

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

In the Matter of)
)
Biennial Regulatory Review – Amendment) WT Docket No. 03-264
of Parts 1, 22, 24, 27, and 90 to Streamline)
and Harmonize Various Rules Affecting)
Wireless Radio Services)

COMMENTS OF ERICSSON INC

I. SUMMARY

Ericsson Inc (“Ericsson”) hereby submits comments in response to the Federal Communications Commission’s (“FCC” or “Commission”) *Notice of Proposed Rulemaking* (“*NPRM*”), released January 7, 2004.¹ The Commission seeks to streamline and harmonize licensing provisions in the wireless radio services that were identified in its 2000 and 2002 biennial reviews pursuant to Section 11 of the Communications Act of 1996. Under Section 11, the Commission must review its regulations that are applicable to telecommunications service providers to determine whether any rule is “no longer necessary in the public interest as the result of meaningful economic competition.”²

At ¶¶ 13-18 of its *NPRM*, the Commission seeks comment on whether its Part 24 transmitter power and antenna height restrictions, adopted in 1994, are still necessary. Ericsson believes that the current power limit is too restrictive and no longer necessary to ensure that PCS operators will not use power beyond the mobile’s capability. Ericsson makes the following recommendations in response to the issues raised in the *NPRM*:

- The Commission should eliminate the per-transmitter output power limit entirely;

¹ *Notice of Proposed Rulemaking, In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, 19 FCC Rcd. 708, WT Docket No. 03-264 (rel. Jan. 7, 2004).

² 47 U.S.C. § 161.

- If the Commission determines that it should retain this limit, it should apply the limit on a per carrier basis; and
- The Commission should not apply any output power limits on a power spectral density basis.

Additionally, Ericsson raises a very important issue in Section 24.232 that, like the others raised in the *NPRM*, needs to be addressed to streamline and harmonize the rules. The rule only permits output power measurement on a “peak” basis. Ericsson believes that the Commission should allow operators to measure output power limits on an average as well as peak basis. This change will conform the rule to current practice and provide needed clarity and certainty to the industry. Accordingly, the Commission should eliminate all references to “peak” in Section 24.232(a), (b) and (c) to permit measurements on either a peak or average basis, without restriction.³

Ericsson attaches its proposed revisions to the rule at Appendix A that show its recommendations, assuming the Commission retains the 100 watt transmitter output power limit.

II. The Commission Should Eliminate the Per-Transmitter Output power Limit Entirely

The Commission seeks comment on whether it should relax the transmitter power limit in Section 24.232(a) by clarifying that the output power limit of 100 watts applies on a per-carrier (as opposed to per-transmitter) basis or by eliminating the transmitter output power limitations entirely.⁴ It also seeks comment on which approach is more desirable, given the potential

³ Alternatively, the Commission could retain “peak” and add “average” measurement in each reference.

⁴ *NPRM* ¶ 17. The rule provides as paragraph (a):

Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT...In no case may the peak output power of a base station transmitter exceed 100 watts.

benefits to the public, and the impact on quality of service for subscribers.⁵ Ericsson urges the Commission to eliminate the transmitter output power limit entirely. Under current market conditions, the limit no longer serves its original purpose. In fact, eliminating the limit will bring many more benefits to the public, including giving operators much needed flexibility to meet dramatically increasing customer demand for service and providing customers improved coverage and better quality of service.

The Commission originally adopted the 100 watt transmitter output power limit in 1994 to ensure that broadband PCS licensees using the concurrent increase in EIRP limit for base stations from 100 to 1640 watts would use low power transmitters with high gain directional antennas.⁶ The FCC maintained that the limit would discourage licensees from transmitting a strong signal over distances well beyond the mobile unit's capability to respond.⁷

In current market conditions, the FCC's original justification for the transmitter power limit may no longer be valid. First, the current intensely competitive environment makes minimization of costs the primary driver for CMRS operators which also works to limit the use of excessive transmitter power beyond a mobile unit's capacity to respond. Because transmitter output power is one of the more costly aspects of operation, most operators are not likely to deploy higher output power than is necessary to balance the reverse link in order for mobile stations to reach base stations. Consequently, no PCS licensee would intentionally design a system that made use of mobile phones less effective. In these circumstances, the government no longer needs to worry that, without regulation, an operator will transmit power beyond the mobile's capability to respond. Market forces will ensure that transmitter output power will not exceed what is necessary to match the reverse link.

⁵ *Id.* ¶ 17.

⁶ *Id.* ¶ 13.

