SPECIFIC OPERATIONS CHECKLIST

FCC EMC MEASUREMENTS

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 to be used during the assessment phase of the accreditation process as a guide to evaluate the capability of the prospective 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 judgement 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 deficiency.** Record the item number and write the deficiency explanations and/or comments in this list on the comment sheet(s). Place the letter "**C**" beside each item on which you are commenting for other reasons. If the item is "Not Applicable," place the letters "NA" beside the item.

I. DOCUMENTATION *(The following documents are required at a minimum and should be expanded as necessary for the scope of the accreditation.)*

Y N 1. ANSI C63.2-1996: American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 kHz to 40 GHz—Specifications.

Y N 2. ANSI C63.4-1992: 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 3. ANSI C63.7-1992: American National Standard Guide for construction of Open Area Test Sites for Performing Radiated Emission Measurements.

Y N 4. CISPR Publication 16-1:1993 and amendment 1:1995, CISPR Specifications for Radio Interference Measuring Apparatus and Measurement Methods.

Y N 5. CISPR Publication 22:1992 - 2nd Edition or 1997 - 3rd Edition, as appropriate: Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.

Y N 6. 47 CFR Parts 2, 15 and 18, as appropriate (FCC Rules and Regulations)

Y N 7. 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 8. Are 50 Ω /50 μH LISNs used per ANSI C63.4-1992, Section 4.1.2?

Y N 9. Are 50 Ω /5 μH LISNs used per MP-5 for ISM equipment, when appropriate?

Y N 10. Do the LISNs have an indication of characterization status per NIST Handbook 150?

Y N 11. Have the impedance and insertion losses of the LISNs been characterized within the last year per ANSI C63.4, Appendix F, and are the test results within the specified tolerance?

Y N 12. Are the LISN impedance measurements made at the point where the 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 13. Are all unused EUT ports appropriately terminated?

Y N 14. Ask for a spot check of the LISNs' impedance and insertion loss measurements. Are the tests made in accordance with ANSI C63.4-1992, Section 4.4.2 and are the test results within tolerance?

Y N 15. Are the LISNs installed and used in accordance with ANSI C63.4-1992, Sections 5, 6 & 7 and MP-5, as appropriate?

Y N 16. For each measuring instrument that is automated, is the firmware/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.)

B. Antennas

Y N 17. Does each of the antennas used for compliance measurements comply with the criteria in ANSI C63.4-1992, Section 4.1.5 and MP-5, as appropriate? (Note: Rod and log-spiral antennas are not permitted for FCC-type measurements.)

Y N 18. Are the antennas calibrated and labeled in accordance with recommended practices contained in ANSI C63.4-1992, Section 4.4.1?

C. Measurement Receiver or Spectrum Analyzer

Y N 19. Does the measuring receiver(s) or spectrum analyzer(s) used for final EMC measurements meet the requirements in ANSI C63.4-1992, Section 4.1 or CISPR 16-1-1993, Clause 2?

Y N 20. Has the receiver(s) or spectrum analyzer(s) been calibrated in accordance with ANSI C63.4-1992, Section 4.4? Is there documentation showing all calibration per NIST Handbook 150?

Y N 21. For each measuring instrument that is automated, is the firmware/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.)

Y N 22. Have the RF Cables, RF Switches, terminators, attenuators and pre-amps been characterized in accordance with ANSI C63.4-1992, Section 4.4.4?

III. TEST FACILITIES

A. Facilities for Measuring Powerline Conducted Emissions

Y N 23. Is there sufficient power available to perform the required measurements and is the powerline conducted ambient at least 6 dB below the limit per ANSI C63.4-1992, Section 5.1?

Y N 24. For each type and size of EUT to be measured, does each line-conducted facility comply with the conditions and requirements of ANSI C63.4-1992, Section 5.2 and MP-5, as appropriate? Be sure to ask about the need and use of a LISN(s) and isolation transformers, if needed.

Y N 25. For each type of EUT to be measured at this facility, can accurate and repeatable line-conducted measurements be performed in accordance with ANSI C63.4-1992, Sections 6 & 7?

Y N 26. Is the vertical conducting plane, if used, installed and used in accordance with ANSI C63.4-1992, Section 5.2.2?

Y N 27. Ask for a demonstration or description of how large EUTs are handled. Are the guidelines in ANSI C63.4-1992, Sections 6 & 7 and MP-5 followed for large EUTs, including in-situ, if appropriate? (Ask the test person to explain what special measurements and conditions are required when the power requirement is greater than the rate capacity of the LISN.)

B. Facilities for Measuring Radiated Emissions in the Frequency Range of 30 MHz to 1 GHz

Y N 28. For each type and size of EUT to be measured, does each radiated emission test facility comply with the conditions and requirements of ANSI C63.4-1992, Section 5.4?

