Small Cell Wireless Telecommunications and RF Emissions Workshop

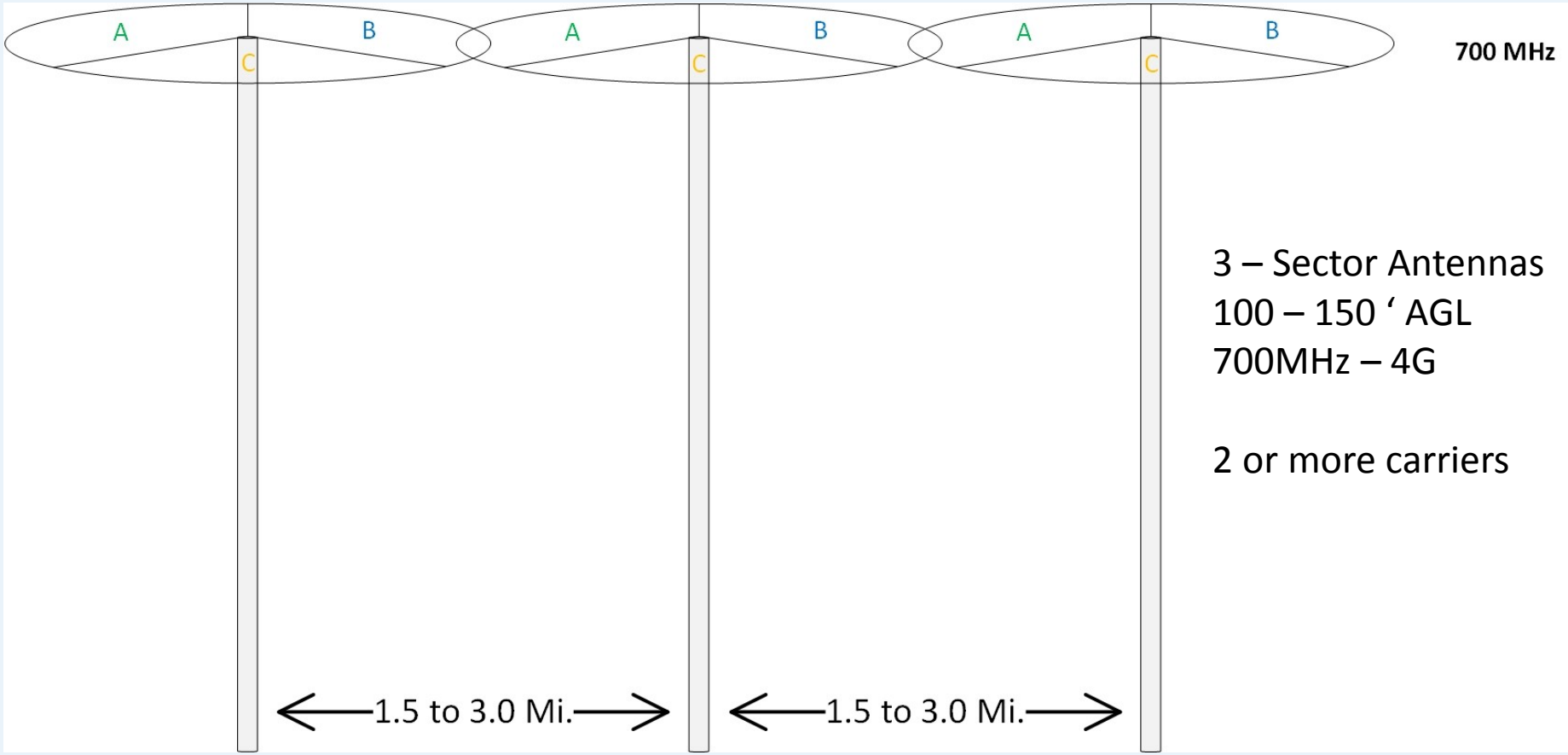
City of San Clemente

November 20, 2019

Agenda

1. Small Cells: What are they, What Role They Play in Wireless Networks
2. Typical Configurations
3. Radio Frequency (RF) Energy Exposure
4. Q & A

