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An Optimal Matching Design Method of Space-Based Optical Payload for Typical Aerial Target Detection

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Abstract : In order to effectively detect aerial targets over long distances, an optimal matching design method of space-based optical payload is proposed. Firstly, main factors affecting optical detectability of small targets under complex environment are analyzed based on the full link of a detection system, including band center, band width and spatial resolution. Then a performance characterization model representing the relationship between image signal-to-noise ratio (SCR) and the above influencing factors is established to describe a detection system. Finally, an optimal matching design example is demonstrated for a typical aerial target by simulating and analyzing its SCR under different scene clutter coupling with multi-scale characteristics, and the optimized detection band and spatial resolution are presented. The method can provide theoretical basis and scientific guidance for space-based detection system design, payload specification demonstration and information processing algorithm optimization.

Keywords : space-based detection, aerial targets, optical system design, detectability characterization
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