

PCTEST

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HEARING AID COMPATIBILITY

Applicant Name:

LG Electronics U.S.A, Inc. 111 Sylvan Avenue, North Building Englewood Cliffs, NJ 07632 United States Date of Testing: 10/05/2020 - 10/13/2020 Test Site/Location: PCTEST, Columbia, MD, USA Test Report Serial No.: 1M2009230153-08.ZNF Date of Issue: 11/03/2020

FCC ID: ZNFK200QM

APPLICANT: LG ELECTRONICS U.S.A, INC.

Scope of Test: Audio Band Magnetic Testing (T-Coil)

Application Type: Certification
FCC Rule Part(s): CFR §20.19(b)
HAC Standard: ANSI C63.19-2011

285076 D01 HAC Guidance v05

285076 D02 T-Coil testing for CMRS IP v03

DUT Type: Portable Handset **Model:** LM-K200QM

Additional Model(s): LMK200QM, K200QM

Test Device Serial No.: Pre-Production Sample [S/N: 00301]

C63.19-2011 HAC Category: T3 (SIGNAL TO NOISE CATEGORY)

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 has been tested in accordance with the specified measurement procedures. Test results reported herein relate only to the item(s) tested. Hearing-Aid Compatibility is based on the assumption that all production units will be designed electrically identical to the device tested in this report. North American Bands only.

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.







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1. INTRODUCTION

On July 10, 2003, the Federal Communications Commission (FCC) adopted new rules requiring wireless manufacturers and service providers to provide digital wireless phones that are compatible with hearing aids. The FCC has modified the exemption for wireless phones under the Hearing Aid Compatibility Act of 1998 (HAC Act) in WT Docket 01-309 RM-86581 to extend the benefits of wireless telecommunications to individuals with hearing disabilities. These benefits encompass business, social and emergency communications, which increase the value of the wireless network for everyone. An estimated more than 10% of the population in the United States show signs of hearing impairment and of that fraction, almost 80% use hearing aids. Approximately 500 million people worldwide and 30 million people in the United States suffer from hearing loss.

Compatibility Tests Involved:

The standard calls for wireless communications devices to be measured for:

- RF Electric-field emissions
- T-coil mode, magnetic-signal strength in the audio band
- T-coil mode, magnetic-signal frequency response through the audio band
- T-coil mode, magnetic-signal and noise articulation index

The hearing aid must be measured for:

- RF immunity in microphone mode
- RF immunity in T-coil mode

In the following tests and results, this report includes the evaluation for a wireless communications device.



Figure 1-1 Hearing Aid in-vitu

¹ FCC Rule & Order, WT Docket 01-309 RM-8658

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2. DUT DESCRIPTION



FCC ID: ZNFK200QM

Applicant: LG Electronics U.S.A, Inc.

111 Sylvan Avenue, North Building

Englewood Cliffs, NJ 07632

United States

Model: LM-K200QM

Additional Model(s): LMK200QM, K200QM

Serial Number: 00301 HW Version: rev_e

SW Version: K200QM07c
Antenna: Internal Antenna
DUT Type: Portable Handset

I. LTE Band Selection

This device supports the following pairs of LTE bands with similar frequencies: LTE B12 & B17, LTE B25 & B2 and LTE B66 & B4. These pairs of LTE bands have the same target powers and share the same transmission paths. Since the supported frequency span for the smaller LTE bands are completely covered by the larger LTE bands, only the larger LTE bands (LTE B12, B25 & B66) were evaluated for hearing-aid compliance.

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Table 2-1 ZNFK200QM HAC Air Interfaces

				= 0 0 0			
Air-Interface	Band (MHz)	Type Transport	HAC Tested	Simultaneous But Not Tested	Name of Voice Service	Audio Codec Evaluated	
	835		.,	V 145. 27	crancy : 1	51/00	
CDMA	1900	VO	Yes	Yes: WIFI or BT	CMRS Voice ¹	EVRC	
	EvDO	VD	Yes	Yes: WIFI or BT	Google Duo²	OPUS	
	850	VO	Yes	Yes: WIFI or BT	CMRS Voice ¹	EFR	
GSM	1900	VO	res	res: WIFI OF BI	CIVIRS VOICE	EFK	
	GPRS/EDGE	VD	Yes	Yes: WIFI or BT	Google Duo²	OPUS	
	850						
UMTS	1700	VD	Yes	Yes: WIFI or BT	CMRS Voice ¹	NB AMR	
OWITS	1900						
	HSPA	VD	Yes	Yes: WIFI or BT	Google Duo²	OPUS	
	700 (B12)						
	700 (B17)						
	780 (B13)						
	850 (B5)						
LTE (FDD)	1700 (B4)	VD	Yes	Yes: WIFI or BT	VoLTE ¹ , Google Duo ²	Volte: NB AMR, WB AMR, EVS Google Duo: OPUS	
	1700 (B66)					Google Dav. of os	
	1900 (B2)						
	1900 (B25)						
	2500 (B7)						
WIFI	2450	VD	Yes	Yes: CDMA, GSM, UMTS, or LTE	Google Duo²	Google Duo: OPUS	
BT	2450	DT	No	Yes: CDMA, GSM, UMTS, or LTE	N/A	N/A	
Type Transport Notes:							
VO = Voice Only						ation.	
DT = Digital Dat	DT = Digital Data - Not intended for Voice Services 2. Reference level is -20dBm0 in accordance with FCC KDB 285076 D02						

VD = CMRS and/or IP Voice over Data Transport

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3. ANSI C63.19-2011 PERFORMANCE CATEGORIES

I. MAGNETIC COUPLING

Axial and Radial Field Intensity

All orientations of the magnetic field, in the axial and radial position along the measurement plane shall be \geq -18 dB(A/m) at 1 kHz in a 1/3 octave band filter per §8.3.1.

Frequency Response

The frequency response of the axial component of the magnetic field shall follow the response curve specified in EIA RS-504-1983, over the frequency range 300 Hz – 3000 Hz per §8.3.2.

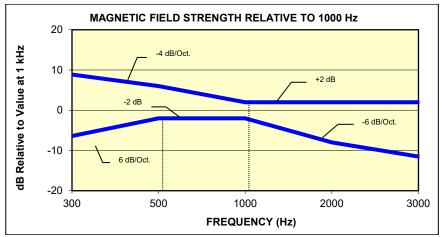


Figure 3-1
Magnetic field frequency response for Wireless Devices with an axial field ≤-15 dB(A/m) at 1 kHz

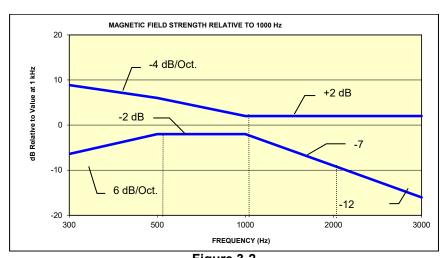


Figure 3-2
Magnetic Field frequency response for wireless devices with an axial field that exceeds
-15 dB(A/m) at 1 kHz

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Signal Quality

The table below provides the signal quality requirement for the intended audio magnetic signal from a wireless device. Only the RF immunity of the hearing aid is measured in T-coil mode. It is assumed that a hearing aid can have no immunity to an interference signal in the audio band, which is the intended reception band for this mode. The only criterion that can be measured is the RF immunity in T-coil mode. This is measured using the same procedure as the audio coupling mode at the same levels.

The signal quality of the axial and radial components of the magnetic field was used to determine the T-coil mode category.

Catagory	Telephone RF Parameters		
Category	Wireless Device Signal Quality [(Signal + Noise)-to-noise ratio in dB]		
T1	0 to 10 dB		
T2	10 to 20 dB		
Т3	20 to 30 dB		
T4	> 30 dB		
Table 3-1 Magnetic Coupling Parameters			

Note: The FCC limit for SNNR is 20dB and the test data margins will indicate a margin from the FCC limit for compliance.

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4. METHOD OF MEASUREMENT

I. Test Setup

The equipment was connected as shown in an acoustic/RF hemi-anechoic chamber:

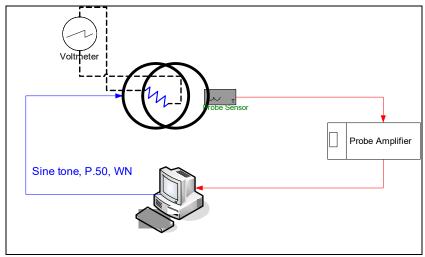


Figure 4-1
Validation Setup with Helmholtz Coil

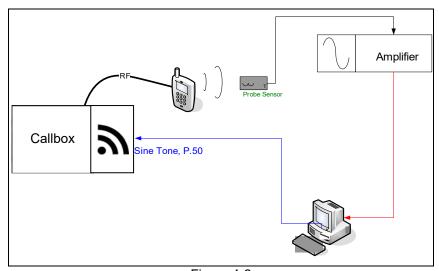


Figure 4-2 **T-Coil Test Setup**

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II. **Scanning Mechanism**

Manufacturer: TEM

Accuracy: ± 0.83 cm/meter

Minimum Step Size: 0.1 mm 6.1 cm/sec Maximum speed Line Voltage: 115 VAC Line Frequency: 60 Hz

Material Composite: Delrin (Acetal) Data Control: Parallel Port

Dynamic Range (X-Y-Z): 45 x 31.75 x 47 cm

36" x 25" x 38" Dimensions: 36" x 49" x 55" Operating Area:

Reflections: < -20 dB (in anechoic chamber)

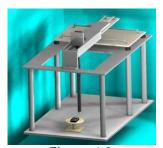


Figure 4-3 RF Near-Field Scanner

III. **ITU-T P.50 Artificial Voice**

ITU-T Manufacturer:

Active Frequency 100 Hz – 8 kHz Range:

Stimulus Type: Male and Female, no spaces

Single Sample 20.96 seconds

Duration: Activity Level: 100%

Figure 4-4 Spectral Characteristic of full P.50

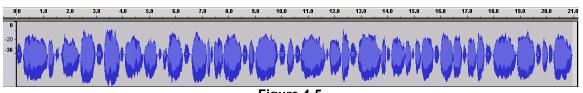
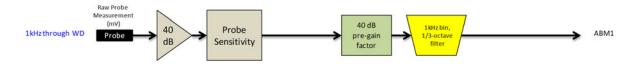


Figure 4-5 Temporal Characteristic of full P.50

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ABM2 Measurement Block Diagram:



Figure 4-6 Magnetic Measurement Processing Steps

IV. Test Procedure

- 1. Ambient Noise Check per C63.19 §7.3.1
 - Ambient interference was monitored using a Real-Time Analyzer between 100-10,000 Hz with 1/3 octave filtering.
 - b. "A-weighting" and Half-Band Integration was applied to the measurements.
 - c. Since this measurement was measured in the same method as ABM2 measurements, this level was verified to be more than 10 dB below the lowest measurement signal (which is the highest ABM2 measurement for a T4 WD). Therefore the maximum noise level for a T4 WD with an ABM1 = -18 dBA/m is:

- 2. Measurement System Validation (See Figure 4-1)
 - a. The measurement system including the probe, pre-amplifier and acquisition system were validated as an entire system to ensure the reliability of test measurements.
 - b. ABM1 Validation

The magnetic field at the center of the Helmholtz coil is given by the equation (per C63.19 Annex D.10.1):

$$H_c = \frac{NI}{r\sqrt{1.25^3}} = \frac{N(\frac{V}{R})}{r\sqrt{1.25^3}}$$

Where H_c = magnetic field strength in amperes per meter N = number of turns per coil

For the Helmholtz Coil, N=20; r=0.08m; R=10.2Ω and using V=18mV:

$$H_c = \frac{20 \cdot (\frac{0.018}{10.2})}{0.08 \cdot \sqrt{1.25^3}} = 0.316A/m \approx -10dB(A/m)$$

Therefore a pure tone of 1kHz was applied into the coils such that 18mV was observed across the resistor. The voltmeter used for measurement was verified to be capable of measurements in the audio band range. This theoretically generates an expected field of -10 dB(A/m) in the center of the Helmholtz coil which was used to validate the probe measurement at -10dB(A/m). This was verified to be within \pm 0.5 dB of the -10dB(A/m) value (see Page 34).

