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Report No.: SZEM180200114704
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TEST REPORT

Application No.: SZEM1802001147CR(SGS SZ No.:T51810200006EM)
Applicant: Toy State International Ltd.
Address of Applicant: Unit 905, 9/F, West Wing, Tsim Sha Tsui Centre, 66 Mody Road, TST East,
Kowloon, Hong Kong

Equipment Under Test (EUT):

EUT Name: Mini FPV Racer
Model No.: 22615
Country of Origin: China
FCC ID: V9Q-22615X58
Standard(s) : 47 CFR Part 15, Subpart E 15.407
Date of Receipt: 2018-02-05
Date of Test: 2018-03-15 to 2018-04-04
Date of Issue: 2018-04-10

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2018-04-10		Original

Authorized for issue by:				
				
		Gebin Sun /Project Engineer		
				
		Eric Fu /Reviewer		



2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart E 15.407	N/A	47 CFR Part 15, Subpart C 15.203	Pass
Transmission in the Absence of Data	47 CFR Part 15, Subpart E 15.407	N/A	47 CFR Part 15, Subpart E 15.407 (c)	Pass

N/A: Not applicable

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
99% Bandwidth	47 CFR Part 15, Subpart E 15.407	KDB 789033 II D	N/A	Pass
Minimum 6 dB bandwidth (5.725-5.85 GHz band)	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II C 2	47 CFR Part 15, Subpart E 15.407 (e)	Pass
Maximum Conducted output power	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II E	47 CFR Part 15, Subpart E 15.407 (a)	Pass
Peak Power spectrum density	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II F	47 CFR Part 15, Subpart E 15.407 (a)	Pass
Radiated Emissions	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II G	47 CFR Part 15, Subpart C 15.209 & 15.407(b)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II G	47 CFR Part 15, Subpart C 15.209 & 15.407(b)	Pass
Frequency Stability	47 CFR Part 15, Subpart E 15.407	ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart E 15.407 (g)	Pass

N/A: Not applicable



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4 General Information

4.1 Details of E.U.T.

Operation Frequency	5.8GHz(5732MHz, 5769MHz, 5806MHz, 5843MHz)
Channel number:	4
Modulation Type:	FM
Sample Type:	Portable production
Antenna Type:	Integral
Antenna Gain:	3dBi
Power supply:	Rechargeable battery DC3.7V for Drone
Cable:	Charging Cable:60cm unshielded

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25×10^{-8}
2	Duty cycle	0.37%
3	Occupied Bandwidth	3%
4	RF conducted power	0.75dB
5	RF power density	2.84dB
6	Conducted Spurious emissions	0.75dB
7	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
8	Radiated Spurious emission test	4.5dB (Below 1GHz)
		4.8dB (Above 1GHz)
9	Temperature test	1 °C
10	Humidity test	3%
11	Supply voltages	1.5%
12	Time	3%



4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China.
518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



5 Equipment List

99% Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

Minimum 6 dB bandwidth (5.725-5.85 GHz band)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

Maximum Conducted output power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

Peak Power spectrum density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

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Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-02	2020-05-01
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2017-07-13	2018-07-12
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-13
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2017-09-27	2018-09-26
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2017-09-27	2018-09-27
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018-04-02	2019-04-01
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2018-04-02	2019-04-01
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21
Band filter	N/A	N/A	SEM023-01	N/A	N/A

Frequency Stability					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26



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Transmission in the Absence of Data					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-28
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-17



6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

Standard 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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3dBi.

Antenna location: Refer to Appendix(Internal photos)



6.2 Transmission in the Absence of Data

6.2.1 Test Requirement:

47 CFR Part 15, Subpart E 15.407 (c)

6.2.2 Conclusion

Standard Requirement:

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Applicants shall include in their application for equipment authorization a description of how this requirement is met.

EUT Details:

WIFI chip (AR9342) support automatically discontinue transmission in case of either absence of information to transmit or operational failure, if the chip detect absence of information to transmit or operational failure, it will be automatically shut off.

7 Radio Spectrum Matter Test Results

7.1 99% Bandwidth

Test Requirement KDB 789033 II D

Test Method: KDB 789033 II D

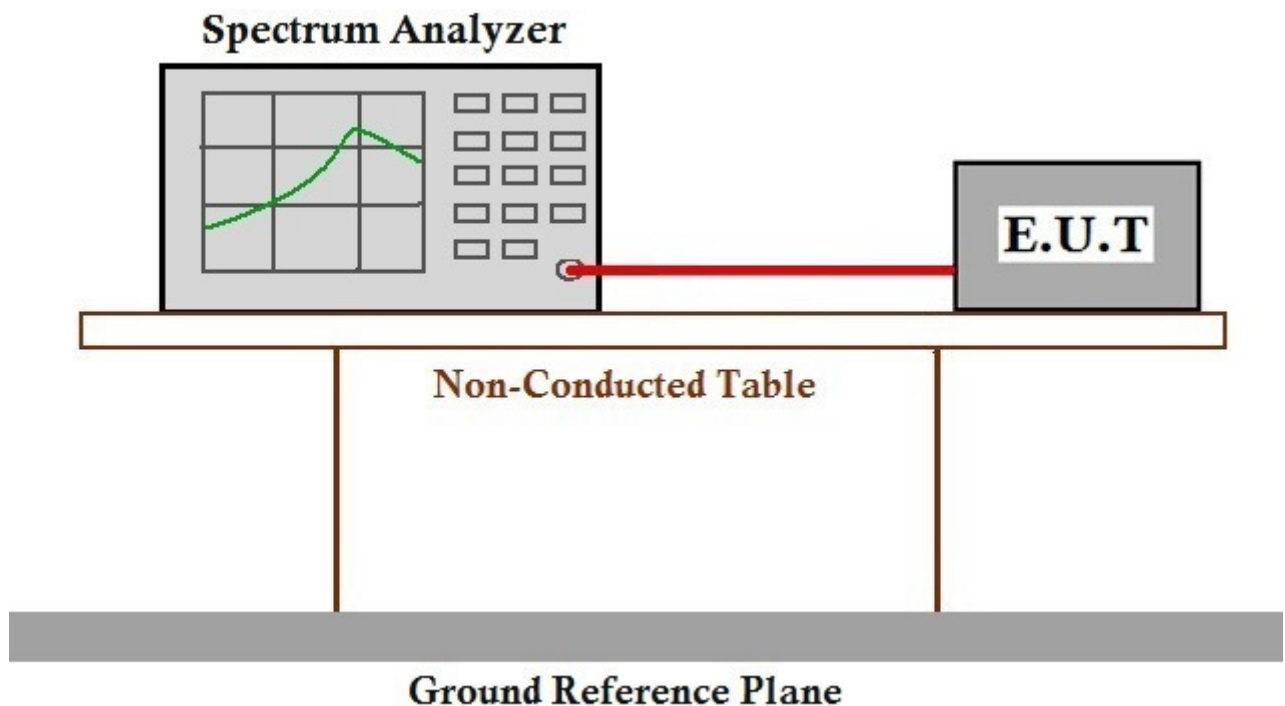
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 43.6 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.407

7.2 Minimum 6 dB bandwidth (5.725-5.85 GHz band)

Test Requirement 47 CFR Part 15, Subpart E 15.407 (e)
 Test Method: KDB 789033 D02 II C 2
 Limit: ≥ 500 kHz

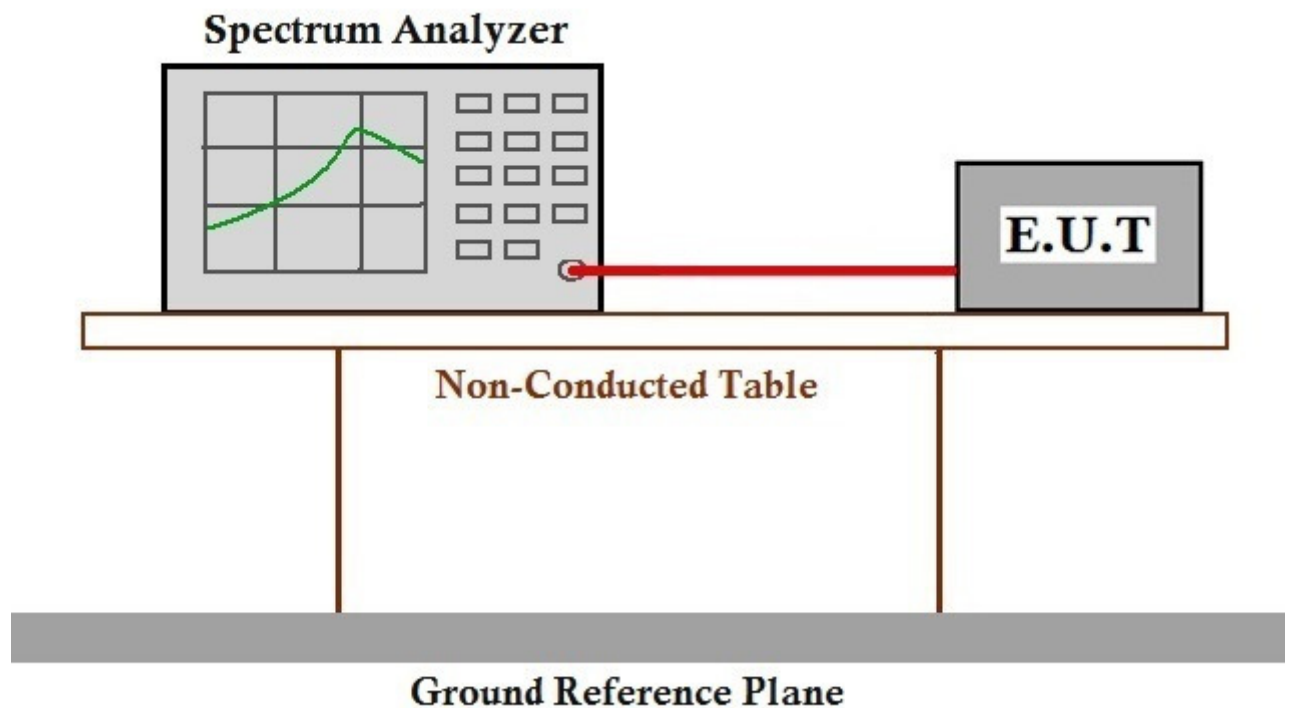
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 43.7 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.407

7.3 Maximum Conducted output power

Test Requirement 47 CFR Part 15, Subpart E 15.407 (a)

Test Method: KDB 789033 D02 II E

Limit:

Frequency band(MHz)	Limit
5150-5250	$\leq 1\text{W}(30\text{dBm})$ for master device
	$\leq 250\text{mW}(24\text{dBm})$ for client device
5250-5350	$\leq 250\text{mW}(24\text{dBm})$ for client device or $11\text{dBm}+10\log B^*$
5470-5725	$\leq 250\text{mW}(24\text{dBm})$ for client device or $11\text{dBm}+10\log B^*$
5725-5850	$\leq 1\text{W}(30\text{dBm})$
Remark:	* Where B is the 26dB emission bandwidth in MHz. The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

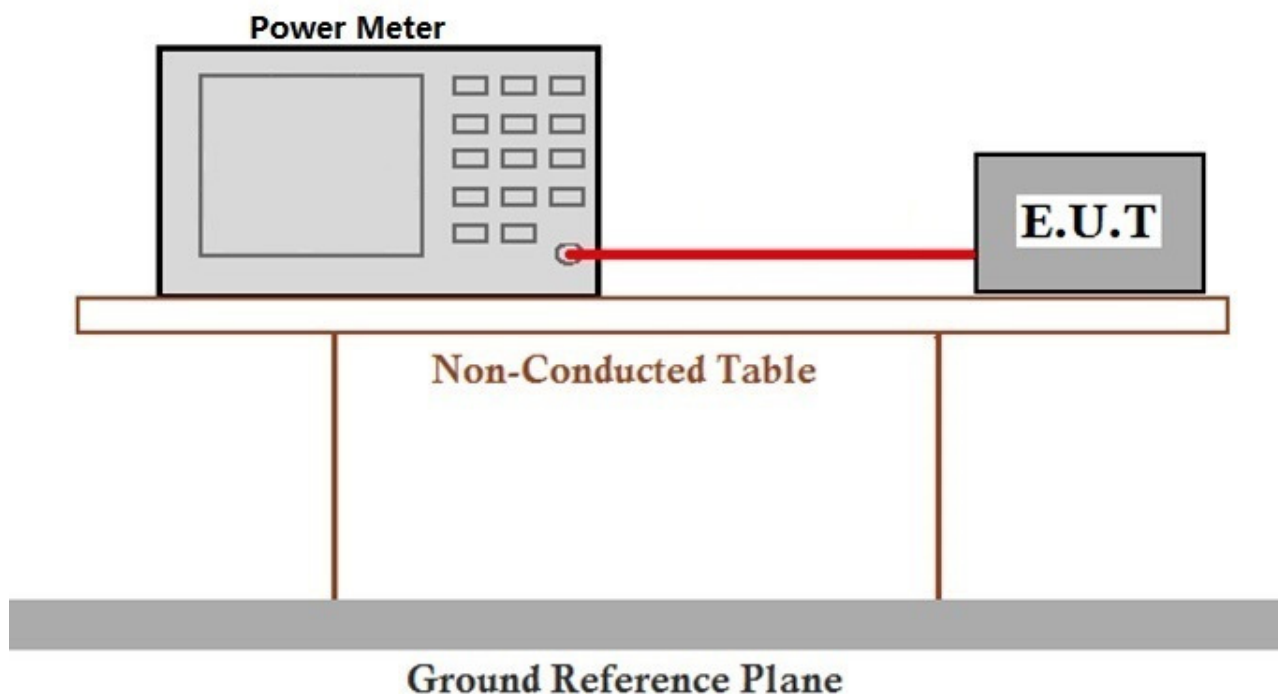
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 43.7 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.407

7.4 Peak Power spectrum density

Test Requirement 47 CFR Part 15, Subpart E 15.407 (a)

Test Method: KDB 789033 D02 II F

Limit:

Frequency band(MHz)	Limit
5150-5250	≤17dBm in 1MHz for master device
	≤11dBm in 1MHz for client device
5250-5350	≤11dBm in 1MHz for client device
5470-5725	≤11dBm in 1MHz for client device
5725-5850	≤30dBm in 500 kHz
Remark:	The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.

