2.1.1 Radiated Emissions - Electric Field (30 MHz to 1000 MHz)

Radiated emission measurements were made from 30 MHz to 1000 MHz, although the emission limits only require measurements up to 400 MHz. The following table shows the worst case emissions as taken from the data report.

Electric Field - 30 MHz to 1000 MHz Worst Case Emissions		
Sample	**Frequency (MHz)**	**Level @ 3m (dBμV/m)**
Proto 3, Sample 3	188.0	57
Proto 3, Sample 1	203.9	56
Proto 3, Sample 2	195.0	59
Proto 3 Samples 1, 2 & 3	204.7	58
Proto 4	276.5	47

The radiated emissions from the device were significantly impacted when the design of the lamp was altered, as embodied in Proto 4. The emission levels were reduced by as much as 12 dB. This change in design also caused a change in frequency range of emissions. Please note that these readings were maximized through cable length and manipulation, turntable rotation, lamp polarization, and antenna height and antenna polarization.

2.1.2 Radiated Emissions - Electric Field (9 kHz to 30 MHz)

Electric Field measurements from 9 kHz to 30 MHz were made in order to demonstrate compliance to the IEEE C95.1-1991 emission limits.

Electric Field - 9 kHz to 30 MHz Worst Case Emissions		
Sample	**Frequency (MHz)**	**Level @ 3m (dBμV/m)**
Proto 3, Sample 1	2.620	70
Proto 3, Sample 2	2.490	69
Proto 3, Sample 3	2.570	70
Proto 3 Samples 1, 2 & 3	2.580	69
Proto 4	2.583	75

Please note that the readings in the above table were maximized through variation of cable length and manipulation and turntable rotation. IEEE C95.1 specifies a limit of electric field strength not to exceed 329.5 V/m in uncontrolled environments. The highest field strength measured from the four lamps was 75 dBμV/m at a distance of 3 meters. Assuming a linear interpolation from the 3 meter distance to 0.5 meters (an estimate of the distance that the human body could normally be in contact with the lamp), the level at 0.5 meters from the lamp would be approximately 90 dBμV/m, or 0.316 V/m. This level is 60 dB below the IEEE C95.1-1991 limit.

2.1.3 Radiated Emissions - Magnetic Field (9 kHz to 30 MHz)

Measurements of magnetic emissions from 9 kHz to 30 MHz were performed for comparison to the IEEE C95.1-1991 guidelines. The measurements were performed using loop antennas. The conversion from field strength (dBμV/m) to magnetic field (dBμA/m) assumes the far-field and free space impedance.

Magnetic Field - 9 kHz to 30 MHz Worst Case Emissions			
Sample	**Frequency (MHz)**	**Level @ 3m (dBμA/m)**	**Level @ 3m (dBμV/m)**
Proto 3, Sample 1	2.620	37.5	89
Proto 3, Sample 2	2.490	38.5	90
Proto 3, Sample 3	2.570	37.5	89
Proto 3 Samples 1, 2 & 3	2.490 2.580	37.5	89
Proto 4	2.589	21.4	73

Please note that the readings above were maximized through variations in cable length and manipulation and turntable rotation. The maximum recommended exposure is 6.5 A/m, as stated IEEE C95.1-1991. The highest level of magnetic field measured was observed from Proto 3, Sample 2, and was 38.5 dBμA/m, or 84 μA/m at a distance of 3 meters. Extrapolated into a distance of 0.5 meters using the previously calculated 53 dB/decade drop-off would yield a magnetic field of 79.7 dBμA/m, or 9660 μA/m. This level is 57 dB below the recommended limit of 6.5 dBμA/m.

2.1.4 Radiated Emissions - ELF/VLF (50 Hz to 9 kHz)

ELF/VLF measurements were made for comparison of the Electrodeless Compact Fluorescent Lamps to the Swedish MPR 1990:10 emission limits. These emissions have been prepared for Video Display Terminals. The limits of 25 V/m for VDTs has been used for a reference for all measurements. Please note that the distance of 50 cm was maintained for all testing, as this distance was determined to be the closest distance for the human body to be in contact with the lamp for an extended period of time.

Radiated Emissions - ELF/VLF - 50 Hz to 9 kHz Worst Case Emissions		
Sample	**Frequency (Hz)**	**Level (V/m)**
Proto 3 Samples 1, 2 & 3	59.9	24.0
Proto 4	59.9	22.6

Please note that the readings above were maximized through orientation of the fixture and lamps, variations in cable length and manipulation and turntable rotation.

2.1.5 AC Mains Line-Conducted Emissions - (450 kHz to 30 MHz)

Measurements of AC mains line-conducted emissions were performed for direct comparison to the applicable emission limits as stated in FCC Part 18.

AC Mains Line-Conducted Emissions - 450 kHz to 30 MHz Worst Case Emissions		
Sample	**Frequency (MHz)**	**Level (dBμV)**
Proto 3, Sample 1	2.620	59
Proto 3, Sample 2	2.490	63
Proto 3, Sample 3	2.570	59
Proto 3 Samples 1, 2 & 3	2.490	62
Proto 4	2.580	59

Please note that the readings above reflect the maximum values obtained with several different lengths of AC mains cord. The power cable was manipulated in order to maximize the emissions.

2.2 Worst Case Scenarios

Several variations of the lamp were tested to determine the worse case emission levels. For these measurements, the length of power wiring was increased, the origination of the cabling was varied, and the lamp's placement in the three orthogonal axes was checked. The worst case emissions were reported in the respective test reports.

