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ORIGINAL FILE

August 26, 1992

92-100

Ms. Donna Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: Ex Parte Presentation
ET Docket ~~90-100~~

Dear Ms. Searcy:

On August 21, 1992, the following representatives of PacTel Paging ("PacTel") met with Thomas Stanley and members of his staff in the Office of Engineering and Technology: Mark Stachiw (Counsel), James Lawson (Technical Director), Carl W. Northrop (Communications Counsel - Bryan Cave) and Gerald Udwin (Principal - The Udwin Group).

The purpose of the meeting was to report on results of PacTel's ongoing experimentation in the 930-931 MHz band, and its implications for the licensing scheme to be adopted for this band in the above-referenced proceeding.

Pursuant to Section 1.1206 of the Commission's rules, a copy of the materials distributed at this meeting is attached hereto.

Should any questions arise in connection with this matter, please contact the undersigned.

Very truly yours,

Carl W. Northrop

Carl W. Northrop/sm

Enclosure

CWN/tcm DC01 0032384

cc: Thomas Stanley

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List A B C D E

MEETING WITH OFFICE OF ENGINEERING AND TECHNOLOGY

SECOND REPORT

AUGUST 21, 1992

PACTEL PAGING
Three Forest Plaza, SUITE 800
Dallas, Texas 75251

RECEIVED
AUG 26 1992
Federal Communications Commission
Office of the Secretary

FRAMEWORK

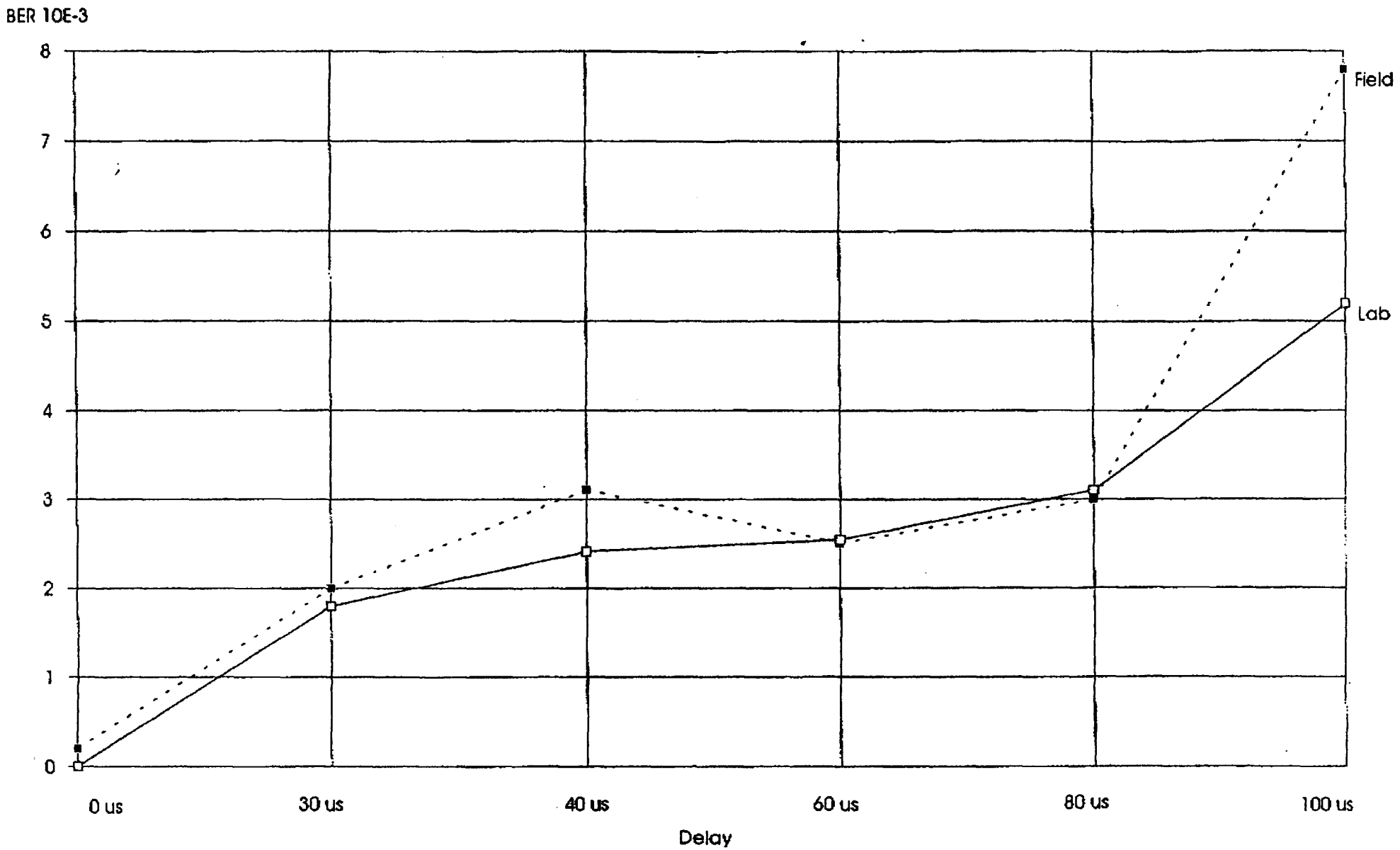
- PACTEL EXPERIMENTATION IS BASIC RESEARCH ON THE SIMULCAST BARRIER
  - THIS EXPERIMENTATION IS APPLICABLE IRRESPECTIVE OF MODE, CODING SCHEME, OR FORMAT
- PACTEL'S NEXT EXPERIMENTAL PHASE IS TO BEGIN DEVELOPING A SYSTEM WHICH INCORPORATES THE BASIC RESEARCH IT HAS DEVELOPED
  - THIS SYSTEM MUST ALLOW FOR GRACEFUL INCREASES IN SPEED AND CAPACITY
  - THIS SYSTEM MUST BE ECONOMICAL AND EFFICIENT
  - PACTEL WILL BUILD THIS SYSTEM USING ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM) ON A 25 KHZ CHANNEL(S)
    - THE BASIC RESEARCH WILL BE INCORPORATED INTO HOW FAST THE INFORMATION IN EACH SUBBAND CAN BE SENT

