

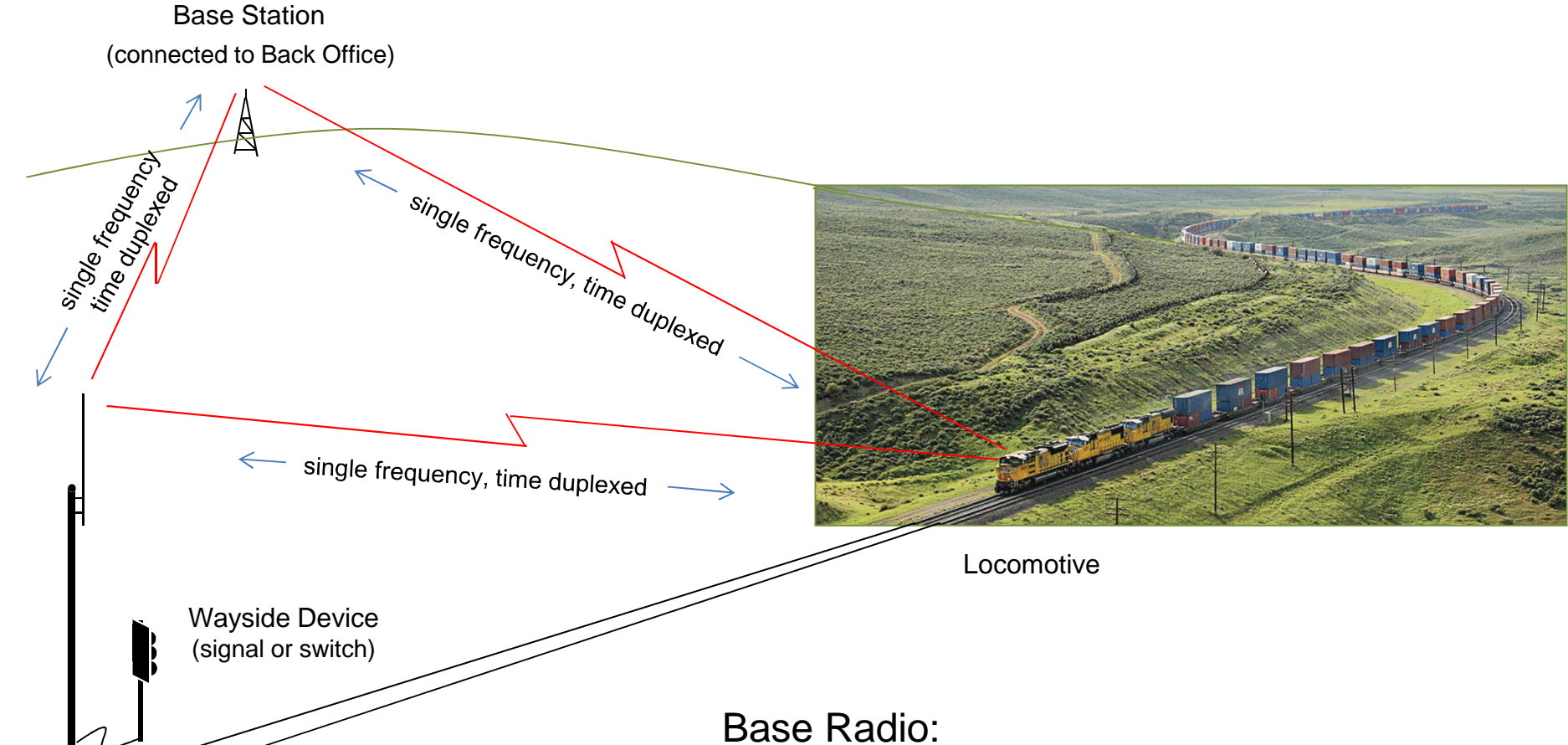
Maximizing Efficient Use of 220 MHz Spectrum for Positive Train Control

October 2, 2012
PTC-220, LLC

Overview

- Positive Train Control (PTC) is a Federal Mandate to enhance rail safety
- There is limited spectrum available that is suitable for PTC
- Current rules inhibit the full use of 220 MHz spectrum for PTC
- More efficient use of 220 MHz spectrum would:
 - Maximize the performance of PTC networks
 - Minimize the need to seek additional spectrum
 - Make more spectrum available to other PTC operators
- Efficiency could be achieved by waiving the §90.729(b) power and antenna height limits for PTC base stations operating in the 221-222 MHz band and imposing alternative protections already found in other rule sections, as detailed herein.

