

EMC

TEST REPORT

Report No. : EME-040462

Model No. : 36288

Issued Date : Aug. 5, 2004

Applicant : SENTON Enterprises Limited
Flat 10, 17/F., Fotan Ind. Centre, 26-28 Au Pui Wan St.,
Fo Tan, Shatin, N. T. Hong Kong

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

This test report consists of 26 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of Intertek Laboratory. The test result(s) in this report only applies to the tested sample(s).

Project Engineer

Jackey Chiu

Jackey Chiu

Reviewed By

Jerry Liu

Jerry Liu

Table of Contents

Summary of Tests	3
1. General information	4
1.1 Identification of the EUT	4
1.2 Additional information about the EUT	4
1.3 Antenna description	5
1.4 Peripherals equipment	5
2. Test specifications	6
2.1 Test standard	6
2.2 Operation mode	6
2.4 Test equipment	7
3. Radiated emission test FCC 15.249 (C)	8
3.1 Operating environment	8
3.2 Test setup & procedure	8
3.3 Emission limit	9
3.3.1 Fundamental and harmonics emission limits	9
3.3.2 General radiated emission limits	10
3.4 Radiated spurious emission test data	11
3.4.1 Measurement results: frequencies equal to or less than 1 GHz	11
3.4.2 Measurement results: frequency above 1GHz	13
3.4.3 Measurement results: Fundamental emission	14
4. Conducted emission test FCC 15.207	18
4.1 Operating environment	18
4.2 Test setup & procedure	18
4.3 Emission limit	19
4.4 Conducted emission data FCC 15.207	20
5. Radiated emission on the band edge FCC 15.249(C)	22

Summary of Tests**2.4GHz Cordless Phone -Model: 36288****FCC ID: PEG36288**

Test	Reference	Results
Conducted Emission of AC Power	15.207	Complies
Radiated Emission test	15.249(c), 15.209	Complies

1. General information

1.1 Identification of the EUT

Applicant	: SENTON Enterprises Limited
Product	: 2.4GHz Cordless Phone
Model No.	: 36288
FCC ID.	: PEG36288
Frequency Range (Base)	: 2402.55MHz ~ 2405.00MHz
Frequency Range (Handset)	: 2474.000MHz ~ 2476.450MHz
Channel Number	: 50 channels
Frequency of Each Channel (Base)	: 2402.55MHz+0.05kMHz k=0~49
Frequency of Each Channel (Handset)	: 2474.000MHz+0.05kMHz k=0~49
Type of Modulation	: FM
Power Supply (Base)	: 120Vac, 60Hz with adapter (U120050D)
Power Supply (Handset)	: 3.6Vdc Battery
Power Cord	: N/A
Sample Received	: May 11, 2004
Test Date(s)	: May 17, 2004 ~ Aug. 2, 2004

1.2 Additional information about the EUT

The EUT is a 2.4GHz Cordless Phone, it consists of handset unit and base unit.

The models listed below are identical to model 36288 (EUT).

Different brand serves as marking strategy.

Trade Name	Model Number
SENTON	36288
Bell Phone	36288

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 0dBi max

Antenna Type : Copper wire antenna

Connector Type : Soldering

1.4 Peripherals equipment

Dummy Load: 600Ω

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

In the conducted emission test, the EUT was operated in charging mode.
During the other tests, the EUT was operated in continuously transmitting status.

2.4 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Last Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC346	Feb. 18, 2004
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	July 14, 2004
Horn Antenna	EMCO	1GHz~18GHz	3115	EC338	Oct. 15, 2003
Horn Antenna	SCHWARZBECK	14GHz~42GHz	BBHA 9170	EC351	July 09, 2004
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC368	Feb. 21, 2004
Turn Table	HDGmbH	N/A	DS 420S	EP311	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP310	N/A
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	May 13, 2004
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	Jan. 20, 2004

Note: The above equipments are within the valid calibration period.

