

Before the
Federal Communications Commission
Washington, D.C. 20554

CC Docket No. 88-135

In the Matter of

Height and Power
Increases in the Public
Mobile Service

ORDER ON RECONSIDERATION

Adopted: July 3, 1990;

Released: July 20, 1990

By the Commission:

I. INTRODUCTION

1. On June 29, 1989, the Commission released a *Report and Order (Order)*¹ adopting rule changes to permit antenna height and effective radiated power (ERP) increases for facilities authorized to operate in the Public Mobile Service (PMS).² In the *Order*, the Commission adopted an increase in permissible ERP, but not in height, in the 35, 150 and 450 MHz frequency bands and retained the current rules for height-power limitations in the remaining frequency bands of 43 MHz and 900 MHz. The Commission found that permitted increases in radiated power would foster more economical and efficient use of the spectrum, without creating interference to other licensees. Sections 22.100 (adding a blanketting interference rule), 22.505 (raising antenna height-power limits), and 22.506 (raising effective radiated power), of the Commission's Rules were modified to promote efficiency and innovation in the allocation and use of the electromagnetic spectrum. No further height and power limits were adopted out of an abundance of caution about potential electrical interference.

2. On August 10, 1989, TELOCATOR Network of America (TELOCATOR) and National Satellite Paging, Inc. (National) filed petitions for partial reconsideration of the *Order*. Megamessage, Inc. (Megamessage) and the National Association of Business and Educational Radio, Inc. (NABER) each filed petitions for reconsideration. Opposition and Reply comments were filed against the petitions.³

**II. BACKGROUND AND CONTENTIONS
OF THE PARTIES**

3. The propagation characteristics for each frequency band used by licensees to provide PMS are affected uniquely by changes in radiated power and antenna height. Accordingly, in the *Order*, the Commission adopted an increase in permissible power from 500 watts to 600 watts in the 35 MHz band, an increase from 500 watts to 1400 watts in the 150 MHz band and an increase from 500 watts to 3500 watts in the 450 MHz band. Additionally, the Commission retained the present power limita-

tions for four channels in the 150 MHz band⁴ and for one channel in the 450 MHz band⁵ adjacent to private radio services because an increase in permissible radiated power at these frequencies might cause interference to private radio services. Moreover, the Commission retained the present power limitations in the 43 MHz band because any further increase in power would cause increased interference to television sets. Similarly, in the newly adopted rules, the Commission did not permit increases in permissible antenna heights because of an inability to predict co-channel interference with other Commission licensees using existing Carey calculations.⁶ The *Order* did, however, allow the three nationwide paging channels in the 931 MHz band to operate without height restrictions since each of the channels is controlled nationwide by one entity and will not cause interference to other licensees. Additionally, as suggested by staff and commenters in the NPRM, the *Order* adopted a blanketting rule using the formula which calculates the interference area used in Section 73.318 of the Rules.⁷ The blanketting rule delineates the responsibility of the carrier and fosters efficient resolution of interference problems to electronic equipment without the necessity of Commission intervention.⁸

4. In its petition for partial reconsideration, TELOCATOR raises five issues. First, it asserts that the decision to retain the existing radiated power limit of 500 watts on radio common carrier (RCC) frequencies 152.24, 152.84, 158.10, 158.70 and 454.025 MHz in order to avoid interference to adjacent private radio channel licensees, overstates the potential for interference and overlooks the less restrictive alternative the Commission could adopt to require licensees to engage in cross-service coordination.⁹ In his comments, John E. Sonneland, President of Courtesy Communications (Sonneland) supports TELOCATOR's petition. Second, TELOCATOR contends that the Commission's decision to retain height restrictions on all frequency bands because of the inaccuracy of established standards for determining co-channel interference at heights above 500 feet, ignores the alternative of using developmental licensing to resolve those concerns. Third, TELOCATOR argues that radiated power in the 900 MHz band should be increased because such increases would permit fewer transmitters to cover the same service areas and enable carriers to offer more efficient service to the public. Fourth, TELOCATOR asserts that the blanketting rule adopted in the *Order* is unclear, unnecessary, and discriminates against RCCs because other land mobile licensees are not regulated by a blanketting rule. Lastly, petitioner contends that the Commission overestimated the potential for TV interference in the 43 MHz band and suggests that the developmental procedures correctly used in this frequency band¹⁰ would protect against such interference.

5. In its petition for reconsideration, Megamessage argues that the Commission should revise Sections 22.505(c) and 22.506(f) of the Rules to permit a maximum of 3500 watts ERP for the three nationwide paging frequencies because each of these three frequencies is utilized only by one licensee and therefore interference to other licensees on the same frequency is not at issue. Further, Megamessage contends that the frequency allocation plan for the nationwide paging band is adequate to prevent adjacent channel interference.

6. In its petition for partial reconsideration, National requests (1) clarification of the applicability of the "fill-in" provision in Section 22.117(b) of the Rules to network paging carriers¹¹ and (2) the Commission adopt an increase in permissible power for 900 MHz facilities.

7. In its comments, the Association of Maximum Service Telecasters (AMST) argues that the Commission should retain the blanketing rule and the height and power limitations on 43 MHz band frequencies in order to avoid interference to television receivers.

