Volume Control TEST REPORT

No.24T04Z101721-001

for

HMD Global Oy

Mobile Phone

TA-1658

FCC ID:2AJOTTA-1658

with

Hardware Version: V1.0
Software Version: 000T_0_362

Issued Date: 2024-09-12

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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
24T04Z101721-001	Rev.0	1st edition	2024-08-30
24T04Z101721-001	Rev.1	complemented one empty PN-SDNR cell with "/" in Table 6.3.5.	2024-09-12

Note: the latest revision of the test report supersedes all previous version.

CONTENTS

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

Location 1: CTTL(huayuan North Road)

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

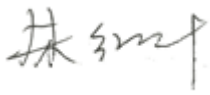
1.3. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-10/+55℃
Relative Humidity:	20-75%
Ambient noise of acoustic chamber	14dB(A) and is compliance with requirement of standards (SEE ANNEX H)

1.4. Project data

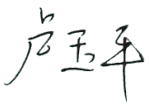
Testing Start Date:	2024-07-25
Testing End Date:	2024-08-13

1.5. Signature



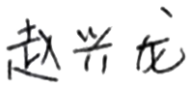
Zhu Hongye

(Prepared this test report)



Lu Yuping

(Reviewed this test report)



Zhao Xinglong

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	HMD Global Oy
Address:	Bertel Jungin aukio 9, 02600 Espoo, Finland
Postal Code:	Reza Serafat
Country:	reza.serafat@hmdglobal.com
Telephone:	+491735287964
Fax:	/

2.2. Manufacturer Information

Company Name:	HMD Global Oy
Address:	Bertel Jungin aukio 9, 02600 Espoo, Finland
Postal Code:	Reza Serafat
Country:	reza.serafat@hmdglobal.com
Telephone:	+491735287964
Fax:	/

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

3.1. About EUT

General Information:

Description	Mobile Phone
Model name/HVIN	TA-1658
Brand name	HMD
FCC ID	2AJOTTA-1658
Extreme Temperature	-10~55℃
Nominal Voltage	3.87V
Extreme High Voltage	4.45V
Extreme Low Voltage	3.6V

Supported Bands:

UMTS Frequency Band(s)	B 1/2/4/5
GSM Frequency Band(s)	GSM 850/900/1800/1900
E-UTRA Frequency Band(s)	B 2/3/4/5/7/8/12/17/25/26/28/41/66/71
WLAN Frequency Band(s)	2.4G/5GHz
5G Frequency Band(s)	N 2/5/7/8/25/41/66/71/77/78

Supported Codecs:

UMTS Audio Codec(s)	AMR NB/AMR WB
GSM Audio Codec (s)	EFR/AMR NB/AMR WB
E-UTRA Audio Codec(s)	AMR NB/AMR WB/EVS NB/EVS WB/EVS SWB
WLAN Audio Codec(s)	AMR NB/AMR WB/EVS NB/EVS WB/EVS SWB
5G Audio Codec(s)	AMR NB/AMR WB/EVS NB/EVS WB/EVS SWB
OTT	Google Meet

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
UT27a	IMEI: 353401640000504/ 353401640000512	V1.0	000T_0_362	2024-07-22

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

3.3. Internal Identification of AE

AE ID*	Description	SN

/ / /

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

4. Reference Documents

4.1. Documents supplied by applicant

EUT parameters, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
ANSI C63.19	American National Standard Methods of Measurement of Compatibility Between Wireless Communications Devices and Hearing Aids	2019
TIA 5050	Telecommunications Communications Products Receive Volume Control Requirements for Wireless (Mobile) Devices	2018 Edition
285076 D04 Volume Control v02	GUIDANCE FOR PERFORMING VOLUME CONTROL MEASUREMENTS ON MOBILE HANDSETS	2023.09.29
285076 D05 HAC Waiver DA 23-914 v01	HAC COMPLIANCE UNDER WAIVER DA 23-914	2023.09.29

5. Air Interfaces / Bands used for testing

The codec bit rates of the applicant's choosing are EVS-NB 24.4kbps and EVS-WB 24.4kbps.

Air-interface	Band	Tested Codec	Tested Rate(kbps)
GSM	850/1900	EFR	/
WCDMA (UMTS)	B2/4/5	AMR-NB	4.75/12.2
		AMR-WB	6.6/23.85
VoLTE	B2/4/5/7/12/17/25/26/ 41/66/71	AMR-NB	4.75/12.2
		AMR-WB	6.6/23.85
		EVS-NB	24.4
		EVS-WB	24.4
VoWiFi	802.11g/ac	AMR-NB	4.75
		EVS-NB	24.4
		EVS-WB	24.4
VoNR	N 2/5/25/41/66/71	AMR-NB	4.75
		AMR-WB	6.6
		EVS-WB	24.4

6. Test Results

6.1. Test summary and Conclusions

The volume control measurement method is in accordance with the TIA 5050-2018.
The EUT was tested in CTTL acoustics laboratory. All the detail results are showed in section 6.3.

I: Under the waiver, only CMRS narrowband and CMRS wideband voice codecs are required to comply with the volume control requirements of the TIA 5050-2018 Volume Control Standard as amended as follows:

a. For the 2N mounting force test, one narrowband and one wideband voice codec embedded with the handset must pass with at least one volume control setting with a conversational gain of ⩾ 6 dB for all voice services, bands of operation and air interfaces over which it operates using one codec bit rate of the applicant's choosing.

b. For the 8N mounting force test, one narrowband and one wideband voice codec embedded with the handset must pass with at least one volume control setting with a conversational gain of ⩾ 6 dB8 for all voice services, bands of operation and air interfaces over which they operate but is not required to meet or exceed the full 18 dB of conversational gain specified in section 5.1.1 of the TIA 5050 Volume Control Standard using one codec bit rate of the applicant's choosing.

II: For all other narrowband and wideband codecs not evaluated in I.a. above, TIA 5050-2018 Receive Distortion and Noise Performance and Receive Acoustic Frequency Response

Performance evaluations are not required; however, these codecs shall be assessed for conversational gain and documented in the test report at the 2N and 8N levels with a gain of ⩾ 6 dB for all voice services, bands of operation and air interfaces over which they operate. The handset volume setting used to comply with I.a. shall be used for these other CMRS codec evaluations.

