

**AMENDMENT NO. 2**  
**TO**  
**AIS-004/1999**  
**Electromagnetic Radiation from Automotive Vehicle - Permissible Levels**  
**and Methods of Tests.**

1. All pages :

Substitute “ AIS-004 (Part 1) / 1999 ” for “ AIS-004/1999 ” wherever it appears.

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THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA  
P. B. NO. 832, PUNE 411 004  
ON BEHALF OF  
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE  
UNDER  
CENTRAL MOTOR VEHICLE RULES - TECHNICAL STANDING COMMITTEE  
SET-UP BY  
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS  
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)  
GOVERNMENT OF INDIA  
May 2008

**AMENDMENT NO. 1  
TO  
AIS-004/1999  
Electromagnetic Radiation from Automotive Vehicle - Permissible Levels and  
Methods of Tests.**

1. Page no. 9, clause no. 7.10 (i) :  
Add at the end “If the vehicle is provided with air conditioning system then the same shall be in operation with maximum blower speed during testing ”
2. Page 15, Table 2, In the Title, 3<sup>rd</sup> line – Add “--- or mean (average)---” after the word “ peak ---”
3. Page 17, Annexure : 2, clause no 3 , sub-clause sr. no. 8, in column –2 :  
Substitute “Change in ignition system components such as magneto/alternator, CDI/transistorised ignition system, HT cable, HT coil, spark plug, suppressor cap, ECU and/or their makes ” for the existing text
4. Page 17, Annexure : 2, clause no 3 , sub-clause sr. no. 11, in column –3 :  
Substitute “ No test required ” for “ Test needed ”
5. Page 20, Figure - 3, row no. 3 and column no.1 :  
Substitute “ Detector Peak/Average” for “ Peak ”
6. Page 21, Figure – 4, row no. 3 and column no.1 :  
Substitute “ Detector Peak/Average” for “ Peak ”

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SET-UP BY  
MINISTRY OF ROAD TRANSPORT & HIGHWAYS  
GOVERNMENT OF INDIA

September-2003

**AUTOMOTIVE INDUSTRY STANDARD**

**Electromagnetic Radiation from  
Automotive Vehicle - Permissible  
Levels & Methods of Tests**

PRINTED BY:  
THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA  
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ON BEHALF OF :  
DEPT. OF INDUSTRY  
GOVERNMENT OF INDIA  
AND  
MINISTRY OF SURFACE TRANSPORT  
GOVERNMENT OF INDIA

January 1999

Status chart of the Standard to be used by the purchaser  
for updating the record

<b>Sr. No.</b>	<b>Corr-igenda.</b>	<b>Amend-ment</b>	<b>Revision</b>	<b>Date</b>	<b>Remark</b>	<b>Misc.</b>

**General remarks :**

## Introduction

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997.

To ensure that the electromagnetic radiation emitted by the vehicle and by its various subsystems should not cause any undue interference with external systems, a standard on the permissible limits of such radiation, was prepared by the erstwhile Committee to frame the safety & pollution standards, formed by the Ministry of Industry, numbered as SS21 & has been notified in the CMVR under Rule 124 and has been in force from March 1994. The Safety Standard specifies the maximum limits for the wide (broad) band electromagnetic radiation emitted by the vehicle, in the frequency range 40 to 400 MHz. and is generally in line with the EEC directive No. 72/245. This standard was once amended as SS21.1 which also has been notified in CMVR.

In Europe, by subsequent amendments to the EEC directives, the following additional requirements for the radiation limits have been incorporated;

- The maximum limits for wide band electromagnetic radiation emitted by the vehicle in the frequency range 30 to 1000 MHz.
- The maximum limits for narrow band electromagnetic radiation emitted by the vehicle in the frequency range of 30 to 1000 MHz.

This AI Standard is a revision of the Safety Standard 21.1 to incorporate the above requirements. Preparation of this Draft was undertaken by ARAI on the recommendation of erstwhile CMVR Technical Sub-Committee in the form of an amended Safety Standard (SS : 21.2). The AISC after it was constituted finalised this Standard in the present form and renumbered it as AIS - 004 / 98. This has been approved by the permanent CMVR Technical Standing Committee (CTSC) in its meeting held on -----.

Based on the recommendation of the CTSC the MOST will be notifying this Standard in the CMVR for implementation. This will remain in operation until corresponding Indian Standard / revised Standard comes into effect.

The Automotive Research Association of India (ARAI), Pune, being the Secretariat of AIS Committee, has printed this Standard.

Preparation of a standard for the immunity when the vehicle/electronic sub assembly are subjected to external electromagnetic field to find out the immunity performance has been identified in the programme of work for AISC.

The committee responsible for preparation of this standard is given in Annexure : 3

## **Electromagnetic Radiation From Automotive Vehicle- Permissible Levels & Methods of Tests**

### **1.0 SCOPE**

This standard lays down the method of measurement and permissible limits of interference voltage caused by Automotive Vehicles.

### **2.0 PURPOSE**

This standard lays down the method of measurement and permissible limits of interference voltage or interference field strength emitted in the form of electromagnetic waves by Automotive Vehicles & / or separate technical units intended for fitment in vehicles.

### **3.0 APPLICATION**

This standard applies to all types of motor vehicles, including agricultural tractors. This also applies to electric vehicle or vehicles fitted with electric motors and to components or separate technical units intended for fitment in vehicles.

### **4.0 DEFINITIONS**

For the Purposes of this standard following definitions shall apply:

- 4.1 'Electromagnetic disturbance', means any electromagnetic phenomenon which may degrade the performance of a vehicle or one of its electronic/electrical systems or a separate technical unit. An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself
- 4.2 'Electromagnetic environment' means totality of electromagnetic phenomena present in a given location
- 4.3 'Reference limit', means the nominal level to which the type approval limit values are referenced
- 4.4 'Reference antenna', for the frequency range 20 to 80 MHz means a shortened balanced dipole being a half wave resonant dipole at 80 MHz, and for the frequency range above 80 MHz, means a balanced half wave resonant dipole tuned to the measurement frequency.
- 4.5 'Broad-band emission' means an emission which has a band-width exceeding that of a specific receiver or a particular measuring instrument
- 4.6 'Narrow-band emission' means any emission which has a band-width less than that of a specific receiver or a particular measuring instrument

- 4.7 'Electronic / electrical system' means (an) electronic and / or electrical device (s) or set(s) of devices together with any associated electrical connections which form part of a vehicle but which are not intended to be type approved separately from the vehicle.
- 4.8 'Electrical / electronic sub assembly' (ESA) means (an) electrical and /or electronic device(s) or set(s) of devices intended to be part of a vehicle, together with any associated electrical connections and wiring, which performs one or more specialised functions. An ESA may be approved at the request of a manufacturer as either a 'component' or a 'separate technical unit (STU)'.
- 4.9 "Vehicle Type" in relation to electromagnetic radiation characteristics (compatibility) means vehicles which do not differ essentially in such respects as; the overall size and shape of the engine compartment; the general arrangement of the electrical and / or electronic components and the general wiring arrangements; the primary material of which the body or shell ( if applicable ) of the vehicle is constructed. The presence of panels of different material does not change the vehicle type provided the primary material of the body is unchanged.
- 4.10 An "ESA type " in relation to electromagnetic radiation characteristic (compatibility) means ESAs which do not differ in such essential respects as the function performed by the ESA; the general arrangement of the electrical and / or electronic components; if applicable.

## **5.0 TYPE APPROVAL - APPROVAL OF A VEHICLE TYPE**

- 5.1 The vehicle manufacturer shall draw up a schedule describing all projected combinations of relevant vehicle electronic/electrical systems, or separate technical units, body styles, variations in body material, general wiring arrangement, engine variations, left hand/ right hand versions and wheel base versions. Relevant vehicle electrical / electronic systems or ESAs are those which may emit significant narrow band or broad (wide) band radiation and /or those which are involved in the driver's direct control. The driver's direct control of the vehicle is exercised by means of for example, steering braking or engine speed control. Information to be supplied shall contain at least the details given in the format enclosed in Annexure 1 A.

### 5.2 Type approval of a vehicle

The following alternative routes to type-approval of a vehicle may be used at the discretion of the vehicle manufacturer.

#### 5.2.1 Approval of vehicle installation

A vehicle installation may achieve type approval directly by following the provisions laid down in paragraph 6. If this route is chosen by a vehicle manufacturer, no separate testing of electrical/electronic systems or ESAs is required.

### 5.2.2 Approval of vehicle type by testing of individual ESAs.

A vehicle manufacturer may obtain approval of the vehicle by demonstrating to the testing agency that all the relevant (see Para 5.1) electrical/electronic systems or ESAs have been individually approved in accordance with this standard and have been installed in accordance with any conditions attached thereto.

5.2.3 A manufacturer, may obtain approval if the vehicle has no equipment of the type which is subject to emission tests. The vehicle shall have no systems as specified in paragraph 5.1 and no spark ignition equipment. Such approvals do not require testing.

### 5.3 Type approval of an ESA

An ESA may achieve type approval by following the provisions laid down in paragraph 6. Type approval may be granted to an ESA to be fitted either to any vehicle type or to a specific vehicle type or types as requested by the manufacturer. ESAs involved in the direct control, as explained in 5.1, of vehicles will normally receive type approval in conjunction with applicable vehicle. Information to be supplied shall contain at least the details given in the format enclosed in Annexure 1 B.

