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Test Report

Certification

FCC ID	2AAAS-TL01
Equipment Under Test	TL01
Test Report Serial No	V071562_03
Date of Test	November 27, 2023
Report Issue Date	December 21, 2023

Test Specifications:	Applicant:
FCC Part 15, Subpart C, 15.231	Vivint, Inc. 4931 N 300 W Provo, UT 84604 U.S.A.

TESTING
NVLAP LAB CODE 100272-0

Certification of Engineering Report

This report has been prepared by VPI Laboratories, Inc. to document compliance of the device described below with the requirements of Federal Communications Commission (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

Applicant	Vivint, Inc.
Manufacturer	Vivint, Inc.
Brand Name	Vivint
Model Number	TL01
FCC ID	2AAAS-TL01

On this 21st day of December 2023, I, individually and for VPI Laboratories, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has accredited the VPI Laboratories, Inc. EMC testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

VPI Laboratories, Inc.

Tested by: Benjamin N. Antczak

Reviewed by: Jason Stewart

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	December 21, 2023
02	Corrections to table 5.1.1 and section 6.2.2.4	January 09, 2024
03	Removing Photographs for Confidentiality	January 23, 2024

Table of Contents

1 Client Information

1.1 Applicant

Company Name	Vivint, Inc. 4931 N 300 W Provo, UT 84604 U.S.A.
Contact Name	Norman Hansen
Title	Regulatory Compliance Engineer

1.2 Manufacturer

Company Name	Vivint, Inc. 4931 N 300 W Provo, UT 84604 U.S.A.
Contact Name	Norman Hansen
Title	Regulatory Compliance Engineer

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	Vivint
Model Number	TL01
FCC ID	2AAAS-TL01
Serial Number	Engineering Unit 1 (Constant Transmit) Engineering Unit 2 (Normal Operation)
Dimensions (cm)	7.0 x 2.5 x 1.0
Mfr. Declared Antenna Gain (dBi)	N/A

2.2 Description of EUT

The Vivint TL01 is a tilt sensor for use in Vivint's Smart Home Life Safety and Security Systems. Installed on doors and windows (or other locations such as a pet door or mailbox lid), the TL01 monitors and reports open and closed states. The sensor transmits a momentary 345 MHz signal to the control panel/hub when it is tilted. The Vivint TL01 is an indoor use only device powered by a CR2032 battery.

This report covers the transmitter circuitry of the devices subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Subpart B was found to be compliant and is covered in VPI Laboratories, Inc. report V071561_01.

2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: Vivint MN: TL01 (Note 1) SN: Engineering Unit 1 (Constant Transmit) Engineering Unit 2 (Normal Operation)	Tilt Sensor Security Device	See Section 2.4

Notes: (1) EUT

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT

There are no interface ports on the EUT.

2.5 Modification Incorporated/Special Accessories on EUT

There were no modifications or special accessories required to comply with the specification.

2.6 Deviation from Test Standard

There were no deviations from the test specification.

3 Test Specification, Methods and Procedures

3.1 Test Specification

Title	FCC PART 15, Subpart C (47 CFR 15) 15.203, 15.207, and 15.231 Periodic operation in the 40.66 – 40.70 MHz and above 70 MHz
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures

3.2.1 §15.203 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

3.2.2 §15.207 Conducted Limits

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50*	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Table 1: Limits for conducted emissions at mains ports of Class B ITE.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

3.2.3 §15.231

a) (a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

b) In addition to the provisions of §15.205, the field strength of emission from intentional radiators operated under this section shall not exceed the following.

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 –130	1,250	125
130 – 174	1,250 to 3,750 **	125 to 375 **
174 – 260	3,750	375
260 – 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** Linear interpolations

Table 2: Limits for field strength of emissions from intentional radiators.

1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provision in §15.35 for averaging pulsed emission and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

3) The limits on the field strength of the spurious emission in the above table are based on the fundamental frequency of the intentional radiator. Spurious emission shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

d) For devices operation within the frequency band 40.66-40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ±0.01%. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation on the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided that intentional radiator complies with the provisions of paragraphs (b) through (d) of this section except the field strength table in paragraph (b) of this section is replaced by the following.

