TESTING
NVLAP LAB CODE 600118-0

HAC RF TEST REPORT

No. I22Z60517-SEM02

For

Shenzhen Tinno Mobile Technology Corp.

Mobile Phone

Model Name: U115AA,U115AC

With

Hardware Version: V1.0

Software Version:

U115AAV01.13.10;U115ACV01.20.10

FCC ID: XD6U115AA

Results Summary: M Category = M4

Issued Date: 2022-05-30

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	Issue Date	Description
I22Z60517-SEM02	Rev.0	2022-05-30	Initial creation of test report

TABLE OF CONTENT

1 Test Laboratory

1.1 Testing Location

CompanyName:	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2 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.	

1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	May 17, 2022
Testing End Date:	May 17, 2022

1.4 Signature

Lin Xiaojun

(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

HMD Global Oy	Shenzhen Tinno Mobile Technology Corp.
Address/Post:	27-001, South Side of Tianlong Mobile Headquarters Building, Tongfa South Road, Xili Community, Xili Street, Nanshan District, Shenzhen ,PRC
Contact Person:	xiaoping.li
Contact Email:	xiaoping.li@tinno.com
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2.2 Manufacturer Information

Company Name:	Shenzhen Tinno Mobile Technology Corp.
Address/Post:	27-001, South Side of Tianlong Mobile Headquarters Building, Tongfa South Road, Xili Community, Xili Street, Nanshan District, Shenzhen ,PRC
Contact Person:	xiaoping.li
Contact Email:	xiaoping.li@tinno.com
Telephone:	0755-86095550
Fax	0755-86095551

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

3.1 About EUT

Description:	Mobile Phone
Model name:	U115AA,U115AC
Operating mode(s):	WCDMAB2/B4/B5, BT, Wi-Fi, LTE Band 2/4/5/12/14

3.2 Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT	863145060006300	V1.0	U115AAV01.13.10

*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	LT25H426271B	\	GUANGDONG FENGHUA NEW ENERGY 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
WCDMA (UMTS)	850	VO	NO(1)	BT, WLAN	CMRS Voice
	1700				
	1900				
LTE FDD	Band2/4/5/12/14	V/D	NO(1)	BT, WLAN	VoLTE,
BT	2450	DT	NA	WCDMA ,LTE	NA
WLAN	2450	DT	NA	WCDMA ,LTE	NA

NA: Not Applicable VO: Voice Only V/D: CMRS and IP Voice Service over Digital Transport
DT: Digital Transport
* HAC Rating was not based on concurrent voice and data modes, Non current mode was found to represent worst case rating for both M and T rating
Note1 = The air interface is exempted from testing by low power exemption that its average antenna input power plus its MIF is ≤17 dBm, and is rated as M4.

4 Maximum Output Power.

WCDMA 850MHz	Conducted Power (dBm)		
	Channel 4233(846.6MHz)	Channel 4182(836.4MHz)	Channel 4132(826.4MHz)
RMC	25	25	25
WCDMA 1700MHz	Conducted Power (dBm)		
	Channel1513(1752.6MHz)	Channel1412(1732.4MHz)	Channel1312(1712.4MHz)
RMC	24.5	24.5	24.5
WCDMA 1900MHz	Conducted Power (dBm)		
	Channel 9538(1907.6MHz)	Channel 9400(1880MHz)	Channel 9262(1852.4MHz)
RMC	24.5	24.5	24.5
LTE Band2 QPSK	Conducted Power (dBm)		
	Channel 19100(1900MHz)	Channel 18900(1880MHz)	Channel18700(1860MHz)
	24.5	24.5	24.5
LTE Band4 QPSK	Conducted Power (dBm)		
	Channel20300(1745MHz)	Channel 20175(1732.5MHz)	Channel20050(1720MHz)
	24.5	24.5	24.5
LTE Band5 QPSK	Conducted Power (dBm)		
	Channel 20600(844MHz)	Channel 20525(836.5MHz)	Channel20450(829MHz)
	25	25	25
LTE Band12 QPSK	Conducted Power (dBm)		
	Channel 23330(793MHz)		
	25	25	25
LTE Band14 QPSK	Conducted Power (dBm)		
	Channel 26965(841.5MHz)	Channel 26865(831.5MHz)	Channel26775(822.5MHz)
	25	25	25

5 Reference Documents

5.1 Reference Documents for testing

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

Reference	Title	Version
ANSI C63.19-2011	American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids	2011 Edition
FCC 47 CFR §20.19	Hearing Aid Compatible Mobile Headsets	2015 Edition
KDB 285076 D01	Equipment Authorization Guidance for Hearing Aid Compatibility	v06

6 OPERATIONAL CONDITIONS DURING TEST

6.1 HAC MEASUREMENT SET-UP

These measurements are performed using the DASY5 NEO 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 XP system and HAC Measurement Software DASY5 NEO, 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.

