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Automatic Distance/Time
Speedmeter Handbook
(Second Edition)
Provisional

A Guide to Type-Approval Procedures for
Automatic Distance/Time Speedmeters
Used for Road Traffic Law Enforcement in Great Britain

Dr S R Lewis

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HOME OFFICE SCIENTIFIC DEVELOPMENT BRANCH

THE AUTOMATIC DISTANCE/TIME SPEEDMETER HANDBOOK
(SECOND EDITION)

DR S R LEWIS

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Management Summary

Road traffic law now facilitates the introduction of new methods of speed detection, especially those that permit automatic and unattended detection by using a camera to record the offending motorist. This is one of a series of handbooks which contain a description of the technical requirements to be met for consideration of type-approval of certain types of speedometer which are prescribed devices for the purposes of the road traffic legislation. The handbooks are intended to be a reference for manufacturers wishing to develop or sell existing products to the police service in Great Britain. The handbooks contain not only a list of technical requirements but also guidance on methods of measurement, and the procedures to be followed in seeking type-approval.

This handbook covers speedometers which automatically measure average speed from the time taken to travel between two positions a known distance apart.

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1 INTRODUCTION

- 1.1 Section 20 of the Road Traffic Offenders Act 1988, as originally enacted, provides that evidence from a radar speed detection device is admissible in a prosecution for exceeding the speed limit only if the device is of a type approved by the Secretary of State. This provision was previously laid down in section 90 of the Road Traffic Regulation Act 1984. In practice, this means that all radar speedmeters used by the police for speed enforcement in Great Britain need to be of a type approved by the Home Secretary. To obtain such approval a model speedmeter must, among other things, first meet specific technical requirements laid down by the former Police Scientific Development Branch (PSDB), now the Home Office Scientific Development Branch (HOSDB). The first type-approval specification documents for hand-held and across-the-road radar devices were published by PSDB (now HOSDB) in 1983 and 1984 respectively.
- 1.2 In the White Paper, *'The Road User and the Law'*, published on the 7th February 1989, the Government set out proposals for enabling more effective use of automatic detection devices in the enforcement of road traffic law, particularly speeding and traffic light offences. Statutory provisions to implement these proposals were included in the Road Traffic Act which received Royal Assent on 25 July 1991. Following this legislation, PSDB published the first editions of the *Speedmeter Handbook* and the *Red Light Camera Handbook* to provide guidance on the type approval requirements for a range of speedmeter devices and red light cameras. These took into account recommendations made by the International Organisation of Legal Metrology (OIML) and were expanded to include equipment incorporating photography and designed for unattended and automatic operation.
- 1.3 The opportunity was taken to include in a second edition of the *Speedmeter Handbook*, published in 1992, the technical requirements for speedmeters using optical methods, road-surface and sub-surface sensors. For greater clarity, it was decided not to continue to incorporate more new types of speedmeter in further editions of the *Speedmeter Handbook*, but to produce self standing documents for each type. These are based on the second and subsequent editions of the *Speedmeter Handbook*. This is such a document and covers speedmeters which automatically measure the average speed of a vehicle from the time taken to travel between two positions a known distance apart.
- 1.4 The type-approval procedure consists of a number of technical performance tests which are carried out on a single production model of the type of speedmeter offered for approval by the manufacturer or his appointed agent. The actual testing is carried out by an independent testing laboratory, and is paid for by the manufacturer or their agent. The formal steps necessary to seek approval are described later in section 9 of this guide.
- 1.5 The technical procedures described in this document replace previous requirements. They are intended as a guide to manufacturers and their agents. The procedures will be updated from time to time to take account of developments in speedmeter technology, and amended versions of this guide will be issued subsequently.

2 SCOPE

- 2.1 The test procedures described here are applicable to that equipment used for law enforcement which automatically measures the average speed of a vehicle from the time taken to travel between two positions a known distance apart. Such equipment may be designed for automatic use either unattended or supervised and used with photographic or electronic cameras to record a speeding vehicle.

