HAC TEST REPORT

Applicant	COOSEA GROUP (HK) COMPANY LIMITED
FCC ID	2A28USL112
Product	Smart Phone
Model	SL112A; SL112C
Report No.	R2212A1312-H1V1
Issue Date	March 27, 2023

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **ANSI C63.19-2011.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Prepared by: Wei Fangying   *Approved by: Fan Guangchang*

TA Technology (Shanghai) Co., Ltd.

Building 3, No.145, Jintang Rd, Pudong Shanghai, P.R.China
TEL: +86-021-50791141/2/3
FAX: +86-021-50791141/2/3-8000

Table of Contents

Version	Revision description	Issue Date
Rev.0	Initial issue of report.	March 16, 2023
Rev.1	Update description.	March 27, 2023
Note: This revised report (Report No.: R2212A1312-H1V1) supersedes and replaces the previously issued report (Report No.: R2212A1312-H1). Please discard or destroy the previously issued report and dispose of it accordingly.		

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA Technology (Shanghai) Co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	Building 3, No.145, Jintang Rd, Pudong Shanghai, P.R.China
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Fan Guangchang
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	fanguangchang@ta-shanghai.com

1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 28 °C
Relative humidity	Min. = 0%, Max. = 80%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Statement of Compliance

Table 2.1: The Total M-rating of each tested band

Mode	Rating
WCDMA & LTE – FDD & Wi-Fi	M4
The Total M-rating is M4	
Date of Testing: January 18, 2023 ~ February 3, 2023 Date of Sample Received: January 11, 2023	
Note: 1. Refer to section 5.6.2 Evaluation for Low-power Exemption. WCDMA /LTE/Wi-Fi 2.4G/ Wi-Fi 5G mode applicable air-interfaces are exempt from testing in accordance with C63.19-2011 Clause 4.4 and are rated M4. 2. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.	

3 Description of Equipment under Test

Client Information

Applicant	COOSEA GROUP (HK) COMPANY LIMITED
Applicant address	UNIT 5-6 16/F MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIMSHATSUI KL, HONG KONG, CHINA
Manufacturer	COOSEA GROUP (HK) COMPANY LIMITED
Manufacturer address	UNIT 5-6 16/F MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIMSHATSUI KL, HONG KONG, CHINA

General Technologies

Device Type:	Portable Device	
State of Sample:	Prototype Unit	
Model:	SL112A; SL112C	
IMEI:	351384680005462	
Hardware Version:	1.0	
Software Version:	SL112A10010	
Antenna Type:	PIFA Antenna	
Power Class:	WCDMA Band II/IV/V: 3 LTE FDD 2/4/5/7/12/14/30:3	
Power Level	WCDMA Band II/IV/V: All up bits LTE FDD 2/4/5/7/12/14/30:max power	
Test Modulation:	(WCDMA) QPSK; (LTE) QPSK, 16QAM, 64QAM; (Wi-Fi 2.4G) DSSS,OFDM (Wi-Fi 5G) OFDM	
Operating Frequency Range(s):	**Mode**	**Tx (MHz)**
	WCDMA Band II	1850 ~ 1910
	WCDMA Band IV	1710 ~ 1755
	WCDMA Band V	824 ~ 849
	LTE FDD 2	1850 ~ 1910
	LTE FDD 4	1710 ~ 1755
	LTE FDD 5	824 ~ 849
	LTE FDD 7	2500 ~ 2570
	LTE FDD 12	699 ~ 716
	LTE FDD 14	788 ~ 798
	LTE FDD 30	2305 ~ 2315
	Wi-Fi 2.4G	2412 ~ 2462
	Wi-Fi 5G(U-NII-1)	5150 ~ 5250
	Wi-Fi 5G(U-NII-2A)	5250 ~ 5350

	Wi-Fi 5G(U-NII-2C)	5470 ~ 5725
	Wi-Fi 5G(U-NII-3)	5725 ~ 5850
	Bluetooth	2402 ~ 2480
Accessory Equipment		
Adapter	Manufacturer: ShenZhen BaiJunDa Electronic Co., Ltd Model: UT-592A-5200ZY	
Battery	Manufacturer: Huizhou Highpower Technology Co., Ltd Model: BL-A50CT	
USB Cable	Manufacturer: Shenzhen Yihuaxing Electronics Co.Ltd.. Model: K342-002	
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. 2. The customer claims that SL112A and SL112C are only different in model, and the others are the same. This report only tests SL112A.		

