HAC T-Coil Test Report

For

Applicant Name:	**Xwireless LLC**
Address:	11565 Old Georgetown Road, Rockville, MD, USA
EUT Name:	Mobile Phone
Model Number:	HD65

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:	BTF230413R01402
Test Standards:	ANSI C63.19-2011 FCC 47 CFR §20.19 KDB 285076 D01v06 KDB 285076 D02v04 KDB 285076 D03v01r05
FCC ID:	2ADLJ-HD65
Test Conclusion:	Pass
Test Date:	2023-05-10 to 2023-05-12
Date of Issue:	2023-05-15
Prepared By:	Monica Zhou / Project Engineer
Date:	2023-05-15
Approved By:	Ryan.CJ / EMC Manager
Date:	2023-05-15

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Revision History		
Version	Issue Date	Revisions Content
R_V0	2023-05-15	Original
Note:	*Once the revision has been made, then previous versions reports are invalid.*	

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BTF Testing Lab (Shenzhen) Co., Ltd.
F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

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.

(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

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:	ZTECH COMMNICATION(SZ) CO LTD
Address:	FL 7 BLOCK D BAO'AN ZHIGU INNOVATION PARK YIN'TIAN ROAD NO.4 XI'XIANG STR' BAO'AN DISTRICT SZ CHINA

2.4 General Description of Equipment under Test (EUT)

EUT Name	Mobile Phone
Under Test Model Name	HD65
Sample No.	BTFSN230413E008-1/1

2.5 Equipment under Test Ancillary Equipment

Ancillary Equipment 1	Rechargeable Battery	
	Capacity	4000mAh
	Rated Voltage	4.45V

2.6 Technical Information

Network and Wireless connectivity	2G Network GSM/GPRS 850/1900 3G Network WCDMA/HSDPA/HSUPA Band 2/4/5 4G Network FDD LTE Band 2/4/5/12/13/25/26/66/71 TDD LTE Band 41 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/HT40) 5G WIFI 802.11a, 802.11n(HT20/HT40), 802.11ac(VHT20/VHT40/VHT80) BT (EDR+BLE)

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2.7 Air Interfaces / Bands Indicating Operating Modes

Air Interface	Band	Type	Simultaneous Transmitter	Name of Service
GSM	850	VO	WLAN & BT	CMRS Voice
	1900	VO	WLAN & BT	CMRS Voice
	GPRS/EGPRS	DT	N/A	N/A
WCDMA	Band II	VO	WLAN & BT	CMRS Voice
	Band IV	VO	WLAN & BT	CMRS Voice
	Band V	VO	WLAN & BT	CMRS Voice
	HSPA	DT	N/A	N/A
LTE	Band 2	VD	WLAN & BT	VoLTE
	Band 4	VD	WLAN & BT	VoLTE
	Band 5	VD	WLAN & BT	VoLTE
	Band 12	VD	WLAN & BT	VoLTE
	Band 13	VD	WLAN & BT	VoLTE
	Band 25	VD	WLAN & BT	VoLTE
	Band 26	VD	WLAN & BT	VoLTE
	Band 41	VD	WLAN & BT	VoLTE
	Band 66	VD	WLAN & BT	VoLTE
	Band 71	VD	WLAN & BT	VoLTE
WLAN	2.4g & 5g	DT	WWAN	N/A
BT	2450	DT	WWAN	N/A

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

* HAC Rating was not based on concurrent voice and data modes; Noncurrent mode was found to represent worst case rating for both M and T rating.

3. Summary of Test Results

3.1 Test Standards

No.	Identity	Document Title
1	ANSI C63.19-2011	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 D01v06	Equipment Authorization Guidance for Hearing Aid Compatibility
4	KDB 285076 D02v04	Guidance for performing T-Coil tests for air interfaces supporting voice over IP (e.g., LTE and WiFi) to support CMRS based telephone services
5	KDB 285076 D03v01r05	Hearing aid compatibility frequently asked questions

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3.2 Attestation of Testing Summary

Frequency Band	T-rating
GSM 850	T4
GSM 1900	T3
WCDMA II	T4
WCDMA IV	T4
WCDMA V	T4
LTE Band 2	T3
LTE Band 4	T4
LTE Band 5	T4
LTE Band 12	T3
LTE Band 13	T4
LTE Band 25	T4
LTE Band 26	T4
LTE Band 41	T4
LTE Band 66	T4
LTE Band 71	T4
HAC Rate Category: T3	

Notes：

1. It is compliance with HAC limits for this device that specified in FCC 47 CFR Part 20.19 and ANSI C63.19.
2. When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

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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

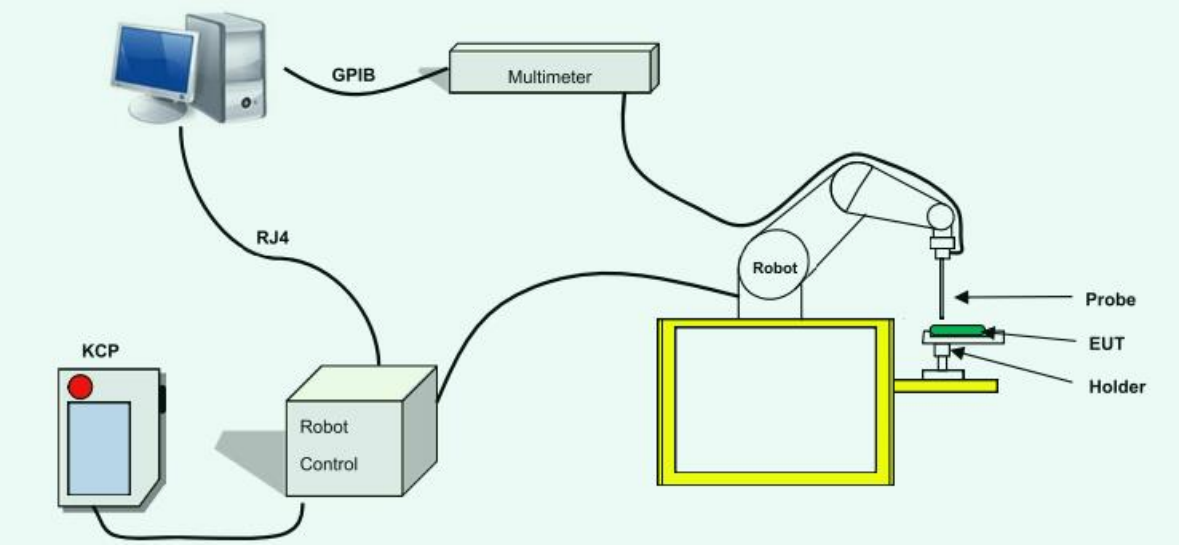
Corresponding to the WD measurements, the hearing aid is measured for:

a) RF immunity in microphone mode

b) RF immunity in T-coil mode

5.2 MVG HAC System

MVG HAC System Diagram



5.2.1 Robot

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

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.

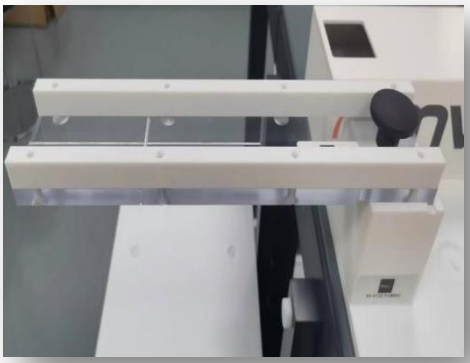
5.2.3 TMFS

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.

5.3 T-Coil Measurement Set-up

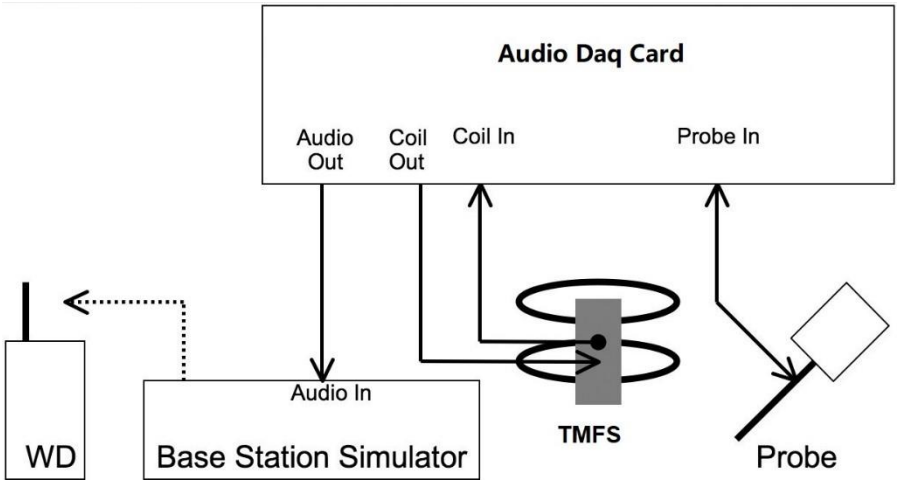


Fig. 2. T-coil signal measurement test setup

The sequence of the measurement is T-Coil testing procedure over a wireless communication device:

1. Confirm Geometry & signal check. Probe phantom alignment and check of accuracy.
2. Background noise measurement in the area of the WD.
3. Perform 50x50mm area scan with narrow band signal to determine ABM1, ABM2 and SNR for axial and radial orientation positions.
4. For Axial position, perform optimal SNR point measurement with a broadband signal – determine Frequency Response
5. Define the all applicable input audio level according to ANSI C63.19-2011 and KDB 285076 D02v03.

Note：

#. The EUT do not use the special HAC SW.

#. Setting the maximum volume for EUT during the measurement.

#. For the measurement, it don't use the "post-test measurement processing of results".

#. Per KDB 285076 D01v05, handsets that that have the ability to support concurrent connections using simultaneous transmissions shall be independently tested for each air interface/band given in ANSI C63.19-2011. At the present time ANSI C63.19 does not provide simultaneous transmission test procedures.

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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

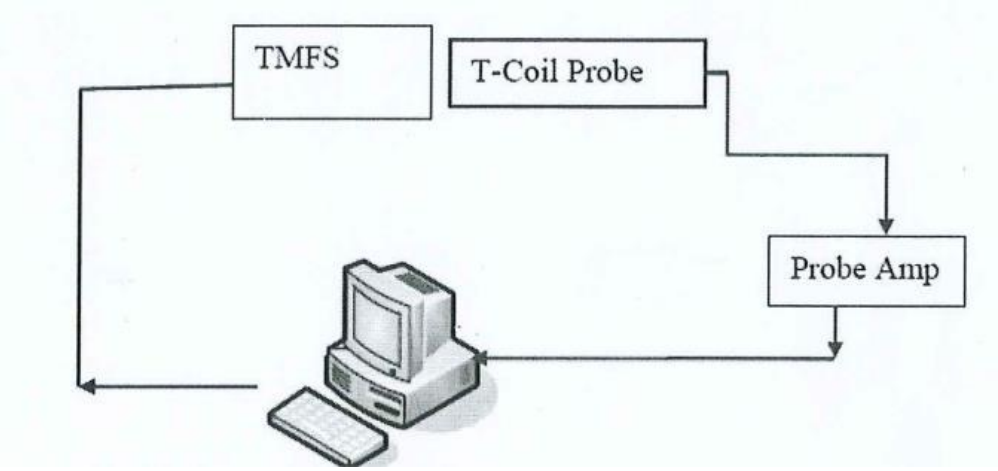
b) Audio output power to TMFS: 1025Hz, 500mV.

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.



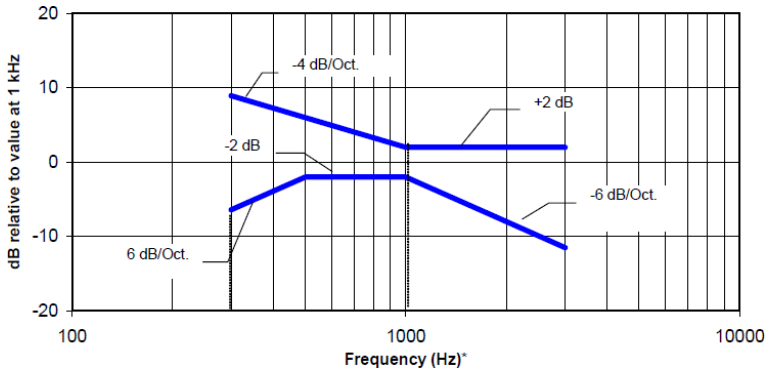
6. HAC (T-Coil) Measurement

6.1 T-Coil Performance Requirements

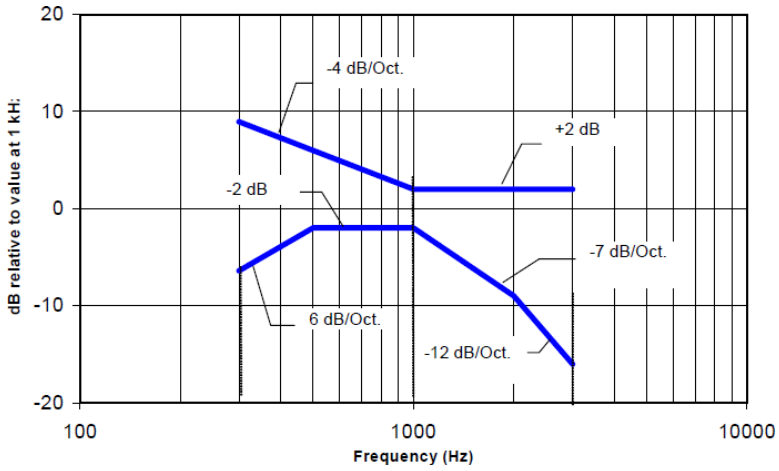
In order to be rated for T-Coil use, a WD shall meet the requirements for signal level and signal quality contained in this part.

1) T-Coil coupling field intensity
When measured as specified in ANSI C63.19, the T-Coil signal shall be ≥ –18 dB (A/m) at 1 kHz, in a 1/3 octave band filter for all orientations.

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) Signal quality

This part provides the signal quality requirement for the intended T-Coil signal from a WD. Only the RF immunity of the hearing aid is measured in T-Coil mode. It is assumed that a hearing aid can have no immunity to an interference signal in the audio band, which is the intended reception band for this mode. So, the only criteria that can be measured is the RF immunity in T-Coil mode. This is measured using the same procedure as for the audio coupling mode and at the same levels.

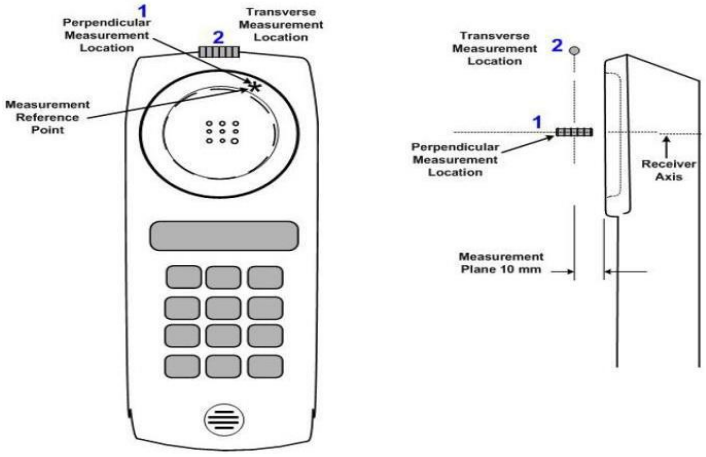
The worst signal quality of the three T-Coil signal measurements shall be used to determine the T-Coil mode category per Table 3

Category	Telephone parameters WD signal quality [(signal + noise) – to – noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Table 3： T-Coil signal quality categories

6.2 T-Coil measurement points and reference plane

Figure 3 illustrate the references and reference plane that shall be used in a typical EUT emissions measurement. The principle of this section is applied to EUT with similar geometry. Please refer to Appendix C for the setup photographs.
The area is 5 cm by 5 cm.
The area is centered on the audio frequency output transducer of the EUT.
The area is in a reference plane, which is defined as the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of
the receiver area of the phone and is defined by the points of the receiver-end of the EUT handset, which, in normal handset use, rest against the ear.
The measurement plane is parallel to, and 10 mm in front of, the reference plane.



Axis and planes for WD audio frequency magnetic field measurements

6.3 T-Coil Measurement Procedure

According to ANSI C63.19-2011, section 7.4:
This section describes the procedures used to measure the ABM (T-Coil) performance of the WD. In addition to measuring the absolute signal levels, the A-weighted magnitude of the unintended signal shall also be determined. To assure that the required signal quality is measured, the measurement of the intended signal and the measurement of the unintended signal must be made at the same location for each measurement position. In addition, the RF field strength at each measurement location must be at or below that required for the assigned category.
Measurements shall not include undesired properties from the WD's RF field; therefore, use of a coaxial connection to a base station simulator or nonradiating load might be necessary. However, even with a coaxial connection to a base station simulator or nonradiating load, there might still be RF leakage from the WD, which can interfere with the desired measurement. Premeasurement checks should be made to avoid this possibility. All measurements shall be performed with the WD operating on battery power with an appropriate normal speech audio signal input level given in ANSI C63.19-2011 Table 7.1. If the device display can be turned off during a phone call, then that may be done during the measurement as well.
Measurements shall be performed at two locations specified in ANSI C63.19-2011 A.3, with the correct probe orientation for a particular location, in a multistage sequence by first measuring the field intensity of the desired T-Coil signal (ABM1) that is useful to a hearing aid T-Coil. The undesired magnetic components (ABM2) shall be examined for each probe orientation to determine the possible effects from the WD display and battery current paths that might disrupt the desired T-Coil signal. The undesired magnetic signal (ABM2) must be measured at the same location as the desired ABM or T-Coil signal (ABM1), and the ratio of desired to undesired ABM signals must be calculated. For the perpendicular field location, only the ABM1 frequency response shall be determined in a third measurement stage.
The following steps summarize the basic test flow for determining ABM1 and ABM2. These steps assume that a sine-wave or narrowband 1/3 octave signal can be used for the measurement of ABM1.

a) A validation of the test setup and instrumentation may be performed using a TMFS or Helmholtz coil. Measure the emissions and confirm that they are within the specified tolerance.
b) Position the WD in the test setup and connect the WD RF connector to a base station simulator or a nonradiating load as shown in ANSI C63.19-2011 Figure 7.1 or Figure 7.2. Confirm that the equipment that requires calibration has been calibrated and that the noise level meets the requirements of ANSI C63.19-2011 clause 7.3.1.
c) The drive level to the WD is set such that the reference input level specified in ANSI C63.19-2011 Table 7.1 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 (ABM1) 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 defined in C63.19-2011 clause 7.4.2, 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.47 The same drive level shall be used for the ABM1 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.
d) Determine the magnetic measurement locations for the WD device (A.3), if not already specified by the manufacturer, as described in C63.19-2011 clause 7.4.4.1.1 and 7.4.4.2.
e) At each measurement location, measure and record the desired T-Coil magnetic signals (ABM1 at fi) as specified in C63.19-2011 clause 7.4.4.2 in each ISO 266-1975 R10 standard 1/3 octave band. The desired audio band input frequency (fi) shall be centered in each 1/3 octave band maintaining the same drive level as determined in item c) and the reading taken for that band.
f) 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 specified 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.)

g) All measurements of the desired signal shall be shown to be of the desired signal and not of an undesired signal. This may be shown by turning the desired signal ON and OFF with the probe measuring the same location. If the scanning method is used, the scans shall show that all measurement points selected for the ABM1 measurement meet the ambient and test system noise criteria in C63.19-2011 clause 7.3.1.

h) At the measurement location for each orientation, measure and record the undesired broadband audio magnetic signal (ABM2) as specified in C63.19-2011 clause 7.4.4.4 with no audio signal applied (or digital zero applied, if appropriate) using A-weighting49 and the half-band integrator. Calculate the ratio of the desired to undesired signal strength (i.e., signal quality).

i) Determine the category that properly classifies the signal quality, based on C63.19-2011 Table 8.5.

7. Max. Conducted RF Output Power

2G

GSM850	Maximum Tune-up (dBm)	Burst Average Power (dBm)		
		CH128	CH190	CH251
		824.2MHz	836.6MHz	848.8MHz
GSM	**32.00**	31.65	**31.85**	31.80
GSM1900	**Maximum Tune-up (dBm)**	**Burst Average Power (dBm)**		
		CH512	CH661	CH810
		1850.2MHz	1880.0MHz	1909.8MHz
GSM	**30.50**	**30.20**	29.86	29.43

3G

Mode	Maximum Tune-up (dBm)	WCDMA Band II		
		Conducted Power (dBm)		
		CH9262	CH9400	CH9538
		1852.4MHz	1880.0MHz	1907.6MHz
RMC 12.2K	**22.50**	**22.26**	21.89	21.74
Mode	Maximum Tune-up (dBm)	WCDMA Band IV		
		Conducted Power (dBm)		
		CH1312	CH1450	CH1513
		1712.4MHz	1740.0MHz	1752.6MHz
RMC 12.2K	**23.00**	22.42	**22.50**	22.41
Mode	Maximum Tune-up (dBm)	WCDMA Band V		
		Conducted Power (dBm)		
		CH4132	CH4182	CH4233
		826.4MHz	836.4MHz	846.6MHz
RMC 12.2K	**22.50**	22.12	22.13	**22.16**

4G

LTE-FDD Band 2				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		18700	18900	19100
					1860.0MHz	1880.0MHz	1900.0MHz
20MHz	QPSK	1	0	22.00	21.88	21.60	21.37
			50	**22.50**	**22.32**	21.91	21.74
			99	22.00	21.60	21.39	21.22
		50	0	21.50	**21.39**	20.65	20.96
			25	21.50	21.11	20.79	20.68
			50	21.00	20.83	20.87	20.89
		100	0	21.50	21.15	20.78	20.91
	16QAM	1	0	21.50	21.19	20.79	20.97
			50	21.50	21.49	21.08	21.26
			99	21.00	20.92	20.66	20.83
		50	0	20.50	20.47	19.66	20.02
			25	20.50	20.17	19.85	19.71
			50	20.00	19.87	19.89	19.89
		100	0	20.50	20.30	19.78	19.97

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LTE-FDD Band 4				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		20050	20175	20300
					1720.0MHz	1732.5MHz	1745.0MHz
20MHz	QPSK	1	0	22.50	22.41	22.43	22.34
			50	**23.00**	**22.87**	22.84	22.78
			99	22.50	22.42	22.39	22.31
		50	0	22.00	21.58	21.87	21.85
			25	22.00	**21.75**	21.78	21.72
			50	22.00	21.74	21.56	21.62
		100	0	22.00	21.66	21.69	21.73
	16QAM	1	0	22.00	21.75	21.68	21.96
			50	22.50	22.17	22.07	22.37
			99	22.00	21.76	21.61	21.85
		50	0	21.00	20.67	20.94	20.94
			25	21.00	20.83	20.80	20.79
			50	21.00	20.81	20.63	20.67
		100	0	21.00	20.75	20.75	20.82

LTE-FDD Band 5				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		20450	20525	20600
					829.0MHz	836.5MHz	844.0MHz
10MHz	QPSK	1	0	22.50	21.98	22.08	21.98
			25	**22.50**	22.23	22.21	**22.24**
			49	22.50	22.04	21.94	21.87
		25	0	21.50	21.11	21.27	21.03
			13	21.50	21.18	21.14	**21.09**
			25	21.50	21.15	21.05	20.84
		50	0	21.50	21.15	21.13	20.94
	16QAM	1	0	22.00	21.60	21.22	21.02
			25	22.00	21.81	21.43	21.25
			49	22.00	21.63	21.14	20.90
		25	0	20.50	20.20	20.30	20.15
			13	20.50	20.28	20.19	20.22
			25	20.50	20.24	20.10	20.01
		50	0	20.50	20.19	20.15	19.95

LTE-FDD Band 12				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		23060	23095	23130
					704.0MHz	707.5MHz	711.0MHz
10MHz	QPSK	1	0	22.00	21.82	21.90	21.99
			25	**22.50**	22.10	22.19	**22.20**
			49	22.50	21.93	21.97	22.05
		25	0	21.50	20.97	20.89	**21.22**
			13	21.50	21.06	21.05	21.10
			25	21.50	21.12	20.84	21.12
		50	0	21.50	21.06	20.80	21.18
	16QAM	1	0	21.50	21.44	21.10	20.96
			25	22.00	21.74	21.35	21.21
			49	22.00	21.51	21.14	21.04
		25	0	20.50	20.09	19.94	20.36
			13	20.50	20.17	20.12	20.20
			25	20.50	20.22	19.86	20.24
		50	0	20.50	20.10	19.92	20.26

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LTE-FDD Band 13				Maximum Tune-up(dBm)	Conducted Power(dBm)
Bandwidth	Modulation	RB allocation	RB offset		23230
					782.0MHz
10MHz	QPSK	1	0	23.00	22.62
			25	**23.00**	**22.73**
			49	22.50	22.44
		25	0	**22.00**	**21.81**
			13	22.00	21.69
			25	22.00	21.61
		50	0	22.00	21.73
	16QAM	1	0	22.50	22.03
			25	22.50	22.36
			49	22.00	21.99
		25	0	21.00	20.92
			13	21.00	20.78
			25	21.00	20.73
		50	0	21.00	20.78

LTE-FDD Band 25				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		26140	26365	26590
					1860.0MHz	1882.5MHz	1905.0MHz
20MHz	QPSK	1	0	22.00	21.99	21.72	21.53
			50	**22.50**	**22.33**	22.10	21.92
			99	22.00	21.72	21.62	21.41
		50	0	22.00	**21.58**	20.78	20.73
			25	21.50	21.21	20.97	20.78
			50	21.00	20.95	20.87	20.63
		100	0	21.50	21.33	20.80	20.71
	16QAM	1	0	21.50	21.32	20.86	21.10
			50	22.00	21.66	21.27	21.37
			99	21.50	21.01	20.87	21.04
		50	0	21.00	20.56	19.81	19.79
			25	20.50	20.32	20.01	19.81
			50	20.00	19.99	19.99	19.67
		100	0	20.50	20.41	19.87	19.79

LTE-FDD Band 26				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	21.99	22.12	22.07
			38	**22.50**	22.23	**22.36**	22.16
			74	22.50	22.11	22.01	21.94
		36	0	21.50	21.25	21.25	21.28
			18	21.50	21.29	**21.34**	21.24
			39	21.50	21.35	21.21	21.12
		75	0	21.50	21.26	21.24	21.19
	16QAM	1	0	22.00	21.64	21.36	21.56
			38	22.00	21.90	21.48	21.53
			74	22.00	21.67	21.23	21.37
		36	0	20.50	20.23	20.33	20.26
			18	20.50	20.35	20.39	20.20
			39	20.50	20.36	20.27	20.15
		75	0	20.50	20.30	20.27	20.22

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LTE-TDD Band 41				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		39750	40620	41490
					2506.0MHz	2593.0MHz	2680.0MHz
20MHz	QPSK	1	0	24.00	22.61	23.62	23.78
			50	24.00	22.72	23.90	23.71
			99	**24.00**	22.63	**23.93**	23.36
		50	0	23.00	21.58	22.79	22.95
			25	23.00	21.69	22.91	22.93
			50	23.00	21.71	**22.94**	22.71
		100	0	23.00	21.62	22.86	22.77
	16QAM	1	0	23.00	21.62	22.27	22.97
			50	23.00	21.60	22.89	22.89
			99	23.00	21.82	22.81	22.16
		50	0	22.00	20.55	21.75	21.85
			25	22.00	20.65	21.94	21.80
			50	22.00	20.66	21.85	21.65
		100	0	22.00	20.61	21.84	21.73

LTE-FDD Band 66				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		132072	132322	132572
					1720.0MHz	1745.0MHz	1770.0MHz
20MHz	QPSK	1	0	23.00	22.86	22.88	22.66
			50	**23.50**	**23.32**	23.28	23.12
			99	23.00	22.85	22.76	22.53
		50	0	22.50	22.06	22.32	21.87
			25	22.50	22.20	22.19	21.98
			50	22.50	**22.25**	22.04	22.02
		100	0	22.50	22.13	22.21	21.96
	16QAM	1	0	22.50	22.18	22.16	22.16
			50	23.00	22.64	22.50	22.50
			99	22.50	22.23	21.99	22.09
		50	0	21.50	21.10	21.39	20.89
			25	21.50	21.25	21.25	20.92
			50	21.50	21.32	21.10	20.99
		100	0	21.50	21.16	21.27	20.98

LTE-FDD Band 71				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		133222	133322	133372
					673.0MHz	683.0MHz	688.0MHz
20MHz	QPSK	1	0	22.00	21.68	21.48	21.53
			50	**22.50**	**22.16**	21.81	21.96
			99	22.00	21.75	21.65	21.87
		50	0	21.50	20.72	21.30	20.92
			25	21.00	**20.97**	20.86	20.89
			50	21.50	20.96	21.18	21.14
		100	0	21.50	20.85	21.13	20.99
	16QAM	1	0	21.00	20.39	20.37	20.56
			50	21.50	20.87	20.91	21.01
			99	21.00	20.71	20.78	20.93
		50	0	20.50	19.60	20.24	19.92
			25	20.00	19.86	19.95	19.95
			50	20.50	19.88	20.30	20.17
		100	0	20.50	19.81	20.20	20.02

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8. T-Coil Test Result

Plot No.	Mode	Channel/Freq.	Probe Position	ABM1 (dB A/m)	ABM2 (dB A/m)	SNR (dB)	T Rating
1	GSM850	190/836.6MHz	Axial(Z)	-4.66	-38.94	34.28	T4
			Transversal(Y)	-2.55	-33.6	31.05	T4
2	PCS1900	512/1850.2MHz	Axial(Z)	-4.49	-32.05	27.56	T3
			Transversal(Y)	-2.84	-35.89	33.05	T4
3	WCDMA Band II	9262/1852.4MHz	Axial(Z)	-4.25	-40.01	35.76	T4
			Transversal(Y)	-2.86	-34.82	31.96	T4
4	WCDMA Band IV	1450/1740.0MHz	Axial(Z)	-3.23	-34.41	31.18	T4
			Transversal(Y)	-3.04	-35.13	32.09	T4
5	WCDMA Band V	4233/846.6MHz	Axial(Z)	-3.25	-35.47	32.22	T4
			Transversal(Y)	-2.82	-36.02	33.20	T4
6	LTE FDD Band 2	18700/1860.0MHz	Axial(Z)	-4.10	-34.39	30.29	T4
			Transversal(Y)	-3.30	-34.93	31.63	T4
7	LTE FDD Band 4	20050/1720.0MHz	Axial(Z)	-4.26	-34.35	30.09	T4
			Transversal(Y)	-3.21	-34.48	31.27	T4
8	LTE FDD Band 5	20600/844.0MHz	Axial(Z)	-4.91	-38.12	33.21	T4
			Transversal(Y)	-3.74	-37.77	34.03	T4
9	LTE FDD Band 12	23130/711.0MHz	Axial(Z)	-4.52	-31.29	26.77	T3
			Transversal(Y)	-2.46	-35.09	32.63	T4
10	LTE FDD Band 13	23230/782.0MHz	Axial(Z)	-4.36	-39.03	34.67	T4
			Transversal(Y)	-2.23	-33.75	31.52	T4
11	LTE FDD Band 25	26140/1860.0MHz	Axial(Z)	-3.99	-39.13	35.14	T4
			Transversal(Y)	-2.13	-40.20	38.07	T4
12	LTE FDD Band 26	26865/831.5MHz	Axial(Z)	-4.65	-38.91	34.26	T4
			Transversal(Y)	-2.52	-33.63	31.11	T4
13	LTE FDD Band 41	40620/2593.0MHz	Axial(Z)	-4.17	-39.08	34.91	T4
			Transversal(Y)	-2.31	-40.15	37.84	T4
14	LTE FDD Band 66	132072/1720.0MHz	Axial(Z)	-4.57	-38.89	34.32	T4
			Transversal(Y)	-2.71	-39.96	37.25	T4
15	LTE FDD Band 71	133222/673.0MHz	Axial(Z)	-4.00	-39.85	35.85	T4
			Transversal(Y)	-1.87	-34.57	32.70	T4

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

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	2022/11/24	2023/11/23
Audio Card	National Instruments	NI PCI-4461	01C4B4EB	N/A	N/A
WIDEBAND RADIO COMMUNICATION TESTER	ROHDE&SCHWARZ	CMW500	161997	2022/11/24	2023/11/23
COMOHAC T-Coil Probe	MVG	STCOIL	07/17 TCP38	2023/02/06	2024/02/05
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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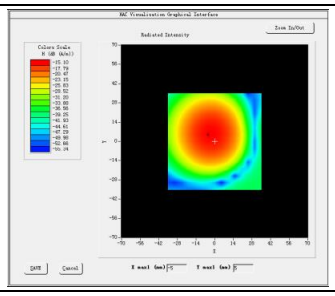
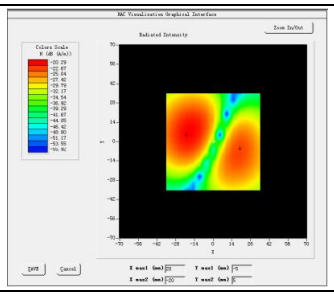
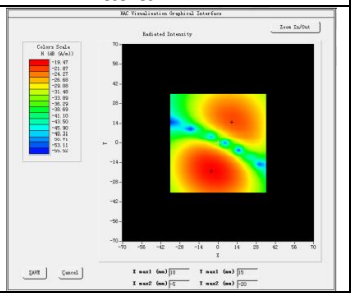
ANNEX A System Validation Result

Input Level (mV)	Axial Description	Location	Magnetic Field(dBA/m)
500	Axial	Max	-15.22
	Radial H	Right	-22.32
		Left	-20.21
	Radial V	Upper	-22.50
		Lower	-19.66
Note: The tolerance limit of System validation ±25%			

Note: Target value was referring to the Measurement value in the calibration certificate of reference TMFS.

	Axial ABM1	Radial H ABM1	Radial V ABM1
Test plots			

ANNEX B Test Data

Measurement at GSM850

Date of measurement: 11/5/2023

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 (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	GSM	GSM 850	Intensity, Axial	-18	Max	-4.66	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.55	-	PASS
				-18	Left side	13.15	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	11.96	-	PASS
				-18	Lower side	8.36	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	34.28	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	31.05	T4	PASS
				20	Left side	53.66	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	49.61	T4	PASS
				20	Lower side	47.59	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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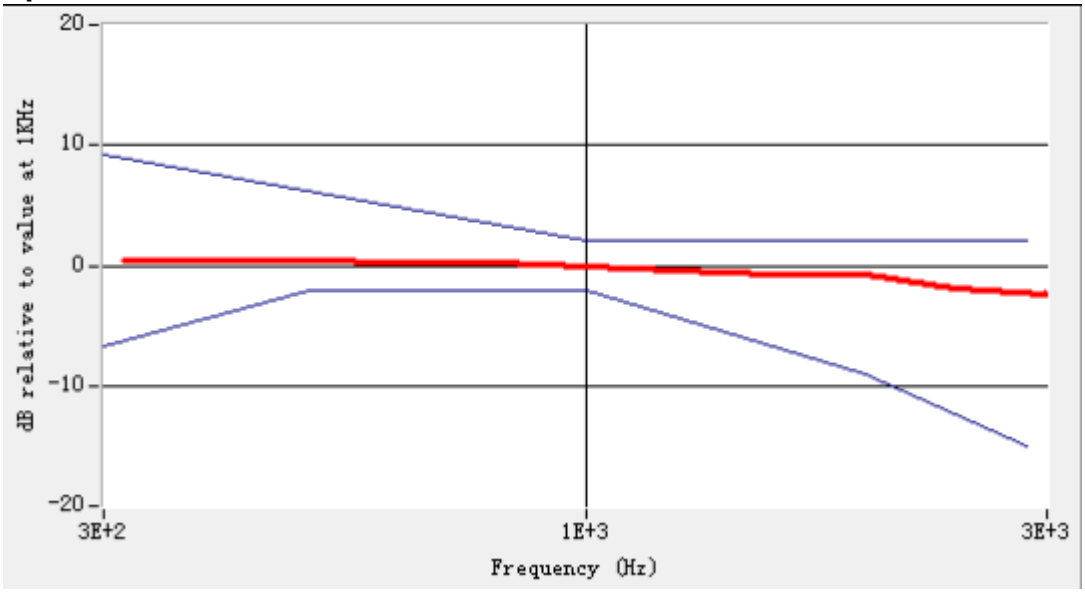
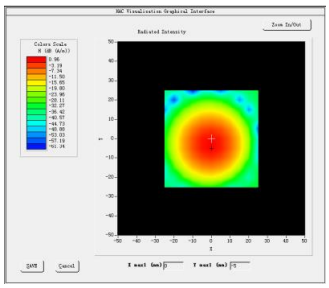
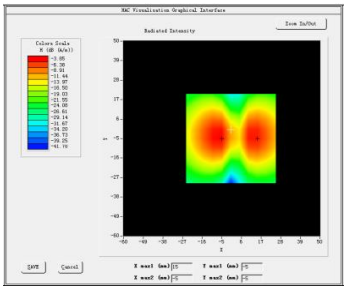
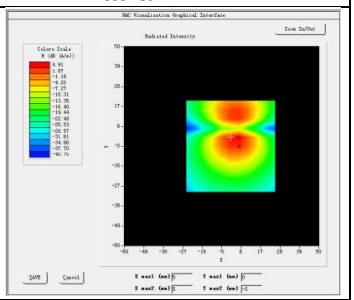
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.66	13.15	-2.55	11.96	8.36
ABM2 dB(A/m)	-38.94	-40.51	-33.60	-37.65	-39.23
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	34.28	53.66	31.05	49.61	47.59
S+N/N per orientation (dB)	34.28	31.05		47.59	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at GSM1900

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	GSM
Band	GSM1900
Channels	Low
Channels Number	512
Frequency (MHz)	1850.20

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	GSM	GSM 1900	Intensity, Axial	-18	Max	-4.49	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.84	-	PASS
				-18	Left side	15.5	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	15.47	-	PASS
				-18	Lower side	14.10	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	27.56	T3	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	33.05	T4	PASS
				20	Left side	52.66	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	53.49	T4	PASS
				20	Lower side	51.68	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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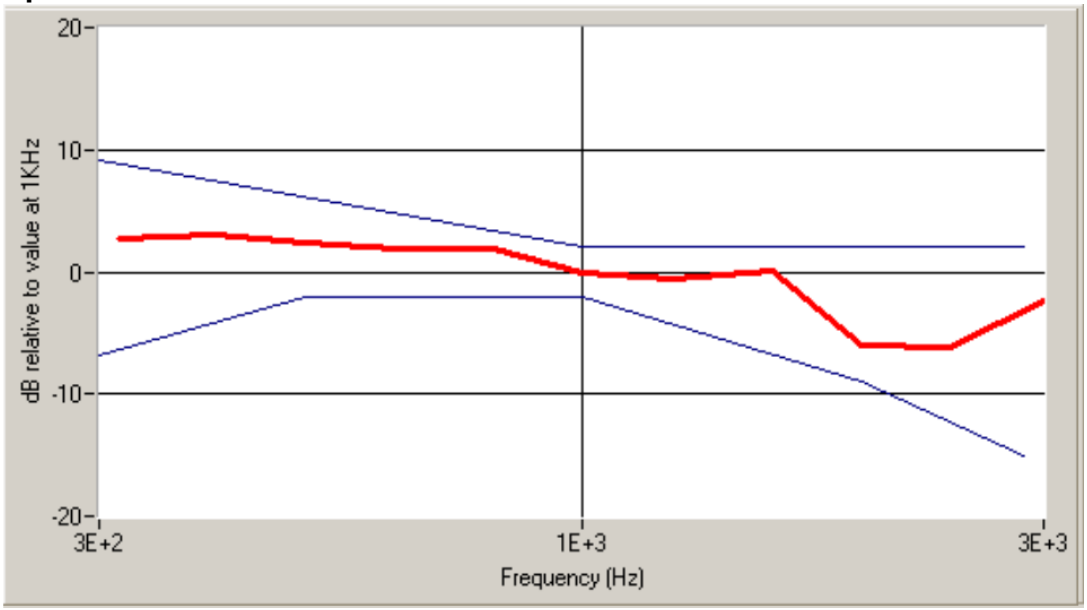
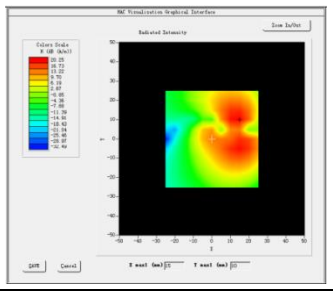
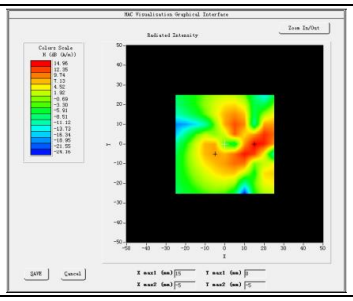
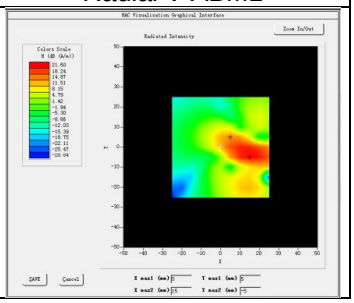
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.49	15.50	-2.84	15.47	14.10
ABM2 dB(A/m)	-32.05	-37.16	-35.89	-38.02	-37.58
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	27.56	52.66	33.05	53.49	51.68
S+N/N per orientation (dB)	27.56	33.05		51.68	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at WCDMA Band 2 (1900)

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	W-CDMA
Band	Band 2 (1900)
Channels	Low
Channels Number	9262
Frequency (MHz)	1852.40

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	WCDMA	Band 2_WCDMA1900	Intensity, Axial	-18	Max	-4.25	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.86	-	PASS
				-18	Left side	11.19	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	12.11	-	PASS
				-18	Lower side	13.00	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	35.76	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	31.96	T4	PASS
				20	Left side	52.26	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	52.84	T4	PASS
				20	Lower side	53.38	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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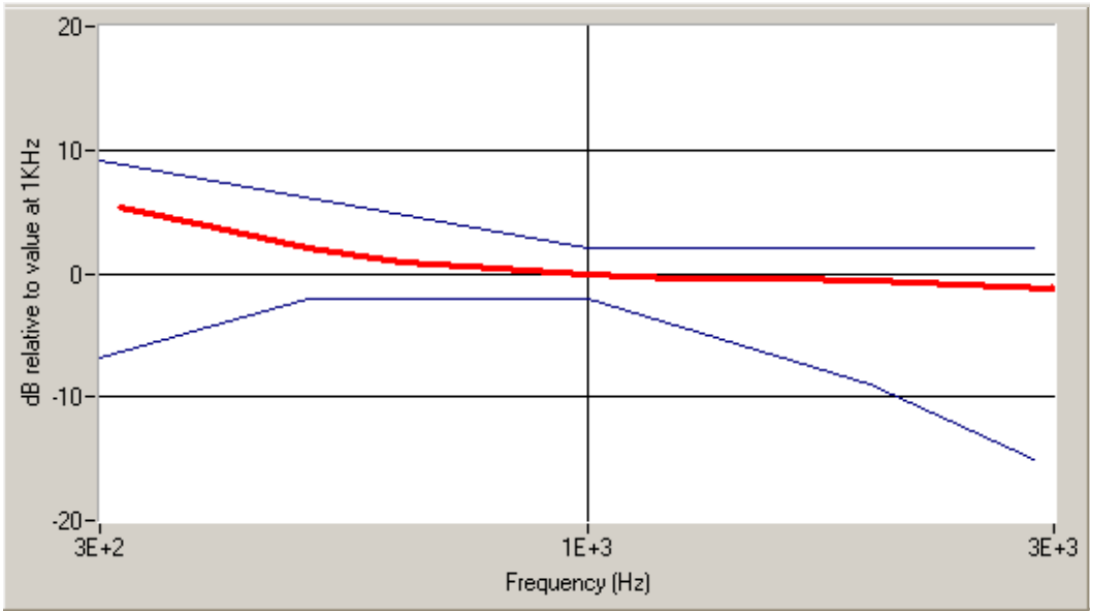
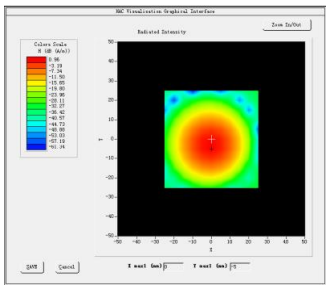
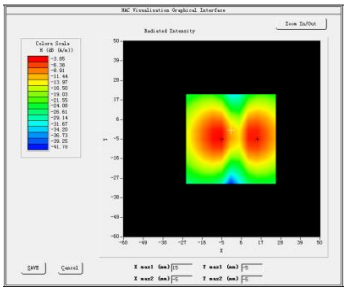
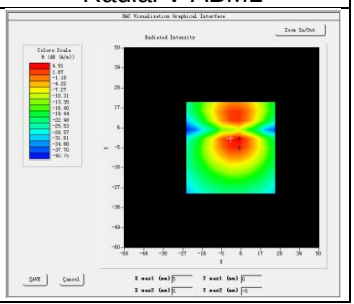
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.25	11.19	-2.86	12.11	13.00
ABM2 dB(A/m)	-40.01	-41.07	-34.82	-40.73	-40.38
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	35.76	52.26	31.96	52.84	53.38
S+N/N per orientation (dB)	35.76	31.96		52.84	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at WCDMA Band 4 (1700)

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	W-CDMA
Band	Band 4 (1700)
Channels	Middle
Channels Number	1450
Frequency (MHz)	1740.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	WCDMA	Band 4_WCDMA1700	Intensity, Axial	-18	Max	-3.23	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-3.04	-	PASS
				-18	Left side	14.22	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	15.43	-	PASS
				-18	Lower side	20.35	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	31.18	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	32.09	T4	PASS
				20	Left side	49.55	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	50.71	T4	PASS
				20	Lower side	55.95	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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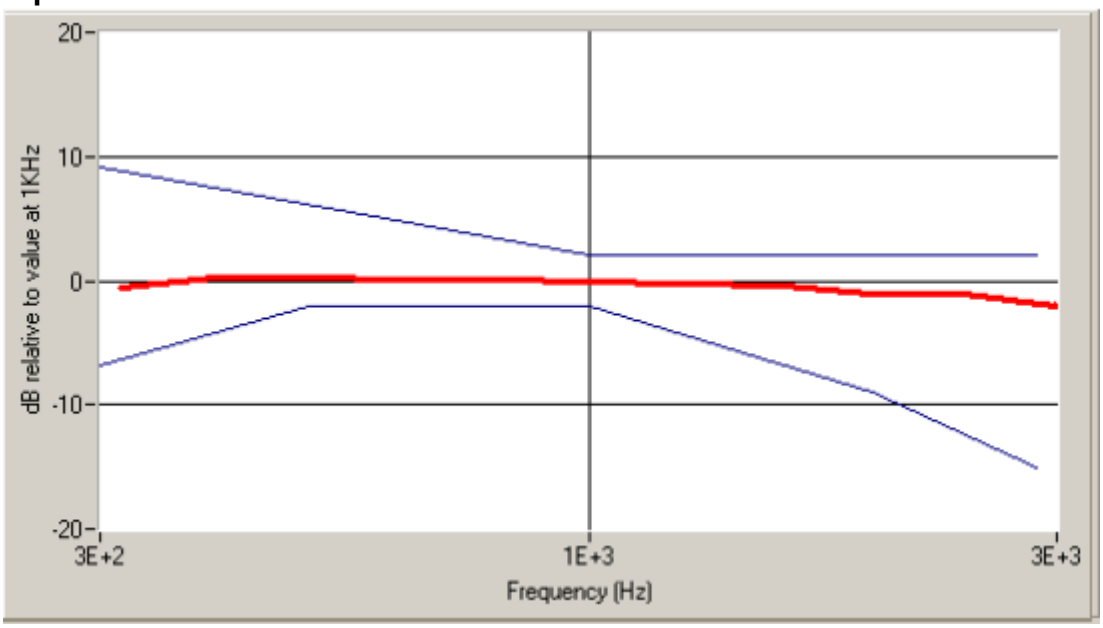
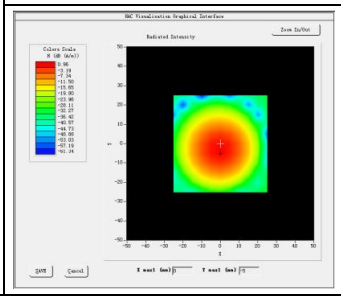
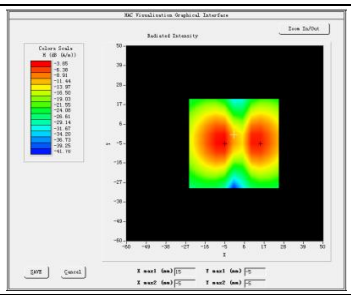
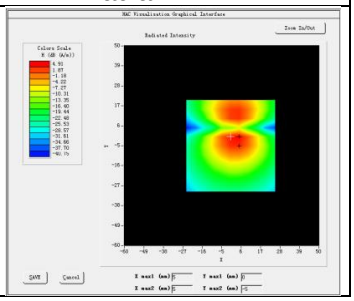
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-3.23	14.22	-3.04	15.43	20.35
ABM2 dB(A/m)	-34.41	-35.33	-35.13	-35.28	-35.60
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	31.18	49.55	32.09	50.71	55.95
S+N/N per orientation (dB)	31.18	32.09		50.71	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at WCDMA Band 5 (850)

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	W-CDMA
Band	Band 5 (850)
Channels	High
Channels Number	4233
Frequency (MHz)	846.60

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	WCDMA	Band 5_WCDMA850	Intensity, Axial	-18	Max	-3.25	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.82	-	PASS
				-18	Left side	13.39	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	15.42	-	PASS
				-18	Lower side	16.34	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	32.22	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	33.20	T4	PASS
				20	Left side	50.67	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	55.75	T4	PASS
				20	Lower side	53.89	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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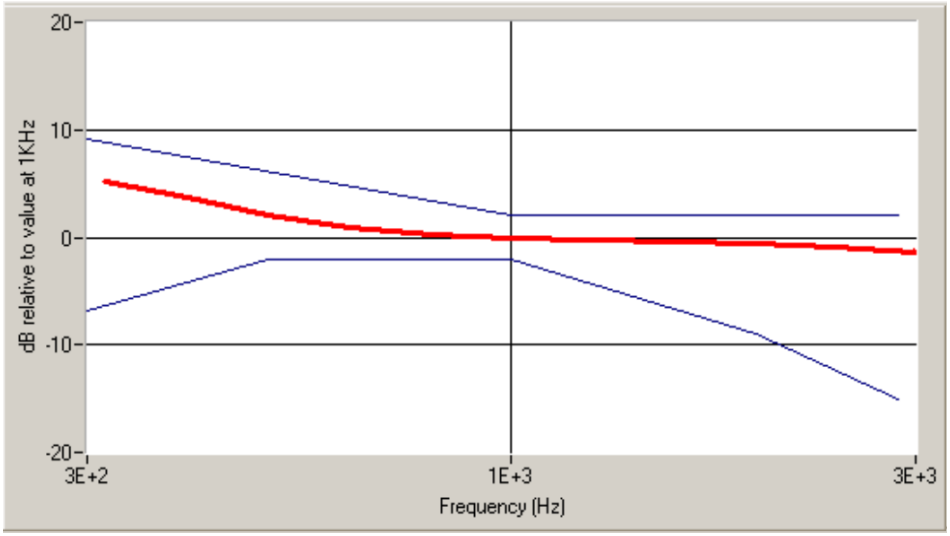
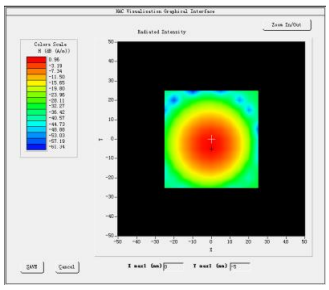
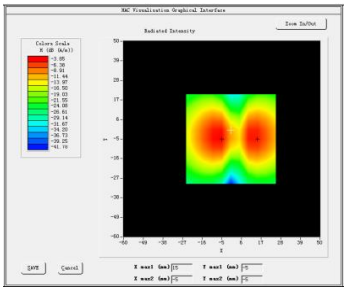
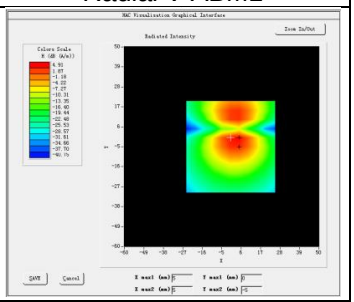
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-3.25	13.39	-2.82	15.42	16.34
ABM2 dB(A/m)	-35.47	-37.28	-36.02	-40.33	-37.55
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	32.22	50.67	33.20	55.75	53.89
S+N/N per orientation (dB)	32.22	33.20		53.89	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

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Measurement at LTE Band 2

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 2
Channels	Low
Channels Number	18700
Frequency (MHz)	1860.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 2	Intensity, Axial	-18	Max	-4.10	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-3.30	-	PASS
				-18	Left side	14.40	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	12.43	-	PASS
				-18	Lower side	12.59	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	30.29	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	31.63	T4	PASS
				20	Left side	49.98	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	48.26	T4	PASS
				20	Lower side	49.26	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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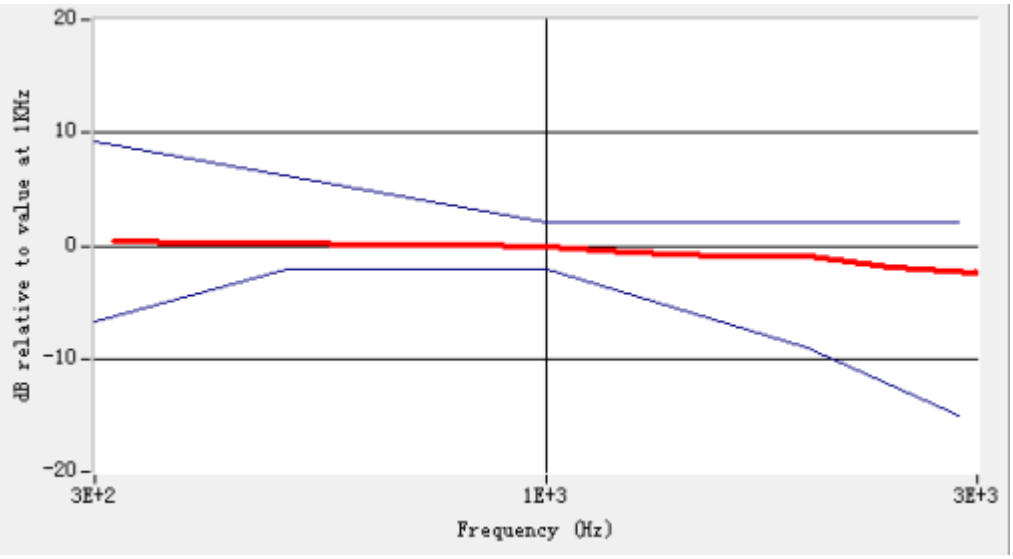
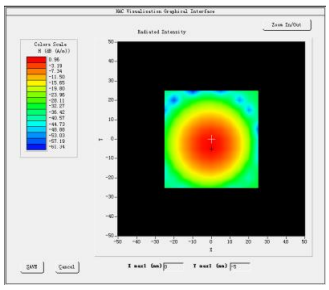
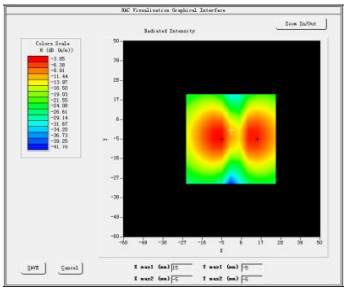
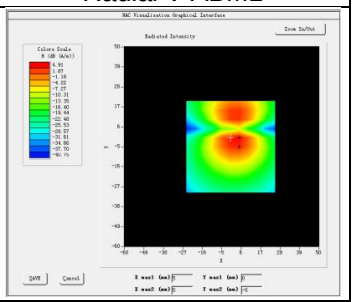
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.10	14.40	-3.30	12.43	12.59
ABM2 dB(A/m)	-34.39	-35.58	-34.93	-35.83	-36.67
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	30.29	49.98	31.63	48.26	49.26
S+N/N per orientation (dB)	30.29	31.63		48.26	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 4

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 4
Channels	Low
Channels Number	20050
Frequency (MHz)	1720.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 4	Intensity, Axial	-18	Max	-4.26	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-3.21	-	PASS
				-18	Left side	11.21	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	15.02	-	PASS
				-18	Lower side	16.94	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	30.09	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	31.27	T4	PASS
				20	Left side	46.92	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	51.75	T4	PASS
				20	Lower side	53.88	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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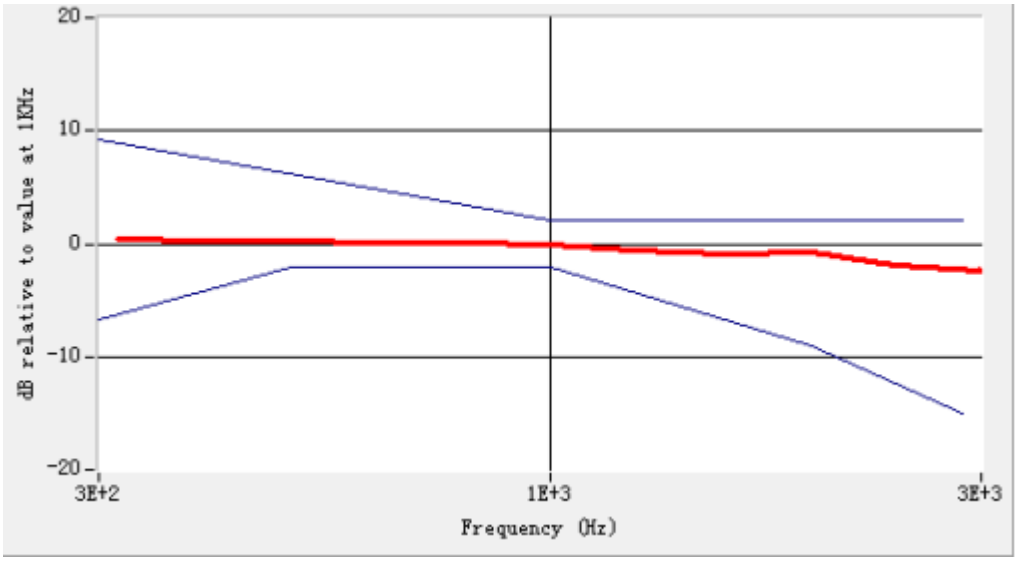
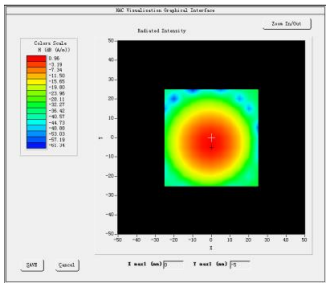
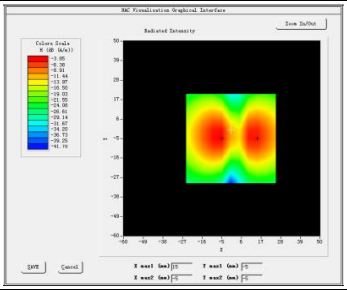
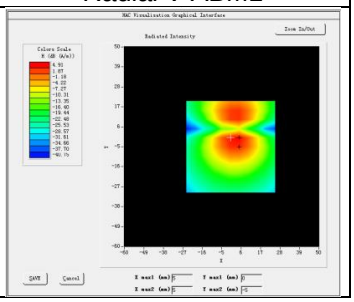
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.26	11.21	-3.21	15.02	16.94
ABM2 dB(A/m)	-34.35	-35.71	-34.48	-36.73	-36.94
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	30.09	46.92	31.27	51.75	53.88
S+N/N per orientation (dB)	30.09	31.27		51.75	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 5

Date of measurement: 11/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 5
Channels	High
Channels Number	20600
Frequency (MHz)	844.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 5	Intensity, Axial	-18	Max	-4.91	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-3.74	-	PASS
				-18	Left side	15.53	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	13.39	-	PASS
				-18	Lower side	18.56	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	33.21	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	34.03	T4	PASS
				20	Left side	54.77	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	52.69	T4	PASS
				20	Lower side	58.11	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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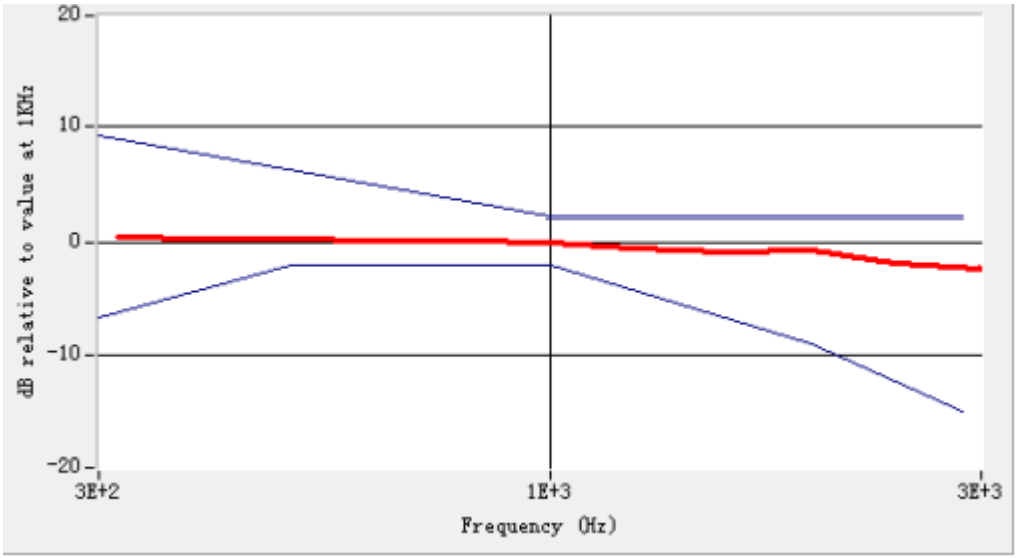
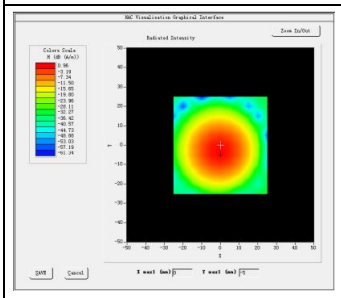
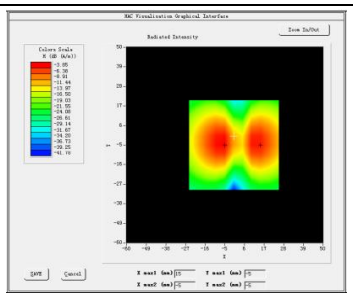
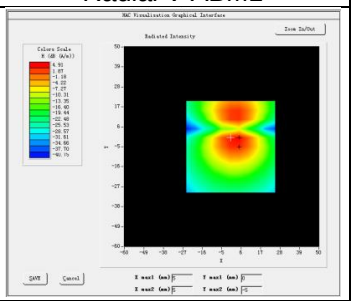
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.91	15.53	-3.74	13.39	18.56
ABM2 dB(A/m)	-38.12	-39.24	-37.77	-39.30	-39.55
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	33.21	54.77	34.03	52.69	58.11
S+N/N per orientation (dB)	33.21	34.03		52.69	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 12

Date of measurement: 12/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 12
Channels	High
Channels Number	23130
Frequency (MHz)	711.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 12	Intensity, Axial	-18	Max	-4.52	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.46	-	PASS
				-18	Left side	14.35	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	12.24	-	PASS
				-18	Lower side	15.16	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	26.77	T3	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	32.63	T4	PASS
				20	Left side	49.63	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	49.50	T4	PASS
				20	Lower side	54.71	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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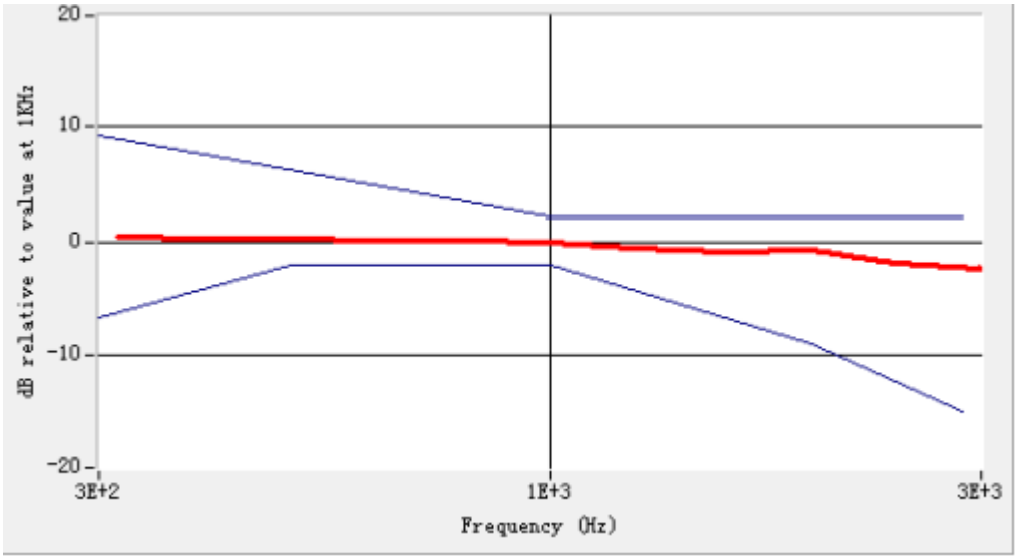
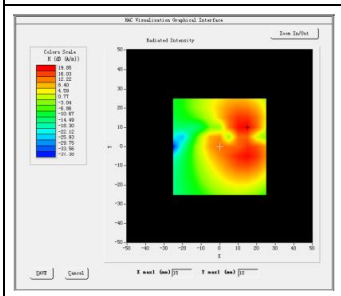
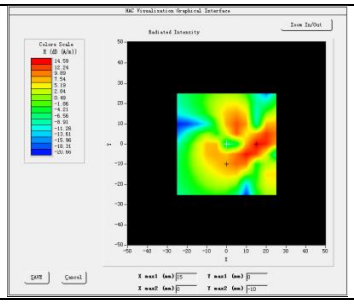
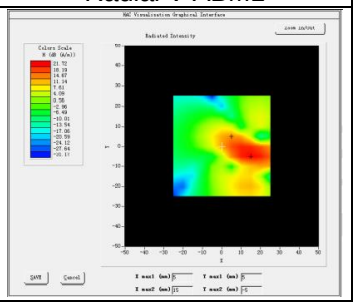
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.52	14.35	-2.46	12.24	15.16
ABM2 dB(A/m)	-31.29	-35.28	-35.09	-37.26	-39.55
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	26.77	49.63	32.63	49.50	54.71
S+N/N per orientation (dB)	26.77	32.63		49.50	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 13

Date of measurement: 12/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 13
Channels	Middle
Channels Number	23230
Frequency (MHz)	782.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 17	Intensity, Axial	-18	Max	-4.36	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.23	-	PASS
				-18	Left side	13.47	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	14.27	-	PASS
				-18	Lower side	14.64	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	34.67	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	31.52	T4	PASS
				20	Left side	54.15	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	55.02	T4	PASS
				20	Lower side	54.03	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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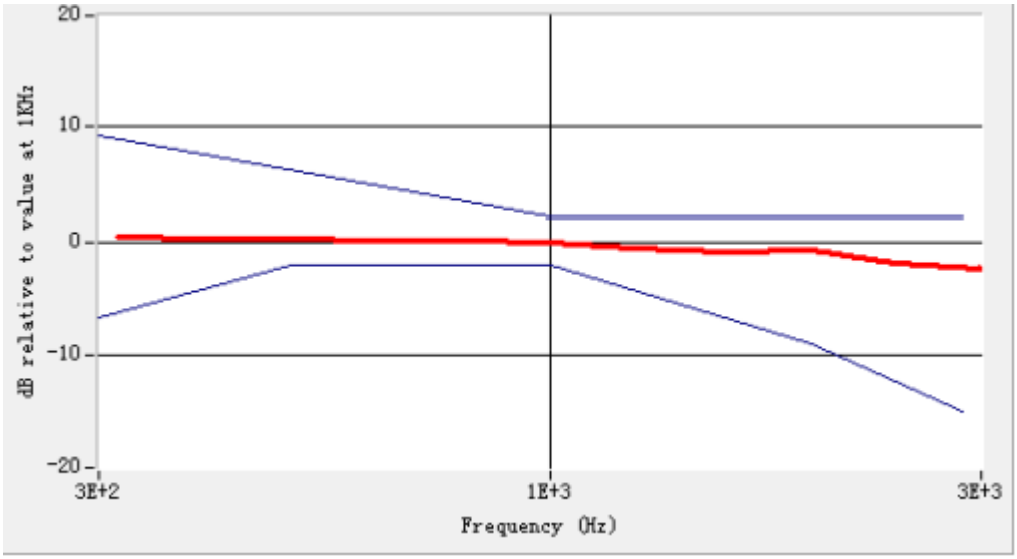
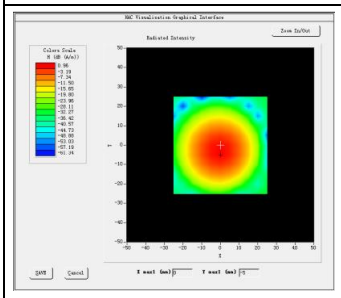
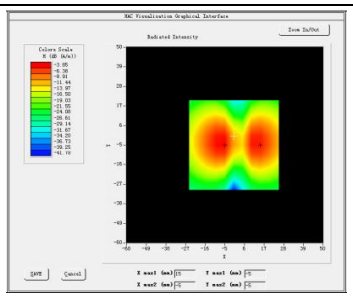
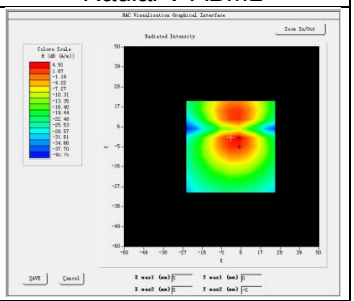
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.36	13.47	-2.23	14.27	14.64
ABM2 dB(A/m)	-39.03	-40.68	-33.75	-40.75	-39.39
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	34.67	54.15	31.52	55.02	54.03
S+N/N per orientation (dB)	34.67	31.52		54.03	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 25

Date of measurement: 12/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 25
Channels	Low
Channels Number	26140
Frequency (MHz)	1860.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 66	Intensity, Axial	-18	Max	-3.99	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.13	-	PASS
				-18	Left side	14.61	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	13.60	-	PASS
				-18	Lower side	12.58	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	35.14	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	38.07	T4	PASS
				20	Left side	55.43	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	54.25	T4	PASS
				20	Lower side	53.67	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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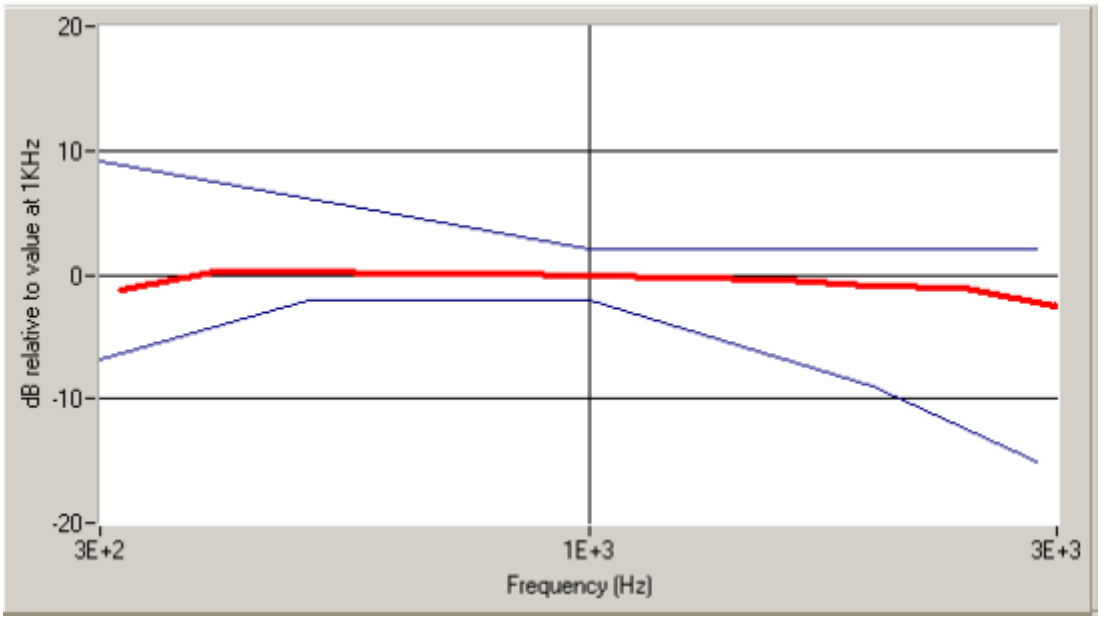
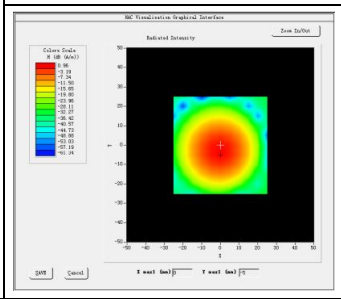
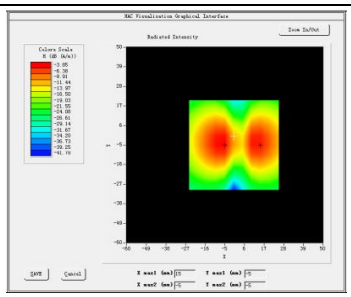
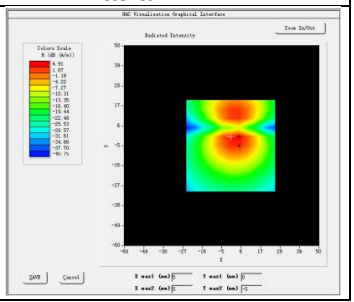
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-3.99	14.61	-2.13	13.60	12.58
ABM2 dB(A/m)	-39.13	-40.82	-40.20	-40.65	-41.09
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	35.14	55.43	38.07	54.25	53.67
S+N/N per orientation (dB)	35.14	38.07		53.67	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 26

Date of measurement: 12/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 26
Channels	Middle
Channels Number	26865
Frequency (MHz)	831.50

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 66	Intensity, Axial	-18	Max	-4.24	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.38	-	PASS
				-18	Left side	14.36	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	13.35	-	PASS
				-18	Lower side	12.33	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	34.75	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	37.68	T4	PASS
				20	Left side	55.04	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	53.86	T4	PASS
				20	Lower side	53.28	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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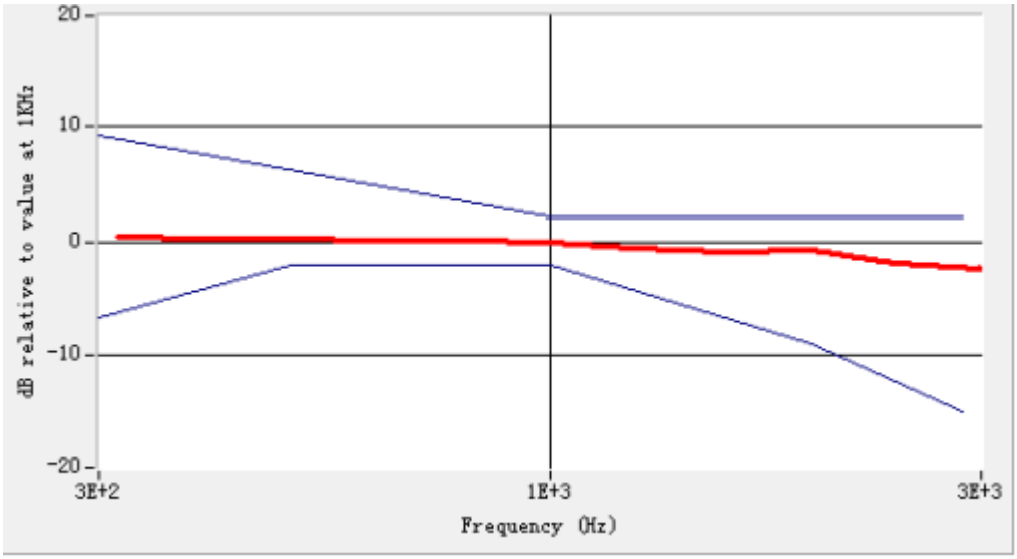
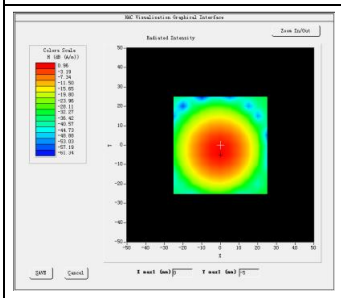
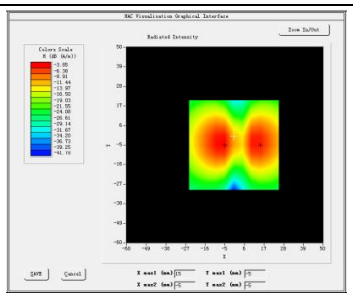
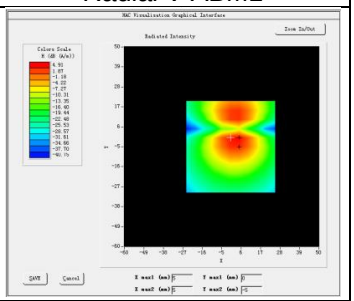
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.24	14.36	-2.38	13.35	12.33
ABM2 dB(A/m)	-38.99	-40.68	-40.06	-40.51	-40.95
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	34.75	55.04	37.68	53.86	53.28
S+N/N per orientation (dB)	34.75	37.68		53.28	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 41

Date of measurement: 12/4/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE TDD
Band	LTE band 41
Channels	Middle
Channels Number	40620
Frequency (MHz)	2593.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 66	Intensity, Axial	-18	Max	-4.17	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.31	-	PASS
				-18	Left side	14.43	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	13.42	-	PASS
				-18	Lower side	12.40	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	34.91	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	37.84	T4	PASS
				20	Left side	55.20	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	54.02	T4	PASS
				20	Lower side	53.44	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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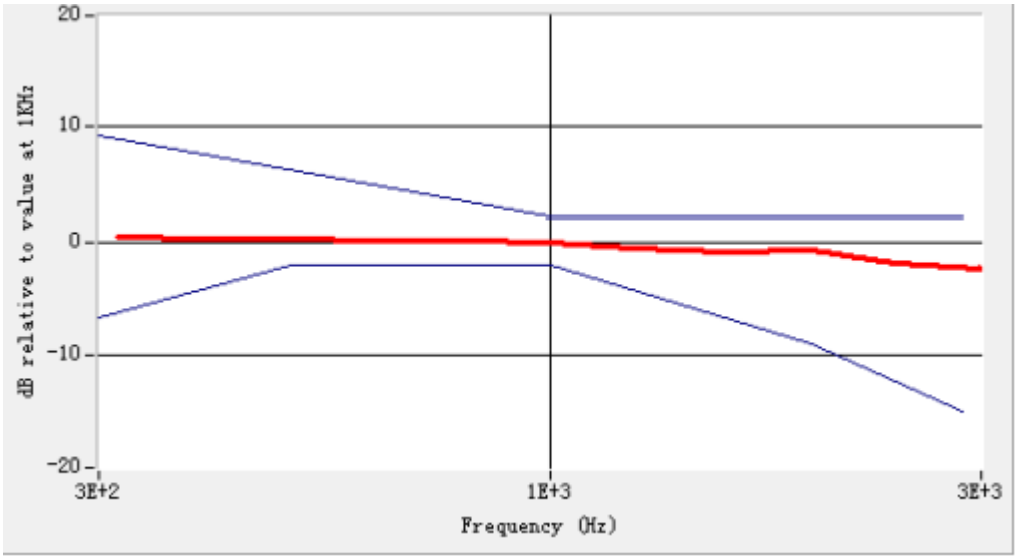
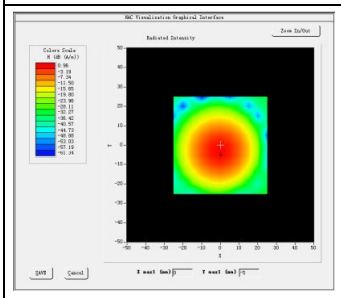
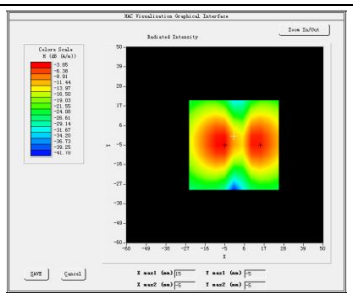
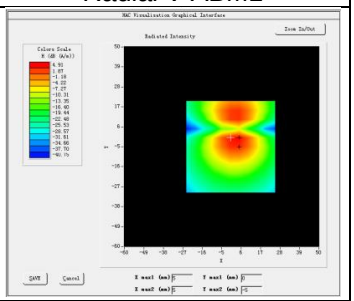
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.17	14.43	-2.31	13.42	12.40
ABM2 dB(A/m)	-39.08	-40.77	-40.15	-40.60	-41.04
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	34.91	55.20	37.84	54.02	53.44
S+N/N per orientation (dB)	34.91	37.84		53.44	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

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Measurement at LTE Band 66

Date of measurement: 12/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 66
Channels	Low
Channels Number	132072
Frequency (MHz)	1720.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 66	Intensity, Axial	-18	Max	-4.57	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-2.71	-	PASS
				-18	Left side	14.03	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	13.02	-	PASS
				-18	Lower side	12.00	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	34.32	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	37.25	T4	PASS
				20	Left side	54.61	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	53.43	T4	PASS
				20	Lower side	52.85	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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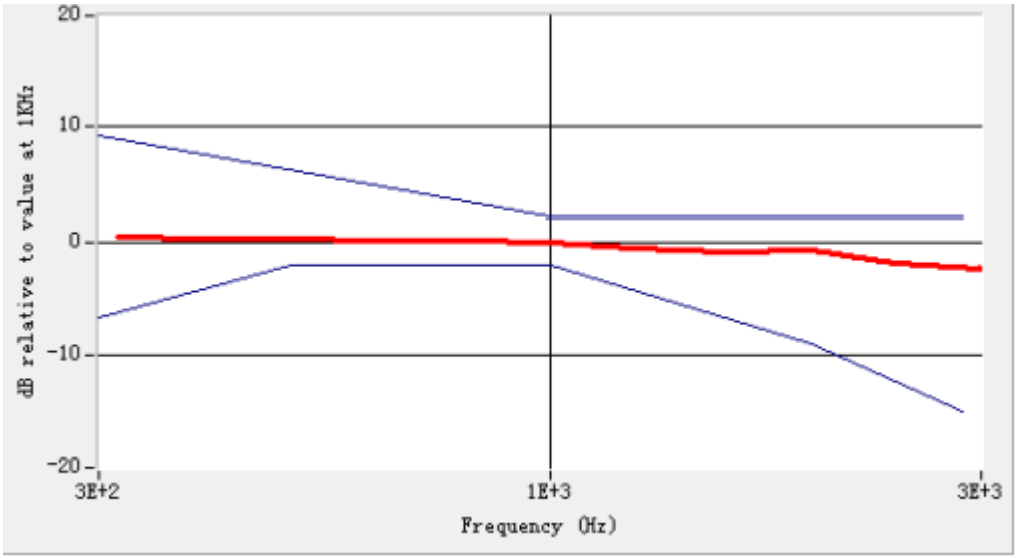
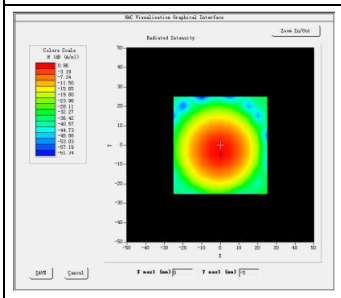
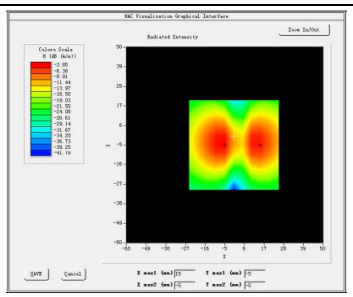
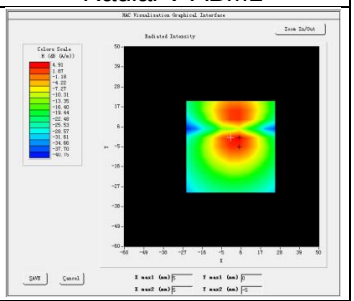
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.57	14.03	-2.71	13.02	12.00
ABM2 dB(A/m)	-38.89	-40.58	-39.96	-40.41	-40.85
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	34.32	54.61	37.25	53.43	52.85
S+N/N per orientation (dB)	34.32	37.25		52.85	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

Measurement at LTE Band 71

Date of measurement: 12/5/2023

Experimental Conditions

Probe	SN_0717_TCP38
Signal	LTE FDD
Band	LTE band 71
Channels	Low
Channels Number	133222
Frequency (MHz)	673.00

Results

Device compliant	Yes
Measurement status	Complete

Requirement verification

C63.19	Mode	Band	Test Description	Minimum Limit (dBA/m)	Location	Measured (dBA/m)	Category	Verdict
7.3.1.1	LTE	LTE FDD Band 17	Intensity, Axial	-18	Max	-4.00	-	PASS
7.3.1.2			Intensity, RadialH	-18	Right side	-1.87	-	PASS
				-18	Left side	13.83	-	PASS
7.3.1.2			Intensity, RadialV	-18	Upper side	14.63	-	PASS
				-18	Lower side	15.00	-	PASS
7.3.3			Signal to noise/noise, Axial	20	Max	35.85	T4	PASS
7.3.3			Signal to noise/noise, RadialH	20	Right side	32.70	T4	PASS
				20	Left side	55.33	T4	PASS
7.3.3			Signal to noise/noise, RadialV	20	Upper side	56.20	T4	PASS
				20	Lower side	55.21	T4	PASS
7.3.2			Frequency reponse, Axial	0	-	2.00	-	PASS

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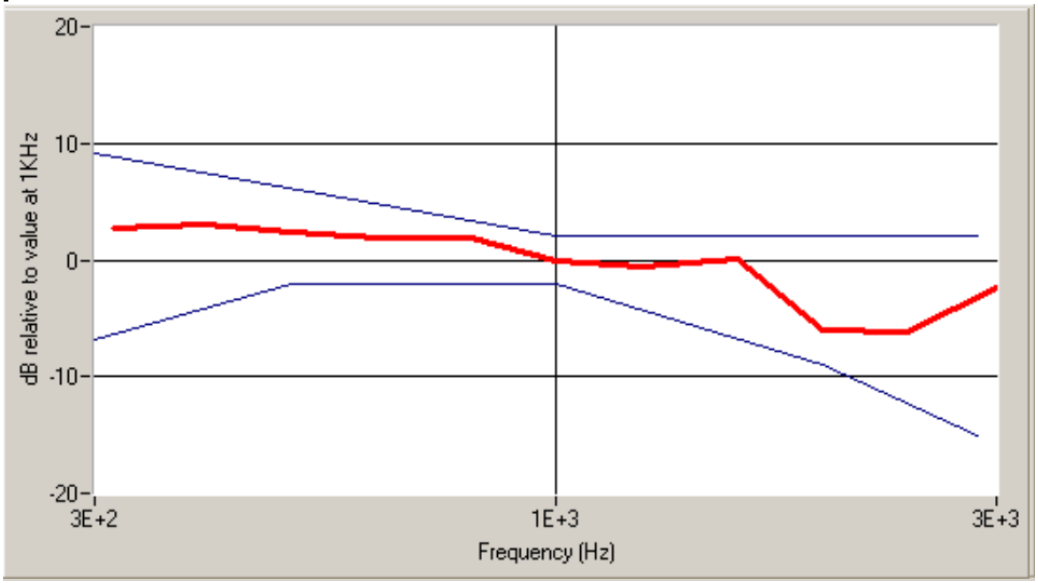
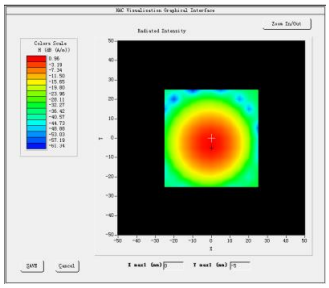
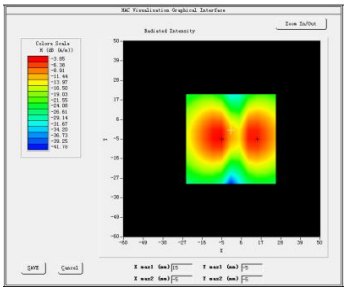
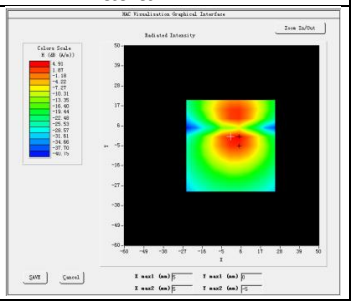
Frequency response（field that exceeds -15 dB）



Raw data result

	Axial	Radial H		Radial V	
	Max	Left	Right	Up	Down
ABM1 dB(A/m)	-4.00	13.83	-1.87	14.63	15.00
ABM2 dB(A/m)	-39.85	-41.50	-34.57	-41.57	-40.21
Ambient noise, dB(A/m)	-50.00	-50.00	-50.00	-50.00	-50.00
Freq Reponse Margin (dB)	2.00	-	-	-	-
S+N/N(dB)	35.85	55.33	32.70	56.20	55.21
S+N/N per orientation (dB)	35.85	32.70		55.21	
Test plots	Axial ABM1	Radial H ABM1		Radial V ABM1	
					

ANNEX C Test Setup Photo

Reference Photo


ANNEX D EUT External & Internal Photos

Please refer to RF Report.

ANNEX E Calibration Information

Please refer the document “Calibration.pdf”.

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