III. Any other codec for voice services embedded in the handset, not identified in I and II above, is not required to comply or demonstrate in the test reports for conversational gain.

Table 6.1-1: the worst-case test results of the chosen codec of telephony call

Mode	Channel	Modulation	Data Rate	Volume Level	Codec	NB/WB	Bit Rate	2N/8N	Conv. Gain (ANNEX D)	RFR (ANNEX D)	Minimum Distortion (ANNEX D)		Verdict
			[Mbps]				[kbps]	[N]	[dB]		[Hz]	[dB]	
802.11g	6	CCK	11	Max-2	EVS	NB	24.4	2N	17.72	PASS	500	31.83	PASS
802.11g	6	CCK	11	Max-2	EVS	NB	24.4	8N	10.86	PASS	630	25.45	PASS
802.11g	6	CCK	11	Max-2	EVS	WB	24.4	2N	19.06	PASS	1250	20.58	PASS
802.11g	6	CCK	11	Max-2	EVS	WB	24.4	8N	11.49	PASS	4000	26.06	PASS

Table 6.1-2: the worst-case test results of other codecs of telephony call

Band	Channel	Bandwidth	Modulation	SCS (kHz)	RB	Volume Level	Codec	NB/WB	Bit Rate	2N/8N	Conv. Gain (ANNEX E)	FR	Min PN-SDNR		Verdict
		[MHz]							[kbps]	[N]	[dB]		[Hz]	[dB]	
VoNR N41	40620	50	64QAM	30	133	Max-2	AMR	NB	4.75	2N	17.08	/	/	/	PASS
VoNR N41	40620	50	64QAM	30	133	Max-2	AMR	NB	4.75	8N	9.82	/	/	/	PASS
VoNR N41	40620	50	64QAM	30	133	Max-2	AMR	WB	6.6	2N	18.72	/	/	/	PASS
VoNR N41	40620	50	64QAM	30	133	Max-2	AMR	WB	6.6	8N	11.47	/	/	/	PASS

6.2. Description of Test Setup

In order to provide the complete information about the measurement environment within this report the setup is described in this chapter. Figure 6.2.1 shows a block diagram of the test arrangement.

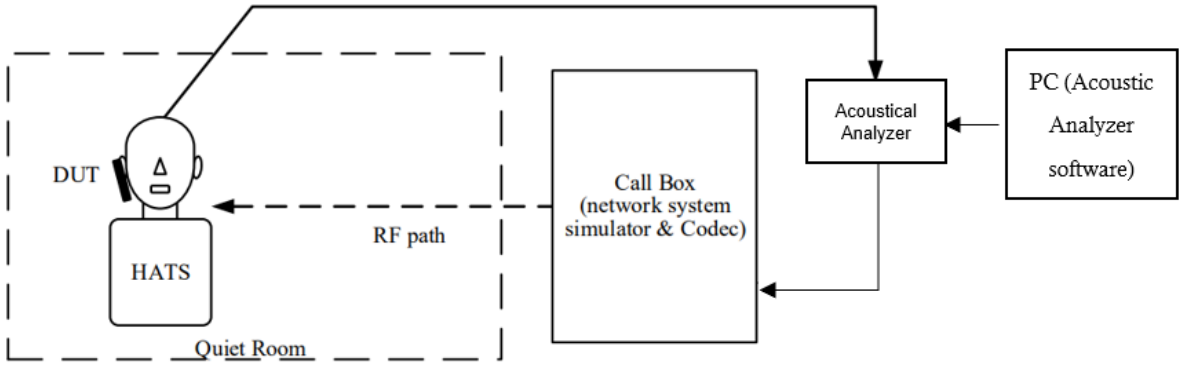


Fig. 6.2.1: Block diagram of the test setup

An artificial head measurement system according to ITU-T Recommendation P.58 equipped with artificial ears (Type3.3 acc. ITU-T Rec. P.57) are used. The artificial head is placed in the center of an anechoic test room. The measurements are implemented in the HEAD acoustics software ACQUA and can be carried out automatically. They allow signal recording at the artificial ears and feeding at the network simulator.

The network simulators (e.g. Rohde & Schwarz CMW500, CMX500) establish the call to the mobile phone via an antenna connection. The EUT was tested using EFR/AMR-NB/AMR-WB/EVS-NB/EVS-WB codecs.

ANNEX C shows the handheld Positioner with mounted EUT. The application force between the phone and the artificial ear is adjusted. A mounting force of 2N or 8 N is adjusted.

6.3. Test Detail Results

According to TIA 5050, the mobile TA-1658's frequency response and distortion failures occur at the maximum and max-1 volume control setting, the max-2 volume is found for which the conversational gain requirement is met without a frequency response or a distortion failure.

6.3.1 VoLTE IMS call investigation

Table 6.3.1-1: the **Codec** and **Bandwidth** investigating results of **VoLTE** IMS call

Band	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Volume Level	Codec	NB/WB	Bit Rate [kbps]	2N/8N [N]	Conv. Gain [dB]	FR	Min PN-SDNR [Hz]	Min PN-SDNR [dB]
B2	18900	10	QPSK	50	0	Max-2	EVS	NB	24.4	2N	17.54	PASS	1250	31.53
B2	18900	10	QPSK	50	0	Max-2	EVS	NB	24.4	8N	10.90	PASS	500	27.42
B2	18900	10	QPSK	50	0	Max-2	EVS	WB	24.4	2N	19.06	PASS	250	23.34

B2	18900	10	QPSK	50	0	Max-2	EVS	WB	24.4	8N	11.71	PASS	1250	26.84
B2	18900	10	QPSK	50	0	Max-2	AMR	NB	4.75	2N	16.71	/	/	/
B2	18900	10	QPSK	50	0	Max-2	AMR	NB	4.75	8N	10.23	/	/	/
B2	18900	10	QPSK	50	0	Max-2	AMR	NB	12.2	8N	11.44	/	/	/
B2	18900	10	QPSK	50	0	Max-2	AMR	WB	6.6	2N	18.48	/	/	/
B2	18900	10	QPSK	50	0	Max-2	AMR	WB	6.6	8N	11.14	/	/	/
B2	18900	10	QPSK	50	0	Max-2	AMR	WB	23.85	8N	12.32	/	/	/