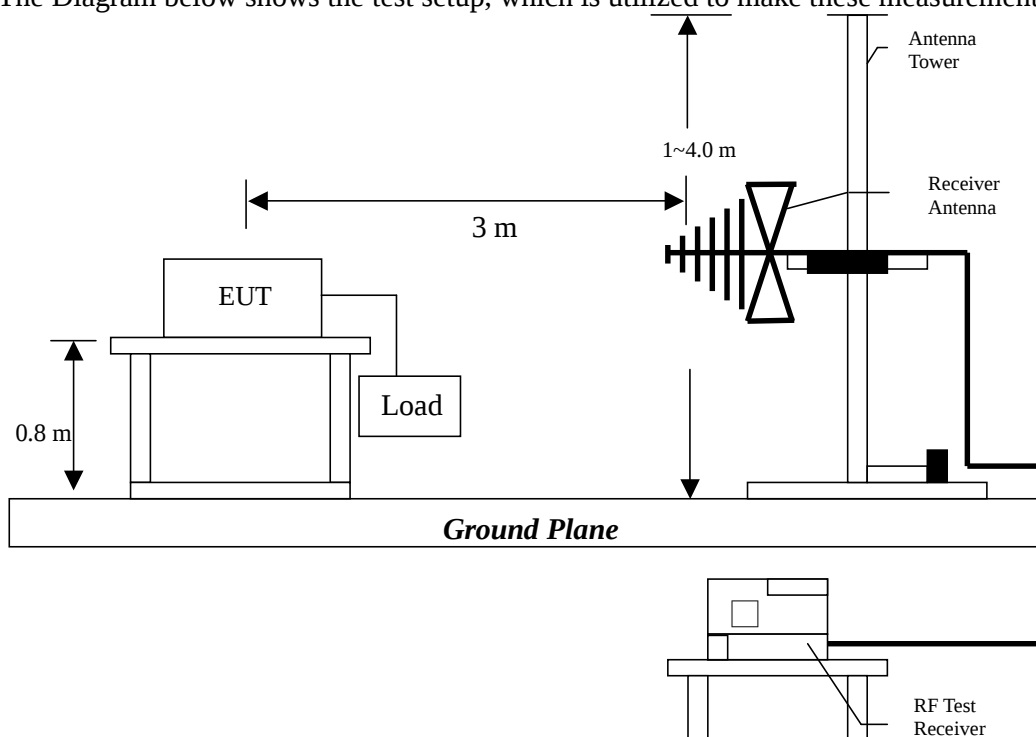
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

Temperature:	24	°C	(10-40°C)
Relative Humidity:	55	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

3.2 Test setup & procedure

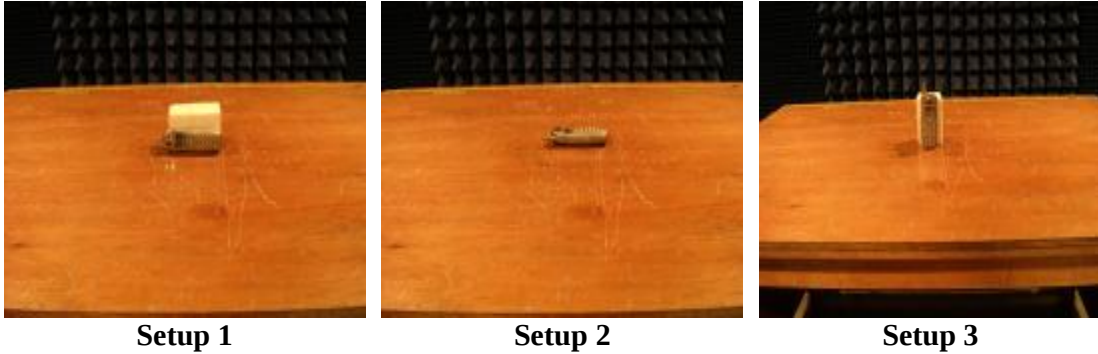
The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report. The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

This test was verified at three orthogonal axes, and the test configuration was listed below:



After verifying three axes, the worst case was occurred at setup 1 configuration. The final test was executed under this configuration and recorded in this report.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

3.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.

Expanded uncertainty (k=2) of radiated emission measurement is ± 4.98 dB.

Expanded uncertainty (k=2) of conducted emission measurement is ± 2.02 dB.

