HAC RF TEST REPORT

No. 23T04Z80206-30

For

OnePlus Technology (Shenzhen) Co., Ltd.

Mobile Phone

Model Name: CPH2611

with

Hardware Version: 11

Software Version: OxygenOS V14.0

FCC ID: 2ABZ2-AA560

HAC-2019 Compliance: PASS

Issued Date: 2023-12-8

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Issue Date	Description
23T04Z80206-30	Rev.0	2023-12-8	Initial creation of test report

TABLE OF CONTENT

1 Test Laboratory

1.1 Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website.

1.2 Testing Location

CompanyName:	CTTL
Address:	No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

1.3 Testing Environment

Temperature:	18°C~25°C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

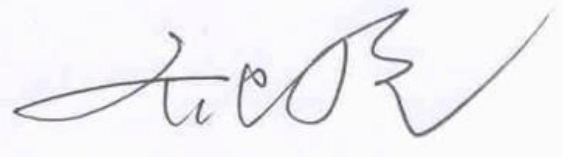
1.4 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Wang Tian
Testing Start Date:	November 4, 2023
Testing End Date:	November 4, 2023

1.5 Signature

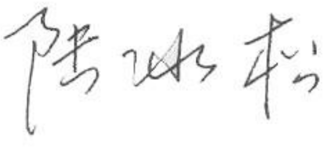
Wang Tian

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)



Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2 Client Information

2.1 Applicant Information

Company Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address/Post:	18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China.
Contact Person:	Ariel Cheng
Contact Email:	chenglijun1@oppo.com
Telephone:	(86)75561882366
Fax	/

2.2 Manufacturer Information

Company Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address/Post:	18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China.
Contact Person:	Ariel Cheng
Contact Email:	chenglijun1@oppo.com
Telephone:	(86)75561882366
Fax	/

3 Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1 About EUT

Description:	Mobile Phone
Model name:	CPH2611
Operating mode(s):	GSM850/900/18001900, WCDMA B1/2/4/5/8 LTE Band FDD:1/2/3/4/5/7/8/12/13/17/18/19/20/25/26/28/30/66/71 LTE Band TDD:38/39/40/41/48 5G NR N1/2/3/5/7/20/25/28/38/40/41/66/71/77/78 BT, Wi-Fi(2.4G), Wi-Fi(5G), Wi-Fi(6E),NFC

3.2 Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT	869135060029356	11	OxygenOS V14.0

*EUT ID: is used to identify the test sample in the lab internally.

3.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	BLPA33	/	Sunwoda Electronic Co., Ltd

*AE ID: is used to identify the test sample in the lab internally.

3.4 Air Interfaces / Bands Indicating Operating Modes

Air-interface	**Band(MHz)**	**Type**	**C63.19/tested**	**Simultaneous Transmissions**	**Name of Voice Service**
GSM	850	VO	Yes	BT, WLAN	CMRS Voice
	1900				
GPRS/EDGE	850	DT	Yes		MEET
	1900				
WCDMA (UMTS)	850	VO	Yes	BT, WLAN	CMRS Voice
	1700				
	1900				
	HSPA	DT	Yes		MEET
LTE TDD	Band38/41/48	V/D	Yes	BT, WLAN	VoLTE, MEET
LTE FDD	Band2/4/5/7/12/13/17/25/26/30/66/71	V/D	Yes	BT, WLAN	VoLTE, MEET
NR	n2/n5/n7/n25/n38/n41/n66/n71/n77/n78	DT	Yes	BT, WLAN	MEET
BT	2450	DT	NA	WWAN	NA
WLAN	2450	V/D	Yes	WWAN	VoWiFi, MEET
WLAN	5G	V/D	Yes	WWAN	VoWiFi, MEET

NA: Not Applicable VO: Voice Only V/D: CMRS and IP Voice Service over Digital Transport
DT: Digital Transport

4 Maximum Output Power

Bands	Antenna	Conducted Power (dBm)
GSM 850	1	34
GSM 1900	5	30.5
WCDMA 850	0	24.3
	1	25
WCDMA 1700	5	21.8
	6	19.8
WCDMA 1900	5	21.3
	6	18.8
LTE Band2	0	18.8
	5	21
	6	18.8
	7	22.3
LTE Band4	0	20.8
	5	23
	6	19.8
	7	21.8
LTE Band5	0	23.3
	1	25
LTE Band7	0	20.8
	2	22.8
LTE Band12	0	24.3
	1	25
LTE Band13	0	22.8
	1	25
LTE Band17	0	24.3
	1	25
LTE Band25	0	18.8
	5	21
	6	18.8
	7	22.5
LTE Band26	0	23.3
	1	25
LTE Band30	0	22.6
	2	24.3
	5	22
	6	20.9
LTE Band38	0	21.8
	2	19.8
	5	21.5
	6	19.8

LTE Band41 PC2	0	23.4
	2	21.4
	5	21.9
	6	22.4
LTE Band41 PC3	0	22
	2	20
	5	20.3
	6	20.8
LTE Band48	6	20
	8	18.8
	10	20.5
	12	18
LTE Band66	0	20.8
	5	23
	6	19.8
	7	21.9
LTE Band71	0	22.8
	1	25
NR n2	0	20.7
	5	21.2
	6	18.7
	7	21.9
NR n5	0	23.9
	1	24.7
NR n7	0	22.2
	2	23.2
NR n25	0	20.2
	5	20.7
	6	18.7
	7	22.4
NR n38	0	21.7
	2	24.2
	5	23.7
	6	17.9
NR n41 PC2	0	20.2
	2	23.2
	5	26.7
	6	16.2
NR n41 PC3	0	20.2
	2	23.2
	5	25.2
	6	15.9

NR n66	**0**	**20.7**
	5	**20.7**
	6	**19.7**
	7	**22.4**
NR n71	**0**	**24.1**
	1	**25.4**
NR n77 PC2	**6**	**17.5**
	8	**20.4**
	10	**19**
	12	**14.2**
NR n77 PC3	**6**	**17.5**
	8	**20.4**
	10	**19**
	12	**14.2**
NR n78 PC2	**6**	**17.2**
	8	**19.2**
	10	**19.2**
	12	**14.7**
NR n78 PC3	**6**	**17.2**
	8	**19.2**
	10	**19.2**
	12	**14.7**
WLAN 2.4GHz	**7**	**19**
	12	**18.5**
WLAN 5GHz	**9**	**16.5**
	15	**18**

5 Reference Documents

5.1 Reference Documents for testing

The following document listed in this section is referred for testing.

