NRAO TUCSON INTERNAL REPORT
MEMO NO. 10

National Radio Astronomy Observatory
Tucson, Arizona

February 10, 1989

MEMORANDUM

To: NRAO Internal Report Series

From: P. R. Jewell

Subject: Optimum Position of the North-South Translation Stage

During system test time on February 8-9, I measured the optimum position of the "North-South" or "Y" translation stage as a function of elevation angle. The weather wasn't very good during the observations -- the skies were very hazy and occasionally opaque. *As a result, observations reported herein must be confirmed.* Nonetheless, successive observations produced repeatable results, and I thus believe the observations are valid, at least at the higher elevations.

The source observed was Jupiter and the frequency ν_{LO} was 344.3 GHz. Jupiter had a disk diameter of ~40", almost twice the FWHM of the main beam. Although a point source would give a better indication of the power in the main beam, the large diameter was helpful in that small pointing errors were not critical. The observations were done with the automatic observing procedure NSFOCAL, which positions the N-S stage at 7 positions from -3 to +3 mm, in steps of 1 mm. The elevation pointing of the telescope is adjusted automatically, according to a prime focus plate scale of 34"/mm. This value was calibrated about 2 years ago and was not redone with the new subreflector.

The results are plotted in Figure 1. I have over-plotted the theoretically predicted curve, taken from **12 Meter Memo No. 219** by L. J. King, and have used the best fit curve calculated by M. A. Gordon to be

$$Y = -1.77 \times 10^{-3} X^{1.70} + 1.80, \qquad (1)$$

where Y is the position of the N-S stage in millimeters and X is elevation angle in degrees. If the curve were translated down by about 2 mm (dashed line), a plausible fit results. These data are not good enough, particularly at low elevation, to be sure about the fit. We should try to repeat these observations as soon as possible. This is a good year for such measurements, as Jupiter transits at a very high elevation. For comparison with the N-S stage calibration, Figure 2 shows the deflection of the prime focus as a function of elevation angle as measured with the laser quadrant detector (from **Internal Report No. 9**).

Figures 3 and 4 are the N-S focus curves for elevations of 77° and 43°, respectively. You will note that at 77° elevation, we were not receiving maximum gain even at -3 mm, the lower travel limit of the N-S stage! Note also that at this elevation, the gain is 49% higher at a N-S position of -3 mm than at 0 mm, where the N-S stage is normally set.

There is no documentation at the telescope for the automatic N-S focus measurement. Here it is:

FORTH COMMANDS:

nnnn NSPOS !	[in microns, sets a position of the N-S stage]
SNSF	[drives the N-S stage to the position set by NSPOS]
NSFOCAL	[takes a 7 point focus measurement from -3 to +3 mm, in steps of 1 mm; adjustment of elevation pointing is automatic; integration time per point is set with the SEC command.]
xx ' PNS !	[in arcsec, sets the plate scale for elevation pointing]
0. NSCOR RND .'	[gives the current Elevation pointing correction; needed for diagnostic purposes only]

NSFOCAL is defined in FORTH block 130. PNS is set in FORTH block 88. Whether the elevation pointing is adjusted or not is determined by the value of ELNS (BLOCK 88).

CONDAR ANALYSIS COMMANDS:

INSTALL NSFOC	[installs the off-line procedure NSFOC, which is a clone of the normal FOCALIZE procedure]
scan_no NSFOC	[displays the data and does a fit]

DISTRIBUTION:

