1. Dielectric Tests Subcommittee

April 15, 2015

San Antonio, TX.

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| **Dielectric Tests Subcommittee** | | |
| **Chair: Michael Franchek** | **Vice-Chair: Thang Hochanh** | **Secretary: Ajith M. Varghese** |
| Room : Regency Center/West | Date : April 15 ,2015 | Time: 11:00 am to 12:20 pm |
| Members : 106 | Present at time of checking : 71 | Present per attendance roster & recorded to AM System: 78 |
| Guests : 86 | Membership requested : 4 | Membership accepted: 1 |

# Chair’s Remarks

The Chair briefly highlighted the requirement that while introducing one need to state their employer/ company and sponsor if difference from company. Chair also reminded that IEEE and transformer committee are non-commercial organizations and standards shall focus only in developing performance and functional requirement and not design and construction details.

The Chair reminded the WG on attendance requirement for new membership and for continuation and the requirement to have attendance updated in AM system. Chair welcomed 6 new members during the meeting. Chair noted that all corresponding members’ status was changed to guest after Washington meeting in discussion with individuals.

The Chair shared details of upcoming PES sponsored meeting as well as details of next transformer committee.

Current Status of PARs was presented. Bertrand Poulin noted that C57.160 was missed on list presented.

# Quorum, Approval of Minutes and Agenda

The membership list was shown and a show of hands of committee members present showed that a quorum of members were in attendance at the start of the meeting. 71 out of 106 members were present at time of checking, so there was a quorum

All attendance is recorded in AM System.

With respect to Fall 2014 meeting minutes, it was brought to the attention that reference to 1550 SIL under external clearance WG minutes should be 1550 BIL. The minutes of the meeting was approved with above noted correction.

Chair presented agenda for the meeting. A motion to approve agenda for the meeting was made by Phil Hopkinson and was seconded by Daniel Sauer.

# Working Group Reports

## Working Group on External Dielectric Clearances

## Eric Davis, Chair; Troy Tanaka, Secretary

The Working Group met on April 13, 2015 at 9:30 am with 43 people attending the meeting; 13 of 21 members, and 30 guests. One guest requested membership. A quorum was achieved. The full attendance record is available in the AM System.

Dan Sauer moved that the fall 2014 meeting minutes be approved as written. David Wallace seconded the motion. There were no revisions or additions to the minutes. The motion passed unanimously.

The WG completed reviewing the results of the recent Survey sent to the Working Group.

* In response to a request to round the mm dimensions to the nearest 100 mm, the WG decided that dimensions are minimum dimensions, and therefore do not need to be rounded.
* In response to a concern that potential additional clearances may be required to accommodate issues such as animal intrusion, the WG agreed rely upon the large “CAUTION” note in the written text.

* The WG agreed to replace the “D” in the Column “Minimum Clearances between live parts of different phases” with calculated values based on the formulas previously agreed upon.

Prior to the next meeting, dimensions in the table will be reformatted to match current dimensional standards. Modifications will also be made to the text. The chair will disseminate the updated documentation to the WG prior to the next meeting.

The WG intends to vote on the changes at the next IEEE Transformer Committee Meeting in Memphis and send its findings to the Subcommittee for action.

Dan Sauer moved to adjourn the meeting at 10:35 AM. Troy Tanaka seconded.

# B.3.2 WG on Dielectric Frequency Response Analysis (DFR)

**Ali Naderian, WG Chair; Poorvi Patel, Secretary**

**Spring 2015 IEEE Transformers Committee Meeting – San Antonio, TX**

**Monday, April 13th, 2015 – (3:15 -4:30PM)**

The meeting was called to order by the WG chair Ali Naderian at 3:15 PM. This is the fourth Working group meeting. There were a total of 82 attendees; 19 members and 63 guests and 4 requested to become members. 3 members were accepted as members in this WG.

