10TH INTERNATIONAL CONFERENCE ON VIBRATION MEASUREMENTS BY LASER AND NONCONTACT TECHNIQUES—AIVELA 2012

Ancona, Italy 27 – 29 June 2012

EDITOR

Enrico Primo Tomasini Polytechnic University of Marche, Ancona, Italy

SPONSORING ORGANIZATIONS

AIP – American Institute of Physics EAA – European Acoustics Association EOS – European Optical Society OSA – The Optical Society SEM – Society for Experimental Mechanics



Editor

Enrico Primo Tomasini
A.I.VE.LA. c/o Department of Industrial
Engineering and Mathematical Sciences Polytechnic University of Marche
Via Brecce Bianche
60131 Ancona
Italy
E-mail: aivela@univpm.it

Authorization to photocopy items for internal or personal use, beyond the free copying permitted under the 1978 U.S. Copyright Law (see statement below), is granted by the American Institute of Physics for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$30.00 per copy is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923, USA: http://www.copyright.com. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Services is: 978-0-7354-1059-6/12/\$30.00

© 2012 American Institute of Physics

Permission is granted to quote from the AIP Conference Proceedings with the customary acknowledgment of the source. Republication of an article or portions thereof (e.g., extensive excerpts, figures, tables, etc.) in original form or in translation, as well as other types of reuse (e.g., in course packs) require formal permission from AIP and may be subject to fees. As a courtesy, the author of the original proceedings article should be informed of any request for republication/reuse. Permission may be obtained online using RightsLink. Locate the article online at http://proceedings.aip.org, then simply click on the RightsLink icon/"Permissions/Reprints" link found in the article abstract. You may also address requests to: AIP Office of Rights and Permissions, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502, USA; Fax: 516-576-2450; Tel.: 516-576-2268; E-mail: rights@aip.org.

AIP Conference Proceedings, Volume 1457 10th International Conference on Vibration Measurements by Laser and Noncontact Techniques—AIVELA 2012

Table of Contents

Preface: 10th International Conference on Vibration Measurements by Laser and Noncontact Techniques Enrico Primo Tomasini	1
ADVANCES IN LASER VIBROMETRY I	
Are rotating wedges a feasible alternative to dual mirrors for scanning and tracking LDV? Steve J. Rothberg and Mario Tirabassi	5
Advanced techniques in vibrometry by using spatial light modulators S. Mayer, B. Tibken, and C. Rembe	14
Generalized Laser Doppler Vibrometer noise maps Patrick O'Malley, Joseph Vignola, and John Judge	24
Demodulator electronics for laser vibrometry G. Dudzik, A. T. Waz, P. R. Kaczmarek, A. J. Antonczak, J. Z. Sotor, K. Krzempek, G. Sobon, and K. M. Abramski	35
BLADE TIP TIMING	
Tip timing measurement chain validation with the Universal Tip Timing Calibrator UTTC, approach and experience Uwe Pfeifer and Michael Zidorn	43
Data acquisition and processing for tip timing and operational modal analysis of turbomachinery blades	
Danilo Sabbatini, Bart Peeters, Ton Martens, and Karl Janssens	52
Development and experimental characterization of a new non contact sensor for blade tip timing Jean-Francois Brouckaert, Roberto Marsili, Gianluca Rossi, and Roberto Tomassini	61
APPLICATION OF LDV TO MEMS	
Dynamical topography measurements of MEMS up to 25 MHz, through transparent window, and in liquid by Digital Holographic Microscope (DHM) Yves Emery, Nicolas Aspert, and François Marquet	71

There is plenty of room at the bottom to approach sub-femtometer vibrometry Christian Rembe	78
Measuring MEMS vibration with novel quasi-heterodyned laser interferometry Adam Styk, Patrick Lambelet, Roman Paris, and Małgorzata Kujawińska	88
ADVANCES IN LASER VIBROMETRY II	
A universal laser interferometer for high linearity measurements Grzegorz Budzyn, Tomasz Podzorny, and Janusz Rzepka	97
Simultaneous 3D-vibration measurement using a single laser beam device Christian Brecher, Alexander Guralnik, and Stephan Baümler	105
Remote-sensing vibrometry at 1550 nm wavelength A. Dräbenstedt, J. Sauer, and C. Rembe	113
SELF MIXING VIBROMETRY	
Digital to analog conversion methodology applied to self-mixing displacement signals Antonio Luna Arriaga, Francis Bony, and Thierry Bosch	125
Optical feedback interferometry for measuring dynamic stress deformation of beams Reza Atashkhooei, Francisco Azcona, Santiago Royo, and Lluis Gil Espert	132
Error analysis due to laser beams misalignment of a double laser self-mixing velocimeter Bendy Tanios, Francis Bony, and Thierry Bosch	139
Robust real-time self-mixing interferometric laser vibration sensor with embedded MEMS	
accelerometer Usman Zabit, Olivier D. Bernal, and Thierry Bosch	148
Nanovibration amplitude measurement using semiconductor laser autodyne Dmitry A. Usanov, Anatoly V. Skripal, Evgenii O. Kashchavtcev, and Michael Yu. Kalinkin	156
METROLOGY AND CALIBRATION	
Developed in Collaboration with Dr. H. J. von Martens	
The problem of calibrating Laser-Doppler Vibrometers at high frequencies M. Winter, H. Füser, M. Bieler, G. Siegmund, and C. Rembe	165
Calibrating angular transducer using sinusoidal and shock excitation Li Zhang and Jun Peng	176

