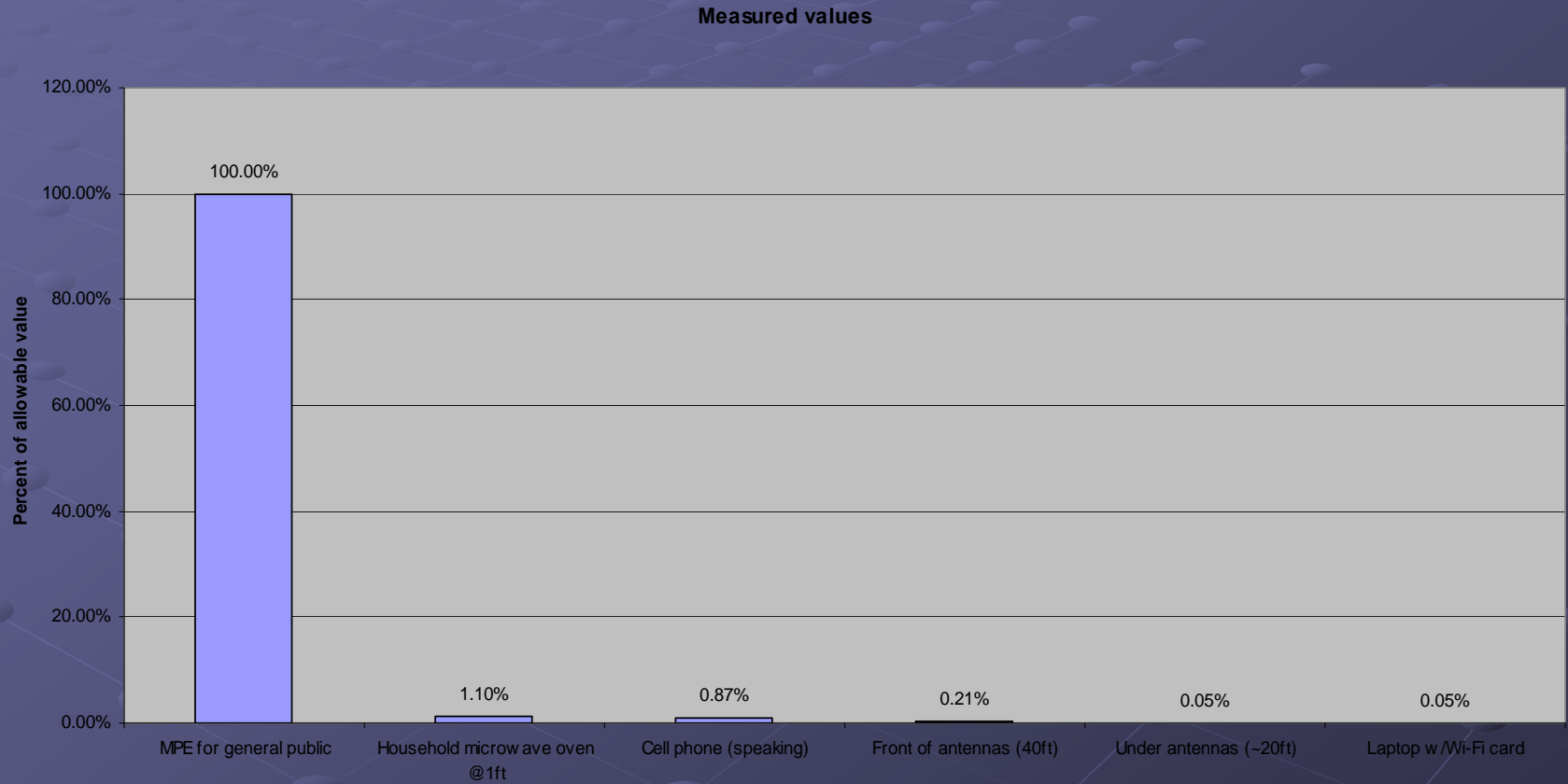
Health and Safety (cont.)

- The FCC does not establish RF exposure guidelines:
 - FCC has adopted limits and guidelines set forth by expert organizations and endorsed by agencies of the Federal Government responsible for health and safety.
 - FCC enforces compliance with published guidelines.

Who Established Exposure Guidelines?

- US standards have been developed and validated by a number of highly qualified organizations.
 - American National Standards Institute (ANSI)
 - Institute for Electrical and Electronic Engineers (IEEE)
 - National Council on Radiation Protection (NCRP)
- Other public health organizations have also evaluated the recommended levels and have published opinions supporting them.
 - Food and Drug Administration
 - World Health Organization
- The FCC does not establish exposure guidelines.
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Putting Things in Perspective



RF Emission Resources

- **FCC RF Safety Program:**

<http://www.fcc.gov/oet/rfsafety/>

- **World health Organization:**

<http://www.who.int/peh-emf/en/>

The Significance of FCC's 'Shot Clock' on Wireless Facility Siting

What the FCC's Action Does?

- Provides municipalities 90 days to act on an application to collocate wireless facilities.
- Provides municipalities 150 days to act on all other applications to site wireless facilities.
- Allows municipalities to freeze the time frames while an applicant gathers any requested additional information required to complete an application (incomplete notice to applicant must be within 30 days of filing).
- Clarifies that a municipality may not deny an application for a wireless facility on the basis that a different carrier is already serving the area.

Access - ROWs

- C.R.S. §38-5.5-101(c):
 - Telecommunications providers have a right to occupy and utilize public rights-of-way
- C.R.S. §38-5.5-101(d):
 - Access must be competitively neutral
- C.R.S. §38-5.5-107:
 - Political subdivisions may levy license fee authorized under §31-15-501(1)(1) or Article XX of the State Constitution or construction and permit fees but such fees “shall be reasonably related to the costs directly incurred...in providing services relating to the granting or administration of permits” and must be competitively neutral