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HAC RF Emission TEST REPORT

Pantech Co., Ltd.
Pantech Building, I-2, DMC,
Sangam-dong, Mapo-gu, Seoul, Korea
(ZIP : 121-792)

Date of Issue: Feb. 26, 2014
Test Report No.: HCT-A-1402-F007
Test Site: HCT CO., LTD.

FCC ID: JYC78

APPLICANT: Pantech Co., Ltd.

Application Type	:	Certification
EUT Type	:	Cellular/ PCS CDMA/ GSM Phone one with Bluetooth
Tx Frequency	:	824.20 - 848.80 MHz (GSM850)
	:	1 850.20 -1 909.80 MHz (GSM1900)
		824.70 – 848.31 MHz (CDMA835)
		1 851.25 – 1 908.75 MHz (PCS1900)
Trade Name/Model(s)	:	Pantech /C781R3
FCC Classification	:	Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s)	:	§20.19
HAC Standard	:	ANSI C63.19-2011

Hearing Aid Near-Field Category: M4

This wireless portable device has been shown to be hearing-aid compatible under the above rated category, specified in ANSI/IEEE Std. C63.19-2011 and had been tested in accordance with the specified measurement procedures. Hearing-Aid Compatibility is based on the assumption that all production units will be designed electrically identical to the device tested in this report.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT Co., Ltd. Certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti- Drug Abuse Act of 1998, 21 U.S. C. 862.

Report prepared by
: Young-Soo Jang
Test Engineer of SAR Part

Approved by
: Dong-Seob Kim
Manager of SAR Part

Version

Rev	DATE	DESCRIPTION
	Feb.26.2014	First Approved Report

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HAC MEASUREMENT REPORT

1. APPLICANT / EUT DESCRIPTION

1.1 Applicant

- Company Name: Pantech Co., Ltd.
- Attention: Pantech Building, I-2, DMC,
  Sangam-dong, Mapo-gu, Seoul, Korea (ZIP : 121-792)
- Tel. / Fax : +82-2-2030-1363 / +82-2-2030-2519

1.2 EUT Description

- EUT Type: Cellular/ PCS CDMA/ GSM Phone one with Bluetooth
- Trade Name: Pantech
- Model(s): C781R3
- FCC ID: JYC78
- Serial Number(s): #1
- Tx Frequency: 824.20 - 848.80 MHz (GSM850),1 850.20 -1 909.80 MHz (GSM1900)
  824.70 – 848.31 MHz (CDMA835),1 851.25 – 1 908.75 MHz (PCS1900)
- FCC Classification: Licensed Portable Transmitter Held to Ear (PCE)
- FCC Rule Part(s): § 20.19(b); §6.3(v), §7.3(v)
- Modulation(s): GSM850, GSM1900, CDMA835, PCS1900
- Antenna Type: Integral Antenna
- Date(s) of Tests: Feb. 26, 2014
- Place of Tests: HCT CO., LTD.
  Icheon, Kyoung ki-Do, KOREA
- Report Serial No.: HCT-A-1402-F007
- Max E-Field Emission: GSM1900 512ch, 1 850.2 MHz = 28.31 dBV/m (M4)

Air-Interface	Band (MHz)	Type	HAC Tested	Simultaneous Transmissions Note: Not to be tested	concurrent HAC Tested or not Tested	Reduced Power 20.19(C)(1)	Voice over Digital Transport OTT Capability	WiFi Low Power
GSM	850	VO	Yes	Yes: BT	Not tested[1]	N/A	N/A	N/A
	1900							
	GPRS	DT	N/A	Yes: BT	N/A	N/A	Yes	N/A
CDMA	835	VO	Yes	Yes: 2.4GHz WIFI or BT	Not tested[1]	N/A	N/A	N/A
	1900	VO						
BT	2450	DT	NO	Yes: GSM or CDMA	N/A	N/A	N/A	N/A

Type Transport

VO=Voice Only

DT= Digital Data-Not intended for CMRS Service

1. Non-concurrent mode was found to be the Worst Case mode

2. HAC MEASUREMENT SET-UP

These measurements are performed using the DASY5 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium IV computer, near-field probe, probe alignment sensor. The robot is a six-axis industrial robot performing precise movements.

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the HP Pentium IV 3.0 GHz computer with Windows XP system and HAC Measurement Software DASY5, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

