Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Proposed Changes in the Commission's	)	ET Docket No. 03-137
Rules Regarding Human Exposure to	)	
Radiofrequency Electromagnetic Fields	)	

To: The Commission

COMMENTS OF T-MOBILE USA, INC.

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CONTENTS

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T-Mobile USA, Inc. ("T-Mobile") hereby submits comments in response to the Notice of Proposed Rulemaking ("NPRM") regarding proposed changes to the Commission's rules governing human exposure to radiofrequency ("RF") electromagnetic fields.[1]

I. Introduction

In this proceeding, the Commission seeks to amend its guidelines for human exposure to RF energy in order to improve the practical efficiency, consistency and scope of protection of the Commission's RF rules. The amendments regarding routine environmental evaluation will increase the number of new wireless installations that will require such evaluations. The methods that may be employed to accomplish these evaluations, however, are not significantly more burdensome than the safety procedures currently employed by T-Mobile and many other wireless carriers. Accordingly, T-Mobile supports the Commission's proposals in this regard, because these changes will increase the level of public confidence in the safety of workers and the public, without imposing unnecessarily burdensome requirements on industry.

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[1] *In the Matter of Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields*, Notice of Proposed Rulemaking, ET Docket No. 03-137, FCC 03-132 (rel. June 26, 2003) ("NPRM").

T-Mobile urges the Commission to continue to make use of its position of authority and expertise to explain and emphasize to policy makers, to the public and to the industry, that wireless transmitters typically pose no danger to human health from excessive RF exposure, and that the Commission's guidelines, both current and proposed, incorporate huge margins of safety. With greater understanding of the safety mechanisms built into the Commission's rules, T-Mobile believes that the changes proposed in the NPRM will generate both greater public acceptance of, and more flexible and efficient industry compliance with, its RF guidelines. It is also important to recognize that safety allows, and principles of fairness and environmental law strongly support, application of the new rules only prospectively, to facilities to be constructed in the future.

T-Mobile commends the Commission for continuing to closely monitor technical and scientific developments in this area that increase our understanding of the issue of human exposure to RF radiation from FCC-licensed facilities. T-Mobile fully supports the Commission's commitment to the paramount importance of maintaining safe environments around all transmission facilities, while minimizing unnecessary compliance burdens on industry that must build and maintain the advanced wireless networks. T-Mobile commends the FCC for its efforts to improve the RF rules, and encourages the FCC to adopt rules consistent with its stated goal of "provid[ing] more efficient, practical and consistent application of compliance procedures."[2]

II. Background

Over the past twenty-five years, the Commission has acted carefully, in compliance with the nation's environmental laws, to protect the public from excessive RF exposure, while at the same time permitting the rapid development and construction of the advanced wireless networks necessary for the public necessity, convenience, safety and security. In doing so, the Commission has acted under a mandate to achieve a "balance between the need to protect

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[2] *Id.* ¶ 1.

the public and workers from exposure to potentially harmful RF electromagnetic fields and the requirement that industry be allowed to provide telecommunications services to the public in the most efficient and practical manner possible."[3]

The FCC first adopted guidelines for human exposure to RF radiation from FCC-regulated transmitters and facilities in 1985, after a lengthy six-year rulemaking that started in 1979.[4] The action in the initial Report and Order was based on a consensus among participating experts, and adopted guidelines issued in 1982 by the standards setting body, the American National Standards Institute ("ANSI").

In 1992, ANSI and the Institute of Electrical and Electronic Engineering ("IEEE") developed and published a health standard for RF exposure that was more restrictive than the one ANSI had previously adopted. In response, the FCC released a Notice of Proposed Rulemaking in 1993 proposing to revise its 1985 guidelines in accordance with the new ANSI standard.[5] In that notice, the Commission noted that the 1992 ANSI standard was less restrictive than standards proposed by two other standards bodies, the National Council on Radiation Protection and Measurements ("NCRPM"), and the International Radiation Protection Association ("IRPA").[6]

In 1996 and 1997, after reviewing comments from multiple expert organizations and individuals, industry and the general public, the Commission ultimately adopted RF exposure

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[3] *In the Matter of Procedures for Reviewing Requests for Relief From State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act; Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation; Petition for Rulemaking of the Cellular Telecommunications Industry Association Concerning Amendment of the Commission's Rules to Preempt State and Local Regulation of Commercial Mobile Radio Service Transmitting Facilities;* Second Memorandum Opinion and Order and Notice of Proposed Rulemaking, 12 FCC Rcd 13494, 13496 (1997) ("RF Order II").

[4] Biological Effects of Radiofrequency Radiation, *Report and Order*, 100 F.C.C. 2d 543 (1985).

[5] *Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, Notice of Proposed Rulemaking, 8 FCC Rcd 2849 (1993).

[6] *Id.*

guidelines that incorporated the more restrictive maximum permitted exposure ("MPE") limits suggested by the IRPA, as well as certain other elements of the 1992 ANSI standard.[7]

In the current rulemaking proceeding, the Commission continues in the path of seeking reasonable guidelines with huge margins of safety, while assisting industry to comply with these guidelines efficiently, with a minimum of unnecessary regulatory or compliance burdens.

III. Discussion

A. Routine Evaluation and Categorical Exclusion

1. The New and More Conservative Compliance Standards Can Work With Appropriate Commission Guidance

The Commission's previous RF orders were based on advances in scientific research and understanding, and upon newly adopted standards or recommendations from other standards bodies, or by other federal agencies with primary expertise and responsibility for health and safety.

In the NPRM, the Commission makes clear that it is satisfied with the current exposure limits, and the current NPRM does not propose a change in or seek comment on the MPE limits themselves.[8] Instead, the Commission seeks to provide for a more "conservative range of power and separation distances "for facilities that will in the future require routine environmental evaluation.[9] Thus the proposed changes are procedural, not substantive, and seek merely to alter the threshold requirements for routine environmental evaluation, to determine if further processing to assure safety compliance may be necessary. Although

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[7] *See Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, First Memorandum Opinion and Order, 11 FCC Rcd 17512 (1996); RF Order II.

[8] NPRM ¶ 5.

[9] *Id.* ¶ 9.

these changes will increase the number of T-Mobile installations that will require routine evaluation, T-Mobile supports the changes.

