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Preface

The first 2007 issue is constituted of papers dealing with the subject of modern trends in the development of microwave techniques, antenna and satellite technology. The significant cluster of papers covers the field of smart, ring and phased array antennas and their applications and equipment, as well as issues connected with satellites and radars.

The future wireless systems have to be equipped with multiband and wideband smart antennas in order to provide high speed data transmission and avoid undesired interference. The beam-forming techniques used in the narrowband systems are unsuitable for wideband counterparts as they cause such adverse effects as main beam squinting and null shifting. The use of the radar adapting wideband beam and null steering methods is unattractive for communication systems because of both, high complexity and the cost of the systems. In order to overcome this obstacle, the fully spatial wideband beam forming techniques can be applied in designing of the wideband smart antennas. In the paper by M. Uthansakul and M. E. Bialkowski, a smart array antenna with the capability of beam steering in azimuth over a wide frequency band using only spatial signal processing, is presented. In this array, only constant real-value weighting coefficients, realized using amplifier or attenuator, are used to form a desired radiation pattern. Another solution to increase the amount of data to be transferred as well as the increase of bit rates is presented in the paper by S. Kozłowski *et al.* The results of simulation of a MIMO system comprising phased array antennas in all receiving branches are shown in this paper. Bit error rate (BER) of two systems using different detection methods was examined in order to determine phased array antennas applicability. It has been shown that using the phase array can significantly improve the communication system performance.

Example of compact planar antenna for multiband system, among others, for WLAN, is presented in the paper by A. Miskiewicz and M. Kitliński. The designed antenna is matched in the bands of HiperLAN1/2 and IEEE 802.11b/g standards. Due to the application of the new feeding technique, it is possible to design and implement antennas which could operate in multi-standard terminals. The paper by M. Hornik *et al.*, presents the results of an optimization into patch antenna elements that would be capable of providing good circular polarization not only in the broadside direction, but also over a wide range of elevation angles. The optimized patches are to be used mostly in space communications, polarimetric measurements and in radio interface of wireless services. The paper by M. Khruslov and V. Pazyinin presents the novel coaxial monopole antenna with additional element as a second metal screen. It was found that the different conical radiation patterns can be

formed by variations of both, the distance between these screens and the additional screen dimensions. This kind of antenna can be considered as a promising candidate for various practical applications, e.g., as a single radiator or an array composite element.

Another important area, where modern microwave antennas are used, is the radar technology. Radars can be used in many security applications to detect and track intruders and also in the remote sensing applications to create high resolution images of the Earth, the Moon and other planets' surface. The paper by R. Rytel-Andrianik describes the use of classical continuous wave radar to estimate not only the target position and velocity but also the target acceleration. The paper by B. Dawidowicz and K. Kulpa covers combinely two hot topics: space technology and radar technology. This paper presents the possibility of designing and manufacturing of cheap space-borne synthetic aperture radar for 3D mapping of the Moon surface. The radar was designed for student satellite under SSETI-ESMO project.

The space research and space technology are the subjects of the next few papers. The student's involvement with space technology is described in the paper on SSETI Express satellite mission by K. Kardach and D. Wydymus. The Express satellite was the first students' satellite ever launched. The satellite was constructed and financed entirely by students groups cooperating in SSETI initiatives. The problem of constructing the cheap satellite is also described in the paper *Technologies for low costs small satellites*. The times when the budget for huge satellites was almost unlimited, are over. Now, it is necessary to work out cheap, but reliable technology for satellite missions, especially if formation flight is a required feature. The formation satellite flights are required for both, optical and microwave interferometer missions, for creating precise 2D and 3D images of the Earth surface and also for deep-space exploration. The problem of the precise controlling over the formation flights is the subject of the paper by R. Wawrzaszek and M. Banaszkiewicz. In order to glimpse the results of satellite experiments, remotely taken images and collect other data it is necessary to construct the radio-links networks covering almost the whole planet. Building the professional radio-station for satellite communication is a difficult, time- and money-consuming task. The paper by M. Stolarski and W. Winiński presents the concept of cheap radio amateur net for communication with satellites. The final paper in the space field deals with the problem of "proper disposal" of old satellites – which is, their interception. This process is described in the paper *Interception of a free-rotating satellite: an autonomous rendezvous scenario*.

Rapid technological progress in the field of SiGe HBT technology has also found its reflection in the areas of interests of the authors, as it allows to rethink and apply silicon technology also for the millimeter wave applications. With its use, M. Krčmar *et al.* proposed a wideband amplifier achieving more than 10 dB gain over 20–50 GHz band with noise lower than 9 dB and acceptable power consumption. It is the highest gain-bandwidth product ever reported for monolithic SiGe HBT amplifier. Another hot area is still MEMS technologies, which are presented in the first paper providing information on the new type of an RF MEMS capacitors with dual-gap height architecture for continuous tuning with low-resisting loss and a large tuning range at 30 GHz. The paper by A. Shutko *et al.*, covering the subject of remote sensing microwave technology for monitoring and emergency mapping of areas of water seepage and high groundwaters, deserves particular attention. The passive microwave radiometry (PMR) is based on spectral measurements and is the only technology which takes these measurements under the earth's surface. This noteworthy method, proposed by the authors, helps to monitor water seepage and undergrounds waters fast and reliably.

The guest editor would like to take this opportunity and express his thanks to the authors and reviewers who made efforts to delve into various issues of technological interests and presented the results of their research in terms of practical application.

Józef Modelski
Guest Editor