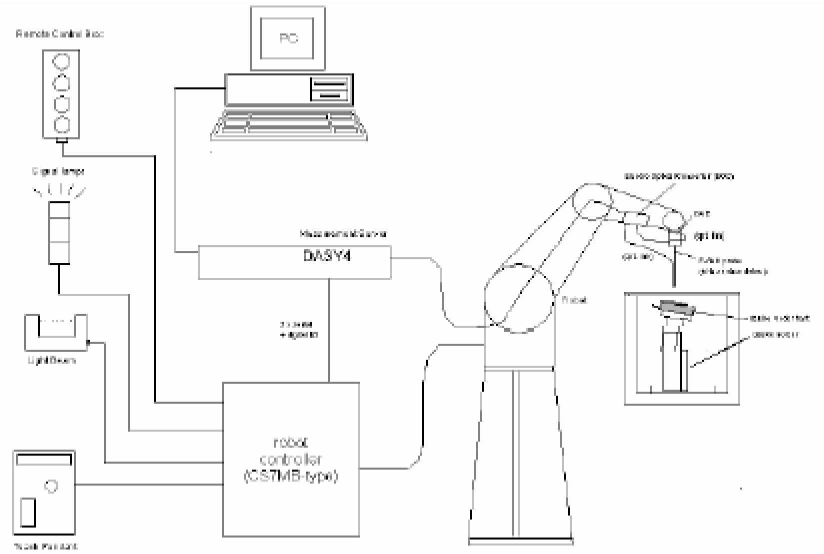


Figure 1. HAC Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

3. SYSTEM SPECIFICATIONS

3.1 Probe

3.1.1 E-Field Probe Description

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges	 [E-Field Probe]
Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy ± 6.0 %, *k* = 2)	
Frequency	100 MHz to > 6 GHz; Linearity: ± 0.2 dB (100 MHz to 3 GHz)	
Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)	
Dynamic Range	2 V/m to > 1000 V/m (M3 or better device readings fall well below diode compression point)	
Linearity	± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm	

3.2 Phantom & Device Holder

Figure 2. HAC Phantom & Device Holder

The Test Arch phantom should be positioned horizontally on a stable surface. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.
The devices can be easily, accurately, and repeatable positioned according to the FCC specifications.

3.3 Robotic System Specifications

Specifications		
	POSITIONER:	Stäubli Unimation Corp. Robot Model: RX90LB
	Repeatability:	0.02 mm
	No. of axis:	6
Data Acquisition Electronic (DAE) System		
	Cell Controller	
	Processor:	Core i7
	Clock Speed:	3.0 GHz
	Operating System:	Windows 7
	Data Card:	DASY5 PC-Board
	Data Converter	
	Features:	Signal Amplifier, multiplexer, A/D converter, and control logic
	Software:	DASY5 software
	Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock
PC Interface Card		
	Function:	24 bit (64 MHz) DSP for real time processing Link to DAE 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot

4. EUT ARRANGEMENT

4.1 WD RF Emission Measurements Reference and Plane

Figure 3. Illustrate the references and reference plane that shall be used in the WD emissions measurement.

- The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.
- The grid is centered on the audio frequency output transducer of the WD (speaker or T-coil).
- The grid is in a reference plane, which is defined as the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of the receiver area of the phone and is defined by the points of the receiver-end of the WD handset, which, in normal handset use, rest against the ear.
- The measurement plane is parallel to, and 1.5 cm in front of, the reference plane.