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c. Frequency Response Validation

The frequency response through the Helmholtz Coil was verified to be within 0.5 dB relative to 1kHz, between 300 – 3000 Hz using the P.50 signal as shown below:

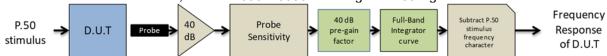


Figure 4-7 Frequency Response Validation

d. ABM2 Measurement Validation

WD noise measurements are filtered with A-weighting and Half-Band Integration over a frequency range of 100Hz – 10kHz to process ABM2 measurements. Below is the verification of the system processing A-weighting and Half-Band integration between system input to output within 0.5 dB of the theoretical result:

Table 4-1
ABM2 Frequency Response Validation

	HBI, A -	HBI, A -	
f (Hz)	Measured	Theoretical	dB Var.
	(dB re 1kHz)	(dB re 1kHz)	
100	-16.180	-16.170	-0.010
125	-13.257	-13.250	-0.007
160	-10.347	-10.340	-0.007
200	-8.017	-8.010	-0.007
250	-5.925	-5.920	-0.005
315	-4.045	-4.040	-0.005
400	-2.405	-2.400	-0.005
500	-1.212	-1.210	-0.002
630	-0.349	-0.350	0.001
800	0.071	0.070	0.001
1000	0.000	0.000	0.000
1250	-0.503	-0.500	-0.003
1600	-1.513	-1.510	-0.003
2000	-2.778	-2.780	0.002
2500	-4.316	-4.320	0.004
3150	-6.166	-6.170	0.004
4000	-8.322	-8.330	0.008
5000	-10.573	-10.590	0.017
6300	-13.178	-13.200	0.022
8000	-16.241	-16.270	0.029
10000	-19.495	-19.520	0.025

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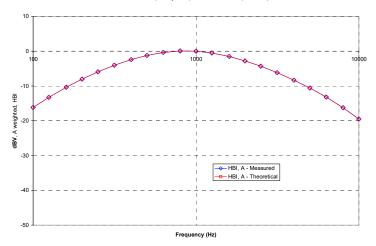
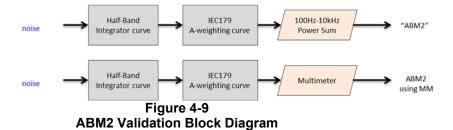


Figure 4-8
ABM2 Frequency Response Validation

The ABM2 result is a power sum from 100Hz to 10kHz with half-band integration and A-weighting. To verify the power sum measurement, a power sum over the full band was measured and verified to track with the source level (See Figure 4-9). Therefore the setup in this step was used to verify the power sum post-processing for ABM2 measurements. See below block diagram:



The power summed output results for a known input were compared to the multi-meter results to verify any deviation in the post-processing implemented with the power-sum.

Table 4-2
ABM2 Power Sum Validation

WN Input (dBV)	Power Sum (dBV)	Multimeter-Full (dBV)	Dev (dB)
-60	-60.36	-60.2	0.16
-50	-50.19	-50.13	0.06
-40	-40.14	-40.03	0.11
-30	-30.13	-30.01	0.12
-20	-20.12	-20	0.12
-10	-10.14	-10	0.14

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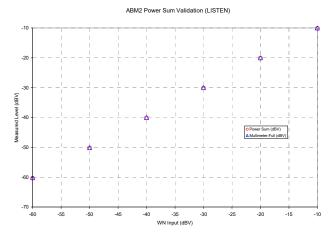
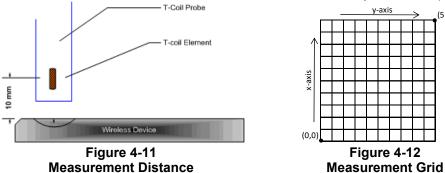


Figure 4-10 **ABM2 Power Sum Validation**

3. Measurement Test Setup

- a. Fine scan above the WD (TEM)
 - i. A multitone signal was applied to the handset such that the phone acoustic output was stable within 1dB over the probe settling time and with the acoustic output level at the C63.19 specified levels (below). The measurement step size was in 2 mm increments at a distance of 10 mm between the surface of the wireless device as shown below (note that in Figure 4-12, the grid is not to scale but merely a graphical representation of the coordinate system in use):

(5.2,5.2)



- ii. After scanning, the planar field maximum point was determined. The position of the probe was moved to this location to setup the test using the SoundCheck system.
- iii. These steps were repeated for all T-coil orientations (axial and radial) per Figure 4-14 after a T-coil orientation was fully measured with the SoundCheck system.
- b. Speech Signal Setup to Base Station Simulator
 - i. C63.19 Table 7-1 states audio reference input levels for various technologies:

Standard	Technology	Input Level (dBm0)
TIA/EIA/IS-2000	CDMA	-18
J-STD-007	GSM (217)	-16
T1/T1P1/3GPP	UMTS (WCDMA)	-16
iDEN TM	TDMA (22 and 11 Hz)	-18

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- ii. See Section 5 for more information regarding CMW500 audio level settings for Voice Over LTE (VoLTE).
- iii. See Section 6 for more information regarding audio level settings for Over-The-Top (OTT) Voice Over IP (VoIP) Testing.
- c. Real-Time Analyzer (RTA)
 - i. The Real-Time Analyzer was configured to analyze measurements using 1/3 Octave band weighted filtering.
- d. WD Radio Configuration Selection
 - i. The device was chosen to be tested in the worst-case ABM2 condition (See Section 7 for more information regarding worst-case configurations for CDMA and UMTS. LTE configuration information can be found in Section 5 and 6. WIFI configuration information can be found in Section 6.)
 - ii. Supported GSM vocoders were investigated for the worst-case ABM2 condition. GSM-EFR was deemed the worst-case condition for the GSM air interface.
- 4. Signal Quality Data Analysis
 - a. Narrow-band Magnetic Intensity
 - i. The standard specifies a 1kHz 1/3 octave band minimum field intensity for a sine tone. The ABM1 measurements were evaluated at 1kHz with 1/3 octave band filtering over an averaged period of 10 seconds.
 - b. Frequency Response
 - i. The appropriate frequency response curve was measured to curves in Figure 3-1 or Figure 3-2 between 300 3000 Hz using digital linear averaging (limit lines chosen according to measurement found in step 4a). A linear average over 3x the length of the artificial voice signal (3x sampling) was performed. A 10 second delay was configured in the measurement process of the stimulus to ensure handset vocoder latency effects and echo cancellation devices (if any) were appropriately stabilized during measurements.
 - ii. The appropriate post-processing was applied according to the system processing chain illustrated in Figure 4-7. All R10 frequencies were plotted with respect to 0dB at 1kHz value and aligned with respect to the EIA-504 mask.
 - iii. The margin is represented by the closest measured data point on the curve to the EIA-504 limit lines, in dB.
 - c. Signal Quality Index
 - i. Ensuring the WD was at maximum RF power, maximum volume, backlight off, display on, maximum contrast setting, keypad lights on (when possible) with no audio signal through the vocoder, the WD was measured over at least 100 Hz 10,000 Hz, maximized over 5 seconds with a 50ms sample time for the ABM2 measurement (5 second time period is used in noise measurements under standards such as IEEE 269, etc.).
 - ii. After applying half-band integration and A-weighting to the result, a power sum was applied over each 1/3 octave bandwidth frequency for an ABM2 value.
 - iii. This result was subtracted from the ABM1 result in step a, to obtain the Signal Quality.

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V. **Test Setup**

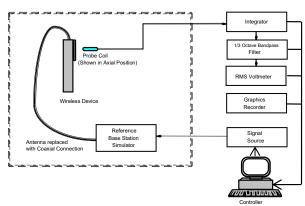


Figure 4-13 **Audio Magnetic Field Test Setup**

Environmental conditions such as temperature and relative humidity are monitored to ensure there are no impacts on system specifications. Proper voltage and power line frequency conditions are maintained with three phase power sources. Environmental noise and reflections are monitored through system checks.

VI. **Deviation from C63.19 Test Procedure**

Non-conducted RF connection due to inaccessible RF ports.

VII. Air Interface Technologies Tested

All air interfaces which support voice capabilities over a managed CMRS or pre-installed OTT VoIP applications were tested for T-coil unless otherwise noted. See Table 2-1 for more details regarding which modes were tested.

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VIII. Wireless Device Channels and Frequencies

1. 2G/3G Modes

The frequencies listed in the table below are those that lie in the center of the bands used for cellular telephony. Low, middle and high channels were tested in each band for FCC compliance evaluation to ensure the maximum emission is captured across the entire band. Only middle channels were evaluated for data modes.

Table 4-3
Center Channels and Frequencies

Test frequencies & associated channels				
Channel	Frequency (MHz)			
Cellular 850				
384 (CDMA)	836.52			
190 (GSM)	836.60			
4183 (UMTS)	836.60			
AWS 1750				
1412 (UMTS)	1730.40			
PCS 1900				
600 (CDMA)	1880			
661 (GSM)	1880			
9400 (UMTS)	1880			

2. 4G (LTE) Modes

The middle channel for every band and bandwidth combination was tested for each probe orientation. The band and bandwidth combination from each probe orientation resulting in the worst-case SNNR was additionally tested using low and high channels for that band and bandwidth combination. See Tables 8-5 to 8-10, and Table 8-14 for LTE bandwidths and channels.

3. WIFI

The middle channel for each IEEE 802.11 standard was tested for each probe orientation. The 2.4GHz IEEE 802.11 standard from each probe orientation resulting in the worst-case SNNR was additionally tested using low and high channels. See Table 8-15 for WIFI standards and channels.

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IX. Test Flow

The flow diagram below was followed (From C63.19):

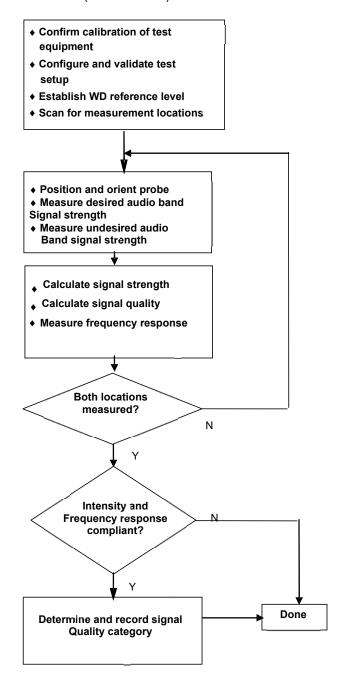


Figure 4-14 C63.19 T-Coil Signal Test Process

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5. VOLTE TEST SYSTEM SETUP AND DUT CONFIGURATION

I. Test System Setup for VoLTE over IMS T-coil Testing

1. Equipment Setup

The general test setup used for VoLTE over IMS is shown below. The callbox used when performing VoLTE over IMS T-coil measurements is a CMW500. The Data Application Unit (DAU) of the CMW500 was used to simulate the IP Multimedia Subsystem (IMS) server.

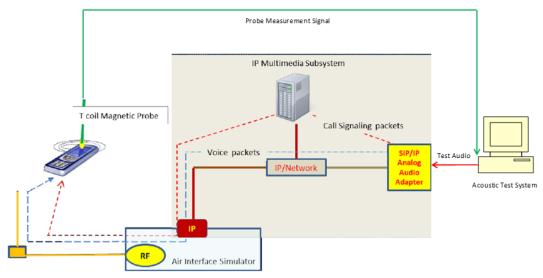


Figure 5-1
Test Setup for VoLTE over IMS T-Coil Measurements

2. Audio Level Settings

According to the July 2012 interpretations by the C63 Committee regarding the appropriate audio levels to be used for VoLTE over IMS T-coil testing, -16dBm0 shall be used for the normal speech input level*. The CMW500 base station simulator was manually configured to ensure that the settings for speech input and full scale levels resulted in the -16dBm0 speech input level to the DUT for the VoLTE over IMS connection.

