



TEST REPORT #151107A

STANDARD: FCC PART 15

SUBPART C--INTENTIONAL RADIATORS

**SECTION 15. 223 OPERATION
IN THE BAND 1.705 - 10 MHZ**

EQUIPMENT TESTED:

STARKEY LABORATORIES, INC.

NEARCOM WITH OTICON PLUG IN

MODEL: TM1

TEST DATE: 15 NOVEMBER, 2007

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Glencoe, MN 55336



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CERTIFICATION SERVICES, INC.

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Prepared by: International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336

International Certification Services represents to the client that testing is done in accordance with standard procedures applicable and that reported test results are accurate within generally accepted commercial ranges of accuracy.

This report only applies to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. International Certification Services shall have no liability for any deductions, inferences or generalizations drawn by the client or others from this report.

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TABLE OF CONTENTS

1.0	Test Summary	4
2.0	Applicable Standards	5
2.1	Referenced Standards	5
2.2	Equipment Units Tested	5
2.3	Equipment and Cable Configuration.....	5
2.4	List of Test Equipment.....	5
2.5	Units of Measurement.....	5
2.6	Location of Test Site.....	6
2.7	Measurement Procedures	6
	FCC 15.223	6
	Figure 1: Fundamental Frequency Amplitude	7
	Figure 2. 6 dB Bandwidth	7
	FCC 15.223	7
	Figure 3. Harmonic Emissions.....	8
	FCC 15.209	9
	Figure 4 FCC 15.209 Radiated Emissions.....	9
2.1046	RF Power Output.....	9
2.1047	Modulation Characteristics.....	10
	Figure 5 EUT Fundamental Frequency.....	10
2.1049	Occupied Bandwidth	11
	Figure 6 EUT Occupied Bandwidth	11
2.1051	Spurious Emissions at antenna terminals	11
2.1053	Field strength of spurious radiation	12
	Figure 7 EUT Harmonics	12
2.1055	Frequency stability.....	12
3.8398	13
2.1057	Frequency spectrum to be investigated.....	13
3.0	Radiated Emissions Data	13
Attachment A	14
	Figure 8 Radiated Emissions test configuration (Low Frequency) FCC 15.209.....	15
	Figure 9 Radiated Emissions test configuration (Mid Frequency) FCC 15.209	15
	Figure 10 Radiated Emissions test configuration (High Frequency) FCC 15.209.....	16
Attachment B	17

1.0 Test Summary

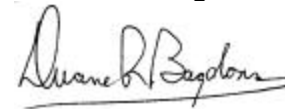
TEST REPORT: #151107	
COMPANY:	Starkey Laboratories, Inc.
AGENT:	International Certification Services, Inc.
PHONE:	320-864-4444
TEST DATE:	15 Novmber, 2007
EQUIPMENT UNDER TEST:	nEARcom with OTICON plug in Model: TM1
GENERAL TEST SUMMARY: The testing was performed at International Certification Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336	
VERIFICATION / CERTIFICATION STATUS:	The 3.8 Mhz transmitter was found to be in compliance with the FCC Part 15 Subpart C, Section 15.223 requirements.
MODIFICATIONS NECESSARY:	None

TESTED BY

Steve Wendlandt

WRITTEN BY

Duane R. Bagdons



2.0 Applicable Standards

47 CFR Ch.1 (10-1-98 Edition)
FCC Part 15 Radio Frequency Devices
Subpart C Intentional Radiators
Section 15.223 Operation in the band 1.705 - 10 Mhz

2.1 Referenced Standards

ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 Ghz.

2.2 Equipment Units Tested

The equipment tested was a battery powered 3.8 Mhz transmitter that is part of the Starkey Laboratories, Inc. Wireless Hearing Aid Programming Adaptor nEARcom product. The nEARcom product is the base platform that allows up to 5 different wireless Technology plug in Modules to operate. The Wireless Technology Modules plug into the nEARcom. The intentional radiator is located in each of the Wireless Technology Modules. This report is for the nEARcom unit with an Oticon TM1 plug in module installed. There is no external antenna involved, the TM1 plug in module contains its own internal antenna on its PC board. The Intentional Radiator operates at a frequency of 3.85172 Mhz and is tested against the FCC Part 15.223 section of the FCC Part 15 standard. The Wireless Technology Module is strictly battery operated and is powered from the nEARcom base platform called the NOAHlink.

