

## PICOSECOND MULTI-GIGAWATT 4-STAGE MAGNETIC COMPRESSOR

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Over last several years, the situation in the field of generating powerful picosecond pulses has changed drastically. It turned out that a gyromagnetic nonlinear transmission line (NLTL), containing ferrite rings set on the inner conductor of the line and magnetized by an external magnetic field, under certain conditions can operate not only as a microwave oscillator [1], but also as a peak power amplifier [2–4]. The essence of the approach is that the line operates in a magnetic compression mode (Magnetic Compression Line, MCL), which is realized at close values of the input pulse duration and the period of oscillations generated in the line. In this case, the main part of the input pulse energy is transmitted only to the first peak of the oscillations.

The most important features of the MCL approach are as follows. Firstly, it does not require the use of any switching elements – closing or opening switches. The amplification of the pulse in power and its compression in time occurs automatically during the passage of the pulse along the line. Secondly, the approach allows the use of several MCLs connected in series. Herewith, in each MCL power amplification close to twofold occurs. Third, being solid state devices, MCLs allow to create all-solid-state picosecond generators using a solid state driver of the input pulse. In particular, this is implemented in the SOS+MCL approach, when the input pulse from a solid-state generator with a semiconductor opening switch (SOS) is used.

In this paper, we present results of the study of a 4-stage magnetic compressor, which focuses on the operation of the fourth stage line, MCL4. The maximum electric and magnetic fields are realized in this line, and the output peak power reaches ~80 GW at a pulse duration of less than 100 ps. Issues of the influence of the transverse dimensions of the line on the output pulse parameters are discussed. The results of theoretical studies of the energy compression mechanism are presented, as well as the results of numerical simulation and their comparison with experimental data.

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