

FCC Radio Test Report

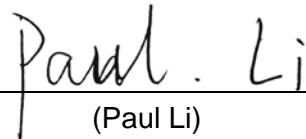
FCC ID: 2AO38-AP1000-41

This report concerns (check one): ☒ Original Grant ☐ Class I Change ☐ Class II Change

Project No. : 1812C016
Equipment : Apex Lifestyle Small Cell
Test Model : AP1000-41
Series Model : N/A
Applicant : Casa Systems, Inc.
Address : 100 Old River Road Suite 100 Andover,
Massachusetts 01810 United States

Date of Receipt : Dec. 04, 2018
Date of Test : Dec. 04, 2018 ~ Dec. 20, 2018
Issued Date : Jan. 03, 2019
Tested by : BTL Inc.

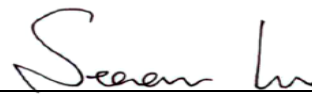
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Certificate #5123.02

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BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Jan. 03, 2019

1. GENERAL SUMMARY

Equipment : Apex Lifestyle Small Cell
Brand Name : N/A
Test Model : AP1000-41
Series Model : N/A
Applicant : Casa Systems, Inc.
Manufacturer : Casa Systems, Inc.
Address : 100 Old River Road Suite 100 Andover, Massachusetts 01810 United States
Date of Test : Dec. 04, 2018 ~ Dec. 20, 2018
Test Sample : Engineering Sample No.: D181211154
Standard(s) : FCC Part15, Subpart E(15.407) / ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc..

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-2-1812C016) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

Test results included in this report is only for the RLAN 5GHz UNII-1 part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart E(15.407)			
Standard(s) Section	Test Item	Judgment	Remark
15.207	AC Power Line Conducted Emissions	PASS	
15.407(a)	Spectrum Bandwidth	PASS	
15.407(a)	Maximum Output Power	PASS	
15.407(a)	Power Spectral Density	PASS	
15.407(a)	Radiated Emissions	PASS	
15.407(b)	Band Edge Emissions	PASS	
15.407(g)	Frequency Stability	PASS	
15.203	Antenna Requirements	PASS	

Note:

(1) "N/A" denotes test is not applicable in this test report.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

BTL's Test Firm Registration Number for FCC: 357015

BTL's Designation Number for FCC: CN1240

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor) $k=1.96$ or $k=2$ (which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Measurement Uncertainty for a Level of Confidence of 95 %, $U=2 \times U_c(y)$.

The BTL measurement uncertainty as below table:

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150 KHz ~ 30 MHz	2.32

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9 kHz~30 MHz	V	3.79
		9 kHz~30 MHz	H	3.57
		30 MHz~200 MHz	V	3.82
		30 MHz~200 MHz	H	3.60
		200 MHz~1,000 MHz	V	3.86
		200 MHz~1,000 MHz	H	3.94
		1 GHz~18 GHz	V	3.12
		1 GHz~18 GHz	H	3.68
		18 GHz~40 GHz	V	4.15
		18 GHz~40 GHz	H	4.14

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT



Equipment	Apex Lifestyle Small Cell	
Brand Name	N/A	
Test Model	AP1000-41	
Series Model	N/A	
Model Difference	N/A	
Hardware Version	REV1.0	
Software Version	v4.2.3	
Product Description	Operation Frequency	5150MHz ~ 5250MHz
	Modulation Technology	OFDM
	Bit Rate of Transmitter	866 Mbps
	Output Power (Max.)_Non-Beamforming	802.11a: 20.58dBm 802.11n (20M): 20.66dBm 802.11n (40M): 20.05dBm 802.11ac (20M): 20.74dBm 802.11ac (40M): 19.64dBm 802.11ac (80M): 18.27dBm
	Output Power (Max.)_with Beamforming	802.11n (20M): 20.45dBm 802.11n (40M): 19.84dBm 802.11ac (20M): 20.59dBm 802.11ac (40M): 19.44dBm 802.11ac (80M): 17.98dBm
Power Source	DC voltage supplied from AC/DC adapter. Model Name: S24B72-120A200-0K	
Power Rating	I/P: 100-240V ~50/60Hz Max. 0.8A O/P: 12V --- 2A	

Note:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- Channel List:

802.11a 802.11n 20 MHz 802.11ac 20 MHz		802.11n 40 MHz 802.11ac 40 MHz		802.11ac 80 MHz	
UNII-1		UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

3. Antenna Specification:

Ant.	Brand	P/N	Antenna Type	Connector	Gain(dBi)
1		SSR-1809026	Internal	IPEX	3.14
2		SSR-1805035	Internal	IPEX	3.40

Note:

This EUT supports MIMO 2X2, any transmit signals are correlated with each other. Then, Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$ dBi. So,

- (1) For Non Beamforming function, Directional gain = $10\log[(10^{3.14/20} + 10^{3.40/20})^2 / 2]$ dBi = 6.28. The output power limit is 30-6.28+6=29.72, the power density limit is 17-9.28+6=16.72.
- (2) For Beamforming function, Beamforming Gain: 3dBi. So, Directional gain = 3.40+3=6.40dBi. Then, the output power limit is 30-6.40+6=29.60, the power density limit is 17-6.40+6=16.60.

4. The worst case for 1TX/ 2TX as follow:

Operating Mode TX Mode	1TX	2TX
802.11a	V (ANT 2)	-
802.11n(20 MHz)	-	V (ANT 1+ANT 2)
802.11n(40 MHz)	-	V (ANT 1+ANT 2)
802.11ac(20 MHz)	-	V (ANT 1+ANT 2)
802.11ac(40 MHz)	-	V (ANT 1+ANT 2)
802.11ac(80 MHz)	-	V (ANT 1+ANT 2)

3.2 DESCRIPTION OF TEST MODES

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 above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX A Mode / CH36, CH40, CH48
Mode 2	TX N20 Mode / CH36, CH40, CH48
Mode 3	TX N40 Mode / CH38, CH46
Mode 4	TX AC20 Mode / CH36, CH40, CH48
Mode 5	TX AC40 Mode / CH38, CH46
Mode 6	TX AC80 Mode / CH42
Mode 7	TX Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test	
Final Test Mode	Description
Mode 7	TX Mode

For Radiated Test	
Final Test Mode	Description
Mode 1	TX A Mode / CH36, CH40, CH48
Mode 2	TX N20 Mode / CH36, CH40, CH48
Mode 3	TX N40 Mode / CH38, CH46
Mode 4	TX AC20 Mode / CH36, CH40, CH48
Mode 5	TX AC40 Mode / CH38, CH46
Mode 6	TX AC80 Mode / CH42

Note:

- (1) For radiated 30 MHz to 1000 MHz test, the 802.11a mode is found to be the worst case and recorded.

3.3 TABLE OF PARAMETERS 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

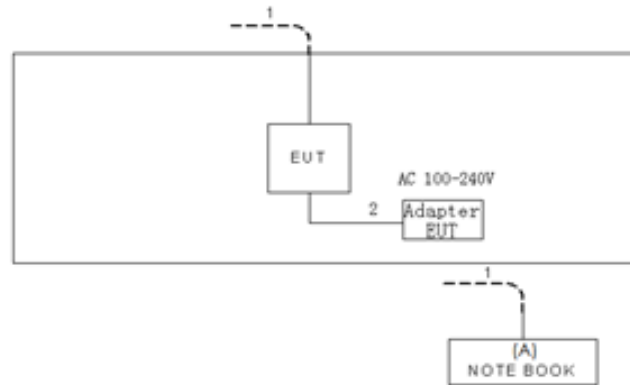
Non-Beamforming

Test Software Version	QATest Application V0.0.1.84		
Frequency (MHz)	5180	5200	5240
A Mode	18	1F	24
N20 Mode	1E	24	24
AC20 Mode	1E	24	24
Frequency (MHz)	5190	5230	
N40 Mode	18	21	
AC40 Mode	23	24	
Frequency (MHz)	5210		
AC80 Mode	1F		

With Beamforming

Test Software Version	QATest Application V0.0.1.84		
Frequency (MHz)	5180	5200	5240
N20 Mode	1E	24	24
AC20 Mode	1E	24	24
Frequency (MHz)	5190	5230	
N40 Mode	18	21	
AC40 Mode	23	24	
Frequency (MHz)	5210		
AC80 Mode	1F		

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 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.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	NOTEBOOK	DELL	INSPIRON 1420	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	10m	RJ45 Cable
2	NO	NO	1.8m	DC Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150 kHz-30 MHz)

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 -0.50	66 to 56*	56 to 46*
0.50 -5.0	56	46
5.0 -30.0	60	50

Note:

- (1) The tighter limit applies at the band edges.
- (2) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value - Limit Value

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

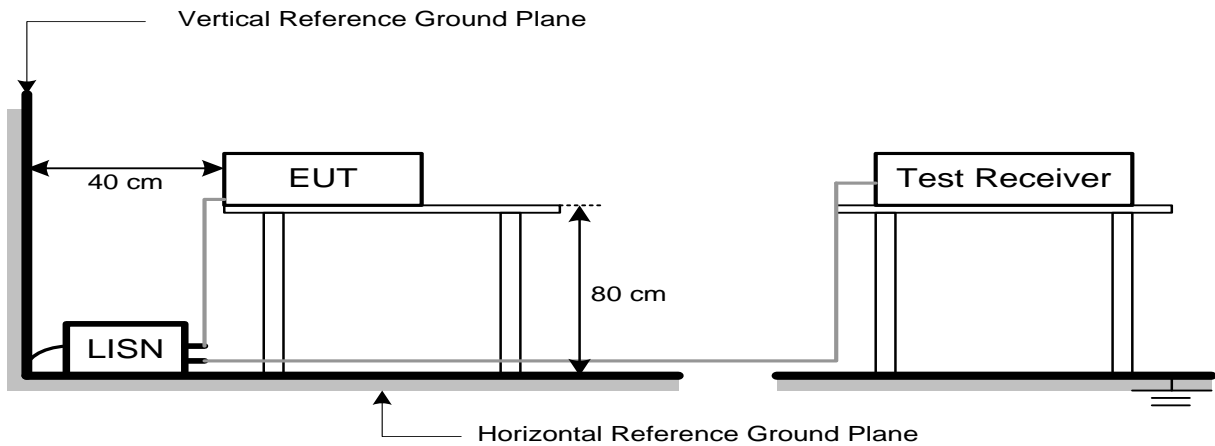
4.1.2 TEST PROCEDURE

- a. 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 equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. 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.
- c. 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.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting/TX Mode mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 53% Test Voltage: AC 120V/60Hz

4.1.7 TEST RESULTS

Please refer to the Appendix A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a “ * ” marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150 kHz to 30 MHz.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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
960~1000	500	3

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150-5250	-27	68.3

Note:

1. The following formula is used to convert the equipment isotropic radiated power (eirp) to

field strength: $E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m}$, where P is the eirp (Watts)

2. According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

4.2.2 TEST PROCEDURE

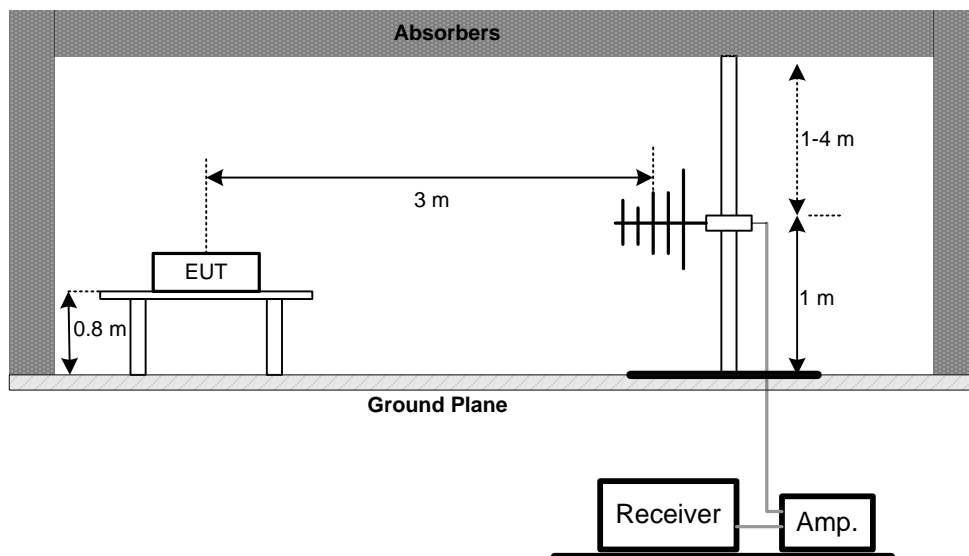
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

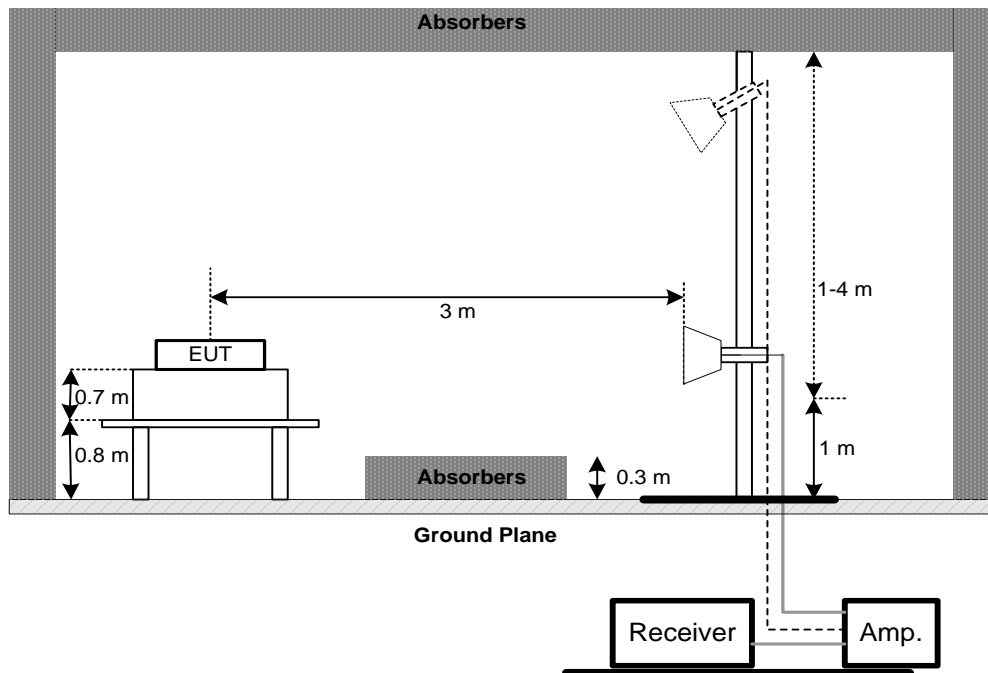
No deviation

4.2.4 TEST SETUP

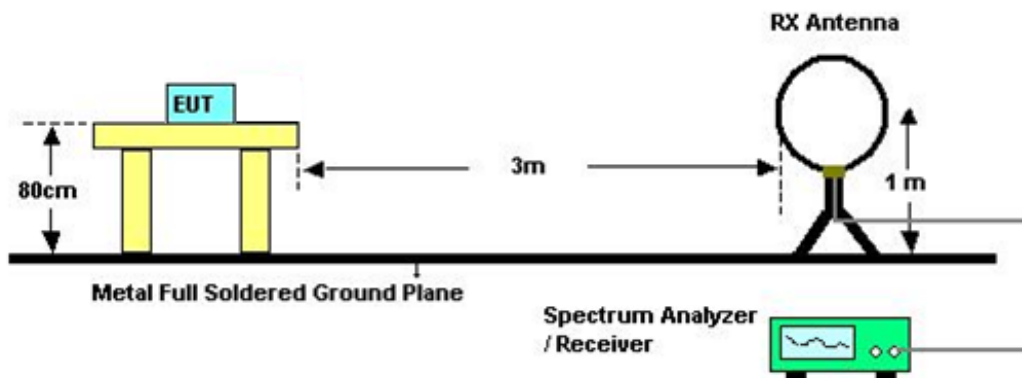
(A)Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(C) Radiated emissions below 30 MHz



4.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.2.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 60% Test Voltage: AC 120V/60Hz

4.2.7 TEST RESULTS (9 kHz TO 30 MHz)

Please refer to the Appendix B

Remark:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8 TEST RESULTS (30 MHz TO 1000 MHz)

Please refer to the Appendix C.

