Recently, in pursuit of improving safety, comfort, and environmental-friendliness, electronic control units (ECUs) in vehicles have been rapidly enhancing their higher function, performance and integration. Wireless communications with GPS, ETC, etc. have been growing and technical innovation such as communication networks (LAN) linking those ECUs will never remain the same.

As the technologies for vehicles progress, EMC (electromagnetic compatibility) performance has become an important challenge that the car industry needs to address. Accordingly, car manufacturers request their suppliers to test each ECU for confirmation to ensure EMC performance, and thus man-hours for evaluation are increasing every year.

In these circumstances, in order to curb the increase in evaluation man-hours and ensure EMC quality in product development, FUJITSU TEN has promoted development of EMC evaluation methods since fiscal year 2007. We developed, for the purpose of reducing the man-hours, the system to measure "conducted emissions" which is frequently measured and requires many man-hours in evaluation. This document describes our development of the measurement system that may replace the conventional method.

Abstract

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Development of Automatic Measurement System for Conducted Emissions
1.1 EMC Environment for Vehicles

1.2 Endeavor for Evaluation Method Development

Promotion of evaluation methods development synchronized with ECU development, accurately grasping the changing electromagnetic environment in the market and/or for cars

Creation of efficient and accurate EMC evaluation environment

Development of low-cost evaluation methods

1.3 Reasons for Equipment Development

1.4 Effect of Conducted Emissions on Receivers

2.1 Problems and Objectives of Conventional Measurement Method

2.2 Aims and Targets of New Method
4.1 Measurement Theory

4.2 Verification of Theory

Noise Detection Method
Development of Automatic Measurement System for Conducted Emissions

4.2.2 Verification Results

5.1 Determination of Control Parameters
5.2 Specifications

5.2.1 Structure

5.2.2 Measuring Portion

5.3 Measurement Process
Verification Results

6.1 Verification Results

5IJTTFDUJPOEFTDSJCFTUIFSFTVMUTPGDIFDLJOHWBMJEJUZPGUIFTZTUFNCZNFBTVSFNFOUVTJOHBUFTUTJHOBMHFOFSBPUPSFJOBGUFSSFGFSSFEUPBTBDPNCHFOFSBUP"DPNCHFOFSBUPSTBPDBMJCSBUJPOUPPMXJUI8)TQMBDFEJOQBSBMMFMUPFMJNJOBUFFGGFDUTPGBOFODJSDMJOH8)5IFSFTVMUTPGJOQVUTJHOBMTSBOHJOHGSPN.)[UP()[BSFTIPXOJOUIFOFYUTFDUJPO6.1.1 Measured Results

'JH TIPXTUIFXBWFGPSNPGUIFBDUVBMJOQVUTJHOBMTIFSFJOBGUFSSFGFSSFEUPBTUIFPSFUJDBMWBMVFT

6.1.2 Results of Separation Analysis

'B

UP'JH F TIPXUIFBOBMZTJTSFTVMUTBCPWFJOEJWJEVBM8)T5IFSFTVMUTNFBTVSFEBCPWFUIF8)TFYDFQUUIF8)BSFTFQBSBUFECZUIFBOBMZTJT*OBEEJUJPOGPSUIF8)

UIFBOBMZ[FEEBUBJTBMNPTUUIFTBNFBTUIFUIFPSFUJDBMWBMVFT0OUIFUIFPSIBOE
TJHOBMTXFSFBMTPNFBTVSFEBCPWFUIFPUIFS8)TUPXIJDITJHOBMTXFSFOPUJOQVU&TQFDJBMMZDMFBS
TJHOBMTXFSFNFBTVSFEBCPWFUIF8)'PSTPMWJOHUIJTQSPCMFNUIFTFQBSBUJPOBOBMZTJTUBTDPOEVDUFE5IFMFWFMTPGXBWFGPSNTTIPXOJO

'B

UIFTJHOBMTXFSFBMTPNFBTVSFEBCPWFUIF8)'PSTPMWJOHUIJTQSPCMFNUIFTFQBSBUJPOBOBMZTJTUBTDPOEVDUFE5IFMFWFMTPGXBWFGPSNTTIPXOJO

'JH BSFEJGGFSFOU
GSPNUIFPOFPGUIFUIFPSFUJDBMWBMVFTCFDBVTFUIFZBSFUIFPOFTCFGPSFCFJOHDPSSFDUFEXJUIUIFBOUFOOBGBDUPST

345x4198 6.1 Verification Results and Challenges for the Future
6.1.3 Comparison to Conventional Measurement Method

6.2 Achievements

6.3 Development in the Future

Conclusion

Profiles of External Writers

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Research associate in Department of Electrical and Electronic Engineering of Tokyo Institute of Technology in 1982, lecturer in Yokohama National University in 1989, associate professor in Yokohama National University in 1991. Currently, being engaged in research in microwave circuit for electromagnetic wave heating, antenna and radio propagation for mobile communications, EMC/EMI, etc. as professor of Graduate School of Yokohama National University.

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Established Microwave Factory Co., Ltd. in 2003. Since then, has engaged in the business related to radio waves such as designing and building radio anechoic rooms/shielded rooms, designing of high-frequency inspection instruments, etc. Currently, being CEO of Microwave Factory Co., Ltd.