

## **TOMMASO ISERNIA Curriculum Vitae (February 2017)**

Tommaso Isernia graduated (with honors) in Electronic Engineering at Università di Napoli Federico II in 1988. After a short industrial experience at Ansaldo Trasporti, he joined the Applied Electromagnetics group of the Federico II University (led by Prof. Franceschetti and Prof. Bucci). In particular, he was there a PhD student under the supervision of Prof. Pierri (1989-1992), and then Assistant Professor (1992-1998), and Associate Professor (1998-2003). Since 2005 he is a Full Professor of Electromagnetic Fields at Università Mediterranea di Reggio Calabria. He is also an Associate Researcher of IREA, an Institute on the Italian Consiglio Nazionale delle Ricerche, as well as of INFN (Istituto Nazionale di Fisica Nucleare).

The scientific activities of Tommaso Isernia have been mainly concerned with the solution of non-linear inverse problems in applied electromagnetics, with particular reference to:

- i. the analysis of the properties and representations of e.m. fields radiated or scattered from objects of known dimensions, and their impact on antennas measurement and synthesis and on inverse scattering problems;
- ii. phase retrieval of radiated fields from phaseless measurements, with application to diagnostics of antennas, laser sources, SAR imaging, as well as to lensless optical microscopy. In such a framework, he has introduced two new effective solution approaches. In the first one, the problem is conveniently formulated as the inversion of a quadratic operators. In the second, more recent one, the problem is reduced to the constrained maximization of a functional. In both cases one is able to understand and tackle in an effective fashion the so called 'false solution' problem.
- iii. Antenna power pattern synthesis problems, with reference to the optimal synthesis of both shaped beams and pencil beams.  
In such a framework, he has given relevant contributions to two canonical problems. In fact, he has shown that for any fixed geometry array the optimal focusing of a scalar field subject to arbitrary sidelobe levels can be formulated as a convex programming problem, and that the optimal synthesis of shaped beams by means of linear arrays or linear sources can be conveniently reduced to a linear programming problem followed by a factorization (which also allows to determine all the equivalent solutions).  
Recent activities on the subject include the optimal synthesis of easily reconfigurable array antennas and the synthesis of arrays with a reduced number of control points.
- iv. Inverse scattering problems in electromagnetics, both from a theoretical point of view and developing new effective inversion procedures. These latter have been successfully applied to a number of applications such as subsurface sensing and biomedical imaging. The theoretical contributions include the proposal of tools to quantify the 'degree of non linearity' of the problem at hand, a new formulation of the scattering equations such to reduce such a degree, and the introduction of the so called 'virtual experiments' framework, which allows to introduce some new effective approximations.
- v. Field synthesis in non homogeneous regions of space, including the cases where one looks for a uniform amplitude (which is of interest in MRI imaging) and the case where a focused field is looked for. Such a latter problem is of interest in deep hyperthermia applications as well as in High Intensity Focused Ultrasound (HIFU) applications.

The activities of Tommaso Isernia have considered the theoretical, algorithmic and experimental aspects of the problems dealt with, with particular reference to the problem of the possible occurrence of false solutions when solving the considered non linear problems.

The interest of the scientific activities of Tommaso Isernia, who is a Senior Member of IEEE, is witnessed by over one hundred publications on scientific peer reviewed (and well reputed) journals, and by an h-index equal to 30 (Scopus, February 2017). He has been the coordinator or scientific responsible of several research project financed by Italian Ministry of research, the European Defense Agency, and the European Space Agency.

Full Professor of Electromagnetics since 2003, he has been the Dean of the studies in Ingegneria dell'Informazione at Università Mediterranea di Reggio Calabria, where he also served as a member of 'Consiglio di Amministrazione' of the whole University. He is presently a member of the board of Administrators of CNIT (the Italian University Consortium for Telecommunications, which joins 37 Italian Universities active in Telecommunications and Electromagnetics), and he is the Coordinator of the PhD studies in 'Ingegneria dell'Informazione' at Università Mediterranea.

