

## CURRICULUM VITAE, Aldo Minardo

Aldo Minardo was born in Naples in November 18, 1974. He graduated (summa cum laude) in Electronic Engineering at the University of Naples Federico II, Italy, in March 2000. In 2000, he worked at the Electronic Engineering group at the University of Naples Federico II. He received the Ph.D. degree in Electronic Engineering in December 2003. In September 2003 he has been visiting scientist at the Swiss Federal Institute of Technology in Lausanne (Switzerland). Since November 2015, he is associate professor at the Department of Information Engineering of Second University of Naples.

His research activity deals with distributed optical fiber sensors and optoelectronic devices.

He serves as a referee for the following scientific journals: Optics Letters, Chinese Optics Letters, Optics Express, Journal of the Optical Society of America B, IEEE Journal of Lightwave Technology, IEEE Photonics Technology Letters, Sensor and Actuators A, IEEE Sensors Journal, IEEE Photonic Journal, Measurement Science and Technology, Applied Physics B, Research Letters in Optics, Lasers in Engineering, Journal of Optics, Measurement, Optics & Laser Technology, New Journal of Physics, Nondestructive Testing and Evaluation, Journal of Zhejiang University-SCIENCE A, Journal of Visualized Experiments, Experimental Mechanics, Sensors, Journal of Selected Topics in Quantum Electronics, Applied Optics, Physical Science International Journal.

He has published fifty-nine papers in international journals and numerous conference papers.

In 2010 he has been scientific coordinator of the research project "FOSAS", funded by the European Union under the Seventh framework programme, and focused on the application of optical fiber sensors in structural health monitoring for aerospace.

In 2014 he has been nominated as MC substitute for the Cost Action TU1402 "*Quantifying the value of structural health monitoring*".

In 2013, he was co-founder of the spinoff company Optosensing ([www.optosensing.it](http://www.optosensing.it)). Optosensing is involved in the design, manufacturing, and installation of systems for environmental and structural monitoring based on fiber optic technology.



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#### Co-operation with international journals:

Since 2014 it is Editorial member of the international journal "Structural Monitoring and Maintenance", published by Techno Press, and "Journal of Sensors" published by Hindawi.

#### Co-operation with conferences:

Since 2014 it is member of the Technical Committee of the Italian National Conference "Fotonica" (2015).

#### Schools:

- February 2001 – School in Information Engineering, Naples, Italy
- June 2001 – School for Ph.D students, National Group of Electronics (GE) 2001, Catania, Italy
- September 2002 – Advanced school on chemical optical sensors ASCOS, Wroclaw (Poland)

#### Awards:

- In 2005, he won the prize "Best Doctoral Thesis Award in Optoelectronics" of IEEE/LEOS as the author of the best Doctoral thesis in Optoelectronics discussed in Italy during 2003-2004.

#### Affiliations:

- He is member of the *National Group of Electronics* (GE)
- He is a member of the National Institute for the Physics of Matter (INFN)

#### Teaching activity - courses taught:

- 2004-2005: "Integrated systems Architecture", Faculty of Engineering, Second University of Naples.
- 2005-2010: "Microelectronic devices and technologies", Faculty of Engineering, Second University of Naples.
- 2009-present: "Digital System Electronics", Faculty of Engineering, Second University of Naples.



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### Languages:

He has an excellent knowledge of English (both written and spoken), and a good knowledge of French.

### Research activity:

#### Integrated optoelectronic devices and sensors

##### *a) Integrated optoelectronic sensors and biosensors*

This research activity deals with the development of integrated optical sensors for measuring physical and chemical quantities, useful f.i. in environmental monitoring. In fact, these sensors offer unique advantages like versatility, high sensitivity, low price.