4.2.9 TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Appendix D.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. SPECTRUM BANDWIDTH

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Bandwidth	26 dB Bandwidth	5150-5250	PASS

5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below

b.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 26 dB Bandwidth
RBW	300 kHz(Bandwidth 20 MHz) 1 MHz(Bandwidth 40 MHz and 80 MHz)
VBW	1 MHz(Bandwidth 20 MHz) 3 MHz(Bandwidth 40 MHz and 80 MHz)

c. Measured the spectrum width with power higher than 26 dB below carrier

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 EUT TEST CONDITIONS

Temperature: 22.2°C Relative Humidity: 49.9% Test Voltage: AC 120V/60Hz

5.1.6 TEST RESULTS

Please refer to the Appendix E.

6. MAXIMUM OUTPUT POWER

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Maximum Output Power	AP device: 1 Watt (30 dBm)	5150-5250	PASS
	Client device: 250 mW (24 dBm)	5150-5250	PASS
<p>Note: For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).</p>			

6.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Used spectrum analyzer band power measurement function.
-

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz.
VBW	≥ 3 MHz.
Sweep points	≥ 2 x span / RBW
Detector	RMS
Trace	Trace average at least 100 traces in power averaging(rms) mode.
Sweep Time	auto

- Test was performed in accordance with method of KDB 789033 D02.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 EUT TEST CONDITIONS

Temperature: 22.2°C Relative Humidity: 49.9% Test Voltage: AC 120V/60Hz

6.1.6 TEST RESULTS

Please refer to the Appendix F.

7. POWER SPECTRAL DENSITY TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Power Spectral Density	AP device:17 dBm/MHz	5150-5250	PASS
	Client device:11 dBm/MHz	5150-5250	PASS

7.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
-

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz.
VBW	≥ 3 MHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

Note:

- The value measured with RBW=1 MHz is to be added with $10\log(500 \text{ kHz}/1 \text{ MHz})$ which is -3 dB. For example, if the measured value is +10dBm using RBW=1 MHz (that is +10 dBm/MHz), then the converted value will be +7dBm/500kHz.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 EUT TEST CONDITIONS

Temperature: 22.2°C Relative Humidity: 49.9% Test Voltage: AC 120V/60Hz

7.1.6 TEST RESULTS

Please refer to the Appendix H.

8. FREQUENCY STABILITY MEASUREMENT

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Frequency Stability	Specified in the user's manual	5150-5250	PASS

8.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b.

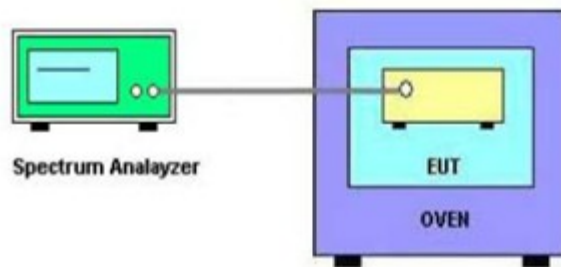
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Sweep Time	Auto

- c. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
- d. User manual temperature is 0°C~45°C.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 EUT TEST CONDITIONS

Temperature: 22.2°C Relative Humidity: 49.9% Test Voltage: AC 120V/60Hz

8.1.6 TEST RESULTS

Please refer to the Appendix I.

9. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 11, 2019
2	LISN	EMCO	3816/2	52765	Mar. 11, 2019
3	50Ω Terminator	SHX	TF2-3G-A	8122901	Mar. 11, 2019
4	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 11, 2019
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 23, 2019

Radiated Emission Measurement - 9KHZ TO 30MHZ					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Loop Antenna	EM	EM-6876-1	230	Feb. 07, 2019
2	Cable	N/A	RG 213/U	C-102	Jun. 01, 2019
3	EMI Test Receiver	R&S	ESCI	100382	Mar. 11, 2019
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement - 30MHZ TO 1000MHZ					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 11, 2019
2	Amplifier	HP	8447D	2944A09673	Aug. 11, 2019
3	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May 25, 2019
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement - Above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 11, 2019
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2019
3	Amplifier	Agilent	8449B	3008A02274	Mar. 11, 2019
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 11, 2019
5	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	B10-01-01-12M	18072744	Jul. 30, 2019
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Spectrum Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Maximum Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019
2	Precision Oven Tester	Bell	BTH-50C	20170306001	Mar. 11, 2019

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

10. EUT TEST PHOTOS

Conducted Measurement Photos



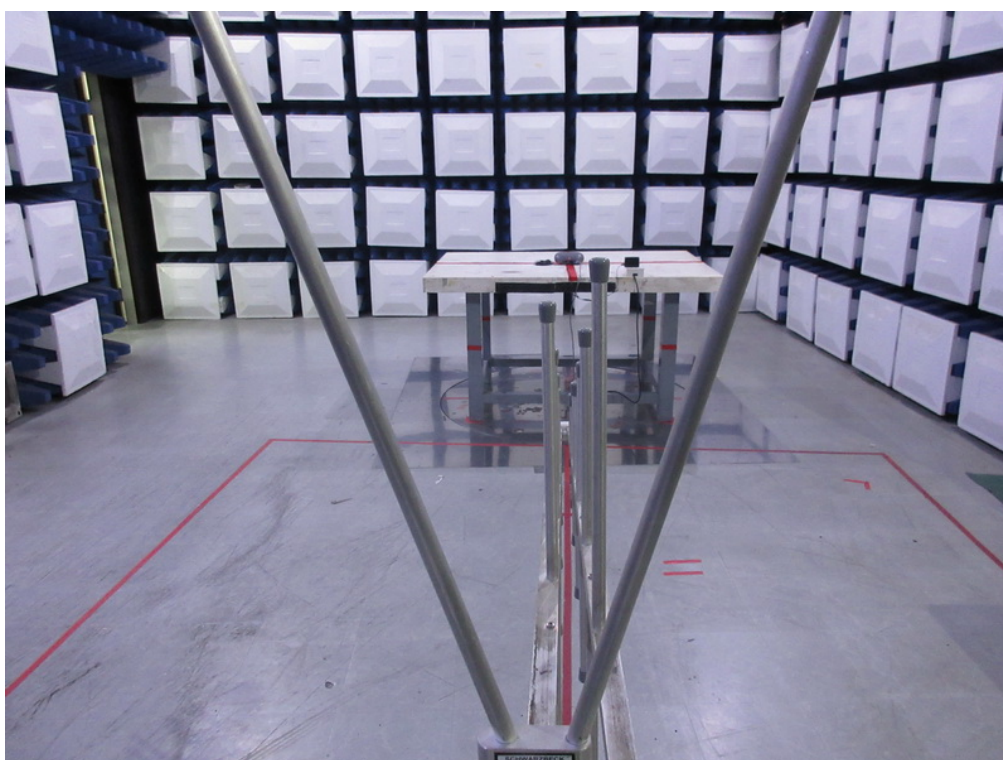
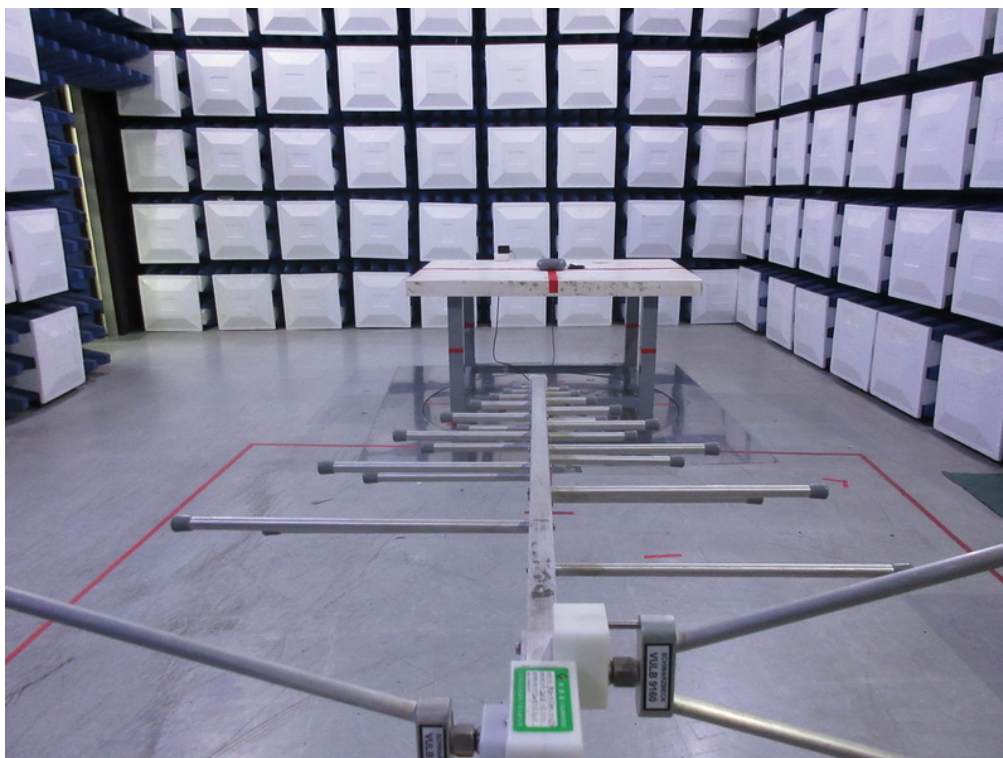
Radiated Measurement Photos

9 kHz to 30 MHz



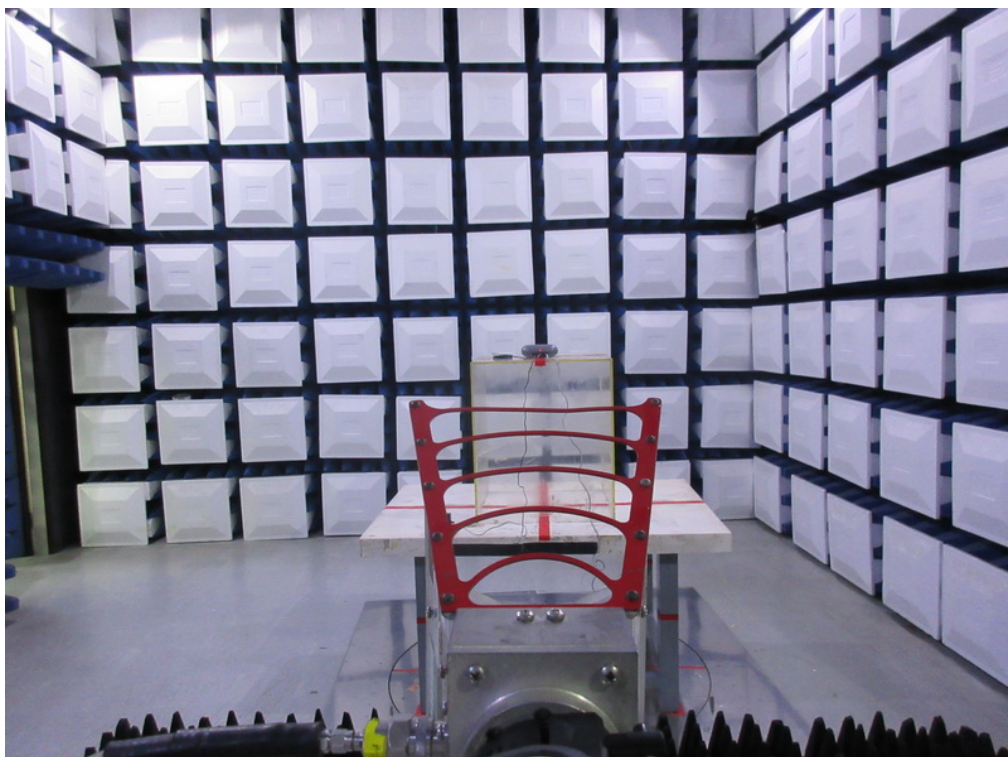
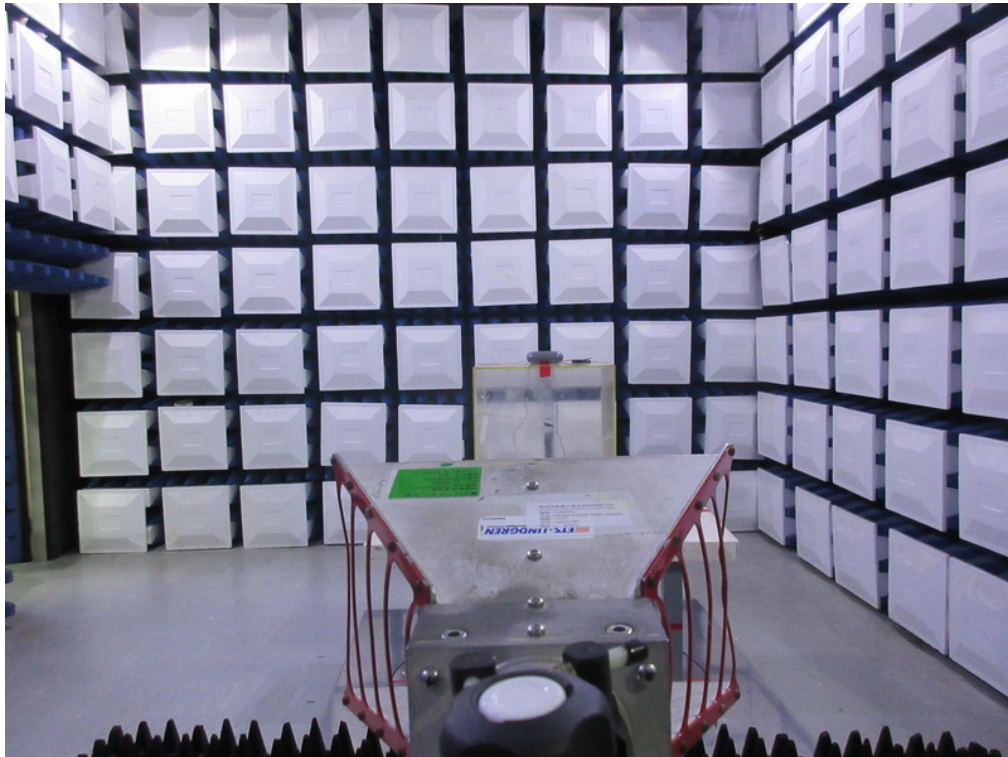
Radiated Measurement Photos

