INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 61869-11
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INSTRUMENT TRANSFORMERS –

Part 11: Additional requirements for low-power passive voltage transformers

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by IEC technical committee 38: Instrument transformers.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
38/663/DISH	38/672/RVDISH

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

1 Introduction

IEC 61869-11 was published in 12-2017 and since then experience with the application of the document has been gained. During this period, it became visible that the type test "Test for impact of electric field from other phases" as required in 7.2.6.1101 and outlined in Annex 11A creates ambiguities in the execution of the test and the interpretation of its results.

IEC 61869-11:2017-12/ISH1:2021-09(en-fr)

ICS 17.220.20

7.2.6.1101 Test for impact of electric field from other phases

The purpose of this test is to verify the influence of the electric fields at rated frequency emitted by other phases.

The test shall be performed in a configuration representing the real installation. The test can be performed in three-phase or single-phase. Test arrangement and procedure are given in Annex 11A.

Annex 11A (normative)
Tests for impact of electric field from other phases

11A.1 General

Adjacent phases in a three-phase power system can influence the accuracy of passive LPVT. To evaluate the impact of electric fields effects at rated frequency generated by adjacent phases in the power system the following test shall be performed.

2 Background

2.1 General

The type test is intended to evaluate the impact of horizontal and vertical stray capacitances that the equipment is exposed to in service, which is typically different to the situation in the laboratory. In order to estimate this impact on the ratio of the LPVT, Annex 11A describes a test layout and procedure where:

Figure 1 (Figure 11A.1 from IEC 61869-11, annotated, with stray capacitances when busbar is grounded) shows the general layout of the test setup in which the influence of stray capacitances is evaluated through a two-step test process. The setup consists of the equipment under test (EUT, coded 1 in Figure 1 and Figure 3 (Figure 11A.1 from IEC 61869-11, annotated, with stray capacitances if busbar is energized), a second LPVT (coded 2 in Figure 1 and Figure 3), a metallic busbar with a length equal to twice the distance between the second LPVT and EUT, a switch to connect the busbar to either ground or high voltage, a grounded metallic wall with 1,5 times the height of the EUT, a reference VT, measuring equipment and an HV generator, see Figure 1 and Figure 3. The distance D between the EUT to the metallic wall as well as between the EUT to the second LPVT is equal to the distance between phases of a power system operating at U_m of the EUT.

The stray capacitances of the setup originate from the horizontal capacitance between the two LPVTs as well as to the metallic wall and the vertical stray capacitances of the LPVTs to ground. The horizontal stray capacitances depend on the height of the LPVT and the distance to parallel objects. The vertical stray capacitances depend on the height of the LPVT over ground potential, i.e., height of a pedestal, specified by the system design supplier. Depending on the dimensions of the test laboratory hall, the distance between the top of the EUT to the laboratory roof may pose restrictions due to necessary insulation clearances and add additional stray capacitances to the grounded roof.

2.2 First step

In the first step of the evaluation the busbar is grounded, and the following stray capacitances are effective:

C_{E1_E}: Stray capacitance between EUT and ground

C_{E1_MW}: Stray capacitance between EUT and grounded metallic wall

$C_{E1\_E'}$: Stray capacitance between EUT and grounded busbar

C_{E1_2}: Stray capacitance between EUT and second LPVT

C_{E2_E}: Stray capacitance between second LPVT and ground (can be disregarded, only shown for completeness)