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT : 36288
Test Unit : Base
Worst Case Condition : Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
45.550	QP	V	13.05	15.20	28.25	40.00	-11.75	156.00	212.00
53.360	QP	V	13.07	15.30	28.37	40.00	-11.63	115.00	145.00
84.130	QP	V	9.50	21.10	30.60	40.00	-9.40	108.00	23.00
214.320	QP	V	11.52	18.60	30.12	43.50	-13.38	148.00	258.00
718.890	QP	V	22.22	20.20	42.42	46.00	-3.58	136.00	365.00
800.190	QP	V	23.89	15.30	39.19	46.00	-6.81	147.00	214.00
99.870	QP	H	10.44	21.00	31.44	43.50	-12.06	158.00	362.00
111.580	QP	H	11.80	20.40	32.20	43.50	-11.30	200.00	165.00
117.450	QP	H	11.80	19.30	31.10	43.50	-12.40	198.00	147.00
280.350	QP	H	14.07	11.70	25.77	46.00	-20.23	236.00	185.00
800.210	QP	H	23.89	12.90	36.79	46.00	-9.21	154.00	254.00
827.390	QP	H	24.46	10.90	35.36	46.00	-10.64	166.00	360.00

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss

EUT : 36288
 Test Unit (Worst Case Condition) : Handset (Setup 1)
 Test Condition : Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
796.360	QP	V	23.49	10.50	33.99	46.00	-12.01	108.00	325.00
807.980	QP	V	23.89	8.40	32.29	46.00	-13.71	114.00	360.00
823.880	QP	V	23.89	9.10	32.99	46.00	-13.01	103.00	321.00
842.980	QP	V	24.46	7.80	32.26	46.00	-13.74	108.00	140.00
862.480	QP	V	24.39	8.40	32.79	46.00	-13.21	168.00	0.00
885.570	QP	V	24.51	8.40	32.91	46.00	-13.09	154.00	125.00
796.350	QP	H	23.49	16.20	39.69	46.00	-6.31	154.00	47.00
813.840	QP	H	23.89	8.10	31.99	46.00	-14.01	168.00	164.00
839.100	QP	H	24.46	7.70	32.16	46.00	-13.84	125.00	360.00
860.350	QP	H	24.39	8.40	32.79	46.00	-13.21	178.00	147.00
879.770	QP	H	24.51	7.80	32.31	46.00	-13.69	149.00	165.00
901.150	QP	H	24.76	8.50	33.26	46.00	-12.74	164.00	136.00

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss

3.4.2 Measurement results: frequency above 1GHz

EUT : 36288
Test Unit : Base
Test Condition : Tx at channel 1 and 50

Test Result:

No spurious emission was found above the spectrum analyzer's noise floor.
The noise floor are listed as below:

For PK:

1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

EUT : 36288
Test Unit (Worst Case Condition) : Handset (setup1)
Test Condition : Tx at channel 1and 50

Test Result:

No spurious emission was found above the spectrum analyzer's noise floor.
The noise floor are listed as below:

For PK:

1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

3.4.3 Measurement results: Fundamental emission

EUT : 36288

Test Unit : Base

Test Condition : Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
2402.550	PK	V	33.74	30.54	60.03	56.83	114.00	-57.17	100.00	313.00
2402.550	AV	V	33.74	30.54	59.62	56.42	94.00	-37.58	100.00	313.00
2402.550	PK	H	33.74	30.54	58.38	55.18	114.00	-58.82	141.00	84.00
2402.550	AV	H	33.74	30.54	57.95	54.75	94.00	-39.25	141.00	84.00

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

EUT : 36288
Test Unit : Base
Test Condition : Tx at channel 50

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
2405.000	PK	V	33.74	30.54	59.15	55.95	114.00	-58.05	178.00	151.00
2405.000	AV	V	33.74	30.54	58.35	55.15	94.00	-38.85	178.00	151.00
2405.000	PK	H	33.74	30.54	57.16	53.96	114.00	-60.04	140.00	85.00
2405.000	AV	H	33.74	30.54	56.52	53.32	94.00	-40.68	140.00	85.00

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

For PK:

1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

EUT : 36288
 Test Unit (Worst Case Condition) : Handset (Setup 1)
 Test Condition : Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
2474.000	PK	V	33.74	30.54	63.93	60.73	114.00	-53.27	185.00	314.00
2474.000	AV	V	33.74	30.54	63.57	60.37	94.00	-33.63	185.00	314.00
2474.000	PK	H	33.74	30.54	60.83	57.63	114.00	-56.37	189.00	41.00
2474.000	AV	H	33.74	30.54	60.24	57.04	94.00	-36.96	189.00	41.00

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

For PK:

1GHz-3GHz: 20dBuV
 3GHz-14GHz: 27dBuV
 14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV
 3GHz-14GHz: 16dBuV
 14GHz-26.5GHz: 28dBuV

EUT : 36288
 Test Unit (Worst Case Condition) : Handset (Setup 1)
 Test Condition : Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
2476.450	PK	V	33.74	30.54	60.09	56.89	114.00	-57.11	100.00	197.00
2476.450	AV	V	33.74	30.54	59.60	56.40	94.00	-37.60	100.00	197.00
2476.450	PK	H	33.74	30.54	58.97	55.77	114.00	-58.23	189.00	153.00
2476.450	AV	H	33.74	30.54	58.66	55.46	94.00	-38.54	189.00	153.00

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

For PK:

1GHz-3GHz: 20dBuV
 3GHz-14GHz: 27dBuV
 14GHz-26.5GHz: 39dBuV

For AV:

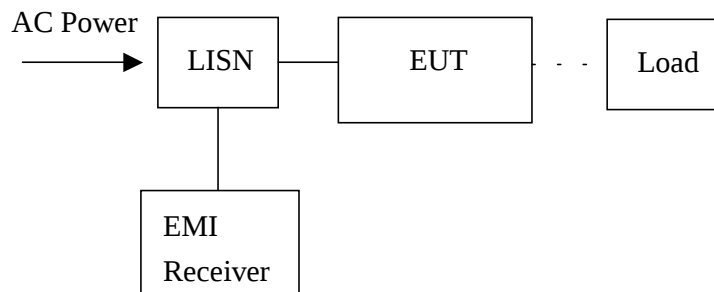
1GHz-3GHz: 10dBuV
 3GHz-14GHz: 16dBuV
 14GHz-26.5GHz: 28dBuV

4. Conducted emission test FCC 15.207

4.1 Operating environment

Temperature:	23	°C	(10-40°C)
Relative Humidity:	55	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1061hPa)

