

343

Accession number:20123815445476

Title:Stereopsis-inspired time-stretched amplified real-time spectrometer (STARS)

Authors:Asghari, Mohammad H. (1); Jalali, Bahram (1)

Author affiliation:(1) Photonics Laboratory, Department of Electrical Engineering, University of California, Los Angeles, CA 90095, United States; (2) California NanoSystems Institute, University of California, Los Angeles, CA 90095, United States; (3) Biomedical Engineering Department, University of California, Los Angeles, CA 90095, United States

Corresponding author:Asghari, M.H.(asghari@ucla.edu)

Source title:IEEE Photonics Journal

Abbreviated source title:IEEE Photon. J.

Volume:4

Issue:5

Issue date:2012

Publication year:2012

Pages:1693-1701

Article number:6269979

Language:English

ISSN:19430655

Document type:Journal article (JA)

Publisher:Institute of Electrical and Electronics Engineers Inc., 445 Hoes Lane / P.O. Box 1331, Piscataway, NJ 08855-1331, United States

Abstract:We introduce and demonstrate a single-shot real-time optical vector spectrum analyzer (VSA). This simple and powerful instrument combines amplified dispersive Fourier transform with stereopsis reconstruction algorithm and is inspired by binocular vision in biological eyes. Moreover, a dynamic time-stretch concept is employed to dramatically enhance the phase reconstruction accuracy and dynamic range for ultrashort optical signals ($\times 30$ times). We show that, using a noniterative analytical expression, the phase profile of the input signal can be reconstructed using intensity-only measurements. The proposed method is experimentally proved by fully characterizing the time-varying amplitude and phase of single-shot THz-bandwidth optical signals, with durations ranging from sub-ps to 35000 ps, with ultrasmall to ultralarge temporal phase variations and at 25-MHz update rate. We have also used this instrument to characterize the amplitude and phase of a prechirped 40-Gbps DQPSK optical signal using a 1.5-GHz digitizer and without using a reference signal. © 2009-2012 IEEE.

Number of references:16

Main heading:Optical signal processing

Controlled terms:Binocular vision - Spectrum analyzers

Uncontrolled terms:Analytical expressions - Digitizers - Dynamic range - Input signal - Non-iterative - Optical signals - Phase profile - Phase reconstruction - Reconstruction algorithms - Reference signals - Single-shot - Temporal phase - Time varying - Ultra-small - Ultrafast optics - Vector spectrum analyzer

Classification code:703 Electric Circuits - 741.2 Vision - 941 Acoustical and Optical Measuring Instruments - 942 Electric and Electronic Measuring Instruments - 943 Mechanical and Miscellaneous Measuring Instruments - 944 Moisture, Pressure and Temperature, and Radiation

Measuring Instruments

DOI:10.1109/JPHOT.2012.2213588

Database:Compendex

Compilation and indexing terms, Copyright 2012 Elsevier Inc.