### 5.4 Guidelines for deciding whether testing is needed

Annexure 2 gives factors to be considered for extension of type approval certificate of one model to changes in technical specifications or its variant (s).

## 6.0 REQUIREMENTS

### 6.1 For Vehicles

#### 6.1.1 Broad Band (Wide band)

- (i) This test is intended to measure the broad band (wide band) emissions generated by spark ignition systems.
- (ii) Two, alternate, reference antenna - from the vehicle distances are permissible: 10.0 +/- 0.2 m or 3.00 +/- 0.05 m. The choice of distance can be made upon relation of consistently recorded ambient level with limits specified at the distance.
- (iii) Every vehicle when tested for electromagnetic radiation with the method given in this standard shall meet the requirements of the limits of radiation given in Table 1 at the spot frequencies described at ' 7.12.4 '. On the vehicle tested, the measured values, expressed in dB microvolts/m, shall be at least 2.0 dB (20 %) below the reference limits.



### 6.1.2 Narrow Band

- (i) This test is intended, to measure narrow band electromagnetic emissions which might generate from a microprocessor-based system or other narrow band source.
- (ii) Two, alternate, reference antenna - from - the vehicle distances are permissible:  $10.0 \pm 0.2$  m or  $3.00 \pm 0.05$  m. The choice of distance can be made upon relation of consistently recorded ambient level with limits specified at the distance.
- (iii) Every vehicle when tested for electromagnetic radiation with the method given in this standard shall meet the requirements of limits of radiation given in Table 2.

On the vehicle tested, the measured values, expressed in dB micro volts/m, shall be required to be at least 2.0 dB (20%) below the reference limits.

- (iv) Notwithstanding the limits defined in paragraph 6.1.2. (ii) if during the initial step as described in paragraph 7.13 the signal strength measured at the vehicle broadcast radio antenna is less than 20 dB micro volts (10 micro volts) over the frequency range from 88 to 108 MHz, then the vehicle shall be deemed to comply with the limits for narrow band emissions and no further testing will be required.
- (v) The emission should be measured as per MEAN detection for two or three wheeled vehicles.
- (vi) The emission should be measured as per PEAK detection or AVERAGE detection for four wheeled and other vehicles.

## 6.2 For Electronic Sub-Assemblies (ESA)

### 6.2.1 Broad Band ( Wide band )

Every ESA when tested for electromagnetic radiation with the method given in this standard shall meet the limits of radiation given in Table 3 at the spot frequencies described at ' 7.12.4 '.

On the ESA representative of its type, the measured values, expressed in - dB microvolts/m, shall be at least 2.0 dB (20 %) below the reference limits.

### 6.2.2 Narrow Band

Every ESA when tested for electromagnetic radiation with the method given in this standard shall meet the requirements of the limits of radiation given in Table 3.

On the ESA representative of its type, the measured values, expressed in dB microvolts/m, shall be at least 2.0 dB (20%) below the reference limits.

The emission should be measured as per MEAN detection for ESAs for two or three wheelers.

The emission should be measured as per PEAK or AVERAGE detection for ESAs for four wheeled or other vehicles.

### 6.3 Exceptions

6.3.1 Vehicle or electrical/electronic system or ESA that does not include an electronic oscillator with an operating frequency greater than 9 kHz shall be deemed to comply with the requirements of narrow band emission in 6.1.2 / 6.2.2.

6.3.2 For vehicles fitted with tyres, the vehicle body/chassis can be considered to be an electrically isolated structure. Significant electrostatic forces in relation to the vehicle's external environment only occur at the moment of occupant entry into or exit from the vehicle. As the vehicle is stationary at these moments, no type-approval test for electrostatic discharge is deemed necessary.

6.3.3 Since during normal driving, no external electrical connections are made to vehicles, no conducted transients are generated in relation to the external environment. The responsibility of ensuring that equipment can tolerate the conducted transients within a vehicle, e.g. due to load switching and interaction between systems lies with manufacturer. No type-approval test for conducted transients is deemed necessary.

6.3.4 Vehicles with compression ignition engine are deemed to comply with the requirements of Broad band emission as per 6.1.1. They need to be tested for narrow band for the purpose of establishing compliance as described in 6.1.2.

## 7. TEST PROCEDURE

### 7.1 Measuring Apparatus

The measuring equipment must meet the conditions laid down in Publication No. 16, edition 2, of the International Special Committee on Radio Interference (CISPR).

A quasi-peak detector shall be used to measure broad-band electromagnetic emissions or if a peak detector is used an appropriate correction factor shall be used depending on the spark pulse rate. (see 7.12.3.).

An mean (average) detector or a peak detector shall be used for the measurement of radiated narrow band electromagnetic emissions.

## 7.2 Expression of the Results

The measured results are expressed in dB micro volts/m (micro volts/m). In the case of broad band (wide band) measurements, this shall be expressed for a band width of 120 kHz.

If the actual bandwidth B (expressed in kHz) does not correspond exactly to 120 kHz, the readings taken in micro volts/m are converted to a bandwidth of 120 kHz through multiplication by a factor of  $120/B$ .

## 7.3 Ambient

In order to ensure the absence of any noise or extraneous signals of a level that might materially affect the measurements, such measurements must be taken before and after the main test. Steps must be taken to ensure that no emission from the vehicle can significantly affect the measurements (e.g., the ignition key should be removed or the battery disconnected &/or the vehicle is withdrawn from the test surface). For both types of measurements, the noise or extraneous signal must be at least 10 dB below the limits stated in Tables 1,2 or 3 except for intentional narrow-band ambient transmissions.

## 7.4 Measuring location for tests on vehicle

7.4.1 The test surface must be horizontal and untrammelled and free of electromagnetic reflective surfaces within a minimum radius of 30 m, measured from a point mid-way between the vehicle and the antenna (see figure 7).

7.4.2 Both the measuring equipment and the test cab or the vehicle in which the measuring equipment is situated are positioned within the part of the test surface shown in Figure 7. Other measuring antennae are allowed within the test area, at a minimum distance of 10 m both from receiving antenna and the vehicle under test, provided that it can be shown that the test results will not be affected.

7.4.3 Enclosed testing installations may be used for the tests, if correlation can be shown between these installations and the external test site. Such installations are not subject to the conditions laid down in Figure 7 except for the condition relating to the distance between the vehicle and the antenna and to the height of the latter. Neither do they need to have ambient emissions checked before or after the test as indicated in paragraph 7.3 of this standard.

## 7.5. Antenna Type

For test of vehicle any antenna is permitted, provided that it can be normalised with the reference antenna. The method described in CISPR publication No 12, edition 3, Appendix A, may be used to calibrate the antenna.

## 7.6 Antenna position for tests of vehicle

### Height and distance measurement

#### Height

##### 10 m test

The antenna phase centre must be  $3.00 \pm 0.05$  m above the vehicle resting plane.

##### 3 m test

The antenna phase centre must be  $1.80 \pm 0.05$  m above the vehicle resting plane.

No part of the antenna receiving components must be less than 0.25 m from the vehicle resting plane.

#### Distance of Measurement

##### 10 m test

The horizontal distance from the tip or other appropriate point of antenna defined during the normalisation procedure to the outer body surface of the vehicle shall be  $10.0 \pm 0.2$  m.

##### 3 m test

The horizontal distance from the tip or other appropriate point of antenna defined during the normalisation procedure to the outer body surface of the vehicle shall be  $3.00 \pm 0.05$  m.

If the test is carried out in an enclosed installation with the object of creating an electromagnetic screen against radio frequencies, the position of the antenna receiving components must not be less than 1.0 m from any type of radio-frequency absorbent material and no closer than 1.5 m to the wall of the enclosed testing installation.

There must be no absorbent material between the receiving antenna and the vehicle under test.

#### Antenna location relative to vehicle

The antenna must be positioned successively on Right and Left hand side of the vehicle parallel to the longitudinal median plane of vehicle and in line with the mid-point of the engine (see figure 8).

#### Antenna position

Readings are taken for each measuring point, first with the antenna vertically polarised and also horizontally polarised (see figure 8).

### 7.7. Measuring location for tests on ESA

The test site shall meet the conditions laid down in Publication No. 16, edition 2, of the International Special Committee on Radio Interference (CISPR). Fig. 10.

The measuring set, test hut or vehicle in which the measurement set is located shall be outside the boundary shown in Fig 10.

Enclosed testing installation may be used for the tests, provided that correlation can be shown between these installations and the external test site. The testing installations are not subject to the dimensional conditions laid down in figure 10 except for condition relating to the distance between the ESA and the antenna and to the height of the latter. Fig 9A & 9B.

### 7.8 Antenna type for test on ESA

Any linearly polarised antenna shall be permitted, provided that it can be normalised with reference antenna.

### 7.9 Antenna position for tests on ESA

#### Height & distance measurement

#### Height

The phase centre of the antenna shall be  $150 \pm 10$  mm above the ground plane for broad band (wide band) measurements. The phase centre of the antenna shall be  $50 \pm 10$  mm above the ground plane for narrow band measurements

#### Distance of measurement

The horizontal distance measured between the antenna phase centre and the edge of the ground plane shall be  $1.00 \pm 0.05$  m. No part of the antenna shall be less than 0.5 m from the ground plane.

The antenna shall lie parallel to a plane that is perpendicular to the ground plane and runs coincident with the edge of the ground plane along which the main portion of the harness are situated.

If the test is carried out in an enclosed testing installation with the object of creating a screen against radio-frequencies, the antenna's components shall not be less than 0.5 m from any type of radio - frequency absorptive material or less than 1.5 m from the wall of the screen in question. There shall be no absorbent material between the receiving antenna and the ESA under test.