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66 - 40.70	1,000	100
70 –130	500	50
130 – 174	500 to 1,500 **	50 to 150 **
174 – 260	1,500	150
260 – 470	1,500 to 5,000 **	150 to 500 **
Above 470	5,000	500

** Linear interpolations

Table 3: Limits for field strength of emissions from intentional radiators.

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent periods between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

3.3 Test Procedure

VPI Laboratories, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2024. VPI Laboratories, Inc. carries FCC Accreditation Designation Number US5263. VPI Laboratories main office is located at 313 W 12800 S, Suite 311, Draper, UT 84020. The testing was performed according to the procedures in ANSI C63.10-2013 and 47 CFR Part 15.

4 Operation of EUT During Testing

4.1 Operating Environment

Power Supply	3VDC from Internal Battery
AC Mains Frequency	N/A

4.2 Operating Modes

Each mode of operation was exercised to produce worst-case emissions. The EUT can be installed in any orientation and was tested in three orthogonal axes. The worst-case emissions were with the EUT laying on its back.

4.3 EUT Exercise Software

Engineering firmware was installed for constant transmission.

5 Summary of Test Results

5.1 FCC Part 15, Subpart C

5.1.1 Summary of Tests

Part 15, Subpart C Reference	Test Performed	Frequency Range (MHz)	Result
15.203	Antenna Requirement	N/A	Complied
15.207	Emissions at the AC Mains	N/A	Not Applicable
15.231 (a)	Periodic Operation	345	Complied
15.231 (b)	Radiated Emissions	10-3450	Complied
15.231 (c)	Bandwidth (20dB)	345	Complied
N/A	Bandwidth (99% OCB)	345	Reported
15.231 (d)	Frequency Stability	N/A	Not Applicable
15.231 (e)	Radiated Emissions	N/A	Not Applicable

5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

6 Measurements, Examinations and Derived Results

6.1 General Comments

This section contains the test results only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Section 7 of this report.

When calculations in this report require EUT antenna gains, those values have been provided by the manufacturer unless otherwise noted.

6.2 Test Results

6.2.1 §15.203 Antenna Requirements

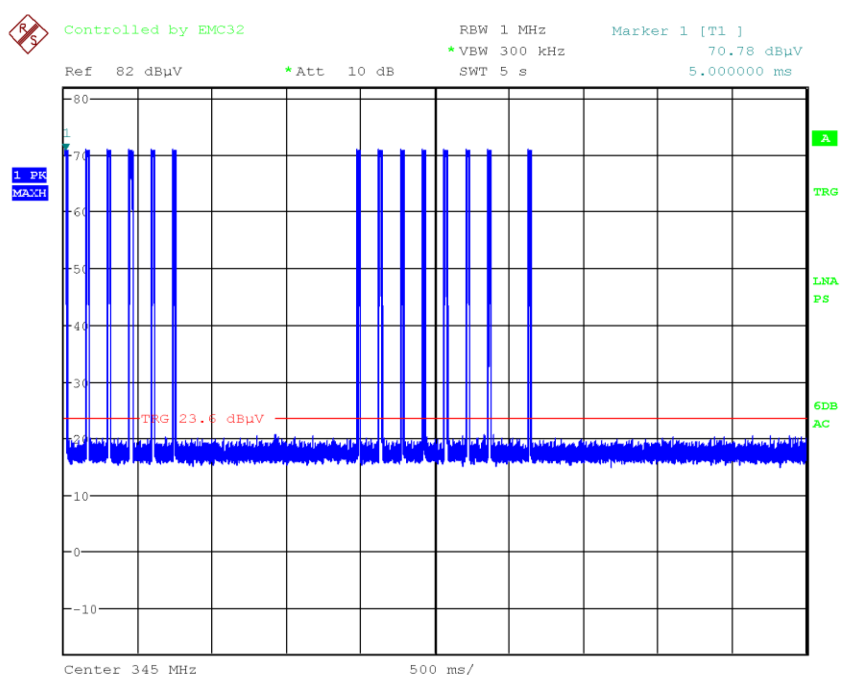
The EUT contains a PCB trace antenna. The antenna cannot be changed or modified by the end user.

Result

The EUT complied with the specification.

6.2.2 §15.231 (a)

1) The EUT is not manually activated.
2) The EUT is automatically activated when the door or window being monitored is opened or closed. Transmission ceases in 3.6 seconds after activation, less than the 5 second requirement.



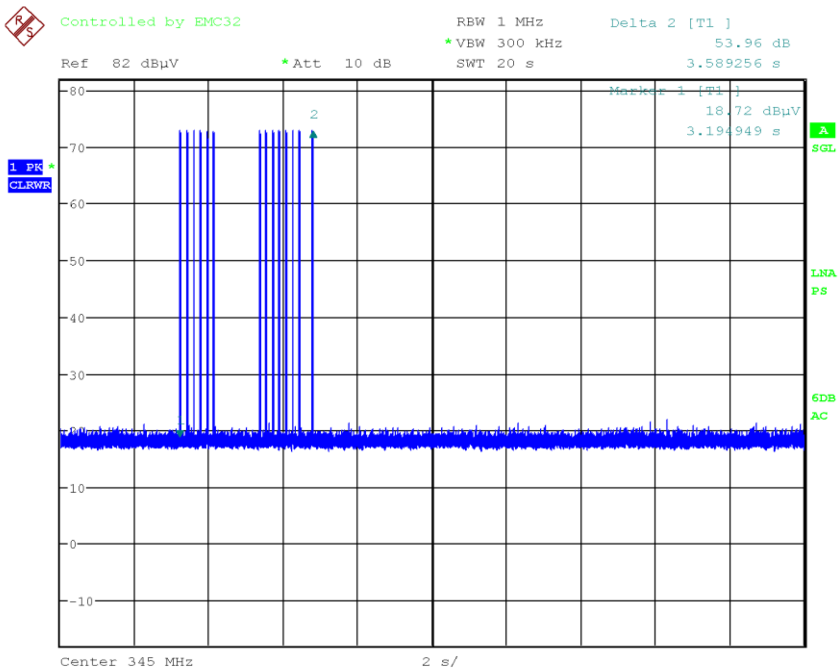
Graph 1: Plot Showing EUT ceases transmission within 5 seconds of activation when automatically activated.

3) The EUT does transmit at regular predetermined intervals for any reason other than verification of system integrity. The EUT is used in security systems and transmits once in approximately 70 minutes for the security system integrity checks such as polling battery life. The emission that

occurs to maintain security system integrity is shown below. The manufacturer declares that integrity checks are contained in 6 pulse trains, far fewer than the 14 pulses tested as worst-case transmissions. This evaluation considered the worst-case transmission of 14 pulses of 24 ms (which includes the 6 integrity check pulses). The total on time in 70 minutes is 336.0 ms, well below the requirement of 2 seconds per hour.

4) The EUT is used during an emergency that involves fire and safety of life.

5) The EUT does require set up information transmissions by a professional installer. The EUT is installed by a professional installer and the setup information is contained in the 14 pulses, each 24.0 ms in duration, of a normal transmission in 3.6 seconds. This will also occur when the battery is replaced. The requirement is that these transmissions occur within in a 10 second period.



Graph 2: Worst Case Pulse Train for all Modes ends after 3.6 Seconds with No Additional Transmissions (Setup Information Transmission contained in Normal Operation Transmission).

In the configuration tested, the EUT complied with the requirements of this section.

6.2.3 §15.231 (b) Radiated Emissions

The TL01 operates at 345 MHz. Therefore; the field strength of the fundamental must be less than 7,291.7 µV/m (77.3 dBµV/m) at 3 meters. The maximum permitted field strength of any unwanted emission must be 20 dB below the maximum allowable fundamental field strength (57.3 dBµV/m).

