

4.9 GHz Public Safety Broadband Spectrum

Overview of Technical Rules And Licensing Instructions

By

**Motorola, Inc.
January 20, 2005**

**Bette Rinehart
David Eierman**

Motorola Spectrum & Standards

Eligibility

Public Safety services as defined under Part 90 rule section 90.523 are eligible to hold a 4.9 GHz license. All state or local governmental entities (including municipal utilities) are eligible to hold 4.9 GHz licenses. Entities not eligible to hold a license, but which perform operations in support of public safety, (such as private critical infrastructure industries) can negotiate sharing agreements with 4.9 GHz public safety licensees. The federal government is not eligible to hold 4.9 GHz licenses but can share state and local public safety systems. Sharing of systems must be by written agreement between the licensee and the party sharing the system and all communications by the non-licensee must be in support of public safety, related to the protection of life, health or property.

Types of Uses

The 4.9 GHz band has been allocated to public safety for broadband technologies. Communications must be related to the protection of life, health or property. Examples of types of uses are:

- Wireless LANS for incident scene management
- Mobile data
- Video security
- VoIP
- PDA connectivity
- Hotspots
- T1 line replacement (fixed point-to-point operations are secondary to base mobile and temporary fixed operations)

4.9 GHz Band Plan

The following channel center frequencies are permitted, per FCC rules (90.1213), to be aggregated to channel bandwidths of 5, 10, 15, or 20 MHz. The maximum bandwidth of a 4.9 GHz channel is 20 MHz.

Center Frequency (MHz)	Channel Nos.	Channel Bandwidth
4940.5	1	1 MHz
4941.5	2	1 MHz
4942.5	3	1 MHz
4943.5	4	1 MHz
4944.5	5	1 MHz
4947.5	6	5 MHz
4952.5	7	5 MHz
4957.5	8	5 MHz
4962.5	9	5 MHz
4967.5	10	5 MHz
4972.5	11	5 MHz
4977.5	12	5 MHz
4982.5	13	5 MHz
4985.5	14	1 MHz
4986.5	15	1 MHz
4987.5	16	1 MHz
4988.5	17	1 MHz
4989.5	18	1 MHz

Technical Requirements

Emission Mask

The emission masks for 4.9 GHz are listed in 90.210. In November 2004, the FCC defined two masks for use in the 4.9 GHz band: the DSRC-A mask (identical to the mask defined in the 802.11 standards) for a low power devices, and the DSRC-C mask, with better adjacent channel protection, for higher power devices. The low-to-high power breakpoint varies by channel bandwidth: 20 dBm (100 milliwatts) for 20 MHz channels, 17 dBm for 10 MHz channels, 14 dBm for 5 MHz channels and 7 dBm for 1 MHz channels. Public Safety users requested the looser mask for low power devices such that existing 5 GHz commercial-off-the-shelf (COTS) equipment could be easily modified to operate in the 4.9 GHz band, thereby bringing down the costs and reducing initial time to market.

The power limits of stations operating in the 4.9 GHz band are outlined in Rule Section 90.1215. Maximum transmitter power increases according to the amount of bandwidth used. High power devices are limited to a peak power spectral density of 21 dBm within any 1 MHz of bandwidth as long as they do not exceed the peak transmit power over the

entire channel bandwidth defined in table 90.1215(a). Likewise, low power devices are limited to a peak power spectral density of 8 dBm within any 1 MHz of bandwidth.

The peak transmit power should not exceed:

Channel Bandwidth (MHz)	Low power peak transmitter power (dBm)	High power peak transmitter power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

All devices can use omni or directional antenna gains up to 9 dBi at maximum transmit power output. Directional antenna gain may exceed 9 dBi, if both power transmit power and power spectral density are reduced dB-per-dB by the amount that directional antenna gain exceeds 9 dBi.