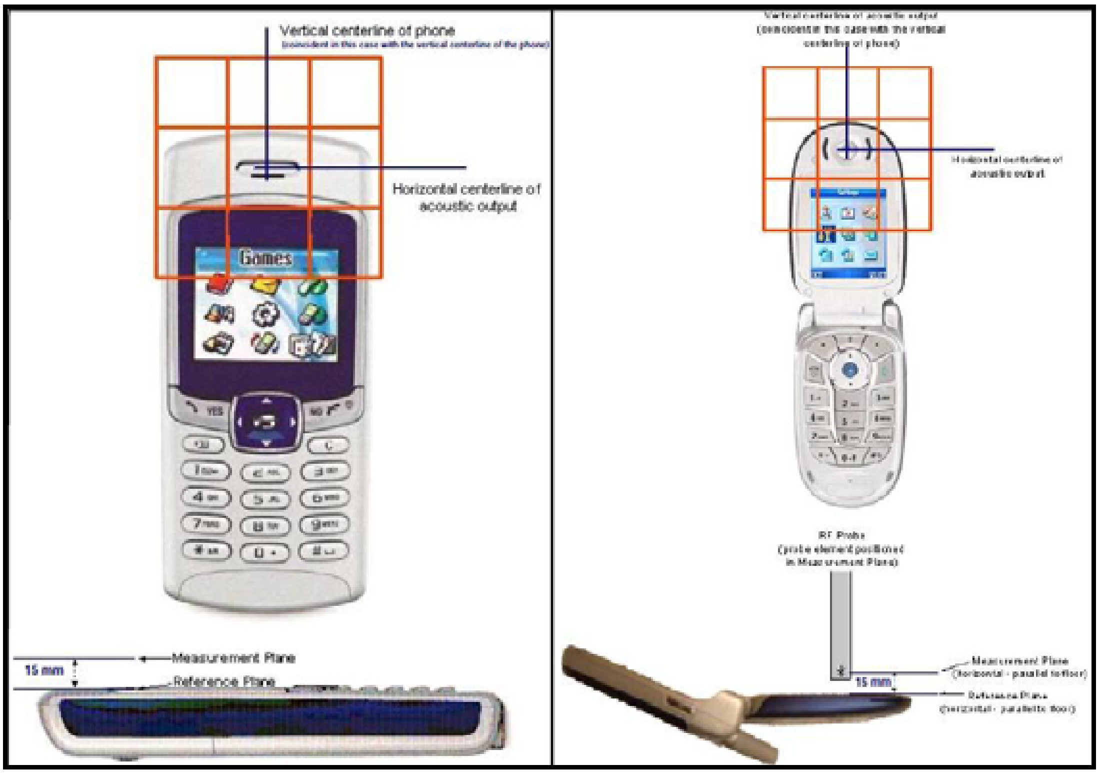


Figure 3. WD reference and plane for RF emission measurements

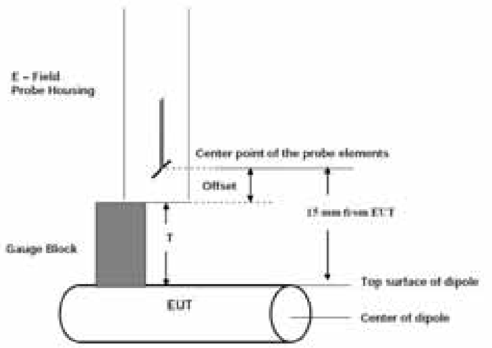


Figure 4. Gauge Block with E-Field Probe

5. SYSTEM VALIDATION

The test setup was validated when configured and verified periodically thereafter to ensure proper function. The procedure is a validation procedure using dipole antennas for which the field levels were computed by FDTD modeling.

5.1 Validation Procedure

Place a dipole antenna meeting the requirements given in ANSI-C63.19 in the position normally occupied by the WD. The dipole antenna serves as a known source for an electrical and magnetic output. Position the E-field probe so that:

- the probes and their cables are parallel to the coaxial feed of the dipole antenna
- the probe cables and the coaxial feed of the dipole antenna approach the measurement area from opposite directions; and
- the probes are 15 mm from the surface of the dipole elements.

Scan the length of the dipole with E-field probe and record the maximum values for each.
Compare the readings to expected values.

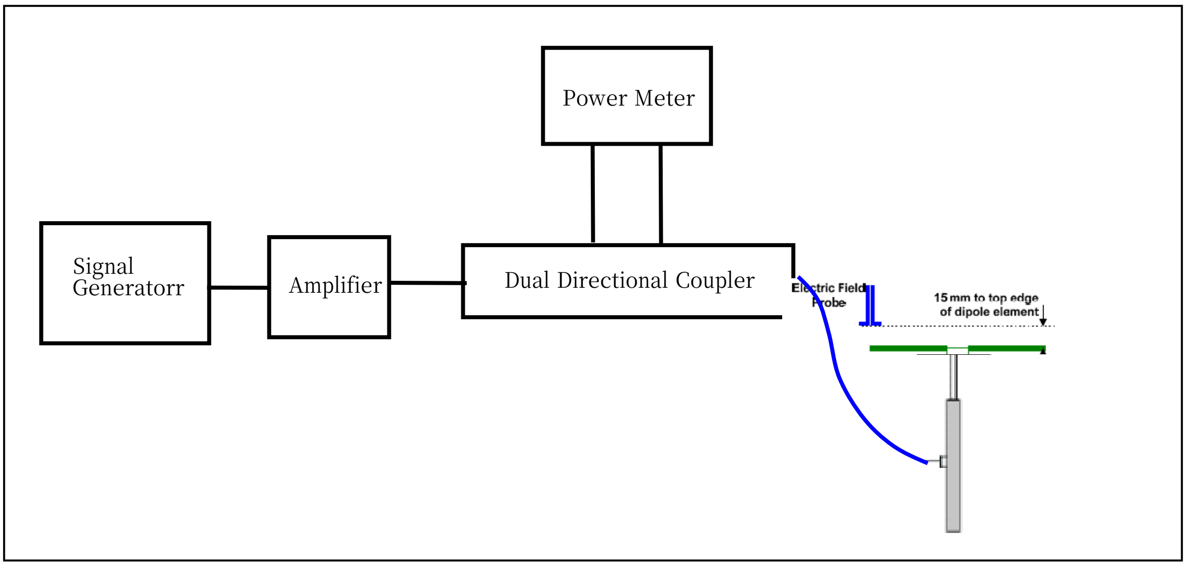


Figure 6. Dipole Validation SET-UP

5.2 Validation Result

5.2.1 E-Field Scan

Mode	Freq. [MHz]	Input Power [dBm]	Measured Value [V/m]	Target Value [V/m] SPEAG	Deviation [%]
CW	835	20	109.85	105.75	+ 3.87
CW	1 880	20	90.18	91.25	- 1.17

Notes:

1) Deviation (%) = 100 * (Measured value minus Target value) divided by Target value. ANSI-C63.19 requires values to be within 25 % of their targets. 12 % is deviation and 13 % is measurement uncertainty.
2) The maximum E-field was evaluated and compared to the target values provided by SPEAG in the calibration certificate of specific dipoles.
3) Please refer to the attachment for detailed measurement data and plot.

6. Modulation interference factor

6.1 Measuring Modulation Interference Factors

For any specific fixed and repeatable modulated signal, a modulation interference factor (MIF, expressed in dB) may be developed that relates its interference potential to its steady-state rms signal level or average power level. This factor is a function only of the audio-frequency amplitude modulation characteristics of the signal and is the same for field-strength and conducted power measurements. It is important to emphasize that the MIF is valid only for a specific repeatable audio-frequency amplitude modulation characteristic. Any change in modulation characteristic requires determination and application of a new MIF.

