==========

**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D. C. 20554**

| | | |
|---|---|---|
| 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 | ) | 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 2500-2520/2670-2690 MHz Frequency Bands for the Mobile Satellite Service | ) | RM-9911 |

**COMMENTS OF ARRAYCOMM, INC.**

Respectfully submitted,

ARRAYCOMM, INC.

By:_____
Bradley Holmes
Senior Vice President
Regulatory and Government Affairs

Of Counsel:
Leonard S. Kolsky, Esq.
Lukas, Nace, Gutierrez & Sachs, Chartered
1111 19th Street, N.W., Suite 1200
Washington, D.C. 20036
(202) 857-3500

February 22, 2001

==========

ArrayComm, Inc. (hereinafter "ArrayComm") is pleased to submit the following comments in the above-entitled matter.

1. The Commission has launched an ambitious proceeding, or proceedings, to explore how best to provide for future generations of wireless systems. It intends to consider spectrum already used for mobile systems (i.e., spectrum assigned to the Personal Communications Service (PCS) and to the Specialized Mobile Radio (SMR) Services; spectrum obtained from the Federal Government for allocation to the "Private Sector" (1710-1755 MHz); spectrum currently assigned to and used by the Federal Government (1755-1850 MHz), and three other bands (2110-2150 MHz, 2160-2165 MHz and 2500-2690 MHz) which are used today by FCC licensees but for purposes inconsistent with their potential deployment by advanced wireless systems. ArrayComm supports this goal but urges the FCC to ensure that it does not foreclose the use of new technology to provide 3G services.

2. In its introductory paragraph, the Commission implicitly recognizes not only the enormity of its task to make spectrum available for "new advanced wireless services" but the added complexity of trying to predict what these future services will be. "3G" will certainly be a component but over a 10 year or longer period, the market place will demand, and industry will provide, services and sub-services which will only emerge clearly as the future unfolds. Certainly, today there is a wide divergence of opinion as to what "3G" is. There is no consensus, particularly among some prominent 2G carriers that there even is a "3G" market[1/]; a reaction that comes as no surprise to ArrayComm (see paragraph 13 and 14, infra). This attitude places an added burden on the Commission to adhere to the 1996 Telecommunications Act, notably Section 706[1/], as establishing its obligations to provide for these new systems and to promote competition among terrestrial services. At this stage, keeping its options open by asking questions rather than proposing solutions seems to be the course that the Commission, wisely we believe, has taken.

3. The requirements for additional spectrum to satisfy these demands seem to be infinite. This creates a dilemma for the Commission because even today's demands are said to exceed today's available spectrum. How

---

[1/] See Wall Street Journal, Wednesday, February 21, 2001, B1: "Next Generation of Cellphones Becomes Murky".

[2/] Pub. L. 104-104, Title VII §706, Feb. 8, 1996, 110 Stat. 153. Section 706(c)(1) states that this should be accomplished "...WITHOUT REGARD TO ANY TRANSMISSION MEDIA OR TECHNOLOGY" (emphasis supplied) and "...USING ANY TECHNOLOGY." (emphasis supplied)

to assure efficient utilization of whatever spectrum is under consideration will bring an additional sense of urgency. The right technology to permit services to emerge and flourish will be important but so will insistence that the most spectrum-efficient techniques be deployed.

4. ArrayComm is a proponent of one of those technologies, Time Division Duplex ("TDD"), particularly to transmit high-speed content from a portable unit to the internet. In a TDD system, transmit and receive occur on the same frequency channels. While TDD can be used to transmit voice communications in a spectrally efficient manner, its efficiency for data use is unparalled.

5. TDD, is well-suited for 3G-like services for three principal reasons. First, TDD is particularly effective in handling asymmetric traffic. Second, while smart antennas (see paragraph 8, infra) can improve the spectral efficiency of all systems, gains are highest with TDD air interfaces. Third, TDD provides regulators with increased flexibility to create band plans.

