



Report No.: TBR-C-202204-0107-1 Page: 1 of 45

Radio Test Report

FCC ID: 2A2GJ-M2802

Report No.	\</th <th>TBR-C-202204-0107-1</th>	TBR-C-202204-0107-1
Applicant	22	Heltec Automation Technology Co., Ltd
Equipment Under	Test	(EUT)
EUT Name	:	Heltec Indoor Hotspot
Model No.	-	HT-M2802
Series Model No.		
Brand Name		
Sample ID		RW-C-202204-0107-1-1# & RW-C-202204-0107-1-2#
Receipt Date	:	2022-04-15
Test Date	84	2022-04-15 to 2022-04-29
Issue Date	:	2022-05-10
Standards	:	FCC Part 15 Subpart C 15.247
Test Method	:	ANSI C63.10: 2013
		KDB 558074 D01 15.247 Meas Guidance v05r02
Conclusions		PASS

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

Witness Engineer

Engineer Supervisor

Engineer Manager



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0



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Revision History

Report No.	Version	Description	Issued Date
TBR-C-202204-0107-1	Rev.01	Initial issue of report	2022-05-10
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1. General Information about EUT

1.1 Client Information

Applicant	-	Heltec Automation Technology Co., Ltd	
Address : 1st floor, No. 54, 56, 58 zirui North Street, High-tech Zone, Chengdu city, China			
Manufacturer	: Heltec Automation Technology Co., Ltd		
Address 1st floor, No. 54, 56, 58 zirui North Street, High-tech Zone, Chengdu city, China			

1.2 General Description of EUT (Equipment Under Test)

EUT Name		Heltec Indoor Hotspot				
Models No.	•	HT-M2802				
Model Different	:					
THE		Operation Frequency:	Bluetooth 4.0(BDR+EDR): 2402MHz~2480MHz			
Developed	1	Number of Channel:	79 channels			
Product Description		Antenna Gain:	3.0dBi Internal Antenna			
AT TURN	5	Modulation Type:	GFSK(1Mbps) π /4-DQPSK(2Mbps) 8-DPSK(3Mbps)			
Power Supply			Adapter(DSS12D-0502000-E) nput: 100-240V~50/60Hz 0.5A			
Software Version	:	N/A				
Hardware Version):	N/A				
Remark: (1) The antenna gai	n a	nd adapter provided by	the applicant, the verified for the RF			

conduction test provided by TOBY test lab.

(2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(3) Antenna information provided by the applicant.



(4) Channel List:

Bluetooth Channel List						
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	
00	2402	27	2429	54	2456	
01	2403	28	2430	55	2457	
02	2404	29	2431	56	2458	
03	2405	30	2432	57	2459	
04	2406	31	2433	58	2460	
05	2407	32	2434	59	2461	
06	2408	33	2435	60	2462	
07	2409	34	2436	61	2463	
08	2410	35	2437	62	2464	
09	2411	36	2438	63	2465	
10	2412	37	2439	64	2466	
11	2413	38	2440	65	2467	
12	2414	39	2441	66	2468	
13	2415	40	2442	67	2469	
14	2416	41	2443	68	2470	
15	2417	42	2444	69	2471	
16	2418	43	2445	70	2472	
17	2419	44	2446	71	2473	
18	2420	45	2447	72	2474	
19	2421	46	2448	73	2475	
20	2422	47	2449	74	2476	
21	2423	48	2450	75	2477	
22	2424	49	2451	76	2478	
23	2425	50	2452	77	2479	
24	2426	51	2453	78	2480	
25	2427	52	2454			
26	2428	53	2455			



1.3 Block Diagram Showing the Configuration of System Tested

Conducted Test

ted Test				
		EUT –	ADAPTER	- AND
	L			

1.4 Description of Support Units

Equipment Information							
Model	FCC ID/SDOC	Manufacturer	Used "√"				
DSS12D-0502000-E		DSS	\checkmark				
Cá	able Information						
Shielded Type	Ferrite Core	Length	Note				
		1.0M	A				
	Model DSS12D-0502000-E Ca	ModelFCC ID/SDOCDSS12D-0502000-ECable Information	ModelFCC ID/SDOCManufacturerDSS12D-0502000-EDSSCable InformationShielded TypeFerrite CoreLength				

