ANNEX I

REQUIREMENTS TO BE MET BY VEHICLES AND ELECTRICAL/ ELECTRONIC SUBASSEMBLIES FITTED TO A VEHICLE

6. SPECIFICATIONS

6.1. General specification

6.1.1. A vehicle and its electrical/electronic system(s) or ESA(s) shall be so designed, constructed and fitted as to enable the vehicle, in normal conditions of use, to comply with the requirements of this Directive.

6.1.1.1. A vehicle shall be tested for radiated emissions and for immunity to radiated disturbances. No tests for conducted emissions or immunity to conducted disturbances are required for vehicle type-approval.

6.1.1.2. ESA(s) shall be tested for radiated and conducted emissions, for immunity to radiated and conducted disturbances.

6.1.2. Before testing, the technical service has to prepare a test plan in conjunction with the manufacturer, which contains at least mode of operation, stimulated function(s), monitored function(s), pass/fail criteria(s) and intended emissions.

6.2. Specifications concerning broadband electromagnetic radiation from vehicles

6.2.1. Method of measurement

The electromagnetic radiation generated by the vehicle representative of its type shall be measured using the method described in Annex IV. The method of measurement shall be defined by the vehicle manufacturer in accordance with the technical service.

6.2.2. Vehicle broadband type-approval limits

6.2.2.1. If measurements are made using the method described in Annex IV using a vehicle-to-antenna spacing of 10,0 ± 0,2 m, the limits shall be 32 dB microvolts/m in the 30 to 75 MHz frequency band and 32 to 43 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 2 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 43 dB microvolts/m.

6.2.2.2. If measurements are made using the method described in Annex IV using a vehicle-to-antenna spacing of 3,0 ± 0,05 m, the limits shall be 42 dB microvolts/m in the 30 to 75 MHz frequency band and 42 to 53 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 3 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 53 dB microvolts/m.

6.2.2.3. On the vehicle representative of its type, the measured values, expressed in dB microvolts/m shall be below the type-approval limits.

6.3. Specifications concerning narrowband electromagnetic radiation from vehicles.

6.3.1. Method of measurement

The electromagnetic radiation generated by the vehicle representative of its type shall be measured using the method described in Annex V. These shall be defined by the vehicle manufacturer in accordance with the technical service.

6.3.2. Vehicle narrowband type-approval limits

6.3.2.1. If measurements are made using the method described in Annex V using a vehicle-to-antenna spacing of 10,0 ± 0,2 m, the limits shall be 22 dB microvolts/m in the 30 to 75 MHz frequency band and 22 to 33 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 4 of this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 33 dB microvolts/m.

6.3.2.2. If measurements are made using the method described in Annex V using a vehicle-to-antenna spacing of 3,0 ± 0,05 m, the limit shall be 32 dB microvolts/m in the 30 to 75 MHz frequency band and 32 to 43 dB microvolts/m in the 75 to 400 MHz frequency band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 5 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 43 dB microvolts/m.

6.3.2.3. On the vehicle representative of its type, the measured values, expressed in dB microvolts/m, shall be below the type-approval limit.

6.3.2.4. Notwithstanding the limits defined in paragraphs 6.3.2.1, 6.3.2.2 and 6.3.2.3 of this Annex, if, during the initial step described in Annex V, paragraph 1.3, the signal strength measured at the vehicle broadcast radio antenna is less than 20 dB microvolts over the frequency range 76 to 108 MHz measured with an average detector, then the vehicle shall be deemed to comply with the limits for narrowband emissions and no further testing will be required.

6.4. Specifications concerning immunity of vehicles to electromagnetic radiation.

6.4.1. Method of testing

The immunity to electromagnetic radiation of the vehicle representative of its type shall be tested by the method described in Annex VI.

6.4.2. Vehicle immunity type-approval limits.

6.4.2.1. If tests are made using the method described in Annex VI, the field strength shall be 30 volts/m rms in over 90 % of the 20 to 2 000 MHz frequency band and a minimum of 25 volts/m rms over the whole 20 to 2 000 MHz frequency band.

