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# ~~ETSI EN 301 444 V1.1.1 (2000-05)~~

~~Candidate Harmonized European Standard (Telecommunications series)~~

**Satellite Earth Stations and Systems (SES);  
Harmonized EN for Land Mobile Earth Stations (LMES)  
operating in the 1,5 GHz and 1,6 GHz bands  
providing voice and/or data communications  
covering essential requirements ~~under Article 3.2~~  
~~of the R&TTE directive~~**



# ETSI EN 301 444 V1 2 1 (2012-01)



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Harmonized EN for Land Mobile Earth Stations (LMES)  
operating in the 1,5 GHz and 1,6 GHz bands  
providing voice and/or data communications  
covering essential requirements of article 3.2  
of the R&TTE directive**

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**Reference**~~DEN/SEC 000 TBR 44~~

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**Keywords**~~satellite~~, earth station, LMES, ~~regulation~~

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**Reference****REN/SES-00319**

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**Keywords**earth station, LMES, regulation, satellite**ETSI**

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# Contents

<del>Intellectual Property Rights</del>	<del>5</del>
<del>Foreword</del>	<del>5</del>
<del>Introduction</del>	<del>6</del>
<del>1 Scope</del>	<del>9</del>
<del>2 References</del>	<del>9</del>
<del>3 Definitions and abbreviations</del>	<del>10</del>
<del>3.1 Definitions</del>	<del>10</del>
<del>3.2 Abbreviations</del>	<del>10</del>
<del>4 Technical requirement specifications</del>	<del>11</del>
<del>4.1 Environmental profile</del>	<del>11</del>
<del>4.2 Conformance requirements</del>	<del>11</del>
<del>4.2.1 Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz</del>	<del>11</del>
<del>4.2.1.1 Justification</del>	<del>11</del>
<del>4.2.1.2 Specification</del>	<del>11</del>
<del>4.2.1.3 Conformance test</del>	<del>13</del>
<del>4.2.2 Maximum unwanted emissions within the 1 625,8 MHz to 1 661,2 MHz band</del>	<del>13</del>
<del>4.2.2.1 Justification</del>	<del>13</del>
<del>4.2.2.2 Specifications</del>	<del>13</del>
<del>4.2.2.3 Conformance test</del>	<del>13</del>
<del>4.2.3 Control and Monitoring Functions (CMF)</del>	<del>13</del>
<del>4.2.3.1 General</del>	<del>13</del>
<del>4.2.3.2 Processor monitoring</del>	<del>13</del>
<del>4.2.3.2.1 Justification</del>	<del>13</del>
<del>4.2.3.2.2 Specification</del>	<del>14</del>
<del>4.2.3.2.3 Conformance test</del>	<del>14</del>
<del>4.2.3.3 Transmit subsystem monitoring</del>	<del>14</del>
<del>4.2.3.3.1 Justification</del>	<del>14</del>
<del>4.2.3.3.2 Specification</del>	<del>14</del>
<del>4.2.3.3.3 Conformance test</del>	<del>14</del>
<del>4.2.3.4 Power-on/reset</del>	<del>14</del>
<del>4.2.3.4.1 Justification</del>	<del>14</del>
<del>4.2.3.4.2 Specification</del>	<del>14</del>
<del>4.2.3.4.3 Conformance test</del>	<del>14</del>
<del>4.2.3.5 Control Channel (CC) reception</del>	<del>14</del>
<del>4.2.3.5.1 Justification</del>	<del>14</del>
<del>4.2.3.5.2 Specification</del>	<del>14</del>
<del>4.2.3.5.3 Conformance test</del>	<del>15</del>
<del>4.2.3.6 Network control commands</del>	<del>15</del>
<del>4.2.3.6.1 Justification</del>	<del>15</del>
<del>4.2.3.6.2 Specification</del>	<del>15</del>
<del>4.2.3.6.3 Conformance test</del>	<del>15</del>
<del>4.2.3.7 Initial burst transmission</del>	<del>15</del>
<del>4.2.3.7.1 Justification</del>	<del>15</del>
<del>4.2.3.7.2 Specification</del>	<del>15</del>
<del>4.2.3.7.3 Conformance test</del>	<del>16</del>
<del>5 Testing for compliance with technical requirements</del>	<del>16</del>
<del>5.1 Environmental conditions for testing</del>	<del>16</del>
<del>5.2 Essential radio test suites</del>	<del>16</del>
<del>5.2.1 General</del>	<del>16</del>
<del>5.2.2 Measurement of unwanted emissions</del>	<del>16</del>
<del>5.2.2.1 General</del>	<del>16</del>

# Contents

<a href="#">Intellectual Property Rights</a>	<a href="#">5</a>
<a href="#">Foreword</a>	<a href="#">5</a>
<a href="#">Introduction</a>	<a href="#">5</a>
<a href="#">1 Scope</a>	<a href="#">7</a>
<a href="#">2 References</a>	<a href="#">7</a>
<a href="#">2.1 Normative references</a>	<a href="#">7</a>
<a href="#">2.2 Informative references</a>	<a href="#">8</a>
<a href="#">3 Definitions and abbreviations</a>	<a href="#">8</a>
<a href="#">3.1 Definitions</a>	<a href="#">8</a>
<a href="#">3.2 Abbreviations</a>	<a href="#">9</a>
<a href="#">4 Technical requirement specifications</a>	<a href="#">9</a>
<a href="#">4.1 Environmental profile</a>	<a href="#">9</a>
<a href="#">4.2 Conformance requirements</a>	<a href="#">10</a>
<a href="#">4.2.0 Maximum EIRP</a>	<a href="#">10</a>
<a href="#">4.2.0.1 Justification</a>	<a href="#">10</a>
<a href="#">4.2.0.2 Specification</a>	<a href="#">10</a>
<a href="#">4.2.0.3 Conformance test</a>	<a href="#">10</a>
<a href="#">4.2.1 Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz and outside the band 1 667,3 MHz to 1 675,7 MHz</a>	<a href="#">10</a>
<a href="#">4.2.1.1 Justification</a>	<a href="#">10</a>
<a href="#">4.2.1.2 Specification</a>	<a href="#">10</a>
<a href="#">4.2.1.3 Conformance test</a>	<a href="#">12</a>
<a href="#">4.2.2 Maximum unwanted emissions within the 1 625,8 MHz to 1 661,2 MHz band and within the 1 667,3 MHz to 1 675,7 MHz band</a>	<a href="#">12</a>
<a href="#">4.2.2.1 Justification</a>	<a href="#">12</a>
<a href="#">4.2.2.2 Specifications</a>	<a href="#">13</a>
<a href="#">4.2.2.3 Conformance test</a>	<a href="#">13</a>
<a href="#">4.2.3 Control and Monitoring Functions (CME)</a>	<a href="#">14</a>
<a href="#">4.2.3.1 General</a>	<a href="#">14</a>
<a href="#">4.2.3.2 Processor monitoring</a>	<a href="#">14</a>
<a href="#">4.2.3.2.1 Justification</a>	<a href="#">14</a>
<a href="#">4.2.3.2.2 Specification</a>	<a href="#">14</a>
<a href="#">4.2.3.2.3 Conformance test</a>	<a href="#">14</a>
<a href="#">4.2.3.3 Transmit subsystem monitoring</a>	<a href="#">14</a>
<a href="#">4.2.3.3.1 Justification</a>	<a href="#">14</a>
<a href="#">4.2.3.3.2 Specification</a>	<a href="#">14</a>
<a href="#">4.2.3.3.3 Conformance test</a>	<a href="#">14</a>
<a href="#">4.2.3.4 Power-on/reset</a>	<a href="#">14</a>
<a href="#">4.2.3.4.1 Justification</a>	<a href="#">14</a>
<a href="#">4.2.3.4.2 Specification</a>	<a href="#">14</a>
<a href="#">4.2.3.4.3 Conformance test</a>	<a href="#">15</a>
<a href="#">4.2.3.5 Control Channel (CC) reception</a>	<a href="#">15</a>
<a href="#">4.2.3.5.1 Justification</a>	<a href="#">15</a>
<a href="#">4.2.3.5.2 Specification</a>	<a href="#">15</a>
<a href="#">4.2.3.5.3 Conformance test</a>	<a href="#">15</a>
<a href="#">4.2.3.6 Network control commands</a>	<a href="#">15</a>
<a href="#">4.2.3.6.1 Justification</a>	<a href="#">15</a>
<a href="#">4.2.3.6.2 Specification</a>	<a href="#">15</a>
<a href="#">4.2.3.6.3 Conformance test</a>	<a href="#">15</a>
<a href="#">4.2.3.7 Initial burst transmission</a>	<a href="#">16</a>
<a href="#">4.2.3.7.1 Justification</a>	<a href="#">16</a>
<a href="#">4.2.3.7.2 Specification</a>	<a href="#">16</a>
<a href="#">4.2.3.7.3 Conformance test</a>	<a href="#">16</a>



<del>5.2.2.2</del>	<del>Test site .....</del>	<del>17</del>
<del>5.2.2.3</del>	<del>Test method .....</del>	<del>17</del>
<del>5.2.2.3.1</del>	<del>    Installation .....</del>	<del>17</del>
<del>5.2.2.3.2</del>	<del>    Receive test equipment .....</del>	<del>18</del>
<del>5.2.2.3.2.1</del>	<del>        Measuring receiver for measurements up to 1 000 MHz .....</del>	<del>18</del>
<del>5.2.2.3.2.2</del>	<del>        Spectrum analyser for measurements above 1 000 MHz .....</del>	<del>18</del>
<del>5.2.2.4</del>	<del>Procedure .....</del>	<del>18</del>
<del>5.2.2.4.1</del>	<del>    Test arrangements .....</del>	<del>18</del>
<del>5.2.2.4.2</del>	<del>    Unwanted emissions up to 1 000 MHz .....</del>	<del>19</del>
<del>5.2.2.4.3</del>	<del>    Unwanted emissions above 1 000 MHz .....</del>	<del>19</del>
5.2.3	LMES Control and Monitoring Functions (CMF) .....	20
<del>5.2.3.1</del>	<del>    General .....</del>	<del>20</del>
<del>5.2.3.2</del>	<del>    Test arrangement .....</del>	<del>20</del>
<del>5.2.3.3</del>	<del>    Processor monitoring .....</del>	<del>21</del>
<del>5.2.3.3.1</del>	<del>        Test method .....</del>	<del>21</del>
<del>5.2.3.4</del>	<del>    Transmit subsystem monitoring .....</del>	<del>21</del>
<del>5.2.3.4.1</del>	<del>        Test method .....</del>	<del>21</del>
<del>5.2.3.5</del>	<del>    Power on/Reset .....</del>	<del>21</del>
<del>5.2.3.5.1</del>	<del>        Test method .....</del>	<del>21</del>
<del>5.2.3.6</del>	<del>    Control Channel (CC) reception .....</del>	<del>22</del>
<del>5.2.3.6.1</del>	<del>        Test method .....</del>	<del>22</del>
<del>5.2.3.7</del>	<del>    Network control commands .....</del>	<del>23</del>
<del>5.2.3.7.1</del>	<del>        Test method .....</del>	<del>23</del>
<del>5.2.3.8</del>	<del>    Initial burst transmission .....</del>	<del>24</del>
<del>5.2.3.8.1</del>	<del>        Test method .....</del>	<del>24</del>
<del>Annex A (normative):</del>	<del>    The EN Requirements Table (EN-RT) .....</del>	<del>25</del>
<del>Bibliography .....</del>	<del>.....</del>	<del>26</del>
<del>History .....</del>	<del>.....</del>	<del>27</del>

<u>4.2.4</u>	<u>Protection of the radio astronomy service operation in the band 1 660,0 MHz to 1 660,5 MHz and in the band 1 668,0 MHz to 1 670,0 MHz</u>	<u>16</u>
<u>4.2.4.1</u>	<u>Purpose</u>	<u>16</u>
<u>4.2.4.2</u>	<u>Technical requirements</u>	<u>16</u>
<u>4.2.4.3</u>	<u>Conformance test</u>	<u>16</u>
<u>5</u>	<u>Testing for compliance with technical requirements</u>	<u>16</u>
<u>5.1</u>	<u>Environmental conditions for testing</u>	<u>16</u>
<u>5.2</u>	<u>Essential radio test suites</u>	<u>16</u>
<u>5.2.1</u>	<u>General</u>	<u>16</u>
<u>5.2.2</u>	<u>Measurement of unwanted emissions</u>	<u>17</u>
<u>5.2.2.1</u>	<u>General</u>	<u>17</u>
<u>5.2.2.2</u>	<u>Test site</u>	<u>18</u>
<u>5.2.2.3</u>	<u>Test method</u>	<u>18</u>
<u>5.2.2.3.1</u>	<u>Installation</u>	<u>18</u>
<u>5.2.2.3.2</u>	<u>Receive test equipment</u>	<u>18</u>
<u>5.2.2.4</u>	<u>Procedure</u>	<u>19</u>
<u>5.2.2.4.1</u>	<u>Test arrangements</u>	<u>19</u>
<u>5.2.2.4.2</u>	<u>Unwanted emissions up to 1 000 MHz</u>	<u>20</u>
<u>5.2.2.4.3</u>	<u>Unwanted emissions above 1 000 MHz</u>	<u>20</u>
<u>5.2.3</u>	<u>LMES Control and Monitoring Functions (CMF)</u>	<u>21</u>
<u>5.2.3.1</u>	<u>General</u>	<u>21</u>
<u>5.2.3.2</u>	<u>Test arrangement</u>	<u>21</u>
<u>5.2.3.3</u>	<u>Processor monitoring</u>	<u>22</u>
<u>5.2.3.3.1</u>	<u>Test method</u>	<u>22</u>
<u>5.2.3.4</u>	<u>Transmit subsystem monitoring</u>	<u>22</u>
<u>5.2.3.4.1</u>	<u>Test method</u>	<u>22</u>
<u>5.2.3.5</u>	<u>Power-on/Reset</u>	<u>23</u>
<u>5.2.3.5.1</u>	<u>Test method</u>	<u>23</u>
<u>5.2.3.6</u>	<u>Control Channel (CC) reception</u>	<u>23</u>
<u>5.2.3.6.1</u>	<u>Test method</u>	<u>23</u>
<u>5.2.3.7</u>	<u>Network control commands</u>	<u>24</u>
<u>5.2.3.7.1</u>	<u>Test method</u>	<u>24</u>
<u>5.2.3.8</u>	<u>Initial burst transmission</u>	<u>25</u>
<u>5.2.3.8.1</u>	<u>Test method</u>	<u>25</u>
<b><u>Annex A (normative):</u></b>	<b><u>HS Requirements and conformance Test specifications Table (HS-RTT)</u></b>	<b><u>26</u></b>
<b><u>Annex B (informative):</u></b>	<b><u>The EN title in the official languages</u></b>	<b><u>28</u></b>
<b><u>Annex C (informative):</u></b>	<b><u>Bibliography</u></b>	<b><u>29</u></b>
<b><u>History</u></b>		<b><u>30</u></b>

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## Foreword

This ~~Candidate~~ Harmonized European Standard (~~Telecommunications series~~) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under ~~Council Directive 98/34/EC [3] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.~~

~~The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [1] 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 ("the R&TTE Directive").~~

National transposition dates	
Date of adoption of this EN:	<del>28 April 2000</del>
Date of latest announcement of this EN (doa):	<del>31 July 2000</del>
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 <del>January 2001</del>
Date of withdrawal of any conflicting National Standard (dow):	<del>31 January 2001</del>

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---

## Foreword

This Harmonized European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Directive 98/34/EC [i 1] as amended by Directive 98/48/EC [i 2].

