

## EMC TEST REPORT

**Applicant:** Shenzhen Maikejie Technology Co., Ltd.

**Address of Applicant:** 301A, 5# Building, Furong Road, Gushu Community, Xixiang Street, Bao'an District, Shenzhen 518126, China

**Manufacturer/Factory:** Shenzhen Maikejie Technology Co., Ltd.

**Address of Manufacturer/Factory:** 301A, 5# Building, Furong Road, Gushu Community, Xixiang Street, Bao'an District, Shenzhen 518126, China

**Equipment Under Test (EUT)**

Product Name: Wireless earphones

Model No.: M31, M32, M9S, Y1, M27, M28, M29, M35, M36, M38

Trade Mark: Defunc

**Applicable standards:** ETSI EN 301 489-1 V2.2.3 (2019-11)  
ETSI EN 301 489-17 V3.1.1 (2017-02)

**Date of sample receipt:** May 26, 2020

**Date of Test:** May 26, 2020-June 02, 2020

**Date of report issue:** June 02, 2020

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.



Robinson Lo

Laboratory Manager

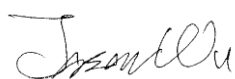


This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver

## 2 Version

Version No.	Date	Description
00	June 02, 2020	Original

Prepared By:

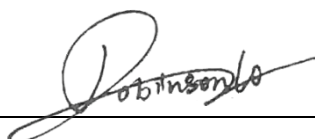


Date:

June 02, 2020

Project Engineer

Check By:



Date:

June 02, 2020

Reviewer

## 3 Contents

	Page
1 COVER PAGE .....	1
2 VERSION .....	2
3 CONTENTS .....	3
4 TEST SUMMARY .....	4
5 GENERAL INFORMATION .....	5
5.1 GENERAL DESCRIPTION OF EUT .....	5
5.2 OPERATING MODES .....	6
5.3 DESCRIPTION OF SUPPORT UNITS .....	6
5.4 TEST FACILITY .....	6
5.5 TEST LOCATION .....	6
5.6 DEVIATION FROM STANDARDS .....	6
5.7 ABNORMALITIES FROM STANDARD CONDITIONS .....	6
5.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER .....	6
5.9 MONITORING OF EUT FOR ALL IMMUNITY TEST .....	6
6 EQUIPMENT USED DURING TEST .....	7
7 EMC REQUIREMENTS SPECIFICATION IN ETSI EN 301 489-17 .....	10
7.1 EMI (EMISSION) .....	10
7.1.1 Radiated Emission .....	10
7.1.2 Conducted Emissions .....	14
7.1.3 Harmonics Test Results .....	17
7.1.4 Flicker Test Results .....	17
7.2 IMMUNITY .....	18
7.2.1 Electrostatic Discharge .....	21
7.2.2 Radiated Immunity .....	23
7.2.3 Radio frequency common mode .....	25
7.2.4 Electrical Fast Transients .....	27
7.2.5 Surge .....	29
7.2.6 Voltage Dip and Voltage Interruptions .....	31
8 TEST SETUP PHOTO .....	33
9 EUT CONSTRUCTIONAL DETAILS .....	33

## 4 Test Summary

EMI Test				
Test Item	Test Requirement	Test Method	Application	Result
Radiated Emission	ETSI EN 301 489-17	ETSI EN301 489-1	Enclosure	Pass
Conducted Emission	ETSI EN 301 489-17	ETSI EN301 489-1	AC port	Pass
Harmonic Current Emissions	ETSI EN 301 489-17	ETSI EN301 489-1	AC port	N/A
Voltage Fluctuations and Flicker	ETSI EN 301 489-17	ETSI EN301 489-1	AC port	Pass
EMS Test				
ESD (Electrostatic Discharge)	ETSI EN 301 489-17	EN 61000-4-2	Enclosure	Pass
Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	ETSI EN 301 489-17	EN 61000-4-3	Enclosure	Pass
EFT (Electrical Fast Transients)	ETSI EN 301 489-17	EN 61000-4-4	AC port	Pass
Surge Immunity	ETSI EN 301 489-17	EN 61000-4-5	AC port	Pass
Radio frequency, common mode	ETSI EN 301 489-17	EN 61000-4-6	AC port	Pass
Voltage Dips and Interruptions	ETSI EN 301 489-17	EN 61000-4-11	AC port	Pass

*Remark:*

*Pass: The EUT complies with the essential requirements in the standard.*

## 5 General Information

### 5.1 General Description of EUT

Product Name:	Wireless earphones
Model No.:	M31, M32, M9S, Y1, M27, M28, M29, M35, M36, M38
Test Model No:	M31
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.	
Operation Frequency:	2402~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation technology:	GFSK, Pi/4DQPSK, 8DPSK
Antenna Type:	Integral Antenna
Antenna gain:	2.71dBi(Declare by applicant)
Power Supply:	Charge box: Battery DC 3.7V, 300mAh, 1.11Wh Earphone: Battery DC 3.7V, 45mAh, 0.166Wh

## 5.2 Operating Modes

Operating mode	Detail description
Bluetooth mode	Keep the EUT in communications with Bluetooth function.
Charge mode	Keep the EUT in charge status.

