ELECTRIC VEHICLE ON ELECTRIFIED ROADWAY POWERED WHILE RUNNING "EVER-PWR"

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Abstract: Electric vehicles (EVs) are strongly expected to replace gasoline-engine motors as a green transportation. However, currently used EVs have inherent disadvantages such as too short cruising range by one charge, too long time of battery charging, too heavy weight, and too high maintaining cost. These are all due to bulky batteries onboard. To overcome those problems, there are many attempts to apply the power-while-running scheme like the electric railway to electric vehicles. One approach to this scheme is the magnetic coupling between two coils, which was first demonstrated in MIT and worldwide known as wireless electricity. This approach may be useful for charging the vehicles when they are staying at the parking lot or some facility. It would be difficult to keep a high power transfer efficiency when the vehicle is running. This is because the coils must be accurately placed to have a common axis to obtain a high efficiency. This lecture presents a novel scheme to achieve a high transfer power efficiency even while the vehicle is running. The idea stems from the railway, but how can it be done without an overhead wire? We focus on the tire with a built-in steel belt, which always touches a road on the surface. Supposing a pair of electrodes just beneath the road surface, the steel belt can pick up the power through displacement current in the tire. This scheme is called Electric Vehicle on Electrified Roadway Powered While Running or "EVER-PWR". The audience may say is it really feasible. So the lecture shows a spectacular demonstration at least in a video on the screen. As a measurement result using a scale model of EVER-PWR, an incredible power transfer efficiency exceeding 77% is exhibited. This is a major step toward the development of quite promising green vehicle technology for our sustainable future.

BRIEF BIOGRAPHY

Takashi Ohira received the B.E. and D.E. degrees in communication engineering from Osaka University, Osaka, Japan, in 1978 and 1983. In 1983, he joined NTT Electrical Communication Laboratories, Yokosuka, Japan, where he was engaged in research on monolithic integration of microwave semiconductor devices and circuits. He developed GaAs MMIC transponder modules and microwave beamforming networks aboard Japanese domestic multibeam communication satellites, Engineering Test Satellite VI (ETS-VI) and ETS-VIII, at NTT Wireless Systems Laboratories, Yokosuka, Japan. Since 1999, he has been engaged in research on wireless ad-hoc networks and microwave analog adaptive antennas aboard consumer electronic devices at ATR Adaptive Communications Research Laboratories, Kyoto, Japan. Concurrently he was a Consulting Engineer for National Space Development Agency (NASDA) ETS-VIII Project in 1999, and an Invited Lecturer for Osaka University from 2000 to 2001. From 2005, he was Director of ATR Wave Engineering Laboratories, Kyoto, Japan. Currently, he is Professor of Toyohashi University of Technology. He coauthored Monolithic Microwave Integrated Circuits (Tokyo: IEICE, 1997). Prof. Ohira was awarded the 1986 IEICE Shinohara Prize, the 1998 APMC Prize, and the 2004 IEICE Electronics Society Prize. He serves as European Microwave Association Award Councilor and IEICE Microwave Technical Group President. He is an IEEE Fellow, Founder of IEEE MTT-S Kansai Chapter, and Founder of IEEE MTT-S Nagoya Chapter.

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