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Search for radio emission from faint variable starlike objects

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A high sensitivity search for 2695- and 8085-MHz radio emission from optically-variable quasar candidates has had negative results.

INTRODUCTION

RECENT studies of the optical spectra of suggested quasar identifications for radio sources have resulted in the recognition of several quasars with very high redshifts (Lowrance *et al.* 1972; Lynds and Wills 1972; Carswell and Strittmatter 1973; Wampler *et al.* 1973). Both the nature and number of such objects are important for observational cosmology because of the significance of systems with high *cosmological* redshift for tests of world-models.

The known high-redshift quasars do not exhibit the ultraviolet excesses characteristic of low-redshift quasars; quasar searches selecting by color might therefore be biased against high-redshift objects. With this in mind, a quasar search based on *optical variability* as a selection criterion was made by van den Bergh *et al.* (1973) using a seven-year 48-in. Schmidt plate collection covering two fields in the vicinity of M31. The detection of radio emission from the faint variable objects recognized in their search would be an important step in obtaining high-redshift quasar candidates.

We report limits to the 2695-MHz (11 cm) and 8085-MHz (3.7 cm) flux densities of twelve of these variable objects, derived from high-sensitivity observations with the three-element interferometer at the National Radio Astronomy Observatory, Green Bank, West Virginia.

I. OBSERVATIONS

The positions of twelve faint optically variable objects discovered on the 48-in. Schmidt plates by van den Bergh *et al.* (1973) were observed between 26 March and 31 March 1973, using the NRAO three-element interferometer at 2695 and 8085 MHz. Each position was tracked for a total observation time of about two hours, separated into five observations at various hour angles to minimize confusion. Maps were produced with a 30-arcmin field of view at 2695 MHz and a 10-arcmin field at 8085 MHz.

The results of the observations are given in Table I. The optical positions (accuracy ~1 arcsec) are given at epoch 1950.0 in the first two columns. The average V magnitude is given next for each object. The observed flux densities at 2695 and 8085 MHz at the optical positions are listed in milliflux units in the next two columns. The rms flux-density error for all sources (estimated from the system parameters) is 1.5 milliflux units at 2695 MHz and 2.3 milliflux units at 8085 MHz. These estimates are valid only for unresolved sources, i.e., less than 9 arcsec in diameter at 2695 MHz and less than 3 arcsec at 8085 MHz. Several radio fields, mostly at 2695 MHz and denoted by a in Table I, contained a source brighter than 20 milliflux units more than 10 arcsec away from the optical object. These confusing sources and their sidelobes were removed before estimating the flux densities of the optical objects.

II. DISCUSSION

There are no significant detections of any of the faint variable objects; the distribution of the flux densities at the positions of the objects is consistent with the estimated random noise. As we have examined these objects with an angular resolution and limiting sensitivity approaching the best that is currently available at radio wavelengths, we conclude that optical investigations are more likely to elucidate the

TABLE I. Radio measurements of faint variable starlike objects.

α (1950.0)	δ (1950.0)	$\langle V\rangle$	Flux density 10^{-29} w Hz^{-1} m^{-2} 2695 MHz	8085 MHz
$00^h32^m03^s.1$	42°37′45″	19.7	0.0±1.5	−0.8±2.3
00 36 15.9	41 52 30	19.5	0.6	−2.3
00 37 05.9	42 52 44	18.8	−0.8	0.0
00 37 29.8	42 44 01	19.1	−1.2	1.7[a]
00 40 49.8	39 40 27	16.9	0.0	−4.8
00 42 28.5	39 37 20	18.1	1.0	0.0
00 43 16.6	40 14 38	18.9	−6.0	−3.2
00 43 35.1	39 15 20	19.0	−1.8	1.4
00 43 36.5	39 15 35	17.8	1.8	−2.8
00 44 02.2	39 22 11	17.5	3.5	−0.7[a]
00 48 47.2	39 56 06	19.9	−1.5	−3.4
00 48 49.3	39 08 54	18.4	1.5	−2.7

[a] Source greater than 20×10^{-29} w Hz^{-1} m^{-2} in the radio field of view at 2695 or 8085 MHz.

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nature of these objects than are radio studies at the present time. We emphasize that our failure to detect radio emission from any of these objects does not imply that they are *not* quasars, as confirmed quasars are known that are radio-quiet at the emission levels investigated here (Wardle and Miley 1971; Katgert *et al.* 1973). The objects might also include faint variable stars, or supernovae in distant galaxies.

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