Correcting of Non-uniformity of Brightness of the Image in a Scanning Microscope

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Abstract – **The reasons of occurrence of non-uniformity of brightness of formation of the image of researched microobject in the scanning television optical channel are analyzed. Ways of removal of components of non-uniformity of a signal are specified.**

Key words **– Scanning microscope, Non-uniformity of a signal, Microobject.**

I. INTRODUCTION

At photometry biological microobjects non-uniformity of brightness of the formed image influences reliability of results of measurement, for example, concentration of the certain protein and its localizations in a cell with the help of fluorescent markers. Studying of the reasons of occurrence of this non-uniformity, ways of their removal or correction in view of algorithms of dynamics of work of electronic circuits is very necessary.

II. CORRECTING OF NON-UNIFORMITY OF BRIGHTNESS

The structural scheme of scanning television optical microscope (STOM) from the point of view of change of size of a signal on a working field of the screen of a microscope at its work on translucence is submitted on fig. 1. The block of scanning electron beam tube BSEBT, optical channel OC, an objective O, researched object RO, condenser C, photoelectronic multiplier PEM, the former of video signal FVS.

On change of size of a signal on a working field of a microscope to which there corresponds the image, influence electron beam tube (EBT) on which screen the scanning raster is formed, the optical channel who collects light past through researched object (or reflected from it with the help of a translucent mirror which is used in the optical channel of a microscope working on reflection) and the photoelectronic multiplier which transforms a light signal in electric.

Change of size of a signal is influenced with following parameters EBT:

- non-uniformity of a luminescence of a scanning spot on the screen of a tube depending on its site;
- change of the size of a scanning spot on the screen of a tube on a working field of a scanning raster;
- astigmatism of a scanning spot on a working field of a scanning raster;

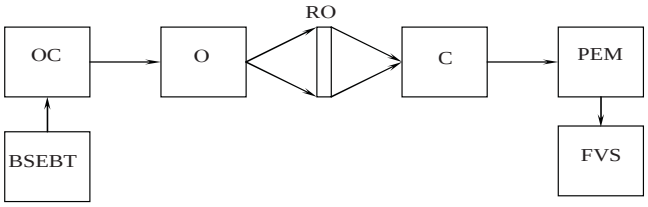

Fig. 1. The structural scheme of STOM at its work on a translucence

- non-linearity of sweep of a scanning spot;
- distortion deviation of a scanning spot;
- noise of phosphor of scanning EBT.

The reason of change of size of a signal can be parasitic light-fogging of the optical channel, and also heterogeneity of factor of reflection of a translucent mirror. The objective makes changes to size of a signal for the account: a) non-uniformity of factor of transfer of a light signal; b) dependences of factor of transfer on a spectrum of a signal; c) astigmatism and distortion.

Condenser changes size of a signal in connection with heterogeneity passing of the light in the center and at edges. Sources of instability of size of an input signal for account of PEM are the following:

- non-uniformity of sensitivity of PEM target;
- change of PEM sensitivity at change of a supply;
- noise of PEM;
- change of sensitivity of PEM from various factors.

The opportunity to compensate change of brightness of a luminescence of a spot by two ways is considered:

- by dynamic change of brightness of a scanning spot due to submission of an additional adjusting signal on the modulator of a tube or respective alteration of amplitude of pulses to light spot at a point-coordinate way of formation of a scanning raster;
- by respective alteration of factor of amplification of formation of video signal.

The technique of calibration STOM is developed with the purpose of maintenance of the minimal non-uniformity of brightness of formation of the image of researched microobject.

III. CONCLUSIONS

Ways of correction of non-uniformity of luminescence EBT are offered allow to reduce non-uniformity of brightness of the image at use of calibration from 40 % up to 5 %.

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