

# Features of Execution of the Converter Pressure in Scanning a Television Optical Microscope

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**Abstract** – Ways of design of precision voltage-current converters (VCC) are proposed. VCCs are used for formation of currents in deflection coils with high accuracy and stability. Currents form scanning raster on high resolution ELT screen.

**Keywords** – scanning microscope, voltage-current converter, inductive load, negative feedback, accuracy of parameters, temperature stability of parameters.

## I. THE INTRODUCTION

Efficient key developments are used for raster formation in television and chamber microscopes with use of electronic beam tubes. However, such developments do not allow changing sizes within large limits and shift reduced raster along the whole area of the tube screen. Operations of raster size change and its movement in scanning microscope allow scaling fragment of the image of investigated microobject on the screen of video-control device without losing its resolution. For that purpose precision signals of developments are converted to current of corresponding deflection coils.

## II. VOLTAGE-CURRENT CONVERTERS

To provide high accuracy of conversion of input signal into loading current VCC is used designed complying with DC amplifier circuit with negative current feedback. The feedback signal is formed on precision thermostable resistor connected serially to loading.

The necessary VCC gain factor is defined not including feedback impact, necessary to provide necessary accuracy of current formation in loading. Static errors of current formation error in loading have been analyzed which are firstly defined by instability of comparative resistors, adjusted input bias voltage drift, instability of feedback resistor, gain factor instability, supply voltage instability.

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Current adjustment rate in inductive load depending on signal amplitude on VCC input is analyzed. It is shown that current adjustment time in inductive loading at large amplitude of input signal consists of three components: 1) adjustment time of maximum value of voltage at loading, 2) current adjustment time in loading to certain value when feedback starts working, 3) current adjustment time in loading in loading when all VCC cascades work in linear mode.

It is shown that in small signal mode adjustment time is defined mainly by VCC bandwidth at high frequency and own resonance frequency of inductive loading. The connection between bandwidth expansion and circuit operation stability is shown. The impact of shunting resistor's resistance value to current adjustment accuracy in loading and amplifier' operation stability is defined.

Ways of VCC rate improvement while applying large amplitude signal to its input are analyzed. Possibility of additional supply by application of additional two sources connected directly by deflection signal is considered. It is shown inexpediency of application of circuits with storage inductance or capacity of capacitor in precision VCC. Possibility of implementation of VCC using dialogue operating mode with personal computer for blocking of development signal for the period of transition process of current adjustment in loading is considered.

## III. CONCLUSIONS

Suggested voltage-current converter provides:

- formation of complete raster in selected operating mode of scanning microscope;
- high accuracy and stability of current formation in deflection coils complying with input signals;
- reduction of consumed power by application of additional supply for period of transition of current adjustment;
- shift of reduced raster to any point of scanning tube screen that allows to investigate microobject's fragments in increased scale without loss of resolution.