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Optimization of parameters of device for measuring the luminous intensity of distant source.

The development and the research of characteristics of photometer which is an optic-electronic device has been carried out. This device is used for measuring irradiance from low-size sources in the plane of entrance pupil. The measurements allow to calculate the luminous intensity of a distant source.

The peculiarity of the photometer's work is the fact that the flux of radiation from a source is considerably less than the flux from radiation background of equal brightness. That is why it was necessary to achieve flux suppression from radiation background using optical methods in order to develop this device.

The second peculiarity of the photometer's work is connected with electronic circuit of signal processing. This electronic circuit must provide tracking frequency of reference signal for modulation frequency and also independence of output signal from the phase of input signal.

The structure chart shows all these peculiarities of the device. The device consists of an optical and electronic parts. The connection between them is achieved with the help of a radiation detector.

All elements of this structure chart such as the radiation detector, the condenser, the flux modulator, the electronic circuit of signal processing have been developed and analyzed during the work.

The optical part consists of the reflecting objective and the condenser. The reflecting objective is constructed according to the Cassegrain arrangement (mounting) with the application of plane specular reflector.

The electronic part consists of preliminary amplifier, amplifier, signal detection circuit, reference generator, power unit.

As a result of this work has been developed the device whose basic characteristics are illustrated in table 1.

Table 1. The basic characteristics of photometer.

Spectral range, мкм	1,7-3,2	The distance between the center of condenser and the center of raster, mm	67,0933
Minimum irradiance of entrance pupil, W / cm^2	10^{-10}	Modulation factor of background	$2,1 \cdot 10^{-7}$
Measurement accuracy, %	0,44	Modulation factor of souse	0,635059
Field of vision, $2\alpha, ^\circ$	4	Number of pairs of raster strokes	57
Aperture ratio	1:3,5	Factor of noise	1,4
Diameter of entrance pupil, mm	314,74	Supply voltage, V	15
Diameter of radiation detector, mm	46	Amplification factor of amplifier	22,5
Diameter of condenser, mm	78	Light-emitting diode	GaAs(0,985μm)
Type of radiation detector	In As	Photodiode	Si(1 μm)
Detection ability, $W^{-1} \cdot cm \cdot Hz^{1/2}$	10^{-9}		