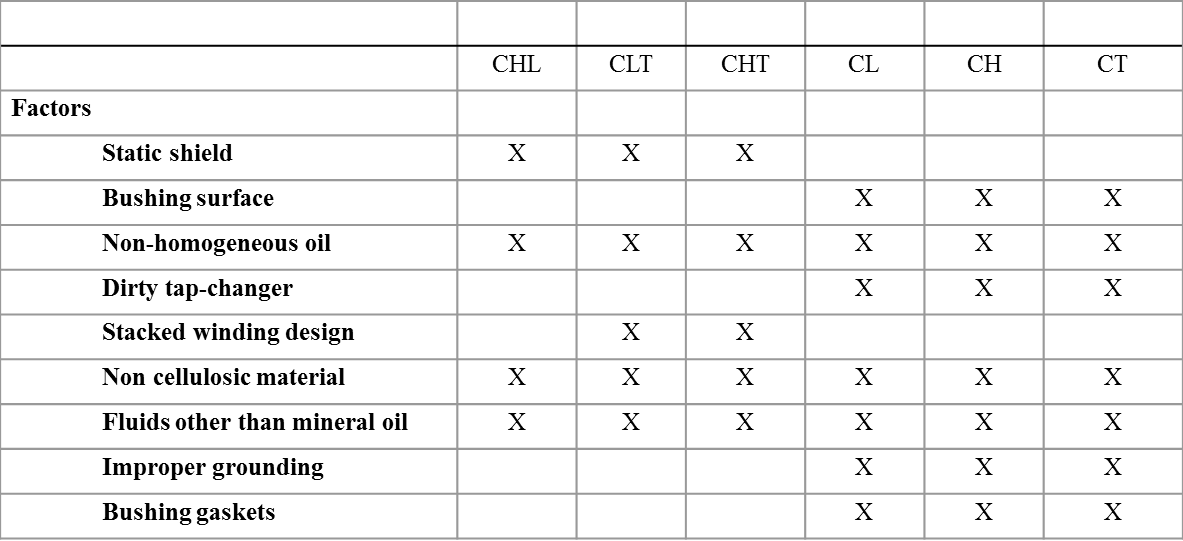
1. The minutes of meeting from the WG Spring 2014 meeting in Washington D.C. could not be approved since there was no quorum. To have a quorum we needed 20 members to be present
2. The minutes from Savannah and Washington D.C. will be sent by email for electronic approval.
3. The Agenda was reviewed but could not be approved.
4. The draft DFR guide is now uploaded in the IEEE site
5. Ali went through the table of content for the DFR Guide
   1. Chapters 1-3 are to be completed
   2. Chapter 4-6 are completed
   3. Chapter 7 is completed and will be presented in this meeting
   4. Annex A completed
   5. Annex B is completed and will be presented in this meeting.
   6. Annex C completed
6. Please review the DFR guide and submit your comments to be discussed in the next meeting
7. Diego presented the work done in chapter 7- Measurement Analysis & Interpretation.

In this section it was also presented factors influencing the moisture estimates.

* Winding configuration and measurement set-up
  + Generally, a well-defined insulation structure, i.e. an ungrounded specimen test between two windings, e.g. high and low voltage (or series+common windings to tertiary winding) preferable. Otherwise effects of bushings, tap-changers and more may influence the results.
* Cellulose density, and type of cellulose
  + Generally, at low moisture contents, higher density cellulose show higher losses for same moisture content; At higher moisture content, moisture dominate over cellulose density
* Influence of low molecular weight acids
  + Generally, low molecular weight acids (LMWA) may be present in aged and wet insulation, i.e. it is normally not a problem assessing dry or moderate wet insulation. However, if insulation is assessed wet assuming no presence of LMWA, the assessment may overestimate the level of moisture in insulation system.
* Noise from surrounding such as nearby energized transformers

1. Mario Locarno presented the Annex B- Non-Moisture Related Factors influencing the DFR Measurements. In this section collection of cases are presented such as
   1. Cu2S contamination case
   2. Carbon tracking case
   3. Shielding issue case
   4. Tap-changer issue case

A table is also presented to guide in which measurement set-up the different issue may show up.



1. Ronald Hernandez presented the inconsistency regarding the minimum frequency level throughout the document.

* Section 4.2 of the DFR Guide mentions that typical frequency range is 1 kHz – 1 mHz. Same is stated in Table 2 (Section 4.3).
* However, it is known that for new, dry transformers frequency range of 1 kHz – 0.1 mHz is recommended.