PTC Wireless Communication Paths



Wayside Radio:

- 25 Watts PEP
- 5 dB typical antenna gain
- Trackside, typ 54 ft AGL max height

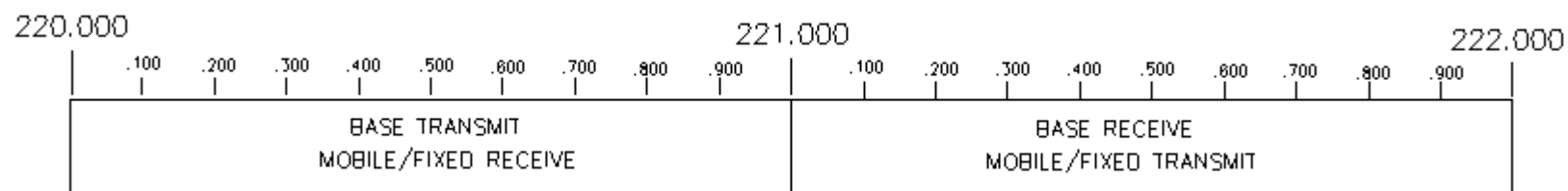
Base Radio:

- 75 Watts PEP
- 5 dB typical net antenna gain (~240 Watts ERP)
- Often on high ground

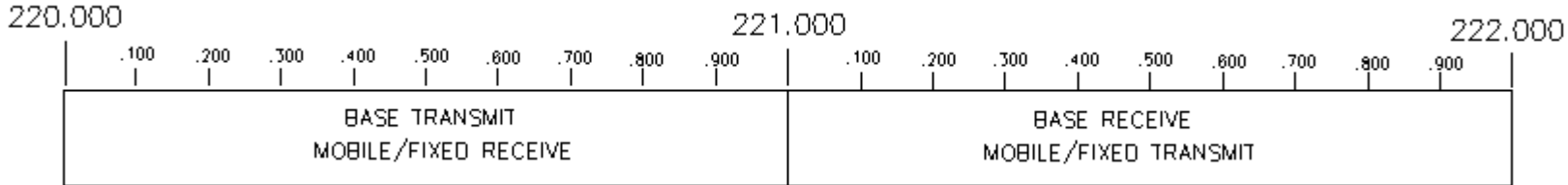
Locomotive Radio:

- 50 Watts PEP
- 0 dBd antenna gain
- Space diversity

220 MHZ DUPLEX BAND



220 MHZ DUPLEX BAND



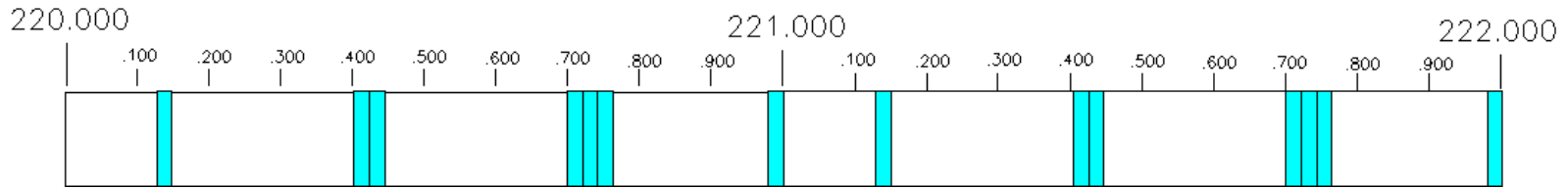
Max 500 Watts ERP @ 150 meters HAAT

Mobile/Fixed only (no Bases)

Max 50 Watts ERP @ 7 meters HAAT
 (Can raise antenna at expense of power)

