A method for determining interval estimations of bearings and coordinates of the radio source

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Radiogoniometry (direction radio) is widely used in aviation and in the Navy as a means of air and sea navigation, in military affairs, in determining the provisions of satellites, spacecraft, etc. The article describes a method for determining coordinates of the radio source and bearings when receiving a radio radiation source (SRE) using a nonlinear (including annular) antenna system (AS), an arbitrary shape consisting of poorly directed and directional elements (vibrators), and other methods of determining direction, for example based on the Doppler effect, radio imaging, and others. Multistage registration system, as featured on the ground, on aircraft is used. Improvement of the accuracy and reduction of the time to determine the origin of the radio source is achieved by using in determining the bearing of radio sources (SRE), a universal formula describing the complex envelope outputs of the AU, which allows us to obtain explicit expressions to calculate the amplitude and initial phase of the bearing signals. The collected values of bearings from different devices detect the signal of SRE using the methods of confluent analysis obtained equations of the lines in the plane and in space, the intersection of which determines the coordinates of the point estimates of the radiation source. For estimates of bearings and coordinates of the radiation source we obtained covariance matrix scattering estimates obtained from an ellipse or ellipsoid scattering unknown quantities.

Keywords: *bearing, antenna systems, source of radio emission, iterative process, the inverse matrix.*

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Greshilov A.A. (b. 1939) graduated from Moscow Engineering Physics Institute, Department of Experimental and Theoretical Physics in 1964. Dr. Sci. (Eng.), Professor. In 1964–1977 he took part in nuclear tests at Semipalatinsk and Novaya Zemlya proving grounds. In 1967–1968 he proposed and substantiated the method of measuring nuclear charges by gaseous fission products — isotopes of krypton and xenon. This method is in demand in our time for detection of illicit nuclear explosions. Greshilov A.A. is the winner of an international competition announced by the U.S. government in developing methods for detection of nuclear explosions conducted in secret. In 1968 he proposed an original method for measuring the activity of the isotope xenon-133 in natural mixtures by its characteristic X-ray radiation. In 1980s under his leadership there was developed a methodology of forecasting and calculating the five-year plan for the industry "communication". He suggested methods of accounting errors of all input data (confluent analysis) when processing the results of observations and a number of methods for solving ill-posed problems. He is also the author of methods for determining bearings of radio emission in the passive direction finding, which reduced time response while simultaneously improving the accuracy of determining bearing. In recent years Greshilov A.A. pays great attention to writing books on mathematics with attached multimedia disks that can help students to solve problems outlined in his books. He is the author of over 200 scientific papers, including more than 30 monographs, 30 patents on developing mathematical methods of considering uncertainty of the initial information in mathematical physics, pattern recognition, forecasting, and other technical applications. e-mail: agresh@mail.ru