The title and reference to the present document are intended to be included in the publication in the Official Journal of the European Union of titles and references of Harmonized Standard under the Directive 1999/5/EC [1].

See article 5.1 of Directive 1999/5/EC [1] for information on presumption of conformity and Harmonised Standards or parts thereof the references of which have been published in the Official Journal of the European Union.

The requirements relevant to Directive 1999/5/EC [1] are summarised in annex A.

<b>National transposition dates</b>	
Date of adoption of this EN:	<u>24 January 2012</u>
Date of latest announcement of this EN (doa):	<u>30 April 2012</u>
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 <u>October 2012</u>
Date of withdrawal of any conflicting National Standard (dow):	<u>30 April 2015</u>

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## Introduction

The requirements defined in the present document have been selected to ensure an adequate level of compatibility with other radio services. The levels, however, do not cover extreme cases, which may occur in any location but with a low probability of occurrence.

The present document may not cover those cases where a potential source of interference which is producing individually repeated transient phenomena or a continuous phenomenon is present, e.g. a radar or broadcast site in the near vicinity. In such a case it may be necessary to use special protection applied to either the source of interference, or the interfered part or both.

The present document does not contain any requirement, recommendation or information about the installation of the LMES.

# Introduction

ETSI has designed a modular structure for the standards. Each standard is a module in the structure. The modular structure is shown in figure 1.

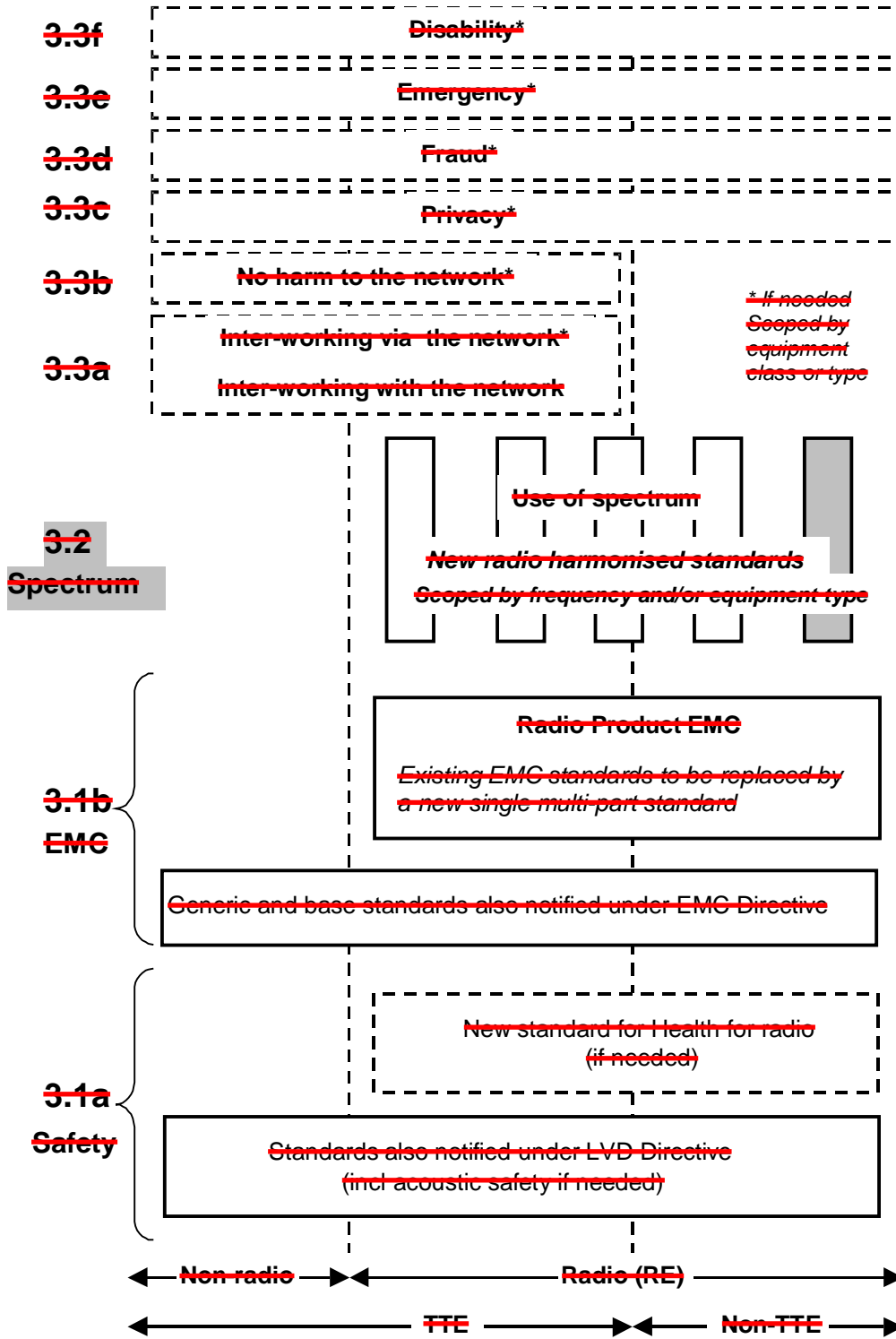


Figure 1: Modular structure for the various standards used under the R&TTE Directive

The left hand edge of the figure shows the different subclauses of Article 3 of the Directive.

The previous version [6] of this harmonized standard contained two sets of limits to provide a transition from TRR 044 [4]. One set of limits (table 2a) was applicable up to 1 June 2002 and a more stringent set (table 2b) was applicable after this date. The first set of limits (table 2a) has been removed in the present document since it is no longer required. The second set of limits (table 2b) is retained for existing and legacy LMES and may continue to be used for LMES that only operate in the original L-band allocation (sub-band 1 as defined in table 1a).

The determination of the parameters of the user earth stations using a given geo-stationary satellite for the protection of the spectrum allocated to that satellite, is considered to be under the responsibility of the satellite operator or the satellite network operators. *Applicants for LMESs operating in satellite networks which provide radio navigation service and/or other safety services* should note that such satellite network operators may require testing in addition to the present document to prove correct interworking in order to avoid the LMES causing harmful interference which endangers the functioning of these services. References to these requirements will be listed in the Bibliography of the present document as they become known.

The present document specifies a new set of emission requirements for LMESs that are capable of transmitting in the frequency band from 1 668,0 MHz to 1 675,0 MHz. Following the WRC-03 decision to allocate to MSS the bands 1 518 MHz to 1 525 MHz (space to Earth) and 1 668 MHz to 1 675 MHz (Earth to space) and the conclusions of WRC-07, the present document specifies the necessary requirements to harmonise the use of these extended frequency bands by LMESs.

The present document treats the two parts of the L-band frequency allocation (as extended) as two sub-bands which may be used separately or in any combination. The original L-band allocation is referenced in the present document as "sub-band 1" and the extended L-band is referenced as "sub-band 2".

A new table 2c is added to the present document for LMESs that are capable of transmitting in any combination of either or both of these sub-bands. The new table 2c is recommended for all new LMESs including LMES that can only operate in sub-band 1.

The applicant may choose between tables 2b and 2c for new LMESs that are capable of transmitting in only the sub-band 1. The applicant has to declare which alternative is used.

#### **Figure 1: Void**

~~For article 3.3 various horizontal boxes are shown. Their dotted lines indicate that no essential requirements in these areas have yet been adopted by the Commission. If such essential requirements are adopted, they will be elaborated in individual standards whose scope is likely to be specified by function or interface type.~~

~~The vertical boxes show the standards under article 3.2 for the use of the radio spectrum. The scopes of these standards are specified either by frequency (normally in the case where frequency bands are harmonized) or by radio equipment type.~~

~~For article 3.1(b), the diagram shows the new single multi-part product EMC standard for radio, and the existing collection of generic and base standards currently used under the EMC Directive [2]. The parts of this new standard will become available in the second half of 2000, and the existing separate EMC standards will be used until it is available.~~

~~For article 3.1(a) the diagram shows the existing safety standards currently used under the LVD Directive [3] and the possibility of a new standard on health relating to radio emissions~~

~~The bottom of the figure shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular equipment may be radio equipment, telecommunications terminal equipment or both.~~

~~The modular approach has been taken because:~~

- ~~— it minimizes the number of standards needed. Because equipment may have multiple interfaces and functions it is not practicable to produce a single standard for each possible combination of functions that may occur in an equipment;~~
- ~~— it provides scope for standards to be added:
 
  - ~~— under article 3.2 when new frequency bands are agreed, or~~
  - ~~— under article 3.3 should the Commission take the necessary decisions,~~~~
- ~~without requiring alteration of standards that are already published.~~

~~The technical requirements in the present document are applied under Articles 3.2 of the R&TTE Directive [1], concerning the effective uses of the spectrum allocated to terrestrial/space radio communication and orbital resources so as to avoid harmful interference. These requirements are in two major categories.~~

~~**emissions limits.** to protect other radio services from harmful interference generated by the LMES in normal use.~~

~~**LMES Control and Monitoring Functions (CMF).** to protect other radio services from unwanted transmissions from the LMES. The CMF in each LMES is capable of answering to commands from the Network Control Facilities (NCF) for its LMES.~~

~~The requirements have been selected to ensure an adequate level of compatibility with other radio services. The levels, however, do not cover extreme cases, which may occur in any location but with a low probability of occurrence.~~

The present document may not cover those cases where a potential source of interference which is producing individually repeated transient phenomena or a continuous phenomenon is present, e.g. a radar or broadcast site in the near vicinity. In such a case it may be necessary to use special protection applied to either the source of interference, or the interfered part or both.

The present document does not contain any requirement, recommendation or information about the installation of the LMES.

~~The present document is based on TBR 044 [4], which was based on ETS 300 423 [5] which has been used for type approval purposes on a national basis for several years. For this reason, the following text was included in the TBR 044 [4] on which the present document is based, and has therefore been transposed into the present document produced under the R&TTE Directive [1] for the purpose of explaining the applicability of the tables 2a and 2b;~~

# 1 Scope

The present document applies to Land Mobile Earth Stations (LMESs) radio equipment with an EIRP less than or equal to 33 dBW and which have the following characteristics:

- the LMES could be either vehicle mounted or portable equipment;
- these LMESs are controlled and monitored by a Network Control Facility (NCF). The NCF is outside the scope of the present document;
- the LMES operate through geostationary satellites as part of a network providing voice and/or data communications;
- the LMES is capable of operating in any combination of all or any part of the frequency ranges sub-band 1 and sub-band 2 defined in table 1a.

**Table 1a: Land Mobile Satellite Service frequency bands**

<u>Sub-Band</u>	<u>Direction of transmission</u>	<u>LMSS frequency bands</u>
<u>1</u>	<u>Transmit 1 (Earth to space)</u>	<u>1 631.5 MHz to 1 660.5 MHz</u>
	<u>Receive 1 (space to Earth)</u>	<u>1 525.0 MHz to 1 559.0 MHz</u>
<u>2</u>	<u>Transmit 2 (Earth to space)</u>	<u>1 668.0 MHz to 1 675.0 MHz</u>
	<u>Receive 2 (space to Earth)</u>	<u>1 518.0 MHz to 1 525.0 MHz</u>

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) Article 3.2 which states that "... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of Article 3 of the R&TTE Directive [1] may apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site <http://www.newapproach.org>.

## 2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

### 2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications equipment and the mutual recognition of their conformity (R&TTE Directive).
- [2] CISPR 16-1-4 (2010): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus- Antennas and test sites for radiated disturbance measurements".
- [3] Void.



~~NOTE: Due to a new requirement for the protection of the Aeronautical Radio Navigation Service based on the Global Navigation Satellite System (GNSS), scheduled to offer approach and landing operational services likely not before the year 2005, new limits for unwanted emissions will be necessary. These new limits may not be completely met by existing or presently marketed equipment that was developed on the basis of ETS 300 423 [5] and TBR 044 [4]. Consequently the following transitional arrangement is necessary.~~

~~The present document incorporates two sets of limits. One set (table 2a) applicable up to 1 June 2002 and a more stringent set of limits (table 2b) applicable after this date for the protection of the Aeronautical Radio Navigation Service in the GNSS band.~~

~~The protection of the GNSS band from the year 2005 onwards from harmful interference from LMESs previously approved to TBR 044 [4] or complying with the present document before 1 June 2002 or already in service before the CTR 44 entered into force may be obtained either by decisions of the national regulatory authorities to stop the operation of such equipment, or by operational restrictions agreed by the regulatory authority with satellite operators. It is recommended that such decisions should be harmonized at the European level. Such decisions are outside the scope of the present document.~~

The determination of the parameters of the user earth stations using a given geo-stationary satellite for the protection of the spectrum allocated to that satellite, is considered to be under the responsibility of the satellite operator or the satellite network operators. *Applicants for LMESs operating in satellite networks which provide radio navigation service and/or other safety services* should note that such satellite network operators may require testing in addition to the present document to prove correct interworking in order to avoid the LMES causing harmful interference which endangers the functioning of these services. References to these requirements will be listed in the Bibliography of the present document as they become known.

- [4] ETSI TRR 044 (1998): "Satellite Earth Stations and Systems (SES); Land Mobile Earth Stations (LMES) operating in the 1,5 GHz and 1,6 GHz bands providing voice and/or data communications".
- [5] Void.
- [6] ETSI EN 301 444 (V1 1 1): "Satellite Earth Stations and Systems (SES); Harmonized EN for Land Mobile Earth Stations (LMES) operating in the 1,5 GHz and 1,6 GHz bands providing voice and/or data communications covering essential requirements under Article 3.2 of the R&TTE directive".

**NOTE:** This is a specific reference to the previous version of the present document.

## 2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services.
- [i.2] Directive 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.

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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1] and the following apply:

**applicant:** manufacturer or his authorized representative within the European Community or the person responsible for placing the apparatus on the market

**antenna transmit gain:** ratio, expressed in decibels, of the power that would have to be supplied to an isotropic radiator to the power supplied to the antenna being considered, so that they produce the same field strength at the same distance in the same direction

**carrier-off state:** LMES is in this state when either it is authorized by the Network Control Facility (NCF) to transmit but when it does not transmit any signal, or when it is not authorized by the NCF to transmit.

