

TEST REPORT

FCC ID: 2AG87NM-DB-3N

Product: Wi-Fi® Radio Transceiver

Model No.: NM-DB-3

Additional Model No.: DLM180, NM-DB-2,
NE-DB-2, NE-DB-3, NO-DB-2, NO-DB-3

Trade Mark: N/A

Report No.: TCT170221E006

Issued Date: Feb. 28, 2017

Issued for:

Doodle Labs (SG) Pte Ltd

150 Kampong Ampat, KA Centre, Suite #05-03, Singapore 368324

Issued By:

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Appendix A: Photographs of Test Setup

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1. Test Certification

Product:	Wi-Fi® Radio Transceiver
Model No.:	NM-DB-3
Additional Model No.:	DLM180, NM-DB-2, NE-DB-2, NE-DB-3, NO-DB-2, NO-DB-3
Applicant:	Doodle Labs (SG) Pte Ltd
Address:	150 Kampong Ampat, KA Centre, Suite #05-03, Singapore 368324
Manufacturer:	Doodle Labs (SG) Pte Ltd
Address:	150 Kampong Ampat, KA Centre, Suite #05-03, Singapore 368324
Date of Test:	Aug. 18 – Feb. 24, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407:2014 KDB662911 D01 Multiple Transmitter Output v02r01 789033 D02 General UNII Test Procedures New Rules v01r03

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Beryl Zhao

Date:

Feb. 24, 2017

Reviewed By:



Joe Zhou

Date:

Feb. 27, 2017

Approved By:



Tomsin

Date:

Feb. 27, 2017

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a) §2.1046	PASS
6dB Emission Bandwidth	§15.407(a) §2.1049	PASS
26dB Emission Bandwidth & 99% Occupied Bandwidth	§15.407(a) §2.1049	PASS
Power Spectral Density	§15.407(a)	PASS
Restricted Bands around fundamental frequency	§15.407(a)	PASS
Radiated Emission	§15.407(a) §2.1053	PASS
Frequency Stability	§15.407(g) §2.1055	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product Name:	Wi-Fi® Radio Transceiver
Product Type:	WLAN(3TX, 3RX)
Radio Type:	3x3 MIMO
Model :	NM-DB-3
Additional Model:	DLM180, NM-DB-2, NE-DB-2, NE-DB-3, NO-DB-2, NO-DB-3
Trade Mark:	N/A
Operation Frequency:	Band I: 5180MHz~5240MHz Band IV: 5745MHz~5825MHz
Channel Bandwidth:	802.11a :20MHz 802.11n :20MHz, 40MHz
Modulation Technology:	Orthogonal Frequency Division Multiplexing(OFDM)
Modulation Type	256QAM, 64QAM, 16QAM, BPSK, QPSK
Antenna Type:	R-SMA antenna
Antenna Gain:	Band I: 5180MHz~5240MHz: 3dBi Band IV: 5745MHz~5825MHz: 3dBi
Power Supply:	DC 3.3V
Model difference :	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Band I (5150MHz~5250MHz) Power level setup in software

Mode	Channel	Frequency	Soft set
11a	CH36	5180	11
11a	CH44	5220	11
11a	CH48	5240	11
11n(HT20)	CH36	5180	11
11n(HT20)	CH44	5220	11
11n(HT20)	CH48	5240	11
11n(HT40)	CH38	5190	9
11n(HT40)	CH46	5230	9

Band IV (5725 - 5850 MHz) Power level setup in software

Mode	Channel	Frequency	Soft set
11a	CH149	5745	8
11a	CH157	5785	8
11a	CH165	5825	8
11n (HT20)	CH149	5745	8
11n (HT20)	CH157	5785	8
11n (HT20)	CH165	5825	8
11n (HT40)	CH151	5755	7.5
11n (HT40)	CH159	5795	7.5

Note: The Soft set value is the internal setting required to meet the requirements and does not necessarily mean the 'dBm' value

Operation Frequency each of channel

20MHz		40MHz	
Channel	Frequency	Channel	Frequency
36	5180	38	5190
40	5200	46	5230
44	5220	151	5755
48	5240	159	5790
149	5745		
153	5765		
157	5785		
161	5805		
165	5825		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/n(HT20)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	149	Low	5745
44	Mid	5220	157	Mid	5785
48	High	5240	165	High	5825

For 802.11n (HT40)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	151	Low	5755
46	High	5230	159	High	5795

4. Genera Information

4.1. Test environment and mode

Operating Environment:

Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar

Test Mode:

Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%)
-------------------	--

The sample was placed 0.8m/1.5m for blow/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	Data rate
802.11a	6Mbps
802.11n(HT20)	6.5 Mbps
802.11n(HT40)	13.5 Mbps

Final Test Mode:

Operation mode:	Keep the EUT in continuous transmitting with modulation
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4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
Intel NUC	D54250WYKH	G6YK4390029 U	DOC	Intel

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- CNAS - Registration No.: CNAS L6165

Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

Tel: 86-755-36638142

5.3. Measurement Uncertainty

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

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

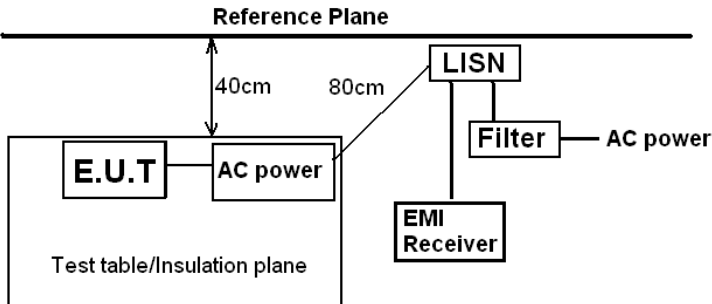
6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 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, 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.	
E.U.T Antenna:	
The EUT three antennas are R-SMA antennas which is only the antenna type used, and the best case gain of the antennas all are 3dBi.	
	

6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	Reference Plane  Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m														
Test Mode:	Tx Mode														
Test Procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.														
Test Result:	PASS														

6.2.2. Test Instruments

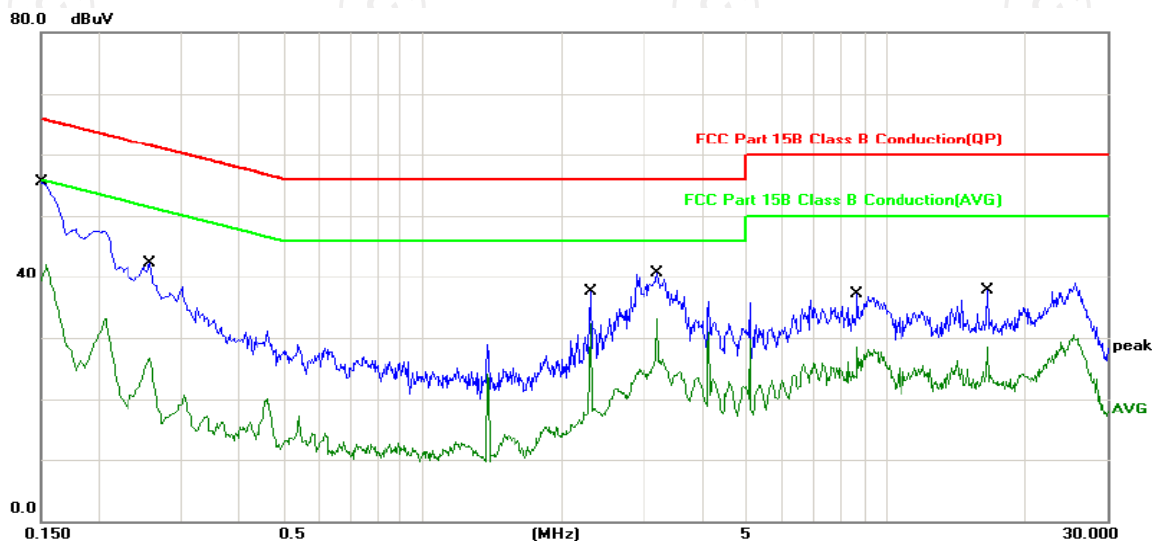
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Aug. 11, 2017
LISN	Schwarzbeck	NSLK 8126	8126453	Aug. 16, 2017
Coax cable	TCT	CE-05	N/A	Aug. 11, 2017
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: **L1** Temperature: 23
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector	Comment
1		0.1500	40.73	11.47	52.20	65.99	-13.79	QP	
2		0.1500	27.03	11.47	38.50	55.99	-17.49	AVG	
3		0.2580	26.51	11.42	37.93	61.49	-23.56	QP	
4		0.2580	13.05	11.42	24.47	51.49	-27.02	AVG	
5		2.2980	22.01	11.58	33.59	56.00	-22.41	QP	
6		2.2980	20.73	11.58	32.31	46.00	-13.69	AVG	
7		3.2180	26.09	11.25	37.34	56.00	-18.66	QP	
8	*	3.2180	21.85	11.25	33.10	46.00	-12.90	AVG	
9		8.6620	22.89	11.16	34.05	60.00	-25.95	QP	
10		8.6620	17.05	11.16	28.21	50.00	-21.79	AVG	
11		16.4920	23.32	11.34	34.66	60.00	-25.34	QP	
12		16.4920	18.88	11.34	30.22	50.00	-19.78	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = attenuator factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

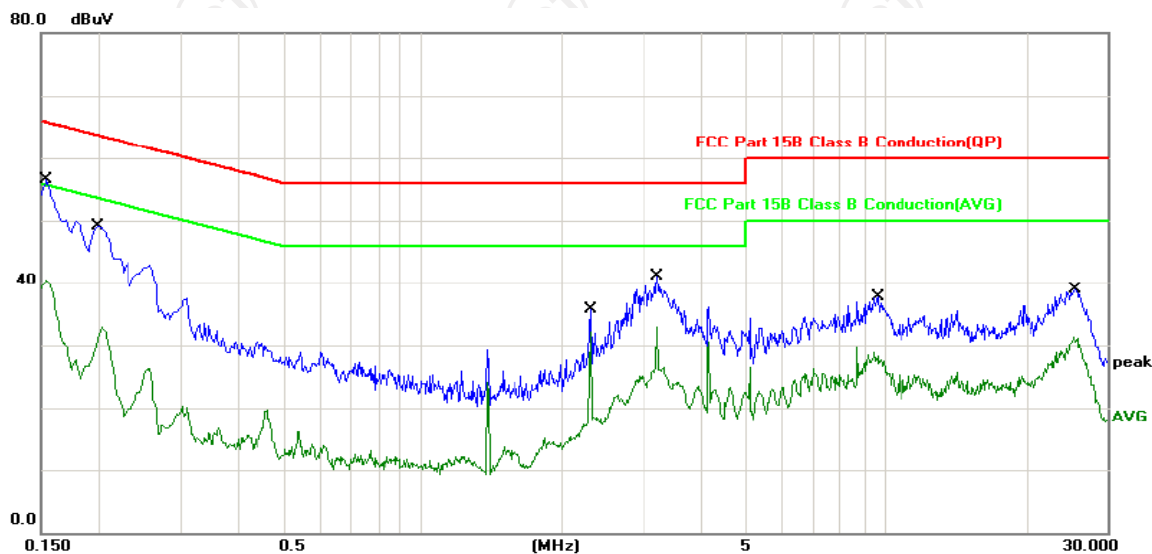
Margin (dB) = Measurement (dBμV) – Limits (dBμV)

Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2

Phase: **N**

Temperature: 23

Limit: FCC Part 15B Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1539	41.57	11.47	53.04	65.78	-12.74	QP	
2		0.1539	28.99	11.47	40.46	55.78	-15.32	AVG	
3		0.1980	32.82	11.45	44.27	63.69	-19.42	QP	
4		0.1980	18.40	11.45	29.85	53.69	-23.84	AVG	
5		2.2980	22.08	11.58	33.66	56.00	-22.34	QP	
6		2.2980	20.60	11.58	32.18	46.00	-13.82	AVG	
7		3.2180	25.76	11.25	37.01	56.00	-18.99	QP	
8		3.2180	21.44	11.25	32.69	46.00	-13.31	AVG	
9		9.5620	21.16	11.28	32.44	60.00	-27.56	QP	
10		9.5620	16.13	11.28	27.41	50.00	-22.59	AVG	
11		25.6120	24.23	10.75	34.98	60.00	-25.02	QP	
12		25.6120	19.31	10.75	30.06	50.00	-19.94	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = attenuator factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

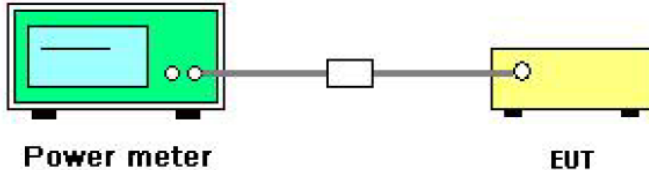
Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

6.3. Maximum Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407(a)& Part 2 J Section 2.1046	
Test Method:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r03 Section E	
Limit:	Frequency Band (MHz)	Limit
	5150-5250	1W for indoor access point
	5250-5350	250 mW or 11 dBm + 10log B, whichever is less.
	5470-5725	250 mW or 11 dBm + 10log B, whichever is less.
	5725-5850	1 W
	Note: Where “B” is the 26 dB emissions bandwidth in MHz.	
Test Setup:	 Power meter EUT	
Test Mode:	Transmitting mode with modulation	
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v01r03 Section E, 3, a 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 5. Measure the conducted output power and record the results in the test report.	
Test Result:	PASS	
Remark:	Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power	

