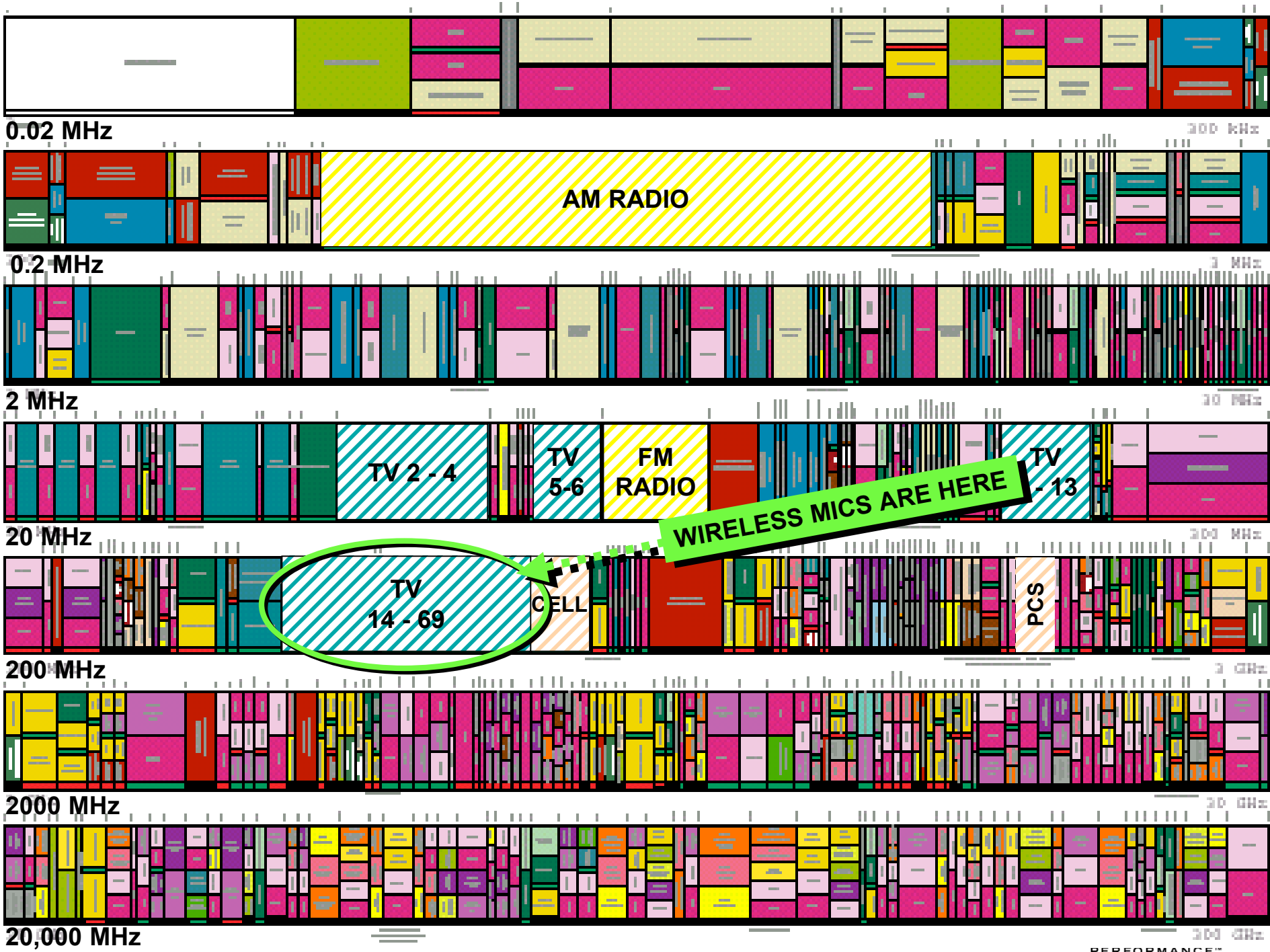


# Spectrum & Wireless

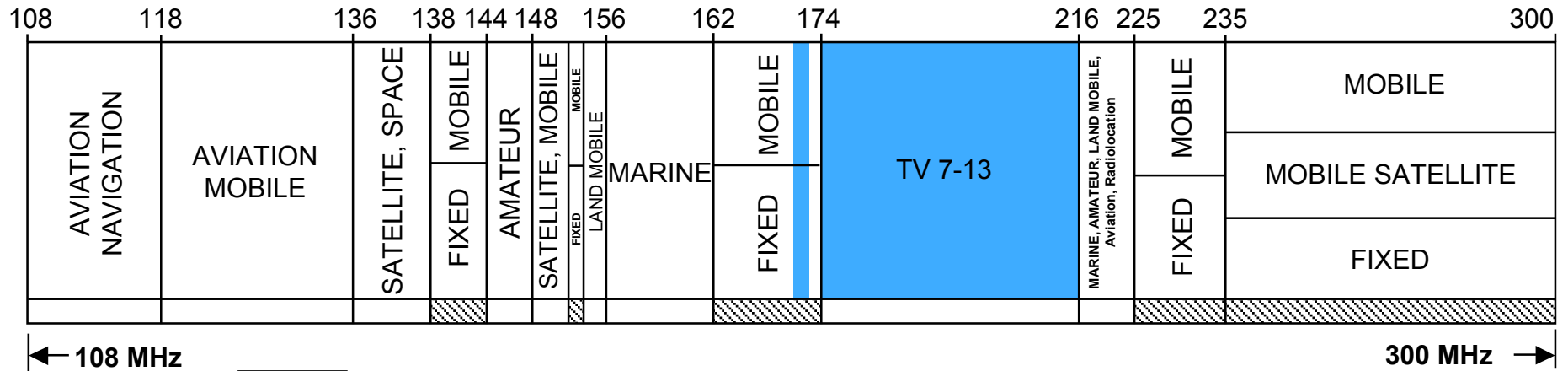
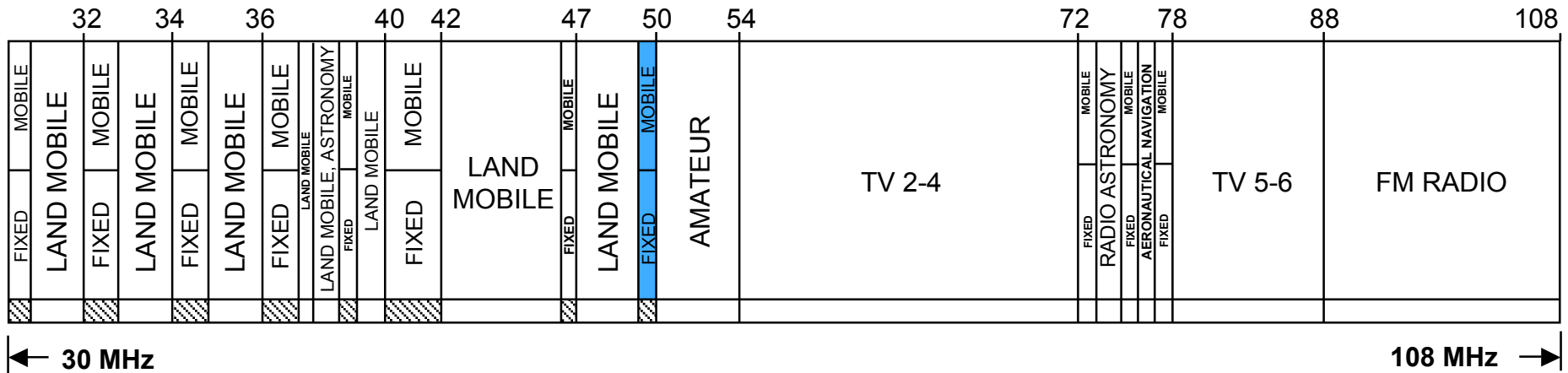
*An Ever-Changing Landscape*

---

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PERFORMANCE™



# VHF Allocations: United States (30-300 MHz)



(government frequencies)



(wireless microphone frequencies)

