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Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)	
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Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems)	ET Docket No. 00-258
)	
Petition for Rulemaking of the Cellular Telecommunications Industry Association Concerning Implementation of WRC-2000: Review of Spectrum and Regulatory Requirements for IMT-2000)	RM-9920
)	
Amendment of the U.S. Table of Frequency Allocations to Designate the 2500-2520/2670- 2690 MHz Frequency Bands for Mobile-Satellite Service)	RM-9911
)	

REPLY COMMENTS OF VERIZON WIRELESS

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To: The Commission

REPLY COMMENTS OF VERIZON WIRELESS

SUMMARY

Verizon Wireless hereby replies to comments filed with the Commission in response to its rulemaking to consider spectrum allocations below 3 GHz to support the introduction of Third Generation ("3G") mobile and other advanced wireless services.¹ The record broadly supports the allocation of additional spectrum for 3G services in a

¹ *In the Matter of Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, Notice of Proposed Rulemaking and Order ("NPRM") FCC 00-455 (rel. Jan. 5, 2001).

manner that is consistent with international agreements supported by the United States and other world governments at the International Telecommunications Union's ("ITU") 2000 World Radiocommunication Conference ("WRC-2000"). To give force to those decisions, substantial amounts of additional spectrum must be allocated in frequency bands below 3 GHz to support high-quality voice, high-speed data, and a variety of multimedia applications. These spectrum allocations should be harmonized both regionally and globally to maximize interoperability and minimize cost. Consequently, allocations should come from each of the bands that have been identified for 3G worldwide; i.e., 1710-1850 MHz, 2110-2165 MHz, and 2500-2690 MHz.

We understand that most of this spectrum is currently occupied by other services and will not likely be available for use before 2004, at the earliest. However, it is urgent that the Commission make the necessary spectrum allocation decisions now, so that manufacturers and operators can make plans for using these bands. The Commission should allocate a substantial amount of spectrum for 3G in addition to those bands currently used for first-generation ("1G") and second-generation ("2G") mobile systems, and ensure that the timeframes for spectrum availability are reasonable and relocation costs are minimized. We urge the Commission to:

1. Allocate the entire 1710-1755 MHz band and make it available for 3G and other advanced services.
2. Allocate the entire 2110-2165 MHz ("2.1 GHz") band and make it available for 3G and other advanced services.
3. Relocate Multipoint Distribution Service ("MDS") operations from the 2.1 GHz band, or at a minimum, move them to the 2155-2165 MHz band and tighten out-of-band emission limits to minimize guard band requirements.
4. Work with the National Telecommunications and Information Administration ("NTIA") to reallocate substantial portions of the 1755-1850 MHz band and harmonize it with 3G allocations worldwide.

5. Reallocate and auction a minimum of 60 MHz of spectrum from within the 2500-2690 MHz band and make it available for 3G and other advanced services.

I. THE COMMISSION MUST ALLOCATE SUBSTANTIAL AMOUNTS OF ADDITIONAL SPECTRUM TO SUPPORT THE GROWTH OF 3G AND OTHER ADVANCED WIRELESS SERVICES.

A. 3G Is Critically Important To The Continued Growth And Productivity Of The United States' Economy.

Most comments acknowledge the ITU study that was adopted as part of Resolution 223 at WRC-2000 and the report by the President's Council of Economic Advisors ("CEA") as the bases for allocating additional spectrum to 3G mobile services.² Some commentators, however, ignore or trivialize the overriding theme of the ITU study and CEA report: evolution to 3G mobile technologies *is* the future of wireless communications – a future whose advent depends on the allocation of adequate spectrum resources. The rapid growth of mobile wireless communications suggests, but cannot fully convey, the urgent nature of this issue. The vital importance of the communications industry to the U.S. economy, the tremendous social costs that will be incurred if the output and productivity growth of communications is stymied, the increasingly global nature of the economy, and the role 3G mobile communications will play in determining the position of the U.S. in the global marketplace, demand that the Commission provide the spectrum required for the next generation of wireless services.

² See Comments of AT&T Wireless Services, Inc., filed in NPRM ("AT&T Comments") (filed Feb. 22, 2001) at 1; see also Comments of Cingular Wireless LLC, filed in NPRM ("Cingular Comments") (filed Feb. 22, 2001) at 4; see also Comments of Motorola, Inc., filed in NPRM ("Motorola Comments") (filed Feb. 22, 2001) at 4; see also Comments of Qualcomm Incorporated, filed in NPRM ("Qualcomm Comments") (filed Feb. 22, 2001) at 2.

The U.S. economy has expanded rapidly in recent years, with total factor productivity (the source of growth most closely identified with technological gains) rising sharply since the mid-1990s.³ The communications industry has been one of the key drivers of the U.S. economy's growth in output and productivity over the past four decades.⁴ The contribution of communications to output and productivity growth will only increase as the industry continues to convert its infrastructure to digital technologies that complement computing and data networking. The role of communications as an input to most other goods and as distinct services for end user consumption affects every sector of the economy. Mobile wireless services – the fastest growing segment of the communications industry – play a critical, and growing, role in this economic evolution.

WorldCom asserts that, from the Commission's standpoint, all advanced services should be presumed equal.⁵ However, allocating needed spectrum for 3G is not at all inconsistent with the principle of technological neutrality. Moreover, this principle must not blind the Commission to the real-world consequences of delaying deployment of the next generation of wireless technology in the United States. The decade-long delay of the introduction of cellular networks – due in large part to the regulatory process – has been estimated conservatively to have cost American citizens in excess of \$86 billion dollars, excluding the immeasurable costs associated with the path of research and

³ See Bureau of Labor Statistics, U.S. Dept. of Labor, *Multifactor Productivity Trends*, USDL 99-36. U.S. Government Printing Office, Feb. 11, 1999; see also Gullickson, William and Michael J. Harper, *Possible Measurement Bias in Aggregate Productivity Growth*, 1999, *Monthly Labor Review* 122(2): 47-67.