NRAO Internal Report Series (Town & Telescope)
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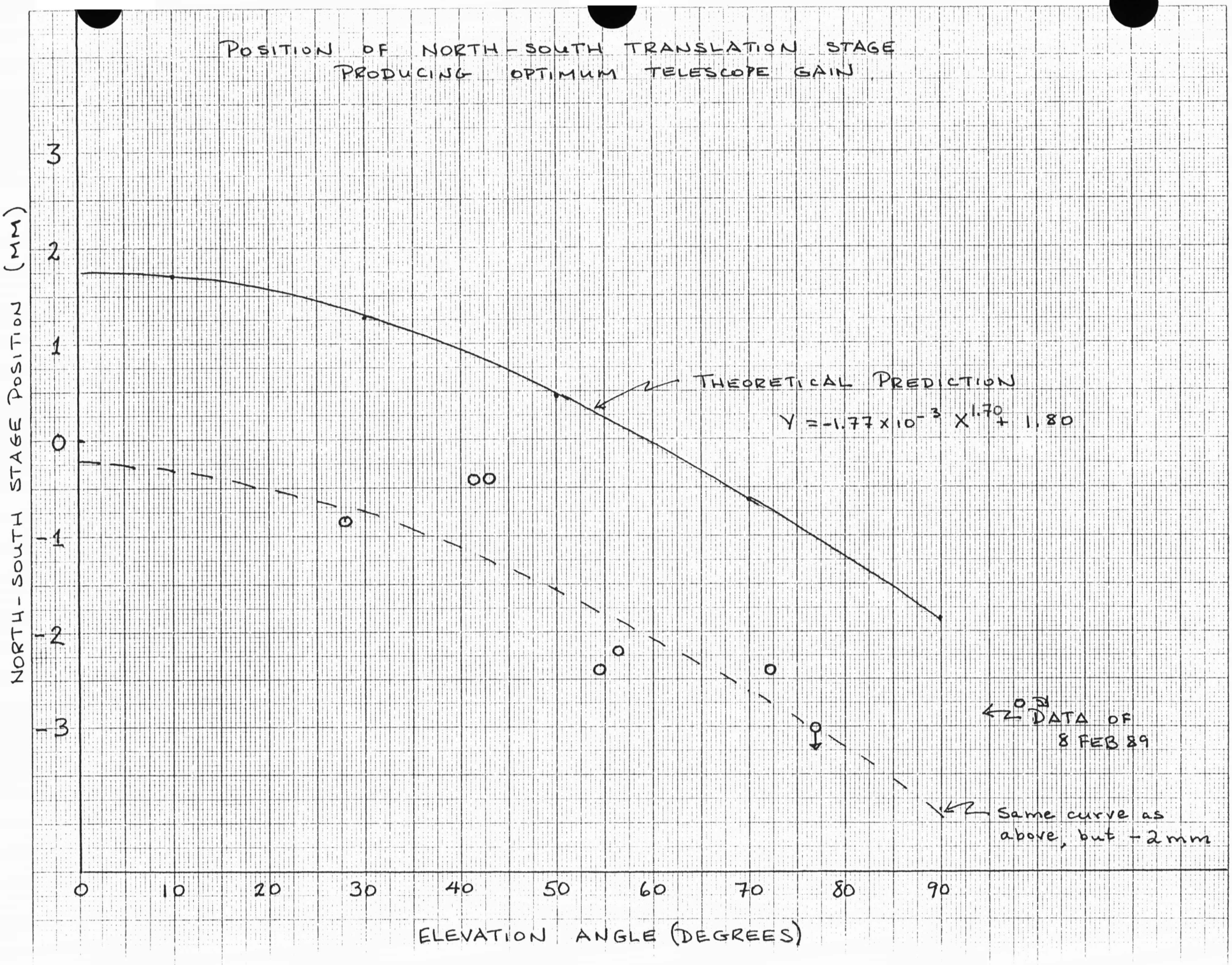
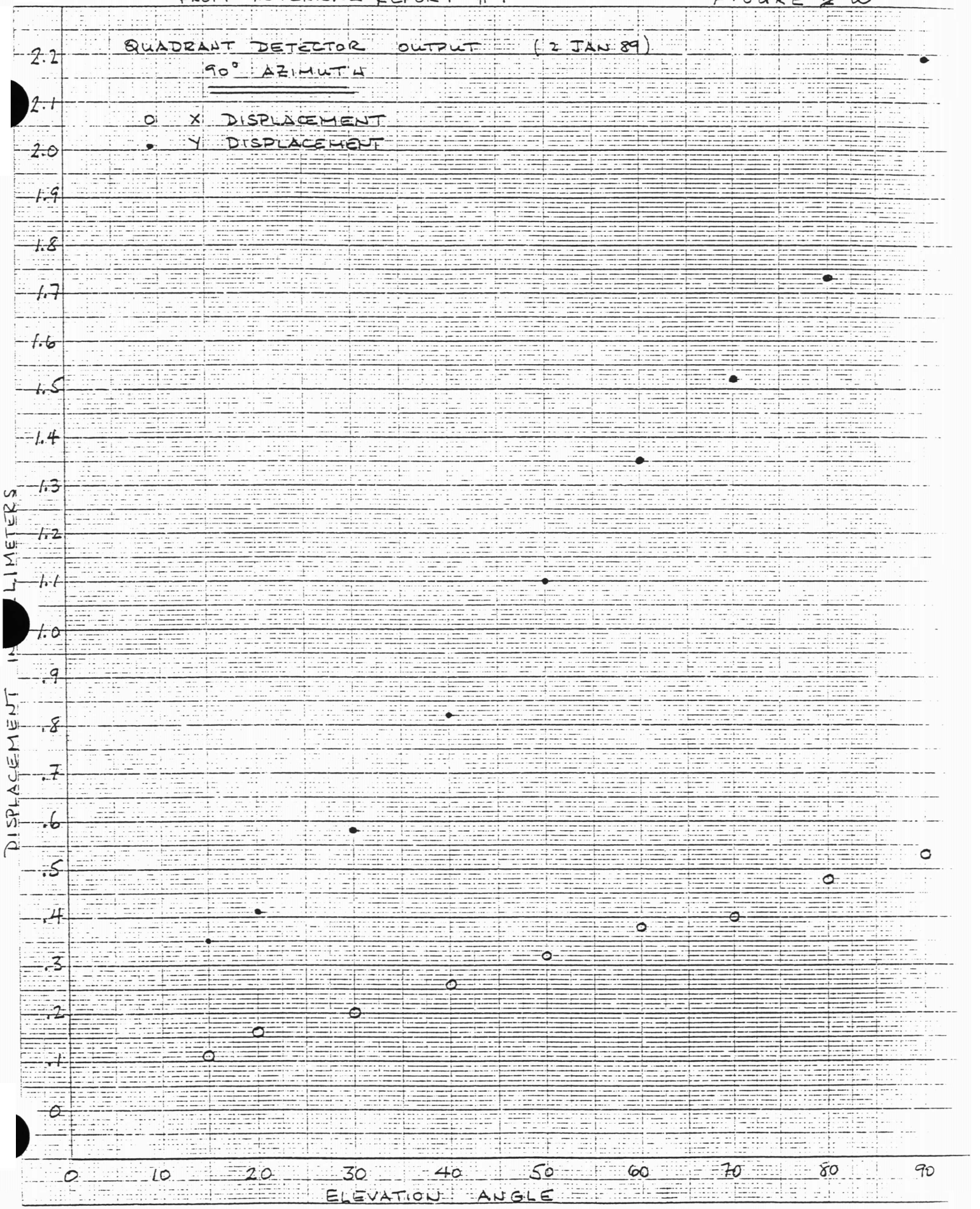
FIG


