A Survey on Dual-Band Polar Transmitter Architecture for Railroad Wireless Communication

Jin-Kyu Choi*, Hanbyeog Cho*, Kyong-Ho Kim*, Heung-Gyoon Ryu**

* Industries IT Convergence Research Department, Electronics and Telecommunications Research Institute (ETRI),

218 Gajeong-ro, Yuseong-gu, Daejeon, 305-700, Korea

** Department of Electronic Engineering, Chungbuk National University, Korea

{jkchoi, hbcho, kkh}@etri.re.kr, ecomm@cbu.ac.kr

***Abstract*—In this study, we briefly introduce a novel concept of dual-band polar transmitter design based on digital quadrature modulation techniques for the application of railroad wireless communication (e.g., TRS & GSM-R) to reduce the bandwidth of dual-band PM (phase modulation) signal. We show that the complex signal processing at low frequency effectively utilizes the polar transmitter which is susceptible to the bandwidth of PM signal. Also, we evaluated the zero-crossing rate of two different schemes. There is the remarkable reduction of zero-crossing rate, compared to the conventional scheme.**

***Keyword*— Complex signal processing, Dual-band transmitter, Polar transmitter, SDR**

Jin-Kyu Choi received B.S. and M.S. degrees from the Department of Electronics, Communications and Electromagnetics Engineering at Hanyang University, Korea, in 1999 and 2001 respectively. Since January 2001 he has been an senior researcher in the Smart Mobility Research Department of ETRI, Daejeon, Korea. His research interests include MIMO-OFDM, 3GPP LTE, SDR, e-Navigation, and LTE-R.

Hanbyeog Cho received the B.S. degree in industrial engineering from the Ajou University, Suwon, Korea, in 1981, the M.S. degree in 1983, and the Ph.D . degree in industrial engineering from Hanyang University, in 1992, respectively. He is currently a principal researcher in the Smart Mobility Research Department of ETRI, Daejeon, Korea. His research interests include Telematics/ITS Services & Standardization, Vehicle-Vehicle/Vehicle-Infrastructure Communications, Cooperative ITS, and Railway Wireless Communications Technology.

Kyong-Ho Kim is a principal researcher and director of the Human–Vehicle Interaction Research Center, Electronics and Teleco mmunications Research Institute, Daejeon, Rep. of Korea. He received his BS and MS degrees in electronic engineering from K yungpook National University, Daegu, Rep. of Korea, in 1993 and 1995, respectively, and his Ph.D degree in computer science from the Korea Advanced Institute of Science and Technology, Daejeon, Rep. of Korea, in 2010. Since 1994, he has been with ETRI. His current research topics include intelligent vehicles, human–computer interaction, head-up displays, and augmented real ity applications in vehicles.

Heung-Gyoon Ryu is professor in Chungbuk National University, Korea. He received the B.S. and M.S. and Ph.D. degrees in electronic engineering from Seoul National University in 1982, 1984 and 1989. Since 1988, he has been with Chungbuk National University, Korea, where he is currently Professor of Department of Electronic Engineering in Chungbuk National University. His main research interests are digital communication systems, communication circuit design, spread spectrum system and communication signal processing.