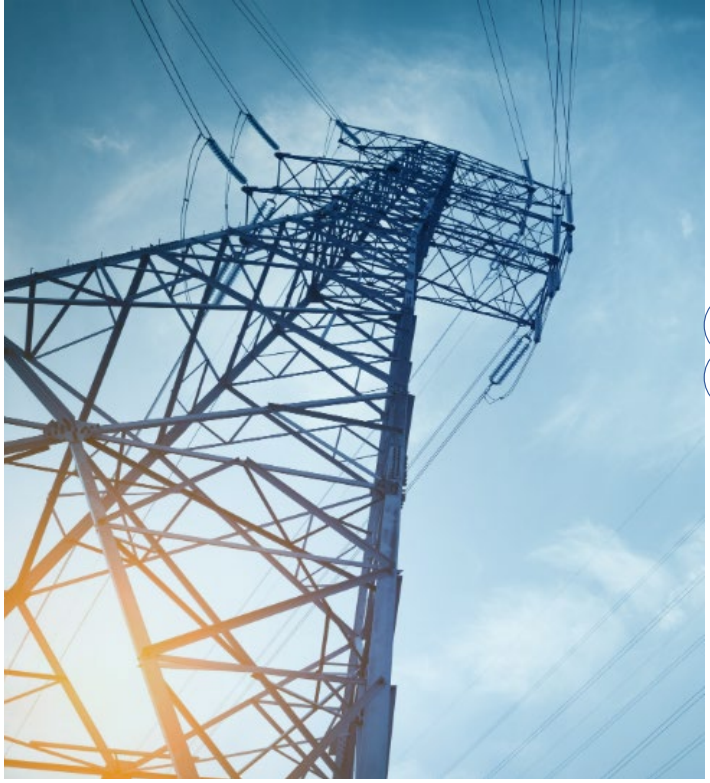

ADMIT

AC & DC High Frequency Instrument Transformers

Characterisation of AC and DC MV instrument transformers in extended frequency range up to 150 kHz (2023 – 2026)

Society's increasing use of switching devices (inverters, bulky power electronic converters, active filters, etc.), both as loads and as part of generators, especially for renewable energy sources, has driven the consequent proliferation of conducted disturbances on grid voltage and current, also at medium voltage level, up to hundreds of kilohertz, due to the harmonics of the components around the switching frequency.

The main objective of this project is to build up the metrological framework to allow the accuracy evaluation of voltage and current transformers for medium voltage grids, up to 36 KV and 2 kA, in a frequency range from DC up to 150 kHz. Suitable reference generation and measurement systems, for voltage and current, will be specifically developed.

To support the European electrical power industry, this three-year project will provide the currently missing solutions for the calibration of voltage and current transformers for medium voltage grids up to 150 kHz. The project will also support IEC TC 38 'Instrument Transformers' in their work on the issue of new standards on the topic, with the goal of fostering accurate voltage and current measurements in medium voltage grids up to 150 kHz.

SCIENTIFIC OBJECTIVES

Accuracy parameters and test methods for MV VTs and CTs up to 150 kHz

Reference voltage generation and measurement system up to 36 kV, 150 kHz

Reference voltage generation and measurement system up to 2 kA, 150 kHz

To provide data, methods, guidelines & recommendations to IEC TC 38 necessary for testing MV VTs and CTs up to 150 kHz.