Reference	Title	Version
ANSI C63.19-2019	American National Standard for Methods of Measurement of Compatibility Between Wireless Communication Devices and Hearing Aids	2019 Edition
FCC 47 CFR §20.19	Hearing Aid Compatible Mobile Headsets	2015 Edition
KDB285076 D01 v06r04.	Equipment Authorization Guidance for Hearing Aid Compatibility	2023 Edition

6 Operational Conditions During Test

6.1 HAC MEASUREMENT SET-UP

These measurements are performed using the DASY6/8 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Stäubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor. The robot is a six-axis industrial robot performing precise movements. A cell controller system contains the power supply, robot controller, teach pendant (Joystick),and remote control, is used to drive the robot motors. The PC consists of the HP Intel Core21.86 GHz computer with Windows 10 system and HAC Measurement Software DASY6/8, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE)circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

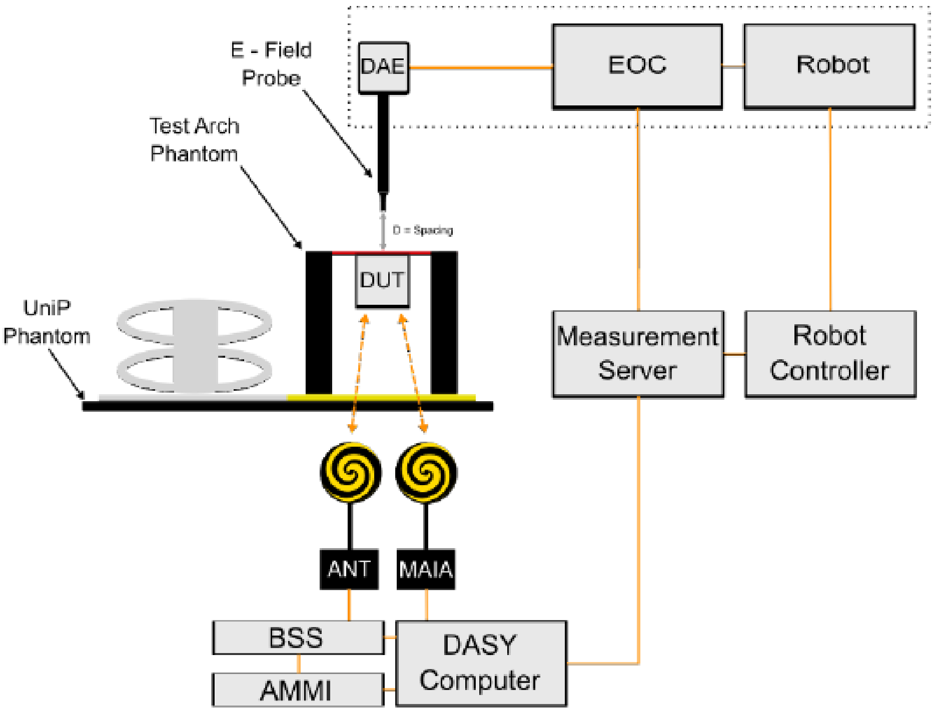
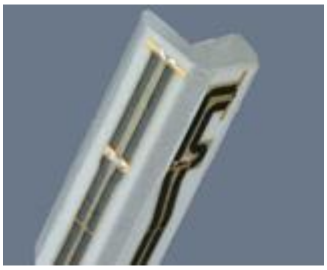


Fig. 1 HAC Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

6.2 Probe Specification

E-Field Probe Description



[EF3DV3]

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges
Calibration	In air from 30 MHz to 6.0 GHz (absolute accuracy ±6.0%, k=2)
Frequency	30 MHz to 6 GHz Linearity: ± 0.2 dB (100 MHz to 3 GHz)
Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)
Dynamic Range	2 V/m to 1000 V/m; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 4 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.5 mm
Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms

6.3 Test Arch Phantom &Phone Positioner

The Test Arch phantom should be positioned horizontally on a stable surface. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. It enables easy and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot (Dimensions: 370 x 370 x 370 mm).

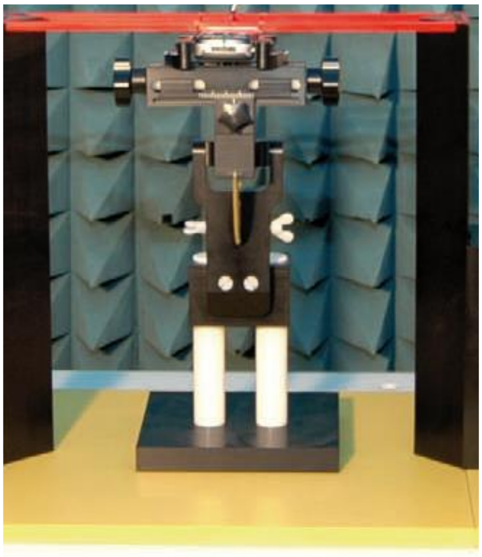


Fig. 2 HAC Phantom & Device Holder

6.4 Robotic System Specifications

Specifications

Positioner: Stäubli Unimation Corp. Robot Model: RX160L
Repeatability: ±0.02 mm
No. of Axis: 6

Data Acquisition Electronic (DAE) System

Cell Controller
Processor: Intel Core2
Clock Speed: 1.86GHz
Operating System: Windows 10
Data Converter
Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY6/8 cD6 HAC
Connecting Lines: Optical downlink for data and status info.
Optical uplink for commands and clock

7 EUT Arrangement

7.1 WD RF Emission Measurements Reference and Plane

Figure 3 illustrates the references and reference plane that shall be used in the WD emissions measurement.

• The measurement area is 50.0 mm by 50.0 mm.

• The measurement area is centered on the audio frequency output transducer of the WD (speaker or T-Coil signal).

• The measurement area is in a reference plane, which is defined as the planar area tangent to 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.

