cosmic radio sources by the moon are being observed regularly. A search is going on for a nonthermal radio-frequency radiation from the planets of the solar system. Using the radio-frequency radiation of cosmic sources, we can study with the aid of the UTR-2 the refraction, damping, and fluctuations of radio waves in the ionosphere. After some changes in the operating conditions of the instrument, it is planned to use it to compile charts of the distributed cosmic radio emissions and, in particular, of the absorption regions of this radiation in ionized hydrogen clouds. Preparatory work is in progress on the construction on the basis of the UTR-2 of several radiointerferometers with long base lines for the measurement of the angular dimensions of radio sources. The execution of these and a number of incidental programs will allow in the next few years a substantial expansion of the volume of information that can be obtained in the decameter band on cosmic radiation.

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V. S. Troitskiĭ. Radioastronomical Observations with the Aid of Interferometers with Independent Reception (with Ultralong Base Lines) in the USSR. The application of interferometers in radioastronomy allowed the measurement of the angular dimensions of sources with a high resolution computed in fractions of the width of the interference fringe and equal to $\Delta = \lambda/d$, where d is the distance between the antennas and λ is the wavelength. Attempts to increase the resolving power of the interferometer by increasing the base line encountered insurmountable difficulties in the construction of long communication lines between the two stations, lines necessary for signal integration and the transmission of heterodyne voltages. From roughly 1965 there began in the USA, Canada, and the USSR (at the Gor'kiĭ Radiophysics Research Institute (GRRI)) the development of interferometers with independent reception based on the registration of signals at each point with the subsequent reproduction and processing. In this case lasers were used at each point as heterodynes; they also guaranteed precise time makings on the signal recording (see, for example, [1]).

The first transcontinental interferometer in the USA and Canada started operating at 67-cm wavelength in 1967. In the USSR the first interferometer with independent reception based on the rubidium frequency standards and with processing on the BÉSM-4 computer was constructed in 1969. In 1969–1970 the dimensions of two quasi-stellar sources were measured at 3.5-m wavelength with the aid of the ASPI (Academy of Sciences Physics Institute) antennas and this interferometer with a 230-km base line. The fringe width was $\Delta = 3''$. These measurements at ultrashort wavelengths with a long base line were the first and, for the present, remain the only ones that have been performed[2]. In Table I the results obtained are compared with foreign data for close values of d/λ: foreign data are available only for shorter waves. The main result of the measurements is that the dimensions of the indicated quasars at a substantially longer wavelength turned out to be roughly the same as at decimeter wavelengths. From this follows the important conclusion that the halo, if there is one, is small, and that scattering by the inhomogeneities of the interstellar and interplanetary media does not lead to a substantial increase.

In 1972, at the GRII, a more accurate interferometric system was constructed jointly with the Byurakan Astronomical Observatory (BAO) of the Academy of Sciences of the Armenian SSR on whose computer, the

TABLE I

$\lambda = 3.5$ m, d = 230 km, $\Delta = 3''$

Source	Frequency MHz	d/λ	Visual range γ	Angular dimensions of source, angle x sec	Position angle θ	Literature
3C 298	86	$6.5 \cdot 10^4$	0.94	$\leqslant 0.4$	32	This report
	1422	$4.7 \cdot 10^5$	0.65	0.2	150	[3]
3C 380 (V)	86	$6.5 \cdot 10^4$	0,8	0.9	24	This report
	1422	$6 \cdot 10^5$	0,43	0.4	0–180	[3]
	2695	$8.32 \cdot 10^4$	0 76	0.8	—	[4]

TABLE II

f = 408 MHz, $\lambda = 73$ cm, d = 1100 km, $\Delta = 0.15''$

Source	Frequency MHz	$d/\lambda \cdot 10^{-6}$	Visual range γ	Angular dimensions of source, angle x sec	Position angle θ	Literature
3C 147	408	1.3	0.27	0.11	58	This report
	408	1.12	0.22	0,13	126	[5]
	1400	2.6	0.2	0.07	128	[6]
3C 273B (V)	408	1.3	0.9	$\leqslant 0.03$	58	This report
	408	4.6	0,48	0.02	95	[5]
3C 286	408	1,3	0.63	0,07	58	This report
	448	1,33	0.5	0.08	52	[5]
	1400	1.75	0.75	0.04	170	[6]
3C 454,3 (V)	408	1.3	1,0	$\leqslant 0.03$	58	
	2690	1.1	0.96	$\leqslant 0.02$	0–180	This report
	4998	2.1	0.99	< 0.02	0–180	[3]

"Razdan-3," the data processing was carried out. Measurements at a fringe width $\Delta = 0.15$ ($d/\lambda = 1.3 \times 10^6$) have been carried out jointly with the Crimean Astronomical Observatory (CAO) at 75-cm wavelength with a 1100-km base line from Byurakan to Simeiz. The results of these measurements are compared in Table II with the data of other authors for the same wavelength. It can be seen from the table that the dimensions of the sources for comparable spatial frequencies d/λ are practically the same for significantly different directions of the cross section of the source (different position angles). It is shown that these sources are practically symmetric.

