

Amateur Radio License

Introduction

Amateur Radio

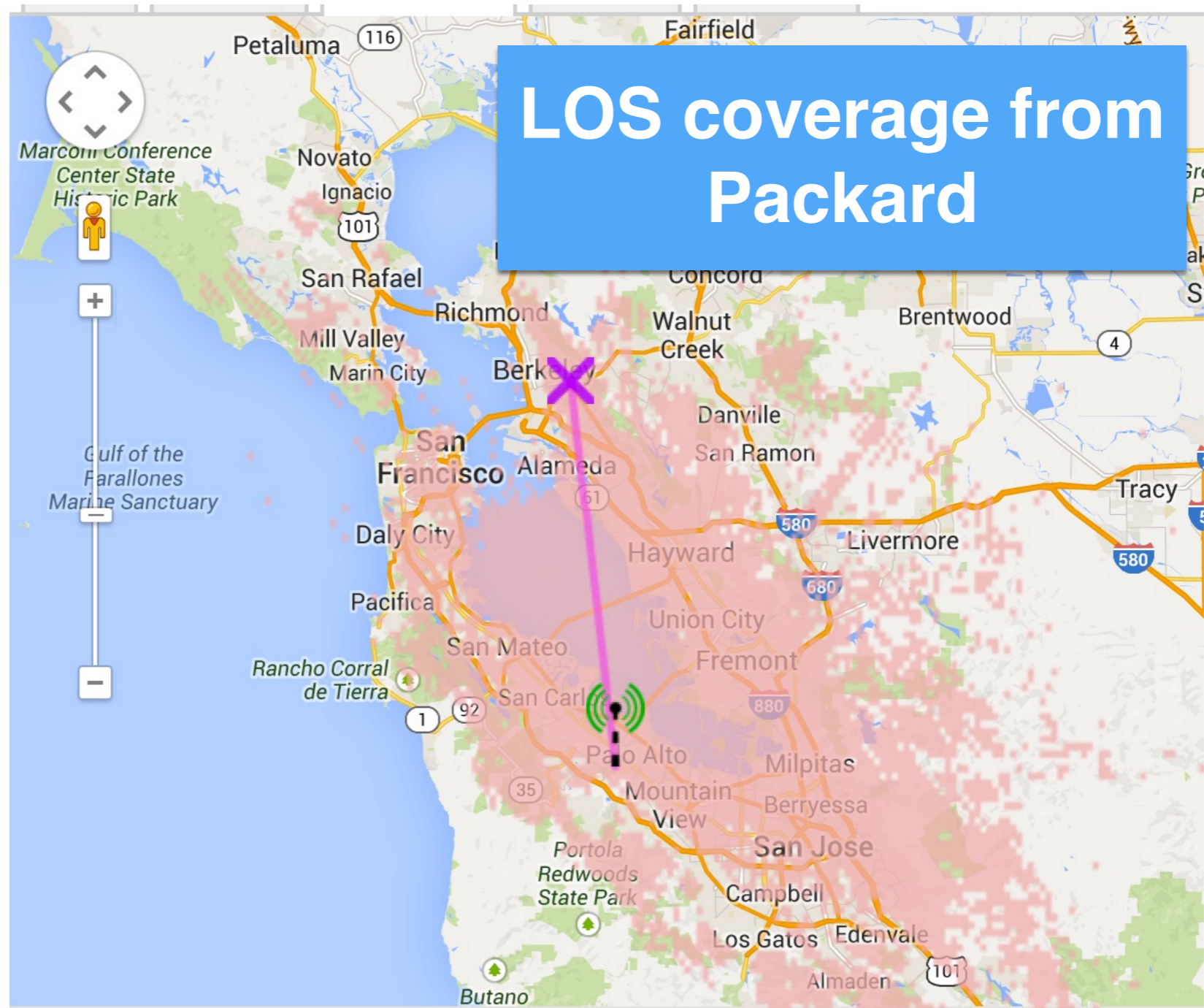
- What Can You Do?
- US Spectrum Allocation
- Types of Amateur Licenses
- Test Format
- Study Aids

What Can You Do

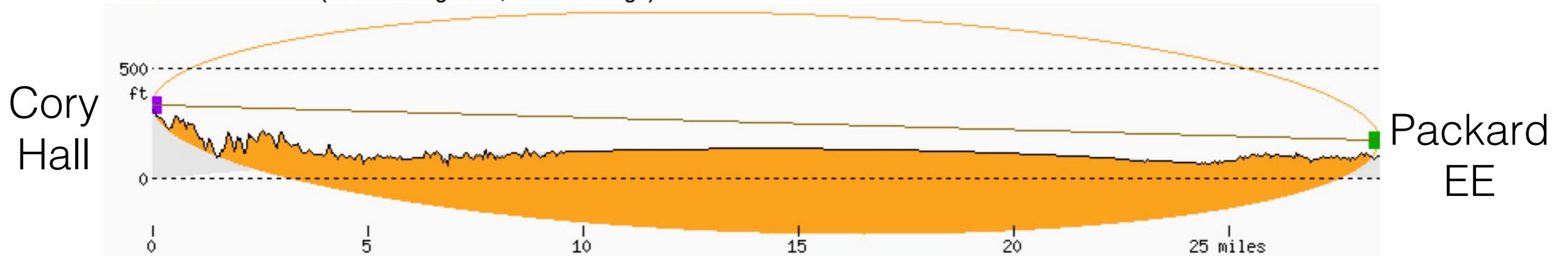
- Talk to people (near and far)
- Build stuff (amps, sdr's, antennas, receivers)
- Emergency communications (emcom)
- First person view (FPV) vehicles (drones), High altitude balloons, rocket telemetry
- Bounce signals off of satellites, moon
- APRS, packet radio
- Repeaters, networks

Line of Sight Radio

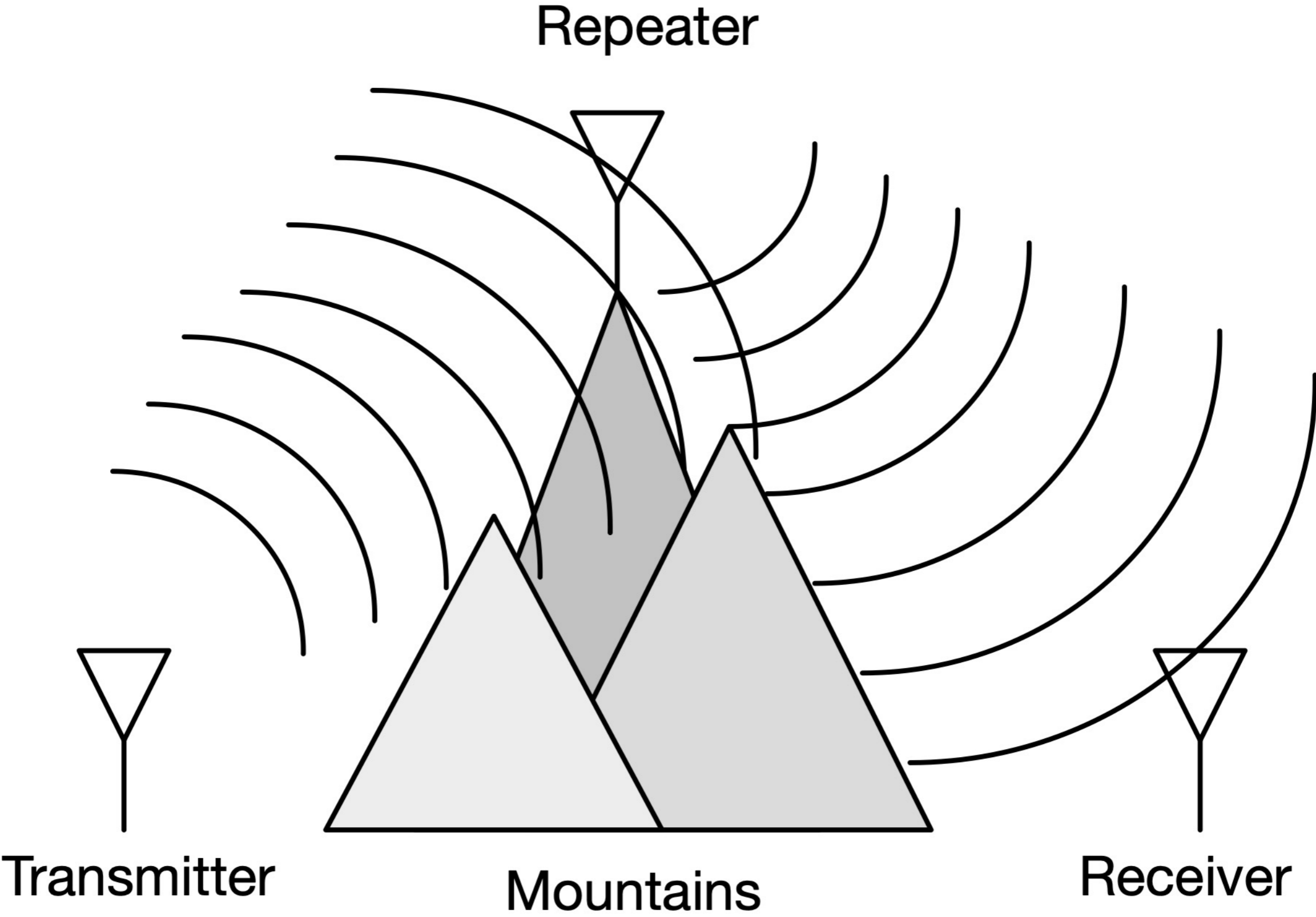
Packard EE to Cory Hall, UCB



Packard EE
159°/0°/28 miles 61% (75 ft above ground, 50 miles range)



