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Guide to EMC Directive conformity of equipment designed for military purposes

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National foreword

This Published Document is the UK implementation of CLC/TR 50538:2010. It supersedes PD R210-008:2002 which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Guide to EMC Directive conformity of equipment designed for military purposes

Guide de conformité à la Directive CEM pour les équipements conçus à usages militaires

Leitfaden zur Konformität von Geräten, die für militärische Zwecke entwickelt wurden, mit der EMV-Richtlinie

This Technical Report was approved by CENELEC on 2010-09-17.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This Technical Report was prepared by WG 9, EMC of Military Equipment, of Technical Committee CENELEC TC 210, Electromagnetic Compatibility (EMC).

It was circulated for voting in accordance with the Internal Regulations, Part 2, Subclause 11.4.3.3 (simple majority) and was approved by CENELEC as CLC/TR 50538 on 2010-09-17.

This document supersedes R210-008:2002.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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Introduction

CENELEC R210-008:2002 has been updated and revised with regard to the EMC Directive 2004/108/EC to create this new Technical Report, CLC/TR 50538 "*Guide to EMC Directive conformity of equipment designed for military purposes*".

The EMC Directive, 2004/108/EC [1], does not contain any reference to military equipment.

The manufacturer is fully responsible for complying with the EMC Directive, 2004/108/EC [1] and cannot devolve this responsibility to a third party. Comprehensive guidance is provided in the "*Guide for the EMC Directive 2004/108/EC*" [16].

There are a number of recent and emerging documents that have been considered including

- Defence Procurement Directive 2009/81/EC [2],
- Public Procurement Directive 2004/18/EC [15],
- the EU Interpretative Communication COM (2006) 779 final [4] on the application of Article 296 TEC to the procurement of military equipment. (Note that Article 296 of the Treaty of Amsterdam has now become Article 346 of the Treaty of Lisbon.)

This Technical Report has been prepared by reviewing all currently available relevant documentation as listed in the Bibliography.

The purpose of this Technical Report is to provide guidance to manufacturers, suppliers, importers, procurement authorities and those taking equipment into service within Member States on the application of the EMC Directive to military equipment.

Background

A Technical Report was produced by CLC/TC 210 (EMC) in 1998 in order to provide guidance to manufacturers of military equipment to comply with the EMC Directive 89/336/EEC [5] Under this Directive 89/336/EEC there were interpretations at Member State level which resulted in a non-harmonised application of the directive by military equipment manufacturers across the EU.

An interpretative communication concerning the Public Procurement Directive was issued in late 2006. It states; “According to existing EU law, defence contracts fall under Internal Market rules”. This has been interpreted as meaning that all military equipment is subject to the rules of the EU regarding the procurement of equipment, However Member States can exempt defence contracts under Article 296(1)(b) that it considers to fulfil the concept of ‘essential security interests’.

The conclusion from the Commission lawyers (validated in a court case between the Commission and a Member State), in COM (2006) 799 is very specific and concludes that the exemptions are very few and will have to be assessed on a case-by-case basis by the contracting authority.

More recently the Defence Procurement Directive 2009/81/EC of 13 July 2009 [2] has been published. This concerns the gradual establishment of a European defence equipment market and as a prerequisite an appropriate legislative framework. This Directive has profound implications on Members States procurement of Defence equipment and services. A précis of the Directive is provided in Annex A.

CEN WS 10 EG7 E3 [1)] has reviewed military Electromagnetic standards for inclusion in the “*European Handbook for Defence Procurement*” (CWA 15517 [10]). The information contained in their report has been used and incorporated where applicable.

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1) CEN: European Committee for Standardisation, Workshop 10: Standardization for Defence Procurement, EG7: Expert Group 7: Electromagnetic Environment

1 Scope

This Technical Report is applicable to any non-exempt military equipment.

This Technical Report does not affect the requirements to meet military standards.

This Technical Report only covers aspects related to EMC as covered by the EMC Directive 2004/108/EC and other directives that address EMC. In this respect there is no distinction between civilian and defence equipment.

For the purpose of this Technical Report the term “military” is equivalent to the term “defence”.

Annex B describes Article 346 and Annex C provides the associated EC Council List of items under Article 346 [12].

The definitions in EMC Directive 2004/108/EC of “apparatus” and “fixed installations” as applied to military equipment are considered and guidance is given on applicability with the use of flow diagrams.

For apparatus, the use of military standards to demonstrate compliance with the EMC Directive by using various assessment methods that do not use harmonised standards and a “gap” analysis tool for comparison of military standard results with harmonised standards is presented.

This Technical Report also covers fixed installations using military equipment, and their impact on neighbouring environments.

The conformity assessment procedures of EMC Directive 2004/108/EC have been reviewed and guidance given on the applicability and contents of detailed technical EMC assessment. An-

nex J includes some case studies to help clarify the extent and use of this Technical Report.

2 Directives for EMC conformity

2.1 EMC Directive

The EMC Directive (2004/108/EC) defines the following protection requirements as essential requirements:

a) the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended;

b) it has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use.

The conformity procedures are detailed in 3.2.3 and 3.2.4.

The EMC Directive makes specific exemptions for radio equipment and telecommunications terminal equipment covered by Directive 1999/5/EC [3], civilian aircraft or equipment fitted to civilian aircraft referred to in Regulation (EC) No. 1592/2002 [14], radio amateur equipment and inherently benign equipment.

This section contains a summary of other pertinent EU Directives.

2.2 Radio & Telecommunication Terminal Equipment Directive

As noted above, all equipment in the scope of the R&TTE Directive 1999/5/EC [3] is excluded from the EMC Directive. The EMC aspects of equipment within the scope of the R&TTE Directive are covered by that Directive. It follows that equipment that falls outside the scope of the R&TTE Directive is therefore within the scope of the EMC Directive.

In particular, the R&TTE Directive does not apply to apparatus exclusively used for activities concerning public security, defence, state security and activities of the state in the area of criminal law. Accordingly, military radios used solely by state armed forces may be subject to the EMC Directive. It is important to note that such use must be exclusive. If these radios are also sold to private security operations for use other than defined in the “security” exclusion, they are regulated under the R&TTE Directive. For example, TETRA systems that are widely used by public authorities are subject to the R&TTE Directive because they are not exclusively used for the activities excluded from its scope. However a Tetra-based system designed only for security use as defined in Article 1.5 is excluded from the scope of the R&TTE Directive, whether the equipment is used by a Department of a Member State or by a private or public company undertaking duties on behalf of the Member State.

2.3 Automotive Directive

In the case of vehicles intended for use on public roads, the Automotive EMC Directive 2004/104/EC [6] applies to cars, trailers and their electronic sub-assemblies. It should be noted that Directive 2007/46/EC (Framework Directive) [7] may also apply to other road going vehicles. Compliance with Directive 2004/104/EC is demonstrated by affixing ‘e-marking’ to the equipment or vehicle.

2.4 Marine Equipment Directive

In the case of marine equipment, the Directive 96/98/EC [13] amended by Directives 98/85/EC, 2001/53/EC and 2002/75/EC applies International Maritime Organisation (IMO) standards to assess the compliance of equipment related to safety at sea (navigation and radio communications) and pollution prevention. This is a type approval process and compliance with the directive is demonstrated by affixing “wheelmark” to such equipment. All non-safety equipment are assessed following the EMC Directive 2004/108/EC.

3 Application of the EMC Directive to military equipment

3.1 Introduction to apparatus and installations

In order for military equipment to comply with the EMC Directive it is first important to understand the different types covered. In essence the EMC Directive covers equipment which is either apparatus or fixed installations and defines a different regime for these two categories.

The following definitions are extracted from the EMC Directive 2004/108/EC, Article 2, for clarification on the two types of equipment/system covered by the directive:

a) ‘apparatus’ means any finished appliance or combination thereof made commercially available as a single functional unit, intended for the end user and liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbance. Apparatus is subject to the full provisions of the directive including a Declaration of Conformity (DoC) and CE marking;

b) ‘fixed installation’ means a particular combination of several types of apparatus and, where applicable, other devices, which are assembled, installed and intended to be used permanently at a predefined location;

Fixed installations do not require a DoC or CE marking but must meet the protection requirements.

In the special case of apparatus intended for incorporation into a specific fixed installation which is otherwise not commercially available the provision of Article 13(1) of the EMC Directive may be applied. This apparatus does not need to be CE marked but must be supplied with installation instructions that ensure the essential protection requirements. This provision is only for an individual apparatus intended for a specific fixed installation.

The protection requirements of the directive are the same for both apparatus and fixed installations such that

c) the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended,

d) it has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use.

Mobile installations are defined as a combination of apparatus intended to be moved and operated in a range of locations. All provisions of the EMC Directive, as defined for apparatus, apply to mobile installations.

3.2 Apparatus

3.2.1 Conformity assessment procedure

This subclause describes the conformity assessment procedure for military apparatus falling within the scope of the EMC Directive.

The conformity assessment procedure for apparatus is described in Article 7 of the EMC Directive 2004/108/EC. Comprehensive guidance is provided in the "*Guide for the EMC Directive 2004/108/EC*" [16].

This conformity assessment procedure applied to military apparatus is given in Annex E.

The EMC assessment described in Annex II of the EMC Directive 2004/108/EC requires all normal intended operating conditions and configurations to be taken into account.

3.2.2 Intended operating conditions, interfaces and environment

As highlighted above due consideration must be given to the operating conditions, interfaces and environment.

The operating conditions relate to the modes of operation. They could include where equipment is provided with a peacetime mode where certain functions may be disabled. All relevant operating conditions (peacetime role) need to be considered where these distinct modes will have an impact on the electromagnetic performance.

The operating environment and interfaces need careful consideration since this will define what and how close other equipment is located. Equipment located in a controlled EM environment (for example, below decks ship equipment) is very different to man portable radio equipment. Refer to Clause D.3.

3.2.3 EMC conformity assessment

3.2.3.1 Introduction

The EMC Directive requires an EMC assessment of the apparatus to determine if the protection requirements are met. The EMC assessment is described in the conformity assessment procedure for apparatus given in Article 7 and Annexes I, II and III of the EMC Directive 2004/108/EC.

According to the "*Guide for the EMC Directive 2004/108/EC*" [16], three methods are possible for the EMC assessment and their application in the context of military equipment is discussed below:

- use of harmonised standards;
- mixed EMC assessment;
- detailed technical EMC assessment.