Table 6.3.1-2: the **Radio Configuration** investigating results of **VoLTE** IMS call

Band	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Volume Level	Codec	NB/WB	Bit Rate [kbps]	2N/8N [N]	Conv. Gain [dB]	FR	Min PN-SDNR [Hz]	Min PN-SDNR [dB]
B2	18900	10	QPSK	1	0	Max-2	EVS	WB	24.4	2N	19.00	PASS	1250	22.31
B2	18900	10	QPSK	1	49	Max-2	EVS	WB	24.4	2N	19.73	PASS	250	22.99
B2	18900	10	16QAM	1	0	Max-2	EVS	WB	24.4	2N	19.70	PASS	250	23.45
B2	18900	10	16QAM	1	49	Max-2	EVS	WB	24.4	2N	19.79	PASS	250	23.17
B2	18900	10	16QAM	50	0	Max-2	EVS	WB	24.4	2N	19.87	PASS	2000	24.10
B2	18900	20	QPSK	100	0	Max-2	EVS	WB	24.4	2N	19.31	PASS	250	22.93
B2	18900	20	QPSK	1	0	Max-2	EVS	WB	24.4	2N	19.29	PASS	1250	22.98
B2	18900	20	QPSK	1	99	Max-2	EVS	WB	24.4	2N	19.23	PASS	250	23.70
B2	18900	20	16QAM	1	99	Max-2	EVS	WB	24.4	2N	19.26	PASS	250	22.87
B2	18900	20	16QAM	1	0	Max-2	EVS	WB	24.4	2N	19.30	PASS	250	22.83
B2	18900	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.29	PASS	2000	21.79
B2	18900	15	QPSK	75	0	Max-2	EVS	WB	24.4	2N	19.25	PASS	250	22.84
B2	18900	15	QPSK	1	74	Max-2	EVS	WB	24.4	2N	19.27	PASS	1250	22.27
B2	18900	15	16QAM	1	74	Max-2	EVS	WB	24.4	2N	19.27	PASS	250	23.51
B2	18900	15	16QAM	75	0	Max-2	EVS	WB	24.4	2N	19.25	PASS	1250	22.75
B2	18900	5	QPSK	1	24	Max-2	EVS	WB	24.4	2N	19.25	PASS	250	23.22
B2	18900	5	16QAM	25	0	Max-2	EVS	WB	24.4	2N	19.26	PASS	250	22.85
B2	18900	3	16QAM	15	0	Max-2	EVS	WB	24.4	2N	19.30	PASS	1250	22.47

B2	18900	1.4	16QAM	6	0	Max-2	EVS	WB	24.4	2N	19.21	PASS	250	23.34
B2	18900	10	QPSK	1	0	Max-2	AMR	NB	4.75	8N	10.62	/	/	/
B2	18900	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.06	/	/	/
B2	18900	10	16QAM	1	0	Max-2	AMR	NB	4.75	8N	10.21	/	/	/
B2	18900	10	16QAM	1	49	Max-2	AMR	NB	4.75	8N	10.32	/	/	/
B2	18900	10	16QAM	50	0	Max-2	AMR	NB	4.75	8N	10.23	/	/	/
B2	18900	20	QPSK	100	0	Max-2	AMR	NB	4.75	8N	10.40	/	/	/
B2	18900	20	QPSK	1	0	Max-2	AMR	NB	4.75	8N	10.65	/	/	/
B2	18900	20	QPSK	1	99	Max-2	AMR	NB	4.75	8N	10.30	/	/	/
B2	18900	20	16QAM	100	0	Max-2	AMR	NB	4.75	8N	10.07	/	/	/
B2	18900	20	16QAM	1	0	Max-2	AMR	NB	4.75	8N	10.68	/	/	/
B2	18900	20	16QAM	1	99	Max-2	AMR	NB	4.75	8N	10.32	/	/	/
B2	18900	15	QPSK	1	74	Max-2	AMR	NB	4.75	8N	10.16	/	/	/
B2	18900	15	16QAM	75	0	Max-2	AMR	NB	4.75	8N	10.43	/	/	/
B2	18900	5	QPSK	1	24	Max-2	AMR	NB	4.75	8N	10.51	/	/	/
B2	18900	5	16QAM	25	0	Max-2	AMR	NB	4.75	8N	10.22	/	/	/
B2	18900	3	QPSK	1	14	Max-2	AMR	NB	4.75	8N	10.14	/	/	/
B2	18900	3	16QAM	15	0	Max-2	AMR	NB	4.75	8N	10.26	/	/	/
B2	18900	1.4	QPSK	1	5	Max-2	AMR	NB	4.75	8N	10.35	/	/	/
B2	18900	1.4	16QAM	6	0	Max-2	AMR	NB	4.75	8N	10.33	/	/	/

Table 6.3.1-3: the **LTE Band** investigating results of **VoLTE** IMS call

Band	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Volume Level	Codec	NB/WB	Bit Rate [kbps]	2N/8N [N]	Conv. Gain [dB]	FR	Min PN-SDNR [Hz]	Min PN-SDNR [dB]
B4	20175	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.18	PASS	250	22.78
B5	20525	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.23	PASS	250	23.44

B7	21100	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.19	PASS	5000	23.78
B12	23095	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.21	PASS	250	24.95
B17	23790	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.26	PASS	250	23.50
B25	26365	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.31	PASS	250	24.72
B26	26865	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.32	PASS	250	22.92
B41	40620	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.20	PASS	250	23.36
B66	132322	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.26	PASS	250	24.77
B71	133297	20	16QAM	100	0	Max-2	EVS	WB	24.4	2N	19.29	PASS	250	23.36
B4	20175	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.04	/	/	/
B5	20525	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.29	/	/	/
B7	21100	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.32	/	/	/
B12	23095	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.17	/	/	/
B17	23790	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.25	/	/	/
B25	26365	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.25	/	/	/
B26	26865	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.35	/	/	/
B41	40620	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.15	/	/	/
B66	132322	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.22	/	/	/
B71	133297	10	QPSK	1	49	Max-2	AMR	NB	4.75	8N	10.10	/	/	/