⁴ See Jorgenson, Dale W. and Kevin J. Stiroh, *Industry-Level Productivity and Competitiveness Between Canada and the United States*, *American Economic Review* (2000) 90(2) at 161-167.

⁵ See Comments of WorldCom, Inc., filed in NPRM ("WorldCom Comments") (filed Feb. 22, 2001) at 4.

development, technology diffusion, and high-wage jobs that went abroad in the absence of a more nurturing environment in the United States.⁶

Despite the regulatory delays and resulting economic losses, 1G and 2G wireless services are, at long last, becoming pervasive in this country. Working off such a tremendous base, 3G wireless services promise a wonderful expansion beyond previous generations. Some commentators, however, would use the regulatory process to block or delay the development of a communications market that is vital to the U.S. economy. The Commission must reject their “do nothing” position, because now the potential cost to the United States is much greater than that associated with previous delays in deploying wireless technologies.

Our economy is fundamentally more global than the comparative vacuum in which cellular mobile radio services took off in the early 1980s. The global trends towards trade liberalization and increasing mobility of capital raise the stakes associated with technology deployment higher than they ever have been.⁷ This means that the costs

⁶ See generally Rohlfs, Jeffrey, H. and Charles Jackson *et al.*, *Estimate Of The Loss To The United States Caused By The FCC's Delay In Licensing Cellular Telecommunications*, National Economic Research Associates (2001) *mimeo*.

⁷ See Blinder, Alan, *How the Economy Came to Resemble the Model*, *Business Economics* (2000) 35(1). The meteoric rise of the Finnish wireless industry provides a case in point:

Gross domestic product rose more than 30% in the five years after 1992 and is projected to increase an additional 20% by the end of this year. Unemployment has dropped from 20% at the start of the decade to 10.5% now--a level not expected to change despite healthy increases in new jobs each year because of the specialized training needed for the country's new high-tech focus.

* * *

Finland's phenomenal rise from relative poverty followed in the comet trail of Nokia, the 134-year-old company that left its traditional pursuits of tire and rubber-boot manufacturing only a decade ago to focus on wireless communications. Nokia, Ericsson and other Nordic telecom leaders prospered from early recognition that a common standard for mobile phones and roaming agreements among service providers would allow all wireless customers to reach one another, regardless of location or which brand of handset they own. "It's a wireless world now, and standardization in Europe has really created opportunities here," says Jari Raappana, marketing director of Stonesoft, a

of the domestic productivity losses caused by regulatory delay will be compounded by competitive losses in the global marketplace.

As the NTIA has observed, mobile broadband wireless Internet access has become a key economic component for Asian and European countries, many of which are on the cusp of driving the next wave of the Internet revolution.⁸ Asia and Europe are about to surpass the U.S. in Internet and wireless users due to their head start in developing 3G services.⁹ This advantage has given non-U.S. manufacturers a significant advantage in shaping future communications technologies, electronic commerce, and the Internet.¹⁰

The United States is in jeopardy of losing its global leadership role in the development of wireless technologies and services. The experience of European countries that were late to issue 1G and 2G licenses shows that catching up is a slow and arduous process.¹¹ The Commission must act now to develop a spectrum management

network security and information management firm near Helsinki. "We lost the Internet growth to the United States, but wireless is a good opportunity for Europe--something in which we can be the world leader."

<http://www.fcc.gov/rural/finland1108.html> (reproducing Williams, Carol, J. *A Wireless Wake-Up Call for Finland: The Mobile Communications Industry Has Reinvigorated The Country, Changing The Way Finns Work, Play, And See Their Place In The World*, LA Times, Nov. 8, 1999).

Finland's leadership in wireless technology development has prompted one commentator to predict that the leader in sales in computing devices in 2002 is not likely to be a U.S. computer manufacturer, but Nokia M. Ferranti, *IT Shifting Global Distribution Of Power*, IDG News Service (Dec. 21, 1999) (citing Dec. 1999 report by Nomura Bank International).

⁸ *'Wireless' Internet: What the 3G Challenge Means for U.S. Competitiveness*, introduction, <http://www.ntia.doc.gov/ntiahome/threeg/3gintro.htm>.

⁹ *Id.*

¹⁰ *Id.*

¹¹ European countries that began adopting first and second generation wireless systems at a later date have been slow to catch up, with international convergence expected only by around 2006. see H. Gruber & F. Verboven, *The Diffusion Of Mobile Telecommunications Services In The European Union*, 45 *European Economic Review* (2001) at 577-588.

plan for satisfying the future demand for 3G services. Any further delay risks a significant and prolonged negative effect on U.S. economic growth.

B. The Demand For 3G Services Is Expected To Be High.

The comments broadly support the view that there is a significant demand for wireless data services, and that this demand will increase substantially in the future.¹² While only about two percent of mobile traffic is currently data,¹³ analysts estimate that it will grow at a rate of 25 to 30 percent annually and there will be more than 100 million wireless data customers by 2007.¹⁴ In its fifth annual report on the state of competition in the mobile services market, the Commission reports that this growth in mobile data can be attributed to several factors.¹⁵ First, wireless operators are rapidly deploying digital technology. Second, new technologies – like 3G – have been developed and are becoming commercially available to support significantly faster data speeds. Third, technological advances are transforming mobile handsets from simple voice telephones to sophisticated data devices. Finally, the acceptance of wireline Internet use has become universal and is driving the demand for mobile access to the World Wide Web.

