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**Performance requirements and test methods for the navigation
module of the SAR/BDS return link service**

北斗国际搜救返向链路导航模块性能要求及测试方法

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the Equipment Development Department of the Central Military Commission. This document is under the jurisdiction of the National BeiDou Satellite Navigation Standardization Technical Committee (SAC/TC544). This document was drafted by: China Satellite Navigation Engineering Center, China Electronics Technology Group Corporation (Ningbo) Marine Electronics Research Institute Co., Ltd., and China Transport Telecommunications. Information Center, the 20th Research Institute of China Electronics Technology Group Corporation, and Beijing Oriental Measurement and Testing Institute. The main drafters of this document are: Li Gang, He Zehua, Yang Xiaoheng, Yang Congxi, Liu Lijiao, Guo Shuren, Yang Wenhui, Gao Weiguang, Lu Yun, and Su Chenggeng. Lu Hongyang, Gao Ya, Xu Lili, Wang Tian, Chen Ying, Chen Liang, Chen Zhengkun. BeiDou International Search and Rescue Return Link Navigation Module Performance

Requirements and Test Methods

1.Scope This document specifies the technical requirements for the composition, function, performance, and interfaces of the BeiDou international search and rescue return link navigation module, and describes the corresponding... Test method. This document applies to the design, development, production, and testing of the BeiDou international search and rescue return link navigation module.

4 Technical Requirements

4.1 Composition This module is generally used to support the 406MHz beacon in the BeiDou return link. The module mainly consists of an RF signal processing unit and a baseband processing unit. It consists of functional units such as the Beidou satellite navigation information processing unit, the Beidou RLM processing unit, and the data output interface unit, and can be externally connected to... The active or passive antenna operates, and the module composition is shown in Figure 1.

4.2 Functional Requirements

4.2.1 Positioning The module should support the reception and positioning calculation of BeiDou satellite navigation signals and have the ability to output positioning results.

4.2.2 RLM Reception and Output The module should support the reception of BeiDou satellite navigation B2b signals and comply with Chapter 6 of GB/T 39414.5 and GB/T 47423-2026. The requirement is to parse, process, and output the RLM messages in the B2b signals of BeiDou MEO and IGSO satellites.

4.3.1 Satellite navigation signal reception and processing

4.3.1.1 Capture Sensitivity The acquisition sensitivity level should not exceed -133 dBm. The acquisition sensitivity of other satellite navigation signals should comply with relevant standards or technologies. Standard requirements.

4.3.1.2 Tracking Sensitivity The tracking sensitivity level should not exceed -133 dBm. The tracking sensitivity of other satellite navigation signals should comply with relevant standards or technologies. Standard requirements.

4.3.1.3 Positioning Accuracy The positioning accuracy should be better than 10m. The positioning accuracy of other satellite navigation signals should meet the requirements of relevant standards or technical specifications.

4.3.1.4 Cold start positioning time The cold start positioning time should not exceed 60 seconds.

4.3.1.5 Loss-of-lock recapture time The recapture time after loss of lock should not exceed 5 seconds.

4.3.2 Return Link Spatial Signal Reception and Processing

4.3.2.1 B2b signal receiving sensitivity Without considering antenna gain and with a bit error rate not exceeding $1e-5$, the B2b signal receiving sensitivity level should not exceed -135dBm.

4.3.2.2 Number of B2b signal tracking channels The module should have at least 12 channels capable of simultaneously tracking B2b signals from both BeiDou MEO and IGSO satellites.

4.3.2.3 BeiDou RLM Output Statement Response Time After receiving the BeiDou RLM message, the module should output an RLM statement that meets the requirements of 4.4.3, and the response time should not exceed 2 seconds.

4.4 Interface Requirements

4.4.1 General Requirements The module should provide at least the following interfaces.

- a) Radio frequency interface, supporting the connection of active or passive antennas;
- b) Data interface. The module shall provide at least one output interface compliant with IEC 61162-1:2024 requirements, supporting asynchronous serial communication. Output statements for navigation information and return link messages;
- c) Power interface, compatible with 3.3V~5V power supply voltage.

4.4.2 Navigation Information Statements The navigation information output by the module should include at least GPS Fixed Data (GGA) language conforming to Chapter 7 of IEC 61162-1:2024. One of the following. GNSS Fixed Data (GNS) statement, or Recommended Minimal Specific GNSS Data (RMC) statement.

4.4.3 BeiDou RLM Output Statements The BeiDou RLM output statement from the module should include the beacon ID, reception time, message type, and message content. Among these, the beacon ID and message type... The data type and message content are received from the satellite. The format of the output statement and the field definitions and descriptions are shown in Figure 2 and Table 1, respectively.

4.5 Environmental adaptability requirements

4.5.1 Operating Temperature The module should be able to operate normally in an ambient temperature range of -20°C to 55°C.

4.5.2 Vibration The module should be able to withstand wideband random vibrations in the frequency range of 20Hz to 2000Hz.

5 Test Methods

5.1 Test Environment Unless otherwise specified, all test environment conditions shall meet the following requirements.

- a) Temperature. 15°C~35°C;
- b) Relative humidity. 20%~80%. If the actual test conditions cannot meet the above environmental conditions, the test results should indicate the actual ambient temperature and relative humidity during the test.

5.2 Testing Instruments and Equipment The test was conducted using a GNSS signal simulator. The test equipment met the following requirements.

- a) It should have been verified or calibrated by a metrology department, and the parameters or range should meet the performance requirements and be within the validity period of the verification or calibration;
- b) The simulated test signal generated by the GNSS signal simulator should have the same characteristics as the satellite signal and be able to function under normal dynamic constellation conditions. Generate satellites with good geometric positioning (planar accuracy attenuation factor less than or equal to 4, or point accuracy attenuation factor greater than or equal to 6). star signal;
- c) The GNSS signal simulator supports the broadcasting of BeiDou B2b signals and RLM signals;
- d) The performance of the GNSS signal simulator, including measurement range, resolution, accuracy, and stability, shall comply with GB/T 39413. Regulation.

5.3 Test Items The test items, corresponding technical requirements, and test methods are shown in Table 2.

5.4 Functional Check

5.4.1 Positioning According to the instruction manual provided by the manufacturer of the module under test, the GNSS signal simulator broadcasts the satellite navigation signals supported by the module under test to check for accuracy. Check if there is a location result output.

5.4.2 RLM Reception and Output According to the instruction manual provided by the manufacturer of the module under test, the output interface of the module under test is connected to a computer, and a GNSS signal simulator generates and... Broadcast B2b signals conforming to Chapter 6 of GB/T 47423-2026, and the equivalent signal strength at the RF input of the module under test. The value is -135dBmW. The information output by the module under test is checked and confirmed by using the manufacturer's software or third-party software to read the information. The information output by the module is consistent with the information sent by the GNSS signal simulator.