Investigation into the Errors in the CISPR 12 Full Vehicle Radiated Emissions Measurements Due to Vehicle Directivity

Max Paterson, John F Dawson

Electronics Department, The University of York, UK

mp638@york.ac.uk

Abstract. This project investigates the errors introduced when recording the radiated emissions of current road vehicles due to the directivity of the vehicle body shell. Within modern cars there is an ever increasing array of electronic devices, all of which pose an electromagnetic interference threat to other electronic devices both within the vehicle and also outside of the vehicles boundary. The threat could range from someone walking past using their I-Pod or mobile phone through to a TV or stereo system in the home. Electronic devices can be considered as unintentional transmitters of radio frequency energy, this energy propagates away from the device with unknown directions and amplitudes. In order to ascertain the exact direction at which the maximum amplitude occurs a full spherical scan of the device with a measurement system is required.

The aim of CISPR 12 is to provide protection against such interference by defining a limit below which all vehicles radiated emissions must fall. The current method utilised during a CISPR 12 measurement program does not maximise the emissions through azimuth rotation and antenna height scanning, as is the case with most other Standards used to test typical domestic and commercial appliances. During a CISPR 12 measurement a fixed receive antenna height of 3m is used, with the DUT being measured at just two azimuth angles (normal to the left hand and right hand side of the vehicle, in line with the centre of the engine block).

In an attempt to investigate the errors introduced by using the current CISPR 12 measurement method, a simple representation of a vehicle body shell has been modelled using a package of commercially available electromagnetic simulation software (CONCEPT II.) The model was excited using a single 2m long harness located in the passenger foot well position. The amplitude of the vertical and horizontal component of the electric field has been simulated for five frequencies between 100 MHz and 500 MHz. From this data, polar plots of the radiation pattern were produced. The maximum amplitude recorded over the full 360 degree rotation of the model was then compared to the amplitude recorded at the two CISPR 12 equivalent azimuth angles. Errors of up to 30 dB have been recorded across the frequency band considered.

Future work will investigate methods of reducing the errors described above, this will include the use of alternate azimuth angles and the use of different heights for the receive antenna above the ground.