

22NRM06 ADMIT

Characterisation of AC and DC MV instrument transformers in extended frequency range up to 150 kHz

METROLOGY
PARTNERSHIP



Overview of WP1

Performance requirements, parameters and test procedures for accuracy evaluation

Mario Luiso, Università degli Studi della Campania «Luigi Vanvitelli»

22NRM06 ADMIT - Workshop

Torino, 21 June 2023



Università
degli Studi
della Campania
Luigi Vanvitelli

Dipartimento di Ingegneria

Acknowledgement

METROLOGY
PARTNERSHIP



The project 22NRM06 ADMIT has received funding from the European Partnership on Metrology, co-financed by the European Union's Horizon Europe Research and Innovation Programme and by the Participating States.



Università
degli Studi
della Campania
Luigi Vanvitelli

METROLOGY
PARTNERSHIP



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

Aims of WP1

- To define:
 - Characteristics of grid disturbances
 - Performance requirements of ITs
 - Accuracy parameters and uncertainty limits of VTs and CTs
- The focus are distribution grids up to 36 kV and 2 kA
- Important for WP2 and WP3
 - Indications for the definition of the specifications of generation and measuring systems
 - Voltage and current levels, rated test conditions
 - Measurement algorithms for the comparators
 - Uncertainty evaluation



• Università
• degli Studi
• della Campania
Luigi Vanvitelli

**METROLOGY
PARTNERSHIP**



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

Tasks of WP1

1. Characteristics of grid disturbances up to 150 kHz
 - Analysis of literature, standards and previous projects
 - Measurement campaigns and simulations
 - Database of waveforms
2. Definition of IT performance requirements
 - Performance requirements for VTs and CTs up to 150 kHz
 - Future measurement needs for power system applications up to 150 kHz
 - Rated test conditions for IT accuracy evaluation
3. Definition of accuracy, measurement methods and uncertainty limits
 - Measurement algorithms for the selected disturbances
 - Accuracy parameters and related evaluation methods
 - Uncertainty limits for IT accuracy evaluation



• Università
• degli Studi
• della Campania
Luigi Vanvitelli

**METROLOGY
PARTNERSHIP**



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

Deliverables of WP1

1 (A1.2.8)	D1	Report describing performance requirements both for ITs as well as for the measuring instruments connected to them, based on disturbances in AC and DC MV grids (system voltage < 36 kV) and on future measurement needs in the frequency range up to 150 kHz	Report	SUN, ARTECHE, FFII, LNE, RSE, UNARETI, UNIBO, UNIGE, VSL	Feb 25 (M21)
2 (A1.3.10)	D2	Report describing suitable parameters for the definition of the accuracy of voltage and current instrument transformers in the frequency range up to 150 kHz including suitable calibration conditions and procedures for the accuracy evaluation	Report	UNIGE, ARTECHE, FFII, LNE, RSE, SUN, UNARETI, UNIBO, VSL	Mar 26 (M34)
5 (A1.3.13)	D7	Letter from the IEC/CENELEC TC38 chair confirming contribution of the project results, related to the accuracy evaluation of instrument transformers in the frequency range up to 150 kHz, to future standards (IEC 61869 standard family)	Letter	RSE, FFI, LNE, VSL, SUN, UNIBO, UNIGE, ARTECHE, UNARETI	May 26 (M36)

- Measurement campaigns, simulations, disturbances, waveforms, performance requirements

M21

- Accuracy parameters, procedures, calibration conditions, uncertainty

M34

- Letter from IEC TC38 about contribution to standardization documents

M36

Task 1.1

Characteristics of grid disturbances up to 150 kHz

- Start M1
- End M11
- Involved partners
 - ARTECHE, UNARETI, UNIBO, UNIGE, RSE, SUN
- Main outputs
 - Simulations of realistic power systems
 - Measurement campaign
 - Software and database of waveforms
 - Report about the characteristics of grid disturbances up to 150 kHz

Task 1.2

Definition of IT performance requirements

- Start M8
- End M21
- Involved partners
 - SUN, FFII, LNE, VSL, RSE, UNIBO, UNIGE, ARTECHE, UNARETI
- Main outputs
 - Power system future measurement needs up to 150 kHz
 - VT and CT performance requirements
 - Rated test conditions
 - Report on Instrument Transformers performance requirements in the frequency range up to 150 kHz (**Deliverable 1**)