6.3.2 VoWiFi IMS call investigation

Table 6.3.2: the investigating results of **VoWiFi** IMS call

Mode	Channel	Modulation	Data Rate [Mbps]	Volume Level	Codec	NB/WB	Bit Rate [kbps]	2N/8N [N]	Conv. Gain [dB]	FR	Min PN-SDNR [Hz]	Min PN-SDNR [dB]
802.11g	6	DSSS	1	Max-2	EVS	WB	24.4	2N	19.15	PASS	250	23.93
802.11g	6	DSSS	2	Max-2	EVS	WB	24.4	2N	19.09	PASS	1600	21.30
802.11g	6	CCK	5.5	Max-2	EVS	WB	24.4	2N	19.05	PASS	250	24.62
802.11g	6	CCK	11	Max-2	EVS	WB	24.4	2N	19.06	PASS	1250	20.58
802.11ac	6	BPSK	6	Max-2	EVS	WB	24.4	2N	19.07	PASS	1250	21.17
802.11ac	6	BPSK	9	Max-2	EVS	WB	24.4	2N	19.07	PASS	250	23.67

802.11ac	6	QPSK	12	Max-2	EVS	WB	24.4	2N	19.01	PASS	250	23.22
802.11ac	6	QPSK	18	Max-2	EVS	WB	24.4	2N	19.03	PASS	250	23.14
802.11ac	6	16-QAM	24	Max-2	EVS	WB	24.4	2N	19.08	PASS	250	23.20
802.11ac	6	16-QAM	36	Max-2	EVS	WB	24.4	2N	19.05	PASS	1250	22.25
802.11ac	6	64-QAM	48	Max-2	EVS	WB	24.4	2N	19.04	PASS	4000	22.29
802.11ac	6	64-QAM	54	Max-2	EVS	WB	24.4	2N	19.05	PASS	250	23.45
802.11g	6	DSSS	1	Max-2	AMR	NB	4.75	8N	10.65	/	/	/
802.11g	6	DSSS	2	Max-2	AMR	NB	4.75	8N	10.48	/	/	/
802.11g	6	CCK	5.5	Max-2	AMR	NB	4.75	8N	10.62	/	/	/
802.11g	6	CCK	11	Max-2	AMR	NB	4.75	8N	10.46	/	/	/
802.11ac	6	BPSK	6	Max-2	AMR	NB	4.75	8N	10.39	/	/	/
802.11ac	6	BPSK	9	Max-2	AMR	NB	4.75	8N	10.64	/	/	/
802.11ac	6	QPSK	12	Max-2	AMR	NB	4.75	8N	10.28	/	/	/
802.11ac	6	QPSK	18	Max-2	AMR	NB	4.75	8N	10.33	/	/	/
802.11ac	6	16-QAM	24	Max-2	AMR	NB	4.75	8N	10.41	/	/	/
802.11ac	6	16-QAM	36	Max-2	AMR	NB	4.75	8N	10.56	/	/	/
802.11ac	6	64-QAM	48	Max-2	AMR	NB	4.75	8N	10.35	/	/	/
802.11ac	6	64-QAM	54	Max-2	AMR	NB	4.75	8N	10.47	/	/	/

6.3.3 GSM call investigation

Table 6.3.3: the investigating results of **GSM** call

Band	Channel	Volume Level	Codec	Voice bandwidth	Bit Rate	2N/8N	Conv. Gain	FR	Min PN-SDNR	
					[kbps]	[N]	[dB]		[Hz]	[dB]
GSM850	162	Max-2	EFR	NB	/	2N	14.65	/	/	/
GSM850	162	Max-2	EFR	NB	/	8N	11.01	/	/	/
GSM1900	600	Max-2	EFR	NB	/	2N	14.61	/	/	/
GSM1900	600	Max-2	EFR	NB	/	8N	11.13	/	/	/

6.3.4 WCDMA call investigation

Table6.3.4: the investigating results of **WCDMA** call

air interface	Band	Channel	Volume Level	Codec	Voice bandwidth	Bit Rate	2N/8N	Conv. Gain	FR	Min PN-SDNR	
						[kbps]	[N]	[dB]		[Hz]	[dB]
WCDMA	Band2	9800	Max-2	AMR	NB	4.75	2N	13.71	/	/	/
WCDMA	Band2	9800	Max-2	AMR	NB	4.75	8N	10.23	/	/	/

WCDMA	Band2	9800	Max-2	AMR	NB	12.2	8N	11.02	/	/	/
WCDMA	Band2	9800	Max-2	AMR	WB	6.6	2N	16.49	/	/	/
WCDMA	Band2	9800	Max-2	AMR	WB	6.6	8N	11.29	/	/	/
WCDMA	Band2	9800	Max-2	AMR	WB	23.85	8N	11.94	/	/	/
WCDMA	Band4	1312	Max-2	AMR	NB	4.75	8N	10.19	/	/	/
WCDMA	Band5	4132	Max-2	AMR	NB	4.75	8N	9.99	/	/	/