It is the convergence of wireless and the Internet that will fuel the tremendous growth of wireless data. As one analyst observes:

¹² Motorola Comments at 3; PCIA Comments at 5; AT&T Comments at 5.

¹³ Jonathan Collins, *Sprint's Aggressive Ad Campaign Could Fire Up Demand For Wireless Net Access Or Give It A Bum WAP*, TELE.COM, Feb. 21, 2000, available in 2000 WL 10907294.

¹⁴ Thomas J. Lee, *The U.S. Mobile Data Report – A Special Edition of Mobile Outlook*, Equity Research: United States Wireless Services, Salomon Smith Barney, Sept. 21, 1999, at 8.

¹⁵ See *In the Matter of Implementation of Section 6002(b) of the Omnibus Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, Fifth Report (“Fifth Competition Report”) (rel. Aug. 18, 2000) at 34.

“The telecoms industry is undergoing the greatest revolution in history, as the computing and communication worlds converge to give rise to a completely new value-chain. The changes resulting from this convergence are not just of a technological nature, but are also impacting the competitive environment and customers, leading to a whole new business paradigm”.¹⁶

Moreover, “the shift towards enabling technologies, such as 3G, will aid this astonishing growth.”¹⁷ 3G technology will allow operators to provide their customers with services at data rates “up to 2 Mbps for indoor traffic, 384 kbps for pedestrian traffic, and 144 kbps for high-mobility (vehicular) traffic.”¹⁸ Industry analysts observe that there is a global shift toward these next generation technologies, as wireless operators position themselves to meet the demand for mobile data. It has been estimated that purchases for next generation equipment will exceed \$70B in 2002, surpassing investments in current 2G technology.¹⁹

The Commission should be wary of attempts by some commentators to undermine its efforts to allocate additional spectrum by incorrectly relying on recent press reports on the availability of 3G technology. These reports resulted from recent announcements in Europe and Japan that equipment for a particular 3G technology – wideband CDMA (“W-CDMA”) – will not be ready when originally expected.

The recent setbacks with W-CDMA have no impact, however, on the plans of Verizon Wireless and other U.S. carriers²⁰ to deploy 3G technologies. As we noted in

¹⁶ Rachel Rowe, *Smartphones Market to Take Giant Leap As Mobile Phone Boom Intensifies*, Frost and Sullivan (April 2000) available at www.frost.com.

¹⁷ *Id.*

¹⁸ PCIA Comments at 5.

¹⁹ Strategis Group, *Global Next Generation Wireless Technology and Infrastructure Forecasts* (Mar. 1, 2001) available at www.strategisgroup.com.

²⁰ Qualcomm Comments at 9.

our comments, we will begin to deploy 3G technology and services this year, utilizing a 3G technology called cdma2000 1xRTT (“1x”).²¹ We are currently trialing this technology in two markets – Maple Shade, New Jersey and Columbus, Ohio – and expect to begin commercial deployment in the 4th quarter.

Cdma2000, one of five radio specifications adopted by the ITU for 3G, has three modes of operation: 1xRTT, 3xRTT and 1xEV (also known as High Data Rate or “HDR”).²² The 1x mode will support typical data rates of 144 kbps and potential data rates up to 307 kbps in a mobile environment.²³ The technology supports both voice and data capability and requires 2.5 MHz of spectrum for each carrier implemented. The cdma2000 1xEV mode is a data-only solution that provides up to 2.4 Mbps data rates in the same amount of spectrum.²⁴ We will trial 1xEV in the 2nd half of this year, and are considering commercial deployment in late 2002.

Our deployment of cdma2000 will put us in a position to meet what we believe will be significant demands for high-speed data services. While this technology will provide greater spectral efficiency as compared to existing 2G technologies, the customers’ thirst for higher and higher bit rates will ultimately exceed these efficiency gains. Therefore, substantial amounts of additional spectrum will ultimately be needed to keep pace with the tremendous growth in wireless and the increasing demand for high-speed data services.

²¹ See Comments of Verizon Wireless, filed in NPRM (“Verizon Wireless Comments”) (filed Feb. 22, 2001) at 6.

²² Qualcomm Comments at 4.

²³ Id at 4.

²⁴ Id at 5.

C. The Commission Must Allocate At Least 200 MHz Of Additional Spectrum For 3G And Other Advanced Wireless Services.

The comments overwhelmingly support the ITU study that estimates an additional 160 MHz of spectrum will be needed for 3G “*in addition to that already identified for IMT-2000 [at WARC-92] and in addition to the spectrum used for first- and second-generation mobile systems.*”²⁵ In fact, no commentors disputed the ITU study.

Moreover, the United States Government and 159 other world governments supported this study in adopting Resolution 223 at WRC-2000 in Istanbul, Turkey last June.²⁶

There appears to be some confusion, however, about how this 160 MHz requirement would be met. Some commentors point to the recently concluded re-auction of C and F block PCS licenses, the proposed reallocation of 2110-2150 MHz and 2160-2165 MHz (“2.1 GHz band”), and the pending auction of licenses at 747-762 MHz and 777-792 MHz (“700 MHz band”) as spectrum resources that would help to satisfy the 3G requirement.²⁷ These assertions are wrong.

