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August 15, 2005

Via ECFS

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: Written Ex Parte Presentation in WT Docket Nos. 03-137

Dear Ms. Dortch:

On behalf of QUALCOMM Incorporated ("QUALCOMM"), I am filing herewith the following written ex parte presentation regarding the above-referenced proceeding.

I. Introduction

QUALCOMM's interest in this proceeding stems from the facts that today, there are no rules governing Part 22 and 24 modules, and laptop vendors have expressed interest in embedding modules with QUALCOMM's wireless wide area network ("WWAN") technologies, including 1xEV-DO and WCDMA/HSDPA, in their laptop models to operate on licensed PCS and cellular spectrum. As a result, QUALCOMM has filed comments and made ex parte presentations to propose rules that would govern the approval process for equipment authorizations for laptops containing these embedded modules. A number of laptop and module vendors, including IBM, Hewlett Packard, Dell, and Novatel Wireless, have filed letters in this proceeding supporting all or some of QUALCOMM's proposals.

In this vein, after filing comments in this proceeding, QUALCOMM met with staff members of the FCC Office of Engineering & Technology ("OET") on May 4, 2004 and in response to that meeting, QUALCOMM performed some additional work and filed a written ex parte presentation on September 30, 2004 to refine QUALCOMM's proposal. On February 18, 2005, QUALCOMM had a conference call with OET staff members to discuss our recent filings and related activities pertaining to Paragraph 27 of the Notice of Proposed Rule Making ("NPRM") in this docket, wherein it is proposed that no SAR evaluation be required for devices operating under 200mW when a separation distance of 20cm can be maintained from the user's body. In QUALCOMM's original comments in this proceeding, QUALCOMM proposed that SAR measurements not be required for laptops containing modules that operate under Part 22 and 24 on licensed cellular and PCS spectrum operating at or below 500mW when a separation distance of 20cm is maintained from the user's body. QUALCOMM was encouraged to present SAR data for devices to help substantiate this position.

QUALCOMM, in its filing dated September 30, 2004, presented such data taken from the FCC's database of equipment authorization grants that supports a power level of 500mW as QUALCOMM has proposed.

QUALCOMM also asked the FCC to consider adoption of a separation distance of less than 20 cm so that the test requirements for laptop type approvals can be relaxed while still ensuring compliance with RF safety requirement with comfortable margin. New laptop models are trending toward smaller sizes such that any antenna in the lid is not likely to be 20 cm from the user's lap, and therefore under the current approval process, such laptops would have to go through lengthy and costly SAR tests for each laptop model with a WWAN device embedded in it. The data extracted from the FCC's own database and filed in this proceeding on October 5, 2004 demonstrates that compliance with the FCC SAR requirements at a distance of much less than 20cm is readily achievable by devices such as WWAN PC cards installed in laptop computers. The data supports the claim that WWAN devices operating at cellular and/or PCS frequencies meet the SAR limits with significant margin at a 10 cm separation distance. QUALCOMM proposed that 10cm should be considered as the separation value for laptops containing embedded modules with WWAN technologies, thereby differentiating between WWAN enabled devices such as these laptops and "portable" devices such as mobile phones to allow evaluation with respect to MPE limits only for such laptops. .

QUALCOMM is providing the following additional information in support of its proposals and asks that the FCC consider this information, including market data, empirical evidence, and theoretical underpinning, when specifying the power threshold at which SAR data must be supplied for Part 22/24 devices that are integrated into laptops where a 10cm or greater separation distance can be maintained from the user. QUALCOMM also proposes that the FCC allow the installation by customers and retailers of Part 22 and 24 approved modules into laptops, just as the FCC today permits unlicensed modules to be installed by end-users into laptops. This would permit laptop vendors to sell WWAN-ready laptop, with the WWAN antennas and other necessary components built in, but in which the end-user could install an approved module (approved for specific laptop models) and enable WWAN connectivity for their laptop device.

Finally, QUALCOMM requests that these rules cover embedded modules operating not only on spectrum regulated under Part 22 and 24, but also under Part 27.