2.3 Equipment and Cable Configuration

See photo of the EUT test configuration setup in Attachment A

2.4 List of Test Equipment

<u>Test Equipment</u>	<u>Model</u>	<u>S/N</u>	<u>Calibration Date</u>
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	07/17/06
Preamp	P0024	N/A	04/04/07
Preamp	CLC102	22773	04/04/07
Biconical Antenna	EMCO Model 93110B	105799	03/30/07
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	03/30/07
Monopole Antenna	EMCO 3301B	2095	07/19/06
Loop Antenna	EMCO 6512	8912-1074	03/30/07

Measurement cable losses, and antenna correction factors are included in the data sheets. The Resolution BW was set at 10 KHz and the Video BW was set at 30 KHz.

2.5 Units of Measurement.

All measurements were taken in dBuV/m and frequency measurements are recorded in Mhz. The receiving antenna was positioned at a distance of 1 meter and then 0.5 meters from the

EUT for measuring the Intentional Radiator signal. The difference in distances was because the EUT produced such a small signal that the antenna had to be moved in closer to it to measure the signal.

2.6 Location of Test Site

The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-2003. See letter of compliance from FCC dated July 23, 1998. (FCC 31040/SIT 1300F2)

2.7 Measurement Procedures

All recorded data was taken with a NEW battery installed in the device under test as required by FCC 15.31 (e). Also the antenna distance of 0.5 meter was used for all recorded data from 0.01 to 30 Mhz and then the data was corrected to the proper antenna distance required by FCC 15.223 and FCC 15.209 using a correction factor of the square of an inverse linear distance extrapolation factor (40 dB per decade) as required by FCC 15.31 (f) (2). The requirements of FCC 15.223 are as follows:

FCC 15.223

The field strength of any emission within the band 1.705-10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. “However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this Section, bandwidth is determined at the points 6 dB down from the modulated carrier.”

Fundamental Frequency = 3.83 Mhz

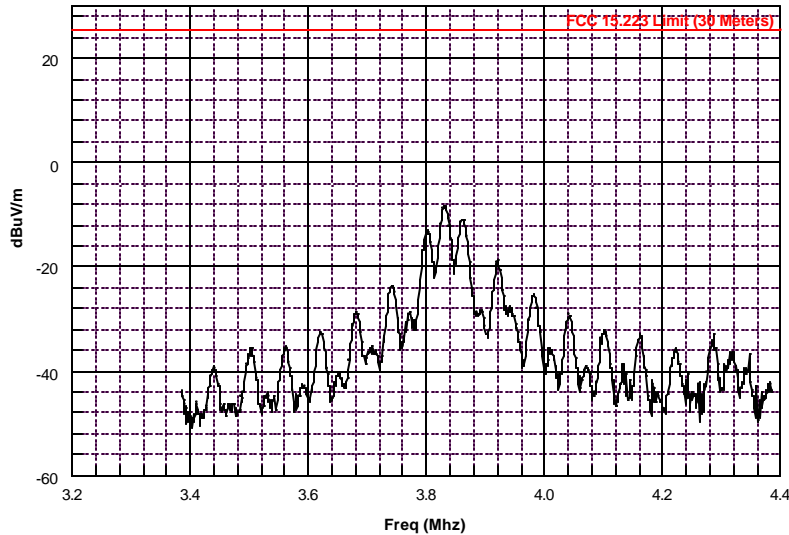
10% of this frequency = 38.3 KHz

Frequency (Mhz) (-6dB point)	Frequency (Mhz) (+6dB point)	Bandwidth (kHz)
3.798	3.868	70

The 6 dB bandwidth of the NearCom TM1 is 42 KHz.

