1392-1395 MHz

1. Band Introduction

This band plays an important part in radio astronomy research. The National Science Foundation has identified this band as necessary for radio astronomy research of spectral lines that are not currently within a band allocated exclusively to passive services.

The National Aeronautics and Space Administration currently uses this band for the satellite (Aquarius) passive remote sensing of ocean salinity and soil moisture content.

2. Allocations

2a. Allocation Table

The frequency allocation table shown below is extracted from the Manual of Regulations and Procedures for Federal Radio Frequency Management, Chapter 4 – Allocations, Allotments and Plans.

Table of Frequency Allocations

United States Table

Federal Table	Non-Federal Table	FCC Rule Part(s)
1392-1395 5.339 US37 US342 US385 US398	1392-1395 FIXED MOBILE except aeronautical mobile 5.339 US37 US342 US385 US398	Wireless Communications (27)

2b. Additional Allocation Table Information

5.339 The bands 1370-1400 MHz, 2640-2655 MHz, 4950-4990 MHz and 15.20-15.35 GHz are also allocated to the space research (passive) and Earth exploration-satellite (passive) services on a secondary basis.

US37 In bands 1390-1400 and 1427-1432 MHz, Federal operations (except for devices authorized by the FCC for the Wireless Medical Telemetry Service) are on a non-interference basis to non-Federal operations and shall not constrain implementation of non-Federal operations.

US311 Radio astronomy observations may be made in the bands 1350-1400 MHz, 1718.8-1722.2 MHz, and 4950-4990 MHz on an unprotected basis at the following radio astronomy observatories:

Allen Telescope Array, Hat Creek, CA	Rectangle between latitudes 40° 00' N and 42° 00' N and between longitudes 120° 15' W and 122° 15' W.	
NASA Goldstone Deep Space Communications Complex, Goldstone, CA	80 kilometers (50 mile) radius centered on 35° 20' N, 116° 53' W.	
National Astronomy and Ionosphere Center, Arecibo, PR	Rectangle between latitudes 17° 30' N and 19° 00' N and between longitudes 65° 10' W and 68° 00' W.	
National Radio Astronomy Observatory, Socorro, NM	Rectangle between latitudes 32° 30' N and 35° 30' N and between longitudes 106° 00' W and 109° 00' W.	
National Radio Astronomy Observatory, Green Bank, WV	Rectangle between latitudes 37° 30' N and 39° 15' N and between longitudes 78° 30' W and 80° 30' W.	
National Radio Astronomy Observatory, Very Long Baseline Array Stations	80 kilometer radius centered on:	
	North latitude	West longitude
Brewster, WA	48° 08'	119° 41'
Fort Davis, TX	30° 38'	103° 57'
Hancock, NH	42° 56'	71° 59'
Kitt Peak, AZ	31° 57'	111° 37'
Los Alamos, NM	35° 47'	106° 15'
Mauna Kea, HI	19° 48'	155° 27'
North Liberty, IA	41° 46'	91° 34'
Owens Valley, CA	37° 14'	118° 17'
Pie Town, NM	34° 18'	108° 07'
Saint Croix, VI	17° 45'	64° 35'
Owens Valley Radio Observatory, Big Pine, CA	Two contiguous rectangles, one between latitudes 36° 00' N and 37° 00' N and between longitudes 117° 40' W and 118° 30' W and the second between latitudes 37° 00' N and 38° 00' N and between longitudes 118° 00' W and 118° 50' W.	

In the bands 1350-1400 MHz and 4950-4990 MHz, every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed and mobile services that could interfere with radio astronomy observations within the geographic areas given above. In addition, every practicable effort will be made to avoid assignment of frequencies in these bands to stations in the aeronautical mobile service which operate outside of those geographic areas, but which may cause harmful interference to the listed observatories. Should such assignments result in harmful interference to these observatories, the situation will be remedied to the extent practicable.

US342 In making assignments to stations of other services to which the bands:

13360-13410 kHz	42.77-42.87 GHz*
25550-25670 kHz	43.07-43.17 GHz*
37.5-38.25 MHz	43.37-43.47 GHz*
322-328.6 MHz*	48.94-49.04 GHz*
1330-1400 MHz*	76-86 GHz
1610.6-1613.8 MHz*	92-94 GHz
1660-1660.5 MHz*	94.1-100 GHz
1668.4-1670 MHz*	102-109.5 GHz
3260-3267 MHz*	111.8-114.25 GHz
3332-3339 MHz*	128.33-128.59 GHz*
3345.8-3352.5 MHz*	129.23-129.49 GHz*
4825-4835 MHz*	130-134 GHz
4950-4990 MHz	136-148.5 GHz
6650-6675.2 MHz*	151.5-158.5 GHz
14.47-14.5 GHz*	168.59-168.93 GHz*
22.01-22.21 GHz*	171.11-171.45 GHz*
22.21-22.5 GHz	172.31-172.65 GHz*
22.81-22.86 GHz*	173.52-173.85 GHz*
23.07-23.12 GHz*	195.75-196.15 GHz*
31.2-31.3 GHz	209-226 GHz
36.43-36.5 GHz*	241-250 GHz
42.5-43.5 GHz	252-275 GHz

are allocated (*indicates radio astronomy use for spectral line observations), all practicable steps shall be taken to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (*see* ITU *Radio Regulations* at Nos. **4.5** and **4.6** and Article **29**).

US351 In the band 1390-1400 MHz, Federal operations, except for medical telemetry operations in the sub-band 1395-1400 MHz, are on a non-interference basis to authorized non-Federal operations and shall not hinder implementation of any non-Federal operations. However, Federal operations authorized as of March 22, 1995 at 17 sites identified below will be continued on a fully protected basis until January 1, 2009.