II. Overview

The information presented in this filing is separated into five distinct sections as follows:

A. Update on the 3G data market and the evolution of WWAN enabled laptop devices.
B. Data from FCC database of recently granted authorizations is presented herein showing SAR levels measured near or above 500mW with various separation distances
C. QUALCOMM SAR data on a WWAN PC card configured laptop measured at increasing separation distance from SAR phantom

D. Rationale for allowing compliance with RF exposure requirements to be evaluated with respect to MPE limits for Part 22/24 devices that are integrated into laptops where a 10cm or greater separation distance can be maintained from the user.

E. Conclusion

A. Market Update

Market Drivers for the Embedded 3G Notebook

Three trends should be considered early indicators of the future success of broadband access via 3G wireless networks. The first trend is the ongoing shift from desktop computers to notebook computers; second is the growing demand for wireless broadband currently represented by WLAN; and third is the continuing proliferation of 3G networks around the world.

The Shift Towards Notebook Computers

Notebooks are no longer for road warriors only. The combination of computing power, portability and affordability has made notebooks an increasingly popular choice for general purpose computing. Beyond the enterprise, notebooks are also widely used in homes and in schools.

A recent report by the Gartner[1] estimates that global notebook shipments currently represent over 30% of all personal computers shipped today and will account for 40% of all personal computers shipped by 2009. **Figure 1** shows the increasing share of notebooks as a percentage of total sales.

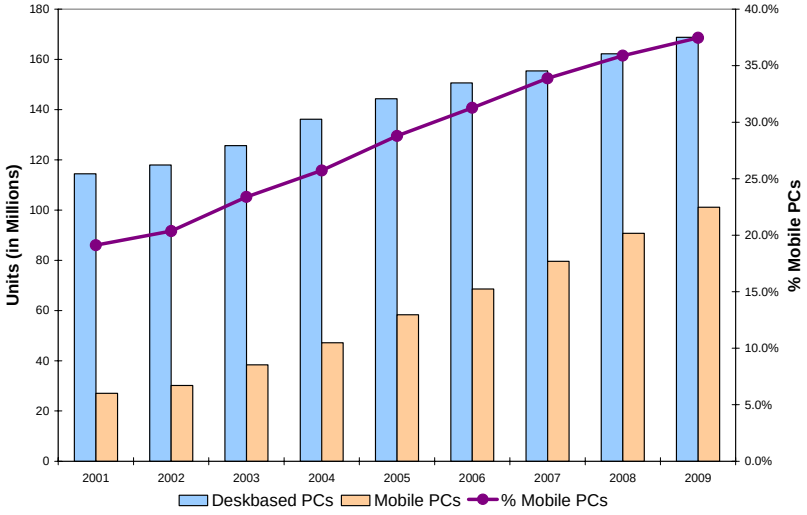


Figure 1. Gartner Worldwide Mobile and Desk-based PC Shipments 2001-2009

[1] Source: Gartner Dataquest Marketview Database - June 2005

The Growing Demand for Wireless Broadband

The corporate sector has embraced WLAN technology. Enterprises have deployed WLAN networks in their offices and corporate campuses. The networks are being used for corporate intranet access as well as access to vertical applications in the field – such as in warehouses, factories and at loading docks. The uptake of notebooks and WLAN in the enterprise has even impacted the consumer market. An increased demand for WLAN-enabled notebook computers demonstrates the desire to be free from a wired desktop when getting broadband access.

WLAN connectivity was initially achieved through PC cards. Today, most WLAN modems are embedded directly into notebooks as a standard configuration. The rapidly growing sales of notebooks with embedded WLAN modems are highlighted in **Figure 2**. Including consumer and enterprise notebooks, Strategy Analytics[2] estimates that approximately 70% of notebooks sold today have an embedded WLAN modem.

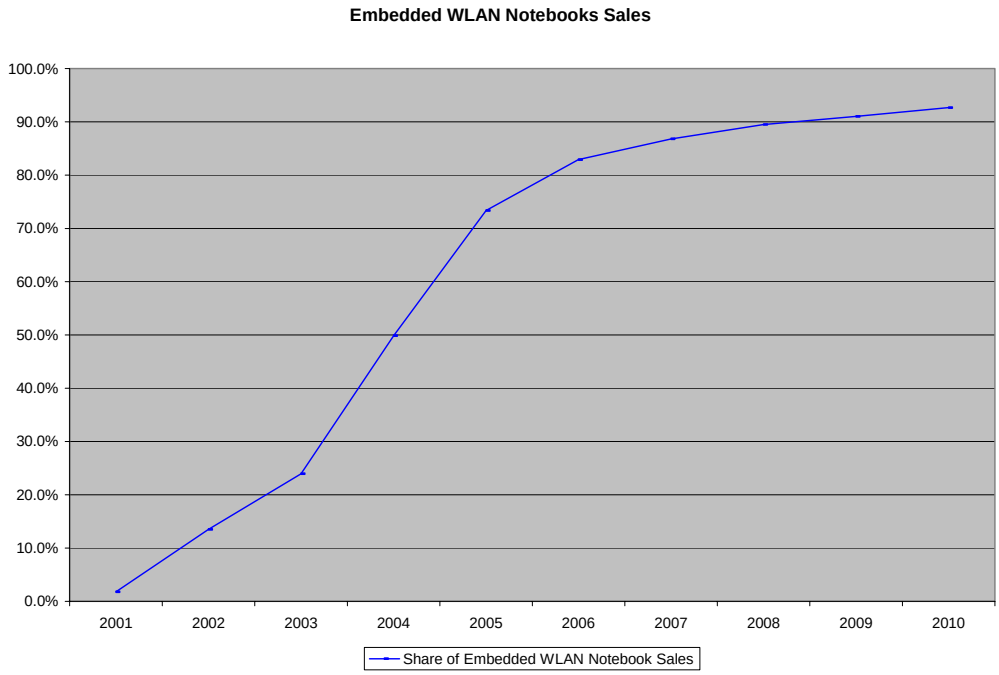


Figure 2. Strategy Analytics Global Notebook PC Sales

Today WLAN is used in several different environments. WLAN access is used in most corporations to provide employees network access throughout office campuses such as conference rooms, cafeterias and building lobbies. The familiarity of using WLAN access in the enterprise and the growing number of notebook computers with embedded WLAN capabilities has led to an increased usage outside the office environment.

A common place to find WLAN coverage is in locations frequently visited by business travelers. Most hotels, convention centers and airport lounges now offer WLAN coverage to

[2] Strategy Analytics, Dec. 2004 Global Notebook PC Sales Forecast

its visitors. In addition, some coffee shops and restaurants are offering WLAN access that is not only targeted to the business person, but also the consumer looking to stay connected. Finally, there has been a large interest in the deployment of WLAN into the home. Deploying a WLAN network in the home provides the notebook users wireless access from anywhere within the home network coverage area – allowing users access in places such as the couch, kitchen table or outside on the patio. Drivers for the uptake in personal WLAN networks in the home include an increase in the demand for notebook computers and the cost reduction of WLAN access points.

The Growth of 3G

3G technology has been deployed on a large scale and is well established. Networks have been in commercial service since the year 2000 with CDMA2000 1X. Commercial WCDMA (UMTS) networks were introduced in 2001 and CDMA2000 1xEV-DO networks 2002. There are a total of 68 countries in which 3G services are provided, with North America, Western Europe, Japan and Korea leading the uptake in subscribers. **Figure 3** provides a world view of the countries in which 3G networks have been deployed.

Figure 3. Worldwide 3G Presence

There are over 152 commercial 3G networks which are providing service to over 184 million paying subscribers[3]. The market potential for 3G has led to significant support from the 3G device and infrastructure manufacturing community, resulting in favorable economies of scale even today. To date, more than over 722 3G devices have been commercialized and more than 10 leading infrastructure manufacturers are providing 3G network equipment. As

[3] Source: 3G today, http://www.3gtoday.com June 2005

seen in **Figure 4** below, industry research firm Strategy Analytics expects CDMA2000 and WCDMA technology families to account for more than 1.3 billion subscribers worldwide, or nearly 50% of the mobile subscriber base, by 2010[4]. Such a high growth rate is a strong indication of the competitive nature of the 3G market and the technology itself. With the increase in number of 3G subscribers globally it is expected that the cost of devices and network infrastructure will continue to decline. And with network operators all vying for these subscribers, the cost of 3G services is also expected to decline.