In particular, we have been involved in the analysis, design and realization of refractive index sensors based on antiresonant reflecting optical waveguides (ARROW). In these waveguides the field is not confined by total internal reflection, as in conventional waveguides, but by cladding layers designed to form high reflectivity Fabry-Perot mirrors. This peculiar design offers some particular properties that make them very attractive for sensing application. Particularly, it has been shown that they exhibit a strong attenuation dependence on the claddings refractive indexes. So it is possible to use this intensity modulation mechanism as the sensing principle in order to realize optical integrated refractometers that can also easily be integrated with the photodetectors used for the optical readout. This research activity is carried out in cooperation with the Delft Institute for Microelectronics and Submicron technology (DIMES) - Technical University of Delft (The Netherlands) -, where two different devices have been realized: planar rib waveguides for refractive index sensing and hollow core micromachined waveguides for gas and liquid sensing. Hollow waveguides exhibit the advantage of being able to guide both the light and the fluids. This property is particularly suitable for micro total analytical system ( $\mu$ -TAS) applications.

On this line of argument, exploiting the hollow core ARROW waveguides, we developed and successfully tested a novel micro-flow-cytometer for single cells and particles analysis by means of scattering and/or fluorescence emission.

##### *b) Integrated optofluidic devices*

Optofluidics represents a novel approach for the dynamic manipulation of optical properties, enabling the realization of reconfigurable photonic circuits. The research activity deals with the realization of optofluidic devices based on the hydrodynamic focusing inside hollow core ARROW waveguides. This approach permits to take advantage of both the light confinement properties of the ARROW structures and the reconfigurable waveguides achievable by means of the hydrodynamic focusing. The preliminary experimental results have shown the validity of the proposed approach.

This research activity is carried out in strict cooperation with the Delft Institute for Microelectronics and Submicron technology (DIMES) - Technical University of Delft (The Netherlands).



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### *c) Metal-clad waveguides for sensing applications*

Metal-clad leaky waveguides (MCLW) are interesting structures for sensing applications because they exhibit an evanescent field with high penetration depth. We are working on the exploitation of such structures as sensors suitable for refractive index measurements and fluorescence analysis. Preliminary measurements have confirmed the high sensitivity of MCLWs as refractive index sensors.

Furthermore, we have shown that MCLWs can be designed in order to obtain an efficient coupling of fluorescence emission with their leaky modes. This leads to a higher directionality of the fluorescence emission into the glass substrate, when compared to emission in presence of a pure glass/water interface and surface-plasmon coupled emission. Such high directionality can be exploited to perform an efficient spatial filtering of the fluorescent signal from scattered light. Numerical analyses also indicate that exciting the fluorescence from the glass side while collecting fluorescence emission through a water-immersed microscope objective, may result in a 70-fold enhancement of the detectable signal, when compared to conventional fluorescence collection carried out on a bare glass/water interface.

## **Fiber optic devices and sensors**

### *a) Fiber optic distributed sensors*

Fiber optic sensors are very attractive for a variety of applications because of their immunity to electromagnetic interference and the possibility to employ them in hostile environments. In particular, they can be used for distributed sensing in large structures. Among distributed fiber optic sensors, those based on stimulated Brillouin scattering (SBS) have been extensively investigated in the past few years for distributed tensile strain and temperature measurements. In fact, the dependence of the Brillouin frequency shift on environmental quantities makes SBS very attractive for sensing applications in large structures like dams, tunnels etc., where the use of fiber optic point sensors is not suitable. These techniques are basically based on pump and probe methods to measure the distributed profile of Brillouin frequency shift along an optical fiber, which is dependent on the local strain and temperature conditions of the fiber itself. Spatial information can be obtained using, e.g. optical time domain analysis of the probe signal, when the pump laser is modulated to produce a train of pulses. An important issue is the signal processing schemes used to enhance the spatial resolution and the measurement precision of the sensors.

We have been involved in the analysis of optimized recovery techniques for temperature and strain profiles reconstruction starting from SBS data. Preliminary results show that the proposed methods may result in a better resolution on the evaluated temperature or strain profiles, and, furthermore, in the enhancement of the dynamic range of the sensor systems.

