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On the influence of background temperature on the threshold sensitivity of a modern thermal imaging devices

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An engineer's method has been developed for recalculating the threshold sensitivity of modern highly sensitive staring thermal imaging devices (TID), determined by a noise equivalent temperature difference, from the normalized background temperature of 295 K to its actual temperature. The technique takes into account the photonic noise caused by the radiation of the background and the TID itself, the noise of the dark current and the spatial noise arising from the residual, after correction, the sensitivity spread of the elements of the matrix photodetector (focal plane array). The dependence of the threshold sensitivity of the TID on the background temperature and parameters characterizing the photodetector is investigated. The research results are presented in a form convenient for practical use. It is concluded that the high threshold sensitivity of modern TIDs is maintained even at low background temperatures.

Keywords: thermal imaging device, threshold sensitivity, background temperature.

REFERENCES

1. Baloev V. A., Il'in G. I., Ovsyannikov V. A. and Filippov V. L., Efficiency, clatter-protection and clatter-stability of electro-optical imaging systems, Kazan, KGTU izdatel'stvo, 2015 [in Russian].

2. Dhar V., Khan Z., Sharma R. and Muralidharan R., Proc. SPIE **8014**, 80140P-1 (2011).

3. Findlay G. and Cutten D., Applied Optics, № 23, 323 (1989).

4. Hodgkin A., Kowalewski B., Tomkinson D., Teaney B., Corbin T. and Driggers R., Proc. SPIE **6207**, 620708-1 (2006).

5. Li I. I., Avtometriya, № 2, 131 (2001) [in Russian].

6. Webb C. and Halford C., Optical Engineering **38** (5), 845 (1999).

7. Holst G., Electro-optical imaging system performance. 3 ed., US, SPIE press, 2003.

8. Patrashin A. I., Applied Physics, № 2, 103 (2010) [in Russian].

9. Ovsyannikov V. A., Ovsyannikov Y. V. and Filippov V. L., Kontenant, № 1, 60 (2019) [in Russian].

10. Ebbutt G., Griffith H. and Williamson J., Jane's C41SR and mission systems. Joint and common equipment 2017-2018, US, IHS Markit, 2018.

11. Ovsyannikov V. A. and Filippov V. L., Kontenant, № 4, 68 (2019) [in Russian].