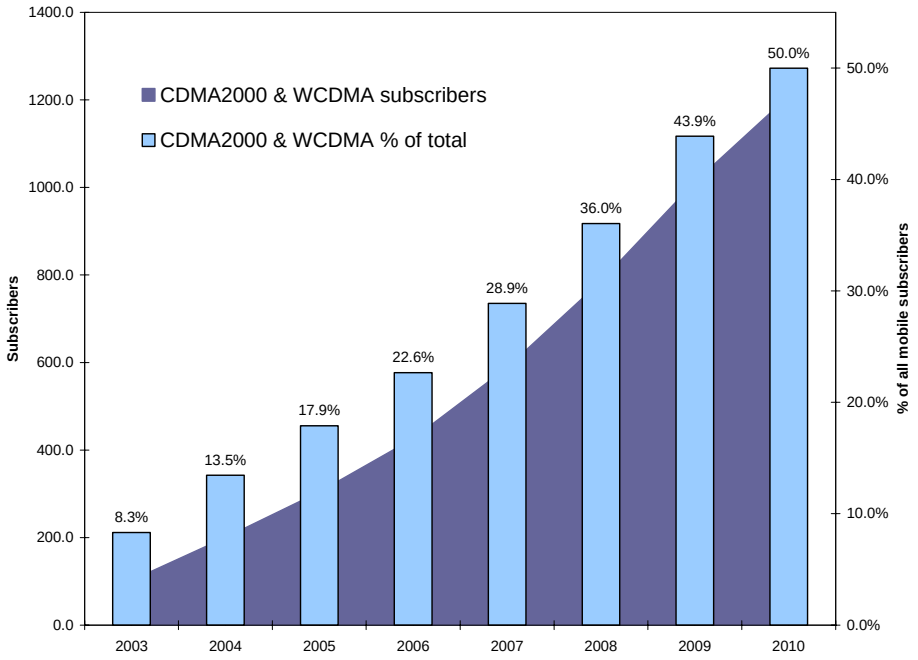


Figure 4 - Strategy Analytics: CDMA2000 and WCDMA Subscriber Growth

3G services providers continue to invest in 3G by expanding their network coverage areas. Already today in the US, 3G services including CDMA2000 1X, EV DO and WCDMA are available to close to 90% of the population. So not only does 3G have an ever increasing presence throughout the world, but it also has a large footprint within individual markets.

The three trends discussed indicate that real demand exists for wireless broadband access via notebooks and 3G's large coverage areas and favorable economies of scale is evidence that a solution already exists today to meet the needs of the wireless broadband user.

Embedded 3G enabled notebooks are expected to be launched commercially in the US beginning in Q3/4 2005, and the number of 3G enabled notebook models being placed on the market is expected to increase rapidly through 2006.

[4] Source: Strategy Analytics, Wireless Network Strategies (WNS) Strategic Advisory Service, Dec. 2004

B. Updated SAR data

Data from the FCC database of granted authorizations is presented showing SAR levels for Part 22/24 devices measured with various separation distances. 11 grants for PCMCIA cards issued between May 2004 and May 2005 and one grant for an embedded WWAN enabled laptop from Sony Corporation that was authorized on April 12th 2005 are summarized in **Table 1.**

The data shows that all of the examined PC card devices meet the FCC SAR limit while transmitting at power levels near or above 500mW with a separation distance of 1 to 2 cm and that the WWAN enabled laptop complied with significant margin based on an antenna embedded into the laptop display and located approximately 8cm from the user position. Based on this data, it is clear that these devices would meet the FCC SAR limit with a separation distance of 20cm by a significant margin. It is also true to say that a distance less then 20cm will also result in significant margin as demonstrated by the WWAN enabled laptop data. Many new laptop computers with small physical profiles would benefit from a relaxed separation distance requirement because they will incorporate display embedded antenna sub-systems. From reviewing laptop designs, a distance of 10cm is a realistic separation distance that would allow laptop manufacturers to proceed with their embedded wireless WWAN designs without the need for costly and time consuming SAR measurements.