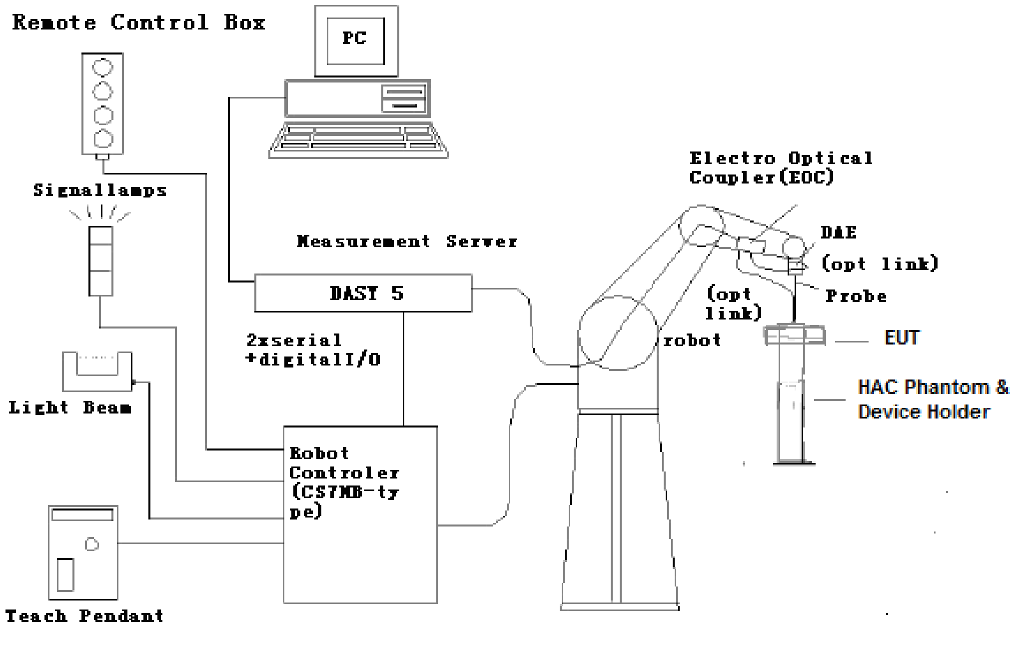
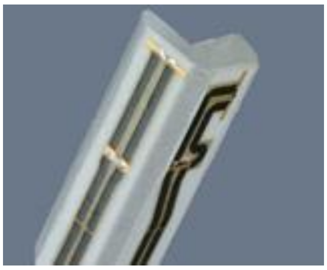


Fig. 1 HAC Test Measurement Set-up

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



[ER3DV6]

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material
Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2)
Frequency	40 MHz to > 6 GHz (can be extended to < 20 MHz) 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: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 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).

The Phone Positioner supports accurate and reliable positioning of any phone with effect on near field <±0.5 dB.

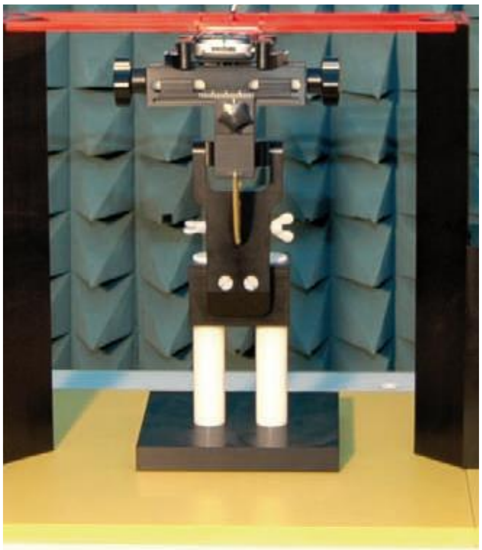


Fig. 2 HAC Phantom & Device Holder

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 XP
Data Converter
Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY5 software
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 4 illustrates the references and reference plane that shall be used in the WD emissions measurement.

- The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.
- The grid is centered on the audio frequency output transducer of the WD (speaker or T-coil).
- The grid is located by reference to a reference plane. This reference plane is the planar area that contains the highest point in the area of the WD that normally rests against the user's ear
- The measurement plane is located parallel to the reference plane and 15 mm from it, out from the phone. The grid is located in the measurement plane.