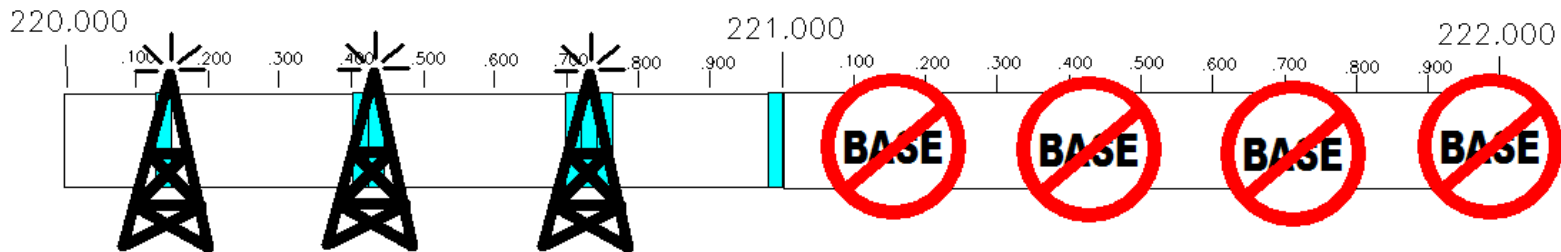
- **PTC doesn't use frequency-duplex channels**

All radios transmit and receive on same frequency



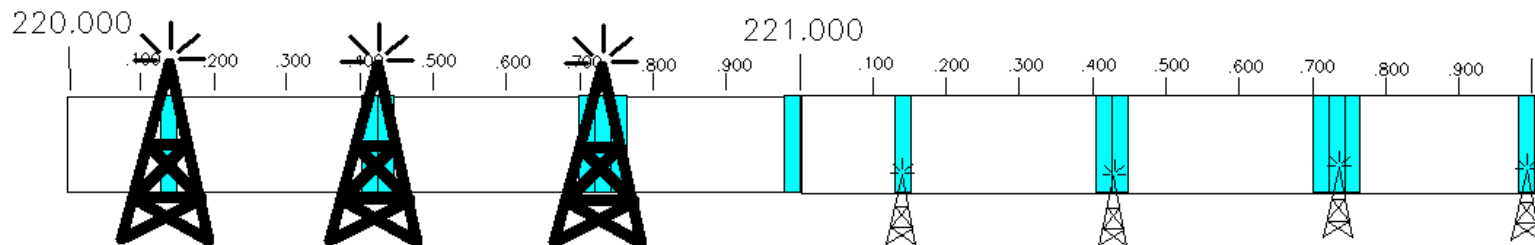
- **Rules limit bases to lower half of band**

