IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the **PATENT APPLICATION** of:	
David K. Mesecher	
Application No.: 12/901,616	
Confirmation No.: 1473	
Filed: October 11, 2010	Our File: I-2-0108US08
For: CODE DIVISION MULTIPLE ACCESS TRANSMISSION ANTENNA WEIGHTING	
Group: 2634	
Examiner: Tesfaldet Bocure	

DECLARATION PURSUANT TO 37 C.F.R. §1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

1. I, David Mesecher, am the sole inventor of the subject matter of the above-identified patent application.
2. The above-identified patent application is a continuation of application no. 11/315,795 (now US 7,813,413), which is a continuation of application no. 10/068,718 (now US 6,983,008), which is a continuation of application no. 09/602,963 (now US 6,373,877), which is a continuation of application no. 09/394,452 (now US 6,115,406) which was filed on September 10, 1999.
3. On or prior to August 7, 1997, I conceived of the invention claimed in the above-identified patent application. Attached are my dated inventor notebook pages. These notes were faxed to outside patent counsel on at least

March 30, 1998 (that fax cover sheet is also attached). From conception to the effective reduction to practice date of September 10, 1999 (filing date of the 09/394,452 application), I, with due diligence, worked with internal and outside patent counsel to prepare and file the 09/394,452 application.

4. The acts relied upon to establish a date prior to September 1, 1999, the filing date of US 6,778,507 (Jalali), were all carried out in the United States.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 31 day of October 2014 at Melville, NY.

David K. Mesecher

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TOTAL NO. OF PAGES INCLUDING COVER: 10
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RE:

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

RECEIVED
AM/PM
MAR 30 1998
VOLPE & KOENIG, P.C.

Adaptive Beamsteering Through Downlink Channel

On the opposite page is a drawing of a scheme to perform adaptive beamsteering through the downlink channel of the B-CDMA system in order to provide spatial processing gain, or antenna-array gain, to each downlink.

Shown is a three-element array (the number of desired elements is theoretically unlimited). Three global pilots are transmitted (chips are synchronized), one from each element.

The receiver has 3 rake despreaders, one for each pilot signal. The outputs of all despreaders are weighted and combined to produce an estimate of the despread pilot signal value, namely $1+j0$. This estimate is compared to the true value $1+j0$ to generate an error signal. The error signal is used to adjust all weights to use some adaptive algorithm like RLS, or LMS (LMS shown here).

By selecting the total weight set to minimize error, the receiver will pick the best combination of the 3 pilot signals, and it will do so for whatever multipath environment the 3 pilots experience.

By selecting the best combination of the 3 pilot signals, the receiver will achieve spatial gain from the transmitting antenna-array. ~~The applying these weights to the AMF (all virtual channel [illegible] would now require 3 [illegible] per code.~~

A ~~second~~ similar receiver at a different angle would find the set of weights that would achieve spatial gain in that direction.

Some weight-finding algorithm also (LMS shown here)

