Nº 51/LE147

Test report No:

NIE: 47427RAN.001

Test report
REFERENCE STANDARDS:
FCC 47CFR Part 2.1093, Published RF Exposure KDB Procedures, IC RSS -102 Issue 5:2015

Identification of item tested.....:	Accessory to wireless hearing instrument
Trade .....:	ReSound
Model and /or type reference .....:	SM-2P
Other identification of the product .....:	The purpose of the device is to pick up audio signals from one of 4 audio sources and transmit audio signal to a compatible hearing instrument through propietary 2.4 GHz protocol (Proximity). The 4 audio sources are: - Built-in microphone - Mini-jacj line in - 3pin Euro line in Built-in telecoil receiver FCC ID: X26SM-2P IC: 6941C-SM2P
Final HW version .....:	PCBA, SM-2P MAIN BOARD, Rev A
Final SW version .....:	Farlander 3.2.0
Features.....:	2.4 GHz proprietary wireless data protocol (Proximity)
Manufacturer.....:	Company name: GN Hearing A/S Postal Addres: Lautrupbjerg 7, 2750 Ballerup, Denmark Contact person: Youssef El Mahdaoui Job title /Department: Sr. Test & Certification Specialist Telephone: +4521166605 e-mail: ymahdaoui@gnresound.com
Test method requested, standard.....:	1. FCC 47 CFR Part 2.1093. (10-1-14 Edition) Radiofrequency radiation exposure evaluation: portable devices. 2. FCC OET KDB 447498 D01 General RF Exposure Guidance v06 (October 2015)

	3. FCC OET KDB 865664 D01 - SAR Measurement Requirements for 100 MHz to 6 GHz v01r04 (August 2015). 4. FCC OET KDB 865664 D02 RF Exposure Reporting v01r02 (October 2015) 5. IC RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) 6. Canada`s Safety Code No.6 – Limits of Human Exposure to Radiofrequency Electromag-netic Fields in the Frequency Range from 3 kHz to 300 GHz .
Summary .....:	Considering the results of the performed test according to FCC 47CFR Part 2.1093 and IC RSS-102 Issue 5, the item under test is IN COMPLIANCE with the requested specifications specified in the standards. The maximum 1g volume averaged SAR found during this test has been 0.043 W/kg. NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".
Approved by (name / position & signature) .....:	Miguel Lacave Antennas Lab Manager  MIGUEL LACAVE GARCÍA 2016.01.19 11:59:32 +01'00'
Date of issue .....:	2016-01-19
Report template No.....:	FDT08_17

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Competences and guarantees

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In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

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Uncertainty

Uncertainty (factor k=2) was calculated according to the following documents:

1. FCC OET KDB 865664 D01 - SAR Measurement Requirements for 100 MHz to 6 GHz v01r04 (August 2015).

Usage of samples

Samples undergoing test have been selected by: the client

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
47427/003	HI Accessory	SM-2P	--	18/11/2015
47427/024	AC/DC adapater	FW7713	--	18/11/2015
47427/030	USB cable	FW7713	--	18/11/2015
47427/087	RF cable	--	--	18/11/2015

Sample M/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
47427/003	HI Accessory	SM-2P	--	18/11/2015
47427/024	AC/DC adapater	FW7713	--	18/11/2015
47427/030	USB cable	FW7713	--	18/11/2015

1. Sample M/01 has undergone the test(s) specified in subclause “Test method requested”: Conducted average output power.
2. Sample M/02 has undergone the test(s) specified in subclause “Test method requested”: SAR evaluation for proprietary wireless data protocol (Proximity) mode.

Test sample description

The test sample consists of an accessory to wireless hearing instrument.

Identification of the client

Company name: GN Hearing A/S

Postal Address: Lautrupbjerg 7, 2750 Ballerup, Denmark

Contact Person: Youssef El Mahdaoui

Job title / Department: Sr. Test & Certification Specialist

Telephone: +4521166605

e-mail: ymahdaoui@gnresound.com

Testing period

The performed test started on 2015-12-21 and finished on 2015-12-22.

The tests have been performed at AT4 wireless.

Environmental conditions

In the laboratory for measurements, the following limits were not exceeded during the test:

Temperature	Min. = 21.20 ºC Max.= 22.70 ºC
Relative humidity	Min. = 44.88 % Max. = 60.57 %

Remarks and comments

1: Only FAST SAR measurement has been performed for this configuration, because a low SAR value, very close to ambient noise, was found.