Upper part of band would be underutilized

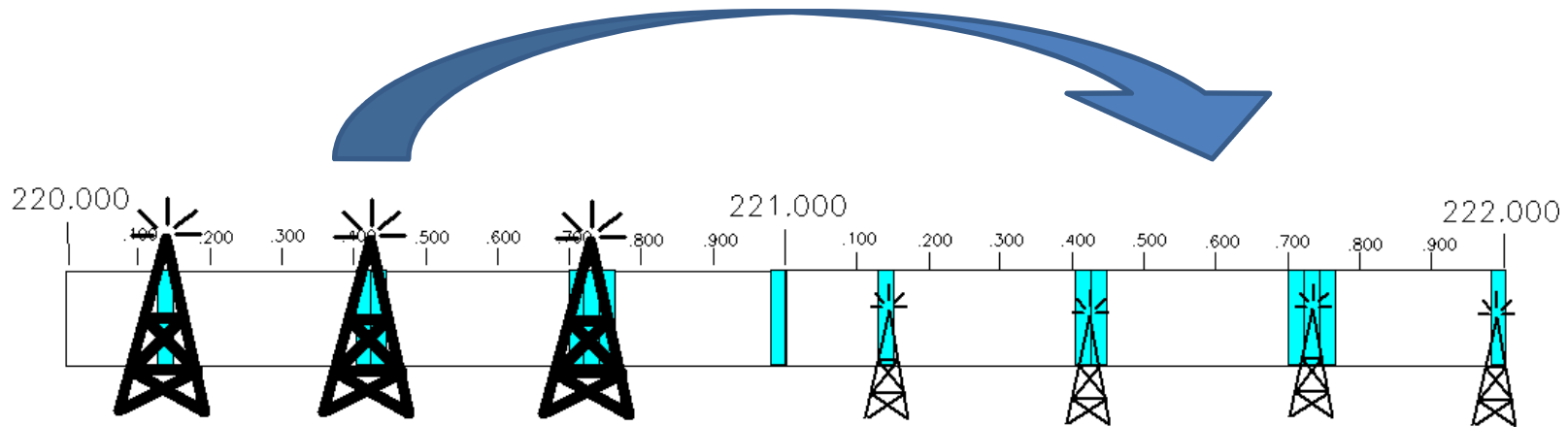


- **2009 waiver grants allow bases over entire band**

However, power/height limits remain

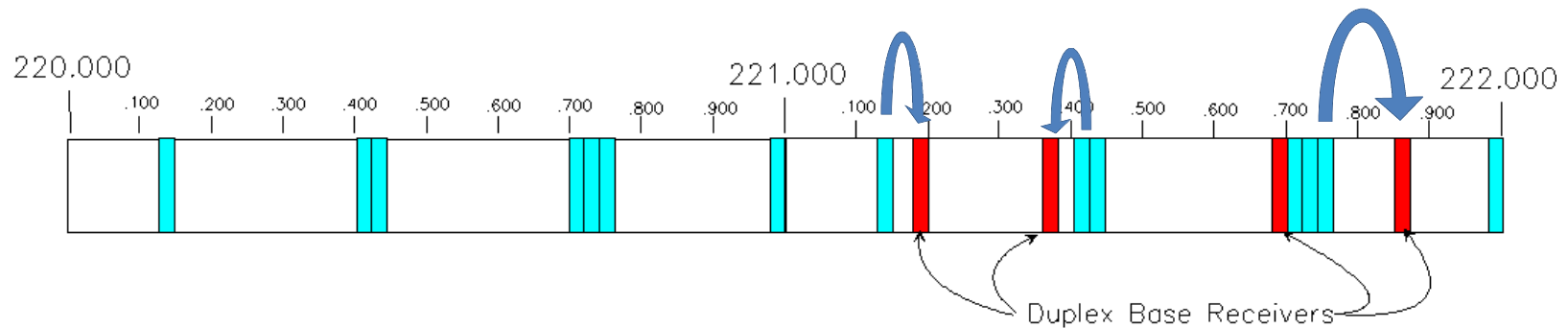


- We want to use full power on bases in the upper part of the band



- However, the current rules are designed to protect against interference to adjacent channel base receivers

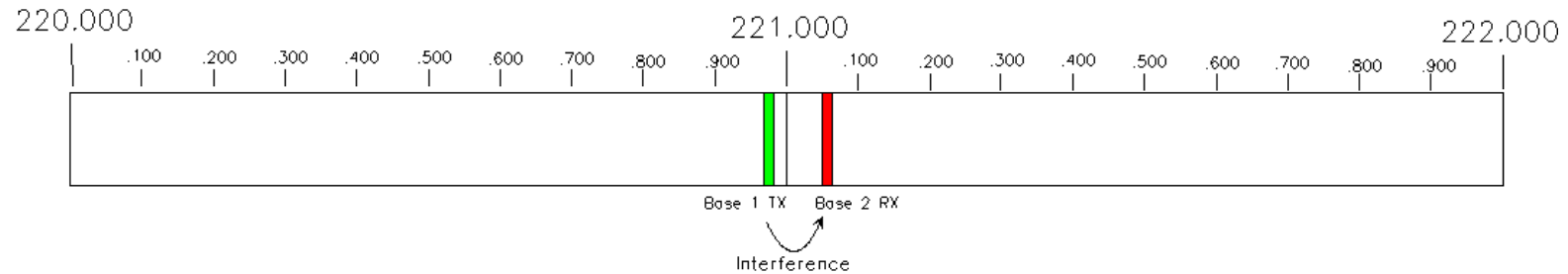
PTC-220's nationwide (and *de facto* nationwide) licenses will have no co-channel licensees