6.4.2.2. The vehicle representative of its type shall be considered as complying with immunity requirements if, during the tests performed in accordance with Annex VI, there shall be no degradation of performance of ‘immunity-related functions’.

6.5. Specification concerning broadband electromagnetic interference generated by ESAs

6.5.1. Method of measurement

The electromagnetic radiation generated by the ESA representative of its type shall be measured by the method described in Annex VII.

6.5.2. ESA broadband type-approval limits

6.5.2.1. If measurements are made using the method described in Annex VII, the limits shall be 62 to 52 dB microvolts/m in the 30 to 75 MHz frequency band, this limit decreasing logarithmically with frequencies above 30 MHz, and 52 to 63 dB microvolts/m in the 75 to 400 MHz band, this limit increasing logarithmically with frequencies above 75

MHz as shown in Appendix 6 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 63 dB microvolts/m.

6.5.2.2. On the ESA representative of its type, the measured values, expressed in dB microvolts/m, shall be below the type-approval limits.

6.6. Specifications concerning narrowband electromagnetic interference generated by ESAs.

6.6.1. Method of measurement

The electromagnetic radiation generated by the ESA representative of its type shall be measured by the method described in Annex VIII.

6.6.2. ESA narrowband type-approval limits

6.6.2.1. If measurements are made using the method described in Annex VIII, the limits shall be 52 to 42 dB microvolts/m in the 30 to 75 MHz frequency band, this limit decreasing logarithmically with frequencies above 30 MHz, and 42 to 53 dB microvolts/m in the 75 to 400 MHz band, this limit increasing logarithmically with frequencies above 75 MHz as shown in Appendix 7 to this Annex. In the 400 to 1 000 MHz frequency band the limit remains constant at 53 dB microvolts/m.

6.6.2.2. On the ESA representative of its type, the measured value, expressed in dB microvolts/m shall be below the type-approval limits.

6.7. Specifications concerning immunity of ESAs to electromagnetic radiation.

6.7.1. Method(s) of testing

The immunity to electromagnetic radiation of the ESA representative of its type shall be tested by the method(s) chosen from those described in Annex IX.

6.7.2. ESA immunity type-approval limits

6.7.2.1. If tests are made using the methods described in Annex IX, the immunity test levels shall be 60 volts/m for the 150 mm stripline testing method, 15 volts/m for the 800 mm stripline testing method, 75 volts/m for the TEM cell testing method, 60 mA for the bulk current injection (BCI) testing method and 30 volts/m for the free field testing method in over 90 % of the 20 to 2 000 MHz frequency band, and to a minimum of 50 volts/m for the 150 mm stripline testing method, 12,5 volts/m for the 800 mm stripline testing method, 62,5 volts/m, for the TEM cell testing method, 50 mA for the bulk current injection (BCI) testing method and 25 volts/m for the free field testing method over the whole 20 to 2 000 MHz frequency band.

6.7.2.2. The ESA representative of its type shall be considered as complying with immunity requirements if, during the tests performed in accordance with Annex IX, there shall be no degradation of performance of ‘immunity-related functions’.

6.8. Specifications concerning the immunity to transient disturbances conducted along supply lines

6.8.1. Method of testing

The immunity of ESA representative of its type shall be tested by the method(s) according to ISO 7637-2:DIS2002 as described in Annex X with the test levels given in Table 1.

Table 1:

IMMUNITY OF ESA

Test pulse number	**Immunity test level**	**Functional status for systems**	
		Related to immunity-related functions	**Not related to immunity-related functions**
1	III	C	D
2a	III	B	D
2b	III	C	D
3a/3b	III	A	D
4	III	B *(for ESA which must be operational during engine start phases)* C *(for other ESAs)*	D

6.9. Specifications concerning the emission of conducted disturbances

6.9.1. Method of testing

The emission of ESA representative of its type shall be tested by the method(s) according to ISO 7637-2:DIS2002 as described in Annex X for the levels given in Table 2.

Table 2:

MAXIMUM ALLOWED PULSE AMPLITUDE

Polarity of pulse amplitude	**Maximum allowed pulse amplitude for**	
	vehicles with 12 V systems	**vehicles with 24 V systems**
Positive	+ 75	+ 150
Negative	– 100	– 450