

12 METER MILLIMETER WAVE TELESCOPE

MEMO No. 192

TO: 12M WORKING GROUP

FROM: L. J. KING

SUBJECT: 12M SURFACE ERRORS DUE TO GRAVITATIONAL FORCES

THE CALCULATIONS GIVEN IN THIS MEMORANDUM ARE BASED ON THE LATEST 12M TELESCOPE STRUCTURE:

- (1) THE ESSCG SURFACE PLATES OF 8.55 KG/SQM (1.75 #/SQFT) PLUS THE SUPPORT BOLTS AND BRACKETS.
- (2) THE UPDATED STRUCTURE WITH 4 RECEIVER MOUNTING FRAMES.
- (3) OFFSETTED FEED LEGS WITH TORSION RODS PRELOADED TO 600 LBS EACH.
- (4) 300# EQUIPMENT WEIGHT AT APEX.

- (I) THE FIRST SECTION SUMMARIZES THE SURFACE ERRORS DUE TO GRAVITATIONAL FORCES WITHOUT RECEIVER.

THE SURFACE RMS FOR VARIOUS ZENITH ANGLES ARE TABULATED AND PLOTTED ON P.2. TWO SURFACE ADJUSTMENT ANGLES, 30 & 40 DEGREES, ARE CALCULATED. THE ADJUSTMENT ANGLE SHOULD THEREFORE BE CHOSEN BASED ON THESE RESULTS AS WELL AS THE WEIGHTED SKY.

THE CONTOUR PLOTS OF 10 & 80 DEG. ZENITH ANGLES FOR 30 & 40 DEG. ADJUSTMENT ANGLES, RESP., ARE GIVEN ON PP. 3-6.

- (II) THE SECOND SECTION SHOWS THE EFFECTS ON THE SURFACE ERROR DUE TO RECEIVERS MOUNTED IN VARIOUS COMBINATIONS.

THE RESULTS OF NINE DIFFERENT CASES FOR TWO ZENITH ANGLES ARE TABULATED ON P.7.

(I) SURFACE ERROR WITHOUT RECEIVERS

ZENITH ANGLE ZA	REF. ANGLE (SURFACE ADJUSTMENT)	
	(A) ZA = 30	(B) ZA = 40
0	24 MU	32 MU
10	16	25
20	8	17
30	0	8
40	8	0
50	17	8
60	25	17
70	33	25
80	42	34
90	49	42
10-80 RMS	23 MU	20 MU
0-90 RMS	27	24

