HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

Hermon Laboratories Ltd.
Harakevet Industrial Zone, Binyamina 30500,
Israel
Tel. +972-4-6288001
Fax. +972-4-6288277
E-mail: mail@hermonlabs.com

TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231 (e) and subpart B

FOR:

Given Imaging Ltd.
Capsule
Model:SmartPill
FCC ID:O8PSMARTPILL

Table of contents

1 Applicant information

Client name:	Given Imaging Ltd.
Address:	2 Hacarmel street, P.O.Box 258,Yokneam, 20692, Israel
Telephone:	+972 4909 7783
Fax:	+972 4993 8060
E-mail:	Liron.Bar-Yaakov@givenimaging.com
Contact name:	Mr. Liron Bar Yaakov

2 Equipment under test attributes

Product name:	Capsule
Product type:	Transmitter
Model(s):	SmartPill
Serial number:	33982
Hardware version:	Rev 13
Software release:	V1.4
Receipt date	11-Mar-14

3 Manufacturer information

Manufacturer name:	Given Imaging Ltd.
Address:	2 Hacarmel street, New Industrial Park, P.O.Box 258, Yokneam, 20692, Israel
Telephone:	+972 4909 7783
Fax:	+972 4993 8060
E-Mail:	Liron.Bar-Yaakov@givenimaging.com
Contact name:	Mr. Liron Bar Yaakov

4 Test details

Project ID:	25291
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	11-Mar-14
Test completed:	16-Mar-14
Test specification(s):	FCC 47CFR part 15, subpart C, §15.231(e) subpart B

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Part 15, Section 231(e), Periodic operation requirements	Pass
FCC Part 15, Section 231(e), Field strength of emissions	Pass
FCC Part 15, Section 231(c), Occupied bandwidth	Pass
FCC Part 15, Section 207, Conducted emission	Not required
FCC Part 15, Section 203, Antenna requirements	Pass
Unintentional emissions	
FCC Part 15, Section 107, Conducted emission at AC power port	Not required
FCC Part 15, Section 109, Radiated emission	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. Alex Chaplik, test engineer	March 16, 2014	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 20, 2014	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	March 21, 2014	

6 EUT description

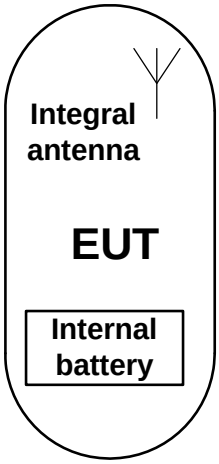
6.1 General information

The EUT, SmartPill capsule, is a battery fed device, which comprises a transmitter operating at 434 MHz.

6.2 Changes made in EUT

No changes were performed in the EUT during the testing.

6.3 Test configuration

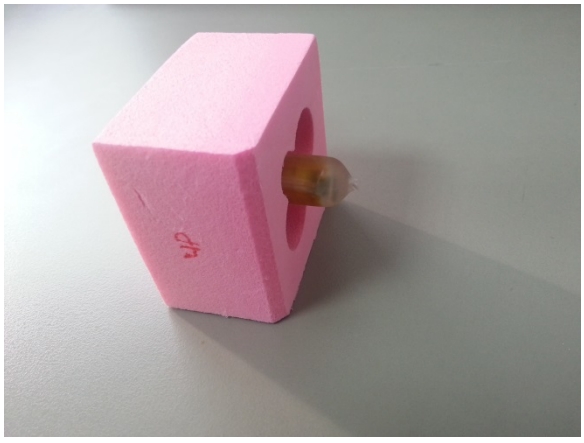


6.4 EUT orthogonal positions

Photograph 6.4.1 EUT in X-axis orthogonal position

Photograph 6.4.2 EUT in Y-axis orthogonal position

Photograph 6.4.3 EUT in Z-axis orthogonal position



6.5 Transmitter characteristics

Type of equipment							
V	Stand-alone (Equipment with or without its own control provisions)						
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)						
	Plug-in card (Equipment intended for a variety of host systems)						
Operating frequencies;	434.2 MHz						
Maximum field strength	65.62 dB(µV/m) at 3 m test distance						
Is transmitter output power variable?	**V**	No					
		Yes		continuous variable			
				stepped variable with stepsize, software controlled	dB		
Antenna connection							
unique coupling	standard connector		**V**	Integral		with temporary RF connector	
					V	without temporary RF connector	
Antenna/s technical characteristics							
Type	Manufacturer	Model number	Gain				
Printed	Given Imaging	NA	Not defined				
Type of modulation	ASK						
Transmitter aggregate data rate/s	8.192 kbps						
Transmitter duty cycle supplied for test	1%						
Transmitter power source							
V	Battery	**Nominal rated voltage**	3 VDC	Battery type			
	DC	**Nominal rated voltage**					
	AC mains	**Nominal rated voltage**		Frequency			
Common power source for transmitter and receiver			**V**	yes		no	

Test specification:	FCC Part 15, Section 231(e), Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Mar-14		
Temperature: 22.7 ºC	Air Pressure: 1013 hPa	Relative Humidity: 43 %	Power Supply: 3V battery
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C requirements

7.1 Periodic operation requirements

7.1.1 General

The EUT was verified for compliance with periodic operation requirements listed below:

- Continuous transmissions such as voice, video and the radio control of toys are not permitted;
- Duration of each transmission shall not be greater than 1 second;
- Silent period between transmissions shall be at least 30 times the duration of the transmission;
- Silent period between transmissions shall be in no case less than 10 seconds.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 7.1.1.

7.1.2 Test procedure for transmitter shut down test

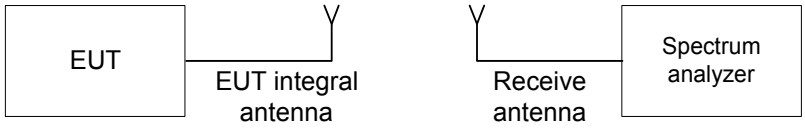
7.1.2.1 The EUT was set up as shown in Figure 7.1.1.

7.1.2.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.2.3 The transmitter was activated either manually or automatically. Once manually operated transmitter was activated, the switch was immediately released.

7.1.2.4 The transmission time was captured and shown in the associated plots. The test results were recorded in Table 7.1.2.

Figure 7.1.1 Setup for transmitter shut down test



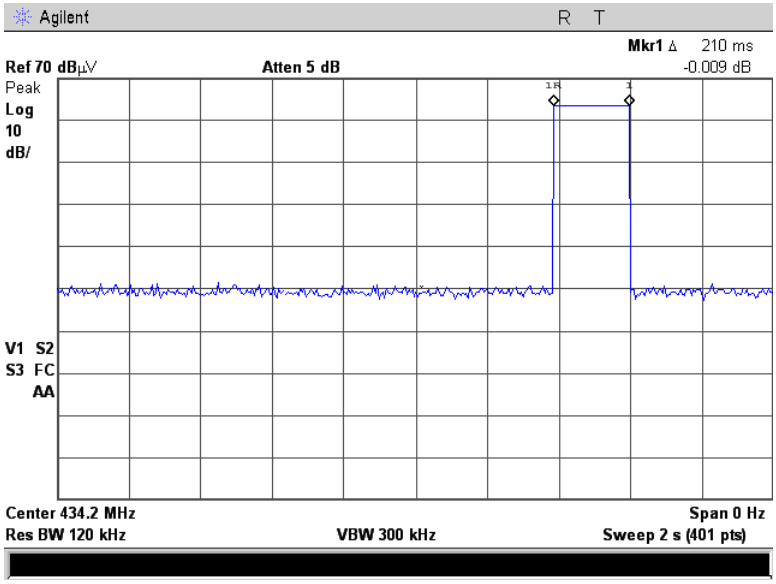
Test specification:	**FCC Part 15, Section 231(e), Periodic operation requirements**		
Test procedure:	Supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Mar-14		
Temperature: 22.7 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 43 %	**Power Supply:** 3V battery
Remarks:			

Table 7.1.1 Periodic operation requirements

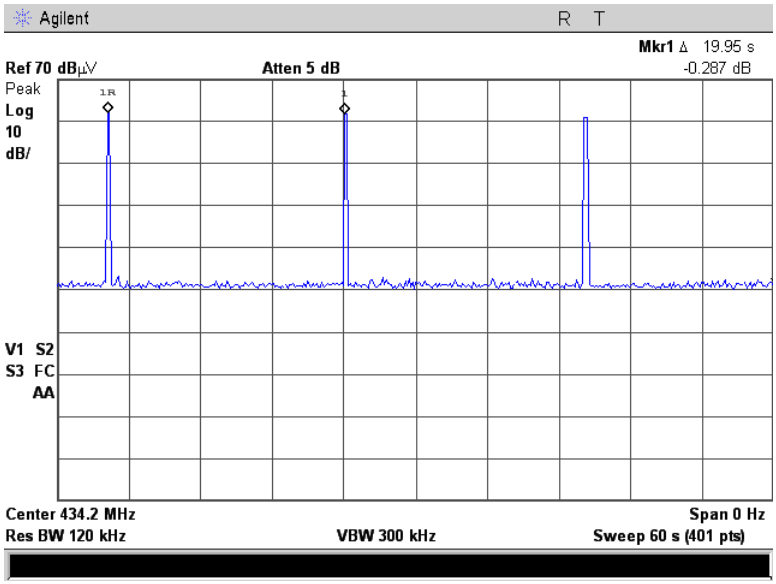
Requirement	Rationale	Verdict
Continuous transmissions are not permitted	Supplier declaration	Comply
Duration of each transmission shall not be greater than 1 second	Plot 7.1.1	Comply
Silent period between transmissions shall be at least 30 times the duration of the transmission	Plot 7.1.2	Comply
Silent period between transmissions shall be in no case less than 10 seconds	Plot 7.1.2	Comply

Test specification:	FCC Part 15, Section 231(e), Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Mar-14		
Temperature: 22.7 °C	Air Pressure: 1013 hPa	Relative Humidity: 43 %	Power Supply: 3V battery
Remarks:			

Plot 7.1.1 Transmitter pulse duration



Plot 7.1.2 Transmission pulse period



Test specification:	FCC Part 15, Section 231(e), Periodic operation requirements		
Test procedure:	Supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Mar-14		
Temperature: 22.7 ºC	Air Pressure: 1013 hPa	Relative Humidity: 43 %	Power Supply: 3V battery
Remarks:			

Table 7.1.2 Total duration of transmissions

Total transmission duration, ms	Silent period between transmissions, s	Silent period between transmissions limit, s	Margin, s	Verdict
210	20	10	10	Pass

Reference numbers of test equipment used

HL3001							

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

7.2 Field strength of emissions

7.2.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.2.1 and Table 7.2.2.