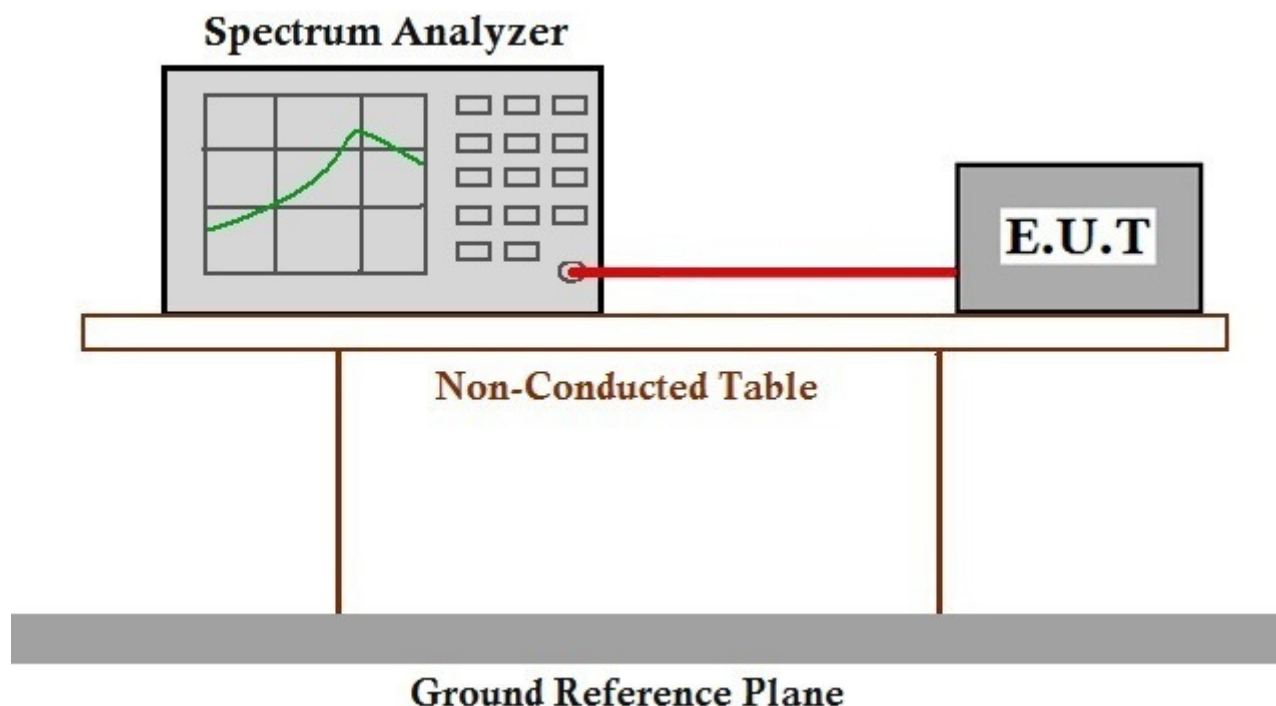
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 43.7 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.407

7.5 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.407(b)

Test Method: KDB 789033 D02 II G

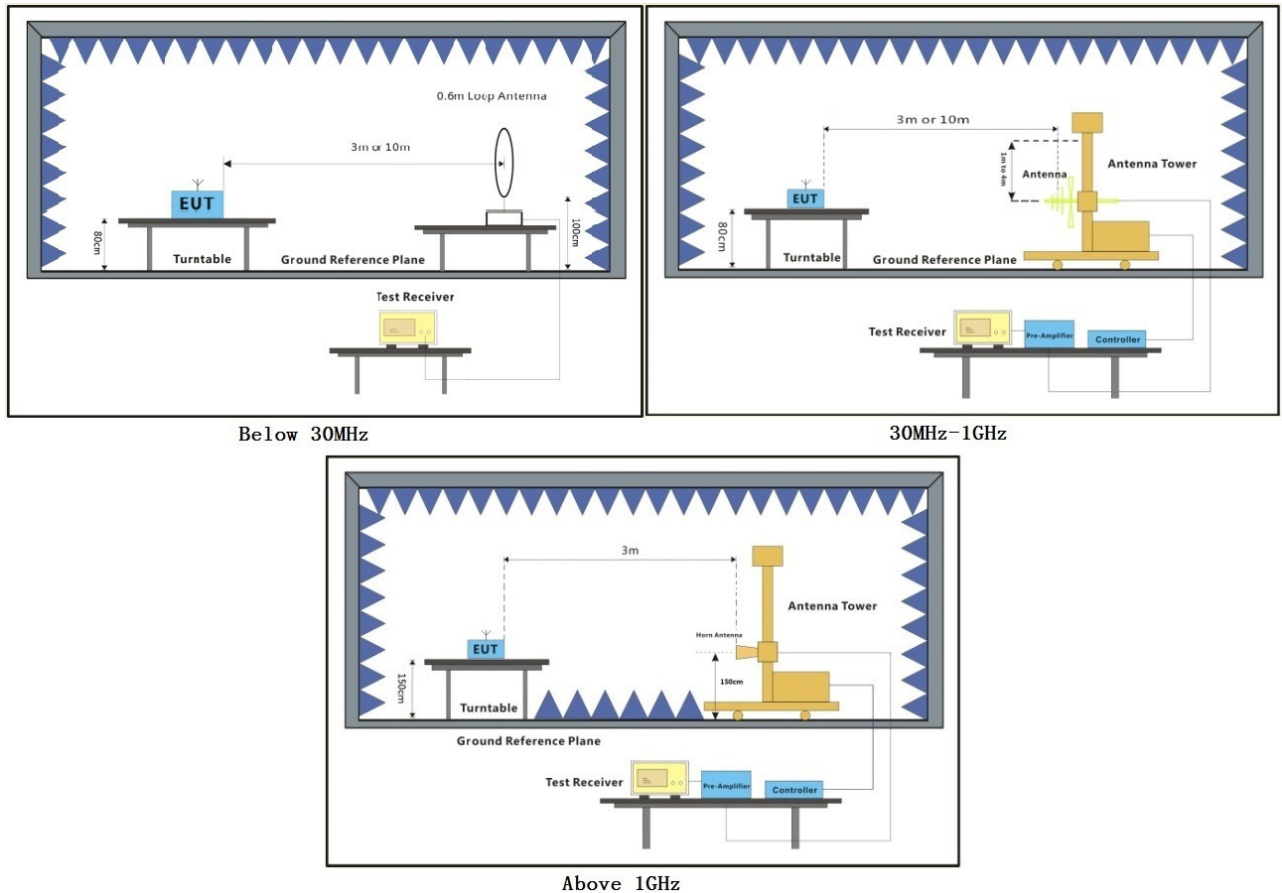
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 43.7 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

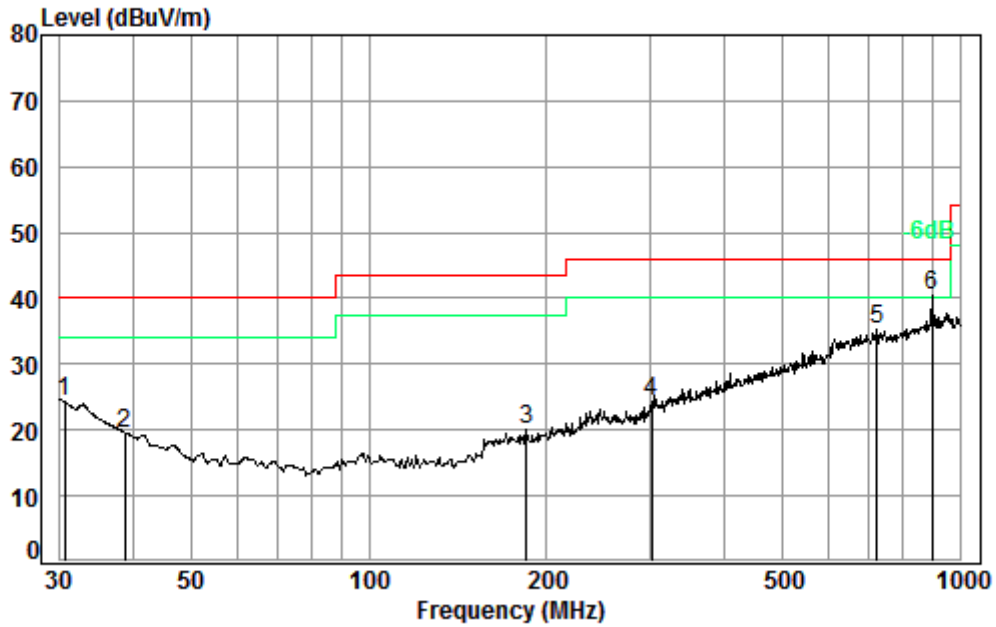
Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. For emission below 1GHz, through the pre-scan found the worst case is the lowest channel of 802.11a. Only the worst case is recorded in the report.
3. Scan from 9kHz to 40GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
4. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



Below 1GHz:

Mode:d; Polarization:Horizontal;



Condition: 3m HORIZONTAL

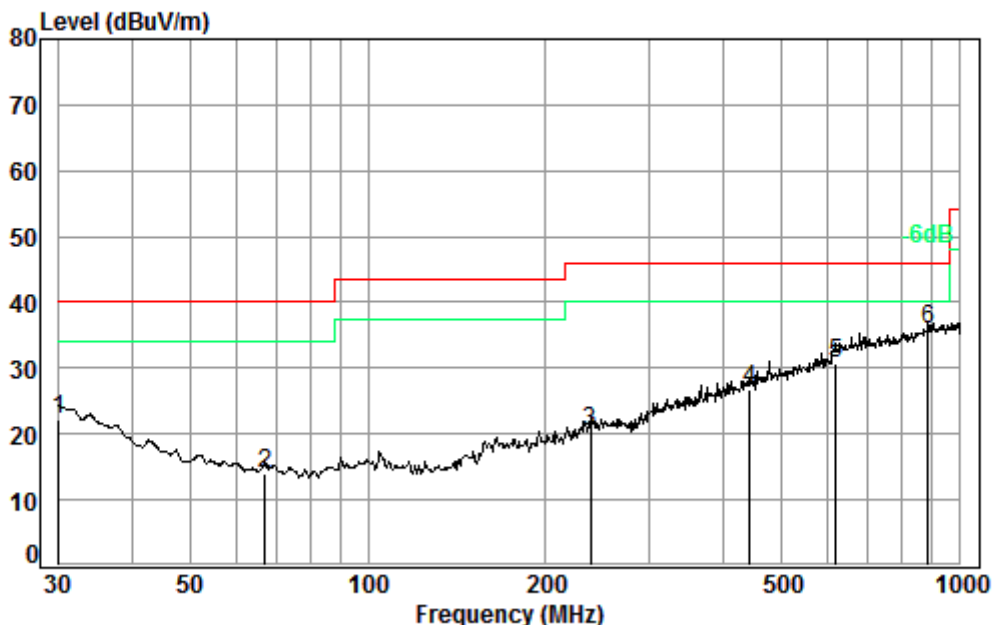
Job No. : 01147CR

Test mode: d

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.64	0.60	22.13	27.67	29.24	24.30	40.00	-15.70
2	38.75	0.60	18.05	27.63	28.59	19.61	40.00	-20.39
3	184.49	1.38	16.04	27.53	30.26	20.15	43.50	-23.35
4	300.37	1.90	19.61	27.54	30.47	24.44	46.00	-21.56
5	721.73	2.97	28.04	27.52	31.73	35.22	46.00	-10.78
6 pp	893.86	3.58	29.72	27.10	34.14	40.34	46.00	-5.66



