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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 43941.1-2024

**Technical requirements and test methods for intermediate and
high-speed modulators and demodulators in satellite
communications - Part 1**

星地数据传输中高速调制解调器技术要求和测试方法 第1部分:调制器

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Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document is part 1 of GB/T 43941 "Technical requirements and test methods for high-speed modems in satellite-to-earth data transmission": GB/T 43941 has published the following parts:

--- Part 1: Modulator;

--- Part 2: Demodulator: Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the responsibility for identifying patents: This document was proposed and coordinated by the National Technical Committee for Standardization of Aerospace Technology and Its Applications (SAC/TC425): This document was drafted by: China Electronics Technology Group Corporation's 10th Research Institute, China Aerospace Standardization Institute, National Satellite Ocean Application Center, Xi'an Space Radio Technology Research Institute, Shenzhen Magic Cube Satellite Technology Co., Ltd., and Nanjing Kongwei Communication Technology Co., Ltd: The main drafters of this document are: Zhang Bo, Fang Ke, Liu Tian, Wang Yuzhou, Xu Changzhi, Wu Kuiqiao, Lu Ouxin, Ni Yan, Lv Qian, Zhou Yuxia, Zheng Lei, Zhu Shengli, Liu Ming, Chen Jun, Luo Lijuan, Dong Limei, Bao Ling, Lai Haiguang:

High-speed modulators and demodulators in satellite-to-ground data transmission are used to realize wireless data transmission between satellites, space stations, probes and other spacecraft and the ground: It is a key equipment widely used in satellite-to-ground data transmission systems such as earth observation, manned space flight, relay satellites, and commercial space flight: The controller can generate different types of medium and high

speed digital transmission signals in real time, and the medium and high speed demodulator can receive different types of medium and high speed digital transmission signals in real time: GB/T 43941 "Technical requirements and test methods for high-speed modems in satellite-to-earth data transmission" is intended to consist of two parts:

--- Part 1: Modulator: The purpose is to specify the functional composition, performance requirements, interface requirements of high-speed modulators in satellite-to-earth data transmission: Sum test method:

--- Part 2: Demodulator: The purpose is to specify the functional composition, performance requirements, interface requirements, and other requirements of high-speed demodulators in satellite-to-earth data transmission: Sum test method: The above two parts together constitute the standard system of technical requirements and test methods for high-speed modems in satellite-to-earth data transmission: High-speed modem for satellite-to-ground data transmission Technical requirements and test methods Part 1: Modulators

1 Scope

Part 1 of China's national technical requirements and test methods for the intermediate and high speed modems used in satellite communications. The modem is where a satellite link's performance is determined. Everything else - the antenna, the amplifier, the transponder - contributes power and bandwidth, and the modem decides how many bits per second are extracted from them. The margin available is small and expensive: satellite bandwidth is leased by the megahertz, and the difference between a modem that achieves close to the theoretical limit and one that does not is directly a difference in the transponder capacity required. That is why modern satellite modems use the coded modulation schemes that approach the Shannon bound, with adaptive rates that track the fading caused by rain. Specifying and testing them means fixing how bit error rate against signal to noise ratio is measured, which is the figure that everything else reduces to.

This document specifies the functional composition, performance requirements, interface requirements and test methods of high-speed modulators in satellite-to-earth data transmission: This document is applicable to data transmission rates between satellites, space stations, probes and other spacecraft and the ground at a rate between 5Mb/s and 4800Mb/s: Design and test of medium and high speed modulator (hereinafter referred to as "modulator"):

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This

document:

GB/T 39348-2020 Telemetry synchronization and channel coding for space data and information transmission systems

GB/T 42041 Aerospace terminology Space data and information transmission GY/T 338-2020 Digital TV satellite transmission channel coding and modulation specifications

3 Terms and definitions

The terms and definitions defined in GB/T 42041 and the following apply to this document:
3:

1 Intermediate/high-speed The satellite-to-ground data transmission rate is between 5Mb/s and 4800Mb/s: 3:

2 Modulator An electronic device deployed on a spacecraft or ground station to modulate digital signals into intermediate frequency/radio frequency analog signals: 3:

3 Demodulator An electronic device deployed on spacecraft or ground stations to convert intermediate frequency/radio frequency analog signals into digital signals: 3:

4 Symbol rate symbolrate The number of symbols generated or transmitted per unit time:
3:5 bit rate The number of bits generated or transmitted per unit time:

Note: The number of bits refers to the total number of IQ bits after encoding and adding frame synchronization words: 3:

6 Data Framing The process of adding frame synchronization words to transmitted data: