



EMC TEST REPORT

Applicant iRay Technology Co. Ltd.
FCC ID 2ACHK-01070189
Product Wireless Digital Flat Panel Detector
Model Mars1417V-TSI
Report No. R1907A0426-E1
Issue Date August 29, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2018)/ ANSI C63.4 (2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Wei Liu

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Guangchang Fan

Approved by: Guangchang Fan/ Director

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Summary of measurement results

Number	Test Case	Clause in FCC Rules	Conclusion
1	Radiated Emission	FCC Part15.109, ANSI C63.4-2014	PASS
2	Conducted Emission	FCC Part15.107, ANSI C63.4-2014	PASS
Test Date: July 3, 2019 ~ July 5, 2019			

The module WIFI-2-V897EA1 is a part of the EUT P-41. FCC ID duplicated from the module for the EUT.

Mars1417V-TSI (Report No.R1907A0426-E1) is a variant model of P-41(Report No. R1907A0346-E1V1).

Different	Original	Variant
model	P-41	Mars1417V-TSI
Product name	DIRECT DIGITIZER SKR 4000	Wireless Digital Flat Panel Detector
Charging port	3Pin	3Pin and 4Pin
Color	Black	White
Others	The same	The same
The difference between the two Configuration is only the Charging port and Color.		

Data tested case see the table below.

Test Case	Original P-41 (R1907A0346-E1V1)	Variant Mars1417V-TSI (R1907A0426-E1)
Radiated Emission	Pass	add test result of 4Pin
Conducted Emission	Pass	add test result of 4Pin

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
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Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

2 General Description of Equipment under Test

2.1 Client Information

Applicant	iRay Technology Co. Ltd.
Applicant address	RM 202, Building 7, No. 590, Ruiqing RD., Pudong, Shanghai, China
Manufacturer	iRay Technology Taicang Ltd.
Manufacturer address	No.33 Xinggang Road, Taicang Port Economic and Technological Development Zone, Taicang, 215434 Jiangsu, China

2.2 General information

EUT Description			
Device Type:	Portable Device		
Model:	Mars1417V-TSI		
IMEI:	/		
HW Version:	V2.2		
SW Version:	ARM:Core:1.9 Kernel:1.19 FPGA microblaze:2.25 FPGA main:2.15 MCU:1.0 SDK:4.0		
Antenna Type:	Internal Antenna		
Frequency:	Band	Tx (MHz)	Rx (MHz)
	WIFI 2.4G:	2412 ~ 2462	2412 ~ 2462
	WIFI 5G(U-NII-1):	5150 ~ 5250	5150 ~ 5250
	WIFI 5G(U-NII-3):	5725 ~ 5850	5725 ~ 5850
Modulation:	WLAN 802.11b: DSSS WLAN 802.11a/g/n/ac: OFDM		
EUT Accessory			
Battery	Manufacturer: iRay Technology Co. Ltd. Model: BATTERY-KV Ratings:10.8Vdc,4125mAh		
Note: The information of the EUT is declared by the manufacturer.			



2.3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

FCC Code CFR47 Part15B (2018)

ANSI C63.4 (2014)



2.4 Test Mode

Test Mode	
Mode 1	Adapter + EUT + Idle

3 Test Case Results

3.1 Radiated Emission

Ambient condition

Temperature	Relative humidity	Pressure
24°C~26°C	45%~50%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier. During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated signal level.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.

Set the spectrum analyzer in the following:

Below 1GHz:

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

Above 1GHz:

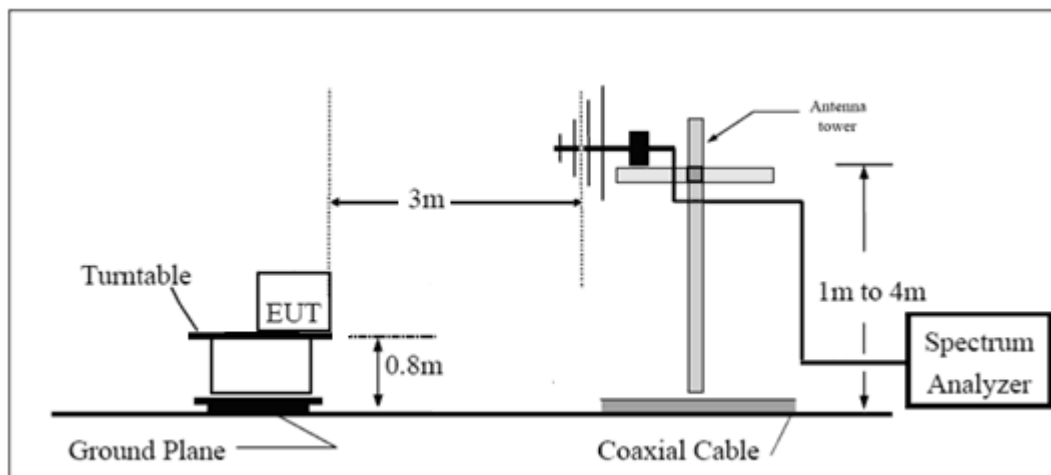
(a) PEAK: RBW=1MHz / VBW=3MHz/ Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

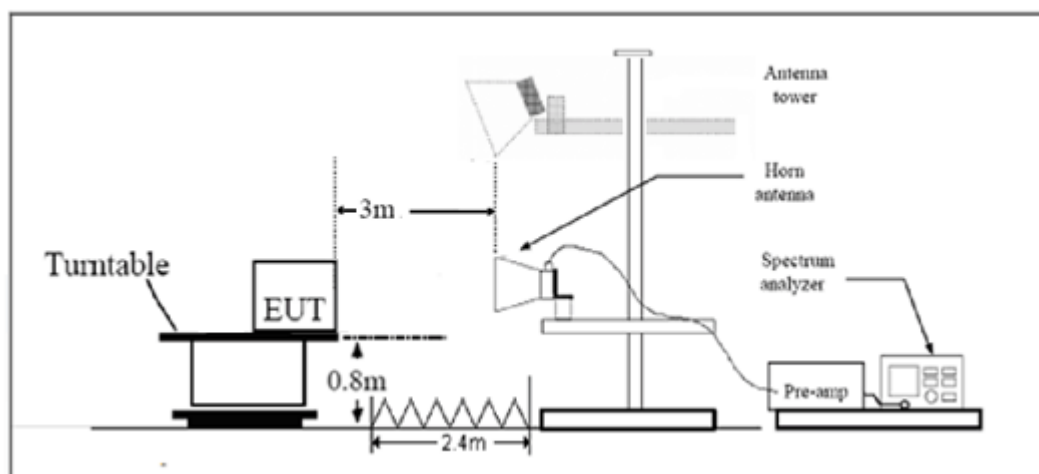
The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