Mode:d; Polarization: Vertical



Condition: 3m VERTICAL

Job No. : 01147CR

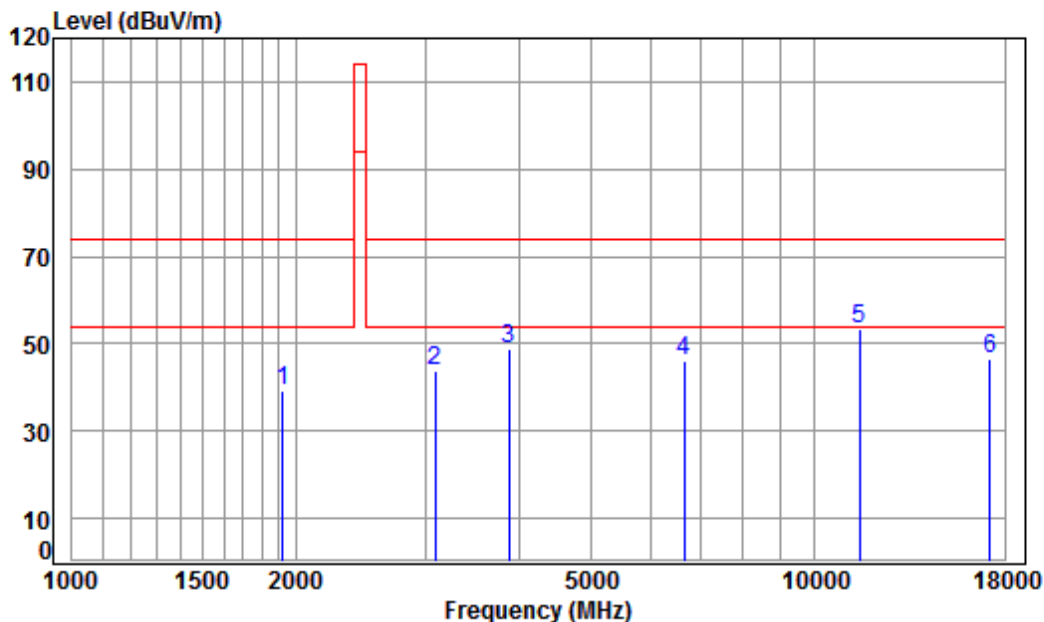
Test mode: d

	Freq	Cable	Ant	Preamp	Read	Limit	Over
	MHz	Loss	Factor	Factor	Level	Level	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m
1	30.11	0.60	22.44	27.67	26.96	22.33	40.00
2	66.97	0.80	12.91	27.54	27.69	13.86	40.00
3	237.48	1.61	18.61	27.53	27.72	20.41	46.00
4	441.74	2.38	23.38	27.80	28.69	26.65	46.00
5	618.54	2.74	26.86	27.67	28.79	30.72	46.00
6 pp	884.50	3.54	29.61	27.13	29.96	35.98	46.00



above 1GHz

Mode:d; Polarization: Horizontal; Modulation:FM ;Channel:Low



Condition: 3m HORIZONTAL

Job No : 01147CR

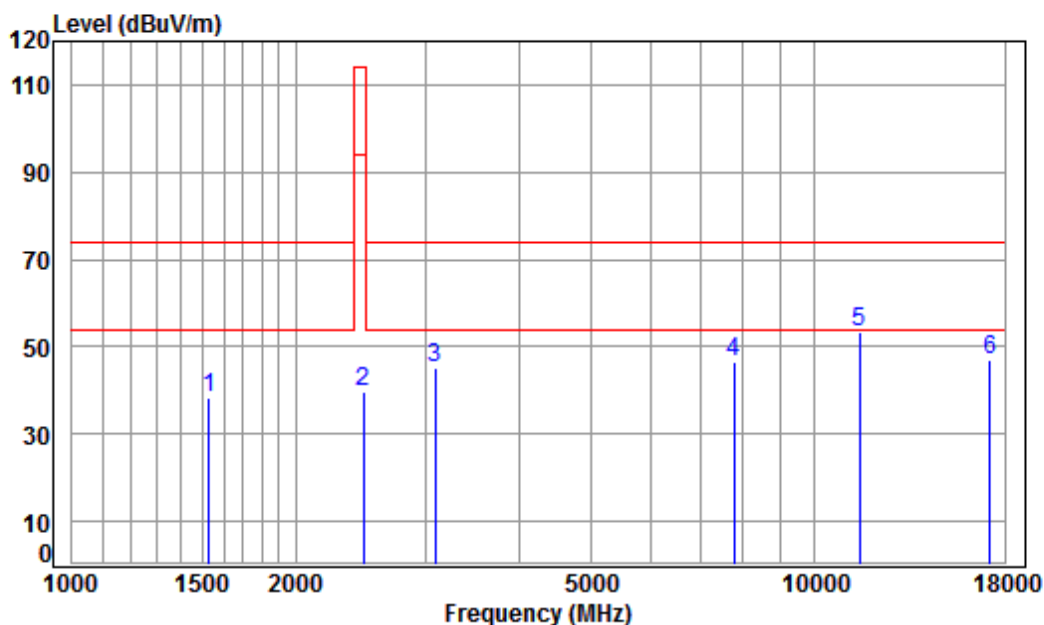
Mode : 5732 TX SE

Note :

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1921.727	4.98	27.52	41.65	48.42	39.27	74.00	-34.73	Peak
2	3087.140	6.07	31.47	42.12	48.22	43.64	74.00	-30.36	Peak
3	3879.027	6.86	33.28	42.30	50.86	48.70	74.00	-25.30	Peak
4	6659.763	11.08	35.56	41.10	40.75	46.29	74.00	-27.71	Peak
5	pp11464.000	12.10	38.07	38.17	41.25	53.25	74.00	-20.75	Peak
6	17196.000	16.27	43.04	40.45	27.79	46.65	74.00	-27.35	Peak



Mode:d; Polarization:Vertical; Modulation:FM; Channel:Low



Condition: 3m VERTICAL

Job No : 01147CR

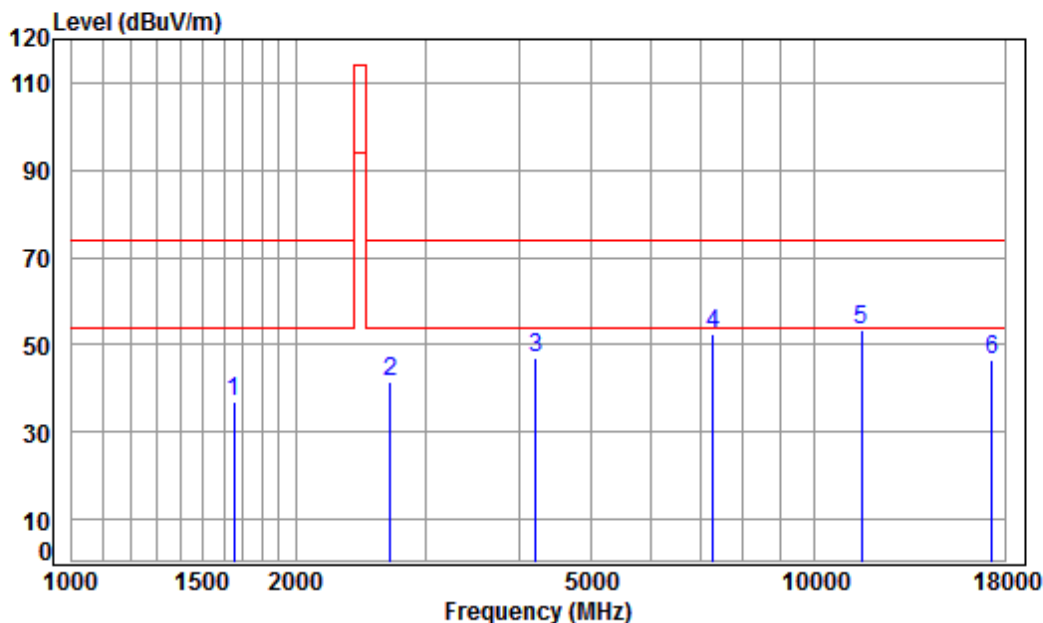
Mode : 5732 TX SE

Note :

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1529.414	5.44	25.94	41.43	48.58	38.53	74.00	-35.47	Peak
2	2471.157	5.58	29.32	41.91	46.63	39.62	114.00	-74.38	Peak
3	3087.140	6.07	31.47	42.12	49.72	45.14	74.00	-28.86	Peak
4	7784.729	9.97	36.47	40.33	40.28	46.39	74.00	-27.61	Peak
5	pp11464.000	12.10	38.07	38.17	41.53	53.53	74.00	-20.47	Peak
6	17196.000	16.27	43.04	40.45	28.07	46.93	74.00	-27.07	Peak



Mode:d; Polarization:Horizontal; Modulation:FM; Channel:middle



Condition: 3m HORIZONTAL

Job No : 01147CR

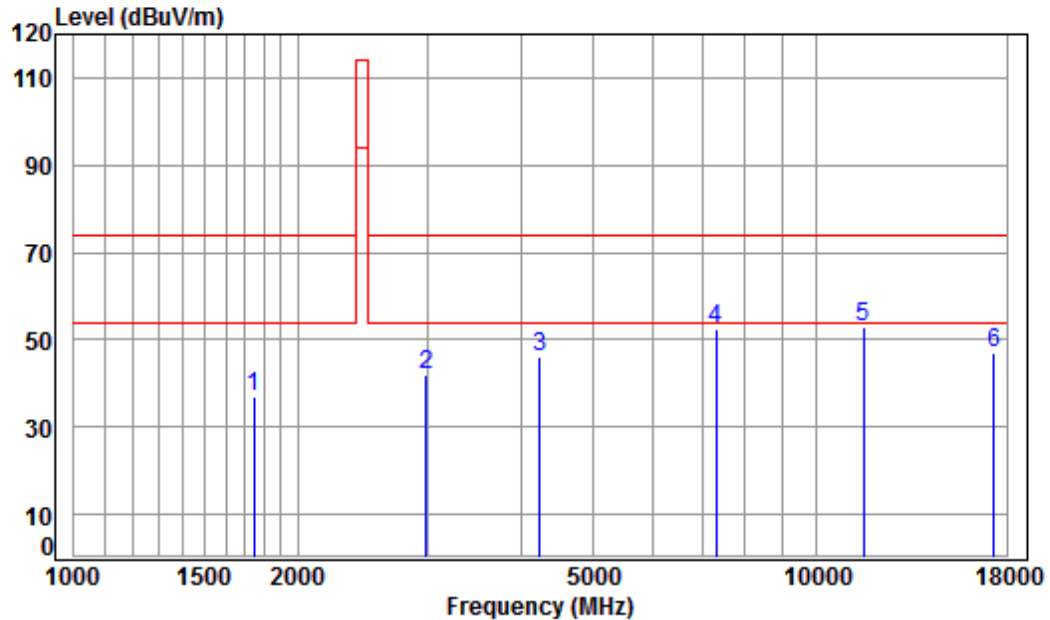
Mode : 5769 TX SE

Note :

		Cable	Ant	Preamp	Read		Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1653.550	5.28	26.48	41.50	46.61	36.87	74.00	-37.13	Peak
2	2679.464	5.76	30.12	41.99	47.80	41.69	74.00	-32.31	Peak
3	4206.011	7.23	33.60	42.36	48.41	46.88	74.00	-27.12	Peak
4	7284.038	10.06	36.38	40.66	46.83	52.61	74.00	-21.39	Peak
5	pp11538.000	12.15	38.14	38.22	41.54	53.61	74.00	-20.39	Peak
6	17307.000	16.02	43.17	40.54	27.98	46.63	74.00	-27.37	Peak



Mode:d; Polarization:Vertical; Modulation:FM; Channel:middle



Condition: 3m VERTICAL

Job No : 01147CR

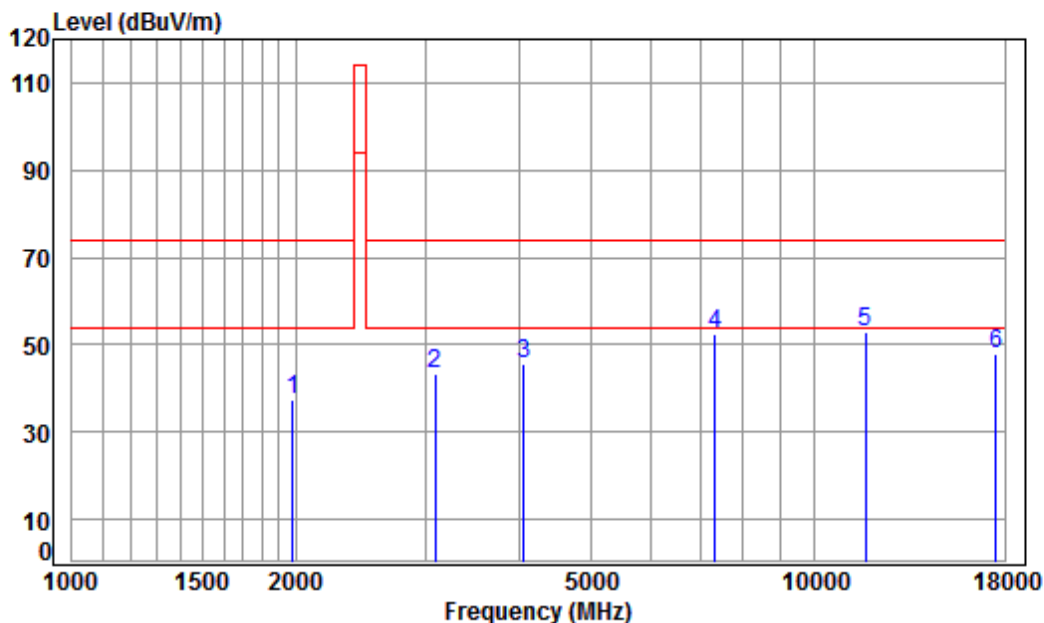
Mode : 5769 TX SE

Note :