Table 1

Type of Device	Modulation for SAR Testing	Band	Grant Power (W)	Grant Power (dBm)	1g SAR (mW/g)	Specified Separation Distance (cm)
PCMCIA card for UMTS/GPRS/GSM/WLAN	GPRS (UMTS for Europe)	Cellular	1.45	31.6	0.876	1
		PCS	0.794	29.0	1.47	
PCMCIA card for EGPRS/GPRS/GSM	GPRS	Cellular	1.479	31.7	0.772	1
		PCS	0.776	28.9	0.17	
PCMCIA card for UMTS/GPRS/GSM. Internal Anrtenna	GPRS (UMTS for Europe)	Cellular	1.45	31.6	0.876	1
		PCS	0.794	29.0	1.47	
CDMA Dual-Band PCMCIA Card (Permisive change)	CDMA	Cellular	0.339	25.3	1.42	1.23
		PCS	0.262	24.2	0.79	
Laptop computer with GSM, WLAN and BT radios	GPRS	Cellular	0.52	27.2	0.134	Picture indicates approx 8cm
		PCS	0.832	29.2	0.176	
GSM 850/900/1800/1900 and WLAN IEEE802.11g PC card	GSM	Cellular	2.24	33.5	0.306	Approx 2cm
		PCS	0.346	25.4	0.322	
GSM 850/900/1800/1900 and WLAN IEEE802.11g PC card	GSM	Cellular	2.24	33.5	0.545	1.5
		PCS	0.346	25.4	0.663	
GSM 850/1800/1900 PCMCIA Card	GSM	Cellular	0.617	27.9	1.264	1.2
		PCS	0.805	29.1	1.298	
Quadband GSM/GPRS/EDGE PC Card	GSM	Cellular	1.39	31.4	1.19	1.05
		PCS	0.69	28.4	0.167	
Dual-Band CDMA PC Card	CDMA	Cellular	0.266	24.2	0.44	2
		PCS	0.292	24.7	1.26	
Wireless PC Card Modem	GSM/GPRS	PCS	0.832	29.2	0.538	Not declared, picture shows approx 2cm?
3G Wireless PC Card Modem	WCDMA	PCS	0.126	21.0	0.693	Not declared, picture shows approx 2cm?

C. QUALCOMM SAR Measurements

QUALCOMM has performed SAR measurements using a commercially available laptop configured with a WWAN CDMA PCMCIA card with the aim of illustrating the relationship between SAR levels and separation distance. The measurements were performed using an in-house DASY Dosimetric Assessment System by Schmid & Partner Engineering AG. The laptop computer was measured in two orientations, one with the bottom of the laptop base adjacent to the measurement phantom and the other with the laptop PCMCIA card slot side adjacent to the measurement phantom. This was not intended to be a thorough SAR evaluation, but rather a demonstration of the relationship between SAR and distance. With this in mind measurements were made at a single PCS frequency of 1880MHz and with the card transmitting at full power. **Figures 5 and 6** shows the horizontal and vertical orientation of the laptop respectively.

Figure 5 – Horizontal Orientation (indicates 1.3 cm and 10cm separation distance)