Two experimental set-ups have been implemented, working in the time domain and in the frequency domain, respectively, and the achieved experimental results indicate the validity of the proposed approaches. The achieved spatial resolution of the above sensors is about 30cm. Furthermore, the ability of the proposed sensors to identify relatively small defects in steel beams has been demonstrated.

### *b) Optical controllable delay lines*



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Stimulated Brillouin scattering (SBS) has been recently shown to offer a mechanism for generating tunable all-optical delays in room-temperature single-mode optical fibers at telecommunication wavelengths. This technique makes use of the rapid variation of the refractive index that occurs in the vicinity of the Brillouin gain resonance. When the slow-light pulse delay is subject to a constraint on the allowable pulse distortion, it has been shown that the use of a pair of closely-spaced Brillouin gain lines can increase the distortion-constrained delay, with respect to the single-line configuration. We have numerically and experimentally demonstrated that the same experimental apparatus usually employed for generating a Brillouin gain doublet, can also be used for achieving three equally-spaced Brillouin gain resonances, further increasing the distortion-constrained pulse delay.

#### Publications:

#### Chapters on Books

**B-1** Bernini, A. Minardo, L. Zeni, “*Optical fiber sensors based on stimulated Brillouin scattering*” in Encyclopedia of Sensors edited by C. A. Grimes, E. C. Dickey and M. V. Pishko, vol. 7, pp. 183-197, (2006).

**B-2** R. Bernini, A. Minardo, L. Zeni, “*Distributed optical fiber sensors*”, in the book “An Introduction to Optoelectronic Sensors” edited by Righini, Tajani, Cutolo, ISBN: 9812834125, Ed. World Scientific, pp. 77-94, January 2009.

**B-3** G. De Maria, A. Minardo, C. Natale, S. Pirozzi, L. Zeni, “*Optical fibres in aeronautics, robotics and civil engineering*”, in the book "Optical Fibre, New Developments", ISBN 978-953-7619-50-3, pp. 17-33 (2009).

#### National Patents

**PN-1** “*Metodo di misura di profilo di shift Brillouin in fibra ottica basato sulla demodulazione ottica dei segnali, e relativo apparato*” (co-inventor), deposited on 09 June 2006, patent number: RM2006A000302.

**BN-2** “*Metodo di misura di deformazioni dinamiche in fibra ottica basato sullo scattering di Brillouin tra due impulsi ottici, e relativo apparato*” (co-inventor), deposited on 25 November 2008, patent number: RM2008A626.

**BN-3** “*Metodo di ricostruzione del profilo di shift Brillouin in fibra ottica a partire da misure di scattering di Brillouin eseguite nel dominio della frequenza*” (co-inventor), deposited on 5 October 2011, patent number: RM2011A000525.

#### International Patents

**PI-1** “*Method for measuring the Brillouin shift distribution along optical fiber based on the optical demodulation of the signals, and relevant apparatus*” (coinventore), pubblicato in data 12/12/2007, European Patent Application no: EP1865289.



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**PI-2** “Method for measuring the Brillouin shift distribution along optical fiber based on the optical demodulation of the signals, and relevant apparatus” (coinventore), pubblicato in data 7/4/2009, US PATENT no. 7515273 B2

### International journals

**J-1** R. Bernini, L. Crocco, A. Minardo, F. Soldovieri, L. Zeni, “Frequency-domain approach to distributed fiber-optic Brillouin sensing”, Optics Letters, vol. 27, nr. 5, pp. 288-290, March 2002.

**J-2** R. Bernini, A. Minardo, L. Zeni, “Reconstruction technique for stimulated Brillouin scattering distributed fiber optic sensors”, Optical Engineering, vol. 41, nr. 9, pp. 2186-2194, September 2002.

**J-3** R. Bernini, L. Crocco, A. Minardo, F. Soldovieri, L. Zeni, “All Frequency Domain Distributed Fiber-Optic Sensing”, IEEE Sensors Journal, vol. 3, nr. 1, pp. 36-43, February 2003.

