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April 20, 1995

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William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

DOCKET FILE COPY ORIGINAL

Re: Ex Parte Communication in PR Docket No. 92-235

Dear Mr. Caton:

Pursuant to Section 1.1206 of the Commission's Rules, please be advised that on April 20, 1995, Mr. Michael Bayly, North American Business Development Manager for Securicor Linear Modulation Ltd., and Robert B. Kelly and Ashby Beal of Kelly & Povich, P.C. met with Greg Rosston of the Office of Plans and Policy and Jackie Chorney and Jay Markley of the Wireless Telecommunications Bureau to discuss issues related to the above-captioned proceeding. The attached comments were distributed to staff.

Sincerely,

Robert B. Kelly

Enclosure

cc (without encl.): Greg Rosston
Jackie Chorney
Jay Markley

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FEDERAL COMMUNICATIONS COMMISSION
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Ex - Parte filing
by

Securicor Linear Modulation Technology Ltd

re

PR Docket # 92-235

"Re-Farming Spectrum below 512 MHz"

20 April 1995

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0. INTRODUCTION

Securicor believes that the opportunity afforded to the FCC and the United States of America, by the FCC's PR Docket #92-235, for Re-Farming the spectrum below 512 MHz, is a responsibility of truly great proportions. The consequences for decisions made will affect and reflect on the US's ability to make rules that will affect the country and potentially the world over the next 2 or 3 decades. It is a decision that will be made only after exhaustive discussions and comments, many by vested interests. It would be easy to delay or even put off such a decision, but the consequences of this will be to make a difficult task almost impossible later.

We respectfully submit our thoughts and proposals after discussions already held with FCC Officers, users, manufacturers and other interested parties. We believe we are able to offer a broad and relatively unbiased view, from the perspective of both a manufacturer and a large scale user - a somewhat unusual combination.

The Government of the United States of America through the FCC has a desire to maximize revenue from use of the Radio Spectrum. We believe the solutions offered here will achieve this goal without relinquishing the spectrum to the highest bidder, a mechanism we believe is not wholly appropriate to all parts of the spectrum. We believe there has to be fair access to this most valuable of resources; which is not ownable, only regulatable; but with responsible use where permitted. Pricing can play an important role and we offer, we believe, a novel solution. A recent study in the UK has shown that approx. 3% of GDP is attributable to the use of efficient mobile communications.

Our solution is to split the spectrum into 2.5 kHz blocks and to price it accordingly. This could be: by auction for a license of given duration; for a block of spectrum in a given location; for particular channel blocks on an annually renewable license; the combinations are considerable. We believe no class of user, including Local Governments, should have preferential treatment on pricing. This would help to ensure efficient use and a reduction in channel hoarding.

But by using our proposed method of channel splitting and pricing, different technologies and channel spacings can be used. The user decides and the FCC has made it possible by the rules. The use of any particular technology should not be the concern of the regulator and we appreciate all the efforts being made by the FCC to be able to accommodate different technologies. We believe our recommendations will help in making not just today's technologies available but also future, as yet unknown, technologies.

1. STATEMENT OF INTEREST

1.1 Securicor Linear Modulation Technology Ltd. is a wholly owned subsidiary of Securicor Communications Ltd., London, England. Securicor is a broadly based UK corporate company whose holdings include over-night parcels (the largest in the UK - greater than the Postal Service); security services of cash-in-transit, guarding, alarms, etc.; telecommunications products and services, with a 40% holding in one of the 2 UK National cellular radio networks; hotels and manufacturing interests world wide; with gross income approaching 1.5 billion dollars US. Securicor Radiocoms Ltd., another Communications Division Company, manufactures and operates radio systems for its Group internal operations and also provides commercial services for hire through its interests in other companies, in the USA and UK and other countries throughout the world. It designed, installed and now maintains the radio communications systems for the whole ground operations at London's Heathrow Airport, the busiest in the World.

1.2 In the USA, we have an interest in two telecommunications manufacturers and in various wireless commercial dispatch operations. We hold manufacturing rights to highly spectrum efficient, Very Narrow Bandwidth Radio (VNBR) technologies currently employed in the 220-222 MHz band, and we have licensed these rights to other US manufacturers to ensure dissemination of the technologies. Further, we are actively seeking deployment of these technologies to resolve some of the problems in other radio bands the FCC identified in this rule making proceeding.

1.3 We have no hidden agenda in this matter. We are in business to make a profit. We believe that of the currently manufactured dispatch radio products, ours are the most highly flexible and spectrum efficient. However, we will adopt and adapt new technology in every phase of our operations when it makes sense economically to do so. We are willing and able to compete with other manufacturers in fair and open competition, and we ask that you structure the dispatch rules to permit such competition consistent with your desire to have the widest range of communications options available.

