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Title:Analysis of linewidth tunable terahertz wave generation in periodically poled lithium niobate

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Abstract:A new scheme of optical rectification of femtosecond laser pulses in a periodically poled lithium niobate crystal, which generates high energy and linewidth tunable multicycle terahertz (THz) pulses, is analyzed. The developed simple theoretical model allows investigating the generated THz spectrum and its dependence on spot size of the pump beam. It is shown that the transformation of THz radiation from narrowband to broadband is possible by simply reducing the pump beam size. The temporal waveform and energy of the multicycle THz pulses were calculated as well. It is shown that THz energy is inversely proportional to the pump beam size r^{-1} , whereas energy spectral density is independent of r . The efficiency of optical-to-THz energy conversion for pump pulse energy of 1 mJ is estimated to be 0.8×10^{-4} . The possibility of tuning the generation frequency by changing the direction of the pump beam propagation is analyzed. © Springer Science+Business Media, LLC 2012.

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