The 700 MHz band was not identified by the ITU for 3G use. In fact, governments from around the world rejected the identification of 700 MHz as a 3G band

²⁵ IMT-2000, or International Mobile Telecommunications – 2000, is a set of technology and service standards that represents the ITU’s vision for third generation mobile systems which are schedule to start service around the year 2000, subject to market considerations. See Joint Comments of The Cellular Telecommunications & Internet Association, Telecommunications Industry Association, and Personal Communications Industry Association, filed in NPRM (“Association Group Comments”) (filed Feb. 22, 2001) at 3; Motorola Comments at 7; see also Comments of The Radio Advisory Board of Canada, filed in NPRM (“RABC Comments”) (filed Feb. 22, 2001) at 8; see also Comments of the Personal Communications Industry Association, filed in NPRM (“PCIA Comments”) (filed Feb. 22, 2001) at 7; AT&T Comments at 3; Cingular Comments at 2; see also Comments of Nortel Networks Inc., filed in NPRM (“Nortel Comments”) (filed Feb. 22, 2001) at 1; see also Comments of The Telecommunications Industry Association, filed in NRPM (“TIA Comments”) (filed Feb. 22, 2001) at 2; see also Comments of Ericsson, filed in NPRM (“Ericsson Comments”) (filed Feb. 22, 2001) at 6.

²⁶ See *Provisional Final Acts of the 2000 World Radiocommunication Conference (“WRC-2000”)* (“Final Acts of WRC-2000”) Resolution 223, titled “Additional frequency bands identified for IMT-2000,” was initially called Resolution [COM5/24].

at WRC-2000. Only the United States and Cameroon supported it. Given the importance of harmonization to the development of 3G and the clear intent of most world governments not to deploy 3G services in the 700 MHz band, the band does not represent the best candidate for implementation of 3G in the United States. More importantly, the band is not likely to be available for any use other than broadcast TV for many years. Under current law, broadcasters are not required to vacate the band before 2007 or before 85% of the viewing public has access to digital television (“DTV”), whichever comes later.²⁸ Given the slow progress that DTV has made thus far, and further problems anticipated with its implementation, many expect that 85% penetration will not occur until well after 2010.²⁹ For these reasons, the 700 MHz band cannot be counted on for 3G use in the timeframe addressed by the ITU study.

The PCS and 2.1 GHz bands were identified for IMT-2000 at the 1992 World Administrative Radio Conference (“WARC-92”), and thus, their availability for 3G had already been assumed by the ITU prior to its study. It is perhaps more appropriate to look at the total forecasted spectrum requirement for 3G mobile services, as determined by the ITU. For Region 2, which includes the United States, the ITU estimated that a total of 390 MHz of spectrum would be needed to support 3G services through the year 2010.³⁰ Recognizing that 230 MHz of spectrum was either already being used for mobile

²⁷ See NIA Comments at 22; WCAI Comments at 55; WorldCom Comments at 27.

²⁸ See Section 337(a) of the Communications Act, 47 U.S.C. § 337(a), as amended by § 3004 of the Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997).

²⁹ Barry Fox, *Digital TV Rollout: Has The United States Got It Wrong With Digital Terrestrial TV?*, IEEE Spectrum, February 2001, at 65.

³⁰ RABC Comments at 8.

services or had been identified for IMT-2000 at WARC-92, it thus concluded that an additional 160 MHz of spectrum would be required.

Currently, less than 190 MHz of spectrum is licensed for 1G and 2G mobile services in the U.S.³¹ This includes the recently re-auctioned C and F block PCS licenses. The 45 MHz of additional spectrum at 2110-2150 MHz and 2160-2165 MHz, while identified for 3G at WARC-92, has never been made available for mobile use. Even if one assumes that all spectrum currently used for 1G and 2G systems will be used for 3G, there is still a shortfall of 200 MHz. Consequently, in order to meet the ITU spectrum requirement for 3G services, the Commission must allocate an additional 200 MHz of spectrum from within the bands identified in the NPRM; i.e., 1710-1850 MHz, 2110-2165 MHz, and 2500-2690 MHz.

It is important to note that the spectrum requirements identified by the ITU were based on the use of the spectrum for 3G mobile services. The Commission, however, has indicated that any spectrum allocated in this proceeding would likely be auctioned broadly for both fixed and mobile services. While Verizon Wireless does not oppose such flexible use, the Commission should be aware that this flexibility would likely increase the total spectrum allocation requirement. If a variety of service types will be vying for the use of spectrum identified in this proceeding, then the Commission will need to allocate substantially more than 200 MHz if the anticipated demands for 3G services are to be met.

³¹ This includes 50 MHz in the Cellular Service, 120 MHz in the Personal Communications Service (“PCS”) and about 19 MHz in the Specialized Mobile Radio (“SMR”) Service.

II. MDS OPERATIONS IN THE 2150-2160 MHz BAND WILL SEVERELY RESTRICT 3G OPERATIONS.

As we indicated in our comments,³² and as other commentors agreed,³³ the use of the 2110-2165 MHz band for 3G is significantly hindered by the continued operation of MDS at 2150-2160 MHz. If allowed to remain in that spectrum, the potential for harmful interference to 3G handsets from MDS transmitters would be significant. This problem is caused by out-of-band emission limits for MDS that are extremely lax.³⁴ Continued MDS operation in the 2150-2160 MHz band in accordance with these limits would preclude the use of the 2110-2150 MHz and 2160-2165 MHz bands for future 3G use.

In the accompanying appendix, we further evaluate the adjacent channel interference situation and determine the appropriate out-of-band emission limits required to permit successful 3G operations. The analysis assumes a 5 MHz guard band separating the MDS channel from the adjacent 3G channel. Our analysis shows that successful 3G operations is only possible if the maximum transmitter power is attenuated by at least 95 dB at the 3G channel edge (i.e., 5 MHz away from the MDS channel edge). (See Appendix). To facilitate 3G operations in the 2110-2165 MHz band, the Commission should modify its MDS technical rules to comply with this requirement.

Of course, the use of the 2110-2165 MHz band for 3G can only be maximized if MDS is moved from its current assignment at 2150-2160 MHz. Even if the new technical rules described in the attached appendix are adopted, 3G operators could only

³² See Comments of Verizon Wireless, filed in NPRM (“Verizon Wireless Comments”) (filed Feb. 22, 2001) at 14.

