NSTISSAM TEMPEST/1-93
30 August 1993

NSTISS
NATIONAL
SECURITY
TELECOMMUNICATIONS
AND
INFORMATION
SYSTEMS
SECURITY

COMPROMISING EMANATIONS
FIELD TEST REQUIREMENTS
ELECTROMAGNETICS (U)

~~CLASSIFIED BY DIRNSA (NATIONAL MANAGER, NSTISS)~~
~~DECLASSIFY ON: ORIGINATING AGENCY'S~~
~~DETERMINATION REQUIRED~~

NSTISS
NATIONAL SECURITY TELECOMMUNICATIONS AND INFORMATION SYSTEMS SECURITY

NATIONAL MANAGER

FOREWORD

1. National Security Telecommunications and Information Systems Security Advisory Memorandum (NSTISSAM) TEMPEST 1-93, "Compromising Emanations Field Test Requirements, Electromagnetics," specifies test procedures for conducting an instrumented TEMPEST test in a field environment. NSTISSAM 1-93 is a technical manual to be used by TEMPEST test personnel in the performance of TEMPEST field tests.

2. The Advisory Memorandum supersedes NACSEM 5110, "Facility Evaluation Criteria - TEMPEST," dated July 1973. The principal purpose for this revision is to incorporate the new three-level standard, NSTISSAM TEMPEST/1-91, published in May 1991.

3. Representatives of the National Security Telecommunications and Information Systems Security Committee (NSTISSC) may obtain additional copies of this instruction from:

Executive Secretariat
National Security Telecommunications and Information Systems Security Committee
National Security Agency
Fort George G. Meade, MD 20755-6000

4. U.S. Government contractors should contact their Contracting Officer Representative regarding distribution of this document.

J. M. McCONNELL
Vice Admiral, U.S. Navy

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SECTION I - SCOPE AND APPLICATION

1.1 (U) **Scope** - This document specifies comprehensive test procedures for performing TEMPEST tests on equipment and systems in a field environment. The sponsoring organization may make additions or deletions as specific requirements warrant.

1.1.1 (U) The results of the test procedures specified herein are used to determine a facility's compliance with the National Policy on the Control of Compromising Emanations.

1.1.2 (U) Throughout this document, various options are presented that the sponsoring organization may exercise. Unexercised options shall not apply.

1.2 (U) **Application** - This document is applicable to electrical, electronic, electromechanical equipment and systems that generate, process, or transfer national security information internally or at external interfaces in either digital or analog form.

(U//FOUO)

1.2.1 (U) [redacted]

1.2.2 (C) [redacted]

a. (C) [redacted]

b. (C) [redacted]

c. (C) [redacted]

1.2.3 (U) This document is intended for use by U.S. Government departments and agencies, and their authorized contractors.

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SECTION II - REFERENCE DOCUMENTS

2.1 (U) **Documents** - The following listed documents supplement the information included in this document.

2.1.1 (U) Specifications - Military

(U) MIL-C-45662, Calibration System Requirements (UNCLASSIFIED)

2.1.2 (U) General -

NACSIM No. 5000 - TEMPEST Fundamentals (title UNCLASSIFIED; document CONFIDENTIAL).

NSTISSAM TEMPEST/1-92 - Compromising Emanations Laboratory Test Requirements, Electromagnetic (title UNCLASSIFIED; document CONFIDENTIAL).

NSTISSAM TEMPEST/2-93 - Rational for Laboratory and Field TEMPEST Test Requirements, Electromagnetic (title UNCLASSIFIED; document SECRET).

NSTISSAM TEMPEST/2-91 - Compromising Emanations Analysis Handbook (title UNCLASSIFIED; document CONFIDENTIAL).

NSTISSAM TEMPEST/2-92 - Procedures for TEMPEST Zoning (title UNCLASSIFIED; document FOR OFFICIAL USE ONLY).

NACSEM No. 5002 - Technical Rational: Basis for Electromagnetic Compromising Emanations Limits (title UNCLASSIFIED; document CONFIDENTIAL)

NACSEM No. 5112 - NONSTOP Evaluation Techniques (title UNCLASSIFIED; document SECRET).

NACSIM No. 5203 - TEMPEST Guidelines for Facility Design and RED/BLACK Installation (title UNCLASSIFIED; document CONFIDENTIAL).

NACSEM No. 5204 - Shielded Enclosures (title UNCLASSIFIED; document CONFIDENTIAL).

NTISSI No. 4002 - Classification Guidelines for COMSEC Information (title UNCLASSIFIED; document SECRET).

NTISSP 300 - National Policy on Control of Compromising Emanations (title UNCLASSIFIED; document CONFIDENTIAL).

NTISSI 7000 - TEMPEST Countermeasures for Facilities (title UNCLASSIFIED; document SECRET).

NCSC 3 - TEMPEST Glossary (title Unclassified; document SECRET).

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2.2 (U) **Comments and Recommendations** - Revisions to this document will be made as appropriate. Comments, corrections, and recommendations on its contents are encouraged. Government organizations should submit their comments to their appropriate department or agency authority, who in turn may submit their comments to:

Director, National Security Agency
ATTN: [redacted]
Fort George G. Meade, Maryland 20755-6000

Contractors should submit their comments regarding this standard to their sponsoring organization.

A comment sheet is provided in the back of this document for this purpose. When submitting comments it is suggested that this form be reproduced or that a similar format be used.

SECTION III - GLOSSARY AND ABBREVIATIONS

3.1 (U) **Glossary** - The definitions of terms given in this glossary are specifically for use in this document. In case of conflict among definitions herein and those given in referenced documents, the definitions herein govern. Many TEMPEST related terms used in this document are not included in this glossary, but can be found in NACSIM No. 5000 Appendix A and NCSC 3, TEMPEST Glossary.

3.1.1 (U) Accessibility Space - The area within which the user controls access (with or without the required clearance), maintains an awareness of all persons entering the area, and conducts unannounced inspections of all spaces within the area. It also delineates the closest point of potential vehicular intercept.

3.1.2 (U) Bit Rate - A general term used to express the data transfer rate of binary digital signals. For purposes of this document, it is defined as being numerically equivalent to the reciprocal of the duration in seconds of the shortest unit interval (the interval between the beginning of adjacent bits). The units are bits per second (b/s) for serial transfer, parallel information units per second (PIU) for parallel transfer. For telegraphic signal codes, the term "baud" is synonymous with "bits per second".

3.1.3 (U) Byte - A group of adjacent binary digits associated with one character or unit of information operated upon as a unit and usually shorter than a word; usually connotes a group of eight bits where the digits are operated upon simultaneously as a unit.

3.1.4 (U) Controlled Space - The three-dimensional space surrounding equipment that processes national security information within which unauthorized personnel (1) are denied unrestricted access, and (2) either escorted by authorized personnel or under continual physical or electronic surveillance.

3.1.5 (U) Conversion Factor - A general term that refers to adjustments which must be made to the results of physical measurement to express the results in desired units. A conversion factor always involves a change of units. Some specific conversion factors are: antenna factor (dBμV to dBμV/m or dBμV to dBμA/m); and current probe factor (dBμV to dBμA), and bandwidth conversion factor (dBμV/KHz to dBμV/MHz).

3.1.6 (U) Correction Factor - A general term that refers to adjustments which must be made to the results of a physical measurement to express the results in an accurate relation to a desired reference. A correction factor accounts for gains or losses in the measuring system and does not involve a change of units. Some specific correction factors are: cable losses, mismatch losses, and attenuator losses.

3.1.7 (U) CROSSTALK - RED baseband signal coupling between equipment or conductors of a system processing RED analog signals and any other equipment or conductors that may serve as unintentional signal paths.

3.1.8 (U) Demodulator - A device that operates on a modulated carrier wave in such a way that the wave with which the carrier was originally modulated is recovered.

3.1.9 (U) Detection System - The equipment used in performing a TEMPEST test which includes transducers, detectors, and display devices. Recording devices are also included if they are the only means of displaying the emanations during the test.

3.1.10 (U) Detection System Sensitivity - The input signal level (in dBµV rms, dBµV/m rms, or dBµA/m rms) which produces a zero dB peak signal to rms noise voltage ratio at the detection system output.

3.1.11 (U) Equipment Radiation TEMPEST Zone - A zone established as a result of determined or known equipment radiation TEMPEST characteristics. The zone includes all space within which a successful intercept of compromising emanations is considered possible.

3.1.12 (U) Fingerprint Signal - A unique emanation caused by the processing or transfer of an information unit (e.g., character, byte, etc.) by the EUT. (Also called signature.)

3.1.13 (U) Fortuitous Conduction - Emanations in the form of signals propagated along any unintended conductor.

3.1.14 (U) Ground Plane - A metal sheet, plate, or grid used for circuit returns and a common reference point for electrical signal potentials.

3.1.15 (U) Impulse Bandwidth - The effective bandwidth of a device or detection system, which when multiplied by the impulse single-sided spectral density (volts/Hz) and mid-band gain of the device or detection system, yields the peak magnitude (volts) of the time domain response of the device or detection system to an impulse.

3.1.16 (U) Impulse Strength - The amplitude-density spectrum of an impulse expressed in amplitude per unit bandwidth, or microvolts per MHz (equivalent rms sine wave). Impulse strength is .707 times the magnitude of the single-sided voltage density spectrum, which is also specified in microvolts per MHz (peak).

3.1.17 (U) Inspectable Space - The three-dimensional space surrounding equipment that process classified and/or sensitive information within which TEMPEST exploitation is not considered practical or where legal authority to identify and/or remove a potential TEMPEST exploitation exists.

3.1.18 (U) Literal - Refers to type of signal transfers that are characterized by single unique occurrences such as those produced by a print hammer fire or a keyboard contact, where character codes are not used.

3.1.19 (U) Microvolts Per Megahertz - A unit of measurement for impulsive signals. The impulsive signal level in microvolts per megahertz (µV/MHz) rms is equal to the rms sine wave microvolts (unmodulated, applied to the input of the measuring circuit at its center frequency and resulting in a peak response in the circuit equal to that produced by the signal being measured) divided by the impulse bandwidth, in megahertz, of the measuring circuit. A more commonly used unit of impulsive measurements is decibels above one microvolt per megahertz (dBµV/MHz (equivalent rms sine wave)).

3.1.20 (U) Overall Detection System Bandwidth - The 6 dB bandwidth of the detection system. The overall bandwidth includes the combined influence of all the bandwidth determining circuits between the detection system input and output used.

3.1.21 (U) Plain Text - Intelligible text or signals which have meaning and which can be acted upon without the application of any decryption.

3.1.22 (U) Primary and Secondary RED Lines - Primary RED lines are those which intentionally carry RED signals. Secondary RED lines are non-RED signal lines (e.g., clock, control) which originate or terminate in the same electrical interfaces as or share the same cable with any RED signal line. For a more general definition of primary and secondary RED lines, see NACSIM 5000.

3.1.23 (U) RED Analog Signaling Rate (Rd) - The signaling rate for RED analog signals is equal to the required bandwidth of the signal conveying the national security information and is expressed in Hertz.

3.1.24 (U) RED Digital Signaling Rate (Rd or Rt) - In this document, two RED digital signaling rates are used; RED pulse width signaling rate (Rd), and RED transition time signaling rate (Rt).

3.1.24.1 (U) RED Pulse Width Signaling Rate (Rd) - The signaling rate of RED digital signals, which for serial and parallel format, is equal to the reciprocal of the unit bit width and is expressed in bits per second and parallel information units per second, respectively. For NRZ signals, Rd is equal to the bit rate. For RZ signals, Rd is greater than the bit rate.

3.1.24.2 (U) RED Transition Time Signaling Rate (Rt) - Rt is defined as one-tenth of the reciprocal of the transition time of the RED digital signal; i.e., $Rt = 0.1/Tt$ expressed in bits per second and parallel information units per second for serial and parallel formats, respectively.

3.1.25 (U) RED Signal Source - Any circuit or circuit element, through which a RED signal is fed, which causes a change in signal current with respect to time (di/dt).

3.1.26 (U) RED Signal Type - The characterization of a RED signal by the following features: code, format, parity, whether serial or parallel, whether repetitive or nonrepetitive, the number of bytes simultaneously processed, and whether baseband or a form of modulation or multiplexing.

3.1.27 (U) Shape Factor - The ratio of the 60 dB bandwidth to the 6 dB band-width of the gain vs frequency response of a tunable detection system.

3.1.28 (U) TEMPEST Limited Ambient Emanations - Ambient emanations at each test frequency below which compromising emanations, if present, could not be detected without use of signal processing technique. Such ambient emanations are often below the peak ambient signals found at the test frequency.

3.1.29 (U) Walkaway Test - A test performed by moving the antenna and, or necessary, the detection system away from the system under test to determine the maximum distance at which compromising emanations are detectable.

tone from one frequency to another either in a discrete step or by slewing between the two frequency extremes.

3.1.31 (U) Word - A group of bytes, stored or transferred together as a unit.

3.2 (U) Abbreviations

(U) A	- Ampere
(U) a.c.	- Alternating Current
(U) A/D	- Analog to Digital
(U) AGC	- Automatic Gain Control
(U) A.I.	- Articulation Index
(U) AM	- Amplitude Modulation or Amplitude Modulate (Signal)
(U) ANA	- Analog
(U) AS	- Accessibility Space
(U) ASYNC	- Asynchronous
(U) AUD	- Audio
(U) BD	- Bit Density
(U) BFO	- Beat Frequency Oscillator
(U) BLC	- BLACK Line Conduction
(U) b/s	- Bits Per Second
(U) BW	- Bandwidth
(U) CE	- Compromising Emanations
(U) CLTX	- Clear Text
(U) cm	- Centimeter
(U) CORR E	- Correlated Emanations
(U) CRO	- Cathode-Ray Oscilloscope
(U) CRT	- Cathode-Ray Tube
(U) CS	- Controlled Space
(U) cw	- Continuous Wave
(U) D/A	- Digital to Analog
(U) dB	- Decibel
(U) DBD	- Digraphic Bit Density
(U) d.c.	- Direct Current
(U) DFM	- Double Frequency Modulation
(U) DRE	- Data Related Emanations
(U) DSN	- Detection System Noise
(U) DSS	- Detection System Sensitivity
(U) EMI	- Electromagnetic Interference
(U) EMR	- Electromagnetic Radiation
(U) ENVA	- Environmental Ambient
(U) ER	- Electric Radiation
(U) ERTZ	- Equipment Radiation TEMPEST Zone
(U) EUT	- Equipment Under Test
(U) EUTA	- Equipment Under Test Ambient
(U) FB	- Full Baud
(U) fc	- Center Frequency (synonymous with tuned frequency when referring to tunable devices)
(U) FC	- Fortuitous Conduction
(U) FM	- Frequency Modulation or Frequency Modulated (Signal)
(U) FP	- Fingerprint
(U) G	- Giga-Prefix for 10^9 Multiplier

(U)	Hz	- Hertz
(U)	IBW	- Impulse Bandwidth
(U)	IF	- Intermediate Frequency
(U)	IG	- Impulse Generator
(U)	IR	- Information Ratio
(U)	IS	- Inspectable Space
(U)	k	- Kilo-Prefix for 10^3 Multiplier
(U)	LC	- Line Conduction
(U)	LIT	- Literal
(U)	M	- Mega-Prefix for 10^6 Multiplier
(U)	m	- Meter (linear measurement) or Milli-Prefix for 10^{-3} multiplier
(U)	μ	- Micro-Prefix for 10^{-6} Multiplier
(U)	MDS	- Minimum Discernible Signal
(U)	MFM	- Modified Frequency Modulation
(U)	MR	- Magnetic Radiation
(U)	n	- Nano-Prefix for 10^{-9} Multiplier
(U)	NRZ	- Nonreturn-to-Zero
(U)	NRZI	- Nonreturn-to-Zero Inverted
(U)	NTIC	- National TEMPEST Information Center
(U)	p	- Pico-Prefix for 10^{-12} Multiplier
(U)	PAR	- Parallel
(U)	PCM	- Pulse Code Modulation
(U)	PE	- Phase Encoded
(U)	PIU	- Parallel Information Unit
(C)	[redacted]	
(U)	PLC	- Power Line Conduction
(C)	[redacted]	
(U)	PLISN	- Power Line Impedance Stabilization Network
(C)	[redacted]	
(C)		
(U)	Rd	- RED Analog Signaling Rate or RED Pulse Width Signaling Rate
(U)	RF	- Radio Frequency
(U)	RLC	- RED Line Conduction
(U)	rms	- Root-Mean-Square
(U)	Rt	- RED Transition Time Signaling Rate
(U)	RZ	- Return-to-Zero
(U)	SER	- Serial
(U)	S/N	- Signal/Noise
(U)	SIG	- Signature
(U)	SLC	- Signal Line Conduction
(U)	SNR	- Signal-to-Noise Ratio
(U)	SUT	- System Under Test
(U)	SYNC	- Synchronous
(U)	TBD	- Transition Bit Density
(U)	TIM	- Timing
(U)	TLC	- Telephone Line Conduction
(U)	Tt	- Transition Time
(U)	T01	- Transition 0 to 1
(U)	T10	- Transition 1 to 0
(U)	V	- Volt
(U)	VID	- Video

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SECTION IV - GENERAL APPROACH

4.1 (U) **Introduction** - This section presents general information on the test philosophy and test procedure used in TEMPEST field testing. Specific procedures and test requirements including shielded enclosure and CROSSTALK testing are presented in Sections V through X and in the Appendices.

