

Unofficial Translation

Notification of the National Telecommunications Commission

On Technical Standards for Telecommunication Equipment

**Re: Radiocommunication Equipment Used in Aeronautical Mobile Service in the VHF Band
for Data Communication in the VHF Air-Ground Digital Link (VDL) System**

Whereas it is deemed appropriate to prescribe technical standards for radiocommunication equipment used in aeronautical mobile service in the VHF band for data communication in the VHF Air-Ground Digital Link (VDL) system to keep pace with the advancement of radiocommunication technologies and comply with the radio regulations of the International Telecommunication Union, which are the international principles under which Thailand, as a member country, shall be obliged and follow to prevent frequency interference among businesses, and hence respond to efficient use of radio frequencies, as well as to protect the safety of life and properties used for the aviation in accordance with the criteria and regulations of the International Civil Aviation Organization (ICAO);

Pursuant to Section 51 (6) and Section 78, paragraph one, of the Act on Organization to Assign Radio Frequency and to Regulate the Broadcasting and Telecommunication Services, B.E. 2543 (2000) which contains certain provisions regarding the restriction of the rights and freedom of an individual as permitted to be done under the law by Article 29, in conjunction with Article 35, Article 36, Article 43, Article 45, Article 46, Article 47, Article 61 and Article 64 of the Constitution of the Kingdom of Thailand; and pursuant to Section 32 of the Telecommunications Business Act B.E. 2544 (2001) which contains certain provisions regarding the restriction of the rights and freedom of an individual as permitted to be done under the law by Article 29, in conjunction with Article 35, Article 36, Article 41, Article 43 and Article 45 of the Constitution of the Kingdom of Thailand; together with Section 29 (4) of the Radiocommunications Act B.E. 2498 (1955) which contains certain provisions regarding the restriction of the rights and freedom of an individual as permitted to be done under the law by Article 29, in conjunction with Article 35, Article 36, Article 41, Article 43, Article 45, Article 46, Article 47 and Article 61 of the Constitution of the Kingdom of Thailand; the National Telecommunications Commission hereby specifies the Technical Standards for Telecommunication Equipment Re: Radiocommunication Equipment Used in Aeronautical Mobile Service in the VHF Band for Data Communication in the VHF Air-Ground Digital Link (VDL) System, as detailed in the Technical Standard No. NTC TS 1023-2552 appended hereto.

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This Notification shall come into force as from the day following the date of its publication in the Government Gazette.

Announced on the 8th day of December B.E. 2552 (2009)

General Choochart Promphasid

Chairman of the National Telecommunications Commission

This English version is prepared by International Organizations Bureau with the sole purpose of facilitating the comprehension of foreign participants in the telecommunication rules and regulations and shall not in any event be construed or interpreted as having effect in substitution for or supplementary to the Thai version thereof.

Please note that the translation has not been subjected to an official review by the Office of the National Telecommunications Commission. The Office of NTC, accordingly, cannot undertake any responsibility for its accuracy, nor be held liable for any loss or damages arising out of or in connection with its use.

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TECHNICAL STANDARDS FOR TELECOMMUNICATION EQUIPMENT

NTC TS 1023-2552

Radiocommunication Equipment Used in Aeronautical Mobile Service in the VHF Band for Data Communication In the VHF Air-Ground Digital Link (VDL) System

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Technical Standards for Telecommunication Equipment
NTC TS 1023-2552
Radiocommunication Equipment Used in Aeronautical Mobile Service
In the VHF Air-Ground Digital Link (VDL) System

Table of Contents

	Page
1. Scope	1
2. Requirements for Transmitter	1
2.1 Output power	1
2.2 Frequency error	1
2.3 Conducted spurious emissions	2
2.4 Adjacent channel power	3
3. Requirements for Receiver	3
3.1 Sensitivity	3
3.2 Adjacent channel rejection	3
4. Safety Requirements	4
4.1 Electrical safety requirements	4
4.2 Radiation exposure requirements	4
5. Methods of Measurement	4
5.1 Transmitter	4
5.2 Receiver	5
6. Conformity with the Standard	6
References	7