**J-4** R. Bernini, A. Minardo, L. Zeni, “Accuracy enhancement in Brillouin distributed fiber-optic temperature sensors using signal processing techniques”, IEEE Photonics Technology Letters, vol. 16, nr. 4, pp. 1143-1145, April 2004.

**J-5** R. Bernini, A. Minardo, L. Zeni, “Stimulated Brillouin scattering frequency-domain analysis in a single-mode optical fiber for distributed sensing”, Optics Letters, Vol. 29, nr. 17, September 2004.

**J-6** A. Minardo, A. Cusano, R. Bernini, L. Zeni, M. Giordano, “Response of fiber Bragg gratings to longitudinal ultrasonic waves”, IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, vol. 52, no. 2, pp. 304-312, February 2005.

**J-7** A. Minardo, R. Bernini, L. Zeni, L. Thevenaz, F. Briffod, “A reconstruction technique for long-range stimulated Brillouin scattering distributed fiber-optic sensors: experimental results”, Measurement Science and Technology, vol. 16, pp. 900-908, February 2005.

**J-8** R. Bernini, A. Minardo, L. Zeni, “Distributed fiber-optic frequency-domain Brillouin sensing”, Sensor and Actuators A, vol. 123-124, pp. 337-342, September 2005.

**J-9** R. Bernini, M. Fraldi, A. Minardo, V. Minutolo, F. Carannante, L. Nunziante, L. Zeni, “Optical-fiber sensor measurements for safety assessment and monitoring of bridges and large structure”, Bridge Structures, vol. 1, n.3, pp. 355-363, September 2005.

**J-10** R. Bernini, A. Minardo, L. Zeni, “An accurate high resolution technique for distributed sensing based on frequency domain Brillouin scattering”, Photonics Technology Letters, vol. 18, no. 1, pp. 280-282, January 2006.

**J-11** R. Bernini, M. Fraldi, A. Minardo, V. Minutolo, F. Carannante, L. Nunziante, L. Zeni, “Identification of defects and strain error estimating in bending steel beams through time-domain Brillouin distributed Optical Fiber Sensors”, Smart Materials and Structures, vol. 15, pp. 612-622, March 2006.

**J-12** A. Minardo, R. Bernini, F. Mottola, L. Zeni, “Optimization of metal-clad waveguides for sensitive fluorescence detection”, Optics Express, vol. 14, no. 8, pp. 3512-3527, April 2006.

**J-13** A. Minardo, R. Bernini, L. Zeni, “Low distortion Brillouin slow light in optical fibers using AM modulation”, Optics Express, vol. 14, no. 13, pp. 5866-5876, June 2006.

**J-14** R. Bernini, A. Minardo, L. Zeni, “Accurate high-resolution fiber-optic distributed strain measurements for structural health monitoring”, Sensors and Actuators A, vol. 134, pp. 389-395, 2007.