Applicability of ISO standard methods to vibration measurements at high frequencies and high accelerations	
Hans-Jürgen von Martens	181
Piezoelectric shaker developments for calibration of accelerometers at extended frequencies Bev Payne and David Evans	200
The application of orthogonal homodyne interferometer in the vibration calibration of ultra-low frequency and large amplitude	
Da-zhi Zhang, Ying-jie Cao, Li Zhang, Xin-liang Li, and Chun-yan Hu	206
ADVANCES IN LASER VIBROMETRY III	
Multi-beam Laser Doppler Vibrometer with fiber sensing head P. B. Phua, Y. Fu, M. Guo, and H. Liu	219
Recent development of WDM fiber vibrometry A. T. Waz, G. Dudzik, P. R. Kaczmarek, A. J. Antonczak, J. Z. Sotor, K. Krzempek, G. J. Sobon, and K. M. Abramski	227
Advanced multipoint vibrometry using spatial light modulators Tobias Haist, Christian Lingel, Wolfgang Osten, Marcus Winter, Moritz Giesen, Frank Ritter, and Christian Rembe	234
Experimental validation of a newly designed 6-DoF scanning laser head D. De Maio, C. Schwingshakl, P. Giuliani, and D. J. Ewins	242
Underwater green laser vibrometry Arkadiusz J. Antończak, Paweł Kozioł, Adam T. Wąż, Jarosław Z. Sotor, Grzegorz Dudzik, Paweł R. Kaczmarek, and Krzysztof M. Abramski	251
BIOMEDICAL APPLICATIONS	
Magnetically driven middle ear ossicles for optical measurement of vibrations in an ear with opened eardrum	
John Peacock, Magnus Von Unge, and Joris Dirckx	259
Laser Doppler Vibrometry measurement of the mechanical myogram John W. Rohrbaugh, Erik J. Sirevaag, and Edward J. Richter	266
Simultaneous measurement of respiration and cardiac period in preterm infants by laser Doppler vibrometry	
Lorenzo Scalise, Paolo Marchionni, Ilaria Ercoli, and Enrico Primo Tomasini	275

Real-time full field laser Doppler imaging Marcel Leutenegger, Pascal Harbi, Tyler Thacher, Wassim Raffoul, and Theo Lasser	282
Laser application on haptics: Tactile stiffness measurement L. Scalise, M. Memeo, F. Cannella, M. Valente, D. G. Caldwell, and E. P. Tomasini	287
Determining characteristics of oscillations of elastic spherical shell filled using semiconductor laser autodyne S. Yu. Dobdin, D. A. Usanov, and A. V. Skripal	294
VIBRATION MEASUREMENTS BY RADAR TECHNIQUES	
Developed by Prof. C. Gentile	
Vibration measurement on large structures by microwave remote sensing Carmelo Gentile	299
Real Aperture Radar interferometry as a tool for buildings vibration monitoring: Limits and potentials from an experimental study Guido Luzi, Oriol Monserrat, and Michele Crosetto	309
Radar-based dynamic testing and system identification of a guyed mast Carmelo Gentile and Filippo Ubertini	318
APPLICATIONS OF LASER VIBROMETRY	
Synthetic jet parameter identification and numerical results validation Danilo Sabbatini, Ruta Rimasauskiene, Milan Matejka, Marcin Kurowski, Tomasz Wandowski, Paweł Malinowski, and Piotr Doerffer	329
Analysis of classical guitars' vibrational behavior based on scanning laser vibrometer measurements Marzena Czajkowska	336
Diagnostic procedure on brake pad assembly based on Young modulus estimation P. Chiariotti, M. Martarelli, C. Santolini, and E. P. Tomasini	344
A study on a coincidence phenomenon in building partitions using Laser Doppler Vibrometer Romuald Bolejko	352
Quantitative validation of an air-coupled ultrasonic probe model by Interferometric laser tomography	
G. M. Revel, G. Pandarese, and A. Cavuto	361

NDT AND QUALITY CONTROL

Vibration measurements by laser techniques on rotating micro-tools Giorgio Capelli, Mauro Benedetti, Francesco Bonelli, Stefano Gerussi, Michele Norgia, and Guido Giuliani	373
In-site defectoscopy of granite blocks with a laser vibrometer Tomasz Podżorny, Grzegorz Budzyń, and Janusz Rzepka	377
Different configurations of laser vibrometry for quality control of electric motors with external rotor	
P. Chiariotti, R. Ciarmatori, P. Castellini, A. Bastari, and N. Paone	386
Bearing damage characterization using SVAN 958 and laser in the time domain S. A. Aye	398
Quality control agent: Self-adaptive laser vibrometry for on-line diagnostics S. Serafini, N. Paone, and P. Castellini	405
FIBER OPTIC SENSORS	
Optical fiber sensor to measure the bending of a flexible sheet Guillermo Salceda-Delgado, Alejandro Martínez-Ríos, and David Monzón-Hernández	419
Issues concerning intensity-based fiber sensors for non-contact vibration monitoring A. Vallan, M. L. Casalicchio, and G. Perrone	426
FULL-FIELD METHODS FOR VIBRATION OR DEFORMATION	
Measurement of dynamical paths from elastic objects at the entrainment frequencies using high speed digital holographic interferometry Carlos Pérez López and Fernando Mendoza Santoyo	437
Single-shot digital holographic interferometry using a high power pulsed laser for full field measurement of traveling waves Daniël De Greef and Joris J. J. Dirckx	444
Dual integrated laser interferometer for fringe projection techniques Zbigniew Motyka and Henryk Passia	451
Dynamic speckle—Interferometry of micro-displacements A. P. Vladimirov	459
Author Index	469