This needs to be reviewed and reworded. Ronald showed cases where the frequency range can give substantial different moisture results on brand new spare units.

1. Diego commented that temperature also plays a big role in the analysis and agreed to a revision of the wording is needed and stated a range should be given for the stop frequency depending on the case.
2. Mark Perkins commented that also the geometrical parameters are very important to know for a proper moisture evaluation. As well as sensitivity analysis should be performed. In general if the moisture is 0.8% or 0.3% really is not giving more information as the insulation is considered dry. But if the moisture level is 1% or 1.8% is a significant impact.
3. Chuck Sweetser- commented that the factors influencing the moisture estimates presented by Diego should be stated in Chapter 4, 7 and Annex A.
4. Tom Prevost- suggested that the TF4 leader (Diego) coordinate the factors influencing the moisture estimates re-wording together with TF7 (Peter) and Annex A (George) leaders and their teams.
5. Mark Perkins also commented for Annex B- that for non-moisture related issues it is very important to know the geometrical parameters- and that should be included in this section.
6. A suggestion was also to include Sensitivity analysis is recommended if design information is not known in the Chapter 7.
7. Meeting was adjourned at 4.22 pm

Ali Naderian, WG Chair

Poorvi Patel, Secretary

## B.3.3 Working Group for Revision of the Distribution Impulse Test Guide C57.138 Recommended Practice for Routine Impulse Test of Distribution Transformers; Arthur Molden, Chair; Susmitha Tarlapally, Vice-Chair

Docoment #: C57.138 Current Standard Date: March 9,1998

Document Title: Recommended Practice for Routine Impulse test for distribution transformers

Chair: Arthur Molden Vice Chair: Susmitha Tarlapally

PAR Date: 2/01/2011 PAR Expiration Date: 12/31/2015

Meeting Date -04/14/2015

PAR Status: New

Members: 9 Members Present: 6 Guests Present: 24 Total Attendance: 30

Quorum achieved: YES Attendance recorded in AM system: YES

Location: R

Time: 11:00AM – 12:10PM

Spring 2015 Meeting Minutes:

Quorum was verified and meeting had quorum with 6 members. Chair was only available on Phone and the meeting was conducted by Vice Chair Susmitha Tarlapally. Agenda was presented and Vice Chair requested for a motion to approve the Agenda. Motion by Dan Sauer and Seconded by Mike Franchek. Passed 6 yes 0 no. Vice Chair requested for a motion to approve the fall 2014 meeting minutes in Washington, DC. Motion was passed by Mike Franchek; Second by Dan Sauer passed 6 yes 0 no. And the motion was approved with 6 positive Votes with 0 negatives.

A revised Draft 1 version of C57.138 was sent to the WG members for comment during March this year. All comments received were compiled into a spreadsheet along with suggested document changes to address those comments.

There followed a review of all the comments received on Draft 1 of the document, Resolution of those comments would then be included in Draft 2 of the document.

1. All Editorial comments were approved and accepted by the membership.
2. Technical comments included the following:
   1. The scope limits three phase kVA to 2500, since C57.12.34 present scope is 5000 kVA is this correct. New draft of C57.12.34 goes to 10000 kVA. After the initial discussion on this comment a motion was made by D. Sauer and seconded by Mike Franchek to not expand the Scope of the document at this time but to revisit this comment at the next revision of C57.138. Motion past 6 to 0.
   2. IEEE Standard 4 “recommends" that overshoot be limited to 5%. Yes, up to 10% is allowed, if approved in our testing standards. Significant discussion on this subject and what was included as allowable overshoot in IEEE 4 /60 which allows 5% but in some cases can go up to 10% overshoot. IEC was also discussing that allow higher overshoot of the impulse voltage wave. A motion was made to keep the 5% maximum over shoot as is by D. Sauer and seconded by Jeff Britton. The motion passed 6 to 0.
   3. Current detector is probably used because there are both "shunts" and CTs used for this purpose. There was a discussion on shunt vs. Current detector. It was decided that is was ok to use the generic term current detector.
   4. A.4.2 The use of the words "traveling wave" simply refer to the phenomenon of oscillations that are displaced in time depending on the location being observed. In this case it is noted that there are no such oscillations. It was decided that it was ok to let this as is in the Appendix A as it was just an observation.
   5. Section 5.2.4 Intertie (step) and Auto Transformer connection. Jeff Britton to look up the definition of Intertie transformer – 2-winding transformer where both winding require impulse testing. Decided to change the wording in the Section 5.2.4 heading to something like „ Autotransformers and transformers with both windings above 600 volts“
3. Vote was taken to make the discussed changes to the document and Ballot the DTSC with the new draft. Motion by Dan Sauer, Seconded by Michael Franchek. Approved 6 to 0
4. Motion was made to approve a request for a PAR extension in case we were not able to complete the ballot process in time to finish it by October to get it to Revcom before the PAR expiration the end of 2015. Motion D. Sauer Second M. Franchek, motion passed 6 to 0.
5. Meeting adjourned.

