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RADIO TEST REPORT

Report ID:
REP043672

Project number:
PRJ52103356

Type of assessment:
Final product testing

Applicant:
Sensormatic USA LLC

Description of the product:
Label Deactivator Controller

Model (HVIN):
LFAMB2102

Product marketing name (PMN):
Label Deactivator Controller

FCC identifier:
FCC ID: BVCAMB9012

ISED certification number:
IC: 3506A-AMB9012

Specifications:

- FCC 47 CFR Part 15 Subpart C
- RSS-210, Issue 11, June 2024

Date of issue: August 13, 2024

Tarek Elkholy, Wireless/EMC Specialist
Tested by

Tarek Elkholy
Signature

Alvin Liu, Wireless/EMC Specialist
Reviewed by

Alvin Liu
Signature

Lab locations

Company name	Nemko Canada Inc.			
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Test site identifier	**Organization**	**Ottawa**	**Montreal**	**Cambridge**
	FCC:	CA2040	CA2041	CA0101
	ISED:	2040A-4	2040G-5	24676
Website	www.nemko.com			

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Table of Contents

Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart C	Radio Frequency Devices, Intentional Radiators
RSS-210, Issue 11, June 2024	Licence-Exempt Radio Apparatus: Category I Equipment

1.2 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.3 Exclusions

None

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.3 above. Results obtained indicate that the product under test complies In full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Test report revision history

Table 1.5-1: *Test report history*

Report ID	Date of issue	Details of changes made to test report
REP043672	August 13, 2024	Original report issued

Section 2 Engineering considerations

2.1 Modifications incorporated in the EUT for compliance

There were no modifications performed to the EUT during this assessment.

2.2 Technical judgment

None.

2.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3 Test conditions

3.1 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 4 Information provided by the applicant

4.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results contained within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

4.2 Applicant/Manufacturer

Applicant name	Sensormatic USA LLC
Applicant address	6600 Congress Ave. Boca Raton, Florida 33487, US
Manufacturer name	Same as applicant
Manufacturer address	Same as applicant

4.3 EUT information

Product	Label Deactivator Controller
Model	LFAMB2102
Hardware revision	A
Serial number	123S2419003606; 123S2419003601
Part number	0101-0849-01, REV: 1
Power requirements	100-240 V_{AC}, 50/60 Hz
Description/theory of operation	EUT is a EAS label deactivator.
Software details	FW: 0.5210

4.4 Radio technical information

Frequency band	58 kHz
Frequency Min (MHz)	One Channel 58 kHz
Frequency Max (MHz)	One Channel 58 kHz
Field strength, dBµV/m @ 3 m	110.8 dBµV/m (ANAMB-2402 antenna) 101.1 dBµV/m (DEAC STP-SD antenna)
Measured BW (kHz), 99% OBW	9.6 kHz
Type of modulation	Pulse, no modulation
Antenna information	

Antenna type	Manufacturer	Model number	Part number	Gain (dBi)	Connector type
Inductive loop antenna – Air core	Sensormatic	ANAMB-2402	1811-0104-01	-110	2-pin Connector
Inductive loop antenna – Ferrite core	Sensormatic	DEAC STP-SD	0304-0035-01	-118	2-pin Connector

Note: *As per applicant test plan, both antennas listed above showing the highest gain among both ferrite-core antennas and air-core antennas were selected to be tested in this assessment.*

Radio technical information, continued

Antenna information, supported antennas, not tested

Model	Product Code	Part number	Type	Gain (dBi)
AMB 5014	ZBAMB6001	1811-0103-02	Loop, Air Core	-122
AMB 5195	ZBAMB6003	1811-0103-04	Loop, Air Core	-121
AMB 5500	ZBAMB6002	1811-0103-03	Loop, Air Core	-129
AMB-5010	ZBAMB5010A2	0404-0739-01	Loop, Air Core	-116
AMB-5010	ZBAMB5010A	0505-4514-01	Loop, Air Core	-117
AMB-5010	ZBAMB5010A	0404-0571-01	Loop, Air Core	-117
AMB-5014	ZBAMB5014A	0101-0857-01	Loop, Air Core	-125
AMB-5120	ZBAMB5120H	0101-0525-01	Loop, Air Core	-121
AMB-5184	ZBAMB5184A	0404-0542-01	Loop, Air Core	-117
AMB-5190	ZBAMB5190A	0101-0340-01	Loop, Air Core	-116
AMB-5194	ZBAMB5194L	0101-0716-01	Loop, Air Core	-121
AMB-5196	ZBAMB5196A	0101-0853-01	Loop, Air Core	-121
AMB-5199	ZBAMB5199A	0101-0847-01	Loop, Air Core	-122
AMB-5212	ZBAMB5212A	0101-0786-01	Loop, Air Core	-119
AMB-5274	ZBAMB5274H	0404-0603-01	Loop, Air Core	-119
AMB-5274	ZBAMB5274V	0404-0604-01	Loop, Air Core	-121
AMB-5277	ZBAMB5277H	0101-0728-01	Loop, Air Core	-119
AMB-5277	ZBAMB5277V	0101-0729-01	Loop, Air Core	-120
AMB-5278	ZBAMB5278A	0101-0240-01	Loop, Air Core	-124
AMB-5279	ZBAMB5279A	0101-0786-01	Loop, Air Core	-119
AMB-5290	ZBAMB5290A	0404-1133-01	Loop, Air Core	-132
AMB-5310	ZBAMB5318V	0101-0543-01	Loop, Air Core	-115
AMB-5310	ZBAMB5318H	0101-0542-01	Loop, Air Core	-115
AMB-5410H	ZBAMB5410H	0101-0569-01	Loop, Air Core	-127
AMB-5410V	ZBAMB5410V	0101-0570-01	Loop, Air Core	-118
AMB-5470	ZBAMB5470A	0101-0726-01	Loop, Air Core	-115
AMB-5472	ZMANB5472A	0404-1422-01	Loop, Air Core	-119
AMB-5780	ZBAMB5780	0201-0019-01	Loop, Air Core	-114
AMB-5900	ZBAMB5900A	0404-1410-01	Loop, Air Core	-118
ANAMB-2302	1811-0103-01	1811-0103-01	Loop, Air Core	-113
ANAMB-2402	1811-0104-01	1811-0104-01	Loop, Air Core	-110
DEAC STP-CD	ZBSMPCPE	0304-0038-03	Loop, Ferrite Core	-122
DEAC STP-CD	ZBSMPCPE	0304-0038-03	Loop, Ferrite Core	-123
DEAC STP-LD	ZBSMPLPE	0304-0036-03	Loop, Ferrite Core	-119
DEAC STP-LD	ZBSMPLPE	0304-0036-03	Loop, Ferrite Core	-119
DEAC STP-LP	ZBSMPLP	0304-0036-01	Loop, Ferrite Core	-118
DEAC STP-PD	ZBSMPPPE	0304-0034-02	Loop, Ferrite Core	-119
DEAC STP-PD	ZBSMPPPE	0304-0034-02	Loop, Ferrite Core	-120
DEAC STP-SD	ZBSMPSP	0304-0035-01	Loop, Ferrite Core	-118

4.5 EUT setup details

Radio exercise details

Operating conditions	The EUT is powered up, The EUT is configured to continuously transmit at its maximum power level.
Transmitter state	Transmitter set into continuous mode.

