DOCKET FILE COPY ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

RECEIVED

MAR 16 1993

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of

Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service;	)	CC Docket No. 92-297 RM-7872; RM-7722
Applications for Waiver of the Commission's Common Carrier Point-to-Point Microwave Radio Service Rules;	)	
Suite 12 Group Petition for Pioneer's Preference;	)	PP-22
University of Texas - Pan American Petition for Reconsideration of Pioneer's Preference Requent Denial	)	

COMMENTS OF MOTOROLA INC.

Respectfully submitted by:

Michael D. Kennedy
Director, Regulatory Relations

Michael A. Menius
Manager, Common Carrier Relations

Motorola Inc.
Government Relations Office
1350 I Street, N.W., Suite 400
Washington, DC 20005
(202) 371-6900

March 16, 1993

No. of Copies rec'd 0+5
List A B C D E

COMMENTS

EXECUTIVE SUMMARY

Motorola applauds the Commission for its visionary approach demonstrated in the 28 GHz band proposal. The proposal in the Notice of Proposed Rulemaking (NPRM) seeks to accommodate an innovative technology (a cellular-like millimeter wave component technology) while also encouraging broader categories of services, such as local wireless broadband services, multipoint video programming distribution, wideband video, data, and other telecommunications services. At the same time, the Commission seeks input on how best to protect and provide for the needs of satellite services which have already been allocated spectrum in portions of this same band. Separate comments filed by Motorola Satellite Communications, Inc., address this particular issue.

The Commission's proposal is timely and forward thinking. Motorola has devoted significant R & D resources, for some time, to the challenges and opportunities of providing greater efficiency and transmission capacity in the higher (15 to 50 GHz) bands. Our discussion below will summarize some of the experiences and conclusions drawn from this

effort. In particular, our comments will address certain spectral efficiency considerations which may be relevant to the 28 GHz proceeding.

DISCUSSION

The NPRM offers proposals which provide a flexible licensing approach designed to expedite the availability of a broad range of new technology services in the 28 GHz band. In particular, the NPRM proposes to accommodate video and other communications services, including those proposed by Suite 12 Group, which contemplates using a millimeter wave component technology. Additionally, the Commission proposes flexible rules which could accommodate the type of Local Wireless Broadband Service proposed by Video/Phone Systems, Inc. The licensing policies which are proposed are designed to be flexible enough to permit a broad array of possible operators, which could choose to offer any number of different variations of multipoint video programming distribution, wideband video, data, and other telecommunications services. The Commission's proposal suggests there should be two operators, each receiving one of two blocks of 1,000 MHz. These two segments would be divided into 20 MHz channels.

The Commission's stated intention is to establish rules that provide adequate spectrum for multipoint video programming distribution services and to provide flexibility to accommodate different types of point-to-point and point-to-multipoint communications services.

The NPRM follows a general direction which is entirely consistent with R & D work which has been ongoing within Motorola for a number of years. The effort to test and develop products and technology encompasses the 28 GHz band but covers the broader range of between 15 and 50 GHz.

Motorola spotted the need for wireless Local Area Networks (LANs) in the mid 1980s, and began a research and development effort to explore various methods of implementation. In developing, for example, an 18 GHz data communications technology for in-building use, Motorola applied the same successful concept used for cellular telephones - achieving high levels of "frequency reuse" by using a low-power, highly intelligent 18 GHz transceiver. The specific technological advances are summarized below. These discoveries of course have direct, and encouraging, application in higher bands such as 28 GHz.

SUMMARY OF TECHNOLOGY ADVANCES AND PRODUCT DEVELOPMENT

The Commission has correctly noted, in its NPRM, that up to now the 28 GHz band has remained fallow. Here are some examples of very recent technological breakthroughs which have come out of the Motorola laboratories and which offer the possibility of converting these upper bands into opportunities for commercial development and expanded service to the user public.

Intelligent Six-Sector Antenna: Motorola has developed an "intelligent" six-sector antenna system to help resolve the multipath problem associated with radio waves at any frequency but which was previously believed to present formidable problems in the upper microwave ranges. This antenna system consists of six 60 degree directional antennas and associated circuitry used for both data transmission and reception. The antenna system automatically scans through all the potential paths dozens of times per second, to identify which combination provides the best signal in terms of quality and strength. The process is dynamic, meaning that if a solid object suddenly presents itself and disrupts the currently selected path, the next best

path is automatically selected. The dynamic nature of the scanning process is essential to the successful performance of the system in an office environment.

High Performance RF Digital Signal Processor (DSP) Motorola designed a custom high-speed RF DSP using very large scale integration (VLSI) application specific integrated circuit (ASIC) technology. An effective radio channel speed of 15 megabits per second (Mbps) raw data throughput is achieved. This is suitable for encoding, including overhead, standard 10 Mbps Ethernet data, resulting in a maximum effective throughput of 5.7 Mbps. With built-in error correction and detection, the RF DSP helps eliminate potential distortions caused by multipath.