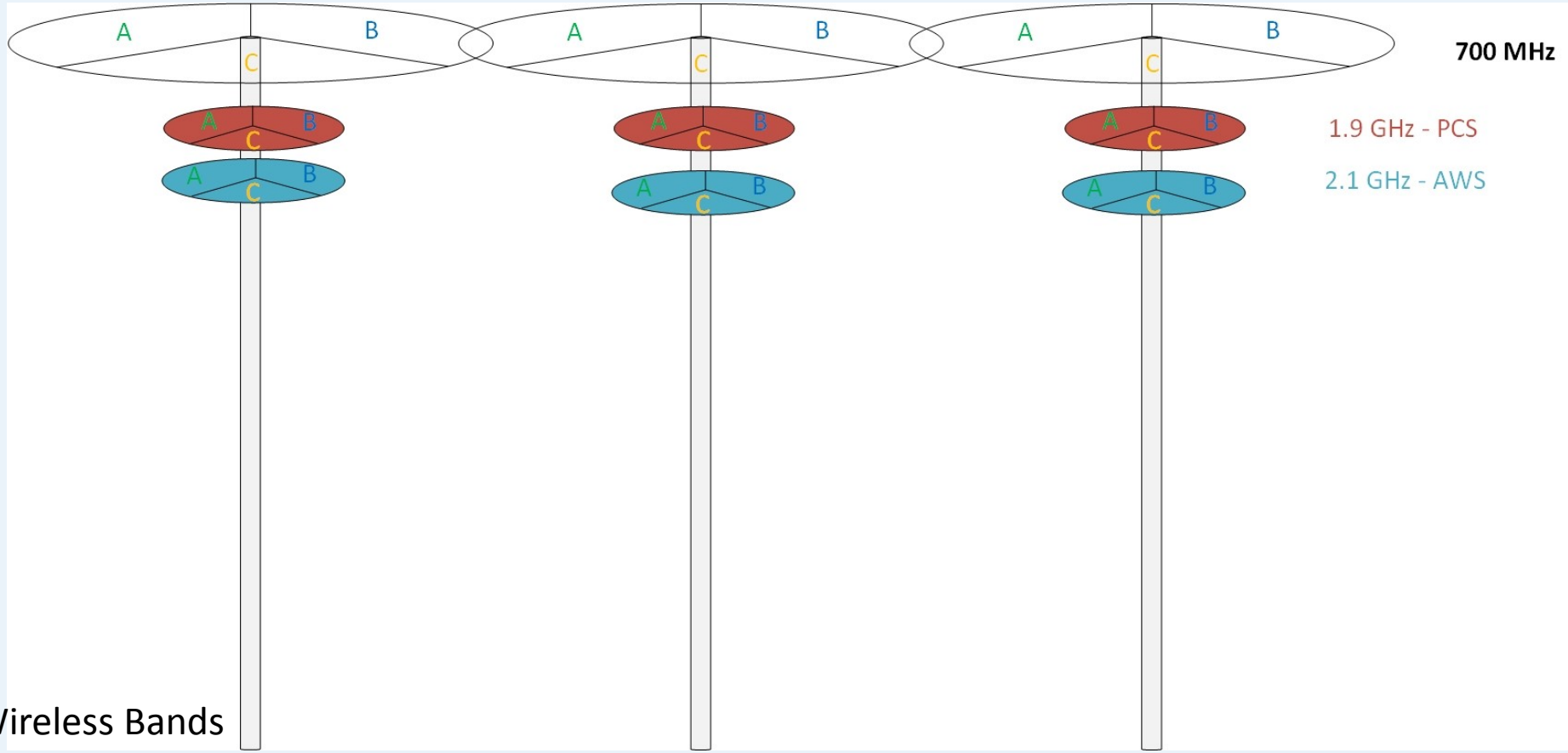
3G/4G: Existing Macro Tower Infrastructure