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METROLOGY PARTNERSHIP | EURAMET

1st Newsletter

ADMIT
AC & DC High Frequency Instrument Transformers

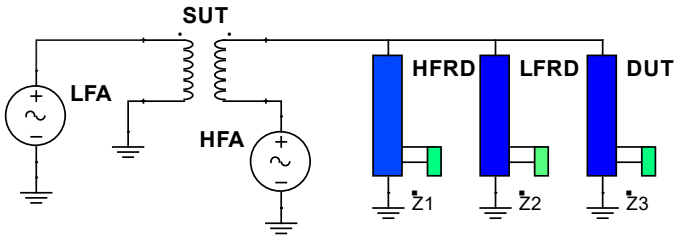
Need

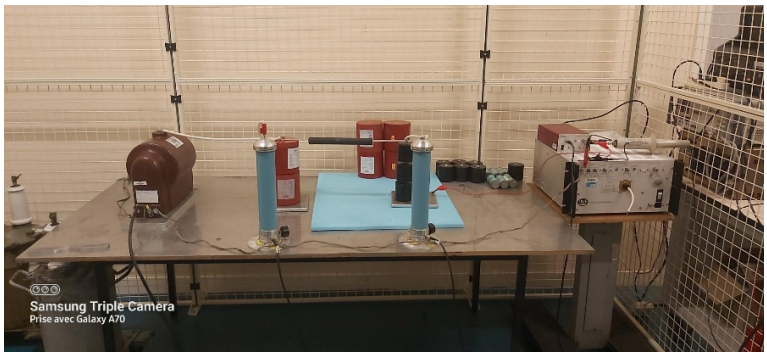
Society's increasing use of switching devices has driven the proliferation of conducted disturbances on grid voltage and current, also at medium voltage level, up to hundreds of kilohertz. Suitable parameters to define the accuracy and the performance requirements of ITs up to 150 kHz are not available, and there is an urgent need to standardise procedures to test ITs up to this range of frequency. Indeed, the standards which are currently in force include requirements only up to 20 kHz and test procedures only for 50/60 Hz.

Progress beyond the state of the art

A reference setup for VT testing based on two series-connected voltage generators

A setup for MV VT testing up to 150 kHz was developed. A Low Frequency Amplifier (LFA) drives a Step-Up Transformer (SUT) that generates the fundamental tone at MV level. The SUT is series connected to a High Frequency Amplifier (HFA) that generates the high frequency components (tens-hundreds of volt). Two reference devices are used, one for fundamental tone (LFRD) and one for the high frequency tones (HFRD).



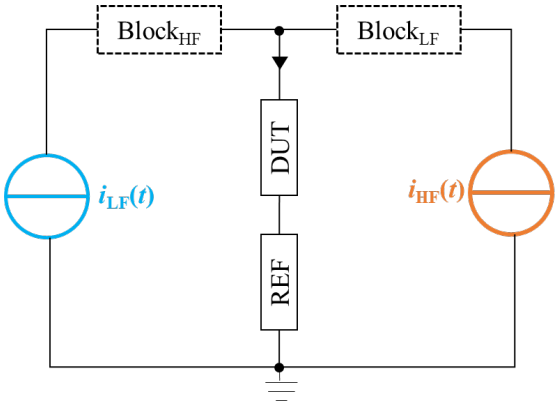


A reference setup for VT testing based on two parallel-connected voltage generators

A setup for MV VT testing up to 150 kHz was developed. The fundamental tone is obtained through a 35 kV Step-Up Transformer. It is connected in parallel to a High Frequency Amplifier that generates the high frequency components (tens-hundreds of volt). The necessary blocking and filtering components are inserted between the two generators for safety reasons. Preliminary tests give accuracies of 0.01 % at 50 Hz and 0.1 % at 150 kHz

A reference setup for CT testing based on two parallel-connected current generators

A setup for CT testing up to 150 kHz was developed. The fundamental tone is obtained through a 1.2 kA transconductance amplifier (i_{LF}). It is connected in parallel to a high frequency transconductance amplifier (i_{HF}) that generates the high frequency components (up to 100 A). The necessary blocking and filtering components are inserted between the two generators for safety reasons. Preliminary tests give accuracies of 50 ppm at 50 Hz and 1 % at 150 kHz.



Consortium

NMIs

INRiM Istituto Nazionale di Ricerca Metrologica · VSL · VTT · LNE · F²I² Fundación para el Fomento de la Innovación Industrial · RISE · METAS

Others

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