•The measurement plane is parallel to, and 15.0 mm in front of, the reference plane.

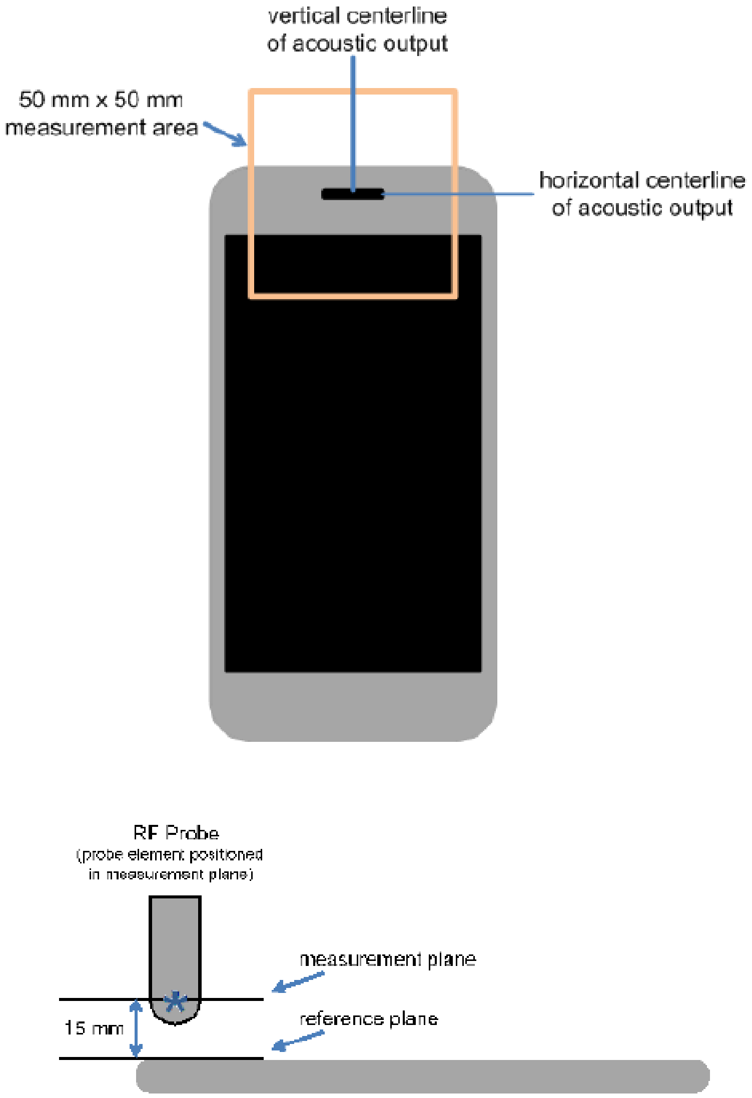


Fig. 3 WD measurement and reference planes for RF emission measurements

8 System Validation

8.1 Validation Procedure

Place a dipole antenna meeting the requirements given in ANSI C63.19 in the position normally occupied by the WD. The dipole antenna serves as a known source for an electrical output. Position the E-field probes so that:

•The probes and their cables are parallel to the coaxial feed of the dipole antenna

•The probe cables and the coaxial feed of the dipole antenna approach the measurement area from opposite directions

• The center point of the probe element(s) are 15 mm from the closest surface of the dipole elements.

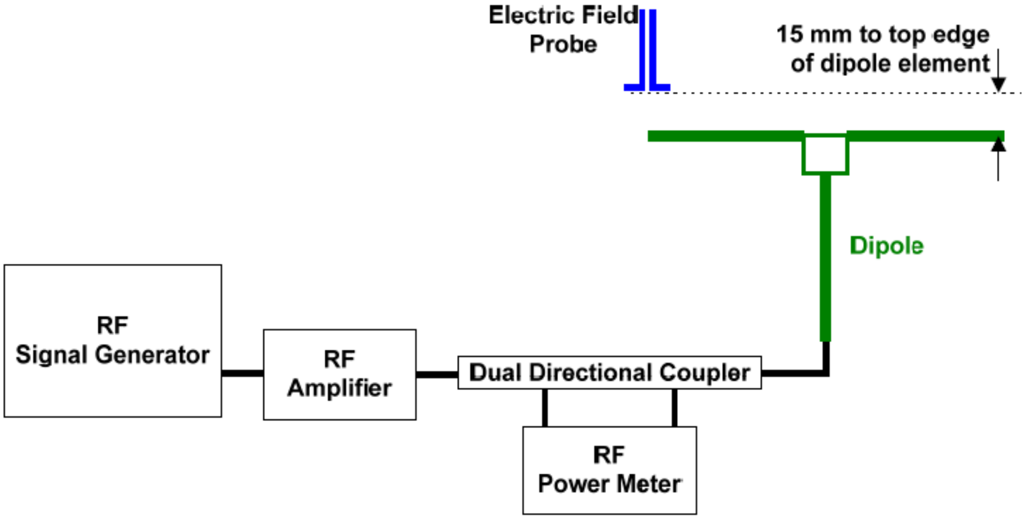


Fig. 4 Dipole Validation Setup

8.2 Validation Result

E-Field Scan						
Mode	**Frequency (MHz)**	**Input Power (mW)**	**Measured[1] Value(V/m)**	**Target[2] Value(V/m)**	**Deviation[3] (%)**	**Limit[4] (%)**
CW	835	100	112	113.4	-1.23	±18
CW	1880	100	89.8	87.2	2.98	±18
CW	2600	100	85.0	86.3	-1.51	±18

Notes:

1. Please refer to the attachment for detailed measurement data and plot.

2. Target value is provided by SPEAG in the calibration certificate of specific dipoles.

3. Deviation (%) = 100 * (Measured value minus Target value) divided by Target value.

4. ANSI C63.19 requires values within ± 18% are acceptable, of which 12% is deviation and 13% is measurement uncertainty. Values independently validated for the dipole actually used in the measurements should be used, when available.