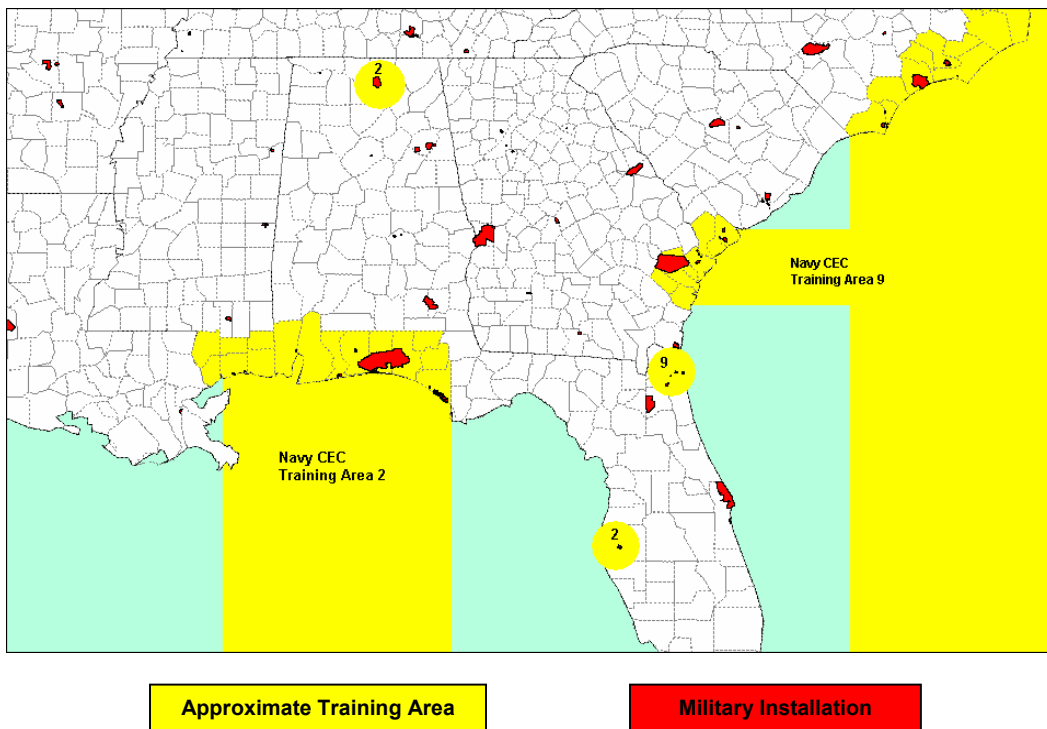
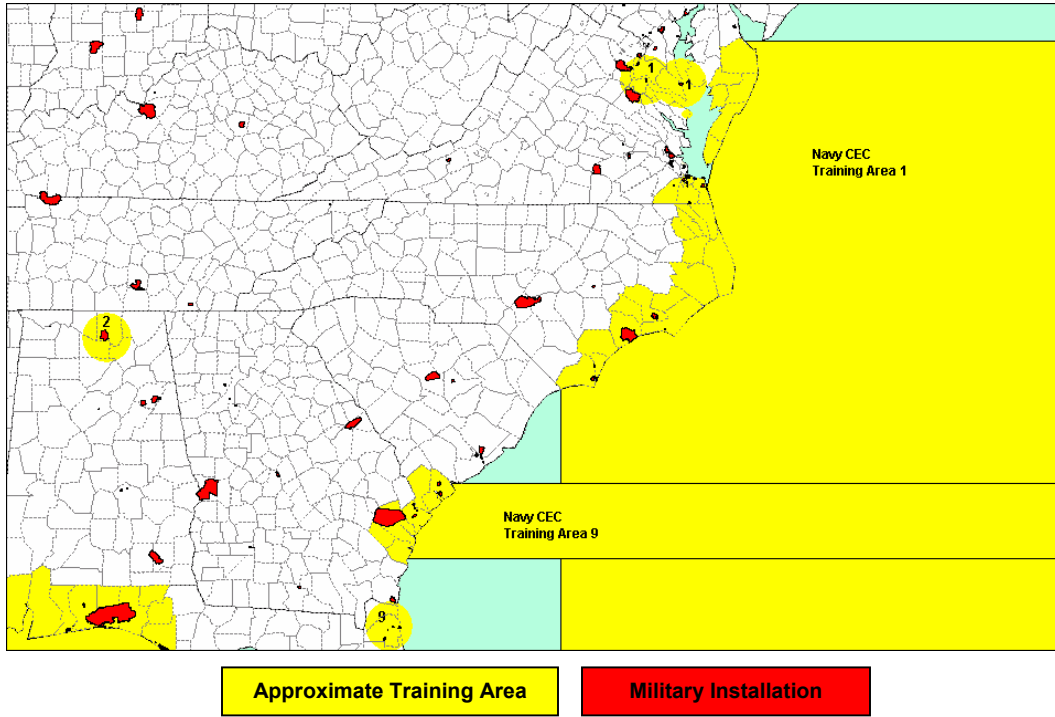
High power devices used for point-to-point or point-to-multipoint operation (fixed or temporary) may use transmit antennas with a directional gain up to 26 dBi at maximum transmit power output. Directional antenna gain may exceed 26 dBi, if both power transmit power and power spectral density are reduced dB-per-dB by the amount that directional antenna gain exceeds 26 dBi.

