D1 Materials and Emerging Test Techniques

SC D1 and AU D1 Panel Activities

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CIGRE ATC Seminar 27 Nov 2023

D1
Materials and emerging test techniques

Study Committee D1 – Scope of Work and Activities

The scope of Study Committee D1 covers new and existing materials for electrotechnology, diagnostic techniques and related knowledge rules, as well as emerging test techniques with expected impact on power systems in the medium to long term. (https://cigregroups.org/display/SCD1/Study+Committee+D1+Home)

Principal areas of interest

- Insulating gases and gaseous insulation systems.
- Liquid and liquid impregnated insulation systems.
- Solid materials.
- High voltage and high current testing and diagnosis.

Current activities

- Characterization of materials and electrical insulation systems (EIS).
- Study of emerging test and diagnosis techniques for HVDC.
- Development of diagnostic tools and related knowledge rules.

Examples of specific activities and areas of interests:

- Providing information on new materials, e.g. SF6 gas replacement options.
- Investigating material degradation mechanisms, e.g, thermal, electrical stress or multi-factor stress.
- Identifying new asset management tools, e.g., on-line monitors, expert systems, AI diagnostic tools…
- Providing insight into the impact of new test techniques on plant, such as life extension and cost reduction.
- Assisting with standardisation of tests and information, in response to requests from IEC, IEEE…

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Study Committee D1 – Structure and Working Bodies

Chairman: Simon Sutton
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Doble/Altanova
5 Weyvern Park
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Secretary: Gordon Wilson
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National Grid House, Gallows Hill
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SC D1 Advisory Groups

Created by Johannes SEILER, last modified by Simon SUTTON on Oct 17, 2022

AG	Title	Convener
SCAG	Strategic and Customer Advisory Group	Simon Sutton (UK)
TAG D1	Tutorial Advisory Group	Ivanka Höhlein-Atanasova (DE)
AG D1.01	Liquid and liquid impregnated insulation systems	Qiang Liu (UK)
AG D1.02	High voltage and current testing and diagnosis	Uwe Riechert (CH)
AG D1.03	Solid materials	Jerome Castellon (FR)
AG D1.04	Insulating gases and mixtures	Karsten Juhre (DE)

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Study Committee D1 – Structure and Working Bodies

Regular Members:

24 regular country members

Regular	Australia	LI Yi	2020	yi.li@measurement.gov.au
	Austria	SCHICHLER Uwe	2022	uwe.schichler@tugraz.at
	Brazil	LEVY Alain François	2022	alainsanson@gmail.com
	Canada	FERNANDO Namal	2022	snfernando@hydro.mb.ca
	China	ZHOU Yuanxiang	2022	zhou-yx@tsinghua.edu.cn
	Finland	LEIVO Senja	2020	senja.leivo@vaisala.com
	France	VU Cong Thanh	2022	congthanh.vu@supergrid-institute.com
	Greece	GONOS Ioannis	2020	igonos@ieee.org
	India	MANDAVA Mr. Mohana Rao	2022	mmrao@bhel.in
	Iran	ALIABADI Abbas	2018	aliabadi@mapnagroup.com
	Italy	SCATIGGIO Fabio	2020	fabio.scatiggio@gmail.com
	Japan	KUMADA Akiko	2022	kumada@hvg.t.u-tokyo.ac.jp
	Korea	NAM Jin-Ho	2020	jin-ho.nam@lscns.com
	Norway	MAUSETH Frank	2018	frank.mauseth@ntnu.no
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	Russia	SLAVINSKY Alexander	2022	alexander_slavinsky@mosizolyator.ru
	South Africa	MAHATHO Nishal	2018	mahathn@eskom.co.za
	Spain	LLOVERA Pedro	2020	pedro.llovera@ite.es
	Sweden	HILLBORG Henrik	2022	henrik.hillborg@hitachienergy.com
	Switzerland	FRANCK Christian	2017	franck@eeh.ee.ethz.ch
	United Kingdom	ANDRITSCH Thomas	2022	t.andritsch@soton.ac.uk
	United States	VAN DER ZEL Luke	2018	lvanderz@epri.com

