3 January 1977

MEMORANDUM TO: VLA File

FROM: C. C. Aleksoff

SUBJECT: Antihermitian Error Analysis

$e^{i\phi n v}$

In a previous memo we suggested the use of an antihermitian input signal.* In this memo we would like to point out that the phase error analysis for the antihermitian input is identical to that for a hermitian input, contrary to that implied in the previous memo.

Let the input signal be $V(u,v)e^{i\phi(u,v)}$ where, for the moment, V is an arbitrary input and ϕ is the input phase error. Then the desired output is proportional to its FT given by

$$E(x,y) = (B' + iB'') * (\varepsilon' + i\varepsilon'')$$
$$= B' * \varepsilon' - B'' * \varepsilon'' + i(B'' * \varepsilon' + B' * \varepsilon'')$$

where

$$B = B' + iB''$$

and

$$\varepsilon = \varepsilon' + i\varepsilon''$$

are the FT's of V and $e^{i\phi}$, respectively and where one prime indicates the real part and two primes indicate the imaginary part.

---

*C.C. Aleksoff memorandam to VLA File, SA-761090-123401, 7 December 1976, "Antihermitian Input Possibilities."

ERIM
FORMERLY WILLOW RUN LABORATORIES, THE UNIVERSITY OF MICHIGAN

Now we note that if the input V is hermitian that B'' = 0 and that

$$E = B' * \varepsilon' + iB' * \varepsilon''$$

where $B' * \varepsilon'$ is the detected (real) part while B' is the desired output.

If we now let the input V be antihermitian then B' = 0 and

$$E = -B'' * \varepsilon'' + iB'' * \varepsilon'$$

where $B'' * \varepsilon'$ is the detected (imaginary) part while B'' is the desired output.

Hence, in either case the desired output is degraded by convolution with the real part of the error ε, or in other words the output error comes from the hermitian part of the input phase error term regardless of whether the input signal is hermitian or antihermitian.

CCA/pw

cc: I. Cindrich
J. Fienup
A. Klooster