

White Spaces

**What They Are, How They Can Be Used and
Why You Should Care**

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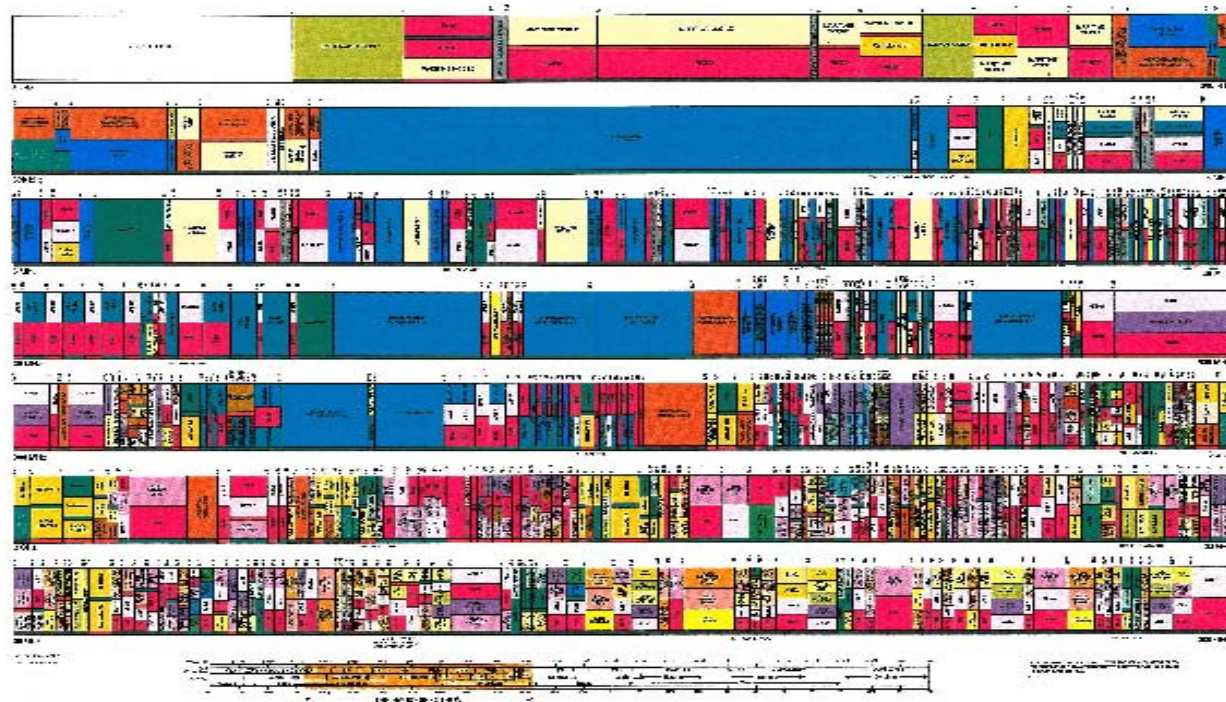
Overview

- What are White Spaces -- Background
- How White Spaces Can Be Used
- FCC Rules
- What's Next

Background

What Are White Spaces?

UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM



What Are White Spaces?

- “Frequencies allocated but not used locally” – *Wikipedia*
 - Unused spectrum that exists at the edges of allocated spectrum to avoid interference
 - Radio spectrum was never used or freed up due to technical changes

Broadcast TV Spectrum

- Where is broadcast spectrum: Channels 2 through 69 (54 MHz – 806 MHz)
- Spectrum is licensed on a “primary basis” to broadcasters (Pt. 73) and other users, including PLMRS and CMRS providers in 13 markets
- Licensed on a “secondary basis” to: low power TV, translators, wireless microphones
- Some unlicensed uses including medical telemetry
- Ch. 37: Radio Astronomy

DTV Transition

- After DTV transition, broadcasters will operate in channels 2-51 (52-69 allocated to other uses)
- During and after transition there will be a number of TV channels in given geographic areas that are not being used
- Significant interest in the white spaces:
 - Very desirable spectrum
 - Good propagation characteristics

Use of White Spaces

Potential Uses

- Broadband providers (WISPs) want to use white spaces to provide enhanced broadband services
- Wireless carriers want to use white spaces for wireless backhaul
- White Spaces Coalition: 8 large technology companies including Microsoft, Google, HP and Intel

Concerns

- Incumbent users (broadcasters, public safety, medical telemetry, radio astronomy, wireless microphones), all concerned about potential interference from new users
- Concern heightened because of increased congestion after DTV transition

FCC Rules

First NPRM

- 5/13/04: FCC adopted NPRM into unlicensed operation in the TV Broadcast Bands ET Docket 04-186
- Goal: To allow new uses on unused broadcast spectrum that will not result in harmful interference
- FCC proposed to use spectrum for unlicensed broadband devices (TVBDs)
- Sought comment on technical and other requirements to prevent interference

First NPRM (cont.)

- Comments filed by 96 parties
 - Prospective manufacturer/users of unlicensed devices
 - Existing users of TV Bands
- Comments broke down by interest as might be expected

First R&O & FNPRM

- 1st R&O and FNPRM adopted 10/12/06
 - Fixed, low power broadband devices permitted in some of the white spaces
 - No TVBDs on:
 - – channel 37 (radio astronomy)
 - – 5, 2-69 (reallocated spectrum)
 - – 14-20 (public safety)
- No marketing of TVBDs until 2/18/09 = DTV transition date

First R&O & FNPRM (cont.)