T-Mobile agrees with the Commission that from a public policy perspective, it is "desirable and appropriate to categorically exclude from routine environmental evaluation only those transmitting facilities that offer little or no potential for exposure in excess of our limits."[10] T-Mobile hopes that the Commission will further explain in its order that a large number of facilities that will now fall within the guidelines requiring routine evaluation, likewise "offer little or no potential for exposure in excess of" the guidelines. These rules must also grant to licensees the flexibility necessary to ensure public safety under the guidelines in the most efficient way possible.

2. The Practical Impact of Restricting Categorical Exclusions

As T-Mobile assesses the proposed rules, it appears that the Commission proposes to significantly limit categorical exclusions for both Part 22 cellular and Part 24 broadband PCS transmitters, requiring routine evaluation in the future for virtually all building and rooftop installations. T-Mobile sees this change as increasing the number of new facilities that will require special attention in the determination of whether an environmental assessment ("EA") is required. These new rules will require all carriers to more carefully scrutinize a larger number of facilities to ensure that they do not present the rare or improbable case where excessive RF human exposure is possible. T-Mobile believes that this change is a positive one.

Under the current rules covering building-mounted or rooftop antenna installations, all Part 22 cellular facilities operating at less than 1000 watts Effective Radiated Power ("ERP"), and all Part 24 broadband PCS facilities operating at less than 2000 watts ERP are categorically excluded from routine environmental review, regardless of their proximity to publicly accessible areas. The Commission adopted this rule because "[o]ur calculations and

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[10] RF Order II at 13513.

analyses indicate that those transmitting facilities that are categorically excluded from routine evaluation should offer little or no potential for exposure in excess of our limits."[11] Virtually all of the many thousands of currently existing T-Mobile-owned rooftop installations operate within these standards today, and thus were properly categorically excluded from routine environmental review.

The proposed rules greatly increase the number and types of facilities that in the future will require routine evaluation. Under the proposed rules, all rooftop facilities within 3 meters (10 feet) of publicly accessible areas must undergo routine evaluation. And for facilities nearer than 10 meters (32.5 feet) from publicly accessible areas, the power level for categorical exclusion has been reduced 90% from 1000 watts to 100 watts for cellular facilities, and from 2000 watts to 200 watts for Broadband PCS facilities. Further, the proposed rule applies these distance measurements in every direction, thus forcing carriers to take into account "publicly accessible" rooms or areas separated from the transmitter by roofs or brick walls. Under these standards, virtually none of T-Mobile's building mounted facilities will qualify for categorical exclusion.

Nevertheless, T-Mobile is confident that all of its new facilities will fall well within the Commission's safety standards. The typical T-Mobile PCS facility will pose little or no risk of exceeding the Commission's RF safety guidelines. This can be shown in the authoritative models for predicting power levels developed by the EPA and in tests of actual equipment that T-Mobile safety personnel have performed. Where the facts establishing that facilities fall within the FCC's guidelines can be confirmed without burdensome testing or engineering studies, but merely by demonstrating the facts and limitations that exist at a given site, T-Mobile is confident that the new rules will improve both levels of confidence and compliance efficiency. Moreover, these procedures are not significantly more far ranging or burdensome than the procedures currently employed by T-Mobile and other wireless carriers to determine whether or not their facilities are categorically excluded from

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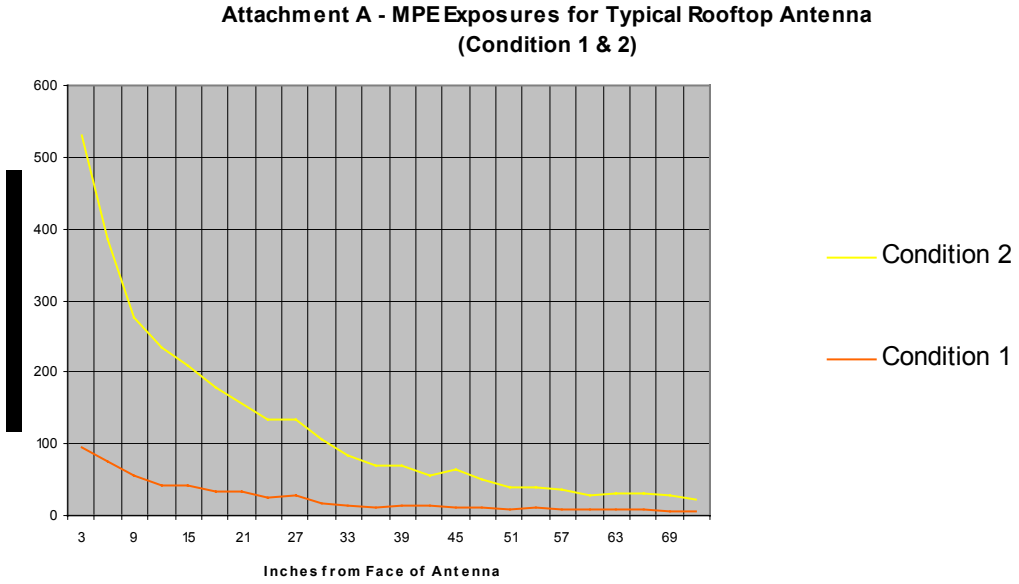
[11] *Id.* at 13512

environmental processing. As such, with appropriate Commission explanation and guidance, the new rules and procedures should be easily accommodated along with other carrier RF safety procedures.

3. Margins of Safety under the Commission's Guidelines

The results of T-Mobile's most recent "Test of Separation Distances and RF EME Exposure Levels" are attached as Exhibit 1. The test measured actual exposure levels at difference power levels and separation distances using a conservative equipment configuration representative of the bulk of legacy wireless outdoor installations on towers and rooftops. The results of that test are shown in the chart below.



The results depicted in this chart show that at power levels of 179 watts ERP (293 watts effective isotropic radiated power ("EiRP")) (Condition 1) and 760 watts ERP (1246 watts EiRP)(Condition 2), respectively, the measured power density in front of the transmitting surface of the antenna drops very rapidly as one moves away from the face of the antenna. Before the distance reaches one meter, power levels are well within the FCC's guidelines for uncontrolled areas, and they approach insignificant levels within 2 meters. It

should be noted that the transmitter used for this test was a Grayson analog transmitter, which would produce power levels some 35% greater than the Global System for Mobile Communications ("GSM") antennas that T-Mobile uses today in its multi channel Broadband PCS facilities.