3 TERMINOLOGY

3.1 Automatic

A speedmeter which, once set up, works by itself without direct and continuing human intervention and operates with an approved secondary check (see 3.10). Such equipment shall record an image of a speeding vehicle together with the time, date and speed, and if operated with a variable speed limit sign, direct evidence of the speed limit in force and displayed at that time.

3.2 Unattended operation

Equipment mounted in an appropriate housing and designed to operate automatically

3.3 Supervised operation

Equipment designed to operate automatically but supervised to protect the equipment and the integrity of the evidence

3.4 Average speed

A calculated speed obtained by dividing the distance between two datum points by the time measured for a vehicle to travel between them.

3.5 Baseline

The distance between two datum points over which an average speed is measured.

3.6 Failure

A speedmeter will be considered to fail a type-approval test if it displays an incorrect reading of speed outside of the tolerance range of error, or if it displays a speed when no measurement should be possible. The display of a blank screen or defined symbol in recognition of an incorrect reading is acceptable.

3.7 Image detector

The automatic detection of the presence, time and identity of a vehicle as it passes a datum point at the entry or exit of a baseline using image recognition techniques

3.8 Manufacturer or his agent

The organisation or company that has developed and/or manufactures the speedmeter or his appointed agent who submits the speedmeter and is party to the type-approval by the Home Office.

3.9 Primary method of speed measurement

The method of measuring the average speed used to provide primary evidence of the speed of a vehicle.

3.10 Second method of speed measurement

A second method of measuring the average speed of a vehicle independent of the primary method that may be used to verify correct performance of the speedmeter.

3.11 Speedmeter

A stationary device for measuring the speed of road traffic vehicles.

3.12 Distance/Time speedmeter

A speedmeter which measures the average speed of a vehicle by measuring the time taken to travel between two datum points.

3.13 Violation record

A record containing the evidence of an offence produced by a speedmeter.

3.14 Camera

A photographic, digital or video camera.

4 GENERAL REQUIREMENTS FOR ELIGIBILITY FOR TYPE-APPROVAL

- 4.1** The supplier shall provide free of charge a written technical description of the speedmeter, its operation and intended use, and full circuit diagrams to HOSDB when the device is accepted for the practical assessment described in section 9. They shall also provide free of charge a copy of this information together with a speedmeter of the type intended for sale to the testing laboratory carrying out the type approval before the laboratory commences its testing.
- 4.2** No liability for breakage or damage will be accepted by the Home Office or its agents.
- 4.3** The model type shall be indelibly marked on the outside of the meter (or its component parts if so assembled), together with a serial number which shall be unique to that instrument.
- 4.4** All models, if approved, shall be numbered consecutively.
- 4.5** Any system software or firmware shall be labelled with a version number, and a copy of the program along with a sample of the memory shall be left with the Home Office.
- 4.6** Once type-approval has been granted the manufacturer or their agent shall not change either the value or type of the components used, or alter the circuit, or the pre-programmed memory of the speedmeter, without permission of the Home Office.
- 4.7** The speedmeters shall be calibrated annually, and a certificate should be issued to this effect and held by the police. A visible sticker showing the date of calibration should be fixed to the meter.
- 4.8** Any repair or calibration shall be carried out by the manufacturer, their appointed agent, or a suitably qualified technician, offering appropriate evidence of technical and professional competence. Such persons shall keep accurate records which shall be open to inspection by the Home Office.
- 4.9** All equipment used for calibration (but not for repair) shall be certificated annually by a competent body with equipment traceable to national standards.
- 4.10** A handbook or a set of written instructions for the use of the operator shall be provided with the instrument when it is accepted for the practical assessment described in section 9. A copy will be provided to HOSDB. The instructions shall be dated and any subsequent changes agreed with HOSDB sent to all users, including the Home Office.
- 4.11** Any requirement for goods or materials to comply with this specification shall comply with :

- 1 a relevant standard or code of practice of a national standards body or equivalent body of any member state of the European Community;
- or 2 any relevant international standard recognised for use in any member state in the European Community;
- or 3 A relevant technical specification acknowledged for use as a standard by a public authority or any member state of the European Community;
- or 4 traditional procedures of manufacture of a member state of the European Union where these are the subject of a written technical description sufficiently detailed to permit assessment of the goods or materials for the use specified;
- or 5 a specification sufficiently detailed to permit assessment for goods or materials of an innovative nature (or subject to an innovative process of manufacture such that they cannot comply with a recognised standard or specification) and which fulfil the purpose provided by the specified standard provided that the proposed standard, code of practice, technical specification or procedure of manufacture provides in use equivalent levels of safety, suitability and fitness for purpose.

