

The optical device for measurement a reflector antenna surface

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The shape control of the antenna reflector is carried out by a variety of optical methods and devices [1,2]. In particular, the triangulation method is used to study the reflector surface. The coordinates of surface points are defined as a location of intersection of two light beams outgoing from the ends of the measuring base. The control of reflector surface with an accuracy of 0.3 - 0.5 mm requires to control the directions of beams with an error in several angular seconds, which is a technically difficult task and requires expensive equipment.

In the report we consider an optical device, Fig. 1, that performs the surface measurements at fixed and a priori well-known angles of the direction of light beams. This device, using diffraction gratings 7,9, creates sets of optical marks on the surface S, the angular distance between which is determined by the frequency of gratings strokes. The mutual imposition of the corresponding marks on the surface S is achieved by moving the elements 9,10 along the measurement base and turning the mirror 10.

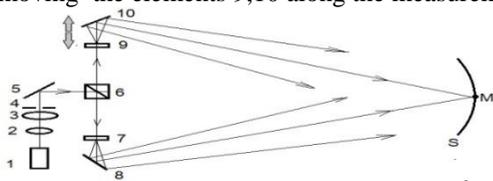


Fig.1. Optical scheme of the device: 1 – laser; 2,3 – collimator; 4 – diaphragm; 5,8,10 – mirrors; 6 – beamsplitter; 7,9 – diffraction gratings; S – surface of the reflector. M-point of the surface.

The mathematical model analysis and experimental testing showed to achieve the coordinates accuracy of 0.3 – 0.5 mm, it is sufficient to control the base longitudinal displacement with accuracy of several hundredths of a millimeter, what can be easily implemented, for example, by an optical linear encoder.

- [1] Axel Donges, Reinhard Noll. Laser Measurement Technology. Fundamental and Applications. ISBN: 978-3-662-43633-2.
- [2] Palamar M., Zelinsky I., Yavorska M. The device for remote measurements. of parameters of antenna reflectors. Вимірювальна техніка та метрологія, №76, 2015 .