⁷ *Id.*

Additionally, eliminating the limit will bring far more benefits to the public than retaining the limit with clarifications. In 1994, when the Commission adopted the current transmitter output power limit, base station transmitter output power limits did not impose substantial barriers to efficient operation because PCS systems needed a smaller number of RF carriers to serve significantly fewer customers. However, in current market conditions, eliminating the limit will give PCS operators very much needed flexibility to meet the dramatic increase in subscriber growth and demand.

In the last few years, subscriber growth has skyrocketed. Consequently, operators must use more carriers, and thus increase total power, to provide the same level of service over the same coverage area. Also, with local community resistance to additional base station construction, operators now must often collocate their PCS equipment at cellular sites. Since operators are faced with constructing PCS physical plants in a cellular system configuration, they must expend proportionately greater transmitter power at higher frequencies to cover the same customer base. For these reasons, continuing to limit transmitter output power will thwart operators' ability to meet customers' needs.

Furthermore, removing restrictions on the transmitter output power limit will have many benefits for the public and will improve service quality. With the ability to use higher transmitter power, operators will be able to improve coverage outdoors, indoors, and in vehicles, as well as overall performance and quality of service.

Finally, removing the transmitter output power limit will not increase harmful interference. If the transmitter output power limit no longer exists, the Commission will still certify a transceiver based on its ability to conform to the Commission's out-of-band emissions requirements. In other words, the transceiver will still need to meet the FCC's emissions limits

at 47 C.F.R. § 24.238, even if the transmitter output power limit is eliminated. This is very important because the Commission's current public interest concern is ensuring that interference be managed. Its earlier concern, that it protect against imbalance in the mobile uplink/downlink, is outmoded and no longer needed.

For all these reasons, the Commission should eliminate the transmitter output power limit entirely.

III. If the Commission Retains the Transmitter Output Power Limit, It Should Apply the Limit on a Per-Carrier Basis

If the Commission decides to retain a base station transmitter output power limit in its rule, it should, at a minimum, modify its rule to reflect the limit on a "per-carrier" basis rather than a "per-transmitter" basis. The Commission already clarified in 1994 that it intended its limit to apply on a per-channel basis, which equates to a per-carrier basis with today's technology. Further, modifying the rule in this manner will ensure that the FCC's base station output power restrictions are not biased in favor of one air interface over another. Additionally, the Commission should reject the suggestion included in ¶ 18 of its *NPRM* that it apply transmitter power limits based on a power spectral density.

A. Applying the Limit on a Per-Carrier Basis is Consistent with the Commission's Prior Clarification of the Rule

In its *Third Memorandum Opinion and Order on Reconsideration* in Docket 90-314,⁸ the Commission addressed a request by Spatial Communications and ArrayComm ("SCI/ArrayComm") to redefine its transmitter output power rule at Section 232 in terms of units of power per-bandwidth (spectral density). SCI/ArrayComm claimed that the rule defined

⁸ *Third Memorandum Opinion and Order, In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services*, GEN Docket No. 90-314, 9 FCC Rcd. 6908 (rel. Oct. 19, 1994) ("*PCS Order*").

transmitter power limits in a manner that favored the use of narrowband over wideband transmissions.⁹

When it rejected SCI/ArrayComm's proposal, the Commission clarified that it intended the transmitter output power limit to apply on a per-channel basis. The Commission clarified:

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 the maximum EIRP radiated by the base station in any given direction on any given channel does not exceed 1640 watts.¹⁰

As this statement indicates, the Commission intended its transmitter output power and EIRP limits to apply on a per-channel basis. The Commission restated the power limit per-transmitter as a power per-channel measurement. Also, it restated the maximum EIRP on a per-channel basis. Both these restatements support that the Commission intended the measurement to apply on a per-channel basis. Certainly, if EIRP limits applied on a per-channel basis, the transmitter limit would have to apply in the same manner, since the two are interdependent.

Also, the distinctions between "channel," "transmitter," and "carrier," however imprecise, were used interchangeably. Specifically, "power-per-transmitter" was commonly assumed to be equivalent to power-per-channel. However, with current technology, distinctions between these terms matter. For instance, the Commission's use of the term "per-channel" in 1994 equates to a "per-carrier" measurement basis today. In 1994, wireless operators established wireless communication links using channels. With current technology, a "channel" is the minimum bandwidth needed to establish one wireless communication link between the base station and mobile unit for any given radio access technology. The industry uses the term "channel" to designate voice or data that has been encoded on a carrier. Therefore, the FCC's

⁹ *Id.* at 6917.

¹⁰ *Id.* at 6918. (emph. added)

use of the term “channel” in its rule clarification has been superseded by “carrier” because, functionally, a channel is no longer the means for establishing a wireless communication link.

