IEEE PES TRANSFORMERS COMMITTEE

DIELECTRIC TEST SUBCOMMITTEE

The meeting was held at the Westin at Crown Center, Kansas City, MO

Dielectric Tests Subcommittee		
Chair: Poorvi Patel	**Vice-Chair: Thang Hochanh**	**Secretary: Diego Robalino**
Room: Century C	**Date:** Wednesday, October 25th, 2023	**Time:** 11:00 am to 12:15 pm
Total DTSC Members: 133	Members present at the meeting: **98**	Attendance according to sign in sheet: **222**
Guests present: **124**	Membership requested: **17**	Membership accepted: **12**
Members moved to Guest Status: 44		

Chair's Remarks

The Chair welcomed members and guests to the Fall 2023 meeting in Kansas City. SC Chair briefly introduced the agenda for today's meeting. Explanation about the roaster sheet provided to review e-mail address and provide any corrections to update the attendance list.

First, SC Chair reviewed policies and procedures according to IEEE SA. Stated the need to identify potential essential patent claims. DTSC members and guests are reminded to inform SC Chair, Secretary or IEEE SA representative for our SC (Patrycja Jarosz, +19087268288, p.jarosz@ieee.org) of potential patent claims. Copyright policies, participation behavior, compliance with all applicable laws, including antitrust and competition laws.

It was requested to all attendees to approach the microphone for questions and comments during the meeting stating name and affiliation.

Future events:

IEEE PES Transformer Committee Meeting Spring 2024	March 10-14, Vancouver BC
2024 IEEE PES- T&D	May 6-9, Anaheim, CA
IEEE PES General Meeting	July 21-25, Seattle, WA
IEEE PES Transformer Committee Meeting Fall 2024	October 27-31, St Louis, MO
IEEE PES Transformer Committee Meeting Spring 2025	March 23-27, Denver, CO

Next, SC Chair requested all TF and WG leaders to submit minutes on or before November 08, 2023 including revised and updated attendance list. The information to be sent to SC Secretary via e-mail (diego_robalino@ieee.org). The information must be consolidated and submitted to the Main Committee by December 08, 2023. Also, a reminder was made for any online meeting happening in-between the in-person meetings also should keep a recorded attendance and minutes.

Patrycja Jarosz - Standards Program Coordinator for the DTSC is looking after any questions related to PAR generation or extensions. Her contact information was provided for guests and members if questions arise.

Regarding WG and SC officer Training, it has become optional but highly recommended. IEEE SA's Antitrust, Competition, and Commercial Terms Policies remain mandatory. Standards Committee/Working Group Officers to complete within 90 days of appointment or **by 31 December 2023**, whichever is later.

Training link: https://iln.ieee.org/Public/ContentDetails.aspx?id=AE404C2328DA4A39AAD7AB5117681F05

Regarding **'Memberplanet'** – No update and we continue manually recording attendance in our meetings.

The SC Chair indicated that all WG and TF leaders are requested to send the list of members to Patrycja to be updated in **MyProject**. For now, it is only requested the list of Members of the WGs or TFs. The information should be submitted before **December 31st, 2023.**

There is a new process for WGs to request an IEC standard using the IEC website and the link IEC Products & Services Portal (iec.ch) website.

- **ADCOM highlights**

Status of Active Standards			
Project	**Title**	**Valid until**	**PAR Status**
C57.127	Guide for the Detection of Acoustic Emissions from Partial Discharges	2028	WG inactive – TF initiated
C57.160	Guide for the Elec. Measurement of PD in HV bushings and Instrument Transformers	2020	PAR **2023** Ballot Resolution Completed – RevCom.
C57.113	Recommended practice for PD Measurement Power	2020	PAR 2023 Prep for publishing
C57.98	Guide for Transformer Impulse Tests	2021	PAR **2024** extension granted (2 years)
C57.138	Recommended Practice for Routine Impulse Tests for Distribution Transformers	2026	PAR 2026
C57.161	Guide for DFR Measurements	2028	WG Inactive. TF Initiated
C57.168	Low-Frequency Test Guide	2032	WG inactive
C57.12.200	Bushing Dielectric Frequency Response Guide (ENTITY WG)	2032	WG inactive

SC Chair invited guests and members of the DTSC to attend the C57.12.200 Tutorial on Thursday October 26th. Next, NesCom/RevCom meeting dates and deadlines were reviewed.

Standard Board Meeting	Submittal Deadlines
5-6th of December 2023	**16th of October 2023**
29th – 31st of January 2024	19th of December 2023
19th – 20th of March 2024	09th of February 2024

SC Secretary's Report

SC Secretary requested unanimous approval to record the meeting for the sole purpose of minutes reporting. None are against it, and the meeting is recorded (only voice no video).

- Total Attendees to DTSC S23 meeting: **182**
  - Total Members attended: **94** (out of 160)
- Requested Membership: **31**
  - Already Members: **14**
  - Rejected Membership: **5**
  - Approved Membership: **12**

FIRST NAME	LAST NAME
Alex	Alahmed
Roberto	Da Silva
Raymond	Frazier
Jean Carlos	Hernandez
Ronald	Hernandez
Jerzy	Kazmierczak
Brian	McBride
Francis	Mills
Zoltan	Roman
Abdulmajid	Shaikh
Christopher	Slattery
Drew	Welton

- Change Status Member to Guest due to no compliance with membership attendance requirements: **44**
  - Membership to DTSC was reviewed 2 out of 3 or 3 out of 5. The same applies to keep member status in the SC.
- **Total Members for Fall 2023 meeting: 130**

A list of members was presented to the audience to establish a quorum during this meeting. Looking at the list of members, we requested to stand up for headcount.

The headcount was completed with over 66 members attending the meeting. **Therefore, the quorum was achieved.** The final review will be carried out against roster signatures.

Question came from Sanjib Som requesting clarification on the SC membership. There seems to be a requirement for WGs and TFs a bit different from what it is for SC membership. Agreed to verify this with TC. (action for SC Secretary)

- **Quorum, Approval of Minutes, and Agenda**

Once quorum was established, Chairperson requested a motion to approve the agenda:

- Motion by Dan Sauer, second Evgenii Ermakov
- No objection to the unanimous approval of the agenda hence approved.

Chairperson requested a motion to approve the Spring 2023 minutes from Milwaukee meeting:

- Motion by Evgenii Ermakov, second Dan Sauer
- No objection to the unanimous approval of the agenda hence approved.

Attendance Summary

	By Roster
Total Attendees	221
Total # Of Members	133
Members Present	98
Quorum Present	**YES (73.68%)**

SC Discussions and Motion passed.

New Business:

SC Chair calls Andrew Larsson (Hitachi Energy) to talk about PD testing on liquid immersed distribution transformers, wind GSUs and Solar.

Andrew presented two slides addressing the procedures described in IEEE and IEC standards where the text refers to dry type units rather than liquid immersed. His concern is that there is no dedicated stadard to the test of PD on liquid immersed distribution transformer.

Ajith Varghese (Prolec GE) suggests PD should be under LF tests TF but not clear what the background is or what the relevance is of this request from the end-user point of view. Andrew indicates that certainly for wind and solar, customers do request PD testing. Ajith suggested to have a TF to look at it.

SC Chair looks for a motion to **create a TF under LF Tests to look into this request.**

- Motion by Tauhid Ansari and second Detlev Gross.
- Discussion:
    - Tauhid Ansari (Hitachi Energy) considers the need for clarification on PD testing for solar and wind distribution transformer for the fact that there is no clarity in the procedure either the test is only in the active part or if it is done when there is a full assembly.
    - Peter Zhao (Hydro One) indicated the need to consider also components such as bushings and therefore the need to review this topic.
    - Joshua Yon (Virginia Transformer) suggest that if a TF is created, it should look at harmonizing the standards related to DT.
    - Thang Hochanh (BC Hydro) commented following Peter's comments indicating the difference in PD levels for bushings vs. transformers.
    - Ali Naderian commented also on the PD for accessories and components making reference to potential sources for the 1.3V reference. He commented and several challenges that may be encountered and support the idea of a TF to be created for analysis.
    - After discussion, Ajith indicated that the study of bushings is not directly under this SC and better to move forward with a TF to study the request and provide a report to the SC.
    - Detlev Gross asked to limit the discussion as time is running short for the WG and TF reports.
    - SC Chair asked for voting and no objections were addressed. **Motion carries**

Old Business: No old business

Taskforce and Working Group Reports

Reports are in the order presented during the meeting

TF Core Ground and Winding Insulation Resistance

Chair: Diego Robalino

Secretary: Aniruddha Narawane

No meeting held in Kansas City

TF Revision to Low Frequency Dielectric Tests

Kansas City, Missouri Meeting – October 24, 2023 1:45-3:30pm CDT

Chair: Ajith Varghese

Vice Chair: Markus Schiessl

Secretary: Jason Varnell

1. The meeting was called to order at 1:45 PM.
2. 95 individuals were in attendance. A quorum was achieved with 27 of 36 total members present. 19 individuals requested membership; however, only 14 were given member status based on attendance and participation and will be added after the F23 meeting. 2 Members that were not present had missed 2 out of the last three meetings and will be moved to guest after the F23 meeting, which means there will be 48 members.
3. A motion was made by Dan Sauer (Eaton Corp.) and seconded by Don Ayers (Independent Consultant) to approve the Fall 2023 meeting agenda. There were no objections to unanimous approval of the agenda. A motion was made by Dan Sauer (Eaton Corporation) and seconded by Pragnesh Vyas (Sunbelt-Solomon) to approve the Spring 2023 task force meeting minutes. There were no objections to unanimous approval of the Spring 2023 task force meeting minutes.
4. PD in Bushings During Factory Testing
    a. The chair reviewed the history of the discussion which included a summary of the 2020 DTSC survey on the subject of venting bushings. Additionally, it was stated that during the F22 meeting a study group was formed to come up with recommendations to address the concerns. The study group met on 1/27/2023, 2/10/2023 and 2/24/2023. It was reviewed that the S23 TF had passed a motion to form a small group to finalize the text that would be sent for survey to the TF and DTSC. The small group included: Steve Antosz, Jason Varnell, Markus Schießl, and Ajith Varghese.
    b. The chair presented the text that the small group finalized. There was discussion on the technical appropriateness for using the word “partial vacuum.” The group decided to change the wording to “under-pressure.” A motion was made by Phil Hopkinson (HVOLT) and

seconded by Steve Antosz (Stephen Antosz and Associates), which passed unanimously to change the words “partial vacuum” to “under-pressure”.

c. The following modified text to proposed to add to C57.12.90, was agreed to be sent to survey in the TF and request for survey at the F23 DTSC meeting:

If the partial discharge is measured during the Induced-voltage testing of the transformer and is suspected to be generated within an OIP (oil-impregnated-paper) bushing(s), it is permissible to “vent” the bushing(s) exhibiting partial discharge to the atmosphere using the bushing manufacturer’s instructions.

The Induced-voltage test shall be entirely repeated after venting the bushing and a note shall be added to the certified test report indicating bushing(s) were vented during the Induced-voltage Test.

Notes:

1. Partial discharge intended to be addressed by venting the bushing, is a low energy discharge arising from under-pressure (pressure below atmosphere) or gas bubbles generated during the Temperature Rise test and the cooling down afterwards. Under-pressure is created in the expansion chamber due to absorption of nitrogen or air into oil, and gas bubbles are formed due to saturation of nitrogen or air. Partial discharges from these cases may be resolved by venting the bushing to dissipate any gas bubbles in oil. If continuous gas bubble generation or elevated partial discharge remains after the venting, additional investigations are required.

2. If there are concerns of gas generation from the Temperature Rise test causing bushing failure during Impulse or Applied Voltage test, an Induced-voltage Test can be performed before impulse testing for diagnostic purposes. A complete Induced-voltage test shall be performed as the last dielectric test, as specified in Subclause 10.1.5.1 for dielectric test sequence.

3. Unless agreed between parties in advance, Bushings shall not be vented proactively prior to dielectric testing.

4. Not all OIP bushings exhibit these conditions, so bushing design is a factor.

5. The same condition of gas bubble formation or under-pressure may occur in service during normal operation of load and overload cycles.

6. Re-establishment of the bushing gas space blanket and resealing of the bushing must also be performed in accordance with the bushing manufacturer’s instructions following completion of the induced test. The internal integrity of the bushing may be compromised by venting, by allowing in oxygen and moisture or by not reestablishing proper conditions.