Used instrumentation

1. Dosimetric E-field probes SPEAG ES3DV3
2. Data acquisition device SPEAG DAE4
3. Electro-optical converter SPEAG EOC3
4. 2450 MHz dipole validation kit SPEAG D2450V2
5. Robot Stäubli RX60BL
6. Robot controller Stäubli CM7MB
7. SAR measurement software SPEAG DASY52 V52.8.8.1222
8. SAR post processing software SPEAG SEMCAD X
9. Measurement server SPEAG DASY5 SE UMS 011 BS
10. Oval flat phantom SPEAG ELI 4
11. Body Tissue Equivalent Liquid for 2450MHz band
12. Vector network analyzer Agilent FieldFox N9923A and Agilent E5071C.
13. Dielectric probe kit SPEAG DAK-3.5
14. Power meter R&S NRVD and power sensors R&S NRV-Z51
15. Power meter Agilent E4419B
16. RF Generator R&S SMU200A
17. DC Power supply Agilent U8002A
18. Dual directional coupler NARDA FSCM 99899
19. Power amplifier MITEQ AMF-4D-00400600-50-30P
20. 6dB attenuator Weinschel 75 A-6-11
21. 20dB attenuator Weinschel 75 A-20-11
22. Handset positioner SPEAG Device Holder

Testing verdicts

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

- <u>2450 MHz band</u>

FCC 47CFR Part 2.1093 Paragraph	VERDICT			
	NA	P	F	NM
(d)(2) Proprietary wireless data protocol (Proximity)		P		

Appendix A – Test configuration

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1. GENERAL INTRODUCTION

1.1. Application Standard

The Federal Communications Commission (FCC) sets the limits for General Population/Uncontrolled exposure to radio frequency electromagnetic fields for transmitting devices designed to be used within 20 centimetres of the body of the user under FCC 47 CFR Part 2.1093 - "Radiofrequency radiation exposure evaluation: portable devices", paragraph (d)(2).

Industry of Canada (IC) sets the limits for General Population/Uncontrolled exposure when the expsosure occurs at a distance of 0.2 m or less into the Health Canada Safety Code 6, paragraph 2.1 "Basic restrictions".

1.2. General requirements

The SAR measurement has been performed continuing the following considerations and environment conditions:

- The ambient temperature shall be in the range of 18ºC to 25ºC and the variation shall not exceed +/- 2ºC during the test.
- The ambient humidity shall be in the range of and 30% - 70%.
- The device battery shall be fully charged before each measurement.

1.3. Measurement system requirements

The measurement system used for SAR tests fulfils the procedural and technical requirements described at the reference standards used.

1.4. Phantom requirements

The phantom model for body measurements is an elliptical open-top container with a flat bottom, with the following shape and dimensions:

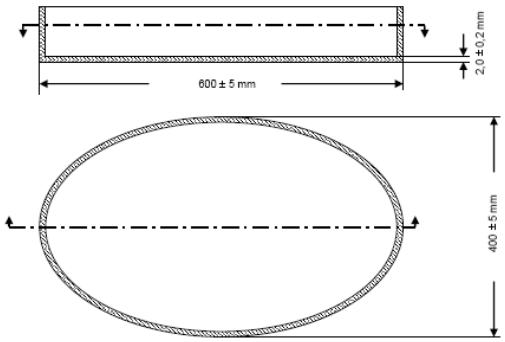

Figure 1: Proportions and shape of Phantom shell

1.5. Measurement Liquids requirements.

The liquids used to simulate the human tissues, must fulfils the requirements of the dielectric properties required. These target dielectric properties per FCC OET KDB 865664 D01 instructions come from the dipole and probe calibration data which are included in Appendix B, Section 3, of this document.

To minimize the effect of reflections on peak spatial-average SAR values, from the upper surface of the tissue-equivalent liquid, the depth of the liquid should be at least 15 cm.

2. MEASUREMENT SYSTEM

2.1. Measurement System

The DASY5 system for performing compliance tests consists of the following items:

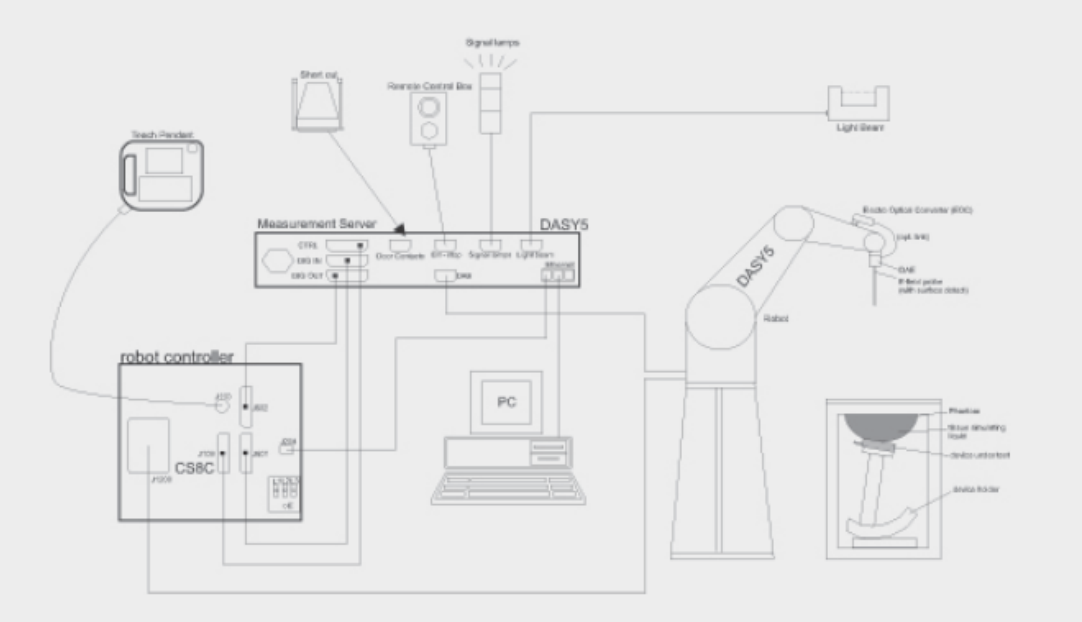

Figure 2: SAR Measurement system

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

Manufacturer	Device	Type
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	ES3DV3
Schmid & Partner Engineering AG	Data Acquisition Electronics	DAE4
Schmid & Partner Engineering AG	Electro-Optical Converter	EOC3
Stäubli	Robot	RX60BL
Stäubli	Robot controller	CS7MB
Schmid & Partner Engineering AG	Measurement Server	DASY5 SE UMS 011 BS
Schmid & Partner Engineering AG	Oval flat phantom	SPEAG ELI 4
Schmid & Partner Engineering AG	Handset Positioner	SD000 HD1HA
Schmid & Partner Engineering AG	Measurement Software	DASY52 V52.8.8.1222
Schmid & Partner Engineering AG	Postprocessing Software	SEMCAD X
Rohde & Schwarz	RF Generator	SMU 200A
MITEQ	Power amplifier	AMF-4D-00400600-50-30P
Agilent	DC Power supply	U8002A
NARDA	Directional coupler	FSCM 99899
Weinschel	6dB attenuator	75A-6-11
Weinschel	20 dB attenuator	75A-20-11
Rohde & Schwarz	Power Meter & Power Sensor	NRVD & NRV-Z51
Agilent	Power Meter	E4419B
Schmid & Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2
Agilent	Vector Network Analyser	FieldFox N9923A
Schmid & Partner Engineering AG	Dielectric Probe Kit	DAK-3.5

Table 1: Measurement Equipment

DOSIMETRIC E-FIELD PROBE

ES3DV3
Isotropic E-Field Probe for Dosimetric Measurements

	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

DOSIMETRIC E-FIELD PROBE

EX3DV4
Smallest Isotropic E-Field Probe for Dosimetric Measurements

	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

DATA ACQUISITION ELECTRONICS

DAE4 - Data Acquisition Electronics

	Signal amplifier, multiplexer, A/D converter, and control logic Serial optical link for communication with DASY4/5 embedded system (fully remote controlled) Two-step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset Voltage	< 5 µV (with auto zero)
Input Resistance	200 MOhm
Input Bias Current	< 50 fA

OVAL FLAT PHANTOM

ELI

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters
Wooden Support	SPEAG standard phantom table

HANDSET POSITIONER

Mounting Device for Hand-Held Transmitters

In combination with the Twin SAM V5.0/V5.0c or ELI Phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).

Material: Polyoxymethylene (POM)

DIPOLES

System Validation Kits 300 MHz – 6 GHz

Symmetrical dipole with I/4 balun
Enables measurement of feedpoint impedance with NWA
Matched for use near flat phantoms filled with tissue simulating solutions

Calibration	ISO/IEC 17025		
Frequency	300, 400, 450, 600, 733, 750, 835, 850, 900, 1300, 1450, 1500, 1640, 1750, 1800, 1900, 1950, 2000, 2100, 2300, 2450, 2550, 2600, 3000, 3300, 3500, 3700 MHz and D5GHz (5100-5800 MHz)		
Return Loss	> 20 dB at specified validation position		
Power Capability	> 100 W (f < 1GHz); > 40 W (f > 1GHz)		
Dimensions (length and overall height in mm)	**Product**	**Dipole length**	**Overall height**
	D450V3	290.0	330.0
	D750V3	179.0	330.0
	D900V2	148.5	340.0
	D1800V2	72.5	300.0
	D2000V2	65.0	300.0
	D2450V2	52.0	290.0
	D2600V2	49.2	290.0
	D5GHzV2	20.6	300.0

2.2. Test Positions of device relative to body

According to FCC OET KDB 447498 v05r02, devices that support transmission while used with body-worn accessories must be tested for body-worn accessory SAR compliance.