4. Other Types of Facilities Can Easily be Shown to Fall Within Safety Guidelines

T-Mobile notes that the Commission has in the past invited licensees to suggest more innovative or efficient ways to determine categorical exclusions from RF environmental processing. In the RF Order II, the Commission stated:

> [I]t may be possible to refine these categorical exclusions, based on additional relevant data that may be gathered over time, in order to distinguish more easily between situations that should be subject to routine evaluation and those that should not. Along this line, we encourage interested parties to develop data and submit proposals, in the form of petitions for rule making, as they gain experience in doing routine environmental evaluations.[12]

In the NPRM, the Commission has rejected detailed incremental levels of categorical exclusion in favor of a rule that emphasizes "simplicity and certainty," and also that leaves the measurement and confirmation of compliance with the Commission's guidelines to the carriers. T-Mobile believes that this approach can be efficient and workable, particularly if carriers can develop their own standards for confirming safety compliance. This will require an understanding of the different characteristics of transmitters and the RF emissions they generate. The significant differences between transmitters with different characteristics can be used to simplify the process of routine environmental evaluation.

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[12] *Id.* at 13513.

a. Cellular and PCS Transmitters

One of the most important characteristics that create different power levels at distance from an antenna is radiated power, described as ERP or EiRP. As shown in the chart labeled EPA Model 1, attached to these comments at Exhibit 2, separation distances to accessible areas shorter than 10 meters can still be very safe, particularly for lesser power levels. Thus, licensed facilities in these services can often fall well within the Commission's safety standards, even though they may be separated from accessible areas by fewer than 10 meters.

For example, using models developed by the Environmental Protection Agency ("EPA")[13] for predicting ground level field strength and power density, even using the worst case" scenarios put forth by OET Bulletin 65, it appears that a reasonable separation distance for Broadband PCS facilities operating at the maximum level of 2000 watts ERP can be as little as 9 meters. At 1000 watts, the safe separation distance is 6 meters, almost half that proposed in the NPRM. The Commission could assist carriers in confirming the safety characteristics of transmitters operating at power levels below the maximum allowed by publishing a clearly understandable chart such as that in EPA Model 1.

Like the Commission's rules, RF safety standards typically use "worst case" scenarios to make sure that the standards will provide a sufficient margin of safety for all possible antenna configurations and situations, even though for other situations, the extra margin is not required. For example, the EPA model uses a "reflection coefficient" of 1.6 to take into account possible mirror reflection that might increase power densities over that from the transmitter alone. This reflection effect would be greatly reduced in the absence of mirror surface reflectors, few of which are encountered on buildings and rooftops. And it would be

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[13] Gailley, P.C., and R.A. Tell, An Engineering Assessment of the Potential Impact of Federal Radiation Protection Guidance on the AM, FM and TV Broadcast Services." U.S. Environmental Protection Agency, Report No. EPA 520/6-85-011, April 1985, NTIA Order No. PB 85-245868. Although this study was designed for antennas operating in the AM, FM and TV broadcast frequency bands, the charts attached hereto have been developed taking into account the different RF absorption rates at the cellular and PCS frequency bands.

further reduced where the antenna is mounted far above the ground or a rooftop. With this coefficient removed, as shown in EPA Model 2, attached as Exhibit 3, the safe separation distances are reduced even further, for both PCS and cellular facilities, to 6 meters and 4 meters respectively. A table such as that in EPA Model 2 might well be used to calculate allowable separation distances in a routine evaluation of a facility where a reflection coefficient is not needed, such as tower-mounted facilities or rooftop installations where the antenna is higher than 10 meters above the ground or rooftop..

As another example, T-Mobile believes that it is not necessary to apply identical rules to facilities that pose very different levels of potential danger. For example, it makes little sense to always treat directional antennas and arrays as if these antennas were omni-directional. The Commission has acknowledged that doing so results in an "overly conservative 'worst case' prediction of the field at a given point."[14] Thus, although the new categorical exclusion rule treats all antennas as omni-directional, in routine evaluations, carriers could apply a more accurate and more practical standard. Review of highly directional antennas used in cellular and PCS facilities, carriers would measure separation distances to publicly accessible areas taking into account the directional nature of the antenna, and the shape and direction of the transmission beam that the antenna would produce.

Further, in most cases, accessible spaces separated from a transmitter by a brick wall or a rooftop, particularly those below or behind the antenna, do not require the same distance-separation protection as do open spaces in front of the antenna. The Commission has acknowledged that "[f]or rooftop locations . . . exposures inside a building can be expected to be reduced by at least 10-20 dB due to attenuation caused by building materials in the walls

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[14] OET Bulletin 65 at 22.

and roof."[15] Thus, in routine evaluations, carriers can apply appropriate standards to review situations where accessible areas are protected by brick walls or rooftops.

A further example of distinctions in facilities that should be acknowledged in the Commission's RF exposure rules is the distinction in power characteristics for the technology being used. Systems using time-division technologies such as Time Division Multiple Access ("TDMA") or the GSM systems used by T-Mobile, by their nature reduce the power density in transmissions from the antennas by up to 30-40%. T-Mobile proposes that for antennas that will operate using time division-based systems, the calculation of distance separations from publicly accessible areas for routine environmental review purposes should apply a conservative 25% reduction to account for the lower time-averaged power densities generated by these systems.

b. Microcells

In the NPRM, the Commission proposes a categorical exclusion for certain low-power fixed transmitters such as "micro" base stations and Mobile believes that routine evaluation of "micro" base stations and similar fixed devices.[16] The standard proposed is that where such devices are "mounted in such a way that persons are not normally closer than 20 cm from any part of the radiating structure," the power threshold for categorical exclusion is 1.5 watts ERP for transmitters operating at frequencies at or below 1.5 GHz, and 3 watts ERP for transmitters operating above 1.5 GHz.[17]

T-Mobile supports this standard as it is an approach combining the best features of high safety and reasonable efficiency. T-Mobile's testing confirms that this standard provides a high margin of safety in near field environments such as with micro cell installations. This conclusion is described in the report attached as Exhibit 1, and illustrated in the chart below.