7. Performing temperature rise or other tests with bushing unsealed (with loose or open vent plug) increases the risk of air/gas space compromised with moisture.

d. The chair opened the floor for any updates from the TF regarding any special tests on bushings, which was a follow up to the S23 presentation given by Egon Kirchenmayer. The previous presentation was on bushing test to simulate cool down behavior and bubble evolution, that

could be considered as type or special Test. There were no updates and there was no discussion on the topic.

5. Task Force on PD Testing of Class 1 Power Transformers – Don Ayers

The task force met on Monday, October 23, 2023. There was a quorum. There were votes held on 7 different proposals that came from the survey of the RLFT TF. The TF will modify the text based on votes held during the F23 TF meeting. The TF will finalize the draft and send to the RLFT TF. See TF minutes in Appendix A.

6. Old business

The previous topic of contradictions within C57.12.90 and C57.12.00 related to the induced voltage test overvoltage factor was discussed. The proprosed changes drafted by Jason Varnell (Doble Engineering) was displayed (and copied below). The subgroup that was formed during the S23 TF meeting reviewed the proposed changes and agreed with the proposed wording; however, the final recommendation from the group was not given at this time. The group will continue to review the wording and the TF chair solicited additional participants to look at the proposed wording. The follow people volunteered, Onome Avanoma (MJ Consulting), Krishnamurthy Vijayan (PTI Transformers) . The subgroup will propose the final text for the S24 TF meeting with the goal to survey the TF. The previous members of the subgroup are the following: Jason Varnell (Doble Engineering), Steve Antosz (Steve Antosz Assoc.), Bill Griesacker (Griesacker and Assoc.), Salahuddin Shaikh (Hitachi Energy), and AbdulMajid Shaikh (Delta Star).

C57.12.90

10.8 Induced-voltage test for Class II power transformers

10.8.1 General

Each Class II power transformer shall receive an induced-voltage test with the required test voltage levels from IEEE Std C57.12.00-2021 Table 4 columns 6 and 7 based on the HV voltage class corresponding to the maximum system voltage. The required test voltage levels shall be induced in the high-voltage winding. The tap connections shall be chosen, when possible, so that test levels developed in the other windings during the one-hour test are x times their ~~maximum~~ nominal ~~operating~~ system voltages, as specified in Table 4 of IEEE Std C57.12.00-2021, where x (also referred to as the "overvoltage factor" in the text that follows) is the ratio of the line-to-line test voltage on the high-voltage winding to the ~~maximum~~ nominal ~~operating~~ system voltage.

Draft proposed changes to C57.12.00

5.10.5.5 Induced-voltage test for Class II power transformers

With the transformer connected and excited as it will be in service, an induced-voltage test shall be performed as indicated in Figure 2, at voltage levels indicated in Columns 6 and 7 of Table 4. ~~Minimum line-to-ground induced test levels for Class II power transformers shall be a multiple of corresponding line-to-ground nominal system voltage as follows: 1.58 times for one-hour tests and 1.8 times for 7200 cycles enhancement level tests.~~

C57.12.00

Table 4—Dielectric insulation levels for all windings of Class II power transformers, voltages in kV

Maximum system voltage (kV rms)	Nominal system voltage[a] (kV rms)	Applied-voltage test[a] (kV rms)			Induced-voltage test[b,c] (phase to ground) (kV rms)		Winding line-end BIL[d] (kV crest)				Neutral BIL[e,f] (kV crest)	
		Delta and fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL	Enhanced 7200 cycle	One hour	Minimum	Alternates			Grounded wye	Impedance grounded wye or grounded wye with higher BIL
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13
≤ 17	≤ 15	34	34	34	16	14	**110**				110	110
26	25	50	34	40	26	23	**150**				110	125
36	34.5	70	34	50	36	32	**200**				110	150
48	46	95	34	70	48	42	200	250			110	200
73	69	140	34	95	72	63	250	350			110	250
121	115	175	34	95	120	105	350	**450**	550		110	250
145	138	207	34	95	145	125	450	**550**	650		110	250
169	161	242	34	140	170	145	550	**650**	750	825	110	350
242	230	345	34	140	240	210	650	**750**	**825**	**900**	110	350
362	345	518	34	140	360	315	900	1050	1175		110	350
550	500	N/A	34	140	550[f]	475[f]	1425	1550	1675		110	350
765	735	N/A	34	140	880[f]	750[f]	1950[f]	2050			110	350
800	765	N/A	34	140	885[f]	795[f]	1950[f]	2050			110	350

[a]For nominal system voltage greater than maximum system voltage, use the next higher voltage class for applied-voltage test levels.

[b]The iInduced-voltage tests voltages in the table above are based on approximately an overvoltage factor of ~~shall be conducted at~~ 1.58 × nominal system voltage for one hour test and 1.80 × nominal system voltage for enhanced 7200 cycle test. The actual test voltages are the values listed in the table corresponding to the HV maximum system voltage.

7. New business
    a. There was no new business.
8. The meeting was adjourned at 2:15 p.m. via motion from Sanjib Som (Pennsylvania Transformer) and Fernado Neal (Prolec-GE), which passed unanimously. The next meeting will be in Vancouver, BC Canada at the Spring 2024 IEEE Transformers Committee Meeting.

During the SC meeting Ajith Varghese presented the motion from his WG **to survey the modified text proposed to add to C57.12.90**. It was agreed to be sent to survey in the TF and request for survey at the F23 DTSC members.

- Motion by Ajith and second by Dan Sauer.
- Discussion:
    - Opinions were addressed. Comments can be included during the survey if needed.
- No votes against, therefore **motion carries.**

Attendance Record

Role	First Name	Last Name	Company
Member	Alex	Alahmed	Evergy
Member	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Elise	Arnold	SGB
Member	Onome	Avanoma	MJ Consulting
Guest	Hugo	Avila	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Christopher	Baumgartner	We Energies
Guest	Duvier	Bedoya	Hitachi ABB Power Grids
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Dominique	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Michael	Botti	Hyosung HICO
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Member	David	Calitz	Siemens Energy
Guest	Vivian	Chan	Hitachi Energy
Guest	Gabriel	Delgado	Invergy
Guest	Scott	Dennis	Hitachi ABB Power Grids
Guest	Scott	Digby	Duke Energy
Guest	Nikolaus	Dillon	Dominion Energy
Guest	Luc	Dorpmanns	SMIT Transformatoren B.V.
Guest	Evgenii	Ermakov	Hitachi Energy
Guest	Reto	Fausch	RF Solutions
Guest	Fadi	Fayad	ASD
Guest	Sean	Fitzgerad	ComEd
Member	Hugo	Flores	Hitachi ABB Power Grids
Member	Raymond	Frazier	Ameren
Guest	Rich	Frye	Eaton
Guest	Renjie	Fu	ERMCO
Guest	Luis	Gonzales	Evergy
Guest	Shawn	Gossett	Ameren
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Guest	Ravi	Gupta	Megger
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Guest	Peter	Heinzig	Weidmann Electrical Technology
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Sramma	Hoffman	P&L

Guest	Philip	Hopkinson	HVOLT Inc.
Guest	Jeremy	Johnson	Burns & McDonnell
Member	Thrinadha	Katapalli	Virginia Transformer Corp.
Guest	Nathan	Katz	PacifiCorp
Guest	Stacey	Kessler	ULTEIG ENGINEERS
Guest	Zan	Kiparizoski	Howard Industries
Guest	Krzysztok	Kulasek	Delta Star Inc.
Member	Mark	Lachman	Doble Engineering Co.
Member	Fernando	Leal	Prolec GE
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Tim-Felix	Mai	Siemens Energy
Guest	Swapnil	Marathe	Megger
Guest	James	McBride	JMX Services, Inc.
Member	Mike	Miller	Siemens Energy
Guest	Francis	Mills	Power Engineers
Guest	Juliano	Montanha	Siemens Ltda
Guest	Masta	Munoz	Hitachi Energy
Guest	Paul	Mushill	Ameren
Guest	George	Partyka	PTI Transformers
Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Member	Harry	Pepe	Phenix Technologies, Inc.
Guest	Jay	Pidcock	Ameren
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Bojan	Popovii	Koncar Power Transformer
Guest	Bertrand	Poulin	Hitachi ABB Power Grids
Guest	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Jonathan	Reimer	FortisBC
Guest	Juan	Reyes Perez	Hitachi Energy
Member	Rodrigo	Ronchi	WEG-Voltran
Member	Hakan	Sahin	Virginia and Georgia Transformers
Member	Daniel	Sauer	EATON Corporation
Vice-Chair	Markus	Schiessl	SGB
Member	Eric	Schleismann	Southern Company Services
Guest	Cihangir	Sen	Duke Energy
Member	AbdulMajid	Shaikh	Delta Star Inc.
Guest	Kushal	Singh	ComEd
Member	Christopher	Slattery	FirstEnergy Corp.
Guest	Yong Taz	Sohn	Hyosung HICO
Member	Sanjib	Som	Pennsylvania Transformer
Guest	H. Allen	Steele	TVA
Guest	Andrew	Steineman	Delta Star Inc.

Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Matthew	Sze	OMICRON electronics Corp USA
Guest	Troy	Tanaka	Burns & McDonnell
Guest	Val	Tatu	Powersmiths
Guest	Andreas	Thiede	Highvolt Dresden
Member	Eduardo	Tolcachir	TTE S.A.
Chair	Ajith	Varghese	Prolec-GE Waukesha
Secretary	Jason	Varnell	Doble Engineering Co.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Dharam	Vir	Prolec-GE Waukesha
Member	Pragnesh	Vyas	Sunbelt-Solomon
Guest	David	Wallach	Duke Energy
Member	Eric	Weatherbee	PCORE Electric
Member	Matthew	Weisensee	PacifiCorp
Guest	Shibao	Zhang	PCORE Electric
Member	Kris	Zibert	Allgeier, Martin and Associates

Appendix A: TF Partial Discharge for Class I Transformers Meeting Minutes

TF Partial Discharge for Class I Transformers

Document #: C57.12.00 – 2021 & C57.12.90 - 2021

Document Title: TF Partial Discharge for Class I Transformers

Chair:	**Donald E. Ayers**	**Vice-Chair**	
Secretary	**Pugal Selvaraj**	**Percent Complete**	

Current Draft Being Worked On:	**N/A**	**Dated:**	**N/A**
PAR Expiration Date:	**N/A**		

Meeting Date:	**10/22/2023**	**Time:**	**11.00 AM to 12.15 PM**
Location:	**Kansas City, Missouri**		

Attendance:	**Members**	**11**
	Guests	**52**
	Guests Requesting Membership	**12**
	Total*	**75**

*** Attendance list for this meeting is shown at end of meeting minutes**

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 11 am on 22th October 2023

1. Administrative
    a. IEEE Patent Policy and Call for Patents and IEEE SA Copyright Policy
        i. No comments from group

b. Introduction of the Task Force's new leadership
    i. Chair: Don Ayers
    ii. Secretary: Pugal Selvaraj (not present)
    iii. Acting Secretary Daniel Sauer
c. Review of Fall 2023 agenda
    i. No comments from group
d. Attendance
    i. Members present were 11, 8 members required, quorum achieved.
    ii. Attendance sheets were passed out.
    iii. Fifteen attendees expressed interest to become members when attendance justifies.
    iv. Attendance sheet noted with the total of 75 attendees in the meeting
e. The following approvals were achieved.
    i. Fall 2023 agenda –
        1. Motion by Phil Hopkinson, Second by Detlev Gross, passed unanimously.
    ii. Minutes from Fall 2021, Fall 2022 & Spring 2023.
        1. Motion by Onome Avanoma, seconded by Phil Hopkinson, passed unanimously.