Body-worn accessory SAR compliance must be based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, according to the relevant voice and/or data mode transmissions and operations.

The device under test could be described as a body-worn device, which only supports data mode transmissions. 1-g SAR testing has been performed for each supported frequency band, positioning both faces at 0 mm distance testing from the flat phantom, as specified by the manufacturer.

2.3. Test to be performed

DUT will be placed at the center of flat phantom. The DUT position using during the body SAR tests will be the one where the maximum peak SAR was found. Each data mode, wireless technology and frequency band supported by the device must be tested. Low and high channels for each band should be tested at this position.

If the DUT is also designed to transmit with other configurations (antenna fully extended/retracted, keypad cover opened/closed…), all tests described above shall be performed for each configuration. When considering multi-mode and multi-band mobile phones, all of the tests shall be performed at each transmitting mode/band with the corresponding maximum peak power level.

2.4. Description of interpolation/extrapolation scheme

The local SAR inside the Phantom is measured using small dipole sensing elements inside a probe element. The probe tip must not be in contact with the Phantoms surface in order to minimise measurement errors, but the highest local SAR is obtained from measurements at a certain distances from the shell trough extrapolation. The accurate assessment of the maximum SAR averaged over 1 gr and 10 gr. requires a very fine resolution in the three dimensional scanned data array. Since the measurements have to be performed over a limited time, the measured data have to be interpolated to provide an array of sufficient resolution.

The interpolation of 2D area scan is used after the initial area scan, at a fixed distance from the Phantom shell wall. The initial scan data is collected with approx. 15 mm spatial resolution and this interpolation is used to find the location of the local maximum for positioning the subsequent 3D scanning within a 1 mm resolution.

For the 3D scan, data is collected on a spatially regular 3D grid having 5 mm steps in both directions. After the data collection by the SAR probe, the data are extrapolated in the depth direction to assign values to points in the 3D array closer to the shell wall. A notional extrapolation value is also assigned to the first point outside the shell wall so that subsequent interpolation schemes will be applicable right up to the shell wall boundary.

2.5. Determination of the largest peak spatial-average SAR

To determine the maximum value of the peak spatial-average SAR of a DUT, all device positions, configurations and operational modes should be tested for each frequency band.

The averaging volume shall be chosen as 1gr. of contiguous tissue. The cubic volumes, over which the SAR measurements are averaged after extrapolation and interpolation, are chosen in order to include the highest values of local SAR.

The maximum SAR level for the DUT will be the maximum level obtained of the performed measurements, and indicated in the previous points.

2.6. System Validation

Prior to the SAR measurements, system verification is done to verify the system accuracy. A complete SAR evaluation is done using a half-wavelength dipole as source with the frequency of the mid-band channel of the operating band, or within 10% of this channel.

The measured 1 gr. and 10 gr. SAR should be within 10% of the expected target values specified in the calibration certificate of the dipole, for the specific tissue and frequency used.

3. UNCERTAINTY

According to FCC OET KDB 865664 D01 - SAR Measurement Requirements for 100 MHz to 6 GHz v01r04 (August 2015), as the highest measured 1-g SAR has been < 1.5 W/kg, SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in the actual SAR report, but it has been included for ISO 17025 accreditation.

Uncertainty for 300 MHz – 6 GHz

ERROR SOURCES	Uncertainty value (± %)	Probability distribution	Divisor	(c_i) 1g	(c_i) 10g	Standard uncertainty (1g) (± %)	Standard uncertainty (10g) (± %)
Measurement Equipment							
Probe Calibration	6.550	N	1	1	1	6.550	6.550
Axial Isotropy	4.700	R	√3	0.7	0.7	1.899	1.899
Hemisfericall Isotropy	9.600	R	√3	0.7	0.7	3.880	3.880
Boundary effect	2.000	R	√3	1	1	1.155	1.155
Linearity	4.700	R	√3	1	1	2.714	2.714
System Detection limits	1.000	R	√3	1	1	0.577	0.577
Probe modulation response	6.100	R	√3	1	1	3.522	3.522
Readout electronics	0.300	N	1	1	1	0.300	0.300
Response time	0.800	R	√3	1	1	0.462	0.462
Integration time	2.600	R	√3	1	1	1.501	1.501
RF Ambient noise	3.000	R	√3	1	1	1.732	1.732
RF Ambient reflections	3.000	R	√3	1	1	1.732	1.732
Probe positioner mech. restrictions	0.800	R	√3	1	1	0.462	0.462
Probe positioning with respect to phantom shell	6.700	R	√3	1	1	3.868	3.868
Max. SAR Eval.	4.000	R	√3	1	1	2.309	2.309
Test Sample Related							
Device holder uncertainty	2.900	N	1	1	1	2.900	2.900
Test sample positioning	3.600	N	1	1	1	3.600	3.600
Drift of output power	5.000	R	√3	1	1	2.887	2.887
Phantom and Setup							
Phantom uncertainty (shape and thickness tolerances)	6.600	R	√3	1	1	3.811	3.811
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.900	N	√3	1	0.84	1.097	0.921
Liquid conductivity (meas.)	1.500	N	√3	0.78	0.71	0.675	0.615
Liquid permittivity (meas.)	1.200	N	√3	0.26	0.26	0.180	0.180
Liquid conductivity – temperature uncertainty	3.400	N	√3	0.78	0.71	1.531	1.394
Liquid permittivity – temperature uncertainty	0.400	N	√3	0.23	0.26	0.053	0.060
Combined standard uncertainty	$u_c = \sqrt{\sum_{1=1}^{m} c_i^2 \cdot u_i^2}$					**12.66**	**12.63**
Expanded uncertainty (confidence interval of 95%)	*ue =2.00 uc*					**25.33**	**25.26**