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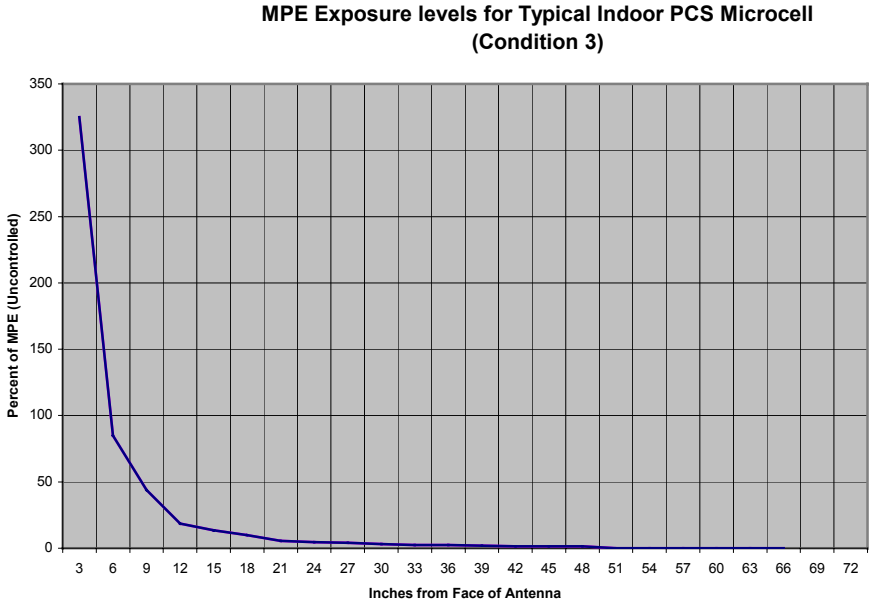
[15] *Id.* at 23.

[16] NPRM ¶ 14.

[17] *Id.*



As shown above, T-Mobile tested near-field effects from a transmitter of the type typically used in T-Mobile microcell installations, and using a transmitter operating at 4 watts with an ERP of 4 watts (6.6 watts EiRP). As shown in the chart, the power levels drop significantly within a very short distance from the face of the antenna. As the distance from the antenna increases the power level drops quickly, passing the FCC safety standard guidelines at approximately 4 inches. At 20 cm (approximately 7.8 inches) the power level is 50% below the FCC guidelines. Thereafter, the power level drops to approximately 25% of the FCC standard at 12 inches, and near zero at less than one meter and beyond.

5. The Proposed Rules on Routine Evaluations Must Be Applied Prospectively

T-Mobile believes that any changes in separation distances or power requirements for routine environmental evaluation that are adopted in this proceeding should be prospective only, and that all existing facilities must be understood to enjoy a "grandfather" status of presumed compliance. This prospective application is efficient, fundamentally fair,

consistent with the Commission's RF safety responsibilities and legally required under case law interpreting the National Environmental Policy Act ("NEPA").[18]

First, grandfathering existing facilities is fair because the owners of facilities constructed prior to the adoption of the new rules in reliance on the Commission's RF emission standards should not be prejudiced by post hoc regulation. Wireless carriers have installed thousands of wireless facilities pursuant to and in reliance on the RF guidelines now in effect, which are still valid and accurate safety standards. Where existing facilities were constructed in compliance with the current and then existing emission standards, notions of fundamental fairness require that the proposed rules should not apply to already existing facilities.

Second, grandfathering existing facilities is consistent with the Commission's responsibilities because facilities categorically excluded under the current standard were and are in fact safe. On this point, the Commission stated that "[o]ur calculations and analyses indicate that those transmitting facilities that are categorically excluded from routine evaluation should offer little or no potential for exposure in excess of our limits." [19] Because existing facilities have already been determined safe and in compliance with the Commission's rules, additional evaluation of these facilities is not necessary to ensure the continued safety of workers or the general population.

Third, existing facilities should be grandfathered because the Commission's environmental rules are promulgated pursuant to NEPA, and federal case law recognizes that NEPA is a prospective statute, enforceable only prior to construction of federally licensed facilities. Courts have consistently held that NEPA does not authorize relief after the fact of construction, absent bad faith on the part of the agency.[20] In *Ogunquit Village Corp. v.*

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[18] National Environmental Policy Act, 42 U.S.C. § 4321 *et seq.*

[19] RF Order II at 13512.

[20] 42 U.S.C. § 4332(c) ("[A]ll agencies of the Federal Government shall — . . . (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly

Davis, the First Circuit held that it did not have jurisdiction to afford post-completion relief under NEPA absent "conscious design to circumvent the requirements of NEPA as would amount to bad faith."[21] Similarly, the Fifth Circuit has held in *Richland Park Home Ass'n v. Pierce* that "NEPA contemplates a future-looking agency inquiry" and refused to grant post-construction relief."[22] Accordingly, the FCC may not apply its proposed RF rules implementing the requirements of NEPA to existing facilities, but only prospectively, to facilities to be constructed in the future.

B. Transition Period

For existing facilities grandfathered under T-Mobile's proposal above, a transition period will be moot. Should the Commission opt not to grandfather existing facilities, given the broad scope of the proposed rule changes, the significant compliance resources that must be expended by the wireless industry in response to these changes and the sheer number of transmitters impacted by the rule change, T-Mobile believes a transition period of no less than two years is necessary to allow carriers and licensees to survey existing transmitters.

C. Labeling Requirements

The Commission seeks comment concerning the conditions under which it should forgo safety-labeling requirements for certain subscriber transceiver antennas, including those

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affecting the quality of the human environment, a detailed statement by the responsible official on - (i) the environmental impact of the *proposed action*, (ii) any adverse environmental effects which cannot be avoided *should the proposal be implemented*, (iii) alternatives to the *proposed action*, (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved in the *proposed action should it be implemented*.") (emphasis added).

[21] 553 F.2d 243, 246 (1st Cir. 1977).

[22] 671 F.2d 935, 941 (5th Cir. 1982), *citing Aertsen v. Landrieu*, 637 F.2d 12, 19 (1st Cir. 1980); *see also Citizens and Landowners v. United States Dept. of Energy*, 683 F.2d 1171 (8th Cir. 1982) (refusing to afford remedy post-construction).

offered by cellular, PCS and CMRS carriers.[23] T-Mobile supports the Commission's proposal not to require labeling of such devices if the responsible party demonstrates by any appropriate means that MPE or Specific Absorption Rate ("SAR") limits could not be exceeded at any distance from the antenna. For those antennas that may exceed MPE or SAR limits at certain small separation distances, T-Mobile concurs that safety labeling may be considered sufficient to ensure compliance with the distance separation requirements.