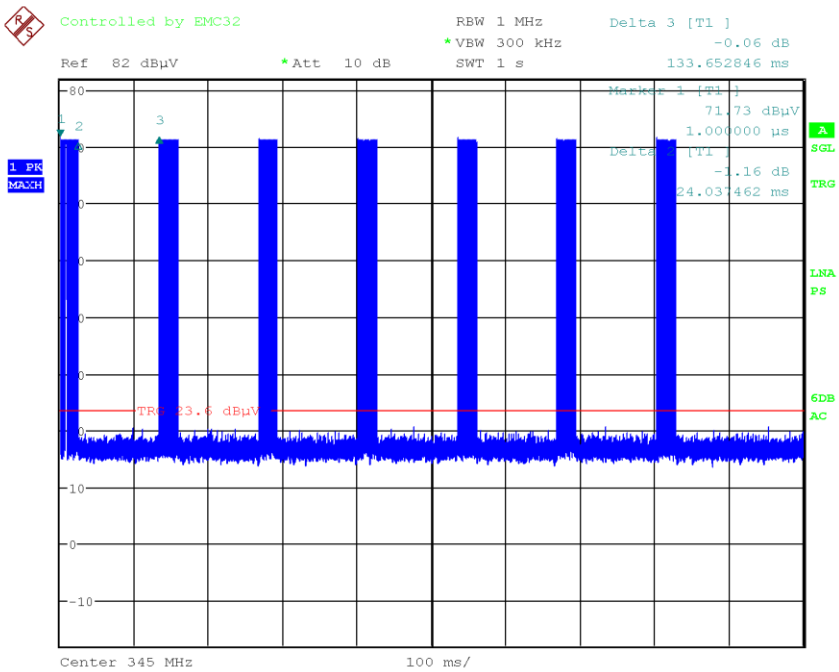
Emissions in the restricted bands of §15.205 must meet the limits specified in §15.209.

Measurement Data Fundamental and Harmonic Emissions

The frequency range from the lowest frequency used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any radiated emissions.

Pulsed Emission Averaging Factor

The TL01 transmitter is a pulsed emission device using Manchester encoding; therefore, the method of §15.35 for averaging a pulsed emission may be used. A timing diagram of the pulsed transmission, plots of the pulse train, and the average factor calculations are shown below.



Graph 3: Worst Case Pulse Train for all Modes.

Average factor calculation

From the plots, each pulse is 24.0 ms in duration per 100 ms. The Average Factor will be calculated using 100 ms as specified in FCC §15.35(c). The pulsed emissions use Manchester encoding that gives a 50% duty cycle in all cases.

The Average Factor is calculated by the equation:

Average Factor = 20 log (on time/pulse train time)

Pulse train time = 100 ms

Pulse time = 24.0 ms

Pulse on-time = 24.0 ms * 0.5 = 12.0 ms

Average Factor = 20 log (12.0 / 100) = -18.42 dB

§15.35(b) specifies a 20 dB maximum between the peak and average measurements; therefore, a -18.42 dB averaging factor will be used.

6.2.4 Radiated Interference Measurements – (Horizontal Polarity)

Frequency (MHz)	Detector	Receiver Reading (dBμV)	Average Factor (dB)	Correction Factor (dB/m)	Field Strength (dBμV/m)	Limit (dBμV/m)	Delta (dB)
345.0	Peak	67.8	-18.4	25.1	74.5	77.3	-2.8
690.0	Peak	18.2	-18.4	35.4	35.2	81.9	-46.7
1035.0*	Peak	33.3	-18.4	0.4	15.3	54.0	-38.7
1380.0*	Peak	51.2	-18.4	4.5	37.3	54.0	-16.8
1725.0	Peak	47.1	-18.4	2.9	31.6	61.9	-30.3
2070.0	Peak	58.3	-18.4	4.5	44.4	61.9	-17.5
2415.0	Peak	56.7	-18.4	5.3	43.6	61.9	-18.3
2760.0*	Peak	49.8	-18.4	5.9	37.3	54.0	-16.7
3105.0	Peak	39.7	-18.4	7.6	28.9	61.9	-33.0
3450.0	Peak	38.9	-18.4	8.2	28.7	61.9	-33.2
*** Emissions within restricted bands**							