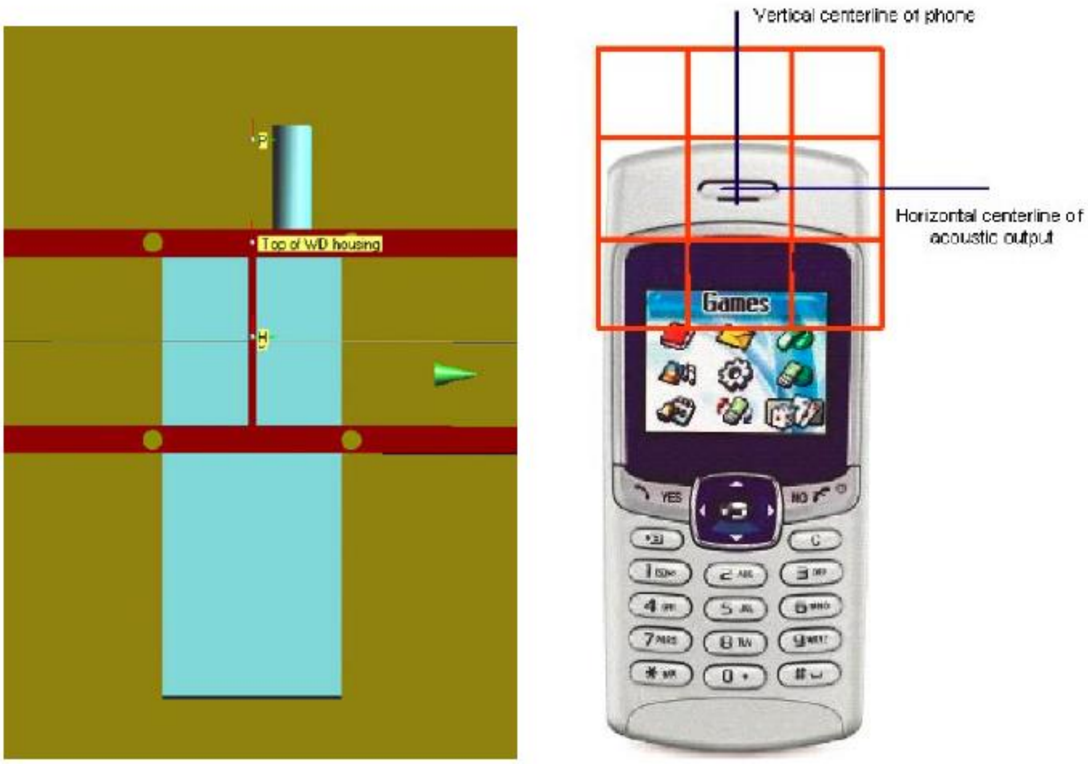


Fig. 3 WD reference and plane for RF emission measurements

8 Evaluation of MIF

8.1 Introduction

The MIF (Modulation Interference Factor) is used to classify E-field emission to determine Hearing Aid Compatibility (HAC). It scales the power-averaged signal to the RF audio interference level and is characteristic to a modulation scheme. The HAC standard preferred "indirect" measurement method is based on average field measurement with separate scaling by the MIF. With an Audio Interference Analyzer (AIA) designed by SPEAG specifically for the MIF measurement, these values have been verified by practical measurements on an RF signal modulated with each of the waveforms. The resulting deviations from the simulated values are within the requirements
of the HAC standard.

The AIA (Audio Interference Analyzer) is an USB powered electronic sensor to evaluate signals in the frequency range 698MHz - 6 GHz. It contains RMS detector and audio frequency circuits for sampling of the RF envelope.