4.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

4.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

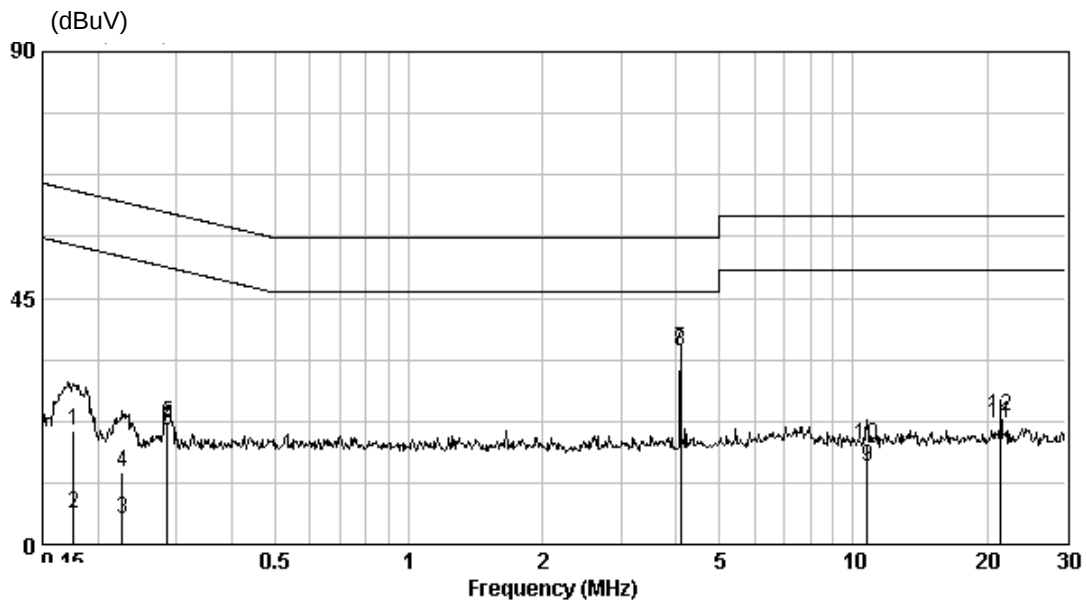
4.4 Conducted emission data FCC 15.207

(1) Line

EUT : 36288

Worst Case Condition : Charging mode

Freq. (MHz)	Correction Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.176	0.00	20.84	64.68	-43.84	QP
0.176	0.00	5.48	54.68	-49.20	AVERAGE
0.227	0.00	13.20	62.56	-49.36	QP
0.227	0.00	4.48	52.56	-48.08	AVERAGE
0.286	0.00	22.11	60.64	-38.53	QP
0.286	0.00	20.75	50.64	-29.89	AVERAGE
4.095	0.00	35.65	56.00	-20.35	QP
4.095	0.00	35.39	46.00	-10.61	AVERAGE
10.738	0.00	18.12	60.00	-41.88	QP
10.738	0.00	14.31	50.00	-35.69	AVERAGE
21.478	0.00	23.36	60.00	-36.64	QP
21.478	0.00	22.05	50.00	-27.95	AVERAGE

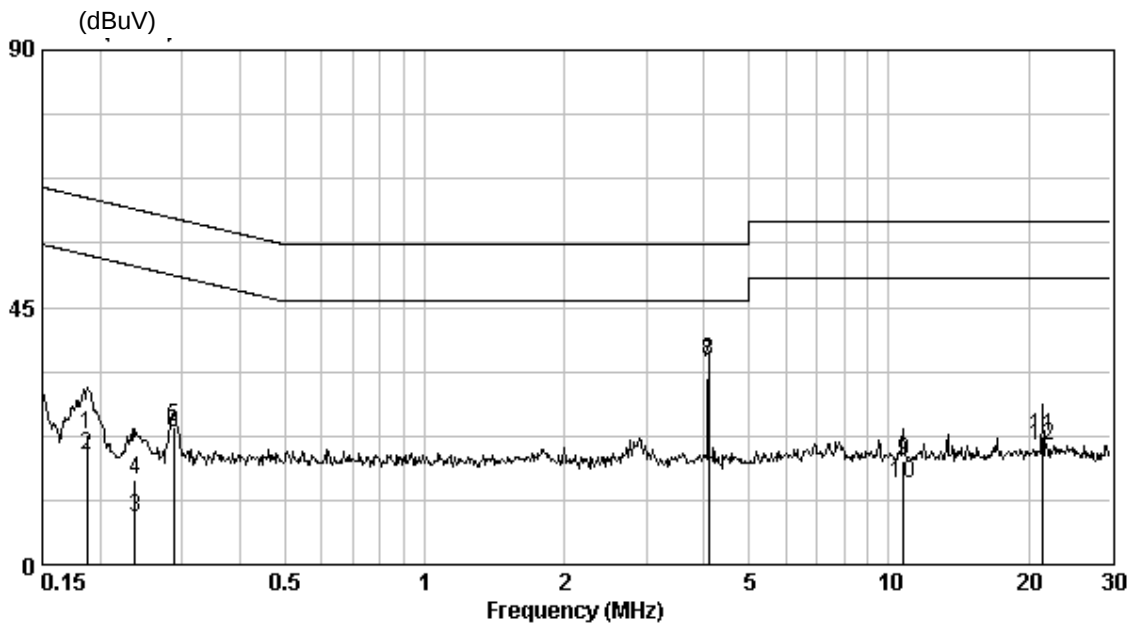


(1) Neutral

EUT : 36288

Worst Case Condition : Charging mode

Freq. (MHz)	Correction Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.187	0.00	22.90	64.15	-41.25	QP
0.187	0.00	19.06	54.15	-35.09	AVERAGE
0.238	0.00	14.87	62.16	-47.29	QP
0.238	0.00	8.38	52.16	-43.78	AVERAGE
0.288	0.00	23.93	60.57	-36.64	QP
0.288	0.00	22.92	50.57	-27.65	AVERAGE
4.095	0.00	35.64	56.00	-20.36	QP
4.095	0.00	35.21	46.00	-10.79	AVERAGE
10.738	0.00	18.04	60.00	-41.96	QP
10.738	0.00	14.31	50.00	-35.69	AVERAGE
21.478	0.00	22.41	60.00	-37.59	QP
21.478	0.00	20.85	50.00	-29.15	AVERAGE