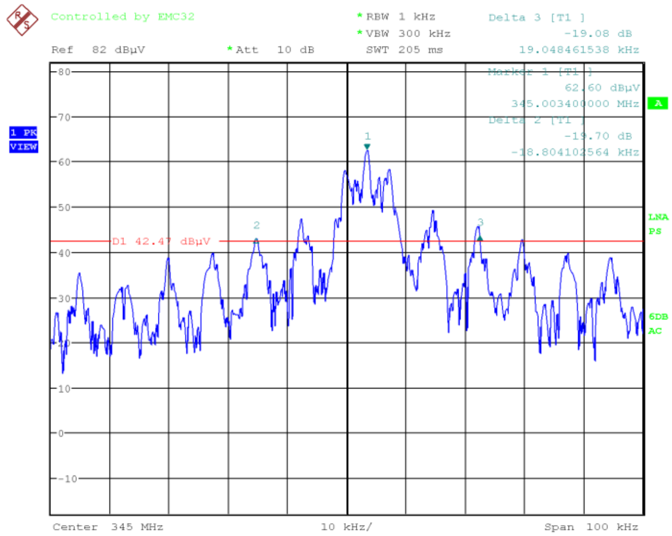
6.2.5 Radiated Interference Measurements – (Vertical Polarity)

Frequency (MHz)	Detector	Receiver Reading (dBμV)	Average Factor (dB)	Correction Factor (dB/m)	Field Strength (dBμV/m)	Limit (dBμV/m)	Delta (dB)
345.0	Peak	54.7	-18.4	25.1	61.4	77.3	-15.9
690.0	Peak	18.0	-18.4	35.4	35.0	81.9	-46.9
1035.0*	Peak	33.6	-18.4	0.4	15.6	54.0	-38.4
1380.0*	Peak	44.2	-18.4	4.5	30.3	54.0	-23.7
1725.0	Peak	43.3	-18.4	2.9	27.8	61.9	-34.1
2070.0	Peak	52.1	-18.4	4.5	38.2	61.9	-23.7
2415.0	Peak	55.6	-18.4	5.3	42.5	61.9	-19.4
2760.0*	Peak	41.9	-18.4	5.9	29.4	54.0	-24.7
3105.0	Peak	33.1	-18.4	7.6	22.3	61.9	-39.6
3450.0	Peak	33.7	-18.4	8.2	23.5	61.9	-38.4
*** Emissions within restricted bands**							

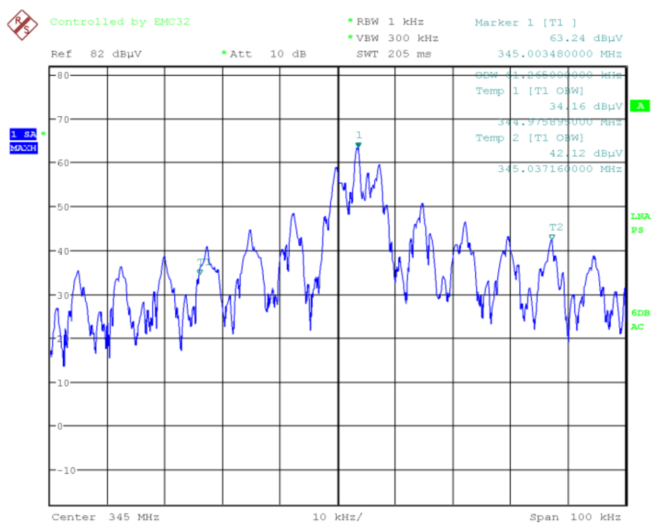
6.2.6 §15.231 (c) Bandwidth

Demonstration of Compliance

The 20dB bandwidth of the emission must not be wider than 0.25% of the center frequency. The center frequency is 345 MHz, therefore the bandwidth must not be wider than 86.3 kHz. The TL01 20dB bandwidth was 37.9 kHz. See spectrum analyzer plot below.



Graph 4: 20dB Bandwidth Plot showing 37.9kHz Bandwidth.



Graph 5: 99% Bandwidth Plot showing 61.3kHz Bandwidth.

Result

In the configuration tested, the EUT complied with the requirements of this section.