The MIF may be determined using a radiated RF field or a conducted RF signal:

a. Using RF illumination or conducted coupling, apply the specific modulated signal in question to the measurement system at a level within its confirmed operating dynamic range.
b. Measure the steady-state RMS level at the output of the fast probe or sensor.
c. Measure the steady-state average level at the weighting output.
d. Without changing the square-law detector or weighting system, and using RF illumination or conducted coupling, substitute for the specific modulated signal a 1kHz , 80% amplitude modulated carrier at the same frequency and adjust its strength until the level at the weighting output equals the step c) measurement.
e. Without changing the carrier level from step d), remove the 1kHz modulation and again measure the steady-state RMS level indicated at the output of the fast probe or sensor.
f. The MIF for the specific modulation characteristic is provided by the ratio of the step e) measurement to the step b) measurement, expressed in dB (20 x log[(step e)/(step b)]).

The following procedure was used to measure the MIF using the SPEAG Audio Interference Analyzer(AIA),Type No: SE UMS 170CB, Series No:10xx:

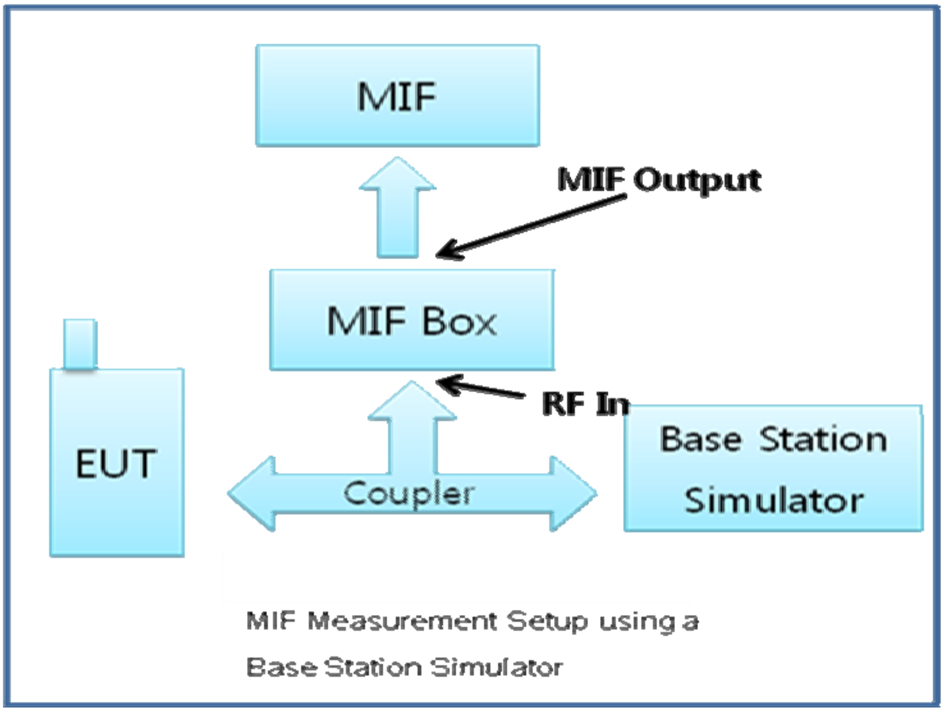
1. The device was placed into a simulated call using a base station simulator or set to transmit using test soft for a given mode.
2. The device was then set to continuously transmit at maximum power.
3. Using a coupler if needed, the device output signal was connected to the RF in port of the AIA, which was connected to a desktop computer. Alternatively, a radiated RF signal may be used with the AIA's built-in antenna.
4. The MIF measurement procedure in the DASY software was run, and the resulting MIF value was recorded.
5. Steps 1-4 were repeated for all CMRS air interfaces, frequency bands, and modulations.

The modulation interference factors obtained were applied to readings taken of the actual wireless device in order to obtain an accurate audio interference level reading using the formula:

Audio interference Level [dB(V/m)] = 20* log[Raw Field Value (V/m)] + MIF (dB)

Because the MIF value is output power independent, MIF values fot a given mode should be constant across all devices; however, per C63.19-2011 &D.7, MIF values should be measured for each device being evaluated. The voice mode for this device have been investigated in this section of the report.

6.2 MIF Measurement Block Diagrams



MIF Measurement Setup using a
Base Station Simulator

6.3 Measured Modulation Interference Factors:

6.3.1 E-Field

Band	Channel	Frequency [MHz]	Measured MIF Values [dB] SO3 RC1	Measured MIF Values [dB] SO3 RC3
CDMA 835	1013	824.7	2.86	-20.05
	384	836.52	2.9	-19.9
	777	848.31	2.75	-19.8
PCS 1900	25	1851.25	2.81	-18.11
	600	1880	2.75	-20
	1175	1908.75	2.34	-19.75

Band	Channel	Frequency [MHz]	Measured MIF Values [dB]
GSM850	128	824.2	3.51
	190	836.6	3.53
	251	848.8	3.53
GSM1900	512	1 850.2	3.5
	661	1 880.0	3.48
	810	1 909.8	3.3

6.4 Analysis of RF Air interface Technologies

1. An analysis was performed, following the guidance of 4.3 and 4.4 of the ANSI standard, of the RF air interface technologies being evaluated. The factors that will affect the RF interference Potential were evaluated, and the worst case operating modes were identified and used in the evaluation. A WD's interference potential is a function both of the WD's average near-field field strength and of the signal's audio-frequency amplitude modulation characteristics. Per 4.4, RF air interface technologies that have low power have been found to produce sufficiently low RF interference potential, so it is possible to exempt them from the product testing specified in Clause 5 of the ANSI standard. An RF air interface technology of a device is exempt from testing When its average antenna input power plus its MIF is ≤ 17dBm for all of its operating modes.