2. Old Business
    a. Chair presented the survey feedback on the proposed changes to the C57.12.00 -2021 Partial Discharge test for Class I Power Transformer section and opened the floor for discussion.
    b. Discussion on Proposal I : Revising PD acceptable limits from 500pC to 250 Pc

    - After discussion, a motion made by Detlev Gross and seconded by Phil Hopkinson to accept 250 PC as the acceptable limit. Motion passed with 10 for and 1 against.

    c. Discussion on Proposal 2 : Mak reduced duration for PD tests available.
    After discussion, a motion was made by Detlev Gross and seconded by Phil Hopkinson to reject lower durations for the PD test. Motion passed with 5 for, 2 against and 2 abstaining.
    d. **Discussion on Proposal 3**: **Remove PD testing for Voltage Rating below 34.5kV**
    After discussion, a motion was made by Phil Hopkinson and seconded by Dan Sauer to eliminate PD limits on transformers rated below 34.5 kV. The proposed motion was amended to propose that PD limits on transformer rated below 34.5 kV be set by agreement between purchaser and manufacturer. The amendment passed 10 for, o against. The original amended motion passed with 10 for and 1 against.

    e. **Discussion on Proposal 4,5,6,7 and 8 related to where language should insered in the standards.**
    After discussion, a motion was made by Ajith Varghese and seconded by Sergio Hernandez-Cano to keep the proposed language changes for C57.12.90 out of Section 10.8 (Class II transformers) and to move all proposed language changes into a restructured Section 10.7 under Class I transformers.
    f. **Discussion on Proposal 4,5,6,7 and 8 related Tables 3 and 4 structure**
    After discussion, a motion was made by Dan Sauer and seconded by Ajith Varghese to maintain table 4 as presently exists and move test voltage information on Class I transformers to Table 3 and add a third section. The existing second section shall be re-labeled Class I without PD Test. The new third section shall be labeled Class I with PD test when specified. The motion passed with 9 for and 1 against.

3. Close of meeting

a. A motion was made by Onome Avanoma to adjourn the meeting. It was seconded by Detlev Gross and passed unanimously. Meeting adjourned at 12.05PM

Submitted by: Donald E. Ayers Date: 11/14/2023 Rev A

IEEE/PES Transformers Committee			
SC/WG/TF: TF on PD Testing of Class 1 Transformers			
Meeting Location: Fall 2023 Date: 10/22/2023			
	Last Name	**First (Given) Name**	**Company (Affiliation)**
Member	Ayers	Donald	Ayers Transformer Consulting
Member	Avanoma	Onome	MJ Consulting
Member	Gamboa	Jose	H-J Family of Companies
Member	Gross	Detlev	Power Diagnostix Consult GmbH
Member	Hernandez Cano	Sergio	Hammond Power Solutions
Member	Hopkinson	Philip	HVOLT Inc.
Member	Lee	Moonhee	Hammond Power Solutions
Member	Sauer	Daniel	EATON Corporation
Member	Slattery	Christopher	FirstEnergy Corp.
Member	Szczechowski	Janusz	Maschinenfabrik Reinhausen
Member	Varghese	Ajith	SPX Transformer Solutions, Inc.
Guest	Antosz	Stephen	
Guest	Beaudoin	Jason	
Guest	Bedoya	Duvier	Hitachi Energy
Guest	Berman	Andrew	
Guest	Betancourt	Edwin	
Guest	Bhardwaj	Rahul	
Guest	Boettger	William	Boettger Transformer Consulting LLC
Guest	Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.
Guest	Britton	Jeffrey	Phenix Technologies, Inc.
Guest	Chiang	Solomon	
Guest	Davis	Eric	??
Guest	Dennis	Scott	
Guest	Door	Jeffrey	H-J Family of Companies
Guest	Ellis	William	
Guest	Eshenroder	Jacob	
Guest	Fayad	Fadi	
Guest	Fitzagerald	Sean	
Guest	Frye	Richard	
Guest	Gaytan	Carlos	Prolec GE
Guest	Gossett	Shawn	Ameren
Guest	Hollrah	Derek	

Guest	Iman	Mohammad	MGM Transformer Company
Guest	John	John	
Guest	Kaineda	Kurt	??
Guest	Katapalli	Thrinadha	
Guest	Katz	Nathan	PacifiCorp
Guest	Koeck	Klaus	
Guest	Lachman	Mark	Doble Engineering Co.
Guest	Lambert	Jason	
Guest	Larison	Andrew	
Guest	Larochelle	David	NDB Technologies
Guest	Leal	Fernando	Prolec GE
Guest	Makey	Shemann	
Guest	Mellin	Toni	
Guest	Morales-Cruz	Emilio	
Guest	Moreno	Andre	
Guest	Naderian	Ali	METSCO Energy Solutions Inc.
Guest	Naranjo	Volney	
Guest	Newhill	Mark	
Guest	Owen	John	
Guest	Parkinson	Dwight	
Guest	Partyka	George	PTI Transformers
Guest	Patel	Nitesh	Hyundai Power Transformers USA
Guest	Pepe	Harry	Phenix Technologies, Inc.
Guest	Pousset	Baptist	
Guest	Sarkar	Amitabh	
Guest	Schleismann	Eric	Southern Company Services
Guest	Schwartz	Daniel	
Guest	Shalkh	Abdulmajid	??
Guest	Sharifi	Masoud	
Guest	Singh	Kushal	
Guest	Snyder	Steven	Hitachi Energy
Guest	Soeller	Markus	Power Diagnostix
Guest	Sohail	Mohammad Abdullah	
Guest	Steineman	Andrew	
Guest	Stretch	Kerwin	Siemens Energy
Guest	Sze	Matthew	
Guest	Thiede	Andreas	
Guest	Tirado	Fernaudo	
Guest	Trifunoski	Risto	Trench Limited
Guest	Veeran	Kannan	Georgia Transformer
Guest	Vyas	Pragnesh	Sunbelt-Solomon Solutions
Guest	Weisensee	Matthew	
Guest	Wimberly	Barreh	

Task Force on Revision of Impulse Tests

Chair: Sylvain Plante

Vice Chair: Daniel Sauer

Kansas City, MO, Fall 2023

Unapproved meeting minutes

The TF met on October 24th, 2023 from 08:00 am to 09:15 am. Twenty-eight (28) members and eighty-seven (87) guests attended the meeting (see attached attendance list). Forty (40) Guests were attending for the first time the Task Force. Twenty-three (23) guests requested membership but only 17 are eligible to have attended at least 2 of the last 3 meetings. The meeting was chaired by Sylvain Plante, Chair of the TF. and Mr. Daniel Sauer was the vice-chair.

The meeting has been called to order by the Chair at 08:00 am.

Attendance has been recorded in the TF's attendance EXCEL spreadsheets and includes in the annex. Because the new AMS system was still not ready.

IEEE Patents and Copyright slides were presented. There were no comments or requests regarding Patents and Copyrights.

Required quorum was met, presence of at least 18 members was required, we had 24 at the beginning and finish with 27.

The meeting agenda has been approved unanimously. Motion has been made by Tauhi Haque Ansari and was seconded by David Wallach.

The S23 Milwaukee, WI, meeting minutes has been approved unanimously. Motion has been made by Jim McBride and was seconded by Donald Ayers.

A motion to accept the new text and sent it to the Working Group of the C57.12.90 has been made by Steve Antosz and second by Kris Ziebert. It has been unanimously approved.

The second item of business was related to the survey sent to the TF regarding the use of tolerances on the applied voltage during switching and lightning impulse test. This subject raises a lot of comment and discussion. The comment from the survey has been reviewed.

A motion to take the survey text from the DTSC regarding the use of tolerance for switching impulse (10.2.2.2) and lightning impulse (10.3.1.1) and send it to the DTSC to approve and send to the WG C57.12.90 was made by Steve Antosz and was seconded by Matt Weisensee has been made.

A motion to amend the proposition and modified the word accepted by considered has been made by Steven Antosz and second by Matt Weisensee has been rejected (0 in favour, 20 against, 3 abstain).

A motion to amend the proposition and modified the to change the text with “Impulse crest shall be accepted as valid." was made by Jim McBride and second by Ajith Varghese has been adopted unanimously.

The original motion to adopt the following text has been adopted (24 in favour, 3 against, 0 abstain).

The basic rule for the application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the impulse crest shall be accepted as valid. For any required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value.

We discuss the comment received from the other survey regarding the proposal for clause 10.2.4 of IEEE C57.12.90 regarding the tap selection during switching impulse test. A proposition will be made for next meeting will all the comment received.

The meeting adjourned at 09:15 am on October 24th, 2023.

The next meeting is planned to be held in Vancouver, BC, Canada March 10th – 14th, 2023.

Minutes wrote by:

Sylvain Plante, Eng

TF Chair

October 24th, 2023

Attendance List

Role	First Name	Last Name	Company
Member	Kayland	Adams	GE Prolec
Member	Tauhid Haque	Ansari	Hitachi Energy
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Onome	Avanoma	MJ Consulting
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	Christopher	Baumgartner	We Energies
Guest	Duvier	Bedoya	Hitachi Energy
Guest	Eolwin	Betancourt	Siemens Energy
Guest	William	Boettger	Boettger Transformer Consulting LLC
Member	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Michel	Botti	
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Guest temp	Steven	Brzoznowski	Bonneville Power Administration
Member	David	Calitz	Siemens Energy
Guest	camilo	casallas	

Guest	David	Caverly	Trench Limited
Guest	Vivian	Chan	
Guest	Ennyoung	Cho	
Guest	Eric	Davis	Burns & McDonnell
Guest	Everton	De Oliveira	Siemens Energy
Member	Scott	Dennis	Hitachi Energy
Member	Hugo	Flores	Hitachi Energy
Guest	Richard	Frye	EATON Corporation
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Shawn	Gossett	Ameren
Member	Peter	Heinzig	Weidmann Electrical Technology
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Mohammad	Iman	MGM Transformer Company
Member	John	John	Virginia Transformer Corp.
Member	Thrinadha	Katapalli	
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Qasim	Khan	
Guest	Zan	Kiparizoski	Howard Industries
Member	Evan	Knapp	Eaton corp
Member	Mark	Lachman	Doble Engineering Co.
Member	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Guest	Junho	Lee	
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	James	McBride	JMX Services, Inc.
Guest	Francis	Mills	
Guest	Martha	Minoz	
Guest	Juliano	Montanha	Siemens Energy
Member	David	Murray	Tennessee Valley Authority
Guest	George	Partyka	PTI Transformers
Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Klaus	Pointner	Trench Austria GmbH
Member	Bertrand	Poulin	Hitachi Energy
Member	Jarrod	Prince	ERMCO
Member	Rodrigo	Ronchi	WEG Transformers USA Inc.
Member	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Dinesh	sankarakurup	
Vice-Chair	Daniel	Sauer	EATON Corporation
Guest	Eric	Schleisman	Southern Company Services
Guest	Alfons	Schrammel	
Member	Cihangir	Sen	Duke Energy
Member	abdulmajid	Shaikh	
Member	Mike	Shannon	REA Magnet Wire

Member	Jin	Sim	Jin Sim & Associates
Member	Christopher	Slattery	FirstEnergy Corp.
Guest	Jason	Snyder	
Member	Sanjib	Som	Pennsylvania Transformer
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Andrew	Steineman	Delta Star Inc.
Member	Scott	Thomas	Hitachi Energy
Member	core	van dreel	
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Krishnamurthy	Vijayan	PTI Transformers
Guest	David	Walker	MGM Transformer Company
Member	David	Wallach	Duke Energy
Guest	Matthew	Weisensee	PacifiCorp
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Waldemar	Ziomek	PTI Transformers
New Guest	Shanan	Hkim	
New Guest	lee	Mattews	
New Guest	john	Younat	
New Guest	patel	nitesh	
New Guest	sean	barker	
New Guest	rahul	bhardw	
New Guest	lin	tong	
New Guest	christopher	Johnson	
New Guest	Michael	Richardson	
New Guest	Mauricio	soto	
New Guest	Alexander	alahmed	
New Guest	luc	Dorpranns	
New Guest	Isaac	Abdalah	
New Guest	Dragana	Gasic	
New Guest	Matija	Koprich	
New Guest	Janko	Disolan	
New Guest	Raul	Dominguez	
New Guest	Javier	Artega	
New Guest	Joseph	Mc Bride	
New Guest	Scott	Digby	
New Guest	Daniel	Blaydon	
New Guest	Moses	Manzano	
New Guest	Jean	Firzgerald	
New Guest	Kabir	Sethi	
New Guest	Fadi	Fayad	

New Guest	Mark	Newbill	
New Guest	Dragan	Kovic	
New Guest	Jacob	Esheroder	
New Guest	Rogerio	Verdolin	
New Guest	Roussell	Marnie	
New Guest	Juan	Reyes	
New Guest	Gabriel	Delgano	
New Guest	David	Larochelle	
New Guest	Rafal	Kowalski	
New Guest	Daniel	Allens	
New Guest	Vivek	Blah	
New Guest	Saranna	Hoffman	
New Guest	Jeremy	Johnson	
New Guest	Ismael	Haja	
New Guest	Mike	Miffu	

Survey results

Date of issue: August 4th 2023;

Closing date: September 15th , 2023;

Number of surveys sent: 199 in DTSC;

Number of surveys returned: Total: 76 returns, **(40%)** (77/ (199-11))

Number of E-mail bounced: 11;

Number of affirmative: 61 + 3 with comments **(84.2%)**;

Number of negative: 4 (5.3%);

Number of abstain: 7+ 1 Retirement;

Comments received: See the following table.

