

Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attayi

Dates of Test
August 31- Sep. 23, 2015

RTS-6066-1509-19

Report No

FCC ID L6ARHK210LW

Annex B: Probe and dipole descriptions and calibration certificates

B.2 Dipole calibration certificate



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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Client

Blackberry Waterloo

Accreditation No.: SCS 108

Certificate No: CD835V3-1011 Nov13

Calibration procedure(s)	QA CAL-20.v6 Calibration proce		
		edure for dipoles in air	
Calibration date:	November 12, 2	013	
The measurements and the unc	ertainties with confidence p acted in the closed laborate	fional standards, which realize the physical units probability are given on the following pages and any facility: environment temperature (22 ± 3)°C (are part of the certificate. and humidity < 70%.
rimary Standards	4D #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09 Oct-13 (No. 217-01827)	Oct-14
ower sensor HP 8481 A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 10 dB Attenuator	SN: 5047.2 (10q)	04-Apr-13 (No. 217-01731)	Apr-14
Probe ERSDV6	SN: 2336	26-Dec-12 (No. ER3-2336_Dec12)	Dec-13
Probe H3DV6	SN: 6065	28-Dec-12 (No. H3-6065, Dec12)	Dec-13
DAE4	SN: 781	13-Sep-13 (No. DAE4-781_Sep13)	Sep-14
Secondary Standards	10 #	Check Date (in house)	Scheduled Check
Power mater Agliant 4419H	SN: GB42420191	09-Oct-09 (in house check Oct-13)	In house check: Oct-15
Power sensor HP E4412A	SN: MY41495277	01-Apr-08 (in house check Oct-13)	In house check: Oct-15
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-13)	in house check: Oct-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14
RF generator R&S SMT-06	SN: 832283/011	27-Aug-12 (in house check Oct-13)	in house check: Oct-15
	Name	Function	Signature
Calibrated by:	Claudio Laubler	Laboratory Technician	
			Mela
Approved by:	Fin Bornholt:	Deputy Technical Manager	F. Bondoull

Certificate No: CD835V3-1011_Nov13

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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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References

 ANSI-C63.19-2011
 American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- Coordinate System: y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna
 (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes.
 In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a
 distance of 15 mm above the top metal edge of the dipole arms.
- Measurement Conditions: Further details are available from the hardcopies at the end of the certificate. All
 figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector
 is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a
 directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- Antenna Positioning: The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the
- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any specified.
- E-field distribution: E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1

DASY Version	DASY5	V52.8.7
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	15mm	
Scan resolution	dx, dy = 5 mm	
Frequency	835 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 835 MHz

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	110.1 V / m
Maximum measured above low end	100 mW input power	104.5 V / m
Averaged maximum above arm	100 mW input power	107.3 V / m ± 12.8 % (k=2)

Appendix

Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	16.3 dB	42.8 Ω - 12.4 jΩ
835 MHz	29.4 dB	$51.5 \Omega + 3.1 j\Omega$
900 MHz	16.3 dB	55.5 Ω - 15.3 jΩ
950 MHz	19.6 dB	44.2 Ω + 8.1 jΩ
960 MHz	16.2 dB	50.8 Ω + 15.7 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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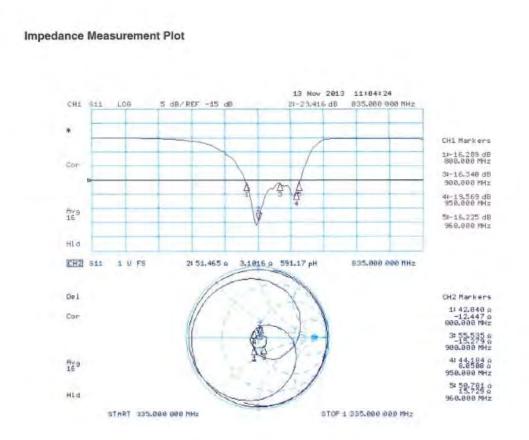
Daoud Attayi