³³ Motorola Comments at 17; AT&T Comments at 12.

³⁴ See 47 C.F.R. § 21.908.

make use of the 2110-2145 MHz band, leaving 10 MHz of spectrum unusable. Ideally, MDS operation should be relocated to spectrum outside the 2.1 GHz band.³⁵ At a minimum, it should be shifted up in frequency to the 2155-2165 MHz band.

If MDS operation is relocated out of the 2.1 GHz band, one option would be to move it to 2500-2690 MHz. This would allow it to be used more easily in conjunction with spectrum already utilized by MDS operators, thus easing equipment design and reducing cost. As discussed *infra*, it would appear to be possible to reallocate a substantial portion of the Instructional Television Fixed Service (“ITFS”) band for non-ITFS purposes, including an additional 10 MHz to accommodate MDS operations relocated from the 2.1 GHz band.

III. A SUBSTANTIAL AMOUNT OF SPECTRUM SHOULD BE REALLOCATED FROM THE 1755-1850 MHz BAND.

The record clearly supports the reallocation of a substantial portion of the 1755-1850 MHz band for 3G services.³⁶ The Association Group has concluded that interim

³⁵ We note that various MDS commenters assert that the Commission should not move MDS licensees because, e.g., “the forced relocation of an emerging mass-market service. . . would be unprecedented.” See WorldCom Comments at 26-27. See also Sprint Comments at 26. This claim is without merit. The Commission has relocated consumer-based, mass-market service providers. In fact, the Commission has more than once ordered the relocation of established TV broadcast licensees, whose services by any measure are more “mass-market” and consumer-driven than those of ITFS/MDS providers. (Verizon Wireless understands that, unlike television sets, the equipment required to receive ITFS/MDS is installed by and under the control of the service provider, rather than the consumer.) In 1970, the Commission reallocated UHF television channels 70-83 (806-890 MHz) to land mobile services, requiring the ultimate relocation of two full-power TV stations and hundreds of TV translators to channels 14-69. See *An Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz, and Amendment of Parts 2, 18, 21, 73, 74, 89, 91, and 93 of the Rules Relative to Operations in the Land Mobile Service Between 806 and 960 MHz*, 19 RR 2d 1663 (1970). In 1997, in its DTV proceeding, the Commission adopted a DTV allotment plan that will require the relocation of all television licensees currently located in channels 52-69 to the new “core” TV spectrum at channels 2-51. *Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, 12 FCC Rcd 14588 (1997). In early 1998, the Commission reallocated channels 60-69 to fixed, mobile, and new broadcast services (with existing full-service broadcasters grandfathered in this spectrum until the end of the DTV transition). *Reallocation of Television Channels 60-69, the 746-806 MHz Band*, ET Docket No. 97-157, 12 FCC Rcd 22953 (1998).

³⁶ AT&T Comments at 2; RABC Comments at 2; Motorola Comments at i; Association Group Comments at v; Nortel Comments at 5; NIA Comments at 23; Sprint Comments at 32; UWCC Comments at 9.

sharing and long-term migration plans could be implemented to make this band available for 3G services, while accommodating the needs of Federal users.³⁷ We urge the Commission to work with NTIA and affected Federal agencies to reallocate this spectrum expeditiously. A substantial portion of the band should be made available and paired with spectrum at 1710-1755 MHz and 2110-2165 MHz in a manner that supports regional and global harmonization.

Moreover, the Commission should ensure that the band is cleared of incumbent systems in a timely manner and at reasonable cost, while accommodating incumbents as necessary, and as required by law. It would be more efficient, and more expeditious, if the reimbursements paid to Federal users for relocation related expenses were paid through the auction proceeds. This would substantially reduce post-auction transaction costs, and give the Federal agency greater control over the relocation process. These same principles should also be applied to the 1710-1755 MHz band which has already been reallocated for private sector use.

IV. THE COMMISSION SHOULD SEGMENT THE 2500-2690 MHz BAND AND REALLOCATE A MINIMUM OF 60 MHz FOR 3G SERVICES.

A. The Commission Must Investigate Actual Use Of The ITFS Band.

In its Interim Report, the Commission assessed the potential for accommodating 3G services in the 2500-2690 MHz band.³⁸ First, it analyzed the potential for sharing the band with incumbents, and concluded that co-channel sharing is not possible. We agree

³⁷ Association Group Comments at v.

³⁸ Office of Engineering and Technology, Mass Media Bureau, Wireless Telecommunications Bureau, and International Bureau, Federal Communications Commission, *Spectrum Study of the 2500-2690 MHz Band, The Potential for Accommodating Third Generation Mobile Systems*, Staff Report ("FCC Interim Report") (Nov. 15, 2000).

with this conclusion. Next, it considered whether it would be feasible to segment the band by providing separate spectrum for 3G and incumbent services. The Commission did not reach a tentative conclusion on band segmentation. This is not surprising, considering that too little information was provided in the Interim Report about the current uses of the band to allow the Commission to make an informed decision.

The Commission's review of current and future MDS/ITFS uses must include an assessment of the amount of ITFS spectrum that is leased for commercial purposes. This is the only way for the Commission to determine how much spectrum is actually required for educational purposes. In the deliberations of the Industry Association Group ("Association Group") that followed the release of the Interim Report, there was again a significant void of information coming from the MDS and ITFS incumbents about their current use of the band despite their active participation in the discussions. In its final report, the Association Group recommended that the Commission "investigate more fully the current and planned uses of the band for commercial and educational purposes by ITFS and MDS incumbents" as part of its review in this proceeding.³⁹ The importance of such an investigation cannot be overstated. Indeed, as one commenter notes, the Commission's ability to reach a final decision in this proceeding "could be severely frustrated by the continued failure of incumbent licensees to provide the necessary hard data about current and future service."⁴⁰ We urge the Commission to request that ITFS licensees provide it with specific information about the spectrum that they lease.

