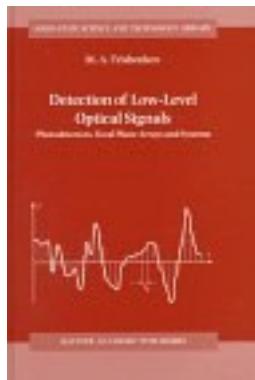


# Detection of Low-Level Optical Signals



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This book is intended for designers of military and civil systems, such as systems for guiding and control, target acquisition, surveillance, laser range-finding, fiber-optical communications, thermal imaging and the like, as well as for designers of photodetectors for optical signal detection. The first question they face is how to detect an ultimately weak optical signal. This book gives the answer to this most important question. All the main types of photodetectors are considered, from photodiodes (including avalanche photodiodes) to focal plane arrays (FPA). Methods of matching photodetectors with preamplifiers are described. The pair photodetector plus preamplifier is treated as an integrated detection system. Much attention is paid to different types of noise and ways of maximising the signal-to-noise ratio (SNR). Foundations of theory of optimal filtering of photosignals are discussed taking due account of typical shapes of optical signals and noise spectra. Methods for tuning quasi-optimal filters to maximise the SNR are explained. The main problems associated with detection of low-level optical signals are considered: operation of avalanche photodiodes in photon count mode, filtering in the case of charge accumulation in FPA cells, and the effect of the number of pixels and geometry of FPAs on detection. Finally, using the examples of the laser range finder and IR Imager, we give guidelines for calculating the limiting parameters of optoelectronic systems to

achieve the highest possible SNR. The book is based on many years' experience by the author and his colleagues in the development of photodetectors and FPAs. The book is aimed at research workers, engineers, students and postgraduates.

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