



Federal Communications Commission
Washington, D.C. 20554

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Fish & Richardson P.C.
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11th Floor
Washington, DC 20005
Attn: Terry G. Mahn
Robert J. Ungar

Gentlemen:

This is in response to your letter of August 21, 2002 on behalf of Powerwave, Inc., which requests a waiver of Section 24.232 of the Commission's rules to permit certification of a multicarrier power amplifier (MCPA) with an output power of 125 Watts. Paragraph (a) of Section 24.232 provides, among other things, that the peak output power of a base station transmitter in the broadband Personal Communications Service (PCS) may not exceed 100 Watts. After consideration of the justifying circumstances described in your letter, we grant this request, for the reasons given herein, and subject to the conditions set forth below.

In your letter, you note that the subject rule limiting the output power capability of a PCS base station transmitter is based on the assumption that a separate transmitter is used for each individual channel, and you suggest that it is thus unfair to apply this rule to certification of an MCPA, which is a single transmitter that is specifically designed to be able to transmit multiple channels. You observe that this has the effect of limiting the aggregate power of several channels to the level the Commission intended for one channel. You further state that, although 125 Watts is a *de minimis* increase of only 1 dB above the 100 Watt limit set forth in the rule, allowing certification of an MCPA at the higher level would result in significant benefits in terms of licensee flexibility, cost savings and spectrum use efficiency. For example, you state that use of an MCPA yields improvements in intermodulation distortion cancellation, allows closer channel spacing to increase capacity, allows the licensee to change modulation technology without replacing equipment, reduces space and energy requirements, and improves power transfer efficiency between the transmitter and antennas.

Circumstances that may justify grant of a request for waiver of Wireless Radio Services rules are set forth in Section 1.925(b)(3) of the Commission's rules.¹ In particular, paragraph (b)(3)(i) provides that the Commission may grant a waiver request if it is shown that the underlying purpose of the rule would not be served by its application to the specific instance, and that such a grant would be in the public interest. Your request for waiver is considered under the guidance of that paragraph.

¹ 47 C.F.R. § 1.925(b)(3).

The 100 Watt transmitter power output limit for broadband PCS base station transmitters was adopted by the Commission upon reconsideration of its *Second Report and Order* in GEN Docket No. 90-314², concurrently with its decision to increase the equivalent isotropically radiated power (EIRP) limit for PCS base stations from 100 to 1640 Watts. The purpose of this new 100 Watt transmitter power output limitation was to ensure that broadband PCS licensees utilizing higher EIRP at their base stations (pursuant to the new 1640 Watt EIRP limit) did so by using low power transmitters with high-gain, directional antennas, rather than high power transmitters with low-gain, non-directional antennas. The Commission reasoned that this would reduce the likelihood that PCS licensees would deploy base stations that could transmit a strong signal over distances well beyond a mobile unit's capability to respond. Subsequently, the Commission clarified the applicability of these power limits in its *Third Memorandum Opinion and Order on Reconsideration*, stating:

"As regards power levels per transmitter, antenna or antenna element, it was always our intent that the 100 Watts per channel and 1640 Watts EIRP requirements apply to these individual components and not to the sum of all components at the entire base station, provided that the maximum EIRP radiated by the base station in any given direction on any given channel does not exceed 1640 Watts."³

As is clear from the "per channel" language in the foregoing paragraph, the 100 Watt power output rule is to be applied individually to each of any number of transmitters in use at a broadband PCS base station, each of which transmits on a single channel.⁴ When adopting the rule, the Commission may not have considered the possibility that future PCS base stations might utilize individual transmitters that are designed to transmit on multiple channels, such as MCPAs, and that have the aggregate transmitter output power of all of these channels. While the current rule does not explicitly prohibit the use of MCPAs (you indicated that the Commission has previously certified MCPAs having an output power of 100 Watts or less), it does have the effect of limiting the power of all channels transmitted by an MCPA (28 channels in the example you cited) to the intended limit for one channel. This, in turn, could discourage the use of MCPAs at PCS base stations where many channels are used.