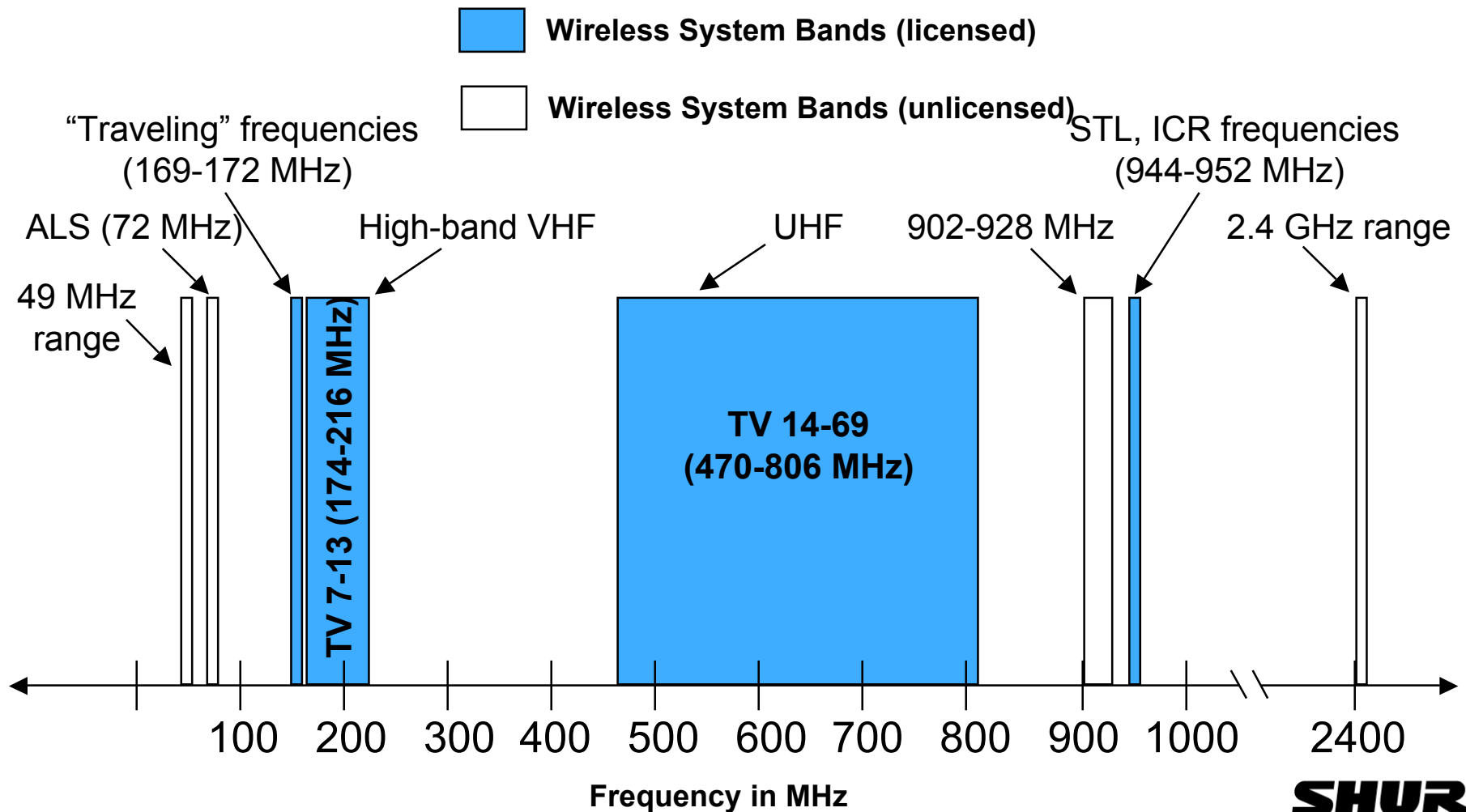


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# Wireless Mic Spectrum: United States

~410 MHz Total Bandwidth

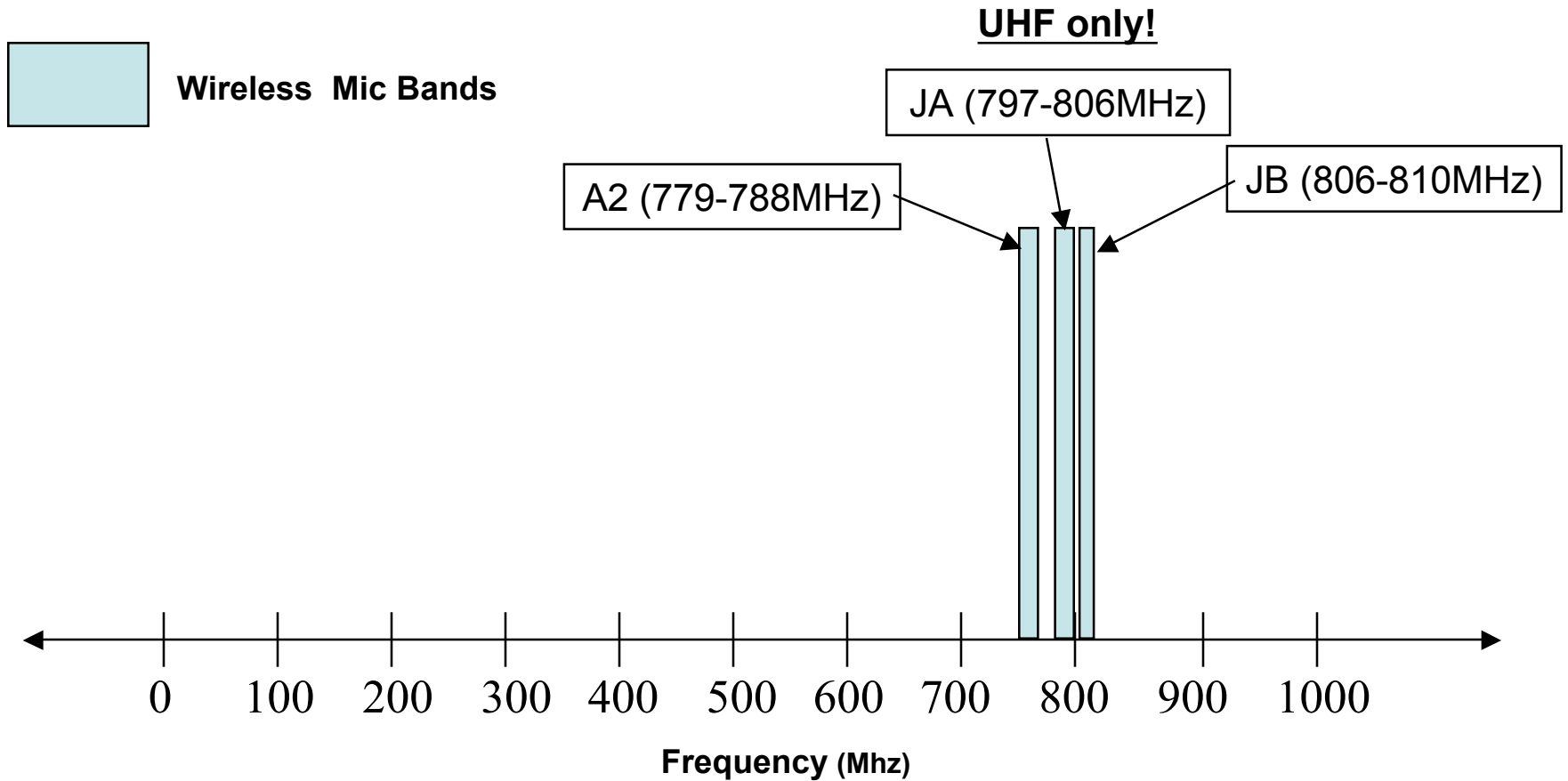


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# Wireless Spectrum: Japan

## ~22 MHz Total Bandwidth



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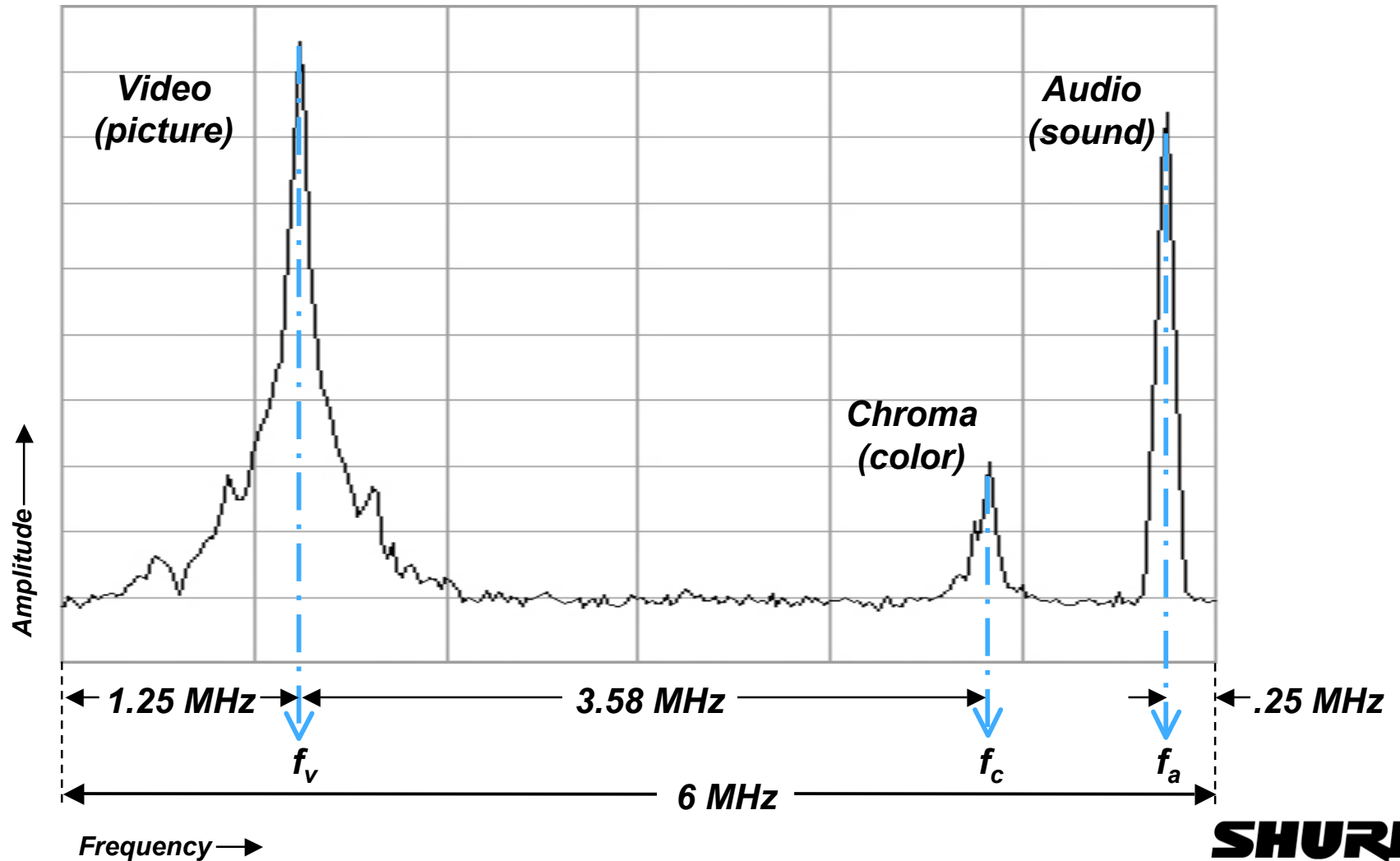
# Why Operate in the Television Band?

