TEST REPORT

Report Number: 103993771MPK-002
Project Number: G103993771
November 01, 2019

Testing performed on the
TrueTear 2.0 System
Model(s): F-0071

consists of
TrueTear 2.0 Base Unit, Model: F-0072 and
TrueTear 2.0 Charger Case, Model: F-0073

FCC ID: 2AUA2-OCUTT20

to

FCC Part 15 Subpart C (15.225)
Industry Canada RSS-210 Issue 9

For

Allergan PLC

Test Performed by:	Test Authorized by:
Intertek	Allergan PLC
1365 Adams Court	4410 Rosewood Drive
Menlo Park, CA 94025 USA	Pleasanton, CA 94588 USA

Prepared by: _____ **Date:** November 01, 2019
Aaron Chang

Reviewed by: _____ **Date:** November 01, 2019
Krishna Vemuri

Report No. 103993771MPK-002	
Equipment Under Test:	TrueTear 2.0 System
Trade Name:	Allergan PLC
Model(s) Tested:	F-0071 consists of TrueTear 2.0 Base Unit, Model: F-0072 and TrueTear 2.0 Charger Case, Model: F-0073
Applicant:	Allergan PLC
Contact:	Jarren Baldwin
Address:	Allergan PLC 4410 Rosewood Drive Pleasanton, CA 94588 USA
Country:	USA
Tel. Number:	(415) 580-6177
Email:	Jarren.baldwin@allergan.com
Applicable Regulation:	FCC Part 15 Subpart C (15.225) Industry Canada RSS-210 Issue 9
Date of Test:	October 9, 15 to 29, 2019

We attest to the accuracy of this report:

Aaron Chang
Project Engineer

Krishna K Vemuri
Engineering Team Lead

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1.0 Summary of Tests

TEST	REFERENCE FCC 15.225	REFERENCE RSS-210	RESULTS
Field Strength of Fundamental	15.225(a)	B.6	Complies
Radiated Emissions Outside the band	15.225(b), 15.225(c), 15.225(d), 15.209	B.6	Complies
Frequency Tolerance of the Carrier	15.225(e)	B.6	Complies
Line Conducted Emissions	15.207	RSS-GEN	N/A[2]
Occupied Bandwidth	15.215	RSS-GEN	Complies
Antenna requirement	15.203	RSS-GEN	Complies[1]

1 EUT utilizes an internal Antenna.
2 EUT is battery powered.

2.0 General Description

2.1 Product Description

Allergan PLC supplied the following description of the EUT:

The TrueTear 2.0 System is an Intranasal Tear Neurostimulator. The F-0071 is the complete system which includes F-0072 - TrueTear 2.0 Base Unit and F-0073 - TrueTear 2.0 Charger Case.

Overview of the EUT

Models	F-0071 consists of F-0072 & F-0073
FCC Identifier	2AUA2-OCUTT20
Operating Frequency	13.56MHz
Number of Channels	1
Type of Modulation	OOK
Operating Temperature	-20°C to +50°C
Antenna Type	Internal Antenna
Applicant name & address	Allergan PLC 4410 Rosewood Drive Pleasanton, CA 94588 USA

EUT receive date: October 8, 2019
EUT receive condition: The EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: October 9, 2019
Test completion date: October 29, 2019

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4. Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47 7, ANSI C63.10: 2013 & RSS-GEN Issue 5.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz	30 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-

3.0 System Test Configuration

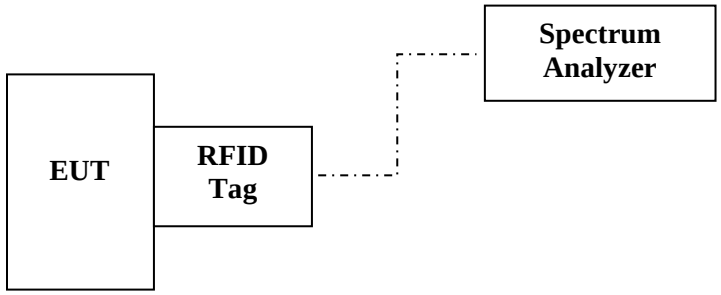
3.1 Support Equipment and description

No Support Equipment was used for testing.

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	**Manufacturer**	**Model**	**Serial Number**
Conducted Sample	Allergan PLC	F-0072	B0002829

3.2 Block Diagram of Test Setup (Continued)



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit and looking for tags.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Allergan PLC

3.5 Mode of Operation during test

The EUT was constantly broadcasting a 13.56 MHz signal while reading an RFID tag.

3.6 Modifications required for Compliance

No Modifications were made e to bring the EUT into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Field Strength of Fundamental and Radiated Emissions Outside the band

4.1.1 Requirements

FCC Rules 15.225, 15.209

a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBuV) at 30 meters.

b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

§15.209 Radiated emission limits; general requirements.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were performed at 10 meters. Data results below are corrected for distance at 10m. Limits were normalized to 10 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz.
Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz
9 kHz or greater for 150kHz to 30 MHz
120 kHz or greater for 30MHz to 1000 MHz
For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:

FS = RA + AF + CF – AG – DCF

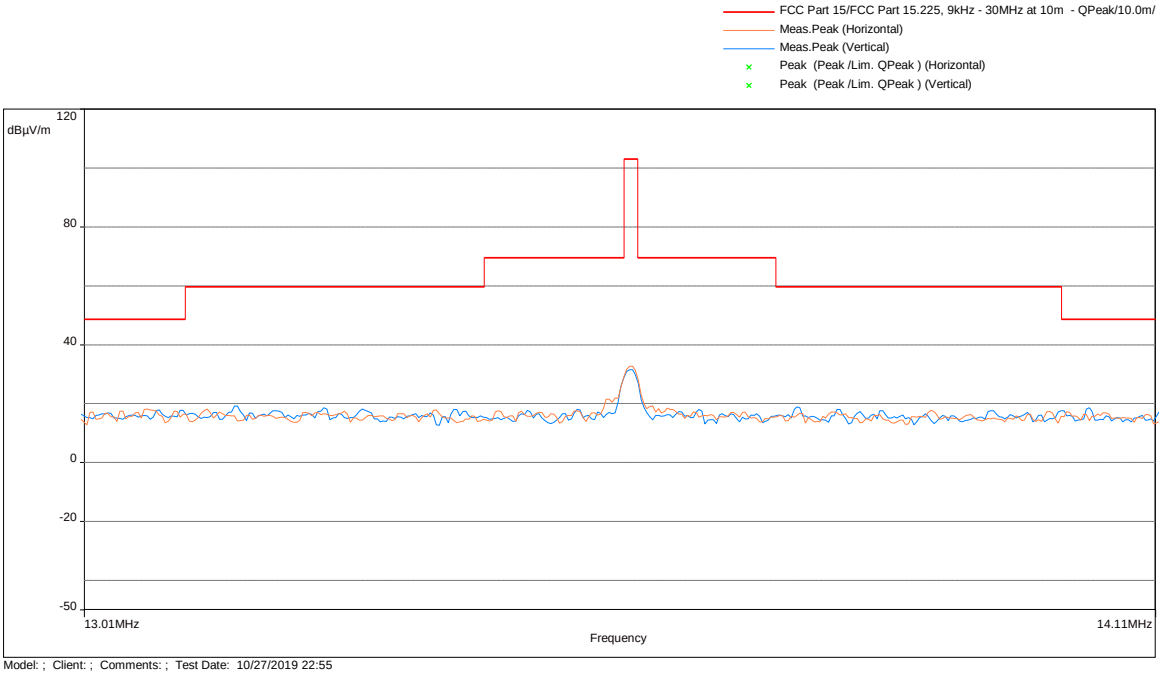
Where FS = Field Strength in dB (μV/m)

RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
AG = Amplifier Gain in dB
DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz

4.1.3 Test Results

The data below shows the significant emission frequencies, the limit and the margin of compliance.
Note: Measurements were performed at parallel and perpendicular orientation of loop antenna. The worst-case data was presented below.

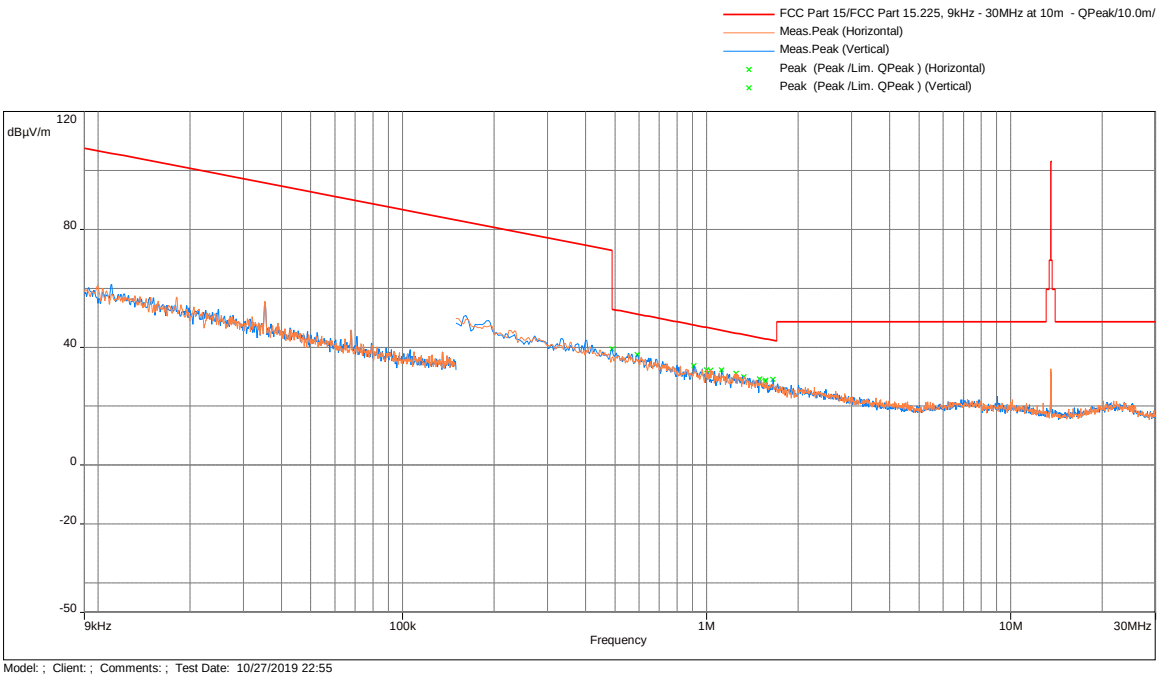


Frequency	Corrected Peak FS @10m	Limit @10m	Margin	RA@10m	Correction
(MHz)	dB(µV/m)	dB(µV/m)	dB	dB(uV)	dB
13.56	32.8	103.1	-70.3	29.5	3.3

Note: Correction = AF+CF–AG

4.1.3 Test Result (Continued)

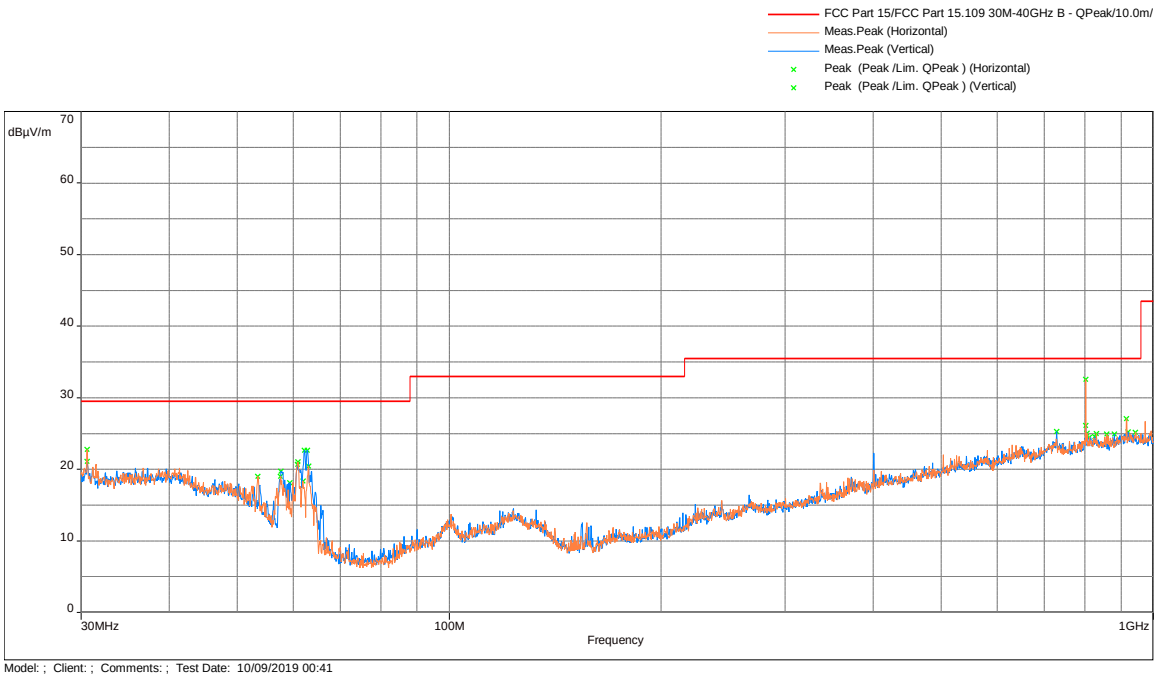
Radiated Spurious Emissions from 9 kHz to 30MHz



Model: ; Client: ; Comments: ; Test Date: 10/27/2019 22:55

4.1.3 Test Result (Continued)

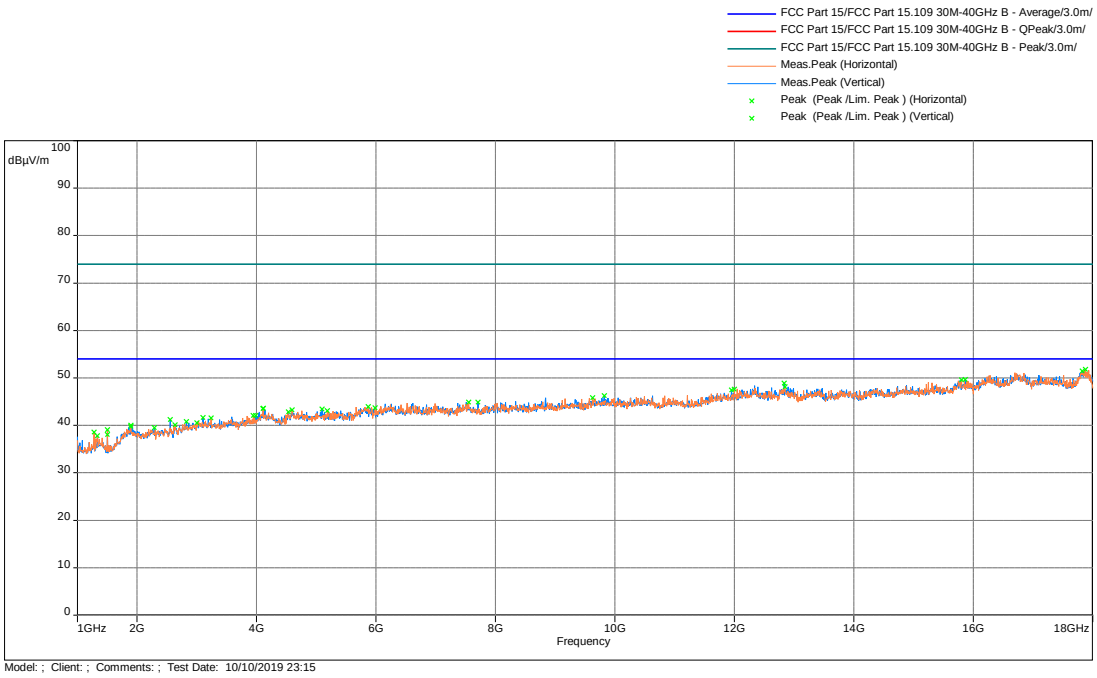
Radiated Spurious Emissions from 30 MHz to 1000 MHz



Frequency (MHz)	QP FS (dBµV/m) @10m	Lim. QPeak (dBµV/m) @10m	Margin (dB)	Height (m)	Angle (°)	Polarity	Correction (dB)
30.582	22.74	29.5	-6.76	0.98	122.75	Horizontal	-6.76
30.582	21.1	29.5	-8.4	1	35	Vertical	-6.76
57.677	19.7	29.5	-9.8	4	167.75	Vertical	-14.32
60.846	20.66	29.5	-8.84	2.5	325	Vertical	-15.61
60.975	21.04	29.5	-8.46	3.98	189.5	Horizontal	-15.66
62.301	22.65	29.5	-6.85	2.5	325	Vertical	-15.96
62.883	22.67	29.5	-6.83	4	211.5	Vertical	-16.13
63.109	20.43	29.5	-9.07	3.98	189.5	Horizontal	-16.2
728.659	25.28	35.5	-10.22	2.5	167	Vertical	-2.26
801.829	32.57	35.5	-2.93	0.98	328.5	Horizontal	-1.64
801.829	26.08	35.5	-9.42	2.5	118.5	Vertical	-1.64
916.354	27.04	35.5	-8.46	0.98	10.25	Horizontal	-0.41

4.1.3 Test Result (Continued)

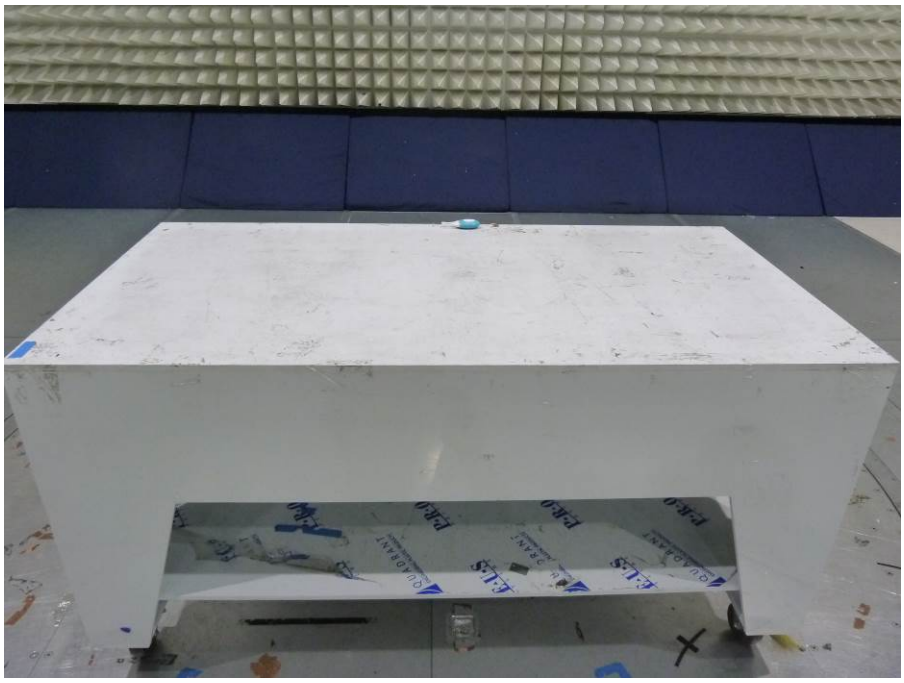
Radiated Spurious Emissions from 1GHz-18GHz, Peak Detector

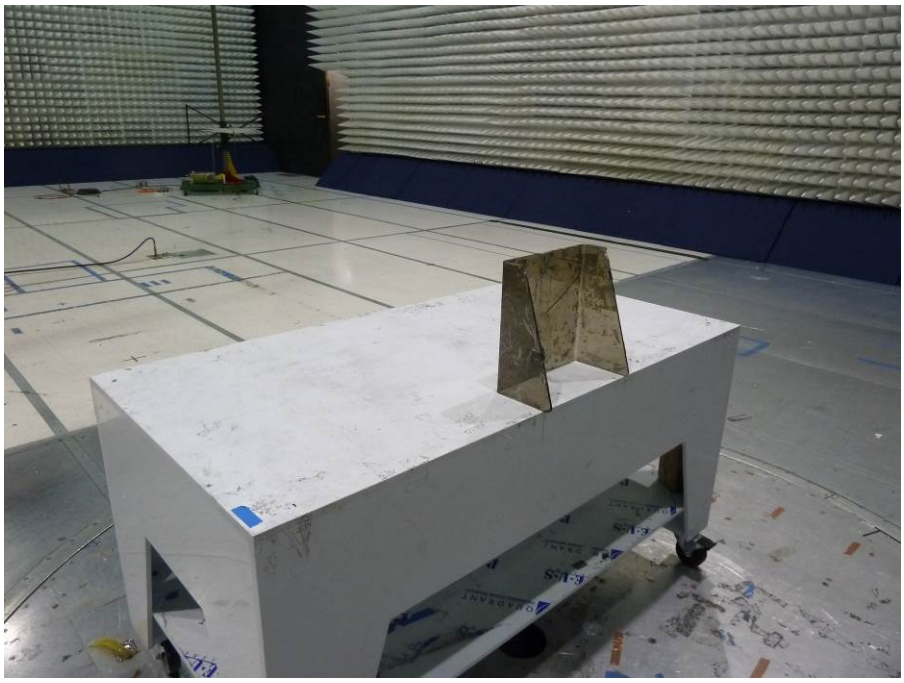


Results: **Complies** by 2.93 dB

4.1.4 Test Configuration Photographs

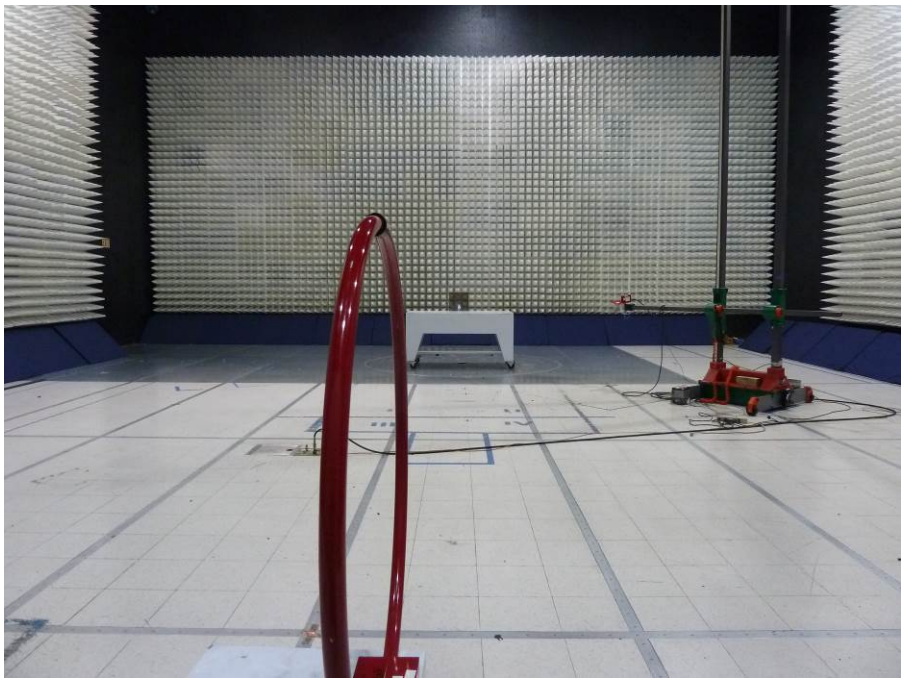
The following photographs show the testing configurations used.





Electromagnetic Radiated Disturbance Setup Photograph

4.1.5 Test Configuration Photographs (Continued)



4.1.5 Test Configuration Photographs (Continued)

4.2 Frequency Tolerance

4.2.1 Requirement
FCC 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in 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.

4.2.2 Procedure

The RFID radio was placed in the temperature chamber. The frequency counter was connected to the transmitter output. For each temperature, the carrier frequency was recorded.

4.2.3 Test Results

Voltage (DC)	Temperature (C)	Measured Frequency (Hz)	Deviation from Reference (Hz)	Deviation (%)
Battery	-20	13559926	0	0
Battery	-10	13560567	641	0.004727
Battery	0	13560247	321	0.002367
Battery	10	13560246	320	0.00236
Battery	20	13559926	0	0
Battery	30	13560247	321	0.002367
Battery	40	13559926	0	0
Battery	50	13559926	0	0

Nominal Frequency @ 20C:13559926 Hz

4.3 Occupied Bandwidth
FCC 15.215

4.3.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, 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. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

4.3.2 Procedure

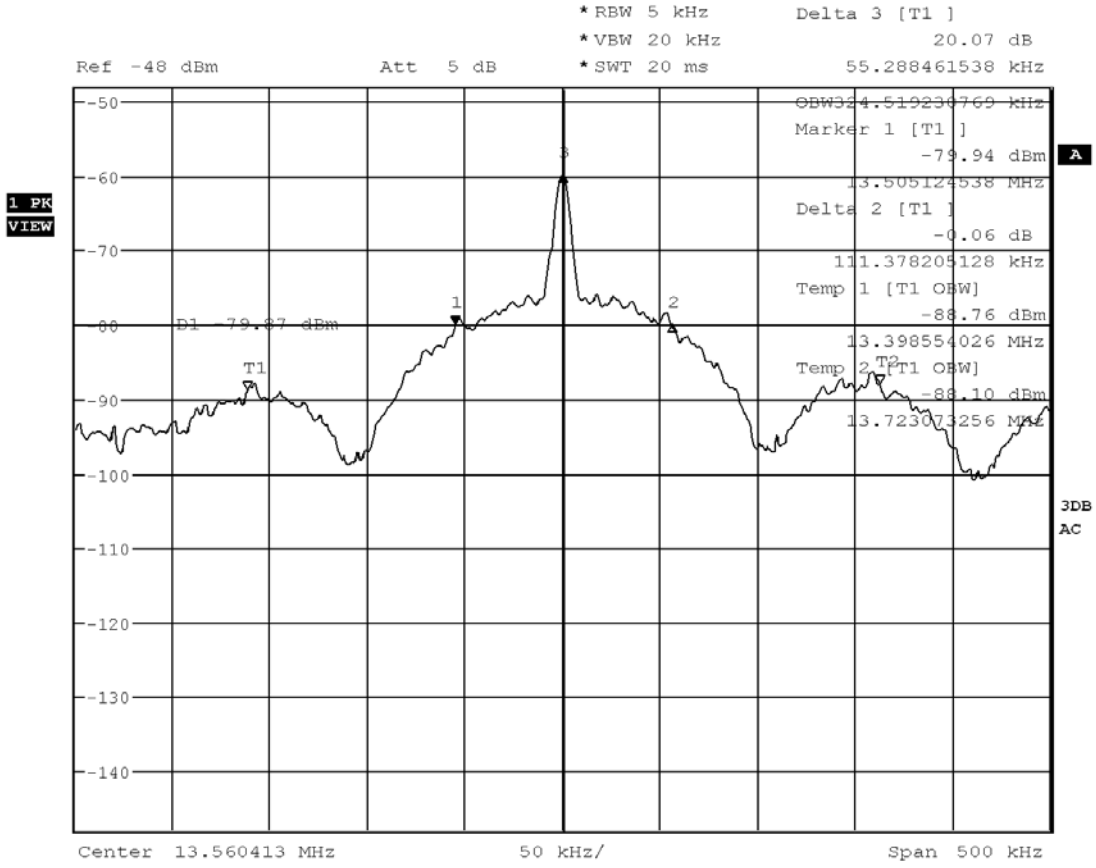
The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

4.3.3 Test Results

Frequency (MHz)	20-dB Channel Bandwidth (Hz)	99% Channel Bandwidth (Hz)
13.56	111.378	324.519

20-dB Channel Bandwidth & 99% Channel Bandwidth



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4.4 AC Line Conducted Emission
FCC Rule 15.207

4.4.1 Requirement

Frequency Band MHz	15.207 Limit dB(µV)	
	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *
0.50-5.00	56	46
5.00-30.00	60	50

*Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.*

4.4.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 to ensure the device complies with 15.207 outside the transmitter fundamental emissions band. After, the EUT antenna is removed from the EUT and only the fundamental emission band was measured to show that the fundamental emission band is in compliance with the 15.207 limits.

Equipment setup for conducted disturbance tests followed.

4.4.3 Test Result

N/A. EUT is battery powered.

5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset No.	Calibration Interval	Cal Due
EMI Receiver	Rohde and	ESR7	ITS 01607	12	10/23/19
EMI Receiver	Rohde and	ESU40	ITS 00961	12	10/27/20
Bi-Log Antenna	Antenna Research	LPB-2513	ITS 00355	12	04/24/20
Pre-Amplifier	Sonoma Instrument	310N	ITS 00415	12	04/17/20
RE Cable	TRU Corporation	TRU CORE 300	ITS 01462	12	08/27/20
RE Cable	TRU Corporation	TRU CORE 300	ITS 01465	12	08/27/20
RE Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	08/27/20
RF Cable	TRU Corporation	TRU CORE 300	ITS 01342	12	12/05/19
RF Cable	Mega Phase	EMC1-K1K1-	ITS 01537	12	02/20/20
RF Cable	Mega Phase	TM40-K1K1-59	ITS 01156	12	02/20/20
Passive Loop Antenna	EMCO	6511	ITS 001597	12	10/22/20
Environmental Test	ESPEC	BTX-475	ITS 01436	12	10/09/20
Ant-Passive Loop	ETS Lindgren	6512	ITS 876	12	08/20/20

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.17.0.10	Oculeve 10-8-2019.bpp

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
1.0 / G103993771	AC	KV	November 01, 2019	Original document
2.0 / G103993771	AC	KV	November 21, 2019	Per manufacturer request report was issued under Allergan PLC.

END OF REPORT