Y N 29. Are LISNs and isolation transformers, if used, installed in accordance with ANSI C63.4-1992, Section 5.2.3?

Y N 30. Is the conducting ground plane in accordance with ANSI C63.4-1992, Section 5.4.3?

Y N 31. Is the turntable installed and grounded in accordance with ANSI C63.4-1992, Section 5.4.4?

Y N 32. Is the antenna positioner installed in accordance with ANSI C63.4-1992, Section 5.4.5?

Y N 33. Are the guidelines in ANSI C63.7-1992 followed?

Y N 34. Does the radiated emission test site(s) meet the validation requirements of ANSI C63.4-1992, Section 5.4.6? The site validation data must meet the ± 4 dB criteria. For alternative test sites, see Section 5.4.6.5.

Y N 35. For each type of EUT to be measured at this facility, can accurate and repeatable radiated measurements be performed in accordance with ANSI C63.4-1992, Sections 6 & 8 for each radiated emission test site?

Y N 36. Ask for a demonstration or description of how large EUTs are handled, if appropriate. Are the guidelines in ANSI C63.4-1992, Sections 6 & 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.)

IV. EMISSION TESTS

A. General Operating Conditions and Configurations of the EUT *(Require a demonstration and/or description of the testing and setup for all types of equipment to be tested at the facility.)*

Y N 37. 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 38. Do the operating conditions and setup for each type follow the general guidelines and procedures in ANSI C63.4-1992, Section 6, and 47 CFR 15.31-15.32?

Y N 39. Is the EUT configured and arranged with appropriate accessories per ANSI C63.4-1992, Sections 6.1-6.2, and 47 CFR 15.31-15.35?

Y N 40. 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 C63.4-1992, Sections 6.1-6.2, and 47 CFR 15.31?

B. Powerline Conducted Emission Tests *(Require a demonstration and/or description of the testing and setup for all types of equipment to be tested at the facility.)*

Y N 41. Are the powerline conducted emission tests performed in accordance with the applicable parts of ANSI C63.4-1992, Section 7, and 47 CFR 15.31-15.35 & 15.107?

Y N 42. Does the procedure for using a voltage probe, if required, follow ANSI C63.4-1992, Section 4.1.3?

Y N 43. If a voltage probe is required, can the test person provide an adequate explanation of when and how it is used?

Y N 44. 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 C63.4-1992, Sections 6 & 7?

Y N 45. Is the conducted emission test setup in accordance with Figure 9(a) for a table-top EUT and Figure 9(b) for a floor-standing EUT of ANSI C63.4-1992, Sections 6 & 7?

Y N 46. 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 C63.4-1992 for acceptable criteria.)

Y N 47. Is the EUT connected to one LISN and all the peripherals connected to at least one other LISN?

Y N 48. Based on preliminary tests, does this conducted emission compliance test represent the maximized cable configuration and worse case mode of EUT operation yielding the highest levels?

Y N 49. 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 50. Does the test engineer know how and when to apply the relaxation in 47 CFR 15.107(d) for an EUT exhibiting broadband emissions? Ask for a demonstration.

Y N 51. 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 15.107(e) and the referenced standard ANSI C63.4-1992?

Y N 52. For a personal computer or peripheral, was the step-by-step guidance in ANSI C63.4-1992, Appendix E adequately followed?

Y N 53. For an unintentional radiator other than ITE (e.g., receiver or TV interface device), was the step-by-step guidance in ANSI C63.4-1992, Appendix H adequately followed?

Y N 54. For an intentional radiator (e.g., remote control and security transmitter), was the step-by-step guidance in ANSI C63.4-1992, Appendix I adequately followed?

C. Radiated Emission Tests *(Request a demonstration and/or description of the testing and setup for all types of equipment to be tested at the facility.)*

Y N 55. Are the radiated emission tests performed in accordance with ANSI C63.4-1992 Sections 8, 11, etc. and the FCC Rules (e.g., 47 CFR 15.31-15.35)?

Y N 56. Do the procedures for handling ambient emissions, if appropriate, follow the guidelines in ANSI C63.4-1992, Section 5.1.2 and good engineering practices, when appropriate?

Y N 57. Are pre-scan (when appropriate) and final radiated measurements made in accordance with the guidance in ANSI C63.4-1992, Sections 8.3, 11 and Appendix D?

Y N 58. Is the radiated emission test setup in accordance with ANSI C63.4-1992 Figure 9(c) for a table-top EUT and Figure 9(d) or Figure 10 for a floor-standing EUT?

Y N 59. For IT equipment, is the EUT setup operated and tested in accordance with the procedures in ANSI C63.4-1992, Section 11? (Note: Personal computers should be tested in accordance with ANSI C63.4-1992, Appendix E.)