8. In its petition for reconsideration, NABER requests that the Commission not increase ERP on frequency 152.03 MHz, which is adjacent to private radio channel 152.0075 MHz, and frequency 152.51 MHz, which is adjacent to 152.48 MHz. NABER asserts that 152.03 MHz is 22.5 kHz removed from 152.0075 MHz, a frequency used for mobile stations in the Special Emergency Radio Service. NABER argues that without adjacent channel coordination for these two 150 MHz frequencies, the interference potential to Special Emergency Paging systems on 152.0075 is even greater than the interference potential between the other 150 MHz frequencies which are exempted by the *Order*. Similarly, NABER notes that 152.51 MHz is adjacent to 152.48 MHz which is the most heavily used private carrier paging channel and poses an adjacent channel interference problem on 152.48 MHz.

9. In opposition to NABER's petition, TELOCATOR asserts that the Commission should require common carrier licensees to coordinate frequencies for higher powered common carrier facilities operating on frequencies adjacent to private radio carriers which have base stations that have elevated receivers. TELOCATOR contends that its coordination proposal is more consistent with the Commission objective of enhancing spectrum efficiency and achieving increased competition and innovation, rather than enacting a complete ban on increased power for the five channels exempted from permitted power increases in the *Order* and the one-way paging channels which NABER specifies in its petition.

10. In its opposition to TELOCATOR's and National's petitions for reconsideration, Associated Public-Safety Communications Officers, Inc. (APCO) opposes any further increases in common carrier height and power limitations, particularly those proposed by TELOCATOR in its request for increased power for fill-in common carrier stations on the frequencies adjacent to private radio channels. APCO asserts that an increase in power for these specific facilities will cause intermodulation and desensitization interference to public safety operations,¹² thus causing a threat to the safety of life and property. Similarly, APCO supports the request of NABER to prohibit increased power on common carrier frequencies 152.03 MHz and 152.51 MHz, which are adjacent to two private radio channels.

11. In reply to APCO's opposition, Megamessage argues that APCO's concerns regarding the potential for intermodulation and desensitization interference is not a relevant concern for the three nationwide paging frequencies. Megamessage contends that APCO's alleged potential interference problems are caused by the use of non-linear equipment and installations. Therefore, Megamessage, in its reply, reiterates its request that the Commission adopt a maximum limit of 3500 watts of power for the three nationwide paging frequencies.

12. Similarly, TELOCATOR points out in its reply to APCO's opposition, that APCO's concerns regarding potential desensitization and intermodulation interference to public safety radio systems can be avoided either through cross-service coordination, developmental licensing, proper site management, and good engineering. TELOCATOR contends that intermodulation interference can be caused by a variety of sources, including non-radio common carrier operations, and that the prohibition sought by APCO is an overly restrictive remedy which is unnecessary and which would frustrate the Commission's goal of enhancing spectrum efficiency. Additionally, TELOCATOR asserts that APCO has failed to provide technical engineering studies to substantiate its assertions.

III. DISCUSSION

A. 43 MHz Band

1. Power

13. In the NPRM, the Commission proposed that the existing 500 watt ERP for the 43 MHz band be retained. Later in the *Order*, the Commission found that any additional benefits gained by increasing maximum permissible power did not offset the additional interference potential caused to television receivers. TELOCATOR asserts that the Commission's refusal to permit an increase in ERP ignores the fact that the increase is minimal and underestimates the safeguards afforded by the Commission's developmental procedures for 43 MHz stations. Furthermore, TELOCATOR requests that increased power be considered in low population areas and any interference problems could be resolved on a case by case basis. In opposition, AMST states that the Commission's decision to deny an increase in power for stations in the 43 MHz band is based on an extensive history of interference to television. AMST argues that where increasing interference is a certainty, authorizing any increase in power, even on a developmental basis, is inimical to the public interest.

14. In the NPRM and the *Order*, the Commission did not intend to allow an increase in interference to TV reception. Implementation of the present developmental, two-year survey program within two miles of each 43 MHz base station merely aids the Commission in resolving interference problems after TV interference has occurred. There is normally a long lag time between the discovery of the interference and the time the interference is actually resolved. Due to the limited nature of the surveys required by Section 22.501(a)(5) of the Rules to be conducted by the paging carrier, interference problems remain unresolved on numerous occasions, either because the general public is unaware of the cause of the interference or because the public is unaware of the proper forum to register a complaint. On the other hand, TELOCATOR's increase in proposed ERP from 500 watts to 600 watts, will add only 0.7 miles to the service radius of a 43 MHz base station.¹³ This minor increase in the reliable service area contour does not justify a rule change because the benefit of increased flexibility afforded carriers using 43 MHz frequencies does not outweigh the additional TV interference which is likely to occur. Additionally, TELOCATOR's request that the power increase be permitted in sparsely populated areas is also denied. Given a long history of interference with TV receivers

from paging facilities operating at 43 MHz and the likelihood that operation at increased power levels will exacerbate this existing problem, we do not believe it is in the public interest to further increase the permissible power level for 43 MHz transmitters even in sparsely populated areas.

2. Height

15. The Commission, in the *Order*, denied TELOCATOR's request to allow increased heights for stations in the 43 MHz band because an increase in height would cause additional interference to television reception. TELOCATOR, in its petition for reconsideration, states that increasing permissible height will allow licensees to use fewer transmitters, thus eliminating some of the potential TV interference, which occurs in close proximity to the 43 MHz base stations. Additionally, TELOCATOR submits that any interference problems that would occur could be handled by granting developmental authority in this frequency band. AMST contends that, based on current interference problems, an additional increase in height is not justified.