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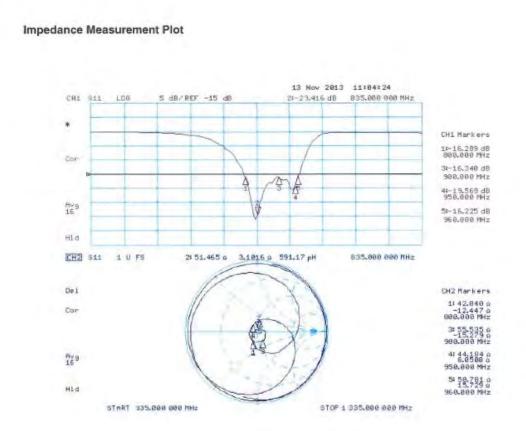
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Client

Blackberry Waterloo

Accreditation No.: SCS 108

Certificate No: CD1880V3-1008_Nov13

Object	CD1880V3 - SN	: 1008	
Calibration procedure(s)	QA CAL-20.v6 Calibration process	edure for dipoles in air	
Calibration date:	November 12, 2	013	
This calibration certificate docur	nents the traceability to na	tional standards, which realize the physical units	of measurements (SI).
		probability are given on the following pages and a	
AR OF A Para base bases and	and to the street let and	6-19	700
All calibrations have been condi	icted in the crosed laborate	ory facility: environment temperature (22 ± 3)°C a	and numicity < 70%.
Calibration Equipment used (Ma	TE critical for calibration)		
	TE critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
rimary Standards		Cal Date (Certificate No.) 09-Oct-13 (No. 217-01827)	Scheduled Calibration Oct-14
rimary Standards lower meter EPM-442A	(D#		
rimary Standards lower meter EPM-442A lower sensor HP 8481A	ID# GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A	ID # GB37480704 US37292783	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827)	Oct-14 Oct-14
Primary Standards Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator	ID # GB37480704 US37292783 MY41092317	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828)	Oct-14 Oct-14
Primary Standards Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator Probe ER3DV6	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 (10q)	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731)	Oct-14 Oct-14 Oct-14 Apr-14
rimary Standards rower meter EPM-442A rower sensor HP 8481A rower sensor HP 8481A deference 10 dB Attenuator robe ER3DV6 robe H3DV6	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2336, Dec12)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13
Primary Standards Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2336, Dec12) 28-Dec-12 (No. H3-6065_Dec12)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13
Primary Standards Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Becondary Standards Power meter Agilent 4419B	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2336 Dec12) 28-Dec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house) 09-Oct-09 (in house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Scheduled Check In house check; Oct-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 DAE4 Secondary Standards Power meter Agilent 4419B Power sensor HP E4412A	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: MY41495277	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2336 Dec12) 28-Dec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house) 09-Oct-09 (in house check Oct-13) 01-Apr-08 (in house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Schaduled Check In house check: Oct-15 In house check: Oct-15
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Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe HSDV6 DAE4 Secondary Standards Power meter Agilient 4419B Power sensor HP 8482A Network Analyzer HP 8753E	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: MY41495277 SN: US37295597 US37390585	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2336 Dec12) 28-Dec-12 (No. DAE4-781_Sep13) Check Date (in house) 09-Oct-09 (in house check Oct-13) 09-Oct-09 (in house check Oct-13) 18-Oct-01 (in house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Schaduled Check In house check: Oct-15
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- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
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Measurement Conditions

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DASY5	V52.8.7
HAC Test Arch	
15mm	
dx, dy = 5 mm	
835 MHz ± 1 MHz	
< 0.05 dB	
	HAC Test Arch 15mm dx, dy = 5 mm 835 MHz ± 1 MHz

Maximum Field values at 835 MHz

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	110.1 V / m
Maximum measured above low end	100 mW input power	104.5 V / m
Averaged maximum above arm	100 mW input power	107.3 V / m ± 12.8 % (k=2)