## 5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
SAMSUNG	Mobile Phone	S7EDGE	R28H835BJ2B
APPLE	USB Charger	A1399	N/A

## 5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>• <b>FCC —Registration No.: 381383</b> Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.</li> <li>• <b>IC —Registration No.: 9079A</b> The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A</li> <li>• <b>NVLAP (LAB CODE:600179-0)</b> Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0</li> </ul>
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## 5.5 Test Location

RI test was performed at:
SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.
All other tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 123- 128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

## 5.6 Deviation from Standards

None.
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## 5.7 Abnormalities from Standard Conditions

None.
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## 5.8 Other Information Requested by the Customer

None.
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## 5.9 Monitoring of EUT for All Immunity Test

Visual:	Monitored the light and work status of the EUT
Audio:	Monitored the sound of the EUT

## 6 Equipment Used during Test

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 26 2019	June. 25 2020
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 26 2019	June. 25 2020
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 26 2019	June. 25 2020
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 26 2019	June. 25 2020
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 26 2019	June. 25 2020
9	Coaxial Cable	GTS	N/A	GTS211	June. 26 2019	June. 25 2020
10	Coaxial cable	GTS	N/A	GTS210	June. 26 2019	June. 25 2020
11	Coaxial Cable	GTS	N/A	GTS212	June. 26 2019	June. 25 2020
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 26 2019	June. 25 2020
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 26 2019	June. 25 2020
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 26 2019	June. 25 2020
15	Band filter	Amindeon	82346	GTS219	June. 26 2019	June. 25 2020
16	Power Meter	Anritsu	ML2495A	GTS540	June. 26 2019	June. 25 2020
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 26 2019	June. 25 2020
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 26 2019	June. 25 2020
19	Splitter	Agilent	11636B	GTS237	June. 26 2019	June. 25 2020
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 26 2019	June. 25 2020
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 26 2019	June. 25 2020

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 26 2019	June. 25 2020
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 26 2019	June. 25 2020
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 26 2019	June. 25 2020
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 26 2019	June. 25 2020
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 26 2019	June. 25 2020

ESD						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	ESD Simulator	KIKUSUI	KES4021A	GTS242	June. 26 2019	June. 25 2020
2	Thermo meter	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020

Conducted Immunity						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Signal Generator	ROHDE & SCHWARZ	SMB 100A	GTS553	June. 26 2019	June. 25 2020
2	CDN	LionCEL	CDN-M3-16	GTS554	June. 26 2019	June. 25 2020
3	CDN	CYBERTEK	EM 5070	GTS559	June. 26 2019	June. 25 2020
4	Power amplifier	rflight	NTWPA-00010475	GTS555	June. 26 2019	June. 25 2020
5	ATT	SUNWAVE	SJ-50-06DB	GTS556	June. 26 2019	June. 25 2020
6	Clamp	SCHAFFNER	KEMZ 801	GTS558	June. 26 2019	June. 25 2020

Harmonic/ Flicker						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Power Analyzer H/F	EMTEST	DPA500	GTS235	June. 26 2019	June. 25 2020
2	AC POWER SUPPLY	EMTEST	ACS500	GTS236	June. 26 2019	June. 25 2020
3	Thermo meter	KTJ	TA328	GTS256	June. 26 2019	June. 25 2020



EFT, Surge, Voltage dips and Interruption						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	EMTEST system	EMTEST	UCS500N	GTS239	June. 26 2019	June. 25 2020
2	Clamp	EMTEST	HFK	GTS557	June. 26 2019	June. 25 2020
3	Thermo meter	KTJ	TA328	GTS238	June. 26 2019	June. 25 2020

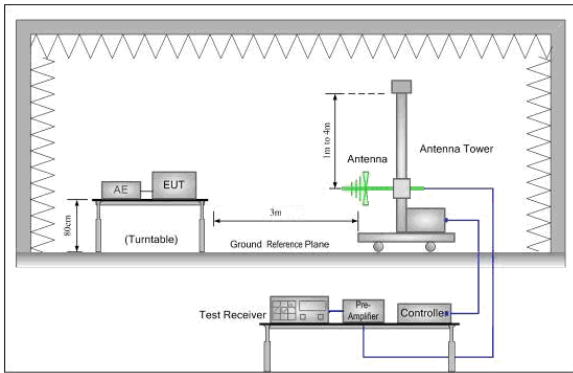
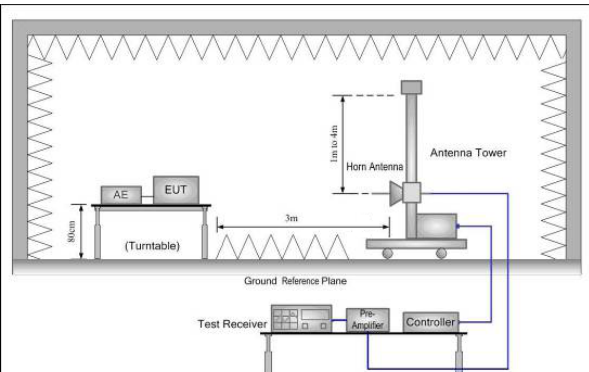
Radiated Immunity						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Fully-Anechoic Chamber 2	Chang Zhou Zhong Shuo	854	SEM001-05	2020-05-09	2023-05-08
2	Power Sensor	Rohde & Schwarz	NRP-Z91	SEM009-09	2020-03-31	2021-03-30
3	Stacked Log.-Per.- Broadband Antenna (70MHz-10GHz)	Schwarzbeck	STLP 9129	SEM003-25	N/A	N/A
4	Signal Generator (9kHz-6GHz)	Rohde & Schwarz	SMB100A	SEM006-11	2020-03-31	2021-03-30
5	Broadband Amplifier (80MHz-1GHz)	Rohde & Schwarz	BBA150-BC250	SEM005-12	2019-09-24	2020-09-23
6	Broadband Amplifier(800MHz-3GHz)	Rohde & Schwarz	BBA150-D110	SEM005-13	2020-03-31	2021-03-30
7	Broadband Amplifier(2.5GHz-6GHz)	Rohde & Schwarz	BBA150-E60	SEM005-16	2020-04-11	2021-04-10
8	Measurement Software	Rohde & Schwarz	EMC32 V9.25.00	N/A	N/A	N/A