* http://c63.org/documents/misc/posting/new_interpretations.htm

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II. **DUT Configuration for VoLTE over IMS T-coil Testing**

1. Radio Configuration

An investigation was performed to determine the modulation and RB configuration to be used for testing. The effects of modulation and RB configuration were found to be independent of band and bandwidth; therefore, only one band and bandwidth were used for this investigation. 16QAM, 1RB, 99%RB offset was used for the testing as the worst-case configuration for the handset. See below table for SNNR comparison between different radio configurations:

> Table 5-1 **VoLTE over IMS SNNR by Radio Configuration**

Band	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	SNNR [dB]
66	1745.0	132322	20	QPSK	1	0	13.39	-49.81	63.20
66	1745.0	132322	20	QPSK	1	50	13.34	-47.90	61.24
66	1745.0	132322	20	QPSK	1	99	13.36	-47.03	60.39
66	1745.0	132322	20	QPSK	50	0	13.34	-48.40	61.74
66	1745.0	132322	20	QPSK	50	25	13.35	-47.77	61.12
66	1745.0	132322	20	QPSK	50	50	13.27	-48.23	61.50
66	1745.0	132322	20	QPSK	100	0	13.36	-48.69	62.05
66	1745.0	132322	20	16QAM	1	0	13.42	-44.33	57.75
66	1745.0	132322	20	16QAM	1	50	13.34	-43.42	56.76
66	1745.0	132322	20	16QAM	1	99	13.34	-42.27	55.61
66	1745.0	132322	20	16QAM	50	0	13.37	-47.79	61.16
66	1745.0	132322	20	16QAM	50	25	13.35	-47.48	60.83
66	1745.0	132322	20	16QAM	50	50	13.33	-46.80	60.13
66	1745.0	132322	20	16QAM	100	0	13.34	-47.59	60.93
66	1745.0	132322	20	64QAM	1	0	13.14	-43.84	56.98
66	1745.0	132322	20	64QAM	1	50	13.31	-43.83	57.14
66	1745.0	132322	20	64QAM	1	99	13.32	-42.75	56.07
66	1745.0	132322	20	64QAM	50	0	13.24	-47.84	61.08
66	1745.0	132322	20	64QAM	50	25	13.20	-48.18	61.38
66	1745.0	132322	20	64QAM	50	50	13.31	-47.50	60.81
66	1745.0	132322	20	64QAM	100	0	13.38	-47.95	61.33

2. Codec Configuration

An investigation was performed to determine the audio codec configuration to be used for testing. The effects of codec configuration were found to be independent of radio configuration; therefore, only one radio configuration was used for this investigation. The WB AMR 6.60kbps setting was used for the audio codec on the CMW500 for VoLTE over IMS T-coil testing. See below table for comparisons between different codecs and codec data rates:

> Table 5-2 AMR Codec Investigation - VolTE over IMS

7 time o o o o mi o o tigation					102:2 010: 1110			
Codec Setting:	WB AMR 23.85kbps	WB AMR 6.60kbps	NB AMR 12.2kbps	NB AMR 4.75kbps	Orientation	Band / BW	Channel	
ABM1 (dBA/m)	13.45	13.29	13.77	13.68				
ABM2 (dBA/m)	-45.15	-44.39	-45.23	-44.93	Avial	LTE Band 66	40000	
Frequency Response	Pass	Pass	Pass	Pass	- Axial	20MHz	132322	
S+N/N (dB)	58.60	57.68	59.00	58.61				

- Mute on; Backlight off; Max Volume; Max Contrast
- TPC = "Max Power"

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Table 5-3
EVS Codec Investigation - VoLTE over IMS

			· · · · · · · · · · · · · · · · · · ·				
Codec Setting:	EVS Primary WB 13.2kbps	EVS Primary WB 5.9kbps	EVS Primary NB 13.2kbps	EVS Primary NB 5.9kbps	Orientation	Band / BW	Channel
ABM1 (dBA/m)	13.29	13.30	13.33	13.25			
ABM2 (dBA/m)	-44.90	-44.91	-44.84	-45.24	Asial	LTE Band 66 20MHz	132322
Frequency Response	Pass	Pass	Pass	Pass	- Axial		
S+N/N (dB)	58.19	58.21	58.17	58.49			

- · Mute on; Backlight off; Max Volume; Max Contrast
- TPC = "Max Power"

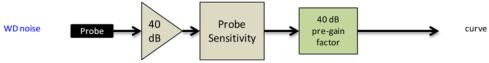


Figure 5-2
Audio Band Magnetic Curve Measurement Block Diagram

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6. OTT VOIP TEST SYSTEM AND DUT CONFIGURATION

I. Test System Setup for OTT VoIP T-Coil Testing

1. OTT VoIP Application

Google Duo is a pre-installed application on the DUT which allows for VoIP calls in a held-to-ear scenario. Duo uses the OPUS audio codec and supports a bitrate range of 6kb/s to 75kb/s. All air interfaces capable of a data connection were evaluated with Google Duo.

2. Equipment Setup

A CMW500 callbox was used to perform OTT VoIP T-coil measurements. The Data Application Unit (DAU) of the CMW500 was connected to the internet and allowed for an IP data connection on the DUT. An auxiliary VoIP unit was used to initiate an OTT VoIP call to the DUT. The auxiliary VoIP unit allowed for the configuration and monitoring of the OTT VoIP codec bitrate during a call. Both high and low bitrate settings were evaluated in to determine the worst-case configuration.

3. Audio Level Settings

According to KDB 285076 D02, the average speech level of -20dBm0 shall be used for protocols not specifically listed in Table 7.1 of ANSI C63.19-2011 or the ANSI C63.19-2011 VoLTE interpretation². The auxiliary VoIP unit allowed for monitoring the signal input level to ensure that the settings for speech input and full scale levels resulted in the -20dBm0 speech input level to the DUT for the OTT VoIP call.

Note: The green highlighted text is approved by FCC under the TCB PAG Re-Use Policy 388624 D01 IV. D. for T-Coil Testing for WI-FI calling and Google Duo.

II. DUT Configuration for OTT VoIP T-Coil Testing

1. Codec Configuration

An investigation was performed for each applicable data mode to determine the audio codec configuration to be used for testing. The effects of codec configuration were found to be independent of radio configuration; therefore, only one radio configuration for each applicable data mode was used for these investigations. The 75kbps codec setting was used for the audio codec on the auxiliary VoIP unit for OTT VoIP T-Coil testing. See below tables for comparisons between codec data rates on all applicable data modes:

Table 6-1
Codec Investigation – OTT VoIP (EvDO)

Codec Setting:	75kbps	6kbps	Orientation	Channel			
ABM1 (dBA/m)	7.66	7.65					
ABM2 (dBA/m)	-49.14	-49.92	Axial	222			
Frequency Response	Pass	Pass	Axiai	600			
S+N/N (dB)	56.80	57.57					

² FCC Office of Engineering and Technology KDB, "285076 D02 T-Coil Testing for CMRS IP v03," September 13, 2017

1 CC Office of Engineer	ing and recimology NDB, 200	DOTO DOZ T-CON TESHING TO CIVING II	voo, oepterriber 15, 2	2017
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Table 6-2
Codec Investigation – OTT VoIP (EDGE)

Ocace iiiv	Junganio		* O:: (E	DUL,	
Codec Setting:	75kbps	6kbps	Orientation	Channel	
ABM1 (dBA/m)	7.48	7.32			
ABM2 (dBA/m)	-35.29	-36.25	Axial	661	
Frequency Response	Pass	Pass	Axiai		
S+N/N (dB)	42.77	43.57			

Table 6-3
Codec Investigation – OTT VoIP (HSPA)

Codec investigation – Ott von (nor A)								
Codec Setting:	75kbps	6kbps	Orientation	Channel				
ABM1 (dBA/m)	7.55	7.38						
ABM2 (dBA/m)	-48.42	-48.74	Axial	9400				
Frequency Response	Pass	Pass	Axiai	9400				
S+N/N (dB)	55.97	56.12						

Table 6-4
Codec Investigation – OTT VoIP (LTE)

	O V OOL	O	··· \ /	,	
Codec Setting:	75kbps	6kbps	Orientation	Band / BW	Channel
ABM1 (dBA/m)	7.32	7.27			
ABM2 (dBA/m)	-40.42	-40.52	Axial LTE	LTE Band 25 20MHz	26365
Frequency Response	Pass	Pass	Axiai		20MHz
S+N/N (dB)	47.74	47.79			

Table 6-5
Codec Investigation – OTT VoIP (WIFI)

Codec investigation – OTT voir (viii)									
Codec Setting:	75kbps	6kbps	Orientation	Band	Standard	Channel			
ABM1 (dBA/m)	7.40	7.72				6			
ABM2 (dBA/m)	-39.94	-41.47	Axial	2.404-	2.4GHz IEEE 802.11b				
Frequency Response	Pass	Pass	Axiai	2.4902					
S+N/N (dB)	47.34	49.19							

- Mute on; Backlight off; Max Volume; Max Contrast
- · Radio Configurations can be found in Section 8.II.F

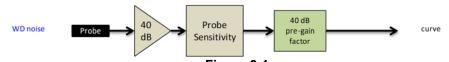


Figure 6-1
Audio Band Magnetic Curve Measurement Block Diagram

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2. Radio Configuration for OTT VoIP (LTE)

An investigation was performed to determine the worst-case LTE FDD band to be used for OTT VoIP testing. LTE FDD Band 7 was used for the testing as the worst-case configuration for the handset. See below table for SNNR comparison between different LTE FDD bands:

Table 6-6
OTT VoIP (LTE FDD) SNNR by LTE Band

Band	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	SNNR [dB]
12	707.5	23095	10	16QAM	1	49	7.46	-42.53	49.99
13	782.0	23230	10	16QAM	1	49	7.42	-41.05	48.47
5	836.5	20525	10	16QAM	1	49	7.49	-41.79	49.28
66	1745.0	132322	20	16QAM	1	99	7.25	-38.51	45.76
25	1882.5	26365	20	16QAM	1	99	7.11	-40.24	47.35
7	2535.0	21100	20	16QAM	1	99	7.26	-38.14	45.40

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3. Radio Configuration for OTT VoIP (WIFI)

An investigation was performed on all applicable data rates and modulations to determine the radio configuration to be used for testing. See tables below for SNNR comparison between radio configurations in each IEEE 802.11 standard:

Table 6-7
IEEE 802.11b SNNR by Radio Configuration

Mode	Channel	nnel Modulation Data Rate ABM1 [Mbps] [dB(A/m		ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	SNNR [dB]
IEEE 802.11b	6	DSSS	1	7.28	-42.53	49.81
IEEE 802.11b	6	DSSS	2	7.40	-43.04	50.44
IEEE 802.11b	6	CCK	5.5	7.38	-44.81	52.19
IEEE 802.11b	6	CCK	11	7.38	-44.69	52.07

Table 6-8
IEEE 802.11g SNNR by Radio Configuration

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Mode	Channel	Modulation	Data Rate [Mbps]	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	SNNR [dB]		
IEEE 802.11g	6	BPSK	6	7.34	-46.29	53.63		
IEEE 802.11g	6	BPSK	9	7.25	-45.76	53.01		
IEEE 802.11g	6	QPSK	12	7.60	-45.05	52.65		
IEEE 802.11g	6	QPSK	18	7.40	-47.84	55.24		
IEEE 802.11g	6	16QAM	24	7.31	-47.61	54.92		
IEEE 802.11g	6	16QAM	36	7.36	-48.21	55.57		
IEEE 802.11g	6	64QAM	48	7.25	-48.36	55.61		
IEEE 802.11g	6	64QAM	54	7.24	-47.99	55.23		

Table 6-9
IEEE 802.11n SNNR by Radio Configuration

in the second se							
Mode	Channel	Modulation	MCS Index	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	SNNR [dB]	
IEEE 802.11n	6	BPSK	0	7.39	-47.13	54.52	
IEEE 802.11n	6	QPSK	1	7.35	-47.48	54.83	
IEEE 802.11n	6	QPSK	2	7.31	-47.66	54.97	
IEEE 802.11n	6	16QAM	3	7.34	-47.81	55.15	
IEEE 802.11n	6	16QAM	4	7.35	-48.86	56.21	
IEEE 802.11n	6	64QAM	5	7.35	-48.35	55.70	
IEEE 802.11n	6	64QAM	6	7.32	-49.55	56.87	
IEEE 802.11n	6	64QAM	7	7.31	-48.51	55.82	

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FCC 3G MEASUREMENTS 7.

I. **CDMA Test Configurations**

Radio Configuration 1, Service Option 3 (thick, green data curve) was used for the testing as the worstcase configuration for the handset due to vocoder gating from the EVRC logic. See below plot for ABM noise comparison between operational field service options and radio configurations for a CDMA2000 handset:

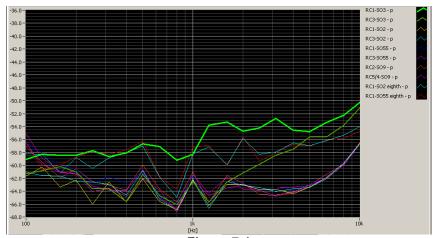
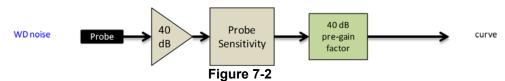


Figure 7-1 **CDMA Audio Band Magnetic Noise**

Table 7-1 FCC 3G ABM Measurements for ZNFK200QM (CDMA)

			1		
Configuration:	RC1/SO3	RC3/SO3	RC4/SO3	Orientation	Channel
ABM1 (dBA/m)	3.25	3.11	3.02		600
ABM2 (dBA/m)	-42.52	-58.10	-58.15	Axial	
Frequency Response	Pass	Pass	Pass	Axiai	
S+N/N (dB)	45.77	61.21	61.17		

- Mute on; Backlight off; Max Volume; Max Contrast
- Power Control Bits = "All Up"



Audio Band Magnetic Curve Measurement Block Diagram

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II. **UMTS Test Configurations**

AMR at 12.2kbps, 13.6kbps SRB (thick, purple data curve) was used for the testing as the worst-case configuration for the handset. See below plot for ABM noise comparison between vocoder rates:

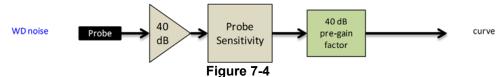


Figure 7-3 **UMTS Audio Band Magnetic Noise**

Table 7-2 **Codec Investigation - UMTS**

		co mvestigatio			
Codec Setting:	AMR 12.2kbps	AMR 7.95kbps	AMR 4.75kbps	Orientation	Channel
ABM1 (dBA/m)	1.59	1.46	1.36		9400
ABM2 (dBA/m)	-55.84	-58.71	-58.62	Axial	
Frequency Response	Pass	Pass	Pass	Axiai	
S+N/N (dB)	57.43	60.17	59.98		

- Mute on; Backlight off; Max Volume; Max Contrast
- TPC="All 1s"



Audio Band Magnetic Curve Measurement Block Diagram

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T-COIL TEST SUMMARY 8.

Table 8-1 **Consolidated Tabled Results**

Consolidated Tabled Results									
			esponse rgin		netic / Verdict		SNNR dict	Margin from FCC Limit	C63.19-2011
C62 10	Section	8.3	3.2	8.3	3.1	8.3	3.4	(dB)	Rating
C63. 18	Section	Axial	Radial	Axial	Radial	Axial	Radial		
CDMA	Cellular	PASS	NA	PASS	PASS	PASS	PASS	-6.40	Т3
CDIVIA	PCS	PASS	NA	PASS	PASS	PASS	PASS	-0.40	13
EvDO	Cellular	PASS	NA	PASS	PASS	PASS	PASS	-32.50	T4
(OTT VoIP)	PCS	PASS	NA	PASS	PASS	PASS	PASS	-32.50	14
GSM	Cellular	PASS	NA	PASS	PASS	PASS	PASS	-2.00	Т3
GSIVI	PCS	PASS	NA	PASS	PASS	PASS	PASS		13
EDGE	Cellular	PASS	NA	PASS	PASS	PASS	PASS	-11.84	T4
(OTT VoIP)	PCS	PASS	NA	PASS	PASS	PASS	PASS	-11.04	14
	Cellular	PASS	NA	PASS	PASS	PASS	PASS		
UMTS	AWS	PASS	NA	PASS	PASS	PASS	PASS	-29.15	T4
	PCS	PASS	NA	PASS	PASS	PASS	PASS		
	Cellular	PASS	NA	PASS	PASS	PASS	PASS		
HSPA (OTT VoIP)	AWS	PASS	NA	PASS	PASS	PASS	PASS	-29.52	T4
(011 7011)	PCS	PASS	NA	PASS	PASS	PASS	PASS		
	B12	PASS	NA	PASS	PASS	PASS	PASS		
	B13	PASS	NA	PASS	PASS	PASS	PASS		
LTE FDD	B5	PASS	NA	PASS	PASS	PASS	PASS	-19.85	T4
LIE FUU	B66	PASS	NA	PASS	PASS	PASS	PASS	-19.05	14
	B25	PASS	NA	PASS	PASS	PASS	PASS		
	В7	PASS	NA	PASS	PASS	PASS	PASS		
LTE FDD (OTT VoIP)	В7	PASS	NA	PASS	PASS	PASS	PASS	-17.14	T4
	IEEE 802.11b	PASS	NA	PASS	PASS	PASS	PASS		
WLAN (OTT VoIP)	IEEE 802.11g	PASS	NA	PASS	PASS	PASS	PASS	-23.37	T4
(311 7011)	IEEE 802.11n	PASS	NA	PASS	PASS	PASS	PASS		

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I. Raw Handset Data

Table 8-2
Raw Data Results for CDMA

Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates		
		1013	3.18	-43.15		2.00	46.33	20.00	-26.33	T4			
	Axial	384	3.15	-41.82	-64.24	2.00	44.97	20.00	-24.97	T4	2.0, 2.0		
Cellular		777	3.25	-39.85		2.00	43.10	20.00	-23.10	T4			
Celiulai		1013	-5.77	-35.26			29.49	20.00	-9.49	Т3			
	Radial	384	-6.21	-34.29	-63.55	-63.55 N/A		20.00	-8.08	Т3	2.6, 2.6		
		777	-5.77	-32.17			26.40	20.00	-6.40	Т3			
		25	3.12	-44.00		2.00	47.12	20.00	-27.12	T4			
	Axial	600	3.03	-43.39	-64.24	2.00	46.42	20.00	-26.42	T4	2.0, 2.0		
PCS		1175	3.22	-42.74		2.00	45.96	20.00	-25.96	T4			
FUS		25	-6.03	-36.77	-63.55				30.74	20.00	-10.74	T4	
	Radial	600	-5.63	-36.04		-63.55 N/A	30.41	20.00	-10.41	T4	2.6, 2.6		
		1175	-6.11	-35.37			29.26	20.00	-9.26	Т3			

Table 8-3
Raw Data Results for GSM

Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response	S+N/N (dB)	FCC Limit	Margin from FCC Limit	C63.19-2011 Rating	Test Coordinates
		128	2.23	-28.88		Margin (dB)	31.11	20.00	(dB)		
							-	20.00	-11.11	T4	
	Axial	190	2.16	-29.01	-64.24	2.00	31.17	20.00	-11.17	T4	2.0, 2.0
GSM850		251	2.21	-30.40		2.00	32.61	20.00	-12.61	T4	
GSIVIOSO		128	-6.14	-28.14			22.00	20.00	-2.00	Т3	
	Radial	190	-6.38	-28.69	-63.55	N/A	22.31	20.00	-2.31	Т3	2.6, 2.6
		251	-6.38	-31.01			24.63	20.00	-4.63	Т3	
		512	2.03	-32.64		2.00	34.67	20.00	-14.67	T4	
	Axial	661	2.08	-32.15	-64.24	2.00	34.23	20.00	-14.23	T4	2.0, 2.0
CSM4000		810	2.15	-32.22		2.00	34.37	20.00	-14.37	T4	
GSM1900		512	-6.21	-33.29			27.08	20.00	-7.08	Т3	
	Radial	661	-6.14	-32.61		26.47	20.00	-6.47	Т3	2.6, 2.6	
		810	-6.54	-32.73			26.19	20.00	-6.19	Т3	

Table 8-4
Raw Data Results for UMTS

Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
		4132	1.42	-58.23		2.00	59.65	20.00	-39.65	T4	
	Axial	4183	1.43	-55.08	-64.24	2.00	56.51	20.00	-36.51	T4	2.0, 2.0
UMTS V		4233	1.40	-57.54		2.00	58.94	20.00	-38.94	T4	
OW 10 V		4132	-6.88	-58.40			51.52	20.00	-31.52	T4	
	Radial	4183	-6.93	-56.08	-63.55	N/A	49.15	20.00	-29.15	T4	2.6, 2.6
		4233	6.95	-43.66			50.61	20.00	-30.61	T4	
		1312	1.40	-57.66		2.00	59.06	20.00	-39.06	T4	
	Axial	1412	1.44	-58.45	-64.24	2.00	59.89	20.00	-39.89	T4	2.0, 2.0
UMTS IV		1513	1.41	-57.77		2.00	59.18	20.00	-39.18	T4	
0111011		1312	-6.86	-58.80			51.94	20.00	-31.94	T4	
	Radial	1412	-6.91	-59.88	-63.55	N/A	52.97	20.00	-32.97	T4	2.6, 2.6
		1513	-6.91	-58.79			51.88	20.00	-31.88	T4	
		9262	1.51	-58.57		2.00	60.08	20.00	-40.08	T4	
	Axial	9400	1.47	-56.21	-64.24	2.00	57.68	20.00	-37.68	T4	2.0, 2.0
UMTS II		9538	1.43	-57.47		2.00	58.90	20.00	-38.90	T4	
OWISII		9262	-6.87	-58.92			52.05	20.00	-32.05	T4	
	Radial	9400	-6.84	-59.03	-63.55	N/A	52.19	20.00	-32.19	T4	2.6, 2.6
		9538	-6.87	-58.75			51.88	20.00	-31.88	T4	

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Table 8-5 **Raw Data Results for LTE B12**

Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
		10MHz	23095	13.39	-44.79		2.00	58.18	20.00	-38.18	T4	
	Axial	5MHz	23095	13.27	-44.14	-64.24	2.00	57.41	20.00	-37.41	T4	2.0, 2.0
	Axiai	3MHz	23095	13.17	-44.27	-04.24	2.00	57.44	20.00	-37.44	T4	2.0, 2.0
LTE Band 12		1.4MHz	23095	13.25	-44.35		2.00	57.60	20.00	-37.60	T4	
LIE Ballu 12		10MHz	23095	4.57	-41.90			46.47	20.00	-26.47	T4	
	Radial	5MHz	23095	4.57	-40.88	-63.93	N/A	45.45	20.00	-25.45	T4	2.6, 2.6
	Naulai	3MHz	23095	4.47	-42.19	-03.93	INA	46.66	20.00	-26.66	T4	2.0, 2.0
		1.4MHz	23095	4.61	-41.90			46.51	20.00	-26.51	T4	

Table 8-6 **Raw Data Results for LTE B13**

Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
	Axial	10MHz	23230	13.23	-44.11	-64.24	2.00	57.34	20.00	-37.34	T4	2.0. 2.0
LTE Band 13		5MHz	23230	13.22	-44.20	-04.24	2.00	57.42	20.00	-37.42	T4	2.0, 2.0
LIE Band 13	Radial	10MHz	23230	4.58	-41.94	-63.93	N/A	46.52	20.00	-26.52	T4	2.6, 2.6
	radiai	5MHz	23230	4.55	-41.20	-03.93	IVA	45.75	20.00	-25.75	T4	2.0, 2.0

Table 8-7 **Raw Data Results for LTE B5**

Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates														
		10MHz	20525	13.27	-44.22		2.00	57.49	20.00	-37.49	T4															
		5MHz	20525	13.35	-42.69		2.00	56.04	20.00	-36.04	T4															
	Axial	3MHz	20635	13.30	-42.36	-64.70	2.00	55.66	20.00	-35.66	T4	2.0, 2.0														
	Axidi	3MHz	20525	13.44	-42.02	-04.70	2.00	55.46	20.00	-35.46	T4	2.0, 2.0														
		3MHz	20415	13.34	-44.90		2.00	58.24	20.00	-38.24	T4															
LTE Band 5		1.4MHz	20525	13.37	-42.27		2.00	55.64	20.00	-35.64	T4															
LIE Ballu 5		10MHz	20525	4.39	-40.75			45.14	20.00	-25.14	T4															
		5MHz	20525	4.43	-39.08			43.51	20.00	-23.51	T4															
	Padial	3MHz	20635	4.48	-35.37	62.02	N/A	39.85	20.00	-19.85	T4	2.6, 2.6														
	Radial	3MHz	20525	4.61	-37.78	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	IVA	42.39	20.00	-22.39	T4	2.0, 2.0
		3MHz	20415	4.47	-38.96			43.43	20.00	-23.43	T4															
		1.4MHz	20525	4.61	-39.60			44.21	20.00	-24.21	T4															

Table 8-8 **Raw Data Results for LTE B66**

Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates													
		20MHz	132322	13.31	-42.18		2.00	55.49	20.00	-35.49	T4														
		15MHz	132322	13.18	-43.25		2.00	56.43	20.00	-36.43	T4														
	Axial	10MHz	132322	13.31	-43.57	-64.24	2.00	56.88	20.00	-36.88	T4	2.0, 2.0													
	Axiai	5MHz	132322	13.40	-43.56	-04.24	2.00	56.96	20.00	-36.96	T4	2.0, 2.0													
		3MHz	132322	13.35	-43.86		2.00	57.21	20.00	-37.21	T4														
1 TE D 1 00		1.4MHz	132322	13.23	-43.25		2.00	56.48	20.00	-36.48	T4														
LTE Band 66		20MHz	132322	4.50	-40.26			44.76	20.00	-24.76	T4														
		15MHz	132322	4.39	-38.04			42.43	20.00	-22.43	T4														
	D	10MHz	132322	4.36	-38.60	00.00	N/A	42.96	20.00	-22.96	T4	00.00													
	Radial	5MHz	132322	4.50	-41.32	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	-63.93	IWA	45.82	20.00	-25.82	T4	2.6, 2.6
		3MHz	132322	4.55	-39.53			44.08	20.00	-24.08	T4														
		1.4MHz	132322	4.45	-40.90			45.35	20.00	-25.35	T4														

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Table 8-9 Raw Data Results for LTE B25

