Annotation

This work is devoted to the study of the features of formation of ultrashort light pulses in active mode-locked (AML) picosecond Nd: YAG laser with electro-optical negative feedback (NFB) with intent to reduce optical pulse jitter relative to the various sources of external signals. A subnanosecond synchronization accuracy (~ 100-200ps in laser with active mode locking and ~ 200-240ps in laser with an active-passive mode-locking) was originally obtained, and the dependence of this quantity on the various parameters of generation was revealed. This yield a reason to believe that the crucial contribution to the accuracy of such synchronization is introduced by instability of the formation of the optical radiation in the cavity, but not by quality of electronic circuits, which have a much lower jitter. Experimental study of the output radiation with the streak-camera confirmed that the laser pulse have unstable envelope, significantly different from the envelope of bandwidth-limited pulse, which leads to increased jitter, particularly in an active-passive mode-locking.

For further studies of this problem, experimental laser with active mode locking and electro-optical feedback has been designed, having the most simple configuration of the cavity to avoid possible effects due to the presence of parasitic interferometers. Jitter dependence on various parameters of generation and negative feedback settings were measured with higher quality equipment. Also, laser pulse envelope was investigated by streak-camera Agate SF-3 using specially designed software for capturing, visualization and runtime analysis of obtained data. As a result, ~50ps jitter was achieved, as well as a stable generation of picosecond pulses with a Gaussian shape (bandwidth-limited pulses). Obtained jitter value, apparently, is now determined mainly by jitter of AML signal.