Performance Comparison of Multipath Channel Estimation Algorithms with 28 GHz Channel Measurements

Jinyi LIANG, Juyul LEE, Myung-Don KIM, Jae-Joon PARK, Bonghyuk PARK

Wireless Applications Research Department, ETRI (Electronics and Telecommunications Research Institute)

218, Gajeongno, Yuseong-gu, Daejeon, Korea

{liangjinyi, juyul, mdkim, jjpark, bhpark}@etri.re.kr

***Abstract*—To analyze multipath propagation channels from field measurement data, multipath parameter extraction algorithms are utilized. Among them, the Space-Alternating Generalized Expectation-maximization (SAGE) provides high-resolution performance on parameter estimations although it requires high computational complexity. On the other hand, Bartlett Beamformer (BBF) with low complexity is known to provide comparatively lower resolution for channel parameter estimation. In this paper, we investigate the performance of SAGE and BBF with our 28 GHz field measurement data in terms of dispersion characteristics such as delay spread and angular spread. The performance of two algorithms is evaluated by comparison of standard deviation of estimated parameters. We also compare the computation time of each algorithm even the iterative algorithm such as SAGE is complicated to count algorithm complexity. Our results show that the angular spread values obtained, respectively, by SAGE and BBF are similar. On the other hand, the delay spread values obtained by the two methods has small difference. In terms of computational complexity, our simulation results show that BBF can save 99% computation time comparing to the SAGE.**

***Keywords*— Bartlett beamformer, SAGE, millimetre wave propagation, channel measurement, and multipath channel.**

Jinyi Liang (BS'04–MS'13) is a Researcher in the Advanced Communications Research Laboratory at Electronics and Telecommunications Research Institute (ETRI). He is Chinese and joined ETRI, Daejeon, Rep. of Korea, in July 2013, and he's working on the project 'Wireless Channel and Frequency Characterization based on Field Measurements for Broadband Mobile Hot-Spot Applications'. His research interests include MIMO, channel measurement and channel modeling for next generation mobile communications.

Myung-Don Kim (BS'93–MS'95) is a Principal Researcher in the Advanced Communications Research Laboratory at Electronics and Telecommunications Research Institute (ETRI). He joined ETRI, Daejeon, Rep. of Korea, in 1995, and he worked on the development of mobile test-beds for CDMA, IMT- 2000 and WCDMA systems. Since 2006, he has been involved in the development of wideband MIMO channel measuring system, measurement and channel estimation of MIMO channels. His research interests include MIMO, channel measurement and channel modeling for next generation mobile communications.

Juyul Lee (BS'96-MS'98-PhD'10) is a Senior Researcher in the Advanced Communications Research Laboratory at Electronics and Telecommunications Research Institute (ETRI) since 2000. Prior joining with ETRI, he was a Research Engineer with the Agency for Defense Development (ADD) from 1998 to 2000. His research spans the fields of information theory and wireless communications, with special interests in multiple-antenna/multiple-user/multi-cell resource allocations, device-to-device communication.

Jae-Joon Park received his BS and MS in control and instrumentation from Chungang University, Seoul, Rep. of Korea, in 1997 and 1999, respectively. Since 1999, he has been a senior researcher at ETRI, Daejeon, Rep. of Korea. He has worked on development of smart antennas for FDD/TDD WCDMA systems, the wireless broadband (WiBro) system, and a wideband wireless channel model for next-generation mobile communication. His research interests are wireless channel modeling for multilink and mobile-to-mobile systems and microwave and millimeter-wave wireless communications.

Bonghyuk Park received the BS degree in electrical engineering from Kyungpook National
University, Korea, in 1996, and the MS degree in mechatronics from Gwangju Institute Science and Technology (GIST), Gwangju, Korea, in 1998, respectively. From 1998 to 1999, he worked as an RF Application Engineer at Ansoft. Since 1999, he has been with Electronics and Telecommunications Research Institute (ETRI), and he is also working toward the PhD degree from KAIST Daejeon, Korea. His main research interests include UWB RF transceiver front-end circuit design and system-level integration of transceivers. He is also interested in 5G mobile RF system, Power amplifier and RFIC.