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- J-15** R. Bernini, N. Cennamo, A. Minardo, L. Zeni, "*Planar waveguides for fluorescence-based biosensing: optimization and analysis*", IEEE Sensors Journal, vol. 6, no. 5, pp. 1218-1226, October 2006.
- J-16** R. Bernini, E. De Nuccio, F. Brescia, A. Minardo, L. Zeni, P. M. Sarro, R. Palombo, M. R. Scarfi, "*Development and characterization of an integrated silicon micro flow cytometer*", Analytical and Bioanalytical Chemistry Journal, Vol. 386, no. 5, pp. 1267-1272, November 2006.
- J-17** R. Bernini, A. Minardo, L. Zeni, "*Self-demodulated Heterodyne Frequency Domain Distributed Brillouin Fiber Sensor*", IEEE Photonics Technology Letters, vol. 19, no. 6, March 2007.
- J-18** R. Bernini, E. De Nuccio, A. Minardo, and L. Zeni, "*2D MMI devices based on integrated hollow ARROW waveguides*", Journal of Selected Topics on Quantum Electronics, vol. 13, no. 2, pp. 194-201, 2007.
- J-19** R. Bernini, A. Minardo, G. V. Persiano, R. Vaccaro, D. Villacci, and L. Zeni, "*Dynamic Loading of Overhead Lines by Adaptive Learning Techniques and Distributed Temperature Sensing*", IET Generation Transmission and Distribution Volume 1, Issue 6, p. 912-919 November 2007
- J-20** A. Minardo, R. Bernini, and L. Zeni, "*Stimulated Brillouin scattering modeling for high-resolution, time-domain distributed sensing*", Optics Express, vol. 15, no. 16, pp. 10397-10407, 2007.
- J-21** R. Bernini, A. Minardo and L. Zeni, "*Vectorial dislocation monitoring of pipelines by use of Brillouin-based fiber-optics sensors*", Smart Mater. Struct., vol. 17, pp. 015006, November 2007.
- J-22** R. Bernini, E. De Nuccio, A. Minardo, L. Zeni and P. M. Sarro, "*Liquid-core/liquid-cladding integrated silicon arrow waveguides*", Optics Communications, vol. 281, no. 8, pp. 2062-2066, April 2008.
- J-23** A. Minardo, R. Bernini, W. Urbanczyk, J. Wojcik, N. Gorbatov, M. Tur, L. Zeni, "*Stimulated Brillouin scattering in highly-birefringent microstructure fiber: experimental analysis*", Optics Letters, vol. 33, no. 20, pp. 2329-2331, October 2008.
- J-24** L. Olivares, E. Damiano, R. Greco, L. Zeni, L. Picarelli, A. Minardo, A Guida, R Bernini, "*An Instrumented Flume to Investigate the Mechanics of Rainfall-Induced Landslides in Unsaturated Granular Soils*", Geotechnical Testing Journal, vol. 32, no. 2, March 2009.
- J-25** A. Minardo, R. Bernini, L. Zeni, "*Brillouin optical frequency-domain single-ended distributed fiber sensor*", IEEE Sensors Journal, vol. 9, no. 3, pp. 221-222, 2009.
- J-26** A. Minardo, R. Bernini, L. Zeni, "*A simple technique for reducing pump depletion in long-range distributed Brillouin fiber sensors*", IEEE Sensors Journal, vol. 9, no. 6, pp. 633-634, 2009.
- J-27** A. Cavallo, C. May, A. Minardo, C. Natale, P. Pagliarulo, S. Pirozzi, "*Modelling and control of a smart auxiliary mass damper equipped with a Bragg grating for active vibration control*", Sensors and Actuators A, vol. 153, no. 2, pp. 180-186, 2009.
- J-28** R. Bernini, A. Minardo, L. Zeni, "*Dynamic strain measurement in optical fibers by stimulated Brillouin scattering*", Optics Letters, vol. 34, no. 17, pp. 2613-2615, September 2009.
- J-29** A. Minardo, G. Testa, L. Zeni, R. Bernini, "*Theoretical and experimental analysis of Brillouin scattering in single mode optical fiber excited by an intensity- and phase-modulated pump*", IEEE Journal of Lightwave Technology, vol. 28, no. 2, pp. 193-200, January 2010.