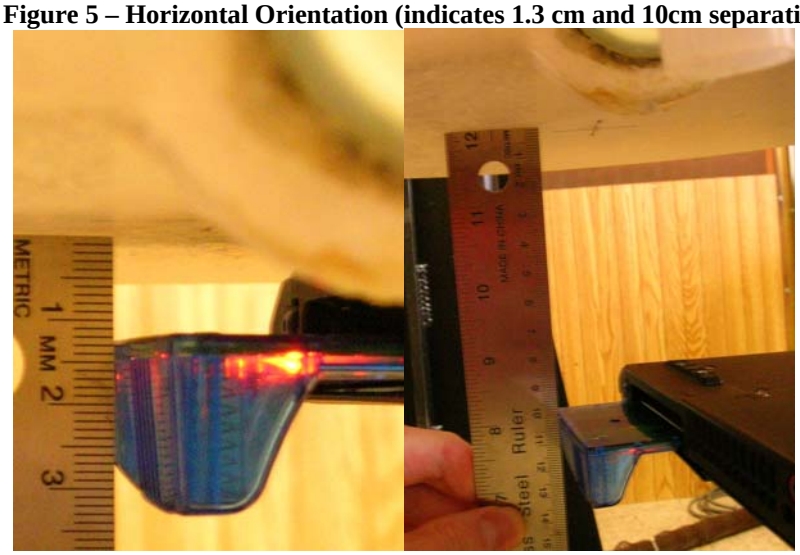
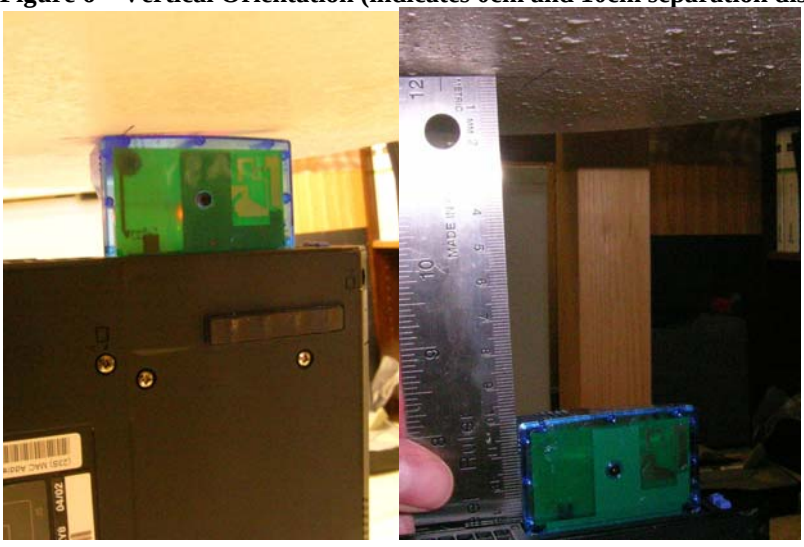


Figure 6 – Vertical Orientation (indicates 0cm and 10cm separation distance)



In the case of the laptop computer with a PCMCIA card installed, the highest local SAR value is typically measured at the location adjacent to the cards integrated antenna element and the internal fields generated in the SAR measurement phantom will decay exponentially with the distance from the antenna element. This effect is shown in the measurement summary presented in **Figures 7 and 8**. (Actual test plots are available upon request)

Figure 7 – SAR versus Distance: Horizontal Orientation

Distance (mm)	1 g SAR (mW/g)
13	1.95
15	1.32
20	0.544
30	0.197
60	0.0382
100	0.0163
150	0.00324
200	0.00197