7/28/97

Base Station

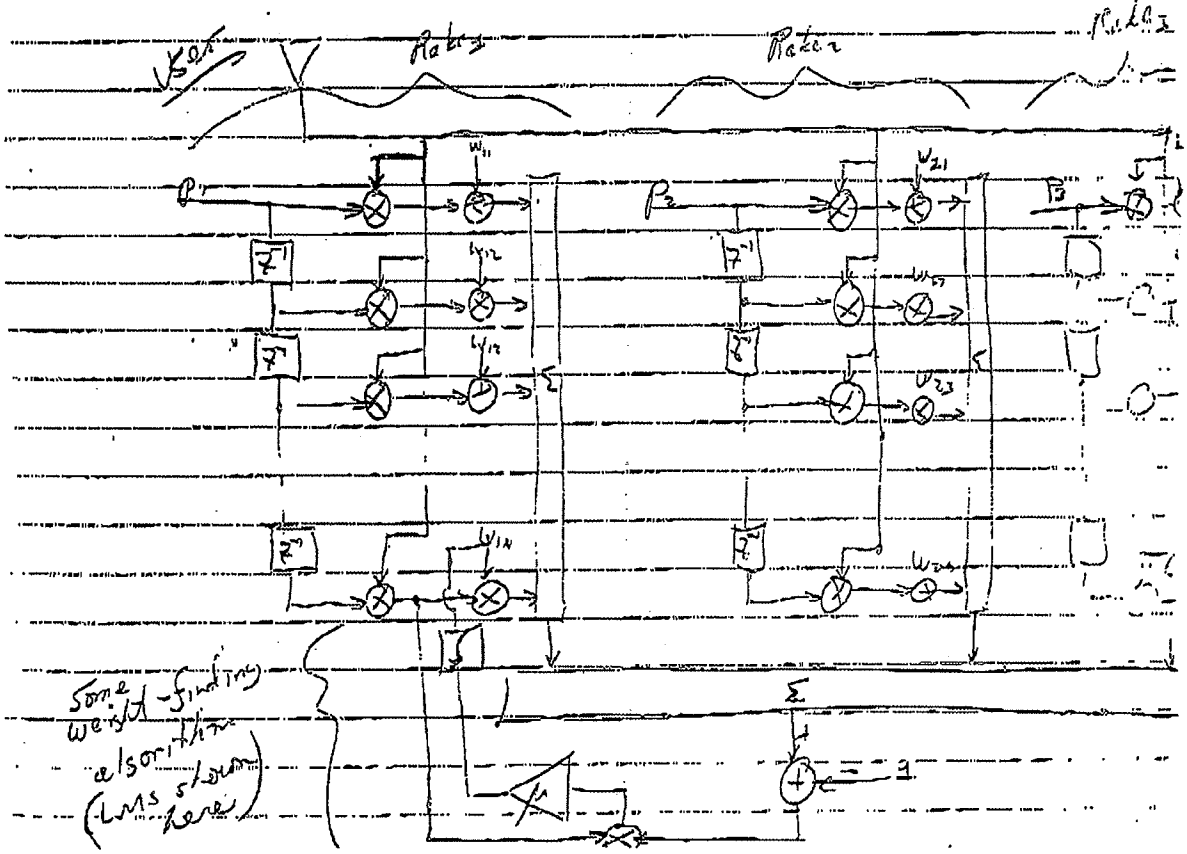
39 Total Ps

P_1 P_2 P_3

Gary,

I think this will work although it is a lot of processing

Dave



Some weight-finding algorithm (LMS here)