4800 Baud Test Results

- Investigate the performance of 4800 Baud in a Simulcast environment.

- Conclusion:

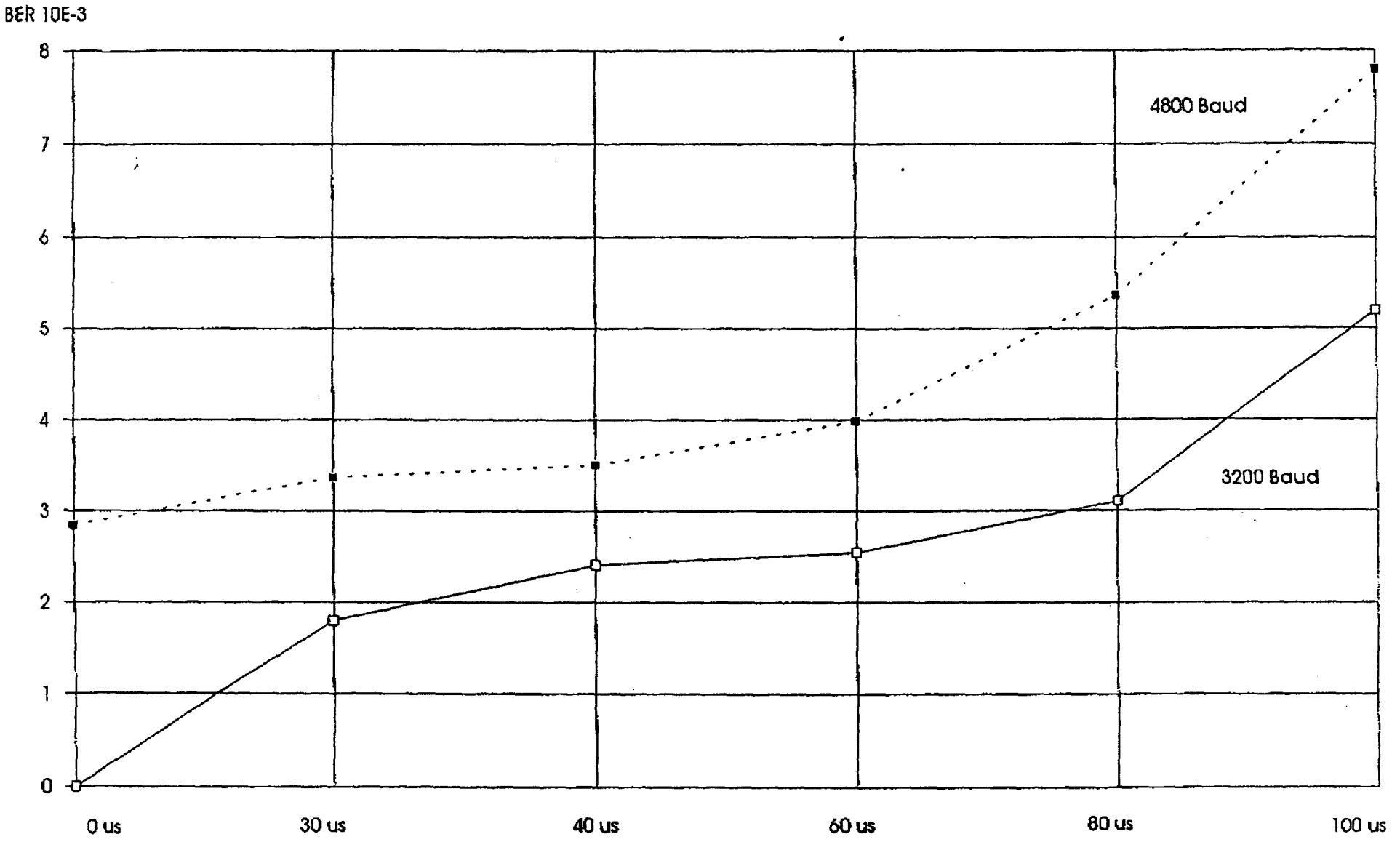
  4800 baud can be used in a Simulcast environment but system delay must be kept under 50 us.



