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

In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services	))))	GEN Docket No. 90-314 ET Docket No. 92-100

To: The Commission

COMMENTS OF CALIFORNIA MICROWAVE, INC.

California Microwave, Inc. is a participant in both the microwave and wireless communications industries, and offers the following comments in support of the Commission's allocation of frequency spectrum for the application of emerging technologies to personal communications services (PCS).

Our comments are directed primarily at the user-PCS technical issues related to providing service to a large enough number of users to realize the economic and societal potential of PCS. Also, we suggest that conforming licensed-PCS and user-PCS rules can make possible a single user device that can perform in both services. Last, we offer some specific comments regarding the fair relocation of operational-fixed users currently licensed to the proposed PCS frequency band.

- **Spectrum efficiency and frequency reuse considerations suggest extremely short range (*i.e.*, very low power spectral density) devices to serve an economically-adequate number of users.**

- **Portable transmitting devices, either singly or in widespread applications, cannot share frequency allocations on a co-primary basis with existing microwave operational fixed installations.**

- **User-PCS requires more than 20 MHz to provide both voice (e.g., wireless PBX) and data (e.g., wireless LAN) service to an economically-adequate number of users; in view of its relative regulatory simplicity, user-PCS should be unbundled and approved for immediate application.**

- **Common technical rules (e.g., power, modulation) for both licensed- and user-PCS will make possible a single device for multiple uses (e.g., for voice, cordless telephone, wireless PBX and microcellular telephone).**

- **So as to foster new PCS technologies, user-PCS rules should be minimal while providing for coexistence but not interoperability; WINForum can fulfil the FCC's requirement for a user-PCS technical advisory body.**

- **Existing industry groups, (e.g., WINForum) can establish a clearing house for payments to relocate existing licensees; to be fair, payments should reflect true costs and depreciated equipment values, and the initial funding burden should not act to exclude smaller companies from the PCS business.**

- **Opportunities for improved frequency reuse and spectral efficiency also exist in the op-fixed service, and could make it possible to provide cleared frequency channels during the transition period.**

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User-PCS must accommodate very large numbers of users

The wireless industry envisions a universal personal communications service, with voice, paging, electronic messaging, and interactive computing ranging from personal digital organizers to networks of individual computers. Market sizes for this type of service, if successful, are quantified at some 60 million individual users and $195 billion. This application has the promise of going far beyond the usefulness of merely replacing wires or augmenting cellular telephony in existing applications, and will ultimately impact energy and economic policy worldwide.

A user will choose from a family of personal devices ranging from a "Dick Tracy Wrist Radio" telephone (perhaps with timekeeping and paging or messaging), through a pocket-size interactive personal organizer (with calculator, news dissemination and wrist-radio functions), to a miniature palm- or lap-top computer work station that incorporates all of these wireless communications functions. Individual type-approved devices will offer both voice and data services, and will be able to roam among private gateways within premises as well as among licensed public gateways offering network carrier-PCS services for a fee.

Common technical rules for licensed- and user-PCS desirable

In order that this service be accepted widely enough to be truly economical, it is thought necessary that, having made a choice of device, the user will be able to use that one device to access both the type-approved private and public network gateways, as well as to accomplish local peer-to-peer communications independent of infrastructure interaction. The concept of a single identification number permitting service to an individual anywhere in the country has received widespread publicity. Separate short-range and long-range pocket telephones, pagers and computers will create the same consumer confusion seen in the proliferation of appliance remote controls.

Co-primary operation of portable devices not feasible

In order that the user devices be as small and inexpensive as possible so as to promote user acceptance, it is viewed as a precondition to widespread success of PCS that a suitable frequency band be provided free of a requirement to share spectrum with incompatible signals. While a number of industry participants have suggested the possibility of approaches to permit sharing, there is substantial doubt that a fixed microwave device can be assured of non-interference by any economically feasible portable or mobile PCS transmitting device.

User-PCS requires more than 20 MHz

Also, it can be shown that a 20 MHz bandwidth system with interference ranges of the order of 50-100 meters can provide voice and data service only to a small percentage ($\leq$10%) of users in a typical office, conference or classroom density. This analysis implies that up to ten times this bandwidth is required in order to provide quality service to a reasonable portion of potential users.

Minimal rules, early user-PCS allocation will foster technical innovation

Because user-PCS (private) access points will be owned and operated within an individual premise by its owners or lessees, any requirement for control or intervention by a regional authority such as a public licensee will represent a serious deterrent to widespread acceptance. At the same time, requiring a potential user to own and carry multiple devices in order to access the full range of PCS services will also greatly limit acceptance and will compromise the economies of scale of a truly universal user device. We believe the public interest will be best served by unbundling user-PCS services for early approval and operation.