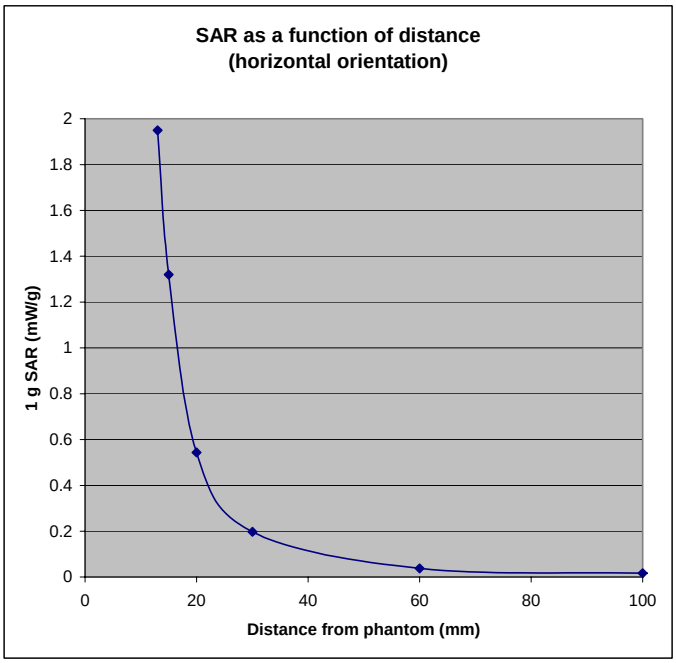
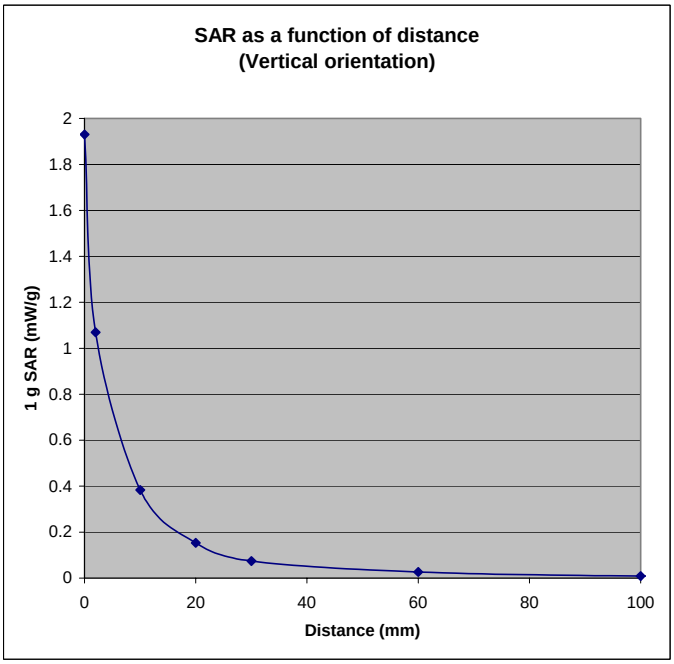


Figure 8 – SAR versus Distance: Vertical Orientation

Distance (mm)	1 g SAR (mW/g)
0	1.93
2	1.07
10	0.383
20	0.153
30	0.0744
60	0.0265
100	0.00875
150	0.00309
185	0.00296



D. Rationale for MPE Measurement versus SAR

FCC Bulletin OET 65 Edition 97-01 section entitled "Evaluating Mobile and Portable Devices" describes the definition of "portable" and "mobile" devices and provides links to the derivation of the 20-cm value for differentiating between these two device types.

> The bulletin states: "The selection of the 20-cm value for differentiating between "portable" and "mobile" devices is based on the specifications in the 1992 ANSI/IEEE standard that 20cm should be the minimum separation distance where reliable field measurements to determine adherence to MPE can be made**. Therefore, although at closer distances a determination of SAR is normally a more appropriate measure of exposure, for "mobile" devices, as defined above, compliance can be evaluated with respect to MPE limits, and the generic equations of this section, such as equation (3) and (4)[5] can be used for calculating exposure potential.**" (Emphasis added.)

It is the applicability of the last sentence (shown in bold above) that QUALCOMM would like to review. QUALCOMM has made the claim that WWAN radios with power levels of 500mW or less will comply with SAR requirements by a significant margin when the radiating element associated with the WWAN device is located at a distance of 10cm or more from the user. If SAR is not the appropriate measure of exposure, then compliance can be evaluated with respect to MPE limits.

When using the generic equations provided in the OET bulletin to calculate the exposure potential, a WWAN radio operating at the lowest cellular frequency with a maximum power of 500mW complies with the MPE limit at a separation distance of **8.52cm or greater**. See **Figure 9**.