Table 7.2.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
434.205	92.9	72.9

Table 7.2.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)				
	Within restricted bands			Outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	74.0***	54.0***
0.090 – 0.110	NA	108.5 – 106.8**	NA		
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**		
0.490 – 1.705	NA	73.8 – 63.0**	NA		
1.705 – 30.0*		69.5			
30 – 88		40.0			
88 – 216		43.5			
216 – 960		46.0			
960 - 1000		54.0			
Above 1000	74.0	NA	54.0		

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

**- The limit decreases linearly with the logarithm of frequency.

***-The limit used in accordance with section 15.231(b)(3).

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

Test specification:	**FCC Part 15, Section 231(e), Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 50 %	**Power Supply:** 3V battery
Remarks:			

7.2.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.

7.2.2.2 The measurements were performed in three EUT orthogonal positions.

7.2.2.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

7.2.2.4 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

7.2.3 Test procedure for spurious emission field strength measurements above 30 MHz

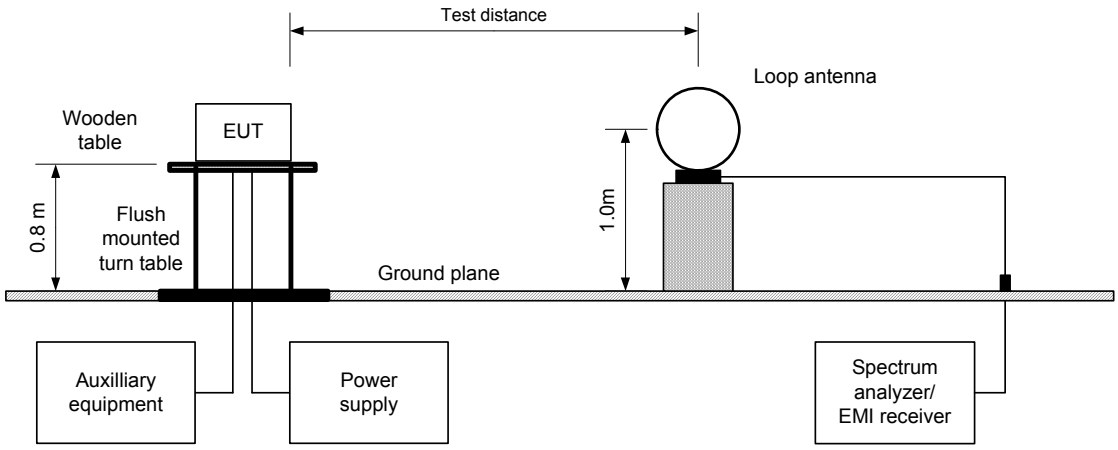
7.2.3.1 The EUT was set up as shown in Figure 7.2.2, energized and the performance check was conducted.

7.2.3.2 The measurements were performed in three EUT orthogonal positions.

7.2.3.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

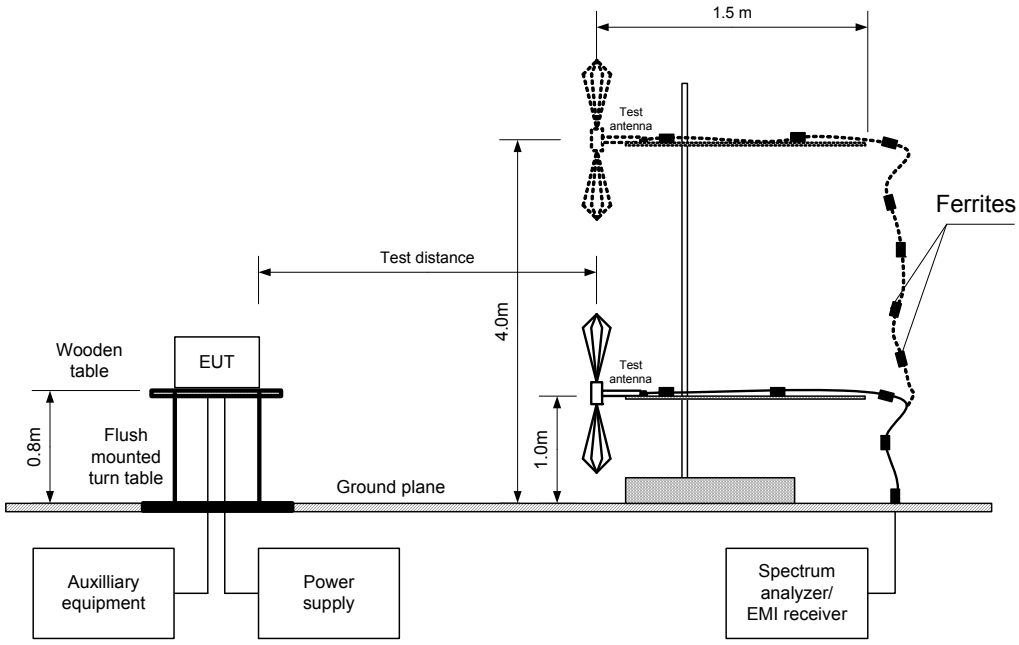
7.2.3.4 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz



Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	**FCC Part 15, Section 231(e), Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 50 %	**Power Supply:** 3V battery
Remarks:			

Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE:	3 m
EUT POSITION:	3 orthogonal (X / Y / Z)
MODULATION:	ASK
MODULATING SIGNAL:	ID code
BIT RATE:	8.192 kbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 - 4500 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) 1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Fundamental emission* **											
434.2013	V	1.0	310	65.62	92.9	-27.28	65.62	NA	72.9	-7.28	Pass
Spurious emissions											
868.4075	H	1.0	270	37.94	72.9	-34.96	37.94	NA	52.9	-14.96	Pass
1302.578	V	1.5	90	47.88	74.0	-26.12	45.72	NA	54.0	-8.28	
1737.490	V	1.3	360	45.33	74.0	-28.67	40.09	NA	54.0	-13.91	
2171.050	V	1.6	280	47.89	74.0	-26.11	42.58	NA	54.0	-11.42	
2605.155	V	1.5	30	47.50	74.0	-26.50	43.22	NA	54.0	-10.78	
3039.348	V	1.5	30	54.16	74.0	-19.84	52.65	NA	54.0	-1.35	
3473.590	V	1.5	300	53.87	74.0	-20.13	52.15	NA	54.0	-1.85	
3907.895	V	1.5	220	53.53	74.0	-20.47	51.75	NA	54.0	-2.25	
4341.575	V	1.5	360	49.98	74.0	-24.02	44.68	NA	54.0	-9.32	

Note: The limit for spurious in the restricted bands used in accordance with section 15.231(b)(3).

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = dB below (negative if above) specification limit.
*** Max value was obtained in the EUT Y-axis orthogonal position.

Table 7.2.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Number of pulses during 100ms	Duration, ms	Period, ms		
210	1	NA	NA	NA	NA

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

Test specification:	**FCC Part 15, Section 231(e), Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 50 %	**Power Supply:** 3V battery
Remarks:			

Table 7.2.5 Field strength of emissions below 1 GHz within restricted bands

TEST DISTANCE:	3 m
EUT POSITION:	3 orthogonal (X / Y / Z)
MODULATION:	ASK
MODULATING SIGNAL:	ID code
BIT RATE:	8.192 kbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	**Peak emission, dB(μV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***				
No emissions were found								Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

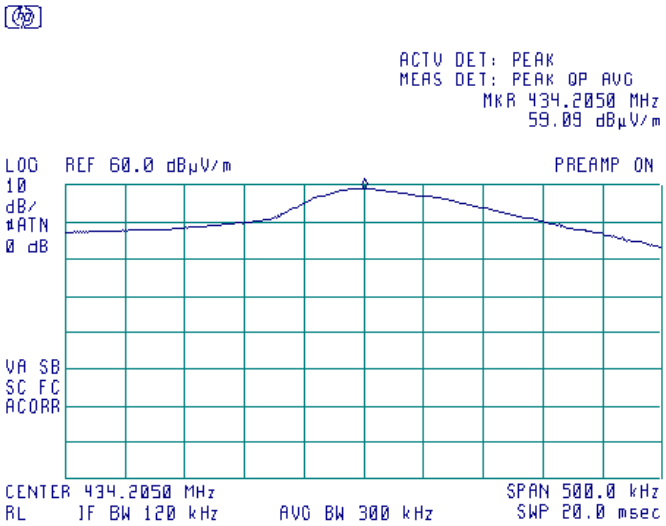
HL 0446	HL 0521	HL 0604	HL 2871	HL 4353			

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

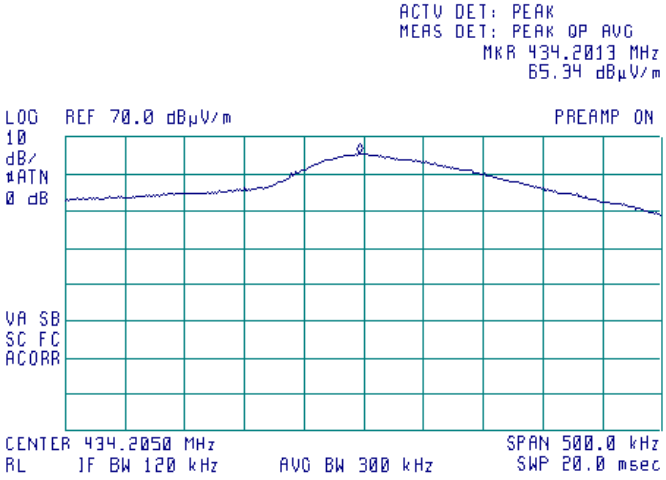
Plot 7.2.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: X-axis
INPUT VOLTAGE: Unom



Plot 7.2.2 Radiated emission measurements at the fundamental frequency

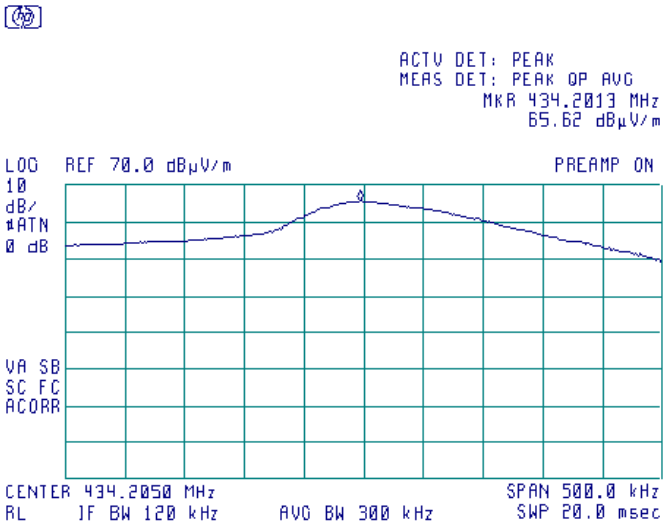
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: X-axis
INPUT VOLTAGE: Unom



Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

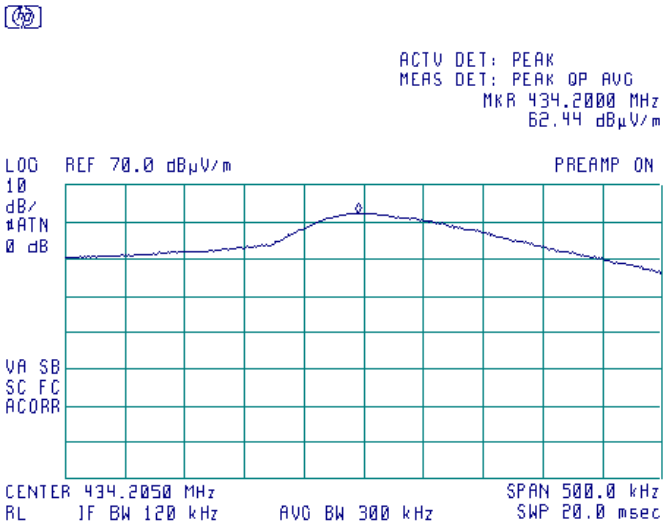
Plot 7.2.3 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis
INPUT VOLTAGE: Unom



Plot 7.2.4 Radiated emission measurements at the fundamental frequency

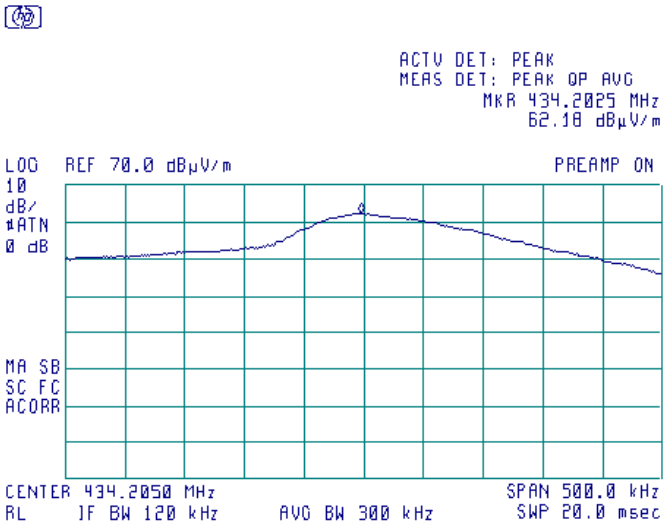
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis
INPUT VOLTAGE: Unom



Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

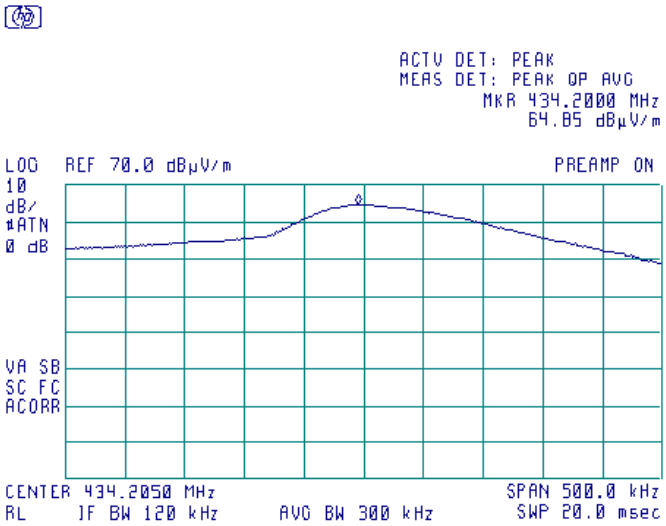
Plot 7.2.5 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Z-axis
INPUT VOLTAGE: Unom



Plot 7.2.6 Radiated emission measurements at the fundamental frequency

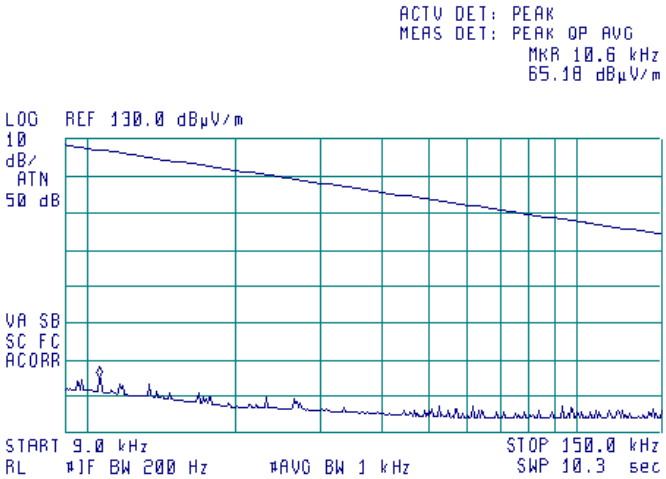
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Z-axis
INPUT VOLTAGE: Unom



Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

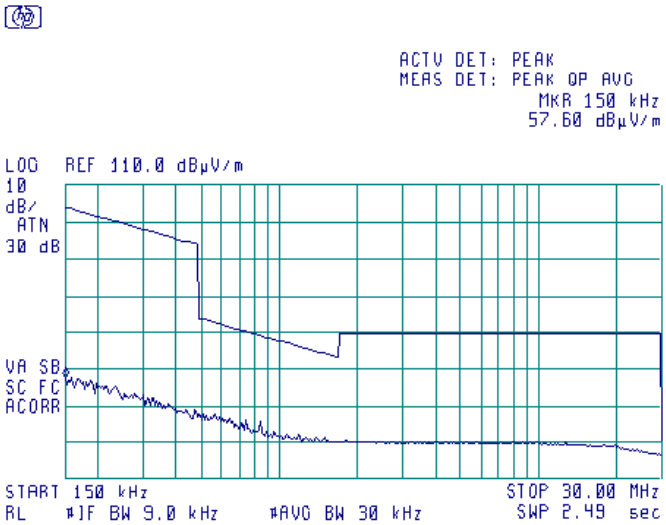
Plot 7.2.7 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



Plot 7.2.8 Radiated emission measurements from 0.15 to 30 MHz

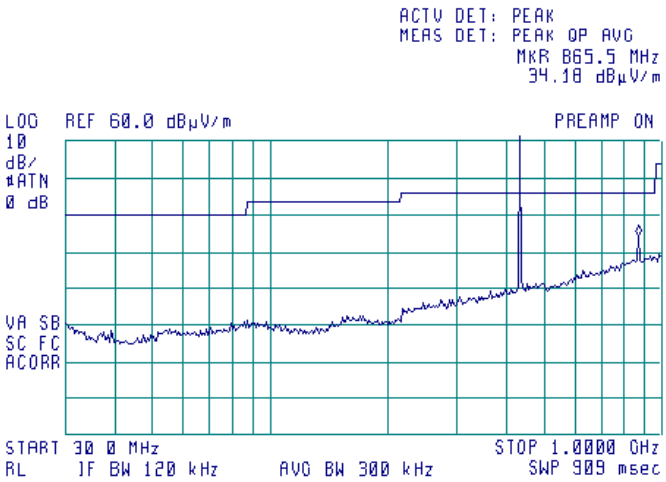
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

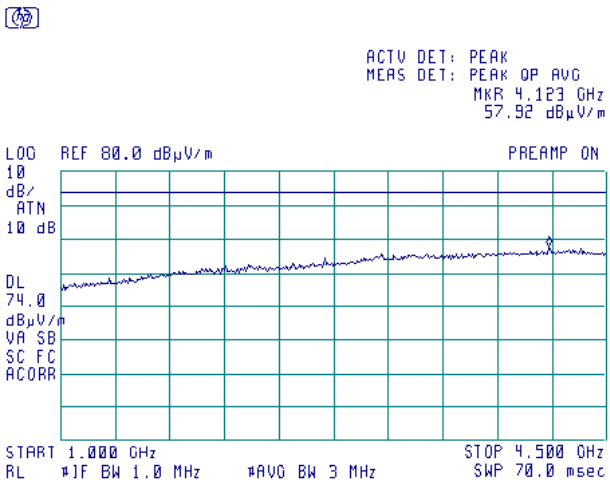
Plot 7.2.9 Radiated emission measurements from 30 to 1000 MHz

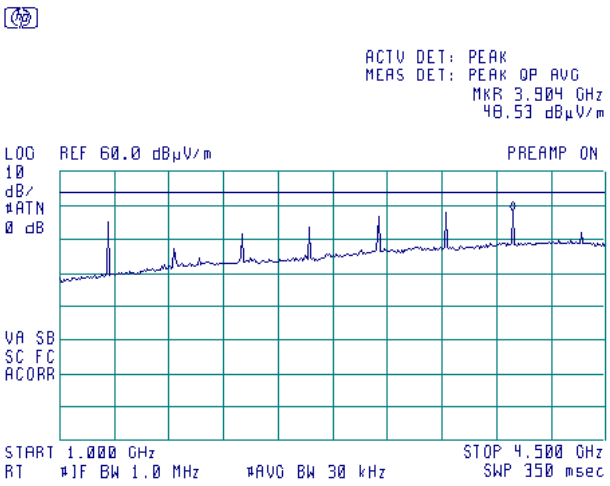
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Y-axis



Plot 7.2.10 Radiated emission measurements from 1000 to 4500 MHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Y-axis