#### Orientation and polarisation of the antenna

Readings are to be taken at the measuring point, with the antenna polarised horizontally and also vertically.

#### 7.10 Vehicle state during test

Testing shall not be conducted while rain or other precipitation is falling on the vehicle or within 10 minutes after such precipitation has stopped.

##### (i) Broad band (wide band) test:

The engine must function at its normal operating temperature and, where a gear box is fitted, it must be in neutral. If this is not possible for practical reasons, alternative solutions must be sought by agreement with the manufacturer and the test agency.

Steps must be taken to ensure that the gear-changing mechanism do not exert any influence on electromagnetic radiation from the vehicle. During each measurement, the engine shall operate at a speed within specified range. The same speed shall be used for all the frequencies.

Engine Type	Method of Measurement
Spark Ignition	Quasi-peak/Peak
No. of Cylinders	Engine speed
One	2500 rpm +/- 10 %
More than One	1500 rpm +/- 10 %

##### (ii) Narrow band test:

The vehicle's electronic system shall all be in normal operating mode with the vehicle stationary.

The ignition shall be switched on. The engine shall not be operating.

#### 7.11 State of ESA on test - arrangement for ESA

The ESA shall be in its normal operating state. Measurement shall not be made while rain or other precipitation is falling on the ESA under test or within 10 minutes after rain or other precipitation has stopped. The ESA and its cable harnesses shall be supported on wooden or insulated table at  $50 \pm 5$  mm above the table. However, if one of the parts of the ESA is intended to be connected electrically to the metal bodywork of the vehicle that part shall be located on and be connected electrically to the ground plane.

The ground plane shall have to take the form of metal sheet at least 0.5 mm thick. The minimum size of the ground plane will depend upon the size of the ESA, but it will have to be sufficiently large to receive the vehicle system components and the cable harness. The ground plane shall be connected to the protective earth conductor and shall be located at a height of 1.0 +/- 0.1 m above the test facility floor and run parallel to it.

The ESA shall be ready to operate and be connected in accordance with the instructions. The power distribution cables shall run parallel to and lie at the most at 100 mm from the edge of the ground plane/table that is closest to the antenna.

The ESA shall be earthed as specified by the manufacturer, no additional earth connections shall be permitted.

The distance between the ESA and the other conducting structures such as the walls of a shielded area (except for the ground plane/table supporting the test object) shall be at least 1.0 m.

Power shall be applied to the ESA via a 5 micro-H/50 ohm resistance artificial network (AN) that is bonded electrically to the ground plane. The electrical supply voltage shall be maintained within  $\pm 10\%$  of the nominal operating voltage of the system. Any ripple voltage shall be less than 1.5 % of the nominal operating voltage of the system measured at the AN monitoring port. If the ESA consists of more than one device the best way of linking these together is to use the cable harness intended for use on the vehicle. If such a harness is not available, the length between the electronic control unit and the AN must be  $1.500 \pm 0.075$  m. All cables in the harness shall end in the most realistic way as possible and preferably, receive real loads and actuators. If other equipment is needed for the proper functioning of the ESA it will be necessary to compensate for its contributions to emission measured.

## 7.12 Frequencies of Broad band tests

7.12.1 Measurements are taken over a range of frequencies from 30 to 1000 MHz. Compliance with the required limits will be checked at spot frequencies described at 7.12.4.

A vehicle/ESA is considered as very likely to satisfy the required limits over the whole frequency range if it satisfies them at the spot frequencies described at 7.12.4. In the event that the limit is exceeded during the tests, steps must be taken to confirm that this is due to the vehicle/ESA and not due to back ground radiation.

7.12.2 The limits apply throughout the frequency range 30 to 1000 MHz.

7.12.3 Measurements can be performed with either quasi-peak or peak detectors. The limits given in Table 1 & 3 are for quasi-peak. If peak is used, add 38 dB for 1 MHz band width or subtract 22 dB for 1 kHz bandwidth.

7.12.4 Tolerance on Frequencies

Spot frequency (MHz)	Tolerance (MHz)
45,65,90,120,150,190 and 230	$\pm 5$
280,380,450,600,750 and 900	$\pm 20$

The tolerances are applied to the frequencies stated above with the aim of avoiding interference from transmissions operating at, or close to, the nominal frequencies during the measurements.

#### 7.13 Frequencies for narrow band tests:

As an initial step the levels of emissions in the FM frequency band (88 to 108 MHz) shall be measured at the vehicle broadcast radio antenna with equipment as specified in 6.1.2, (iv).

If the level specified in Table 2 is not exceeded, then the vehicle shall be deemed to comply with the requirements of this standard in respect of frequency band and the full test shall not be carried out.

In the case of an ESA, as a short (2 to 3 minutes) initial step, choosing one antenna polarisation, it is permitted to make sweeps of the frequency range identified in "7.13" using a spectrum analyser to indicate the existence and /or whereabouts of peak emissions. This may assist in the choice of frequencies to be tested.

#### Measurement

Measurements are taken over a range of frequencies from 30 to 1000MHz. This range is divided into 13 bands. In each band a test should be carried out at one spot frequency. In order to confirm that the vehicle complies with the requirements of this standard the test agency shall test at one such point in each of the following 13 frequency bands:

30 to 50, 50 to 75, 75 to 100, 100 to 130, 130 to 165, 165 to 200, 200 to 250, 250 to 320, 320 to 400, 400 to 520, 520 to 660, 660 to 820 and 820 to 1000 MHz.

In the event that the limit is exceeded during the tests, steps must be taken to confirm that this is due to the vehicle/ESA and not due to background radiation. If during the initial step described in the case of ESA the radiated narrow band emissions for any of the bands identified above are at least 10dB below reference limit, then the ESA shall be deemed to comply with the requirements of narrow band emission in respect of that frequency band.

#### 7.14 Readings

The maximum of the four readings taken in the case of vehicles or two readings in the case of ESAs at each spot frequency shall be taken as the characteristic reading at the frequency at which the measurements are made.

## 8 Notes

- (i) Where compliance of vehicle system has already been certified for SS 21, for establishing compliance to this standard, broad band emissions for frequencies up to 220 MHz need not be measured again.



## ANNEXURE : 1 A

## TECHNICAL SPECIFICATIONS FOR EMI TEST (VEHICLE)

<b>0.0</b>	<p><b>General</b></p> <p>Type and general commercial description (This covers model and Variants)</p> <p>Name of Manufacturer Address</p>
<b>1.0</b>	<p><b>Mass &amp; Dimensions</b></p> <p>Overall length Overall width Overall height Wheel base Kerb weight</p>
<b>2.0</b>	<p><b>Engine</b></p> <p>Type of engine ( 2 stroke / 4 stroke, SI / CI. ) No. of cylinders Position and arrangement Bore and Stroke Compression ratio Maximum net power Fuel Lubrication mix No. of carburettors Intake system Position / drawing of air filter Air filter make Air filter type (Ref. 5.1)</p>
<b>3.0</b>	<p><b>Electrical equipment</b></p> <p>Nominal voltage</p> <p><b>Ignition system</b></p> <p>Make Type ( Ref. 5.1) Operating principle Ignition adv. Characteristic Point gap</p>

**Generator**

Type ( Ref. 5.1 )  
Nominal power

**4.0 Interference Suppression System**

**Spark Plug**

Make  
Type (Ref. 5.1)  
Point gap

**HT cable and coil**

Make  
Type (Ref. 5.1)  
Identification  
Length x OD  
Resistance of ignition cable

**Cap (Resistive)**

Make  
Type (Ref. 5.1)  
Part no. / Identification

**Electronic unit**

Make  
Type (Ref. 5.1)  
Terminology and drawing of  
Interference Suppression  
Equipment  
Resistance of ignition cable

**Place :**

**Authorised Signatory :**

**Note :** Please use system of units as practised in BIS for measurements indicated in this table.

**ANNEXURE : 1 B****TECHNICAL SPECIFICATIONS FOR EMI TEST (ESA)****0. General**

Type (General commercial description) :

Make (Trade name of manufacturer) :

Name of the manufacturer :

Address :

1. This ESA shall be approved as a component/STU (\*)  
(\* ) Delete what is not applicable
  
2. Any restrictions of use & conditions for

**Note :**

Any drawing must be supplied in appropriate scale and in sufficient detail. Photographs, if any, must show sufficient details. If the systems, components or separate technical units have electronic controls, information concerning their performance must be supplied. The details shall also include description of the ESA chosen to represent the type and relevant test reports if parts of ESA are already type approved.

**Table 1**

**Limits For Broad Band Emission From Vehicles  
(Measured with quasi-peak detector)**

Frequency Range (MHz)	If the antenna is at 10 m Nominal distance from the vehicle		If the antenna is at 3 m Nominal distance from the vehicle	
	Microvolt/m	Equivalent dB Microvolt/m	Microvolt/m	Equivalent dB Microvolt/m
30 to 75	50	34	160	44
75 to 400	50 at 75 MHz increasing to 180 at 400 MHz (Ref. fig.1)	34 at 75 MHz increasing to 45 at 400 MHz (Ref. fig.1)	160 at 75 MHz increasing to 562 at 400 MHz (Ref. fig.2)	44 at 75 MHz increasing to 55 at 400 MHz (Ref. fig.2)
400 to 1000	180	45	562	55

If a peak detector is used appropriate correction factors given in CL 7.12.3 is to be used.