Figure 9 – MPE Calculations for WWAN Devices operating in Cellular and PCS Bands

						Minimum Seperation Distance required to meet FCC MPE limit per OET 65 equation 4	
	Frequency (MHz)	Wavelength (cm)	EIRP (W)	EIRP (dBm)	FCC MPE Limit (mW/cm^2)	cm	in
800 Mobile Low Frequency	**824**	**36.41**	**0.50**	**27.00**	**0.549**	**8.52**	**3.35**
800 Mobile Center Frequency	836	35.89	0.50	27.00	0.557	8.46	3.33
800 Mobile High Frequency	848	35.38	0.50	27.00	0.565	8.40	3.31
PCS Mobile Low Frequency	1850	16.22	0.50	27.00	1.000	6.32	2.49
PCS Mobile Center Frequency	1880	15.96	0.50	27.00	1.000	6.32	2.49
PCS Mobile High Frequency	1910	15.71	0.50	27.00	1.000	6.32	2.49

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[5] Equation (4) per OET65: $S = \frac{EIRP}{4\pi r^2}$

Per OET65 page 24. "These equations are generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction."

As referenced in the previous paragraphs, the 1992 ANSI/IEEE document derives a minimum distance of 20cm where reliable field measurements to determine adherence to MPE can be made and it is this distance that the FCC adopted. Based on this it would appear that although a WWAN 500mW Cellular or PCS radio would comply with MPE requirements at a distance of **8.52 cm**, there is some question over the applicability of MPE at this distance.

On reviewing the ANSI/IEEE C95.1-1992 document and the complimentary document ANSI/IEEE C95.3 (1991), which describes the measurement of potentially hazardous fields, it would appear that the 20cm minimum separation distance was derived for a frequency of 300 MHz and that a minimum separation distance of 2 cm is valid for a frequency of 3000 MHz. Applying the same conditions identified in this document to a frequency of 824 MHz, which corresponds to the minimum frequency of a WWAN cellular device used in the US, results in a minimum separation distance of **7.28 cm** as being a separation distance at which a valid MPE measurement can be made.

Based on this observation, QUALCOMM would ask for a review of the IEEE documents, which confirm that a relaxation in the 20cm minimum separation distance can be supported for WWAN devices operating at a minimum frequency of 824 MHz.

If the FCC agrees that SAR is not the appropriate measure of exposure for laptop devices then MPE must apply and be valid. It is important to note that the minimum separation distance of 10 cm proposed by QUALCOMM for WWAN devices transmitting at 500mW will complies with the MPE limit with margin when applying the equations recommended in OET bulletin 65 as shown in Section D.

E. Conclusion

QUALCOMM has provided data from the FCC OET database for recently approved commercially available devices, including an actual embedded laptop product, to support the claim that WWAN devices are complying with SAR requirements by significant margins at minimum separation distances much less that 20cm. The known relationship between SAR and separation distance can be easily demonstrated through test as shown in the QUALCOMM laptop test. Based on the information contained in Section B and C of this filing, there is a question over whether a SAR measurement is appropriate for a WWAN enabled laptop with its radiating element located at a separation distance of 10cm or greater. If SAR is not the appropriate measure of exposure, then MPE applies and Section D traces the technical assessment in IEEE/ANSI standards that supports the validity of an MPE assessment at a minimum frequency of 824 MHz.

QUALCOMM asks that the FCC consider this market update, empirical evidence and documented rationale when specifying the power threshold at which SAR data must be supplied for Part 22/24 devices that are integrated into laptops where a 10 cm or greater separation distance can be maintained from the user.

QUALCOMM also proposes that the FCC allow the installation by customers and retailers of Part 22 and 24 approved modules into laptops, just as the FCC today permits unlicensed modules to be installed by end-users into laptops. This would permit laptop vendors to sell WWAN-ready laptop, with the WWAN antennas and other necessary components built in, but in which the end-user could install an approved module (approved for specific laptop models) and enable WWAN connectivity for their laptop device.

Finally, to promote harmonization within the Commission's rules, QUALCOMM requests that the rules to govern WWAN modules embedded in laptops cover modules that operate on spectrum regulated under Part 22, 24, and 27, thereby ensuring that modules operating on all of the licensed wireless spectrum bands will be regulated in a similar manner.

We stand ready to participate in further discussion with the FCC staff and appreciate your attention in this matter.

Respectfully submitted,

/s/ Dean R. Brenner

Dean R. Brenner
Senior Director, Government Affairs
QUALCOMM Incorporated

Cc : Bruce Franca
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