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020

## 7 EMC Requirements Specification in ETSI EN 301 489-17

### 7.1 EMI (Emission)

#### 7.1.1 Radiated Emission

Test Requirement:	ETSI EN 301 489-17				
Test Method:	ETSI EN 301 489-1 and EN 55032				
Test Frequency Range:	30MHz to 6GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	100kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		AV	1MHz	3MHz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-230MHz		40.00		Quasi-peak Value
	230MHz-1GHz		47.00		Quasi-peak Value
	1GHz-3GHz		50.00		Average Value
			70.00		Peak Value
	3GHz-6GHz		54.00		Average Value
			74.00		Peak Value
Test setup:	Below 1GHz				
					
	Above 1GHz				
					

Test Procedure:	<p>■ <b>From 30MHz to 1GHz:</b></p> <ol style="list-style-type: none"> <li>1. The radiated emissions test was conducted in a semi-anechoic chamber.</li> <li>2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.</li> <li>3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT.</li> <li>4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.</li> </ol> <p>■ <b>Above 1GHz:</b></p> <ol style="list-style-type: none"> <li>1. The radiated emissions test was conducted in a fully-anechoic chamber.</li> <li>2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.</li> <li>3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emission spectrum plots of the EUT.</li> <li>4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.</li> </ol>					
Test environment:	Temp.:	25 °C	Humid.:	50%	Press.:	1 010mbar
Measurement Record:	<p>Uncertainty: 3.8039dB (30MHz-200MHz) 3.9679dB (200MHz-1GHz) 4.29dB (1GHz-18GHz)</p>					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details.					
Test results:	Pass					

## Remark:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

## Measurement Data

### Below 1GHz

#### Bluetooth mode

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarity
36.90	38.85	11.67	0.63	35.48	15.67	40.00	-24.33	Vertical
47.66	37.27	12.28	0.75	36.07	14.23	40.00	-25.77	Vertical
96.10	36.42	11.65	1.16	36.69	12.54	40.00	-27.46	Vertical
216.02	37.20	11.02	1.93	37.35	12.80	40.00	-27.20	Vertical
300.37	35.79	13.60	2.36	37.42	14.33	47.00	-32.67	Vertical
742.26	33.52	20.41	4.24	37.63	20.54	47.00	-26.46	Vertical
35.38	38.74	11.39	0.61	35.38	15.36	40.00	-24.64	Horizontal
41.57	38.85	12.22	0.68	35.75	16.00	40.00	-24.00	Horizontal
48.67	37.53	12.29	0.76	36.12	14.46	40.00	-25.54	Horizontal
55.81	36.09	11.70	0.82	36.27	12.34	40.00	-27.66	Horizontal
91.18	34.78	10.84	1.12	36.65	10.09	40.00	-29.91	Horizontal
504.71	33.32	17.41	3.33	37.51	16.55	47.00	-30.45	Horizontal

#### Charge mode

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarity
36.13	47.52	11.52	0.62	35.43	24.23	40.00	-15.77	Vertical
57.59	48.13	11.53	0.84	36.29	24.21	40.00	-15.79	Vertical
64.43	50.63	9.57	0.90	36.38	24.72	40.00	-15.28	Vertical
182.56	47.69	9.15	1.75	37.25	21.34	40.00	-18.66	Vertical
209.31	49.93	10.76	1.89	37.34	25.24	40.00	-14.76	Vertical
321.06	37.17	14.01	2.47	37.44	16.21	47.00	-30.79	Vertical
30.32	38.46	11.21	0.55	35.02	15.20	40.00	-24.80	Horizontal
36.00	38.63	11.52	0.62	35.42	15.35	40.00	-24.65	Horizontal
41.13	39.72	12.21	0.67	35.73	16.87	40.00	-23.13	Horizontal
56.40	39.13	11.65	0.83	36.27	15.34	40.00	-24.66	Horizontal
183.84	51.25	9.32	1.76	37.26	25.07	40.00	-14.93	Horizontal
226.10	54.28	11.38	1.99	37.36	30.29	40.00	-9.71	Horizontal

## Above 1GHz

### Bluetooth mode

#### Peak measurement

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarity
1820.00	36.64	26.08	5.45	36.39	31.78	70.00	-38.22	Vertical
2575.00	35.45	27.84	6.58	37.00	32.87	70.00	-37.13	Vertical
3340.00	36.24	28.40	7.74	37.34	35.04	74.00	-38.96	Vertical
3895.00	33.53	29.33	8.58	37.39	34.05	74.00	-39.95	Vertical
4510.00	31.84	30.82	9.14	37.61	34.19	74.00	-39.81	Vertical
5575.00	29.79	31.78	9.96	36.98	34.55	74.00	-39.45	Vertical
1560.00	35.68	25.61	5.05	36.21	30.13	70.00	-39.87	Horizontal
2590.00	35.58	27.86	6.61	37.01	33.04	70.00	-36.96	Horizontal
3085.00	35.72	28.55	7.36	37.31	34.32	74.00	-39.68	Horizontal
4005.00	33.04	29.61	8.74	37.40	33.99	74.00	-40.01	Horizontal
4310.00	31.49	30.34	8.98	37.53	33.28	74.00	-40.72	Horizontal
5040.00	32.88	31.69	9.54	37.73	36.38	74.00	-37.62	Horizontal