**Table 2**

**Limits For Narrow Band Emission From Vehicles  
[Measured with mean (average) detector for two or three wheelers and with peak detector for four wheelers]**

Frequency Range (MHz)	If the antenna is at 10 m nominal distance from the vehicle		If the antenna is at 3 m Nominal distance from the vehicle	
	Microvolt/m	Equivalent dB Microvolt/m	Microvolt/m	Equivalent dB Microvolt/m
30 to 75	16	24	50	34
75 to 400	16 at 75 MHz increasing to 56 at 400 MHz (Ref. fig.3)	24 at 75 MHz increasing to 35 at 400 MHz (Ref. fig.3)	50 at 75 MHz increasing to 180 at 400MHz (Ref. fig.4)	34 at 75 MHz increasing to 45 at 400 MHz (Ref. fig.4)
400 to 1000	56	35	180	45

Table 3

**Limits of Electromagnetic Emission From  
Electronic Sub Assemblies (ESA)**

Frequency Range (MHz)	Broad Band (Wide Band) With quasi peak detector *		Narrow Band	
	Microvolt/m	Equivalent dB Microvolt/m	Microvolt/m	Equivalent dB Microvolt/m
30 to 75	1600 at 30 MHz decreasing to 500 at 75 MHz (Ref. fig 5)	64 at 30 MHz decreasing to 54 at 75 MHz (Ref. fig. 5)	500 at 30 MHz decreasing to 160 at 75 MHz (Ref. fig. 6)	54 at 30 MHz decreasing to 44 at 75 MHz (Ref. fig.6)
75 to 400	500 at 75 MHz increasing to 1800 at 400 MHz	54 at 75 MHz increasing to 65 at 400 MHz	160 at 75 MHz increasing to 560 at 400 MHz	44 at 75 MHz increasing to 55 at 400 MHz
400 to 1000	1800	65	560	55

\* If a peak detector is used appropriate correction factors given in CL 7.12.3 is to be used.

**ANNEXURE : 2**  
**GUIDELINES FOR DECIDING WHETHER TESTING IS NEEDED**

1. This Annex. gives factors to be considered for the extension of type approval certificate of one model to changes in technical specifications or its variant (s).
2. In general, when changes in technical specifications of vehicle do not affect the performance adversely, and is still within the stipulated limits, the type approval certificates can be extended. The changes in parameters that affect the performance are listed in the table below as a guideline.
3. In the case of following changes, with respect to the vehicle tested, in the details submitted as per Annexure 1 A, tests are necessary for establishing compliance as follows:-

Sr. No.	PARAMETER	TO BE TESTED / NOT TESTED
1.	Change in Engine Power	No test, required, if change in power is within 10 %.
2.	Compression ratio (SI engines)	No test required, if change in compression ratio is within 10 %.
3.	Changes in body and cowling	Changes like 2 door to 4 door, shape of fenders or contours of hood, size of wheels or tyres are unlikely to have effect. Other changes need to be tested.
4.	Changes in size and shape of engine compartment.	Test needed.
5.	Location of HT Coil and consequent change in location of HT cable & high tension harness.	Test needed.
6.	Change in body material such as metal to non - metal & vice - versa.	Test needed.
7.	Change in the position and general mounting arrangement of engine consequent to situations like front engine to rear engine, LHS steering to RHS steering and vice - versa etc.	Test needed.
8.	Changes in suppression system or any suppressing component thereof and /or their makes.	Test needed.
9.	Addition of any electronic control unit under driver's direct control as defined in 5.1	Test needed.
10.	Changes in constituents of electronic control units as defined in 6.3.2	Test needed.
11.	Change in type, location and material of air - cleaner.	Test needed.
12.	Addition of air - conditioning equipment	Test needed.
13.	Significant difference in the clear opening to engine compartment - around wheel or - due to metal radiator construction change.	Test needed.
14.	Changes in protective coating	Type of paint is unlikely to affect EMI.

4. Above changes are listed for guidance only. It is not practicable to list all the changes that affect EMI.

Note: Changes in non-resistive elements of ignition system are considered to have no significant effect in EMI provided the vehicle manufacturer certifies so. (The elements are spark plug, spark plug cap, high tension cable & coil).

### VEHICLE BROADBAND REFERENCE LIMITS

Antenna - Vehicle Separation : 10 m

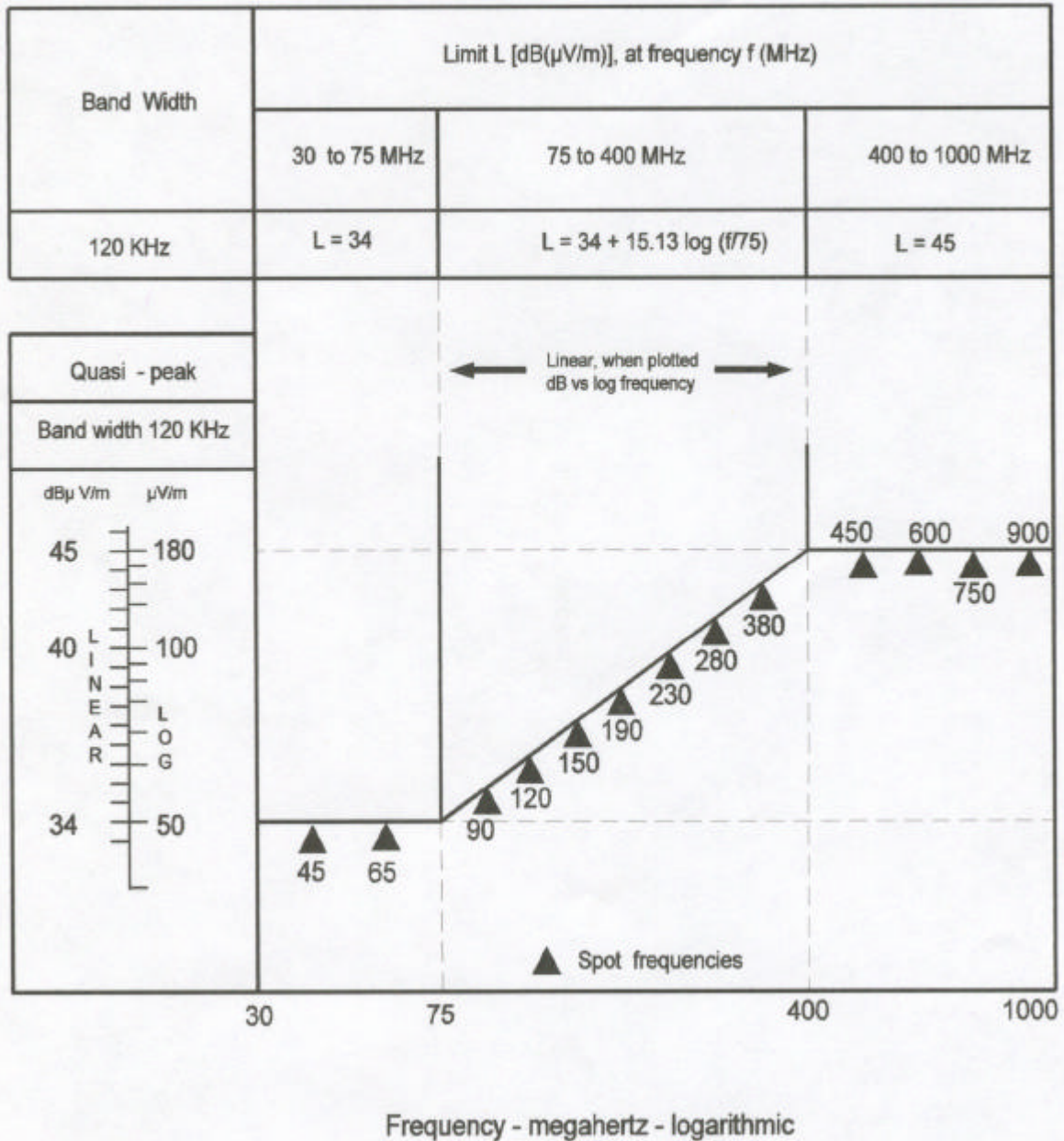


Figure - 1

## VEHICLE BROADBAND REFERENCE LIMITS

Antenna - Vehicle Separation : 3 m

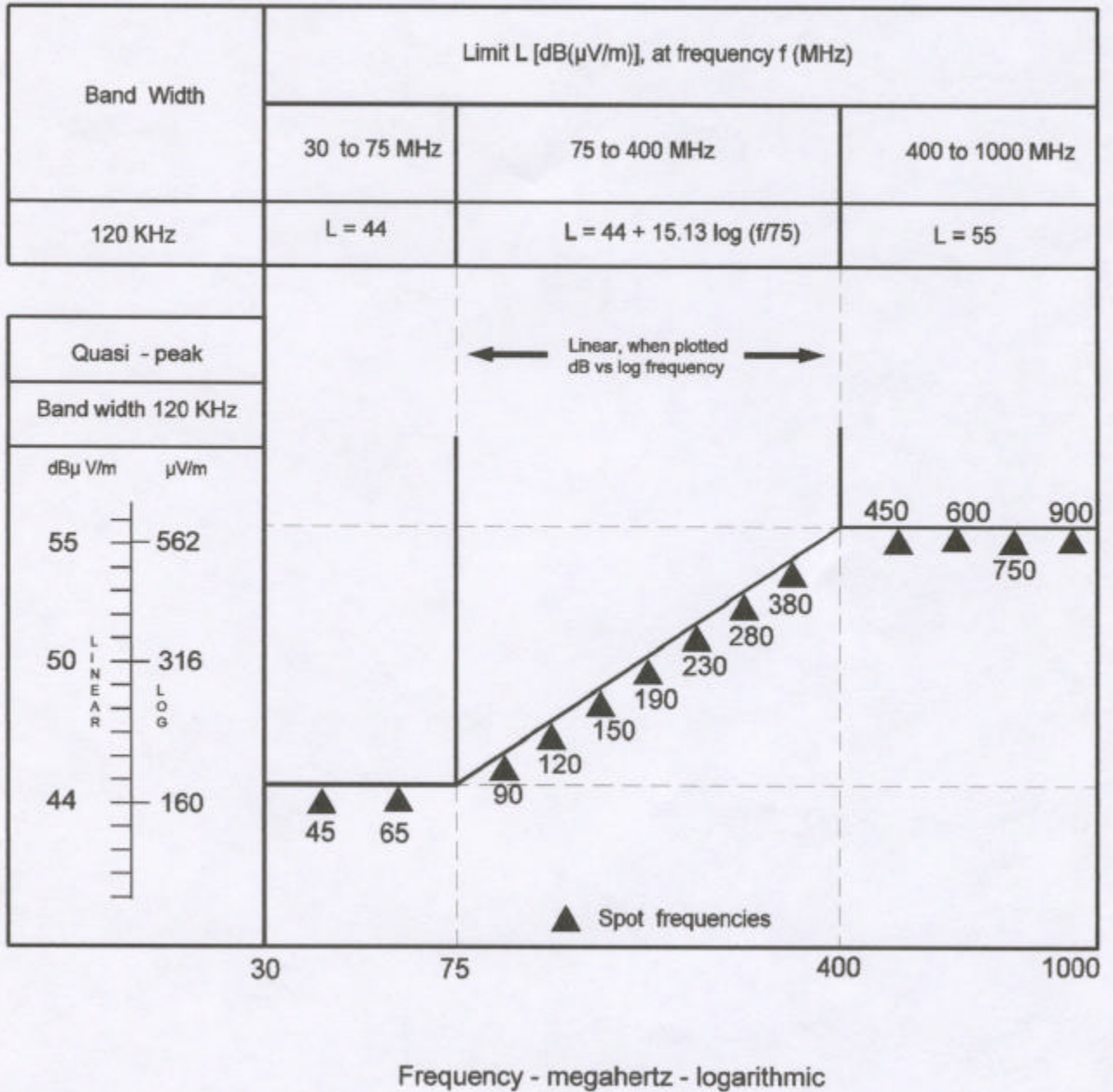
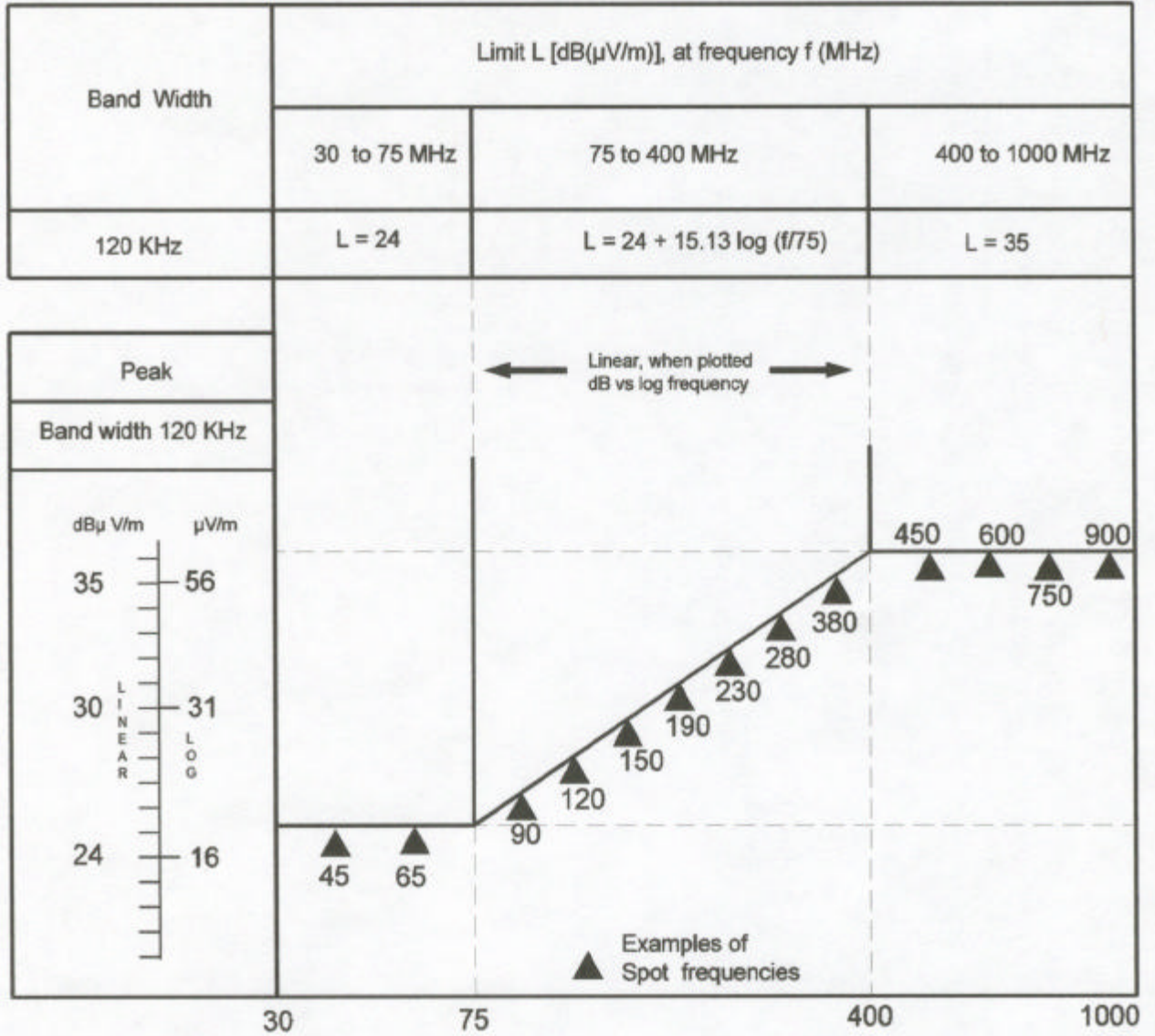