Submitted by

Susmitha Tarlapally

# B.3.4 Working Group on Revision of Impulse Tests

# Pierre Riffon, Chair; Daniel Sauer, Vice-Chair

The WG met on April 14, 2015, from 4:45 pm to 6:00 pm. Twenty-two (22) members and sixty-five (65) guests attended the meeting. Six (6) guests requested membership. The meeting was chaired by Pierre Riffon, chair of the WG. Mr. Martin Hinow who was the vice-chair resigned. Mr. Daniel Sauer will take over the vice-chair position.

Attendance has been recorded in the AM system.

Required quorum was met; presence of at least 22 members was required. The working group membership has been reviewed after the Washington meeting and members who did not attend the last two meetings were moved as guests.

The agenda has been reviewed and a motion to approve the agenda has been made by Mr. D. Wallace and seconded by Mr. V. Khalin. The agenda was approved by all members present.

Minutes of the Washington meeting were approved, as written, by all members present at the meeting. The motion for approval of Washington meeting minutes was made by Mr. M. Perkins and seconded by Mr. J. McBride.

The first item of business was related to the comments received from the ballot on IEEE C57.12.90/D10.2 concerning clauses 10.2 and 10.3 (impulse test sections). A summary of the comments received together with suggested resolutions was prepared by the chairman.

1. The first group of comments was related to the increase of number of full impulses in the test sequence from one to three impulses. The suggested chairman answer to the comments received was:

"Not accepted. The number of full-waves during impulse tests has been increased to 3 x 100% full-wave tests in order to be consistent with Procedure A defined in IEEE Std. 4 which applies to non-self-restoring insulation systems such as transformers. This increase of number of full wave impulses is also in-line with the requirements stated in IEC 60076-3, IEC 60060-1, IEC 60071-1 and IEC 60071-2. Statistical considerations have been reviewed and the new procedure has been discussed in length during several WG meetings. These changes were surveyed within the WG and the Dielectric Tests Subcommittee membership with a large majority of acceptance.

Procedure A of IEEE Std. 4 is a better statistical impulse test plan than the past procedure for accepting good transformers and rejecting bad transformers. No change proposed."

A motion to approve the chair proposal was made by Mr. B. Poulin and was seconded by Mr. S. Tuli. The proposal was approved by all members present at the meeting.

1. The second group of comments was related to the tap changer position during the lightning impulse test series. The suggested chairman answers to the four comments received were:
2. First comment: "Not accepted. This sentence has been added as a compromise for not extending testing time, wave shape adjustments may take time. The fact of changing the tap position is actually changing the transformer impedance. The resulting wave shape may slightly change due to this impedance change. In general, the impulse time parameters do not change so much but in some particular cases where the starting impulse time parameters (on the first phase) are close to impulse time parameter standardized limits, it may be seen, when the tap position is changed for the two other phases, that the impulse time parameters are slightly out of the standardized tolerances. The WG considered that it is more important to make impulse tests at three different tap positions for generating different service conditions than to have strict impulse time parameter limits. Note that impulse tests with time parameters outside standardized time parameters are acceptable for transformers having high capacitance and low impedance. We recommend keeping the text as proposed since requiring a strict wave shape adjustment for the two other phases may lead to more negatives."

A motion to approve the chair proposal was made by Mr. A. Varghese and was seconded by Mr. Mark Perkins. The proposal was approved unanimously by the members present at the meeting.

