TESTING
NVLAP LAB CODE 600118-0

HAC RF TEST REPORT

No. I21Z70014-SEM01

For

FIH CO., LTD.

WCDMA/LTE Mobile Phone

Model Name: EA1002, EC1002

With

Hardware Version: 3.0

Software Version: EA1002_01N0_1_180

EC1002_00N0_1_180

FCC ID: RYQEC1002

Results Summary: M Category = M4

Issued Date: 2021-2-24

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
I21Z70014-SEM01	Rev.0	2021-2-10	Initial creation of test report
I21Z70014-SEM01	Rev.1	2021-2-19	Add the lab number on page4 Update the footnote in section 3.3 on page6
I21Z70014-SEM01	Rev.2	2021-2-24	Update the information in section 3.3 on page6

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
Lab number	12389A-1

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.	

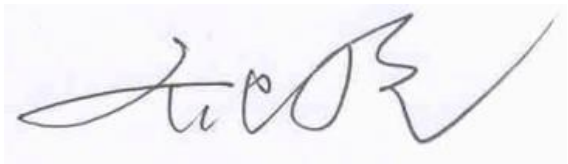
1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Hao
Testing Start Date:	February 9, 2021
Testing End Date:	February 9, 2021

1.4 Signature

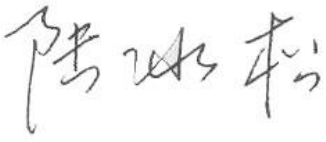
Lin Xiaojun

(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

Company Name:	FIH CO., LTD.
Address/Post:	No.4, Mingsheng St., Tu-Cheng Dist.,New Taipei City 23679, Taiwan
Contact Person:	Jinling Wang
Contact Email:	jinlingwang@fih-foxconn.com
Telephone:	+8613911384201

2.2 Manufacturer Information

Company Name:	FIH CO., LTD.
Address/Post:	No.4, Mingsheng St., Tu-Cheng Dist.,New Taipei City 23679, Taiwan
Contact Person:	Jinling Wang
Contact Email:	jinlingwang@fih-foxconn.com
Telephone:	+8613911384201

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

3.1 About EUT

Description:	WCDMA/LTE Mobile Phone
Model name:	EA1002, EC1002
Operating mode(s):	WCDMA B2/B4/B5, BT, Wi-Fi, LTE Band 2/4/5/12/14/29/30/66

3.2 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	HE399	/	Zhong shan Tianmao Battery Co.,Ltd

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

3.3 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[N2]	BT, WLAN	CMRS Voice
	1700				
	1900				
	HSPA	DT	NO[N2]		Google duo
LTE FDD	Band2/4/5/12/14/30/66	V/D	NO[N2]	BT, WLAN	VoLTE, Google duo
BT	2450	DT	NA	WCDMA, LTE	NA
WLAN	2450	V/D	NO[N2]	WCDMA, LTE	VoWiFi, Google duo
WLAN	5G	V/D	NO[N2]	WCDMA, LTE	VoWiFi, Google duo

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 = No Associated T-Coil measurement has been made in accordance with 285076 D02 T-Coil testing for CMRS IP
Note2= According to ANSI C63.19 2011, 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. So the WCDMA, LTE FDD and WiFi are exempt from testing and rated as M4. The detail is described in chapter 9.

