HAC T-COIL SIGNAL TEST REPORT

FCC 47 CFR § 20.19
ANSI C63.19-2019

For
Smartphone

FCC ID: BCG-E8953A
Model Name: A3521

Report Number: 15496281-S2V2
Issue Date: 8/19/2025

Prepared for
APPLE INC.
1 APPLE PARK WAY
CUPERTNO, CA 95014-2084

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

ACCREDITED
CERT #0751.05

Revision History

Rev.	Date	Revisions	Revised By
V1	8/14/2025	Initial Issue	Luis Rivera
V2	8/19/2025	Removed section 5.3	Luis Rivera

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1. Attestation of Test Results

Applicant Name	APPLE, INC.
FCC ID	BCG-E8953A
Model Name	A3521
Applicable Standards	FCC 47 CFR § 20.19 ANSI C63.19-2019
Date Tested	8/7/2025 to 8/13/2025
Test Results	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested can demonstrate compliance with the requirements as documented in this report.

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not considered unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the U.S. Government, or any agency of the U.S. government.

Approved & Released By:	Prepared By:
Devin Chang Senior Laboratory Engineer UL Verification Services Inc.	Luis Rivera Laboratory Engineer UL Verification Services Inc.

2. Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.19-2019 Methods of Measurement of Compatibility Between Wireless Communications Devices and Hearing Aids and FCC published procedure:

KDB 285076 D01 HAC Guidance v06r04
KDB 285076 D02 T-Coil testing for CMRS IP v04
KDB 285076 D03 HAC FAQ v01r07

In addition to the above, the following guidance was used:
TCB workshop updates:

- TCB Workshop October 2022; Publication Update & Administrative Notes (Publication Update: 285076 D01 & D04)
- TCB Workshop October 2022; Federal Communications Commission Hearing Aid Compatibility Updates
- TCB Workshop April 2023; Publication Update& Administrative Notes (Publications Since Oct Workshop: 285076 HAC Update)
- TCB Workshop October 2023; Publication Update & Administrative Notes (Publication Update: 285076 09/29/2023: HAC Guidance blanket)
- TCB Workshop April 2024; HAC Updates (Handset Configuration)

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

47266 Benicia Street
SAR Lab 13

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05

The Test Lab Conformity Assessment Body Identifier (CABID)

Location	CABID	Company Number
47173 Benicia Street, Fremont, CA, 94538 UNITED STATES	US0104	2324A
47266 Benicia Street, Fremont, CA, 94538 UNITED STATES		

4. Test Equipment and Uncertainty

4.1. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations and is traceable to recognized national standards.

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Magnetic Field Probe	SPEAG	AM1DV3	3083	1/10/2026
Data Acquisition Electronics	SPEAG	DAE4	1784	4/30/2026
AMMI	SPEAG	SE UMS 010 CA	2007	N/A
DAC	Yellowtech	YT4211	248643	N/A
Support Device	APPLE	Macbook 2	KQLYW3VG95	N/A
Radio Communication Tester	R&S	CMW 500	124236-eS	2/14/2026
Radio Communication Tester	R&S	CMX 500	101639-EE	2/28/2026

4.1.1. Base Station Simulator Software and Firmware

The following software/firmware was used to simulate the VoLTE, VoNR (5G NR) and VoWiFi server for CMRS testing using R&S CMW500 and CMX500 base station simulators:

Technology	Firmware	License Key	Software Name
VoLTE	V3.8.10 for LTE	KS500	LTE FDD R8 SIG BASIC
		KS550	LTE TDD R8 SIG BASIC
	V3.8.10 for Audio	KA100	IP APPL ENABLING IPv4
		KA150	IP APPL ENABLING IPv6
		KAA20	IP APPL IMS BASIC
		KM050	DATA APPL MEAS
		KS104	EVS SPEECH CODEC
VoNR 5G NR (FR1)	V8.20.0.112 for 5G NR	CMX-KS600B	NR SIG BASIC FSET1
		CMX-KS600M	NR SIG MEDIUM FSET1
		CMX-KS601B	NR SIG BASIC FSET2
		CMX-KS601M	NR SIG MEDIUM FSET2
		CMX-KS610B	NR SIG ETX. BASIC FSET3
		CMX-KS610M	NR SIG ETX. MEDIUM FSET3
		CMX-KS611B	NR SIG ETX. BASIC FSET4
	V8.20.0.112 for Audio	CMX-KA100	IP APPL FSET1
		CMX-KA110	IP APPL FSET2
		CMX-KA180	APPL AUDIO
		CMX-KA181	APPL AUDIO POLQA
VoWiFi	V3.8.20 for WLAN	KS650	WLAN A/B/G SIG BASIC
		KS651	WLAN N SIG BASIC
		KS656	WLAN IEEE 802.11ac
		KS657	WLAN IEEE 802.11ax
	V3.8.10 for Audio	KA100	IP APPL ENABLING IPv4
		KA150	IP APPL ENABLING IPv6
		KAA20	IP APPL IMS BASIC
		KM050	DATA APPL MEAS
		KS104	EVS SPEECH CODEC

4.2. Measurement Uncertainty

Uncertainty of Audio Band Magnetic Measurements							
Error Description	Uncertainty Values (±%)	Probe Dist.	Div.	(c_i) ABMd	c_i ABMu	Std. Uncertainty ABMd (±%)	Std. Uncertainty ABMu (±%)
Probe Sensitivity							
Reference Level	3.0	N	1	1	1	3.0	3.0
AMCC Geometry	0.4	R	√3	1	1	0.2	0.2
AMCC Current	1.0	R	√3	1	1	0.6	0.6
Probe Positioning during Calibration	0.1	R	√3	1	1	0.1	0.1
Noise Contribution	0.7	R	√3	0.0143	1	0.0	0.4
Frequency Slope	5.9	R	√3	0.1	1.0	0.3	3.5
Probe System							
Repeatability / Drift	1.0	R	√3	1	1	0.6	0.6
Linearity / Dynamic Range	0.6	R	√3	1	1	0.4	0.4
Acoustic Noise	1.0	R	√3	0.1	1	0.1	0.6
Probe Angle	1.0	R	√3	1	1	0.6	0.6
Spectral Processing	0.9	R	√3	1	1	0.5	0.5
Integration Time	0.6	N	1	1	5	0.6	3.0
Field Disturbation	0.2	R	√3	1	1	0.1	0.1
Test Signal							
Reference Signal Spectral Response	0.6	R	√3	0	1	0.0	0.4
Positioning							
Probe Positioning	1.9	R	√3	1	1	1.1	1.1
Phantom Thickness	0.9	R	√3	1	1	0.5	0.5
DUT Positioning	1.9	R	√3	1	1	1.1	1.1
External Contributions							
RF Interference	0.0	R	√3	1	0.3	0.0	0.0
Test Signal Variation	2.0	R	√3	1	1	1.2	1.2
Combined Uncertainty							
Combined Std. Uncertainty (ABM field)						3.9	6.0
Expanded Std. Uncertainty (%)						**7.8**	**11.9**

Notes:
1. N - Nomal
2. R - Rectangular
3. Div. - Divisor used to obtain standard uncertainty
4. ABMd - Desired ABM Signal
5. ABMu - Undesired ABM Field

5. Test Procedures for all Technologies

5.1. Test Procedure for T-Coil signal per ANSI C63.19-2019, §6

This subclause describes the procedures used to measure the ABM (T-Coil) performance of the WD. Measurements shall be performed over a measurement area 50 mm square, in the measurement plane, as specified in Annex A.3. The measurement area shall be scanned with a uniform measurement point spacing of 2.0 mm ± 0.5 mm in each X-Y axis of the plane, yielding 676 measurement points with approximately even spacing throughout the area.

Optionally, measurement point spacing may be increased to 4 mm, with interpolation employed to yield the required 676 equivalent measurement points distributed uniformly over the 50 mm square measurement area. Interpolated points shall be derived from the average of the linear representations of the field strengths of the nearest two or four equidistant measured points. The area of measurement is increased to a 52 mm square so that edge rows and columns of the required 50 mm square can be either measured or interpolated, with none extrapolated.

In addition to measuring the desired ABM signal levels, the weighted magnitude of the unintended signal shall also be determined. Weighting of the unintended and undesired ABM field shall be by the spectral and temporal weighting described in Annex D.4 through D.6.