3 – Sector Antennas
100 – 150 ‘ AGL
700MHz – 4G

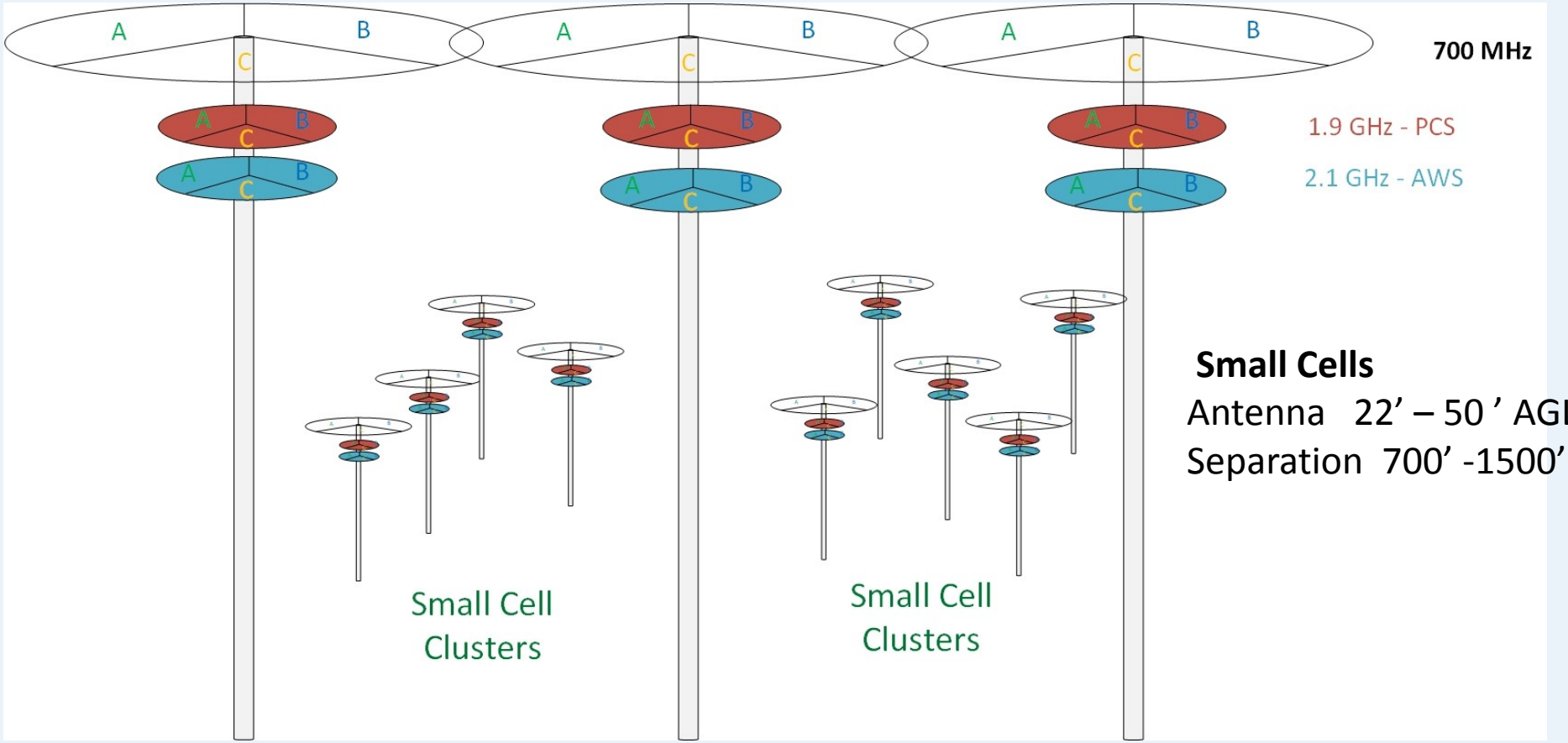
2 or more carriers

Macro Tower Multi-Band Capacity Enhancement For Broadband Wireless



- Additional Wireless Bands
- Increased Data Throughput Capacity Near Tower Site
- Often Additional Sector Antennas within a Wireless Band