1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test			
Final Test Mode Description			
Mode 1 TX GFSK Mode Channel 00			
	For Radiated Test		
Final Test Mode Description			
Mode 1	TX GFSK Mode Channel 00		
Mode 2 TX Mode (GFSK) Channel 00/39/78			
Mode 3	TX Mode(π /4-DQPSK) Channel 00/39/78		
Mode 4 TX Mode(8-DPSK) Channel 00/39/78			
Mode 5 Hopping Mode (GFSK)			
Mode 6 Hopping Mode(π /4-DQPSK)			
Mode 7	Hopping Mode(8-DPSK)		

Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

TX Mode: GFSK (1 Mbps)

TX Mode: π /4-DQPSK (2 Mbps)

TX Mode: 8-DPSK (3 Mbps)

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a Mobile unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version	anB'	RFTestTool	
Frequency	2402 MHz	2441MHz	2480 MHz
GFSK	DEF	DEF	DEF
π /4-DQPSK	DEF	DEF	DEF
8-DPSK	DEF	DEF	DEF

1.7 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U _{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.50 dB ±3.10 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.50 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB



1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F.,Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.

2. Test Summary

Standard Section	Test How		Judgment	
FCC	Test Item	Test Sample(s)		Remark
FCC 15.207(a)	Conducted Emission	RW-C-202204-0107-1-1#	PASS	N/A
CC 15.209 & 15.247(d)	Radiated Unwanted Emissions	RW-C-202204-0107-1-1#	PASS	N/A
FCC 15.203	Antenna Requirement	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.247(a)	99% Occupied Bandwidth & 20dB Bandwidth	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.247(b)(1)	Peak Output Power	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.247(a)(1)	Carrier frequency separation	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.247(a)(1)	Time of occupancy	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.247(b)(1)	Number of Hopping Frequency	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.247(d)	Band Edge	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.207	Conducted Unwanted Emissions	RW-C-202204-0107-1-2#	PASS	N/A
FCC 15.205	Emissions in Restricted Bands	RW-C-202204-0107-1-2#	PASS	N/A
	On Time and Duty Cycle	RW-C-202204-0107-1-2#		N/A

Note: N/A is an abbreviation for Not Applicable.

3. Test Software

Test Item	Test Software	Manufacturer	Version No.
Conducted Emission	EZ-EMC	EZ	CDI-03A2
Radiation Emission	EZ-EMC	EZ	FA-03A2RE
RF Conducted Measurement	MTS-8310	MWRFtest	V2.0.0.0
RF Test System	JS1120	Tonscend	V2.6.88.0336

4. Test Equipment

Conducted Emission	on Test				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 02, 2021	Jul. 01, 2022
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 02, 2021	Jul. 01, 2022
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 02, 2021	Jul. 01, 2022
LISN	Rohde & Schwarz	ENV216	101131	Jul. 02, 2021	Jul. 01, 2022
Radiation Emission	n Test (A Site)	-	-	-	-
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 02, 2021	Jul. 01, 2022
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 02, 2021	Jul. 01, 2022
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Feb. 27, 2022	Feb. 26, 2024
Horn Antenna	ETS-LINDGREN	3117	00143207	Feb. 26, 2022	Feb. 25, 2024
Horn Antenna	SCHWARZBECK	BBHA 9170	1118	Feb. 26, 2022	Feb. 25, 2024
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 06, 2021	Jul. 05, 2022
Pre-amplifier	SONOMA	310N	185903	Feb. 26, 2022	Feb. 25, 2023
Pre-amplifier	HP	8449B	3008A00849	Feb. 26, 2022	Feb. 25, 2023
HF Amplifier	Tonscend	TAP0184050	AP21C806129	Sep. 03, 2021	Sep. 02, 2022
Radiation Emission	n Test (B Site)	÷	÷	<u>.</u>	÷
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 02, 2021	Jul. 01, 2022
MXA Signal Analyzer	Agilent	N9020A	MY47380425	Sep. 03, 2021	Sep. 02, 2022
EMI Test Receiver	Rohde & Schwarz	ESU-8	100472	Feb. 26, 2022	Feb. 25, 2023
Bilog Antenna	SCHWARZBECK	VULB 9168	1225	Dec. 05, 2021	Dec. 04, 2023
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2463	May 20, 2021	May 19, 2022
Horn Antenna	SCHWARZBECK	BBHA 9170	1118	Feb. 26, 2022	Feb. 25, 2024
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 06, 2021	Jul. 05, 2022
HF Amplifier	Tonscend	TAP9E6343	AP21C806117	Sep. 03, 2021	Sep. 02, 2022
HF Amplifier	Tonscend	TAP051845	AP21C806141	Sep. 03, 2021	Sep. 02, 2022
HF Amplifier	Tonscend	TAP0184050	AP21C806129	Sep. 03, 2021	Sep. 02, 2022
Antenna Conducte	d Emission				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 02, 2021	Jul. 01, 2022
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 02, 2021	Jul. 01, 2022
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Sep. 03, 2021	Sep. 02, 2022
Spectrum Analyzer	KEYSIGT	N9020B	MY60110172	Sep. 03, 2021	Sep. 02, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO26	Sep. 03, 2021	Sep. 02, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO29	Sep. 03, 2021	Sep. 02, 2022
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO31	Sep. 03, 2021	Sep. 02, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO33	Sep. 03, 2021	Sep. 02, 2022
RF Control Unit	Tonsced	JS0806-2	21F8060439	Sep. 03, 2021	Sep. 02, 2022



