Lab Exercise 1: High Voltage Measuring Instruments

(Laboratory F1-115)

Task:

Set three different values of voltage (up to 30 kV, respect the range of meters) on testing AC voltage source Tr 100 kV. Measure all voltage values by some standard measurement systems and compare them with measured values from the voltmeter V2. The voltmeter V2 has a direct metrological traceability to the national measurement system.

Conversion of AC voltage amplitude to its effective value and correction to atmospheric conditions:

Corrected effective flashover voltage of SG

$$V = \frac{\delta}{\sqrt{2}} V_{nm}, \qquad \delta = 2{,}89 \frac{b}{273 + \vartheta} \qquad \left(b_n = 101{,}3\ kPa,\ \vartheta_n = 20\ °C\right)$$

where,

V_{nm}	voltage amplitude for normal atmospheric conditions
V	rms voltage value after correction to real atmospheric conditions
Δ	relative air density
B	atmospheric pressure (kPa)
ϑ	temperature (°C)

Used equipment:

V1	indicative voltmeter placed on the control board of AC voltage source
V2	electrostatic voltmeter with voltage range up to 30 kV
VD	capacitive voltage divider 30 kV with electrostatic voltmeter
IVT	instrument voltage transformer with digital scope
SG	sphere gap with diameter 100 mm

Measurement circuit:

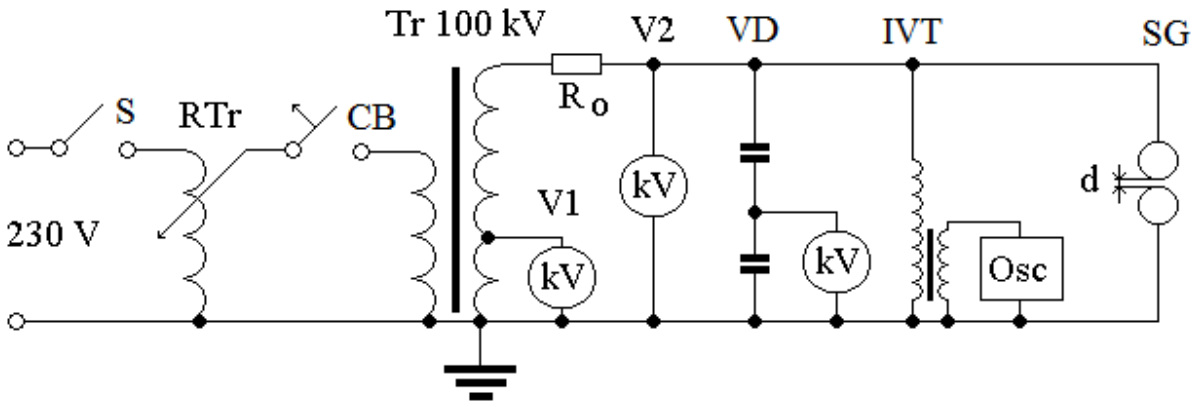
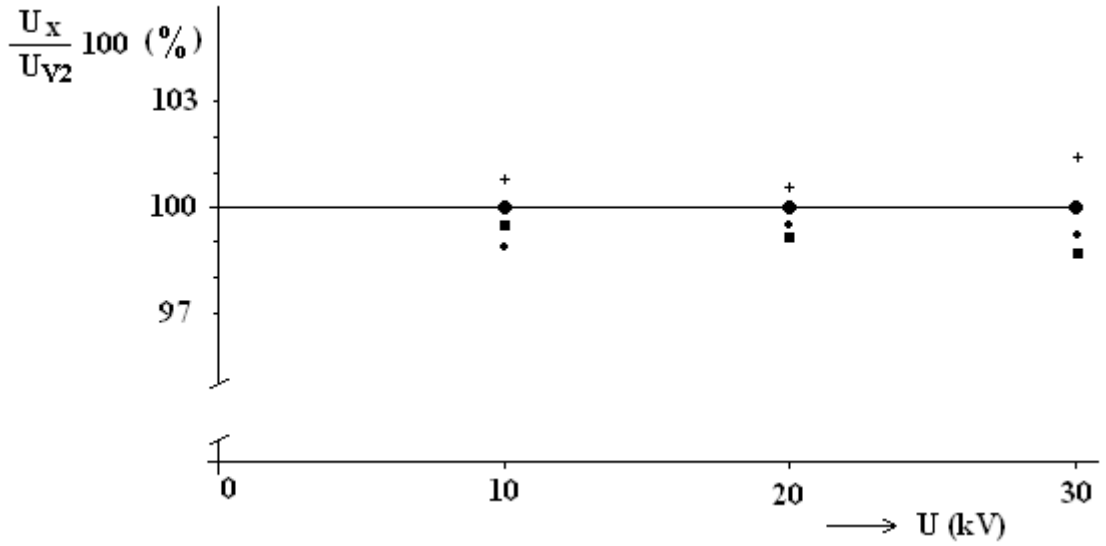


Table:

V1 V (kV)	V2 V (kV)	VD V (kV)	IVT V_{peak} (kV)	IVT V_{rms} (kV)	SG distance (mm)				SG V_{nm} (kV)	SG V (kV)
					1.	2.	3.	Avg.		

Example of graphical presentation of determined differences:



References:

Kind, D., Feser,K.: High-Voltage Test Techniques, Vieweg/SBA Publications. 1999
IEC 60052:2002 Voltage measurement by means of standard air gaps
IEC 60060-1:2010 High-voltage test techniques – Part 1: General definitions and test requirements
IEC 60060-2:2010 High-voltage test techniques – Part 2: Measuring systems