



TEST REPORT

Test Report No. : UL-RPT-RP10495966JD01A V2.0

Manufacturer : Datecs Ltd
Model No. : INFINEA X
FCC ID : YRWDATECSBTIX
Technology : *Bluetooth* – Basic Rate & EDR
Test Standard(s) : FCC Parts 15.107, 15.109, 15.207, 15.209(a) & 15.247

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

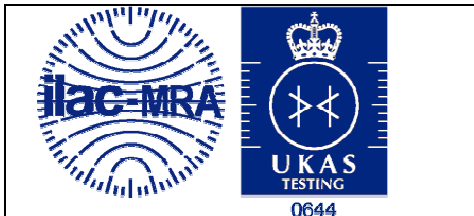
Date of Issue: 20 May 2016

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Company Signatory:

Steven White
Service Lead, Radio Laboratory,
UL VS LTD



This laboratory is accredited by UKAS.
The tests reported herein have been
performed in accordance with its terms
of accreditation.

The *Bluetooth*[®] word mark and logos are owned by the *Bluetooth* SIG, Inc. and any use of such marks by UL VS LTD is under licence. Other trademarks and trade names are those of their respective owners.

UL VS LTD

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK
Telephone: +44 (0)1256 312000
Facsimile: +44 (0)1256 312001

This page has been left intentionally blank.

Table of Contents

1. Customer Information.....	4
2. Summary of Testing.....	5
2.1. General Information	5
2.2. Summary of Test Results	5
2.3. Methods and Procedures	6
2.4. Deviations from the Test Specification	6
3. Equipment Under Test (EUT)	7
3.1. Identification of Equipment Under Test (EUT)	7
3.2. Description of EUT	7
3.3. Modifications Incorporated in the EUT	7
3.4. Additional Information Related to Testing	8
3.5. Support Equipment	9
4. Operation and Monitoring of the EUT during Testing	11
4.1. Operating Modes	11
4.2. Configuration and Peripherals	11
5. Measurements, Examinations and Derived Results.....	12
5.1. General Comments	12
5.2. Test Results	13
5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions	13
5.2.2. Receiver/Idle Mode Radiated Spurious Emissions	19
5.2.3. Transmitter AC Conducted Spurious Emissions	25
5.2.4. Transmitter 20 dB Bandwidth	30
5.2.5. Transmitter Carrier Frequency Separation	35
5.2.6. Transmitter Number of Hopping Frequencies and Average Time of Occupancy	38
5.2.7. Transmitter Maximum Peak Output Power	42
5.2.8. Transmitter Radiated Emissions	50
5.2.9. Transmitter Band Edge Radiated Emissions	59
6. Measurement Uncertainty	68
7. Report Revision History	69

1. Customer Information












Company Name:	Datecs Ltd
Address:	4 Datecs, 1592 Sofia, Bulgaria

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.207 & 15.209
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart B (Unintentional Radiators) – Sections 15.107 & 15.109
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	16 October 2014 to 01 May 2016

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.107	Receiver/Idle Mode AC Conducted Emissions	
Part 15.109	Receiver/Idle Mode Radiated Emissions	
Part 15.207	Transmitter AC Conducted Emissions	
Part 15.247(a)(1)	Transmitter 20 dB Bandwidth	
Part 15.247(a)(1)	Transmitter Carrier Frequency Separation	
Part 15.247(a)(1)(iii)	Transmitter Number of Hopping Frequencies and Average Time of Occupancy	
Part 15.247(b)(1)	Transmitter Maximum Peak Output Power	
Parts 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	
Parts 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	
Key to Results		
 = Complied  = Did not comply		

2.3. Methods and Procedures

Reference:	ANSI C63.4-2014
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Datecs
Model Name or Number:	INFINEA X
Test Sample Serial Number:	MAR003431UN14
Hardware Version:	C018910
Software Version:	IBBLRF 5.54.0
FCC ID:	YRWDATECSBTIX

Brand Name:	Datecs
Model Name or Number:	INFINEA X
Test Sample Serial Number:	MAR003432UN14
Hardware Version:	C018910
Software Version:	IBBLRF 5.54.0
FCC ID:	YRWDATECSBTIX

3.2. Description of EUT

The Equipment Under Test was an iPhone case with an RFID barcode reader and *Bluetooth* V2.1 BR+EDR, operating at 2.4 GHz to 2.4835 GHz. It is powered from a 3.7 Volt battery.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	<i>Bluetooth</i>		
Power Supply Requirement:	Nominal	3.7 VDC	
Type of Unit:	Transceiver		
Channel Spacing:	1 MHz		
Mode:	Basic Rate	Enhanced Data Rate	
Modulation:	GFSK	$\pi/4$ -DQPSK	8DQPSK
Packet Type: (Maximum Payload)	DH5	2DH5	3DH5
Data Rate (Mbit/s):	1	2	3
Maximum Conducted Output Power:	-33.9 dBm		
Antenna Gain:	2.0 dBi		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	USB Charger
Brand Name:	Apple
Model Name or Number:	A1385
Serial Number:	Not marked or stated

Description:	Communication cable, length 1.6 metres
Brand Name:	MoreEase International Inc.
Model Name or Number:	ME-5005-0005
Serial Number:	Not marked or stated

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude E5410
Serial Number:	DQC78L1

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude D610
Serial Number:	00062

Description:	USB cable, length 0.9 metres
Brand Name:	MoreEase International Inc.
Model Name or Number:	A5005-017
Serial Number:	Not marked or stated

Description:	Test board for Bluetooth module
Brand Name:	Datecs Ltd
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Power supply
Brand Name:	ONTOP
Model Name or Number:	SA115B-05G
Serial Number:	Not marked or stated

Support Equipment (continued)

Description:	Mobile phone
Brand Name:	Apple
Model Name or Number:	iPhone 5
Serial Number:	DNPK2WTDDTTN
IMEI:	013428005248776

Description:	Ethernet cable, length 1 metre
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	USB type A to type B cable, length 2 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	USB to SPI converter
Brand Name:	CSR
Model Name or Number:	CSRDEV-SYS-1808-1A
Serial Number:	298482

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Continuously transmitting at maximum power on bottom, middle and top channels in Basic Rate (DH5 packets) or EDR (2DH5 or 3DH5 packets) as required.
- Continuously transmitting at maximum power in hopping mode and in Basic Rate (DH5 packets) or EDR (2DH5 or 3DH5 packets) as required.
- Receive/idle mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- An iPhone was fitted to the EUT during all tests. The iPhone was turned off.
- Controlled using CSR Bluetest application supplied by the manufacturer. The application was installed on two laptop PCs. It was used to enable continuous transmission and to select the test channels as required. Transmitter tests were performed with a reduced power setting as requested by the manufacturer. Bluetest Power (Ext, Int) settings of 255, 20 were used, default settings are 255, 50.
- For receiver/idle mode radiated spurious emissions, transmitter radiated emissions 1 – 4 GHz and band edge radiated emissions testing, the EUT was connected to a USB to SPI converter via an Ethernet cable. The USB to SPI converter was connected to the laptop PC with serial number DQC78L1, via a USB type A to type B connector. The laptop PC, the USB to SPI converter and the USB type A to type B cable were placed inside a metal screening box.
- For transmitter radiated emissions 30 MHz – 1 GHz and 4 -25 GHz, the EUT was connected to a test board for Bluetooth module. The test board was connected to the laptop PC with serial number 00062, via a 1.6 metre communication cable. The test board was powered from a power supply. The laptop PC was placed inside a metal screening box.
- For all other radiated tests, the EUT was connected to a USB to SPI converter via an Ethernet cable. The USB to SPI converter was connected to the laptop PC with serial number DQC78L1, via a USB type A to type B connector. The laptop PC and the USB to SPI converter were placed outside the anechoic chamber.
- The two different ways of operating the EUT, as described above, were used because the test interface board for the EUT Bluetooth module was found to produce spurious emissions at certain frequencies.
- The EUT was connected to a USB charger via a USB cable.
- Transmitter radiated spurious emissions tests were performed with the EUT transmitting in DH5 mode as this mode was found to transmit the highest power.
- The EUT with serial number MAR003432UN14 was used for radiated spurious emissions tests.
- The EUT with serial number MAR003431UN14 was used for all other tests.
- All unused active ports were terminated.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results**5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions****Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	01 May 2016
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Part 15.107
Test Method Used:	ANSI C63.4 Section 7

Environmental Conditions:

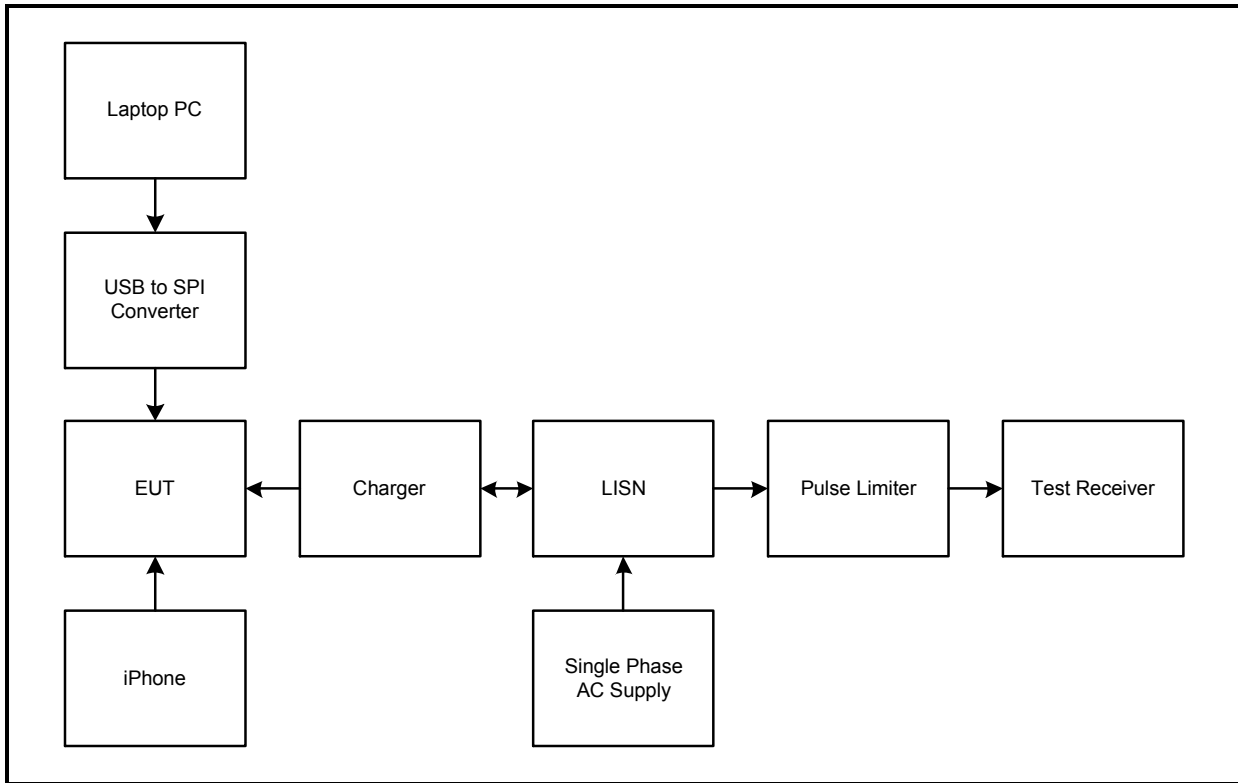
Temperature (°C):	21
Relative Humidity (%):	33

Note(s):

1. The EUT was connected to an AC charger via a USB cable. The AC charger was connected to 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with KDB 174176 Q4, tests were also performed with the power supply connected to a 240 VAC 60 Hz single phase supply via a LISN.
3. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
4. A pulse limiter was fitted between the LISN and the test receiver.

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Test setup:



Receiver/Idle Mode AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	46.4	65.3	18.9	Complied
0.245	Live	42.7	61.9	19.2	Complied
0.339	Live	40.1	59.2	19.1	Complied
0.411	Live	33.6	57.6	24.0	Complied
0.771	Live	33.0	56.0	23.0	Complied
4.470	Live	28.1	56.0	27.9	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Live	31.3	55.1	23.8	Complied
0.254	Live	30.6	51.6	21.0	Complied
0.335	Live	26.3	49.3	23.0	Complied
0.596	Live	20.8	46.0	25.2	Complied
0.785	Live	28.0	46.0	18.0	Complied
4.358	Live	26.0	46.0	20.0	Complied

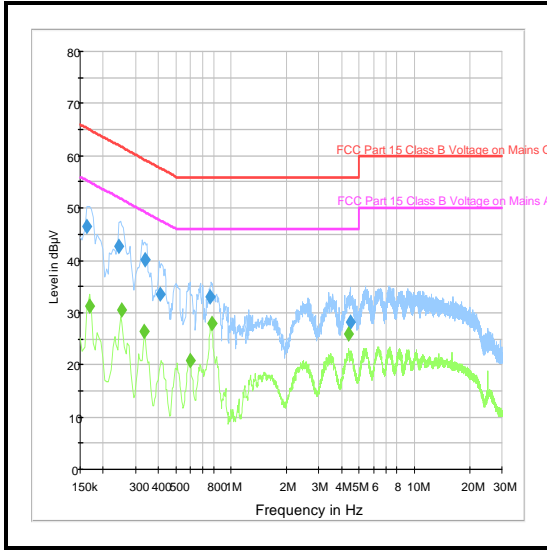
Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Neutral	47.7	65.3	17.6	Complied
0.245	Neutral	44.0	61.9	17.9	Complied
0.326	Neutral	39.9	59.6	19.7	Complied
0.407	Neutral	34.8	57.7	22.9	Complied
0.582	Neutral	30.0	56.0	26.0	Complied
0.771	Neutral	30.0	56.0	26.0	Complied

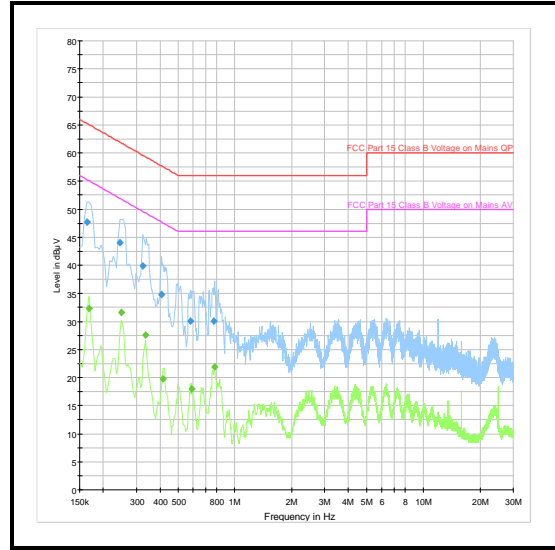
Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Neutral	32.3	55.1	22.8	Complied
0.249	Neutral	31.6	51.8	20.2	Complied
0.335	Neutral	27.6	49.3	21.7	Complied
0.416	Neutral	19.8	47.5	27.7	Complied
0.591	Neutral	18.0	46.0	28.0	Complied
0.780	Neutral	21.8	46.0	24.2	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)



Live / 120 VAC 60 Hz



Neutral / 120 VAC 60 Hz

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Live	40.4	65.1	24.7	Complied
0.191	Live	37.8	64.0	26.2	Complied
0.371	Live	42.4	58.5	16.1	Complied
0.425	Live	33.2	57.4	24.2	Complied
0.798	Live	32.4	56.0	23.6	Complied
4.862	Live	28.5	56.0	27.5	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Live	33.9	54.4	20.5	Complied
0.366	Live	40.1	48.6	8.5	Complied
0.807	Live	28.5	46.0	17.5	Complied
2.274	Live	22.2	46.0	23.8	Complied
3.476	Live	24.1	46.0	21.9	Complied
4.947	Live	24.8	46.0	21.2	Complied