80 km radius of operation centered on:		
State	Site	Coordinates
AK	Ft. Greely	63° 47' N, 145° 52' W
AL	Ft. Rucker	31° 13' N, 085° 49' W
AL	Redstone	34° 35' N, 086° 35' W
AZ	Ft. Huachuca	31° 33' N, 110° 18' W
AZ	Yuma	32° 29' N, 114° 20' W

CA	China Lake	35° 41' N, 117° 41' W
CA	Edwards AFB	34° 54' N, 117° 53' W
CA	Pacific Missile Range	34° 07' N, 119° 30' W
FL	Eglin AFB	30° 28' N, 086° 31' W

MD	Aberdeen PG	39° 29' N, 076° 08' W
MD	Patuxent River	38° 17' N, 076° 25' W
NC	Cherry Point	34° 57' N, 076° 56' W
NM	Holloman AFB	33° 29' N, 106° 50' W
NM	WSM Range	32° 10' N, 106° 21' W
OH	Wright-Patterson AFB	39° 50' N, 084° 03' W
UT	Dugway PG	40° 11' N, 112° 53' W
UT	Utah Test Range	40° 57' N, 113° 05' W

US398 In the bands 1390-1400 MHz and 1427-1432 MHz, airborne and space-to-Earth operations, except for feeder downlinks for the Non-Voice Non-Geostationary Mobile-Satellite Service in the band 1430-1432 MHz (see US368), are prohibited.

3. Federal Agency Use:

3a. Federal Agency Frequency Assignments Table:

There are no Federal frequency assignments in this band.

The following table identifies the frequency band, type(s) of allocation(s), types of application, and the number of frequency assignments in the Government Master File (GMF) by agency.

Passive systems do not require a frequency authorization. Therefore, frequency assignment data in passive bands will not accurately represent overall spectrum usage.

3b. Percentage of Frequency Assignments Chart

There are no Federal frequency assignments in this band.

4. Frequency Band Analysis By Application

4a. Radio Astronomy

Radio astronomy is defined as astronomy based on the reception of radio waves of cosmic origin.[1] The service is unique in that it involves only passive systems. Since the signals received emanate from natural sources, radio astronomers have no control over

[1] NTIA Manual §6.1.1 at 6-12.

the power, the frequency, or other characteristics of the emissions. The spectrum used is based on physical phenomena rather than expected growth, as is the case for most other radio services. Using terrestrial radio telescopes, radio astronomers can observe cosmic phenomena at frequencies ranging from 15 MHz to over 800 GHz. To meet the needs of radio astronomy, frequencies at regular intervals across this range must be protected from interference in the vicinity of the radio astronomy observatories. The basic plan of spectrum management for radio astronomy is to protect small bands across the range for continuum observations, while choosing those bands so they contain the spectral lines of greatest scientific interest.[2] Radio astronomy has contributed much to the science of astronomy and has produced numerous technical innovations that have benefitted radiocommunications and humankind in general. It has provided information on the atmospheric absorption of radio waves, important in the area of telecommunications and communications technology.[3] Footnote US 311 provides the locations of the sites where radio astronomy observations are made in this band are performed on an unprotected basis.

4b. Satellite Passive Remote Sensing

Systems operating in the Earth exploration-satellite (passive) service are used to obtain information relating to the characteristics of the Earth and its natural phenomena from passive sensors on satellites. Radio waves of natural origin are emissions from the ground, air, and water. All objects emit radio waves and the emissions convey information about those objects. Earth exploration-satellite passive sensors are designed to receive and measure natural emissions produced by the Earth's surface and its atmosphere. The societal benefits from Earth exploration satellite passive sensing include:

- Weather Prediction: a key input to numerical weather prediction models used globally for weather forecasting.
- Global Warming: concentrations and distributions of atmospheric gases, sea and land ice thickness and change, and ozone measurements are key components to studying and prediction of global warming.
- Severe Weather Events: the prediction of severe weather events requires accurate measurements of rain rates in storms over the oceans which is only possible with remote sensing satellites.
- Forest Fires: detection of fires through smoke by their microwave radiation.
- Management of Natural Resources: measurements of biomass, deforestation, and water resources through systematic environmental monitoring.

[2] The preferred frequency bands for continuum and spectral line observations are specified in International Telecommunication Union-Radiocommunication Sector Recommendation RA.314-10.

[3] An overview of applications of astronomical techniques and devices that benefit the public is contained in National Telecommunications and Information Administration, NTIA Report 99-35, *Radio Astronomy Spectrum Planning Options* (April 1998) at Appendix B.

- Volcanoes: used to detect volcanic activity even before eruptions and to track and predict the volcanic fallout effects.
- Shipping: used to track sea ice, ice flows, and ocean storms to steer ships out of harm's way.
- Long Range Climate Forecasts: study of global atmospheric and oceanic events such as El Niño requires sea surface temperature, ocean winds, ocean wave height, and many other components used in the prediction of long range weather forecasting and climatic trends.

The NASA Aquarius is a satellite mission to observe and model the processes that relate salinity variations to climatic changes in the global cycling of water and to understand how these variations influence the general ocean circulation. By measuring salinity globally and synoptically every month for 3 years, Aquarius mission will provide an unprecedented new view of the ocean's role in climate. The Aquarius mission will address these processes on the seasonal cycle as a basis for understanding interannual climate variations. Due to the secondary allocation status, satellite systems operating in this service are not protected internationally from services allocated on a primary basis.

5. Planned Use

The radio astronomy observations performed in this band are expected to continue indefinitely.

The passive measurements performed in this band of ocean salinity, soil moisture, snow liquid content, sea ice thickness, and ocean sea state which are used for agriculture and fishing, monitoring water resources, and hazard warning for ship routing are expected to continue for the foreseeable future.