### Charge mode

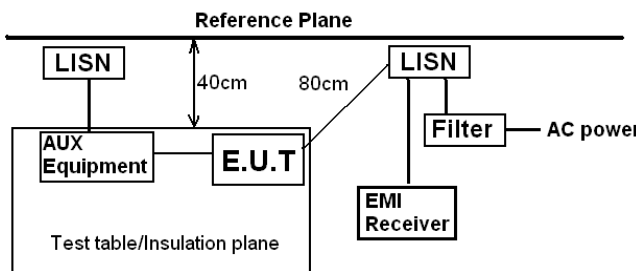
#### Peak measurement

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarity
1450.00	36.73	25.38	4.88	36.13	30.86	70.00	-39.14	Vertical
2270.00	34.99	27.10	6.13	36.75	31.47	70.00	-38.53	Vertical
3155.00	35.65	28.51	7.46	37.32	34.30	74.00	-39.70	Vertical
3775.00	32.68	29.01	8.39	37.38	32.70	74.00	-41.30	Vertical
4300.00	31.82	30.32	8.97	37.53	33.58	74.00	-40.42	Vertical
5685.00	29.64	32.04	10.04	36.82	34.90	74.00	-39.10	Vertical
2330.00	35.98	27.26	6.22	36.80	32.66	70.00	-37.34	Horizontal
3385.00	37.14	28.37	7.81	37.34	35.98	74.00	-38.02	Horizontal
3735.00	32.17	28.91	8.34	37.38	32.04	74.00	-41.96	Horizontal
4870.00	31.14	31.47	9.41	37.75	34.27	74.00	-39.73	Horizontal
5265.00	30.40	31.65	9.71	37.40	34.36	74.00	-39.64	Horizontal
5635.00	29.40	31.92	10.00	36.89	34.43	74.00	-39.57	Horizontal

#### Remark:

1. The EUT was test at 3m in field chamber.
2. If the average limit is met when using a Peak detector, the EUT shall be deemed to meet both peak and average limits. And measurement with the average detector is unnecessary.

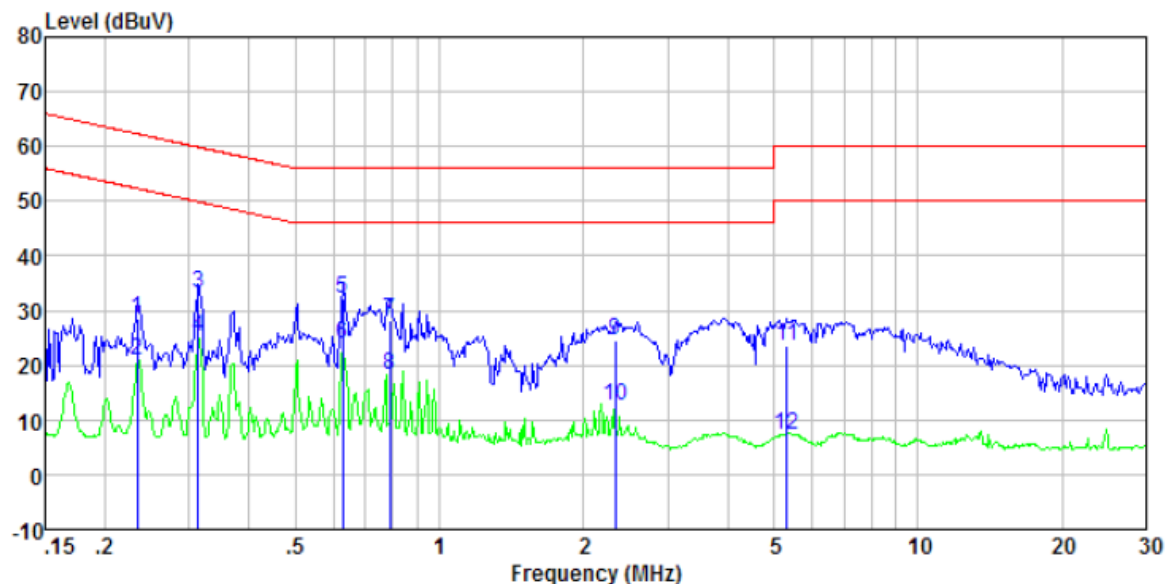
## 7.1.2 Conducted Emissions

Test Requirement:	ETSI EN 301 489-17		
Test Method:	ETSI EN 301 489-1 and EN55032		
Test Frequency Range:	150kHz to 30MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test setup:	 <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>		
Test procedure	<ol style="list-style-type: none"> <li>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to EN55032 Class B on conducted measurement.</li> </ol>		
Test Instruments:	Temp.: 24 °C	Humid.: 51%	Press.: 1 010mbar
Measurement Record:	Uncertainty: 3.44dB		
Test Instruments:	Refer to section 6.0 for details		
Test mode:	Refer to section 5.2 for details, only show the worst case.		
Test results:	Pass		