6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Agilent	N1911A	MY45101557	Aug. 11, 2017
Power Sensor	Agilent	N1922A	MY44124432	Aug. 11, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

Configuration Band I (5150 - 5250 MHz) / Antenna 0+Antenna 1+ Antenna 2								
Mode	Test channel	Maximum Conducted (Average) Output Power (dBm)				FCC Limit (dBm)	IC Limit (dBm)	Result
		Ant0	Ant1	Ant2	Total			
11a	CH36	21.81	20.69	22.04	26.32	28.2	N/A	PASS
11a	CH44	22.11	21.74	22.19	26.79	28.2	N/A	PASS
11a	CH48	21.66	21.43	21.98	26.47	28.2	N/A	PASS
11n(HT20)	CH36	20.41	21.45	21.21	25.82	28.2	N/A	PASS
11n(HT20)	CH44	22.20	22.01	22.09	26.87	28.2	N/A	PASS
11n(HT20)	CH48	21.68	22.42	21.57	26.68	28.2	N/A	PASS
11n(HT40)	CH38	19.88	20.51	20.51	25.08	28.2	N/A	PASS
11n(HT40)	CH46	20.45	19.74	20.63	25.06	28.2	N/A	PASS

Note: $G_{ANT} = 3\text{dBi}$, Array Gain = $10\log(N_{ANT}/N_{SS}) = 4.8\text{dBi}$, Directional Gain = $G_{ANT} + \text{Array Gain} = 7.8\text{dBi}$,

So limit = $30 - (7.8 - 6) = 28.2\text{dBm}$

Configuration Band IV (5725 - 5850 MHz) / Antenna 0+Antenna 1+ Antenna 2								
Mode	Test channel	Maximum Conducted (Average) Output Power (dBm)				FCC Limit (dBm)	IC Limit (dBm)	Result
		Ant0	Ant1	Ant2	Total			
11a	CH149	19.72	19.49	19.98	24.51	28.2	28.2	PASS
11a	CH157	19.71	20.86	20.57	25.18	28.2	28.2	PASS
11a	CH165	20.12	19.75	20.23	24.81	28.2	28.2	PASS
11n (HT20)	CH149	20.25	20.15	20.56	25.09	28.2	28.2	PASS
11n (HT20)	CH157	20.33	19.87	19.90	24.81	28.2	28.2	PASS
11n (HT20)	CH165	19.45	19.62	19.77	24.39	28.2	28.2	PASS
11n (HT40)	CH151	18.09	17.74	17.83	22.66	28.2	28.2	PASS
11n (HT40)	CH159	18.43	18.18	17.85	22.93	28.2	28.2	PASS

Note 1: $G_{ANT} = 3\text{dBi}$, Array Gain = $10\log(N_{ANT}/N_{SS}) = 4.8\text{dBi}$, Directional Gain = $G_{ANT} + \text{Array Gain} = 7.8\text{dBi}$,

So limit = $30 - (7.8 - 6) = 28.2\text{dBm}$

6.4. 6dB Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e)& Part 2 J Section 2.1049
Test Method:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r03 Section C
Limit:	>500kHz
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v01r03 Section C 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSQ	200061	Aug. 12, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.4.3. Test data

ANT 0

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11a	CH149	5745	15.77	0.5	PASS
11a	CH157	5785	15.71	0.5	PASS
11a	CH165	5825	16.41	0.5	PASS
11n(HT20)	CH149	5745	16.99	0.5	PASS
11n(HT20)	CH157	5785	17.18	0.5	PASS
11n(HT20)	CH165	5825	17.05	0.5	PASS
11n(HT40)	CH151	5755	35.64	0.5	PASS
11n(HT40)	CH159	5795	35.64	0.5	PASS

ANT 1

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11a	CH149	5745	15.77	0.5	PASS
11a	CH157	5785	15.77	0.5	PASS
11a	CH165	5825	16.41	0.5	PASS
11n(HT20)	CH149	5745	16.99	0.5	PASS
11n(HT20)	CH157	5785	16.92	0.5	PASS
11n(HT20)	CH165	5825	16.99	0.5	PASS
11n(HT40)	CH151	5755	35.77	0.5	PASS
11n(HT40)	CH159	5795	35.64	0.5	PASS

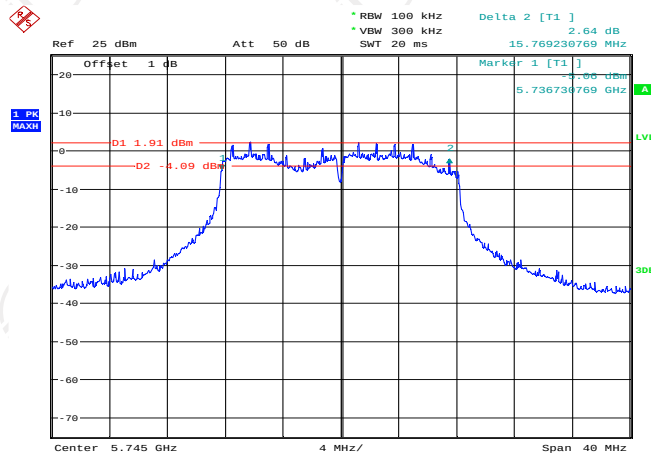
ANT 2

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11a	CH149	5745	15.77	0.5	PASS
11a	CH157	5785	15.77	0.5	PASS
11a	CH165	5825	16.41	0.5	PASS
11n(HT20)	CH149	5745	17.12	0.5	PASS
11n(HT20)	CH157	5785	17.37	0.5	PASS
11n(HT20)	CH168	5825	16.99	0.5	PASS
11n(HT40)	CH151	5755	35.51	0.5	PASS
11n(HT40)	CH159	5795	35.64	0.5	PASS

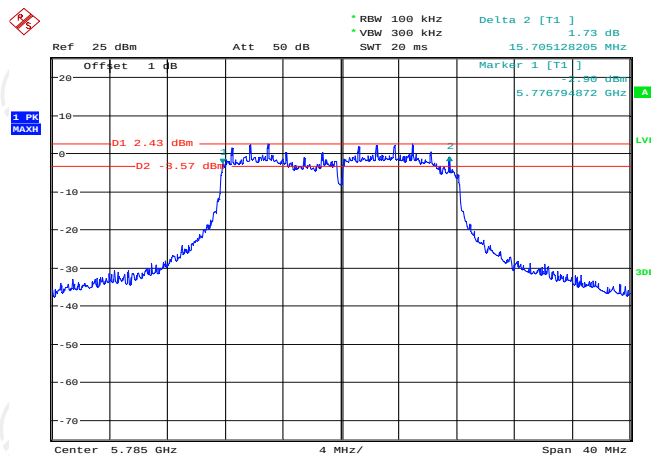
Test plots as follows:

ANT 0
Band IV (5725 – 5850 MHz)
11a

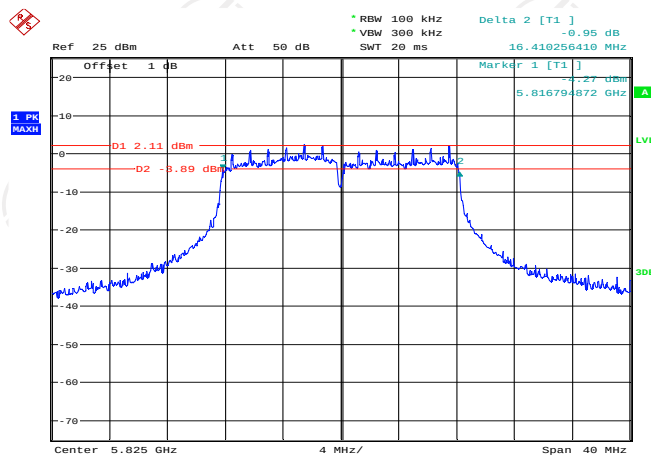
CH149



CH157

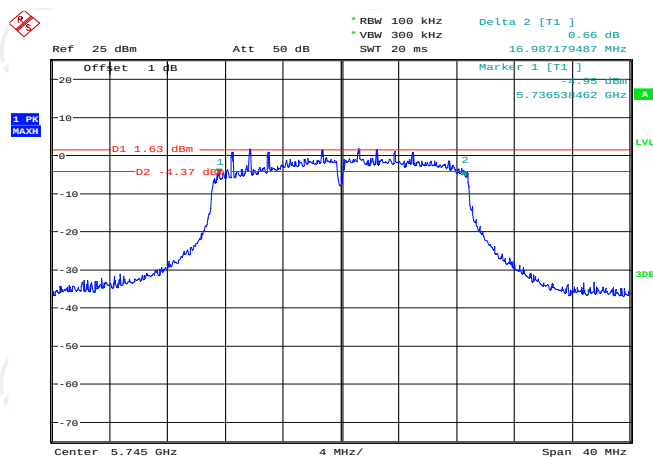


CH165

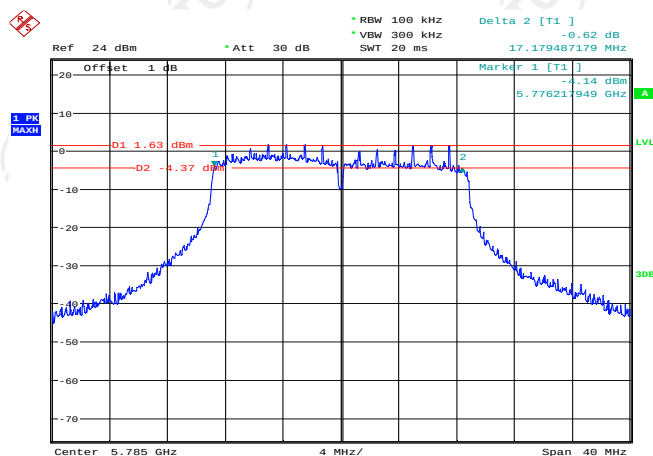


11n(HT20)

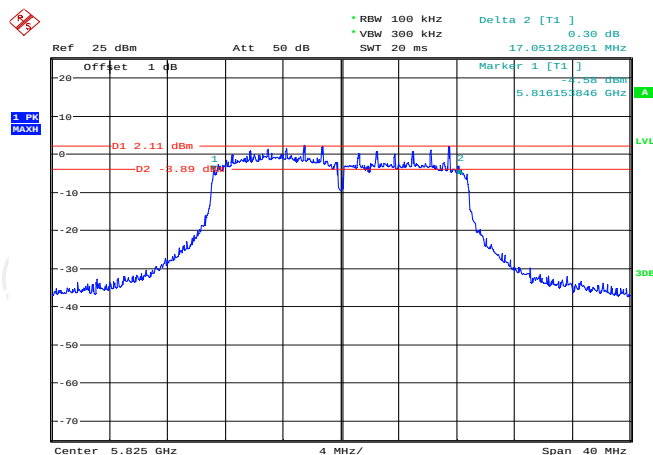
CH149



CH157

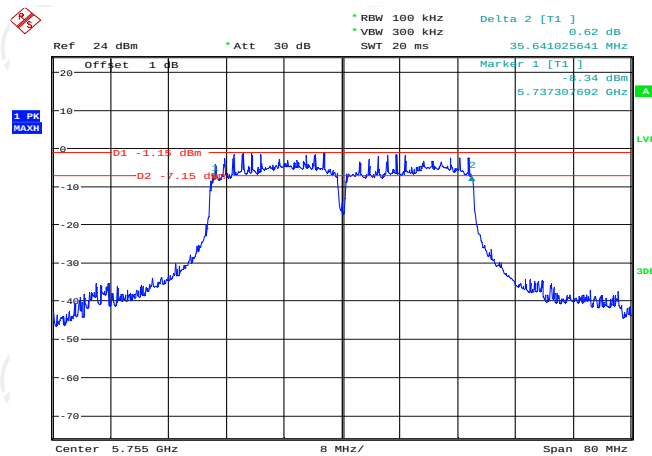


CH165

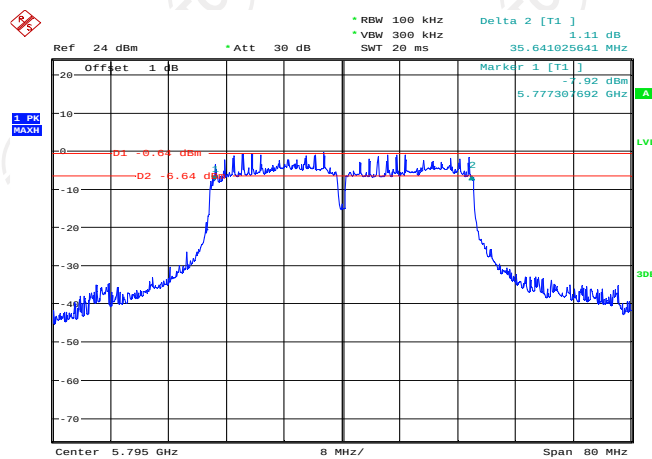


11n(HT40)