16. We have reexamined the issue of raising the permissible antenna height limit in the 43 MHz frequency band without reducing ERP as proposed by TELOCATOR. If a paging system in the 43 MHz band is located within one mile or less of a television receiver, interference is likely to occur. The probable reason for the interference is the direct signal pickup by the intermediate frequency (IF) components of the television receiver. When this occurs, all television channels are affected.¹⁴ One way to limit the amount of interference caused is to lower the field strength of the interfering signal in the near vicinity of the transmitter. Limiting the field strength can be accomplished in the following two ways: (1) by lowering the ERP of the station,¹⁵ or (2) by raising the height of the transmitting antenna so that the area within the near vicinity of the transmitter is further removed from the main lobe of the vertical beam of the antenna.¹⁶ While there may be a few cases where the higher height would allow the signal to pass over an obstruction, we believe that reconsideration of permissible height levels for 43 MHz frequencies is justified. By allowing increased heights, carriers can usually reduce the field strength near the transmitter and thus, reduce interference to television receivers. Additionally, since stations operating at higher heights have larger service areas, fewer transmitters would need to be used to cover a service area which would further reduce potential TV interference. Any interference that is caused still must be corrected in accordance with the developmental licensing procedures. Therefore, we grant TELOCATOR reconsideration and have modified the rules to permit licensees operating on the 43 MHz frequency band to increase antenna height without reducing power when they do not exceed existing interference contours.

B. Adjacent Channel Radio Systems

17. In the *Order*, the Commission modified the rules to permit increased power in the 150 MHz frequency band from 500 to 1400 watts ERP and in the 450 MHz frequency band from 500 to 3500 ERP. The Commission excluded five specific frequencies from the increased power limits and retained the current ERP limitations for those five frequencies. These frequencies were excluded to prevent the potential interference which might be caused

to adjacent private radio channels. NABER has identified two additional frequencies which it claims should also be included in the exempted frequency class due to claimed potential adjacent channel interference. The following table lists all affected adjacent channels and their uses:

150 and 450 MHz BAND CHANNELS ADJACENT TO PRIVATE RADIO and COMMON CARRIER CHANNELS

PLMRS (MHz)	Frequency	Private Radio Service or Common Carrier Frequency Receiving Interference (MHz)	Use of Frequency Receiving Interference
	152.03	152.0075 Special Emergency Radio Service	Paging*
	152.24	152.27 Taxicab Radio Service	Base and Mobile
	152.51	152.48 Business Radio Service	Paging*
	152.84	152.87 Special Industrial Radio Service and Motion Picture Radio Service	Base and Mobile
		158.13 Power Radio Service	Base and Mobile
	158.10		
		158.07 Common Carrier	Mobile and Fixed**
		158.73 Police Radio Service	Base and Mobile
	158.70	158.67 Common Carrier	Mobile and Fixed**
	454.025	454.000 Petroleum Radio Service	Base and Mobile

* NABER argues that these frequencies should be included in the exempted class.

** Common Carrier Docket Number 87-120 permits these frequencies to be used for control or other point-to-point functions on a primary basis.

18. In the *Order*, the Commission declined to permit increases in ERP where the common carrier station operates on an adjacent channel to that used by private radio stations whose mobile or fixed point transmitters send signals that are received by antennas at high elevations above ground.¹⁷ In its petition, NABER requests that the frequencies 152.03 and 152.51 MHz also be included in the list of frequencies which are not permitted to increase height or power because these frequencies are adjacent to private radio channels. In its opposition to TELOCATOR, APCO avers that increased height and

power for common carrier stations adjacent to private radio channels might cause desensitization and intermodulation interference to public safety operations.

19. In its petition, TELOCATOR argues that the Commission's concerns on adjacent channel interference are overstated and that the Commission should have considered requiring that common carrier licensees coordinate frequencies with private radio coordinators. TELOCATOR contends that using the Commission's theoretical separation distances outlined in the *Order*, 99% of the land area in the United States would be available for common carrier stations to operate at higher power. Additionally, TELOCATOR states that protection of mobile units (paging and two-way) from adjacent channel interference is impractical and is contrary to current Commission practice. TELOCATOR points out that the private radio paging stations on 152.48 MHz operates with high powers and is not required to provide any protection to mobile or paging units operating on the adjacent common carrier frequency 152.51 MHz, and that adjacent channel common carriers should not be subject to a 500 watt limitation if adjacent channel private systems are not subject to a similar limitation.

20. On reconsideration, we believe that the potential for adjacent channel interference to private radio carriers is not sufficient to justify a total ban on increased power in the *Order's* five specified frequencies throughout the United States. Rather, we believe that providing carriers with increased flexibility in designing their systems is in the public interest and that increasing permitted power levels for all frequencies in the 150 and 450 MHz bands should be adopted as long as harmful interference can be prevented. Operation at higher power can be permitted, with appropriate safeguards, in such a way as not to jeopardize the use of channels by licensed users. We believe these goals can be achieved through much less intrusive regulation than the total ban on power increases adopted in the *Order*.

21. We have examined the matter of protecting adjacent channel mobile units and pagers on frequencies 152.0075 and 152.48 MHz as requested by NABER and find that the Commission's decision to exclude the frequencies 152.03 and 152.51 MHz from the increased power limits is not necessary. The potential for adjacent channel interference to receivers is greatest in close proximity to the common carrier transmitter, and any interference would be intermittent in nature. We should note that private radio systems do not offer any special protection to private radio or common carrier systems operating mobile units and pagers on adjacent channels, and we have not had any significant interference problems as a result of this arrangement. We see no public interest reason to provide private radio mobile units special protection to which common carrier mobile units are also not entitled.