**carrier-on state:** LMES is in this state when it is authorized by the NCF to transmit and when it transmits a signal.

**Control Channel (CC):** channel or channels by which LMES receive control information from the NCF for their network

**environmental profile:** range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

**Externally Mounted Equipment (EME):** EME consists of those of the modules of the IE which are intended to be mounted externally to the vehicle as stated by the applicant.

**Installable Equipment (IE):** equipment which is intended to be fitted to a vehicle. An IE may consist of one or several interconnected modules

**Internally Mounted Equipment (IME):** those of the modules of the IE which are not declared by the applicant as EME are defined as Internally Mounted Equipment (IME)

# 1 Scope

The present document applies to Land Mobile Earth Stations (LMESs) radio equipment ~~which have the following characteristics:~~

- the LMES could be either vehicle mounted or portable equipment;
- these LMESs are controlled and monitored by a Network Control Facility (NCF). The NCF is outside the scope of the present ~~document:~~
- the LMES operate through geostationary satellites as part of a network providing voice and/or data communications;
- ~~▪ the LMES is capable of operating in all or any part of the frequency ranges given in table 1a.~~

**Table 1a: Land Mobile Satellite Service frequency bands**

<del>Direction of transmission</del>	<del>LMSS frequency bands</del>
<del>Transmit 1 (earth to space)</del>	<del>1 631,5 MHz to 1 634,5 MHz</del>
<del>Transmit 2 (earth to space)</del>	<del>1 660,5 MHz to 1 660,5 MHz</del>
<del>Receive 1 (space to earth)</del>	<del>1 525,0 MHz to 1 544,0 MHz</del>
<del>Receive 2 (space to earth)</del>	<del>1 555,0 MHz to 1 559,0 MHz</del>

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) Article 3.2 which states that "... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of Article 3 of the R&TTE Directive [1] may apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the ~~ETSI web site:~~

# 2 References

~~The following documents contain provisions which, through reference in this text, constitute provisions of the present document:~~

- ~~References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.~~
- ~~For a specific reference, subsequent revisions do not apply.~~
- ~~For a non-specific reference, the latest version applies.~~
- ~~A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.~~

[1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications equipment and the mutual recognition of their ~~conformity:~~

~~[2] CISPR 16-1 "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1: Radio disturbance and immunity measuring apparatus" (annex G: Validation of the open area test site for the frequency range of 30 MHz to 1 000 MHz).~~

~~[3] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and ~~regulations:~~~~

**nominated bandwidth:** bandwidth of the LMES radio frequency transmission nominated by the applicant and that is wide enough to encompass all spectral elements of the transmission necessary for communication and which have a level greater than the specified unwanted emissions limits and is within the LMSS transmit frequency band within which the LMES operates

**NOTE:** The nominated bandwidth is wide enough to take account of the transmit carrier frequency stability.

**Portable Equipment (PE):** portable equipment is generally intended to be self-contained, free standing and portable

**NOTE:** A PE would normally consist of a single module, but may consist of several interconnected modules.

**unwanted emissions:** unwanted emissions are those falling outside the nominated bandwidth

**sub-band:** contiguous portion of the operating band

**NOTE:** Two sub-bands are defined (see table 1a).

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CC	Control Channel
CMF	Control and Monitoring Functions
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EME	Externally Mounted Equipment
ETS	European Telecommunication Standard
EUT	Equipment Under Test
IE	Installable Equipment
IME	Internally Mounted Equipment
LMES	Land Mobile Earth Station
MES	Mobile Earth Station
MSS	Mobile Satellite Service
NCF	Network Control Facility
PE	Portable Equipment
<u>RA</u>	<u>Radio Astronomy</u>
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
STE	Special Test Equipment
TBR	Technical Basis for Regulation

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## 4 Technical requirement specifications

### 4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the applicant. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile. The environmental profile for operation of the equipment shall include the ranges of humidity, temperature and supply voltage.

- [4] ~~TBR 044: "Satellite Earth Stations and Systems (SES); Land Mobile Earth Stations (LMES) operating in the 1,5 GHz and 1,6 GHz bands providing voice and/or data communications".~~
- [5] ~~ETS 300 423: "Satellite Earth Stations and Systems (SES); Land Mobile Earth Stations (LMES) operating in the 1,5/1,6 GHz bands providing voice and/or data communications".~~

## 3 Definitions and abbreviations

### 3.1 Definitions

For the ~~purpose~~ of the present document, the terms and definitions in the R&TTE Directive [1], ~~and the following terms and definitions apply.~~

**applicant:** manufacturer or his authorized representative within the European Community or the person responsible for placing the apparatus on the ~~market.~~

**antenna transmit gain:** ratio, expressed in decibels, of the power that would have to be supplied to an isotropic radiator to the power supplied to the antenna being considered, so that they produce the same field strength at the same distance in the same ~~direction.~~

**carrier-off state:** LMES is in this state when either it is authorized by the Network Control Facility (NCF) to transmit but when it does not transmit any signal, or when it is not authorized by the NCF to transmit.

**carrier-on state:** LMES is in this state when it is authorized by the NCF to transmit and when it transmits a signal.

**Control Channel (CC):** channel or channels by which LMES receive control information from the NCF for their ~~network.~~

**Environmental profile:** range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present ~~document.~~

**Externally Mounted Equipment (EME):** EME consists of those of the modules of the IE which are intended to be mounted externally to the vehicle as stated by the applicant.

**Installable Equipment (IE):** equipment which is intended to be fitted to a vehicle. An IE may consist of one or several interconnected ~~modules.~~

**Internally Mounted Equipment (IME):** those of the modules of the IE which are not declared by the applicant as EME are defined as Internally Mounted Equipment (~~IME).~~

**nominated bandwidth:** bandwidth of the LMES radio frequency transmission ~~is nominated by the applicant. The nominated bandwidth~~ is wide enough to encompass all spectral elements of the transmission necessary for communication and which have a level greater than the specified unwanted emissions ~~limits. The nominated bandwidth~~ is wide enough to take account of the transmit carrier frequency stability. ~~The nominated bandwidth~~ ~~is within the LMSS transmit frequency band within which the LMES operates.~~

**Portable Equipment (PE):** portable equipment is generally intended to be self-contained, free standing and ~~portable.~~ A PE would normally consist of a single module, but may consist of several interconnected modules.

**unwanted emissions:** unwanted emissions are those falling outside the nominated ~~bandwidth.~~

### 3.2 Abbreviations

For the ~~purpose~~ of the present document, the following abbreviations apply:

CC	Control Channel
CMF	Control and Monitoring Functions
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EME	Externally Mounted Equipment

## 4.2 Conformance requirements

### 4.2.0 Maximum EIRP

#### 4.2.0.1 Justification

Not needed.

#### 4.2.0.2 Specification

The maximum eirp of the LMES shall not exceed 33 dBW.

#### 4.2.0.3 Conformance test

Declaration of maximum eirp by the applicant.

NOTE: No conformance test is defined for this requirement.

### 4.2.1 Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz and outside the band 1 667,3 MHz to 1 675,7 MHz

#### 4.2.1.1 Justification

The technical requirements presented in this clause shall apply to all LMESs that are capable of transmitting either in sub-band 1 or sub-band 2, or in both sub-bands as defined in table 1a for the purpose of:

- protection of terrestrial and satellite services from emissions caused by LMES outside the band 1 625,8 MHz to 1 661,2 MHz; and
- protection of terrestrial and satellite services from emissions caused by LMES outside the band 1 667,3 MHz to 1 675,7 MHz.

#### 4.2.1.2 Specification

Unwanted emissions from Land Mobile Earth Stations (LMESs) outside the band 1 625,8 MHz to 1 661,2 MHz and outside the band 1 667,3 MHz to 1 675,7 MHz shall be below the following limits.

Unless otherwise stated the specification in this clause shall apply to all types of LMESs notwithstanding their transmitting capabilities within the frequency bands as defined in table 1a.

- 1) The unwanted emissions over the frequency range 30 MHz to 1 000 MHz shall not exceed the limits in table 1.

**Table 1: Limits of unwanted emissions up to 1 000 MHz at a measuring distance of 10 m**

<b>Frequency (MHz)</b>	<b>Quasi-peak limits (dB(µV/m))</b>
30 to 230	30
230 to 1 000	37

The lower limit shall apply at the transition frequency.

- 2) For LMES that are capable of transmitting within only the sub-band 1 frequency band as defined in table 1a, the unwanted emissions Equivalent Isotropically Radiated Power (EIRP) above 1 000 MHz in the measurement bandwidth and in all directions shall not exceed limits of either tables 2b or 2c. The applicant shall declare which alternative shall be used.

ETS	European Telecommunication Standard
EUT	Equipment Under Test
IE	Installable Equipment
IME	Internally Mounted Equipment
LMES	Land Mobile Earth Station
MES	Mobile Earth Station
MSS	Mobile Satellite Service
NCF	Network Control Facility
PE	Portable Equipment
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
STE	Special Test Equipment
TBR	Technical Basis for Regulation

## 4 Technical requirement specifications

### 4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the applicant. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile. The environmental profile for operation of the equipment shall include the ranges of humidity, temperature and supply voltage.

### ~~4.2 Conformance requirements~~

#### 4.2.1 Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz

##### ~~4.2.1.1 Justification~~

~~Protection~~ of terrestrial and satellite services from emissions caused by LMES outside the band 1 625,8 MHz to 1 661,2 MHz.

##### ~~4.2.1.2 Specification~~

~~Unwanted emissions from Mobile Earth Stations (MESs)~~ outside the band 1 625,8 MHz to 1 661,2 MHz shall be below the following limits:

- 1) The unwanted emissions over the frequency range 30 MHz to 1 000 MHz shall not exceed the limits in table 1.

**Table 1: Limits of unwanted emissions up to 1 000 MHz at a measuring distance of 10 m**

Frequency (MHz)	Quasi-peak limits (dB(µV/m))
30 to 230	30
230 to 1 000	37

The lower limit shall apply at the transition frequency.

- 2) ~~The~~ unwanted emissions Equivalent Isotropically Radiated Power (EIRP) above 1 000 MHz in the measurement bandwidth and in all directions shall not ~~exceed~~

~~before 1 June 2002 the limits of table 2a,~~

~~from 1 June 2002 the limits of table 2b.~~

- 3) For L MES that are capable of transmitting within only the sub-band 2 frequency band or within both sub-band 1 and sub-band 2 frequency bands as defined in table 1a, the unwanted emissions Equivalent Isotropically Radiated Power (EIRP) above 1 000 MHz in the measurement bandwidth and in all directions shall not exceed the limits in table 2c.

**Table 2a: Void****Table 2b: Limits of unwanted emissions above 1 000 MHz and outside the band 1 625,8 MHz to 1 661,2 MHz, applicable from 1 June 2002**

Frequency range (MHz)	Carrier-on		Carrier-off	
	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
1 000,0 to 1 525,0	49	100	48	100
1 525,0 to 1 559,0	49	100	17	3
<u>1 559,0 to 1 580,42</u>	<u>50</u>	<u>1 000</u>	<u>50</u>	<u>1 000</u>
<u>1 580,42 to 1 605,0</u>	<u>50</u>	<u>1 000</u>	<u>50</u>	<u>1 000</u>
<u>1 605,0 to 1 610,0</u>	<u>(note 5)</u>	<u>100</u>	<u>(note 6)</u>	<u>100</u>
1 <u>610,0</u> to 1 625,8	74	100	48	100
1 625,8 to 1 661,2	(note 1)	(note 1)	(note 1)	(note 1)
1 661,2 to 1 690,0	74	100	48	100
1 690,0 to 3 400,0	49 (note 2)	100	48	100
3 400 to 10 700	55 (notes 3 & 4)	100	48	100
10 700 to 21 200	61	100	54	100
21 200 to 40 000	67	100	60	100

NOTE 1: The unwanted emissions in the band 1 625,8 MHz to 1 661,2 MHz are limited by clause 4.2.2.  
NOTE 2: In the band 3 263,0 MHz to 3 321,0 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 82 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.  
NOTE 3: In each of the bands 4 894,5 MHz to 4 981,5 MHz, 6 526,0 MHz to 6 642,0 MHz and 8 175,5 MHz to 8 302,5 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.  
NOTE 4: In the band 9 789,0 MHz to 9 963,0 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 61 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.  
NOTE 5: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 74 dBpW in 100 kHz at 1 610,0 MHz.  
NOTE 6: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 48 dBpW in 100 kHz at 1 610,0 MHz.

**Table 2c: Limits of unwanted emissions above 1 000 MHz and outside the band 1 625,8 MHz to 1 661,2 MHz and the band 1 667,3 MHz to 1 675,7 MHz**

Frequency range (MHz)	Carrier-on		Carrier-off	
	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
1 000,0 to <u>1 518</u>	<u>60</u>	<u>1 000</u>	<u>48 (note 7)</u>	<u>100</u>
<u>1 518,0 to 1 525,0</u>	<u>60</u>	<u>1 000</u>	<u>17</u>	<u>3</u>
<u>1 525,0</u> to 1 559,0	49	100	17	3
1 559,0 to 1 580,42	50	1 000	50	1 000
1 580,42 to 1 605,0	50	1 000	50	1 000
1 605,0 to 1 610,0	(note 5)	100	(note 6)	100
1 610,0 to 1 625,8	74	100	48	100
1 625,8 to 1 661,2	(note 1)	(note 1)	(note 1)	(note 1)
1 661,2 to 1 <u>661,7</u>	<u>(note 8)</u>	<u>100</u>	<u>48</u>	<u>100</u>
<u>1 661,7 to 1 666,8</u>	<u>74</u>	<u>100</u>	<u>48</u>	<u>100</u>
<u>1 666,8 to 1 667,3</u>	<u>(note 9)</u>	<u>100</u>	<u>48</u>	<u>100</u>



**Table 2a:** Limits of unwanted emissions above 1 000 MHz and outside the bands 1 625,8 MHz to 1 661,2 MHz, applicable before 1 June 2002

Frequency range (MHz)	Carrier-on		Carrier-off	
	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
1 000,0 to 1 525,0	49	100	48	100
1 525,0 to 1 559,0	49	100	17	3
1 559,0 to <del>1 600,0</del>	<del>49</del>	<del>100</del>	<del>48</del>	100
1 <del>600,0</del> to 1 625,8	74	100	48	100
1 625,8 to 1 661,2	(note 1)	(note 1)	(note 1)	(note 1)
1 661,2 to 1 690,0	74	100	48	100
1 690,0 to 3 400,0	49 (note 2)	100	48	100
3 400 to 10 700	55 (notes 3 & 4)	100	48	100
10 700 to 21 200	61	100	54	100
21 200 to 40 000	67	100	60	100

NOTE 1: The unwanted emissions in ~~that frequency range~~ are limited by subclause 4.2.2

NOTE 2: In the band 3 263,0 MHz to 3 321,0 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 82 dBpW. Elsewhere in this band the power limit in table 2a shall be applied.

NOTE 3: In each of the bands 4 894,5 MHz to 4 981,5 MHz, 6 526,0 MHz to 6 642,0 MHz and 8 175,5 MHz to 8 302,5 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2a shall be applied.