3.2.3.2 Use of harmonised standards

Harmonised standards are published in the Official Journal of the EU. Apparatus that complies with relevant harmonised standards has a presumption of conformity with the protection requirements of the EMC Directive. Harmonised standards fall into three categories, basic, product specific and generic. Basic standards are those that are referred to by Product specific or Generic standards to simplify the writing of the standards. Product specific standards are those written particularly for a product type. Generic standards are written to provide harmonised standards where there are no product specific standards.

If the manufacturer prefers to use harmonised standards and since there are no harmonised standards dedicated for military equipment, then a suitable civil harmonised standard should be identified.

A description of harmonised standards is given in Clause D.2 with guidance on when they may be applicable to military equipment.

3.2.3.3 Mixed EMC assessment

A mixed EMC assessment is where parts of a harmonised standard have been applied together with a technical assessment to demonstrate that all the protection requirements are met. A more detailed description of the technical EMC assessment is given in 3.2.3.4. The technical assessment may include a wide range of technical analysis methods to identify or mitigate any disparity between the military compliance and EMC Directive protection requirements. Analysis methods are described in 3.2.4.

3.2.3.4 Detailed technical EMC assessment

A detailed technical EMC assessment is where no harmonised standard has been applied but a detailed assessment performed instead.

Annex IV(1) of the EMC Directive 2004/108/EC, states that this includes

- steps taken to meet the requirements,
- description of the electromagnetic assessment,
- results of design calculations (it is suggested by this guide that this could include modelling and simulation),
- examinations carried out,
- test reports.

The "*Guide for the EMC Directive 2004/108/EC*" [16] adds that the assessment required will depend on several factors, such as

- nature of apparatus,
- intended use,
- location of use,
- EMC environment,
- types of disturbance created by or affecting the apparatus,
- environmental conditions,
- performance criteria for immunity.

The technical assessment for military apparatus may include methods such as those shown in Figure E.1.

3.2.4 Examples of detailed technical assessment methods

3.2.4.1 Introduction

The aim of an assessment is to provide evidence that the equipment will meet the protection requirements of the EMC Directive.

The methods include using existing EMC test evidence or in some circumstances additional evidence such as modelling, engineering tests or experiments, or specific in-situ (special) tests, or by gap analysis. Other methods of determining compliance may take the form of a review of existing design evidence, or of particular circumstances that provide mitigation and or control of the products electromagnetic characteristics. One form might be to use the similarity of the current product to an earlier version.

These methods can be applied individually or in combination and are further described below.

3.2.4.2 Using existing EMC test evidence (e.g. military standards)

In many circumstances, test results against a military specification can be examined by experienced personnel who will be able to determine compliance with the protection requirements by inspection.

3.2.4.3 Engineering tests, or experiments, or in-situ (special) tests

There are circumstances where the manufacturer might want to make tests and/or assessments on part of the equipment, or prototypes, or to implement special in-situ tests and practices.

The manufacturer has to evaluate this risk when he declares conformity to the protection requirements allowing himself such deviations, and he takes full responsibility of the choice. The technical documentation should give detailed information on such deviations described hereafter:

a) the nature of the engineering tests or experiments performed, and the rationale for having chosen these tests;

b) the standards, if any, adopted as reference for performing the tests, and all the precautions implemented during the tests execution, or the simplified methods (sometimes called pre-compliance methods) utilized;

c) the test set-up and the deviations from the prescriptions of the standard adopted, and all the other details useful to understand the performed activities;

d) the results of the tests and of any pre-scan measurement made to quickly obtain information on the performances (emission and immunity) of the apparatus, in order to decide whether a full complete measurement is considered necessary;

When applying special tests it is essential to identify

- the coupling mechanism with the external environment,
- the ports/interfaces where conducted and/or radiated (high or low frequency) disturbances may be applied from or towards the fixed installation (power supply port, control and telecommunication ports etc.);

3.2.4.4 Modeling and simulation

In recent years Computational Electromagnetic Modelling (CEM) codes and bespoke simulation tools such as those based on topological processes have become more readily available. These modelling and simulation tools can be used for carrying out detailed modelling and analyses of complex electromagnetic problems such as; induced currents and voltages in wires, conduits, LRU cases, and various structural components. The development of three-dimensional computer codes that can be run on machines of increasing speed and efficiency now has made such analyses viable.

Whilst CEM and simulation tools are unable to directly compute the magnitude of emissions or the immunity of a modelled or simulated apparatus or installation, these tools capable of providing support to the overall analysis. Some examples where modelling and simulations support has been shown to be useful are:

a) defining and selecting the optimum test methodologies (time and cost),

b) assessing the completeness and validity of the test results (i.e., assessing the impact of the approximations made during testing),

c) assessing how small design changes between equipment variants may impact on compliance,

d) spectrum utilisation assessment.

In this way modelling and simulation methods can be used to produce evidence of compliance. The use of modelling and simulation methods is well established and used by civil aircraft equipment manufacturers [ref: ED107]. The rationale for the use and selection of CEM methods depends on many factors, not least, the maturity and complexity of the project and a cost/benefit assessment.

3.2.4.5 Design evidence

A manufacturer may wish to declare the conformity of his apparatus or installation directly to the protection requirements, without reference to harmonised standards, by making his own EMC assessment based on peculiar design techniques, good engineering practices or on specific mitigation and control measures he may have implemented. This assessment needs to follow a technical methodology to ensure that the requirements of the EMC Directive are met, as the manufacturer needs to provide clear evidence of compliance.

This option is of particular importance as it allows a high flexibility for those technical developments that are crucial in case of manufacturing new or innovative apparatus for which standards do not exist, or cannot be used.

Further guidance on 'good engineering practices' can be found in the "*Guide for the EMC Directive 2004/108/EC*" [16] (section 4).

3.2.4.6 Similarity

Similarity in product designs may be considered to exhibit similar electromagnetic performance where the changes are insignificant. The "*Guide for the EMC Directive 2004/108/EC*" [16] (section 3.2.1.1) provides details on 'worst case' assessment and should also be applied.

3.2.4.7 Mitigation and control (limitations of use)

Consideration of the operating conditions identified in 3.2.2 may identify conformity with the EMC Directive is subject to placing restriction on use to ensure that the protection requirements are met. Examples may include

- restricting modes of operation,
- ensuring separation between the product and other equipment.

3.2.4.8 Gap analysis

The gap analysis process may be used in the "mixed" or detailed technical EMC assessment. Its purpose is to identify any shortfalls in the EMC performance of the military equipment against the EMC Directive protection requirements. In order to achieve this, the EMC standards, test methods and limits applied to the military equipment must be identified and compared to the equivalent harmonised standard, test methods and limits that represent the product specific requirement or generic environment standard applicable to the product. The first stage is therefore to align test methods that address similar EMC phenomena.

The "*Report of the CEN WS 10 EG7 'Electromagnetic environment'*" [11] provides a comparison table in its Appendix C that might be used to locate an equivalent standard that may be used in the assessment. This may prove useful in the cross referencing of military standards. The table has been updated in this Technical Report and included in Annex H.

The detailed comparison of test methods is complex and guidance on the relevant factors to be considered is given in Annex G.

The comparison factors must be quantified and then used to modify the test methods and limits being compared. Either the military standard or harmonised standard limit is modified to allow both sets of limits to be presented on a single graph or table using common units of frequency/amplitude or time/amplitude.

From this comparison the differences in frequency range, time scale or amplitude can be quantified. Examples of gap analysis are shown in Annex I.

Where the military test method and limit is more onerous than the harmonised standard equivalent then this demonstrates that the military equipment is in conformity with the harmonised standard test method and limit.

Where the military test method and limit is less onerous than the harmonised standard equivalent then this demonstrates a shortfall or gap against the required conformity with the harmonised standard test method and limit.

Note that for emission tests a shortfall identified by comparing military and harmonised standard test method and limits may be mitigated by considering the actual military equipment test result and the margin by which it is below the emissions limit. If this margin is greater than the shortfall at the relevant frequencies then this information demonstrates that the harmonised standard test method and limit would have been met.

In some instances, a harmonised standard might indicate a test method and limit for an electromagnetic phenomena that has not been examined by the military standard. Before entering into lengthy simulations or expensive testing, the assessor should consider the suitability of including this aspect in the assessment. E.g. in the case of electrostatic discharge, does the military processes used when handling the equipment mitigate this risk? If this is the case, the assessor need only document that this “gap” is mitigated by the military process. This may be the case in other situations for other products.

Once the gaps and missing tests, that are not otherwise mitigated, have been identified, they may be addressed by application of relevant harmonised standards or basic standards through test or analysis of the military equipment. Alternatively they may be assessed by any suitable method noted in the previous paragraphs where such is thought applicable

The gap analysis and any additional test or analysis against harmonised standards should then demonstrate overall that the military equipment is in conformity with the protection requirements of the EMC Directive for all relevant EMC phenomena.

3.2.5 Technical documentation

The manufacturer draws up technical documentation (a technical file) as described in Annex IV of the EMC Directive 2004/108/EC, providing evidence of the conformity of the equipment with the essential requirements of the Directive. The purpose of the technical documentation is to enable the conformity of the equipment with the protection requirements to be assessed. The following is an example of the content of a technical file:

- an identification of the equipment covered by the technical documentation. This identification should allow unambiguously linking between the technical document and the equipment;
- a general description of the equipment. The amount of information required will depend on the complexity of the equipment, simple apparatus may be fully defined in one line whereas more complex fixed installation may need a complete description (a picture may be included);
- consideration of applicable military/non-battlefield operating environments and hence the required standards to represent the environment;
- consideration of relevant modes of operation and configurations that may impact neighbouring environments;
- if European harmonised standards have been applied, then evidence of compliance is required. at a minimum this will be a dated list of the European harmonised standards applied and the results obtained on their application;

- if European harmonised standards have not been applied or have been applied only in part then a description of the steps taken to meet the essential requirements as discussed in 3.2.4.

- If a manufacturer is using the procedure of Annex III of the EMC Directive 2004/108/EC, then the Notified Body statement shall be included.

- The level and type of documentation needed to show due diligence and hence compliance with the relevant directive requirements will depend upon the type of system being developed and its target operational use, as military systems cover all the deployment options covered within all the regulatory legal enforcement framework.

