Closing Remarks

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In tandem with the recent globalization of social and economic activities, there is an expanding need for the development of a better broadband environment covering a wider range of activities over the sea and sky. Furthermore, the significance of satellite communications in the event of a large-scale disaster has become widely recognized, and it is highly expected that satellite communications will come to be utilized in an emergency as a highly mobile communication means. National Institute of Information and Communications Technology (NICT) has conducted research and development of diverse satellite communications and broadcasting technologies since the 1970s, the early days of satellite communications. Having succeeded in commercializing a Ku-band mobile satellite communication system, NICT has continued R&D on Wideband Internetworking Engineering Test and Demonstration Satellite (WINDS), which is a Ka-band mobile satellite communication system, for further expanding the broadband network, and has achieved a maximum transmission capacity of 3.2 Gbps per channel. In this manner, NICT has developed basic technologies for broadband satellite communications. At present, N-STAR and WIDESTAR II have been commercialized and are being operated in Japan as S-band mobile satellite communication systems. NICT owns a large-scale deployable reflector of 13 m in diameter for R&D on Engineering Test Satellite VIII and has demonstrated through experiments during disaster drills that satellite communications are available with personal mobile terminals on the ground even in the event of a disaster. NICT has thus developed basic technologies for mobile personal satellite communications as well.

The Satellite Terrestrial Integrated mobile Communication System (STICS), which is featured in this special issue, is a further advanced and pioneering S-band mobile satellite communication system, aiming to enable people to have access to satellite communications with the mobile terminals they usually use. As one of its R&D policies, the Ministry of Internal Affairs and Communications promoted STICS during the period from FY2008 to FY2012 with the aim of strengthening disaster prevention measures and ensuring more effective use of radio frequencies. NICT was entrusted with the related research and development and had developed fundamental technologies for STICS. STICS, which is a system to integrate terrestrial and satellite mobile phone systems and to provide services via integrated mobile terminals, has R&D challenges that can be broadly divided into those related to terrestrial communication network systems and those related to onboard satellite communication systems. In R&D on terrestrial communication network systems, NICT developed cooperative control technologies for sharing frequencies among terrestrial and satellite mobile phone systems. It was confirmed that communications are available with priority mobile phones even in the event of congestion through a large-scale simulation by using actual traffic data at the time of the Great East Japan Earthquake. In R&D on onboard satellite communication systems, NICT confirmed basic performance of major components, such as 100-element-class or 100-beam-class feed arrays, beam formers and channelizers using digital signal processing, and anti-saturation power amplifiers, by making prototypes. Furthermore, the feasibility of the communication system as a whole was also confirmed through a comprehensive evaluation test conducted in an anechoic chamber.

Based on the outcome obtained through the development of fundamental technologies for STICS, NICT is now carrying out research on technical problems for commercializing S-band mobile satellite communication systems and working on the international standardization for developing legislation. When such satellite communication systems are commercialized in the future, people will only have to add a satellite communication function to the mobile phones they usually use, which are ordinarily connected to the terrestrial mobile phone system, and will be able to use the satellite link therewith even in blind zones, such as remote areas or backwoods, where the terrestrial mobile phone system is not available, and even in the event of a disaster. I hope that the outcome of the research and development featured in this special issue will contribute to the future development of practical systems and the realization of a safer and more peaceful society.

With regard to Ka-band mobile satellite

communication systems, recent global trends are projects of high-capacity satellites called “High Throughput Satellites” (HTSs) with a total transmission capacity of 50–140 Gbps, such as KA-SAT, ViaSat, and Inmarsat-5. Also in Japan, deliberations have been commenced on advanced engineering test satellites for further increasing the capacity of satellite communications. The Space Communication Systems Laboratory, Wireless Network Research Institute, NICT, is committed to making further efforts for research and development on satellite communications using various frequency bands for making human life safer and more peaceful. We would appreciate the understanding and cooperation of related parties to support our efforts.

Lastly, NICT was able to confirm the feasibility of STICS and achieve the goals in this research and development thanks to the efforts and cooperation of engineers and people from various ministries, agencies, companies, and related organizations. I would like to pay my respects and extend my gratitude to all these people.

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