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NIST HANDBOOK 150-11A CHECKLIST

ECT: FCC Parts 2, 15, and 18

Instructions to the Assessor: This checklist addresses specific criteria relating to accreditation of a laboratory to determine the capability and competence of that laboratory to perform tests to show compliance of equipment subject to the FCC EMC Regulations contained in 47 CFR Parts 2, 15, and 18. It is intended for use during the assessment phase of the accreditation process as a guide to evaluate the capability of the applicant laboratory facility and to determine the competency of the laboratory personnel for performing the required measurements. It is not intended to replace the good engineering judgment of the technical assessor or a thorough evaluation of the facility. Other points may and should be added to this checklist as the on-site assessment progresses.

Circle all items you observed and verified at the laboratory. Circle the letter "Y", representing "yes" to show conformance with the criteria. Circle the letter "N", representing "No", to show a nonconformity. If the item is "Not Applicable", circle "N/A". Record an explanation of any nonconformity or comment on the comment sheet provided at the end of the checklist.

I. DOCUMENTATION (The laboratory should have copies of appropriate FCC rules, standards and measurement methods based on its scope of accreditation. The following documents may be needed and should be revised as necessary based upon the laboratory's scope of accreditation.)			
Y	N	N/A	1. C63.2-1996: American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 kHz to 40 GHz – Specifications.
Y	N	N/A	2. C63.4-2003: American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Y	N	N/A	3. C63.7-1992: American National Standard Guide for construction of Open Area Test Sites for Performing Radiated Emission Measurements.
Y	N	N/A	4. CISPR 16-1-1 – "Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 1-1: Radio Disturbance and Immunity Measuring Apparatus – Measuring Apparatus."
Y	N	N/A	5. CISPR 16-1-2 – "Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 1-2: Radio Disturbance and Immunity Measuring Apparatus – Ancillary Equipment – Conducted Disturbances."
Y	N	N/A	6. CISPR 16-1-3 – "Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 1-3: Radio Disturbance and Immunity Measuring Apparatus – Ancillary Equipment – Disturbance Power."

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Y	N	N/A	7. CISPR 16-1-4 – “Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 1-4: Radio Disturbance and Immunity Measuring Apparatus – Ancillary Equipment – Radiated Disturbances.”
Y	N	N/A	8. CISPR Publication 22 (2005 -5th Edition) Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement.
Y	N	N/A	9. 47 CFR Parts 2, 15 and 18, as appropriate (FCC Rules and Regulations)
Y	N	N/A	10. FCC MP-5-1986: Methods of measurement of radio noise emissions from Industrial, Scientific and Medical (ISM) equipment. (Note: This procedure is only required when the prospective lab is being accredited for measuring ISM equipment. The special conditions and requirements in MP-5 must be taken into consideration, which do not always follow ANSI C63.4.)
II. MEASUREMENT INSTRUMENTATION			
A. Line Impedance Stabilization Network (LISN)			
Y	N	N/A	11. Are 50 Ω /50 μ H LISNs used per ANSI C63.4-2003, Section 4.1.2?
Y	N	N/A	12. Do the LISNs have an indication of characterization status per ISO/IEC Standard 17025:2005?
Y	N	N/A	13. Has the impedance and insertion loss of the LISNs been characterized per ANSI C63.4 Appendix E – Verification of LISN Characteristics, and are the test results within the specified tolerance?
Y	N	N/A	14. If automated software is used for conducted emissions measurements (and the insertion loss is greater than 0.5 dB), then check if the LISN insertion loss in the calibration report is the same as the software look-up table.
Y	N	N/A	15. Are the LISN impedance measurements made at the point where the Equipment Under Test (EUT) is connected to the LISN with 50 ohm termination on the instrumentation monitoring port? (Note: Connection of the EUT to the LISN socket or at the end of an extension cord may make a difference in line-conducted measurements.)
Y	N	N/A	16. Are all unused EUT ports appropriately terminated?
Y	N	N/A	17. Are the LISNs installed and used in accordance with ANSI C63.4-2003, Sections 5, 6 and 7 and MP-5, as appropriate?