6.3.5 VoNR call investigation

Table6.3.5: the investigating results of **VoNR** call

Band	Channel	Bandwidth [MHz]	Modulation	SCS (kHz)	RB	Volume Level	Codec	NB/WB	Bit Rate [kbps]	2N/8N [N]	Conv. Gain [dB]	FR	Min PN-SDNR [Hz]	Min PN-SDNR [dB]
N41	40620	100	QPSK	30	273	Max-2	EVS	WB	24.4	2N	19.09	PASS	2000	22.02
N41	40620	100	QPSK	30	270	Max-2	EVS	WB	24.4	2N	19.13	PASS	2000	21.99
N41	40620	100	QPSK	30	137	Max-2	EVS	WB	24.4	2N	19.12	PASS	2000	22.00
N41	40620	100	16QAM	30	273	Max-2	EVS	WB	24.4	2N	19.14	PASS	2000	21.98
N41	40620	100	16QAM	30	1	Max-2	EVS	WB	24.4	2N	19.10	PASS	2000	21.98
N41	40620	100	64QAM	30	273	Max-2	EVS	WB	24.4	2N	19.10	PASS	2000	21.98
N41	40620	100	64QAM	30	1	Max-2	EVS	WB	24.4	2N	19.09	PASS	2000	21.98
N41	40620	100	256QAM	30	273	Max-2	EVS	WB	24.4	2N	19.12	PASS	2000	21.98
N41	40620	80	QPSK	30	109	Max-2	EVS	WB	24.4	2N	19.11	PASS	2000	21.32
N41	40620	80	16QAM	30	1	Max-2	EVS	WB	24.4	2N	19.09	PASS	2000	21.82
N41	40620	80	64QAM	30	1	Max-2	EVS	WB	24.4	2N	19.14	PASS	2000	21.82
N41	40620	80	256QAM	30	1	Max-2	EVS	WB	24.4	2N	18.94	PASS	2000	22.19
N41	40620	50	QPSK	30	67	Max-2	EVS	WB	24.4	2N	19.11	PASS	2000	22.18
N41	40620	50	16QAM	30	1	Max-2	EVS	WB	24.4	2N	19.12	PASS	2000	22.18
N41	40620	20	QPSK	30	50	Max-2	EVS	WB	24.4	2N	19.15	PASS	2000	22.00

N41	40620	20	16QAM	30	1	Max-2	EVS	WB	24.4	2N	19.12	PASS	2000	21.80
N41	40620	10	16QAM	30	1	Max-2	EVS	WB	24.4	2N	19.10	PASS	2000	22.10
N2	18900	20	QPSK	15	106	Max-2	EVS	WB	24.4	2N	19.48	PASS	2000	21.93
N5	20525	20	QPSK	15	106	Max-2	EVS	WB	24.4	2N	19.50	PASS	2000	21.93
N25	26365	20	QPSK	15	106	Max-2	EVS	WB	24.4	2N	19.51	PASS	2000	21.92
N66	132322	20	QPSK	15	106	Max-2	EVS	WB	24.4	2N	19.50	PASS	2000	21.92
N71	133297	20	QPSK	15	106	Max-2	EVS	WB	24.4	2N	19.07	PASS	2000	21.93
N41	40620	100	QPSK	30	273	Max-2	AMR	NB	4.75	8N	10.29	/	/	/
N41	40620	100	QPSK	30	137	Max-2	AMR	NB	4.75	8N	10.70	/	/	/
N41	40620	100	16QAM	30	273	Max-2	AMR	NB	4.75	8N	10.09	/	/	/
N41	40620	100	16QAM	30	1	Max-2	AMR	NB	4.75	8N	10.26	/	/	/
N41	40620	100	64QAM	30	273	Max-2	AMR	NB	4.75	8N	10.28	/	/	/
N41	40620	100	64QAM	30	1	Max-2	AMR	NB	4.75	8N	10.06	/	/	/
N41	40620	100	256QAM	30	273	Max-2	AMR	NB	4.75	8N	10.29	/	/	/
N41	40620	100	256QAM	30	1	Max-2	AMR	NB	4.75	8N	10.33	/	/	/
N41	40620	80	QPSK	30	217	Max-2	AMR	NB	4.75	8N	10.22	/	/	/
N41	40620	80	16QAM	30	217	Max-2	AMR	NB	4.75	8N	9.91	/	/	/
N41	40620	80	64QAM	30	1	Max-2	AMR	NB	4.75	8N	10.16	/	/	/
N41	40620	80	256QAM	30	217	Max-2	AMR	NB	4.75	8N	10.26	/	/	/
N41	40620	50	16QAM	30	1	Max-2	AMR	NB	4.75	8N	10.33	/	/	/
N41	40620	50	64QAM	30	133	Max-2	AMR	NB	4.75	8N	9.82	/	/	/
N41	40620	20	16QAM	30	1	Max-2	AMR	NB	4.75	8N	10.26	/	/	/
N41	40620	20	64QAM	30	51	Max-2	AMR	NB	4.75	8N	10.26	/	/	/
N41	40620	10	16QAM	30	1	Max-2	AMR	NB	4.75	8N	10.21	/	/	/
N41	40620	10	64QAM	30	24	Max-2	AMR	NB	4.75	8N	10.31	/	/	/

N2	18900	20	64QAM	15	106	Max-2	AMR	NB	4.75	8N	10.25	/	/	/
N5	20525	20	64QAM	15	10.25	Max-2	AMR	NB	4.75	8N	10.35	/	/	/
N25	26365	20	64QAM	15	106	Max-2	AMR	NB	4.75	8N	10.81	/	/	/
N66	132322	20	64QAM	15	106	Max-2	AMR	NB	4.75	8N	10.72	/	/	/
N71	133297	20	64QAM	15	106	Max-2	AMR	NB	4.75	8N	10.11	/	/	/

7. Test Facilities Utilized

No	Name	Type	SN	Manufacturer	Cal.Due Date
1	Measurement Frontend	Labcore	77000136	HEAD acoustics GmbH	2025-11-29
2	HEAD measurement system	HMS II.3	12306194 (torso137 40182)	HEAD acoustics GmbH	2024-10-25
3	Universal communication tester	CMW500	170430	Rohde&Schwarz	2026-08-03
4	Universal communication tester	CMX500	101626	Rohde&Schwarz	2026-08-05
5	Acoustic chamber	4.70 m×4.30 m×2.10 m	None	Ruisen	2026-10-26
Software					
Name		**Version**			
ACQUA		V 6.0.200			

END OF REPORT BODY

ANNEX A: EUT photograph

No phone’s photos for Confidentiality requirements.