³⁹ Association Group Comments at V.

⁴⁰ See Comments of Universal Wireless Communications Consortium (UWCC), filed in NPRM ("UWC Comments") (filed Feb. 22, 2001) at 6.

B. Reallocation Is Warranted When, As Here, Spectrum Is Not Being Used For Its Original Intended Purpose.

The record is replete with examples of valuable educational services provided over ITFS facilities. Verizon Wireless does not dispute the benefits provided by these services. However, the question the Commission must answer is how much spectrum is actually required to deliver these educational services. No specific data was provided in the comments to substantiate the degree to which the enormous amount of spectrum allocated to ITFS is actually used to deliver these services.

In fact, the record supports our initial assertion that significant portions of the 2500-2690 MHz band are no longer being used to deliver educational services, and that the band has been largely commercialized. According to The Catholic Television Network (“CTN”), an association of Roman Catholic archdioceses and dioceses that operate many ITFS systems, “the deployment of fixed broadband services by commercial operators is based on the use of the *entire* 2.5 GHz band,” and “approximately two-thirds of the spectrum used by commercial operators comes from ITFS licensees.”⁴¹ CTN states that “leasing the maximum amount of channel capacity permitted by the FCC may result in the spectrum being put to its highest and best use through the creation of shared networks.”⁴² In citing the dramatic increase in ITFS applications filed with the FCC after new leasing rules were adopted in 1983, the ITFS Spectrum Development Alliance states that “[o]ver 90 percent of these applications were premised on excess capacity leases.”⁴³

⁴¹ See Comments of The Catholic Television Network, filed in the NPRM (“CTN Comments”) (filed Feb. 22, 2001) at 22.

⁴² CTN Comments at 19.

⁴³ See Joint Comments of The ITFS Spectrum Development Alliance, filed in NPRM (“Alliance Comments”) (filed Feb. 22, 2001) at 6.

Commercial MDS operators have made similar statements supporting the fact that there is extensive leasing of ITFS spectrum. Sprint, one of the two largest MDS operators in the country, indicates that more than two-thirds of the channels it uses to provide service are made available to them via leases.⁴⁴ Nucentrix, the third largest MDS operator in the country, states that “ITFS licensees furnish the majority of the spectrum that commercial operators need to provide service.”⁴⁵ The Wireless Communications Association International (“WCAI”), which professes to be “the primary advocate of the fixed wireless broadband industry”⁴⁶ on matters related to MDS and ITFS spectrum, states:

“The leasing of ITFS channel capacity for commercial broadband operations is pervasive. The FCC Interim Report concludes that ‘[t]oday, most ITFS licensees lease excess capacity to MDS operators,’ and elsewhere the Commission has found that up to 95% of all ITFS licensees engage in leasing. This leasing reflects the fact that most, if not all of the available spectrum in the 2.1 and 2.5 GHz bands must be available in order for a broadband service to be viable.”⁴⁷

WCAI even bases its engineering-economic model on the assumption that MDS operators will have access to a minimum of 158 MHz,⁴⁸ though these operators hold licenses for only about 78 MHz. It bases its study on “input received from the industry,”⁴⁹ and both WorldCom⁵⁰ and Sprint⁵¹ cite the study in their comments. While

⁴⁴ See Comments of Sprint Corporation, filed in NPRM (“Sprint Comments”) (filed Feb. 22, 2001) at 3.

⁴⁵ See Comments of Nucentrix Broadband Networks, Inc., filed in NRPM (“Nucentrix Comments”) (filed Feb. 22, 2001) at 30.

⁴⁶ WCAI Comments at i.

⁴⁷ Id at 36.

⁴⁸ Id at 33.

⁴⁹ Id, Appendix B at 5.

⁵⁰ WorldCom Comments at 18.

⁵¹ Sprint Comments at 20.

Verizon Wireless does not believe that 158 MHz is the minimum amount of spectrum necessary to develop a viable broadband wireless business, the use of this assumption is telling because it reveals that at least 80 MHz of ITFS spectrum is being used by commercial operators, and therefore, is not being used to deliver educational services.

We acknowledge the importance of technology as a tool in educating this country's youth. However, it is clear from the record that ITFS licensees do not use most of this spectrum to deliver educational services. Instead, they lease it in return for money. Many MDS and ITFS licensees submitting comments in this proceeding, by highlighting the importance of lease payments in funding their programs, demonstrate how little their licensed spectrum is actually used for instruction – which, after all, was the intended purpose of the original ITFS allocation.⁵² In addition to using the spectrum to obtain financial support, these licensees typically “leverage their spectrum to obtain a host of facilities and services from their commercial partners such as discounted Internet access, video programming, studio equipment, high-speed connections among educational facilities, local or long-distance telephone service, and technical support.”⁵³

This Commission's statutory duties do not include aiding licensees to “leverage” spectrum they do not need. Those duties do include ensuring that spectrum demands are met by allocating spectrum and maximizing efficient use. Verizon Wireless understands the difficulties that many school districts have in obtaining funding for educational programs, and we acknowledge the mutual benefits that have been created through

⁵² See Comments of University of Colorado, filed in NPRM (filed Feb. 22, 2001) at 5; *see also* Comments of the American Federation of Teachers, filed in NPRM (filed Feb. 22, 2001) at 2; *see also* Comments of The American Association of Community Colleges and The Association of Community College Trustees, filed in NPRM (filed Feb. 22, 2001) at 3; Nucentrix Comments at 32.

⁵³ CTN Comments at 17.

