LUNAR OCCULTATION AND PROVISIONAL IDENTIFICATION OF MSH 19-27

A lunar occultation of the radio source MSH 19-27 was observed on June 16, 1965. The observation was made at the National Aeronautics and Space Administration's Data Acquisition Facility located in the western North Carolina mountains (latitude $35^{o}12'\ 0''.05$ North, longitude $05^{h}31^{m}29^{s}.294$ West). In addition to position and diameter measurements, the occultation has provided a possible optical counterpart to the radio source.

The observation was made with a parabolic antenna 85 feet in diameter, which tracked the center of the moon for the duration of the occultation. The receiver was a switched type system employing gain modulation. The receiving frequency was 137 Mc/s with an intermediate frequency of 30 Mc/s, bandwidth of 2.5 Mc/s and RC integration time of 3 seconds. Digitized records of the disappearance and reappearance of the source are presented in figures 1a. and 1b., respectively.

The records were analysed in an IBM 7094 computer with a program adapted from the work of Von Hoerner[1] which was based on the restoration program discussed by Scheuer[2]. This program convolves the digitized data with various restoring functions to produce the brightness distribution as it would be observed with a gaussian fan beam scanned along the position angle of the occultation. Examples of the restored data are presented in figures 2a. and 2b.

The data has been restored with seven different beamwidths and a gaussian curve fitted to the resulting brightness distribution. Analysis of the fit provides the best values for the position of the intensity peak and the diameter of the source along the scan. The diameters and corresponding position angles are given in Table 1.

TABLE 1

Phase	Position Angle	Diameter	Time of Occurrence U.T.	Restoring Beamwidth Used
Disappearance	58^{o}	$8''.0 \pm 1''.7$		$4''.6$
			$07^{h}28^{m}35^{s}.0 \pm 1^{s}.6$	$8''.0$
Reappearance	104^{o}	$5''.9 \pm 1''.5$		$3''.4$
			$08^{h}47^{m}38^{s}.0 \pm 1^{s}.5$	$5''.9$

The position of the source has been computed from the Universal Times (corrected for RC integration time[3]) corresponding to the peak intensities of the restored brightness distributions. There are two possible positions for the source corresponding to these times.

Position 1: R.A.(1965.5) = $19^{h}26^{m}58^{s}.46 \pm 0^{s}.03$

DEC.(1965.5) = $-25^{o}55'32''.4 \pm 0''.5$

Position 2: R.A.(1965.5) = $19^{h}26^{m}51^{s}.18 \pm 0^{s}.03$

DEC.(1965.5) = $-25^{o}44'1''.4 \pm 0''.5$

In calculating these positions, it has been assumed that the difference in Universal and Ephemeris Time is 35.0 seconds.

The ambiguity in position can be resolved by considering the position given in the MSH catalogue[4].

TABLE 2

	Position 1	MSH	Position 2
R.A.(1950.0)	$19^{h}26^{m}1^{s}.62 \pm 0^{s}.03$	$19^{h}25^{m}.6 \pm 0^{m}.3$	$19^{h}25^{m}54^{s}.42 \pm 0^{s}.03$
DEC.(1950.0)	$-25^{o}57'26''.6 \pm 0''.5$	$-25^{o}44' \pm 5'$	$-25^{o}45'55''.4 \pm 0''.5$

Since position 2 lies within the quoted error limits of the catalogue while position 1 lies considerably outside the declination limits, the source is assumed to be at position 2.

The radio position of the source was located on the National Geographic Society - Palomar Observatory Sky Survey Plates from comparison with a number of 8th and 9th magnitude stars in the area. The optical positions were obtained from the Cordoba Durchmusterung Catalogue which has positions given to the nearest 0!1 of arc. Within the error limits of the plate measurement, the radio position was found to coincide with the position of an extremely faint object ($\Delta\delta \approx 0''$ $\Delta\alpha \approx 1''$). Since in most cases the optical and radio positions do not coincide exactly, an area twice the radio diameter and several times the optical diameter was examined for other possible objects. The probability of the identification was increased when no other objects were found in this area.

