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**Technical requirements and test methods for BeiDou navigation  
satellite system (BDS) geodetic module**

北斗卫星导航系统测量型模块技术要求及测试方法

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### 1 Scope

This document specifies the technical requirements for the geodetic module of the BeiDou navigation satellite system (referred to below as the module) and describes the corresponding test methods.

It applies to the development, production and inspection of BeiDou/global navigation satellite system (GNSS) geodetic modules.

### 2 Normative references

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated references, only the edition corresponding to that date applies; for undated references, the latest edition, including all amendments, applies.

GB/T 2423.1-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Test A: Cold.

GB/T 2423.2-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Test B: Dry heat.

GB/T 2423.3-2016 Environmental testing - Part 2: Test methods - Test Cab: Damp heat, steady state.

GB/T 4937.26 Semiconductor devices - Mechanical and climatic test methods - Part 26: Electrostatic discharge (ESD) sensitivity testing - Human body model (HBM).

GB/T 39267 BeiDou navigation satellite system terminology.

GB/T 39399 General specification for BeiDou navigation satellite system geodetic receivers.

GB/T 42576 Technical requirements and test methods for BeiDou/global navigation satellite system (GNSS) high precision system on chip (SoC).

### 3 Terms, definitions and abbreviations

3.1 Terms and definitions. The terms and definitions given in GB/T 39267, GB/T 39399 and GB/T 42576 apply, together with the two defined here.

3.1.1 Cold start: the state of the module going from power-on to normal positioning when the ephemeris, the almanac, the approximate time and the approximate position are all unknown.

3.1.2 Hot start: the state of the module going from power-on to normal positioning when the ephemeris, the approximate time and the approximate position are all valid.

3.2 Abbreviations. The abbreviations listed apply to the document: BDS (BeiDou Navigation Satellite System), Galileo (Galileo Navigation Satellite System), GLONASS, GNSS (Global Navigation Satellite System), GPS (Global Positioning System), HBM (Human Body Model), PDOP (Positional Dilution Of Precision), PRN (Pseudo Random Noise), PPP (Precise Point Positioning), PPS (Pulse Per Second), RINEX (Receiver Independent Exchange Format), RMS (Root Mean Square), RTD (Real-Time Differential), RTK (Real-Time Kinematic) and UTC (Universal Time Coordinated).

In the printed list both GLONASS and GNSS are glossed in English as Global Navigation Satellite System; the Chinese glosses distinguish the two, the English ones do not. The wording is reported as printed.

### 4.1 Functional requirements

4.1.1 Working modes. The module shall have two working modes: the ability to achieve a

high precision measurement solution with BeiDou and GNSS jointly, and the ability to achieve a high precision measurement solution when receiving only the open service signals broadcast by BDS.

4.1.2 Signal tracking. The module shall support BDS signal tracking and should support GPS, GLONASS and Galileo signal tracking; it shall track some or all of the signal types listed in Table 1. Table 1 has two columns, GNSS and signal type, and gives: BDS - B1I, B1C, B2I, B2a, B2b, B3I; GPS - L1C/A, L1C, L2P(Y), L2C, L5I/L5Q; GLONASS - L1, L2; Galileo - E1, E5a, E5b, E5(a+b), E6.

4.1.3 Positioning. The module shall be able to receive satellite navigation signals, compute a position and output the positioning result; the positioning modes supported are standard point positioning, RTD positioning, RTK positioning and network RTK positioning.

4.1.4 Baseline measurement. The module shall be able to receive satellite navigation signals and to carry out baseline measurement by means of data processing software.

4.1.5 Velocity measurement. The module shall be able to receive satellite navigation signals, compute velocity and output the velocity measurement result.

4.1.6 Timing. The module shall be able to receive satellite navigation signals, compute time information and output a 1PPS signal together with time information.

4.1.7 Interfaces. The module shall have a radio frequency input interface for the satellite navigation signal, a standard serial (RS232) input and output interface, a 1PPS output interface and a power input interface.

4.1.8 Protection. The module shall have electrostatic protection; the radio frequency input interface for the satellite navigation signal shall have short circuit protection; the power input interface shall have reverse polarity protection.

4.1.9 Fault detection and exclusion. The module shall be able to detect satellite faults and to reject abnormal data.

## 4.2 Performance requirements

4.2.1 Satellite tracking capability. The requirements and the classification are given in Table 2, which has five columns: module category, number of frequency points, minimum system composition, number of tracked satellites, and remarks. Single mode single frequency: 1 frequency point, BDS, at least 16 satellites tracked, the remark noting that only one frequency point of the BeiDou system is present. Multi mode single frequency: at least 2 frequency points, BDS plus GPS/GLONASS/Galileo, at least 28 satellites, of which at least 16 BDS satellites and at least 12 GPS/GLONASS/Galileo satellites. Single mode multi frequency: at least 2 frequency points, BDS, at least 16 satellites, with two or more BeiDou signal frequency points. Multi mode multi frequency: at least 4 frequency points, BDS plus GPS/GLONASS/Galileo, at least 28 satellites, of which at least 16 BDS satellites and at

least 12 GPS/GLONASS/Galileo satellites. Full constellation multi frequency: at least 8 frequency points, BDS plus GPS plus GLONASS plus Galileo, at least 52 satellites, of which at least 16 BDS satellites and at least 12 GPS/GLONASS/Galileo satellites.

4.2.2 Acquisition sensitivity. The acquisition sensitivity of the module shall be no greater than -133 dBm.

4.2.3 Tracking sensitivity. The tracking sensitivity of the module shall be no greater than -140 dBm.

4.2.4.1 Observation accuracy. The pseudorange observation accuracy and the carrier phase observation accuracy shall meet the requirements of Table 3 and Table 4 respectively. Table 3 has three columns - GNSS, signal type, and pseudorange observation accuracy (RMS) in metres - and fixes, for BDS, upper limits of 0.16 m for B1I, 0.15 m for B1C and 0.12 m for B2I, B2a, B2b and B3I; for GPS, 0.16 m for L1C/A, L2C and L2P(Y), 0.12 m for L1C and 0.09 m for L5; for GLONASS, 0.20 m for L1 and L2; for Galileo, 0.12 m for E1 and 0.09 m for E5a, E5b, E5(a+b) and E6. Table 4 falls beyond the pages available.

In Table 1 the GPS signal types are printed as L1C/A, L1C, L2P(Y), L2C and L5I/L5Q, while Table 3 names the same fifth signal simply L5. Both spellings are reported as printed.