3.2.6 Notified Body involvement

A Notified Body can be used on a voluntary basis to provide an opinion regarding the suitability of the EMC assessment with regard to all or specified EM phenomena within the essential requirements.

The Notified Body issues a statement if satisfied that the apparatus is compliant with the essential requirements.

3.2.7 Declaration of conformity

The manufacturer or supplier issues a declaration of conformity as described in Annex IV of the EMC Directive 2004/108/EC.

The declaration requires a dated reference to the specifications under which conformity is declared. For military equipment the specifications may include military standards and harmonised standards.

Any operating conditions or configurations that are excluded from the declaration of conformity should be listed.

3.2.8 CE marking

If the military apparatus complies with all applicable directives, CE marking is applied in accordance with Annex V of the EMC Directive 2004/108/EC to the apparatus or data plate or if this is not possible, to the packaging and accompanying documents. Because there are implications involved in changing the markings on military hardware, due consideration should be given to this when deciding whether to mark the hardware, the packaging etc. It may be appropriate to only mark the paperwork associated with the product or the accompanying Declaration of Design Performance (DDP) or equivalent when such is appropriate.

3.3 Fixed installations

3.3.1 General

Whilst the definition of fixed installation is detailed in 3.1, it should be noted that the scope of this covers both the installation as a whole and also certain specific apparatus used within it, if it has been specifically designed to be used permanently at a pre-defined location (i.e. was designed for a specific location and customer).

Fixed installations are by definition ‘fixed in a location’ and hence do not move across EU Member State boundaries and since the purpose of the EMC Directive is to permit free trade then CE marking is not relevant and hence fixed installation enjoy what the EU Commission describe as a relaxed regime. There is neither a requirement for a Declaration of Conformity nor a CE mark but they must meet the protection requirements.

EXAMPLES OF TYPES OF FIXED INSTALLATION

In a military environment there are many types of fixed installation. For example an army camp or barracks could be considered as a fixed installation – the individual buildings or electrical systems within the building could also be considered.

A dockyard might be considered as a fixed installation as it has many different types of apparatus contained within it ranging from mobile machinery to radio controlled cranes.

Conversely, a ship is not a fixed installation since by its very nature it is mobile. Like a ship, a military aircraft is mobile and hence is apparatus. However, ground support equipment, e.g. radar, might be considered as a fixed installation.

The common requirement and objective in all of the above examples is that whether a fixed installation or apparatus, the protection requirements are complied with.

Subclause 3.3.2 describes the conformity assessment procedure for military fixed installations falling within the scope of the EMC Directive.

The conformity assessment procedure for fixed installations is described in Article 13(1) of the EMC Directive 2004/108/EC. Comprehensive guidance is provided in the "*Guide for the EMC Directive 2004/108/EC*" [16].

This conformity assessment procedure applied to military fixed installations is given in Annex F.

3.3.2 Essential requirements for fixed installations

Fixed installations have to meet Annex I of the EMC Directive 2004/108/EC protection requirements and also a set of specific requirements for fixed installations. These state that a fixed installation shall be installed applying good engineering practices and respecting the information on the intended use of its components, with a view to meeting the protection requirements. The good engineering practices applied to EMC shall be documented and held by the responsible person.

For a military fixed installation the EMC engineering practices employed to meet military standards should be analysed to determine if they satisfy the EMC Directive specific requirements for fixed installations. If they do, this analysis can be documented. If not, additional protection measures may be required. The analysis needs to consider how the protection requirements, such as controlling emissions, will be met at the installation boundary.

Examples of the EMC engineering practices include

- earthing & bonding,
- cable management,
- apparatus location and separation,
- shielding,
- EMI filtering,
- surge suppression and use of uninterruptable power supplies.

3.3.3 Specific apparatus

Apparatus intended for incorporation into a given fixed installation that is otherwise not commercially available can either follow the conformity procedure for apparatus presented in 3.2.3 or the conformity procedure contained within Article 13(1) second paragraph for fixed installations. If Article 13(1) is followed, the declaration of conformity and CE marking are not required. The following documentation is required and must be held by the responsible person:

- type, batch and serial number of the specific apparatus;
- name and address of manufacturer or representative;
- identity and electromagnetic characteristics of fixed installation;
- any special installation precautions required.

3.3.4 Responsible person

A responsible person must be identified for the fixed installation who is required to provide to the authorities, by request, the EMC fixed installation documentation. The responsible person determines the extent or boundaries of the fixed installation for which they are responsible. The fixed installation EMC documentation includes the good EMC engineering practices, apparatus manufacturer's installation and maintenance instructions and details of any specific apparatus without CE marking used within the fixed installation.

Annex A
(informative)

A précis of the Defence Procurement Directive

The Defence Procurement Directive 2009/81/EC of 13 July 2009 [2] concerns the gradual establishment of a European defence equipment market and as a prerequisite an appropriate legislative framework. The directive supports a strategy for a stronger and more competitive European defence industry. The directive references the Commission's Interpretative Communication of 7 December 2006 and Article 296 TEC.

This Directive allows member states to use Community rules that they can apply to complex and sensitive Defence and Security transactions without putting at risk their legitimate security interests.

The directive applies to military equipment (as specified in the 1958 list), civil equipment that is adapted for military use, and equipment specifically designed for non-military security.

Member States have two years to transpose the Directive into their national legislation.

Section 3 provides details of excluded contracts and the use of exclusions. This lists 11 excluded areas including; *'contracts for which the application of the rules of this Directive would oblige a Member State to supply information the disclosure of which it considers contrary to the essential interests of its security.'*

Article 18 on the application of Technical specifications states; *'Without prejudice to either compulsory national technical rules (including those related to product safety) or the technical requirements to be met by the Member State under international standardisation agreements in order to guarantee the interoperability required by those agreements, and provided they are compatible with Community law, technical specifications shall be drawn up:*

(a) either by reference to technical specifications defined in Annex III (a preference list is provided), or;

(b) in terms of performance or functional requirements; the latter may include environmental characteristics, or;

(c) in terms of performance or functional requirements as mentioned in point (b), with reference to the specifications mentioned in point (a) as a means of presuming conformity with such performance or functional requirements, or;

(d) by referring to the specifications mentioned in point (a) for certain characteristics, and by referring to the performance or functional requirements mentioned in point (b) for other characteristics'.

Annex III provides definitions of technical specifications and standards to be applied to contracts. It states in 2. *'Standard - a technical specification approved by a recognised standardisation body for repeated or continuous application, compliance with which is not compulsory from one of the following categories:*

— international standard: a standard adopted by an international standards organisation and made available to the general public,

— European standard: a standard adopted by a European standardisation body and made available to the general public,

— national standard: a standard adopted by a national standards organisation and made available to the general public,

3. 'Defence standard': a technical specification the observance of which is not compulsory and which is approved by a standardisation body specialising in the production of technical specifications for repeated or continuous application in the field of defence;

4. 'European technical approval': a favourable technical assessment of the fitness for use of a product for a specific purpose, based on fulfilment of the essential requirements for building works, by means of the inherent characteristics of the product and the defined conditions of application and use. European technical approvals are issued by an approval body designated for this purpose by the Member State;

5. 'Common technical specification': a technical specification laid down in accordance with a procedure recognised by Member States which has been published in the Official Journal of the European Union;

6. 'Technical reference': any product produced by European standardisation bodies, other than official standards, according to procedures adapted to developments in market needs'

Importantly Part 4. of Article 18 states, '*Where a contracting authority/entity makes use of the option of referring to the specifications mentioned in paragraph 3(a), it can not reject a tender on the grounds that the products and services tendered for do not comply with the specifications to which it has referred, once the tenderer proves in its tender to the satisfaction of the contracting authority/entity, by whatever appropriate means, that the solutions which it proposes satisfy in an equivalent manner the requirements defined by the technical specifications.*

An appropriate means might be constituted by a technical dossier from the manufacturer or a test report from a recognised body.'

Annex B
(informative)

Article 346 of the Treaty of Lisbon (TEC)

B.1 Legal basis

NOTE Article 296 of the Treaty of Amsterdam has now become Article 346 of the Treaty of Lisbon. Whilst references to Article 296 (Treaty of Amsterdam) have been amended to make reference to Article 346 (Treaty of Lisbon), where documents written prior to the Treaty of Lisbon are used then the original references are retained.

According to existing EU law, defence contracts fall under internal market rules. Directive 2004/18/EC [15] on the procurement of goods, works and services thus applies to "contracts awarded by contracting authorities in the field of defence, subject to Article 346 of the Treaty" (Article 10 of the Directive).

Article 346 TEC reads as follows:

(1) The provisions of the Treaties shall not preclude the application of the following rules:

   (a) no Member State shall be obliged to supply information the disclosure of which it considers contrary to the essential interests of its security;

   (b) any Member State may take such measures as it considers necessary for the protection of the essential interests of its security which are connected with the production of or trade in arms, munitions and war material; such measures shall not adversely affect the conditions of competition in the internal market regarding products which are not intended for specifically military purposes.

(2) The Council may, acting unanimously on a proposal from the Commission, make changes to the list, which it drew up on 15 April 1958, of the products to which the provisions of paragraph 1(b) apply.

The exemption of defence contracts from the rules of the internal market is a measure connected with the trade in arms, ammunition and war material. Accordingly, its legal basis is Article 346(1)(b) TEC. Member States can use this exemption for the award of defence contracts, provided that the conditions laid down in the Treaty as interpreted by the Court of Justice are fulfilled. At the same time, the scope of Article 346(1)(b) TEC is limited by the concept of "essential security interests" and the list of military equipment mentioned in paragraph 2 of that Article.

Article 346(1)(a) TEC goes beyond defence, aiming in general at protecting information which Member States cannot disclose to anyone without undermining their essential security interests. This can also concern the public procurement of sensitive equipment, in both the defence and the security sector. In general, however, possible confidentiality needs related to the procurement process for military equipment are covered by Article 346(1)(b) TEC.

B.2 Security interests and treaty obligations

It is Member States' responsibility to define and protect their security interests. Article 346 TEC recognises this prerogative and provides a derogation for cases where compliance with European law would undermine Member States' essential security interests.

However, using Article 346 TEC for defence procurement results in the non-application of Directive 2004/18/EC, which is the legal instrument intended to secure respect for the basic provisions of the Treaty relating to free movement of goods and services as well as freedom of establishment in the area of public procurement.