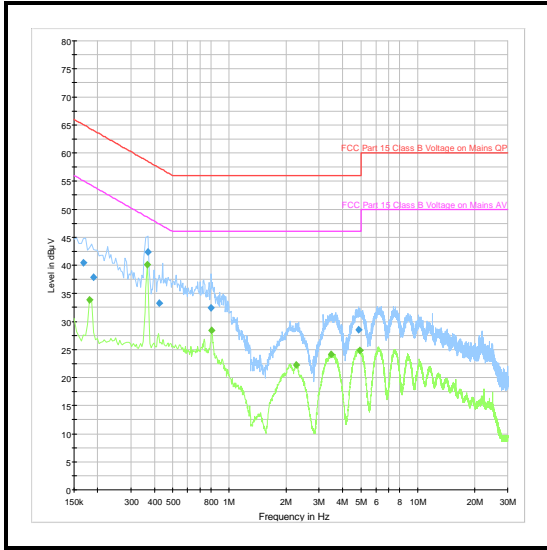
Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Neutral	42.1	64.4	22.3	Complied
0.258	Neutral	35.6	61.5	25.9	Complied
0.366	Neutral	50.0	58.6	8.6	Complied
0.551	Neutral	36.2	56.0	19.8	Complied
0.708	Neutral	38.3	56.0	17.7	Complied
0.920	Neutral	34.8	56.0	21.2	Complied

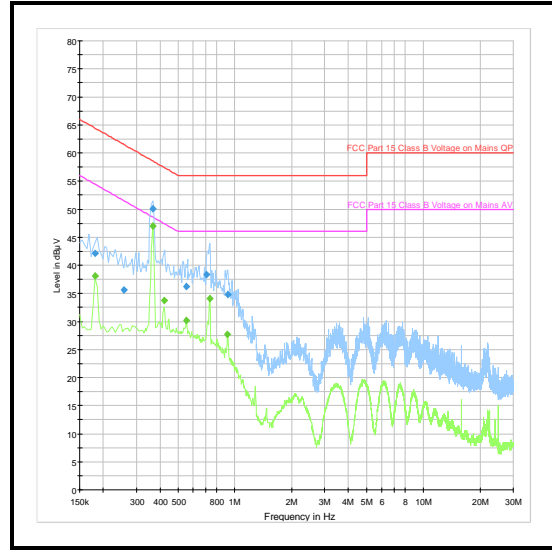
Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Neutral	38.2	54.4	16.2	Complied
0.366	Neutral	47.0	48.6	1.6	Complied
0.420	Neutral	33.7	47.4	13.7	Complied
0.551	Neutral	30.1	46.0	15.9	Complied
0.735	Neutral	34.1	46.0	11.9	Complied
0.915	Neutral	27.7	46.0	18.3	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)



Live / 240 VAC 60 Hz



Neutral / 240 VAC 60 Hz

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	27 Aug 2016	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	08 Mar 2017	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	16 Oct 2016	12
S0539	Variable AC Power Supply	Kikusui	PCR 1000L	13010170	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	26 May 2016	12

5.2.2. Receiver/Idle Mode Radiated Spurious Emissions**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	12 December 2014
Test Sample Serial Number:	MAR003432UN14		

FCC Reference:	Part 15.109
Test Method Used:	ANSI C63.4 Section 8
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

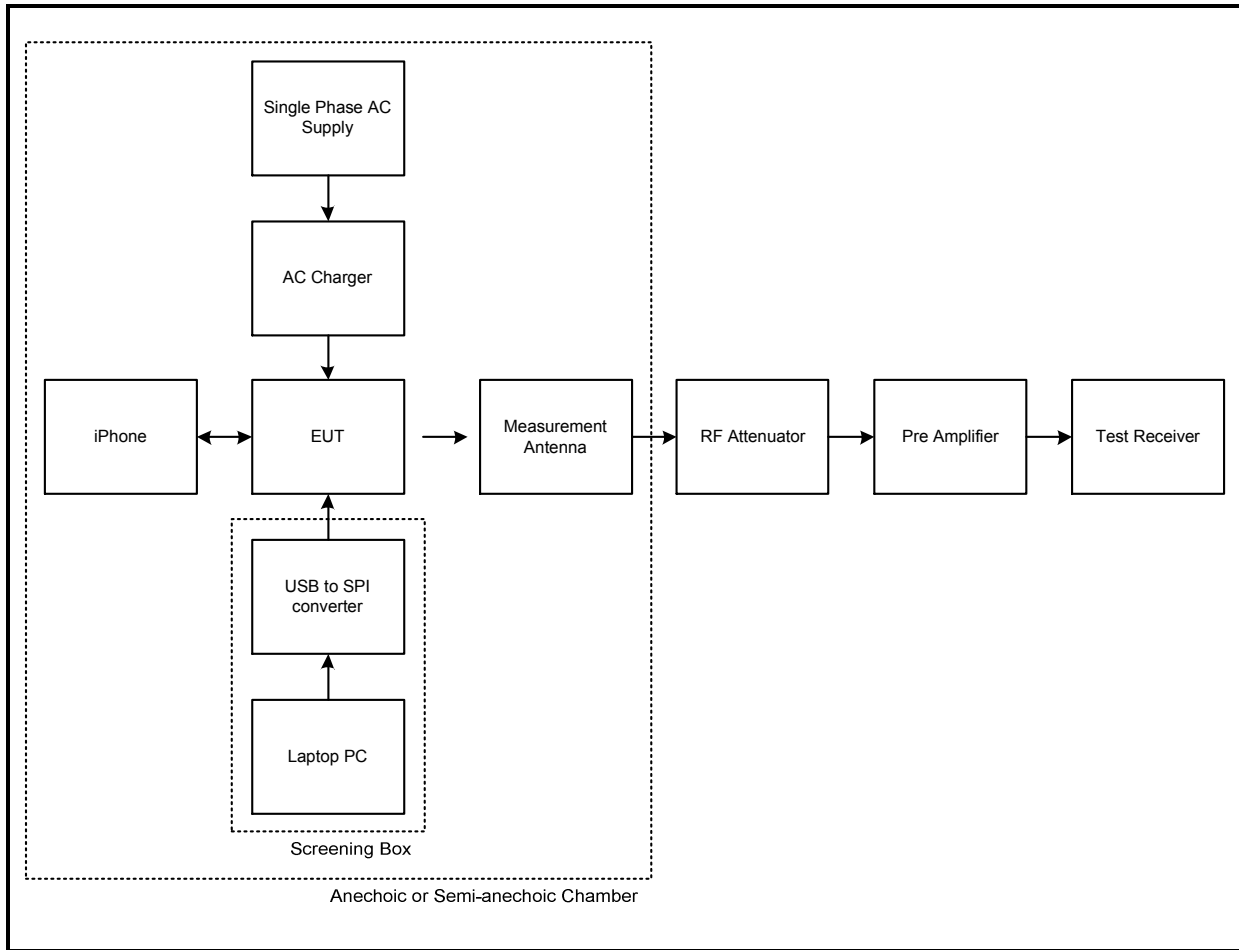
Temperature (°C):	24
Relative Humidity (%):	37

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Receiver/Idle Mode Radiated Spurious Emissions (continued)

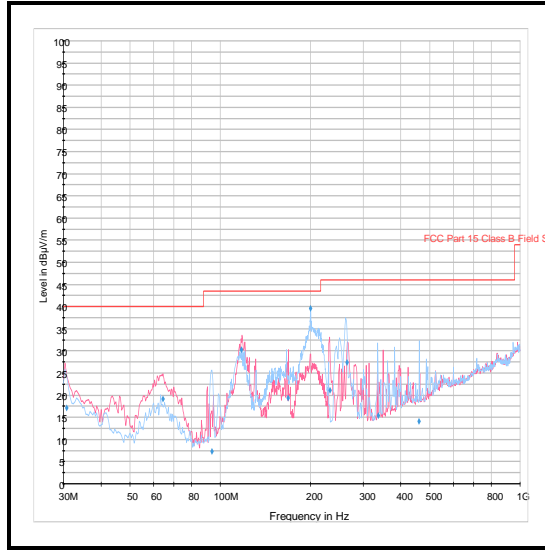
Test setup:



Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
117.574	Vertical	30.3	43.5	13.2	Complied
199.984	Horizontal	39.6	43.5	3.9	Complied
264.435	Horizontal	27.4	46.0	18.6	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Dec 2014	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
G0543	Amplifier	Sonoma	310N	230801	04 Mar 2015	3
A1834	Attenuator	Hewlett Packard	8491B	10444	Calibrated before used	-

Receiver/Idle Mode Radiated Spurious Emissions (continued)**Test Summary:**

Test Engineer:	Mark Percival	Test Date:	30 October 2014
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Part 15.109
Test Method Used:	ANSI C63.4 Section 8
Frequency Range:	1 GHz to 12.75 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	52

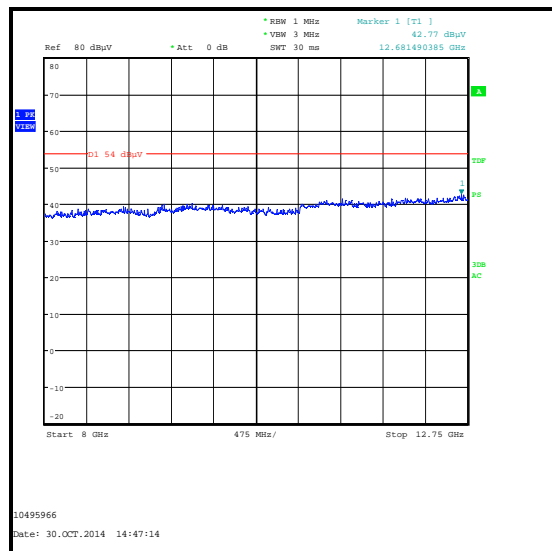
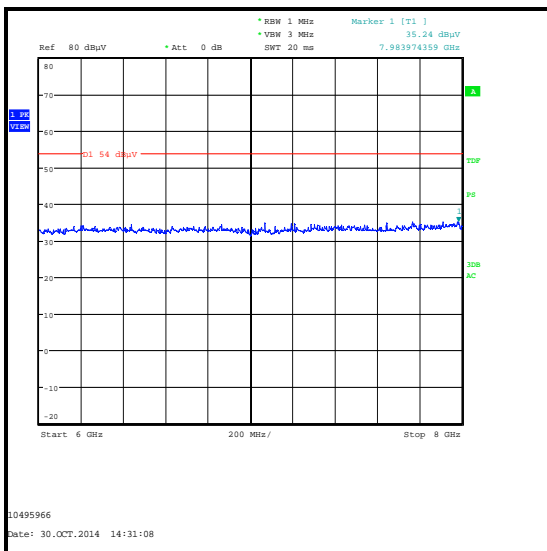
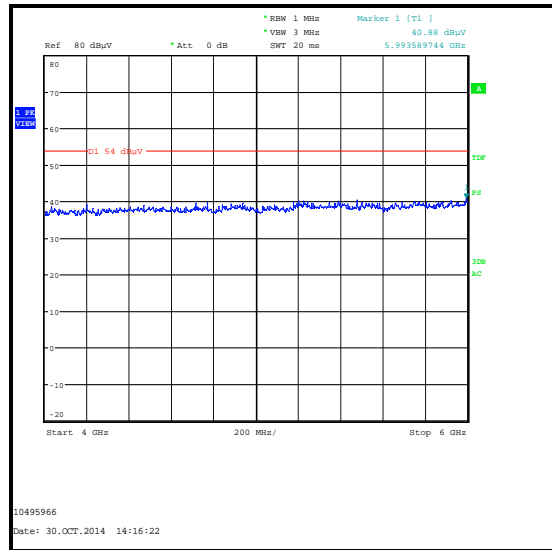
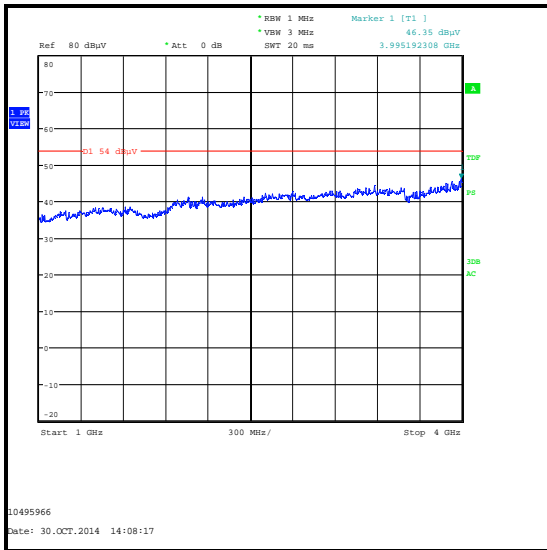
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT.

Results:

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
3995.192	Vertical	46.4	54.0	7.6	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)



Receiver/Idle Mode Radiated Spurious Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	19 Dec 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	19 Dec 2014	12
A253	Antenna	Flann Microwave	12240-20	128	19 Dec 2014	12
A254	Antenna	Flann Microwave	14240-20	139	19 Dec 2014	12
A255	Antenna	Flann Microwave	16240-20	519	19 Dec 2014	12

5.2.3. Transmitter AC Conducted Spurious Emissions**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	01 May 2016
Test Sample Serial Number:	MAR003431UN14		

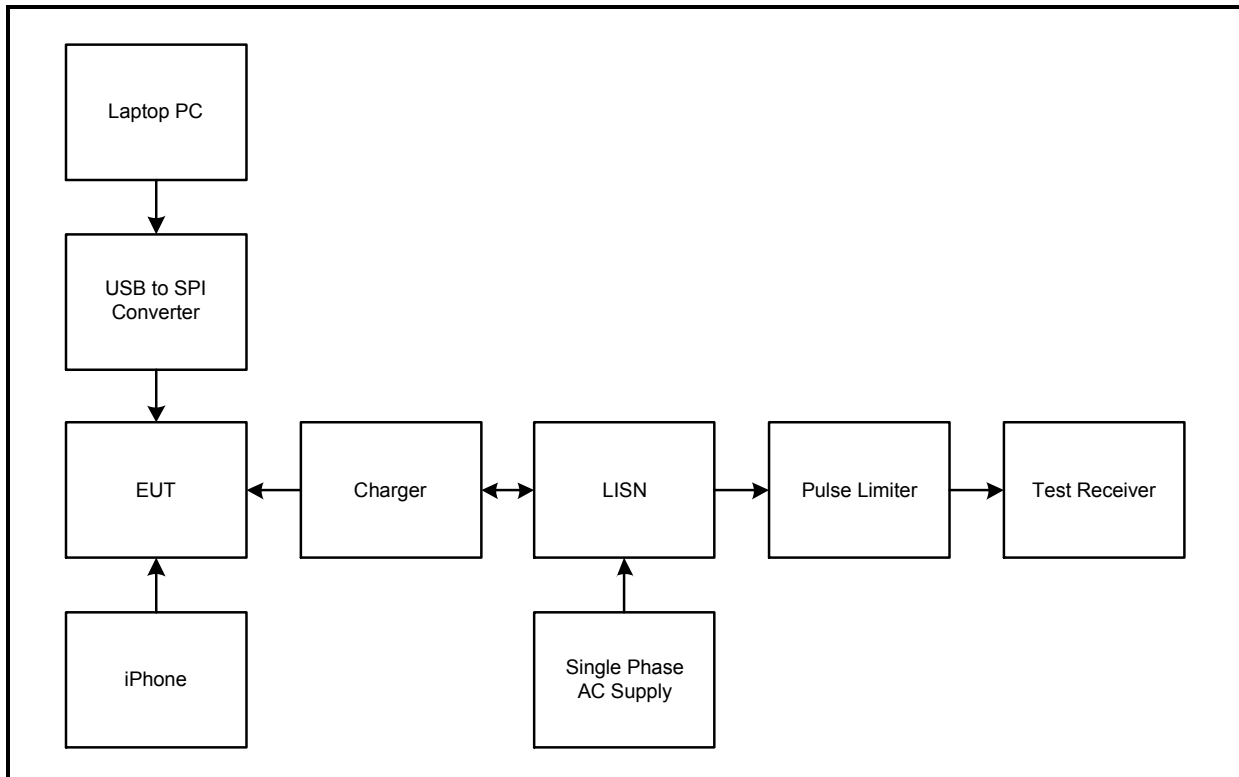
FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	33

Note(s):

5. The EUT was connected to an AC charger via a USB cable. The AC charger was connected to 120 VAC 60 Hz single phase supply via a LISN.
6. In accordance with KDB 174176 Q4, tests were also performed with the power supply connected to a 240 VAC 60 Hz single phase supply via a LISN.
7. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
8. A pulse limiter was fitted between the LISN and the test receiver.