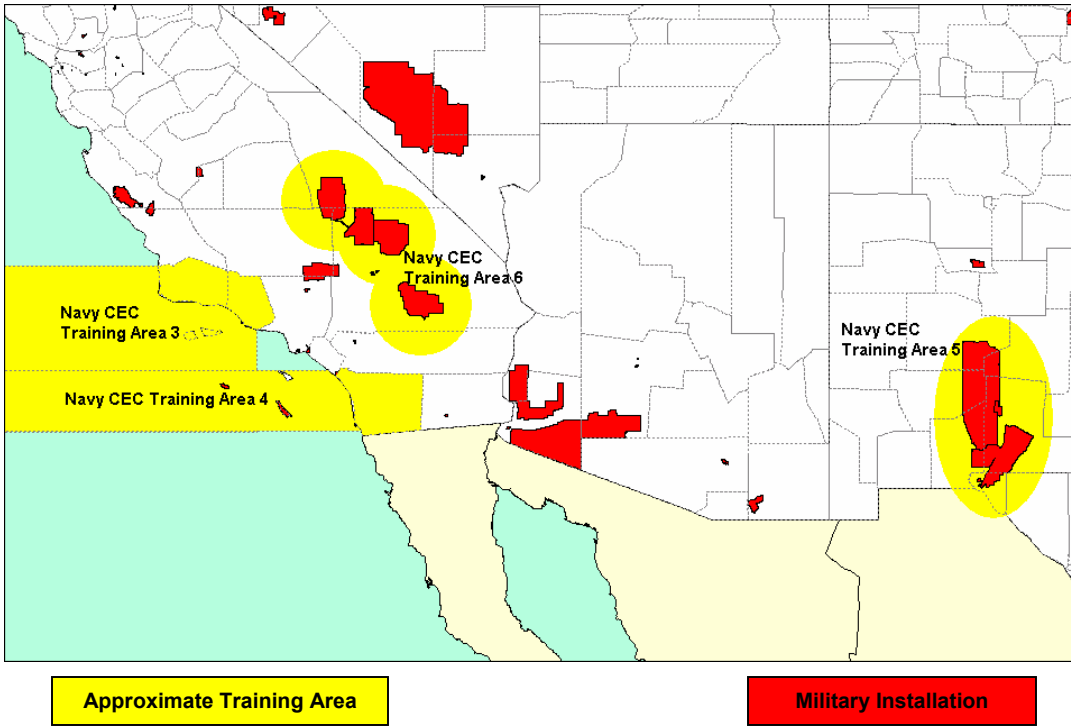
Consideration of Other Operations

US Navy

In the band just below the 4.9 GHz public safety band, the US Navy uses spectrum to conduct Cooperative Engagement Capability (CEC) operations in nine training areas located along the East, West and Gulf Coasts, the entire state of Hawaii, plus military reservations in southern California and New Mexico. 4.9 GHz licensees in or near these areas should consider potential impact of the Navy operations. Maps of the Navy CEC training areas in affected states are shown below. The detailed parameters of the nine CEC training areas, from which these maps were drawn, are identified in Appendix C of the FCC’s 4.9 GHz Third Report and Order, Docket 00-32, released May 2, 2003. That description also notes the possibility that some Navy high power airborne CEC operations might expand the area of consideration around these training areas.