30 MHz to 1000 MHz



Radiated Measurement Photos

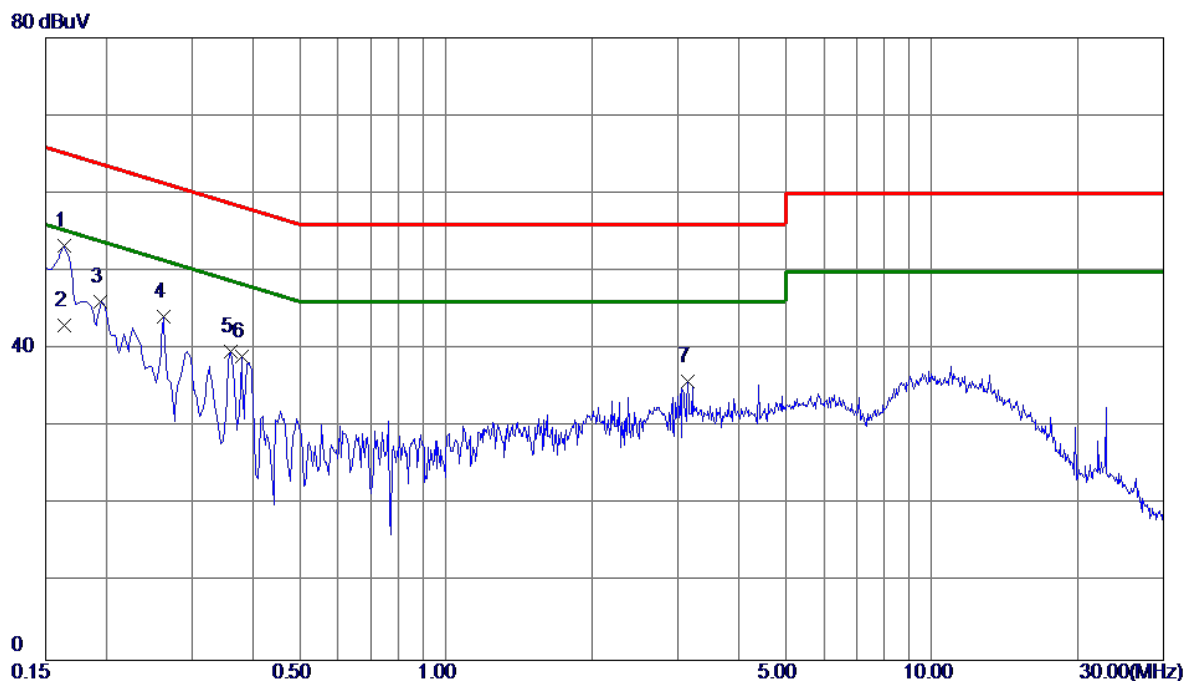
Above 1000 MHz



APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode

Line

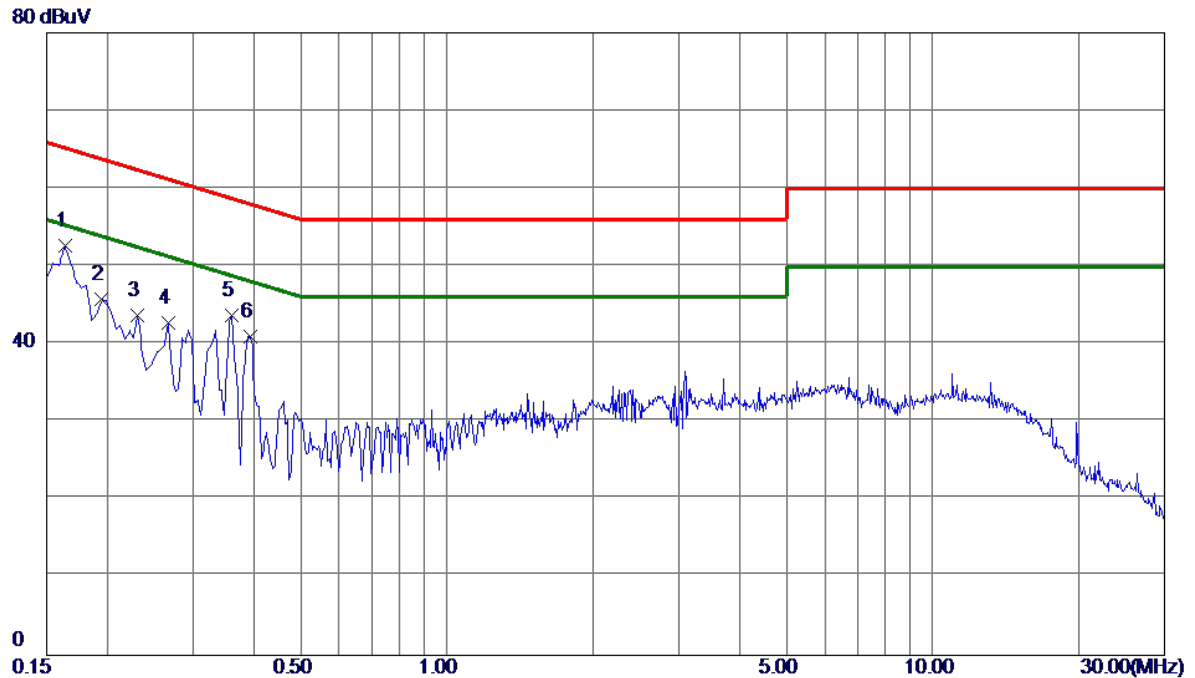


No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1635	43.51	9.82	53.33	65.28	-11.95	Peak	
2	0.1635	33.20	9.82	43.02	55.28	-12.26	AVG	
3	0.1949	36.26	9.82	46.08	63.83	-17.75	Peak	
4	0.2625	34.28	9.82	44.10	61.35	-17.25	Peak	
5	0.3615	29.94	9.81	39.75	58.69	-18.94	Peak	
6	0.3795	29.27	9.81	39.08	58.29	-19.21	Peak	
7	3.1470	25.79	10.06	35.85	56.00	-20.15	Peak	

Note: The test result has included the cable loss.

Test Mode: TX Mode

Neutral



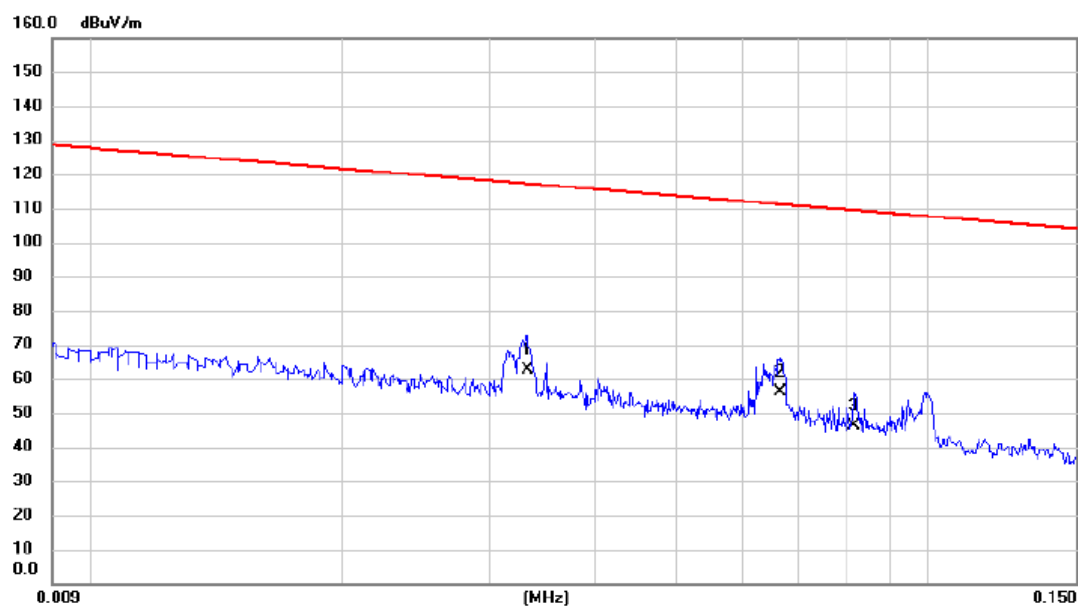
No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1635	42.74	9.91	52.65	65.28	-12.63	Peak	
2	0.1949	35.78	9.91	45.69	63.83	-18.14	Peak	
3	0.2310	33.74	9.92	43.66	62.41	-18.75	Peak	
4	0.2670	32.77	9.92	42.69	61.21	-18.52	Peak	
5	0.3615	33.67	9.95	43.62	58.69	-15.07	Peak	
6	0.3930	30.96	9.95	40.91	58.00	-17.09	Peak	

Note: The test result has included the cable loss.

APPENDIX B - RADIATED EMISSION (9 KHZ TO 30 MHZ)

Test Mode: TX Mode

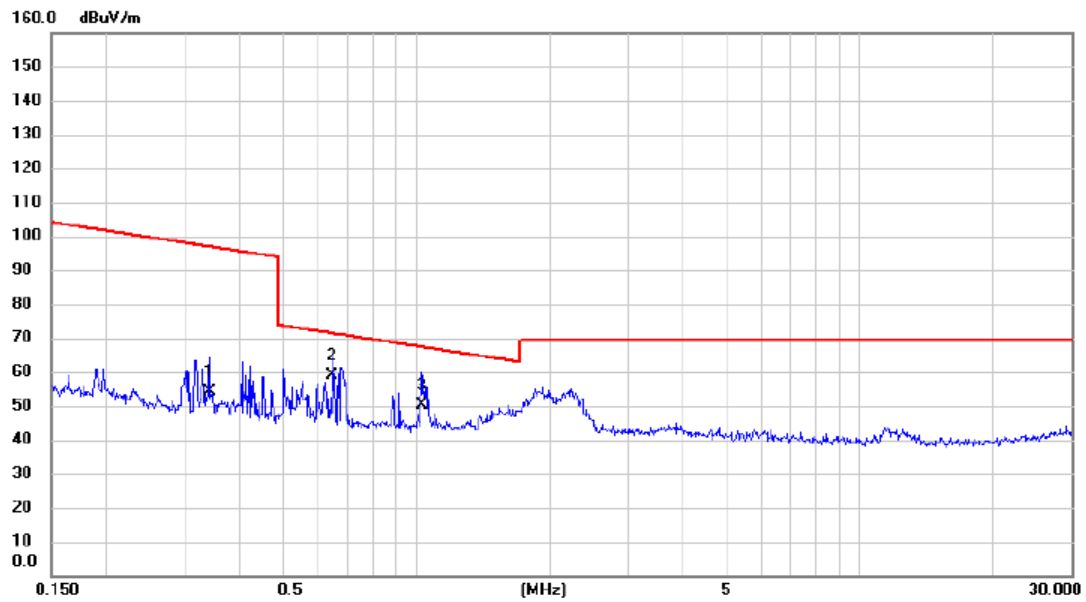
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0333	42.90	19.81	62.71	117.16	-54.45	AVG	
2		0.0667	36.90	19.20	56.10	111.12	-55.02	AVG	
3		0.0816	27.40	18.88	46.28	109.37	-63.09	AVG	

Test Mode: TX Mode

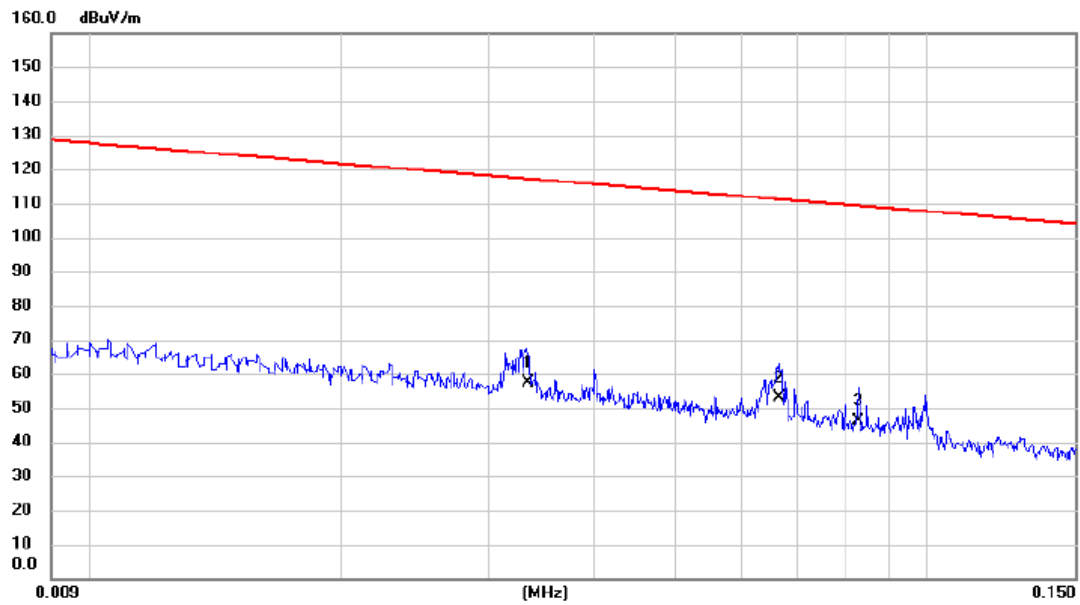
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.3410	37.30	17.02	54.32	96.95	-42.63	AVG	
2	*	0.6440	42.20	16.91	59.11	71.43	-12.32	QP	
3		1.0265	33.40	16.61	50.01	67.38	-17.37	QP	

Test Mode: TX Mode

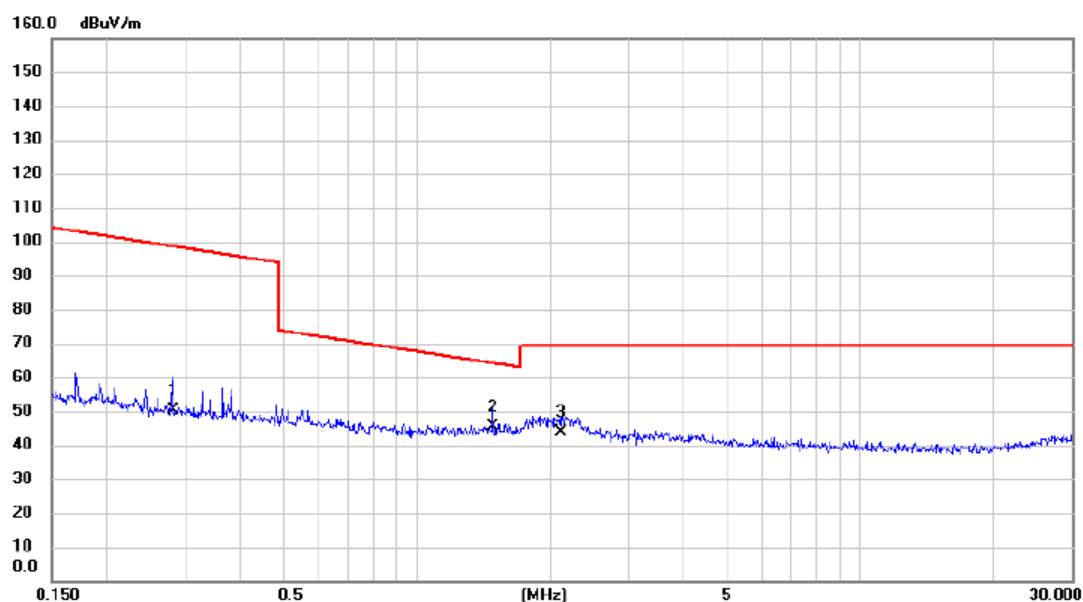
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0334	37.50	19.81	57.31	117.13	-59.82	AVG	
2	*	0.0665	33.80	19.20	53.00	111.15	-58.15	AVG	
3		0.0827	27.19	18.86	46.05	109.25	-63.20	AVG	