Air-Interface	Band (MHz)	Type	ANSI C63.19 tested	Simultaneous Transmissions	Voice over Digital Transport OTT Capability	Name of Voice Service	Power Reduction
WCDMA	Band II	VO	Yes	Yes Bluetooth or Wi-Fi	N/A	CMRS Voice	N/A
	Band IV						
	Band V						
	HSPA	VD	Yes		N/A	N/A	No
LTE	Band 2	VD	Yes	Yes Bluetooth or Wi-Fi	N/A	VoLTE	No
	Band 4						
	Band 5						
	Band 7						
	Band 12						
	Band 14						
	Band 30						
Wi-Fi	2450	VD	Yes	Yes WCDMA, LTE	N/A	VoWi-Fi	No
	U-NII-1						
	U-NII-2A						
	U-NII-2C						
	U-NII-3						
Bluetooth (BT)	2450	DT	No	Yes WCDMA, LTE	N/A	NA	No

VO= legacy Cellular Voice Service from Table 7.1 in 7.4.2.1 of ANSI C63.19-2011

DT= Digital Transport only (no voice)

VD= IP voice service over digital transport.

Remark:

1. It applies the low power exemption based on ANSI C63.19-2011

4 Test Specification and Operational Conditions

4.1 Test Specification

The tests documented in this report were performed in accordance with the following:

FCC CFR47 Part 20.19
ANSI C63.19-2011
KDB 285076 D01 HAC Guidance v06
KDB 285076 D02 T-Coil testing for CMRS IP v04

5 Test Information

5.1 Operational Conditions during Test

5.1.1 General Description of Test Procedures

The phone was tested in all normal configurations for the ear use. The EUT is mounted in the device holder equivalent as for classic dosimeter measurements. The acoustic output of the EUT shall coincide with the center point of the area formed by the dielectric wire and the middle bar of the arch's top frame The EUT shall be moved vertically upwards until it touches the frame. The fine adjustment is possible by sliding the complete. The EUT holder is on the yellow base plate of the Test Arch phantom. These test configurations are tested at the high, middle and low frequency channels of each applicable operating mode.

A communication link is set up with a System Simulator (SS) by air link, and a call is established. The EUT is commanded to operate at maximum transmitting power.

5.2 HAC RF Measurements System Configuration

5.2.1 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 (Stäubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor. The robot is a six-axis industrial robot performing precise movements. Cell controller systems contain the power supply, robot controller, teach pendant (Joystick) and remote control, and are used to drive the robot motors. The Stäubli 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.