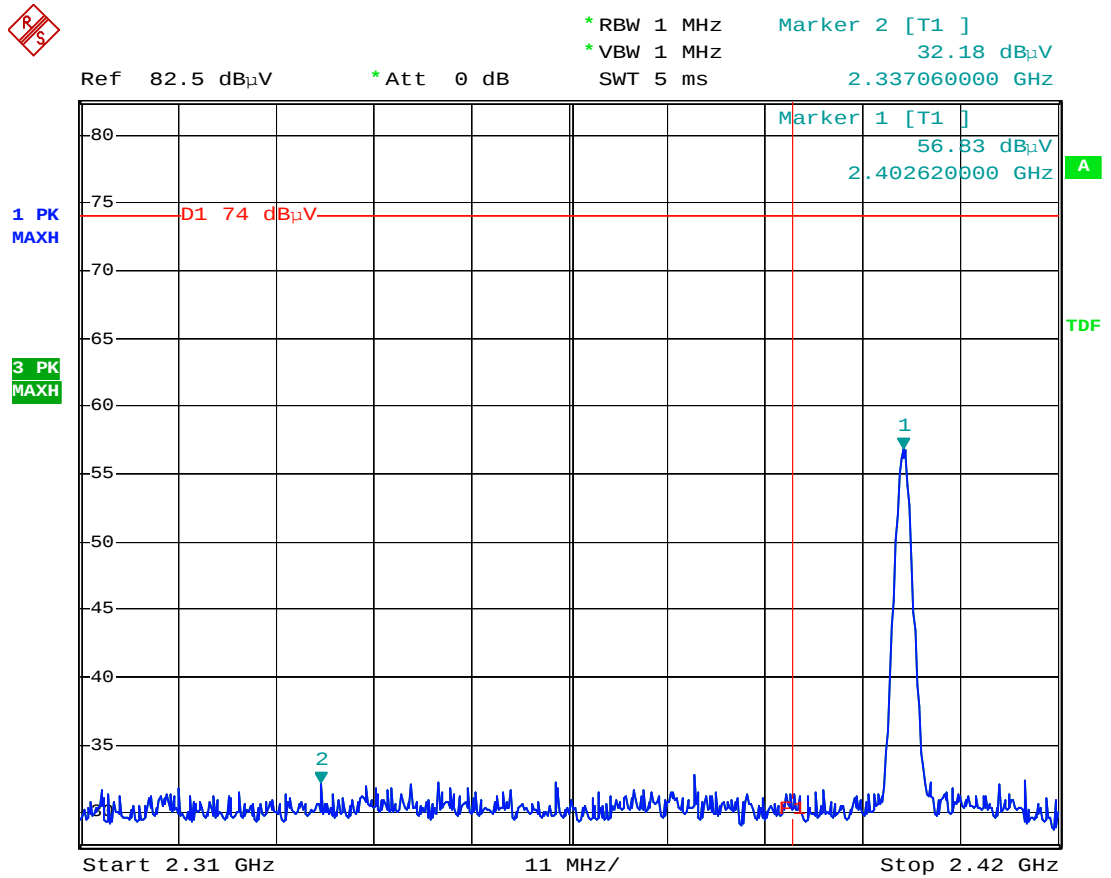


5. Radiated emission on the band edge FCC 15.249(C)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (Base: 2402.55MHz ~ 2405.00MHz, Handset: 2474.000MHz ~ 2476.450MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