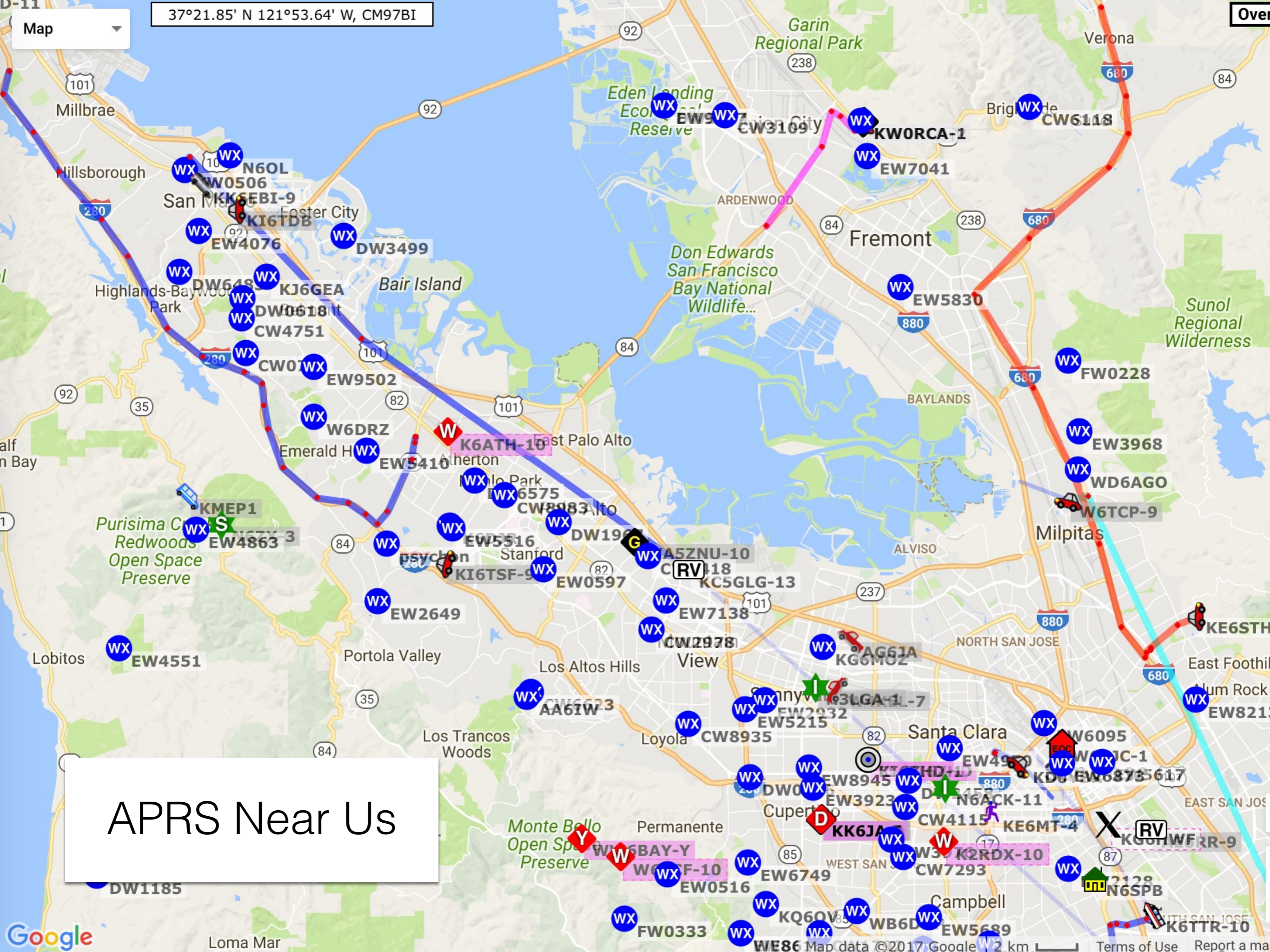
Propagation Path



37°21.85' N 121°53.64' W, CM97BI

Map

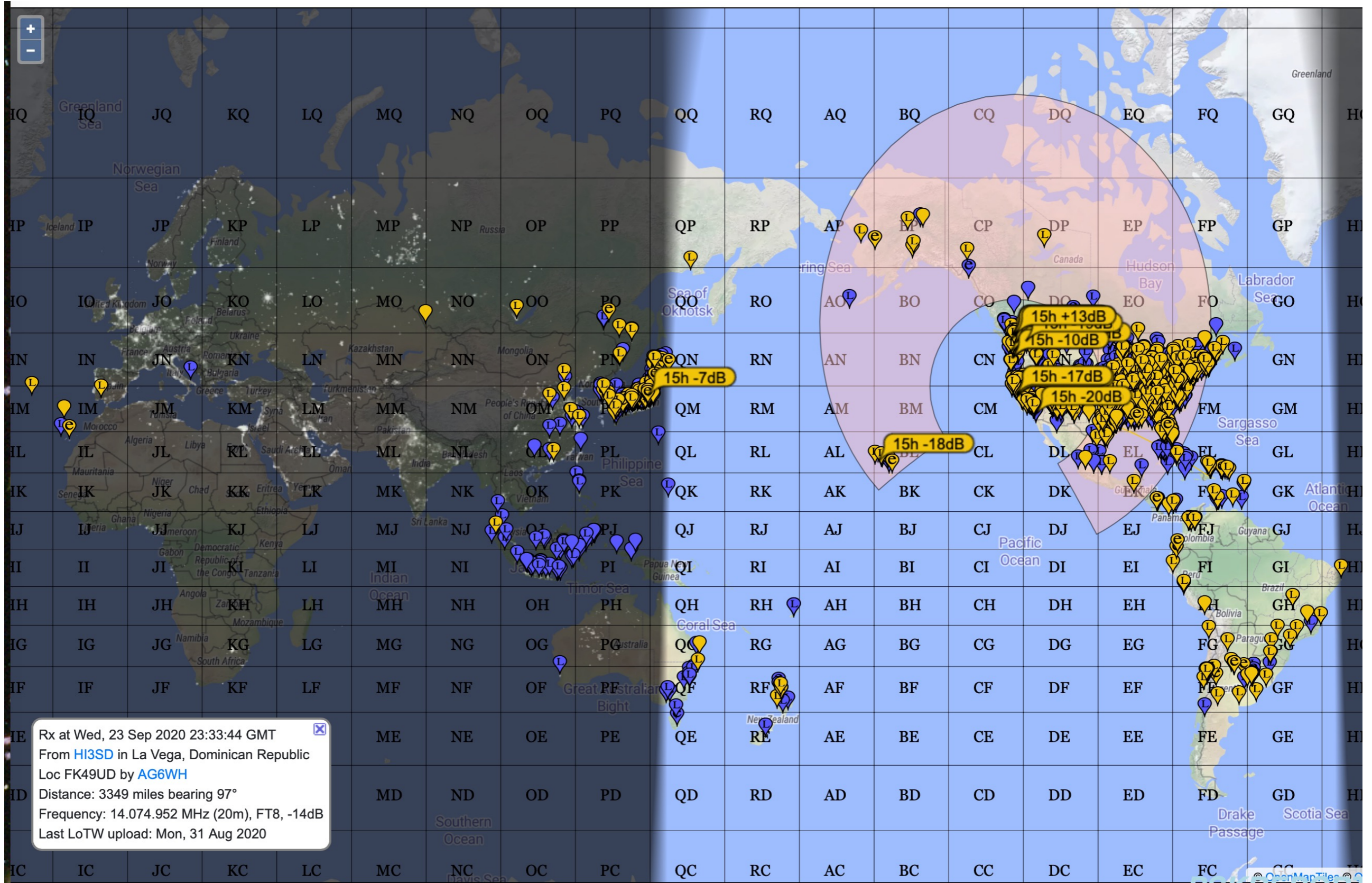
Over



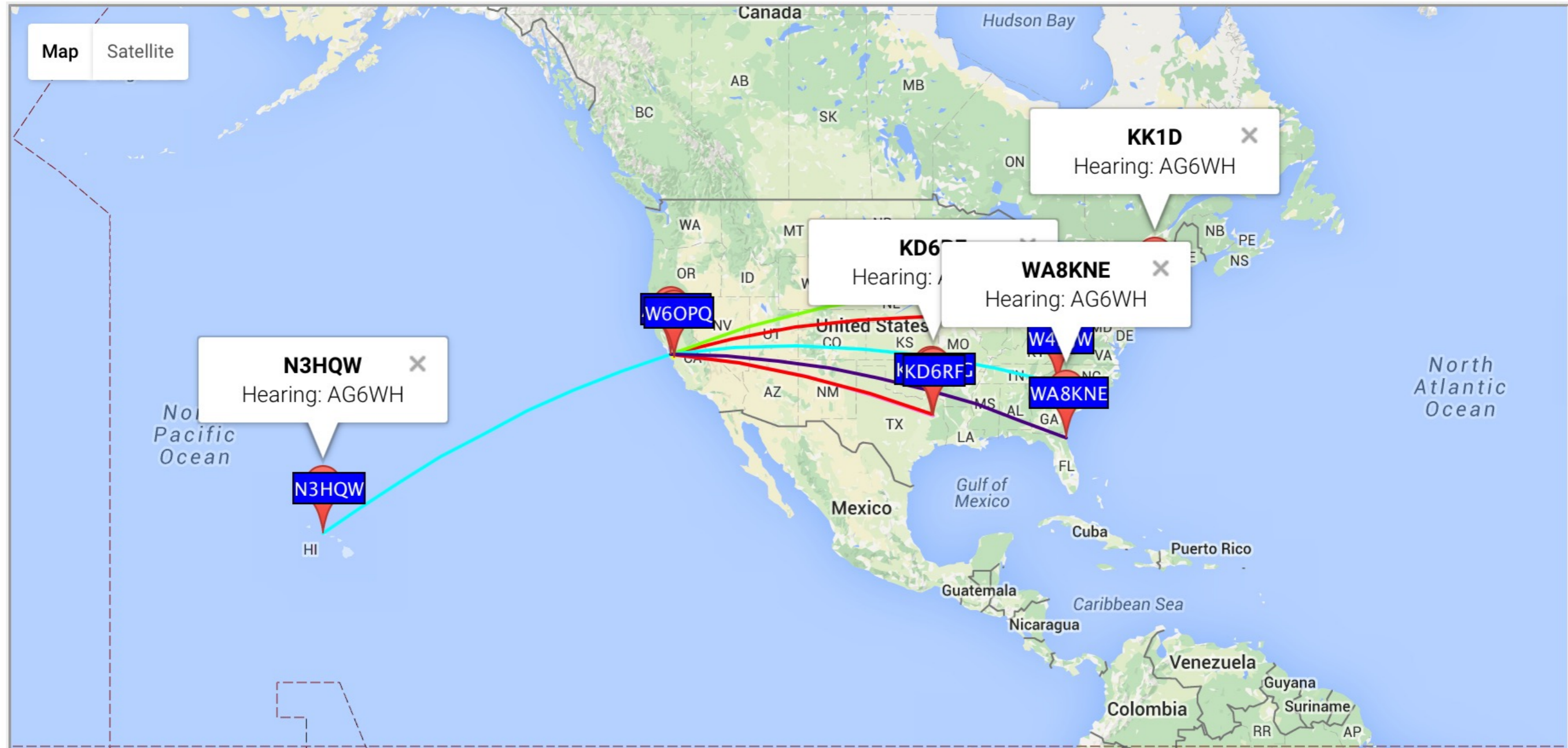
APRS Near Us



HF Long Distance Radio



Low Power Radio



100 mW on 20 m

Frequencies

- Licenses give you access to different frequency bands
- HF: Long distance contacts, big amps, big antennas, expensive radios
- VHF, UHF: Mostly FM handheld or mobile radios, repeaters, packet radio, digital radio
- Above UHF: experimental, remote control (FPV), mesh nets, packet radio

UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND

- AERONAUTICAL MOBILE
- INTER-SATELLITE
- RADIO ASTRONOMY
- AERONAUTICAL MOBILE SATELLITE
- LAND MOBILE
- RADIODETERMINATION SATELLITE
- AERONAUTICAL RADIONAVIGATION
- LAND MOBILE SATELLITE
- RADIOLOCATION
- AMATEUR
- MARITIME MOBILE
- RADIOLOCATION SATELLITE
- AMATEUR SATELLITE
- MARITIME MOBILE SATELLITE
- RADIONAVIGATION
- RADIONAVIGATION SATELLITE
- BROADCASTING
- METEOROLOGICAL
- SPACE OPERATION
- EARTH EXPLORATION SATELLITE
- METEOROLOGICAL SATELLITE
- SPACE RESEARCH
- FIXED
- MOBILE
- STANDARD FREQUENCY AND TIME SIGNAL
- FIXED SATELLITE
- MOBILE SATELLITE
- STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

ACTIVITY CODE

- GOVERNMENT EXCLUSIVE
- GOVERNMENT/NON-GOVERNMENT SHARED
- NON-GOVERNMENT EXCLUSIVE

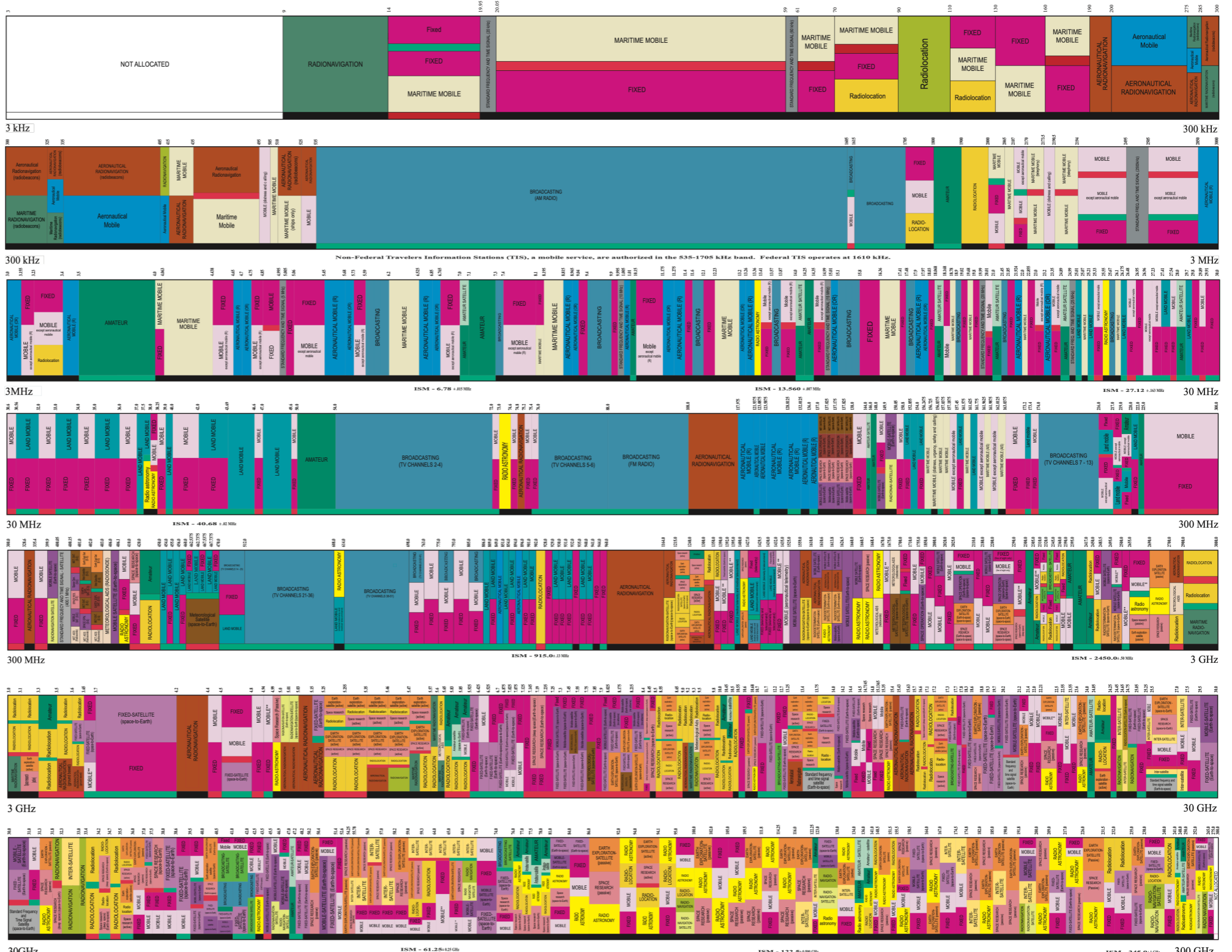
ALLOCATION USAGE DESIGNATION

| SERVICE | EXAMPLE | DESCRIPTION |
|-----------|---------|-------------------------------------|
| Primary | FIXED | Capital Letters |
| Secondary | MOBILE | 1st Capital with lower case letters |

This chart is a graphic single-point-in-time portrayal of the Table of Frequency Allocations used by the FCC and NTIA. As such, it does not completely reflect all aspects, i.e. footnotes and recent changes made to the Table of Frequency Allocations. Therefore, for complete information, users should consult the Table to determine the current status of U.S. allocations.

U.S. DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
 Office of Spectrum Management
 August 2011

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30GHz ISM - 61.25-62.5 GHz ISM - 122.5-130 GHz ISM - 245.0-1 GHz **300 GHz**

* EXCEPT AERONAUTICAL MOBILE (R)
 ** EXCEPT AERONAUTICAL MOBILE

PLANNING NOTE: THE SPACING ALLOTTED THE SERVICES IN THE SPECTRUM SEGMENTS SHOWN IS NOT PROPORTIONAL TO THE ACTUAL AMOUNT OF SPECTRUM OCCUPIED.

UNITED STATES FREQUENCY ALLOCATIONS

THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND

| | | |
|-------------------------------|---------------------------|--|
| AERONAUTICAL MOBILE | INTER-SATELLITE | RADIO ASTRONOMY |
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| AMATEUR | MARITIME MOBILE | RADIOLOCATION SATELLITE |
| AMATEUR SATELLITE | MARITIME MOBILE SATELLITE | RADIONAVIGATION |
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ACTIVITY CODE

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UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

