

FCC Rules and Regulations

Federal Communication Commission (FCC) Responsibilities:

- Regulate the use of Radio Frequency Spectrum
- Assign different frequencies, modulation types, etc. to different uses
- Restrict power levels and antenna heights to limit transmitter range
- Issue licenses allowing groups or individuals to use specific frequencies
- Certify equipment designs
- Certify radio technicians
- Impose fines/jail for severe/dangerous violations

Spectrum Allocations and Radio Standards:

- Individually assigned frequency bands/services
 - Shortwave, AM, FM, TV, Satellite Radio/TV Broadcasting
 - Public Safety (Police, Fire, etc.)
 - Business Radios
- Collectively assigned bands/services
 - Amateur/Ham Radio
 - Cellular Phones
 - Marine / Aircraft Radio
- Unlicensed bands/services
 - Citizen's Band (CB) and Family Radio Service (FRS), Part 15 devices
 - WLAN (IEEE 802.11)
 - Bluetooth (IEEE 802.15)
 - Other short-range technologies (e.g. FM wireless mics, garage door openers, ...)
- White Space Devices (WSD)
 - Reallocation of VHF/UHF spectrum from TV channels to intelligent frequency sharing.
 - Devices must access database to know if it is OK to transmit
 - Rollout has been slow (created in 2008, but little application in 2018 – expected impacts on wireless microphones and other areas by 2021 or before)

FM-Band Wireless Microphones Rules

- Frequency constrained to 87.9 to 107.9 MHz
- Modulation limited to 200 kHz channel width (+/- 75 kHz frequency deviation max)
- Maximum field strength allowed is 250 uV/m at 3 meters
 - $P = |E \times H| = |E|^2 / 377 = 166 \text{ pW/m}^2$ at 3m
 - Area @ 3m = 113 m²
 - Max power = (116 pW/m²)(113 m²) = 18.8 nW or -47 dBm !
 - Use 50 dB attenuator between output and antenna for our designs at Midterm

White Space Devices (from Wikipedia)

- Frequency ranges from 54 to 698 MHz (TV channels)
- Also known as TV Band devices
- Power levels of < 100 mW (specific applications are limited to -2 dBm to +12 dBm)
- Power control required to limit EIRP to minimum needed for communication
- Rules are involved, and require devices to access database of allowed frequencies
- See https://apps.fcc.gov/edocs_public/attachmatch/DA-09-1110A1.pdf for more info
- For impacts on professional wireless microphones, see [https://ecfsapi.fcc.gov/file/104132999814781/FCC%20Auction%20%20%20Wireless%20Mics-2017%20\(01038226xB3D1E\).pdf](https://ecfsapi.fcc.gov/file/104132999814781/FCC%20Auction%20%20%20Wireless%20Mics-2017%20(01038226xB3D1E).pdf) Figure below is reproduced from that document written by Joe Ciaudelli at Sennheiser.