Technical Standards for Telecommunication Equipment

NTC TS 1023-2552

Radiocommunication Equipment Used in Aeronautical Mobile Service

In the VHF Air-Ground Digital Link (VDL) System

1. Scope

This technical standard specifies the minimum technical characteristics for radiocommunication equipment used in the aeronautical mobile services in the VHF frequency band using the VHF Air-Ground Digital Link (VDL) system in the frequency range of 117.975 – 137.000 MHz with channel spacing of 25.0 kHz. Such equipment is used as ground-based aeronautical station with communication made in digital link by the Differential Eight Phase Shift Keying (D8PSK) modulation for VDL Mode 2 and/or by the Gaussian Filtered Frequency Shift Keying (GFSK) modulation for VDL Mode 4 according to the regulations of ICAO Annex 10 [1].

2. Requirements for Transmitter

2.1 Output power

Definition **Output power** is the output power of the equipment as declared by the manufacturer in its technical documents. It is the mean power delivered to the artificial antenna in the presence of modulation. The measured output power must not exceed ± 1 dB of the specified output power.

Limit The output power for VDL Mode 2 and VDL Mode 4 shall not exceed 50 watts.

2.2 Frequency error

Definition **Frequency error** is the difference between the measured carrier frequency in the absence of modulation and the selected frequency of the transmitter.

Limit The frequency error for VDL Mode 2 and VDL Mode 4 shall not exceed ± 2 ppm (part per million).

Technical Standards for Telecommunication Equipment

NTC TS 1023-2552

Radiocommunication Equipment Used in Aeronautical Mobile Service

In the VHF Air-Ground Digital Link (VDL) System

2.3 Conducted spurious emissions

Definition **Conducted spurious emissions** are emissions at the antenna connector 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. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products, but exclude out-of-band emissions.

Limit When the transmitter is in an active or standby status and connected to an artificial antenna as appropriate, the power levels of the conducted spurious emissions for VDL Mode 2 and VDL Mode 4 shall not exceed the values given in the table below:

Frequency	Power of conducted spurious emissions		Reference bandwidth (B)
	Standby	Active	
9 kHz – 150 kHz	- 57 dBm (2 nW)	-36 dBm	B = 1 kHz
> 150 kHz – 1GHz	- 57 dBm (2 nW)	-36 dBm for harmonic emissions -46 dBm for non-harmonic spurious emissions	B = 10 kHz ¹
> 1 GHz – 4 GHz	- 47 dBm (20 nW)	-30 dBm for harmonic emissions -40 dBm for non-harmonic spurious emissions	B = 10 kHz

Note

1. The power of conducted spurious emissions outside the frequency band of ± 1 MHz from the carrier power in the active status.

Technical Standards for Telecommunication Equipment

NTC TS 1023-2552

Radiocommunication Equipment Used in Aeronautical Mobile Service

In the VHF Air-Ground Digital Link (VDL) System

2.4 Adjacent channel power

Definition **Adjacent channel power** is the modulated radio signal power delivered outside the specified channel, including discrete spurious emissions, signal sidebands, and noise density (including phase noise) of the transmitter.

Limit The adjacent channel power levels for VDL Mode 2 and VDL Mode 4 shall not exceed the values given in the table below:

Bandwidth	VDL Mode	Adjacent channel	Channel power (dBm)
16 kHz	2 and 4	1	-18
25 kHz	4	1	2
25 kHz	2 and 4	2	-28
25 kHz	2 and 4	4	-38

3. Requirements for Receiver

3.1 Sensitivity

Definition **Sensitivity** is the modulated maximum level of receiver input signal that will result in an uncorrected Bit Error Rate (BER) being better than or equal to 10^{-3} for VDL Mode 2, and being better than or equal to 10^{-4} for VDL Mode 4.

Limit The sensitivity of VDL Mode 2 and VDL Mode 2 shall not exceed -98 dBm.

3.2 Adjacent channel rejection

Definition **Adjacent channel rejection** is the capability of a receiver to receive a wanted modulated signal. The ratio of the adjacent channel interference to the wanted signal will lead to the minimum uncorrected BER.