- **The FCC already faced this issue when writing the rules...**

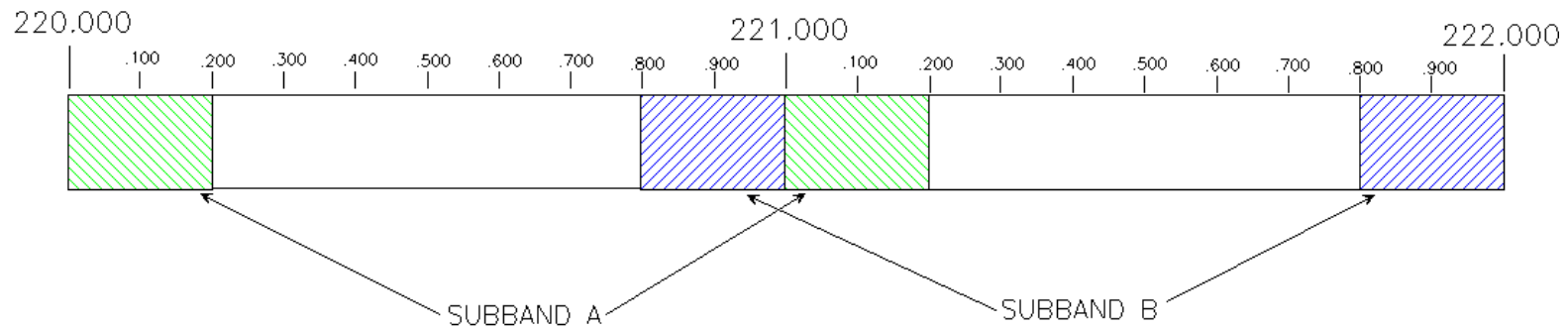
There is no spacing between the Base and Mobile parts of the band

Base transmitters near the top of the band are near Base receivers in the bottom part



...so they defined two Sub-bands

And wrote rules to protect Sub-band A receivers from Sub-band B transmitters [§90.723]



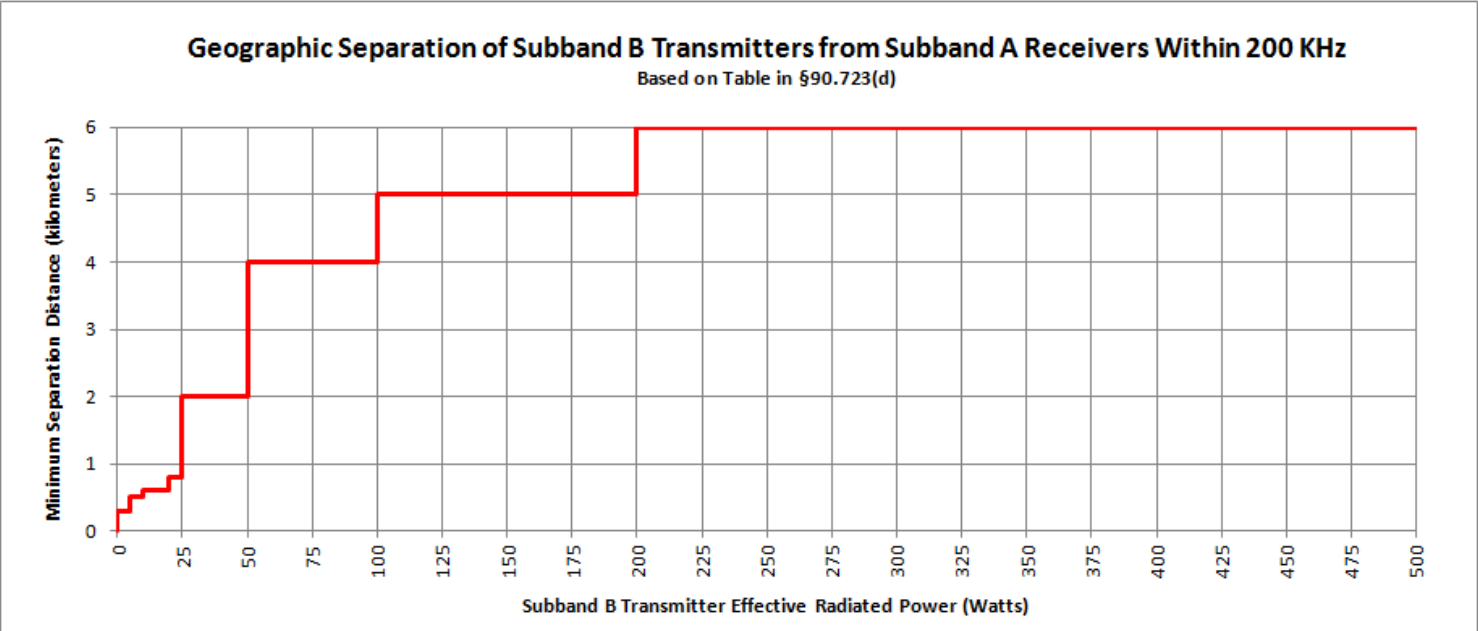
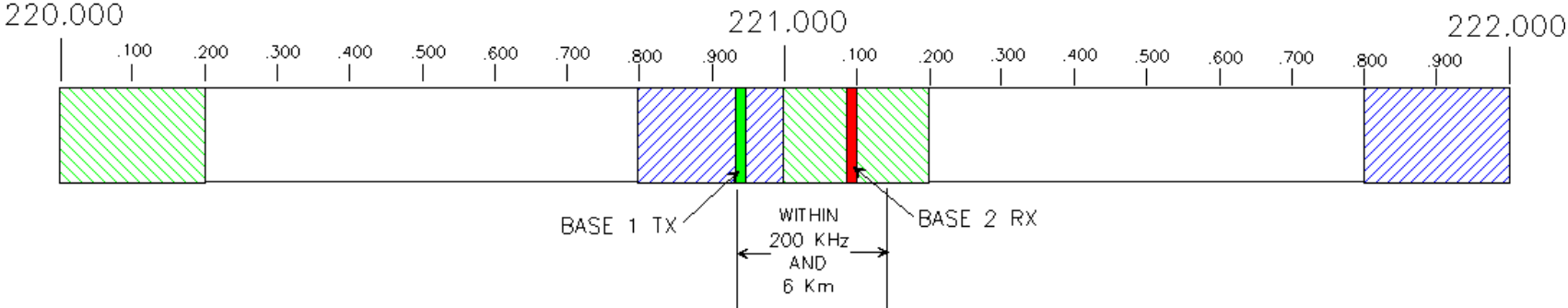
- **We can use these same rules to propose necessary protections in the 221-222 band**

