

Provided by:
Radio Systems, Inc.
601 Heron Drive
Bridgeport, NJ 08014
856-467-8000
www.radiosystems.com

Before the
Federal Communications Commission
Washington, DC 20554

GEN Docket No. 87-839

In the Matter of

Revision of Part 15 of the Rules
regarding the operation of radio
frequency devices without an
individual license - LPB et al
Joint Petition or Partial
Reconsideration

MEMORANDUM, OPINION AND ORDER

Adopted November 16, 1990; Released December 28, 1990

By the Commission

INTRODUCTION

1. By this section, the Commission grants in part the Joint Petition for Partial Reconsideration filed by LPB, Inc., LocRad, Inc., Burden Associates and the Intercollegiate Broadcasting System, Inc. (herein "joint petitioners") requesting partial reconsideration of the First Report and Order (R&O) in this proceeding.¹ The rule changes adopted herein will relax the radio frequency (RF) field strength emission limits for low power AM communications systems, e.g. carrier current and "leaky cable" radio systems operating on the AM radio band. The revised limits for these systems will be the same as those specified in Section 15.7 of the rules that were in place prior to the R&O. We believe these limits are adequate to ensure that such equipment does not pose a significant threat of interference to authorized communications users.

BACKGROUND

2. In the R&O, the Commission adopted a comprehensive revision of Part 15 of the rules. These rules govern radio frequency devices that may be operated without an individual license. The objective of this revision was to encourage more effective use of the radio frequency spectrum by providing additional technical and operational flexibility in the design, manufacture and use of non-licensed devices. In addition, the Commission attempted to establish uniformity among the technical standards for various non-licensed operations while retaining, to the greatest extent possible, operations currently permitted under the rules. As part of this effort, the Commission revised the field strength limits that apply to three types of lower power communications systems that operate on frequencies on the AM band:

(a) Carrier current systems: A carrier current system transmits radio frequency energy by conduction over the electric power lines. This type of system can be designed such that the signals are received by conduction from direct connection to the electric power lines (unintentional radiator) or the signals are received over-the-air due to radiation of the radio frequency signals from the electric power lines (intentional radiator). In the R&O, the Commission applied new, somewhat more stringent field strength limits to carrier current systems.²

(b) Leaky cable systems: Leaky cable systems are intentional radiators employing a coaxial cable that leaks radio frequency energy. This cable is connected to a transmitter and routed through an area for the express purpose of radiating a signal. The signal is usually received on an auto radio and is typically used to provide information at amusement parks and along roadways. The new field strength limits, while also apply to carrier current systems, are similar to the former limits for leaky cable systems.³

(c) Campus radio stations: In the R&O, the Commission adopted special operating provisions for radio stations operating in the AM broadcast band (525 to 1705 kHz) on the campus of a college of other educational institution. These provisions permit campus stations to operate with unlimited field strength emissions within the campus, so long as the field strength of the signal complies with emission limits at the campus boundary. In addition, campus radio systems were permitted to use any kind of antenna and were exempted from using certified transmitters.⁴

JOINT PETITION

3. The joint petitioners market and operate low power communications systems that operate in the AM broadcast band. Typical systems include motorist advisory radio stations, aids for the hearing-impaired, drive-in, churches and campus radio stations. The joint petitions argue that, because carrier current systems rely on reception of the induction field, the new field strength limits, while identical to the old limits for carrier current systems for frequencies at the top end of the AM band,

are substantially reduced for frequencies at the bottom of the band. The joint petitioners state that since almost all carrier current systems operate on the lower AM broadcast frequencies, this change in the rules severely restricts the use of frequencies that operations find most acceptable and makes it significantly more difficult for carrier current systems to be established. The joint petitioners claim that their systems have operated in the AM broadcast band for decades without causing any interference to the AM broadcast serviced. They further claim that the record does not show any need to tighten the Part 15 technical standards.

4. The joint petitioners further state that, since leaky cable systems also operate on the lower AM frequencies and are designed to operate using the induction field, they should be subject to the same emission limits as carrier current systems. The joint petitioners are under the impression that both carrier current systems and intentional radiators employing leaky coaxial cables as antennas were previously subject to Section 5.7 of the Commission rules.⁵ They claim that measurements indicate that it is the induction field which predominates along the length of a properly terminated leaky cable. They state that both theory and measured data indicate that leaky cable and carrier current systems behave similarly. They, therefore, conclude that the Commission should treat leaky cable systems the same as carrier current systems.

5. The joint petitions are concerned that, while the new campus radio provisions in Section 15.221 contain no field strength limitations for operations within the boundary of a campus, the new field strength limits that would apply at the campus boundary would severely restrict carrier current usage at urban educational institutions. They point out that it is these urban institutions that are particularly in need of the ability to conduct carrier current operations, since educational FM frequencies are no longer available in many cities. The joint petitioners state that many large institutions house a significant percentage of the student body adjacent to the campus in large privately-owned residence halls, while are one hundred percent student occupied. They are concerned that the campus radio provisions would not apply to such buildings and the signal levels of the campus station would be too low to be usable.