² 9 FCC Rcd 4957,5022 (1994).

³ 9 FCC Rcd 6908,6917 (1994) at paragraph 62.

⁴ The current broadband PCS rules allow licensees complete flexibility in use of emission types and in channelizing their assigned frequency blocks, and thus do not define what constitutes a "channel" in broadband PCS. In the similar Public Mobile Services, however, a channel is defined generally as "the portion of the electromagnetic spectrum assigned by the FCC for one emission." See Section 22.99 of the Commission's rules (47 C.F.R. § 22.99).

In view of these facts, it appears that application of the 100 Watt transmitter power limit in Section 24.232(a) of the Commission's rules to certification and normal operation of MCPAs does not serve the underlying purpose of the rule to limit transmitter output power on a "per channel" basis. Furthermore, because the 125 Watts you have requested is only 1 dB more than the 100 Watt limit, the underlying purpose of the rule – necessitating the use of high-gain, directional antennas where high base station EIRP is desired – would continue to be served even after the waiver is granted.⁵

Turning to the issue of whether grant of the requested waiver would be in the public interest, the various technical, economic, and spectrum efficiency advantages attributed to expanded use of MCPAs at PCS base stations, in lieu of multiple individual transmitters, could indeed constitute a significant public benefit. Furthermore, no apparent harm will result from such increased use. Thus, allowing broadband PCS licensees to have the option of using MCPAs in the power range (up to 125 Watts) for which this waiver is sought is clearly in the public interest. Considering the advantages of MCPAs in facilitating technology migration, which some wireless carriers are now undertaking in order to provide advanced "3G" services, such as high speed data applications, it further appears that the waiver granted herein is appropriate as a timely vehicle for providing relief for the instant case.⁶

Accordingly, pursuant to Sections 4(i) and 303(e) of the Communications Act of 1934, as amended, (47 U.S.C. § 154(i) and 47 U.S.C. § 303(e), respectively), the 100 Watt transmitter power output limit contained in Section 24.232(a) of the Commission's rules (47 C.F.R. § 24.232(a)) is hereby waived with regard to its application to FCC equipment authorization for, and normal operation of, multicarrier power amplifiers in the Broadband Personal Communications Service, subject to the following conditions:-

⁵ Under the current rule, to obtain 1640 Watts EIRP using a 100 Watt transmitter output power, a net antenna system gain of 12.2 dBi is necessary. Under the requested waiver, to obtain 1640 Watts EIRP using a 125 Watt transmitter power output would still require a net antenna system gain of 11.2 dBi. For an example of a configuration the rule is intended to prevent, consider the use of a 1000 Watt transmitter output power with a net antenna system gain of only 2.15 dBi, which would also result in 1640 Watts EIRP. In reality, PCS systems are normally designed to use far lower base transmitting power levels, typically 100 to 200 Watts EIRP.

⁶ Additional power increases above 125 Watts, however, might not be considered *de minimis* in comparison to the 100 Watt limit in the current rule. Thus, if Powerwave anticipates developing (for certification and use under Part 24) MCPAs that would exceed the 125 Watt limit established under this waiver, it is strongly recommended that Powerwave submit, well in advance, a petition for rule making, pursuant to Section 1.401 of the Commission's rules (47 C.F.R. § 1.401), recommending amendment of Section 24.232(a) to allow authorization and use of such equipment. It would be helpful if such a petition were to include proposed language for amendment of Section 24.232 that would permit the use of advanced technology transmitters, such as MCPAs, while preserving existing interference protection in the broadband PCS.

1. The peak output power of such multicarrier power amplifiers must not exceed 125 Watts.
2. All other provisions of Section 24.232(a), including the 1640 Watt EIRP limit, remain in force.

This action is taken under delegated authority pursuant to Sections 0.131(a) and 0.331 of the Commission's rules (47 C.F.R. §§ 0.131(a), 0.331).



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