Proposed text:

"Use of test voltage tolerance during impulse tests"

As agreed in our last TF "Revision to Impulse Tests" meeting held on March 21st, 2023 in Milwaukee, WI, this revised proposal has been approved (18 in favour, 1 against). The initial proposal has also been approved by 94% of the peoples who responded to a previous survey made within the TF roster. The negative received from the survey has been fully resolved.

In addition, the TF agreed upon to survey the revised proposal within the Dielectric Tests SubCommittee. A motion to survey the proposal within the Dielectric Test SubCommittee has been approved during the Dielectric Test SubCommittee meeting held on March 22nd, 2023 (Milwaukee, WI).

The basis of this proposal is to prevent the laboratory to voluntary aim to the -3% tolerance.

Actual wording (switching impulse test):

10.2.2.2 Waveshape

The switching impulse voltage wave shall have a crest value in accordance with the assigned insulation level, subject to a tolerance of ± 3%, and shall exceed 90% of the crest value for at least 200 μs. The actual time to crest shall be greater than 100 μs, and the time to the first voltage zero on the tail of the wave shall be at least 1000 μs.

Occasionally, core saturation will cause the time to the first voltage zero to be less than 1000 μs. Successive transients of the same polarity may cause the time to the first voltage zero to become even shorter. To increase the time to the first voltage zero, it may be necessary to magnetically bias the core in the direction opposite to that caused by the switching impulse transient. This goal can be accomplished by passing a small direct current through the winding between impulses by reversing the switching impulse polarity on successive applications or by applying reduced impulses of opposite polarity before each full switching impulse transient. If biasing cannot be accomplished to obtain 1000 μs to the first voltage zero, the shorter tail may be used because the duration of a switching impulse in actual service will similarly be reduced because of core saturation.

Proposed wording (switching impulse test, changes shown in red):

10.2.2.2 Waveshape

The switching impulse voltage wave shall have a crest value in accordance with the assigned insulation level, subject to a tolerance of ± 3%, and shall exceed 90% of the crest value for at least 200 μs. The actual time to crest shall be greater than 100 μs, and the time to the first voltage zero on the tail of the wave shall be at least 1000 μs.

The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the impulse crest shall be accepted as valid. For any required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value.

Occasionally, core saturation will cause the time to the first voltage zero to be less than 1000 μs. Successive transients of the same polarity may cause the time to the first voltage zero to become even shorter. To increase the time to the first voltage zero, it may be necessary to magnetically bias the core in the direction opposite to that caused by the switching impulse transient. This goal can be accomplished by passing a small direct current through the winding between impulses by reversing the switching impulse polarity on successive applications or by applying reduced impulses of opposite polarity before each full switching impulse transient. If biasing cannot be accomplished to obtain 1000 μs to the first voltage zero, the shorter tail may be used because the duration of a switching impulse in actual service will similarly be reduced because of core saturation.

Actual wording (lightning impulse test):

First two paragraphs

10.3.1.1 Full-wave test

The test wave rises to crest in 1.2 μs and decays to half of crest value in 50 μs from the virtual time zero. The crest value shall be in accordance with the assigned basic impulse insulation level (BIL), subject to a tolerance of ±3%, and no flashover of the bushing or test gap shall occur. The tolerance on virtual front time should be ±30%, and the tolerance on time to half of crest should be ±20%. However, as a practical matter, once the manufacturer has proven that they have test equipment limitations, the following shall be considered:

a) If the standard impulse waveshape cannot reasonably be obtained because of low winding inductance or high capacitance to earth, the resulting impulse waveshape is generally oscillatory and its relative overshoot magnitude can exceed 5%. In such cases, the front time can be increased to reduce the overshoot amplitude. In all cases, the front time shall not exceed 2.5 μs regardless of the overshoot amplitude.

Proposed wording (lightning impulse test, changes shown in red):

10.3.1.1 Full-wave test

The test wave rises to crest in 1.2 μs and decays to half of crest value in 50 μs from the virtual time zero. The crest value shall be in accordance with the assigned basic impulse insulation level (BIL), subject to a tolerance of ±3%, and no flashover of the bushing or test gap shall occur. The tolerance on virtual front time should be ±30%, and the tolerance on time to half of crest should be ±20%.

The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the impulse crest shall be accepted as valid. For any required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value.

However, as a practical matter, once the manufacturer has proven that they have test equipment limitations, the following shall be considered:

a) If the standard impulse waveshape cannot reasonably be obtained because of low winding inductance or high capacitance to earth, the resulting impulse waveshape is generally oscillatory and its relative overshoot magnitude can exceed 5%. In such cases, the front time can be increased to reduce the overshoot amplitude. In all cases, the front time shall not exceed 2.5 μs regardless of the overshoot amplitude.

Rest of the clause remains as is.

Main highlights from the "Approve with comments" received:

a) *Comment from Jesse Duffy:*

The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. ~~If~~ For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the test shall be accepted as a valid test. For any required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value.

b) *from Kurt Kaineder*

(Change to -3% Tolerance, + Tolerance not necessary, higher test values should be accepted)

c) *from Chris Baumgartner*

The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. If for any of the impulses of a test series, the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the test shall be accepted as a valid test. For any required subsequent impulse on the same terminal, adjustments shall be made to aim closer to the specified test value.

TF Chair Observation: *To be discussed.*

Main highlights from the "Negative" received:

1. *Comment from Joseph Foldi:*

I believe the original wording is clear and we do not need further clarification.

2. *from Ajith Varghese*

I agree with the spirit of the discussion and it was good discussion and in fact that has been Waukesha's practice always but I am voting against, since its not something should be specified in an IEEE standard.

As with any tolerance , The nominal values are specified based on allowed tolerance; so it's understood that unit could be tested -3% lower.
User who have not in agreement with that could order transformer one level higher or could order nonstandard BIL.
I don't see any reason C57.12.90 to be different than IEEE 4.

3. *from Huan Dinh*

My reason is the addition text is not necessary. It seems to address special cases when the test value aimed low, then had few values out of tolerance. The tolerance is for the specified value, it is very clear, thus no need for further explanation. It might cause confusion.

4. *from Sanjib Som*

Rejected since the clause is poorly written. The amendment does not state what will be the action if the attempt to bring to target closer fails. When it fails it exposes the test to be a matter of dispute between the purchaser and seller. Further, There is no scientific

basis of this amendment except to disadvantage the manufacturer by increasing the duration of testing. Insertion of such a clause will require that the manufacturer has to adjust his set-up continuously, there by increases the duration of test. This will also increase the buyer's payout to a consultant, if a consultant was being utilized. If the intent is to not allow negative tolerance, then the tolerance can be change from +/-3% to -0% to +6%. Thus, as long as each shot meets the tolerance no further adjustments should be required. The existing clause has stood the test of time. Neither statistically nor by real life example has it been demonstrated that even if all the shots were in the negative tolerance zone that the unit did not meet the intended specification. In an earlier revision it was shown statistically that by adding another full wave shot the reliability was ensured. Amendment to this clause should also be justified using similar scientific reasoning.

TF Chair Observation: *To be discussed.*

Balloter First name	Balloter last name	Vote	Comment	OBSERVATIONS OF THE TF Chair on each comment submitted
George	Frimpong	Retirement		
Joseph	Foldi	Dissapproved	;. I believe the original wording is clear and we do not need further clarification.	We understand the point, but the task force had agreed to work on the modification of the text.
Sanjib	Som	Dissapproved	Rejected since the clause is poorly written. The amendment does not state what will be the action if the attempt to bring to target closer fails. When it fails it exposes the test to be a matter of dispute between the purchaser and seller. Further, There is no scientific basis of this amendment except to disadvantage the manufacturer by increasing the duration of testing. Insertion of such a clause will require that the manufacturer has to adjust his set-up continuously, there by increases the duration of test. This will also increase the buyer's payout to a consultant, if a consultant was being utilized. If the intent is to not allow negative tolerance, then the tolerance can be change from +/-3% to -0% to +6%. Thus, as long as each shot meets the tolerance no further adjustments should be required. The existing clause has stood the test of time. Neither statistically nor by real life example has it been demonstrated that even if all the shots were in the negative tolerance zone that the unit did not meet the intended specification. In an earlier revision it was shown statistically that by adding another full wave shot the reliability was ensured. Amendment to this clause should also be justified using similar scientific reasoning.	The reason for that modification is not to incread the voltage, but to prevent voluntary aiming for the -3%. The reason for a tolerance is to NOT reject a test because the voltage is a bit lower, and to not said it's a bad equipement when it fail at higher voltage. I think the tolerance is good, but we need to use it as a tolerance and not in a way to cheat using lower voltage.
Ajith	Varghese	Dissapproved	I agree with the spirit of the discussion and it was good discussion and in fact that has been Waukesha's practice always but I am voting against, since its not something should be specified in an IEEE standard. As with any tolerance , The nominal values are specified based on allowed tolerance; so it's understood that unit could be tested -3% lower. User who have not in agreement with that could order transformer	We understand the point, but the task force had agreed to work on the modification of the text.

			one level higher or could order nonstandard BIL. I don't see any reason C57.12.90 to be different than IEEE 4.	
Huan	Dinh	Disapprouved	My reason is the addition text is not necessary. It seems to address special cases when the test value aimed low, then had few values out of tolerance. The tolerance is for the specified value, it is very clear, thus no need for further explanation. It might cause confusion.	In fact, the reason for this modification is because some lab voluntary target the -3% tolerance when testing. I kind of agree with you that the text should not be necessary, but because of my previous sentence, in order to be fair with all manufacturers (the one aiming for target value and the one aiming for the -3% value) the TF has suggested modifying the text to make it clearer that the target value is the target value and the tolerance should not be used to reduce voluntary target value. So if you target the target value, and it's normal that you can be higher or lower, you shall readjust the charging voltage for the following surge ?
Edmundo	Arevalo	bad email		
Larry	Christodoulou	bad email		
Eric	Davis	bad email		
Thang	Hochanh	bad email		
Kent	Miller	Bad email		
Tim	Rocque	bad email		
Jeffrey	Schneider	bad email		
Ibrahim	Shteyh	bad email		
Jason	Snyder	bad email		
Vijay	Tendulkar	bad email		
Deanna	Woods	bad email		
Jesse	Duffy	approved with comment	The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. ~~If~~ For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the test shall be accepted as a valid test. For any	Agreed

			required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value	
Kurt	Kaineder	Approved with comment	(Change to -3% Tolerance, + Tolerance not necessary, higher test values should be accepted)	Not accepted by the Task Force. The highest value is accepted. The text already said it.
Weijun	Li	Approved		
Kyle	Stechschulte	Approved with comment	The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. If for any of the impulses of a test series, the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of ±3%, the test shall be accepted as a valid test. For any required subsequent impulse on the same terminal, adjustments shall be made to aim closer to the specified test value.	Text has been reject by the TF, Aim is not reach. We belived that it should aim not to a closer, but to the specified value, even if it not reaching it. The target Shall be the specified voltage.
Kayland	Adams	Approved		
Elise	Arnold	approved		
Donald	Ayers	Approved		
Christopher	Baumgartner	Approved		
William	Boettger	Approved		
Sanket	Bolar	Approved		
Jeremiah	Bradshaw	Approved		
Jeffrey	Britton	Approved		
Steven	Brzoznowski	Approved		
David	Calitz	Approved		
Camilo	Casallas	Approved	What is the reason for the upper +3% tolerance? One thought is to consider if there is reason for the upper tolerance to be removed and just have a -3% tolerance. Comment cleared	The main reason for this modification is to make sure that if the voltage is lower, it will be re-adjust to have the specified voltage. If the manufacturer wants to adjust when the voltage is higher, he can do it, but it will not be mandatory. Maybe, it's

				not an issue, and would prefer to just continue with the same set-up to be faster.
Solomon	Chiang	Approved		
Hugo	Flores	Approved		
Bruce	Forsyth	Approved		
Orlando	Giraldo	Approved		
Luis	Gonzalez	Approved		
Shawn	Gossett	Approved		
Roger	Hayes	Approved		
Kyle	Heiden	approved		
Peter	Heinzig	Approved		
Jean Carlos	Hernandez	Approved		
Sergio	Hernandez Cano	Approved		
John	Herron	Approved		
Saramma	Hoffman	Approved		
John	John	Approved		
Stephen	Jordan	approved		
Sheldon	Kennedy	Approved		
Gary	King	Approved		
Zan	Kiparizoski	approved		
Moonhee	Lee	Approved		
Aleksandr	Levin	Approved		
Mario	Locarno	approved		