9 Evaluation of MIF

9.1 Introduction

The HAC Standard ANSI C63.19-2019 defines the MIF as a scaling factor to evaluate the Radio Frequency Audio Interference Level (RFail). It is applicable to any modulation scheme. The MIF (in dB) is added to the measured averaged E-field (in dBV /m) to obtain the RFail (also in dBV/m) which defines the audible amplitude of the measured RF signal strength. The RFail is then compared to the associated qualification level.

The MIF is defined in section D.7 of the ANSI C63.19-2019 as the interference potential of a signal to its steady state RMS signal level or average power level. This factor is a function only of the audio frequency amplitude modulation characteristics of the signal and is the same for field strength or conducted power measurements. The modulated signal is processed as described below:

• The full signal bandwidth is presented to a wideband square law detector which demodulates the signal.

• The baseband signal (after demodulation) is presented to a spectral weighting filter which is normalized to 1 kHz. The filter frequency response is shown in Section D.4 of the ANSI C63.19-2019 standard.

• The spectral weighted signal is presented to a temporal weighting filter consisting of rapid Root Mean Square (RMS) level detection followed by peak detection with a 550 ms decay time.

• The MIF is calculated as $\frac{10 \cdot log10_{10}(filtered\ signal)}{1.154 \cdot RMS\ of\ \ demodulated\ signal}$

Measurements of the MIF value are conducted using the MAIA designed by SPEAG. The resulting deviations from the simulated values are within the requirements of the HAC standard.

MAIA is a hardware interface for evaluating the modulation and audio interference characteristics of RF signals in the frequency range 698–6000 MHz. It uses USB-powered active electronics to identify the modulation of the DUT. It can be operated with the over-the-air interface using the built-in ultra-broadband planar log spiral antenna (698–6000 MHz) or in the conducted mode using the coaxial SMA 50W connector (300–6000 MHz).

Fig. 5 MAIA View

9.2 DUT MIF results

Based on the KDB285076D01v06r02, the handset can also use the MIF values predetermined by the test equipment manufacturer. MIF values applied in this test report were provided by the HAC equipment provider of SPEAG, and the worst values for all air interface are listed below.

Typical MIF levels in ANSI C63.19-2019	
Transmission protocol	Modulation interference factor
GSM-FDD (TDMA, GMSK)	+3.63 dB
EDGE-FDD (TDMA, 8PSK, TN 0-1)	+1.23dB
EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	-0.52dB
EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	-1.82dB
UMTS-FDD(WCDMA, AMR)	-25.43dB
UMTS-FDD (HSPA+)	-20.39dB
LTE-FDD (SC-FDMA, 1RB, 20MHz, QPSK)	-15.63 dB
LTE-FDD (SC-FDMA, 1RB, 20MHz, 16QAM)	-9.76 dB
LTE-FDD (SC-FDMA, 1RB, 20MHz, 64QAM)	-9.93 dB
LTE-TDD (SC-FDMA, 1RB, 20MHz, QPSK)	-1.62 dB
LTE-TDD (SC-FDMA, 1RB, 20MHz, 16QAM)	-1.44 dB
LTE-TDD (SC-FDMA, 1RB, 20MHz, 64QAM)	-1.54 dB
LTE-TDD(SC-FDMA,1RB,20MHz,QPSK,UL Subframe=2,3,4,7,8,9)	-3.41 dB
LTE-TDD(SC-FDMA,1RB,20MHz,16QAM,UL Subframe=2,3,4,7,8,9)	-3.17 dB
LTE-TDD(SC-FDMA,1RB,20MHz,64QAM,UL Subframe=2,3,4,7,8,9)	-3.31 dB

IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	-5.90 dB
IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	-5.17 dB
IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	-3.37 dB
IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	-2.02 dB
IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	-0.36dB
IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	-15.80 dB
IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	-5.82 dB
IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	-12.23dB
5G NR (DFT-s-OFDM, 1RB, 100 MHz, QPSK, 30 kHz)	-1.64dB
5G NR (CP-OFDM, 1RB, 20 MHz, QPSK, 15 kHz)	-1.65dB
5G NR (DFT-s-OFDM, 1RB, 20 MHz, QPSK, 15 kHz)	−15.06dB
5G NR (CP-OFDM, 1RB, 5 MHz, QPSK, 15 kHz)	−12.18dB
5G NR (CP-OFDM, 1RB, 10 MHz, QPSK, 15 kHz)	−12.26dB
5G NR (CP-OFDM, 1RB, 15 MHz, QPSK, 15 kHz)	−12.08dB
5G NR (CP-OFDM, 1RB, 20 MHz, QPSK, 15 kHz)	−12.20dB
5G NR (CP-OFDM, 1RB, 5 MHz, QPSK, 30 kHz)	−14.39dB
5G NR (CP-OFDM, 1RB, 10 MHz, QPSK, 30 kHz)	−14.47dB
5G NR (CP-OFDM, 1RB, 15 MHz, QPSK, 30 kHz)	−14.33dB
5G NR (CP-OFDM, 1RB, 20 MHz, QPSK, 30 kHz)	−14.46dB
5G NR (CP-OFDM, 1RB, 25 MHz, QPSK, 30 kHz)	−14.35dB
5G NR (CP-OFDM, 1RB, 30 MHz, QPSK, 30 kHz)	−14.32dB
5G NR (CP-OFDM, 1RB, 40 MHz, QPSK, 30 kHz)	−14.32dB
5G NR (CP-OFDM, 1RB, 50 MHz, QPSK, 30 kHz)	−14.55dB
5G NR (CP-OFDM, 1RB, 60 MHz, QPSK, 30 kHz)	−14.45dB
5G NR (CP-OFDM, 1RB, 80 MHz, QPSK, 30 kHz)	−14.47dB
5G NR (CP-OFDM, 1RB, 90 MHz, QPSK, 30 kHz)	−14.43dB
5G NR (CP-OFDM, 1RB, 100 MHz, QPSK, 30 kHz)	−14.38dB
5G NR (DFT-s-OFDM, 1RB, 5 MHz, QPSK, 15 kHz)	−15.06dB
5G NR (DFT-s-OFDM, 1RB, 10 MHz, QPSK, 15 kHz)	−15.06dB
5G NR (DFT-s-OFDM, 1RB, 15 MHz, QPSK, 15 kHz)	−15.06dB
5G NR (DFT-s-OFDM, 1RB, 20 MHz, QPSK, 15 kHz)	−15.06dB

10 Evaluation of RF Audio Interference Power Level

According to ANSIC 63.19-2019, the WD's conducted power must be at or below either the stated RF_{AIPL} (Table 13-1) or the stated peak power level (Table 13-2), or the average near-field emissions over the measurement area must be at or below the stated RF_{AIL} (Table 13-3), or the stated peak field strength (Table 13-4). The WD may demonstrate compliance by meeting any of these four requirements, but it must do so in each of its operating bands at its established worst-case normal speech-mode operating condition. This chapter will evaluate the RF audio interference power level of WD.

Bands	Antenna	Average $Power_{max}$ (dBm)	MIF_{worst} (dB)	Power + MIF	C63.19 Lowest RF_{AIPL}(dBm)	Compliance
GSM 850	1	34	3.63	37.63	29	To be tested
GSM 1900	5	30.5	3.63	34.13	26	To be tested
WCDMA 850	0	24.3	-20.39	3.91	29	PASS
	1	25	-20.39	4.61	26	PASS
WCDMA 1700	5	21.8	-20.39	1.41	26	PASS
	6	19.8	-20.39	-0.59	26	PASS
WCDMA 1900	5	21.3	-20.39	0.91	26	PASS
	6	18.8	-20.39	-1.59	26	PASS
LTE Band2	0	18.8	-9.76	9.04	26	PASS
	5	21	-9.76	11.24	26	PASS
	6	18.8	-9.76	9.04	26	PASS
	7	22.3	-9.76	12.54	26	PASS
LTE Band4	0	20.8	-9.76	11.04	26	PASS
	5	23	-9.76	13.24	26	PASS
	6	19.8	-9.76	10.04	26	PASS
	7	21.8	-9.76	12.04	26	PASS
LTE Band5	0	23.3	-9.76	13.54	29	PASS
	1	25	-9.76	15.24	29	PASS
LTE Band7	0	20.8	-9.76	11.04	25	PASS
	2	22.8	-9.76	13.04	25	PASS
LTE Band12	0	24.3	-9.76	14.54	29	PASS
	1	25	-9.76	15.24	29	PASS
LTE Band13	0	22.8	-9.76	13.04	29	PASS
	1	25	-9.76	15.24	29	PASS
LTE Band17	0	24.3	-9.76	14.54	29	PASS
	1	25	-9.76	15.24	29	PASS
LTE Band25	0	18.8	-9.76	9.04	26	PASS
	5	21	-9.76	11.24	26	PASS
	6	18.8	-9.76	9.04	26	PASS
	7	22.5	-9.76	12.74	26	PASS
LTE Band26	0	23.3	-9.76	13.54	29	PASS
	1	25	-9.76	15.24	29	PASS

LTE Band30	**0**	22.6	-9.76	12.84	25	PASS
	2	24.3	-9.76	14.54	25	PASS
	5	22	-9.76	12.24	25	PASS
	6	20.9	-9.76	11.14	25	PASS
LTE Band38	**0**	21.8	-1.44	20.36	25	PASS
	2	19.8	-1.44	18.36	25	PASS
	5	21.5	-1.44	20.06	25	PASS
	6	19.8	-1.44	18.36	25	PASS
LTE Band41 PC2	**0**	23.4	-1.44	21.96	25	PASS
	2	21.4	-1.44	19.96	25	PASS
	5	21.9	-1.44	20.46	25	PASS
	6	22.4	-1.44	20.96	25	PASS
LTE Band41 PC3	**0**	22	-1.44	20.56	25	PASS
	2	20	-1.44	18.56	25	PASS
	5	20.3	-1.44	18.86	25	PASS
	6	20.8	-1.44	19.36	25	PASS
LTE Band48	**6**	20	-1.44	18.56	25	PASS
	8	18.8	-1.44	17.36	25	PASS
	10	20.5	-1.44	19.06	25	PASS
	12	18	-1.44	16.56	25	PASS
LTE Band66	**0**	20.8	-9.76	11.04	26	PASS
	5	23	-9.76	13.24	26	PASS
	6	19.8	-9.76	10.04	26	PASS
	7	21.9	-9.76	12.14	26	PASS
LTE Band71	**0**	22.8	-9.76	13.04	29	PASS
	1	25	-9.76	15.24	29	PASS
NR n2	**0**	20.7	-1.64	19.06	26	PASS
	5	21.2	-1.64	19.56	26	PASS
	6	18.7	-1.64	17.06	26	PASS
	7	21.9	-1.64	20.26	26	PASS
NR n5	**0**	23.9	-1.64	22.26	29	PASS
	1	24.7	-1.64	23.06	29	PASS
NR n7	**0**	22.2	-1.64	20.56	29	PASS
	2	23.2	-1.64	21.56	29	PASS
NR n25	**0**	20.2	-1.64	18.56	26	PASS
	5	20.7	-1.64	19.06	26	PASS
	6	18.7	-1.64	17.06	26	PASS
	7	22.4	-1.64	20.76	26	PASS
NR n38	**0**	21.7	-1.64	20.06	25	PASS
	2	24.2	-1.64	22.56	25	PASS
	5	23.7	-1.64	22.06	25	PASS
	6	17.9	-1.64	16.26	25	PASS

NR n41 PC2	**0**	20.2	-1.64	18.56	25	PASS
	2	23.2	-1.64	21.56	25	PASS
	5	26.7	-1.64	25.06	25	To be tested
	6	16.2	-1.64	14.56	25	PASS
NR n41 PC3	**0**	20.2	-1.64	18.56	25	PASS
	2	23.2	-1.64	21.56	25	PASS
	5	25.2	-1.64	23.56	25	PASS
	6	15.9	-1.64	14.26	25	PASS
NR n66	**0**	20.7	-1.64	19.06	26	PASS
	5	20.7	-1.64	19.06	26	PASS
	6	19.7	-1.64	18.06	26	PASS
	7	22.4	-1.64	20.76	26	PASS
NR n71	**0**	24.1	-1.64	22.46	29	PASS
	1	25.4	-1.64	23.76	29	PASS
NR n77 PC2	**6**	17.5	-1.64	15.86	25	PASS
	8	20.4	-1.64	18.76	25	PASS
	10	19	-1.64	17.36	25	PASS
	12	14.2	-1.64	12.56	25	PASS
NR n77 PC3	**6**	17.5	-1.64	15.86	25	PASS
	8	20.4	-1.64	18.76	25	PASS
	10	19	-1.64	17.36	25	PASS
	12	14.2	-1.64	12.56	25	PASS
NR n78 PC2	**6**	17.2	-1.64	15.56	25	PASS
	8	19.2	-1.64	17.56	25	PASS
	10	19.2	-1.64	17.56	25	PASS
	12	14.7	-1.64	13.06	25	PASS
NR n78 PC3	**6**	17.2	-1.64	15.56	25	PASS
	8	19.2	-1.64	17.56	25	PASS
	10	19.2	-1.64	17.56	25	PASS
	12	14.7	-1.64	13.06	25	PASS
WLAN 2.4GHz	**7**	19	-0.36	18.64	25	PASS
	12	18.5	-0.36	18.14	25	PASS
WLAN 5GHz	**9**	16.5	-5.82	10.68	25	PASS
	15	18	-5.82	12.18	25	PASS

According to the above table, the RF_{AIPL} for WCDMA, LTE, WIFI and NR are less than the stated RF_{AIPL} (Table 13.1). Near field emission testing is required for the GSM and n41 PC2 with ANT5.

11 Near-field Emission Test Procedures

The evaluation was performed with the following procedure:

1) Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.

2) Position the WD in its intended test position. The gauge block can simplify this positioning.

3) Set the WD to transmit a fixed and repeatable combination of signal power and modulation characteristic that is representative of the worst case (highest interference potential) encountered in normal use. Transiently occurring start-up, changeover, or termination conditions, or other operations likely to occur less than 1% of the time during normal operation, may be excluded from consideration.

4) The measurement area shall be centered on the acoustic output or the T-Coil mode measurement reference point, as appropriate. Locate the field probe at the initial test position in the 50 mm by 50 mm measurement area, which is contained in the measurement plane. If the field alignment method is used, align the probe for maximum field reception

5) Record the reading at the output of the measurement system.

6) Scan the entire 50 mm by 50 mm measurement area in equally spaced step sizes and record the reading at each measurement point.

7) Calculate the average of the measurements taken in Step 6)

8) The RF audio interference level in dB(V/m) is obtained by adding the Modulation Interference Factor (in decibels) to the average steady state rms field strength reading over the measurement area, in dB(V/m)

9) Compare this RF audio interference level to the limits in ANSI C63.19-2019 clause 4.7 and record the result.

12 Near-field Emission Test Results

Bands	Frequency（MHz）	Channel	RFail (dBV/m)	Compliance
GSM 850 ANT1	848.8	251	**31.90**	**PASS**
	836.6	190	**32.16**	**PASS**(see Fig B.1)
	824.2	128	**31.63**	**PASS**
GSM 1900 ANT5	1909.8	810	**22.66**	**PASS**(see Fig B.2)
	1880	661	**22.38**	**PASS**
	1850.2	512	**22.34**	**PASS**
NR n41 PC2 ANT5	2640	528000	**20.09**	**PASS**(see Fig B.3)
	2592.99	518598	**17.52**	**PASS**
	2546.01	509202	**19.26**	**PASS**

13 ANSIC 63.19-2019 Limits

13-1 Wireless device RF audio interference power level

Frequency range (MHz)	RF_{AIPL} (dBm)
<960	29
960–2000	26
>2000	25

13-2 Wireless device RF peak power level

Frequency range (MHz)	$RF_{Peak\ Power}$ (dBm)
<960	35
960–2000	32
>2000	31

13-3 Wireless device RF audio interference level

Frequency range (MHz)	RF_{AIL} [dB(V/m)]
<960	39
960–2000	36
>2000	35

13-4 Wireless device RF peak near-field level

Frequency range (MHz)	RF_{Peak} [dB(V/m)]
<960	45
960–2000	42
>2000	41

14 Measurement Uncertainty

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) Eav	Std. Unc. E
Measurement System					
Probe Calibration	±5.1 %	N	1	1	±5.1 %
Axial Isotropy	±4.7 %	R	√3	1	±2.7 %
Sensor Displacement	±7.2 %	R	√3	0.5	±2.1 %
Boundary Effects	±2.4 %	R	√3	1	±1.4 %
Phantom Boundary Effect	±7.2 %	R	√3	1	±4.2 %
Probe Linearity	±4.7 %	R	√3	1	±2.7 %
Scaling to Peak Power with MIF	±10.0 %	R	√3	1	±5.8 %
System Detection Limit	±1.0 %	R	√3	1	±0.6 %
Readout Electronics	±0.3 %	N	1	1	±0.3 %
Response Time	±0.8 %	R	√3	0	±0 %
Integration Time	±2.6 %	R	√3	0	±0 %
RF Ambient Conditions	±3.0 %	R	√3	1	±1.7 %
RF Reflections	±12.0 %	R	√3	1	±6.9 %
Probe Positioner	±1.2 %	R	√3	1	±0.7 %
Probe Positioning	±3.0 %	R	√3	1	±1.7 %
Extrapolation and Interpolation	±1.0 %	R	√3	1	±0.6 %
Test Sample Related					
Device Positioning Vertical	±4.7 %	R	√3	1	±2.7 %
Device Positioning Lateral	±1.0 %	R	√3	1	±0.6 %
Device Holder and Phantom	±2.4 %	R	√3	1	±1.4 %
Power Drift	±5.0 %	R	√3	1	±2.9 %
Phantom and Setup Related					
Phantom Thickness	±2.4 %	R	√3	1	±1.4 %
Combined Std. Uncertainty					±13.2 %
Expanded Std. Uncertainty on Power					**±26.4 %**
Expanded Std. Uncertainty on Field					**±13.2 %**

15 Main Test Instruments

Table 1: List of Main Instruments

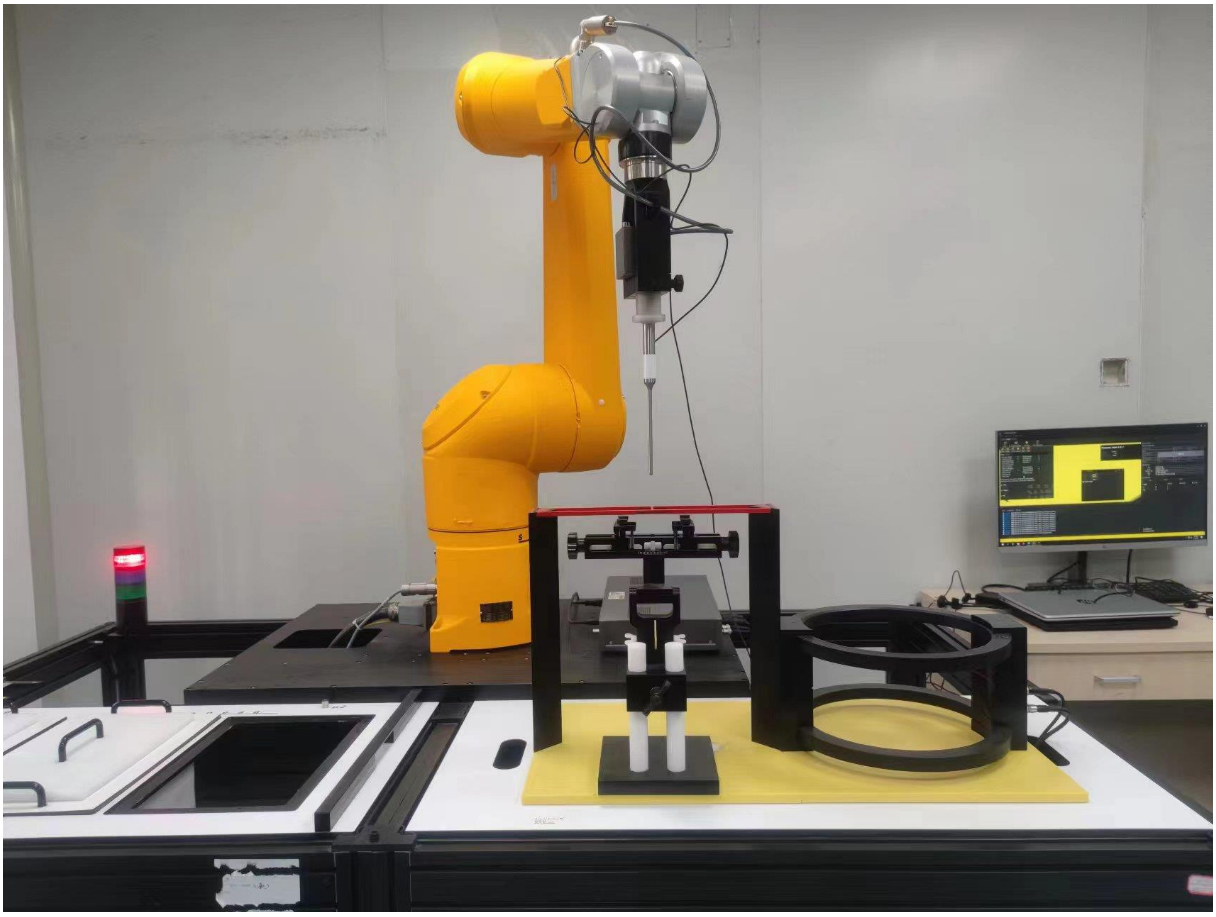
No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Signal Generator	E4483C	MY49070393	May 15, 2023	One Year
02	Power meter	NRP2	106276	May 15, 2023	One year
03	Power sensor	NRP6A	101369		
04	Amplifier	60S1G4	0331848	No Calibration Requested	
05	E-Field Probe	EF3DV3	4060	May 24, 2023	One year
06	DAE	SPEAG DAE4	771	February 8, 2023	One year
07	HAC Dipole	CD835V3	1023	August 15, 2023	One year
08	HAC Dipole	CD1880V3	1018	August 15, 2023	One year
09	HAC Dipole	CD2600V3	1017	August 15, 2023	One year
10	BTS	CMW500	166370	July 4, 2023	One year
11	AIA	SE UMS 170 CB	1029	No Calibration Requested	

16 Conclusion

The HAC measurement indicates that the EUT complies with the HAC limits of the ANSIC63.19-2019. It is comprehensively determined as **PASS**

END OF REPORT BODY

ANNEX A TEST LAYOUT



Picture A1:HAC RF System Layout

ANNEX B TEST PLOTS

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
EF3DV3 - SN4060	May 24, 2023	DAE4 Sn771	February 08, 2023

Communication Systems

Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	GSM-FDD (TDMA, GMSK)	190	836.6

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
50.0	50.0	10.0	10.0	15.0

Results

Emax [dB(V/m)]	Eavg50x50 max [dB(V/m)]	MIF [dB]	RFail [dB(V/m)]
30.25	28.53	3.63	32.16