5. Conducted Emission

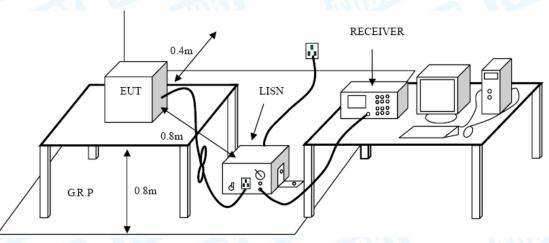
- 5.1 Test Standard and Limit
 - 5.1.1 Test Standard
 - FCC Part 15.207
 - 5.1.2 Test Limit

Fraguanay	Maximum RF Line Voltage (dBμV)		
Frequency	Quasi-peak Level	Average Level	
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *	
500kHz~5MHz	56	46	
5MHz~30MHz	60	50	

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.2 Test Setup



5.3 Test Procedure

● The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50 uH of coupling impedance for the measuring instrument.

●Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

●I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

●LISN at least 80 cm from nearest part of EUT chassis.

●The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.



5.4 Deviation From Test Standard

No deviation

5.5 EUT Operating Mode

Please refer to the description of test mode.

5.6 Test Data

Please refer to the Attachment A inside test report.



6. Radiated and Conducted Unwanted Emissions

- 6.1 Test Standard and Limit
 - 6.1.1 Test Standard

FCC Part 15.209 & FCC Part 15.247(d)

6.1.2 Test Limit

General field strength limits at frequencies Below 30MHz		
Frequency	Field Strength	Measurement Distance
(MHz)	(microvolt/meter)**	(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30

Note: 1, The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

General field	General field strength limits at frequencies above 30 MHz		
Frequency (MHz)	Field strength (μV/m at 3 m)	Measurement Distance (meters)	
30~88	100	3	
88~216	150	3	
216~960	200	3	
Above 960	500	3	

General field strength limits at frequencies Above 1000MHz			
Frequency	Frequency Distance of 3m (dBuV/m)		
(MHz) Peak Average		Average	
Above 1000	74	54	

Note:

(1) The tighter limit applies at the band edges.

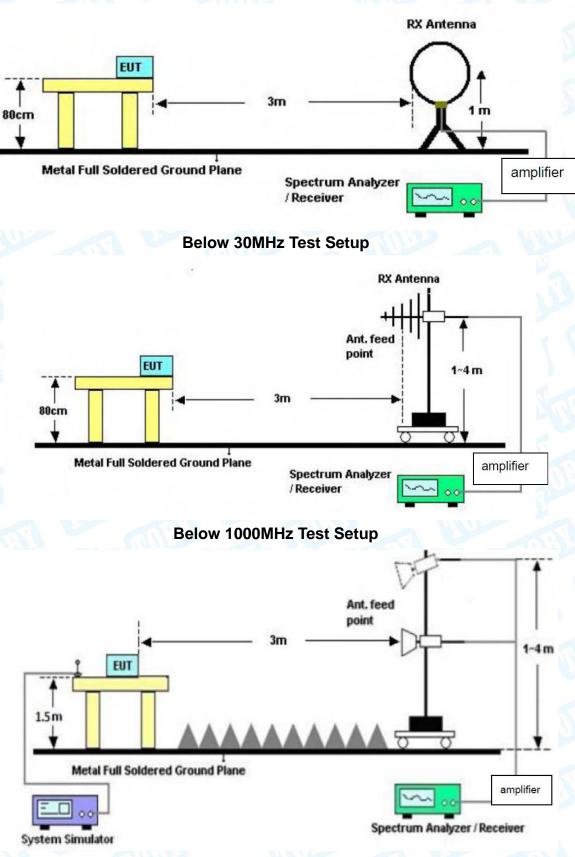
(2) Emission Level(dBuV/m)=20log Emission Level(uV/m)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

6.2 Test Setup

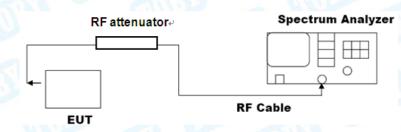
Radiated measurement





Above 1GHz Test Setup Conducted measurement





6.3 Test Procedure

---Radiated measurement

● The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.

• Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.

• The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.

• The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

● If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Below 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.

● Testing frequency range 30MHz-1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection. Testing frequency range 9KHz-150Hz the measuring instrument use VBW=200Hz with Quasi-peak detection. Testing frequency range 9KHz-30MHz the measuring instrument use VBW=9kHz with Quasi-peak detection.

● Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

• For the actual test configuration, please see the test setup photo.



--- Conducted measurement

•Reference level measurement

- Establish a reference level by using the following procedure:
- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to≥1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW≥[3*RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Emission level measurement

Establish an emission level by using the following procedure:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW≥[3*RBW].
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

6.4 Deviation From Test Standard

No deviation

6.5 EUT Operating Mode

Please refer to the description of test mode.

6.6 Test Data

Radiated measurement please refer to the Attachment B inside test report. Conducted measurement please refer to the Appendix A.



7. Emissions in Restricted Bands

- 7.1 Test Standard and Limit
 - 7.1.1 Test Standard

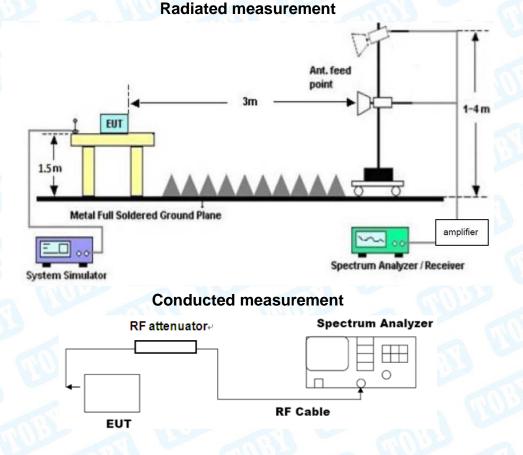
FCC Part 15.205 & FCC Part 15.247(d)

7.1.2 Test Limit

Restricted Frequency	Distance Meters (at 3m)		
Band (MHz)	Peak (dBuV/m)	Average (dBuV/m)	
2310 ~2390	74	54	
2483.5 ~2500	74	54	
	Peak (dBm)see 7.3 e)	Average (dBm) see 7.3 e)	
2310 ~2390	-21.20	-41.20	
2483.5 ~2500	-21.20	-41.20	

alternative to radiated measurements for determining compliance in the restricted frequency bands requirements. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test forcabinet/case emissions is required.

7.2 Test Setup





7.3 Test Procedure

---Radiated measurement

• Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.

• The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.

● The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

• The Peak Value and average value both need to comply with applicable limit above 1 GHz.

● Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

• For the actual test configuration, please see the test setup photo.

--- Conducted measurement

a) Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 11.12.2.3 through 11.12.2.5 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP (see 11.12.2.6 for guidance on determining the applicable antenna gain).

c) Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies \leq 30 MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies > 1000 MHz).

d) For MIMO devices, measure the power of each chain and sum the EIRP of all chains in linear terms (i.e., watts and mW).

e) Convert the resultant EIRP to an equivalent electric field strength using the following relationship:

$E = EIRP-20 \log d + 104.8$

where

E is the electric field strength in dBuV/m

EIRP is the equivalent isotropically radiated power in dBm

d is the specified measurement distance in m

f) Compare the resultant electric field strength level with the applicable regulatory limit.

g) Perform the radiated spurious emission test.



7.4 Deviation From Test Standard

No deviation

7.5 EUT Operating Mode

Please refer to the description of test mode.

7.6 Test Data

Remark: The test uses antenna-port conducted measurements as an alternative to radiated measurements for determining compliance in the restricted frequency bands requirements.

Please refer to the Appendix A.



8. 99% Occupied and 20dB Bandwidth

8.1 Test Standard and Limit

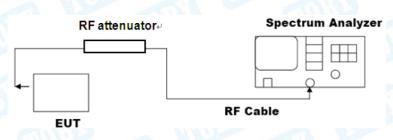
8.1.1 Test Standard

FCC Part 15.205 & FCC Part 15.247(a)

8.1.2 Test Limit

For an FHSS system operating in the 2400 to 2483.5 MHz band, there are no limits for 20dB bandwidth and 99% occupied bandwidth.