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B. Antennas			
Y	N	N/A	18. Does each of the antennas used for compliance measurements comply with the criteria in ANSI C63.4-2003, Section 4.1.5 and MP-5, as appropriate? (Note: Rod and log-spiral antennas are not permitted for FCC type measurements.)
Y	N	N/A	19. Are the antennas calibrated and labeled in accordance with recommended practices contained in ANSI C63.4-2003 Section 4.4.2?
Y	N	N/A	20. Is the lab using the antenna factors that are the same for vertical and horizontal polarization (for the same antenna, at the same frequency per ANSI C63.5)?
C. Measurement Receiver or Spectrum Analyzer			
Y	N	N/A	21. Does the measuring receiver(s) or spectrum analyzer(s) used for final EMC measurements meet the requirements in ANSI C63.4-2003, Section 4.1 or CISPR 16-1-1?
Y	N	N/A	22. Has the receiver(s) or spectrum analyzer(s) been calibrated? Is there documentation showing all calibration per ISO/IEC Standard 17025: 2005?
Y	N	N/A	23. For each measuring instrument that is automated, is the software documented and adequate for use? Ask for a demonstration to show appropriate use. (Note: Any loadable parameters inside instruments or automated equipment shall be considered a data transfer and subject to appropriate checks. i.e., latest calibration corrections factors.)
Y	N	N/A	24. Have the RF Cables, RF Switches, terminators, attenuators and pre-amps been characterized in accordance with ANSI C63.4-2003, Section 4.4.5?
III. TEST FACILITIES			
A. Facilities for Measuring Powerline Conducted Emissions			
Y	N	N/A	25. Is there sufficient power available to perform the required measurements and is the power-line conducted ambient at least 6 dB below the limit per ANSI C63.4-2003, Section 5.1.2?
Y	N	N/A	26. For each type and size of EUTs to be measured, does each line conducted facility comply with the conditions and requirements of ANSI C63.4-2003, Section 5.2 and MP-5, as appropriate?
Y	N	N/A	27. For each type of EUT to be measured at this facility, can accurate and repeatable line-conducted measurements be performed in accordance with ANSI C63.4-2003, Sections 6 and 7?

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Y	N	N/A	28. Is the vertical conducting plane, if used, installed and used in accordance with ANSI C63.4-2003, Section 5.2.2? Is the vertical plane bonded (3 cm minimum strap width) properly to the horizontal plane (3 bonds minimum)?
Y	N	N/A	29. Ask for a demonstration or description of how large EUTs are handled. Are the guidelines in ANSI C63.4-2003 (Sections 5 and 6), and MP-5 followed for large EUTs, including in-situ, if appropriate? (Ask the test personnel to explain what special measurements and conditions are required when the power requirement is greater than the rated capacity of the LISN.)
Y	N	N/A	30. Ask to review the documentation of conducted emission site (calibration, drawings, and pictures).
B. Facilities for Measuring Radiated Emissions in the Frequency Range of 30 MHz to 1 GHz			
Y	N	N/A	31. For each type and size of EUTs to be measured, does each radiated emission test facility comply with the conditions and requirements of ANSI C63.4-2003, Section 5.4?
Y	N	N/A	32. Are LISN(s), filters, and isolation transformers, if used, installed in accordance with ANSI C63.4-2003, Section 5.2.3?
Y	N	N/A	33. Is the reflecting ground plane in accordance with ANSI C63.4-2003, Clause 5.4.3?
Y	N	N/A	34. Is the EUT turntable installed and used in accordance with ANSI C63.4-2003, Clause 5.4.4?
Y	N	N/A	35. Is the antenna positioner installed in accordance with ANSI C63.4-2003, Clause 5.4.5?
Y	N	N/A	36. Are the guidelines in ANSI C63.7-1992 followed?
Y	N	N/A	37. Does the radiated emission test site(s) meet the site quality validation requirements of ANSI C63.4-2003, Section 5.4.6? The site quality validation data must meet the ± 4 dB criteria. For alternative test sites, see Section 5.4.6.5.
Y	N	N/A	38. Check the antenna factor data points from the antenna calibration report and those used for NSA. Do these agree and have they been interpolated properly? Are the vertical and horizontal antenna factors the same (for the same antenna used at the same frequency and distance)?