1. Second comment: "Accepted in principle. The text for which the comment refers to should have been in the main text (editorial error, wrong character size used), not in Note 2 as it looks in the Draft sent for ballot. Text will be put in the main text and the wording will be improved in order to make it clear that this is an exception to the main case.

Suggested wording:

"As an exception the previous rule for selecting the tap changer position, for transformers using a reactor-type on-load tap changer, one of the tests shall be performed in a bridging position. This test shall be performed on a tap position close as possible to the middle position e.g. one tap higher or one tap lower. If only one single phase transformer is tested (e.g. for single-phase application or for a replacement unit or as a spare unit, etc.), the tests shall be performed in a bridging position closest to the minimum effective turns position."

A motion to approve the chair proposal was made by Mr. D. Wallace and was seconded by Mr. Mark Perkins. The proposal was approved by all the members present at the meeting.

1. Third comment: "Not accepted. The WG considered that it is important to make impulse tests at three different tap positions for generating different service conditions and associated internal overvoltage. This is also in line with the requirements of IEC 60076-3. No change proposed."

A motion to approve the chair proposal was made by Mr. B. Poulin and was seconded by Mr. V. Khalin. The proposal was approved by all the members present at the meeting.

1. Fourth comment: "Not accepted. The WG considered that it is important to make impulse tests at three different tap positions for generating different service conditions and associated internal over-voltages. Note 2 is also important because the results of impulse stress calculations during the design stage may indicate that the maximum stress may occur at another tap position than those required for the impulse test sequence and allows a user and manufacturer to call for another tap position. The required tap position (minimum effective turn ratio) in the actual 2010 edition of C57.12.90 may also not produce the maximum dielectric stress. No change proposed."

A motion to approve the chair proposal was made by Mr. M. Perkins and was seconded by Mr. S. Tuli. The proposal was approved by a majority of members present (20 in favor, 1 against and 1 abstain).

1. The third group of comments was related to the test order for impulse tests on distribution transformers. The suggested chairman answer was reviewed and the following amended answer was agreed upon:

"Accepted in principle. In the actual edition of IEEE C57.12.90, the impulse tests (when required) test shall precede the low frequency tests. This is the general rule. The note required by the balloter is covered by the last paragraph of clause 10.4.2.3 which remains. The last paragraph of clause 10.4.2.3 will be modified as follow:

"As an exception to the test order given in clause 10.1.5.1, the routine impulse test may be conducted either before or after the low-frequency dielectric tests; however, the preferred sequence is for the impulse test to precede the low-frequency dielectric tests."

A motion to approve the modified chair proposal was made by Mr. D. Wallace and was seconded by Mr. J. John. The proposal was approved unanimously.

1. The fourth group of comments was related to the tap changer position during switching impulse tests (clause 10.2.4). The suggested chairman answer to the comment received was:

"Accepted in principle. The WG will add this subject on its programme of work. This discussion and WG agreement may take some times and to not jeopardize the issue of this revision, it is suggested to postpone this change for the next revision."

A motion to approve the chair proposal was made by Mr. S. Tuli and was seconded by Mr. V. Ziomek. The proposal was approved by all the members present.

1. The fifth group of comments was related to the neutral grounding during switching impulse tests (clause 10.2.5). The suggested chairman answer to the comment received was:

"Not accepted. This is not in the scope of C57.12.90 but rather in C57.12.00."

The chair suggested answer was quickly reviewed but not voted since the balloter did not request to have it satisfied.

1. The sixth group of comments was related to the addition of a new type of impulse test (Fast-front switching impulse FFSI). The suggested chairman answer to the comment received was:

"Accepted in principle. Will be added on the WG's programme of work if accepted in C57.12.00"

The chair suggested answer was quickly reviewed but not voted since the balloter did not request to have it satisfied.

1. The seventh group of comments was related to the equation for determining impulse tail time (clause 10.3.1.1). The suggested chairman answer to the comment received was:

"Accepted in principle. A note will be added that for single-phase transformers, the three-phase bank parameters shall be used in the equation.

Suggested Note 2:

"Note 2: For single-phase transformers, the three-phase bank power rating and the associated phase-to-phase voltage need to be used in the above equation."