8.2 Test Setup



8.3 Test Procedure

• The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequence between these two frequencies.



h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

8.4 Deviation From Test Standard

No deviation

8.5 EUT Operating Mode

Please refer to the description of test mode.

8.6 Test Data

Please refer to the Appendix A.



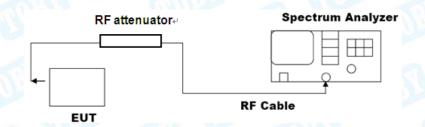
9. Peak Output Power Test

9.1 Test Standard and Limit

- 9.1.1 Test Standard FCC Part 15.247(b)(1)
- 9.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
	P _{max-pk} ≤ 1 W	
	<i>N</i> _{ch} ≥ 75	
AUDE A	$f \ge MAX \{ 25 \text{ kHz}, BW_{20dB} \}$	
	max. BW20dB not specified	
	$tch \le 0.4$ s for $T = 0.4^* Nch$	The state of the s
Peak Output Power	<i>P</i> max-pk ≤ 0.125 W	2400~2483.5
	<i>Nch</i> ≥ 15	
	f ≥ [MAX{25 kHz, 0.67*BW20dB}	
100	OR MAX{25 kHz, BW20dB}]	
	max. BW20dB not specified	
6035	$tch \le 0.4$ s for $T = 0.4^* N_{ch}$	
	cupancy; $T =$ period; $N_{ch} = #$ hopping f = hopping channel carrier frequency s	

9.2 Test Setup



9.3 Test Procedure

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:
 a) Use the following spectrum analyzer settings:

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW≥ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.
- d) The indicated level is the peak output power, after any corrections for external



attenuators and cables.

e) A plot of the test results and setup description shall be included in the test report.

NOTE-A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

9.4 Deviation From Test Standard

No deviation

9.5 EUT Operating Mode

Please refer to the description of test mode.

9.6 Test Data

Please refer to the Appendix A.



10. Carrier frequency separation

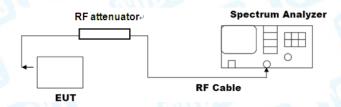
10.1 Test Standard and Limit

10.1.1 Test Standard FCC Part 15.247(a)(1)

10.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
	<i>P</i> _{max-pk} ≤ 1 W	
	<i>N</i> _{ch} ≥ 75	
	f ≥ MAX { 25 kHz, BW20dB }	
	max. BW20dB not specified	
	$tch \le 0.4$ s for $T = 0.4^* Nch$	AUDO A
Carrier frequency	<i>P</i> max-pk ≤ 0.125 W	2400~2483.5
separation	<i>Nch</i> ≥ 15	
A THURS	f ≥ [MAX{25 kHz, 0.67*BW20dB}	
	OR MAX{25 kHz, BW20dB}]	
	max. BW20dB not specified	
an BL	$tch \le 0.4$ s for $T = 0.4^* N_{ch}$	
	ccupancy; $T =$ period; $N_{ch} = #$ hopping f f = hopping channel carrier frequency s	

10.2 Test Setup



10.3 Test Procedure

• The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Wide enough to capture the peaks of two adjacent channels.
- b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- c) Video (or average) bandwidth (VBW) \geq RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.



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10.4 Deviation From Test Standard

No deviation

10.5 Antenna Connected Construction

Please refer to the description of test mode.

10.6 Test Data

Please refer to the Appendix A.



11. Time of occupancy (Dwell time)

11.1 Test Standard and Limit

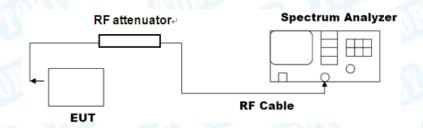
11.1.1 Test Standard

FCC Part 15.247(a)(1)

11.1.2 Test Limit

Test Item	Limit	Frequency Range (MHz)
E CIUP	<i>P</i> _{max-pk} ≤ 1 W	
	N _{ch} ≥ 75	
	f ≥ MAX { 25 kHz, BW20dB }	
	max. BW20dB not specified	
	$tch \le 0.4 ext{ s for } T = 0.4^* Nch$	and the second
Time of occupancy	<i>P</i> max-pk ≤ 0.125 W	2400~2483.5
(Dwell time)	<i>Nch</i> ≥ 15	
	f ≥ [MAX{25 kHz, 0.67*BW20dB}	
	OR MAX{25 kHz, BW20dB}]	
	max. BW20dB not specified	
an BL	$tch \leq 0.4 ext{ s for } T = 0.4^* N_{ch}$	

11.2 Test Setup



11.3 Test Procedure

• The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: Zero span, centered on a hopping channel.

b) RBW shall be \Box channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.

c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

d) Detector function: Peak.

e) Trace: Max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies



with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =

(number of hops on spectrum analyzer)x(period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

11.4 Deviation From Test Standard

No deviation

11.5 Antenna Connected Construction

Please refer to the description of test mode.