Test setup:

Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	52.8	65.3	12.5	Complied
0.249	Live	48.8	61.8	13.0	Complied
0.411	Live	38.4	57.6	19.2	Complied
0.497	Live	37.1	56.1	19.0	Complied
0.812	Live	33.9	56.0	22.1	Complied
13.124	Live	30.1	60.0	29.9	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Live	37.9	55.1	17.2	Complied
0.249	Live	33.5	51.8	18.3	Complied
0.335	Live	31.3	49.3	18.0	Complied
0.416	Live	24.9	47.5	22.6	Complied
0.497	Live	24.5	46.1	21.6	Complied
0.758	Live	28.2	46.0	17.8	Complied

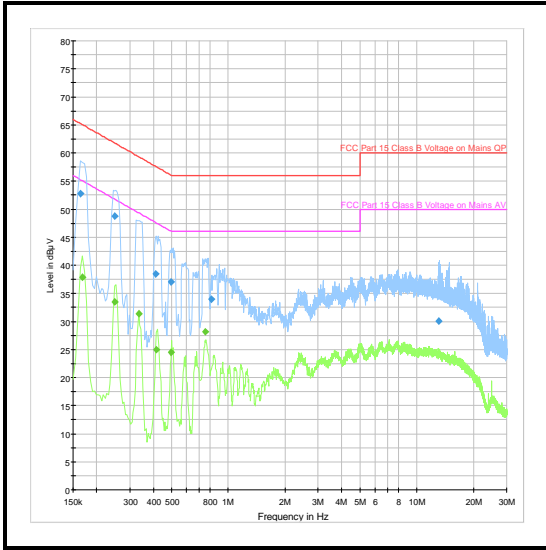
Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Neutral	49.4	65.3	15.9	Complied
0.254	Neutral	46.4	61.6	15.2	Complied
0.326	Neutral	41.9	59.6	17.7	Complied
0.407	Neutral	37.2	57.7	20.5	Complied
0.497	Neutral	33.4	56.1	22.7	Complied
0.780	Neutral	29.6	56.0	26.4	Complied

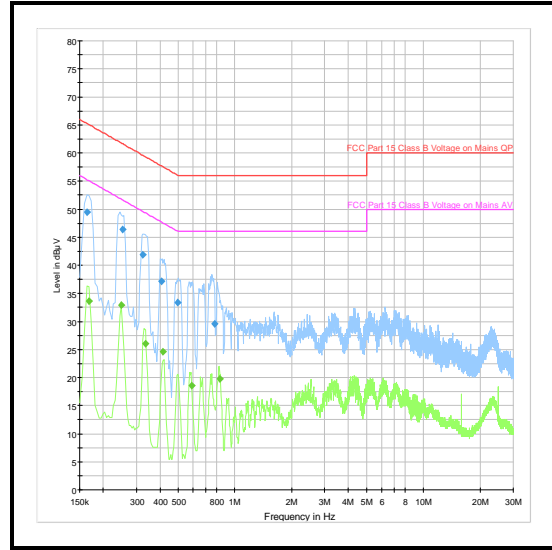
Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Neutral	33.6	55.1	21.5	Complied
0.249	Neutral	32.9	51.8	18.9	Complied
0.335	Neutral	26.0	49.3	23.3	Complied
0.416	Neutral	24.6	47.5	22.9	Complied
0.591	Neutral	18.5	46.0	27.5	Complied
0.830	Neutral	19.8	46.0	26.2	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live / 120 VAC 60 Hz



Neutral / 120 VAC 60 Hz

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	38.1	65.3	27.2	Complied
0.366	Live	44.3	58.6	14.3	Complied
0.614	Live	30.9	56.0	25.1	Complied
0.749	Live	30.9	56.0	25.1	Complied
4.911	Live	27.9	56.0	28.1	Complied
7.575	Live	27.8	60.0	32.2	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Live	33.7	54.4	20.7	Complied
0.366	Live	41.1	48.6	7.5	Complied
0.803	Live	27.3	46.0	18.7	Complied
3.566	Live	23.7	46.0	22.3	Complied
4.952	Live	24.6	46.0	21.4	Complied
6.279	Live	24.7	50.0	25.3	Complied

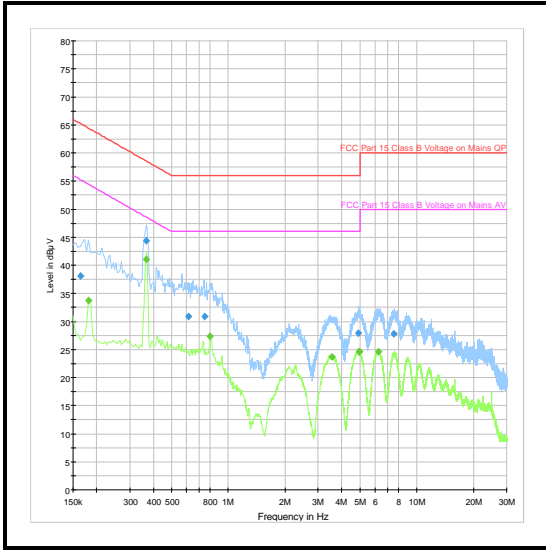
Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Neutral	42.1	64.4	22.3	Complied
0.218	Neutral	37.0	62.9	25.9	Complied
0.371	Neutral	49.6	58.5	8.9	Complied
0.524	Neutral	34.3	56.0	21.7	Complied
0.731	Neutral	39.6	56.0	16.4	Complied
0.902	Neutral	32.7	56.0	23.3	Complied

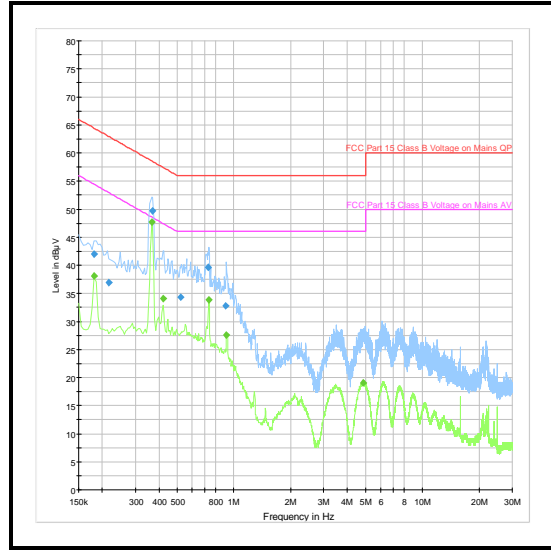
Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Neutral	38.1	54.4	16.3	Complied
0.366	Neutral	47.7	48.6	0.9	Complied
0.420	Neutral	34.1	47.4	13.3	Complied
0.735	Neutral	33.8	46.0	12.2	Complied
0.915	Neutral	27.5	46.0	18.5	Complied
4.844	Neutral	19.0	46.0	27.0	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live / 240 VAC 60 Hz



Neutral / 240 VAC 60 Hz

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	27 Aug 2016	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	08 Mar 2017	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	16 Oct 2016	12
S0539	Variable AC Power Supply	Kikusui	PCR 1000L	13010170	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	26 May 2016	12

5.2.4. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Georgios Vrezas	Test Date:	30 April 2016
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Part 15.247(a)(1)
Test Method Used:	ANSI C63.10 Section 6.9.2

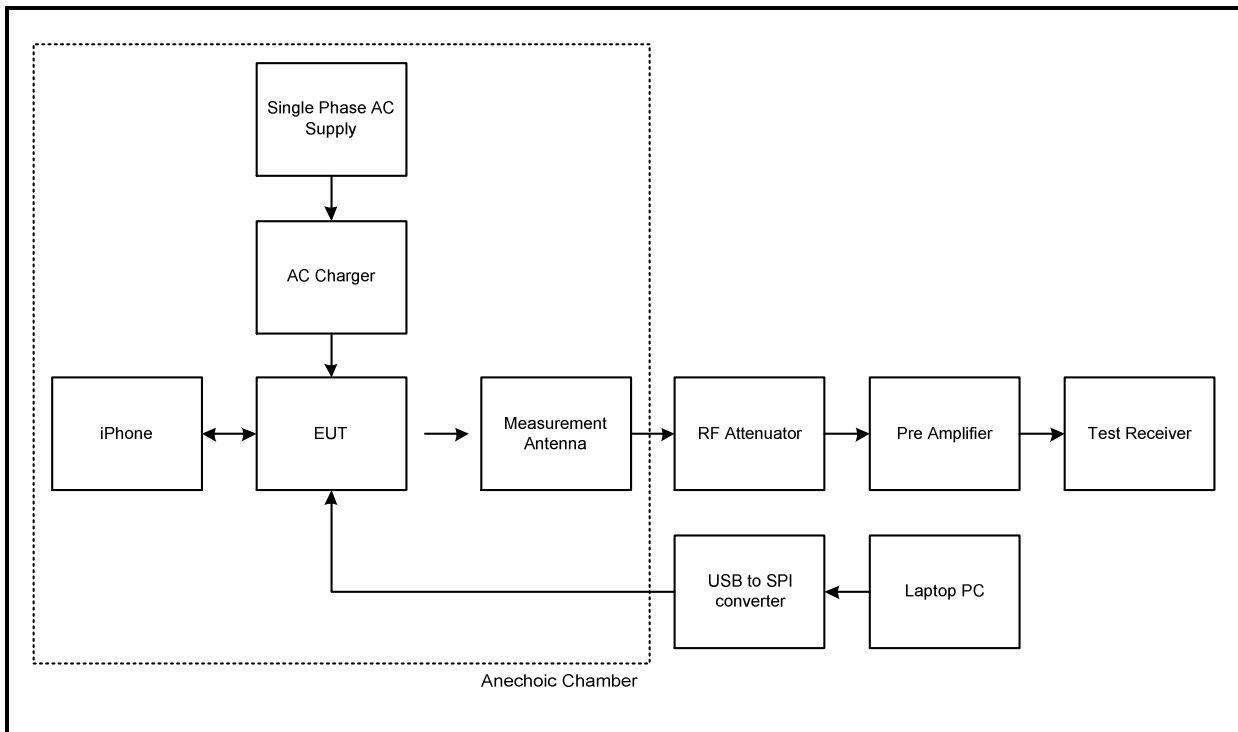
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	31

Note(s):

1. The test receiver resolution bandwidth was set to 30 kHz and video bandwidth 100 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 3 MHz. Normal and delta markers were placed 20 dB down from the peak of the carrier. These results are documented in the table below.
2. Tests were performed radiated.

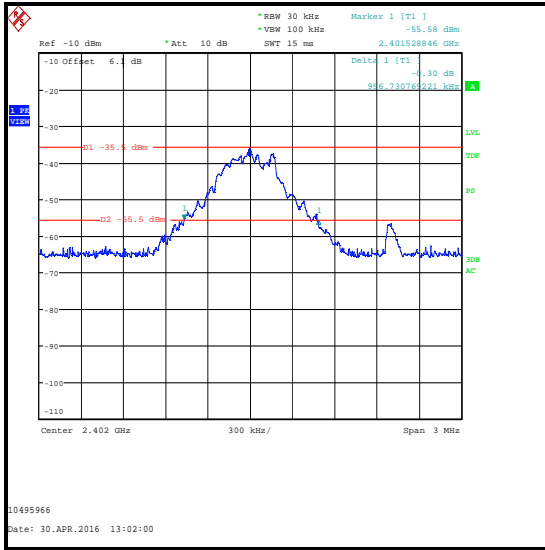
Test setup:



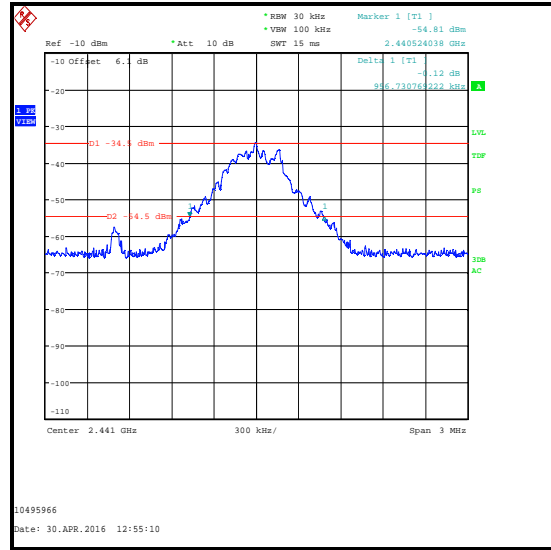
Transmitter 20 dB Bandwidth (continued)

Results DH5:

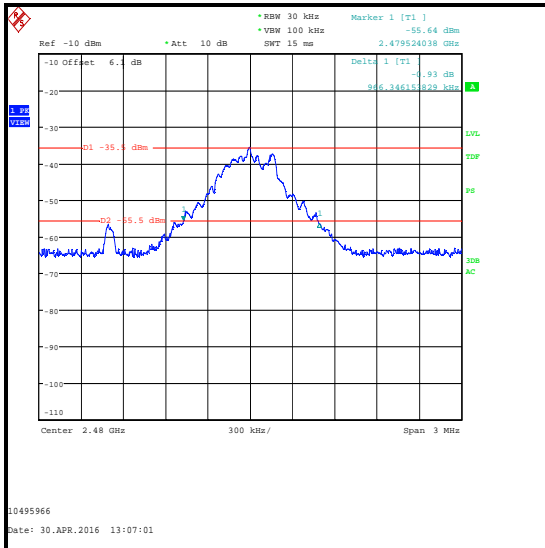
Channel	20 dB Bandwidth (kHz)
Bottom	956.731
Middle	956.731
Top	966.346



Bottom Channel



Middle Channel

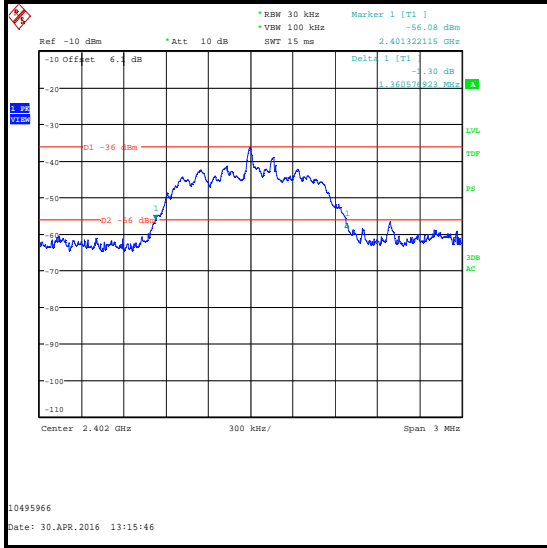


Top Channel

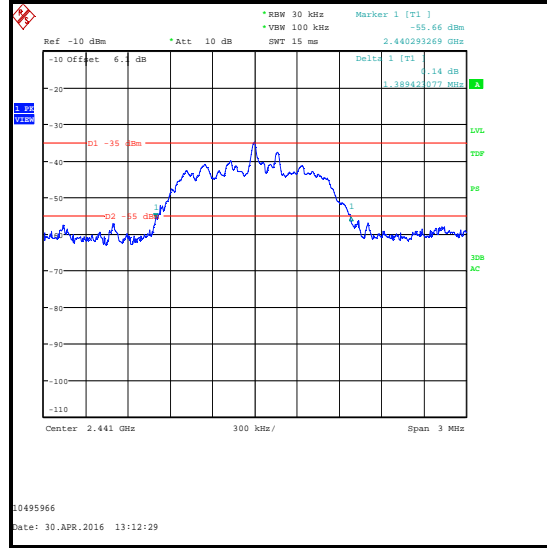
Transmitter 20 dB Bandwidth (continued)

Results 2DH5:

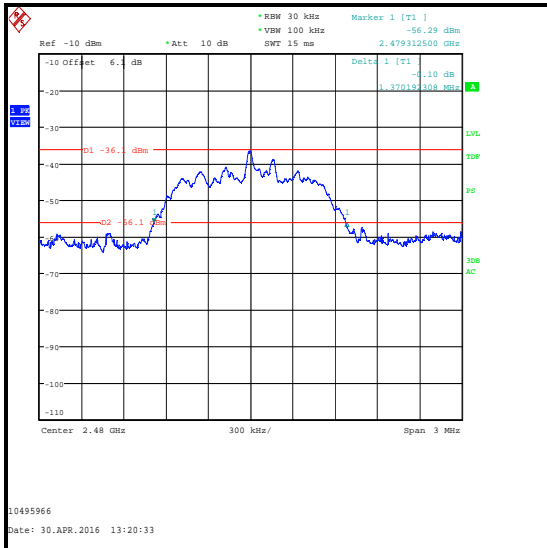
Channel	20 dB Bandwidth (kHz)
Bottom	1360.577
Middle	1389.423
Top	1370.192



Bottom Channel



Middle Channel

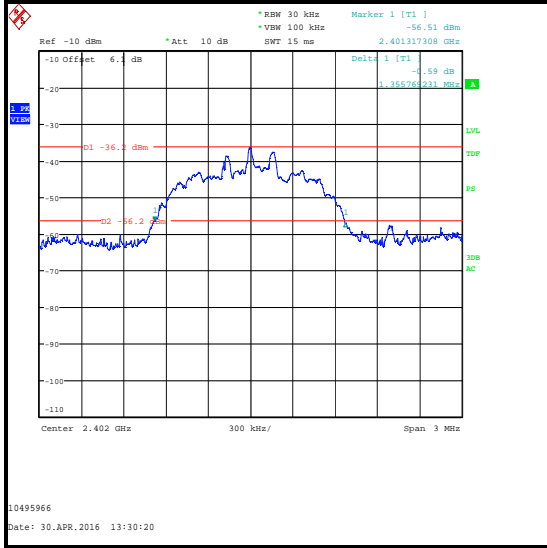


Top Channel

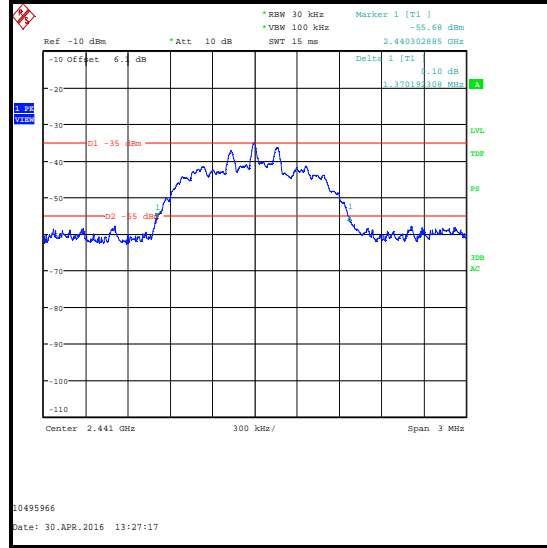
Transmitter 20 dB Bandwidth (continued)

Results 3DH5:

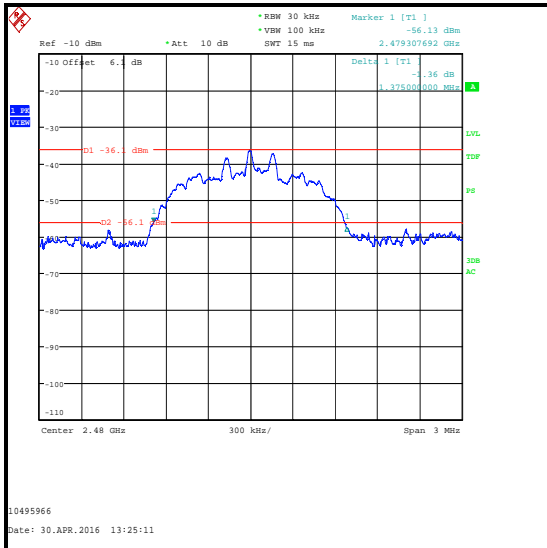
Channel	20 dB Bandwidth (kHz)
Bottom	1355.759
Middle	1370.192
Top	1375.000



Bottom Channel



Middle Channel



Top Channel

Transmitter 20 dB Bandwidth (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100553	21 Mar 2017	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A239	Attenuator	Huber & Suhner	6806.17.B	None stated	05 May 2016	12

5.2.5. Transmitter Carrier Frequency Separation

Test Summary:

Test Engineer:	Georgios Vrezas	Test Date:	30 April 2016
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Part 15.247(a)(1)
Test Method Used:	ANSI C63.10 Section 7.8.2 and notes below

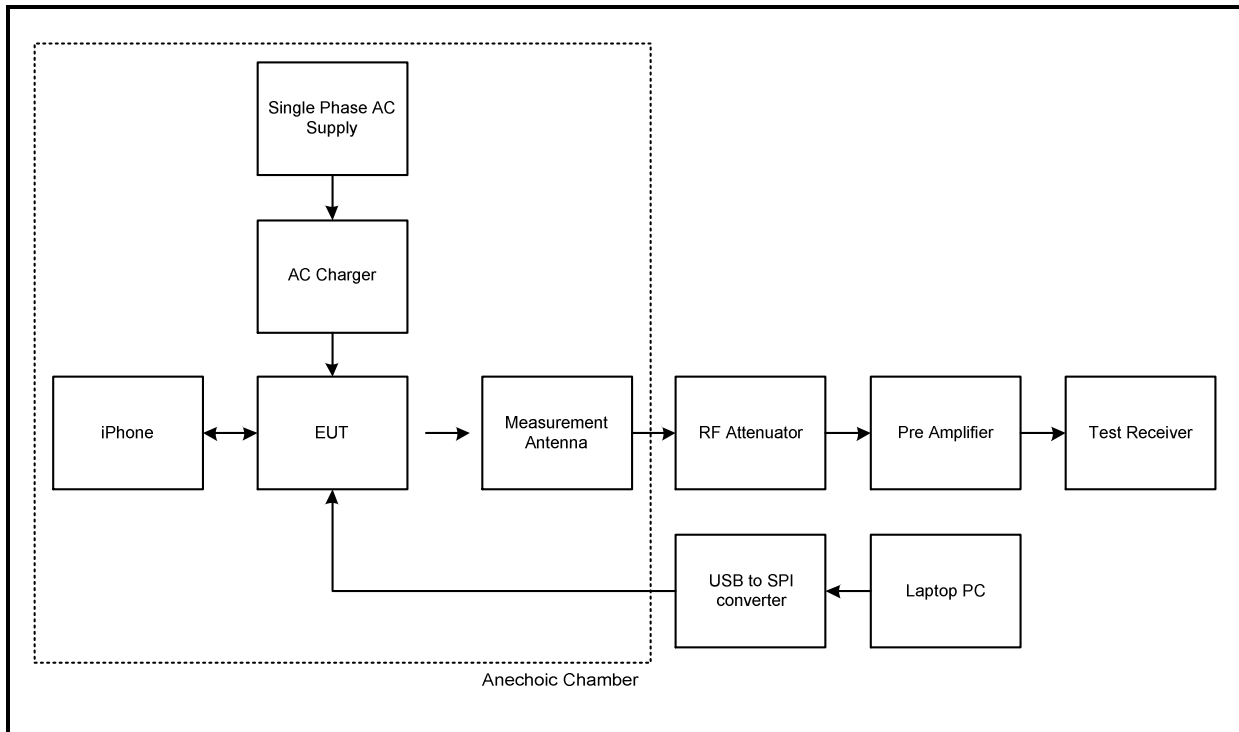
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	31

Note(s):

1. The 20 dB bandwidth measured for the middle channel operating at 2441 MHz was used to calculate the limit.
2. In order to identify the centre of adjacent channels, the spectrum analyser resolution bandwidth was set to 30 kHz and video bandwidth set to 100 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was wide enough to capture the peaks of two adjacent channels. A marker was placed at the peak on the first channel and a delta marker was placed at the peak of the adjacent channel. The delta between the two markers was recorded for each mode of operation.
3. Tests were performed radiated.

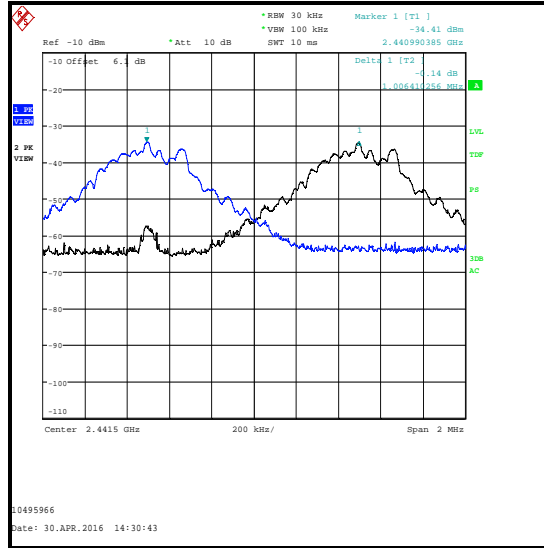
Test setup:



Transmitter Carrier Frequency Separation (continued)

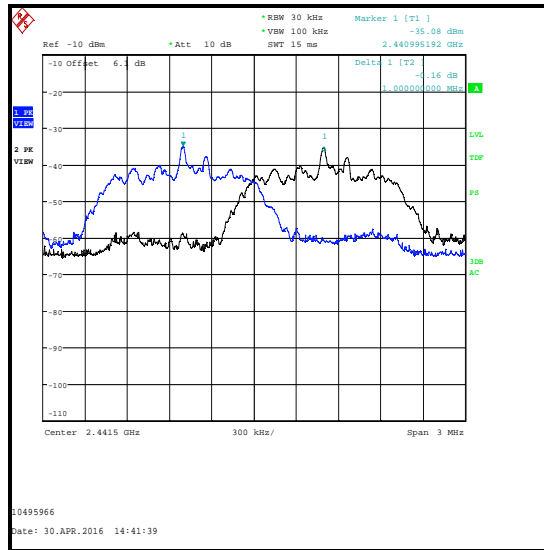
Results: DH5

Carrier Frequency Separation (kHz)	Limit ($2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1006.410	637.821	368.589	Complied



Results: 2DH5

Carrier Frequency Separation (kHz)	Limit ($2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1000.000	926.282	73.718	Complied



Transmitter Carrier Frequency Separation (continued)

Results: 3DH5

Carrier Frequency Separation (kHz)	Limit ($2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1000.000	913.461	86.539	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100553	21 Mar 2017	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A239	Attenuator	Huber & Suhner	6806.17.B	None stated	05 May 2016	12

5.2.6. Transmitter Number of Hopping Frequencies and Average Time of Occupancy**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	30 April 2016
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Part 15.247(a)(1)(iii)
Test Method Used:	ANSI C63.10 Sections 7.8.3 & 7.8.4 and notes below

Environmental Conditions:

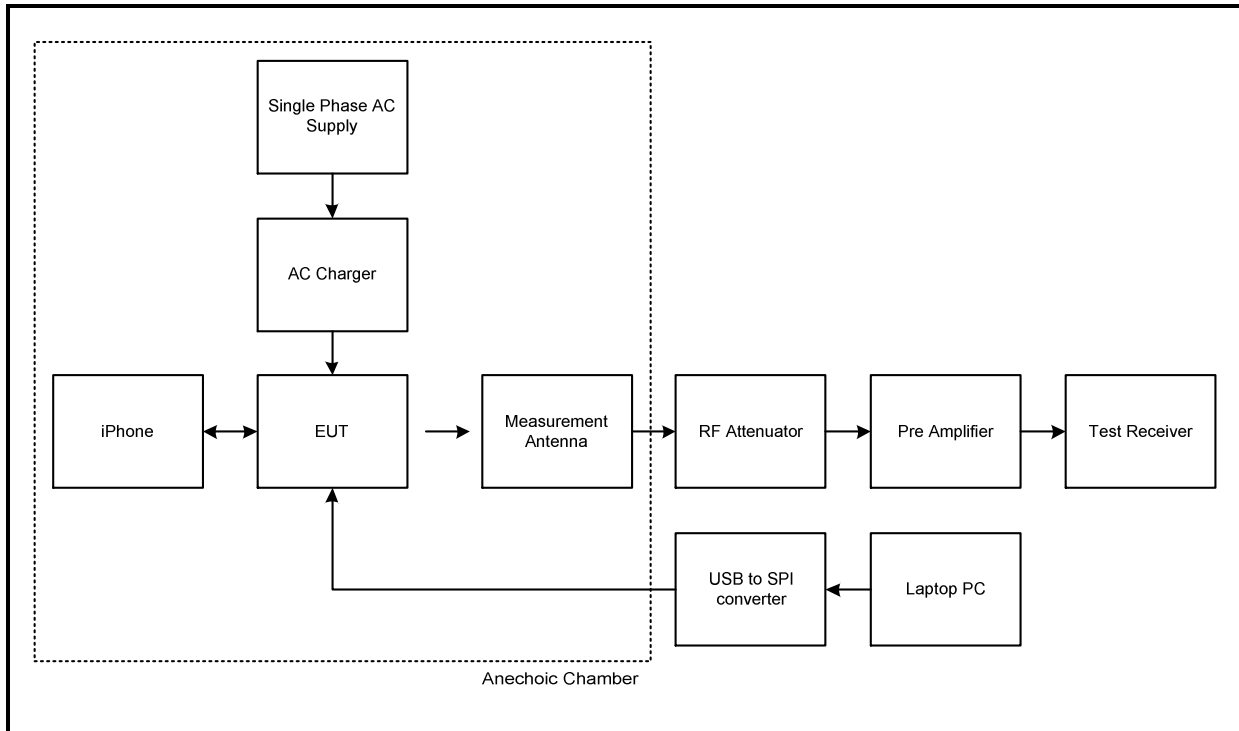
Temperature (°C):	22
Relative Humidity (%):	31

Note(s):

1. Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.
2. The test receiver was set up for the Number of Hopping Frequencies measurement as follows: the resolution bandwidth was set to 100 kHz and video bandwidth of 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 83.5 MHz.
3. The test receiver was set up for the Emission Width measurement as follows: the resolution bandwidth was set to 1 MHz and video bandwidth of 3 MHz. A peak detector was used and sweep time was set to auto with a span of zero Hz. The test receiver was set to trigger at 0.4 ms, with a marker placed at the start of the emission and a delta marked place at the end of the emission. The emission width is recorded in the table below
4. The test receiver was set up for the Number of Hopping Frequencies in 32 seconds measurement as follows: the resolution bandwidth was set to 100 kHz and video bandwidth of 300 kHz. A peak detector was used and sweep time was set to 32 seconds. The EUT was set to transmit in a hopping frequency mode with zero span. The total number of hopping frequencies were recorded in the table below.
5. Tests were performed radiated.

Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)

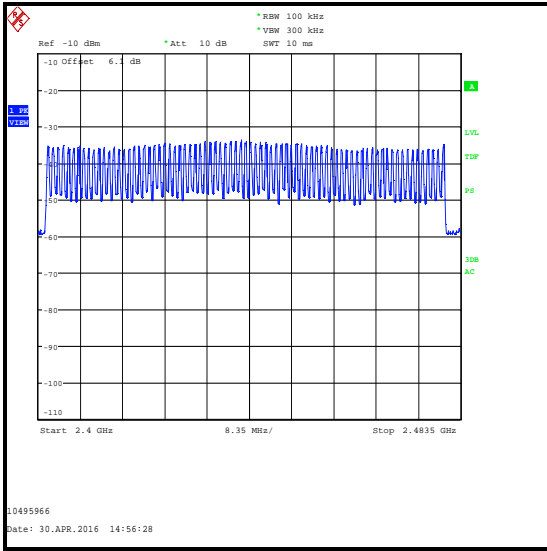
Test setup:



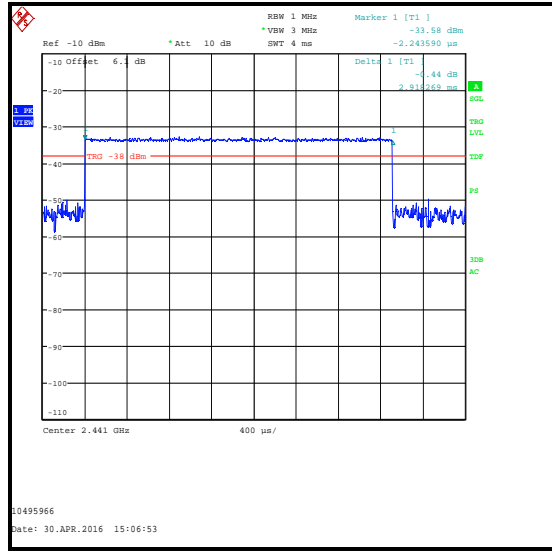
Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)

Results:

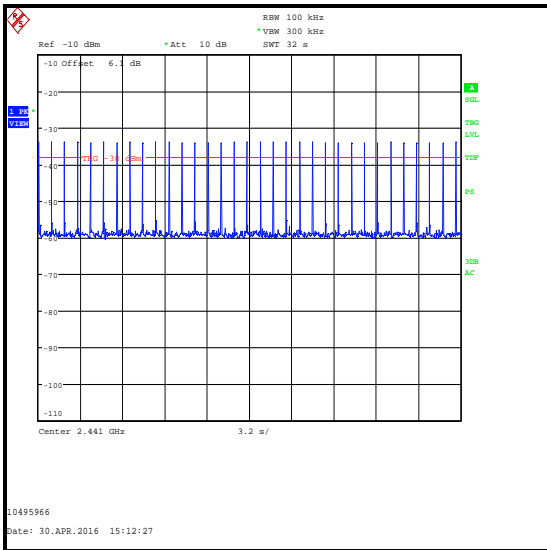
Emission Width (μ s)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2918.269	33	0.1	0.4	0.3	Complied



Number of Hopping Frequencies



Emission Width



Number of Hopping Frequencies in 32 s

Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100553	21 Mar 2017	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A239	Attenuator	Huber & Suhner	6806.17.B	None stated	05 May 2016	12

5.2.7. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Georgios Vrezas	Test Date:	30 April 2016
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Part 15.247(b)(1)
Test Method Used:	ANSI C63.10 Section 7.8.5 and notes below

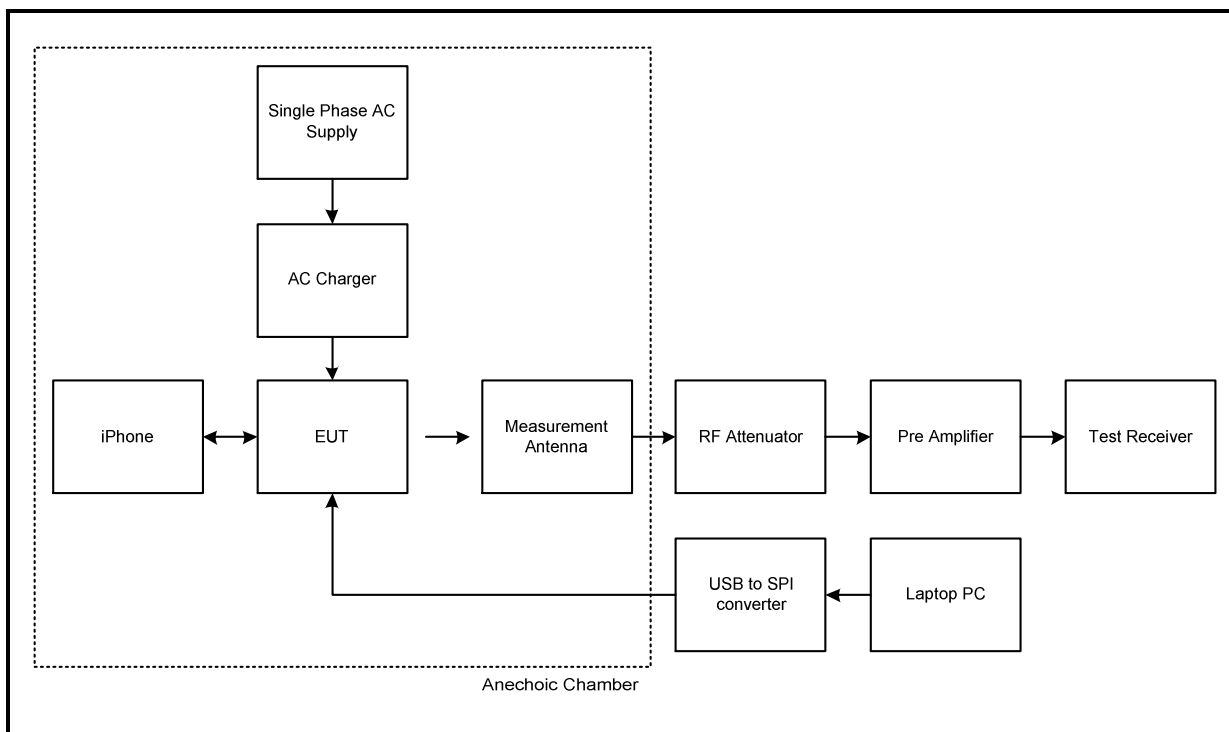
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	31

Note(s):

1. Tests were performed using a combination of the conducted test method described in ANSI C63.10 Section 7.8.5 and the test methods for radiated emissions measurements described in Sections 6.3 and 6.6. The reason for this being that the measurements were performed radiated as the EUT has an integral antenna and does not have an external antenna port.
2. The test receiver resolution bandwidth was set to 2 MHz (≥20 dB bandwidth) and video bandwidth of 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to approximately five times the 20 dB bandwidth. A marker was placed at the peak of the signal and the results recorded in the tables below.
3. These tests were performed radiated, therefore the EUT antenna gain is encompassed in the final result and not measurable.

Test setup:



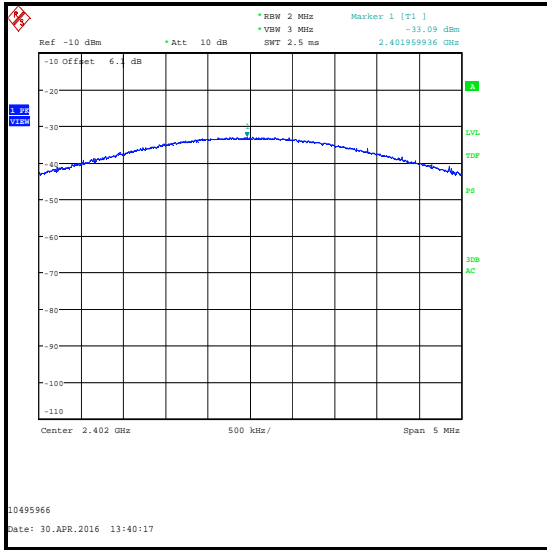
Transmitter Maximum Peak Output Power (continued)**Results: DH5**

Channel	EIRP (dBm)	Declared Antenna Gain (dBi)	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-32.8	2.0	-34.8	30.0	64.8	Complied
Middle	-31.9	2.0	-33.9	30.0	63.9	Complied
Top	-32.1	2.0	-34.1	30.0	64.1	Complied

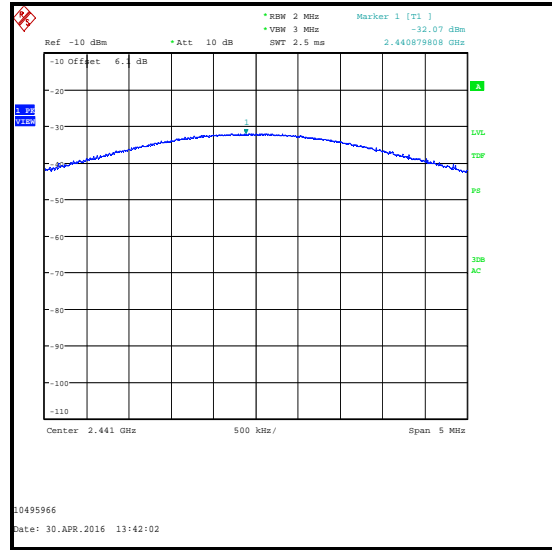
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-32.8	36.0	68.8	Complied
Middle	-31.9	36.0	67.9	Complied
Top	-32.1	36.0	68.1	Complied

Transmitter Maximum Peak Output Power (continued)

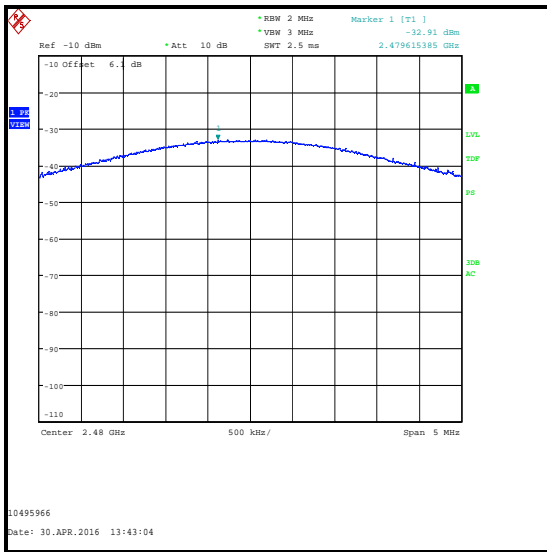
Results: DH5



Bottom Channel



Middle Channel



Top Channel

Note: These plots are for indication purposes only. For final measurements with substitutions, see accompanying table.

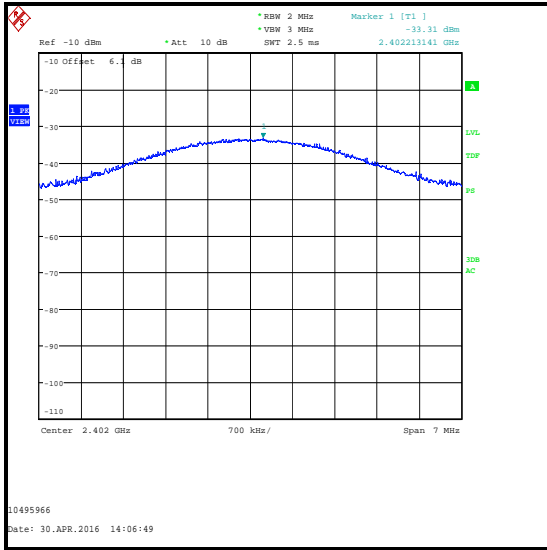
Transmitter Maximum Peak Output Power (continued)**Results: 2DH5**

Channel	EIRP (dBm)	Declared Antenna Gain (dBi)	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-33.0	2.0	-35.0	21.0	56.0	Complied
Middle	-32.1	2.0	-34.1	21.0	55.1	Complied
Top	-31.9	2.0	-33.9	21.0	54.9	Complied

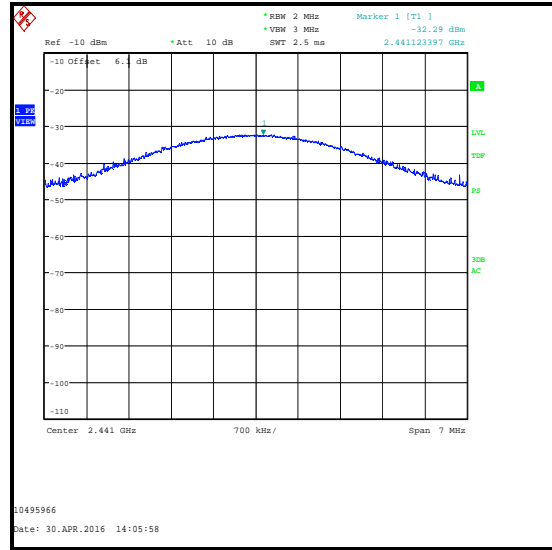
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-33.0	27.0	60.0	Complied
Middle	-32.1	27.0	59.1	Complied
Top	-31.9	27.0	58.9	Complied

Transmitter Maximum Peak Output Power (continued)

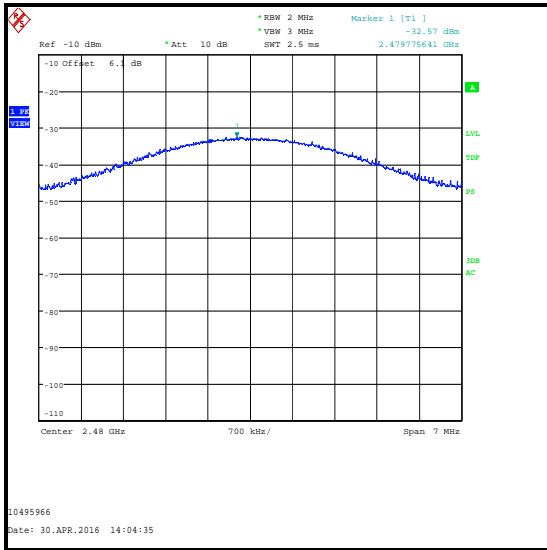
Results: 2DH5



Bottom Channel



Middle Channel



Top Channel

Note: These plots are for indication purposes only. For final measurements with substitutions, see accompanying table.