B. A Per-Carrier Power Limit Rule is Technologically Neutral and Far Preferable to Basing Transmitter Power Limits on Spectral Density

Modifying the rule to apply the base station transmitter output power limits on a per-carrier basis will make the rule technologically neutral. Changing the rule in this manner will ensure that the FCC does not hinder development of technological innovations, such as equipment that combines signals at the base station. The FCC should also reject the suggestion at ¶ 18 that it base transmitter output power limits on power spectral density.¹¹ Measuring transmitter output power limits on this basis favors one radio access technology over another and hinders the Commission’s goal that its rules be technologically neutral.

Ericsson agrees with Staff and Powerwave that the Commission should modify the transmitter output limit to apply on a per-carrier basis to ensure that the rule does not discourage development of new technologies that permit operators to combine power amplifiers.¹² Over the last five years, as demand for service has exploded, the industry has continued to develop new products to meet this growth. For example, operators now use equipment that combines the output power of multiple radios before being sent to the Multi-Carrier Power Amplifier (“MCPA”), which then amplifies all the signals at once. If the output power of the MCPA is treated as one “transmitter,” then it likely may not meet the rule’s standard. Consequently, if the Commission does not modify the rule to reflect that it is applied on a per-carrier basis, it will discourage the development and deployment of technologies, such as MCPAs, that combine

¹¹ See also, Qualcomm Incorporated’s Notice of Ex Parte Presentation, WT Docket No. WT 03-264 and ET Docket No. 02-137 (fil. Mar. 18, 2004) (“Qualcomm Ex Parte”), p. 1.

¹² *NPRM* at ¶ 16.

signals in innovative ways yet do not increase the risk of harmful interference to neighboring systems.

A per-carrier output limit is technologically neutral in other respects, such as between narrowband and broadband air interfaces. Notably, when the FCC clarified in 1994 that its current transmitter power limit applied on a per-channel basis (which equates today to a power limit per-carrier), it also rejected a challenge by SCI/ArrayComm that the existing rule was biased because it favored narrowband over broadband systems. The FCC stated:

[T]he existing approach simply leaves to the licensee the determination how to balance the multiple design considerations in its system, from transmitter power and configuration to the gain achieved by receivers, without placing any overall limit on system power so long as its individual transmitters and field strength data comply with our rules. As Motorola observes, system design partakes of many considerations other than the power tradeoffs inherent in narrowband and wideband systems. We find that *our current definition of power limitations does not constrain licensees considering such choices; nor does it significantly favor one technology over another.*¹³

Therefore, the FCC has already found that a per-channel/carrier output limit is technologically neutral for sound reasons.

Also, the Commission should reject the suggestion in ¶ 18 of its *NPRM* supported by Qualcomm that it base transmitter output power limits on power spectral density. Qualcomm maintains that applying transmitter output power limits on a per-carrier basis would not be technologically neutral because it would favor radio access technologies that use narrower channels over those that use wider channels, including CDMA.¹⁴ Qualcomm's reasoning is not supported. In fact, basing limits on power spectral density is not technologically neutral.

Different radio access technologies have different power densities depending on channel bandwidth. The smaller the channel bandwidth, the higher power density becomes. Defining

¹³ *PCS Order* at p. 6918 (emph. added).

¹⁴ Qualcomm Ex Parte, p. 1.

power in terms of power density discriminates against narrowband technologies in comparison to wideband systems. Following is a power density comparison between four technologies, based on carrier power of 20 watts (43 dBm):

Power density (dBm/Hz) = power per carrier (dBm) – 10* Log (full channel bandwidth) (Hz)

IS136 (TDMA)	43 - 10* Log (30000)	= -1.8 dBm/Hz
(GSM)	43 – 10* Log (200000)	= -10 dBm/Hz
IS95 (CDMA)	43 – 10* Log (1.25 e6)	= -18 dBm/Hz
(WCDMA)	43 – 10* Log (5 e6)	= -24 dBm/Hz

If the Commission adopts power density as the output power measurement, narrowband systems will be forced to transmit at significantly lower levels than wideband systems per carrier. Therefore, basing transmitter output power limits on this measurement will discriminate against narrowband technologies, such as TDMA or GSM.

Moreover, the power spectral density limit proposal is analogous to SCI/ArrayComm’s proposal in 1994 that the Commission redefine transmitter limits on a power-per-hertz or power-per-unit-bandwidth basis. Measuring EIRP per-MHz, as proposed by SCI/ArrayComm, is similar to the radiated power density basis of measurement supported by Qualcomm. The FCC rejected SCI/ArrayComm’s power per-hertz proposal and upheld its existing rule (measuring output on a per-channel/carrier basis) as technologically neutral. The Commission should follow this precedent and reject the related power spectral density measurement.

