

Laser ranging by time-of-flight measurement of femtosecond light pulses

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Abstract. Time-of-flight (TOF) measurement of femtosecond light pulses was investigated for laser ranging of long distances with sub-micrometer precision in the air. The bandwidth limitation of the photo-detection electronics used in timing femtosecond pulses was overcome by adopting a type-II nonlinear second-harmonic crystal that permits producing the balanced optical cross-correlation signal between two overlapped light pulses. This method offered a sub-femtosecond timing resolution in determining the temporal offset between two pulses through lock-in control of the pulse repetition rate with reference to the atomic clock. The exceptional ranging capability was verified by measuring various distances from 1.5 m to 700 m. This method is found suited for terrestrial land surveying and space missions of formation-flying satellites.

The material presented at the conference has recently been published and the author proposes to the reader the references below.

References

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