Appendix

Antenna Parameters

Frequency	Return Loss	Impedance
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835 MHz	29.4 dB	$51.5 \Omega + 3.1 j\Omega$
900 MHz	16.3 dB	55.5 Ω - 15.3 jΩ
950 MHz	19.6 dB	44.2 Ω + 8.1 jΩ
960 MHz	16.2 dB	$50.8 \Omega + 15.7 jΩ$

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Certificate No: CD835V3-1011_Nov13

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Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attayi

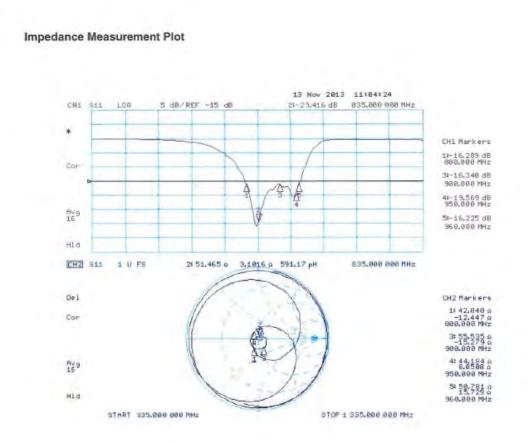
Dates of Test

August 31- Sep. 23, 2015

RTS-6066-1509-19

Report No

FCC ID L6ARHK210LW



Certificate No: CD835V3-1011_Nov13

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Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attayi

Dates of Test

August 31- Sep. 23, 2015

Report No **RTS-6066-1509-19**

FCC ID L6ARHK210LW

DASY5 E-field Result

Date: 12.11.2013

Test Laboratory; SPEAG Lab2

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1011

Communication System: UID 0 - CW; Frequency, 835 MHz Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m³ Phantom section: RF Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 28.12.2012;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 13.09.2013
- . Phantom: HAC Test Arch with AMCC; Type: SD HAC PO1 BA; Serial: 1070
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole E-Field measurement @ 835MHz/E-Scan - 835MHz d=15mm/Hearing Aid Compatibility Test (41x361x1):

Interpolated grid: dx=0,5000 mm, dy=0,5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 111.2 V/m; Power Drift = 0,01 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 110,1 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 M4	Grid 2 M4	Grid 3 M4
102.6 V/m	104.5 V/m	103.0 V/m
Grid 4 M4	Grid 5 M4	Grid 6 M4
62.00 V/m	62.75 V/m	61.79 V/m
Grid 7 M4	Grid 8 M4	Grid 9 M4
108.2 V/m	110.1 V/m	107.9 V/m



0 dB = 110.1 V/m = 40.84 dBV/m

Certificate No: CD835V3-1011_Nov13

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Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attayi

Dates of Test

August 31- Sep. 23, 2015

Report No **RTS-6066-1509-19**

FCC ID L6ARHK210LW

Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurloh, Switzerland





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C Service suisse d'étalonnage
Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client

