# HAC T-Coil Test Report

## For

| | |
|---|---|
| **Applicant Name:** | **Xwireless LLC** |
| Address: | 11565 Old Georgetown Road, Rockville, MD, USA |
| EUT Name: | Mobile Phone |
| Brand Name: | Vortex |
| Model Number: | ZG55 |

## Issued By

| | |
|---|---|
| **Company Name:** | **BTF Testing Lab (Shenzhen) Co., Ltd.** |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Report Number: | BTF240130R00302 |
| Test Standards: | ANSI C63.19-2019 FCC 47 CFR §20.19 KDB 285076 D01 KDB 285076 D02 KDB 285076 D03 |
| FCC ID: | 2ADLJ- ZG55 |
| Test Conclusion: | Pass |
| Test Date: | 2024-02-28 to 2024-03-01 |
| Date of Issue: | 2024-03-04 |
| Prepared By: | Amenda Zhong<br>Amenda Zhong / Project Engineer |
| Date: | 2024-03-04 |
| Approved By: | Ryan.CJ<br>Ryan.CJ / EMC Manager |
| Date: | 2024-03-04 |

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| Revision History | | |
|---|---|---|
| Version | Issue Date | Revisions Content |
| R_V0 | 2024-03-04 | Original |
| | | |
| *Note:* | *Once the revision has been made, then previous versions reports are invalid.* | |

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# 1. Introduction

## 1.1 Identification of Testing Laboratory

| | |
|---|---|
| Company Name: | BTF Testing Lab (Shenzhen) Co., Ltd. |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Phone Number: | +86-0755-23146130 |
| Fax Number: | +86-0755-23146130 |

## 1.2 Identification of the Responsible Testing Location

| | |
|---|---|
| Test Location: | BTF Testing Lab (Shenzhen) Co., Ltd. |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Description: | All measurement facilities used to collect the measurement data are located at F101,201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| FCC Registration Number | 518915 |
| Designation Number | CN1330 |

## 1.3 Laboratory Condition

| | |
|---|---|
| Ambient Temperature: | 21℃ to 25℃ |
| Ambient Relative Humidity: | 48% to 59% |
| Ambient Pressure: | 100 kPa to 102 kPa |

## 1.4 Announcement

(1) The test report reference to the report template version v0.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.

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# 2. Product Information

## 2.1 Application Information

| | |
|---|---|
| Company Name: | Xwireless LLC |
| Address: | 11565 Old Georgetown Road, Rockville, MD, USA |

## 2.2 Manufacturer Information

| | |
|---|---|
| Company Name: | Xwireless LLC |
| Address: | 11565 Old Georgetown Road, Rockville, MD, USA |

## 2.3 Factory Information

| | |
|---|---|
| Company Name: | BOPEL MOBILE TECHNOLOGY CO., LTD. |
| Address: | RM603, 6/ F, HANG PONT COMM BLDG, 31 TONKIN ST, CHEUNG SHA WA N, KOWLOON, HONG KONG |

## 2.4 General Description of Equipment under Test (EUT)

| | |
|---|---|
| EUT Name | Mobile Phone |
| Under Test Model Name | ZG55 |
| Sample No. | BTFSN240130004/5 |

## 2.5 Equipment under Test Ancillary Equipment

| | | |
|---|---|---|
| Ancillary Equipment 1 | Rechargeable Battery | |
| | Capacity | 2500mAh |
| | Rated Voltage | 4.35V |

## 2.6 Technical Information

| | |
|---|---|
| Network and Wireless connectivity | 2G Network GSM/GPRS 850/1900<br>3G Network WCDMA/HSDPA/HSUPA Band 2/4/5<br>4G Network FDD LTE Band 2/4/5/12/13/25/26/66/71 TDD LTE Band 41<br>2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40)<br>5G WIFI 802.11a, 802.11n(HT20/HT40), 802.11ac(VHT20/40/80)<br>BT (EDR+BLE) |

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## 2.7 Air Interfaces / Bands Indicating Operating Modes

| Air Interface | Band | C63.19 Tested | Type | Simultaneous Transmitter | Name of Service | Power Reduction |
|---|---|---|---|---|---|---|
| GSM | 850 | Yes | VO | WLAN & BT | CMRS Voice | No |
| | 1900 | Yes | VO | WLAN & BT | CMRS Voice | No |
| | GPRS/EGPRS | Yes | DT | N/A | N/A | No |
| WCDMA | Band II | Yes | VO | WLAN & BT | CMRS Voice | No |
| | Band IV | Yes | VO | WLAN & BT | CMRS Voice | No |
| | Band V | Yes | VO | WLAN & BT | CMRS Voice | No |
| | HSPA | Yes | DT | N/A | N/A | No |
| LTE | Band 2 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 4 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 5 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 12 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 13 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 25 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 26 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 41 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 66 | Yes | VD | WLAN & BT | VoLTE | No |
| | Band 71 | Yes | VD | WLAN & BT | VoLTE | No |
| WLAN | 2.4g & 5g | No | DT | WWAN | N/A | No |
| BT | 2450 | No | DT | WWAN | N/A | No |

NA: Not Applicable
VO: Voice Only
VD: CMRS and IP Voice Service over Digital Transport
DT: Digital Transport Only

Notes:
1. For protocols not listed in Table 6.1 of ANSI C63.19:2019,the average speech level of -20 dBm0 should be used.

# 3. Summary of Test Results

## 3.1 Test Standards

| No. | Identity | Document Title |
|---|---|---|
| 1 | ANSI C63.19-2019 | American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids |
| 2 | FCC 47 CFR §20.19 | Hearing Aid Compatible Mobile Headsets |
| 3 | KDB 285076 D01 | HAC Guidance v06r04 |
| 4 | KDB 285076 D02 | T-coil testing for CMRS IP v04 |
| 5 | KDB 285076 D03 | HAC FAQ v01r06 |

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## 3.2 Attestation of Testing Summary

| Frequency Band | Frequency Response | result |
|---|---|---|
| GSM 850 | Pass | Pass |
| GSM 1900 | Pass | Pass |
| WCDMA II | Pass | Pass |
| WCDMA IV | Pass | Pass |
| WCDMA V | Pass | Pass |
| LTE Band 2 | Pass | Pass |
| LTE Band 4 | Pass | Pass |
| LTE Band 5 | Pass | Pass |
| LTE Band 12 | Pass | Pass |
| LTE Band 13 | Pass | Pass |
| LTE Band 25 | Pass | Pass |
| LTE Band 26 | Pass | Pass |
| LTE Band 41 | Pass | Pass |
| LTE Band 66 | Pass | Pass |
| LTE Band 71 | Pass | Pass |

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# 4. Test Uncertainty

| UNCERTAINTY EVALUATION FOR AUDIO HAC MEASUREMENT | | | | | |
|---|---|---|---|---|---|
| Uncertainty Component | Tol (+- %) | Prob. Dist. | Div. | Uncertainty (dB) | Uncertainty (%) |
| Measurement System | | | | | |
| RF reflections | 0.1 | R | √3 | 0.06 | |
| Acoustic noise | 0.1 | R | √3 | 0.06 | |
| Probe coil sensitivity | 0.49 | R | √3 | 0.28 | |
| Reference signal level | 0.25 | R | √3 | 0.14 | |
| Positioning accuracy | 0.4 | R | √3 | 0.23 | |
| Cable loss | 0.1 | N | 2 | 0.05 | |
| Frequency analyzer | 0.15 | R | √3 | 0.09 | |
| System repeatability | 0.2 | N | 1 | 0.20 | |
| Repeatability of the WD | 0.4 | N | 1 | 0.40 | |
| **Combined Standard Uncertainty** | | N | 1 | 0.61 | |
| **Expanded uncertainty (confidence level of 95%,k = 2)** | | N | K=2 | 1.22 | 15.05 |
| **REPORTED Expanded uncertainty (confidence level of 95%, k = 2)** | | N | K=2 | 1.20 | 15.00 |

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# 5. Measurement System

## 5.1 Definition of Hearing Aid Compatibility (HAC)

The purpose of this standard is to establish categories for hearing aids and for WD (wireless communications devices) that can indicate to health care practitioners and hearing aid users which hearing aids are compatible with which WD, and to provide tests that can be used to assess the electromagnetic characteristics of hearing aids and WD and assign them to these categories. The various parameters required, in order to demonstrate compatibility and accessibility are measured. The design of the standard is such that when a hearing aid and WD achieve one of the categories specified, as measured by the methodology of this standard, the indicated performance is realized.

In order to provide for the usability of a hearing aid with a WD, several factors must be coordinated:

a) Radio frequency (RF) measurements of the near-field electric and magnetic fields emitted by a WD to categorize these emissions for correlation with the RF immunity of a hearing aid.

b) Magnetic field measurements of a WD emitted via the audio transducer associated with the T-coil mode of the hearing aid, for assessment of hearing aid performance.

c) Measurements with the hearing aid and a simulation of the categorized WD T-coil emissions to assess the hearing aid RF immunity in the T-coil mode.