D. Compliance Evaluation Based on SAR Limits

T-Mobile supports the Commission's proposed correction to Section 1.1310 to specify exposure criteria in terms of allowed levels for SAR, a standard established by the National Council on Radiation Protection ("NCRP") and the IEEE.[24]

E. Section 15.427 Unlicensed Devices

Section 15.427 governs the use of unlicensed spread spectrum transmitters that may operate at higher powers than other unlicensed devices due to the nature of "spread" technology.[25] The Commission has expressed concern that some spread spectrum devices may pose a health risk and therefore proposes to require routine evaluation of all such devices designed for use within 20cm of the body, if the maximum peak output power of the device exceeds 100 milliwatts.[26]

T-Mobile believes that routine evaluation of such devices is unnecessarily cumbersome in light of the more efficient and equally effective self-certification process. Accordingly, T-Mobile encourages the Commission to adopt rules permitting manufacturers

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[23] NPRM ¶¶ 15,42.

[24] *Id.* ¶ 44.

[25] *Id.* ¶ 17.

[26] *Id.* ¶ 18.

of Section 15.427 devices to self-certify compliance with the Commission's RF exposure guidelines.

F. Measurement of SAR from Multiple Transmitters

The Commission seeks comment regarding the manner in which the SAR of a single portable or mobile device with multiple transmitters will be measured.[27] In the absence of a better predictive model, the Commission has proposed to measure the SAR of such devices by adding together the SAR values of all transmitters that could functionally transmit at the same time.[28] T-Mobile supports this proposal because it is practical and efficient.

G. Spatial Averaging for Evaluating Compliance

T-Mobile supports the consideration of spatial or time averaging to determine compliance with the MPE limits contained in OET Bulletin 65, but only for occupational/controlled exposure situations.[29] T-Mobile believes the power levels and separation distances proposed herein provide sufficient protection for general population/uncontrolled exposure situations.

H. Multiple Tenant Environments

The sharing of towers and rooftops among multiple carriers and licensees is a practice that has grown and flourished under Commission policies and local land use and zoning laws favoring collocation. The Commission's rules, however, are sometimes impractical or confusing when applied to the RF compliance responsibilities of carriers in multiple tenant environments.

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[27] *Id.* ¶¶ 31-32.

[28] *Id.* ¶ 31.

[29] *Id.* ¶¶ 45-47.

T-Mobile believes that the Commission should adopt a policy that imposes on newcomers to a multiple tenant environment the primary responsibility for ensuring that the addition of new transmitters will not result in a cumulative RF effect that would exceed the Commission's limits. Currently, newcomers are required to assess the RF environment and, if necessary, submit an EA, but are not required to take primary responsibility to resolve any non-compliance caused by the new transmitter, nor are they required to advise preexisting carriers that they have added transmitters to a site or possibly created a non-compliant situation.[30] Except for setting a new 5% threshold for determining which carriers must share responsibility for RF compliance at multiple-tenant sites, the Commission has thus far declined to provide detailed instructions on how to allocate responsibility and this lack of guidance has lead to confusion on the part of carriers in multiple tenant environments.[31] T-Mobile urges the Commission to clarify that although pre-existing carriers in a multiple tenant environment must cooperate with a newcomer in resolving RF issues, the pre-existing carrier bears only secondary responsibility to ensure compliance with the Commission's guidelines where new transmitters are added to the environment.

IV. Conclusion

T-Mobile believes that the changes proposed in the NPRM regarding routine environmental evaluation will improve both the public confidence in and the scope of protection of the Commission's RF rules, so long as carriers can take into account the basic differences in transmitters and technology that bring most installations well within the Commission's safety guidelines. Although the amendments will increase the number of new wireless installations that will in the future require routine environmental evaluation, the efforts required to assure that each site falls within the FCC's guidelines is not onerous. T-Mobile supports these changes because they will increase the public confidence in RF safety

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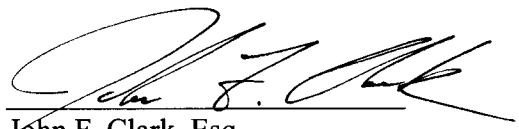
[30] 47 C.F.R. § 1.1307(b)(3)(i).

[31] RF Order II at 13523-34.

to workers and the public, without imposing unnecessarily burdensome requirements on industry. T-Mobile urges the Commission to incorporate into the order adopting new guidelines these and the other comments and proposals discussed herein.

Respectfully submitted,



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Dated: December 8, 2003

JFC:jfc

Exhibit 1:
Test of Separation Distances and RF EME Exposure Levels

Test of Separation Distances and RF EME Exposure Levels Using typical T-Mobile antennas and Maximum power levels

Overview

On November 18, 2003, the T-Mobile Safety Department undertook a test to approximate exposure levels in the typical T-Mobile rooftop site installation. This test was to determine what type of distance separation is reasonable in relationship to power levels experienced on a typical T-Mobile rooftop and indoor installations using typical equipment and power levels.

The results of this test are graphically shown in the charts attached as Attachments "A" and "B."

Test Field Setup

A testing site was assembled in St Louis behind the MSO facility in Maryland Heights, MO. This is a large paved area with a combination of asphalt and concrete surface. A tripod was placed on this surface a minimum of 15 feet from any obstruction on the surface of the pavement.

The testing transmitter was a Grayson analog transmitter. Analog transmitters will have higher average power levels than a comparable GSM or TDMA transmitter due to the pulsing effect, or the on-off cycling of the transmitter. CDMA would be roughly equal in power levels given a constant carrier. The Grayson transmitter was operating at the frequency of 1950.4 MHz in the PCS band. No modulation was added to the carrier. The transmitter was connected to the test antennas through 2 8ft long sections of LDF4-50 coaxial cable using type "N" connectors. At the junction point of the 2 cables, a Byrd model 43 wattmeter with a 25-watt element was inserted to read accurate RF power levels. All connections were secured and checked for loose or incomplete connection through a combination of visual inspection and checking for "reflected" power with the wattmeter.

To mate with the Allgon 7250.02 antenna, a Teflon type low-loss adapter was used to convert the type "N" connector on the cable to the "DIN" type connector on the antenna. Direct connection was made from the cable to the Andrew DB794SM5N-M antenna.

Transmitter power was set to the 4-watt and 17 watt levels respectively for each antenna test and verified with the wattmeter. This yields the ERP levels for the specific antennas used:

Typical Rooftop or Tower

	Antenna	Power	ERP	EiRP
Condition 1	Allgon 7250.02	4 W	178.7	315.2

Condition 2	Allgon 7250.02	17W	759.4	1339.5

For Indoor Micro-cell installations:

Condition 3	DB794SM5N-M	4W	4.0	6.6

All readings were within 10% of selected power output of the transmitter. The 4 and 17-watt power levels are typical of TX power output levels commonly in use in the US and are within those limits used for the Nokia equipment in use by T-Mobile.