Blackberry Waterloo

Accreditation No.: SCS 108

Certificate No: CD1880V3-1008_Nov13

Object	CD1880V3 - SN	: 1008	
Calibration procedure(s)	QA CAL-20.v6 Calibration proce	edure for dipoles in air	
Calibration date:	November 12, 2	013	
The measurements and the uno	ertainties with confidence particles in the closed laborate	fional standards, which realize the physical units probability are given on the following pages and by facility: environment temperature (22 \pm 3) $^{\circ}$ C a	are part of the certificate.
Primary Standards	1D#	Cal Date (Certificate No.)	Scheduled Calibration
	ID# GB37480704	Cal Date (Certificate No.) 09-Oct-13 (No. 217-01827)	Scheduled Calibration Oct-14
Power meter EPM-442A		and the second second second second	
Power meter EPM-442A Power sensor HP 8481A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A	GB37480704 US37292783	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827)	Oct-14 Oct-14
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator	GB37480704 US37292783 MY41092317	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828)	Oct-14 Oct-14 Oct-14
Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator Probe ER3DV6	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q)	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731)	Oct-14 Oct-14 Oct-14 Apr-14
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2336, Dec12)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13
Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4	G837480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2396 SN: 6065	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Oec-12 (No. ER3-2396, Dec12) 28-Oec-12 (No. DAE4-781_Sep13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2396 Dec12) 28-Dec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14
Power mater EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agilent 4419B	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Oec-12 (No. ER3-2396 Dec12) 28-Oec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house) 09-Oct-09 (in house)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Scheduled Check
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agilent 44198 Power sensor HP E4412A	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2396 Dec12) 28-Dec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Schadulad Check In house check: Oct-15
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agillent 44198 Power sensor HP E4412A Power sensor HP 8482A	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: MY41495277	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Dec-12 (No. ER3-2396, Dec12) 28-Dec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house) 09-Oct-09 (In house check Oct-13) 01-Apr-08 (In house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Schaduled Check In house check: Oct-15 In house check: Oct-15
Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agillent 4419B Power sensor HP 8482A Network Analyzer HP 8753E	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: MY41495277 SN: US37295597	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 05-Oec-12 (No. HS-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (in house) 09-Oct-08 (in house check Oct-13) 01-Apr-08 (in house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Schaduled Check In house check: Oct-15 In house check: Oct-15 In house check: Oct-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agillent 4419B Power sensor HP E4412A Power sensor HP 8482A Network Analyzer HP 8753E RF generator R&S SMT-06	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: MY41495277 SN: US37295597 US37390665	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 08-Oct-12 (No. ER3-2336 Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house) 09-Oct-09 (in house check Oct-13) 09-Oct-09 (in house check Oct-13) 18-Oct-01 (in house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Scheduled Check In house check: Oct-15
Power meter EPM-442A Power sensor HIP 8481A Power sensor HIP 8481A Power sensor HIP 8481A Reference 10 dB Attenuator Probe ER3DV6 DAE4 Secondary Standards Power meter Agillent 4419B Power sensor HIP 84412A Power sensor HIP 8482A Network Analyzer HIP 8753E	GB37480704 US37292783 MY41092317 SN: 5047.2 (10q) SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: MY41495277 SN: US37295597 US37390565 SN: 832283/011	09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01827) 09-Oct-13 (No. 217-01828) 04-Apr-13 (No. 217-01828) 04-Apr-13 (No. 217-01731) 28-Oec-12 (No. ER3-2396 Dec12) 28-Oec-12 (No. H3-6065_Dec12) 13-Sep-13 (No. DAE4-781_Sep13) Check Date (In house) 09-Oct-09 (In house check Oct-13) 01-Apr-08 (In house check Oct-13) 09-Oct-09 (In house check Oct-13) 18-Oct-01 (In house check Oct-13) 27-Aug-12 (In house check Oct-13)	Oct-14 Oct-14 Oct-14 Apr-14 Dec-13 Dec-13 Sep-14 Schaduled Check In house check: Oct-15 In house check: Oct-15 In house check: Oct-15 In house check: Oct-15 In house check: Oct-14 In house check: Oct-14

Certificate No: CD1880V3-1008_Nov13

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Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attavi

Dates of Test

August 31- Sep. 23, 2015

Report No RTS-6066-1509-19 FCC ID LOCATION LOCATION TO THE PERSON TO TH

Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerlacher Kalibrierdienst
C Service sulass d'étalonnage
Servizio svizzero di taratura
Swiss Calibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

References

ANSI-C63.19-2011
 American National Standard, Methods of Measurement of Compatibility between Wireless Communications
 Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- Coordinate System: y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna
 (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes.
 In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a
 distance of 15 mm above the top metal edge of the dipole arms.
- Measurement Conditions: Further details are available from the hardcopies at the end of the certificate. All
 figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector
 is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a
 directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- Antenna Positioning: The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- E-field distribution: E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: CD1880V3-1008_Nov13



Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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S Schweizerlacher Kalibrierdienst
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References

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 American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- Coordinate System: y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna
 (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes.
 In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a
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- Measurement Conditions: Further details are available from the hardcopies at the end of the certificate. All
 figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector
 is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a
 directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- Antenna Positioning: The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- E-field distribution: E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: CD1880V3-1008_Nov13



Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	15mm	
Scan resolution	dx, dy = 5 mm	
Frequency	1880 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 1880 MHz

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	90.8 V / m
Maximum measured above low end	100 mW input power	87.3 V / m
Averaged maximum above arm	100 mW input power	89.0 V / m ± 12.8 % (k=2)

Appendix

Antenna Parameters

Frequency	Return Loss	Impedance
1730 MHz	27.3 dB	$52.4 \Omega + 3.7 j\Omega$
1880 MHz	20.3 dB	50.2 Ω + 9.7 jΩ
1900 MHz	20.8 dB	52,5 Ω + 9.0 jΩ
1950 MHz	28.5 dB	52.5 Ω + 2.9 jΩ
2000 MHz	18.5 dB	43.0 Ω + 8.7 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attayi

Dates of Test

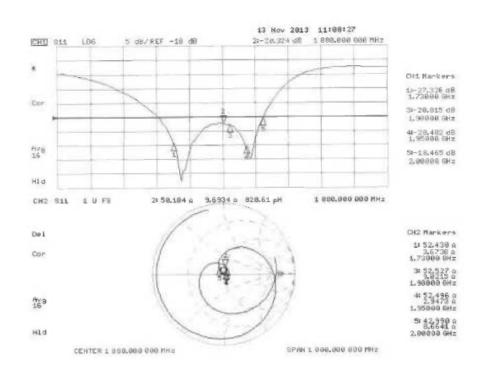
August 31- Sep. 23, 2015

RTS-6066-1509-19

Report No

FCC ID L6ARHK210LW

Impedance Measurement Plot



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Author Data

Daoud Attayi

Dates of Test

August 31- Sep. 23, 2015

Report No **RTS-6066-1509-19**

FCC ID L6ARHK210LW

DASY5 E-field Result

Date: 12.11.2013

Test Laboratory: SPEAG Lab2

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: CD1880V3 - SN: 1008

Communication System: UTD 0 - CW; Frequency: 1880 MHz Medium parameters used: $\sigma = 0$ S/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³ Phantom section: RF Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

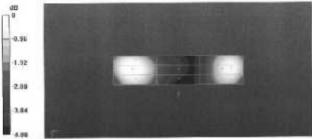
- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 28.12.2012;
- · Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 13.09.2013
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole E-Field measurement @ 1880MHz/E-Scan - 1880MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):

Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 149.9 V/m: Power Drift = 0.00 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 90.79 V/m
Near-field entegory: M3 (AWF 0 dB)

PMF scaled E-field

Grid 2 M3 90.79 V/m	
 Grid 5 M3 70.42 V/m	33 14 1
Grid 8 M3 87.31 V/m	



0 dB = 90.79 V/m = 39.16 dBV/m

Certificate No: CD1880V3-1008_Nov13

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Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHK211LW (STV100-1)

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Author Data

Daoud Attayi

Dates of Test

August 31- Sep. 23, 2015

RTS-6066-1509-19

Report No

FCC ID L6ARHK210LW

Calib ration Laboratory of Schmid & Partner Englineering AG Zeughar Strasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
Swiss Calibration Service

Accreditation No.: SCS 0108

Issued: March 11, 2015

Accredif ed by the Swiss Accreditation Service (SAS)