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ACTIVITY CODE

GOVERNMENT EXCLUSIVE GOVERNMENT/NON-GOVERNMENT SHARED

NON-GOVERNMENT EXCLUSIVE

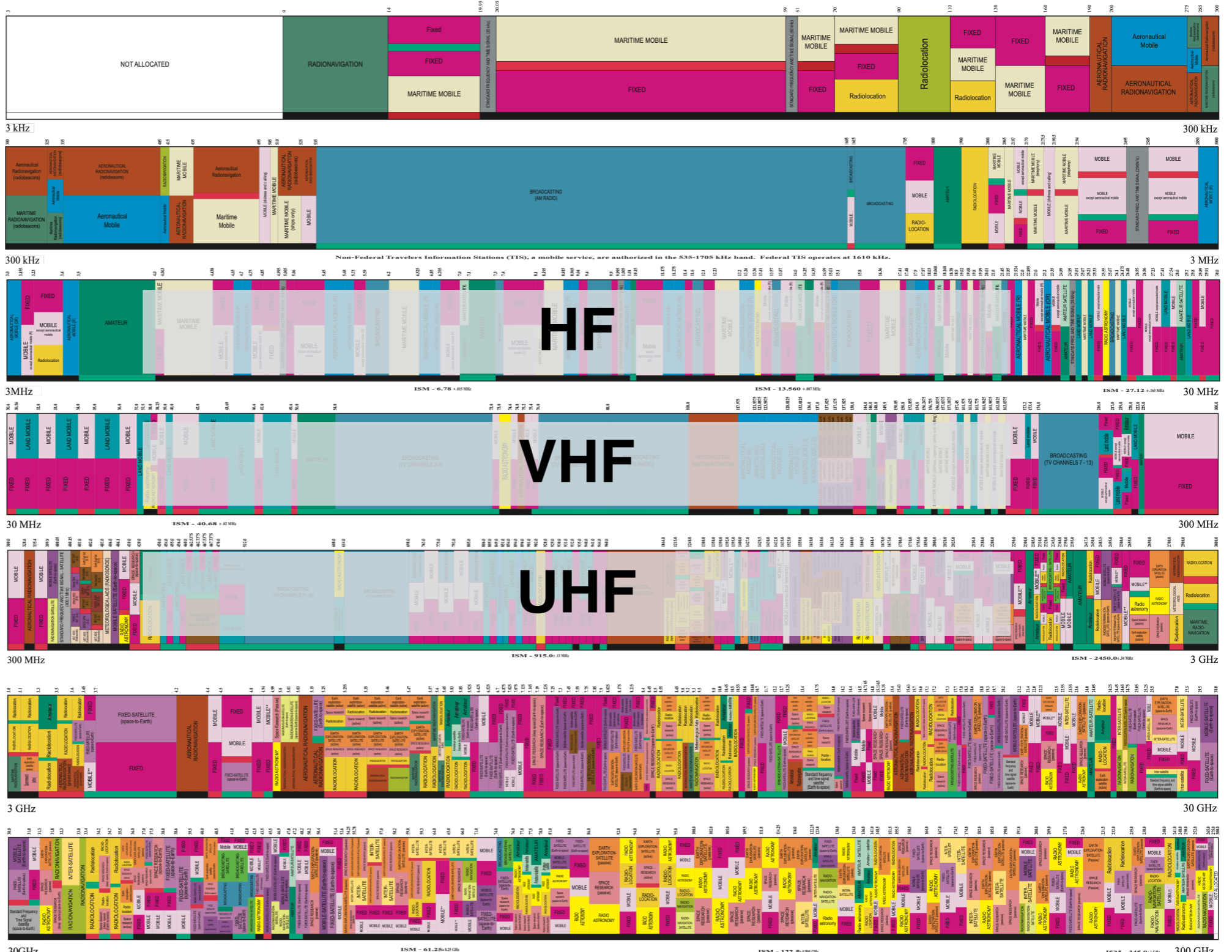
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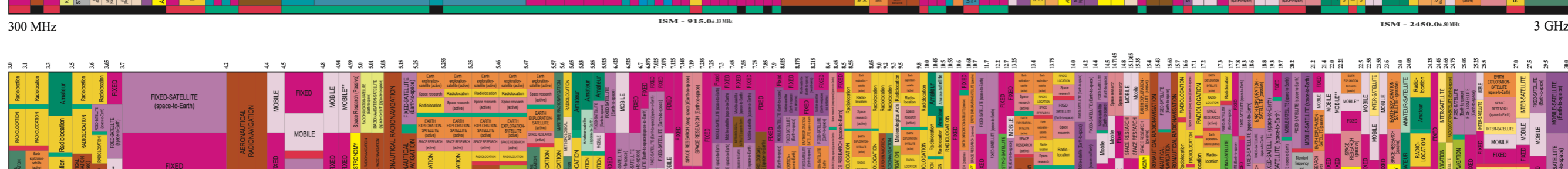
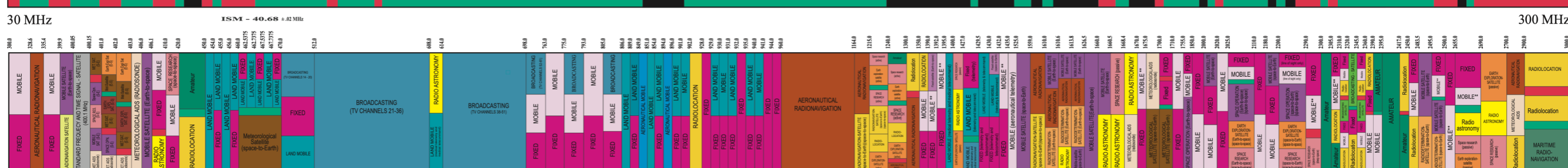
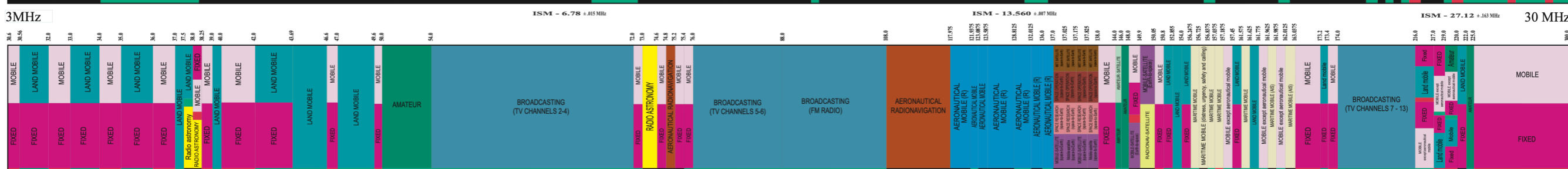
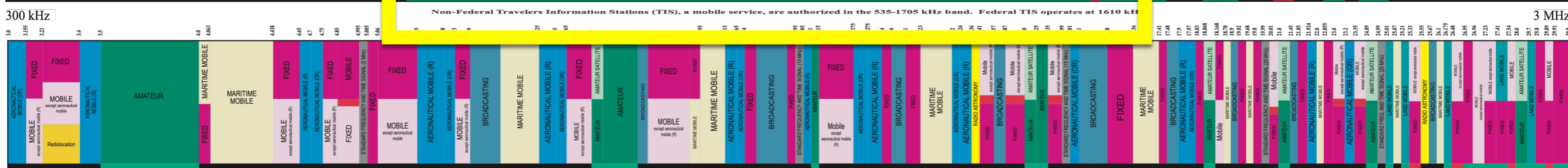
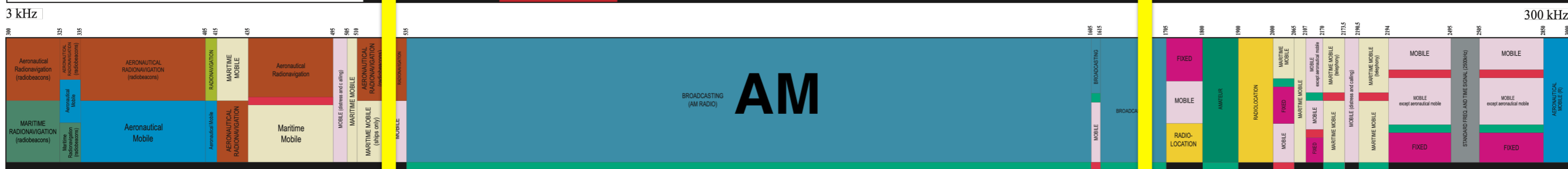
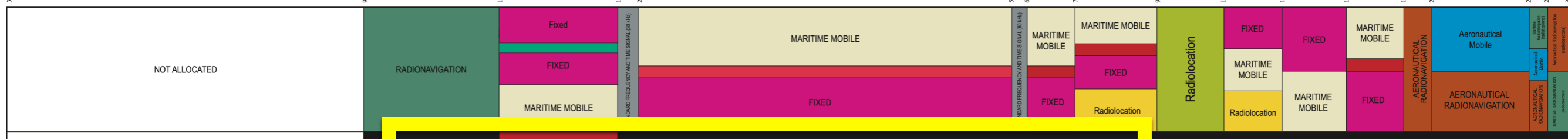
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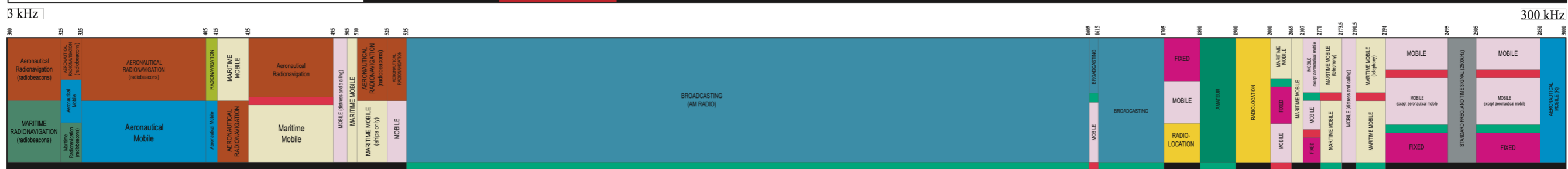
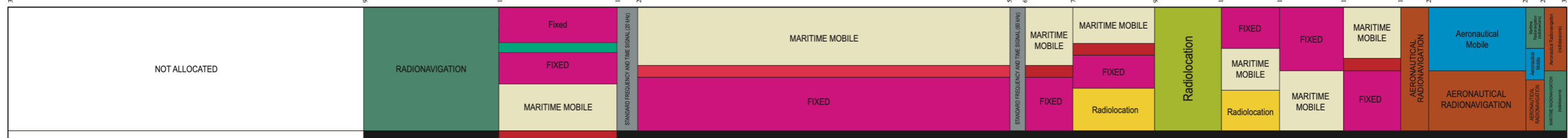


30GHz **300GHz**

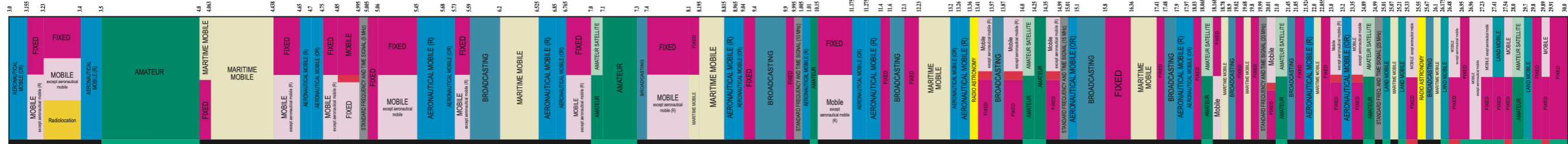
* EXCEPT AERONAUTICAL MOBILE (M)
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PLANNING NOTE: THE SPACING ALLOTTED TO THE SERVICES IN THE SPECTRUM SEGMENTS SHOWN IS NOT PROPORTIONAL TO THE ACTUAL AMOUNT OF SPECTRUM OCCUPIED.

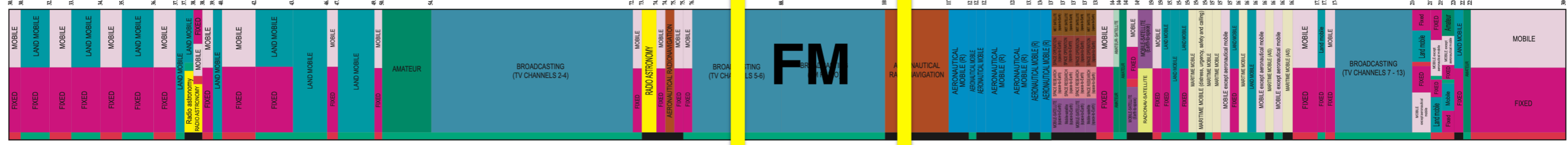




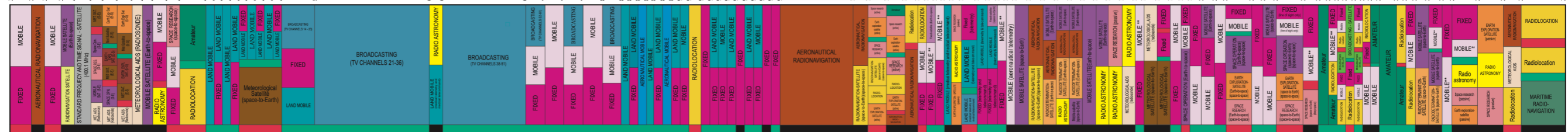
Non-Federal Travelers Information Stations (TIS), a mobile service, are authorized in the 535-1705 kHz band. Federal TIS operates at 1610 kHz.