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- J-30** A. Minardo, R. Bernini, L. Zeni, “Comment on ““Slow Light” in stimulated Brillouin scattering: on the influence of the spectral width of pump radiation on the group index””, Optics Express, vol. 18, no. 2, pp. 1788-1790, 2010.
- J-31** R. Bernini, A. Minardo, G. Testa, L. Zeni, “Dynamic strain measurements on a cantilever beam by stimulated Brillouin scattering”, Smart Materials and Structures, vol. 19, pp. 045024, 2010.
- J-32** A. Zornoza, A. Minardo, A. Loayssa, L. Zeni, “Pulsing the probe wave to reduce nonlocal effects in Brillouin optical time domain analysis (BOTDA) sensors”, IEEE Sensors Journal, vol. 11, no. 4, pp. 1067, 1068, April 2011.
- J-33** R. Bernini, A. Minardo, S. Ciaramella, V. Minutolo, L. Zeni, “Distributed strain measurement along a concrete beam via stimulated Brillouin scattering in optical fibers”, International Journal of Geophysics, vol. 2011, Article ID 710941, 5 pages, 2011. doi:10.1155/2011/710941.
- J-34** A. Minardo, R. Bernini, L. Zeni, “Numerical analysis of single pulse and differential pulse-width pair BOTDA systems in the high spatial resolution regime”, Optics Express, vol. 19, no. 20, pp. 19233-19244.
- J-35** R. Bernini, A. Minardo and L. Zeni, “Long-range distributed Brillouin fiber sensors by use of an unbalanced double sideband probe,” Optics Express, vol. 19, no. 24, pp. 23845–23856, November 2011.
- J-36** A. Minardo, R. Bernini, L. Amato, L. Zeni, “Bridge monitoring using Brillouin fiber-optic sensors”, IEEE Sensor Journal, vol. 12, no. 1, pp. 145-150, Jan. 2012.
- J-37** R. Bernini, A. Minardo, L. Zeni, “Distributed sensing at cm-scale spatial resolution by BOFDA: measurements and signal processing,” IEEE Photonics Journal, vol. 4, no. 1, pp. 48-56, Feb. 2012.
- J-38** A. Cipullo, G. Gruca, K. Heeck, F. De Filippis, D. Iannuzzi, A. Minardo, L. Zeni, “Numerical and experimental study of a ferrule-top cantilever optical fiber sensor applied to low speed air flow velocity measurements”, Sensors and Actuators A, vol. 178, pp. 17-25, 2012.
- J-39** A. Minardo, R. Bernini, L. Zeni, “Spatial resolution enhancement in pre-activated BOTDA schemes by numerical processing,” IEEE Photonics Technology Letters, vol. 24, no. 12, pp. 1003-1005, June 2012.
- J-40** A. Minardo, R. Bernini, L. Zeni, “Differential Techniques for High-Resolution BOTDA: an Analytical Approach,” IEEE Photonics Technology Letters, vol. 24, no. 15, pp. 1295-1297, Aug. 2012.
- J-41** A. Minardo, G. Persichetti, G. Testa, L. Zeni, R. Bernini, “Long term structural health monitoring by Brillouin fiber-optic sensing: a real case”, Journal of Geophysics and Engineering, vol. 9, pp. S64-S69, Aug 2012.
- J-42** N. Jimenez–Redondo, N. Bosso, L. Zeni, A. Minardo, F. Schubert, F. Heinicke, A. Simroth, “Automated and Cost Effective Maintenance for Railway (ACEM–Rail)”, Procedia - Social and Behavioral Sciences, vol. 48, pp. 1058-1067, ISSN 1877-0428, 10.1016/j.sbspro.2012.06.1082, 2012.