Figure - 2



### VEHICLE NARROWBAND REFERENCE LIMITS

Antenna - Vehicle Separation : 10 m

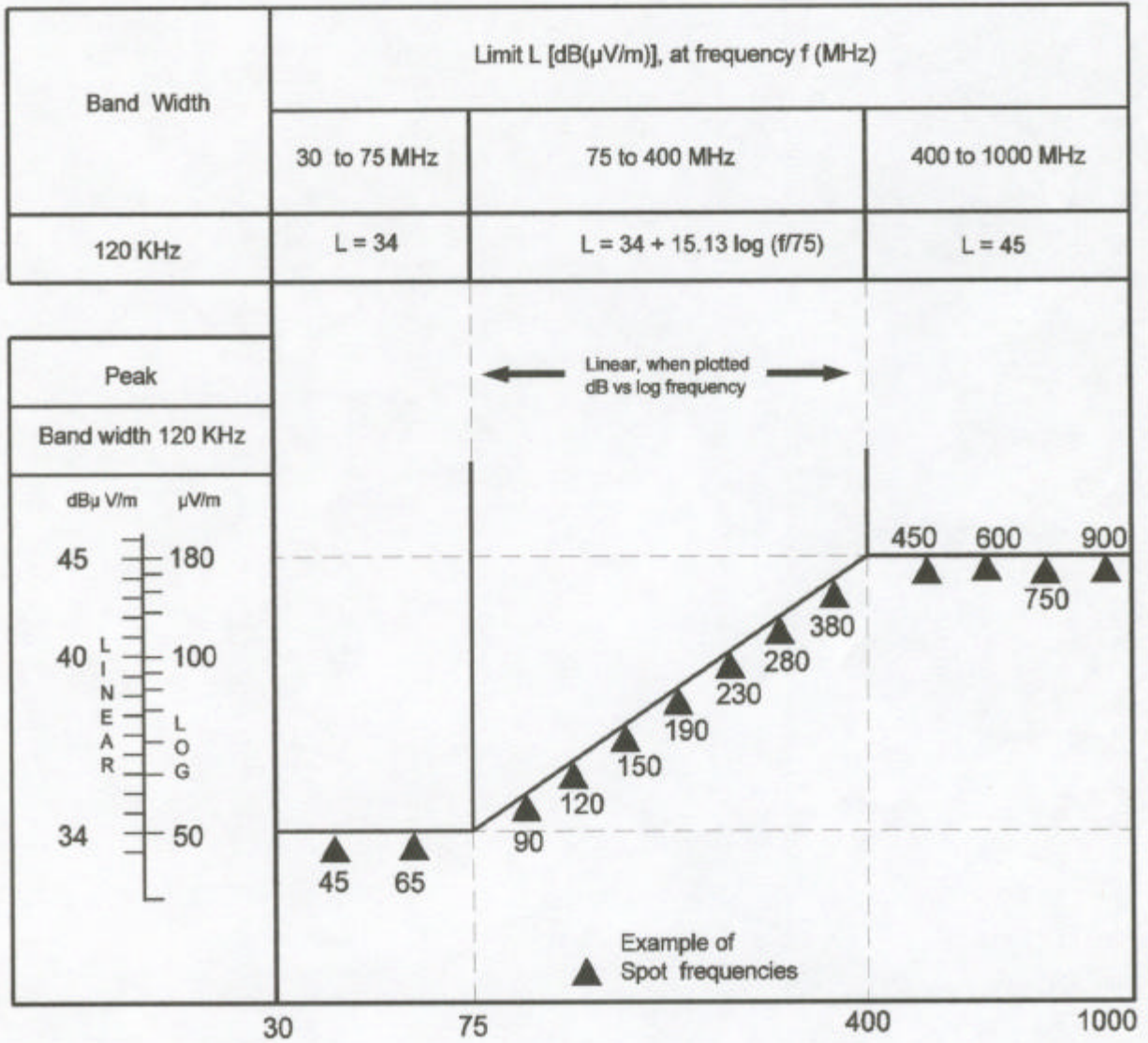


Frequency - megahertz - logarithmic

Figure - 3

## VEHICLE NARROWBAND REFERENCE LIMITS

Antenna - Vehicle Separation : 3 m



Frequency - megahertz - logarithmic

Figure - 4

ELECTRICAL / ELECTRONIC SUB - ASSEMBLY

Broadband Reference Limits

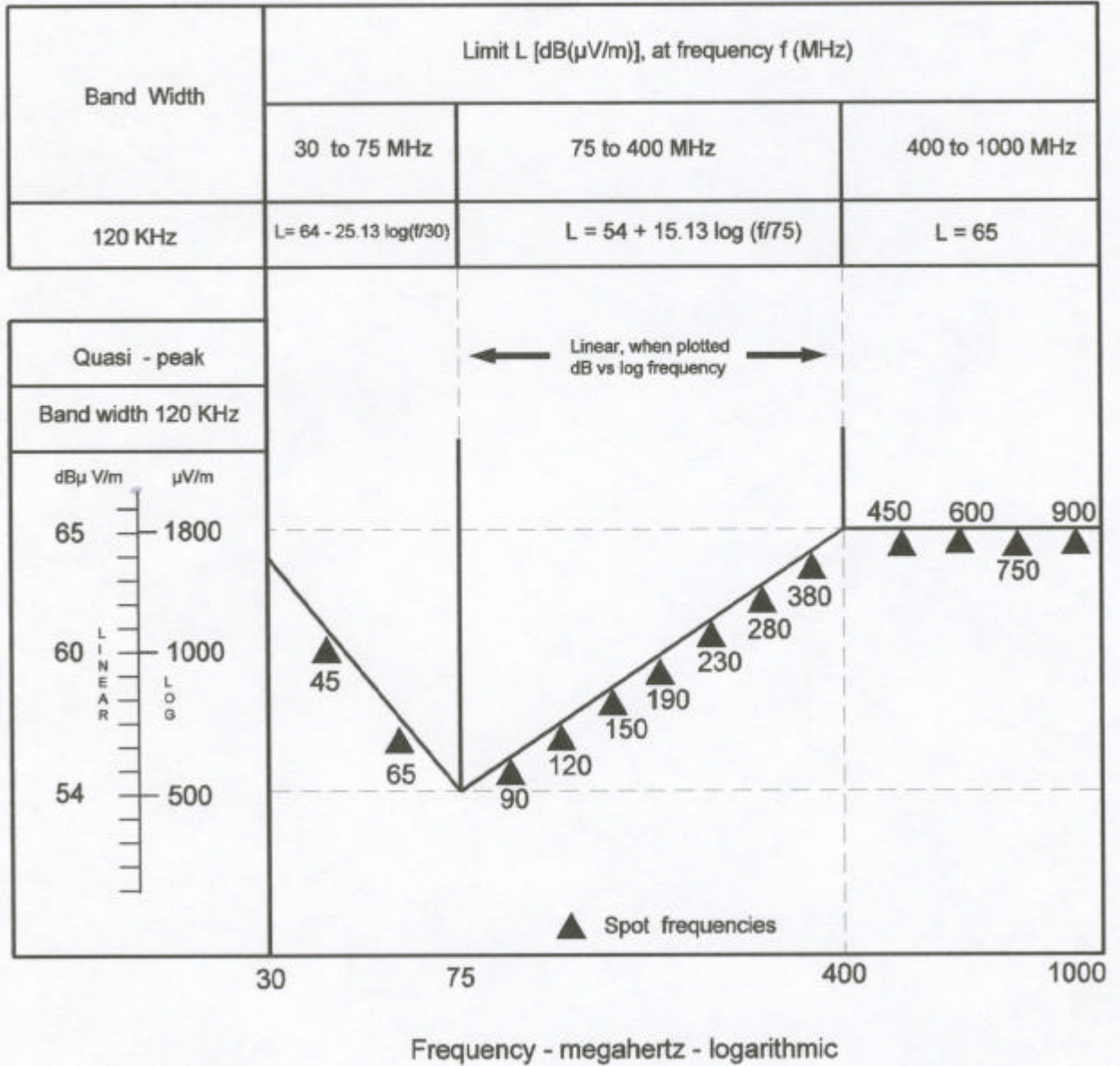
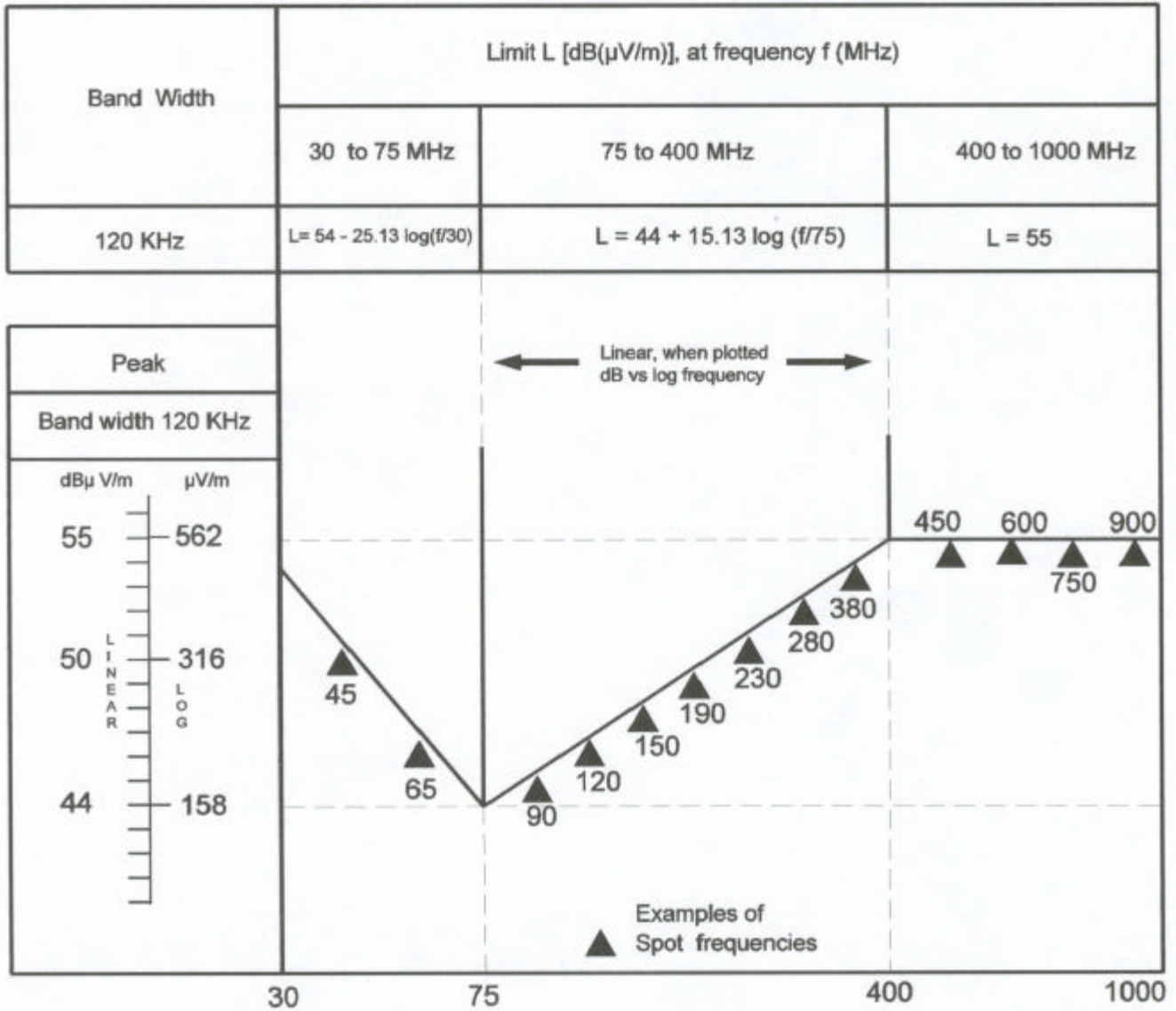


Figure - 5

## ELECTRICAL / ELECTRONIC SUB - ASSEMBLY

### Narrowband Reference Limits



Frequency - megahertz - logarithmic

Figure - 6

Vehicle test surface  
Clear horizontal surface free of electromagnetic reflection  
See CISPR 12, Edition 2