NOTE 4: In the band 9 789,0 MHz to 9 963,0 MHz the maximum ~~power~~ EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 61 dBpW. Elsewhere in this band the power limit in table 2a shall be applied.

**Table 2b:** Limits of unwanted emissions above 1 000 MHz and outside the band 1 625,8 MHz to 1 661,2 MHz, applicable from 1 June 2002

Frequency range (MHz)	Carrier-on		Carrier-off	
	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
1 000,0 to <del>1 525,0</del>	<del>49</del>	<del>100</del>	<del>48</del>	<del>100</del>
<del>1 525,0</del> to 1 559,0	49	100	17	3
1 559,0 to 1 580,42	50	1 000	50	1 000
1 580,42 to 1 605,0	50	1 000	50	1 000
1 605,0 to 1 610,0	(note 5)	100	(note 6)	100
1 610,0 to 1 625,8	74	100	48	100
1 625,8 to 1 661,2	(note 1)	(note 1)	(note 1)	(note 1)
1 661,2 to 1 <del>690,0</del>	<del>74</del>	<del>100</del>	<del>48</del>	<del>100</del>
<del>1 690,0</del> to 3 400,0	<del>49 (note 2)</del>	<del>100</del>	<del>48</del>	<del>100</del>
<del>3 400</del> to 10 700	55 (notes 3 & 4)	<del>100</del>	<del>48</del>	<del>100</del>
<del>10 700</del> to 21 200	<del>61</del>	<del>100</del>	<del>54</del>	<del>100</del>
<del>21 200</del> to 40 000	<del>67</del>	<del>100</del>	<del>60</del>	<del>100</del>

NOTE 1: ~~The unwanted emissions in that frequency range are limited by subclause 4.2.2~~

NOTE 2: In the band 3 263,0 MHz to 3 321,0 MHz the maximum EIRP in one, and only one, ~~100 kHz~~ measurement bandwidth shall not exceed 82 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.

NOTE 3: In each of the bands 4 894,5 MHz to 4 981,5 MHz, 6 526,0 MHz to 6 642,0 MHz and ~~8 175,5 MHz to 8 302,5 MHz~~ the maximum EIRP in one, and only one, ~~100 kHz~~ measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.

NOTE 4: In the band ~~9 789,0 MHz to 9 963,0 MHz~~ the maximum EIRP in one, and only one, ~~100 kHz~~ measurement bandwidth shall not exceed ~~61~~ dBpW. Elsewhere in this band the power limit in table 2b shall be applied.

NOTE 5: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 74 dBpW in 100 kHz at 1 610,0 MHz.

NOTE 6: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 48 dBpW in 100 kHz at 1 610,0 MHz.

Frequency range (MHz)	Carrier-on		Carrier-off	
	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
<u>1 667,3 to 1 675,7</u>	<u>(note 2)</u>	<u>(note 2)</u>	<u>(note 2)</u>	<u>(note 2)</u>
<u>1 675,7 to 1 676,2</u>	<u>(note 10)</u>	<u>100</u>	<u>48</u>	<u>100</u>
<u>1 676,2 to 1 704,5</u>	<u>74</u>	<u>100</u>	<u>48</u>	<u>100</u>
<u>1 704,5 to 2 250,0</u>	<u>49</u>	<u>100</u>	<u>43 (note 7)</u>	<u>100</u>
<u>2 250,0 to 3 400,0</u>	<u>60 (note 3)</u>	<u>1 000</u>	<u>43 (note 7)</u>	<u>1 000</u>
<u>3 400 to 10 700</u>	<u>60 (notes 4)</u>	<u>1 000</u>	<u>43 (note 7)</u>	<u>1 000</u>
<u>10 700 to 21 200</u>	<u>60</u>	<u>1 000</u>	<u>43 (note 7)</u>	<u>1 000</u>
<u>21 200 to 40 000</u>	<u>60</u>	<u>1 000</u>	<u>43 (note 7)</u>	<u>1 000</u>

NOTE 1: The unwanted emissions in the band 1 625,8 MHz to 1 661,2 MHz are limited by clause 4.2.2.

NOTE 2: The unwanted emissions in the band 1 667,3 MHz to 1 675,7 MHz are limited by clause 4.2.2.

NOTE 3: In the band 3 263,0 MHz to 3 321,0 MHz and 3 336,0 MHz to 3 350,0 MHz the maximum EIRP in one, and only one, 3 MHz measurement bandwidth shall not exceed 82 dBpW. Elsewhere in this band the power limit in table 2c shall be applied.

NOTE 4: In the bands 4 894,5 MHz to 4 981,5 MHz and 5 004,0 MHz to 5 025,0 MHz the maximum EIRP in one, and only one, 3 MHz measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2c shall be applied.  
In the bands 6 526,0 MHz to 6 642,0 MHz and 6 672,0 MHz to 6 700,0 MHz the maximum EIRP in one, and only one, 3 MHz measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2c shall be applied.  
In the bands 8 157,5 MHz to 8 302,5 MHz and 8 340,0 MHz to 8 375,0 MHz the maximum EIRP in one, and only one, 3 MHz measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2c shall be applied.

NOTE 5: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 74 dBpW in 100 kHz at 1 610,0 MHz.

NOTE 6: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 48 dBpW in 100 kHz at 1 610,0 MHz.

NOTE 7: Peak-hold measurement methods shall be used for carrier-off limits in the band 1 000,0 MHz to 1 518,0 MHz and in all the bands from 1 704,5 MHz to 40 000 MHz. Otherwise average measurement methods should be used.

NOTE 8: For an LMES transmitting in sub-band 1 (as defined in table 1a) the limit shall be linearly interpolated from 80 dBpW in 100 kHz at 1 661,2 MHz to 74 dBpW in 100 kHz at 1 661,7 MHz. For an LMES transmitting in sub-band 2 (as defined in table 1a) a limit of 74 dBpW in 100 kHz shall apply.

NOTE 9: For an LMES transmitting in sub-band 2 (as defined in table 1a) the limit shall be linearly interpolated from 74 dBpW in 100 kHz at 1 666,8 MHz to 80 dBpW in 100 kHz at 1 667,3 MHz. For an LMES transmitting in sub-band 1 (as defined in table 1a) a limit of 74 dBpW in 100 kHz shall apply.

NOTE 10: For an LMES transmitting in sub-band 2 (as defined in table 1a) the limit shall be linearly interpolated from 80 dBpW in 100 kHz at 1 675,7 MHz to 74 dBpW in 100 kHz at 1 676,2 MHz. For an LMES transmitting in sub-band 1 (as defined in table 1a) a limit of 74 dBpW in 100 kHz shall apply.

#### 4.2.1.3 Conformance test

Conformance test shall be carried out in accordance with clause 5.2.2.

### 4.2.2 Maximum unwanted emissions within the 1 625,8 MHz to 1 661,2 MHz band and within the 1 667,3 MHz to 1 675,7 MHz band

#### 4.2.2.1 Justification

The technical requirements presented in this clause shall apply to all LMESs that are capable of transmitting either in sub-band 1, or sub-band 2, or in both sub-bands as defined in table 1a for the purpose of:

- protection of satellite and terrestrial services operating in the 1 625,8 MHz to 1 661,2 MHz frequency band; and
- protection of satellite and terrestrial services operating in the 1 667,3 MHz to 1 675,7 MHz frequency band.

### 4.2.1.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause 5.2.2~~.

## 4.2.2 Maximum unwanted emissions within the 1 625,8 MHz to ~~1 661,2 MHz band~~

### ~~4.2.2.1 Justification~~

~~Protection~~ of satellite and terrestrial services operating in the 1 625,8 MHz to 1 661,2 MHz frequency ~~band~~.

### ~~4.2.2.2 Specifications~~

#### ~~Specification 1. Carrier-on state~~

~~The~~ unwanted emission EIRP in any 3 kHz band within the 1 625,8 MHz to 1 661,2 MHz band, but outside the nominated bandwidth, shall not exceed the limits of table ~~3~~.

**Table 3: Limits for unwanted emissions within the 1 625,8 MHz to 1 661,2 MHz band**

Offset from the edge of the band of the nominated bandwidth (kHz)	Maximum EIRP (dBpW)
0 to 10	125
10 to 20	110
20 to 100	105
100 to 200	95
200 to 700	85
Greater than 700	75

~~The~~ limits in table 3 may be exceeded provided that the sum in watts of the spectrum components exceeding the limits of table 3 does not exceed 104 dBpW.

#### ~~Specification 2. Carrier-off state~~

The EIRP of any emission in any 3 kHz band within the 1 625,8 MHz to 1 661,2 MHz band shall not exceed ~~57 dBpW~~.

### 4.2.2.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause 5.2.2~~.

## 4.2.3 Control and Monitoring Functions (CMF)

### 4.2.3.1 General

The following minimum set of CMF shall be implemented in LMES in order to minimize the probability that they originate unwanted transmissions that may give rise to harmful interference to other systems.

Under any fault condition when the LMES transmissions are being suppressed the limits for carrier-off state shall apply.

### 4.2.3.2 Processor monitoring

#### 4.2.3.2.1 Justification

To ensure that the LMES can suppress transmissions in the event of a processor sub-system failure.

## 4.2.2.2 Specifications

If an LMES is capable of transmitting in both sub-band 1 and sub-band 2 as defined in table 1a, there are two different limits in this clause. The limits defined in table 3 shall only apply for the current transmit band as defined below.

### Specification 1: Carrier-on state

For LMES transmitting in sub-band 1 (as defined in table 1a), the unwanted emission EIRP in any 3 kHz band within the 1 625,8 MHz to 1 661,2 MHz band, but outside the nominated bandwidth, shall not exceed the limits of table 3; and the emission limits within the 1 667,3 MHz to 1 675,7 MHz frequency band shall not exceed 74 dBpW in any 100 kHz measurement bandwidth.

NOTE 1: If an applicant declares to use table 2b for an LMES the same emission limit for the 1 667,3 MHz to 1 675,7 MHz frequency band is also defined in table 2b.

For LMES transmitting in sub-band 2 (as defined in table 1a), the unwanted emission EIRP in any 3 kHz band within the 1 667,3 MHz to 1 675,7 MHz band, but outside the nominated bandwidth, shall not exceed the limits of table 3; and the emission limits within the 1 625,8 MHz to 1 661,2 MHz frequency band shall not exceed 74 dBpW in any 100 kHz measurement bandwidth.

**Table 3: Limits for unwanted emissions within the 1 625,8 MHz to 1 661,2 MHz band and within the 1 667,3 MHz to 1 675,7 MHz band**

Offset from the edge of the band of the nominated bandwidth (kHz)	Maximum EIRP (dBpW)
0 to 10	125
10 to 20	110
20 to 100	105
100 to 200	95
200 to 700	85
Greater than 700	75

If an applicant declares to use table 2b for an LMES the limits in table 3 may be exceeded provided that the sum in watts of the spectrum components exceeding the limits of table 3 does not exceed 104 dBpW. This additional requirement is retained for compatibility with the previous version [6] of the present document.

### Specification 2: Carrier-off state

For LMES which is capable of transmitting in either sub-band 2 only or in both sub-band 1 and sub-band 2 (as defined in table 1a), Specification 2a shall apply. This requirement shall also apply if an applicant declares to use table 2c for LMES capable of transmitting in sub-band 1 only and should also apply if an applicant declares to use table 2b.

Specification 2a: The EIRP of any emission in any 100 kHz band within the 1 625,8 MHz to 1 661,2 MHz band and the 1 667,3 MHz to 1 675,7 MHz band shall not exceed 48 dBpW.

However, if an applicant declares to use table 2b for LMES capable of transmitting in sub-band 1 only (as defined in table 1a), then Specification 2b shall apply:

Specification 2b: The EIRP of any emission in any 3 kHz band within the 1 625,8 MHz to 1 661,2 MHz band and the 1 667,3 MHz to 1 675,7 MHz band shall not exceed 57 dBpW.

NOTE 2: Specification 2b is retained for compatibility with the previous version [6] of the present document. Specification 2a is recommended for all new LMES.

## 4.2.2.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.2](#).

#### 4.2.3.2.2 Specification

The LMES shall incorporate a processor monitoring function for each of its processors involved in the manipulation of traffic and in Control and Monitoring Functions (CMF).

The processor monitoring function shall detect any failure of the processor hardware and software.

No later than one second after any fault condition occurs, the LMES shall enter the carrier-off state until the processor monitoring function has determined that all fault conditions have been cleared.

#### 4.2.3.2.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause~~ 5.2.3.3.

#### 4.2.3.3 Transmit subsystem monitoring

##### 4.2.3.3.1 Justification

To ensure the correct operation of the transmit frequency generation sub-system and to inhibit transmissions should the sub-system fail.

##### 4.2.3.3.2 Specification

The LMES shall monitor the operation of its transmit frequency generation sub-system.

No later than 5 seconds after any fault condition of the transmit frequency generation sub-system occurs, the LMES shall enter the carrier-off state until the transmit sub-system monitoring function has determined that all fault conditions have been cleared.

##### 4.2.3.3.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause~~ 5.2.3.4.

#### 4.2.3.4 Power-on/reset

##### 4.2.3.4.1 Justification

To demonstrate that the LMES achieves a controlled non-transmitting state following the powering of the unit, or the occurrence of a reset made by a local operator when this function is implemented.

##### 4.2.3.4.2 Specification

During and following "power-on" or a manual reset when this function is implemented, the LMES shall remain in the carrier-off state.

##### 4.2.3.4.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause~~ 5.2.3.5.

#### 4.2.3.5 Control Channel (CC) reception

##### 4.2.3.5.1 Justification

To ensure that the LMES cannot transmit unless it correctly receives the Control Channel (CC) messages from the NCF.

##### 4.2.3.5.2 Specification

- a) ~~Without~~ correct reception of the CC messages from the NCF, the LMES shall remain in the carrier-off ~~state~~.

## 4.2.3 Control and Monitoring Functions (CMF)

### 4.2.3.1 General

The following minimum set of CMF shall be implemented in LMES in order to minimize the probability that they originate unwanted transmissions that may give rise to harmful interference to other systems.

Under any fault condition when the LMES transmissions are being suppressed the limits for carrier-off state shall apply.

### 4.2.3.2 Processor monitoring

#### 4.2.3.2.1 Justification

To ensure that the LMES can suppress transmissions in the event of a processor sub-system failure.

#### 4.2.3.2.2 Specification

The LMES shall incorporate a processor monitoring function for each of its processors involved in the manipulation of traffic and in Control and Monitoring Functions (CMF).

The processor monitoring function shall detect any failure of the processor hardware and software.

No later than one second after any fault condition occurs, the LMES shall enter the carrier-off state until the processor monitoring function has determined that all fault conditions have been cleared.

#### 4.2.3.2.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.3.3](#).

### 4.2.3.3 Transmit subsystem monitoring

#### 4.2.3.3.1 Justification

To ensure the correct operation of the transmit frequency generation sub-system and to inhibit transmissions should the sub-system fail.

