

IEEE WG Revision of C57.98 Guide for Transformer Impulse Tests

4.1.2.1 The transformer effect on the waveshape

Remove "Large transformers in IEEE Std 4".

4.1.2.1.1 Waveshape with overshoot (peak oscillations) and test voltage factor procedure

In IEEE Std-4-2013 clause 8.2.1.1 and Annex A, when an lightning impulse waveshape shows an relative overshoot β' , it is recommended to limit β' to 10% for HV apparatus.

In impulse testing for transformers and reactors, due to low winding inductance and/or high surge capacitance, it is recommended to proceed with the test when the test circuit is optimal and the test voltage procedure is enable.

For test voltage factor procedure and chopped wave, see clause 4.2.2.1.

NOTE – In case of an high β' value and an overshoot frequency above 500 kHz, the test voltage procedure reduce the test voltage value V_t significantly against the recorded peak value V_e . This may lead to higher electrical stress and possible breakdown of the insulation system.

For lightning impulse tests on transformers and reactors, a manual evaluation of the test function procedure is not reliable. A test laboratory who does not have the Test function procedure available, should inform the customer at the stage of quotation.

4.1.2.1.1 Test voltage factor procedure when performing chopped wave

In general, for liquid immersed transformers the chopped wave is 110% of the full wave, while in Dry-type transformers, the chopped wave is 100%. The test voltage procedure evaluation of a chopped wave of 110%

of the wave, should give a peak value of 110% of the full wave.

When the test voltage procedure calculation of V_t is inconsistent, the following steps are recommended:

a) Front chopped wave lightning impulse:

There is no correction and V_t is equal to V_e .

b) Tail chopped lightning impulse:

Voltage reduction ratio Method (IEEE Std 4™ 2013, Annex A)

- Apply a reduced full wave (RFW)
- The test voltage procedure provide the test voltage V_t and the peak value V_e of the original recorded curve.
- If V_e is not available, V_e can be determined graphically on the recorded oscillogram
- Calculate the voltage reduction ratio $R_v = V_t / V_e$
- Apply a full voltage chopped wave, having a recorded voltage $V'e$.

The calculate $V't$ is defined as:

$$V't = R_v * V'e$$

c) The value of front time T_1 of the reduced full wave (RFW) is used to determine the T_1 value of the chopped wave.

4.1.2.1.2 Test voltage factor procedure and presentation of test results

When the test voltage procedure is enable, the following test results should be displayed:

- V_t is the test voltage
- β' is the relative overshoot magnitude

The following optional value should be available for display:

- V_e the peak value of the original noise free recorded curve.