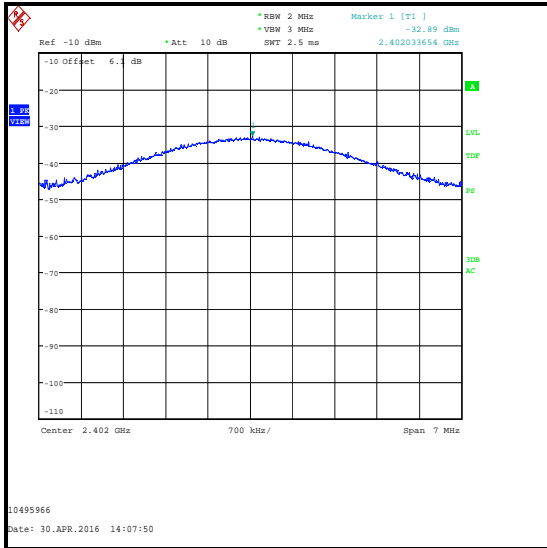
Transmitter Maximum Peak Output Power (continued)**Results: 3DH5**

Channel	EIRP (dBm)	Declared Antenna Gain (dBi)	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-32.6	2.0	-34.6	21.0	55.6	Complied
Middle	-32.2	2.0	-34.2	21.0	55.2	Complied
Top	-32.5	2.0	-34.5	21.0	55.5	Complied

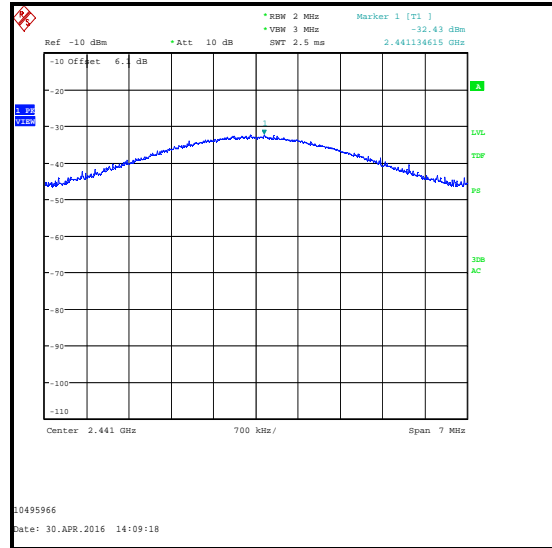
Channel	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-32.6	27.0	59.6	Complied
Middle	-32.2	27.0	59.2	Complied
Top	-32.5	27.0	59.5	Complied

Transmitter Maximum Peak Output Power (continued)

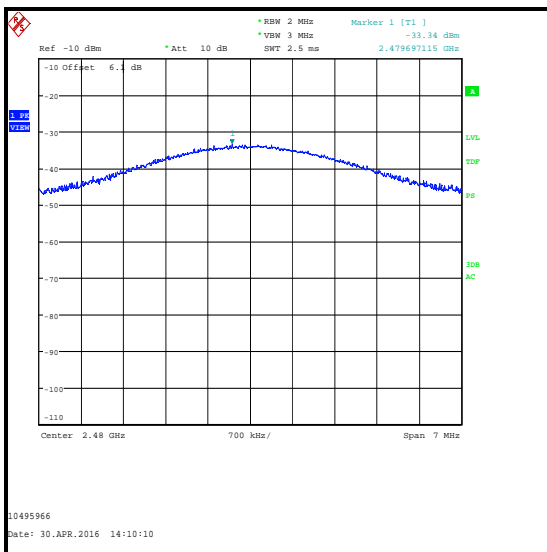
Results: 3DH5



Bottom Channel



Middle Channel



Top Channel

Note: These plots are for indication purposes only. For final measurements with substitutions, see accompanying table.

Transmitter Maximum Peak Output Power (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100553	21 Mar 2017	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A239	Attenuator	Huber & Suhner	6806.17.B	None stated	05 May 2016	12
A032	Antenna	EMCO	3115	2874	01 Mar 2019	36
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
G0628	Signal Generator	Rohde & Schwarz	SMBV100A	261847	25 Jan 2017	12

5.2.8. Transmitter Radiated Emissions**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	16 October 2014
Test Sample Serial Number:	MAR003432UN14		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

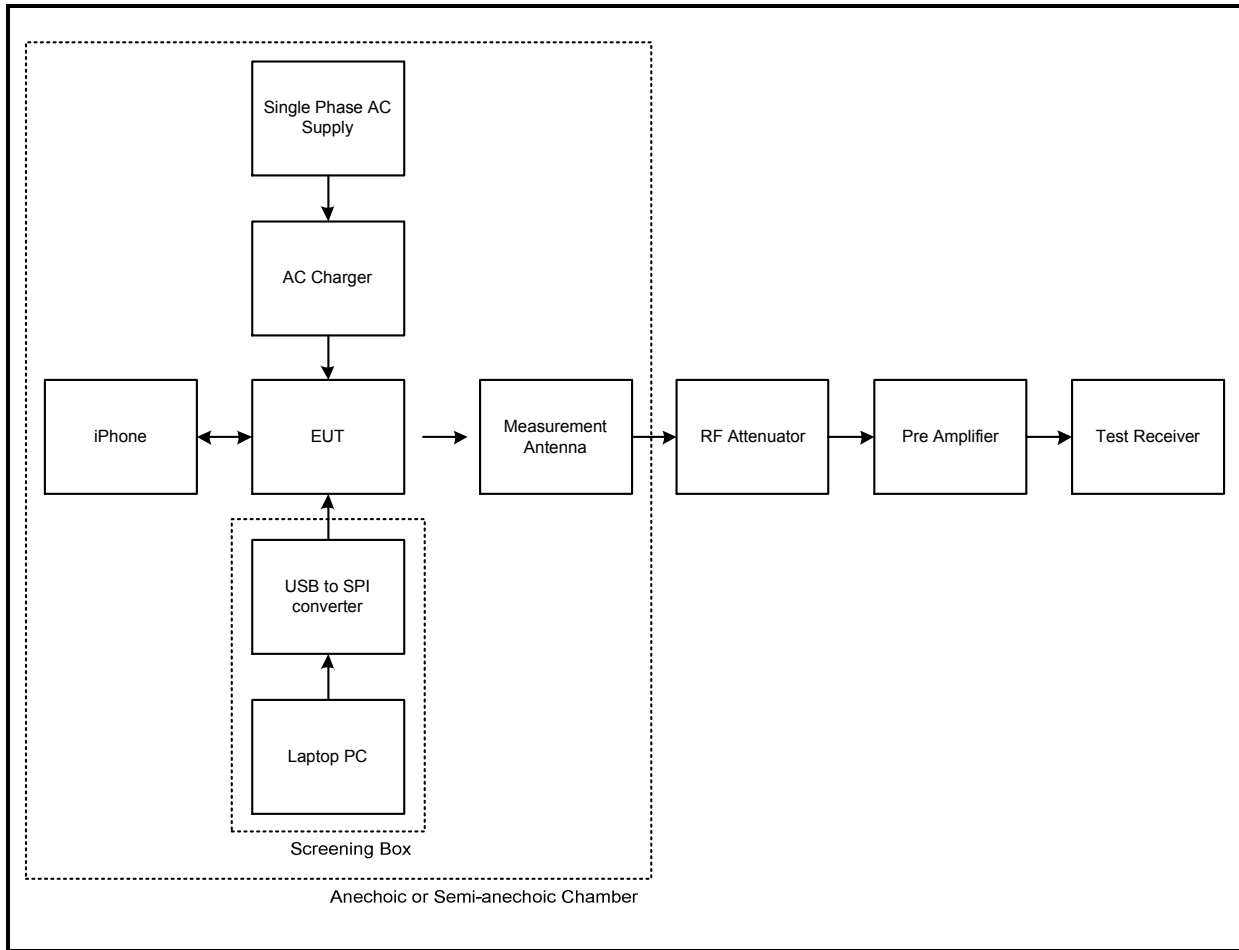
Temperature (°C):	23
Relative Humidity (%):	37

Note(s):

1. Transmitter radiated spurious emissions tests were performed with the EUT transmitting in DH5 mode as this was found to transmit the highest power and therefore deemed worst case.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the middle channel only.
4. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. * -20 dBc limit

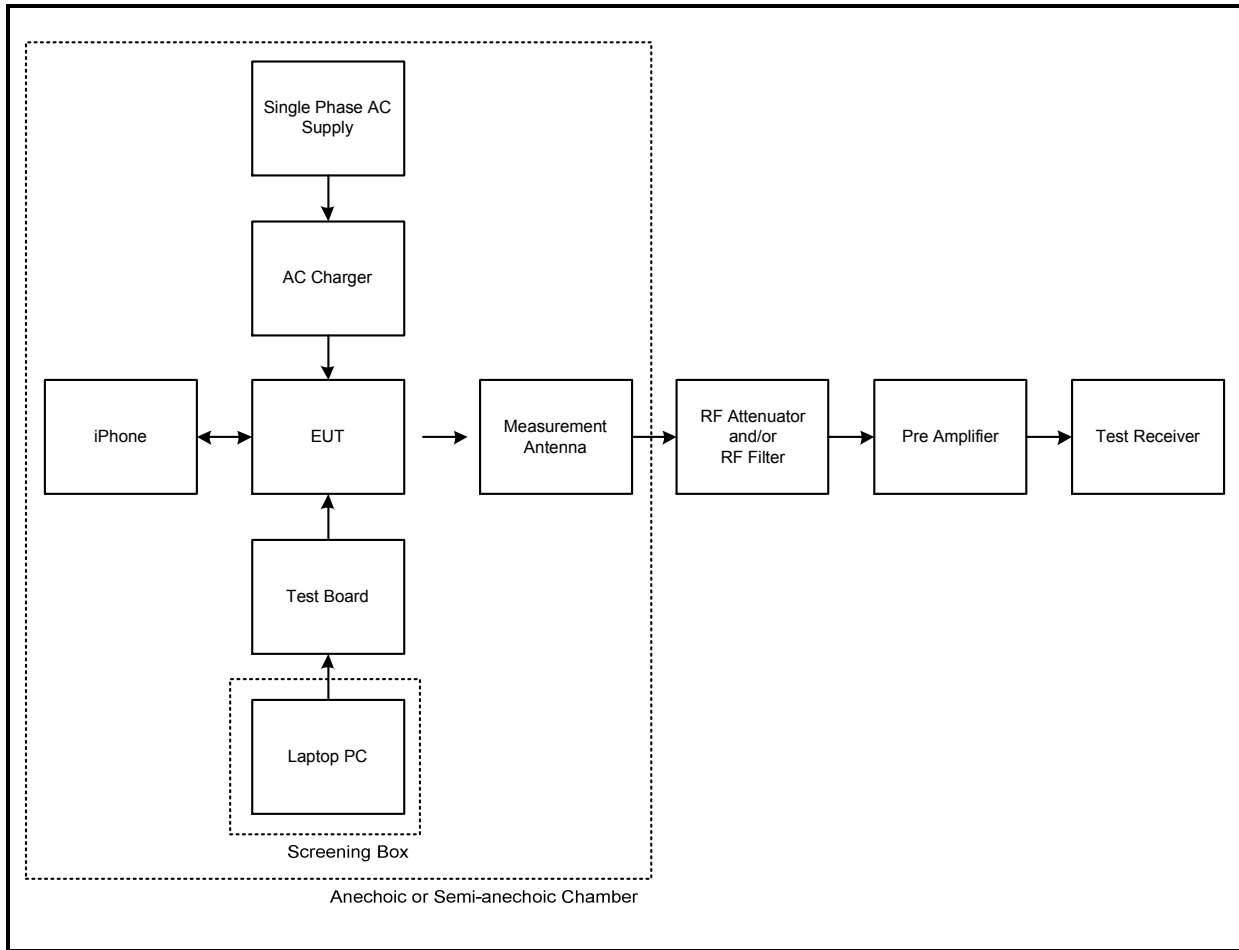
Transmitter Radiated Emissions (continued)

Test setup:



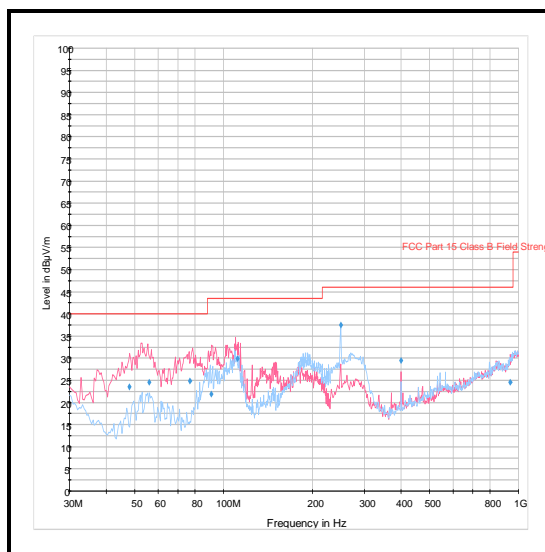
Transmitter Radiated Emissions (continued)

Test setup:



Transmitter Radiated Emissions (continued)**Results: Quasi-Peak / DH5**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
47.903	Vertical	23.5	36.0*	12.5	Complied
55.788	Vertical	24.6	36.0*	11.4	Complied
76.949	Vertical	24.8	36.0*	11.2	Complied
90.594	Vertical	22.0	36.0*	14.0	Complied
111.444	Vertical	30.0	43.5	13.5	Complied
249.999	Horizontal	37.5	46.0	8.5	Complied
399.981	Vertical	29.5	46.0	16.5	Complied
939.239	Vertical	24.6	36.0*	11.4	Complied



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
G0543	Amplifier	Sonoma	310N	230801	20 Nov 2014	3
A1834	Attenuator	Hewlett Packard	8491B	10444	15 Nov 2014	12

Transmitter Radiated Emissions (continued)**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Dates:	20 October 2014 & 08 December 2014
Test Sample Serial Number:	MAR003432UN14		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	38 to 47

Note(s):

1. Transmitter radiated spurious emissions tests were performed with the EUT transmitting in DH5 mode as this was found to transmit the highest power and therefore deemed worst case.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental at 2441 MHz.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Radiated Emissions (continued)**Results: Peak / Bottom Channel / DH5**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4803.590	Vertical	51.0	74.0	23.0	Complied

Results: Average / Bottom Channel / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4803.958	Vertical	49.1	54.0	4.9	Complied

Results: Peak / Middle Channel / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4881.522	Vertical	50.1	74.0	23.9	Complied

Results: Average / Middle Channel / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4882.115	Vertical	47.7	54.0	6.3	Complied

Results: Peak / Top Channel / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.016	Vertical	50.7	74.0	23.3	Complied

Results: Average / Top Channel / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.112	Vertical	49.1	54.0	4.9	Complied

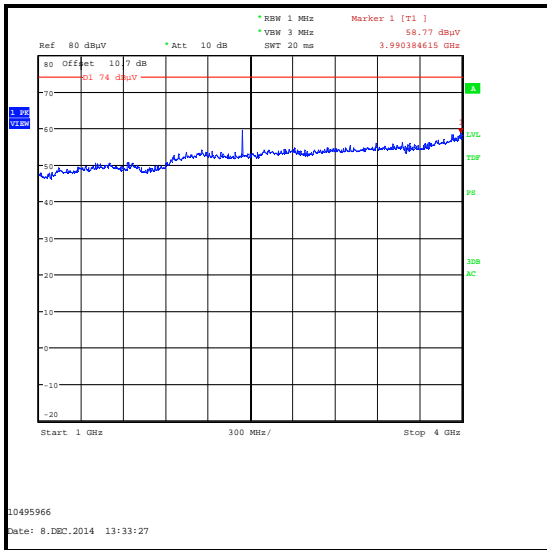
Results: Peak / Hopping Mode / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4925.865	Vertical	54.0	74.0	20.0	Complied

Results: Average / Hopping Mode / DH5

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4919.808	Vertical	52.3	54.0	1.7	Complied

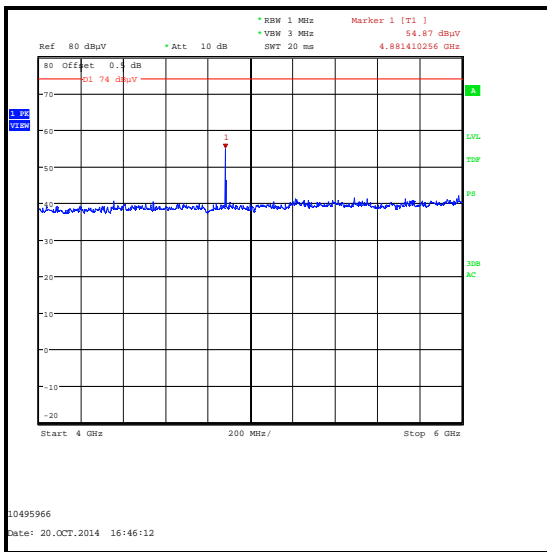
Transmitter Radiated Emissions (continued)