The Treaty therefore contains strict conditions for the use of this derogation, balancing Member States' interests in the field of defence and security against the fundamental principles and objectives of the Community. The aim of these conditions is to prevent possible misuse and to ensure that the

derogation remains an exception limited to cases where Member States have no other choice than to protect their security interests nationally.

The Court of Justice has consistently made it clear that any derogation from the rules intended to ensure the effectiveness of the rights conferred by the Treaty must be interpreted strictly.

Therefore, both the field and the conditions of application of Article 346 TEC must be interpreted in a restrictive way.

B.3 Conditions of applications of Article 296 TEC (according to interpretative communication COM(2006) 779 final

The interpretative communication COM(2006) 779 final [4] is intended to prevent possible misinterpretation and misuse of Article 296 TEC in the field of defence procurement by National Authorities inside the European Internal Market.

This communication states that:

Military items included in the 1958 list (Council Decision 255/58) are not automatically exempted from the rules of the Internal Market.

According to Article 296 TEC, Member States can take measures they consider necessary for the protection of their essential security interests. This provision has been acknowledged to grant to Member States a broad degree of discretion in deciding how to protect their essential security interests: However, the text ("necessary for the protection …") also demonstrates that this discretion is not unfettered. The very existence of Article 298 TEC, which lays down a special procedure to be followed in the event of possible improper use of Article 296 TEC, confirms that Member States do not have absolute freedom in their decision to exempt a specific procurement contract from the rules of the Internal Market. On the contrary, "it is for the Member State which seeks to rely on [Article 296 TEC] to furnish evidence that the exemptions in question do not go beyond the limits of such [clearly defined] cases" and to demonstrate "that the exemptions … are necessary for the protection of the essential interests of its security".

Moreover, Article 296 TEC refers not to the protection of security interests in general, but to the protection of essential security interests. This specification underlines the exceptional character of the derogation and makes it clear that the specific military nature of the equipment included in the 1958 list is, by itself, not sufficient to justify exemption from EU procurement rules. On the contrary, the particularly strong wording ("essential") limits possible exemptions to procurements which are of the highest importance for Member States' military capabilities.

The wording of Article 298 TEC and the relevant case law, which refer to Article 296 in general, confirm that this reasoning should apply to the use of both paragraph 1(a) and paragraph 1(b) of Article 296 TEC.

B.4 How to apply Article 346 TEC

In the area of defence procurement, the only way for Member States to reconcile their prerogatives in the field of security with their Treaty obligations is to assess with great care for each procurement contract whether an exemption from Community rules is justified or not. Such case-by-case assessment must be particularly rigorous at the borderline of Article 346 TEC where the use of the exemption may be controversial.

This means in particular that contracting authorities have to evaluate

- which essential security interest is concerned?
- what is the connection between this security interest and the specific procurement decision?
- why is the non-application of the Public Procurement Directive in this specific case necessary for the protection of this essential security interest?

Keeping proper records is important in the event of a challenge from the European Commission and/or industry. The European Commission may seek to verify whether the conditions for exempting contracts form the Regulations are being applied correctly by a Member State in particular. In such cases, the Member State has to provide, at the Commission's request, the rationale for use of an exemption for a specific contract.

At the same time, Article 346(1)(b) TEC stipulates that measures taken under this Article "shall not adversely affect the conditions of competition in the common market regarding products which are not intended for specifically military purposes". In the area of defence procurement, this can be the case for offsets, in particular for indirect, non-military offsets. Member States must therefore make sure that offset arrangements related to defence contracts covered by Article 346(1)(b) TEC do respect this provision.

Annex C
(informative)

Council Decision 255/58 – EC Council list of items defining the scope of Article 223 of the Treaty of Rome

The provisions of Article 223(1) (b) of the Treaty of Rome apply to arms, munitions and war material listed hereunder, including nuclear weapons:

1 Portable and automatic firearms

such as: rifles, carbines, revolvers, pistols, sub-machine guns and machine guns, except for hunting weapons, pistols and other low calibre weapons of the calibre less than 7 mm.

2 Artillery, and smoke, gas and flame-throwing weapons

such as:

a) cannon, howitzers, mortars, artillery, anti-tank guns, rocket launchers, flame-throwers, recoil less guns;

b) military smoke and guns.

3 Ammunition for the weapons at 1 and 2 above

4 Bombs, torpedoes, rockets and guided missiles

a) bombs, torpedoes, grenades, including smoke grenades, smoke bombs, rockets, mines, guided missiles, underwater grenades, incendiary bombs;

b) military apparatus and components specially designed for the handling, assembly, dismantling, firing or detection of the articles at a.

above. **5 Military fire control apparatus**

a) firing computers and guidance systems in infra-red and other night guidance devices.

b) telemeters, position indicators, altimeters;

c) electronic tracking components, gyroscopic, optical and acoustic;

d) bombs sights and gun sights, periscopes for the apparatus specified in this

list. **6 Tanks and specialist fighting vehicles**

a) tanks;

b) military types vehicles, armed or armoured, including amphibious vehicles;

c) armoured cars;

d) half-tracked military vehicles;

e) military vehicles with tank bodies;

f) trailers specially designed for the transportation of the ammunition specified under 3 and

4. **7 Toxic or radioactive agents**

a) toxic, biological or chemical agents and radioactive agents adapted for destructive use in war against persons, animals or crops;

b) military apparatus for the propagation, detection and identification of substances at paragraph a. above.

c) counter-measures material related to paragraph a. above.

8 Powders, explosives and liquid or solid propellants

a) powders and liquid or solid propellants specially designed and constructed for use with the material at paragraphs 3, 4 and 7 above;

b) military explosives;

c) incendiary and freezing agents for military use.

9 Warships and their specialist apparatus

a) warships of all kinds;

b) apparatus specially designed for laying, detecting and sweeping mines;

c) underwater cables.

10 Aircraft and apparatus for military use

11 Military electronic apparatus

12 Camera apparatus specially designed for military use

13 Other apparatus and material

a) parachutes and parachute fabric;

b) water purification plant specially designed for military use;

c) military command relay electrical apparatus.

14 Specialised parts and items or material included in this list insofar as they are of a military nature

15 Machines, apparatus and items exclusively designed for the study, manufacture, testing and control of arms, munitions and apparatus of an exclusively military nature included in this list

Annex D
(informative)

Environments

D.1 Military standards and environments

There are many differences between the military and harmonised EMC standards. These differences concern the primary aims of the standards which address the principal problems arising from their respective operating environments.

Military EMC specifications primarily concentrate on protection of RF spectrum to minimise interference to, and from, intentional transmitters and receivers, where this also incorporates protection from military platform power systems and their associated switched loads. The available standards almost invariably deal with tri-service environments targeted for particular service uses, e.g. Ships above and below decks, aircraft internal, external and safety critical systems and land use, fixed or mobile with potential for common maintenance and servicing equipment.

As such, testing is based on representative system/sub-system Line Replaceable Unit (LRU) compatibility, with increasing emphasis on integrated, fielded platform level tests to prove performance. This intra-system compatibility of sub-assemblies, is targeted to ensure that the highest level of complete system compatibility is achieved in a potentially high packing density situation, however, full compliance with the identified target military environments are potentially not needed for the LRU's to be compatible.

Full compliance with the military standard may not be achieved and military apparatus may be subject to waivers or concessions approved by the purchasing military department. It is therefore necessary to review the test report to establish the actual EMC performance of a military apparatus.

It is not within the scope of this Technical Report to provide detailed guidance on military electromagnetic environments. Reference should be made to the applicable military standards. Note, the project called "CEN Workshop 10 on Standardisation for Defence Procurement", managed by the European Committee for Standardisation (CEN) and sponsored by the European Commission has produced the "*European Handbook for Defence Procurement (EHDP)*" (CWA 11517 [10]). Contained in the handbook is the "*Report of the CEN WS 10 EG7 'Electromagnetic environment'*" [11]. Reference should be made to [10] & [11] for a review of the available military EMC standards within the EU.

The report [11] found that the most common military electromagnetic environment effects standards were

1. US MIL-STD,
2. National military standards in Europe: Def-Stan, VG and GAM,
3. European Standards: EN, ETSI,
4. STANAG and AP,
5. International Electrotechnical Standards: IEC.

The report [11] specifically compared the following military EMC standards and recommended the future adoption of the NATO STANAG 4370 AECTP 500 series in place of national standards (some of which have been updated or superseded as shown):

- STANAG 4370 AECTP 500 series (NATO);
- GAM EG13 (France);
- VG 95373 (Germany);

- NO-06-A200, NO-06-A500, PN-V-8410 (Poland);
- DEF STAN 59-41 (latest DEF STAN 59-411) (United Kingdom);
- Mil-Std-461E (latest Mil-Std-461F) (United States).

In addition to military standards, avionics standards such as RTCA DO160 may have been applied to a military apparatus.

The power quality, i.e. low-frequency power supply interference phenomena could be taken into account. CEN WS10, EG15 made a similar report of comparison of standards for power quality.

D.2 Harmonised standards and environments

EN 61000-2 series describes the basic environments. It identifies the default basic compatibility requirements where none of the other directives, or certification frameworks, apply given in Clause 2, but is especially aimed at domestic, commercial, light industrial and industrial (fixed) environments described below. Note reference should always be made to the latest version of EN 61000-2 series for the most up to date and complete descriptions.

The harmonised European EMC standards associated with these environments are based more on users' perception of interference, hence tests and acceptable interference limits are more statistically concerned with inter-system compatibility, with greater emphasis upon batch testing for continued compliance. A description of the International and European EMC standards structure is given in CENELEC Guide 24 [9]. In summary the standards structure is:

a) **Product specific**: These relate to a particular type of product, for instance welding equipment, road traffic signal systems, electricity meters, gas detectors etc. Although there are many of these, there are also many types of product that are not covered in this way. Also, it is quite common for a product or product-specific standard not to cover all EMC phenomena, so that another standard such as a generic is needed to complete the coverage. A product specific standard will include the whole range of EMC phenomena applicable to the product.

b) **Product family**: These relate to a particular product family, e.g. Information Technology (IT), Industrial/Scientific/Medical (ISM) etc. There is a particular significance to EN 55011, EN 55014-1, EN 55014-2 and EN 55022 in that, as well as being product family standards in themselves and derived from CISPR original documents, they are applied very much more widely and referenced from Generic and Product specific standards. A product family standard will include the whole range of EMC phenomena applicable to the product.

c) **Generic standards**: These are related to a particular environment, either residential, commercial & light industrial or, industrial. They can be used if there is no product or product specific standard available. A generic standard will include the whole range of EMC phenomena applicable to the specified environment. The generic standards are
   - EN 61000-6-1,
   - EN 61000-6-2,
   - EN 61000-6-3,
   - EN 61000-6-4.

   i) <u>Residential, commercial and light industrial environment:</u>

      This category applies to equipment that is supplied with power directly from a low-voltage public mains network or dedicated DC source which is intended to interface directly between apparatus and the low-voltage public mains network.