To ensure that the required signal quality is measured, the measurement of the intended signal and the measurement of the unintended signal shall be made at the same locations. Measurements shall not include undesired influence from the WD's RF field; therefore, use of a coaxial connection to a base station simulator or non-radiating load might be necessary. However, even then with a coaxial connection to a base station simulator or non-radiating load there could still be RF leakage from the WD, which could interfere with the desired measurement. Pre-measurement checks should be made to avoid this possibility. All measurements shall be done with the WD operating on battery power with an appropriate normal speech audio signal input level given in Table 6.1. If the device display can be turned off during a phone call, then that may be done during the measurement as well. If tested with the display in the off state this shall be documented in the test report.

Measurements shall be performed with the probe coil oriented in the transverse direction, as illustrated in Annex A.3, that is, aligned in the plane of the measurement area and perpendicular to the long dimension of the WD. A multi-stage sequence consists of first measuring the field strength of the desired T-Coil signal (desired ABM signal) that is useful to a hearing aid T-Coil at each specified measurement point. The undesired magnetic component (undesired ABM field) is then measured in the same transverse orientation at each of the same measurement points. At a single location only, taken at or near the highest desired ABM signal reading, the desired ABM signal frequency response shall be determined in a third measurement stage. The flowchart in Figure 6.3 illustrates this three-stage process.

To minimize the need to test every WD operating mode to the telecoil requirements of Clause 6, it is permissible to exclude some subset of supported configurations. For a given WD, every mode that supports voice communication shall be considered for telecoil testing. However, if it can be demonstrated that a certain configuration will not be the worst-case telecoil configuration, such configurations may be excluded from the full telecoil scans of 6.4.[1] For example, operating modes may be pre-screened by scanning for both desired ABM signal and undesired ABM field at a lower measurement point density than the final scans, thus saving considerable testing time by eliminating configurations that are excellent performers from more detailed testing for worst-case. In any case, the specific methods and criteria used to determine which configurations are excluded for a WD shall be explicitly stated and justified in the test report. To be considered for exclusion from telecoil testing, operating modes shall also be shown to pass the frequency response requirements of 6.6.3.

Many factors could affect telecoil test results. RF power level and amplitude modulation characteristics as well as the specific current paths within the WD associated with the RF output stage(s), the display, and processing circuitry could affect the undesired ABM field. Audio codec implementation and acoustic receiver characteristics could also affect the desired ABM signal). Therefore, any justifications for exclusions should be thorough documented. If an operating mode is under user control and instructions on how to place the WD in a less interfering condition is in the user instructions, those instructions may be followed in configuring the device for testing.

The following steps summarize the basic test flow for determining desired ABM signal and undesired ABM field. These steps assume that a sine wave or narrowband 1/3 octave signal can be used for the measurement of desired

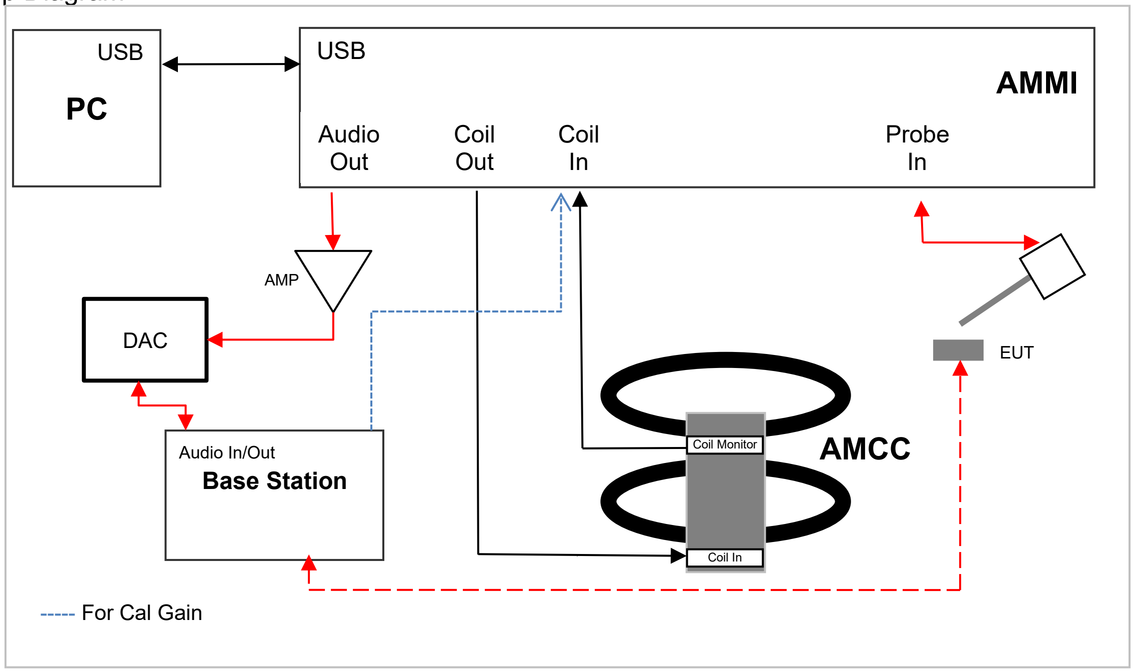
[1] The allowance to not test all modes does not remove the requirement that all modes meet the requirements of this standard if a claim of compliance is to be made. What is allowed is a reduction of testing, where there is a good basis for believing that testing that is performed demonstrates the compliance of all possible operating modes.

ABM signal level. An alternative procedure, yielding equivalent results, using a broadband excitation is described in 6.5.

a) A validation of the test setup and instrumentation shall be performed. This may be done using a TMFS or Helmholtz Coil. Measure the emissions and confirm that they are within tolerance of the expected values.
b) Confirm that equipment that requires calibration has been calibrated, and that the noise level meets the requirements given in 6.3.2.
c) Position the WD in the test setup and connect the WD RF connector to a base station simulator or a non-radiating load (if necessary to control RF interference in the measurement equipment) as shown in Figure 6.1 or Figure 6.2.
d) The drive level to the WD is set such that the reference input level specified in Table 6.1 is input to the base station simulator (or manufacturer's test mode equivalent) in the 1 kHz, 1/3 octave band. This drive level shall be used for the T-Coil signal test (desired ABM signal) at f = 1 kHz. Either a sine wave at 1025 Hz, or a voice-like signal, band-limited to the 1 kHz 1/3 octave, as specified in 6.4.3, shall be used for the reference audio signal. If interference is found at 1025 Hz an alternative nearby reference audio signal frequency may be used.[2] The same drive level will be used for the desired ABM signal frequency response measurements at each 1/3 octave band center frequency. The WD volume control may be set at any level up to maximum, provided that a signal at any frequency at maximum modulation would not result in clipping or signal overload.
e) At each measurement location over the measurement area and in the transverse orientation, measure and record the desired 1 kHz T-Coil magnetic signal (desired ABM signal) as described in Step c).
f) At or near a location representing a maximum in the just-measured desired ABM signal, measure and record the desired T-Coil magnetic signals (desired ABM signal at f_i) as described in 6.4.5.2 in each individual ISO 266:1975 R10 standard 1/3 octave band. The desired audio band input frequency (f_i) shall be centered in each 1/3 octave band maintaining the same drive level as determined in Step c), and the reading taken for that band.[3] Equivalent methods of determining the frequency response may also be employed, such as fast Fourier transform (FFT) analysis using noise excitation or input–output comparison using simulated speech. The full-band integrated or half-band integrated probe output, as described in D.9, may be used, as long as the appropriate calibration curve is applied to the measured result, so as to yield an accurate measurement of the field magnitude. (The resulting measurement shall be an accurate measurement in dB(A/m).) Compare the frequency response found to the requirements of 6.6.3.
g) At the same locations measured in Step d), measure and record the undesired broadband audio magnetic signal (undesired ABM field) with no audio signal applied (or digital zero applied, if appropriate) using the specified spectral weighting, the half-band integrator followed by the temporal weighting.
h) Calculate and record the location and number of the measurement points that satisfy both the minimum desired ABM signal level and the maximum undesired ABM field level specified in 6.6.2. Compare this to the requirements in 6.6.4 and record the result.
i) Calculate and record the location and number of the measurement points that satisfy the maximum undesired ABM field level and distribution requirements specified in 6.6.4.

[2] The 1025 Hz frequency was selected rather than 1 kHz because a 1 kHz reference frequency could interfere with emission harmonics or test equipment fundamental frequencies.
[3] See 6.4.5.2 and 6.4.5.4 for details.

Test Setup Diagram



Note(s):
For Audio OUT, an amplifier was added to amplify signal to meet DAC specifications.

5.2. Reference Input Levels per ANSI C63.19-2019, §6

The following reference input levels (Figure 6.1) that correlate to a normal speech input level shall be used for the standard transmission protocols.

