Current Regulator with Compensation Circuit Current in the Primary Pulse Converter

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Constant current regulators are widely used in the electronics devices development. There are two types of current regulators: linear and pulsed. Linear current regulators provide fast response time of an automatic control system. However, this regulators' efficiency is poor (this efficiency is calculated as $\eta = 1 - U_2/U_1$, where U_2, U_1 stabilizer's output and input voltages). Pulsed current regulators provide high efficiency, but there fast response time is limited by both control circuit and high-value smoothing capacitor. Different linear and pulsed regulators combinations (eg. cascade connection method, current compensation) are implemented for the high efficiency and response time regulators designing [1].

We suggest current regulation module, which is based on the linear and pulsed current compensative regulators parallel connection in the primary circuit of the pulse transformer. Structural diagram is shown on the Fig. 1.

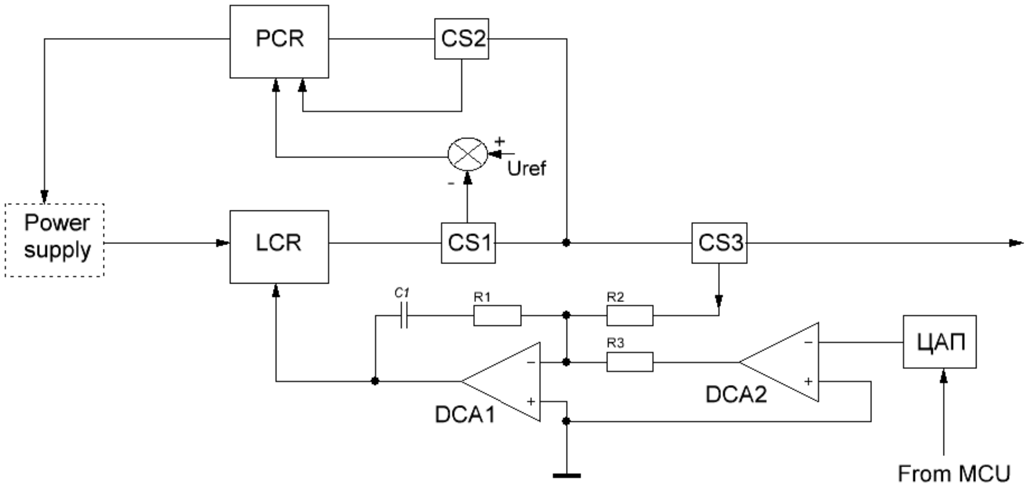

Figure 1 - Functional circuit current regulator

This current regulator operation principle is based on the special control of the PCR and LCR to equate current through the regulator with the set value. This value is driven by DAC and error is amplified by DCA1. Therefore, on the DCA1 input DCA2 negative voltage sums up with the positive voltage from the CS3 current sensors. The PCR and LCR adjusting characteristics are chosen to equate steady state LCR current with 5-10 % of the initial current. LCR consumes all current during the period of the DAC peak voltage alteration within transition. PCR control circuit adjusts this effect (PCR current is increased when LCR current is decreased) with the help of CS1 current sensor feedback signal.

Setup process of the regulator's current-voltage characteristic (CVC) operating point is shown on Fig. 2. CVC operation point 4 (line 1') is described with (I, U) coordinates. Point 5 power on the PVC (line 5') is equal to the CVC point 4 power.

The voltage increase process within operation point jump is shown by the CVC operation point step from 4 to 1. Pulsed regulator power was described by PVC point 6 (line 3') at the charging initial moment. Due to the PCR slow response the charging time decrease was provided by the short LCR switching on. It compensates the power lack. LCR consumed power is decreased within the PCR output power increase. LCM consumed power vanishes when the transition is fully developed.

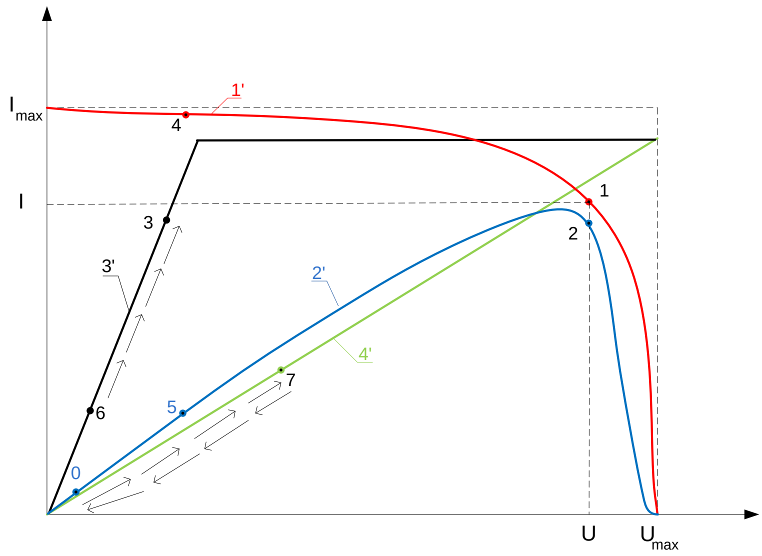

Figure 2 - CVC and PVC forming with parallel PCR and LCR load

Model test results showed satisfied static and dynamic characteristics. Pulse current amplitude is within 2%, PCR build-up time within input peak voltage alteration is less than 3 ms. At the 1 kW model load power leakage is less than 100 W. Power increase is obtained by the several cells parallel connection.

LCR and PCR collaboration was tested during design the anode-cathode discharge circuit of the plasma generator. In this design we applied structural diagram (Fig. 1) as current regulator cell.

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Electrocardiograph as a Space and Ground Support Equipment

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The monitoring of vital physiological signals has proven to be one of the most efficient ways for continuous and remote tracking of the health status of the patients. Electrocardiographs are often used in many medical service centers and hospitals to diagnose and monitor person’s health status by measuring their cardiac activity. Electrocardiography (ECG) is a non-invasive method, which can be applied to evaluate the heart electrical activity, to identify any heart damage, the position of the chambers, to measure the rate and regularity of heartbeats and investigate the effect of drugs and devices used to regulate the heart activity. This procedure is very useful for monitoring people with (or susceptible to) impairments in their cardiac activity [1].

One of the invariable risks, associated with space missions, is the threats posed by the very harsh spatial environments to the physical and mental health of astronauts. Changes in the