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Electromagnetic compatibility test methods for fuel cell engine (English Translation)

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1 Scope

This standard specifies the electromagnetic compatibility performance test method for fuel cell engines.

This standard applies to proton exchange membrane fuel cell engine systems. Other types of fuel cell engine systems can be implemented as reference.

This standard applies to fuel cell engine systems that use hydrogen as fuel, and other fuel supply systems can be implemented as reference.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article. For undated reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 18655-2018 Limits and measurement methods of radio disturbance characteristics of vehicles, ships and internal combustion engines used to protect on-board receivers
GB/T.19951-2019 Test method for immunity of electrical/electronic components of road vehicles to electrostatic discharge
GB/T.20042.1-2017 Proton Exchange Membrane Fuel Cell Part 1: Terminology
GB/T 21437.2-2008 Road vehicle electrical disturbance caused by conduction and coupling Part 2: Electrical transient conduction along power lines
GB/T 21437.3-2012 Road Vehicles Electrical Disturbance Caused by Conduction and Coupling Part 3: Conductor Passing Capacity Except Power Line
Electrical transient emission with sexual and inductive coupling
GB/T 24548-2009 Terminology for fuel cell electric vehicles
GB/T 28046.2-2019 Environmental conditions and tests for electrical and electronic equipment of road vehicles-Part 2: Electrical load
GB/T 29259-2012 Road Vehicle Electromagnetic Compatibility Terminology
GB/T 33014.1-2016 Test method for immunity of electrical/electronic components of road vehicles to narrowband radiated electromagnetic energy Part 1.

General provisions

GB/T 33014.2-2016 Test method for immunity of electrical/electronic components of road vehicles to narrow-band radiated electromagnetic energy Part 2.

Anechoic chamber method
GB/T 33014.4-2016 Test method for immunity of electrical/electrical components of road vehicles to narrow-band radiated electromagnetic energy Part 4.

Large current injection (BCI) method
GB 50493-2009 Design code for the detection and alarm of combustible gas and toxic gas in petrochemical industry
ISO 11452-8 Road Vehicles Electrical Disturbance from Narrowband Radiated Electromagnetic Energy Part 8:

Magnetic Field Immunity ISO 11452-9 Road Vehicles Electrical Disturbance from
Narrowband Radiated Electromagnetic Energy Part 9: Portable Transmitter

3 Terms and definitions

The terms and definitions defined in GB/T.20042.1-2017, GB/T 24548-2009 and GB/T 29269-2013 and the following terms and definitions apply to this file. For ease of use, GB/T.20042.1-2017, GB/T 24548-2009 and GB/T 29269-2013 are listed repeatedly below. Some terms and definitions in.

Fuel cell

The chemical energy in the externally supplied fuel and oxidant is directly converted into electricity, heat and other reaction products through electrochemical reactions.

Electric device.

[GB/T 24548-2009, definition 3.1.1] 3.2 Fuel cell electric vehicle fuel cell electric vehicle; FCEV A car that uses a fuel cell system as the power source or main power source.

[GB/T 24548-2009, definition 3.1.2] 3.3 Off gas; tail gas the gas discharged from the fuel cell stack includes unreacted gas, generated gas, and/or inert gas.

[GB/T 24548-2009, definition 3.1.10] 3.4 Rated power the power of the fuel cell stack specified by the manufacturer that can continue to work under specific operating conditions.

[GB/T 24548-2009, definition 3.1.21] 3.5 Proton exchange membrane; PEM A membrane that uses protons as electrical charges. An independent layer in the fuel cell that acts as an electrolyte and blocks the hydrogen-rich gas on the anode side and the cathode Barrier of oxygen-rich gas on the side.

[GB/T 24548-2009, definition 3.1.1.3] 3.6 Proton exchange membrane fuel cell; PEMFC Fuel cell using proton exchange membrane as electrolyte [GB/T.20042.1-2017, definition 2.3.6] 3.7 Ventilation system/module A system or module that realizes air exchange inside and outside the casing of a fuel cell system by mechanical or natural means.

[GB/T.20042.1-2017, definition 2.4.1] 3.8 Exhaust system/module the system or module responsible for discharging the exhaust gas and waste generated by the fuel cell system to the external environment.

[GB/T.20042.1-2017, definition 2.4.3] 3.9 Exhaust treatment system/module A system or module used to process the exhaust gas discharged from the stack to meet the relevant emission standards, mainly to remove or dilute the anode tail There is no reactive fuel in the gas.

[GB/T.20042.1-2017, definition 2.4.10] 3.10 Gas/water separator A device that condenses and separates the water in the gas discharged from the fuel cell.

[GB/T 24548-2009, definition 3.2.1.4] 3.11 Fuel cell power system Including fuel cell systems, DC/DC converters, drive motors and their control systems, and on-board energy storage devices.

[GB/T 24548-2009, definition 3.4.2] 3.12 Fuel cell system/fuel cell engine fuel cell system Including fuel cell stack and fuel cell auxiliary system, it can work normally under the condition of external hydrogen source.

[GB/T 24548-2009, definition 3.4.3] 3.13 Fuel cell auxiliary system Including. air supply system, fuel supply system, water/heat management system, control system, safety guarantee system, etc.

[GB/T 24548-2009, definition 3.4.4] 3.14 Air supply system A system for filtering, humidifying, and pressure regulating the air entering the fuel cell.

[GB/T 24548-2009, definition 3.2.2.1]

5.2.1 Test method

In the frequency range of 0.15 MHz to 2 500 MHz, refer to the method specified in the GB/T 18655-2018 standard.

5.2.2 Test status

EUT works in mode 1; if EUT is in other working status, it should be clearly recorded in the test plan.

If the EUT contains multiple units, the connecting wires between the units should use the connecting harness used on the original vehicle;

The length of the connection line between the EUT and the artificial power supply network shall comply with the provisions of this standard. The wiring harness should be terminated according to actual conditions, with actual load and excitation.

Note: If the actual requirements cannot be met, a simulated load that can meet the actual load conditions and parameters can be used.

5.2.3 Test arrangement

Figure 5 is an example of the test layout of a logarithmic antenna during radiation emission testing when the fuel cell engine is integrated with DC/DC; rod antenna, biconical antenna

For the layout of the wire and horn antenna, refer to the test layout of the logarithmic antenna.

The three test positions (1), (2) and (3) of the antenna are marked in Figure 5. Among them, position (1) is the center of the harness of 7 and 25; position (2) is 1 and 25 and the center of the harness; position (3) is the center of 1. When testing rod antenna, biconical antenna