This bandwidth is greater than 10% of the fundamental frequency therefore the limit is either 15 uV/m or 70 KHz/3.83 Mhz = 18.277 uV/m. Since 18.277 uV/m is greater than 15 uV/m the allowable limit is 18.277 uV/m for this device measured at 30 meters. (25.238 dBuV/m @ 30 meters)

Starkey Laboratories, Inc.
 Model: nEARcom TM1
 FCC 15.223 Radiated Emissions
 (Antenna Distance = 0.5 meter)
 Data projected to 30 meters
 Fundamental Frequency

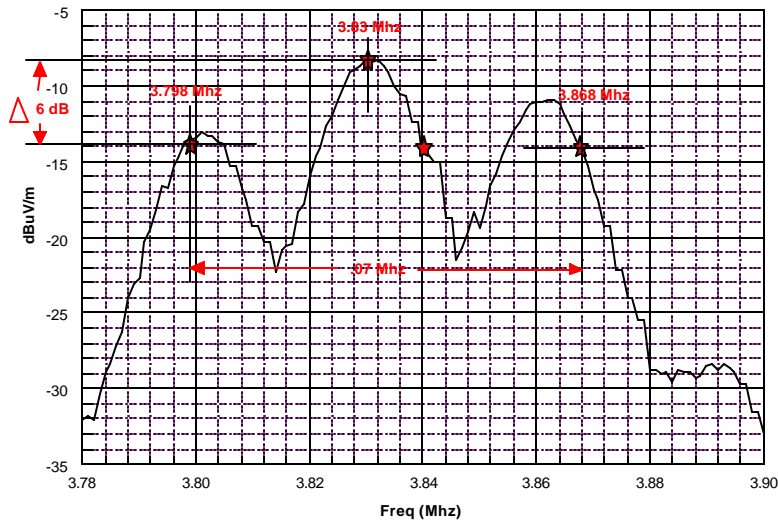


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November 15, 2007

Figure 1: Fundamental Frequency Amplitude

Starkey Laboratories, Inc.
 Model: nEARcom TM1
 FCC 15.223 Radiated Emissions
 Fundamental Frequency 6 dB Bandwidth



International Certification Services, Inc.

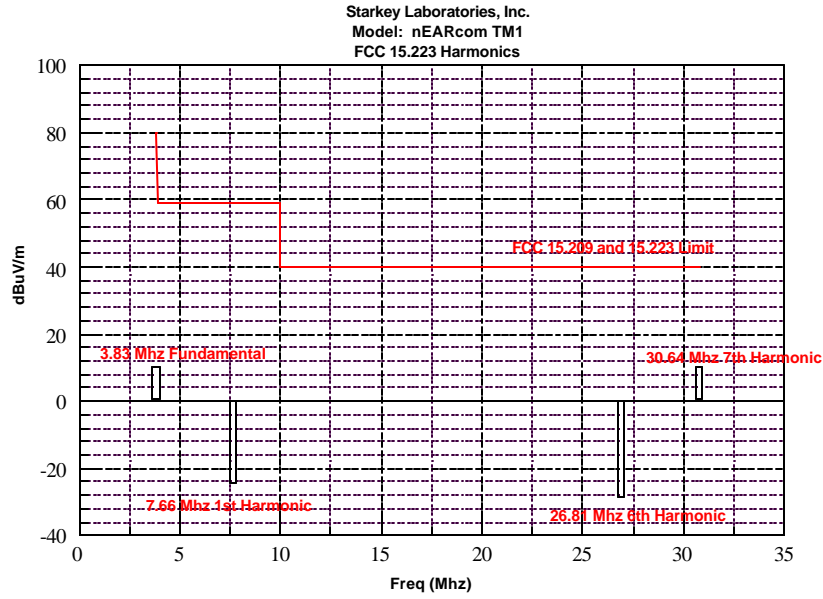
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Figure 2. 6 dB Bandwidth

FCC 15.223

The emission limits for FCC 15.223 are based on measurement instrumentation employing an average detector. The measured data taken for this report was taken with a PEAK detector and it was below the limit so Average Detection was not used.

The field strength of emissions outside of the band 1.705-10.0 MHz shall not exceed the general radiated emission limits in Section 15.209.