4.2 (U) **General Test Philosophy**

4.2.1 (U) Communications and information systems equipment generate unintended electromagnetic emanations, which can be radiated or conducted beyond a facility's inspectable space. The TEMPEST field test determines if emanations are present which, when analyzed, compromise the data processed and determines to what distances these emanations can be detected.

4.2.2 (U) The possible compromising emanations (CE) are initially predicted by investigating the equipment characteristics with respect to operation, RED data flow, RED pulse width signaling rate (Rd), RED transition time signaling rate (Rt), data format, type transfers, etc. Such information enables the TEMPEST personnel to determine:

a. (U) The possible sources of CE to ensure that all signals of interest are investigated thoroughly.

b. (U) The type of CE expected so that appropriate test messages can be devised.

c. (U) The appropriate test frequency range and overall detection system bandwidth as derived from the tables in Appendix B.

d. (U) The synchronous points that can be used to facilitate isolating the CE from other signals.

4.3 (U) **General Test Procedure**

4.3.1 (U) During TEMPEST testing, the equipment under test (EUT) shall be exercised in all of its normal operating modes. All circuits that are active during a given mode of operation shall be in operation when that mode is tested. Normal operating modes may be modified to facilitate efficient testing of time shared, random access or other similar circuits. Modification is intended to force greater than normal circuit activity to reduce the time required for testing. Controls shall be adjusted for optimum design performance as required by the EUT specification, interface lines shall be terminated in their normal load impedances (may be simulated only if the actual termination device is not available for the tests) unless otherwise specified, and normal interface signal levels and waveforms shall be used. The EUT signaling rates shall be used to determine test category and instrumentation requirements. Refer to Section VIII for details on EUT operation requirements.

4.3.2 (U) The test procedures that are normally used for most TEMPEST field tests are provided in the subparagraphs below. They summarize the general practice followed in testing the equipment. Searches for emanations correlative to RED digital and RED analog signals shall be made with tunable and, at the option of the sponsoring organization, nontunable detection systems. Refer to Chapter 6 for instrumentation requirements. All tests shall be performed in a test environment wherein the test equipment is configured for the lowest ambient as discussed in Section VII. Sections IX and X provide the emanations search and emanations measurement requirements, respectively.

4.3.2.1 (C) [redacted]

4.3.2.2 (C) [redacted]

4.4 (U) **Summary of Options** - The following list is a summary of the various options that may be exercised by the sponsoring organization to modify the requirements stated in this document. Only those options exercised shall apply; otherwise, the requirements shall remain as stated herein. The options are:

a. If preparation of a TEMPEST test plan is required.

b. If other than three years, the length of time detection system certification approval is valid (see paragraph 5.4).

c. If footnote 2 on Table B-4 shall apply, this reduces the maximum test frequencies from those specified in the table.

d. If data sheets are required in test reports.

e. If 6 dB bandwidth measurements are required.

f. If impulse bandwidth measurements are required.

g. If shape factor measurements are required.

h. If measurement and documentation of test setup ambient levels is required.

i. If any test media are to be completely eliminated from testing requirements.

j. If a test matrix is required.

k. If analysis performed by the testing organization is not required.

l. If nontunable tests are required.

m. If any RED signal tests are deleted or prioritized.

n. If CROSSTALK, NONSTOP or HIJACK tests are required.

SECTION V - DOCUMENTATION REQUIREMENTS

5.1 (U) **Test Plan Requirements/Contents** - At the option of the sponsoring organization, a test plan shall be prepared that will detail the means of implementation and application of the test procedures to be performed. The test plan, when executed with the applicable TEMPEST requirements of this document, shall demonstrate and delineate whether the equipment meets or fails to meet the National Policy. The test plan shall include, but not necessarily be limited to, the following items. Refer to the TEMPEST Test Plan Outline in Appendix G for detailed requirements.

Appendix A. General Test Philosophy/Procedure

Appendix B. System I Test Plan

I. Introduction

A. System Description

B. General Test Philosophy

II. Equipment Description and Test Philosophy

A. Equipment No. I

1. General Description

2. Test Philosophy

B. Equipment No. 2

C. Test Programs and Procedures (if applicable)

1. Objective

2. Test Procedure

Annex C. System 2 Test Plan

5.2 (U) **Data Recording** - When CE are detected, they shall be measured and recorded. Refer to Section X for emanation measurement requirements.

5.2.1 (U) Data Sheets - The data sheets shall include, but not necessarily be limited to, the following items:

a. (U) Date data was taken.

b. (U) EUT type, manufacturer, model number, serial number.

c. (U) Signal of interest including type transfer and type CE.

d. (U) Test media/transducer; e.g., PLC/capacitive probe.

e. (U) For each measurement, the following data shall be recorded.

(1) (U) CE frequency range

(2) (U) Test measurement frequency

(3) (U) Overall detection system bandwidth

(4) (U) Calibrated source (signal generator, impulse generator) signal and/or noise level readings in appropriate units

(5) (U) Transducer distance from EUT

(6) (U) Maximum distance from EUT

(7) (U) Any other pertinent remarks; e.g., CE type and National Policy status

5.2.2 (U) Waveform Recordings - Waveform recordings of EUT emanations (plots, photographs and/or strip charts) should be provided. Recordings representative of CE should be provided whether detected inside or outside the inspectable space. Recordings should substantiate conclusions by the tester as to compliance or noncompliance of the EUT with the national policy or, when applicable, to provide adequate descriptions of EUT emanations to allow the government to determine compliance via signal analysis. The recordings shall be captioned and be accompanied by a brief description of what is being presented. Applicable timing, amplitude, and other relevant data (e.g., information ratio (IR) when calculated) shall be denoted. Emanations shall be clearly shown on the recordings.

5.2.3 (U) Test Data Graphs - All measured EUT emanations may be presented on graphs, together with ambient noise. Graphs shall be plotted with signal level in dB on a linear scale vs frequency on a logarithmic scale. Graphs shall be scaled horizontally and vertically to show effectively the required test frequency range and the recorded levels. Units of measurement shall be included.

5.3 (U) **Test Report** - At the completion of a TEMPEST field test, a report shall be written. The basic objective of the field test report is to state the TEMPEST posture of the equipment, system, or facility that was tested and to document compliance or noncompliance with the National Policy. Essentially, there are two types of field test reports, the message/letter report and the full technical report. These reports are applicable as follows:

5.3.1 (U) Message/Letter Report - A message/letter report provides preliminary or summary findings to the customer and other interested agencies soon after the field test is completed. This report shall include, but not necessarily be limited to, the following items:

a. (U) Background information

(1) (U) Basis for conducting tests

(2) (U) Facility and location

(3) (U) System/Equipment tested

(4) (U) Test dates

(5) (U) Test team

b. (U) National Policy status of system/equipment tested

c. (U) Inspectable space description

d. (U) List of equipment including total quantity and number tested

e. (U) Significant test results

f. (U) TEMPEST modifications

g. (U) Recommendations

h. (U) Exception request statement (if applicable)

5.3.2 (U) Technical Report - The technical report provides complete documentation of the TEMPEST field test to the customer and other interested agencies. The technical report shall include, but not necessarily be limited to, the following items. Refer to the TEMPEST Test Report Outline in Appendix H for detailed requirements.

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Abstract

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II. Facility Description

III. TEMPEST Test Plan

IV. Test Results

V. Conclusions

VI. Recommendations

Appendices

A. General Test Philosophy/Procedures (P/O Test Plan)

B. System/Equipment Description (P/O Test Plan)

C. TEMPEST Profile

5.3.2.1 (U) TEMPEST Profile - The TEMPEST Profile provides a summary of the TEMPEST field tests. The profile contains three forms. The first form contains background information with a short narrative of the significant findings. The second form lists all equipment tested in the system, the maximum distance to which CE were detected, and each unit's National Policy status. The third form provides a summary of the test data including the different tests performed and all significant test findings. See Appendix I for details in filling out the forms.

5.4 (U) **Test Instrumentation Certification Report** - The sponsoring organization may require instrumentation (i.e., detection system and signal generators), used for TEMPEST testing to be certified and approved prior to performing field TEMPEST evaluations. To obtain certification approval, the testing organization must provide descriptions and detection system sensitivity measurements of the test instrumentation and submit this data in a certification report to the sponsoring organization or approval authority. The certification approval will be valid for a period of three years from the date of approval, unless otherwise specified by the approval authority. (This does not eliminate the requirement that test instrumentation be calibrated in six month intervals.) The test instrumentation certification report shall include, but not necessarily be limited to, the following items:

a. (U) Name of organization or firm conducting the test, contracting agency, and contract number.

b. (U) Date(s) of tests.

c. (U) The entire complement of TEMPEST test instrumentation to include the nomenclature, identification number, bandwidths, frequency ranges, and manufacturer of receivers, antennas, probes, signal generators, oscilloscopes, etc.

d. (U) Sensitivities for each bandwidth to be used for both tunable and nontunable detection system test configurations if applicable. This data includes line conduction and space radiation sensitivities. The sensitivity data and bandwidths used shall be presented in graphic form that compares the measured detection system sensitivity with the appropriate Level I limits of NSTISSAM TEMPEST/1-92.

e. (U) Pertinent control settings of the test devices and instruments when the sensitivities were measured.

f. (U) All conversion and correction factors used for the applicable test frequency ranges.

g. (U) Block diagrams of the detection systems and calibration signal sources used during the tests.

h. (U) When applicable, an explanation and justification of noncompliance with sensitivity, bandwidth, and frequency requirements. Also, specify the steps that were taken in an effort to comply with these requirements. The justification of non-compliance may be based on the existence of ambient noise levels in the field test environment.

SECTION VI - INSTRUMENTATION REQUIREMENTS

6.1 (U) **Introduction** - The TEMPEST test instrumentation consists of detection systems and calibrated signal substitution sources that shall meet the performance requirements and operating characteristics specified herein. Measurements of sensitivity and bandwidth shall be performed as specified.

6.2 (U) **Detection Systems**: General Requirements - There are two basic types of detection systems; tunable and nontunable. The tunable detection system is required. At the option of the sponsoring organization, the nontunable detection system may also be required. All systems shall have a 50-ohm input impedance with the exception of conducted signal probes and electric radiation antenna interface amplifiers, which may be high impedance. Systems shall be selected that meet the frequency range and bandwidths required by the EUT internal RED signaling rate(s). The testing organization shall consider and address system selectivity, dynamic range, and directivity when selecting a selection system. Systems selected shall meet the appropriate sensitivity requirements of NSTISSAM TEMPEST/1-92. Pulse-stretching circuits may be used on the output of any tunable detection system provided the following requirements are met:

* Charge time constant $\leq$ 1/BW
* Discharge time constant $\leq$ 10/BW
* Signal level as observed on the oscilloscope is not reduced by more than 20%.

where BW is the predetection bandwidth of the detection system. Pulse-stretching circuits shall not be used when measuring the sensitivity or band-width of the detection systems even if the circuit is used during TEMPEST testing.

6.3 (U) **Signal Measurement Standards** - The acceptable calibration standards, for the purpose of this document, are impulse generators and sine wave generators.

6.3.1 (U) Impulse Generators - Impulse generators (IG's) shall conform to the following requirements:

a. (U) Calibrated in dBμV/MHz (equivalent rms sine wave) (peak minus 3 dB) to a 50-ohm resistive load.

b. (U) Flat spectrum (±1 dB) over the detection system bandwidth at all test frequencies applicable to the bandwidth.

c. (U) Amplitude accuracy (±2 dB) calibrated at a minimum of three frequencies including the maximum, minimum, and center frequencies of the range over which they are to be used. Calibration of impulse generators shall be accomplished according to procedures outlined in Appendix F.

6.3.2 (U) Sine Wave Generators - Sine wave generators shall conform to the following requirements:

a. (U) Frequency accuracy: ±2 percent.

b. (U) Harmonic and spurious outputs 30 dB or more, down from power level of the fundamental signal frequency. RF coupling that bypasses the signal generator attenuator should not induce errors in any measurements.

c. (U) Amplitude accuracy : ± 1 dB $\leq$ 1GHz
± 3 dB $>$ 1GHz.

6.4 (U) **Calibration Requirements and Operational Check** - At the beginning of each working day or at the request of the sponsoring organization, all test instrumentation shall be checked to assure proper operation. The operation and calibration of the instrumentation shall be verified at six month intervals or immediately after exposure to conditions that might affect calibration. All instrumentation (detection system, signal measurements standards, etc.) shall be calibrated in accordance with a recognized calibration procedure, e.g., MIL- STD 45662, NBS traceable, etc. If, during any of the above tests a departure from the requirements of this document is noted, the tester shall:

a. (U) Determine the cause(s) of deviations.

b. (U) Make necessary repairs and adjustments.

c. (U) Request the authority sponsoring the tests to determine the necessity for rerun of affected tests.

SECTION VII - TEST ENVIRONMENT

7.1 (U) **Introduction** - The electromagnetic environment in which TEMPEST tests are performed influences the ability to detect emanations from the EUT. Strict attention must be paid to grounding and the test setup isolation to eliminate extraneous coupling paths that could produce erroneous test results.

7.2 (U) **Test Configuration**

7.2.1 (U) EUT Configuration

7.2.1.1 (U) The configuration of the EUT shall be in a normal operating status/mode. If necessary, the equipment shall be modified to the minimum extent needed to simplify testing (e.g., forcing repetitive operation where such is not the usual mode). The equipment should be spot-tested in its unmodified condition, if possible, to determine if the modification had affected the equipment's TEMPEST profile.

7.2.1.2 (U) If installation deviations lead to the noncompliance of an equipment or system, then such deviations must be documented in the test report. Likewise, any EUT test installation details, which differ from that provided in the TEMPEST Test Plan, shall also be documented in the test report.

7.2.2 (U) Test Detection System - Prior to beginning the field test, all instrumentation shall be checked to assure proper operation. The instrumentation shall be rechecked immediately after exposure to conditions that may affect proper operation. The detection system shall be installed and configured to minimize undesired signal coupling from the EUT and to minimize sensitivity degradation resulting from high level environmental ambients. Sensitivity degradation can be minimized by using equipment case shields, shielded interconnecting wiring, isolation transformers, shielded terminations, directional antennas, and tunable filters.

7.3 (U) **Test Setup Ambient Signal Control** - The sponsoring organization may require measurement and documentation of the test setup ambient levels. Ambient noise levels shall be measured with the EUT power off or in standby mode whenever possible. Antennas shall be placed one meter in front of the EUT or, if several EUTs are to be tested, in a central location of the CS.

7.4 (U) **Equipment Testing** - A minimum number of equipment within a system and/or facility shall be tested to determine equipment type profile. Refer to Paragraph 9.8 for details.

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

SECTION VIII - EQUIPMENT UNDER TEST OPERATION

8.1 (U) **Operation** - During TEMPEST testing, the EUT shall be exercised in all of its normal operating modes. All circuits, which are active during a given mode of operation, shall be in operation when that mode is tested. Normal operating modes may be modified to facilitate efficient testing of time shared, random access or other similar circuits. Modification is intended to force greater than normal circuit activity to reduce the time required for testing. The EUT will be operated in its normal operating mode(s) or conditions, interface lines shall be terminated in their normal load impedances and grounded as operationally installed (may be simulated only if the actual termination device is not available for the tests) unless otherwise specified, and normal interface signal levels and waveforms shall be used. The EUT signaling rates shall be used to determine test category and instrumentation requirements. Proper EUT operation shall be verified before initiating tests, periodically during long, continuous testing periods, and after completion of the tests.