CH151

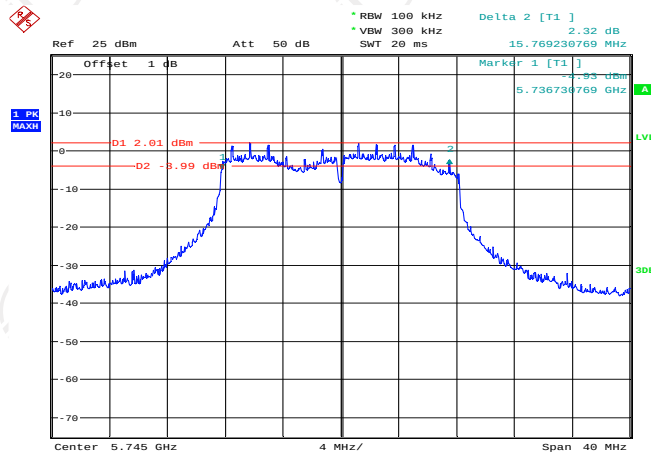


CH159

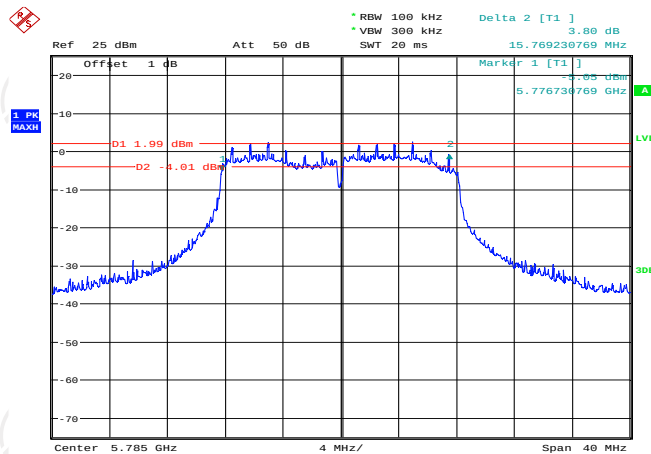


ANT 1
Band IV (5725 – 5850 MHz)
11a

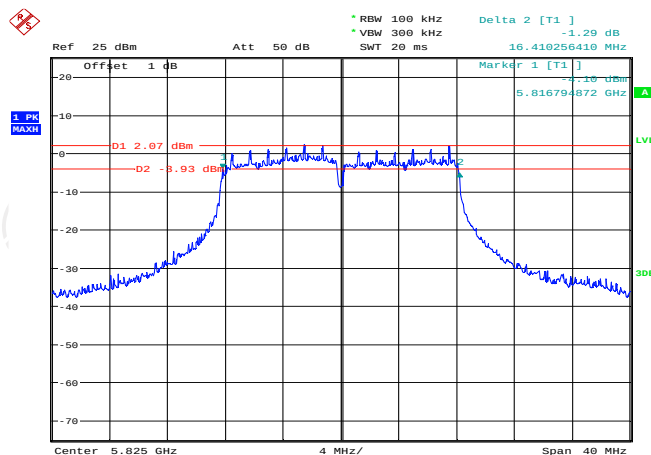
CH149



CH157

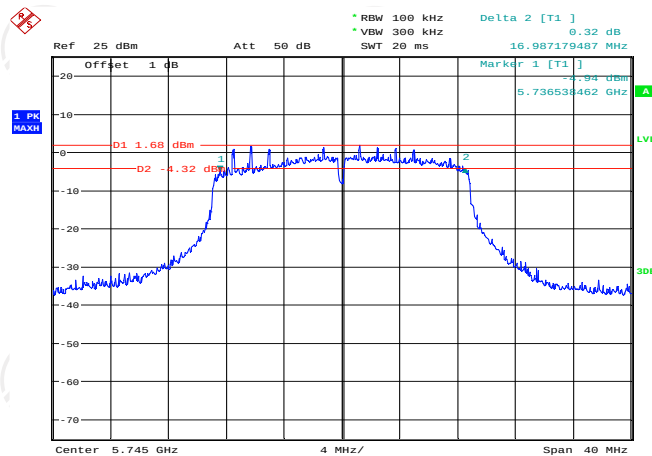


CH165

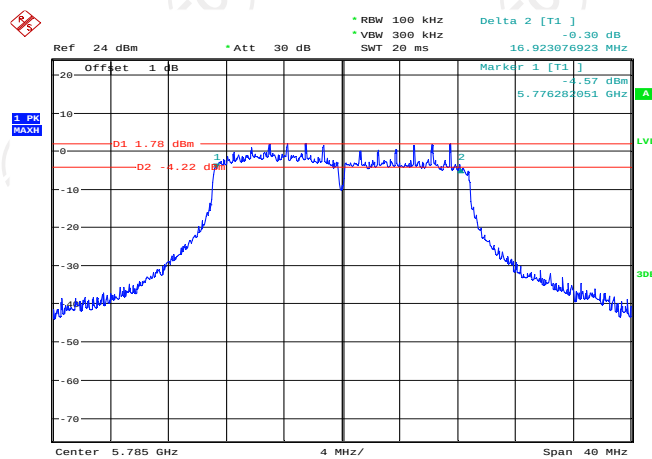


11n(HT20)

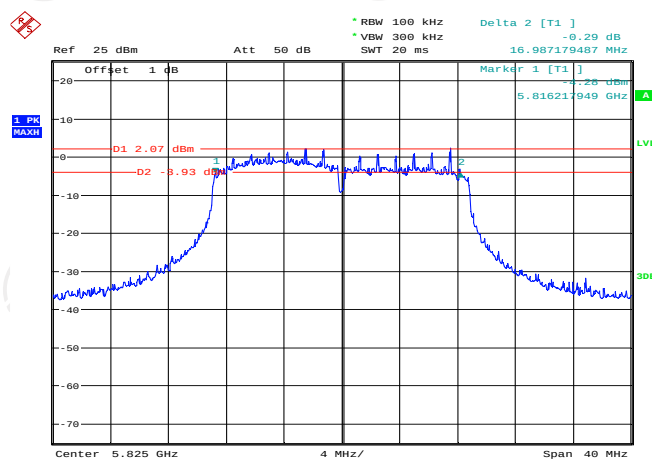
CH149



CH157

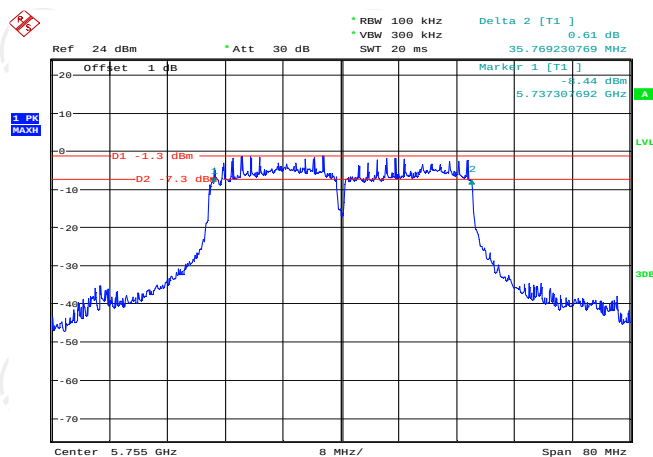


CH165

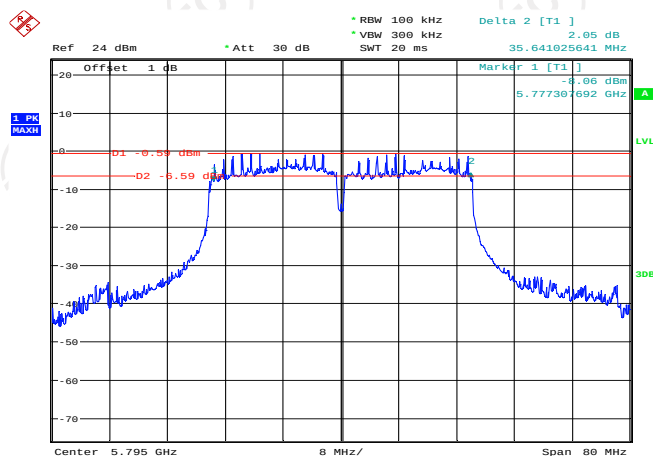


11n(HT40)

CH151

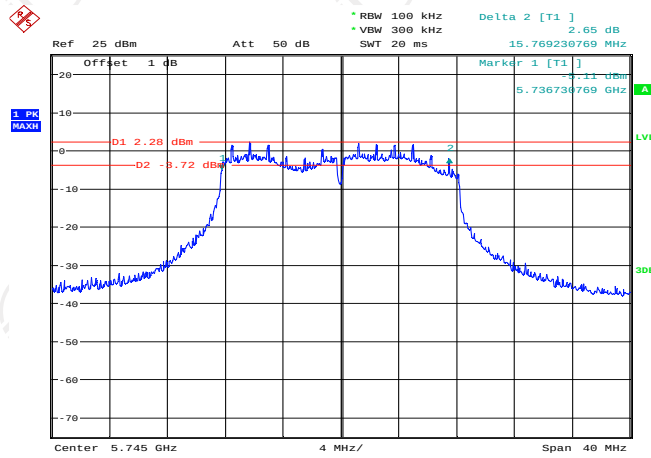


CH159

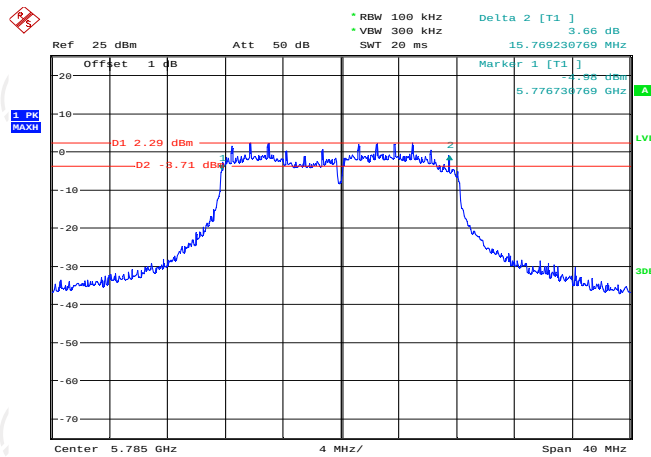


ANT 2
Band IV (5725 – 5850 MHz)
11a

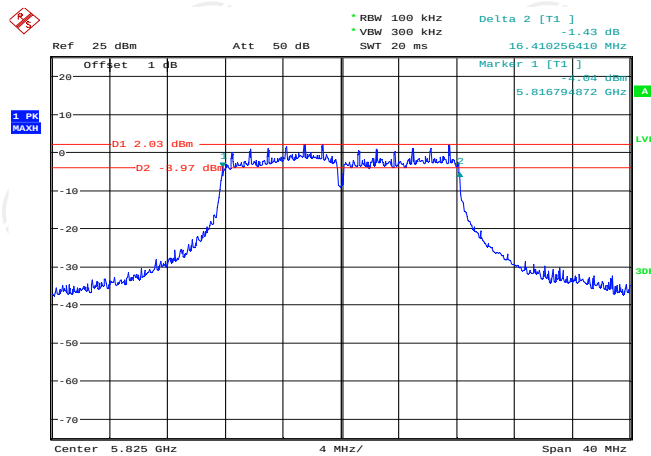
CH149



CH157

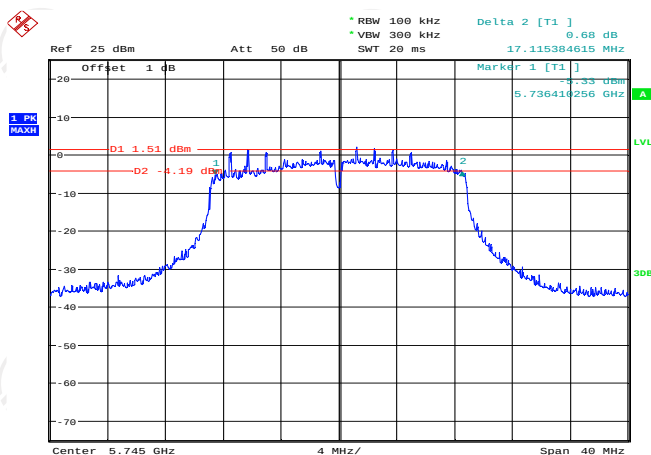


CH165

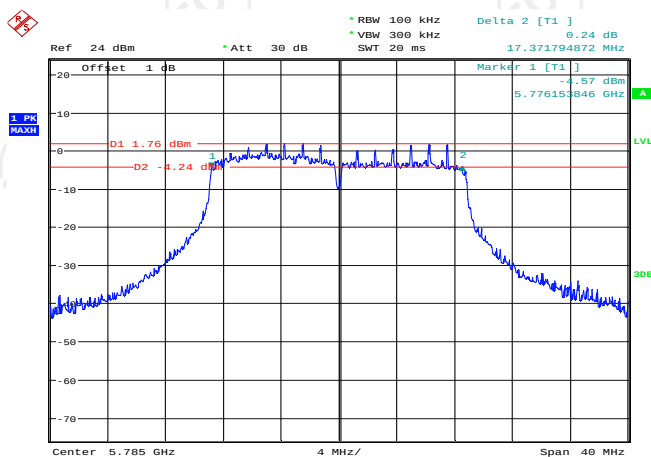


11n(HT20)