5 OPERATIONAL REQUIREMENTS

5.1 General

5.1.1 If one or more cameras are used to record a speeding vehicle at least one camera shall have a field of view sufficient to ensure that the speeding vehicle is clearly identified in relation to the exit datum point and its location. Road markings may be used to identify the location.

5.1.2 Any violation record shall show, in addition to the full image of the speeding vehicle at the exit datum point, in the order: the date in days, month, and year; and the time in hours, minutes, and seconds and a code representing the location of the measurement. In addition the base line distance and elapsed time used in the primary measurement shall be shown with the full precision used in the calculation. The time shown in photographs shall be within 10 seconds of a broadcast radio clock signal. On power up the speedometer shall not commence enforcement until this synchronisation has been established. Enforcement shall stop whenever synchronisation is not maintained or is not confirmed within 14 days. When image detectors are used in the measurement a reduced image from both the entry and exit detector cameras shall also be shown. These shall show the registration plate and surrounding vehicle area used in the automatic identification of the speeding vehicle and displayed with the precise time they were captured in hours, minutes, seconds and milliseconds. If two images a known time apart are used for the second method of speed measurement these images shall also be shown with the base line distance and elapsed time used in its calculation. All of the data shall be imprinted on or recorded with the violation record at the time of the speed measurement.

5.1.3 When image detectors are used, both shall be positioned to use the same angle of view to the same registration plate of vehicles passing the measurement datum points.

5.1.4 The speedmeter shall be provided with an on/off switch; 'power on' and, if batteries are to be used, 'battery low' indicators.

5.2 Test signal

The instrument shall be provided with an in-built test signal to simulate a measurement. The test signal shall be independent of the measuring circuits, and shall be capable of checking the function and accuracy of all circuits from the sensor/image detector input onwards. The test signal may operate automatically when the equipment is switched on, but it shall also be available for manual operation. When the test signal operates, the violation record shall clearly show that a test signal has been generated.

5.3 Segmented display

If a segmented display is used there shall be a means of checking that all segments are functioning.

5.4 Second Method of Speed Measurement

A second method of average speed measurement shall be used to verify the primary average speed measurement. The time interval used in the second method shall coincide within 0.1 second of the start and end of the primary measurement. The accuracy of the second method shall be within 10% of the average speed recorded by the primary measurement. The accuracy of this measurement shall be checked when each primary speed measurement is made under section 8.2.

5.5 Offence data storage

The data used as evidence of an offence shall be recorded on either

- i) photographic film;
- or ii) a removable digital storage medium which provides a physical record of the data and, once written, cannot be amended with new data

If the equipment is constantly supervised to maintain the integrity of the evidential chain, then the data may also be recorded on:

- iii) removable read writable digital storage media provided two copies are simultaneously made.

For unattended operation, all data shall be stored and only output with security codes generated using HOSDB published standards for data protection. It shall be recorded at the roadside unless requirements separately published by HOSDB for distributed automatic distance/time speedmeters with remote control and recording of evidence are also complied with. The data protection shall be applied immediately after capture within the tamper-proof cabinet. There shall be no external means of accessing the data without the protection being applied.

6 CONSTRUCTIONAL REQUIREMENTS

6.1 Components

The speedmeter shall be constructed of good quality components that shall be clearly marked with their type number or value, either in writing or by a recognised code. Any sensor cables shall have an identifying mark.

6.2 Power supply

Any part intended to connect to the mains supply shall conform with electrical safety regulations currently in force.

6.2.1 Battery operation

When the speedmeter supply is set at the normal voltage and the supply is gradually reduced below the minimum working voltage, no erroneous reading shall appear. Speed indication shall be inhibited when the power supply voltage varies beyond the design limits.