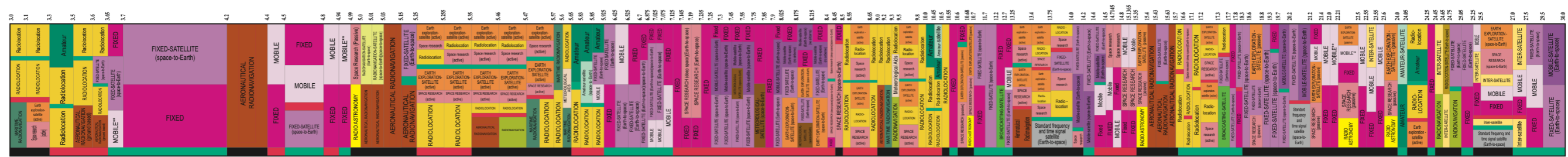
ISM - 6.78 ± 0.15 MHz



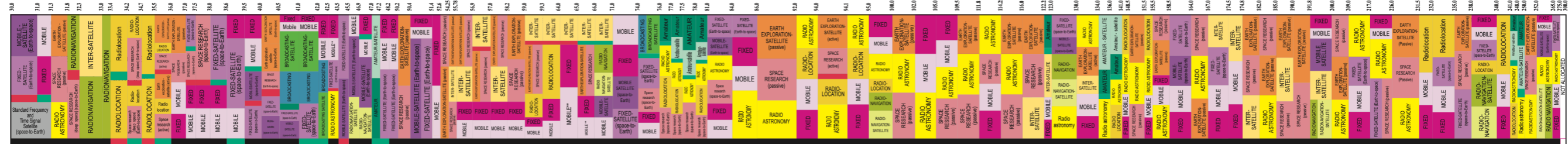
ISM - 40.68 ± 0.02 MHz

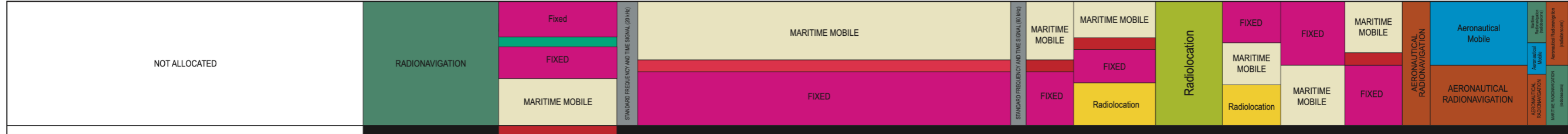


ISM - 915.0 ± 1.3 MHz

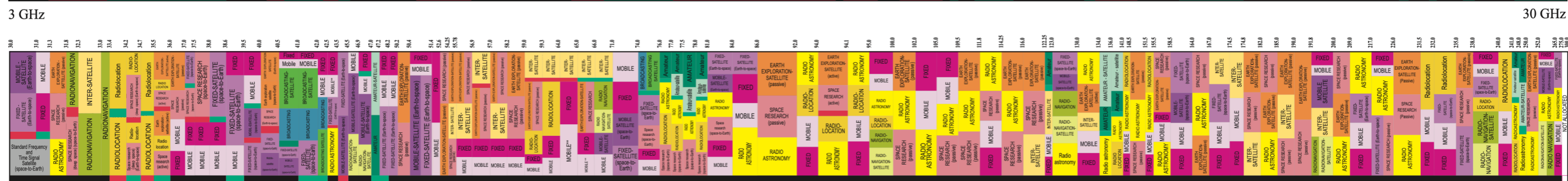
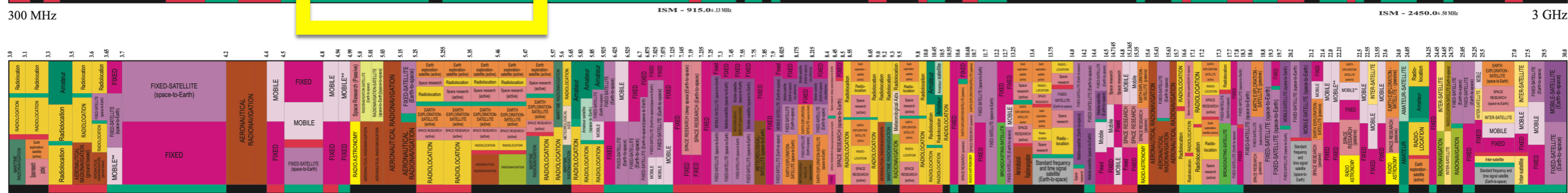
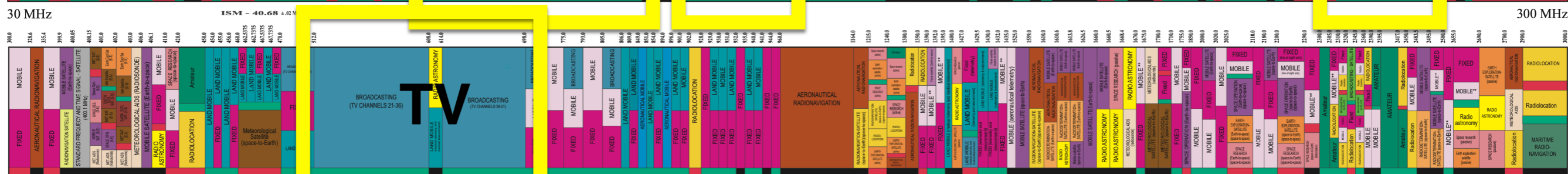
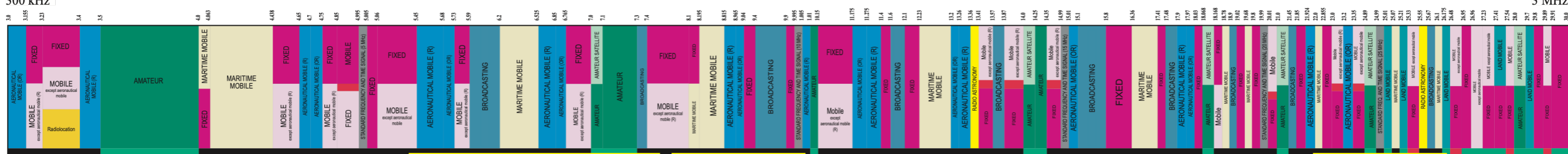


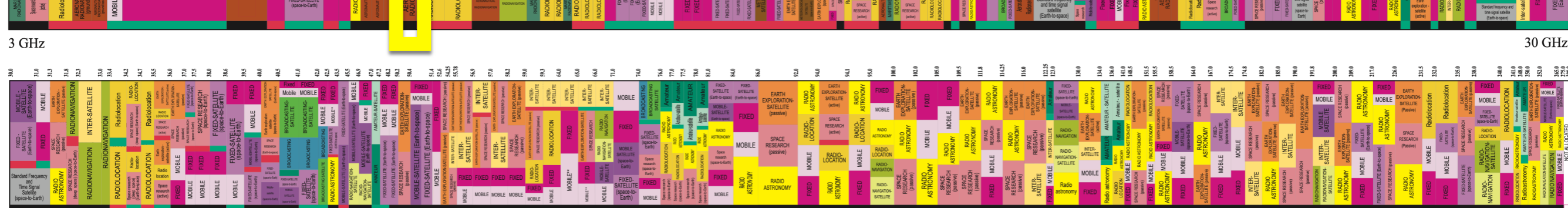
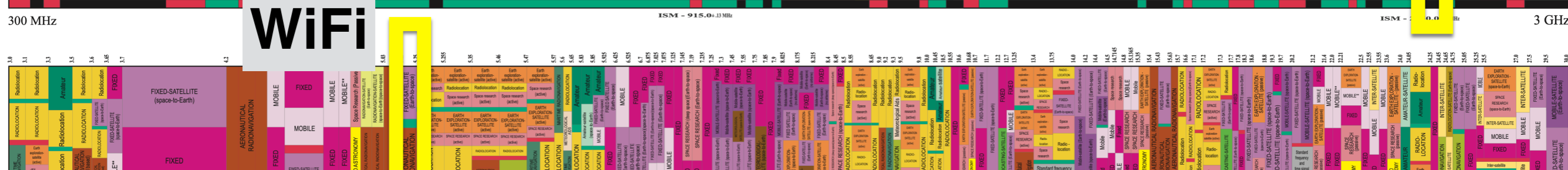
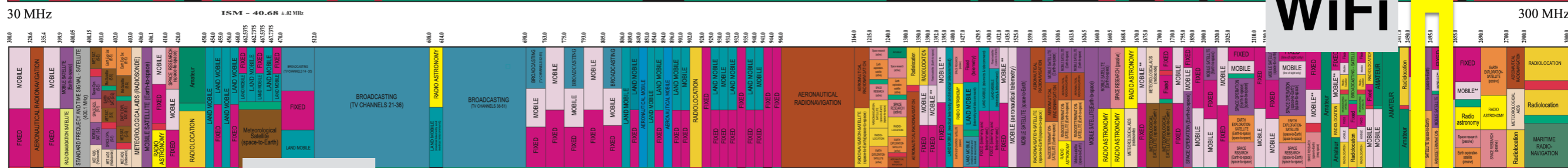
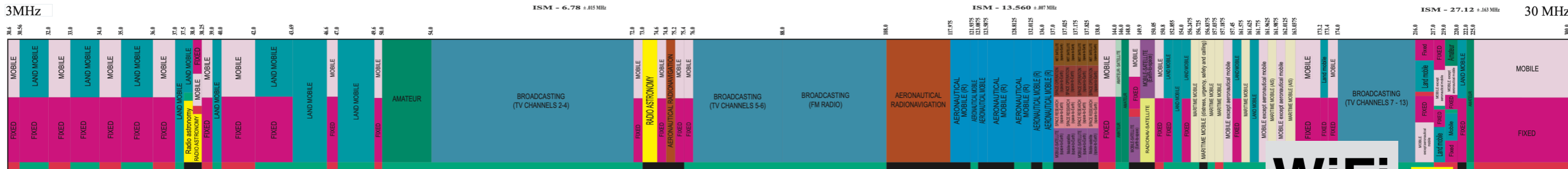
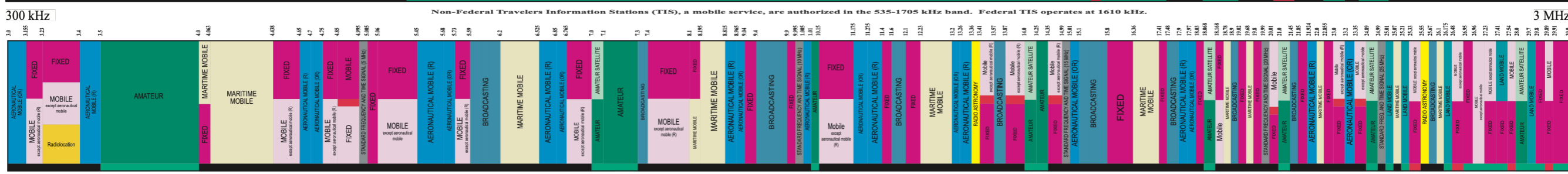
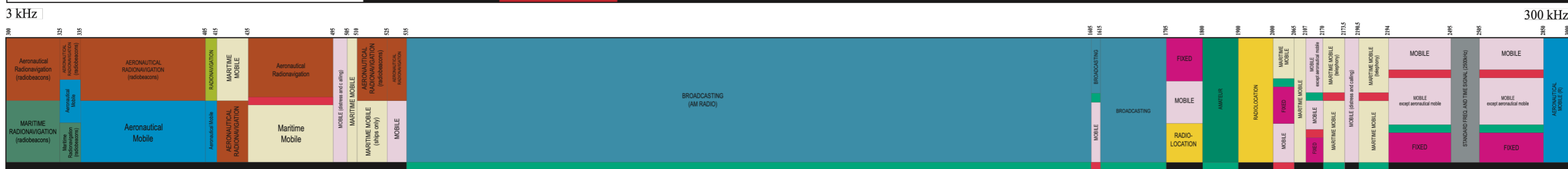
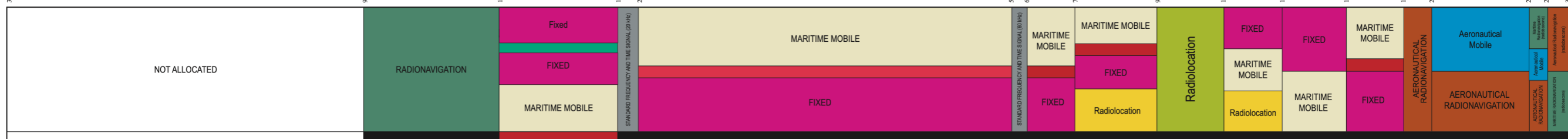
ISM - 2450.0 ± 50 MHz