6.3 Sample Measurement Calculations

6.3.1 Filed Strength Calculations

The field strength is calculated by adding the *Correction Factor* (*Antenna Factor* + *Cable Factor*), to the measured level from the receiver. The receiver amplitude reading is compensated for any amplifier gain. The basic equation with a sample calculation is shown below:

Receiver Amplitude Reading=Receiver Reading-Amplifier Gain

Correction Factor=Antenna Factor + Cable Factor

Field Strength=Receiver Amplitude Reading + Correction Factor

Example

Assuming a *Receiver Reading* of 42.5 dBμV is obtained from the receiver, the *Amplifier Gain* is 26.5 dB the *Antenna Factor* is 4.5 dB, and the *Cable Factor* is 4.0 dB. The *Field Strength* is calculated by subtracting the *Amplifier Gain* and adding the *Correction Factor*, giving a *Field Strength* of 24.5 dBμV/m.

$$Receiver\ Amplitude\ Reading\ =\ 42.5 - 26.5\ =\ 16.0\ \mathrm{dB\mu V/m}$$

$$Correction\ Factor\ =\ 4.5 + 4.0\ =\ 8.5\ \mathrm{dB}$$

$$Field\ Strength\ =\ 16.0 + 8.5\ =\ 24.5\ \mathrm{dB\mu V/m}$$

6.3.2 Conducted Measurement Value Calculations

A conducted emission value is calculated by adding the *Correction Factor* (*LISN Transducer Factor* + *Cable Factor*) to the measured value from the receiver. The LISN contains an internal 10dB (nominal) attenuation accounted for in the LISN Transducer Factor. Amplifiers are not utilized for this measurement. The basic equation with a sample calculation is shown below:

Correction Factor = LISN Transducer Factor + Cable Factor

Conducted Emission Value = Receiver Amplitude Reading + Correction Factor

Example

Assuming a *Receiver Reading* of 20.8 dBμV is obtained from the receiver, *LISN Transducer Factor* is 10.1 dB, and the *Cable Factor* is 0.3 dB. The *Conducted Emissions Value* is calculated by adding the *Correction Factor*, giving a *Conducted Emissions Value* of 31.2 dBμV.

$$Receiver\ Amplitude\ Reading\ =\ 20.8\ \mathrm{dB\mu V}$$

$$Correction\ Factor\ =\ 10.1 + 0.3\ =\ 10.4\ \mathrm{dB}$$

$$Conducted\ Emissions\ Value\ =\ 20.8 + 10.4\ =\ 31.2\ \mathrm{dB\mu V}$$

7 Test Procedures and Test Equipment

7.1 Radiated Emissions

The radiated emissions from the EUT were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings.

A preamplifier with a fixed gain was used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges. For frequencies below 30 MHz, a 9 kHz resolution bandwidth was used. For frequencies above 1000 MHz, a 1 MHz resolution bandwidth was used.

A loop antenna was used to measure frequencies below 30 MHz. A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors. A double-ridged guide antenna was used to measure the emissions at frequencies above 1000 MHz at a distance of 3 and/or 1 meter from the EUT.

The configuration of the EUT was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.3 via the interconnecting cables listed in Section 2.4. A technician manually manipulated these interconnecting cables to obtain worst-case radiated emissions. The EUT was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

Desktop EUT are measured on a non-conducting table 0.8 meters above the ground plane. For frequencies above 1000 MHz, the EUT is placed on a table 1.5 meters above the ground plane. The table is placed on a turntable, which is level with the ground plane. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

For radiated emissions testing that is performed at distances closer than the specified distance; an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	V033119	08/20/2023	08/20/2024
Spectrum Analyzer/ Signal Analyzer	Rohde & Schwarz	FSV40	V044352	03/08/2022	03/08/2024
Biconilog Antenna	EMCO	3142E	V057461	06/06/2023	06/06/2025
Power Amplifier	HP	5086-7005	V067767	03/14/2023	03/14/2024
Double Ridged Guide Antenna	EMCO	3115	V034413	01/25/2023	01/25/2025
High Frequency Amplifier	Miteq	AFS4-001018000-35-10P-4	V033997	12/23/2022	12/23/2023
6' High Frequency Cable	Microcoax	UFB197C-0-0720-000000	V033638	12/23/2022	12/23/2023
20' High Frequency Cable	Microcoax	UFB197C-1-3120-000000	V033979	12/23/2022	12/23/2023

