Record of Letter Ballot Review by TC Chapter for Procedural Review

Region/Locale: Europe

Global Technical Committee: Compound Semiconductor Materials

TC Chapter Cochairs: Arnd Weber (SiCrystal)

Standards Staff: Kevin Nguyen

|  |  |  |
| --- | --- | --- |
|  | Scheduled in Background Statement | Actual |
| Date  | Oct 7, 2015 | Oct 7, 2015 |
| Location | Dresden, Germany | Dresden, Germany |
| Reason for Change of Date and/or Location(if changed) |  |

**Note: See *Regulations* ¶ 9.5 Exception for allowable reason to change.**

I. Document Number and Title

|  |  |
| --- | --- |
| **Document Number 5795** | **Document Title****New Standard: Test Method for Contactless Resistivity Measurement of Semi Insulating Semiconductors** |

II. Tally

Standards staff to fill in.

**Voting Tally: As-cast tally after close of voting period**

**Note: A minimum of 60% of the Voting Interests that have TC Members within the global technical committee that issued the Letter Ballot must return Votes. (*Regulations* ¶ 9.7.1.1)**

**Voting Tally:**

**Note: See *Regulations* § 3.2.1 for definition of Voting Interest.**

III. Rejects

None

IV. Other Technical Issues

None

V. Comments

V- (i) Voters’ Comments

Commenter 1 (Vargas Bernal, Rafael/ITSdI) - Comment 1

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| --- | --- |
| **Comment** | 1. **In subsection 2.1, separate 'Ohmcm' to 'Ohm cm'.**
2. **Figure 3, A1.1 and A2.1 must be improved.**
3. **Separate units of temperature of their quantities.**
4. **In Table A1.1.1 emphasize technical variables.**
5. **In Table A3.1, separate '10,with'.**
 |
| **All comments are accepted except for comment 3 & 4 above.** |
| **Action** | **The TC Chapter agreed to do one of the following actions.**  |
| \***No motion is required in this step.** |
|  | Already addressed by Commenter #, Comment # |
|  | No further action was taken by the TC Chapter. |
|  | Refer to the TF for more consideration.  |
|  | New Business  |
| x | Editorial Change |
|  |  | Options for editorialchange **(check one)** | x | **Case 1: No vote in this section:** |
| **To be included and voted on as a group in § VI. *Editorial Changes Other than Those Voted on in § V*.** |
|  |  | **Case 2: Voted in this section:** |
| **Original section number and at least one full sentence are required in “FROM” and “TO” fields.** |
| **Editorial Changes** | **1** | **FROM: Section/Paragraph xxx** |
| **TO: Section/Paragraph xxx** |
| **Justification (If necessary)** |
| **2** | **FROM: Section/Paragraph xxx** |
| **TO: Section/Paragraph xxx** |
| **Justification (If necessary)** |
| **Motion** | To approve above editorial change(s) |
| **Motion by/2nd by** | Name (Company)/Name (Company) |
| **Discussion** | XXXX |
| **Vote** | XX **Y**-XX **N**; Motion passed/failed.  |

Commenter 2 (Kronwasser, Judy/Novasic) - Comment 1

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| **Comment** | **Background statement. '....reproducible and preferentially non contacting' The correct word is preferably.** **Draft document.**1. **Scope: Should there be a dash in ohmcm ? ohm cm.**
2. **I would delete the first occurrence of the word resistivity in the next sentence: 'It may also be used to characterize other resistivity materials exhibiting resistivity in this range, including in particular high resistivity silicon.'**
3. **6.3 'holed counter electrode' I think you mean 'annular counter electrode'**
4. **7.2.2 the word is not 'uncritical' Use either non critical or not critical.**
5. **Appendix 1**