NOTE: ZA IN DEGREES; MU = .001 MM

TABLE 1 12M SURFACE RMS ERRORS

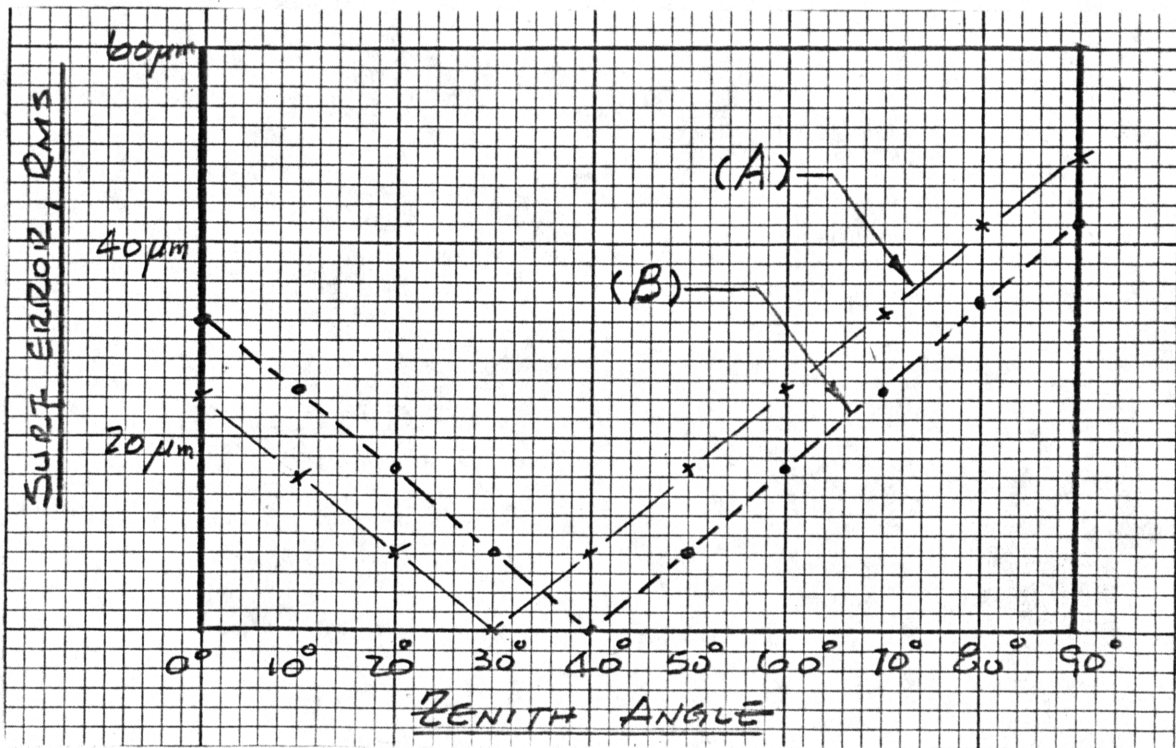


FIG. 1 SURFACE RMS