The worst case MIF plus the worst case average antenna input power for all modes are investigated below to determine the testing requirements for this device.

6.4.1 Analysis of RF Air interface Technologies

Air Interface	Maximum Average Power (dBm)	Worst Case MIF (dB)	Total (Power + MIF, dB)	C63.19 Testing Required
GSM	32.32	3.53	35.85	Yes
CDMA – Full Frame Rate	24.35	- 20.05	4.3	No
CDMA – 1/8th Frame Rate	24.45	2.9	27.35	Yes

Table 1. Max. Power + MIF calculations for Low Power Exemptions

6.4.2 Low-Power Exemption Conclusions

Per ANSI C63.19-2011, RF Emissions testing for this device is required only for GSM voice and 1/8th CDMA voice modes. All other applicable air interfaces are exempt.

7. RF Conducted Power Measurements

Sample pre-testing of the various modes were performed at the worst case probe location as part of subset testing justification. See below for measured conducted power for applicable device modes:

7.1 Handset Measured Conducted Powers

Band	Channel	GSM	GPRS(GMSK) Data – CS1		EDGE(8PSK) Data – MCS7	
		Voice (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	EDGE 1 TX Slot (dBm)	EDGE 2 TX Slot (dBm)
GSM 850	128	32.32	32.42	31.07	30.52	29.13
	190	32.18	32.16	30.94	30.69	29.07
	251	32.14	31.97	30.95	30.04	28.86
GSM 1900	512	28.54	28.36	28.31	28.08	27.55
	661	28.8	28.48	28.27	28.18	27.66
	810	29.19	28.84	28.62	28.34	27.97

Table 2. Maximum average GSM Conducted output powers **(Burst-Average)**

Band	Channel	SO3	SO3	SO55	SO55	TDSO	1xEVDO Rev.0	1xEVDO Rev.0	1xEVDO Rev.A	1xEVDO Rev.A
		RC1 (dBm)	RC3 (dBm)	RC1 (dBm)	RC3 (dBm)	RC3 (dBm)	(FTAP) (dBm)	(RTAP) (dBm)	(FETAP) (dBm)	(RETAP) (dBm)
CDMA 835	1013	24.20	24.18	24.18	24.10	24.02	24.14	24.15	24.16	24.20
	384	24.10	24.00	23.95	23.90	23.98	24.00	24.02	24.06	24.08
	777	24.25	24.23	24.25	24.16	24.15	24.20	24.20	24.20	24.21
PCS 1900	25	24.15	24.12	24.17	24.11	24.25	24.09	24.13	24.08	24.05
	600	24.10	24.04	24.07	23.98	23.95	24.05	24.00	24.10	24.09
	1175	24.00	23.85	23.80	23.73	23.72	23.84	23.86	23.87	23.90

Table 3. Maximum average CDMA Conducted output powers

8. TEST PROCEDURE

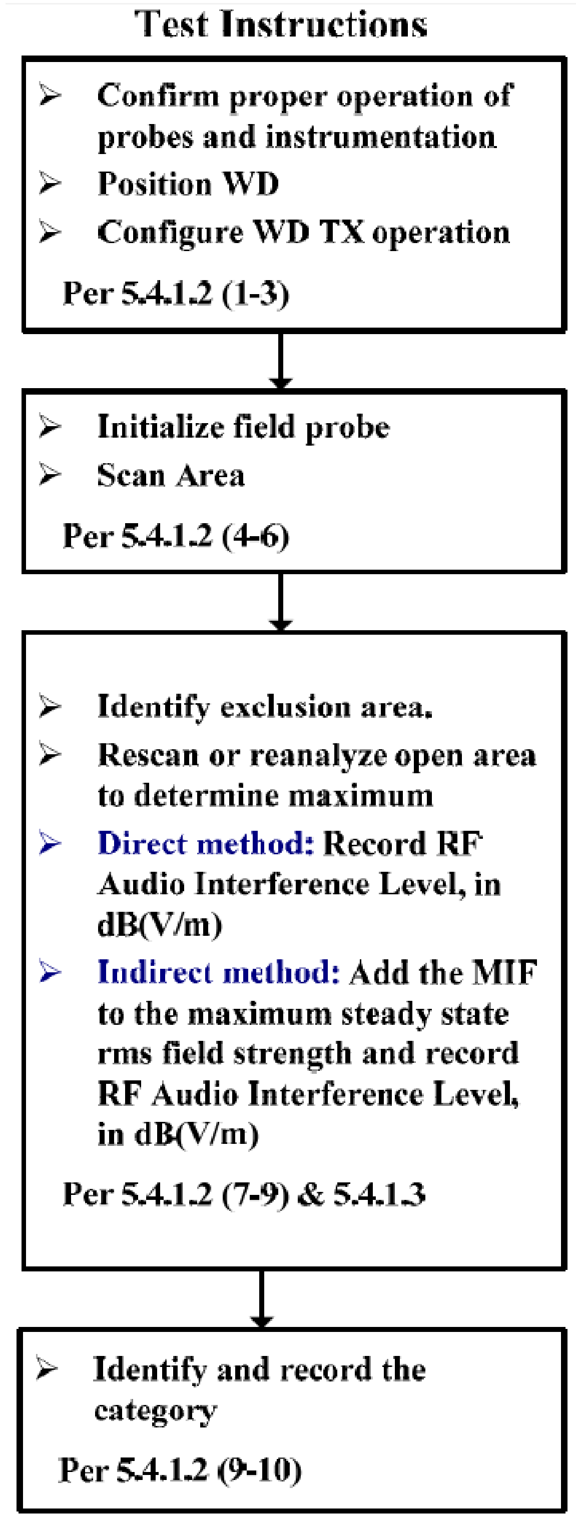


Figure 9. WD near-field emission automated test flowchart

The evaluation was performed with the following procedure:

1. Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.
2. Position the WD in its intended test position. The measurement should be performed at a distance 1.5 cm
   from the probe elements so the gauge block can simplify this positioning.
3. Configure the WD normal operation for maximum rated RF output power, at the desired channel and other operating parameters, as intended for the test.
4. The center sub-grid shall be centered on the center of the WD output (acoustic or T-Coil output), as appropriate.
5. A Surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the HAC Phantom.
6. Locate the field probe at reference location and measure the field strength.
7. Scan the entire 5 cm by 5 cm region at 5 mm increments and record the reading at each measurement point.
8. Identify the maximum field reading within the non-excluded sub-grids identified in Step 7.
9. Move the probe to the location of maximum scan measurement and then 360° rotating the probe to align it for the maximum reading at that position.
10. Locate the field probe at the reference location and measure the field strength for drift evaluation.
    If conducted power deviations of more than 5 % occurred, the tests were repeated.
11. Convert the maximum field strength reading identified in Step 8 to V/m or A/m, as appropriate. For probes which require a probe modulation factor, this conversion shall be done using the appropriate probe modulation.
12. Repeat Step 1 through Step 11 for both the E field measurements.

9. ANSI/IEEE C63.19 PERFORMANCE CATEGORIES

The EUT must meet the following M3 or M4 category:

Category	Telephone RF Parameters
Near Field Category	E-Field Emissions CW dB [V/m]
Frequency < 960 MHz	
M1	50 to 55
M2	45 to 50
M3	40 to 45
M4	< 40
Frequency > 960 MHz	
M1	40 to 45
M2	35 to 40
M3	30 to 35
M4	< 30

Table 4. Telephone near-field categories in linear units

10. MEASUREMENT UNCERTAINTIES

10.1 E-Field

	HAC (E-Field) Uncertainty Budget [According to ANSI C63.19]									Note/ Comment
	Error Description	Uncertainty [%]	Probability Distribution	Divisor	ci [E]	Standard Uncertainty [E]	Stand Uncert^2	(Stand Uncert^2) X (ci^2)	Vi & Veff	
	Measurement system									
1	Probe Calibration	5.1 %	Normal	1.00	1	5.1 %	26.01	26.01	∞	
2	Axial Isotropy	4.7 %	Rectangular	1.73	1	2.7 %	7.36	7.36	∞	
3	Sensor Displacement	16.5 %	Rectangular	1.73	1	9.5 %	90.75	90.75	∞	
4	Boundary effect	2.4 %	Rectangular	1.73	1	1.4 %	1.92	1.92	∞	
5	Linearity	4.7 %	Rectangular	1.73	1	2.7 %	7.36	7.36	∞	
6	Scaling to peak Envelope Power	2.0 %	Rectangular	1.73	1	1.2 %	1.33	1.33	∞	
7	System Detection limits	1.0 %	Rectangular	1.73	1	0.6 %	0.33	0.33	∞	
8	Readout Electronics	0.3 %	Normal	1.00	1	0.3 %	0.09	0.09	∞	
9	Response time	0.8 %	Rectangular	1.73	1	0.5 %	0.21	0.21	∞	
10	Integration time	2.6 %	Rectangular	1.73	1	1.5 %	2.25	2.25	∞	
11	RF Ambient Conditions	3.0 %	Rectangular	1.73	1	1.7 %	3.00	3.00	∞	
12	RF Reflections	1.2 %	Rectangular	1.73	1	0.7 %	0.50	0.50	∞	
13	Probe positioner	1.2 %	Rectangular	1.73	1	0.7 %	0.48	0.48	∞	
14	Probe positionering	4.7 %	Rectangular	1.73	1	2.7 %	7.36	7.36	∞	
15	Extrap. And Interpolation	1.0 %	Rectangular	1.73	1	0.6 %	0.33	0.33	∞	
	Test Sample Related									
16	Device Positioning Vertical	4.7 %	Rectangular	1.73	1	2.7 %	7.36	7.36	∞	
17	Device Positioning Lateral	1.0 %	Rectangular	1.73	1	0.6 %	0.33	0.33	∞	
18	Device Holder and Phantom	2.4 %	Rectangular	1.73	1	1.4 %	1.92	1.92	∞	
19	Test Sample	0.4 %	Normal	1.00	1	0.4 %	0.16	0.16	9	0.17 dB
20	Power drift	3.0 %	Rectangular	1.73	1	1.7 %	3.00	3.00	∞	
	PMF Calculations									
21	Power Sensor	1.0 %	Rectangular	1.73	1	0.6 %	0.32	0.32	∞	
22	Dual Directional Coupler	1.0 %	Rectangular	1.73	1	0.6 %	0.32	0.32	∞	
	Phantom and Setup Related									
23	Phantom Thickness	2.4 %	Rectangular	1.73	1	1.4 %	1.92	1.92	∞	
	Combined standard Uncertainty [%]					12.8 %		164.64		0.523 dB
	Expanded standard Uncertainty [k = 2 , Confidence 95 %]					25.7 %				0.993 dB