 **A1 3.1 '....gradual ρ variations ... is encountered' Should be 'are encountered'** |
| **Background statement is not part of the ballot.****All others are accepted except for comment 3.** |
| **Action** | **The TC Chapter agreed to do one of the following actions.**  |
| \***No motion is required in this step.** |
|  | Already addressed by Commenter #, Comment # |
|  | No further action was taken by the TC Chapter. |
|  | Refer to the TF for more consideration.  |
|  | New Business  |
| x | Editorial Change |
|  |  | Options for editorialchange **(check one)** | x | **Case 1: No vote in this section:** |
| **To be included and voted on as a group in § VI. *Editorial Changes Other than Those Voted on in § V*.** |
|  |  | **Case 2: Voted in this section:** |
| **Original section number and at least one full sentence are required in “FROM” and “TO” fields.** |
| **Editorial Changes** | **1** | **FROM: Section/Paragraph xxx** |
| **TO: Section/Paragraph xxx** |
| **Justification (If necessary)** |
| **2** | **FROM: Section/Paragraph xxx** |
| **TO: Section/Paragraph xxx** |
| **Justification (If necessary)** |
| **Motion** | To approve above editorial change(s) |
| **Motion by/2nd by** | Name (Company)/Name (Company) |
| **Discussion** | XXXX |
| **Vote** | XX **Y**-XX **N**; Motion passed/failed.  |

Commenter 3 (Weber, Arnd Dietrich/SiCrystal) - Comment 1

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| **Comment** | **I recommend minor editorial fixes in Appendix 1:** **paragraph A1 1.3 and formula A1 3: line feed is broken**  **formula A1 4 & A1 6: remove point at the end of the formula to be consistent with the rest of the document** |
| **All comments are accepted.** |
| **Action** | **The TC Chapter agreed to do one of the following actions.**  |
| \***No motion is required in this step.** |
|  | Already addressed by Commenter #, Comment # |
|  | No further action was taken by the TC Chapter. |
|  | Refer to the TF for more consideration.  |
|  | New Business  |
| x | Editorial Change |
|  |  | Options for editorialchange **(check one)** | x | **Case 1: No vote in this section:** |
| **To be included and voted on as a group in § VI. *Editorial Changes Other than Those Voted on in § V*.** |
|  |  | **Case 2: Voted in this section:** |
| **Original section number and at least one full sentence are required in “FROM” and “TO” fields.** |
| **Editorial Changes** | **1** | **FROM: Section/Paragraph xxx** |
| **TO: Section/Paragraph xxx** |
| **Justification (If necessary)** |
| **2** | **FROM: Section/Paragraph xxx** |
| **TO: Section/Paragraph xxx** |
| **Justification (If necessary)** |
| **Motion** | To approve above editorial change(s) |
| **Motion by/2nd by** | Name (Company)/Name (Company) |
| **Discussion** | XXXX |
| **Vote** | XX **Y**-XX **N**; Motion passed/failed.  |

V-(ii) Comments Created by Handling Negative

None

VI. Editorial Changes Other than Those Voted on in § V

**Original section/paragraph number and at least one full sentence are required in “FROM” and “TO” fields.**

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| **1** | Origin of this editorial change**(Check one)** | **x** | Commenter 1 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** **Figure 3**

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| --- | --- |
| A  **CA CA****SG SG** | B **FSG****SCC** |

Figure 3Equivalent Circuit (network) of the PS and RS Sensors, Analyzed by Methods TD (A) and FD (B) |
| **TO: Figure 3**

|  |  |
| --- | --- |
| A | B **FSG****SCC** |

Figure 3Equivalent Circuit (network) of the PS and RS Sensors, Analyzed by Methods TD (A) and FD (B) |
| **Justification:** **Clarification to figure for improvement**  |
| **2** | Origin of this editorial change**(Check one)** | **x** | Commenter 1 / Comment(s) # |
|  | Other [ ] |
| **FROM:** **Figure A1-1**Figure A1-1Reproduction of Figure 3A, Equivalent Circuit (network) of the Capacitive Sensor, Analyzed by Method TD |
| **TO: Figure A1-1**Figure A1-1Reproduction of Figure 3A, Equivalent Circuit (network) of the Capacitive Sensor, Analyzed by Method TD |
| **Justification: Clarification to figure for improvement**  |
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| Origin of this editorial change**(Check one)** | **x** | Commenter 1 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** Table A3-1 row

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| --- | --- |
| Resistivity data array | 10 x 10,with 0.1 cm step |

 |
| **TO:** Table A3-1 row

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| --- | --- |
| Resistivity data array | 10 x 10~~,~~with 0.1 cm step |