The chair suggested answer was quickly reviewed but not voted since the balloter did not request to have it satisfied.

1. The eighth group of comments was related to a wrong referenced standard (clause 10.2.5). The suggested chairman answer to the comment received was:

"Accepted (IEEE Std. 4-1995 will be changed for IEEE Std. 4-2013)".

The chair suggested answer was reviewed but not voted since the balloter did not request to have it satisfied.

1. The ninth group of comments was related to the measurement of switching impulse time-to-peak (clause 10.2.2.3) The suggested chairman answer to the comment received was Accepted. A reference to IEEE Std. 4 -2013 will be made.

Suggested wording for clause 10.2.2.3: Replace the actual wording by: "The actual time to crest shall be defined and determined as described in clause 8.1 of IEEE Std. 4-2013."

A motion to approve the chair proposal was made by Mr. B. Poulin and was seconded by Mr. J. McBride. The proposal was approved by all the members present.

The meeting ran out of time and the rest of the agenda was not discussed and the various subjects will be postponed to the next meeting. The meeting adjourned at 6:00 pm on April 14, 2015. The adjournment motion was made by Mr. V. Khalin and was seconded by Mr. M. Locarno.

The next meeting is planned to be held in Memphis, Tennessee, on November 3, 2015.

Pierre Riffon P. Eng.

# B.3.5 Working Group on Revision of Low Frequency Tests

## Bertrand Poulin, Chairman; Bill Griesacker, Secretary

## San Antonio, TX – April 14, 2015

# There were 86 attendees, 19 members and 64 guests present at the meeting; 2 guests requested membership. More than 50 % of the working group members were in attendance at the meeting, therefore a quorum was present.

# The agenda for the meeting was presented and unanimously approved.

# A request was made by the chairman to approve the minutes from the Fall 2014 meeting in Washington, DC. No objections or comments were made; therefore the minutes were unanimously approved.

1. Old business
   1. Applying pressure inside a transformer tank during induced test.

Suggested adding the following comment: “Increasing the pressure inside the transformer tank for the purpose of increasing the partial discharge inception voltage or decreasing the partial discharge level is not permitted during this test”.

Mark Perkins of ABB made a request to survey the addition of this statement.

* 1. Tap Changer Position During Induced Test
     1. 3rd revision of the proposal for tap changer position during induced voltage testing was issued for comments. The text of the proposal was modified to say that LTC position should be chosen for a tap position which provides the highest voltage across the preventive autotransformer.
     2. If cannot meet required test due to inductive MVAR requirement, recommend to allow a combination of tap changer positions. Motion by Mark Perkins, ABB, to survey the working group on the final paragraph.

1. New Business
   1. Subject: request to remove the reference to the RIV test method for detection of PD during the induced test and remove Annex A from C57.12.90. Motion: Vote to delete the RIV reference from the body of the standard text paragraph 10.9.1, by Mark Perkins, ABB second offered. Motion amended to delete “in lieu of, or” in paragraph 2 of 10.9.1. Motion accepted unanimously.
   2. Distribution transformers with wound cores with return legs. Proposed wording details special induced voltage test application procedure to detect core grounding problems. Don Platts made a motion to survey
2. The remaining items on the agenda were deferred to the next meeting of the WG. The meeting adjourned at 3:00 p.m.

# B.3.6 WG - IEEE Guide for the Detection of and Location of Acoustic Emissions from Partial

**Discharges in Oil-Immersed Power Transformers and Reactors (C57.127)**

**Chair: Detlev Gross Chairs Vice Chair: Jack Harley Secretary: David Larochelle**

**San Antonio, April 13th 2015**

**Room: Chula Vista**

## Meeting Attendance

The working group met at 11 AM. 38 persons were in the room and 17 members were present. Quorum requirement was met. Complete attendance record is available in the AM System.

The following guests requested membership for next meeting:

* Omar Ahmed
* Jeffrey Benach
* James Borowitz
* Gustavo Leal
* Gregorio Lobo
* Andre Shor

## Discussions

The meeting started with Professor Hemchandra Shertukde’s presentation on acoustic PD location. A description of a location system as well as cases of PD location was presented. The concept of wavelet processing was discussed, highlighting the fact that it allows for a certain frequency analysis of the pulses.

