ULTRA-SHORT SOLITARY ELECTROMAGNETIC PULSES AND SEMICONDUCTOR TESTING

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In connection with the events of the last few years and with the increased number of terrorist activities, the problem of identification and measurement of electromagnetic weapons or other systems impact occurred. Among these are also microwave sources, which can reach extensive peak power of up to 100 MW.

Solitary, in some cases several times repeated, impulses lasting from 1 to 60 ns, cause the destruction of semiconductor junctions. These days we can find scarcely no human activity, where semiconductor structures are not used. The problem of security support of the air traffic, transportation, computer nets, banks, national strategic data centres, and other applications crops up. Several types of system protection from the ultra-short electromagnetic pulses present itself, passive and active protection.

The paper deals with analysis of the possible measuring methods, convenient for the identification and measurement of the ultra-short solitary electromagnetic pulses. Some of these methods were chosen and used for practical measurement.

The method based on Faraday's law amended by post-measuring data adjustment measuring the magnetic component of the electromagnetic wave is considered. But for ultra-short pulses the problem with the measurement accuracy increases.

Among other methods considered belongs the scanning of the wave magnetic component, based on the Faraday´s and Keer´s magneto-optic effects. These methods develop dynamically along with the design and use of the sensors.

It is possible to use the electro-optic effect for the electric component of the wave scanning. Several types of the broadband antennas for the reception of the ultra-short electromagnetic pulse can be used.

The method of ultra-short pulses identification and evaluation is the measurement of the maximum power, or energy, of the pulse. The method uses molecular properties of some chemical elements and their changes, which occur when electromagnetic wave impacts on these chemical elements. The basic principle is conversion of the pulse energy into heat and its evaluation. Well-chosen layers of materials are able to screen out pulses in power range 8 mJ ÷200 J, power of these levels can be measured with a sufficient accuracy.

The experimental results of the measurements based on some of the methods named above are presented in the article.

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