MAPS OF NAVY CEC TRAINING AREAS

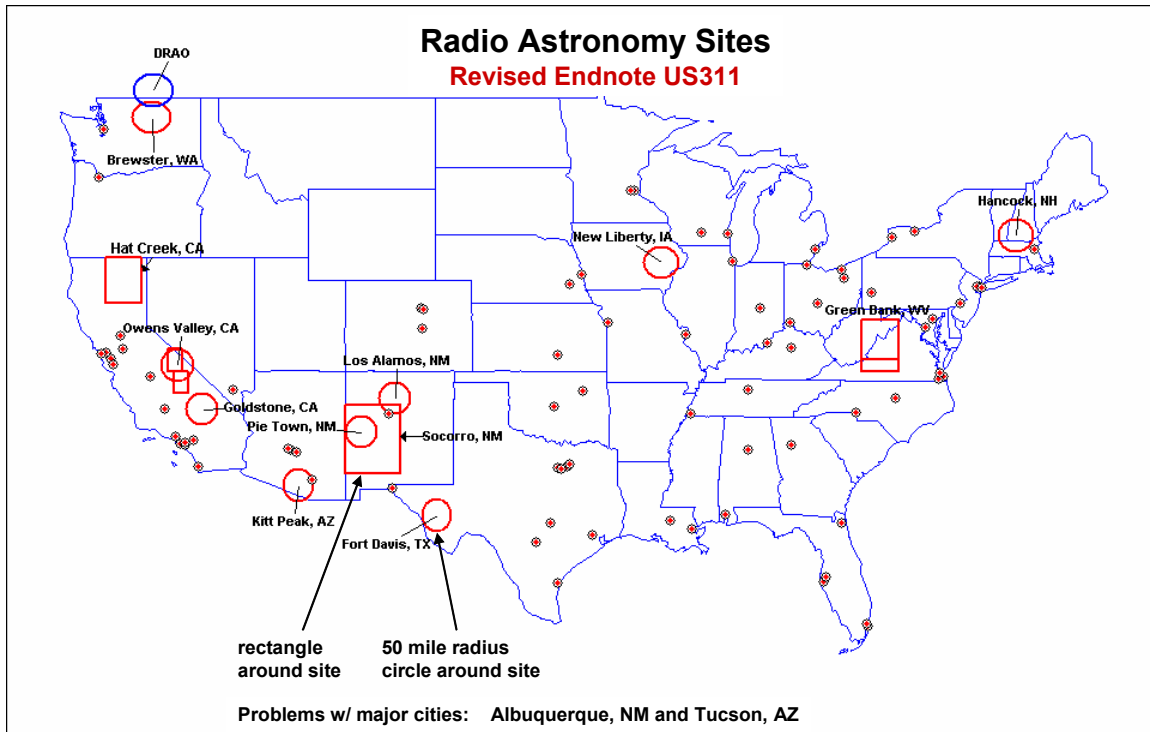




Note: Navy CEC Training Area 7 includes all of the state of Hawaii and the Pacific Ocean waters surrounding the islands of Hawaii. Area 8 includes all of Puerto Rico, St. Thomas, Virgin Islands, and the ocean waters surrounding Puerto Rico and the Virgin Islands.

Radio Astronomy

Radio Astronomy operates in the 4990-5000 MHz band on a primary basis and in 4950-4990 MHz at 14 specific locations on a secondary basis. 4.9 GHz licensees must protect those operations as required in Part 2, Table of Frequency Allocations, footnote US311. Because public safety transmitters will primarily be operating close to the ground, we believe that the chance of interference to radio astronomy observatories is minimal. The need to protect radio astronomy is one of the reasons behind the prohibition on aeronautical use of the 4.9 GHz on a routine basis. The radio astronomy sites that must be protected and their coordination zones are shown as circles and squares on the US map below. (Note that the red dots indicate major cities.)



Primary Uses

Primary uses of the 4.9 GHz band are for hot spots, point-to-multi-point, base/mobile/portable operations, temporary fixed point-to-point. Communications must be related to the protection of life, health or property. Unattended and continuous operation is permitted; voice, data and video operations are permitted. Operation on-board aircraft is prohibited, although the FCC will entertain waivers for such operations (see section on “Uses Requiring Waiver.”)

Secondary Uses

Permanent fixed point-to-point operations are permitted, but are secondary to the primary uses of the band. Fixed point-to-point operations are considered permanent if they are constructed and in place for more than one year. Secondary operations must not cause interference to primary operations and must accept interference from primary operations in the band. Secondary operations must mitigate any interference caused to primary operations up to and including ceasing operations.

