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

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In the Matter of:	)	
	)	
Requests for Pioneer's Preferences to Provide Data or Paging Services at Frequencies In the 930-931 MHz Paging Reserve Band	)	ET Docket No. 92-100
	)	
	)	PP-79, PP-80, PP-81, PP-82, PP-83, PP-84. PP-85
	)	

COMMENTS OF PAGEMART, INC.

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Dated: June 19, 1992.

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Paging Reserve Band	)	
	)	

COMMENTS OF PAGEMART, INC.

PageMart, Inc. ("PageMart"), by its attorneys, hereby submits its comments on the requests for pioneer's preference for allocation of the 930-931 MHz paging reserve band on which the Commission has requested comment by June 19, 1992.[1]

INTRODUCTION

In this consolidated docket, the Commission has before it seven additional proposals, all filed June 1, 1992, for use of portions of the 930-931 MHz band for advanced messaging services. PageMart previously has commented on six other requests for pioneer's preference in the paging reserve band.[2] As with the initial group of requests for pioneer's preferences in this docket, the requests now before the Commission fall into two groups: those proposing to utilize technologies that are essentially undeveloped and untested, and those proposing no new

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[1] By Public Notice released June 4, 1992 the Chief Engineer accepted for filing, and established a schedule for public comment on, the proposals of Freeman Engineering Associates ("Freeman"), Global Enhanced Messaging Venture ("Global"), Metriplex, Inc. ("Metriplex"), Mobile Communications Corporation of America ("MobileComm"), Montauk Telecommunications Company ("Montauk"), Paging Network, Inc ("PageNet"), and Skycell Corporation ("Skycell").

[2] Comments of PageMart (June 1, 1992) and Reply Comments of PageMart (June 16, 1992).

functionality or other innovation. The Commission should not allocate scarce spectrum for proposals that may not be viable, if at all, until years into the future, or that provide nothing not already feasible with existing services. PageMart's "Personal Information Messaging Service" ("PIMS") remains the only proposal before the Commission which meets all the criteria necessary for an advanced messaging meriting the allocation of new spectrum reserved for enhanced paging services.[3]

I. PAGEMART'S PIMS PROPOSAL IS AN INNOVATIVE COMBINATION OF EXISTING TECHNOLOGIES THAT RESULTS IN A TRULY PERSONAL, PORTABLE, AND UBIQUITOUS WIRELESS MESSAGING SERVICE

PageMart's PIMS proposal is clearly superior to the alternative proposals before the Commission, for many different reasons. First, by relying on an innovative system architecture rather than on untested, unproven technology (including data speeds three or four times current state of the art or never-used modulation schemes or both), PageMart's PIMS system is commercially feasible today. Second, the PIMS architecture can be implemented using commercially-available, off-the-shelf components; the sole exception is the industry-standard PCMCIA Type II card containing the paging transceiver, which is already in

[3] As PageMart explained in its June 1, 1992 comments, an "advanced" messaging service must meet each of the following minimum criteria: (1) transmission of lengthy, complex text, graphic and facsimile files; (2) very high "throughput" measured not in transmission speed but more importantly in total bits delivered to total subscribers; (3) high degree of spectrum efficiency; (4) system capacity for a large number of users regionally and nationally; (5) communications equipment is small, lightweight, and low-priced; (6) communications equipment is low-powered with low battery drain; and (7) "two-way" service availability. PageMart Comments, at 3-4 (June 1, 1992).

prototype.[4]

Third, the use of a PCMCIA Type II card for the PIMS transceiver allows that unit to transform an enormous variety of devices—fax machines, desktop portable and laptop personal computers, pocket organizers (such as the Sharp Wizard® and HP 95LX), and next-generation devices (such as Apple's Newton®)—to serve as PIMS-capable sending and receiving devices. Thus, customers will not have to carry an additional single-purpose device to use PIMS. Fourth, unlike many of the single-purpose proposals, PIMS can send and receive any kind of information to and from any device. Thus, for example, a customer could receive a fax or text or graphics file on a PIMS-capable device, edit the text, and send it to a PIMS-capable personal computer.

Fifth, since all the intelligence (file handling, hand-shaking, store and forward capability, etc.) will be built into the PIMS network or card, sending and receiving information will be a "one-button" operation, giving the system "appliance" ease of operation; sending and receiving PIMS messages will be more like sending and receiving faxes than like exchanging messages over a computer data base or electronic mail system. Sixth, the messages exchanged over PIMS will not be limited to brief alphanumeric messages; rather, the PIMS networks will be able to send messages of length and complexity equivalent to several pages of text or graphics among 50,000 customers in each MSA or coverage area*for each 25 kHz of*

[4] The only component of the network that has no current commercially-available analog is the paging transceiver contained on an industry-standard PCMCIA card, and PageMart currently has a prototype of a paging receiver on a PCMCIA card, as well as manufacturers ready to produce the card.

spectrum used in the configuration proposed by PageMart. Seventh, PIMS can provide or support all of the service applications

Finally, PIMS operates on a decentralized network, which has important implications. The network provider will not bear sole financial responsibility for network implementation, sharing it instead with end user groups who will establish in-office cells at costs more like cordless phones and significantly below the prices of today's low-end business phone systems; and the network can be rolled out progressively, with building and office cells implemented as the need arises without major revisions to the basic network.

In each of these characteristics, PIMS is fundamentally different from all other proposals for pioneer's preferences in this docket, and the only service which meets all of the essential criteria of a truly "advanced" messaging service.

II. THE ALTERNATIVE REQUESTS FOR PIONEER'S PREFERENCE ARE FLAWED IN THAT THEY RELY ON TECHNOLOGIES THAT ARE NOT COMMERCIALLY FEASIBLE OR DO NOT PROVIDE ADDED FUNCTIONALITY TO EXISTING PAGING SERVICES

The seven additional requests for pioneer's preferences now before the Commission either propose new, essentially untested technologies to achieve greater throughput through speed or modulation development in a simulcast environment, or propose limited-application services that can be provided by current networks without allocation of new spectrum. As described below, these proposals fail to achieve the promise of truly "advanced" messaging services and do not merit an allocation of spectrum in the 930-931 MHz paging reserve band.

MobileComm has requested a pioneer's preference for its so-called

Verified Information Paging ("VIP") service, which it describes as a one-way paging service with two-way data communications capability.[5] MobileComm claims that its VIP service will "transfer data at a much higher rate than a traditional paging system and the messages transmitted can be much longer."[6] Since MobileComm has failed to provide an adequate description of the system architecture it plans to utilize, however, it is impossible to determine with any specificity what service and capabilities MobileComm plans to provide or to verify MobileComm's claims for data transmission capability in the real-world messaging environment.

As presented by MobileComm, VIP appears to be nothing more than a simulcast paging service which is only marginally faster than existing systems. MobileComm claims that it plans to experiment with various parameters in order to achieve an effective data rate of 12,000 bps in harsh urban environments.[7] In order to achieve this increased speed, however, MobileComm's VIP service requires 50 kHz channelization, or twice the bandwidth per channel of most of the other proposals, including PageMart's.[8] Approximately the same amount of data can be

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5 MobileComm Request for Pioneer's Preference, June 1, 1992 at p.1.

6 *Id.* at 2.

7 MobileComm states that it can achieve transmission rates of 15,000 bps, but that in "difficult situations" transmission speed might be limited to 12,000 bps. MobileComm Request at p. 8, n. 7. Although MobileComm never defines what it means by "difficult situations," the harsh, urban multipath environment in which advanced messaging services must be offered clearly constitutes a "difficult" RF situation.

8 MobileComm states that its VIP service requires an 50 kHz channel with a 12.5 kHz return channel. MobileComm Request, at p. 8. It is unclear from MobileComm's proposal, however, whether they are requesting a total allocation of 50 kHz, or 62.5 kHz (i.e., 12.5 kHz in addition to a 50 kHz data channel). Accordingly, reliable judgments as to MobileComm's system capacity cannot be made on the basis of the technical descriptions submitted with its request.

transmitted on 50 kHz at 12,000 bps as can be transmitted at 6,000 bps on 25 kHz. Thus, since the ERMES European paging standard offers data transmission rates of 6,250 bps in a 25 kHz channel, MobileComm's VIP service essentially provides no additional throughput over what is currently available in paging technology. PageMart estimates that, at these data rates, MobileComm would be capable of transmitting only about 65 facsimiles per hour in a large urban market such as New York City,[9] a totally anemic capacity. Finally, it appears that the modulation technology necessary for VIP service is not currently available and has not even been selected by MobileComm.[10]

PageNet has filed a request for a pioneer's preference for ten 25 kHz channels to provide what it has termed "VoiceNow" voice paging service. PageMart has previously commented on certain aspects of PageNet's proposal in the docket.[11] PageNet's proposed service is fundamentally similar to PageMart's, however PageNet limits itself to providing voice only service. Like PageMart, PageNet properly recognizes that frequency reuse is the key to the future of advanced messaging service. Unlike PageMart's PIMS, however, PageNet's VoiceNow proposal fails to take advantage of the two-way capability that is inherent in a design with a return network by allowing for only one return-link receiver. Except for this deficiency, however, the PageNet network architecture is virtually a

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9 (15,000 bps X (3,600 sec./hour) X 0.6 (forward error correction) + 500,000 bits).

10 MobileComm Request at p. 14 (MobileComm will be performing experiments "to test and validate a number of coding and modulation schemes in a variety of locations and conditions").

11 PageMart Reply Comments, at pp. 12-23.

complete carbon copy of PageMart's PIMS. PageNet proposes the same 250 kHz allocation, including two 25 kHz channels for control and polling use, as designed by PageMart, along with implementation of frequency reuse for a cellular approach to paging service, precisely as originally proposed by PageMart in its August 1991 "cellular paging service" experimental application which underlies its PIMS pioneer's preference request.

While PageNet recognizes the importance of frequency reuse, however, its proposal fails to take full advantage of that capability by limiting reuse to only geographic cells. PageMart's hierarchical network, on the other hand, allows for reuse within geographic, micro, and pico (in-building and in-office) cells, so that the same frequencies can be reused multiple times within the same geographic area, resulting in vastly greater efficiency and requiring less spectrum to provide the same amount of information transfer. Systems that employ frequency reuse only at the geographic cell level, such as cellular service, require significantly more spectrum than systems that employ frequency reuse at all three cell levels, such as PageMart's. PageNet must compensate for this lack of reuse capability by either employing 16 QAM modulation to increase the speed of its transmission, or requiring additional frequency channels. PageMart is unaware of any 16 QAM equipment that is currently in place and believes that this technology is still untested and will not be commercially available in the near future.[12]

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[12] PageNet's own request indicates that a consultant to the company is reviewing the feasibility of 16 QAM modulation. PageMart's Reply Comment questioned the feasibility of 16 QAM modulation in a multipath environment. PageMart Reply Comments, at pp. 21-22. Appendix I to these comments further describes the technical complexity of 16 QAM modulation.

Metriplex has requested a pioneer's preference for its Hybrid Data Network with Acknowledgement Paging service ("HDNAP"), which it claims combines the necessary features of a high-speed one way data and paging channel with the functions of an acknowledgement paging system operating on a second back channel.[13] Metriplex requests that the Commission set aside the entire 1MHz at issue in this docket for HDNAP type services.[14] Metriplex's proposal is nothing more than acknowledgement paging, a service that can be provided by any existing or advanced messaging service and does not merit any spectrum in the 930-931 MHz band, let alone the entire paging reserve ban. In fact, Metriplex's limited two-way HDNAP service is less versatile than Pagemart's PIMS, in that it is not only limited in the type of material that it can receive or send,[15] but it requires the customer to obtain a specialized device. PageMart, on the other hand, has developed a service that can be transferred, via the use of an interchangeable PCMCIA-standard card, between customer information processing equipment, and therefore is flexible enough so that it can be used practically anywhere. Metriplex does not require a pioneer's preference in order to provide this service.

The remaining requests for pioneer's preference—Global, Skycell, Montauk and Freeman—are little more than proposals to market existing paging services to certain niche markets. The Montauk and Skycell proposals are

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13 Petition of Metriplex, Inc. for a Pioneer's Preference, June 1, 1992 at p. 1-2.