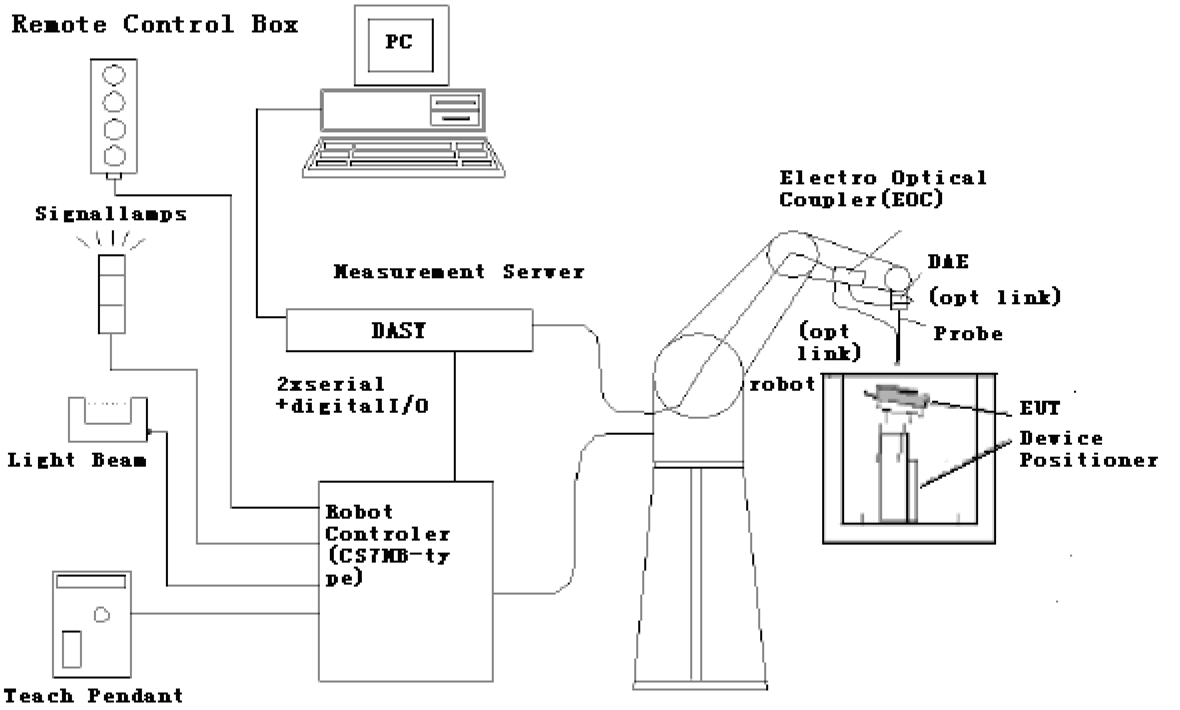

Figure 1 HAC Test Measurement Set-up

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.

5.2.2 Probe System

The HAC measurements were conducted with the E-Field Probe ER3DV6 and the H-Field Probe H3DV6 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

E-Field Probe Description

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material
Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2)
Frequency	40 MHz to > 6 GHz (can be extended to < 20 MHz) Linearity: ± 0.2 dB (100 MHz to 3 GHz)
Directivity	± 0.2 dB in air (rotation around probe axis)

Figure 2 ER3DV6 E-field Probe

	± 0.4 dB in air (rotation normal to probe axis)
Dynamic Range	2 V/m to > 1000 V/m; 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
Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms

5.2.3 Test Arch Phantom & Phone Positioner

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. It enables easy and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot (Dimensions: 370 x 370 x 370 mm).
The Device reference point is set for the EUT at 6.3 mm, the Grid reference point is on the upper surface at the origin of the coordinates, and the “user point \Height Check 0.5 mm” is 0.5mm above the center, allowing verication of the gap of 0.5mm while the probe is positioned there.

The Phone Positioner supports accurate and reliable positioning of any phone with effect on near field <±0.5 dB.

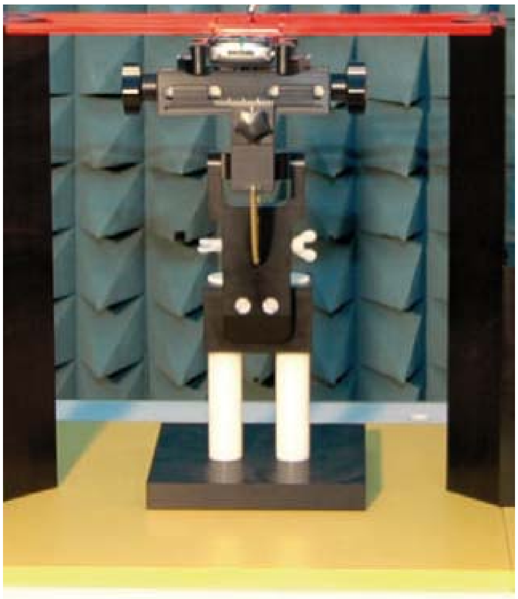

Figure 3 HAC Phantom & Device Holder

5.3 RF Test Procedures

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 gauge block can simplify this positioning. Note that a separate E-field gauge block will be needed if the center of the probe sensor elements is at different distances from the tip of the probe.
3. Configure the WD normal operation for maximum rated RF output power, at the desired channel and other operating parameters (e.g., test mode), as intended for the test.
4. The center sub-grid shall center on the center of the axial measurement point or the acoustic output, as appropriate. Locate the field probe at the initial test position in the 50 mm by 50 mm grid, which is contained in the measurement plane. If the field alignment method is used, align the probe for maximum field reception.
5. Record the reading.
6. Scan the entire 50 mm by 50 mm region in equally spaced increments and record the reading at each measurement point. The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.The distance between measurement points shall be sufficient to assure the identification of the maximum reading.
7. Identify the five contiguous sub-grids around the center sub-grid with the lowest maximum field strength readings. Thus the six areas to be used to determine the WD's highest emissions are identified and outlined for the final manual scan. Please note that a maximum of five blocks can be excluded for both E-field measurements for the WD output being measured. Stated another way, the center sub-grid and three others must be common to both the E-field measurements.
8. Identify the maximum field reading within the non-excluded sub-grids identified in Step 7.
9. 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 factor and the calibration.
10. Repeat Step 1 through Step 10 for both the E-field measurements.
11. Compare this reading to the categories in ANSI C63.19 Clause 8 and record the resulting category. The lowest category number listed in 8.2, Table 8.3 obtained in Step 10 for either E-field determines the M category for the audio coupling mode assessment. Record the WD category rating.

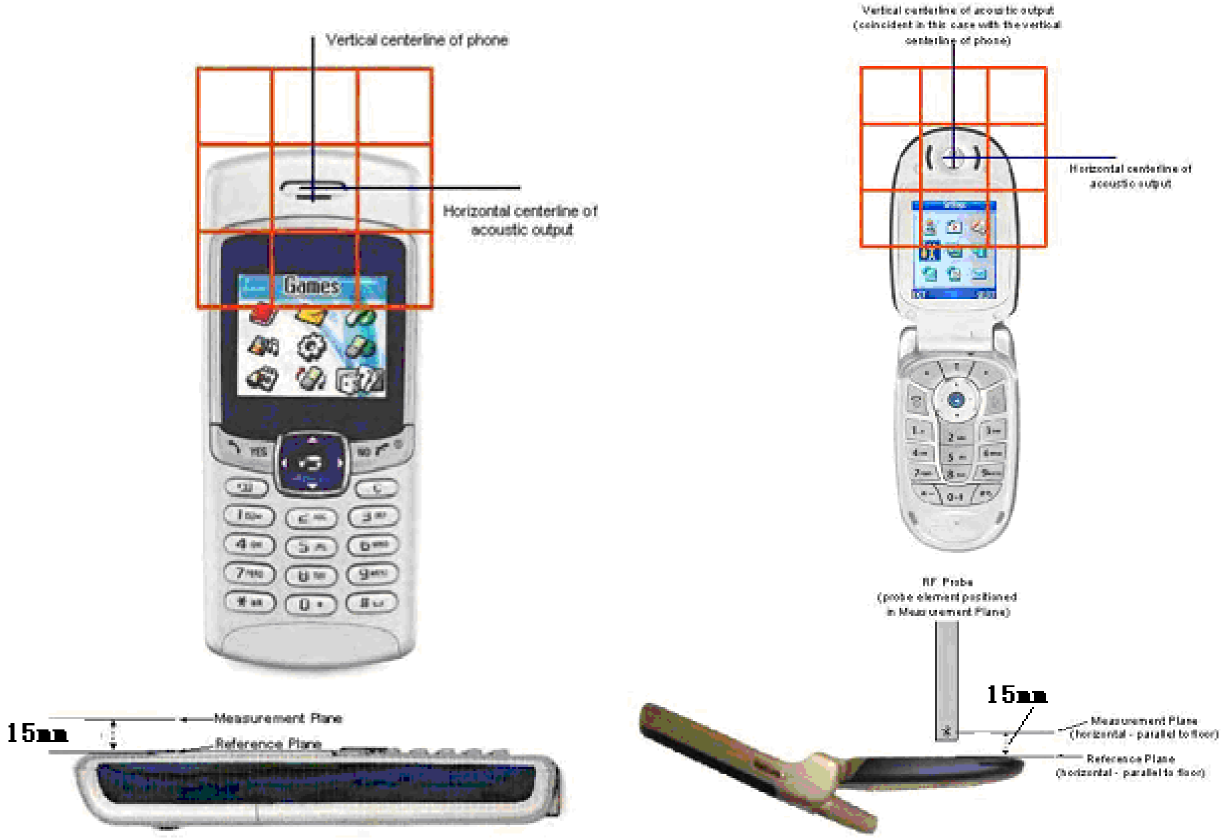

Figure 4 WD reference and plane for RF emission measurements

5.4 System Check

Validation Procedure

Place a dipole antenna meeting the requirements given in ANSI C63.19 D.11 in the position normally occupied by the WD. The dipole antenna serves as a known source for an electrical 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.
Position the E-field probe at a 15 mm distance from the center of the probe element to the top surface. Validation was performed to verify that measured E-field is within +/-18% from the target reference values provided by the manufacturer. ”Values within +/-18% are acceptable. Of which 12% is deviation and 13% is measurement uncertainty.”