The WD radio frequency (RF) and audio band emissions are measured. Hence,
the following are measurements made for the WD:

a) RF E-Field emissions

b) T-coil mode, magnetic signal strength in the audio band

c) T-coil mode, magnetic signal and noise articulation index

d) T-coil mode, magnetic signal frequency response through the audio band

Corresponding to the WD measurements, the hearing aid is measured for:

a) RF immunity in microphone mode

b) RF immunity in T-coil mode

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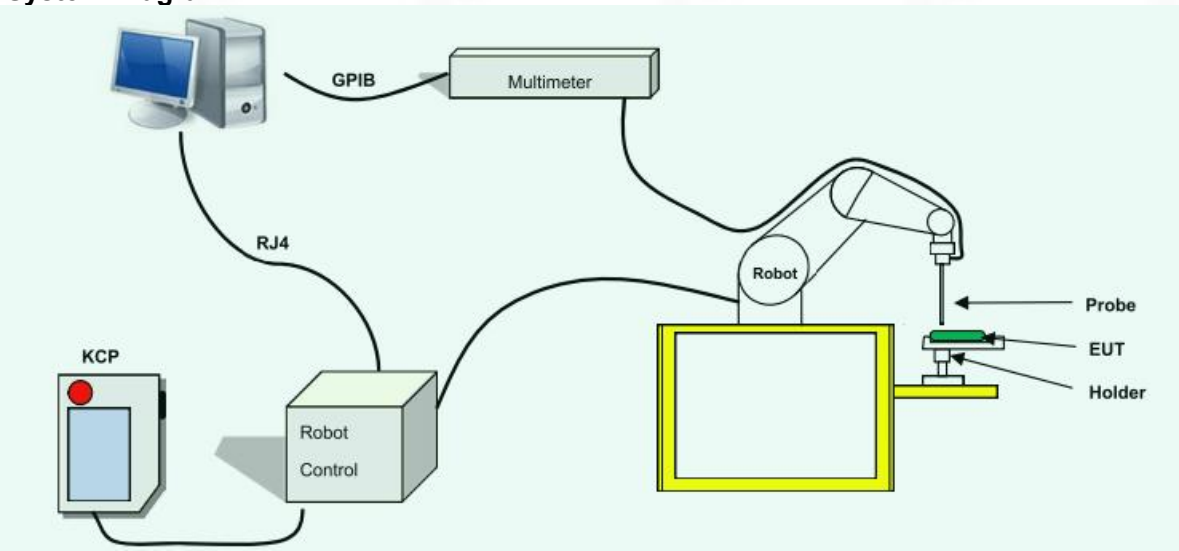
## 5.2 MVG HAC System

**MVG HAC System Diagram**




### 5.2.1 Robot

A standard high precision 6-axis robot (Denso) with teaches pendant with Scanning System
· It must be able to scan all the volume of the phantom to evaluate the tridimensional distribution of SAR.
· Must be able to set the probe orthogonal of the surface of the phantom (±30°).
· Detects stresses on the probe and stop itself if necessary to keep the integrity of the probe.

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### 5.2.2 T-coil Probe

**Figure 1** – *MVG COMOHAC T-coil Probe*

| | |
|---|---|
| Coil Dimension | 6.55 mm length * 2.29 mm diameter |
| DC resistance | 860.6 Ω |
| Wire size | 51AWG |
| Inductance at 1 kHz | 132.1 mH at 1 kHz |

| **Device Under Test** | |
|---|---|
| Device Type | COMOHAC T-COIL PROBE |
| Manufacturer | MVG |
| Model | STCOIL |
| Serial Number | SN 07/17 TCP38 |
| Product Condition (new / used) | New |
| Frequency Range of Probe | 200-5000 Hz |

This probe is designed to fulfill ANSI recommendations for the measurement of audio frequency magnetic fields radiated by mobile phones. The T-Coil probe has two connectors:

the 6 male wires connector enables to fix the probe on the robot
the BNC connector enables to link the probe to the audio DAQ

This probe was designed for a 6-axis robot. The coil is oriented with a 45 degree angle so that used with a 6-axis robot, both radial and axial measurements can be performed with one probe.

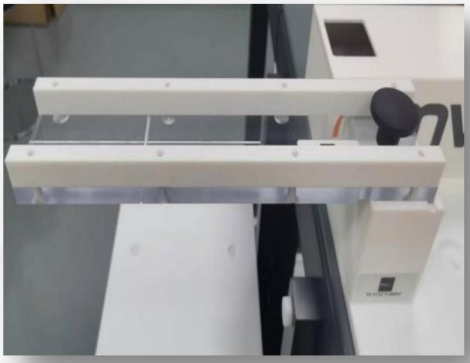
### 5.2.3 TMFS

MVG COMOHAC Magnetic Simulator

| Device Under Test | |
|---|---|
| Device Type | COMOHAC Magnetic Field Simulator |
| Manufacturer | MVG |
| Model | STMFS |
| Serial Number | SN 13/22 TMFS30 |
| Product Condition (new / used) | New |
| Frequency Range | 200-5000 Hz |

All methods used to perform the measurements and calibrations comply with the ANSI C63.19. All measurements were performed with the TMFS in the standard device test configuration, with the TMFS in free space, 10 mm below the coil center.

### 5.2.4 Device Holder/DUT positioner

| | |
|---|---|
| |  |
| DUT Holder | DUT Positioner |

During test, use DUT positioner to check if the Speaker is aligned with the positioner center.

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## 5.3 T-Coil Measurement Set-up

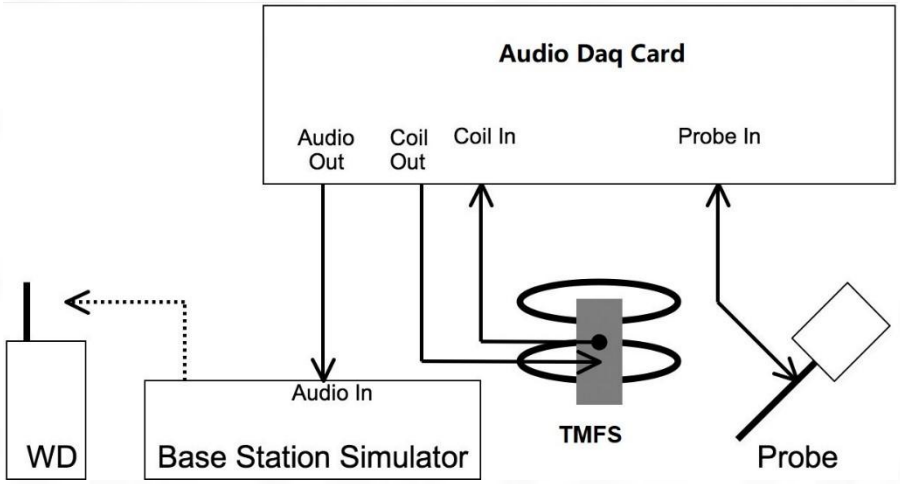
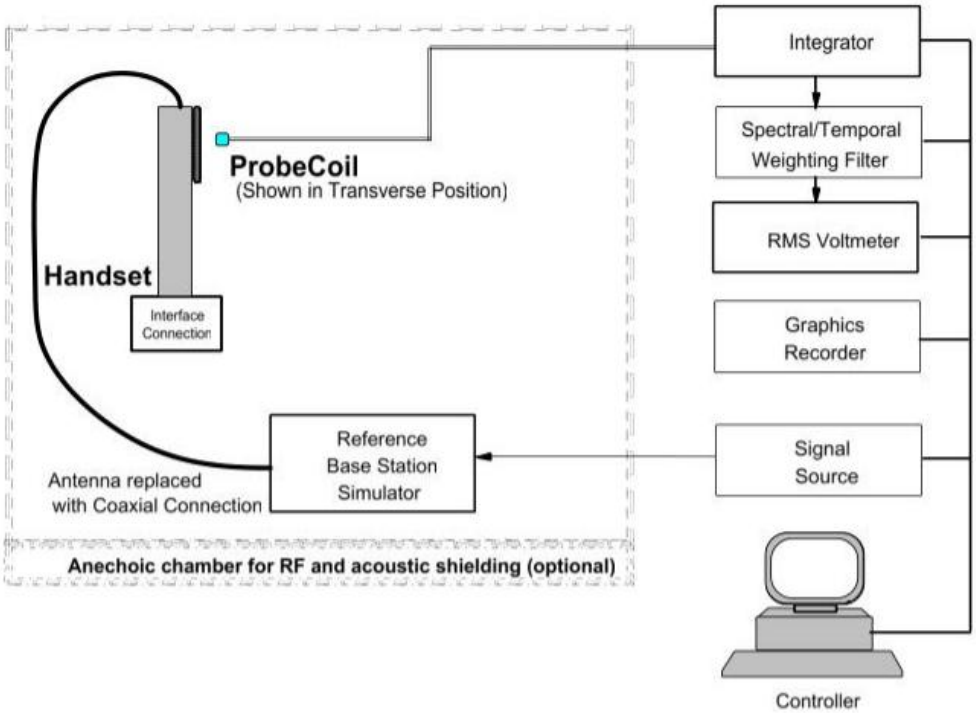



Fig. 2. T-coil signal measurement test setup




Note：

1. The setup assumes that the proper reference input level to the base station simulator or phone interface as specified in ANSI C63.19-2019 section 6.4.3.2 has already been determined.
2. The receive audio signal for the WD may be injected into the base station simulator, which transmits it to the WD while the WD is on a call. An alternative method is to use the WD manufacturer's test mode, if available. If a manufacturer's test mode is used, it is up to the tester to show that the signal is equivalent to the reference input level into a base station simulator as specified in ANSI C63.19-2019 Table 6.1.