Table 5. Uncertainties (E-Field)

Notes:

1. Worst-Case uncertainty budget for HAC free field assessment according to ANSI-C 63.19[1].The budget is valid for the frequency range 800 MHz-3 GHz and represents a worst-Case analysis. For specific test sand configurations, the uncertainty could be considerably smaller. Some of the parameters are dependent on the user situations and need adjustment according to the actual laboratory conditions.

2. * Uncertainty specifications from Schmidt & Partner Engineering AG (not site specific)

11. HAC TEST DATA SUMMARY

11. 1 E-Field Measurement Results (CDMA / PCS DATA)

Ambient TEMPERATURE (°C): **20.6**

S/N: **#1**

Mode	Ch.	Back light	Battery	Antenna	Conducted Power [dBm]	Time Avg. Field [V/m]	Peak Field [dBV/m]	FCC Limit [dBV/m]	FCC MARGIN [dB]	MIF	RESULT	Exclusion Block
CDMA	1013	off	SO3/RC1	Standard	24.2	19.4	28.61	51	-22.39	2.860	**M4**	none
CDMA	384	off	SO3/RC1	Standard	24.1	18.6	28.30	51	-22.70	2.900	**M4**	none
CDMA	777	off	SO3/RC1	Standard	24.25	24.9	30.67	51	-20.33	2.750	**M4**	none
PCS	25	off	SO3/RC1	Standard	24.15	16.7	27.27	41	-13.73	2.810	**M4**	none
PCS	600	off	SO3/RC1	Standard	24.1	14.2	25.81	41	-15.19	2.750	**M4**	none
PCS	1175	off	SO3/RC1	Standard	24	15.5	26.17	41	-14.83	2.340	**M4**	none
CDMA	777	off	SO3/RC1	Extended	24.25	24.3	30.45	51	-20.55	2.750	**M4**	none
PCS	25	off	SO3/RC1	Extended	24.15	15.2	26.44	41	-14.56	2.810	**M4**	none

NOTES:

1. All modes of operation were investigated and the worst-case are reported.
2. Battery Type ☒ Standard ☒ Extended ☐ Fixed
3. Power Measured ☒ Conducted ☐ EIRP ☐ ERP
4. Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
5. SAR Measurement System ☒ SPEAG

11. 2 E-Field Measurement Results (GSM850 / GSM1900)

Ambient TEMPERATURE (°C): 20.6

S/N: #1

Mode	Ch.	Back light	Battery	Antenna	Conducted Power [dBm]	Time Avg. Field [V/m]	Peak Field [dBV/m]	FCC Limit [dBV/m]	FCC MARGIN [dB]	MIF	RESULT	Exclusion Block
GSM850	128	off	Standard	Intenna	32.32	32.26	33.68	45	-11.32	3.510	**M4**	none
GSM850	190	off	Standard	Intenna	32.18	35.27	34.48	45	-10.52	3.530	**M4**	none
GSM850	251	off	Standard	Intenna	32.14	16.38	36.10	45	-8.90	3.530	**M4**	none
GSM1900	512	off	Standard	Intenna	28.54	17.40	28.31	35	-6.69	3.500	**M4**	none
GSM1900	661	off	Standard	Intenna	28.8	16.48	27.24	35	-7.76	3.480	**M4**	none
GSM1900	810	off	Standard	Intenna	29.19	15.42	27.59	35	-7.41	3.300	**M4**	none
GSM850	251	off	Extended	Intenna	32.14	41.48	35.89	45	-9.11	3.530	**M4**	none
GSM1900	512	off	Extended	Intenna	28.54	28.31	27.84	35	-7.16	3.500	**M4**	none

NOTES:

1. All modes of operation were investigated and the worst-case are reported.
2. Battery Type ☒ Standard ☒ Extended ☐ Fixed
3. Power Measured ☒ Conducted ☐ EIRP ☐ ERP
4. Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
5. SAR Measurement System ☒ SPEAG