- Wide frequency range available for operating many systems
  - 330 MHz bandwidth available in UHF
- Predictable interference from TV stations
- No intermittent or unpredictable interference from consumer or unlicensed devices **(At the moment)**
- Other bands inherent problems: 900MHz - 2.4GHz - 5.6GHz
  - Interference: WiFi, BlueTooth, Microwave, Consumer electronics

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# Analog Television Channel Spectrum

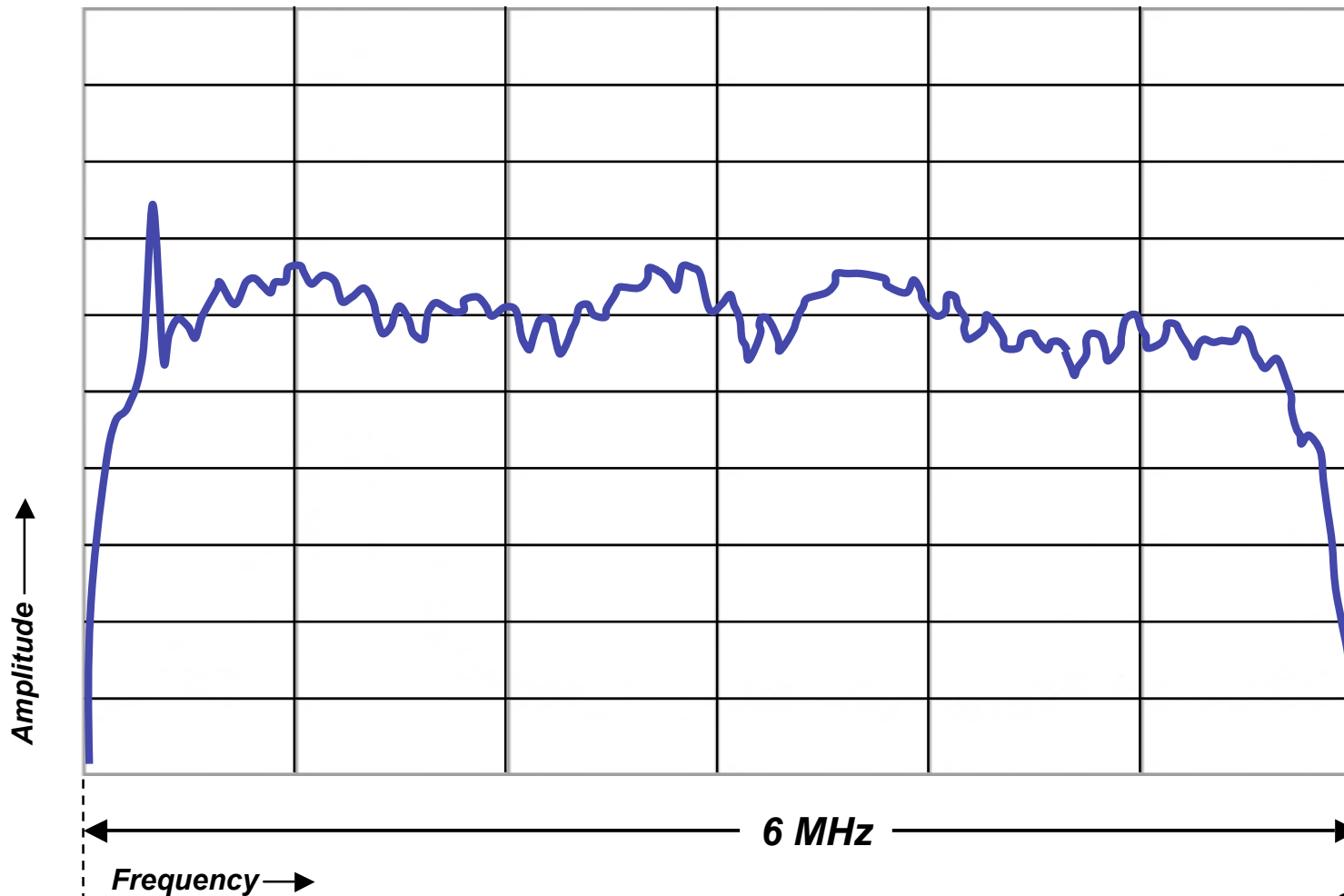


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# Digital Television Channel Spectrum (DTV)

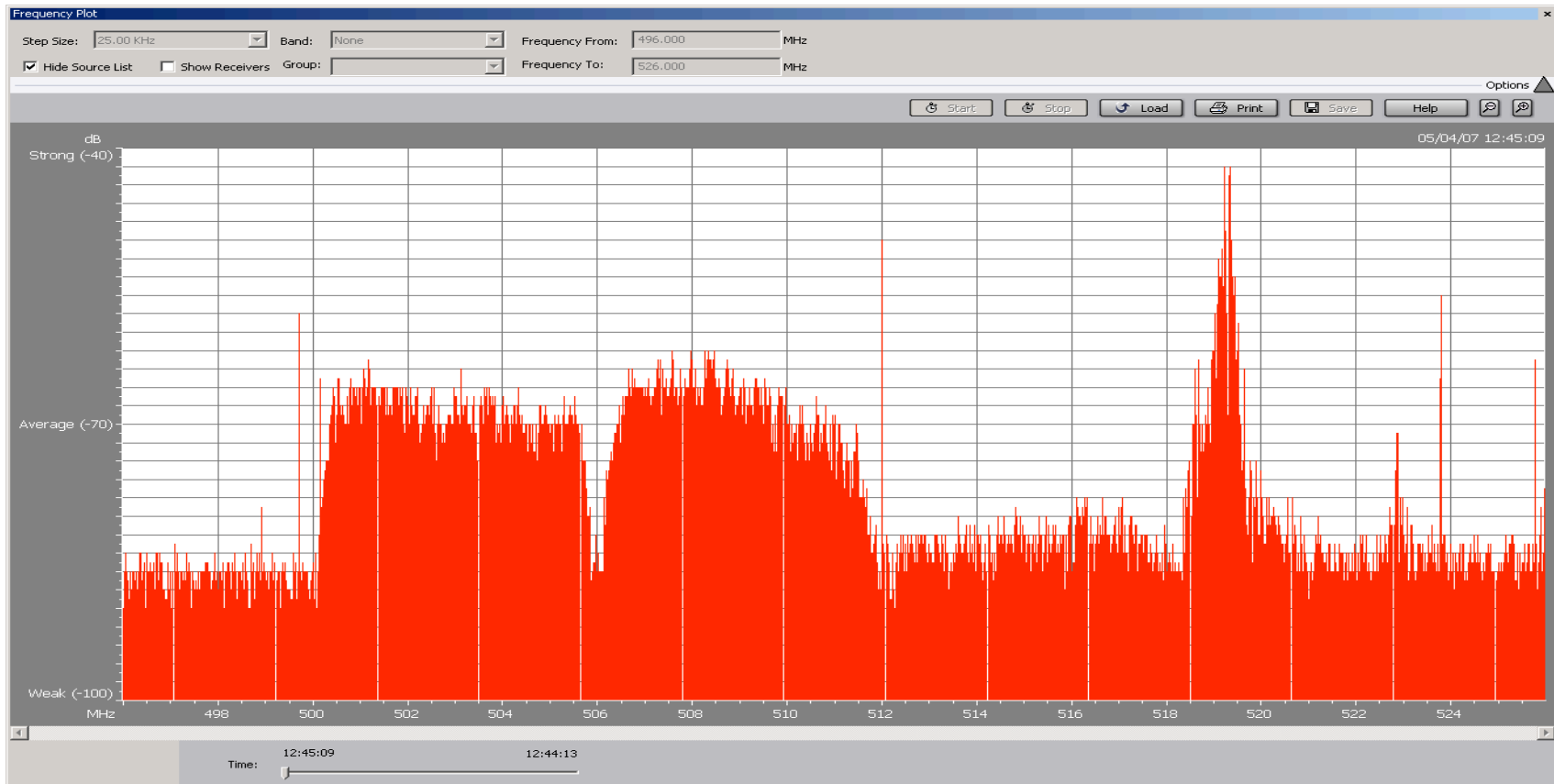


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# UHF Spectrum and TV Station Interference

- Avoid Occupied TV Channels



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# Avoid Occupied TV Channels

- Broadcast TV transmitters
  - Outdoors within 50-60 miles
  - Indoors within 30-40 miles
- Different channels in different cities
- Analog TV and Digital TV (DTV) have same effect:
  - Dropouts
  - Reduced range
  - No noticeable audio quality difference
- DTV channels can be VHF or UHF

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# The Changing Landscape of Wireless Mic Spectrum

1996: VHF → UHF

- Microphone channel counts rise

1997: FCC Announcement: DTV + 700 MHz Band Re-Allocation

- TV CH 52-62 and 65-67 to be sold to highest bidder
- TV CH 63-64, 68-69 re-allocated for Public Safety

2000: Start of DTV Transition - Digital TV goes on the AIR

- Number of open TV channels drops by approx half

2006: FCC Timetable for White Spaces

- FCC Decides to allow fixed unlicensed devices into TV bands
- FCC proposal for personal portable unlicensed devices into TV band

2009: End of DTV Transition – Analog TV goes OFF the AIR

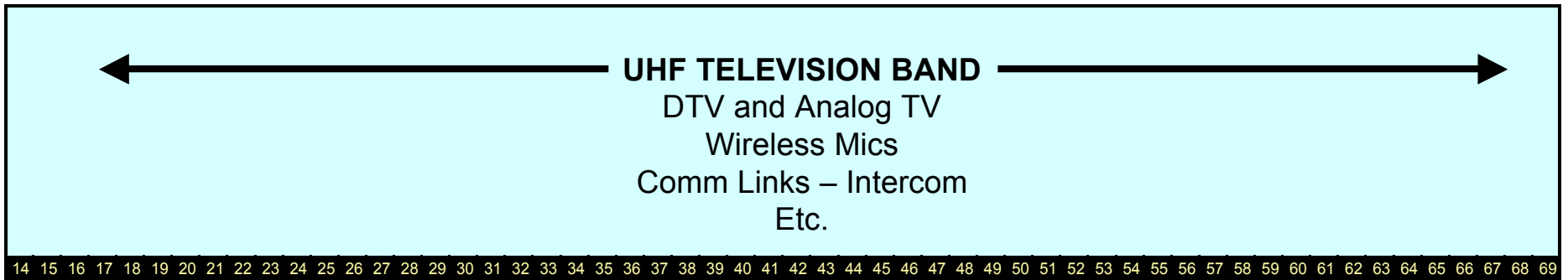
- Number of open TV channels increases by ~two fold
- If White Spaces Proposal is approved: unlicensed devices operate in TV bands
- Wireless mics un-allowed in the 700 MHz UHF band