Limit The adjacent channel rejection shall be equal to or higher than the values given below:

-3

VDL Mode 2: 44 dB at BER 10^{-3}

-4

VDL Mode 4: 32 dB at BER 10^{-4}

Technical Standards for Telecommunication Equipment
NTC TS 1023-2552
Radiocommunication Equipment Used in Aeronautical Mobile Service
In the VHF Air-Ground Digital Link (VDL) System

4. Safety requirements

4.1 Electrical safety requirements

The electrical safety requirements for radiocommunication equipment used in aeronautical mobile service in the VHF frequency band for data communication in the VHF Air-Ground Digital Link (VDL) system shall comply with one or more of the following standards:

4.1.1 IEC 60950-1 : Information Technology Equipment – Safety – Part 1:
General requirements

4.1.2 TIS 1561—2548: Information Technology Equipment - Safety: General
Requirements

4.2 Radiation exposure requirements

The installation of radiocommunication stations and the use of radiocommunication equipment in aeronautical mobile service in the VHF frequency band for data communication in the VHF Air-Ground Digital Link (VDL) system shall comply with the safety standard for the use of radiocommunication equipment on human health and safety criteria and measures for the use of radiocommunication equipment on human health prescribed by the National Telecommunications Commission.

5. Methods of Measurement

5.1 Transmitter

5.1.1 Output power

VDL Mode 2 : The measurement method shall follow ETSI EN 301 841-1 [2], or any other equivalent method.

VDL Mode 4 : The measurement method shall follow ETSI EN 301 842-1 [3], or any other equivalent method.

Technical Standards for Telecommunication Equipment

NTC TS 1023-2552

Radiocommunication Equipment Used in Aeronautical Mobile Service

In the VHF Air-Ground Digital Link (VDL) System

5.1.2 Frequency error

VDL Mode 2 : The measurement method shall follow ETSI EN 301 841-1, or any other equivalent method.

VDL Mode 4 : The measurement method shall follow ETSI EN 301 842-1, or any other equivalent method.

5.1.3 Conducted spurious emissions

VDL Mode 2 : The measurement method shall follow ETSI EN 301 841-1, or any other equivalent method.

VDL Mode 4 : The measurement method shall follow ETSI EN 301 842-1, or any other equivalent method.

5.1.4 Adjacent channel power

VDL Mode 2 : The measurement method shall follow ETSI EN 301 841-1, or any other equivalent method.

VDL Mode 4 : The measurement method shall follow ETSI EN 301 842-1, or any other equivalent method.

5.2 Receiver

5.2.1 Sensitivity

VDL Mode 2 : The measurement method shall follow ETSI EN 301 841-1, or any other equivalent method.

VDL Mode 4 : The measurement method shall follow ETSI EN 301 842-1, or any other equivalent method.

5.2.2 Adjacent channel rejection

VDL Mode 2 : The measurement method shall follow ETSI EN 301 841-1, or any other equivalent method.

VDL Mode 4 : The measurement method shall follow ETSI EN 301 842-1, or any other equivalent method.

Technical Standards for Telecommunication Equipment

NTC TS 1023-2552

Radiocommunication Equipment Used in Aeronautical Mobile Service

In the VHF Air-Ground Digital Link (VDL) System

6. Conformity with the Standard

The radiocommunication equipment used in aeronautical mobile service in the VHF frequency band for data communication in the VHF Air-Ground Digital Link (VDL) system shall present its conformity with this Standard. It shall be regarded as telecommunication equipment Type B prescribed in the Notification of the National Telecommunications Commission Re: Conformity Assessment of Telecommunication Equipment.

Technical Standards for Telecommunication Equipment
NTC TS 1023-2552
Radiocommunication Equipment Used in Aeronautical Mobile Service
In the VHF Air-Ground Digital Link (VDL) System

References

- [1] Annex 10 to the Convention on International Civil Aviation: "Aeronautical Telecommunications", Volume III Communication Systems.
 - [2] ETSI EN 301 841-1 V1.2.1 (2003-08) : Electromagnetic compatibility and Radio spectrum Matters (ERM); 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
 - [3] ETSI EN 301 842-1 V1.3.1 (2006-11) : Electromagnetic compatibility and Radio spectrum Matters (ERM); 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
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