4 Maximum Output Power

WCDMA 850MHz	Conducted Power (dBm)		
	Channel 4233(846.6MHz)	Channel 4182(836.4MHz)	Channel 4132(826.4MHz)
RMC	24.5	24.5	24.5
HSPA	22.5	22.5	22.5
WCDMA 1700MHz	**Conducted Power (dBm)**		
	Channel 1513 (1752.6MHz)	**Channel 1412 (1732.4MHz)**	**Channel 1312 (1712.4MHz)**
RMC	25	25	25
HSPA	22.5	22.5	22.5
WCDMA 1900MHz	**Conducted Power (dBm)**		
	Channel 9538(1907.6MHz)	**Channel 9400(1880MHz)**	**Channel 9262(1852.4MHz)**
RMC	25	25	25
HSPA	22.5	22.5	22.5
LTE Band2	**Conducted Power (dBm)**		
	Channel 19100(1900MHz)	**Channel 18900(1880MHz)**	**Channel18700(1860MHz)**
QPSK	24.5	24.5	24.5
16QAM	23.5	23.5	23.5
LTE Band4	**Conducted Power (dBm)**		
	Channel 20300(1745MHz)	**Channel 20175(1732.5MHz)**	**Channel20050(1720MHz)**
QPSK	24.5	24.5	24.5
16QAM	23.5	23.5	23.5
LTE Band5	**Conducted Power (dBm)**		
	Channel 20600(844MHz)	**Channel 20525(836.5MHz)**	**Channel20450(829MHz)**
QPSK	24	24	24
16QAM	23	23	23
LTE Band12	**Conducted Power (dBm)**		
	Channel 23130(711MHz)	**Channel 23095(707.5MHz)**	**Channel23060(704MHz)**
QPSK	24	24	24
16QAM	23	23	23
LTE Band14	**Conducted Power (dBm)**		
	Channel 23330(793MHz)		
QPSK	24		
16QAM	23		
LTE Band30	**Conducted Power (dBm)**		
	Channel 27710(2310MHz)		
QPSK	24.5		
16QAM	23.5		
LTE Band66	**Conducted Power (dBm)**		
	Channel 132572(1770MHz)	**Channel 132322(1745MHz)**	**Channel 133072(1720MHz)**

QPSK	25	25	25
16QAM	24	24	24
2.4GHz 802.11g	**Conducted Power (dBm)**		
	Channel 11 (2462MHz)	**Channel 6 (2437MHz)**	**Channel 1 (2412MHz)**
	18	18	18
5GHz 802.11a	**Tune up (dBm)**		
	Channel 60 (5300MHz)	**Channel 124 (5620MHz)**	**Channel 157 (5785MHz)**
	18	18	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 C63.19-2011	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	v05r01

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.

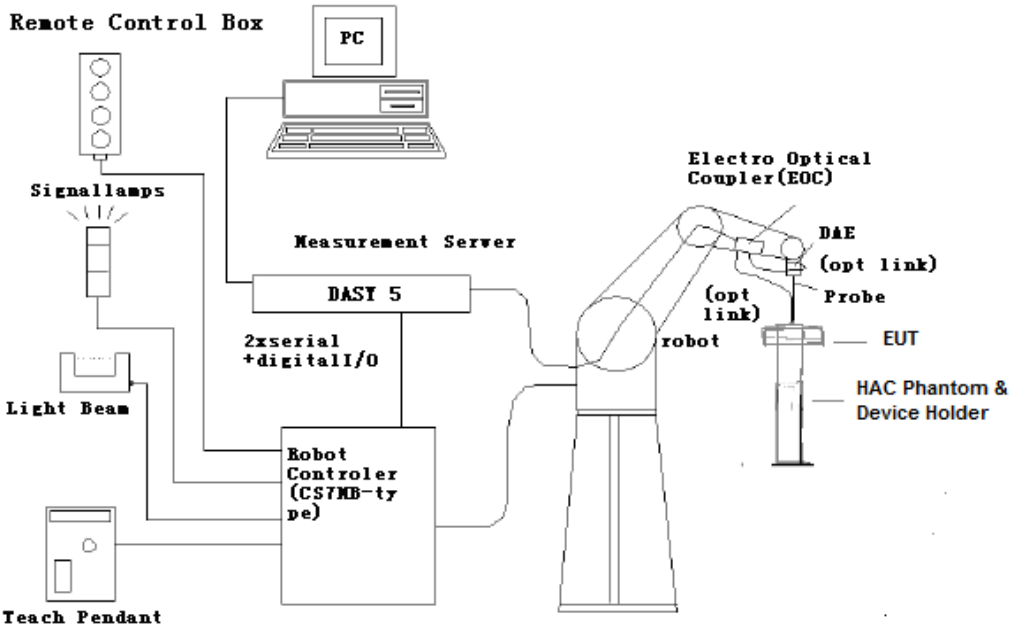


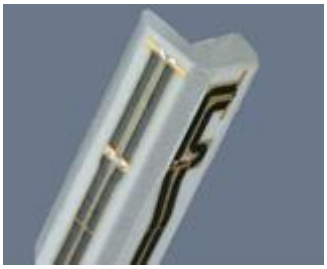
Fig. 1 HAC Test Measurement Set-up

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

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



[ER3DV6]

6.3Test 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.