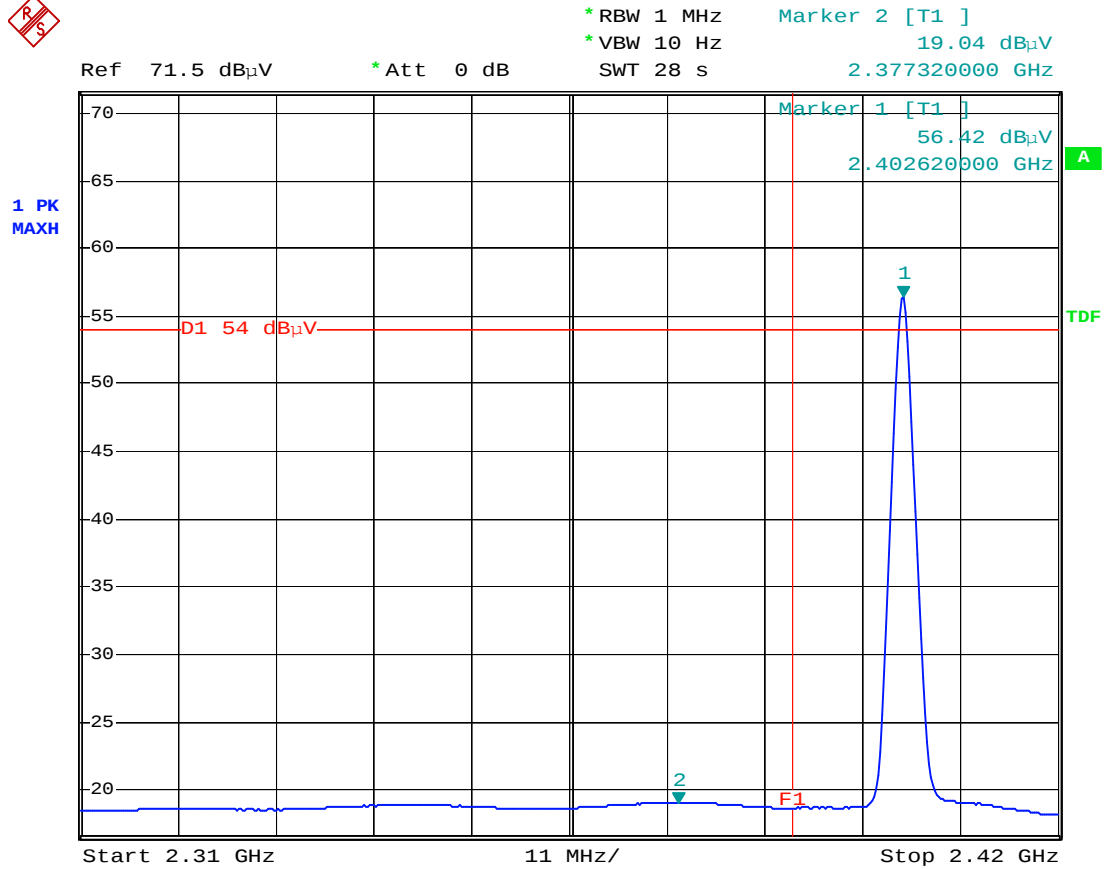
Please see the plot below.