6.2.2 Vehicle fitting

Equipment operating from a vehicle shall use a separate battery to power the speedmeter, and any charging circuit from the vehicle power supply shall be disconnected when the speedmeter is switched on.

6.2.3 Mains operation

This section shall apply only to speedmeters intended to operate from the public mains supply, this section does not relate to safety legislation which is covered by the provisions of Directive 73/23/EEC (Electrical safety). No erroneous reading shall appear when the following disturbances are applied:

- a) variations of power supply voltage from minus 15% to plus 20% of nominal value;
- b) variation of power supply frequency from minus 2% to plus 2% of the nominal value;
- (c) power supply interruptions to any level down to and including:
 - (i) Zero voltage for 10 ms or less
 - (ii) 50% of nominal voltage for 20ms or less
 - (iii) 80% of nominal voltage for 50ms or less
- (d) repetitive electrical fast transients to test level 3 of EN 61000-4-4:1995

7 PERFORMANCE REQUIREMENTS

7.1 Storage

7.1.1 The speedmeter control unit and any electronic parts of the sensors shall, when out of service, be capable of storage in adverse conditions.

7.1.2 They shall be held for at least 3 hours at -25° and then $+70^{\circ}\text{C}$, with low humidity. The units shall then be allowed to return to room temperature and tested to ensure correct operation.

7.2 Working temperature range

7.2.1 The equipment shall function within specification over a temperature range of at least -10° to $+50^{\circ}\text{C}$, with 80% humidity above 20°C . The temperature shall be varied in 5° steps, and the equipment left for 30 minutes or longer to obtain thermal equilibrium. The equipment shall function correctly at each temperature step.

7.2.2 Unattended equipment shall have some form of sensor to prevent the equipment operating beyond the working temperature range.

7.3 Robustness

Equipment shall be constructed so as to be fit for its purpose, in particular, equipment designed for unattended use shall be tamper-proof.

All parts of the equipment that may be exposed to the weather shall comply with the requirement of BS EN 60529 (1992) classification IP 55 for water ingress and dust protection.

7.4 Electromagnetic compatibility

The equipment shall be capable of operating without indicating an erroneous reading as follows:

- a. in fields of at least 10V/m from 80 to 2000 MHz .
- b. in the presence of common mode currents from 27 MHz –100 MHz to Level 2 of Table 1 in EN 61000-4-6.

and, if designed for automatic supervised use

- c. in simulated TETRA fields as defined in section 8.5.6 of at least 20V/m.

For (a) and (c) the basic test procedure defined in EN 61000-4-3 shall be used. For (b) the basic common mode injection test procedure defined in EN 61000-4-6 shall be used.

Some of the requirements may be met by complying with the provisions of Directive 2004/108/EC (Electromagnetic compatibility). Under these circumstances equipment complying with the directive and which has already been granted the certificates of conformity provided for therein shall be exempt from the parts of the type approval procedure covered by the directive.

7.5 Electrostatic discharge

The speedmeter shall be tested in accordance with EN 61000-4-2: 1995. At least ten single discharges shall be applied to the exposed surface of each separate part of the meter.

For permanent installations, tests may be performed in the final installed position.

A maximum test voltage of 4 kV shall be employed.

7.6 Measuring accuracy

7.6.1 General

The speedmeter shall be assessed by comparing its readings with a vehicle fitted with a speed measuring system having an accuracy equal to or better than ± 1 mph which can output both spot and average speeds. Measurements at different speeds, up to the maximum stated by the manufacturer, shall be made. Simulated speeds may be used for speeds above 120mph. The speedmeter shall give a positive error no larger than + 2 mph (or +3% above 66 mph) and a negative error of no greater than 5 mph or 10 % above 50 mph (see 8.2). The second method of speed measurement shall be within 10% of the primary measurement.

7.6.2 Minimum Baseline

The manufacturer or his agent shall specify the minimum baseline distance to be used and this distance shall be used in all speed accuracy tests.