6. To address these concerns, the joint petitioners request that all lower power communications devices, including both intentional and unintentional radiators, operating in 525 kHz to 1705 kHz be regulated by a single rule duplicating the former Section 15.7.

7. Thirty-seven parties submitted comments in response to the joint petition. In general, all the commenters supported the joint petition and restated the arguments presented by the joint petitioners. No negative comments to the joint petition were filed. A list of those filing comments is contained in Appendix A.

DISCUSSION

8. We recognize that carrier current and leaky cable systems are used to provide valuable services that often cannot easily be provided through other means. These systems allow low-power, one-way communications using standard AM radio receivers. Campus radio stations have operated successfully for years using carrier current systems and motorist advisory stations, such as those serving amusement parks, are now using leaky cable systems. In the R&O, the Commission specified uniform field strength limits for both carrier current systems and other types of lower power communications devices in order to simplify the Part 15 rules. The new limits are somewhat more stringent for the lower frequencies of the AM band than the former limits. They have the effect of significantly impeding the usability of carrier current systems. As indicated above, however, the Commission did not intend to preclude Part 15 operations and, in fact, considered carrier current operations in specifying the field strength for the 490-1705 MHz band.

10. Carrier current and leaky cable systems operate on a different physical principle than other wireless radio frequency communication systems. Such systems rely on the induction (or magnetic) field, which is present only in the immediate vicinity of a transmission line or cable carrying RF energy to provide communications to receivers. As the petitioners observed, induction fields rapidly decrease in strength as distance from the transmission line is increased. Radiation fields, which are more typically used for radio communications, decreases much more slowly. Although induction fields are stronger than radiation fields at locations very near carrier current and leaky cable systems, radiation fields are stronger and, therefore more likely to cause interference at greater distances.

11. Under our previous rules, carrier current systems were measured approximately at the distance at which the radiation field begins to exceed the induction field.⁶ Under the new field strength limits, measurements of carrier current systems operating in the lower frequencies of the AM band were required to be made at substantially shorter distances, i.e. distances where the induction field is stronger than the radiation field. While we did increase the field strength limits to compensate for the shorter measurement distance, we apparently did not sufficiently allow for the higher field strength of the induction field in areas very near to carrier current systems. -The new field strength limits adopted in the R&O, therefore, significantly restrict the use of new carrier current systems. However, carrier current systems have been operated for decades under the former field strength limits without causing interference problems for AM broadcasters. Those levels were sufficient to avoid interference in the past and we believe they remain appropriate for future use. Accordingly, we are allowing carrier current systems operating in the AM band to comply with either the new limits or those which were contained in the former rules, re-specified in the International Systems of Units. While this change will lessen the uniformity of former Part 15 emission standards,

we believe the benefits of applying for former standards in this case outweigh the advantages of uniformity.

12. We previously treated leaky cable systems in a manner similar to typical radio transmitters because, like radio transmitters, leaky cable systems could control where their antennas (leaky cables) were placed. However, because leaky cable systems operate more like carrier current systems relying primarily on the induction field, we are granting the request to subject leaky cable systems operating in the AM band to the same field strength limits and equipment authorization requirements as carrier current systems.

13. The above rule changes will also resolve the difficulties that campus radio stations operation on lower band AM frequencies face in providing service beyond the boundaries of the institution under the new rules. In general, the rules adopted in the R&O were intended to permit campus radio stations greater flexibility and freedom in designing their operations. Consistent with this intent, campus radio stations will now be able to use both carrier current and leaky cable systems and the signal levels specified for carrier current systems under the previous rules to serve off-campus locations such as privately owned residence halls.

ORDERING CLAUSE

14. In accordance with the above discussion and pursuant to the authority contained in Sections 4(D), 301, 302, 303, 304 and 307 of the Communications Act of 1934, as amended, IT IS ORDERED that the Joint Petition filed by LPB, Inc., LocRad, Inc, Burden Associates and the Intercollegiate Broadcasting Systems, Inc. IS GRANTED to the extent indicated herein. In addition, IT IS FURTHER ORDERED that Part 15 of the Commission's Rules and Regulations IS AMENDED as set forth in Appendix B below. These rules and regulations are effective February 14, 1991.

APPENDIX B

CHANGES TO THE REGULATIONS

Title 47 of the Code of Federal Regulations, Part 15, is amended as follows:

1. The authority citation for Part 15 continues to read as follows:

Authority: Sec 4, 402, 303, 304, 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, 304 and 307.

2. Section 15.109 is amended by revision paragraph (c) to read as followed:

Section 15.109 Radiated emission limits:

Carrier current systems used as unintentional radiators or other unintentional radiators that are designed to conduct their radio frequency emissions via connecting wires or cables and that operate in the frequency range of 9 kHz to 30 MHz, including devices that deliver the radio frequency energy to transducers such as ultrasonic devices not covered under Part 18 of this Chapter, shall comply with the radiating emission limits for intentional radiators provided in Section 15.209 for the frequency range of 9 kHz to 30 MHz. As an alternative, carrier current systems used as unintentional radiators and operating in the frequency range of 525 kHz to 1705 kHz may comply with the radiated emission limits provided in Section 15.221(a). At frequencies above 30 MHz, the provisions of paragraph (a) of this Section apply.