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1746.898	5.17	26.86	41.56	46.63	37.10	74.00	-36.90	Peak
2	2981.899	5.97	31.24	42.09	46.84	41.96	74.00	-32.04	Peak
3	4242.641	7.27	33.60	42.37	47.51	46.01	74.00	-27.99	Peak
4	7305.122	10.05	36.38	40.64	46.86	52.65	74.00	-21.35	Peak
5	pp11538.000	12.15	38.14	38.22	40.89	52.96	74.00	-21.04	Peak
6	17307.000	16.02	43.17	40.54	28.19	46.84	74.00	-27.16	Peak



Mode:d; Polarization:Horizontal; Modulation:FM; Channel:High



Condition: 3m HORIZONTAL

Job No : 01147CR

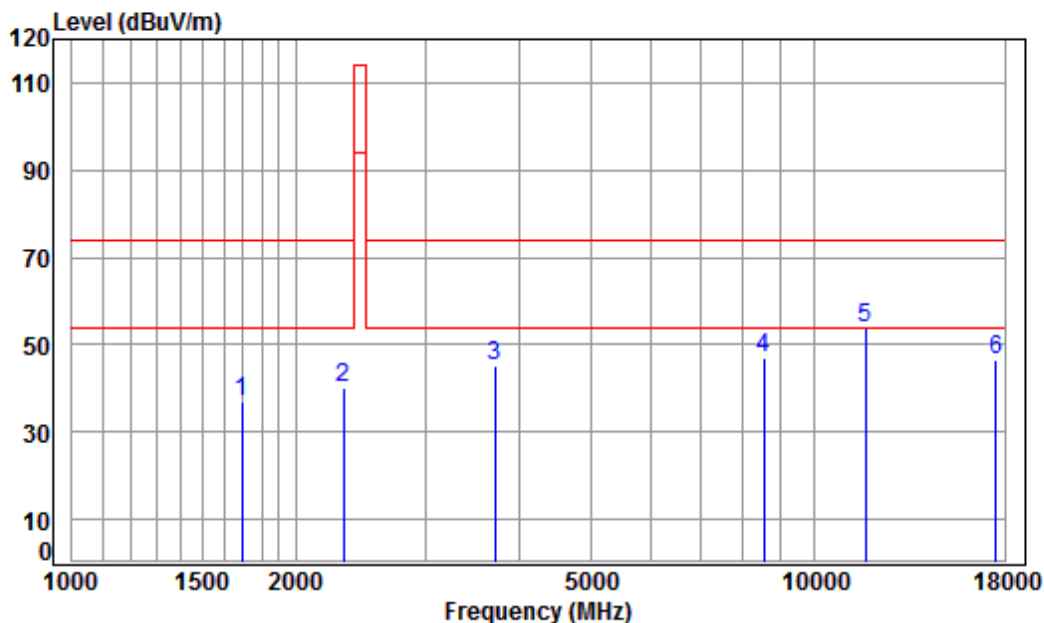
Mode : 5843 TX SE

Note :

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1983.808	4.92	27.74	41.69	46.60	37.57	74.00	-36.43	Peak
2	3087.140	6.07	31.47	42.12	47.79	43.21	74.00	-30.79	Peak
3	4062.629	7.06	33.60	42.34	47.45	45.77	74.00	-28.23	Peak
4	7347.474	10.04	36.36	40.62	46.58	52.36	74.00	-21.64	Peak
5	pp11686.000	12.21	38.29	38.31	40.65	52.84	74.00	-21.16	Peak
6	17529.000	15.63	43.45	40.72	29.41	47.77	74.00	-26.23	Peak



Mode:d; Polarization:Vertical; Modulation:FM; Channel:High



Condition: 3m VERTICAL

Job No : 01147CR

Mode : 5843 TX SE

Note :

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1692.231	5.24	26.64	41.53	46.42	36.77	74.00	-37.23	Peak
2	2318.912	5.38	28.86	41.84	47.70	40.10	74.00	-33.90	Peak
3	3714.443	6.69	32.82	42.27	48.08	45.32	74.00	-28.68	Peak
4	8539.102	10.28	36.05	39.32	40.06	47.07	74.00	-26.93	Peak
5	pp11686.000	12.21	38.29	38.31	41.45	53.64	74.00	-20.36	Peak
6	17529.000	15.63	43.45	40.72	28.02	46.38	74.00	-27.62	Peak



Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 40GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



7.6 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.407(b)

Test Method: KDB 789033 D02 II G

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

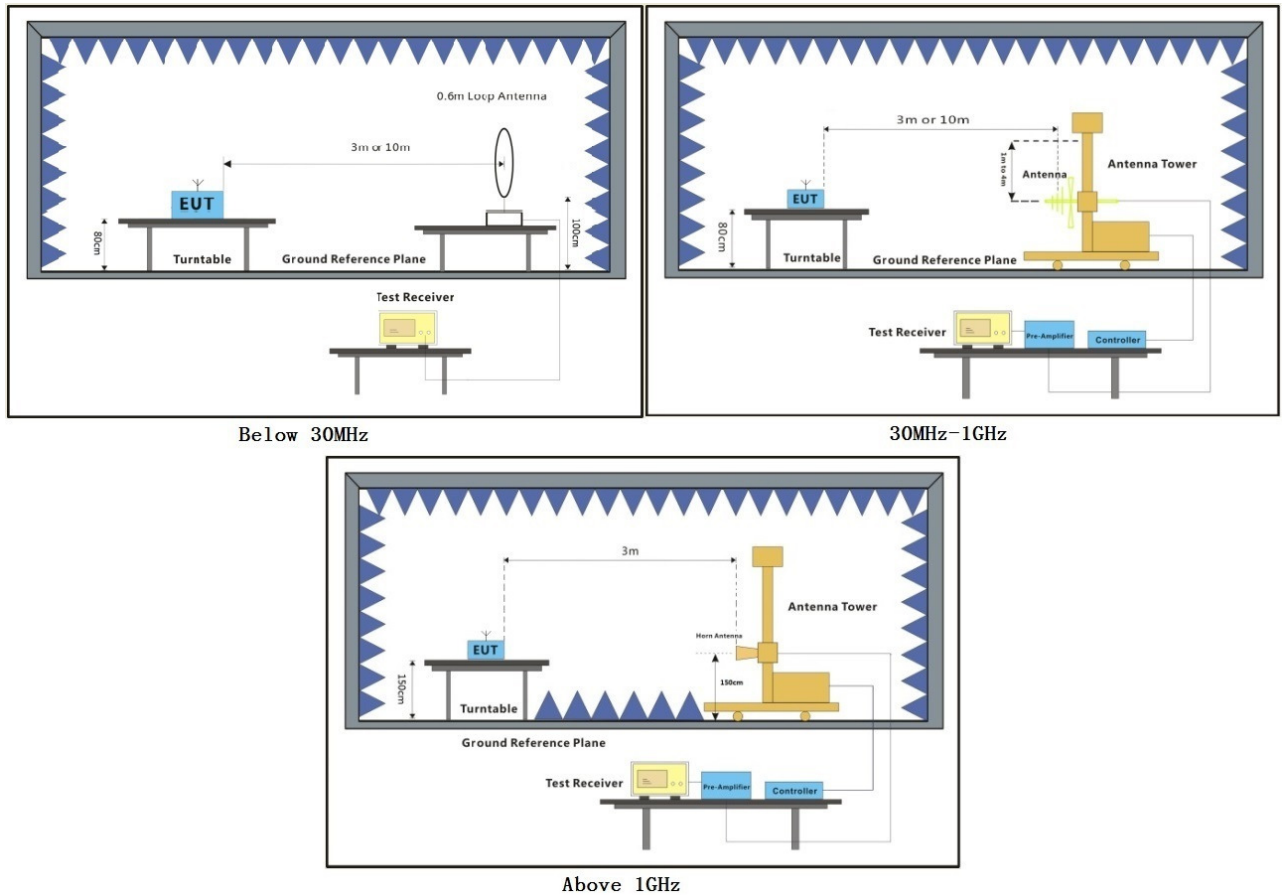
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 21.2 °C Humidity: 60.8 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.6.2 Test Setup Diagram

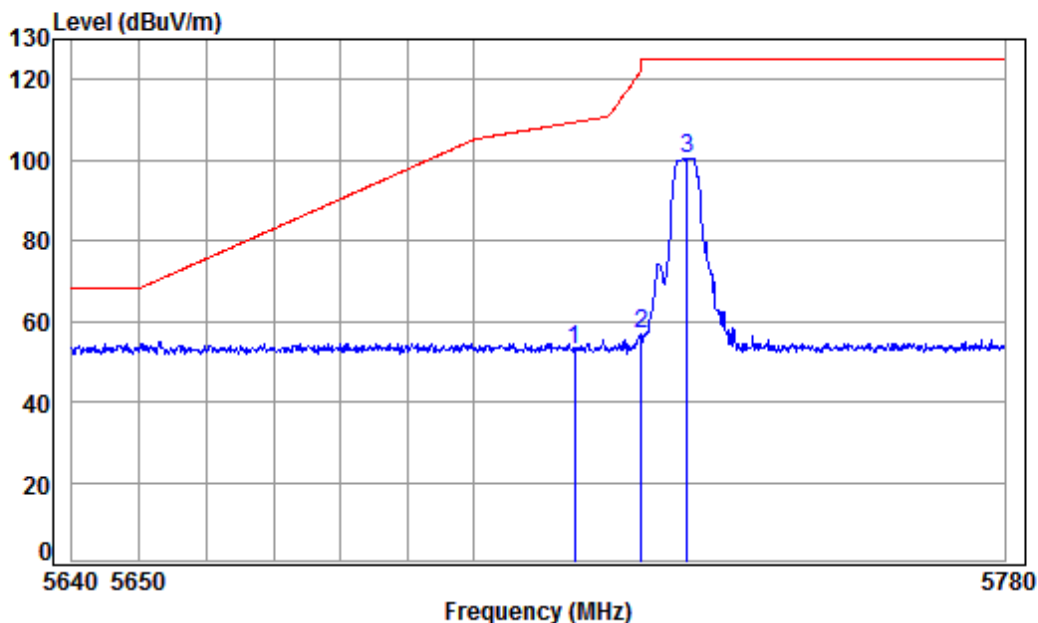


7.6.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Mode:d; Polarization:Horizontal; Modulation:FM; Channel:Low



Condition: 3m HORIZONTAL

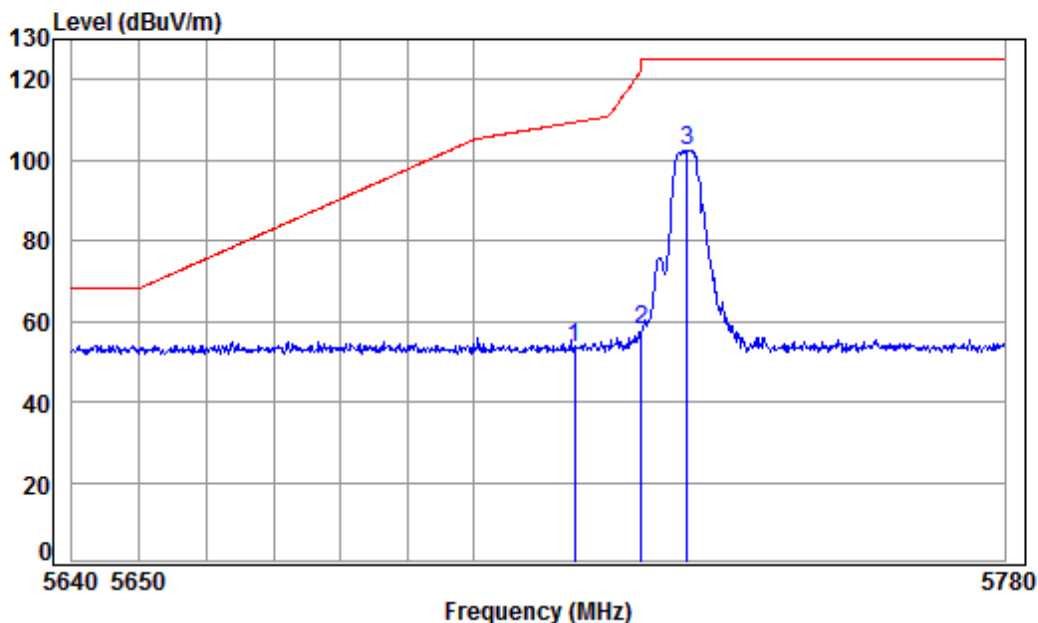
Job No : 01147CR

Mode : 5732 Band edge

Note : Plane

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	5715.000	9.61	34.53	41.85	50.51	52.80	109.40	-56.60 peak
2	5725.000	9.64	34.54	41.84	54.59	56.93	122.20	-65.27 peak
3 pp	5732.000	9.71	34.55	41.82	97.94	100.38	125.20	-24.82 peak