2. SUMMARY

2.1 In this paper we provide additional information not available in any of the previous documents associated with PR Docket 92-235. We have analyzed data from several different sources to help us understand both the technological and economic bases and the vast quantities of comments from individuals as well as licensees and trade associations. In some cases commenters have provided well reasoned, technologically sound responses. In others, the reactions of commenters have been visceral -- either from concern about losing privilege or concern about being subjected to runaway added costs for continued radio system operation.

2.2 One thing is clear. A number of commenters don't want the dispatch radio functions of today changed. Even the trade organizations such as APCO, UTC and others prefer to see only marginal changes in technology -- changes that leave these services far behind their potential. Even when confronted by revolutions in office automation, the explosion in global telecommunications capability and the high level of interest at the individual consumer level of continuous universal contact while in motion, these groups and individuals want voice dispatch as their primary choice, but in a bandwidth far exceeding the minimum required to transmit intelligible high quality voice.

2.3 Most of the commenters understand FM radio. Fewer understand the technological improvements that come from modulation methods permitting replication of wireline performance in a wireless environment. Their concern is understandable, if in error. We need some constants in life.

2.4 Now, however, in dispatch radio communications we find we must continually adapt to advanced technologies or be faced with the prospect that other highly advanced wireless services will shortly so eviscerate these dispatch services that there won't be any significant requirement for them. If there is no significant requirement for them, the spectrum will be reassigned to wireless services that need spectrum when the demand can no longer go unanswered. The old saw "Use it or lose it" was never more appropriately applied. But only by providing a firm lead will the industry be able to make the move forward it will have to make to remain viable in the future. For the threat from other nations able to take on new technologies at a faster pace will quicken and the US Communications Industry cannot afford that.

2.5 And THOSE are the only choices. A choice of *status quo* is a choice for the latter. A choice for less than the most highly efficient message transfer technologies currently in the research and development laboratories is also a choice for the latter, though not as dramatic. Only a choice for highly efficient technologies, both analog and digital, can carry us beyond the next five years or two levels of microprocessor development, whichever comes first.

2.6 We are convinced that rapid adoption of technologies that do not offer a fourfold or better improvement in message carrying capability spells disaster for the dispatch services. Focusing only on "proven" manufacturers and their current offered technologies will not keep dispatch services from their inevitable decline.

2.7 Our examination has taken us in a couple of directions. In the next few pages, we will examine several factors, lay out our case and provide a meaningful way to get to the next real generation of dispatch services.

3. SPECTRUM ISSUES

Perhaps the most significant long term request (almost 50 years) from wireless communications operators is for more spectrum. "Spectrum " is directly translatable to more talk paths or assignable channels. The FCC's NPRM identified increase in channel capacity as a primary reason for adoption of the NPRM, and the recent successful series of PCS license auctions indicate that operating privileges have great value. There is plenty of spectrum within the present allocations if it is used efficiently, according to Robert J. Matheson [in his paper, Spectrum Stretching: Adjusting to an age of Plenty, IVHS Journal, 1994, Vol. 1 (4), pp. 397 - 407]. Matheson, a senior scientist at NTIA's Boulder, CO laboratories, estimates that using today's technology, we can expect a 500 fold increase in spectrum capacity.

Because there are three physical elements to a talk path (spectrum, time and distance between transmitter and receiver), radio systems and products have been designed to operate efficiently at the maximum distance, holding both occupied spectrum and time as constants. With current technology all three elements can be controlled to achieve efficient communications. Spectrum requirements can be reduced to less than the normal voice bandwidth and still be intelligible through voice band compression techniques, either as analog or digital signals. Similarly, store and forward techniques can be applied to transmit voice or data in pseudo real time, and techniques such as adaptive antennas and power control can be applied to provide only enough signal to achieve the required distance. Admittedly all these are not yet in full scale production for dispatch services, but the longevity of the rules to be adopted in this Docket must take these probabilities into account.

3.1 **Frequency bands.** The frequency bands of significance in which major changes in structure and capacity are proposed are the 72 - 76 MHz band, the 150 - 174 MHz band and the 450 - 470 MHz band. In our view, the 150 - 174 MHz band needs dramatic action. Its structure reflects the one frequency simplex structure of the dispatch services of the 1940's. Paired channels promote spectrum efficiency and should be provided for within this band. Two other bands are also proposed to be changed. However, the 421 - 430 MHz band and the 470 - 512 MHz band are severely restricted geographically, and equipment and systems designed to operate in these bands are essentially the same as those available for the 450 - 470 MHz band.