Test Setup

Below 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

Limits

Frequency (MHz)	Field Strength (dB μ V/m)	Detector
30 -88	40.0	Quasi-peak
88-216	43.5	Quasi-peak
216 – 960	46.0	Quasi-peak
960-1000	54.0	Quasi-peak
1000-5 th harmonic of the highest frequency or 40GHz, which is lower	54 74	Average Peak

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
30MHz~200MHz	4.02 dB
200MHz~1000MHz	3.28 dB
1GHz~18GHz	3.70 dB
18GHz~26.5GHz	5.78 dB

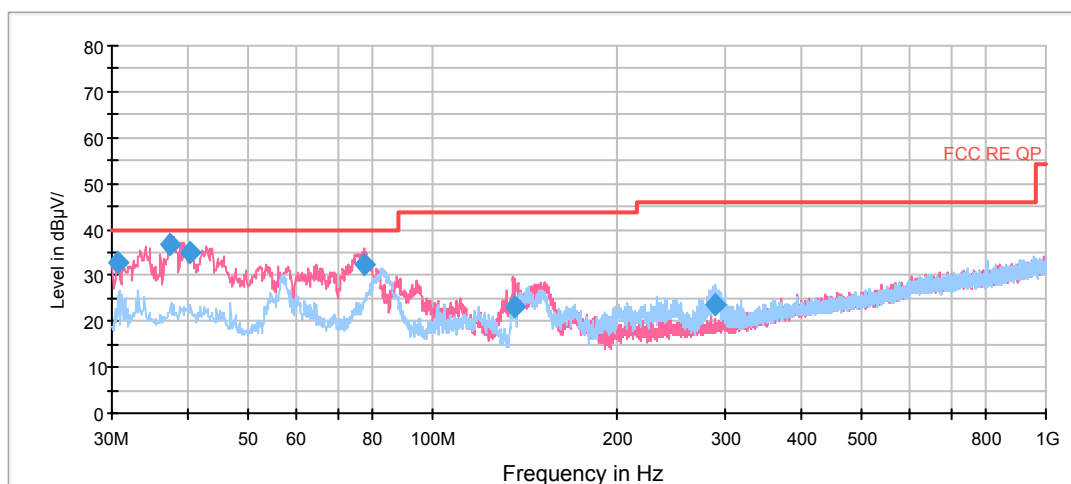
Test Results

Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier, the Emissions in the frequency band 18GHz- 26.5GHz is more than 20dB below the limit are not reported.

The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

Original

RE 0.03-1GHz QP Class B

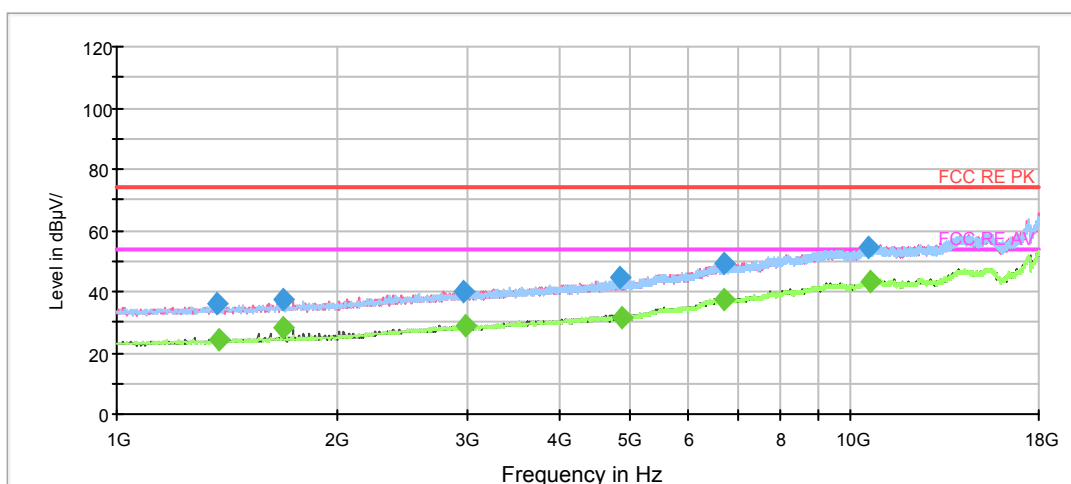


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
30.606250	32.6	100.0	V	261.0	14.5	7.4	40.0
37.360000	36.6	100.0	V	356.0	16.7	3.4	40.0
40.106250	35.1	100.0	V	52.0	17.0	4.9	40.0
77.207500	32.5	100.0	V	287.0	10.3	7.5	40.0
136.208750	23.0	100.0	V	287.0	9.8	20.5	43.5
288.256250	23.7	100.0	H	305.0	15.0	22.3	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
2. Margin = Limit – Quasi-Peak