Uses Requiring Waiver

Operation on-board aircraft – helicopter video downlinks for example – is not generally permitted in the 4.9 GHz band because of concern about interference from such operations to radio astronomy operations. Agencies wishing to use the band for airborne operations can seek a waiver to do so. All waiver requests for airborne operations must include the following information:

- All technical parameters of the proposed airborne operation
- Technical showings, using ‘established criteria’ (interference threshold levels contained in ITU-R Recommendation RA. 769-1) demonstrating the proposed operation will not cause interference to any radio astronomy operations.
- Demonstrate how the airborne operations will protect other 4.9 GHz band operations.

The FCC will coordinate with the National Telecommunications and Information Administration (NTIA) before acting on any waivers requesting airborne operations.

Licensing

Licenses in the 4.9 GHz band have been available since July 31, 2003. (See Appendix A for a “How To” Guide on filing 4.9 GHz license applications). Primary operations are licensed on a geographic basis over the applicant’s legal jurisdiction – e.g. city, county, state, etc. The 4.9 GHz band is a shared band; there are no exclusive assignments; all licensees are granted for all 50 MHz available and must coordinate use with other granted licensees within their jurisdiction. Transmitters can be deployed anywhere within the licensed area of operation (entity’s legal jurisdiction) without any additional licensing required, except under certain conditions. Individual licenses are required if:

- International coordination is required
- An environmental assessment is required under Part 1 OR
- The station would affect the radio quiet zones

Any antenna structure requiring notification to and approval from the Federal Aviation Administration (FAA) must be registered with the FCC.

Secondary, permanent fixed point-to-point operations must license each transmitter site and provide coordinates, ground elevation, HAAT, antenna height, etc. Six transmitter sites can be accommodated per Form 601/call sign.

Licenses are granted for a term of 10 years.

Construction Requirements

There is no construction deadline for primary licensees.

Secondary, permanent fixed point-to-point systems must be constructed within 18 months of license grant.

Regional Planning

The FCC delegated the authority for developing 4.9 GHz Regional Plans to the existing 700 MHz Regional Planning Committees. However, there is no requirement for the Regions to write and file a 4.9 GHz Regional Plan with the FCC. If a Region chooses to develop a 4.9 GHz Regional Plan, it must be filed with the FCC on May 12, 2005. Required elements of a 4.9 GHz Regional Plan can be found in Rule Section 90.1211:

- Identification of the document as a plan for sharing the 4.9 GHz band in the Region specified
- Names, business addresses, business telephone numbers, and organizational affiliations of the chairperson(s) and all members of the Committee
- Summary of the major elements of the Plan
- Explanation of how all eligible entities within the Region were given an opportunity to participate in the planning process
- Explanation of how the Plan was coordinated with adjacent Regions
- Description of the coordination procedures for both temporary fixed and mobile operations

Lack of a Regional Plan does not prevent eligible entities within a Region from filing license applications and receiving granted authorizations in the 4.9 GHz band.

If a Region fails to form a 4.9 GHz Planning Committee or develop a 4.9 GHz Regional Plan, the FCC gives licensees the option to establish a local ad hoc planning committee or appoint a band manager or frequency coordinator to assist them in effectively coordinating the use of the band. The FCC stresses that licensees must cooperate in the selection and use of channels to reduce interference and make efficient use of the band.

Effective Date of the New Technical Rules

The new technical rules will go into effect 60 days after they are published in the Federal Register. As of January 18, 2005, publication had not occurred.

Filing for a 4.9 GHz License

Frequency coordination is not required at 4.9 GHz, so eligible entities can apply for a 4.9 GHz license using the FCC's on-line application system, the Universal Licensing System (ULS).

Eligible entities interested in obtaining 4.9 GHz licenses can either use the filing guide provided in Appendix A of this document, or contact one of the many FCC licensing preparation firms for assistance.

APPENDIX A

How to File for a 4.9 GHz License

Eligibility for a 4.9 GHz license is limited to public safety entities and communications on the band must be limited to the protection of life, health or property. Cities, towns, counties, states, municipal utilities are all eligible to hold 4.9 GHz licenses.