Table 6.1 - Normal speech input levels

Standard	Protocol	Input (dBm0)
TIA-2000	CDMA	-18
TIA/EIA-136	TDMA (50 Hz)	-18
J-STD-007	GSM (217 Hz)	-16
T1/T1P1/3GPP (See Note 1)	UMTS (WCDMA)	-16
iDEN®	TDMA (22 Hz and 11 Hz)	-18
VoIP[a] (See Note 2)	Voice over Internet Protocol	-16
NOTE 1 - For UMTS (Universal Mobile Telecommunications System), refer to 3GPP TS26.131 and TS26.132 (http://www.3gpp.org). NOTE 2 - VoIP is used in this table as a general term specifying a group of voice services that use −16 dBm0 as their normal acoustic level. The group includes a variety of voice services, including Voice-over-LTE (VoLTE), Voice-over-IP-multimedia-subsystem (VoIMS), Voice-over-Wi-Fi (VoWiFi) and similar services. For 3G, LTE, and WLAN terminals used for Commercial Mobile Radio Service (CMRS) based telephony, refer to 3GPP TS26.131 and TS26.132.		

[a] The manufacturer shall establish that −16 dBm0 is the normal acoustic level in order to place it in this category.

For protocols not listed in Table 6.1, use the normal speech input level per the relevant specifications for that air interface.[4]

[4] The intent of this subclause is to provide a nominal level speech input independent of air interface and measure the magnetic response in a normal use condition without requiring an acoustic reference. The nominal level speech signals in 6.4.3.2 will result in acoustic speech levels that are mutually consistent and also span a range including 94 dB SPL, as shown in the examples below. This is intended to allow the operator to set WD adjustable volume controls as needed to produce a sufficient desired magnetic level (desired ABM signal) based on intended usage. When measuring with the specified nominal speech input level of –16 dBm0 for GSM, a GSM phone shall not exceed a receive loudness rating (RLR) of –13 dB at maximum volume setting. However, at a nominal volume control setting with the same –16 dBm0 input, a GSM phone shall have an RLR of at least 2 dB ± 3 dB. An RLR of 2 dB ± 3 dB corresponds to a sound pressure level of 84 dB ± 3 dB SPL, assuming an earpiece frequency response that is flat over the frequency bands specified as per ITU-T Recommendation P.79. An RLR of –13 dB corresponds to a sound pressure level of 99 dB SPL, assuming an earpiece frequency response that is flat over the frequency bands specified as per ITU-T Recommendation P.79. When measuring with the specified nominal speech input level of –18 dBm0 for CDMA, a CDMA phone with volume control set to the midpoint should provide an RLR of 2 dB ± 5 dB. The CTIA (Rev. 3.21, 2003) CDMA test plan (V1.2) does not specifically place an upper limit on RLR. References: ITU-T Recommendation P.79. Calculation of loudness ratings for telephone handsets. Cellular Telecommunications Industry Association Performance Evaluation Standard for 800 MHz AMPS and Cellular/PCS CDMA Dual Mode Wireless Subscriber Stations.

6. Calibrations & Gain Measurements

Calibrations and Gain measurements are performed using guidance from SPEAG's *DASY6/8 Module HAC System Handbook §7.3.*

6.1. Calibration of AM1DVx Probe

For correct measurement of the audio-band magnetic field, the AM1DVx probe must first calibrated. The calibration is performed in the Helmholtz Audio Magnetic Calibration Coil (AMCC).

6.1.1. Calibration Setup

During the calibration procedure, the system is set as described below:

- the AMMI is powered on and connected to the DASY6/8 PC via USB.
- the AMMI COIL OUT port is connected to the AMCC COIL IN.
- the AMMI COIL IN port is connected to the AMCC COIL MONITOR.
- the AM1DVx probe is mounted on the robot.

6.1.2. Sensor Angle Alignment

The sensor angle relative to the robot arm depends on several factors: probe connector angle, Data Acquisition Electronics (DAE) connector angle, use of a Quick Adaptor Change System (QACS). In DASY6/8, the sensor angle is assessed automatically during the alignment phase.

The alignment procedure consists of rotating the probe in the AMCC for angle within the [0° −360°] in 10° steps. The sensor angle is defined as the angle giving the maximum H-field response for the sensor. The angle corresponds to the sensor in the axial direction (same orientation as the AMCC field).

Note: The calibration must be repeated after any change in the measurement instrumentation, especially when the probe / DAE has been remounted on the robot.

6.1.3. System Response Calibration

The sensitivity and frequency response of the AM1DVx probe is calibrated over the [50Hz − 10 kHz] frequency range using a multi-sine signal. The sines are at the center frequency of each 1/3 octave band.

The measurement is performed in the AMCC with the probe sensor in axial orientation. The Coil In channel of the Audio Magnetic Measurement Instrument (AMMI) measures the voltage over the AMCC internal shunt, which is proportional to the magnetic field in the AMMI. In parallel, the Probe In channel measured the amplified signal picked up by the probe coil. The sensitivity of the probe in V/(A/m) is defined at the voltage ratio at 1 kHz. The frequency response in dB is defined as the ratio between the voltages in each 1/3 octave band normalized to the 1 kHz ratio.

The obtained sensitivity is compared to the one from the probe configuration file for verification purposes. A warning is issued if the deviation exceeds 2 %.

6.2. AMMI Audio Output Calibration

The audio output calibration of the AMMI is performed as described below:

- Connect Audio Out to Coil In on the AMMI and click on Calibrate.
- Click on the Calibrate button.
- Once calibration is complete, re-establish the cabling illustrated in Test Setup Diagram §5.1.

6.3. Codec / System Delay Measurements

Codec / system delay measurements are calculated using the guidance from SPEAG's *DASY6/8 Module HAC System Handbook §7.3.2.4:*

- A time delay might occur in the audio signal path (latency of the codec, Windows settings ...). For accurate measurements, the system must take into account this delay, and shift in time the probe readings accordingly.
- Module HAC features automated measurement of the delay. The assessed delay will then be used for the subsequent desired ABM signal level and undesired ABM field level measurements.
- The delay is measured by pressing the Assess Delay button under the Scan Control section of the Measurement tab. The system must be ready to measure, and the DUT must be transmitting in the desired test mode.
- A scan with reduced resolution will be performed and the delay will be assessed at the measured maximum.
- This measurement must be repeated after every change in the hardware setup, or when a different DUT / Codec is used.

Please refer to test data tables in §9 & 10 for all Codec / system delay measurements performed during testing.

6.4. Compute Gain Settings

Gain settings are computed using the following procedure:

- Define the Scan Type as Signal in the Scan Type section.
- Specify the Input Level and Codec Delay in the Base Station Simulator Settings.
  - Input level refers to full scale input level equivalent to 3.14 dBm0.
    - Input level of 1V is used for R&S CMW500 Base Station Simulator.
    - Input level of 1.23V is used for R&S CMX500
  - The codec delay can be measured automatically using the procedure described above in §6.3 above.
- Enter the desired speech level in dBm0. Refer to §5.2 for applicable Reference Input Levels.
- Specify the audio file and the measurement duration to be used for the area and frequency response scans.
  - Use Audio file 48k_voice_1kHz_1s.wav for ABMd and ABMu measurements.
  - Use Audio file 48k_voice_300-3000_2s.wav for Frequency Response measurements.
- Click on Compute Gain Settings. The properties of the audio file, such as the bandwidth compensation factor (BWC), peak value, etc. will be automatically computed. In addition, the audio file scaling (also called gain) will calculated. A popup is displayed in case the resulting gain exceeds the AMMI dynamic range.

