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Intra-pixel response test method for high encircled energy infrared detector

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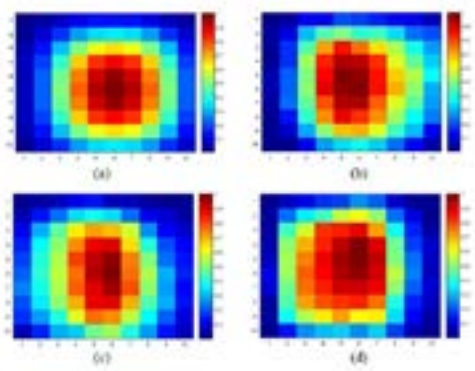
The infrared system used for weak point target detection has high encircled energy and the accurate measurement of the intra-pixel response is the key to realize high-precision radiation calibration and combined positioning of the detection system. A variety of test methods have been established to measure the intra-pixel response in the visible detector pixels, such as the spot scan with the microscopy system. However, there are few types of research about the test method of the intra-pixel response of infrared detectors due to its location in the Dewar cold space. In this paper, an intra-pixel response test method for high encircled energy infrared detection photoelectric system is proposed and a mathematical model for intra-pixel response calculation is established. The test system consists of a small hole that simulates a point target, a collimator, a turntable and an optical system of the infrared detection system itself. The PSF of the optical system is restricted. Based on the established model, the intra-pixel response parameters of the detector's pixels are calculated by the method of grid search and optimized by the cross-validation method. Several pixels are selected to test and the data is collected by scanning 10×10 spots in a single pixel with a different radius of holes. The same pixel in the detector is tested with small holes of different radius, the consistent intra-pixel response and PSF of the optical system are obtained, which proves the effectiveness of the method. Finally, the internal response function was verified by the geometric positioning method and the error was within 8%.



Biography

Fansheng Chen has completed his PhD in the year 2007 from SITP (ShangHai Institute of Technical Physics of CAS). He is the Professor of SITP, a premier optical remote sensing instrument organization. He has published 32 papers in the main academic journals and authorized 10 patents..

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