Mode:d; Polarization:Vertical; Modulation:FM; Channel:Low



Condition: 3m VERTICAL

Job No : 01147CR

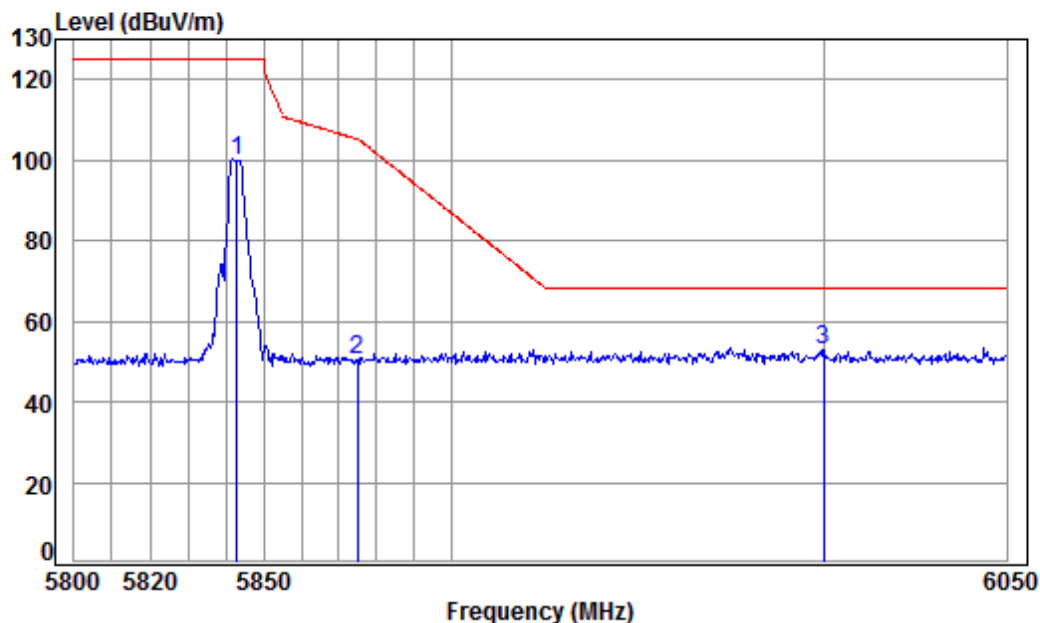
Mode : 5732 Band edge

Note : Plane

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	5715.000	9.61	34.53	41.85	51.26	53.55	109.40	-55.85 peak
2	5725.000	9.64	34.54	41.84	55.37	57.71	122.20	-64.49 peak
3 pp	5732.000	9.67	34.54	41.83	99.89	102.27	125.20	-22.93 Peak



Mode:d; Polarization:Horizontal; Modulation:FM; Channel:High



Condition: 3m HORIZONTAL

Job No : 01147CR

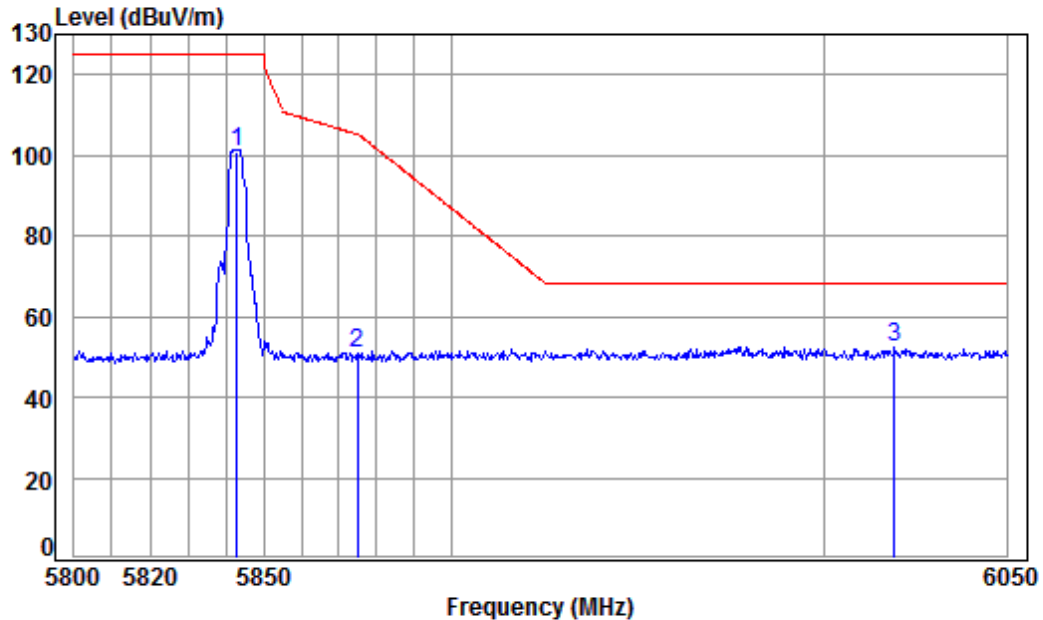
Mode : 5843 Band edge

Note : Plane

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	5843.000	10.05	34.61	41.74	96.89	99.81	125.20	-25.39 Peak
2	5875.000	10.15	34.63	41.71	47.24	50.31	105.20	-54.89 Peak
3 pp	6000.053	10.57	34.70	41.61	49.11	52.77	68.20	-15.43 Peak



Mode:d; Polarization:Vertical; Modulation:FM; Channel:High



Condition: 3m VERTICAL

Job No : 01147CR

Mode : 5843 Band edge

Note : Plane

		Cable	Ant	Preamp	Read		Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	5843.000	10.05	34.61	41.74	98.12	101.04	125.20	-24.16	Peak
2	5875.000	10.15	34.63	41.71	47.90	50.97	105.20	-54.23	Peak
3	pp 6019.309	10.61	34.72	41.59	48.71	52.45	68.20	-15.75	Peak

Remark:

As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

7.7 Frequency Stability

Test Requirement	47 CFR Part 15, Subpart E 15.407 (g)
Test Method:	ANSI C63.10 (2013) Section 6.8
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

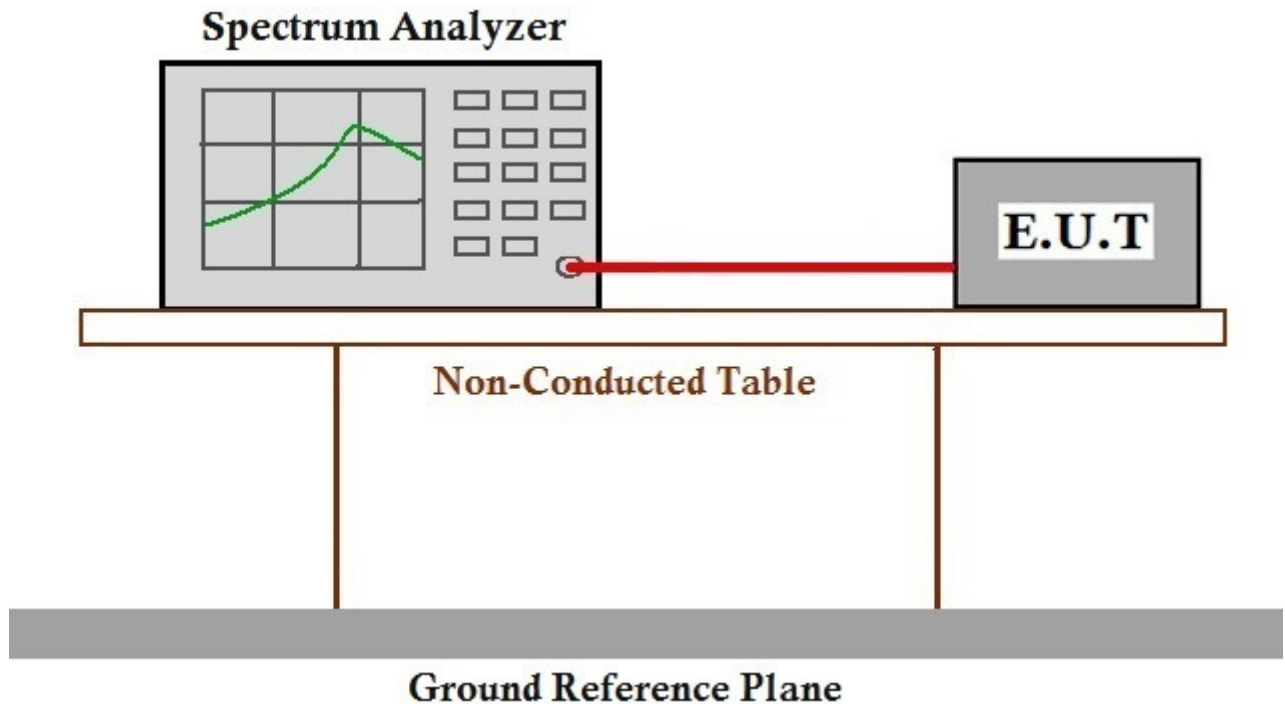
7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 43.7 % RH Atmospheric Pressure: 1015 mbar

Test mode d:5.8G TX mode_Keep the EUT(Drone) in transmitting with modulation mode.