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Y	N	N/A	39. For each type of EUT to be measured at this facility, can accurate and repeatable radiated measurements be performed in accordance with ANSI C63.4-2003, Sections 6 and 8 for each radiated emission test site?
Y	N	N/A	40. Ask for a demonstration or description of how large EUTs are handled, if appropriate. Are the guidelines in ANSI C63.4-2003, Sections 6 and 8 and MP-5 followed for large EUTs, including in-situ, if appropriate? (Note: In this case, a large EUT is one that is larger than can be handled on a test site.)
Y	N	N/A	41. Ask to review the documentation on the OATS (including drawings, pictures, and NSA).
C. Facilities for Measuring Radiated Emissions in the Frequency Range of 1 GHz to 40 GHz			
Y	N	N/A	42. For each type of EUT to be measured at this facility, is there a test site for making radiated emissions measurements to the highest frequency required?
Y	N	N/A	43. Has the test site been evaluated to determine that undesired reflections do not affect the measurements (ANSI C63.4-2003, Section 8.2.4)?
Y	N	N/A	44. Is the sensitivity of the measurement system at least 6 dB below the applicable limit and have any preamplifiers used to attain this sensitivity been checked to ensure that they do not cause distortion, spurious signals or overload (ANSI C63.4-2003, Section 4.1.5.4)?
Y	N	N/A	45. Are the beamwidths of the antennas known so that the beamwidth versus size of the EUT can be taken into account (ANSI C63.4-2003, Sections 4.1.5.4, 8.2.4 and 8.3.1.2)? If the manufacturer's antenna specification sheet is being relied on for the beamwidth data, then has the beamwidth data been considered over the frequency range of the test?
Y	N	N/A	46. Is there a calibrated frequency meter capable of measuring up to the highest frequency required (ANSI C63.4-2003, Sections 13.1.5 & 13.1.6)?

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IV. EMISSION TESTS			
A. General Operating Conditions and Configurations of the EUT <i>(Require a demonstration and/or description of the testing and setup for all types of equipment to be tested at the facility.)</i>			
Y	N	N/A	47. Does the test engineer have an adequate set of instructions for operation of the EUT? The instructions should include turn-on procedure, turn-off procedure, procedure for setting the proper modes and the method of determining that the EUT is operating properly.
Y	N	N/A	48. Do the equipment arrangements and operation for each type of equipment follow the general guidelines and procedures in ANSI C63.4-2003, Section 6, and 47 CFR 15.31-15.32?
Y	N	N/A	49. Is the EUT arrangement configured with appropriate accessories per ANSI C63.4-2003, Sections 6.1-6.2, and 47 CFR 15.31-15.35?
Y	N	N/A	50. If there are multiple ports of the same type on the EUT, is each port connected to an additional cable to investigate the additive effect these cables have on the EUT emissions, per ANSI C63.4-2003, Sections 6.1.3, and 47 CFR 15.31?
B. Powerline Conducted Emission Tests <i>(Require a demonstration and/or description of the testing and setup for all types of equipment to be tested at the facility.)</i>			
Y	N	N/A	51. Are the AC powerline conducted emission tests performed in accordance with the applicable parts of ANSI C63.4-2003, Section 7, and 47 CFR 15.31-15.35 and 15.107?
Y	N	N/A	52. Does the procedure for using a voltage probe, if required, follow ANSI C63.4-2003, Section 4.1.3?
Y	N	N/A	53. If a voltage probe is required, can the test personnel provide an adequate explanation of when and how it is used?
Y	N	N/A	54. Are all surfaces of the EUT (both floor-standing and table-top systems) at least 80 cm from any other conducting surfaces, including all LISNs per ANSI C63.4-2003, Sections 6 and 7?
Y	N	N/A	55. Is the conducted emission test setup in accordance with Figure 10(a) for a table-top EUT and Figure 10(b) for a floor-standing EUT of ANSI C63.4-2003, Sections 6 and 7?
Y	N	N/A	56. Is the excess power cord length between the EUT and the LISN folded back and forth in a serpentine bundle, located in the center of the power cord, not to exceed 40 cm? (If non-flexible power leads are used, refer to Section 7.2.1 of ANSI C63.4-2003 for acceptable criteria.)