Computed Gain settings for each supported technology is illustrated in the table below:

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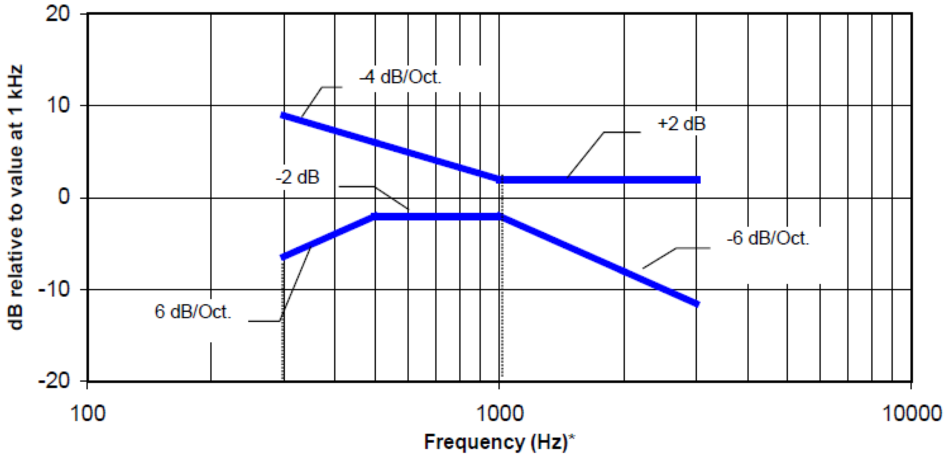
Computed Gain Settings						
Technology	**Signal Type**	**Speech Level (dBm0)**	**Peak to Full Scale (dB)**	**Peak to RMS Scale (dB)**	**BWC (dB)**	**Scaling (Gain) (dB)**
GSM	Voice 1 kHz	-16.0	-0.37	15.74	0.07	-12.55
	Voice 300-3kHz	-16.0	0	21.57	10.81	-6.72
W-CDMA	Voice 1 kHz	-16.0	-0.37	15.74	0.07	-12.56
	Voice 300-3kHz	-16.0	0	21.57	10.81	-6.73
VoLTE	Voice 1 kHz	-16.0	-0.37	15.74	0.07	-12.56
	Voice 300-3kHz	-16.0	0	21.57	10.81	-6.73
VoNR	Voice 1 kHz	-16.0	-0.37	15.74	0.07	-10.76
	Voice 300-3kHz	-16.0	0	21.57	10.81	-4.93
VoWiFi	Voice 1 kHz	-16.0	-0.37	15.74	0.07	-12.56
	Voice 300-3kHz	-16.0	0	21.57	10.81	-6.73

7. T-coil Measurement Criteria

7.1. Frequency Response

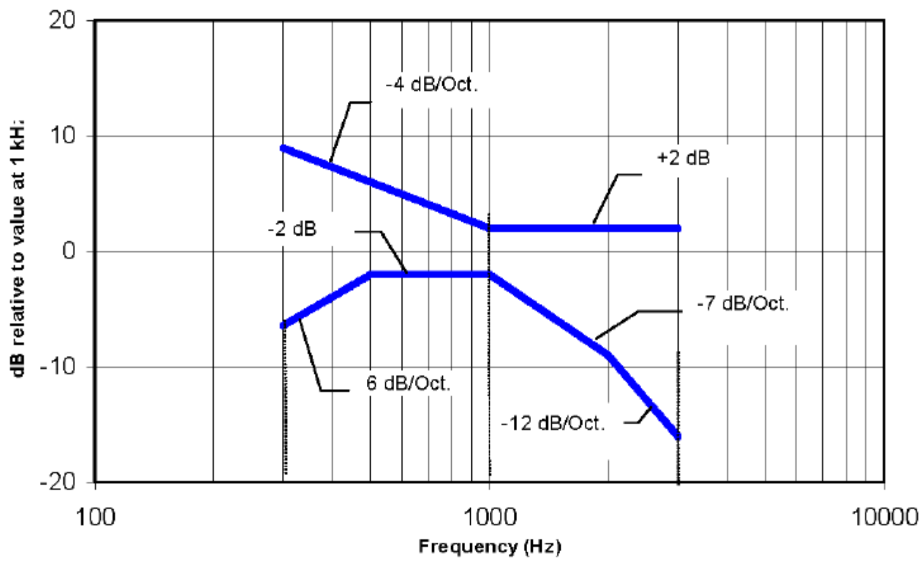
The frequency response of the magnetic field, measured in 1/3 octave bands, shall follow the response curve specified in this subclause, over the frequency range 300 Hz to 3 kHz.

Figure 6.4 and Figure 6.5 provide the boundaries for the specified frequency. These response curves are for true field strength measurements of the T-Coil signal. Thus the 6 dB/octave probe response has been corrected from the raw readings.



NOTE—Frequency response is between 300 Hz and 3 kHz.

Figure 6.4—Magnetic field frequency response for WDs with a maximum field ≤−15 dB(A/m) at 1 kHz



NOTE—Frequency response is between 300 Hz and 3000 Hz.

Figure 6.5—Magnetic field frequency response for WDs with a maximum field that exceeds −15 dB(A/m) at 1 kHz

7.2. Coupling Mode Requirements

To comply with the requirements for T-Coil use, a WD's tested operating modes shall simultaneously meet the requirements for minimum desired ABM signal level and maximum undesired ABM field contained in this subclause at the minimum specified number of scanned locations.

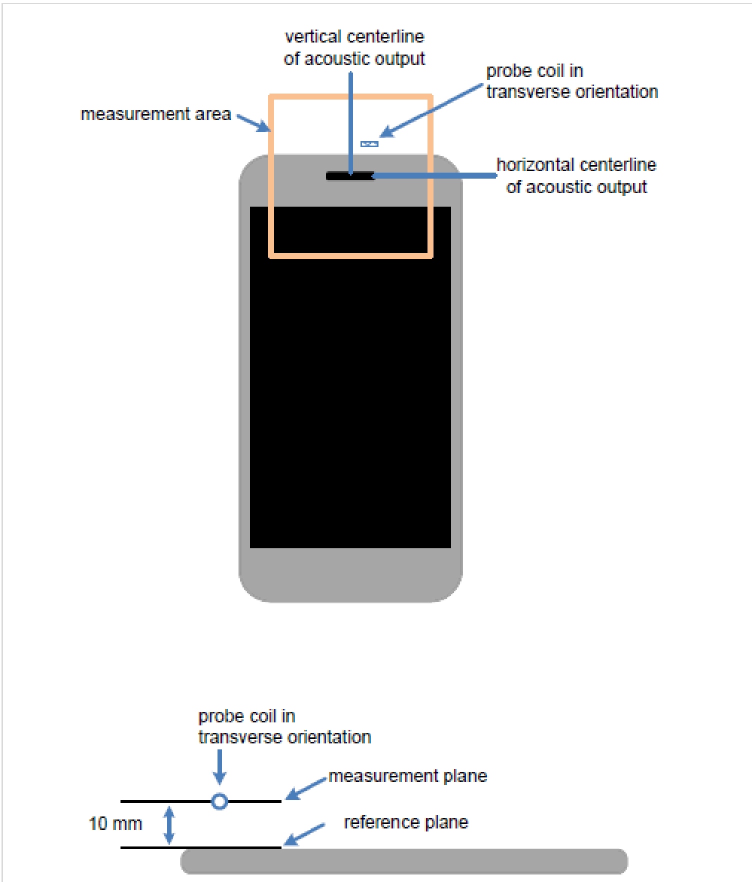
When measured as specified in this standard, there are two groups of qualifying measurement points:

Primary group: A qualifying measurement point shall have its T-Coil signal, desired ABM signal, ≥−18 dB(A/m) at 1 kHz, in a 1/3 octave band filter. These measurements shall be made with the WD operating at a reference input level as specified in Table 6.1. Simultaneously, the qualifying measurement point shall have its weighted magnetic noise, undesired ABM field ≤−38 dB(A/m).

Secondary group: A qualifying measurement point shall have its weighted magnetic noise, undesired ABM field ≤−38 dB(A/m). This group inherently includes all the members of the primary group.

These levels are designed to be compatible with hearing aids that produce the same acoustic output level for either an acoustic input level of 65 dB SPL or a magnetic input level of −25 dB(A/m) (56.2 mA/m)[5] at either 1.0 kHz or 1.6 kHz. The hearing aid operational measurements are performed per ANSI S3.22-2014.

Measurement locations and reference plane to be used for the T-coil measurements.



[5] IEC 60118-1 refers to hearing aid output being the same for an acoustic input of 70 dB SPL and a magnetic input of 100 mA/m. Thus 31.6 mA/m is equivalent to an acoustic input of 60 dB SPL, and an acoustic input of 65 dB SPL is equivalent to 56.2 mA/m.

7.3. Desired ABM Signal and Undesired ABM Field Requirements

For a WD that is expected to operate primarily in radio access technologies that include 2G GSM for legacy support, the WD shall be qualified for telecoil compatibility one of two ways:

- The DUT shall be rated for telecoil use for all other voice operating modes, exclusive of 2G GSM, according to the criteria of §6.6.4.2 of ANSI C63.19 2019.
- If the DUT is to be rated for telecoil use in its 2G GSM operating modes, these modes shall be qualified according to the criteria of §6.6.4.3 of ANSI C63.19 2019.

