
TECHNOLOGIES FOR TOMORROW

NGK High Voltage Laboratory

1. Introduction

NGK High Voltage Laboratory is equipped with world class testing facilities such as AC 1,650kV high voltage test facilities, 4,200kV lightning impulse generator and AC 1,000kV/DC 750kV insulator contamination test facilities. Electrical and mechanical tests in actual scale have been carried out in this laboratory. These activities include research and developments for AC 1,000kV/DC 800kV class insulator string assembly and 1,000kV class gas bushings. The insulator design suitable for contaminated environments has also been studied in this laboratory. We are proud of our contribution to power industry in the world by supplying these high-quality insulators yielded through our research and developments activities.

These achievements are widely presented at the international conferences such as IEEE and CIGRE, and are partly published as "NGK Review".

2. Main Test Facilities

2.1 High Voltage Tests for AC and DC

High voltage tests of insulator assemblies up to the 1,000kV class can be carried out. Withstand and flash-over voltage performance of the various insulator assemblies can be evaluated under dry and wet conditions. Also, visible corona and RIV tests are possible to conduct.

- UHV AC Test Hall

Dimension of hall: 40m x 40m x 30m h.

Double-shielding system by expanded iron netting (Electromagnetic shielding effect: 75dB).

- AC 1,650kV Voltage Source

Transformer: 550kV, 500kVA, 3 units in cascade connection, corona free up to 1,000kV.

- DC 500kV High Voltage Source

Type: Delon-Greinacher circuit by using silicone rectifiers.

Rated voltage: 500kV, Rated current: 30mA.

- Corona Noise Measurement Equipment

Coupling capacitors: 2,000pF(500kV), 1,000pF (1,000kV).

Radio noise meters: NEMA type meter. CISPR type meter.

2.2 Contamination Tests

Contamination withstand and flashover voltage tests of the insulator assemblies can be carried out. After specimen insulators are artificially contaminated, a constant test voltage applied. Then, the contaminated insulators are moistened by artificial fog in order to simulate normal environmental conditions.

- UHV Contamination Test Hall

Dimension of hall: 30m x 25m x 30m h.

Electromagnetic shielding effect: 65dB.

Fog generating equipment(steam fog): 3.6 ton/h.

- AC 1000kV Voltage Source

Testing transformer: 1,000kV, 5,000kVA/1 min., 4,000kVA/continuous.

Voltage drop of the total system: Less than 5% at 3A, 600 - 1,000kV.

- DC 750kV Voltage Source

Type: Cascaded three phase full-wave rectification with feed-back system.

Rated voltage: 750kV.

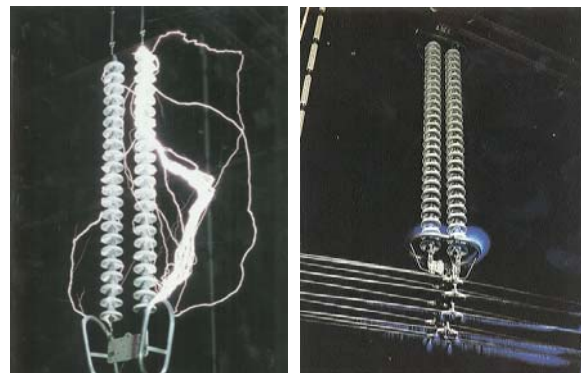
Voltage drop of the total system: Less than 5% at 2.2A, 200 - 750kV.

2.3 Impulse Voltage Tests

Lightning and switching impulse voltage tests can be carried out on an actual scale, for the transmission and substation insulator equipment, the transmission line arrester and others.



AC withstand voltage test on 1,100kV gas bushing



(a)

(b)

(a): Flashover test of 500kV insulator assembly

(b): Corona test under wet conditions of 1,000kV insulator assembly

- 4,200kV Lightning Impulse Voltage Generator
Type: Marx Circuit. Max. Storage energy: 315kJ.
Main capacitor: 0.0375 μ F(1.5 μ F/42).
Max. charging voltage: 4,200kV.
Max. voltage available: 3,300kV.
- 2,500kV Switching Impulse Voltage Test Facilities
Type: Marx circuit.
Generator: The above 4,200kV generator.
Max. voltage available: 2,500kV.
Wave form controlling capacitor:
0.0132 μ F(0.5 μ F/38).
Wave form: (50 - 500) x (2,500 - 3,000) μ s.

3. Mechanical Tests

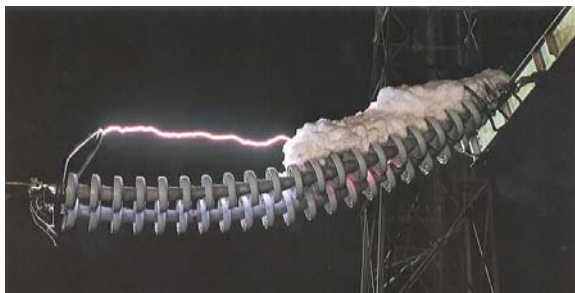
Mechanical performance tests on various kinds of insulator equipment and artificial galloping test, etc. can be carried out.



DC contamination test of DC500kV insulator assembly



Impulse voltage test facilities



Switching impulse flashover voltage test of 500kV insulator assembly with snow accumulation

4. Accredited Laboratory

NGK High Voltage Laboratory was accredited conforming to ISO/IEC 17025 in February 1999 for the first accredited high voltage laboratory by JAB(Japan Accreditation Board) which covers AC, DC and Impulse high voltage tests. High voltage tests are carried out on insulator assemblies and power equipment for transmission and distribution lines and substations. The report and certificates are issued with accreditation symbol of internationally recognized.



Artificial galloping test of tension insulator assembly



Certificate of accreditation

By Osamu Fujii

NGK High Voltage Laboratory
NGK INSULATORS, LTD.

1155 Tagami, Futaebori, Komaki 485-8566, Japan.
Tel:+81-568-72-3127, Fax:+81-568-72-3932
<http://www.ngk.co.jp/english/index.html>