7/28/97

Base Station

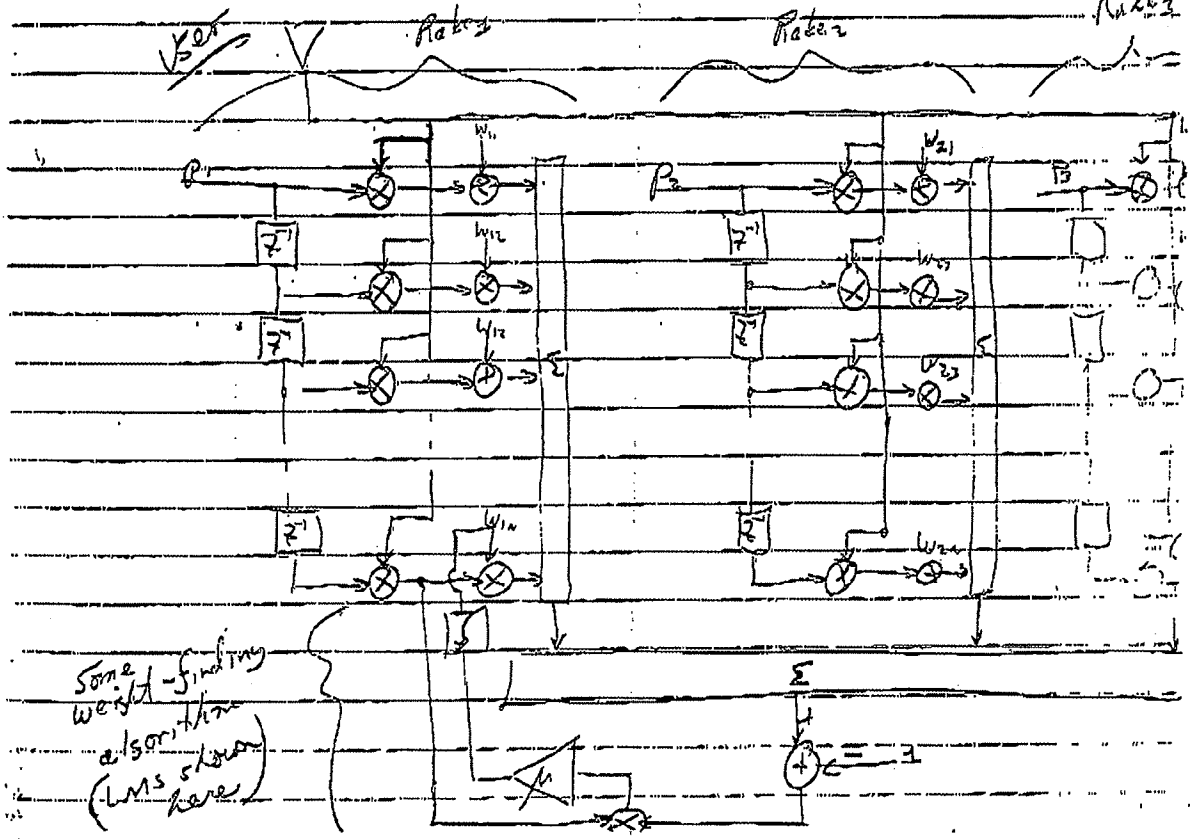
39 mobiles

P_1 P_2 P_3

Gary

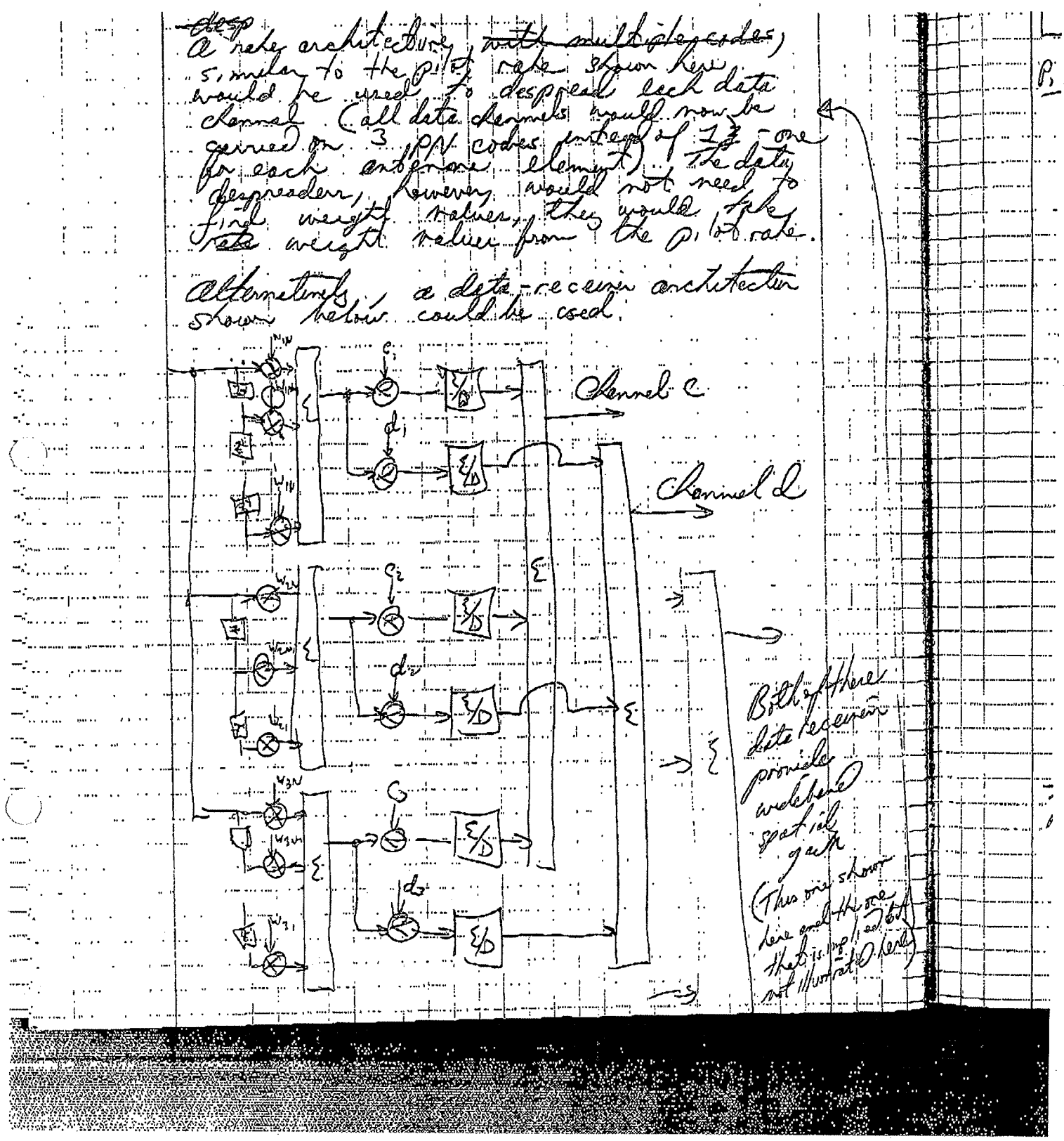
I think this will work although it is a lot of processing

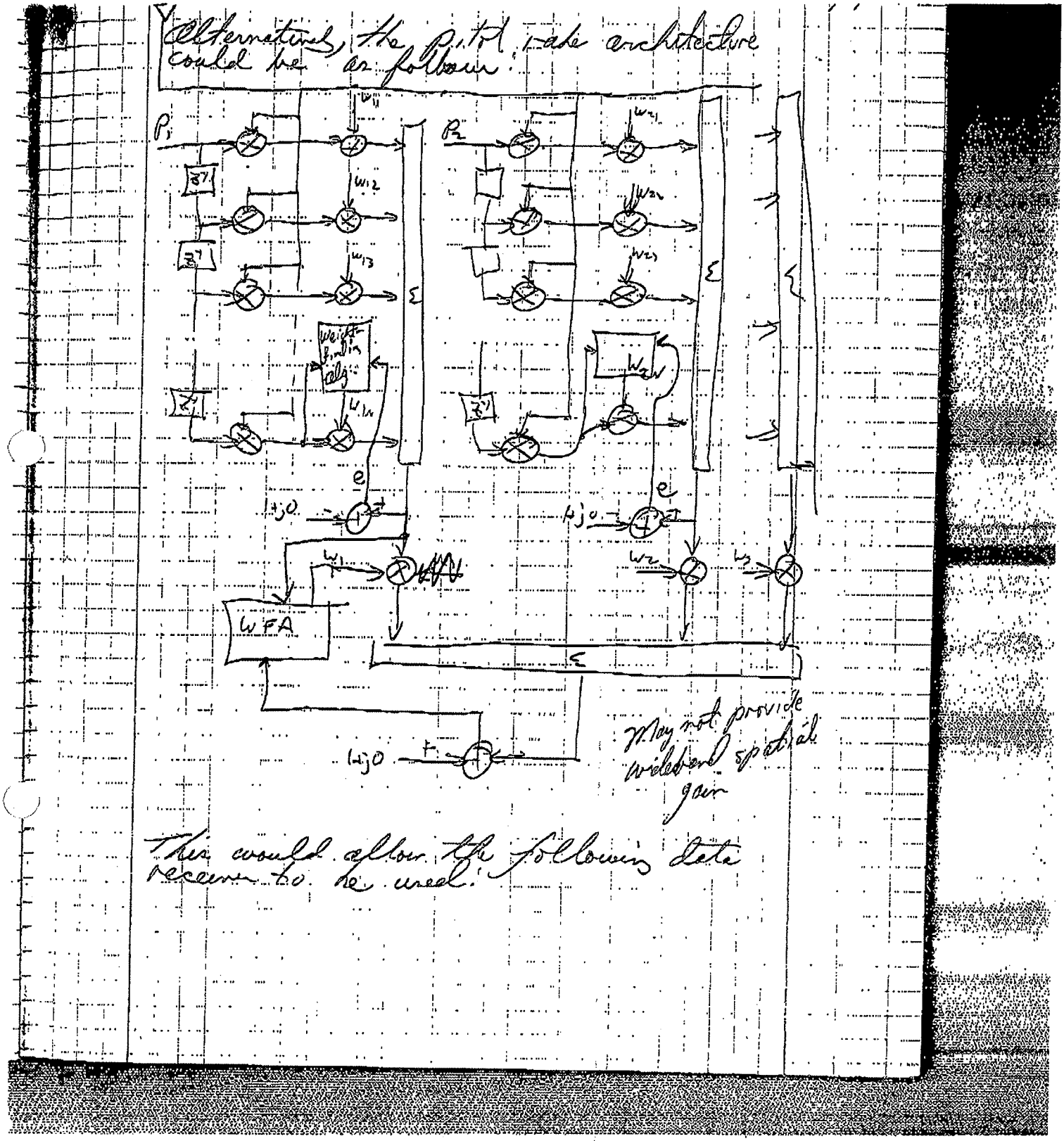
Dave

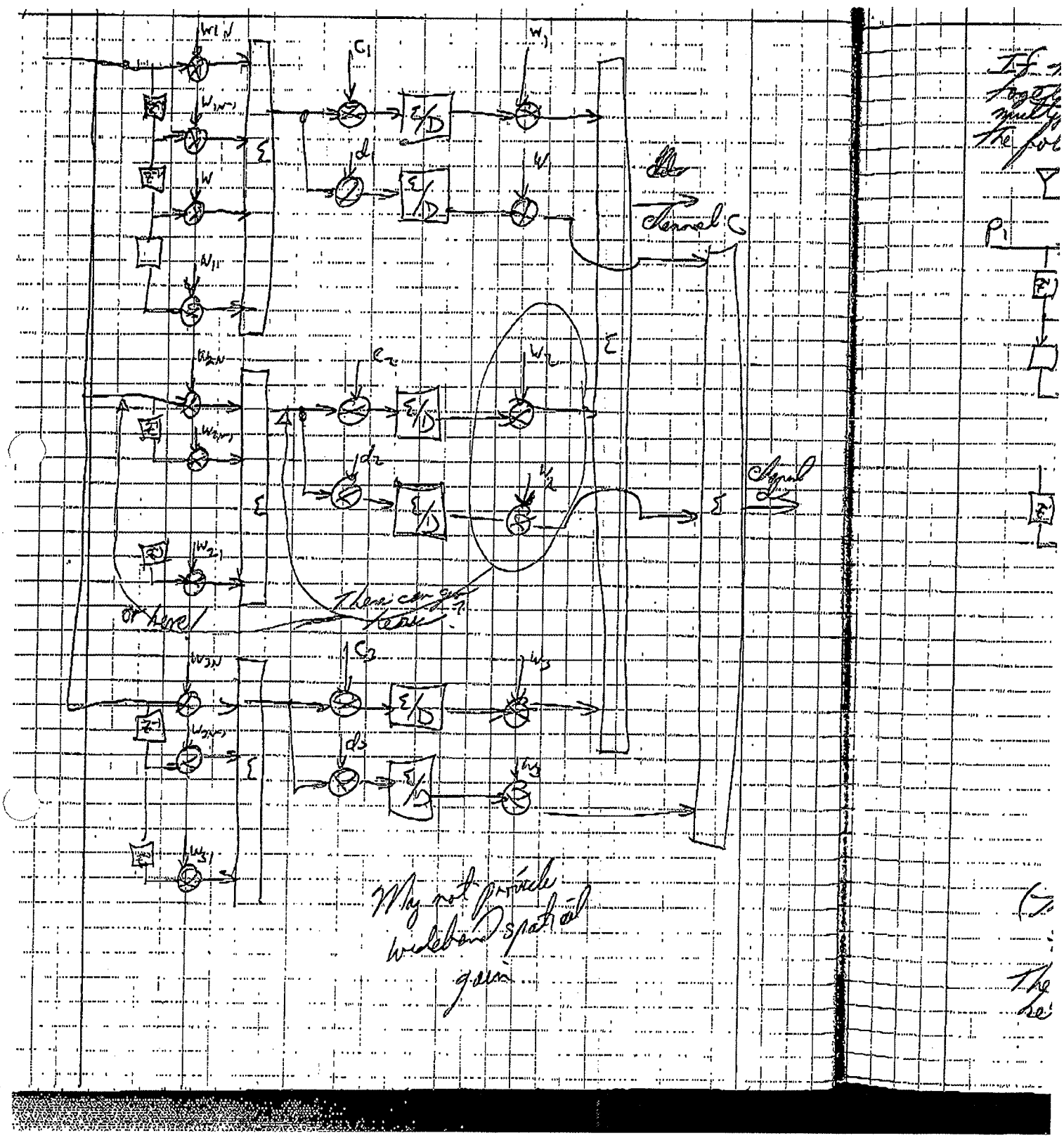


~~Desp~~
A rake architecture, ~~with multiple codes~~, similar to the pilot rake shown here, would be used to despread each data channel. (All data channels would now be served on 3 PN codes instead of 1 - one for each antenna element). The data despreader, however, would not need to find weight values, they would take weight values from the pilot rate.

Alternately, a data-receiver architecture shown below could be used.

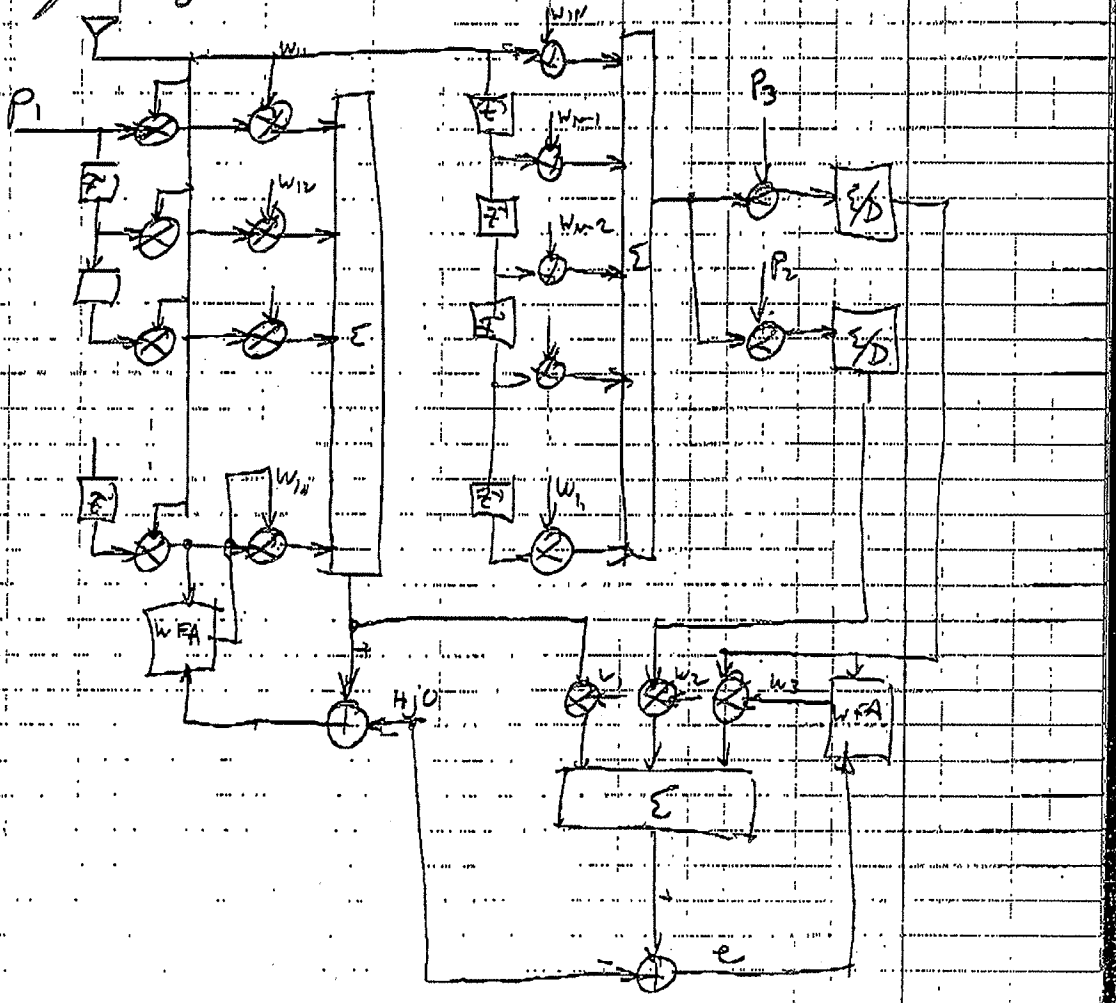



Alternatively, the P.T.D. rake architecture could be as follows:
P_1
P_2
w_{11}
w_{12}
w_{13}
w_{21}
w_{22}
w_{23}
w_{1N}
w_{2N}
z^{-1}
z^{-1}
z^{-1}
weight binding alg.
Σ
Σ
e
e
$+j0$
$+j0$
w_1
w_2
w_3
WFA
Σ
$+j0$
May not provide wideband spatial gain
This would allow the following data vectors to be used:


Signal
or here!
May not provide wideband spatial gain

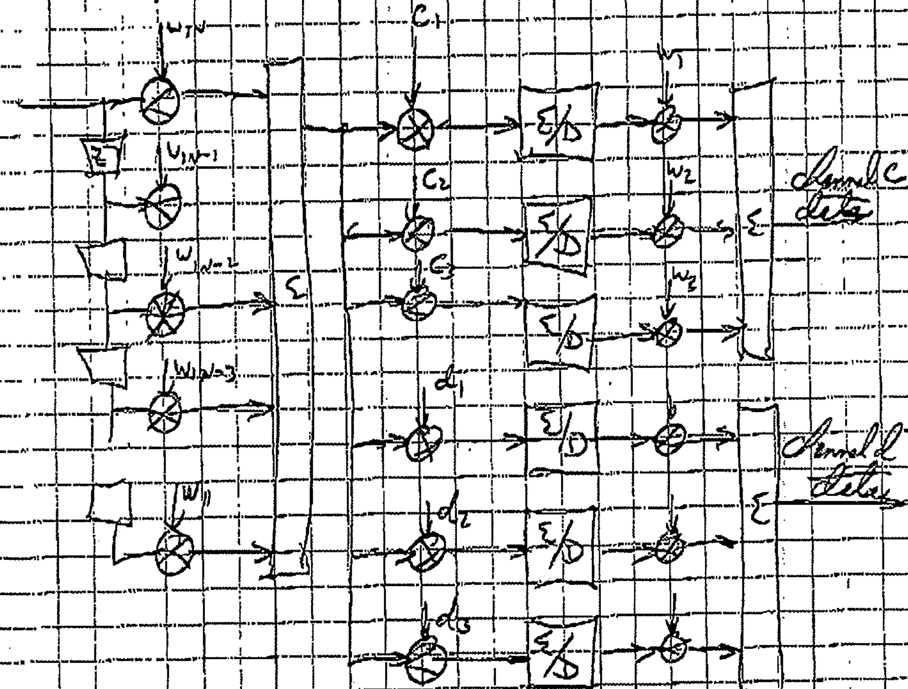
8/1/97

If the elements are close enough together, so that all 3 experience same multipath channel to the receiver, then the following rake receiver can be used:



(This would not provide wideband spatial gain)

The following data receiver could then be used:



Note: the
through
In beam
direc
in the d
possible t
re-direc
can only
However,
is extrai
phase inf
needed
it were
The tech
beamform
(complex
at
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SNR a
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Note, the technique described on pp 76 through 83 will not provide beamforming. In beamforming, energy is taken from ~~an~~ directions not of interest and focused in the direction of interest. It is not possible to perform any such energy re-direction from a remote site. It can only be accomplished at the source of the energy. However, the phase information that is extracted at the remote site is the phase information that would be needed to perform energy focusing if it were done at the transmitter site. The technique then can be used for beamforming if the phase information (complex weights) and that are obtained at the receiver are the transmitted to the transmitter array and applied there. Then actual spatial gain due to beamforming would be achieved, thereby increasing SNR at the receiver.

Moreover, if all receivers use similar processing, then energies would be focused away from the receiver of interest, thereby further increasing SNR at the receiver of interest.

Symbolic Data

Normal Data

****
*** ACTIVITY REPORT ***
****

RECEPTION OK

TX/RX NO.	6173
CONNECTION TEL	5166220100
CONNECTION ID	
START TIME	03/30 15:18
USAGE TIME	06'23
PAGES	10
RESULT	OK