

## FCC Rules in Regards to Unlicensed Spectrum Usage from 2 to 11 GHz

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Purpose:

Inform the participants about the FCC Rules in regard to the unlicensed spectrum from 2 to 11 GHz

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# **FCC Rules in Regards to Unlicensed Spectrum Usage from 2 to 11 GHz**

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## **FCC Technical Rules For Unlicensed Spectrum**

- Bands 2400-2483.5 and 5725-5850 MHz
- Part 15 of the FCC Rules governs this spectrum
- For background information on the Rules in place see Report and Orders under Docket No. 89-345 and Docket 96-8

## **FCC Rules Have Restrictions**

- Power Levels Limited
- CDMA or CDMA like modulation must be utilized
- Operating Bandwidth Limited
- Out of Band (OOB) Emissions restricted
- Operations in some bands secondary to Government systems

## Power Levels Limits

- Output Power Limited to 1 Watt (0 dBW) for omnidirectional antenna (0 dBi Gain)
- Output power must be reduced by the increased gain of antenna if directional antennas greater than 6 dBi are utilized
- Gives a total of 6 dBW EIRP max power
- However, there is an exception.....

## Power Levels Limits (Continued)

### Point to Point Systems

- Fixed systems using 2400-2483.5 MHz can operate at antenna gains greater than 6 dBi by a reduction in power of 1 dB per every 3 dB of increased antenna gains
- Example calculation
  - We have a subscriber antenna with 18 dBi of gain
  - We can operate at  $0 - (18 - 6) / 3 + 18 = 14$  dBW EIRP

## **Power Levels Limits (Continued)**

### **Point to Point Systems**

- Fixed systems using 5725-5850 MHz can operate using directional antennas with gains greater than 6 dBi with no reduction in power.
- However systems must comply with exposure limits to the general public which are outlined in Part 1.1307(b)(1) of the Commissions Rules.

# CDMA Modulation

- Frequency hopping systems
  - System must use a minimum of 75 hopping frequencies
  - 20 dB bandwidth of a channel must be less than 1 MHz
  - No frequency can be occupied more than 0.4 seconds in a 30 second period
  - Not required to use all hopped channels in one transmission
- Direct sequence systems
  - Peak power spectral density must be less than 8dBm in any 3 kHz band
  - Processing gain or spreading factor must be at least 10 dB



## CDMA Modulation- cont'd

- Hybrid Systems (Frequency Hopping + Direct Sequence)
  - Processing gain must be 17 dB or greater
  - Hopping shall not exceed 0.4 seconds with a time period equal to the number of hopping frequencies multiplied by 0.4

## Out of Band Emissions

- Signal must be attenuated by at least 20 dB at any 100 kHz portion of spectrum that is outside of the frequency band that the signal operates.
- Systems are not required to comply with Part 15.209(a) that states the signal must be below 500 microvolts/meter at a distance of 3 meters.

## **End of Presentation**

- This information is located in Part 15.247 of the FCC Rules