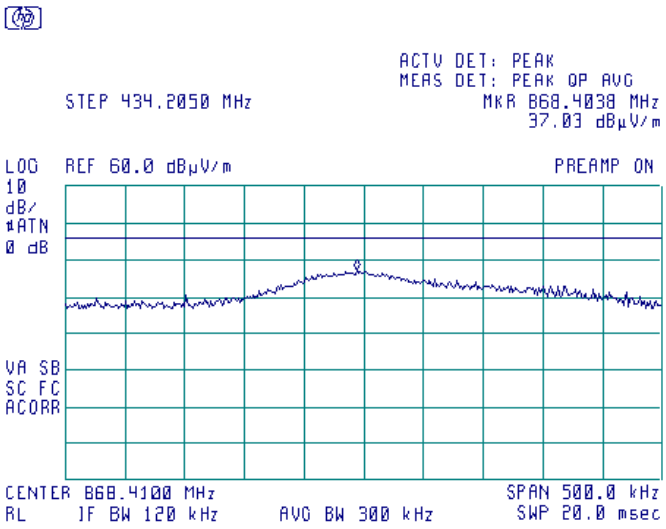




Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

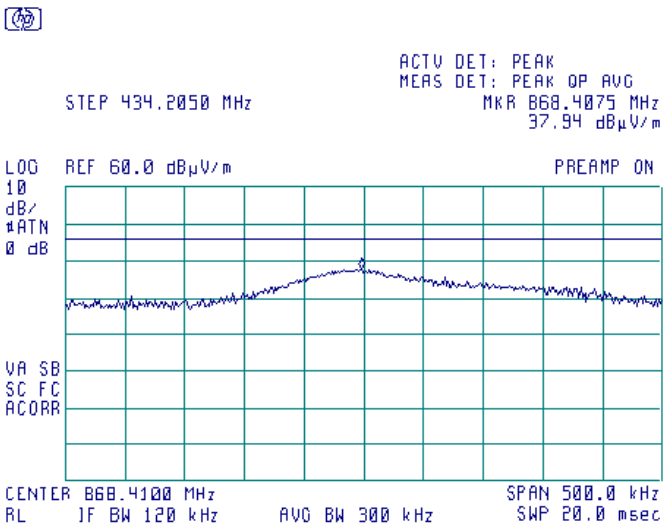
Plot 7.2.11 Radiated emission measurements at the second harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis



Plot 7.2.12 Radiated emission measurements at the second harmonic frequency

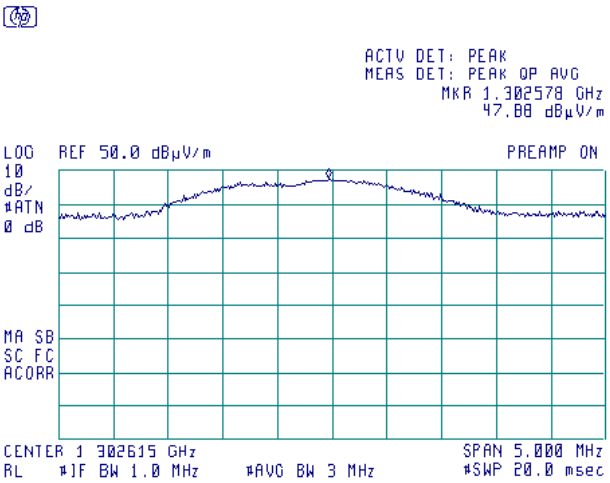
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

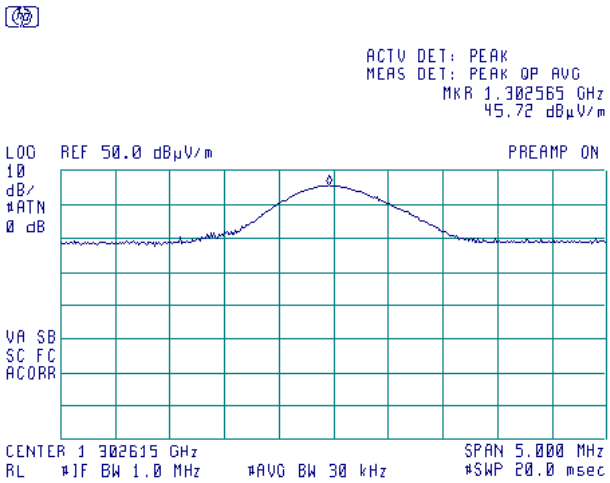


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.13 Radiated emission measurements at the third harmonic frequency

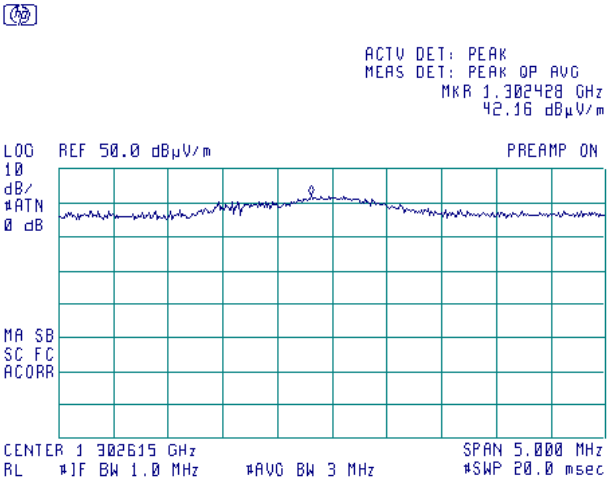
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

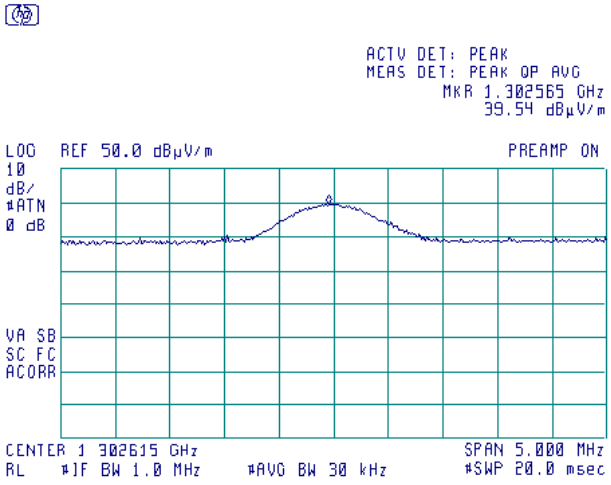




Plot 7.2.14 Radiated emission measurements at the third harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

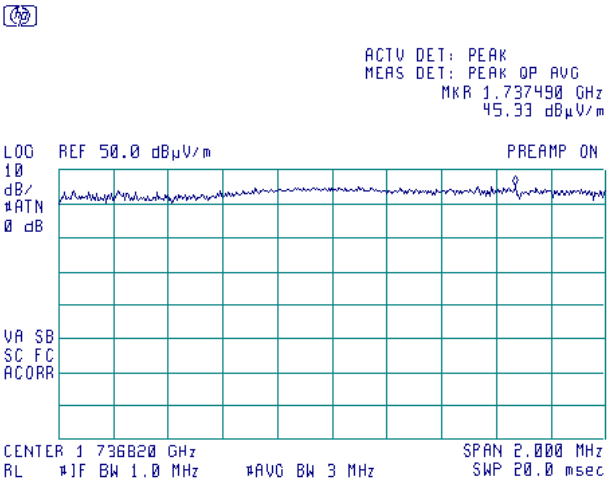


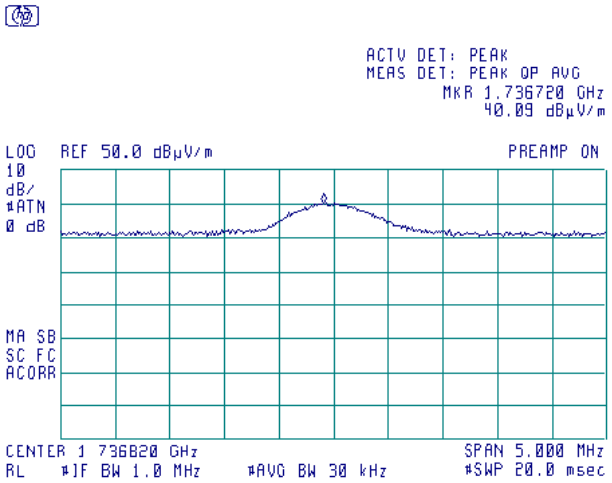


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.15 Radiated emission measurements at the fourth harmonic frequency

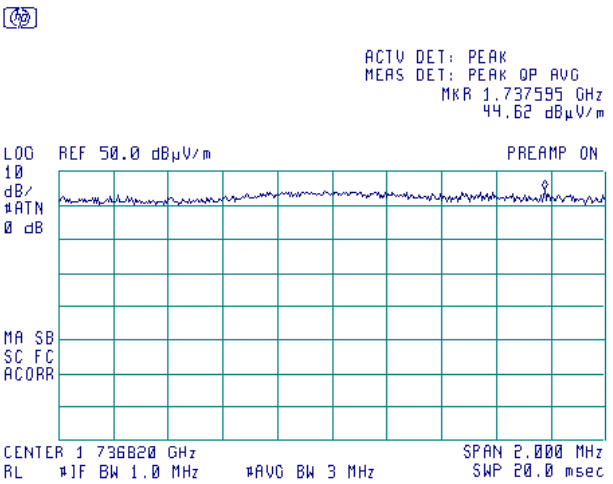
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

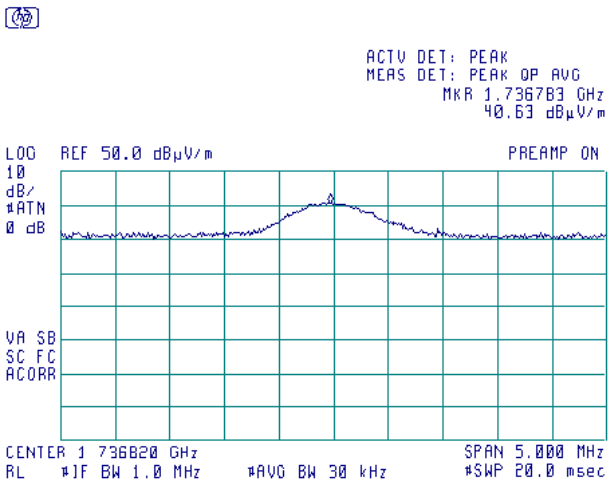




Plot 7.2.16 Radiated emission measurements at the fourth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