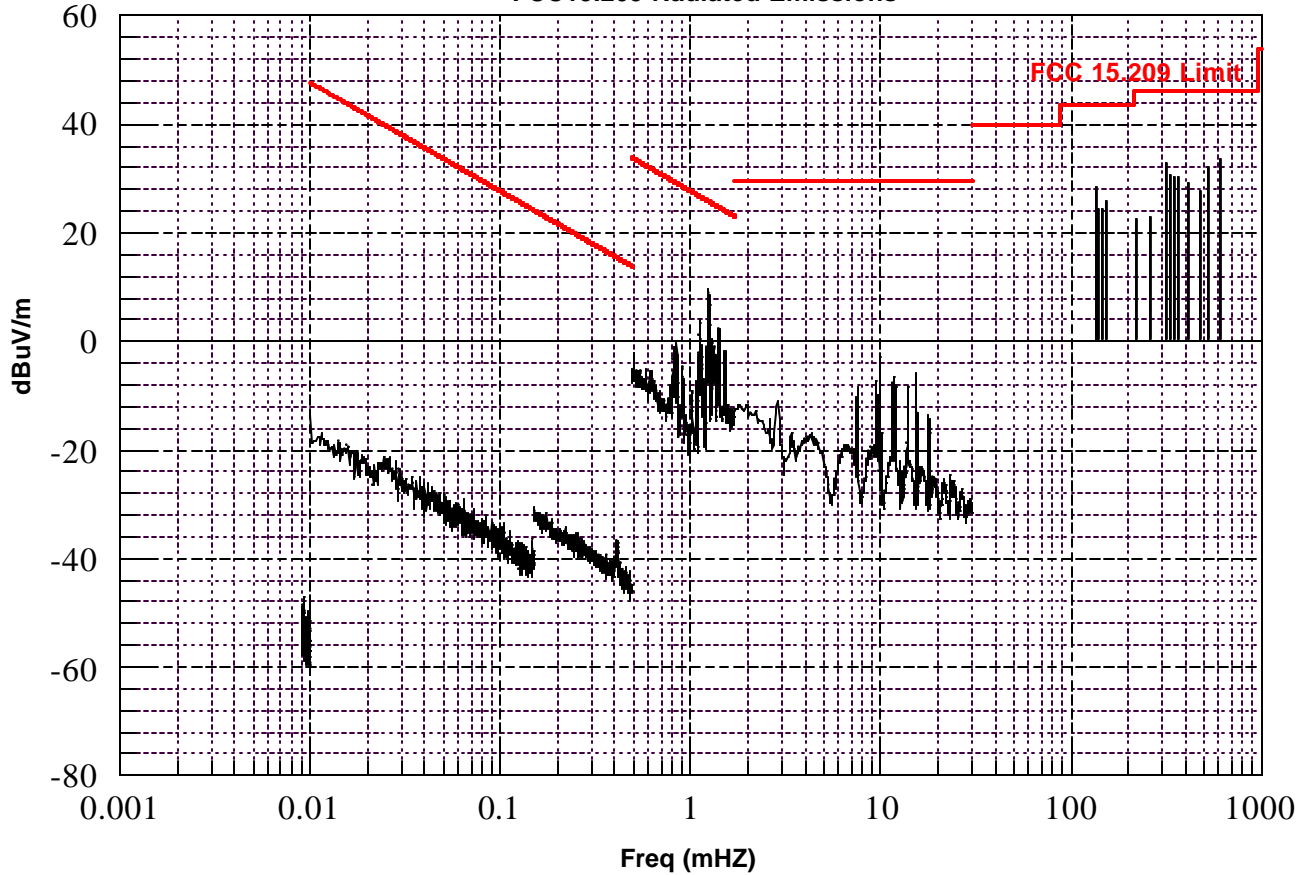
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Figure 3. Harmonic Emissions

FCC 15.209

Starkey Laboratories, Inc.
Model: NearCom TM1
FCC15.209 Radiated Emissions



International Certification Services, Inc.

November 15, 2007

Figure 4 FCC 15.209 Radiated Emissions

The antenna was placed at a distance of 0.51 meter from the EUT for frequencies below 30 Mhz and a distance of 10 meters from 30 to 1000 Mhz. The EUT was set on an insulating table in the OATS site and rotated through 360 degrees to determine the worst case EUT orientation. The Loop antenna was used for frequencies below 30 Mhz and above 30 Mhz a BiCon and Log Periodic Antenna was used. No EUT signals were detected throughout the frequency range of 30 to 137 Mhz.