7.7.2 Test Setup Diagram



7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.407

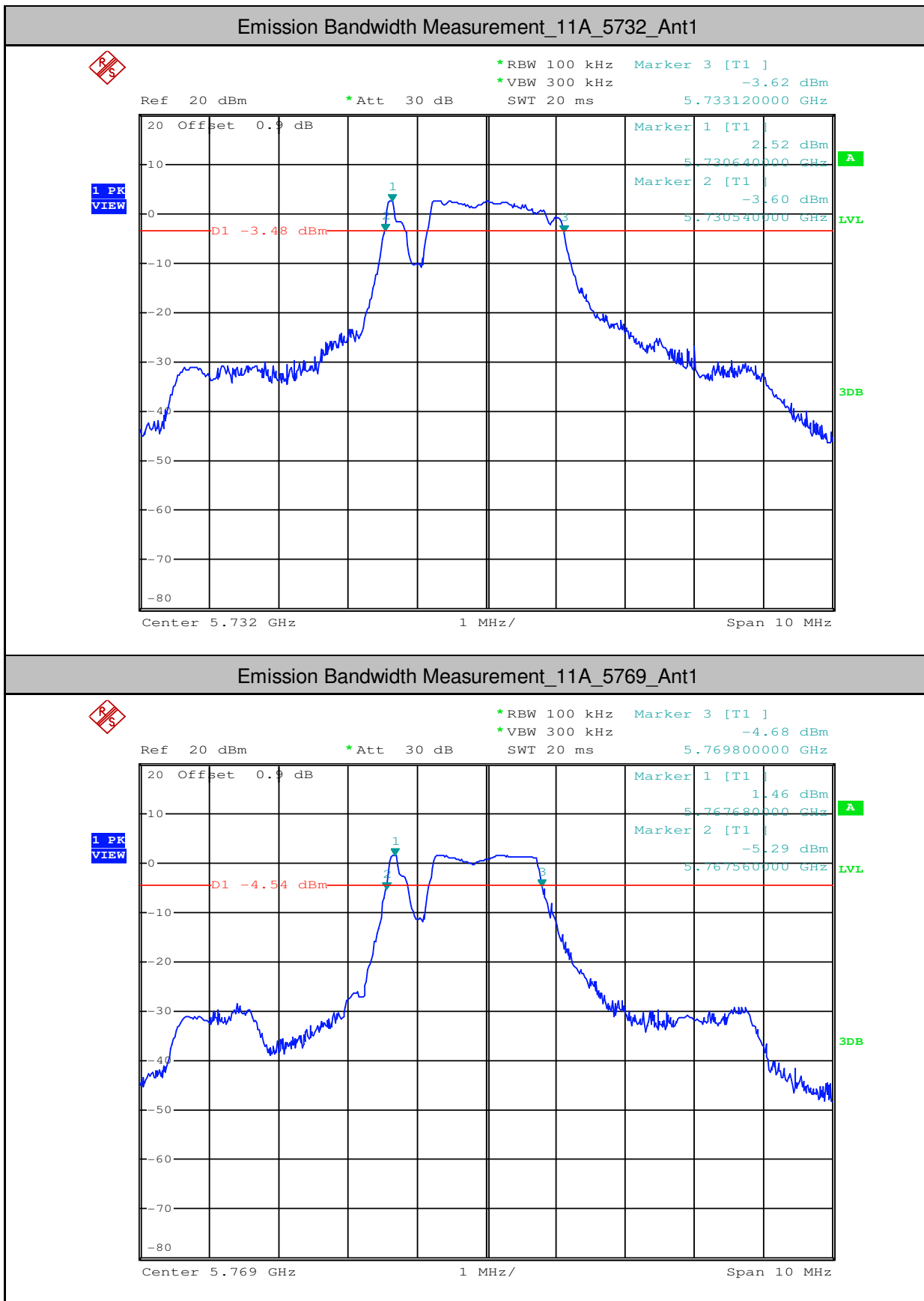


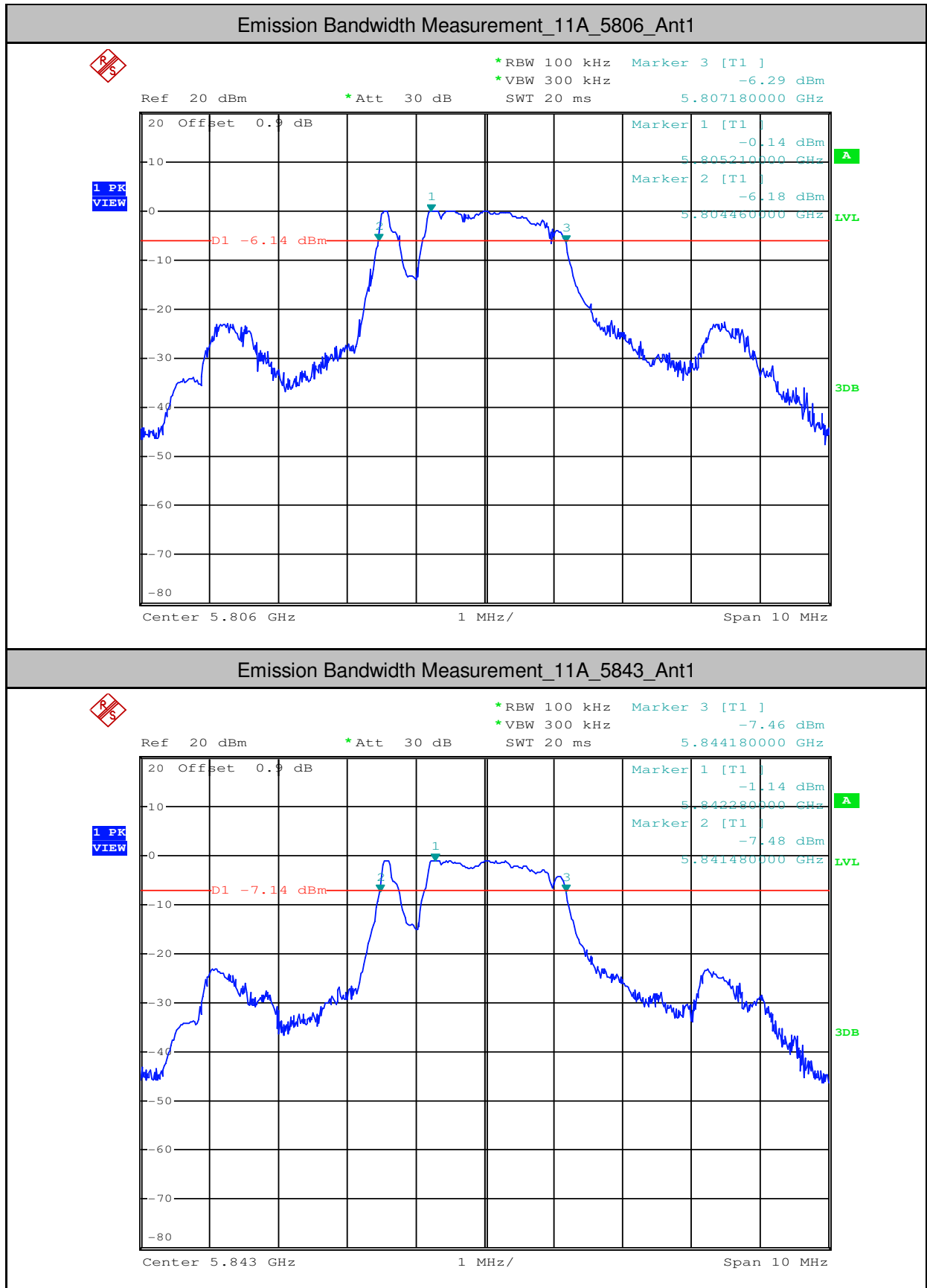
8 Appendix

8.1 Appendix 15.407

1.Emission Bandwidth Measurement

Test Mode	Test Channel	Ant	EBW[MHz]	Limit[MHz]	Verdict
FM	5732	Ant1	2.580	≥ 0.5	PASS
FM	5769	Ant1	2.240	≥ 0.5	PASS
FM	5806	Ant1	2.720	≥ 0.5	PASS
FM	5843	Ant1	2.700	≥ 0.5	PASS

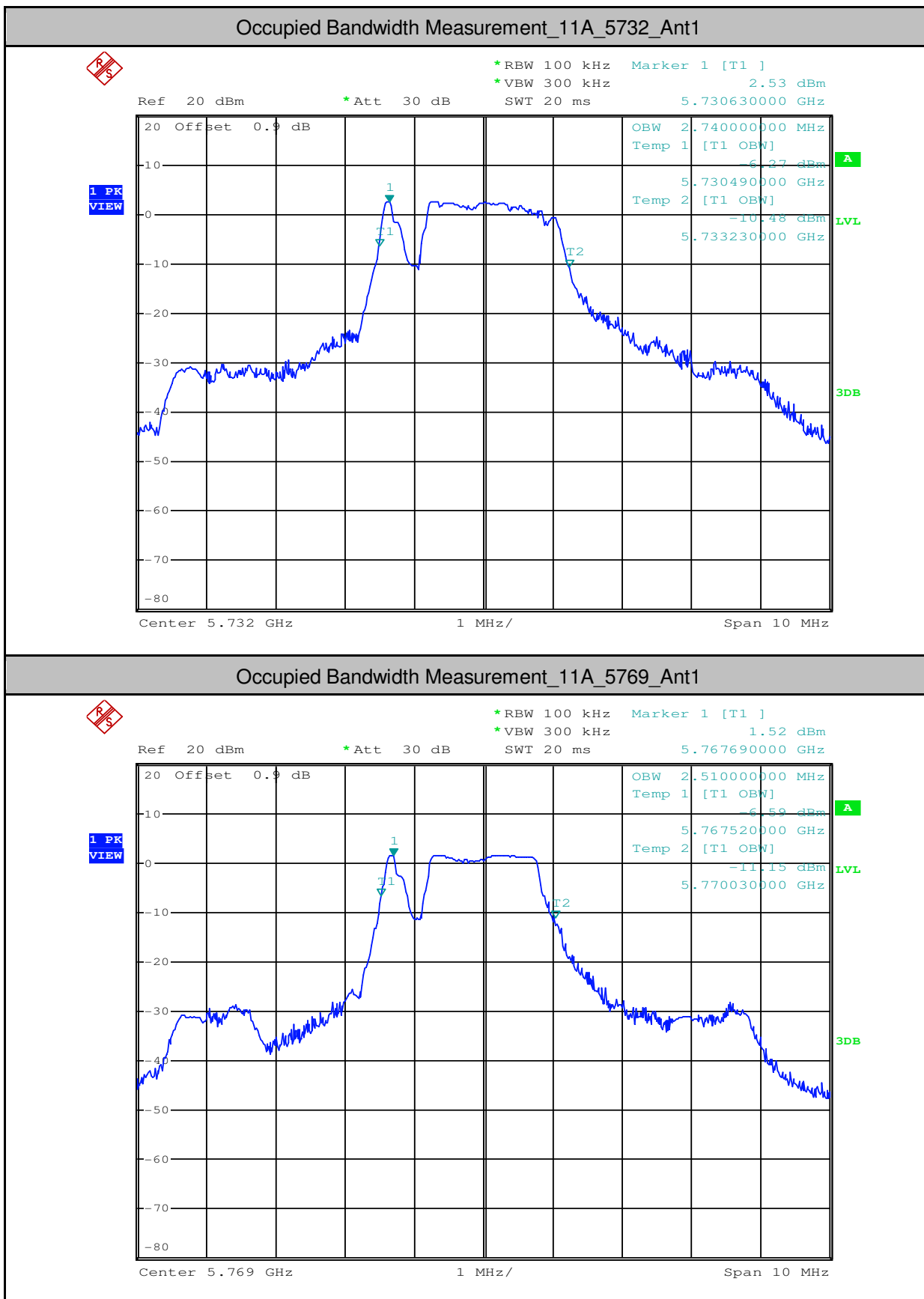




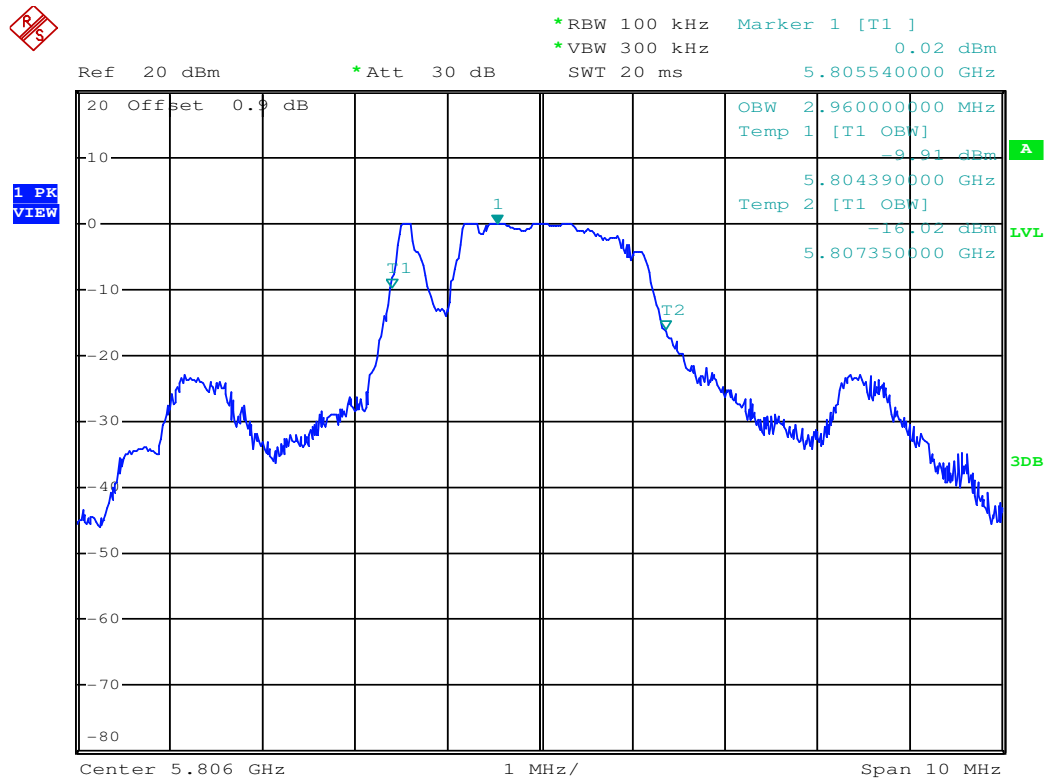


2.Occupied Bandwidth Measurement

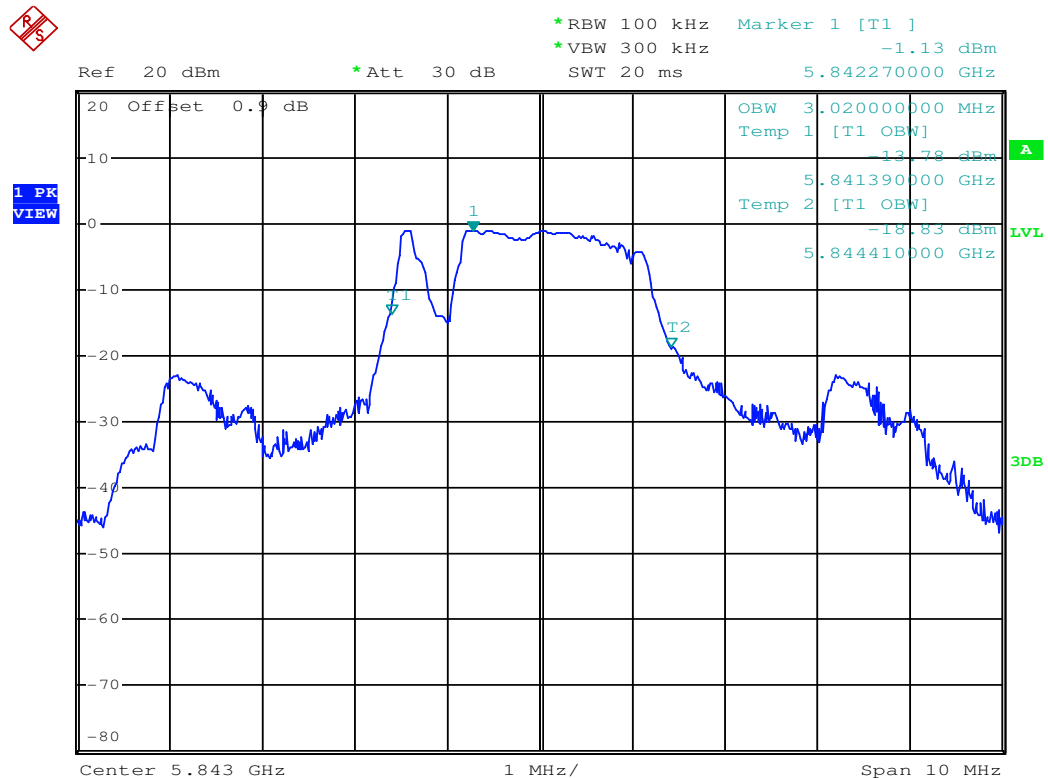
Test Mode	Test Channel	Ant	OBW[MHz]	Limit[MHz]	Verdict
FM	5732	Ant1	2.740	---	PASS
FM	5769	Ant1	2.510	---	PASS
FM	5806	Ant1	2.960	---	PASS
FM	5843	Ant1	3.020	---	PASS