The line cord was not found to be a major contributor to the emission levels. The line cord lengths were tested from 0.8 m to 5.8 m. An isolation transformer was placed in series between the lamp and the extension cord, but no significant reduction was observed at the 2.2 - 3.0 MHz frequency range.

For measurements of the impact of line cord lengths, the lamp was attached to the fixture and placed in the center of the turntable. Then, the excess line cord was manipulated in order to maximize the emission. At no time was the excess line cord brought in a circle around the lamp. However, the resonance of the line cord was varied by a combination of stretching the cable, and bunching it together. Only the line cord length was varied during measurements. All methods for maximizing the emissions were followed in each condition.

Please see the table below summarizing the effects on emission levels with this variable.

Impact of Line Cord Length at Fundamental Frequency			
Length (m)	**E-Field Strength (dBμV/m)**	**H-Field Strength (dBμV/m)**	**AC Mains Conducted (dBμV)**
0.8	-	90	58
1.8	67	90	58
2.8	-	90	58
5.8	67	93	58

- signifies no measurement in that condition

Please note that the E-Field Strength and H-Field Strengths are reported as 3 meter measurements. When comparing these numbers to the far field, an extrapolation is required. Please note that the drop-off is not proportional to the distance, but closer to the square of the distances.

3.0 Operations: 2.2 MHz to 3.0 MHz

3.1 Services Allocated in CFR 47

The following services are provided in CFR 47:

Part 23 International Fixed Public Radio Communication Services
- a. Radiotelephone systems
- b. Radiotelegraph systems

Part 80 Maritime Services
- a. Ship -to- shore communications
- b. Distress communications
- c. Public Correspondence
- d. Private Communications
- e. Aircraft Stations

Part 87 Aviation Services
- a. Civil Air Patrol
- b. Domestic HF (Off-shore drilling, for example)
- c. International HF

Part 90 Private Land Mobile Radio Services
- a. Local Government
- b. Police Radio Service
- c. Forestry Conservation Radio Service
- d. Special Emergency Radio Service
- e. Power Radio Service
- f. Petroleum Radio Service
- g. Motion Picture Radio Service
- h. Special Industrial Radio Service
- i. Telephone Maintenance Radio Service

Please see the following information taken from Part 2 of CFR 47 summarizing the frequency band.

International table			United States table		FCC use designators	
Region 1—allocation kHz	Region 2—allocation kHz	Region 3—allocation kHz	Government Allocation kHz	Non-Government Allocation kHz	Rule part(s)	Special-use frequencies
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2194-2300 FIXED. MOBILE except aeronautical mobile (R). 484 495 502	2194-2300 FIXED. MOBILE. 502		2194-2495 FIXED. MOBILE.	2194-2495 FIXED. LAND MOBILE. MARITIME MOBILE. NG19	AVIATION (87). INTERNATIONAL FIXED PUBLIC (23). MARITIME (80). PRIVATE LAND MOBILE (90).	
2300-2498 FIXED. MOBILE except aeronautical mobile (R). BROADCASTING 503 495	2300-2495 FIXED. MOBILE. BROADCASTING 503.					
2498-2501 STANDARD FREQUENCY AND TIME SIGNAL (2500 kHz).	2495-2501 STANDARD FREQUENCY AND TIME SIGNAL (2500 kHz).		2495-2505 STANDARD FREQUENCY AND TIME SIGNAL.	2495-2505 STANDARD FREQUENCY AND TIME SIGNAL.		2500 kHz: Standard frequency.
2501-2502	STANDARD FREQUENCY AND TIME SIGNAL. Space Research.					
2502-2625 FIXED. MOBILE except aeronautical mobile (R).	2502-2505 STANDARD FREQUENCY AND TIME SIGNAL.		G106			

484 495 504 2625-2850 MARITIME MOBILE. MARITIME RADIO-NAVIGATION. 484 2650-2850 FIXED. MOBILE except aeronautical mobile (R). 484 495	2505-2850 FIXED. MOBILE.		2505-2850 FIXED. MOBILE. US285	2505-2850 FIXED. LAND MOBILE. MARITIME MOBILE. US285	AVIATION (87). INTERNATIONAL FIXED PUBLIC (23). MARITIME (80). PRIVATE LAND MOBILE (90).	
2850-3025	AERONAUTICAL MOBILE (R). 501 505		2850-3025 AERONAUTICAL MOBILE (R). 501 505 US283	2850-3025 AERONAUTICAL MOBILE (R). 501 505 US283	AVIATION (87).	
3025-3155	AERONAUTICAL MOBILE (OR).		3025-3155 AERONAUTICAL MOBILE (OR).	3025-3155 AERONAUTICAL MOBILE (OR).		
3155-3200	FIXED. MOBILE except aeronautical mobile (R). 506 507		3155-3230 FIXED. MOBILE except aeronautical mobile (R).	3155-3230 FIXED. MOBILE except aeronautical mobile (R).	AVIATION (87). INTERNATIONAL FIXED PUBLIC (23). MARITIME (80). PRIVATE LAND MOBILE (90).	
3200-3230	FIXED MOBILE except aeronautical mobile (R). BROADCASTING 503. 506					

3.2 Description of Communication

The four groups, International Fixed Public Radio Communication Services, Maritime Services, Aviation Services, and Private Land Mobile Radio Services, offer services to the Commercial Industries and Government Organizations with minimal private licenses. A standard frequency and time signal is operated at 2.495 MHz and 2.505 MHz.