					Duta IN							
Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
		20MHz	26365	13.34	-44.89		2.00	58.23	20.00	-38.23	T4	
		15MHz	26365	13.31	-44.52		2.00	57.83	20.00	-37.83	T4	
	Axial	10MHz	26365	13.30	-45.39	-64.24	2.00	58.69	20.00	-38.69	T4	20.20
	Axiai	5MHz	26365	13.17	-43.73	-04.24	2.00	56.90	20.00	-36.90	T4	2.0, 2.0
		3MHz	26365	13.27	-43.75		2.00	57.02	20.00	-37.02	T4	
LTE Band 25		1.4MHz	26365	13.30	-43.98		2.00	57.28	20.00	-37.28	T4	
LIE Ballu 25		20MHz	26365	4.39	-43.23			47.62	20.00	-27.62	T4	
		15MHz	26365	4.47	-44.32			48.79	20.00	-28.79	T4	
	Radial	10MHz	26365	4.51	-42.20	-63.93	N/A	46.71	20.00	-26.71	T4	2.6, 2.6
	Radiai	5MHz	26365	4.58	-41.89	-03.93	IVA	46.47	20.00	-26.47	T4	2.0, 2.0
		3MHz	26365	4.46	-40.42			44.88	20.00	-24.88	T4	
		1.4MHz	26365	4.48	-42.31			46.79	20.00	-26.79	T4	

Table 8-10 Raw Data Results for LTE B7

Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
		20MHz	21100	13.37	-44.23		2.00	57.60	20.00	-37.60	T4	
	Axial	15MHz	21100	13.15	-44.87	-64.70	2.00	58.02	20.00	-38.02	T4	2.0, 2.0
	Axidi	10MHz	21100	13.17	-45.05	-04.70	2.00	58.22	20.00	-38.22	T4	2.0, 2.0
LTE Band 7		5MHz	21100	13.19	-45.60		2.00	58.79	20.00	-38.79	T4	
LIE Band /		20MHz	21100	4.52	-39.79			44.31	20.00	-24.31	T4	
	Radial	15MHz	21100	4.49	-38.87	62.02	N/A	43.36	20.00	-23.36	T4	2.6, 2.6
	Naulai	10MHz	21100	4.47	-39.39	-63.93	IVA	43.86	20.00	-23.86	T4	2.0, 2.0
		5MHz	21100	4.45	-40.75			45.20	20.00	-25.20	T4	

Table 8-11
Raw Data Results for EvDO (OTT VoIP)

Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
Cellular	Axial	384	7.54	-49.04	-64.24	1.30	56.58	20.00	-36.58	T4	2.0, 2.0
EvDO	Radial	384	-1.09	-53.59	-63.55	N/A	52.50	20.00	-32.50	T4	2.6, 2.6
PCS	Axial	600	7.59	-49.18	-64.24	1.38	56.77	20.00	-36.77	T4	2.0, 2.0
EvDO	Radial	600	-0.81	-54.42	-63.55	N/A	53.61	20.00	-33.61	T4	2.6, 2.6

Table 8-12
Raw Data Results for EDGE (OTT VoIP)

Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
FDCF0F0	Axial	190	7.55	-34.23	-64.24	1.40	41.78	20.00	-21.78	T4	2.0, 2.0
EDGE850	Radial	190	-1.02	-32.86	-63.55	N/A	31.84	20.00	-11.84	T4	2.6, 2.6
EDGE1900	Axial	661	7.59	-34.98	-64.24	1.36	42.57	20.00	-22.57	T4	2.0, 2.0
LDGL 1900	Radial	661	-1.04	-36.04	-63.55	N/A	35.00	20.00	-15.00	T4	2.6, 2.6

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Table 8-13 Raw Data Results for HSPA (OTT VoIP)

Raw Data Results for Hor A (OTT VOIL)											
Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
HSPA V	Axial	4183	7.45	-48.81	-64.24	1.34	56.26	20.00	-36.26	T4	2.0, 2.0
HOFA V	Radial	4183	-1.27	-50.79	-63.55	N/A	49.52	20.00	-29.52	T4	2.6, 2.6
HSPA IV	Axial	1412	7.38	-48.21	-64.24	1.31	55.59	20.00	-35.59	T4	2.0, 2.0
HOPAIV	Radial	1412	-1.10	-53.34	-63.55	N/A	52.24	20.00	-32.24	T4	2.6, 2.6
HSPA II	Axial	9400	7.39	-48.42	-64.24	1.36	55.81	20.00	-35.81	T4	2.0, 2.0
HOPAII	Radial	9400	-1.25	-53.61	-63.55	N/A	52.36	20.00	-32.36	T4	2.6, 2.6

Table 8-14 Raw Data Results for LTE B7 (OTT VoIP)

						, 101 - 1 -	(1 1011 /				
Mode	Orientation	Bandwidth	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
Axial	20MHz	21350	7.13	-37.78		1.31	44.91	20.00	-24.91	T4		
		20MHz	21100	7.40	-38.30	-64.70	1.28	45.70	20.00	-25.70	T4	2.0, 2.0
	Avial	20MHz	20850	7.16	-36.95		1.33	44.11	20.00	-24.11	T4	
	Axiai	15MHz	21100	7.24	-38.49		1.33	45.73	20.00	-25.73	T4	
		10MHz	21100	7.29	-39.25		1.29	46.54	20.00	-26.54	T4	
LTE Band 7		5MHz	21100	7.29	-40.16		1.30	47.45	20.00	-27.45	T4	
LIL Dalla /		20MHz	21350	-1.36	-40.11			38.75	20.00	-18.75	T4	
		20MHz	21100	-1.34	-38.48			37.14	20.00	-17.14	T4	
	Destin	20MHz	20850	-1.41	-39.56	60.00	NVA	38.15	20.00	-18.15	T4	00.00
	Radial	15MHz	21100	-1.36	-39.24	-63.93	N/A	37.88	20.00	-17.88	T4	2.6, 2.6
		10MHz	21100	-1.35	-39.73			38.38	20.00	-18.38	T4	
		5MHz	21100	-1.40	-41.83			40.43	20.00	-20.43	T4	

Table 8-15 Raw Data Results for 2.4GHz WIFI (OTT VoIP)

Mode	Orientation	Channel	ABM1 [dB(A/m)]	ABM2 [dB(A/m)]	Ambient Noise [dB(A/m)]	Frequency Response Margin (dB)	S+N/N (dB)	FCC Limit (dB)	Margin from FCC Limit (dB)	C63.19-2011 Rating	Test Coordinates
		1	7.32	-44.32		1.35	51.64	20.00	-31.64	T4	
	Axial	6	7.27	-42.31	-64.24	1.32	49.58	20.00	-29.58	T4	2.0, 2.0
IEEE		11	7.22	-45.19		1.36	52.41	20.00	-32.41	T4	
802.11b		1	-1.07	-46.79			45.72	20.00	-25.72	T4	
	Radial	6	-1.00	-44.37	-63.55	N/A	43.37	20.00	-23.37	T4	2.6, 2.6
		11	-1.15	-45.37			44.22	20.00	-24.22	T4	
IEEE	Axial	6	7.46	-45.43	-64.24	1.32	52.89	20.00	-32.89	T4	2.0, 2.0
802.11g	Radial	6	-1.08	-49.69	-63.55	N/A	48.61	20.00	-28.61	T4	2.6, 2.6
IEEE	Axial	6	7.26	-46.92	-64.24	1.38	54.18	20.00	-34.18	T4	2.0, 2.0
802.11n	Radial	6	-1.08	-48.30	-63.55	N/A	47.22	20.00	-27.22	T4	2.6, 2.6

II. **Test Notes**

A. General

- 1. Phone Condition: Mute on; Backlight off; Max Volume; Max Contrast
- 2. 'Radial' orientation refers to radial transverse.
- 3. Hearing Aid Mode (Phone→Settings→Accessibility→Hearing aids) was set to ON for Frequency Response compliance
- 4. Speech Signal: ITU-T P.50 Artificial Voice
- 5. Bluetooth and WIFI were disabled while testing 2G/3G/4G modes.
- 6. Licensed data modes and Bluetooth were disabled while testing WIFI modes.
- 7. The Margin from FCC limit column indicates a margin from the FCC limit for compliance (T3).

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B. CDMA

- 1. Power Configuration: Power Control Bits = "All Up"
- 2. Vocoder Configuration: RC1/SO3 (CDMA EVRC)

C. GSM

- 1. Power Configuration: GSM850: PCL=5, GSM1900: PCL=0;
- 2. Vocoder Configuration: EFR (GSM);

D. UMTS

- 1. Power Configuration: TPC= "All 1s";
- 2. Vocoder Configuration: AMR 12.2 kbps (UMTS);

E. LTE FDD

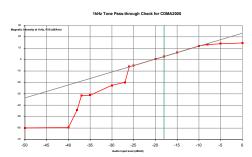
- 1. Power Configuration: TPC = "Max Power"
- 2. Radio Configuration: 16QAM, 1RB, 99%RB offset
- 3. Vocoder Configuration: WB AMR 6.60kbps
- 4. The worst-case band and bandwidth combination for each probe orientation is additionally tested on the low and high channels for those combinations. LTE Band 5 at 3MHz is the worst-case for both Axial and Radial probe orientations.

F. OTT VolP

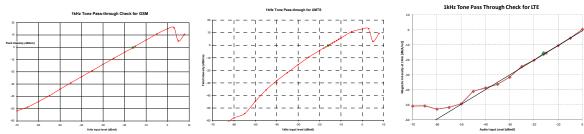
- 1. Vocoder Configuration: 75kbps
- 2. EvDO Configuration
 - a. Revision: A
- 3. EDGE Configuration
 - a. MCS Index: 7
 - b. Number of TX slots: 2
- 4. HSPA Configuration:
 - a. Release: 6
 - b. 3GPP 34.121 Subtest 1
- 5. LTE FDD Configuration:
 - a. Power Configuration: TPC = "Max Power"
 - b. Radio Configuration: 16QAM, 1RB, 99%RB offset
 - c. LTE Band 7 was the worst-case band from Table 6-6 and was used to test both Axial and Radial probe orientations.
 - d. The worst-case band and bandwidth combination for each probe orientation is additionally tested on the low and high channels for those combinations. LTE Band 7 at 20MHz is the worst-case for both Axial and Radial probe orientations.
- 6. WIFI Configuration:
 - a. Radio Configuration
 - i. IEEE 802.11b: DSSS, 1Mbps
 - ii. IEEE 802.11g: QPSK, 12Mbps
 - iii. IEEE 802.11n: BPSK, MCS 0
 - b. The worst-case standard for 2.4GHz WIFI in each probe orientation is additionally tested on the low and high channels. IEEE 802.11b is the worst-case for both Axial and Radial probe orientations.

FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stement	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager
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III. 1 kHz Vocoder Application Check



This model was verified to be within the linear region for ABM1 measurements at -18 dBm0 for CDMA. This measurement was taken in the axial configuration above the maximum location.



This model was verified to be within the linear region for ABM1 measurements at -16 dBm0 for GSM, UMTS, and VoLTE over IMS. This measurement was taken in the axial configuration above the maximum location.



This model was verified to be within the linear region for ABM1 measurements at -20 dBm0 for OTT VoIP. This measurement was taken in the axial configuration above the maximum location.

FCC ID: ZNFK200QM	PCTEST* Proud to be part of the internet	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogg 22 of 72
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IV. T-Coil Validation Test Results

Table 8-16
Helmholtz Coil Validation Table of Results – 10/5/2020

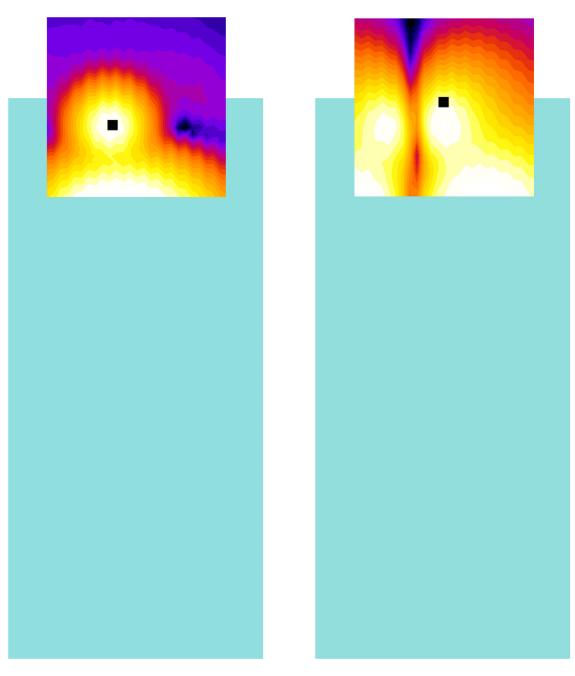
	laation rable of ite	341t3 10/0/2020	
ltem	Target	Result	Verdict
Axial			
Magnetic Intensity, -10 dBA/m	-10 ± 0.5 dB	-10.229	PASS
Environmental Noise	< -58 dBA/m	-64.24	PASS
Frequency Response, from limits	> 0 dB	0.70	PASS
Radial			
Magnetic Intensity, -10 dBA/m	-10 ± 0.5 dB	-10.296	PASS
Environmental Noise	< -58 dBA/m	-63.55	PASS
Frequency Response, from limits	> 0 dB	0.70	PASS

Table 8-17
Helmholtz Coil Validation Table of Results – 10/12/2020

Item	Target	Result	Verdict
Axial			
Magnetic Intensity, -10 dBA/m	-10 ± 0.5 dB	-10.237	PASS
Environmental Noise	< -58 dBA/m	-64.70	PASS
Frequency Response, from limits	> 0 dB	0.70	PASS
Radial			
Magnetic Intensity, -10 dBA/m	-10 ± 0.5 dB	-10.390	PASS
Environmental Noise	< -58 dBA/m	-63.93	PASS
Frequency Response, from limits	> 0 dB	0.70	PASS

FCC ID: ZNFK200QM	PCTEST* Proud to be port of @ steemed	HAC (T-COIL) TEST REPORT	① LG	Approved by: Quality Manager
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V. ABM1 Magnetic Field Distribution Scan Overlays



Axial Radial (Transverse)

Figure 8-1
T-Coil Scan Overlay Magnetic Field Distributions

Notes:

- 1. Final measurement locations are indicated by a cursor on the contour plots.
- 2. See Test Setup Photographs for actual WD overlay.