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Y	N	N/A	57. Is the EUT connected to one LISN and all the peripherals connected to at least one other LISN?
Y	N	N/A	58. Based on exploratory tests, does this conducted emission compliance test represent the maximized cable configuration and worst case mode of EUT operation yielding the highest levels?
Y	N	N/A	59. For each type of EUT, are the correct frequency ranges measured and the correct detectors and bandwidth used per MP-5, 47 CFR 15.33 and 15.35?
Y	N	N/A	60. For a personal computer or associated peripheral, was the step-by-step guidance in ANSI C63.4-2003, Annex D adequately followed?
Y	N	N/A	61. For an unintentional radiator, other than ITE (e.g., receiver or TV interface device), was the step-by-step guidance in ANSI C63.4-2003, Annex G adequately followed?
Y	N	N/A	62. For an intentional radiator (e.g., remote control and security transmitter) was the step-by-step guidance in ANSI C63.4-2003, Annex H adequately followed?
C. Radiated Emission Tests (<i>Assessor should request a demonstration and/or description of the testing and setup for all types of equipment to be tested at the facility.</i>)			
Y	N	N/A	63. Are the radiated emission tests performed in accordance with ANSI C63.4-2003 Sections 8, 11, etc. and the FCC Rules (e.g., 47 CFR 15.31-15.35)?
Y	N	N/A	64. Do the procedures for handling ambient emissions, if appropriate, follow the guidelines in ANSI C63.4-2003, Section 5.1.2 and good engineering practice, when appropriate?
Y	N	N/A	65. Are exploratory (when appropriate) and final radiated measurements made in accordance with the guidance in ANSI C63.4-2003, Sections 8.3, 11 and Annex C?
Y	N	N/A	66. Is the radiated emission test setup in accordance with Figure 11(a) for a table top EUT and Figures 11(b), 12a, and 12b for a floor-standing EUT?
Y	N	N/A	67. For Information Technology Equipment (ITE), is the EUT setup operated and tested in accordance with the procedures in ANSI C63.4-2003, Section 11? (Note: Personal computers and associated peripherals should be tested in accordance with ANSI C63.4-2003, Annex D.)
Y	N	N/A	68. Are unintentional radiators, other than ITE, tested in accordance with the requirements in 47 CFR 15.31 and the procedures in ANSI C63.4-2003, Section 12 and Annex G and MP-5?

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Y	N	N/A	69. Are EUTs that are intentional radiators tested in accordance with the requirements in 47 CFR 15.31 and the procedures in ANSI C63.4-2003, Section 13 and Annex H?
Y	N	N/A	70. Based on exploratory tests, does this radiated emission compliance test represent the maximized cable configuration and worse case mode of EUT operation yielding the highest levels?
Y	N	N/A	71. For each type of EUT, are the correct frequency ranges investigated and the correct detectors and bandwidth used per 47 CFR 15.33 and 15.35?
Y	N	N/A	72. For products in which CISPR 22 is used to show compliance with 47 CFR Part 15, are the measurements made in accordance with 47 CFR 15.109(g)?
Y	N	N/A	73. For a personal computer or peripheral, was the step-by-step guidance in ANSI C63.4-2003, Annex D adequately followed?
Y	N	N/A	74. For an unintentional radiator other than ITE (e.g., receiver or TV interface device) was the step-by-step guidance in ANSI C63.4-2003, Annex G adequately followed?
Y	N	N/A	75. For an intentional radiator (e.g., remote control and security transmitter), was the step-by-step guidance in ANSI C63.4-2003, Annex H adequately followed?
Y	N	N/A	76. Ask for a demonstration of radiated emission and other required measurements for each type of product within the scope of accreditation. Do the testing personnel, during the demonstration, use the correct application notes and precautions; e.g., for overload and ambient conditions? (Such demonstrations may be combined with other requested demos.)
Y	N	N/A	77. Ask for uncertainty calculations procedure and explanations of contributing factors for radiated emission.
V. TEST REPORTS (<i>Assessor should request to review several sample test reports for various types of products.</i>)			
Y	N	N/A	78. Does each of the test reports contain all the information requested in ANSI C63.4-2003, Section 10, and Part 2 (and other applicable Parts) of the FCC Rules?
Y	N	N/A	79. Is the standard to which the EUT was tested clearly referenced in the test report, per ANSI C63.4-2003, Section 10.1.1? If an alternative procedure was used, are the deviations clearly defined and justified per ANSI C63.4-2003, Section 10.1.9?