- FNPRM Sought comment on a number of issues
 - Licensed v. unlicensed operation
 - Options to prevent interference
 - Spectrum sensing
 - Geo-location database
 - Control signals
 - Operation on channels 14-20 and 2-4
 - Other issues (including types of devices permitted)

First R&O & FNPRM (cont.)

- Comments filed by 46 commenters, including CTIA
- In this phase wireless carriers actively pursued assignment of the spectrum on a licensed basis for wireless backhaul

Second R&O

- FCC issued its Second report and Order and Memorandum Opinion and Order on 11/14/08
- Not published in the Federal register until 2/17/09
- Nailed down rights to the spectrum, type of devices and technical rules. Left some issues for an NOI.

Licensed v. Unlicensed?

- Licensed Proponents
 - Spectrum needed for broadband & mobile backhaul
 - Would encourage innovation, promote investment
 - Would generate \$\$ for US Treasury
 - No need for more unlicensed spectrum
- Unlicensed Proponents
 - Encourage innovation
 - Does not require large infrastructure to implement
 - Too expensive to acquire licenses
- Hybrid proposal

FCC Decision = Unlicensed

- Permits innovative uses
- Propagation characteristics will facilitate provision of improved/more economical wireless internet service to consumers, particularly in rural area
- Protects operation of TV and other authorized services
- Meets additional spectrum needs for unlicensed broadband devices
- Licenses would not provide benefits proponents claimed

Two Basic Uses

Fixed

- WISPs providing broadband
- Higher power, several kilometers

Portable

- LANs connections between modems and computers
- Lower power, short distances

FCC adopted different rules for each category

Rules for Fixed Devices

- Fixed TVBDs are permitted to provide wireless broadband services on a fixed point-to-point or point-to-multipoint basis
- Power limited to 4 watts EIRP
- Must register with the database, must transmit identifying information
- Must comply with RF exposure guidelines (15" separation)

Portable Devices

- Limited to 100 mW EIRP (40 mW in adjacent channels)
- No need to transmit basic identifying information
- No need to register with database
- Subject to same RF exposure guidelines as other wireless portable devices

Where Can TVBDs Operate?

- FCC key concern is in protecting the existing users of the spectrum
- Two ways of accomplishing the protection
 - (1) Prohibit TVBDs from operating on certain channels and in certain geographic areas
 - (2) Prohibit TVBDs from operating on “occupied” channels

Where Can TVBDs Operate?

Permissible Channels

- Fixed or Portable

21-36

38-51

- Fixed

2

5-13

14-20 (outside of PLMRS/CMRS areas)

Where Can TVBDs Operate

Forbidden Channels/Areas

No TVBDs in	Protects
14-20 (<i>portable</i> anywhere)	Public safety/wireless microphones
3-4	VCRs/DVDs
37 (plus any channel near observatory)	Radio astronomy
2 channels in 13 markets where PLMRS/CMRS operate	Wireless microphones
15-18 (certain geographic regions)	Offshore radio
14-20 (<i>fixed</i> in special geographic areas)	Public Safety CMRS/PLMRS
Areas adjacent to cable head ends/TV transmitters	Cable headends/TV transmitters

Methods for Determining Occupied Channel

1. Geo-location and Database

- Devices will have to include geo-location technology (e.g. GPS)
- Device must access database of licensed users to determine permitted channel before operating
- Works particularly well for preventing conflicts with fixed, licensed users

Methods (con't)

2. Spectrum Sensing

- Technology that detects and avoids other nearby wireless signals
- All TVBDs must include this capability as a *secondary* means for determining occupied channel
- Useful for detecting presence of intermittent users (e.g., wireless microphones)

Special Equipment Certification for “Sensing Only” TVBDs

- for personal / portable devices only
- must be tested by the FCC and meet a “proof of performance”
- limited to 50 mW EIRP
- manufacturers must submit an application
- must be approved by the full Commission

Database

- Managed by a 3rd party (may be more than one)
- Database must be checked by TVBDs daily
- Portable devices must re-establish location coordinates and access database each time activated
- If devices do not check in within a specified period of time, registration removed

Information stored in Database

Information	Fixed	Portable
FCC ID	X	X
Manufacturing serial #	X	X
Device Coordinates	X	X
Device Owner	X	
Device Input	X	
Contact address	X	
Contact email	X	
Phone #	X	

What's Next?

Petitions for Reconsideration

- Filed by 19 parties
- Alleging a variety of deficiencies with 2nd R&O
- Oppositions due on April 28, 2009

Petition for Review

- filed 2/27/09 by Association for Maximum Service Television Inc. (MSTV) and NAB in D.C. Circuit
- alleges FCC decision will allow harmful interference
- FCC decision is arbitrary and capricious and not in accordance with applicable law

Staff Review & Report – 2 Years

- FCC staff directed to conduct a review and report to the Commission in two years on:
 - types of devices on the market
 - extent of implementation
 - technical development
 - interference problems
 - aspects of rules to be altered to increase opportunities and address conflicts

NOI

- In the 2nd R&O the FCC stated that it would commence a NOI to consider:
 - other uses of white space
 - higher power, fixed devices in rural areas
 - used for point-to-point backhaul in rural areas; substitute for special access