11.6 Test Data

Please refer to the Appendix A.

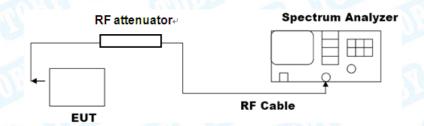


12. Number of hopping frequencies

- 12.1 Test Standard and Limit
 - 12.1.1 Test Standard
 - FCC Part 15.247(b)(1)
 - 12.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
	P _{max-pk} ≤ 1 W	
	$N_{ch} \ge 75$	
GUDD A	f ≥ MAX { 25 kHz, BW20dB }	
6035	max. BW20dB not specified	
	$tch \le 0.4 ext{ s for } T = 0.4^* Nch$	and the second
Carrier frequency	<i>P</i> max-pk ≤ 0.125 W	2400~2483.5
separation	<i>Nch</i> ≥ 15	
AUP	f ≥ [MAX{25 kHz, 0.67*BW20dB}	
	OR MAX{25 kHz, BW20dB}]	
	max. BW20dB not specified	
an BL	$tch \le 0.4 ext{ s for } T = 0.4^* N_{ch}$	
	ccupancy; $T =$ period; $N_{ch} =$ # hopping f f = hopping channel carrier frequency s	

12.2 Test Setup



12.3 Test Procedure

• The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.

b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

c) VBW ≥ RBW.

- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the

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hopping frequencies.

Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

12.4 Deviation From Test Standard

No deviation

12.5 Antenna Connected Construction

Please refer to the description of test mode.

12.6 Test Data

Please refer to the Appendix A.



13. Antenna Requirement

13.1 Test Standard and Limit

11.1.1 Test Standard FCC Part 15.203

11.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

13.2 Deviation From Test Standard

No deviation

13.3 Antenna Connected Construction

The gains of the antenna used for transmitting is 3.0dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

13.4 Test Data

The EUT antenna is a Internal Antenna. It complies with the standard requirement.

Antenna Type	
Permanent attached antenna	NU
Unique connector antenna	031
Professional installation antenna	A DOD

Attachment A-- Conducted Emission Test Data

Temperature:	24.5℃	Relative	Humidity:	44%			
Fest Voltage:	AC 120V/60Hz						
Ferminal:	Line	CIUD		UL			
Fest Mode:	Mode 1	Con a	1	5	NO		
Remark:	Only worse case is	reported.					
80.0 dBuV							
				QP: AVG:			
30 Marine	W M W WWW M MAN W WWW WWW WWW	**************************************	MANNA MILLANA	Mary My John Mary Mary Mary	when when AVI		
-20							

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1900	19.30	11.65	30.95	64.03	-33.08	QP
2		0.1900	4.75	11.65	16.40	54.03	-37.63	AVG
3		0.4060	23.70	11.44	35.14	57.73	-22.59	QP
4	*	0.4060	15.38	11.44	26.82	47.73	-20.91	AVG
5		0.6300	10.00	11.44	21.44	56.00	-34.56	QP
6		0.6300	1.09	11.44	12.53	46.00	-33.47	AVG
7		1.3220	13.98	10.99	24.97	56.00	-31.03	QP
8		1.3220	5.12	10.99	16.11	46.00	-29.89	AVG
9		4.2819	14.12	10.12	24.24	56.00	-31.76	QP
10		4.2819	1.98	10.12	12.10	46.00	-33.90	AVG
11		5.2819	17.00	10.08	27.08	60.00	-32.92	QP
12		5.2819	1.49	10.08	11.57	50.00	-38.43	AVG

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) =QuasiPeak/Average (dBuV)-Limit (dBuV)

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Temperature:	24.5 ℃	Relative Humidity:	44%
Test Voltage:	AC 120V/60Hz		GUL:
Terminal:	Neutral	1	
Test Mode:	Mode 1		
Remark:	Only worse case is rep	orted.	61102
80.0 dBuV			QP: AVG:
-20 0.150	0.5 (M	Hz) 5	30.000