7.6.3 Location criteria for image detectors

The manufacturer or his agent shall specify in three dimensions all locations that may be used for image detection cameras with respect to their measurement datum point. All speed tests shall be undertaken for each location specified (or at the extremes of any continuous ranges). If both monitoring directions are to be used, then all speed tests shall be repeated for each direction. The same location criteria and monitoring direction shall be used for each detector and the cameras shall be mounted according to the manufacturer's instructions.

7.7 Camera timing accuracy

7.7.1 Video cameras

Video cameras linked to the speedmeter shall conform to CCIR standards. Video frames taken of the same vehicle for the purposes of calculating journey time shall show:

- date in day, month and year;
- time in hours, minutes, seconds and milliseconds;

If two images taken of the same vehicle with a measured time interval are used to confirm the measurement the interval shall be accurate to plus or minus 20 milliseconds.

8 MEASURING METHODS

8.1 General

This section describes suitable methods of measurement for carrying out the tests described in previous sections. It is recommended that the methods be followed to ensure uniformity and repeatability of testing. All measuring procedures shall be recorded in the test report.

8.2 Speed measurement

A road or track test shall be performed by driving a car fitted with a speedometer calibrated to within 1 mph (1% above 100 mph), past the speedometer under test at various speeds between 20 mph and the manufacturers stated maximum or 120mph if less. At least 100 measurements shall be taken for each direction and detector location criteria specified for use by the manufacturer.

8.3 Speed simulators

8.3.1 Speedmeters using image detectors

The speed measurement may be simulated using a fixed image mounted on a bench to trigger both image detectors used to start and stop the measurement and a mechanical shutter to simulate a time of transit over an assumed base line distance. An independent timer display in the field of view of the image detectors can be used to measure the simulated transit time. Its display shall be of sufficient size to enable a timing resolution of one millisecond to be used to verify the measurement accuracy of the speedometer. Any fixed base line greater than or equal to the minimum base line may be used.

8.4 Environmental tests

8.4.1 At each temperature step in the working temperature range the equipment shall be checked by performing an internal calibration check and a simulated speed measurement. The simulator for speedmeters using image detectors may be located outside the environmental test chamber if and only if the time measurement used in calculating the primary speed measurement is independent of the simulator.

8.4.2 Care shall be taken to ensure that any fans, thermostats, or other electronic control devices associated with the environmental chamber, do not cause spurious readings during the testing cycle.

8.5 Electromagnetic compatibility

8.5.1 General

- 8.5.1.1 The test arrangement is applicable to both radiated and conducted tests. The object of the tests is to confirm that the speedmeter is capable of operating in the presence of electromagnetic fields without recording an erroneous speed reading.
- 8.5.1.2 The layout of the speedmeter shall be representative of the normal operating conditions, in so far as this will permit a repeatable measurement. The measurement shall be carried out in screened test facilities described in EN61000-4-3 with the equipment set up as intended for use. The field uniformity criteria of EN61000-4-3 apply for the radiated immunity test.
- 8.5.1.3 The equipment to be tested is placed centrally in the calibrated test area. The device and its wiring are mounted on a non-conducting bench 0.8m above the ground plane (figure 1). Devices designed to operate on a tripod shall be adjusted to be 1m above ground.
- 8.5.1.4 Any associated cable bundles/wiring shall be arranged in general accordance with EN61000-4-3. At least 1m cabling from the device to the test facilities power supplies must run in the calibrated area. Any interconnecting cabling, remote control cabling or camera cabling will be treated as follows:
- the manufacturer's specified cable types and connectors shall be used.
 - when the manufacturer's specification requires a wiring length of less than 3m, then the specified length shall be used. The wiring shall be bundled low-inductively to 1m length.
 - when the specified length is greater than 3m then the illuminated length shall be a minimum of 1m. The remainder shall be run outside the calibrated area on the floor de-coupled at the 1m point by the use of lossy tubes. However in the case of remote control cables, the remote control unit must be in the calibrated area as shown in Figure 1. Therefore the cable length excess greater than 1m shall be zig-zagged on the floor parallel to and behind the remote sensor cables.
- 8.5.1.5 In at least one orientation of the device the wiring shall be arranged parallel to the calibrated uniform area of the field.
- 8.5.1.6 The exposed wiring shall be run in a configuration that simulates as closely as possible the manner it is run in operation.
- 8.5.1.7 All wiring running on the floor in the calibrated test area shall be spaced 0.1m from the floor by means of low dielectric spacers.
- 8.5.1.8 Any changes found necessary in the layout shall be recorded in the test report.