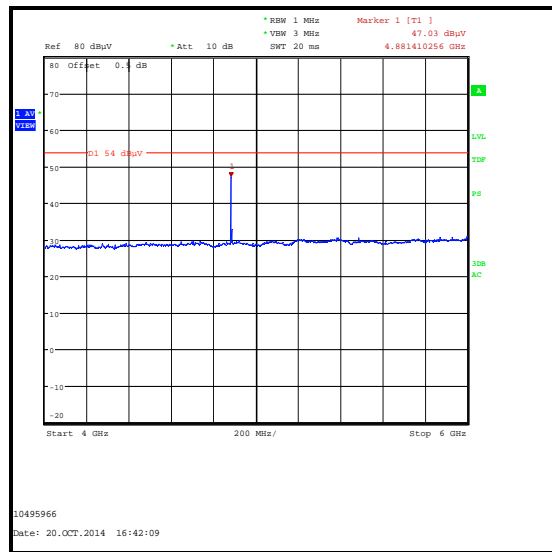
Peak Detector



Average Detector

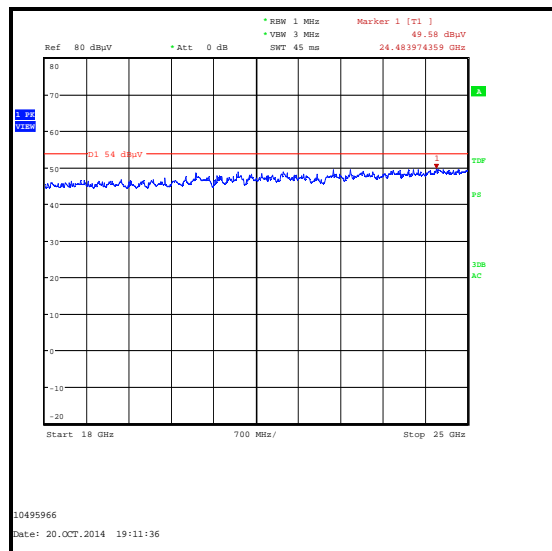
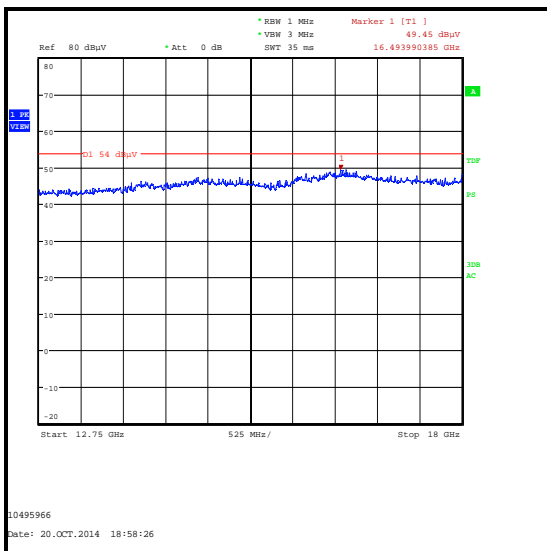
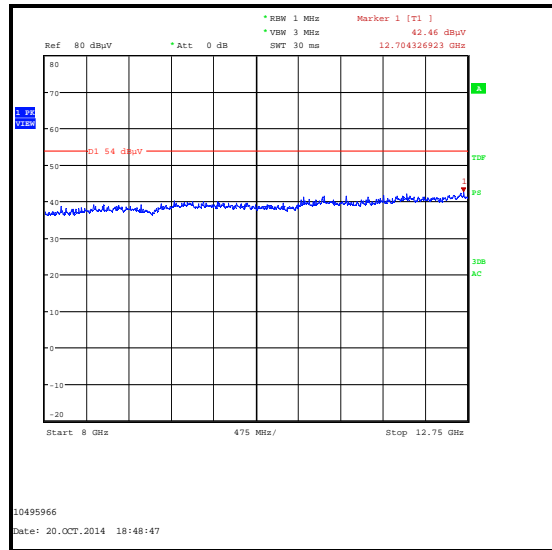
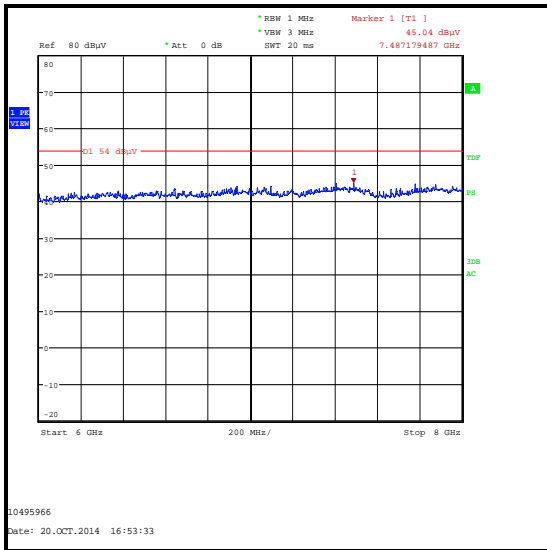


Peak Detector



Average Detector

Transmitter Radiated Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	19 Dec 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	19 Dec 2014	12
A253	Antenna	Flann Microwave	12240-20	128	19 Dec 2014	12
A254	Antenna	Flann Microwave	14240-20	139	19 Dec 2014	12
A255	Antenna	Flann Microwave	16240-20	519	19 Dec 2014	12
A256	Antenna	Flann Microwave	18240-20	400	19 Dec 2014	12
A436	Antenna	Flann Microwave	20240-20	330	19 Dec 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	12 Apr 2015	12

5.2.9. Transmitter Band Edge Radiated Emissions**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	16 December 2014
Test Sample Serial Number:	MAR003431UN14		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.10

Environmental Conditions:

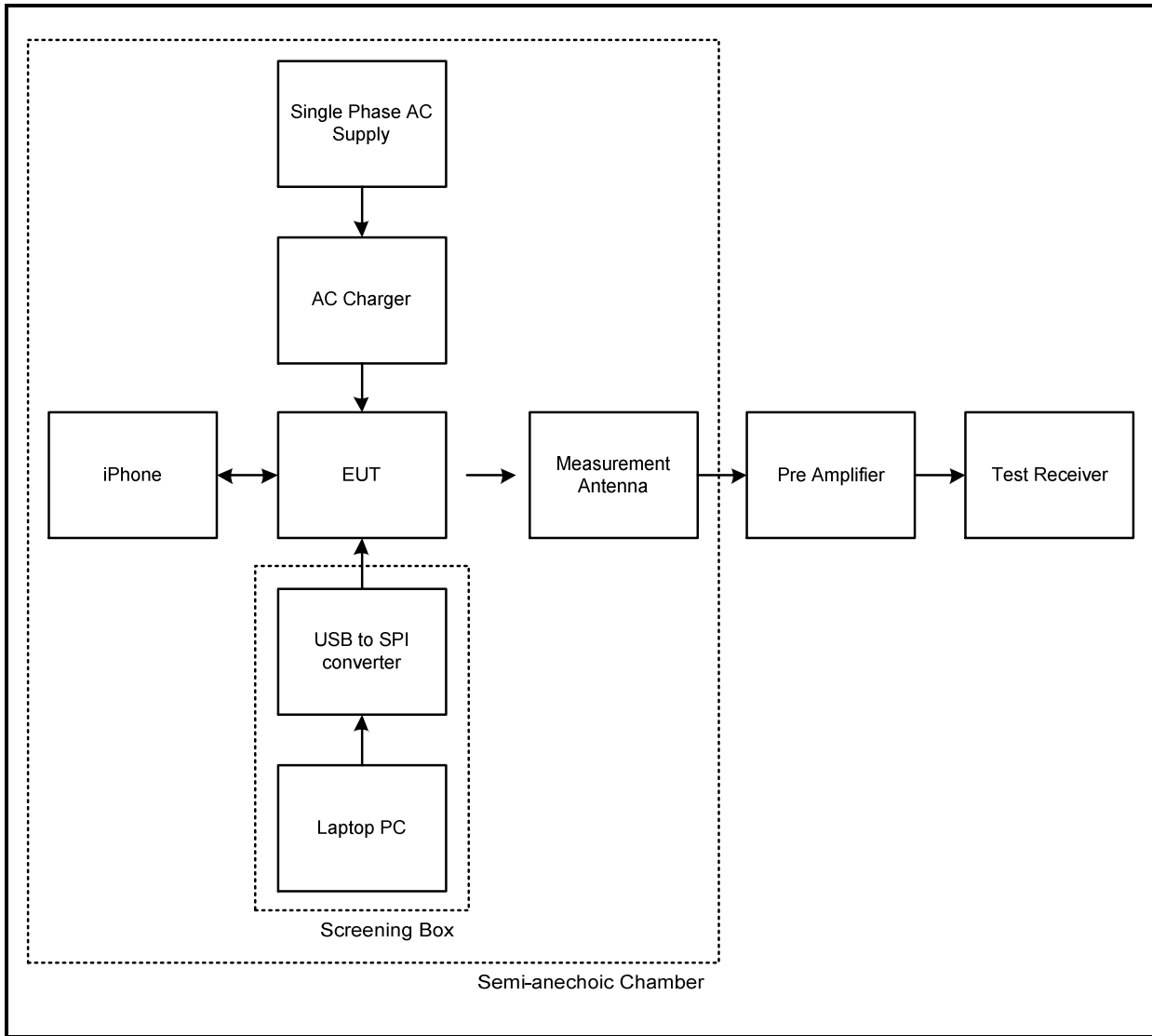
Temperature (°C):	22
Relative Humidity (%):	36

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. * -20 dBc limit.
3. **In accordance with ANSI C63.10 Section 6.6.4.3 NOTE 1, the peak level complied with the average limit, therefore average results were not required.

Transmitter Band Edge Radiated Emissions (continued)

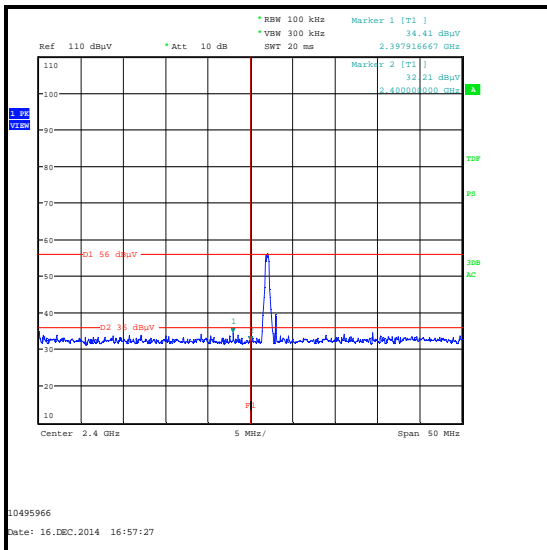
Test setup:



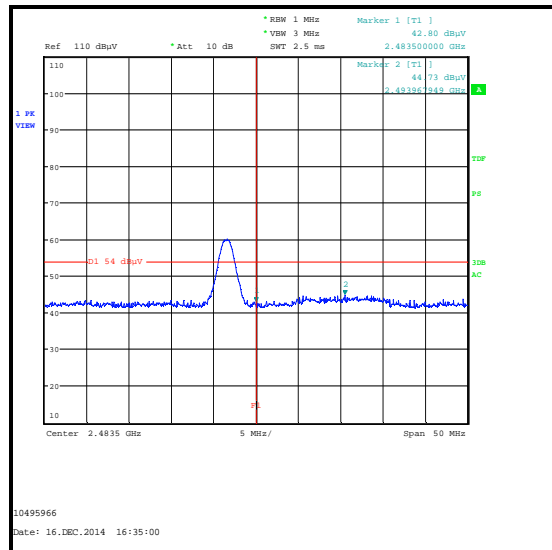
Transmitter Band Edge Radiated Emissions (continued)

Results: Static Mode / DH5

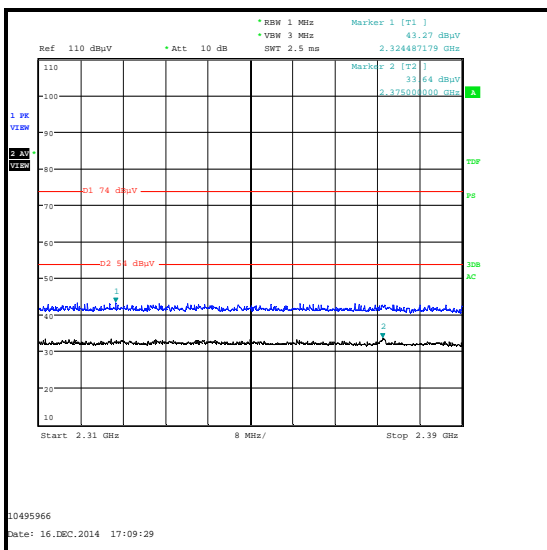
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2324.487	Horizontal	43.3	54.0**	10.7	Complied
2397.917	Horizontal	34.4	36.0*	1.6	Complied
2400.0	Horizontal	32.2	36.0*	3.8	Complied
2483.5	Horizontal	42.8	54.0**	11.2	Complied
2493.968	Horizontal	44.7	54.0**	9.3	Complied



Lower Band Edge / Peak Static



Upper Band Edge / Peak Static

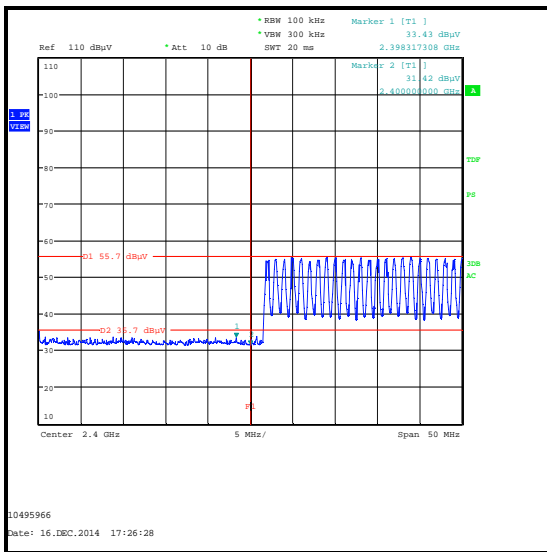


2310-2390 MHz Restricted Band Measurement

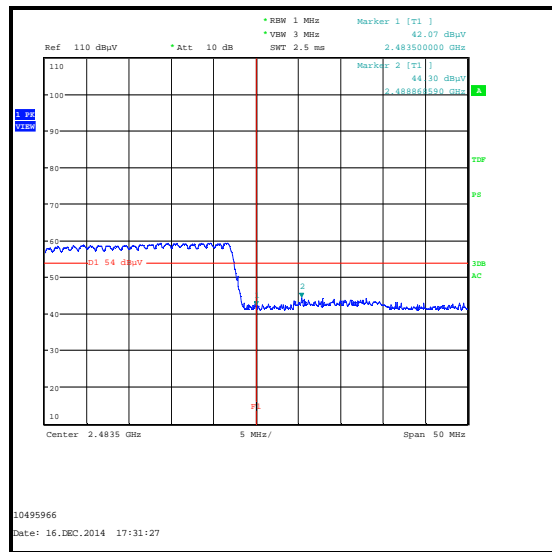
Transmitter Band Edge Radiated Emissions (continued)

