

# NTS Labs, LLC MIL-STD-461G Test Report for the Ethernet Switch Box

## Prepared For

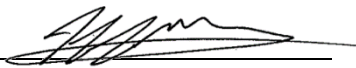
Amphenol Aerospace | 40-60 Delaware Ave | Sidney, NY 13838

## Prepared By

NTS Labs, LLC | 36 Gilbert Street South | Tinton Falls, NJ 07701 | 732-936-0800 | [www.nts.com](http://www.nts.com)

Handwritten signature of Brett Leslie in blue ink.

Brett Leslie  
Senior Technical Writer

Handwritten signature of Jeff Maselli in blue ink.

Jeff Maselli  
EMI Project Engineer

Handwritten signature of Mark Betts in blue ink.

Mark Betts  
Quality Management Representative

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**Revision History**

<b>Rev.</b>	<b>Description</b>	<b>Issue Date</b>
0	Initial Release	10/25/2022



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## 1.0 Introduction

### 1.1 Purpose

The purpose of this report is to document the procedural steps for testing and criteria for evaluating the results of the MIL-STD-461G Electromagnetic Interference (EMI) testing of the Ethernet Switch Box. The test program was conducted to determine the ability of the Ethernet Switch Box to successfully satisfy the requirements specified in Section 4.

This EMI Test Report (EMITR) is contracted by Amphenol Aerospace. It is the end user who is ultimately responsible for the compliance of the equipment installed. The contracted test facility is NTS Labs, LLC in Tinton Falls, New Jersey.

### 1.2 Acronyms

<b>BIT</b>	Built-In-Test	<b>EUT</b>	Equipment Under Test
<b>CE</b>	Conducted Emissions	<b>FCC</b>	Federal Communications Commission
<b>CI</b>	Commercial Item	<b>FFT</b>	Fast Fourier Transform
<b>CS</b>	Conducted Susceptibility	<b>FWHM</b>	Full Width Half Maximum
<b>DID</b>	Data Item Description	<b>GFE</b>	Government Furnished Equipment
<b>DoD</b>	Department of Defense	<b>ISO</b>	International Organization for Standardization
<b>DSPO</b>	Defense Standardization Program Office	<b>LISN</b>	Line Impedance Stabilization Network
<b>E3</b>	Electromagnetic Environmental Effects	<b>MAD</b>	Magnetic Anomaly Detectors
<b>EMC</b>	Electromagnetic Compatibility	<b>NDI</b>	Non-Developmental Item
<b>EME</b>	Electromagnetic Environment	<b>RE</b>	Radiated Emissions
<b>EMI</b>	Electromagnetic Interference	<b>RF</b>	Radio Frequency
<b>EMICP</b>	Electromagnetic Interference Control Procedures	<b>RMS</b>	Root Mean Square
<b>EMITP</b>	Electromagnetic Interference Test Procedures	<b>RS</b>	Radiated Susceptibility
<b>EMITR</b>	Electromagnetic Interference Test Report	<b>TEM</b>	Transverse Electromagnetic
<b>ERP</b>	Effective Radiated Power	<b>TPD</b>	Transient Protection Device
<b>ESD</b>	Electrostatic Discharge		

### 1.3 Definitions

**Above Deck** is an area on ships which is not considered to be “below deck” as defined herein.

**Below Deck** is an area on ships which is surrounded by a metallic structure, or an area which provides significant attenuation to electromagnetic radiation, such as the metal hull or superstructure of a surface ship, the pressure hull of a submarine and the screened rooms in non-metallic ships.

**Decibel (dB)** is a logarithmic unit of measurement that expresses the magnitude of a physical quantity (usually power or intensity) relative to a specified or implied reference level.

**Metric Units** are a system of measures defined by the International System on Units based on the “Le System International d’ Unites (SI)”, of the International Bureau of Weights and Measures. These units are described in ASTM E3380.

**Non-Developmental Item** is a broad, generic term that covers material available from a wide variety of sources both industry and Government with little or no development effort required by the procuring activity.

**Octave** refers to the interval between one frequency and another with double its frequency.

**Semi-Anechoic Chamber** refers to a chamber with RF absorber lining on all walls and ceiling, but not the floor.

**Safety Critical** is a category of subsystems and equipment whose degraded performance could result in loss of life or loss of vehicle platform.

**Test Setup Boundary** includes all enclosures of the EUT and interconnecting and power leads required by MIL-STD-461G.

**2.0 References**

The following listed in Tables 2.0-1 and 2.0-2 form a part of this document to the extent specified herein.

**Table 2.0-1: Government Specifications, Standards, and Handbooks**

No	Specification	Title
1	MIL-STD-461G	<i>Department of Defense Interface Standard, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment</i> , dated December 11, 2015
2	DI-EMCS-80200C	<i>Data Item Description Electromagnetic Interference Test Report (EMITR)</i> , dated November 30, 2007

**Table 2.0-2: Other Documents, Drawings, and Publications**

No	Document	Title
3	ISO/IEC 17025:2017(E)	<i>General Requirements for the Competence of Testing and Calibration Laboratories</i> , dated 11/01/2017
4	NTS QPM	NTS Labs, LLC Quality Policy Manual, Rev 10 dated 8/1/2019
5	ANSI NCSL Z540-1	<i>Calibration Laboratories and Measuring and Test Equipment—General Requirements</i>
6	441971	Amphenol Aerospace Purchase Order, dated 08/08/2022
7	Signed COS	Amphenol Aerospace Purchase Order, dated 08/26/2022
8	OP0622062-0	NTS Labs, LLC Quotation, dated 07/22/2022
9	062-QTP Final Draft	Qualification Test Plan and Procedure for Ethernet Switch, Document Number: L-40978-192, Revision A, dated 08/01/2022

### 3.0 Equipment Under Test

#### 3.1 Description

The Equipment Under Test (EUT) for this test program is the Ethernet Switch Box.

**Table 3.1-1: EUT Information**

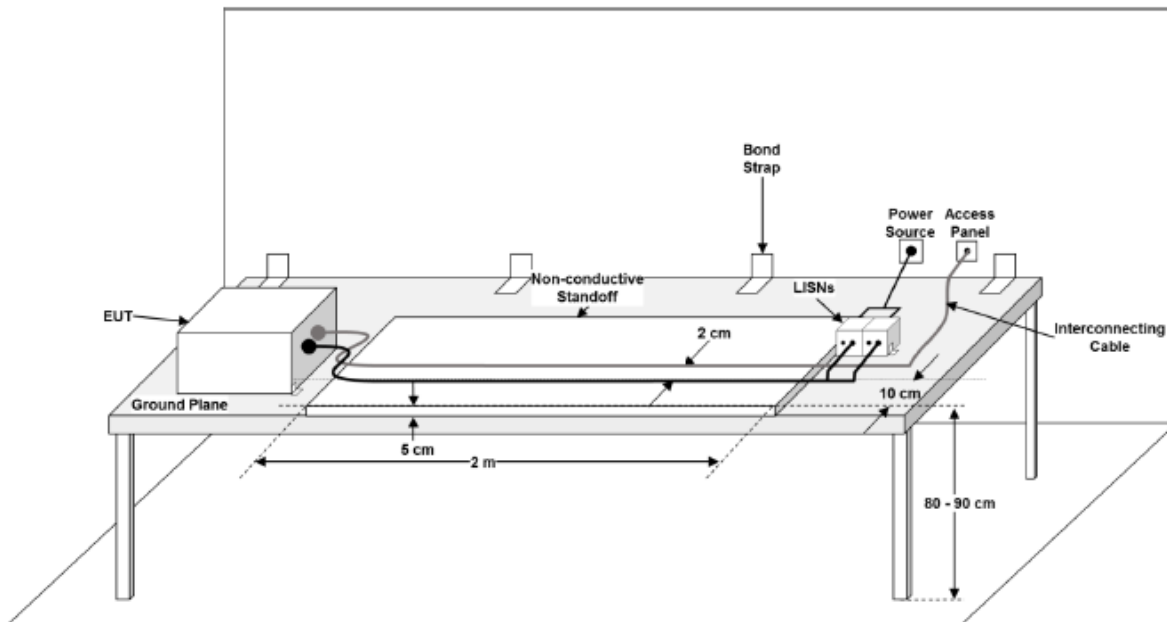
Item	Qty.	Name/Description	Part Number	Serial Number
1	1	Ethernet Switch Box	CF-020400-06	N/A

**Table 3.1-2: EUT Power Input Information**

<b>Voltage:</b>	28 VDC
<b>Frequency:</b>	DC
<b>Current:</b>	6 Amps max
<b>Power Factor:</b>	1

The Ethernet Switch Box is assembled using a specially configured ruggedized 1/10 GbE network switch. The intended installation is the U-2 airborne system.

#### 3.2 EUT System Setup



**Figure 3.2-1: Ethernet Switch Box Setup Overview**

#### 3.3 EUT Operation and Monitoring

The Ethernet Switch Box was operated and monitored by Amphenol Aerospace personnel.

#### 3.4 Pass/Fail Criteria

The Pass/Fail criteria for the Ethernet Switch Box was defined by the EMITP, specified in Table 2.0-2.



### 3.5 EMI Suppression Devices

At the time of testing, no EMI suppression devices were added to the EUT in order to achieve compliance.

### 3.6 EUT Bonding / Grounding Requirements

The bonding / grounding requirements for the Ethernet Switch Box was defined by the EMITP, specified in Table 2.0-2.

### 3.7 EUT Cabling

The EUT cabling requirements for the Ethernet Switch Box was defined by the EMITP, specified in Table 2.0-2.

### 3.8 Non-Developmental Items (NDI) and Government Furnished Equipment (GFE)

The Ethernet Switch Box does not contain any Non-Developmental Items (NDI) and Government Furnished Equipment (GFE).

### 3.9 Security Classification

The Ethernet Switch Box is considered an unclassified defense article. While unclassified, it should be handled only by authorized personnel. This equipment contains technical data within the definition of the International Traffic in Arms Regulations, and is subject to the export control laws of the USG. Retransfer of this data by any means to any Foreign Person, whether in the United States or abroad, without the written approval of the U. S. Department of State, is prohibited. See CFR 22 Parts 120-130.

## 4.0 Test Requirements

This section provides an overview of the EMI test requirements and general information.

### 4.1 Test Facility Location

All testing was performed at NTS Labs, LLC, located in Tinton Falls, NJ, USA.

### 4.2 Test Resources

#### 4.2.1 Test Equipment

Lists of the NTS Labs, LLC-provided equipment used during testing are included in each test section. This equipment is calibrated according to ISO/IEC 17025, and calibration is traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at NTS Labs, LLC.

#### Measurement Tolerances

Unless otherwise stated for a particular measurement, the tolerance shall be as follows:

- Distance:  $\pm 5\%$
- Frequency:  $\pm 2\%$
- Amplitude, measurement receiver:  $\pm 2$  dB
- Amplitude, measurement system (includes measurement receivers, transducers, cables, and so forth):  $\pm 3$  dB
- Time (waveforms):  $\pm 5\%$
- Resistors:  $\pm 5\%$
- Capacitors:  $\pm 20\%$

#### 4.2.2 Test Automation and Data Collection Software

Various software packages are used for test automation and data collection, depending on the test type. Refer to Appendix A for detailed information on the software used for each test.

### 4.3 General Test Requirements

#### 4.3.1 Test Facility

The NTS Labs, LLC laboratory, located in Tinton Falls, NJ, is accredited to ISO/IEC 17025.

All testing occurred within a shielded semi anechoic enclosure or shielded room, located in Tinton Falls, NJ. Semi anechoic chambers are lined with anechoic Radio Frequency (RF) absorbing tiles and cones on the walls and the ceiling. Peripheral equipment is located outside the shielded enclosure. All power leads entering the shielded enclosures will be routed via electromagnetic interference filters to provide at least 80 dB of attenuation above 10 kHz when measured in accordance with MIL-STD-220B. Interconnecting cables are routed via feed-through ports when practical. Shielding effectiveness to electric fields and plane waves of this EMI test chamber exceed 80 dB from 14 kHz-10 GHz, and 60 dB from 10 GHz-40 GHz.

#### 4.3.2 Ground Plane

The table-top ground plane was copper, measuring at least 2.5 square meters in area with the smaller side no less than 76 cm. The ground plane is electrically bonded to the floor of the shielded enclosure at least once every 1 meter. The metallic bond straps are solid and maintain a five-to-one ratio or less in length to width. The DC resistance between the ground plane and the shielded enclosure is less than 2.5 mΩ.

#### 4.3.3 Power Source Impedance

The impedance of power sources providing input power to the EUT are controlled by LISNs for all measurement procedures of this document unless otherwise stated in a particular test procedure. LISNs are not be used on output power leads. The LISNs are located at the power source end of the exposed length of power leads. The LISN impedance characteristics are in accordance with Figure 4.3-2. The LISN impedance are measured periodically under the following conditions:

- The impedance shall be measured between the power output lead on the load side of the LISN and the metal enclosure of the LISN.
- The LISN signal output port has a 50 Ω termination.
- The power input terminal on the power source side of the LISN shall be un-terminated.

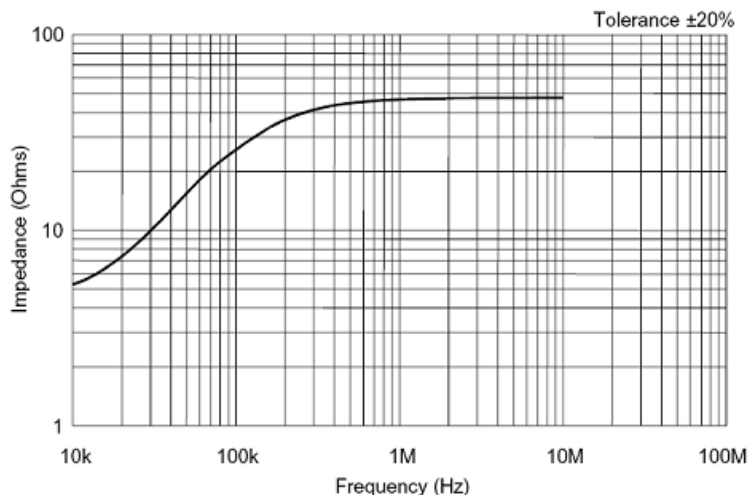


Figure 4.3-2: LISN Impedance Example

Refer to Appendix B for LISN Impedance plots for the specific LISNs used for tests in this report.

### 4.4 Emissions Testing

#### Receiver Bandwidth and Measurement Time

The measurement receiver bandwidths listed in Table 4.4-1, which are derived from MIL-STD-461G, are used for emissions testing. These bandwidths are specified at the 6 dB down points for the overall selectivity

curve of the receivers. Video filtering is not used to bandwidth limit the receiver response. A controlled video bandwidth is available on the measurement receivers used; it was set to its greatest value. This value was 50MHz.

**Table 4.4-1: Bandwidth and Measurement Times**

Frequency Range	6 dB Bandwidth	Dwell Time <sup>1</sup>	Min Measurement Time of Analog Measurement Receiver
30 Hz-1 kHz	10 Hz	0.15 sec	0.015 sec/Hz
1 kHz-10 kHz	100 Hz	0.015 sec	0.15 sec/kHz
10 kHz-150 kHz	1 kHz	0.015 sec	0.015 sec/kHz
150 kHz-30 MHz	10 kHz	0.015 sec	1.5 sec/MHz
30 MHz-1 GHz	100 kHz	0.015 sec	0.15 sec/MHz
> 1GHz	1 MHz	0.015 sec	15 sec/GHz

#### Ambient Electromagnetic Level

During testing, the ambient electromagnetic level is measured with EUT de-energized and all auxiliary equipment turned on and shall be at least 6 dB below the allowable specified limits. Ambient conducted levels on power leads are measured with the leads disconnected from the EUT and connected to a resistive load which draws the same current as the EUT. The ambient are recorded in the EMITR.

#### 4.5 Susceptibility Testing

For susceptibility measurements, the entire frequency range for each applicable test are scanned. For swept frequency susceptibility testing, frequency scan rates and frequency step sizes of signal sources did not exceed the values listed in Table 4.5-1. The rates and step sizes are specified in terms of a multiplier of the tuned frequency ( $f_0$ ) of the signal source. Analog scans refer to signal sources which are continuously tuned. Stepped scans refer to signal sources which are sequentially tuned to discrete frequencies. Stepped scans dwell at each tuned frequency for 3 seconds. Scan rates and step sizes are decreased when necessary to permit observation of a response.

**Table 4.5-1: Susceptibility Scanning**

Frequency Range	Analog Scans Max Scan Rates	Stepped Scans Max Step Size
30 Hz - 1 MHz	$0.0333f_0/\text{sec}$	$0.05 f_0$
1 MHz - 30 MHz	$0.00667 f_0/\text{sec}$	$0.01 f_0$
30 MHz - 1 GHz	$0.00333 f_0/\text{sec}$	$0.005 f_0$
1 GHz - 40 GHz	$0.00167 f_0/\text{sec}$	$0.0025 f_0$

#### Susceptibility Criteria

The susceptibility criteria are defined by Section 3.4.

#### Modulation of Susceptibility RF Signals

Susceptibility test signals for RS103 and CS114 are pulse modulated (on/off ratio of 40 dB minimum) at 1 kHz rate with a 50% duty cycle.

#### Thresholds of Susceptibility

When susceptibility indications are noticed in EUT operation, a threshold level shall be determined when possible, and where the susceptible condition shall be no longer present. Thresholds of susceptibility are determined as follows:

- When a susceptibility condition is detected, the interference signal shall be reduced until the EUT recovered.
- The interference shall be reduced by an additional 6 dB.
- The interference signal shall be gradually increased until the susceptibility condition reoccurred.
- The level, frequency range of occurrence, frequency and level of greatest susceptibility, and other test parameters, as applicable will be recorded.



**5.0 Test Methods, Procedures and Test Results**

**Table 5.0-1: Test Methods and Test Results Summary**

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	CE102, Conducted Emissions	MIL-STD-461G and 062-QTP_final draft	Tinton Falls	10/19/2022 - 10/21/2022	CF-020400-06	N/A	Did not comply
5.2	RE102, Radiated Emissions	MIL-STD-461G and 062-QTP_final draft	Tinton Falls	10/19/2022 - 10/21/2022	CF-020400-06	N/A	Passed

The decision rule for Test Results was based on the Test Specification used for testing.

## 5.1 CE102, Conducted Emissions: Conducted Emissions, Radio Frequency Potential, Power Leads

### 5.1.1 CE102 Purpose

This test verifies that electromagnetic emissions from the EUT do not exceed the limit specified in Figure 5.1-1 for input leads, including returns, in the frequency range of 10 kHz-30 MHz.

### 5.1.2 CE102 Limit

This requirement is applicable for power leads, including returns that obtain power from other sources not part of the EUT.

The upper frequency limit shall be extended to 30 MHz.

The test setup shown in MIL-STD-461G, figure CE102-3 shall be used, except that where practical the length of the cable between the LISN and the EUT power input shall be shortened to 0.5 meter for measurements between 10 MHz and 30 MHz in lieu of the 2-meter length specified in paragraph 4.3.8.6.2 of MIL-STD-461G.

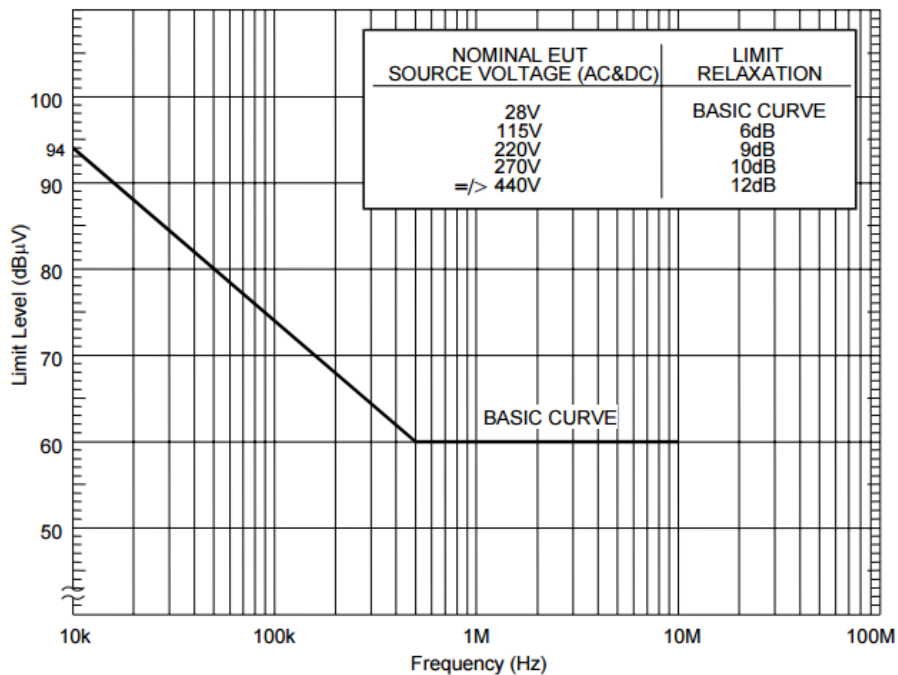


Figure 5.1-1: CE102 Limit (EUT Power Leads, AC and DC) for all Applications

### 5.1.3 CE102 EUT Test Setup

The EUT was set up in accordance with Section 3.2, Figure 3.2-1, and operated according to Section 3.3.

### 5.1.4 CE102 Measurement System Check

With the EUT power off, the test setup was configured for the system check in accordance with Figure 5.1-2.

1. The measurement system check was performed prior to testing the EUT.
2. The measurement equipment was turned on, and sufficient time was allowed for stabilization.

3. A signal level of 90 dB $\mu$ V at 10.5 kHz and 100 kHz was applied to the power output terminal of the LISN. At 10.5 kHz and 100 kHz, an oscilloscope was used, in high impedance mode, to verify that there was a proper signal level at the LISN and verify that it was sinusoidal. After establishing the proper signal at the LISN, the LISN was disconnected and the resulting voltage was measured using an oscilloscope with 50 ohm input impedance. The ratio of the LISN voltage to the 50 ohm voltage measurement must be within the following tolerances: at 10.5 kHz = -14 dB (+1 dB/-2 dB) and at 100 kHz = -3 dB (+1 dB/-2 dB).
4. A signal level was applied that is at least 6 dB below the limit at 10.5 kHz, 100 kHz, 1.95 MHz and 9.8 MHz to the power output terminal of the LISN. At 10.5 kHz and 100 kHz, an oscilloscope was used to calibrate the signal level. At 1.95 MHz, 9.8 MHz, and 29.5 MHz the calibrated output level directly from a 50  $\Omega$  signal generator was used.
5. The measurement receiver was scanned for each frequency in the same manner as a normal data scan.
6. The measurement receiver must indicate a level  $\pm$ 3 dB of the calibrated injected level.
7. Steps 3-6 were repeated for each LISN.
8. An ambient measurement was performed across the frequency range with the EUT power leads disconnected and with a resistor rated to draw the same current as the EUT. All auxiliary support equipment was powered during this measurement.
9. Corrections factors for the 20 dB attenuator cables and the voltage drop due to the LISN 0.25 microfarad coupling capacitor were added to the raw data collected from the measurement receiver. For example: *Attenuator (dB) + Cable (dB) + LISN insertion loss (dB) + Raw Data (dB $\mu$ V) = corrected data (dB $\mu$ V).*

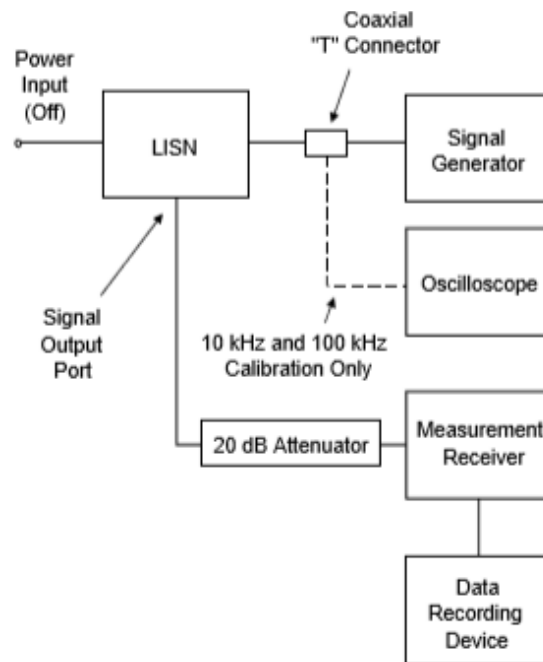
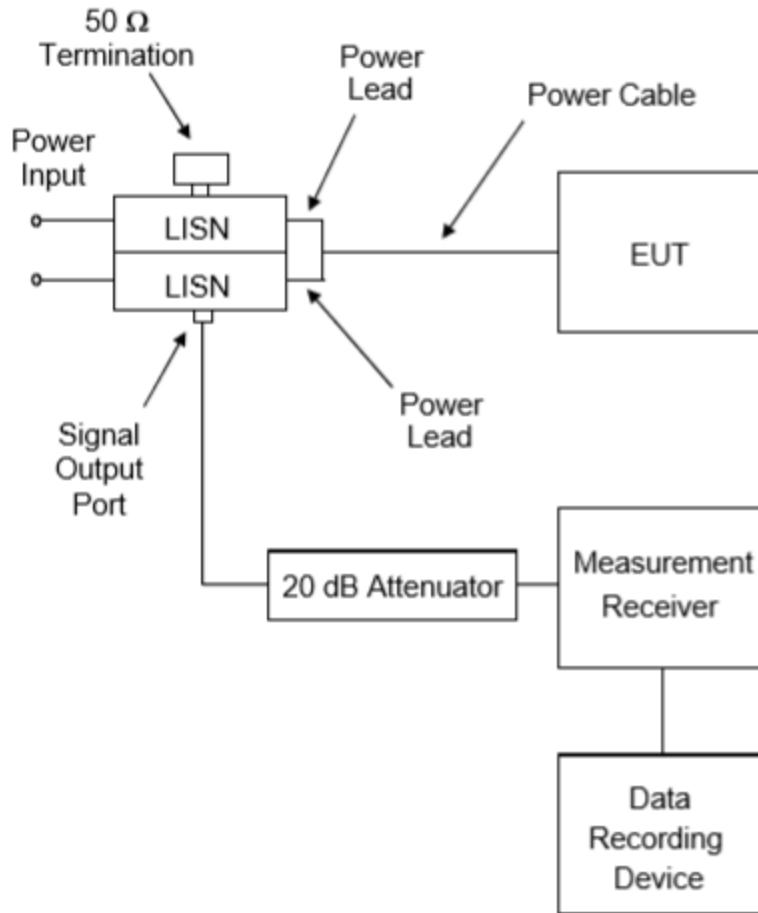


Figure 5.1-2: CE102 Measurement System Check Setup

### 5.1.5 CE102 Test Procedure

The test setup was configured in accordance with Figure 5.1-3.

1. An appropriate lead was selected for testing.
2. The measurement receiver was scanned over the frequency range of 10 kHz - 30 MHz, using the bandwidths and minimum measurement times specified in Table 4.4-1.
3. Corrections factors for the 20 dB attenuator cables and the voltage drop due to the LISN 0.25 microfarad coupling capacitor were added to the raw data collected from the measurement receiver. For example: *Attenuator (dB) + Cable (dB) + LISN insertion loss (dB) + Raw Data (dB $\mu$ V) = corrected data (dB $\mu$ V).*
4. Steps 1 through 3 were repeated for each power lead.



**Figure 5.1-3: CE102 Measurement Setup**

**5.1.6 CE102 Test Results, Conclusions and Recommendations**

The EUT did not comply. A test deviation occurred. For details, refer to the Notice of Deviation (NOD) section.

At the time of testing, no remedial actions were taken in order to achieve compliance with the requirements. No corrective measures have been recommended.



5.1.7 CE102 Notice of Deviation (NOD)



NOTICE OF DEVIATION

<b>Client:</b>	Amphenol Aerospace	<b>Job #:</b>	PR163842	<b>NOD #:</b>	1
<b>P. O. #:</b>	N/A	<b>Date of Deviation:</b>	10/21/2022	<b>CAR #:</b>	N/A
<b>Notification Made To:</b> <i>(Client Contact)</i>	Jared Sibrava	<b>Notification Made By:</b>	Tristian Gaines		
<b>If notification was not made, provide justification:</b>	N/A				
<b>Date:</b>	10/21/2022	<b>Via:</b>	Email		
<b>Test:</b>	CE102	<b>Test Item:</b>	Ethernet SwitchBox		
<b>Specification:</b>	062-QTP-Final Draft	<b>Model or P/N:</b>	CF-020400-06		
<b>Revision/Date:</b>	0	<b>Serial Number:</b>	N/A		

**REQUIREMENTS:** *(Reference paragraph or section of specification)*

5.5.2 CE102 limits. Conducted emissions on power leads shall not exceed the applicable values shown on Figure CE102-1.

**DESCRIPTION OF DEVIATION**

The EUT exceeded the limit.