3200 Baud Test Results

TELESIS TECHNOLOGIES LABORATORY

TTL 071592



4800 Baud Test Results

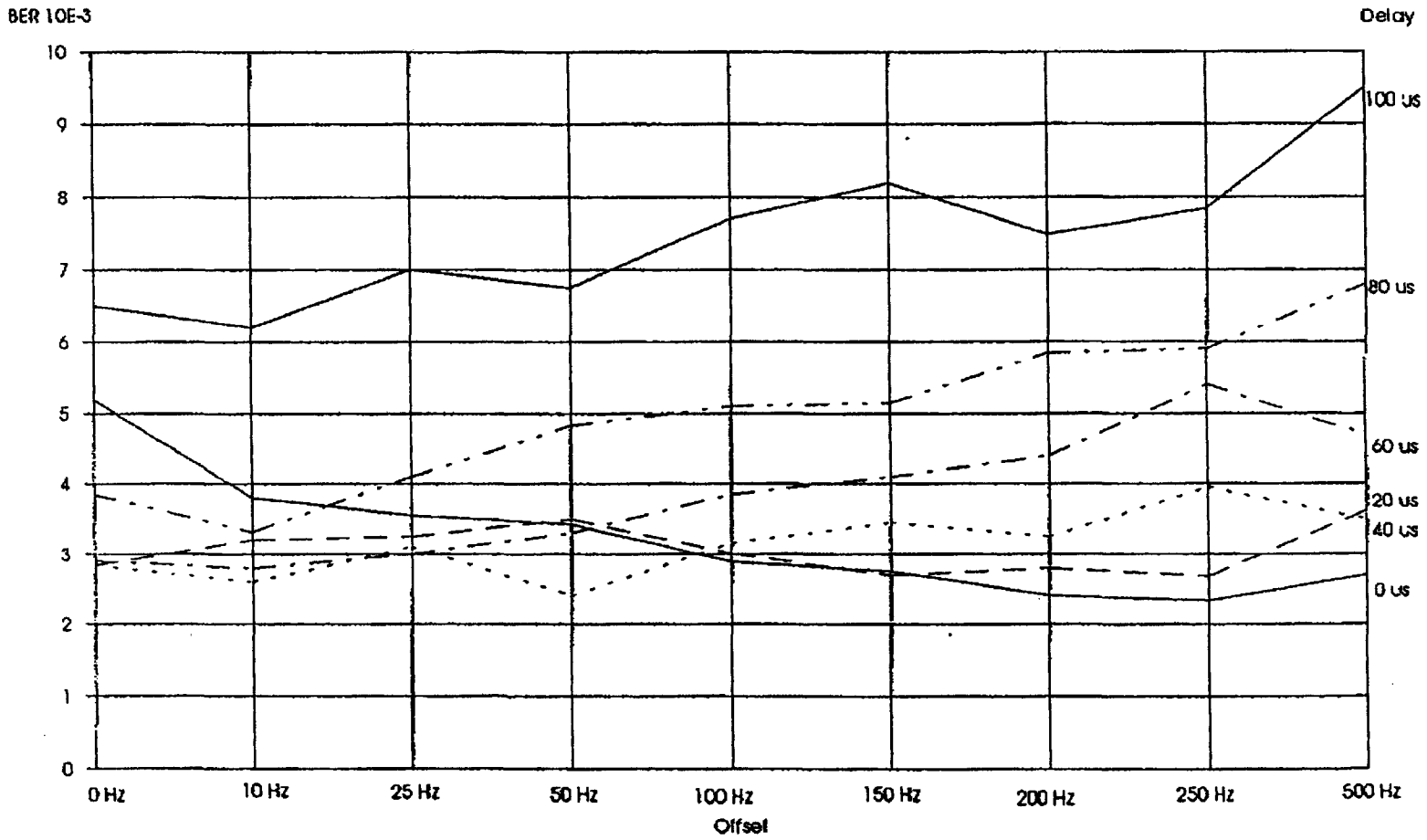
TELESIS TECHNOLOGIES LABORATORY

TTL 071592

Delay Versus Frequency Offset

- Analyze the effect of delay between transmitters and their Bit Error Rate performance.
- Analyze the effect of Frequency Offset between transmitters and their Bit Error Rate performance.

JUL 15 '92 01:31PM 510 210-8806



Frequency Offset vs. Delay

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Advanced Modulation Schemes

- Digital Modulation:

Advantages:

Higher data rate possible than with analog in a limited bandwith, *i.e.*, 25 Khz.

Example:

An FSK signal requires an SNR of 15 db to achieve a bit error rate of 10E-6.

8PSK requires the same SNR to achieve the same bit error rate of 10E-6.

But with 8PSK we can achieve a data rate of 14.4 kBps versus 4.8 kBps.

Advanced Modulation Schemes (Cont.)

- Digital Modulation Tests Underway.

  Modulations Schemes being investigated.

  QPSK 8PSK 16 QAM 64 QAM

Preliminary Results:

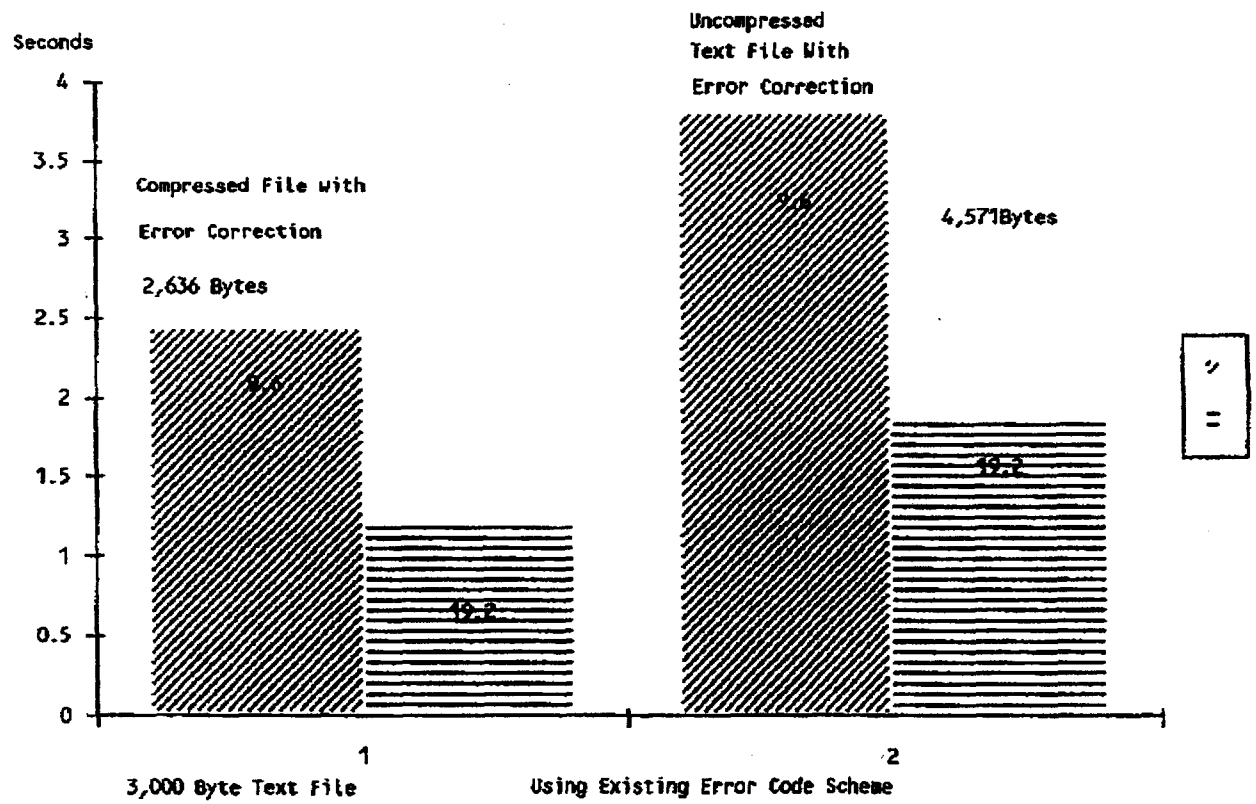
Intersymbol interference at 0 frequency offset and 0 us delay too great to cause signal capture.

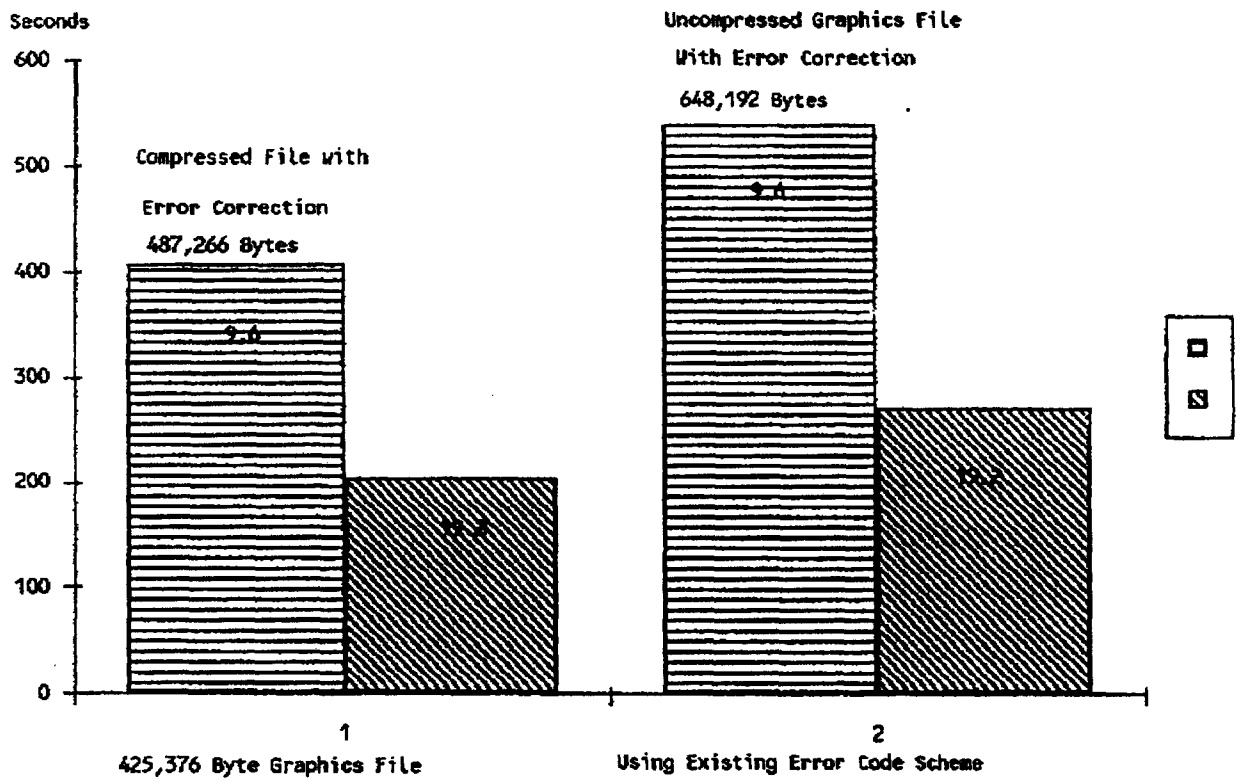
PRBS generator being modified to provide 9.6 and 19.2 kBaud and ability to provide delay between the two transmit data sources.

