

Investigation of the optimal operating mode of magnetic power amplifier using permanent magnets

The purpose of the research is to develop optimal design and operating modes of the magnetic power amplifier.

Research Objectives

- Choice of materials and scheme solution of the ferromagnetic cores.
- Development of an electronic circuit to control operation of the magnetic power amplifier.
- Research to maximize output power level for minimization of input power in the control circuits (the ratio of output and consumed electric power).

Research Results

- The power consumption should be about 30% of the output power.
- It is planned to get autonomous mode of operation of the power amplifier, which uses a change of magnitude of magnetic flux induction in area of the generator coils. Initial magnetic flux is provided by permanent magnet. In this mode, external primary power supply can be used only to start the operating mode.

Main planned parameters of the power amplifier

- Dimensions about 200x400x100 mm
- The primary power source is a 12VDC battery 12AH
- The permanent magnets of about 1T.

The main result to be obtained is the possibility of an autonomous operating mode of the experimental device, which will make it possible to use this technology as energy sources that do not require fuel or external power. Starting with a battery it should work as fuel less generator to power some load. Applications are electronic equipment, tools, and electrical devices.

Basic concepts

Power amplifier is a device in which the energy parameters of a signal (influence) are increased by using the energy of an auxiliary source. Magnetic power amplifier - the amplifier of electrical signals, whose work is based on the inherent ferromagnetic materials nonlinear dependence of magnetic induction on the strength of the magnetic field. The ferromagnetic block is part of the magnetic amplifier, which includes the core of their ferromagnetic material, the coils of the control circuit coils and the output coil or generator coils. Stand-alone mode of operation is special operating mode of the experimental device, primary energy source is disconnected, part of the generated output power is used to operate the control circuit, and main part of the generated power is directed to the payload circuit.

Modern research on this topic, usually is named as MEG (English word MEG - motionless electromagnetic generator), although the principle of controlling the magnetic flux of permanent magnet was previously known as a **magnetic transistor**. Devices of this type allow to use weak control signal (current in the control coil) to create powerful changes of output coil magnetic flux, and thus generate an Electro Motive Force in the payload circuit.



Right photo is Frolov's MEG (half U-core is not connected here)

Unlike other authors schemes, the Frolov's design uses inexpensive conventional ferrite materials and also this scheme does not require precise tuning. The principle can be explained here in short. The design is clear demonstrated at this photo. The ring core is for control coil. The U-shaped core is output coil core. Magnets (a column of 1 mm thick several discs 1 mm) is placed in center. The height of magnets is smaller than the height of the ring... there you need to pick up the gap and gaskets (cardboard).

The magnet does not stick to the magnetic circuit, it is placed in the gap. It is necessary to start with selection of main parameters of the control current and the gap (the height of the column of magnets). With a strong magnetic flux, it is hard controlled. Starting with minimum of magnets and maximum gap you can get simple test. Connect the control coil to an adjustable DC power source, the voltage is the same as for your planned pulse generator. Then down the current in control coil up to zero. In this case, the U-shaped must adhere to the central W-core.

Then increase the current, see the indication of the current amperage. In a correctly assembled design, with an increase of the control coil current, the U-shaped core will be detached from the W-shaped core.

It is not necessary to achieve complete detachment of the U-shaped from the S-shaped. 50% modulation is fine.

Further, it is necessary to replace the DC source of the control coil with some source of pulses, keeping the amperage of the current in the pulse and the same voltage we determined for the test.

The shape of the control signal should be sinusoid or half-period of a sinusoid. The demo version is planned for 12 volts.

The control current must be minimized, increasing the number of turns in control coil. However, a large inductance in the control coil will limit the operating frequency that lead to low operation frequencies.

The parameters of the coil on the U-shaped core should be designed to get 14 volts output. After rectification, through the diode, output current is directed to storage capacitor. Starting the circuit from the battery by charging the storage capacitor. Then it should work in self-running mode.

I am looking for Investor to start R&D on this topic, then develop this project to commercial prototype).

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