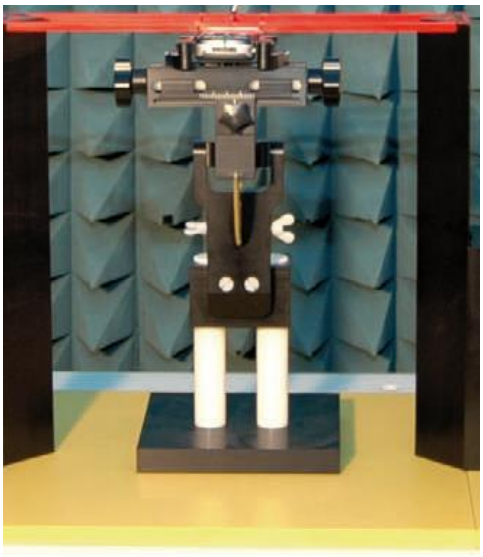


Fig. 2 HAC Phantom & Device Holder

6.4Robotic 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.

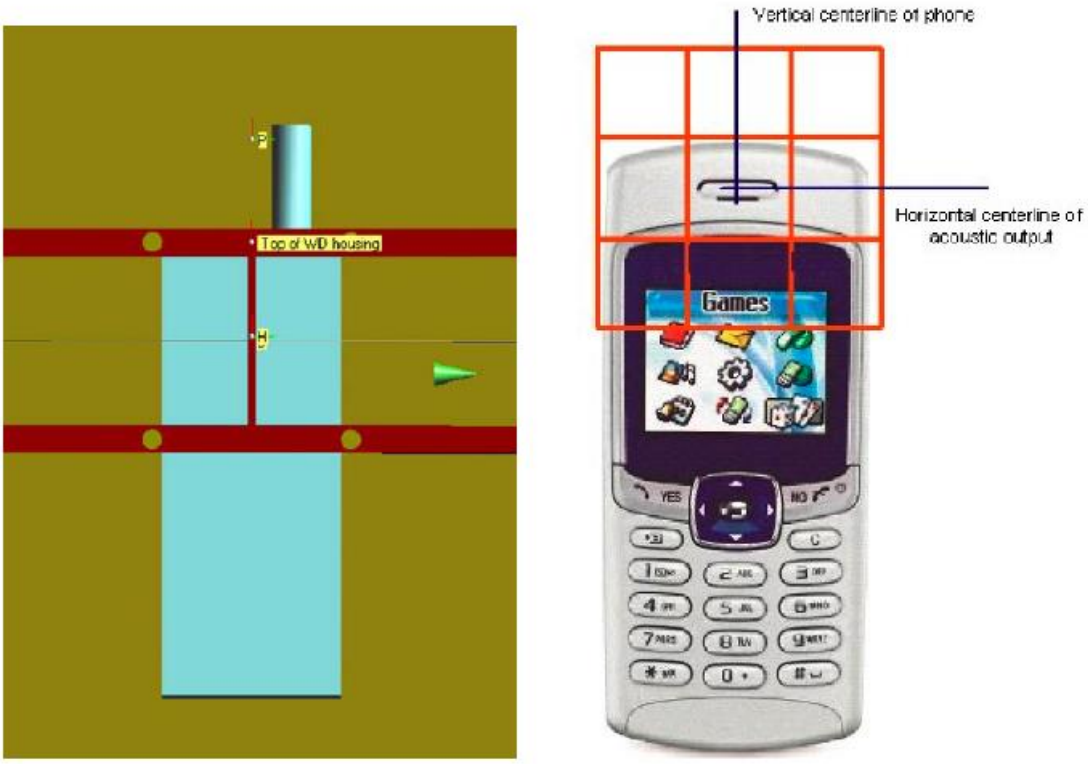


Fig. 3 WD reference and plane for RF emission measurements

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.