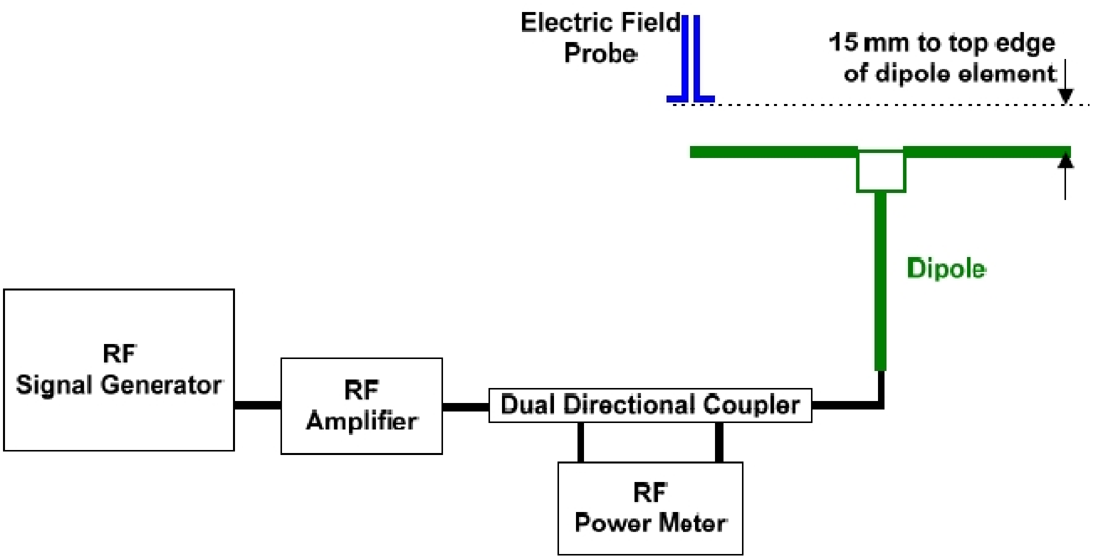

Figure 5 Dipole Validation Setup

5.5 Modulation Interference Factor

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,

b) 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.

c) Measure the steady-state rms level at the output of the fast probe or sensor.

d) Measure the steady-state average level at the weighting output.

e) 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 d) measurement.

f) Without changing the carrier level from step e), remove the 1 kHz modulation and again measure the steady-state ms level indicated at the output of the fast probe or sensor.

g) MIF values were not tested by a probe or as specified in the standards but are based on analysis provided by SPEAG (Version: UID_ Summary_ 210906) for all the air interfaces (GSM, WCDMA, CDMA, LTE, and Wi-Fi). The data included in this report are for the worst case operating modes. The UIDs used are listed below:

UID	Communication system	MIF(dB)
10011-CAB	UMTS-FDD (WCDMA)	-27.23
10170-CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16QAM)	-9.76
10176-CAF	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16QAM)	-9.76
10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	-2.02
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	0.12
10591-AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	-5.59
10069-CAC	IEEE 802.11a/n WiFi 5 GHz (OFDM, 54 Mbps)	-3.15
10616-AAC	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	-5.57

5.6 Justification of Held to Ear Modes Tested

5.6.1 Analysis of RF Air Interface Technologies

a. According to the April 2013 TCB workshop slides, LTE and other OTT data services are outside the current definition of a managed CMRS service and are currently not required to be evaluated.
b. No associated T-coil measurements for VoIP over WIFI CMRS have been made in accordance with the guidance issued by OET in KDB publication 285076 D02 T-Coil testing for CMRS IP.
c. 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. RF air interface technologies exempted from testing in this manner are automatically assigned an M4 rating to be used in determining the overall rating for the WD.
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.

5.6.2 Average Antenna Input Power & Evaluation for Low-power Exemption

An RF air interface technology of a device is exempt from testing when its average antenna input power plus its **MIF is ≤17 dBm** for any of its operating modes. If a device supports multiple RF air interfaces, each RF air interface shall be evaluated individually.