Measurement

A Narda model 8718B Electromagnetic Survey Meter was used for these measurements with a model 8742D isotropic, shaped frequency response electronic field probe attached as the receiving device. These units combined produce a very accurate depiction of the RF energy field at a given location.

The specific probe notes a field correction factor of .79 at 1800MHz and we used this correction factor to adjust for anomalies in the accuracy of the probe (as determined by calibration).

Methods

Each antenna tested, an Allgon 7250.02 model antenna, typical of an outdoor installation on a tower or a rooftop, and a Andrew DB794SM5N-M indoor style antenna (such as used for an indoor micro-cell or pico-cell), were mounted to the support structure with non-permanent mounting methods.

At the aforementioned test field, we held a fiberglass tape measure device approx 18 inches below the center of the antenna tested. Along this tape measure, at 3-inch intervals, the level of electro-magnetic energy was measured and this measurement was recorded.

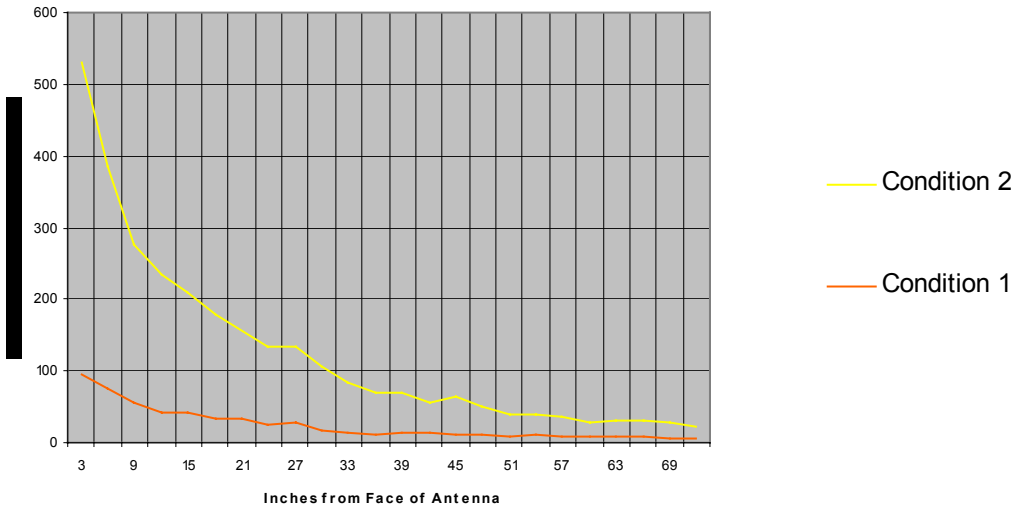
Findings

Based on the observations of the test, it was readily apparent that the FCC Maximum Exposure Level for the General Public (non-controlled environment) was only exceeded when in close proximity to the antenna radiating elements. In a worst-case situation, involving average power levels well in excess of that which would be encountered in a typical GSM installation, the distance where exposure levels drop below the FCC defined MPE is far less than the current FCC MPE and in fact is less than 30 inches from the face of the antenna. The drop in power density levels is graphically shown in the attached charts.

It should be noted that, in "gain" antenna installations, the power density behind or to the sides of an antenna are substantially lower – or as much as 20dbW, or a factor of 1/100 of the main direction of energy radiation.

Indoor type antennas, such as used in micro-cell installations exhibit a higher near-field energy level due to the concentration of the energy level at the measuring point. In this case, the MPE is exceeded only in a distance of approx 7 inches from the face of the element.

Attachment A - MPE Exposures for Typical Rooftop Antenna
(Condition 1 & 2)



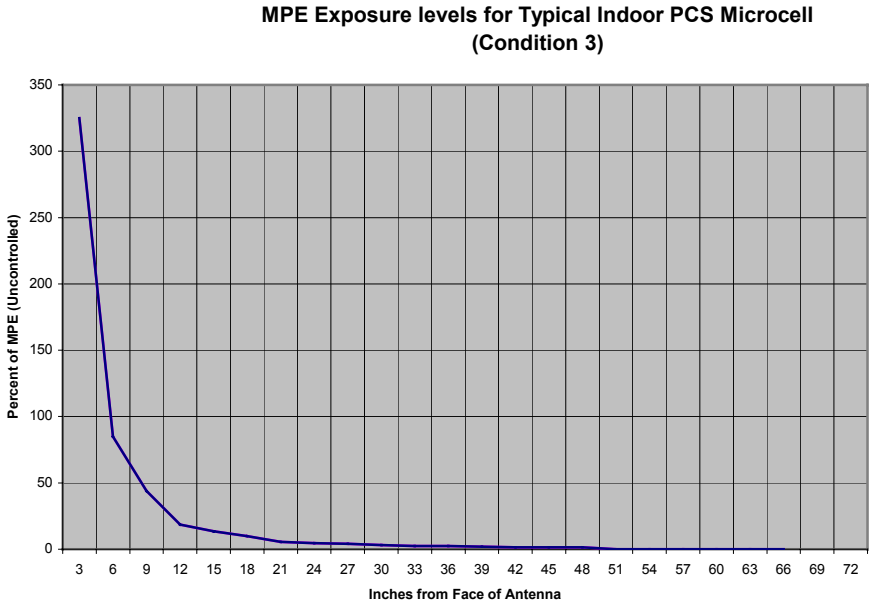

MPE Exposure levels for Typical Indoor PCS Microcell
(Condition 3)
Percent of MPE (Uncontrolled)
350
300
250
200
150
100
50
0
3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72
Inches from Face of Antenna

Exhibit 2:
EPA Model 1

EPA Model 1
Predictions of Separation Distances to FCC Limits Using EPA Model
Reflection coefficient is set to 1.6