7.3.1. Non-2G GSM Operating modes

The goal of this requirement is to ensure an adequate area where desired ABM signal is sufficiently strong to be heard clearly and a larger area where undesired ABM field is sufficiently low as to avoid undue annoyance. Qualifying measurement points shall fulfill the coupling mode requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 75 measurement points.
- The secondary group shall include at least 300 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

7.3.2. 2G GSM Operating modes

For 2G GSM operating mode(s), the qualifying measurement points shall fulfil the coupling mode requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 25 measurement points.
- The secondary group shall include at least 125 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

8. Device Under Test

Normal operation	Held to head		
Back Cover	The Back Cover is not removable		
Test sample information	**S/N**	**IMEI**	**Notes**
	KF44C57R6X	N/A	HAC Sample

8.1. Air Interfaces and Operating Mode

All air interfaces which support voice capabilities over a managed CMRS or pre-installed OTT VoIP applications were tested.

Air Interface	Bands (MHz)	Type	C63.19 Tested	Simultaneous Transmitter	Name of Voice Service	Power Mode[3]	Power Reduction	Audio Codecs Evaluated[1]
GSM	850	VO	Yes	Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS	Power State 1 Mode A	N/A	EFR, AMR-NB & AMR-WB
	1900						N/A	
	GPRS/EDGE	DT/VD	No	Wi-Fi, BT, NB U-NII, & 802.15.4	FaceTime[5]	Power State 1 Mode A	N/A	ACC-ELD
W-CDMA (UMTS)	850	VO	Yes	Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS	Power State 1 Mode A	N/A	AMR-NB & AMR-WB
	1700							
	1900							
	HSPA	VD	No	Wi-Fi, BT, NB U-NII, & 802.15.4	FaceTime[5]	Power State 1 Mode A	N/A	ACC-ELD
LTE - FDD	700 (B12/13/17)	VD	Yes	Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[5]	Power State 1 Mode A	N/A	AMR-NB, AMR-WB, EVS, & ACC-ELD
	850 (B5/26)							
	1700 (B4/66)							
	1900 (B2/25)							
	2300 (B30)							
	2600 (B7)							
LTE - TDD	2600 (B41)	VD	Yes	Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[5]	Power State 1 Mode A	N/A	AMR-NB, AMR-WB, EVS, & ACC-ELD
	3600 (B48)							
5G NR(FR1) FDD	700 (n12)	VD	Yes[2]	Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[5]	Power State 1 Mode A	N/A	AMR-NB, AMR-WB, EVS, & ACC-ELD
	850 (n5/n26)							
	1700 (n66)							
	1900 (n2/n25)							
	2300 (n30)							
	2500 (n7)							
5G NR(FR1) TDD	2600 (n41)[4]	VD	Yes[2]	Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[5]	Power State 1 Mode A	N/A	AMR-NB, AMR-WB, EVS, & ACC-ELD
	3500 (n77 Block A)							
	3700 (n48)[4]							
	3900 (n77 Block C)							

Type
VO: Legacy Cellular Voice Service
DT: Digital Transport only (no voice)
VD: IP Voice Service over Digital Transport
CMRS: Commercial Mobile Radio Service

Note(s):
1. For protocols not listed in Table 6.1 of ANSI C63.19-2019, the average speech level of -20 dBm0 was used. Refer to §5.2 for reference input levels.
2. 5G NR (VoNR) is supported: manufacturer states that 5G NR (VoNR) uses the same protocol, Codec(s) and bitrates as LTE (VoLTE).
3. For all air interfaces, the maximum held-to-head output power was used for T-Coil evaluations. The maximum held-to-head output power is Power State 1 Mode A for WWAN operating modes and Power State 1 Mode A for WLAN operating modes. Refer to §9 & §10 for T-Coil evaluations.
4. LTE TDD B41 supports Power Class 2 and 3, 5G NR TDD n41 and n77 support Power Class 2 and 3.
5. Per the manufacturer, FaceTime audio is disabled via SW code for this model. Therefore, OTT testing is not required

Air Interfaces and Operating Modes

Air Interface	Bands (MHz)	Type	C63.19 Tested	Simultaneous Transmitter	Name of Voice Service	Power Mode[2]	Power Reduction	Audio Codecs Evaluated[1]
Wi-Fi	2450	VD	Yes	WWAN, Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[4]	Power State 1 Mode A	N/A	AMR-NB, AMR-WB, EVS, & ACC-ELD
	U-NII-1			WWAN, Wi-Fi, BT, NB U-NII, & 802.15.4				
	U-NII-2A							
	U-NII-2C							
	U-NII-3							
	U-NII-5	VD	Yes	WWAN, Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[4]	Power State 1 Mode A	N/A	AMR-NB, AMR-WB, EVS, & ACC-ELD
	U-NII-6	VD	No[3]	WWAN, Wi-Fi, BT, NB U-NII, & 802.15.4	CMRS FaceTime[4]	Power State 1 Mode A	N/A	N/A
	U-NII-7							
	U-NII-8							
NB-U-NII	U-NII-1	DT	N/A	WWAN, Wi-Fi, BT, & 802.15.4	N/A	N/A	N/A	N/A
	U-NII-3							
	U-NII-5							
802.15ab NB	U-NII-3	DT	N/A	WWAN, Wi-Fi, BT, & 802.15.4	N/A	N/A	N/A	N/A
802.15.4	2450	DT	N/A	WWAN, Wi-Fi, BT, & NB U-NII	N/A	N/A	N/A	N/A
BT	2450	DT	NA	WWAN, Wi-Fi, NB U-NII, & 802.15.4	NA	N/A	N/A	N/A
NFC	13	DT	N/A	N/A	N/A	N/A	N/A	N/A
UWB (Ultra-Wideband)	6500	DT	N/A	N/A	N/A	N/A	N/A	N/A
	8000							

Type
VO: Legacy Cellular Voice Service
DT: Digital Transport only (no voice)
VD: IP Voice Service over Digital Transport
CMRS: Commercial Mobile Radio Service

Note(s):
1. For protocols not listed in Table 6.1 of ANSI C63.19-2019, the average speech level of -20 dBm0 was used. Refer to §5.2 for reference input levels.
2. For all air interfaces, the maximum held-to-head output power was used for T-Coil evaluations. The maximum held-to-head output power is Power State 1 Mode A for WWAN operating modes and Power State 1 Mode A for WLAN operating modes. Refer to §9 & §10 for T-Coil evaluations
3. Supported Frequency > 6GHz. ANSI C63,19 2019 only requires HAC evaluations for Technologies/Frequencies < 6GHz.
4. Per the manufacturer, FaceTime audio is disabled via SW code for this model. Therefore, OTT testing is not required.

9. Investigations (Codec & Air Interface)

To comply with the requirements for T-Coil use, a WD's tested operating modes shall simultaneously meet the requirements for minimum desired ABM signal level and maximum undesired ABM field contained in this subclause at the minimum specified number of scanned locations.

When measured as specified in this standard, there are two groups of qualifying measurement points:

Primary group: A qualifying measurement point shall have its T-Coil signal, desired ABM signal, ≥−18 dB(A/m) at 1 kHz, in a 1/3 octave band filter. These measurements shall be made with the WD operating at a reference input level as specified in Table 6.1. Simultaneously, the qualifying measurement point shall have its weighted magnetic noise, undesired ABM field ≤−38 dB(A/m).

Secondary group: A qualifying measurement point shall have its weighted magnetic noise, undesired ABM field ≤−38 dB(A/m). This group inherently includes all the members of the primary group.

2G GSM Operating modes
For 2G GSM operating mode(s), the qualifying measurement points shall fulfil the coupling mode requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 25 measurement points.
- The secondary group shall include at least 125 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

Non-2G GSM Operating modes
Qualifying measurement points shall fulfill the coupling mode requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 75 measurement points.
- The secondary group shall include at least 300 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

5G NR Operating modes
The DUT supports 5G NR, Voice over New Radio (VoNR). Per the manufacturer, 5G NR (VoNR) uses the same protocol, Codec(s) and bitrates as LTE (VoLTE). Investigations were performed on LTE (VoLTE) and the worst-case Codec & Air Interface configurations from LTE (VoLTE) was used for 5G NR (VoNR) evaluations. Refer to §10 for 5G NR (VoNR) evaluations.

All Operating modes

For all air interfaces, the maximum held-to-head output power was used for T-Coil evaluations. The maximum held-to-head output power is Power State 1 Mode A for WWAN operating modes and Power State 1 Mode A for WLAN operating modes. Refer to §9 & §10 for T-Coil evaluations.

