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VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 3: Additional broadcast aspects

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**VHF air-ground Digital Link (VDL) Mode 4 radio equipment;  
Technical characteristics and methods of measurement  
for ground-based equipment;  
Part 3: Additional broadcast aspects**

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## Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Aeronautics (AERO).

The present document is part 3 of a multi-part deliverable covering the VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment, as identified below:

- Part 1: "EN for ground equipment";
- Part 2: "General description and data link layer";
- Part 3: "Additional broadcast aspects";**
- Part 4: "Point-to-point functions";
- Part 5: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

The present document is accompanied by an equivalent airborne standard, ETSI EN 302 842 parts 1-4 [i.4], covering the VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for airborne equipment.

<b>National transposition dates</b>	
Date of adoption of this EN:	6 April 2015
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## 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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## Introduction

The present document states the technical specifications for Very High Frequency (VHF) Digital Link (VDL) Mode 4 ground-based radio transmitters, transceivers and receivers for air-ground communications operating in the VHF band, using Gaussian-filtered Frequency Shift Keying (GFSK) Modulation with 25 kHz channel spacing and capable of tuning to any of the 25 kHz channels from 112,000 MHz to 136,975 MHz as defined in ICAO VHF Digital Link (VDL) Standards and Recommended Practices (SARPs) [1].

The present document considers the additional broadcast functionality required to support ADS-B, TIS-B, FIS-B, and GNS-B services.

The present document may be used to produce tests for the assessment of the performance of the equipment.



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# 1 Scope

The present document applies to the following radio equipment types:

- Very High Frequency (VHF) Digital Link (VDL) Mode 4 ground-based radio transmitters and receivers for air-ground communications operating in the VHF band, using Gaussian-filtered Frequency Shift Keying (GFSK) Modulation with 25 kHz channel spacing and capable of tuning to any of the 25 kHz channels from 112,000 MHz to 136,975 MHz as defined in ICAO VHF Digital Link (VDL) Standards and Recommended Practices (SARPs) [1].

The present document provides part 3 of the technical specifications.

The present document is designed to ensure that equipment certified to it will be compatible with the relevant ICAO VHF Digital Link (VDL) Standards and Recommended Practices (SARPs) [1] and VDL Mode 4 Technical Manual (TM) [i.1].

Manufacturers should note that in future the tuning range for the ground transceivers may also cover any 25 kHz channel from 108,000 MHz to 111,975 MHz.

The scope of the present document is limited to ground stations. The equivalent specification for airborne stations is ETSI EN 302 842 [i.4].

A description of the scope of the VDL Mode 4 system is provided in ETSI EN 301 842-2 [3], clause 1.

ETSI EN 301 842-1 [2] deals with tests of the physical layer. ETSI EN 301 842-2 [3] deals with tests of the link layer sufficient to support broadcast functionality including requirements and tests sufficient to recognize and respond to transmissions associated with point-to-point communication. The present document provides technical specifications for a VDL Mode 4 ground-based transceiver supporting a full Automatic Dependent Surveillance-Broadcast (ADS-B) capability and, optionally, the additional functionality of either, or a combination of, the following services:

- Traffic Information Service-Broadcast (TIS-B);
- Flight Information Service-Broadcast (FIS-B);
- GNSS Augmentation Service-Broadcast (GNS-B).

The TIS-B, FIS-B or GNS-B functionality in the ground-based equipment is expected to be provided by a TIS-B, FIS-B or GNS-B processor, which could be contained within the VDL Mode 4 transceiver, but could also be housed in a separate physical unit. Therefore to support TIS-B, FIS-B or GNS-B, the minimum functionality demanded of a basic VDL Mode 4 ground-based transceiver unit (i.e. one that does not have a TIS-B, FIS-B or GNS-B processor housed within it) is to receive, from the TIS-B, FIS-B or GNS-B processor, all messages to be transmitted, and to transmit them. In the case of FIS-B there is an additional requirement to receive report request messages (from other VDL4 stations) and to pass those messages to the FIS-B processor.