**DISPOSITIONS/COMMENTS/RECOMMENDATIONS:**

N/A

(Notified via email, 10/21/22)

Client Test Witness (if applicable) \_\_\_\_\_ Date

NTS Quality Representative \_\_\_\_\_ 10/21/22  
Date

NTS Project Manager \_\_\_\_\_ 10/21/22  
Date

Government QAR (if applicable) \_\_\_\_\_ Date

**NOTE: IT IS THE CLIENT'S RESPONSIBILITY TO ANALYZE AND DISPOSITION DEVIATIONS ON CLIENT TEST PROGRAMS.**

<b>FOR NTS QA USE:</b>	<b>Tracking Code:</b> 5
	<b>Risk Level:</b> Low

**Tracking Codes:**

1. Employee Error - Training	2. Employee Error - Process	3. Test Equipment Problem	4. Equipment Limitations	5. Customer Item Problem	6. Other
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**Risk Levels:**

Low	Medium	High
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COR 16.0, REV. 6





5.1.8 CE102 Test Datasheets and Log Sheet

NTS Labs LLC												
MIL-STD-461 CE102 Bandwidth, Measurement Time and Frequency Resolution												
Project :		PR163842					Customer:		Amphenol Aerospace			
EUT:		Ethernet Switch Box					Model:		CF-020400-06			
Procedure:		062-QTP_final draft					Date:		10/19/2022			
Start Freq. (MHz)	Stop Freq. (MHz)	MIL-STD-461G Table II Min. Meas. Time (sec/MHz)	Table II 6dB Resolution BW (MHz)	Min. Meas. time for this band (sec)	Number of Sweep Points	Min. Number of ranges needed	Minimum Measurement Time per Range (sec)	Sampling Resolution (MHz)	Scan Settings Meet or Exceed 1% Requirement?	Scan Settings Meet or Exceed 2xRBW Requirement?	Acceptable Scan Settings?	
0.01	0.15	15	0.001	2.1	1001	1	2.1	0.00013986	No	Yes	Yes	
0.15	1	1.5	0.01	1.275	1001	1	1.275	0.00084915	Yes	Yes	Yes	
1	5	1.5	0.01	6	1001	1	6	0.00399600	Yes	Yes	Yes	
5	15	1.5	0.01	15	1001	1	15	0.00999001	Yes	Yes	Yes	
15	25	1.5	0.01	15	1001	1	15	0.00999001	Yes	Yes	Yes	
25	30	1.5	0.01	7.5	1001	1	7.5	0.00499500	Yes	Yes	Yes	



NTS Labs LLC					
MIL-STD-461 CE102 System Verification					
<b>Project :</b>	PR163842	<b>Customer:</b>	Amphenol Aerospace		
<b>EUT:</b>	Ethernet Switch Box	<b>Model:</b>	CF-020400-06		
<b>Procedure:</b>	062-QTP_final draft	<b>Date:</b>	10/19/2022		
<b>Remarks:</b> Apply a calibrated signal level, which is at least 6 dB below the applicable limit at 10.5 kHz, 100 kHz, 1.95 MHz and 9.8 MHz to the power output terminal of the LISN. At 10.5 kHz and 100 kHz, use an oscilloscope to calibrate the signal level and verify that it is sinusoidal. At 1.95 MHz and 9.8 MHz, use a calibrated output level directly from a 50 ohm signal generator.					
<b>CE102 Limit:</b>	Limit for all applications, 28V				
Frequency (MHz)	Conducted Emissions Limit (dBuV)	10.5kHz and 100kHz Oscilloscope Target Voltage (mVrms)	1.95MHz and 9.8MHz Target Voltage on the Spectrum Analyzer (dBuV)	Signal Generator Setting (dBm)	
0.0105	93.6	21.321	Not Applicable	Manually Adjust	
0.1	74.0	2.239	Not Applicable	Manually Adjust	
1.95	60.0	Not Applicable	53	-53.0	
9.8	60.0	Not Applicable	53	-53.0	
CE102 Verification Results					
Frequency (MHz)	LISN Line Tested	Expected Result (dBuV)	Actual Result (dBuV)	Deviation (dB)	Result
0.0105	Line 1	86.58	85.6	-0.98	PASS
0.1	Line 1	67.00	67.8	0.80	PASS
1.95	Line 1	53.00	52.7	-0.30	PASS
9.8	Line 1	53.00	52.6	-0.40	PASS
29.5	Line 1	53.00	52.9	-0.10	PASS
0.0105	Line 2	86.58	85.2	-1.38	PASS
0.1	Line 2	67.00	66.9	-0.10	PASS
1.95	Line 2	53.00	52.6	-0.40	PASS
9.8	Line 2	53.00	53.2	0.20	PASS
29.5	Line 2	53.00	53.5	0.50	PASS
<b>Test Performed By:</b>	Tristian Gaines		<b>Test Date:</b>	10/19/2022	



NTS Labs LLC						
MIL-STD-461 CE102 System Verification						
<b>Project :</b>	PR163842	<b>Customer:</b>	Amphenol Aerospace			
<b>EUT:</b>	Ethernet Switch Box	<b>Model:</b>	CF-020400-06			
<b>Procedure:</b>	062-QTP_final draft	<b>Date:</b>	10/19/2022			
Remarks: Apply a signal level of 90 dB $\mu$ V at 10.5 kHz and 100 kHz to the power output terminal of the LISN. At 10.5 kHz and 100 kHz, use an oscilloscope, in high impedance mode, to verify that there is a proper signal level at the LISN and verify that it is sinusoidal. After establishing the proper signal at the LISN, disconnect LISN and measure resulting voltage using an oscilloscope with 50 ohm input impedance. The ratio of the LISN voltage to the 50 ohm voltage measurement must be within the following tolerances: at 10.5 kHz = -14 dB (+1 dB/-2 dB) and at 100 kHz = -3 dB (+1 dB/-2 dB).						
LISN	Frequency (MHz)	90dB $\mu$ V (31.62mV), 1M $\Omega$ Oscilloscope Voltage at LISN (mVrms)	50 $\Omega$ Oscilloscope Voltage - Direct Measurement (mVrms)	LISN voltage ratio	Is waveform sinusoidal?	Result
Line1	0.0105	31.6	169	14.56	Yes	PASS
	0.1	31.6	41.4	2.35	Yes	PASS
LISN	Frequency (MHz)	90dB $\mu$ V (31.62mV), 1M $\Omega$ Oscilloscope Voltage at LISN (mVrms)	50 $\Omega$ Oscilloscope Voltage - Direct Measurement (mVrms)	LISN voltage ratio	Is waveform sinusoidal?	Result
Line 2	0.0105	31.6	169	14.56	Yes	PASS
	0.1	31.6	40	2.05	Yes	PASS
<b>Test Performed By:</b>	Tristian Gaines		<b>Test Date:</b>	10/19/2022		

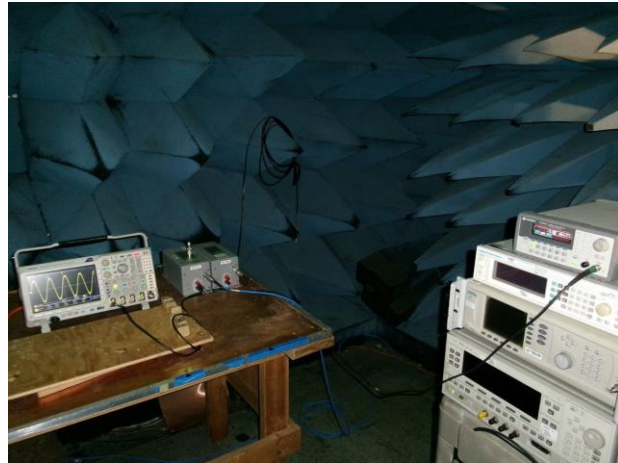


NTS Labs LLC			
MIL-STD-461 CE102 Data Sheet			
<b>Project :</b>	PR163842	<b>Customer:</b>	Amphenol Aerospace
<b>EUT:</b>	Ethernet Switch Box	<b>Model:</b>	CF-020400-06
<b>Procedure:</b>	062-QTP_final draft	<b>Date:</b>	10/19/2022
<b>Input Voltage:</b>	28VDC	<b>Frequency:</b>	DC
<b>Pre-Test Physical Inspection:</b>	PASS	<b>Observation:</b>	None
<b>Pre-Test Operational Inspection:</b>	PASS	<b>Observation:</b>	None
EUT Power Line Tested	Limit Level	EUT Mode of Operation	Test Result
+28VDC	Limit for all applications, 28V	Normal	FAIL
Return	Limit for all applications, 28V	Normal	PASS
<b>Post-Test Physical Inspection:</b>	PASS	<b>Observation:</b>	None
<b>Post-Test Operational Inspection:</b>	PASS	<b>Observation:</b>	None
<b>Test Performed By:</b>	Tristian Gaines	<b>Test Date:</b>	10/19/2022

NTS Labs LLC			
MIL-STD-461 CE102 Log Sheet			
<b>Project :</b>	PR163842	<b>Customer:</b>	Amphenol Aerospace
<b>EUT:</b>	Ethernet Switch Box	<b>Model:</b>	CF-020400-06
<b>Procedure:</b>	062-QTP_final draft	<b>Date:</b>	10/19/2022
Date	Time	Log Entries	Initials
10/19/22	0745	Lockheed witness arrived.	TG
	0934	System checks complete.	↓
	1000	Amphenol will be coming 10/20/2022 with an ethernet sheath and 2 unshielded power cables. Doing RE system checks in the meantime.	↓
10/21/22	1055	Began Ambient Checks.	TG
	1315	CE102 outage on +28VDC at 1.2MHz.	
<b>Test Performed By:</b>	Tristian Gaines		

**5.1.9 CE102 Photographs**

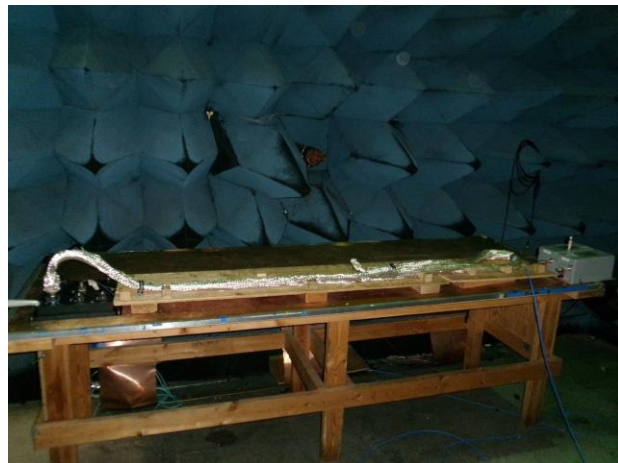
CE102 LISN Vdrop Check



CE102 Signal Path Check



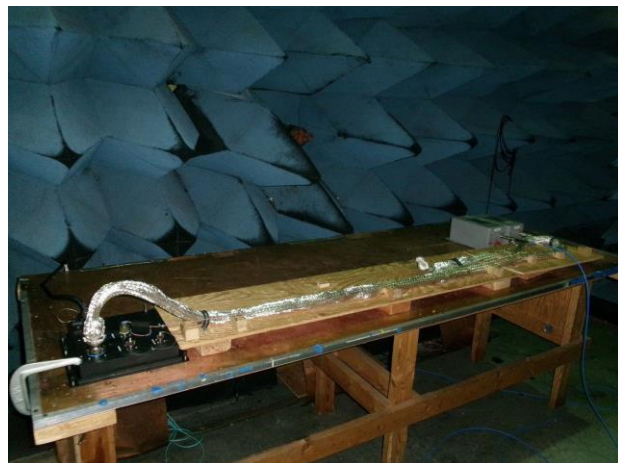
CE102 Ambient Check



CE102 Test, Line 1, 10kHz-10MHz



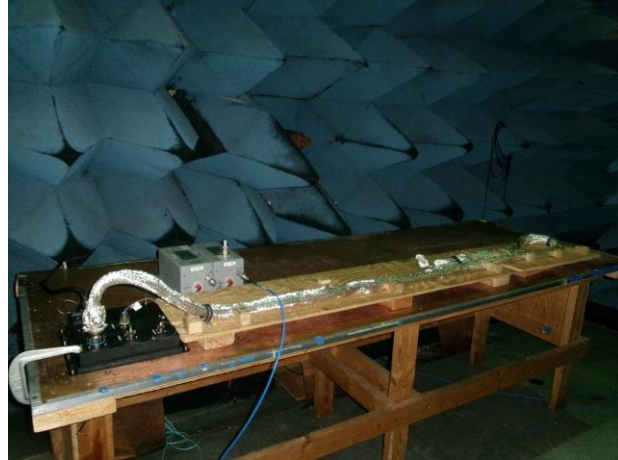
CE102 Test, Line 2, 10kHz-10MHz



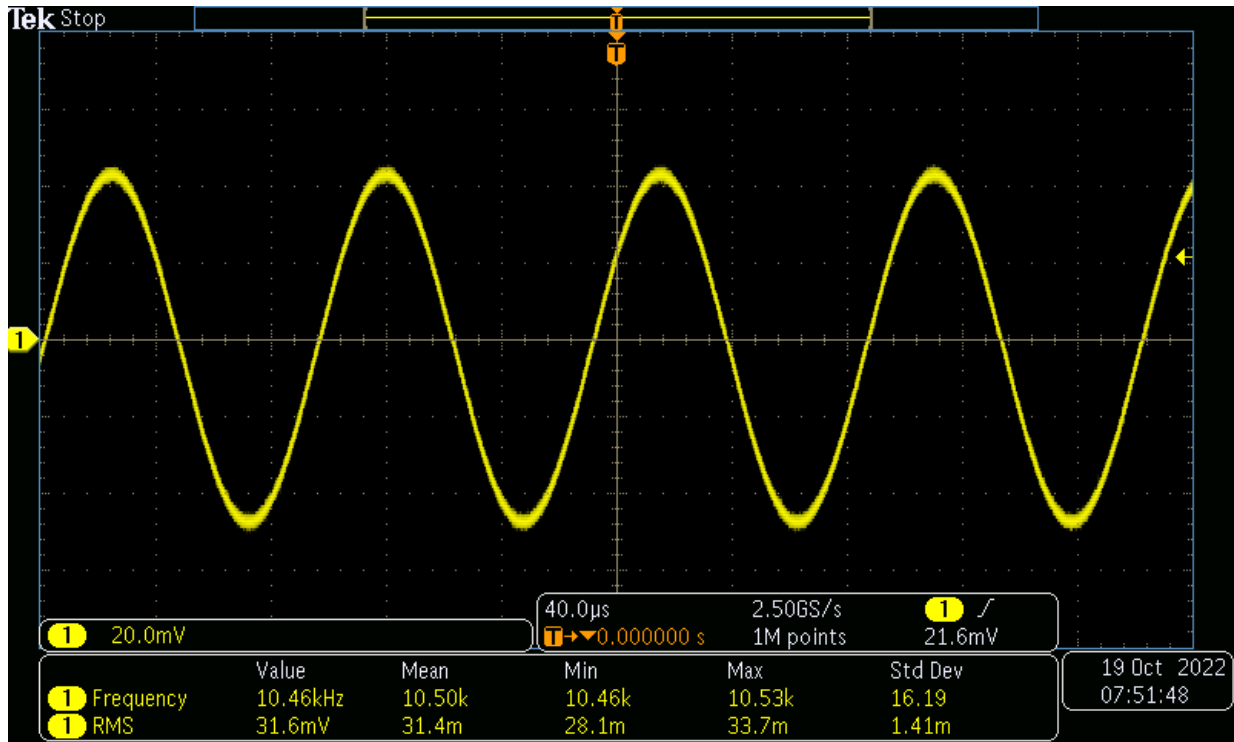
CE102 Troubleshooting, CM Ferrite x2 Turns