22. In the case of common carrier stations on adjacent channels operating near a common carrier or private radio base station receiving mobile transmissions, different concerns are raised. The area of interference is potentially much greater because of the adjacent channel receivers trying to receive weak mobile signals, and because the interference is of a continuous nature since it occurs between fixed points. We believe that common carriers can employ increased powers without causing harmful interference on channels adjacent to private carrier and common carrier receive antennas if a proper separation distance is maintained. In determining the separation dis-

tance necessary to prevent interference, we will use the 70 dB selectivity figure that the Electronic Industries Association has adopted in its standards.¹⁸ Using a received signal level of -125 dBw for 152 MHz band and -133 dBw for 454 MHz band, and assuming free space loss, we find a separation distance of 3.2 miles for the 152 MHz band and 4.4 miles for the 454 MHz band is appropriate. All applications proposing common carrier stations on channels operating with ERPs above 500 watts that are adjacent to private radio stations receiving mobile transmissions must submit a study of the Commission's Master Frequency File showing that the required separation distance to the adjacent channel has been met. In the case of an adjacent channel licensee, who can substantiate in an engineering showing (this showing must detail the station's equipment and the measurement used in determining such interference) interference caused by another adjacent channel licensee, the applicant last filed with the Commission, notwithstanding the separation distance between the adjacent channel stations, must take reasonable steps to reduce interference. In addition, any common carrier stations operating on 158.70 and 158.10 MHz at powers greater than 500 watt must submit an analysis of the common carrier land mobile base station cumulative staff study showing that they are located more than 3.2 miles from common carrier stations operating on the base channels 152.21 and 152.81 MHz, respectively.¹⁹

C. Height

(35, 150, and 454 MHz Band Stations)

23. In the *Order*, the Commission declined to permit stations to operate with powers above 500 watts along any radial where the height above average terrain exceeded 500 feet. The Commission found that the Carey curves used to predict service and interference contours underestimated the contours along the radials at heights higher than 500 feet height above average terrain (HAAT). The Commission did permit stations to maintain an ERP of 500 watts regardless of height because under the current method of restricting power, the reduction in ERP required is based on the average height above average terrain (AHAAT) of the eight cardinal radials.²⁰ Using this method, some of the radials may exceed the power limits that would be permitted if the power reduction were done on an individual radial basis. By adopting this procedure in the *Order*, the Commission stated that information gathered from these stations will be used to help develop new propagation curves and at the same time minimize the risk of co-channel interference.

24. In its petition, TELOCATOR contends that for the construction of additional facilities when the proposed interference contour does not exceed the existing interference contours of co-channel stations operating under the control of the same licensee, inaccuracy of the Carey curves is less significant than it would be for an initial construction proposal. Regardless of the accuracy of the Carey curves under the above circumstances, TELOCATOR, along with other commenters, argues that the Commission could grant developmental authorization until potential interference problems become known.

25. We disagree with TELOCATOR's assessment that stations operating at increased antenna heights and ERP are no different than stations operating under the current limits and that developmental authority is a viable alternative. As the Commission stated previously, heights high-

er than 500 feet above average terrain, the curves underestimate the interfering field strength. Therefore, TELOCATOR's comparison of Carey predicted interference contours of proposed stations at higher heights, where the curves are believed to be inaccurate, to stations operating at lower heights, where we believe the Carey curves to be accurate, is unreasonable. For this reason, we must deny TELOCATOR's request that stations operating above 500 watts and 500 feet AHAAT be authorized under developmental authority. Developmental authority was never meant to permit a whole new class of stations to operate while the Commission considered rules to govern these stations, and to deal with the risk of co-channel interference. Under our developmental rules, only a handful of select stations may be granted authority in order for our staff to gather the necessary information to develop rules with proper interference safeguards.²¹ Therefore, TELOCATOR's proposal that we should authorize a large number of developmental stations, is rejected.

26. We will, however, adopt a modified interference procedure for stations that propose to operate with powers above 500 watts along individual radials that exceed 500 feet HAAT. A correction factor of 3 dB per octave will be added to the formula used to determine the required ratio of desired-to-undesired fields found in the Carey report.²² The value for the correction factor will be determined from the following formula:

$$C = 10 \times \log(\text{HAAT}/500)$$

The formula for determining "R" from the Carey report would become:

$$R = A + C + K(L_d^2 + L_u^2 + T_u^2)^{1/2}$$

where C is the correction factor. This modification will permit greater flexibility to increase height over 500 feet above AHAAT. Co-channel interference will be prevented by modifying the separation distances between base stations. If this approach in practice leads to increased co-channel interference we can take appropriate action at that time to correct the problem, rather than using the *Order's* more restrictive approach of prohibiting increased height in all circumstances.

D. 931 MHz Band

27. In the NPRM, the Commission proposed to grant unlimited ERP to common carriers operating in the 931 MHz band when the interference contours of existing co-channel stations are not exceeded. In the *Order*, the Commission denied TELOCATOR's request for increased antenna height and ERP limits in the 931 MHz band with the exception of permitting unlimited antenna height for the three nationwide paging channels. TELOCATOR's proposals were not adopted because its rationale for these increases was based on the issue of parity in the operating parameters between the 450 MHz private radio service and the 931 MHz common carrier radio services.²³ The Commission found that the 900 MHz private radio service and the 900 MHz common carrier service both have height and power limits of 1000 watts at 1000 feet above average terrain and that no change was needed for parity to exist between these two radio services.