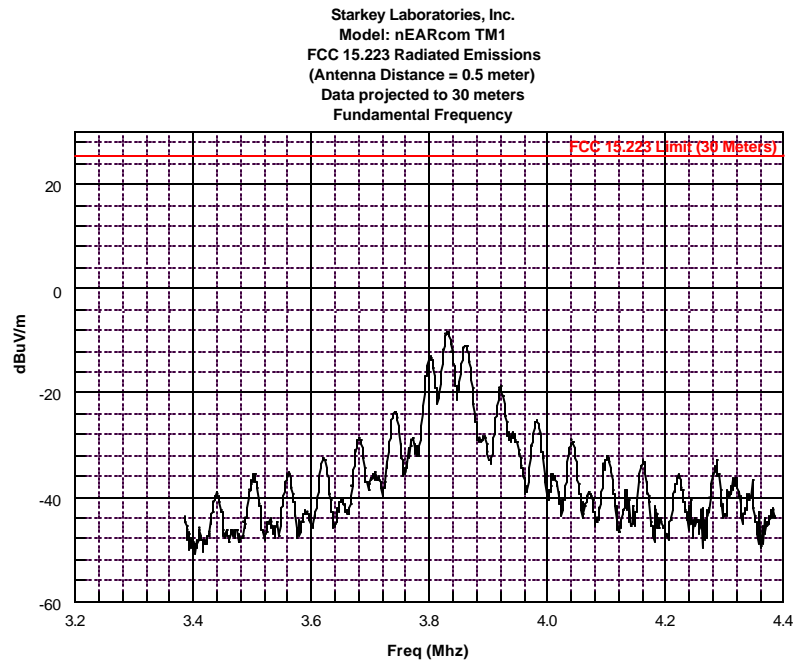
2.1046 RF Power Output

This device does not have antenna terminals; the antenna is built into the PC board. Also, there is no transmitter tuning designed into this system. The transmitter power output is permanently

set by design. This parameter was not measured; instead the output field strength already reported above in section 15.223 shows the output levels of this EUT.

2.1047 Modulation Characteristics

The plot below shows the modulation characteristics of the transmitted signal.



International Certification Services, Inc.