The types of communications are mainly from base to mobile. Under the Maritime provisions, the base stations will be present along the shoreline. However, all other licensees may be located throughout the U.S. The mobile stations range from ship stations, which could travel on US and International Waters, to handheld transceivers which could be used anywhere on land, including locations for search and rescue attempts.

These base and mobile stations employ some type of AM modulation, whether single-sideband, suppressed carrier or double side-band amplitude modulation. All communications are analog and for telephony purposes (all voice communications). The base transceivers will likely employ low loss and directional antennas which will extend outside of the facility. Towers will be used at the base location in order to maximize the equipment sensitivity and effective ranges. The mobile radios may be attached to vehicles, or may be handheld. In most cases, the mobile transceivers would not be operated within a facility, neither a consumer or non-consumer environment.

The bands offered under the Fixed Public Radio Communication Service are available for services such as radiotelephone and radiotelegraph communications. Under the Maritime Services, the frequencies between 2.2 MHz and 3.0 MHz are allocated for ship-to-shore communications. Under the Maritime Services, frequencies are provided for many purposes, but mostly for emergency situations. Distress Communications, Public Correspondence, Private Communications, and Aircraft Stations are provided in the Maritime Services.

The Civil Air Patrol, Domestic and International HF have the ability to use channels between 2.2 MHz and 3.0 MHz under the Aviation Services. These channels can be used for communication between the mainland and off-shore drilling rigs, for example.

The Private Land Mobile Radio Service offers the widest range of frequencies. These frequencies may be licensed to Local Governments, Police Radio Services, and many private individuals including the Motion Picture Radio Service. Similar to the Maritime Services, licenses within this band can be issued for a several purposes, but particularly for emergency situations. Emergency situations consist of search and rescue attempts, auxiliary broadcasting, and distress communications.

The frequencies are identified by their location in the spectrum. The frequencies between 2.2 MHz and 3.0 MHz are identified as MF/HF (mid-frequency / high frequency). The frequencies in the 150 MHz vicinity are identified as VHF frequencies.

4.0 Services Currently Used

As mentioned earlier in Exhibit 3.0, the following services offer frequencies between 2.2 MHz and 3.0 MHz: Part 23 (International Fixed Public Radio Communication Services), Part 80 (Maritime Services), Part 87 (Aviation Services), and Part 90 (Private Land Mobile Radio Services). Representatives from each of the organizations were contacted to discuss the current usage of the frequencies between 2.2 MHz and 3.0 MHz.

4.1 General Usage per Service

4.1.1 International Fixed Public Radio Communication Services - Part 23

Many frequencies are offered under the Fixed Public Radio Communication Service. These frequencies have existed for many years, and appear to have been phased out of usage. These frequencies were originally available for services such as radiotelephone and radiotelegraph communications.

According to Jay O'Connor, Engineer, Facilities Division of the Federal Communications Commission, International Fixed Division of Common Carrier [(202) 632-7834], these frequencies are no longer used for International Communications. Other bands have been offered for International Communications, and are currently in service. No longer are the frequencies from 2.2 MHz to 3.0 MHz required for this type of communication.

After a thorough review of the current licenses for operation at frequencies between 2.2 MHz and 3.0 MHz, it appears that no party has the authority to operate at this frequency without a new request and application for a license.

4.1.2 Maritime Services - Part 80

Between 2.2 MHz and 3.0 MHz, channels are allocated for ship-to-shore communications. Frequencies are provided for many purposes, mostly for emergency situations. Distress Communications, Public Correspondence, Private Communications, and Aircraft Stations are provided in the Maritime Services.

According to Sean White, Attorney, Aviation and Marine Branch of the Federal Communications Commission [(202) 632-7175], the frequencies that are commonly used are for communication from ship to shore at distances from 25 miles off-shore to 300 miles off-shore. Within 25 miles, VHF radios are normally used. Each of these devices is a transceiver, with one transceiver installed on ship, the other transceiver is installed on the coast.

There are many advantages for both the MF/HF (Mid-frequency/High-frequency) and VHF (Very-high-frequency) radio frequencies. The VHF frequencies are monitored by all coast guard boats and facilities, as well as many average boaters. The effective range of VHF radios is estimated at line-of-sight, or about 25 miles. The total power from a mobile VHF radio is 25 Watts. The MF/HF mobile transceivers have a maximum output power of 150 Watts and can extend hundreds of miles. Most vessels in excess of 35 feet have a MF/HF transceiver. All boats which extend off-shore distances greater than 25 miles should include a MF/HF transceiver.

The most common distress frequency in the MF/HF band is 2182 kHz. Other common frequencies include 2174.5 kHz, and 2187.5 kHz. These most common distress frequencies are outside the~~ band from~~ 2.2 MHz~~ to 3.0 MHz~~.

A relatively new service has been offered for emergency situations, the Global Maritime Distress and Safety System (GMDSS) service. The GMDSS service is provided to accommodate the users while the satellite communication system is readily available for the consumer. The most current drawback of the satellite communication system is its cost.

Sean White had mentioned the development of the GMDSS system, and that frequencies were offered between 2.2 MHz and 3.0 MHz. Recent literature published about the GMDSS, including FCC Public Notices, however, does not indicate the frequency range from 2.2 MHz to 3.0 MHz as having any frequency allocations. Existing frequencies of 2174.5 kHz, 2182.0 kHz, and 2187.5 kHz are referred to. In recent publications for GMDSS, frequencies above 1.5 GHz are discussed in combination with the Maritime Mobile-Satellite Distress and Safety Communications.

Sean believes at the present time, operation of the Maritime and Aviation Services in the frequency range from 2.2 MHz to 3.0 MHz will continue until the more effective satellite communications are available. Currently, due to the costs for the service, satellite communications are not available for all mariners.

4.1.3 Aviation Services - Part 87

The Civil Air Patrol, Domestic and International HF have the ability to use channels between 2.2 MHz and 3.0 MHz. These channels can be used for communication between the mainland and off-shore drilling rigs. Also, aircraft to station communications are possible for aeronautical enroute, equipment test, emergency, and backup use. The frequency range from 2.310 to 2.390 MHz are assigned for telemetry and telecommand operations associated with the flight testing of manned or unmanned aircraft and missiles, or their major components.

The GMDSS system, as discussed above, may also be used for the Aviation Services. According to Sean, many airlines are utilizing the MF and HF frequencies for planes that travel over seas or waterways. The emergency frequency of 2.182 MHz is used as an international distress frequency.

4.1.4 Private Land Mobile Radio Service - Part 90

The Private Land Mobile Radio Service offers the widest range of frequencies. These frequencies may be licensed to Local Governments, Police Radio Services, and many private individuals including the Motion Picture Radio Service. A typical usage for these frequencies and licenses are for radio stations in case of emergencies when broadcasting on the normal licensed channels is not possible.

Joe Levin, Chief of Policy and Planning Branch, Private Radio Bureau, Land/Mobile/Microwave Division of the Federal Communications Commission [(202) 634-2443], mentioned several services currently offered, including Auxiliary Broadcast, Special Industrial, and Special Emergency. He acknowledged the trend to use higher frequencies, but was not able to comment on whether he saw an increase, or decrease of the use of the particular frequencies in the range from 2.2 MHz to 3.0 MHz.

4.2 Description of the users

A private organization, Interactive Systems Inc. of Arlington Virginia, is contracted by the FCC to hold a complete database with a detailed description of all the licenses currently listed held under the FCC rules.

From the information provided by Interactive Systems Inc. (ISI), data was tabulated to determine several factors: 1) A description of the licensees; 2) The location of the transmit stations; and 3) A determination of whether usage in the services is increasing or decreasing. The following data was obtained from the ISI database:

Only the following services currently hold licenses using these particular frequencies (please note that this list does not include current aviation and maritime licenses):

BA - Auxiliary Broadcast
IP - Petroleum
IS - Special Industrial
PL - Local Government
PO - Forestry Conservation
PP - Police
PS - Special Emergency

Each of the above frequencies is licensed under Part 90 of CFR 47. The Auxiliary Broadcast licensees (BA) are broadcast stations which, if a disruption occurs, could endanger life or public property. Operation in the frequency range from 2.2 MHz to 3.0 MHz may include transmission of messages only during the periods when normal circuits are inoperative due to circumstances beyond the control of the licensee. During such periods, the station would transmit any communication which would be carried by the regular circuit.

Licensees under the Petroleum Radio Service (IP) may include persons primarily engaged in prospecting for, producing, collecting, refining, or transporting by means of pipeline, petroleum or petroleum products (including natural gas). The communications may include two-way communications, both mobile and base.

The Special Industrial Radio Service (IS) may be used by: Farmers (for the production of crops or plants, vines or trees, plowing, soil conditioning and harvesting, spraying or dusting of insecticides, herbicides, or fungicides), Ranchers (for livestock breeding services, grazing and feeding of livestock), Miners (for the gathering or recovery of solid fuels, minerals, metal, rock, sand and gravel), Petroleum Distributors (including the maintaining, patrolling or repairing gas or liquid transmission pipelines, tank cards, water or waste disposal wells, industrial storage tanks), and Heavy Contractors (including construction of roads, bridges, sewer systems, pipelines, airfields).

The Local Government Radio Service (PL) may be allowed to operate between 2.2 MHz and 3.0 MHz in order to operate radio stations for the transmission of communications essential to official activities of the licensee. The Forestry-Conservation Radio Service (PO) is provided for radio stations for transmission of communications essential to official forestry-conservation activities. The Police Radio Service (PP) provides for radio communications essential to official police activities.

The Special Emergency Radio Service (PS) allows usage of the frequency range from 2.2 MHz to 3.0 MHz for the following agencies: Public Safety National Plan (although the principal spectrum resource for the National Plan is the 821 - 824 MHz and the 866 - 869 MHz bands), Medical Services (for the delivery or rendition of medical services to the public), Rescue organizations, Physically handicapped, Veterinarians, Disaster relief organizations, School buses, Beach Patrols, Establishment in isolated areas, Communications standby facilities, emergency repair of public communications facilities, and Paging operations (only authorized outside 75 miles of major cities). Please note that the frequencies between 2.2 MHz and 3.0 MHz are assigned on a secondary basis to the frequencies licensed under Part 80 (Maritime Services).

Part 90 also offers many additional frequencies for communication for each of the users identified in the ISI database. The density of the channels between 2.2 MHz and 3.0 MHz with respect the frequency bands shown below has not been investigated. A list of the general frequency bands is provided in the following table.

Other Frequencies Assigned to Licensed Users		
Symbol	**Group**	**Frequencies**
BA	Auxiliary Broadcast	3.201 - 48 MHz, 72 - 76 MHz, 150 - 170 MHz, 220 - 222 MHz, 450 - 470 MHz, and 806 MHz + above
IP	Petroleum	1.614 - 2.200 MHz, 4637.5 MHz, 25 - 222 MHz, 406 - 512 MHz, and 806 MHz + above
IS	Special Industrial	3 - 25 MHz, 30.6 - 50 MHz, 72 - 76 MHz, 150 - 174 MHz, 216 - 220 MHz, 406 - 512 MHz, and 806 MHz + above
PL	Local Government	530 kHz - 1.7 MHz, 3.0 MHz - 10 MHz, 37 - 45 MHz, 72 - 76 MHz, 150 - 174 MHz, 220 - 222 MHz, 450 - 512 MHz, 806 - 824 MHz, 851 - 869 MHz, 928 MHz + above
PO	Forestry Conservation	30 - 32 MHz, 44 - 45 MHz, 72 - 76 MHz, 150 - 172 MHz, 220 - 222 MHz, 450 - 512 MHz, 806 MHz + above
PP	Police	0.851 - 1.730 MHz, 37 - 46 MHz, 72 - 76 MHz, 150 - 173 MHz, 220 - 222 MHz, 450 - 512 MHz, 806 MHz + above
PS	Special Emergency	3.201 MHz, 33 - 48 MHz, 72 - 76 MHz, 150 - 172 MHz, 220 - 222 MHz, 450 - 470 MHz, 806 MHz + above

4.3 Number of Users within Service

A table was generated to show which services of Part 90 use the 2.2 MHz to 3.0 MHz frequency range. A total of 7 services currently use this band, although a total of nine may apply for a station license.

Each of the licensed services is detailed in CFR 47, Part 90. The active services are as follows:

Usage of the Frequencies by Service						
BA	**IP**	**IS**	**PL**	**PO**	**PP**	**PS**
12	78	23	1801	6	6	9

KEY:

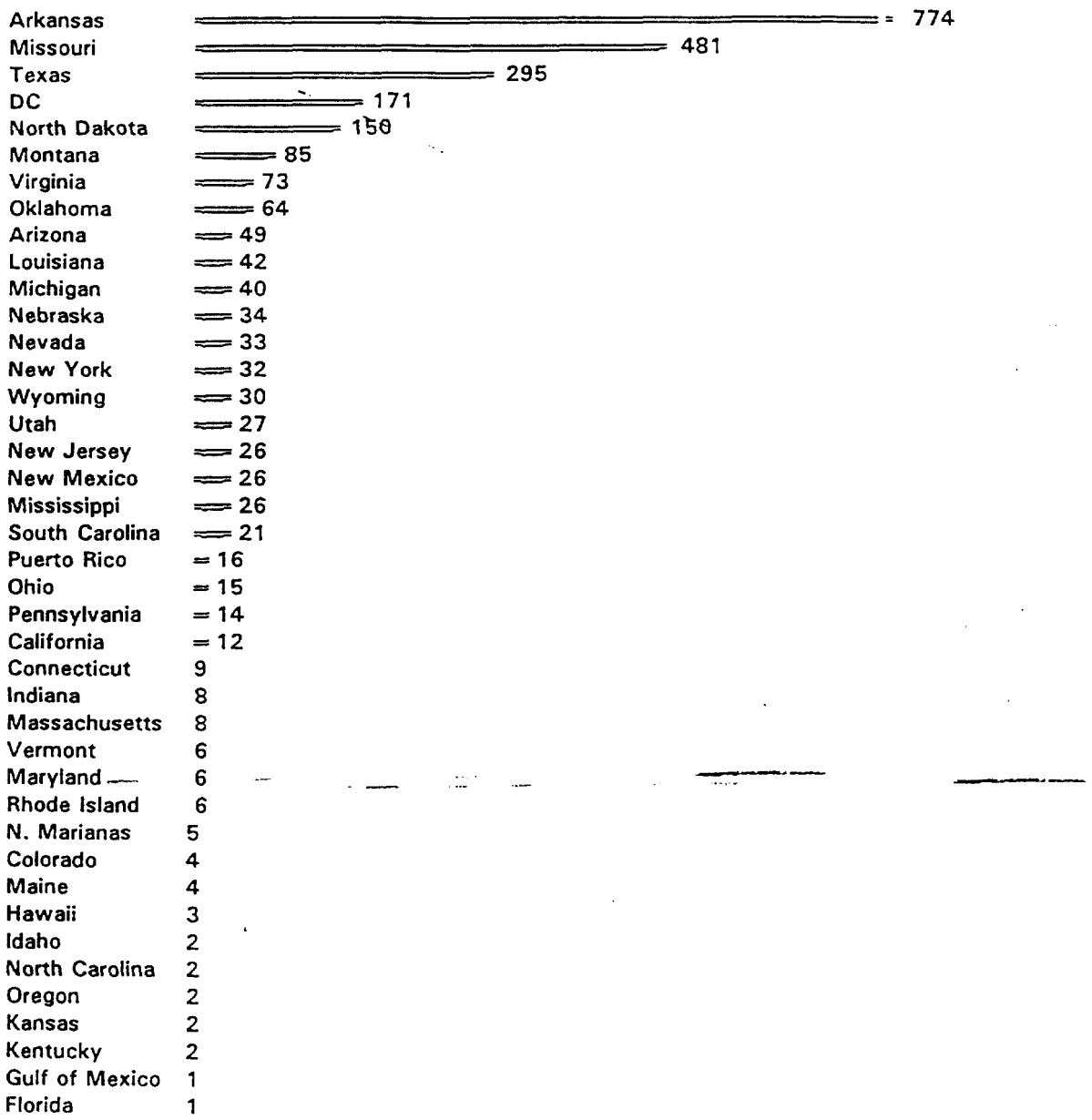
BA - Auxiliary Broadcast
IP - Petroleum
IS - Special Industrial
PL - Local Government
PO - Forestry Conservation
PP - Police
PS - Special Emergency

Usage of the Frequencies by State									
AK	AL	AS	AX	AR	CA	CO	CT	DE	DC
774	0	0	49	0	12	4	9	0	171
FL	GA	GM	GU	HI	ID	IL	IN	KS	KY
1	0	1	1	3	2	0	8	2	2
LA	MA	MD	ME	MI	MN	MO	MP	MS	MT
42	8	6	4	40	0	481	5	26	85
NC	ND	NE	NH	NJ	NU	NM	NV	NY	OH
2	150	34	0	0	26	26	33	32	15
OK	OR	PA	PR	RI	SC	SD	TN	TX	UM
64	2	14	16	6	21	0	0	295	0
UT	VA	VI	VT	WA	WI	WV	WY		
27	73	0	6	21	0	0	30		

KEY

AL	Alabama	IN	Indiana	NY	New York	WV	West Virginia
AK	Alaska	IA	Iowa	NC	North Carolina	WI	Wisconsin
AZ	Arizona	KS	Kansas	ND	North Dakota	WY	Wyoming
AR	Arkansas	KY	Kentucky	OH	Ohio	AS	American Samoa
CA	California	LA	Louisiana	OK	Oklahoma	GU	Guam
CO	Colorado	ME	Maine	OR	Oregon	UM	Midway Island
CT	Connecticut	MD	Maryland	OR	Oregon	MP	Northern Mariana Islands
DE	Delaware	MA	Massachusetts	PA	Pennsylvania	PR	Puerto Rico
DC	District of Columbia	MI	Michigan	RI	Rhode Island	VI	Virgin Islands
FL	Florida	MN	Minnesota	SC	South Carolina	UM	Wake Island
GA	Georgia	MS	Mississippi	SD	South Dakota		
GM	Gulf of Mexico	MO	Missouri	TN	Tennessee		
HI	Hawaii	MT	Montana	TX	Texas		
ID	Idaho	NE	Nebraska	UT	Utah		
IL	Illinois	NV	Nevada	VT	Vermont		
		NH	New Jersey	VA	Virginia		
		NM	New Mexico	WA	Washington		

Usage of the Frequencies by Location



The largest user of the Part 90 service within 2.2 MHz to 3.0 MHz is local government (PL). This user commonly uses both base units and mobile units. The information transmitted is general information which is required to successfully operate the organization. Communication is not limited to emergency situations. However, the majority of the licenses are held by the Emergency Management Divisions of the particular states.

4.4 Service Usage - Increasing or Decreasing

In an attempt to predict whether usage of this particular frequency band is increasing or decreasing, two approaches were taken. First, the licensing database was carefully reviewed to determine the number of applications prepared according to dates and also the number of application expirations per date. A table and graph are provided for both the license issue date and the license expiration date. Also, the database was carefully reviewed to determine the number of modification filings (change of frequency assignments), the number of station renewals, and the number of new licenses issued.

Date of License Issuance					
1989 and Before	**1990**	**1991**	**1992**	**1993**	**1994**
133	468	127	540	481	165 *

* Please note that the data is incomplete for 1994

Date of License Expiration					
1994 and Before	**1995**	**1996**	**1997**	**1998**	**1999**
155	468	131	522	495	167 *

* Please note that the data is incomplete for 1999

Licenses for these services are issued for a 5 year period. The date of expiration is proportional to the date of license issuance. Please see the graphs on the following pages which clearly show the number of license issued, and shows their renewal dates.

Three other parameters were investigated over the years from 1989 through 1993: 1) the amount of modification filings; 2) the number of station renewals; and 3) the number of new applications.

Modification Filings					
1989 and Before	**1990**	**1991**	**1992**	**1993**	**1994**
62	134	37	42	20	*

* No data accumulated

Application Renewals					
1989 and Before	**1990**	**1991**	**1992**	**1993**	**1994**
0	0	14	66	268	165*

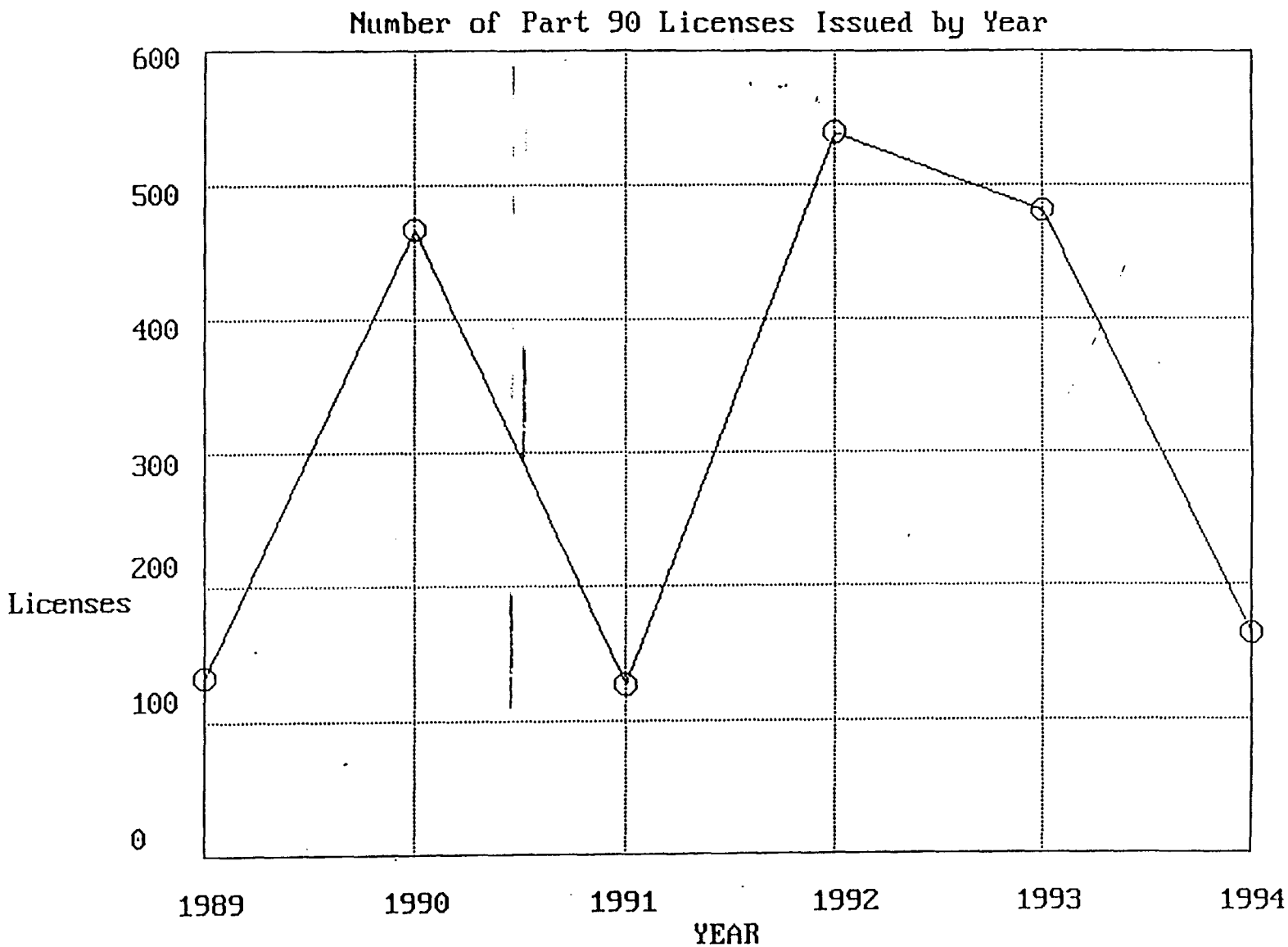
* Incomplete Data

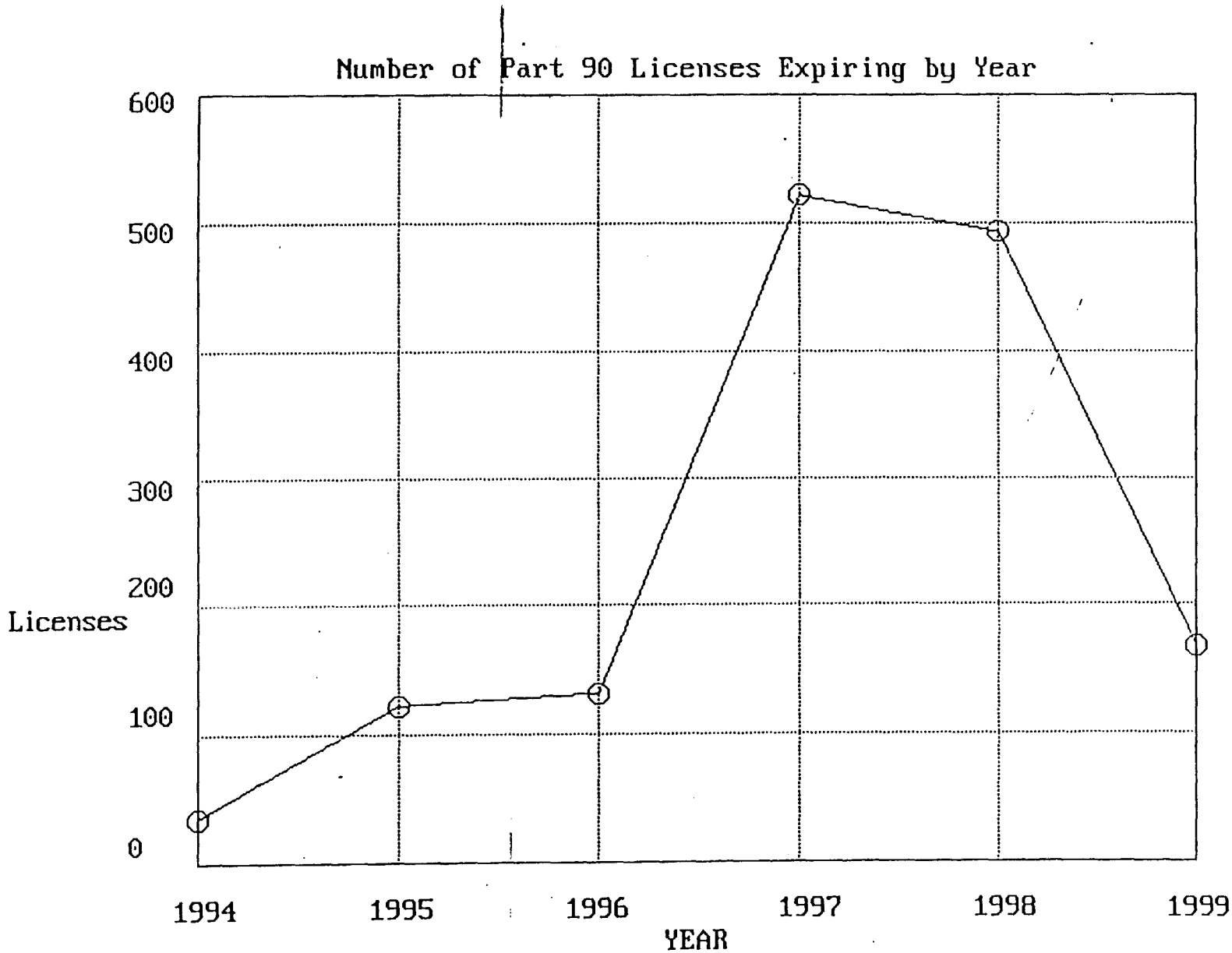
New Station Licenses Issued					
1989 and Before	**1990**	**1991**	**1992**	**1993**	**1994**
16	322	72	407	178	*

* No data accumulated

The number of modification filings has decreased significantly over the past few years, possibly due common changes in frequency. New application requests have risen steadily, over the past five years. From 1989 and 1991, a total of 338 new requests were recorded. For 1992 and 1993, a total of 585 new requests were recorded.

From review of this information, it appears that usage of the Part 90 bands is increasing, but not drastically. Users in these bands are few (less than 2000 across the United States) and are mostly government organizations, whether local or state branches.


Number of Part 90 Licenses Issued by Year
600
500
400
300
200
100
0
Licenses
1989
1990
1991
1992
1993
1994
YEAR


Number of Part 90 Licenses Expiring by Year
600
500
400
300
200
100
0
Licenses
1994
1995
1996
1997
1998
1999
YEAR

The second approach was to determine from the FCC administration what was the status for each service within the frequency range from 2.2 MHz to 3.0 MHz. Several contacts with the FCC were required to identify three specific individuals.

Exhibit 3.3 briefly discusses the conversations with the FCC. Of the International Fixed Public Radio Communication Services, no frequencies were being used. From a Part 23 standpoint, the band from 2.2 MHz to 3.0 MHz was wide open.

The representative from the Maritime/Aviation Services, Sean White, had mentioned several services, particularly for Emergency Distress signals. Services are offered in the Maritime Service for ship-to-shore communications, as well as ship-to-ship emergency communications. The Aviation Services offer communication from aircraft to ship within the frequency range from 2.2 MHz to 3.0 MHz.

Joe Levin, of the Private Land Mobile Service, expressed several areas with current usages. Licenses in general are for emergency usage, and consist of both base and mobile transceivers. From review of the ISI database, approximately 2000 current licenses are held under FCC Part 90.

4.5 Complaints of Interference

The volume of complaints for interference in this band is currently being investigated. A request was issued to the Field Office Bureau of the FCC in an attempt to determine, nationwide, the volume of complaints. The volume of interference complaints is yet to be determined. The request was forwarded to the Office of the Managing Director, Federal Communications Commission, 1919 M. Street N.W., Washington DC, 20554. Larry Clance, Attorney Advisor to the Bureau Chief, Field Office Bureau, is working on obtaining this information. We expect a response from the FCC shortly.

5.0 Possibility of Interference by EFL

In general, the base stations are to be present at any commercial location in the continental United States. The mobile stations may be present anywhere, but mainly outdoors. Although the mobile stations may, at times, enter a facility, whether non-consumer (commercial or consumer environments, most emergency situations where the licensee could operate from 2.2 MHz to 3.0 MHz (as covered by Part 90 of CFR 47) would occur outside of the facility. Also, all mobile transceivers operated under the Maritime, Aviation, and International Services would not be within a consumer or non-consumer facility.

The Electrodeless Compact Fluorescent Lamp would not likely cause interference to emergency communications at the mobile transceiver end of the system. Any possible interference would occur at the base station end.

5.1 The Noise Floor

The noise floor within this range varies dependant on the location of the service. The noise floor was measured using a spectrum analyzer and active monopole (E-field) antenna. The bandwidth of the spectrum analyzer was selected at 1 kHz and 3 kHz. Measurements are reported as measured with a quasi-peak detector and an average detector.

Noise Floor Measurements				
	1 kHz Resolution BW		3 kHz Resolution BW	
Location	Quasi-Peak	Average	Quasi-Peak	Average
Boston Massachusetts	2.505 MHz 7 dBμV/m	2.505 MHz 4 dBμV/m	2.505 MHz 13 dBμV/m	2.505 MHz 9 dBμV/m
Belmont California	2.592 MHz 2 dBμV/m	2.592 MHz 0 dBμV/m	2.592 MHz 7 dBμV/m	2.592 MHz 4 dBμV/m

From the above table, the average noise floor was observed to be approximately 2 μV. The standard sensitivity of a receiver ranges between 5 μV to 15 μV, which is approximately 8 dB (assume 6 dBμV noise floor, higher than the noise floor in that band.