The agenda was approved with the note that the number of members in our working group is 22.

Minutes from Washington’s meeting were unanimously approved.

The group had a discussion on the proposed modifications to the document, starting with Chapter 3 (Background information). Robert Brusetti suggested that the paragraph describing the power factor tip up should be kept as it might sometimes be used throughout the investigation process. Keeping in mind that Chapter 3 gives an overview of different techniques that are available for detecting the possible presence of PD, power factor tip up will be kept, as well as the paragraph describing UV techniques.

There was a concern raised by Robert Brusetti about the intent of suggesting precise threshold levels in the guide. It was general agreement that such thresholds cannot be established knowing that noise levels, PD characteristics and propagation parameters will differ in every cases without relation to the severity of the PD. There is no intent to define such thresholds in the guide.

Alexander Golubev commented on the use of coupling capacitor and their impact in limiting the bandwidth of the electric signal. He volunteered to provide wording to describe the phenomenon in more details.

Moving to chapter 5, Robert Brusetti suggested that chapter “5.8 – Multiple sensors systems” be generalized.

There was a general agreement to review section “5.9 – Bandpass filter” to make it more generic. The use of such filters is not mandatory for good location results. Arturo Nunez suggested having a better differentiation of the sensor’s frequencies, not only taking into account the differences of noise levels in lower frequencies, but also the sensitivity on the PD signal. Charles Sweetser accepted to work on this paragraph with the help of Arturo Nunez. They will create a frequency visual to show where emissions from various phenomena occur.

Marco Tozzi raised a question about the relation of reliability of location versus the repetition rate of the partial discharge. Detlev Gross explained that while a very low repetition rate does not prevent a good location result, a good practice would be to try to confirm a result with a second reading to avoid a false diagnostic, especially in field conditions. It is to be considered that a very high repetition rate would become problematic as acoustic emissions from different PD sources would overlap and diminish the averaging capabilities or the location performances. Arturo Nunez introduced the concept of re-arming time of a system, which creates a blind period after an acoustic waveform was found and recorded. Hemchandra Shertukde suggested creating an annex for this section. The sensor’s characteristics being an important item to be considered in the location process, there was a preference in keeping this information as a section of the guide.

Arturo Nunez accepted to present his technical experience in partial discharge location during the next meeting in Memphis.

## Adjournment

The meeting was adjourned at 12:15 PM by motion from Hemchandra Shertukde seconded by Michael Franchek.

David Larochelle

## B 3.7 Working Group for PD in bushings, PTs and CTs – PC57.160

## WG Secretary: Thomas Sizemore; WG Chair: Thang Hochanh

The meeting of this Working Group was led by Thang Hochanh.

The WG secretary is Thomas Sizemore.

A check was made to determine if a quorum was present. A total of 15 over 24 WG members were presents which did fulfill the quorum requirements. 42 people attend the meeting and 2 requested membership.

The meeting began with the remarks from the WG chair.

* The chair presented the draft 5.2. This draft was sent to the WG members one week before. As it was mentioned, this document and the discussion during this Spring 2015 meeting will be incorporated to the next Draft shortly and will be sent to WG members shortly. The working group members are encouraged to return the comments in before and in advance of the next Fall meeting in Memphis.
* The chair also explain the two mains topics that will be covered at this meeting :
  + Presentation of the latest PD patterns submitted to the chair
  + Review the complemented Draft 5.2

1. A review on the section related to instrument transformers was discussed.
2. Presentation of the latest received patterns:
   1. Pattern of PD caused by “*Wrinkled paper in the head insulation of a CT*”.
   2. Patterns, displayed over an ellipse. This type of PD representation was very common in the 90’s. It was proposed to put more emphasis on the new PD pattern representation as PRPD (phase resolve partials discharges).
   3. Pattern representing PD due to *a case of* *bad impregnation*
   4. Pattern due to a *loose bushing cap*.
   5. Patterns due to *defects in resin bushings*
   6. Patterns not yet identified
3. Acceptation criteria vs ambient-partial-discharge noise :
   1. The calibration is performed at the PicoCoulomb limit (100%).
   2. The 50% of the limit level is then injected for verification as well a 200% of the limit is applied.
   3. The calibration is successful if the “50% level” calibration pulse is visible and above the noise level.
   4. NOTE:
      1. In case of the random high frequency noise is higher than the 50% level, the calibration has failed and the calibration process should be corrected and resubmit.
      2. In case that, the high frequency noise is higher than the 50% level, the noise pattern is correlated to the frequency of the test source AND the 50% level calibration pulses is clearly visible, then in agreement with the customer, the calibration process is acceptable and the PD test can be performed.
4. There were agreement on the representation on the bushing that can be represented as C1-C2 and C1-C2-C3. This agreement is conditional to a note following the paragraph. This note should mention that the type of bushing with C1, C2, C3 (with test tap and voltage tap) is a known practice in Europe and is more and more in use in North America.
5. The WG chair presented calibration circuits in balanced and unbalanced configurations.