The main development of interferometry abroad is in the direction of trying to resolve finer and finer details by increasing d to the earth's diameter and decreasing the wavelength. In the USSR investigations at meter and decameter wavelengths are being developed. The importance of this direction is obvious, since it brings in data on extended source structures like the halo or the envelopes of supernovae, etc. At the same time, measurements at ultrashort and decameter wavelengths yield information on the inhomogeneities of the structure of the interstellar and intergalactic media. The interferometric investigations with independent reception at decameter wavelengths were begun at GRRI in 1971, and the dimensions of the remnants of the supernova Cassiopeia A have already been measured at 33-m wavelength (9 MHz). Notice that measurements of the dimensions of this supernova had not been extended below 100 MHz, with the exception of a single measurement at 15-m wavelength carried out in 1959 with the aid of a radio interferometer[7]. The author of this work found the dimension of this source to be equal to 9 and infers the existence of a large halo around the source. Measurements in the 33-m band presented great difficulties because of the amplitude and phase scintillations of the source. The observations were carried out at a time when the critical frequencies of the ionosphere were not higher than 2–3 MHz. The mean of several hundred measurements showed that the apparent dimensions of Cassiopeia A at 33-m wavelength are $8.5' \pm 1'$. However, this two-fold increase in the dimensions as compared to the dimensions for decimeter waves is, as analysis of the measurements showed, most probably connected with diffraction by the inhomogeneities of the ionosphere. The proper dimensions of Cassiopeia A turned out to be roughly equal to $5' \pm 1'$. The increase by 1 in the dimension can be explained by scattering in the interplanetary medium.

Thus, the boundary of the supernova's envelope turns out apparently to be the same in the centimeter-decameter wave band. The measurements on Cassiopeia A are now continuing at frequencies of 6, 9, 13, and 25 MHz. Between February and March, 1971, the Institute of Radio Engineering and Radioelectronics of the Academy of Sciences of the Ukrainian SSR (Khar'kov) carried out measurements at a frequency of 25 MHz on a number of quasi-stellar sources, using the UTR-2 antenna with a 900-km, Gor'kiĭ-Khar'kov base line. An attempt was made to measure the angular dimensions of the sources 3C 196, 254, 273, and 144 (the Crab nebula). Interference was observed from only the Crab nebula, and then only during 1% of the observational time of 630 sec. This is connected with the poor state of the ionosphere during the period of observation*).

In 1969 and 1971 Soviet-American measurements of the dimensions of the compact parts of sources were carried out with a Simeiz-Green Bank base line at 6-, 2.7-, and 1.35-cm wavelengths. The Soviet part of the measurements were performed by the ASPI, the Institute of Cosmic Research, CAO, and others. The apparatus used in these measurements was brought from the USA, and the data was processed on American computers[8] Compact sources of dimension less than 0.3 μsec have been shown to exist.

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M. M. Kobrin, A. I. Korshunov, and V. V. Pakhomov. Quasiperiodic Components in the Fluctuations of the Solar Radio-frequency Radiation. Investigations of the fluctuations in the radio emission of the Sun that were carried out at Gor'kiĭ Radiophysics Research Institute (GRRI) led to the discovery in 1964 of quasiperiodic components (QPC) in the intensity spectrum of the radio emission of the sun with periods of about 300 sec and intensities of up to 2% of the sun's radiation. Further investigations that were carried out on special radiotelescopes, using a quasinull method, allowed the detection of a whole series of QPC with periods of from 100 to 1000 sec and the demonstration of their solar origin. The QPC were detected (in the absence of bursts of radio emission) at 8-mm wavelength as well as at 2-, 3-, 10-, 30-, and 60-cm wavelengths and in the polarization at 3.3-cm wavelength. A connection between QPC of periods T = 180 and 600–900 sec and the active regions was discovered at 8-mm wavelength on the ASPI 22-m radiotelescope. The periods of the QPC detected in the radio emission coincided with the periods of the QPC of the velocity field and the intensity of radiation that have been determined by optical methods for the photosphere and the lower chromosphere.

The existence of QPC was confirmed by a number of authors (Gel'freĭkh, Simon-Shimabukuro, and others). Experiments performed in 1971 with radiotelescopes separated by a distance of 1500 km confirmed the main characteristics of the QPC in the indicated band. Starting from 1969, investigations of the fluctuations were carried out with the object of studying the long-period QPC with periods longer than 1000 sec. In 1969 QPC with periods of 33 and 50 min were discovered at 3-cm wavelength. The possibility of detecting the modulation