

**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 )	
_____ )	

To: The Commission

**COMMENTS OF QUALCOMM INCORPORATED**

Dean R. Brenner  
Senior Director, Government Affairs  
QUALCOMM Incorporated  
2001 Pennsylvania Ave., N.W.  
Suite 650  
Washington, D.C. 20006  
(202) 263-0020  
Attorney for QUALCOMM Incorporated

Dated: April 23, 2004

**TABLE OF CONTENTS**

**I. Summary ..... 1**

**II. Background ..... 3**

**III. The Commission Should Not Adopt a Per Carrier Base Station Output Power Limit Because It Would Favor GSM and TDMA Networks That Use Narrower Channels and, Therefore, More Carriers Per MHz, and Disfavor CDMA and WCDMA Networks .....5**

**IV. The Commission Should Adopt a Spectral Power Density Limit to Regulate Base Station Power..... 7**

**V. Conclusion ..... 10**

**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 )	
_____ )	

To: The Commission

**COMMENTS OF QUALCOMM INCORPORATED**

QUALCOMM Incorporated (“QUALCOMM”) hereby submits its Comments in the above-captioned proceeding to oppose the proposal in paragraphs 17-18 of the Notice of Proposed Rule Making, FCC 03-334, released Jan. 7, 2004, (“NPRM”) that the Commission modify the base station output power limit, in Section 24.232 (a) of the Commission’s Rules, to reflect a per carrier limit rather than the per transmitter limit in the existing rule.

**I. Summary**

QUALCOMM urges the Commission not to modify Section 24.232(a) of the Commission’s Rules to impose a new base station output power limit that would favor PCS networks operated with air interfaces that use narrower channels, such as GSM and TDMA, over those that use wider channels, such as CDMA and WCDMA. A rule that would enable a network that uses a greater number of carriers per MHz to operate base stations at greater power, as the Commission proposed in the Notice of Proposed Rule Making, would effectively favor the GSM and TDMA networks and disfavor CDMA and WCDMA networks. Adoption of such a

rule would be grossly unfair and unwise and would impair the operations of the CDMA and WCDMA networks.

Such a rule change would be inconsistent with the longstanding, fundamental Commission policy under which the Commission has adopted and maintained technology-neutral rules in wireless services to allow operators to have a free choice of which air interface to deploy without the government favoring or disfavoring any particular air interface and to establish a level playing field with technology-neutral technical rules that apply to all wireless networks, no matter the air interface they employ. For the Commission to tip the scales in favor of any particular air interface through the base station output power limit would contravene this policy, which has led to the tremendous growth and expansion of the wireless industry in the United States, and would be directly contrary to the public interest.

QUALCOMM asks the Commission to adopt a limit on PCS base station output power that is based on the radiated power density of a base station, without regard to the air interface employed and without regard to the number of carriers used at the base station. The current limit of 1640 Watts peak EIRP translates to approximately 1312 Watts EIRP/MHz on a CDMA network, assuming the use of a single carrier in a base station. However, since the time that the FCC adopted the 1640 Watts peak EIRP limit, low amplifier noise technology has advanced substantially, and the noise figures of receivers has improved a great deal. This improved technology allows operators to provide increased range on the reverse link in situations where long range of coverage is desirable, but where capacity needs are not great. To permit wireless operators to take advantage of this technology, the forward link range must also be extended, and as such, it is necessary for the FCC to permit base stations to operate at higher power.

Consequently, to permit the public to reap the benefits of this improved receiver technology, QUALCOMM suggests that the Commission adopt a PCS base station power limit of 5040 Watts EIRP/MHz, or approximately 6 dB above the present limit, measured in 1 MHz. No air interface would be favored or disfavored with this density limit. Accordingly, it would be fully in keeping with the Commission's policy of technology neutrality, and the public interest would be furthered if the Commission were to adopt this proposed base station output power limit.

The NPRM itself, at paragraph 18, appears to concede that a per carrier limit would favor networks that use narrower channels, such as GSM, over those that use wider channels, such as CDMA, and, for that reason, the NPRM asked for comment on whether a power spectral density limit would be more equitable and thus preferable. QUALCOMM believes that it is clear that a per carrier limit would discriminate against CDMA and WCDMA networks, and for that reason, the Commission should not adopt such a limit. Rather, as the NPRM noted, a power spectral density limit, such as the one that QUALCOMM has proposed, would treat all networks equally, in keeping with Commission policy, and, thus, would be far more equitable and preferable.

Indeed, no limit on base station output power would be vastly preferable to a limit that would discriminate against networks that use wider channels, such as CDMA and WCDMA networks. QUALCOMM is, however, concerned about the possibility of harmful interference that could occur if there is no limit on base station output power, and therefore, QUALCOMM favors the technology-neutral limit of 5040 Watts EIRP/MHz .