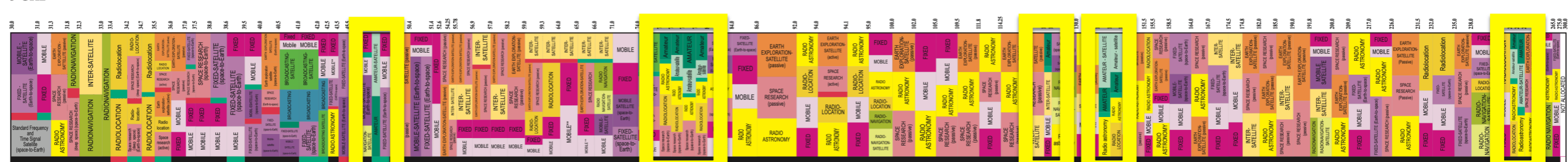
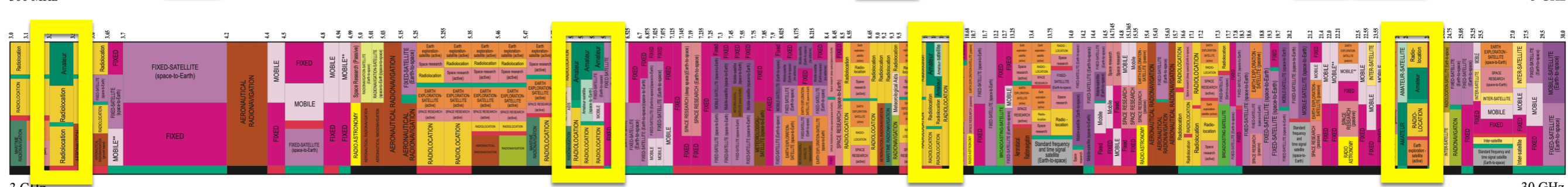
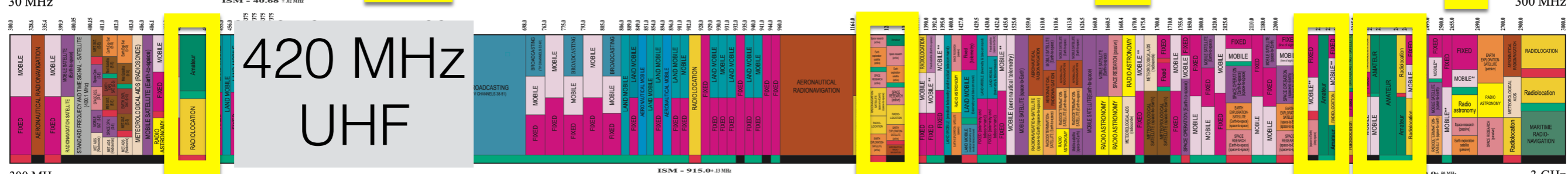
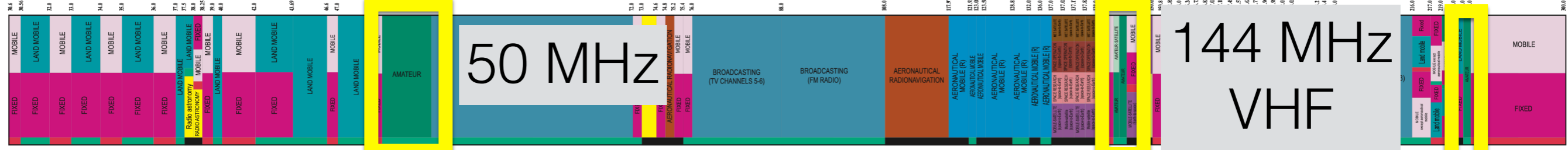
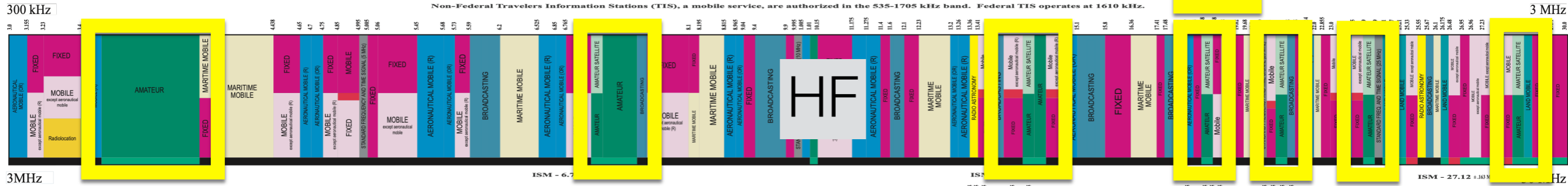


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Amateur Bands



Types of Amateur Licenses

- Technician: all bands from 50 MHz and up, CW in HF bands, SSB band on 28 MHz
- General: voice and data in most of the HF bands
- Extra: A little more spectrum in HF

US Amateur Radio Bands

US AMATEUR POWER LIMITS

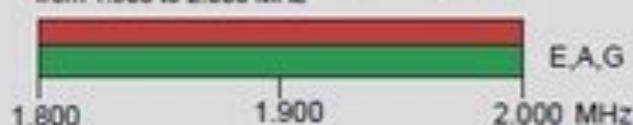
FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

Effective Date
March 5, 2012

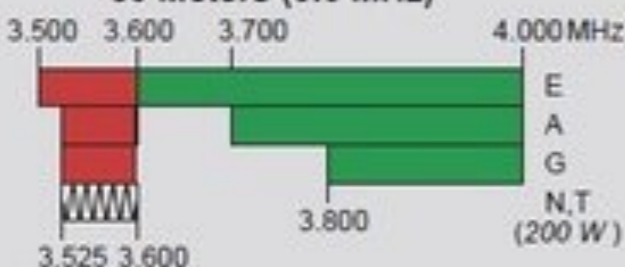
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225 Main Street, Newington, CT USA 06111-1494

160 Meters (1.8 MHz)

Avoid interference to radiolocation operations from 1.900 to 2.000 MHz



80 Meters (3.5 MHz)

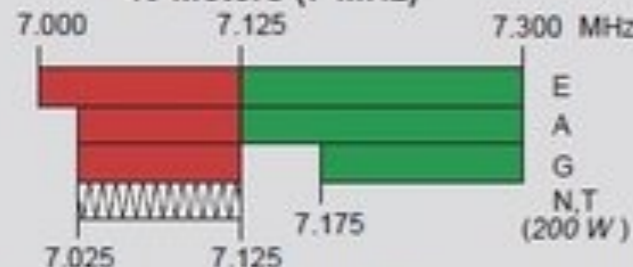


60 Meters (5.3 MHz)



General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated output of 100 W PEP. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III as defined by the FCC Report and Order of November 18, 2011. USB is limited to 2.8 kHz centered on 5332, 5348, 5358.5, 5373 and 5405 kHz. CW and digital emissions must be centered 1.5 kHz above the channel frequencies indicated above. Only one signal at a time is permitted on any channel.

40 Meters (7 MHz)



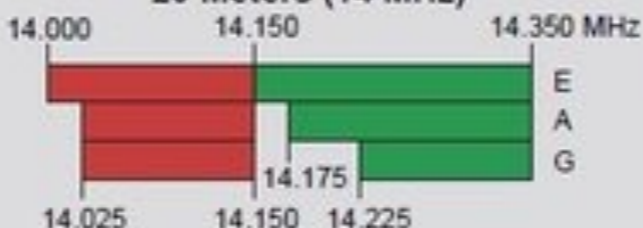
Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11). Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz and between

30 Meters (10.1 MHz)

Avoid interference to fixed services outside the US.



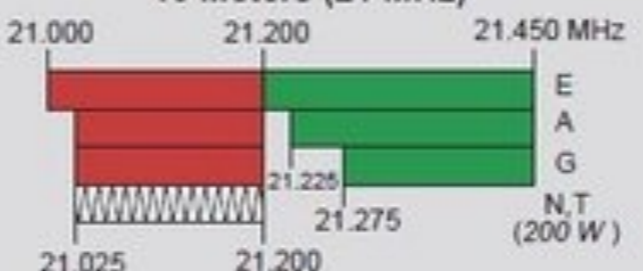
20 Meters (14 MHz)



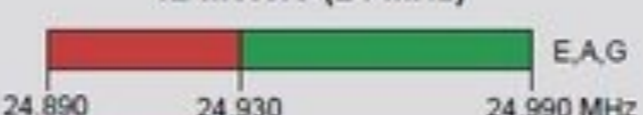
17 Meters (18 MHz)



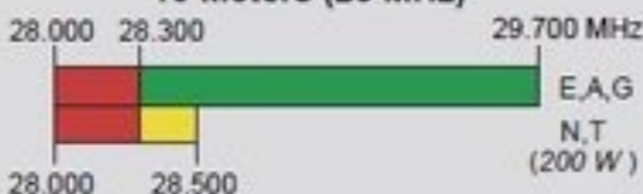
15 Meters (21 MHz)



12 Meters (24 MHz)



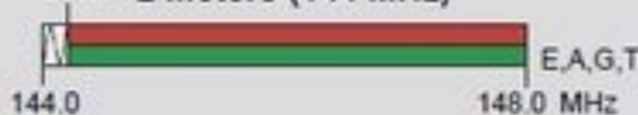
10 Meters (28 MHz)



6 Meters (50 MHz)



2 Meters (144 MHz)

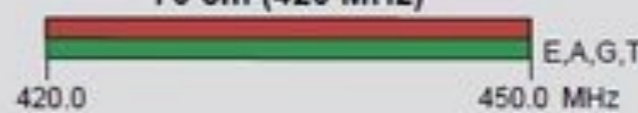


1.25 Meters (222 MHz)

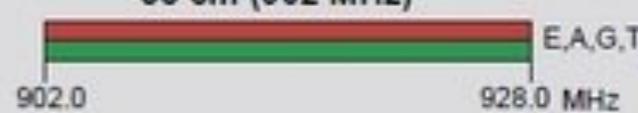


*Geographical and power restrictions may apply to all bands above 420 MHz. See The ARRL Operating Manual for information about your area.