Occupied Bandwidth Measurement_11A_5806_Ant1



Occupied Bandwidth Measurement_11A_5843_Ant1

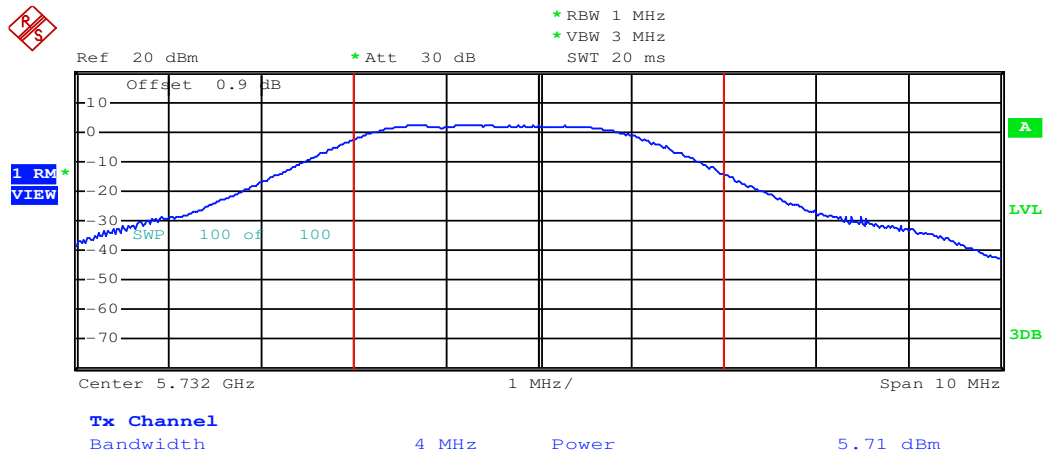




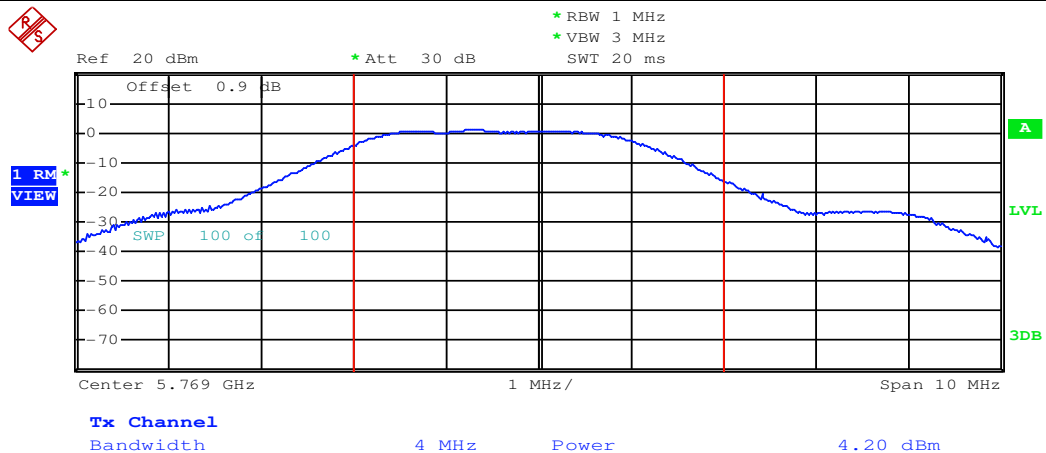
3.Maximum Conduct Output Power

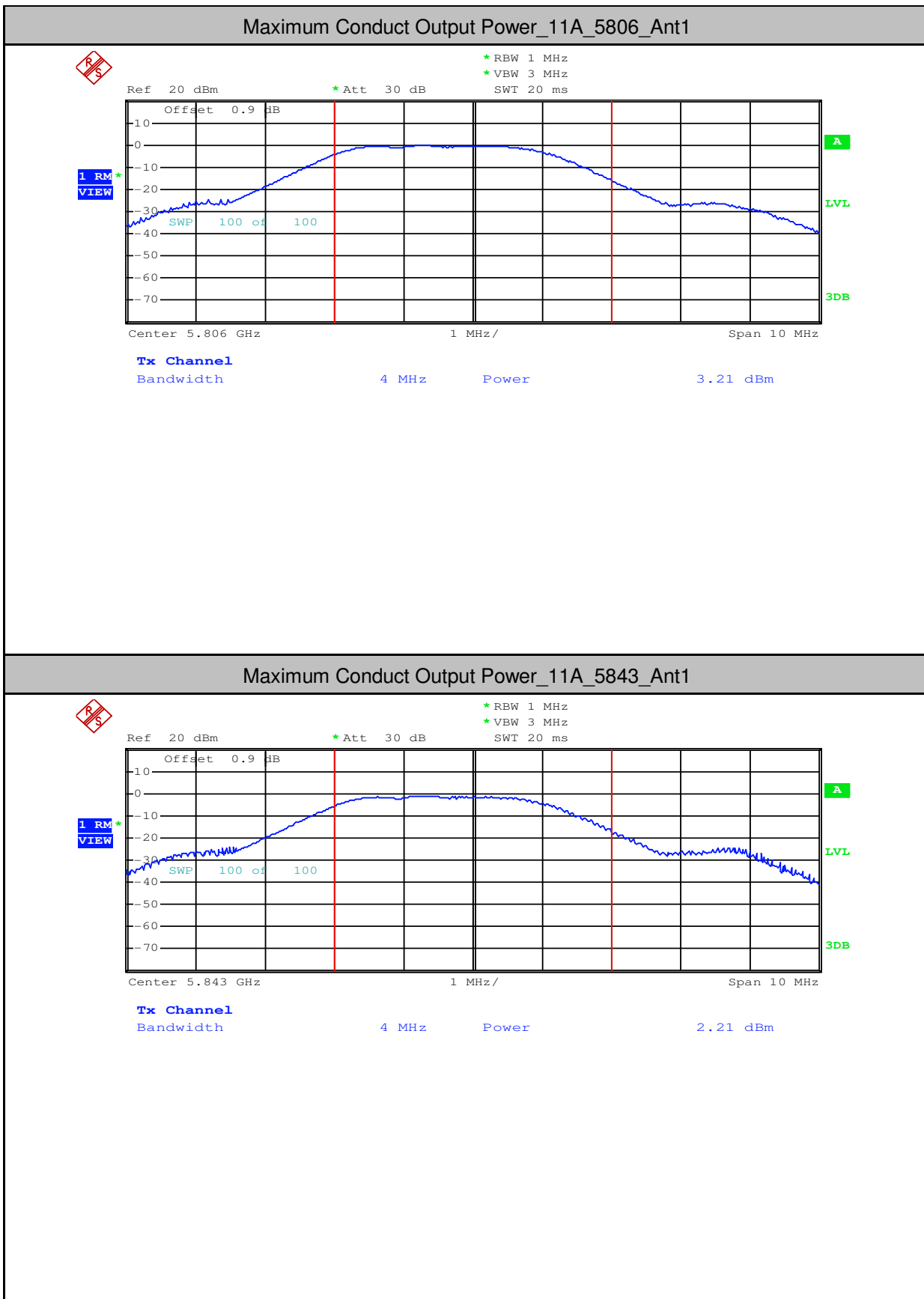
Test Mode	Test Channel	Ant	Level [dBm]	10log(1/x) Factor [dB]	Power [dBm]	Limit [dBm]	Verdict
FM	5732	Ant1	5.71	0	5.71	<30.00	PASS
FM	5769	Ant1	4.2	0	4.20	<30.00	PASS
FM	5806	Ant1	3.21	0	3.21	<30.00	PASS
FM	5843	Ant1	2.21	0	2.21	<30.00	PASS