Typical locations include

- residential properties, for example houses, apartments,
- retail outlets for example shops, supermarkets,
- business premises for example offices, banks,
- areas of public entertainment for example cinemas, public bars, dance halls,
- outdoor locations for example petrol stations, car parks, amusement and sports
- centres, light-industrial locations for example workshops, laboratories, service centres.

ii) Industrial environment

This category covers apparatus that is intended to be connected to a power network supplied from a high or medium voltage transformer dedicated to the supply of an installation feeding manufacturing or similar plant, and intended to operate in or in proximity to industrial locations. It also applies to apparatus which is battery operated and intended to be used in industrial locations. Industrial locations are in addition characterised by the existence of one or more of the following:

- industrial, scientific and medical (ISM) apparatus;
- heavy inductive or capacitive loads are frequently
- switched; currents and associated magnetic fields are high;
- operation from 3 phase supplies.

d) **Basic standards**: These generally specify test methods and are, by definition, independent of any particular product. The EN/IEC 61000-3 series of low frequency emission standards are stated to be basic standards but also include limits, and are harmonised in the OJEU. The EN/IEC 61000-4 series of immunity standards specify test methods and are not harmonised. Each basic standard generally addresses a single EMC phenomenon.

D.3 Selection of environments and standards for the EMC assessment

The range of EM phenomena is described in Annex 3 of the "*Guide for the EMC Directive 2004/108/EC*" [16]. The designer/manufacturer needs to identify those that are appropriate to the product depending upon its intended operational environment. In the absence of product specific harmonised standard being identified, the Generic standards, EN 61000-6-1 and EN 61000-6-3 for residential, commercial and light industrial uses and EN 61000-6-2 and EN 61000-6-4 for industrial uses, identify the minimum phenomena and limits for these environments. The phenomena and limits in military environments are listed in the military standards.

Note, depending upon the original design intent, the manufacturer should consider extending the operational environment to include the expected complete through life interfaces with neighbouring environments, covering at minimum, user trials, storage, training establishments, military establishments, dockyards, airfields, peacetime operations, policing activities and training.

For example, consideration must be given to the impact of the military equipment on neighbouring environments

- if military equipment ever connects to public mains supplies then there is an impact on the neighbouring environment,
- if military equipment ever connects to public telecommunication networks then there is an impact on the neighbouring environment,

- if military equipment operates on either a mobile or fixed basis within residential, commercial or industrial environments, then there is an impact on the neighbouring environment,
- if military equipment can generate field strengths in excess of those defined within EN 61000-2 for public accessible areas, then there is an impact on the neighbouring environment.

Annex E
(informative)

Flow diagram for apparatus

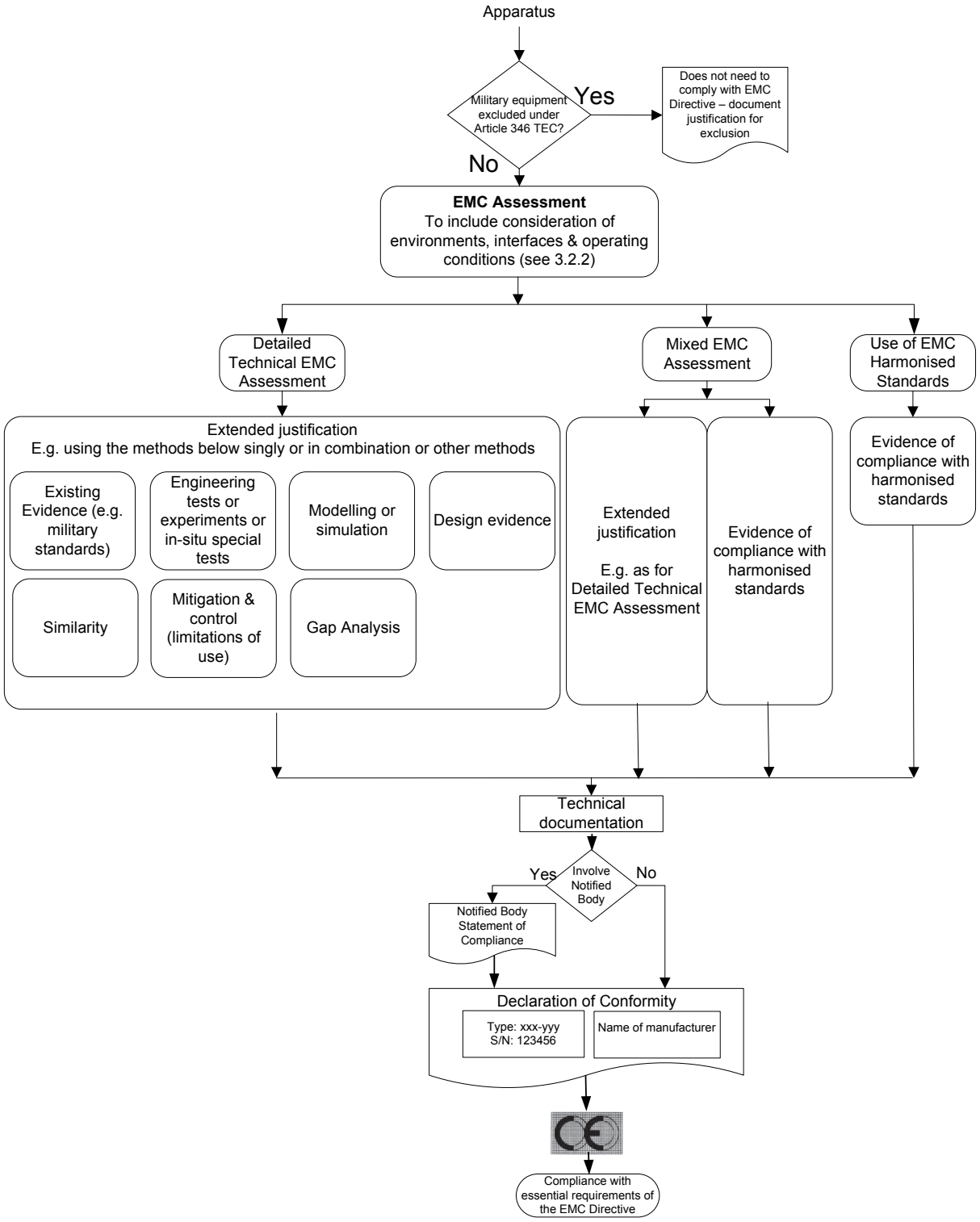

Figure E.1 – Flow diagram for apparatus

Annex F
(informative)

Flow diagram for fixed installation/specific apparatus

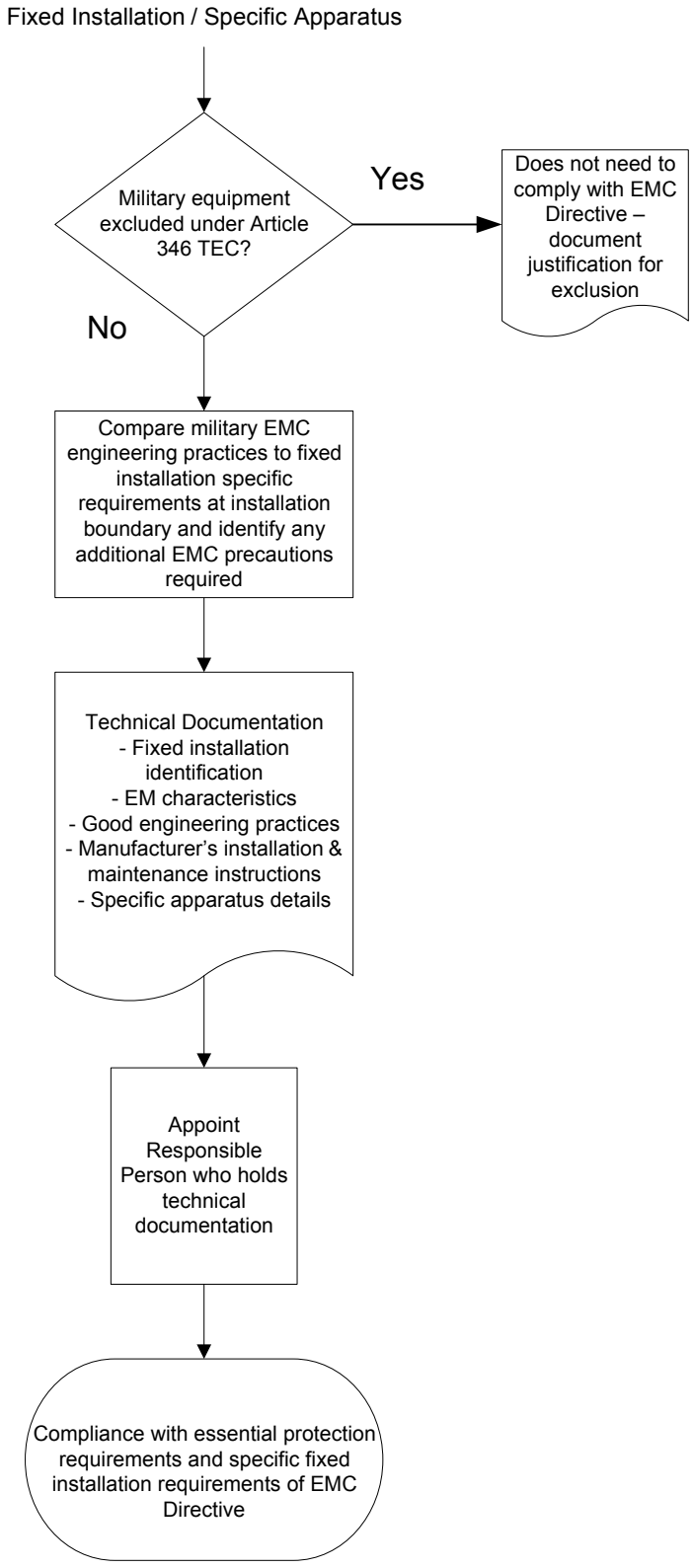

Figure F.1 – Flow diagram for fixed installation/specific apparatus

Annex G
(informative)

