

OBSERVATION ON THE RADIO TELESCOPE URAN-4 OF RADIO SOURCES, CONNECTED WITH THE CORONAL MASS EJECTION ON THE SUN

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ABSTRACT. In 2012 and 2013 the observations of radio sources covering by the solar corona was conducted on the radio telescope URAN-4. In obtained data there was fixed the records of the strong radio sources, which had flow level comparable with the 3c461 source. As a result of information analysis from miscellaneous observatories about the solar activity conditions there is done the conclusion that they are connected with the coronal mass ejections which was took place that time.

Key words: radio source, solar corona.

Radio telescope URAN-4 (RT) is the part of long base radio interferometer system (LBRS), which is located on the Ukraine territory from west to east [1]. Working frequency band of this instrument is 10-30 MHz. Radio telescope consist of antenna array with the phased system, system of precision time synchronization and information registration system.

Antenna of the radio telescope is represents the electrically controlled phased array that consist of 128 tourniquet vibrators with the linear size of 232.5 on 22.5 m. It can select two polarized components of the signal. Direction diagram width of this antenna, measured on the half power level on the frequency 25 MHz has value 2.7×22 degrees. In the long base radio interferometer regime there is 2 seconds resolution provided.

In the year 2010 in Odessa radio astronomy observatory URAN-4 of RI NAN of Ukraine there was made the modernization of the equipment resulting in the creation of digital radiometer and software for processing of obtained information.

In 2011 was begun the observations of outer regions of solar corona by the radio sources radiation using the “translucence” method, which is widely used for study of near sun plasma. First experiments used this method was made in 60-th of past age by V.V.Vitkevitch and A.Hjuish. Next years until today many works of researchers from various countries was dedicated to this subject.

In our institute in 1970 in Astronomy journal there was published an article “Crab nebula decameter radiation scattering in solar corona” by S.Y.Braude, A.V.Megn, L.L.Baseljan dedicated to “translucence” observations through the solar corona. Same year and in same publishing

was published theoretical work by P.V.Blyoch, V.G.Sinitsyn, and N.M.Phuks in which considering problems of flat wave spreading in solar corona with account of it scattering and refraction on the large-scale irregularities.

In 2012 the experiments on the RT URAN-4 were continued. In the period from 06.06 to 21.06 the flow of Crab nebulae (3c144) was measured on two frequencies 20 and 25 MHz. During the eclipse the sharp increasing of the source flow was observed on the small elongation angles from Sun, which is comparable with the flow of supported source 3c461. Analyzing the processes which took place that time on the Sun and on the base of information from radio spectrographs of Nancey and San-Vito observatories and also from satellites SOHO and STEREO we intended that these phenomena are connected with the solar flashes.

For the validation of our conclusions, in 2013 we make an experiment, sense of which is showed on the fig.1. For this purpose in the period from 26.05 to 20.06 there were measured flows of Sun and 3c123 and 3c144 sources on two frequencies.

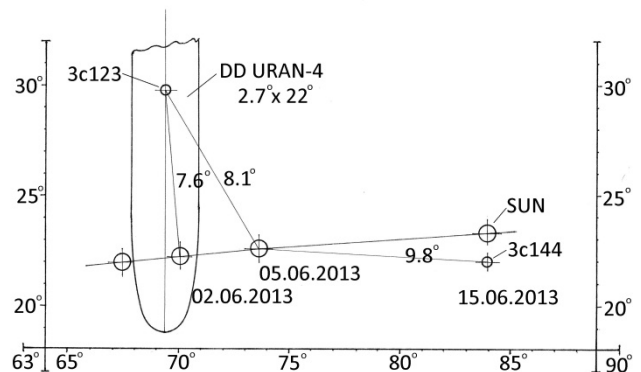


Figure 1: Scheme of experiment.

During the observations 05.06 some source was recorded (fig.2) which flow was similar to those ones that we observed previous year.

That day Sun was placed between two sources with elongation angle 8.1 degree to 3c123 and 9.8 degree to 3c461. Power level of this source three times exceeds level of supported source 3c461.

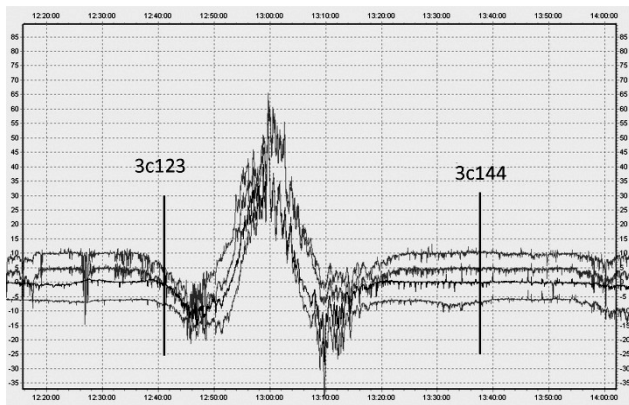


Figure 2: The observed source.