#### 4.2.3.3.2 Specification

The LMES shall monitor the operation of its transmit frequency generation sub-system.

No later than 5 seconds after any fault condition of the transmit frequency generation sub-system occurs, the LMES shall enter the carrier-off state until the transmit sub-system monitoring function has determined that all fault conditions have been cleared.

#### 4.2.3.3.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.3.4](#).

### 4.2.3.4 Power-on/reset

#### 4.2.3.4.1 Justification

To demonstrate that the LMES achieves a controlled non-transmitting state following the powering of the unit, or the occurrence of a reset made by a local operator when this function is implemented.

#### 4.2.3.4.2 Specification

During and following "power-on" or a manual reset when this function is implemented, the LMES shall remain in the carrier-off state.

- ~~b) The LMES shall enter the carrier-off state immediately after a period not exceeding 30 seconds without correct reception of the CC messages from the NCF.~~

#### 4.2.3.5.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause 5.2.3.6.~~

#### 4.2.3.6 Network control commands

##### 4.2.3.6.1 Justification

These requirements ensure that the LMES is capable of:

- a) retaining a unique identification in the network and transmitting it upon reception of an appropriate request;
- b) receiving commands from the NCF through its Control Channel(s) (CCs) and executing those commands.

##### 4.2.3.6.2 Specification

The LMES shall hold, in non-volatile memory, its unique identification code in the network.

The LMES shall be capable of receiving through its Control Channel(s) (CCs) dedicated messages (addressed to the LMES) from the NCF, and which contain:

- transmission enable commands;
- transmission disable commands;
- identification request.

Once a transmission enable command is received the LMES is authorized to transmit.

After power-on or reset the LMES shall remain in the carrier-off state until it receives a transmission enable command. For systems where no transmission enable command is expected after power-on or reset the LMES may only transmit initial bursts (see ~~subclause 4.2.3.7.~~

Once a transmission disable command is received, within 1 second the LMES shall enter into, and shall remain in, the carrier-off state until the transmission disable command is superseded by a subsequent transmission enable command.

The LMES shall be capable of transmitting its identification code upon reception of an identification request.

##### 4.2.3.6.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause 5.2.3.7.~~

#### 4.2.3.7 Initial burst transmission

##### 4.2.3.7.1 Justification

To limit disturbance to other services.

##### 4.2.3.7.2 Specification

For systems where no transmission enable command is expected after power-on or reset the LMES may transmit initial ~~bursts.~~

- a) the transmission of the initial burst shall not exceed 1 % of the time;
- b) each burst shall not last more than one second.

#### 4.2.3.4.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.3.5](#).

#### 4.2.3.5 Control Channel (CC) reception

##### 4.2.3.5.1 Justification

To ensure that the LMES cannot transmit unless it correctly receives the Control Channel (CC) messages from the NCF.

##### 4.2.3.5.2 Specification

- a) ~~without~~ correct reception of the CC messages from the NCF, the LMES shall remain in the carrier-off ~~state~~.
- b) ~~the~~ LMES shall enter the carrier-off state immediately after a period not exceeding 30 seconds without correct reception of the CC messages from the NCF.

##### 4.2.3.5.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.3.6](#).

#### 4.2.3.6 Network control commands

##### 4.2.3.6.1 Justification

These requirements ensure that the LMES is capable of:

- a) retaining a unique identification in the network and transmitting it upon reception of an appropriate request;
- b) receiving commands from the NCF through its Control Channel(s) (CCs) and executing those commands.

##### 4.2.3.6.2 Specification

The LMES shall hold, in non-volatile memory, its unique identification code in the network.

The LMES shall be capable of receiving through its Control Channel(s) (CCs) dedicated messages (addressed to the LMES) from the NCF, and which contain:

- transmission enable commands;
- transmission disable commands;
- identification request.

Once a transmission enable command is received the LMES is authorized to transmit.

After power-on or reset the LMES shall remain in the carrier-off state until it receives a transmission enable command. For systems where no transmission enable command is expected after power-on or reset the LMES may only transmit initial bursts (see [clause 4.2.3.7](#)).

Once a transmission disable command is received, within 1 second the LMES shall enter into, and shall remain in, the carrier-off state until the transmission disable command is superseded by a subsequent transmission enable command.

The LMES shall be capable of transmitting its identification code upon reception of an identification request.

##### 4.2.3.6.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.3.7](#).



#### 4.2.3.7.3 Conformance test

Conformance test shall be carried out in accordance with ~~subclause 5.2.3.8.~~

## 5 Testing for compliance with technical requirements

### 5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared environmental profile.

### 5.2 Essential radio test suites

#### 5.2.1 General

The values of measurement uncertainty associated with each measurement parameter apply to all of the test cases described in the present document. The measurement uncertainties shall not exceed the values shown in table 4.

**Table 4: Measurement uncertainty**

Measurement parameter	Uncertainty
Radio Frequency (RF)	$\pm 10$ kHz
RF power	$\pm 0,75$ dB
conducted spurious	$\pm 4$ dB
antenna gain	$\pm 2$ dB
radiated spurious	$\pm 6$ dB

To enable the performance tests to be carried out the use of Special Test Equipment (STE), made available by the applicant may be necessary. Since this test equipment will be specific to the particular system, it is not possible to provide detailed specifications in the present document. However, the following baseline is provided:

- if the LMES requires to receive a modulated carrier from the satellite in order to transmit, then special test arrangements are required to simulate the satellite signal, thus enabling the LMES to transmit allowing measurement of transmission parameters;
- any characteristic of these special test arrangements which may have direct or indirect effects on the parameters to be measured shall be clearly stated by the applicant.

All tests in the carrier-on state shall be undertaken with the transmitter operating at the maximum power setting and with the maximum transmit burst rate where applicable.

All technical characteristics and operational conditions declared by the applicant shall be entered in the test report.

### 5.2.2 Measurement of unwanted emissions

#### 5.2.2.1 General

For purposes of the test, the EUT comprises:

- a) for IE:
  - the EME;
  - ~~the IME;~~
  - interconnecting cables between IME and EME units as supplied by the applicant;
  - the necessary power supply cables and any other cable ensuring a proper functioning of the terminal;

#### 4.2.3.7 Initial burst transmission

##### 4.2.3.7.1 Justification

To limit disturbance to other services.

##### 4.2.3.7.2 Specification

For systems where no transmission enable command is expected after power-on or reset the LMES may transmit initial bursts:

- a) the transmission of the initial burst shall not exceed 1 % of the time;
- b) each burst shall not last more than one second.

##### 4.2.3.7.3 Conformance test

Conformance test shall be carried out in accordance with [clause 5.2.3.8](#).

### 4.2.4 Protection of the radio astronomy service operation in the band 1 660,0 MHz to 1 660,5 MHz and in the band 1 668,0 MHz to 1 670,0 MHz

#### 4.2.4.1 Purpose

To protect the radio astronomy service in the 1 660,0 MHz to 1 660,5 MHz band and the 1 668,0 MHz to 1 670,0 MHz band from emissions produced by LMESs the transmissions in these frequency bands shall be capable of being disabled in the vicinity of RA stations recorded in the ITU Master International Frequency Register.

#### 4.2.4.2 Technical requirements

The LMES shall be able to have its transmissions disabled as specified in clause 4.2.3.6.2.

The actual procedure used in an MSS network to protect the radio astronomy service in the 1 660,0 MHz to 1 660,5 MHz band and 1 668,0 MHz to 1 670,0 MHz band may utilize additional features of the LMES.

#### 4.2.4.3 Conformance test

Conformance tests shall be carried out in accordance with clause 5.2.3.7.1.

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## 5 Testing for compliance with technical requirements

### 5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared environmental profile.

### 5.2 Essential radio test suites

#### 5.2.1 General

The values of measurement uncertainty associated with each measurement parameter apply to all of the test cases described in the present document. The measurement uncertainties shall not exceed the values shown in table 4.

b) for PE:

- for a single module PE, the module itself with any deployable parts in their normal operating configuration;
- for a multiple module PE, all such modules with all necessary interconnecting cables of lengths as normally supplied by the applicant; again any deployable parts should be in their normal operating configuration.

For measurements up to 1 000 MHz the distance between the EUT and the measuring antenna shall be 10 m. For measurements above 1 000 MHz the distance between the EUT and the measuring antenna shall be such that the radiating near-field of each antenna shall not overlap with that of the other.

The highest frequency to which tests shall be performed shall be the 10th harmonic of the highest conversion frequency or ten times the highest transmit frequency, whichever is the greater.

The upper and lower extremes of the tuning range shall be stated by the applicant.

### 5.2.2.2 Test site

The test shall be performed either in an open area test site, a semi-anechoic chamber or an anechoic chamber. Ambient noise levels shall be at least 6 dB below the applicable unwanted emissions limit.

An open area test site shall be flat, free of overhead wires and nearby reflecting structures, sufficiently large to permit aerial placement at the specified measuring distance and provide adequate separation between aerial, test unit and reflecting structures.

A metal ground plane shall be inserted on the natural ground plane and it shall extend at least 1 m beyond the perimeter of the EUT at one end and at least 1 m beyond the measurement antenna at the other end.

### 5.2.2.3 Test method

#### 5.2.2.3.1 Installation

For IE, the EUT shall be installed with a separation of about 0,5 m between the IME and the EME, the maximum length connection cable specified by the applicant shall be installed. The height of the cable shall be between 0,5 m and 1 m. The cable shall be maintained in that position by non-metallic means. The EME shall be set, in its normal operating configuration on a non-metallic turn-table at a height between 0,5 m and 1 m. The IME shall be set on a non-metallic turn-table at a height of 0,8 m for tests up to 1 000 MHz and between 0,5 m and 1 m for tests above 1 000 MHz. Any associated equipment, e.g. portable computer or data terminal if required for operation of the LMES, shall be placed next to, and at the same height as, the IME.

For PE, the equipment shall be arranged in its normal operating configuration as recommended by the applicant on a non-metallic turn table at a height between 0,5 m and 1 m.

The EUT shall be terminated with matched impedance at the terrestrial ports if recommended by the applicant in the user documentation and if there is no associated equipment connected to such port.

For frequencies up to 80 MHz the measuring antenna shall be a balanced dipole which has a length equal to the 80 MHz resonant length and shall be matched to the feeder by a suitable transforming device. Measurements with broad band antennas are also possible provided that the test site has been calibrated according to the requirements of CISPR 16-~~+~~ [2].

For frequencies between 80 MHz and 1 000 MHz the measuring antenna shall be a balanced dipole which shall be resonant in length. Measurements with broad band antennas are also possible provided that the test site has been calibrated according to the requirements of CISPR ~~16-+~~ [2].

For frequencies above 1 000 MHz the antenna shall be a horn radiator of known gain/frequency characteristics. When used for reception the antenna and any associated amplification system shall have an amplitude/frequency response within  $\pm 2$  dB of the combined calibration curves across the measurement frequency range considered for the antenna. The antenna is mounted on a support capable of allowing the antenna to be used in either horizontal or vertical polarization and at the specified height.

Table 4: Measurement uncertainty

Measurement parameter	Uncertainty
Radio Frequency (RF)	$\pm 10$ kHz
RF power	$\pm 0,75$ dB
conducted spurious	$\pm 4$ dB
antenna gain	$\pm 2$ dB
radiated spurious	$\pm 6$ dB

To enable the performance tests to be carried out the use of Special Test Equipment (STE), made available by the applicant may be necessary. Since this test equipment will be specific to the particular system, it is not possible to provide detailed specifications in the present document. However, the following baseline is provided:

- if the LMES requires to receive a modulated carrier from the satellite in order to transmit, then special test arrangements are required to simulate the satellite signal, thus enabling the LMES to transmit allowing measurement of transmission parameters;
- any characteristic of these special test arrangements which may have direct or indirect effects on the parameters to be measured shall be clearly stated by the applicant.

All tests in the carrier-on state shall be undertaken with the transmitter operating at the maximum power setting and with the maximum transmit burst rate where applicable.

All technical characteristics and operational conditions declared by the applicant shall be entered in the test report.

## 5.2.2 Measurement of unwanted emissions

### 5.2.2.1 General

For purposes of the test, the EUT comprises:

- a) for IE:
  - the EME;
  - ~~the IME;~~
  - interconnecting cables between IME and EME units as supplied by the applicant;
  - the necessary power supply cables and any other cable ensuring a proper functioning of the terminal;
- b) for PE:
  - for a single module PE, the module itself with any deployable parts in their normal operating configuration;
  - for a multiple module PE, all such modules with all necessary interconnecting cables of lengths as normally supplied by the applicant; again any deployable parts should be in their normal operating configuration.

For measurements up to 1 000 MHz the distance between the EUT and the measuring antenna shall be 10 m. For measurements above 1 000 MHz the distance between the EUT and the measuring antenna shall be such that the radiating near-field of each antenna shall not overlap with that of the other.

The highest frequency to which tests shall be performed shall be the 10th harmonic of the highest conversion frequency or ten times the highest transmit frequency, whichever is the greater.

The upper and lower extremes of the tuning range shall be stated by the applicant.

For tests up to 1 000 MHz the receive test equipment shall be a measuring receiver. For tests above 1 000 MHz the receive test equipment shall be a spectrum analyser.

### 5.2.2.3.2 Receive test equipment

#### 5.2.2.3.2.1 Measuring receiver for measurements up to 1 000 MHz

Measuring receivers shall conform to the following characteristics:

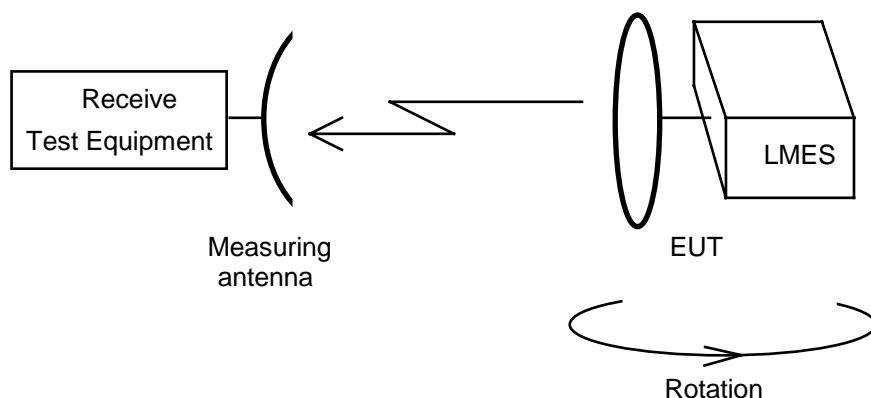
- the response to a constant amplitude sine wave signal shall remain within  $\pm 1$  dB across the frequency range of interest;
- quasi-peak detection shall be used in a -6 dB bandwidth of 120 kHz;
- the receiver shall be operated at more than 1 dB below the compression point during tests/measurements.