Tim-Felix	Mai	Approved		
James	McBride	Approved		
Goran	Milojevic	approved		
Emilio	Morales-Cruz	Approved		
Hugo	Murillo	approved		
David	Murray	Approved		
Kristopher	Neild	Approved		
Harry	Pepe	Approved		
Christoph	Ploetner	Approved		
Ion	Radu	Approved		
Leslie	Recksiedler	Approved		
Pierre	Riffon	Approved		
Mickel	Saad	Approved		
Hakan	Sahin	approved		
Markus	Schiessl	Approved		
Alfons	Schrammel	Approved		
Pugal	Selvaraj	Approved		
Cihangir	Sen	Approved		
Abdulmajid	Shaikh	Approved		
Steven	Snyder	Approved		
Mike	Spurlock	Approved		
Shankar	Subramany	Approved		

Charles	Sweetser	Approved		
Troy	Tanaka	approved		
Jason	Varnell	approved		
Bruce	Webb	Approved		
Kris	Zibert	Approved		
Waldemar	Ziomek	Approved		
Francis	Mills	Abstain Not member		
Onome	Avanoma	abstain		
Jeff	Benach	abstain		
Peter	Kleine	Abstain		
Jerry	Murphy	abstain		
Diego	Robalino	Abstain		
Eric	Weatherbee	abstain		

- Sylvain Plante **makes the motion to the SC members to consider the text being surveyed** and the results to be taken to the WG level.
    - Dan Sauer seconds the motion.
    - Discussion:
        - Sanjib Som made comments about ambiguity of the text.
        - Dan Sauer indicated that the survey has been well reviewed, and it has been for quite some time on the agenda. During the survey any one can comment and request modifications if needed.
    - By majority of votes, **motion carries**

Task Force on Guide for DFR Test (C57.161)

Chair: Evgenii Ermakov

Secretary: Diego Robalino

Kansas City, MO, Fall 2023

Unapproved meeting minutes

Total 55 attendees

Requested Membership 34

Total members = 36 (including Chair and Secretary)

Poorvi Patel (motion to approve agenda) Peter Werelius (second)

TF Chair presented Patent & Copyright Policies

The main idea of this TF is to review the existing C57.161 document and improve the information based on a thorough review by this TF. Als, it is necessary to decide if this work is to be completed as a Task Force or if it should go up to a WG.

- Main consideration is that there is a new DFR guide for HV bushings and 161 might be transformer focus.

TF Chair went through the observations he identified in the document and made suggestion for improvement and possible changes.

- Minor discussion between the use of FDS or DFR
- Not just describe the differences between DF and DFR but get more into the concepts and fundamentals of DFR and the modeling theory.
- Further explanation to test CH or CL
- Clarification regarding non-typical responses

- Description of frequency response and “hump”
- Revision of Table 1 and 6

Task Force attendees commented on the use of DFR for reactors and Autotransformers as well as the use of alternative fluids natural/synthetic esters.

Ali Naderian put a motion to create a WG to review/revise this document. After discussion and agreed that more clarity is needed regarding the scope of the work, this motion was tabled.

Next meeting will be the same TF with an additional revision of scope before a decision is taken to bring this to a WG.

Attendees to TF meeting

Role	First Name	Last Name	Email
Guest	Isaac	Abdalla	iabdalla@hicoamerica.com
Guest	Koffi	Akakpo	okoffiakakpo@burnsmcd.com
Member	Maad	Al Saad	maadh.alsaad@evergy.com
Guest	Deniss	Carr	deniss.carr@ge.com
Member	Marcelo	Catugas	mcatugas@myneil.com
Guest	Vivian	Chan	vivian.chan@hitachienergy.com
Guest	Jaroslaw	Chorzepa	jaroslaw.chorzepa@us.abb.com
Member	James	Cross	james.cross@kinetrics.com
Member	Gabriel	Delgado	gaboad18@gmail.com
Guest	Nikolaus	Dillon	nikolaus.n.dillon@dominionenergy.com
Guest	Kirk	Durkar	kirk.durcar@ieee.org
Chair	Evgenii	Ermakov	evgenii.ermakov@hitachienergy.com
Member	Rob	Ghosh	sghrob@gmail.com
Member	Alireza	Gorzin	gorzina@bv.com
Member	Ismail	Guner	ismailguner@ieee.org
Member	Roger	Hayes	roger.hayes1@ge.com
Member	Ronald	Hernandez	rhernandez@doble.com
Guest	Karl	Jakob	karl_jakob@cargill.com
Guest	Jeremy	Johnson	jejohnson@burnsmcd.com
Guest	Gael	Kennedy	grkennedy@ieee.org
Member	Qasim	Khan	qasim.khan@neetracogatech.edu
Guest	Mark	Lachman	mlachman@doble.com
Member	Fernando	Leal	ferleal@gmail.com
Member	Mario	Locarno	mlocarno@doble.com
Guest	Stephanie	Mabrey	stephanie.mabrey@weidmann-group.com
Member	Darrell	Mangubat	darrell.mangubat@ieee.org
Member	Alberto	Martinez	martineza@weg.net
Member	Robert	Middleton	bob.middleton@rhmintl.com
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Member	David	Murray	dbmurray@tva.gov
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Member	Rakesh	Patel	rakesh.patel@hitachienergy.com
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Member	Zoltan	Roman	zoltan.roman@ge.com
Member	Rodrigo	Ronchi	rronchi@weg.net
Member	Mickel	Saad	mickel.saad@hitachienergy.com
Member	Hakan	Sahin	hakanshaun@gmail.com
Member	Hemchandra	Shertukde	shertukde@hartford.edu
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Guest	Hampton	Steele	hasteele@tva.gov
Member	Charles	Sweetser	charles.sweetser@omicronenergy.com
Guest	Matthew	Sze	matthew.sze@omicronenergy.com
Member	Eduardo	Tolcachir	etolcachir@tte.com.ar
Member	Risto	Trifunoski	risto.trifunoski@trenchgroup.com
Guest	Kannan	Veeran	kannan.veeran@gatransformer.com
Member	Drew	Welton	dwelton88@live.com
Member	Peter	Werelius	peter.werelius@megger.com
Member	Guang	Yuan	guang.yuan@hitachienergy.com
Member	Shibao	Zhang	shibao.zhang@ieee.org

TF C57.127- Revision of IEEE Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges

Detlev Gross

Unapproved Meeting Minutes

Kansas City, October 25th, 2023, Room: Liberty

Meeting Attendance

The task force met at 9:30 AM. 29 participants were in the room and 19 requested to be members of the group.

Discussions

After the call for patent and showing the copyright policy, we proceeded with the chair's remarks on the start of this new task force. Understanding that the current C57.127 documents will expire in 2028, the task force will have about 4 years to revise and update its content.

The current Title, Scope and Purpose were presented. Gary Hoffman made a comment about how "Power transformers" refers to a category that excludes distribution transformers. A motion was made to remove both "Power" in the title (motion by James Cross, seconded by Alexander Kraetge, unanimously approved). The discussion that followed aimed at modifying the current Title and Scope to include other electrical equipment without having to specify each (for example voltage transformers, traction transformers etc). The following wording was finally voted on (motion by Marcus Soeller, seconded by Gary Hoffmann) and unanimously approved. The chair will ask for a vote at the dielectric subcommittee meeting so a PAR can be filed and get the working group officialized by the next spring meeting.

Title

Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Transformers and Reactors.

Scope

This guide is applicable to the detection and location of sources of acoustic emissions (AEs) from partial discharges (PDs) and other sources in power and distribution transformers, reactors, cast resin dry-type transformers and other specialty transformers. There are descriptions of acoustic instrumentation, test procedures, and interpretation of results.

Purpose

This guide is intended to provide information that may be helpful in planning, installing, and operating acoustic measuring equipment and meaningful interpretation of resulting data.

It was then mentioned that short presentations on case studies or new techniques could be beneficial for the group. Any participant interested in presenting should contact one of the TF officers so it can be planned in the next meetings by dedicating between 20 and 30 minutes to such tutorial sessions.

Adjournment

The meeting was adjourned at 10:30 AM (motion by Gary Hoffmann, seconded by Jeff Benach)
David Larochelle

Attendee List

Complete name	Email	Affiliation	Status
Detlev Gross	dwg@mailbox.org	Independent	C
John Harley	jack.harley@FirstPowerGroupLLC.com	FirstPower Group LLC	VC
David Larochelle	david.larochelle@ndbtech.com	NDB Technologies	S
Charles Sweetser	charles.sweetser@omicronenergy.com	OMICRON electronics Corp USA	G
Janusz Szczechowski	jszczechowski@reinhausen.com	Reinhausen	M
Alexander Kraetge	alexander.kraetge@omicronenergy.com	OMICRON electronics Corp USA	M
Igor Simonov	isimonov@torontohydro.com	Toronto Hydro	M
Marco Espindola	marco.a.espindola@hitachienergy.com	Hitachi Energy	M
Derek Hollragh	dhollragh@burnsmcd.com	Burns McDonnell	G
Gary Hoffman	grhoffman@advpowertech.com	Advanced Power Tech	M
Rodrigo Ronchi	rronchi@weg.net	WEG	M
Fadi Fayad	fayad.fad@gmail.com	ASD	G
James Cross	james.cross@kinectrics.com	Kinectrics	M
Mickel Saad	mikel.saad@hitachienergy.com	Hitachi Energy	M
Aron Sexton	aron.sexton@kinectrics.com	Kinectrics	M
Jeff Benach	jeff.benach@megger.com	Megger	M
Poorvi Patel	ppatel@epri.com	EPRI	M

William Boettger	weboettger@aol.com		M
Vivian Chan	vivian.chan@hitachienergy.com	Hitachi Energy	G
Markus Soeller	soellev@pdix.com	Power diagnostix Systems	M
Matthew Sze	matthew.sze@omicronenergy.com	OMICRON electronics Corp USA	M
K Thrinadha	kthrinadha@vatransformer.com	Virginia Transformer	G
K Vierech	k.vierech@reinhausen.com	Reinhausen	G
Timothy Rocque	timothy.rocque@prolec.energy.com	Prolec Energy	M
Andre Moreno	andre.moreno@siemens-energy.com		M
Andrew Berman	andrew.berman@sandc.com	S&C Electric	G
Alberto Martinez	martineza@weg.net		G
Jonathan Reimer	jonathan.reimer@fortisbc.com	Fortis BC	G
Abdulmajid Shalkh	abdul_muzib@ieee.org		G
Onome Avanoma	o.avanoma@outlook.com		M

- Detlev Made a **motion requesting the DTSC to authorize the TF to file a PAR** to start an official WG.
    - Ali Naderian seconds the motion.
    - Discussion:
        - No discussion. All in favor. **Motion carries**

WG C57.138 - Recommended Practice for Routine Impulse Tests

Unapproved Meeting Minutes
Kansas City, October 24th, 2023

Chair:	**Hakan Sahin**	**Vice-Chair**	**N/A**
Secretary	**David Wallace**	**Percent Complete**	**40%**

Current Draft Being Worked On:	**Draft not started**	**Dated:**	**n/a**
PAR Expiration Date:	**2026**		

Meeting Date:	**24 October 2023**	**Time:**	**3:15pm CST**
Location:	**Kansas City, MO, USA**		

Attendance:	**Members**	**9**
	Guests	**29**
	Guests Requesting Membership	**4**
	Total*	**38**

*** Attendance list for this meeting is shown at end of meeting minutes**

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 3:15pm CST, October 24, 2023.

