WIRELESS COMMUNICATIONS IN CHINA: TECHNOLOGY VS. MARKETS

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There has been tremendous interest recently in China's wireless mobile markets, research, and business opportunities, because China has the largest wireless mobile subscriber population in the world. It is expected that China's wireless market revenue will exceed US$200 billion by 2008. Advanced wireless mobile systems have been (or have the potential to be) deployed in China, and R&D on emerging wireless technologies, such as open wireless architecture (OWA), is becoming mission-critical for China's long-term development strategy. Furthermore, characteristics of the business and market in China are unique since they are mixed with technology, market, cultural, and government forces. This special issue presents recent developments in China's emerging wireless mobile communications networks, as well as perspectives on China's future wireless mobile technology and market, with an emphasis on research, development, deployment, application, and business issues. It is timely and valuable for future research and strategy activities, as well as market analysis in China.

China has made significant efforts in developing its home-grown third-generation (3G) standard, time-division synchronous code-division multiple access (TD-SCDMA). In the first article, "Recent Advances on TD-SCDMA in China" by Li *et al.*, an overview of the TD-SCDMA standard is presented. The article discusses the key technologies of TD-SCDMA, including the typical multiplexing structure, joint detection, smart antenna, dynamic channel allocation, and baton handover. It also reviews commercialization development of TD-SCDMA in China.

The following two articles emphasize the visions of Beyond 3G/fourth-generation (B3G/4G) time-division duplex (TDD) mobile communication systems. In "A Vision from the Future: Beyond 3G TDD," Zhang *et al.* give an overview of B3G communications from China's TDD Special Work Group. This article addresses issues such as system architecture, radio transmission design, radio resource management strategies, and demonstration system implementation. In "TD-CDM-OFDM: Evolution of TD-SCDMA Toward 4G," Zheng *et al.* provide us with an evolutionary path of TD-SCDMA toward TD-CDM-OFDM, a vision of 4G systems. By combination of multiple-input multiple-output (MIMO) and orthogonal frequency-division multiplexing (OFDM) technologies, the requirements of large coverage, high data rate, and spectrum efficiency in the TD-CDM-OFDM system can be met. The TD-CDM-OFDM system architecture on the physical layer is also addressed.

The next two articles focus on physical layer techniques. In "A Road to Future Broadband Wireless Access: MIMO-OFDM-Based Air Interface," Yang demonstrates that MIMO-OFDM is a potential candidate for future wireless communication systems to provide high data rate and bandwidth efficiency. The key techniques of MIMO-OFDM are discussed extensively. Link-level simulations also present encouraging performance of the MIMO-OFDM system. In the article "Novel Techniques to Improve Downlink Multiple Access Capacity for Beyond 3G," Zhou *et al.* introduce a distributed wireless communication system (DWCS) to deal with the issues of system capacity limit and power efficiency in B3G communication systems. This article also addresses the techniques of code-division multiplexing, adaptive MIMO and interleaver pattern division multiple access in the downlink.

To evaluate the emerging new technologies for future mobile communications, a B3G-oriented research project called Future Technologies for Universal Radio Environment (FuTURE) is being carried out in China. In the article "Toward Beyond 3G: The FuTURE Project in China," Yu *et al.* provide an overview of the FuTURE system. This article discusses the application requirements, technology challenges, and some potential solutions of B3G systems. The schedule and progress of the FuTURE project are also presented.

It is very likely that multiple air interface models will be deployed in China's 3G/4G systems. In "Efficient Resource Allocation for China's 3G/4G Wireless Networks," Cheng *et al.* present an all-IP differentiated services platform to interwork heterogeneous wireless access networks with the Internet backbone. This article addresses efficient resource allocation for real-time and non-realtime traffic with quality of service provisioning. A performance evaluation is

presented to demonstrate the effectiveness of the proposed resource allocation strategy.

In closing, the guest editors would like to thank all the authors who responded to the call for papers, regardless of whether their paper has been included in this issue or not due to space limitations. The editors would also like to acknowledge the contribution of many experts who participated in the review process and provided helpful suggestions to the authors on improving the content and presentation of the articles. The advice and support of Dr. Glitho, Editor-in-Chief of *IEEE Communications Magazine*, and the assistance of Sue Lange and Jennifer Porcello are greatly appreciated.