Y N 60. Are EUTs, other than ITE, tested in accordance with the requirements in 47 CFR 15.31 and the procedures in ANSI C63.4-1992, Section 12 & Appendix H and MP-5 (as appropriate)?

Y N 61. Are EUTs that are intentional radiators tested in accordance with the requirements in 47 CFR 15.31 and the procedures in ANSI C63.4-1992, Section 13 & Appendix I?

Y N 62. Based on preliminary 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 63. 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 64. 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 65. For a personal computer or peripheral, was the step-by-step guidance in ANSI C63.4-1992, Appendix E adequately followed?

Y N 66. For an unintentional radiator other than ITE (e.g., receiver or TV interface device), was the step-by-step guidance in ANSI C63.4-1992, Appendix H adequately followed?

Y N 67. For an intentional radiator (e.g., remote control and security transmitter), was the step-by-step guidance in ANSI C63.4-1992, Appendix I adequately followed?

Y N 68. Ask for a demonstration of radiated emission and other required measurements for each of the different types of products within the scope of accreditation. Do the testing personnel during the demonstrations use the correct application notes and precautions; e.g., for overload and ambient conditions? (Such demonstrations may be combined with other requested demos.)

V. TEST REPORTS *(Request to review several sample test reports for various types of products. This can be accomplished during the pre-audit.)*

Y N 69. Does each of the test reports contain all the information requested in ANSI C63.4-1992, Section 10, and Part 2 and other applicable Parts of the FCC Rules?

Y N 70. Is the standard to which the EUT was tested clearly referenced in the test report, per ANSI C63.4-1992, Section 10.1.1? If an alternative procedure was used, are the deviations clearly defined and justified per ANSI C63.4-1992, Section 10.1.9?

Y N 71. Is the rationale for selecting and arranging the EUT clearly stated and are the components of the EUT system clearly identified per ANSI C63.4-1992, Section 10.1.2?

Y N 72. 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 C63.4-1992, Section 10.1.12?

Y N 73. Does the measurement report include a sample calculation with all conversion and correction factors used?

Y N 74. Is the test report signed in accordance with ANSI C63.4-1992, Section 10.1.1?

Y N 75. Is the test report signed in accordance with the requirements of NIST Handbook 150?

VI. PERSONNEL COMPETENCY *(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.)*

A. Questions to Ask: *(Check Y (yes) or N (no) based on your belief that the laboratory personnel have provided the proper responses to the specific question.)*

Y N 76. Is there sufficient training and supervision in place to ensure technical competency of the personnel performing the measurements?

Y N 77. Has the appropriate technical competency been determined for all test personnel and persons supervising the testing?

Y N 78. 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 79. Are laboratory personnel able to obtain recent and appropriate interpretations of the FCC Rules?

Y N 80. Does the test person know how to perform radiated emission pre-scan measurements?

Y N 81. Does the test person know the difference between pre-scan and final radiated emission measurements?

Y N 82. Does the test person understand how pre-scan test results relate to final radiated emission measurements?

Y N 83. Does the test person know how to determine if the emission is from the EUT or an ambient?

Y N 84. Does the test person know how to handle an emission that is close to or coincident with an ambient?

Y N 85. Does the test person know how to identify and avoid potential overload conditions of the test instrumentation?

Y N 86. Does the test person know when CISPR 22 can be used to show compliance with 47 CFR Part 15 and the conditions of its use?

Y N 87. Do the test personnel know the requirements for measurement of broadband conducted emissions and how are they handled?

Y N 88. 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 89. Are coax cables, antennas, receiver or spectrum analyzer checked at the start of each test for proper operation?

Y N 90. 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 91. 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 set up and tested? Can he/she adequately discuss the assumptions that went into the test setup?

Y N 92. For a laboratory providing on-site testing service, can the test person satisfactorily describe how measurements would be performed at the user's location?

Y N 93. Can the test person demonstrate the correct procedures, precautions and FCC requirements for testing each of the devices under the scope of accreditation?

Y N 94. For a laboratory that plans to act as an agent for a manufacturer, are there procedures in place to ensure that the equipment is labeled in accordance with the FCC Rules and complies with all other requirements in the FCC Rules?

Y N 95. Does the test person correctly perform pre-scan and final conducted and radiated emission tests? Be sure to observe the setup and arrangement for the complete test.

Y N 96. Have someone at each type of site at the laboratory replicate at least three frequency points on the horizontal site attenuation and at least three frequency points on the vertical site attenuation. Is 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 normalized site attenuation.

SPECIFIC OPERATIONS CHECKLIST FOR FCC PART 15 DEVICES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "N." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*