Maximum Conduct Output Power_11A_5732_Ant1



Maximum Conduct Output Power_11A_5769_Ant1

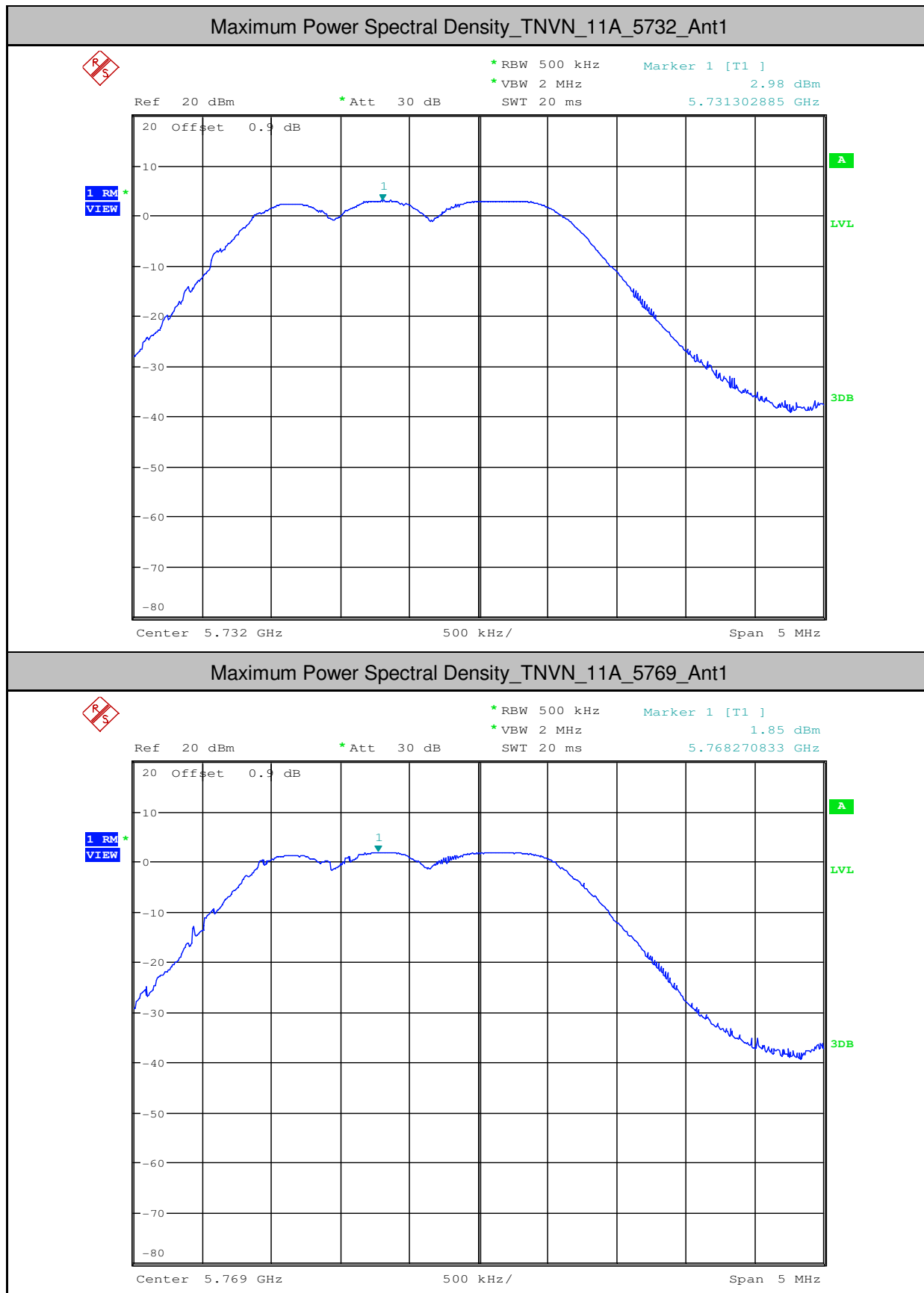


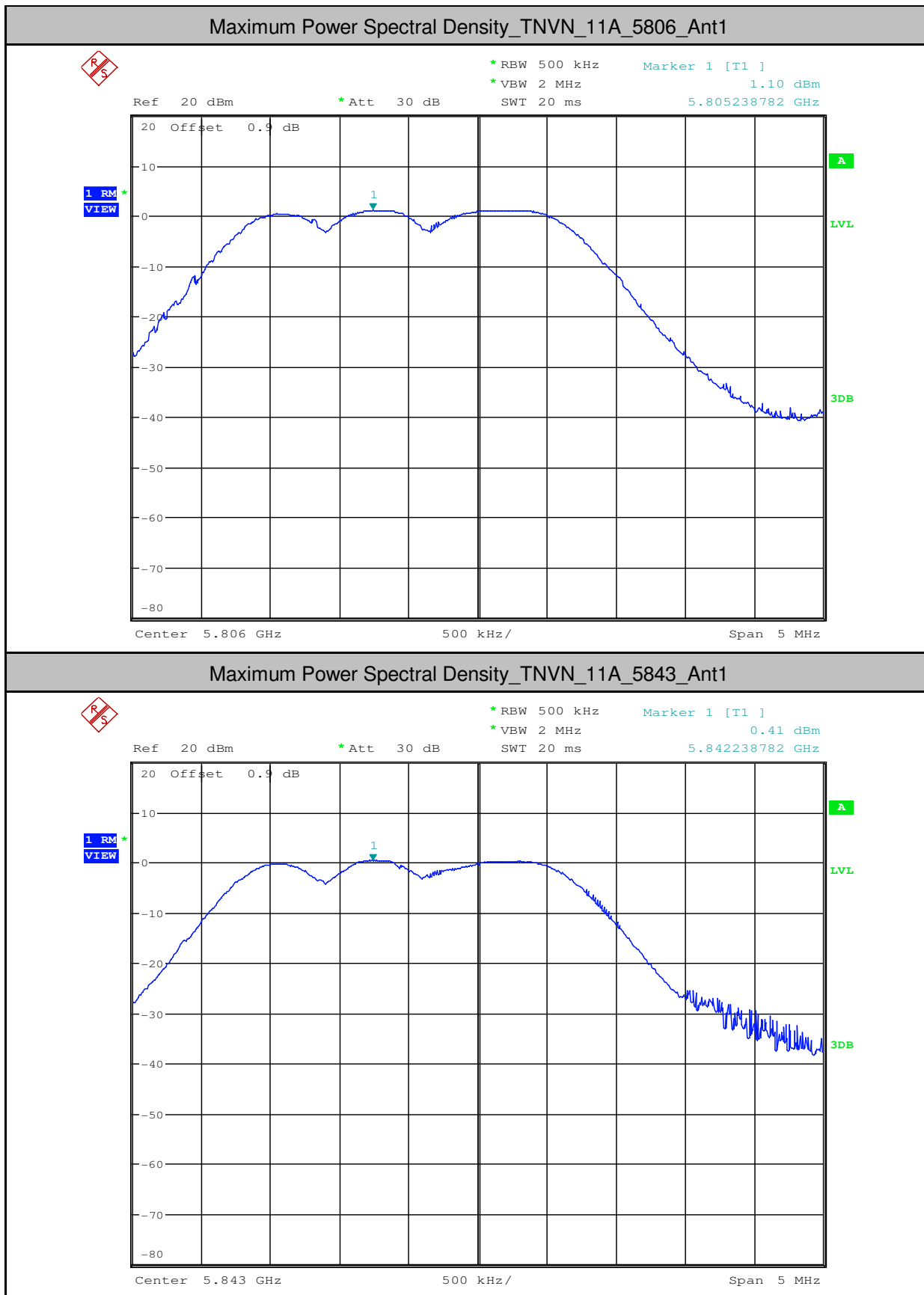




4. Maximum Power Spectral Density

Test Mode	Test Channel	Ant	Level [dBm/500kHz]	10log(1/x) Factor[dB]	PSD [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
FM	5732	Ant1	2.98	0	2.98	<30.00	PASS
FM	5769	Ant1	1.85	0	1.85	<30.00	PASS
FM	5806	Ant1	1.10	0	1.10	<30.00	PASS
FM	5843	Ant1	0.41	0	0.41	<30.00	PASS

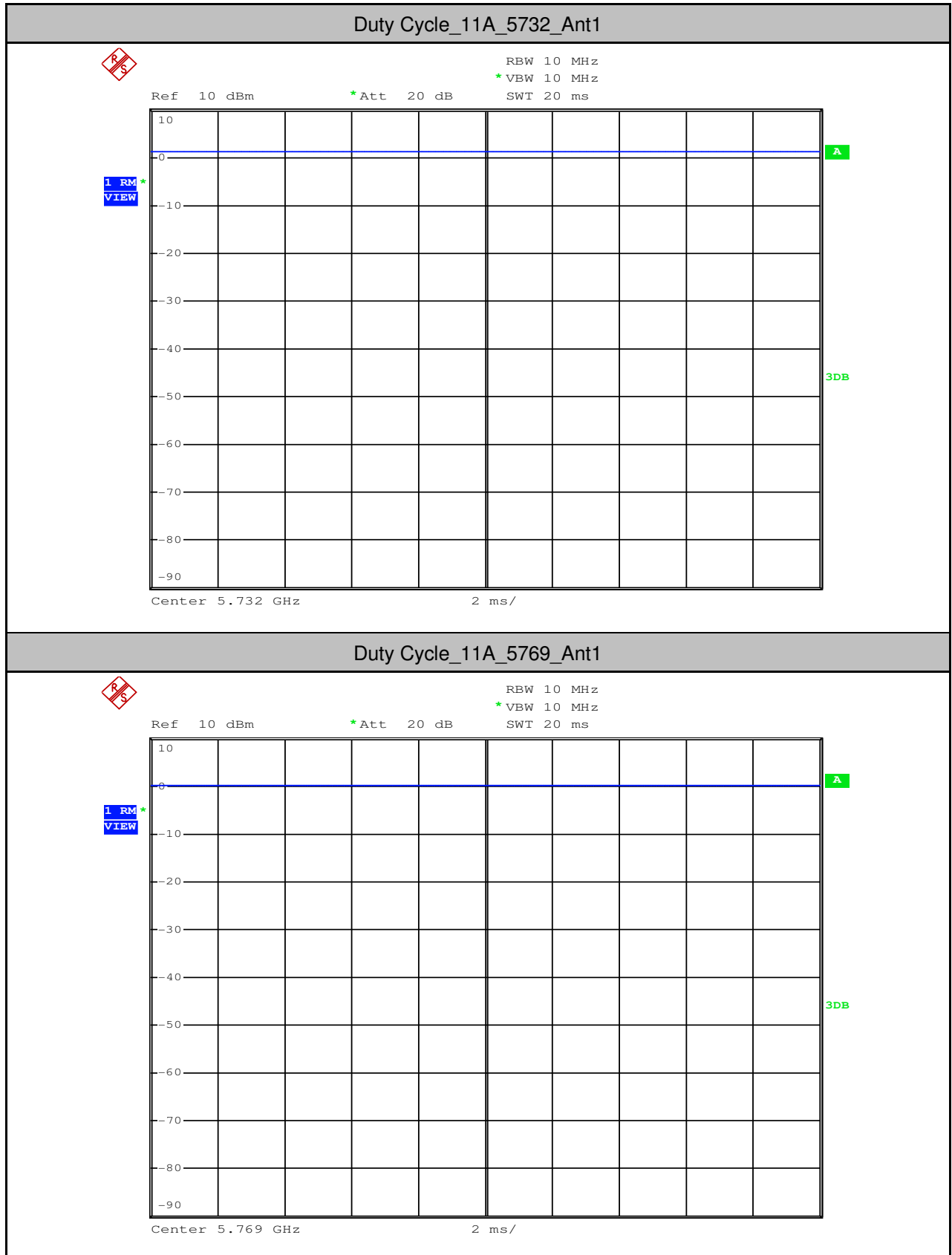


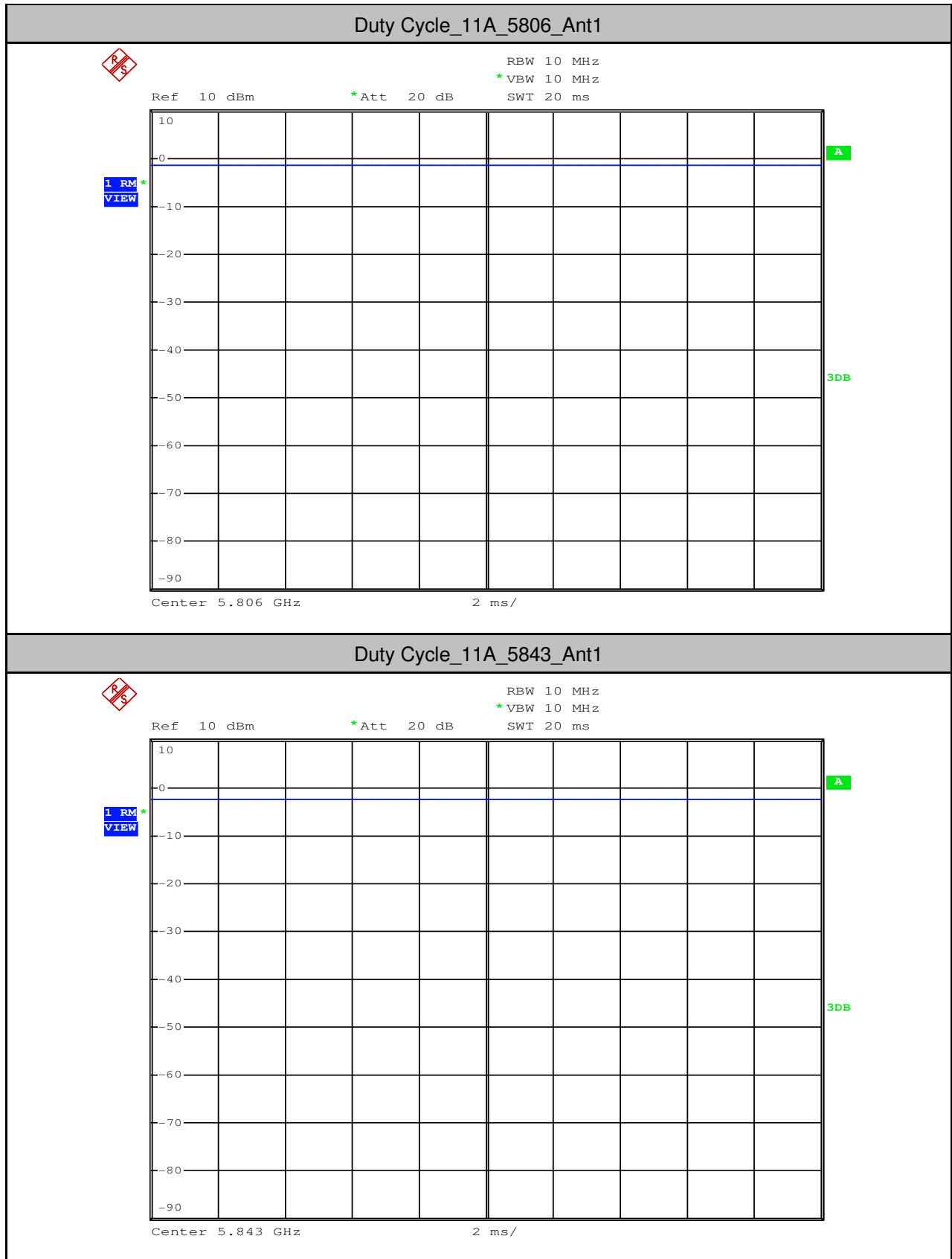




5.Duty Cycle (x)

Test Mode	Test Channel	Ant	Duty Cycle[%]	10log(1/x) Factor[dB]
FM	5732	Ant1	100	0
FM	5769	Ant1	100	0
FM	5806	Ant1	100	0
FM	5843	Ant1	100	0







6.Frequency Stability

Test mode:	FM	Frequency(MHz):	5732
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Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Result
40	3.7	5732.2304	Pass
30		5732.2307	Pass
20		5732.2303	Pass
10		5732.2305	Pass
0		5732.2306	Pass
25	4.25	5732.2308	Pass
	3.7	5732.2303	Pass
	3.15	5732.2310	Pass

Test mode:	FM	Frequency(MHz):	5769
------------	----	-----------------	------

Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Result
40	3.7	5769.4821	Pass
30		5769.4816	Pass
20		5769.4824	Pass
10		5769.4823	Pass
0		5769.4826	Pass
25	4.25	5769.4822	Pass
	3.7	5769.4825	Pass
	3.15	5769.4827	Pass

Test mode:	FM	Frequency(MHz):	5843
------------	----	-----------------	------

Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Result
40	3.7	5843.6736	Pass
30		5843.6731	Pass
20		5843.6734	Pass
10		5843.6739	Pass
0		5843.6736	Pass
25	4.25	5843.6733	Pass
	3.7	5843.6735	Pass
	3.15	5843.6736	Pass

- End of the Report -