Table 4.5-1: *EUT interface ports*

Description	Qty.
AC power input	1
RS-485 communication port	1
USB Scanner Port	1
RJ-45 Scanner Port	1
Remote RJ11 port	1
Antenna port	1
USB type B service port	1

Table 4.5-2: *Inter-connection cables*

Cable description	From	To	Length (m)
AC mains input	EUT	Mains	2
RF cable	EUT	Loop antenna	2

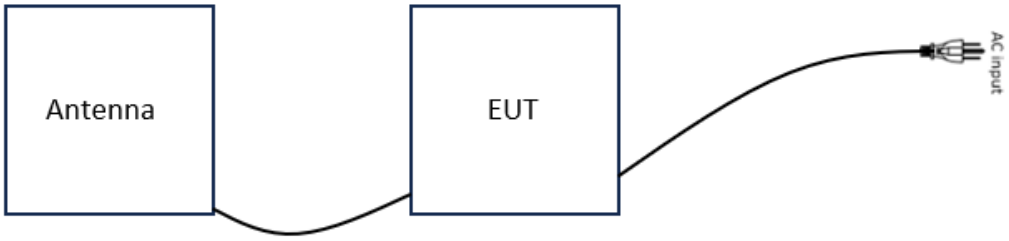


Figure 4.5-1: *Block diagram*

Section 5 Summary of test results

5.1 Testing location

Test location (s)	Cambridge

5.2 Testing period

Test start date	June 3, 2024	Test end date	July 15, 2024

5.3 Sample information

Receipt date	May 30, 2024	Nemko sample ID number(s)	PRJ521033560001, PRJ521033560002

5.4 FCC Part 15 Subpart A and C, general requirements test results

Table 5.4-1: *FCC general requirements results*

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass
§15.31(m)	Number of tested frequencies	Pass
§15.203	Antenna requirement	Pass
§15.215	Occupied bandwidth	Pass
§15.209(a)	Radiated emission limits; general requirements.	Pass

Notes: EUT is an AC powered device.

5.5 ISED test results

Table 5.5-1: *RSS-Gen requirements results*

Clause	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
6.9	Operating bands and selection of test frequencies	Pass
8.8	AC power-line conducted emissions limits	Pass
6.7	Occupied bandwidth	Pass

Notes: [1]According to sections 5.2 and 5.3 of RSS-Gen, Issue 5 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.
EUT is an AC powered device.

Table 5.5-2: *RSS-210 requirements results*

Clause	Test description	Verdict
8.3	Transmitters with wanted and unwanted emissions that are within the general field strength limits	Pass

Section 6 Test equipment

6.1 Test equipment list

Table 6.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA003012	1 year	January 22, 2025
Flush mount turntable	SUNAR	FM2022	FA003006	—	NCR
Controller	SUNAR	SC110V	FA002976	—	NCR
Antenna mast	SUNAR	TLT2	FA003007	—	NCR
DC power supply	GW	GPR-3060D	EH922508	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESR26	FA002969	1 year	May 17, 2025
Bilog antenna (30–2000 MHz)	SUNAR	JB1	FA003010	1 year	July 14, 2024
Active loop antenna (0.01–30 MHz)	Com-Power	AL-130R	FA003002	1 year	May 15, 2025
Two-line v-network	Rohde & Schwarz	ENV216	FA002965	1 year	November 30, 2024
ISN T8-Cat6	TESEQ	ISN T8-CAT6	FA002946	1 year	December 31, 2024
50 Ω coax cable	Rohde & Schwarz	None	FA003074	1 year	July 27, 2024
50 Ω coax cable	Huber + Suhner	None	FA003047	1 year	July 27, 2024
50 Ω coax cable	Huber + Suhner	None	FA003402	1 year	July 27, 2024

Notes: NCR - no calibration required

Table 6.1-2: *Automation software details*

Test description	Manufacturer of Software	Details
Radio/EMC test software	Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 10.60.00

Table 6.1-3: *Measurement uncertainty calculations based on equipment list*

Measurement	Measurement uncertainty, ±dB
AC power line conducted emissions	3.33
Radiated disturbances (using an active loop antenna) (9 kHz to 30 MHz)	3.42
Radiated spurious emissions (30 MHz to 1 GHz)	4.27

Notes: UKAS Lab 34, TIA-603 and ETSI TR 100 028-1&2 have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Section 7 Testing data

7.1 Variation of power source

References, definitions and limits

FCC §15.31 (e):

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test summary

Verdict	Pass		
Test date	June 3, 2024	Temperature	22.5 °C
Tested by	Tarek Elkholy	Air pressure	979 mbar
Test location	Cambridge	Relative humidity	50 %

Observations, settings and special notes

The testing was performed as per ANSI C63.10 Section 5.13.

a) Where the device is intended to be powered from an external power adapter, the voltage variations shall be applied to the input of the adapter provided with the device at the time of sale. If the device is not marketed or sold with a specific adapter, then a typical power adapter shall be used.
b) For devices, where operating at a supply voltage deviating ±15% from the nominal rated value may cause damages or loss of intended function, test to minimum and maximum allowable voltage per manufacturer's specification and document in the report.
c) For devices with wide range of rated supply voltage, test at 15% below the lowest and 15% above the highest declared nominal rated supply voltage.
d) For devices obtaining power from an input/output (I/O) port (USB, firewire, etc.), a test jig is necessary to apply voltage variation to the device from a support power supply, while maintaining the functionalities of the device.

For battery-operated equipment, the equipment tests shall be performed using a variable power supply.

Test data

EUT Power requirements:	☒ AC	☐ DC	☐ Battery
If EUT is an AC or a DC powered, was the noticeable output power variation observed?	☐ YES	☒ NO	☐ N/A
If EUT is battery operated, was the testing performed using fresh batteries?	☐ YES	☐ NO	☒ N/A
If EUT is rechargeable battery operated, was the testing performed using fully charged batteries?	☐ YES	☐ NO	☒ N/A

7.2 Number of frequencies

References, definitions and limits

FCC §15.31:

(m) Measurements on intentional radiators or receivers shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table.

RSS-Gen, Clause 6.9:

Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in table below. The frequencies selected for measurements shall be reported in the test report.

Table 7.2-1: *Frequency Range of Operation*

Frequency range over which the device operates (in each band)	Number of test frequencies required	Location of measurement frequency inside the operating frequency range
1 MHz or less	1	Center (middle of the band)
1–10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near center and 1 near low end

Notes: "near" means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

Test summary

Verdict	Pass		
Test date	June 3, 2024	Temperature	22.5 °C
Tested by	Tarek Elkholy	Air pressure	979 mbar
Test location	Cambridge	Relative humidity	50 %

Observations, settings and special notes

None.

Test data

The EUT utilizes only one operational channel at 58 kHz.

7.3 Antenna requirement

References, definitions and limits

FCC §15.203:

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 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 §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.

RSS-Gen, Clause 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report.

