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## Foreword

This Harmonized European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been produced by ETSI in response to mandate M/405 issued from the European Commission under Directive 98/34/EC [i.4] as amended by Directive 98/48/EC [i.3].

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 [i.2].

The requirements relevant to Directive 1999/5/EC [i.2] are summarized in annex A.

The present document is part 3 of a multi-part deliverable covering VHF air-ground Digital Link (VDL) Mode 2; Technical characteristics and methods of measurement for ground-based equipment, as identified below:

Part 1: "Physical layer and MAC sub-layer";

Part 2: "Upper layers";

**Part 3: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".**

### National transposition dates

Date of adoption of this EN:	21 April 2015
Date of latest announcement of this EN (doa):	31 July 2015
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2016
Date of withdrawal of any conflicting National Standard (dow):	31 January 2016

## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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# 1 Scope

The present document applies to VDL Mode 2 ground-air digital communications using Differential Eight Phase Shift Keying (D8PSK), intended for channel increments of 25 kHz. The VDL Mode 2 system provides data communication exchanges between aircraft and ground-based systems, operating in the VHF band (117,975 MHz to 137,000 MHz). The scope of the present document is limited to ground based stations.

NOTE 1: The VDL Mode 2 can be used as an Air/Ground sub-network of the Aeronautical Telecommunication Network (ATN) using a band with AM(R)S spectrum allocation.

The present document is intended to cover the provisions of Directive 1999/5/EC [i.2] (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 may apply to equipment within the scope of the present document.

NOTE 2: A list of such ENs is included on the web site <http://www.newapproach.org>.

Compliance with relevant aviation regulations may also be required before equipment within the scope of the present document can enter into service.

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## 2 References

### 2.1 Normative 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 referenced 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.

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

- [1] ETSI EN 301 841-1 (V1.4.1) (04-2015): "VHF air-ground Digital Link (VDL) Mode 2; Technical characteristics and methods of measurement for ground-based equipment; Part 1: Physical layer and MAC sub-layer".

### 2.2 Informative 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 referenced document (including any amendments) applies.

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

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] ETSI TR 100 028 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

- [i.3] 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.
- [i.4] 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.

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [i.2] and the following apply:

**adjacent channel power:** amount of the modulated RF signal power transmitted outside of the assigned channel

NOTE: Adjacent channel power includes discrete spurious, signal sidebands, and noise density (including phase noise) at the transmitter output.

**adjacent channel rejection:** receiver's ability to demodulate the desired signal and meet the uncorrected BER requirement in the presence of an interfering signal in an adjacent channel

NOTE: The ratio (in dB) between the adjacent interfering signal level and the desired signal level necessary to achieve the specified minimum uncorrected BER, is the Adjacent Channel Rejection (ACR) ratio.

**Aeronautical Mobile Service (AMS):** mobile service between ground based stations and airborne stations, or between aircraft stations, in which survival craft stations may participate

**average transmitter output power:** average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long, compared with the lowest frequency encountered in the modulation, taken under normal operating conditions

**Bit Error Rate (BER):** ratio between the number of erroneous bits received and the total number of bits received

NOTE: The uncorrected BER represents the BER without the benefit of Forward Error Correction (FEC).

**Co-Channel Interference (CCI):** capability of a receiver to demodulate the desired signal and achieve the minimum specified BER performance in the presence of an unwanted signal at the same assigned channel

NOTE: The ratio (in dB) between the wanted signal level and the unwanted signal level is the co-channel interference ratio.

**conducted measurements:** measurements which are made using a direct RF connection to the equipment under test

**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

**ground based station:** aeronautical station equipment, in the Aeronautical Mobile Service (AMS), for use with an external antenna and intended for use at a fixed location

**radiated measurements:** measurements which involve the measurement of a radiated field

**spurious emissions:** conducted RF emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE: Spurious emissions include parasitic emissions, intermodulation products and frequency conversion products.