1. **Administrative**
   a. IEEE Patent Policy and Call for Patents
      i. No comments from group.
   b. IEEE SA Copyright Policy
      ii. No comments from group.
   c. Review of agenda
      iii. No comments from group.
   d. Introductions of the attendees
      iv. Attendance sheets were passed out.
   e. Updated membership review and count for quorum
      v. 38 people were in attendance with 9 out of 17 members present. Quorum was **achieved.**
      vi. Approval of the previous Fall_22 and Spring_23 unapproved meetings' minutes was conducted. Dan Sauer motioned, Reto Faush seconded, no objections; meeting minutes were approved. Approval of the agenda was conducted. Reto Faush motioned, Dan Sauer seconded; approved, no objections.
      vii. 4 attendees requested membership.

2. **Old Business**

   a. Old Business - Section 6.1.3: Effects of impulse generator loading, clarifications on Lg, and possible addition of a note about the effect of (Cpl) in the circuit – 1st slide

6.1.3 Effects of impulse generator loading

The impulse equipment used for routine impulse tests on distribution transformers must satisfy a different set of requirements than equipment used for design impulse testing in laboratory environments. Due to the large number of tests that must be performed on a typical production line and the short time allotted to the routine impulse test, impulse circuit parameters are generally not modified for each test. Therefore, the impulse circuit, as indicated in Figure 1, should be designed such that it will supply the proper impulse wave shape for all units to be tested without the need to make changes. A few guidelines on impulse circuit design for production line testing are given in the following paragraphs.

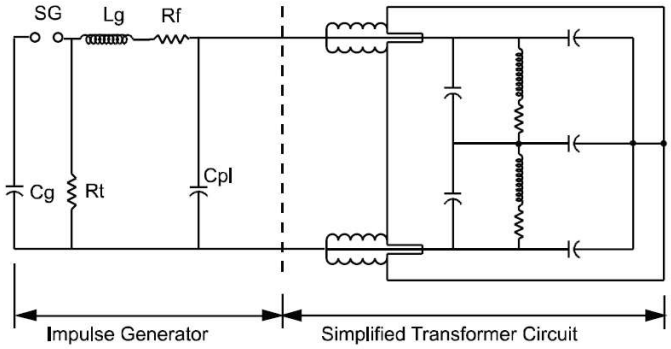

Figure 1—Typical lightning impulse circuit

Group discussed and agreed to change the figure as follows. Did not vote as the chair promised to clean up the figure and add the below notes before the next meeting and the vote:

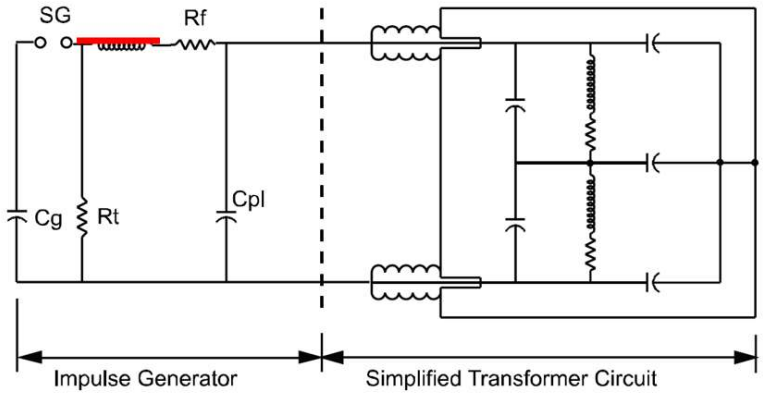

Figure 1—Typical lightning impulse circuit

Remove Lg from all figures with impulse circuits that has the Lg.
Change SG to IG on all figures related to impulse circuit.
Add the voltage divider block to all figures related to …

b. Old Business - Possible revision of Figure 2

6.2 Transformer connections

The required connections for routine impulse tests on distribution transformers are defined in 10.4 of IEEE Std C57.12.90-2015. The impulse is applied to one end of a high-voltage winding while the other end of the same winding is connected to ground through a low-impedance shunt or wide-band current transformer (CT). All other windings, the isolated tank, and the core are grounded in a likewise manner. A typical connection meeting these requirements is shown in Figure 2. It should be noted that in Figure 2 only one terminal of the non-impulsed winding is connected to ground. The single ground connection to the non-impulsed windings enhances fault detection sensitivity. However, the voltage to ground on any non-tested terminal should not be allowed to exceed 80% of its assigned BIL. Additional low-voltage impulses may have to be applied to the terminal under test to enable the voltage transferred to non impulsed terminals to be determined. Recommended connections for various types of transformers and a few special considerations are provided in the following paragraphs. The voltage divider and digital impulse recorder connection, as shown in Figure 2 was omitted for clarity in Figure 3 through Figure 20.

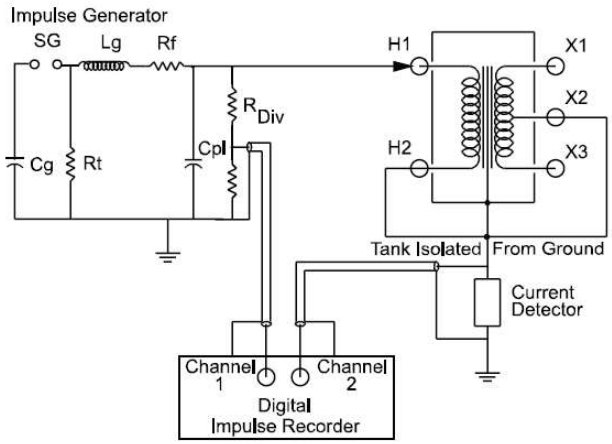

Figure 2—Typical transformer connection for routine impulse testing

Group verbally agreed to make the similar changes as for figure-1 and then remove the below sentence from the paragraph.

The voltage divider and digital impulse recorder connection, as shown in Figure 2 was
igure 3 through Figure 20.

Chair will present these changes during the next meeting for the group to vote.

This applies to both Fig 2 and 3) 1) Current detector could be:

a resistive shunt, an RC shunt, high frequency CT. For better turn to turn fault detection recommended to use the RC shunt.

Group verbally agreed to make the voltage divider a block for both this and add to fig 3 on the following section for figure-3

6.2.1 Improved fault detection sensitivity

It is generally accepted that one of the more difficult transformer impulse failures to detect is a single shorted turn near the grounded end of a high-voltage, low-kilovoltampere, wire-wound primary coil. This type of coil design combines many turns, low volts per turn, and small gauge wire, which are all factors that reduce fault detection sensitivity. Tests on these and other similar units have shown that the sensitivity of the fault detection circuitry to staged faults of this type is increased whenever the tank and one terminal of all non-impulsed windings are connected directly to ground, rather than through the current detector. Routing the tank and low-voltage winding currents through the current detector reduces the fault detection sensitivity. A typical connection for greater detector sensitivity during routine impulse tests on distribution transformers is shown in Figure 3.

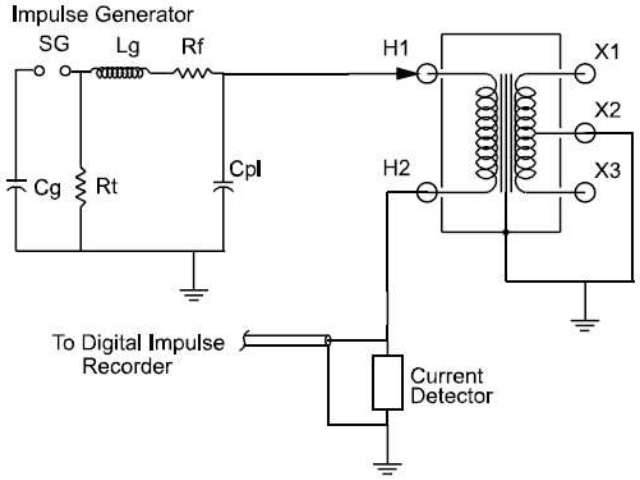

Figure 3—Maximum sensitivity connection

Group continued to review all figures thru 17. Agreed all requires some changes. Revise 6.2.3.3 and match the figures 14 and 15 to the new revised paragraph. Revise 6.2.3.4 and match the figures 16 and 17 to the new revised paragraph

Stopped at 6.2.3.5
Chair agreed to work off line with Jim, Reto, Dan and David to update all discussed points during the Fall meeting off line and to present during the next meeting to the group and vote (pending quorum).

Group will continue the review of the document from clause 6.2.3.5

3. **Next meeting: Vancouver BC, CANADA, March 10-14, 2024**
4. **Close of meeting**
   b. Meeting adjourned at 4:30pm CST

Submitted by: Hakan Sahin Date: 11/12/23

11/24/2023 **Meeting Attendance:**

					Attendance			
Last Name	**First Name**	**Company**	**Status**	**Status Change**	**3/29/20**	**10/18/20**	**3/21/20**	**10/24/20**
Alonso	Mario	Georgia Transformers	Guest		X			
Avanoma	Onome	MJC	Guest	To guest b4 F23		X		X
Beaudoin	Jason	Weidmann	Guest				X	
Betancourt	Edwin	Siemens Energy	Guest				X	
Binder	Wallace	Consultant	Guest			X		
Bolliger	Alain	HV Technologies	Member		X	X		
Bolliger	Dominiques	HV Technologies	Guest					X
Britton	Jeffery	Phenix Technology	Guest				X	X
Carr	Deniss	GE	Guest		X	X		
Costa	Florian	Corimpex	Guest	To guest b4 F23		X		
CruzValdes	Juan Carlos	Prolec GE	Member		X	X		
Davis	Eric	Consultant	Guest		X	X		X
Derouen	Craig	ERMCO	Guest				X	
Diaz	Cesar	Eaton	Member		X	X		
Dolloff	Paul	EKPC	Guest		X			
Door	Jeffrey	H-J	Guest	To guest b4 F23		X		X
Elliott	William	Prolec GE	Guest		X			
Eshenroder	Jacob	Burns and McDonnell	Guest					X
Fausch	Reto	RF Solutions	Member		X	X		X
Fayad	Fadi	ASD	Guest					X
Flores	Hugo	Hitachi	Guest		X	X	X	X
Frye	Richard	Eaton	Member		X	X	X	
Garcia	Eduardo	Siemens Energy	Member			X	X	X
Gaytan	Carlos	Prolecge	Guest				X	
Ghosh	Rob		Guest				X	
Givaldo	Orlando	HJ Family	Guest	To guest b4 F23		X		
Hernandez	Giovannie	Virginia Transformers	Guest		X	X	X	X
Hochanh	Thang	PowerTech	Guest			X		
Hopkinson	Phil	Hvolt	Member			X	X	
Jarosz	Patrycja	IEEE SA						X
Jordan	Steve	TVA	Guest			X		
Katz	Nathan	Pacificorp	Guest					X
Kennedy	Gael	GRKennedy&Associates LLC	Guest					X
King	Gary	Howard Industry	Guest				X	
Knapp	Evan	Eaton	Guest					X
Lachman	Mark	Doble	Guest			X		

					Attendance			
Last Name	First Name	Company	Status	Status Changes	3/29/20	10/18/20	3/21/20	10/24/20
Lambert	Jason	JST Power	Guest					X
Mani	Balakrishnan	ITEC	Guest					X
McBride	Jim	JMXHV	Member			X	X	X
Montanha	Juliano	Siemens Energy	Guest				X	X
Moreno	Andre	Siemens Energy	Guest					X
Morris	Tim	Walton EMC	Guest			X		
Murray	David	TVA	Guest		X			
Orozco	Polo	GE Grid Solutions	Guest	To guest b4 F23		X		
Owen	John	PowerTech Labs	Guest					X
Parrales	Herman	Prolec GE	Guest	To guest b4 F23		X		
Patel	Poorvi	EPRI	Member		X		X	X
Pepe	Harry	Phenix Technology	Guest				X	X
Plante	Sylvain	Hydro-Quebec	Guest	To guest b4 F23		X		
Plisic	Goran	Siemens Energy	Guest				X	
Posadas	Daniel	CELECO	Guest	To guest b4 F23		X		
Pousset	Baptiste	Transformer Protection Co.	Guest					X
Prince	Jarrod	ERMCO	Guest		X		X	
Rhett	Chrysler	ERMCO	Guest				X	
Ronchi	Rodrigo	WEG	Guest					X
Sahin	Hakan	Virginia and Georgia Transformer	Member		X	X	X	X
Salinas	Fernando	Power Partners	Member			X	X	
Sarkar	Amitabh	VA Transformer	Guest				X	
Sauer	Dan	Eaton	Member			X	X	X
Schrammel	Alfons	Siemens Energy	Guest					X
seluargj	Pugual	VA Transformer	Guest				X	
Shalabi	Jaber	Vantran	Member		X	X		
Slattery	Chris	First Energy	Member			X	X	
Snyder	Steve	Hitachi Energy	Guest			X	X	X
Steele	Hampton	TVA	Guest					X
Stretch	Kerwin	Siemens Energy	Guest					X
Thibolt	Mike	PG&E	Guest				X	
Thomas	Scott	Hitachi Energy	Guest					X
Tillery	Tim	Howard Industry	Guest				X	
Traut	Alan	Howard	Member			X	X	X
Verdell	Joshua	ERMCO	Guest				X	
Walker	David	MGM Transformers	Guest	To guest b4 F23		X		
Wallace	David	Mississippi State University	Member		X	X	X	X
Wimbery	Barret	GE	Guest		X	X		
Winter	Alexandar	Highvolt	Guest	To guest b4 F23	X			
Yun	Joshua	Virgina Transformer Corp	Member			X	X	X
Zanwan	Anand	Siemens Energy	Guest				X	
Zhang	Shibao	PCORE	Guest	To guest b4 F23		X		
Ziger	Igor	Kovear	Guest					X

WG – Low Frequency Test Guide PC57.168

Chair: Dan Sauer

Secretary: Sergio Hernandez

As a reminder, C57.168 did not meet. The document has been published. As stated in e-mail received from Dan Sauer on 11/12/23.