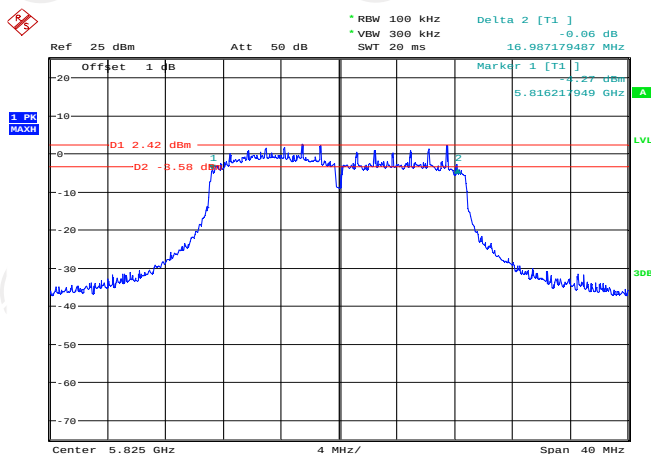
CH149



CH157

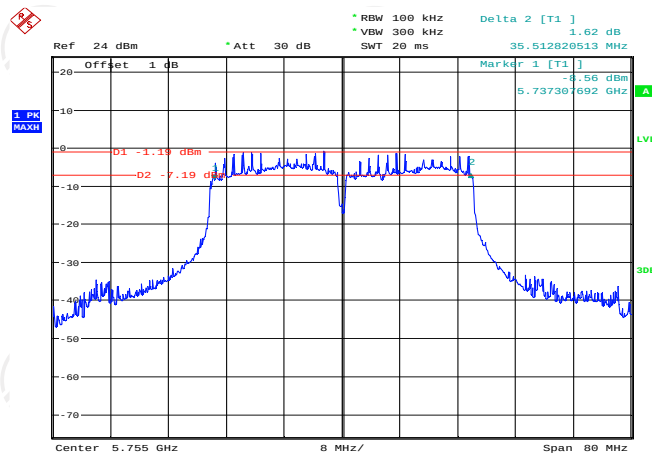


CH165

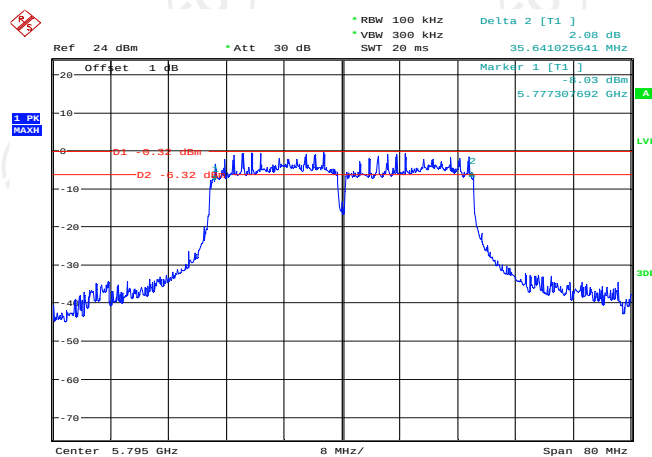


11n(HT40)

CH151



CH159



6.5. 26dB Bandwidth and 99% Occupied Bandwidth

6.5.1. Test Specification

Test Requirement:	47 CFR Part 15C Section 15.407 (a)& Part 2 J Section 2.1049
Test Method:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r03 Section D
Limit:	No restriction limits
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v01r03 Section D 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. 4. Measure and record the results in the test report.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSQ	200061	Aug. 12, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.5.3. Test data

ANT 0

Band I

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	23.46	17.051
11a	CH44	5220	23.27	17.115
11a	CH48	5240	23.08	17.115
11n(HT20)	CH36	5180	23.78	18.141
11n(HT20)	CH44	5220	23.46	18.141
11n(HT20)	CH48	5240	23.78	18.205
11n(HT40)	CH38	5190	47.44	37.051
11n(HT40)	CH46	5230	47.31	36.923

Band IV

Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11a	CH149	5745	16.987
11a	CH157	5785	17.115
11a	CH165	5825	17.115
11n(HT20)	CH149	5745	18.141
11n(HT20)	CH157	5785	18.205
11n(HT20)	CH165	5825	18.013
11n(HT40)	CH151	5755	37.051
11n(HT40)	CH159	5795	36.923

ANT 1**Band I**

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	22.88	17.051
11a	CH44	5220	23.01	17.115
11a	CH48	5240	22.95	17.115
11n(HT20)	CH36	5180	23.78	18.141
11n(HT20)	CH44	5220	24.17	18.141
11n(HT20)	CH48	5240	23.65	18.077
11n(HT40)	CH38	5190	47.82	36.923
11n(HT40)	CH46	5230	47.18	36.795

Band IV

Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11a	CH149	5745	16.987
11a	CH157	5785	17.051
11a	CH165	5825	17.115
11n(HT20)	CH149	5745	18.013
11n(HT20)	CH157	5785	18.205
11n(HT20)	CH165	5825	18.077
11n(HT40)	CH151	5755	36.795
11n(HT40)	CH159	5795	36.923

ANT 2 Band I

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	22.44	17.051
11a	CH44	5220	23.14	17.115
11a	CH48	5240	22.88	17.115
11n(HT20)	CH36	5180	23.78	18.141
11n(HT20)	CH44	5220	23.65	18.141
11n(HT20)	CH48	5240	23.65	18.077
11n(HT40)	CH38	5190	47.69	37.051
11n(HT40)	CH46	5230	46.79	36.795

Band IV

Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11a	CH149	5745	17.115
11a	CH157	5785	17.051
11a	CH165	5825	17.115
11n(HT20)	CH149	5745	18.077
11n(HT20)	CH157	5785	18.141
11n(HT20)	CH165	5825	18.013
11n(HT40)	CH151	5755	36.795
11n(HT40)	CH159	5795	36.923

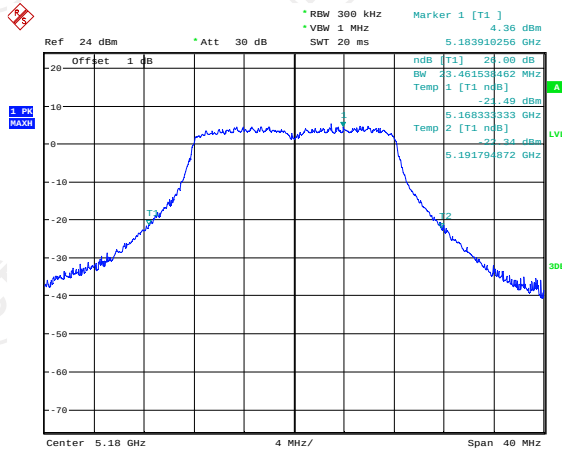
Test plots as follows:

26dB Bandwidth

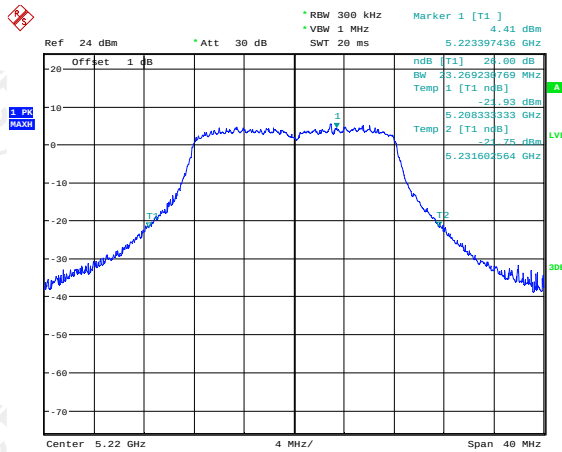
ANT 0: Band I (5150 – 5250 MHz)

11a

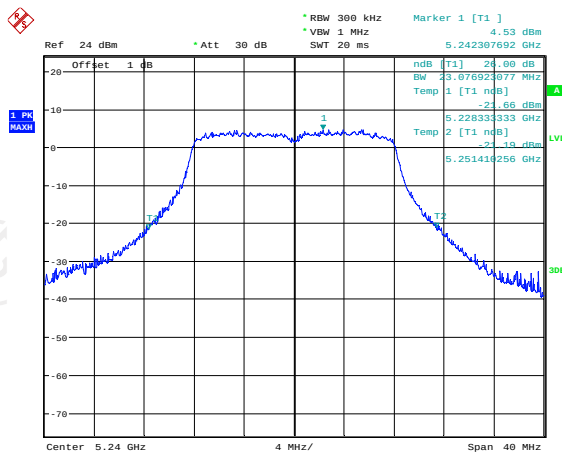
CH36



CH44

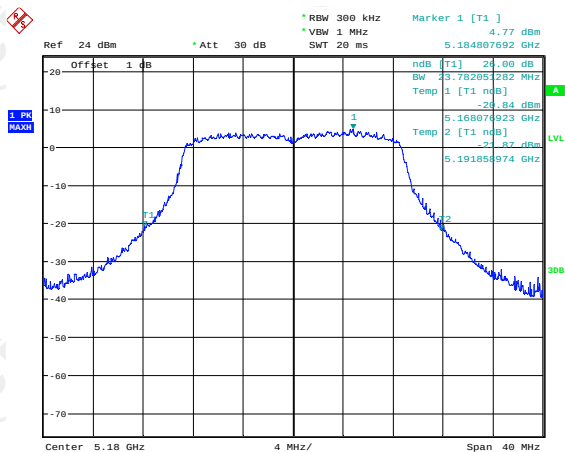


CH48

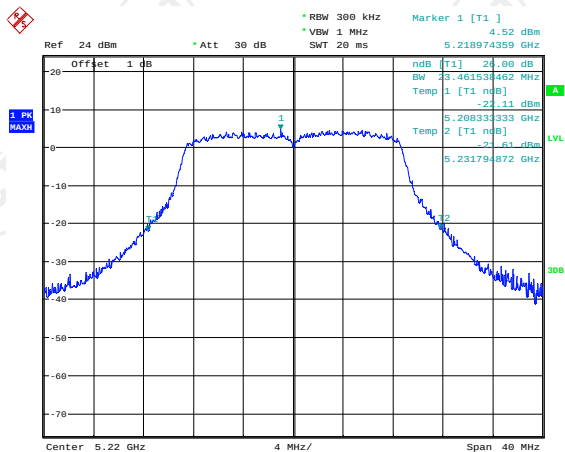


11n(HT20)

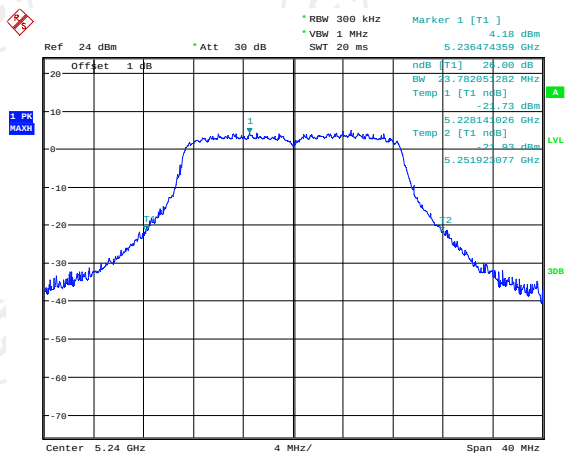
CH36



CH44

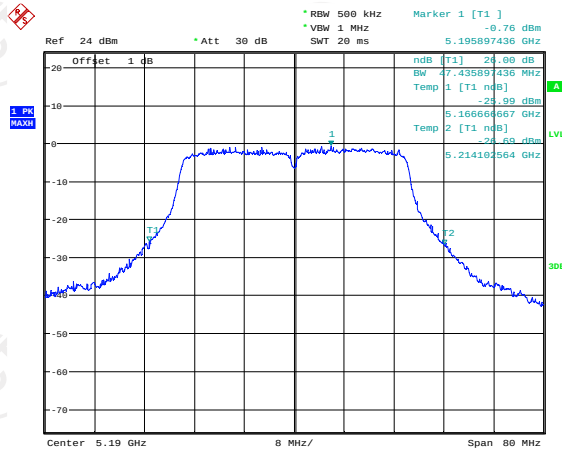


CH48

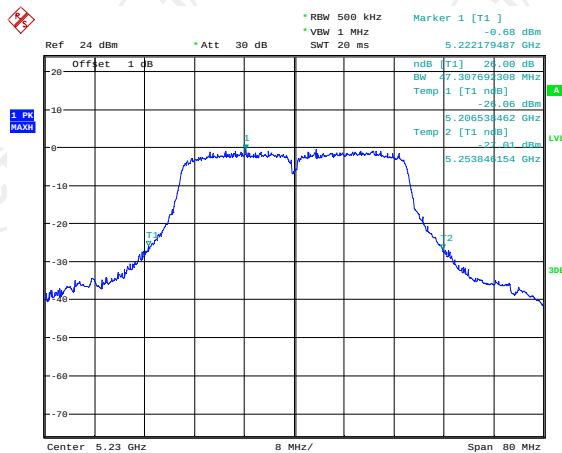


11n(HT40)

CH38



CH46

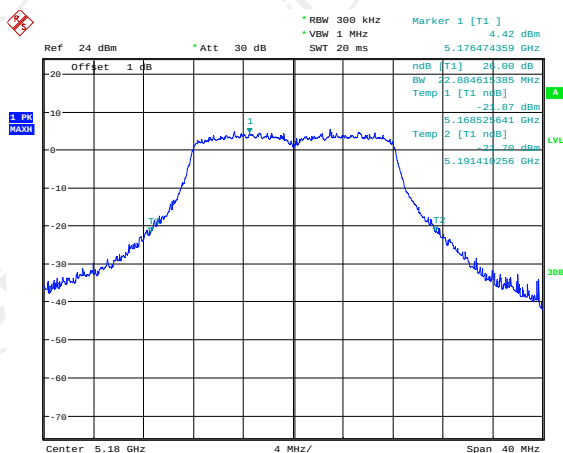


ANT 1

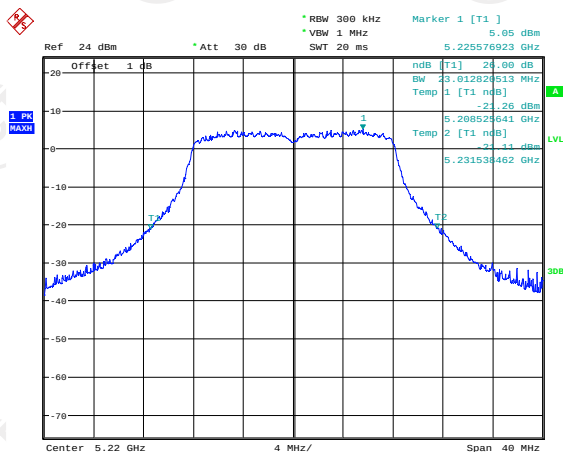
Band I (5150 – 5250 MHz)