**SHURE**<sup>®</sup>

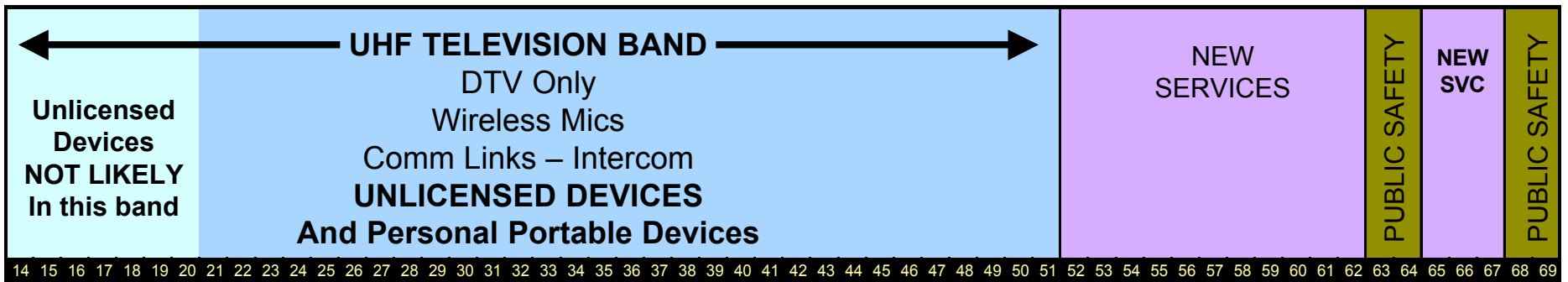
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# Spectrum Re-Allocation: UHF TV 14 - 69

- **Current**



- **Post February 17, 2009**



**SHURE**<sup>®</sup>

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PERFORMANCE™

# The Changing Landscape of Wireless Mic Spectrum

1996: VHF → UHF

- Microphone channel counts rise

700 MHz  
Reallocation

1997: FCC Announcement: DTV + 700 MHz Band Re-Allocation

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- TV CH 63-64, 68-69 re-allocated for Public Safety

DTV

2000: Start of DTV Transition - Digital TV goes on the AIR

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White  
Spaces

2006: FCC Timetable for White Spaces

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2009: End of DTV Transition – Analog TV goes OFF the AIR

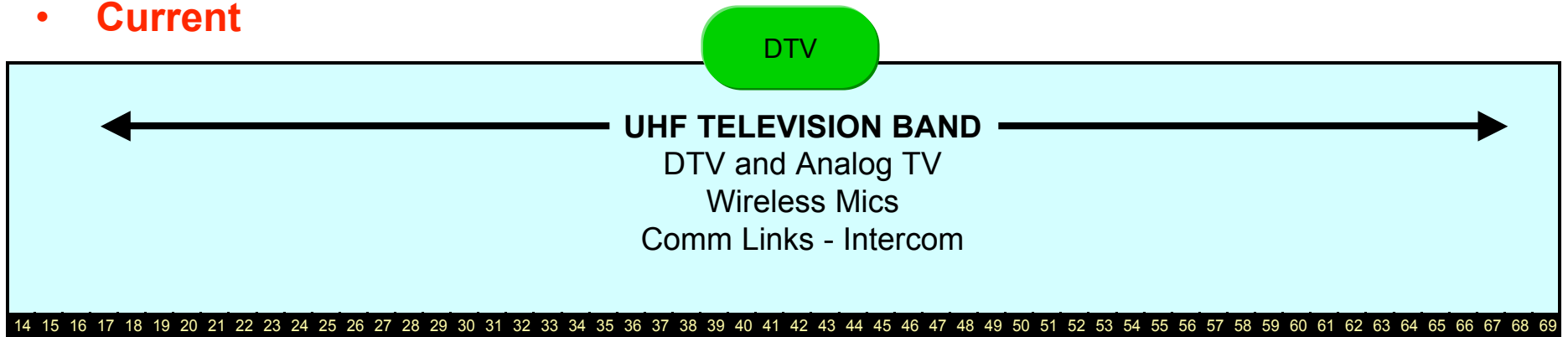
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- If White Spaces Proposal is approved: unlicensed devices operate in TV bands
- Wireless mics un-allowed in the 700 MHz UHF band

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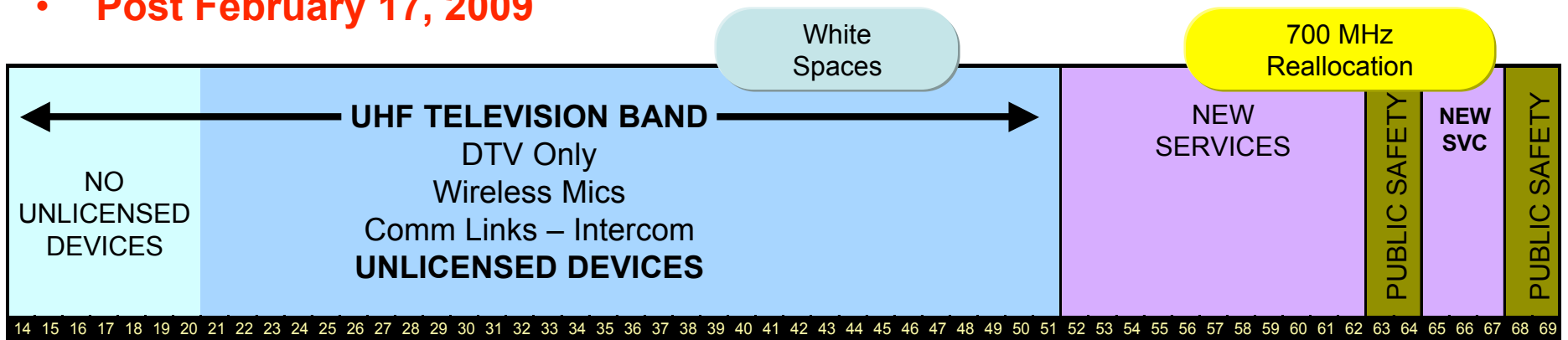
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# Spectrum Re-Allocation: UHF TV 14 - 69

- **Current**



- **Post February 17, 2009**



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# *What is DTV?*

- DTV = Digital Television
- Second DTV channel for all current Analog, over the air, TV
- Each DTV channel can carry:
  - Combination of HDTV and SDTV signals
  - Hi-fidelity multi-channel audio
  - Text, second language, program info, etc.
- Viewers need new TV set or converter box
- Stations need new transmitter, antenna, etc.



# How DTV Can Affect Wireless Microphones

Same way that current Analog TV affects Wireless Mics:

- Decrease range by causing drop outs
- How bad? Depends on:
  - whether user is indoors or outdoors
  - distance from the TV transmitter
  - TV transmitter power
  - distance from wireless transmitter to wireless receiver
  - antenna type and placement

DTV

## Example: Los Angeles, CA

| <u>Call Sign</u> | <u>Analog</u> |   | <u>DTV</u> |
|------------------|---------------|---|------------|
| KCBS             | 2             | → | 60         |
| KNBC             | 4             |   | 36         |
| KTLA             | 5             |   | 31         |
| KABC             | 7             |   | 53         |
| KCAL             | 9             |   | 43         |
| KTTV             | 11            |   | 65         |
| KCOP             | 13            |   | 66         |
| KSCI             | 18            |   | 61         |
| KWHY             | 22            |   | 42         |
| KVCR             | 24            |   | 26         |
| KCET             | 28            |   | 59         |
| KPXN             | 30            |   | 38         |
| KMEX             | 34            |   | 35         |
| KTBN             | 40            |   | 23         |
| KLCS             | 58            |   | 41         |

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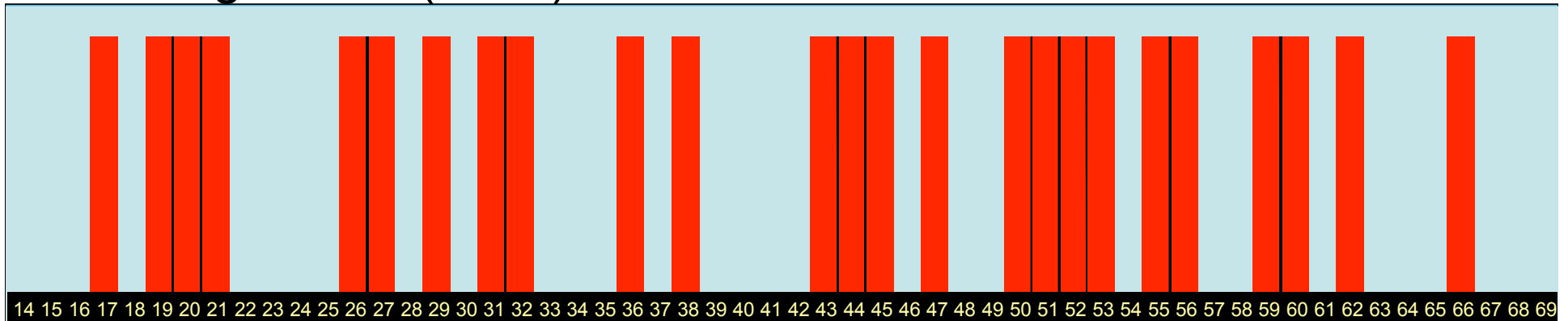
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# Example: Chicago, IL