It should be noted that the specifications for TIS-B, FIS-B and GNS-B in the present document represent a first step towards defining these applications, based on the work carried out as part of the NUP and MEDUP Programmes, and changes to the specifications for these services may therefore occur in the future.

The present document is organized as follows:

- clause 2 provides references to relevant documents;
- clause 3 provides general definitions, abbreviations and symbols used;
- clause 4 describes the VDL Mode 4 ground station functionality to support ADS-B, TIS-B, FIS-B and GNS B;
- clause 5 provides performance specifications for the VDL Mode 4 ground station supporting ADS-B, TIS-B, FIS-B and GNS-B Services;
- clause 6 provides general design requirements;
- clause 7 provides protocol tests which emphasis the ADS-B, TIS-B, FIS-B and GNS-B functions of the system;

- annex A provides a detailed cross-reference to the relevant requirements contained in [i.1].

Note that the system can support a very wide range of functions. It is not practical to provide specific tests for all aspects of functionality. The approach used is to provide detailed tests for the core functionality to support ADS-B, FIS B, TIS-B and GNS-B focusing on the system requirements which, if wrongly implemented, could cause a deterioration in the service offered by other VDL Mode 4 stations.

#### Mandating and Recommendation Phrases

- a) "Shall":

the use of the word "Shall" indicates a mandated criterion; i.e. compliance with the particular procedure or specification is mandatory and no alternative may be applied.

- b) "Should":

the use of the word "Should" (and phrases such as "It is recommended that...", etc.) indicates that though the procedure or criterion is regarded as the preferred option, alternative procedures, specifications or criteria may be applied, provided that the manufacturer, installer or tester can provide information or data to adequately support and justify the alternative.

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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.

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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] ICAO Annex 10 to the Convention on International Civil Aviation: "Aeronautical Telecommunications, Volume III: Communication Systems, Part I: Digital Data Communication Systems, chapter 6", including Amendment 88 (applicable 14/11/13).
- [2] ETSI EN 301 842-1 (V1.4.1): "VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 1: EN for ground equipment".
- [3] ETSI EN 301 842-2 (V1.7.1): "VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 2: General description and data link layer".
- [4] ETSI EN 301 842-4 (V1.3.1): "VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 4: Point-to-point functions".
- [5] EUROCAE ED-114A (March 2013): "MOPS for Global Navigation Satellite Ground Based Augmentation System Ground Equipment to Support Category I Operations".
- [6] Amendments 76 and 77 to Volume I of Annex 10 to the Convention on International Civil Aviation, International Civil Aviation Organization: appendix B-B2, 3.6 Ground-Based Augmentation System (GBAS).

## 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.

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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] ICAO Doc 9816 AN/448 (First Edition 2004): "Manual on VHF Digital Link (VDL) Mode 4, Part 2: Detailed Technical Specifications".
- [i.2] RTCA DO-242A: "Minimum Aviation System Performance Standards for Automatic Dependent Surveillance Broadcast (ADS-B)".
- [i.3] WMO Publication No. 306: "Manual on Codes Vol 1.1, Part A".
- [i.4] ETSI EN 302 842 (all parts): "VHF air-ground and air-air Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for aeronautical mobile (airborne) equipment".
- [i.5] North European ADS-B Network Update Programme: "FIS-B Service Description" V1.5.1, 10<sup>th</sup> October 2003.
- [i.6] North European ADS-B Network Update Programme: "TIS-B Service Description" V1.33, 11<sup>th</sup> February 2003.
- [i.7] North European ADS-B Network Update Programme: "GRAS Service Description" V1.2, 19<sup>th</sup> November 2003.
- [i.8] EUROCAE ED-108A: "MOPS for VDL Mode 4 Aircraft Transceiver for ADS-B".

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