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

GB/T 47449-2026

**Test methods for the grid-connected power supply of manned
spacecraft**

载人航天器并网供电测试方法

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1 Scope

GB/T 47449-2026 is the Chinese national standard covering connecting the power systems of two spacecraft - when a vehicle docks with a station the two electrical systems have to be paralleled without disturbing either, and this is how that is tested before flight. First edition, in force since 1 November 2026. It was issued on 30 April 2026 and takes effect on 1 November 2026, as a first edition. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

4.4 Test Status The test status requirements are as follows:

- a) The spacecraft providing the power supply should be tested as a complete unit or test system with the same electrical performance at its grid-connected power supply interface as in its on-orbit condition. The space station, as the power supply... When an electric spacecraft participates in the test, a ground-based accompanying electrical system or a grid-connected power supply interface simulation system can be used, including a grid-connected controller and a grid-connected control system. The power supply cable, primary power supply, power distribution system, and bus load transmitted from the controller to the grid connection point.
- b) Powered spacecraft should be tested using a complete device or test system with the same electrical performance as in-orbit conditions via a grid-connected power supply interface; a prototype is preferred. Electrical equipment or samplers, including grid connection interface equipment, power supply cables from the grid connection point to the grid connection interface equipment, primary power supply, and power distribution. System,

bus load.

- c) The primary power supply for the powered spacecraft should use the same power controller as in orbit, and should be equipped with a solar array simulator and energy storage system. Battery pack or storage battery simulator.
- d) The load on the powered spacecraft bus should be configured according to the on-orbit condition, and the peak power, step change, and other characteristics of the load power should be consistent with the on-orbit condition. When the difference is significant, ground-based equipment such as electronic loads can be used as alternatives.
- e) Before conducting grid-connected power supply tests, both the power supply spacecraft and the power receiving spacecraft should complete their own energy system tests and connect to the grid power supply. Check the status of relevant equipment.
- f) The grounding of the power supply spacecraft and the power receiving spacecraft shall be consistent with the on-orbit status and comply with the provisions of GB/T 29084.
- g) Both the power supply spacecraft and the power receiving spacecraft are equipped with a test support system that supports the operation of the entire ship or simulation system, and has telemetry receiving and judgment capabilities. It has read and command sending capabilities, and can set the grid-connected voltage and grid-connected current.
- h) Grid-connected test equipment can be configured to perform real-time measurement of voltage and current waveforms as needed for testing.
- i) For a spacecraft grid-connected power supply system with bidirectional power supply capability, a spacecraft can act as either a power supply spacecraft or a power receiving spacecraft. The direction of energy transmission is determined by the current grid-connected power supply.

4.5 Testing and Monitoring Requirements The testing and monitoring requirements are as follows:

- a) For each test item, the input voltage, input current, output voltage, output current, and grid connection voltage of the grid-connected controller should be monitored and recorded. Monitoring and recording the bus voltage and primary power output of the powered spacecraft, including voltage setpoints, grid current setpoints, and module operating status. Key parameters such as output current, load current, and primary power supply operating status;
- b) During the test, the waveforms of the grid connection point voltage (or the grid controller output voltage) and the grid current should be dynamically monitored. Pay attention to the grid connection mode switching, the dynamic adjustment process of the primary bus voltage of the powered spacecraft, and the changes in the operating status of the primary power supply. Condition.

4.6 Testing Equipment The testing equipment requirements are as follows:

4 General Requirements

4.1 Test Objective The purpose of grid connection power supply testing is to verify the correctness of the grid connection power supply interface design for visiting spacecraft and other powered spacecraft, and its compatibility with the power supply systems of space stations and other similar facilities. The compatibility and power supply safety of the Tianqi grid-connected power supply interface were comprehensively verified, covering grid-connected power supply operating modes and different grid-connected voltages/currents. The parameters are set under steady-state conditions and the grid connection/exit process and the dynamic process of grid connection mode switching.

4.2 Test Basis Before grid-connected power supply testing, a corresponding test plan or outline should be formulated based on the provisions of this document and the specific conditions of the grid-connected power supply interface. The documents that serve as the basis for conducting testing.

4.3 Testing System The grid-connected power supply test system includes a power supply spacecraft, a power receiving spacecraft, and corresponding test support systems and grid-connected test equipment. For spacecraft... During the space station project, visiting spacecraft need to obtain grid-connected power from the space station while docked. In this state, the space station powers the spacecraft. The spacecraft is a powered spacecraft, and its grid connection point is typically the floating disconnecter of the docking mechanism circuit. This applies to other manned spaceflight missions, such as manned lunar exploration. The power supply spacecraft and the power receiving spacecraft should be determined based on the grid connection relationship between spacecraft. The grid connection controller is generally located in the power supply spacecraft. The test system consists of the following components, as shown in Figure 1. Figure

5 Test Items

Grid-connected power supply testing should cover the status of the grid-connected power supply interface, the voltage performance of the powered spacecraft bus, and power supply safety during the grid-connected power supply process. For various situations that may affect performance, and based on the working mode of grid-connected power supply and the influencing factors of grid-connected power supply characteristics, the grid-connected power supply test items are detailed below. Table 1.

7 Test Requirements

7.1 Grid-connected power supply test setup The test system and test status should be prepared in accordance with the requirements of

4.3 and 4.4, and the following settings should be completed.

- a) Select a typical interface that the powered spacecraft needs to receive grid-connected power from and configure it to connect the power supply spacecraft and the powered spacecraft. Connect the components and test them one by one.
- b) After testing a typical interface, disconnect the connection and then reconnect to other interfaces, focusing on projects with different statuses. test.
- c) For multiple visiting spacecraft simultaneously docking at the space station and receiving grid power, multiple spacecraft can be operated simultaneously according to their on-orbit operating conditions. Grid-connected power supply testing of the visiting aircraft; or testing using a combination of a single visiting aircraft and an equivalent simulation system. The entire aircraft should be tested, covering every interface.
- d) The test items can be set up and carried out independently, or they can be combined with system-level flight simulation to test long-term stable working conditions and sunny/shaded areas. Testing of the film zone process.

7.2 Grid Connection Process Testing After setting the primary power supply and load of both the power supply and receiving spacecraft according to their on-orbit conditions, the test was conducted using the following method.

- a) Check and confirm that the primary power supply and power distribution system of the power supply spacecraft are functioning normally, and that the primary power supply and power distribution system of the power receiving spacecraft are also functioning normally. Normal working condition;
- b) Configure the grid-connected controller status and execute the power-on and power conversion module startup sequences for the grid-connected controller inputs.
- c) Set the initial grid connection voltage, which should preferably be lower than the bus voltage of the powered spacecraft;
- d) Set the grid-connected current; the value should not exceed 1A.
- e) Sequentially connect the power supply output switch of the grid-connected controller and the power receiving switch of the spacecraft;
- f) Set the grid-connected voltage to the specified grid-connected voltage value;
- g) Based on the on-orbit grid connection status, the operating domain of the primary power supply of the powered spacecraft is covered, generally including the current distribution domain, discharge domain, and Charging domain, etc.;

7.3 Grid-connected current regulation test

7.3.1 Nominal Current Test The grid-connected current parameters for spacecraft such as