Band	Maximum Average Antenna Input Power (dBm)	Worst Case MIF [1] (dB)	Maximum Average Antenna Input Power + MIF (dBm)	Low power exemption
WCDMA Band II	24.50	-27.23	-2.73	No [2]
WCDMA Band IV	24.50	-27.23	-2.73	No [2]
WCDMA Band V	24.50	-27.23	-2.73	No [2]
LTE FDD 2	25.00	-9.76	15.24	No [2]
LTE FDD 4	25.00	-9.76	15.24	No [2]
LTE FDD 5	25.00	-9.76	15.24	No [2]
LTE FDD 7	24.00	-9.76	14.24	No [2]
LTE FDD 12	25.00	-9.76	15.24	No [2]
LTE FDD 14	25.00	-9.76	15.24	No [2]
LTE FDD 30	25.00	-9.76	15.24	No [2]
802.11b	19.00	-2.02	16.98	No [2]

802.11g	16.50	0.12	16.62	No [2]
802.11n	16.00	-5.59	10.41	No [2]
802.11a	17.00	-3.15	13.85	No [2]
802.11ac	15.00	-5.57	9.43	No [2]

Note: 1. MIF values applied in this test report were provided by the HAC equipment provider, SPEAG.
2. No test for low power exemption.

6 Test Results

6.1 ANSI C63.19-2011 Limits

Category	Telephone RF parameters < 960 MHz	Telephone RF parameters > 960 MHz
Near field	**E-field emissions**	
Category M1	50 to 55 dB (V/m)	40 to 45 dB (V/m)
Category M2	45 to 50 dB (V/m)	35 to 40 dB (V/m)
Category M3	40 to 45 dB (V/m)	30 to 35 dB (V/m)
Category M4	< 40 dB (V/m)	< 30 dB (V/m)

7 Measurement Uncertainty

Measurement uncertainty evaluation template for DUT HAC RF test

Error source	Type	Uncertainty Value (± %)	Prob. Dist.	k	c_i/E	c_iH	Standard Uncertainty ui (± %) E	Degree of freedom Veff or vi
Measurement system								
Probe Calibration	B	5.1	N	1	1	1	5.1	∞
Axial Isotropy	B	4.7	R	1.732	1	1	2.7	∞
Sensor Displacement	B	16.5	R	1.732	1	0.145	9.5	∞
Boundary Effects	B	2.4	R	1.732	1	1	1.4	∞
Test Arch	B	7.2	R	1.732	1	0	4.2	∞
Linearity	B	4.7	R	1.732	1	1	2.7	∞
Scaling to Peak Envelope Power	B	2.0	R	1.732	1	1	1.2	∞
System Detection Limit	B	1.0	R	1.732	1	1	0.6	∞
Readout Electronics	B	0.3	N	1	1	1	0.3	∞
Response Time	B	0.8	R	1.732	1	1	0.5	∞
Integration Time	B	2.6	R	1.732	1	1	1.5	∞
RF Ambient Conditions	B	3.0	R	1.732	1	1	1.7	∞
RF Reflections	B	12.0	R	1.732	1	1	6.9	∞
Probe Positioner	B	1.2	R	1.732	1	0.67	0.7	∞
Probe Positioning	A	4.7	R	1.732	1	0.67	2.7	∞
Extra. And Interpolation	B	1.0	R	1.732	1	1	0.6	∞
Test sample related								
Device Positioning Vertical	B	4.7	R	1.732	1	0.67	2.7	∞
Device Positioning Lateral	B	1.0	R	1.732	1	1	0.6	∞
Device Holder and Phantom	B	2.4	R	1.732	1	1	1.4	∞
Power Drift	B	5.0	R	1.732	1	1	2.9	∞
Phantom and Setup related								
Phantom Thickness	B	2.4	R	1.732	1	0.67	1.4	∞
Combined standard uncertainty (%)							15.3	
Expanded Std. uncertainty on power (K=2)							30.6	
Expanded Std. uncertainty on field (K=2)							15.3	

*****END OF REPORT *****

ANNEX A: The EUT Appearances and Test Configuration

The EUT Appearance and Test Configuration are submitted separately.