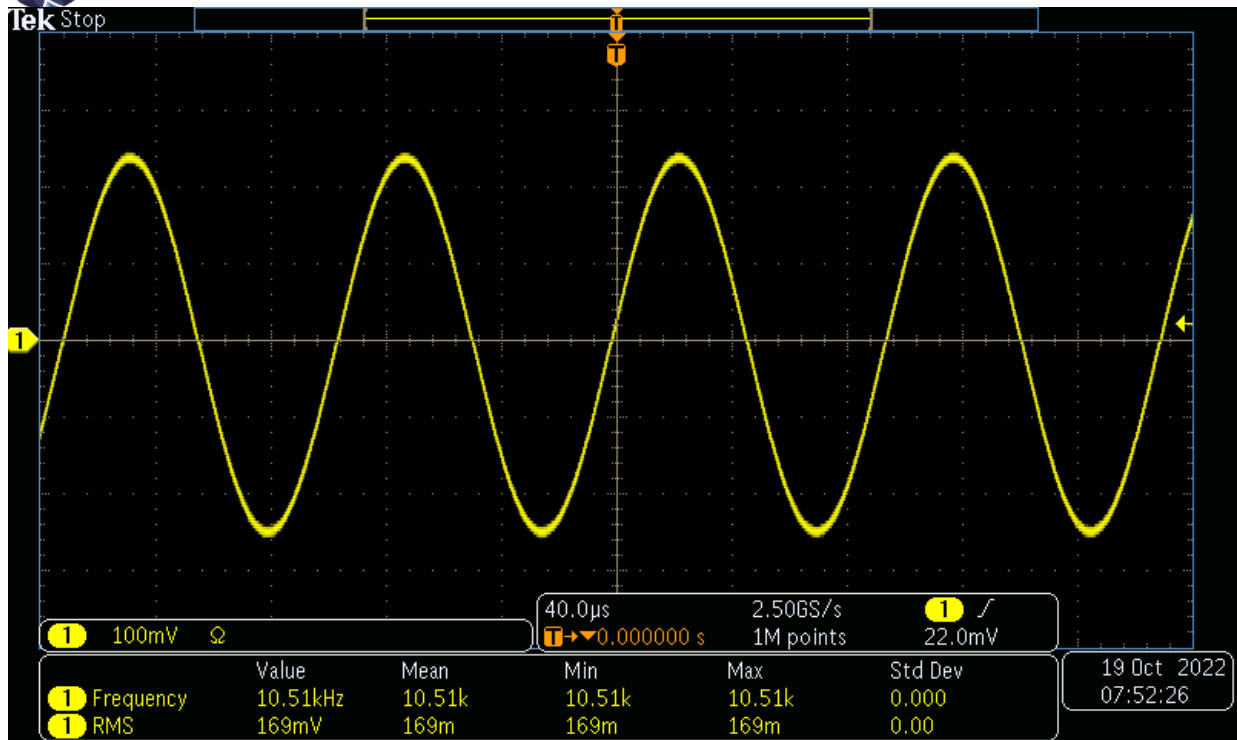
CE102 Test, Line 1, 10MHz-30MHz



CE102 Test, Line 2, 10MHz-30MHz

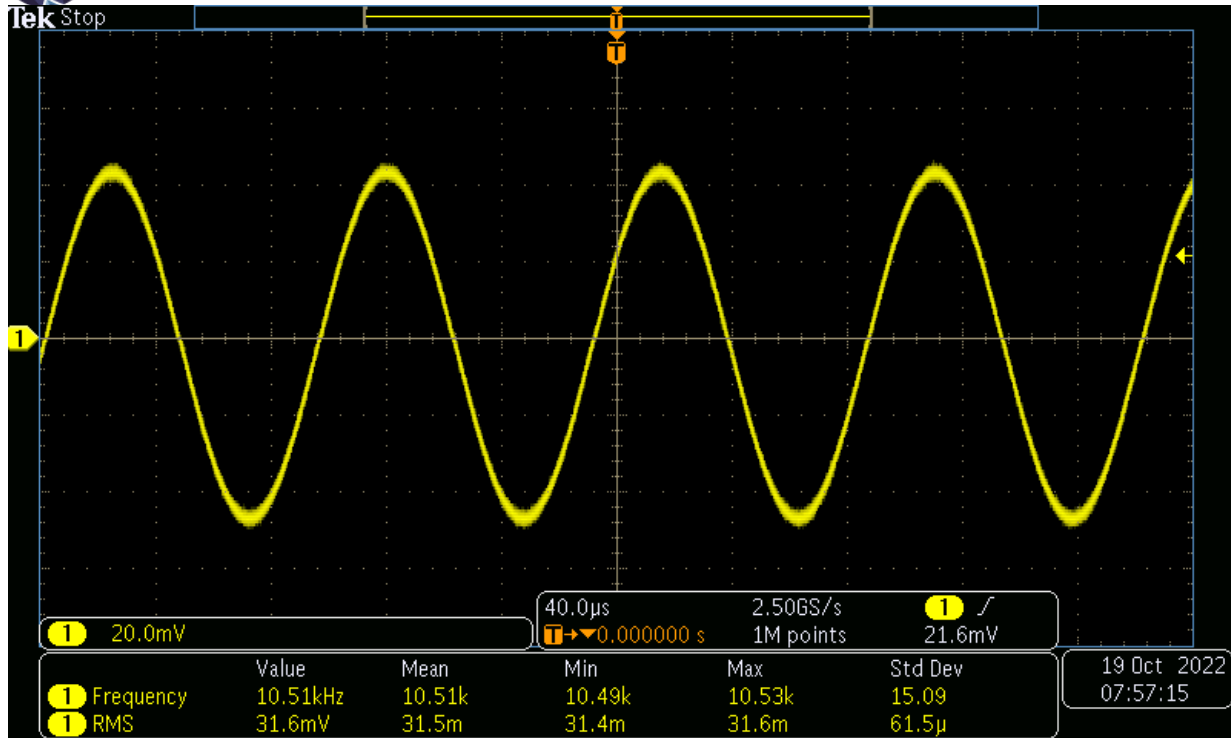
**5.1.10 CE102 Waveforms**


CE102 V Drop, 10.5kHz, 1M Ohm, Line 1

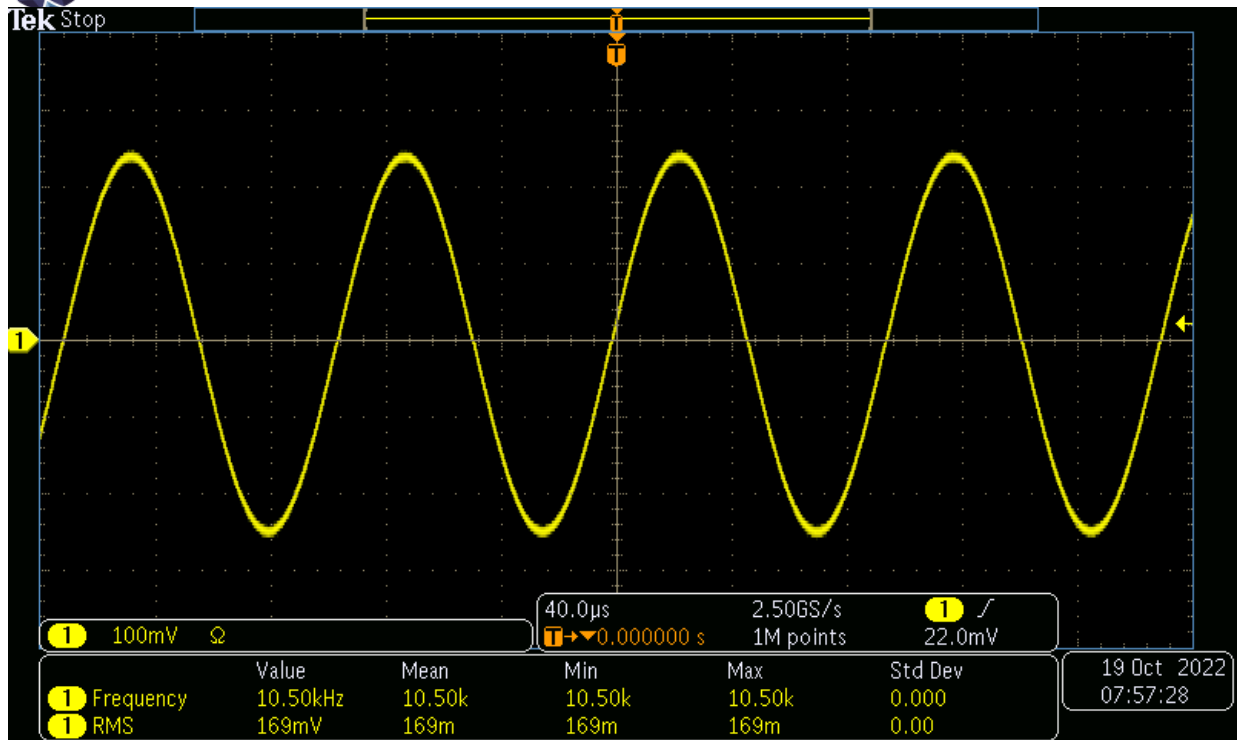


CE102 V Drop, 10.5kHz, 50 Ohm, Line 1

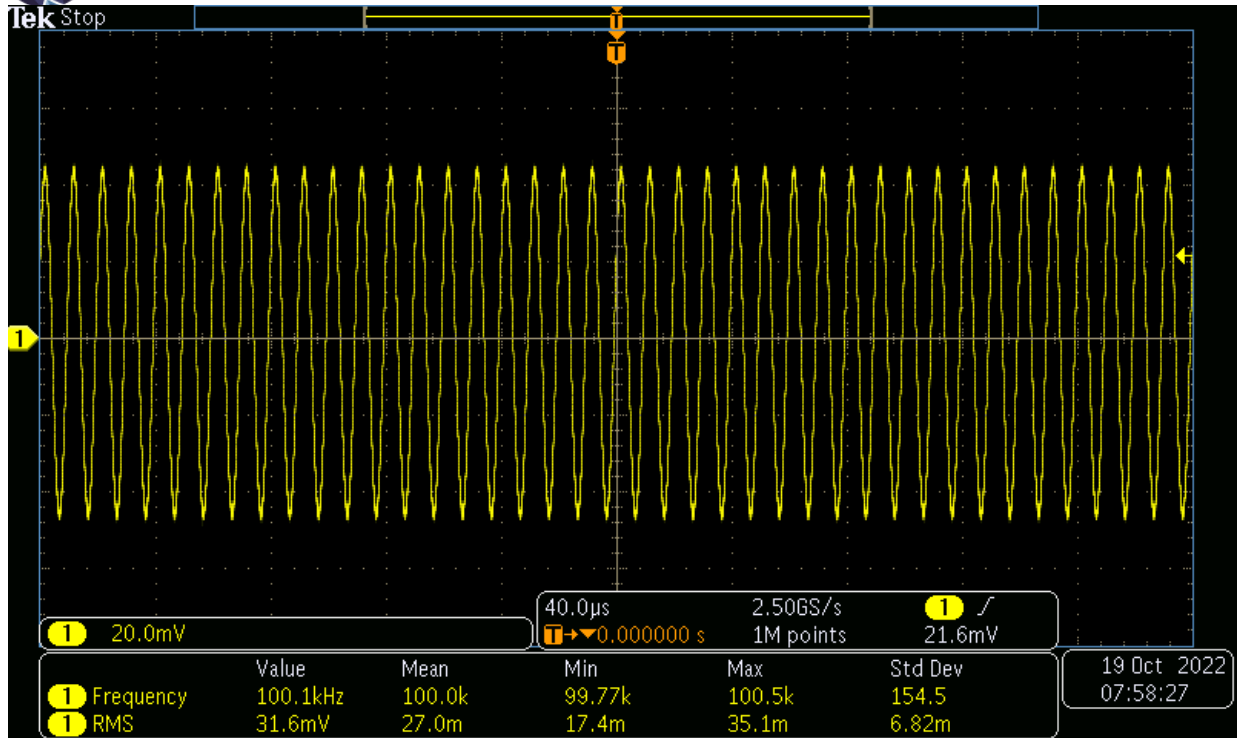




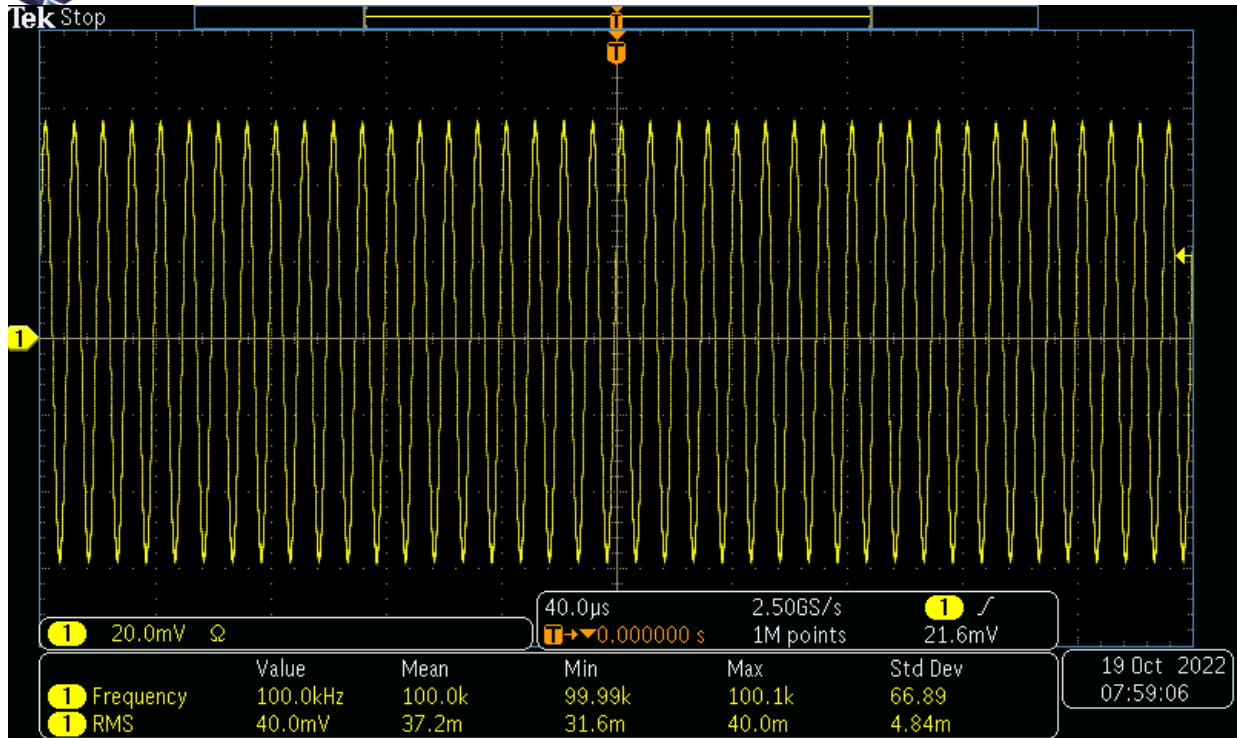
CE102 V Drop, 10.5kHz, 1M Ohm, Line 2



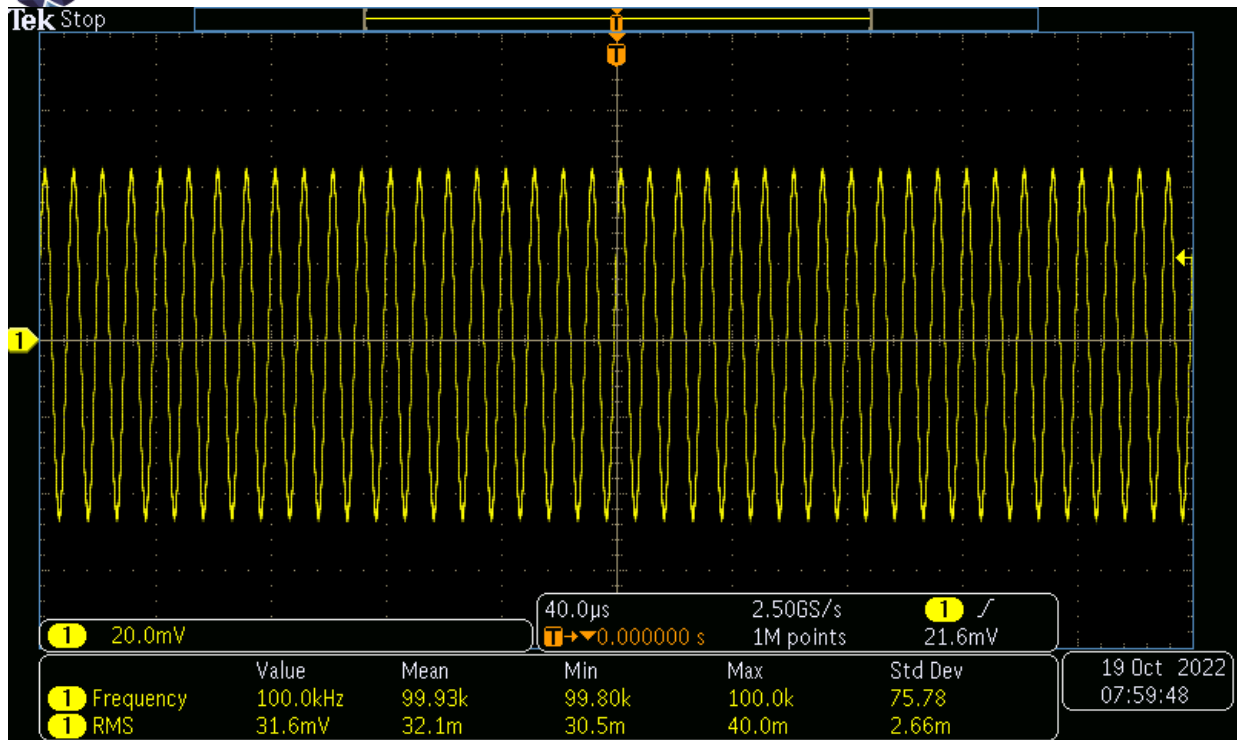
CE102 V Drop, 10.5kHz, 50 Ohm, Line 2



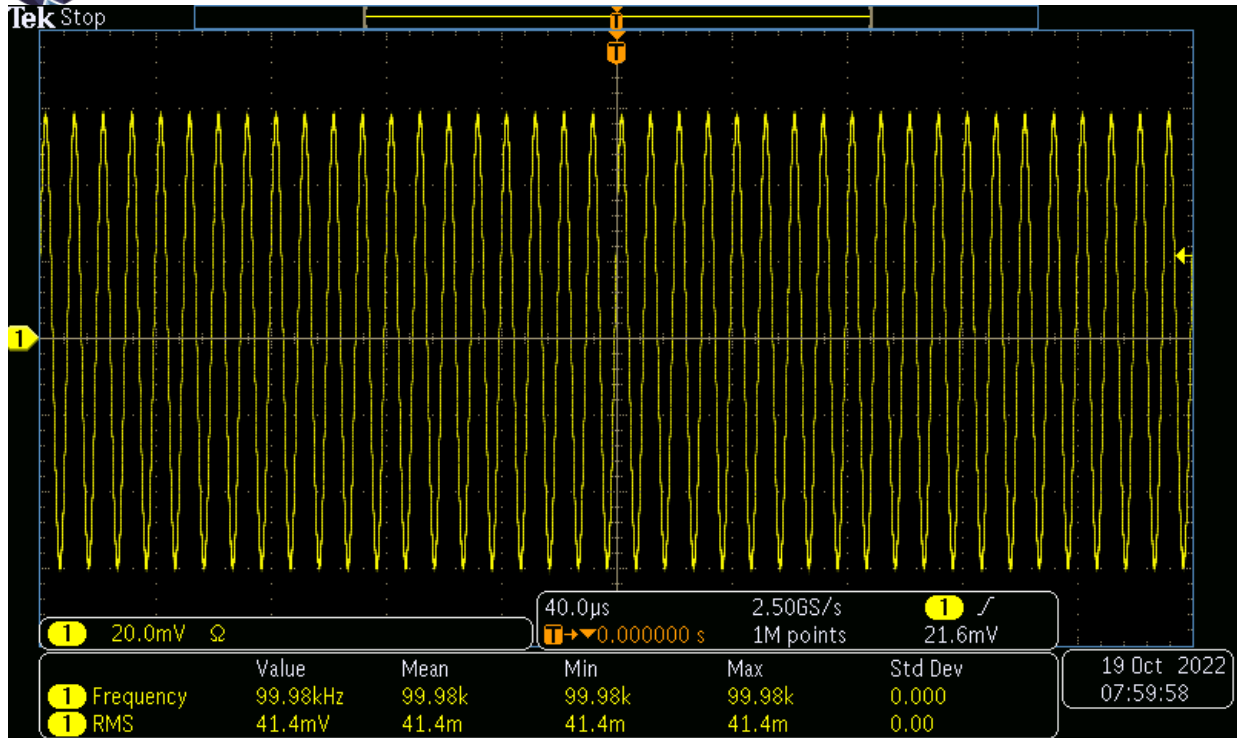
CE102 V Drop, 100kHz, 1M Ohm, Line 2



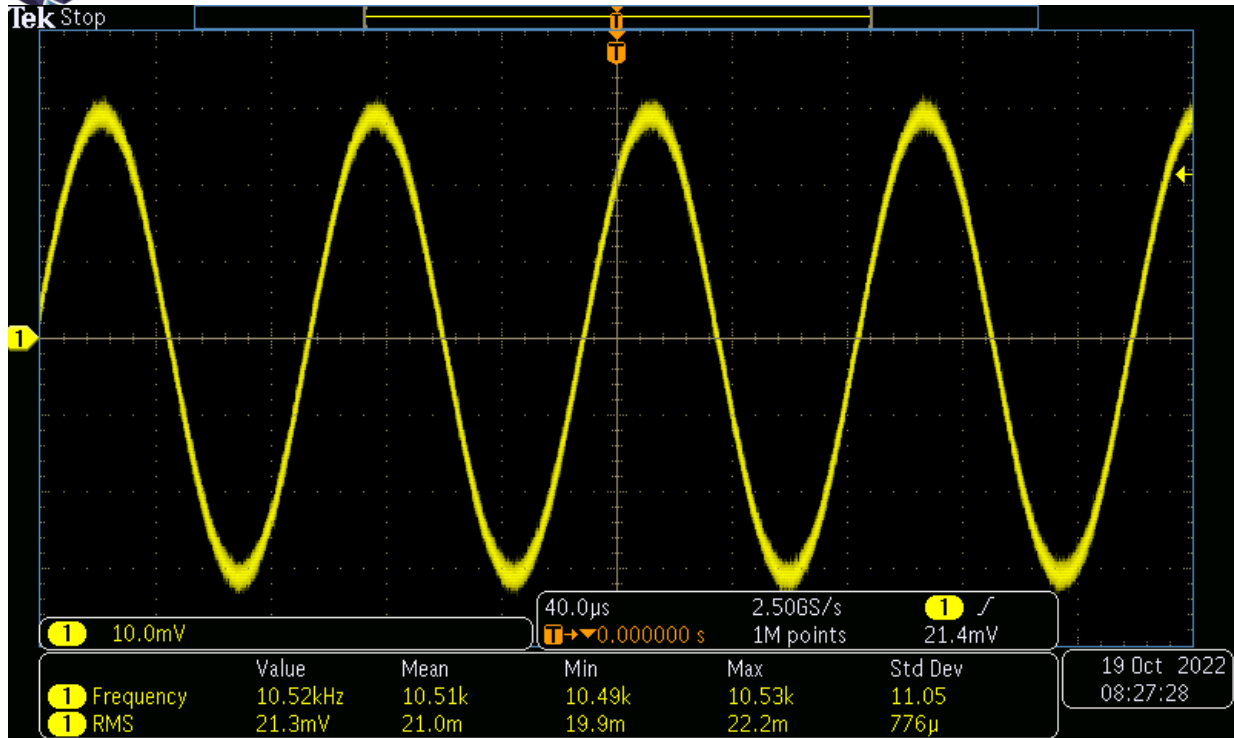
CE102 V Drop, 100kHz, 50 Ohm, Line 2



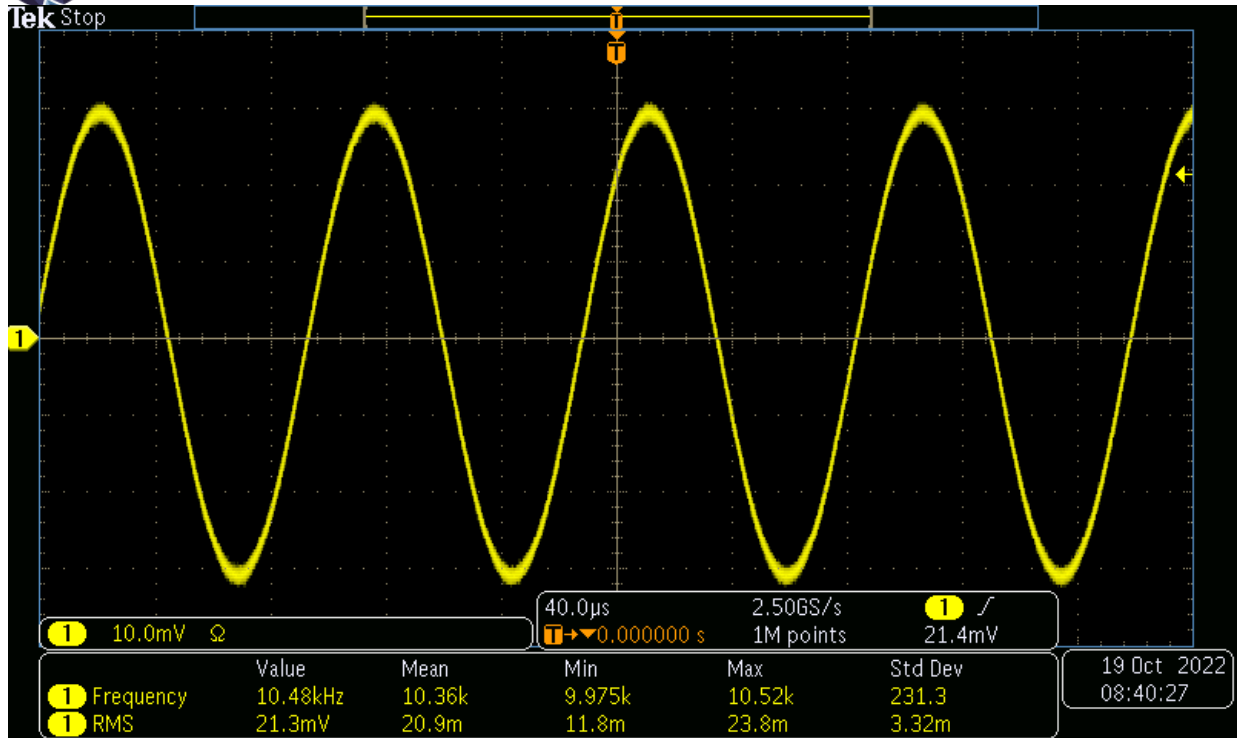
CE102 V Drop, 100kHz, 1M Ohm, Line 1



CE102 V Drop, 100kHz, 50 Ohm, Line 1

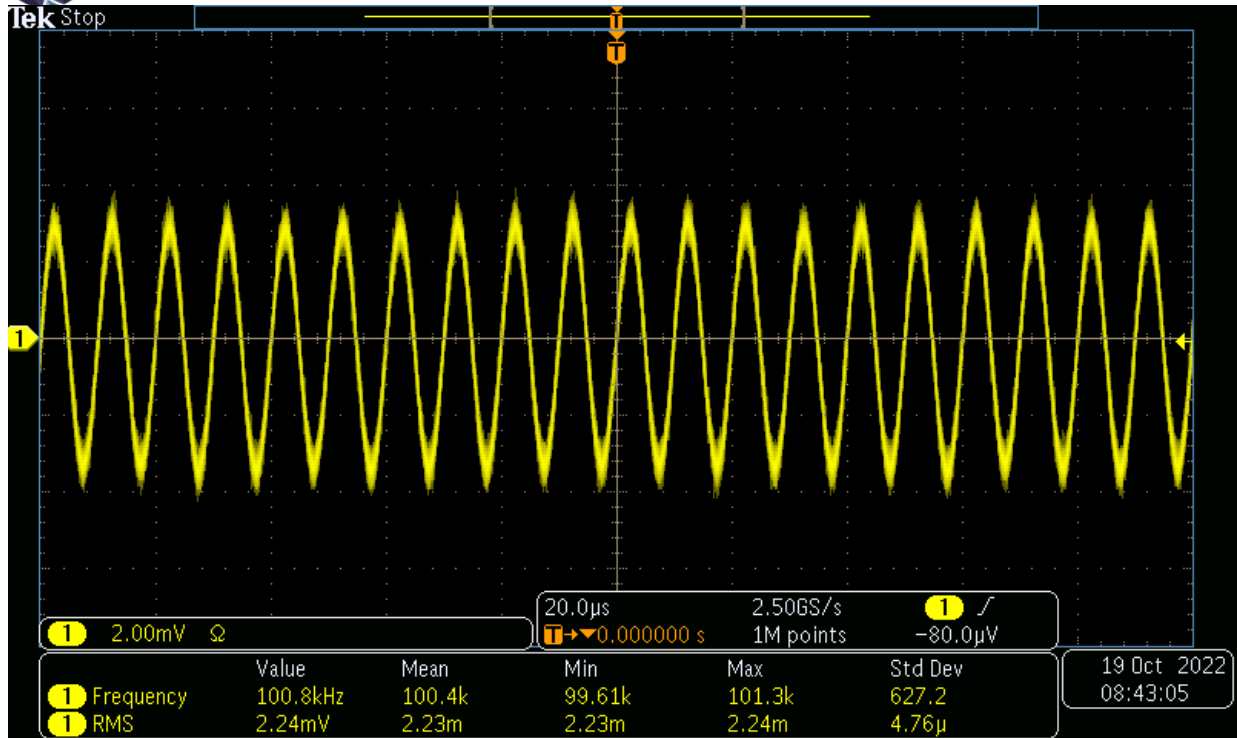


CE102 System Check, 10.5kHz, Line 1

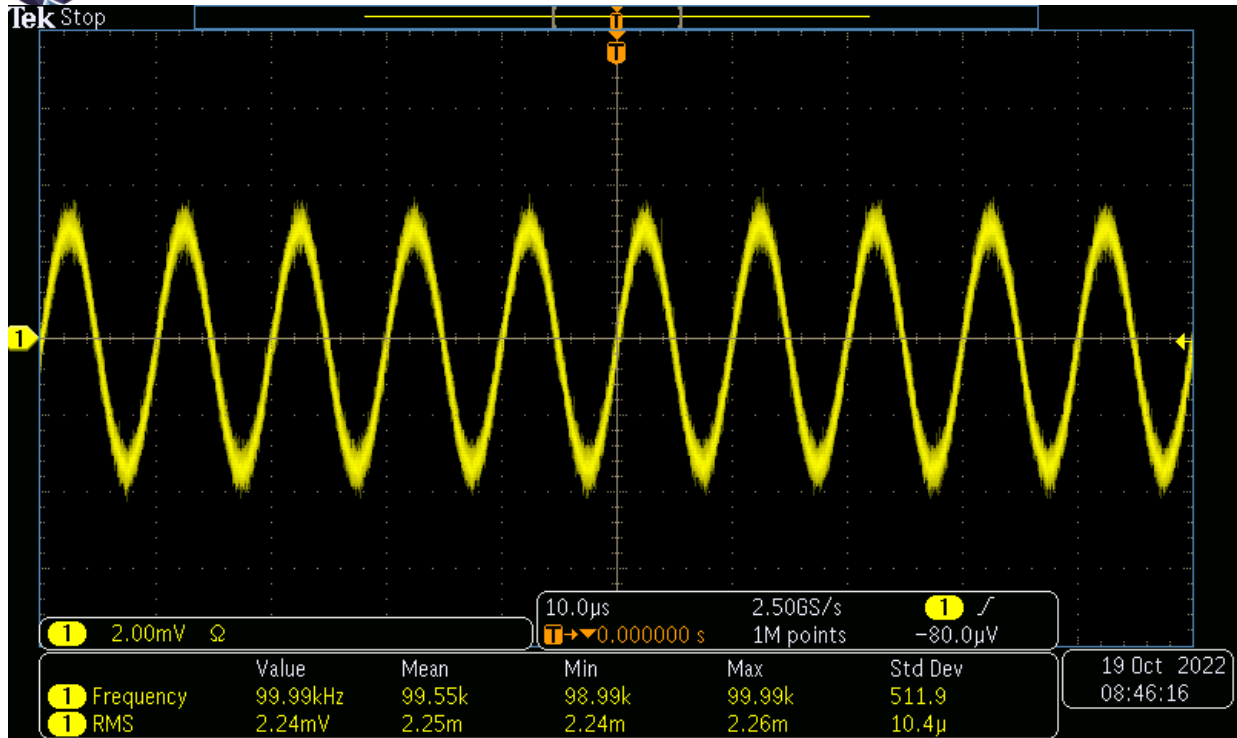


CE102 System Check, 10.5kHz, Line 2



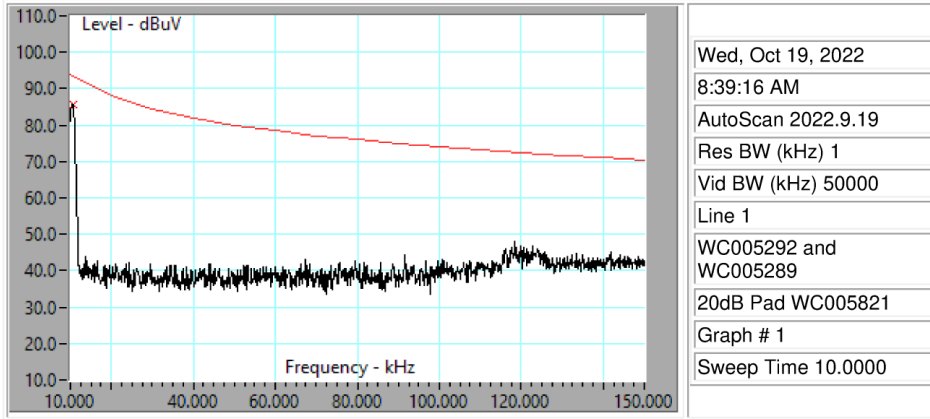


CE102 System Check, 100kHz, Line 2



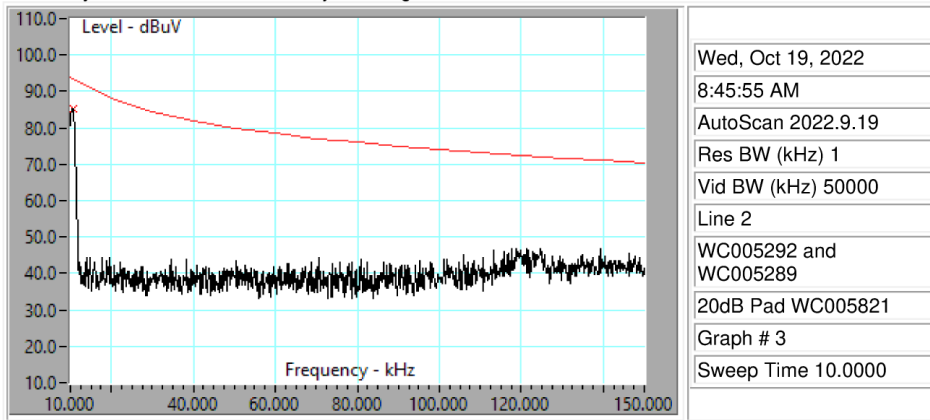
CE102 System Check, 100kHz, Line 1

CE102 System Check: Calibrated Injected Signal = 86.5 dBuV @ 10.5 kHz



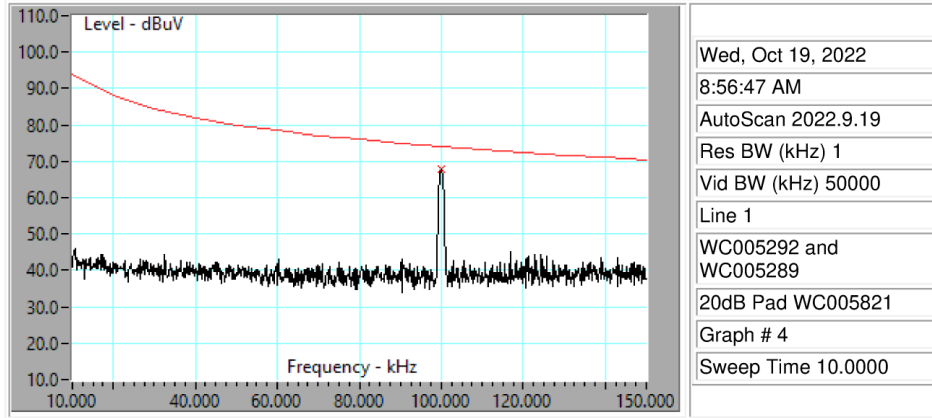
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
kHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
10.5600	85.6	93.5	-8.0	61.47	4.21	0.03	19.84	-24.08

CE102 System Check: Calibrated Injected Signal = 86.5 dBuV @ 10.5 kHz



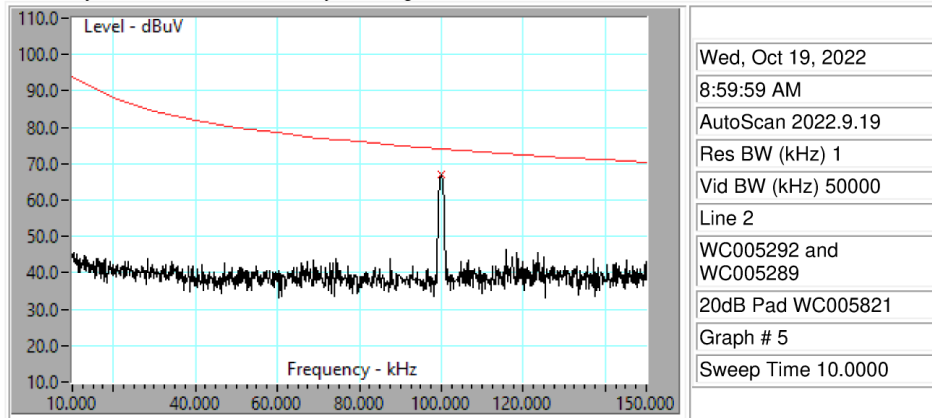
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
kHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
10.5600	85.2	93.5	-8.3	60.25	5.11	0.03	19.84	-24.98

CE102 System Check: Calibrated Injected Signal = 67 dBuV @ 100 kHz



Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
kHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
100.02	67.8	74.0	-6.2	47.76	0.12	0.03	19.84	-19.99

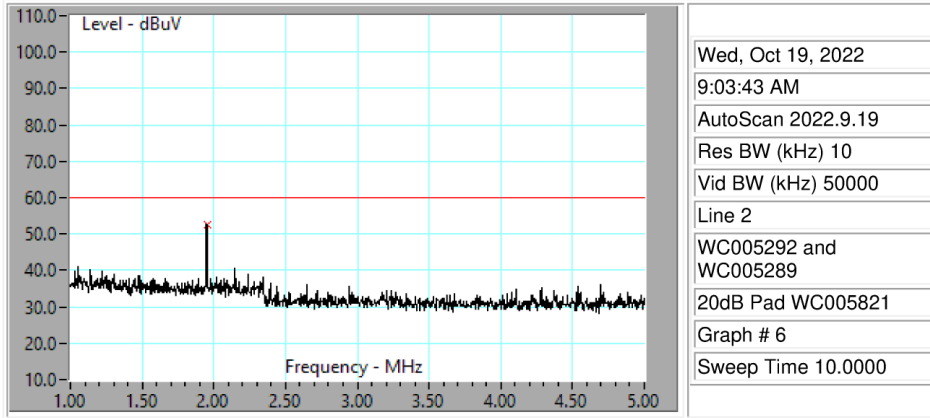
CE102 System Check: Calibrated Injected Signal = 67 dBuV @ 100 kHz



Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
kHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
100.02	66.9	74.0	-7.1	46.61	0.42	0.03	19.84	-20.29

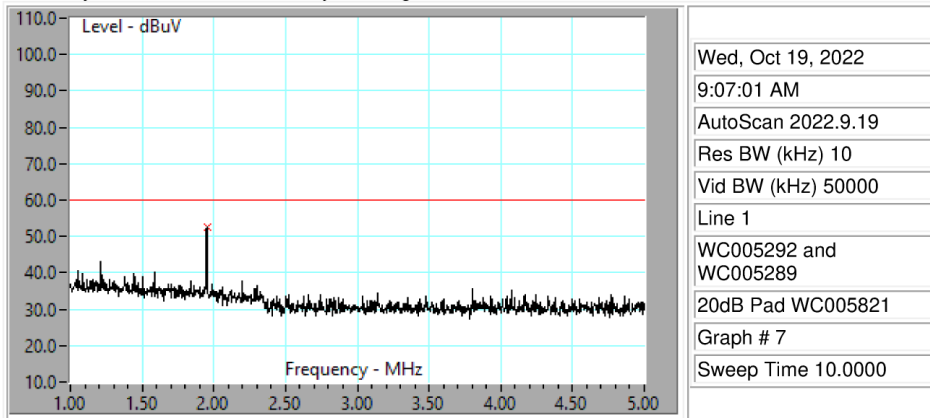


CE102 System Check: Calibrated Injected Signal = 53 dBuV @ 1.95 MHz



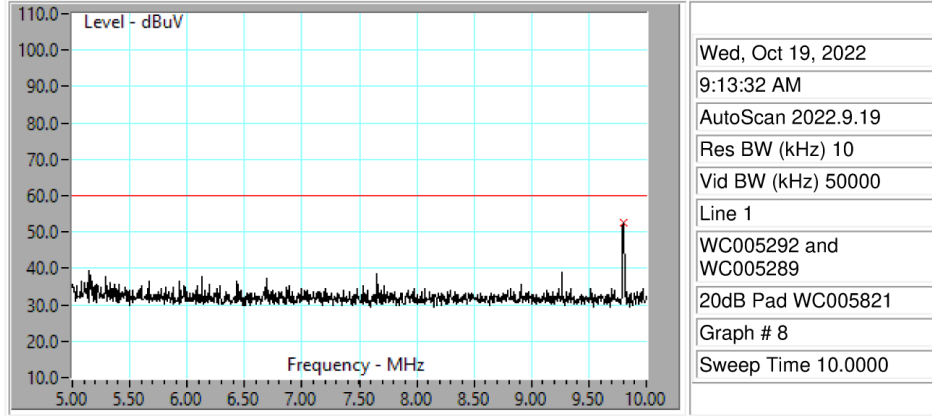
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
1.952	52.6	60.0	-7.4	32.53	0.06	0.15	19.85	-20.06

CE102 System Check: Calibrated Injected Signal = 53 dBuV @ 1.95 MHz



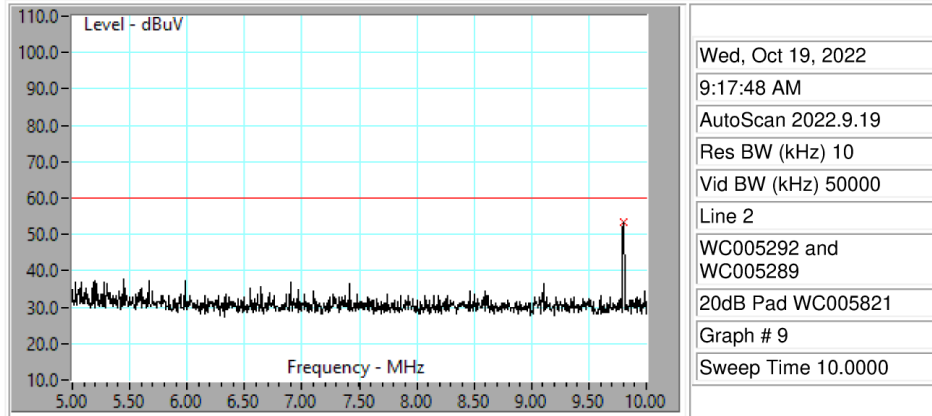
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
1.952	52.7	60.0	-7.3	32.66	0.04	0.15	19.85	-20.04

CE102 System Check: Calibrated Injected Signal = 53 dBuV @ 9.8 MHz



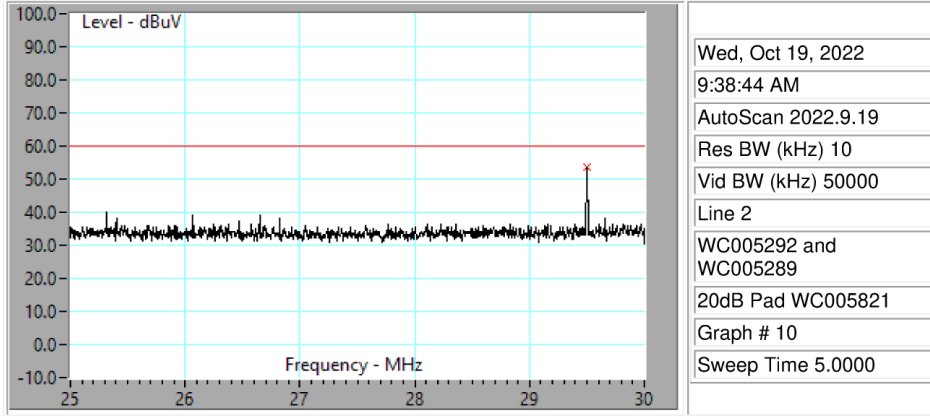
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
9.800	52.6	60.0	-7.4	32.40	0.06	0.31	19.86	-20.23

CE102 System Check: Calibrated Injected Signal = 53 dBuV @ 9.8 MHz



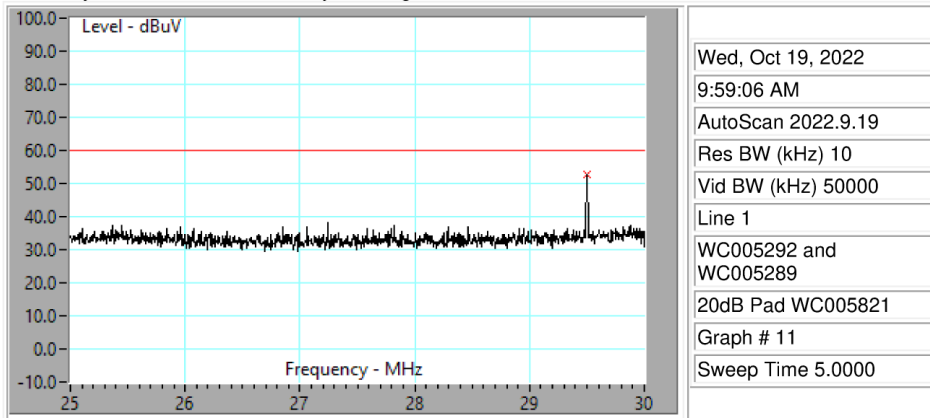
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
9.800	53.2	60.0	-6.8	32.96	0.07	0.31	19.86	-20.24

CE102 System Check: Calibrated Injected Signal = 53 dBuV @ 29.5 MHz



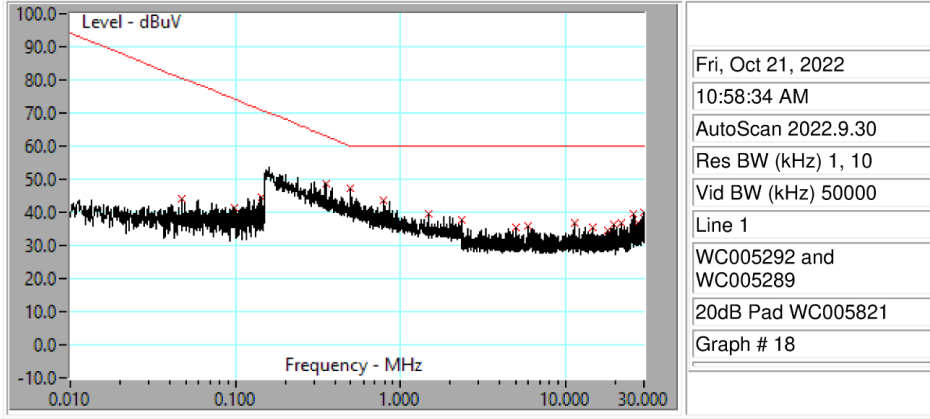
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
29.50	53.5	60.0	-6.5	32.90	0.12	0.56	19.87	-20.56

CE102 System Check: Calibrated Injected Signal = 53 dBuV @ 29.5 MHz



Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
29.50	52.9	60.0	-7.1	32.33	0.12	0.56	19.87	-20.55

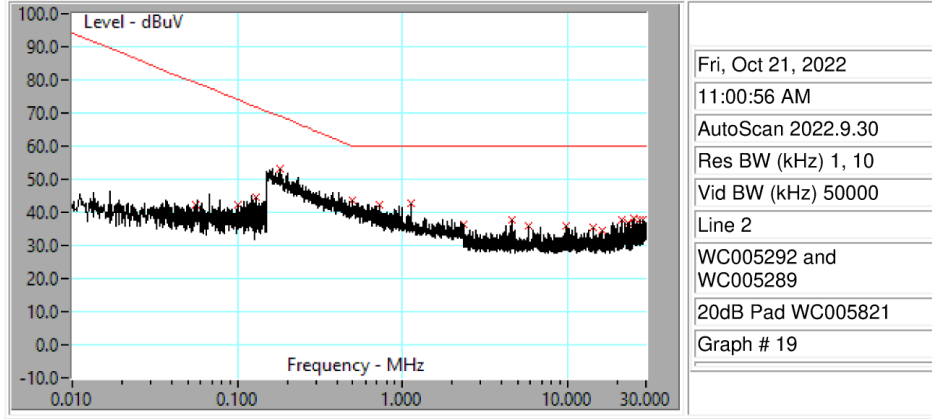
CE102 System Check: Ambient Scan



Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
0.048	44.2	80.4	-36.3	23.90	0.38	0.03	19.84	-20.25
0.098	41.5	74.2	-32.6	21.54	0.12	0.03	19.84	-20.00
0.143	44.5	70.9	-26.4	24.50	0.08	0.03	19.84	-19.95
0.353	48.6	63.0	-14.4	28.68	0.04	0.04	19.84	-19.92
0.496	47.2	60.1	-12.9	27.28	0.04	0.04	19.84	-19.92
0.792	43.7	60.0	-16.3	23.74	0.04	0.10	19.85	-19.98
1.4960	39.4	60.0	-20.6	19.33	0.04	0.14	19.85	-20.03
2.3440	37.9	60.0	-22.1	17.82	0.04	0.16	19.85	-20.05
4.9760	35.3	60.0	-24.7	15.20	0.04	0.21	19.84	-20.10
5.9000	36.0	60.0	-24.0	15.93	0.04	0.23	19.84	-20.12
11.3800	36.7	60.0	-23.3	16.41	0.06	0.33	19.86	-20.25
14.5300	35.3	60.0	-24.7	15.01	0.06	0.37	19.86	-20.30
18.2900	34.4	60.0	-25.6	14.01	0.08	0.42	19.86	-20.36
19.5000	36.6	60.0	-23.4	16.18	0.08	0.44	19.86	-20.38
21.9100	36.7	60.0	-23.3	16.27	0.09	0.47	19.87	-20.42
26.0050	39.6	60.0	-20.4	19.10	0.11	0.52	19.87	-20.50
27.4300	36.9	60.0	-23.1	16.33	0.11	0.54	19.87	-20.52
29.7600	39.8	60.0	-20.2	19.29	0.12	0.57	19.87	-20.56

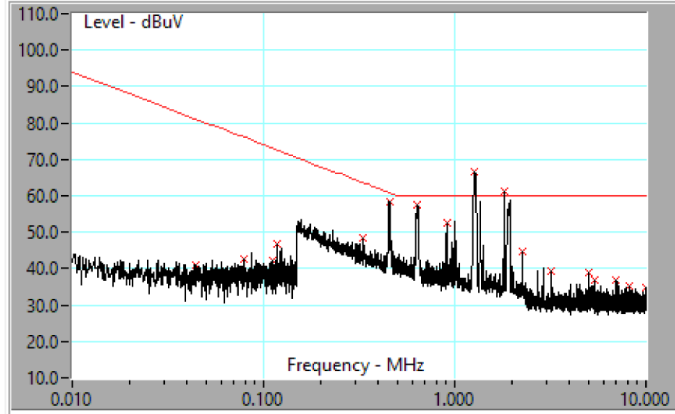


CE102 System Check: Ambient Scan



Frequency MHz	Level dBuV	Limit dBuV	Delta dB	Raw dBuV	LISN dB	Cable dB	Xducer dB	All Factors dB
0.056	42.2	79.0	-36.8	21.43	0.92	0.03	19.84	-20.79
0.101	42.4	73.9	-31.5	22.13	0.41	0.03	19.84	-20.29
0.129	44.5	71.8	-27.2	24.36	0.30	0.03	19.84	-20.18
0.183	53.0	68.7	-15.8	32.90	0.20	0.03	19.84	-20.07
0.499	43.8	60.0	-16.3	23.78	0.09	0.04	19.84	-19.97
0.733	42.3	60.0	-17.7	22.30	0.08	0.08	19.85	-20.01
1.1200	42.7	60.0	-17.3	22.67	0.07	0.14	19.85	-20.06
2.3600	36.6	60.0	-23.4	16.50	0.06	0.16	19.85	-20.07
4.6600	37.6	60.0	-22.4	17.48	0.06	0.21	19.84	-20.11
5.7800	35.7	60.0	-24.3	15.59	0.06	0.23	19.84	-20.13
9.7500	36.0	60.0	-24.0	15.76	0.07	0.31	19.86	-20.24
14.2800	35.4	60.0	-24.6	15.05	0.07	0.37	19.86	-20.30
16.2500	34.4	60.0	-25.6	14.06	0.08	0.40	19.86	-20.34
21.2700	37.5	60.0	-22.5	17.11	0.10	0.46	19.87	-20.42
23.4600	36.9	60.0	-23.1	16.43	0.10	0.49	19.87	-20.46
25.2950	38.0	60.0	-22.0	17.50	0.11	0.51	19.87	-20.49
27.6900	37.6	60.0	-22.4	17.06	0.12	0.54	19.87	-20.53
28.6200	37.6	60.0	-22.4	17.04	0.12	0.55	19.87	-20.54

