

Comparison of three reference measuring systems used for composite and combined voltages

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Setup

PTB prepared their high-voltage laboratory for composite voltage measurements. Impulse generator was used together with the DC and AC (50 Hz) sources to generate the composite test voltages up to 300 kV. Additional coupling capacitor (DC) and blocking resistor (AC) was used protect the impulse generator. With AC, Δt was fixed to ~5 ms.

Test plan

Comparison campaign was carried out in 27.6.-8.7.2022.

Case	AC (peak) [kV]	DC [kV]	LI [kV]	SI [kV]
DC+LI		100	100	
DC+LI		0	300	
DC+LI		0	-300	
DC+LI		150	-300	
DC+LI		300	150	
DC+LI		300	-300	
DC+SI		0		270
DC+SI		150		150
DC+SI		150		-270
AC+LI	50		100	
AC+LI	50		200	
AC+LI	50		-200	
AC+SI	30			100
AC+SI	30			200
AC+SI	30			-200

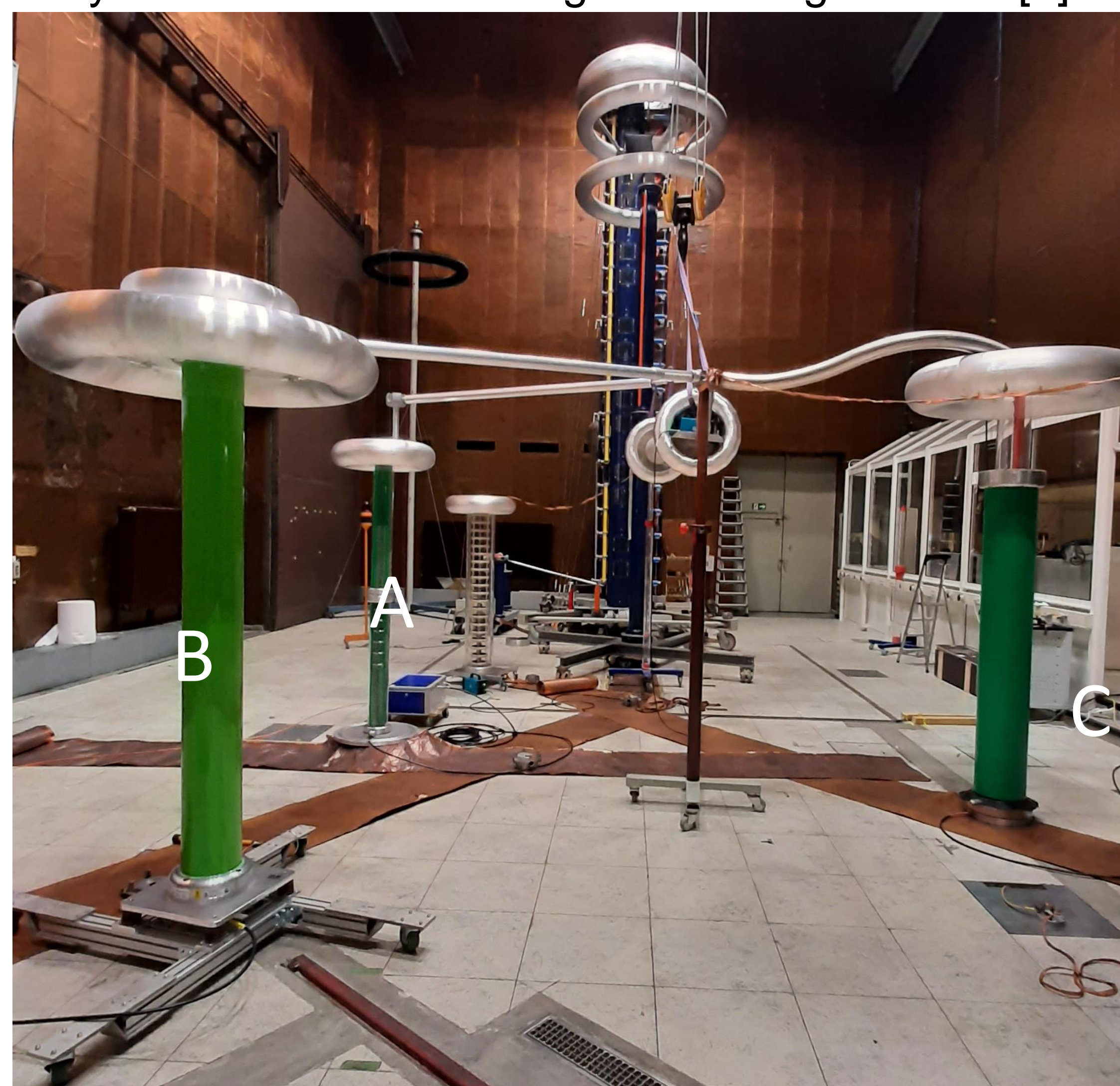
Results

Average of the measuring systems' readings was used as a reference value for each parameter. The highest observed differences from the reference values were the following:

DC+LI
DC: 0.5 %, U_t : 0.7 %, T_1 : 3.6 %, T_2 : 0.7 %
DC+SI
DC: 0.1 %, U_p : 0.7 %, T_p : 1.8 %, T_2 : 0.3 %
AC+LI
AC (peak): 0.7 %, AC (rms): 0.6 %, f : 0.1 %, Δt : 0.3 %, U_t : 0.7 %, T_1 : 3.6 %, T_2 : 0.7 %
AC+SI
AC (peak): 1.0 %, AC (rms): 0.6 %, f : 0.1 %, Δt : 1.3 %, U_p : 0.5 %, T_p : 1.0 %, T_2 : 0.6 %

Measuring systems

- New universal voltage divider [1] and measuring instrument [2] developed in this project
- New universal voltage divider [3] and measuring instrument [4] developed by RISE for this project
- System based on existing PTB voltage divider [5]



Conclusions

- Comparison campaign was carried out at PTB in June-July 2022
- Composite voltages up to 300 kV were used: DC+LI, DC+SI, AC+LI, AC+SI
- All three measuring systems had test voltage results within the target of 2 %

References

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