POWER ERP	POWER EIRP	Seperation Distances (in meters) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.64	0.033409806	0.0083525	0.0037122	0.0020881	0.0013364	0.0009281	0.0006818	0.000522	0.000412	0.000334	0.000276	0.000232	0.000198	0.00017	0.000148
2	3.28	0.066819611	0.0167049	0.0074244	0.0041762	0.0026728	0.0018561	0.0013637	0.001044	0.000825	0.000668	0.000552	0.000464	0.000395	0.000341	0.000297
3	4.92	0.100229417	0.0250574	0.0111366	0.0062643	0.0040092	0.0027842	0.0020455	0.001566	0.001237	0.001002	0.000828	0.000696	0.000593	0.000511	0.000445
5	8.2	0.167049028	0.0417623	0.018561	0.0104406	0.006682	0.0046403	0.0034092	0.00261	0.002062	0.00167	0.001381	0.00116	0.000988	0.000852	0.000742
8	13.12	0.267278445	0.0668196	0.0296976	0.0167049	0.0106911	0.0074244	0.0054547	0.004176	0.0033	0.002673	0.002209	0.001856	0.001582	0.001364	0.001188
10	16.4	0.334098057	0.0835245	0.037122	0.0208811	0.0133639	0.0092805	0.0068183	0.00522	0.004125	0.003341	0.002761	0.00232	0.001977	0.001705	0.001485
20	32.8	0.668196113	0.167049	0.074244	0.0417623	0.0267278	0.018561	0.0136367	0.010441	0.008249	0.006682	0.005522	0.00464	0.003954	0.003409	0.00297
30	49.2	1.00229417	0.2505735	0.111366	0.0626434	0.0400918	0.0278415	0.020455	0.015661	0.012374	0.010023	0.008283	0.00696	0.005931	0.005114	0.004455
40	65.6	1.336392226	0.3340981	0.148488	0.0835245	0.0534557	0.037122	0.0272733	0.020881	0.016499	0.013364	0.011045	0.009281	0.007908	0.006818	0.00594
50	82	1.670490283	0.4176226	0.18561	0.1044056	0.0668196	0.0464025	0.0340916	0.026101	0.020623	0.016705	0.013806	0.011601	0.009885	0.008523	0.007424
75	123	2.505735424	0.6264339	0.278415	0.1566085	0.1002294	0.0696038	0.0511375	0.039152	0.030935	0.025057	0.020709	0.017401	0.014827	0.012784	0.011137
100	164	3.340980565	0.8352451	0.3712201	0.2088113	0.1336392	0.092805	0.0681833	0.052203	0.041247	0.03341	0.027611	0.023201	0.019769	0.017046	0.014849
200	328	6.681961131	1.6704903	0.7424401	0.4176226	0.2672784	0.18561	0.1363666	0.104406	0.082493	0.06682	0.055223	0.046403	0.039538	0.034092	0.029698
500	820	16.70490283	4.1762257	1.8561003	1.0440564	0.6681961	0.4640251	0.3409164	0.261014	0.206233	0.167049	0.138057	0.116006	0.098846	0.085229	0.074244
1000	1640	33.40980565	8.3524514	3.7122006	2.0881129	1.3363922	0.9280502	0.6818328	0.522028	0.412467	0.334098	0.276114	0.232013	0.197691	0.170458	0.148488
1500	2460	50.11470848	12.528677	5.5683009	3.1321693	2.0045883	1.3920752	1.0227492	0.783042	0.6187	0.501147	0.414171	0.348019	0.296537	0.255687	0.222732
2000	3280	66.81961131	16.704903	7.4244013	4.1762257	2.6727845	1.8561003	1.3636655	1.044056	0.824933	0.668196	0.552228	0.464025	0.395382	0.340916	0.296976
2500	4100	83.52451413	20.881129	9.2805016	5.2202821	3.3409806	2.3201254	1.7045819	1.305071	1.031167	0.835245	0.690285	0.580031	0.494228	0.426145	0.37122
3000	4920	100.229417	25.057354	11.136602	6.2643386	4.0091767	2.7841505	2.0454983	1.566085	1.2374	1.002294	0.828342	0.696038	0.593073	0.511375	0.445464
4500	7380	150.3441254	37.586031	16.704903	9.3965078	6.013765	4.1762257	3.0682475	2.349127	1.8561	1.503441	1.242513	1.044056	0.88961	0.767062	0.668196
5000	8200	167.0490283	41.762257	18.561003	10.440564	6.6819611	4.6402508	3.4091638	2.610141	2.062334	1.67049	1.38057	1.160063	0.988456	0.852291	0.74244
5500	9020	183.7539311	45.938483	20.417103	11.484621	7.3501572	5.1042759	3.7500802	2.871155	2.268567	1.837539	1.518628	1.276069	1.087301	0.93752	0.816684
6000	9840	200.4588339	50.114708	22.273204	12.528677	8.0183534	5.5683009	4.0909966	3.132169	2.4748	2.004588	1.656685	1.392075	1.186147	1.022749	0.890928
6500	10660	217.1637368	54.290934	24.129304	13.572734	8.6865495	6.032326	4.431913	3.393183	2.681034	2.171637	1.794742	1.508082	1.284993	1.107978	0.965172
7000	11480	233.8686396	58.46716	25.985404	14.61679	9.3547456	6.4963511	4.7728294	3.654197	2.887267	2.338686	1.932799	1.624088	1.383838	1.193207	1.039416
7500	12300	250.5735424	62.643386	27.841505	15.660846	10.022942	6.9603762	5.1137458	3.915212	3.093501	2.505735	2.070856	1.740094	1.482684	1.278436	1.11366
8000	13120	267.2784452	66.819611	29.697605	16.704903	10.691138	7.4244013	5.4546621	4.176226	3.299734	2.672784	2.208913	1.8561	1.581529	1.363666	1.187904
8500	13940	283.9833481	70.995837	31.553705	17.748959	11.359334	7.8884263	5.7955785	4.43724	3.505967	2.839833	2.34697	1.972107	1.680375	1.448895	1.262148
9000	14760	300.6882509	75.172063	33.409806	18.793016	12.02753	8.3524514	6.1364949	4.698254	3.712201	3.006883	2.485027	2.088113	1.77922	1.534124	1.336392
9500	15580	317.3931537	79.348288	35.265906	19.837072	12.695726	8.8164765	6.4774113	4.959268	3.918434	3.173932	2.623084	2.204119	1.878066	1.619353	1.410636
10000	16400	334.0980565	83.524514	37.122006	20.881129	13.363922	9.2805016	6.8183277	5.220282	4.124667	3.340981	2.761141	2.320125	1.976912	1.704582	1.48488