8.1.1 ~~(C)~~ [redacted]

8.1.2 (U) EUT Signaling Rate, Analog Signals - EUT RED analog test signals shall contain some form of amplitude or frequency variations. If a simulated RED data input is used, it shall take one, or a combination of the following forms:

U//FOUO a. ~~(U)~~ [redacted]

b. (U) [redacted]

8.1.3 (U) EUT Signaling Rate, Analog Voice Signals - If a simulated RED data input is used, it shall take one, or a combination of the following forms:

U//~~FOUO~~ a. (U) [redacted]

b. (U) [redacted]

8.2 ~~(C)~~ [redacted]

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(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

8.2.1 (C) [redacted]

8.2.2 (U) Examples of test messages/patterns for specific equipment types are listed in NSTISSAM TEMPEST/1-92 AND NSTISSAM TEMPEST/2-91.

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

SECTION IX - EMANATIONS SEARCH AND TEST TECHNIQUES

9.1 (U) **Introduction** - The object of the TEMPEST field test is to determine if compromising emanations from any device are detectable beyond the inspectable space of the facility. This chapter discusses procedures for selecting RED signals, techniques used in searching for correlated emanations, and procedures for sample testing.

9.1.1 (U) Test Requirements - There are two basic types of testing; tunable and nontunable. The tunable tests are required. The nontunable tests which are required in NSTISSAM TEMPEST/1-92 laboratory testing, will remain optional to the sponsoring organization for field testing.

9.1.2 (U) Prioritization - At times, the large number of devices handling national security information within a facility may restrict tests to the items most likely to cause TEMPEST problems. At the option of the sponsoring organization, tests for specific RED data types may be deleted or prioritized.

9.2 (U) **RED Signal Identification/Selection and General Search Requirements**

9.2.1 (C) [redacted]

9.2.2 (C) [redacted]

9.2.3 (U) RED Signal Identification/Selection

9.2.3.1 (C) [redacted]

9.2.3.2 (C) [redacted]

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

9.2.3.3 (U) Selection of RED Signaling Rates for Testing - Only those RED signaling rates utilized in the normal operation of the equipment shall be used.

~~U//FOUO~~

a. (U) [redacted]

b. (U) [redacted]

(l) (U) [redacted]

(2) (U) [redacted]

(a) ~~(C)~~ [redacted]

(b) ~~(C)~~ [redacted]

9.2.3.4 (U) RED Signal Flow Description/Diagram - A RED signal flow description and diagram shall be used to ensure all RED signal types and major potential sources are identified, to show the relationship between signals identified, and to show the RED signaling rates.

9.2.4 ~~(C)~~ [redacted]

9.2.4.1 ~~(C)~~ [redacted]

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(b)(3)-18 USC 798
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(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

9.2.4.2 (C) [redacted]

9.2.4.3 (C) [redacted]

a. [redacted]

b. [redacted]

c. [redacted]

9.2.4.4 (C) [redacted]

9.2.5 (U) Test Messages/Patterns for RED Signal Testing - Discussion of test messages/patterns are found in Paragraph 8.2.

9.2.6 (C) [redacted]

a. (C) [redacted]

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(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

b. ~~(C)~~ [redacted]

c. ~~(C)~~ [redacted]

d. ~~(C)~~ [redacted]

e. ~~(C)~~ [redacted]

9.3 (U) **Equipment Selection** - The instrumentation needed for field tests is discussed in Section VI - Instrumentation Requirements.

9.4 (U) **Correlated Emanations Search**

9.4.1 ~~(C)~~ [redacted]

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(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

9.4.2 (C) [redacted]

9.4.3 (U) Initial Testing - TEMPEST tests shall be performed to search for EUT emanations in all test media, (i.e., electromagnetic radiation and conduction tests) unless otherwise specified by the sponsoring organization. Tests are thus required for RED signal types in all media; however, tests are not necessarily required for all RED signal types selected in a given media or in all media for a given RED signal type. To determine the tests to be performed and the tests to be eliminated, a test matrix may be generated (and included in the test plan) that shall list the RED signal types (with sync/monitors) along one axis and each test media (including each line to be tested) along the other axis. Based upon the EUT theory of operation and RED signal flow diagram/description, the testing organization shall select the RED signal types to be tested for in each media. As minimum requirements, at least one RED signal type shall be tested for in each media, and at least one media shall be examined for each RED signal type. All RED signal types shall be searched for in at least one media, and all media shall be examined for at least one RED signal type. The tests, selected and eliminated by the testing organization, shall be justified in the test plan and subject to approval by the sponsoring organization.

9.4.3.1 (U) Electromagnetic Radiation: Antenna Position for Maximum Radiation - The antenna should be oriented to locate the position of maximum radiation from the EUT. For dipole, planar log periodic, horn, and similar antennas, the antennas shall also be oriented (i.e., rotated and directed) for maximum pickup. (NOTE: This in effect adjusts the antenna for optimum polarization and direction.) During formal measurements, the antenna shall be located at the position (and orientation) of maximum radiation.

9.4.3.1.1 (U) Electric Radiation (ER)

a. (C) [redacted]

(b) (1)
(b) (3)-18 USC 798
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[redacted]

b. (C) [redacted]

9.4.3.1.2 (U) Magnetic Radiation (MR)

a. (C) [redacted]

b. (C) [redacted]

9.4.3.2 (C) [redacted]

9.4.3.2.1 (U) Line Conduction, General Requirements (includes guidance for selection of lines to be tested).

a. (C) [redacted]

(1) (U) The d.c. voltages on the line may saturate a d.c.-coupled detection device and render the device ineffective.

(2) (U) Intended signals or harmonics thereof may tend to saturate the detection system, particularly the transducer and input circuits, thereby causing the system to become insensitive to emanations on the line.

(3) (U) The detection system may cause undue loading of the intended signal on the line such that the EUT is inoperable.

b. (C) [redacted]

(1) (U) [redacted]

(2) (U) [redacted]

(3) (U) [redacted]

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(b)(3)-18 USC 798
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[redacted]

9.4.3.2.2 ~~(C)~~ [redacted]

9.4.3.2.3 ~~(C)~~ [redacted]

9.4.3.2.4 ~~(C)~~ [redacted]

9.4.3.3 ~~(C)~~ [redacted]

9.4.3.4 ~~(C)~~ [redacted]

9.4.3.5 (U) Nontunable Frequency Coverage and Bandpass Requirements - Nontunable test frequency coverage and bandpass requirements are specified inAppendix B, Table B-3. The lowest test frequency for a nontunable test on a.c.

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(b)(3)-18 USC 798
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power lines is not required to be less than 150 times the power line frequency.

9.4.4 ~~(C)~~ [redacted]

9.4.4.1 ~~(C)~~ [redacted]

9.4.4.2 ~~(C)~~ [redacted]

9.4.4.2.1 ~~(C)~~ [redacted]

9.4.4.2.2 ~~(C)~~ [redacted]

U//~~FOUO~~ 9.4.4.2.3 (U) [redacted]

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9.4.5 (U) Inspectable Space Considerations - Circumstances exist at some facilities that prevent performing walkaway radiation tests at, or beyond the boundary of the inspectable space. In these cases, a theoretical required inspectable space may be calculated from CE signal levels measured at one meter from the EUT and may be used as the walkaway distance.

9.5 (U) **CROSSTALK, NONSTOP, HIJACK Tests** - These tests may be required at the option of the sponsoring organization. Procedures for performing CROSSTALK tests are found in Appendix C; and procedures for NONSTOP and HIJACK tests are described in NACSEM 5112.

9.6 (U) **Shielded Enclosure Testing** - The objective of field testing shielded enclosures is to verify that sufficient attenuation exists, so that the probability of CE being detectable outside the enclosure is reduced to a minimum. Procedures for performing shielded enclosure tests and certification requirements are found in Appendix D.

9.7 (U) **TEMPEST Zone Testing** - The objective of the TEMPEST Zone tests is to measure the attenuation characteristics of a facility processing national security information. Procedures for performing TEMPEST Zone tests are found in NSTISSAM TEMPEST/1-92.

9.8 (U) **Sample Testing**

9.8.1 ~~(C)~~ [redacted]

9.8.2 ~~(C)~~ [redacted]

9.8.3 ~~(C)~~ [redacted]

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[redacted]

9.9 (U) **Ambient Noise Consideration** - Field tests differ from laboratory tests in many ways. One way they differ is that the ambient noise is not controlled during a field test and is much higher due to intentional transmission (radio, television, etc.) and/or extraneous noise generated by other sources. This often high and uncontrolled ambient may mask or complicate the detection and analysis of signals. The following paragraphs suggest methods for minimizing ambient problems.

9.9.1 (U) Filters - Use of filters at the receiver RF input is recommended. This prevents high level environmental noise from saturating the receiver front end.

9.9.2 (U) Active Antennas - Wideband active antennas used during TEMPEST field tests are susceptible to saturation by high level ambient signals that are not present in a laboratory environment. Antenna saturation may result in reduced sensitivity and in uncalibrated signal level measurements. Active antennas should therefore be used with caution. Passive antennas are recommended for walkaway tests and for tests in high ambient environments.

9.9.3 (U) Directional Antennas - Directional antennas can be beneficial for gaining sensitivity and for excluding nearby interference by optimum positioning of the antenna. Directional antennas are recommended for walkaway tests.

9.9.4 ~~(C)~~ [redacted]

SECTION X - EMANATIONS MEASUREMENTS

10.1 (U) **Introduction** - The measurement procedures herein are applicable when measuring correlated emanations and when separate signal and noise measurements are required. Emanations measurements are required when performing emanations searches in each test media.

10.2 (C) [redacted]

10.3 (U) **Measurement Accuracy** - All measurements shall have the following accuracies:

a. (U) Frequency accuracy: +5%

b. (U) Amplitude accuracy: +2 dB ≤ 1GHz
+4 dB > 1GHz.

10.4 (U) **Emanations Measurement Methods and Procedures**

10.4.1 (C) [redacted]

10.4.2 (C) [redacted]

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(b) (3)-P.L. 86-36

[redacted]

10.4.2.1 ~~(C)~~ [redacted]

10.4.2.2 (U) Method 2 Measurements (Unmodulated Sine Wave)

a. ~~(C)~~ [redacted]

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(b)(3)-18 USC 798
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b. ~~(C)~~ [redacted]

10.4.2.3 ~~(C)~~ [redacted]

a. ~~(C)~~ [redacted]

[redacted]

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Figure 10-1 [redacted] (U)

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
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[redacted]

Figure 10-2 [redacted] (U)

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(b)(3)-P.L. 86-36

(b) (1)
(b) (3)-18 USC 798
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Figure 10-3 [redacted] (U)

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(b) (3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
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b. ~~(C)~~ [redacted]

10.4.2.4 ~~(C)~~ [redacted]

10.4.3 ~~(C)~~ [redacted]

10.4.3.1 ~~(C)~~ [redacted]

a. ~~(C)~~ [redacted]

b. ~~(C)~~ [redacted]

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Figure 10-4 (U)

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(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

[redacted]

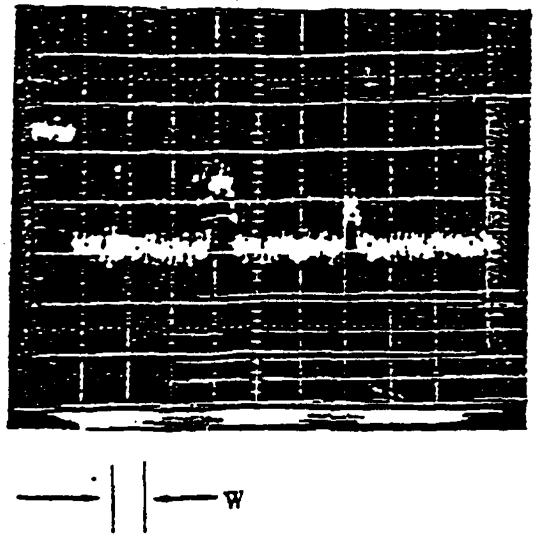
10.4.3.2 ~~(C)~~ [redacted]

10.5 (U) Signal and Noise Measurements

10.5.1 (U) General - When correlated emanations are detected, and analysis is required, both signal and noise measurements of the detected output shall also be performed and documented. The minimum number of signal and noise measurements suggested for detected CE is three per decade. If more than three per decade are found, the three worst-case (i.e., highest observed signal-to-noise ratio) emanations shall be measured. The intent is to measure characteristics related to the correlation component of the detected emanations. Figure 10-5 shows a correlated emanation in the presence of equipment ambient. An appropriate measurement window, W, shows a correlated emanation in the presence of equipment ambient. The objective is to select W, such that noise not contributing to the TEMPEST limited ambient, is ignored in proximity to the correlated emanation. All signal and noise measurements are made within W. The noise measurement made in W is the TEMPEST limited ambient. Noise measurements shall be made using either a statistical signal analyzer (or equivalent measurement system) that measures the mean and variance of a sampled video voltage, or a visual "A-Scope" presentation.

10.5.2 (U) Procedure 1: Statistical Measurements - Using this procedure, the voltage parameters of the emanations to be measured and documented are the peak signal mean (S_p) and the rms noise (N_σ). It may be necessary to document sets of signal and noise measurements corresponding to the test pattern used.

10.5.3 (U) Procedure 2: Visual Measurements - Using this procedure, the voltage parameters of the emanations to be measured are the peak signal mean (S_p) (maximum polarity for bi-polar signals) and the peak-to-peak noise (N_{pp}). All measurements shall be performed using the "A-Scope". The following paragraphs discuss examples illustrating the visual "A-Scope" measurements for serial (analog or digital) and parallel (digital) signal processing and visual measurements for serial signals using the raster presentation.



UNCLASSIFIED

Figure 10-5. Example of Noise Measurement Window, W (U)

10.5.3.1 (U) Serial Signals - Figure 10-6 illustrates ideal emanations related to a signal serially processed. The output levels (i.e., voltage or vertical divisions) to be measured are E_1, E_2, and E_3.

a. The noise measurement is equal to:

$$N = E_3 - E_1$$

Note: The intent is to measure the noise that occurs with the signal. A simpler method may be used when it is obvious that the baseline noise appears equal to the noise on the signal. In this case, it is acceptable to measure the baseline noise.

b. The signal measurement is equal to: $\overline{S}p = E_2$

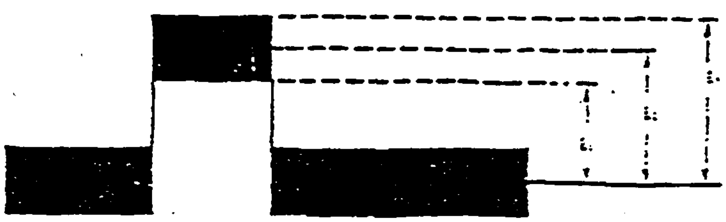


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Figure 10-6. Signal/Noise Measurements: Serial Signal Example

10.5.3.2 (U) Parallel Signals - Correlated emanations from parallel information transfer equipments are considered to be fingerprint correlated. The total zero-to-peak variation of each fingerprint waveform shall be measured.

10.5.3.3 (U) Small Signal-to-Noise Ratios - When correlated emanations are characterized by small signal-to-noise ratios, performing separate signal and noise measurements may be difficult. An alternate procedure may be used which requires a visual "A-Scope" measurement representing the signal plus noise, and a visual "A-Scope" measurement representing the noise alone. Figure 10-7 illustrates this type of emanations (ideal). The voltage levels to be measured are E_1 and E_2.

a. The noise measurement is equal to:

$$N_{pp} = E_2 - E_1$$

b. The signal plus noise measurement is equal to:

$$\overline{S} + N_p = E_2$$

c. The signal level is computed using the following equation:

$$\overline{S} = E_2 - N_{pp}/2 = (E_2 + E_1)/2$$

Note: As in previous noise measurements, the baseline noise (N_{pp}) may be used when it is obvious that it appears equal to the noise on the signal. This procedure can be extended to apply to emanations related to a signal that is either serially or parallel-processed.