Table 2: Uncertainty Assessment for 300 MHz - 6 GHz

4. SAR LIMIT

Having a worst case measurement, the SAR limit is valid for general population/uncontrolled exposure.

The SAR values have to be averaged over a mass of 1 gr. (SAR 1 gr.) with the shape of a cube and averaged over a mass of 10 gr (Extremity SAR 10 gr). These levels couldn't exceed the values indicated in the application Standard:

Standard	SAR	SAR Limit (W/kg)
FCC 47 CFR Part 2.1093, Paragraph (d)(2)	SAR $_{1\ gr.}$	1.6
Health Canada Safety Code 6, Paragraph 2.1.2	SAR $_{1\ gr.}$	1.6

Table 3: SAR limit

5. DEVICE UNDER TEST

5.1. Dimensions

Dimensions	Millimetres
Height x Width x Depth	60.0 x 28.0 x 19.0
Overall Diagonal:	61.0

Table 4: Dimensions

5.2. Wireless Technology

Wireless Technology	Frequency Bands	Modes
Proximity	2.45 GHz	Proprietary wireless data protocol (Proximity)

Table 5: Supported modes

5.3. Antenna Location

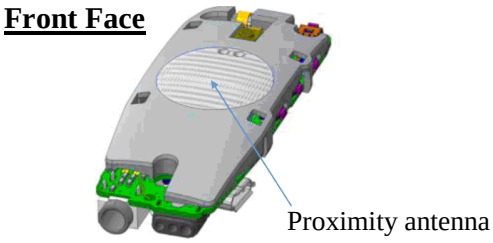

Figure 3: Antenna diagram location sketch

Appendix B – Test results

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1. TEST CONDITIONS

1.1. Power supply (V):

V_n = 3.7 Li-polymer rechargeable battery

Type of power supply = DC Voltage from rechargeable Li-Ion 3.7 V battery.

1.2. Temperature (ºC):

T_n = +20.00 to +25.00

The subscript n indicates normal test conditions.

1.3. Test signal, Output Power and Frequencies

For the Proximity mode, the sample (47427/003) was put into operation by using a manufacturer proprietary test mode, setting the maximum output power.

A fully charged battery was used for every test sequence. In all operating bands and test positions, the measurements were performed on the middle channel. In each band, for those positions where the maximum averaged SAR was found, measurements were performed on the remaining required channels except those with applicable test reductions.

The DUT doesn't support simultaneous transmission, so only standalone transmission operation has been evaluated.

The maximum conducted peak output power declared by the manufacturer for the device SM-2P is 13.4 dBm, which corresponds to a maximum average output power of 4.29 dBm, according to its transmitting duty cycle value of 12.28 %.

The target power alignments for RF components and tunning tolerance declared by the manufacturer are:

Protocol	Maximum Declared Transmission Power		
	Max. Average Power (dBm)	Tuning tolerance (dB)	Max. Average Output Power (dBm)
Proprietary wireless data protocol (Proximity)	4.29	+1/-1	5.29

1.4. DUT and test-site configurations

The DUT was placed with each face against the flat phantom surface, the separation distance between DUT and flat phantom surface was 0 mm for body worn exposure testing.

2. CONDUCTED AVERAGE POWER MEASUREMENTS

2.1. Proximity GN Proprietary Protocol

Band	Mode	Frequency (MHz)	Average Output Power (dBm)
2.45 GHz	Proprietary wireless data protocol (Proximity)	2404	3.85
		2441	3.53
		2478	3.24

Based on paragraph "4.3.1 Standalone SAR test exclusion considerations" of the KDB 447498 D01 - General RF Exposure Guidance:

[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)]

≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

Protocol	Time Avg. Max Conducted Power		Max Avg. output power declared by manufacturer		Min. Test Distance (mm)	Freq. (GHz)	Result	Test Exclusion
	(dBm)	(mW)	(dBm)	(mW)				
Proximity	3.85	2.43	5.29	3.38	5	2.404	1.05	√

The computed value for Proximity mode is < 3.0, so this mode qualifies for Standalone SAR test exclusion for 1-g SAR and 10-g.