11a

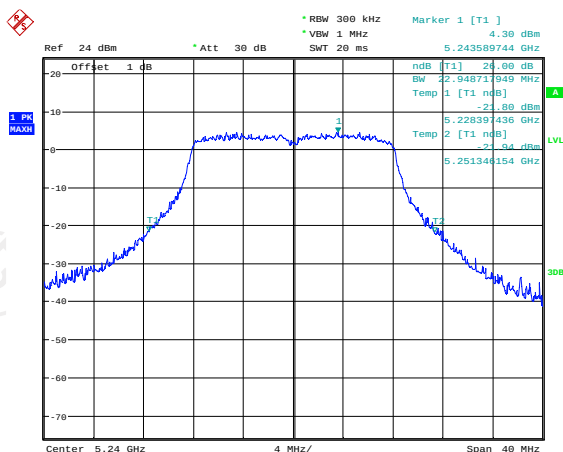
CH36



CH44

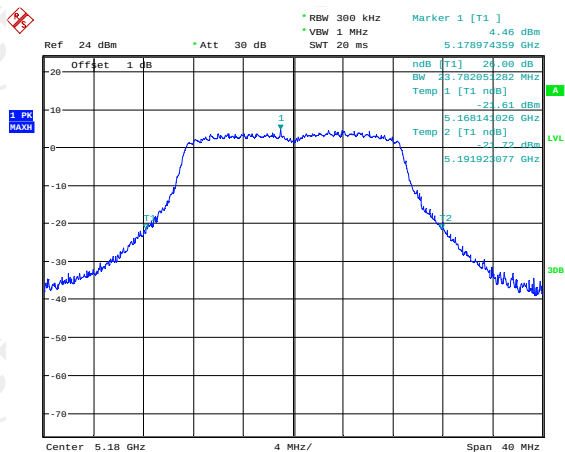


CH48

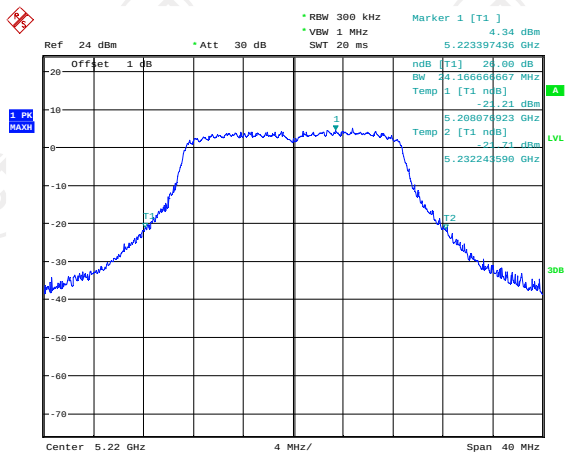


11n(HT20)

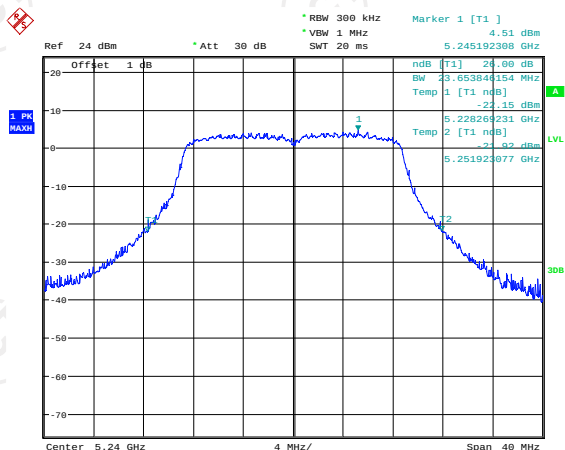
CH36



CH44

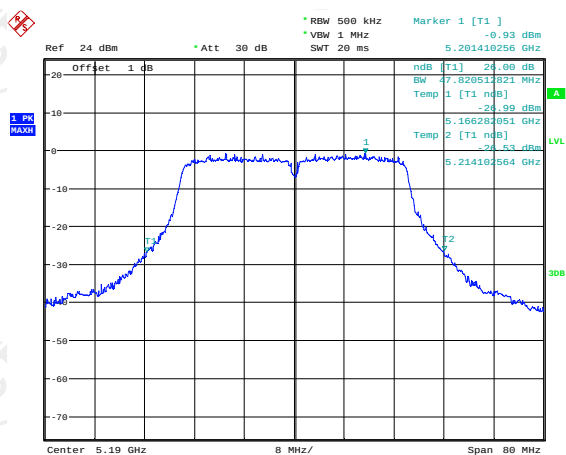


CH48

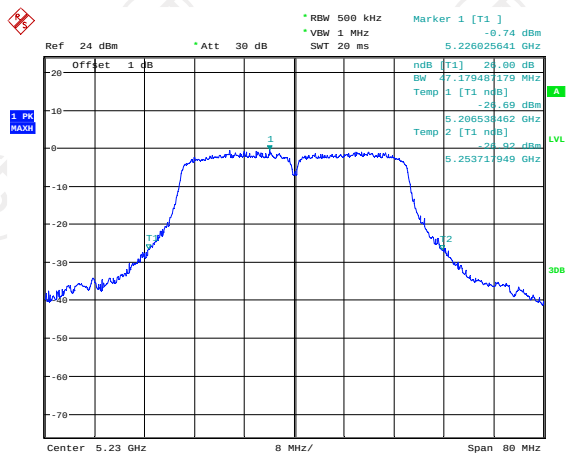


11n(HT40)

CH38



CH46

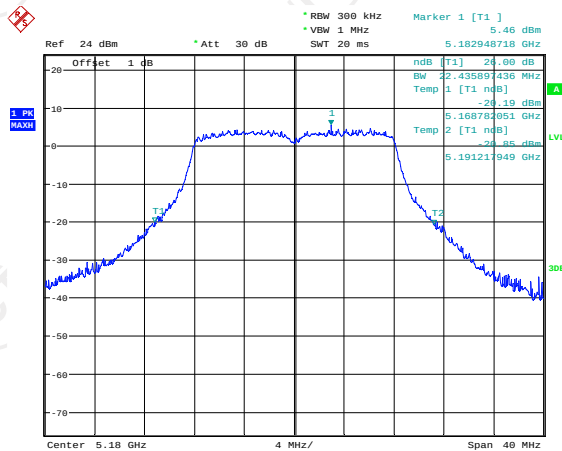


ANT 2

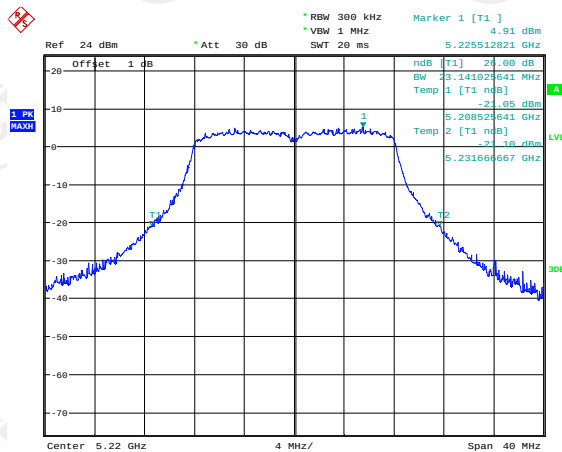
Band I (5150 – 5250 MHz)

11a

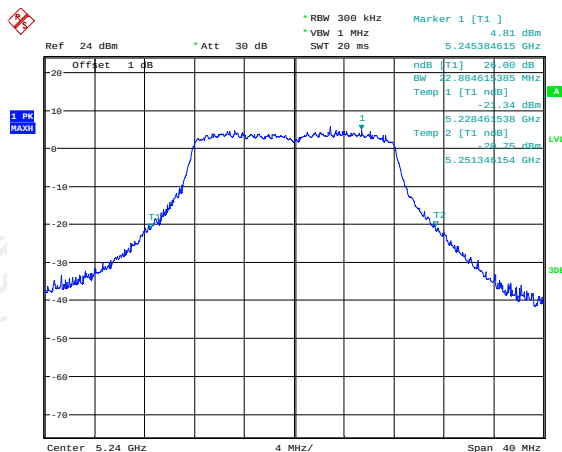
CH36



CH44

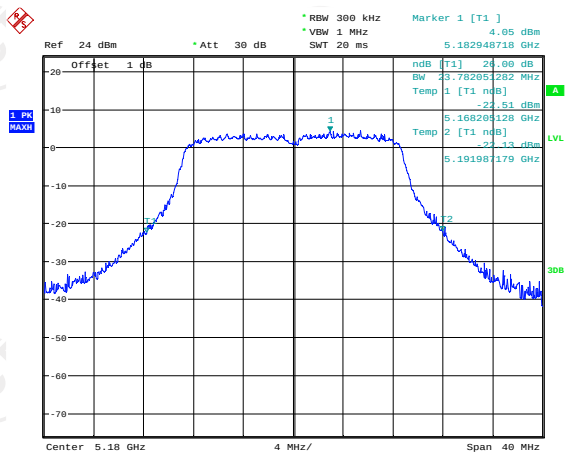


CH48

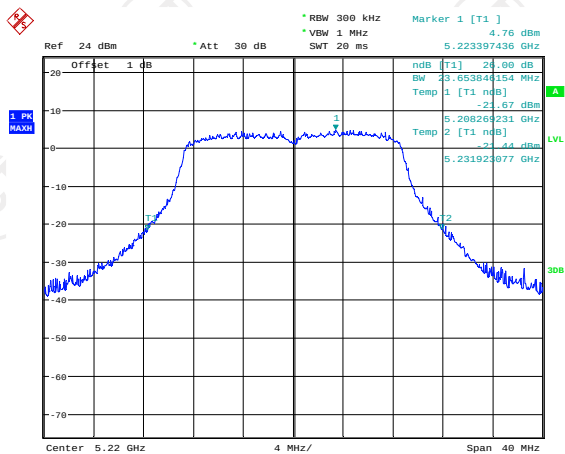


11n(HT20)

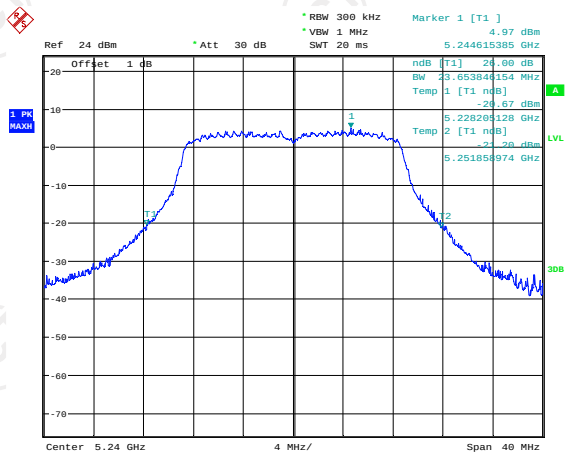
CH36



CH44

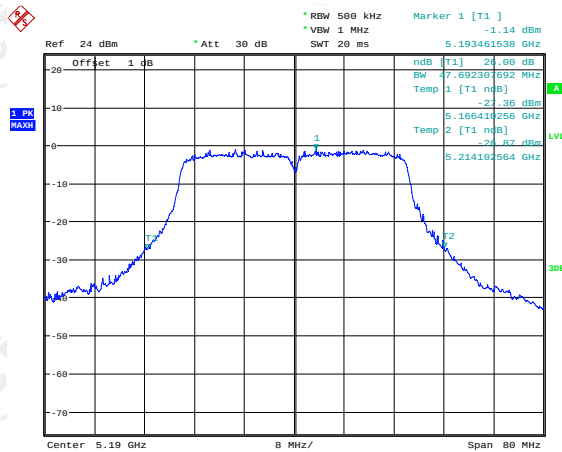


CH48

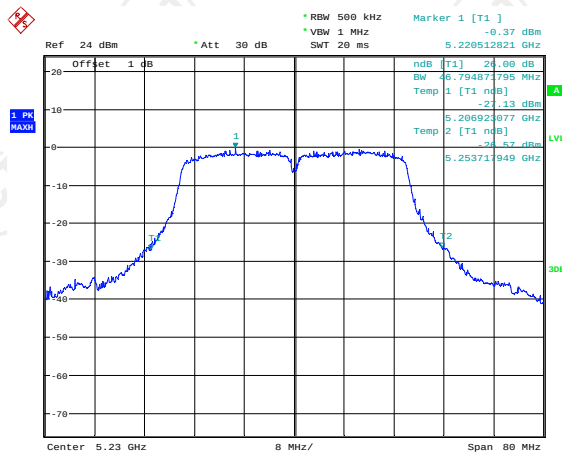


11n(HT40)