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- J-43** A. Minardo, L. Zeni, R. Bernini, "High-spatial and spectral resolution time-domain Brillouin distributed sensing by use of two frequency-shifted optical beam pairs", IEEE Photonics Journal, vol. 4, no. 5, pp. 1900-1908, Oct 2012.
- J-44** A. Minardo, A. Coscetta, S. Pirozzi, R. Bernini, L. Zeni, "Modal analysis of a cantilever beam by use of Brillouin based distributed dynamic strain measurements", Smart Materials and Structures, 21, 125022, 2012, Nov 2012.
- J-45** A. Minardo, R. Bernini, L. Zeni, "Limitations and strategies to improve measurement accuracy in DPP-BOTDA sensing", Applied Optics, vol. 52, no. 13, pp. 3020-3026, 2013.
- J-46** A. Minardo, G. Porcaro, D. Giannetta, R. Bernini, L. Zeni, "Real-time monitoring of railway traffic using slope-assisted Brillouin distributed sensors", Applied Optics, vol. 52, pp. 3770-3776, 2013.
- J-47** A. Minardo, R. Bernini, L. Zeni "Bend-induced Brillouin frequency shift variation in a single-mode fiber", IEEE Photonics Technology Letters, vol. 25, no. 23, pp. 2362-2364, 2013.
- J-48** A. Minardo, A. Coscetta, S. Pirozzi, R. Bernini, L. Zeni, "Experimental modal analysis of an aluminum rectangular plate by use of the slope-assisted BOTDA method", Smart Materials and Structures, 22, 125035, 2013.
- J-49** L. Zeni, A. Minardo, G. Porcaro, D. Giannetta, and R. Bernini, "Monitoring railways with optical fibers", SPIE Newsroom (December 2013). Published Online: December 2, 2013. doi: 10.1117/2.1201311.005246.
- J-50** A. Minardo, R. Bernini, L. Zeni, "Distributed temperature sensing in polymer optical fiber by BOFDA", IEEE Photonics Technology Letters, vol. 26, no. 4, pp. 387-390, Feb. 2014.
- J-51** A. Minardo, A. Coscetta, L. Zeni, R. Bernini "High-spatial-resolution DPP-BOTDA by real-time balanced detection," IEEE Photonics Technology Letters, vol. 26, no. 12, pp. 1251-1254, June 2014.
- J-52** A. Minardo, R. Bernini, L. Zeni, "Experimental and numerical study on stimulated Brillouin scattering in a graded-index multimode fiber," Optics Express, vol. 22, no. 14, pp. 17480-17489, July 2014.
- J-53** A. Minardo, A. Coscetta, G. Porcaro, D. Giannetta, R. Bernini and L. Zeni, "Distributed optical fiber sensors for integrated monitoring of railway infrastructures," Structural Monitoring and Maintenance, vol. 1, no. 2, pp. 173-182, 2014, DOI: 10.12989/smm.2014.1.2.173, 2014.
- J-54** A. Minardo, A. Coscetta, R. Bernini, R. Ruiz-Lombera, J. Mirapeix Serrano, J. Miguel Lopez-Higuera, and L. Zeni, "Structural damage identification in an aluminum composite plate by Brillouin sensing", IEEE Sensors Journal, vol. 15, no. 2, pp. 659-660, Feb 2015.
- J-55** L. Zeni, L. Picarelli, B. Avolio, A. Coscetta, R. Papa, G. Zeni, C. Di Maio, R. Vassallo, A. Minardo, "Brillouin Optical Time Domain Analysis for Geotechnical Monitoring", Journal of Rock Mechanics and Geotechnical Engineering, vol. 7, pp. 458-462, May 2015.
- J-56** E. Damiano, L. Olivares, R. Greco, A. Minardo, L. Zeni, L. Picarelli, "Performance of Slope Behaviour Indicators in Unsaturated Pyroclastic Soils", Journal of Mountain Science, vol. 12, no. 6, pp. 1434-1447, 2015.



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**J-57** A. Minardo, R. Bernini, L. Zeni, “*Analysis of SNR penalty in Brillouin Optical Time-Domain Analysis sensors induced by laser source phase noise*”, Journal of Optics, vol. 18, no. 2, 025601, Feb. 2016.

**J-58** A. Minardo, A. Coscetta, R. Bernini, L. Zeni, “*Heterodyne Slope-Assisted Brillouin Optical Time-Domain Analysis for dynamic strain measurements*”, Journal of Optics, vol. 18, no. 2, 025606, Feb. 2016.

**J-59** A. Minardo, A. Coscetta, S. Pirozzi, L. Zeni, “*Brillouin Optical Time Domain Analysis Sensor for Active Vibration Control of a Cantilever Beam*,” Journal of Sensors, vol. 2016, Article ID 1351378, 6 pages, 2016. doi:10.1155/2016/1351378.

### National and international conferences

**C-1** A. Minardo, L. Zeni, A. Cusano, G. Coppola, A. Calabrò, M. Giordano, L. Nicolais, A. Cutolo, G. Breglio, “*Analysis of Feasibility on the use of a Fiber Bragg Grating as an Ultrasound Detector*”, Proc. SPIE 2001, Newport, 4-8 March 2001, vol. 4328, p. 224-232

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