Macro Towers Plus Small Cells:
Enhancing Broadband Capacity and In-Building Coverage



Small Cells

Antenna 22’ – 50 ’ AGL

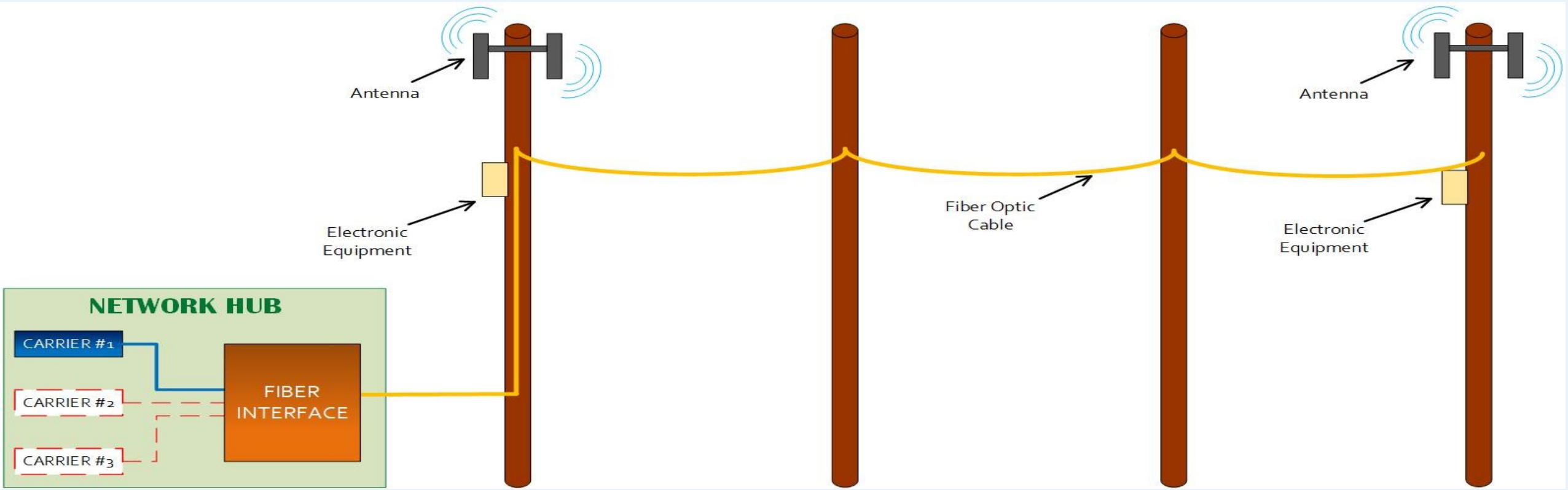
Separation 700’ -1500’

What is a Small Cell?

FCC Small wireless facility Section 1.1312(e)(2)

- The structure on which antenna facilities are mounted
  50 feet or less in height, or
  - No more than 10 percent taller than other adjacent structures, or
  - Not extended to a height of more than 10 percent above its preexisting
- **Each** antenna is no more than 3 cubic feet in volume
- **All equipment** no more than 28 cubic feet in volume
- Does not require FAA antenna structure registration
- Is not located on Tribal lands
- **Complies with FCC guidelines for human exposure to radiofrequency radiation**