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
3 Meter Radiated Emissions Cable Wanship Upper Site	Microcoax	UFB205A-0-4700-000000	V033639	12/23/2022	12/23/2023
10 Meter Radiated Emissions Cable Wanship Upper Site	VPI Labs	Cable L	V033649	12/23/2022	12/23/2023
EMC32 Test Software	Rohde & Schwarz	10.60.20	N/A	N/A	N/A

Table 4: List of equipment used for radiated emissions testing.

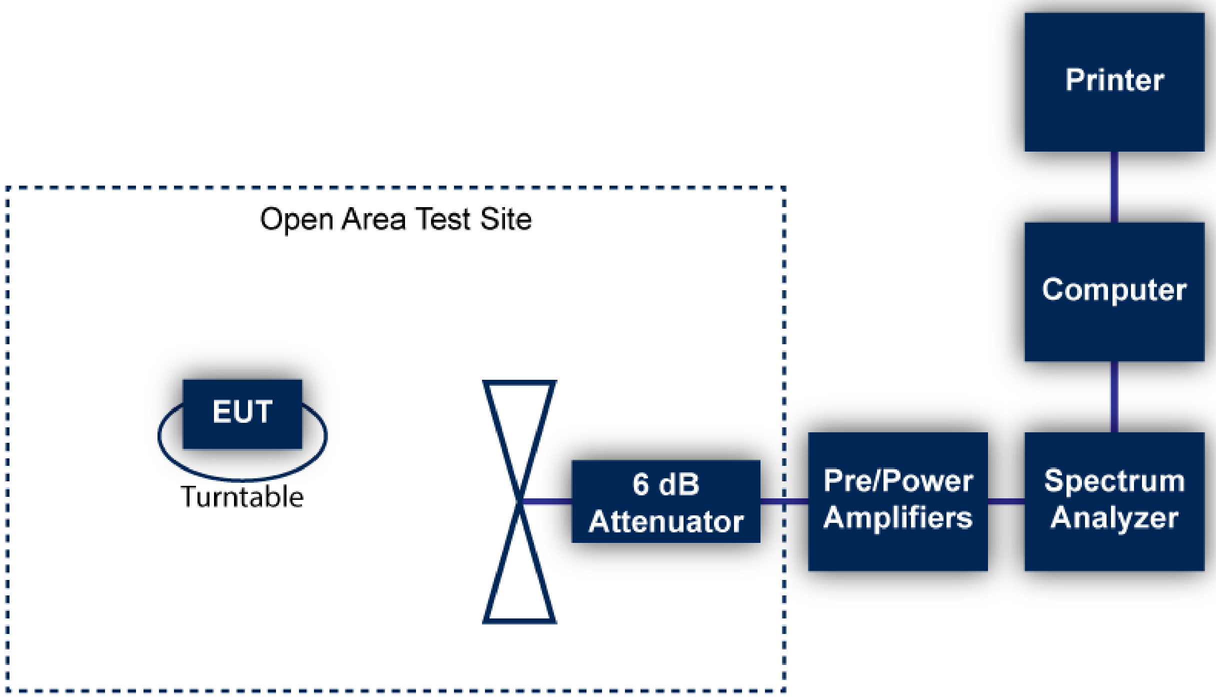


Figure 1: Radiated Emissions Test

7.2 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or VPI Laboratories, Inc. personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

7.3 Measurement Uncertainty

Test	Uncertainty (±dB)	Confidence (%)
Conducted Emissions	2.8	95
Radiated Emission (9 kHz to 30 MHz)	3.3	95
Radiated Emissions (30 MHz to 1 GHz)	3.4	95
Radiated Emissions (1 GHz to 18 GHz)	5.0	95
Radiated Emissions (18 GHz to 40 GHz)	4.1	95

8 Photographs

Photographs are contained in an external appendix.

--- End of Report ---