8.5.1.9 The device under test shall be irradiated by both horizontal and vertical polarised fields from 4 orthogonal illumination angles. Figure 2 shows a plan view of a typical test arrangement.

8.5.2 Modulation

8.5.2.1 All test signals shall be 90% amplitude modulated with a square wave signal. During these tests a speed simulator shall be used to monitor the correct operation of the equipment under test.

8.5.2.2 A modulation frequency of 1 KHz shall be used.

8.5.3 Speed simulators test arrangements and set up

8.5.3.1 Care shall be taken to ensure that the connection of the simulator does not degrade the immunity of the equipment under test.

8.5.3.2 The display of the device shall be monitored throughout the test period, and any erroneous readings or inconsistency in behaviour noted together with the appropriate test frequency and field intensity.

8.5.4 Conducted immunity test

8.5.4.1 The test is conducted in basic accordance with EN61000-4-6 with the following test method deviations:

- The clamp injection procedure is to be used with the signal being applied to the total cable bundle i.e. common mode injection. The signal is injected at each electronic unit of the device under test connector by connector. The current probe monitoring the injected current is placed 0.05m from the device's connector on the bundle under test. The injection clamp is placed 0.05m from this.
- The modulation and limits are as defined in sections 8.5.2 and 7.4

8.5.5 Test limits and frequencies

8.5.5.1 The tests limits defined in section 7.4 for a) the standard radiated immunity test and b) the standard conducted immunity test are in terms of the cw value of the signal; the modulation being applied on top giving peak readings 90% higher than the cw limit.

8.5.5.1 The RF signal shall be applied at each test frequency at the test limit for a time long enough to fully operate the device under test. The frequencies shall be stepped incrementally across the test range with a step size not exceeding 1% of the previous frequency. If any effect is observed, the applied signal shall be reduced by 12dB and increased in steps of 3 dB until the required test level is reached. The level at which the threshold of any effect shall be observed, logged and recorded in the test report.

8.5.6 Simulated TETRA immunity test

8.5.6.1 The device under test shall be irradiated with both horizontal and vertically polarised fields from four orthogonal illumination angles in turn.

8.5.6.2 The device shall be tested at each of the test frequencies specified in section 8.5.6.3 by increasing the field, at each test frequency, from a minimum level of 12dB down from

the appropriate test limit in steps of 3dB until the test level is achieved. The level at which the threshold of any effect is observed shall be logged and recorded in the test report.

8.5.6.3 The test frequencies to be used for this test are:

- 380, 385, 390, 395, 400, 405, 410, 415 and 420MHz.

The tolerance on these frequencies is ± 0.1 MHz.

8.5.6.4 The test limit given in section 7.4 is in terms of the peak value of the modulated signal as measured using a peak detector calibrated in terms of the equivalent rms sine wave value that would give the same reading. This is the standard calibration for all peak detector functions on EMC receivers or spectrum analysers.

8.5.6.4 The modulation to be applied shall be an 18kHz square wave modulation with a depth >98% additionally gated on and off at 17Hz. The duty cycle shall be 50%. This is shown in figure 3.

8.5.6.5 The test limits are in terms of the peak value of the signal when measured using the peak detector function of the measuring receiver/spectrum analyser. This is calibrated in terms of the equivalent rms value of a sine wave as defined by:

When measuring a modulated signal, the bandwidth of the measuring receiver should be set wide enough to capture the total energy of the signal. The amplitude reading as measured by the peak detector function is noted. The unknown signal is disconnected and a sine wave signal at the same frequency fed in. Its amplitude is adjusted until the same reading is produced on the measuring receiver. This amplitude is expressed in terms of the rms value of the sine wave e.g. a 1 volt rms sinewave input will give an indicated measurement of 1 volt. This will not change if the signal is switched on and off, the peak reading will still be 1 volt hence the term peak rms.