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| **Justification: Deleting a comma for editorial correction.**  |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 1 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** 2.1…….resistivity range 1E5 to 1E12 Ohmcm. |
| **TO:** 2.1…….resistivity range 1E5 to 1E12 Ohm·cm. |
| **Justification: Inserting a dot to correct proper resistivity unit**  |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 2 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** 2.1It may also be used to characterize other resistivity materials exhibiting resistivity in this range, including in particular high resistivity silicon. |
| **TO:** 2.1It may also be used to characterize other ~~resistivity~~ materials exhibiting resistivity in this range, including in particular high resistivity silicon. |
| **Justification: Eliminating redundancy.** |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 2 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** 6.3 The ring sensor (RS) consists of a circular bottom electrode, typically with a diameter D = 0.6 -1 cm, surrounded by a holed counter-electrode, which is formed as an extended plate to deposit the sample. The bottom electrode, centered in the hole of the counter-electrode, defines an annular gap of width de. It is recessed with respect to the counter-electrode such that an air gap da between the bottom electrode and the bottom sample surface is generated. The circular portion of the sample subject to the electric field above the bottom electrode, with a diameter of about 1.5 D, is analyzed (see Appendix 2 for details). |
| **TO:**6.3 The ring sensor (RS) consists of a circular bottom electrode, typically with a diameter D = 0.6 -1 cm, surrounded by a holed counter-electrode, which is formed as an extended plate to deposit the sample. The bottom electrode, centered in the hole of the counter-electrode, defines an annular gap of width de. The bottom electrode ~~It~~ is recessed with respect to the counter-electrode such that an air gap da between the bottom electrode and the bottom sample surface is generated. The circular portion of the sample subject to the electric field above the bottom electrode, with a diameter of about 1.5 D, is analyzed (see Appendix 2 for details). |
| **Justification: Added texts for clarity**  |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 2 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** 7.2.2 The surface of the sample can be as-sawn, but preferably should be lapped or polished. Due to the vertical orientation of the electric field and the resulting vertical direction of the discharging current, spurious surface conductivity resulting from surface contamination is uncritical. |
| **TO:**7.2.2 The surface of the sample can be as-sawn, but preferably should be lapped or polished. Due to the vertical orientation of the electric field and the resulting vertical direction of the discharging current, spurious surface conductivity resulting from surface contamination is ~~uncritical~~ not critical. |
| **Justification: Editorial correction.** |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 2 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** A1 3.1 '....gradual ρ variations ... is encountered'  |
| **TO:**A1 3.1 '....gradual ρ variations ... ~~is~~ are encountered'  |
| **Justification: Grammatical correction.**  |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 3 / Comment(s) #  |
|  | Other [ ] |

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| **FROM:**  (A1-4) (A1-6) |
| **TO:** (A1-4) (A1-6) |
| **Justification: Deletion of period at the end of both equation for consistency.**  |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 3 / Comment(s) #  |
|  | Other [ ] |

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| Origin of this editorial change**(Check one)** | **x** | Commenter 3 / Comment(s) #  |
|  | Other [ ] |
| **FROM:** * + 1. We describe the measurement procedure by assuming that both capacitances Cs and Ca in Figure 3A are discharged. At time t = 0 a voltage step U (typically 10V) is applied by the signal generator SG, charging the capacitances instantaneously with an initial charge:

 (A1-3) |
| **TO:*** + 1. We describe the measurement procedure by assuming that both capacitances Cs and Ca in Figure 3A are discharged. At time t = 0 a voltage step U (typically 10V) is applied by the signal generator SG, charging the capacitances instantaneously with an initial charge:

(A1-3) |
| **Justification: Editorial correction for MS Word formatting error. Carriage return on the equation A1-3** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** 4.1.4 *Ca, Cs [pF]* – Capacitances of the air gap and of the evaluated portion of sample below the top electrode of the sensor Figure 1A and above the bottom electrode of the sensor Figure 1B, respectively. |
| **TO:**4.1.4 *Ca, Cs [pF]* – Capacitances of the air gap and of the evaluated portion of sample below the top electrode of the sensor Figure 1~~A~~ and above the bottom electrode of the sensor Figure 2~~1B~~, respectively. |
| **Justification: Correction to figure references** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** 5.1 Conventionally the resistivity ρ is obtained using Ohm law: |
| **TO:**5.1 Conventionally the resistivity ρ is obtained using Ohm’s law: |
| **Justification: Correction to grammatical error.** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** 4.4 *ε0 [Cb/V\*cm]* – Dielectric constant of vacuum. |
| **TO:**4.4 *ε0 [Cb/(V~~\*~~·cm)]* – Dielectric constant of vacuum. |
| **Justification: Editorial correction** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** 6.1 The network to be analyzed is physically realized by the sample and sensor arrangement. Depending on practical considerations either a sensor containing a plate capacitor (Figure 1) or a ring capacitor (Figure 2) is used. |
| **TO:**6.1 The network to be analyzed is physically realized by the sample and sensor arrangement. Depending on practical considerations either a plate sensor (PS) containing a plate capacitor (Figure 1) or a ring sensor (RS) containing a ring capacitor (Figure 2) is used. |
| **Justification: Added texts for clarity** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** **Add a new note 1 under 6.1** 6.1 The network to be analyzed is physically realized by the sample and sensor arrangement. Depending on practical considerations either a plate sensor (PS) containing a plate capacitor (Figure 1) or a ring sensor (RS) containing a ring capacitor (Figure 2) is used. |
| **TO:**6.1 The network to be analyzed is physically realized by the sample and sensor arrangement. Depending on practical considerations either a plate sensor (PS) containing a plate capacitor (Figure 1) or a ring sensor (RS) containing a ring capacitor (Figure 2) is used.Note 1:Throughout this document plate capacitor refers to “parallel plate capacitor” |
| **Justification: For further clarification, note is informational.** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** Sensor containing a Plate Capacitor |
| **TO:**Figure 1Plate Sensor (PS) Containing a Plate Capacitor |
| **Justification: Clarification on figure 1 caption** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** Sensor containing a Ring Capacitor |
| **TO:**Figure 2Ring Sensor (RS) Containing a Ring Capacitor |
| **Justification: Clarification on figure 2 caption** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** 7.2 For analysis with the PS (Figure 1, 2 and § 6.2) the sample must be a slab with a thickness ds between 0.02 and 0.5 cm (200-5000 µm). The sample thickness variation must not exceed 2% across the measurement area D. For automated topographic evaluation of the entire sample area the overall thickness variation must not exceed 100 µm. |
| **TO:**7.2 For analysis with the PS (Figure 1~~,~~ ~~2~~ and § 6.2) the sample must be a slab with a thickness ds between 0.02 and 0.5 cm (200-5000 µm). The sample thickness variation must not exceed 2% across the measurement area D. For automated topographic evaluation of the entire sample area the overall thickness variation must not exceed 100 µm. |
| **Justification: Editorial correction on an error in reference** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** A1-1.2 The network shown in Figure A1-1 (for convenience reproduced below) is realized in conjunction with the parallel plate or ring sensor as shown in Figure 1 and Figure 2, respectively. These sample/electrode arrangements generate sample capacitances Cs and air capacitances Ca connected in series, such that the total capacitance is |
| **TO:**A1-1.2 The network shown in Fig. 3A ~~Figure A1-1~~ (for convenience reproduced below as Figure A1-1) is realized in conjunction with the parallel plate or ring sensor as shown in Figure 1 and Figure 2, respectively. These sample/electrode arrangements generate sample capacitances Cs and air capacitances Ca connected in series, such that the total capacitance is |
| **Justification: Editorial correction on an error in reference** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** A2-1.1 The FD measurement procedure is shown in Figure A2-1, reproduced here for convenience  |
| **TO:**A2-1.1 The FD measurement procedure is shown in Figure 3B ~~A2-1~~, reproduced here for convenience as Fig. A2-1. |
| **Justification: Editorial correction on an error in reference** |

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| Origin of this editorial change**(Check one)** |  | Commenter (s) / Comment(s) #  |
| **x** | Other [ ] |
| **FROM:** **APPENDIX 3 REFERENCES SAMPLES**  |
| **TO:****APPENDIX 3 REFERENCE~~S~~ SAMPLES** |
| **Justification: Editorial correction for grammatical error.** |

 |
| **Motion** | To approve the above editorial change(s). |
| **Motion by/****2nd by** | Wolfgang Jantz (SEMIMAP)/Peter Wagner(Self) |
| **Discussion** | None |
| **Vote** | 6 **Y**- 0 **N**; Motion passed  |

VII. Approval Conditions Check

VII. - (i). Approval Rate

**APPROVAL CONDITION 1: All Negatives have been discussed and were withdrawn, found not related, found not persuasive, or addressed by a technical change. (*Regulations* ¶ 9.7.1.2)**

**APPROVAL CONDITION 2: At least 90% of the sum of valid Voting Interest Accept and Voting Interest Reject Votes must be Accept. (*Regulations* ¶ 9.7.1.3)**

Note: If both approval conditions are not satisfied, the Document fails.

