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Transformation of the frequency-modulated continuous-wave field into a train of short pulses by resonant filters

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Abstract

© 2017 American Physical Society. The resonant filtering method transforming the frequency-modulated radiation field into a train of short pulses is proposed to be applied in the optical domain. Effective frequency modulation can be achieved by using an electro-optic modulator. Due to frequency modulation, a narrow-spectrum cw radiation field is seen by the resonant filter as a comb of equidistant spectral components separated by the modulation frequency. Tuning a narrow-bandwidth filter in resonance with the nth spectral component of the comb transforms the radiation field into bunches of pulses, with n pulses in each bunch. The transformation is explained by the interference of the coherently scattered resonant component of the field with the whole comb. Constructive interference results in the formation of pulses, while destructive interference is seen as dark windows between pulses. It is indicated that the optimal thickness of the resonant filter is several orders of magnitude smaller than the necessary thickness of the dispersive filters used before in the optical domain to produce short pulses from the frequency-modulated field.

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