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## 5.4 System Calibration

For correct and calibrated measurement of the voltages and ABM field, Denso will perform a calibration job as below.

for cable loss calibration:

a) Use Audio Generator to determine the loss between Audio Generator and TMFS

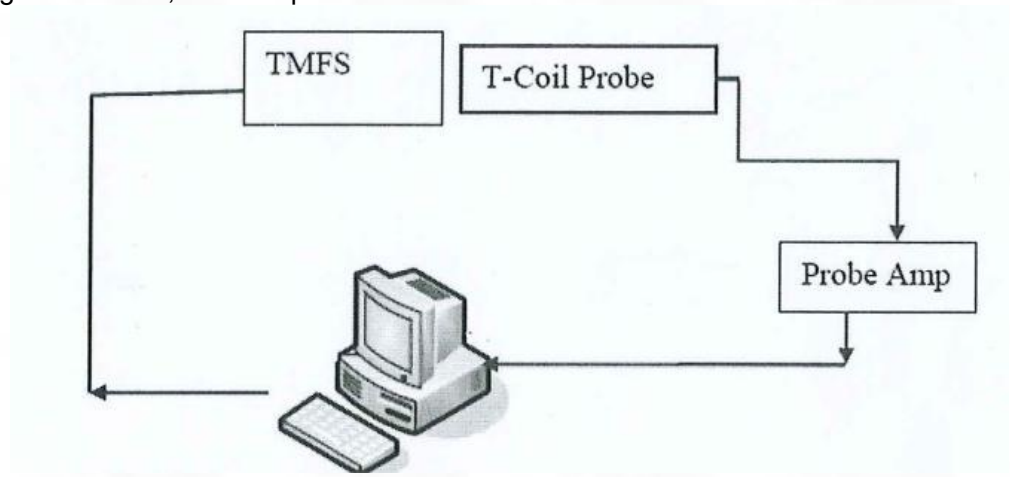
b) Audio output power to TMFS: 1025Hz, 500mV.

c) adjust the audio signal output power to check the cable loss, and use front panel of Multimeter to show target level: 1025Hz, 500mW. (for example, set the audio output power to TMFS: 1025Hz, 0.5924V)

for system verification:

a) Place TMFS properly—the distance between the center of TMFS and T-coil probe is 10mm.

b) send the signal to TMFS, and use probe to measure the ABM1 over the TMFS.

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# 6. HAC (T-Coil) Measurement

## 6.1 T-Coil Performance Requirements

In order to be rated for T-Coil use, a WD shall meet the requirements for signal level and signal quality contained in this part.

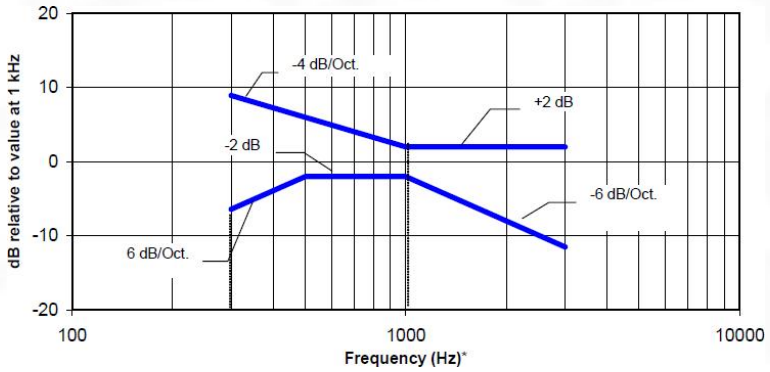
1) T-Coil coupling field intensity
When measured as specified in this standard, there arc two groups of qualifying measurement points:

Primary group: A qualifying measurement point shall have its T-Coil signal, desired ABM signal, >-18 dB(A/m) at I 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).

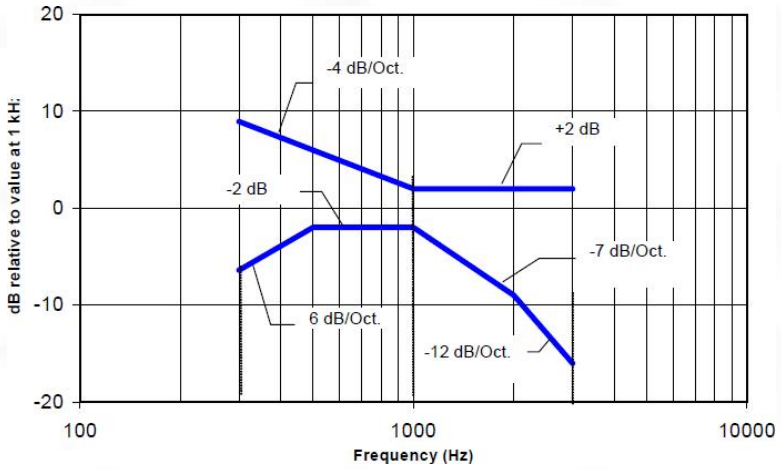
Secondary group: A qualifying measurement point shall have its weighted magnetic noise, undesired ABM field <-38 dB(A/m). This group inherently includes all the members of the primary group.

These levels arc 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)39 at either 1.0 kHz or 1.6 kHz. The hearing aid operational measurements are performed per ANSI S3.22-2014.

2) Frequency response
The frequency response of the axial component of the magnetic field, measured in 1/3 octave bands, shall follow the response curve specified in this sub-clause, over the frequency range 300 Hz to 3000 Hz. Figure 1 and Figure 2 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.




**Magnetic field frequency response for WDs with a field ≤ –15 dB (A/m) at 1 kHz**




**Magnetic field frequency response for WDs with a field that exceeds –15dB(A/m) at 1 kHz**

3) Desired ABM signal, undesired ABM field qualification requirements

**<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 requirements of ANSI 63.19-2019 section 6.6.2; 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.

Figure 6.6 is an example of a qualifying scan. The total number of primary group qualifying measurement points is 161, which is ≥75.The total number of secondary group qualifying points is 536,which is ≥300.

The secondary group has a longitudinal column of 26,which is ≥10,and a transverse row also of 26 contiguous points, which is≥15.

**<2G GSM operating modes>**

If the 2G GSM operating mode(s) are selected for qualification, the qualifying measurement points shall fulfil the requirements of 6.6.2; 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.

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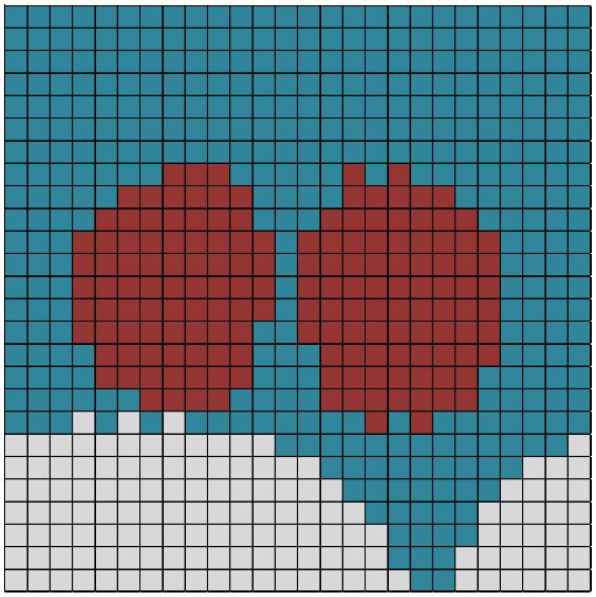

Red (primary group): AB desired ABM signal M1 ≥−18 dB(A/m) and undesired ABM field ≤−38 dB(A/m)
Blue and red (secondary group): undesired ABM field ≤−38 dB(A/m)

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## 6.2 T-Coil measurement points and reference plane