FCC RE 1G-18GHz PK+AV Class B

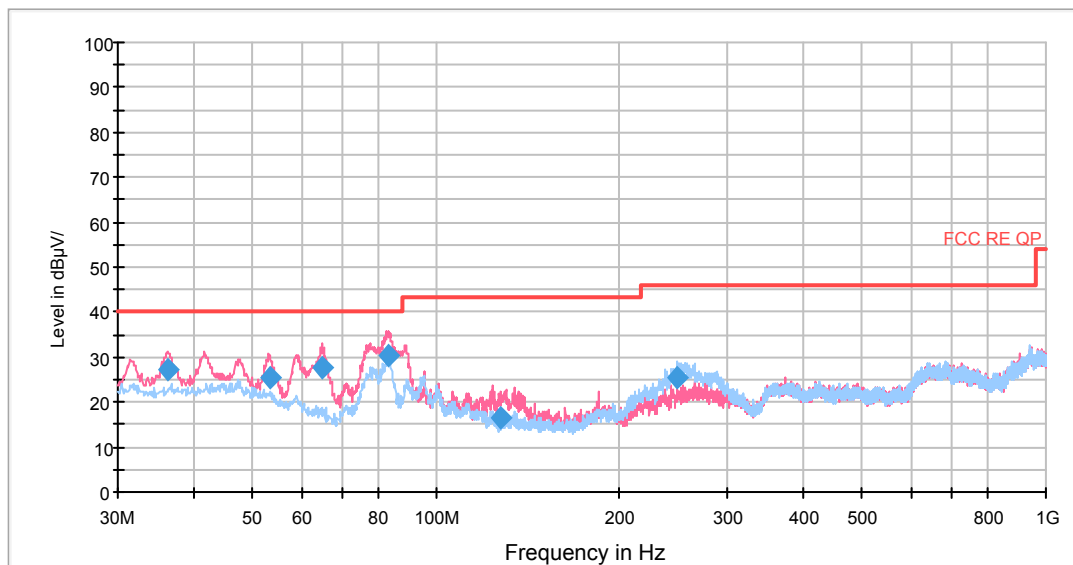


Radiated Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1371.875000	36.3	200.0	H	243.0	-10.8	37.7	74.0
1680.000000	37.6	100.0	V	350.0	-9.7	36.4	74.0
2963.500000	40.2	100.0	H	11.0	-5.3	33.8	74.0
4839.875000	44.4	200.0	V	102.0	-0.6	29.6	74.0
6712.000000	49.2	200.0	V	1.0	5.0	24.8	74.0
10581.625000	54.6	100.0	H	139.0	13.0	19.4	74.0

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1378.250000	24.1	100.0	H	3.0	-10.7	29.9	54.0
1680.000000	28.3	100.0	V	350.0	-9.7	25.7	54.0
2976.250000	28.6	200.0	V	218.0	-5.3	25.4	54.0
4867.500000	31.6	100.0	V	353.0	-0.5	22.4	54.0
6707.750000	37.5	100.0	V	350.0	5.0	16.5	54.0
10588.000000	43.0	200.0	V	38.0	13.0	11.0	54.0

Variant

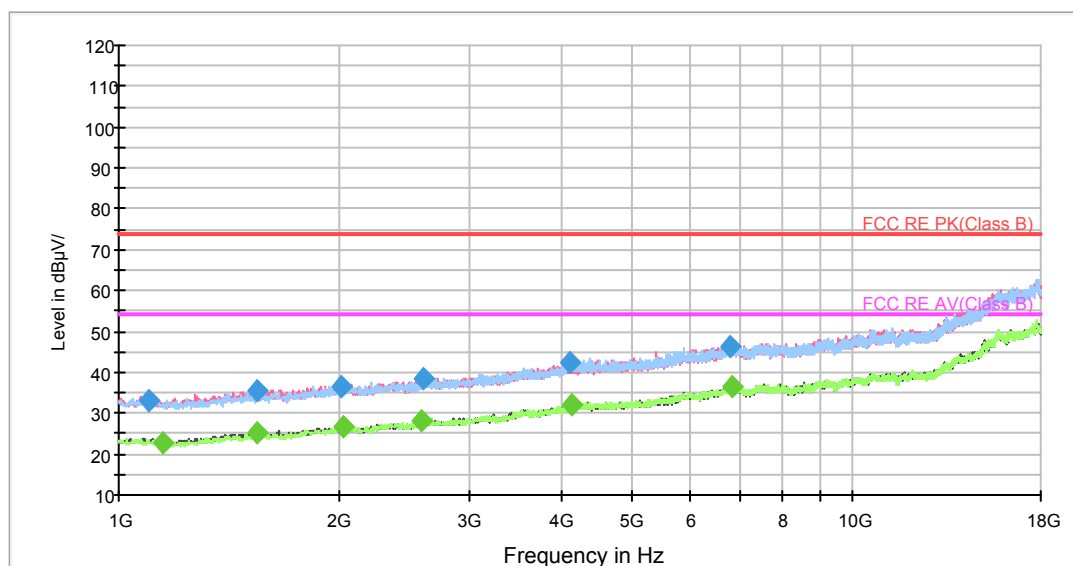


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
36.274210	27.1	100.0	V	133.0	-4.0	12.9	40.0
53.146800	25.4	100.0	V	58.0	-6.6	14.6	40.0
65.037700	27.5	175.0	V	304.0	-11.5	12.5	40.0
83.180678	30.3	100.0	V	0.0	-11.9	9.7	40.0
127.682160	16.7	100.0	V	258.0	-14.0	26.8	43.5
248.870500	25.6	125.0	H	242.0	-11.1	20.4	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak



Radiated Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1102.000000	33.3	100.0	H	88.0	-9.9	40.7	74.0
1546.125000	35.4	200.0	V	260.0	-7.7	38.6	74.0
2007.250000	36.5	200.0	H	45.0	-5.7	37.5	74.0
2600.125000	38.5	100.0	H	69.0	-3.4	35.5	74.0
4117.375000	42.6	100.0	H	236.0	2.0	31.4	74.0
6811.875000	46.5	100.0	V	314.0	7.7	27.5	74.0

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1146.625000	22.7	100.0	V	332.0	-9.6	31.3	54.0
1539.750000	25.0	200.0	V	56.0	-7.8	29.0	54.0
2024.250000	26.6	200.0	H	85.0	-5.7	27.4	54.0
2585.250000	28.0	200.0	V	36.0	-3.4	26.0	54.0
4149.250000	32.1	100.0	V	332.0	2.0	21.9	54.0
6858.625000	36.3	200.0	H	280.0	7.7	17.7	54.0