As a young researcher, he was the recipient of the 'Barzilai Award' of the Italian Electromagnetics Society on 1994. Later, several his PhD students have been also awarded (Crocco and D'Urso 2004, Morabito and Laganà 2012, Bevacqua and Scapaticci 2014).

## Publications (limited to contributions on peer-reviewed Scientific Journals)

1. M. Bevacqua, L. Crocco, L. Di Donato, T. Isernia, 'Non linear inverse scattering via sparsity regularized Contrast Source Inversion', *IEEE Trans. on Computational Imaging*, in print (accepted Feb. 2017)
2. M. Bevacqua, T. Isernia, 'Shape Reconstruction Via Equivalence Principles, Constrained Inverse Source Problems And Sparsity Promotion' *Progress In Electromagnetic Research (PIER)*, in print (accepted Feb. 2017)
3. D.A.M. Iero, L. Crocco, T. Isernia, "Advances in 3D Electromagnetic Focusing: Optimized Time Reversal and Optimal Constrained Power Focusing" *Radio Science*, 2017
4. Palmeri R, Bevacqua M, Crocco L, Isernia T, Di Donato L 'Microwave Imaging via Distorted Iterated Virtual Experiments. *IEEE Transactions on Antennas and Propagation*, February 2017
5. A.R. Laganà, A.F. Morabito, Isernia T 'Phase Retrieval by Constrained Power Inflation and Signum Flipping'. *Radio Science*, ISSN: 0048-6604, 2016
6. L. Di Donato, R. Palmeri, G. Sorbello, Isernia T, L. Crocco 'A New Linear Distorted Wave Inversion Method for Microwave Imaging via Virtual Experiments' *IEEE Transactions on Microwave Theory and Techniques*, vol. 64, p. 2478-2488, (2016) ISSN: 0018-9480, doi: 10.1109/TMTT.2016.2584604
7. Crocco L, Di Donato L, Catapano I, Isernia T. 'The factorization method for virtual experiments based quantitative inverse scattering. *Progress in Electromagnetic Research (PIER)* vol. 157 pp. 121-131 (2016) ISSN: 1559-8985
8. T. Isernia, A.F. Morabito "Mask constrained power synthesis of linear arrays with even excitations" *IEEE Trans. on Antennas and Propagation*, vol. 64, p. 3212-3217, (2016) ISSN: 0018-926X, doi: 10.1109/TAP.2016.2556712
9. A.F. Morabito, R. Palmeri, T. Isernia "A compressive sensing inspired procedure for array antennas diagnostics by a small number of phaseless measurements" *IEEE Trans. on Antennas and Propagation*, vol. 64, p. 3260-3265, (2016) ISSN: 0018-926X, doi: 10.1109/TAP.2016.2562669
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12. Iero D.A.M., Crocco L., Isernia T. (2016) 'On the role and choice of source polarization in time reversal focusing of vector fields', *IEEE Antennas and Wireless Propagation Letters*, vol. 15, pp. 214-217, 2016
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14. Di Donato L., Palmeri R., Sorbello G., Isernia T, Crocco L. (2015). 'Assessing the Capabilities of a New Linear Inversion Method for Quantitative Microwave Imaging' *Int. Journal of Antennas and Propagation*, 501, 403760 (2015)
15. D.A.M. Iero, L. Crocco, Isernia T (2015). Constrained Power Focusing of Vector Fields: an Innovative Globally Optimal Strategy. *Journal of Electromagnetic Waves and Applications*, vol. 29, p. 1708-1719.
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113. T. Isernia, L. Di Donato, A.F. Morabito 'Orbital Angular Momentum Antennas : Understanding actual possibilities by simple tools' submitted
114. G. G. Bellizzi, L. Crocco, D.A.M. Iero, T. Isernia '3-D field intensity shaping : the scalar case', submitted