ANNEX B: EUT parameters

Disclaimer: The bands and codecs of EUT provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

General Information:

Description	Mobile Phone
Model name/HVIN	TA-1658
Brand name	HMD
FCC ID	2AJOTTA-1658
Extreme Temperature	-10~55℃
Nominal Voltage	3.87V
Extreme High Voltage	4.45V
Extreme Low Voltage	3.6V

Supported Bands:

UMTS Frequency Band(s)	B 1/2/4/5
GSM Frequency Band(s)	GSM 850/900/1800/1900
E-UTRA Frequency Band(s)	B 2/3/4/5/7/8/12/17/25/26/28/41/66/71
WLAN Frequency Band(s)	2.4G/5GHz
5G Frequency Band(s)	N 2/5/7/8/25/41/66/71/77/78

Supported Codecs:

UMTS Audio Codec(s)	AMR NB/AMR WB
GSM Audio Codec (s)	EFR/AMR NB/AMR WB
E-UTRA Audio Codec(s)	AMR NB/AMR WB/EVS NB/EVS WB/EVS SWB
WLAN Audio Codec(s)	AMR NB/AMR WB/EVS NB/EVS WB/EVS SWB
5G Audio Codec(s)	AMR NB/AMR WB/EVS NB/EVS WB/EVS SWB
OTT	Google Meet

ANNEX C: Test Layout

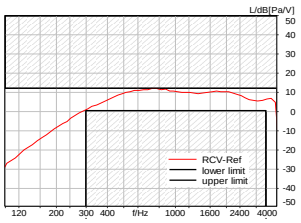
Artificial Ear Type		3.3
Mounting Force [N]		2 and 8
Center Fork Offset [°]		0
Volume Level		5(1-7)
Angle settings		
Xe [°]	Ye [°]	Ze[°]
0	0	5

NOTE: The handset shall be placed in either the standard test position as specified in IEEE Std 269 or a recommended test position specified by the manufacturer that complies with the recommended test position requirements in IEEE Std 269.

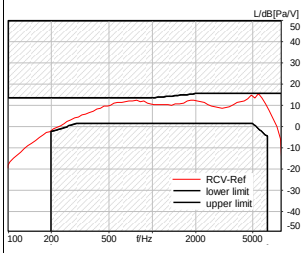
No phone's photos for Confidentiality requirements.

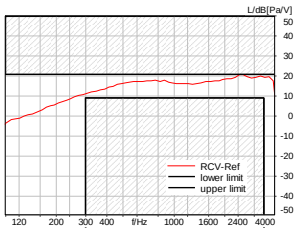
ANNEX D: The Worst-case Measurement Data of The Chosen Codec of Telephony Call

SMD	Status	Single Value Description	Single Value	Object
5.1 Receive Volume Control Performance 8N Table-9	Done	Speech Level [dB[SPL]]	80.86	24T04Z101721 VoWifi EVS
5.1.1 -1 Conversation Gain 8N Table-9	Ok	Calculated Value [dB]	10.86	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 400Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	33.04	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 500Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	28.33	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 630Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	25.45	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 800Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	41.96	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1000Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	36.94	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1250Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	33.29	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1600Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	44.42	24T04Z101721 VoWifi EVS

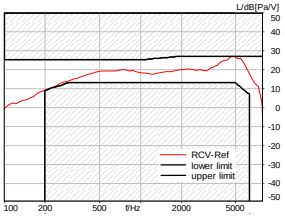
Receive path - distortion and noise 2000Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	45.77	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2500Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	42.29	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 3150Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	35.57	24T04Z101721 VoWifi EVS
5.2 Receive path – distortion and noise Table-9	Ok			24T04Z101721 VoWifi EVS
5.3 Receive Acoustic Frequency response Performance Table-9	Ok	Min. dist. to tolerance scheme [dB], 305.9 Hz	 1.26	24T04Z101721 VoWifi EVS
5.1 Receive Volume Control Performance 8N Table-9	Done	Speech Level [dB[SPL]]	81.49	24T04Z101721 VoWifi EVS
5.1.1 -1 Conversation Gain 8N Table-9	Ok	Calculated Value [dB]	11.49	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 250 WBonly Table-9	Done	Distortion (Noise) [dB], 0.0 dB	38.44	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 315Hz WBonly Table-9	Done	Distortion (Noise) [dB], 0.0 dB	39.04	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 400Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	39.47	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 500Hz	Done	Distortion (Noise) [dB], 0.0 dB	35.58	24T04Z101721 VoWifi EVS

WB&NB Table-9				
Receive path - distortion and noise 630Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	37.31	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 800Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	41.10	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1000Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	38.05	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1250Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	33.19	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1600Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	42.58	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2000Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	29.34	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2500Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	41.53	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 3150Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	40.92	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 4000Hz WBonly Table-9	Done	Distortion (Noise) [dB], 0.0 dB	26.06	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 5000Hz WBonly Table-9	Done	Distortion (Noise) [dB], 0.0 dB	35.75	24T04Z101721 VoWifi EVS

5.2 Receive path – distortion and noise Table-9	Ok			24T04Z101721 VoWifi EVS
5.3 Receive Acoustic Frequency response Performance Table-9	Ok	Min. dist. to tolerance scheme [dB], 205.7 Hz	 1.12	24T04Z101721 VoWifi EVS
5.1 Receive Volume Control Performance 2N Table-9	Done	Speech Level [dB[SPL]]	87.72	24T04Z101721 VoWifi EVS
5.1.1 -1 Conversation Gain 2N Table-9	Ok	Calculated Value [dB]	17.72	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 400Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	32.74	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 500Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	31.83	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 630Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	38.46	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 800Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	40.09	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1000Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	39.32	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1250Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	32.34	24T04Z101721 VoWifi EVS

Receive path - distortion and noise 1600Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	40.25	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2000Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	35.65	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2500Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	42.49	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 3150Hz WB&NB Table-9	Done	Distortion (Noise) [dB], 0.0 dB	41.60	24T04Z101721 VoWifi EVS
5.2 Receive path – distortion and noise Table-9	Ok			24T04Z101721 VoWifi EVS
5.3 Receive Acoustic Frequency response Performance Table-9	Ok	Min. dist. to tolerance scheme [dB], 305.9 Hz	 2.59	24T04Z101721 VoWifi EVS
5.1 Receive Volume Control Performance 2N CCK;11Mbps; Table-9	Done	Speech Level [dB[SPL]]	89.06	24T04Z101721 VoWifi EVS
5.1.1 -1 Conversation Gain 2N CCK;11Mbps; Table-9	Ok	Calculated Value [dB]	19.06	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 250 WBonly CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	24.67	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 315Hz WBonly CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	30.66	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 4000Hz	Done	Distortion (Noise) [dB], 0.0 dB	39.97	24T04Z101721 VoWifi EVS