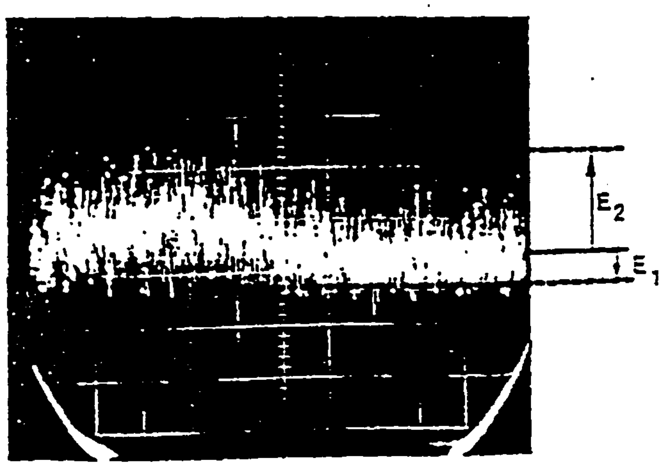

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Figure 10-7. Small Signal-to-Noise Ratios Example

10.5.3.4 (U) Extensions/Precautions - The previous examples illustrate the signal and noise measurement parameters to be measured using simplified signals. While it is recognized that many signals encountered in TEMPEST testing do not appear in this form, the concept remains the same and the measurement procedures should be easily extended. The noise voltage measurements shall relate only to the noise that limits detectability of the signal; the limiting noise is not necessarily the maximum noise level (e.g., do not measure 60 Hz power line noise that is present but does not limit detectability of the signal).

10.5.4 (U) Relating Statistical and Visual Measurements - The statistical and visual measurements outlined in Paragraphs 10.5.2 and 10.5.3 are not precisely related because of the subjective nature of the visual measurements. However, based on

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

because of the subjective nature of the visual measurements. However, based on implifying assumptions[1], the statistical and visual noise measurements can be related by:

$$N_{pp}\,(dB) = N_{\sigma}\,(dB) + 14\,dB$$

10.5.5 ~~(C)~~ [redacted]

a. ~~(C)~~ [redacted]

b. ~~(C)~~ [redacted]

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

ANNEX A

CLASSIFICATION OF COMPROMISING EMANATIONS INFORMATION

A.1 (U) **General** - The Director, National Security Agency, has responsibility for providing guidance on security classification and control of information pertaining to compromising emanations, including the releasability of this information to foreign nationals.

A.2 (U) **Scope** - These guidelines cover information relating to the control of compromising emanations and supplement those in NTISSI-4002 dated 5 June 1986.

A.3 (U) **Rationale** - Compromising emanations information shall be classified based on provisions of Executive Order 12356, "National Security Information" dated 2 April 1982.

a. (C) [redacted]

(1) (C) [redacted]

(2) (C) [redacted]

(3) (C) [redacted]

(4) (C) [redacted]

(5) (C) [redacted]

b. (U) The following guidelines describe various aspects of the compromising emanations problem and provide levels of classifications that shall be assigned to this information. The levels of classification indicate the minimum levels of protection that shall be afforded a particular category of compromising emanations information. It may be necessary to assign higher levels of classification to specific categories of compromising emanations information depending on such factors as: (a) the widespread usage of a particular equipment or system used to process classified information; (b) the level or sensitivity of the traffic being processed by a particular equipment system or site; and (c) the severity of the TEMPEST problem associated with a particular equipment or system[2].

c. (U) Unclassified information concerning compromising emanations shall not be discussed or made available to persons without a need-to-know, especially when the aggregate of unclassified information could be combined to reveal classified

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Does not apply to contractors.

information. No person is entitled to knowledge, possession of, or access to, information concerning compromising emanations solely because of his office, position or type of clearance. No information related to the subject of compromising emanations shall be released for public consumption through the press, advertising, radio, TV or other public media without specific written approval from the Director, National Security Agency.

d. (U) The use of commercial telephones for the discussion of TEMPEST information is discouraged. Unclassified information can easily be combined to reveal classified information. Attempts to "talk around" classified TEMPEST information should be avoided.

A.4 (U) **Classification Marking** - In accordance with the following guidelines, classification markings for compromising emanations information shall be reflected in each paragraph and at the top and bottom of each page and the cover sheets:

a. (U) For Department of Defense contractors and bidders--
in accordance with the directives of DOD 5220.22-M and the authorization and guidelines of the contractor's/bidder's DD-254

b. (U) For all other contractors and bidders—
in accordance with appropriate department or agency guidance.

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c. (U) For U.S. government testing agencies—
"Classified by: NTISSI 4002
Declassify on: Originating Agency's Determination Required"

A.5 (U) **Foreign Release** - Classified TEMPEST information may be released to foreign nationals only when authorized by the Director, National Security Agency. Address requests for authorization to Director, National Security Agency, ATTN: [redacted] Fort George G. Meade, MD 20755-6000. Each publication that contains classified TEMPEST information shall have the following notation placed on its letter of promulgation, handling instructions or title page.

> "This publication or the information it contains may not be released to foreign nationals without prior specific approval from the Director, National Security Agency. All approvals will identify the specific information or copies of this publication authorized for release to specific foreign holder. All requests for additional issuances must receive prior specific approval from the Director, National Security Agency."

A.6 (U) **Specific Guidelines** - This annex contains classification guidelines that relate only to TEMPEST information. Terms, details of testing, test data, etc., related to standard radio frequency interference (RFI), electromagnetic interference (EMI) or electromagnetic compatibility (EMC) testing are unclassified and are not dealt with within these guidelines. These guidelines cover the most common occurrences; if circumstances arise, which are not covered by these guidelines, the originator must determine a classification on the rationale contained in paragraph A.3 above.

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

A.7 (U) **TEMPEST Classification Chart Outline** - The following is a TEMPESTclassification chart to assist in specific problems. The contents of this chart are:

a. (U) Terms (when associated with TEMPEST) and definitions.

b. (U) Policy.

c. (U) General TEMPEST statements.

d. (U) Procedures, techniques, and specifications.

e. (U) Laboratory tests.

A.8 (U) **TEMPEST Classification Chart** -

a. (U) Terms (when associated with TEMPEST) and Definitions. The definitions for the terms listed herein are contained in Appendix A, NACSIM 5000 and/or NSTISSI No. 7000.

Terminology	Classification: Term	Classification: Definition
1. (U) Average Depth of Correct Character (ADCC)	UNCLASSIFIED	CONFIDENTIAL
2. (U) Bit Density Information	UNCLASSIFIED	UNCLASSIFIED
3. (U) Compromising Emanations (CE)	UNCLASSIFIED	UNCLASSIFIED
4. (U) Controlled Space (CS)	UNCLASSIFIED	CONFIDENTIAL
5. (U) Digraphic Information	UNCLASSIFIED	UNCLASSIFIED
6. (U) Emission Security	UNCLASSIFIED	UNCLASSIFIED
7. (U) Fortuitous Conduction (FC)	UNCLASSIFIED	UNCLASSIFIED
8. (U) Information Ratio (IR)	UNCLASSIFIED	UNCLASSIFIED
9. (U) Inspectable Space (IS)	UNCLASSIFIED	UNCLASSIFIED
10. (U) Line Conduction (LC)	UNCLASSIFIED	CONFIDENTIAL
11. (U) Monographic Information	UNCLASSIFIED	CONFIDENTIAL
12. (U) Polygraphic Information	UNCLASSIFIED	UNCLASSIFIED
13. (U) Powerline Conduction	UNCLASSIFIED	UNCLASSIFIED
14. ~~(C)~~ [redacted]		
15. ~~(C)~~		
16. ~~(C)~~		
17. (U) Short Cycle Operation	UNCLASSIFIED	UNCLASSIFIED
18. (U) Skewed Parallel Signal	UNCLASSIFIED	CONFIDENTIAL
19. (U) Telecommunications	UNCLASSIFIED	UNCLASSIFIED
20. (U) TEMPEST	UNCLASSIFIED	UNCLASSIFIED
21. (U) Transition Density Information	UNCLASSIFIED	CONFIDENTIAL

Statement	Classification
b. (U) Policy - Information indicating the U.S. Government's national-level policies, programs, responsibilities or resources for the control of compromising emanations.	CONFIDENTIAL
c. (U) General TEMPEST Statements -	
(1) (U) The statement, without giving details, that a specific plaintext processing equipment/system has TEMPEST deficiencies. (If any specifics are provided, see paragraph A.8.e).	UNCLASSIFIED
(2) (U) The statement that a TEMPEST-suppressed version of a plaintext processing equipment/system is available. (If any specifics are provided, see paragraph A.8.e).	UNCLASSIFIED
(3) (U) Schematics or information regarding the technical or performance characteristics of specific countermeasures (circuits, devices or components) which are identified as being used to control or eliminate the following types of TEMPEST problems if not associated with a specific equipment of system. (If a specific equipment or system is identified, see paragraph A.8.e).	
(a) (U) Electromagnetic radiation, line conduction	UNCLASSIFIED
(b) (C) [redacted]	
(4) (U) The statement that a specific equipment/ system has been scheduled for a TEMPEST test.	UNCLASSIFIED
(5) (U) Complete or essentially complete listings of TEMPEST documents.	UNCLASSIFIED
d. (U) Procedures, Techniques and Specifications -	
(1) (U) Procedures, techniques, and specifications for the detection of compromising emanations that compromise plaintext.	CONFIDENTIAL
(2) (U) Information revealing the specific analytic methods or techniques used to extract information or otherwise exploit compromising emanations related to plaintext.	SECRET
(3) (U) Information revealing newly discovered or certain special techniques for interception, analysis or testing.	TOP SECRET

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

Statement	Classification
e. (U) Laboratory Tests - The following statements provide guidance relative to system and equipment TEMPEST evaluations.	
(1) (U) Tests results, or other information, including the information ratio (IR), which indicates that the following TEMPEST vulnerabilities exist with a specific equipment/system, that process national security information.	
(a) (U) Emanations within a CS or below a specification limit (i.e., CE) that compromise plaintext.	CONFIDENTIAL
(b) (C) [redacted]	
(2) (U) The statement, without revealing specific details that an equipment/system has been modified to meet TEMPEST requirements or that TEMPEST vulnerabilities have been corrected.	UNCLASSIFIED
(3) (U) Information that specific TEMPEST vulnerabilities have been corrected with a specific equipment/system.	CONFIDENTIAL
(4) (C) [redacted]	

NOTE: Schematics and drawings that include TEMPEST countermeasures, but do not identify them as such, are not classified.

ANNEX B

FIGURES AND TABLES

Annex B to
NSTISSAM TEMPEST/1-93

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

~~CONFIDENTIAL~~

Figure B1 [redacted] (U)

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

[redacted]

~~CONFIDENTIAL~~

Figure B-2.-[redacted] (U)

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

~~CONFIDENTIAL~~

Figure B-8 - (U)

(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

ANNEX C

GUIDELINES FOR CROSSTALK TESTING

C.1 (U) **Introduction** - The purpose of this annex is to define the crosstalk phenomenon and to provide specific requirements for TEMPEST crosstalk field tests of baseband analog speed signals. The objective of the field tests is to determine if compromising emanations (CE) can be detected on BLACK equipment or conductors.

C.1.1 (U) Definition - Crosstalk is defined as RED baseband coupling between equipment or conductors of a system processing RED analog signals and other equipment or conductors that may serve as unintentional signal paths.

C.1.2 (U) Scope - This annex covers crosstalk signals associated with systems that process baseband analog speech signals, and is not applicable to other types of analog data or to speech signals that are modulated or frequency shifted.

C.2 (U) **Crosstalk Field Test Requirements**

C.2.1 (U) General - The crosstalk field test outlined in this annex uses speech test tones as a test message. The test shall be performed on each BLACK conductor or equipment under test, which is susceptible to crosstalk.

C.2.2 (U) Test Matrix - A test matrix should be developed to plan and document specific equipment configurations for each test performed. The test matrix should reflect both the possible RED inter/intra-equipment signal path combinations and any possible BLACK conductors. Normal operational modes should be annotated along with other possible configurations, including those for which the system may not have been intended. Both send and receive modes of duplex equipment must be included. All systems that share common RED processing equipment or patch facilities should be identified and noted if any portion can be utilized to process both RED and BLACK information.

C.3. (U) **Test Instrumentation**

C.3.1 (U) Detection system - The detection system shall consist of a spectrum analyzer, either a swept frequency or Fast Fourier Transform (FFT) type. The spectrum analyzer shall operate over the test frequency range of 50 to 5000 Hz with a bandwidth or frequency resolution less than or equal to 50 Hz. The spectrum analyzer noise floor must be less than that of the system under evaluation throughout the test frequency range. If the characteristic output impedance of the BLACK conductor under test does not equal the spectrum analyzer input impedance, an impedance matching network must be employed.

C.3.2 (U) Injection system - The speech test tones shall be generated by a tracking oscillator synchronized with the detection system or a discrete tone generator. The frequency response of the tracking oscillator or tone generator shall be within +2 dB over the test frequency range of 50 to 5000 Hz. If the characteristic input impedance of the EUT does not equal the speech test tone generator output impedance, an impedance matching network must be employed.

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

C.3.3 (U) Spectral Shaping Filter - A spectral shaping filter may be used to simulate the power spectrum of speech. The frequency response of the filter shall be within +2 dB of the spectral shaping correction levels at each of the twelve test frequencies specified in the speech test table, Table C-1. The characteristic input and output impedance of the filter shall match the output impedance of the tracking oscillator or tone generator.

C.4 (U) Speech Tone Test Procedure

C.4.1 (U) Speech System Setup - Adjust the speech system volume control to the highest level that is used for normal operation. If this level produces distortion, reduce the volume until the distortion is no longer audible. Do not disturb the speech system for the remainder of the test.

U//~~FOUO~~ C.4.2 ~~(U)~~ [redacted]

U//~~FOUO~~ C.4.3 ~~(U)~~ [redacted]

U//~~FOUO~~ C.4.4 ~~(U)~~ [redacted]

U//~~FOUO~~ C.4.4.1 ~~(U)~~ [redacted]

TABLE C-1

(U)

C.4.4.2 (U) Measurement Procedure With Signal Generator - Set the signal generator frequency to the first test tone frequency in the Speech Test Table, Table C-1. Select a spectrum analyzer IF bandwidth or frequency resolution setting less than or equal to 50 Hz and a frequency span that includes the test tone. Adjust the generator frequency to avoid ambient noise (such as power line harmonics). With the spectrum analyzer, measure the level at the tone frequency and record the results into the speech test table. Remove the tone from the input of the speech system and measure the noise level at the tone frequency. Repeat the procedure for each test tone frequency.

C.4.5 (U) Speech Tone Test Results:

C.4.5.1 ~~(C)~~ [redacted]

C.4.5.2 (U) [redacted]

C.4.5.3 ~~(C)~~ [redacted]

(a) [redacted]

(b) [redacted]

(c) [redacted]

C.4.6 (U) Documentation - Documentation of the test parameters should include a detailed block diagram of the test instrumentation utilized. The block diagram should reflect all impedances and transformations. The documentation should also specify the speech system settings, speech system modes of operation, injection system levels and spectrum analyzer settings.

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

Figure C-1

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

Figure C-2

(U)

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

[redacted]

Figure C-3

[redacted] (U)

(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

ANNEX D

GUIDELINES FOR SHIELDED ENCLOSURE TESTING

D.l (U) **Introduction** - This annex covers specific requirements applicable to TEMPEST testing RF shielded enclosures in a field environment. The objective of the field test is to verify that sufficient attenuation exists, so that the probability of compromising emanations (CE) being detectable outside the enclosure is reduced to a minimum. To facilitate this verification, the test at 10 MHz which is normally performed as an Electric Field test is incorporated herein as a Magnetic Field test requirement.

D.1.1 (U) Application - This annex is not applicable where the containment of intentional RF energy is required, or when it is the opinion of the TEMPEST test engineer that CE may exist that will not be contained by the attenuation requirements specified herein. A TEMPEST field test must be performed to investigate these instances.

D.1.2 (U) New Construction - The field TEMPEST enclosure testing methods and criteria within this annex are applicable only for field testing of existing enclosures and is not intended for use in initial acceptance testing. For testing of new shielded enclosures, see NSTISSAM TEMPEST/3-93.

D.2 (U) **Enclosure Field Test Requirements** - To establish the enclosure's attenuation characteristics, the following minimum tests must be performed:

1. Magnetic Field - l, l0, l00 KHz, and l and 10 MHz.
2. Plane Wave - l00, 400, and l000 MHz. (See Note 1)
3. Power Line Filter Testing.
4. Signal Line Filter Testing.