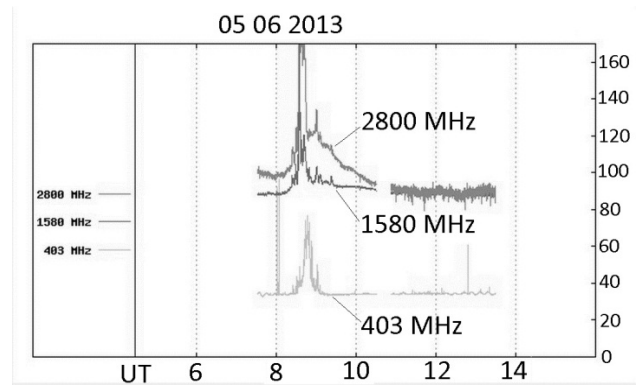


Figure 3: Sun flash on three frequencies.

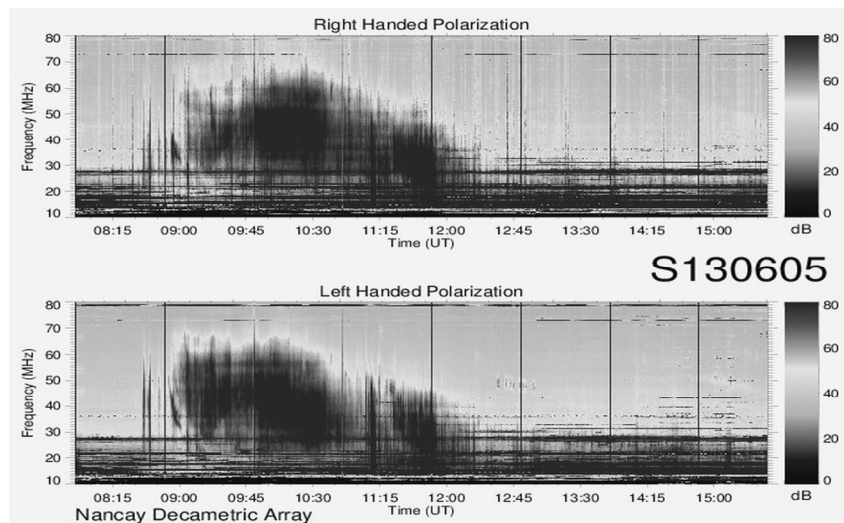


Figure 4: Spectrograph data from Nancey observatory.

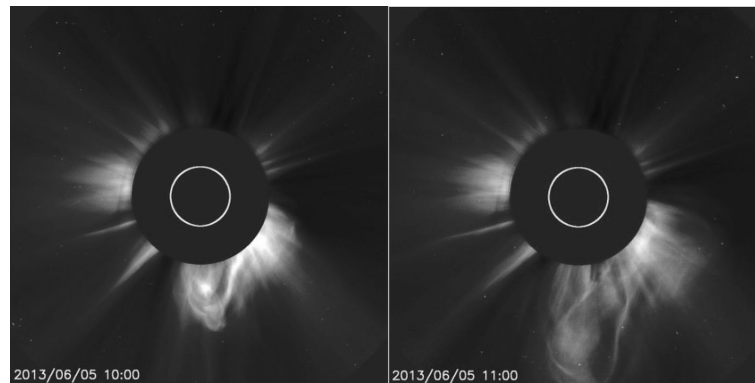


Figure 5: Active processes on the Sun

Analysis of the observations obtained by miscellaneous observatories which we made for this day showed, that according to polish astronomers (fig. 3) who measured on 403, 1500 and 2800 MHz frequencies from 11 hours to 14 hours the solar flashes were took place.

According to spectrograph data of Nancey observatory (fig. 4) which works in the band 20-70MHz, the active processes on the Sun begun in 11.15. In 15.45 the process finished, but some separate flashes were continued until 18.40 and they are visible on the spectra from 20 to 60 MHz frequencies.

According to SOHO observatory data showed on fig. 5, the active processes on the Sun that is connected with the coronal

mass ejections begun in 12.12 (LASCO-2). An expected finish of this process is 15.00, but diffused remainders of the ejected matter were visible until the end of the day.

So, analysis of data from miscellaneous observatories and our observations that we made from 06.06 to 21.06.2012 along with our observations 05.06.2013 showed that we was observe the sources, that was created as a result of solar coronal mass ejections.

References

Galanin V.V. et al.: 1989, Kinematics and Physics of celestial bodies, **5**, 5, 87.