#### 5.2.2.3.2.2 Spectrum analyser for measurements above 1 000 MHz

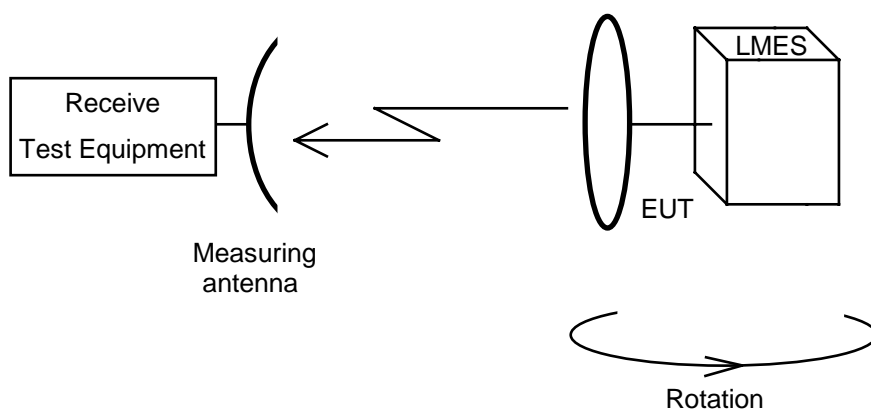
The spectrum analyser resolution bandwidth shall be set to the specified measuring bandwidth or as close as possible. If the resolution bandwidth is different from the specified measuring bandwidth, bandwidth correction shall be performed for noise-like wideband signals. The measuring system shall be capable of detecting signals at least 6 dB below the applicable unwanted emissions limit.

### 5.2.2.4 Procedure

#### 5.2.2.4.1 Test arrangements



**Figure 2: Test arrangement - emissions measurement, first axis**



**Figure 3: Test arrangement - emissions measurement, second axis**

### 5.2.2.2 Test site

The test shall be performed either in an open area test site, a semi-anechoic chamber or an anechoic chamber. Ambient noise levels shall be at least 6 dB below the applicable unwanted emissions limit.

An open area test site shall be flat, free of overhead wires and nearby reflecting structures, sufficiently large to permit aerial placement at the specified measuring distance and provide adequate separation between aerial, test unit and reflecting structures.

A metal ground plane shall be inserted on the natural ground plane and it shall extend at least 1 m beyond the perimeter of the EUT at one end and at least 1 m beyond the measurement antenna at the other end.

### 5.2.2.3 Test method

#### 5.2.2.3.1 Installation

For IE, the EUT shall be installed with a separation of about 0,5 m between the IME and the EME, the maximum length connection cable specified by the applicant shall be installed. The height of the cable shall be between 0,5 m and 1 m. The cable shall be maintained in that position by non-metallic means. The EME shall be set, in its normal operating configuration on a non-metallic turn-table at a height between 0,5 m and 1 m. The IME shall be set on a non-metallic turn-table at a height of 0,8 m for tests up to 1 000 MHz and between 0,5 m and 1 m for tests above 1 000 MHz. Any associated equipment, e.g. portable computer or data terminal if required for operation of the LMES, shall be placed next to, and at the same height as, the IME.

For PE, the equipment shall be arranged in its normal operating configuration as recommended by the applicant on a non-metallic turn table at a height between 0,5 m and 1 m.

The EUT shall be terminated with matched impedance at the terrestrial ports if recommended by the applicant in the user documentation and if there is no associated equipment connected to such port.

For frequencies up to 80 MHz the measuring antenna shall be a balanced dipole which has a length equal to the 80 MHz resonant length and shall be matched to the feeder by a suitable transforming device. Measurements with broad band antennas are also possible provided that the test site has been calibrated according to the requirements of CISPR 16-1-4 [2].

For frequencies between 80 MHz and 1 000 MHz the measuring antenna shall be a balanced dipole which shall be resonant in length. Measurements with broad band antennas are also possible provided that the test site has been calibrated according to the requirements of CISPR 16-1-4 [2].

For frequencies above 1 000 MHz the antenna shall be a horn radiator of known gain/frequency characteristics. When used for reception the antenna and any associated amplification system shall have an amplitude/frequency response within  $\pm 2$  dB of the combined calibration curves across the measurement frequency range considered for the antenna. The antenna is mounted on a support capable of allowing the antenna to be used in either horizontal or vertical polarization and at the specified height.

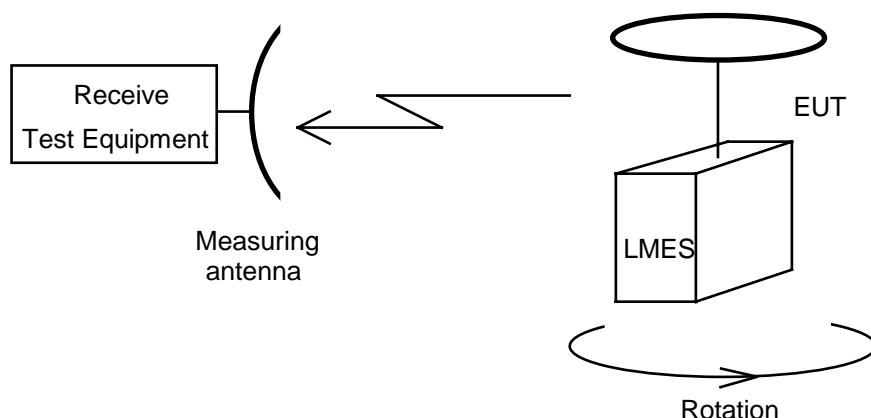
For tests up to 1 000 MHz the receive test equipment shall be a measuring receiver. For tests above 1 000 MHz the receive test equipment shall be a spectrum analyser.

#### 5.2.2.3.2 Receive test equipment

##### 5.2.2.3.2.1 Measuring receiver for measurements up to 1 000 MHz

Measuring receivers shall conform to the following characteristics:

- the response to a constant amplitude sine wave signal shall remain within  $\pm 1$  dB across the frequency range of interest;
- quasi-peak detection shall be used in a -6 dB bandwidth of 120 kHz;
- the receiver shall be operated at more than 1 dB below the compression point during tests/measurements.



**Figure 4: Test arrangement - emissions measurement, third axis**

#### 5.2.2.4.2 Unwanted emissions up to 1 000 MHz

- a) The test arrangement shall be as shown in figure 2 with the measuring receiver installed. EUTs with adjustable antennas shall have the antenna boresight axis in the plane of rotation. The measuring antenna boresight axis shall coincide with the plane of rotation of the boresight of the EUT.
- b) The EUT shall be in the carrier-on state with the carrier at ~~the lowest possible centre frequency.~~
- c) The EUT shall be rotated through 360° LMES whilst unwanted emissions are measured in frequency and amplitude, over the frequency range 30 MHz to 1 000 MHz. The frequency and amplitude of each signal shall be noted.
- d) The measurements shall be repeated with the measuring antenna in the orthogonal polarization and the signal levels similarly noted.
- e) The tests in c) and d) above shall be repeated with the EUT carrier at the highest possible centre ~~frequency.~~
- f) The tests in c) and d) above shall be repeated with the carrier-off.
- g) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is orthogonal to that of the first case, as shown in figure 3. The EUT antenna boresight axis shall remain in the plane of rotation.
- h) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is mutually orthogonal to those of the first two cases, as shown in figure 4. The EUT antenna boresight axis shall be perpendicular to the plane of rotation.

#### 5.2.2.4.3 Unwanted emissions above 1 000 MHz

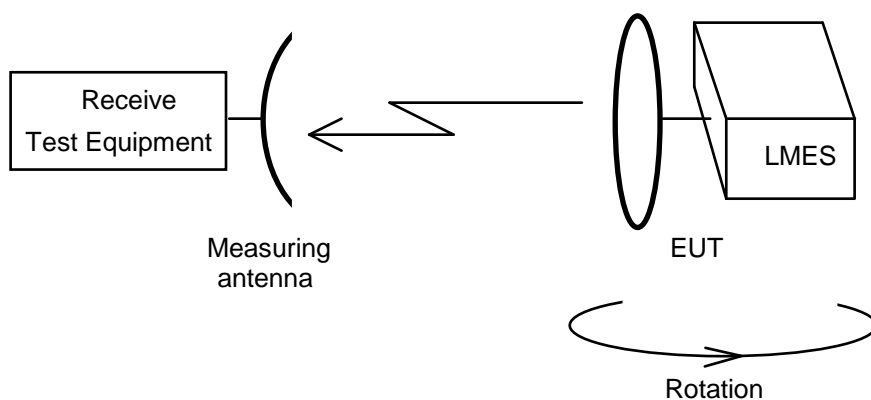
- a) The test arrangement shall be as shown in figure 2 with the spectrum analyser installed. EUTs with adjustable antennas shall have the antenna boresight axis in the plane of rotation. The measuring antenna boresight axis shall coincide with the plane of rotation of the boresight of the EUT.
- b) The EUT shall be in the carrier-on state with the carrier at ~~the lowest possible centre frequency.~~
- c) The EUT shall be rotated through 360° whilst unwanted emissions are measured in frequency and amplitude, over the frequency range 1 000 MHz to 40 GHz. The frequency and amplitude of each signal shall be noted.
- d) The measurements shall be repeated with the measuring antenna in the orthogonal polarization and the signal levels similarly noted.
- e) The tests in c) and d) above shall be repeated with the EUT carrier at ~~the highest possible centre frequency.~~
- f) The tests in c) and d) above shall be repeated with the carrier-off.
- g) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is orthogonal to that of the first case, as shown in figure 3. The EUT antenna boresight axis shall remain in the plane of rotation.

### 5.2.2.3.2.2 Spectrum analyser for measurements above 1 000 MHz

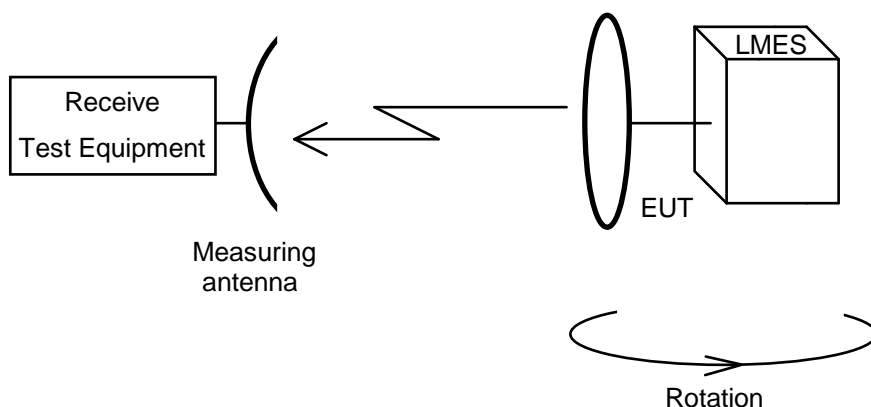
The spectrum analyser resolution bandwidth shall be set to the specified measuring bandwidth or as close as possible. If the resolution bandwidth is different from the specified measuring bandwidth, bandwidth correction shall be performed for noise-like wideband signals. The measuring system shall be capable of detecting signals at least 6 dB below the applicable unwanted emissions limit.

## 5.2.2.4 Procedure

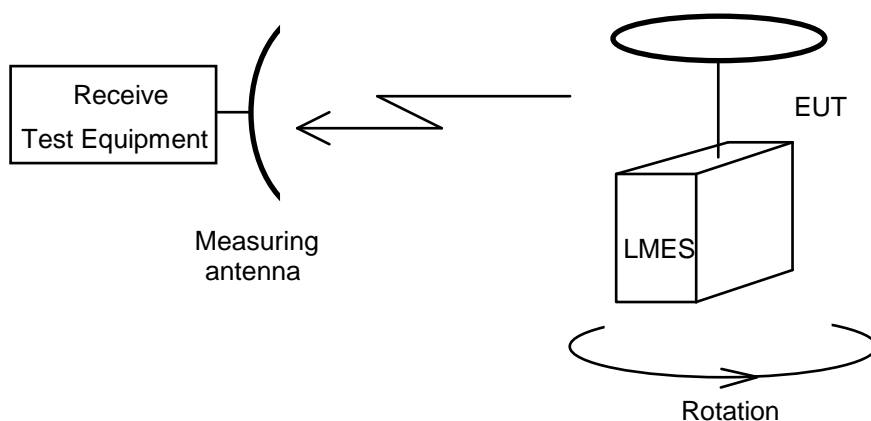
### 5.2.2.4.1 Test arrangements



**Figure 2: Test arrangement - emissions measurement, first axis**



**Figure 3: Test arrangement - emissions measurement, second axis**



**Figure 4: Test arrangement - emissions measurement, third axis**



- h) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is mutually orthogonal to those of the first two cases, as shown in figure 4. The EUT antenna boresight axis shall be perpendicular to the plane of rotation

## 5.2.3 LMES Control and Monitoring Functions (CMF)

### 5.2.3.1 General

If the EUT is a LMES that has been modified by the applicant for these tests then full documentation of such modification(s) shall be provided to prove that the modification(s) will simulate the required test condition.

For the purpose of this test, the EUT is the LMES either with, or without its antenna connected.

The measurement of the EIRP spectral density shall be limited within either the nominated bandwidth or to a 10 MHz bandwidth centred on the carrier frequency whichever is the greater.