Exhibit 3:
EPA Model 2

Free Space model
Reflection coefficient is set to 0

POWER ERP	POWER EIRP	Seperation Distances (in meters)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.64	0.013050705	0.0032627	0.0014501	0.0008157	0.000522	0.0003625	0.0002663	0.000204	0.000161	0.000131	0.000108	9.06E-05	7.72E-05	6.66E-05	5.8E-05
2	3.28	0.026101411	0.0065254	0.0029002	0.0016313	0.0010441	0.000725	0.0005327	0.000408	0.000322	0.000261	0.000216	0.000181	0.000154	0.000133	0.000116
3	4.92	0.039152116	0.009788	0.0043502	0.002447	0.0015661	0.0010876	0.000799	0.000612	0.000483	0.000392	0.000324	0.000272	0.000232	0.0002	0.000174
5	8.2	0.065253527	0.0163134	0.0072504	0.0040783	0.0026101	0.0018126	0.0013317	0.00102	0.000806	0.000653	0.000539	0.000453	0.000386	0.000333	0.00029
8	13.12	0.104405643	0.0261014	0.0116006	0.0065254	0.0041762	0.0029002	0.0021307	0.001631	0.001289	0.001044	0.000863	0.000725	0.000618	0.000533	0.000464
10	16.4	0.130507053	0.0326268	0.0145008	0.0081567	0.0052203	0.0036252	0.0026634	0.002039	0.001611	0.001305	0.001079	0.000906	0.000772	0.000666	0.00058
20	32.8	0.261014107	0.0652535	0.0290016	0.0163134	0.0104406	0.0072504	0.0053268	0.004078	0.003222	0.00261	0.002157	0.001813	0.001544	0.001332	0.00116
30	49.2	0.39152116	0.0978803	0.0435024	0.0244701	0.0156608	0.0108756	0.0079902	0.006118	0.004834	0.003915	0.003236	0.002719	0.002317	0.001998	0.00174
40	65.6	0.522028213	0.1305071	0.0580031	0.0326268	0.0208811	0.0145008	0.0106536	0.008157	0.006445	0.00522	0.004314	0.003625	0.003089	0.002663	0.00232
50	82	0.652535267	0.1631338	0.0725039	0.0407835	0.0261014	0.018126	0.013317	0.010196	0.008056	0.006525	0.005393	0.004531	0.003861	0.003329	0.0029
75	123	0.9788029	0.2447007	0.1087559	0.0611752	0.0391521	0.027189	0.0199756	0.015294	0.012084	0.009788	0.008089	0.006797	0.005792	0.004994	0.00435
100	164	1.305070533	0.3262676	0.1450078	0.0815669	0.0522028	0.036252	0.0266341	0.020392	0.016112	0.013051	0.010786	0.009063	0.007722	0.006659	0.0058
200	328	2.610141067	0.6525353	0.2900157	0.1631338	0.1044056	0.0725039	0.0532682	0.040783	0.032224	0.026101	0.021571	0.018126	0.015445	0.013317	0.011601
500	820	6.525352667	1.6313382	0.7250392	0.4078345	0.2610141	0.1812598	0.1331705	0.101959	0.08056	0.065254	0.053929	0.045315	0.038612	0.033293	0.029002
1000	1640	13.05070533	3.2626763	1.4500784	0.8156691	0.5220282	0.3625196	0.2663409	0.203917	0.16112	0.130507	0.107857	0.09063	0.077223	0.066585	0.058003
1500	2460	19.576058	4.8940145	2.1751176	1.2235036	0.7830423	0.5437794	0.3995114	0.305876	0.24168	0.195761	0.161786	0.135945	0.115835	0.099878	0.087005
2000	3280	26.10141067	6.5253527	2.9001567	1.6313382	1.0440564	0.7250392	0.5326819	0.407835	0.32224	0.261014	0.215714	0.18126	0.154446	0.13317	0.116006
2500	4100	32.62676333	8.1566908	3.6251959	2.0391727	1.3050705	0.906299	0.6658523	0.509793	0.4028	0.326268	0.269643	0.226575	0.193058	0.166463	0.145008
3000	4920	39.152116	9.788029	4.3502351	2.4470073	1.5660846	1.0875588	0.7990228	0.611752	0.483359	0.391521	0.323571	0.27189	0.231669	0.199756	0.174009
4500	7380	58.728174	14.682044	6.5253527	3.6705109	2.349127	1.6313382	1.1985342	0.917628	0.725039	0.587282	0.485357	0.407835	0.347504	0.299634	0.261014
5000	8200	65.25352667	16.313382	7.2503919	4.0783454	2.6101411	1.812598	1.3317046	1.019586	0.805599	0.652535	0.539285	0.453149	0.386116	0.332926	0.290016
5500	9020	71.77887933	17.94472	7.975431	4.48618	2.8711552	1.9938578	1.4648751	1.121545	0.886159	0.717789	0.593214	0.498464	0.424727	0.366219	0.319017
6000	9840	78.304232	19.576058	8.7004702	4.8940145	3.1321693	2.1751176	1.5980456	1.223504	0.966719	0.783042	0.647142	0.543779	0.463339	0.399511	0.348019
6500	10660	84.82958467	21.207396	9.4255094	5.301849	3.3931834	2.3563774	1.731216	1.325462	1.047279	0.848296	0.701071	0.589094	0.50195	0.432804	0.37702
7000	11480	91.35493733	22.838734	10.150549	5.7096836	3.6541975	2.5376371	1.8643865	1.427421	1.127839	0.913549	0.754999	0.634409	0.540562	0.466097	0.406022
7500	12300	97.88029	24.470073	10.875588	6.1175181	3.9152116	2.7188969	1.9975569	1.52938	1.208399	0.978803	0.808928	0.679724	0.579173	0.499389	0.435024
8000	13120	104.4056427	26.101411	11.600627	6.5253527	4.1762257	2.9001567	2.1307274	1.631338	1.288959	1.044056	0.862857	0.725039	0.617785	0.532682	0.464025
8500	13940	110.9309953	27.732749	12.325666	6.9331872	4.4372398	3.0814165	2.2638979	1.733297	1.369518	1.10931	0.916785	0.770354	0.656396	0.565974	0.493027
9000	14760	117.456348	29.364087	13.050705	7.3410218	4.6982539	3.2626763	2.3970683	1.835255	1.450078	1.174563	0.970714	0.815669	0.695008	0.599267	0.522028
9500	15580	123.9817007	30.995425	13.775745	7.7488563	4.959268	3.4439361	2.5302388	1.937214	1.530638	1.239817	1.024642	0.860984	0.73362	0.63256	0.55103
10000	16400	130.5070533	32.626763	14.500784	8.1566908	5.2202821	3.6251959	2.6634093	2.039173	1.611198	1.305071	1.078571	0.906299	0.772231	0.665852	0.580031