**X 25:** ITU-T standard for the protocols and message formats that define the interface between a terminal and a packet switching network



## 3.2 Abbreviations

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

ACR	Adjacent Channel Rejection
AM	Amplitude Modulation
AM(R)S	Aeronautical Mobile (Route) Service
AMS	Aeronautical Mobile Service
ATN	Aeronautical Telecommunication Network
BER	Bit Error Rate
CCI	Co-Channel Interference
D8PSK	Differential Eight Phase Shift Keying
DSB	Double Side Band
FEC	Forward Error Correction
MAC	Medium Access Control
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
TX	Transmission
VDL	VHF Data Link
VHF	Very High Frequency

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## 4 Technical requirements 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 supplier. 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.

### 4.2 Conformance requirements

#### 4.2.1 Transmitter requirements

##### 4.2.1.1 Frequency error

###### 4.2.1.1.1 Requirement

Requirement for frequency tolerance is specified in ETSI EN 301 841-1 [1], clause 6.1.1.

###### 4.2.1.1.2 Conformance

Conformance tests as defined in clause 5.3.1.1 shall be carried out with the limits defined by clause 4.2.1.1.1.

##### 4.2.1.2 Manufacturer's declared output power

###### 4.2.1.2.1 Requirement

Requirement for manufacturer's declared output power is specified in ETSI EN 301 841-1 [1], clause 6.1.2.

###### 4.2.1.2.2 Conformance

Conformance tests as defined in clause 5.3.1.2 shall be carried out with the limits defined by clause 4.2.1.2.1.

##### 4.2.1.3 Adjacent channel power

###### 4.2.1.3.1 Requirement

Requirement for adjacent channel power is specified in ETSI EN 301 841-1 [1], clause 6.1.3.



#### 4.2.1.3.2 Conformance

Conformance tests as defined in clause 5.3.1.3 shall be carried out with the limits defined by clause 4.2.1.3.1.

#### 4.2.1.4 Conducted spurious emissions

##### 4.2.1.4.1 Requirement

Requirement for conducted spurious emissions is specified in ETSI EN 301 841-1 [1], clause 6.1.4.

##### 4.2.1.4.2 Conformance

Conformance tests as defined in clause 5.3.1.4 shall be carried out with the limits defined by clause 4.2.1.4.1.

#### 4.2.1.5 Cabinet radiation

##### 4.2.1.5.1 Requirement

Requirement for cabinet radiation is specified in ETSI EN 301 841-1 [1], clause 6.1.5

##### 4.2.1.5.2 Conformance

Conformance tests as defined in clause 5.3.1.5 shall be carried out with the limits defined by clause 4.2.1.5.1.

#### 4.2.1.6 Void

#### 4.2.1.7 Intermodulation attenuation

##### 4.2.1.7.1 Requirements

Requirement for Inter-modulation attenuation is specified in ETSI EN 301 841-1 [1], clause 6.1.7.

If the intended use of the base station equipment is not in the special service conditions class as described in that clause, this has to be stated clearly in the user manual and/or in the installation manual.

NOTE: The required class (general - or special service conditions) depends on the local situation and regulatory frequency assignment.

##### 4.2.1.7.2 Conformance

Conformance tests as defined in clause 5.3.1.7 shall be carried out with the limits defined by clause 4.2.1.7.1.

#### 4.2.1.8 Void

#### 4.2.1.9 RF power release time

##### 4.2.1.9.1 Requirement

Requirement for RF power release time is specified in ETSI EN 301 841-1 [1], clause 6.1.9.

##### 4.2.1.9.2 Conformance

Conformance tests as defined in clause 5.3.1.8 shall be carried out with the limits defined by clause 4.2.1.8.1.

#### 4.2.1.10 Transient behaviour of the transmitter

##### 4.2.1.10.1 Receiver to transmitter turn-around time

###### 4.2.1.10.1.1 Requirement

Requirement for receiver to transmitter turn-around is specified in ETSI EN 301 841-1 [1], clause 6.1.10.1.

###### 4.2.1.10.1.2 Conformance

Conformance tests as defined in clause 5.3.1.10.1 shall be carried out with the limits defined by clause 4.2.1.10.1.1.