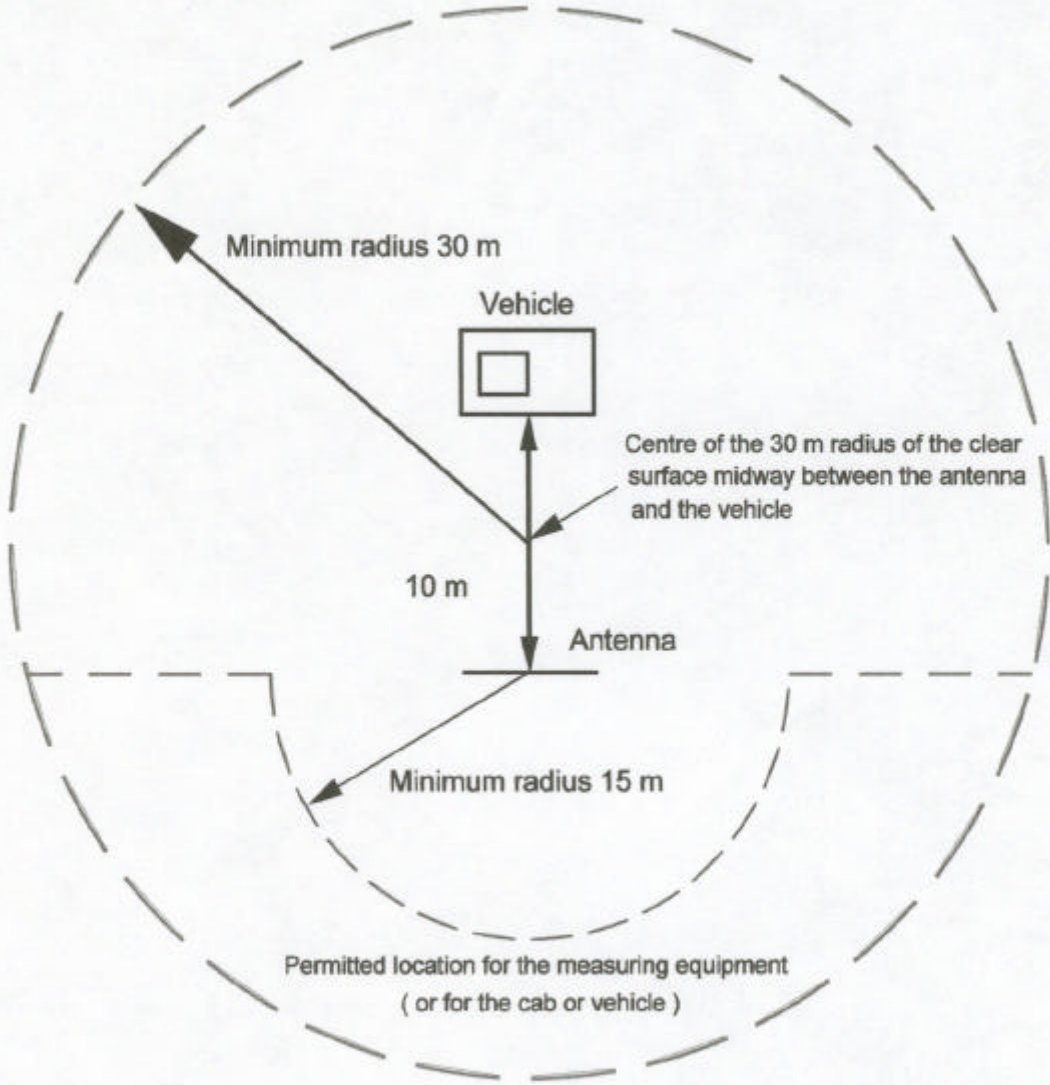


Figure - 7

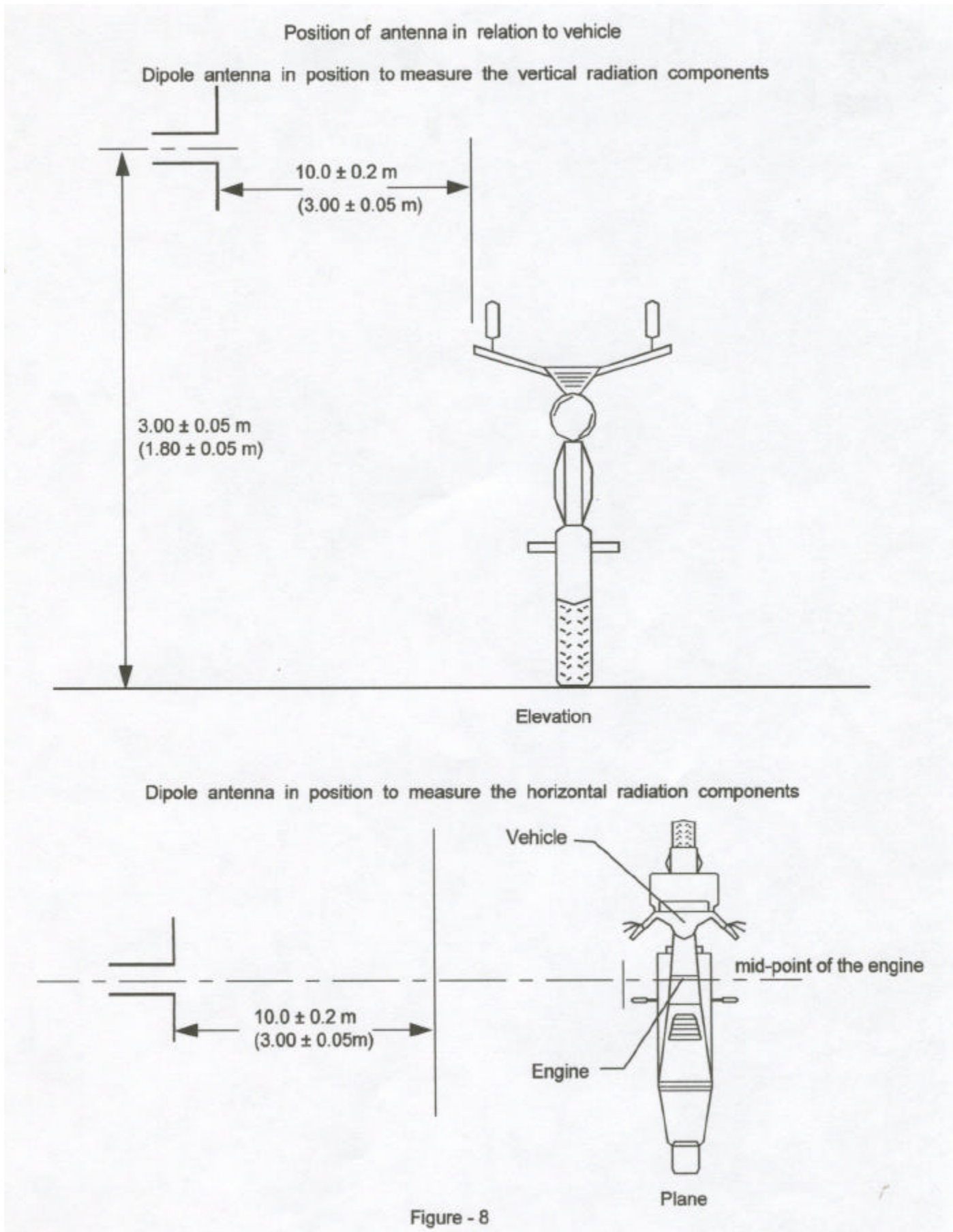
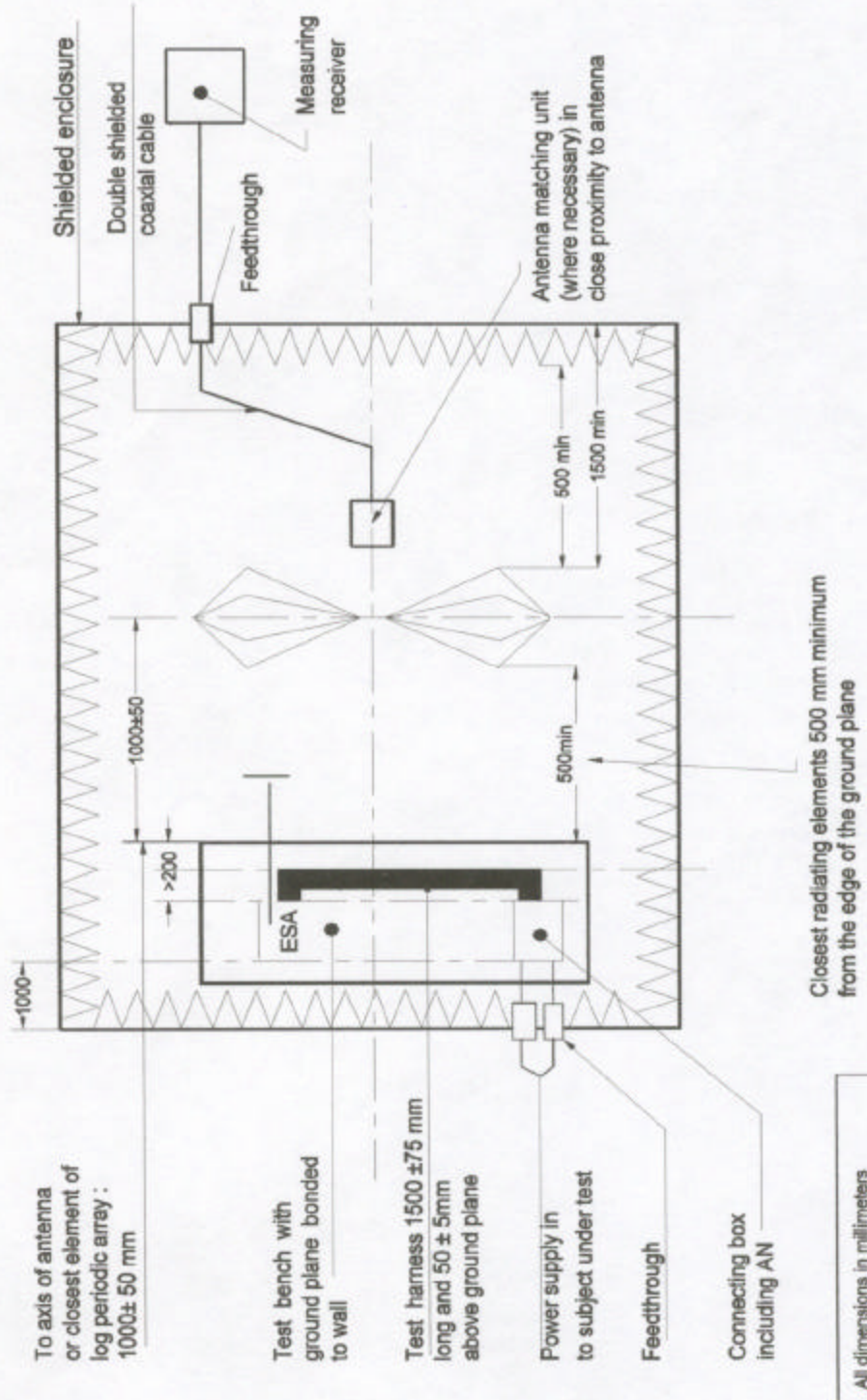
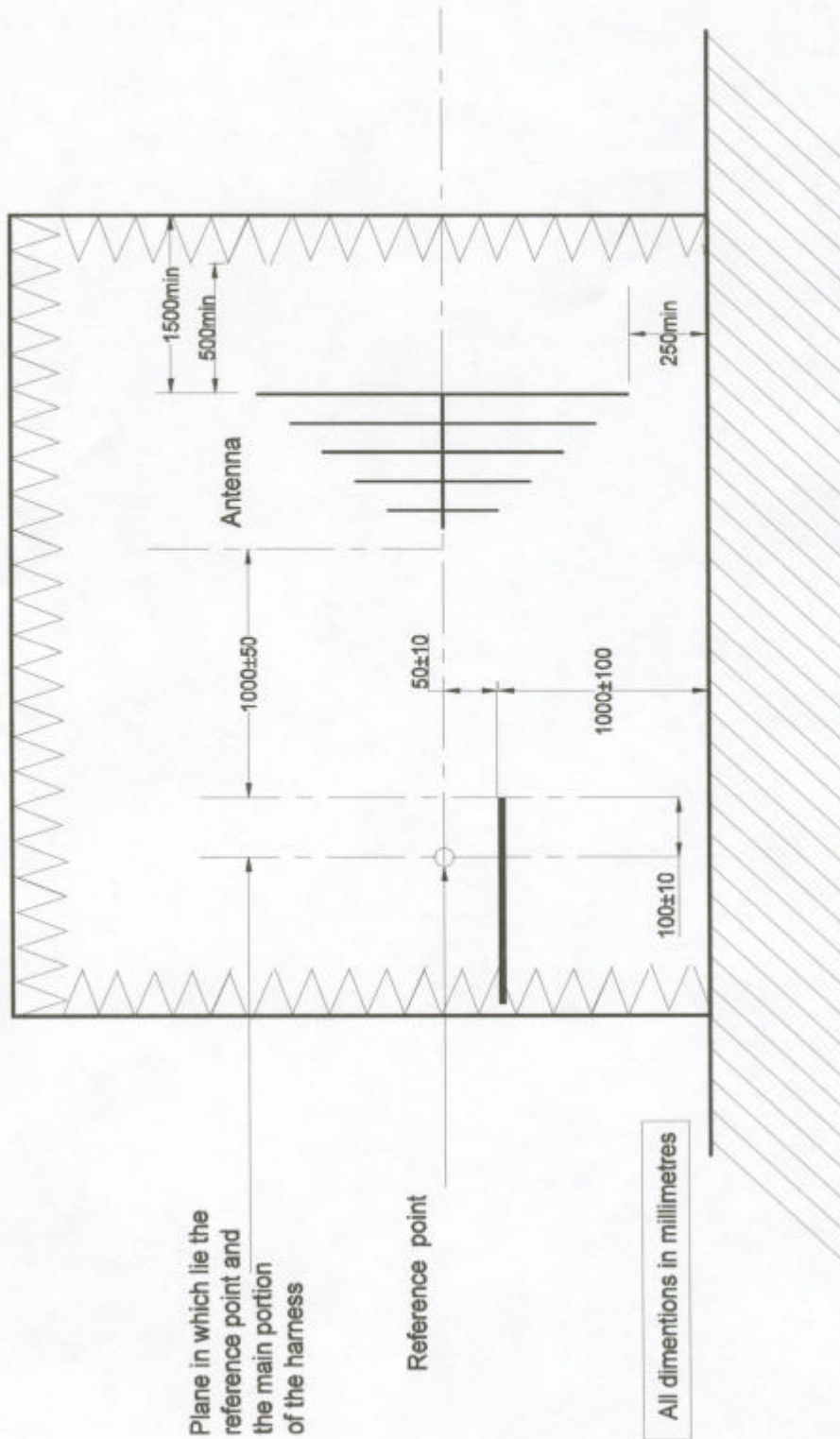