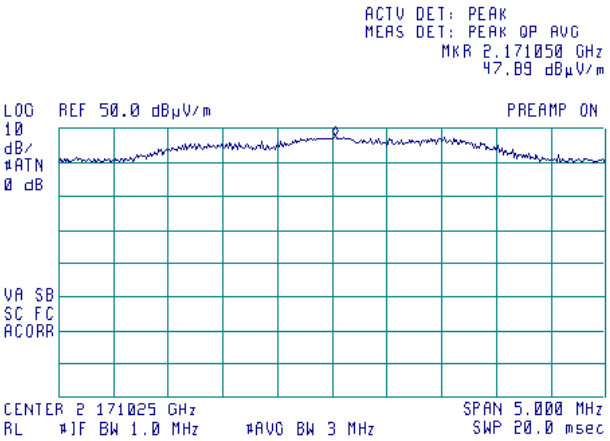


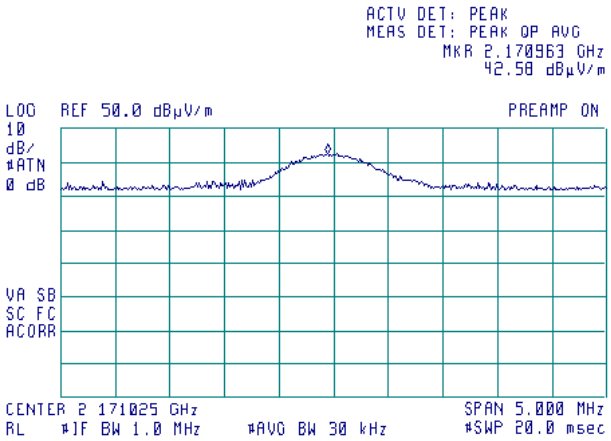


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.17 Radiated emission measurements at the fifth harmonic frequency

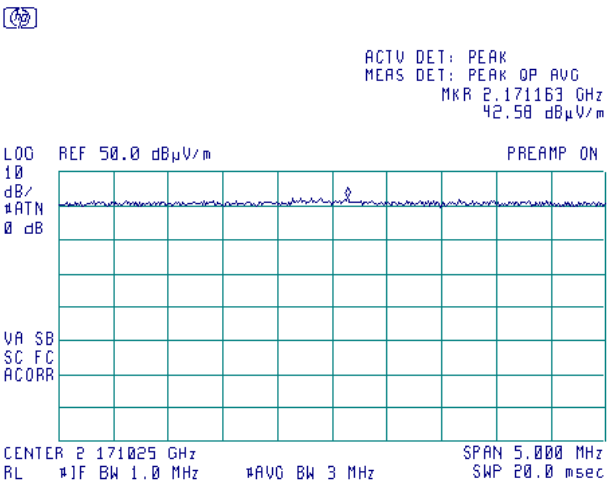
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

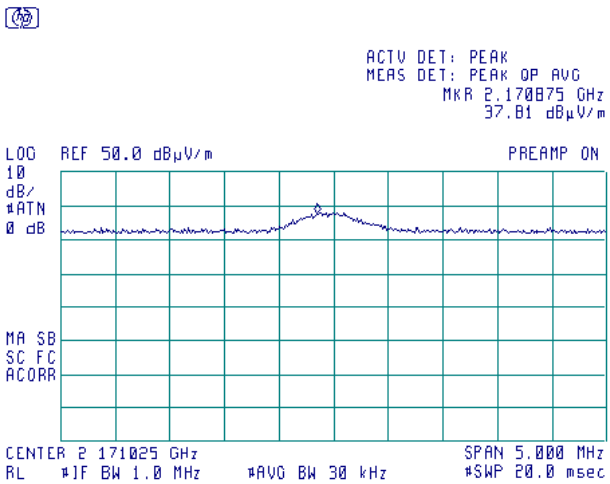




Plot 7.2.18 Radiated emission measurements at the fifth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

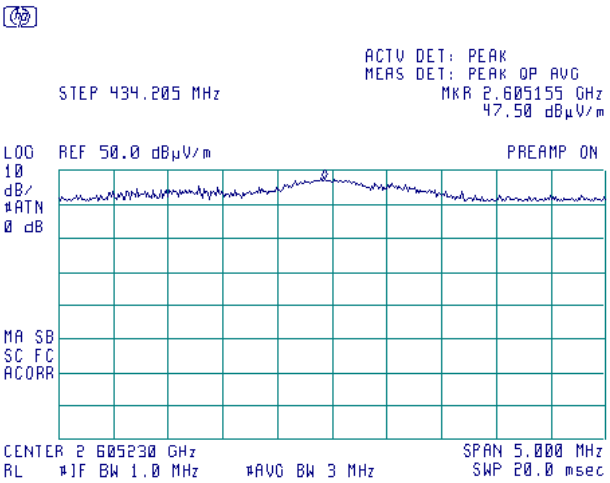


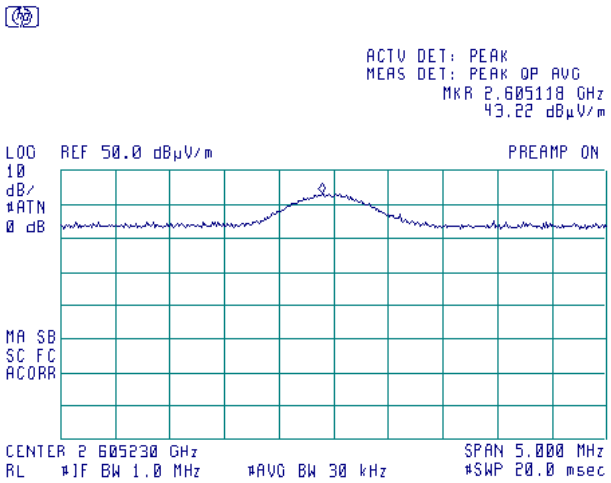


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.19 Radiated emission measurements at the sixth harmonic frequency

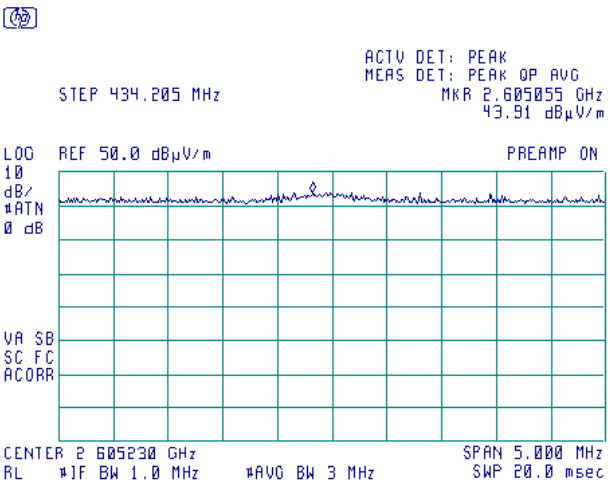
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

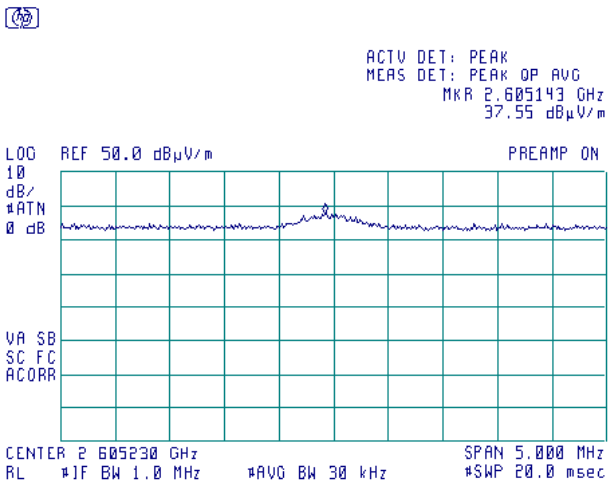




Plot 7.2.20 Radiated emission measurements at the sixth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

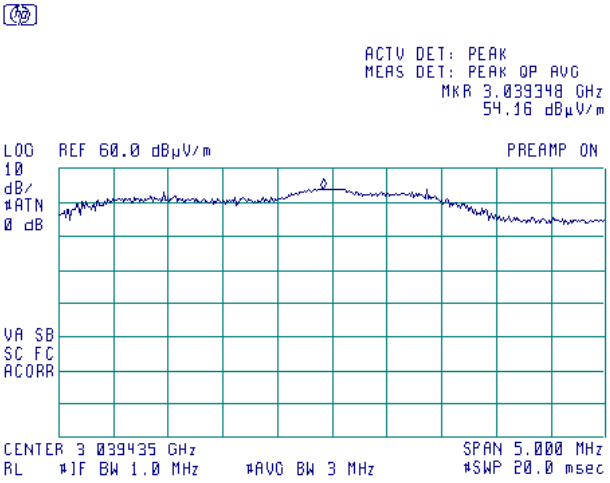


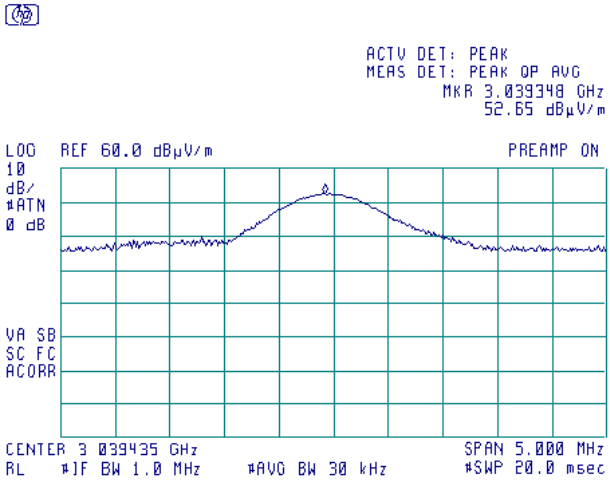


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.21 Radiated emission measurements at the seventh harmonic frequency

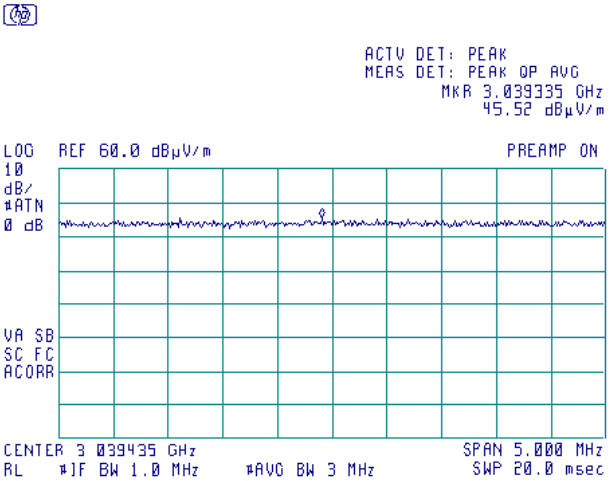
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