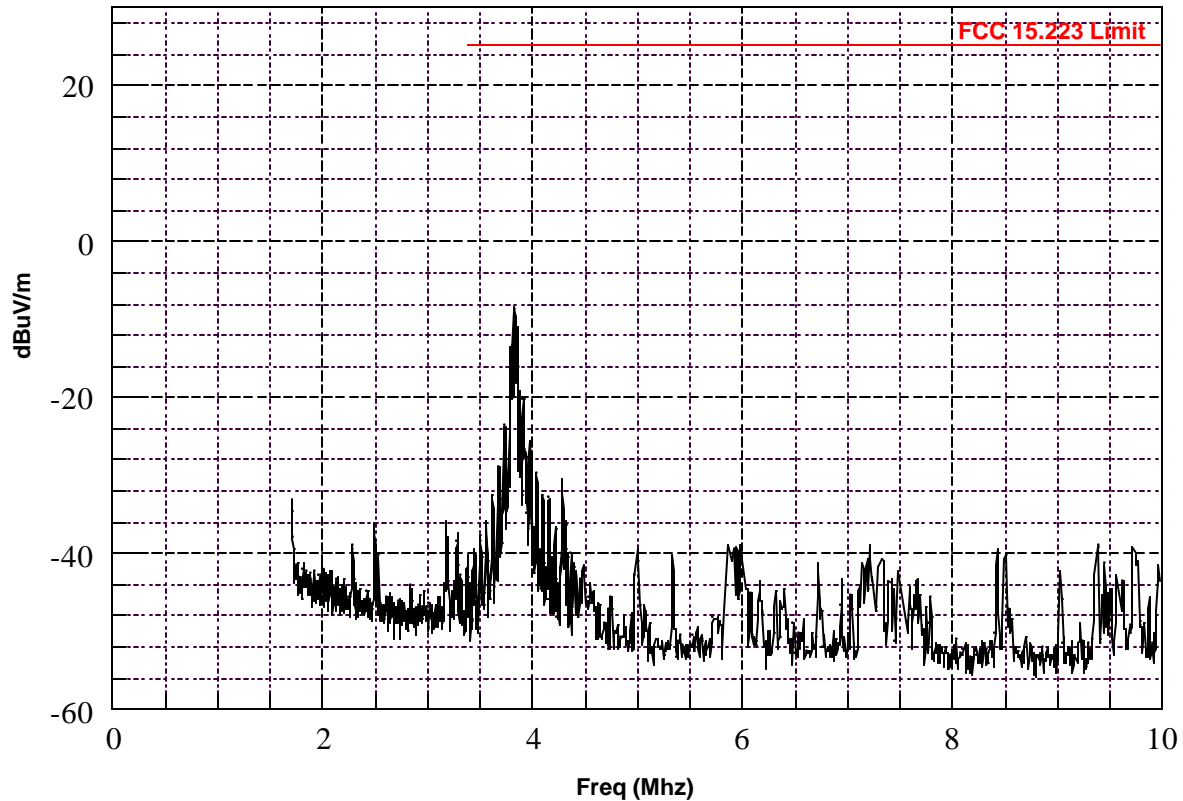
November 15, 2007

Figure 5 EUT Fundamental Frequency

2.1049 Occupied Bandwidth

The Peak Output level measured at 3.82159 Mhz is -8.6089 dBuV/m (0.371 μ V) and the level at where the output level goes asymptotic to the ground floor noise is at 3.17619 Mhz (as opposed to the band limit of 1.705 Mhz and 10 Mhz) and that level is already -39.38917 dBuV/m (0.010729 μ V). This is 0.5% of the mean radiated power.

Starkey Laboratories, Inc.
Model: nEARcom TM1
FCC 15.223 Radiated Emissions
Band Edges



International Certification Services, Inc.

November 15, 2007

Figure 6 EUT Occupied Bandwidth

2.1051 Spurious Emissions at antenna terminals

This is not applicable because there are no antenna terminals; the antenna is built into the PC board.

2.1053 Field strength of spurious radiation

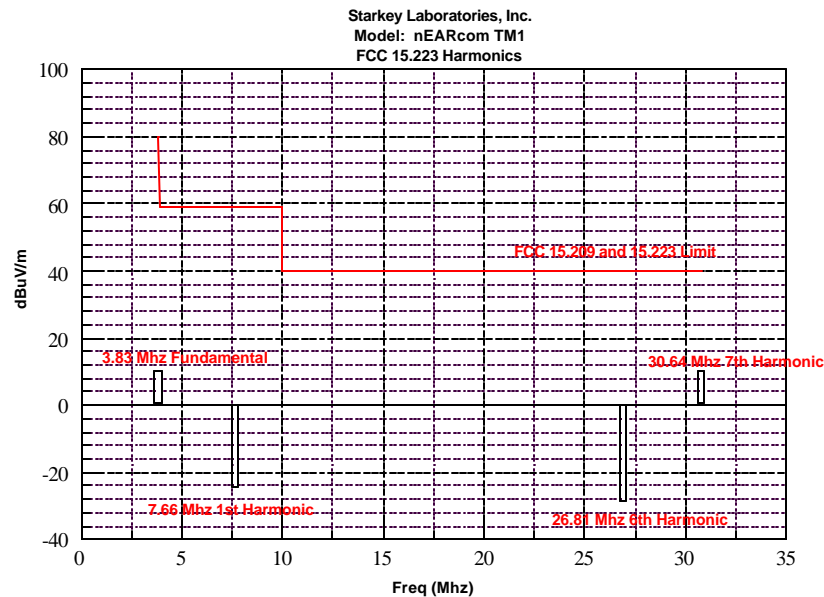


Figure 7 EUT Harmonics

2.1055 Frequency stability

The operating frequency of the EUT was measured at the extremes of the specified temperature range and at intervals of not more than 10 deg Centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level was allowed prior to frequency measurements. There were no short-term transients effects on the frequency of the transmitter due to keying or any heating elements cycling normally occurring at each ambient temperature level. The whole EUT was immersed in the thermal chamber for this test. The frequency stability was measured at a minimum battery voltage level specified by the manufacturer.