No. M	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	0.1500	20.67	11.59	32.26	65.99	-33.73	QP
2	0.1500	-0.30	11.59	11.29	55.99	-44.70	AVG
3 *	0.4220	24.40	11.48	35.88	57.41	-21.53	QP
4	0.4220	7.75	11.48	19.23	47.41	-28.18	AVG
5	0.8340	16.05	11.34	27.39	56.00	-28.61	QP
6	0.8340	1.65	11.34	12.99	46.00	-33.01	AVG
7	1.2220	14.87	11.04	25.91	56.00	-30.09	QP
8	1.2220	1.62	11.04	12.66	46.00	-33.34	AVG
9	3.0260	14.28	10.17	24.45	56.00	-31.55	QP
10	3.0260	1.35	10.17	11.52	46.00	-34.48	AVG
11	5.5340	18.64	10.06	28.70	60.00	-31.30	QP
12	5.5340	2.41	10.06	12.47	50.00	-37.53	AVG

Remark: 1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) =QuasiPeak/Average (dBuV)-Limit (dBuV)



Attachment B--Unwanted Emissions Data

---Radiated Unwanted Emissions

9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB Below the permissible value has no need to be reported.

30MHz~1GHz

Temperature:	24.3 ℃	3 100	Relative Hu	umidity:	45%			
Test Voltage:	DC 5V		GUL	1	199			
Ant. Pol.	Horizontal	Horizontal						
Test Mode:	Mode 2 TX Mode (GFSK) Channel 00							
Remark:	Only worse	case is reported	AUDE	-	Children of the second			
80.0 dBuV/m								
70								
60				(75)500				
50				(REJECC 1 Margin -6	5C 3M Radiation dB	pea		
40	I		3		6 X			
30	Å	2	× ;		month of hundburd	where		
20 Repartmenter	manuf M	2 and the stand and the stand of the	when had the	which many and	MAR William Const			
10	<u></u>	and the second						
0								
-10								
-20								

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	70.3365	58.40	-24.39	34.01	40.00	-5.99	peak
2	125.0065	44.24	-22.97	21.27	43.50	-22.23	peak
3	250.3011	55.93	-22.34	33.59	46.00	-12.41	peak
4	325.5958	49.19	-20.23	28.96	46.00	-17.04	peak
5	501.1790	47.86	-15.62	32.24	46.00	-13.76	peak
6	750.1082	49.05	-10.79	38.26	46.00	-7.74	peak

*:Maximum data x:Over limit !:over margin

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = QuasiPeak (dB μ V/m)-Limit QPK(dB μ V/m)

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	Mode (GFS case is rep		nel 00			
Mode 2 TX			nel 00			
			nel 00			
				(RF)FCC 1 Margin -6	15C 3M Radiatior	n peak
	2		3	* *	5 6	
Summer My		whenthe	shirt Man An	Jat the month when he		
60.00		(MHz)	300.00			1000.000
	60.00	60.00	60.00 (MHz)	60.00 (MHz) 300.00	60.00 (MHz) 300.00	60.00 (MHz) 300.00

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	67.6751	59.26	-24.14	35.12	40.00	-4.88	peak
2	125.0065	48.24	-22.97	25.27	43.50	-18.23	peak
3	250.3011	52.64	-22.34	30.30	46.00	-15.70	peak
4	375.9385	57.05	-19.03	38.02	46.00	-7.98	peak
5	501.1790	53.71	-15.62	38.09	46.00	-7.91	peak
6	625.0780	52.53	-12.86	39.67	46.00	-6.33	peak

*:Maximum data x:Over limit !:over margin

Remark:

- Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = QuasiPeak (dBµV/m)-Limit QPK(dBµV/m)

Above 1GHz

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V	AUL -	
Ant. Pol.	Horizontal		20
Test Mode:	TX GFSK Mode 2402MHz		- CE

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4804.211	40.97	1.37	42.34	54.00	-11.66	AVG
2	4804.341	51.70	1.37	53.07	74.00	-20.93	peak

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		C. C.
Ant. Pol.	Vertical	and a	
Test Mode:	TX GFSK Mode 2402MHz		Cin C

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4804.094	50.99	1.38	52.37	74.00	-21.63	peak
2 *	4804.314	40.78	1.37	42.15	54.00	-11.85	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



26 ℃	Relative Humidity:	54%
DC 5V		E DE
Horizontal		
TX GFSK Mode 2	441MHz	
	DC 5V Horizontal	DC 5V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4882.218	39.52	1.55	41.07	54.00	-12.93	AVG
2	4882.344	49.69	1.55	51.24	74.00	-22.76	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 °C	Relative Humidity:	54%
Test Voltage:	DC 5V		2013
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2441MHz	miller	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4882.344	41.19	1.55	42.74	54.00	-11.26	AVG
2	4882.415	50.79	1.55	52.34	74.00	-21.66	peak

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		900
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2480MHz		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4960.217	48.53	1.81	50.34	74.00	-23.66	peak
2 *	4960.514	40.83	1.81	42.64	54.00	-11.36	AVG

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V	600	
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2480MHz	TUD A	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4960.347	40.60	1.81	42.41	54.00	-11.59	AVG
2	4960.351	48.34	1.81	50.15	74.00	-23.85	peak

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m) 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	26℃	Relative Humidity:	54%
Test Voltage:	DC 5V	COURS -	MU2
Ant. Pol.	Horizontal	201	
Test Mode:	TX π /4-DQPSK Mode 240	2MHz	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4804.215	50.40	1.37	51.77	74.00	-22.23	peak
2 *	4804.448	40.70	1.37	42.07	54.00	-11.93	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
 Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		0
Ant. Pol.	Vertical		and by
Test Mode:	TX π /4-DQPSK Mode 240	2MHz	A A A

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4804.217	53.00	1.37	54.37	74.00	-19.63	peak
2 *	4804.541	41.74	1.37	43.11	54.00	-10.89	AVG

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	26 ℃	Relative Humidity:	54%		
Test Voltage:	DC 5V				
Ant. Pol.	Horizontal	0 0			
Test Mode:	TX π /4-DQPSK Mode 2441	MHz			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4882.141	40.29	1.55	41.84	54.00	-12.16	AVG
2	4882.340	51.59	1.55	53.14	74.00	-20.86	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
 Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		0
Ant. Pol.	Vertical		1000
Test Mode:	TX π /4-DQPSK Mo	ode 2441MHz	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4882.211	52.46	1.55	54.01	74.00	-19.99	peak
2 *	4882.374	38.76	1.55	40.31	54.00	-13.69	AVG

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

TOBY

Temperature:	26 ℃	Relative Humidity:	54%	
Test Voltage:	DC 5V			
Ant. Pol.	Horizontal			
Test Mode:	TX π /4-DQPSK Mode 2480M	Hz		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4960.157	39.26	1.81	41.07	54.00	-12.93	AVG
2	4960.347	50.56	1.81	52.37	74.00	-21.63	peak

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V	200	
Ant. Pol.	Vertical		
Test Mode:	TX π /4-DQPSK Mode 2480M	IHz	GUL

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4960.284	39.77	1.81	41.58	54.00	-12.42	AVG
2	4960.408	<mark>51.66</mark>	1.81	53.47	74.00	-20.53	peak

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		
Ant. Pol.	Horizontal	0 0	
Test Mode:	TX 8-DPSK Mode 2402MH	z	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4804.117	38.99	1.38	40.37	54.00	-13.63	AVG
2	4804.351	49.71	1.37	51.08	74.00	-22.92	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
 Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		0
Ant. Pol.	Vertical		CODD -
Test Mode:	TX 8-DPSK Mode 2402MH	łz	- OF

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4804.217	52.10	1.37	53.47	74.00	-20.53	peak
2 *	4804.358	39.96	1.37	41.33	54.00	-12.67	AVG

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V	CON BU	muy-
Ant. Pol.	Horizontal		
Test Mode:	TX 8-DPSK Mode 2441MH	z	

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4882.257	39.08	1.55	40.63	54.00	-13.37	AVG
2	4882.348	49.82	1.55	51.37	74.00	-22.63	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
 Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V		C D
Ant. Pol.	Vertical		
Test Mode:	TX 8-DPSK Mode 2441MH	z	- DR

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4882.147	39.83	1.55	41.38	54.00	-12.62	AVG
2	4882.421	49.69	1.55	51.24	74.00	-22.76	peak

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V	anis)	AUP
Ant. Pol.	Horizontal		
Test Mode:	TX 8-DPSK Mode 2480MHz		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1 *	4960.341	39.44	1.81	41.25	54.00	-12.75	AVG
2	4960.411	48.57	1.81	50.38	74.00	-23.62	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	26 ℃	Relative Humidity:	54%
Test Voltage:	DC 5V	200	
Ant. Pol.	Vertical		
Test Mode:	TX 8-DPSK Mode 2480MHz		CIII:

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)		Margin (dB)	Detector
1	4960.184	51.40	1.81	53.21	74.00	-20.79	peak
2 *	4960.348	38.43	1.81	40.24	54.00	-13.76	AVG

Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

5. No report for the emission which more than 20dB below the prescribed limit.

-----END OF REPORT-----