Citywide Small Cell System Deployment Overview



Typical Configurations

Summary of Applications

- Existing Pole Configuration
- Proposed Pole Modification
  - Extending Pole Height (Antenna)
  - Adding Antenna(s)
- Wireless hardware
  - Power Meter
  - Power Disconnect Switch
  - Coaxial Cabling/Coupler
  - Remote Radios
  - Fiber network interface

Federal RF Exposure Standards

- National Environmental Policy Act of 1969 (NEPA) requires the Federal Government to evaluate and set standards
- FCC has been assigned the responsibility to set standards for human exposure to RF energy emitted by FCC-regulated equipment
- FCC adopted first set of guidelines in 1985
- Current FCC guidelines: OET Bulletin 65 Edition 97-01
- Standards were developed with input from expert agencies such as National Council on Radiation Protection and Measurement, Institute of Electrical and Electronic Engineers (IEEE), American National Standards Institute (ANSI), Environmental Protection Agency (EPA), Food and Drug Administration (FDA) and others

Federal RF Exposure Standards

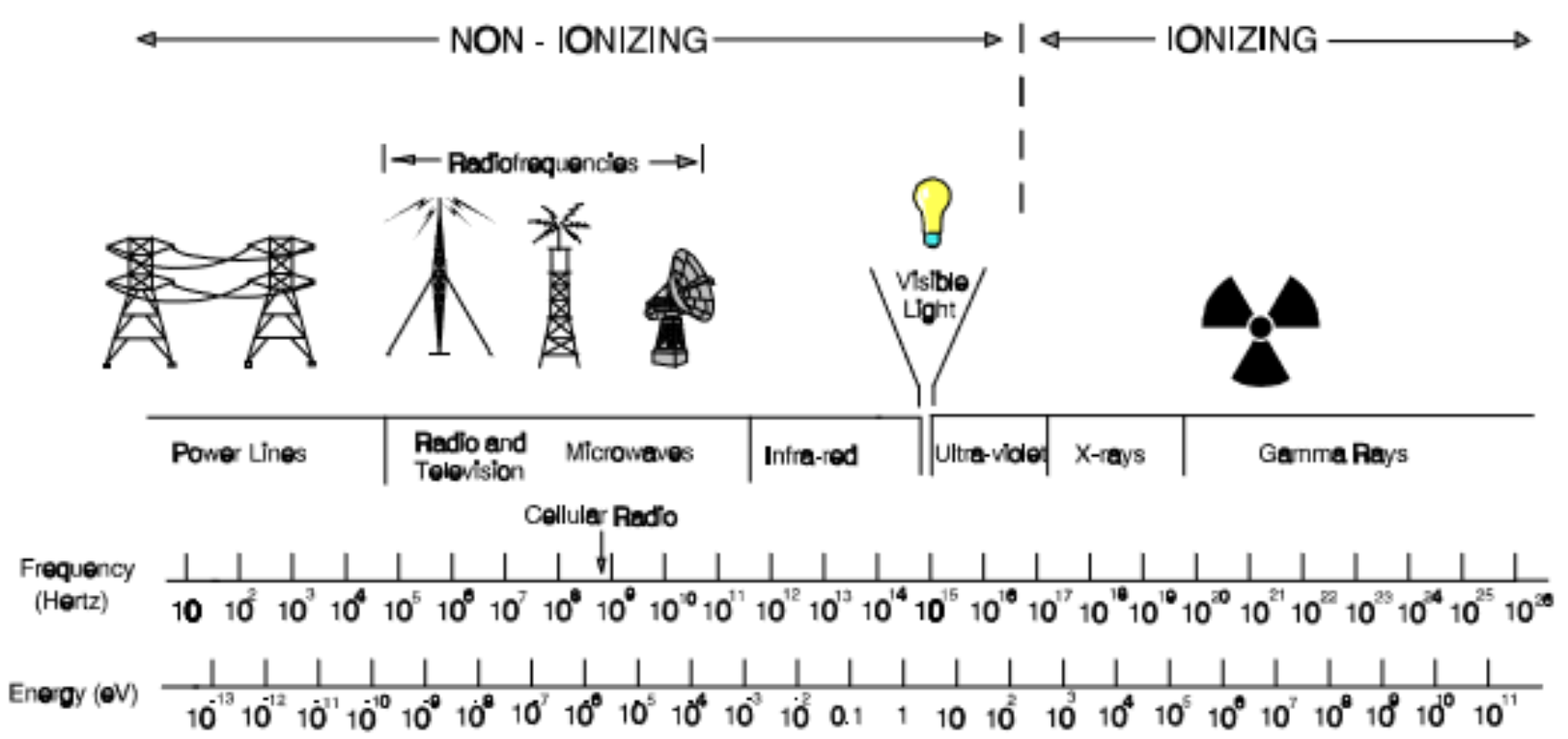


FIGURE 2. *The Electromagnetic Spectrum*

Source FCC

Federal RF Exposure Standards

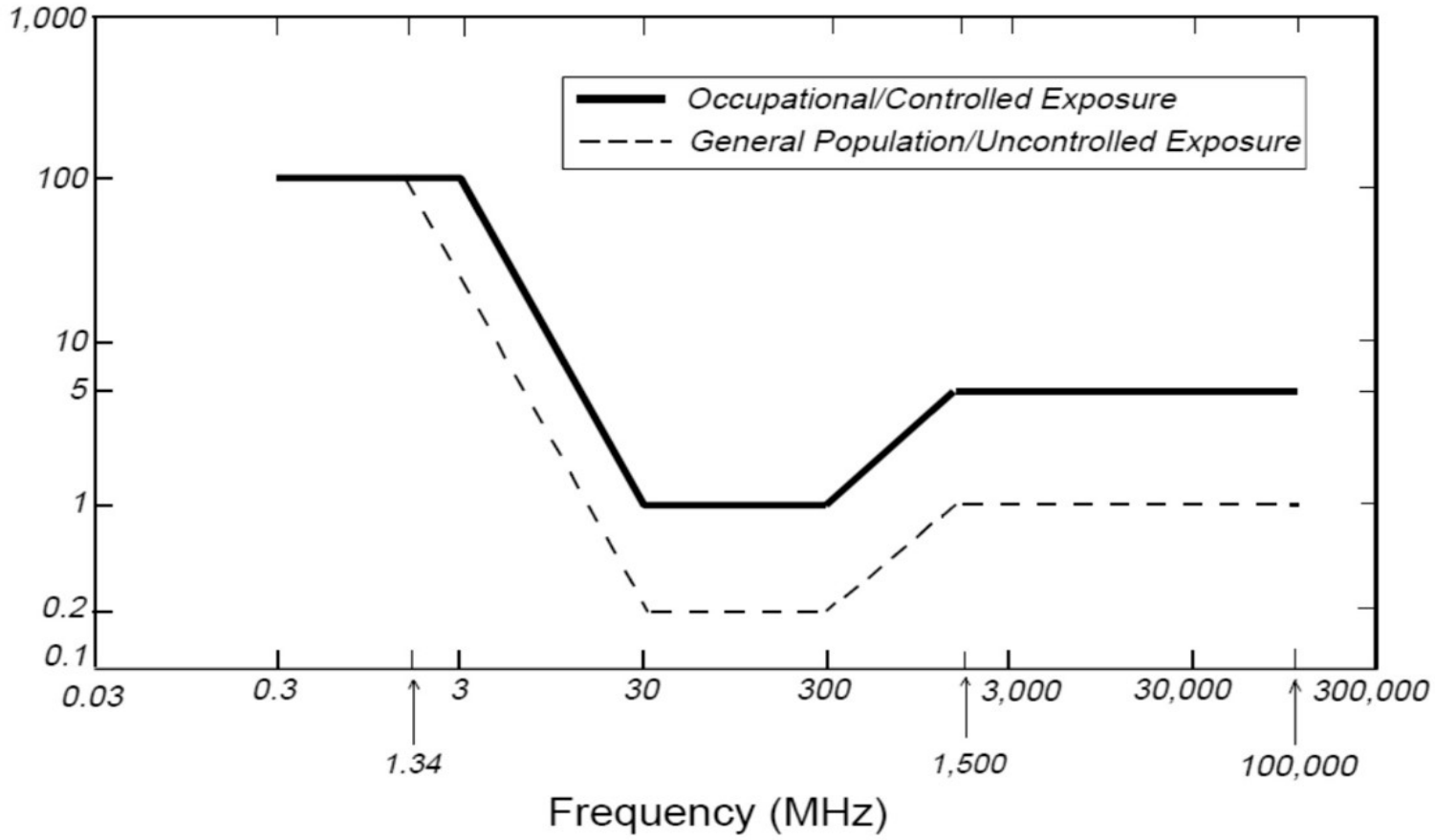
$$S = \frac{33.4\ ERP}{R^2}$$

where: S = power density in $\mu W/cm^2$
ERP = power in watts
R = distance in meters

