Exact analytic solutions for the electromagnetic fields of few-cycle, focused laser pulses[1] SCOTT SEPKE, DONALD UMSTADTER, University of Nebraska — With few cycle light pulses available and development progressing at a high rate, detailed vector models of the fields are required to describe experiments. To meet this need, the analytic solution for the fields of a focused laser beam is derived for any spot size saving a factor of >100 in computation time compared to the integral solution [1]. Using this monochromatic model, the pulsed fields are then derived without approximation saving an additional factor of >100 in computer time. This analytic model forms a complete vector description of each of the electromagnetic field components of a laser pulse focused to any spot size and pulse length. As the pulse duration decreases below ten cycles, significant changes arise. Specifically, the fraction of the laser energy in the focus is reduced from the monochromatic value of 86.5% to 83.5% for a 5 fs Ti:Sapphire laser and to 72.7% in a single cycle pulse.

[1] S. Sepke and D. Umstadter, Opt. Lett. **31**, 1447 (2006)

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