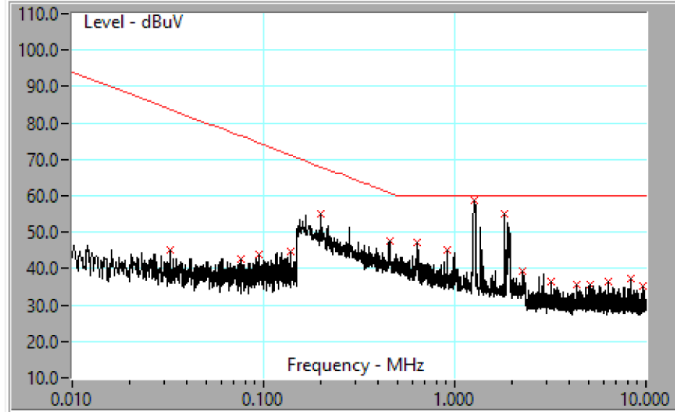
CE102: Ethernet Switch Box



Fri, Oct 21, 2022
11:07:25 AM
AutoScan 2022.9.30
Res BW (kHz) 1, 10
Vid BW (kHz) 50000
Line 1
WC005292 and WC005289
20dB Pad WC005821
Graph # 20

Frequency MHz	Level dBuV	Limit dBuV	Delta dB	Raw dBuV	LISN dB	Cable dB	Xducer dB	All Factors dB
0.044	41.1	81.1	-40.1	20.75	0.44	0.03	19.84	-20.31
0.080	42.5	76.0	-33.5	22.45	0.17	0.03	19.84	-20.04
0.112	42.1	73.0	-31.0	22.09	0.11	0.03	19.84	-19.98
0.118	46.7	72.5	-25.9	26.71	0.10	0.03	19.84	-19.98
0.333	48.4	63.5	-15.2	28.44	0.04	0.04	19.84	-19.92
0.455	58.4	60.8	-2.5	38.43	0.04	0.04	19.84	-19.92
0.640	57.6	60.0	-2.4	37.62	0.04	0.07	19.85	-19.95
0.909	52.7	60.0	-7.3	32.73	0.04	0.12	19.85	-20.01
1.2760	66.6	60.0	6.6	F 46.56	0.04	0.14	19.85	-20.03
1.8160	61.3	60.0	1.3	F 41.29	0.04	0.15	19.85	-20.04
2.2720	44.6	60.0	-15.4	24.54	0.04	0.16	19.85	-20.05
3.1840	39.5	60.0	-20.5	19.47	0.04	0.18	19.84	-20.06
5.0000	38.8	60.0	-21.2	18.71	0.04	0.22	19.84	-20.10
5.4200	36.7	60.0	-23.3	16.63	0.04	0.22	19.84	-20.11
6.9650	36.7	60.0	-23.3	16.59	0.05	0.25	19.85	-20.15
8.1350	35.1	60.0	-24.9	14.88	0.05	0.28	19.85	-20.18
9.9300	34.9	60.0	-25.1	14.66	0.06	0.31	19.86	-20.23

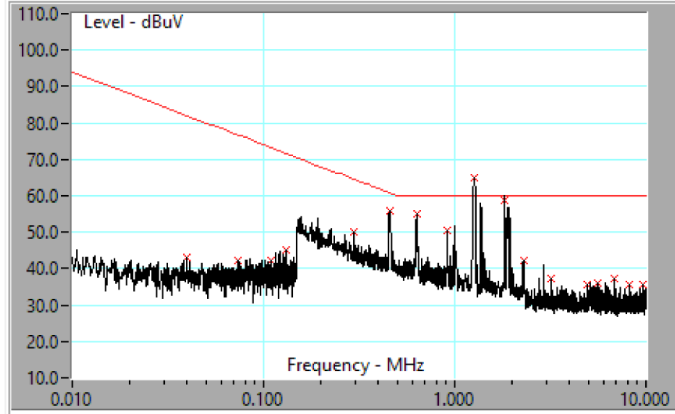
CE102: Ethernet Switch Box



Fri, Oct 21, 2022
11:10:46 AM
AutoScan 2022.9.30
Res BW (kHz) 1, 10
Vid BW (kHz) 50000
Line 2
WC005292 and WC005289
20dB Pad WC005821
Graph # 21

Frequency MHz	Level dBuV	Limit dBuV	Delta dB	Raw dBuV	LISN dB	Cable dB	Xducer dB	All Factors dB
0.032	45.3	83.8	-38.5	23.65	1.80	0.03	19.84	-21.67
0.076	42.6	76.4	-33.9	22.08	0.61	0.03	19.84	-20.49
0.095	43.7	74.5	-30.7	23.42	0.44	0.03	19.84	-20.31
0.137	44.9	71.2	-26.4	24.72	0.28	0.03	19.84	-20.15
0.200	54.9	68.0	-13.0	34.87	0.18	0.03	19.84	-20.06
0.455	47.6	60.8	-13.2	27.65	0.09	0.04	19.84	-19.97
0.636	47.1	60.0	-12.9	27.11	0.08	0.07	19.85	-19.99
0.911	45.1	60.0	-14.9	25.02	0.07	0.12	19.85	-20.04
1.2760	58.6	60.0	-1.4	38.51	0.07	0.14	19.85	-20.06
1.8240	54.9	60.0	-5.1	34.84	0.06	0.15	19.85	-20.06
2.2720	39.4	60.0	-20.6	19.38	0.06	0.16	19.85	-20.07
3.1920	36.3	60.0	-23.7	16.22	0.06	0.18	19.84	-20.08
4.3560	35.6	60.0	-24.4	15.45	0.06	0.20	19.84	-20.10
5.1050	35.4	60.0	-24.6	15.31	0.06	0.22	19.84	-20.12
6.3600	36.6	60.0	-23.4	16.43	0.06	0.24	19.85	-20.15
8.3300	37.4	60.0	-22.6	17.17	0.06	0.28	19.85	-20.20
9.6500	35.3	60.0	-24.7	15.10	0.07	0.31	19.86	-20.24

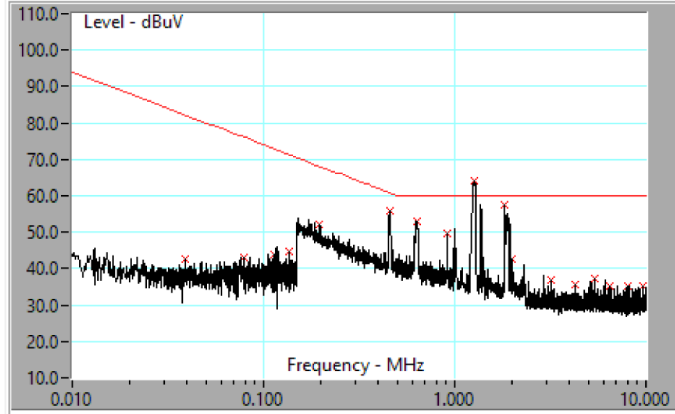
CE102: Ethernet Switch Box Added 0475176451 Ferrite, No Turns



Fri, Oct 21, 2022
11:14:23 AM
AutoScan 2022.9.30
Res BW (kHz) 1, 10
Vid BW (kHz) 50000
Line 1
WC005292 and WC005289
20dB Pad WC005821
Graph # 22

Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
0.040	42.9	82.0	-39.1	22.52	0.51	0.03	19.84	-20.39
0.074	42.2	76.7	-34.4	22.19	0.19	0.03	19.84	-20.06
0.110	42.3	73.2	-30.9	22.34	0.11	0.03	19.84	-19.98
0.132	45.0	71.6	-26.5	25.08	0.09	0.03	19.84	-19.96
0.298	50.3	64.5	-14.2	30.35	0.05	0.04	19.84	-19.93
0.458	56.0	60.8	-4.7	36.12	0.04	0.04	19.84	-19.92
0.634	55.0	60.0	-5.0	35.00	0.04	0.07	19.85	-19.95
0.915	50.4	60.0	-9.6	30.38	0.04	0.12	19.85	-20.01
1.2680	64.8	60.0	4.8	F 44.81	0.04	0.14	19.85	-20.03
1.8240	59.0	60.0	-1.0	38.93	0.04	0.15	19.85	-20.04
2.2840	42.1	60.0	-17.9	22.05	0.04	0.16	19.85	-20.05
3.2040	37.2	60.0	-22.8	17.16	0.04	0.18	19.84	-20.06
4.9720	35.5	60.0	-24.5	15.38	0.04	0.21	19.84	-20.09
5.6450	36.1	60.0	-23.9	16.03	0.04	0.23	19.84	-20.11
6.8700	37.1	60.0	-22.9	16.99	0.05	0.25	19.85	-20.15
8.1800	35.4	60.0	-24.6	15.27	0.05	0.28	19.85	-20.18
9.7250	35.5	60.0	-24.5	15.33	0.05	0.31	19.86	-20.22

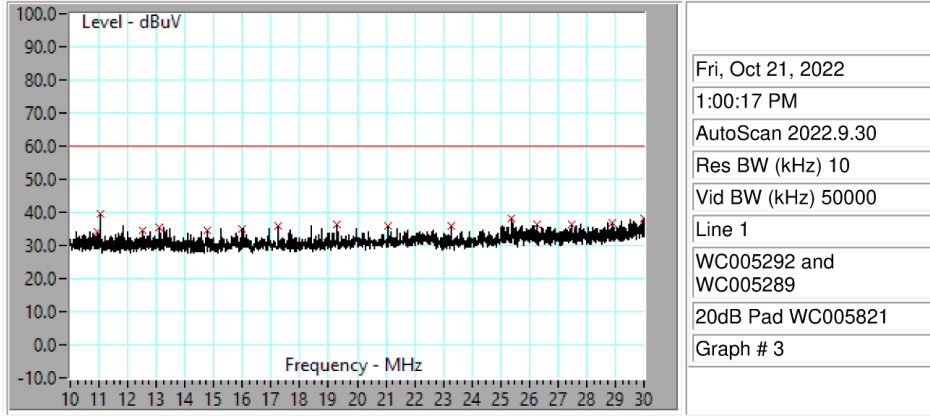
CE102: Ethernet Switch Box Added 400ohm @ 1MHz Ferrite, 2x Turns



Fri, Oct 21, 2022
11:36:19 AM
AutoScan 2022.9.30
Res BW (kHz) 1, 10
Vid BW (kHz) 50000
Line 1
WC005292 and WC005289
20dB Pad WC005821
Graph # 23

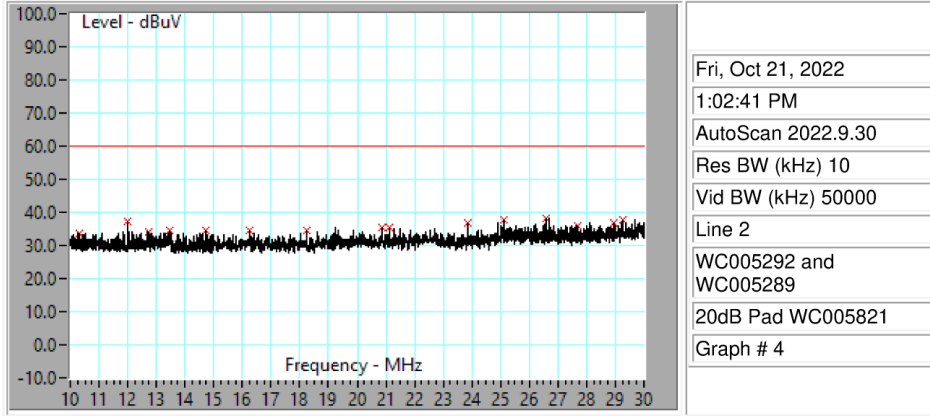
Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
0.039	42.6	82.2	-39.6	22.17	0.54	0.03	19.84	-20.41
0.079	42.9	76.0	-33.2	22.85	0.17	0.03	19.84	-20.04
0.113	43.9	72.9	-29.1	23.91	0.11	0.03	19.84	-19.98
0.136	44.8	71.3	-26.6	24.81	0.08	0.03	19.84	-19.96
0.197	52.1	68.1	-16.0	32.15	0.06	0.03	19.84	-19.94
0.457	55.8	60.8	-5.0	35.84	0.04	0.04	19.84	-19.92
0.635	53.1	60.0	-6.9	33.12	0.04	0.07	19.85	-19.95
0.915	49.7	60.0	-10.3	29.73	0.04	0.12	19.85	-20.01
1.2680	64.1	60.0	4.1	F 44.12	0.04	0.14	19.85	-20.03
1.8280	57.5	60.0	-2.5	37.46	0.04	0.15	19.85	-20.04
2.0080	42.6	60.0	-17.4	22.53	0.04	0.16	19.85	-20.04
3.2040	36.7	60.0	-23.3	16.60	0.04	0.18	19.84	-20.06
4.2920	35.6	60.0	-24.4	15.53	0.04	0.20	19.84	-20.08
5.3700	37.2	60.0	-22.8	17.13	0.04	0.22	19.84	-20.10
6.5100	35.1	60.0	-24.9	14.99	0.04	0.25	19.85	-20.13
8.1100	35.4	60.0	-24.6	15.21	0.05	0.28	19.85	-20.18
9.6600	35.1	60.0	-24.9	14.91	0.05	0.31	19.86	-20.22

CE102: Ethernet SwitchBox



Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
11.0	34.2	60.0	-25.8	13.98	0.06	0.33	19.86	-20.25
11.1	39.7	60.0	-20.3	19.43	0.06	0.33	19.86	-20.25
12.5	34.6	60.0	-25.4	14.35	0.06	0.35	19.86	-20.27
13.1	35.4	60.0	-24.6	15.16	0.06	0.35	19.86	-20.28
14.8	34.4	60.0	-25.6	14.12	0.06	0.38	19.86	-20.30
16.0	35.1	60.0	-24.9	14.78	0.07	0.39	19.86	-20.32
17.2	35.9	60.0	-24.1	15.58	0.07	0.41	19.86	-20.34
19.3	36.3	60.0	-23.7	15.93	0.08	0.43	19.86	-20.38
21.1	36.1	60.0	-23.9	15.65	0.09	0.46	19.87	-20.41
23.3	36.0	60.0	-24.0	15.54	0.09	0.48	19.87	-20.44
25.4	38.4	60.0	-21.6	17.88	0.10	0.51	19.87	-20.48
26.2	36.3	60.0	-23.7	15.76	0.11	0.52	19.87	-20.50
27.5	36.5	60.0	-23.5	15.96	0.11	0.54	19.87	-20.52
28.9	37.0	60.0	-23.0	16.42	0.12	0.56	19.87	-20.54
30.0	38.2	60.0	-21.8	17.62	0.12	0.57	19.87	-20.56

CE102: Ethernet SwitchBox



Frequency	Level	Limit	Delta	Raw	LISN	Cable	Xducer	All Factors
MHz	dBuV	dBuV	dB	dBuV	dB	dB	dB	dB
10.3	33.5	60.0	-26.5	13.25	0.07	0.32	19.86	-20.25
12.0	37.1	60.0	-22.9	16.84	0.07	0.34	19.86	-20.27
12.8	34.1	60.0	-25.9	13.86	0.07	0.35	19.86	-20.28
13.5	34.5	60.0	-25.5	14.24	0.07	0.36	19.86	-20.29
14.7	34.4	60.0	-25.6	14.11	0.07	0.38	19.86	-20.31
16.2	34.5	60.0	-25.5	14.17	0.08	0.39	19.86	-20.34
18.2	34.6	60.0	-25.4	14.22	0.09	0.42	19.86	-20.37
20.9	35.4	60.0	-24.6	14.96	0.10	0.45	19.87	-20.42
21.1	35.4	60.0	-24.6	14.96	0.10	0.46	19.87	-20.42
23.9	36.7	60.0	-23.3	16.20	0.11	0.49	19.87	-20.47
25.1	37.6	60.0	-22.4	17.10	0.11	0.51	19.87	-20.49
26.6	38.4	60.0	-21.6	17.87	0.12	0.53	19.87	-20.51
27.7	36.1	60.0	-23.9	15.53	0.12	0.54	19.87	-20.53
28.9	36.9	60.0	-23.1	16.32	0.12	0.56	19.87	-20.54
29.2	37.8	60.0	-22.2	17.26	0.12	0.56	19.87	-20.55



## 5.1.12 CE102 Test Equipment List

Table 5.1-1: CE102, Conducted Emissions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC005510	Chamber (EMI, Semi-Anechoic)	National Technical Systems	AR 1	NCR	NCR
WC005821	Attenuator (Coaxial)	Narda	766A-20	12/10/2021	12/10/2024
WC005289	Network (LISN)	Solar Electronics	8028-50-TS-24-BNC	03/17/2022	03/17/2025
WC005292	Network (LISN)	Solar Electronics	8028-50-TS-24-BNC	01/28/2022	01/28/2025
WC058386	Oscilloscope (Digital)	Tektronix	MDO3034	01/31/2022	01/31/2023
WC058452	Generator (Waveform)	Keysight Technologies	33250A	06/09/2022	06/09/2023
WC058456	Receiver	Keysight Technologies	N9038A	10/29/2021	01/29/2023
WC058500	Cable (Test)	Winchester	E50-E50-2150720	10/04/2022	10/04/2024
WC058501	Cable (Test)	Winchester	E50-E50-2150960	05/09/2022	05/09/2024

NCR = No Calibration Required; as per NTS Labs, LLC QA policy, the equipment does not require calibration as long as the test signal being generated can be verified with other calibrated equipment prior to or during the test.



## 5.2 RE102, Radiated Emissions: Radiated Emissions, Electric Field

### 5.2.1 RE102 Purpose

This test verifies that electric field emissions from the EUT shall not exceed the Fixed Wing External limit specified in Figure 5.2-1.

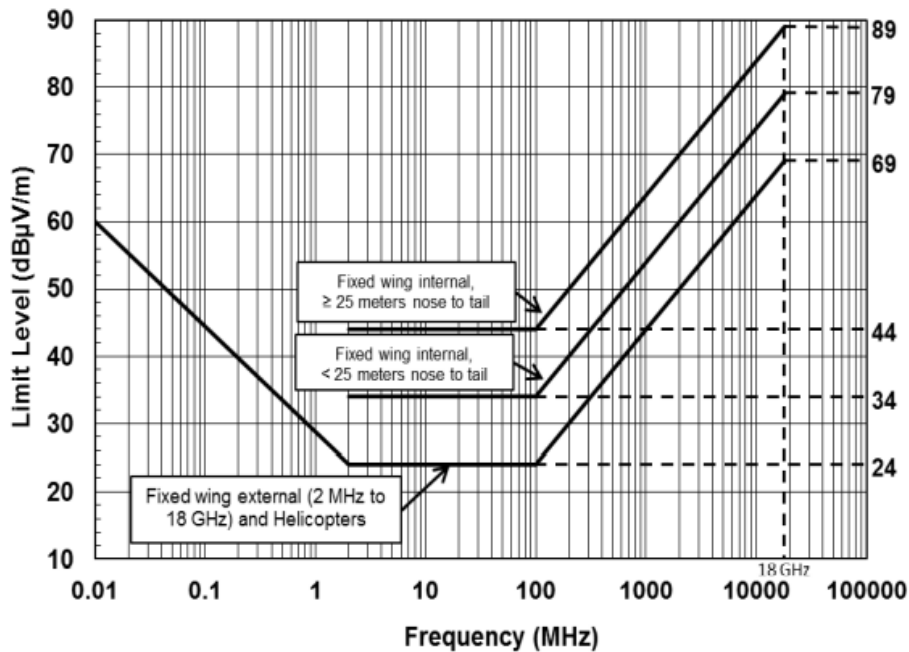


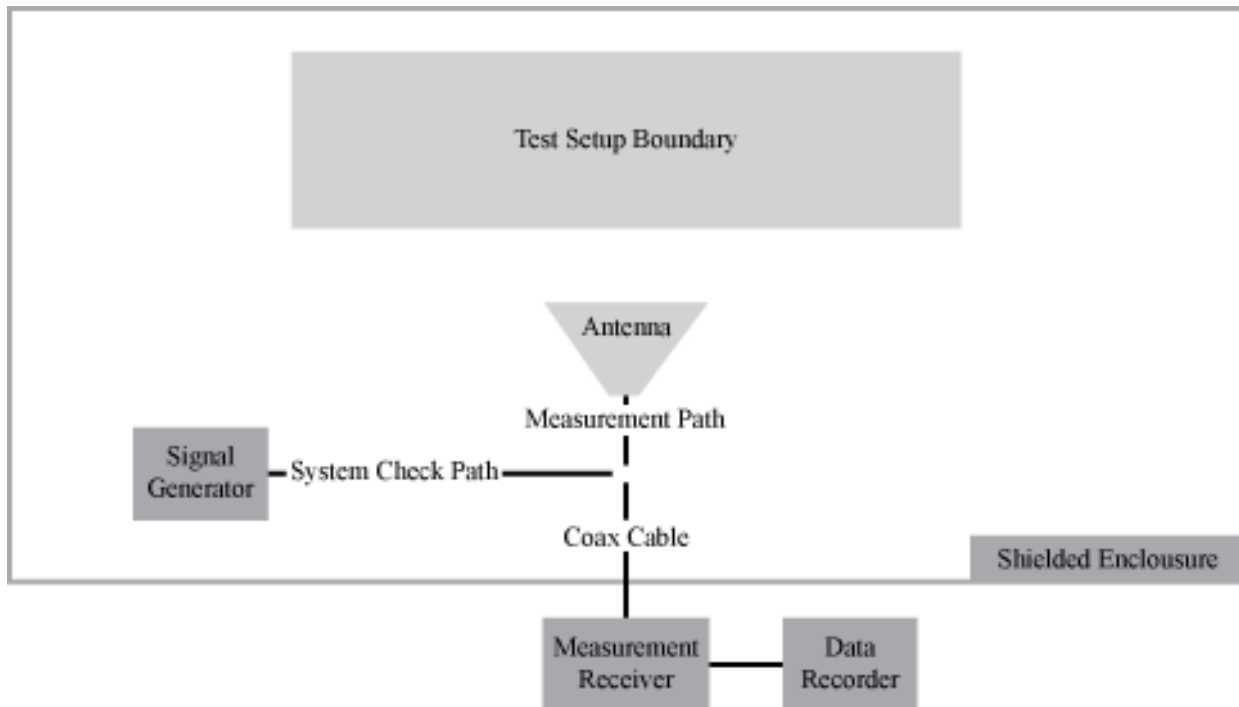
Figure 5.2-1: RE102 Limit for Aircraft and Space System Applications

### 5.2.2 RE102 Measurement System Check

1. The measurement system check was performed prior to testing.
2. The measurement system was set up per Figure 5.2-2.
3. The evaluation was performed on the overall measurement system from each antenna to the data output device at the highest measurement frequency of the antenna. For the active rod antenna, the evaluation was performed at the lowest frequency of test, at a mid-band frequency, and at its highest measurement frequency.
4. A signal generator was connected to the coax in place of the measurement antenna. For the active rod antenna, the active rod antenna calibration fixture was used in place of the rod element and the signal was injected across a 10 pF capacitor in the calibration fixture.
5. The signal generator was adjusted to produce a signal 6 dB below the RE102 limit (limit minus antenna factor) shown in Figure 5.2-1.
6. The signal detected at the measurement receiver was confirmed to be within  $\pm 3$  dB of the calibrated level.
7. This process was repeated for each frequency defined as follows:
  - Active rod Antenna: 10.5 kHz (only for testing performed between 10 kHz and 2 MHz), 2.1MHz, 12MHz, 29.5 MHz
  - Biconical Antenna: 197 MHz
  - Large Double Ridged Horn Antenna: 990 MHz
  - Small Double Ridged Horn Antenna: 17.5 GHz
8. Correction factors were added to the raw data collected from the measurement receiver. For example:

Cable loss (dB) + Antenna factors (dB) + Raw Data (dB $\mu$ V) - Preamplifier gain (dB) = corrected data (dB $\mu$ V/m).

9. Using the measurement path of Figure 5.2-2, the following evaluation for each antenna was performed to demonstrate that there is electrical continuity through the antenna:
  - A. A signal was radiated using an antenna or stub radiator at the highest measurement frequency of each antenna.
  - B. The measurement receiver was tuned to the frequency of the applied signal and the received signal of appropriate amplitude was present. NOTE: This evaluation is intended to provide a coarse indication that the antenna is functioning properly. There is no requirement to accurately measure the signal level.
10. An ambient measurement was performed across the frequency range with the EUT power leads disconnected. All auxiliary support equipment was powered during this measurement.



**Figure 5.2-2: RE102 Measurement System Check Setup**

### 5.2.3 RE102 EUT Test Setup

The EUT was set up in accordance with Section 3.2, Figure 3.2-1, and operated according to Section 3.3.

### 5.2.4 RE102 Antenna Positioning

1. Measure the EUT and test setup boundary for use in positioning of antennas. Use the physical reference points on the antennas shown in Figure 5.2-3 for measuring heights of the antennas and distances of the antennas from the test setup boundary.
2. Position antennas 1 meter from the front edge of the test setup boundary for all setups.
3. Position antennas 120 cm above the floor ground plane. For free standing EUTs, antenna heights shall be determined as described in points 6 and 7 below.
4. Ensure that no part of any antenna is closer than 1 meter from the walls and 0.5 meter from the ceiling of the shielded enclosure.

The number of required antenna positions depends on the size of the EUT and test setup boundary and the number of enclosures included in the setup.

5. For testing below 200 MHz, use the following criteria to determine the individual antenna positions.



- a. For setups with the side edges of the boundary 3 meters or less, one position is required and the antenna was centered with respect to the side edges of the boundary.
  - b. For setups with the side edges of the boundary greater than 3 meters, use multiple antenna positions at spacings as shown in Figure 5.2-4. Determine the number of antenna positions (N) by dividing the edge-to-edge boundary distance (in meters) by 3 and rounding up to an integer.
6. For testing from 200 MHz up to 1 GHz, place the antenna in a sufficient number of positions such that the entire area of each EUT enclosure and the first 35 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beamwidth of the antenna.
- The antenna positions are determined by calculating the antenna coverage. For example:  
Antenna Coverage =  $2 * (\text{TAN}(\Theta) * a)$   
Where  $\Theta = 1/2$  (antenna 3dB beamwidth)  
a = antenna distance from setup boundary
7. For testing at 1 GHz and above, place the antenna in a sufficient number of positions such that the entire area of each EUT enclosure and the first 7 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beamwidth of the antenna.
- The antenna positions are determined by calculating the antenna coverage. For example:  
Antenna Coverage =  $2 * (\text{TAN}(\Theta) * a)$   
Where  $\Theta = 1/2$  (antenna 3dB beamwidth)  
a = antenna distance from setup boundary

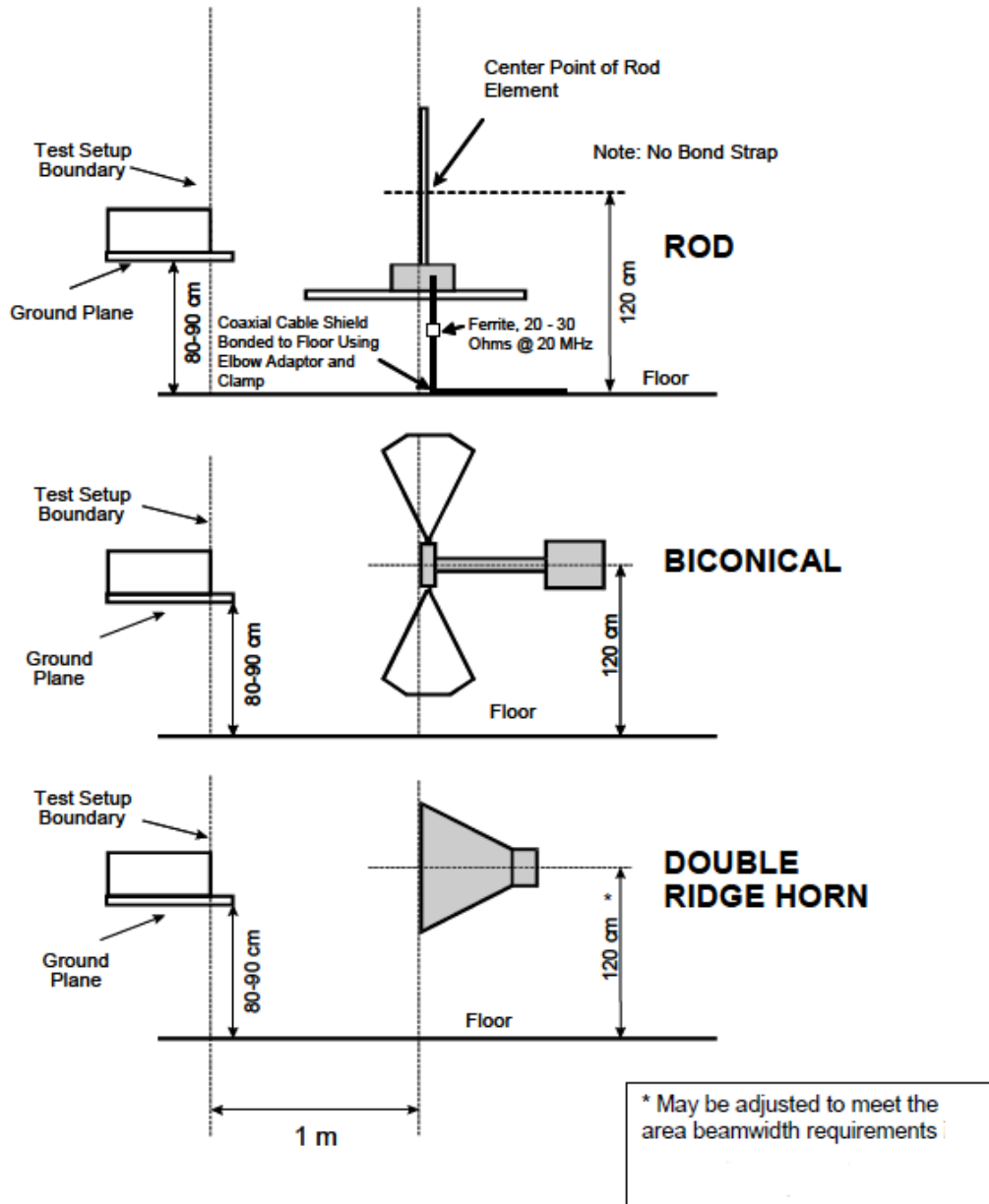


Figure 5.2-3: Antenna Positioning

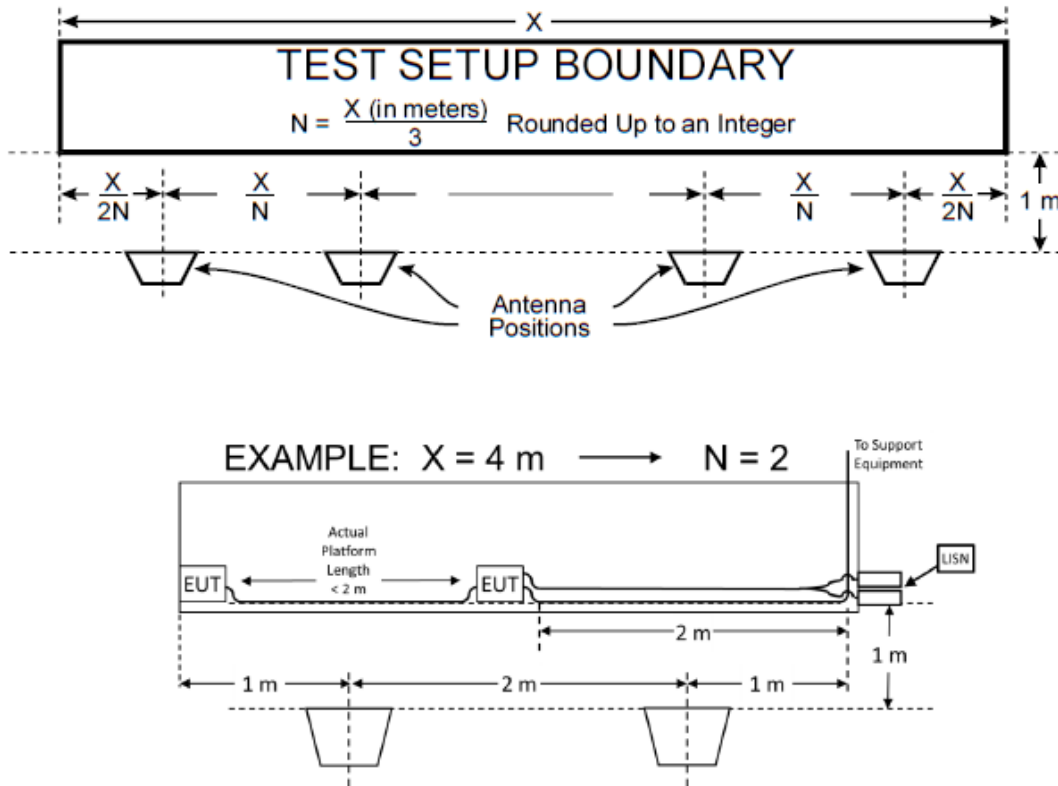


Figure 5.2-4: Multiple Antenna Positions

### 5.2.5 RE102 Test Procedure

1. The EUT was powered on, placed into operating mode and allowed sufficient time for stabilization.
2. The applicable frequency range was scanned, using the bandwidths and minimum measurement times specified in Table 4.4-1.
3. Above 30 MHz, both horizontal and vertical polarities were tested. Below 30 MHz, only vertical polarity measurements were performed.
4. Correction factors were added to the raw data collected from the measurement receiver. For example:  
 $Raw\ Data\ (dB\mu V) + Cable\ loss\ (dB) + Antenna\ factors\ (dB) - Preamplifier\ gain\ (dB) = Corrected\ Data\ (dB\mu V/m)$ .
5. Measurements were made at each antenna position determined in 5.2.4.
6. The following types of antennas, listed in Table 5.2-1, were used to scan the entire frequency range:

Table 5.2-1: Antenna Type and Applicable Frequencies

Antenna	Characteristics	Frequency Range
41" Active Rod	104 cm with impedance matching network, preamplifier, and square counterpoise measuring 60cm on a side	10 kHz - 30 MHz
Biconical	137 cm tip to tip	30 MHz - 200 MHz
Double Ridged Horn	69 x 94.5 cm opening	200 MHz - 1 GHz
Double Ridged Horn	24.2 x 13.6 cm opening	1 GHz - 18 GHz

### 5.2.6 RE102 Test Results, Conclusions and Recommendations

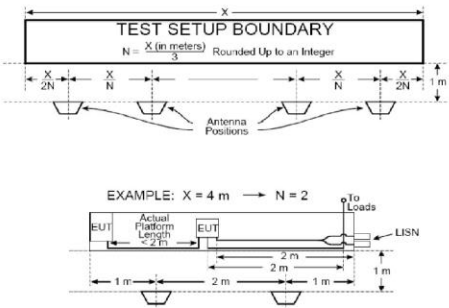
The EUT Passed.