3.2 Conducted Emission

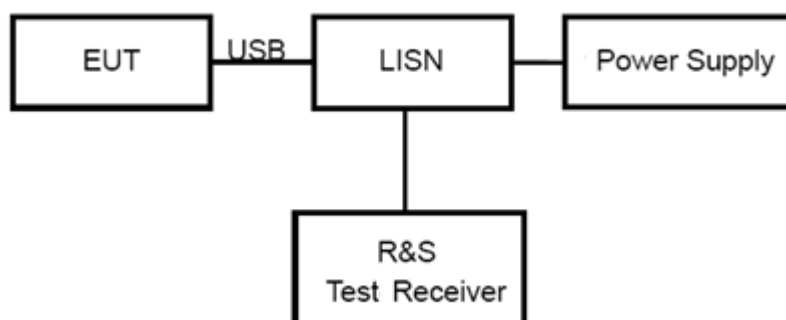
Ambient condition

Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

Test Setup



Note: Power Supply is AC Power source and it is used to change the voltage 120V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dB μ V)	
	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.		

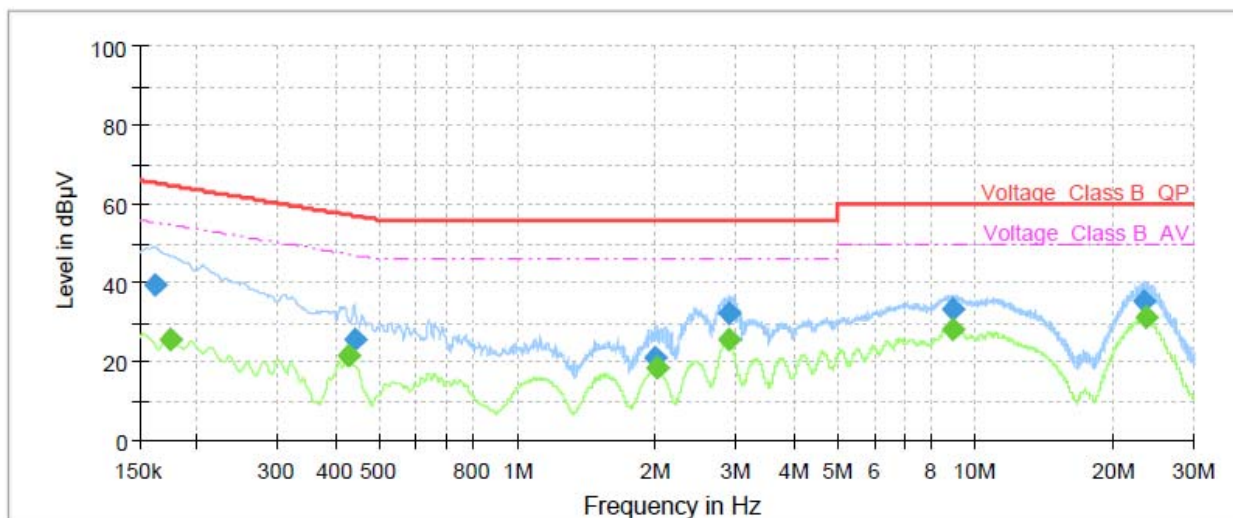
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 2.57$ dB.

Test Results

Following plots, Blue trace uses the peak detection; Green trace uses the average detection.

Original

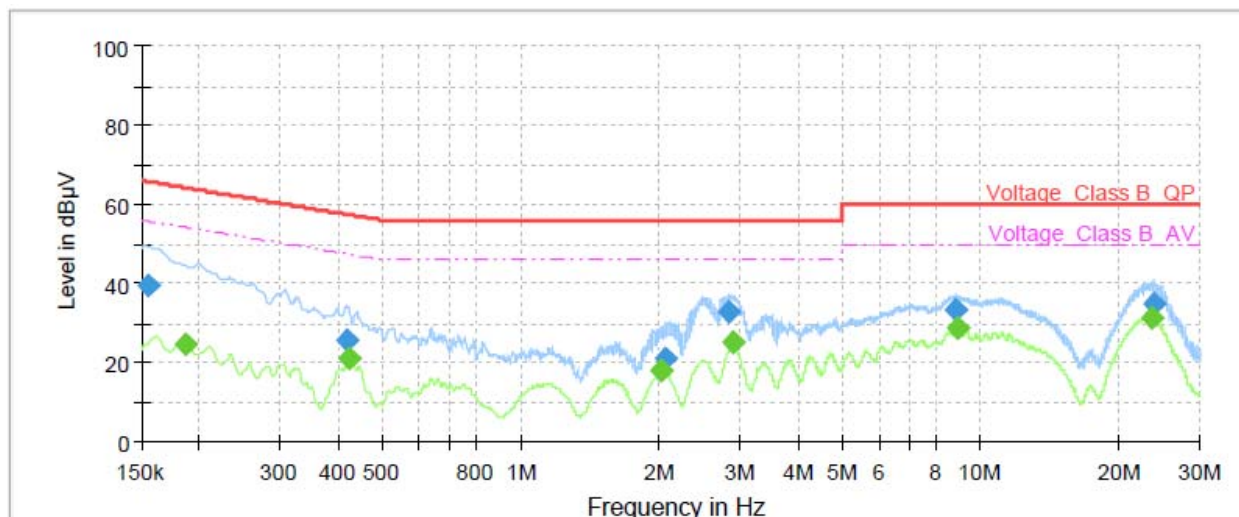


Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.16	39.46	---	65.40	25.94	1000.0	9.000	L1	ON	19.13
0.17	---	25.56	54.73	29.17	1000.0	9.000	L1	ON	19.15
0.43	---	21.78	47.27	25.49	1000.0	9.000	L1	ON	19.23
0.44	25.58	---	57.06	31.48	1000.0	9.000	L1	ON	19.23
1.99	21.13	---	56.00	34.87	1000.0	9.000	L1	ON	19.13
2.01	---	18.56	46.00	27.44	1000.0	9.000	L1	ON	19.13
2.89	---	25.64	46.00	20.36	1000.0	9.000	L1	ON	19.06
2.89	32.40	---	56.00	23.60	1000.0	9.000	L1	ON	19.07
8.94	---	28.44	50.00	21.56	1000.0	9.000	L1	ON	19.28
8.96	33.15	---	60.00	26.85	1000.0	9.000	L1	ON	19.28
23.30	35.17	---	60.00	24.83	1000.0	9.000	L1	ON	19.65
23.48	---	31.14	50.00	18.86	1000.0	9.000	L1	ON	19.66