BIOGRAPHIES

KE GONG [M] obtained a Doctor degree in technical science in November 1986 from the Technical University of Graz, Austria. Since 1987 he has been working at Tsinghua University, where he is a professor. His main research interests are in wireless communications, especially in wireless channel characterization for personal mobile communication and wireless multimedia transmission, microwave technology for land mobile and satellite as well as other wireless systems, antenna, propagation, and EMC technologies. He serves as University Vice President, Director of the Chinese State Key Laboratory on Microwave & Digital Communications, and Dean of the School of Information Science and Technology. He also serves as Vice Chairman of the China Institute of Communications (CIC), Vice Chairman of the Chinese Institution of Electronics (CIE), and a member of many other technical associations.

WILLIE W. LU [SM] (wwlu@ieee.org) is a consulting professor of Stanford University, and a special advisor on emerging technologies and strategies in several Chinese information and communications authorities. He was a member of the Technological Advisory Council of U.S. Federal Communications Commission (US FCC-TAC), and a senior principal architect and vice president of Siemens and Infineon Technologies. He is also an internationally well recognized and accredited senior expert in emerging wireless technologies and has been a senior technical advisor for 22 wireless communication authorities in more than 10 countries. He is an independent technical examiner for several high-tech venture capitals in the United States, Europe, Asia, and other places, and is listed in major Who's Whos in the world. He has guest edited around 50 special issues on emerging wireless communications in IEEE, IEICE, ACM, CIC, and other major publications, and has had over 150 papers published in major professional publications. He is a member of the editorial board of *IEEE Spectrum*, the flagship publication of the IEEE. He has been technical chairman of numerous IEEE conferences including GLOBECOM '03, WCNC '02, VTC '03, and WWC 2000–'04, and wireless feature editor of *IEEE Communications Magazine*, *IEEE Transactions on Wireless Communications* (formerly *JSAC Wireless*), and others. He is a frequent keynote and featured speaker at global technical fora, and a prominent wireless pioneer on a worldwide basis. He is a member of ACM, IEICE, CIC, CIE, and Sigma Xi, and an adjunct professor at many world-class universities. He is also the founding chairman of the prestigious World Wireless Congress, Global Mobile Congress, and Fourth Generation Mobile Forum (4GMF), and has been a distinguished Chinese wireless expert overseas for various Chinese authorities since 1996.

XUEMIN (SHERMAN) SHEN [SM] (xshen@bbcr.uwaterloo.ca) received a B.Sc. (1982) degree from Dalian Maritime University, China, and M.Sc. (1987) and Ph.D. (1990) degrees from Rutgers University, New Jersey, all in electrical engineering. From September 1990 to September 1993 he was first with Howard University, Washington D.C., and then the University of Alberta, Edmonton, Canada. Since October 1993 he has been with the Department of Electrical and Computer Engineering, University of Waterloo, Canada, where he is a professor and associate chair for graduate studies. His research focuses on mobility and resource management in interconnected wireless/wireline networks, UWB wireless communications systems, wireless security, and ad hoc and sensor networks. He is a coauthor of two books, and has published more than 150 papers and book chapters in wireless communications and networks, control, and filtering. He was Technical Co-Chair for IEEE GLOBECOM '03 Symposium on Next Generation Networks and Internet, ISPAN '04, and is Special Track Chair of the 2005 IFIP Networking Conference. He serves as Associate Editor for I*EEE Transactions on Wireless Communications*; *IEEE Transactions on Vehicular Technology*; *Dynamics of Continuous, Discrete and Impulsive — Series B: Applications and Algorithms*; *Wireless Communications and Mobile Computing* (Wiley); and *International Journal of Computer and Applications*. He has also served as Guest Editor for *IEEE JSAC*, *IEEE Transactions on Vehicular Technology*, *IEEE Wireless Communications*, and *IEEE Communications Magazine*. He received the Premier's Research Excellence Award (PREA) from the Province of Ontario, Canada, for demonstrated excellence of scientific and academic contributions in 2003, and the Distinguished Performance Award from the Faculty of Engineering, University of Waterloo, for outstanding contribution in teaching, scholarship, and service in 2002. He is a registered Professional Engineer of Ontario, Canada.