Due to the extreme faintness, any interpretation of the nature of the object was seriously affected by the photographic limits of the survey plates. Figures 3a. and 3b. are 20X enlargements of the source area on the red and blue plates, respectively. In red light, the source appeared to consist of a faint object with two centers of light concentration; while in blue light, there was only one center (apparently brighter than the red) surrounded by a faint halo. A number of different types of objects were examined on the survey plates in attempt to find similarities. While no conclusions could be reached, the blue image was found to be similar in some ways to a faint galaxy with a luminous nucleus. However, the nature of the object was not identified and must await more optical evidence.

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3. Howard, W. E., Astron. J., 66, 521 (1961).
4. Mills, B. Y., Slee, O. B., and Hill, E. R., Austral. J. Phys., 13, 676 (1960).

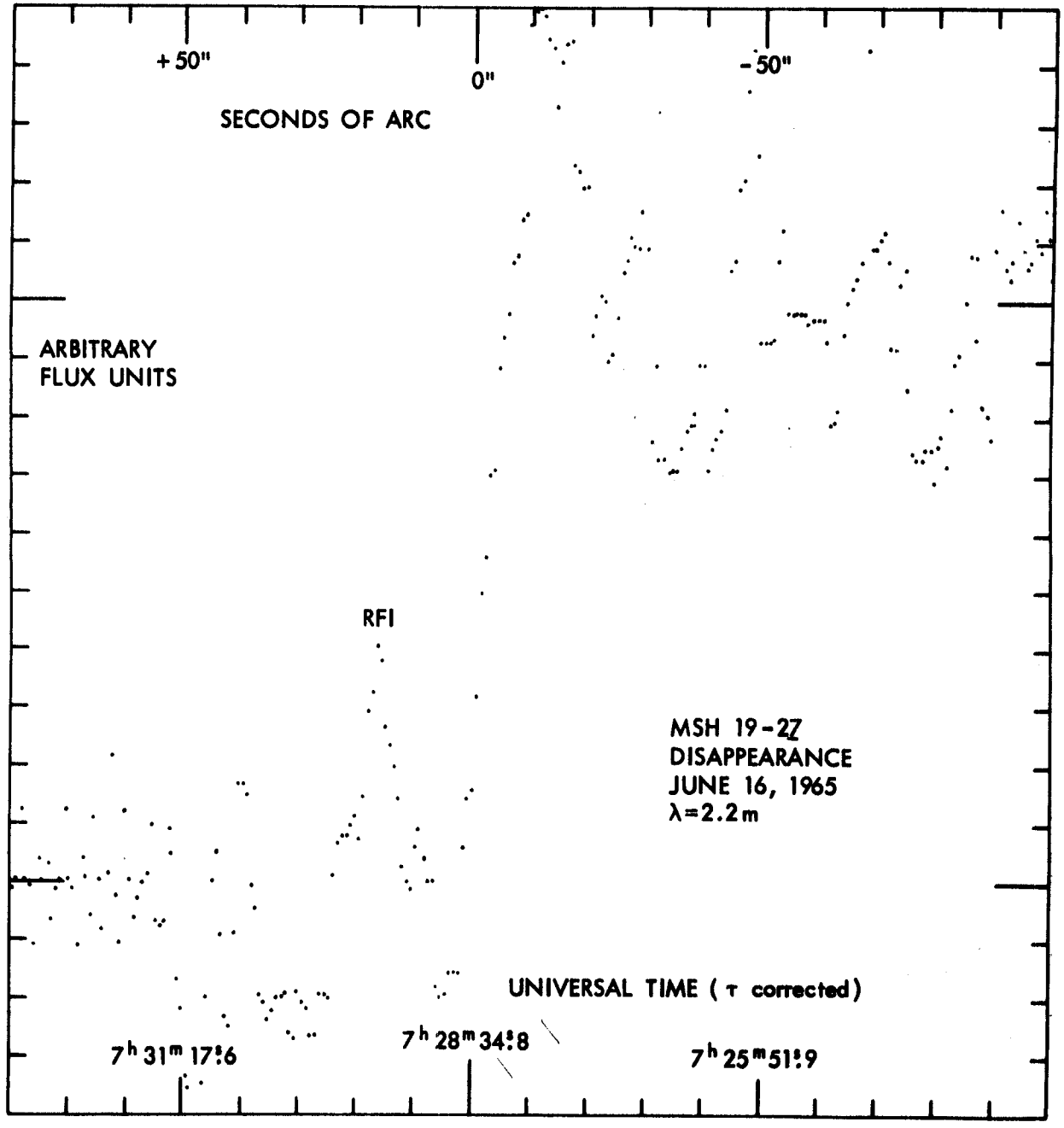

Fig.1a - Digitized Data
Disappearance

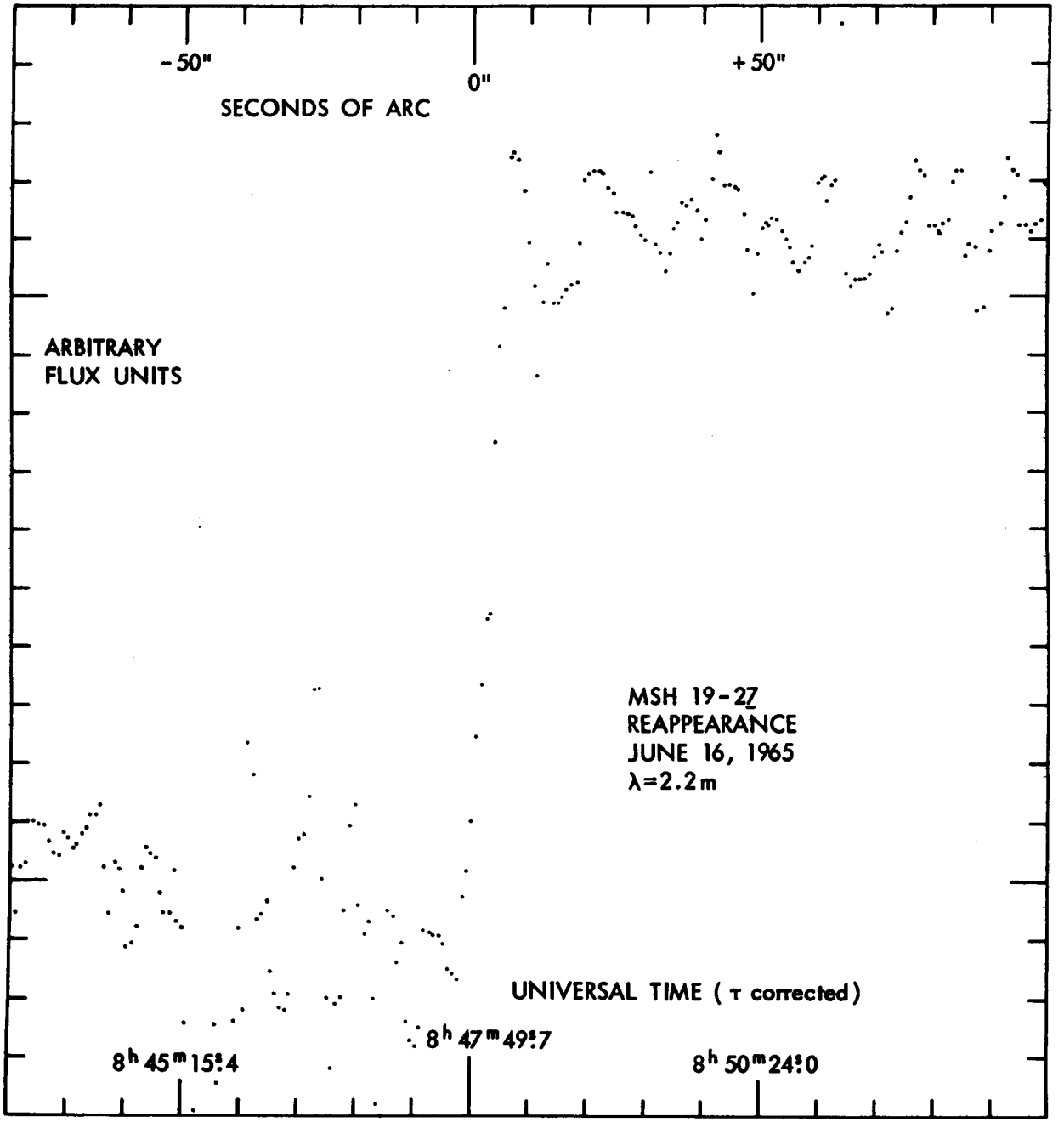

Fig.1b - Digitized Data
Reappearance

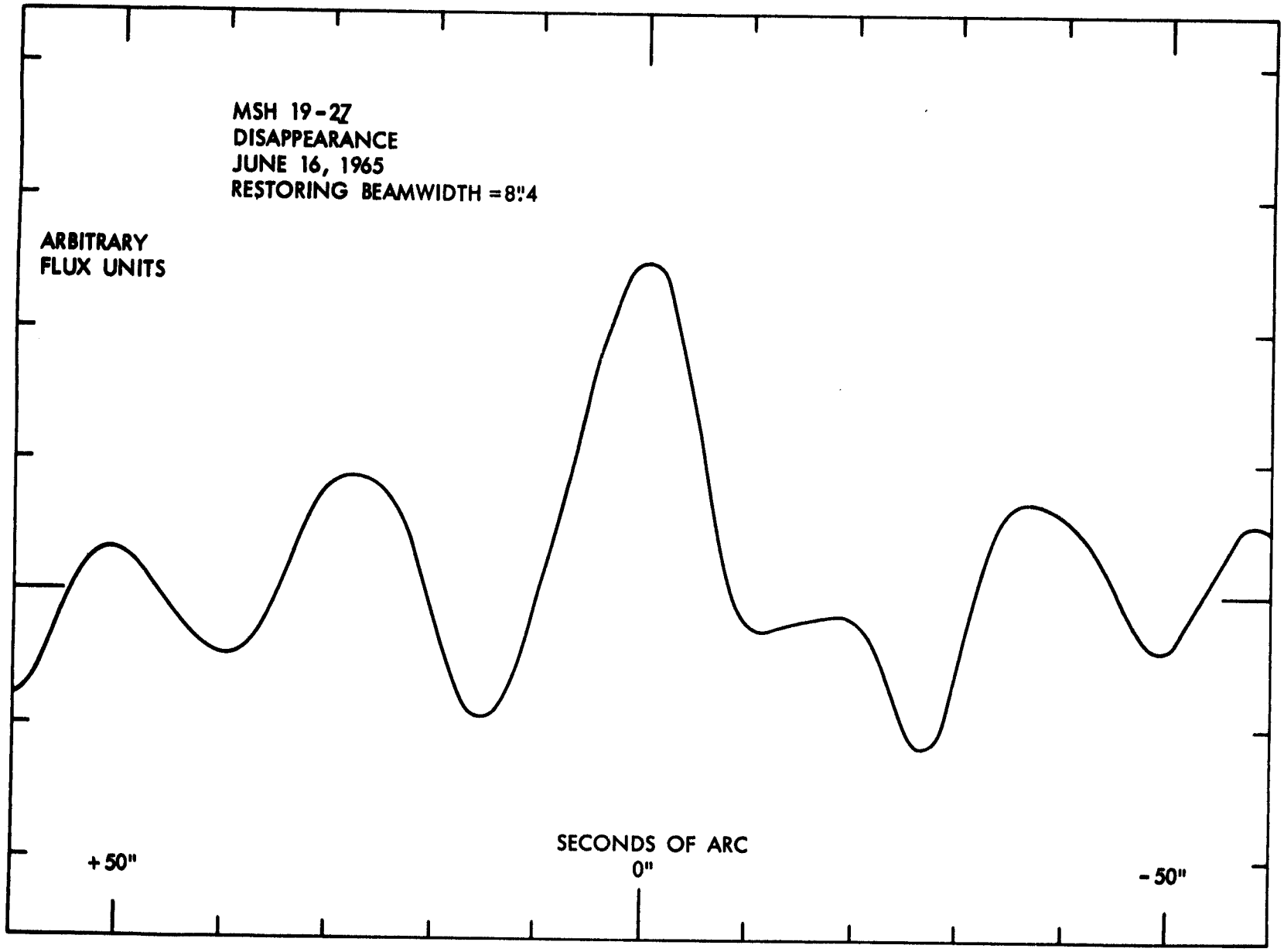

Fig.2a - Restored Data:
Disappearance restored
with a beamwidth of 8".4

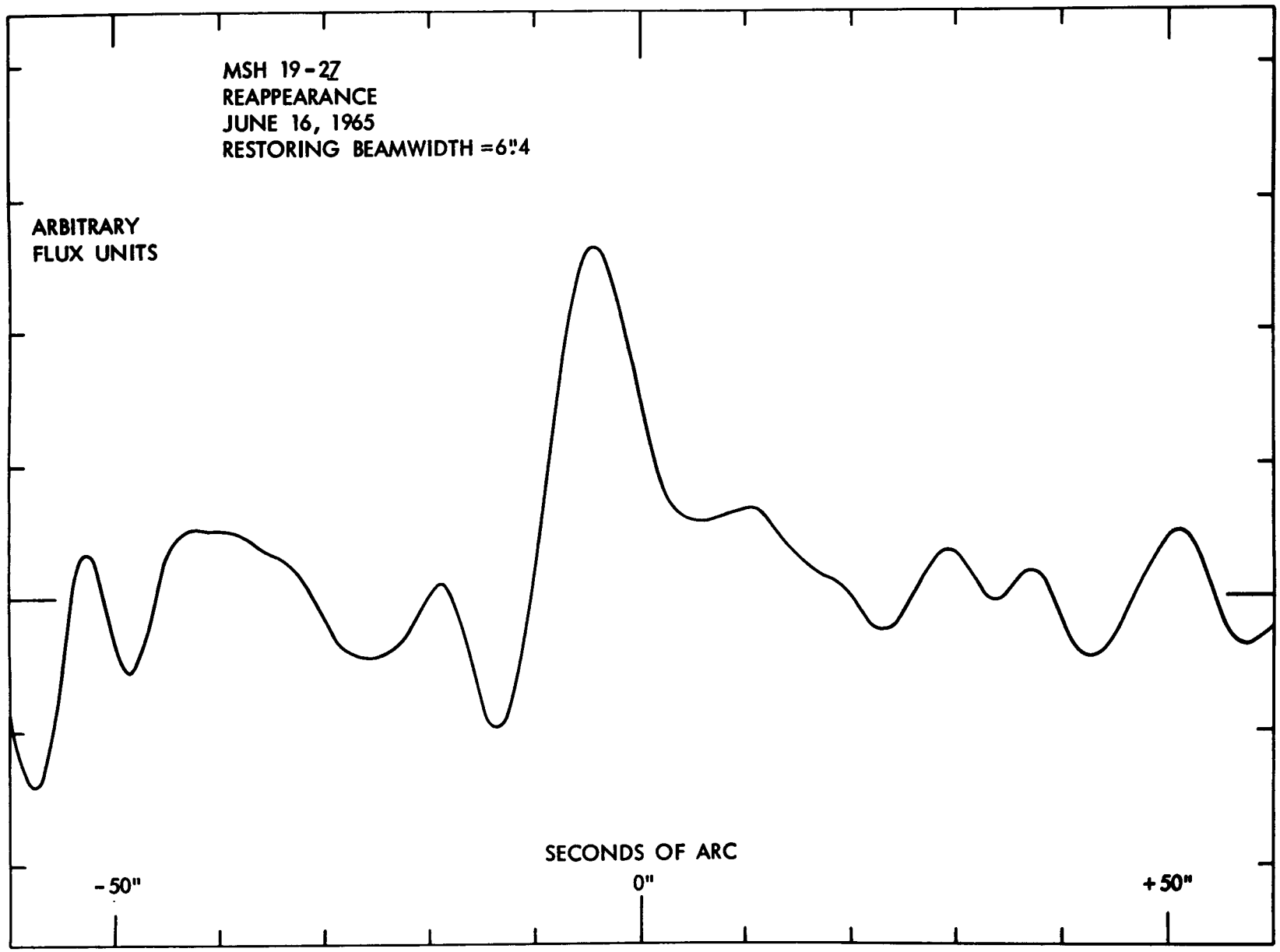