Read across tables between military and harmonised standards (Test method level)

Table G.1 – Factors to be considered during an EMC gap analysis

Test type	EMC gap analysis factors affecting test severity (Not all may be applicable)
Conducted emission	Scope of lines under test (power and/or signal, control) Frequency range Detector (average/peak/quasi peak) Measurement device (LISN/Current probe/AMN/ISN) Measurement distance from EUT along cable Limit units (current/voltage) Circuit impedance for converting between current and voltage Limit level
Radiated emission	Frequency range Antenna test distance Extrapolation method Detector (average/peak/quasi peak) Test set-up (ground plane/EUT height/Bonding) Limit units (current/voltage) Limit level
Conducted susceptibility	Scope of lines under test (power and/or signal, control) Frequency range Modulation Coupling device (Current probe/Coupling Decoupling Network/Shield Injection) Coupling distance from EUT along cable Limit units (current/voltage) Circuit impedance for converting between current and voltage Calibration technique (CW/peak envelope/monitor open circuit/monitor in circuit) Limit level
Radiated susceptibility	Frequency range Modulation Test set-up (ground plane/EUT height/Bonding) Limit units (current/voltage) Calibration technique (CW/peak envelope/pre-calibrated volume/field monitored) Limit level
Transient susceptibility	Scope of lines under test (power and/or signal, control) Peak (absolute) Voltage/Current (Impedance conditions) Peak (absolute) value of rate of rise Peak (absolute) Impulse – impulse equivalent maximum energy in a single polarity pulse Rectangular Impulse – impulse equivalent of total energy Root action integral – total energy Time to peak value Frequency spectrum Calibration technique (pre-calibrated level/monitored in circuit) Differential or common mode coupling

Annex H
(informative)

Comparison of EMC test methods

The following Table H.1 was given in "*Report of the CEN WS 10 EG7 'Electromagnetic environment'*" [11]. Note that some standards may have now been superseded.

Table H.1 – Comparison of EMC test methods

NATO	France	Germany	Poland			United Kingdom	United States	IEC/EN
AECTP 500	GAM EG13	VG 95373	NO-06-A200:1998	NO-06-A500:1998	PN-V-8410:2002	DEF-STAN 59-41	MIL-STD 461E	Various
NCE01	62C1	LA01	KCE-01	PCE-01	NCE01	DCE01.3	CE101	EN 61000-3-2, but NC
NCE02	62C2	LA02	KCE-02	PCE-02	NCE02	DCE01.3	CE102	EN 55022 etc, NC
NCE03	NE	NE	KCE-03	PCE-03	NE	NE	= CE106	ETSI product standards
NCE04	NE	LA03	NE	NE	NE	= DCE03.3	NE	NE
NCE05	62C3	LA01	NE	NE	NE	= DCE02.3	NE	EN 55022, absorbing clamp, etc., NC
NCS01	63C1	LF01	KCS-01	PCS-01	NCS01	DSC01.3	= CS101	61000-4-11 etc, NC
NCS02	63C2	LF02	KCS-02	PCS-02	NCS02	= DSC03.3	NE	
NCS03	NE	NE	KCS-03	PCS-03	NCS03	NE	= CS103	ETSI product standards
NCS04	NE	NE	KCS-04	PCS-04	NCS04	NE	= CS104	ETSI product standards
NCS05	NE	NE	KCS-05	PCS-05	NE	NE	= CS105	ETSI product standards
NCS06	NE	LF06	KCS-06	PCS-06	NE	NE	= CS109	
NCS07	63C3	LF06	KCS-07	PCS-07	NE	check	= CS114	EN 61000-4-6, differences
NCS08	63C4	LF03, LF04	KCS-08	PCS-08	NE	check	= CS115	
NCS09	NE	NE	NE	NE	NE	check	= CS116	
NCS10	NE	NE	NE	NE	NE	= DSC09.3	NE	
NCS11	NE	NE	NE	NE	NE	= DCS12.3	NE	
NCS12	NE	LF05	NE	NE	NE	= DCS10.3	NE	IEC 61000-4-2
NRE01	62R1	SA01	KRE-01	PKE-01	NRE01	~ DRE02.3	= RE101	IEC-CISPR15, NC
	62R2	SA02	NE	NE	NE			
NRE02	62R3	SA03, SA04, SA05	KRE-02	PRE-02	NRE02	~ DRE01.3	= RE102	EN 61000-6-4 > EN 55011, NC
NRE03	NE	NE	KRE-03	PRE-03	NE	NE	= RE103	NE
NRS01	63R1	SF01	KRS-01	PRS-01	NRS01	DRS01.3	= RS101	EN 61000-6-1 > EN 61000-4-8, 9, 10, NC
	63R2	SF02						
NRS02	63R3	SF03, SF04, SF05	KRS-02	PRS-02	NRS02	DRS02.3	= RS103	EN 61000-6-1 > EN 61000-4-3, EN 61000-4-6, NC
NRS03	national adaptions	NE	KRS-03	PRS-03	NE	national adaptions	= RS105	IEC 61000-4-25, but not equal
NRS04	NE	NE	NE	NE	NE	= DRS03.3	= 1399 070/2036A	EN 61000-6-1 > EN 61000-4-8, NC

NE: No Equivalent
NC: Not Comparable (IEC)

The following Table H.2 is a more detailed example of comparable test methods.

NOTE Other Member States standards may be included.

Table H.2 – Detailed comparison of EMC test methods

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NCE01	Conducted emissions, power leads, 30 Hz to 10 kHz	CE101	Conducted emissions, power leads, 30 Hz to 10 kHz	DCE01	Conducted emission on primary power lines, 0 Hz to 150 MHz	None		EN 61000-3-2	Exported harmonics 100 Hz to 2 kHz (50 Hz supply)
NCE02	Conducted emissions, power leads, 10 kHz to 10 MHz	CE102	Conducted emissions, power leads, 10 kHz to 10 MHz			None		EN 55015 EN 60945	Conducted disturbance at mains ports 9 kHz to 30 MHz
						Clause 21	Emission of radio frequency energy, 150 kHz to 152 MHz	EN 55011 EN 55013 EN 55014-1 EN 55016-2-1 EN 55022	Conducted disturbance at mains ports 150 kHz to 30 MHz
NCE03	Conducted emissions, antenna terminal, 10 kHz to 40 GHz	CE106	Conducted emissions, antenna terminal, 10 kHz to 40 GHz	None		None		Radio communication device standards EN 300 series EN 301 series EN 302 series	Conducted spurious emissions
NCE04	Conducted emissions, exported transients on power leads on/off, functional transient	None		DCE03	Exported transients power lines, on/off, functional transient	None		EN 61000-3-3 ETSI EN 300 386 EN 61000-6-3	Voltage fluctuations and flicker
NCE05	Conducted emissions, secondary power, control & signal leads, 30 Hz to 150 MHz	None		DCE02	Conducted emission on control, signal and secondary power lines, 20 Hz to 150 MHz	Clause 21	Emission of radio frequency energy, 150 kHz to 152 MHz	EN 55016-2-1 EN 55022 EN 61000-6-3	Conducted common mode disturbance at telecommunication ports, 150 kHz to 30 MHz
NRE01	Radiated emissions, magnetic field, 30 Hz to 100 kHz	RE101	Radiated emissions, magnetic field, 30 Hz to 100 kHz	DRE02	H Field radiation, 20 Hz to 100 kHz	None		EN 55011 EN 55015	Magnetic field strength, 9 kHz to 30 MHz

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NRE02	Radiated emissions, electric field, 10 kHz to 18 GHz	RE102	Radiated emissions, electric field, 10 kHz to 18 GHz	DRE01	Radiated emissions, E-field, 14 kHz to 18 GHz	Clause 21	Emission of radio frequency energy, 100 MHz to 6 GHz	EN 55011 EN 55015	Magnetic field strength, 9 kHz to 30 MHz
								EN 60945	Magnetic field strength, 150 kHz to 30 MHz
								EN 55011 EN 55013 EN 55016-2-3 EN 55022 ETSI EN 300 386 EN 61000-6-3 EN 61000-6-4 EN 61326-1	Radiated disturbance, 30 MHz to 1 000 MHz
								EN 60945	Radiated disturbance, 30 MHz to 2 000 MHz
None		None		DRE03	Radiated emissions, installed antenna, 1,6 MHz to 88 MHz	None		EN 55011 EN 55015	Magnetic field strength, 9 kHz to 30 MHz
								EN 55011 EN 55022 EN 61000-6-3 EN 61000-6-4	Radiated disturbance, 30 MHz to 1 000 MHz
NRE03	Radiated emissions, antenna spurious and harmonic outputs	RE103	Radiated emissions, antenna spurious and harmonic outputs, 10 kHz to 40 GHz	None		None		Radio communication device standards EN 300 series EN 301 series EN 302 series	Radiated spurious emissions

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NCS01	Conducted susceptibility, power leads, 30 Hz to 150 kHz	CS101	Conducted susceptibility, power leads, 30 Hz to 150 kHz	DCS01	Conducted susceptibility, primary power lines, 20 Hz to 50 kHz	Clause 18	AF conducted susceptibility power inputs, 10 Hz to 150 kHz	EN 61000-4-13	Harmonics and interharmonics including mains signalling at AC power port, 16 Hz to 2 kHz
								EN 61000-4-16	Conducted common mode disturbance, Mains frequency and DC, 15 Hz to 150 kHz
NCS02	Conducted susceptibility, control & signal leads, 20 Hz to 50 kHz	None		DCS03	Conducted susceptibility, control and signal lines, 20 Hz to 50 kHz	Clause 19	Induced signal susceptibility, 350 Hz to 32 kHz	EN 61000-4-16	Conducted common mode disturbance, Mains frequency and DC, 15 Hz to 150 kHz
NCS03	Conducted susceptibility, antenna port, intermodulation, 15 kHz to 10 GHz	CS103	Conducted susceptibility, antenna port, intermodulation, 15 kHz to 10 GHz	None		None		Radio communication device standards EN 300 series EN 301 series EN 302 series	Intermodulation response rejection
NCS04	Conducted susceptibility, antenna port, rejection of undesired signals, 30 Hz to 20 GHz	CS104	Conducted susceptibility, antenna port, rejection of undesired signals, 30 Hz to 20 GHz	None		None		Radio communication device standards EN 300 series EN 301 series EN 302 series	Spurious response rejection
NCS05	Conducted susceptibility, antenna port, cross-modulation, 30 Hz to 20 GHz	CS105	Conducted susceptibility, antenna port, cross-modulation, 30 Hz to 20 GHz	None		None		Radio communication device standards EN 300 series EN 301 series EN 302 series	Blocking or desensitisation