28. In its petition for reconsideration, TELOCATOR argues that a comparison of 931 MHz common carrier channels to 450 MHz private radio channels was utilized "not to justify a particular level but to show the feasibility of such a level." TELOCATOR Petition at page 12. However, TELOCATOR did justify the need for increased antenna height and ERP by submitting facts which indicate that its proposal would improve service, reduce rates and increase competition. Additionally, TELOCATOR stated that adjacent and co-channel interference is unlikely because the frequency band is relatively uncongested and subject to different technical considerations than the other frequency bands used by common carrier services. TELOCATOR urges the Commission to adopt the engineering standards which it proposed in its comments to the NPRM. Other commenters argue that we currently do not have technical standards to resolve interference problems at powers and heights above 1000 watts ERP and 1000 feet AHAAT for stations in the 931 MHz frequency band. National requests that the nationwide paging licensees be permitted to add stations to their systems regardless of coverage area pursuant to Section 22.117(b) of the Rules.

29. In order to address all of the proposals in the 900 MHz band, we will separate this discussion into three issues: (1) whether the nationwide paging channels should be permitted to operate with higher power; (2) whether to permit the non-nationwide 931 MHz licensees to exceed the existing height and power limitations; and (3) whether to grant nationwide paging licensees the request for permission to file for stations under Section 22.117(b).

30. First, with regard to raising the maximum permissible power for the nationwide paging channels, we find that raising the permissible power to 3500 watts ERP to be in the public interest because no harmful interference will occur to co-channel stations because each licensee controls a frequency throughout the nation. At the same time, allowing these licensees to raise the ERP to 3500 watts is in the public interest because increased power will enhance building penetration and help overcome man-made noise.²⁴

31. Second, in regard to the request for increased height and power limits for non-nationwide paging frequencies in the 931 MHz frequency band, we find that TELOCATOR's arguments in support of this request are persuasive. The Commission finds that increasing the permissible height and power for 931 MHz radio common carriers will allow for greater flexibility for these paging systems to use fewer transmitters to cover the same geographic area. In addition, we find that any minor increase in desensitization or intermodulation interference are outweighed by the benefits to the public by gaining more efficient and lower cost services. Nevertheless, in examining TELOCATOR's proposal to determine a method to implement a new height and power limitation, we find several drawbacks to its proposal. First, the proposal does not provide for the protection of a newly authorized facility from co-channel interference. Second, in calculating interference from these stations which exceed the existing height-power limits, TELOCATOR's proposal included the cumulative effect of simulcast transmissions by multiple transmitters. Third, the proposal does not include a method to protect other 931 MHz applicants, should the underlying stations used to justify the grant of the higher antenna height and ERP facility be dismantled.²⁵

32. Third, with regard to National's request, we deny permission for these licensees of the nationwide paging frequencies to file for additional facilities, without regard to existing coverage, under Section 22.117(b) of the Rules. This issue was not raised in the NPRM or the *Order* and, therefore, under Section 553 of the Administrative Procedure Act, the Commission cannot consider the proposed rule in this proceeding.

33. We find that our current system of 931 MHz frequency allocation, based upon a standard separation distance of 70 miles, provides for the efficient assignment of channels. However, in order to increase permissible antenna height and ERP and to allow for the protection of existing and future stations from interference, certain modifications can be made to the current system of 900 MHz frequency allocation to accommodate increased height and power. Those modifications are as follows: The creation of five classes of stations based on the propagation curves that TELOCATOR has derived from the Okumura Report;²⁶ the formulation of a table that lists the required separation distances between each class of stations, and a table showing the service area and interference area for each class of station. (See Appendix 2) We believe that in taking these steps, we will enable licensees to enhance building penetration and cover larger areas with fewer transmitters while ensuring that co-channel interference does not occur.

E. Blanketing Interference

34. In the *Order*, the Commission adopted a blanketing rule stating that such a rule would delineate the responsibility of the carrier and foster efficient resolution of complaints caused by interference to electronic equipment by common carriers without the necessity of Commission intervention. In its petition for reconsideration, TELOCATOR contends that the blanketing rule is premature, and that the Commission should wait for further comment on whether significant interference problems will exist. It also questions whether the rule, which is the same as that used in the FM radio service, is appropriate for Part 22 operations. Additionally, TELOCATOR avers that if the blanketing rule is left in place, such a rule should be imposed on all land mobile services including private radio. In response to TELOCATOR, AMST argues that TELOCATOR's comments are without merit and that the blanketing rule should be affirmed.

35. Upon further consideration, we have re-examined the issue of blanketing interference and have decided that a rule on blanketing interference should be retained for now. We will, however, review the continuing need for the rule after two years of experience with it. In its petition, TELOCATOR asks us to address the following three issues: (1) whether to use the blanketing rule from the FM radio service, (2) whether to impose a blanketing rule on all land mobile services, and (3) whether significant interference problems exist.