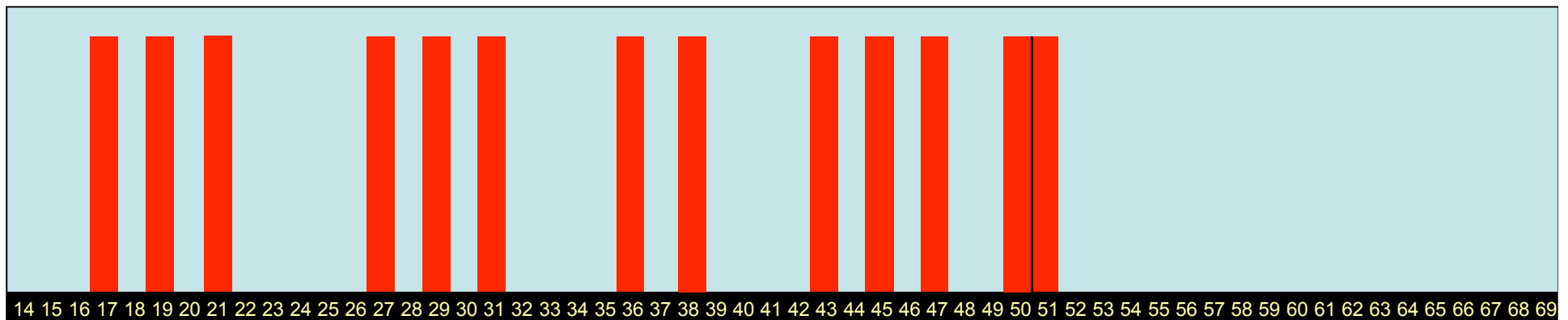
| <u>Call Sign</u> | <u>Analog</u> |   | <u>DTV</u> |
|------------------|---------------|---|------------|
| WBBM             | 2             | → | 3          |
| WMAQ             | 5             |   | 29         |
| WLS              | 7             |   | 52         |
| WGN              | 9             |   | 19         |
| WTTW             | 11            |   | 47         |
| WYCC             | 20            |   | 21         |
| WCIU             | 26            |   | 27         |
| WFLD             | 32            |   | 31         |
| WCPX             | 38            |   | 43         |
| WPWR             | 50            |   | 51         |
| WGBO             | 66            |   | 53         |

# Example: Chicago, IL

- Chicago: Now (2007)

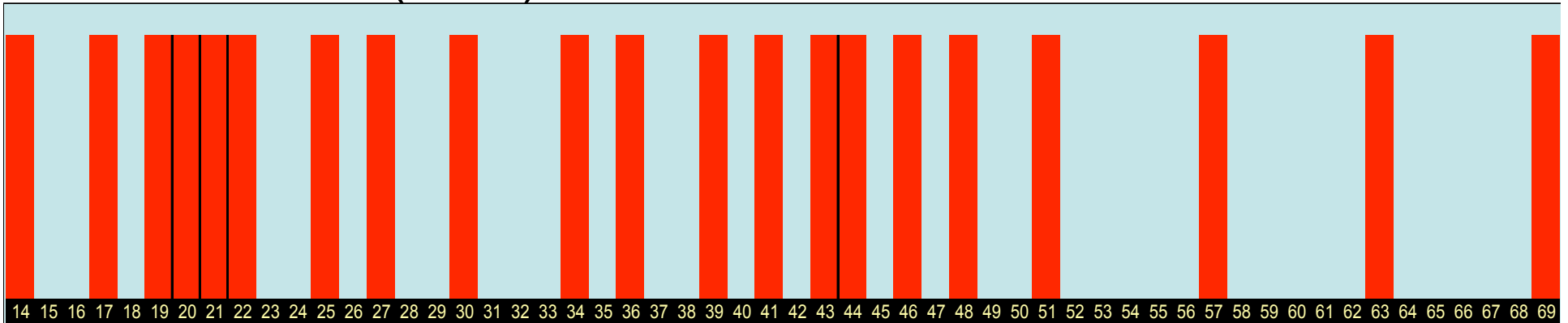


- Chicago: Future (Feb, 2009)

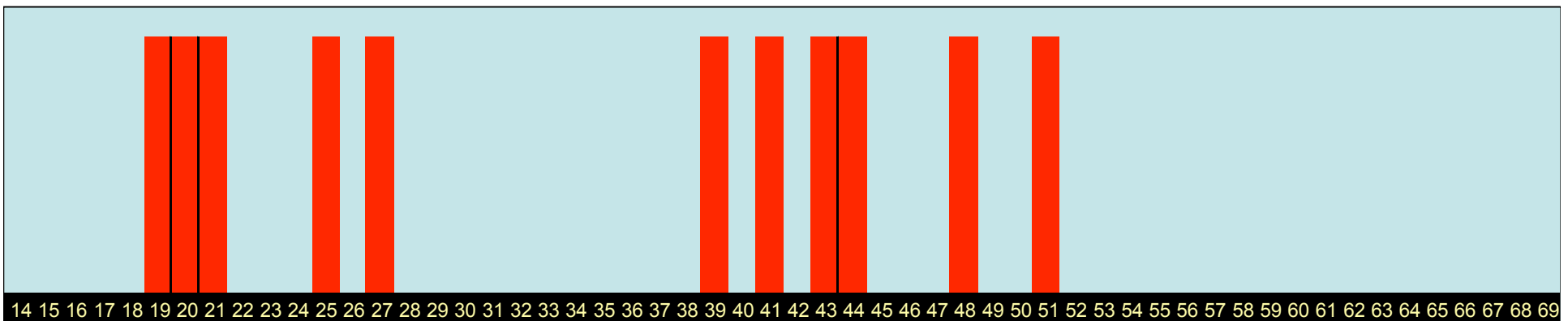


# Example: Atlanta, GA

- Atlanta: Now (2007)



- Atlanta: Future (2009)





- TECH SUPPORT
  - Find An Answer
  - Wireless Frequency Finder
  - Educational Articles
  - Magazines And Newsletters
  - Cable Selector
  - Wireless Mic Remote Antennas Tool

Pro Audio Home > Tech Support > [Wireless Frequency Finder](#)

## Wireless Frequency Finder

This selection guide provides recommended frequencies and the estimated number of compatible systems for all Shure Wireless Systems and PSM Wireless Systems. Shure Applications Engineering updates these lists regularly.

[Change city/zip code](#)
[Show Frequencies](#)

City: **Washington DC**  
 Series: **UHF-R**

Local Television Channels (50 mile radius):

| Call Letters | City, State    | Channel    | Distance | Active |
|--------------|----------------|------------|----------|--------|
| WMPT         | ANNAPOLIS, MD  | 22 analog  | 23 miles | On Air |
| WUTB         | BALTIMORE, MD  | 24 analog  | 29 miles | On Air |
| WETA-TV      | WASHINGTON, DC | 26 analog  | 6 miles  | On Air |
| WETA-TV      | WASHINGTON, DC | 27 digital | 6 miles  | On Air |
| WFPT         | FREDERICK, MD  | 28 digital | 29 miles | On Air |
| WMPB         | BALTIMORE, MD  | 29 digital | 39 miles | On Air |
| WNVTV        | GOLDVEIN, VA   | 30 digital | 29 miles | On Air |
| WHUT-TV      | WASHINGTON, DC | 32 analog  | 6 miles  | On Air |
| WHUT-TV      | WASHINGTON, DC | 33 digital | 4 miles  | Future |
| WUSA         | WASHINGTON, DC | 34 digital | 4 miles  | On Air |
| WDCA         | WASHINGTON, DC | 35 digital | 5 miles  | On Air |
| WTTG         | WASHINGTON, DC | 36 digital | 5 miles  | On Air |
| WJZ-TV       | BALTIMORE, MD  | 38 digital | 35 miles | On Air |
| WJLA-TV      | WASHINGTON, DC | 39 digital | 4 miles  | On Air |
| WNUV         | BALTIMORE, MD  | 40 digital | 35 miles | On Air |
| WUTB         | BALTIMORE, MD  | 41 digital | 29 miles | On Air |
| WMPT         | ANNAPOLIS, MD  | 42 digital | 23 miles | On Air |
| WPXW         | MANASSAS, VA   | 43 digital | 18 miles | On Air |
| WBFF         | BALTIMORE, MD  | 45 analog  | 35 miles | On Air |
| WBFF         | BALTIMORE, MD  | 46 digital | 35 miles | On Air |
| WRC-TV       | WASHINGTON, DC | 48 digital | 4 miles  | On Air |
| WDCW         | WASHINGTON, DC | 50 analog  | 3 miles  | On Air |
| WDCW         | WASHINGTON, DC | 51 digital | 3 miles  | On Air |

Use these recommended Groups/Channels:

| Band | Max # of transmitters | Recommended Group | Recommended Channels                         |
|------|-----------------------|-------------------|--|
| H4   | 13                    | Group: 6          | 4, 5, 6, 7, 8, 9, 10, 11, 20, 29, 30, 33, 34 |

Band 35 is not recommended in Washington, DC.  
 If you are trying to select a group/channel for a system that you already own in band 35, contact [Shure Applications Engineering](#) for assistance in choosing a group/channel.

TV Query results are derived from the public files at <http://www.fcc.gov/mb/databases/cdbs>. Requests to correct data should be referred to [Hossein Hashemzadeh](mailto:Hossein.Hashemzadeh@fcc.gov), [hossein.hashemzadeh@fcc.gov](mailto:hossein.hashemzadeh@fcc.gov). Comments on the TV Query may be referred to [Dale Bickel](mailto:Dale.Bickel@fcc.gov), [dale.bickel@fcc.gov](mailto:dale.bickel@fcc.gov).

- This list is best printed in LANDSCAPE mode.
- Use the TEXT SIZE input on the [TV Query](#) page to change the text size in the list below, for easier printing or viewing.
- Click on the blue Call Sign or blue Facility ID Number to retrieve more detailed information from the TV Query, including access to the CDBS database records pertaining to that station.
- Records for stations outside the USA are derived from international notifications.
- License, application, and construction permit (CP) coordinates shown in the TV Query are NAD 27 coordinates.
- Antenna Structure Registration (ASR) coordinates are NAD 83.