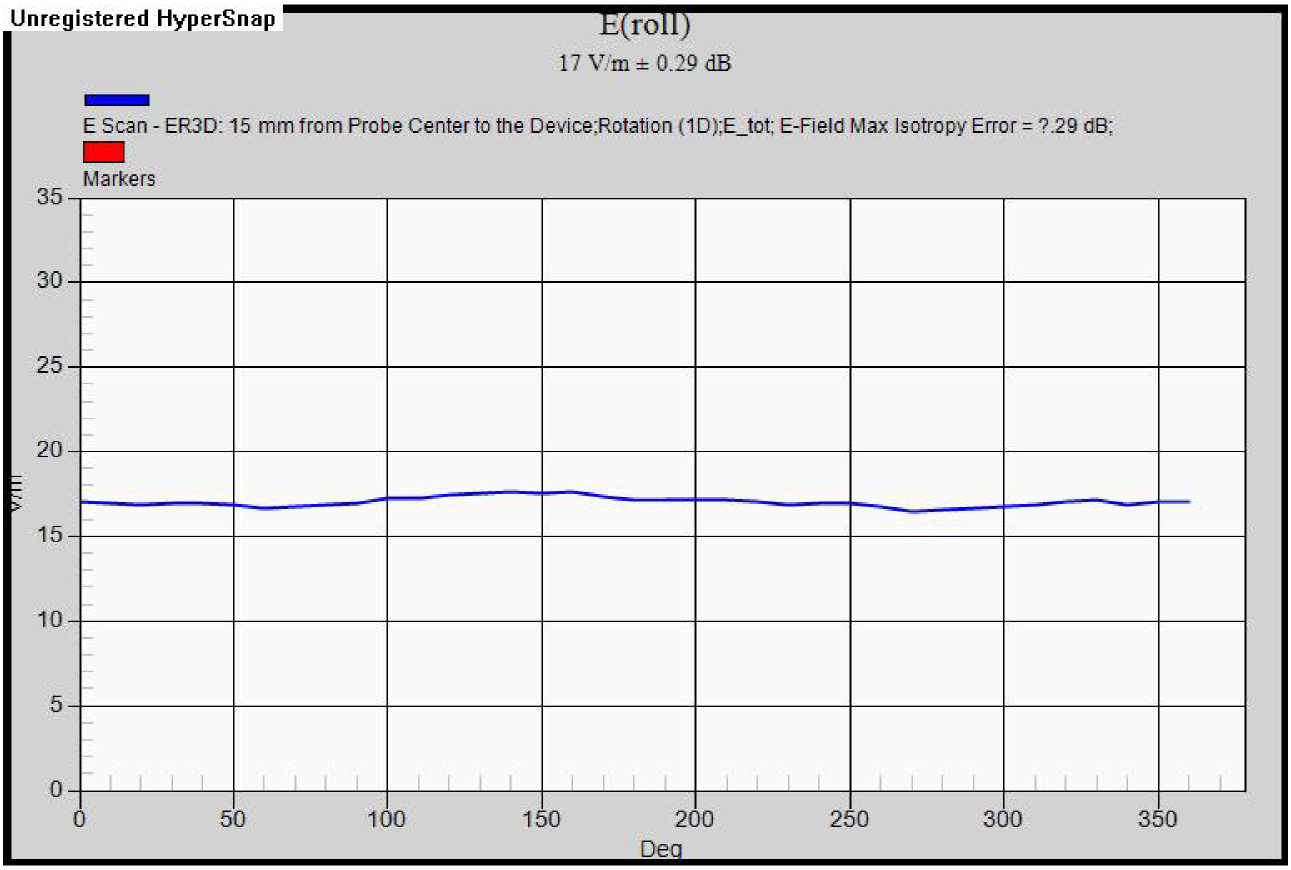
11.2 Worst-case Configuration Evaluation

Ambient TEMPERATURE (°C): 20.6

S/N: #1

Peak Reading 360° Probe Rotation at Azimuth axis

Mode	Ch.	Back light	Battery	Antenna	Conducted Power [dBm]	Time Avg. Field [V/m]	Peak Field [dBV/m]	FCC Limit [dBV/m]	FCC MARGIN [dB]	MIF	RESULT	Exclusion Block
GSM1900	512	off	Standard	Intenna	28.54	17.61	28.41	35	-6.59	**M4**	28.54	none



Worst-Case Probe Rotation about Azimuth axis

12. HAC TEST EQUIPMENT LIST

Manufacturer	Type / Model	S/N	Calib. Date	Calib. Interval	Calib. Due
Staubli	Robot TX90 XLspeag	F11/5K3RA1/A/01	N/A	N/A	N/A
Staubli	Robot Controller	F11/5K3RA1/C/01	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	S-1203 0309	N/A	N/A	N/A
HP	Pavilion t000_puffer	KRJ51201TV	N/A	N/A	N/A
SPEAG	SPEAG HAC Phantom	-	N/A	N/A	N/A
SPEAG	Light Alignment Sensor	265	N/A	N/A	N/A
SPEAG	DAE4	648	Apr. 24, 2013	Annual	Apr. 24, 2014
SPEAG	E-Field Probe	4034	Jan. 06, 2014	Annual	Jan. 06, 2015
SPEAG	Validation Dipole CD835V2	1024	Mar. 15, 2013	Annual	Mar. 15, 2014
SPEAG	Validation Dipole CD1880V2	1019	Mar. 15, 2013	Annual	Mar. 15, 2014
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 01, 2013	Annual	Nov. 01, 2014
Agilent	Power Sensor(G) 8481	MY41090870	Oct. 30, 2013	Annual	Oct. 30, 2014
HP	Signal Generator 8664A	3744A02069	Nov. 04, 2013	Annual	Nov. 04, 2014
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2014	Annual	Feb. 10, 2015
SPEAG	Audio Analyzer AIA	1060	N/A	N/A	N/A

NOTE:
The probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Validation measurement is performed by HCT Lab. before each test.

13. CONCLUSION

The HAC measurement indicates that the EUT complies with the HAC limits of the ANSI-C63.19-2011.

These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise Laboratory measures were taken to assure repeatability of the tests.