CH38



CH46

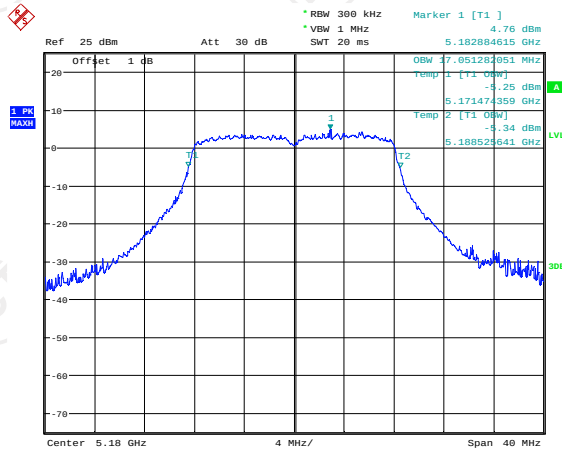


99% Bandwidth

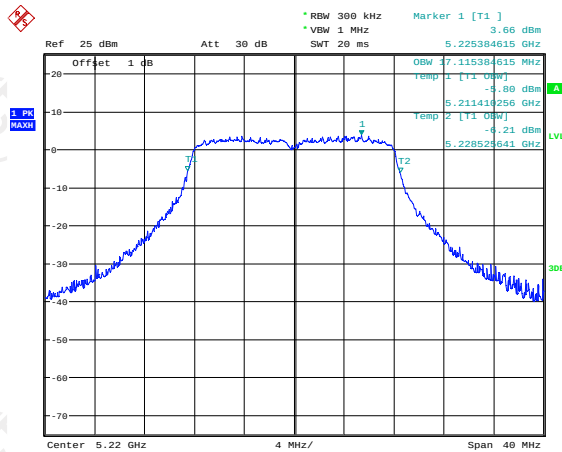
ANT 0: Band I (5150 – 5250 MHz)

11a

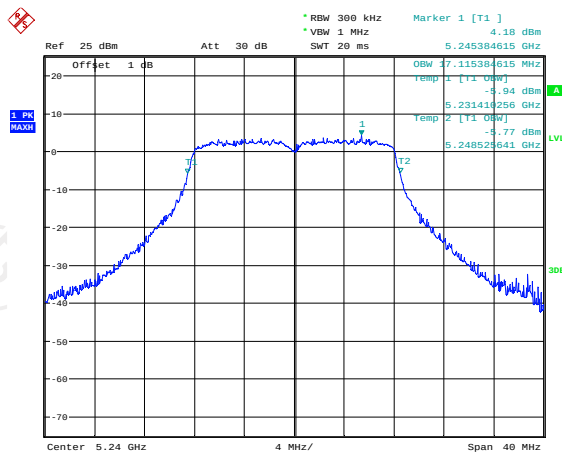
CH36



CH44

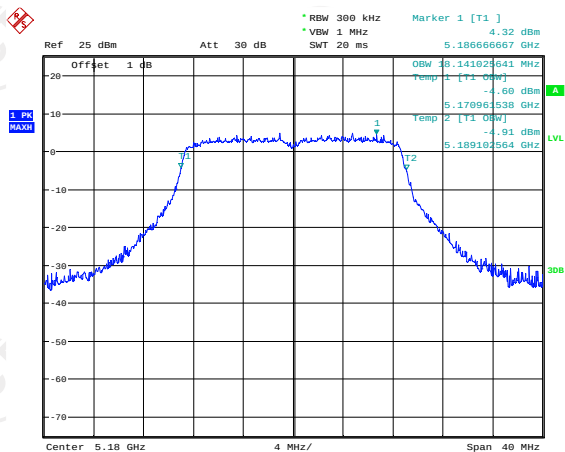


CH48

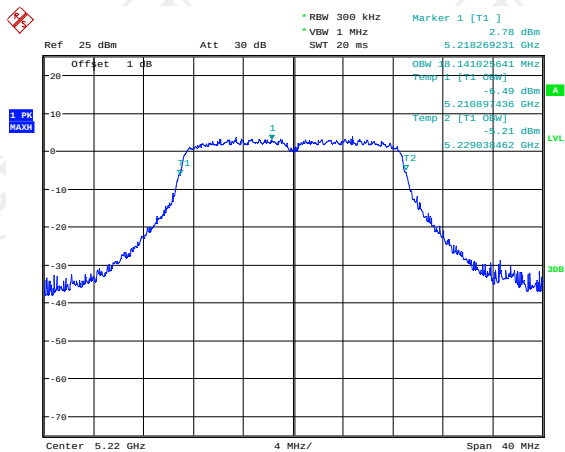


11n(HT20)

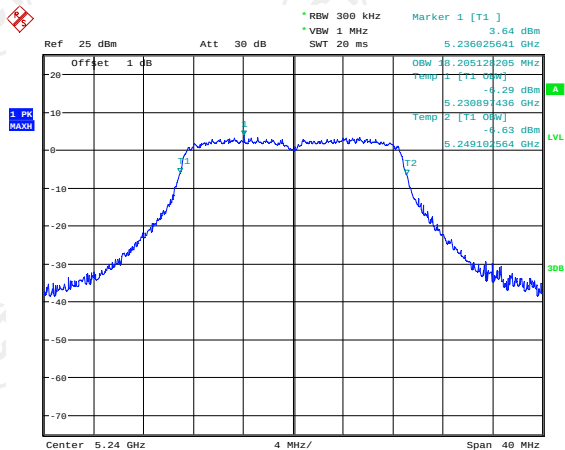
CH36



CH44

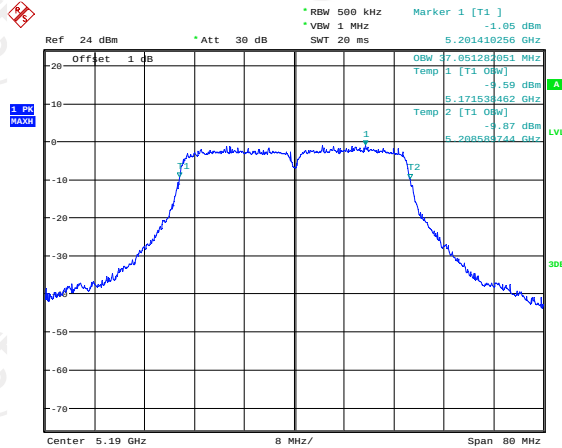


CH48

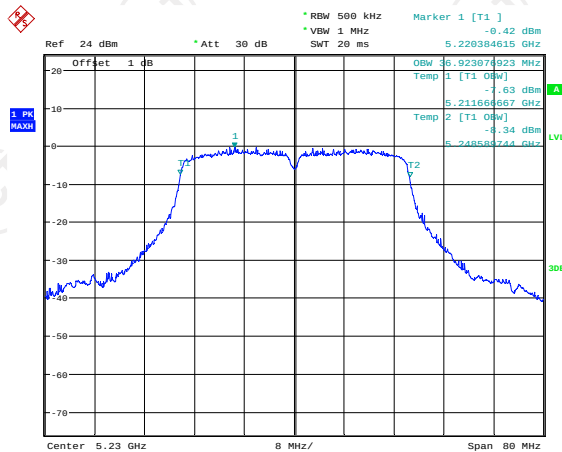


11n(HT40)

CH38



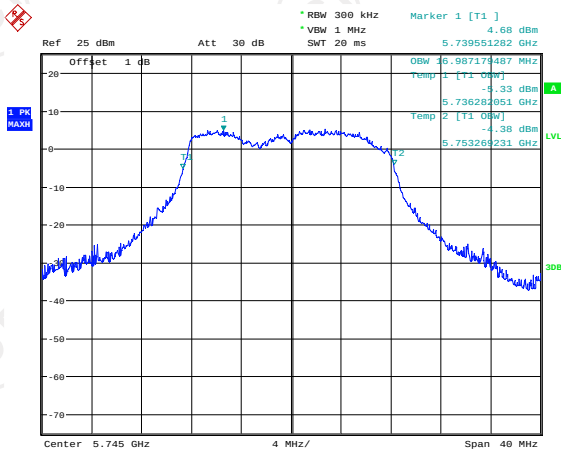
CH46



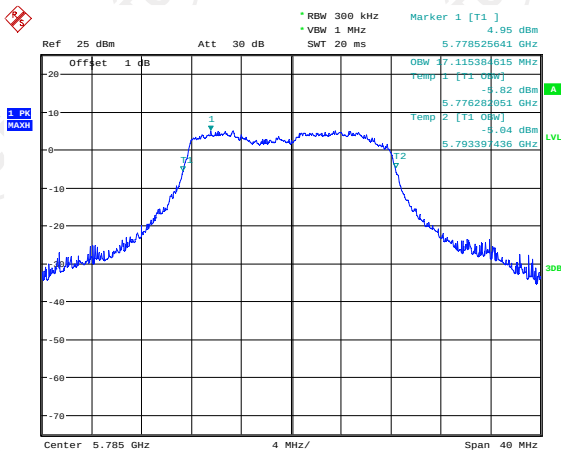
Band IV (5725 – 5850 MHz)

11a

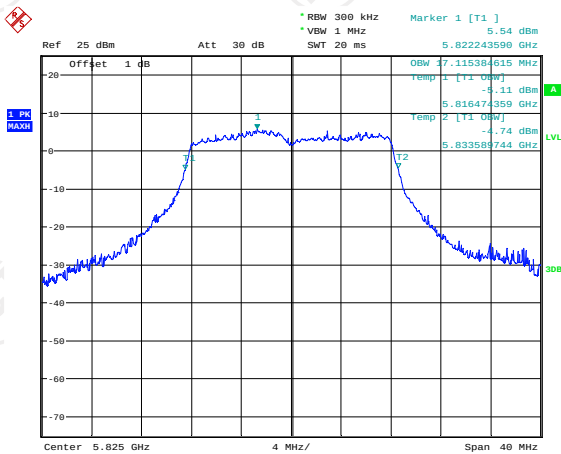
CH149



CH157

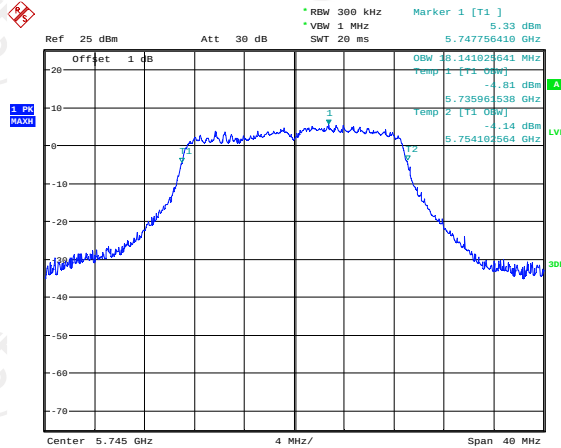


CH165

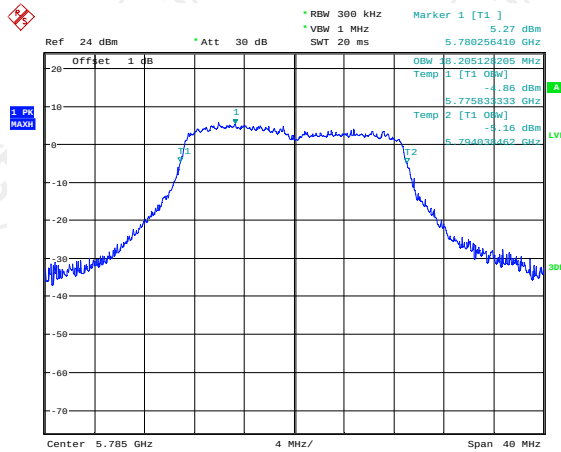


11n(HT20)

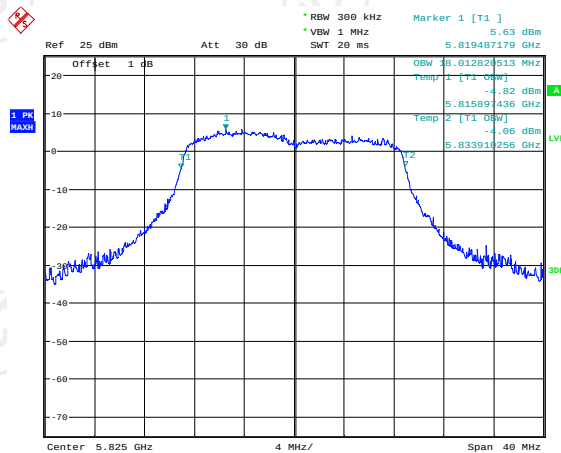
CH149



CH157

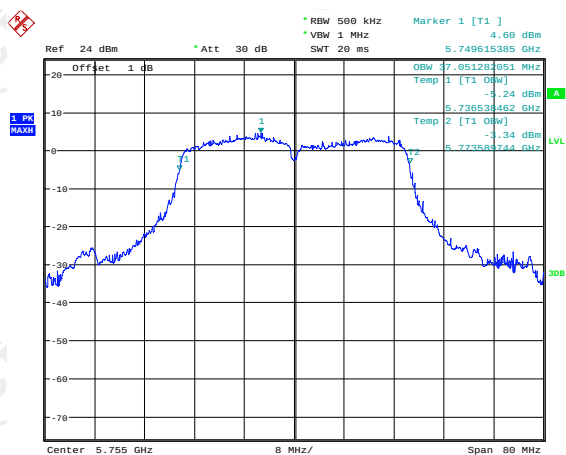


CH165

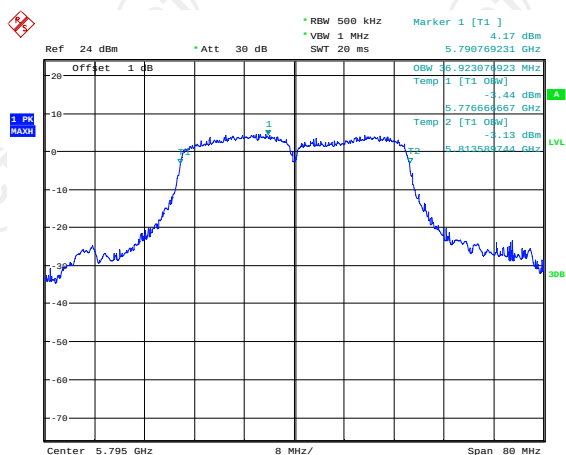


11n(HT40)