• Università
• degli Studi
• della Campania
Luigi Vanvitelli

METROLOGY
PARTNERSHIP



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

Task 1.3

Definition of accuracy, measurement methods and uncertainty limits

- Start M10
- End M36
- Involved partners
 - SUN, FFII, LNE, VSL, RSE, UNIBO, UNIGE, ARTECHE, UNARETI
- Main outputs
 - Accuracy parameters, test procedures, uncertainty limits and related evaluation methods
 - Report on parameters, measurement methods and test procedures for the evaluation of Instrument Transformer accuracy up to 150 kHz (**Deliverable 2**)
 - Report on the results of the project related to the accuracy evaluation of instrument transformers in the frequency range up to 150 kHz (**Related to Deliverable 7**)



• Università
• degli Studi
• della Campania
Luigi Vanvitelli

**METROLOGY
PARTNERSHIP**



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

Joint paper

A1.3.8 M34	Submission of a joint paper A paper dealing with measurement methods and test procedures for the evaluation of Instrument Transformers accuracy up to 150 kHz will be jointly prepared by SUN, with support of FFII, LNE, RSE, UNIBO, UNIGE and VSL, and submitted to an open-access journal.	SUN, FFII, LNE, RSE, UNIBO, UNIGE, VSL
---------------	---	--

- The deadline is far (M34)....
- All the previous activities are important to produce scientific knowledge to publish in the joint papers

Output of WP1 to the other WPs

- From WP1
 - A1.1.4 Selection of grid disturbances up to 150 kHz
 - A1.1.6 Software for numeric generation of complex waveforms
 - A1.2.5 Definition of voltage and current levels
 - A1.2.6 Definition of rated test conditions
- To WP2 & WP3
 - Voltage generation (A2.1.1-A2.1.6)
 - Current generation (A3.1.1-A3.1.4)

Interactions of WP1 with the other WPs

- From WP1
 - A1.1.4 Selection of grid disturbances up to 150 kHz
 - A1.2.2 Performance requirements for Voltage Transformers
 - A1.2.3 Performance requirements for Current Transformers
 - A1.2.5 Definition of voltage and current levels
 - A1.3.1 Definition of measurement algorithms for the considered disturbances
 - A1.3.2 Definition of IT accuracy parameters at frequencies other than power frequency
 - A1.3.3 Definition of measurement methods of IT accuracy parameters
 - A1.3.4 Definition of test procedures for the evaluation of IT accuracy parameters
- To WP2 & WP3
 - Voltage measurement (A2.2.1-A2.2.6)
 - Industry oriented VT test procedures (A2.3.3-A2.3.4)
 - Current measurement (A3.2.1-A3.2.5)
 - Industry oriented CT test procedures (A3.3.3-A3.3.4)



• Università
• degli Studi
• della Campania
Luigi Vanvitelli

**METROLOGY
PARTNERSHIP**



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

Input to WP1 from the other WPs

- From WP2 & WP3
 - A2.3.1 Test of commercial VTs
 - A2.3.2 Analysis of experimental results
 - A3.3.1 Test of commercial CTs
 - A3.3.2 Analysis of experimental results
- To WP1
 - A1.3.1 Definition of measurement algorithms for the considered disturbances
 - A1.3.2 Definition of IT accuracy parameters at frequencies other than power frequency
 - A1.3.3 Definition of measurement methods of IT accuracy parameters
 - A1.3.4 Definition of test procedures for the evaluation of IT accuracy parameters



• Università
• degli Studi
• della Campania
Luigi Vanvitelli

**METROLOGY
PARTNERSHIP**



ADMIT WP1 - Overview
Mario Luiso
Workshop - 21st June 2023

22NRM06 ADMIT

Characterisation of AC and DC MV instrument transformers in extended frequency range up to 150 kHz

METROLOGY
PARTNERSHIP



Overview of WP1

Performance requirements, parameters and test procedures for accuracy evaluation

Mario Luiso, Università degli Studi della Campania «Luigi Vanvitelli»

22NRM06 ADMIT - Workshop

Torino, 21 June 2023



Università
degli Studi
della Campania
Luigi Vanvitelli

Dipartimento di Ingegneria