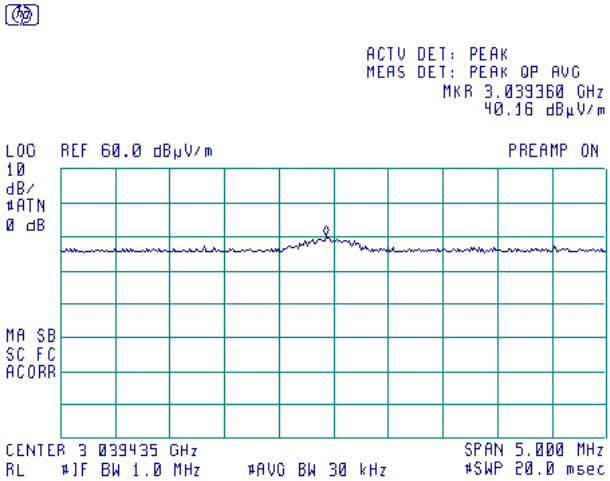




Plot 7.2.22 Radiated emission measurements at the seventh harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

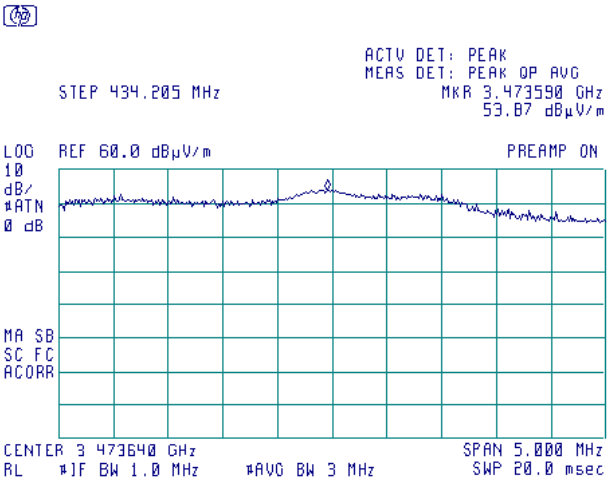


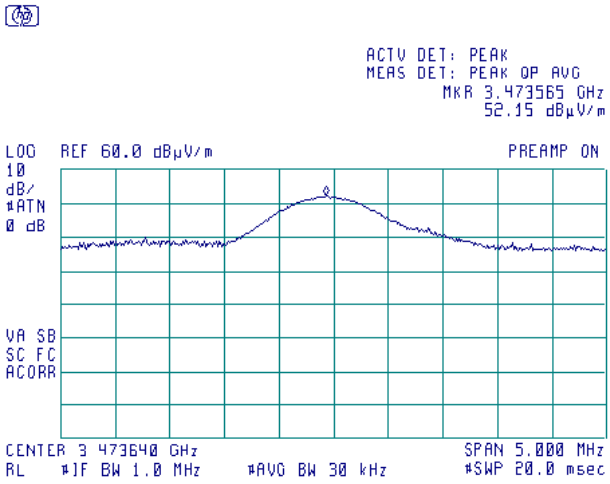


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.23 Radiated emission measurements at the eighth harmonic frequency

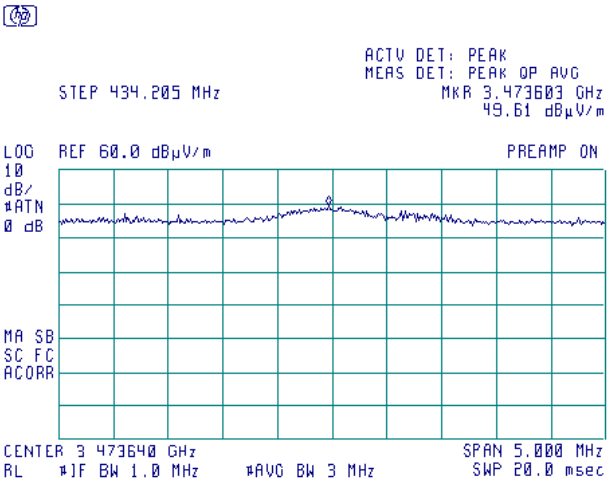
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

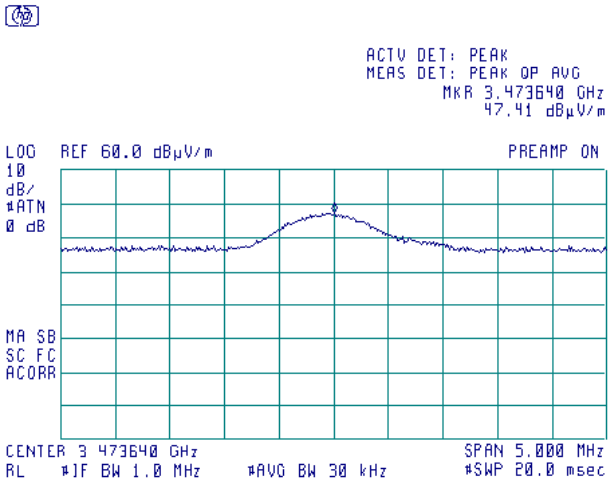




Plot 7.2.24 Radiated emission measurements at the eighth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

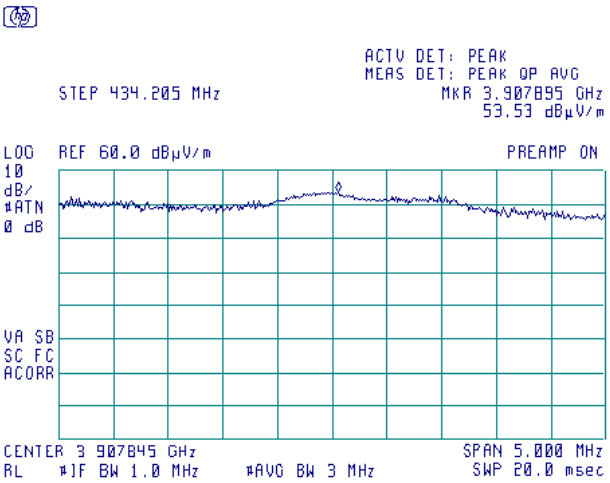


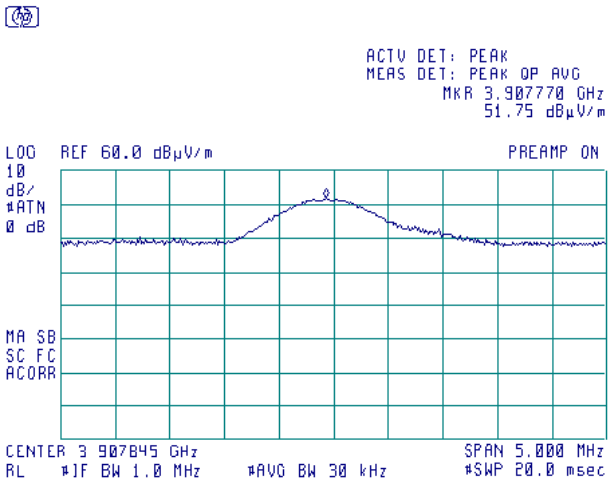


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.25 Radiated emission measurements at the ninth harmonic frequency

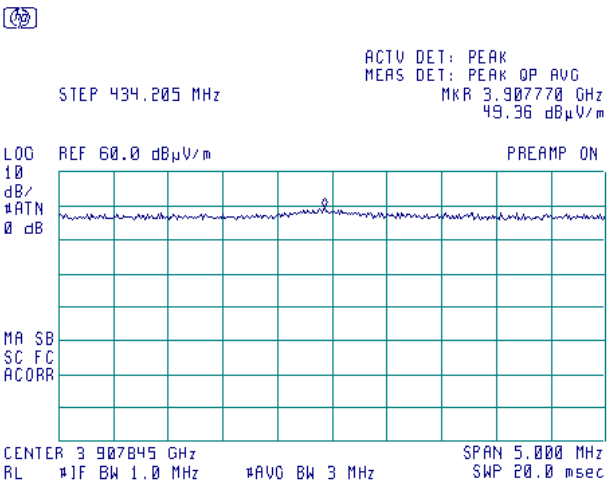
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

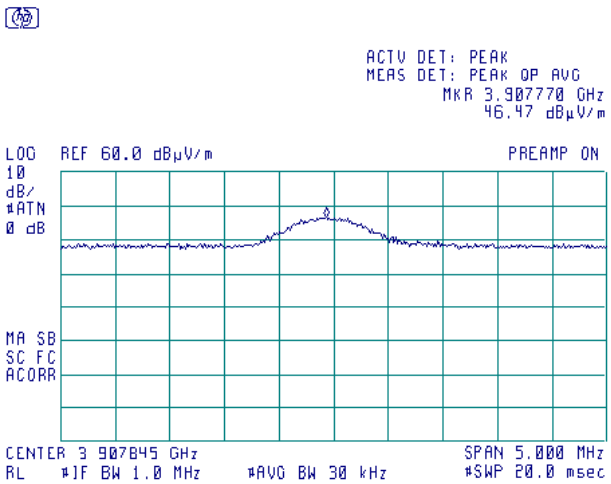




Plot 7.2.26 Radiated emission measurements at the ninth harmonic frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis

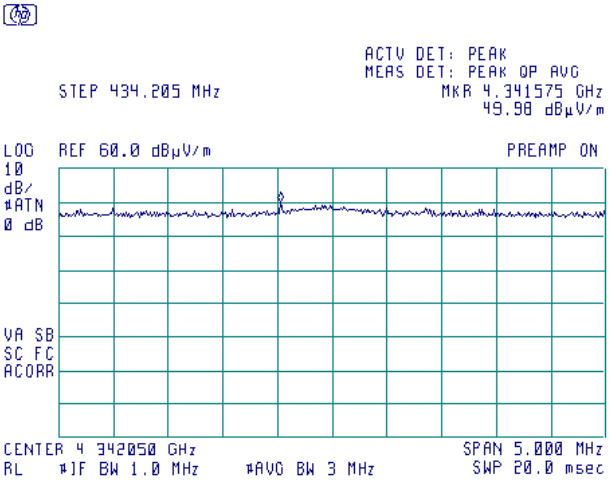


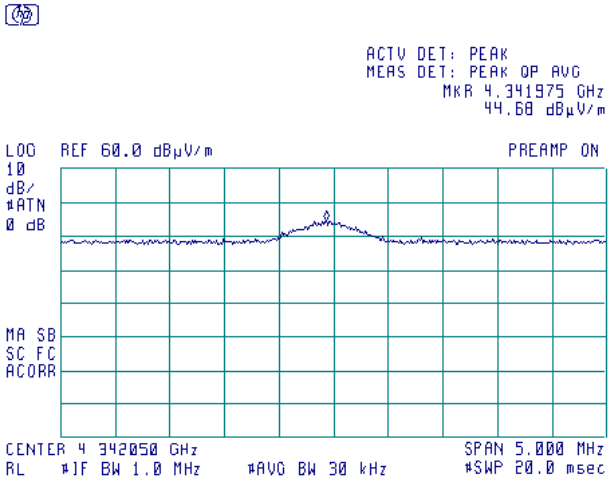


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.27 Radiated emission measurements at the tenth harmonic frequency

