

MODERN LASER RANGEFINDING

*Muraviov O. V.**National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»,
Kyiv, Ukraine, stals98@ukr.net*

The accuracy of distance measurement has always been an important metrological problem which relates to various spheres of human activity: military complex, aerospace industry, geodesy, robotics, photo equipment and many others. Development of laser rangefinding technology has begun in 1964 with the invention of pulsed solid-state lasers, but in our days higher demands are being placed on instruments of this class due to the fact that they are using in high-precision positioning and object detection systems.

Not so long time ago the main characteristics of laser rangefinder were parameters of optical system (relative aperture, transmission coefficient, focusing accuracy on the photodetector) and power of included to structure laser. The major problems of rangefinding were inhomogeneities in the refractive index of the atmosphere and effect of temperature, pressure, humidity along the route. These external factors undoubtedly affect to geometric trajectory and duration of the laser beam. Today the decisive role in solving of these problems is played by mathematical processing of the signal which received from photodetector and its characteristics stabilization. For example, modern avalanche photodiodes at certain conditions allow to get coefficient of multiplication $M > 1000$, that gives possibility to register the individual falling photons and, therefore, to simplify laser rangefinder objective design [1]. Latter will significantly reduce the cost of such device, since optical materials used in the near-infrared range of spectrum are mostly artificial crystals, which are requiring considerable financial and time costs for their growth.

Modern laser rangefinders, as a rule, operate in the near-infrared range, which is primarily due to the absence of compact high-frequency pulsed lasers in the middle and far ranges of infrared spectrum. Solution of this problem will allow this class of devices to work in other spectral ranges, where the nomenclature of optical materials is much wider and there is also no background solar radiation, whose concentration on the earth's surface includes wavelengths from 0,29 to 2,5 micrometers [2].

Keywords: laser range finder, distance measurement, signal processing, avalanche photodiode.

References

- [1] Морозов М. А. Современная лазерная дальнометрия / М. А. Морозов, А. В. Муравьев // Новые направления развития приборостроения: материалы 9-й международной научно-технической конференции молодых ученых и студентов, 20-22 апреля. – Минск, Беларусь, 2016. – С. 38.
- [2] Кучеренко О.К. Вплив температури на абераційні властивості ІЧ-об'єктивів / О.К. Кучеренко, О.В. Муравйов, Д.О. Остапенко. // Наукові вісті НТУУ "КПІ". – 2013. – № 1. – С. 99-105.