3. Section 15.207 is amended by revising paragraph (b) to read as follows:

Section 15.207 Conducted limits.

(b) The limit in paragraph (a) shall not apply to intentional radiators operated as carrier current systems in the frequency range of 450 kHz to 30 MHz. Such systems are subject to radiated emission limits as provided in Section 15.205 and Section 15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

4. Section 15.221 is revised to read as follows:

Section 15.221 Operating in the band 525 - 1705 kHz:

(a) Carrier current systems and transmitters employing a leaky coaxial cable as the radiating antenna may operate in the band 525-1705 kHz provided the field strength levels of the radiated emissions do not exceed 15 uV/m as measured at a distance of $47.715/\text{frequency in kHz}$ meters (equivalent to $\text{Lambda}/2\pi$ from the electric power line or the coaxial cable, respectively). The field strength levels of emissions outside this band shall not exceed the general radiated emission limits in Section 15.209.

(b) As an alternative to the provisions in paragraph (a) intentional radiators used for the operation of an AM broadcast station on a college or university campus or on the campus of any other education institution may comply with the following:

(1) On the campus, the field strength of emissions appearing outside of this frequency band shall not exceed the general radiated emission limits shown in Section 15.209 as measured from the radiating source. There is no limit on the field strength of emissions appearing within this frequency band, except that the provisions of Section 15.5 continue to comply.

(2) At the perimeter of the campus, the field strength of any emissions, including those within the frequency band 525-1705 kHz, shall not exceed the general radiated emissions in Section 15.209.

(3) The conducted limits specified in Section 15.207 apply to the radio frequency voltage on the public utility power lines outside of the campus. Due to the large number of radio frequency devices which may be used on the campus contributing to the conducted emissions as an alternative to measuring conducted emissions outside of the campus, it is acceptable to demonstrate compliance with this provision by measuring each individual intentional radiator employed in the system at the point where it connects to the AC power limits.

(c) A grant of equipment authorization is not required for intentional radiators operated under this section. In lieu therefore, the intentional radiator shall be verified for compliance with the regulations in accordance with Subpart J of Part 2 of this Chapter. This data shall be kept on file at the location of the studio, office or control room associated with the transmitting equipment. In some cases, this may correspond to the location of the transmitting equipment.

(d) For the band 535-1705 kHz, the frequency of operation shall be chosen such that operation is not within the protected field strength contours of the licensed AM station.

FOOTNOTES

1 See First Report and Order GEN Docket No. 87-389 adopted March 30, 1989, 4 FCC Rcd 3493 (1989). Unless otherwise stated, all references to Part 15 regulations are to the rules adopted herein.

2 Under the previous rules, the field strength of carrier current stations was specified in Section 15.7 CFR Section 15.7 (1988 edition). In the R&O, the Commission applied new limits in Sections 15.109(e) and 15.209. See 47 CFR Sections 15.109(e) and 15.209.

3 Under the previous rules, the Commission treated leaky cable systems as low power communications devices subject to Section 15.111. See CFR Section 15.111 (1988 edition). Under the new rules, they are regulated by Section 15.209. The specified maximum permitted field strength levels are the same in both the existing and previous rules. However, the Commission did in the R&O change the rules to require that signal strength measurements be made using a CISPR quasi-peak detector instead of an average detector as previously required. This measurement

change resulted in a 3 to 6 dB reduction in the actual field strength limit. This change is not questioned by the petitioners.

4 See 47 CFR Section 15.221

5 In fact, this is not the case. Leaky cable systems were subject to the former provisions of Section 15.111 of the Rules. As stated in OST Bulletin No. 63, a communication system where a wire is routed through an area and connected to a transmitter for the express purpose of radiating a signal into space is considered to be a low power communication device. See OST Bulletin No. 63, "Understanding FCC Rules and Regulations under Part 15 for Low Power Transmitters, December, 1984.

6 This distance is approximated by dividing the wave length of the signal by two times the constant π (commonly referred to as $\text{Lambda}/2\pi$ distance of 88 meters. A signal on 1590 kHz has a $\text{Lambda}/2\pi$ distance of 30 meters.

7 We note the former rules allowed the field strength of lower power AM communications systems to be measured using an average detector while the rules adopted in the R&O required the use of a CISPR quasi-peak detector. This measurement change may result in a 3 to 6 dB reduction in the actual field strength limit. CISPR quasi-peak measurement provides a much better indication of the potential for interference to AM broadcast stations. Accordingly, we are retaining the requirement to use a CISPR quasi-peak detector. We believe the relaxation of the field strength limits which we are adopting will provide adequate relief so that carrier current and leaky cable systems can continue to operate successfully.