36. First, we believe that the blanketing rule used by the FM radio service is appropriate for application in the common carrier mobile services. The 115 dBu field strength was determined to cause blanketing interference not because of the source of the interference, but rather because it is measured according to the types of devices receiving the interference. Since we are trying to protect the same devices as FM services are trying to protect, the formula is similarly applicable to common carrier services. Second, common carriers have longer operating

time ("duty cycles") than other mobile services and, thus, interference may be more noticeable and continuous. Lastly, the Field Operations Bureau (FOB) believes that the rule is necessary to resolve blanketing interference problems. Therefore, at this time, we will continue to apply the blanketing rule to common carriers and will consider whether a blanketing rule for these other services will be necessary at some future time. We will review the continued need for the rule after two years of experience. We request that FOB monitor blanketing interference incidents involving radio licensees and report the findings to the operating Bureaus one year from the release of this order so that we can evaluate the continuing need for and coverage of the rule.

F. Filing Procedure

37. The processing staff of the Mobile Services Division is having difficulty in processing applications for height and power requests since this Docket became effective. Many applicants do not submit the call sign(s) and location number(s) of the station(s) that justify the filing under the new height-power rules. This lack of information is causing delays in the processing of these applications. Therefore, the Commission will require the filing of a map showing the interference contour(s) of the stations used to show compliance with the new rules and the interference contour of the proposed station. All station call signs and location numbers must be given. This requirement will not be an additional burden on the applicant because the information requested must be generated before an applicant can determine that they are permitted to file under the new height power rules.

IV. REGULATORY FLEXIBILITY ACT - FINAL ANALYSIS

38. **Reasons for action and objectives.** This reconsideration of the rule making action will enhance the efficiency of PMS operations because fewer transmitters will be needed to cover the same geographic area. In addition, building penetration will be increased, and the PMS systems' ability to overcome man-made noise will be improved. These rule changes will permit carriers to provide more effective service at lower cost and these savings could be passed on to subscribers.

39. **Issues raised by the public in response to the final analysis and petitions for reconsideration.** We have taken into account the various issues raised by the public in the petitions for reconsideration and reply comments. As a result of these comments, whenever possible, we have modified our rules so as to permit both economical and efficient use of the spectrum but without creating interference to other services. Based on suggestions by TELOCATOR and other commenters, we modify, in this order, our current rules and further amend Part 22 of the Rules to permit increased antenna height and radiated power, under certain circumstances.

40. **Reporting, record - keeping and compliance requirements.** PMS licensees will comply with Sections 1.1307(b) and 22.100(e) as required.

41. **Specific alternatives that could accomplish the same objectives.** We have determined no specific alternatives which could accomplish the objective achieved in this rule making order.

42. Any Significant Alternative Minimizing Impact on Small Entities and Consistent with Stated Objectives. We have reduced burdens wherever possible. The regulatory burdens we have retained are necessary in order to carry out our duties under the Communications Act of 1934. We will continue to examine alternatives in the future with the objectives of eliminating unnecessary regulations and minimizing any significant economic impact on small entities. A copy of this Report and Order shall be sent to the Chief Counsel for Advocacy of the Small Business Administration.

43. Paperwork Reduction Act Statement. The proposal contained herein has been analyzed with respect to the Paperwork Reduction Act of 1980 and found to impose a new information collection requirement on the public. The applicant, under Section 22.505 and 22.506 of the Rules, is now required to submit a copy of the contour map that the applicant prepared independently to determine if they comply with the Rules.

V. ORDERING CLAUSES

44. WHEREFORE, for the foregoing reasons, Part 22 of the Commission's Rules ARE HEREBY AMENDED as discussed herein and as shown in Appendix 3 below;

45. IT IS FURTHER ORDERED that the rule changes made herein WILL BECOME EFFECTIVE September 24, 1990.

FEDERAL COMMUNICATIONS COMMISSION

Donna R. Searcy
Secretary

APPENDIX 1

COMMENTS

Petitions for Reconsideration

Megamessage, Inc.
National Association of Business and Educational Radio, Inc.
John E. Sonneland, President of Courtesy Communications

Petitions for Partial Reconsideration

National Satellite Paging, Inc.
TELOCATOR Network of America

Opposition and Replies

Associated Public-Safety Communications Officers, Inc.
Association of Maximum Service Telecasters
Megamessage, Inc.

TELOCATOR Network of America

APPENDIX 2

The following table of heights and powers is used to classify the 931 MHz paging stations:

Average antenna height above average terrain*

	Station class					
4001-5000	G	G	F	F	F	F
2826-4000	H	G	G	F	F	F
2001-2825	K	H	H	G	F	F
1401-2000	L	K	H	G	G	G
1001-1400	L	L	K	H	G	G
581- 000	L	L	L	L	K	H
0-580	L	L	L	L	L	L
	125	250	500	1000	1860	3500

Effective radiated power (watts)**

* Average of the eight cardinal radials.

** For power values falling between those listed above use the next higher figure.

The following table is used to determine the minimum required separation distance between stations in the 931 MHz band:

Station class	Minimum separation between co-channel stations				
L ..	70				
K ..	75	78			
H ..	80	83	86		
G ..	101	104	107	116	
F ..	139	142	145	154	171
	L	K	H	G	F

Station class

The reliable service area and interference area for one-way signaling stations in the 931 MHz band is as follows:

Class	Radius of Service Area (Miles)	Radius of Interference Area (Miles)
F	52	119
G	35	81
H	26	60
K	23	55
L	20	50

APPENDIX 3

RULES SECTION

Part 22 of Title 47 of the Code of Federal Regulations is amended as follows:

Part 22 - Public Mobile Service

1. The authority citation for Part 22 continues to read as follows:

Authority: Secs. 4, 303, 48 Stat. 1066, 1082, as amended (47 U. S. C. 154, 303), sec. 553 of the Administrative Procedure Act (5 U. S. C. 553), unless otherwise noted.