The meeting concluded due to time constraints.

# Liaison Reports

## Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden

The IEEE High Voltage Testing Techniques (HVTT) Subcommittee has not met since the fall 2014 Transformers Committee meeting. Since the last meeting, a new group of officers has taken responsibility for the Subcommittee, with Jeff Britton serving as the new chair of HVTT, Jim McBride as vice-chair, and Yixin Zhang as secretary.

The next HVTT meeting is scheduled to take place in conjunction with the IEEE PES General Meeting in Denver, CO, on Wednesday July 29th, 2015. Just prior to the meeting on the afternoon of July 29th, several members of the PSIM Committee and HVTT Subcommittee will present a panel presentation sponsored by the PSIM Committee on the upcoming revision of IEEE 1122, “IEEE Standard for Digital Recorders for Measurements in High-Voltage Impulse Tests”. During the panel presentation, the speakers will cover various topics related to IEEE 1122, including:

* Review of the scope, revision history and present status of IEEE 1122
* Relationship of IEEE 1122 to the IEC 61083-1 and 61083-2 standards respectively covering hardware and software requirements for instruments used to make high voltage impulse measurements, with emphasis on technical differences existing between the IEEE and IEC documents
* Possible changes to the scope of IEEE 1122 to include software requirements for instruments used to make high voltage impulse measurements
* Possible changes to the scope of IEEE 1122 to include hardware and software requirements for making other types of high voltage measurements using digital recorders, such as AC and DC high voltage measurements where transient characteristics of the test voltage are of interest. There is presently work ongoing within IEC to develop additional standards in the IEC 61083 series to cover digital techniques for measurement of high voltage waveforms other than traditional lightning and switching impulse voltages. Examples may include:
  + Measurement of fast changes in the test voltage during wet tests, or during AC or DC testing of polluted insulators
  + Ripple voltage measurements during HVDC tests
  + Measurements of combined high voltage waveforms such as superimposed DC + lightning or switching impulse voltages

Another potential project that the Subcommittee will consider at the next meeting is the development of a guide to explain using practical examples how an owner of a high voltage measuring system may go about demonstrating that their measuring system is in compliance with the uncertainty requirements of IEEE Std. 4, 2013, and how to establish and maintain a proper record of performance for the system that is in accordance with these requirements.

Jeff Britton on behalf of Arthur Molden 4/15/2015

# Old Business

No old Business was there for discussion

# New Business

* Per previous meeting discussion, a new Task Force is established to review and determine if limits for, winding insulation power factor and insulation resistance for power and distribution class transformers that includes both mineral oil and alternate liquids, can be established. Task force will be headed by Susmitha Tarlapally and first meeting of task force will be at next meeting at Memphis.
* A motion was brought by Sanjib Som to define “grounded or proper grounding “in reference to wound core gassing issue. After deliberation motion was withdrawn as it was agreed to be out of scope of DTSC.
* A discussion was brought by Tauhid Ansari regarding need for developing a guide on testing standard for test apparatus –Equipment used by manufacturers for testing of transformers. Many members agreed on the need for such a guide but no motion was passed as many members commented that it out of scope of DTSC. Chair agreed to update team during next meeting after discussing with AdCom if subject can be included in scope for DTSC or any other transformer committee.

# Adjournment

Meeting adjourned 12.15 PM.

Minutes respectfully submitted by:

**Ajith M. Varghese**

Secretary DTSC.