## Measurement Data

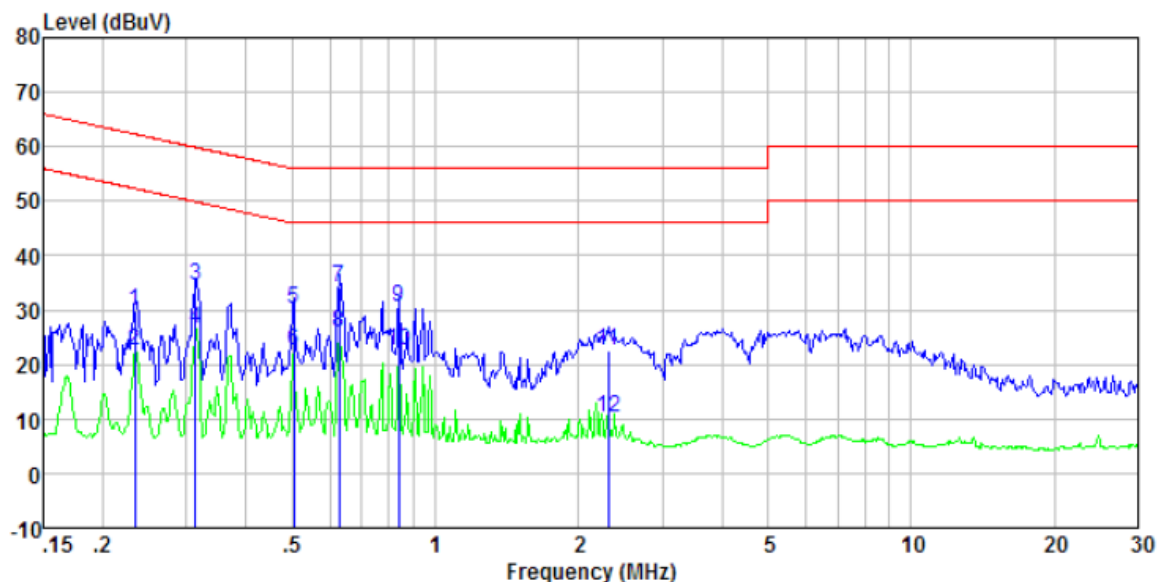
Charge mode

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.23	7.87	20.40	0.11	28.38	62.30	-33.92	QP
0.23	0.52	20.40	0.11	21.03	52.30	-31.27	Average
0.31	12.76	20.39	0.10	33.25	59.88	-26.63	QP
0.31	4.76	20.39	0.10	25.25	49.88	-24.63	Average
0.63	11.71	20.28	0.12	32.11	56.00	-23.89	QP
0.63	3.64	20.28	0.12	24.04	46.00	-21.96	Average
0.79	7.78	20.24	0.14	28.16	56.00	-27.84	QP
0.79	-2.10	20.24	0.14	18.28	46.00	-27.72	Average
2.33	4.18	20.20	0.18	24.56	56.00	-31.44	QP
2.33	-7.96	20.20	0.18	12.42	46.00	-33.58	Average
5.33	3.22	20.20	0.17	23.59	60.00	-36.41	QP
5.33	-12.94	20.20	0.17	7.43	50.00	-42.57	Average

Neutral:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.23	9.47	20.40	0.11	29.98	62.30	-32.32	QP
0.23	2.01	20.40	0.11	22.52	52.30	-29.78	Average
0.31	14.12	20.39	0.10	34.61	59.88	-25.27	QP
0.31	6.18	20.39	0.10	26.67	49.88	-23.21	Average
0.50	9.74	20.31	0.11	30.16	56.00	-25.84	QP
0.50	2.24	20.31	0.11	22.66	46.00	-23.34	Average
0.63	13.86	20.28	0.12	34.26	56.00	-21.74	QP
0.63	5.58	20.28	0.12	25.98	46.00	-20.02	Average
0.84	10.00	20.23	0.14	30.37	56.00	-25.63	QP
0.84	2.34	20.23	0.14	22.71	46.00	-23.29	Average
2.31	2.15	20.20	0.18	22.53	56.00	-33.47	QP
2.31	-10.11	20.20	0.18	10.27	46.00	-35.73	Average

Notes:

1. An initial pre-scan was performed on the live and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.



## 7.1.3 Harmonics Test Results

Test Requirement:	ETSI EN 301 489-17, EN 61000-3-2
Test Method:	N/A: See Remark Below
Remark:	<p>There is no need for Harmonics test to be performed on this product (rated power is less than 75W) in accordance with EN 61000-3-2. For further details, please refer to Clause 7, Note 1 of EN 61000-3-2</p> <p>Which states:</p> <p>“For the following categories of equipment limits are not specified in this edition of the standard.</p> <p>Note 1: Equipment with a rated power of 75W or less, other than lighting equipment.”</p>

## 7.1.4 Flicker Test Results

Test Requirement:	ETSI EN 301 489-17: EN 61000-3-3					
Test Method:	EN 61000-3-3					
Class/Severity:	Clause 5 of EN 61000-3-3					
Measurement Time:	10 min					
Detector:	As per EN 61000-3-3					
Test Instruments:	Temp.:	24 °C	Humid.:	51%	Press.:	1 010mbar
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details.					
Test results:	Pass					

## Measurement Data

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.005	3.30	PASS
dmax [%]	0.056	4.00	PASS
dt [s]	0.000	0.50	PASS

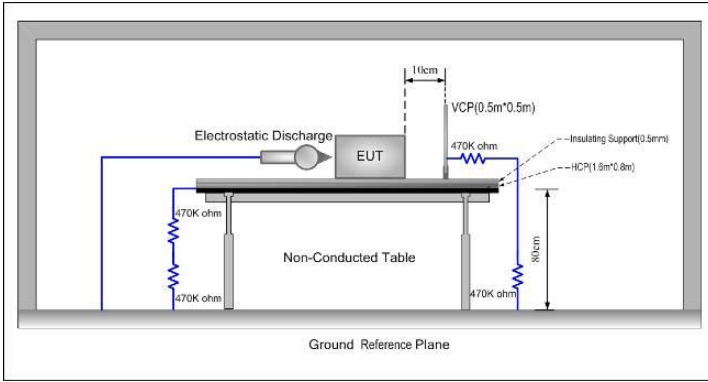
## 7.2 Immunity

Performance Criteria of ETSI EN 301 489-1, clause 6	
<b>6.1 Performance criteria for continuous phenomena applied to transmitters and receivers</b>	<p>If no further details are given in the relevant part of ETSI EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for continuous phenomena shall apply.</p> <p>During and after the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.</p> <p>During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.</p> <p>If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.</p>
<b>6.2 Performance criteria for transient phenomena applied to transmitters and receivers</b>	<p>For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:</p> <ul style="list-style-type: none"> <li>• For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A SW reboot is not allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</li> <li>• For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. A SW reboot is not allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</li> </ul> <p>For all other ports the following applies:</p> <ul style="list-style-type: none"> <li>• After the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.</li> <li>• During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.</li> <li>• If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.</li> </ul>