Remark: Correct factor=cable loss + LISN factor

L line

Conducted Emission from 150 KHz to 30 MHz



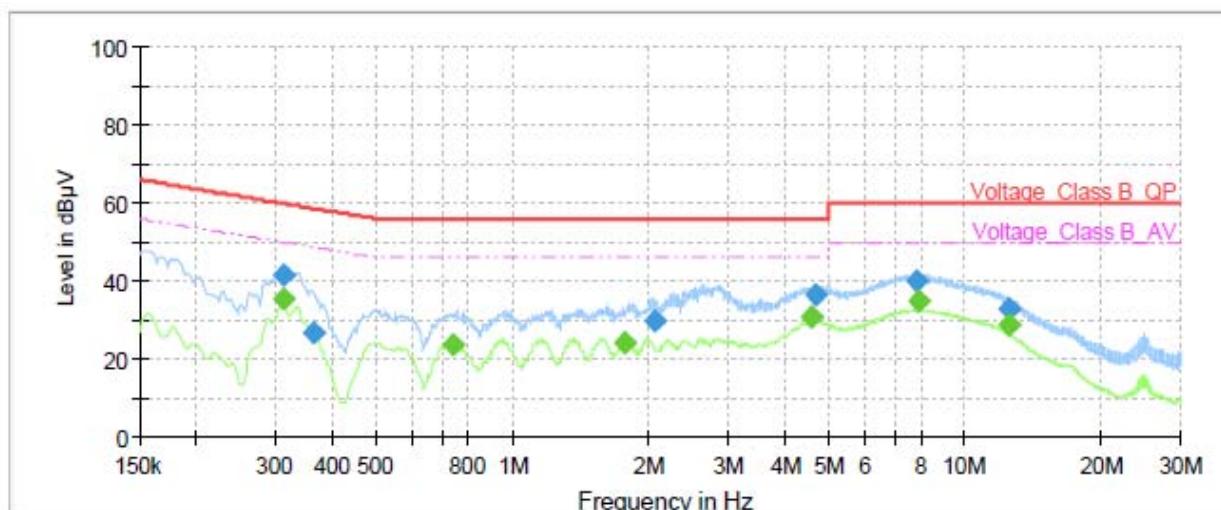
Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	39.36	---	65.75	26.39	1000.0	9.000	N	ON	19.09
0.19	---	24.63	54.21	29.58	1000.0	9.000	N	ON	19.18
0.42	25.53	---	57.49	31.96	1000.0	9.000	N	ON	19.23
0.42	---	21.13	47.36	26.23	1000.0	9.000	N	ON	19.23
2.02	---	17.73	46.00	28.27	1000.0	9.000	N	ON	19.12
2.06	21.22	---	56.00	34.78	1000.0	9.000	N	ON	19.11
2.84	33.07	---	56.00	22.93	1000.0	9.000	N	ON	19.04
2.89	---	25.08	46.00	20.92	1000.0	9.000	N	ON	19.07
8.83	33.17	---	60.00	26.83	1000.0	9.000	N	ON	19.29
8.90	---	28.58	50.00	21.42	1000.0	9.000	N	ON	19.29
23.56	---	31.36	50.00	18.64	1000.0	9.000	N	ON	19.56
23.95	35.10	---	60.00	24.90	1000.0	9.000	N	ON	19.58

Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz

Variant

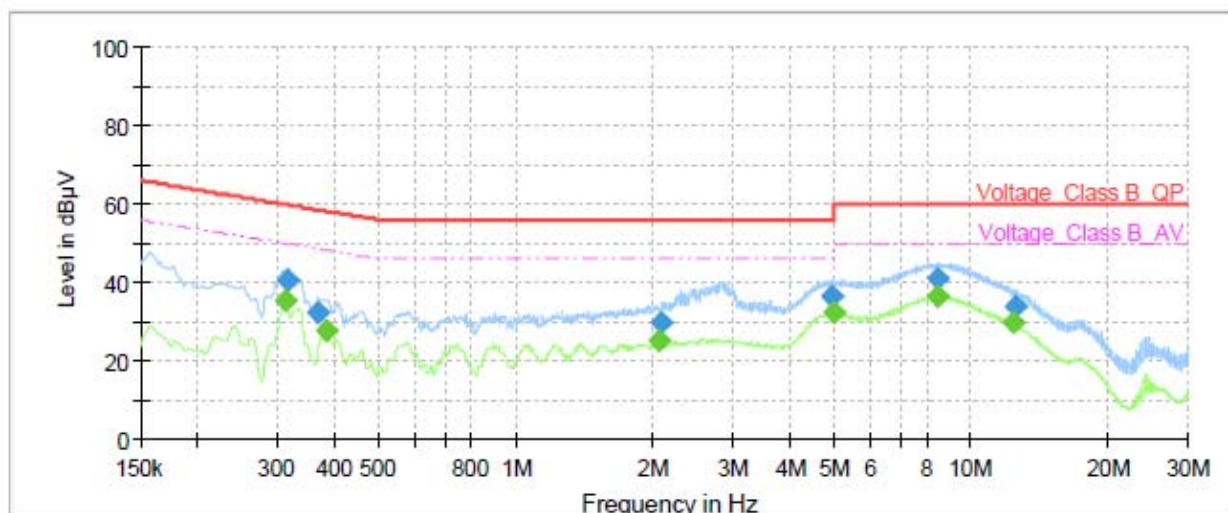


Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.31	---	35.40	49.92	14.52	1000.0	9.000	L1	ON	19.18
0.31	41.37	---	59.92	18.55	1000.0	9.000	L1	ON	19.18
0.36	26.41	---	58.64	32.23	1000.0	9.000	L1	ON	19.19
0.74	---	23.63	46.00	22.37	1000.0	9.000	L1	ON	19.24
1.78	---	24.27	46.00	21.73	1000.0	9.000	L1	ON	19.17
2.06	29.50	---	56.00	26.50	1000.0	9.000	L1	ON	19.11
4.57	---	30.65	46.00	15.35	1000.0	9.000	L1	ON	19.10
4.67	36.28	---	56.00	19.72	1000.0	9.000	L1	ON	19.09
7.82	39.95	---	60.00	20.05	1000.0	9.000	L1	ON	19.21
7.88	---	34.84	50.00	15.16	1000.0	9.000	L1	ON	19.21
12.46	---	28.68	50.00	21.32	1000.0	9.000	L1	ON	19.44
12.50	32.82	---	60.00	27.18	1000.0	9.000	L1	ON	19.44

Remark: Correct factor=cable loss + LISN factor

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.31	---	35.28	49.92	14.64	1000.0	9.000	N	ON	19.18
0.32	40.41	---	59.80	19.39	1000.0	9.000	N	ON	19.17
0.37	32.24	---	58.54	26.30	1000.0	9.000	N	ON	19.20
0.38	---	27.51	48.24	20.73	1000.0	9.000	N	ON	19.23
2.06	---	24.98	46.00	21.02	1000.0	9.000	N	ON	19.11
2.10	29.51	---	56.00	26.49	1000.0	9.000	N	ON	19.09
4.94	36.55	---	56.00	19.45	1000.0	9.000	N	ON	19.07
5.00	---	32.17	46.00	13.83	1000.0	9.000	N	ON	19.08
8.41	41.21	---	60.00	18.79	1000.0	9.000	N	ON	19.23
8.49	---	36.50	50.00	13.50	1000.0	9.000	N	ON	19.24
12.41	---	29.69	50.00	20.31	1000.0	9.000	N	ON	19.41
12.48	34.10	---	60.00	25.90	1000.0	9.000	N	ON	19.42

Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz

4 Main Test Instrument

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV40	15195-01-00	2019-05-19	2020-05-18
EMI Test Receiver	R&S	ESCI	100948	2019-05-19	2020-05-18
Trilog Antenna	SCHWARZBECK	VULB 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Standard Gain Horn	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
Standard Gain Horn	STEATITE	QSH-SL-26-40-K-15	16779	2017-07-20	2019-07-19
EMI Test Receiver	R&S	ESR	101667	2019-05-19	2020-05-18
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Bore Sight Antenna mast	ETS	2171B	00058752	/	/
Test software	EMC32	R&S	9.26.0	/	/