The worst-case configuration is determined by the lowest margin of Primary Group Contiguous Points. The margin Primary Group Contiguous Points is calculated by subtracting the Primary Group points coupling mode requirement (25 for GSM modes and 75 for non-GSM modes) from the measured Primary Group Contiguous Points. The lowest margin of Primary Group Contiguous Points will be highlighted in each table.

For WWAN technologies, the DUT utilizes an Antenna - Port mapping feature. A Port is a collection (cluster) of antennas. Once the Port and Frequency Band has been selected, the transmitting Antenna is auto selected. Below is a description of the Port - Antenna mapping for the DUT.

Port	Frequency Band	Antenna
A	LB	1
	LMB	1
	MBHB	1
	UHB	7
B	LB	2
	LMB	2
	MBHB	2
	UHB	8
C	MBHB	3
	UHB	9
D	MBHB	4
	UHB	4

LB = Lower Band (617 MHz - 960 MHz)

LMB = Lower - Mid Band (1427 MHz - 1700 MHz)

MBHB = Mid Band - High Band (1710 MHz - 2960 MHz)

UHB = Ultra High Band (3300 MHz - 4200 MHz)

An investigation was performed to determine the worst-case Port for each Licensed technology. All subsequent measurements were determined by this investigation.

The device supports (4) WLAN Tx antennas:

Antenna	Technology
3 (Lower)	Wi-Fi 2.4 GHz
	Bluetooth
4 (Upper)	Wi-Fi 2.4 GHz
	Bluetooth
5 (Lower)	Wi-Fi 5 & 6 GHz
6 (Upper)	Wi-Fi 5 & 6 GHz

An investigation was performed to determine the worst-case WLAN Antenna. All subsequent measurements were determined by this investigation.

9.1. Codec Investigations

CMRS requires Reference input level of -16 dBm0 per ANSI C63.19 2019 §6. An investigation between the various supported codec configurations (Low/Mid/High bit rates for EFR, AMR-NB, AMR-WB, and EVS) was performed to determine the worst-case codec and bit rate. The table below compares the varying codec configurations. A codec investigation was performed on one band of each technology: GSM, W-CDMA, LTE FDD, LTE TDD, WLAN 2.4GHz and WLAN 5GHz. The worst-case codec/bit rate determined for each technology will be used for all subsequent testing for the respective technology.

GSM Codec Investigation

GSM Codec Investigation													
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec	Bitrate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	EFR	12.2	Transverse	Pass	-51.98	421	600	26	26	396	475
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	AMR-NB	4.75	Transverse	Pass	-51.98	421	600	26	26	396	475
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	AMR-NB	7.4	Transverse	Pass	-51.98	423	601	26	26	398	476
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	AMR-NB	12.2	Transverse	Pass	-51.98	426	599	26	26	401	474
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	AMR-WB	6.6	Transverse	Pass	-51.98	336	596	26	26	**311**	471
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	AMR-WB	8.85	Transverse	Pass	-51.98	350	592	26	26	325	467
GSM 1900 Voice Coder Speechcodec Low	661 1880 MHz	Mode A	B (ANT 2)	AMR-WB	12.65	Transverse	Pass	-51.98	349	591	26	26	324	466

Note(s):

- For GSM, it is observed that 6.60 kbps is the worst-case bit rate.

W-CDMA Codec Investigation

W-CDMA Codec Investigation													
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec	Bitrate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
W-CDMA BII Rel. 99	9400 1880 MHz	Mode A	B (ANT 2)	AMR-NB	4.75	Transverse	Pass	-51.98	376	559	26	26	301	259
W-CDMA BII Rel. 99	9400 1880 MHz	Mode A	B (ANT 2)	AMR-NB	7.40	Transverse	Pass	-51.98	372	555	26	26	297	255
W-CDMA BII Rel. 99	9400 1880 MHz	Mode A	B (ANT 2)	AMR-NB	12.20	Transverse	Pass	-51.98	366	548	25	26	291	248
W-CDMA BII Rel. 99	9400 1880 MHz	Mode A	B (ANT 2)	AMR-WB	6.60	Transverse	Pass	-51.98	289	556	26	26	**214**	256
W-CDMA BII Rel. 99	9400 1880 MHz	Mode A	B (ANT 2)	AMR-WB	15.85	Transverse	Pass	-51.98	311	560	26	26	236	260
W-CDMA BII Rel. 99	9400 1880 MHz	Mode A	B (ANT 2)	AMR-WB	23.85	Transverse	Pass	-51.98	312	560	26	26	237	260

Note(s):

- For W-CDMA, it is observed that 6.60 kbps is the worst-case bit rate.

LTE (VoLTE) FDD Codec Investigation

LTE FDD Codec Investigation													
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec	Bitrate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	AMR-NB	4.75	Transverse	Pass	-51.98	395	584	26	26	320	284
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	AMR-NB	7.4	Transverse	Pass	-51.98	393	580	26	26	318	280
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	AMR-NB	12.2	Transverse	Pass	-51.98	395	580	26	26	320	280
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	AMR-WB	6.6	Transverse	Pass	-51.98	316	385	26	26	241	85
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	AMR-WB	15.85	Transverse	Pass	-51.98	277	533	25	26	**202**	233
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	AMR-WB	23.85	Transverse	Pass	-51.98	284	542	26	26	209	242
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	EVS	5.9	Transverse	Pass	-51.98	289	535	23	26	214	235
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	EVS	9.6	Transverse	Pass	-51.98	357	536	23	26	282	236
LTE Band 25 QPSK RB 1/0 20 MHz BW	26365 1882.5 MHz	Mode A	B (ANT 2)	EVS	24.4	Transverse	Pass	-51.98	356	535	23	26	281	235

Note(s):

- For LTE-FDD, it is observed that 15.85 kbps is the worst-case bit rate.

LTE (VoLTE) TDD Codec Investigation

LTE TDD Codec Investigation														
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec	Bitrate (kbps)	Orientation	Frequency Response	ABM1 dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	AMR-NB	4.75	Transverse	Pass	18.0	368	531	26	26	293	231
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	AMR-NB	7.4	Transverse	Pass	18.38	358	531	26	26	283	231
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	AMR-NB	12.2	Transverse	Pass	18.49	360	532	26	26	285	232
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	AMR-WB	6.6	Transverse	Pass	14.76	260	519	26	26	**185**	219
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	AMR-WB	15.85	Transverse	Pass	15.24	281	530	26	26	206	230
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	AMR-WB	23.85	Transverse	Pass	14.94	297	538	26	26	222	238
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	EVS	5.9	Transverse	Pass	14.71	293	532	26	26	218	232
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	EVS	9.6	Transverse	Pass	18.52	379	536	26	26	304	236
LTE Band 41 QPSK RB 1/0 20 MHz BW	40620 2593 MHz	Mode A	B (ANT 2)	EVS	24.4	Transverse	Pass	18.54	430	586	26	26	355	286

Note(s):

- For LTE-TDD, it is observed that 6.60 kbps is the worst-case bit rate.

WLAN (VoWiFi) 2.4 GHz Codec Interface Investigation

Wi-Fi 2.4GHz Codec Investigation														
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec	Bitrate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-NB	4.75	Transverse	Pass	-51.97	373	552	26	26	298	252
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-NB	7.4	Transverse	Pass	-51.97	381	561	26	26	306	261
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-NB	12.2	Transverse	Pass	-51.97	385	560	26	26	310	260
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB	6.6	Transverse	Pass	-51.97	299	560	26	26	**224**	260
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB	15.85	Transverse	Pass	-51.97	323	566	26	26	248	266
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB	23.85	Transverse	Pass	-51.97	314	557	26	26	239	257
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	EVS	5.9	Transverse	Pass	-51.97	306	564	26	26	231	264
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	EVS	9.6	Transverse	Pass	-51.97	394	565	26	26	319	265
802.11b DSSS 1 Mbps 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	EVS	24.4	Transverse	Pass	-51.97	388	559	26	26	313	259

Note(s):

- For Wi-Fi 2.4 GHz, it is observed that 6.60 kbps is the worst-case bit rate.