NOTE 1: If the enclosure is designed to provide protection above 1 GHz, an optional Plane Wave test at 10 GHz may be required.

D.3 (U) **Enclosure Certification Requirements**

D.3.1 (U) Steel Enclosures - Steel enclosures (welded steel, armored panel, etc.), that have been constructed to meet either Annex A of NSTISSAM TEMPEST/3-93 or Specification NSA No. 65-6, must provide magnetic field attenuation that shall not be less than that specified in Figure D-1 and plane wave attenuation that is $\geq$ 60 dB for all test frequencies. The power line and signal line filters must exhibit attenuation of $\geq$ 60 dB for all test frequencies.

D.3.2 (U) Non-Steel Enclosures - Non-steel enclosures that have been constructed with alternate shielding materials (ASM) must meet the magnetic and plane wave attenuation requirements established by the sponsoring organization CTTA. The power line and signal line filters must exhibit the same magnitude attenuation for all test frequencies as the RF attenuation provided by the enclosure.

D.3.3 (U) Certification - When the requirements of this annex are met, the enclosures can be placed in an acceptable risk category.

D.4 (U) Enclosure Test Methodology

D.4.1 (U) General - The enclosure power line filters should be carrying normal load current during all testing. Any of the three test methods described in Chapter 6 of NSTISSAM TEMPEST/3-93 may be used to perform the tests required by this document. Although the swept measurement is the preferred methodology, one method may be more appropriate than another in any given situation.

D.4.2 (U) Magnetic Field Testing - Magnetic field testing shall be performed at the following frequencies, as a minimum - 1, 10, and 100 KHz; 1 and 10 MHz.

a. (U) Measurement Procedures - Procedures for the selected test methodology are contained in NSTISSAM TEMPEST/3-93.

b. (U) Data Collection - The magnitude and location of the minimum attenuation provided by the enclosure should be determined by testing not fewer than four locations, preferably on different walls. Tests should also be made around all door frames, at accessible joints, around any filters/isolators, and around air ducts/piping. The ambient noise level in the vicinity of an enclosure may require locating the detection loop within the enclosure.

D.4.3 (U) Plane Wave Testing - Plane wave testing shall be performed at the following frequencies, as a minimum - 100, 400, and 1000 MHz.

a. (U) Measurement Procedures - Procedures for the selected test methodology are contained in NSTISSAM TEMPEST/3-93.

b. (U) Data Collection - The magnitude and location of the minimum attenuation provided by the enclosure should be determined by testing not fewer than four locations, preferably on different walls. Tests should also be made around all door frames, at accessible joints, around any filters/isolaters, and around air ducts/piping. The ambient noise level in the vicinity of an enclosure may require locating the detection antenna within the enclosure.

D.4.4 (U) Power Line Filter Testing - Power line filter testing should be performed at the following frequencies, as a minimum 100 KHz, 1, 10, and 100 MHz. Power line filters must be tested carrying normal operating current. This requirement is necessary since filter inductors undergo an impedance decrease at RF frequencies as the inductor cores approach saturation due to line current. Power line filters tested in a no-load condition may provide unrealistic attenuation characteristics.

a. (U) Reference Level - A detection reference level must be established at each test frequency. The injection signal should have a source impedance of 50 ohms and be of sufficient amplitude that, when used in conjunction with the detection system sensitivity, permits a test system dynamic range $\geq$ 60 dB. Since dB of attenuation is a relative value, any convenient signal measurement unit may be used.

b. (U) Attenuation Measurement - The injection signal input should be on the line side of the power filter so that enclosure power contamination is minimum. (Extreme caution must be exercised as the filter is tested with power applied.) The dB difference between the reference level and the measurement of the detected signal within the enclosure will yield the dB of attenuation provided by the power line filters.

D.4.5 (U) Signal Line Filter Testing - Any signal line penetrating the enclosure must be filtered. All filters must meet the attenuation requirements provided in paragraphs D.3.1 and D.3.2. The tests are conducted similarly to and at the same minimum frequencies listed for power line filter testing. However, due to the broad range of devices encountered, no specifics for testing can be provided. When filter/isolator attenuation cannot be verified by testing, searches for CE are the only positive method to ensure filter/isolator adequacy.

D.4.6 (U) Physical Inspection - The enclosure should be inspected to ensure that all penetrations, air conditioners, low pressure water pipes, etc., contain a nonmetallic section outside of the enclosure. The enclosure grounding system and general installation should be inspected to ensure compliance with NSTISSAM TEMPEST/3-93.

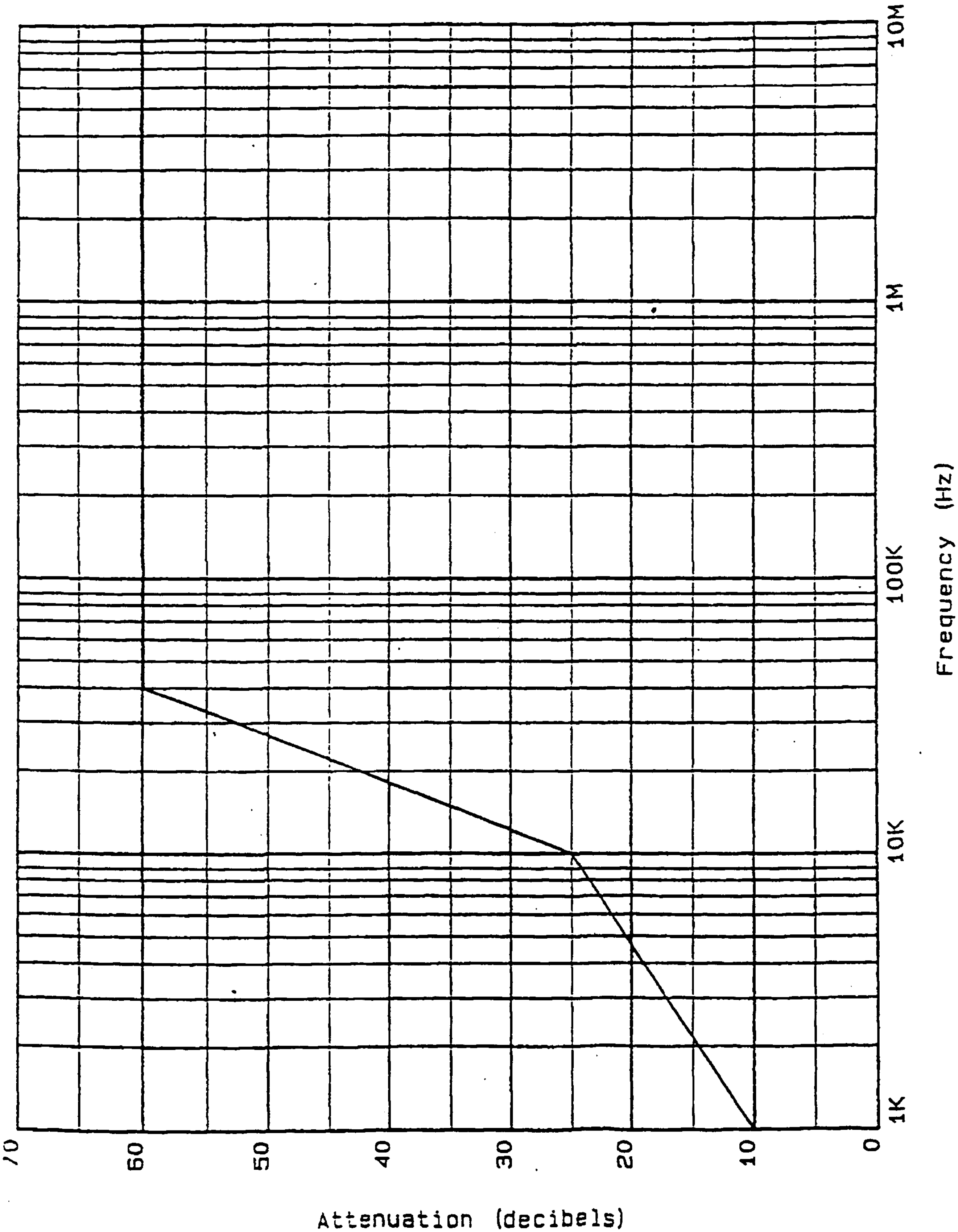


Figure D-1. Required Magnetic Field Attenuation (U)

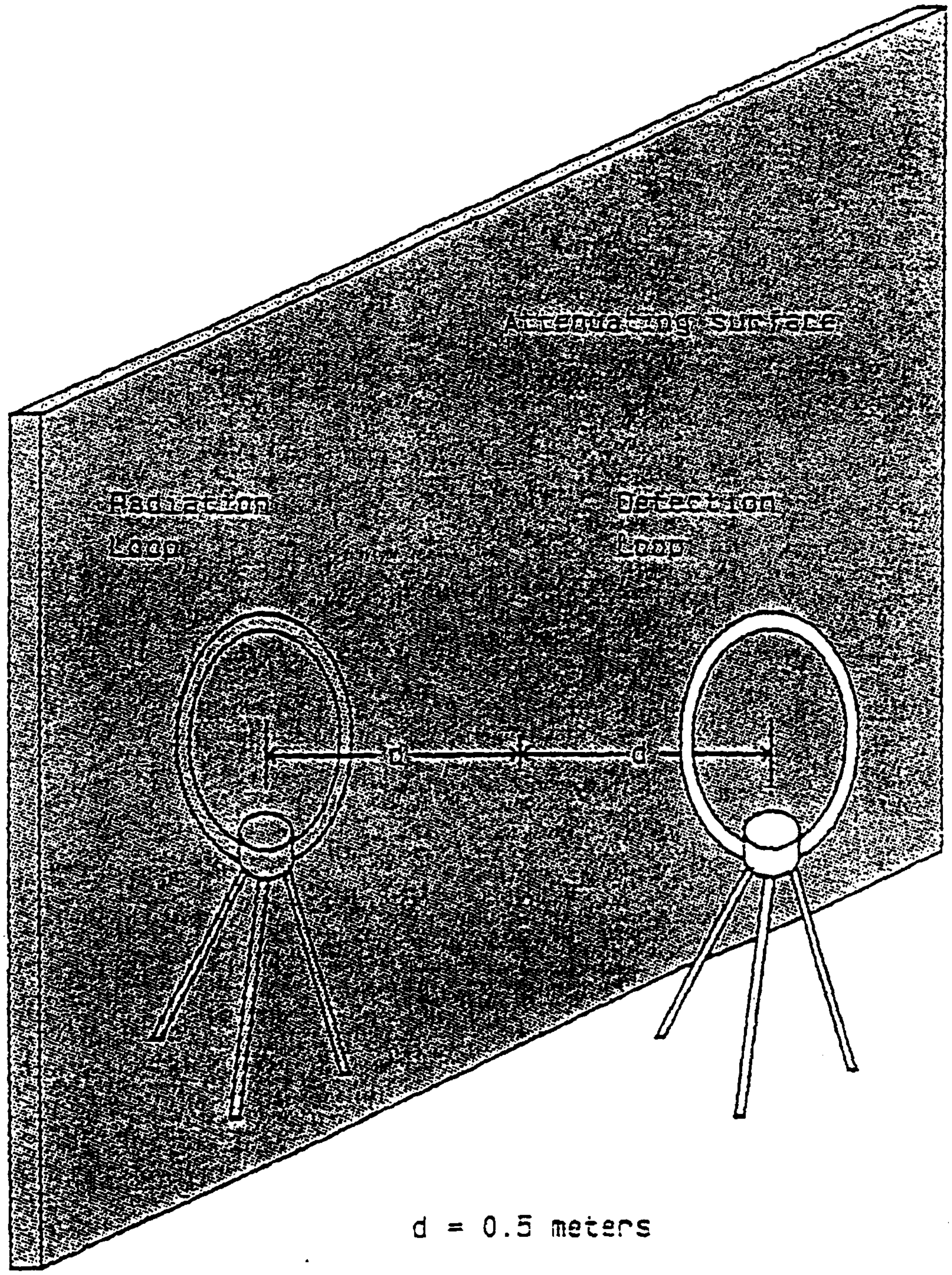
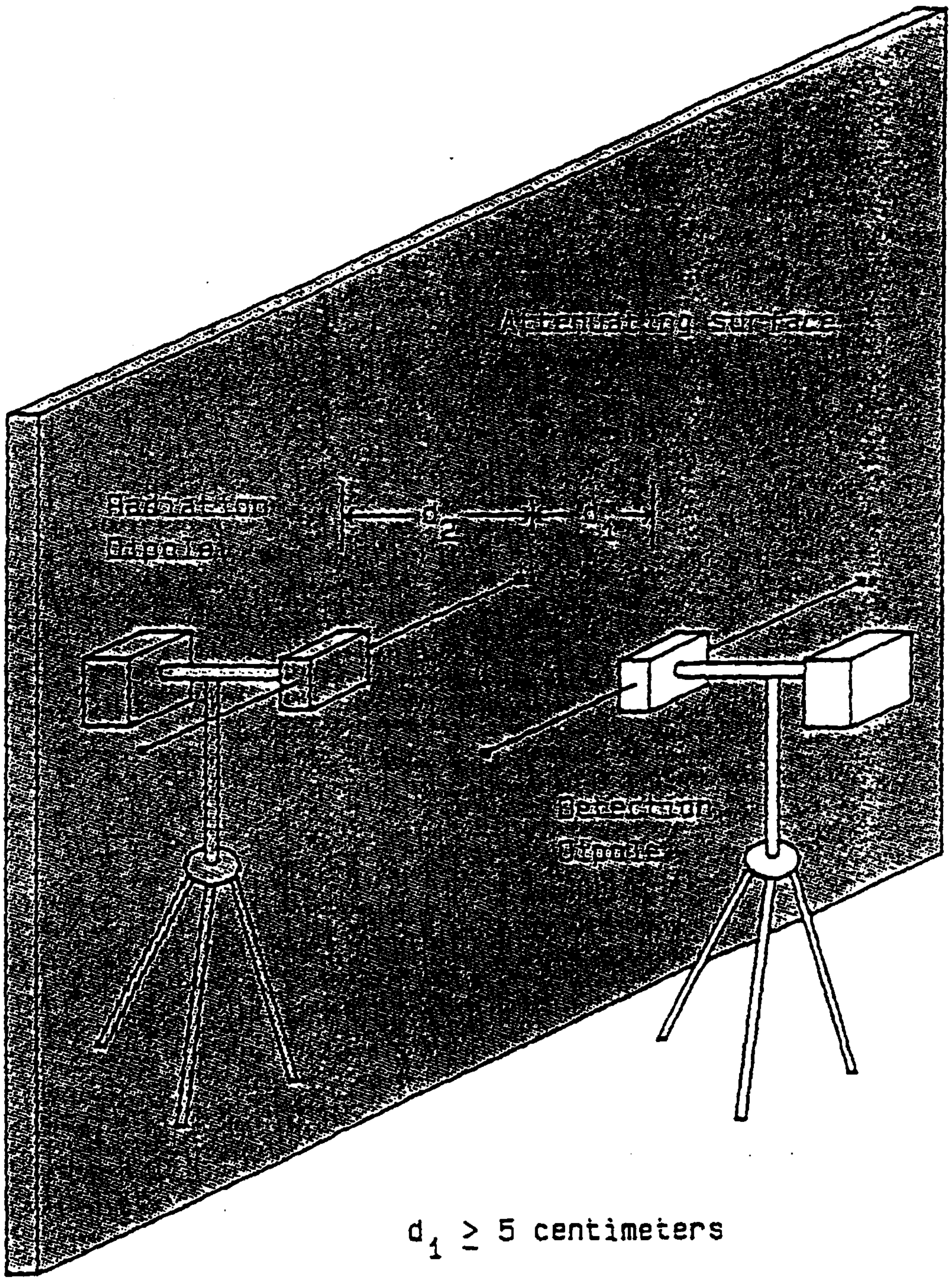


Figure D-2. Magnetic Loop Alignment (U)



$d_1 \geq 5$ centimeters

$d_2 \geq 2\lambda$ at test frequency

Figure D-3. Plane Wave Dipole Alignment (U)

ANNEX E

DETECTION SYSTEM BANDWIDTH MEASUREMENT

E.1 (U) **Introduction** - The overall detection system bandwidth shall be used when determining compliance of TEMPEST detection systems with the bandwidth requirements of this document. Procedures are presented for measuring sine wave and impulse bandwidths of nontunable detection systems and tunable detection systems with and without a demodulator. Alternate procedures may be used provided the same results are obtained as when using the specified procedures herein. The alternate procedures must be documented in the test instrumentation certification report and approved by the sponsoring organization.