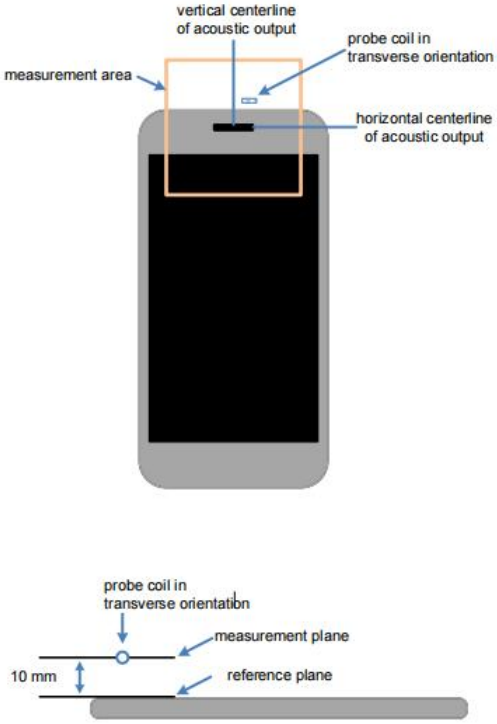
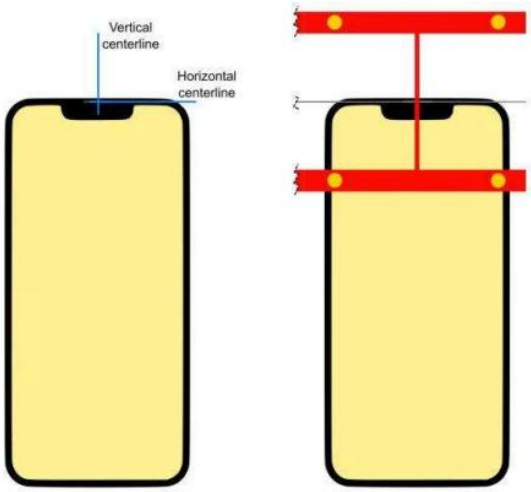



Figure A.4—Measurement and reference planes probe orientation for WD audio frequency magnetic field measurements




**Device Under Test Positioning under the Test Arch**

The T-Coil measurement plane, reference plane and other measurement parameters shall be:

a) The reference plane is the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of the receiver area of the phone and is defined by the points of the receiver-end of the WD handset, which, in normal handset use, rest against the ear.

b) The measurement plane is parallel to, and 10 mm in front of, the reference plane.

c) The reference axis is normal to the reference plane and passes through the center of the acoustic output (or the center of the hole array); or may be centered on or near a secondary inductive source. The actual location of the reference axis and resultant measurement area shall be noted in the test report.

d) The measurement area shall be 50 mm by 50 mm. The measurement area for both desired ABM signal and undesired ABM field may be located where the transverse magnetic measurements are optimum with regard to the requirements. However, the measurement area should be in the vicinity of the acoustic output of the WD and shall be located in the same half of the phone as the WD receiver. In a WD handset with a centered receiver and a circularly symmetrical magnetic field, the measurement axis and the reference axis would coincide.

e) Measurements of desired ABM signal strength and undesired ABM field are made at 2.0 mm ± 0.5 mm or 4 mm intervals in an X-Y measurement area pattern over the entire measurement area (676 measurement points total); either all measured, or measured plus interpolated, per 6.4.

f) Desired ABM signal frequency response is measured at a single location at or near the maximum desired ABM signal strength location.

g) The actual locations of the measurement points shall be noted in the test report.

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## 6.3 Test procedure for T-Coil signal—preferred

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 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 D.4 through D.6.

In order to assure 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 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.

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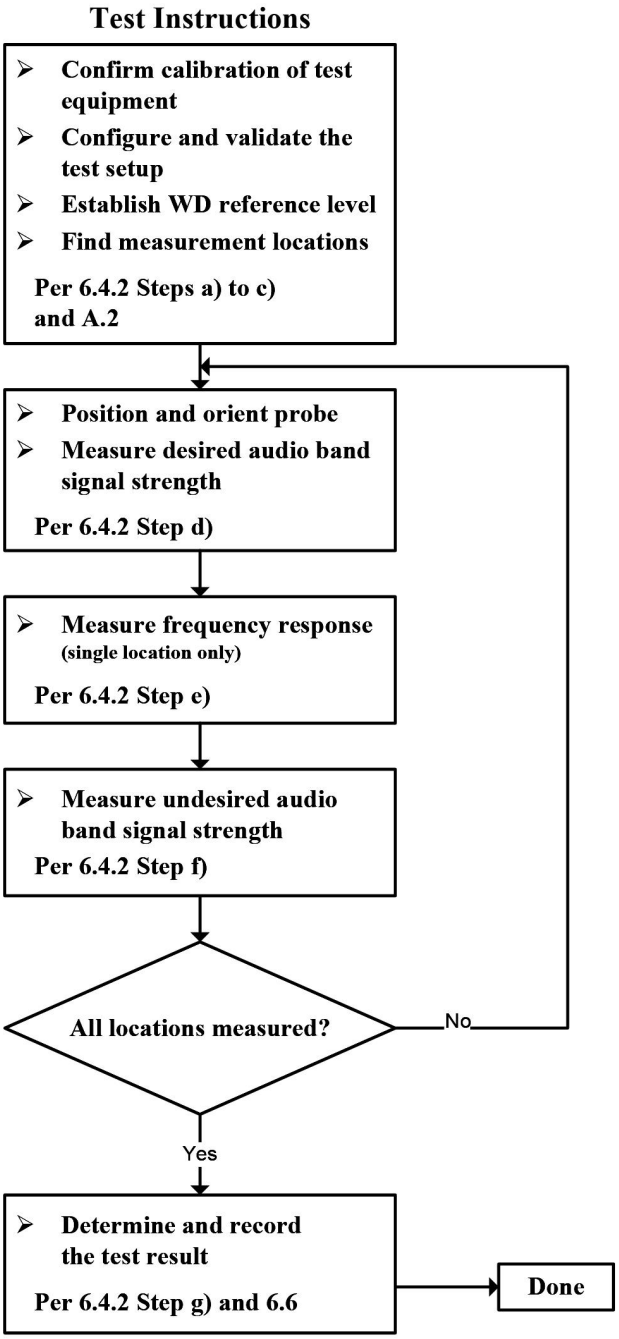
# Test flow for T-Coil signal test

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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 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.35 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.

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.

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# 7. Max. Conducted RF Output Power

## 2G

| Mode: GSM850 | Maximum Tune-up(dBm) | Burst Average Power (dBm) | | |
|---|---|---|---|---|
| | | CH128 | CH190 | CH251 |
| | | 824.2MHz | 836.6MHz | 848.8MHz |
| GSM | **31.50** | 31.42 | **31.47** | 31.11 |
| **Mode: GSM1900** | **Maximum Tune-up(dBm)** | **Burst Average Power (dBm)** | | |
| | | CH512 | CH661 | CH810 |
| | | 1850.2MHz | 1880.0MHz | 1909.8MHz |
| GSM | **29.00** | 28.66 | **27.67** | 28.01 |

## 3G

| Mode | Maximum Tune-up(dBm) | WCDMA Band II | | |
|---|---|---|---|---|
| | | Conducted Power (dBm) | | |
| | | CH9262 | CH9400 | CH9538 |
| | | 1852.4 | 1880.0 | 1907.6 |
| RMC 12.2K | **22.50** | 22.20 | **21.38** | 21.74 |
| Mode | Maximum Tune-up(dBm) | WCDMA Band IV | | |
| | | Conducted Power (dBm) | | |
| | | CH1312 | CH1413 | CH1513 |
| | | 1712.4 | 1732.6 | 1752.6 |
| RMC 12.2K | **22.50** | 22.21 | **21.86** | 21.33 |
| Mode | Maximum Tune-up(dBm) | WCDMA Band V | | |
| | | Conducted Power (dBm) | | |
| | | CH4132 | CH4183 | CH4233 |
| | | 826.4 | 836.6 | 846.6 |
| RMC 12.2K | **23.00** | 22.50 | **22.14** | 22.13 |

## 4G

Band 2

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 18700 | 18900 | 19100 |
|---|---|---|---|---|---|---|---|
| | | | | | 1860.0MHz | 1880.0MHz | 1900.0MHz |
| 20MHz | QPSK | 1 | 0 | 21.50 | 21.46 | 20.79 | 20.70 |
| | | | 50 | **21.50** | 21.47 | **21.11** | 21.16 |
| | | | 99 | 21.50 | 20.76 | 20.73 | 21.08 |
| | | 50 | 0 | 21.00 | 20.73 | 19.98 | 20.01 |
| | | | 25 | 20.50 | 20.45 | 20.04 | 20.08 |
| | | | 50 | 20.50 | 20.29 | 19.97 | 20.17 |
| | | 100 | 0 | 21.00 | 20.51 | 19.96 | 20.08 |
| | 16QAM | 1 | 0 | 21.50 | 21.06 | 20.02 | 20.03 |
| | | | 50 | 21.50 | 21.07 | 20.29 | 20.44 |
| | | | 99 | 20.50 | 20.36 | 19.97 | 20.39 |
| | | 50 | 0 | 20.00 | 19.74 | 18.96 | 18.97 |
| | | | 25 | 19.50 | 19.44 | 19.03 | 19.10 |
| | | | 50 | 19.50 | 19.33 | 18.94 | 19.14 |
| | | 100 | 0 | 20.00 | 19.53 | 18.96 | 19.11 |

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## Band 4

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 20050 | 20175 | 20300 |
|---|---|---|---|---|---|---|---|
| | | | | | 1720.0MHz | 1732.5MHz | 1745.0MHz |
| 20MHz | QPSK | 1 | 0 | 22.00 | 21.89 | 21.71 | 21.28 |
| | | | 50 | **22.50** | 22.08 | **21.78** | 21.44 |
| | | | 99 | 21.50 | 21.47 | 21.17 | 20.88 |
| | | 50 | 0 | 21.50 | 21.06 | 20.78 | 20.41 |
| | | | 25 | 21.50 | 21.03 | 20.71 | 20.30 |
| | | | 50 | 21.00 | 20.89 | 20.56 | 20.18 |
| | | 100 | 0 | 21.50 | 21.01 | 20.71 | 20.31 |
| | 16QAM | 1 | 0 | 21.50 | 21.41 | 20.90 | 20.60 |
| | | | 50 | 22.00 | 21.66 | 21.00 | 20.65 |
| | | | 99 | 21.50 | 21.04 | 20.34 | 20.05 |
| | | 50 | 0 | 20.50 | 20.06 | 19.82 | 19.41 |
| | | | 25 | 20.50 | 20.03 | 19.69 | 19.31 |
| | | | 50 | 20.00 | 19.92 | 19.50 | 19.18 |
| | | 100 | 0 | 20.50 | 20.05 | 19.68 | 19.31 |

## Band 5

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 20450 | 20525 | 20600 |
|---|---|---|---|---|---|---|---|
| | | | | | 829.0MHz | 836.5MHz | 844.0MHz |
| 10MHz | QPSK | 1 | 0 | 22.00 | 21.79 | 21.80 | 21.74 |
| | | | 25 | **22.00** | 22.00 | **21.89** | 21.82 |
| | | | 49 | 22.00 | 21.78 | 21.73 | 21.68 |
| | | 25 | 0 | 21.00 | 20.84 | 20.85 | 20.81 |
| | | | 13 | 21.00 | 20.80 | 20.81 | 20.78 |
| | | | 25 | 21.00 | 20.81 | 20.81 | 20.68 |
| | | 50 | 0 | 21.00 | 20.86 | 20.82 | 20.79 |
| | 16QAM | 1 | 0 | 21.50 | 20.74 | 20.95 | 21.27 |
| | | | 25 | 21.50 | 20.96 | 21.06 | 21.38 |
| | | | 49 | 21.50 | 20.79 | 20.87 | 21.24 |
| | | 25 | 0 | 20.00 | 19.88 | 19.84 | 19.85 |
| | | | 13 | 20.00 | 19.89 | 19.79 | 19.81 |
| | | | 25 | 20.00 | 19.90 | 19.78 | 19.74 |
| | | 50 | 0 | 20.00 | 19.82 | 19.81 | 19.79 |

## Band 12

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 23060 | 23095 | 23130 |
|---|---|---|---|---|---|---|---|
| | | | | | 704.0MHz | 707.5MHz | 711.0MHz |
| 10MHz | QPSK | 1 | 0 | 22.00 | 21.63 | 21.61 | 21.74 |
| | | | 25 | **22.00** | 21.94 | **21.91** | 21.97 |
| | | | 49 | 22.00 | 21.83 | 21.81 | 21.98 |
| | | 25 | 0 | 21.00 | 20.75 | 20.70 | 20.75 |
| | | | 13 | 21.00 | 20.77 | 20.81 | 20.86 |
| | | | 25 | 21.00 | 20.86 | 20.86 | 20.79 |
| | | 50 | 0 | 21.00 | 20.80 | 20.80 | 20.75 |
| | 16QAM | 1 | 0 | 21.50 | 20.58 | 20.77 | 21.18 |
| | | | 25 | 21.50 | 20.85 | 21.04 | 21.46 |
| | | | 49 | 21.50 | 20.77 | 20.99 | 21.25 |
| | | 25 | 0 | 20.00 | 19.85 | 19.73 | 19.82 |
| | | | 13 | 20.00 | 19.86 | 19.86 | 19.95 |
| | | | 25 | 20.00 | 19.95 | 19.90 | 19.83 |
| | | 50 | 0 | 20.00 | 19.82 | 19.81 | 19.80 |

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## Band 13

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 23230 |
|---|---|---|---|---|---|
| | | | | | 782.0MHz |
| 10MHz | QPSK | 1 | 0 | 22.50 | 22.14 |
| | | | 25 | **22.50** | **22.32** |
| | | | 49 | 22.50 | 22.15 |
| | | 25 | 0 | 21.50 | 21.15 |
| | | | 13 | 21.50 | 21.16 |
| | | | 25 | 21.50 | 21.15 |
| | | 50 | 0 | 21.50 | 21.17 |
| | 16QAM | 1 | 0 | 21.50 | 21.13 |
| | | | 25 | 21.50 | 21.27 |
| | | | 49 | 21.50 | 21.10 |
| | | 25 | 0 | 20.50 | 20.23 |
| | | | 13 | 20.50 | 20.23 |
| | | | 25 | 20.50 | 20.23 |
| | | 50 | 0 | 20.50 | 20.14 |

## Band 25

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 26140 | 26365 | 26590 |
|---|---|---|---|---|---|---|---|
| | | | | | 1860.0MHz | 1882.5MHz | 1905.0MHz |
| 20MHz | QPSK | 1 | 0 | 21.50 | 21.49 | 20.75 | 20.77 |
| | | | 50 | **22.00** | 21.59 | **21.09** | 21.43 |
| | | | 99 | 21.50 | 20.87 | 20.73 | 21.32 |
| | | 50 | 0 | 21.00 | 20.81 | 19.95 | 20.13 |
| | | | 25 | 21.00 | 20.58 | 19.98 | 20.33 |
| | | | 50 | 20.50 | 20.41 | 19.91 | 20.38 |
| | | 100 | 0 | 21.00 | 20.59 | 19.93 | 20.28 |
| | 16QAM | 1 | 0 | 21.50 | 21.12 | 19.99 | 20.05 |
| | | | 50 | 21.50 | 21.16 | 20.31 | 20.73 |
| | | | 99 | 21.00 | 20.44 | 20.00 | 20.61 |
| | | 50 | 0 | 20.00 | 19.79 | 18.96 | 19.12 |
| | | | 25 | 20.00 | 19.56 | 18.98 | 19.33 |
| | | | 50 | 19.50 | 19.42 | 18.91 | 19.39 |
| | | 100 | 0 | 20.00 | 19.61 | 18.97 | 19.29 |

## Band 26

| LTE-TDD Band 26c | | | | Maximum Tune-up(dBm) | Conducted Power(dBm) | | |
|---|---|---|---|---|---|---|---|
| Bandwidth | Modulation | RB allocation | RB offset | | 26765 | 26865 | 26965 |
| | | | | | 821.5MHz | 831.5MHz | 841.5MHz |
| 15MHz | QPSK | 1 | 0 | 22.50 | 22.20 | 22.22 | 22.18 |
| | | | 38 | **22.50** | 22.38 | **22.24** | 22.21 |
| | | | 74 | 22.50 | 22.28 | 22.18 | 22.18 |
| | | 36 | 0 | 21.50 | 21.27 | 21.36 | 21.34 |
| | | | 18 | 21.50 | 21.36 | 21.35 | 21.36 |
| | | | 39 | 21.50 | 21.35 | 21.30 | 21.29 |
| | | 75 | 0 | 21.50 | 21.35 | 21.36 | 21.16 |
| | 16QAM | 1 | 0 | 21.50 | 21.30 | 21.44 | 21.26 |
| | | | 38 | 22.00 | 21.40 | 21.53 | 21.21 |
| | | | 74 | 21.50 | 21.32 | 21.38 | 21.18 |
| | | 36 | 0 | 20.50 | 20.29 | 20.35 | 19.81 |
| | | | 18 | 20.50 | 20.29 | 20.35 | 19.79 |
| | | | 39 | 20.50 | 20.34 | 20.33 | 19.75 |
| | | 75 | 0 | 20.50 | 20.26 | 20.35 | 19.80 |

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## Band 41

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 39750 | 40620 | 41490 |
|---|---|---|---|---|---|---|---|
| | | | | | 2506.0MHz | 2593.0MHz | 2680.0MHz |
| 20MHz | QPSK | 1 | 0 | **22.00** | 19.66 | **20.52** | 21.65 |
| | | | 50 | 22.00 | 20.07 | 20.49 | 21.92 |
| | | | 99 | 22.00 | 19.90 | 19.86 | 21.64 |
| | | 50 | 0 | 21.00 | 18.87 | 19.56 | 20.85 |
| | | | 25 | 21.00 | 19.00 | 19.48 | 20.93 |
| | | | 50 | 21.00 | 19.10 | 19.29 | 20.78 |
| | | 100 | 0 | 21.00 | 19.01 | 19.40 | 20.83 |
| | 16QAM | 1 | 0 | 21.00 | 18.23 | 19.22 | 20.91 |
| | | | 50 | 21.00 | 18.63 | 19.35 | 20.97 |
| | | | 99 | 21.00 | 18.49 | 19.04 | 20.62 |
| | | 50 | 0 | 20.00 | 17.84 | 18.53 | 19.86 |
| | | | 25 | 20.00 | 18.00 | 18.43 | 19.94 |
| | | | 50 | 20.00 | 18.01 | 18.24 | 19.83 |
| | | 100 | 0 | 20.00 | 18.00 | 18.44 | 19.89 |

## Band 66

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 132072 | 132322 | 132572 |
|---|---|---|---|---|---|---|---|
| | | | | | 1720.0MHz | 1745.0MHz | 1770.0MHz |
| 20MHz | QPSK | 1 | 0 | 22.50 | 22.48 | 21.70 | 21.30 |
| | | | 50 | **23.00** | 22.54 | **21.75** | 21.59 |
| | | | 99 | 22.00 | 21.93 | 21.26 | 21.40 |
| | | 50 | 0 | 22.00 | 21.60 | 20.93 | 20.45 |
| | | | 25 | 22.00 | 21.51 | 20.85 | 20.46 |
| | | | 50 | 21.50 | 21.39 | 20.68 | 20.53 |
| | | 100 | 0 | 21.50 | 21.47 | 20.79 | 20.47 |
| | 16QAM | 1 | 0 | 22.00 | 21.50 | 20.84 | 20.30 |
| | | | 50 | 22.00 | 21.63 | 20.89 | 20.61 |
| | | | 99 | 21.50 | 21.12 | 20.35 | 20.51 |
| | | 50 | 0 | 21.00 | 20.60 | 19.95 | 19.42 |
| | | | 25 | 21.00 | 20.52 | 19.85 | 19.44 |
| | | | 50 | 20.50 | 20.40 | 19.72 | 19.49 |
| | | 100 | 0 | 20.50 | 20.47 | 19.78 | 19.43 |

## Band 71

| Bandwidth | Modulation | RB allocation | RB offset | Maximum Tune-up(dBm) | 133222 | 133322 | 133372 |
|---|---|---|---|---|---|---|---|
| | | | | | 673.0MHz | 683.0MHz | 688.0MHz |
| 20MHz | QPSK | 1 | 0 | 21.00 | 20.60 | 20.72 | 20.61 |
| | | | 50 | **21.50** | 21.10 | **21.15** | 21.11 |
| | | | 99 | 21.50 | 20.98 | 21.07 | 21.07 |
| | | 50 | 0 | 20.50 | 19.91 | 19.98 | 20.18 |
| | | | 25 | 20.50 | 19.97 | 20.10 | 20.21 |
| | | | 50 | 20.50 | 20.11 | **20.19** | 20.33 |
| | | 100 | 0 | 20.50 | 19.98 | 20.05 | 20.23 |
| | 16QAM | 1 | 0 | 20.00 | 19.73 | 19.78 | 19.82 |
| | | | 50 | 20.50 | 20.20 | 20.23 | 20.33 |
| | | | 99 | 20.50 | 20.09 | 20.21 | 20.24 |
| | | 50 | 0 | 19.50 | 18.83 | 18.98 | 19.22 |
| | | | 25 | 19.50 | 18.92 | 19.08 | 19.24 |
| | | | 50 | 19.50 | 19.09 | 19.16 | 19.39 |
| | | 100 | 0 | 19.50 | 18.90 | 19.05 | 19.24 |

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# Wi-Fi

## 2.4G

| Band (GHz) | Mode | Channel | Freq. (MHz) | Average Power (dBm) | Maximum Tune-up(dBm) |
|---|---|---|---|---|---|
| 2.4g Wifi (2.4~2.4835) | 802.11b | 1 | 2412 | **15.88** | **16.00** |
| | | 6 | 2437 | 14.91 | 15.00 |
| | | 11 | 2462 | 14.71 | 15.00 |
| | 802.11g | 1 | 2412 | 16.90 | 17.00 |
| | | 6 | 2437 | 18.09 | 18.50 |
| | | 11 | 2462 | 17.37 | 17.50 |
| | 802.11n(HT20) | 1 | 2412 | 16.87 | 17.00 |
| | | 6 | 2437 | **18.18** | **18.50** |
| | | 11 | 2462 | 17.29 | 17.50 |
| | 802.11n(HT40) | 3 | 2422 | 16.40 | 16.50 |
| | | 6 | 2437 | 18.17 | 18.50 |
| | | 9 | 2452 | 17.44 | 17.50 |

## 5G

| Band (GHz) | Mode | Channel | Freq. (MHz) | Average Power (dBm) | Maximum Tune-up(dBm) |
|---|---|---|---|---|---|
| U-NII-1 (5.150~5.250) | 802.11n(HT20) | 36 | 5180 | 7.92 | 8.00 |
| | | 40 | 5200 | 7.57 | 8.00 |
| | | 48 | 5240 | 6.67 | 7.00 |
| | 802.11ac(VHT20) | 36 | 5180 | 7.80 | 8.00 |
| | | 40 | 5200 | 7.64 | 8.00 |
| | | 48 | 5240 | 6.87 | 7.00 |
| | 802.11n(HT40) | 38 | 5190 | 7.90 | 8.00 |
| | | 46 | 5230 | 7.36 | 7.50 |
| | 802.11ac(VHT40) | 38 | 5190 | **8.07** | **8.50** |
| | | 46 | 5230 | 7.28 | 7.50 |
| Band (GHz) | Mode | Channel | Freq. (MHz) | Average Power (dBm) | Maximum Tune-up(dBm) |
| U-NII-3 (5.725~5.850) | 802.11n(HT20) | 149 | 5745 | 9.55 | 10.00 |
| | | 157 | 5785 | 9.05 | 9.50 |
| | | 165 | 5825 | 9.09 | 9.50 |
| | 802.11ac(VHT20) | 149 | 5745 | 9.43 | 9.50 |
| | | 157 | 5785 | 8.95 | 9.00 |
| | | 165 | 5825 | 9.18 | 9.50 |
| | 802.11n(HT40) | 151 | 5755 | **10.31** | **10.50** |
| | | 159 | 5795 | 9.78 | 10.00 |
| | 802.11ac(VHT40) | 151 | 5755 | 10.17 | 10.50 |
| | | 159 | 5795 | 9.85 | 10.00 |

# Bluetooth

| | Mode | Maximum Tune-up(dBm) | Average Conducted Output Power (dBm) | | |
|---|---|---|---|---|---|
| EDR | | | 0 | 39 | 78 |
| | | | 2402MHz | 2441MHz | 2480MHz |
| | GFSK | 2.50 | 2.46 | 1.44 | -1.28 |
| | π/4QPSK | 2.50 | 2.16 | 0.76 | -2.03 |
| | 8DPSK | 2.50 | 2.24 | 0.84 | -1.93 |
| BLE | Mode | Maximum Tune-up(dBm) | Average Conducted Output Power (dBm) | | |
| | | | 0 | 20 | 39 |
| | | | 2402MHz | 2440MHz | 2480MHz |
| | 1Mbps | **3.00** | **2.86** | 1.21 | -1.39 |

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# 8. T-Coil Test Result

**General Note:**

1.Phone Condition:Mute on; Backlight off; Max Volume

2. Codec Investigation: For a voice service/air interface,investigate the variations of codec configurations (WB, NB bit rate) and document the parameters (ABM1, ABM2, S+N/N, frequency response) for that voice service. It is only necessary to document this for one channel/band, the following worst investigation codec would be remarked to be used for the testing for the handset.

3. Air Interface Investigation:

a. Through Internal radio configuration investigation (e.g.bandwidth, modulation data rate, subcarrier spacings, and resource blocks) that the worst radio configuration was document as below table.

b. Use the worst-case codec test and document a limited set of bands/channel/bandwidths.

c. According to the ANSI C63.19-2019 section 6.3.3, using a frequency near the center of the frequency band perform T-coil evaluation.