ERRORS VS. ZENITH ANGLES

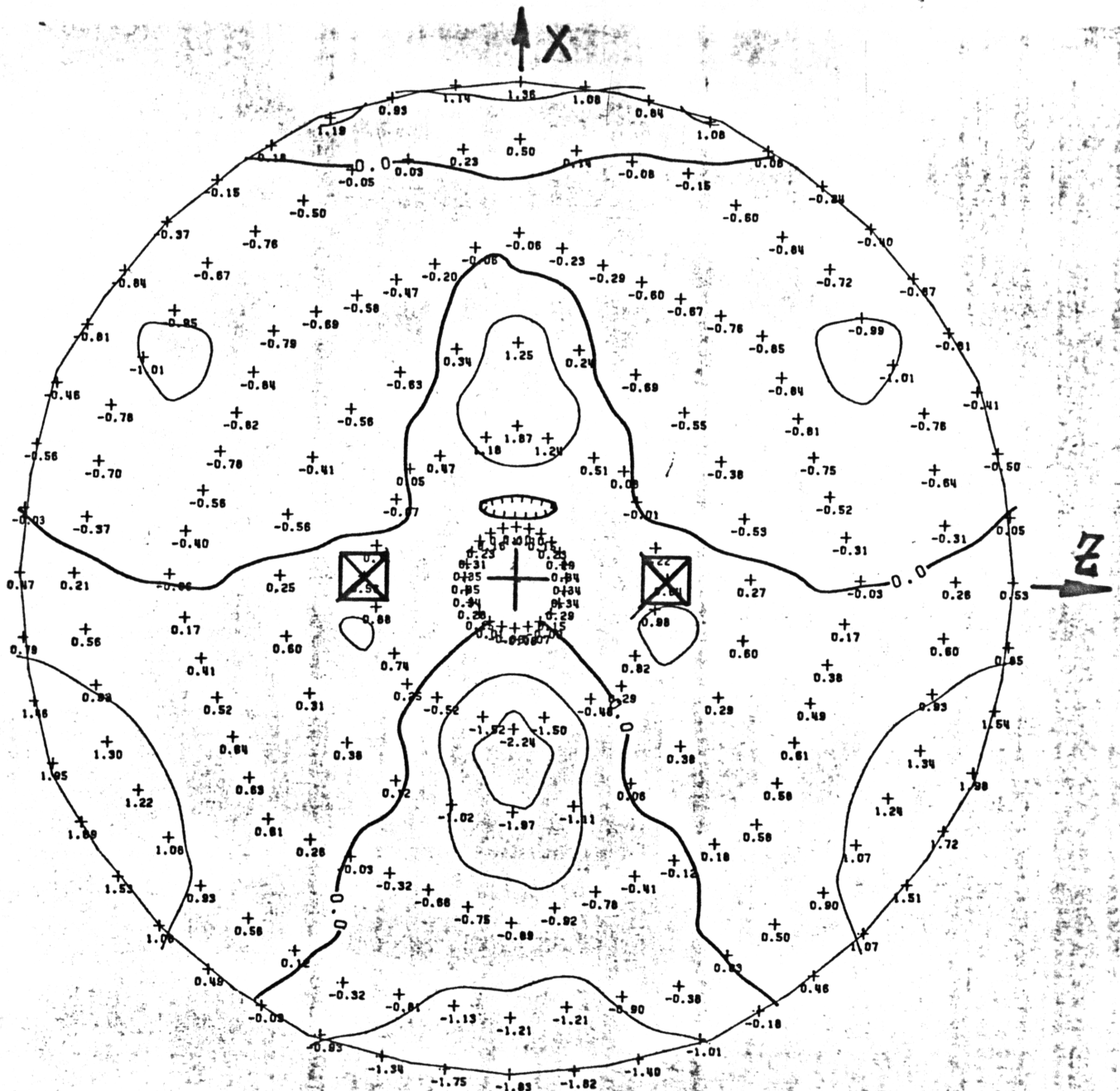


FIG.2

BEST-FIT SURFACE DEVIATIONS ZA=10 ADJA=30