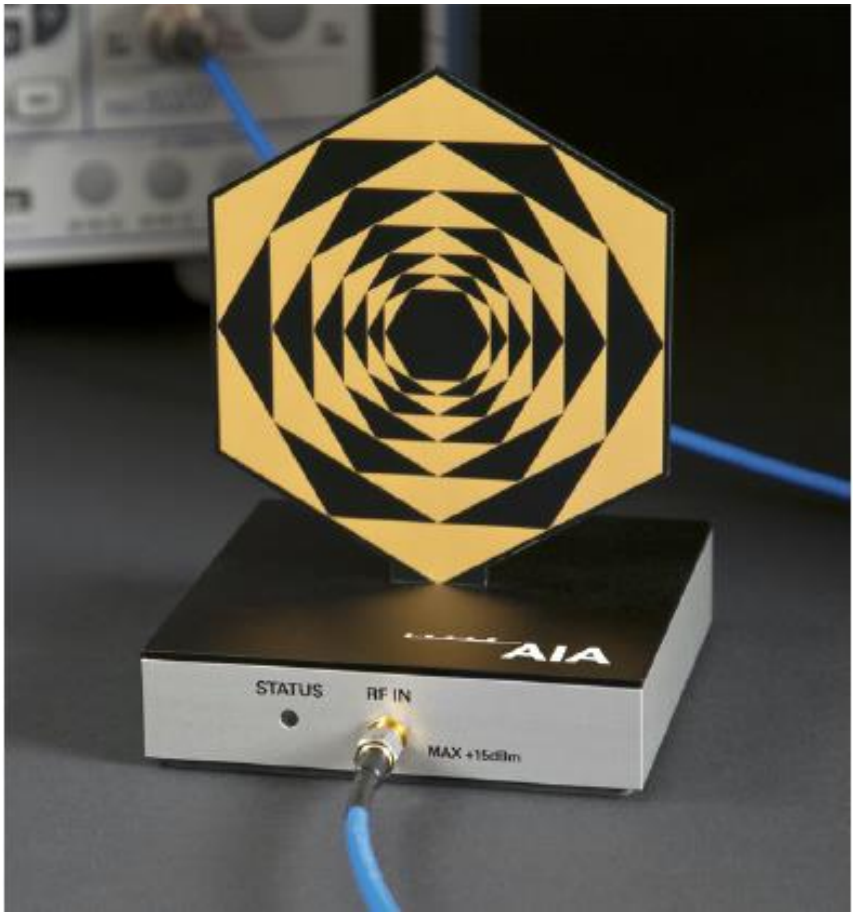


Fig. 5 AIA Front View

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	Agilent

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
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

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	24.5	-25.43	-0.93	No
WCDMA 850 - HSPA	22.5	-20.75	1.75	No
WCDMA 1700 - RMC	25	-25.43	-0.43	No
WCDMA 1700 - HSPA	22.5	-20.75	1.75	No
WCDMA 1900 - RMC	25	-25.43	-0.43	No
WCDMA 1900 - HSPA	22.5	-20.75	1.75	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	24	-15.63	8.37	No
LTE Band 12 QPSK	24	-15.63	8.37	No
LTE Band 14 QPSK	24	-15.63	8.37	No
LTE Band 30 QPSK	24.5	-15.63	8.87	No
LTE Band 66 QPSK	25	-15.63	9.37	No
LTE Band 2 16QAM	23.5	-9.76	13.74	No
LTE Band 4 16QAM	23.5	-9.76	13.74	No
LTE Band 5 16QAM	23	-9.76	13.24	No
LTE Band 12 16QAM	23	-9.76	13.24	No
LTE Band 14 16QAM	23	-9.76	13.24	No
LTE Band 30 16QAM	23.5	-9.76	13.74	No
LTE Band 66 16QAM	24	-9.76	14.24	No
WiFi-2.4G	18	-2.02	15.98	No
WiFi-5G	18	-5.82	12.18	No

9.3 Conclusion

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

***END OF REPORT BODY*