3.1.1 72 - 76 MHz. In this band, the frequencies are channeled at 20 kHz. Channel spacing in the proposed new rules is set at 5 kHz for low power mobile operation, with 2.5 kHz between fixed and mobile assignments. We recommend that the channelization for both fixed and mobile services in this band be the same. Our recommendation would begin channel assignment at 72.00125 MHz, proceeding through 75.99875 MHz in 2.5 kHz increments, with functional assignments virtually identical to those the FCC proposed.

3.1.2 150 - 174 MHz. The utility of the 150 - 174 MHz band can be improved markedly if a scheme of regular pairing of frequencies is implemented. The most significant problem in frequency reuse is base station to base station interference. Two frequency operation removes this mode of interference and promotes better spectrum efficiency as well as operational efficiency. This band has a variety of users and uses, all of which can be accommodated in a new scheme.

We recommend that channeling of this band begin at 150.7625 MHz and proceed in 2.5 kHz increments. Further, we recommend a mobile frequency 4 MHz above the base / mobile frequency to facilitate the practical design and construction of repeater systems with cavity resonators and similar transmission line filter products. In the vicinity of special frequencies for paging and mobile only systems where pairing may not be practical, the channeling plan can continue at 2.5 kHz increments in simplex, with channnels allotted to the existing functions. For example, in the present plan, there are 12 frequencies allotted for paging as the primary function. Under our plan, there could be more than 100 frequencies allotted for paging.

3.1.3 450 - 470 MHz, 421 - 430 MHz and 470 - 512 MHz. These three bands currently operate with essentially the same equipment, the principal difference being that for the 470 - 512 MHz band, the spacing between the base / mobile frequency and the mobile frequency is 3 MHz rather than 5 MHz. Both the 421 - 430 MHz band and the 470 - 512 MHz band are available in a very limited number of urban areas -- 3 for the 421 - 430 MHz band and 13 for the 470 - 512 MHz band. Therefore, the markets for equipment especially designed for these bands are limited. The FCC proposed to use the same channel separation for all three bands.

We recommend 2.5 kHz as the appropriate spacing rather than 6.25 kHz to provide 10 times the number of assignments permitted today. The greater number of possible assignments will provide the competition, market size and diversity of offerings available to meet demand. To demonstrate the advantages, let's look at the 421 - 430 MHz band. Currently, there are 112 paired channels and 20 unpaired frequencies. The FCC proposed 448 paired and 80 unpaired using 6.25 kHz spacing. If our recommendation is applied, and the first channel is centered at 422.1900 MHz, then Cleveland and Detroit would have a total of 1120 paired channels and 200 unpaired frequencies available, and Buffalo would have the 200 unpaired and approximately half the number of paired channels. Similar improvements in channel availability would occur in the 450 - 470 MHz band and in the 470 - 512 MHz band.

3.2 **Implementation.** Central to the issue of creating more assignable channels is the implementation of their use. Except for the 470-512 MHz band, applicants must be accommodated. Few provisions exist to deny requests for license. The FCC's proposal to reduce the number of separate radio services aids implementation and makes a larger number of channels available, thereby leveling the density of stations per unit area and frequency. Additionally, the logical beginning of the transition to new technologies and bandwidth is with new licensees whose assignments are located to

minimize interference to the existing environment. In the 72-76 MHz band, that is 10 kHz off the existing center frequencies. Although this location lies squarely on the R/C model frequencies in Part 95 of the FCC Rules, 47 CFR 95.623, the use of these frequencies on a secondary basis by modelers is typically at low powers and occaisional and thus not likely to experience significant disruption. See 47 CFR 2.106 footnote NG56 and 47 CFR 95.207(d) and (g), and 47 CFR 90.257(c).

In the 150 - 174 MHz band, the proper location is at least 7.5 kHz offset from the existing center frequencies. For most of this band, the current channels are 30 kHz wide, spaced on 15 kHz centers and assigned at least 7 miles apart between stations 15 kHz adjacent in frequency, but without restriction on co-channel assignment. Spacings greater than 7.5 kHz provide additional isolation when they are available.

For the 421-430 MHz band and the 470 - 512 MHz band, new assignments should be at least 10 kHz offset from the existing frequencies. These bands do not offer offset frequency assignments, and the best overall choice would be to begin the transition at 12.5 kHz offset, with second and subsequent assignments at 10 kHz increments using mileage spacing from the 12.5 kHz offset.