Mon Apr 30 11:07:33 2007 Eastern time

**Search Parameters**

|                   |                            |
|-------------------|----------------------------|
| Record type:      |                            |
| Search radius:    | 85.00 km                   |
| Center lat / lon: | N 38 55 42.00 W 77 2 12.00 |
| Lower Channel     | 2                          |
| Upper Channel     | 69                         |

Freq Offset (NTCS analog TV only)

| Call    | Channel | Service | Status | City   | State          | Country | File Number | Docket              | FacilityID | ERP    | DA?      | HAAT   | RCAMSL  | RCAGL   | Latitude      | Longitude     |         |
|---------|---------|---------|--------|--------|----------------|---------|-------------|---------------------|------------|--------|----------|--------|---------|---------|---------------|---------------|---------|
| WMAR-TV | 2       | +       | TV     | LIC    | BALTIMORE      | MD      | US          | BLCT-20000718AAP    | -          | 59442  | 100. kW  | 297. m | 381. m  | 284. m  | N 39 20 6.00  | W 76 39       |         |
| -       | 3       | +       | TX     | STA    | BALTIMORE      | MD      | US          | BSTA-20070413AGZ    | -          | -      | 0.001 kW | 0. m   | 28. m   | 0. m    | N 39 16 40.00 | W 76 37       |         |
| WRC-TV  | 4       | -       | TV     | LIC    | WASHINGTON     | DC      | US          | BLCT-19981230KE     | -          | 47904  | 100. kW  | 227. m | 297. m  | 179. m  | N 38 56 24.00 | W 77 4        |         |
| WTTG    | 5       | -       | TV     | LIC    | WASHINGTON     | DC      | US          | BMLCT-223           | -          | 22207  | 100. kW  | 235. m | 306. m  | 201. m  | N 38 57 22.00 | W 77 4        |         |
| WTTG    | 5       | -       | TV     | CP     | WASHINGTON     | DC      | US          | BPCT-20060519ACI    | -          | 22207  | 94. kW   | 243. m | 312.4 m | 207.6 m | N 38 57 22.00 | W 77 4        |         |
| W06CJ   | 6       | Z       | TX     | CP MOD | FAIRFAX        | VA      | US          | EMPTVL-20060830ABD  | -          | 20450  | 3. kW    | DA     | 0. m    | 198.4 m | 76.2 m        | N 38 53 45.00 | W 77 8  |
| W06CJ   | 6       | Z       | TX     | LIC    | FAIRFAX        | VA      | US          | BLTVL-20070410ACR   | -          | 20450  | 3. kW    | DA     | 0. m    | 198.4 m | 76.2 m        | N 38 53 45.00 | W 77 8  |
| WJLA-TV | 7       | +       | TV     | LIC    | WASHINGTON     | DC      | US          | BMLCT-19981224KI    | -          | 1051   | 316. kW  | 235. m | 308. m  | 184. m  | N 38 57 1.00  | W 77 4        |         |
| WMDQ-LD | 8       | -       | LD     | CP     | WASHINGTON     | DC      | US          | BDCCDVL-20061016ABC | -          | 167370 | 0.13 kW  | 0. m   | 205. m  | 94. m   | N 38 56 10.00 | W 77 5        |         |
| WQAW-LP | 8       | -       | TX     | APP    | LAKE SHORE     | MD      | US          | BDISTVL-20060310ACY | -          | 131071 | 3. kW    | DA     | 0. m    | 123. m  | 120. m        | N 38 58 2.00  | W 76 15 |
| WUSA    | 9       | Z       | TV     | LIC    | WASHINGTON     | DC      | US          | BMLCT-19981223KE    | -          | 65593  | 316. kW  | 235. m | 308. m  | 184. m  | N 38 57 1.00  | W 77 4        |         |
| WBAL-TV | 11      | -       | TV     | LIC    | BALTIMORE      | MD      | US          | BLCT-20000707AEB    | -          | 65696  | 316. kW  | 299. m | 383. m  | 286. m  | N 39 20 5.00  | W 76 39       |         |
| WJZ-TV  | 13      | +       | TV     | LIC    | BALTIMORE      | MD      | US          | BLCT-20000508AAAY   | -          | 25455  | 316. kW  | 292. m | 382. m  | 285. m  | N 39 20 5.00  | W 76 39       |         |
| WFDC-TV | 14      | -       | TV     | CP MOD | ARLINGTON      | VA      | US          | BMPCT-20041217AXU   | -          | 69532  | 2680. kW | 173. m | 243. m  | 124. m  | N 38 56 24.00 | W 77 4        |         |
| WFDC-TV | 14      | -       | TV     | LIC    | ARLINGTON      | VA      | US          | BLCT-19930406KF     | -          | 69532  | 2680. kW | 173. m | 243. m  | 124. m  | N 38 56 24.00 | W 77 4        |         |
| WFDC-TV | 15      | -       | TV     | STA    | ARLINGTON      | VA      | US          | BMDSTA-20051004AED  | -          | 69532  | 175. kW  | 173. m | 243. m  | 0. m    | N 38 56 24.00 | W 77 4        |         |
| WFDC-TV | 15      | -       | TV     | LIC    | ARLINGTON      | VA      | US          | BLCDT-20070215AAB   | -          | 69532  | 325. kW  | 173. m | 243. m  | 125. m  | N 38 56 24.00 | W 77 4        |         |
| WMJF-LP | 16      | Z       | TX     | LIC    | TOWSON         | MD      | US          | BLTTL-20001204AAA   | -          | 67462  | 1.22 kW  | DA     | 0. m    | 169. m  | 47. m         | N 39 23 45.00 | W 76 36 |
| WJAL-TV | 16      | -       | TV     | APP    | SILVER SPRING  | MD      | US          | BPRM-20021003ACN    | -          | 137527 | - kW     | DA     | - m     | - m     | N 38 56 24.00 | W 77 4        |         |
| WMJF-LP | 16      | -       | TV     | LIC    | TOWSON         | MD      | US          | BLTTA-20050909ADB   | -          | 67462  | 3.5 kW   | DA     | 0. m    | 169. m  | 47. m         | N 39 23 45.00 | W 76 36 |
| -       | 17      | -       | TV     | LIC    | WASH (MD & VA) | DC      | US          | ---                 | -          | 97517  | 0. kW    | 0. m   | 0. m    | 0. m    | N 38 53 51.00 | W 77 0        |         |
| -       | 18      | -       | TV     | LIC    | WASH (MD & VA) | DC      | US          | ---                 | -          | 97571  | 0. kW    | 0. m   | 0. m    | 0. m    | N 38 53 51.00 | W 77 0        |         |
| WDCA    | 20      | +       | TV     | LIC    | WASHINGTON     | DC      | US          | BLCT-2091           | -          | 51567  | 3980. kW | 235. m | 310. m  | 0. m    | N 38 57 49.00 | W 77 6        |         |