### 5.2.3.2 Test arrangement

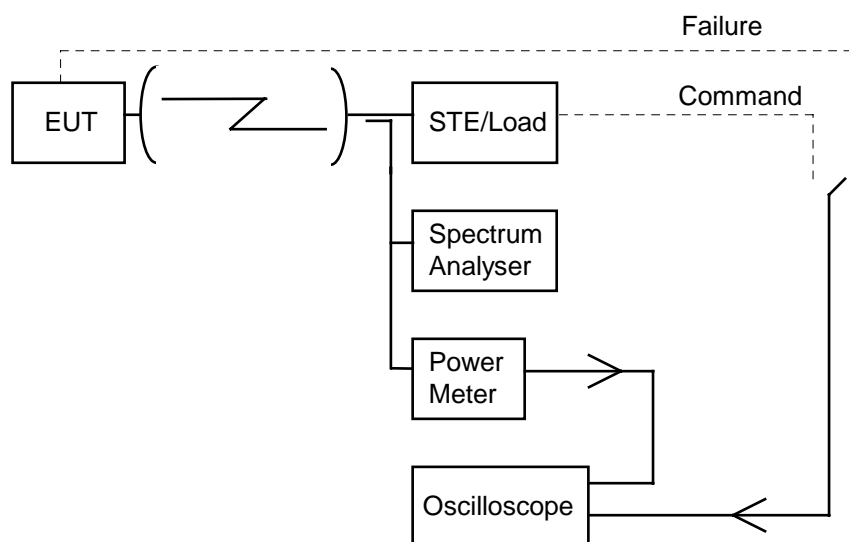


Figure 5: General test arrangement for control and monitoring tests for radiated measurements

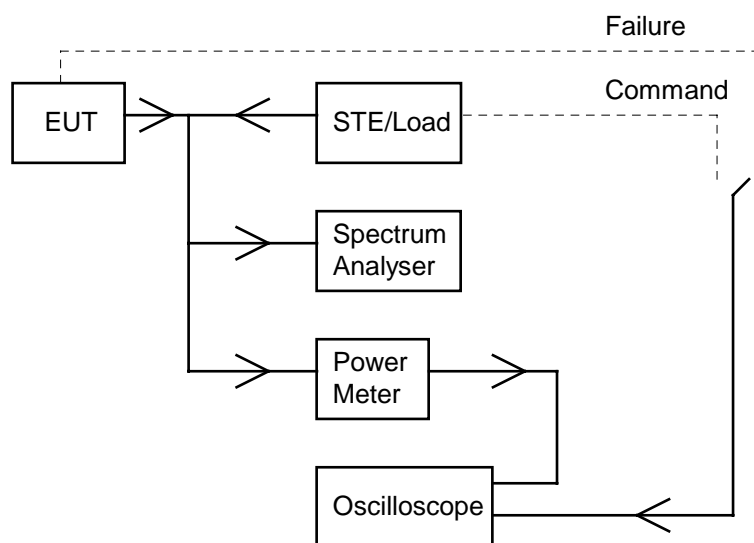


Figure 6: General test arrangement for control and monitoring tests for conducted measurements

#### 5.2.2.4.2 Unwanted emissions up to 1 000 MHz

- a) The test arrangement shall be as shown in figure 2 with the measuring receiver installed. EUTs with adjustable antennas shall have the antenna boresight axis in the plane of rotation. The measuring antenna boresight axis shall coincide with the plane of rotation of the boresight of the EUT.
- b) The EUT shall be in the carrier-on state with the carrier at the lowest possible centre frequency, depending on the operating frequency band of the EUT, as defined in clauses b 1) and b 2) in this clause below.
  - b 1) For EUT capable of transmitting in only one sub-band, either in sub-band 1 or sub-band 2 as defined in table 1a, then only the lowest possible centre frequency of the respective band shall be used.
  - b 2) For EUT capable of transmitting in both the sub-band 1 or sub-band 2 as defined in table 1a, the tests in c) and d) as described in this clause shall be repeated for the lowest possible centre frequency in each of the frequency bands.
- c) The EUT shall be rotated through 360° LMES whilst unwanted emissions are measured in frequency and amplitude, over the frequency range 30 MHz to 1 000 MHz. The frequency and amplitude of each signal shall be noted.
- d) The measurements shall be repeated with the measuring antenna in the orthogonal polarization and the signal levels similarly noted.
- e) The tests in c) and d) above shall be repeated with the EUT carrier at the highest possible centre frequency, depending on the operating frequency band of the EUT, as defined in clauses e 1) and e 2) in this clause below.
  - e 1) For EUT capable of transmitting in only one sub-band, either in sub-band 1 or sub-band 2 as defined in table 1a, then only the highest possible centre frequency of the respective band shall be used.
  - e 2) For EUT capable of transmitting in both the sub-band 1 or sub-band 2 as defined in table 1a, the tests in c) and d) as described in this clause shall be repeated for the highest possible centre frequency in each of the frequency bands.
- f) The tests in c) and d) above shall be repeated with the carrier-off.
- g) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is orthogonal to that of the first case, as shown in figure 3. The EUT antenna boresight axis shall remain in the plane of rotation.
- h) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is mutually orthogonal to those of the first two cases, as shown in figure 4. The EUT antenna boresight axis shall be perpendicular to the plane of rotation.

#### 5.2.2.4.3 Unwanted emissions above 1 000 MHz

- a) The test arrangement shall be as shown in figure 2 with the spectrum analyser installed. EUTs with adjustable antennas shall have the antenna boresight axis in the plane of rotation. The measuring antenna boresight axis shall coincide with the plane of rotation of the boresight of the EUT.
- b) The EUT shall be in the carrier-on state with the carrier at the lowest possible centre frequency, depending on the operating frequency band of the EUT, as defined in clauses b 1) and b 2) in this clause below.
  - b 1) For EUT capable of transmitting only in one sub-band, either in sub-band 1 or sub-band 2 as defined in table 1a, then only the lowest possible centre frequency of the respective band shall be used.
  - b 2) For EUT capable of transmitting in both the sub-band 1 or sub-band 2 as defined in table 1a, the tests in c) and d) as described in this clause shall be repeated for the lowest possible centre frequency in each of the frequency bands.
- c) The EUT shall be rotated through 360° whilst unwanted emissions are measured in frequency and amplitude, over the frequency range 1 000 MHz to 40 GHz. The frequency and amplitude of each signal shall be noted.
- d) The measurements shall be repeated with the measuring antenna in the orthogonal polarization and the signal levels similarly noted.

The test arrangement shall be as shown in ~~figures 5 or 6~~. The EUT shall be authorized to transmit and shall be in the carrier-on state at the commencement of each test, unless otherwise stated. The oscilloscope shall monitor by measuring the time difference between the command, or failure, and the occurrence of the expected event (e.g. the transmission suppression). The spectrum analyser and the power meter shall monitor the EUT output level.

### 5.2.3.3 Processor monitoring

#### 5.2.3.3.1 Test method

- a) Each of the processors within the EUT shall, in turn, be caused to fail.
- b) Within 1 second of such failure the EUT shall cease to transmit as measured by the oscilloscope.
- c) The power meter and spectrum analyser shall be observed to ascertain that the transmissions have been suppressed.
- d) The failed processor shall be restored to normal working condition and the EUT shall restore automatically to normal working before the next processor shall be induced to fail.

### 5.2.3.4 Transmit subsystem monitoring

#### 5.2.3.4.1 Test method

- a) The frequency lock subsystem within the EUT shall be caused to fail.
- b) Within 6 seconds of such failure the EUT shall cease to transmit as measured by the oscilloscope.
- c) The power meter and spectrum analyser shall be observed to ascertain that the transmissions have been suppressed.
- d) The failed elements shall be restored to normal working state and the EUT shall be restored to normal working.
- e) The frequency generation subsystem within the EUT shall be caused to fail.
- f) Within 6 seconds of such failure the EUT shall cease to transmit as measured by the oscilloscope.
- g) The power meter and spectrum analyser shall be observed to ascertain that the transmissions have been suppressed.
- h) The failed elements shall be restored to normal working state and the EUT shall be restored to normal working.

### 5.2.3.5 Power-on/Reset

#### 5.2.3.5.1 Test method

- a) ~~The~~ EUT shall be switched off and the STE shall not transmit the ~~CC~~.
- ~~b) The EUT shall be switched on.~~
- ~~c) The~~ EUT shall not transmit during and after switching-on, and shall enter the carrier-off state.

The events from a) to c) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal. If a manual reset function is implemented the following test shall be performed:

- d) the EUT shall be switched on and the STE shall transmit the CC;
- e) a call shall be initiated from the EUT and the EUT shall enter the carrier-on state;
- f) the reset function shall be initiated;
- g) the EUT shall enter the carrier-off state.

- e) The tests in c) and d) above shall be repeated with the EUT carrier at the highest possible centre frequency, depending on the operating frequency band of the EUT, as defined in clauses e 1) and e 2) in this clause below.
- e 1) For EUT capable of transmitting only in one sub-band, either in sub-band 1 or sub-band 2 as defined in table 1a, then only the highest possible centre frequency of the respective band shall be used.
- e 2) For EUT capable of transmitting in both the sub-band 1 or sub-band 2 as defined in table 1a, the tests in c) and d) as described in this clause shall be repeated for the highest possible centre frequency in each of the frequency bands.
- f) The tests in c) and d) above shall be repeated with the carrier-off.
- g) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is orthogonal to that of the first case, as shown in figure 3. The EUT antenna boresight axis shall remain in the plane of rotation.
- h) The tests in b) to f) above shall be repeated with the EUT turned so that its axis of rotation is mutually orthogonal to those of the first two cases, as shown in figure 4. The EUT antenna boresight axis shall be perpendicular to the plane of rotation

## 5.2.3 LMES Control and Monitoring Functions (CMF)

### 5.2.3.1 General

If the EUT is a LMES that has been modified by the applicant for these tests then full documentation of such modification(s) shall be provided to prove that the modification(s) will simulate the required test condition.

For the purpose of this test, the EUT is the LMES either with, or without its antenna connected.

The measurement of the EIRP spectral density shall be limited within either the nominated bandwidth or to a 10 MHz bandwidth centred on the carrier frequency whichever is the greater.

### 5.2.3.2 Test arrangement

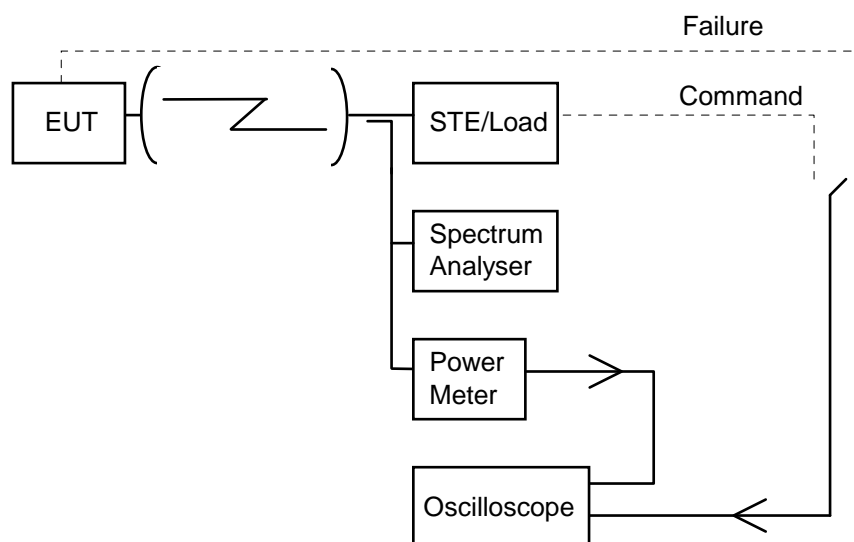


Figure 5: General test arrangement for control and monitoring tests for radiated measurements

The event from e) to g) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

### 5.2.3.6 Control Channel (CC) reception

#### 5.2.3.6.1 Test method

The following tests shall be performed:

- case a) where the CC has never been received by the EUT;
- case b) where the CC is lost by the EUT during a transmission period of a call;
- case c) where the CC is lost by the EUT during a period without transmission;
- case d) where the CC is being lost by the EUT and a call is initiated within the Time-Out period T1.

The Time-Out period T1 used in the tests shall be 30 seconds.

a) Case where the CC has never been received by the EUT:

- a1) The EUT shall be switched off and the STE shall not transmit the CC.
- a2) The EUT shall be switched on.
- a3) A call shall be initiated from the EUT.
- a4) The EUT shall remain in the carrier-off state.

The events from a2) to a4) shall be displayed and verified with the oscilloscope and by measurement of the transmit signal.

b) Case where the CC is lost by the EUT during a transmission period of a call:

- b1) The EUT shall be switched-on and the STE shall transmit the CC.
- b2) A call shall be initiated from the EUT.
- b3) The STE shall stop transmitting the CC.
- b4) Within T1 from b3), the EUT shall enter the carrier-off state.

The events from b2) to b4) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

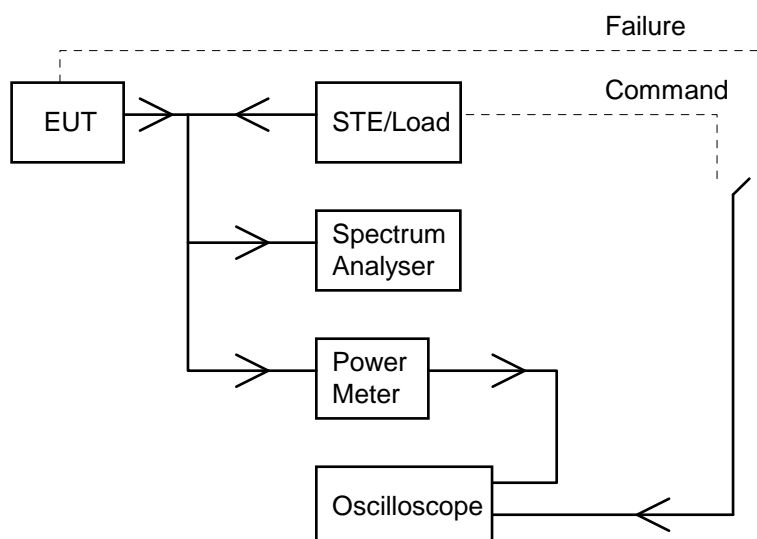
c) Case where the CC is lost by the EUT during a period without transmission:

- c1) The EUT shall be switched on and the STE shall transmit the CC.
- c2) The STE shall stop transmitting the CC.
- c3) More than T1 later, a call shall be initiated from the EUT.
- c4) The EUT shall remain in the carrier-off ~~state~~

The events from c2) to c4) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

d) Case where the CC is being lost by the EUT and a call is initiated within the T1 period:

- d1) The EUT shall be switched on and the STE shall transmit the CC.
- d2) The STE shall stop transmitting the CC.
- d3) Within the period T1 from d2), a call shall be initiated from the EUT.



**Figure 6: General test arrangement for control and monitoring tests for conducted measurements**

The test arrangement shall be as shown in [figure 5](#) or [6](#). The EUT shall be authorized to transmit and shall be in the carrier-on state at the commencement of each test, unless otherwise stated. The oscilloscope shall monitor by measuring the time difference between the command, or failure, and the occurrence of the expected event (e.g. the transmission suppression). The spectrum analyser and the power meter shall monitor the EUT output level.

### 5.2.3.3 Processor monitoring

#### 5.2.3.3.1 Test method

- a) Each of the processors within the EUT shall, in turn, be caused to fail.
- b) Within 1 second of such failure the EUT shall cease to transmit as measured by the oscilloscope.
- c) The power meter and spectrum analyser shall be observed to ascertain that the transmissions have been suppressed.
- d) The failed processor shall be restored to normal working condition and the EUT shall restore automatically to normal working before the next processor shall be induced to fail.

### 5.2.3.4 Transmit subsystem monitoring

#### 5.2.3.4.1 Test method

- a) The frequency lock subsystem within the EUT shall be caused to fail.
- b) Within 6 seconds of such failure the EUT shall cease to transmit as measured by the oscilloscope.
- c) The power meter and spectrum analyser shall be observed to ascertain that the transmissions have been suppressed.
- d) The failed elements shall be restored to normal working state and the EUT shall be restored to normal working.
- e) The frequency generation subsystem within the EUT shall be caused to fail.
- f) Within 6 seconds of such failure the EUT shall cease to transmit as measured by the oscilloscope.
- g) The power meter and spectrum analyser shall be observed to ascertain that the transmissions have been suppressed.
- h) The failed elements shall be restored to normal working state and the EUT shall be restored to normal working.

d4) The EUT may transmit but within the T1 period the EUT shall enter the carrier-off state.