6. Today, the U.S. terrestrial mobile environment is virtually all Frequency Division Duplexing (FDD). Spectrum is assigned on a paired basis, one side of the pair for base stations; the other for mobile/portable use. In this manner, co-channel and adjacent channel base stations "compete" with other base stations but with appropriate geographic spacing, interference is minimized. The assumption is that the communications are symmetrical; that is, the base station traffic and that emanating from mobiles and portables will be essentially equal. While FDD will certainly have an important role in the advanced mobile service picture, it is clear, that communications to the internet will be asymmetrical. In fact, to force TDD systems to use the FDD format, in its traditional form, wastes, for all practical purposes, one half of the pair.[1/] One way to rectify this imbalance which put potential TDD bidders at an economic disadvantage would be to put some number of unpaired channels up for auction along with paired frequencies, with appropriate provisions to allow for co-existence, i.e. no harmful interference. To do so would bring the United States more in line with international allocations.

---

[3/] Because the mobile/portable frequency part of the pair has substantially lower permissible power limits than the base station, TDD systems cannot use them effectively.

7. In WT Docket No.99-168,[4] the initial proposal paired all the spectrum under consideration which, of course, accommodated potential FDD bidders. As a result of objections by ArrayComm and others[5], the Commission agreed to adjust the power limitations so that they are equal on both sides of the pair.[6] This was a major, albeit incomplete, rectification to create technological neutrality.

---

[4] "Service Rules of the 746-764 and 776-794 MHz Bands and Revisions to Part 27 of the Commission's Rules," *Notice of Proposed Rulemaking*, WT Docket No. 99-168, 14 FCC Rcd 11006 (1999).

[5] Petitions for Reconsideration filed by ArrayComm, Adaptive Broadband Corporation ("Adaptive"), TRW, Inc. ("TRW") and US WEST Wireless, LLC ("US WEST") *cited in* "Service Rules of the 746-764 and 776-794 MHz Bands and Revisions to Part 27 of the Commission's Rules," *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 99-168, FCC 00-224, 21 CR 131 ¶ 6 (rel. June 30, 2000)("MO&O").

[6] MO&O.

8. As noted earlier, technologies and techniques must work hand-in-hand to maximize spectral efficiency. Bandwidth-per-user requirements will grow as different 3G-type services evolve and new applications are introduced. It is apparent that demands will be the greatest in the more populous urban areas. Adaptive, or smart antennas[1/], can increase significantly the spectral efficiency of any air interface. Smart antenna technology also results in wireless systems that are "good spectral neighbors"; systems that not only deliver commercially viable services but do so with minimum interference to adjacent channel systems operating in the same geographic area.

9. While the transition from analog to digital in cellular systems provided a roughly three times increase in capacity for voice calls, future improvements in capacity through the introduction of new access and modulation methods will be significantly more modest. This will be particularly true as higher per-user data rates are demanded and stringent requirements on data quality become essential. Technologies to mitigate interference, such as adaptive antennas, will be required to provide these new services with reasonable network economics, given whatever spectrum will be available.

10. The Commission, for its part, must rigorously pursue policies that do not place barriers in the path of technological developments. It must actively encourage such developments. As an example, it must continually review and update its technical rules to assure that they reflect the state-of-the-art. The Out of Band Emission ("OOBE") requirements set forth in Section 27.53 of the Commission's Rules[1/] have inhibited the opportunity for TDD systems

---

[7/] In essence, adaptive antennas produce a win/win scenario: gain for the system and, at the same time, interference mitigation. The result is improved coverage and range with a high spectral efficiency. Unlike cellular systems in which interference is controlled by locating co-channel users in different geographically separate cells, smart antennas transmit directly toward a specific user while actively minimizing the energy radiated toward other co-channel users. The former controls interference but at the cost of having only a fraction of the possible radio resources available at any base station in the network. In contrast, the flexibility and adaptability of the smart antenna allows most of the total energy to be deployed; it is targeted to a specific user; both the transmitter and the receiver discriminate dynamically.

[8/] 47 C.F.R.§ 27.53. *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking.* WT Docket No. 99-168, FCC 00-224, 21 CR 131 (rel. June 30, 2000), Errate DA 00-

to operate on frequencies adjacent to FDD systems. These rules fall far short of reflecting today's best engineering practices. Actual operational systems exceed these rules by 20dB (a factor of 100), as they must to co-exist successfully. While the Commission offered in WT Docket No. 99-168 to intervene in disputes involving adjacent channel interference, such a solution seems unsatisfactory. To have rules that invite the inevitability of FCC involvement is inferior to having rules that in and of themselves set proper guidelines. The current situation places potential new entrants at increased risk and, as a consequence, probably decreases spectrum valuations. In an FDD environment, OOBE rules that are not sufficiently stringent result in "gentlemen's agreements" to raise the OOBE level to the extent that each can operate at an effective level. "Outsiders" rarely are allowed the same courtesy. (The same result would undoubtedly occur if FDD systems sought to operate in the midst of the TDD operations).