At the time of testing, no remedial actions were taken in order to achieve compliance with the requirements. No corrective measures have been recommended.



NTS Labs LLC					
MIL-STD-461 Bonding and Grounding Worksheet					
Project :	PR163842	Customer:	Amphenol Aerospace		
EUT:	Ethernet SwitchBox	Model:	CF-020400-06		
Procedure:	062-QTP_final draft	Date:	10/20/2022		
Test Point	Reference	Specification (mΩ), (<=)	Measured (mΩ)	Results	Note
Ground Plane	Chamber	2.5	0.21	PASS	
EUT Chassis	Ground Plane	2.5	0.8	PASS	
J3 Braid	Ground Plane	2.5	1.59	PASS	
<b>Notes:</b>					
Test Performed By:		Tristian Gaines		Date:	10/20/2022

NTS Labs LLC												
MIL-STD-461 RE102 Bandwidth, Measurement Time and Frequency Resolution												
Project :	PR163842					Customer:	Amphenol Aerospace					
EUT:	Ethernet Switch Box					Model:	CF-020400-06					
Procedure:	062-QTP_final draft					Date:	10/19/2022 - 10/20/2022					
Spectrum Analyzer Used:			Agilent N9038A MXE, WC058456 (3 Hz - 44 GHz)									
Start Freq. (MHz)	Stop Freq. (MHz)	Table II Min. Meas. Time (sec/MHz)	Table II 6dB Resolution BW (MHz)	Min. Meas. time for this band (sec)	Number of Sweep Points	Min. Number of ranges needed	Min. Meas. Time per Range (sec)	Sampling Resolution (MHz)	Scan Settings Meet or Exceed 1% Requirement?	Scan Settings Meet or Exceed 2xRBW Requirement?	Acceptable Scan Settings?	
0.01	0.15	15	0.001	2.1	1001	1	2.1	0.00013986	No	Yes	Yes	
0.15	2	1.5	0.01	2.775	1001	1	2.775	0.00184815	No	Yes	Yes	
2	30	1.5	0.01	42	5600	1	42	0.00500000	Yes	Yes	Yes	
30	200	0.15	0.1	25.5	3400	1	25.5	0.05000000	Yes	Yes	Yes	
200	1000	0.15	0.1	120	16000	1	120	0.05000000	Yes	Yes	Yes	
1000	18000	0.015	1	255	20000	1	255	0.85000000	Yes	Yes	Yes	

NTS Labs LLC					
MIL-STD-461 RE102 Antenna Positions Below 200MHz					
Project :	PR163842	Customer:	Amphenol Aerospace		
EUT:	Ethernet Switch Box	Model:	CF-020400-06		
Procedure:	062-QTP_final draft	Date:	10/19/2022 - 10/20/2022		
<p>Remarks: The number of required antenna positions depends on the size of the test setup boundary and the number of enclosures included in the setup. For testing below 200 MHz, use the following criteria to determine the individual antenna positions. a. For setups with the side edges of the boundary 3 meters or less, one position is required and the antenna shall be centered with respect to the side edges of the boundary. b. For setups with the side edges of the boundary greater than 3 meters, use multiple antenna positions. Determine the number of antenna positions (N) by dividing the edge-to-edge boundary distance (in meters) by 3 and rounding up to an integer.</p>					
Test setup boundary edge to edge distance (cm):			203.0	cm	
Choose the end of the test setup on which the EUT is mounted:	Number of Lateral Positions Required	Position 1 Location (cm from the left edge)	Position 2 Location (cm from the left edge)	Position 3 Location (cm from the left edge)	Position 4 Location (cm from the left edge)
Left	1	101.5	N/A	N/A	N/A
					



NTS Labs LLC						
MIL-STD-461 RE102 Antenna Lateral Positions Above 200MHz						
<b>Project :</b>	PR163842		<b>Customer:</b>	Amphenol Aerospace		
<b>EUT:</b>	Ethernet Switch Box		<b>Model:</b>	CF-020400-06		
<b>Procedure:</b>	062-QTP_final draft		<b>Date:</b>	10/19/2022 - 10/20/2022		
Remarks: The number of required antenna positions depends on the size of the test setup boundary and the number of enclosures included in the setup. For testing from 200 MHz up to 1 GHz, place the antenna in a sufficient number of positions such that the entire area of each EUT enclosure and the first 35 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beam width of the antenna. For testing at 1 GHz and above, place the antenna in a sufficient number of positions such that the entire width of each EUT enclosure and the first 7 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beam width of the antenna.						
If 35 cm and 7 cm of cables / leads are positioned in front of the EUT enclosure, then select "No" for "Include Cables" below.						
<b>EUT width (cm) on the edge facing the receive antenna:</b>			<b>29.0</b>	<b>cm</b>		
<b>Choose the end of the test setup on which the EUT is mounted:</b>			<b>Left</b>			
<b>Include Cables &amp; Leads?:</b>			<b>Yes</b>			
EUT Testing 200MHz to 1GHz						
Receive Antenna Asset Number, Model, and Frequency Range			Most Narrow Beam width (degrees)	Test Distance (meters)	Lateral Antenna coverage (cm)	Required Number of Antenna Positions
WC005310	3106	0.2 -1GHz	28	1	49.9	2
Antenna Position 1 Location, cm Measured from the Left Edge of the EUT	Antenna Position 2 Location, cm Measured from the Left Edge of the EUT		Antenna Position 3 Location, cm Measured from the Left Edge of the EUT		Antenna Position 4 Location, cm Measured from the Left Edge of the EUT	
16.0	48.0		Not Applicable		Not Applicable	

EUT Testing 1GHz to 18GHz						
Receive Antenna Asset Number, Model, and Frequency Range			Most Narrow Beam width (degrees)	Test Distance (meters)	Lateral Antenna coverage (cm)	Required Number of Antenna Positions
WC005297	3115	1-18 GHz	8	1	14.0	3
Antenna Position 1 Location, cm Measured from the Left Edge of the EUT	Antenna Position 2 Location, cm Measured from the Left Edge of the EUT		Antenna Position 3 Location, cm Measured from the Left Edge of the EUT		Antenna Position 4 Location, cm Measured from the Left Edge of the EUT	
6.0	18.0		30.0		Not Applicable	
Antenna Position 5 Location, cm Measured from the Left Edge of the EUT	Antenna Position 6 Location, cm Measured from the Left Edge of the EUT		Antenna Position 7 Location, cm Measured from the Left Edge of the EUT		Antenna Position 8 Location, cm Measured from the Left Edge of the EUT	
Not Applicable	Not Applicable		Not Applicable		Not Applicable	





NTS Labs LLC						
MIL-STD-461 RE102 Antenna Height Positions Above 200MHz						
Project :	PR163842		Customer:	Amphenol Aerospace		
EUT:	Ethernet Switch Box		Model:	CF-020400-06		
Procedure:	062-QTP_final draft		Date:	10/19/2022 - 10/20/2022		
Remarks: The number of required antenna positions depends on the size of the test setup boundary and the number of enclosures included in the setup. For testing from 200 MHz up to 1 GHz, place the antenna in a sufficient number of positions such that the entire area of each EUT enclosure and the first 35 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beam width of the antenna. For testing at 1 GHz and above, place the antenna in a sufficient number of positions such that the entire width of each EUT enclosure and the first 7 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beam width of the antenna.						
EUT height (cm) on the edge facing the receive antenna:			23.0	cm		
EUT Testing 200MHz to 1GHz						
Receive Antenna Asset Number, Model, and Frequency Range		Most Narrow Beam width (degrees)	Test Distance (meters)	Antenna coverage (cm)	Required Number of Antenna Positions	
WC005310	3106	0.2 -1GHz	28	1	49.9	1
Antenna Position 1 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 2 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 3 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 4 Location, cm Measured from the Bottom Edge of the EUT		
11.5	Not Applicable		Not Applicable	Not Applicable		
Antenna Position 5 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 6 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 7 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 8 Location, cm Measured from the Bottom Edge of the EUT		
Not Applicable	Not Applicable		Not Applicable	Not Applicable		

EUT Testing 1GHz to 18GHz						
Receive Antenna Asset Number, Model, and Frequency Range		Most Narrow Beam width (degrees)	Test Distance (meters)	Antenna coverage (cm)	Required Number of Antenna Positions	
WC005297	3115	1-18 GHz	8	1	14.0	2
Antenna Position 1 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 2 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 3 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 4 Location, cm Measured from the Bottom Edge of the EUT		
5.8	17.3		Not Applicable	Not Applicable		
Antenna Position 5 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 6 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 7 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 8 Location, cm Measured from the Bottom Edge of the EUT		
Not Applicable	Not Applicable		Not Applicable	Not Applicable		
Antenna Position 9 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 10 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 11 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 12 Location, cm Measured from the Bottom Edge of the EUT		
Not Applicable	Not Applicable		Not Applicable	Not Applicable		
Antenna Position 13 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 14 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 15 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 16 Location, cm Measured from the Bottom Edge of the EUT		
Not Applicable	Not Applicable		Not Applicable	Not Applicable		
Antenna Position 17 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 18 Location, cm Measured from the Bottom Edge of the EUT		Antenna Position 19 Location, cm Measured from the Bottom Edge of the EUT	Antenna Position 20 Location, cm Measured from the Bottom Edge of the EUT		
Not Applicable	Not Applicable		Not Applicable	Not Applicable		



NTS Labs LLC					
RE102 System Verification					
Project :	PR163842	Customer:	Amphenol Aerospace		
EUT:	Ethernet Switch Box	Model:	CF-020400-06		
Procedure:	062-QTP_final draft	Date:	10/19/2022 - 10/20/2022		
RE102 Limit: Limit for aircraft and space systems applications, Fixed Wing External and Helicopters					
Frequency (MHz)	Limit (dBµV/m)	Calibrated Signal Amplitude (dBµV)	Measured Signal Amplitude (dBµV)	Deviation (dB)	Result
2.1	24.0	17.51	17.40	-0.11	PASS
12	24.0	17.64	18.00	0.36	PASS
29.5	24.0	17.21	16.90	-0.31	PASS
197	29.9	23.09	23.00	-0.09	PASS
990	43.9	36.78	36.30	-0.48	PASS
17500	68.8	61.50	61.80	0.30	PASS
Test Performed By: Tristian Gaines		Date: 10/19/2022 - 10/20/2022			

NTS Labs LLC						
MIL-STD-461 RE102 Data Sheet: Test Results Summary						
Project :	PR163842			Customer:	Amphenol Aerospace	
EUT:	Ethernet Switch Box			Model:	CF-020400-06	
Procedure:	062-QTP_final draft			Date:	10/19/2022 - 10/20/2022	
Input Voltage:	28VDC			Frequency:	DC	
Pre-Test Physical Inspection:		PASS	Observation:		None	
Pre-Test Operational Inspection:		PASS	Observation:		None	
Frequency Range Tested (MHz)	Polarization (H/V)	Antenna Height Position	Lateral Antenna Position	Test Mode or Configuration	Limit Level	Test Result
2.0 - 30	V	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
30 - 200	H	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
30 - 200	V	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
200 - 1,000	H	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
200 - 1,000	V	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS



NTS Labs LLC							
MIL-STD-461 RE102 Data Sheet: Test Results Summary							
<b>Project :</b>		PR163842			<b>Customer:</b>		Amphenol Aerospace
<b>EUT:</b>		Ethernet Switch Box			<b>Model:</b>		CF-020400-06
<b>Procedure:</b>		062-QTP_final draft			<b>Date:</b>		10/19/2022 - 10/20/2022
<b>Input Voltage:</b>		28VDC			<b>Frequency:</b>		DC
<b>Pre-Test Physical Inspection:</b>		PASS		<b>Observation:</b>		None	
<b>Pre-Test Operational Inspection:</b>		PASS		<b>Observation:</b>		None	
Frequency Range Tested (MHz)	Polarization (H/V)	Antenna Height Position	Lateral Antenna Position	Test Mode or Configuration	Limit Level	Test Result	
200 - 1,000	H	1	2	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
200 - 1,000	V	1	2	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	H	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	V	1	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	H	1	2	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	

NTS Labs LLC							
MIL-STD-461 RE102 Data Sheet: Test Results Summary							
<b>Project :</b>		PR163842			<b>Customer:</b>		Amphenol Aerospace
<b>EUT:</b>		Ethernet Switch Box			<b>Model:</b>		CF-020400-06
<b>Procedure:</b>		062-QTP_final draft			<b>Date:</b>		10/19/2022 - 10/20/2022
<b>Input Voltage:</b>		28VDC			<b>Frequency:</b>		DC
<b>Pre-Test Physical Inspection:</b>		PASS		<b>Observation:</b>		None	
<b>Pre-Test Operational Inspection:</b>		PASS		<b>Observation:</b>		None	
Frequency Range Tested (MHz)	Polarization (H/V)	Antenna Height Position	Lateral Antenna Position	Test Mode or Configuration	Limit Level	Test Result	
1,000 - 18,000	V	1	2	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	H	1	3	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	V	1	3	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	H	2	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	
1,000 - 18,000	V	2	1	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS	



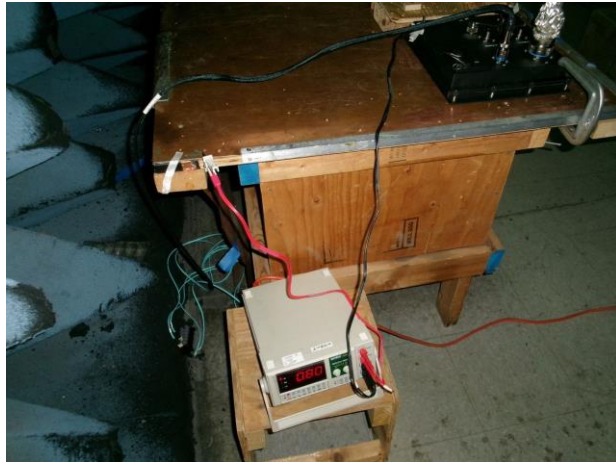
NTS Labs LLC						
MIL-STD-461 RE102 Data Sheet: Test Results Summary						
<b>Project :</b>		PR163842		<b>Customer:</b>		Amphenol Aerospace
<b>EUT:</b>		Ethernet Switch Box		<b>Model:</b>		CF-020400-06
<b>Procedure:</b>		062-QTP_final draft		<b>Date:</b>		10/19/2022 - 10/20/2022
<b>Input Voltage:</b>		28VDC		<b>Frequency:</b>		DC
<b>Pre-Test Physical Inspection:</b>		PASS		<b>Observation:</b>		None
<b>Pre-Test Operational Inspection:</b>		PASS		<b>Observation:</b>		None
Frequency Range Tested (MHz)	Polarization (H/V)	Antenna Height Position	Lateral Antenna Position	Test Mode or Configuration	Limit Level	Test Result
1,000 - 18,000	H	2	2	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
1,000 - 18,000	V	2	2	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
1,000 - 18,000	H	2	3	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
1,000 - 18,000	V	2	3	Normal	Limit for aircraft and space systems applications, Fixed Wing External and Helicopters	PASS
<b>Post-Test Physical Inspection:</b>		PASS		<b>Observation:</b>		None
<b>Post-Test Operational Inspection:</b>		PASS		<b>Observation:</b>		None
<b>Test Performed By:</b>		Tristian Gaines		<b>Date:</b>		10/19/2022 - 10/20/2022

NTS Labs LLC							
MIL-STD-461 RE102 Log Sheet							
<b>Project :</b>		PR163842		<b>Customer:</b>		Amphenol Aerospace	
<b>EUT:</b>		Ethernet Switch Box		<b>Model:</b>		CF-020400-06	
<b>Procedure:</b>		062-QTP_final draft		<b>Date:</b>		10/19/2022 - 10/20/2022	
Date	Time	Log Entries				Initials	
10/19/22	1500	Rod antenna path checks complete. Awaiting customer/equipment.				TG	
10/20/22	1030	Equipment arrived, began test setup.				↓	
↓	1300	2-30MHz pass.				↓	
↓	1600	30MHz-1GHz pass.				TG	
10/21/22	0730	Began 1-18GHz.				↓	
↓	1011	RE102 Pass.				TG	
<b>Test Performed By:</b>		Tristian Gaines					

## 5.2.8 RE102 Photographs



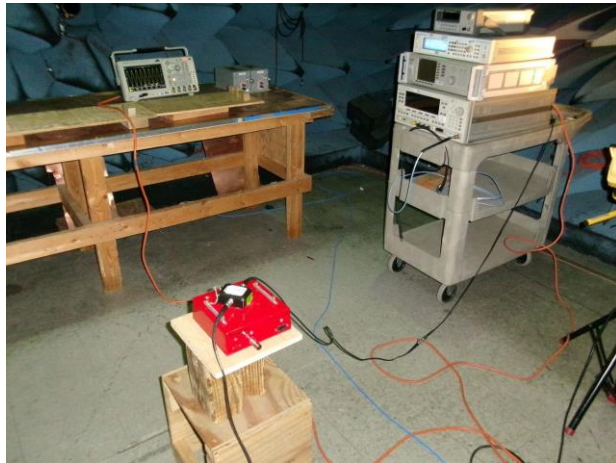
GP to Chamber Bond



GP to EUT Bond



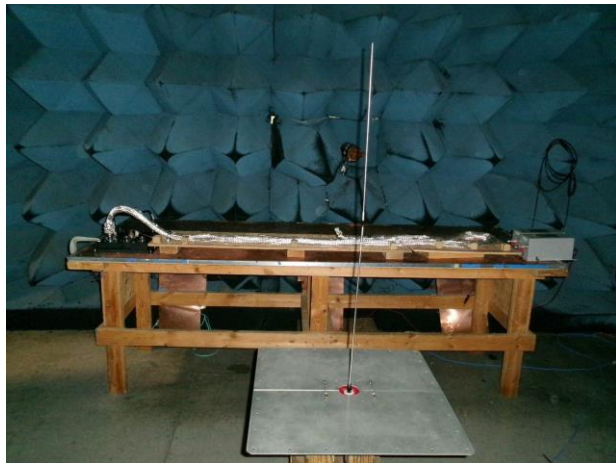
GP to Ethernet Braid Termination



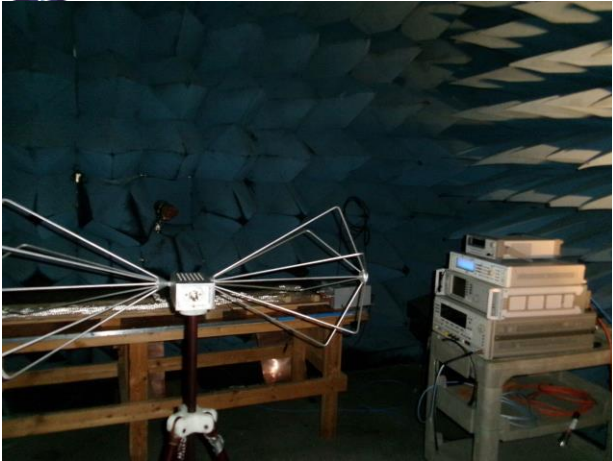
RE102 System Check, 2-30MHz



RE102 Stub Radiator, 2-30MHz



RE102 Test, 2-30MHz



RE102 System Check, 30-200MHz



RE102 Stub Radiator, 30-200MHz



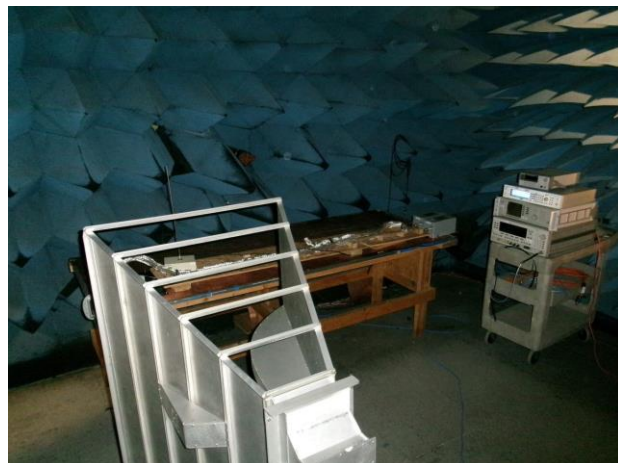
RE102 Test, 30-200MHz Horizontal



RE102 Test, 30-200MHz Vertical



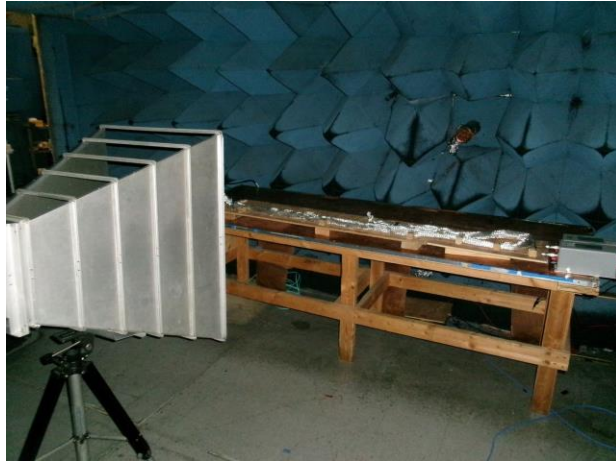
RE102 System Check, 200MHz-1GHz



RE102 Stub Radiator, 200MHz-1GHz



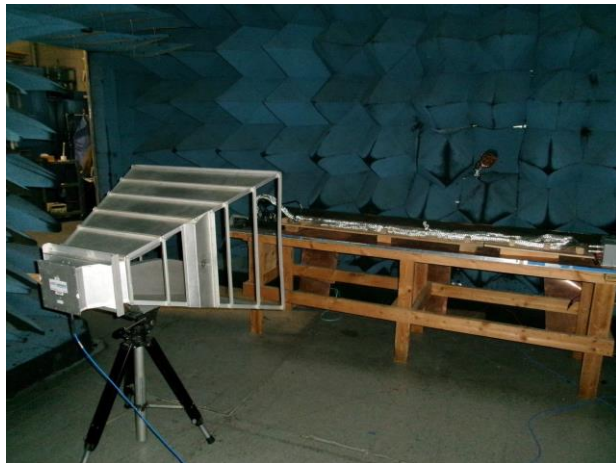
RE102 Test, 200MHz-1GHz, Horizontal, Position 1



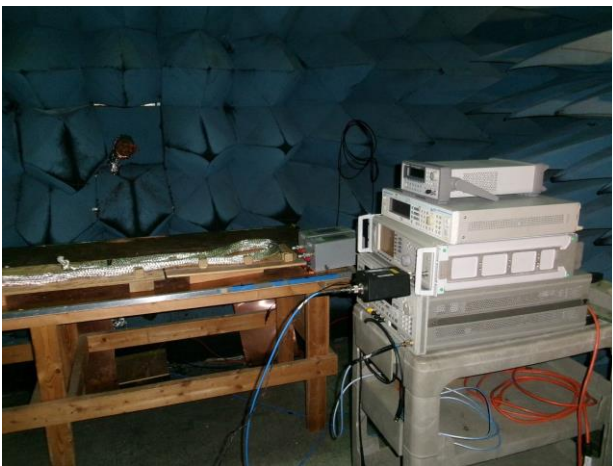
RE102 Test, 200MHz-1GHz, Horizontal, Position 2



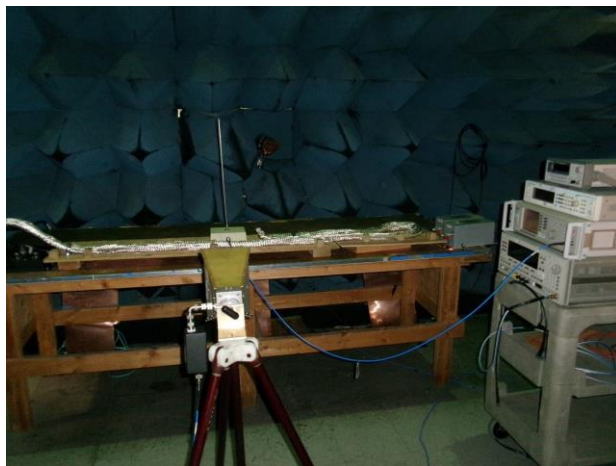
RE102 Test, 200MHz-1GHz, Vertical, Position 2



RE102 Test, 200MHz-1GHz, Vertical, Position 1



RE102 System Check, 1-18GHz



RE102 Stub Radiator, 1-18GHz



RE102 Test, 1-18GHz, Horizontal, Position 1



RE102 Test, 1-18GHz, Vertical, Position 1



RE102 Test, 1-18GHz, Vertical, Position 2



RE102 Test, 1-18GHz, Horizontal, Position 2

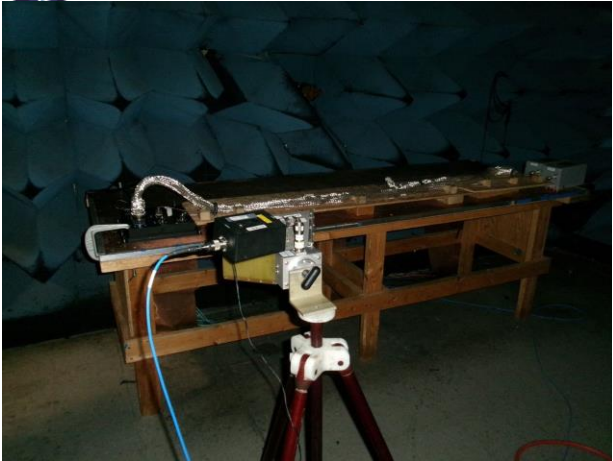


RE102 Test, 1-18GHz, Horizontal, Position 3



RE102 Test, 1-18GHz, Vertical, Position 3

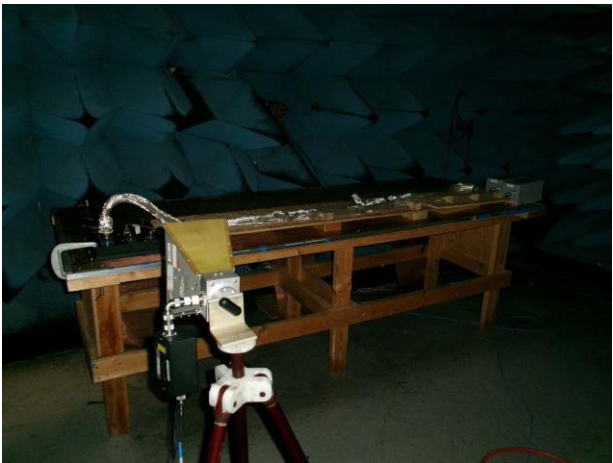




RE102 Test, 1-18GHz, Vertical, Position 4



RE102 Test, 1-18GHz, Horizontal, Position 4



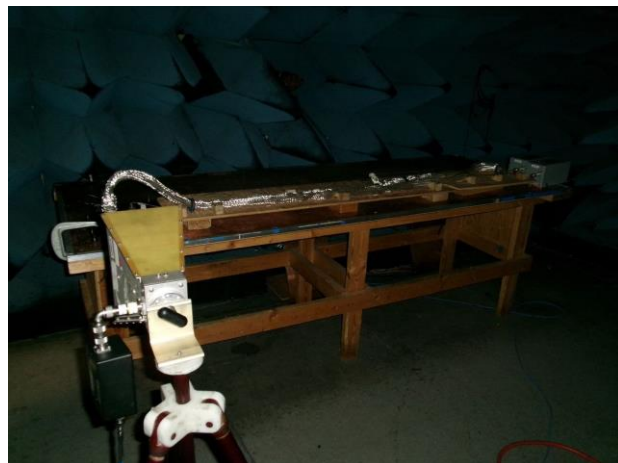
RE102 Test, 1-18GHz, Horizontal, Position 5



RE102 Test, 1-18GHz, Vertical, Position 5

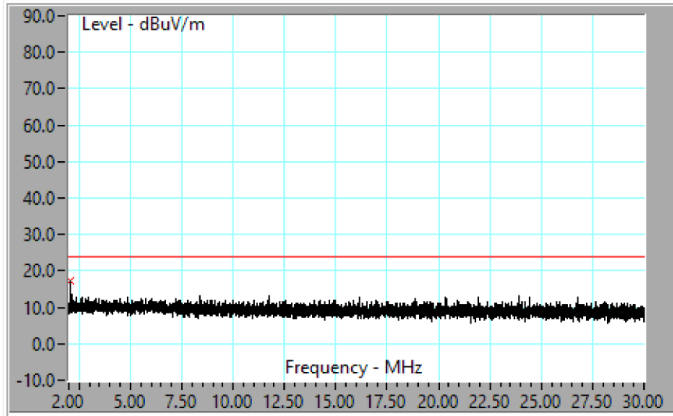


RE102 Test, 1-18GHz, Vertical, Position 6



RE102 Test, 1-18GHz, Horizontal, Position 6

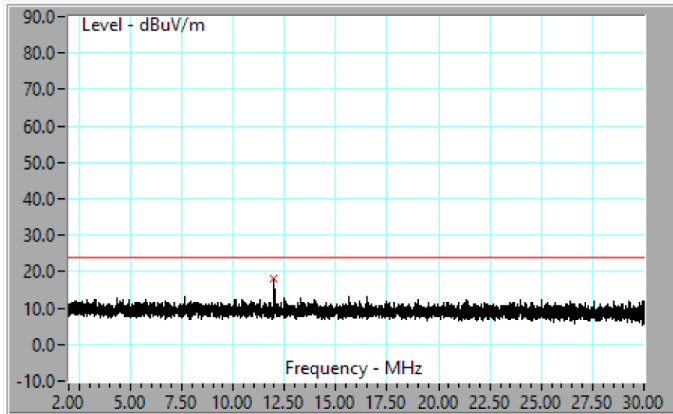
RE102 System Check: Calibrated Injected Signal = 17.51 dBuV @ 2.1 MHz



Wed, Oct 19, 2022
2:25:06 PM
AutoScan 2022.9.19
Res BW (kHz) 10
Vid BW (kHz) 50000
VERTICAL
ETS-Lindgren 3301C Active Monopole
Graph # 12
Sweep Time 90.0002

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
2.100	17.4	24.0	-6.6	18.94	-1.69	0.16	0.00	1.53

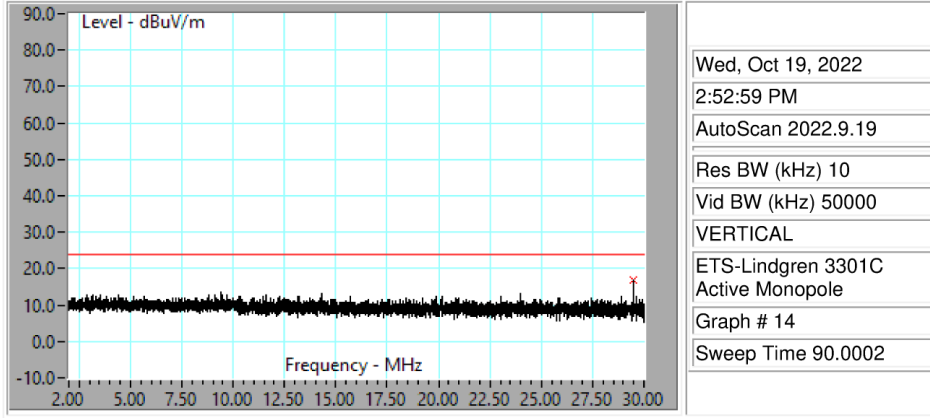
RE102 System Check: Calibrated Injected Signal = 17.64 dBuV @ 2.1 MHz