Gallium Arsenide (GaAs)-Based Miniaturized Radio Transceiver: Motorola used GaAs technology to provide a low cost, compact, very high speed transceiver which can function in upper bands such as 18 GHz and in the 28 GHz band under consideration in the instant rulemaking. The key element of this transceiver is about the size of a silver dollar, yet accomplishes what once could have taken racks of

equipment costing up to tens of thousands of dollars. The transceiver, coupled with the six-sector antenna, provides the platform for what was once impossible - high-speed, low-cost data communications in these upper bands.

High Speed Packet Switch on a Chip Motorola developed a custom ASIC employing complementary metal oxide semiconductor (CMOS) technology, to perform data routing and switching. This "packet switch on a chip" incorporates three different levels of switching and is similar in complexity to a Private Branch Exchange (PBX), but resides on a single integrated circuit. It is capable of setting up and breaking down approximately one million data connections per second.

System Software: Motorola's data communications technology breakthroughs for these upper frequency bands are user friendly and virtually "transparent," because of the extensive software development which accompanied the hardware developed described above.

FUTURE TECHNOLOGY, SPECTRAL EFFICIENCY CONSIDERATIONS IN THE 28 GHZ BAND

As stated previously, the Commission is to be commended for its far-sighted approach in seeking both to encourage technological innovation in the 28 GHz band as well as to incorporate maximum flexibility in the spectrum management process so that video and other possible services can develop optimally.

The technical discussion of the NPRM seeks to permit a wide range of modulation technologies which could in the future be applied to multichannel video service distribution as well as to broadband data applications. It is possible that, in the future, additional alternative modulation technologies will permit some of these services to be implemented within a 250 MHz bandwidth, thereby allowing the cellular-like operation contemplated in the NPRM, to be offered using 500 MHz of spectrum. The concept could involve a 4-cell reuse pattern utilizing two 250 MHz frequency bands, each split into separate cells via vertical/horizontal polarization. Motorola encourages the Commission to adopt flexible allocation and spectrum management policies which make such technological developments possible.

It further appears that increased spectral efficiency may make it possible for additional services to operate in the 26.5 to 28.5 GHz frequency range. This band would be admirably suited, for example, for future 100 Mbps Local Area Network operation such as the type foreseen by the European HIPERLAN group. Additionally, satellite operations in the 28 GHz band may be more readily accommodated if greater spectral efficiencies permit terrestrial system operators to use smaller amounts of spectrum as described above. For a more detailed discussion of the specifics of satellite operations in this band, please refer to the comments filed by Motorola Satellite Communications, Inc.

CONCLUSION

The Commission has done a commendable job in proposing technical rules and flexible policies which will encourage additional competition to presently existing video distribution channels and which will also serve to stimulate a broad array of other data-related services. The marketplace will, of course, determine the appropriate mix of these particular services. The Commission's policies will hopefully be flexible enough to permit this choice by the users to take place.

Motorola has an extensive track record of R & D efforts involving technologies and services related to the 28 GHz band and will follow the developments in this proceeding with great interest.

The Commission's proposed policies for allocating and licensing the spectrum should encourage spectral efficiency and should be flexible enough to permit other, future technologies to be grafted into the present regulatory structure. Such policies may permit additional operators in the future to offer still more varieties of services and may make it easier for terrestrial and satellite services to coexist in this same band where they are both allocated to operate.

CERTIFICATE OF SERVICE

I, Alice M. de Séve, of Motorola Inc., do hereby certify that on this 16th day of March, 1993 a copy of the foregoing "Comments" was sent to each of the following by first-class mail, postage-prepaid except where service by hand is indicated(*):

Alice M. de Séve

Alice M. de Séve

*Donna R. Searcy, Secretary
Office of Managing Director
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, DC 20554

Chairman James H. Quello
Federal Communications Commission
1919 M Street, N.W., Room 802
Washington, DC 2055

Commissioner Sherrie P. Marshall
Federal Communications Commission
1919 M Street, N.W., Room 826
Washington, DC 20554

Commissioner Andrew C. Barrett
Federal Communications Commission
1919 M Street, N.W., Room 844
Washington, DC 20554

Commissioner Ervin S. Duggan
Federal Communications Commission
1919 M Street, N.W., Room 832
Washington, DC 20554

Dr. Thomas P. Stanley, Chief Engineer/OET
Federal Communications Commission
2025 M Street, N.W., Room 7002
Washington, DC 20554

Cheryl Tritt, Chief, Common Carrier
Federal Communications Commission
1919 M Street, N.W., Room 500
Washington, DC 20554