Foreword to the Special Issue on Radiation-Hardness Evaluation and Prediction in Microelectronics

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Today, progress in defense-related electronic technology relies heavily on using high-density micro- or nanoelectronic components to implement fast algorithms of data processing or communication.

Ionizing radiations, whether natural or man-made, represent a major factor in the operation of defense-related semiconductor electronics, making its radiation-hardness evaluation and prediction a vital task.

This is particularly true of spaceborne systems. The last ten years have seen revolutionary changes in space electronics caused by conversion to integrated circuits, bringing dramatic improvements in functionality, economic efficiency, and performance. At the same time, the industry has yet to meet the challenge of increasing the lifetime of spaceborne systems to ten or even twelve years, up from the current three to five years, when the equipment is directly exposed to a space environment. The problem of enhancing the radiation hardness of integrated circuits has thus come into sharp focus, for radiation-induced failures will often be the main limiting factor in the lifetime of such systems. In particular, single-event effects, i.e., ones

caused by high-energy single nuclear particles, become increasingly relevant with growing packing density.

This special issue is concerned with the modeling, simulation, and prediction of ionizing-radiation effects in microelectronics from the standpoint of the performance of components and systems. The papers reflect the current trend toward more extensive use of computer and physical simulation of radiation damage to facilitate the design of radiation-hard electronics. Particular attention is given to microwave electronic products due to their obvious relevance to space communications.

Professor Tatevos Mamikonovich Agakhanyan, an editor of *Mikroelektronika* since its beginning, was the moving spirit behind this publication. It might be seen as a testimony to his accomplishments in radiation-hard electronics since the mid-1970s, when he started a special research group at the Moscow Engineering Physics Institute. This activity continues to yield important results and to influence related work at other institutions.