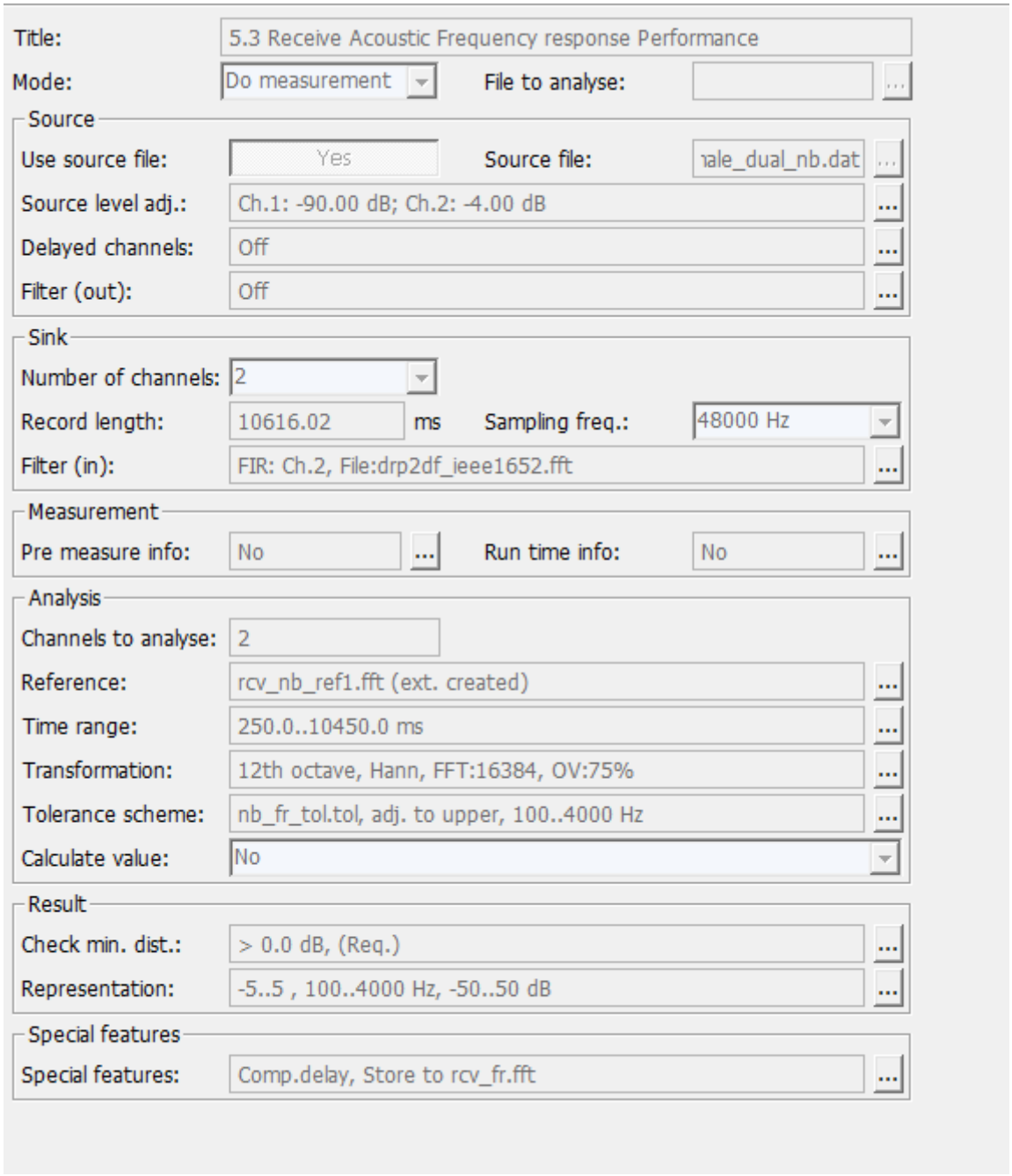
WBonly CCK;11Mbps; Table-9				
Receive path - distortion and noise 400Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	32.00	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 500Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	34.80	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 630Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	38.08	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 800Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	39.29	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1000Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	29.46	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1250Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	20.58	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 1600Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	26.66	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2000Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	45.21	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 2500Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	42.81	24T04Z101721 VoWifi EVS
Receive path - distortion and noise 3150Hz WB&NB CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	33.31	24T04Z101721 VoWifi EVS

Receive path - distortion and noise 5000Hz WBonly CCK;11Mbps; Table-9	Done	Distortion (Noise) [dB], 0.0 dB	42.23	24T04Z101721 VoWifi EVS
5.2 Receive path – distortion and noise CCK;11Mbps; Table-9	Ok			24T04Z101721 VoWifi EVS
5.3 Receive Acoustic Frequency response Performance CCK;11Mbps; Table-9	Ok	Min. dist. to tolerance scheme [dB], 205.7 Hz	 0.32	24T04Z101721 VoWifi EVS