Additionally, creation of user devices with comparable economics to, say, digital watches, appliance remote controls or garage-door openers, demands strongly restrictive limitations on size, battery power and complexity. These technical considerations dictate a communications device with very short range, which in turn suggests the requirement for a widely dispersed access-point infrastructure that bears the burden of hardware and software complexity. A PCS concept that requires that the high-volume user product include the types of complexity imposed on, for example, current cellular telephone products (*e.g.*, cooperative power control, separate control channel, range and multipath requiring substantial power level and battery size) will be severely economically disadvantaged and will not realize appropriate economic and societal objectives for PCS.

The requirement for infrastructure carpeting the service area extends from the in-building context, where this is more readily visualized, to the public-service territory as well. This implies requirements for moderate-data-rate (to carry message and data as well as voice traffic), very-short-range access points distributed along major thoroughfares and throughout public pedestrian and transportation areas. This carpet infrastructure concept also encompasses the seamless access to wireless in-building private branch exchange (PBX) services by users entering, leaving and passing by the premise served by the private gateway infrastructure. It is widely recognized that some isolation is afforded by the reflection or transmission loss of building walls. Separate but compatible provisions may be required to accommodate very high-data-rate peer-to-peer communications as between a lap-top computer and desk-top docking port.

WINForum the user-PCS advisory body

We suggest that the Wireless Information Networks Forum (WINForum) and its technical committee can fulfil the FCC's stated interest in a user-PCS technical advisory body. WINForum tecbnical meetings have been held every two weeks in recent months, and broad industry concensus apprears to be developing in the user-PCS area.

The interconnection of infrastructure devices, such as private access points networked to PBX or LAN functions within a premise or public devices interconnected to the public switched telephone or data networks, is technically within reach and not at issue in the establishment of clear frequency spectrum for the user wireless interconnection. Existing licensed and unlicensed radio services, as well as the full range of cable and optical fiber media, can serve to interconnect the carpet infrastructure that will emerge to serve PCS.

Industry clearing house for relocation royalty payments

It is recognized that existing OFS licensees deserve to continue their communications services without economic penalty. Existing wireless industry groups can establish a clearing house organization to handle the payments for this relocation. To be fair, payments should reflect the true costs of relocation. Compensation should not be replacement cost, but should be defined by the remaining undepreciated book value, as carried in incumbents' own accounts, of assets rendered obsolete. Additionally, the burden of initially funding the clearing house organization should not fall unfairly on smaller companies in such a way as to exclude them from the PCS industry.

Frequency reuse, spectral efficiency issues for OFS as well

There are opportunities for improved frequency reuse and spectral efficiency on the part of current op-fixed licensees as well as for the new PCS services. It seems possible that the active power control and carrier spreading techniques that have been successful in satellite service could be adapted to op-fixed services as well. This would permit revisiting the frequency coordination

criteria that underlie the current occupancy statistics, and might make possible additional cleared frequency channels during the transition period to a cleared band.

Conclusions

Personal communications service will succeed if an adequate number of voice and data users can access private and public services with a single device. This will require clear spectrum for short range access to widely dispersed infrastructure, and sharing of the band among private and public users. Sub-bands for specific services, if deemed appropriate, should be contiguous.

The Commission can facilitate the timely development of PCS by minimal regulation to assure coexistence of different types of devices in the new allocations. Conforming to worldwide adoption of 2-GHz bands for portable service has a sound technical and economic basis. Unbundling private PCS services for immediate clear allocation and operation will provide timely service now awaited by users.

Required bandwidth for PCS, determined by multiple-access user density, cell size (maximum range), multipath mitigation means and maximum data rate, is in the range of 70 to 140 MHz. Development of minimal regulations for peer-to-peer and private PCS service should proceed separately now. Regulations for public carrier-PCS, expected to be more complex, should permit access with the same user device as applied to user-PCS frequencies.

An industry clearing house should be established to provide relocation compensation of incumbents. The remaining undepreciated book value, not the replacement cost, of incumbents' obsoleted assets is a fair basis for compensation. The establishment of a clearing house can be accomplished by existing industry organizations, and should not be funded in such a way as to exclude smaller entrants into the PCS industry.

Opportunities for improved frequency reuse and spectral efficiency should also be sought in the existing operational-fixed service, and could make possible additional cleared frequency bands even during the transition period to a cleared band.

California Microwave is a long-standing supplier to the microwave and satellite communications businesses, and actively supports the efforts of the Wireless Information Networks Forum (WINForum) and the IEEE 802 Local Area Network Standards Committee.

Respectfully submitted

CALIFORNIA MICROWAVE, INC.

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Dr. David B. Leeson, Chairman

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