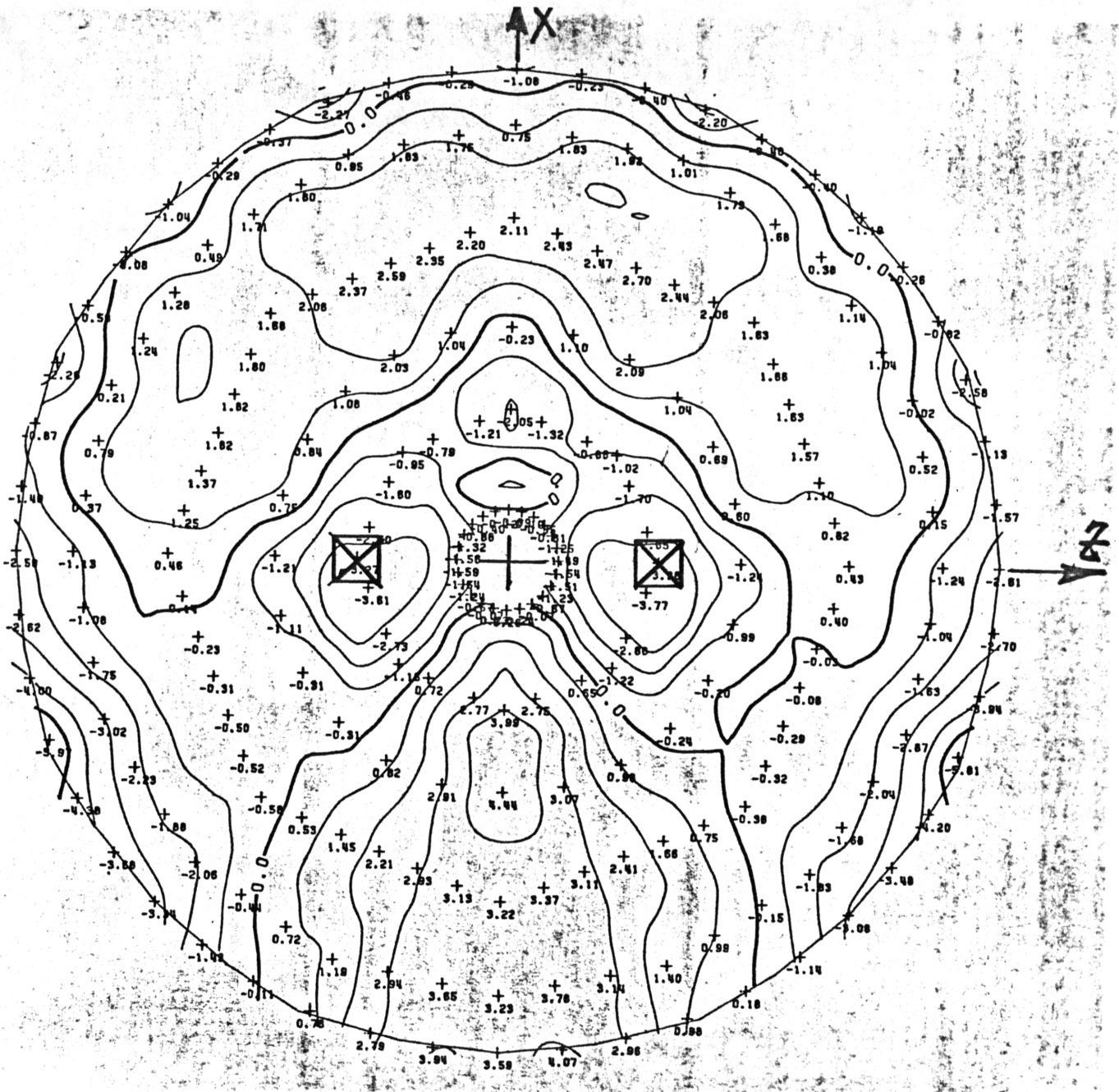


FIG.3

BEST-FIT SURFACE DEVIATIONS ZA=80 ADJA=30

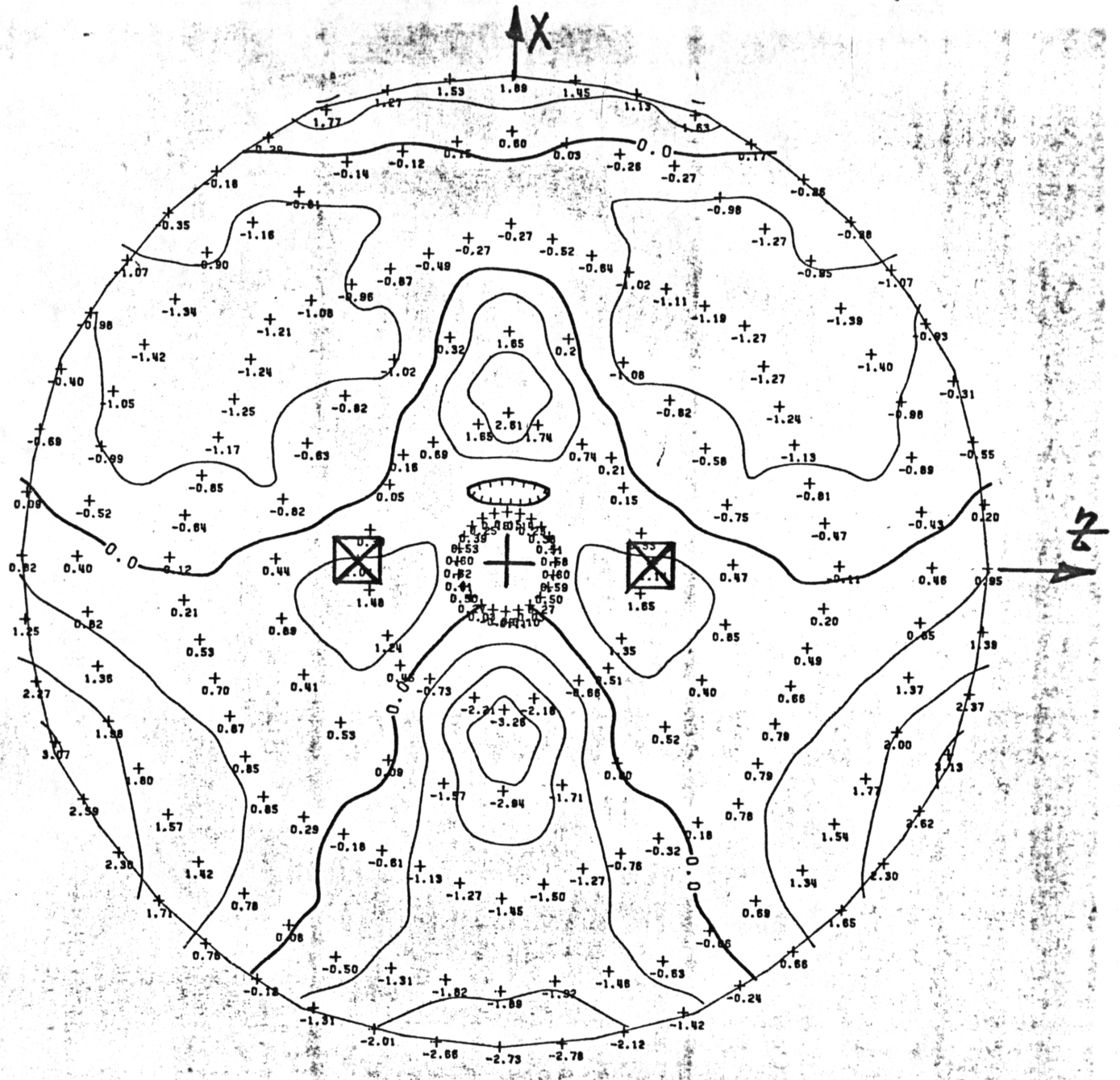