Test Mode: TX Mode

Ant 90°

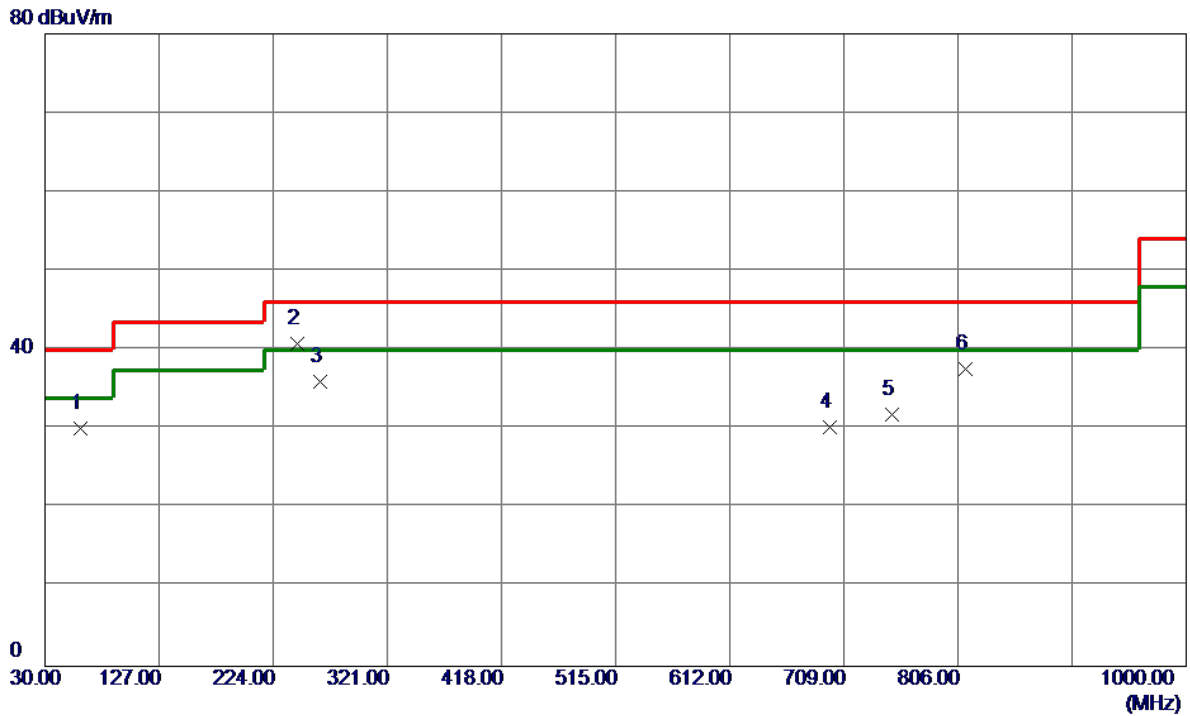


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.2818	33.30	17.05	50.35	98.61	-48.26	AVG	
2	*	1.4796	28.60	16.85	45.45	64.20	-18.75	QP	
3		2.1213	26.70	17.05	43.75	69.54	-25.79	QP	

APPENDIX C - RADIATED EMISSION (30 MHZ TO 1000 MHZ)

Test Mode: TX A Mode 5180 MHz

Vertical

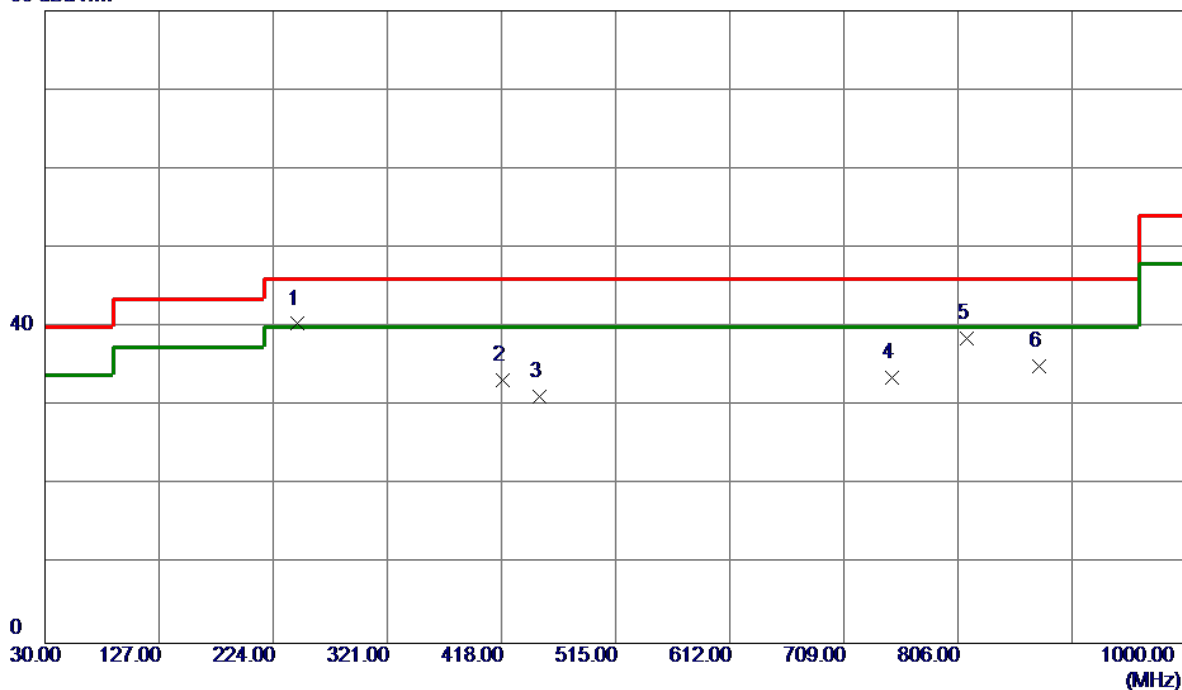


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	60.0700	45.84	-15.69	30.15	40.00	-9.85	Peak	
2 *	244.3700	55.26	-14.51	40.75	46.00	-5.25	Peak	
3	264.2550	49.11	-13.09	36.02	46.00	-9.98	Peak	
4	697.3600	33.17	-2.87	30.30	46.00	-15.70	Peak	
5	750.2250	35.84	-4.03	31.81	46.00	-14.19	Peak	
6	812.3050	38.84	-1.23	37.61	46.00	-8.39	Peak	

Test Mode: TX A Mode 5180 MHz

Horizontal

80 dBuV/m

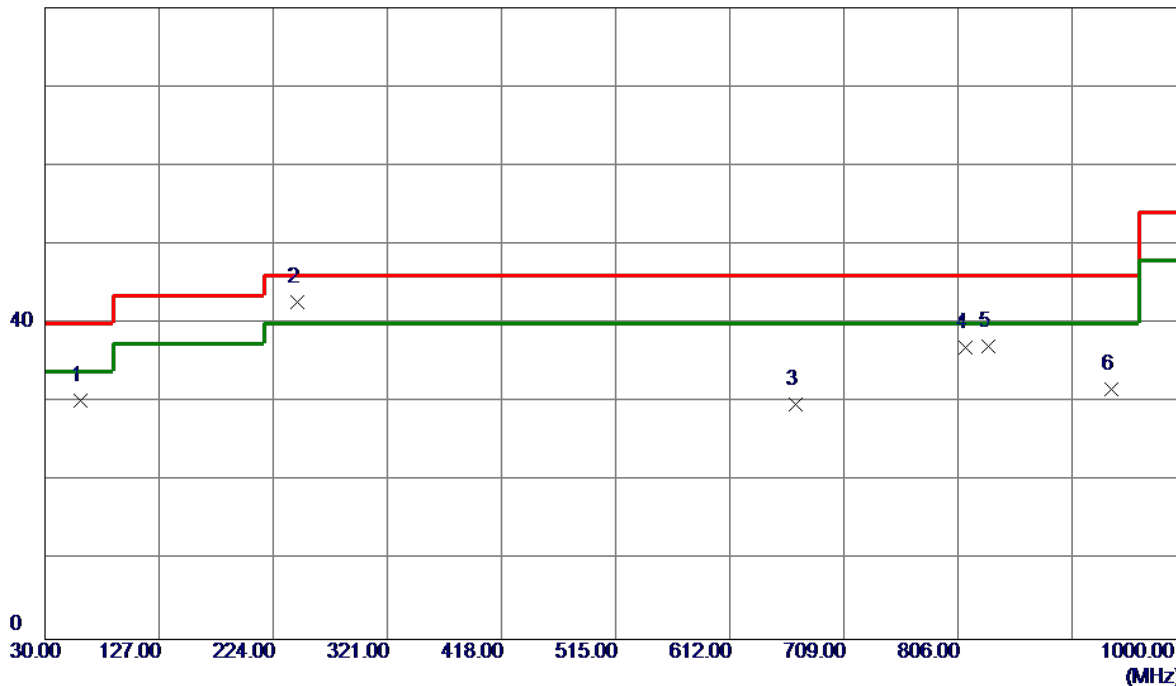


No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	244.8550	54.89	-14.49	40.40	46.00	-5.60	QP	
2	419.4550	41.93	-8.61	33.32	46.00	-12.68	Peak	
3	450.0100	38.66	-7.41	31.25	46.00	-14.75	Peak	
4	750.2250	37.62	-4.03	33.59	46.00	-12.41	Peak	
5	813.7600	39.81	-1.25	38.56	46.00	-7.44	QP	
6	874.8700	36.18	-1.21	34.97	46.00	-11.03	Peak	

Test Mode: TX A Mode 5200 MHz

Vertical

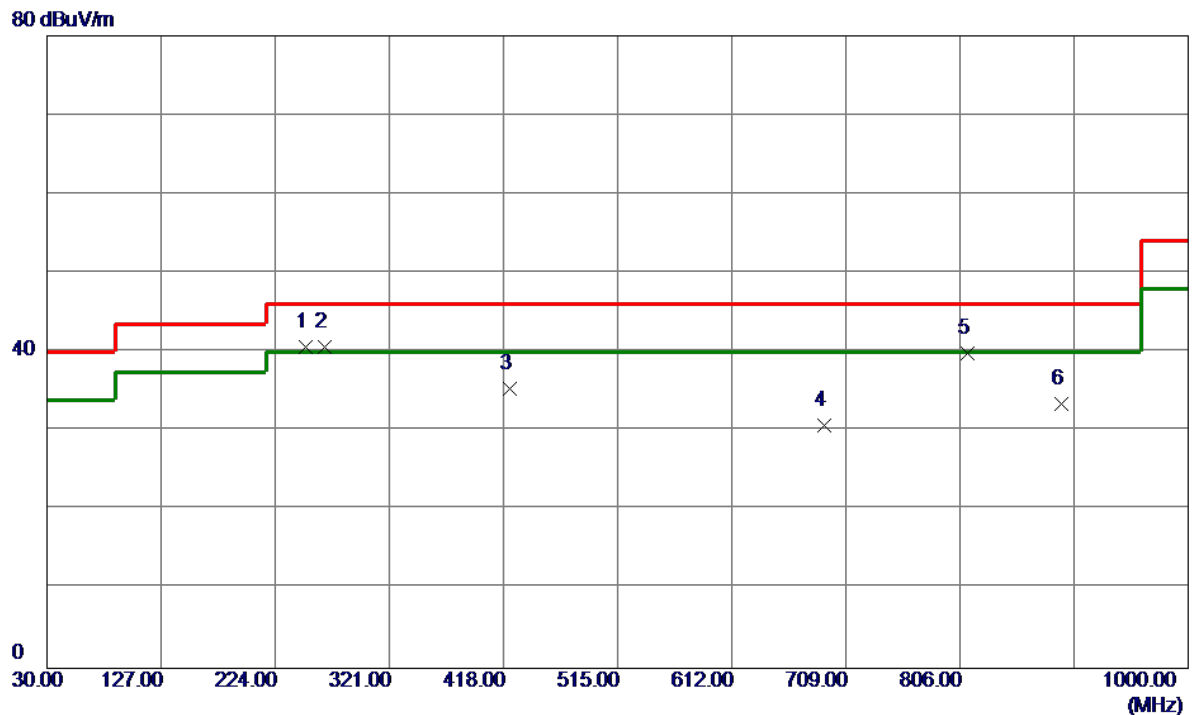
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	60.0700	45.89	-15.69	30.20	40.00	-9.80	Peak	
2 *	244.3700	57.27	-14.51	42.76	46.00	-3.24	Peak	
3	668.2600	34.06	-4.29	29.77	46.00	-16.23	Peak	
4	812.3050	38.26	-1.23	37.03	46.00	-8.97	Peak	
5	832.1900	38.67	-1.54	37.13	46.00	-8.87	Peak	
6	936.4650	30.82	0.87	31.69	46.00	-14.31	Peak	

Test Mode: TX A Mode 5200 MHz

Horizontal

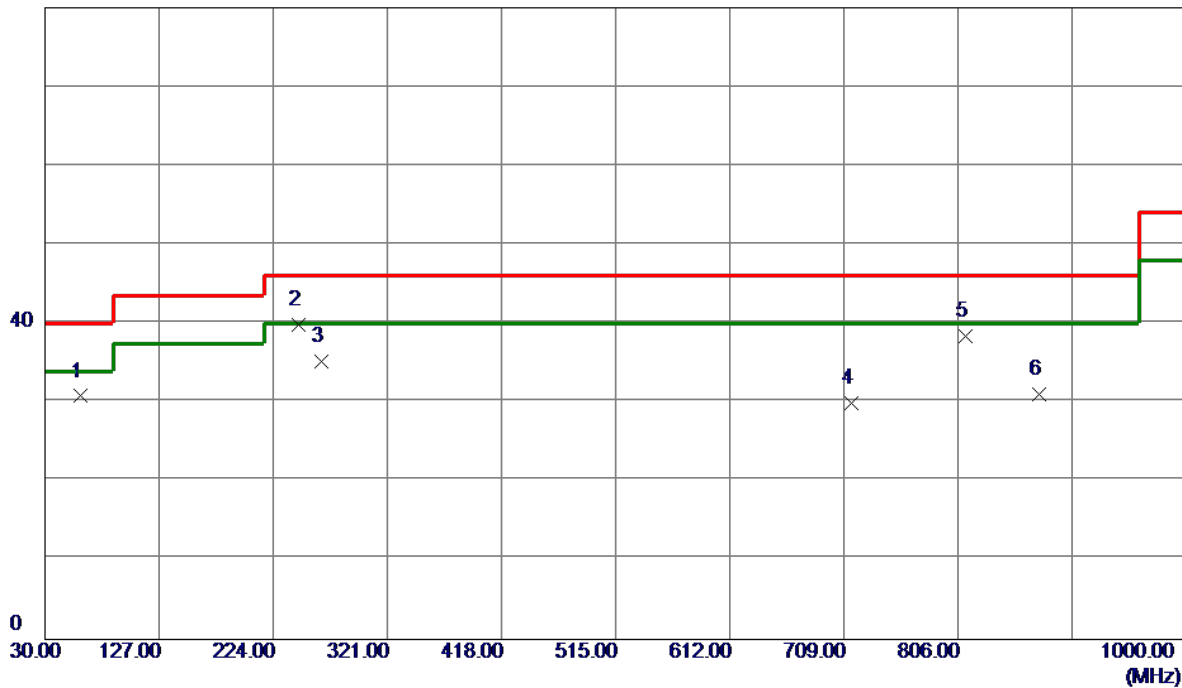


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	250.1900	54.98	-14.28	40.70	46.00	-5.30	QP	
2	265.7100	53.57	-12.94	40.63	46.00	-5.37	Peak	
3	423.8200	43.78	-8.44	35.34	46.00	-10.66	Peak	
4	691.0550	33.89	-3.18	30.71	46.00	-15.29	Peak	
5	812.3050	41.07	-1.23	39.84	46.00	-6.16	Peak	
6	891.8450	34.17	-0.80	33.37	46.00	-12.63	Peak	