Two kinds of licenses require protection:

- Phase I (site-based)
 - Early lottery licenses
 - Sites explicitly listed in ULS (except for NC nationwide)
- Phase II (market based)
 - Later auctioned licenses
 - Licensees are free to locate stations in their market
 - Site locations not listed in ULS
- Phase I licenses are protected by the FCC's explicit spacing rules
- Phase II licenses are protected by "coordination" between licensees
 - A single PTC base could require coordination with many licensees
 - Represents a very large administrative burden
 - A more deterministic approach would be more efficient

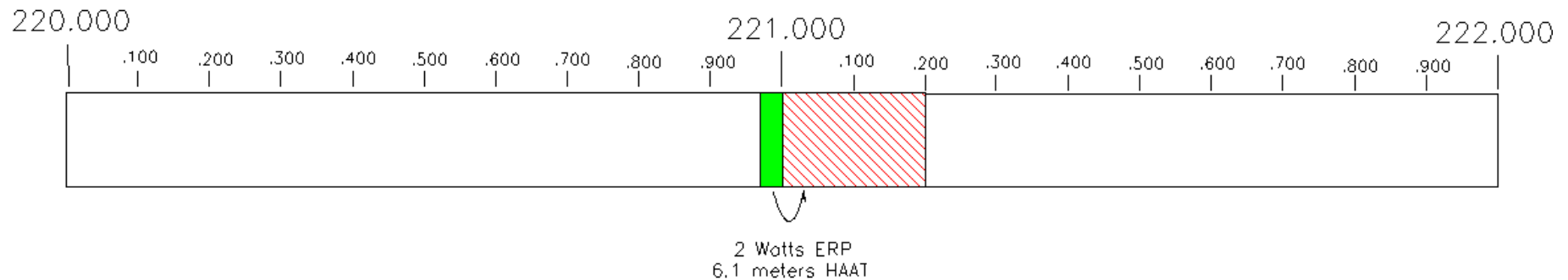
Phase I Receivers:

Base Transmitters within 200 KHZ AND 6 Km of a Base Receiver...
 ...must limit ERP based on distance [§90.723(d) & (e)]