**<GSM Evaluation Results>**

| Codec Investigation | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Codec** | **AMR NB Full Rate** | **AMR NB Full Rate** | **AMR WE Full Rate** | **AMR WE Full Rate** | **EFR NB (FR V2)** | **Orientation** | **Band/Channel** |
| **Bit rate** | **4.75 Kbps** | **12.2 Kbps** | **6.6 Kbps** | **12.65 Kbps** | **12.2Kbps** | | |
| Primary Group Contiguous Point Count | **274** | 289 | 311 | 296 | 342 | Transversal(Y) | GSM 850/190 |
| Secondary Group Contiguous Point Count | **389** | 527 | 625 | 636 | 610 | | |
| Secondary Group Max Longitudinal | 21 | 25 | 26 | 26 | 24 | | |
| Secondary Group Max Transverse | 26 | 26 | 26 | 26 | 26 | | |
| Frequency response | Pass | Pass | Pass | Pass | Pass | | |
| Note: The bold data represents the worst case. | | | | | | | |

**<WCDMA Evaluation Results>**

| Codec Investigation | | | | | | |
|---|---|---|---|---|---|---|
| **Codec** | **NR AMR** | **WB AMR** | **NR AMR** | **WB AMR** | **Orientation** | **Band/Channel** |
| **Bit rate** | **4.75 Kbps** | **6.60 Kbps** | **12.2 Kbps** | **23.85Kbps** | | |
| Primary Group Contiguous Point Count | **152** | 188 | 197 | 253 | Transversal(Y) | WCDMA Band II/9400 |
| Secondary Group Contiguous Point Count | **621** | 636 | 645 | 676 | | |
| Secondary Group Max Longitudinal | 26 | 26 | 26 | 26 | | |
| Secondary Group Max Transverse | 26 | 26 | 26 | 26 | | |
| Frequency response | Pass | Pass | Pass | Pass | | |
| Note: The bold data represents the worst case. | | | | | | |

**<VoLTE Evaluation Results>**

| Codec Investigation | | | | | | |
|---|---|---|---|---|---|---|
| **Codec** | **NR AMR** | **WB AMR** | **NR AMR** | **WB AMR** | **Orientation** | **Band/Channel** |
| **Bit rate** | **4.75 Kbps** | **6.60 Kbps** | **12.2 Kbps** | **23.85Kbps** | | |
| Primary Group Contiguous Point Count | 190 | **185** | 233 | 246 | Transversal(Y) | LTE Band 5/20525 |
| Secondary Group Contiguous Point Count | 603 | **588** | 618 | 625 | | |
| Secondary Group Max Longitudinal | 26 | 26 | 26 | 26 | | |
| Secondary Group Max Transverse | 26 | 26 | 26 | 26 | | |
| Frequency response | Pass | Pass | Pass | Pass | | |
| Note: The bold data represents the worst case. | | | | | | |

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| Air Interface Investigation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plot No. | Mode | Channel/Freq. | BW | Probe Position | Modulation /Mode | Primary Group Contiguous Point Count | Secondary Grour Contiguous Point Count | Secondary Group Max Longitudinal | Secondary Group Max Transverse | Freq. Response Variation (dB) | Ambient Noise (dB A/m) | Frequency Response |
| 1 | GSM850 | 190/836.6MHz | / | Transversal (Y) | Voice | **274** | **389** | 21 | 26 | 1.69 | -50.78 | Pass |
| 2 | PCS1900 | 661/1880.0MHz | / | Transversal (Y) | Voice | 296 | 526 | 24 | 26 | 1.85 | -50.55 | Pass |
| 3 | WCDMA Band II | 9400/1880.0MHz | / | Transversal (Y) | Voice | **152** | **621** | 26 | 26 | 1.15 | -50.42 | Pass |
| 4 | WCDMA Band IV | 1413/1732.6MHz | / | Transversal (Y) | Voice | 199 | 658 | 26 | 26 | 1.36 | -50.48 | Pass |
| 5 | WCDMA Band V | 4183/836.6MHz | / | Transversal (Y) | Voice | 262 | 672 | 26 | 26 | 1.22 | -50.21 | Pass |
| 6 | LTE FDD Band 2 | 18900/1880MHz | 20MHz_QPSK_1_50 | Transversal (Y) | Voice | 198 | 639 | 26 | 26 | 1.09 | -50.37 | Pass |
| 7 | LTE FDD Band 4 | 20175/1732.5MHz | 20MHz_QPSK_1_50 | Transversal (Y) | Voice | 230 | 676 | 26 | 26 | 1.62 | -50.40 | Pass |
| 8 | LTE FDD Band 5 | 20525/836.5MHz | 10MHz_QPSK_1_25 | Transversal (Y) | Voice | **185** | **588** | 26 | 26 | 1.26 | -50.29 | Pass |
| 9 | LTE FDD Band 12 | 23095/707.5MHz | 10MHz_QPSK_1_25 | Transversal (Y) | Voice | 255 | 676 | 26 | 26 | 1.31 | -50.28 | Pass |
| 10 | LTE FDD Band 13 | 23230/782MHz | 10MHz_QPSK_1_25 | Transversal (Y) | Voice | 241 | 670 | 26 | 26 | 1.19 | -50.23 | Pass |
| 11 | LTE FDD Band 25 | 26365/1882.5MHz | 20MHz_QPSK_1_50 | Transversal (Y) | Voice | 272 | 676 | 26 | 26 | 1.48 | -50.41 | Pass |
| 12 | LTE FDD Band 26 | 26865/831.5MHz | 15MHz_QPSK_1_38 | Transversal (Y) | Voice | 206 | 676 | 26 | 26 | 1.07 | -50.35 | Pass |
| 13 | LTE TDD Band 41 | 40620/2593MHz | 20MHz_QPSK_1_0 | Transversal (Y) | Voice | 216 | 676 | 26 | 26 | 1.27 | -50.49 | Pass |
| 14 | LTE FDD Band 66 | 132322/1745MHz | 20MHz_QPSK_1_50 | Transversal (Y) | Voice | 202 | 676 | 26 | 26 | 1.39 | -50.66 | Pass |
| 15 | LTE FDD Band 71 | 133322/683MHz | 20MHz_QPSK_1_50 | Transversal (Y) | Voice | 216 | 676 | 26 | 26 | 1.40 | -50.53 | Pass |

Remark:
1. There is special HAC mode software on this EUT.
2. The volume was adjusted to maximum level and the backlight turned off during T-Coil testing

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# 9. Test Equipment List

| Description | Manufacturer | Model | Serial No./Version | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| PC | Dell | N/A | N/A | N/A | N/A |
| Test Software | MVG | N/A | OpenHAC V5.1.3 | N/A | N/A |
| 6 1/2 Multimeter | Keithley | DMM6500 | 4527164 | 2023/11/16 | 2024/11/15 |
| Audio Card | National Instruments | NI PCI-4461 | 01C4B4EB | N/A | N/A |
| WIDEBAND RADIO COMMUNICATION T ESTER | ROHDE&SCHWARZ | CMW500 | 161997 | 2023/11/16 | 2024/11/15 |
| COMOHAC T-Coil Probe | MVG | STCOIL | 07/17 TCP38 | 2024/02/06 | 2025/02/05 |
| TMFS | MVG | STMFS | SN 13/22 TMFS30 | N/A | N/A |
| Antenna network emulator | MVG | ANTA 74 | 07/22 ANTA 74 | / | / |

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# ANNEX A Test Data

## Measurement at GSM850

Date of measurement: 28/02/2024

## Experimental Conditions

| | |
|---|---|
| Probe | SN_0717_TCP38 |
| Signal | GSM |
| Band | GSM850 |
| Channels | Middle |
| Channels Number | 190 |
| Frequency (MHz) | 836.60 |

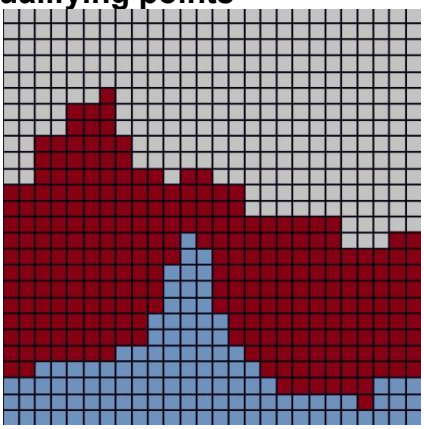
## Results

| | |
|---|---|
| Device compliant | Yes |
| Measurement status | Complete |

## Requirement verification

| C63.19 | Mode | Band | Test Description | Minimum limit | Measured | Verdict |
|---|---|---|---|---|---|---|
| 7.3.1.1 | GSM | GSM850 | Primary group size | 25 | 274 | PASS |
| 7.3.1.2 | | | Secondary group size | 125 | 389 | PASS |
| 7.3.1.3 | | | Secondary Group Max Longitudinal | - | 21 | PASS |
| 7.3.1.4 | | | Secondary Group Max Transverse | - | 26 | PASS |
| 7.3.2 | | | Frequency response inside boundaries | - | 1.69 | PASS |