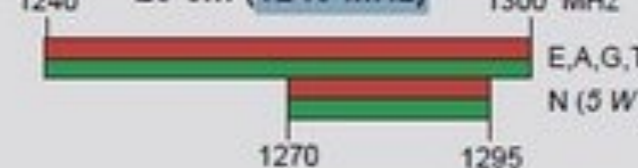
70 cm (420 MHz)*



33 cm (902 MHz)*



23 cm (1240 MHz)*



All licensees except Novices are authorized all modes on the following frequencies:

| | | |
|---------------|-----------------|-------------------|
| 2300-2310 MHz | 10.0-10.5 GHz * | 122.25-123.0 GHz |
| 2390-2450 MHz | 24.0-24.25 GHz | 134-141 GHz |
| 3300-3500 MHz | 47.0-47.2 GHz | 241-250 GHz |
| 5650-5925 MHz | 76.0-81.0 GHz | All above 275 GHz |

* No pulse emissions

KEY

Note:
CW operation is permitted throughout amateur bands.

MCW is authorized above 50.1 MHz except for 144.0-144.1 and 219.0-220.0 MHz.

Test transmissions are authorized 51 MHz, except for 219-220 MHz.

- █ = RTTY and data
- █ = phone and image
- █ = CW only
- █ = SSB phone
- █ = USB phone, CW, and data
- █ = Fixed digital message forwarding system

- E = Amateur Extra
- A = Advanced
- G = General
- T = Technician
- N = Novice

See ARRLWeb at www.arrl.org for detailed band plans.

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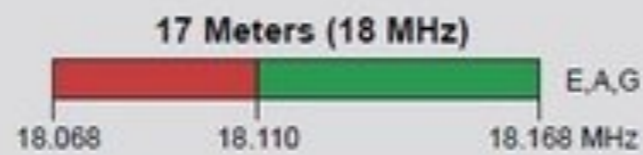
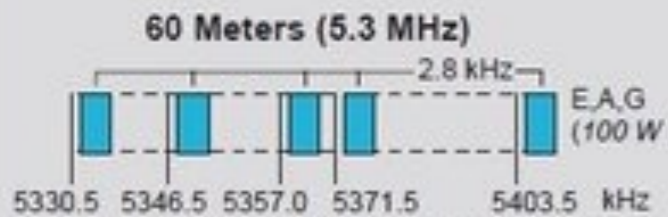
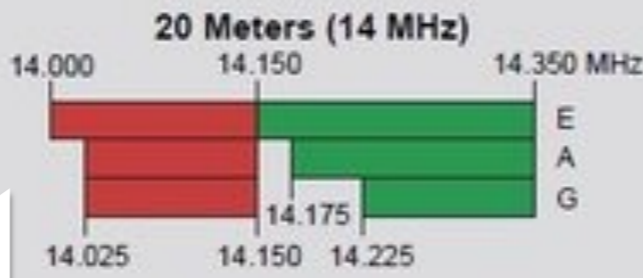
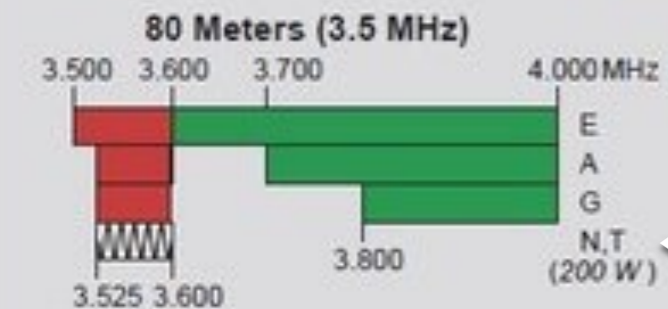
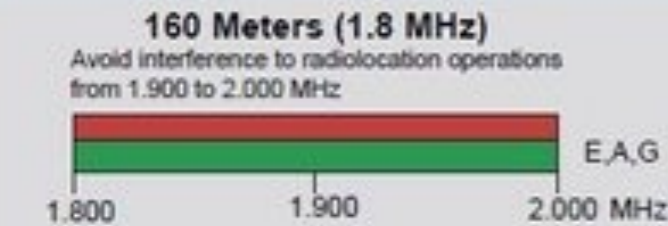
US Amateur Radio Bands

US AMATEUR POWER LIMITS

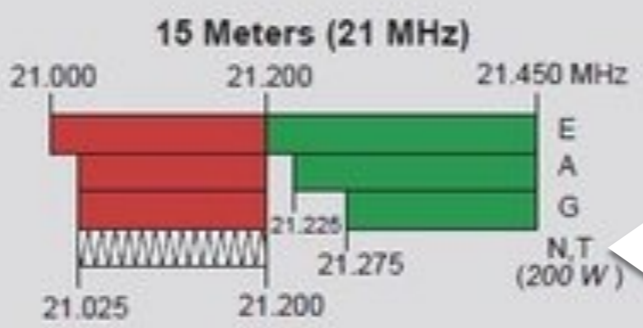
FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

Effective Date
March 5, 2012

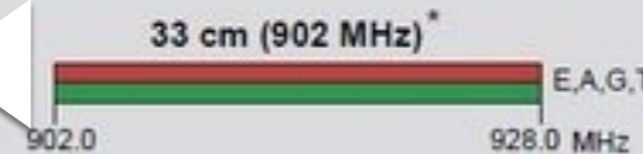
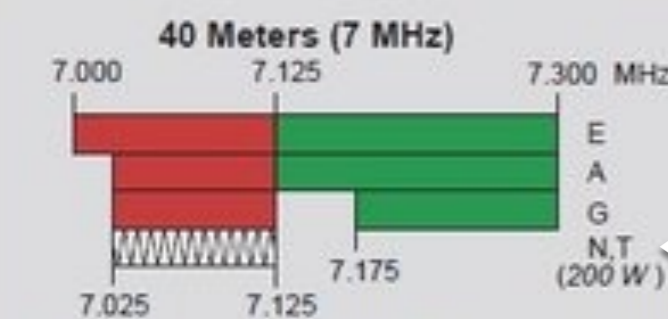
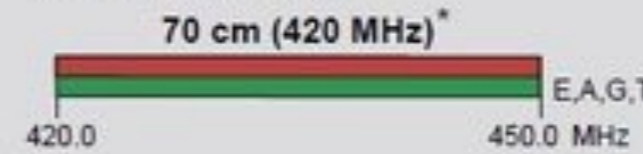
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ARRL The national association for
AMATEUR RADIO[®]
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225 Main Street, Newington, CT USA 06111-1494



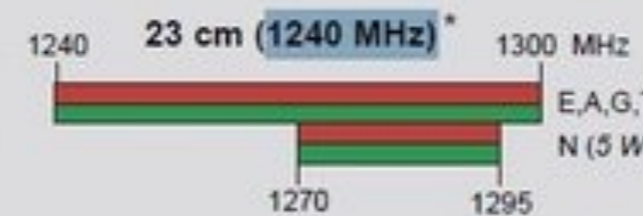
General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated output of 100 W PEP. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III as defined by the FCC Report and Order of November 18, 2011. USB is limited to 2.8 kHz centered on 5332, 5348, 5358.5, 5373 and 5405 kHz. CW and digital emissions must be centered 1.5 kHz above the channel frequencies indicated above. Only one signal at a time is permitted on any channel.



*Geographical and power restrictions may apply to all bands above 420 MHz. See The ARRL Operating Manual for information about your area.



Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11).
Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz and between 7.100 and 7.125 MHz. 7.200 to 7.300 MHz is not available outside ITU Region 2. See Section 97.301(e). These exemptions do not apply to stations in the continental US.



All licensees except Novices are authorized all modes on the following frequencies:

| | | |
|---------------|-----------------|-------------------|
| 2300-2310 MHz | 10.0-10.5 GHz * | 122.25-123.0 GHz |
| 2390-2450 MHz | 24.0-24.25 GHz | 134-141 GHz |
| 3300-3500 MHz | 47.0-47.2 GHz | 241-250 GHz |
| 5850-5925 MHz | 76.0-81.0 GHz | All above 275 GHz |

* No pulse emissions

KEY

Note:
CW operation is permitted throughout all amateur bands.
MCW is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.
Test transmissions are authorized above 1 MHz, except for 219-220 MHz.

- █ = RTTY and data
- █ = phone and image
- = CW only
- █ = SSB phone
- █ = USB phone, CW, RTTY, and data
- █ = Fixed digital message forwarding systems only

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See ARRL Web at www.arrl.org for detailed band plans.

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ARRL Headquarters:
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email: membership@arrl.org

Getting Started in Amateur Radio:
Toll-Free 1-800-326-3942 (860-594-0355)
email: newham@arrl.org

Exams: 860-594-0300 email: vec@arrl.org

License Test Areas

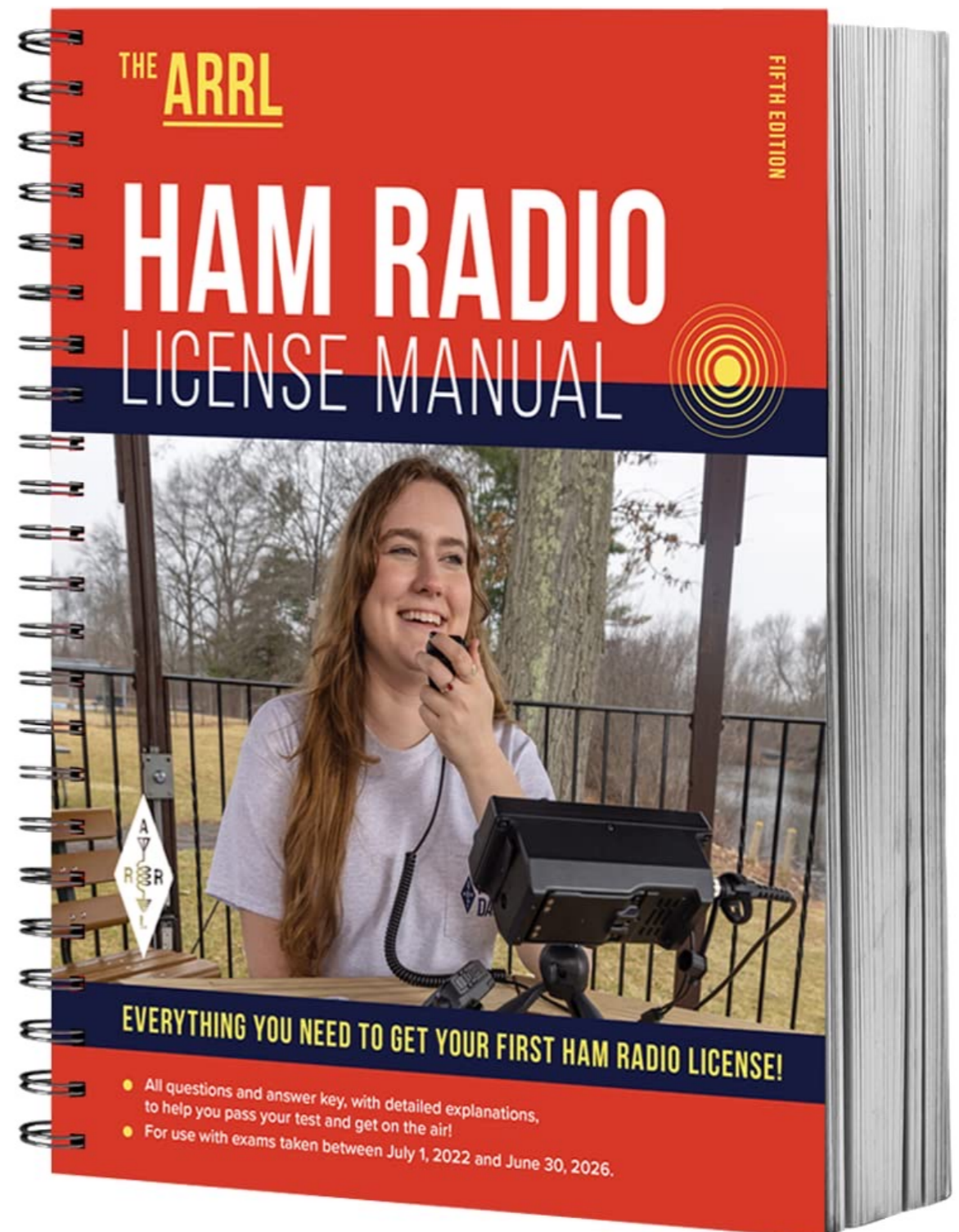
- Radio Signals and Modulation
- Electricity, Components, Circuits
- Antennas and Propagation
- Radio Equipment
- Radio Operation
- Regulations
- Safety
- Each license grade covers the same material, in more detail

