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Visibility range of the laser and LED signaling lights at runway aircraft landing

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Complex usage of radio and lighted landing aids is the most efficient way to increase the regularity and safety of flights. The light signaling navigational information of lighted landing systems (LSs) is simple in its perception and the manned LS itself is highly reliable with a change in meteorological conditions, first of all, in meteorological visibility. This is what predetermines the intense development and continuous improvement of lighted LSs. The paper presents calculation results obtained for the laser landing system (LLS) efficiency on the base of determining minimum required scattered radiation fluxes from fixed extended landmarks (FELs) which are LLS indicators in the case of visual FEL detection in real operational conditions. It is shown that the minimum required powers for a reliable detection of course glide beams in night conditions from distances L ≈ 1.0–1.6 km at meteorological visibility Sm = 800 m (ICAO category 1) are Pmin = 0.5 W. Results of calculations for the luminous intensity from light emitting diode lights necessary for reliable visual detection of runway lights also are presented. Along with this, the estimation of laser radiation safety during visual observation of sources is important when developing and operating LLSs. Methodological problems and theoretical results on determining boundaries of laser-dangerous zones (LDZs) during the action of direct and scattered radiation created by LLS on human eyes are discussed. Dimensions of LDZs are calculated for a single laser source and a group of sources for different meteorological conditions.

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