The Swii ss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client

Blackberry Waterloo

Certificate No: CD2450V3-1011 Mar15

Object	CD2450V3 - SN:	1011	
Callbration procedure(s)	QA CAL-20.v6 Calibration proce	dure for dipoles in air	
Calibration date:	March 11, 2015		
		onal standards, which realize the physical unit	
		robability are given on the following pages and	
All calibrations have been condi	acted in the closed laborato	ry facility: environment temperature (22 ± 3)°C	and humidity < 70%.
Calibration Equipment used (M8	TE critical for calibration)		
	TE critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
rimary Standards	The second secon	Cal Date (Certificate No.) 07-Oct-14 (No. 217-02020)	Scheduled Calibration Oct-15
rimary Standards ower meter EPM-442A	(D.#		
rimary Slandards lower meter EPM-442A lower sensor HP 8481A	ID # GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Primary Slandards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A	ID # GB37480704 US37292783	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020)	Oct-15 Oct-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator	ID # GB37480704 US37292783 MY41092317	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021)	Oct-15 Oct-15 Oct-15
rimary Slandards ower meter EPM-442A ower sensor HP 8481A ower sensor HP 8481A deference 10 dB Attenuator trobe ER3DV6	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921)	Oct-15 Oct-15 Oct-15 Apr-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921) 31-Dec-14 (No. ER3-2336_Dec14)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921) 31-Dec-14 (No. ER3-2336_Dec14) 31-Dec-14 (No. H3-6065_Dec14)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-02021) 31-Dec-14 (No. ER3-2336_Dec14) 31-Dec-14 (No. H3-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power meter Agilent 4419B	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781 ID #	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921) 31-Dec-14 (No. ER3-2336_Deo14) 31-Dec-14 (No. H3-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14) Check Date (in house)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15 Scheduled Check In house check: Sep-16
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ERSDV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agilent 4419B Power sensor HP E4412A	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921) 31-Dec-14 (No. ER3-2336_Dec14) 31-Dec-14 (No. H3-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14) Check Date (in house)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15 Scheduled Check In house check: Sep-16 In house check: Sep-16
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A Probe ERSDV6 Probe ERSDV6 Probe HSDV6 Probe HSD	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: US38485102	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921) 31-Dec-14 (No. ER3-2336_Dec14) 31-Dec-14 (No. H3-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14) Check Date (in house) 09-Oct-09 (in house check Sep-14) 05-Jan-10 (in house check Sep-14)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15 Scheduled Check
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8482A Network Analyzer HP 8753E	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: US38485102 SN: US37295597	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-02021) 03-Apr-14 (No. ERS-2336_Dec14) 31-Dec-14 (No. HS-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14) Check Date (in house) 09-Oct-09 (in house check Sep-14) 05-Jan-10 (in house check Sep-14) 09-Oct-09 (in house check Sep-14)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15 Scheduled Check In house check: Sep-16 In house check: Sep-16
Primary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8482A Network Analyzer HP 8753E	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: US38495102 SN: US37296597 US37390585	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-02021) 31-Dec-14 (No. ER3-2336_Dec14) 31-Dec-14 (No. H3-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14) Check Date (in house) 09-Oct-09 (in house check Sep-14) 05-Jan-10 (in house check Sep-14) 18-Oct-01 (in house check Sep-14)	Oct-15 Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15 Scheduled Check In house check: Sep-16 In house check: Sep-16 In house check: Sep-16
Calibration Equipment used (M8 Primary Slandards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A Reference 10 dB Attenuator Probe ER3DV6 Probe H3DV6 DAE4 Secondary Standards Power meter Agilient 4419B Power sensor HP 8482A Network Analyzer HP 8753E RF generator R&S SMT-06 Calibrated by:	ID # GB37480704 US37292783 MY41092317 SN: 5047.2 / 06327 SN: 2336 SN: 6065 SN: 781 ID # SN: GB42420191 SN: US38485102 SN: US37295597 US37390585 SN: 832283/011	07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02020) 07-Oct-14 (No. 217-02021) 03-Apr-14 (No. 217-01921) 31-Dec-14 (No. ER3-2336_Dec14) 31-Dec-14 (No. H3-6065_Dec14) 12-Sep-14 (No. DAE4-781_Sep14) Check Date (in house) 09-Oct-09 (in house check Sep-14) 05-Jan-10 (in house check Sep-14) 09-Oct-09 (in house check Sep-14) 18-Oct-01 (in house check Sep-14) 27-Aug-12 (in house check Oct-13)	Oct-15 Oct-15 Oct-15 Apr-15 Dec-15 Dec-15 Sep-15 Scheduled Check In house check: Sep-16 In house check: Sep-16 In house check: Oct-15 In house check: Oct-15 In house check: Oct-16