Test summary

Verdict	Pass		
Test date	June 3, 2024	Temperature	22.5 °C
Tested by	Tarek Elkholy	Air pressure	979 mbar
Test location	Cambridge	Relative humidity	50 %

Observations, settings and special notes

None

Test data

Must the EUT be professionally installed?	☒ YES	☐ NO	
Does the EUT have detachable antenna(s)?	☒ YES	☐ NO	
If detachable, is the antenna connector(s) non-standard?	☒ YES	☐ NO	☐ N/A

Table 7.3-1: *Antenna information*

Antenna type	Manufacturer	Model number	Part number	Gain (dBi)	Connector type
Inductive loop antenna – Air core	Sensormatic	ANAMB-2402	1811-0104-01	-110	2-pin Connector
Inductive loop antenna – Ferrite core	Sensormatic	DEAC STP-SD	0304-0035-01	-118	2-pin Connector

Note: *As per applicant test plan, both antennas listed above showing the highest gain among both ferrite-core antennas and air-core antennas were selected to be tested in this assessment.*

Test data, continued

Antenna information, supported antennas, not tested

Model	Product Code	Part number	Type	Gain (dBi)
AMB 5014	ZBAMB6001	1811-0103-02	Loop, Air Core	-122
AMB 5195	ZBAMB6003	1811-0103-04	Loop, Air Core	-121
AMB 5500	ZBAMB6002	1811-0103-03	Loop, Air Core	-129
AMB-5010	ZBAMB5010A2	0404-0739-01	Loop, Air Core	-116
AMB-5010	ZBAMB5010A	0505-4514-01	Loop, Air Core	-117
AMB-5010	ZBAMB5010A	0404-0571-01	Loop, Air Core	-117
AMB-5014	ZBAMB5014A	0101-0857-01	Loop, Air Core	-125
AMB-5120	ZBAMB5120H	0101-0525-01	Loop, Air Core	-121
AMB-5184	ZBAMB5184A	0404-0542-01	Loop, Air Core	-117
AMB-5190	ZBAMB5190A	0101-0340-01	Loop, Air Core	-116
AMB-5194	ZBAMB5194L	0101-0716-01	Loop, Air Core	-121
AMB-5196	ZBAMB5196A	0101-0853-01	Loop, Air Core	-121
AMB-5199	ZBAMB5199A	0101-0847-01	Loop, Air Core	-122
AMB-5212	ZBAMB5212A	0101-0786-01	Loop, Air Core	-119
AMB-5274	ZBAMB5274H	0404-0603-01	Loop, Air Core	-119
AMB-5274	ZBAMB5274V	0404-0604-01	Loop, Air Core	-121
AMB-5277	ZBAMB5277H	0101-0728-01	Loop, Air Core	-119
AMB-5277	ZBAMB5277V	0101-0729-01	Loop, Air Core	-120
AMB-5278	ZBAMB5278A	0101-0240-01	Loop, Air Core	-124
AMB-5279	ZBAMB5279A	0101-0786-01	Loop, Air Core	-119
AMB-5290	ZBAMB5290A	0404-1133-01	Loop, Air Core	-132
AMB-5310	ZBAMB5318V	0101-0543-01	Loop, Air Core	-115
AMB-5310	ZBAMB5318H	0101-0542-01	Loop, Air Core	-115
AMB-5410H	ZBAMB5410H	0101-0569-01	Loop, Air Core	-127
AMB-5410V	ZBAMB5410V	0101-0570-01	Loop, Air Core	-118
AMB-5470	ZBAMB5470A	0101-0726-01	Loop, Air Core	-115
AMB-5472	ZMANB5472A	0404-1422-01	Loop, Air Core	-119
AMB-5780	ZBAMB5780	0201-0019-01	Loop, Air Core	-114
AMB-5900	ZBAMB5900A	0404-1410-01	Loop, Air Core	-118
ANAMB-2302	1811-0103-01	1811-0103-01	Loop, Air Core	-113
ANAMB-2402	1811-0104-01	1811-0104-01	Loop, Air Core	-110
DEAC STP-CD	ZBSMPCPE	0304-0038-03	Loop, Ferrite Core	-122
DEAC STP-CD	ZBSMPCPE	0304-0038-03	Loop, Ferrite Core	-123
DEAC STP-LD	ZBSMPLPE	0304-0036-03	Loop, Ferrite Core	-119
DEAC STP-LD	ZBSMPLPE	0304-0036-03	Loop, Ferrite Core	-119
DEAC STP-LP	ZBSMPLP	0304-0036-01	Loop, Ferrite Core	-118
DEAC STP-PD	ZBSMPPPE	0304-0034-02	Loop, Ferrite Core	-119
DEAC STP-PD	ZBSMPPPE	0304-0034-02	Loop, Ferrite Core	-120
DEAC STP-SD	ZBSMPSP	0304-0035-01	Loop, Ferrite Core	-118

7.4 AC power line conducted emissions limits

References, definitions and limits

FCC §15.407(b):

(8) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in § 15.207.

FCC §15.207:

(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 Ω 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.

ANSI C63.10, Clause 6.2:

If the EUT normally receives power from another device that in turn connects to the public utility ac power lines, measurements shall be made on that device with the EUT in operation to demonstrate that the device continues to comply with the appropriate limits while providing the EUT with power. If the EUT is operated only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines (600 VAC or less) to operate the EUT (such as an adapter), then ac power-line conducted measurements are not required.
For direct current (dc) powered devices where the ac power adapter is not supplied with the device, an “off-the-shelf” unmodified ac power adapter shall be used. If the device is supposed to be installed in a host (e.g., the device is a module or PC card), then it is tested in a typical compliant host.

RSS-Gen, Clause 8.8:

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which 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 table below.
Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Table 7.4-1: *Conducted emissions limit*

	Conducted emissions limit, dBµV	
Frequency of emission, MHz	**Quasi-peak**	**Average****
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Notes: * - The level decreases linearly with the logarithm of the frequency.
** - A linear average detector is required.

Test summary

Verdict	Pass		
Test date	June 5, 2024	Temperature	23 °C
Tested by	Tarek Elkholy	Air pressure	972 mbar
Test location	Cambridge	Relative humidity	43 %