Results: Hopping Mode / DH5

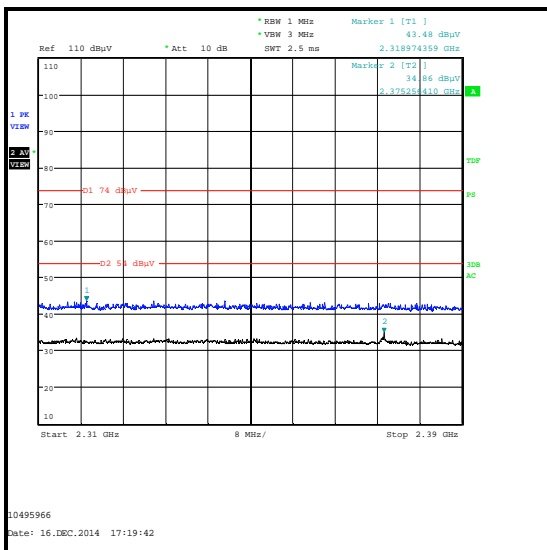
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2318.974	Horizontal	43.5	54.0**	10.5	Complied
2398.317	Horizontal	33.4	35.7*	2.3	Complied
2400.0	Horizontal	31.4	35.7*	4.3	Complied
2483.5	Horizontal	42.1	54.0**	11.9	Complied
2488.869	Horizontal	44.3	54.0**	9.7	Complied



Lower Band Edge / Peak Hopping



Upper Band Edge / Peak Hopping

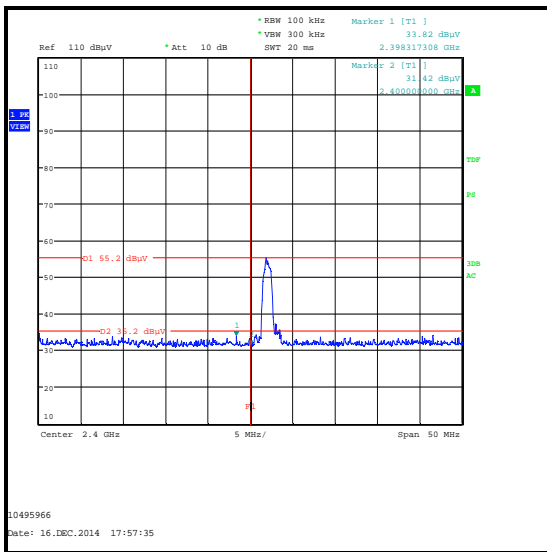


2310-2390 MHz Restricted Band Measurement

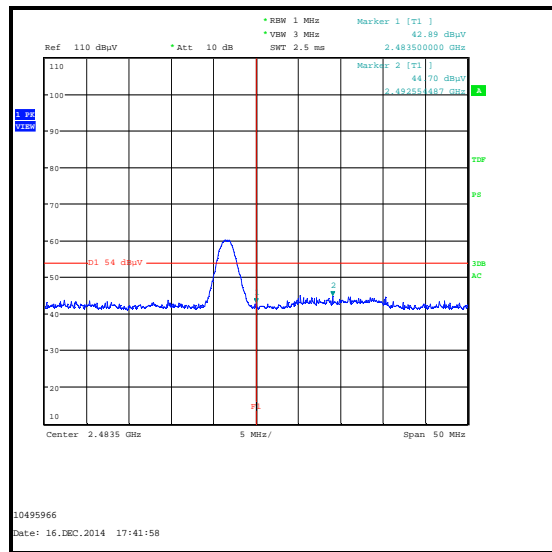
Transmitter Band Edge Radiated Emissions (continued)

Results: Static Mode / 2DH5

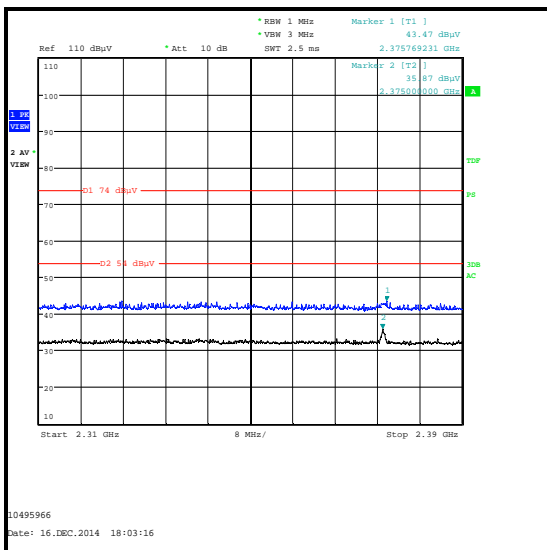
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2375.769	Horizontal	43.5	54.0**	10.5	Complied
2398.317	Horizontal	33.8	35.2*	1.4	Complied
2400.0	Horizontal	31.4	35.2*	3.8	Complied
2483.5	Horizontal	42.9	54.0**	11.1	Complied
2492.554	Horizontal	44.7	54.0**	9.3	Complied



Lower Band Edge / Peak Static



Upper Band Edge / Peak Static

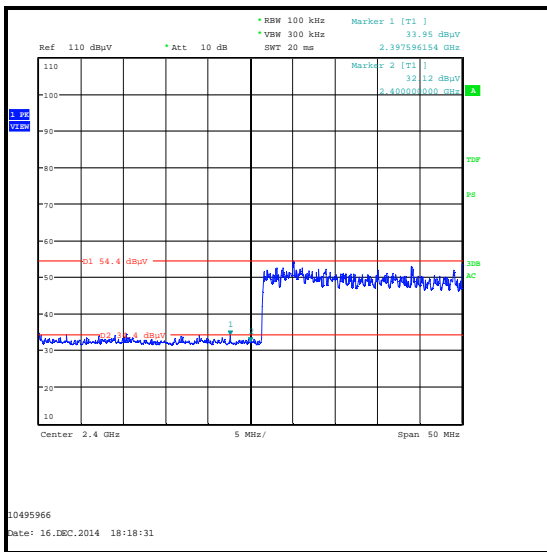


2310-2390 MHz Restricted Band Measurement

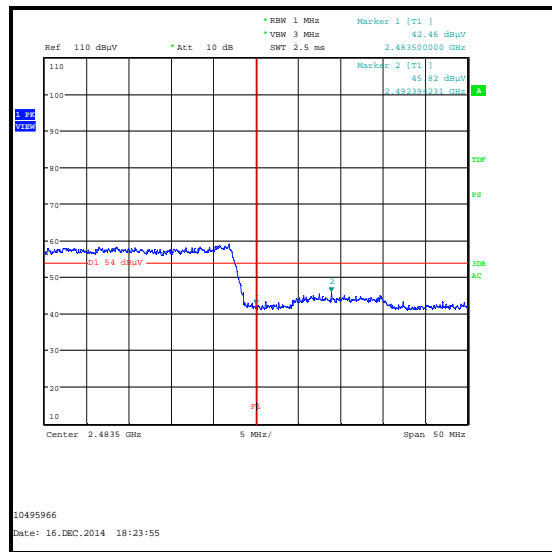
Transmitter Band Edge Radiated Emissions (continued)

Results: Hopping Mode / 2DH5

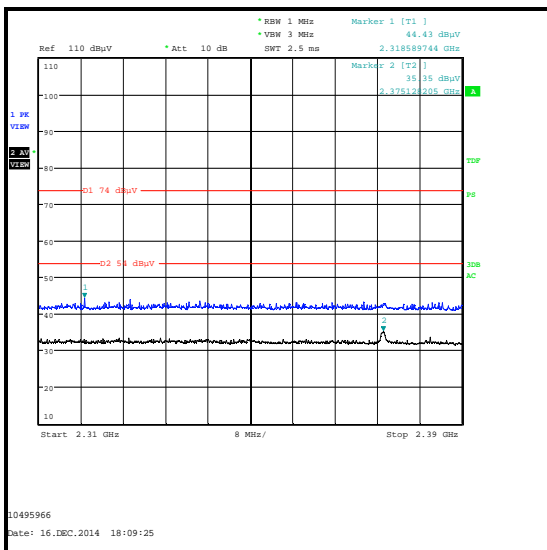
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2318.590	Horizontal	44.4	54.0**	9.6	Complied
2397.596	Horizontal	34.0	34.4*	0.4	Complied
2400.0	Horizontal	32.1	34.4*	2.3	Complied
2483.5	Horizontal	42.5	54.0**	11.5	Complied
2492.394	Horizontal	45.8	54.0**	8.2	Complied



Lower Band Edge / Peak Hopping



Upper Band Edge / Peak Hopping

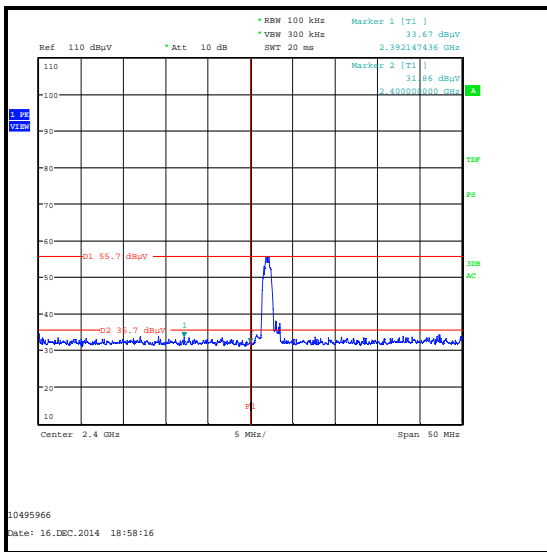


2310-2390 MHz Restricted Band Measurement

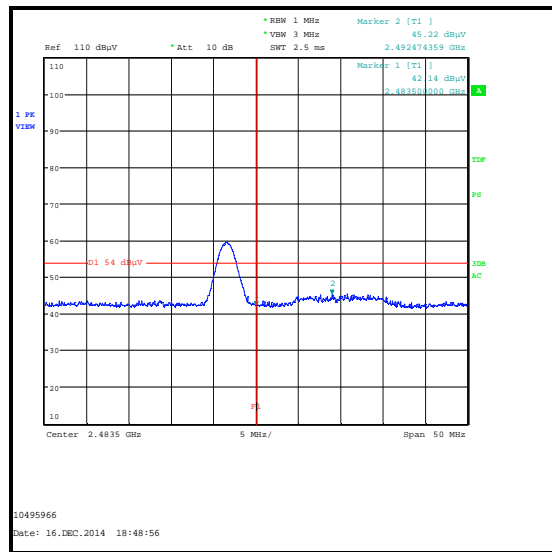
Transmitter Band Edge Radiated Emissions (continued)

Results: Static Mode / 3DH5

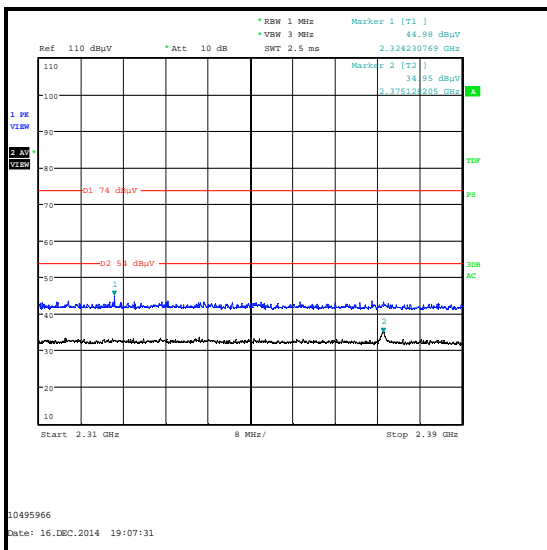
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2324.231	Horizontal	45.0	54.0**	9.0	Complied
2392.147	Horizontal	33.7	35.7*	2.0	Complied
2400.0	Horizontal	31.9	35.7*	3.8	Complied
2483.5	Horizontal	42.1	54.0**	11.9	Complied
2492.474	Horizontal	45.2	54.0**	8.8	Complied



Lower Band Edge / Peak Static



Upper Band Edge / Peak Static

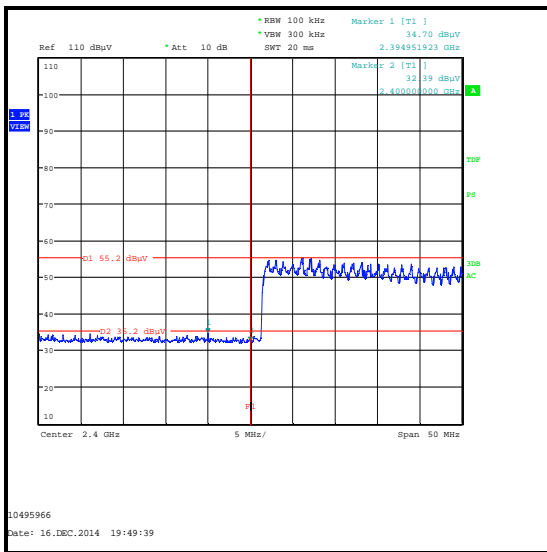


2310-2390 MHz Restricted Band Measurement

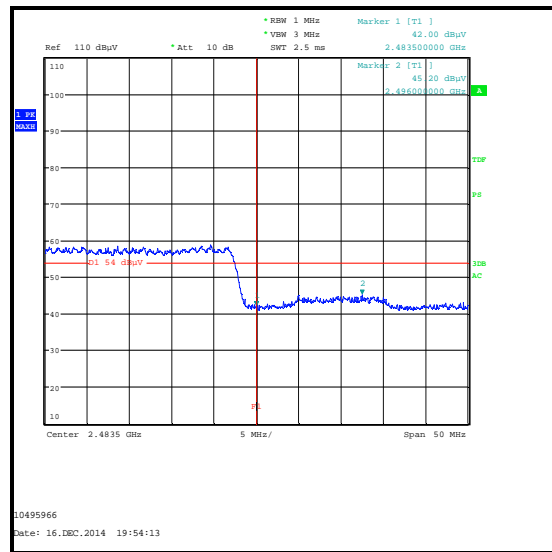
Transmitter Band Edge Radiated Emissions (continued)

Results: Hopping Mode / 3DH5

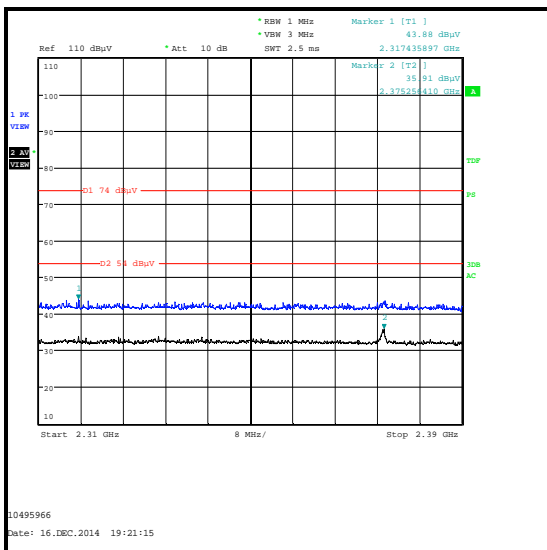
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2317.436	Horizontal	43.9	54.0**	10.1	Complied
2394.952	Horizontal	34.7	35.2*	0.5	Complied
2400.0	Horizontal	32.4	35.2*	2.8	Complied
2483.5	Horizontal	42.0	54.0**	12.0	Complied
2496.000	Horizontal	45.2	54.0**	8.8	Complied



Lower Band Edge / Peak Hopping



Upper Band Edge / Peak Hopping



2310-2390 MHz Restricted Band Measurement

Transmitter Band Edge Radiated Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	RSE Chamber	Rainford EMC	N/A	N/A	19 Dec 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	19 Dec 2014	12

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Radiated Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±2.54 dB
Carrier Frequency Separation	2.4 GHz to 2.4835 GHz	95%	±4.59 %
Average Time of Occupancy	2.4 GHz to 2.4835 GHz	95%	±3.53 ns
20 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±4.59 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 25 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	All	-	Added additional results for the following tests: Receiver/idle mode AC conducted emissions, 20 dB bandwidth, carrier frequency separation, number of hopping frequencies and average time of occupancy, maximum peak output power

--- END OF REPORT ---