FIG. 4 BEST-FIT SURFACE DEVIATIONS ZA=10 ADJA=40

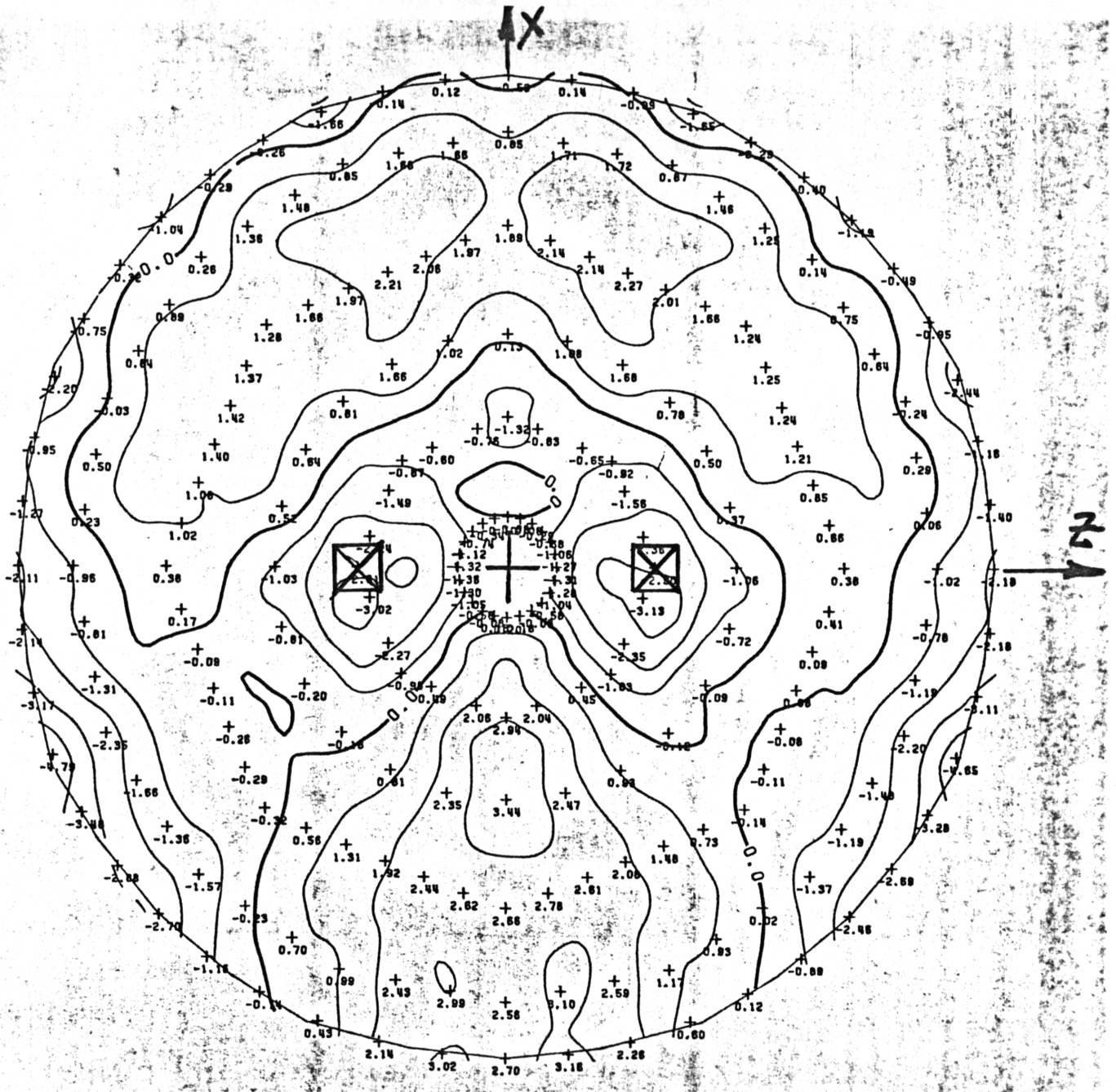
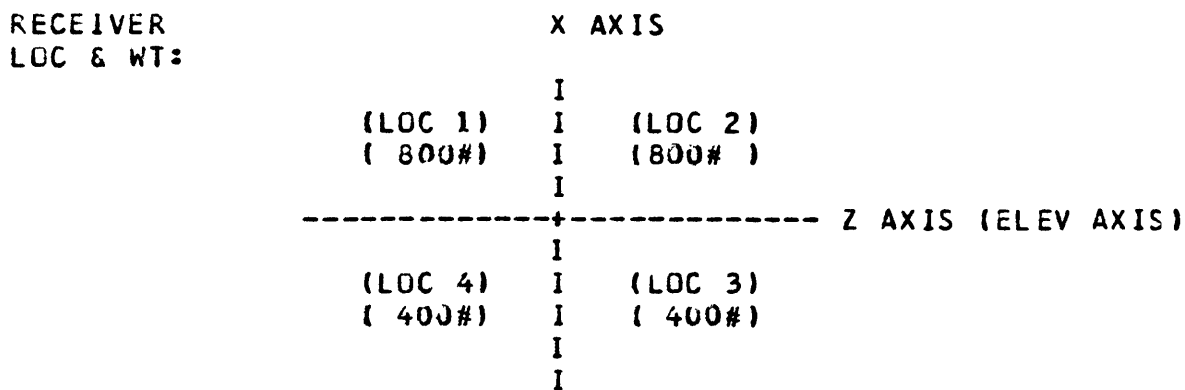