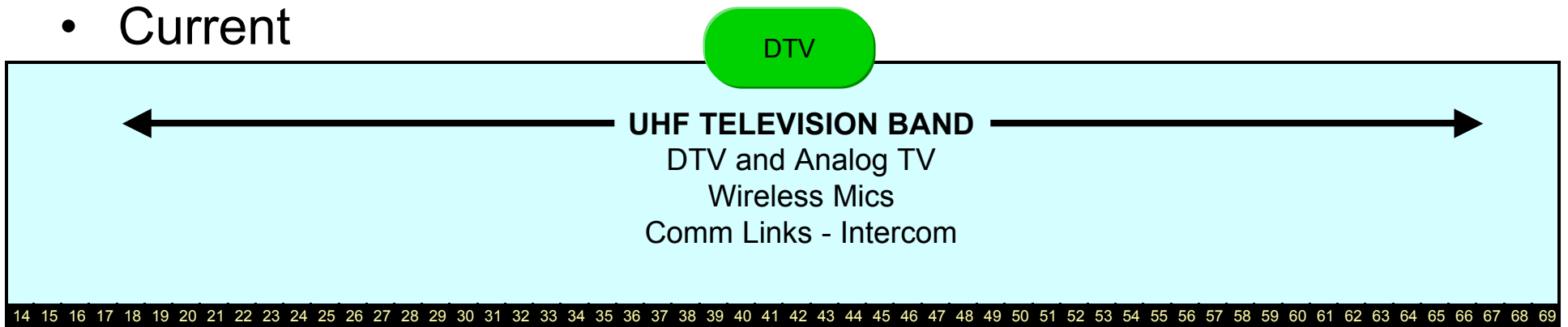
www.nab.org

|   |          |         |             |      |    |
|---|----------|---------|-------------|------|----|
|   |          | WFLD    | FOX         | 32.n | 31 |
|   |          | WCPX    | ION         | 38.n | 43 |
|   |          | WWTO-TV | Religious   | 35.n | 10 |
|   |          | WSNS-TV | Telemundo   | 44.n | 45 |
|   |          | WGBO-TV | Univision   | 66.n | 53 |
|   |          | WMAQ-TV | NBC         | 5.n  | 29 |
|   |          | WPWR-TV | My TV       | 50.n | 51 |
|   |          | WYIN    | PBS         | 56.n | 17 |
|   |          | WYCC    | PBS         | 20.n | 21 |
|   |          | WTTW    | PBS         | 11.n | 47 |
|   |          | WXFT    | TeleFutura  | 60.n | 59 |
| <b>Philadelphia, PA</b>                   | <b>4</b> | WHYY-TV | PBS         | 12.n | 55 |
|   |          | WYBE    | PBS         | 35.n | 34 |
|   |          | WLVT-TV | PBS         | 39.n | 62 |
|   |          | WPHL-TV | My TV       | 17.n | 54 |
|   |          | WNJS    | PBS         | 23.n | 22 |
|   |          | WNJT    | PBS         | 52.n | 43 |
|   |          | WCAU    | NBC         | 10.n | 67 |
|   |          | WMGM-TV | NBC         | 40.n | 36 |
|   |          | WUVP    | Univision   | 65.n | 66 |
|   |          | WWSI-TV | Telemundo   | 62.n | 49 |
|   |          | WPPX    | ION         | 61.n | 31 |
|   |          | WTVE    | Independent | 51.n | 25 |
|   |          | WMCN-DT | Independent | 53.n | 44 |
|   |          | WTFX-TV | FOX         | 29.n | 42 |
|   |          | WGTW-TV | Independent | 48.n | 27 |
|   |          | WBPH-TV | Independent | 60.n | 9  |
|   |          | WFMZ-TV | Independent | 69.n | 46 |
|   |          | KYW -TV | CBS         | 3.n  | 26 |
|   |          | WPSG    | CW          | 57.n | 32 |
|   |          | WPVI-TV | ABC         | 6.n  | 64 |
| <b>San Francisco-Oakland-San Jose, CA</b> | <b>5</b> | KUNO    | Azteca      | 8.n  | 15 |
|   |          | KTNC-TV | Azteca      | 42.n | 63 |
|   |          | KGO-TV  | ABC         | 7.n  | 24 |
|   |          | KTVU    | FOX         | 2.n  | 56 |
|   |          | KBCW    | CW          | 44.n | 45 |
|   |          | KPIX    | CBS         | 5.n  | 29 |
|   |          | KTLN-TV | Independent | 68.n | 47 |
|   |          | KCNS-TV | Independent | 38.n | 39 |
|   |          | KKPX    | ION         | 65.n | 41 |
|   |          | KFTY    | Independent | 50.n | 54 |

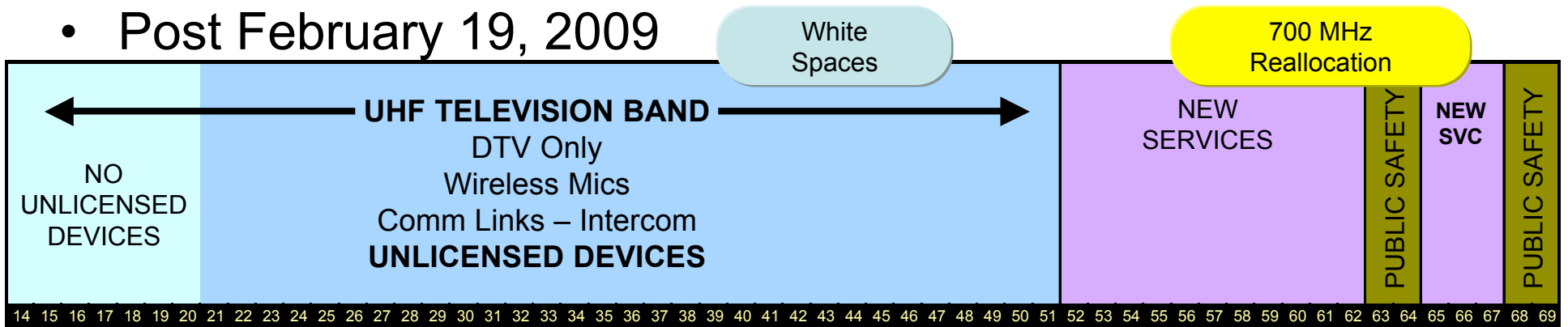


# Spectrum Re-Allocation: UHF TV 14 - 69

- Current



- Post February 19, 2009



**SHURE**<sup>®</sup>

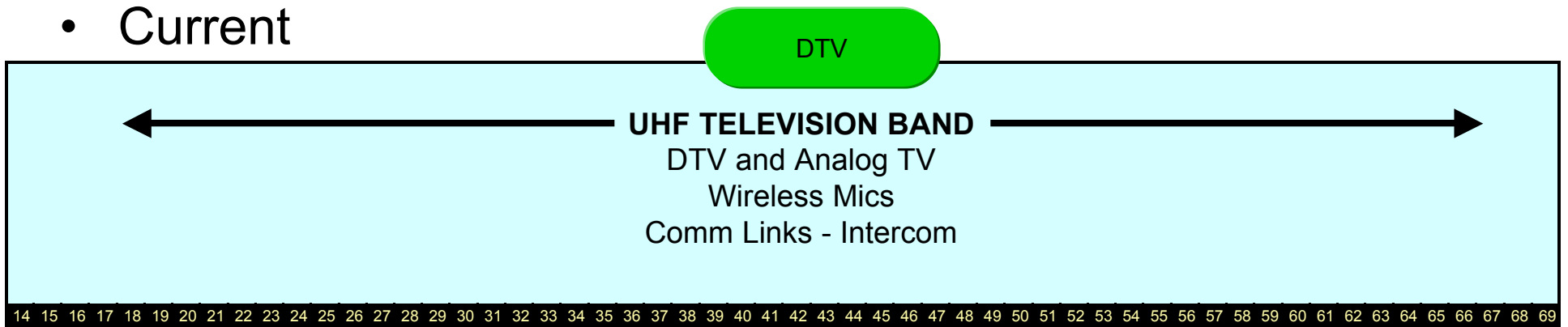
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# Public Safety and 700 MHz Auctions

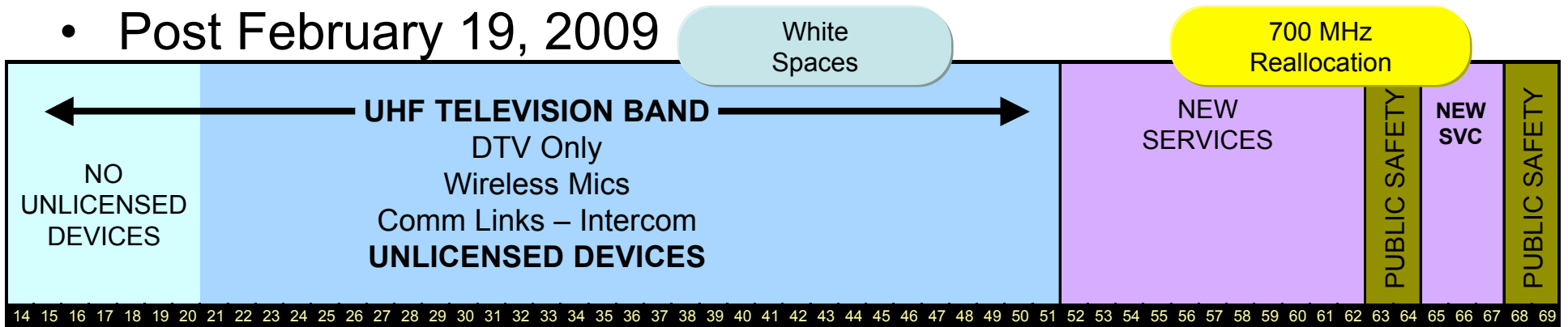
- Public Safety bands will allow for various agencies to communicate with each other
- Services in balance of 700 MHz band largely unknown
- In both cases, wireless microphones will likely lose secondary broadcast rights above TV channel 51 sometime after end of DTV transition
- **Current and future system purchases should all be in frequency bands below 698 MHz!**

# Spectrum Re-Allocation: UHF TV 14 - 69

- Current



- Post February 19, 2009



# Spectrum Today

- The demand for wireless devices is growing
  - Both in the consumer and the professional fields
- Available spectrum is shrinking
  - DTV transition completes February 17, 2009
  - Analog TV stations cease to transmit
  - Leaving “WHITE SPACES” of spectrum unused
- **“White Spaces” Proposal**
  - ET Docket 04-186
  - Generated by the Federal Communications Commission (FCC) in 2004 with initial rules issued November 2006
  - Allows UNLICENSED WIRELESS devices and PERSONAL PORTABLE devices to operate in “un-occupied” TV spectrum beginning in Feb '09

# Terms

- **What are “White Spaces”?**
  - Spectrum in between local TV channels that is “unused”
  - Primary space in which ALL professional wireless microphones, monitors & intercoms operate today
- **What are “Unlicensed Devices”?**
  - Point to multi-point WRAN devices
  - Bring High Speed internet service to rural areas
  - Do not operate in frequencies adjacent to active TV channels
  - Broadband transmitters – 6MHz, 4 watt max output
- **What are “Personal Portable Wireless Devices”?**
  - Wireless devices for personal use: Telephones, PDAs, WLAN
  - Operate anywhere in the UHF TV band (CH 21 to 51)
  - Cannot interfere with licensed services: wireless microphones – Broadcast TV
  - Currently specked at 400 mW

# Why Is This So Important?

*Potential random interference from unlicensed devices  
to microphones in...*

- Broadcast
- Theatre
- Live Music
- Houses of Worship
- Education
- Theme Parks
- Corporations
- Government Facilities

# FCC Timetable For the White Spaces Proceeding

| Projected Date | Milestone   |
|----------------|---|
| October 2006   | Commission adopts a First Report and Order and Further Notice of Proposed Rule Making   |
| March 2007     | FCC Laboratory reports the results of measurements of the interference rejection capabilities of DTV receivers  |
| July 2007      | FCC Laboratory reports the results of tests evaluating potential interference from unlicensed devices to TV and other radio services  |
| October 2007   | Commission adopts a Second Report and Order specifying final technical requirements for unlicensed devices that operate in the TV bands   |
| December 2007  | FCC Laboratory begins accepting applications for certification of unlicensed devices operating in the TV bands; certification will be granted at such time as the application has been reviewed and found to comply with the rules; certification will permit manufacture and shipment of products to distribution points |
| February 2009  | Products will be available for sale at retail   |

# A “Win-Win” Solution

- **Shure has mounted a multi-million dollar legal, policy & technical campaign to explain the issues of this proposal to decision makers in Washington, D.C.**
  - Goal is to create workable means for preventing interference to wireless microphones
- **Shure is aligning the industry to secure a positive wireless future through...**
  - PAMA, NAMM, NSCA, NARAS, SVG