According to IC RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), paragraph 2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation, the device operates below the applicable output power level (adjusted for tune-up tolerance), for the specified separation distance defined in Table 1. Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power.

The DUT has an antenna with a gain of 3.1 dBi, so the isotropically radiated power (e.i.r.p.) source-based, time-averaged output power is 8.39 dBm → 6.90 mW:

Output power level (e.i.r.p.) = 6.90 mW > 4mW (Exemption limit at 2450MHz frequency, 5 mm distance)

Therefore SAR testing is needed according to IC RSS-102 Issue 5 (2015-03).

3. TISSUE PARAMETERS MEASUREMENTS

Frequency (MHz)	Target Body Tissue: Parameters used in Probe Calibration		Target Body Tissue: Parameters used in Dipole Calibration		Measured Body Tissue		Measured Date
	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	
2450	52.7 ± 5%	1.95 ± 5%	52.4 ± 6%	2.03 ± 6%	51.26	2.04	22-12-2015

Note: The dielectric properties have been measured by the contact probe method at 23° C.

- Composition / Information on ingredients

Head and Muscle Tissue Simulation Liquids HBBL1900-3800V3/M HBBL1900-3800V3

Water	50 – 73 %
Non-ionic detergents	27 – 50 % polyoxyethylenesorbitan monolaurate
NaCl	0 – 2 %
Preservative	0.05 – 0.1% Preventol-D7
Safety relevant ingredients:	
CAS-No. 55965-84-9	< 0.1 % aqueous preparation, containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone
CAS-No. 9005-64-5	<50 % polyoxyethylenesorbitan monolaurate

4. SYSTEM CHECK MEASUREMENTS

4.1. Validation results for Body TSL

Date	Frequency (MHz)	SAR	Target SAR	Measured SAR	Drift (%)	Limit (%)
22-12-2015	2450	1 gr.	52.1	56.22	7.91	10
		10 gr.	24.4	25.42	4.16	10

5. MEASUREMENT RESULTS FOR SAR (SPECIFIC ABSORPTION RATE)

5.1. Summary maximum results for 1-g body SAR measurements.

Band	Mode	Side / Position	Channel (Frequency)	Reported SAR (1g avg) (W/Kg)	SAR limit (1g avg) (W/Kg)
2450 MHz	Proximity	Front face 0 mm	CH 4 (2404 MHz)	0.043	1.6

5.2. Results for Proximity Protocol, 2450 MHz Band.

Side / Position	Dist (mm)	Mode	Ch #. (Freq)	1-g SAR (W/Kg)	Power Drift (%)	Max. Output Power (dBm)	Max. Reported 1-g SAR	Plot No.
Front face	0	Proximity	CH 40 (2440 Mhz)	0.026	-0.92	4.29	0.040	1
Back face	0	Proximity	CH 40 (2440 Mhz)	0.0014[1]	4.47	4.29	0.002	
Front face	0	Proximity	CH 4 (2404 Mhz)	0.031	1.74	4.29	0.043	2
Front face	0	Proximity	CH 78 (2478 Mhz)	0.025	3.28	4.29	0.040	3

1: See remarks and comments

Appendix C – Measurement report

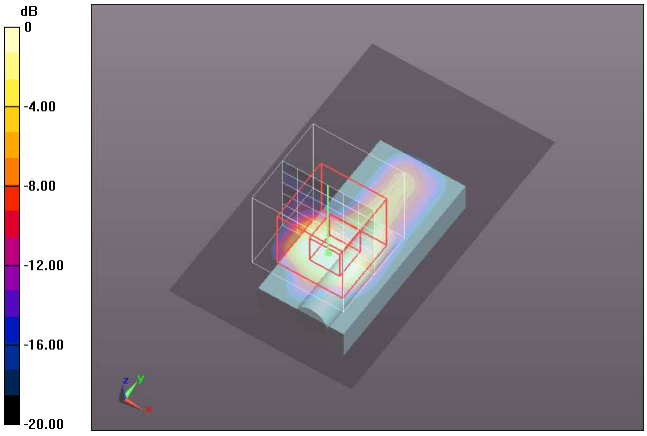
Proximity Protocol – 2450 MHz –Body – Front face, d=0 mm – Middle Channel – Plot Nº 1