Test Format

- 35 questions from a pool of 300
- You need to get 26 right (74%)
- Multiple choice
- Calculators allowed (but you don't really need one)
- You have to take this on-line

Study Aids

- Your book: includes all 300 questions, written for a very broad audience
- New edition 2022, make sure you get the latest

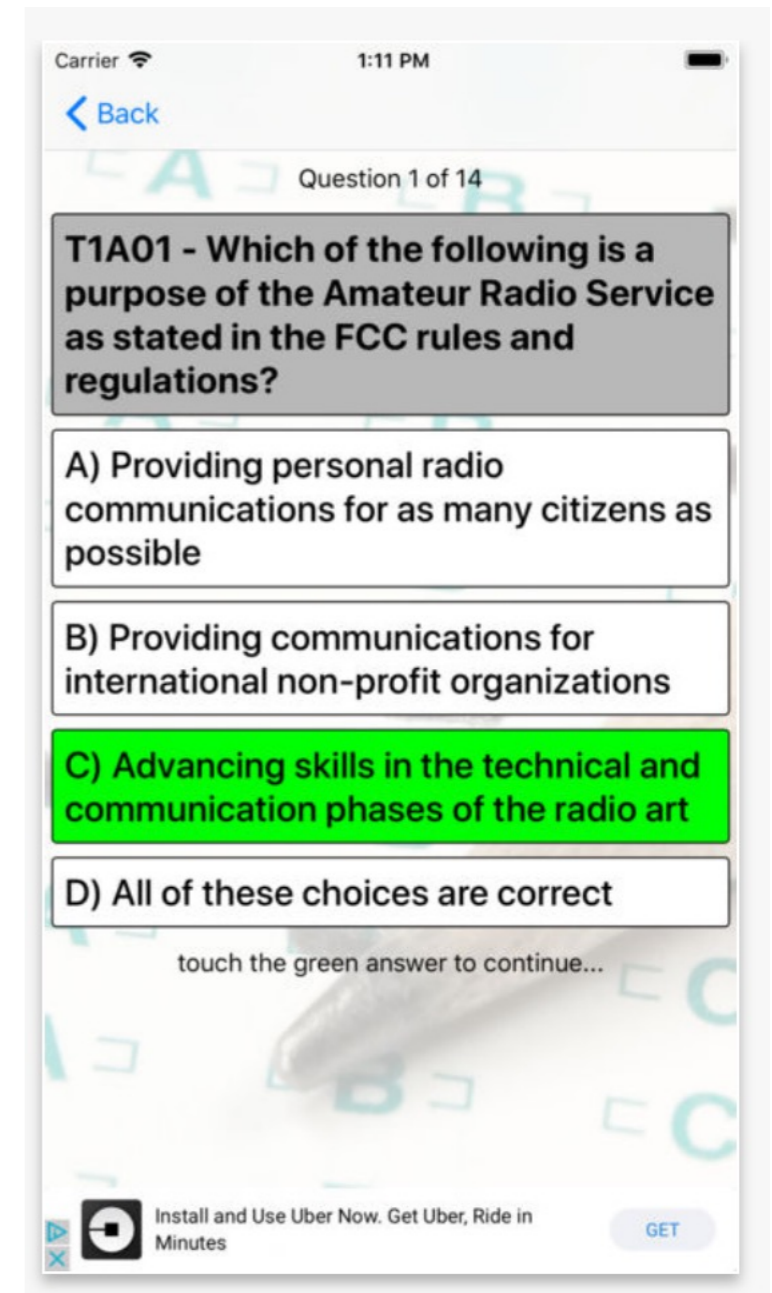


Study Aids

- Web sites: interactive quizzes (eHam.net, HamExam.org, radioexam.org)
- iPhone/Android apps
- Many other books and web resources

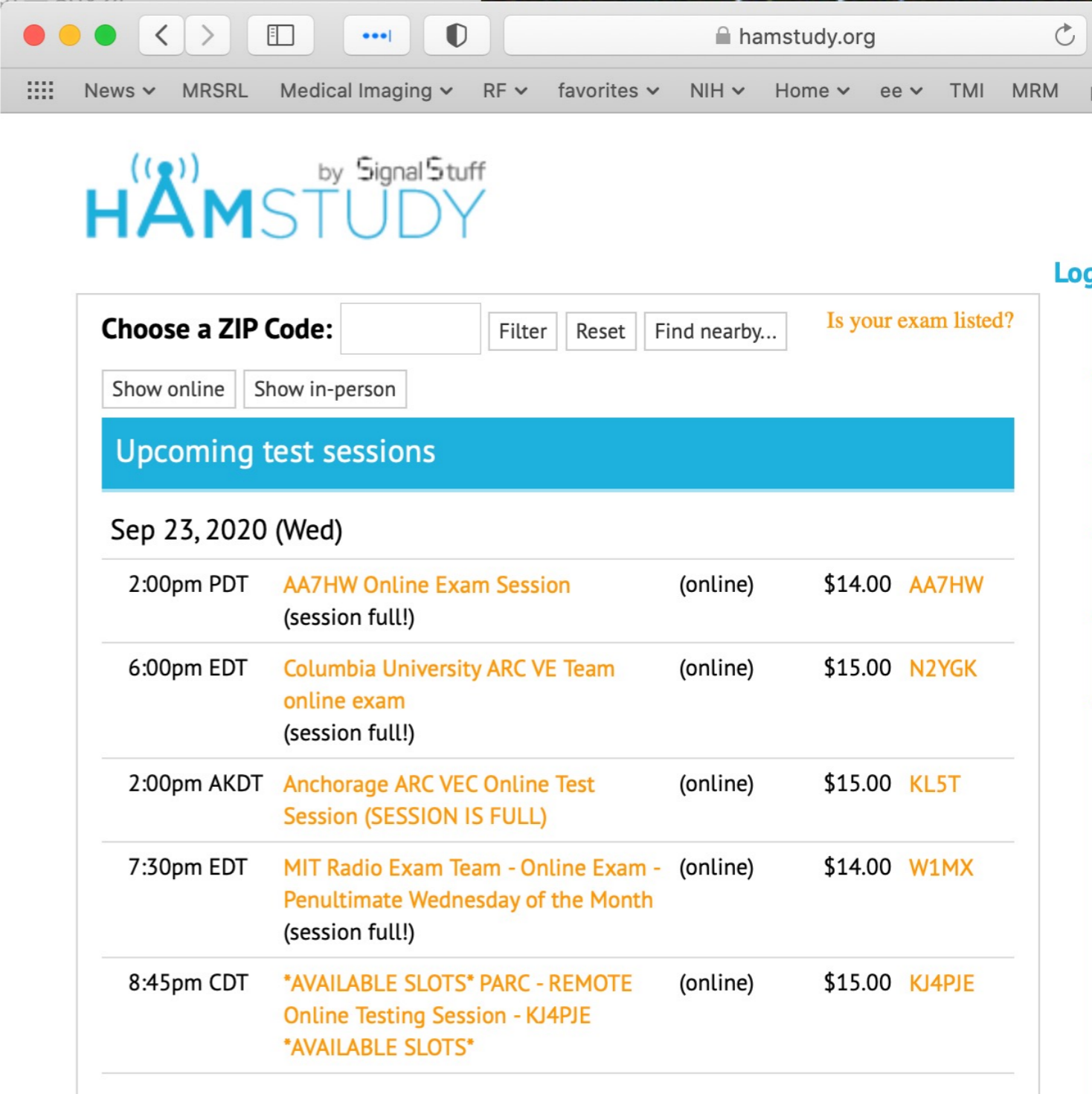
- All slides, other information at

<http://www.stanford.edu/~pauly/AmateurRadio>



Test

- No Stanford test due to Covid
- Several online sites
- hamstudy.org has a list
- You schedule it yourself
- Not as much fun



The screenshot shows the hamstudy.org website interface. At the top, there's a navigation bar with links like News, MRSRL, Medical Imaging, RF, favorites, NIH, Home, ee, TMI, and MRM. The main header features the "HAMSTUDY by SignalStuff" logo. Below the header, there's a search section with a "Choose a ZIP Code:" input field, "Filter", "Reset", and "Find nearby..." buttons, and a link "Is your exam listed?". There are also "Show online" and "Show in-person" buttons. A blue banner reads "Upcoming test sessions". The main content area lists several test sessions for "Sep 23, 2020 (Wed)":

| Time | Exam Name | Mode | Price | Call Sign |
|-------------|--|----------|---------|-----------|
| 2:00pm PDT | AA7HW Online Exam Session (session full!) | (online) | \$14.00 | AA7HW |
| 6:00pm EDT | Columbia University ARC VE Team online exam (session full!) | (online) | \$15.00 | N2YGK |
| 2:00pm AKDT | Anchorage ARC VEC Online Test Session (SESSION IS FULL) | (online) | \$15.00 | KL5T |
| 7:30pm EDT | MIT Radio Exam Team - Online Exam - Penultimate Wednesday of the Month (session full!) | (online) | \$14.00 | W1MX |
| 8:45pm CDT | *AVAILABLE SLOTS* PARC - REMOTE Online Testing Session - KJ4PJE *AVAILABLE SLOTS* | (online) | \$15.00 | KJ4PJE |

Plan

- Cover about 1-2 chapters/week over the next four weeks
- Demos
- Online test whenever you feel ready