<b>6.3 Performance criteria for equipment which does not provide a continuous communication link</b>	For radio equipment which does not provide a continuous communication link, the performance criteria described in clauses 6.1 and 6.2 are not appropriate, in these cases the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The related specifications set out in clause 5.3 have also to be taken into account. The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses 6.1 and 6.2.
<b>6.4 Performance criteria for ancillary equipment tested on a stand alone basis</b>	If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in clauses 6.1 and 6.2 are not appropriate, in these cases the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The related specifications set out in clause 5.3 have also to be taken into account. The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses 6.1 and 6.2.

Performance Criteria of ETSI EN 301 489-17, clause 6		
Criteria	During Test	After Test
<b>A</b>	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
<b>B</b>	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
<b>C</b>	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).
<b>Note 1:</b>	Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.	
<b>Note 2:</b>	Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.	
<b>Note 3:</b>	No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.	

## 7.2.1 Electrostatic Discharge

Test Requirement:	ETSI EN 301489-17
Test Method:	EN 61000-4-2
Discharge Voltage:	Contact Discharge: $\pm 4\text{kV}$ Air Discharge: $\pm 2\text{kV}$ , $\pm 4\text{kV}$ , $\pm 8\text{kV}$ HCP/VCP: $\pm 4\text{kV}$
Polarity:	Positive & Negative
Number of Discharge:	Contact Discharge: Minimum 10 times at each test point, Air Discharge: Minimum 10 times at each test point.
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum
Limit:	Criteria B
Test setup:	
Test Procedure:	<p><b>Air discharge:</b></p> <ol style="list-style-type: none"> <li>1. The test was applied on non-conductive surfaces of EUT.</li> <li>2. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.</li> <li>3. After each discharge, the discharge electrode was removed from the EUT.</li> <li>4. The generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point.</li> <li>5. This procedure was repeated until all the air discharge completed</li> </ol> <p><b>Contact Discharge:</b></p> <ol style="list-style-type: none"> <li>1. The test was applied on conductive surfaces of EUT.</li> <li>2. the generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point.</li> <li>3. the tip of the discharge electrode was touch the EUT before the discharge switch was operated.</li> </ol> <p><b>Indirect discharge for horizontal coupling plane</b></p> <ol style="list-style-type: none"> <li>1. At least 10 single discharges shall be applied at the front edge of each HCP opposite the centre point of each unit of the EUT and 0.1m from the front of the EUT.</li> <li>2. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.</li> <li>3. Consideration should be given to exposing all sides of the EUT.</li> </ol>

	<b>Indirect discharge for vertical coupling plane</b> 1. At least 10 single discharges were applied to the center of one vertical edge of the coupling plane. 2. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. 3. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.
Test environment:	Temp.: 24 °C Humid.: 51% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

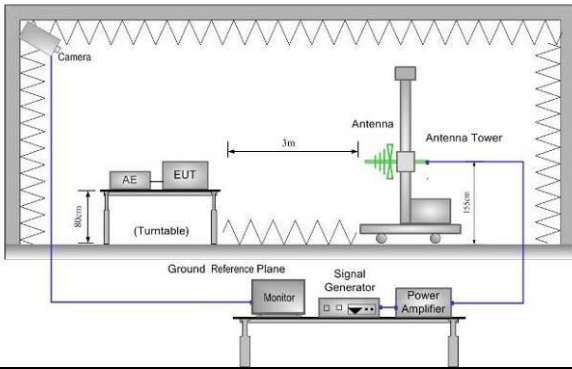
## Measurement Record:

Measurement Record:				
Test points:	I: All metallic parts			
	II: All plastic seams			
Direct discharge				
Discharge Voltage (KV)	Type of discharge	Test points	Observations Performance	Result
± 4	Contact	I	A	Pass
± 2, ± 4,± 8	Air	II	A	Pass
Indirect discharge				
Discharge Voltage (KV)	Type of discharge	Test points	Observation Performance	Result
± 4	HCP-Bottom/Top/ Front/Back/Left/Right	Edge of the HCP	A	Pass
± 4	VCP-Front/Back /Left/Right	Center of the VCP	A	Pass

Remark:

A: Normal performance within the specification limits.

## 7.2.2 Radiated Immunity

Test Requirement:	ETSI EN 301489-17
Test Method:	EN 61000-4-3
Frequency range:	80MHz to 6GHz
Test Level:	3V/m
Modulation:	80%, 1kHz Amplitude Modulation
Performance Criterion:	Criteria A
Test setup:	
Test Procedure:	<ol style="list-style-type: none"> <li>1. For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items.</li> <li>2. If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length.</li> <li>3. The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area).</li> <li>4. The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value.</li> <li>5. The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0,5 s.</li> <li>6. The test normally was performed with the generating antenna facing each side of the EUT.</li> <li>7. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.</li> <li>8. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to monitor the performance of the EUT.</li> </ol>
Test monitor:	<b>Traffic mode:</b>