VII. – (ii) Approval Level (check one)

Note: See *Regulations* § 9.7.2 for further information.

|  |  |
| --- | --- |
| x | Globally Approved (No Ratification Ballot needed):The Letter Ballot meets the Letter Ballot approval conditions for the global technical committee. |
|  | Need a Ratification Ballot:The Letter Ballot meets the Letter Ballot approval conditions for the TC Chapter and a Ratification Ballot will be issued to validate technical changes. |

VIII. Safety Check

Note: See *Regulations* § 15 for further information.

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| **Motion** | **x** | **This is not a Safety Document**, when all safety-related information is removed, the Document is still technically sound and complete.(*Regulations* ¶ 8.7.1) |
|  | **This is a Safety Document**, when all safety-related information is removed, the Document is not technically sound and complete.(*Regulations* ¶ 8.7.2) |
|  |   | Safety Checklist (*Regulations* ¶ 15.3) is complete and has been included with the Document throughout the balloting process. (*Regulations* ¶ 15.1.2) |
| **Motion by/2nd by** | Wolfgang Jantz (SEMIMAP)/Peter Wagner(Self) |
| **Discussion** | None |
| **Vote** | 6 **Y**-0 **N**; Motion passed  |

IX. Intellectual Property (IP) Check

Note: This Letter Ballot may cover all or part of a Standard or Safety Guideline. This IP check applies to the entire Standard or Safety Guideline. See *Regulations* § 16 for further information.

|  |  |
| --- | --- |
| x | The TC Chapter meeting chair asked those participating, if they were aware of any potentially material patented technology or copyrighted items\* in the Standard or Guideline. (*Regulations* ¶ 8.8.1) |
|  | x | No potentially material patented technology or reproduction of copyrighted items is known. | **GO TO SECTION X.** |
|  | Potentially material patented technology or reproduction of copyrighted items is known, but a Letter of Assurance (LOA) or copyright release letter for such items has been obtained or presented to the TC Chapter. | **GO TO SECTION X.** |
|  | Potentially material patented technology or reproduction of copyrighted items is known and use of such materials is technically justified by the TC Chapter, but an LOA or copyright release letter for some of the item(s) has NOT been obtained or presented to the TC Chapter. |
| **Motion** |  | Ask ISC for special permission to publish. |
|  | Quit activity. |
|  | Wait for LOA for patented technology or release of copyrighted items. |
| **Motion by/2nd by** | Name (Company)/Name (Company) |
| **Discussion** | XXXX |
| **Vote** | XX **Y**-XX **N** |
| **Final Action** |  | Motion passed |
|  | Motion failed |

\* Note: Such potentially material patented technology or copyrighted items might have become known since the Standard or Safety Guideline was last reviewed, or might become relevant due to this Letter Ballot.

X. Action for This Document

|  |  |  |
| --- | --- | --- |
| **Motion**  |  | This Document passed TC Chapter review as balloted and will be forwarded to the ISC A&R SC for procedural review. |
| **x** | This Document passed TC Chapter review with editorial changes and will be forwarded to the ISC A&R SC for procedural review. |
|  | This Document passed TC Chapter review with technical changes and with or without editorial changes and will be forwarded to the ISC A&R SC for procedural review. A Ratification Ballot will be issued to verify the technical changes. |
|  | This Document failed TC Chapter review and will be returned to the TF for rework. |
|  | This Document failed TC Chapter review and work will be discontinued. |
| **Motion by/****2nd by** | Wolfgang Jantz (SEMIMAP)/Peter Wagner(Self) |
| **Discussion** | None |
| **Vote** | 6 **Y**- 0 **N** |
| **Final Action** | x | Motion passed |
|  | Motion failed  |

Standards staff to record the result of the A&R procedural review here:

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| --- | --- | --- |
| **A&R** |  | **Approved for publication** |
|  | **Approved pending acceptance of the Ratification Ballot** |
|  | **Not approved** |
| **Reason:** |