Figure - 9 A



Radiated electromagnetic emissions from an ESA test layout (General plan view)

Figure - 9 B



Radiated electromagnetic emissions from an ESA view of test bench plane of longitudinal symmetry.



Boundaries of the testing surface

Free area not including any electromagnetically - reflecting surface

See CISPR 16 ( draft )

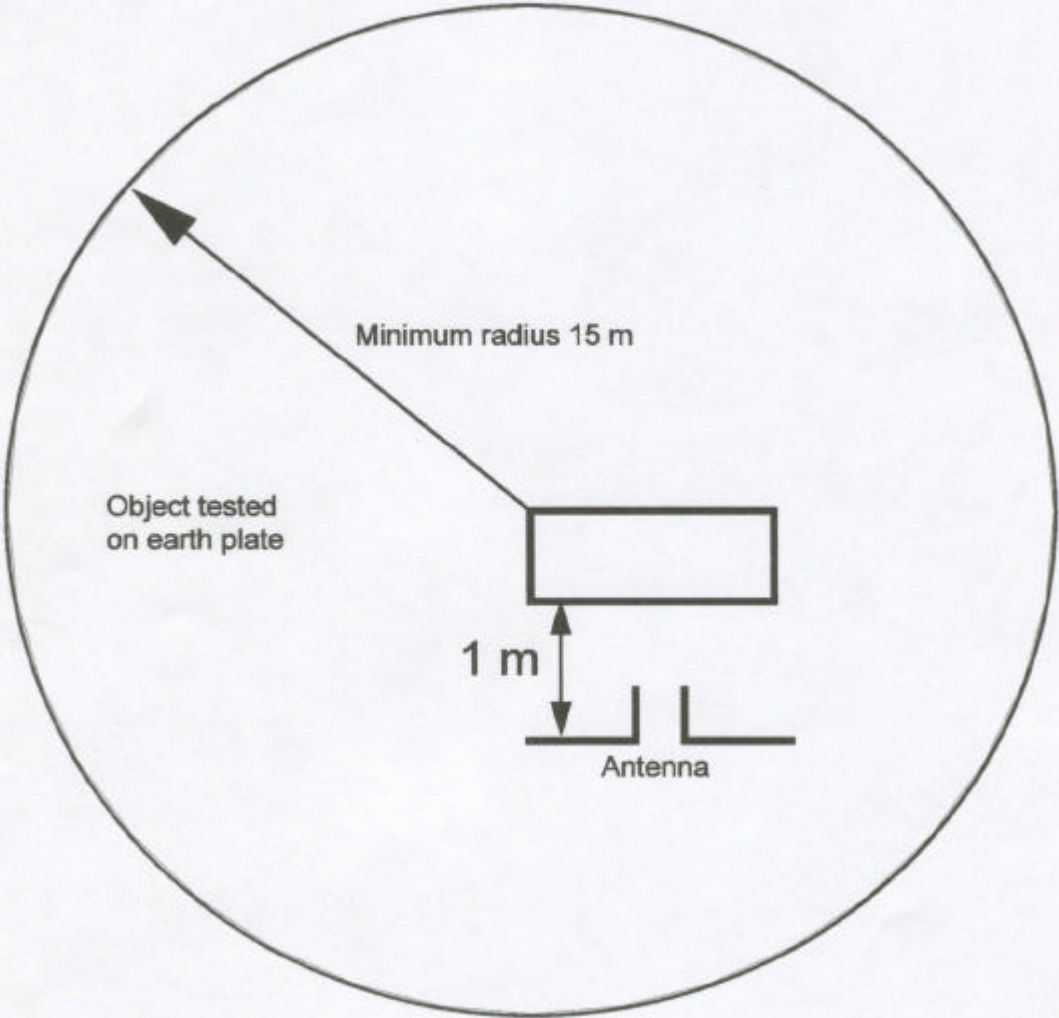


Figure - 10

**Annexure : 3**  
( Introduction )

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