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Cross-Pilot Synchronization of the Phased SDR Antenna Array Formed by a UAV-Group

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Abstract. An algorithm for cross-pilot synchronization of a new type of digital phased SDR antenna array formed by an equidistant UAV grouping of N linearly structured elements has been developed. It is shown that the problem of synchronization of distributed radio communication systems is very relevant and in certain cases is solved by setting the operating mode of each of the elements of the antenna array to full duplex, including the implementation of the principles of building a MIMO system, which is not always acceptable. In this regard, the paper proposes alternative scientific and technical solutions for phase synchronization between drifting independent elements of the receiving SDR antenna array using an external cross-pilot signal. Such solutions are based on determining the time delays between signals from the same source received at different points in space using pilot signals, including industrial radio frequency broadcast signals, such as GSM, GPS, Wi-Fi, etc. When estimating the time delays between the elements of the SDR array formed by the equidistant UAV grouping, it was found that for in-phase signal addition, it is required to delay the first signal by 2.64 discrete samples relative to the second signal at a sampling frequency of 8 GHz. It is shown that in the case of a signal delay of 3 counts, the average correlation value for 25 cross-measurements exceeds 0.89, which indicates a sufficient degree of synchronization between the received signals.

Keywords: synchronization, cross-pilot signal, phased antenna SDR array, UAV grouping, configurable antenna array, digital filtering, correlation processing

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