The events from d2) to d4) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

### 5.2.3.7 Network control commands

#### 5.2.3.7.1 Test method

The following tests shall be performed in sequence:

- a) transmission enable command;
- b) transmission disable command;
- c) identification request.

##### a) Transmission enable command:

a1) The EUT shall be switched-on and the STE shall transmit the CC.

a2) The EUT shall enter the carrier-off state.

a3) A call shall be initiated from the EUT, the EUT shall remain in the carrier-off state.

a4) The STE shall transmit an enable command to the EUT.

a5) A call shall be initiated from the EUT.

a6) The EUT shall enter the carrier-on state and shall transmit.

The events from a2) to a6) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

##### b) Transmission disable command:

b1) Continue from a6).

b2) The STE shall transmit a disable command to the EUT.

b3) The EUT shall enter the carrier-off state within 1 second.

b4) A call shall be initiated from the EUT.

b5) The EUT shall remain in the carrier-off state.

b6) The STE shall transmit an enable command.

b7) A call shall be initiated from the EUT.

b8) The EUT shall enter the carrier-on state and shall transmit.

b9) The call shall be terminated at the EUT.

The events from b2) to b9) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

##### c) Identification request:

c1) Continue from b9).

c2) The STE shall transmit an identification request.

c3) The EUT shall enter the carrier-on state and shall transmit its identification code.

The STE shall display the identification code sent by the EUT.

### 5.2.3.5 Power-on/Reset

#### 5.2.3.5.1 Test method

- a) ~~the~~ EUT shall be switched off and the STE shall not transmit the CC;
- b) ~~the EUT shall be switched on;~~
- c) ~~the~~ EUT shall not transmit during and after switching-on, and shall enter the carrier-off state.

The events from a) to c) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal. If a manual reset function is implemented the following test shall be performed:

- d) the EUT shall be switched on and the STE shall transmit the CC;
- e) a call shall be initiated from the EUT and the EUT shall enter the carrier-on state;
- f) the reset function shall be initiated;
- g) the EUT shall enter the carrier-off state.

The event from e) to g) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

### 5.2.3.6 Control Channel (CC) reception

#### 5.2.3.6.1 Test method

The following tests shall be performed:

- case a) where the CC has never been received by the EUT;
- case b) where the CC is lost by the EUT during a transmission period of a call;
- case c) where the CC is lost by the EUT during a period without transmission;
- case d) where the CC is being lost by the EUT and a call is initiated within the Time-Out period T1.

The Time-Out period T1 used in the tests shall be 30 seconds.

- a) Case where the CC has never been received by the EUT:
  - a1) The EUT shall be switched off and the STE shall not transmit the CC.
  - a2) The EUT shall be switched on.
  - a3) A call shall be initiated from the EUT.
  - a4) The EUT shall remain in the carrier-off state.

The events from a2) to a4) shall be displayed and verified with the oscilloscope and by measurement of the transmit signal.

- b) Case where the CC is lost by the EUT during a transmission period of a call:
  - b1) The EUT shall be switched-on and the STE shall transmit the CC.
  - b2) A call shall be initiated from the EUT.
  - b3) The STE shall stop transmitting the CC.
  - b4) Within T1 from b3), the EUT shall enter the carrier-off state.

The events from b2) to b4) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.



### 5.2.3.8 Initial burst transmission

#### 5.2.3.8.1 Test method

- a) The EUT shall be switched-off and the STE shall transmit the CC.
- b) The EUT shall be switched-on.
- c) The EUT shall not transmit, except the initial bursts, if any.
- d) Each initial burst shall not last more than 1 second, and the transmission of the initial bursts shall not exceed 1 % of the time.

The events from b) to d) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

c) Case where the CC is lost by the EUT during a period without transmission:

- c1) The EUT shall be switched on and the STE shall transmit the CC.
- c2) The STE shall stop transmitting the CC.
- c3) More than T1 later, a call shall be initiated from the EUT.
- c4) The EUT shall remain in the carrier-off state.

The events from c2) to c4) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

d) Case where the CC is being lost by the EUT and a call is initiated within the T1 period:

- d1) The EUT shall be switched on and the STE shall transmit the CC.
- d2) The STE shall stop transmitting the CC.
- d3) Within the period T1 from d2), a call shall be initiated from the EUT.
- d4) The EUT may transmit but within the T1 period the EUT shall enter the carrier-off state.

The events from d2) to d4) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

### 5.2.3.7 Network control commands

#### 5.2.3.7.1 Test method

The following tests shall be performed in sequence:

- a) transmission enable command;
  - b) transmission disable command;
  - c) identification request.
- a) Transmission enable command:
- a1) The EUT shall be switched-on and the STE shall transmit the CC.
  - a2) The EUT shall enter the carrier-off state.
  - a3) A call shall be initiated from the EUT, the EUT shall remain in the carrier-off state.
  - a4) The STE shall transmit an enable command to the EUT.
  - a5) A call shall be initiated from the EUT.
  - a6) The EUT shall enter the carrier-on state and shall transmit.

The events from a2) to a6) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

b) Transmission disable command:

- b1) Continue from a6).
- b2) The STE shall transmit a disable command to the EUT.
- b3) The EUT shall enter the carrier-off state within 1 second.
- b4) A call shall be initiated from the EUT.
- b5) The EUT shall remain in the carrier-off state.

## ~~Annex A (normative): The EN Requirements Table (EN-RT)~~

~~Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the EN-RT proforma in this annex so that it can be used for its intended purposes and may further publish the completed EN-RT.~~

~~The EN Requirements Table (EN-RT) serves a number of purposes, as follows:~~

- ~~it provides a tabular summary of all the requirements;~~
- ~~it shows the status of each EN Requirement, whether it is essential to implement in all circumstances (Mandatory), or whether the requirement is dependent on the applicant having chosen to support a particular optional service or functionality (Optional). In particular it enables the EN-Requirements associated with a particular optional service or functionality to be grouped and identified;~~
- ~~when completed in respect of a particular equipment it provides a means to undertake the static assessment of conformity with the EN.~~

~~The EN-RT is placed in an annex of the EN in order that it may be photocopied and used as a proforma.~~

**Table A.1. EN Requirements Table (EN-RT)**

EN-Reference		EN 301 444				Comment
No.	Reference	EN-Requirement (note)	Status			
1	4.2.1	Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz	M			
2	4.2.2	Maximum unwanted emissions within the 1 625,8 MHz to 1 661,2 MHz band	M			
3	4.2.3.2	Processor monitoring	M			
4	4.2.3.3	Transmit subsystem monitoring	M			
5	4.2.3.4	Power on/Reset	M			
6	4.2.3.5	Control Channel reception	M			
7	4.2.3.6	Network control commands	M			
8	4.2.3.7	Initial burst transmission	M			

~~NOTE: These EN-Requirements are justified under Article 9.2 of the R&TTE Directive.~~

### ~~Key to columns:~~

- ~~No~~                    ~~Table entry number;~~
- ~~Reference~~           ~~Subclause reference number of conformance requirement within the present document;~~
- ~~Status~~                ~~Status of the entry as follows:~~
- ~~M~~                    ~~Mandatory, shall be implemented under all circumstances;~~
- ~~⊖~~                    ~~Optional, may be provided, but if provided shall be implemented in accordance with the requirements;~~
- ~~Comments~~           ~~To be completed as required.~~

- b6) The STE shall transmit an enable command.
- b7) A call shall be initiated from the EUT.
- b8) The EUT shall enter the carrier-on state and shall transmit.
- b9) The call shall be terminated at the EUT.

The events from b2) to b9) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

- c) Identification request:
  - c1) Continue from b9).
  - c2) The STE shall transmit an identification request.
  - c3) The EUT shall enter the carrier-on state and shall transmit its identification code.

The STE shall display the identification code sent by the EUT.

### 5.2.3.8 Initial burst transmission

#### 5.2.3.8.1 Test method

- a) The EUT shall be switched-off and the STE shall transmit the CC.
- b) The EUT shall be switched-on.
- c) The EUT shall not transmit, except the initial bursts, if any.
- d) Each initial burst shall not last more than 1 second, and the transmission of the initial bursts shall not exceed 1 % of the time.

The events from b) to d) shall be displayed and verified with the oscilloscope and by measurement of the transmitted signal.

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## ~~Bibliography~~

~~The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information:~~

- EN 55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
- ETS 300 831: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) for Mobile Earth Stations (MES) used within Satellite Personal Communications Networks (S-PCN) operating in the 1,6/2,4 GHz and 2 GHz frequency bands".

## Annex A (normative):

### HS Requirements and conformance Test specifications

#### Table (HS-RTT)

The HS Requirements and conformance Test specifications Table (HS-RTT) in table A 1 serves a number of purposes, as follows:

- it provides a statement of all the requirements in words and by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it provides a statement of all the test procedures corresponding to those requirements by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it qualifies each requirement to be either:
  - Unconditional: meaning that the requirement applies in all circumstances; or
  - Conditional: meaning that the requirement is dependent on the manufacturer having chosen to support optional functionality defined within the schedule.
- in the case of Conditional requirements, it associates the requirement with the particular optional service or functionality;
- it qualifies each test procedure to be either:
  - Essential: meaning that it is included with the Essential Radio Test Suite and therefore the requirement shall be demonstrated to be met in accordance with the referenced procedures;
  - Other: meaning that the test procedure is illustrative but other means of demonstrating compliance with the requirement are permitted.

**Table A 1- HS Requirements and conformance Test specifications Table (HS-RTT)**

<b>Harmonized Standard EN 301 444</b>						
<u>The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&amp;TTE Directive [1]</u>						
<b>Requirement</b>			<b>Requirement Conditionality</b>		<b>Test Specification</b>	
<b>No</b>	<b>Description</b>	<b>Reference Clause No</b>	<b>U/C</b>	<b>Condition</b>	<b>E/O</b>	<b>Reference Clause No</b>
<u>1</u>	<u>Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz and outside the band 1 667,3 MHz to 1 675,7 MHz</u>	<u>4.2.1</u>	<u>U</u>		<u>E</u>	<u>5.2.2</u>
<u>2</u>	<u>Maximum unwanted emissions within the band 1 625,8 MHz to 1 661,2 MHz and within the band 1 667,3 MHz to 1 675,7 MHz</u>	<u>4.2.2</u>	<u>U</u>		<u>E</u>	<u>5.2.2</u>
<u>3</u>	<u>Processor monitoring</u>	<u>4.2.3.2</u>	<u>U</u>		<u>E</u>	<u>5.2.3.3</u>
<u>4</u>	<u>Transmit subsystem monitoring</u>	<u>4.2.3.3</u>	<u>U</u>		<u>E</u>	<u>5.2.3.4</u>
<u>5</u>	<u>Power-on/Reset</u>	<u>4.2.3.4</u>	<u>U</u>		<u>E</u>	<u>5.2.3.5</u>
<u>6</u>	<u>Control Channel reception</u>	<u>4.2.3.5</u>	<u>U</u>		<u>E</u>	<u>5.2.3.6</u>

## ~~History~~

<del>Document history</del>		
<del>V1.1.1</del>	<del>December 1999</del>	<del>One step Approval Procedure      GAP 200017: 1999-12-29 to 2000-04-28</del>
<del>V1.1.1</del>	<del>May 2000</del>	<del>Publication</del>

<b>Harmonized Standard EN 301 444</b>						
<u>The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&amp;TTE Directive [1]</u>						
<b>Requirement</b>			<b>Requirement Conditionality</b>		<b>Test Specification</b>	
<b>No</b>	<b>Description</b>	<b>Reference: Clause No</b>	<b>L/C</b>	<b>Condition</b>	<b>E/O</b>	<b>Reference: Clause No</b>
<u>7</u>	<u>Network control commands</u>	<u>4.2.3.6</u>	<u>U</u>		<u>E</u>	<u>5.2.3.7</u>
<u>8</u>	<u>Initial burst transmission</u>	<u>4.2.3.7</u>	<u>U</u>		<u>E</u>	<u>5.2.3.8</u>
<u>9</u>	<u>Protection of the radio astronomy service operation in the band 1.660 MHz to 1.660.5 MHz and in the band 1.668 MHz to 1.670 MHz</u>	<u>4.2.4</u>	<u>U</u>		<u>E</u>	<u>5.2.3.7</u>

**Key to columns:****Requirement:**

**No** A unique identifier for one row of the table which may be used to identify a requirement or its test specification.

**Description** A textual reference to the requirement.

**Clause Number** Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

**Requirement Conditionality:**

**L/C** Indicates whether the requirement is to be *unconditionally* applicable (U) or is *conditional* upon the manufacturers claimed functionality of the equipment (C).

**Condition** Explains the conditions when the requirement shall or shall not be applicable for a technical requirement which is classified "conditional".

**Test Specification:**

**E/O** Indicates whether the test specification forms part of the Essential Radio Test Suite (E) or whether it is one of the Other Test Suite (O).

**NOTE:** All tests whether "E" or "O" are relevant to the requirements. Rows designated "E" collectively make up the Essential Radio Test Suite; those designated "O" make up the Other Test Suite; for those designated "X" there is no test specified corresponding to the requirement. The completion of all tests classified "E" as specified with satisfactory outcomes is a necessary condition for a presumption of conformity. Compliance with requirements associated with tests classified "O" or "X" is a necessary condition for presumption of conformity, although conformance with the requirement may be claimed by an equivalent test or by manufacturer's assertion supported by appropriate entries in the technical construction file.

**Clause Number** Identification of clause(s) defining the test specification in the present document unless another document is referenced explicitly. Where no test is specified (that is, where the previous field is "X") this field remains blank.





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## Annex B (informative): The EN title in the official languages

The enlargement of the European Union (EU) resulted in a requirement from the EU for a larger number of languages for the translation of the titles of Harmonized Standards and mandated ENs that are to be listed in the Official Journal to support the implementation of this legislation.

For this reason the title translation concerning the present document can be consulted via the [e-approval](#) application.



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## Annex C (informative): Bibliography

- CENELEC EN 55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
- ETSI ETS 300 831: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) for Mobile Earth Stations (MES) used within Satellite Personal Communications Networks (S-PCN) operating in the 1,6/2,4 GHz and 2 GHz frequency bands".
- ETSI ETS 300 423: "Satellite Earth Stations and Systems (SES); Land Mobile Earth Stations (LMES) operating in the 1,5/1,6 GHz bands providing voice and/or data communications".



## History

<b>Document history</b>		
<a href="#">V1.1.1</a>	<a href="#">May 2000</a>	<a href="#">Publication</a>
<a href="#">V1.2.0</a>	<a href="#">February 2011</a>	<a href="#">Public Enquiry</a> <a href="#">PE 20110628:</a> <a href="#">2011-02-28 to 2011-06-28</a>
<a href="#">V1.2.0</a>	<a href="#">November 2011</a>	<a href="#">Vote</a> <a href="#">V 20120124:</a> <a href="#">2011-11-25 to 2012-01-24</a>
<a href="#">V1.2.1</a>	<a href="#">January 2012</a>	<a href="#">Publication</a>