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NCS06	Conducted susceptibility, structure current, 60 Hz to 100 kHz	CS109	Conducted susceptibility, structure current, 60 Hz to 100 kHz	None		None		None	
NCS07	Conducted susceptibility, bulk cable injection, 10 kHz to 200 MHz	CS114	Conducted susceptibility, bulk cable injection, 10 kHz to 200 MHz	DCS02	Conducted susceptibility, power control and signal lines, 50 kHz to 400 MHz	Clause 20	Radio frequency susceptibility conducted, 10 kHz to 400 MHz	EN 61000-4-16	Conducted common mode disturbance, Mains frequency and DC, 15 Hz to 150 kHz
								EN 55016-2-4 EN 60945 EN 61000-4-6 ETSI EN 300 386 EN 55014-2 EN 55024 EN 60945 EN 61000-6-1 EN 61000-6-2 EN 61326-1	RF common mode, 150 kHz to 80 MHz
NCS08	Conducted susceptibility, bulk cable injection, impulse excitation, 2 ns Tr 30 ns Tp 30 Hz rep. rate	CS115	Conducted susceptibility, bulk cable injection, impulse excitation, 2 ns Tr 30 ns Tp 30 Hz rep. rate	None		Clause 19	Induced signal susceptibility, inductive switching transients, 0,2 µs to 10 µs period	EN 61000-4-4	Fast Transient Bursts, 5/50 Tr/Th ns, 5 kHz rep. rate

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NCS09	Conducted susceptibility, damped sinusoidal transients, cables and power leads, 10 kHz to 100 MHz	CS116	Conducted susceptibility, damped sinusoidal transients, cables and power leads, 10 kHz to 100 MHz	DCS04	Imported transient susceptibility (aircraft), Type 1 transient (2 MHz to 30 MHz) & Type 2 transient (100 kHz)	None		EN 61000-4-12	Ring waves, 100 kHz
						Clause 22 Waveform 3	Lightning induced transient susceptibility, waveform 3 damped oscillatory, 1 MHz & 10 MHz	EN 61000-4-18	Damped oscillatory, 100 kHz, 1 MHz, 3 MHz, 10 MHz & 30 MHz
				DCS05	Externally generated transients, switching & NEMP transient, (0,5 MHz to 50 MHz)	Clause 22 Waveform 3	Lightning induced transient susceptibility, waveform 3 damped oscillatory, 1 MHz & 10 MHz	EN 61000-4-18	Damped oscillatory, 100 kHz, 1 MHz, 3 MHz, 10 MHz & 30 MHz
								EN 61000-4-25	HEMP for equipment and systems, 1 MHz, 10 MHz, 50 MHz damped sinusoid
				DCS06	Imported long transient susceptibility (land and sea systems) AC and DC systems, Group switching (100 kHz)	Clause 17	Voltage spike, 2 µs/10 µs	EN 61000-4-12	Ring waves, 100 kHz
								EN 61000-4-5	Surges, 1,2/50 µs open cct 8/20 µs short cct Common and differential mode
				DCS08	Externally generated transients (aircraft), NEMP and LEMP (2 MHz to 50 MHz)	Clause 22 Waveform 3	Lightning induced transient susceptibility, waveform 3 damped oscillatory, 1 MHz & 10 MHz	EN 61000-4-18	Damped oscillatory, 100 kHz, 1 MHz, 3 MHz, 10 MHz & 30 MHz
								EN 61000-4-25	HEMP for equipment and systems, 1 MHz, 10 MHz, 50 MHz damped sinusoid

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NCS10	Conducted susceptibility, imported lightning (aircraft), lightning short, intermediate and long waveforms	None		DCS09	Imported lightning transient (aircraft), lightning short, intermediate and long waveforms	Clause 22 Waveform 1, 2, 4 & 5B	Lightning induced transient susceptibility, waveform 1: 6,4 µs/69 µs, waveform 2: 100 ns/6,4 µs, waveform 4: 6,4 µs/69 µs, waveform 5B: 50 µs/500 µs	None	
NCS11	Conducted susceptibility, imported low frequency on power leads (ships) switching, 10 kHz to 16 kHz	CS106	Conducted susceptibility, transients power leads, 1,5 µs/5 µs	DCS12	Imported low frequency transient susceptibility power lines (sea systems), switching (10 kHz to 16 kHz)	Clause 17	Voltage spike, 2 µs/10 µs	EN 61000-4-5	Surges, 1,2/50 µs open cct 8/20 µs short cct Common and differential mode
NCS12	Conducted susceptibility, electrostatic discharge, air and contact discharge	None		DCS10	Electrostatic discharge, air & contact discharge	Clause 25	Electrostatic discharge, air and contact discharge	EN 61000-4-2 ETSI EN 300 386 EN 55014-2 EN 55020 EN 55024 EN 61000-6-1 EN 61000-6-2 EN 61326-1	Electrostatic discharge, air and contact discharge
NCS13	Conducted susceptibility, transients power leads, 1,5 µs/5 µs	CS106	Conducted Susceptibility, transients power leads, 1,5 µs/5 µs	DCS12	Imported low frequency transient susceptibility power lines (sea systems), Switching (10 kHz to 16 kHz)	Clause 17	Voltage spike, 2 µs/10 µs	EN 61000-4-5	Surges, 1,2/50 µs open cct 8/20 µs short cct Common and differential mode

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NRS01	Radiated susceptibility, magnetic field, 30 Hz to 100 kHz	RS101	Radiated susceptibility, magnetic field, 30 Hz to 100 kHz	DRS01	H field susceptibility, 20 Hz to 100 kHz	Clause 19	Induced signal susceptibility, magnetic fields induced into equipment & cables	EN 61000-4-8 EN 55024 EN 61000-6-1 EN 61000-6-2	Power frequency magnetic field, 50 Hz/60 Hz
								EN 61000-4-9	Pulse magnetic field, 6,4/16 µs (surge)
								EN 61000-4-10	Damped oscillatory magnetic field, 0,1 MHz and 1 MHz
NRS02	Radiated susceptibility, electric field, 50 kHz to 40 GHz	RS103	Radiated susceptibility, electric field, 2 MHz to 40 GHz	DRS02	E field susceptibility, 10 kHz to 18 GHz	Clause 20	Radio frequency susceptibility radiated, 100 MHz to 18 GHz	EN 55016-2-4 EN 61000-4-3 ETSI EN 300 386 EN 55014-2 EN 55024 EN 61000-6-1 EN 61000-6-2 EN 61326-1	Radiated electromagnetic field, 80 MHz to 1 GHz
								EN 55020	Radiated electromagnetic field, 150 kHz to 150 MHz
								EN 60945	Radiated electromagnetic field, 80 MHz to 2 GHz
								EN 61000-6-2	Radiated electromagnetic field, 1,4 GHz to 2,7 GHz
								EN 61000-4-21	Radiated electromagnetic field, Typically 200 MHz to 18 GHz dependent on room

Table H.2 – Detailed comparison of EMC test methods *(continued)*

AECTP 500 Ed 3		Mil-Std-461F		Defence Standard 59-411 Part 3 Issue 1 Amdt 1		RTCA DO160F		IEC/EN Standards (examples)	
Test ref.	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**	**Test ref.**	**Test description, Frequency range/ Characteristic tested**
NRS03	Radiated susceptibility, transient electromagnetic field	RS105	Radiated susceptibility, transient electromagnetic field, 1,8 to 2,8 ns Tr 23 ns Tp	None		None		None	
NRS04	Radiated susceptibility, magnetic field, susceptibility (DC)	None		DRS03	Magnetostatic field susceptibility, DC magnetic field	None		EN 61000-4-8	Power frequency magnetic field, 50/60 Hz Can be applied at DC

Annex I
(informative)

Examples of gap analysis

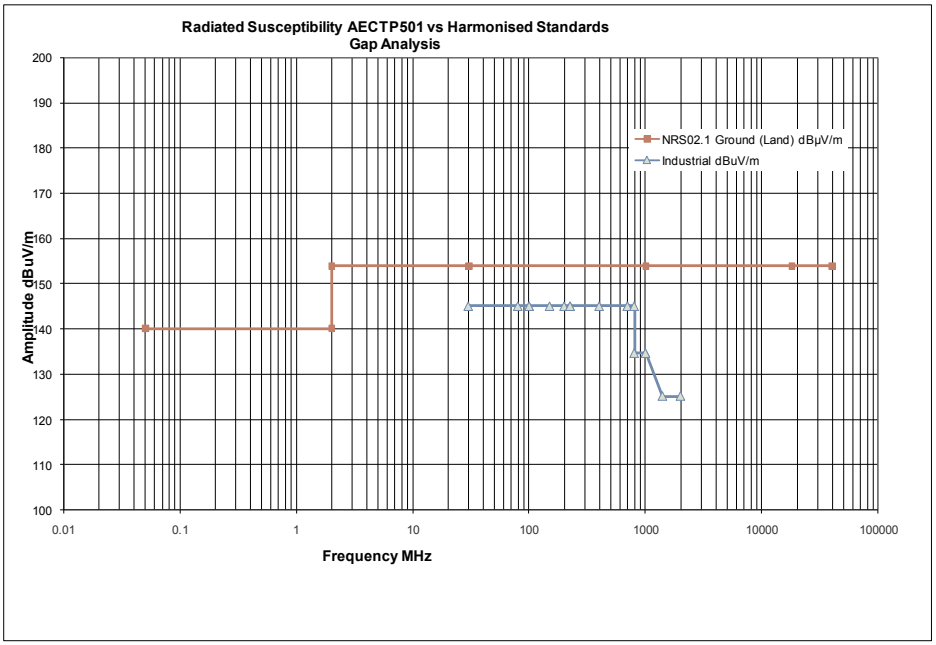

Figure I.1 – Example of Radiated Immunity Gap Analysis between AECTP501 NRS02.1 Ground and 'Industrial' Immunity Limit where the Military Standard is more onerous (Industrial limit modified for comparison)