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Author Data

Daoud Attayi

Dates of Test

August 31- Sep. 23, 2015

Report No

RTS-6066-1509-19

FCC ID L6ARHK210LW

Calib ration Laboratory of Schmail & Partner Engineering AG Zeugha unarrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
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Swiss Calibration Service

Accreditation No.: SCS 0108

Accredit^{©1} by the Swiss Accreditation Service (SAS)

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References

 ANSI-C63.19-2011
 American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- Coordinate System: y-axis is in the direction of the dipole arms, z-axis is from the basis of the antenna
 (mounted on the table) towards its feed point between the two dipole arms, x-axis is normal to the other axes,
 in coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a
 distance of 15 mm above the top metal edge of the dipole arms.
- Measurement Conditions: Further details are available from the hardcopies at the end of the certificate. All
 ligures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector
 is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a
 directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- Antenna Positioning: The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network
 Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was
 eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any
 obstacles.
- E-field distribution: E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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Mea ≤urement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	15 mm	
Scan resolution	dx, dy = 5 mm	
Frequency	2450 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maxí mum Field values at 2450 MHz

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100mW input power	88.6V/m = 38.94 dBV/m
Maximum measured above low end	100mW input power	84.4V/m = 38.52 dBV/m
Averaged maximum above arm	100mW input power	86.5V/m ± 12.8 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

Frequency	Return Loss	Impedance
2250 MHz	17.2 dB	54.5 Ω + 13.9 jΩ
2350 MHz	29.4 dB	$53.4 \Omega + 0.7 j\Omega$
2450 MHz	28.1 dB	$52.9 \Omega + 2.8 j\Omega$
2550 MHz	36.3 dB	51.5 Ω - 0.4 jΩ
2650 MHz	18.0 dB	$61.5 \Omega + 8.0 j\Omega$

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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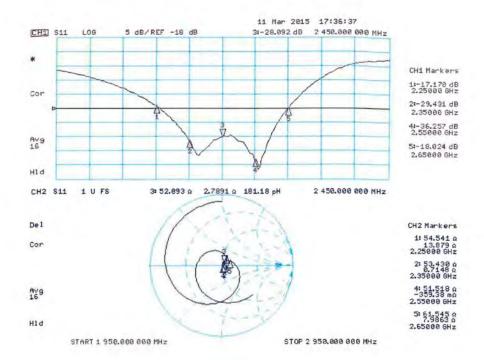
Dates of Test August 31- Sep. 23, 2015

RTS-6066-1509-19

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Imperiance Measurement Plot





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Report No

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DASY 5E-field Result

Date: 11.03.2015

Test La beratory: SPEAG Lab2

DUT: #4C Dipole 2450 MHz; Type: CD2450V3; Serial: CD2450V3 - SN: 1011

Communication System: UID 0 - CW; Frequency; 2450 MHz Medium karameters used: $\sigma = 0$ S/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³ Phanto mucciion: RF Section Measur enem Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 31.12.2014;
- Sensor-Surface: (Fix Surface)
- flectronics: DAE4 Sn781; Calibrated: 12.09.2014
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole E-Field measurement @ 2450MHz/E-Scan - 2450MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):

Interpolated grid: dx=0.5000 mm, dy=0.5000 mm Device Reference Point: 0, 0, -6.3 mm Reference Value = 79.66 V/m; Power Drift = -0.00 dB Applied MIF = 0.00 dB RF audio interference level = 38.94 dBV/m Emission category: M2

MIF scaled E-field

Grid 1 M2	Grid 2 M2	Grid 3 M2
38.23 dBV/m	38.52 dBV/m	38.45 dBV/m
Grid 4 M2	Grid 5 M2	Grid 6 M2
38.15 dBV/m	38.44 dBV/m	38.4 dBV/m
Grid 7 M2	Grid 8 M2	Grid 9 M2
38.7 dBV/m	38.94 dBV/m	38.87 dBV/m



0 dB = 88.55 V/m = 38.94 dBV/m

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