Fig.2b - Restored Data:
Reappearance restored
with a beamwidth of 6".4

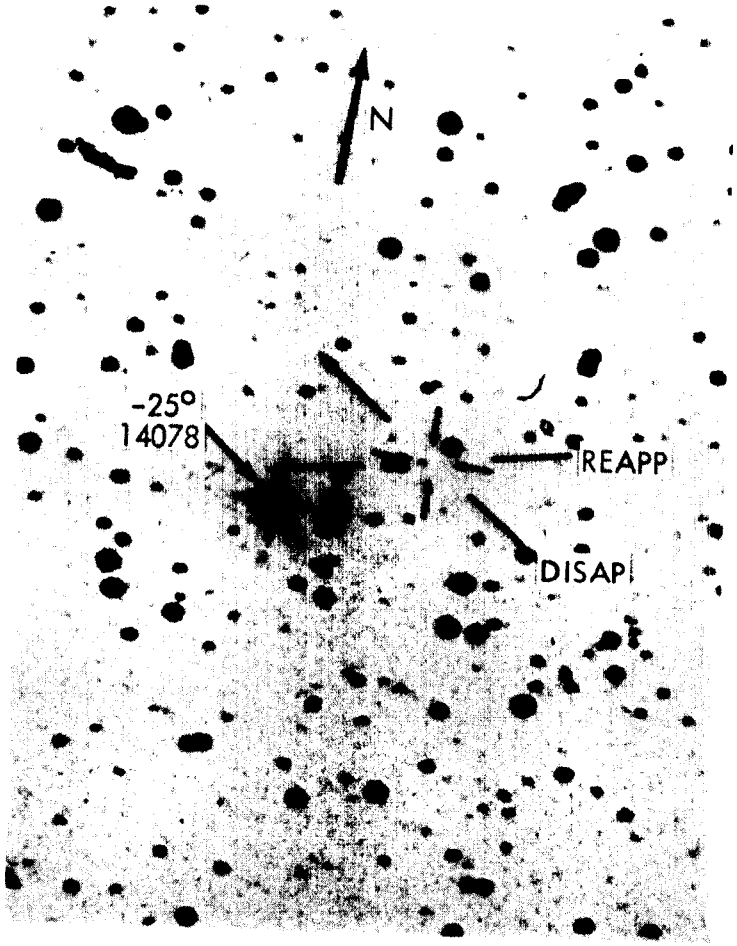

Figure 3a
20X Enlargement of National Geographic - Palomar Survey - Red Plate

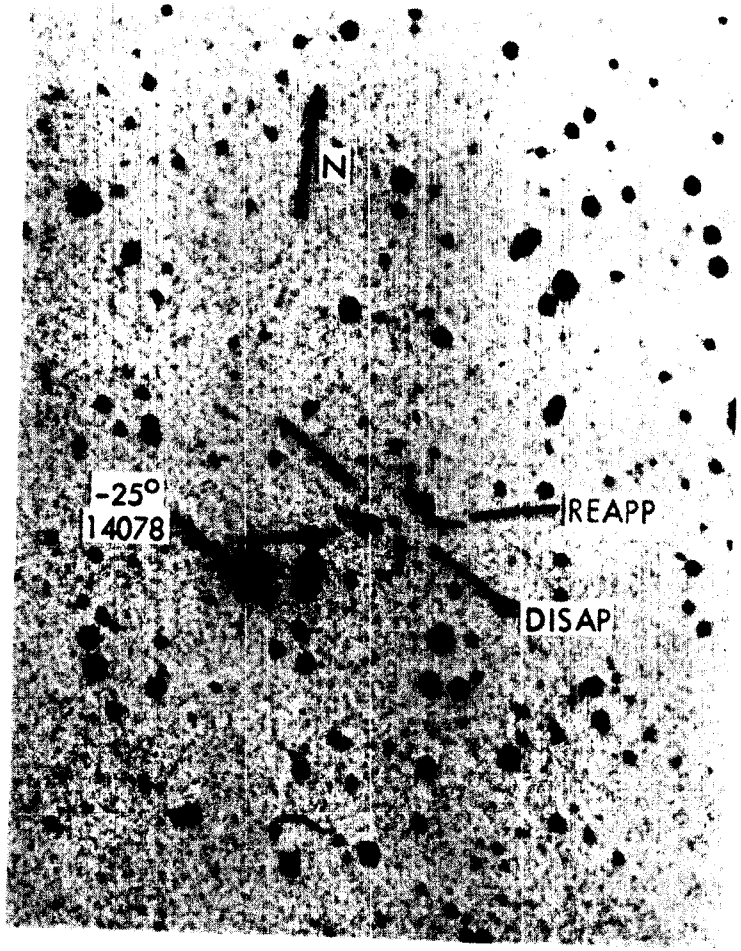

Figure 3b
20X Enlargement of National Geographic - Palomar Survey - Blue Plates