8.5.6.6 The characteristics of the equipment to be used to measure the amplitude of the applied susceptibility test are:

- The amplitudes associated with the test limits are based on the peak of the rms envelope over the complete modulation period.
- Amplitude measurements shall be made in a manner which clearly establishes the peak amplitude of the modulated waveform.
- The measuring instrument must have a fast enough time response to respond to signal amplitude variations. A spectrum analyser may be used.
- The detection, resolution and video bandwidths of the measuring instrument must be wider than the modulating frequency.
- The measurement bandwidth shall be increased until the amplitude of the measured signal does not change by more than 1dB for a factor of three change in bandwidth. This bandwidth setting shall then be used for the test. At the proper setting the individual modulation side bands will not be resolved.

8.5.6.7 It is important to meet these requirements especially when measuring modulated signals. The use of a spectrum analyser for signal measurement during susceptibility testing does provide advantages over power meters or receivers as it allows a more direct visual check on the quality of the applied signal during the testing. It provides

direct indication if the signal source is becoming non-linear, or generating spurious signals. Sometimes, when mismatched, TWT amplifiers have been found to produce parasitic high power oscillations even with no input drive at a frequency that may be well removed from the required test frequency. Regular checks should be made on the quality of the test signal, and presence of spurious signals.

9 TYPE-APPROVAL PROCEDURES

9.1 Persons seeking type-approval should first arrange for the equipment to be demonstrated to the ACPO Road Policing Enforcement Technology Committee, who will arrange for a practical assessment by one or more police forces. Enquiries should be made to:

The Secretary,
ACPO Road Policing Enforcement Technology Committee
Essex Police
Burghstead Close
Billericay
Essex
CM12 9JZ.

Only when this assessment has been satisfactorily completed, and any necessary modifications made to the speedometer, should the device be offered for formal type-approval. Requests for type-approval should be made to:

Road Crime Section
Public Order and Crime Issues Unit
Home Office
5th Floor
Fry Building
2 Marsham Street
London SW1P 4DF.

9.2 Road Crime Section will normally recommend test laboratories to carry out type-approval testing in accordance with procedures laid down by HOSDB*. Manufacturers

* The results of checks and tests carried out by the bodies and laboratories of other Member States, including in particular those in conformity with EN 45000, will be taken into consideration where such results provide a level of accuracy, fitness and suitability for purpose equivalent to the results of tests carried out in the United Kingdom, and where such bodies and laboratories offer suitable and satisfactory guarantees of technical and professional competence and independence.

or their approved agents are expected to bear the full costs of the private test laboratory's evaluation work. On completion of their work, the private test laboratory will submit a report on their evaluation of the device to HOSDB. HOSDB will submit the results to Road Crime Section for consideration to be given to obtaining the agreement of the Secretary of State for the Home Department to formal type-approval.