FCC ID: ZNFK200QM	PCTEST: Proud to be pert of @ sement	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogg 25 of 72
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9. MEASUREMENT UNCERTAINTY

Table 9-1 Uncertainty Estimation Table

Contribution	Data +/- %	Data +/- dB	Data Type	Probability distribution	Divisor	Standard uncertainty	Standard Uncertainty (dB)
ABM Noise	7.0%	0.29	Std. Dev.	Normal k=1	1.00	7.0%	
RF Reflections	4.7%	0.20	Specification	Rectangular	1.73	2.7%	
Reference Signal Level	12.2%	0.50	Specification	Rectangular	1.73	7.0%	
Positioning Accuracy	10.0%	0.41	Uncertainty	Rectangular	1.73	5.8%	
Probe Coil Sensitivity	12.2%	0.50	Specification	Rectangular	1.73	7.0%	
Probe Linearity	2.4%	0.10	Std. Dev.	Normal k=1	1.00	2.4%	
Cable Loss	2.8%	0.12	Specification	Rectangular	1.73	1.6%	
Frequency Analyzer	5.0%	0.21	Specification	Rectangular	1.73	2.9%	
System Repeatability	5.0%	0.21	Std. Dev.	Normal k=1	1.00	5.0%	
WD Repeatability	9.0%	0.37	Std. Dev.	Normal k=1	1.00	9.0%	
Positioner Accuracy	1.0%	0.04	Specification	Rectangular	1.73	0.6%	
Combined standard uncertainty, uc (k=1)						17.7%	0.71
Expanded uncertainty (k=2), 95% confidence level					35.3%	1.31	

Notes:

- 1. Test equipments are calibrated according to techniques outlined in NIS81, NIS3003 and NIST Tech Note 1297.
- All equipments have traceability according to NIST. Measurement Uncertainties are defined in further detail in NIS 81 and NIST Tech Note 1297 and UKAS M3003.

Measurement uncertainty reflects the quality and accuracy of a measured result as compared to the true value. Such statements are generally required when stating results of measurements so that it is clear to the intended audience that the results may differ when reproduced by different facilities. Measurement results vary due to the measurement uncertainty of the instrumentation, measurement technique, and test engineer. Most uncertainties are calculated using the tolerances of the instrumentation used in the measurement, the measurement setup variability, and the technique used in performing the test. While not generally included, the variability of the equipment under test also figures into the overall measurement uncertainty. Another component of the overall uncertainty is based on the variability of repeated measurements (so-called Type A uncertainty). This may mean that the Hearing Aid compatibility tests may have to be repeated by taking down the test setup and resetting it up so that there are a statistically significant number of repeat measurements to identify the measurement uncertainty. By combining the repeat measurement results with that of the instrumentation chain using the technique contained in NIS 81 and NIS 3003, the overall measurement uncertainty was estimated.

FCC ID: ZNFK200QM	PCTEST* Provid to be pert of @ connect	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager
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10. EQUIPMENT LIST

Table 10-1 Equipment List

=qa: p:::ott						
Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Temperature / Humidity Monitor	6/29/2019	Biennial	6/29/2021	192291470
Dell	Latitude E6540	SoundCheck Acoustic Analyzer Laptop	4/24/2019	Biennial	4/24/2021	7BFNM32
RME	Fireface UC	Soundcheck Acoustic Analyzer External Audio Interface	4/24/2019	Biennial	4/24/2021	23528889
Listen	SoundConnect	Microphone Power Supply	4/22/2019	Biennial	4/22/2021	PS2612
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/4/2020	Annual	2/4/2021	162125
Rohde & Schwarz	CMW500	Radio Communication Tester	5/21/2020	Annual	5/21/2021	128635
Seekonk	NC-100	Torque Wrench (8" lb)	8/4/2020	Biennial	8/4/2022	N/A
TEM		HAC System Controller with Software	N/A		N/A	N/A
TEM		HAC Positioner	N/A		N/A	N/A
TEM	Helmholtz Coil	Helmholtz Coil	5/20/2019	Biennial	5/20/2021	925
TEM	Axial T-Coil Probe	Axial T-Coil Probe	5/17/2019	Biennial	5/17/2021	TEM-1124
TEM	Radial T-Coil Probe	Radial T-Coil Probe	5/17/2019	Biennial	5/17/2021	TEM-1130

FCC ID: ZNFK200QM	PCTEST* Proud to be port of @ steemed	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 27 of 72
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11. TEST DATA

FCC ID: ZNFK200QM		HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 29 of 72
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DUT: HH Coil - SN: 925

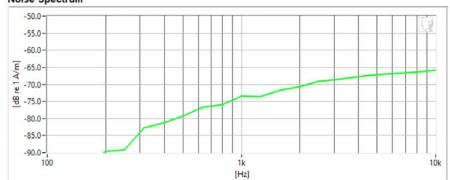
Type: HH Coil Serial: 925

Measurement Standard: ANSI C63.19-2011

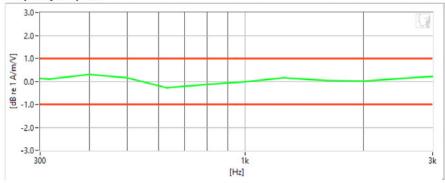
Equipment:

- Probe: Axial T-Coil Probe SN: TEM-1124; Calibrated: 05/17/2019
- Helmholtz Coil SN: 925; Calibrated: 05/20/2019

Noise Spectrum



Frequency Response



Results

Verification 1kHz Intensity	-10.229 d	iΒ	\checkmark	Max/Min	-9.5/-10.5
Verification ABM2	-64.24 d	iB	V	Maximum	-58.0
Frequency Response Margin	700m d	iB.	✓	Tolerance curves	Aligned Data

FCC ID: ZNFK200QM	POTEST* Proud to be part of ® stormed	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 39 of 73
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DUT: HH Coil - SN: 925

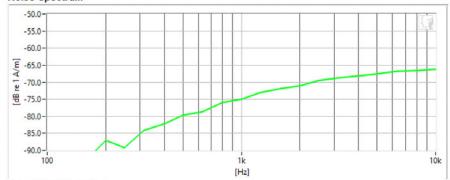
Type: HH Coil Serial: 925

Measurement Standard: ANSI C63.19-2011

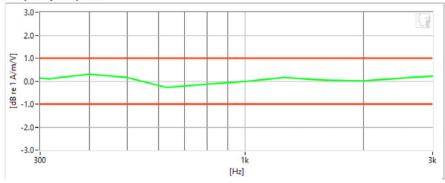
Equipment:

- Probe: Axial T-Coil Probe SN: TEM-1124; Calibrated: 05/17/2019
- Helmholtz Coil SN: 925; Calibrated: 05/20/2019

Noise Spectrum



Frequency Response



Results

Verification 1kHz Intensity	-10.237	dB	•	Max/Min	-9.5/-10.5
Verification ABM2	-64.7	dB	•	Maximum	-58.0
Frequency Response Margin	700m	dB	•	Tolerance curves	Aligned Data

FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 40 of 73
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DUT: HH Coil - SN: 925

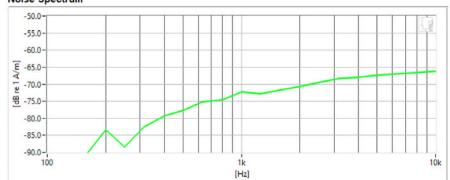
Type: HH Coil Serial: 925

Measurement Standard: ANSI C63.19-2011

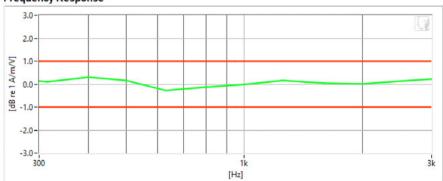
Equipment:

- Probe: Radial T-Coil Probe SN: TEM-1130; Calibrated: 05/17/2019
- Helmholtz Coil SN: 925; Calibrated: 05/20/2019

Noise Spectrum



Frequency Response



Results

Verification 1kHz Intensity	-10.296	dB	•	Max/Min	-9.5/-10.5
Verification ABM2	-63.55	dB	•	Maximum	-58.0
Frequency Response Margin	700m	dB	•	Tolerance curves	Aligned Data

FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stormed	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 41 of 73
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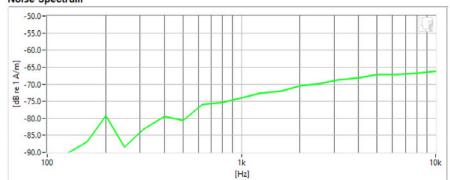
DUT: HH Coil - SN: 925 Type: HH Coil Serial: 925

Measurement Standard: ANSI C63.19-2011

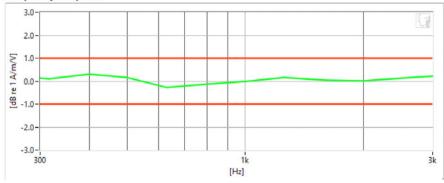
Equipment:

- Probe: Radial T-Coil Probe SN: TEM-1130; Calibrated: 05/17/2019
- Helmholtz Coil SN: 925; Calibrated: 05/20/2019

Noise Spectrum



Frequency Response



Results

Verification 1kHz Intensity	-10.39 dB	\checkmark	Max/Min	-9.5/-10.5
Verification ABM2	-63.93 dB	•	Maximum	-58.0
Frequency Response Margin	700m dB	•	Tolerance curves	Aligned Data

FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 42 of 72
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Measurement Standard: ANSI C63.19-2011

Equipment:

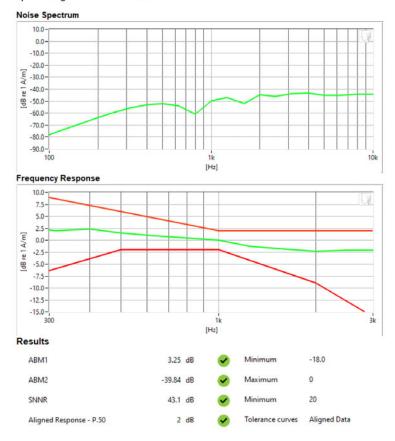
Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

Mode: CDMA Cellular

Channel: 777

Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of the determinant	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 43 of 73
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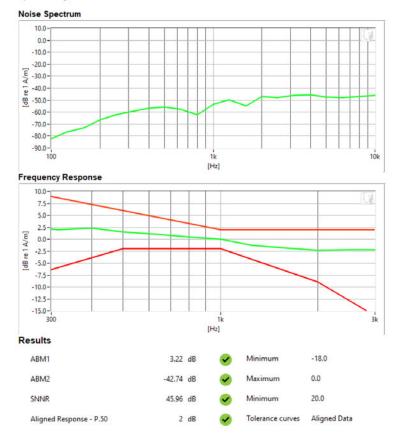
Measurement Standard: ANSI C63.19-2011

Equipment:

Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

- Mode: CDMA PCSChannel: 1175
- . Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 44 of 72
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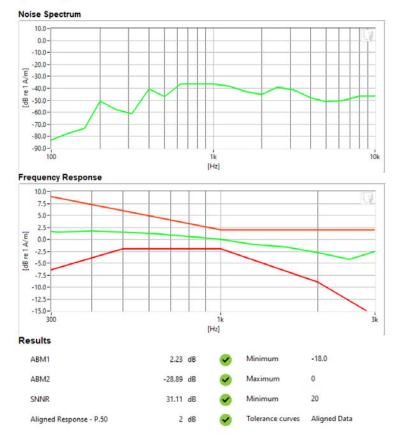
Measurement Standard: ANSI C63.19-2011