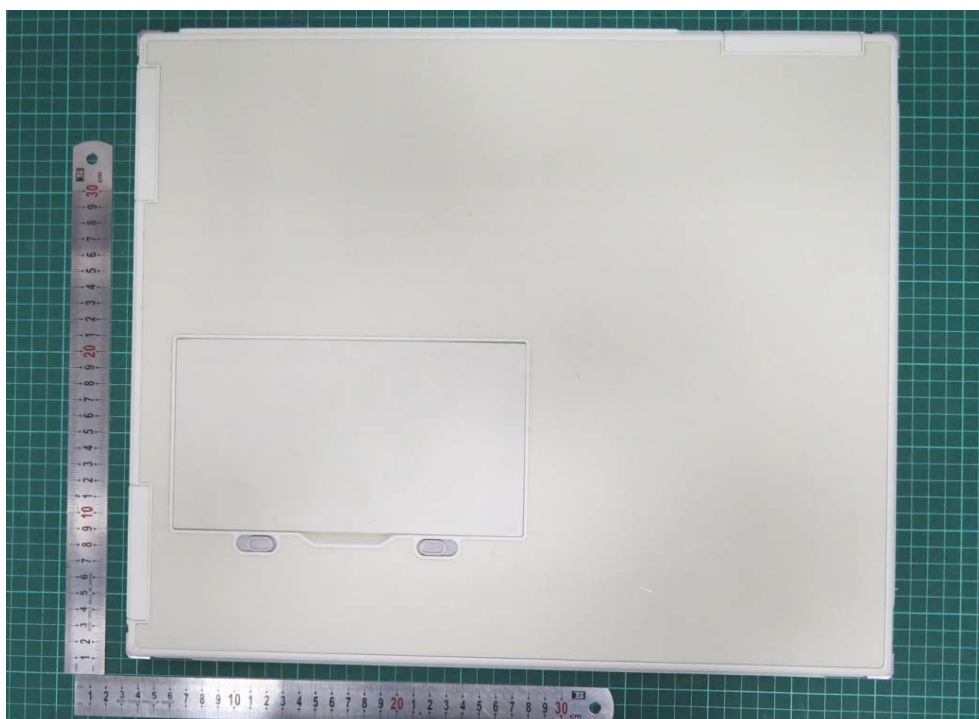
*****END OF REPORT *****

ANNEX A: The EUT Appearance and Test Configuration

A.1 EUT Appearance



Front Side

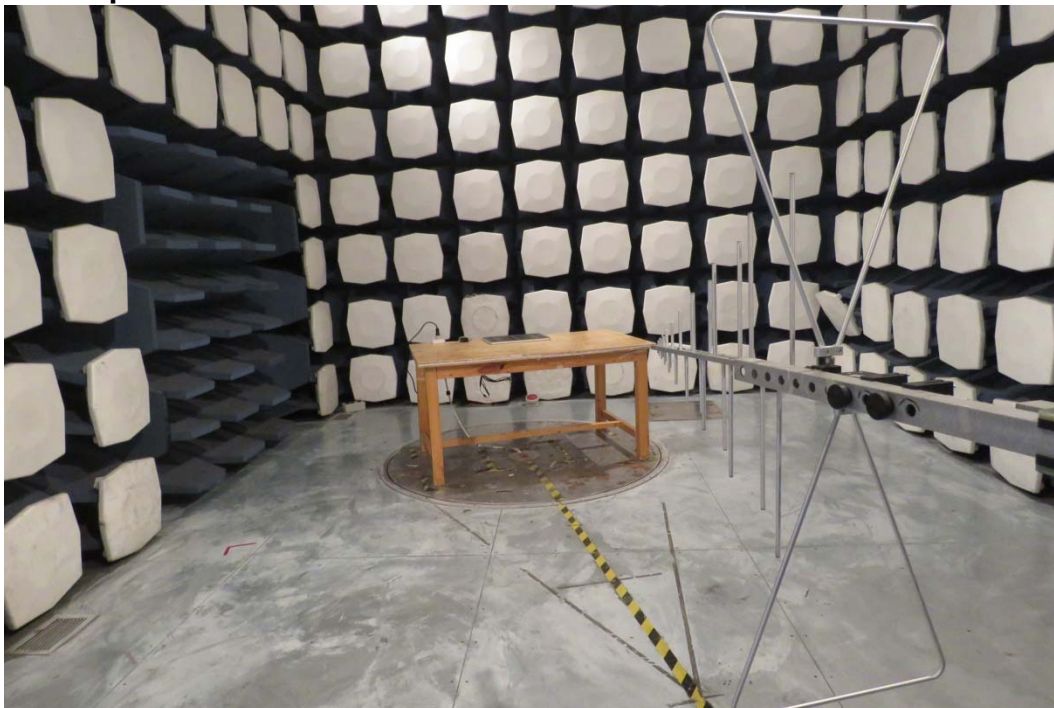


Back Side

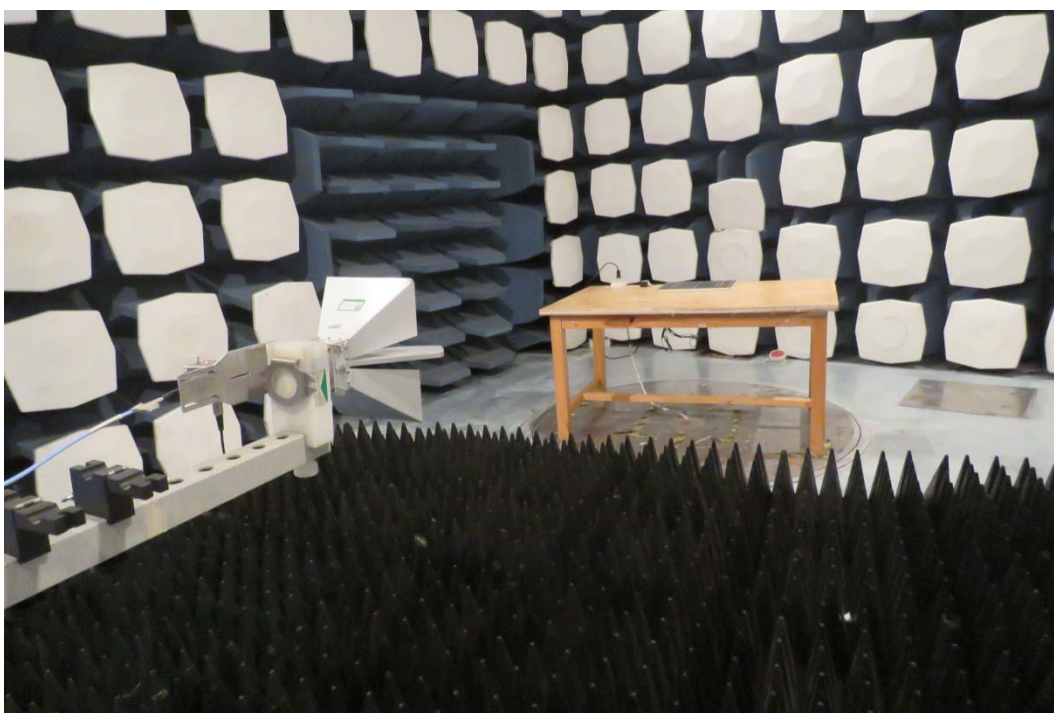
a: EUT

Picture 1 EUT and Accessory

A.2 Test Setup