Test Mode: TX A Mode 5240 MHz

Vertical

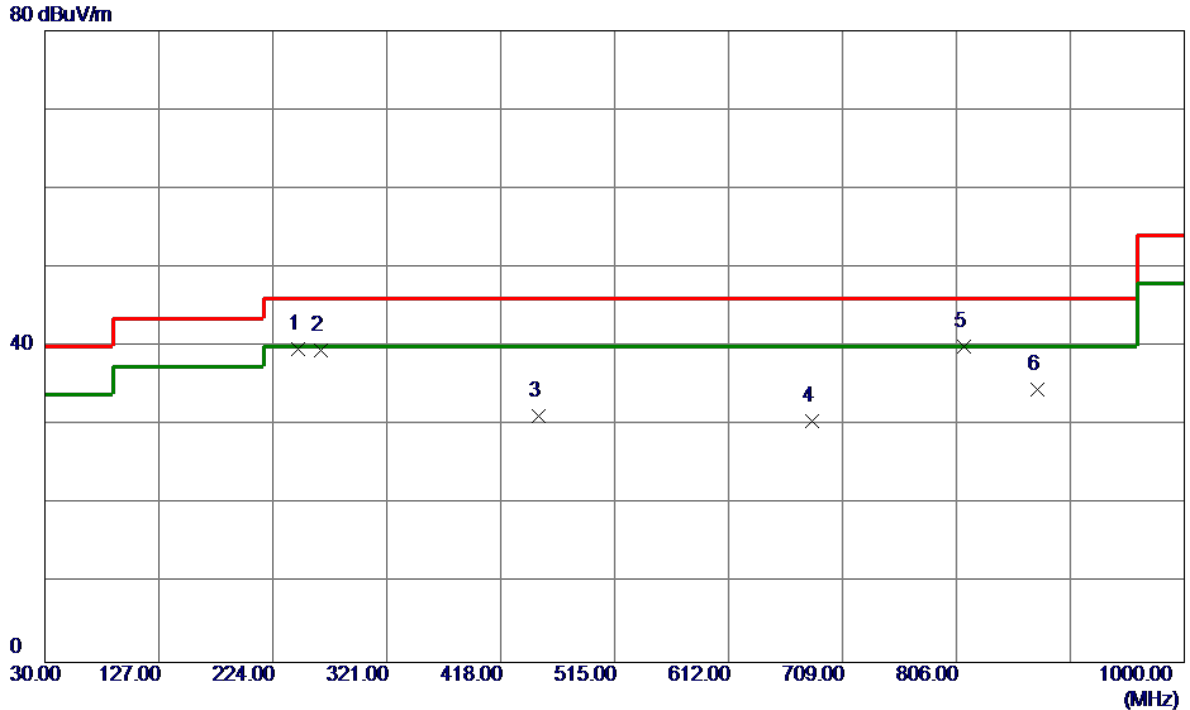
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	60.5550	46.58	-15.78	30.80	40.00	-9.20	Peak	
2 *	245.3400	54.35	-14.47	39.88	46.00	-6.12	Peak	
3	265.2250	48.21	-12.99	35.22	46.00	-10.78	Peak	
4	715.3050	33.09	-3.14	29.95	46.00	-16.05	Peak	
5	812.3050	39.58	-1.23	38.35	46.00	-7.65	Peak	
6	874.8700	32.19	-1.21	30.98	46.00	-15.02	Peak	

Test Mode: TX A Mode 5240 MHz

Horizontal



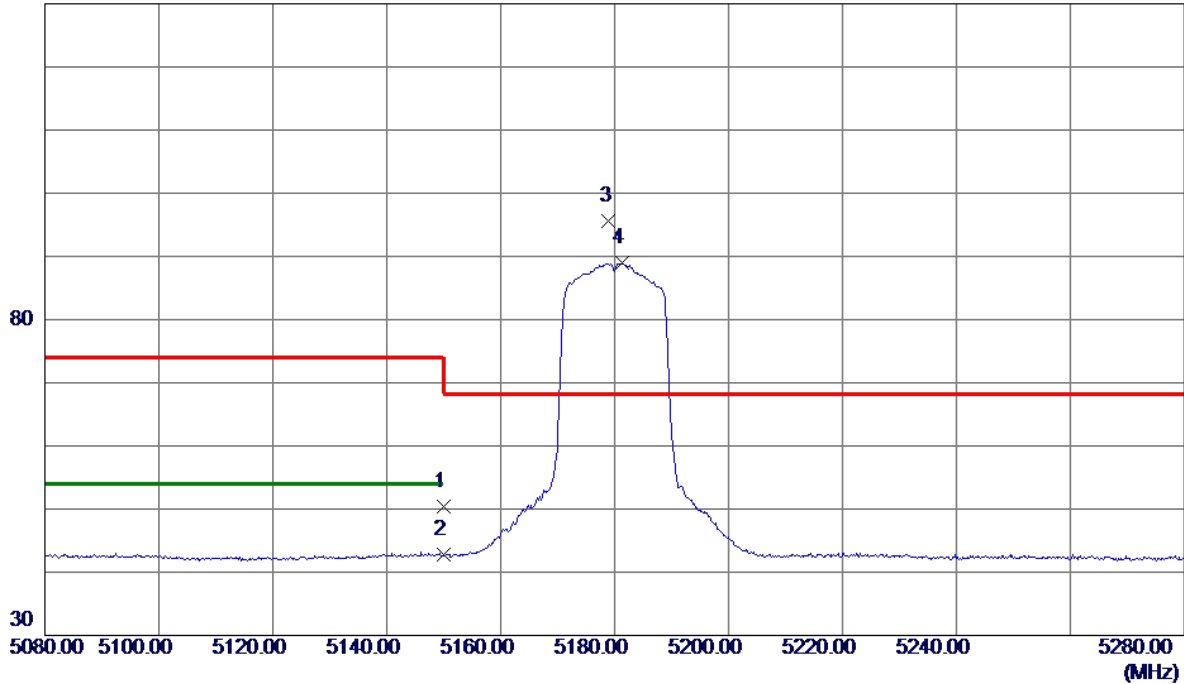
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	245.8250	54.08	-14.45	39.63	46.00	-6.37	QP	
2	265.2250	52.50	-12.99	39.51	46.00	-6.49	Peak	
3	450.4950	38.67	-7.42	31.25	46.00	-14.75	Peak	
4	682.8100	34.13	-3.58	30.55	46.00	-15.45	Peak	
5 *	812.3050	41.18	-1.23	39.95	46.00	-6.05	Peak	
6	874.8700	35.80	-1.21	34.59	46.00	-11.41	Peak	

APPENDIX D - RADIATED EMISSION (ABOVE 1000 MHZ)

Orthogonal Axis:	X
Test Mode:	TX A Mode 5180 MHz

Vertical

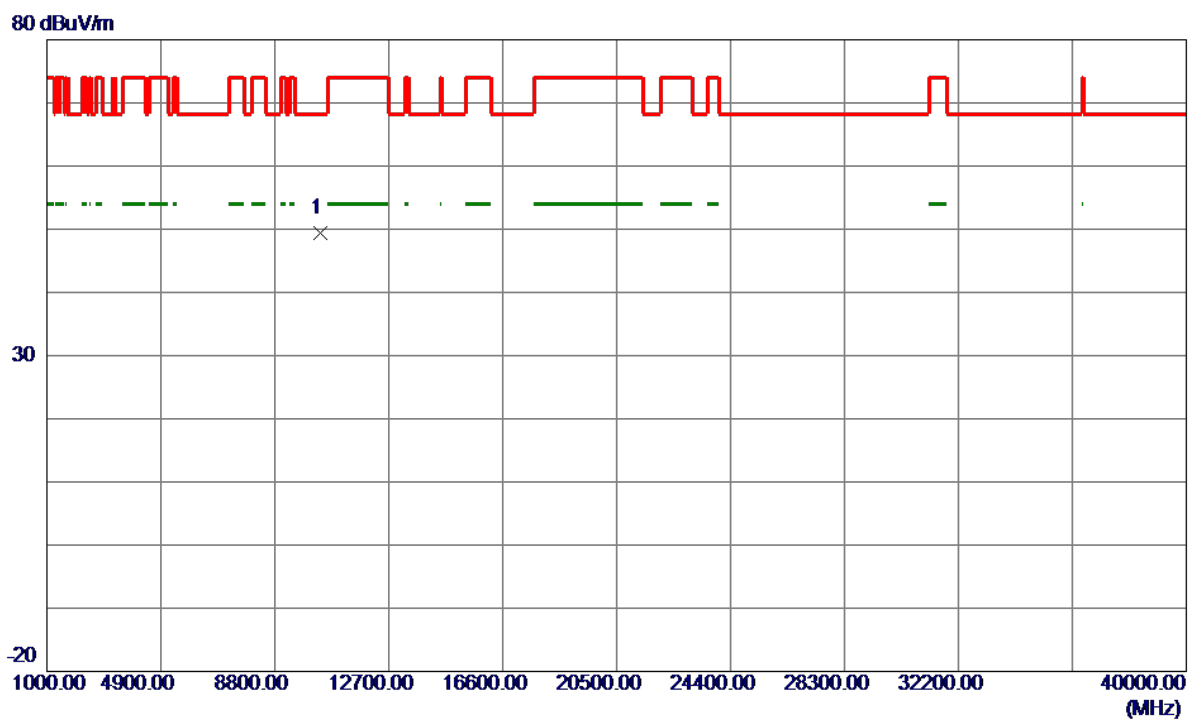
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	35.48	14.91	50.39	74.00	-23.61	Peak	
2	5150.0000	27.93	14.91	42.84	54.00	-11.16	AVG	
3 *	5179.0000	80.69	14.97	95.66	68.30	27.36	Peak	No Limit
4	5181.3000	73.96	14.98	88.94	999.00	-910.06	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX A Mode 5180 MHz

Vertical

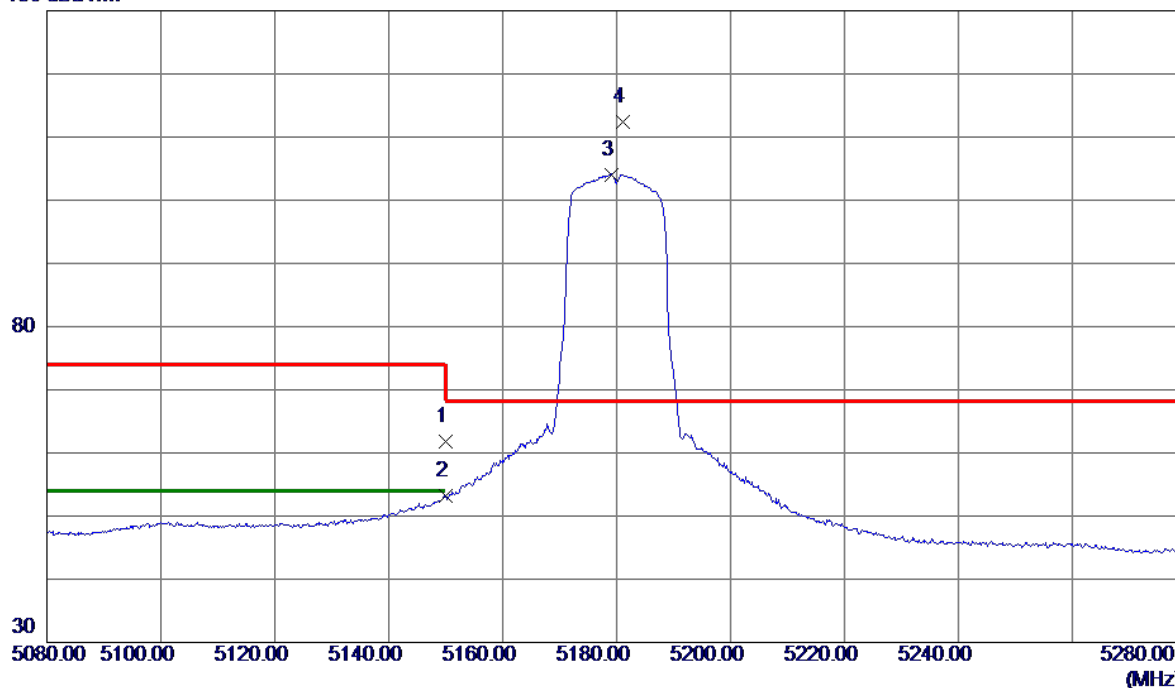


No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10368.3700	36.47	12.91	49.38	68.30	-18.92	Peak	

Orthogonal Axis:	X
Test Mode:	TX A Mode 5180 MHz

Horizontal

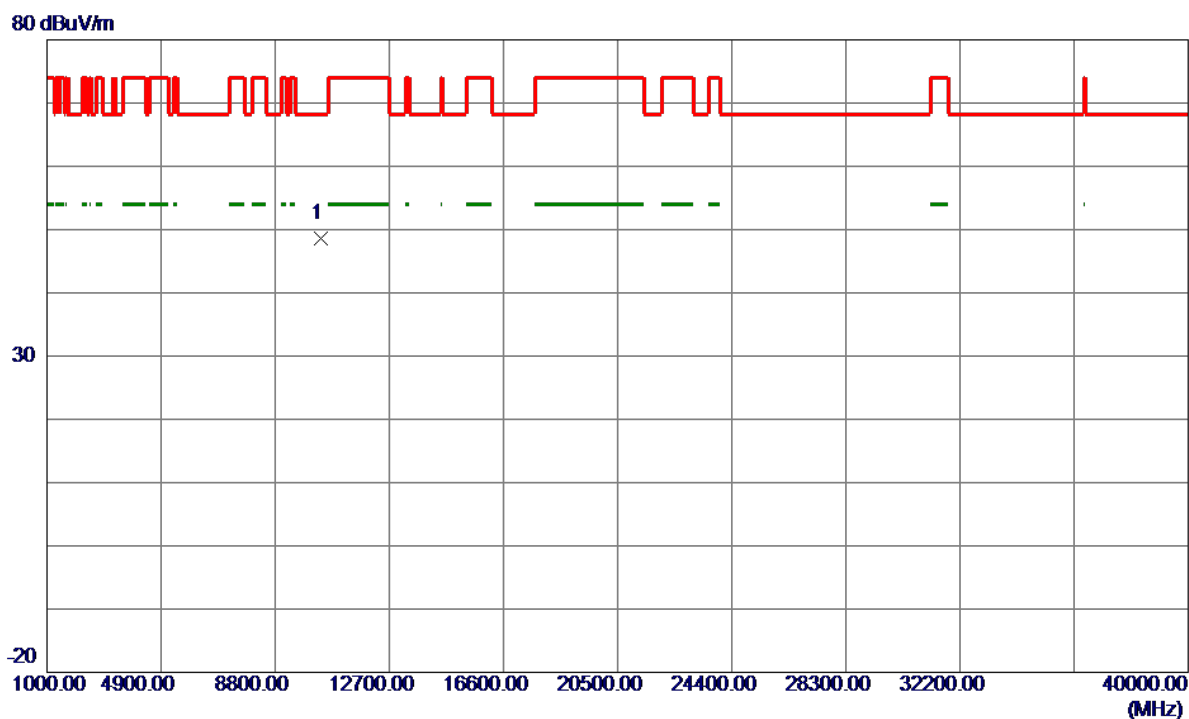
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	46.84	14.91	61.75	74.00	-12.25	Peak	
2	5150.0000	38.24	14.91	53.15	54.00	-0.85	AVG	
3	5179.1000	89.13	14.97	104.10	999.00	-894.90	AVG	No Limit
4 *	5181.2000	97.45	14.98	112.43	68.30	44.13	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX A Mode 5180 MHz

Horizontal

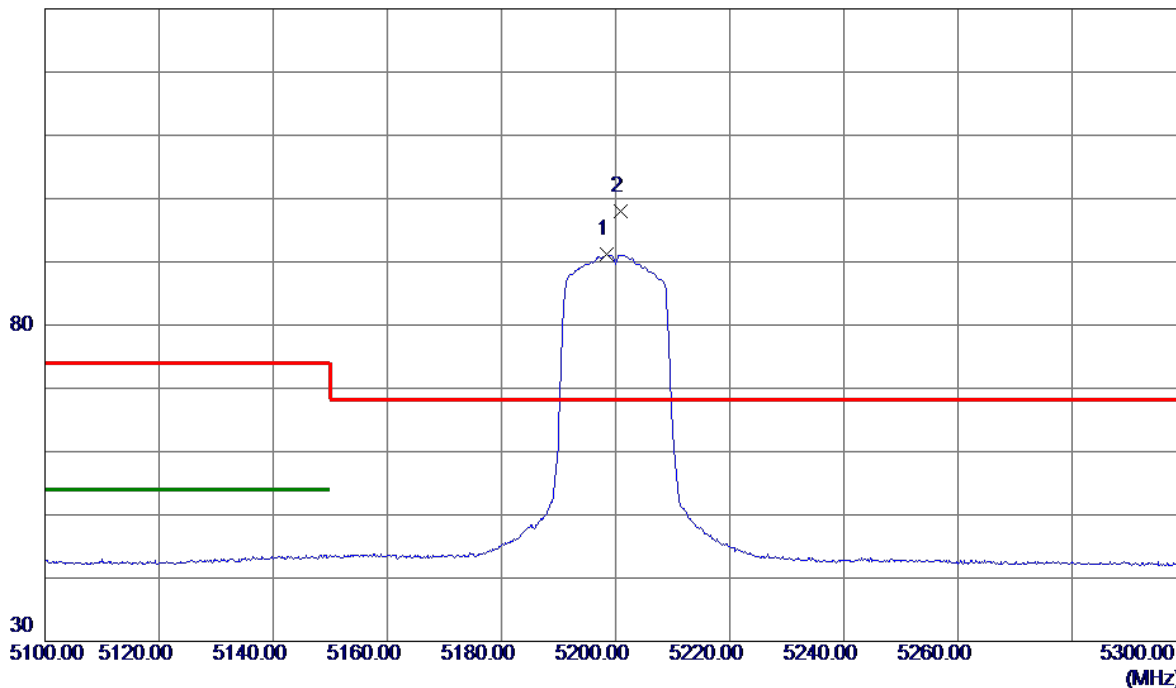


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10354.7699	35.73	12.88	48.61	68.30	-19.69	Peak	

Orthogonal Axis:	X
Test Mode:	TX A Mode 5200 MHz

Vertical

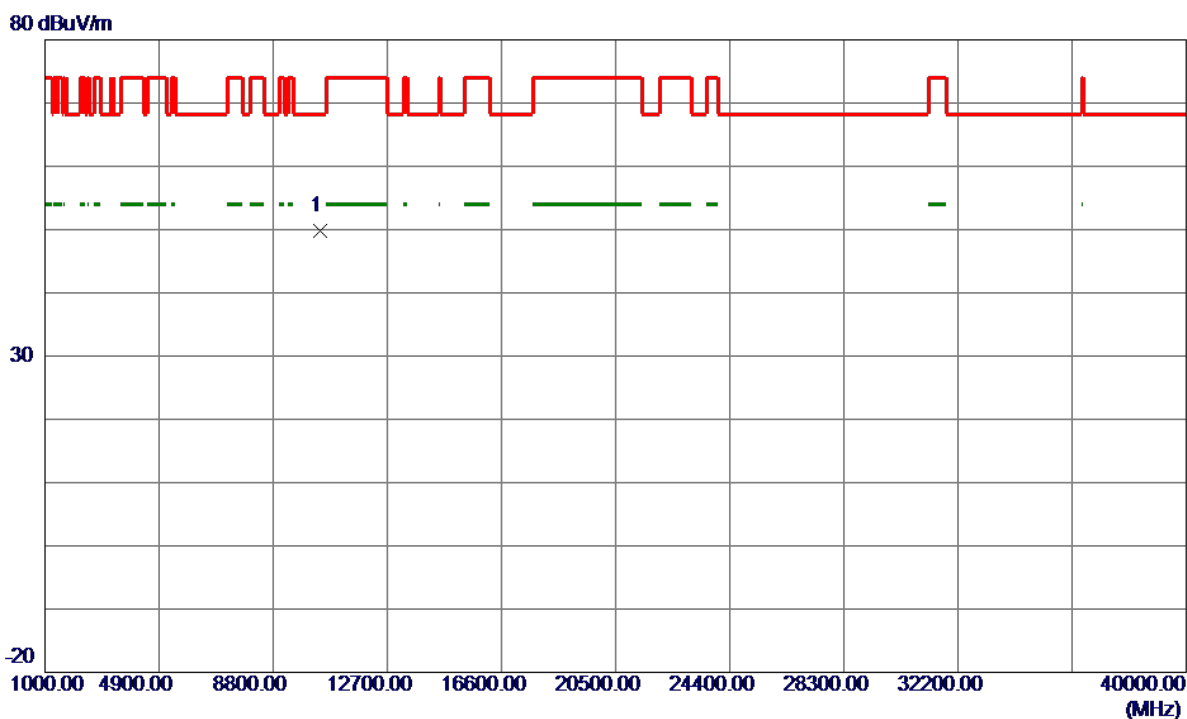
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5198.5000	76.11	15.01	91.12	999.00	-907.88	AVG	No Limit
2 *	5200.9000	82.98	15.02	98.00	68.30	29.70	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX A Mode 5200 MHz

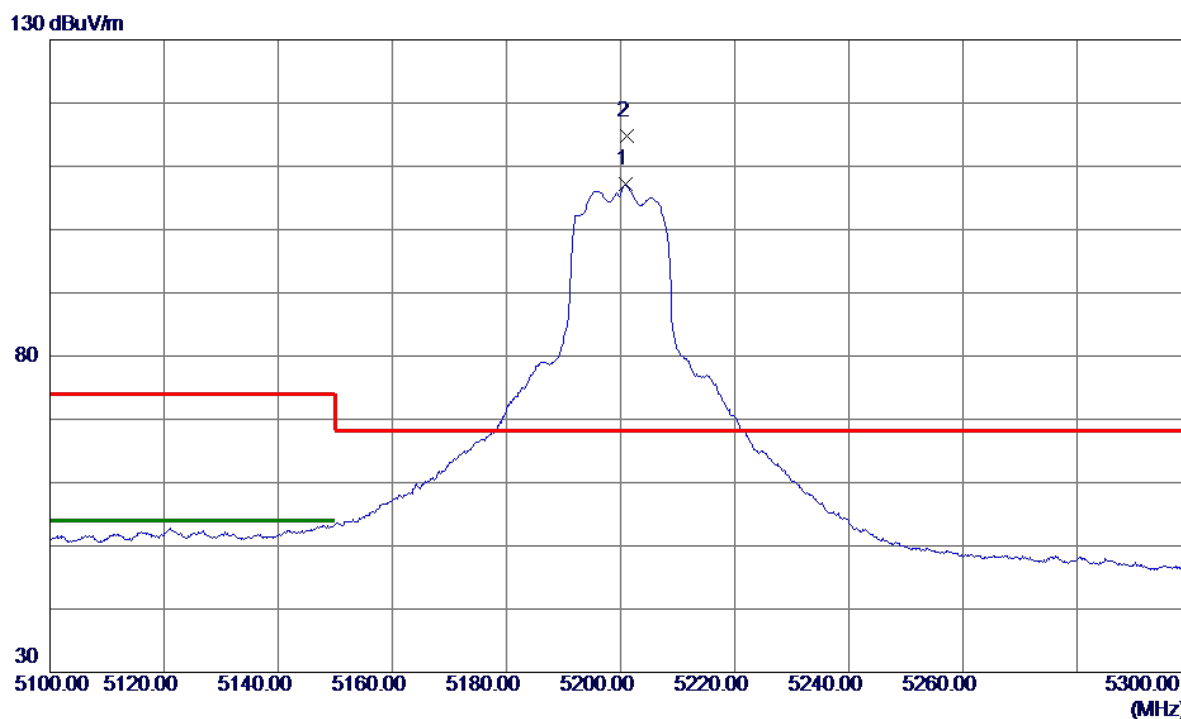
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10390.5300	36.93	12.95	49.88	68.30	-18.42	Peak	

Orthogonal Axis:	X
Test Mode:	TX A Mode 5200 MHz

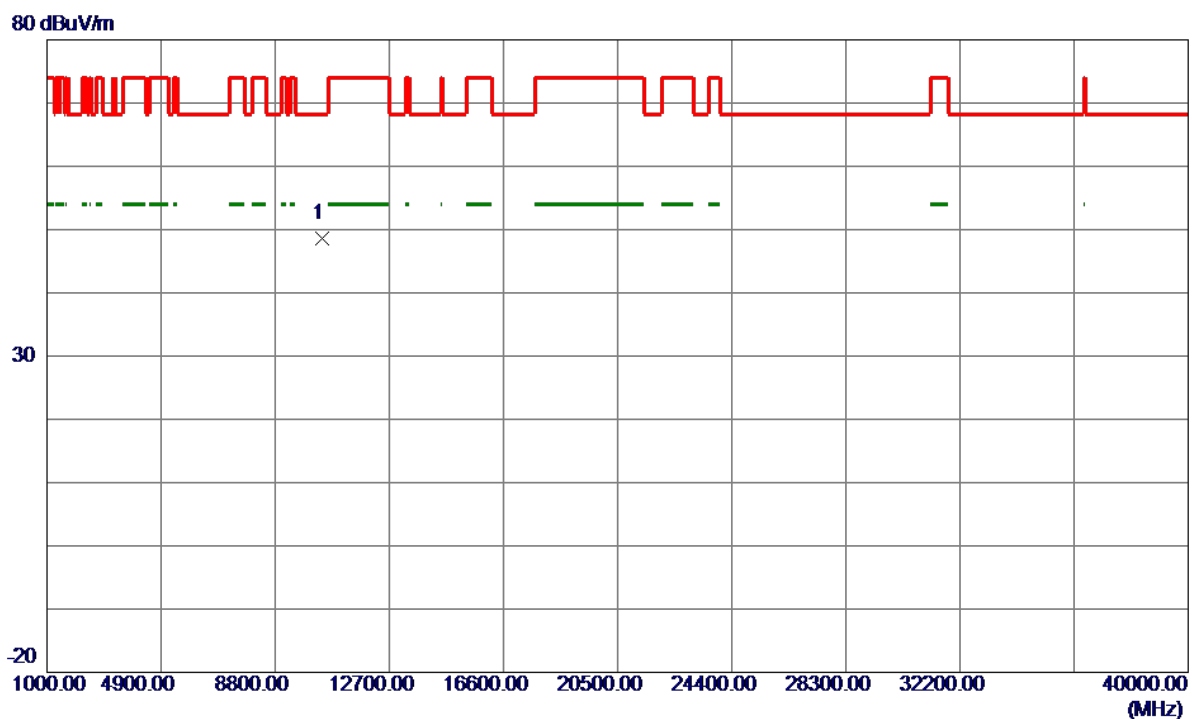
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5200.9000	92.11	15.02	107.13	999.00	-891.87	AVG	No Limit
2 *	5201.1000	99.74	15.02	114.76	68.30	46.46	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX A Mode 5200 MHz

Horizontal

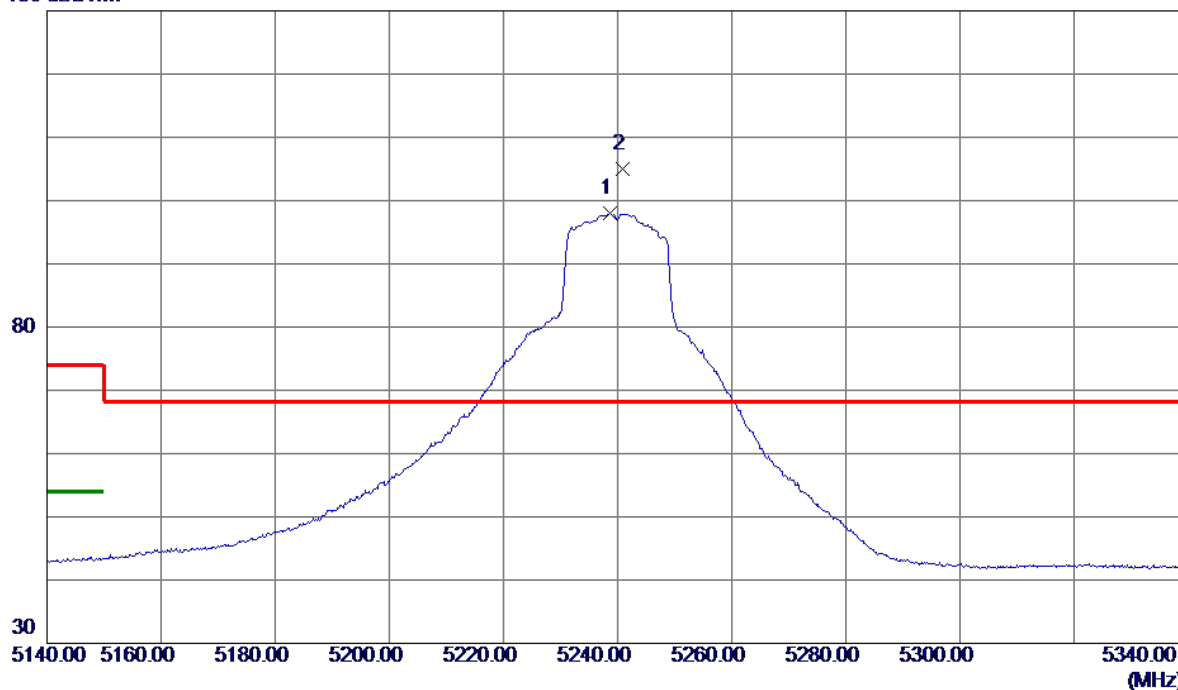


No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10401.6400	35.63	12.98	48.61	68.30	-19.69	Peak	

Orthogonal Axis:	X
Test Mode:	TX A Mode 5240 MHz

Vertical

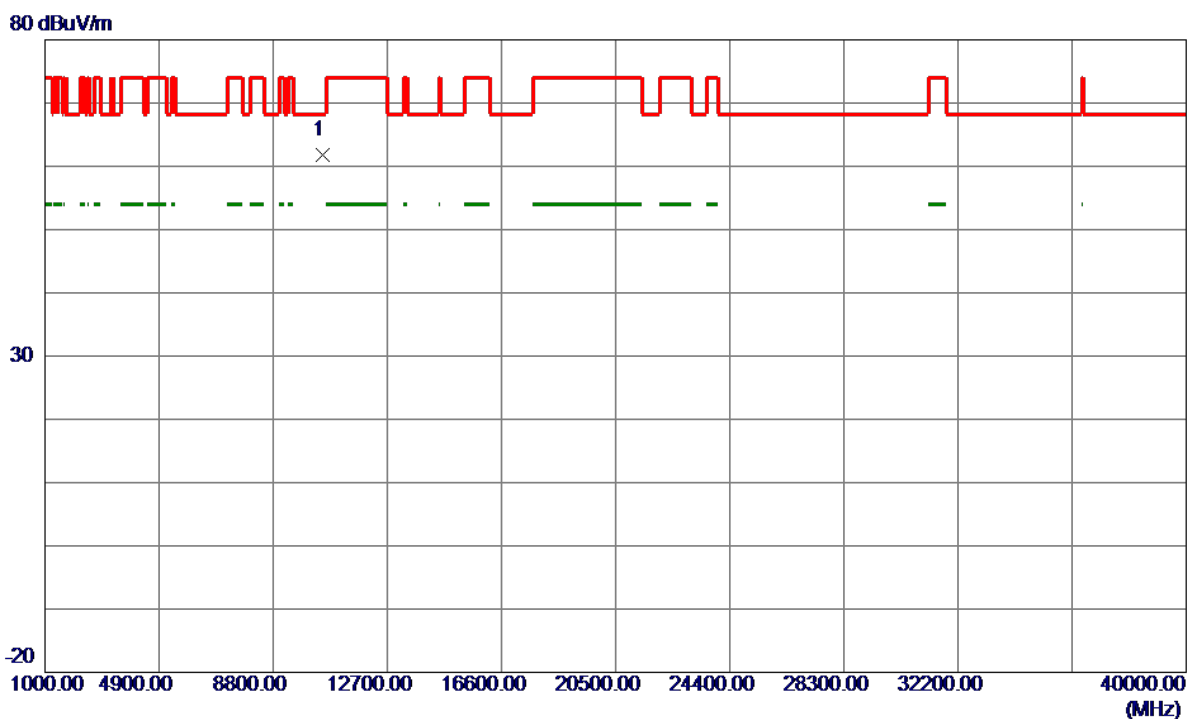
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5238.7000	82.85	15.09	97.94	999.00	-901.06	AVG	No Limit
2 *	5240.8000	89.89	15.10	104.99	68.30	36.69	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX A Mode 5240 MHz

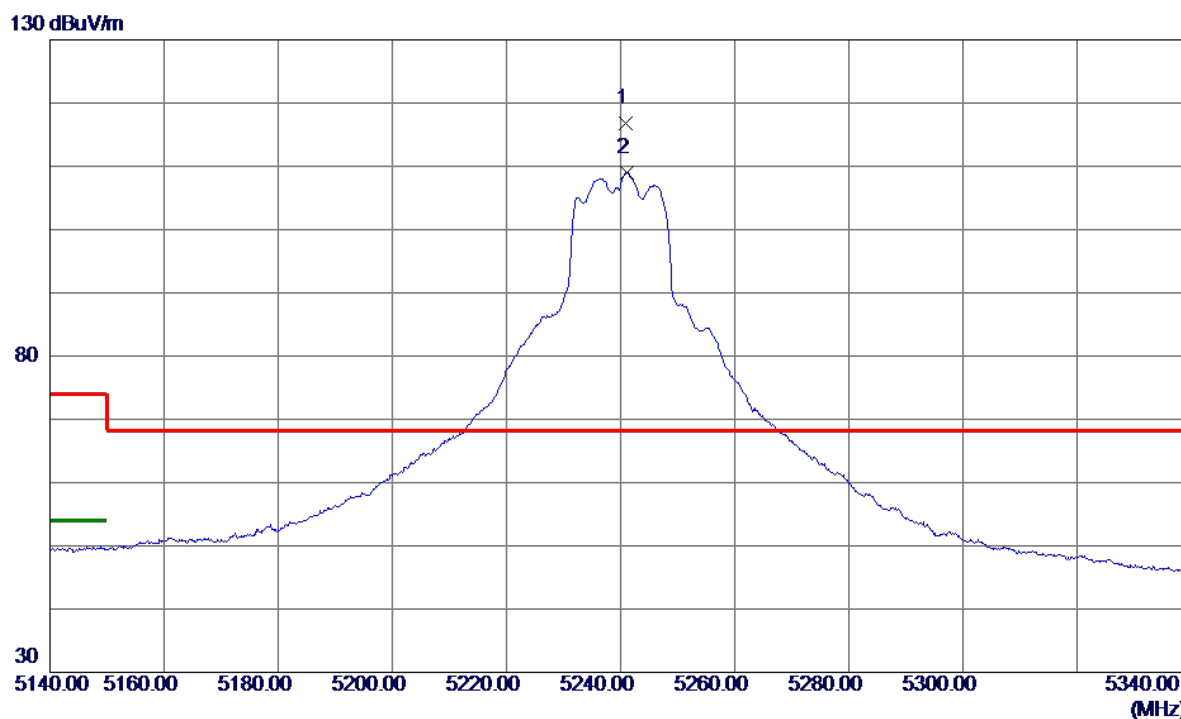
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10480.7200	48.70	13.14	61.84	68.30	-6.46	Peak	

Orthogonal Axis:	X
Test Mode:	TX A Mode 5240 MHz

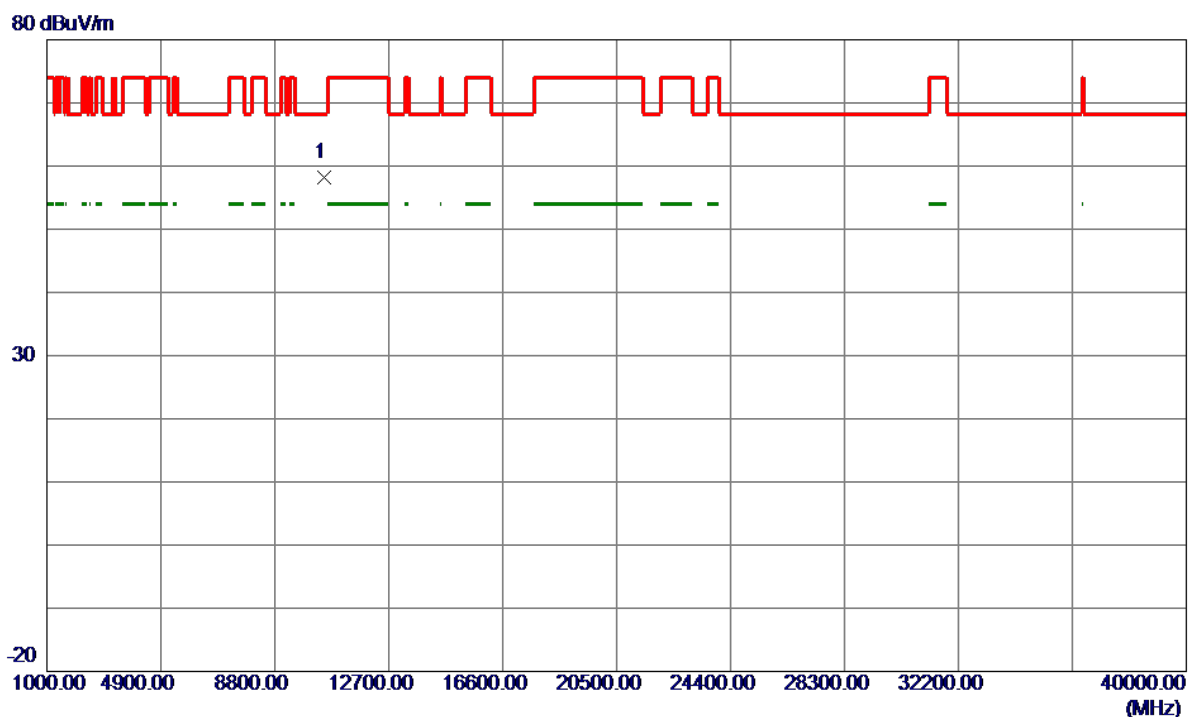
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5240.9000	101.60	15.10	116.70	68.30	48.40	Peak	No Limit
2	5241.1000	93.94	15.10	109.04	999.00	-889.96	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX A Mode 5240 MHz

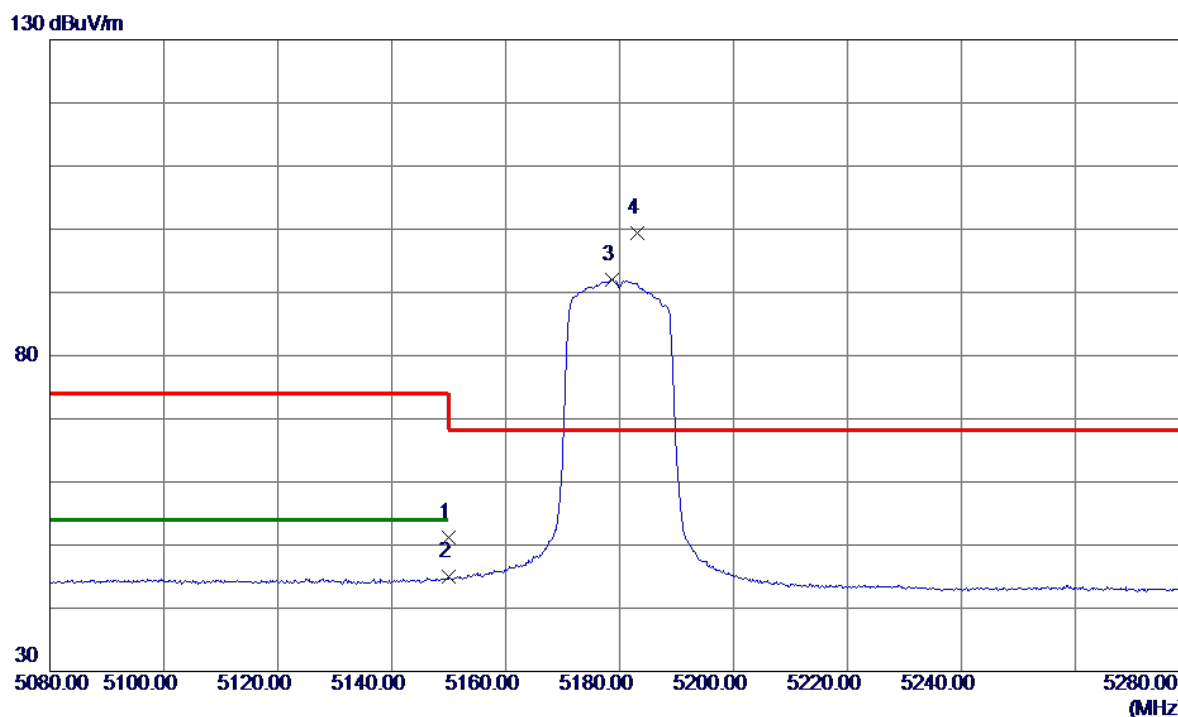
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10480.7699	45.02	13.14	58.16	68.30	-10.14	Peak	

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5180 MHz

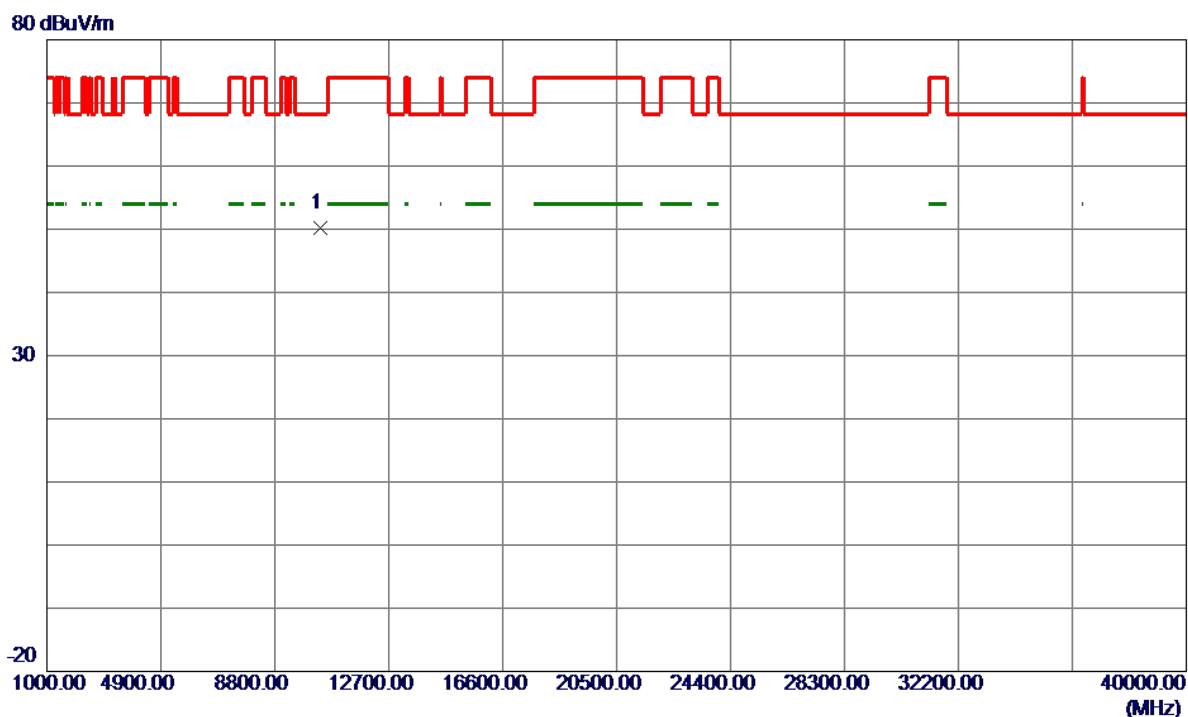
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	36.25	14.91	51.16	74.00	-22.84	Peak	
2	5150.0000	30.05	14.91	44.96	54.00	-9.04	AVG	
3	5178.7000	77.05	14.97	92.02	999.00	-906.98	AVG	No Limit
4 *	5183.1000	84.46	14.98	99.44	68.30	31.14	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5180 MHz

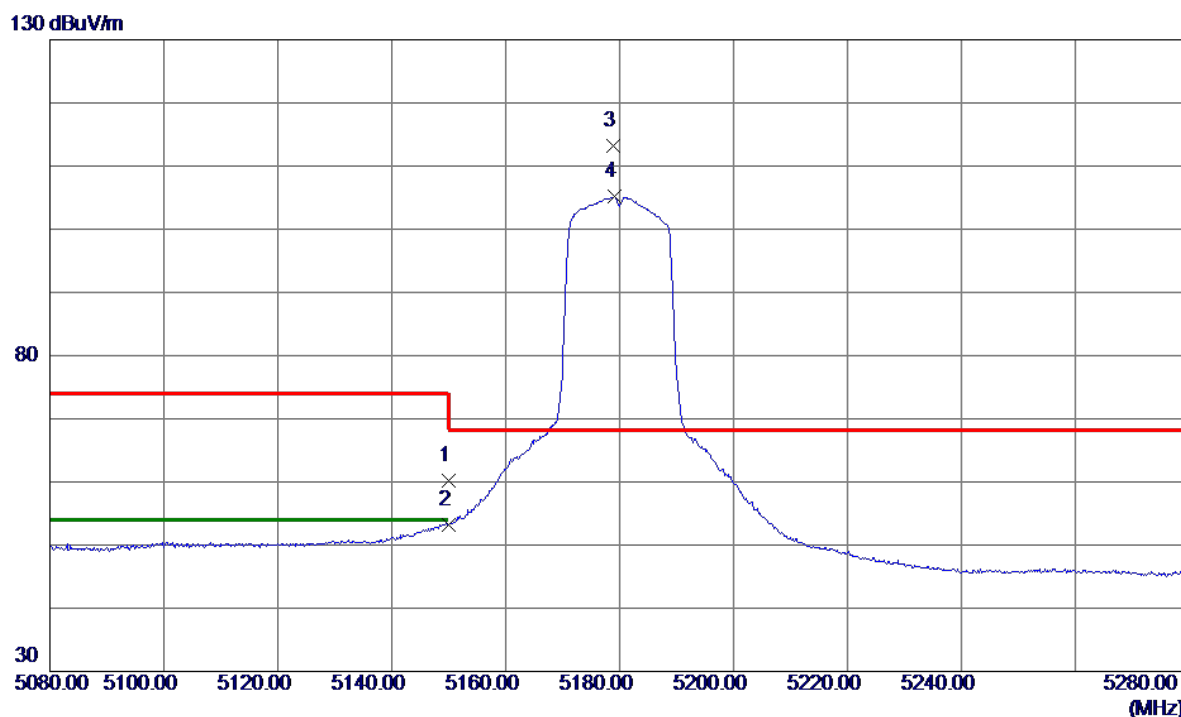
Vertical



No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10362.8099	37.27	12.90	50.17	68.30	-18.13	Peak	