Test Laboratory: AT4 Wireless; Date: 22/12/2015

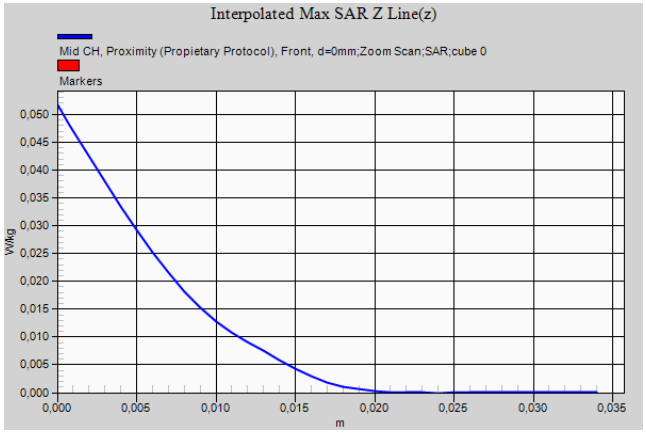
DUT: GNResound; Type: SM-2P; Serial: --

Communication System: UID 0, Proximity (0); Frequency: 2440 MHz; Duty Cycle: 1:8.14329
Medium parameters used: f = 2440 MHz; σ = 2.03 S/m; ε_r = 51.27; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.31, 4.31, 4.31); Calibrated: 20/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 13/07/2015
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Flat Phantom Side - 2450MHz/Mid CH, Proximity (Propietary Protocol), Front, d=0mm/Area Scan (61x101x1):
Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0569 W/kg
Flat Phantom Side - 2450MHz/Mid CH, Proximity (Propietary Protocol), Front, d=0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.283 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.0520 W/kg
SAR(1 g) = 0.026 W/kg; SAR(10 g) = 0.00798 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.0330 W/kg



0 dB = 0.0330 W/kg = -14.81 dBW/kg

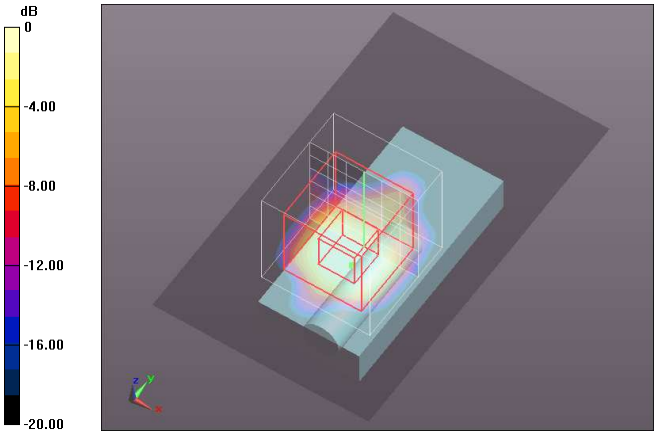


Proximity Protocol – 2450 MHz –Body – Front face, d=0 mm – Lowest Channel – Plot Nº 2

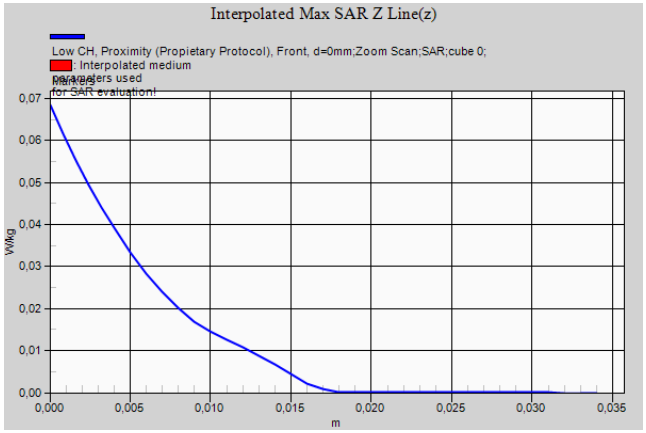
Test Laboratory: AT4 Wireless; Date: 22/12/2015

DUT: GNResound; Type: SM-2P; Serial: --
Communication System: UID 0, Proximity (0); Frequency: 2404 MHz; Duty Cycle: 1:8.14329
Medium parameters used (interpolated): f = 2404 MHz; σ = 1.984 S/m; ε_r = 51.342; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.31, 4.31, 4.31); Calibrated: 20/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 13/07/2015
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Flat Phantom Side - 2450MHz/Low CH, Proximity (Propietary Protocol), Front, d=0mm/Area Scan (61x101x1):
Interpolated grid: dx=1.000 mm, dy=1.000 mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0571 W/kg
Flat Phantom Side - 2450MHz/Low CH, Proximity (Propietary Protocol), Front, d=0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.210 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.0680 W/kg
SAR(1 g) = 0.031 W/kg; SAR(10 g) = 0.011 W/kg (SAR corrected for target medium)
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0361 W/kg