In the 450-470 MHz band, low power mobiles and fixed stations are authorized on 12.5 kHz offset frequencies. Except for 10 frequency pairs in the Special Industrial Radio Service, all assignments on the offsets are secondary to land mobile operation. See FCC rule sections 90.261(a) and 90.267(a)(2), 47 CFR 90.261(a) and 90.267(a)(2). Therefore, initial assignments for the band should also be made at 12.5 kHz and 10 kHz from the land mobile frequencies. For the 21 channel pairs in the Special Industrial Service, although they have primary status, the current rules do not grant exclusive use and the principles of channel sharing are recommended to be carried through to the new rules. Thus initial assignments should also start at either 12.5 kHz or 10 kHz from the 11 land mobile channels.

In summary, there has been no guarantee of the quality of service in these bands and less harm will be done to the existing licensees by the addition of highly efficient technology than there would be in the continuation of the existing analog and digital FM technology.

4. LICENSING ISSUES

The way licensing is approached is as important as the technology. The NPRM provides incentives in the form of additional channels for existing licensees who are early adopters of more spectrum efficient technology. It seems to favor exclusive assignments. It permits trunking, which, while not in any way conserving of spectrum or frequency reuse, reduces the perception that all frequencies are occupied. It sets aside spectrum for innovative technology, and it sets limits for antenna height and effective radiated power.

The recommended approach fails to take advantage of the value of licenses in the dispatch services. As has been amply demonstrated by the FCC's auctions, licenses have significant value. Economic incentives should also include cost avoidance. The licensing process itself should be a tool to encourage early adoption of new technology by means of graduated fees.

Currently, licensees have little incentive to adopt new technology unless efficiencies in the overall business operation occur due to the adoption. There are no costs associated with the licensing of more mobiles than are in operation, use of multiple channels, inefficient dispatching practices, claims of large areas of operation and high spectrum power density.

Annual renewal fees set at levels more properly reflecting the value of a license, and based on the amount of spectrum, number of units and occupancy as well as the service area, will also encourage an early adoption of highly efficient technology in the licensee's primary service area. Using electronic filing and electronic funds transfer, renewals can be processed nearly automatically and at very low added cost.

Further, proper fee structures will encourage the license modifications and updates to the database necessary for good spectrum management. Commercial service providers who resell access to the spectrum should be willing to pay more for the opportunity to profit from the resource. Licensees who want exclusive use of a channel within a service area will evaluate the economics of exclusivity if the license fee is more than a token. Channel hoarding, the holding of an exclusive license without construction and operation of stations using the frequencies, will be diminished if it is uneconomical to do so.

Similarly, licensees who want large service areas or large amounts of spectrum should be willing to pay additional fees to obtain such privileges. If a licensee needs exclusive access to 25 kHz of bandwidth over a service area of, say, 20,432 square kilometers (a circle of 50 miles or 81 kilometers radius), the amount the licensee should be willing to pay for a license for that service area should be many times more than that for shared use of, say, 5 kHz within a service area of 817 square kilometers (a circle 10 miles or 16 kilometers in radius). Similarly, shared access to 25 kHz of spectrum in the 817

square kilometers previous example should cost significantly more than that for 2.5 kHz.

We urge the FCC to avoid the controversy surrounding backward compatibility. Dual mode capability can be designed into any radio system if the purchaser is willing to pay the costs associated with dual mode operation. For new licensees, backward compatibility is important only if they must also operate with an existing licensee whose radio system is not efficient. This can be accomplished by operation on two different radios or by one multimode radio. For early adopters of highly efficient technology, dual mode operation will likely be of little importance. Let the marketplace sort out compatibility.

Another issue of concern in the licensing process is the phase-in period for new technology. We believe the proper approach is to incent existing licensees to changeout to more spectrally efficient technology by permitting them to benefit from some of the increased channel capacity resulting from their changeout. Early adopters could be allowed, for example, to retain more channel blocks on a primary basis than later adopters. Existing licensees should retain a minimum of two contiguous 2.5 kHz blocks per existing channel. Those licensees should be allowed to continue on a secondary basis on their full bandwidth. If this licensing approach is applied, users of today's less efficient technology will be able to continue using it until they are required by their own operational requirements to exchange it for highly efficient technology. The FCC would simply set a time adequate to amortize the value of the system to determine the migration paths of the existing licensees, and might use the US tax code to help it make that determination.

In rural areas, for example, it might be 20 years or more before a licensee would exchange 25 kHz analog equipment for a system using less bandwidth, even though their system had been secondary for many years but without interference. In an urban area, a licensee might find it economic to change to a more efficient system when the system was fully amortized for tax purposes and operation of the system was thought to be hampered by its coprimary status in, say, 3 years.

We agree that early adopters of highly efficient technology should be granted some form of special dispensation. However some of the benefits of the increased channel capacity should flow to the public as well in the form of both capacity or new private systems and possibly, enhanced federal revenues through the auctioning of new commercial capacity. Another method that warrants serious consideration that may benefit existing licensees, one that would continuously encourage licensees to adopt more efficient technology and systems designs as they are developed, is to waive fees for the license term. Again, our recommendation is based on the economic constraints associated with the use of a tool.