Wed, Oct 19, 2022
2:48:41 PM
AutoScan 2022.9.19
Res BW (kHz) 10
Vid BW (kHz) 50000
VERTICAL
ETS-Lindgren 3301C Active Monopole
Graph # 13
Sweep Time 90.0002

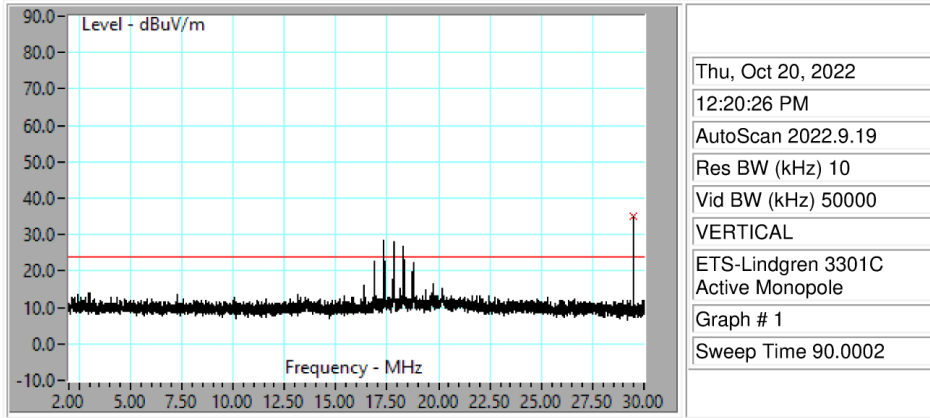
Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
11.997	18.0	24.0	-6.0	18.90	-1.20	0.34	0.00	0.86

RE102 System Check: Calibrated Injected Signal = 17.21 dBuV @ 2.1 MHz



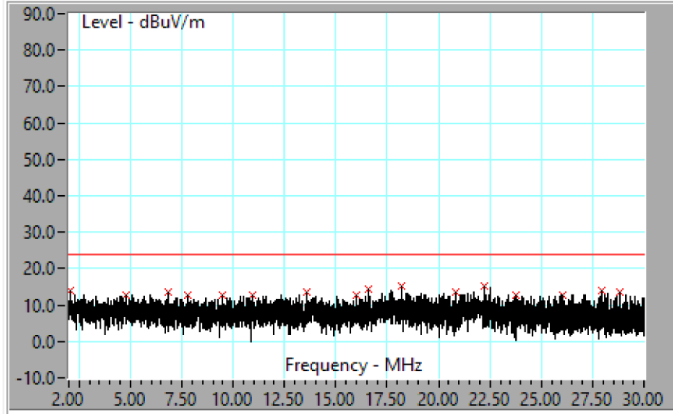
Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
29.50	16.9	24.0	-7.1	15.58	0.76	0.56	0.00	-1.32

RE102 System Check: Stub Radiator @ 29.5MHz



Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
29.50	34.9	24.0	10.9	33.61	0.76	0.56	0.00	-1.32

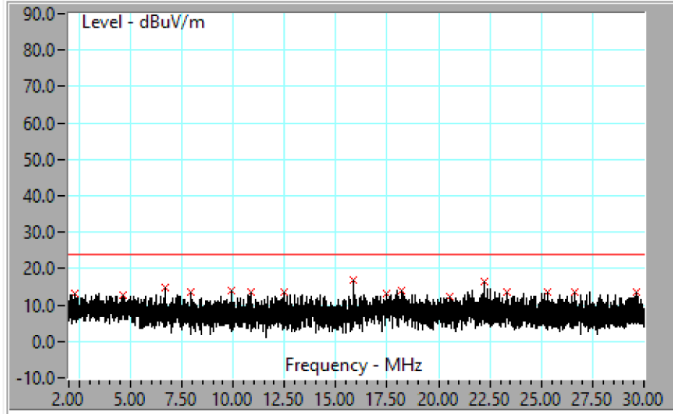
RE102 System Check: Ambient Scan



Thu, Oct 20, 2022
12:43:53 PM
AutoScan 2022.9.30
Res BW (kHz) 10
Vid BW (kHz) 50000
VERTICAL
ETS-Lindgren 3301C
Active Monopole
Graph # 1
Sweep Time 90.0002

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
2.090	14.0	24.0	-10.0	15.57	-1.69	0.16	0.00	1.53
4.760	12.8	24.0	-11.2	14.23	-1.65	0.21	0.00	1.44
6.821	13.4	24.0	-10.6	14.70	-1.57	0.25	0.00	1.32
7.776	12.6	24.0	-11.4	13.80	-1.51	0.27	0.00	1.24
9.486	12.5	24.0	-11.5	13.64	-1.40	0.31	0.00	1.10
10.917	12.9	24.0	-11.1	13.89	-1.30	0.33	0.00	0.97
13.612	13.4	24.0	-10.6	14.06	-1.06	0.36	0.00	0.70
15.997	12.6	24.0	-11.4	13.04	-0.83	0.39	0.00	0.44
16.588	14.3	24.0	-9.7	14.70	-0.77	0.40	0.00	0.37
18.173	15.2	24.0	-8.8	15.36	-0.60	0.42	0.00	0.18
20.828	13.7	24.0	-10.3	13.59	-0.30	0.45	0.00	-0.16
22.209	15.0	24.0	-9.0	14.70	-0.14	0.47	0.00	-0.33
23.749	12.9	24.0	-11.1	12.35	0.05	0.49	0.00	-0.54
26.029	12.9	24.0	-11.1	12.01	0.33	0.52	0.00	-0.85
27.980	13.8	24.0	-10.2	12.74	0.57	0.54	0.00	-1.11
28.810	13.4	24.0	-10.6	12.14	0.67	0.55	0.00	-1.22

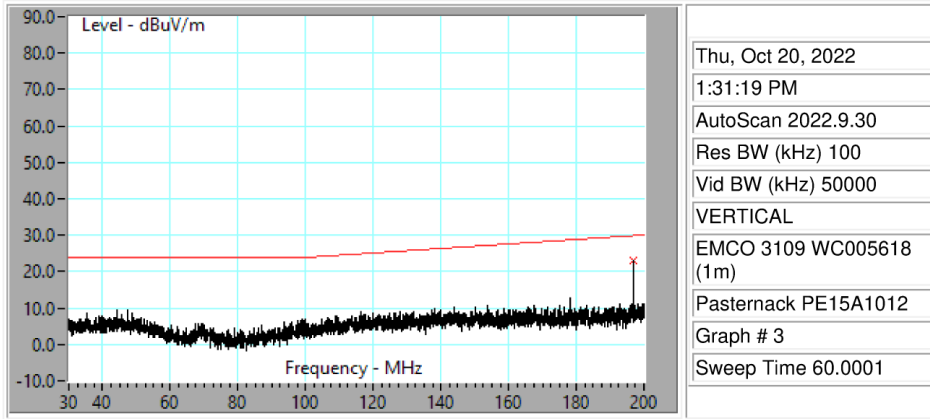
RE102: Ethernet Switch



Thu, Oct 20, 2022
1:00:52 PM
AutoScan 2022.9.30
Res BW (kHz) 10
Vid BW (kHz) 50000
VERTICAL
ETS-Lindgren 3301C
Active Monopole
Graph # 2
Sweep Time 90.0002

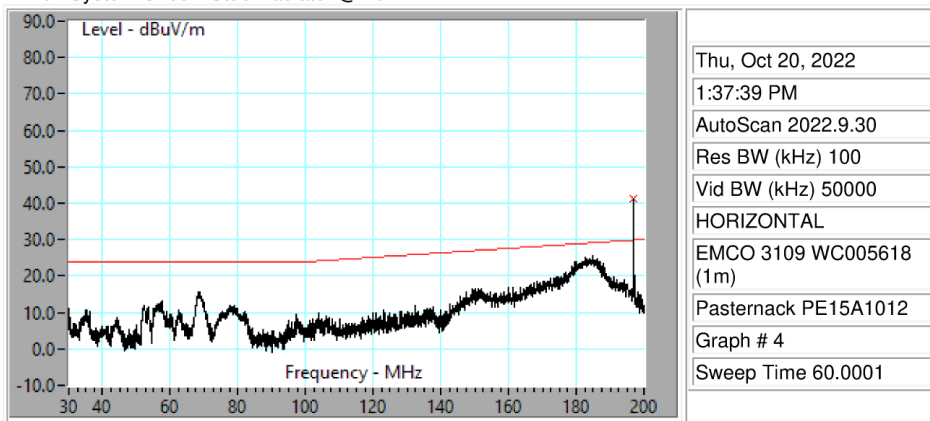
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
2.265	13.3	24.0	-10.7	14.84	-1.69	0.16	0.00	1.53
4.625	12.9	24.0	-11.1	14.36	-1.65	0.21	0.00	1.44
6.671	14.7	24.0	-9.3	15.99	-1.57	0.25	0.00	1.32
7.931	13.7	24.0	-10.3	14.91	-1.51	0.27	0.00	1.23
9.911	13.9	24.0	-10.1	14.95	-1.37	0.31	0.00	1.06
10.897	13.7	24.0	-10.3	14.70	-1.30	0.33	0.00	0.97
12.512	13.7	24.0	-10.3	14.49	-1.16	0.35	0.00	0.81
15.847	17.0	24.0	-7.0	17.42	-0.85	0.39	0.00	0.46
17.453	13.1	24.0	-10.9	13.41	-0.67	0.41	0.00	0.26
18.178	14.1	24.0	-9.9	14.26	-0.60	0.42	0.00	0.18
20.563	12.1	24.0	-11.9	12.02	-0.33	0.45	0.00	-0.12
22.209	16.5	24.0	-7.5	16.19	-0.14	0.47	0.00	-0.33
23.299	13.7	24.0	-10.3	13.25	-0.00	0.48	0.00	-0.48
25.334	13.4	24.0	-10.6	12.65	0.24	0.51	0.00	-0.75
26.629	13.6	24.0	-10.4	12.71	0.40	0.53	0.00	-0.93
29.610	13.4	24.0	-10.6	12.11	0.77	0.56	0.00	-1.33

RE102 System Check: Calibrated Injected Signal = 23.09 dBuV @ 197 MHz



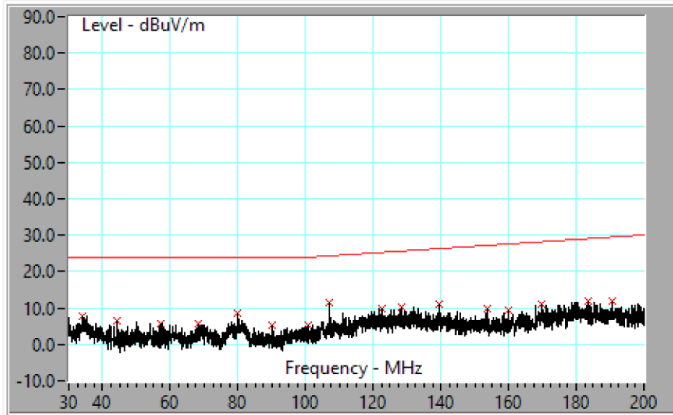
Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
197.00	23.0	29.9	-6.9	46.42	15.09	2.01	40.56	23.46

RE102 System Check: Stub Radiator @ 197 MHz



Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
197.00	41.2	29.9	11.4	65.03	14.77	2.01	40.56	23.78

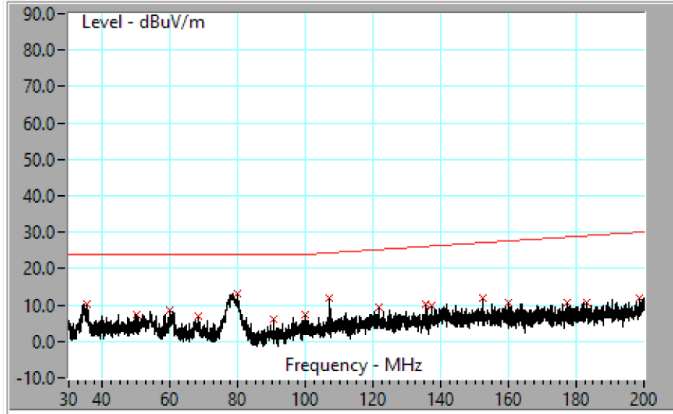
RE102 System Check: Ambient Scan



Thu, Oct 20, 2022
1:44:27 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3109 WC005618 (1m)
Pasternack PE15A1012
Graph # 5
Sweep Time 60.0001

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
34.20	7.6	24.0	-16.4	35.23	12.34	0.62	40.57	27.61
44.30	6.7	24.0	-17.3	34.60	11.90	0.75	40.53	27.89
57.36	5.8	24.0	-18.2	34.50	10.93	0.91	40.52	28.68
68.06	5.9	24.0	-18.1	34.83	10.49	1.05	40.51	28.98
79.96	8.4	24.0	-15.6	39.15	8.56	1.20	40.51	30.75
90.07	5.2	24.0	-18.8	35.37	9.01	1.33	40.48	30.14
100.87	5.4	24.1	-18.6	34.20	10.27	1.46	40.48	28.75
107.02	11.3	24.6	-13.3	39.02	11.26	1.49	40.48	27.72
122.48	10.0	25.8	-15.8	34.80	14.05	1.58	40.49	24.85
128.13	10.4	26.1	-15.8	35.16	14.10	1.62	40.51	24.79
139.28	11.2	26.9	-15.7	36.39	13.61	1.68	40.52	25.23
153.54	9.9	27.7	-17.9	35.86	12.76	1.76	40.52	26.00
160.04	9.3	28.1	-18.8	35.07	12.96	1.80	40.53	25.77
169.74	11.2	28.6	-17.4	35.97	13.90	1.85	40.52	24.77
183.55	11.9	29.3	-17.4	35.08	15.43	1.93	40.55	23.18
190.60	11.9	29.6	-17.7	35.36	15.13	1.97	40.58	23.47

RE102 System Check: Ambient Scan

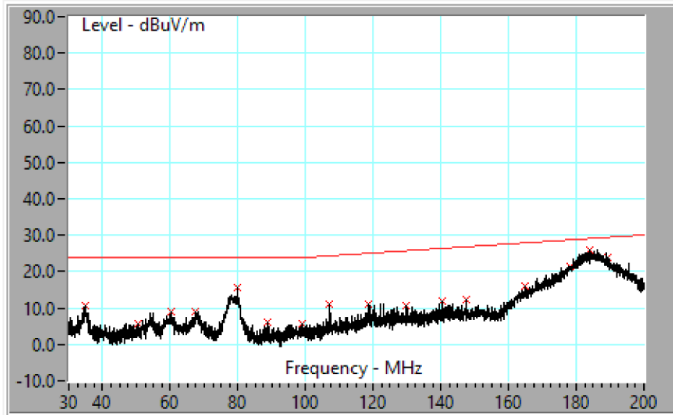


Thu, Oct 20, 2022
1:55:09 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
VERTICAL
EMCO 3109 WC005618 (1m)
Pasternack PE15A1012
Graph # 6
Sweep Time 60.0001

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
35.45	10.2	24.0	-13.8	37.95	12.17	0.64	40.56	27.75
50.01	7.4	24.0	-16.6	34.75	12.40	0.82	40.53	27.31
59.71	8.5	24.0	-15.5	38.25	9.79	0.94	40.51	29.78
68.36	7.0	24.0	-17.0	35.95	10.51	1.05	40.51	28.95
80.01	13.3	24.0	-10.7	44.24	8.40	1.20	40.51	30.91
90.47	6.1	24.0	-17.9	35.75	9.48	1.33	40.48	29.66
99.67	7.4	24.0	-16.6	35.56	10.87	1.45	40.48	28.16
107.12	11.8	24.6	-12.8	39.10	11.74	1.49	40.48	27.25
121.48	9.6	25.7	-16.1	35.49	13.00	1.58	40.48	25.91
135.38	10.4	26.6	-16.2	35.87	13.39	1.66	40.52	25.47
137.18	10.0	26.7	-16.8	35.28	13.52	1.67	40.52	25.33
152.49	12.0	27.7	-15.7	36.96	13.79	1.75	40.52	24.97
159.99	10.6	28.1	-17.5	35.52	13.77	1.80	40.53	24.97
177.24	10.7	29.0	-18.3	35.43	13.90	1.90	40.53	24.73
182.94	10.6	29.2	-18.7	35.00	14.20	1.93	40.55	24.42
198.85	12.0	30.0	-17.9	35.33	15.25	2.02	40.56	23.29



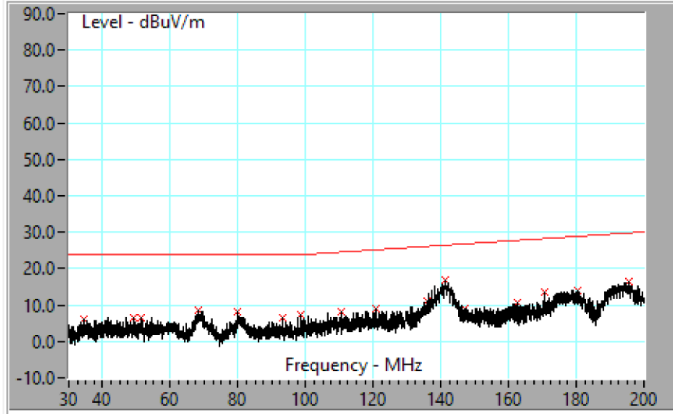
RE102: Ethernet Switch



Thu, Oct 20, 2022
2:00:55 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
VERTICAL
EMCO 3109 WC005618 (1m)
Pasternack PE15A1012
Graph # 7
Sweep Time 60.0001

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
35.00	10.7	24.0	-13.3	38.50	12.11	0.63	40.56	27.82
50.51	5.8	24.0	-18.2	33.13	12.32	0.83	40.53	27.37
60.36	9.0	24.0	-15.0	39.00	9.60	0.95	40.51	29.96
67.51	8.9	24.0	-15.1	38.25	10.11	1.04	40.51	29.36
79.96	15.5	24.0	-8.5	46.38	8.40	1.20	40.51	30.91
88.92	6.2	24.0	-17.8	36.07	9.26	1.31	40.48	29.91
99.17	5.6	24.0	-18.4	33.83	10.80	1.44	40.48	28.24
107.17	11.1	24.6	-13.5	38.34	11.74	1.50	40.48	27.25
118.58	11.1	25.5	-14.3	37.21	12.85	1.56	40.48	26.07
129.88	10.6	26.3	-15.7	36.29	13.15	1.63	40.52	25.74
140.38	12.0	26.9	-15.0	36.93	13.86	1.69	40.52	24.97
147.63	12.5	27.4	-14.9	37.57	13.68	1.73	40.51	25.10
164.89	16.1	28.3	-12.3	41.08	13.70	1.83	40.53	25.00
178.19	21.5	29.0	-7.5	46.20	13.92	1.90	40.53	24.71
184.15	26.0	29.3	-3.3	50.42	14.22	1.94	40.55	24.39
189.25	23.7	29.5	-5.8	47.83	14.49	1.97	40.57	24.12

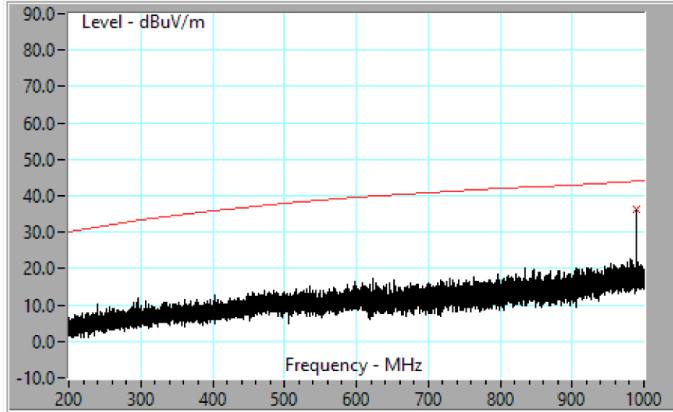
RE102: Ethernet Switch



Thu, Oct 20, 2022
2:06:14 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3109 WC005618 (1m)
Pasternack PE15A1012
Graph # 8
Sweep Time 60.0001

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
34.65	6.0	24.0	-18.0	33.58	12.33	0.63	40.57	27.61
49.16	6.7	24.0	-17.3	34.88	11.54	0.81	40.53	28.18
51.51	6.5	24.0	-17.5	34.63	11.55	0.84	40.53	28.14
68.36	8.4	24.0	-15.6	37.25	10.61	1.05	40.51	28.85
80.01	8.2	24.0	-15.8	38.96	8.56	1.20	40.51	30.75
93.32	6.7	24.0	-17.3	36.49	9.34	1.37	40.48	29.78
98.57	7.2	24.0	-16.8	36.30	9.95	1.44	40.48	29.09
110.62	8.1	24.9	-16.8	35.08	11.97	1.51	40.48	27.00
120.78	9.0	25.6	-16.7	34.01	13.86	1.57	40.48	25.05
135.98	10.9	26.7	-15.7	36.13	13.65	1.66	40.52	25.21
141.18	16.9	27.0	-10.1	42.19	13.54	1.69	40.52	25.28
146.88	9.2	27.3	-18.1	35.03	12.95	1.72	40.51	25.84
162.79	10.7	28.2	-17.5	36.36	13.07	1.81	40.53	25.65
170.64	13.4	28.6	-15.2	38.03	14.06	1.86	40.52	24.61
180.34	14.1	29.1	-15.0	37.35	15.41	1.91	40.53	23.21
195.55	16.3	29.8	-13.5	39.99	14.85	2.00	40.56	23.71

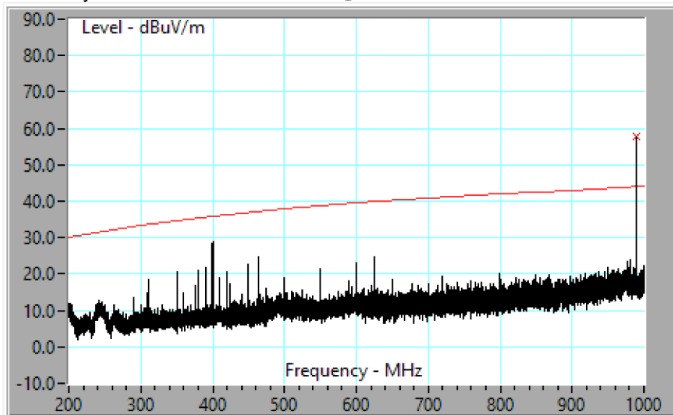
RE102 System Check: Calibrated Injected Signal = 36.78 dBuV @ 990 MHz



Thu, Oct 20, 2022
2:35:07 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 9
Sweep Time 120.0010

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
990.0	36.3	43.9	-7.6	48.23	22.78	4.39	39.12	11.95

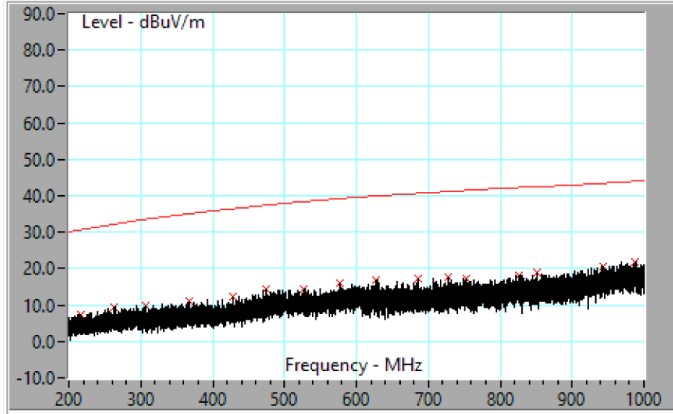
RE102 System Check: Stub Radiator @ 990 MHz



Thu, Oct 20, 2022
2:41:47 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 10
Sweep Time 120.0010

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
990.0	58.0	43.9	14.1	69.91	22.78	4.39	39.12	11.95

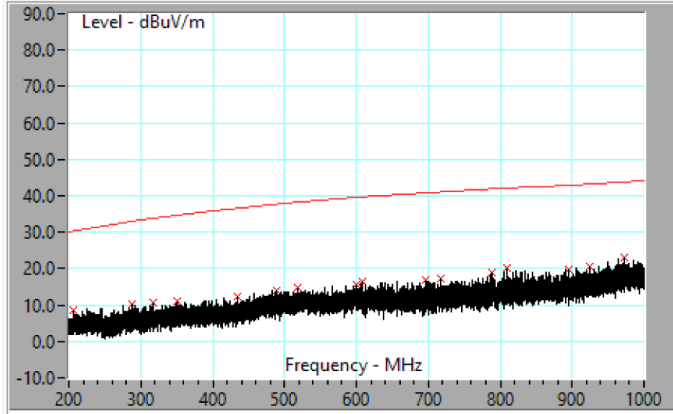
RE102 System Check: Ambient Scan



Thu, Oct 20, 2022
2:47:36 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 11
Sweep Time 120.0010

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
216.10	7.4	30.7	-23.3	35.16	10.74	2.10	40.57	27.73
262.35	9.5	32.4	-22.9	36.15	11.62	2.30	40.62	26.69
307.46	9.9	33.7	-23.9	35.42	12.62	2.50	40.66	25.54
367.06	11.2	35.3	-24.0	35.83	13.42	2.72	40.72	24.59
428.91	12.1	36.6	-24.5	35.98	13.95	2.93	40.73	23.84
474.92	14.5	37.5	-23.0	36.33	15.76	3.09	40.72	21.87
527.42	14.5	38.4	-23.9	35.76	16.22	3.26	40.69	21.22
576.77	16.0	39.2	-23.2	36.46	16.71	3.40	40.62	20.51
627.18	16.9	39.9	-23.1	36.58	17.23	3.54	40.50	19.73
685.43	17.1	40.7	-23.6	36.08	17.69	3.69	40.35	18.97
728.28	17.8	41.2	-23.4	36.03	18.16	3.81	40.20	18.23
753.78	17.3	41.5	-24.2	35.37	18.15	3.88	40.09	18.06
826.84	18.2	42.3	-24.1	34.33	19.50	4.06	39.71	16.15
851.74	18.7	42.6	-23.8	34.63	19.57	4.12	39.59	15.89
944.10	20.8	43.5	-22.7	33.96	21.75	4.31	39.24	13.18
987.75	22.0	43.8	-21.9	33.88	22.84	4.39	39.13	11.90

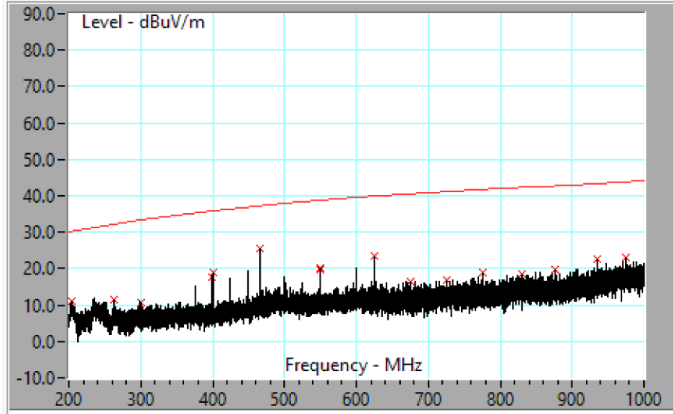
RE102 System Check: Ambient Scan



Thu, Oct 20, 2022
2:58:54 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
VERTICAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 12
Sweep Time 120.0010

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
206.50	8.7	30.3	-21.6	36.57	10.65	2.06	40.56	27.86
288.71	10.3	33.2	-22.9	36.22	12.27	2.42	40.64	25.95
317.36	10.5	34.0	-23.5	35.76	12.91	2.54	40.67	25.23
350.01	10.9	34.9	-23.9	35.57	13.41	2.65	40.70	24.64
434.31	12.3	36.7	-24.5	35.81	14.23	2.95	40.73	23.55
488.57	14.0	37.7	-23.7	35.45	16.18	3.14	40.71	21.40
517.87	14.7	38.3	-23.6	35.66	16.50	3.23	40.70	20.97
599.77	15.6	39.5	-23.9	35.21	17.51	3.46	40.57	19.59
608.78	16.3	39.7	-23.3	35.91	17.46	3.49	40.55	19.59
696.63	17.0	40.8	-23.8	35.87	17.76	3.72	40.32	18.84
716.53	17.5	41.1	-23.6	35.90	18.05	3.78	40.25	18.42
788.19	18.8	41.9	-23.0	36.13	18.66	3.97	39.91	17.28
809.69	20.1	42.1	-22.0	36.74	19.16	4.03	39.80	16.62
896.29	19.8	43.0	-23.2	34.77	20.24	4.22	39.39	14.93
924.25	20.7	43.3	-22.6	34.77	20.95	4.28	39.30	14.08
973.20	23.1	43.7	-20.6	34.98	22.96	4.36	39.16	11.85

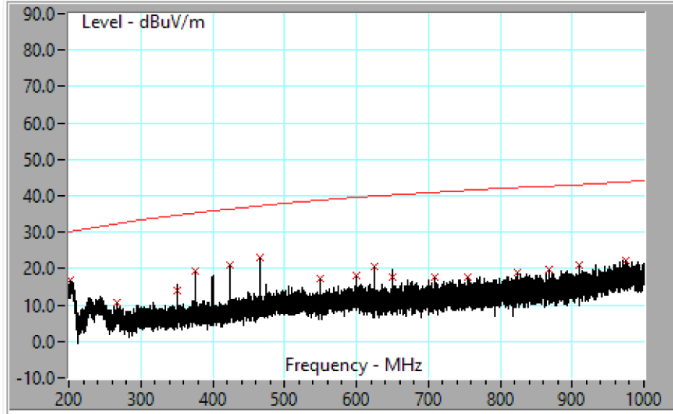
RE102: Ethernet Switch Position 1



Thu, Oct 20, 2022
3:03:42 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 13
Sweep Time 120.0010

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
203.45	11.2	30.2	-18.9	39.30	10.43	2.04	40.56	28.09
262.70	11.3	32.4	-21.1	37.99	11.63	2.31	40.62	26.69
300.91	10.6	33.5	-23.0	36.25	12.51	2.48	40.65	25.67
399.96	17.7	36.0	-18.3	42.01	13.56	2.84	40.72	24.33
400.01	19.0	36.0	-17.0	43.36	13.56	2.84	40.72	24.32
466.57	25.7	37.3	-11.7	47.87	15.46	3.06	40.72	22.20
549.97	20.1	38.8	-18.6	41.59	15.90	3.32	40.67	21.45
550.02	19.7	38.8	-19.0	41.18	15.90	3.32	40.67	21.45
625.03	23.6	39.9	-16.3	43.37	17.23	3.53	40.50	19.74
675.73	16.5	40.6	-24.0	35.46	17.78	3.67	40.37	18.92
724.78	16.9	41.2	-24.3	35.10	18.16	3.80	40.21	18.25
774.99	18.8	41.7	-23.0	36.39	18.43	3.94	39.98	17.61
831.34	18.6	42.4	-23.7	34.73	19.51	4.08	39.69	16.10
875.84	19.7	42.8	-23.1	35.37	19.62	4.18	39.48	15.69
935.40	22.6	43.4	-20.7	36.26	21.36	4.29	39.27	13.61
975.35	23.1	43.7	-20.6	34.75	23.17	4.36	39.16	11.62

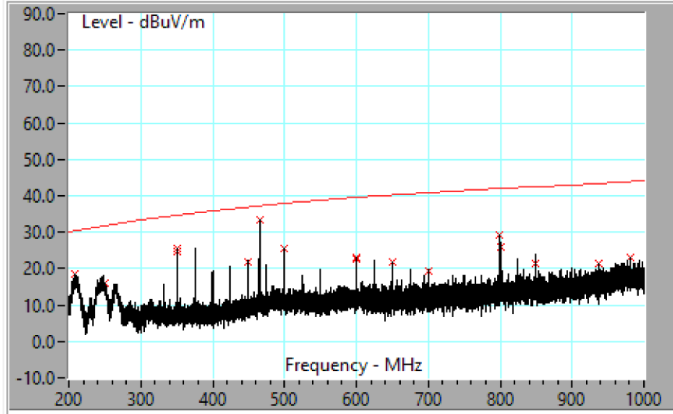
RE102: Ethernet Switch Position 2



Thu, Oct 20, 2022
3:07:39 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
HORIZONTAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 14
Sweep Time 120.0010