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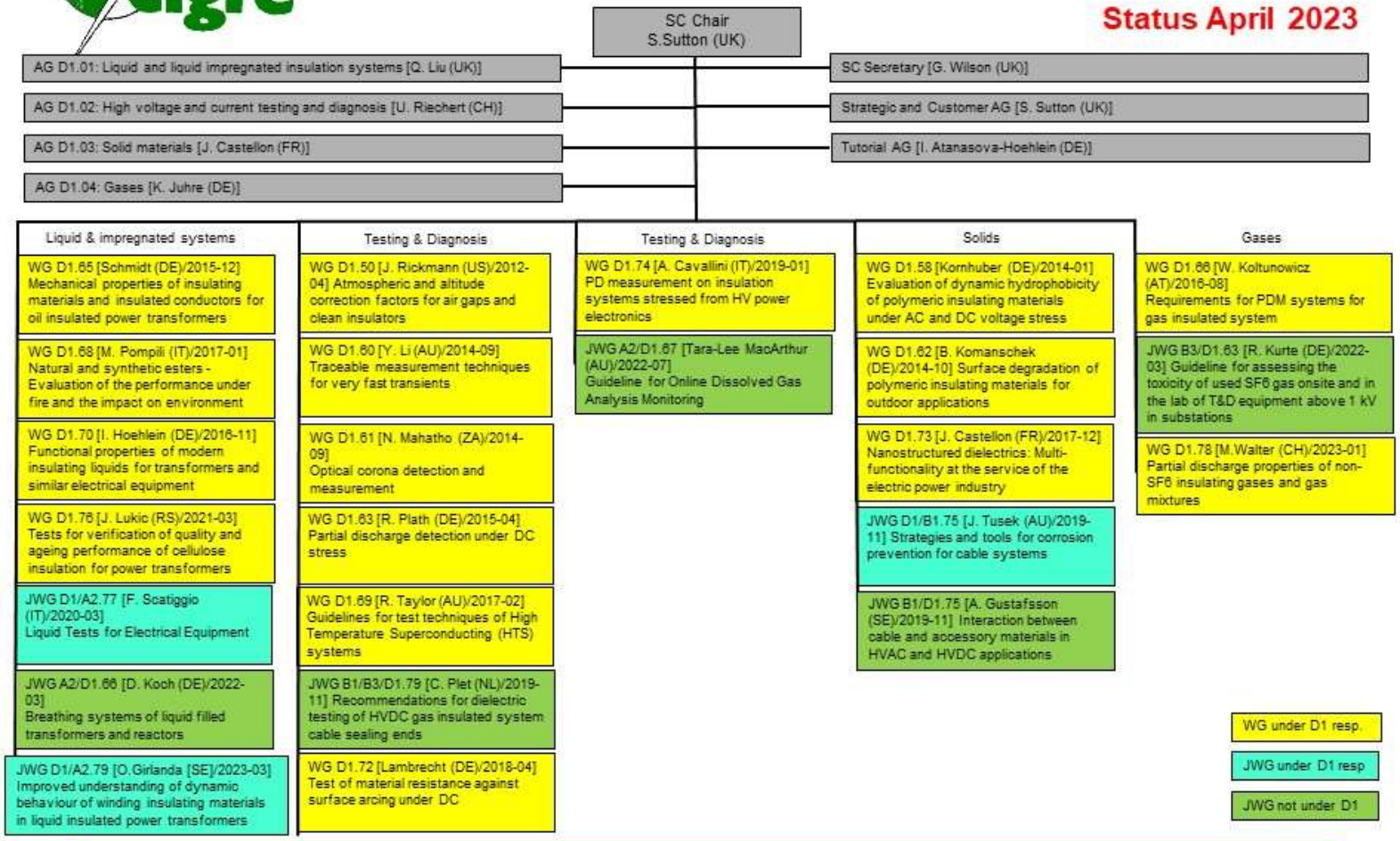
Study Committee D1 – Organisation

Status April 2023



CIGRE Study Committee D1 – Organisation

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Additional SC D1 working groups approved in 2023

WG/JWG	Number	Title	Convener Name (Location)
JWG	A2/D1.72	Retro-fill of mineral oil in transformers – Motivations, considerations and guidance	Roberto ASANO (BRAZIL)
JWG	A2/D1.71	Modern insulating liquids qualification for OLTC, bushings and other accessories.	Lars LIDEN (SWEDEN)
WG	D1.81	Methods and common data file format for time-domain reflectometry	Andrew BARCLAY (UK)
JWG	D1/A2.80	Functional properties of non-metallic solid materials for liquid filled transformers and reactors and their compatibility with insulating liquids	Dejan VUKOVIC (DE)

2023 Published D1 Technical Brochures

WG number	Name of the Publication	Publication details
WG D1.54	TB 894 - Basic principles and practical methods to measure the AC and DC resistance of conductors of power cables	2023-03
WG D1.50	TB 888 - Atmospheric and altitude correction factors for air gaps and clean insulators	2023-03