From a policy perspective, the Commission has stressed that its CMRS rules must accommodate all radio access technologies, regardless of bandwidth.¹⁵ In other words, the

¹⁵ As the Commission has stated: "harmoniz[ing] rules for like services . . . provides regulatory neutrality to help establish a level playing field across technologies and thereby foster more effective competition," *Policy Statement, In the Matter of Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications*

Commission's goal is to accommodate and harmonize all technologies and to make sure that no one technology is given advantages. As the Commission found in 1994, applying its rules on a per-channel/carrier basis accomplishes that goal.

IV. The Commission's Rule Should Permit Output Power Limit Measurements on an Average as well as a Peak Basis

The Commission should also modify the rule to eliminate references to measuring power on a "peak" basis so that measurements may be made on either a "peak" or "average" basis.¹⁶ This is a very important issue. The change will conform the rule to current practice and ensure that the type of output power measurement the Commission requires is technologically neutral.

First, the Commission's current practice is to allow either average or peak detectors when measuring a carrier's OOB (§ 24.238). The FCC Staff has confirmed to Ericsson and Swedish TCB that the Commission still allows average detection as an alternative to peak measurements for measuring both the transmitting carrier and out-of-band emissions. The FCC's published rule should conform to its practice to provide operators clarity and certainty concerning how they may meet the FCC's standards. Also, as the FCC Staff indicates, it is important to maintain consistency between the measurements of out-of-band emissions and transmit power. If an average measurement can be taken of out-of-band emissions, then the carrier's transmit power should be measured on the same basis for consistency.

Moreover, this change will make the rule very much independent of the radio access technology used. An average measurement will provide more accurate and relevant information

Technologies for the New Millennium, 14 FCC Rcd. 18,868 (rel. Nov. 22, 1999) ("Policy Statement"), at ¶ 9; Also, in its *Spectrum Reform Order*, the FCC stated "We . . . must be as competitively and technologically-neutral as possible to allow for competing equipment designs and to avoid hindering or precluding future innovative technological developments." *First Report and Order and Third Notice of Proposed Rulemaking, In the Matter of The Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010, Establishment of Rules and Requirements For Priority Access Service*, WT Docket No. 96-86, 14 FCC Rcd. 152 (rel. Sep. 29, 1998) ("Spectrum Reform Order").

¹⁶ Alternatively, the Commission could retain "peak" and add "average" as an alternative measurement basis.

on output power than a peak measurement for technologies that have non-constant envelope signals such as W-CDMA or CDMA 2000. For these noise-like waveform technologies, a peak measurement does not provide the information needed to determine the power in the entire band and is not at all representative of the output power. This may be why the FCC allows average measurements in practice, since average measurements provide more accurate information for non-constant envelope technologies.

For these reasons, the Commission's rule should not include any reference to the peak form of measurement. Ericsson includes its proposed changes to paragraphs (a), (b), and (c) of § 24.232 to eliminate all "peak" references at Appendix A.

V. CONCLUSION

The FCC is conducting this Biennial Review, in large part, to modify or eliminate rules that are outdated as a result of technological change or increased competition within wireless radio services.¹⁷ The Commission should eliminate its transmitter output power rule on this basis, particularly since this change will allow the industry to continue to meet increasing customer demand, provide customers improved coverage and better service quality, and enable rural carriers to operate more cost-effectively. Competitive forces that effectively prevent the use of excessive transmitter power are now in place. Furthermore, elimination of transmitter output power restrictions will provide operators with a great deal more flexibility to provide improved services without increasing the risk of interference. Alternatively, if the Commission retains a transmitter output power limit, it should apply the limit on a per-carrier basis. Also, and very importantly, it should change the rule to eliminate references to "peak" when measuring output power limits.

¹⁷ *NPRM* ¶ 1.

Respectfully submitted this 23rd day of April, 2004.

Mark Racek, Director, Spectrum Policy
Barbara Baffer, Vice President
Public Affairs and Regulations
Ericsson Inc
1634 I Street, N.W., Suite 600
Washington, D.C. 20006-4083
Telephone: (202) 783-2200
Facsimile: (202) 783-2206

Elisabeth H. Ross
Birch, Horton, Bittner & Cherot
1155 Connecticut Avenue, N.W.
Suite 1200
Washington, D.C. 20036
Telephone: (202) 659-5800
Facsimile: (202) 659-1027

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