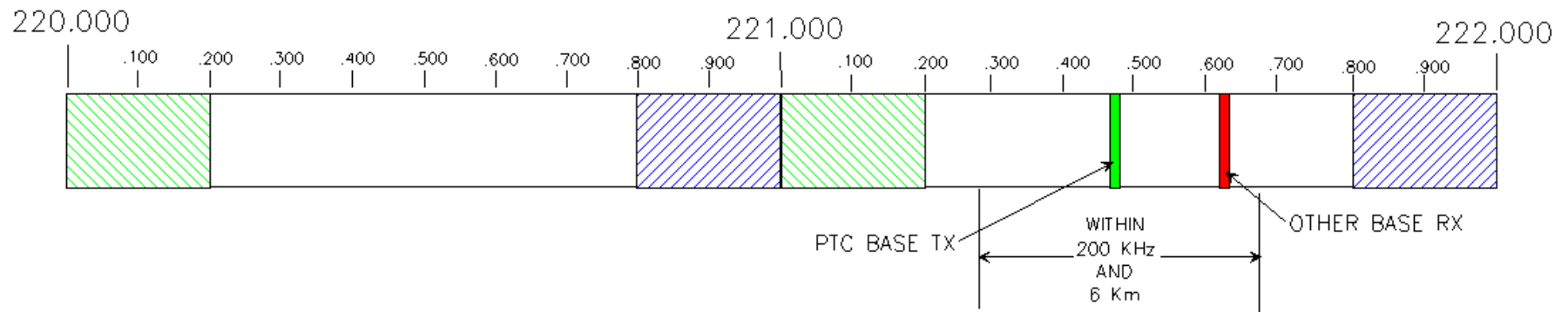
Closer Frequency Spacing

For base transmitters in top 25 KHz: max 2 Watts/6.1 m HAAT [§90.729(c)]...
...if there are base receivers in Sub-band A within 6 Km



- Rule provides necessary extra protection for receivers within 25 KHz
- Not clear why this extra protection is provided for the rest of Sub-band A
- Applies to Phase I and Phase II receivers

- The logic of these existing rules provides the basis for the proposed waivers



- Adjacent channel receivers in the 221-222 MHz band could be protected by the same measures used to protect Subband A receivers

Proposed Protection of Adjacent Channel Receivers

For protection of Phase I licenses:

- For receivers within 25 KHz,
no PTC stations within 6 Km without concurrence of licensee
- For receivers within 200 KHz (but more than 25 KHz) and 6 Km,
limit spacing/ERP according to table in §90.723(d)

For protection of Phase II licenses:

- For existing receivers within 25 KHz,
no PTC stations within 6 Km without concurrence
- For existing receivers within 200 KHz (but more than 25 KHz) and 6 Km,
apply table in §90.723(d)
- For new receivers, coordinate with licensee

Licenses in 220-222 MHz Band

By Radio Service Code

Phase I (Site Based)