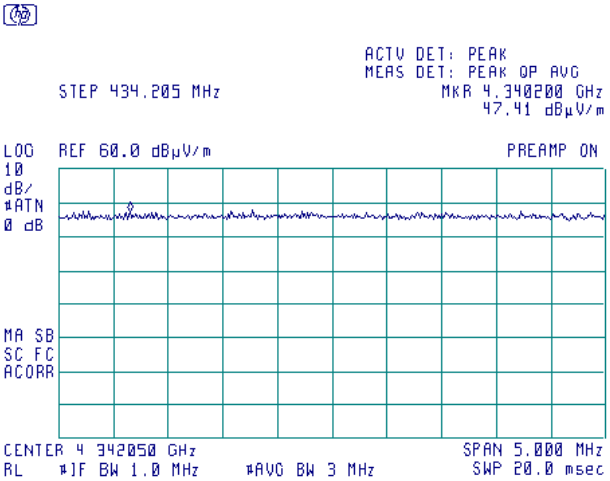
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Y-axis

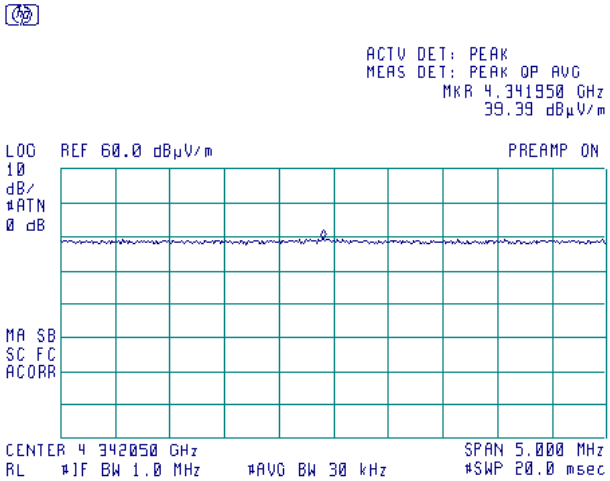




Plot 7.2.28 Radiated emission measurements at the tenth harmonic frequency

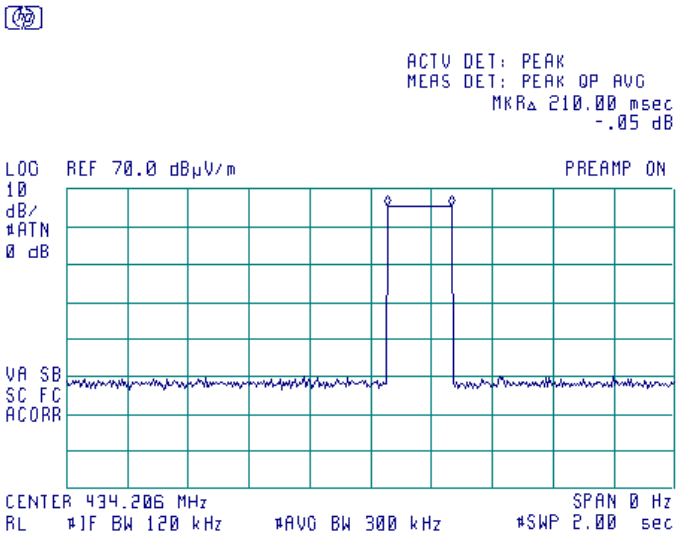
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Y-axis



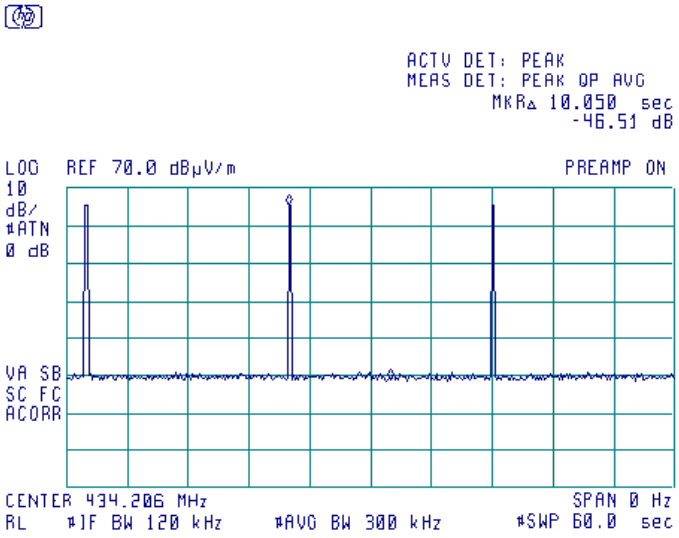


Test specification:	FCC Part 15, Section 231(e), Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14 - 12-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 7.2.29 Transmission pulse duration



Plot 7.2.30 Transmission pulse period



Test specification:	FCC Part 15, Section 231(c), Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Mar-14		
Temperature: 22.8 ºC	Air Pressure: 1013 hPa	Relative Humidity: 43 %	Power Supply: 3V battery
Remarks:			

7.3 Occupied bandwidth test

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, % of the carrier frequency
70 - 900	20.0	0.25
Above 900		0.50

*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

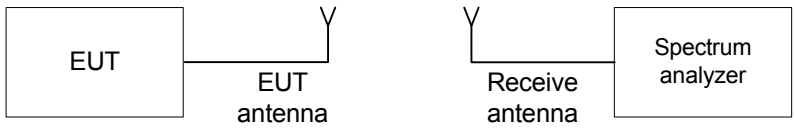
7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

7.3.2.2 The EUT was set to transmit modulated carrier.

7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and the associated plot.

Figure 7.3.1 Occupied bandwidth test setup



Test specification:	**FCC Part 15, Section 231(c), Occupied bandwidth**		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Mar-14		
Temperature: 22.8 ºC	**Air Pressure:** 1013 hPa	**Relative Humidity:** 43 %	**Power Supply:** 3V battery
Remarks:			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	10 kHz
VIDEO BANDWIDTH:	30 kHz
MODULATION ENVELOPE REFERENCE POINTS:	20 dBc
MODULATION:	ASK
MODULATING SIGNAL:	ID code
BIT RATE:	8.192kbps

Carrier frequency, MHz	**Occupied bandwidth, kHz**	**Limit**		**Margin, kHz**	**Verdict**
		% of the carrier frequency	**kHz**		
434.205	69.433	0.25	1085.513	-1016.08	Pass

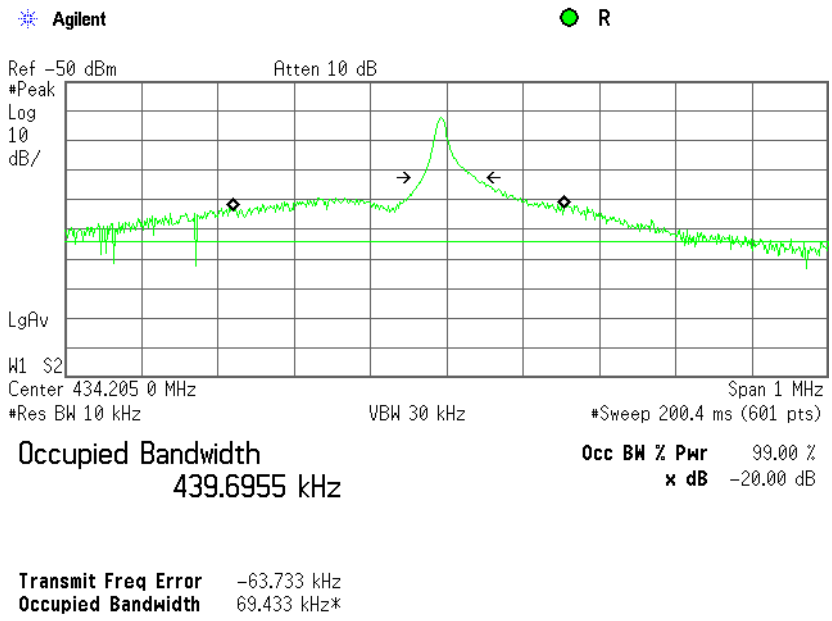
Reference numbers of test equipment used

HL 3818								

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 231(c), Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Mar-14		
Temperature: 22.8 ºC	Air Pressure: 1013 hPa	Relative Humidity: 43 %	Power Supply: 3V battery
Remarks:			

Plot 7.3.1 Occupied bandwidth test result



Test specification:	FCC Part 15, Section 203, Antenna requirements		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Mar-14		
Temperature: 22.7 ºC	Air Pressure: 1013 hPa	Relative Humidity: 42 %	Power Supply: 3V battery
Remarks:			

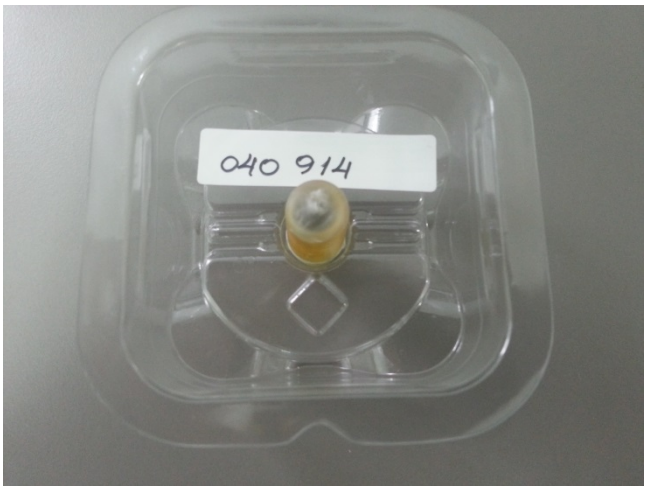
7.4 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

Table 7.4.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.4.1 Antenna assembly



Test specification:	FCC Part 15, Section 109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

8 Unintentional emissions

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Radiated emission limits

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
960 - 5th harmonic**	43.5*	54.0	49.5	60.0*