- Data Compression

  Current paging transmits data uncompressed
  Does not impact existing technology.

  Advanced Paging Systems sending large data files such as facsimile, E-mail or graphics, requires data compression in order to maintain high level of system throughout.


Seconds
4
3.5
3
2.5
2
1.5
1
0.5
0
Compressed File with
Error Correction
2,636 Bytes
Uncompressed
Text File With
Error Correction
4,571Bytes
1
2
3,000 Byte Text File
Using Existing Error Code Scheme


Seconds
600
500
400
300
200
100
0
Compressed File with
Error Correction
487,266 Bytes
9.6
19.2
Uncompressed Graphics File
With Error Correction
648,192 Bytes
9.6
19.2
1
425,376 Byte Graphics File
2
Using Existing Error Code Scheme

CONCLUSIONS AND NEXT STEPS

- THE MAXIMUM SIMULCAST SPEED IS 4800 BAUD, NOT 3200 BAUD AS PREVIOUSLY THOUGHT
  - THIS ALLOWS FOR AN INCREASE IN CAPACITY OF 33% OVER SYSTEMS USING 3200 BAUD SIMULCAST SPEEDS
- USING THIS BASIC RESEARCH, PACTEL HAS DEVELOPED A SYSTEM ARCHITECTURE, ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM), WHICH WILL ALLOW FOR EFFECTIVE CAPACITY OF 19.2K-26K BITS PER 25 KHZ
  - FOR COMPARISON, IF THE CHANNEL SPACING WAS 50 KHZ, PACTEL'S SYSTEM COULD PROVIDE EFFECTIVE RATES OF 38.4-52K BITS PER SECOND PER CHANNEL
  - THIS SYSTEM WOULD SUPPORT 60,000 TO 80,000 NATIONWIDE SUBSCRIBERS PER CHANNEL WITH AN AVERAGE MESSAGE LENGTH OF 5,000 BITS (A SMALL DOS FILE) OR 180,000 TO 240,000 SUBSCRIBERS EACH RECEIVING ONLY REGION SERVICE

NEXT STEPS (CONT'D)

- THIS COULD BE EXPANDED EVEN FURTHER WITH THE USE OF AN ACKNOWLEDGEMENT/SETUP CHANNEL WHICH WOULD ALLOW THE MESSAGE TO BE TRANSMITTED ONLY IN THE METROPOLITAN AREA WHERE THE SUBSCRIBER IS LOCATED
  - ASSUMING ACKNOWLEDGEMENT/SETUP CHANNELS USED IN TOP 30 MARKETS, THEN CAPACITY OF SINGLE SYSTEM COULD BE INCREASED TO 5.4-7.2 MILLION SUBSCRIBERS PER CHANNEL
- THIS IS COMPARED TO CURRENT TODAY'S SYSTEMS WHICH COULD SUPPORT LESS THAN 2,000 SUCH SUBSCRIBERS IN THE SAME BANDWIDTH -- A POTENTIAL 6,000% INCREASE IN CAPACITY

- PACTEL HAS BEGUN BUILDING THE NECESSARY EQUIPMENT TO EXPERIMENT WITH SUCH SYSTEMS IN THE FIELD AND IT EXPECTS TO HAVE RESULTS TO REPORT TO THE COMMISSION WITHIN THE NEXT SEVERAL MONTHS

- ONCE THE NECESSARY EQUIPMENT IS BUILT, PACTEL WILL CONDUCT SYSTEM TESTS UNDER ITS PARENT'S EXPERIMENTAL LICENSE

- PACTEL WILL AT THE SAME TIME CONTINUE WORKING WITH MANUFACTURERS AND INDUSTRY COMMITTEES TO DEVELOP THE NECESSARY CODING SCHEMES AND INFRASTRUCTURE TO OFFER THE SERVICE