VLB ARRAY MEMO No. 112

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TO: VLBI Group

FROM: A.E.E. Rogers

SUBJECT: Elimination of "Bit Shifting" Sidelobes - New Bit Shift Corrections for Automatic Bit Shift Mode

FRNGE using parameters passed from COREL (version $\geq$ 4) now applies to the following frequency dependent phase correction.

$$\phi = (FB \pm 0.5)\ \frac{(1-\backslash INT/S/)}{/S/}\ (w-w_m)\ \pi/(2\ w_m)$$

where

ϕ = the phase shift correction in radians

w = video frequency

w_m = center of video band

$S = \tau\ AP/\tau_s$ = bit shifts in accumulation period

INT/S/ = actual integer number of bit shifts that occur in AP

AP = accumulation period

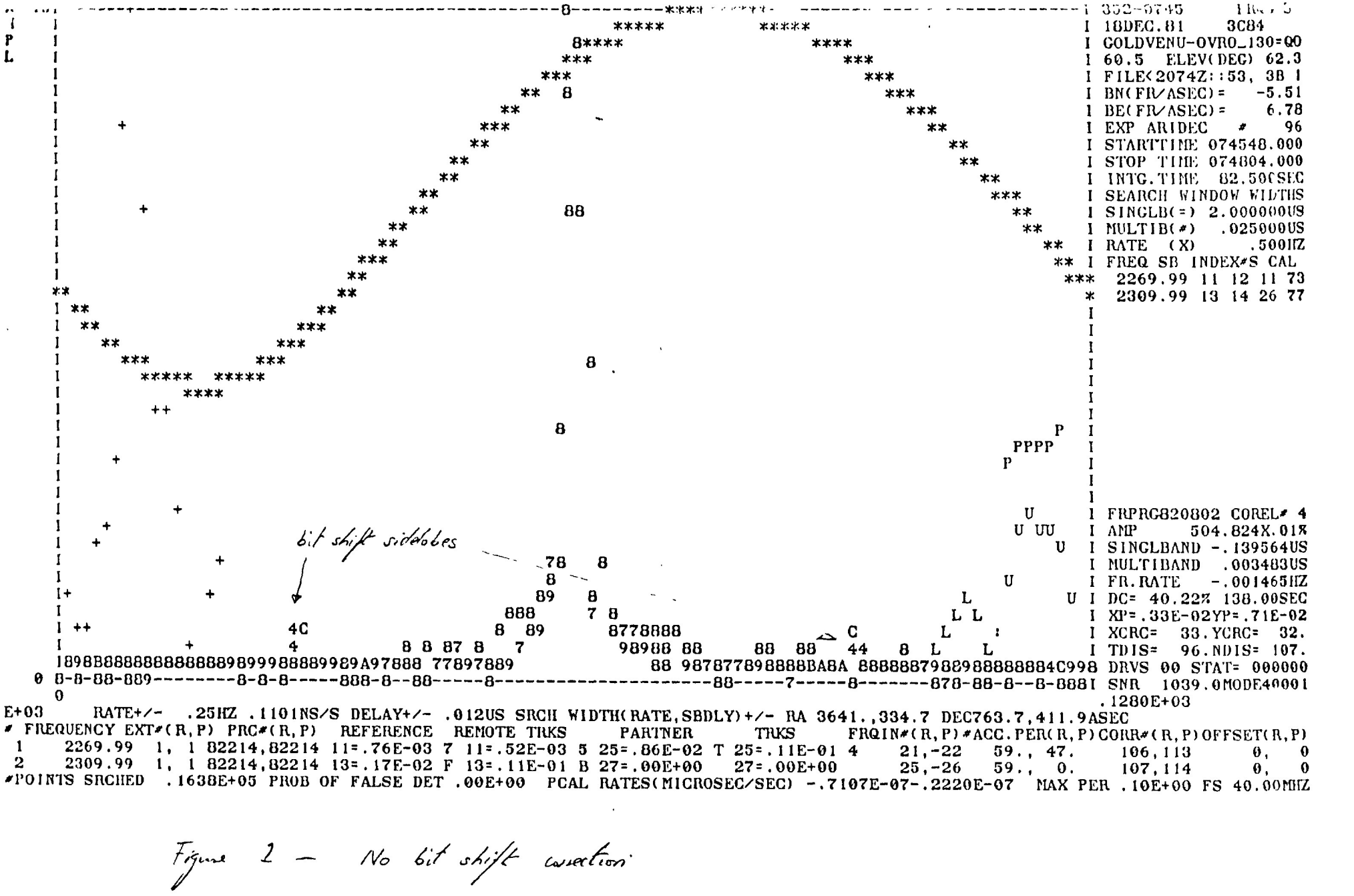
$\pm$ = plus when FB<0, minus when FB>0

FB = fractional bit shift at center of AP

In order to save computation time FRNGE only makes a correction if $/\phi/$ is greater than 0.2 radians at the edge of the bandpass.

The new correction eliminates the bit shift sidelobes which are quite evident when the bit shift rate is less than the inverse of the accumulation period. Since the bit shift sidelobes and the saw-tooth phase modulation in the cross-spectral domain are eliminated, the new bit shift correction method should be satisfactory for spectral line VLBI. It has the great advantage of allowing long accumulation periods without the necessity for frequent conversion to the cross-spectral domain as required by the normal software fractional bit correction method.