Test Mode: Base



Comment : Band-edge test at channel 1

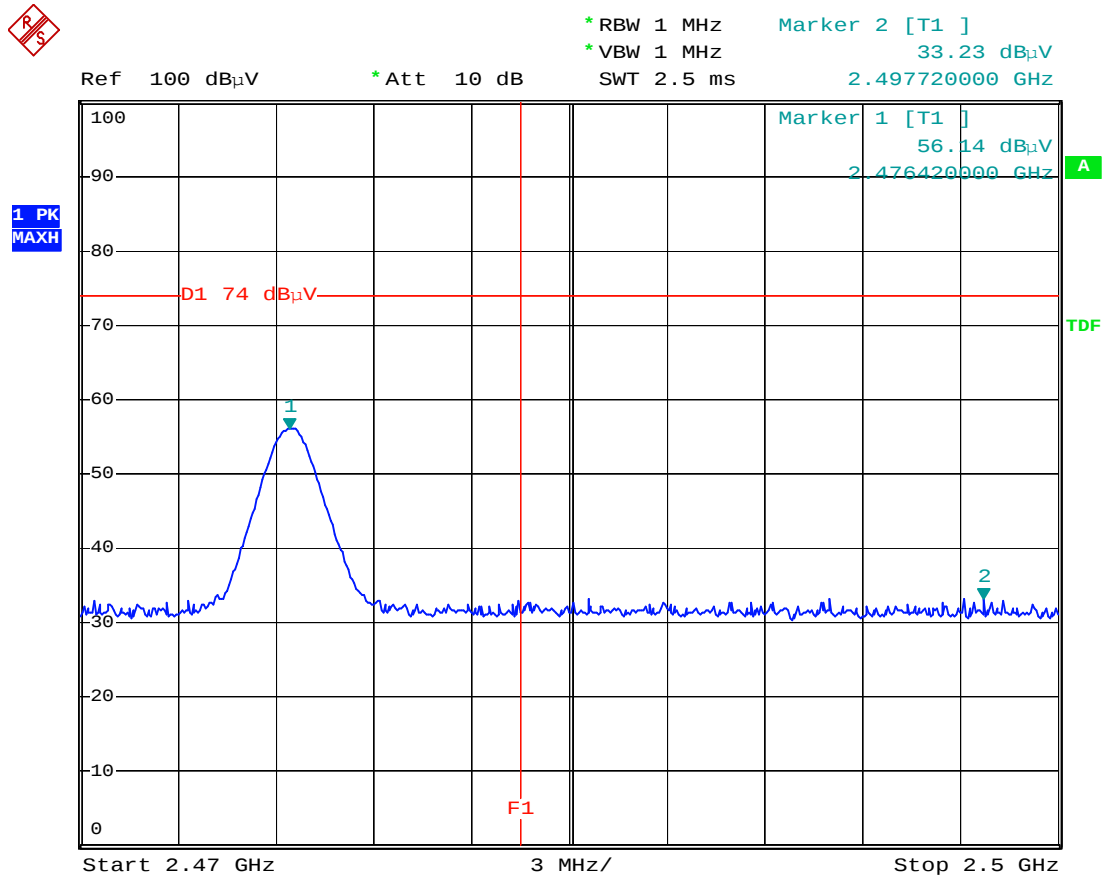
Peak detector F2=2390MHz



Comment : Band-edge test at channel 1

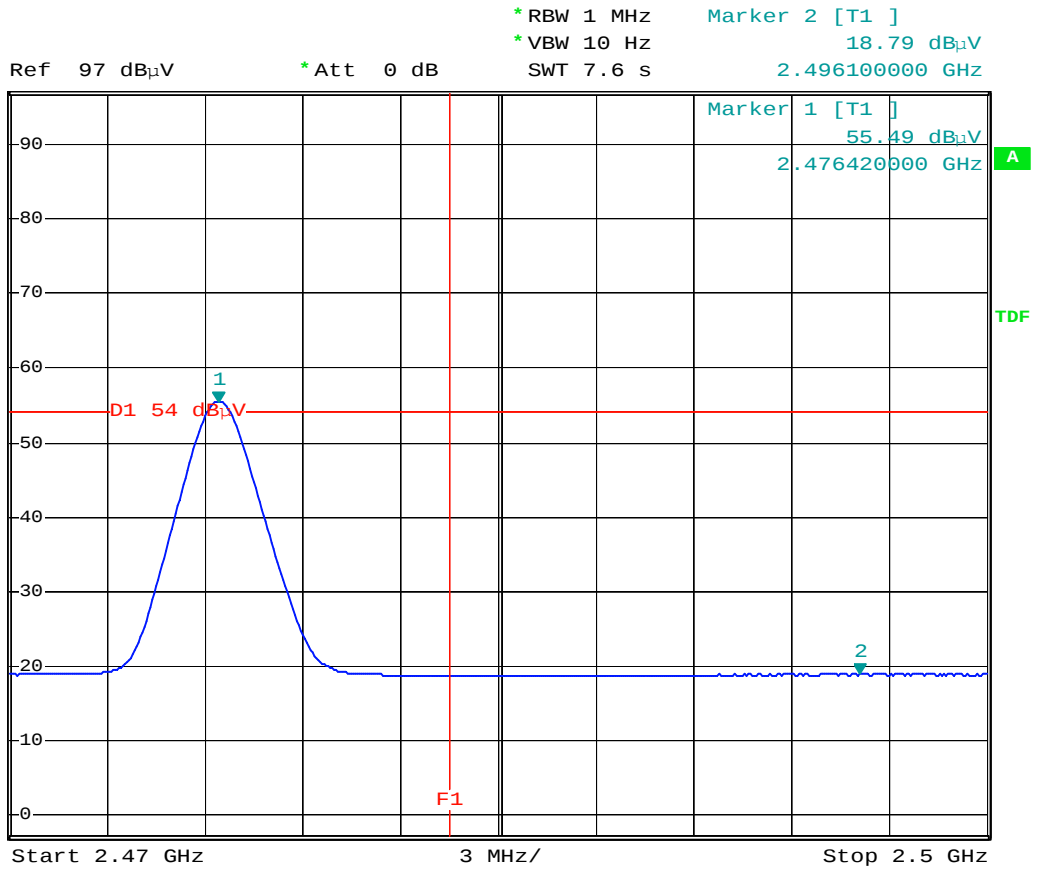
Peak detector F2=2390MHz

Test Mode: Handset



Comment : Band-edge test at channel 50

Peak detector F1=2483.5MHz



Comment : Band-edge test at channel 50

Average detector F1=2483.5MHz