QT--Trunked

- About 500 Licenses
- ~77% have expiration dates in 2013

QD--Data

- Only about 17 licenses
- All above 220.950

QM--Public Safety

- About 60 Licenses
- All above 220.800

QO--Other

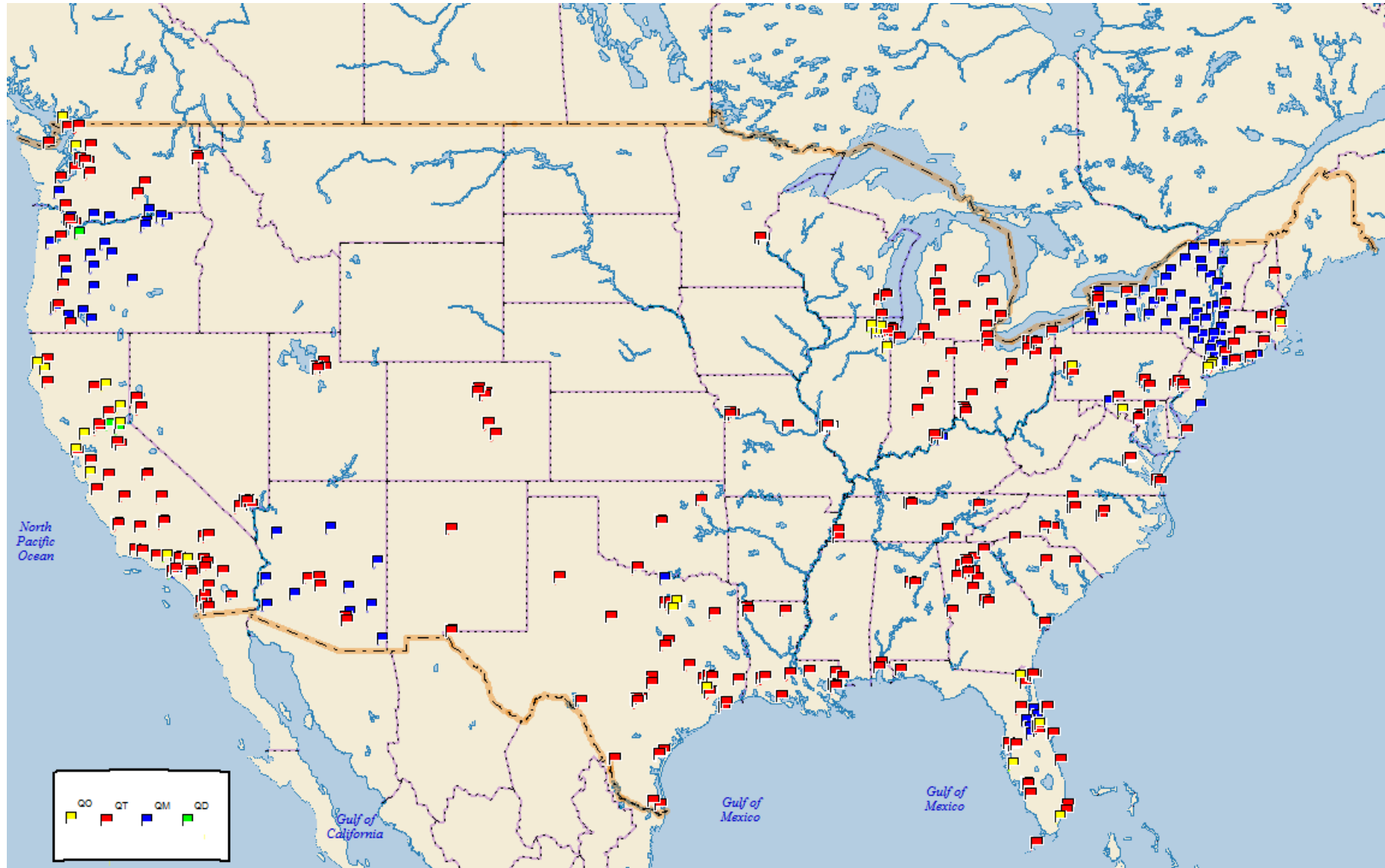
- About 40 Licenses
- All in 220.850-220.900

Phase II (Market Based)

QA--Auctioned

- About 200 Licenses
- Most expirations after 2016
- Station locations not in ULS

220 MHz Phase I Licenses



PTC-220's Non-Nationwide Channels (E Block)

- Current rules require protection of incumbent Phase I co-channel licensees [§90.763(b)(1)]
 - 120 Km spacing (absent agreement otherwise)
 - Some licensees have been difficult to contact, but given the small number of Phase I incumbents, the task should be manageable
- Field strength limits at the market boundaries should protect Phase II licenses [§90.771]
 - Current rule applies to "...base stations...transmitting on base station transmit frequencies..."
 - "Base station frequencies" are defined as 220-221 MHz [§90.715(a)]
 - Need clarification that this limit also applies to PTC bases transmitting in the 221-222 MHz band, to confirm protection for co-channel licenses in neighboring markets

Summary of Changes That Would Maximize 220 MHz Spectrum Utilization

- For all licenses:
 - Waive 90.729(b)'s power and antenna height limits for the 221-222 MHz band and replace with the following protections:
 - Extend §90.723(e)'s limitations on Sub-band B transmitters to PTC bases in 221-222 MHz
 - Extend the spirit of §90.729(c) to PTC bases in 221-222 MHz
(No PTC bases within 25 KHz and 6 Km of existing sites without concurrence)
 - For existing Phase II sites, waive §90.723(f-h) and substitute the provisions in §90.723(e)
- For non-nationwide (E Block) licenses:
 - Clarify that market boundary field strength limits apply to 221-222 MHz bases