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Y	N	N/A	80. Is the rationale for selecting and arranging the EUT clearly stated and are the components of the EUT system clearly identified per ANSI C63.4-2003, Section 10.1.2?
Y	N	N/A	81. Can a regulatory agency or reasonably competent test engineer duplicate the test results from the description of the EUT and test setup? Are there adequate photographs and descriptive material included in the report per ANSI C63.4-2003, Section 10.1.12?
Y	N	N/A	82. Does the measurement report include a sample calculation with all conversion and correction factors used?
Y	N	N/A	83. Is the test report signed in accordance with ANSI C63.4-2003, Section 10.1.11?
Y	N	N/A	84. Is the test report signed in accordance with the requirements of the accrediting body?
<p>VI. PERSONNEL COMPETENCY <i>(The following is a list of general or lead-in questions, which are intended to be used as a guide to assess competency of laboratory personnel. Additional specific questions should be used to determine the technical competency of the personnel performing the measurements, when appropriate. More probing questions should be asked of the person responsible for and signing the report of measurements.)</i></p>			
<p>Questions to ask: <i>(The assessor should check Y (yes) or N (no) based on his/her belief that the laboratory personnel have provided the proper responses to the specific question(s).)</i></p>			
Y	N	N/A	85. Is there sufficient training and supervision in place to ensure technical competency of the personnel performing the measurements?
Y	N	N/A	86. Has at least one laboratory person demonstrated appropriate working knowledge of each of the documents under Section I, above, with others demonstrating a working knowledge of documents used for specific tests, as appropriate?
Y	N	N/A	87. Are laboratory personnel able to obtain recent and appropriate interpretations of the FCC Rules?
Y	N	N/A	88. Does the test person know how to perform radiated emission exploratory measurements?
Y	N	N/A	89. Does the test person know the difference between exploratory and final radiated emission measurements?
Y	N	N/A	90. Does the test person understand how exploratory test results relate to final radiated emission measurements?
Y	N	N/A	91. Does the test person know how to determine if the emission is from the EUT or an ambient?

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Y	N	N/A	92. Does the test person know how to handle an emission that is close to or coincident with an ambient?
Y	N	N/A	93. Does the test person know how to identify and avoid potential overload conditions of the test instrumentation?
Y	N	N/A	94. Does the test person know when CISPR 22 can be used to show compliance with Part 15 and the conditions of its use?
Y	N	N/A	95. For measurement of ISM equipment, is the test person knowledgeable of the intricacies and special procedures in MP-5 and the rules in 47 CFR Part 18?
Y	N	N/A	96. Are coax cables, antennas, receiver or spectrum analyzer checked at the start of each test for proper operation?
Y	N	N/A	97. Can the test person explain the FCC requirements for testing a product in 47 CFR 15.31-15.37? Is he/she knowledgeable of the FCC testing conditions for different types of products?
Y	N	N/A	98. Can the test person describe at least three different types of examples of IT equipment to be tested? Can he/she demonstrate or explain how the equipment would be setup and tested? Can he/she adequately discuss the assumptions that went into the test setup?
Y	N	N/A	99. For a laboratory providing in-situ testing service, can the test person satisfactorily describe how measurements would be performed at the user's location?
Y	N	N/A	100. Have someone at each type of site, at the lab, replicate at least three frequency points on the horizontal site attenuation and at least three frequency points on the vertical site attenuation. Is the test performed correctly and is the site attenuation data at these frequencies consistent with the previously recorded data? (Suggestion: Pick frequencies from previous data that have both low and high deviations from the NSA.)