Source FCC R&R

Figure 1. *FCC Limits for Maximum Permissible Exposure (MPE)*

Plane-wave Equivalent Power Density

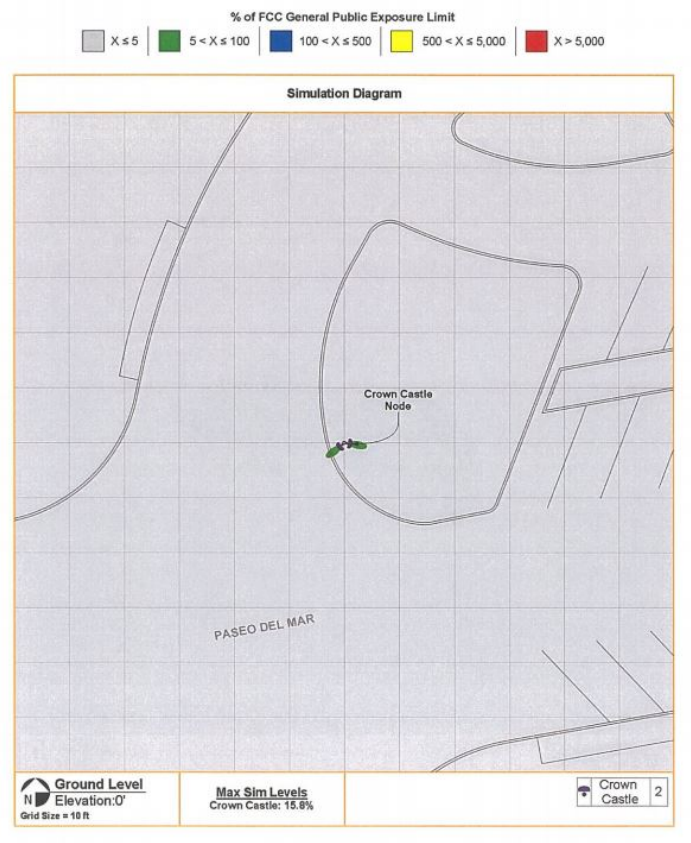


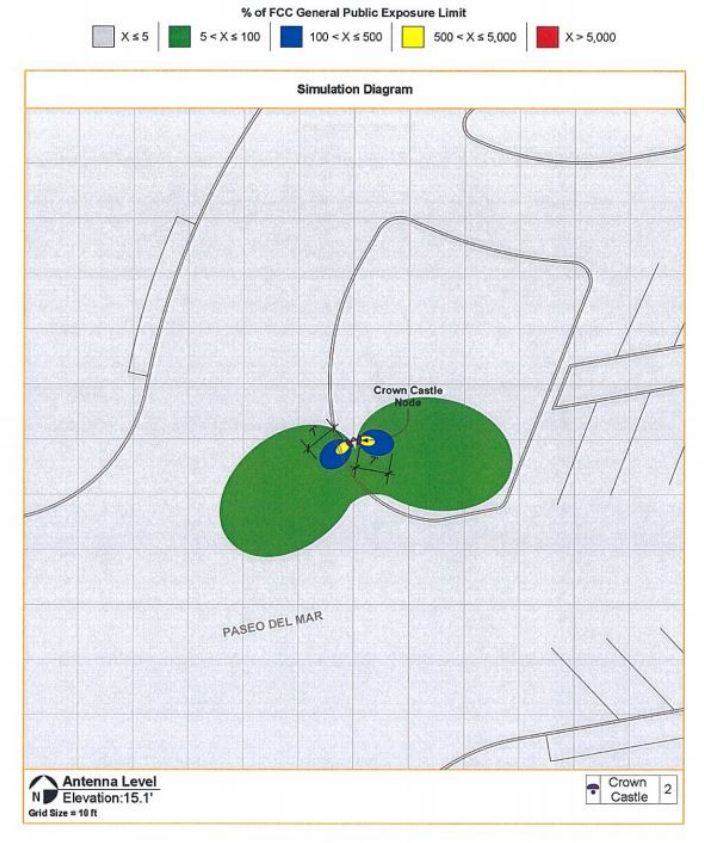
Small Cell RF Emissions Pattern

Maximum energy at antenna height parallel to ground (multi – story)