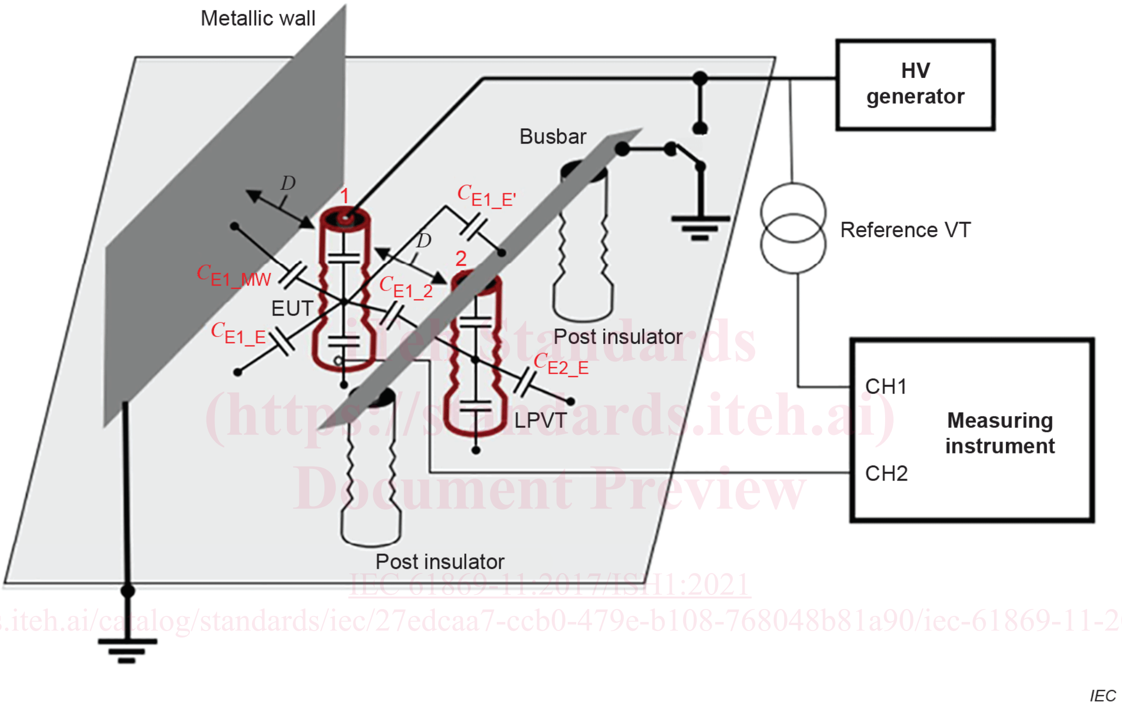

Figure 1 – Test setup with stray capacitances when busbar is grounded (Figure 11A.1, annotated)

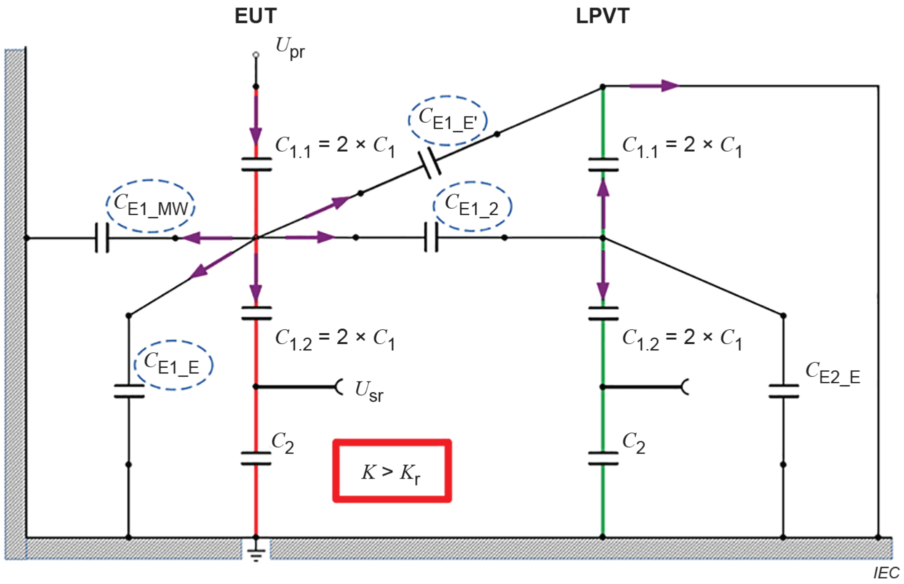

Figure 2 – Equivalent circuit of the test setup in Figure 1 with current flow direction

In this test configuration, the stray capacitances act to decrease the primary capacitance C_1 of the EUT leading to an increase of the transformation ratio, $K > K_r$. The stray capacitances with the largest impact on the ratio are marked with dotted blue circles. The red marked path represents the EUT, the green marked path represents the second LPVT shown in Figure 2.

2.3 Second step

In the second step of the evaluation, the busbar and hence the second LPVT are energized to the same high voltage source as the EUT and the following stray capacitances are effective:

C_{E1_E}: Stray capacitance between EUT and ground;

C_{E1_MW}: Stray capacitance between EUT and grounded metallic wall;

C_{E1_HV}: Stray capacitance between EUT and energized busbar;

C_{E1_2}: Stray capacitance between EUT and second LPVT (0 pF if identical units);

C_{E2_E}: Stray capacitance between second LPVT and ground (can be disregarded, only shown for completeness).