WLAN (VoWiFi) 5 GHz Codec Interface Investigation

Wi-Fi 5GHz Codec Investigation														
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec	Bitrate (kbps)	Orientation	Frequency Response	ABM1 dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	AMR-NB	4.75	Transverse	Pass	18.69	372	549	26	26	297	249
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	AMR-NB	7.4	Transverse	Pass	18.93	376	562	26	26	301	262
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	AMR-NB	12.2	Transverse	Pass	20.00	383	555	26	26	308	255
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	AMR-WB	6.6	Transverse	Pass	16.06	286	547	26	26	211	247
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	AMR-WB	15.85	Transverse	Pass	16.79	307	550	26	26	232	250
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	AMR-WB	23.85	Transverse	Pass	16.81	312	555	26	26	237	255
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS	5.9	Transverse	Pass	15.46	279	557	26	26	**204**	257
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS	9.6	Transverse	Pass	20.00	396	568	26	26	321	268
802.11a BPSK 6 Mbps 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS	24.4	Transverse	Pass	20.08	398	568	26	26	323	268

Note(s):

- For Wi-Fi 5 GHz, it is observed that 5.90 kbps is the worst-case bit rate.

9.2. Air Interface Investigation

A limited set of bands/channels/bandwidths were tested to confirm that there is no effect on the ABM levels when changing the band/channel/bandwidth.

GSM Air Interface Investigation

GSM Air Interface Investigation

Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec and Bit rate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
GSM 1900 Voice Coder Speechcodec Low	512 1850.2 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	329	591	26	26	304	466
GSM 1900 Voice Coder Speechcodec Low	661 1880.0 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	336	596	26	26	311	471
GSM 1900 Voice Coder Speechcodec Low	810 1909.8 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	326	588	26	26	**301**	463

Note(s):

For all subsequent tests for GSM, high channel was used in conjunction with the worst-case bit rate found in §9.1.

W-CDMA Air Interface Investigation

W-CDMA Air Interface Investigation

Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec and Bit rate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
W-CDMA BII Rel. 99	9262 1852.4 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	286	556	26	26	211	256
W-CDMA BII Rel. 99	9400 1880.0 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	289	556	26	26	214	256
W-CDMA BII Rel. 99	9538 1907.6 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	282	551	26	26	**207**	251

Note(s):

For all subsequent tests for W-CDMA, high channel was used in conjunction with the worst-case bit rate found in §9.1.

LTE (VoLTE) Air Interface Investigation

LTE Air Interface Investigation

Band / Mode	Channel and Frequency	Channel Bandwidth	Power Mode	Port/ANT	RB Allocation		Codec and Bit rate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
LTE Band 25 QPSK	26365 1882.5 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.98	277	533	25	26	202	233
LTE Band 25 QPSK	26365 1882.5 MHz	20 MHz	Mode A	B (ANT 2)	100	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	294	544	26	26	219	244
LTE Band 25 16QAM	26365 1882.5 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	274	521	23	26	**199**	221
LTE Band 25 64QAM	26365 1882.5 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	278	525	26	26	203	225
LTE Band 25 256QAM	26365 1882.5 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	292	545	26	26	217	245
LTE Band 25 16QAM	26365 1882.5 MHz	1.4 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	297	547	26	26	222	247
LTE Band 41 QPSK	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	260	519	26	26	**185**	219
LTE Band 41 QPSK	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	100	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	328	570	26	26	253	270
LTE Band 41 16QAM	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	330	574	26	26	255	274
LTE Band 41 64QAM	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	328	570	26	26	253	270
LTE Band 41 256QAM	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	329	579	26	26	254	279
LTE Band 41 QPSK	40620 2593 MHz	5 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	332	598	26	26	257	298

Note(s):

For all subsequent tests for LTE-FDD, middle channel, 16QAM modulation, and 1% RB size and low RB allocation was used in conjunction with the worst-case bit rate found in §9.1.

For all subsequent tests for LTE-TDD, middle channel, QPSK modulation, and 1% RB size and low RB allocation was used in conjunction with the worst-case bit rate found in §9.1.

WLAN (VoWiFi) Air Interface Investigation

Wi-Fi Air Interface Investigation															
Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec and Bit rate (kbps)	Modulation/ Index	Data Rate	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin
802.11b 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	DSSS	1 Mbps	Transverse	Pass	-51.97	299	560	26	26	224	260
802.11b 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	CCK	5.5 Mbps	Transverse	Pass	-51.97	297	560	26	26	222	260
802.11b 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	CCK	11 Mbps	Transverse	Pass	-51.97	297	558	26	26	222	258
802.11g 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	QPSK	12 Mbps	Transverse	Pass	-51.97	309	571	26	26	234	271
802.11n HT20 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	MCS3	26 Mbps	Transverse	Pass	-51.97	289	553	26	26	**214**	253
802.11n HT40 40 MHz BW	9 2452 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	MCS3	54 Mbps	Transverse	Pass	-51.98	311	575	26	26	236	275
802.11ax HE20 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	MCS5	68.8 Mbps	Transverse	Pass	-51.97	300	567	26	26	225	267
802.11a 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	BPSK	6 Mbps	Transverse	Pass	-51.97	279	557	26	26	204	257
802.11a 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	QPSK	18 Mbps	Transverse	Pass	-51.97	283	566	26	26	208	266
802.11a 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	64QAM	54 Mbps	Transverse	Pass	-51.97	281	560	26	26	206	260
802.11n HT20 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	6.5 Mbps	Transverse	Pass	-51.97	303	565	26	26	228	265
802.11n HT40 40 MHz BW	38 5190 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	13.5 Mbps	Transverse	Pass	-51.98	282	568	26	26	207	268
802.11ac VHT20 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	6.5 Mbps	Transverse	Pass	-51.98	281	565	26	26	206	265
802.11ac VHT40 40 MHz BW	38 5190 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	13.5 Mbps	Transverse	Pass	-51.98	301	568	26	26	226	268
802.11ac VHT80 80 MHz BW	42 5210 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	29.3 Mbps	Transverse	Pass	-51.98	294	564	26	26	219	264
802.11ac VHT160 160 MHz BW	50 5250 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	58.5 Mbps	Transverse	Pass	-51.98	245	533	26	26	**170**	233
802.11ax HE20 20 MHz BW	36 5180 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	8.6 Mbps	Transverse	Pass	-51.98	290	573	26	26	215	273
802.11ax HE40 40 MHz BW	38 5190 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	17.2 Mbps	Transverse	Pass	-51.98	288	572	26	26	213	272
802.11ax HE80 80 MHz BW	42 5210 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	36 Mbps	Transverse	Pass	-51.98	269	557	26	26	194	257
802.11ax HE160 160 MHz BW	50 5250 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0	72 Mbps	Transverse	Pass	-51.98	305	569	26	26	230	269

Note(s):

For all subsequent tests for 2.4 GHz, 802.11n MCS3 26 Mbps was used in conjunction with the worst-case bit rate found in §9.1.

For all subsequent tests for 5 GHz, 802.11ac VHT160 MHz MCS0 58.5 Mbps was used in conjunction with the worst-case bit rate found in §9.1.

10. HAC (T-coil) Test Results

The worst-case codec/bit rate and Air interface determined in §9.1 and §9.2 for each technology was used for HAC T-Coil evaluations. Refer to the tables below for HAC T-Coil Test Results.

GSM & W-CDMA Test Results

Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec and Bit rate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Plot Page #
GSM 850 Voice Coder Speechcodec Low	251 848.8 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	319	572	26	26	294	447	1 - 2
GSM 1900 Voice Coder Speechcodec Low	810 1909.8 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	326	588	26	26	301	463	3 - 4
W-CDMA BII Rel. 99	9538 1907.6 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	282	551	26	26	207	251	5 - 6
W-CDMA BIV Rel. 99	1513 1752.6 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	296	554	25	26	221	254	7 - 8
W-CDMA Band V Rel. 99	4233 846.6 MHz	Mode A	B (ANT 2)	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	282	528	26	26	207	228	9 - 10

LTE (VoLTE) Test Results

Band / Mode	Channel and Frequency	Channel Bandwidth	Power Mode	Port/ANT	RB Allocation		Codec and Bit rate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Plot Page #
LTE Band 7 16QAM	21100 2535 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	340	585	26	26	265	285	11 - 12
LTE Band 12 16QAM	23095 707.5 MHz	10 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	342	585	26	26	267	285	13 - 14
LTE Band 13 16QAM	23230 782 MHz	10 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	335	580	26	26	260	280	15 - 16
LTE Band 25 16QAM	26365 1882.5 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	274	521	23	26	199	221	17 - 18
LTE Band 26 16QAM	26865 831.5 MHz	15 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	349	590	26	26	274	290	19 - 20
LTE Band 30 16QAM	27710 2310 MHz	10 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	340	583	26	26	265	283	21 - 22
LTE Band 66 16QAM	132322 1745 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 15.85 kbps	Transverse	Pass	-51.93	340	584	26	26	265	284	23 - 24
LTE Band 38 PC3 QPSK	38000 2595 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	330	587	26	26	255	287	25 - 26
LTE Band 41 PC3 QPSK	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	260	519	26	26	185	219	27 - 28
LTE Band 41 PC2 QPSK	40620 2593 MHz	20 MHz	Mode A	B (ANT 2)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	282	543	26	26	207	243	29 - 30
LTE Band 48 PC3 QPSK	55990 3625 MHz	20 MHz	Mode A	B (ANT 8)	1	0	AMR-WB: 6.6 kbps	Transverse	Pass	-51.93	333	588	26	26	258	288	31 - 32