Equipment:

Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

- Mode: GSM 850
 Channel: 128
- · Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stormed	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 45 of 73
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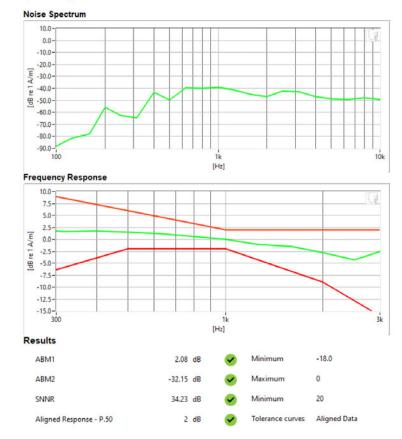
Measurement Standard: ANSI C63.19-2011

Equipment:

Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

- Mode: GSM 1900
- Channel: 661
- Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (I-COIL) IEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 46 of 72
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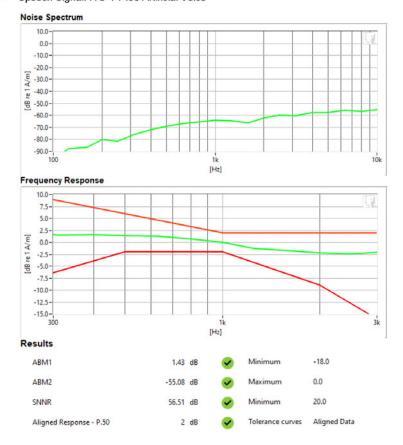
Measurement Standard: ANSI C63.19-2011

Equipment:

Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

- Mode: UMTS Band V
- Channel: 4183
- · Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	POTEST* Proud to be part of ® stement	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 47 of 73
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Measurement Standard: ANSI C63.19-2011

Equipment:

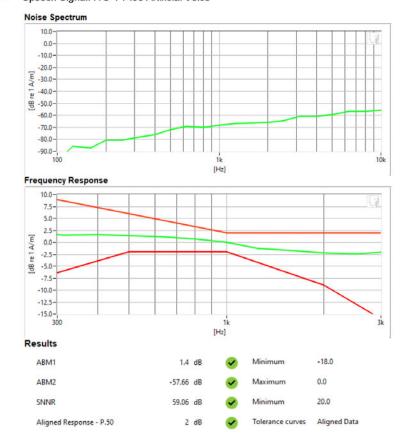
Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

Mode: UMTS Band IV

Channel: 1312

Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Froud to be post of ® riement	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 48 of 73
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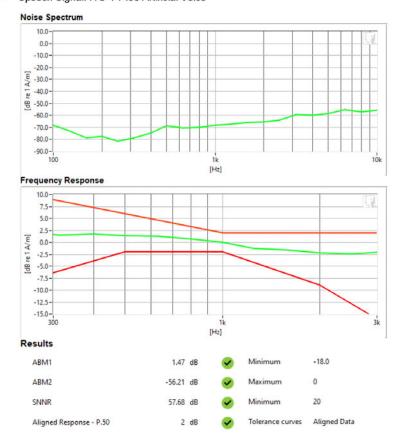
Measurement Standard: ANSI C63.19-2011

Equipment:

Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

- Mode: UMTS Band II
- Channel: 9400
- · Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 40 of 72
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Page 49 of 73



Serial: 00301

Measurement Standard: ANSI C63.19-2011

Equipment:

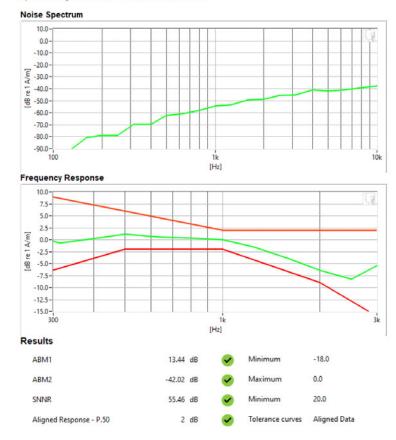
Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

Mode: LTE FDD Band 5 Bandwidth: 3MHz

Channel: 20525

Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (I-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 50 of 72
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Page 50 of 73



Serial: 00301

Measurement Standard: ANSI C63.19-2011

Equipment:

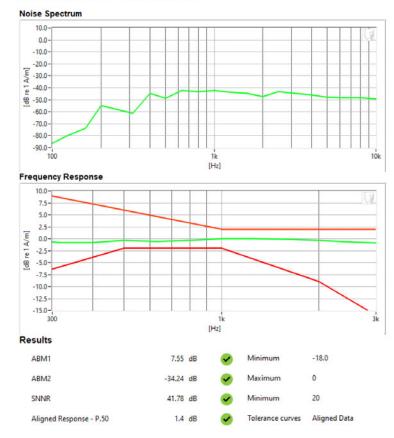
Probe: Axial T-Coil Probe – SN: TEM-1124; Calibrated: 05/17/2019

Test Configuration:

· VolP Application: Google Duo

Mode: EDGE 850Channel: 190

Speech Signal: ITU-T P.50 Artificial Voice



FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 51 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 51 01 73



DUT: ZNFK200QM

Type: Portable Handset Serial: 00301

Measurement Standard: ANSI C63.19-2011

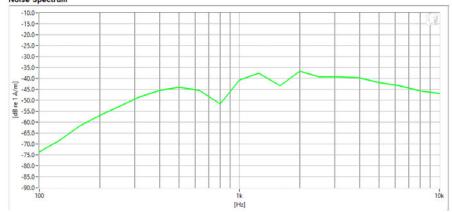
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

Mode: CDMA CellularChannel: 777

Noise Spectrum



Results

ABM1	-5.77	dB	\checkmark	Minimum	-18.0
ABM2	-32.17	dB	•	Maximum	0.0
SNNR	26.4	dB	~	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Proof to be part of ® stement	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 52 of 73
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Measurement Standard: ANSI C63.19-2011

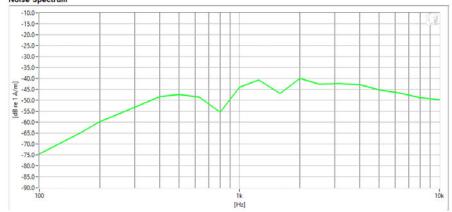
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

 Mode: CDMA PCS Channel: 1175

Noise Spectrum



Results

A	BM1	-6.11	dB	\checkmark	Minimum	-18.0
A	BM2	-35.37	dB	✓	Maximum	0.0
SI	NNR	29.26	dB	✓	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST' Proud to be part of the convent	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 53 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		rage 55 01 75



Measurement Standard: ANSI C63.19-2011

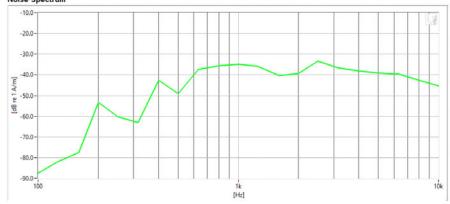
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

 Mode: GSM 850 Channel: 128

Noise Spectrum



Results

ABM1	-6.14	dB	\checkmark	Minimum	-18.0
ABM2	-28.14	dB	•	Maximum	0.0
SNNR	22	dB	✓	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stormed	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 54 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 34 01 73



Measurement Standard: ANSI C63.19-2011

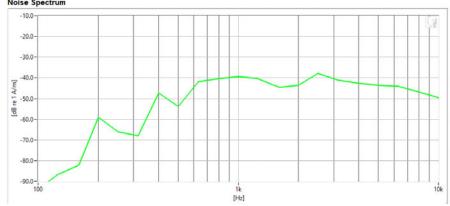
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

 Mode: GSM 1900 • Channel: 810

Noise Spectrum



Results

ABM1	-6.54	dB	\checkmark	Minimum	-18.0
ABM2	-32.73	dB	•	Maximum	0.0
SNNR	26.19	dB	•	Minimum	20.0

FCC ID: ZNFK200QM	POTEST* Proud to be part of ® stement	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 55 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		rage 55 01 75



Measurement Standard: ANSI C63.19-2011

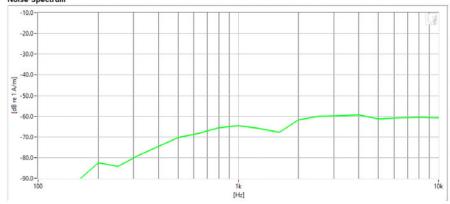
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

. Mode: UMTS Band V Channel: 4183

Noise Spectrum



Results

ABM1	-6.93	dB	\checkmark	Minimum	-18.0
ABM2	-56.08	dB	•	Maximum	0.0
SNNR	49.15	dB	~	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stormed	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 56 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 50 01 75



Measurement Standard: ANSI C63.19-2011

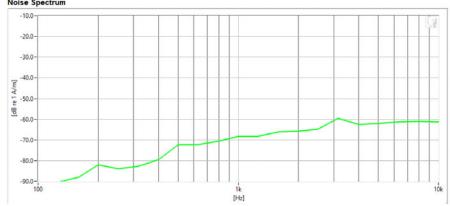
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

. Mode: UMTS Band IV Channel: 1513

Noise Spectrum



Results

ABM1	-6.91	dB	$ \checkmark $	Minimum	-18.0
ABM2	-58.8	dB	•	Maximum	0.0
SNNR	51.88	dB	✓	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Froud to be post of ® riement	HAC (I-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 57 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 37 01 73



Measurement Standard: ANSI C63.19-2011

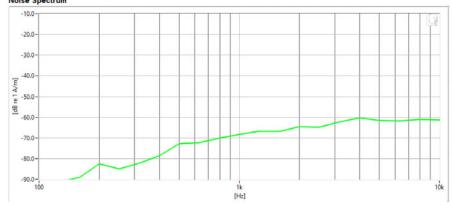
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

. Mode: UMTS Band II Channel: 9538

Noise Spectrum



Results

AB	M1	-6.87	dB	lacksquare	Minimum	-18.0
AB	M2	-58.76	dB	•	Maximum	0.0
SN	NR	51.88	dB	~	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stement	HAC (I-COIL) IEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 58 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		rage 56 01 75



Measurement Standard: ANSI C63.19-2011

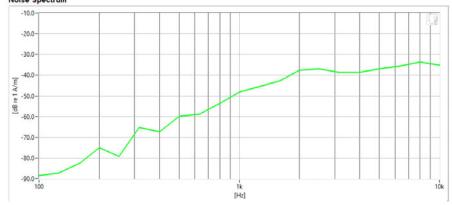
Equipment:

Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

 Mode: LTE FDD Band 5 Bandwidth: 3MHz Channel: 20635

Noise Spectrum



Results

ABM1	4.48	dB	•	Minimum	-18.0
ABM2	-35.36	dB	•	Maximum	0.0
SNNR	39.85	dB	✓	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Proud to be part of ® stormed	HAC (1-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 59 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		rage 39 01 73



Measurement Standard: ANSI C63.19-2011

Equipment:

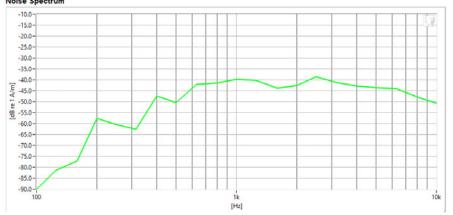
Probe: Radial T-Coil Probe – SN: TEM-1130; Calibrated: 05/17/2019

Test Configuration:

· VolP Application: Google Duo

Mode: EDGE 850 Channel: 190

Noise Spectrum



Results

ABM1	-1.02	dB	\checkmark	Minimum	-18.0
ABM2	-32.86	dB	•	Maximum	0.0
SNNR	31.84	dB	✓	Minimum	20.0

FCC ID: ZNFK200QM	PCTEST* Froud to be post of ® riement	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager	
Filename:	Test Dates:	DUT Type:		Page 60 of 73	
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		rage ou oi 73	

12. CALIBRATION CERTIFICATES

FCC ID: ZNFK200QM	PCTEST: Proud to be port of @ ninesed	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 61 of 72
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Page 61 of 73



Certificate of Calibration

AXIAL T COIL PROBE

Manufactured by:

TEM CONSULTING AXIAL T COIL PROBE

Model No: Serial No:

TEM-1124 29973

Calibration Recall No: Submitted By:

Customer:

ANDREW HARWELL

Company:

PCTEST ENGINEERING LAB 6660-B DOBBIN ROAD

Address:

COLUMBIA

MD 21045

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No.

