

Biography of Giuseppe Macchiarella

Giuseppe Macchiarella graduated in Electronic Engineering at Politecnico di Milano in 1976. From 1977 to 1986 he was a Researcher at Centro Studi per le Telecomunicazioni Spaziali of Italian National Research Council (CNR) where he was involved in the SIRIO propagation experiment (First Italian Satellite for Telecommunication). Since 1986 is Associate Professor of Microwave at Politecnico di Milano (Faculty of Information Engineering).

In the first years of his carrier the scientific activity of Prof. Giuseppe Macchiarella took place in various fields:

- a) Propagation of electromagnetic waves: statistical modeling of earth-satellite communication channel in presence of atmospheric perturbations (rain, snow); evaluation of rain attenuation from pluviometric and radiometric data
- b) Electroacoustics (SAW devices): derivation of equivalent circuit for uniform and apodized transducers; development of design procedures for SAW devices used in telecommunications systems (mainly filters and delay lines); accurate design of unidirectional transducers
- c) numerical techniques for electromagnetics: Efficient Formulations of Integral Contour Method for planar circuits; application of Integral Contour Method and Segmentation Method for analyzing non reciprocal planar devices (circulators)

Since 1990 the research activity of Giuseppe Macchiarella has been completely devoted to microwave circuits, with particular emphasis to microwave filters. The first works in this field were concerned with the characterization of reactive cylindrical discontinuities (metallic posts) in rectangular waveguides in order to derive equivalent circuits suitable to the synthesis of Chebycheff all-pole filters; similar techniques have been also employed for comb-line filters in slab-line with stepped-impedance resonators.

Afterwards, the focus of his works was moved to the microwave filters synthesis theory and applications; in particular he faced the problem of synthesizing filters presenting arbitrary transmission zeros (in general complex) in their characteristic function. The achievements obtained by Giuseppe Macchiarella in this research area have gained an international resonance: in fact some of his published works have become a reference in this field and are commonly quoted in the scientific literature. These works concern more specifically:

- the synthesis of inline prototypes with arbitrary transmission zeros using matrix rotation techniques (Givens transform)
- the exact synthesis of dual band prototype networks through frequency transformations
- the synthesis of prototype networks for duplexer composed by two filters connected at the input ports through specific 3-port junctions
- the extraction of polynomial models from measured scattering parameters of microwave filters (in application to computer-aided filter alignment)
- the synthesis of shunt junction multiplexers based on a polynomial approach

His achievements have found several practical applications, in particular in the base station combiners for mobile communications.

Giuseppe Macchiarella has performed scientific researches also in the area of active microwave circuits. His activities in this area began in 2001 when Politecnico di Milano and Ericsson Lab Italy founded in cooperation PoliEri Lab, whose mission is to support and stimulate applied researches in the field of monolithic integrated circuits for microwave communications; Giuseppe Macchiarella was appointed Scientific Responsible of PoliEri Lab and he has been the coordinator of various research activities in the following areas:

- Low phase noise monolithic microwave oscillators
- Innovative linearizers architectures for monolithic microwave PA
- Power amplifiers configurations for high efficiency performances

Giuseppe Macchiarella has published more than 180 papers on top international journals and conference proceedings. He has been responsible of several contracts and collaborations with various Companies operating in the microwave industry.

He is member (past Chair) of IEEE Technical Committee MTT-5: Filters. He is also a member of the Editorial Board of IEEE Transaction on Microwave Theory and Techniques and IEEE Microwave and Wireless Components Letters. Moreover, he is in the TPRC (Technical Program Review Committee) of IEEE International Microwave Symposium and European Microwave Conference.

Since January 2015 Giuseppe Macchiarella has been elevated to the grade of IEEE Fellow “*for contributions to the synthesis of microwave filters and multiplexers*”.