0 dB = 0.0361 W/kg = -14.42 dBW/kg

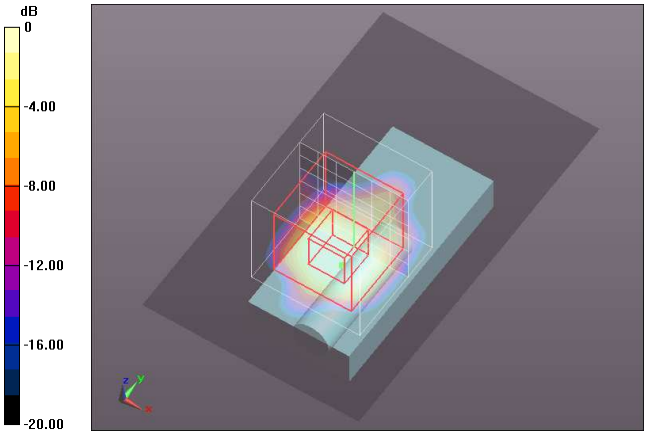


Proximity Protocol – 2450 MHz –Body – Front face, d=0 mm – Highest Channel – Plot Nº 3

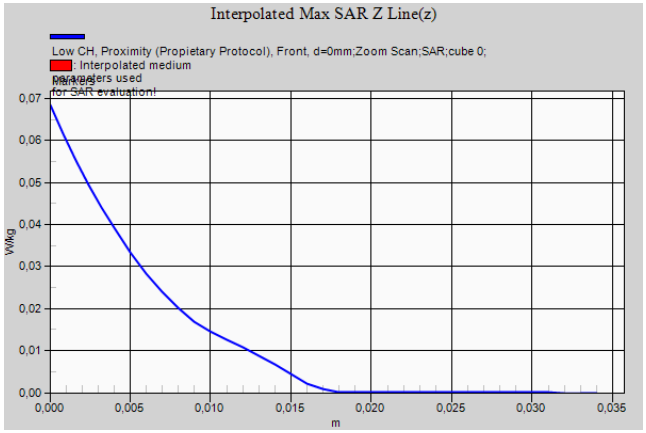
Test Laboratory: AT4 Wireless; Date: 22/12/2015

DUT: GNResound; Type: SM-2P; Serial: --
Communication System: UID 0, Proximity (0); Frequency: 2404 MHz; Duty Cycle: 1:8.14329
Medium parameters used (interpolated): f = 2404 MHz; σ = 1.984 S/m; ε_r = 51.342; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.31, 4.31, 4.31); Calibrated: 20/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 13/07/2015
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Flat Phantom Side - 2450MHz/Low CH, Proximity (Propietary Protocol), Front, d=0mm/Area Scan (61x101x1):
Interpolated grid: dx=1.000 mm, dy=1.000 mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0571 W/kg
Flat Phantom Side - 2450MHz/Low CH, Proximity (Propietary Protocol), Front, d=0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.210 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.0680 W/kg
SAR(1 g) = 0.031 W/kg; SAR(10 g) = 0.011 W/kg (SAR corrected for target medium)
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0361 W/kg



0 dB = 0.0361 W/kg = -14.42 dBW/kg



Appendix D – System Validation Reports

Validation results in 2450 MHz Band for Body TSL

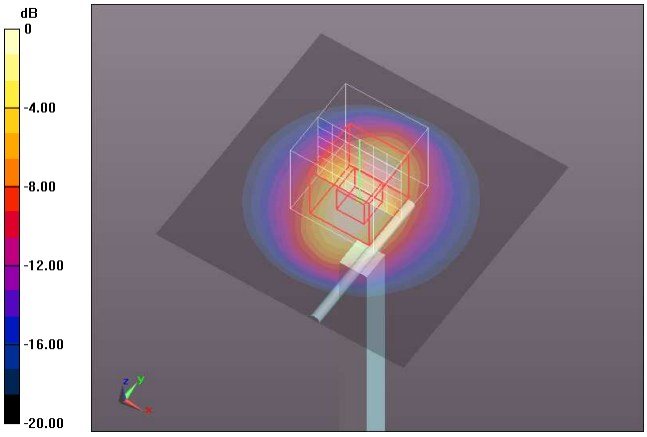
Test Laboratory: AT4 Wireless; Date: 22/12/2015

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:756
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.26; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.31, 4.31, 4.31); Calibrated: 20/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 13/07/2015
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Validation Configuration 2450MHz Dipole/d=10mm, Pin=250 mW/Area Scan (91x91x1):
Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.6 W/kg

System Validation Configuration 2450MHz Dipole/d=10mm, Pin=250 mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.65 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 29.8 W/kg
SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.6 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 16.5 W/kg



0 dB = 16.5 W/kg = 12.17 dBW/kg