AEER/kw
xc: J.M. Moran
I.I. Shapiro



E+03 RATE+/- .25HZ .1101NS/S DELAY+/- .012US SRCH WIDTH(RATE,SBDLY)+/- RA 3641.,334.7 DEC763.7,411.9ASEC

#	FREQUENCY	EXT#(R,P)	PRC#(R,P)	REFERENCE	REMOTE TRKS	PARTNER	TRKS	FRQIN#(R,P)	#ACC.PER(R,P)	CORR#(R,P)	OFFSET(R,P)
1	2269.99	1, 1	82214,82214	11=.76E-03 7	11=.52E-03 5	25=.86E-02 T	25=.11E-01 4	21,-22	59., 47.	106,113	0, 0
2	2309.99	1, 1	82214,82214	13=.17E-02 F	13=.11E-01 B	27=.00E+00	27=.00E+00	25,-26	59., 0.	107,114	0, 0

#POINTS SRCHED .1638E+05 PROB OF FALSE DET .00E+00 PCAL RATES(MICROSEC/SEC) -.7107E-07-.2220E-07 MAX PER .10E+00 FS 40.00MHZ

Figure 2 — No bit shift correction

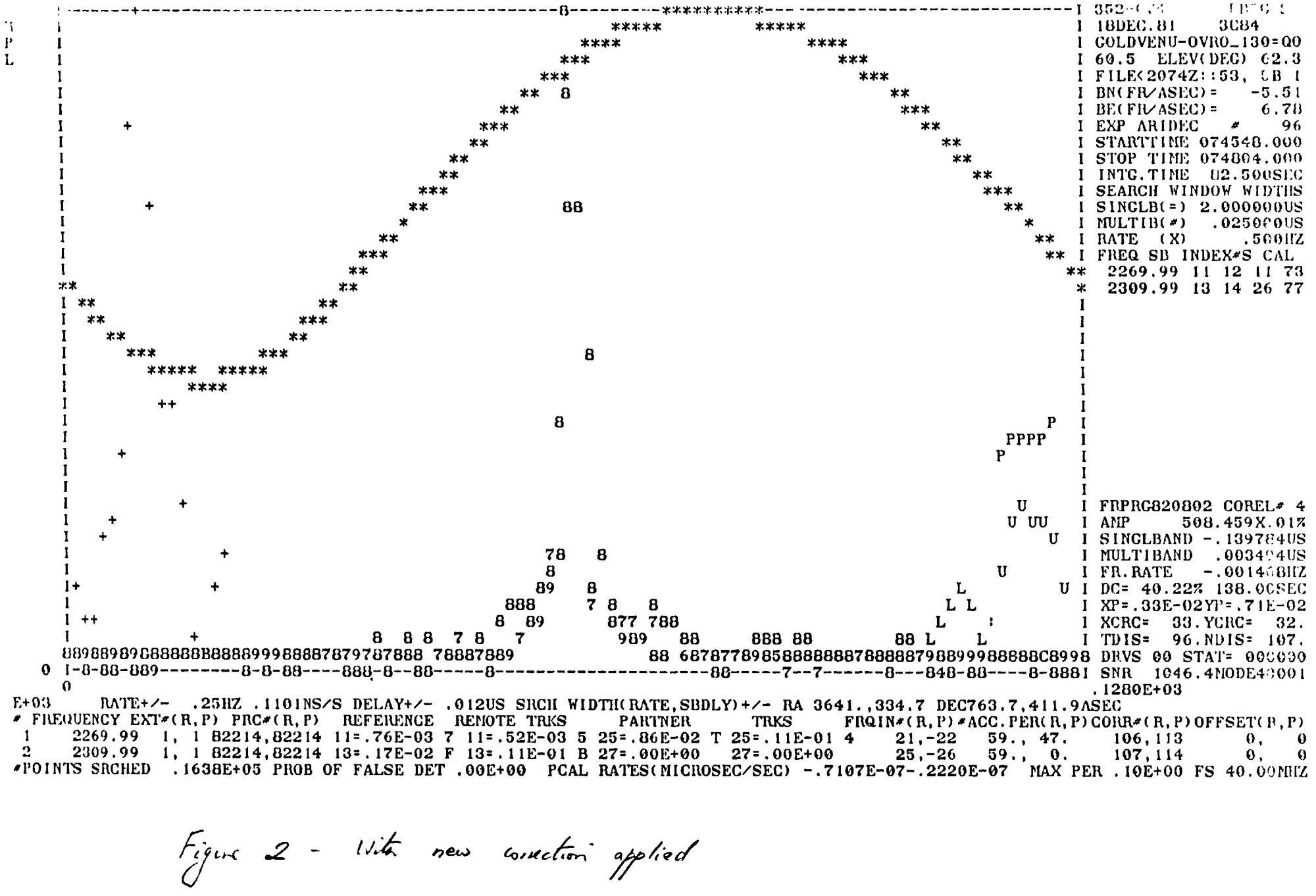


Figure 2 - With new correction applied