AXIAL T C TEM C

Upon receipt for Calibration, the instrument was found to be:

Within (X)

tolerance of the indicated specification. See attached Report of Calibration. The information supplied relates to the calibrated item listed above. West Caldwell Calibration Laboratories' calibration control system meets the requirements, ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2015 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by:

Calibration Date:

17-May-19

James Zhu

Certificate No:

29973 -1

QA Doc. #1051 Rev. 2.0 10/1/01 Certificate Page 1 of 1 West Caldwell Calibration

Laboratories, Inc. uncompromised calibration

ACCREDITED Calibration Lab. Cert. # 1533.01

1575 State Route 96, Victor, NY 14564, U.S.A.

FCC ID: ZNFK200QM HAC (T-COIL) TEST REPORT

Approved by: LG LG **Quality Manager**

Filename: 1M2009230153-08.ZNF Test Dates:

10/05/2020 - 10/13/2020

DUT Type:

Portable Handset

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ACCREDITED

Calibration Lab. Cert. # 1533.01

ISO/IEC 17025: 2005

1575 State Route 96, Victor NY 14564

REPORT OF CALIBRATION

for

TEM Consulting LP Axial T Coil Probe Company: PCTest Engineering Labs

Model No.: Axial T Coil Probe

Serial No.: TEM-1124

I. D. No.: XXXX

Probe Sensitivity measured wit	h Helmhol	tz Coil			
Helmholtz Coil;			Before & after data same:X		
the number of turns on each coil;	10	No.			
the radius of each coil, in meters;	0.204	m	Laboratory Environment:		
the current in the coils, in amperes.;	0.09	Α	Ambient Temperature:	20.7	°C
Helmholtz Coil Constant;	7.09	A/m/V	Ambient Humidity:	42.7	% RH
Helmholtz Coil magnetic field;	5.96	A/m	Ambient Pressure:	98.256	kPa
			Calibration Date:	17-May-2019)
Probe Sensitivity at	1000	Hz.	Calibration Due:	17-May-2020)
was	-60.41	dBV/A/m	Report Number:	2997	3 -1
	0.954	mV/A/m	Control Number:	2997	3
Probe resistance	903	Ohms			

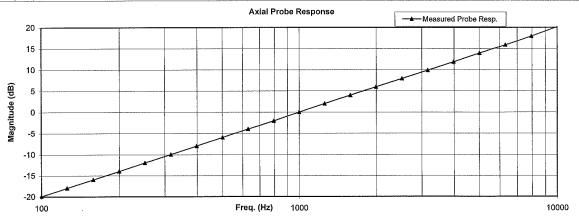
The above listed instrument meets or exceeds the tested manufacturer's specifications.

This Calibration is traceable through NIST test numbers:

683/290345-18

The expanded uncertainty of calibration: 0.30dB at 95% confidence level with a coverage factor of k=2.

Graph represents Probes Frequency Response.



The above listed instrument was checked using calibration procedure documented in West Caldwell

Calibration Laboratories Inc. procedure :

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 HCATEMC

Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures

intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 17025

Cal. Date: 17-May-2019

Measurements performed by:

James Zhu

Calibrated on WCCL system type 9700

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Rev. 7.0 Jan. 24, 2014 Doc. # 1038 HCATEMC

Page 1 of 2

FCC ID: ZNFK200QM	PCTEST* Proud to be part of the determinant	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 63 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 03 01 73

HCATEMC_TEM-1124_May-17-2019

West Caldwell Calibration Laboratories Inc.

1575 State Route 96, Victor NY 14564 Tel. (585) 586-3900 FAX (585) 586-4327

Calibration Data Record

Model No.: Axial T Coil Probe

Serial No.: TEM-1124

TEM Consulting LP Axial T Coil Probe Company: PCTest Engineering Labs

Test	Function	Tolerance		Measured values			
				Before	Out	Remarks	
1.0	Probe Sensitivity at	1000 Hz.	dBV/A/m	-60.41			
			dB				
2.0	Probe Level Linearity		6	6.10			
		Ref. (0 dB)	0	0.00			
			-6	-6.00		ŀ	
			-12	-12.00			
			Hz				
3.0	Probe Frequency Response		100	-19.9			
		126	-17.9				
			158	-16.0			
			200	-14.0			
			251	-12.0			
			316	-10.0			
			398	-8.0			
			501	-6.0			
			631	-3.9			
			794	-2.0			
		Ref. (0 dB)	1000	0.0		1	
			1259	2.0			
			1585	4.0			
			1995	5.9			
			2512	7.9			
			3162	9.9			
			3981	11.9			
			5012	13.9			
			6310	15.9			
			7943	18.0			
			10000	20.2			

			'		
Instruments used for o	alibration:		Date of Cal.	Traceability No.	Due Date
HP	34401A	S/N US360641	25-Jul-2018	,1010733	26-Jul-2019
HP	34401A	S/N US361024	25-Jul-2018	,1010733	26-Jul-2019
HP	33120A	S/N US360437	25-Jul-2018	,1010733	26-Jul-2019
B&K	2133	S/N 1583254	25-Jul-2018	683/290345-18	26-Jul-2019
1					

Cal. Date: 17-May-2019

Calibrated on WCCL system type 9700 This document shall not be reproduced, except in full, without the written approval from West Caldwell Cal. Labs. Inc. Tested by: James Zhu

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 HCATEMC

Page 2 of 2

FCC ID: ZNFK200QM	PCTEST* Proud to be part of the contents	HAC (T-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 64 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 04 01 /3



Certificate of Calibration

for

RADIAL T COIL PROBE

Manufactured by:

TEM CONSULTING

Model No:

RADIAL T COIL PROBE TEM-1130

Serial No: Calibration Recall No:

29973

Submitted By:

Customer:

ANDREW HARWELL

Company: Address: PCTEST ENGINEERING LAB

6660-B DOBBIN ROAD COLUMBIA

MD 21045

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No.

RADIAL T TEM C

Upon receipt for Calibration, the instrument was found to be:

6/4/2019

Within (X)

tolerance of the indicated specification. See attached Report of Calibration.

The information supplied relates to the calibrated item listed above.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2015 and ISO 17025.

Note: With this Certificate, Report of Calibration is Included.

Approved by:

Calibration Date:

17-May-19

Certificate No:

29973 -2

West Caldwell

QA Doc. #1051 Rev. 2.0 10/1/01

Certificate Page 1 of 1

Quality Manager ISO/IEC 17025:2005

James Zhu

Uncompromised calibration Laboratories, Inc.

1575 State Route 96, Victor, NY 14564, U.S.A.

ACCREDITED
Calibration Lab. Cert. # 1533.01

FCC ID: ZNFK200QM

Filename:

1M2009230153-08.ZNF

Test Dates:

10/05/2020 - 10/13/2020

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REV 3.5.M 8/18/2020



1575 State Route 96, Victor NY 14564



REPORT OF CALIBRATION

for

TEM Consulting LP Radial T Coil Probe Company: PCTest Engineering Labs

Model No.: Radial T Coil Probe

Serial No.: TEM-1130

I. D. No.: XXXX

oration results:					
Probe Sensitivity measured wit	h Helmhol	tz Coil			
Helmholtz Coil;			Before & after data same:	X	
the number of turns on each coil;	10	No.			
the radius of each coil, in meters;	0.204	m	Laboratory Environment:		
the current in the coils, in amperes.;	0.08	Α	Ambient Temperature:	20.7	°C
Helmholtz Coil Constant;	7.09	A/m/V	Ambient Humidity:	42.7	% RH
Helmholtz Coil magnetic field;	5.94	A/m	Ambient Pressure:	98.256	kPa
			Calibration Date:	17-May-201	9
Probe Sensitivity at	1000	Hz.	Calibration Due:	17-May-202	0
was	-60.37	dBV/A/m	Report Number:	2997	3 -2
	0.958	mV/A/m	Control Number:	2997	'3

The above listed instrument meets or exceeds the tested manufacturer's specifications.

895

This Calibration is traceable through NIST test numbers:

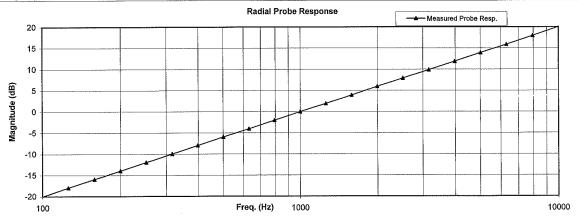
683/290345-18

Ohms

The expanded uncertainty of calibration: 0.30dB at 95% confidence level with a coverage factor of k=2.

Probe resistance

Graph represents Probes Frequency Response.



The above listed instrument was checked using calibration procedure documented in West Caldwell

Calibration Laboratories Inc. procedure :

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 HCRTEMC

Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures

intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 17025

Cal. Date: 17-May-2019

Measurements performed by:

James Zhu

Calibrated on WCCL system type 9700

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Rev. 7.0 Jan. 24, 2014 Doc. # 1038 HCRTEMC

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FCC ID: ZNFK200QM	PCTEST* Proud to be part of the determinant	HAC (T-COIL) TEST REPORT		Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Dogo 66 of 72
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HCRTEMC_TEM-1130_May-17-2019

West Caldwell Calibration Laboratories Inc.

1575 State Route 96, Victor NY 14564 Tel. (585) 586-3900 FAX (585) 586-4327

Calibration Data Record

for

TEM Consulting LP Radial T Coil Probe Company: PCTest Engineering Labs

Model No.: Radial T Coil Probe

Serial No.: TEM-1130

IOIGIA	Tolerance			Measured values			
				Remarks			
1000 Hz.	dBV/A/m	-60.37					
	dB						
r	6	6.00					
Ref. (0 dB)	0	0.00					
	-6	-6.10					
	-12	-12.10					
	Hz						
sponse	100	-20.0					
	126	-17.9					
	158	-16.0					
	200	-14.0					
	251	-12.0					
	316	-10.0					
	398	-8.0		1			
	501	-6.0					
	631	-4.0					
	794	-2.0		ĺ			
Ref. (0 dB)	1000	0.0					
	1259	1.9					
	1585						
	1995						
	2512	7.9					
	3162	9.9					
	3981	11.9		1			
	5012	13.9					
	6310	15.9					
	7943	18.0					
	10000	20.1					
	Ref. (0 dB)	501 631 794 Ref. (0 dB) 1000 1259 1585 1995 2512 3162 3981 5012 6310 7943	501 -6.0 631 -4.0 794 -2.0 Ref. (0 dB) 1000 0.0 1259 1.9 1585 3.9 1995 5.9 2512 7.9 3162 9.9 3981 11.9 5012 13.9 6310 15.9 7943 18.0	501 -6.0 631 -4.0 794 -2.0 Ref. (0 dB) 1000 0.0 1259 1.9 1585 3.9 1995 5.9 2512 7.9 3162 9.9 3981 11.9 5012 13.9 6310 15.9 7943 18.0			

Instruments used for	calibration:		Date of Cal.	Traceability No.	Due Date
HP	34401A	S/N US360641	25-Jul-2018	,1010733	26-Jul-2019
HP	34401A	S/N US361024	25-Jul-2018	,1010733	26-Jul-2019
HP	33120A	S/N US360437	25-Jul-2018	,1010733	26-Jul-2019
B&K	2133	S/N 1583254	25-Jul-2018	683/290345-18	26-Jul-2019

Cal. Date: 17-May-2019

Calibrated on WCCL system type 9700

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Tested by: James Zhu

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 HCRTEMC

Page 2 of 2

FCC ID: ZNFK200QM	PCTEST* Proud to be part of the determinant	HAC (T-COIL) TEST REPORT	(LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 67 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		rage or or 73

13. CONCLUSION

The measurements indicate that the wireless communications device complies with the HAC limits specified in accordance with the ANSI C63.19 Standard and FCC WT Docket No. 01-309 RM-8658. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters specific to the test. The test results and statements relate only to the item(s) tested.

The measurement system and techniques presented in this evaluation are proposed in the ANSI standard as a means of best approximating wireless device compatibility with a hearing-aid. The literature is under continual re-construction.

FCC ID: ZNFK200QM	PCTEST* Proud to be port of @ ninesed	HAC (T-COIL) TEST REPORT	① LG	Approved by: Quality Manager	
Filename:	Test Dates:	DUT Type:		Page 68 of 73	
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		Fage 00 01 73	

14. REFERENCES

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FCC ID: ZNFK200QM	PCTEST* Proud to be post of @ deceaded	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager	
Filename:	Test Dates:	DUT Type:		Page 69 of 73	
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset			

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FCC ID: ZNFK200QM	PCTEST' Proud to be port of @ served	HAC (T-COIL) TEST REPORT	LG	Approved by: Quality Manager
Filename:	Test Dates:	DUT Type:		Page 70 of 73
1M2009230153-08.ZNF	10/05/2020 - 10/13/2020	Portable Handset		raye 10 01 13