SC D1 Activities

- SC D1 Annual General Meeting - 6 Sept 2023 in Cairns
  16 delegates at the meeting (11 SC members and 5 guests)

- Possible new working groups discussed:
  1. JWG D1/B1 on testing with long switching impulse, Oscillating waveforms
  2. WG D1, Calibration of optical measurement systems
  3. WG D1, Sensitivity verification of PD for alternative gases
  4. JWG D1/A3/B3, Radio interference voltage test and corona test.
- Participation of upcoming events (2025 and 2027):
  Trondheim 9/2025: "Changes needed in the power system for the energy transition"
  Jerusalem 2025: "When Technology, Regulation, Markets, Operations and Environment Aspects Merge"
  Colloquia in South African and South Korea for 2027
  Symposium

SC D1 Activities

- 2023 CIGRE Cairns Symposium (4 – 7 Sept) papers:

  11 papers present with one selected as the one of best papers
  Best paper: “Accuracy testing of a high-voltage transformer under rated fundamental voltage and superimposed harmonics ”

  D1 Tutorial presented at CIGRE Cairns Symposium:
  UHF Partial Discharge Detection System for GIS: application Guide for Sensitivity Verification, Uwe Schichler https://www.youtube.com/watch?v=NPTgwiEGaQ0&list=PLwGHigN9C41BUniqYzPaNdeH7tIgzrplE&index=3

  2024 CIGRE Paris Session papers:
  Review of D1 paper synopsis has been completed

SC D1 Preferential Subjects for 2024 Paris Session 25-30 Aug. 2024

PS1 : Testing, Monitoring and Diagnostics

- Testing and condition monitoring for reliability in conventional high voltage systems and power electronics applications.
- Assessment of diagnostics for equipment in remote or inaccessible locations.
- PD measurement under DC, rectifier, and impulse stress.

PS2 : Materials for electrotechnical purposes and modelling

- Ageing of materials under electrical, mechanical or thermal stresses and ageing markers.
- Modelling materials and field simulations for AC and DC applications.
- Assessment of compatibility of aged and new materials resulting from refurbishment or life extending activities.

PS3 : Materials to enable the energy transitions

- Alternative electrotechnical materials or manufacturing processes which reduce environmental footprint.
- Materials and systems for energy storage; batteries, charging devices, capacitors etc.
- Materials to enable a hydrogen economy

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AU D1 Panel membership

Name	Organisation	Name	Organisation
Yi Li (Convenor)	National Measurement Institute	Wenyu Guo	Omicron Australia
Sam Murali (Secretary, NGN Rep)	Transgrid	James Baker	Essential Energy
David Alan	University of Queensland	Karl Haubner	Doble
Andrew McMahon	Transpower	Hui Ma	University of Queensland
Dharmendra Shah	Powerlink	Toan Phung	University of New South Wales
Prasanna Wickramasuriya	Energy Queensland	Trevor Blackburn	University of New South Wales
Mark Cotton	Ausnet Services	Andrew Wilkinson	Electranet
Atanu Mondal	Hitachi Energy	Hao Zhang	Megger