Temp (deg C)	Freq (Mhz)	Time
-30	3.8078	1:22
-20	3.8088	1:38
-10	3.8213	1:50
0	3.8363	2:00
10	3.8473	2:15
20	3.8523	2:26
30	3.8553	2:49
40	3.8563	3:08
50	3.8543	3:21

The frequency variation was:

Freq (Mhz)	Temp (deg C)	% deviation	
3.8078	-30	-1	Min
3.8398	25	0	Nom
3.8563	40	+0.4	Max

2.1057 Frequency spectrum to be investigated

The frequency to be investigated set forth in FCC 2.1051 and 2.1053 in this case was from 9 kHz to the 10th harmonic of the highest fundamental frequency. Testing was performed from 9 kHz to 1000 Mhz which more than adequately covers the required range.

3.0 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics up to the 10th harmonic are reported in the data sheets in Attachment B.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

<u>Frequency</u>		<u>Level</u>	+	<u>Factor</u>	=	<u>Corr Data</u>	-	<u>FCC Limit</u>	=	<u>Margin</u>
<u>(MHz)</u>		<u>(dBuV)</u>	+	<u>(dB)</u>	=	<u>(dBuV/m)</u>	-	<u>(dBuV/m)</u>	=	<u>(dB)</u>
100.0		20.6	+	11.0	=	31.6	-	43.5	=	-11.9

Attachment A

RADIATED MEASUREMENT

TEST SET UP

**Starkey Laboratories, Inc.
Model: nEARcom TM1
Radiated Emissions test set up**



Figure 8 Radiated Emissions test configuration (Low Frequency) FCC 15.209



Figure 9 Radiated Emissions test configuration (Mid Frequency) FCC 15.209

**Starkey Laboratories, Inc.
Model: nEARcom TM1
Radiated Emissions test set up**



Figure 10 Radiated Emissions test configuration (High Frequency) FCC 15.209

Attachment B

**PRODUCT DATA SHEET OR PRODUCT INFORMATION FORM AS SUPPLIED BY THE
CUSTOMER**

COMPANY NAME: Starkey Laboratories, Inc.

CUSTOMER REPRESENTATIVE: International Certification Services, Inc.

EQUIPMENT DESCRIPTION: Wireless hearing aid programming adaptor NearCom with OTICON plug in adapter

MODEL NUMBER: nEARcom TM 1

SERIAL NUMBER: NearCom S/N: 2007999999, TM1 S/N: 2007999999

TYPE OF TEST: _____ Development
 Initial Design Verification
 _____ Design Change (Please describe exact changes below)
 _____ Production Sample (Audit Test)

OSCILLATOR FREQUENCIES:

3.84 Mhz, 8 Mhz

POWERLINE INTERFACE:

Frequency: DC
Voltage: 1.3 VDC

POWER SUPPLY: Battery

POWER LINE FILTER: None

CABINET SHIELDING PROVISION:

Plastic Enclosure

SOFTWARE AND / OR OPERATING MODES:

Proprietary Engineering software (No revision)

INTERFACING EQUIPMENT OR SIMULATORS:

Description	Model & Serial Number
Hearing Aid (Nu Ear)	Model: Rhapsody 1200, S/N: 07641791
Hearing Aid (Nu Ear)	Model: Rhapsody 1200, S/N: 07641878
Programming Sfmp (Starkey)	Model: 65464-000
Computer (Dell)	Model: Latitude D600, S/N: CN-065152-48643-439- 3450
Bluetooth Programming Unit (HIMSA)	Model: Noahlink, S/N: 245837

I/O CABLES:

Function	Length	Connector Type	Shield Termination Location
Programming Cable (X2)	2 meters	Mini DIN 571	Shield terminated to Mini DIN

Starkey Laboratories, Inc.
nEARcom with OTICON Plug In Model: TM1
Test Configuration