5. FREQUENCY COORDINATION

Frequency coordinators are likely to continue to play an important role in the migration of the private mobile radio services to the new band plan. If the FCC is to regulate and evaluate frequency selection and coverage for a particular application, it should set measurement criteria against which an application can be tried.

One methodology available to the public is the Microcomputer Spectrum Analysis Model, MSAM, produced by NTIA and offered to the ITU. This model incorporates several spectrum management models for various frequency bands and radio services. An additional document, A Survey of Relative Spectrum Efficiency of Mobile Voice Communications Systems, NTIA Report 94-311, by R. J. Matheson, US Department of Commerce, National Telecommunications and Information Administration, provides the understanding required to establish measurement methods for comparison of spectrum efficiencies.

We believe the implementation of such tools are essential to a license pricing approach and also provide the capability to evaluate and lend uniformity to coordinator performance.

6. MIGRATION

In the UK we have made a number of channel spacing changes in different bands and at different times. The first change was from 25 kHz to 12.5 kHz in the VHF bands in the late 1960's and early 70's. It was a long process and at the time was the only move that could be made. Technology was, relative to today's advancements, basic. We had a mixture of both AM & FM systems. Looking at the FM experience, deviations were turned down but also receiver IF filters had to be altered. The design of equipments currently in use in the US means that old equipments probably cannot be modified for the receivers even though deviation could be turned down. Without modifying the receivers, users would experience a very poor performance compared to what they currently enjoy. More modern equipments have a dual channel facility allowing a change to 12.5 kHz. BUT most do not know they would experience, *worse* range, voice quality and data performance - many Mobile Data Systems made for 25 kHz would not operate reliably at 12.5 kHz.

The second move was in the UHF 450 MHz band when again spacings were reduced from 25 to 12.5 kHz. This was during the late 80's.

So whilst many users believe that a first move to 12.5 kHz FM systems would be an easy transition, it would not provide a significant increase in available channels. The FCC's own estimate is at best around 20%, a figure which could not support the rapid increases in the use of the "mobile" spectrum for the next 2 decades. Only by making a quantum leap can resource be made to match demand.

VNBR technologies having both frequency and amplitude components, of which our LM (Linear Modulation) is but one, offer a close to theoretical performance. LM enables a graceful migration by allowing new users to be "slotted" in amongst existing 25 kHz FM users. So if it is beneficial for users to go direct to 5kHz (and they will decide on performance and economic criteria) rather than through an ineffective 12.5 kHz interim step they will make that choice. A 12.5 kHz migration plan is **no** migration and cannot succeed, given the substantial growths private dispatch continues to incur. Such products like today's 25 kHz products, should only be given a very short primary status if growth is to be accommodated.

7. CONCLUSIONS

We believe the opportunity facing the Commission is daunting but must be grasped. A recent discussion group between the UK regulators and high level users concluded that the regulators have to make the decisions and that the users and manufacturers would follow that lead. No one denies that it will be a hard one, but with so much at stake for the future of US and World mobile communications a bold lead can be the only solution.

We believe we have indicated a bold solution that will enable the proponents of today's less efficient technologies to be accommodated, provides a substantial revenue stream to the Federal Government and makes the economic issues foremost in decisions by licensees. Let the user decide how best to satisfy his communications requirements on an economic and technological basis by enabling different technologies to co-exist. If spectrum is cost based then maximum efficiency will be derived. The Commission's rules should enable, not prevent, technologies.

Appendix A. BAND PLANS

As we stated earlier, a properly chosen band plan and automation of the evaluation process will resolve most of the technical issues of migration. To clarify our recommendations, we are providing sample channel plans for all the previously mentioned bands.

Indented frequencies indicate interstitial frequencies that may be assigned with geographic spacing much as today's offsets are assigned. Frequencies marked with the symbol # are the farthest from today's channel assignments and generally are 7.5 kHz or more from either channel. Therefore, they cause and receive the least interference and should be the initial assignments, easing migration to the new plan. Frequencies marked with the symbol * are within the power envelope of frequencies 150.770 and 150.790 MHz, which are authorized from the Federal Government spectrum for Emergency Medical Radio Service use. Use of the additional frequencies may require approval of the US Department of Commerce.

72-76 MHz

Generally, the present arrangement is 20 kHz channels on 10 kHz centers beginning at 72.02 MHz through 72.98, from 74.61 through 74.79 MHz and 75.02 through 75.98 MHz. In our recommendation, we begin channeling in 2.5 kHz increments 1.25 kHz from the band edge and continue through each of the sub bands.

Frequency (MHz)	Service	Limitations	Section Listed at
#72.00125	General Category	Low Power	88.907
#72.00375	General Category	Low Power	88.907
#72.00625	General Category	Low Power	88.907
#72.00875	General Category	Low Power	88.907
72.01125	General Category	Low Power	88.907
72.01375	General Category	Low Power	88.907
72.01625	General Category	Low Power	88.907
72.01875	General Category	Fixed	88.1189
72.0200	General Category	Fixed	90.257
72.02125	General Category	Fixed	88.1189
72.02375	General Category	Low Power	88.907
72.02625	General Category	Low Power	88.907
72.02875	General Category	Low Power	88.907
#72.03125	General Category	Low Power	88.907
#72.03375	General Category	Low Power	88.907

* * * * *
* * * * *

72.40625	General Category	Low Power	88.907
72.40875	General Category	Low Power	88.907
#72.41125	General Category	Fixed	88.1189
#72.41375	General Category	Fixed	88.1189
72.41625	General Category	Fixed	88.1189
72.41875	General Category	Fixed	88.1189
72.42125	General Category	Fixed	88.1189
72.42375	General Category	Fixed	88.1189
#72.42625	General Category	Fixed	88.1189
#72.42875	General Category	Fixed	88.1189
72.43125	General Category	Fixed	88.907
72.43375	General Category	Fixed	88.907

* * * * *
* * * * *

75.97875	General Category	Fixed	88.1189
75.9800	General Category	Fixed	90.257
75.98125	General Category	Fixed	88.1189
75.98375	General Category	Fixed	88.1189
75.98625	General Category	Fixed	88.1189
#75.98875	General Category	Fixed	88.1189
#75.99125	General Category	Fixed	88.1189
#75.99375	General Category	Fixed	88.1189
#75.99625	General Category	Fixed	88.1189
#75.99875	General Category	Fixed	88.1189

* * * * *

150-174 MHz

Present arrangement

All frequencies except those in Taxicab Radio Service (5.260 MHz separation) are arranged as single frequency simplex assignments. Pairing for two frequency simplex operation is permitted only in the Public Safety and Taxicab services.

Frequency groupings and spectrum

150.760 - 152.030 = 1.270 MHz
152.255 - 152.495 = 0.240 MHz
152.865 - 156.255 = 3.390 MHz
157.435 - 157.755 = 0.320 MHz
158.115 - 158.475 = 0.360 MHz
158.715 - 161.580 = 3.390 MHz

12 frequencies within the above ranges are paging only.
The frequency bands 156.005 - 156.265, 157.410 - 157.440, 160.610 - 160.965 and 161.485 - 161.590 overlap the VHF marine frequencies. Under the current assignment plan, they are assigned to railroad use.

Plan

Place mobiles on the higher frequencies, same as the 450 MHz and 220 MHz frequencies. Ignore the current service classifications except Public Safety for reassignment purposes. Provide duplex operation using an offset between base and mobile of 4 MHz. Non-paired frequencies are categorized as low power simplex mobile or one way paging, depending on whether they are categorized as mobile or base frequencies today.

New assignment Pools	Converted from	
*150.7625 / 154.7625 (Pub)		
* 150.765 / 154.765		
*150.7675 / 154.7675 (Pub)		
* 150.770 / 154.770		154.770 mo / PP
*150.7725 / 154.7725 (Pub)		
* 150.775 / 154.775	150.775 mo / PM	
*150.7775 / 154.7775 (Pub)		
* 150.780 / 154.780		
*150.7825 / 154.7825 (Pub)		
* 150.785 / 154.785		154.785 mo / PP
*150.7875 / 154.7875 (Pub)		
* 150/790 / 154.790	150.790 mo / PM	
*150.7925 / 154.7925 (Pub)		

* 150.795 / 154.795		
*150.7975 / 154.7975 (Pub)		
* 150.800 / 154.800		154.800 mo / PP
150.8025 / 154.8025 (Pub)		
150.805 / 154.805		
#150.8075 / 154.8075 (Pub)		
150.810 / 154.810		
150.8125 / 154.8125 (Pub)		
150.815 / 154.815	150.815 b-m / LA (IB in VI, PR)	154.815 mo / PP
150.8175 / 154.8175 (Pub)		
150.820 / 154.820		
#150.8225 / 154.8225 (Pub)		
150.825 / 154.825		
150.8275 / 154.8275 (Pub)		
150.830 / 154.830	150.830 b-m / LA (IB Paging Only in VI, PR)	154.830 mo / PP
150.8325 / 154.8325 (Pub)		
150.835 / 154.835		
#150.8375 / 154.8375 (Pub)		
150.840 / 154.840		
150.8425 / 154.8425 (Pub)		
150.845 / 154.845	150.845 b-m / LA (IB in VI, PR)	154.845 mo / PP
150.8475 / 154.8475 (Pub)		
150.850 / 154.850		
#150.8525 / 154.8545 (Pub)		
150.855 / 154.855		
150.8575 / 154.8575 (Pub)		
150.860 / 154.860	150.860 b-m / LA (IB in VI, PR)	154.860 mo / PP
150.8625 / 154.8625 (Pub)		
150.865 / 154.865		
#150.8675 / 154.8675 (Pub)		
150.870 / 154.870		
150.8725 / 154.8725 (Pub)		
150.875 / 154.875	150.875 b-m / LA (IB in VI, PR)	154.875 mo / PP
150.8775 / 154.8775 (Pub)		
150.880 / 154.880		
#150.8825 / 154.8825 (Pub)		
150.885 / 154.885		
150.8875 / 154.8875 (Pub)		
150.890 / 154.890	150.890 b-m / LA (IB in VI, PR)	154.890 mo / PP

150.8925 / 154.8925 (Pub)		
150.895 / 154.895		
#150.8975 / 154.8975 (Pub)		
150.900 / 154.900		
150.9025 / 154.9025 (Pub)		
150.905 / 154.905	150.905 b-m / LA (IB in VI, PR)	154.905 b-m / PP State Police primary
150.9075 / 154.9075 (Pub)		
150.910 / 154.910		
#150.9125 / 154.9125 (Pub)		
150.915 / 154.915		
150.9175 / 154.9175 (Pub)		
150.920 / 154.920	150.920 b-m / LA (IB Paging Only in VI, PR)	154.920 b-m / PP State Police primary
150.9225 / 154.9225 (Pub)		
150.925 / 154.925		
#150.9275 / 154.9175 (Pub)		
150.930 / 154.930		
150.9325 / 154.9325 (Pub)		
150.935 / 154.935	150.935 b-m / LA (IB in VI, PR)	154.935 b-m / PP State Police primary
150.9375 / 154.9375 (Pub)		
150.940 / 154.940		
#150.9425 / 154.9425 (Pub)		
150.945 / 154.945		
150.9475 / 154.9475 (Pub)		
150.950 / 154.950	150.950 b-m / LA (IB in VI, PR)	154.950 mo / PP
150.9525 / 154.9525 (Pub)		
150.955 / 154.955		
#150.9575 / 154.9575 (Pub)		
150,960 / 154.960		
150.9625 / 154.9625 (Pub)		
150.965 / 154.965	150.965 b-m / LA (IB in VI, PR)	154.965 b-m / PL
150.9675 / 154.9675 (Pub)		
150.970 / 154.970		
#150.9725 / 154.9725 (Pub)		
150.975 / 154.975		
150.9775 / 154.9775		
150.980 / 154.980	150.980 b-m / IP Primary Oil Spill	154.980 b-m / PL

150.9825 / 154.9825		
150.985 / 154.985		
#150.9875 / 154.9875		
150.990 / 154.990		
150.9925 / 154.9925		
150.995 / 154.995	150.995 b-m / PH (IB in VI, PR)	154.995 b-m / PL
150.9975 / 154.9975		
151.000 / 155.000		
#151.0025 / 155.0025		
151.005 / 155.005		
151.0075 / 155.0075		
151.010 / 155.010	151.010 b-m / PH (IB in VI, PR)	155.010 b-m / PP
151.0125 / 155.0125		
151.015 / 155.015		
#151.0175 / 155.0175		
151.020 / 155.020		
151.0225 / 155.0225		
151.025 / 155.025	151.025 b-m / PH (IB in VI, PR)	155.025 b-m / PL
151.0275 / 155.0275		
151.030 / 155.030		
#151.0325 / 155.0325		
151.035 / 155.035		
151.0375 / 155.0375		
151.040 / 155.040	151.040 b-m / PH (IB in VI, PR)	155.040 b-m / PL
151.0425 / 155.0425		
151.045 / 155.045		
#151.0475 / 155.0475		
151.050 / 155.050		
151.0525 / 155.0525		
151.055 / 155.055	151.055 b-m / PH (IB in VI, PR)	155.055 b-m / PL
151.0575 / 155.0575		
151.060 / 155.060		
#151.0625 / 155.0625		
151.065 / 155.065		
151.0675 / 155.0675		
151.070 / 155.070	151.070 b-m / PH (IB Paging Only in VI, PR)	155.070 b-m / PP

151.0725 / 155.0725		
151.075 / 155.075		
#151.0775 / 155.0775		
151.080 / 155.080		
151.0825 / 155.0825		
151.085 / 155.085	151.085 b-m / PH` (IB in VI, PR)	155.085 b-m / PL
151.0875 / 155.0875		
151.090 / 155.090		
#151.0925 / 155.0925		
151.095 / 155.095		
151.0975 / 155.0975		
151.100 / 155.100	151.100 b-m / PH (IB in VI, PR)	155.100 b-m / PL
151.1025 / 155.1025		
151.105 / 155.105		
#151.1075 / 155.1075		
151.110 / 155.110		
151.1125 / 155.1125		
151.115 / 155.115	151.115 b-m / PH (IB in VI, PR)	155.115 b-m / PL
151.1175 / 155.1175		
151.120 / 155.120		
#151.1225 / 155.1225		
151.125 / 155.125		
151.1275 / 155.1275		
151.130 / 155.130	151.130 b-m / PH (IB in VI, PR)	155.130 b-m / PP
151.1325 / 155.1325		
151.135 / 155.135		
#151.1375 / 155.1375		
151.140 / 155.140		
151.1425 / 155.1425		
151.145 / 155.145	151.145 b-m / PO (IB in VI, PR)	155.145 b-m / PL
151.1475 / 155.1475		
151.150 / 155.150		
#151.1525 / 155.1525		
151.155 / 155.155		
151.1575 / 155.1575		
151.160 / 155.160	151.160 b-m / PO (IB in VI, PR)	155.160 b-m / PS

151.1625 / 155.1625		
151.165 / 155.165		
#151.1675 / 155.1675		
151.170 / 155.170		
151.1725 / 155.1725		
151.175 / 155.175	151.175 b-m / PO (IB in VI, PR)	155.175 b-m / PS
151.1775 / 155.1775		
151.180 / 155.180		
#151.1825 / 155.1825		
151.185 / 155.185		
151.1875 / 155.1875		
151.190 / 155.190	151.190 b/m / PO (IB Paging Only in VI, PR)	155.190 b-m / PP
151.1925 / 155.1925		
151.195 / 155.195		
#151.1975 / 155.1975		
151.200 / 155.200		
151.2025 / 155.2025		
151.205 / 155.205	151.205 b-m / PO (IB in VI, PR)	155.205 b-m / PS
151.2075 / 155.2075		
151.210 / 155.210		
#151.2125 / 155.2125		
151.215 / 155.215		
151.2175 / 155.2175		
151.220 / 155.220	151.220 b-m / PO (IB in VI, PR)	155.220 b-m / PS
151.2225 / 155.2225		
151.225 / 155.225		
#151.2275 / 155.2275		
151.230 / 155.230		
151.2325 / 155.2325		
151.235 / 155.235	151.235 b-m / PO (IB in VI, PR)	155.235 b-m / PO
151.2375 / 155.2375		
151.240 / 155.240		
#151.2425 / 155.2425		
151.245 / 155.245		
151.2475 / 155.2475		
151.250 / 155.250	151.250 b-m / PO (IB in VI, PR)	155.250 b-m / PP

151.2525 / 155.2525		
151.255 / 155.255		
#151.2575 / 155.2575		
151.260 / 155.260		
151.2625 / 155.2625		
151.265 / 155.265	151.265 b-m / PO (IB in VI, PR)	155.265 b-m / PS
151.2675 / 155.2675		
151.270 / 155.270		
#151.2725 / 155.2725		
151.275 / 155.275		
151.2775 / 155.2775		
151.280 / 155.280	151.280 b-m / PO (IB in VI, PR)	155.280 b-m / PS
151.2825 / 155.2825		
151.285 / 155.285		
#151.2875 / 155.2875		
151.290 / 155.290		
151.2925 / 155.2925		
151.295 / 155.295	151.195 b-m / PO (IB in VI, PR)	155.295 b-m / PS
151.2975 / 155.2975		
151.300 / 155.300		
#151.3025 / 155.3025		
151.305 / 155.305		
151.3075 / 155.3075		
151.310 / 155.310	151.310 b-m / PO (IB Paging Only in VI, PR)	155.310 b-m / PP
151.3125 / 155.3125		
151.315 / 155.315		
#151.3175 / 155.3175		
151.320 / 155.320		
151.3225 / 155.3225		
151.325 / 155.325	151.325 b-m / PO (IB in VI, PR)	155.325 b-m / PM
151.3275 / 155.3275		
151.330 / 155.330		
#151.3325 / 155.5525		
151.335 / 155.335		
151.3375 / 155.3375		
151.340 / 155.340	151.340 b-m / PO (IB in VI, PR)	155.340 b-m / PM mutual aid