

Gigahertz repetition rate ultrashort laser pulses from coherent external Fabry-Pérot cavity

Abstract

Transient analysis of ultrashort laser pulses (USP) output from a coherent external Fabry-Pérot cavity (CEFPC) comprising a group delay dispersion (GDD) balanced ultrafast Bragg reflector and a negative dispersion double-chirped mirror for sub-terahertz repetition rate generation is investigated. Analytical results manifest a low multiplication factor (MF) of the CEFPC with value equal to any non-integer, real number greater than unity (NIRNGU) could lead to the amplitude varying, transient timing-jitter, but at very high constant repetition rate ($f_{\text{rep-o-Constant}}$) USP output pulse train. For the configuration - $(MF) T_{\text{aeFP}} = T_{\text{aUSP-in}}$, where MF is a NZRNGU, the MF is not a factor which usually describes the relationship between the $f_{\text{rep-o}}$ and $f_{\text{rep-i}}$, but rather a factor which determines the correlation of USPs $T_{\text{USP-in}}$ and T_{eFP} . Besides, this mentioned configuration is proven to be more easily to generate a CW, high $f_{\text{rep-o}}$ USP train (>10GHz) at steady-state, compared to the conventional configuration with MF equal to a non-zero positive integer, which requires a much shorter external cavity length to generate a similar high $f_{\text{rep-o}}$ USP train.