8.1.2 Test procedure

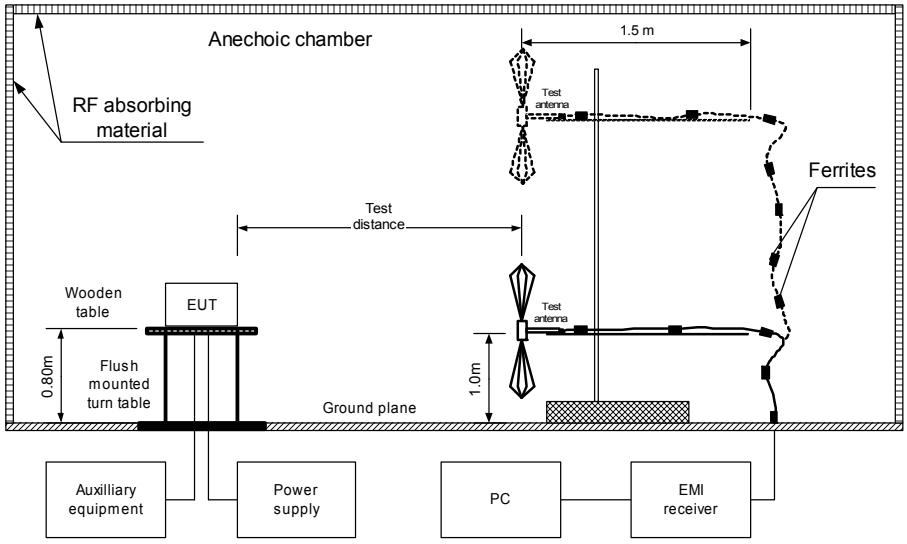
8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photograph/s, energized and the performance check was conducted.

8.1.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

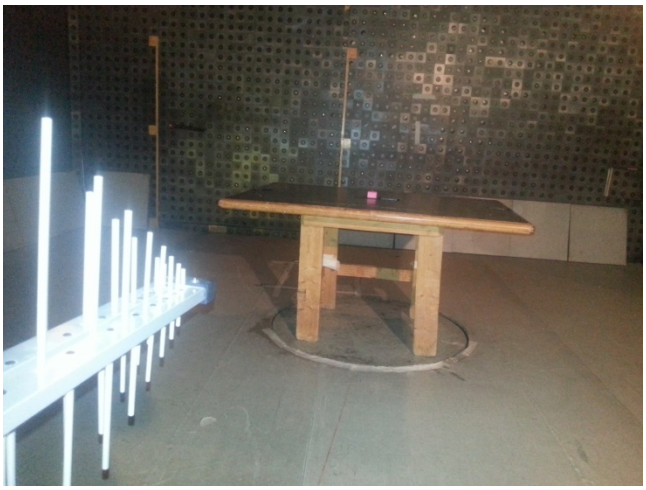
8.1.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

Test specification:	FCC Part 15, Section 109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



Photograph 8.1.1 Setup for preliminary radiated emission measurements



Test specification:	**FCC Part 15, Section 109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	11-Mar-14		
Temperature: 21.7 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 50 %	**Power Supply:** 3V battery
Remarks:			

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	**Peak emission, dB(μV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***				
No emissions were found								Pass

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 2200 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	**Peak**			**Average**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
	Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***	**Measured emission, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB***				
No emissions were found										Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

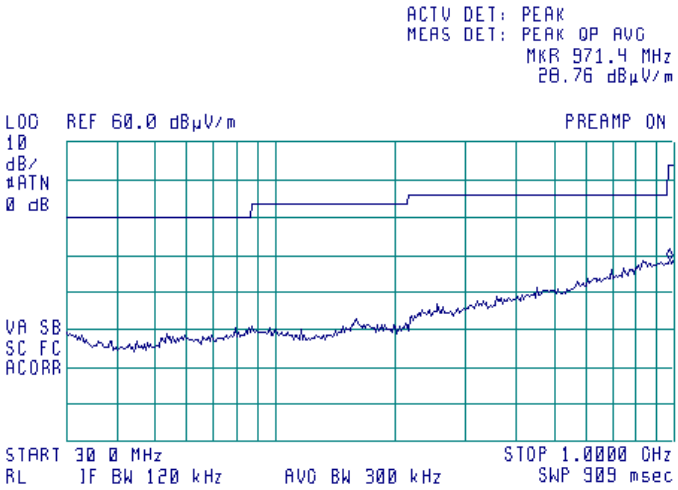
HL 0521	HL 0604	HL 1984	HL 2871	HL 4353			

Full description is given in Appendix A.

Test specification:	FCC Part 15, Section 109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

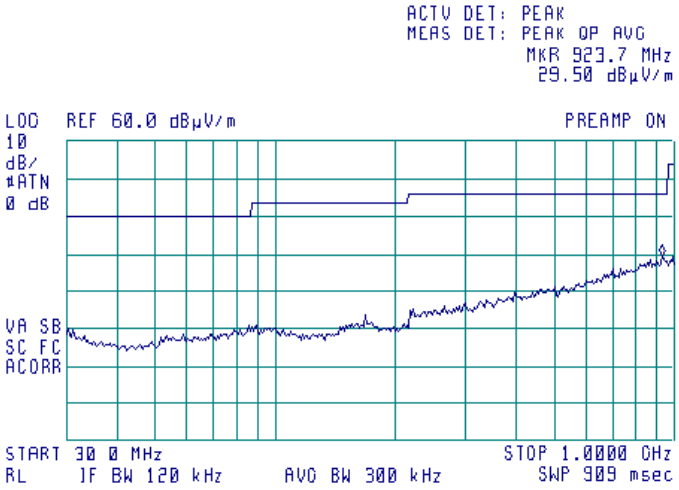
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by



Plot 8.1.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

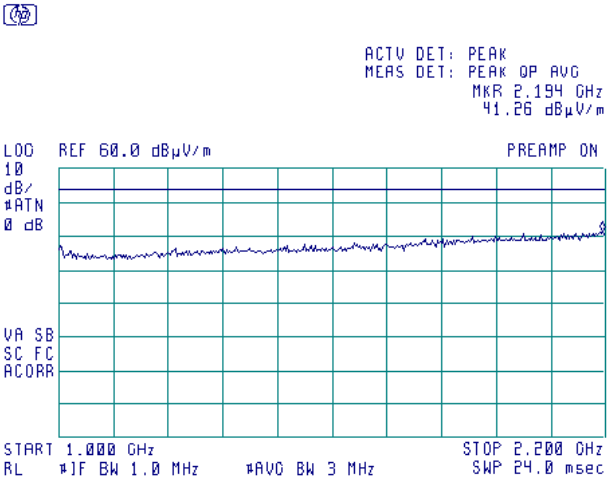
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by

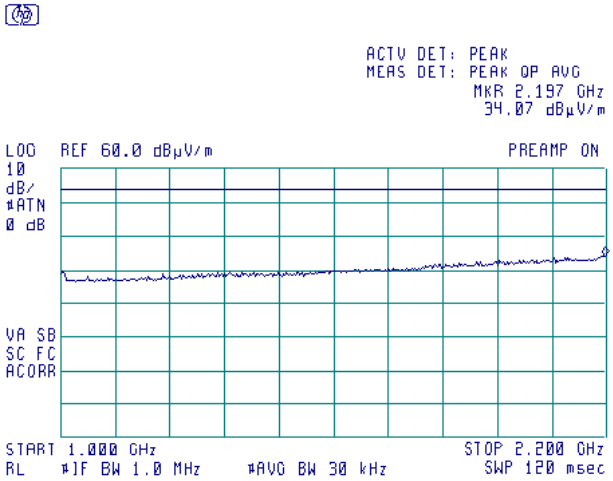


Test specification:	FCC Part 15, Section 109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Mar-14		
Temperature: 21.7 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 3V battery
Remarks:			

Plot 8.1.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization

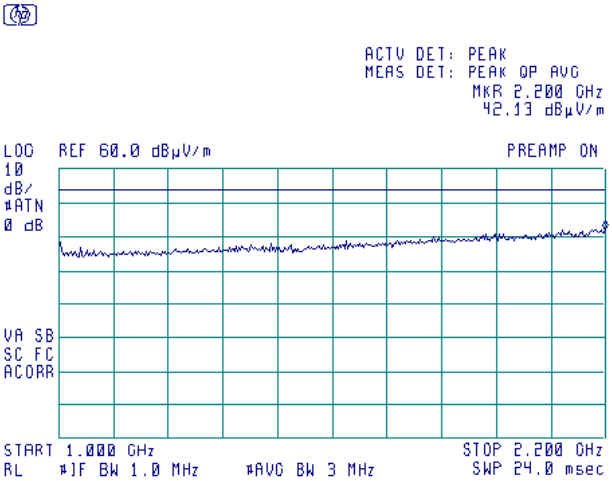
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by

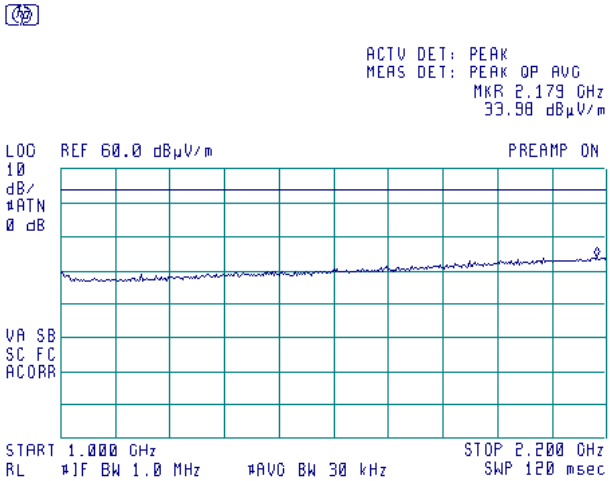




Plot 8.1.4 Radiated emission measurements above 1000 MHz, horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by





9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	21-Jan-14	21-Jan-15
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	28-Oct-13	28-Oct-14
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	04-Jun-13	04-Jun-14
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Jan-14	03-Jan-15
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	04-Dec-13	04-Dec-14
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	24-Apr-13	24-Apr-14
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101003	16-Mar-14	16-Mar-15

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.
Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.
In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

Address: P.O. Box 23, Binyamina 30500, Israel.
Telephone: +972 4628 8001
Fax: +972 4628 8277
e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 15: 2013	Radio Frequency Devices.
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	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.

13 APPENDIX E Test equipment correction factors

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00, HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT