

FCC 15.247 2.4 GHz Report

for

Elitegroup Computer Systems Co., Ltd.

**No. 239, Sec. 2, Ti Ding Blvd,
Taipei, Taiwan 11493**

Product Name : 7" Multi Function Pad
Model Name : mPAD2-7.....
Brand : ECS
FCC ID : WL6TC7A-W

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



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TEST REPORT CERTIFICATION

Applicant : Elitegroup Computer Systems Co., Ltd.
EUT Description
(1) Product : 7" Multi Function Pad
(2) Model : mPAD2-7.....
(3) Brand : ECS

Applicable Standards:

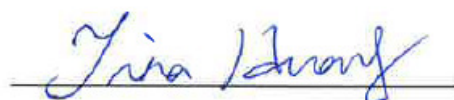
47 CFR FCC Part 15 Subpart C
ANSI C63.10:2013
KDB 558074 D01 DTS Meas Guidance v04

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2017. 03. 16

Reviewed by:



(Tina Huang/Administrator)

Approved by:



(Ben Cheng/Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2017. 03. 16	Original Report	EM-F170099

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	PASS
15.247(d)/15.205	Radiated Band Edge and Radiated Spurious Emission	PASS
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)(3)	Maximum Peak Output	PASS
15.247(d)	Conducted Band Edges and Conducted Spurious Emission	PASS
15.247 (e)	Peak Power Spectral Density	PASS
15.203	Antenna Requirement	PASS

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	Elitegroup Computer Systems Co., Ltd. No. 239, Sec. 2., TiDing Blvd., Taipei, Taiwan 11493
Product	7" Multi Function Pad
Model	mPAD2-7..... (The "." in the model name can be 0 to 9, A to Z, a to z, "-", "_", "\", "/" or blank for marketing use only)
Brand	ECS

3.2. Description of EUT

Test Model	mPAD2-7-CHT4-I																											
Serial Number	N/A																											
Power Rating	Refer to AC adapter rating.																											
RF Features	WLAN:802.11a/b/g/n/ac Bluetooth: BT and BLE NFC, GPS																											
Transmit Type	<table><tr><th colspan="2">2.4 GHz</th></tr><tr><td>802.11b</td><td>2T2R</td></tr><tr><td>802.11g</td><td>2T2R</td></tr><tr><td>802.11n-HT20</td><td>2T2R</td></tr><tr><td>802.11n-HT40</td><td>2T2R</td></tr><tr><td>BT/BLE</td><td>1T1R</td></tr></table> <table><tr><th colspan="2">UNII Bands</th></tr><tr><td>802.11a</td><td>2T2R</td></tr><tr><td>802.11n-HT20/ 802.11ac-VHT20</td><td>2T2R</td></tr><tr><td>802.11n-HT40/ 802.11ac-VHT40</td><td>2T2R</td></tr><tr><td>802.11ac-VHT80</td><td>2T2R</td></tr></table> <table><tr><th colspan="2">13.56MHz</th></tr><tr><td>NFC</td><td>1T1R</td></tr></table>		2.4 GHz		802.11b	2T2R	802.11g	2T2R	802.11n-HT20	2T2R	802.11n-HT40	2T2R	BT/BLE	1T1R	UNII Bands		802.11a	2T2R	802.11n-HT20/ 802.11ac-VHT20	2T2R	802.11n-HT40/ 802.11ac-VHT40	2T2R	802.11ac-VHT80	2T2R	13.56MHz		NFC	1T1R
2.4 GHz																												
802.11b	2T2R																											
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802.11ac-VHT80	2T2R																											
13.56MHz																												
NFC	1T1R																											
Accessories	• Barcode Scanner mPAD (Option) • SCR mPAD (Option) • MSR Module (Option) • USB Ethernet mPAD (Option) • 7” Pad Docking (Option) • 30 Pin to USB Cable • 30 Pin to HDMI Cable • 30 Pin to DC Jack Cable • Power Adapter																											
Date of Receipt	2017. 01. 25																											
Date of Test	2017. 02. 16 ~ 03. 16																											

3.3. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number
802.11b	2412-2462	11
802.11g		11
802.11n-HT20		11
802.11n-HT40	2422-2452	7
BLE	2402-2480	40

Mode	Modulation	Data Rate (Mbps)
802.11b	DSSS (DBPSK/DQPSK/CCK)	Up to 11
802.11g	OFDM (BPSK/QPSK/16QAM/64QAM)	Up to 54
802.11n-HT20		Up to 144.4
802.11n-HT40		Up to 300
BLE	GFSK	1

Channel List			
802.11 b/g/n-HT20		802.11n-HT40	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2412		
2	2417		
3	2422		
4	2427	3	2422
5	2432	4	2427
6	2437	5	2432
7	2442	6	2437
8	2447	7	2442
9	2452	8	2447
10	2457	9	2452
11	2462		

Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
37	2402	18	2442
00	2404	19	2444
01	2406	20	2446
02	2408	21	2448
03	2410	22	2450
04	2412	23	2452
05	2414	24	2454
06	2416	25	2456
07	2418	26	2458
08	2420	27	2460
09	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

RMS Output Power (dBm)				
Channel	802.11b	802.11g	802.11n-HT20	802.11n-HT40
1	17.5	14.0	14.5	
2	17.5	18.5	19.0	
3	17.5	18.5	19.0	12.5
4	17.5	18.5	19.0	15.0
5	17.5	18.5	19.0	15.0
6	17.5	18.5	19.0	15.0
7	17.5	18.5	19.0	15.0
8	17.5	18.5	19.0	15.0
9	17.5	18.5	19.0	8.5
10	17.5	18.5	18.5	
11	17.5	12.5	12.5	

3.1. Antenna Information

GPS Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	13-130-JC5150	Joinsoon Electronics MFG. CO.,LTD	PCB	1510 to 1602	4.62

2.4G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	13-130-002075 (Tx1 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	2400 to 2500	-2.53
2	13-130-002076 (Tx2 Antenna)		PIFA	2400 to 2500	-1.15

5G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	13-130-002075 (Tx1 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	5150 to 5350	-0.53
2				5470 to 5725	0.82
3				5725 to 5850	0.82
4	13-130-002076 (Tx2 Antenna)	Joinsoon Electronics MFG. CO.,LTD	PIFA	5150 to 5350	0.90
5				5470 to 5725	0.53
6				5725 to 5850	0.53

3.2. Descriptions of Key Components

3.2.1. For the All Component Lists

Item	Supplier	Model / Type	Character
Main Board	ECS	TC71A	---
CPU (Socket: BGA1380)	Intel	Z8550	1.44GHz, up to 2.4GHz
Memory (On Board)	SK hynix	H9CCNNNBPTBL	LPDDR3 1600MHz 4GB
7" LCD Panel	KD	KD070D30-31NB-A18	LCD.WXGA.7.800*1280
Touch Module	TOPGROUP EETI	ZC-122A-0776AT EXC3102	Support 10-points multi-touch(Capacitive)
Storage	SanDisk	SDINADF4-64G	64GB
	SanDisk	SDIN9DW4-32G	32GB
Front Camera	Brodsands	BLX2722E-TC7AW-F	Front Camera : 2.0M
Rear Camera	Brodsands	BLX8858E-TC7AW-CB	Rear Camera: 8.0M
Wi-Fi +BT Module	Qualcomm (Azurewave)	QCNFA324 (AW-CM217NF)	Wi-Fi 802.11 a/b/g/n/ac + BT 4.0
GPS	Boradcam	BCM4752	GPS&GLONASS
NFC	NXP	NPC100	---
Battery	Sunwoda	MICA-071	3.7Vdc,4100mAh / 15.17Wh
AC Adapter	Asian Power Devices Inc.	WA-36A12R (Wall-mount, 2C)	I/P: AC 100-240V, 50-60Hz, 0.9A Max. O/P: DC 12V, 3A
		DC Power Cord: Unshielded, Undetachable, 1.8m With one ferrite core	
mPad Module (Option)	ECS	Barcode Scanner mPAD	Barcode Scanner
	ECS	SCR mPAD	Smart Card Reader (SCR)
	ECS	MSR mPAD	Magnetic Stripe Reader (MSR)
	ECS	USB Ethernet mPAD	Giga LAN Port
7" Pad Docking (Option)	ECS	DOCKING mPAD-7	Docking

Remark: For more detailed features description, please refer to the manufacturer's specifications or the user manual.

3.2.2. The EUT collocates with following worst components, which are used to establish a basic configuration of system during test:

Item	Supplier	Model / Type	Character
Main Board	ECS	TC71A	---
CPU (Socket: BGA1380)	Intel	Z8550	1.44GHz, up to 2.4GHz
Memory (On Board)	SK hynix	H9CCNNNBPTBL	LPDDR3 1600MHz 4GB
7" LCD Panel	KD	KD070D30-31NB-A18	LCD.WXGA.7.800*1280
Touch Module	TOPGROUP EETI	ZC-122A-0776AT EXC3102	Support 10-points multi-touch(Capacitive)
Storage	SanDisk	SDIN9DW4-32G	32GB
Front Camera	Brodsands	BLX2722E-TC7AW-F	Front Camera : 2.0M
Rear Camera	Brodsands	BLX8858E-TC7AW-CB	Rear Camera: 8.0M
Wi-Fi +BT Module	Qualcomm (Azurewave)	QCNAFA324 (AW-CM217NF)	Wi-Fi 802.11 a/b/g/n/ac + BT 4.0
GPS	Boradcam	BCM4752	GPS&GLONASS
NFC	NXP	NPC100	---
Battery	Sunwoda	MICA-071	3.7Vdc,4100mAh / 15.17Wh
AC Adapter	Asian Power Devices Inc.	WA-36A12R (Wall-mount, 2C)	I/P: AC 100-240V, 50-60Hz, 0.9A Max. O/P: DC 12V, 3A
		DC Power Cord: Unshielded, Undetachable, 1.8m With one ferrite core	
mPad Module (Option)	ECS	Barcode Scanner mPAD	Barcode Scanner
7" Pad Docking (Option)	ECS	DOCKING mPAD-7	Docking

3.3. Data Rate Relative to Output Power

802.11b							
Channel	Modulation			Date Rate (Mbps)		Power (dBm)	
1	DBPSK			1		20.64	
1	DQPSK			2		20.52	
1	CCK			5.5		20.43	
1	CCK			11		20.36	
802.11g							
Channel	Modulation			Date Rate (Mbps)		Power (dBm)	
1	BPSK			6		16.51	
1	BPSK			9		16.47	
1	QPSK			12		16.42	
1	QPSK			18		16.36	
1	16-QAM			24		16.25	
1	16-QAM			36		16.19	
1	64-QAM			48		16.04	
1	64-QAM			54		15.92	
802.11n-HT20				802.11n-HT40			
Channel	Modulation	Date Rate	Power (dBm)	Channel	Modulation	Date Rate	Power (dBm)
1	BPSK	MCS8	16.69	3	BPSK	MCS8	14.76
1	QPSK	MCS9	16.64	3	QPSK	MCS9	14.71
1	QPSK	MCS10	16.58	3	QPSK	MCS10	14.66
1	16-QAM	MCS11	16.51	3	16-QAM	MCS11	14.60
1	16-QAM	MCS12	16.42	3	16-QAM	MCS12	14.53
1	64-QAM	MCS13	16.35	3	64-QAM	MCS13	14.43
1	64-QAM	MCS14	16.24	3	64-QAM	MCS14	14.35
1	64-QAM	MCS15	16.17	3	64-QAM	MCS15	13.26

Note: Above results are assessed in peak power.

3.4. Test Configuration

Mode	Duty Cycle (x)	T (ms)	Duty Cycle Factor (dB)
802.11b	0.99	12.180	0.04
802.11g	0.95	2.020	0.22
802.11n-HT20	0.90	0.969	0.46
802.11n-HT40	0.82	0.4876	0.86
BLE	0.65	0.626	1.87

Note: When duty cycle is less than 98% (0.98) that duty cycle factor $10\log(1/x)$ is needed to add in conducted test items measured in average detector.

AC Conduction	
Test Case	Normal operation

Item		Mode	Data Rate	Test Channel
Radiated Test Case	Radiated Band Edge Note1	802.11b	1Mbps	1/2/10/11
		802.11g	6Mbps	1/2/10/11
		802.11n-HT20	MCS8	1/2/10/11
		802.11n-HT40	MCS8	3/4/8/9
		BLE	1Mbps	37/39
	Radiated Spurious Emission Note1 & 2	802.11b	1 Mbps	6
		802.11g	6Mbps	6
		802.11n-HT20	MCS8	6
		802.11n-HT40	MCS8	6
		BLE	1Mbps	37/17/39

Item		Mode	Data Rate	Test Channel
Conducted Test Case	6dB Bandwidth	802.11b	1Mbps	1/6/11
		802.11g	6Mbps	1/6/11
		802.11n-HT20	MCS8	1/6/11
		802.11n-HT40	MCS8	3/6/9
		BLE	1Mbps	37/17/39
	Peak Power Spectral Density	802.11b	1Mbps	1/6/11
		802.11g	6Mbps	1/6/11
		802.11n-HT20	MCS8	1/6/11
		802.11n-HT40	MCS8	3/6/9
		BLE	1Mbps	37/17/39
	Peak Output Power	802.11b	1Mbps	1/6/11
		802.11g	6Mbps	1/6/11
		802.11n-HT20	MCS8	1/6/11
		802.11n-HT40	MCS8	3/6/9
		BLE	1Mbps	37/17/39
	Band Edge	802.11b	1Mbps	1/11
		802.11g	6Mbps	1/11
		802.11n-HT20	MCS8	1/11
		802.11n-HT40	MCS8	3/9
		BLE	1Mbps	37/17/39
	Spurious Emission	802.11b	1Mbps	1/6/11
		802.11g	6Mbps	1/6/11
		802.11n-HT20	MCS8	1/6/11
		802.11n-HT40	MCS8	3/6/9
		BLE	1Mbps	37/17/39

Note 1:

☒ Mobile Device: Device was pre-assessed with docking and portable (3 axis), the worst case (side) is tested with docking.

☐ Portable Device, and 3 axis were assessed.

☐ Lie

☐ Side

☐ Stand

Note 2: Low, mid, and high channels were measured, only the worst channel of each modulation was presented in this report.

3.5. Tested Supporting System List

3.5.1. Support Peripheral Unit

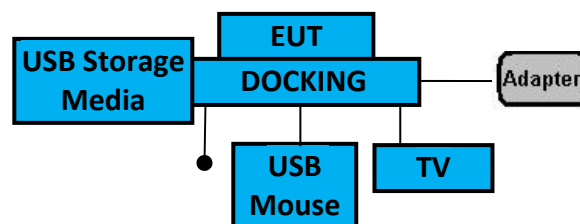
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	TV	LG	22LK330-DB	N/A	N/A
2.	USB Mouse	DELL	MOC5UO	J0M02S8L	By DoC
3.	USB Storage Media	Toshiba	Hayabusa	N/A	N/A

3.5.2. Cable Lists

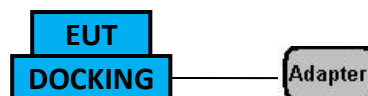
No.	Cable Description Of The Above Support Units
1.	HDMI Cable: Unshielded, Detachable, 1.0m AC Power Cord: Unshielded, Detachable, 1.5m
2.	USB Cable: Unshielded, Detachable, 1.5m
3.	---
4.	LAN Cable: Unshielded, Detachable, 1.0m

3.6. Setup Configuration

3.6.1. EUT Configuration for Power Line & Radiated Emission



3.6.2. EUT Configuration for RF Conducted Test Items



3.7. Operating Condition of EUT

Test program “QCA Radio Control Toolkit” is used for enabling EUT WLAN function under continues transmitting and choosing data rate/ channel.

3.8. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: sales@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2005 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724 (3) FCC OET Designation No. TW1004 & TW1090
Test Facilities	(1) No. 8 Shielding Room (2) Semi-Anechoic Chamber (IC Test Site Registration No.: 5183B-1) (3) Fully Anechoic Chamber (IC Test Site Registration No.: 5183B-4)

3.9. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conduction Test	150kHz~30MHz	±3.50dB
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dB
Power spectral density	± 0.13dB
Conducted Emission Limitations	± 0.13dB

4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Test Receiver	R&S	ESR3	101774	2017. 02. 07	2018. 02. 06
2.	A.M.N.	R&S	ENV4200	100169	2016. 04. 21	2017. 04. 20
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2016. 12. 23	2017. 12. 22
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2017. 01. 16	2018. 01. 15
5.	Test Software	Audix	e3	V.6.120424	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2016. 09. 19	2017. 09. 18
2.	Spectrum Analyzer	Agilent	N9010A-526	MY52220368	2016. 12. 01	2017. 11. 30
3.	Test Receiver	R & S	ESCS30	100338	2016. 06. 22	2017. 06. 21
4.	Amplifier	HP	8447D	2944A06305	2017. 02. 16	2018. 02. 15
5.	Amplifier	Sonoma	310N	187161	2016. 06. 14	2017. 06. 13
6.	Bilog Antenna	CHASE	CBL6112D	33821	2017. 01. 21	2018. 01. 20
7.	Loop Antenna	R&S	HFH2-Z2	891847/27	2016. 12. 23	2017. 12. 22
8.	Double-Ridged Waveguide Horn	ETS-Lindgren	3117	00135902	2016. 03. 09	2017. 03. 08
9.	2.4GHz Notch Filter	K&L	7NSL10-244 1.5E130.5-00	1	2016. 07. 28	2017. 07. 27
10.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-507	MY52220264	2016. 08. 09	2017. 08. 08
2.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2016. 04. 20	2017. 04. 19
3.	Power Meter	Anritsu	ML2495A	1145008	2016. 10. 27	2017. 10. 26
4.	Power Sensor	Anritsu	MA2411B	1126096	2016. 10. 27	2017. 10. 26

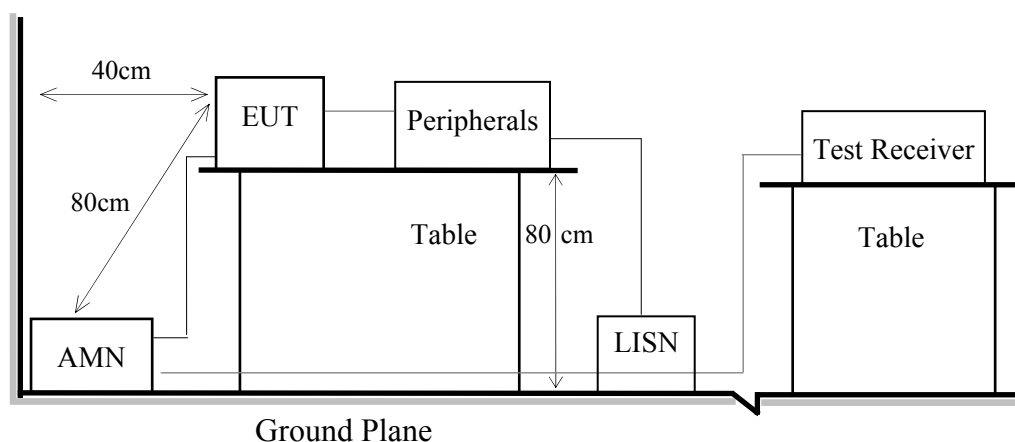
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.9

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

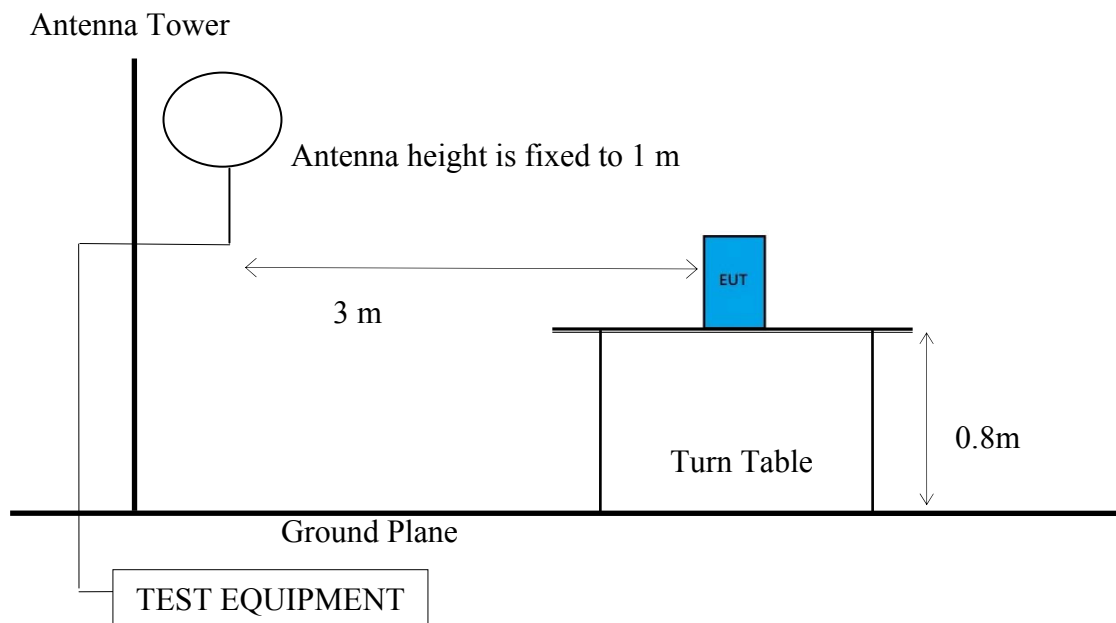
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

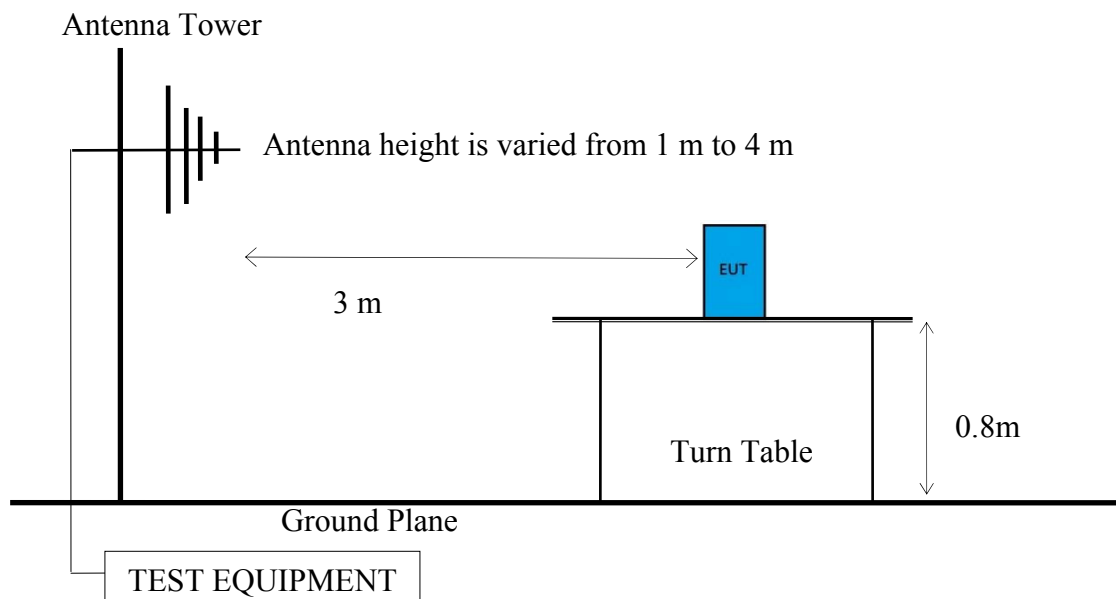
6.1.1. Block Diagram of EUT

Indicated as section 3.9

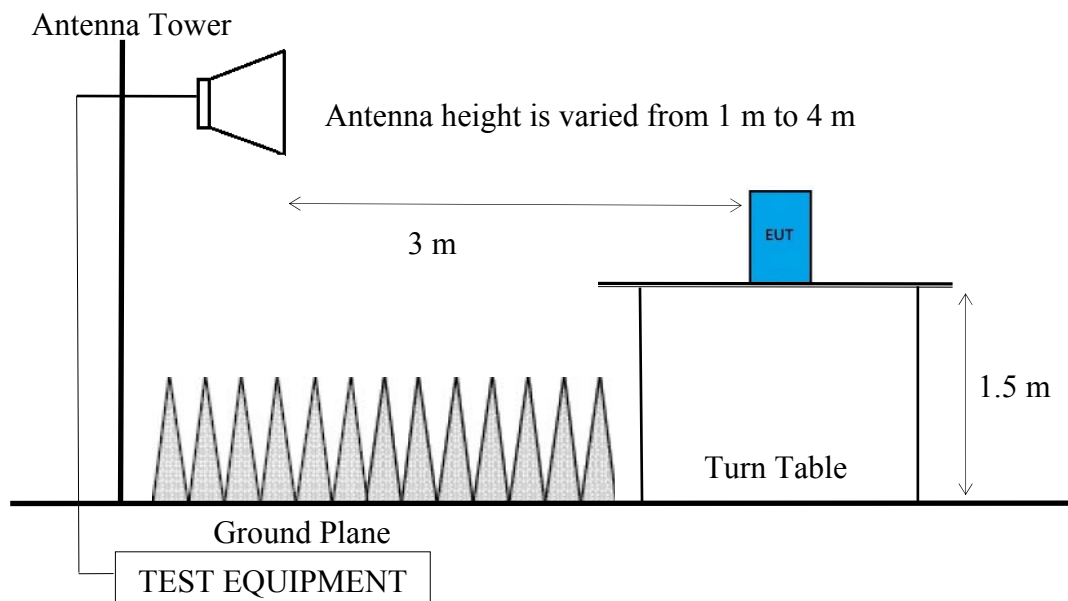
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205 must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dB μ V/m	μ V/m
0.009 - 0.490	300	67.6	2400/kHz
0.490 - 1.705	30	87.6	24000/kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

Remark : (1) dB μ V/m = 20 log (μ V/m)

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:

The EUT setup on the turn find table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required. Otherwise using Q.P. for finally measurement.

Frequency above 1GHz to 10th harmonic (up to 25 GHz):

Peak Detector:

- (1) RBW = 1MHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the average detector is not required. Otherwise using average detector for finally measurement.

Average Detector:**■ Option 1:**

(1) RBW = 1MHz

(2) VBW $\geq$ 1/ T.

Modulation Type	T (ms)	1/ T (kHz)	VBW Setting (kHz)
802.11b	12.18	0.082	0.01
802.11g	2.020	0.495	0.51
802.11n-HT20	0.969	1.032	1.00
802.11n-HT40	0.4876	2.051	2.00
BLE	0.626	1.597	1.6

N/A: 1/ T is not implemented when duty cycle presented in section 3.7 is $\geq$ 98 %.

(1) Detector = Peak.

(2) Sweep time = auto.

(3) Trace mode = max hold.

(4) Allow sweeps to continue until the trace stabilizes.

□ Option 2:

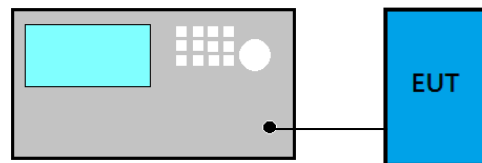
Average Emission Level = Peak Emission Level + D.C.C.F.

6.4. Measurement Result Explanation**■** Peak Emission Level = Antenna Factor + Cable Loss + Meter Reading**■** Average Emission Level = Antenna Factor + Cable Loss + Meter Reading**□** Average Emission Level = Peak Emission Level + DCCFDuty Cycle Correction Factor (DCCF) = $20\log(TX_{on}/TX_{on+off})$ presented in section 3.7**□** ERP = Peak Emission Level - 95.2dB - 2.14dB**6.5. Test Results**

Please refer to Appendix A.

7. 6dB BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

The minimum 6dB bandwidth shall be at least 500kHz.

7.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v04:

- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -6 dB to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

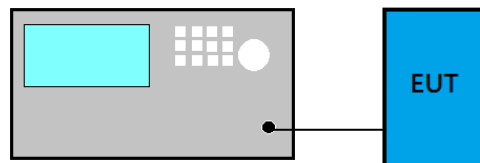
8. MAXIMUM PEAK OUTPUT POWER

8.1. Block Diagram of Test Setup

8.1.1. For WLAN Function



8.1.2. For BLE Function



8.2. Specification Limits

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is : 1Watt. (30dBm), and E.I.R.P.: 4Watt (36dBm)

8.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v04:

■ **PKPM1 Peak power meter method:**

EUT is connected to power sensor and record the maximum output power.

□ **Method AVGPM (Measurement using an RF average power meter):**

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.7 is < 98%.

■ **Method AVGSA-2 (Spectrum channel power)**

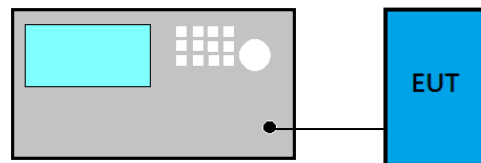
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 -5% of OBW
- (3) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is < 98%.

8.4. Test Results

Please refer to Appendix A

9. EMISSION LIMITATIONS

9.1. Block Diagram of Test Setup



9.2. Specification Limits

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).

9.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v04:

■ Reference Level

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW $\geq 3 \times$ RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max PSD as reference level.

■ Emission Level Measurement

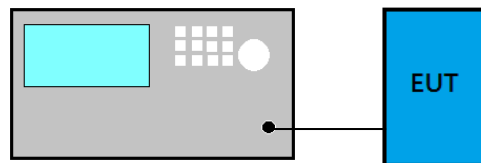
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW $\geq 3 \times$ RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max level.

9.4. Test Results

Please refer to Appendix A

10. POWER SPECTRAL DENSITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

10.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v04:

☒ Method PKPSD (peak PSD)

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- (4) Set the VBW $\geq 3 \times \text{RBW}$.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize.
- (9) Use the peak marker function to determine the maximum amplitude level.
- (10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

☐ Method AVGPSD-2

- (1) Using peak PSD procedure step 1 to step 4.
- (2) Detector = RMS detector
- (3) Sweep time = auto couple
- (4) Trace mode = trace averaging over a minimum of 100 traces
- (5) Use the peak marker function to determine the maximum amplitude level.
- (6) Duty cycle factor is added when duty cycle presented in section 3.7 < 98%.
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

10.4. Test Results

Please refer to Appendix A

11.DEVIATION TO TEST SPECIFICATIONS

【NONE】



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APPDNDIX A

TEST DATA AND PLOTS

(Model: mPAD2-7-CHT4-I)



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APPENDIX B

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APPENDIX B

TEST PHOTOGRAPHS

(Model: mPAD2-7-CHT4-I)