MDS/ITFS partnerships. However, the Commission must separate spectrum management issues from the need to provide funding for education. It is, at best, inefficient to use a valuable, irreplaceable communications resource solely to fund educational programs, rather than for the purpose of providing the most appropriate advanced communications services. There are other ways to ensure that schools have the funding they need. For example, the revenues generated from an auction of some portion of the 2500-2690 MHz band could be directed to those educational programs provided by ITFS licensees or to benefit education generally throughout the nation. These auction revenues may be substantially greater than the valuations of existing leases.

Only the market can determine the highest and best use of this spectrum. The current allocation and licensing scheme for MDS/ITFS is so complex that such a market determination is virtually impossible.⁵⁴ And, while it may be difficult, it is not impossible to structure a band segmentation that accommodates the needs of all parties and provides substantial benefits to the U.S. economy.

C. An MDS Operator Does Not Require Access To The Entire MDS/ITFS Band.

In its business case analysis, WCAI asserts that an MDS operator requires 158 MHz of spectrum in each market and that a significant reduction in available spectrum below this level would “force MDS/MMDS operators to implement more expensive network configurations” and, therefore, “result in an inability to provide service

⁵⁴ We note that there is near unanimous agreement with Verizon Wireless that a secondary market approach that provides incumbent licensees with additional flexibility to sell or lease spectrum for mobile services would be difficult to implement and therefore would not solve the need for additional spectrum for 3G. See *e.g.*, WorldCom Comments at iv; *see also* Sprint Comments at 16; *see also* NIA Comments at 31.

efficiently and economically.”⁵⁵ The assertion that one MDS operator needs 158 MHz in low frequency bands defies logic.⁵⁶ It is, in any event, based on the incorrect assumption that many markets will require a supercell architecture with a cell radius of 35 miles. Because the critical assumption of cell size is flawed, so is the convenient conclusion that all of the spectrum an MDS operator has access to is precisely what it needs.

As we noted in our comments, a reduction in cell size would substantially decrease the amount of spectrum required by MDS operators to provide fixed broadband services.⁵⁷ This principle of frequency reuse is, of course, the fundamental principle on which cellular technology is based. The FCC also notes the effects of frequency reuse on spectrum efficiency in its Interim Report on 3G.⁵⁸ Figure 6.5 of that report illustrates cell size as a function of available spectrum.⁵⁹ It demonstrates that a reduction in cell size from 35 miles to 25 miles would result in a 50% reduction in spectrum requirements, while providing the same level of service to customers.

Although WCAI claims that the MDS business case requires operators to construct supercells of this size, it does not explain why. Instead, WCAI engages in unsupported assertions that undermine its demand to “keep” 158 MHz. For example, it is

⁵⁵ WCAI Comments, Appendix B at 1.

⁵⁶ We note that mobile operators plan to deploy 3G services with data rates exceeding those modeled by WCAI, and that such services can be provided over the long-term with 20 MHz, 30 MHz, or 40 MHz of spectrum – not 158 MHz; see *e.g.*, Comments of Lucent Technologies, Inc., filed in NPRM (filed Feb. 22, 2001) at 7; TIA Comments at 14; RABC Comments at 9; AT&T Comments at 7; Orange Comments, filed in NPRM (filed Feb. 22, 2001) at 2. The Commission must investigate thoroughly why a single MDS operator would need as much as five times the amount of spectrum. The Commission should also take note that WCAI’s precise 158 MHz claim just happens to match the amount of spectrum that it believes is currently available for MDS use.

⁵⁷ Verizon Wireless Comments at 27.

⁵⁸ FCC Interim Report at 62.

⁵⁹ Figure 6.5 was provided by WorldCom in a presentation to the FCC on October 11, 2000.

not clear from the analysis how a reduction in spectrum of about 55% (90 MHz), which reduces the cell size to about one-third, would result in 15 times (Quintile 4) and 22 times (Quintile 3) the number of cell sites, as WCAI claims.⁶⁰

WCAI's position is flawed in other respects. For example, the 35 mile MDS service range is predicated on the theoretical free-space path loss link budget. However, this is not typically the controlling factor in determining MDS commercial range. In most parts of the country, the diffractive effects of terrain, foliage, and various other obstructions will make it extremely difficult to obtain near-line-of-sight communications with a significant percentage of homes using a supercell with a radius of 35 miles. As a result, a more practical limit of 15 miles has historically been used by commercial MDS operators.⁶¹ It is not clear what has changed in the MDS business model to now require such large cells – nor does WCAI identify how many such supercells it has actually built. Some commentators note the planned use for new technology that will reduce line-of-sight issues and thus illuminate more homes.⁶² One technology that provides this capability is the ThruWAVE Wireless Broadband Router manufactured by Hybrid. However, Hybrid notes that “ThruWAVE’s multiple modulation schemes enable an operator to *reuse frequencies more efficiently and to use smaller cells with lower powered transmitters to increase service capacity.*”⁶³

⁶⁰ WCAI Comments, Appendix B at 24.

⁶¹ We note that, using Figure 6.5 from the FCC Interim Report, a reduction in cell size from 35 miles to 15 miles would reduce the spectrum requirements for MDS by 75%.

⁶² Nucentrix Comments at 12.

⁶³ ThruWAVE Wireless Broadband Router (March 7, 2001) available at <http://www.hybrid.com/investor/19a-Feb-2001.htm> (emphasis added).

Closer scrutiny of the MDS business case reveals that MDS licensees do not need all of the 158 MHz of spectrum they claim. Notably, the WCAI study indicates that MDS operators are most likely to serve markets that are clustered around a single metropolitan area, since on average that represents 83.8 percent of the population within a Basic Trading Area.⁶⁴ In those markets, however, reliance on spectrum-inefficient supercells is clearly impractical. In any event, the Commission should not base its spectrum allocation decisions on a particular business case, but on maximizing the use of the spectrum and ensuring it is put to its highest valued use.