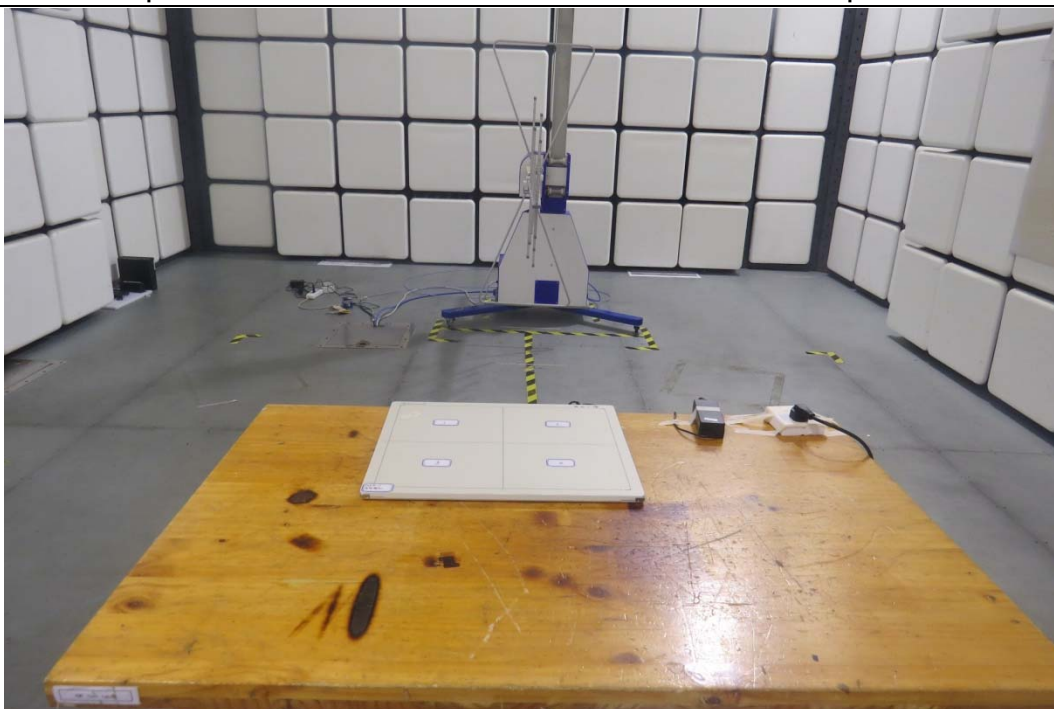


Below 1GHz

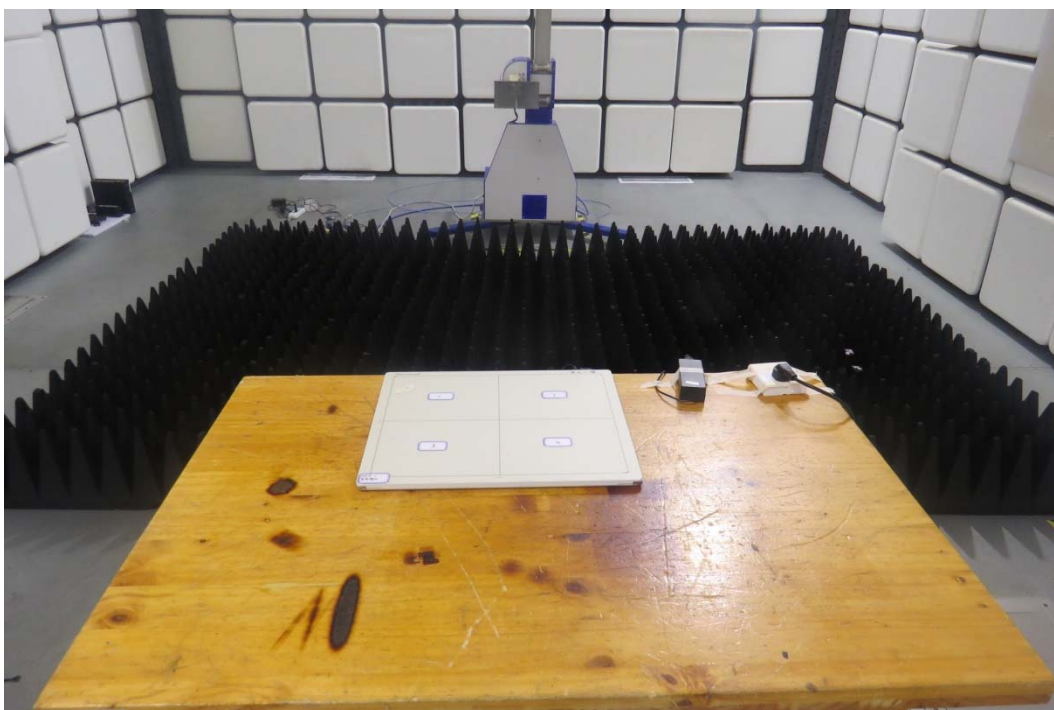


Above 1GHz

Original



Below 1GHz



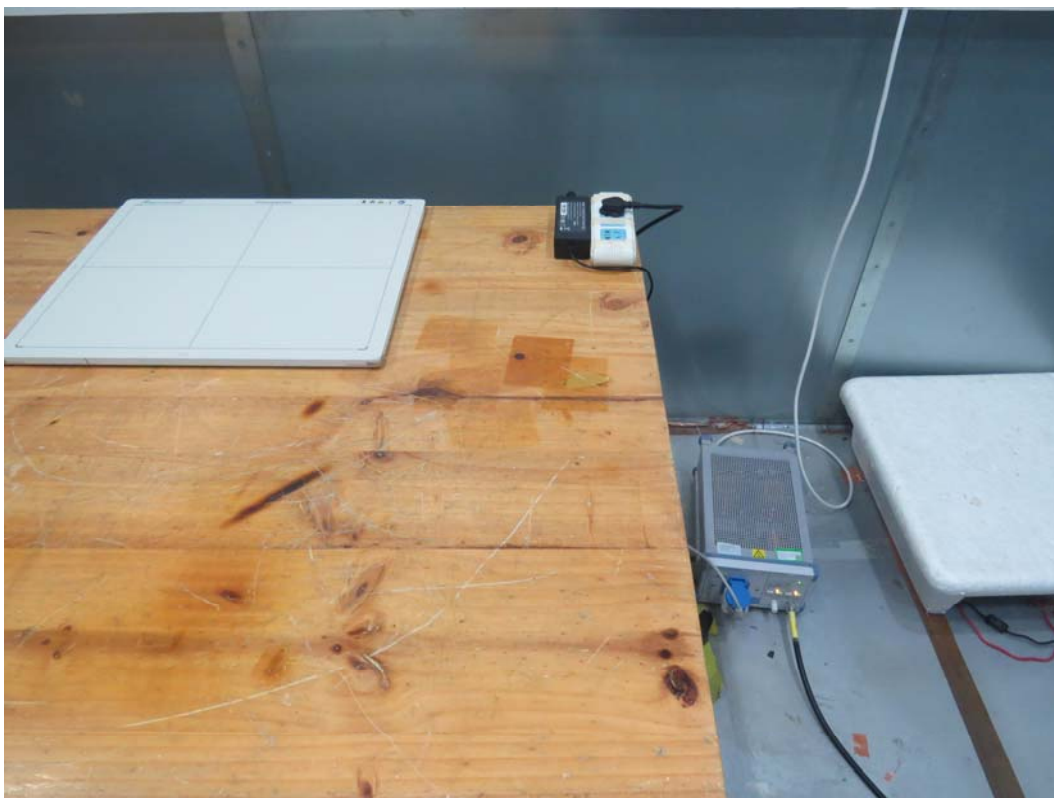
Above 1GHz

Variant

Picture 2 Radiated Emission Test Setup



Original



Variant

Picture 3 Conducted Emission Test Setup