

**SMALL SIZED UNMANNED AERIAL VEHICLES SIGNAL
PROTECTION AGAINST DETECTION TECHNOLOGIES AND
RESILIENCE OF TELEMETRY SYSTEMS**

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The paper examines the issues of detecting small-sized unmanned aerial vehicles and ensuring the robustness of telemetry systems against signal interference in the event of detection. First, the acoustic, electro-optical, radar, radio frequency and multisensor technologies used in detecting unmanned aerial vehicles are analyzed from a technical point of view, and their advantages and limitations in operating conditions are comparatively evaluated. Then, methods of protection against radio electronic interference (jamming and spoofing) directed against the control and communication systems of detected UAVs are presented - including anti-jamming technologies, frequency hopping (FHSS), complex modulation methods and encryption algorithms. In the experimental part of the article, comparative tests of NRF24L01+ and RFD900x modules at a distance of 100 - 500 meters were conducted in laboratory conditions, and the results were analyzed based on indicators such as SNR, BER, packet loss and delay. The results show that while the RFD900x module provides more stable and interference-resistant communication, the NRF24L01+ can only be used over short distances[1-5].

Laboratory tests and analyses have shown that the performance of UAV telemetry systems is directly dependent on distance and interference conditions. The RFD900x module, with its higher output power and ability to provide a stable signal, has shown superior results compared to the NRF24L01+. Especially at distances above 300 meters, the NRF24L01+ module has increased signal attenuation, packet loss, and transmission delay, which makes it unsuitable for long-range communication. Thus, the RFD900x module is more suitable for use in military and critical communication systems, while the NRF24L01+ is recommended for short-range and energy-efficient applications. It is recommended that interference-resistant technologies – such as FHSS, encryption, and error checking mechanisms - be applied to telemetry systems. Future research should focus on simulating signal protection and LoS / NLoS scenarios in systems operating with limited power[6-8].

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STATEMENT OF THE INVERSE PROBLEM OF THE TIKHONOV-LAVRENTIYEV TYPE

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The relationship between the memory of objects and inverse problems of mathematical physics. In the physical sense, the memory of an object means that a material or environment does not forget the effects of the past, that is, its current state depends not only on its current conditions, but also on the history of previous loading and effects. In memory systems, differential equations often take the form