WG – Partial Discharge Test – C57.113

(A. Naderian)

No meeting.

- Draft 5 was circulated June 2023, 62 comments
- Ballot Recirculation was submitted on Aug 28, with 6 editorial comments.
- PC57.113 (PE/TR) Approved by Revcom on Oct 17, 2023
- Expected to be published mid-December 2023

WG C57.160 PD in Bushings/PTs/CTs

Chair: Thang Hochanh
Vice Chair: Reto Fausch
Secretary: vacant

No meeting held in Kansas City. Document submitted to RevCom. Work Completed.

WG – Transformer Impulse Test Guide PC57.98

Unapproved Meeting Minutes

October 23, 2023 | 3:15pm – 4:30pm CST

Kansas City, MO

Chair: Thang Hochanh

Vice Chair: Reto Fausch

Secretary: vacant

Meeting Attendance

The working group met at 3:15pm CST
There were 41 attendees 33 Guest
and 8 of 12 members present.
Quorum was achieved to conduct official business.

- The Minutes of Spring 2023 meeting in (MILWAUKEE, WISCONSIN, USA) had been approved as written.
    - Motion made by Dominique Bolliger and second by Sylvain Plante.
- approve the Agenda for this meeting
    - Motion made by Dominique Bolliger and second by Jeffrey Britton.

- Call for patents
    - No claims
- No copyright violations noted.

- **Discussion**

- The TF lead by Waldemar Ziomek presented suggested clause to be added as 4.1.2.5 in our guide
  Subject: **Chopping waveforms with excessive oscillations (a 'deep valley' CW problem)**
    - and explanations and possible solutions
    - Some minor editorial changes to the text were discussed and approved by the members present
    - Motion made by Sylvain Plante; and second by Dominique Bolliger

- Old business: None

  New business: None

  Adjournment: Motion made by Fernando Leal and second by Dominique Bolliger

Thang Hochanh, Chair
Reto Fausch, Vice-Chair

PC 57.98 - MEMBERS & Guests
MEETING - Fall 2023

Quorum

Total attendance: 41

Guests: 33

Members attending Spring 2023	
Dominique	Bolliger
Jeffrey	Britton
Reto	Fausch
Sergio	Hernandez Cano
Thang	Hochanh
Fernando	Leal
Sylvain	Plante
Waldemar	Ziomek

Members	12
Memd. Present	8
Quorum	66.7%

Attendance Spring 2023	
Isaac	Adballa
Edmond	Aesib
Oname	Avanoma
Rohal	Bhordwaj
Wilson	Calil
Jaroslaw	Chorzepa
Daniel	Crockett
Ravil	Domingez
Luc	Dorpmanns
Nathan	Fatz
Fadi	Fayad
Richard	Frye
Saif	Hassain
Peter	Heinzig
Jeremy	Johnson
Roger Perez	Juan
Thrinadha	Katapalli
Gasim	Khan
Evan	Knapp
Julian	Mantanhe
Joseph	McBride
Marta	Meymoz
Vivian	Onan
Baptiste	Paousset
Harry	Pepe
Bertrand	Poulin
Ulf	Radbrandt
Adnan	Rashid
Rodrigo	Ronchi
Jason	Snyder
Kannan	Veeran
Barret	Wimberly
Malia	Zaman

Annex

For the Clause 4.1.2.5

When the voltage waveform has excessive, high magnitude oscillations immediately following the peak value, the chopper may miss the designated chopping time, T_c, due to a large voltage derivative in time, dV/dt, or a change of its sign. This may lead to: (i) late chopping, passed the targeted chopping time value, often producing high oscillations within and between the windings, (ii) failure to chop, producing a full wave with 110% LI value, overstressing the transformer insulation.

The example of a CW event with a late chopping on the waveform with a deep valley of 48% of the peak value, is shown in the Figure 1 below.

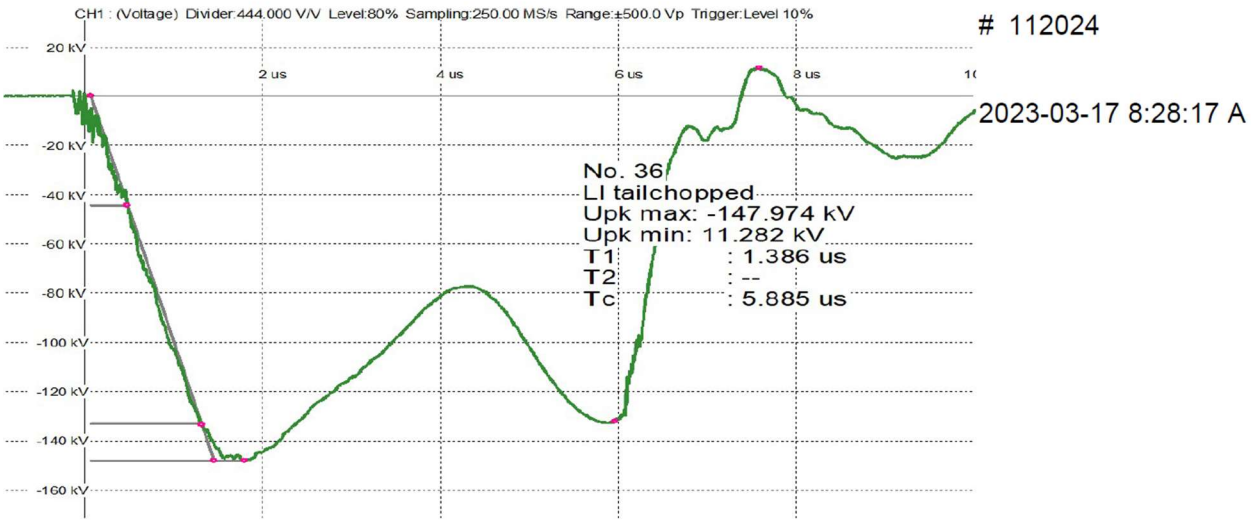

Figure 1 The high magnitude oscillation after the peak value resulted in missing the chopping at 3.5 μs, the late chopping occurred at 6.0 μs; due to excessive oscillation the voltage dropped by 70 kV or 48% at 4.2 μs;

When the oscillation doesn't have excessive magnitude the chopping is successful, as shown in Fig.2 with a valley of 20% of the peak value.

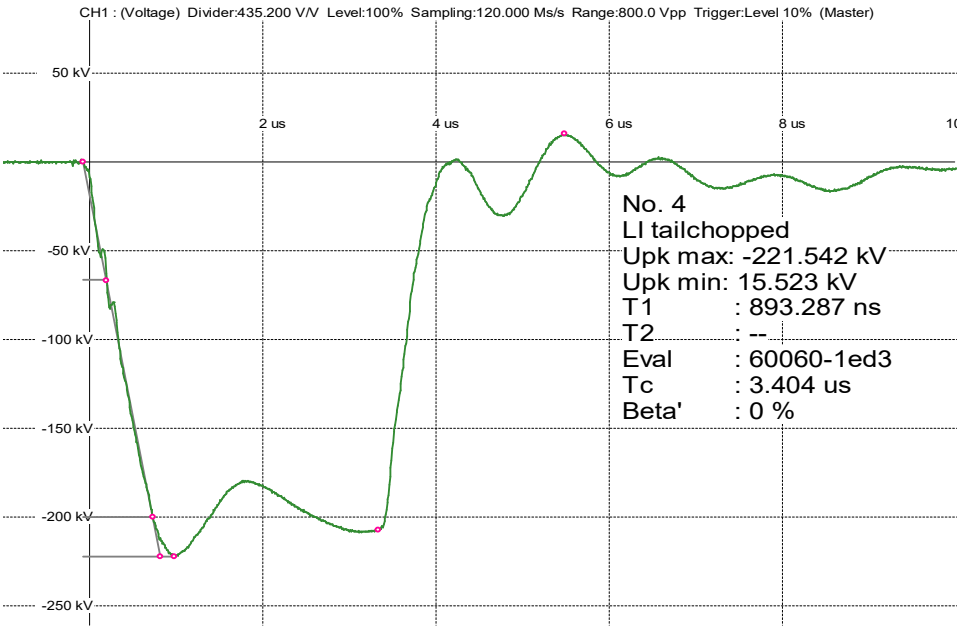

Fig.2. An example of deep valley with lower magnitude: the voltage dropped by 42 kV or 20% at 1.9 µs

The problem with late, or no chopping may occur on the windings with low impedance. If the chopper electronic circuit cannot perform a chop at required chopping time, despite checking different setup configurations, including but not limited to , series gaps , additional capacitance, etc. the use of a conventional chopping gap (rod-rod gap) may solve the problem.

Liaison Report – HVTT

(J. Britton)

- The HVTT Subcommittee has not met since the Spring 2023 Transformers Committee Meeting
- The next round of HVTT Subcommittee Meetings is planned for January 2023 at the IEEE PES Joint Technical Committee Meeting in New Orleans, Louisiana - January 7 thru 11, 2024

JTCM Meeting Website: https://pestechnical.org/

A hybrid meeting format will be offered for all meetings

If you are interested in participating in future meetings,

Contact Jim McBride (jim@jmxhv.com) or Jeff Britton (jbritton@doble.com) to begin receiving HVTT communications

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WG to Investigate the Interaction between Substation Transients and Transformers in HV and EHV Applications and Revision of C57.142

Kansas City, MO
Tuesday, October 24, 2023
11:00 AM – 12:15 PM CDT – USA
Century C (Ballroom Level)

Chairman – Jim McBride
Vice Chair – Xose Lopez-Fernandez
Secretary – Tom Melle

1) Welcome and Chair's Remarks
2) Circulation of Attendance Sheets
3) Member count was 25 of 48 required for quorum; therefore, quorum was achieved, 77 Guests were present. Total Attendance was 102.
4) IEEE Patent Policy Slides presented. There were no conflicts or patent claims.
5) Presentation and approval of meeting Agenda (motion by Waldemar Ziomek / second by Phil Hopkinson) and Minutes from Last Meeting (motion by Phil Hopkinson / seconded by Bertrand Poulin) – approved without opposition.
6) C57.142 Ballot and Comment Resolution – Jim McBride: Summary of the status of open comments before the ballot resolution group as follows:
    a. Total Comments - 305
    b. Comments Incorporated - 282
    c. Remaining Comments to Address – 23
    d. All Figures – Completed and Included thanks to Dr. Xose Lopez-Fernandez
7) All of the latest BRG documents will be posted on WG website.
8) Update on Switchgear Liaison TF - No Task Force meeting held as the Document is in Ballot Resolution.
9) Mitigation Methods Task Force Update – Jim McBride / Phil Hopkinson:
10) Chair commended Pierre Riffon for his contributions and presented seven possible mitigation methods including Resistor-Capacitor Snubbers and Online Monitoring among others.

11) New Business
    a. **STLI modeling and testing**. The chair discussed (but did not show) the following paper:
    b. IEEE Transactions on Power Delivery, Vol. 11, No. 1, January 1996 INVESTIGATIONS OF AN EHV AUTOTRANSFORMER TESTED WITH OPEN AND ARRESTER TERMINATED TERMINALS.
    c. The paper features an example of a 500 MVA,765-345-34.5 kV single phase autotransformer used for modeling and testing. In summary, the STLI test introduced higher voltages to ground in the lower 80 % of the HW windings and even a failure.

d. The Chair introduced comments on the subject from Loren Wagenaar from recent emails. Bertrand Poulin and Phil Hopkinson personally delivered their own comments. The Chair presented comments from research by Jin Sim on STLI testing as well. Dharam Vir commented that in the past modeling was not possible, but modern software can model and predict stresses of a simulated STLI test. Note: the content of most of the comments are contained in the meeting presentation slides.

12) **Open discussion of possible additional mitigation methods**:
    a. Ajith Varghese asked whether there is any database with US grid failures due to transients. The Chair mentioned a CIGRE A2 study containing examples of worldwide interactions involving Switching Transients. That paper will be referenced and listed in the future.
    b. Phil Hopkinson and the Chair discussed the feasibility of factory testing with special impulse tests, since the studied transformers that passed standard factory tests still failed under certain switching conditions. It was generally agreed that special impulse tests, including steep-front impulse testing could be beneficial for certain special-use cases (for example instrument transformers).
    c. Discussion ensued about a tutorial, panel session, presentation and/or possibly a paper on the mitigation methods during an upcoming meeting. A motion was made by Hemchandra Shertukde / seconded by Bertrand Poulin to move ahead with a group presentation. The motion was approved with no opposition.
13) Next Meeting (Vancouver, BC Canada March 10th – 14th, 2024)
14) Motion to Adjourn at 12:15 PM CDT made by Waldemar Ziomek / seconded by Phil Hopkinson with no opposition.

MEETING ATTENDANCE (in process):

Role	Last Name	First Name	Company
Chair	McBride	James	JMX High Voltage
Vice-Chair	Lopez-Fernandez	Xose	Universidade de Vigo
Secretary	Melle	Thomas	HIGHVOLT
Member	Betancourt	Enrique	Prolec GE
Member	Boettger	William	Boettger Transformer Consulting LLC
Member	Britton	Jeffrey	Phenix Technologies, Inc.
Member	Garcia Wild	Eduardo	Siemens Energy
Member	Heiden	Kyle	EATON Corporation
Member	Hopkinson	Philip	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Member	Joshi	Akash	Black & Veatch
Member	Kirchenmayer	Egon	Siemens Energy
Member	Li	Weijun	Braintree Electric Light Dept.
Member	Pointner	Klaus	Trench Austria GmbH
Member	Poulin	Bertrand	Hitachi Energy

Member	Roussell	Marnie	Entergy
Member	Sarkar	Amitabh	Virginia Transformer Corp.
Member	Sen	Cihangir	Duke Energy
Member	Sharp	Michael	Trench Limited
Member	Spurlock	Mike	Spurlock Engineering Services, LLC
Member	Varghese	Ajith	SPX Transformer Solutions, Inc.
Member	Vir	Dharam	Prolec-GE Waukesha
Member	Ziomek	Waldemar	PTI Transformers
Guest	Arritt	Robert	EPRI
Guest	Berube	Jean-Noel	Rugged Monitoring
Guest	Borck	Christopher	EATON Corporation
Guest	Casey	Cole	Invenergy
Guest	Chan	Vivian	Hitachi Energy
Guest	Cochran	Alex	U.S.E.
Guest	Craven	Michael	Qualus Corporation
Guest	Delgado Zamora	Gabriel	Invenergy
Guest	Digby	Scott	Duke Energy
Guest	Dillon	Nikolaus	Dominion Energy
Guest	Dolloff	Paul	East Kentucky Power
Guest	Ermakov	Evgenii	Hitachi Energy
Guest	Espindola	Marco	Hitachi Energy
Guest	FerdJallah	Esseddik	Trench Group
Guest	Frazier	Raymond	Ameren
Guest	Frye	Richard	EATON Corporation
Guest	Gamboa	Jose	H-J Family of Companies
Guest	Gara	Lorne	Shermco
Guest	Garcia	Miguel	Hitachi Energy
Guest	Gaytan	Carlos	Prolec GE
Guest	Gross	Detlev	Power Diagnostix Consultant
Guest	Harley	John	FirstPower Group LLC
Guest	Hernandez	JC	Georgia Tech - NEETRAC
Guest	Hoffman	Saramma	PPL Electric Utilities
Guest	Hossain	Saif	Trench Limited
Guest	Jarosz	Patrycia	IEEE SA
Guest	Katapalli	Thrinadha	Virginia Transformer
Guest	Kessler	Stacey	Ulteig Engineers
Guest	Khan	Qasim	Georgia Tech - NEETRAC
Guest	Klempner	Dmitriy	Southern California Edison
Guest	Knapp	Evan	EATON Corporation

Guest	Labean, Jr.	Bernard	Consumers Energy
Guest	Lachman	Mark	Doble Engineering Co.
Guest	Mani	Kumar	Duke Energy
Guest	Mendez	Omar	Prolec GE

List of Attendees to the DTSC meeting of October 25, 2023

First Name	Last Name	10/25/2023
Isaac	Abdulla	X
Kayland	Adams	X
Alex	Alahmed	X
Daniel	Alelesnalmin	X
Robert	Allison	X
Tauhid Haque	Ansari	X
Elise	Arnold	X
Javier	Arteaga	X
Onome	Avanoma	X
Donald	Ayers	X
Christopher	Baumgartner	X
Jason	Beaudoin	X
Enrique	Betancourt	X
Edwin	Betancourt	X
Rahul	Bhardwaj	X
Vivek	Bhatt	X
Daniel	Blaydon	X
William	Boettger	X
Sanket	Bolar	X
Michael	Botti	X
Jeffrey	Britton	X
Wilerson	Calil	X
David	Calitz	X
Deniss	Carr	X
Juan Alfredo	Carrizales	X

Camilo	Casallas	X
Juan	Castellanos	X
Marcelo	Catugas	X
Eun	Cho	X
Van Dreel	Cole	X
Craig	Colopy	X
Daniel	Crochett	X
Janet	Crockett	X
Juan Carlos	Cruz Valdes	X
Marcos	Czernoucki	X
Roberto	Da Silva	X
Eric	Davis	X
Pouneh	Davoudi	X
Everton	De Oliveira	X
Gabriel	Delgado	X
Scott	Dennis	X
Scott	Digby	X
Nikolaus	Dillon	X
Huan	Dinh	X
Jeffrey	Door	X
Luc	Dorpmanns	X
Samragni	Dutta Roy	X
William	Ellis	X
Evgenii	Ermakov	X
Marco	Espindola	X
Reto	Fausch	X
Fadi	Fayad	X
Sean	Fitzgerald	X
Hugo	Flores	X
Raymond	Frazier	X
Rich	Frye	X
Jose	Gamboa	X
Lorne	Gara	X
Miguel	Garcia	X
Eduardo	Garcia Wild	X
Rob	Ghosh	X
Alireza	Gorzin	X
Shawn	Gossett	X
Detlev	Gross	X
Ravi	Gupta	X
Attila	Gyore	X
Roger	Hayes	X
Peter	Heinzig	X

Jean Carlos	Hernandez	X
Ronald	Hernandez	X
Sergio	Hernandez Cano	X
Thang	Hochanh	X
Saramma	Hoffman	X
Ryan	Hogg	X
Thomas	Holifield	X
Derek	Hollrah	X
Philip	Hopkinson	X
Saif	Hossain	X
Edmund	IDK	X
Patrycja	Jarosz	X
John	John	X
Christopher	Johnson	X
Klaus	Kack	X
Kurt	Kaineder	X
Nathan	Katz	X
Jerzy	Kazmierczak	X
Gael	Kennedy	X
Sheldon	Kennedy	X
Stacey	Kessler	X
Qasim	Khan	X
Kyzysztot	Kidasek	X
Zan	Kiparizoski	X
Egon	Kirchenmayer	X
Evan	Knapp	X
Anton	Koshel	X
Rafal	Kowalski	X
Alexander	Kraetge	X
David	Larochelle	X
Fernando	Leal	X
Moonhee	Lee	X
Junho	Lee	X
Aleksandr	Levin	X
Weijun	Li	X
Mario	Locarno	X
Luc	Loiselle	X
Xose	Lopez-Fernandez	X
Mark	Lowther	X
Luis	Machain	X
Tim-Felix	Mai	X
Darrell	Mangubat	X
Kumar	Mani	X

Moses	Manzano	X
Swaphil	Marathe	X
Thomas	Melle	X
Michael	Miller	X
Francis	Mills	X
Juliano	Montanha	X
Emilio	Morales-Cruz	X
Hugo	Murillo	X
David	Murray	X
Ryan	Musgrove	X
Ali	Naderian	X
Ismael	Naja	X
Volney	Naranjo	X
Aniruddha	Narawane	X
Anthony	Natale	X
Kristopher	Neild	X
Mark	Newbill	X
Anastasia	O'Malley	X
Hoony	Park	X
Dwight	Parkinson	X
Nitesh	Pate	X
Poorvi	Patel	X
Rakesh	Patel	X
Harry	Pepe	X
Jay	Pidcock	X
Sylvain	Plante	X
Klaus	Pointner	X
Bertrand	Poulin	X
Baptiste	Pousset	X
Thomas	Prevost	X
Jarrod	Prince	X
Ulf	Radbrandt	X
Ion	Radu	X
Adnan	Rashid	X
Timothy	Raymond	X
Scott	Reed	X
Jonathan	Reimer	X
Juan	Reyej	X
Michael	Richardson	X
Tim	Rocque	X
Zoltan	Roman	X
Rodrigo	Ronchi	X
Vinious	Rubio	X

Mickel	Saad	X
Hakan	Sahin	X
Dinesh	Sankarakurup	X
Amitabh	Sarkar	X
Daniel	Sauer	X
Alan	Sbravati	X
Markus	Schiessl	X
Alfons	Schrammel	X
Ewald	Schweiger	X
Cihangir	Sen	X
Kabir	Sethi	X
Abdulmajid	Shaikh	X
Jaber	Shalabi	X
Masoud	Sharifi	X
Hemchandra	Shertukde	X
Stephen	Shull	X
Kushal	Singh	X
Christopher	Slattery	X
Jason	Snyder	X
Steven	Snyder	X
Yong Tae	Sohn	X
Sanjib	Som	X
Mike	Spurlock	X
Fabian	Stacy	X
David	Stankes	X
Hampton	Steele	X
Andrew	Steineman	X
Christopher	Steineman	X
Kerwin	Stretch	X
Charles	Sweetser	X
Michak	Swiatkowski	X
Janusz	Szczechowski	X
Matthew	Sze	X
Troy	Tanaka	X
Erik	Tarango	X
Vijay	Tendulkar	X
Andreas	Thiede	X
Scott	Thomas	X
Fernando	Tirado	X
Anar	Tleoukoulov	X
Eduardo	Tolcachir	X
Olivier	Uhlmann	X
Ajith	Varghese	X

Jason	Varnell	X
Rogerio	Verdolin	X
Krishnamurthy	Vijayan	X
Dharam	Vir	X
Richard	vonGemmingen	X
Dejan	Vukovic	X
Pragnesh	Vyas	X
David	Wallace	X
Alan	Washburn	X
Eric	Weatherbee	X
Bruce	Webb	X
Matthew	Weisensee	X
Drew	Welton	X
Peter	Werelius	X
Daniel	Weyer	X
Barrett	Wimberly	X
Terry	Wong	X
Jeffrey	Wright	X
Guang	Yuan	X
Joshua	Yun	X
Shibao	Zhang	X
Peter	Zhao	X
Kris	Zibert	X
Waldemar	Ziomek	X

Meeting Adjourned at 12:15 PM.