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
201.55	16.7	30.1	-13.3	44.88	10.38	2.03	40.55	28.14
267.90	10.7	32.5	-21.8	37.33	11.70	2.33	40.62	26.59
349.96	13.8	34.9	-21.1	38.52	13.32	2.65	40.70	24.73
374.96	19.4	35.5	-16.1	43.92	13.46	2.74	40.73	24.52
425.01	20.8	36.5	-15.7	44.83	13.78	2.92	40.73	24.02
466.02	22.9	37.3	-14.4	45.15	15.44	3.06	40.72	22.23
549.97	17.2	38.8	-21.6	38.67	15.90	3.32	40.67	21.45
599.97	18.2	39.5	-21.3	38.06	17.25	3.46	40.57	19.86
624.98	20.6	39.9	-19.3	40.30	17.23	3.53	40.50	19.74
650.03	17.7	40.2	-22.5	37.31	17.26	3.60	40.43	19.58
709.93	17.6	41.0	-23.4	36.33	17.79	3.76	40.28	18.73
754.33	17.6	41.5	-23.9	35.65	18.16	3.88	40.08	18.05
824.99	18.9	42.3	-23.4	35.07	19.49	4.06	39.72	16.17
867.94	19.6	42.7	-23.1	35.36	19.59	4.16	39.52	15.76
909.14	20.9	43.1	-22.2	35.65	20.37	4.25	39.35	14.73
975.50	22.3	43.7	-21.5	33.88	23.17	4.36	39.16	11.63

RE102: Ethernet Switch Position 2

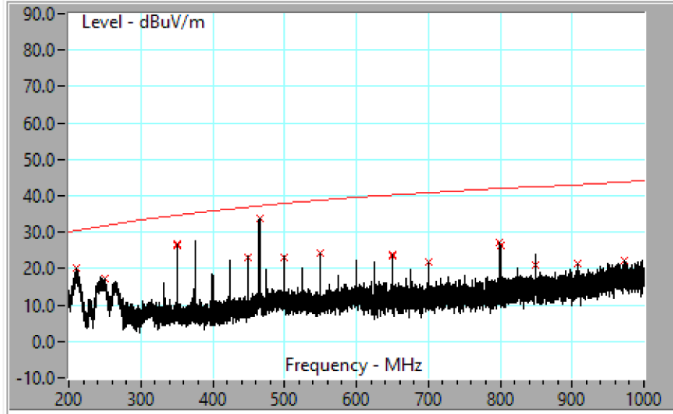


Thu, Oct 20, 2022
3:14:35 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
VERTICAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 15
Sweep Time 120.0010

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
208.20	18.3	30.4	-12.0	46.15	10.70	2.06	40.56	27.80
250.10	16.2	31.9	-15.8	43.19	11.33	2.25	40.62	27.04
349.96	24.7	34.9	-10.2	49.33	13.41	2.65	40.70	24.64
350.01	25.6	34.9	-9.2	50.28	13.41	2.65	40.70	24.64
449.97	21.6	37.0	-15.4	44.68	14.68	3.01	40.73	23.04
465.42	33.5	37.3	-3.8	55.73	15.48	3.06	40.72	22.19
500.02	25.3	37.9	-12.6	46.52	16.35	3.18	40.71	21.18
599.97	22.7	39.5	-16.9	42.26	17.52	3.46	40.57	19.59
600.03	22.9	39.5	-16.6	42.48	17.52	3.46	40.57	19.59
650.03	21.8	40.2	-18.4	41.02	17.60	3.60	40.43	19.24
700.03	19.2	40.9	-21.7	37.99	17.77	3.73	40.32	18.81
799.99	29.3	42.0	-12.7	46.16	19.01	4.00	39.85	16.84
800.04	26.1	42.0	-15.9	42.93	19.01	4.00	39.85	16.84
850.04	21.3	42.5	-21.2	37.09	19.70	4.12	39.59	15.78
936.65	21.6	43.4	-21.8	35.04	21.51	4.30	39.26	13.46
981.00	23.1	43.8	-20.7	34.88	22.97	4.37	39.14	11.80



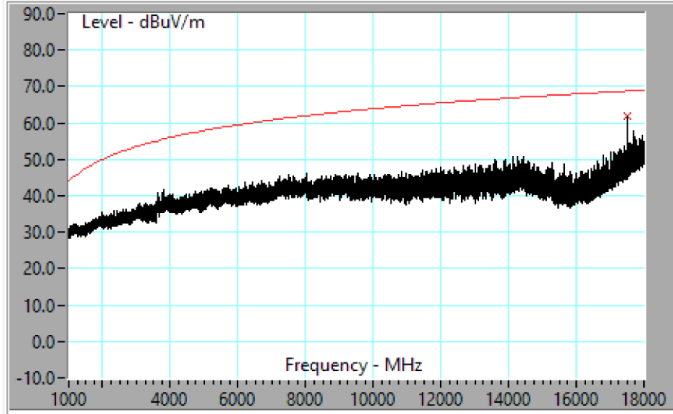
RE102: Ethernet Switch Position 1



Thu, Oct 20, 2022
3:22:19 PM
AutoScan 2022.9.30
Res BW (kHz) 100
Vid BW (kHz) 50000
VERTICAL
ETS 3106 Large Horn
Pasternack PE15A1012
Graph # 16
Sweep Time 120.0010

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
210.50	20.3	30.4	-10.1	48.05	10.76	2.07	40.57	27.73
250.00	17.4	31.9	-14.5	44.46	11.33	2.25	40.62	27.04
349.96	26.3	34.9	-8.5	50.96	13.41	2.65	40.70	24.64
350.01	26.9	34.9	-8.0	51.51	13.41	2.65	40.70	24.64
449.97	23.1	37.0	-13.9	46.15	14.68	3.01	40.73	23.04
465.02	34.0	37.3	-3.3	56.19	15.45	3.06	40.72	22.21
500.02	23.1	37.9	-14.8	44.29	16.35	3.18	40.71	21.18
550.02	24.3	38.8	-14.5	45.70	15.94	3.32	40.67	21.41
649.98	23.7	40.2	-16.5	42.94	17.60	3.60	40.43	19.24
650.03	23.5	40.2	-16.7	42.74	17.60	3.60	40.43	19.24
700.03	21.8	40.9	-19.1	40.61	17.77	3.73	40.32	18.81
799.99	27.0	42.0	-15.0	43.88	19.01	4.00	39.85	16.84
800.04	26.4	42.0	-15.7	43.19	19.01	4.00	39.85	16.84
850.04	21.0	42.5	-21.5	36.81	19.70	4.12	39.59	15.78
908.69	21.6	43.1	-21.5	36.15	20.54	4.25	39.35	14.56
972.95	22.4	43.7	-21.3	34.28	22.95	4.36	39.16	11.86

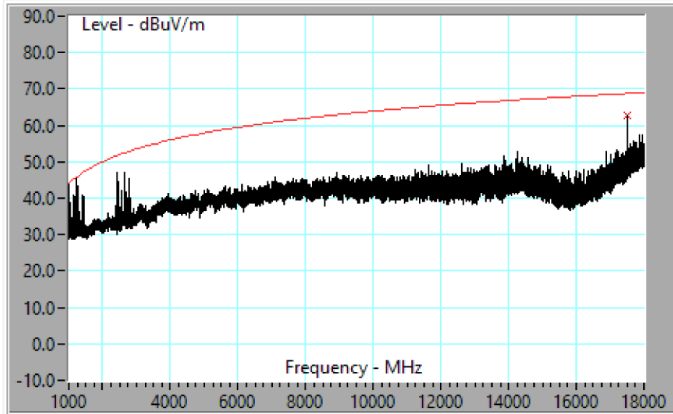
RE102 System Check: Calibrated Injected Signal = 61.5 dBuV @ 17.5 GHz



Fri, Oct 21, 2022
8:08:26 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 1
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
17500.2	61.8	68.8	-6.9	39.66	45.50	18.48	41.80	-22.18

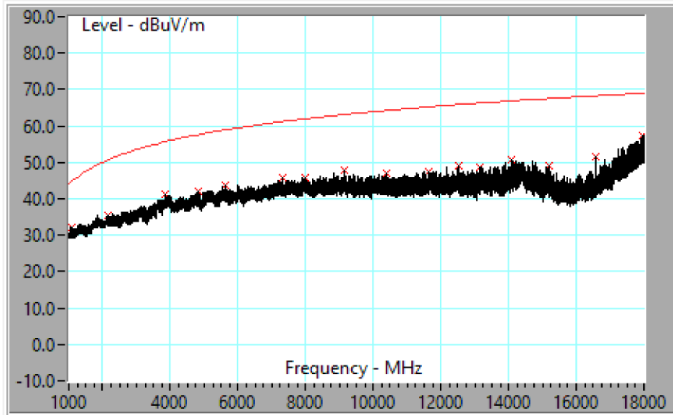
RE102 System Check: Stub Radiator @ 17.5 GHz



Fri, Oct 21, 2022
8:21:47 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 2
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
17500.2	62.7	68.8	-6.1	40.53	45.50	18.48	41.80	-22.18

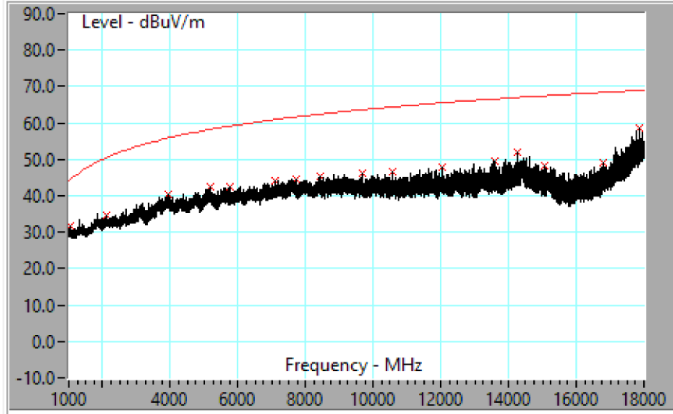
RE102 System Check: Ambient Scan



Fri, Oct 21, 2022
8:28:24 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 3
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
1082.5	32.1	44.6	-12.5	45.33	25.66	4.59	43.43	13.18
2178.2	35.5	50.7	-15.2	43.24	28.96	6.45	43.15	7.74
3843.4	41.1	55.6	-14.6	41.13	34.29	8.50	42.86	0.07
4838.8	41.9	57.6	-15.8	40.12	34.86	9.82	42.92	-1.75
5618.3	43.6	58.9	-15.3	40.32	35.83	10.50	43.02	-3.31
7335.4	45.7	61.2	-15.5	38.60	38.80	11.72	43.44	-7.08
8000.1	45.8	62.0	-16.2	38.39	38.70	12.51	43.84	-7.38
9162.1	47.8	63.1	-15.4	38.47	39.63	13.19	43.54	-9.28
10391.3	47.2	64.2	-17.1	36.78	39.80	14.32	43.72	-10.40
11614.5	47.3	65.2	-17.9	35.08	40.63	15.07	43.43	-12.27
12547.0	49.2	65.9	-16.7	35.33	40.50	16.16	42.77	-13.89
13169.2	48.8	66.3	-17.4	33.17	41.85	15.97	42.14	-15.68
14104.3	50.6	66.9	-16.3	32.75	43.01	16.44	41.65	-17.80
15213.6	49.3	67.5	-18.3	33.08	40.89	16.81	41.53	-16.17
16567.7	51.5	68.3	-16.7	34.14	41.12	17.90	41.63	-17.39
17953.2	57.5	69.0	-11.4	31.64	48.50	18.88	41.48	-25.90

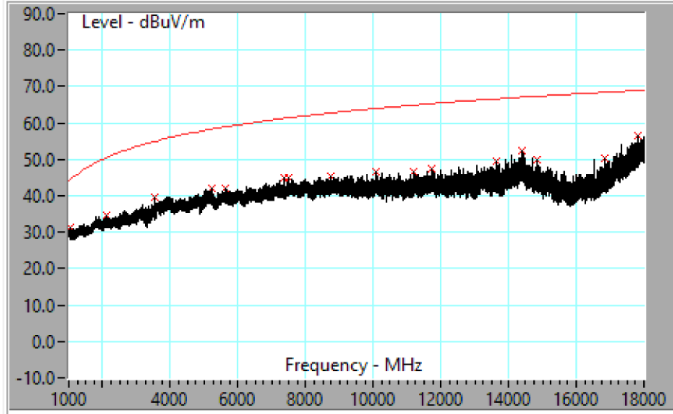
RE102 System Check: Ambient Scan



Fri, Oct 21, 2022
8:33:46 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 4
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1053.6	31.7	44.4	-12.7	46.15	24.44	4.52	43.44	14.48
2113.6	34.7	50.4	-15.7	43.47	28.05	6.35	43.17	8.77
3916.5	40.5	55.8	-15.3	41.54	33.17	8.61	42.86	1.08
5185.6	42.3	58.2	-15.9	40.67	34.44	10.15	42.96	-1.63
5779.8	42.4	59.2	-16.8	40.00	34.70	10.72	43.07	-2.35
7115.2	44.0	61.0	-16.9	38.87	36.96	11.60	43.41	-5.15
7733.2	44.6	61.7	-17.1	38.61	37.43	12.15	43.64	-5.94
8443.8	45.4	62.4	-17.0	38.15	38.19	12.66	43.58	-7.27
9686.6	46.2	63.6	-17.4	37.90	38.52	13.46	43.65	-8.33
10588.5	46.6	64.4	-17.8	37.22	38.72	14.31	43.68	-9.35
12020.0	47.7	65.5	-17.8	35.86	39.58	15.34	43.06	-11.86
13584.9	49.6	66.6	-17.0	33.99	41.44	16.33	42.17	-15.60
14243.7	51.9	67.0	-15.0	34.52	42.49	16.53	41.62	-17.40
15041.0	48.4	67.4	-19.1	32.37	40.62	16.92	41.55	-15.99
16804.8	49.0	68.4	-19.4	30.97	41.59	18.16	41.74	-18.01
17859.7	58.5	68.9	-10.5	33.73	47.36	18.91	41.54	-24.73

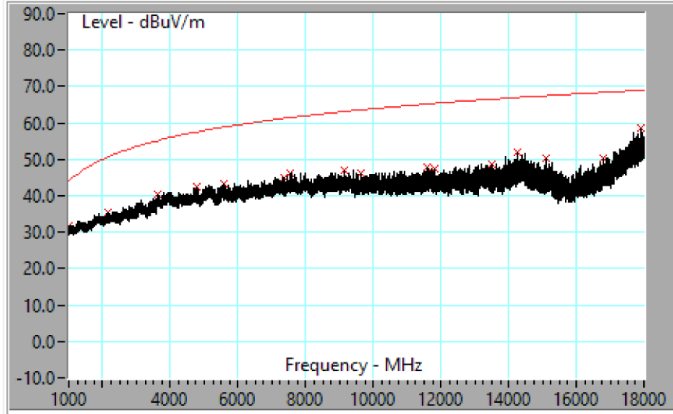
RE102: Ethernet Switch Position 1



Fri, Oct 21, 2022
8:42:47 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 5
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1030.6	31.4	44.2	-12.8	45.96	24.40	4.47	43.44	14.57
2131.4	34.7	50.5	-15.9	43.47	27.97	6.38	43.17	8.81
3515.3	39.6	54.8	-15.2	42.50	31.83	8.18	42.88	2.88
5230.7	42.1	58.3	-16.2	40.38	34.50	10.19	42.97	-1.73
5607.2	42.2	58.9	-16.7	39.74	34.96	10.48	43.02	-2.42
7359.2	44.9	61.2	-16.4	38.89	37.70	11.73	43.44	-5.99
7486.7	45.0	61.4	-16.4	38.98	37.63	11.89	43.46	-6.06
8728.6	45.2	62.7	-17.5	37.43	38.34	12.97	43.53	-7.78
10067.4	46.8	64.0	-17.2	37.93	38.70	13.89	43.78	-8.82
11171.6	46.4	64.9	-18.4	35.98	39.04	14.99	43.59	-10.44
11702.9	47.5	65.3	-17.7	35.88	39.80	15.21	43.35	-11.67
13644.4	49.4	66.6	-17.2	33.71	41.41	16.33	42.10	-15.65
14406.0	52.2	67.1	-14.8	34.93	42.11	16.77	41.59	-17.29
14828.5	49.8	67.3	-17.5	33.03	41.24	17.08	41.56	-16.77
16825.2	50.3	68.4	-18.2	32.25	41.55	18.21	41.75	-18.01
17841.0	56.6	68.9	-12.3	31.98	47.25	18.92	41.56	-24.61

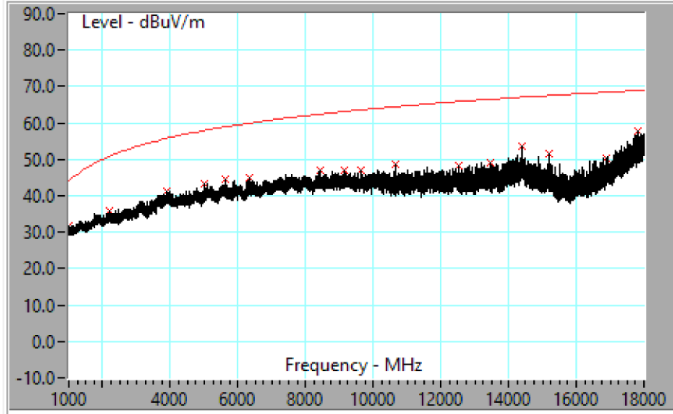
RE102: Ethernet Switch Position 1



Fri, Oct 21, 2022
8:49:41 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 6
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1002.6	31.9	44.0	-12.1	45.99	24.93	4.41	43.45	14.12
2141.6	35.6	50.6	-14.9	43.46	28.92	6.40	43.16	7.85
3631.7	40.4	55.1	-14.7	41.92	33.09	8.31	42.87	1.47
4764.8	42.6	57.5	-14.9	41.22	34.56	9.75	42.91	-1.40
5582.6	43.3	58.9	-15.6	39.91	35.90	10.46	43.01	-3.35
7371.1	45.1	61.3	-16.2	37.97	38.84	11.74	43.44	-7.14
7545.3	46.0	61.5	-15.4	38.92	38.62	11.99	43.49	-7.11
9128.1	46.8	63.1	-16.3	37.53	39.61	13.21	43.53	-9.29
9650.0	46.1	63.6	-17.5	37.11	39.20	13.42	43.64	-8.99
11576.2	47.7	65.2	-17.5	35.49	40.60	15.07	43.46	-12.20
11794.7	47.6	65.3	-17.7	34.81	40.71	15.37	43.26	-12.82
13524.5	48.9	66.5	-17.6	32.64	42.25	16.22	42.24	-16.23
14265.8	51.9	67.0	-15.1	33.80	43.14	16.57	41.61	-18.09
15125.2	50.2	67.5	-17.2	33.88	41.05	16.85	41.54	-16.36
16804.8	50.4	68.4	-18.0	31.39	42.59	18.16	41.74	-19.01
17923.5	58.4	69.0	-10.5	32.48	48.55	18.89	41.50	-25.95

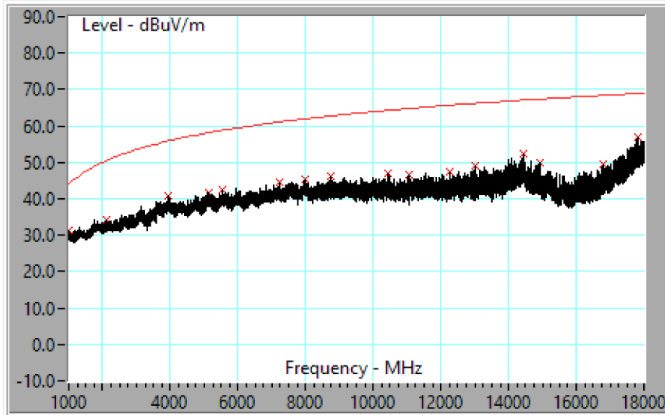
RE102: Ethernet Switch Position 2



Fri, Oct 21, 2022
9:00:00 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 7
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1021.3	31.6	44.1	-12.5	45.51	25.11	4.45	43.45	13.88
2206.2	35.8	50.8	-15.0	43.52	28.98	6.49	43.15	7.68
3902.9	41.3	55.8	-14.4	41.40	34.19	8.59	42.86	0.08
5000.3	43.3	57.9	-14.6	41.31	35.10	9.85	42.95	-1.99
5633.6	44.6	58.9	-14.3	41.38	35.77	10.52	43.02	-3.26
6335.7	44.9	60.0	-15.1	40.63	36.43	11.03	43.22	-4.23
8435.3	47.1	62.4	-15.3	38.90	39.17	12.65	43.58	-8.24
9125.6	47.1	63.1	-16.0	37.83	39.60	13.21	43.53	-9.28
9649.2	47.2	63.6	-16.4	38.17	39.20	13.42	43.64	-8.99
10673.5	48.9	64.5	-15.6	38.38	39.75	14.41	43.67	-10.49
12539.3	48.3	65.9	-17.5	34.48	40.50	16.13	42.78	-13.85
13439.5	49.2	66.5	-17.3	33.33	42.04	16.08	42.25	-15.87
14396.7	53.5	67.1	-13.6	35.61	42.72	16.77	41.59	-17.90
15195.7	51.7	67.5	-15.8	35.43	41.00	16.80	41.53	-16.26
16882.2	50.5	68.4	-17.9	30.93	43.02	18.35	41.78	-19.58
17828.3	57.9	68.9	-11.0	32.32	48.24	18.93	41.57	-25.60

RE102: Ethernet Switch Position 2

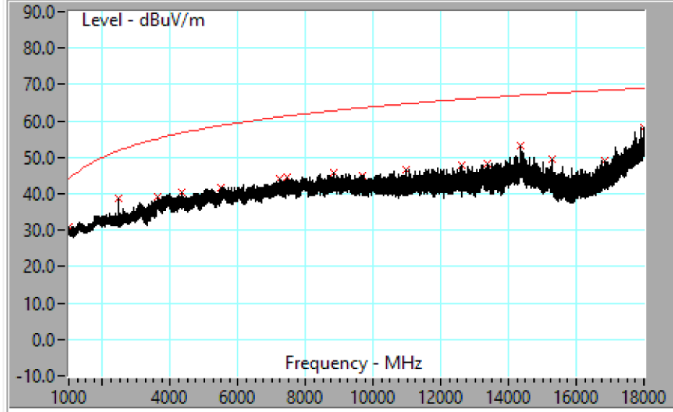


Fri, Oct 21, 2022
9:05:12 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 8
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
1022.1	31.2	44.1	-12.9	45.83	24.40	4.46	43.45	14.59
2132.3	34.3	50.5	-16.2	43.14	27.97	6.38	43.17	8.81
3916.5	41.0	55.8	-14.8	42.05	33.17	8.61	42.86	1.08
5126.1	41.7	58.1	-16.4	40.30	34.30	10.05	42.96	-1.39
5535.8	42.6	58.8	-16.2	40.31	34.89	10.42	42.99	-2.31
7232.5	44.4	61.1	-16.7	38.72	37.43	11.67	43.43	-5.68
7997.5	45.3	62.0	-16.7	38.95	37.70	12.51	43.84	-6.37
8749.8	46.1	62.7	-16.7	38.31	38.30	13.00	43.53	-7.77
10415.9	46.8	64.3	-17.4	37.51	38.70	14.33	43.71	-9.32
11076.4	46.6	64.8	-18.2	36.47	38.85	14.90	43.60	-10.15
12259.7	47.6	65.7	-18.1	35.07	39.50	15.95	42.95	-12.49
13006.0	48.9	66.2	-17.2	34.13	40.71	16.18	42.08	-14.81
14452.8	52.5	67.1	-14.6	35.14	42.19	16.74	41.58	-17.36
14934.7	49.8	67.4	-17.6	33.37	40.97	17.00	41.55	-16.41
16809.9	49.5	68.4	-18.9	31.49	41.58	18.18	41.75	-18.01
17829.1	56.7	68.9	-12.2	32.20	47.17	18.93	41.57	-24.53



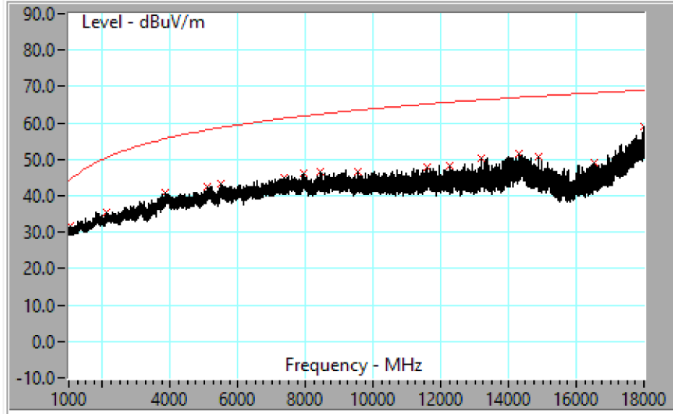
RE102: Ethernet Switch Position 3



Fri, Oct 21, 2022
9:12:17 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 9
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
1005.1	31.1	44.0	-12.9	45.73	24.40	4.42	43.45	14.64
2463.8	38.9	51.8	-12.9	46.27	28.88	6.83	43.07	7.36
3625.8	39.4	55.1	-15.8	41.77	32.15	8.31	42.88	2.41
4344.1	40.5	56.7	-16.2	41.54	32.61	9.17	42.86	1.07
5511.2	41.8	58.7	-16.9	39.38	35.03	10.40	42.99	-2.45
7252.1	44.1	61.1	-17.0	38.34	37.50	11.68	43.43	-5.76
7438.2	44.6	61.3	-16.8	38.52	37.70	11.81	43.45	-6.06
8850.1	45.8	62.8	-17.1	37.65	38.50	13.12	43.53	-8.10
9676.4	45.1	63.6	-18.5	36.84	38.46	13.45	43.65	-8.26
10950.6	46.4	64.7	-18.3	36.49	38.80	14.77	43.62	-9.94
12611.6	47.9	65.9	-18.0	34.51	39.67	16.38	42.67	-13.38
13375.8	48.3	66.4	-18.1	33.15	41.35	16.00	42.22	-15.13
14340.6	53.1	67.0	-13.9	35.80	42.22	16.68	41.60	-17.30
15306.2	49.5	67.6	-18.1	34.29	39.75	16.93	41.52	-15.16
16859.2	49.2	68.4	-19.2	31.08	41.63	18.29	41.77	-18.15
17990.6	58.1	69.0	-10.9	32.94	47.74	18.87	41.45	-25.16

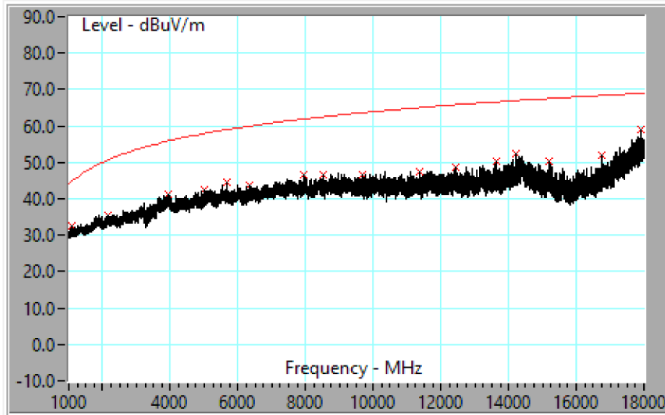
RE102: Ethernet Switch Position 3



Fri, Oct 21, 2022
9:18:10 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 10
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
1036.6	31.6	44.3	-12.7	45.26	25.27	4.49	43.44	13.69
2103.4	35.3	50.4	-15.1	43.12	28.99	6.34	43.17	7.84
3867.2	40.8	55.7	-14.8	40.90	34.27	8.54	42.86	0.06
5115.1	42.7	58.1	-15.4	40.33	35.26	10.04	42.96	-2.34
5511.2	43.3	58.7	-15.5	39.87	35.98	10.40	42.99	-3.39
7344.7	45.0	61.2	-16.3	37.89	38.80	11.73	43.44	-7.09
7960.1	46.2	61.9	-15.7	38.94	38.62	12.45	43.81	-7.26
8443.8	46.8	62.4	-15.6	38.52	39.19	12.66	43.58	-8.27
9565.9	46.4	63.5	-17.1	37.15	39.50	13.35	43.60	-9.25
11572.8	47.8	65.2	-17.4	35.62	40.60	15.07	43.47	-12.20
12250.3	48.4	65.7	-17.2	35.03	40.40	15.98	42.96	-13.42
13215.1	50.4	66.3	-15.9	34.60	42.01	15.94	42.16	-15.78
14291.3	51.6	67.0	-15.4	33.56	43.03	16.61	41.61	-18.03
14876.1	50.6	67.3	-16.8	33.55	41.54	17.04	41.56	-17.03
16550.7	49.2	68.3	-19.1	32.10	40.81	17.88	41.62	-17.07
17994.0	58.9	69.0	-10.1	32.99	48.50	18.86	41.45	-25.92

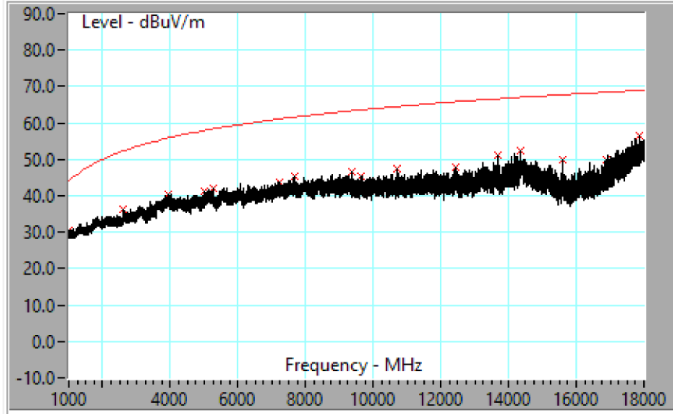
RE102: Ethernet Switch Position 4



Fri, Oct 21, 2022
9:25:16 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 11
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1080.8	32.5	44.6	-12.1	45.70	25.65	4.58	43.43	13.20
2137.4	35.5	50.5	-15.0	43.39	28.93	6.39	43.17	7.85
3928.4	41.2	55.8	-14.6	41.25	34.14	8.63	42.86	0.09
5020.7	42.5	57.9	-15.4	40.46	35.10	9.88	42.95	-2.03
5684.6	44.7	59.0	-14.3	41.36	35.77	10.59	43.04	-3.32
6354.4	43.9	60.0	-16.1	39.65	36.40	11.05	43.23	-4.22
7932.1	46.7	61.9	-15.2	39.41	38.64	12.40	43.79	-7.25
8528.0	46.8	62.5	-15.7	38.44	39.16	12.74	43.54	-8.35
9659.4	46.8	63.6	-16.8	37.79	39.24	13.43	43.64	-9.03
11380.7	47.5	65.0	-17.5	35.55	40.26	15.24	43.55	-11.95
12443.3	48.7	65.8	-17.1	35.33	40.49	15.72	42.87	-13.33
13645.2	50.2	66.6	-16.4	33.78	42.21	16.33	42.09	-16.45
14217.3	52.4	67.0	-14.5	34.42	43.13	16.50	41.62	-18.01
15194.9	50.3	67.5	-17.3	34.01	41.00	16.80	41.53	-16.26
16758.1	52.0	68.4	-16.4	33.52	42.10	18.11	41.72	-18.49
17932.8	59.0	69.0	-10.0	33.04	48.53	18.89	41.49	-25.93

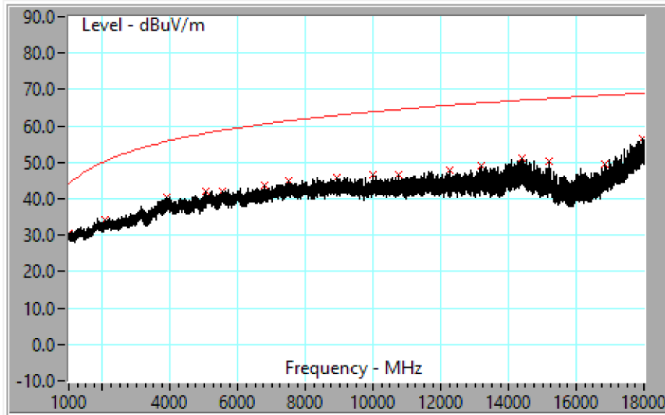
RE102: Ethernet Switch Position 4



Fri, Oct 21, 2022
9:31:43 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 12
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
1002.6	30.5	44.0	-13.5	45.12	24.40	4.41	43.45	14.64
2596.4	36.4	52.2	-15.8	43.22	29.19	7.00	43.03	6.84
3925.8	40.4	55.8	-15.4	41.50	33.15	8.62	42.86	1.09
4989.2	41.4	57.9	-16.4	40.47	34.08	9.85	42.95	-0.97
5270.6	42.2	58.4	-16.2	40.43	34.50	10.22	42.97	-1.75
7251.2	43.8	61.1	-17.3	38.04	37.50	11.68	43.43	-5.76
7694.9	45.3	61.6	-16.3	39.29	37.51	12.12	43.61	-6.03
9365.3	46.7	63.3	-16.6	38.40	38.67	13.24	43.56	-8.35
9628.8	45.4	63.6	-18.1	37.23	38.43	13.40	43.63	-8.20
10716.0	47.5	64.5	-17.0	37.94	38.73	14.46	43.66	-9.53
12447.5	47.7	65.8	-18.1	35.24	39.60	15.73	42.87	-12.47
13675.8	51.0	66.6	-15.6	35.32	41.40	16.32	42.06	-15.66
14363.5	52.2	67.0	-14.9	34.90	42.17	16.72	41.59	-17.29
15611.4	49.9	67.8	-17.8	35.41	38.73	17.33	41.52	-14.54
16899.2	50.0	68.5	-18.4	31.23	42.19	18.39	41.79	-18.79
17865.7	56.4	68.9	-12.5	31.66	47.39	18.91	41.54	-24.77