ANNEX E: The Worst-case Measurement Data of Other Codecs of Telephony Call

SMD	Status	Single Value Description	Single Value	Object
5.1 Receive Volume Control Performance 8N 50MHz,64QAM,SCS=30,RB=133; Table-5; Table-10	Done	Speech Level [dB[SPL]]	79.82	24T04Z101721 VoNR AMR
5.1.1 -1 Conversation Gain 8N 50MHz,64QAM,SCS=30,RB=133; Table-5; Table-10	Ok	Calculated Value [dB]	9.82	24T04Z101721 VoNR AMR
5.1 Receive Volume Control Performance 8N Table-10	Done	Speech Level [dB[SPL]]	81.47	24T04Z101721 VoNR AMR
5.1.1 -1 Conversation Gain 8N Table-10	Ok	Calculated Value [dB]	11.47	24T04Z101721 VoNR AMR
5.1 Receive Volume Control Performance 2N Table-10	Done	Speech Level [dB[SPL]]	87.08	24T04Z101721 VoNR AMR
5.1.1 -1 Conversation Gain 2N Table-10	Ok	Calculated Value [dB]	17.08	24T04Z101721 VoNR AMR
5.1 Receive Volume Control Performance 2N Table-10	Done	Speech Level [dB[SPL]]	88.72	24T04Z101721 VoNR AMR
5.1.1 -1 Conversation Gain 2N Table-10	Ok	Calculated Value [dB]	18.72	24T04Z101721 VoNR AMR

ANNEX F: FREQUENCY RESPONSE USED DF and 1/12 OCTAVE



ANNEX G: HATS CERTIFICATE

中 国 计 量 科 学 研 究 院

证书编号 LSsx2022-08382

校 准 结 果

表 2 HATS 右耳校准结果

频率/Hz	31.5	63	125	250
REF/dB	92.45	92.40	92.39	92.46
(REF+10)/dB	102.45	102.40	102.38	102.47
差值/dB	10.00	10.00	9.99	10.01
频率/Hz	500	1000	2000	16000
REF/dB	92.83	94.00	98.20	94.12
(REF+10)/dB	102.83	104.00	108.19	103.81
差值/dB	10.00	10.00	9.99	9.69

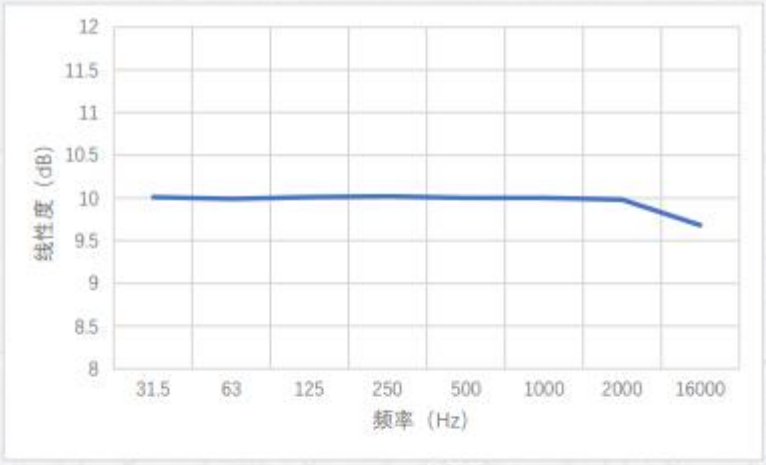


图 2 HATS 右耳线性度图

输出部分

2、频率响应

校准时用 B&K 4938 型压力场传声器在 HATS 嘴正前方，在其参考点处进行校准，测得其嘴（配 PA50 型功率放大器）的频谱如图 3 所示，100 Hz 至 20 kHz 范围内 1/3 倍频程中心频率频谱数据见表 3。

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ANNEX H: ACOUSTIC CHAMBER CERTIFICATE

中 国 计 量 科 学 研 究 院

证书编号 LSsx2021-19386

校 准 结 果

二、背景噪声校准结果

正常情况下，消声室的 A 计权背景噪声为 14 dB，其 1/3 倍频频谱见图 2。

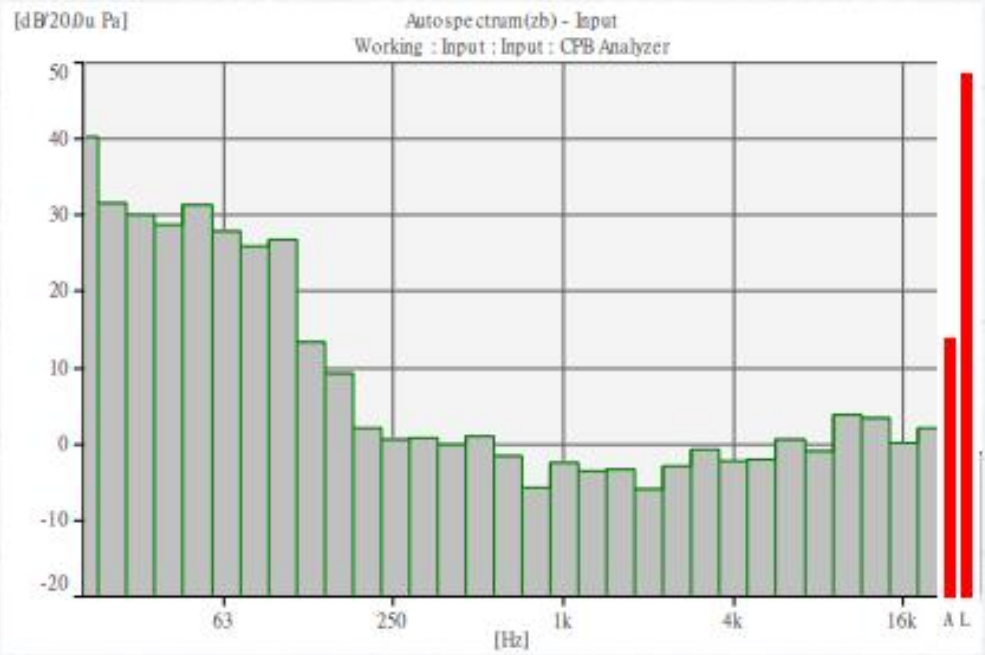

图 2 背景噪声频谱图

声压级校准结果不确定度：U=0.6 dB (k=2)

----------以下空白----------

说明：

根据校准规范 JJF 1147-2006 的规定，通常情况下 60 个月校准一次。

声明：

1. 我院仅对加盖“中国计量科学研究院校准专用章”的完整证书负责。
2. 本证书的校准结果仅对本次所校准的计量器具有效。

校 准 员：郑云山　　核 验 员：牛津

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ANNEX I: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 26th day of June 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

*****END OF REPORT*****