14 Metriplex Petition at p. 20.

15 The transmit function from the paging device is limited to "yes", "no", or "send more information".

conventional paging services tailored to specific markets, delivery of news to fax machines or wireless payphone service, respectively. Global proposes to offer one-way paging service at a speed slightly higher than what is currently available over conventional paging network, but requires the use of a dedicated device capable of only a single, specialized service. Global's "Pagentry" equipment, as demonstrated in Exhibit B, is also extremely large and bulky, far less convenient for users than a portable device supporting text, graphics and facsimiles messages such as PageMart's PIMS service supports. Global's proposal is, therefore, more of an equipment issue rather than a request for spectrum allocation. Finally, Freeman's proposal appears to offer little more than what is currently available from conventional paging services.

CONCLUSION

The Commission should reject all of the proposal for advanced messaging services advanced by the petitions filed on June 1, 1992, since none of

them meet the minimal criteria for a advanced messaging services meriting allocation of spectrum in the 930-931 MHz paging reserve band.

Respectfully submitted,

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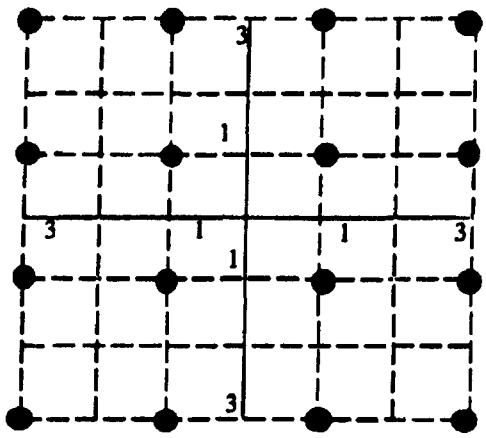
Dated: June 19, 1992.

APPENDIX I

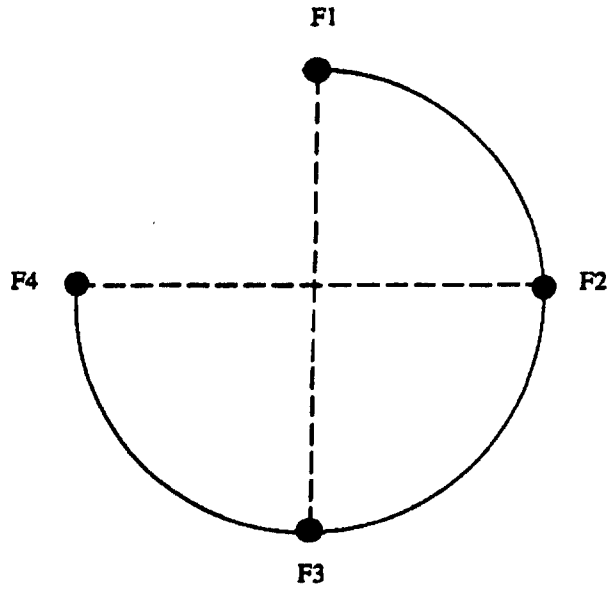
Two-Dimensional Signal Constellations

Phase Plane*



16 QAM

Frequency Plane



ERMES

*Book: Communications for Command and Control System, Page 285, 314

The attached figure shows the phase plane plot of 16 QAM and the frequency plane plot of ERMES.

The 16 QAM signal has three amplitudes. The threshold value (decision boundary) where the wrong state is selected is a minimum of one unit distance or 10db below the RMS value. It would take more than 21db SNR to obtain a BER of better than 1 in 2000 for AWGN ("On the Selection of Two-dimensional Signal Constellation in the Presence of Phase Jitter and Gaussian Noise", BSTJ 1973, page 927-965).

From the ERMES modulation (4-FSK) we have only four frequency states, and to change frequency is to move to or from the nearest neighbor frequency. Note the amplitude is constant, therefore hard limiting is used to remove the in-phase noise terms, plus a simplistic design to obtain constant amplitude at the detector for any input signal level. Consequently, the detection process is to determine which one of the four frequencies the signal is at and the decision boundary is $\Delta f/2$ from the last frequency decision, or simply evaluate F1, F2, F3 and F4 energy over the bit interval and select the maximum energy frequency.

CERTIFICATE OF SERVICE

I, Jennifer L. Roberts, do hereby certify on this 19th day of June, 1992, that I have served a copy of the foregoing **COMMENTS OF PAGEMART, INC.** via first class mail, postage prepaid, or via hand delivery to the parties on the service list below.

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