E.2 (U) **6 dB Bandwidth Measurements**: Tunable Heterodyne Detection System With Demodulator - This procedure is required for determining the overall 6 dB detection system bandwidth of tunable heterodyne detection systems at post-detection output. This overall bandwidth is equal to the difference between the low-pass and high-pass 6 dB cutoff frequencies as measured using E2.2a. through i. below.

E.2.1 (U) Signal Generator Requirements - This procedure accounts for the effect of both the IF and video circuits upon the overall low-pass cutoff frequencies. An RF generator carrier frequency shall be tunable and shall be used for the measurements. The RF signal generator carrier frequency shall be tunable and shall be within the tuned frequency range of the detection system. The RF generator carrier signal shall be amplitude-modulated with a sine wave using any convenient modulation index (e.g. 30%). The modulation index shall be maintained constant during the measurement unless otherwise noted. The frequency of the modulating signal shall be adjustable over the modulating frequency capability of the RF signal generator. If the maximum usable modulating frequency is greater than the expected IF bandwidth, then only one RF signal generator is required. If the expected IF bandwidth is greater than the maximum usable modulating frequency, then two RF generators are required for the test. The second RF generator shall be tunable over the same range as the first RF generator, but shall not be modulated. When two RF generators are required, both generators must provide frequency accuracy and resolution that are at least one order of magnitude better than the expected overall bandwidth.

E.2.2 (U) Measurement Procedure - The overall bandwidth shall be measured as follows:

a. (U) If one RF signal generator is required, apply the output of the generator directly to the input of the detection system. If two RF signal generators are required, apply both generators through a power divider to the input of the detection system. In line attenuation (e.g. 20 dB) may be used as needed to provide signal attenuation and signal generator isolation. Initially decrease the output of the second generator (if used) to zero or at least 40 dB below the output of the modulated RF generator.

b. (U) Adjust the carrier frequency of the modulated RF generator around the tuned center frequency of the detection system until the maximum level of the modulating signal is observed at the same output port of the detection system as used during the TEMPEST testing. The level of the modulating carrier signal applied to the detection system and the modulation index must be such that the detection system output signal is at or below the 1 dB compression point.

c (U) Adjust the frequency of the modulating signal until the maximum output level of the detection system is observed or the maximum available modulating frequency has been reached, whichever comes first. Readjust the RF signal generator level, if necessary, to maintain the detection system output level at or below the 1 dB compression point. Note the modulating frequency and the detection system output level as a reference.

d. (U) Maintaining the same RF generator frequency as in c. above, reduce the frequency of the modulating signal until the output of the detection system decreases 6 dB from the level noted in c. above, or until the modulating frequency is essentially zero frequency (such as would occur in a d.c.-coupled demodulator), whichever comes first. Record this frequency as the 6 dB high-pass cutoff frequency.

e. (U) Increase the modulating frequency found in step d. as necessary to produce a relatively noise free detection system output signal, but do not increase the modulating frequency to more than 10% of the overall bandwidth. Note the resulting modulating frequency and the detection system output as a reference. Shift the RF carrier frequency down until the output of the detection system decreases 6 dB from the reference level of this step. Increase the RF generator carrier level by 6 dB and decrease the modulation index by 6 dB (e.g. to 15%).

f. (U) If only one RF signal generator is required, then increase the frequency of the modulating signal until the maximum output level of the detection system is observed. Note the new output reference level. Then continue to increase the modulating frequency until the detection system output level decreases by 6 dB from the new reference level. Record the resulting modulating frequency as the overall 6 dB low-pass frequency.

g. (U) If two RF signal generators are required, set the frequency of the second generator equal to the first generator plus the reference modulating frequency of step e. Turn off the modulation of the first generator. Increase the level of the second generator until the detection system output equals the reference level of step c. minus 6 dB. Next increase the frequency of the second RF generator until the maximum output of the detection system is observed. Note this output level as the new reference level. Then continue to increase the frequency of the second RF generator until the detection system output level decreases to 6 dB from the new reference level. Record the resulting difference between the two RF generator frequencies as the overall 6 dB low-pass cutoff frequency.

h. (U) Subtract the result of d. above from that of f. or g. above, to obtain the overall 6 dB detection system bandwidth.

i. (U) Repeat the bandwidth measurements at a minimum of two tuned frequencies per decade or one per near the center of the detection system, whichever is the greater number of readings.

E.3 (U) **6 dB Bandwidth Measurements**: Tunable Heterodyne or Tunable Nonheterodyne Detection System Without Demodulator. - The bandwidth of these systems shall be measured as follows:

a. (U) Apply the output of a calibrated, unmodulated sine wave generator to the input of the detection system.

b. (U) Adjust the carrier frequency of the cw generator around the center frequency of the detection system until the maximum output level of the detection system is observed as the same port used during TEMPEST testing. Note the output level.

c. (U) Maintaining the same cw generator carrier amplitude and detection system tuned center frequency as in b. above, reduce the cw generator carrier frequency until the output level of the detection system decreases 6 dB from the level obtained in b. above or until the carrier frequency is essentially zero frequency (such as would occur at a detection system output with d.c. response), whichever comes first. Note this frequency.

d. (U) Repeat c. above, except increase the carrier frequency until the output level decreases 6 dB from the level obtained in b. above. Note this frequency.

e. (U) Subtract the frequency recorded in c. above from that in d above to obtain the detection system bandwidth.

f. (U) Repeat the bandwidth measurements at a minimum of two frequencies per decade or one per tuning band (near the center), whichever is the greater number of readings.

E.4 (U) **6 dB Bandwidth Measurements**: Nontunable Detection Systems - The 6 dB bandwidth on nontunable detection systems shall be measured according to the procedures specified in paragraph E.3. The measurement shall be made on the entire composite detection system, including the transducer (antenna, voltage or current probe, etc.) and display device (oscilloscope, strip recorder, etc.) unless it can be shown that the bandwidth of these devices will not restrict the bandwidth of the remainder of the detection system.

E.5 (U) **Impulse Bandwidth Measurements**: Tunable Heterodyne Detection System With Demodulator - The impulse bandwidth of these detection systems shall be measured as follows:

a. (U) Apply the output of a calibrated AM sine wave generator to the input of the detection system. The generator output signal shall be amplitude-modulated 30% with a sine wave of suitable frequency.

A swept-frequency generator with a constant output voltage may be used in lieu of the manually-tuned generator. Using a calibrated display device, the detection system bandwidth can then be read directly.

The bandwidth of some transducers (e.g., antennas, current probes) is very difficult or impractical to measure. In these cases, bandwidth measurements need not be made on the device but precautions shall be taken to assure that the device does not limit the overall detection system bandwidth.

b. (U) Adjust the carrier frequency of the AM sine wave generator around the detection system until the maximum output level of the detected signal is observed as the same output port of the detection system used during TEMPEST testing. Note the output peak-to-peak amplitude observed on the oscilloscope and the signal level in rms volts of the AM sine wave applied at the input of the detection system.

c. (U) Disconnect the AM sine wave generator and apply the output of a calibrated impulse generator to the input of the detection system. Set the IG repetition rate to any convenient rate less than one-fifth of the nominal overall detection system bandwidth.

d. (U) Adjust the IG output level so that the peak magnitude of the waveform displayed on the oscilloscope (at the detection system output) is equal to one-half the peak-to-peak amplitude of the detected sine wave recorded in b above. Note the level in volts (equivalent rms sine wave)/MHz, of the impulsive signal applied at the input of the detection system.

e. (U) Calculate the impulse bandwidth of the detection system with the following formula:

$$\text{IBW} = \frac{0.3(\text{AM sine wave input signal level in rms volts recorded in b. above})}{(\text{Impulsive input signal level in volts (equivalent rms sine wave)/MHz, recorded in d above.})}$$

f. (U) Repeat the impulse bandwidth measurements at a minimum of two frequencies per decade or one per tuning band (near the center), whichever is the greater number of readings.

E.6 (U) **Impulse Bandwidth Measurements**: Tunable Heterodyne or Tunable Nonheterodyne Detection System Without Demodulator - The impulse bandwidth of these detection systems will be measured as follows:

a. (U) Apply the output of a calibrated unmodulated sine wave generator to the input of the detection system.

b. (U) Adjust the carrier frequency of the cw generator around the center frequency of the detection system until the maximum output level of the detection system is observed on the oscilloscope at the same port used during TEMPEST testing. Note the output peak-to-peak amplitude observed on the oscilloscope, and the signal level in rms volts of the cw sine wave applied at the input of the detection system.

c. (U) Disconnect the cw generator and apply the output of a calibrated impulse generator to the input of the detection system. Set the IG repetition rate to any convenient rate less that one-fifth of the nominal overall detection system bandwidth.

d. (U) Adjust the IG output level so that the peak-to-peak waveform displayed on the oscilloscope (at the output of the detection system) is equal to the peak-to-peak amplitude of the cw waveform recorded in b. Note the level (in volts (equivalent rms sine wave)/MHz) of the impulsive signal applied at the input of the detection system.

e. (U) Calculate the impulse bandwidth of the detection system with the following formula:

$$IBW = \frac{\text{(Sine wave input signal level in rms volts recorded in b. above)}}{\text{(Impulsive input signal level in volts (equivalent rms sine wave)/MHz, recorded in d. above.)}}$$

f. (U) Repeat the impulse bandwidth measurements at a minimum of two tuned frequencies per decade or one per tuning band (near the center) whichever is the greater number of readings.

E.7 (U) **Impulse Bandwidth Measurements**: Nontunable Detection Systems - The impulse bandwidth shall be measured as follows:

a. (U) Apply the output of a calibrated unmodulated sine wave generator to the input of the detection system.

b. (U) Adjust the carrier frequency of the cw frequency of the detection system passband.

c. (U) Obtain a convenient display of the detection system output signal on an oscilloscope. Note the output peak-to-peak amplitude observed on the oscilloscope, and the signal level in rms volts of the cw sine wave applied at the input of the detection system.

d. (U) Disconnect the cw generator and apply the output of a calibrated impulse generator to the input of the detection system. Set the IG repetition rate to any convenient rate less than one-fifth of the nominal overall detection system bandwidth.

e. (U) Adjust the IG output level so that the peak magnitude of the waveform displayed on the oscilloscope (at the output of the detection system) is equal to one-half the peak-to-peak amplitude of the cw waveform recorded in c above. Note the level, (in volts (equivalent rms sine wave)/MHz) of the impulsive signal applied at the input of the detection system.

f. (U) Calculate the impulse bandwidth of the detection system with the following formula:

$$IBW = \frac{\text{(Sine wave input signal level in rms volts, recorded in c. above)}}{\text{(Impulsive input signal level in volts (equivalent rms sine wave)/MHz recorded in d. above.)}}$$

ANNEX F

IMPULSE GENERATOR CALIBRATION

F.1 (U) **Procedure** - Impulse generators shall be calibrated by one of the four following methods:

F.1.1 (U) Method 1

a. (U) Apply the output of the impulse generator to be calibrated to the input of an amplitude-linear receiver having synchronously tuned, less-than- critically-coupled circuits. Radio Interference Field Intensity (RIFI) receivers are satisfactory for this purpose if their impulse bandwidth is at least five times the repetition rate of the impulse generator. Any Automatic Gain Control (AGC) system shall be disabled and the AGC line firmly referred to ground with a low-impedance voltage source of appropriate value.

b. (U) Obtain oscilloscope pattern of the overall receiver response at the IF output. The oscilloscope controls shall be so adjusted that the pattern is as large as possible within the calibrated area on the face plate. Either photograph or trace the pattern. Record the oscilloscope sweep speed setting. (The sweep speed shall be calibrated accurately.)

c. (U) Use a planimeter or other integrating device to determine the area of the positive portion of the major lobe of the response waveform. (More accuracy can be obtained by summing the area under the odd numbered lobes and subtracting from it the total area under the even numbered lobes.) This operation shall be carried out at least 5 times and the average of the readings taken as the area.

d. (U) Calculate the impulse bandwidth of the receiver according to the following formula:

$$\text{IBW in MHz} = \frac{\text{Pattern height* in cm} \times 10^{-6}}{(\text{Pattern area* in cm}^2)(\text{Sweep speed in sec/cm})}$$

*Refers only to positive portion of response waveform.

e. (U) Connect a calibrated sine wave generator to the receiver. Tune the generator to the receiver's tuned frequency and adjust the output until the peak pattern height is the same as that obtained with the impulse generator in a and b above. Record the output of the sine wave generator in microvolts (rms).

f. (U) Calculate 20 log10(e/d) where e and d are the results obtained in e and d above expressed in microvolts (rms) and megahertz, respectively. The calculation gives the spectral intensity of the impulse generator output in dBμV/MHz (equivalent rms sine wave).

Other methods may be used if justified and approved by the sponsoring organization.

F.1.2 (U) Method 2

a. (U) Select a bandpass or low-pass filter with the following characteristics:

(1) Minimum upper roll-off of 18 dB/octave.

(2) Maximum upper 3-dB cutoff point which is 10% of the reciprocal of the width of the driving impulse (from the IG to be calibrated) or 80% of the bandpass of the oscilloscope in use, whichever is less.

(3) Passband wide enough to permit passage of sufficient energy such that peak voltage of the output waveform can be accurately read on the oscilloscope.

(4) 50-ohm input and output impedance in the passband.

b. (U) Determine the impulse bandwidth (IBW) of the filter employing the procedures specified in Method 1 above, a. through d., substituting the word "filter" for "receiver." (Once the IBW of the filter has been measured, the filter may be used to calibrate any number of IG's; however, the IBW shall be rechecked according to the calibration requirements in paragraph 6.6.)

c. (U) Terminate the output of the IG to be calibrated with a 6 dB (minimum), 50-ohm pad and connect it to the input of the filter.

d. (U) Terminate the output of the filter with a 50-ohm resistive load and connect it to the vertical input of the oscilloscope.

e. (U) Record the peak voltage of the filter output on the oscilloscope in microvolts.

f. (U) Calculate:

$$20 \log_{10}(e/b) + \text{Pad Loss} - 3\text{ dB} + \text{Filter Insertion Loss}$$

where e. and b. are the results obtained in e. and b. above expressed in microvolts (peak) and megahertz, respectively. This calculation gives the spectral intensity of the impulse generator output in dBµV/MHz (equivalent rms sine wave).

F.1.3 (U) Method 3 - Compare the output of the IG to be calibrated with the input of another IG which has previously been calibrated according to Method 1 or Method 2 within the last six months.

F.1.4 (U) Method 4

a. (U) Apply the output of the impulse generator to be calibrated to the input of a spectrum analyzer having the following characteristics:

(1) Known impulse bandwidths.
(2) Absolute amplitude accuracy equal to ±2 dB or better.

b. (U) Select a spectrum analyzer bandwidth at least five times the repetition rate of the impulse generator but no larger than one-tenth the usable spectrum of the impulse generator. Select a scan time in seconds/division, no less than 10/repetition rate (Hz) to ensure ten-impulse responses per division.

c. (U) Add any conversion factors to the spectrum analyzer displayed voltage needed to convert dBm to dB referenced to 1 μV rms. Subtract the impulse bandwidth of the spectrum analyzer in dB referenced to 1 MHz from this value to convert to dB referenced to 1 μV/MHz and subtract 3 dB to convert the reading to dBμV/MHz (equivalent rms sine wave) which is the spectral intensity of the impulse generator output.

ANNEX G

TEMPEST TEST PLAN OUTLINE

G.1 (U) **Introduction** - Standardized test plan formats are recommended in order to ensure that sufficient technical data are presented and to facilitate interchange of test plans developed by others. A format that allows assembly of standardized test plans while complying with the requirements of the TEMPEST field test program is presented in this annex. The following outline lists the various annexes that constitute the overall TEMPEST test plan.