FIG.5 BEST-FIT SURFACE DEVIATIONS ZA=80 REFA=40

(II) EFFECT ON SURFACE ERROR DUE TO RECEIVER WEIGHT



I RECEIVERS MOUNTED AT LOCATIONS				I RMS DUE TO RECEIVER LOADINGS			
I 1	I 2	I 3	I 4	I ZA = 10	I	I ZA = 80	I
I ---	I NONE	I ---	I	I 16.4 MU	I	I 41.6 MU	I
I 1	I -	I -	I -	I 16.6	I	I 42.7	I
I -	I -	I 3	I -	I 16.3	I	I 41.7	I
I 1	I 2	I -	I -	I 16.7	I	I 43.2	I
I -	I -	I 3	I 4	I 16.2	I	I 41.1	I
I 1	I -	I 3	I -	I 16.5	I	I 43.1	I
I 1	I -	I -	I 4	I 16.4	I	I 42.1	I
I 1	I 2	I 3	I -	I 16.6	I	I 43.2	I
I -	I 2	I 3	I 4	I 16.4	I	I 42.0	I
I 1	I 2	I 3	I 4	I 16.5	I	I 42.7	I

NOTE: ZA IN DEGREES; MU = .001 MM;
REFL SURF ADJUSTED AT ZA=30

TABLE 2 EFFECTS ON SURFACE DUE TO RECEIVER WEIGHTS