PACS: 42.72. Ai, 42.79. Pw.

On the possibility of simplifying the technique for measuring the temperature-frequency characteristic of staring thermal imaging devices

V. A. Ovsyannikov and Y. V. Ovsyannikov

JSC NPO "State Institute of Applied Optics"
2 Lipatova st., Kazan, 420075, Russia
E-mail: gipo@telebit.ru

Received 1.11.2022; revised 15.11.2022; accepted 29.11.2022

This paper presents an analysis of the legitimacy of using a simplified technique for experimental evaluation of the static temperature-frequency characteristic (TFC) of modern staring thermal imaging devices operating in a contrast-limited mode where their effectiveness is limited by extreme contrast sensitivity of the operator's visual apparatus. The technique is based on detecting a dip in the image of two adjacent bands of a standard four-bar thermal test-target located in the optimal phase relative to the structure of the matrix photodetector when the depth of this dip is maximum. We have established the relationship of this characteristic with the dynamic TFC, which is measured during transverse motion of the device's field of view relative to the test-target, and is the most accurate at determining the capabilities of devices to detect and recognize objects. Practical recommendations for converting the measured static TFC to the dynamic one have been formulated.

Keywords: thermal imaging device, temperature-frequency characteristic, bench testing.

DOI: 10.51368/2307-4469-2023-11-1-61-70

REFERENCES

1. Chrzanowski K., Testing thermal imagers, Military university of technology, Poland, Warsaw, 2010.

2. 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, KGTU izdatel'stvo, Kazan, 2015 [in Russian].

3. Ovsyannikov V. A. and Filippov V. L., Oboronnaya tekhnika, № 3, 3 (2017) [in Russian].

4. Ovsyannikov V. A. and Ovsyannikov Y. V., Usp. Prikl. Fiz. **10** (1), 53 (2022) [in Russian].
DOI: 10.51368/2307-4469-2022-10-1-53-62

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

6. Driggers R., Webb C., Pruchnic J., Halford C. and Burroughs E., Optical Engineering **38** (5), 852 (1999).

7. Wittenstein W., Optical Engineering **38** (5), 773 (1999).

8. Teaney B., Reynolds J. and Du Bosq T., Proc. SPIE **9452**, 94520H-1 (2015).

9. Shtokolov E. A., Shlychkov V. I. and Zolotarev A. I., Kontenant № 1, 13 (2012) [in Russian].

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

11. Holst G., Proc. SPIE **9452**, 94520K-1 (2015).

12. Olson C., Theisen M., Pace T., Halford C. and Driggers R., Proc. SPIE **9820**, 98200B-1 (2016).