11. On a broader policy basis, the Commission will need to examine its rationale(s) for allocating spectrum. The transition from cellular to PCS has been evolutionary. The former was essentially an analog service; the latter has evolved to digital. Both are predominantly voice services, providing wireless extensions of today's wireline telephone service. Two major surprises have emerged in the development of wireless communications: (1) its world-wide acceptance; and (2) its predominant use by hand-held portables rather than just in vehicles.

12. The inherent "similarities" of cellular and PCS has enabled the Commission to concentrate on assuring that these wireless services will be available from multiple sources, i.e., that there would be a choice of operators for the subscriber. In the cellular arena, the Commission authorized two systems per market, even though the process of selecting the operator went from comparative hearings to lotteries to auctions. And the profile of the operators went from a duopoly of wireline telephone companies (usually the local landline provider) and independent radio common carriers to today's duopoly which is one wireline vs. another.

---

1680 (rel. July 28, 2000).

13. There is today no meaningful price differential among PCS providers even though there may be several offering service in a given market. Further, there is little to choose in terms of coverage. Subscribers complain about “dropped calls” and “dead spots” irrespective of who is furnishing the service. Having paid large sums at an auction and having paid another huge amount to install the system[1/], these operators have been loathe to put in additional plant to improve coverage as opposed to obtaining additional spectrum. This, in turn, has caused them to use that spectrum to provide basic service to their subscribers, albeit with some options, as opposed to dedicating spectrum for “3G” services as has been done in Europe and Japan.

14. Thus, there has been a reluctance to deploy TDD in the United States among the traditional VOICE operators. Because they are the biggest “haves,” they tend to want more of what they already have and, predictably, manufacturers cater to their wants. As recent auctions have shown, the appetite for spectrum by these major carriers appears insatiable. It will be tempting for the Commission to make spectrum available under a business as usual platform: everyone offering more of the same. Without providing for alternative services and alternative technologies the results can be readily predicted. The deepest pockets will prevail. They will use the spectrum as needed in those areas where there is overcrowding, and they will stockpile the remainder.

15. Understandably, although perhaps short-sightedly, this would mean a continuation

---

[9/] And even more costs to relocate incumbents.

of emphasis on spectrum essentially designed for FDD. It is true that FDD is effective for communications that are voice and that are symmetrical. In fact, FDD is superior where long-range communications, tens of miles, are required[1/]. But what about tomorrow? The Internet will inevitably be an integral part of the Advanced Mobile Services landscape; data is apt to assume far greater importance. Although TDD systems handle voice traffic effectively, they shine when the communications are asymmetrical, particularly where data is involved. Systems such as DECT and PHS use TDD; virtually all wireless LAN technologies employ TDD, as do some LMDS technologies.

16. The key to the economic efficiency of those identifiable new systems will be information density (bits/s/Hz/square mile). Models, such as FDD, predicated on long range cells are destined, in ArrayComm's opinion, to fail in the delivery of broadband "3G" services when faced with realistic spectrum allocations. Even if they were to establish an initial toe-hold in the market, their capacity ultimately will be inadequate to gain sufficient market penetration.

17. To accomplish its goal the Commission should not foreclose, but rather should encourage the use of new technologies. The Commission is to be commended for the comprehensive nature of this Docket and for this encouraging beginning. The opportunity for the United States to provide competition that is multi-dimensional, that extends beyond identical service offerings and, instead, encompasses genuine diversity of offerings should be seized. ArrayComm stands ready to contribute to effecting a solution that benefit s manufacturers, designers, operators and the public.

---

[10/] ArrayComm would emphasize a point made earlier. Whatever the technology, it will be necessary to use techniques that will enhance spectrum utilization. We have pointed to adaptive or smart antennas as one means of providing capacity gains for all systems.