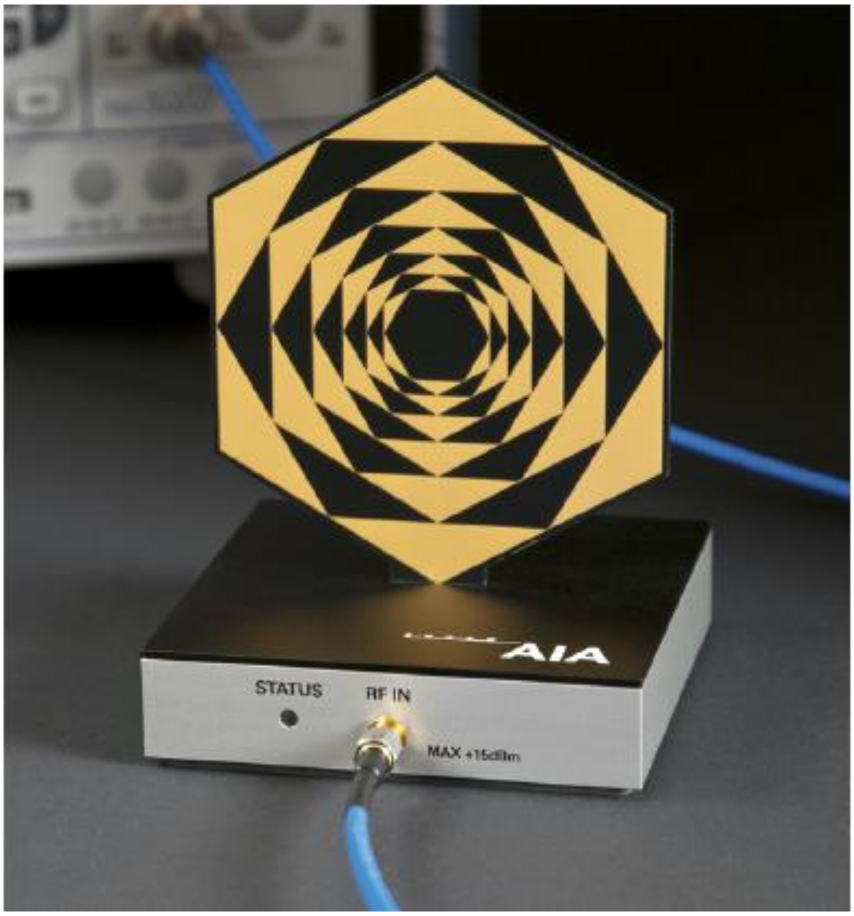


Fig. 5 AIA Front View

8.2 MIF measurement with the AIA

The MIF is measured with the AIA as follows:

1. Connect the AIA via USB to the DASY5 PC and verify the configuration settings.
2. Couple the RF signal to be evaluated to an AIA via cable or antenna.
3. Generate a MIF measurement job for the unknown signal and select the measurement port and timing settings.
4. Document the results via the post processor in a report.

8.3 Test equipment for the MIF measurement

No.	Name	Type	Serial Number	Manufacturer
01	Signal Generator	E4438C	MY49071430	Agilent
02	AIA	SE UMS 170 CB	1029	SPEAG
03	BTS	CMW500	166370	R&S

8.4 DUT MIF results

Based on the KDB285076D01v05, 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 to be determine the Low-power Exemption.

Typical MIF levels in ANSI C63.19-2011	
Transmission protocol	Modulation interference factor
UMTS-FDD(WCDMA, AMR)	-25.43dB
UMTS-FDD (HSPA)	-20.75dB
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

9 Evaluation for low-power exemption

9.1 Product testing threshold

There are two methods for exempting an RF air interface technology from testing. The first method requires evaluation of the MIF for the worst-case operating mode. An RF air interface technology of a device is exempt from testing when its average antenna input power plus its MIF is≤17 dBm for any of its operating modes. The second method does not require determination of the MIF. The RF emissions testing exemption shall be applied to an RF air interface technology in a device whose peak antenna input power, averaged over intervals ≤50 μs20, is ≤23 dBm. An RF air interface technology that is exempted from testing by either method shall be rated as M4.
The first method is used to be exempt from testing for the RF air interface technology in this report.

9.2 Conducted power

Band	Average power (dBm)	MIF (dB)	Sum (dBm)	C63.19 Tested
WCDMA 850 - RMC	25	-25.43	-0.43	No
WCDMA 1700 - RMC	24.5	-25.43	-0.93	No
WCDMA 1900 - RMC	24.5	-25.43	-0.93	No
LTE Band 2 QPSK	24.5	-15.63	8.87	No
LTE Band 4 QPSK	24.5	-15.63	8.87	No
LTE Band 5 QPSK	25	-15.63	9.37	No
LTE Band 12 QPSK	25	-15.63	9.37	No
LTE Band 14 QPSK	25	-15.63	9.37	No

9.3 Conclusion

According to the above table, the sums of average power and MIF for WCDMA, LTE FDD are less than 17dBm. The WCDMA, LTE FDD are exempt from testing and rated as M4.

10 CONCLUSION

The HAC measurement indicates that the EUT complies with the HAC limits of the ANSIC63.19-2011. The total M-rating is **M4.**

END OF REPORT BODY

The photos of HAC test are presented in the additional document:

Appendix to test report No.I22Z60517-SEM02/03

The photos of HAC test