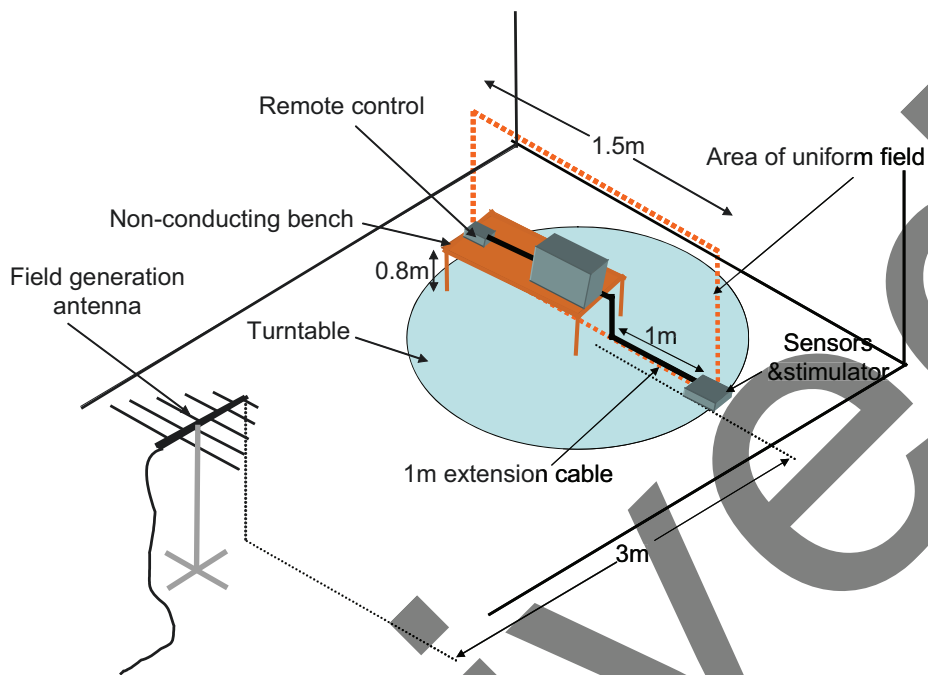
9.3

To back up type-approval, Road Crime Section prepares a supporting agreement for signature by the manufacturer and Home Office officials which is primarily directed at preventing the manufacturer from altering the device in question in any way without the prior approval of the Secretary of State. The manufacturer shall agree:

- (i) not to change the device without the agreement of the Secretary of State;
- (ii) to ensure that the type and serial number of each device is clearly identified by an indelible marking;
- (iii) to ensure that the serial number is unique to each device and that each device is numbered consecutively;
- (iv) to ensure that any repair or calibration facility relating to the device is open to inspection;
- (v) supply free of charge to the Secretary of State a full circuit diagram of the device with all the circuit components clearly indicated; and, if required;
- (vi) to supply a device free of charge to the Secretary of State. The Secretary of State shall not be responsible for any damage caused to the device whilst it is in his possession.

This agreement must be signed by the manufacturer prior to the Home Secretary signing the formal type-approval document.

FIGURE 1: EMC test layout



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FIGURE 2: Plan view of a typical EMC test layout

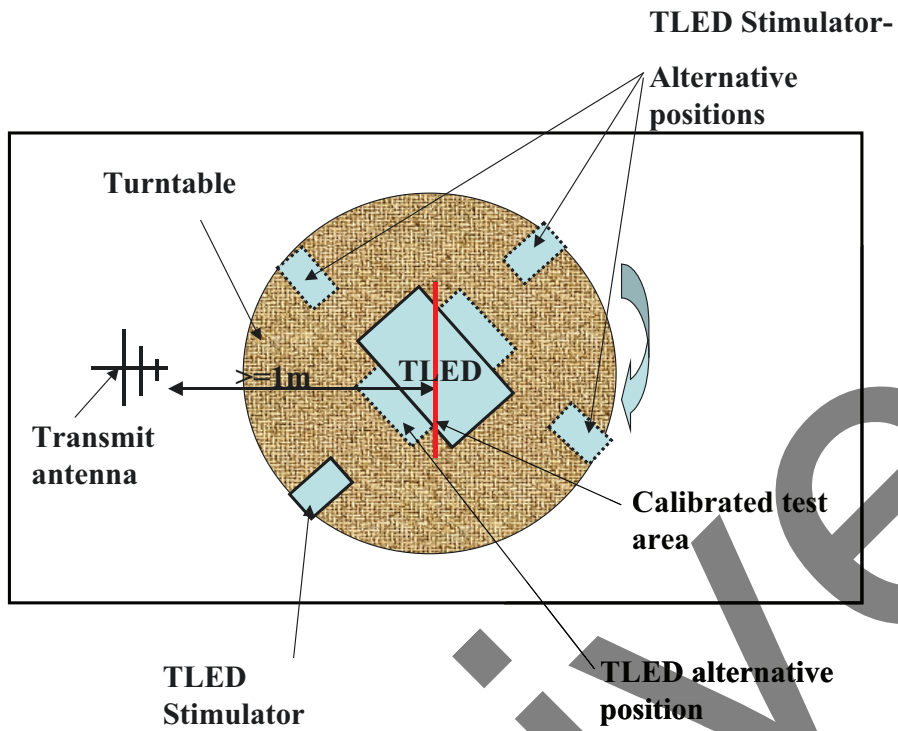


FIGURE 3: Simulated TETRA test dual modulation envelope