CH151



CH159

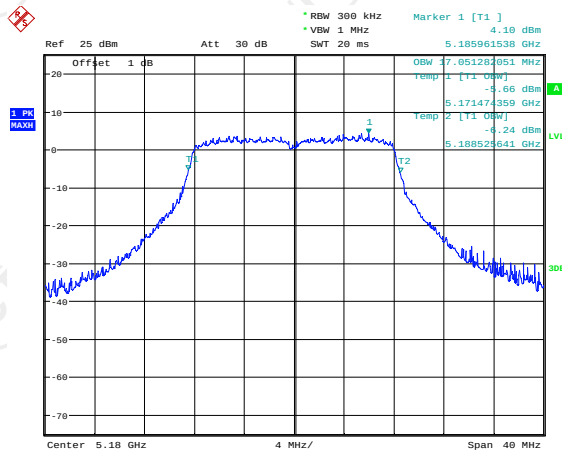


ANT 1

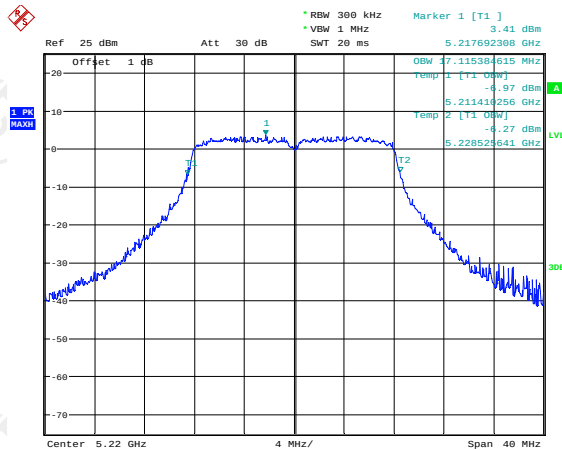
Band I (5150 – 5250 MHz)

11a

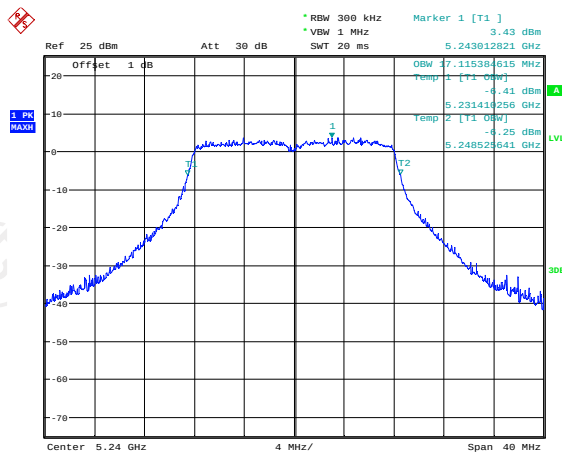
CH36



CH44

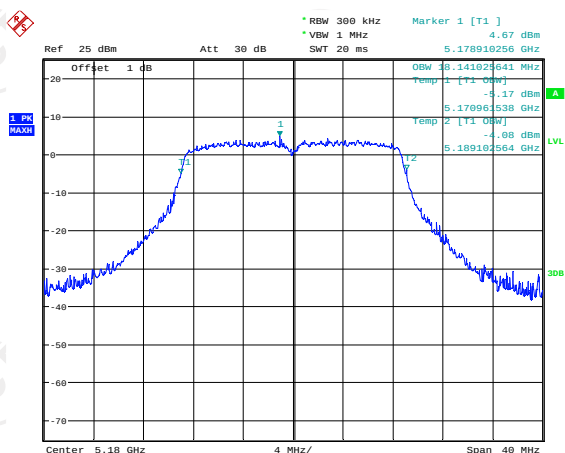


CH48

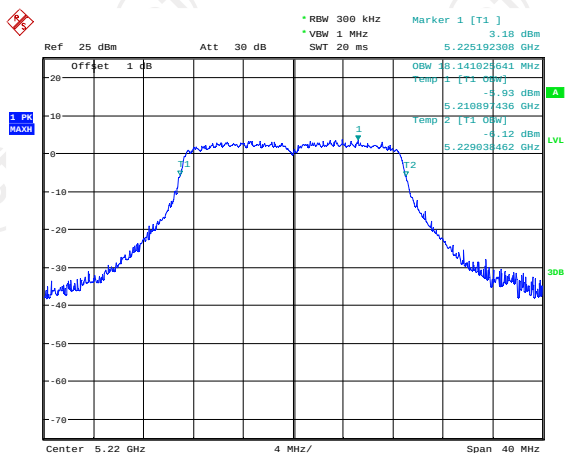


11n(HT20)

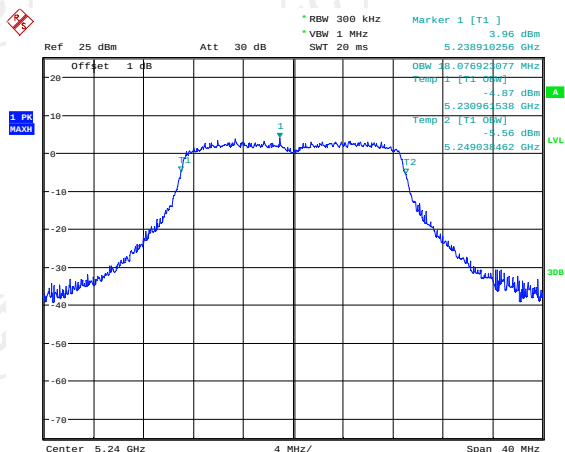
CH36



CH44

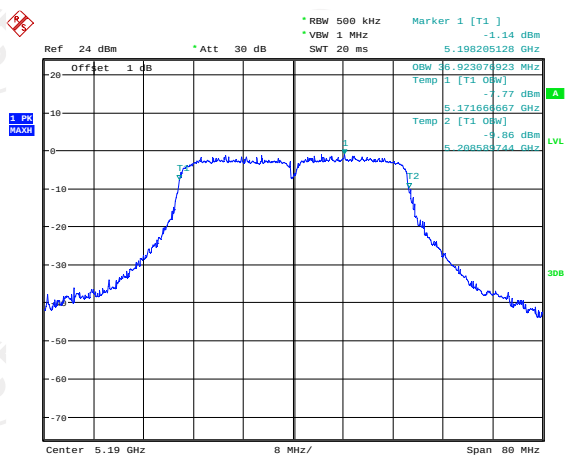


CH48

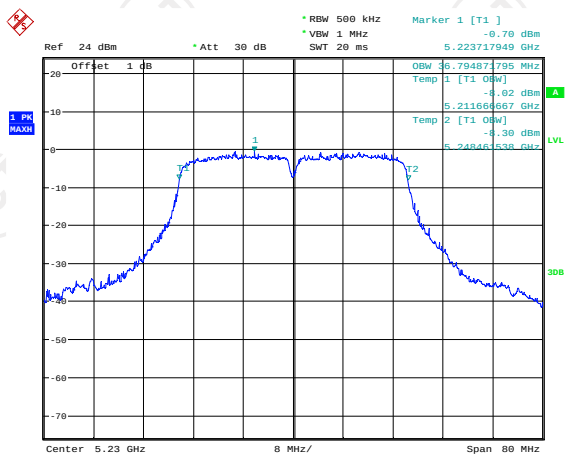


11n(HT40)

CH38



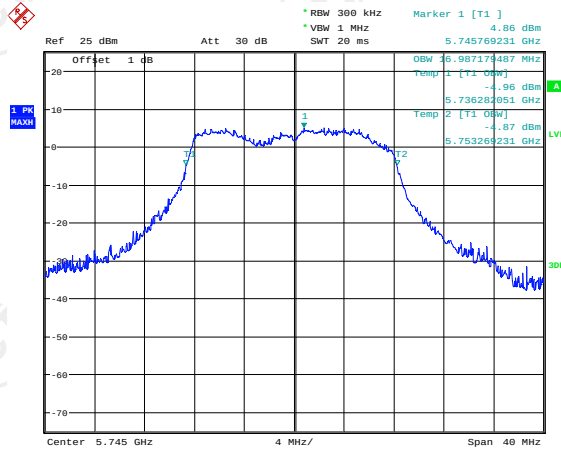
CH46



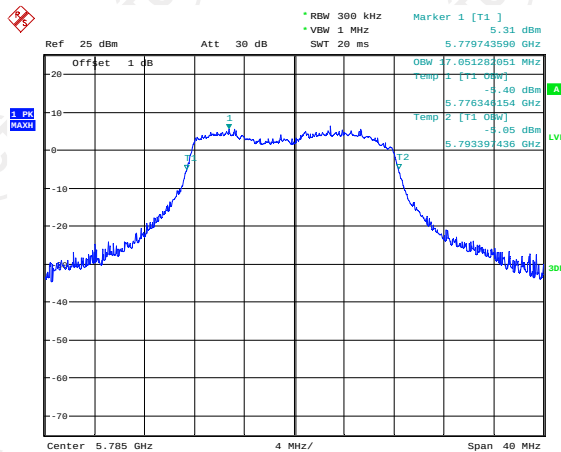
Band IV (5725 – 5850 MHz)

11a

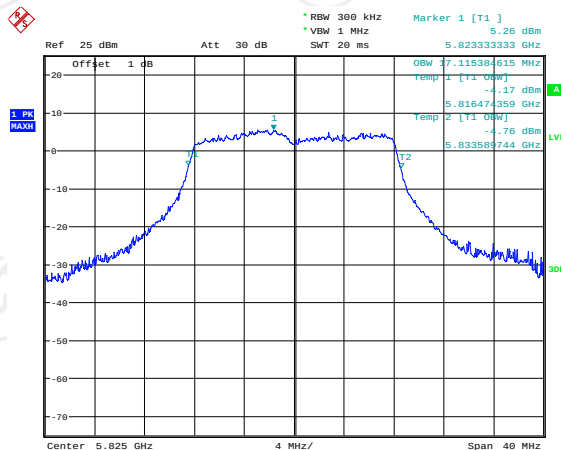
CH149



CH157

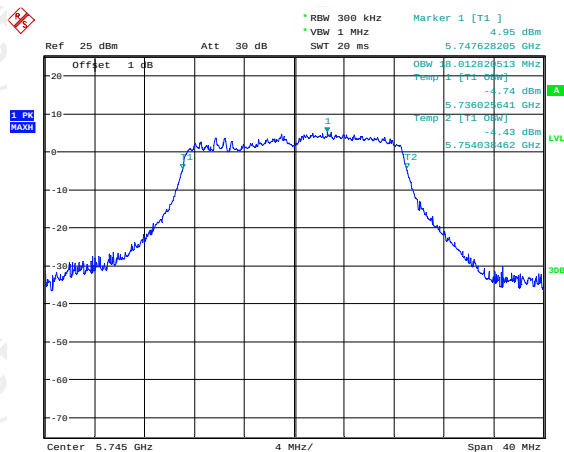


CH165

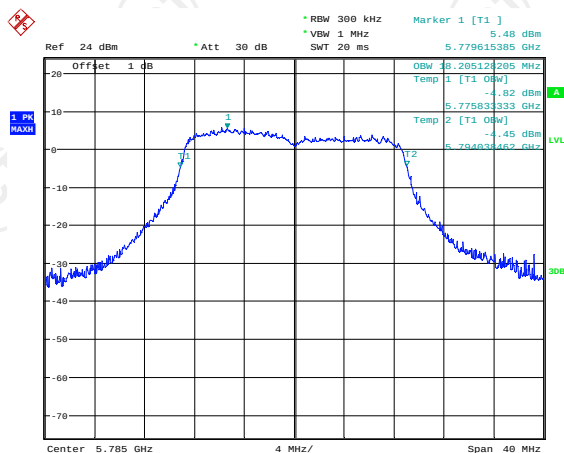


11n(HT20)

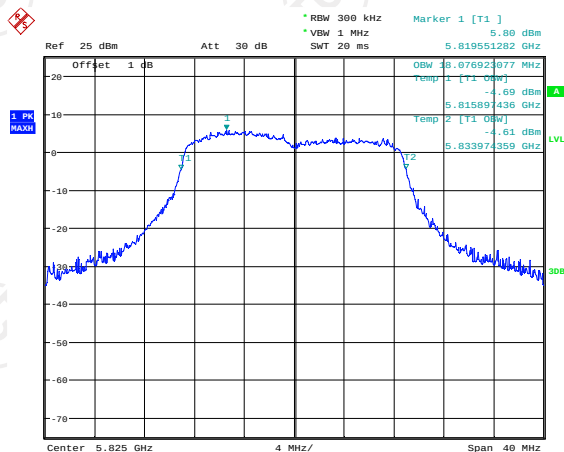
CH149



CH157

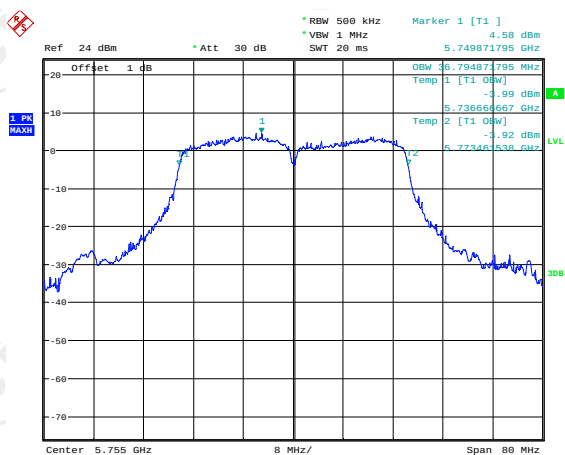


CH165

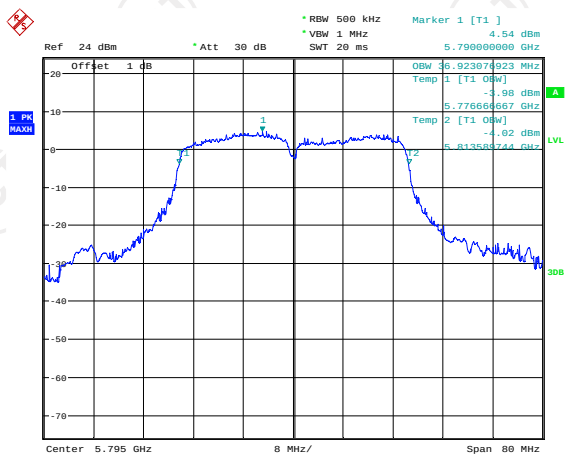


11n(HT40)

CH151



CH159

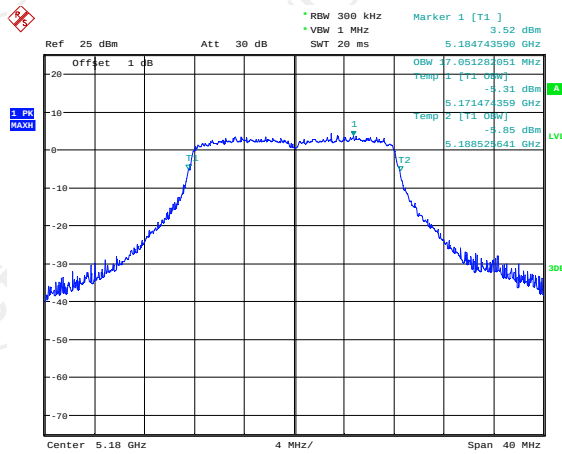


ANT 2

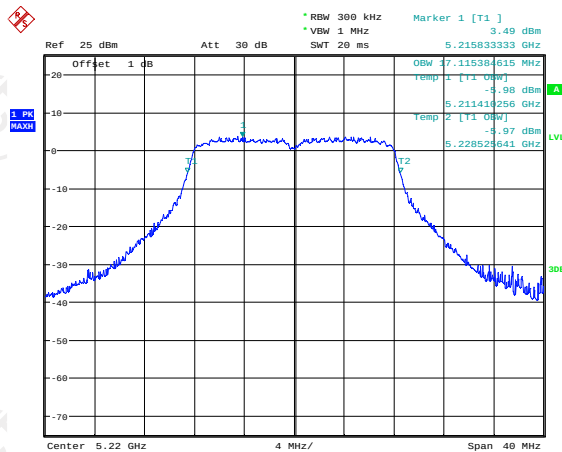
Band I (5150 – 5250 MHz)

11a

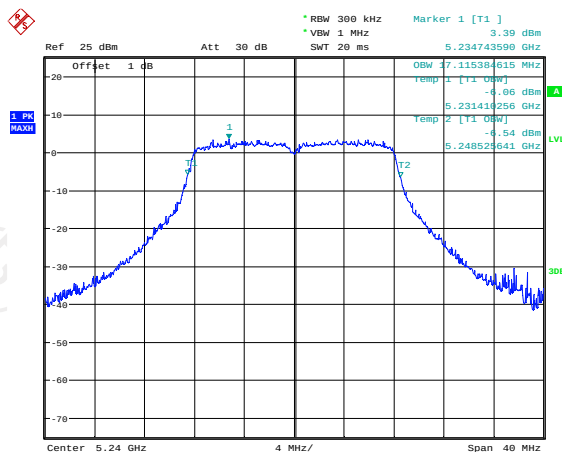
CH36



CH44

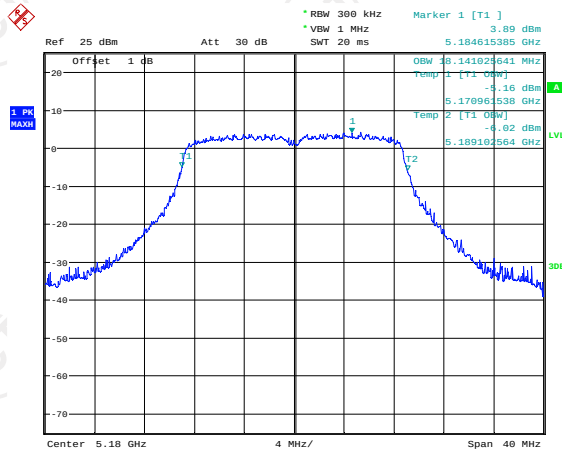


CH48

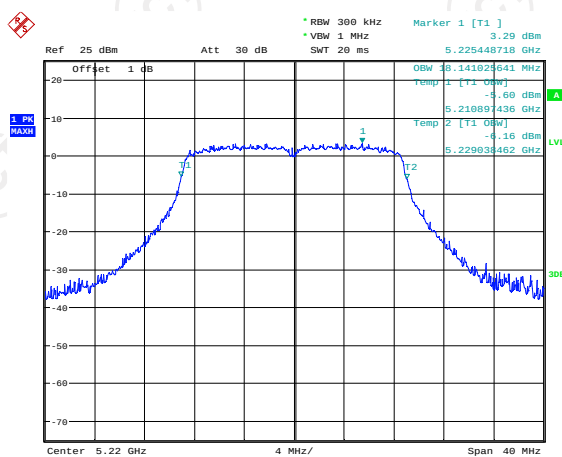


11n(HT20)

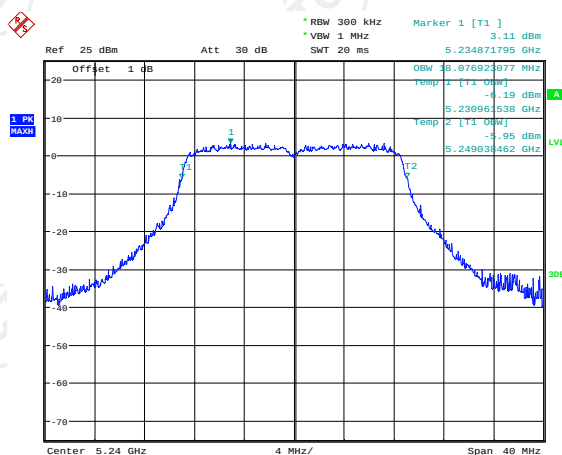
CH36



CH44

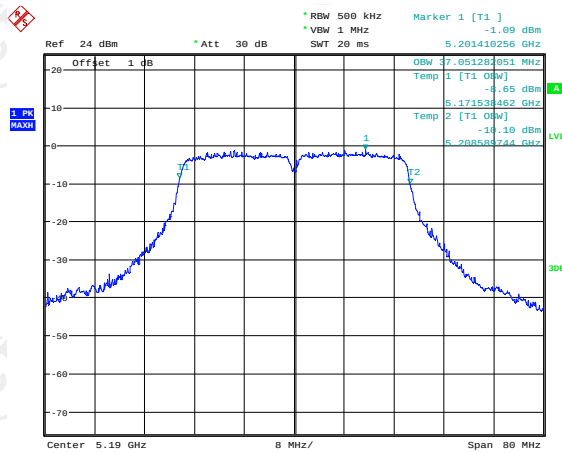


CH48

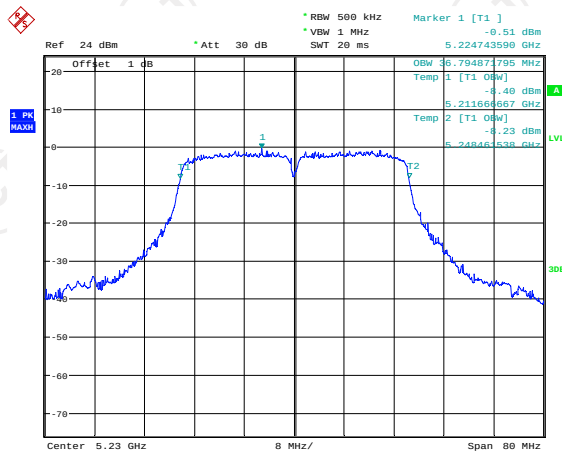


11n(HT40)

CH38



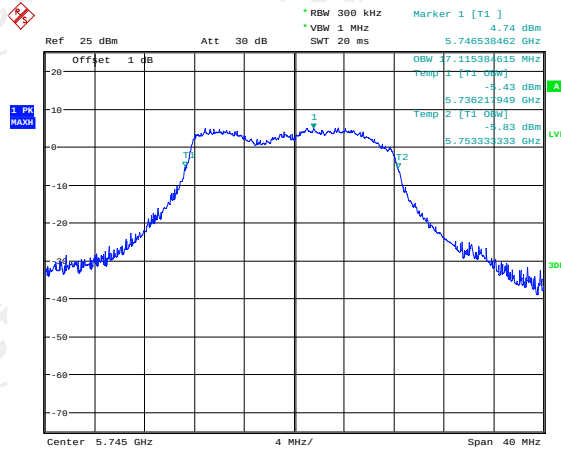
CH46



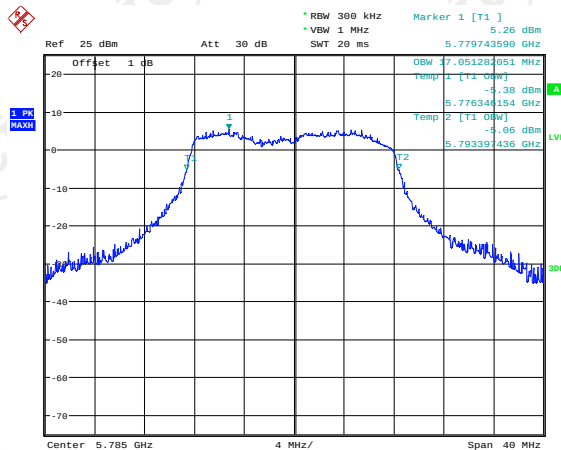
Band IV (5725 – 5850 MHz)

11a

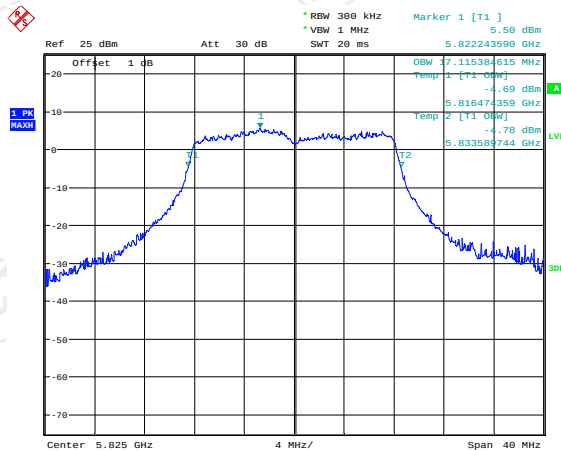
CH149



CH157

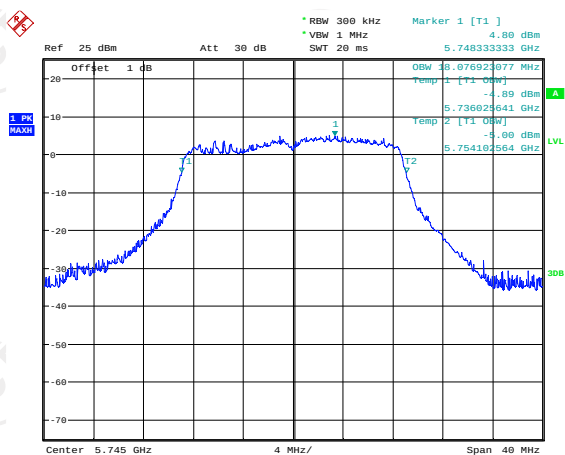


CH165

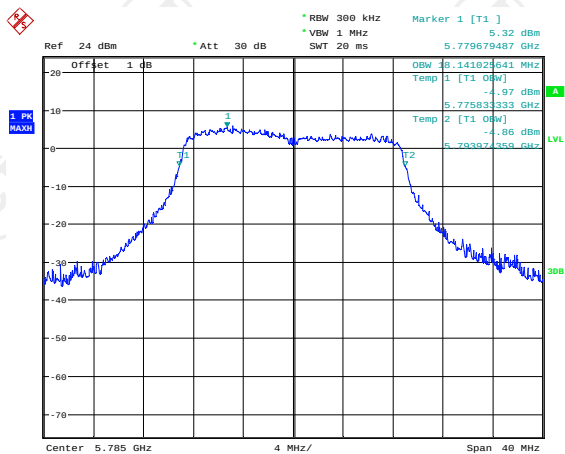


11n(HT20)

CH149



CH157



CH165