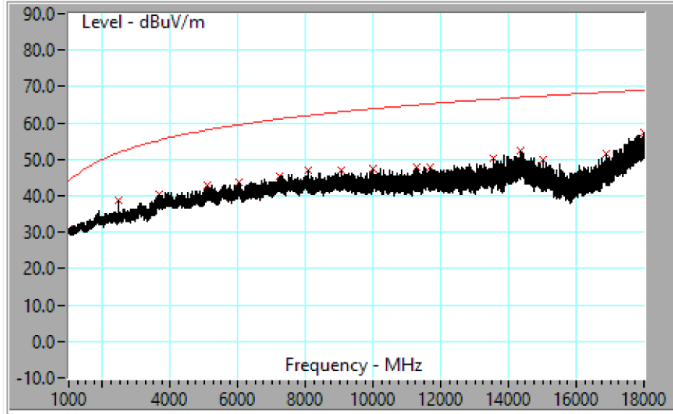
RE102: Ethernet Switch Position 5



Fri, Oct 21, 2022
9:43:55 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 14
Sweep Time 270.0012

Frequency	Level	Limit	Delta	Raw	Ant.	Cable	Amp	All Factors
MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB	dB
1000.0	30.6	44.0	-13.4	45.22	24.40	4.41	43.46	14.65
2087.2	34.1	50.3	-16.2	42.93	28.07	6.31	43.18	8.79
3882.5	40.5	55.7	-15.2	41.56	33.24	8.56	42.86	1.07
5031.8	42.1	58.0	-15.9	41.01	34.10	9.90	42.95	-1.04
5535.8	42.2	58.8	-16.6	39.91	34.89	10.42	42.99	-2.31
6799.0	43.8	60.6	-16.7	39.24	36.30	11.65	43.35	-4.60
7496.9	45.1	61.4	-16.3	39.01	37.61	11.91	43.46	-6.05
8935.1	45.8	62.9	-17.1	37.48	38.63	13.22	43.52	-8.32
10009.6	46.5	63.9	-17.4	37.84	38.62	13.86	43.79	-8.69
10752.5	46.6	64.5	-18.0	36.90	38.79	14.51	43.66	-9.65
12273.3	47.9	65.7	-17.7	35.48	39.50	15.91	42.95	-12.46
13172.6	49.1	66.3	-17.2	34.23	41.08	15.97	42.15	-14.90
14388.2	51.3	67.1	-15.8	33.97	42.12	16.75	41.59	-17.29
15192.3	50.4	67.5	-17.2	34.87	40.22	16.80	41.53	-15.48
16855.0	49.6	68.4	-18.9	31.47	41.57	18.28	41.77	-18.08
17943.9	56.6	69.0	-12.4	31.64	47.51	18.88	41.48	-24.91

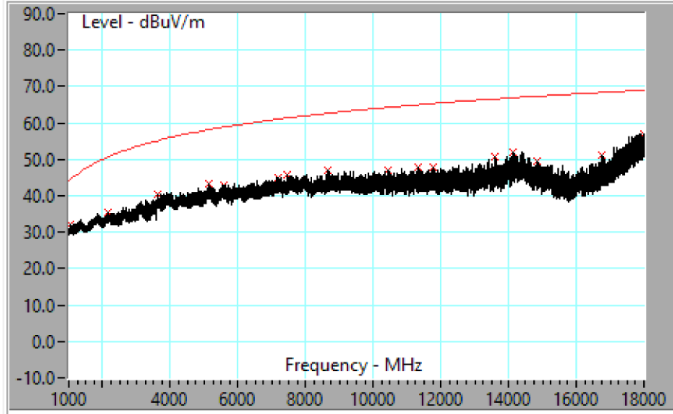
RE102: Ethernet Switch Position 5



Fri, Oct 21, 2022
9:49:12 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 15
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1003.4	31.0	44.0	-13.0	45.13	24.93	4.41	43.45	14.11
2451.0	38.7	51.7	-13.1	45.12	29.80	6.81	43.08	6.46
3682.7	40.4	55.3	-14.9	41.50	33.40	8.35	42.87	1.13
5084.5	42.8	58.0	-15.2	40.62	35.17	9.99	42.96	-2.20
6045.9	43.8	59.5	-15.7	39.78	36.38	10.82	43.15	-4.05
7231.7	45.4	61.1	-15.7	38.67	38.49	11.67	43.43	-6.74
8063.9	46.8	62.0	-15.2	39.42	38.74	12.48	43.80	-7.42
9047.4	47.2	63.0	-15.8	37.87	39.60	13.26	43.52	-9.34
10009.6	47.4	63.9	-16.5	37.77	39.54	13.86	43.79	-9.61
11265.1	47.9	64.9	-17.0	36.24	40.13	15.09	43.57	-11.65
11672.3	47.8	65.2	-17.5	35.24	40.74	15.16	43.38	-12.53
13551.7	50.2	66.5	-16.3	33.95	42.20	16.27	42.21	-16.27
14344.8	52.3	67.0	-14.7	34.21	43.00	16.69	41.60	-18.09
15008.7	50.0	67.4	-17.4	33.38	41.27	16.94	41.55	-16.65
16877.9	51.5	68.4	-17.0	31.98	42.95	18.34	41.78	-19.50
17977.9	57.3	69.0	-11.7	31.41	48.50	18.87	41.46	-25.91

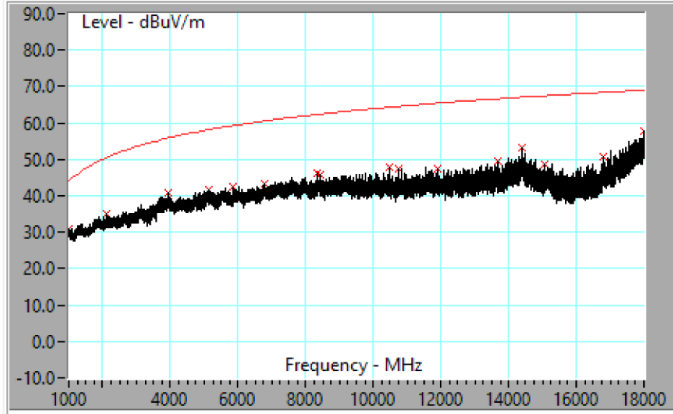
RE102: Ethernet Switch Position 6



Fri, Oct 21, 2022
9:58:54 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
HORIZONTAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 16
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1044.2	32.2	44.3	-12.1	45.83	25.34	4.50	43.44	13.59
2151.8	35.4	50.6	-15.2	43.24	28.90	6.41	43.16	7.84
3636.0	40.3	55.1	-14.8	41.73	33.12	8.31	42.87	1.44
5116.8	43.3	58.1	-14.8	40.98	35.27	10.04	42.96	-2.34
5580.0	43.1	58.9	-15.8	39.72	35.90	10.46	43.01	-3.35
7200.2	45.0	61.1	-16.1	38.46	38.30	11.66	43.42	-6.54
7456.1	45.7	61.4	-15.7	38.58	38.71	11.84	43.45	-7.10
8656.3	46.9	62.7	-15.7	38.47	39.14	12.88	43.54	-8.48
10438.0	47.0	64.3	-17.2	36.70	39.72	14.33	43.71	-10.34
11334.0	47.9	65.0	-17.1	36.11	40.20	15.18	43.56	-11.82
11773.4	48.0	65.3	-17.3	35.19	40.75	15.33	43.28	-12.80
13606.1	50.5	66.6	-16.0	34.05	42.29	16.35	42.14	-16.50
14122.1	52.0	66.9	-14.9	34.19	43.04	16.45	41.64	-17.85
14855.7	49.6	67.3	-17.7	32.44	41.67	17.06	41.56	-17.17
16773.4	51.1	68.4	-17.3	32.39	42.28	18.13	41.73	-18.68
17989.8	57.0	69.0	-12.0	31.10	48.50	18.87	41.45	-25.92

RE102: Ethernet Switch Position 6



Fri, Oct 21, 2022
10:04:06 AM
AutoScan 2022.9.30
Res BW (kHz) 1000
Vid BW (kHz) 50000
VERTICAL
EMCO 3115 (1 Meter)
A.H. Systems PAM-0118P
Graph # 17
Sweep Time 270.0012

Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw dBuV	Ant. dB	Cable dB	Amp dB	All Factors dB
1013.6	30.7	44.1	-13.3	45.35	24.40	4.44	43.45	14.61
2121.2	35.0	50.5	-15.5	43.75	28.02	6.37	43.17	8.79
3917.3	41.0	55.8	-14.8	42.04	33.17	8.61	42.86	1.08
5135.5	41.8	58.1	-16.3	40.43	34.30	10.07	42.96	-1.41
5869.0	42.3	59.3	-17.0	39.86	34.78	10.77	43.10	-2.44
6782.8	43.5	60.5	-17.1	38.91	36.27	11.62	43.34	-4.54
8324.0	46.0	62.3	-16.3	39.11	38.00	12.53	43.65	-6.88
8450.6	45.6	62.4	-16.9	38.29	38.20	12.67	43.57	-7.29
10472.9	47.9	64.3	-16.4	38.62	38.70	14.33	43.70	-9.32
10765.3	47.5	64.5	-17.1	37.81	38.77	14.53	43.65	-9.64
11884.8	47.3	65.4	-18.1	35.35	39.76	15.33	43.18	-11.91
13669.9	49.3	66.6	-17.3	33.64	41.40	16.32	42.06	-15.66
14403.5	53.1	67.1	-14.0	35.81	42.11	16.77	41.59	-17.29
15069.1	48.6	67.5	-18.9	32.65	40.56	16.89	41.55	-15.91
16794.6	50.7	68.4	-17.7	32.77	41.54	18.15	41.74	-17.94
17981.3	57.8	69.0	-11.2	32.65	47.69	18.87	41.45	-25.10





5.2.10 RE102 Test Equipment

Table 5.2-2: RE102, Radiated Emissions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC005510	Chamber (EMI, Semi-Anechoic)	National Technical Systems	AR 1	NCR	NCR
WC005829	Antenna (Active Monopole)	ETS-Lindgren	3301C	01/21/2022	01/21/2023
WC005618	Antenna (Biconical)	ETS-Lindgren	3109	05/10/2022	05/10/2025
WC005310	Antenna (Double Ridge Guide)	ETS-Lindgren	3106	04/21/2020	04/21/2023
WC005289	Network (LISN)	Solar Electronics	8028-50-TS-24-BNC	03/17/2022	03/17/2025
WC005292	Network (LISN)	Solar Electronics	8028-50-TS-24-BNC	01/28/2022	01/28/2025
WC005733	Stub (Radiator)	National Technical Systems	N/A	NCR	NCR
WC058400	Amplifier (Pre/RF/Low Noise)	A. H. Systems	PAM-0118P	05/09/2022	05/09/2023
WC058401	Antenna (Double Ridge Guide)	EMCO	3115	07/08/2021	07/08/2024
WC058456	Receiver	Keysight Technologies	N9038A	10/29/2021	01/29/2023
WC058460	Amplifier (Pre/RF/Low Noise)	Pasternack Enterprises	PE15A1012	05/09/2022	05/09/2023
WC058501	Cable (Test)	Winchester	E50-E50-2150960	05/09/2022	05/09/2024
WC058502	Cable (Test)	Winchester	E50-E50-2153120	05/09/2022	05/09/2024
WC058505	Meter (Milliohm)	Extech Instruments	380560	10/11/2022	10/11/2023
WC058520	Measurement Tools (Tape Measure)	Starrett	KTX1-26ME12-OC	04/01/2021	04/01/2024
WC058538	Amplifier (Pre/RF/Low Noise)	Chase EMC	CPA9231A	NCR	NCR
WC058539	Probe (E-Field/Near Field)	Chase EMC	FFP9152	NCR	NCR

NCR = No Calibration Required; as per NTS Labs, LLC QA policy, the equipment does not require calibration as long as the test signal being generated can be verified with other calibrated equipment prior to or during the test.

Note: LNA Pasternack PE15A1012 P1dB = 17 dBm. LNA AH Systems PAM-0118P P1dB = 6 dBm.



## Appendix A: Test Software Description

**Table A-1: Test Automation and Data Collection Software Revision**

Test	Manufacturer	Model	Rev	Date Verified
CE102	EMCware	AutoScan	2022.9.30	9/30/2022
RE102	EMCware	AutoScan	2022.9.30	9/30/2022



### AutoScan™ EMI Measurement Software

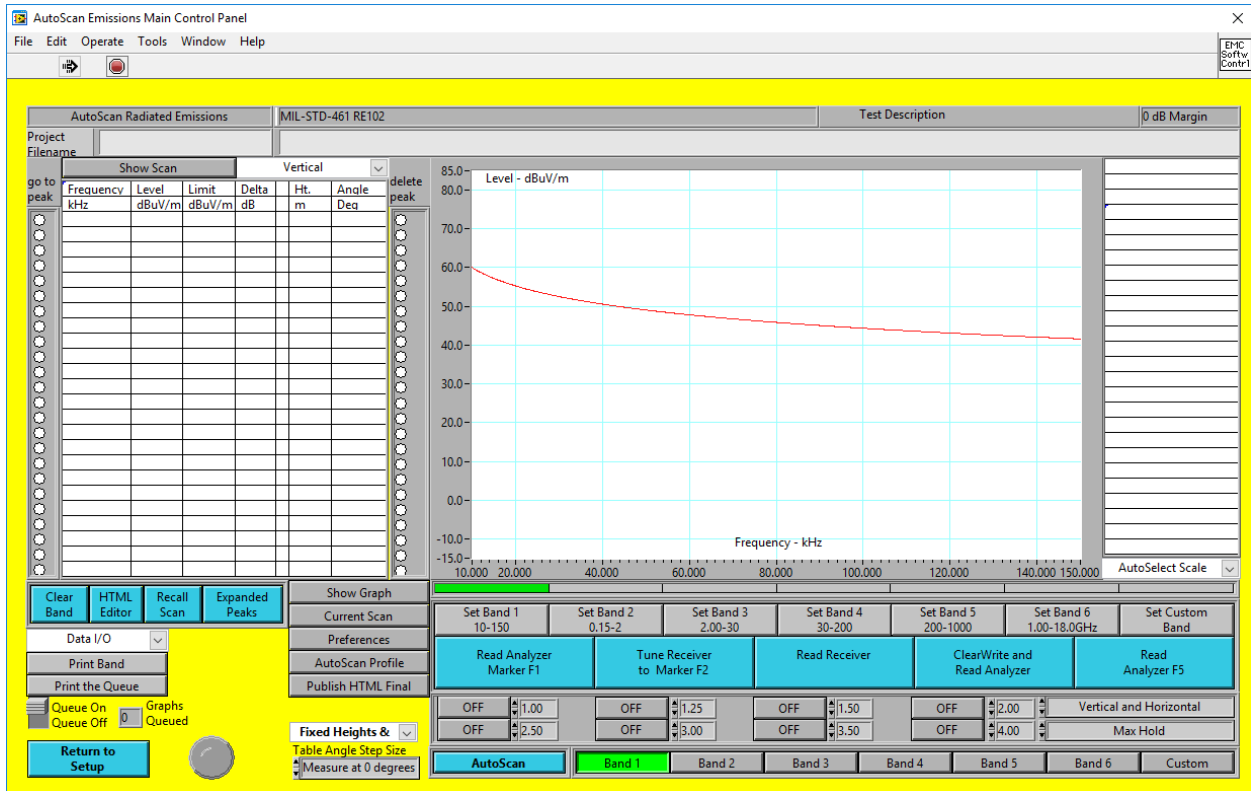
The AutoScan software is a National Instruments LabVIEW™ compiled package, specifically designed by EMCware for automation of Radiated and Conducted RF Emission measurements.

The AutoScan Emissions Scan Plan window shows the administrator defined test parameters including Start Frequency, Stop Frequency, Resolution Bandwidth, Video Bandwidth, Antenna, Amplifier, Cable, Limit, Reference Level, Attenuation and Sweep Time.

The Scan Plan shown below has been defined in order to perform the radiated emissions test in accordance with MIL-STD-461 RE102. Similar Scan Plans have been defined for CE101, CE102 and RE101.

Start (MHz)	Stop (MHz)	Res BW (kHz)	VBW (kHz)	Antenna	Amplifier	Cable	Limit	Table	Ref. Level	Attn. dB	SiteCal	Sweep seconds	Internal PreAmp	Tower Number	Special RF Input
0.01	0.15	1	50000	ETS-Lindgren	None	Metal cable	MIL-STD-461 RE102		85	0		30.000	off		off
0.15	2	10	50000	ETS-Lindgren	None	Metal cable	MIL-STD-461 RE102		85	0		30.000	off		off
2	30	10	50000	ETS-Lindgren	None	Metal cable	MIL-STD-461 RE102		85	0		60.000	off		off
30	200	100	50000	EMCO 3109 1	TRS-Ren Tel	Metal cable	MIL-STD-461 RE102		85	0		60.000	off		off
200	1000	100	50000	ETS 3106, NJ10	TRS-Ren Tel	Metal cable	MIL-STD-461 RE102		85	0		120.000	off		off
1000	18000	1000	50000	EMCO3115, N	TRS-Ren Tel	Sm Teledyn	MIL-STD-461 RE102		85	0		260.000	off		off

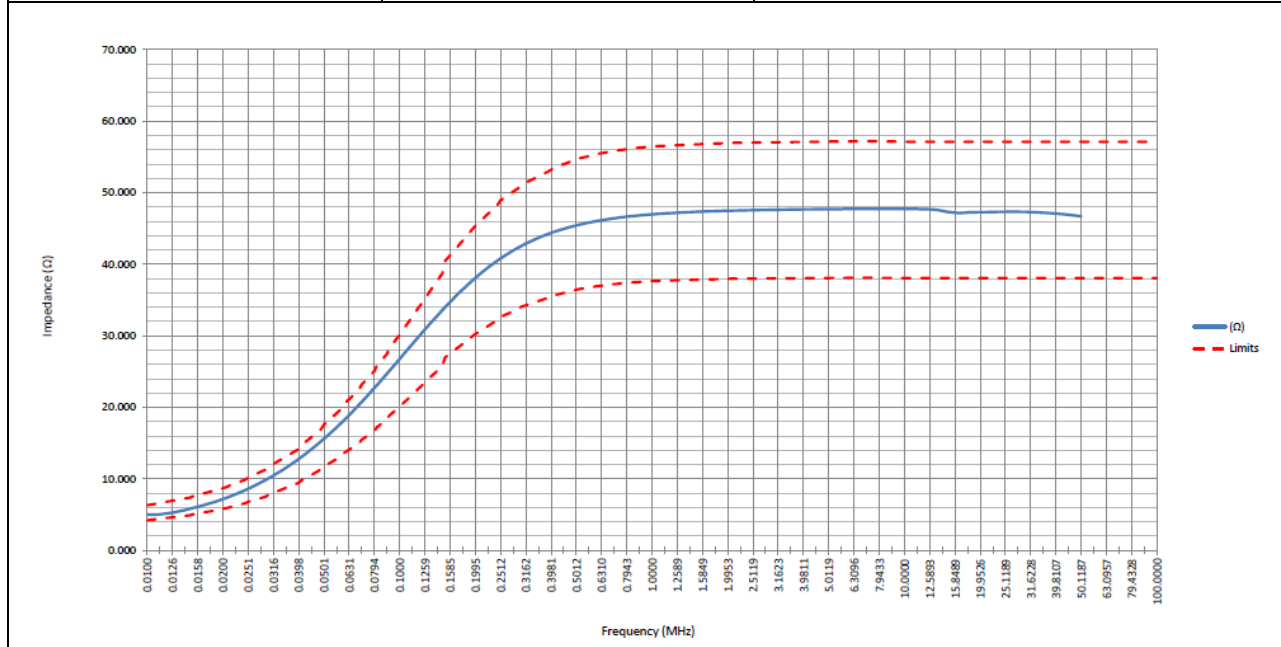
The AutoScan Emissions Main Control Panel window shown below was used to execute the test, using the parameters defined in the Scan Plan.



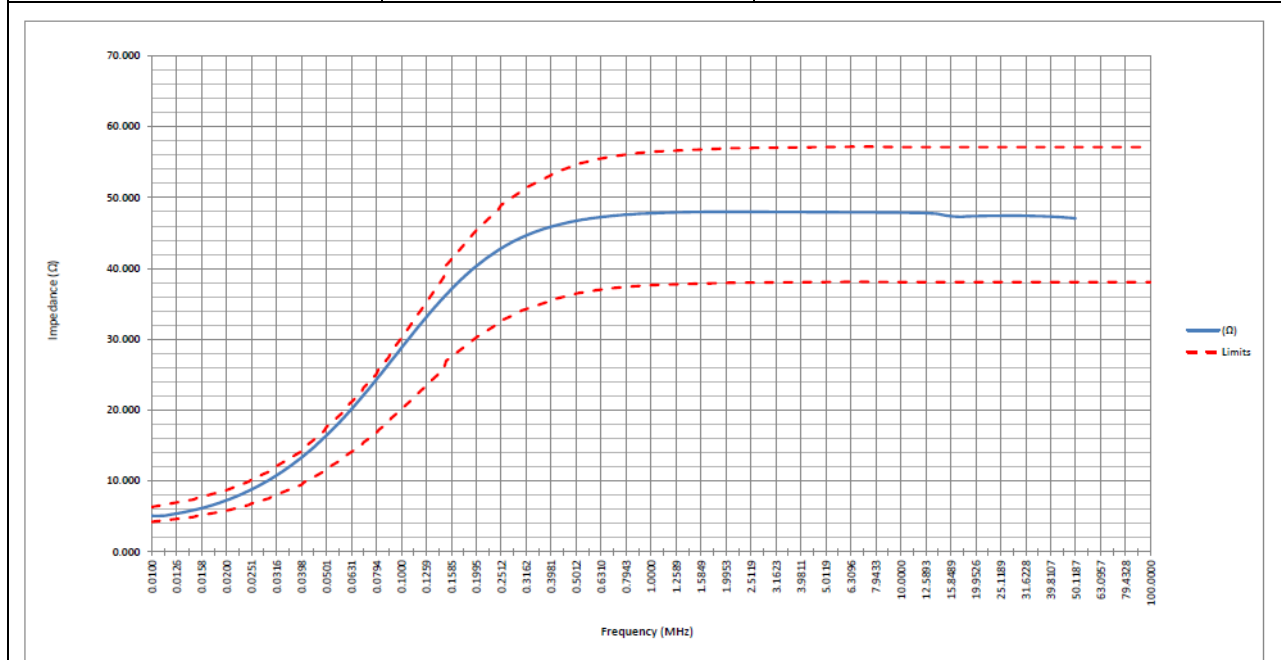


## Appendix B: LISN Impedance

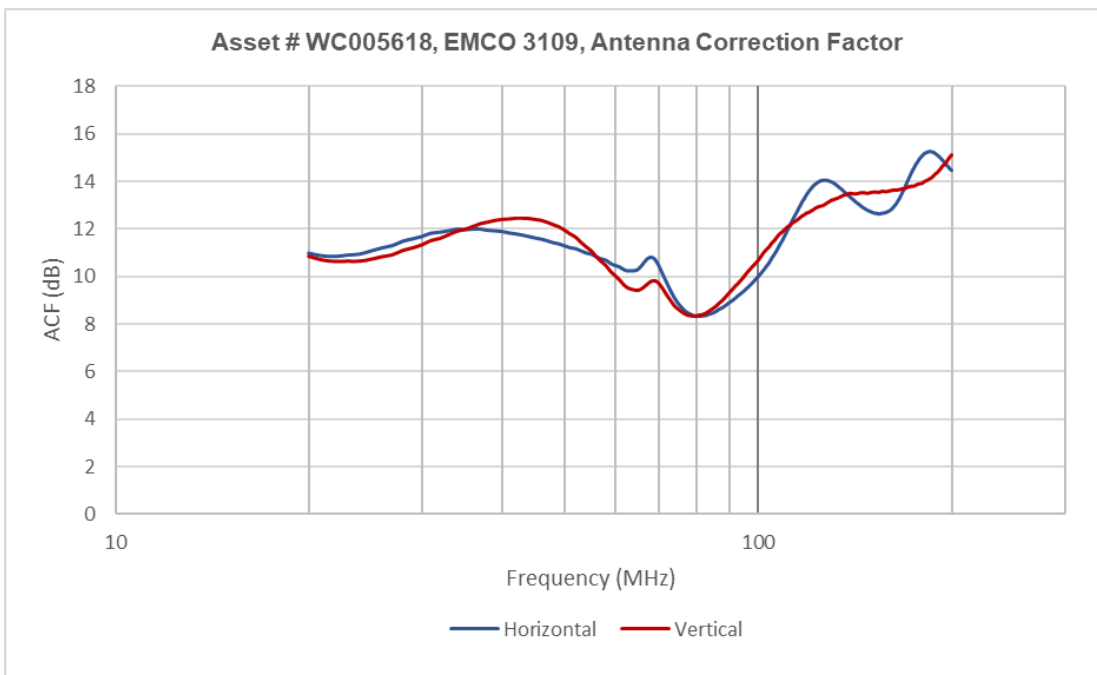
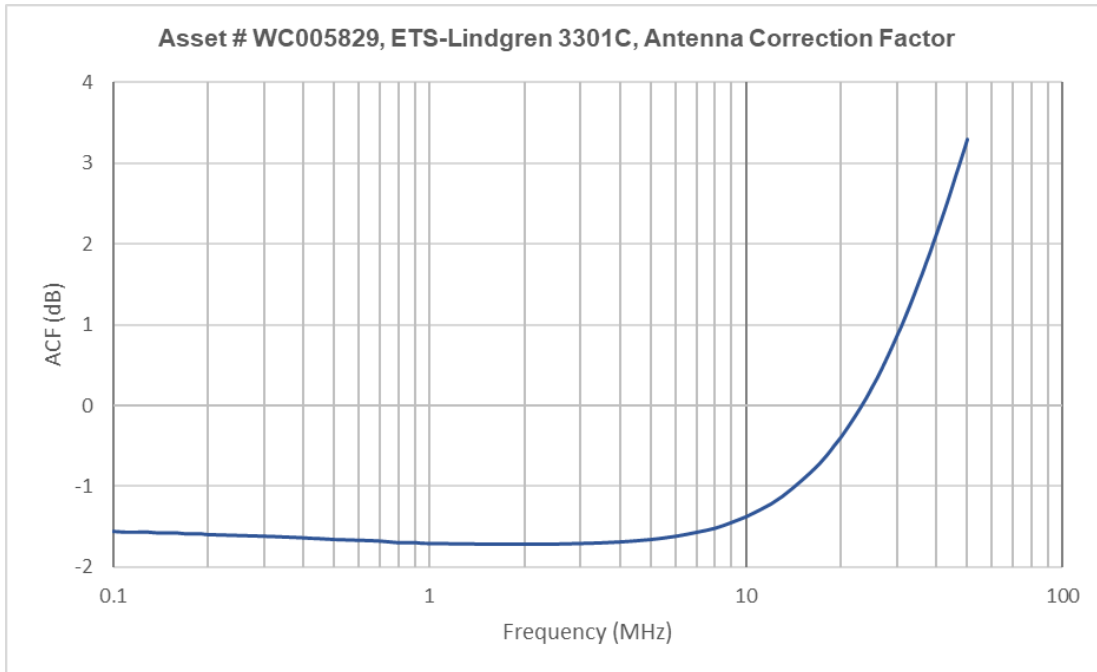
Asset Number	Manufacturer	Model
WC005292	Solar Electronics	8028-50-TS-24-BNC

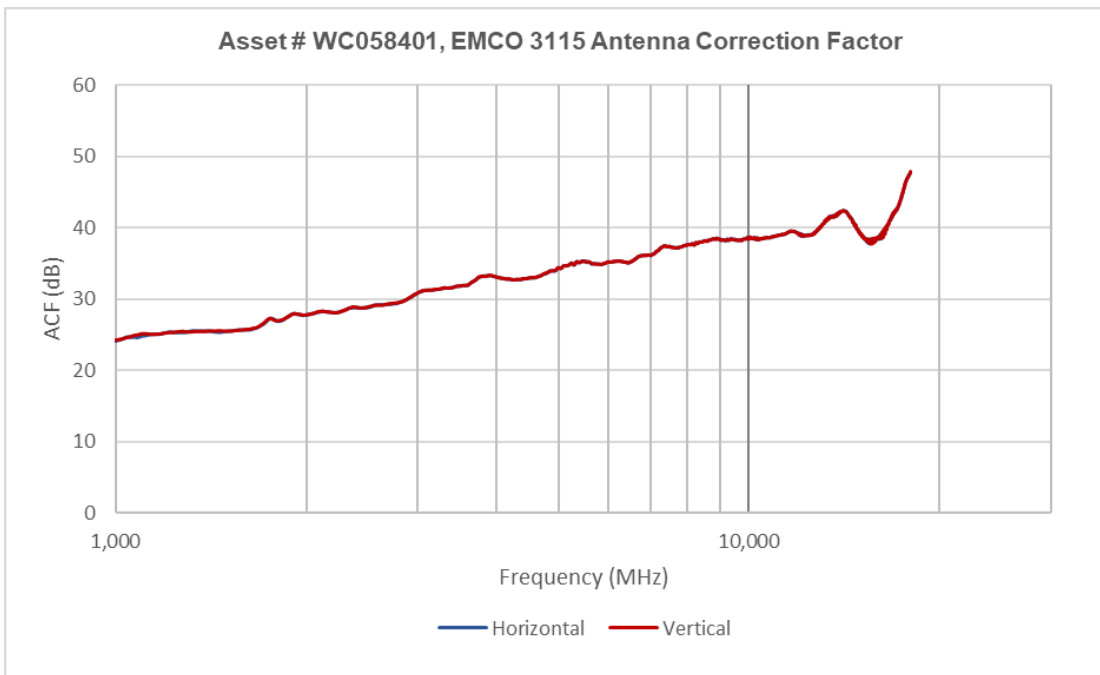
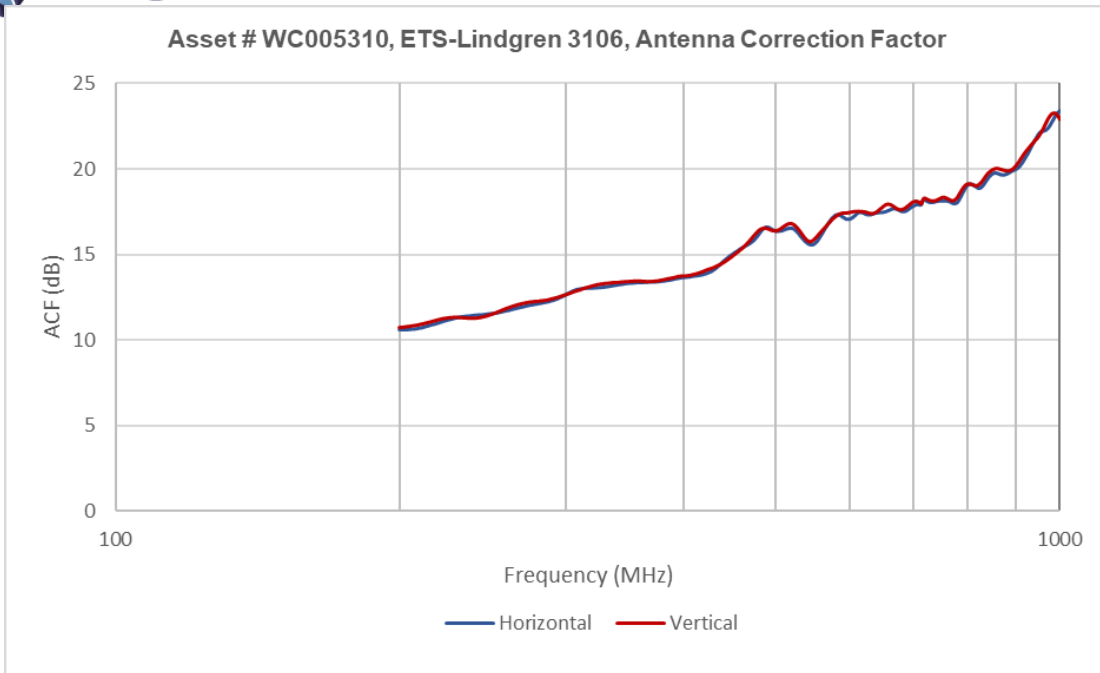


Asset Number	Manufacturer	Model
WC005289	Solar Electronics	8028-50-TS-24-BNC



## Appendix C: Correction Factors







**End of Test Report**