Each 4.9 GHz license is granted for the entire 50 MHz available in the band and all primary licensees share the band equally – there are no exclusive assignments. Licenses in the 4.9 GHz band are granted to cover the licensee’s legal jurisdiction – e.g. citywide, countywide, and statewide. Each transmitter site need not be licensed **unless** it affects an Environmentally Protected Area, is within a Quiet Zone or would require international coordination. Then the site must be licensed separately.

If the applicant is licensing a permanent fixed point-to-point system (which operations are secondary to other operations in the band), then each permanent fixed site must be listed individually on the license application giving complete information about the site.

License applications for operations at 4.9 GHz are filed using the FCC’s Universal Licensing System (ULS). At any time during the electronic filing process, if you do something wrong, or fail to complete a required field, an error message will appear explaining what was completed incorrectly or what information is missing. The system will not let you advance to a new screen until the current screen is completed successfully.

Log onto the FCC’s Universal Licensing System at <http://wireless.fcc.gov/uls/>.

- Click on “On-Line Filing.”
- Enter your FCC Registration Number (FRN) and your password¹
- Click ‘Submit’
- A screen will appear that says “My Applications” – Application at a Glance
- Click on the “Apply for New License” link on the left hand side of this page
- A screen will appear that says “License Manager”
- Use the drop-down box to select the radio service code “PA”
- Click “Continue”
- The Form 601 will appear
- When filling out a Form 601 on-line, certain fields will not require completion – these fields appear faint or faded on the screen.
- First item you will need to respond to is “Will this application require a waiver of the Commissions rules?”
- Select ‘No’²

¹ If you do not have an FCC Registration Number (FRN) you will have to register your Taxpayer Identification Number (TIN) with the FCC following the on-screen prompts using “CORES”. CORES is available on-line on the ULS homepage.

- Click ‘No’³ to the question ‘Are attachments filed with this application?’
- Next question is: “Interconnected Service?”
- Answer yes or no
- Next field is “Fee Status”
- Governmental entities are exempt from fees
- Click “Next page.”
- On the drop down screen in the field “The licensee is” select ‘Governmental Entity’
- Complete all the blank fields (name, address, etc.)
- Click “Next Page.”
- Ownership Questions/Qualifications
- Answer each of the questions using the drop-down boxes
- Click “Next Page.”
- Type the name of the party authorized to sign the application in the box
- Click “Next Page”
- The control point section comes up
- Click on ‘add a control point.’ And fill in the control point information, address, and telephone number.
- Click on ‘Save”
- Click on “Next Page.”
- The Eligibility screen will appear. Enter rule section 90.1203. Describe your activity just as always – e.g. applicant is a governmental entity, etc.
- Click on “Next Page.”
- The Location Page comes up
- Click on “Add”
- Using the drop down box on Location Description Click on “T – Temporary Fixed.”⁴
- Using the drop down box on Area of operation code, choose the area of operation that corresponds with your legal jurisdiction – Countywide, Statewide, or ‘Other’ (for Citywide operations), or kmra around a center point, or box rectangular”
 - A dialogue box will open up after you select the Area of Operation. If you choose:
 - “Other” indicate “within the legal jurisdiction of (city),”
 - “kmra around a set of coordinates,” enter the coordinates, city and state.
 - “County”, enter the county
 - “State”, enter the state

² Operation on-board aircraft requires a waiver. See text of 4.9 GHz Overview for details.

³ If you have requested a waiver, you will need to answer ‘yes’ to this question because the waiver will be attached to the application.

⁴ Temporary Fixed operations are primary. If you propose to operate permanent fixed point-to-point stations, you must select that option from the drop down menu and each permanent fixed site must be listed separately on the application. You must provide coordinates, ground elevation, antenna height, HAAT, etc. for each site.

- The last two questions on the page are whether or not the sites would result in an Environmental Effect or are located within a Quiet Zone. Answer these questions using the drop down boxes.
- Click on “Next Page.”
- This is the antenna page; no information is needed, unless you are filing for permanent fixed point-to-point operations. Click on “Next Page.”
- This is the frequency page. You do not need to enter anything in this section because the Universal Licensing System automatically fills in the frequency range for 4.9 GHz.
- At the bottom of the page, select ‘submit’ to file the application with the FCC.
- The FCC assigns your application a file number so that you can track it if necessary. You should receive a granted license within a short period of time. Some grant literally overnight.