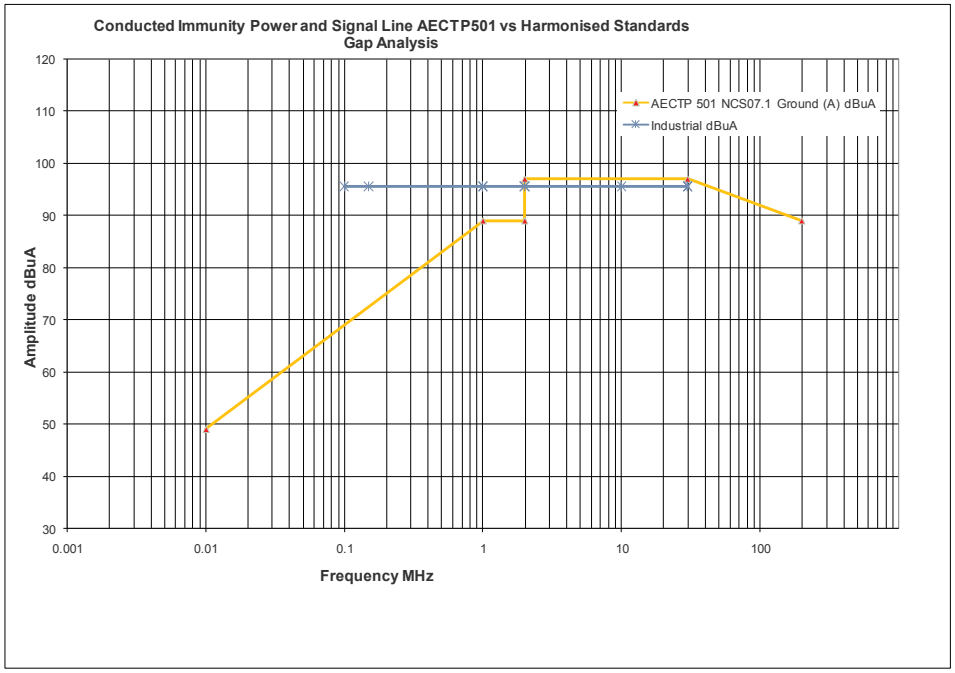

Figure I.2 – Example of Power/Signal Port Conducted Immunity Gap Analysis between AECTP501 NCS07.1 Ground and 'Industrial' Immunity Limit where the Military Standard is less onerous over part of the frequency range (Industrial limit modified for comparison)

Annex J
(informative)

Example Case Studies

This Technical Report attempts to explore and give guidance on the most common situations, which can be extrapolated to the more complex. The situations explored are: compliance of bespoke line replacement unit (LRU) apparatus for a single project; compliance of single bespoke complex systems to single customer and 'military off the shelf' (MOTS) apparatus developed military system available for sale to multiple military and security organisations across multiple countries. Where none of the military system based test approaches uses the harmonised standards as the main proof method, they will therefore require an EMC assessment within the technical documentation file to show compliance unless additional testing to harmonised standards proves a more cost effective approach than the equivalent analysis.

The simplest case is that of the bespoke single apparatus or installation for a single project. In this case, it is proposed that an apparatus can be treated as a one off certain apparatus that requires documentation to show due diligence in minimising the risk of interference, supported by analysis identifying the minimum amount of tests and appropriate test standards required to de-risk that assertion. The one off installation would also follow this model. Both apparatus and fixed installations would be documented by identifying the target military environment/ specification, the possible level of read across to essential requirements and where any harmonised standard testing is required. All of this could reasonably be encompassed by a control plan, which is usually a requirement for this type of military procurement, with the test results held as proof of compliance. Where analysis shows the system fails, additional modifications to meet the EMC Directive protection requirements may be required. For a one off apparatus installed at a given permanent location, it must meet the protection requirements but the following are not compulsory; an EMC assessment, Declaration of Conformity or CE marking.

For the median case, where the LRU or system apparatus is to be installed in multiple platforms or fixed installations, it is proposed that either full testing to every relevant directive is required (at one end of the compliance spectrum) or, on a practical level, the system requires a comprehensive documented analysis including additional testing where the military standards cannot be read across to the harmonised standards. This analysis can again be documented into the EM control plan, or, alternatively, it may be beneficial to place this into a separate document, which would then be used to support the Declaration of Conformity and technical documentation file, that would identify the target design environment, the military test standards used to gather data, any harmonised test standards used and then gap or read across analysis. A Notified Body may be used to verify the technical documentation, depending upon the confidence of the manufacturer in the in-house analysis. Before incorporating any military project documentation into the EMC Directive technical documentation file, the relevant security classification should be considered.

The final case is one that is closest to the directives such as a military off the shelf (MOTS) apparatus. It is proposed that the EMC Directive compliance documentation be kept separate from any individual project requirements. In this case, it is proposed that the equipment or system must conform to the minimum EMC Directive protection requirements as identified from the regulatory framework. A Notified Body would be most useful to verify this. As an independently developed system, no individual national security restriction will apply. Where the analysis or a Notified Body assessment identifies a shortfall against the protection requirements, additional modifications of the apparatus to pass the relevant harmonised standard requirements will be required.

In all cases, where integration into fixed installations are required, the installation design practices used to maintain the EMC integrity of the system and its host platform/installation will need to be documented. An example of one installation that requires only military standard testing would be the integration of a system below decks into sea going vessels. Other installations would need to be assessed for meeting the protection requirements at the interface to neighbouring environments, e.g. integration into road going vehicles where there is little or no EM isolation provided by the platform.

Bibliography

Standards

DEF STAN 59-411 Part 3 Issue 1 Amdt 1 (January 2008), *Electromagnetic Compatibility – Part 3: Test Methods and Limits for Equipment and Sub Systems* (UK Defence Standard)

EN 55011, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement* (CISPR 11, mod.)

EN 55013, *Sound and television broadcast receivers and associated equipment – Radio disturbance characteristics – Limits and methods of measurement* (CISPR 13, mod.)

EN 55014-1*, Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission* (CISPR 14-1)

EN 55014-2*, Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 2: Immunity – Product family standard* (CISPR 14-2)

EN 55015, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment* (CISPR 15)

EN 55016-2-1, *Specification for radio disturbance and immunity measuring apparatus and methods -- Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements* (CISPR 16-2-1)

EN 55016-2-3, *Specification for radio disturbance and immunity measuring apparatus and methods -- Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements* (CISPR 16-2-3)

EN 55016-2-4, *Specification for radio disturbance and immunity measuring apparatus and methods -- Part 2-4: Methods of measurement of disturbances and immunity – Immunity measurements* (CISPR 16-2-4)

EN 55020, *Sound and television broadcast receivers and associated equipment – Immunity characteristics – Limits and methods of measurement* (CISPR 20)

EN 55022, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement* (CISPR 22, mod.)

EN 55024, *Information technology equipment – Immunity characteristics – Limits and methods of measurement* (CISPR 24, mod.)

EN 60945, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results* (IEC 60945)

EN 61000-2 series, *Electromagnetic compatibility (EMC) – Part 2-2: Environment*

EN 61000-3 series, *Electromagnetic compatibility (EMC) – Part 3: Limits* (IEC 61000-3 series)

EN 61000-4 series, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques* (IEC 61000-4 series)

EN 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments* (IEC 61000-6-1)

EN 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments* (IEC 61000-6-2)

EN 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments* (IEC 61000-6-3)

EN 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments* (IEC 61000-6-4)

EN 61326-1, *Electrical equipment for measurement, control and laboratory use – EMC requirements -- Part 1: General requirements* (IEC 61326-1)

ETSI EN 300 386, *Electromagnetic compatibility and Radio spectrum Matters (ERM);Telecommunication network equipment;ElectroMagnetic Compatibility (EMC) requirements*

IEC/TS 61000-1-2, *Electromagnetic compatibility (EMC) – Part 1-2: General – Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena*

MIL-STD-461F (10/12/2007), *Requirements for the control of electromagnetic interference characteristics of subsystems and equipment* (USA Interface Standard)

RTCA DO160F (12/06/2007), *Environmental Conditions and Test Procedures for Airborne Equipment*

ED 107, *Guide for the certification of Aircraft in a High Intensity Radiated Field (HIRF) Environment*

Other documents

[1] *Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC,* OJ L 390, 31.12.2004, p. 24-37

[2] *Directive 2009/81/EC of the European Parliament and of the Council of 13 July 2009 on the coordination of procedures for the award of certain works contracts, supply contracts and service contracts by contracting authorities or entities in the fields of defence and security, and amending Directives 2004/17/EC and 2004/18/EC*, OJ L 216, 20.8.2009, p. 76–136

[3] *Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity,* OJ L 91, 7.4.1999, p. 10–28

[4] COM(2006) 779 final, *Interpretative communication on the application of Article 296 of the Treaty in the field of defence procurement*

[5] *Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility,* OJ L 139, 23.5.1989, p. 19–26

[6] *Commission Directive 2004/104/EC of 14 October 2004 adapting to technical progress Council Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers,* OJ L 337, 13.11.2004, p. 13–58

[7] *Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (Framework Directive)*, OJ L 263, 9.10.2007, p. 1–160

[8] AECTP 500, Edition 3 (February 2009), *Electrical/Electromagnetic Environmental Tests* (NATO, Allied Environmental Conditions and Test Publications)

[9] CLC Guide 24, *Electromagnetic Compatibility (EMC) Standardization for Product Committees concerned with apparatus*

[10] CWA 15517, *European Handbook for Defence Procurement*

[11] *Report of the CEN WS 10 EG7 'Electromagnetic environment'*

[12] *Council Decision 255/58 of 31 March 1958 drawing up a list of products to which Article 223(1) b applies*

[13] *Council Directive 96/98/EC of 20 December 1996 on marine equipment,* OJ L 46, 17.2.1997, p. 25-56

[14] *Regulation (EC) No 1592/2002 of the European Parliament and of the Council of 15 July 2002 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency,* OJ L 240, 7.9.2002, p. 1–21

[15] *Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts,* OJ L 134, 30.4.2004, p. 114–240

[16] *Guide for the EMC Directive 2004/108/EC* (8th Feb 2010)

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