## Qualifying points



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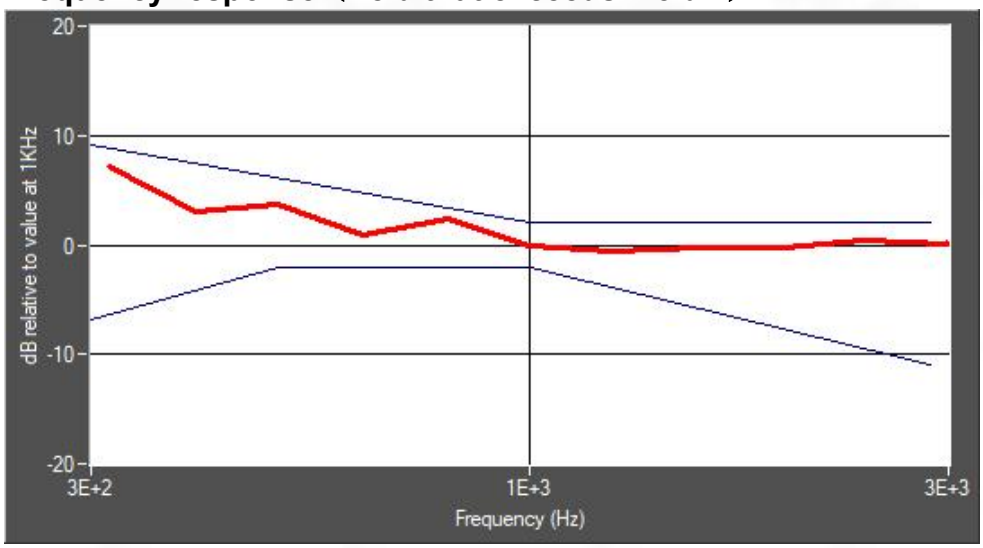
## Frequency response（field that exceeds -15 dB）



## Measurement at WCDMA Band 2 (1900)

Date of measurement: 29/2/2024

## Experimental Conditions

| | |
|---|---|
| Probe | SN_0717_TCP38 |
| Signal | W-CDMA |
| Band | Band 2 (1900) |
| Channels | Middle |
| Channels Number | 9400 |
| Frequency (MHz) | 1880.0 |

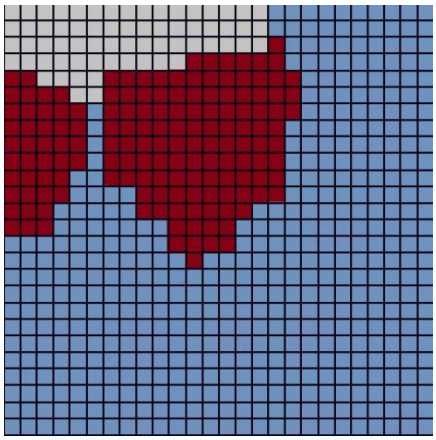
## Results

| | |
|---|---|
| Device compliant | Yes |
| Measurement status | Complete |

## Requirement verification

| C63.19 | Mode | Band | Test Description | Minimum limit | Measured | Verdict |
|---|---|---|---|---|---|---|
| 7.3.1.1 | WCDMA | Band2_WCDMA1900 | Primary group size | 75 | 152 | PASS |
| 7.3.1.2 | | | Secondary group size | 300 | 621 | PASS |
| 7.3.1.3 | | | Secondary Group Max Longitudinal | 10 | 26 | PASS |
| 7.3.1.4 | | | Secondary Group Max Transverse | 15 | 26 | PASS |
| 7.3.2 | | | Frequency response inside boundaries | - | 1.15 | PASS |

## Qualifying points



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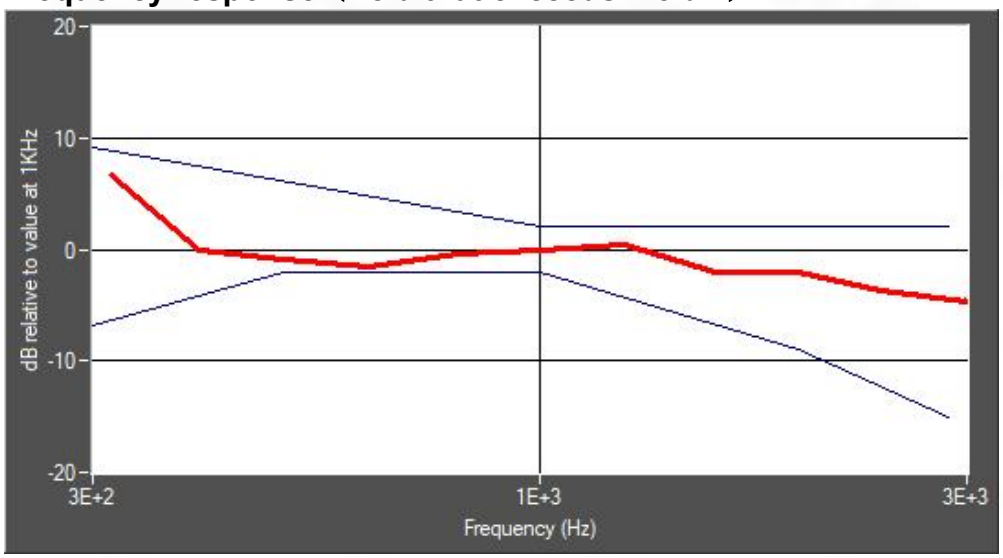
## Frequency response（field that exceeds -15 dB）



## Measurement at LTE Band 5

Date of measurement: 1/3/2024

## Experimental Conditions

| | |
|---|---|
| Probe | SN_0717_TCP38 |
| Signal | LTE FDD |
| Band | LTE band 5 |
| Channels | Middle |
| Channels Number | 20525 |
| Frequency (MHz) | 836.5 |

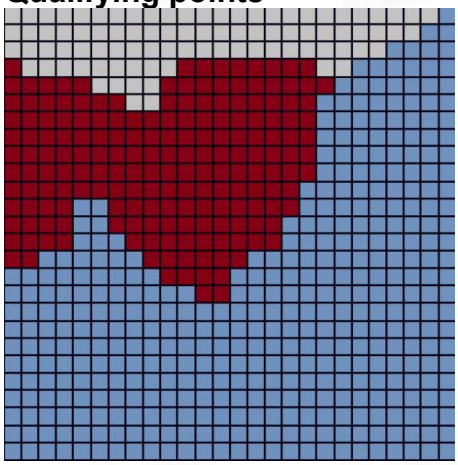
## Results

| | |
|---|---|
| Device compliant | Yes |
| Measurement status | Complete |

## Requirement verification

| C63.19 | Mode | Band | Test Description | Minimum limit | Measured | Verdict |
|---|---|---|---|---|---|---|
| 7.3.1.1 | LTE | LTE FDD band 5 | Primary group size | 75 | 185 | PASS |
| 7.3.1.2 | | | Secondary group size | 300 | 588 | PASS |
| 7.3.1.3 | | | Secondary Group Max Longitudinal | 10 | 26 | PASS |
| 7.3.1.4 | | | Secondary Group Max Transverse | 15 | 26 | PASS |
| 7.3.2 | | | Frequency response inside boundaries | - | 1.26 | PASS |

## Qualifying points



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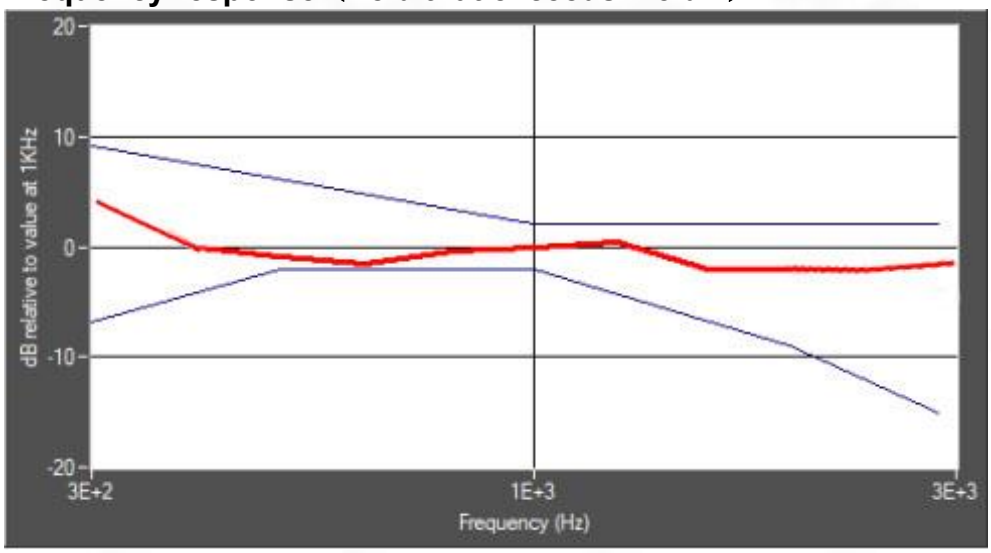
## Frequency response（field that exceeds -15 dB）



# ANNEX B Test Setup Photo

| Reference Photo |
| --- |
| |

# ANNEX C EUT External & Internal Photos

Please refer to RF Report.

# ANNEX D Calibration Information

Please refer to the document “Calibration.pdf”.

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**--END OF REPORT--**

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