	1. The test system shall simulate a Base Station (BS) with Broadcast Control Channel/Common Control Channel (BCCH/CCCH) on one carrier. 2. The EUT shall be synchronized to the BCCH, listening to the CCCH and able to respond to paging messages.					
	<b>Idle mode:</b> 1. The test system shall simulate a Base Station (BS) with Broadcast Control Channel/Common Control Channel (BCCH/CCCH) on one carrier. 2. The EUT shall be synchronized to the BCCH, listening to the CCCH and able to respond to paging messages.					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1 010mbar
Test Instruments:	Refer to section 6.0 for details					
Test results:	Pass					

## Measurement Record:

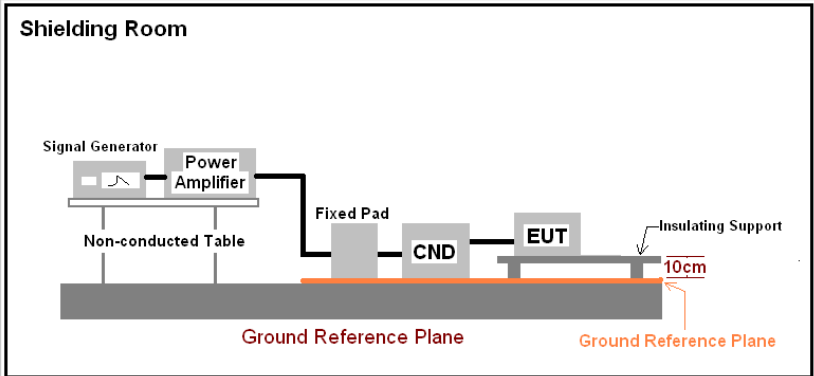
Frequency	Level	Modulation	Operating Mode	Antenna Polarization	EUT Face	Observations (Performance Criterion)
80 MHz-6 GHz	3 V/m	1 kHz, 80 % Amp. Mod, 1 % increment	All modes	V	Front	A
				H		A
				V	Rear	A
				H		A
				V	Left	A
				H		A
				V	Right	A
				H		A
				V	Top	A
				H		A
				V	Bottom	A
				H		A

Remarks:

A: normal performance within the specification limits



## 7.2.3 Radio frequency common mode

Test Requirement:	ETSI EN 301489-17
Test Method:	EN 61000-4-6
Frequency range:	0.15MHz to 80MHz
Test Level:	3V rms on AC Ports (unmodulated emf into 150 $\Omega$ )
Modulation:	80%, 1kHz Amplitude Modulation
Performance Criterion:	Criteria A
Test setup:	
Test Procedure:	<ol style="list-style-type: none"> <li>1. Let the EUT work in test mode and test it.</li> <li>2. The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).</li> <li>3. The disturbance signal described below is injected to EUT through CDN.</li> <li>4. The EUT operates within its operational mode(s) under intended climatic conditions after power on.</li> <li>5. The frequency range is swept from 0.150MHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep shall not exceed <math>1.5 \times 10^{-3}</math> decades/s. Where the frequency is swept incrementally; the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.</li> <li>6. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.</li> </ol>
Test environment:	Temp.: 24 °C Humid.: 51% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details
Test results:	Pass

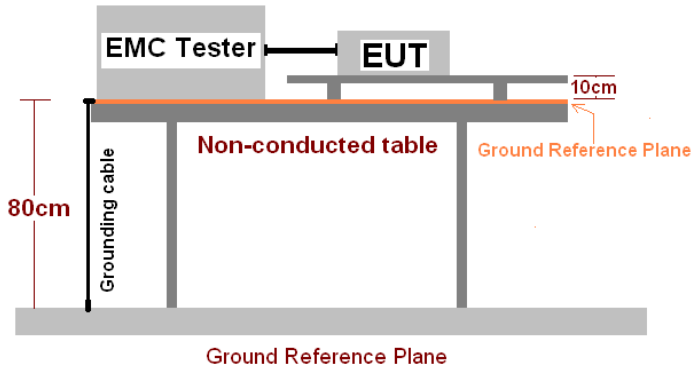
**Measurement Record:**

Frequency	Injected Position	Test Level	Modulation	Step Size	Dwell Time	Observations (Performance Criterion)
150kHz to 80MHz	AC Main	3Vrms	80%, 1kHz Amp. Mod.	1%	2s	A

Remark:

A: Normal performance within the specification limits.

## 7.2.4 Electrical Fast Transients

Test Requirement:	ETSI EN 301489-17
Test Method:	EN 61000-4-4
Test Level:	1.0kV on AC port
Polarity:	Positive & Negative
Repetition Frequency:	5kHz
Burst Duration:	15ms
Burst Period:	300ms
Test Duration:	2 minute per level & polarity
Performance Criterion:	B
Test setup:	 <p>The diagram illustrates the test setup. An EMC Tester is connected to an EUT (Equipment Under Test) via a cable. Both are placed on a non-conducted table. A grounding cable is connected to the table, which is 80cm high. A ground reference plane is shown below the table, and another one is shown to the right of the table, 10cm from the EUT. The table is supported by a wood support.</p>
Test Procedure:	<ol style="list-style-type: none"> <li>1. The EUT and its simulators were placed on the ground reference plane and were insulated from it by a wood support 0.1m + 0.01m thick. The ground reference plane was 1m*1m metallic sheet with 0.65mm minimum thickness.</li> <li>2. This reference ground plane was project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5m.</li> <li>3. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.</li> <li>4. The length of the signal and power lines between the coupling device and the EUT is 0.5m</li> </ol> <p><b>Test on Signal Ports, Telecommunication Ports and Control Ports:</b> The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT with burst noise for 2 minutes.</p> <p><b>Test on power supply ports:</b></p> <ol style="list-style-type: none"> <li>1. The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.</li> <li>2. Each of the Line and Neutral conductors is impressed with burst noise for 2 minutes.</li> </ol>
Test environment:	Temp.: 26 °C Humid.: 54% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details