Annex A. General Test Philosophy/Procedure

Annex B. System 1 Test Plan

- I. Introduction
  - A. System Description
  - B. General Test Philosophy
- II. Equipment Description and Test Philosophy
  - A. Equipment No. 1
    - 1. General Description
    - 2. Test Philosophy
  - B. Equipment No. 2
  - C. Test Programs and Procedures (if applicable)
    - 1. Objective
    - 2. Test Procedure

Annex C. System 2 Test Plan

G.2 (U) **General Test Philosophy/Procedure** - This section presents general information on the test philosophy and test procedure used in TEMPEST field testing. The following paragraphs may be included as Annex A of the TEMPEST field test report.

G.2.1. (U) General Test Philosophy

a. (U) Communications, data processing, and electronic equipment in general are capable of generating electric, magnetic, and acoustic emanations. These emanations become of TEMPEST interest whenever they can be correlated with national security information processed by the equipment.

b. (U) The possible emanations are initially predicted by investigating the equipment characteristics with respect to operation, RED data flow, RED pulse width signalling rate (Rd), RED transition time signalling rate (Rt), data format, type transfers, etc. Such information enables the TEMPEST personnel to determine:

1. (U) The possible sources of CE to ensure that all signals of interest are investigated thoroughly.

2. (U) The type of CE expected in order that appropriate test messages can be devised.

3. (U) The appropriate test frequency range and receiver bandwidth as derived from the tables in Annex B.

4. (U) The synchronous points that can be used to facilitate isolating the CE from other signals.

G.2.2. (U) During TEMPEST testing, the EUT shall be exercised in all of its normal operating modes. All circuits that are active during a given mode of operation shall be in operation when that mode is tested. Controls shall be adjusted for optimum design performance as required by the EUT specification, interface lines shall be terminated in their normal load impedances (may be simulated only if actual termination device is not available for the tests) unless otherwise specified and normal interface signal levels and signal waveforms shall be used. The EUT signaling rates shall be used to determine test category and instrumentation requirements. The equipment shall be tested in its normal day-to-day operational condition.

a. (U) The test procedures that are normally used for most TEMPEST field tests are provided in the subparagraphs below. They summarize the general practice followed in testing the equipment.

1. ~~(C)~~ [redacted]

2. ~~(C)~~ [redacted]

3. (U) Ambient Noise (10 kHz to 1 GHz): Place test antennas in the midst of the equipment to be tested. Obtain the ambient noise readings noting the location, date, and time that the test is conducted.

G.3 (U) **Systems Test Plans** - The annex that follow Appendix A of the TEMPEST field test report, e.g., B, C, ...etc., shall contain the system information, individual equipment descriptions and its specific test philosophies, and an optional test program and procedures section. A separate appendix will be allocated for each system test plan. Each equipment write up shall be on a separate sheet to facilitate extracting write ups from one test plan for use in another. In order to have consistency among the equipment write ups in the reports, it is suggested that the exact wording in the headings (shown in quotes) be used. The categories and subcategories in a system test plan are explained in the following paragraphs.

G.3.1. (U) "Introduction": Included in this section are a system description, an optional general test philosophy for the system, and a system block diagram.

a. (U) "System Description": A general description of the system should be given here, including its purpose, functions, and possibly the type of equipment used. This discussion must give the TEMPEST engineer a fair idea of system operations so that he may communicate knowledgeably with operators and technicians in order to set up his tests. The system description should be kept unclassified as much as possible. The various equipment shall be represented by flow chart symbols in a system block diagram. All RED data lines between equipment should be shown. The direction of RED data flow should be indicated with blackened arrows. Chart-pak tapes may be used to differentiate between various types of transfers and various codes utilized by the system. Figure G-2 is a sample system diagram with a legend of suggested code/chart-pak tape conventions. A legend should be included on the system block diagram. The title of the system block diagram should be in the following format:

"Figure ___." (name of system) line 1
SYSTEM BLOCK DIAGRAM line 2

b. (U) "General Test Philosophy": This subsection may include discussions of types of RED signals general to the system and which may not warrant a repeated explanation in each equipment write up. An example is: "All equipment with audio signals will be checked for ... and tests for other types of RED signals are provided in the following section." If an equipment is used for BLACK information only, or if an equipment write up is used which has a different model number from the unit in the system, this information may also be included here.

G.3.2. (U) " Equipment Description and Test Philosophy"

a. (U) (Name of equipment): The company name, model number, and equipment type should be used, such as DEC LP-05 Printer. If the equipment is DOD, model number and equipment type are sufficient (e.g., AN/UYK-20 Computer). Include any other known names and/or model numbers, e.g., DEC LP-04 (Data Products 2470) Printer.

1. (U) "General Description": Write a general description of the equipment and include pertinent information required in TEMPEST checks. An equipment RED signal flow diagram shall be drawn and referred to. The RED signal flow diagram (see Figure G-3 for sample RED signal flow diagram) should be drawn with the following guidelines. EUT RED signal sources should be identified down to the level of circuit functions such as shift registers, Random Access Memory (RAM),

etc., which are associated with each RED signal type (TEMPEST signal of interest). All data transfers where CE could occur should be shown. Flow chart symbols, chart-paktapes, arrows, legend, and standard note shall be used as described in the system description subsection. The drawing should be labeled.

"Figure___." (name of equipment) line 1
RED SIGNAL FLOW DIAGRAM line 2

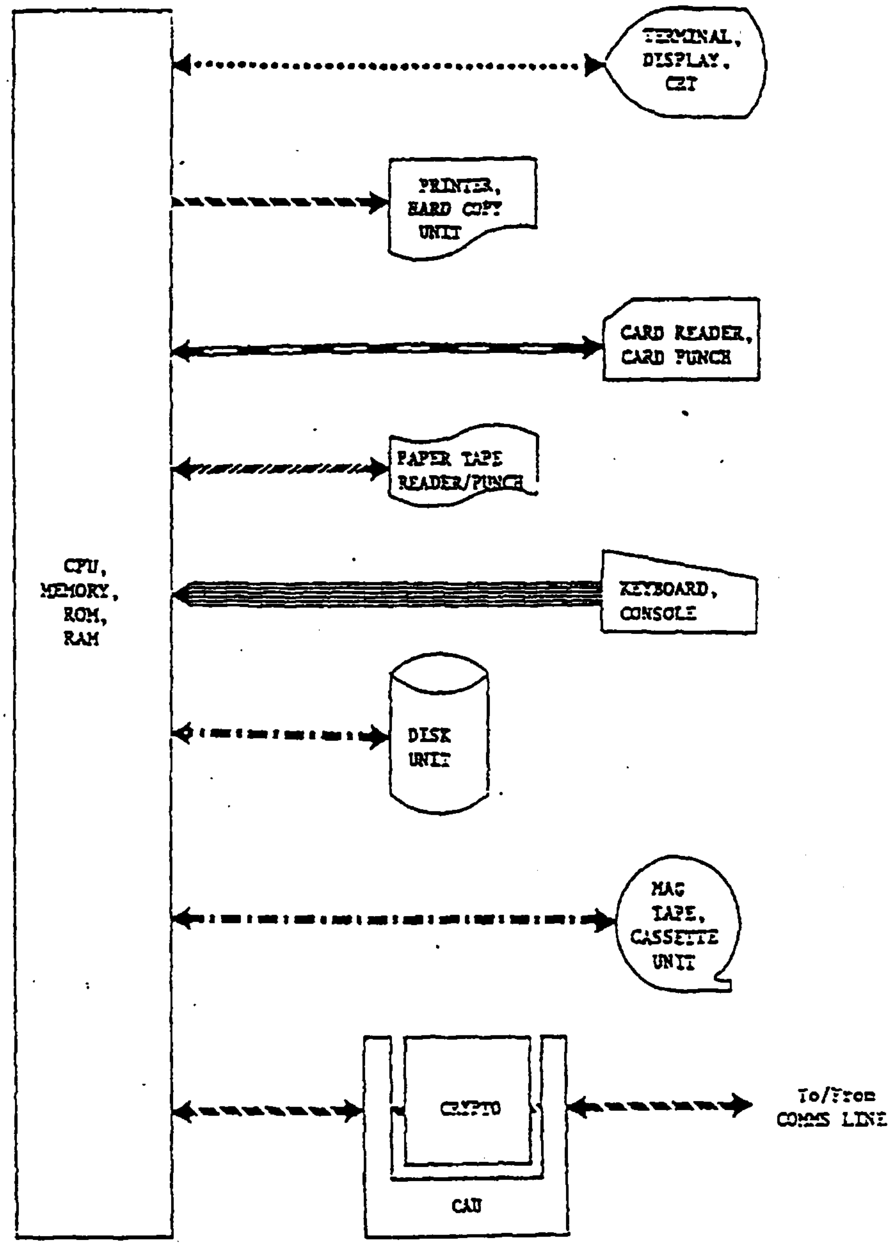
2. (U) "Test Philosophy": Write about types of CE that may be detected from the equipment. A test parameter table shown in Figure G-4 shall be filled in and included to reflect all types of RED signals processed by the EUT, the signaling rates, and the CE that can be expected.

G.3.4. (U) "Test Programs and Procedures" (if applicable)

a. (U) (name of program)

1. (U) "Objective": Write a brief description of what the program will accomplish.

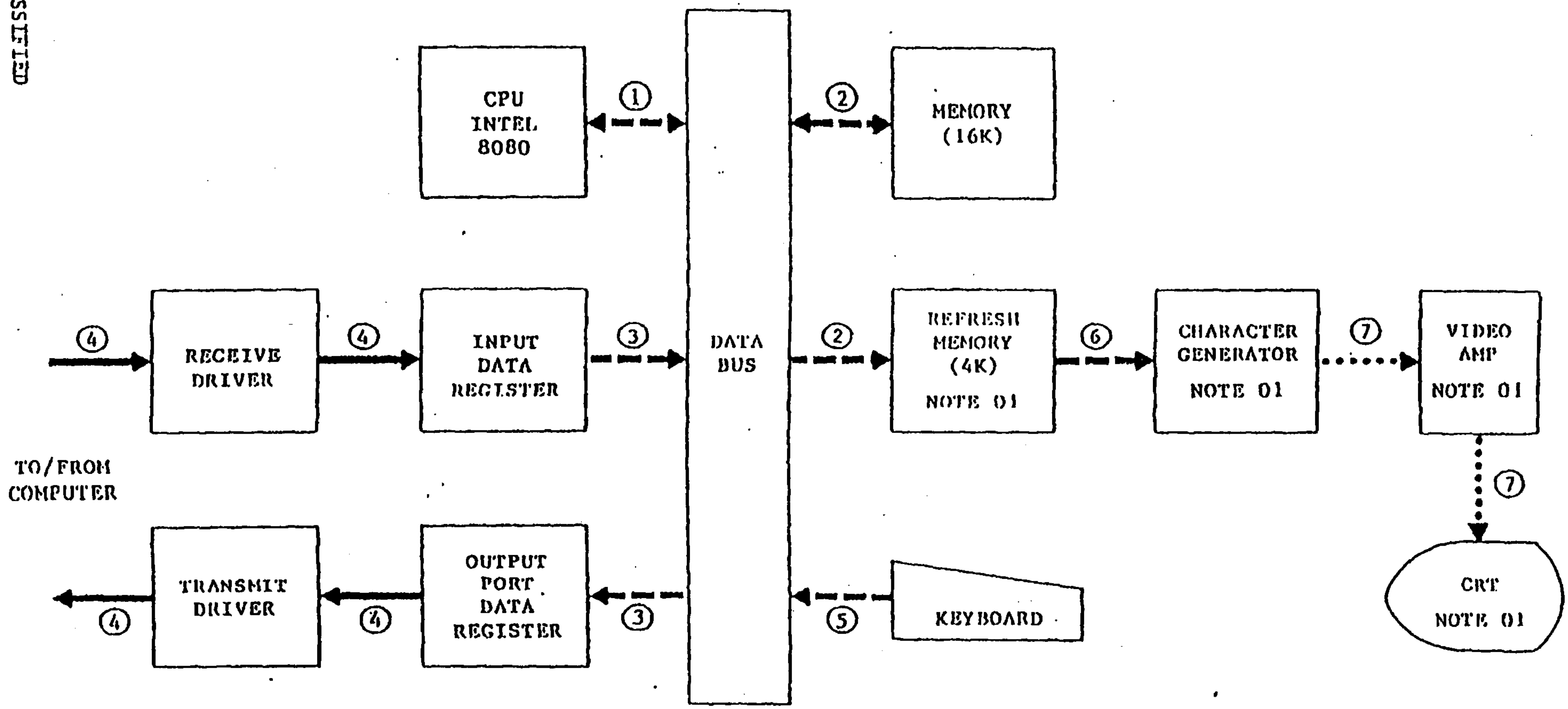
2. (U) "Test Procedure": A step-by-step procedure should be provided. When appropriate, comments and annotations should be included.



LEGEND: The following are suggested Chart-Pac codes

ASCII (Parallel-by-bit)
ASCII (Serial-by-bit)
EBCDIC, HIS (Parallel-by-bit)
EBCDIC, HIS (Serial-by-bit)
ITA-2, BCD (Parallel-by-bit)
ITA-2, BCD (Serial-by-bit)
IBM MIT CODE (Parallel-by-bit)
IBM MIT CODE (Serial-by-bit)
VIMIC (Parallel-by-bit), DOT MATRIX (Hammer Fire)
VIDEO
ANALOG, AUDIO, RF
LITERAL, KEYBOARD MATRIX, HAMMER FIRE LINES
HOLLERITH (Parallel-by-bit)
HOLLERITH (Serial-by-bit)
DIGITIZED VOICE CODES (Serial-by-bit)
CONTROL LINE

Figure G-1 SAMPLE ADP SYSTEM SYSTEM BLOCK DIAGRAM



LEGEND:

ASCII (Serial-by-Bit)

ASCII (Parallel-by-Bit)

VIDEO

Denotes signals of interest.
See TABLE for Test Parameters.

NOTE 01: Represents two CRT systems.

Figure G-2 SAMPLE EQUIPMENT
RED SIGNAL FLOW DIAGRAM

UNCLASSIFIED

TABLE . TEST PARAMETERS FOR

A. SIGNAL SOURCE (SIGNAL OF INTEREST)		
B. SIGNAL TYPE 1. NO. BITS 2. PARITY		
C. TYPE MODULATION		
D. TYPE TRANSFER 1. BYTE SIZE 2. WORD SIZE 3. BLK SIZE		
E. DATA RATE (R_d)E 1. R/F Time (T_t) 2. 0.1÷T_t (R_t) 3. BYTE TIME 4. BYTE + TIME		
F. SYNC POINT (UNIT) 1. PIN 2. CKT FUNCTION		
G. TEST MESSAGE 1. CHAR CODE		
H. TYPE CE		
I. TEST FREQ RANGE		
J. TEST BW RANGE		
CE DETECTED ON PREVIOUS SURVEYS		
K. DOMINANT FREQS. 1. RCVR BW USED 2. TYP S/N @ 1M (dBuV/m/MHz)		

INSTRUCTIONS FOR COMPLETING THE TEST PARAMETER TABLE

A. SIGNAL SOURCE (Signal of Interest) - Enter the circled number ①, ② ③, etc., corresponding to the signals of interest indicated on RED signal flow diagram. Note that there should be a different circled number for each transfer that differs. For example, if there are several 8-bit ASCII parallel transfers with different rates, then a separate entry should be made for each. If desired, the name of the signal source may be included; e.g., ⑤ keyboard character generator.

B. SIGNAL TYPE - Enter code (ASCII, ITA-2, EBCDIC, etc.) for each signal of interest.

1. NO. BITS - Enter number of bits for code including all extra bits (dummy, parity, start, stop, etc.), e.g., "8 + start and 2 stop bits."

2. PARITY - Enter odd, even, or no parity.

C. TYPE MODULATION - Enter type modulation, e.g., RZ, NRZ, NRZ1, MFM, DFM, PCM, PE, AM, FM, RICE, etc.

D. TYPE TRANSFER - Enter SER, PAR, LIT, or ANA for serial, parallel, literal, or analog tranfers, respectively. Also indicate whether serial transfers are SYNC or ASYNC. Literal transfers apply to single unique occurrences such as print hammer fire and keyboard contact, where character codes are not used.

1. BYTE SIZE - Enter number of bits per data element. Include dummy and parity bits if used.

2. WORD SIZE - Enter number of bytes per word.

3. BLOCK SIZE - Enter number of words per block.

E. DATA RATE - Enter the RED analog or RED digital signaling rate (Rd). The RED analog signals shall be determined by the required bandwidth of the signal and shall be expressed in Hertz. For continuously varying baseband signals, this is usually equivalent to the highest required frequency component contained in the signal. The RED digital signaling rate is equal to the reciprocal of the unit bit width and is expressed in bits per second (b/s) and parallel information units per second (PIU), for serial and parallel formats, respectively.