5G NR (VoNR) Test Results

Band / Mode	Channel and Frequency	Channel Bandwidth	SCS (kHz)	Power Mode	Port/ANT	RB Allocation		Codec and Bit rate (kbps)	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Plot Page #
5G NR Band n7 DFT-s QPSK	507000 2535 MHz	40 MHz	15	Mode A	B (ANT 2)	1	1	AMR-WB: 15.85 kbps	Transverse	Pass	-51.98	265	541	26	26	190	241	33 - 34
5G NR Band n12 DFT-s QPSK	141500 707.5 MHz	15 MHz	15	Mode A	B (ANT 2)	1	1	AMR-WB: 15.85 kbps	Transverse	Pass	-51.98	274	550	26	26	199	250	35 - 36
5G NR Band n25 DFT-s QPSK	376500 1882.5 MHz	40 MHz	15	Mode A	B (ANT 2)	1	1	AMR-WB: 15.85 kbps	Transverse	Pass	-51.98	257	535	26	26	182	235	37 - 38
5G NR Band n41 PC3 DFT-s π/2 BPSK	518598 2592.99 MHz	100 MHz	30	Mode A	B (ANT 2)	1	1	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	248	533	26	26	173	233	39 - 40
5G NR Band n41 PC2 DFT-s π/2 BPSK	518598 2592.99 MHz	100 MHz	30	Mode A	B (ANT 2)	1	1	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	252	539	26	26	177	239	41 - 42
5G NR Band n77 PC3 DFT-s π/2 BPSK	656000 3840 MHz	100 MHz	30	Mode A	B (ANT 8)	1	1	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	260	540	26	26	185	240	43 - 44
5G NR Band n77 PC2 DFT-s π/2 BPSK	656000 3840 MHz	100 MHz	30	Mode A	B (ANT 8)	1	1	AMR-WB: 6.6 kbps	Transverse	Pass	-51.98	258	538	26	26	183	238	45 46

Note(s):

A limited set of 5GNR (VoNR) bands were evaluated to confirm 5G NR (VoNR) compliance.

- At least one 5G NR (VoNR)-FDD LB, MB and HB were evaluated.
- At least one 5G NR (VoNR)-TDD HB and UHB were evaluated.

WLAN (VoWiFi) Test Results

Band / Mode	Channel and Frequency	Power Mode	Port/ANT	Codec and Bit rate (kbps)	Modulation/ Data Rate	Orientation	Frequency Response	Ambient Noise dB(A/m)	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Plot Page #
802.11n HT20 20 MHz BW	6 2437 MHz	Power State 1 Head	ANT 2	AMR-WB: 6.6 kbps	MCS3 26 Mbps	Transverse	Pass	-51.97	289	553	26	26	214	253	47 - 48
802.11ac VHT160 160 MHz BW	50 5250 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0 58.5 Mbps	Transverse	Pass	-51.98	245	533	26	26	**170**	233	49 - 50
	114 5570 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0 58.5 Mbps	Transverse	Pass	-51.98	326	576	26	26	251	276	51 - 52
802.11ax HE20 20 MHz BW	5 5975 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0 36 Mbps	Transverse	Pass	-51.98	288	548	26	26	213	248	53 - 54
802.11be EHT20 20 MHz BW	5 5975 MHz	Power State 1 Head	ANT 6	EVS: 5.9 kbps	MCS0 36 Mbps	Transverse	Pass	-51.98	294	546	26	26	219	246	55 - 56

10.1. Worst Case T-Coil Test Plot(s)

UL Verification Services Inc. SAR Lab 13 **Date/Time:** August 12, 2025 at 11:22

T-Coil Signal Test Report: IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)

Device Under Test

Manufacturer	Model	Dimensions [mm]	Speaker Position [mm]
		146.2 x 71.8 x 7.5	144.3

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3083	January 10, 2025	DAE4 Sn1784	April 09, 2025

Communication Systems

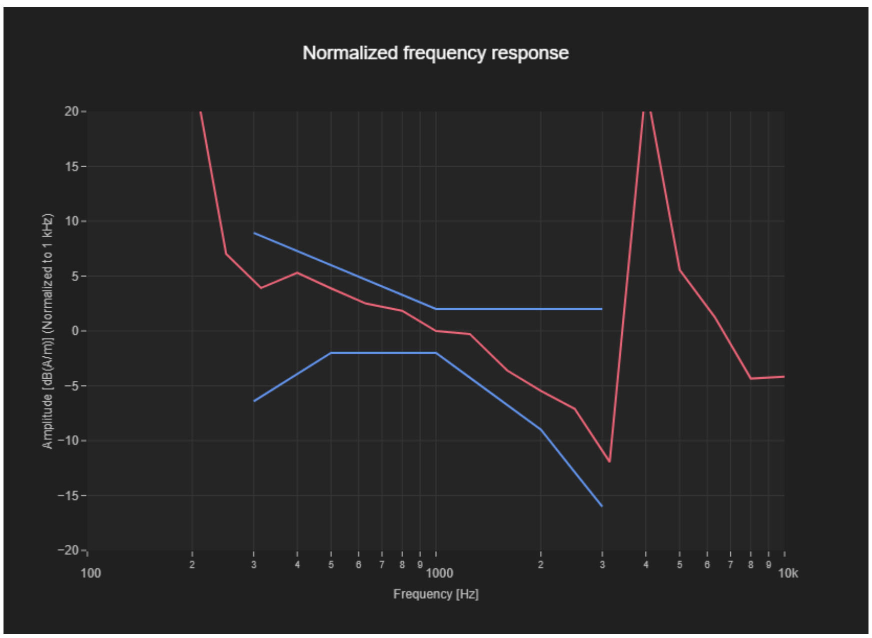
Band Name	Communication Systems Name	Channel	Frequency [MHz]
WLAN 5GHz	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	50	5250.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	6.0	6.0	10.0

Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.45	2.0

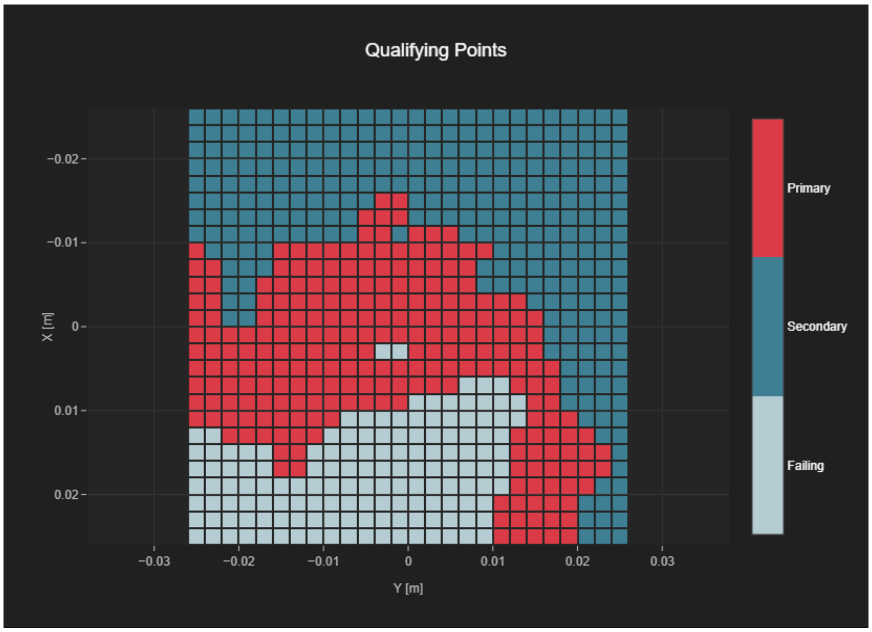


UL Verification Services Inc. SAR Lab 13 **Date/Time:**

T-Coil Coupling Mode Test Report:

Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
245	533	26	26



Appendix

Refer to separate files for the following appendixes:

Appendix A: T-Coil Setup Photo

Appendix B: T-Coil Test Plots

Appendix C: T-Coil Probe Certificates

END OF REPORT