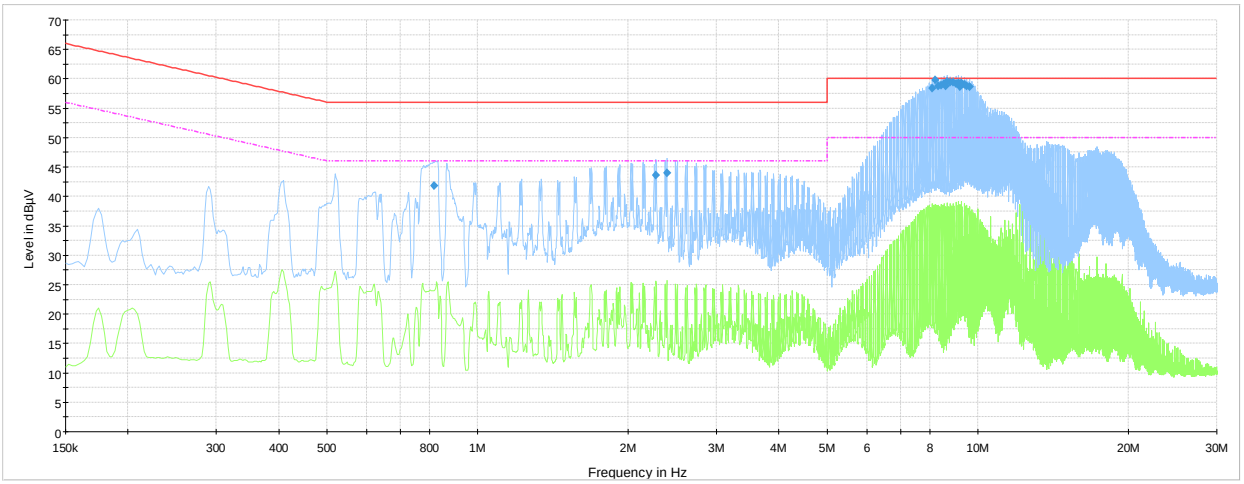
Observations, settings and special notes

Port under test – Coupling device	AC power input – Artificial Mains Network (AMN)
EUT power input during test	120 V_{AC}, 60 Hz
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 10 dB or above the limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.
Additional notes:	– The EUT was set up as tabletop configuration per ANSI C63.10-2013 measurement procedure. – The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance. Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB) – Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

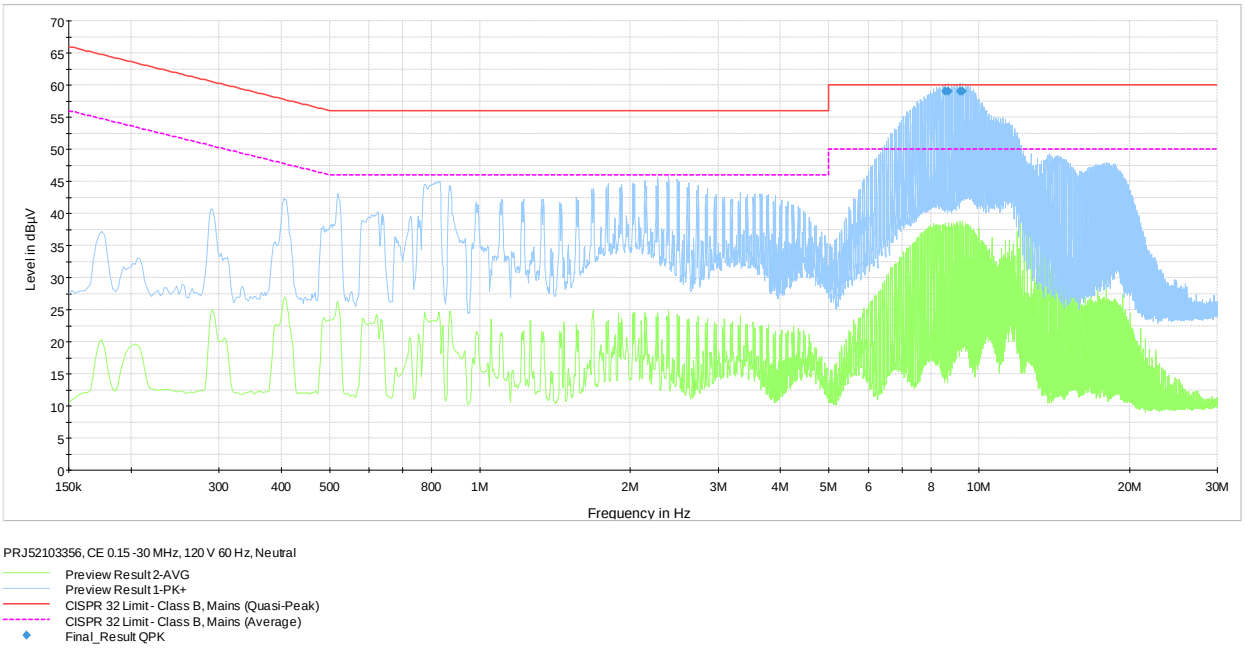
Conducted AC line emissions test was performed as per ANSI C63.10, Clause 6.2. Spectrum analyser settings:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average (Preview), Quasi-peak and CAverage (Final)
Trace mode	Max Hold
Measurement time	100 ms (Preview), 160 ms (Final)

Test data, ANAMB-2402 antenna



Plot 7.4-1: *Conducted emissions on phase line - ANAMB-2402 antenna*



Plot 7.4-2: *Conducted emissions on neutral line - ANAMB-2402 antenna*

Test data, continued

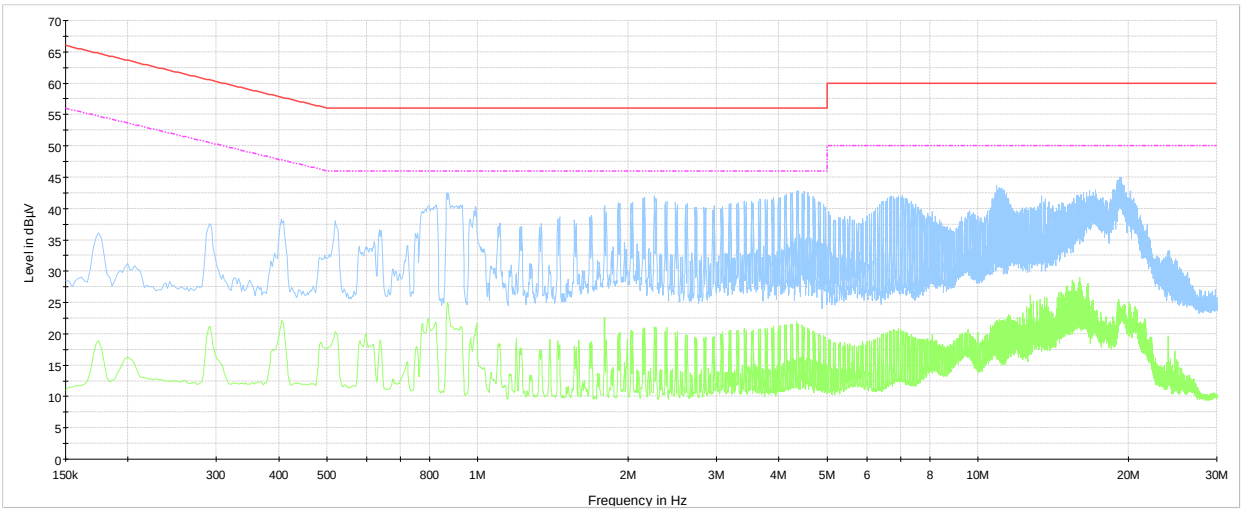
Table 7.4-2: *AC power line conducted emissions limits test results - ANAMB-2402 antenna*

Frequency (MHz)	Quasi-Peak result[1 and 3] (dBµV)	Quasi-Peak limit (dBµV)	Quasi-Peak margin (dB)	Conductor	Correction factor[2] (dB)
8.097	58.4	60.0	1.6	Phase	15.6
8.214	59.8	60.0	0.2	Phase	15.7
8.331	58.7	60.0	1.3	Phase	15.7
8.446	58.9	60.0	1.1	Phase	15.7
8.563	59.2	60.0	0.8	Phase	15.7
8.612	58.7	60.0	1.3	Phase	15.7
8.680	59.5	60.0	0.5	Phase	15.7
8.797	59.4	60.0	0.6	Phase	15.7
8.912	59.4	60.0	0.6	Phase	15.7
9.029	59.2	60.0	0.8	Phase	15.7
9.146	59.3	60.0	0.7	Phase	15.7
9.191	58.7	60.0	1.3	Phase	15.7
9.263	59.3	60.0	0.7	Phase	15.7
9.380	59.0	60.0	1.0	Phase	15.7
9.494	58.8	60.0	1.2	Phase	15.7
9.611	58.7	60.0	1.3	Phase	15.7
8.563	59.0	60.0	1.0	Neutral	15.7
8.680	59.1	60.0	0.9	Neutral	15.7
9.146	59.1	60.0	0.9	Neutral	15.7
9.263	59.0	60.0	1.0	Neutral	15.7

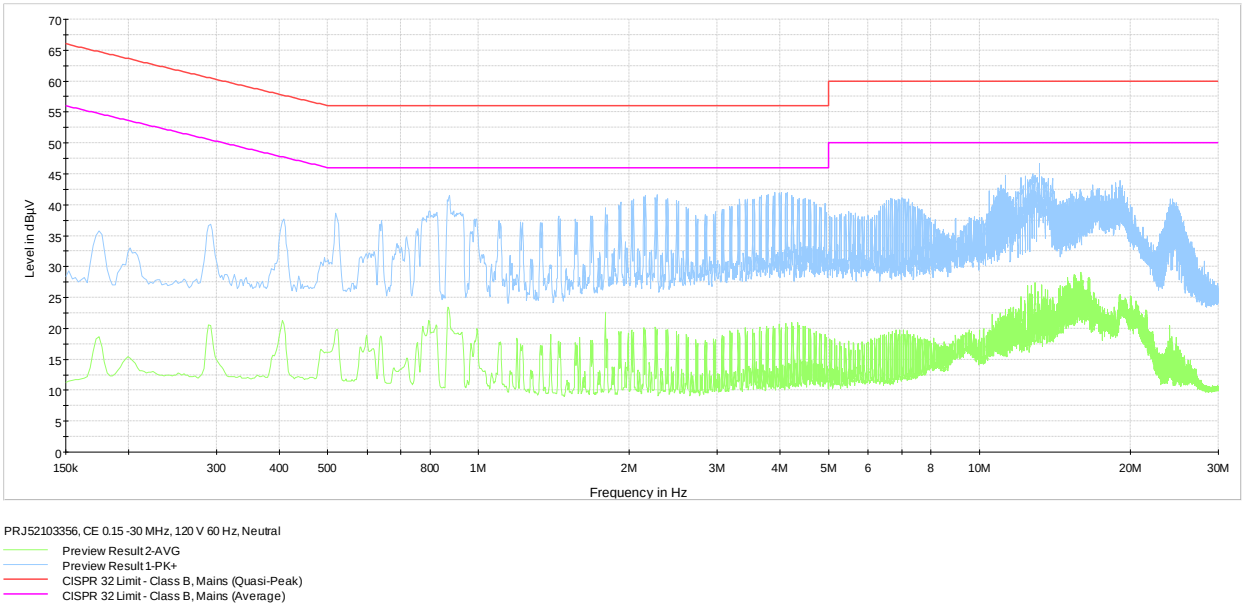
Notes:
[1] Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Sample calculation: 37.5 dBµV (result) = 27.4 dBµV (receiver reading) + 10.1 dB (Correction factor)

Test data, DEAC STP-SD antenna



Plot 7.4-3: *Conducted emissions on phase line - DEAC STP-SD antenna*



Plot 7.4-4: *Conducted emissions on neutral line - DEAC STP-SD antenna*

7.5 Occupied bandwidth

References, definitions and limits

FCC Part §15.215:

Additional provisions to the general radiated emission limitations:

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

ANSI C63.10-2013, Clause 6.9.3:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

RSS-Gen, Clause 6.7:

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test summary

Verdict	Pass		
Test date	June 4, 2024	Temperature	22.5 °C
Tested by	Tarek Elkholy	Air pressure	970 mbar
Test location	Cambridge	Relative humidity	49 %

Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth	≥ 1 % of emission bandwidth
Video bandwidth	≥ 3 × RBW
Frequency span	Wider than emission bandwidth
Detector mode	Peak

Test data, ANAMB-2402 antenna

Table 7.5-1: *Occupied bandwidth measurement result - ANAMB-2402 antenna*

Frequency, kHz	20 dB BW, kHz	99% BW, kHz
58.0	2.8	9.6

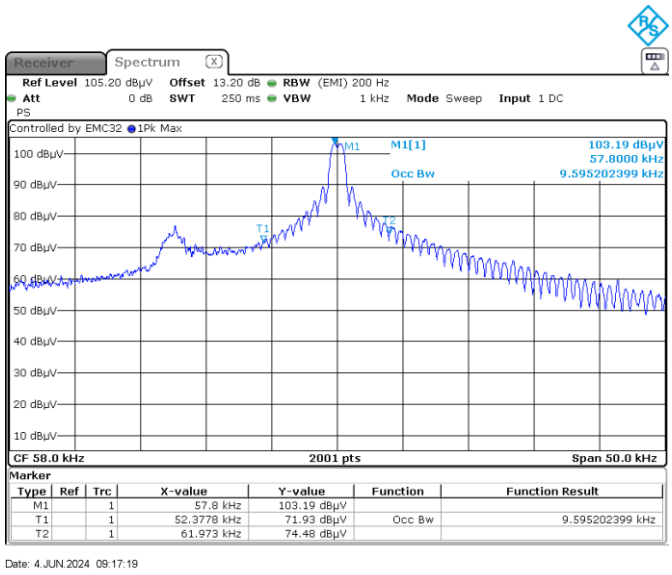


Figure 7.5-1: *99% bandwidth*

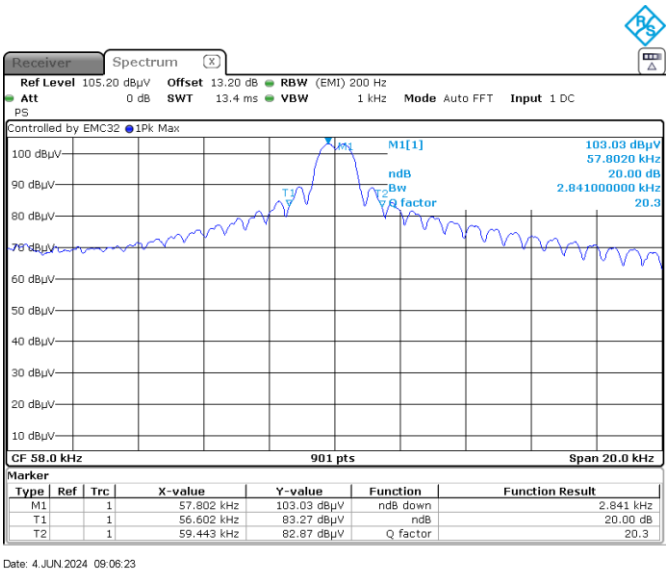


Figure 7.5-2: *20 dB bandwidth*

Test data, DEAC STP-SD antenna

Table 7.5-2: *Occupied bandwidth measurement result - DEAC STP-SD antenna*

Frequency, kHz	20 dB BW, kHz	99% BW, kHz
58.0	1.8	9.0

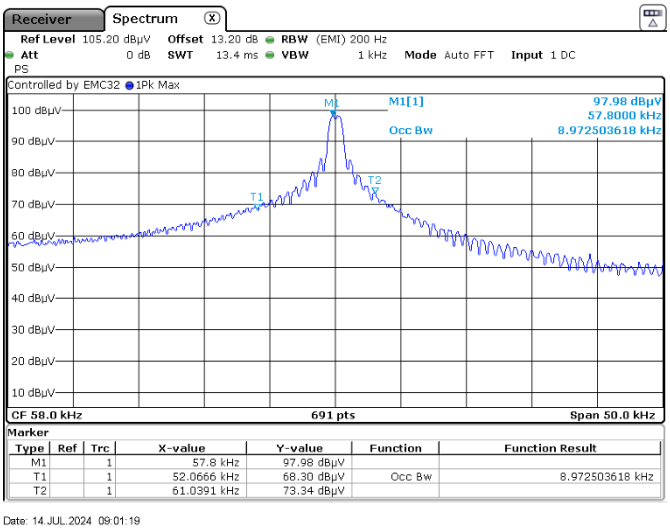


Figure 7.5-3: *99% bandwidth*

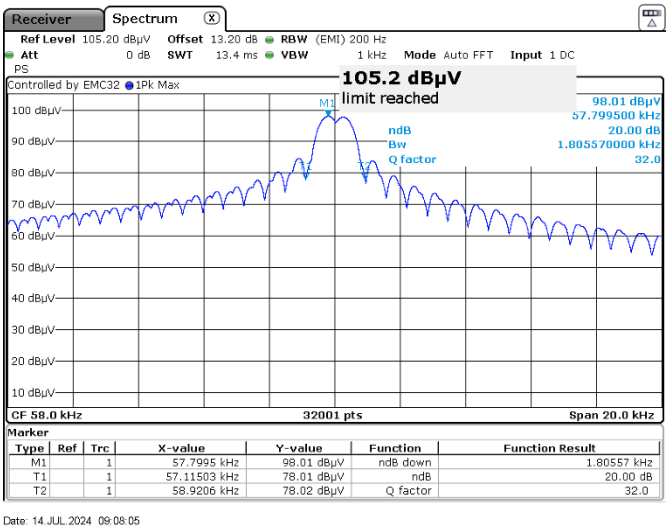


Figure 7.5-4: *20 dB bandwidth*

7.6 Radiated emission limits, general requirements

References, definitions and limits

FCC §15.209:

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

ANSI C63.10, Clause 4.1.4.2:

Specific detector functions and bandwidths for unlicensed wireless device measurements

4.1.4.2.1 Frequencies less than or equal to 1000 MHz

At any frequency or frequencies less than or equal to 1000 MHz, measurements shall be made with the CISPR quasi-peak detector and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector are given in CISPR 16-1-1:2010. Where average limits are specified, an average detector shall be used. Where peak limits are also specified, the peak emission shall also be measured with instrumentation properly adjusted for factors, such as pulse desensitization. As an alternative to CISPR quasi-peak measurements or average measurements, a test laboratory may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long as the equivalent or greater bandwidths as indicated for CISPR quasi-peak measurements or average measurements, as applicable, are employed.

Pulse-modulated devices with a pulse repetition frequency of 20 Hz or less have additional requirements.

4.1.4.2.2 Frequencies above 1000 MHz

Unless otherwise stated, on any frequency or frequencies above 1000 MHz, measurements shall be made with measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. Peak measurements can apply to the total peak emission level radiated by the device (i.e., the total peak power level) depending on the applicable regulatory requirement. Note that the use of a pulse desensitization correction factor might be needed to determine the total peak emission level.

RSS-210:

8.3 Transmitters with wanted and unwanted emissions that are within the general field strength limits

Transmitters whose wanted and unwanted emissions fall within the general field strength limits specified in RSS-Gen may operate licence-exempt in any of the frequency bands, other than the restricted frequency bands listed in RSS-Gen and the TV bands 54-72 MHz, 76-88 MHz, 174-216 MHz and 470-602 MHz, and shall be certified under RSS-210. Under no circumstances shall the level of any unwanted emissions exceed the level of the fundamental emissions.

Table 7.6-1: *FCC §15.209 and RSS-Gen – Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F(kHz)	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F(kHz)	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

References, definitions and limits, continued

Table 7.6-2: *ISED restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.495–0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	Above 38.6
8.41425–8.41475	167.72–173.2	3500–4400	
12.29–12.293	240–285	4500–5150	
12.51975–12.52025	322–335.4	5350–5460	

Note: Certain frequency bands listed in this table and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Table 7.6-3: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

Test summary

Verdict	Pass		
Test date	June 4, 2024	Temperature	22.5 °C
Tested by	Tarek Elkholy	Air pressure	970 mbar
Test location	Cambridge	Relative humidity	49 %

Observations, settings and special notes

- The spectrum was searched from 9 kHz to the frequency of 1 GHz.
- The spectral plots within this section are a summation of a vertical and horizontal scans. The spectral scans have been corrected with the associated applicable transducer factors.
- Radiated measurement 9 kHz – 30 MHz for the EUT with ANAMB-2402 antenna was performed at distance of 4 m to avoid the overload of the active loop antenna.
- Radiated measurement 9 kHz – 30 MHz for the EUT with DEAC STP-SD antenna was performed at distance of 3 m.
- Radiated measurements 30 - 1000 MHz were performed at a distance of 3 m.

Spectrum analyser settings for radiated measurements within restricted bands 9 kHz – 30 MHz:

Resolution bandwidth	200 Hz (9-150 kHz) 9 kHz (150 kHz – 30 MHz)
Video bandwidth	1 kHz (9-150 kHz) 30 kHz (150 kHz – 30 MHz)
Detector mode	Peak or Quasi-peak
Trace mode	Max Hold

Spectrum analyser settings for radiated measurements within restricted bands 30 MHz - 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	1 MHz
Detector mode	Quasi Peak
Trace mode	Max Hold

Test data, ANAMB-2402 antenna

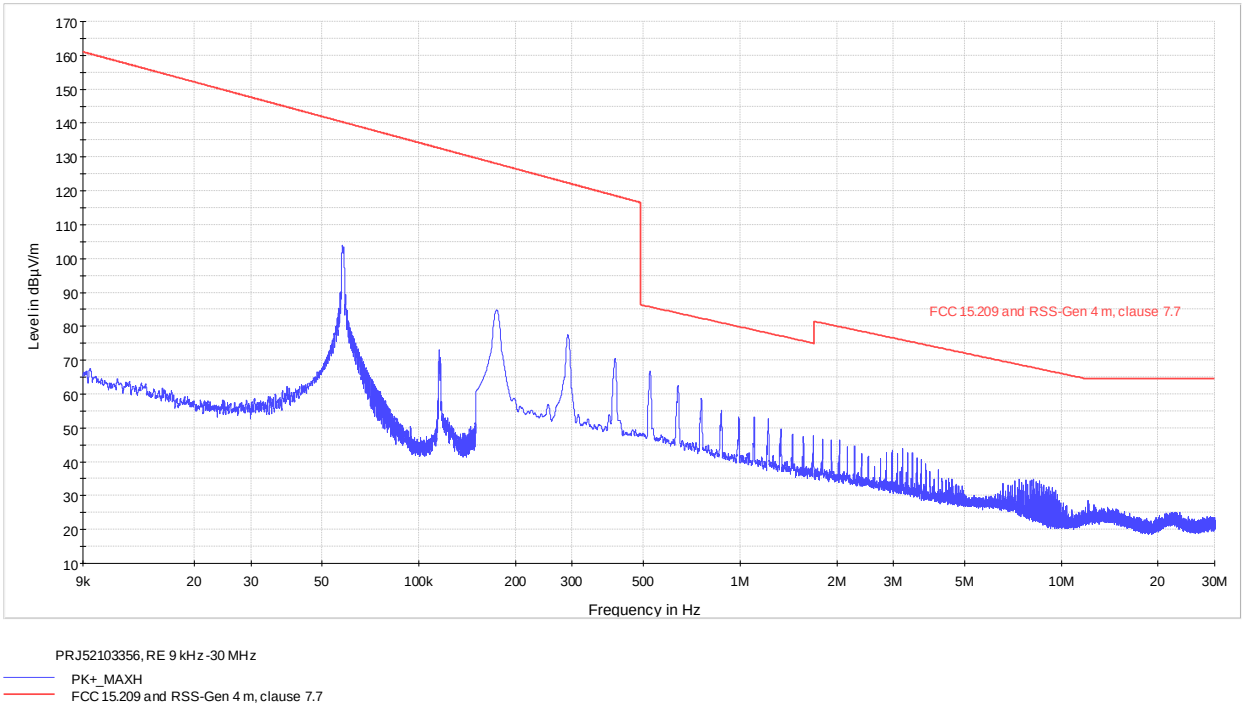


Figure 7.6-1: *Spurious emissions 9 kHz – 30 MHz, ANAMB-2402 antenna*

Table 7.6-4: *Radiated field strength measurement results - ANAMB-2402 antenna*

Frequency, kHz	Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
58.0	103.3	145.0	41.7
174.0	84.8	134.5	49.2
407.3	70.4	119.7	49.3
522.5	66.1	85.7	19.6

Notes:
- The test was performed at measuring distance of 4m.
- Since the EUT utilize inductive loop antenna, and both measurement and the limit are within (λ/2π) boundary, so the applicable limit of the fundamental signal is:
  Limit = Reference limit + (60 Log_{10} ($D_{limit}/D_{measurement}$)) = 32 dBµV/m + (60 Log_{10} (300/4)) = 145 dBµV/m
- For the 3rd harmonic, the limit is not within the (λ/2π) boundary, so the applicable limit is:
  Limit = Reference limit + (60 Log_{10} ($D_{near\ field}/D_{measurement}$)) + (40 Log_{10} ($D_{limit}/D_{near\ field}$))
  = 23 dBµV/m + (60 Log_{10} (274.5/4)) + (40 Log_{10} (300/274.5)) = 134.5 dBµV/m
- For the 7th harmonic (407.3 kHz), the limit is not within the (λ/2π) boundary, so the applicable limit is:
  Limit = Reference limit + (60 Log_{10} ($D_{near\ field}/D_{measurement}$)) + (40 Log_{10} ($D_{limit}/D_{near\ field}$))
  = 15.4 dBµV/m + (60 Log_{10} (117.3/4)) + (40 Log_{10} (300/117.3)) = 119.7 dBµV/m
- For the 9th harmonic (522.5 kHz), both measurement and the limit are within (λ/2π) boundary, so the applicable limit is:
  Limit = Reference limit + (60 Log_{10} ($D_{limit}/D_{measurement}$))
  = 33.2 dBµV/m + (60 Log_{10} (30/4)) = 85.7 dBµV/m
- The fundamental signal calculated field strength at distance of 3 m = 103.3 dBµV/m (at 4 m) + 60×Log_{10}(4/3) = 110.8 dBµV/m (at 3 m)

Test data, ANAMB-2402 antenna, continued

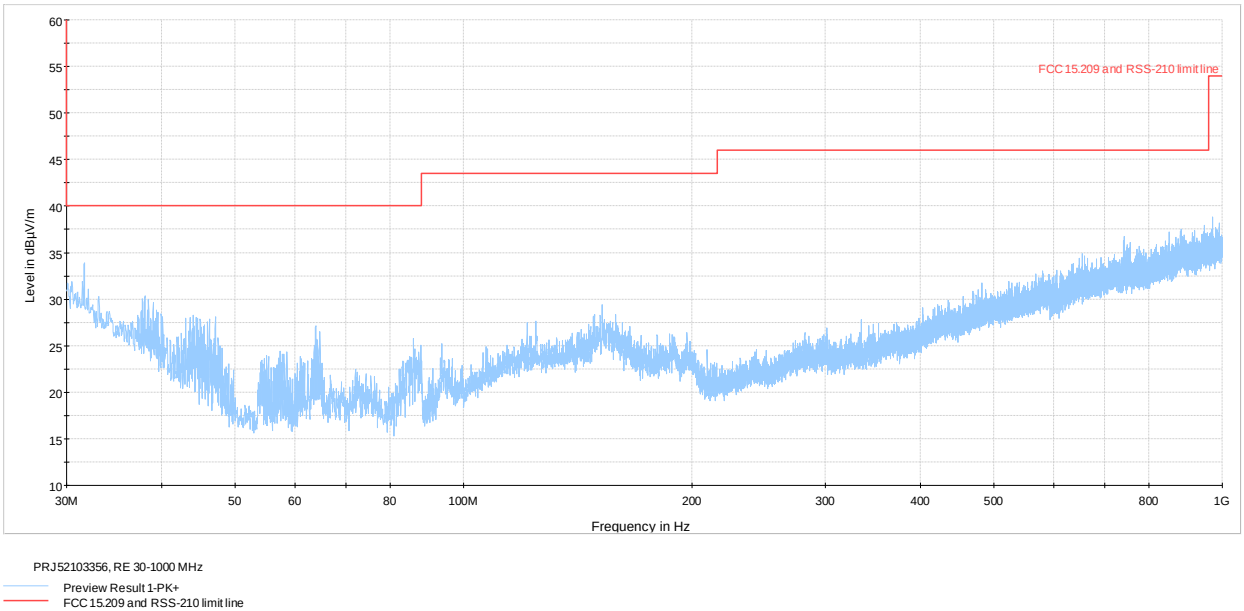


Figure 7.6-2: *Spurious emissions 30 MHz – 1 GHz, ANAMB-2402 antenna*

Test data, DEAC STP-SD antenna

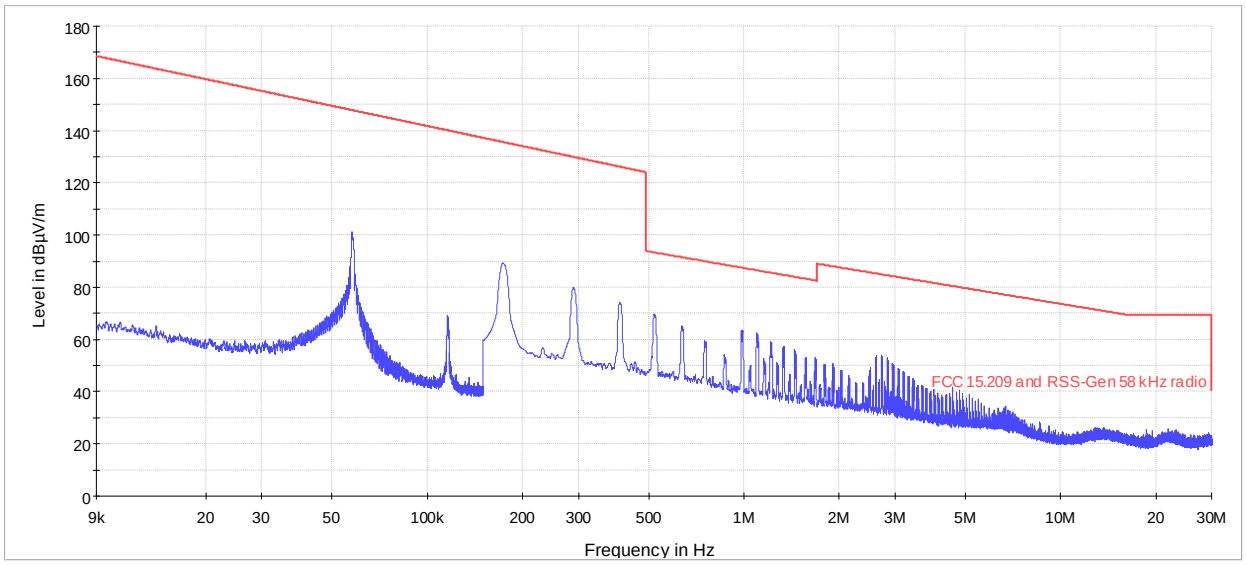


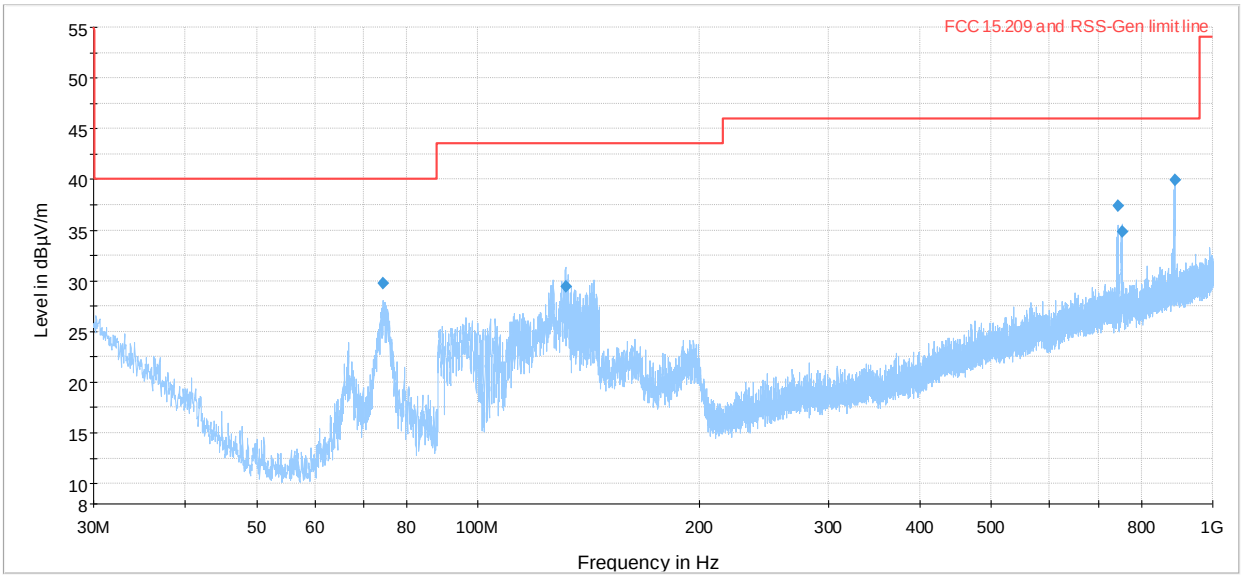
Figure 7.6-3: *Spurious emissions 9 kHz – 30 MHz, DEAC STP-SD antenna*

Table 7.6-5: *Radiated field strength measurement results - DEAC STP-SD antenna*

Frequency, kHz	Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
58.0	101.1	152.3	51.2
174.0	89.2	142.0	52.8
407.3	73.9	127.2	53.3
522.5	69.7	93.2	23.5

Notes:
– The test was performed at measuring distance of 3m.
– Since the EUT utilize inductive loop antenna, and both measurement and the limit are within (λ/2π) boundary, so the applicable limit of the fundamental signal is:
Limit = Reference limit + (60 Log_{10} ($D_{limit}/D_{measurement}$)) = 32 dBµV/m + (60 Log_{10} (300/3)) = 152.3 dBµV/m
– For the 3rd harmonic the limit is not within the (λ/2π) boundary, so the applicable limit is:
Limit = Reference limit + (60 Log_{10} ($D_{near\ field}/D_{measurement}$)) + (40 Log_{10} ($D_{limit}/D_{near\ field}$))
= 23 dBµV/m + (60 Log_{10} (274.5/3)) + (40 Log_{10} (300/274.5)) = 142 dBµV/m
– For the 7th harmonic (407.3 kHz), the limit is not within the (λ/2π) boundary, so the applicable limit is:
Limit = Reference limit + (60 Log_{10} ($D_{near\ field}/D_{measurement}$)) + (40 Log_{10} ($D_{limit}/D_{near\ field}$))
= 15.4 dBµV/m + (60 Log_{10} (117.3/3)) + (40 Log_{10} (300/117.3)) = 127.2 dBµV/m
– For the 9th harmonic (522.5 kHz), both measurement and the limit are within (λ/2π) boundary, so the applicable limit is:
Limit = Reference limit + (60 Log_{10} ($D_{limit}/D_{measurement}$))
= 33.2 dBµV/m + (60 Log_{10} (30/3)) = 93.2 dBµV/m

Test data, DEAC STP-SD antenna, continued



PRJ52103356, RE 30-1000 MHz, DEAC-STP-SD antenna

Preview Result 1-PK+
FCC 15.209 and RSS-Gen limit line
Final_Result PK+

Figure 7.6-4: *Spurious emissions 30 MHz – 1 GHz, DEAC STP-SD antenna*

End of the test report