POSITION OF NORTH-SOUTH TRANSLATION STAGE
PRODUCING OPTIMUM TELESCOPE GAIN
NORTH-SOUTH STAGE POSITION (MM)
3
2
1
0
-1
-2
-3
THEORETICAL PREDICTION
Y = -1.77 x 10^-3 X^1.70 + 1.80
DATA OF
8 FEB 89
Same curve as
above, but +2 mm
0
10
20
30
40
50
60
70
80
90
ELEVATION ANGLE (DEGREES)

FROM INTERNAL REPORT #9

FIGURE # 2



SCAN	SOURCE	#CH	DATE	LST	SEC	TS	AZ	EL
4182	NSFOCAL	1	2- 9	03:38:40	10.0	0	180.3	76.8

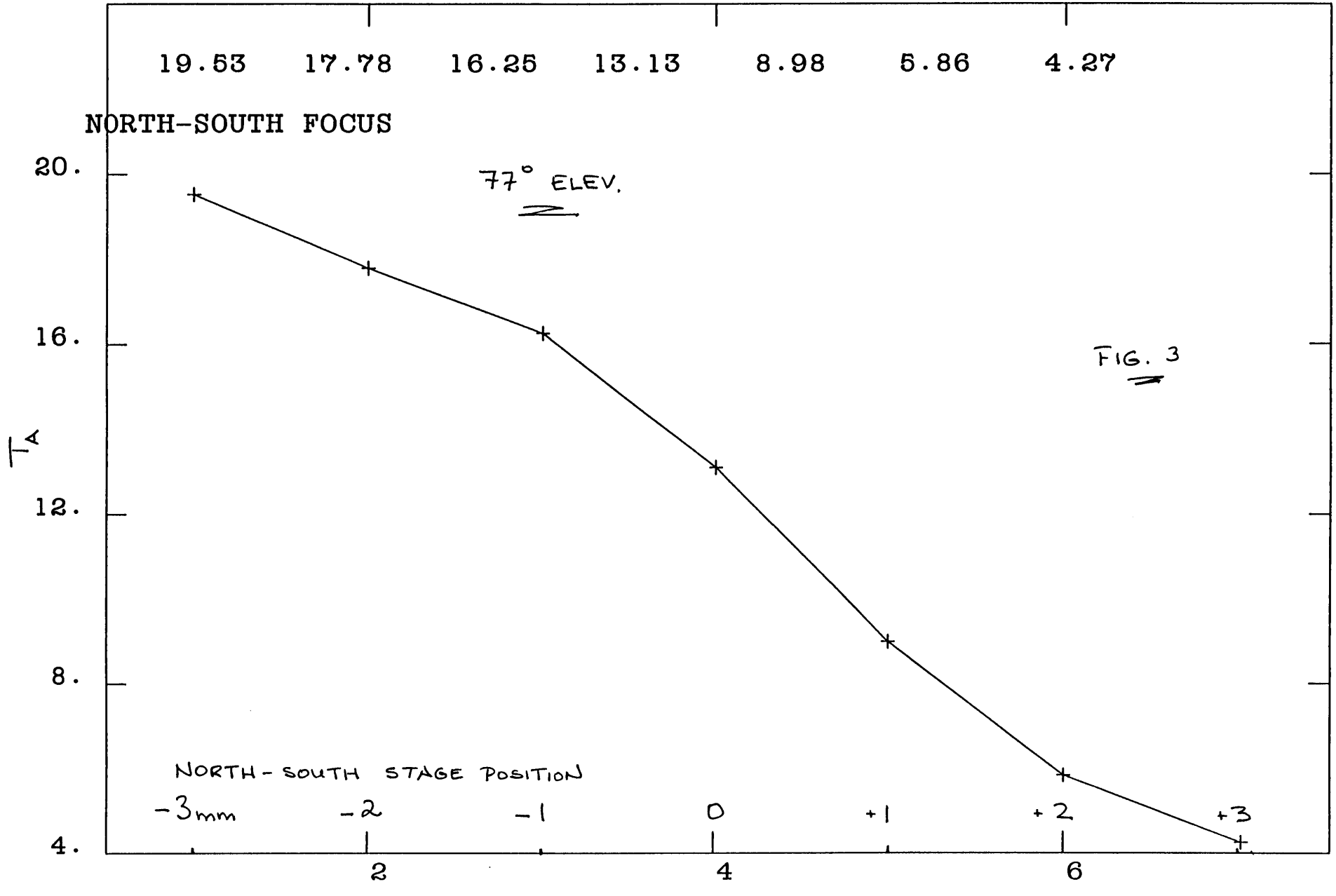


FIG. 3

SCAN	SOURCE	#CH	DATE	LST	SEC	TS	AZ	EL
4276	NSFOCAL	1	2- 9	07:00:21	10.0	0	266.4	43.0