1. R/F TIME - Enter the transition time (Tt) of the RED digital signal. Separate transition times shall be defined for the rise and fall times. The rise and fall times shall be determined by actual measurement or estimated by consideration of system characteristics such as type of logic circuits, filtering, etc. The NACSIM 5110A Tables and Figures appendix include a list of typical rise and fall times for IC families. If justification can be made to show that the rise and fall time cannot be measured or estimated, then except for mechanical switches, the transition time for the RED digital signal shall be determined by using the fall back curve (FBC) included in the NACSIM 5110A Tables and Figures appendix. Indicate with (FBC) if transition time was obtained by using the fallback curve; e.g., 10 usec (FBC).

2. 0.1 - Tt - Enter the RED transition time signaling rate (Rt) which is one-tenth of the reciprocal of the transition time of RED digital signal; e.g., Rt = 0.1/Tt expressed in b/s or PIU. Two RED transition line signaling rates shall be given if required. If the

signal transition time for mechanical switches cannot be measured or estimated, then an Rt of 10 Mb/s shall be assumed.

3. BYTE TIME - Enter time required to transfer a byte of data.

4. BYTE + TIME - Applicable to SE ASYNC signal only. Enter time required to transfer a byte of data plus additional bits such as stop and start bits.

F. SYNC POINT (UNIT) - Enter unit or module for which the synchronuous point is obtained.

1. PIN - Enter sufficient information to identify synchronous point.

2. CKT FUNTION - Enter circuit function that is identified by the synchronous point.

G. TEST MESSAGE - Enter the test message used to identify the signal of interest. For uniformity, the following test messages may be used. (Sp = space)

ASCII - "15 OSp, 20 L, 10 Sp, 20 U"
ITA-2 - "15 KE, 10 A, 5 E, 15 U"
EBCDIC - "15 PSp, 20 A, 10 Sp, 20 N"

1. CHAR CODE - Enter code for characters used in test message.

H. TYPE CE - Using the table below, enter the type or types of CE that may be expected for the signal of interest. A sketch of the predicted CE may also be included in this space if the predicted CE is not apparant. As an example, a sketch of the timing CE for hammer fires from a high speed line printer should be included.

TYPE CE TABLE

FB - FULL BAUD	BD - BIT DENSITY
T10 - TRANSITION 1 - 0	DBD - DIGRAPHIC BD
T01 - TRANSITION 0 - 1	TBD - TRANSITION BD
VID - VIDEO	SIG - SIGNATURE
TIM - TIMING	FP - FINGERPRINT
AUD - AUDIO	CLTX - CLEAR TEXT

I. TEST FREQ RANGE - Enter test frequency range required for signal of interest which is based on the Rd and Rt, and derived from appropriate NACSIM 5110A tables.

J. TEST BW RANGE - Enter test BW range required for signal of interest which is based on the Rd and Rt, and derived from appropriate NACSIM 5110A tables.

K. DOMINANT FREQS - Enter the best bandwidth for item K frequencies at which CE were detected on previous surveys.

1. RCVR BW USED - Enter the best bandwidth for item K frequencies.

2. TYP S/N @ 1 - Enter the signal/noise levels at one meter for the dominant frequencies indicated in item K.

ANNEX H

TEMPEST TEST REPORT OUTLINE

H.1 (U) The technical report is used to provide the customer and other interested agencies complete documentation of the TEMPEST field test. The technical report shall include, but not necessarily be limited to, the following items:

Title Page

Abstract

Table of Contents

List of Illustrations (if desired)

I. Introduction

II. Facility Description

III. TEMPEST Test Plan

IV. Test Results

V. Conclusions

VI. Recommendations

Appendices

A. General Test Philosophy/Procedure (P/O Test Plan)

B. System/Equipment Description (P/O Test Plan)

C. TEMPEST Profile

H.2 (U) Information to be included under outline items listed above shall include, but not necessarily be limited to, the following items:

Title Page

a. (U) Reporting activity

b. (U) Facility and location

c. (U) System/Equipment tested

d. (U) Classification

e. (U) Test dates

f. (U) Test team members

Abstract - The abstract is a concise summary of the contents of the report and informs the reader of the salient features of the field test.

a. (U) The first paragraph should consist of the identification of the site/system/equipment tested and test date(s).

b. (U) The second paragraph should consist of significant findings and/or problems encountered, and whether mods/installation changes were made.

c. (U) The third paragraph should state whether the equipment/system/facility/aircraft complies with the national policy.

d. (U) The fourth paragraph should consist of recommendations/comments. Note any special problems (e.g., CROSSTALK, KG problems), if an exception to the national policy is required, etc.

I. (U) INTRODUCTION

a. (U) The introduction is intended to contribute to the reader's understanding of the purpose of the test and to provide additional background information relevant to the test over and above that provided in the preliminary report. The correspondence establishing the field test and reference material pertaining to scheduling should be noted. In addition, this paragraph should include the dates during which the field test was conducted.

b. (U) The date of the most recent instrumented TEMPEST field test and the results obtained should be noted if applicable. Also, any references such as previous progress reports, tests on similar equipments, etc., may be included.

II. (U) FACILITY DESCRIPTION

a. (U) A list of all RED systems/equipment at/aboard the facility/aircraft/ship should be provided in the TEMPEST Profile. Those that were tested should be identified. Those not tested should also be identified and the reason for not testing indicated in the TEMPEST Profile.

b. (U) A figure illustrating the inspectable space, and the closest point permitting undetected intercept should be included. It should be recognized that quoted distances to the inspectable space are assumed to be the shortest distance in any direction. Thus, floors above and below the equipment must be under the control of the facility if the stated distance to the inspectable space would include those areas. If CE are detected outside the inspectable space, the locations should be indicated on the diagram.

(1) (U) The closest point of undetected intercept of compromising emanations must be determined on a case-by-case basis. This subjective but judicious determination must consider the physical protection afforded the facility being investigated and the areas in which compromising emanations can be detected. It is, for report purposes, the responsibility of the TEMPEST team leader to make the final determination as to the location of the closest point offering possible undetected intercept of compromising emanations.

c. (U) The physical environment (e.g., building location, room location within building, building construction, power distribution, etc.) and the TEMPEST technical environment (e.g., RED/BLACK conditions, filtering, shielding, etc.) of the facility/aircraft (excluding ships) should be documented.

III. (U) TEMPEST TEST PLAN - This paragraph is intended to tie the body of the report to the test plans that are appendices in the report. The following paragraph may be used.

a. (U) A TEMPEST Test Plan normally provides rationale and procedures that may be applied in the tests for radiated and conducted CE expected from the communications and electronic equipment to be tested. It contains functional descriptions of the equipment and provides information on system interconnection, RED data flow, baud, code, type of transfers used, possible sync points, predicted waveforms of CE, and other data essential to the proper conduct of the TEMPEST field test. The test plans are contained in the appropriate appendices.

IV. (U) TEST RESULTS

a. (U) Contents of this paragraph will generally be limited to a discussion of those equipment which at any time during the course of the field test were found not to be in compliance with the national policy and those equipment on which significant findings were obtained. Specific information will include: signal of interest, test media, signal and noise levels, and frequency of and distances to which CE were detected. Photographs and tables to support the test results should be included for amplifying information.

b. (U) The TEMPEST Profile forms should provide the different tests performed on each EUT and all significant test findings.

c. (U) This paragraph should also provide the location of the MDS/ambient profile data within the report.

V. (U) CONCLUSIONS

a. (U) The conclusions must include a statement of compliance or noncompliance with the national policy.

VI. (U) RECOMMENDATIONS

a. (U) The recommendations should address the conclusions stated in the preceding paragraph. If an equipment/system/facility/ship/aircraft is found to be noncompliant with the national policy, a request for an exception to operate should be recommended. Also, specific actions considered necessary to correct any TEMPEST deficiencies or to maintain a secure TEMPEST profile should be addressed. Thus, any modification made during the course of the field test should be noted and be kept in effect for the certification to remain valid.

ANNEX I

INSTRUCTIONS FOR COMPLETING THE TEMPEST PROFILE

Form I

a. Accession No. - Assigned by the TEMPEST Information Center (TIC). Leave blank.

b. Classification - Mark the classification of the report at the top and bottom right of each form.

c. Originating Service or Agency - Enter the group responsible for assigning/ monitoring the test effort; e.g., NESSEC.

d. Orig ID No./Project No. - Enter the originator document identifying control number (project, report, study, task, etc.) of the reporting agency; e.g., Navy field teams use task numbers covered by the reports.

e. Contract No. - Enter the contract number for which the test had been performed, if applicable.

f. Type - Indicate with X, Laboratory, Field, or Study.

g. Testing Organization - Office responsible for the actual performance of the test. Include names of test personnel.

h. Test Standard - Enter the test specification or standard to which the equipment/system was tested; e.g., OPNAVINST C5510.93D.

i. Dates of Test - (1) LAB or Study - Actual dates work was performed. (2) FIELD - Actual on-site test dates.

j. Report Title - Title as it appears on the report cover.

k. Report Date - Date report ready for distribution.

l. Distribution Code - Check the appropriate distribution code.

m. Objectives - Quote the following: "To determine compliance with the National Policy on Control of Compromising Emanations as implemented by (insert agency policy document)."

n. Description - Statement defining activity, activity location, and system tested (This can be the equivalent of the first portion of the Abstract in the TEMPEST report.)

o. Results - Provide a narrative summary of the results of the field test. Information should be provided on (1) any modifications accomplished and their effectiveness; (2) significant findings; unique phenomena observed, etc. Specifically, list those items which failed to comply with the national policy. (This can be the equivalent of the results from the Abstract.)

FORM 1

ACCESSION NO.

CLASSIFICATION

TEMPEST PROFILE

ORIGINATING SERVICE OR AGENCY	ORIG ID NO./PROJ NO. CONTRACT NO.	TYPE LABORATORY ____ FIELD ____ STUDY ____
TESTING ORGANIZATION	TEST STANDARD	DATES OF TEST
REPORT TITLE	REPORT DATE	DISTRIBUTION CODE ALL SCOCE ____ LIMITED ____

OBJECTIVES

DESCRIPTION

RESULTS

CLASSIFICATION

ACCESSION NO.

CLASSIFICATION

TEMPEST PROFILE (CONT.)

RESULTS

CLASSIFICATION

Form 2

a. Classification - Mark the classification of the report at the top and bottom right of the form.

b. Orig ID NO./Project No. - As recorded on form I.

c. Facility - Facility name where test is being conducted.

d. City - City name where facility is located.

e. State - State for the respective city.

f. Country - Country that represents the location of the city/cities previously entered.

g. Item No. - Each hardware item tested shall be given a number. If two or more identical items are tested, each shall be given a different number.

h. Equipment Type - Specify descriptive name for purpose of equipment (e.g., line printer, card reader, magnetic tape unit).

i. Manufacturer - Unless the name of the manufacturer is on the standard list of abbreviations, the full name of manufacturer with any standard short title given in parentheses, e.g., Digital Equipment Corp. (DEC) is to be used. Once the full name has been given, the short title may be used thereafter.

j. Equipment Model No./DoD Nomenclature - Usual short title used for equipment e.g. VIP-7705W, MOD-40, LA-36, etc. Put equipment DoD nomenclature, if known, in parentheses.

k. Serial Number - Provide the serial number of each item tested. If I5 VIP-7705W's are tested, there should be I5 lines used on this page with a different serial number on each line.

l. Maximum Radiated Distance - Maximum distance in meters between EUT and antenna at which emanation is still compromising, e.g., ER-5.

m. Maximum Conducted Distance - Maximum distance in meters between EUT and transducer at which emanation is still compromising, e.g., PLC-2.

n. Failure Maximum Distance (from EUT) - The maximum distance in meters between EUT and transducer at which emanation is still compromising and causes national policy violation.

o. Failure Maximum Distance (beyond CS/AS) - That portion of the distance in item n between the boundary of the CS/AS and the transducer.

p. NPS - Provide the national policy status of each equipment at the end of the field test. Use "PASS" or "FAIL." An asterisk (*) indicates that the team either relocated or modified the equipment during the test.

Note: Items n. and o. are for the same signal. Items l. and m. need not be for the same signal. If no CE are detected, the term "no CE" should be inserted in the appropriate column. If item was not tested, insert term "not tested-" and provide a reason, e.g., "not tested-inoperative," "not tested-unclassified only" or "not tested-sample basis." Entries must be made in all columns.

ORIG ID/PROJ NO.	FACILITY	CITY	STATE	COUNTRY

ITEM NO.	EQUIPMENT TYPE	MANUFACTURER	EQPT MOD NO. (DOD NOMENCLATURE)	SERIAL NO.	MAXIMUM CE DISTANCE (METERS) RADIATED FROM EUT	CONDUCTED FROM EUT	FAILURE FROM EUT	FAILURE BEYOND CS	NPS

LEGEND: MAXIMUM CE DISTANCE

ER - ELECTRIC RADIATION
MR - MAGNETIC RADIATION
FC - FORTUITOUS CONDUCTION
PLC - POWER LINE CONDUCTION
SLC - SIGNAL LINE CONDUCTION
TLC - TELEPHONE LINE CONDUCTION

NPS (NATIONAL POLICY STATUS)

PASS
FAIL
* - EQPT RELOCATED/MODIFIED DURING SURVEY

FORM 2

Form 3

a. Classification - Mark the classification of the report at the top and bottom right of the form.

b. Orig ID No./Project No. - As recorded on form 2.

c. Item No. - As recorded on form 2.

d. Signal of Interest - Enter types of transfers (serial, parallel, literal, or analog) and the types of CE (full baud, video, timing, bit density, etc.) for which tests were conducted. Each transfer and type combination, e.g., PAR-BD, PAR-DBD, or ANA-VID should be entered on a separate line. Two types of CE may be used together to provide more information about the signal, e.g., VID-SIG or VID-CLTX. The signal of interest should be consistent with the test plan.

e. Test Media - Enter the symbol for the medium tested. More than one line may be required for each medium in which CE were detected at more than one meter from the EUT. A line should be used to provide data on the worst media failure (defined to be the signal in the media which goes farthest from the inspectable space). An additional line should be used to provide data on the worst CE (defined to be the signal in the media which goes farthest from the EUT) if different from the worst failure. A single line may be used to list all media in which tests were conducted and no CE detected or in which tests were conducted and CE detected at less than or equal to one meter from the EUT.

f. Freq Range: From/To - Enter the frequency range in MHz over which CE were detected.

g. Freq - Record frequency at which item h. was measured.

h. Signal Levels of CE and of Noise - Corrected levels measured at distance given in item j.

i. BW- Receiver BW used for measurement of item h.

j. Meas Dist - Enter the distance between the transducer and the EUT at the time when item h levels were measured.

k. Max Dist - Maximum distance traveled from the EUT by the CE signal measured in item h.

l. Remarks - Amplifying data that could include items related to signal of interest, maximum distances, and information ratios.

ORIG ID/PROJ NO.

TEST DATA SUMMARY

ITEM NO.	SIGNAL OF INTEREST		TEST MEDIA	FREQ RANGE FROM/TO (MHz)	COMPROMISING EMANATIONS INFORMATION					REMARKS
	TYPE XFER	TYPE CE			FREQ (MHz)	SIGNAL LEVEL CE/NOISE (See Legend)	BW (MHz)	MEAS DIST (METERS)	MAX DIST (METERS)	

LEGEND:

TYPE XFER
- SER - SERIAL
- PAR - PARALLEL
- LIT - LITERAL
- ANA - ANALOG

TYPE CE
- FB - FULL BAUD
- T10 - TRANSITION 1 to 0
- T01 - TRANSITION 0 to 1
- VID - VIDEO
- TIM - TIMING
- AUD - AUDIO
- BD - BIT DENSITY
- DBD - DIGRAPHIC BD
- TBD - TRANSITION BD
- SIG - SIGNATURE
- FP - FINGERPRINT
- CLTX - CLEAR TEXT

SIGNAL LEVEL
- ER - dBuV/m/MHz
- MR - dBuAT/m/MHz
- FC,PLC,SLC,TLC - dBuV/MHz

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