## **II. Background**

QUALCOMM is a world leader in developing innovative digital wireless communications technologies and enabling products and services based on the digital wireless

communications technologies that it develops. QUALCOMM has developed core technology known as code division multiple access (“CDMA”). This technology has been incorporated into standardized wireless technologies deployed by wireless carriers in the United States and around the world, including cdmaOne, the second generation (2G) version of CDMA, and CDMA2000, the third generation (3G) version of CDMA. Virtually all third generation (“3G”) wireless products and services are based on some form of CDMA.

The 3G CDMA technologies include CDMA2000, which operates on 1.25 MHz channels, WCDMA (also known as wideband CDMA or UMTS), which operates on 5 MHz channels, and TD-SCDMA, which is a TDD-based CDMA technology. CDMA2000 includes both 1xRTT and 1xEV-DO, both of which enable carriers to provide high speed, advanced 3G data services in a relatively narrow swath of spectrum. WCDMA technology permits GSM-based networks to upgrade so as to be able to provide offer advanced, high speed 3G data services in a wider swath of spectrum, and these networks can be upgraded further to high speed downlink packet access (“HSDPA”) technology, which will enable them to achieve even faster data rates.

A significant difference between CDMA and WCDMA networks as opposed to TDMA, GSM, and iDEN networks relates to the width of the channels that such networks use. As already noted, CDMA networks use 1.25 MHz channels, and WCDMA networks use 5 MHz channels, even wider. By contrast, TDMA networks use 30 KHz channels; and, GSM networks use 200 KHz channels. Consequently, GSM and TDMA networks use much narrower channels, and thus can deploy a greater number of carriers per MHz, than the CDMA and WCDMA networks, which nevertheless achieve much faster data rates and much greater voice capacity in the same total allocation of spectrum.

CDMA is proliferating at a rapid pace, here in the United States and around the world. At present, there are approximately 188 million CDMA subscribers worldwide. 3G CDMA has been deployed by a total of 77 carriers, which are based in the United States and 36 other countries around the world. 50 of these carriers have reported that they already have a total of over 98 million subscribers for 3G CDMA services. Operators in the United States and elsewhere around the world who have deployed 3G CDMA have experienced dramatic and rapid growth in both in terms of numbers of subscribers and average revenue per subscriber.

Moreover, QUALCOMM broadly licenses CDMA technology to over 100 leading handset and infrastructure equipment manufacturers around the world. At present, there are 46 vendors who have manufactured 458 different 3G device models that are now commercially available in the United States and elsewhere around the world. These devices include a wide array of wireless phones, PCMCIA cards, PDAs, and the like.

**III. The Commission Should Not Adopt a Per Carrier Base Station Output Power Limit Because It Would Favor GSM and TDMA Networks That Use Narrower Channels and, Therefore, More Carriers Per MHz, and Disfavor CDMA and WCDMA Networks**

As already shown, the GSM, and TDMA air interfaces use much narrower channels than the CDMA and WCDMA air interfaces. As a result, networks using the GSM and TDMA air interfaces can use many more carriers per MHz than CDMA and WCDMA networks. For example, a TDMA network can use 15 times the number of carriers that a WCDMA network can use; a GSM network can use more than 5 times the times the number of carriers than a CDMA network can use. This wide disparity in the number of carriers that various networks can use means that a base station output power rule that employs a per carrier limit would necessarily favor GSM and TDMA networks and disfavor CDMA and WCDMA networks, the very networks which will deliver advanced, high speed 3G services to Americans. Thus, to adopt a

per carrier limit would directly violate the Commission's well-established policy of maintaining technology-neutral rules in wireless services and would impair the operations of the latest, state-of-the-art wireless technologies, thereby harming the public interest.

In a recent Notice of Proposed Rule Making issued in another proceeding, the Commission summarized its policy of technology neutrality in wireless services as follows:

“We also note that most of our rules governing the licensing and operation of wireless services, particularly commercial services, are technology-neutral except to the extent necessary to prevent interference among competing spectrum uses.”

In the Matter of IP-Enabled Services, Notice of Proposed Rule Making, WC Docket 04-36, released March 10, 2004 at para. 68.

A per carrier base station output limit is certainly not needed to prevent interference between competing spectrum uses, and as a result, it would violate the Commission's policy of technology neutrality, as explained by the Commission just last month, for the Commission to adopt such a limit. Indeed, a per carrier limit would invariably cause harmful interference as the GSM and TDMA networks could operate base stations at much greater power than the CDMA and WCDMA networks. There is no reason whatsoever for the Commission to foster this result, and the accompanying harm to the services provided to and used by millions of Americans.

The policy of technology neutrality has enabled advanced, spectrally efficient CDMA technology to develop and flourish. This technology is now the basis for the latest generation, the third generation, of modern wireless telecommunications services. In the Commission's proceeding to enhance wireless service to tribal lands, Chairman Powell succinctly stated the Commission's objective of “ensur(ing) that all Americans enjoy technology-neutral access to modern telecommunications services and can participate fully in the digital economy.” See In the Matter of Extending Wireless Telecommunications Services to Tribal Lands, Second Report

and Order and Second Notice of Proposed Rule Making, 18 FCC Rcd 4775, 4791 (2003). A per carrier base station power limit would prevent the accomplishment of this worthwhile objective and would represent an unwarranted reversal from the technology neutral policies that have enabled the explosive growth of wireless services and wireless technology in the United States. For these reasons, QUALCOMM urges the Commission not to adopt a per carrier base station output power limit.

#### **IV. The Commission Should Adopt a Spectral Power Density Limit to Regulate Base Station Power**

QUALCOMM believes that, as suggested in paragraph 18 in the NPRM, that a spectral power density limit would be technology neutral, in keeping with Commission policy, and would be the most equitable and effective way to regulate base station output power. A limit based on EIRP/MHz would be technology neutral and, thus would be far more equitable than a limit based on power per carrier. No technology would be favored or disfavored with an EIRP/MHz limit, and all networks would be protected against excessive base station output power.

QUALCOMM suggests a limit of 5040 Watts EIRP/MHz, measured in 1 MHz, on base station output power. For a CDMA network, the existing 1640 Watts peak EIRP limit translates to approximately 1312 Watts EIRP/MHz assuming use of a single carrier in a base station.<sup>1</sup>

However, it is very important that the Commission to keep its rules current with technological developments. Ever since the FCC adopted the 1640 Watts peak EIRP limit in the

---

<sup>1</sup> This is likely at the upper limit of what can be practically deployed in a typical deployment. Assuming an antenna gain of 18 dBi and a transmit power of approximately 20 watts yields an EIRP of 1262 Watts per 1.25 MHz carrier, or approximately 1000 Watts EIRP/MHz, which is actually below the present limit. There is no reason to decrease the present limit, which needs to be higher than the 1000 Watts EIRP/MHz due to a host of variables that impact actual deployments. Adding 1dB would yield 1260 Watts EIRP/MHz, which would be just less than the current limit of 1640 Watts peak EIRP. As shown in the text, however, there are very compelling reasons for the Commission to increase the limit above its current level.

original PCS technical rules, there have been substantial improvements in low noise amplifier technology. The noise figures of receivers has improved a great deal in ways far beyond what was possible in the early 1990's. To permit wireless operators to take advantage of this improved technology, and to enable to enjoy the higher quality of service, it is necessary for the FCC to permit base stations to operate at higher power.

As a result, QUALCOMM asks that the Commission adopt a PCS base station power limit that is approximately 6 dB (four times) higher than the present limit, or 5040 Watts EIRP/MHz. Such a limit would be technology neutral and would take account of technological innovation.

No air interface would be disadvantaged with such a limit. For example, for a WCDMA network, since it uses more than three times the bandwidth per carrier as compared to a CDMA network, a WCDMA network would get three times the power per carrier. GSM networks would also fare well with this limit. A GSM network could use all 5040 Watts EIRP on one carrier using 1 MHz, or use microcells with a minimum possible frequency reuse of 1, at a per carrier power of 1008 Watts.

Moreover, networks using the narrower bandwidth technologies, such as TDMA, would not suffer in any way with this limit. These networks could all continue to operate their multiple carriers per MHz, with the 5040 Watts EIRP/MHz divided among the multiple carriers. These networks would not be disadvantaged in any assuming they use normal frequency reuse patterns associated with PCS operations.

This spectral power density limit would be relatively easy to enforce by the staff of the Commission's Field Offices. Using a calibrated antenna and receiver, one can determine the receive power density (Watts/MHz) from the nearest base station. Knowing the distance to that

base station, the transmitted power density (EIRP/MHz) can be calculated to determine if the wireless carrier is operating in compliance with the limit.

Finally, the NPRM does discuss the possibility of the Commission eliminating any limit on base station output power. See NPRM at para. 17. While no limit on base station output power would be vastly preferable to a limit that would discriminate against networks that use wider channels, such as CDMA and WCDMA networks, QUALCOMM is concerned about the possibility of harmful interference that could occur if there is no limit on base station output power. For example, without any limit, it is possible that GSM-based networks could substantially increase their base station output power to increase the range of their base stations, thereby overloading CDMA handsets, despite the adjacent channel and co-channel interference protections and even though range will not be increased without an increase in antenna gain rather than amplifier power.

Consequently, QUALCOMM prefers the technology-neutral limit of 5040 Watts EIRP/MHz, measured in 1 MHz, although no limit would be vastly preferable to a per carrier limit, which would discriminate against CDMA and WCDMA networks.

## V. Conclusion

Wherefore, for the foregoing reasons, QUALCOMM respectfully requests that the Commission revise Section 24.232 (a) to provide that PCS base stations may operate at a radiated power spectral density of no more than 5040 Watts EIRP/MHz , as measured in 1 MHz.

Respectfully submitted,

By: /s/Dean R. Brenner  
Dean R. Brenner  
Senior Director, Government Affairs  
QUALCOMM Incorporated  
2001 Pennsylvania Ave., N.W.  
Suite 650  
Washington, D.C. 20006  
(202) 263-0020  
Attorney for QUALCOMM Incorporated

Dated: April 23, 2004