Title: Basic Theory of Radar Detection and CFAR Techniques

Presenter: Prof. Antonio De Maio (PhD, IEEE Fellow), University of Napoli “Federico II”, DIETI, via Claudio 21, 80125 Napoli, Italy. Mobile – Phone: +393331321134, e-mail: ademaio@unina.it

Bio of the Presenter: Antonio De Maio (S'01-A'02-M'03-SM'07-F'13) was born in Sorrento, Italy, on June 20, 1974. He received the Dr.Eng. degree (with honors) and the Ph.D. degree in information engineering, both from the University of Naples Federico II, Naples, Italy, in 1998 and 2002, respectively. From October to December 2004, he was a Visiting Researcher with the U.S. Air Force Research Laboratory, Rome, NY. From November to December 2007, he was a Visiting Researcher with the Chinese University of Hong Kong, Hong Kong. Currently, he is an Associate Professor with the University of Naples Federico II. His research interest lies in the field of statistical signal processing, with emphasis on radar detection, optimization theory applied to radar signal processing, and multiple-access communications.

Dr. De Maio is a Fellow member of IEEE and the recipient of the 2010 IEEE Fred Nathanson Memorial Award as the young (less than 40 years of age) AESS Radar Engineer 2010 whose performance is particularly noteworthy as evidenced by contributions to the radar art over a period of several years, with the following citation for “robust CFAR detection, knowledge-based radar signal processing, and waveform design and diversity”.

Topic and Description: The objective of this tutorial is to teach the basic theory of radar detection and Constant False Alarm Rate (CFAR) techniques according to a rigorous academic style based on the use of statistical decision theory. It is organized into two main sections: a) Basic Theory of Radar Detection and b) CFAR Techniques, where the following specific topics will be explained and thoroughly discussed:


CFAR Techniques: The Constant False Alarm Rate (CFAR) Concept, Basic CFAR Architecture, Cell Averaging (CA-CFAR), CFAR Loss, Masking Effects, Clutter Edges, Robust CFAR Processors, Greatest Of CFAR (GO-CFAR), Smallest OF CFAR (SO-CFAR), CFAR Techniques Based on Order Statistics (OS), Trimmed-Mean and Censored CFAR, OS-CFAR.

Audience: this course is suitable both for young students who are approaching radar signal processing and for radar practitioners who need a rigorous and academic point of view on the fundamentals of radar detection, receiver performance analysis, Monte Carlo simulation of radar receivers, and CFAR algorithms.
Prerequisite: Radar Systems Fundamentals, Basic Probability and Statistical Theory, Mathematical Analysis.

Relevance: The idea is to provide a formative tutorial on the proposed issues which represent the base to address more challenging radar detection problems. It is the author’s belief that the description of a rigorous approach to radar detection and CFAR techniques is always of interest and timely.

Previous Editions: This is the first tutorial proposal by the author on the specific subject.

Equipment: Standard equipment.