

Investigation of the Impact on Emission Performance During Chassis Dynamometer Operation

Katsumasa Aoki ¹⁾

1) Toyota Motor Corporation, 1 Toyota-cho, Toyota, Aichi 471-8572, Japan

KEY WORDS: Electronics and control, Electromagnetic compatibility (electromagnetic interference/electromagnetic susceptibility), Test/measurement/diagnosis, Electrostatic discharge (ESD) [E1]

During antenna-induced noise evaluation using a chassis dynamometer, increased noise levels in the AM radio band were observed during vehicle operation. However, the cause of this phenomenon has not been fully clarified. In this study, electrostatic discharge generated between vehicle tires and chassis dynamometer rollers was investigated as a possible source of increased antenna-induced noise and its influence on emission measurement results.

The antenna-induced noise level at 0.53 MHz increased by 15.8 dB during chassis dynamometer driving compared with the vehicle stop condition, while no increase was observed during jack-up driving. This result indicates that the observed noise increase was not caused solely by the operation of the vehicle systems, but was associated with the contact between the tires and the dynamometer rollers. To investigate the relationship between electrostatic phenomena and noise generation, tire surface potential measurements, anti-static spray evaluation, and visual observation of the tire-roller contact area were conducted.

The antenna-induced noise level at 0.53 MHz increased by 15.8 dB during chassis dynamometer driving compared with the vehicle stop condition, while no increase was observed during jack-up driving. In addition, tire surface potential increased from 0.1 kV to 2.9 kV during chassis dynamometer operation, indicating significant electrostatic charging of the tire surface during roller contact. Application of anti-static spray reduced the noise level by 11.9 dB. Furthermore, light emission was observed near the tire-roller contact area during chassis dynamometer driving, whereas no such phenomenon was observed under the vehicle stop condition. This observation supports the occurrence of electrostatic discharge at the tire-roller interface.

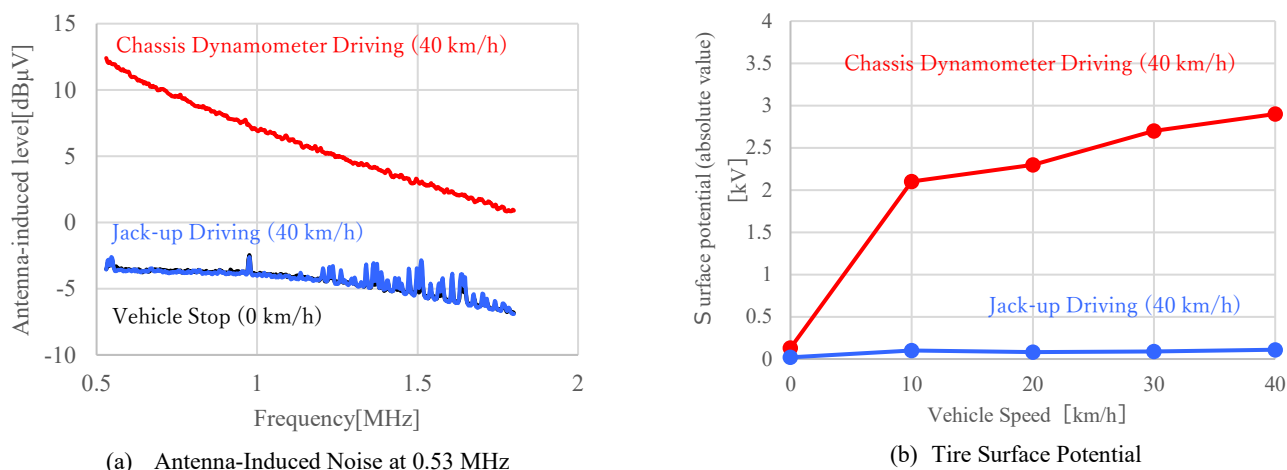


Fig.1 Influence of Chassis Dynamometer Operation on Antenna-Induced Noise and Tire Surface Potential

These results suggest that electrostatic charging and discharge at the tire-roller interface are one of the major factors contributing to the increase in antenna-induced noise observed during chassis dynamometer operation. The findings indicate that electrostatic discharge originating from the test environment should be considered when interpreting emission measurement results obtained under chassis dynamometer conditions. This study provides insights into test-environment-related noise sources affecting antenna-induced noise measurements in the AM radio band and contributes to a better understanding of noise generation mechanisms during chassis dynamometer operation.