

# Synthesis and Analysis of the Optimal Signal Detector in Interrogating Radio Engineering Systems

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**Abstract**—This document presents the synthesis and analysis of the optimal interrogation signal detector in aircraft transponders of interrogation radio engineering systems under the action in the interrogation channel of interrogation signal streams emitted both along the main and side lobes of the interrogator antenna, as well as deliberate uncorrelated and correlated interference. It is shown that taking into account the elements and their arrangements in the structure of the detector that evaluate the amplitudes of useful signals, as well as the excess of the amplitudes of superimposed interfering signals over them, makes it possible to stabilize the probability of false alarm when useful request signals are detected and, as a result, to improve the quality of detection of interrogation signals in aircraft responders.

**Keywords**—radio engineering systems (RES), aircraft transponder, request signals (RS), air traffic control (ATC).

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