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# **A “Win-Win” Solution**

## ***Legal , Policy, Technical***

- **Shure has been meeting with the FCC on a regular basis since 2003 to explore ways to prevent interference to microphones**
  - Granted experimental licenses and authorization to conduct interference tests to microphones
  - Ongoing Special FCC meetings with industry experts
    - Broadway – RF Coordinators
    - Touring – Engineers and Artist (Kelly Clarkson)
    - Grand Ole Opry - Engineers
    - Las Vegas – Engineers
- **Meetings with Representatives of Congress**
  - Educating and working with lawmakers to protect microphones through legislation

# **A “Win-Win” Solution**

## ***Legal , Policy, Technical***

- **Shure is an active member of the Institute of Electrical and Electronic Engineers (IEEE)**
  - 802.18 & 802.22 (Regulatory and Standards Groups)
  - Shure is the only professional microphone company in IEEE 802
  - Goal to implement standardized protection from fixed Unlicensed Devices to incumbent services in the TV bands

# A “Win-Win” Solution *Technical*

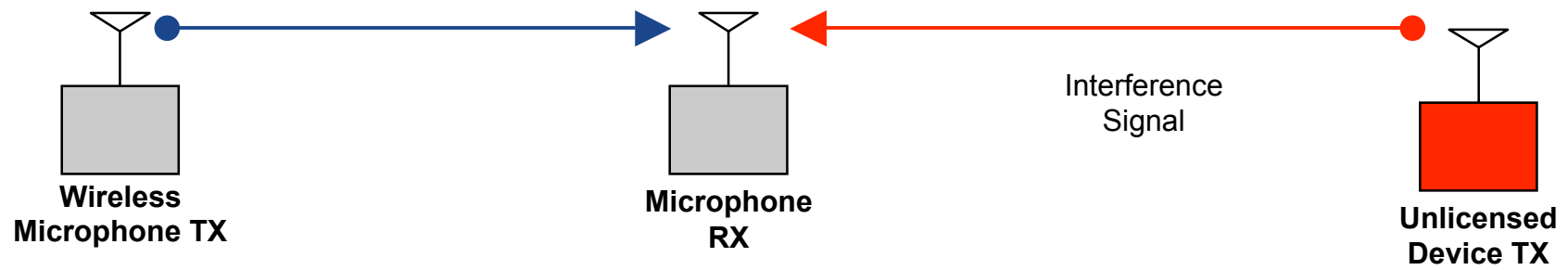
- **Shure is developing a “matrix” of solutions to mitigate White Spaces issues**
  - Short, medium, and long-term strategies
  - Product and regulatory components
  - Working now in detail with the FCC toward final rules in late 2007

# Interference Mitigation Approaches

- “Listen Before Talk” or Cognitive Radio Techniques
- Exempt TV Channels
- Wireless “Smart” Beacon System

# Listen Before Talk

- Wireless microphone users are mobile, and transmissions are not scheduled.
- Unlicensed devices would have to be able to detect comparatively weak wireless microphone signals.
- Hidden node problems are likely.



# Exempt TV Channels

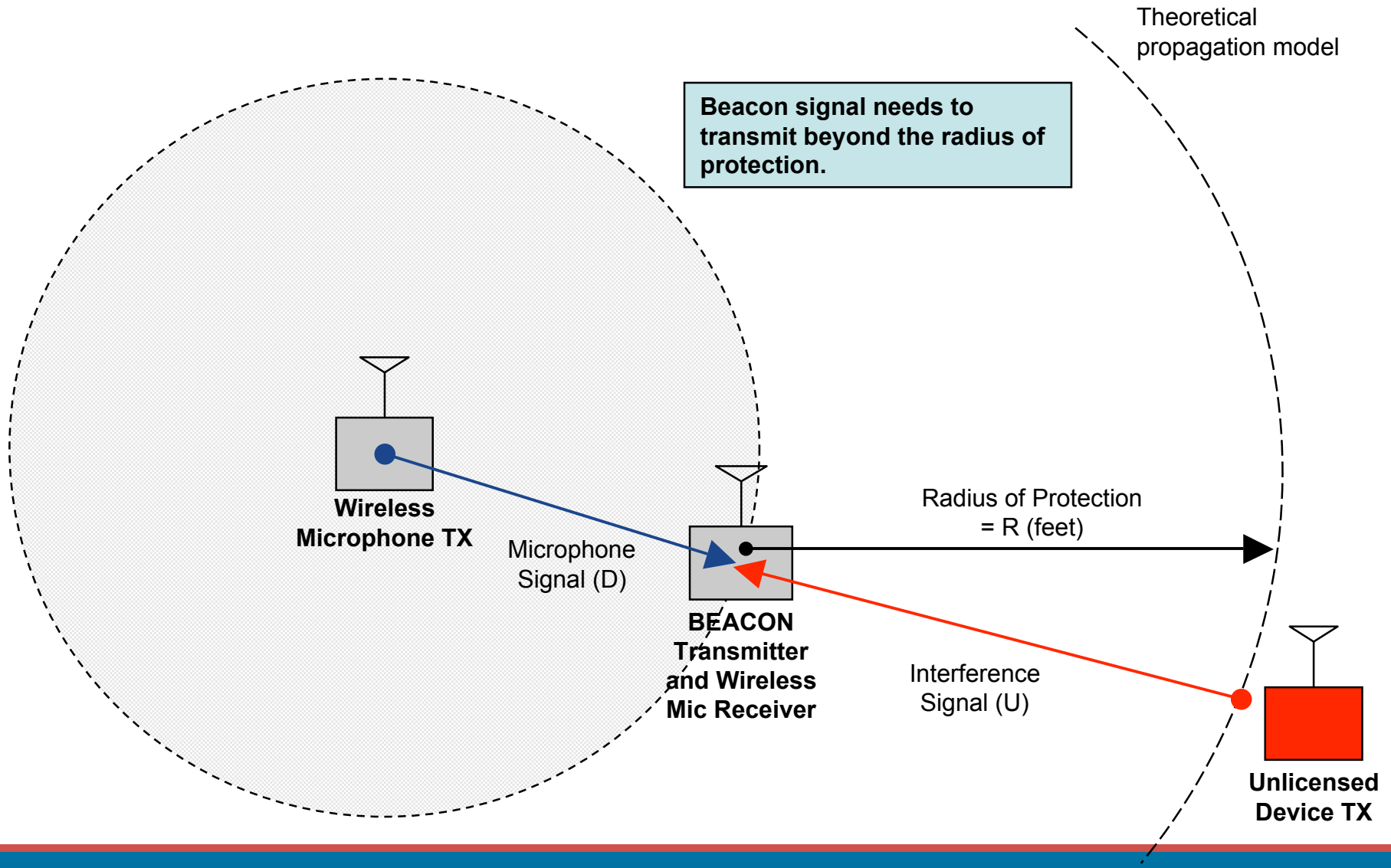
- DTV proponents want unlicensed devices prohibited in “adjacent” TV channels. (N+/-1)
- Wireless microphones would be clear to operate in these channels
- Rural areas may need additional channels.
  - Fewer broadcast stations = fewer “shadows”
  - Based on our analysis, 2 exempt VHF high band TV channels and 6 exempt UHF band TV channels per market are needed.
- Not enough channels for large-scale events (>50 channels of wireless).

| SLX Wireless Bands: | H5                      |                         |                         |                         | J3                      |                         |                         |                         |                         |                         |                         |                         |                         |                         | L4                      |                         |                         |                         |                         |                         | Audio Technica          |                         |                         |                         |                         |                         |                         |                         |       |
|---------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------|
| A-T 3000 Series     | 22                      | 23                      | 24                      | 25                      | 26                      | 27                      | 28                      | 29                      | 30                      | 31                      | 32                      | 33                      | 34                      | 35                      | 36                      | 37                      | 38                      | 39                      | 40                      | 41                      | 42                      | 43                      | 44                      | 45                      | 46                      | 47                      | 48                      | 49                      | 50    |
| City                |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |                         |       |
| Chicago             | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV    |
| Los Angeles         | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV    |
| New York            | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV    |
| Key:                | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV                      | TV    |
|                     | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear                   | clear |
|                     | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices | No "unlicensed" devices |       |

# “Smart” Beacon System

- A local beacon transmitter
  - operates in an unoccupied TV channel
  - broadcasts information to unlicensed devices operating nearby
- The unlicensed devices would need to:
  - scan for the beacon
  - avoid operating on TV channels marked as being in use by wireless microphones
- A variation on the Control Signal approach
  - works specifically at the local level
  - results in much more efficient use of spectrum

# Beacon System concept diagram:





# Congressional Activity

- **White Space proponents were not satisfied with timeline**
  - Extensive lobbying begun by the “coalition” (Microsoft, Intel, Dell, Google, HP)
- **Proponent lobbying culminated in HR 5252 Wireless Communications Act (Stevens Bill)**
  - Bill encompassed net neutrality, video franchising and White Spaces.
  - Bill died with last Congress.
- **Senators Kerry and Sununu revived White Spaces legislation this year**
  - Similar to Stevens bill
- **Rep. Bobby Rush introduced HR 1320 in March**
  - Allows fixed, unlicensed devices in the White Spaces after Feb. 19, 2009
  - Requires manufacturers demonstrate devices will not interfere with incumbents
  - Specifically mentions wireless microphones

# What Can You Do?

- Support efforts that benefit industry-wide solutions
- Control the “sky is falling” messages
  - Remember the FCC wants a win-win solution from Audio & CE industry manufacturers
- Write to the Federal Communications Commission (Shure can help)
- Write to your local Senator or Representative
  - Encourage support of HR 1320
- Contact Shure with questions from customers
- Visit [www.shure.com/whitespaces/](http://www.shure.com/whitespaces/)

## Fact or Fiction?

- The FCC doesn't care about the audio industry
- The FCC is taking away the spectrum for wireless microphones...
- Unlicensed devices cannot interfere with wireless microphones...
- There is a magic or digital technology to solve spectrum problems

**FICTION**

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## Key Points:

- Wireless microphones provide an important public service
- Provisions must be made to protect incumbent users
- The FCC must allow adequate time to thoroughly test proposed solutions