Lower toward the base of mounting structure

RF Emissions Analysis at Ground and Antenna





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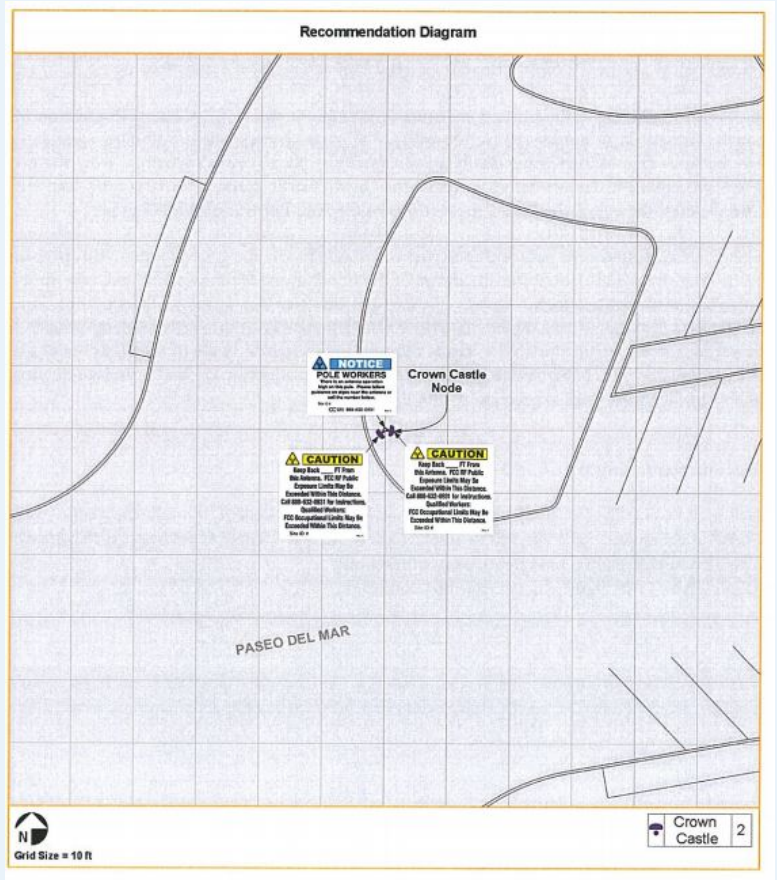
RF Emissions Signage Recommendations



Any Questions