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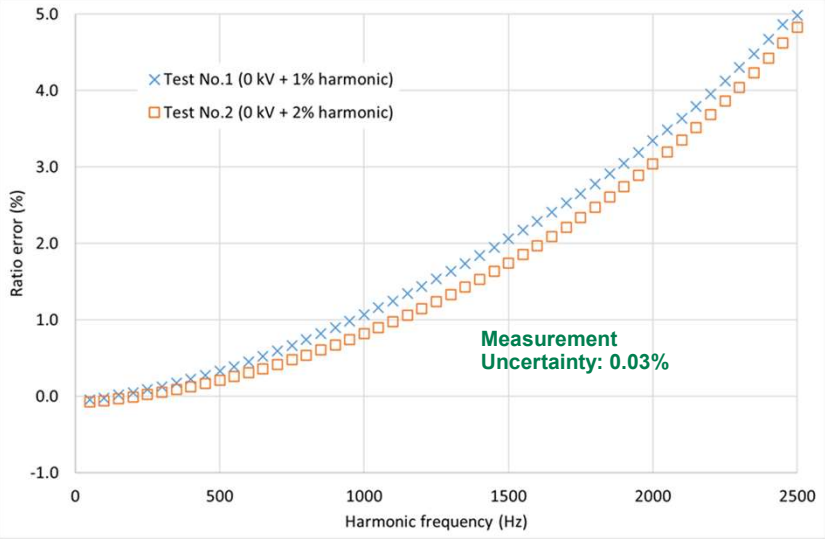
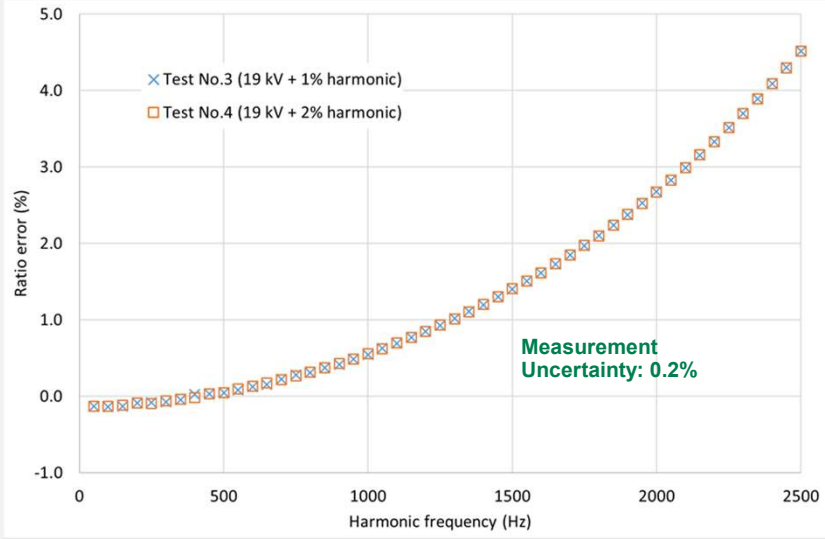
AU D1 Activities

Cairns Symposium AU D1 Member Papers

1170 Accuracy testing of a high-voltage transformer under rated fundamental voltage and superimposed harmonics (one of the 11 best papers in 240 in total)

1335 Leveraging Home Automation Principles for OLCM Integration at Utilities
1148 Performance evaluation of sugar graze paper for transformer solid insulation application
1232 Verification of a Current Transformer's Accuracy on Distorted Current Waveforms





Paper 1170 results – Ratio errors of a 33 kV Inductive VT

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AU D1 Activities

AU D1 2023 Annual Meeting held on 3 – 4 August 2023 in Melbourne

- Face-to-face venue at Uni Hill Conference Centre, 14 members and guests attended, 10 at venue + 4 online
- Members' report on experiences of equipment failures, research activities, new material applications, novel diagnostic techniques…
- Convenor report on CIGRE and SC activities
- NGN activity update by AU D1 NGN representative
- Presentations by members and guests:
  - Research experience at Australasian Transformer Innovation Centre (*UQ)*
  - RIP bushing technology (Ausnet)
  - Experience of cable testing using HV DAC *(Megger)*
  - *VLF diagnosis testing on MV power cables (Megger)*
  - Flame and electrically track resistive polymeric insulation with excellent thermal properties *(RMIT)*
  - A Reference Measurement System for Calibration of High-voltage Transducers at frequencies up to 10 kHz *(NMI)*
  - A System for On-site Calibration of High-Current Transducers with Composite Signals up to 10 kHz *(NMI)*
  - *Development of high-current and high-voltage calibration systems at frequencies up to 10 kHz (NMI)*
  - Accuracy testing of an inductive voltage transformer under rated fundamental voltage and superimposed harmonics *(NMI)*
  - A report on research activities at UNSW (UNSW)
  - Transgrid's alternative gas strategy (TransGrid)
  - Digital post-processing filter for broadband time domain signals to assist in cable fault localization (Omicron)
  - Comparison of PD sensors for MV GIS applications – coupling capacitor, HFCT, VDS and TEV, Omicron (Omicron)
  - Altanova bushing and transformer case study (Altanova/Doble)
  - Transpower SF6 Emissions Reduction Activities (Transpower)

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AU D1 Activities

AU D1 2023 Annual Meeting Melbourne

Tour of RMIT University HV Laboratory

Tour of Omicron Melbourne facility

Meeting Dinner

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AU D1 Activities

– **AU Participation in CIGRE D1 WGs**

WG No.	Topic
D1.60	Traceable measurement techniques for very fast transients
D1.69	Guidelines for test techniques of High Temperature Superconducting (HTS) systems
D1/B1.75	Strategies and tools for corrosion prevention for cable systems

- **AU D1 has setup WhatsApp group for quick info sharing**
- **One D1 paper synopsis (among 35 Australian paper synopses) has been accepted for 2024 Paris Session**

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Thank you !

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