Test mode:	Refer to section 5.2 for details
Test results:	Pass

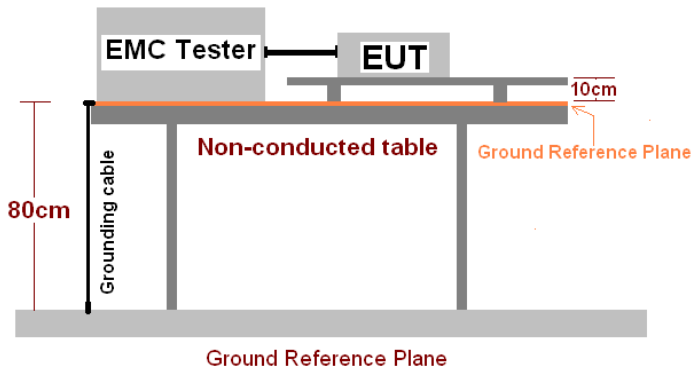
**Measurement Record:**

Lead under Test	Level ( $\pm$ kV)	Coupling Direct/Clamp	Observations (Performance Criterion)	Result
L	$\pm 1.0$	Direct	A	Pass
N	$\pm 1.0$	Direct	A	Pass
L-N	$\pm 1.0$	Direct	A	Pass

Remark:

A: Normal performance within the specification limits

## 7.2.5 Surge

Test Requirement:	ETSI EN 301489-17
Test Method:	ETSI EN 61000-4-5
Test Level:	1kV line to line: Differential mode 2kV line to earth: Common mode
Polarity:	Positive & Negative
Test Interval:	60s between each surge
No. of surges:	5 positive, 5 negative at 0°, 90°, 180°, 270°.
Performance Criterion:	B
Test setup:	 <p>The diagram illustrates the test setup. An EMC Tester and an EUT are positioned on a non-conducted table. The table is supported by a grounding cable. A ground reference plane is established at a height of 10cm from the table surface. The table height is 80cm.</p>
Test Procedure:	<ol style="list-style-type: none"> <li>1. For line-to-line coupling mode, provide a 1kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points, and for active line / neutral lines to ground are same except test level is 2kV.</li> <li>2. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are applied during test.</li> <li>3. Different phase angles are done individually.</li> <li>4. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.</li> </ol>
Test environment:	Temp.: 26 °C Humid.: 53% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

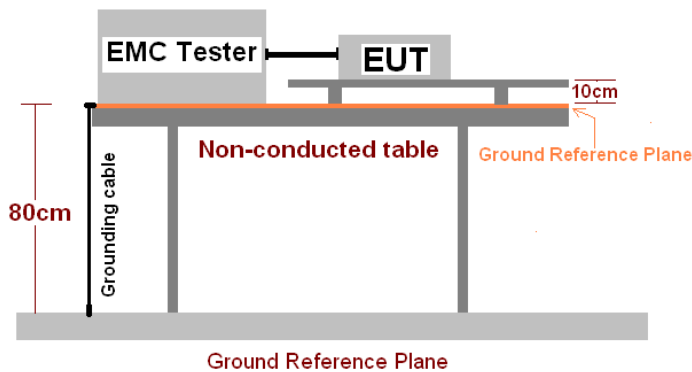
**Measurement Record:**

Location	Level(kV)	Pulse No	Surge Interval	Phase(deg)	Observations (Performance Criterion)
L-N	$\pm 1$	5	60s	0°	A
				90°	A
				180°	A
				270°	A

Remark:

A. Normal performance within the specification limits

## 7.2.6 Voltage Dip and Voltage Interruptions

Test Requirement:	ETSI EN 301489-17
Test Method:	EN 61000-4-11
Test Level:	0% of VT(Supply Voltage) for 0.5 period 0% of VT(Supply Voltage) for 1.0 period 70% of VT(Supply Voltage) for 25 period 0% of VT(Supply Voltage) for 250 period
No. of Dips / Interruptions:	3 per Level
Performance Criterion:	0% VD, 0.5 period----Performance criterion: B 0% VD, 1 period----Performance criterion: B 70% VD, 25 period----Performance criterion: C 0% VI, 250 period----Performance criterion: C
Test setup:	 <p>The diagram illustrates the test setup. An EMC Tester and an EUT (Equipment Under Test) are positioned on a non-conducted table. The table is supported by a metal frame. A grounding cable connects the table to a ground reference plane. The distance from the ground reference plane to the bottom of the table is 80cm. The distance from the ground reference plane to the EUT is 10cm.</p>
Test Procedure:	<p>1&gt;.The EUT and test generator were setup as shown on above setup photo.</p> <p>2&gt;.The interruptions are introduced at selected phase angles with specified duration.</p> <p>3&gt;.Record any degradation of performance.</p>
Test environment:	Temp.: 26 °C Humid.: 53% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

**Measurement Record:**

Test Level $U_T$	Duration (Periods)	Phase angle	No of dropout	Time between dropout	Observations (Performance Criterion)
0%	0.5	0°, 90°, 180°, 270°	3	10s	A
0%	1.0	0°, 90°, 180°, 270°	3	10s	A
70%	25	0°, 90°, 180°, 270°	3	10s	A
0%	250	0°, 90°, 180°, 270°	3	10s	B

Remark:

A: No loss of function was observed.

B: During the test, the EUT stops charging, but after the test, it can automatically return to normal.



## 8 Test Setup Photo

Reference to the **appendix I** for details.

## 9 EUT Constructional Details

Reference to the **appendix II** for details

-----End-----