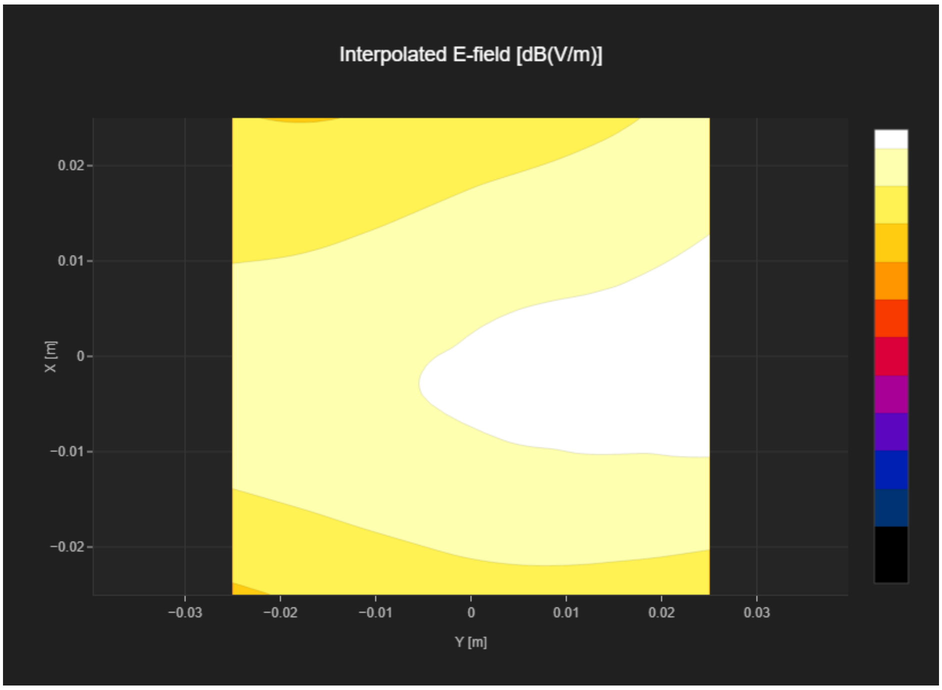


Fig B.1 GSM 850

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
EF3DV3 - SN4060	May 24, 2023	DAE4 Sn771	February 08, 2023

Communication Systems

Band Name	Communication Systems Name	Channel	Frequency [MHz]
PCS 1900	GSM-FDD (TDMA, GMSK)	810	1909.8

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
50.0	50.0	10.0	10.0	15.0

Results

Emax [dB(V/m)]	Eavg50x50 max [dB(V/m)]	MIF [dB]	RFail [dB(V/m)]
22.44	19.03	3.63	22.66

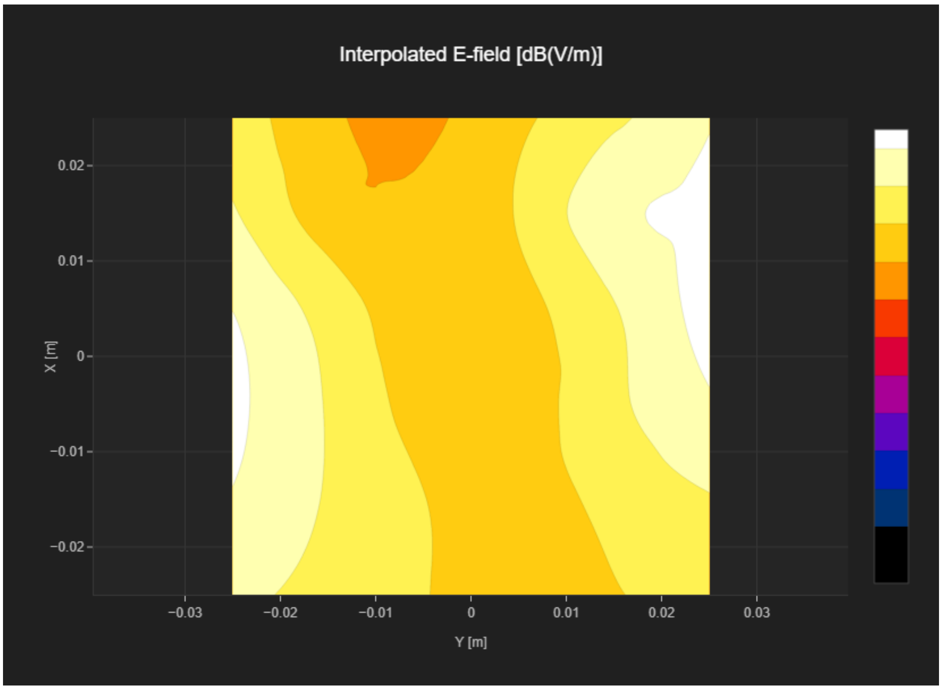


Fig B.2 GSM 1900

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
EF3DV3 - SN4060	May 24, 2023	DAE4 Sn771	February 08, 2023

Communication Systems

Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n41	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	537999	2689.995

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
50.0	50.0	10.0	10.0	15.0

Results

Emax [dB(V/m)]	Eavg50x50 max [dB(V/m)]	MIF [dB]	RFail [dB(V/m)]
25.39	21.74	-1.65	20.09

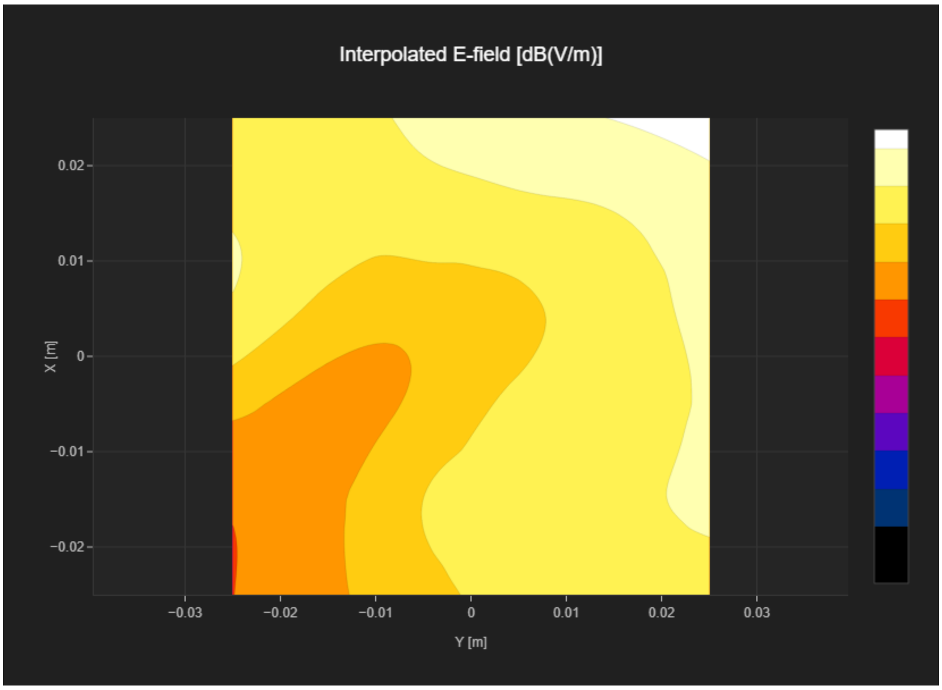


Fig B.3 NR n41 PC2