CONCLUSION

The United States government has determined that 3G services will provide considerable benefits to consumers and the economy, and that substantial amounts of additional spectrum must be allocated to support their development and long-term growth. It has determined that 3G services require spectrum below 3 GHz and that spectrum should be harmonized with allocations around the world to the greatest extent possible. And, it has identified, and urged other countries to consider, the 1710-1850 MHz and 2500-2690 MHz bands for possible 3G implementation.

There can be no serious dispute that the implementation of 3G technology within existing mobile service allocations is limited, that substantial amounts of additional spectrum are needed to meet the demand for 3G services, that 3G deployment cannot be facilitated through more flexible allocations and secondary market mechanisms, and that significant portions of the 1755-1850 MHz and 2500-2690 MHz bands can be reallocated for 3G while accommodating the incumbents that currently occupy those bands.

⁶⁴ WCAI Comments, Appendix B at 14.

The Commission's action, therefore, should be clear. It must promptly allocate a substantial amount of spectrum from within the 1710-1850 MHz, 2110-2165 MHz, and 2500-2690 MHz bands and ensure that this spectrum is available for use. Failure to do so will impede the long-term growth of the wireless industry and the nation's economy.

Respectfully submitted,

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Dated: March 9, 2001

**Analysis of Adjacent Channel Interference Between 3G and MDS
In the 2110-2165 MHz Band
Proposed Rule Modifications**

Introduction

In a previous analysis, Verizon Wireless determined that continued operation of MDS systems in the 2150-2160 MHz band in accordance with the current FCC rules would preclude the operation of 3G systems in the 2110-2150 MHz and 2160-2165 MHz portions of the band. This determination was based on spurious emissions that would be received by 3G (UMTS) handsets operating in adjacent bands if MDS transmitters are operated with the maximum permissible out-of-band emissions (OOBE) limits provided in 47 C.F.R. §21.908. This analysis determines what new OOBE limits must be adopted to permit successful adjacent channel operation of 3G and MDS systems.

The current FCC specifications require that the MDS transmitter OOBE be attenuated by 60 dB at 3 MHz from the band edge and beyond. Thus, irrespective of the guard band employed, the spurious emissions from an MDS transmitter into 3G handsets would be required to be attenuated by no more than 60 dB.

In its earlier analysis, Verizon Wireless considered as an example that the MDS transmitter would be separated from the 3G handset by a distance of 500 meters, and concluded that harmful adjacent channel interference would result. However, we acknowledge that the distance between MDS transmitter and the 3G handset will at times be significantly less than 500 meters and could be as little as 20 meters. This would particularly be true if the MDS station is being used for upstream transmission from a customer's premise. The analysis that follows shows that, for a separation of 20 meters between an MDS transmitter and a 3G handset, the OOBE of the MDS transmitter must be attenuated by a least 95 dB to achieve acceptable 3G handset performance. Approximately 0 dB of interfering signal level above the 3G handset noise level would be considered acceptable, for 3G handsets and MDS transmitters operating in very close proximity.

Assumptions

EIRP	=	2000 watts
	=	45.22 dBm/100kHz
Free Space Loss @ 20m	=	$32.44 + 20\log(2153) + 20\log(0.020)$
	=	65.12 dB
Receive Thermal Noise	=	-99.2 (dBm/3.84 MHz); NF = 9 dB
	=	-115.05 (dBm/100 kHz)

Calculation of Required OOBE Attenuation

Assuming a 0 dB interference signal level above the 3G handset noise level;

$$\begin{aligned}
 \text{ACI}^* &= \text{Thermal Noise} &= & -115.05 \text{ (dBm/100 kHz)} \\
 \text{ACI} &= -115.05 \text{ (dBm/100 kHz)} &= & (\text{EIRP} - L_{fs}) - \text{OOBE Attenuation} \\
 & &= & (45.22 - 65.22) - \text{OOBE Attenuation} \\
 \text{OOBE Attenuation} & &= & (45.22 - 65.22) + 115.05 \\
 & &= & 95.05 \text{ dB}
 \end{aligned}$$

* ACI is adjacent channel interference

Conclusion

To avoid unacceptable interference from MDS transmitters into 3G handsets, the maximum allowable OOBE should be attenuated by 95 dB in frequencies that are separated from the MDS band edge by 5 MHz or more (assumes a guard band of 5 MHz). It is recommended that the FCC's technical rules be modified as follows:

Proposed Change to 47 C.F.R. §21.908:

- Maximum EIRP = 2000 watts.
- Attenuation at the MDS channel edges > 25 dB.
- Attenuation at 250 kHz beyond the nearest MDS channel edge > 40 dB.
- Attenuation along a linear slope from 250 kHz to at least 60 dB at 3 MHz above the upper and below the lower licensed channel edges.
- Attenuation along a linear slope from 3 MHz level to at least 95 dB at 5 MHz above the upper and below the lower licensed channel edges.
- Attenuation at 5 MHz and beyond > 95 dB.

Verizon Wireless notes that it may not be necessary to adopt these more stringent limits if MDS operations is relocated out of the 2.1 GHz band to spectrum that is not adjacent to 3G operations.

Reference

“Analysis of Adjacent Channel Interference Between 3G and MDS in the 2110-2150 MHz Band,” filed with Comments of Verizon Wireless, *In the Matter of Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, Notice of Proposed Rulemaking and Order, FCC 00-455 (rel. Jan. 5, 2001) at A-1.

Certificate of Service

I hereby certify that on this 9th day of March copies of the foregoing “Reply Comments of Verizon Wireless” in ET Docket 00-258 were sent by hand delivery to the following parties:

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