2. Section 22.117 is amended by revising introductory paragraph (b), paragraph (b)(1)(ii) and adding paragraph (b)(1)(iii) to read as follows:

Section 22.117 Transmitters

(b) Additional transmitters. Licensees may construct and operate additional transmitter locations on the same frequency without obtaining prior Commission approval provided:

(1) ***

(ii) Applications for additional transmitters of 931 MHz band stations are required to certify that the proposed service and interference area(s) are totally encompassed by existing co-channel service and interference area(s).

(iii) Licensees must retain a copy of a completed table MOB III found in FCC Form 401 as part of the licensees' records and this shall be made available to the Commission upon request.

3. Section 22.502 is amended by adding a new paragraph (c) to read as follows:

Section 22.502 Classification of base stations.

(c) classes of stations in the 931 MHz Band:

The following table of heights and powers is used to classify the 931 MHz paging stations:

Average antenna height above average terrain*

	Station class					
4001-5000	G	G	F	F	F	F
2826-4000	H	G	G	F	F	F
2001-2825	K	H	H	G	F	F
1401-2000	L	K	H	G	G	G
1001-1400	L	L	K	H	G	G
581-1000	L	L	L	L	K	H
0-580	L	L	L	L	L	L
	125	250	500	1000	1860	3500

Effective radiated power (watts)**

* Average of the eight cardinal radials.

** For power values falling between those listed above use the next higher figure.

4. Section 22.503 is amended by revising paragraph (d) to read as follows:

Section 22.503 Geographic separation of co-channel stations.

(d) The following table is used to determine the minimum required distance separation between stations in the 931 MHz band:

Station class	Minimum separation between co-channel stations				
L..	70				
K..	75	78			
H..	80	83	86		
G..	101	104	107	116	
F..	139	142	145	154	171
	L	K	H	G	F

Station class

5. Section 22.504 is amended by revising paragraph (b)(2) to read as follows:

Section 22.504 Reliable service area.

(b)(2) The reliable service area and interference area for one-way signaling stations in the 931 MHz band is as follows:

Class	Radius of Service Area (Miles)	Radius of Interference Area (Miles)
F	52	119
G	35	81
H	26	60
K	23	55
L	20	50

The reliable service area is used to determine whether claims of economic competitive injury are considered. The reliable service area so defined is not entitled to protection from electrical interference from co-channel stations at interference distances greater than those listed.

6. Section 22.505 is amended by revising paragraph (c) to read as follows:

Section 22.505 Antenna height - power limit.

(c) Stations in the 35, 43, 152, and 454 MHz bands, operating in accordance with Section 22.506(f), may operate stations at 500 watts effective radiated power or less regardless of the average height of the station's antenna above average terrain.

(1) Stations in the 35, 43, 152, and 454 MHz bands, operating in accordance with Section 22.506 (f), that exceed 500 watts effective radiated power, shall calculate their interference contours along all radials exceeding 500 watts and 500 feet above average terrain using the following modification to the formula in the Carey Report for determining the ratio of desired to undesired fields "R":

$$R = A + C + K(L_d^2 + L_u^2 + T_u^2)^{1/2}$$

where C is determined from the following formula:

$$C = 10 \times \log(\text{HAAT}/500)$$

(2) Stations operating on the 931 MHz nationwide paging frequencies, 931.8875, 931.9125 and 931.9375 MHz, may operate at a maximum of 3500 watts without antenna height limitation. Stations in the 931 MHz band not operating on the 931 MHz nationwide paging frequencies may operate without regard to height-power reduction if the interference area of the proposed station does not exceed the interference area(s) of existing stations.

(3) An exhibit demonstrating compliance with this section must be submitted with the application. The exhibit must include a map showing the proposed interference contour/area and the interference contour(s)/area(s) used to justify filing an application under this section.

7. Section 22.506 is amended by adding paragraph (f) to read as follows:

Section 22.506 Power.

(f) Proposed base stations, other than those in the air-ground radio service, in the 43 MHz, the 931 MHz and and the 470-512 MHz bands whose interference contours/areas do not exceed the interference contour(s)/areas of existing co-channel station(s), which are operated under the control of the same licensee, may operate with the following power limits:

Frequency or Frequency Band	Maximum Effective Radiated Power
35 MHz	600 watts
152 MHz	1400 watts
158.10 MHz	1400 watts
158.70 MHz	1400 watts
454 MHz	3500 watts

All applications proposing the use of the frequencies 152.24, 152.84, 158.10, 158.70, and 454.025 MHz operating with effective radiated powers above 500 watts must

show that their base stations are located a required distance from adjacent channel stations: 3.2 miles for the 152 MHz band and 4.4 miles for the frequency 454.025 MHz. All applicants for these adjacent channel frequencies must submit a study of the Commission's Master Frequency File showing that the required separation distances to the adjacent channel base stations have been met. In addition, any common carrier stations operating on 158.70 and 158.10 MHz at powers greater than 500 watts, must submit an analysis of the common carrier land mobile base station cumulative staff study showing that they are located more than 3.2 miles from common carrier stations operating on the base channels 152.21 and 152.81 MHz respectively.

Stations operating on the 931 MHz nationwide paging frequencies, 931.8875, 931.9125, 931.9375 MHz, may operate at a maximum of 3500 watts. Stations in the 931 MHz band not operating on the 931 MHz nationwide paging frequencies may operate at a maximum effective radiated power of 3500 watts if the interference area of the proposed station does not exceed the interference area(s) of existing stations.

An exhibit demonstrating compliance with this section must be submitted with the application. The exhibit must include a map showing the proposed interference contour and the interference contour(s) used to justify filing an application under this section.

FOOTNOTES

¹ This Order addressed the issues raised in a Notice of Proposed Rule Making (NPRM), 3 FCC Rcd 1710 (1988), requesting comments on proposed changes to the Commission's Rules regarding the increase of permissible antenna height and radiated power for PMS licensees when the proposed interference contour does not exceed the existing interference contours of co-channel stations operating under the control of the same licensee.

² Height and Power Increases in the Public Mobile Service, CC Docket No. 88-135, Report and Order, 4 FCC Rcd 5303 (1989).

³ See Appendix 1 for a list of commenters.

⁴ See Order at paragraph 13.

⁵ An adjacent channel is defined, for the purpose of this Rule Making, to be any frequency 30 kHz or less apart in the 152 MHz band and any frequency 25 kHz or less apart in the 454 MHz band.

⁶ Carey calculations are defined in Section 22.504 of the Commission's Rules and in the report by R. B. Carey entitled "Technical Factors Affecting the Assignment of Facilities in the Domestic Public Land Mobile Radio Service" (Carey Report), FCC Report No. R-6406 (June 1964).

⁷ D (in miles) = .245 x P^{1/2}(kilowatts).

⁸ Blanketing interference is the action of a powerful radio signal in close proximity to a receiver that renders the receiver unable to receive desired signals. The blanketing rule provides, *inter alia*, that licensees of new or modified stations must resolve all complaints of blanketing interference which are received by the licensee within one year of filing a "Notification of Status of Facilities," FCC Form 489, which indicates the licensee has commenced operations. See Section 22.100 of the Rules.

⁹ Cross-service coordination, in this case, is defined as the coordination by the common carrier licensees with the certified private radio coordinators, in order to avoid and resolve potential interference problems.

¹⁰ Currently, all 43 MHz PMS facilities are initially authorized on a developmental basis to provide service during a two year period. During this period, the licensees must conduct surveys to determine whether interference is being caused to TV receivers. If interference is caused, the licensee is required to resolve the interference or discontinue operations. See Section 22.501(a)(5) of the Rules.

¹¹ Specifically, National requests that the three nationwide paging channels be permitted to add additional locations by filing a Form 489 permissive change application in a manner similar to that currently permitted in the cellular radio service. See Section 22.117(b) of the Rules.

¹² Desensitization is the reduction in the receiver sensitivity due to the presence of a high power off-channel signal. Intermodulation is the process wherein two or more signals received by a non-linear device, such as radio components, produce additional signals having frequencies differing from but related to those received.

¹³ 500 feet height above average terrain (HAAT) assumed.

¹⁴ See "Interference to Television Reception from Paging Systems," FCC Field Operations Bureau Information Bulletin FO-6 (February 1986).

¹⁵ In this reconsideration, we have already controlled this potential source of additional interference by not permitting any increases in ERP.

¹⁶ This is accomplished because the gain of an antenna diminishes as the angle of radiation below the horizon is increased. The field strength is also reduced because the higher antenna is farther away from the affected television receiver.

¹⁷ Mobile and paging receivers are assumed to operate at a level of approximately six feet above the ground.

¹⁸ Electronic Industries Association EIA Standard RS-204-C, Minimum Standards For Land Mobile Communication FM or PM Receivers, 25-947 MHz (January 1982). We use this adjacent channel selectivity value rather than the one used in the *Order* because it is the minimum standard that the industry has determined would produce no harmful electrical interference.

¹⁹ The base frequencies 152.21 and 152.81 MHz are paired with the mobile frequencies 158.07 and 158.67 respectively.

²⁰ Effective radiated power must be reduced as the average height above average terrain is increased. See Section 22.505 of the Rules.

²¹ Even under developmental authorization, because of the large number of stations involved, the processing staff would have to formulate guidelines to help them determine when interference was harmful. These guidelines, because they are not rules, would be difficult to enforce.

²² TELOCATOR in its comments to the NPRM stated that the adoption of any correction factor would cause discontinuities to the contours. TELOCATOR is correct. However, TELOCATOR has not demonstrated any deleterious effect of these discontinuities.

²³ In its comments to the NPRM, TELOCATOR provided no explanation for comparing 450 MHz private service parameters to 900 MHz common carrier service.

²⁴ This change could affect co-channel interference in neighboring countries such as Canada and Mexico. However, existing coordination procedures will ensure that this increase in power does not result in harmful interference to licensees in neighboring countries.

²⁵ TELOCATOR requested several other engineering changes, including the manner in which HAAT is calculated, the effects of beam tilt, and other similar technical matters. These proposals pertain to all Commission engineering calculations not

merely those that relate to height/power issues. Therefore, they are beyond the scope of this proceeding, and will not be considered herein.

²⁶ Y. Okumura *et. al.*, 16 Rev. Elec. Commun. Lab 825-873 (Sept. - Oct., 1968), reprinted at Land Mobile Communications Engineering (Brodson, *et. al.*, ed. 1967).