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5180 MHz

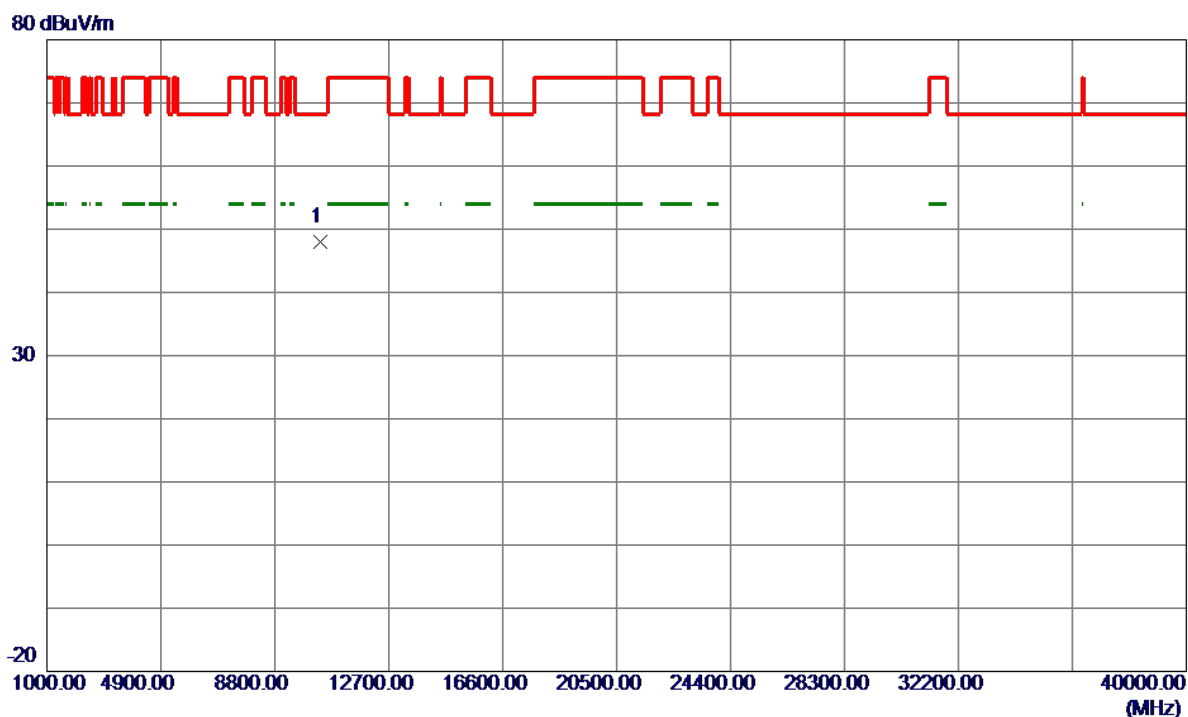
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	45.35	14.91	60.26	74.00	-13.74	Peak	
2	5150.0000	38.29	14.91	53.20	54.00	-0.80	AVG	
3 *	5178.8000	98.22	14.97	113.19	68.30	44.89	Peak	No Limit
4	5179.1000	90.15	14.97	105.12	999.00	-893.88	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5180 MHz

Horizontal

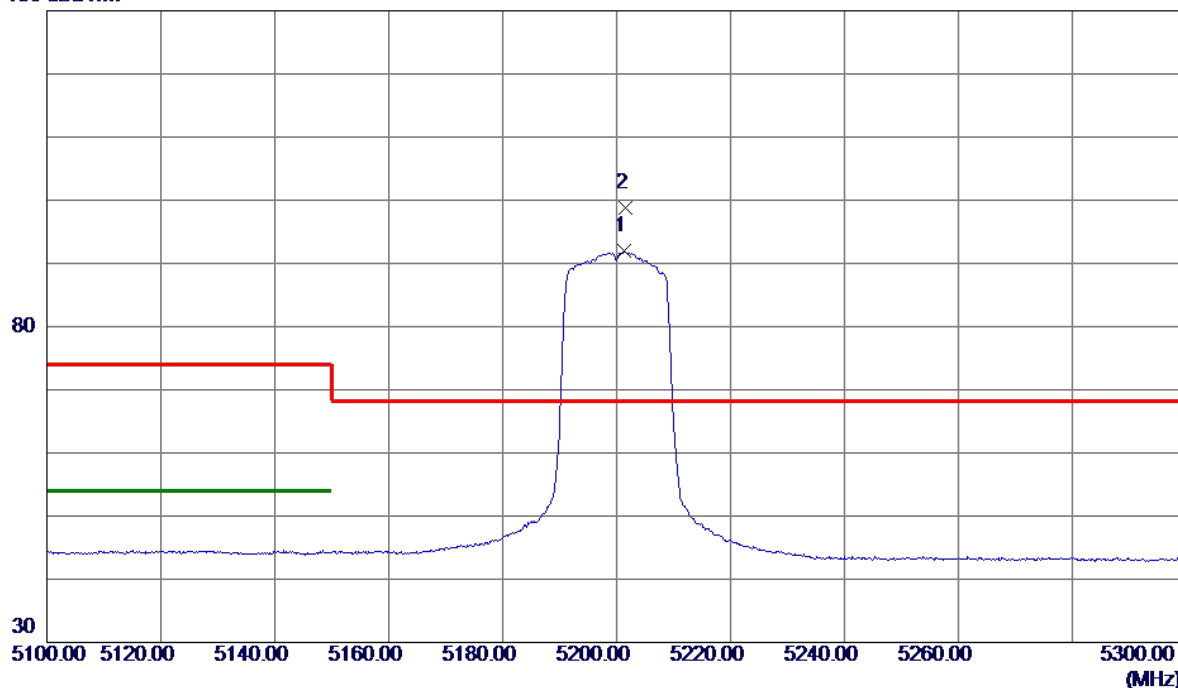


No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10365.7500	35.09	12.90	47.99	68.30	-20.31	Peak	

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5200 MHz

Vertical

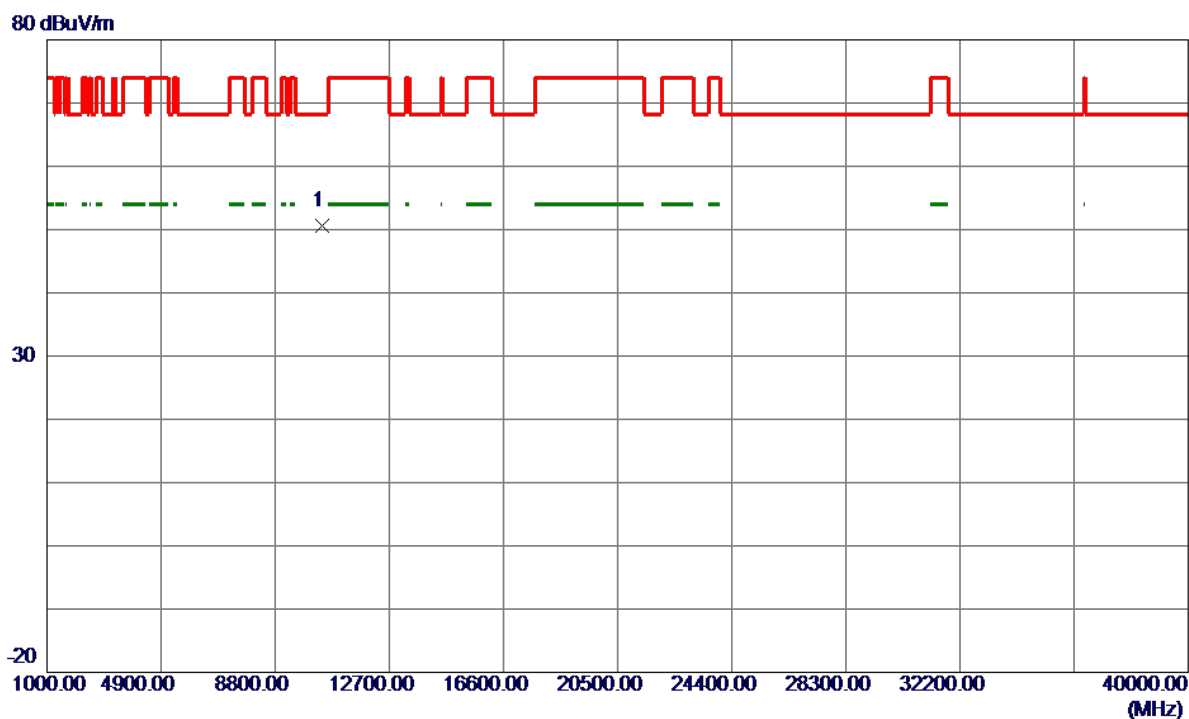
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5201.3000	76.88	15.02	91.90	999.00	-907.10	AVG	No Limit
2 *	5201.5000	83.82	15.02	98.84	68.30	30.54	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5200 MHz

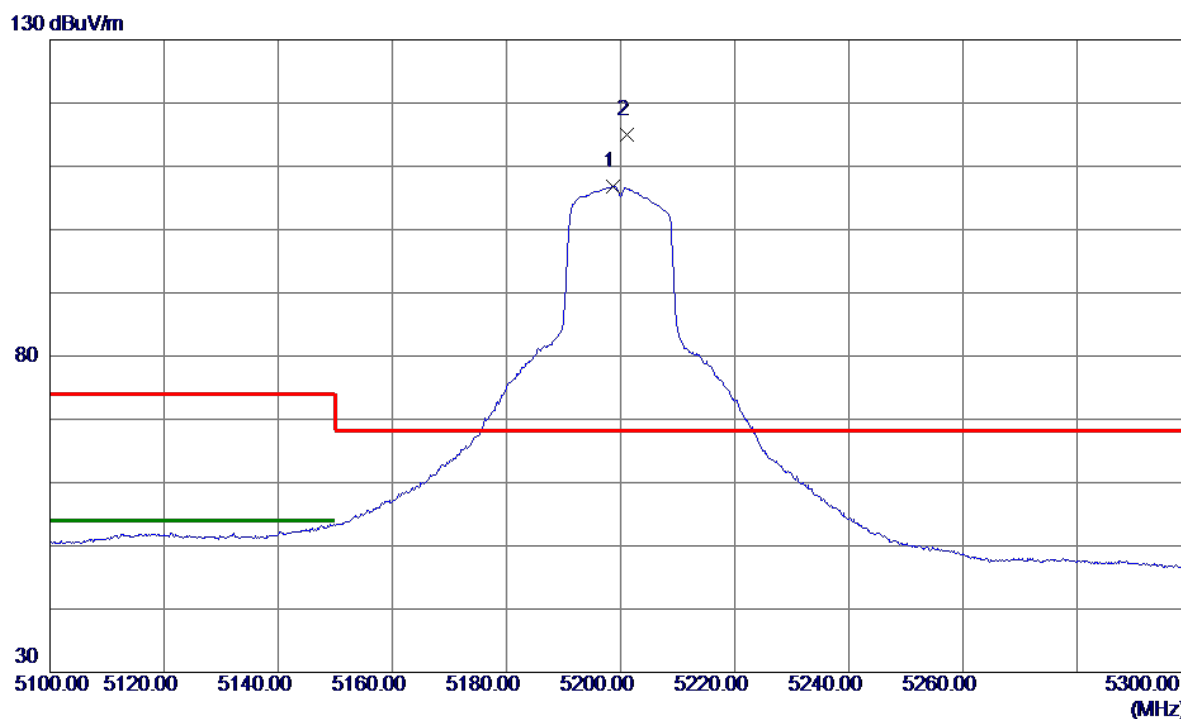
Vertical



No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10402.9000	37.67	12.98	50.65	68.30	-17.65	Peak	

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5200 MHz

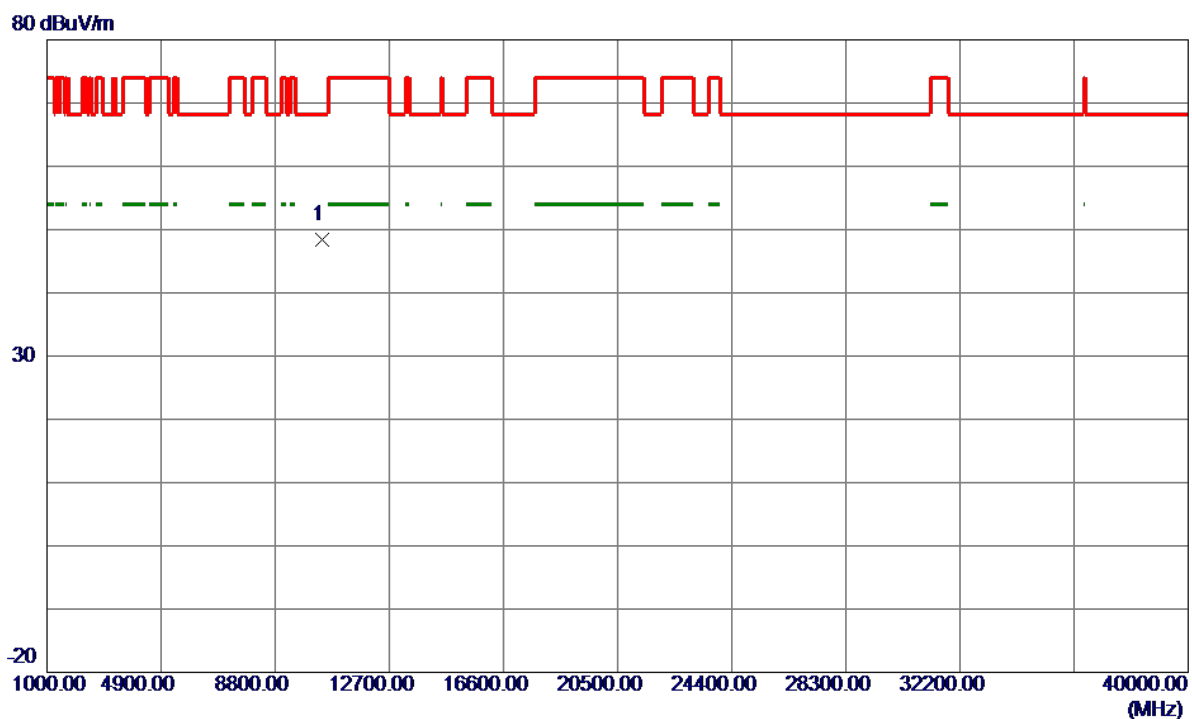
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5198.6000	91.88	15.01	106.89	999.00	-892.11	AVG	No Limit
2 *	5201.1000	100.00	15.02	115.02	68.30	46.72	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5200 MHz

Horizontal

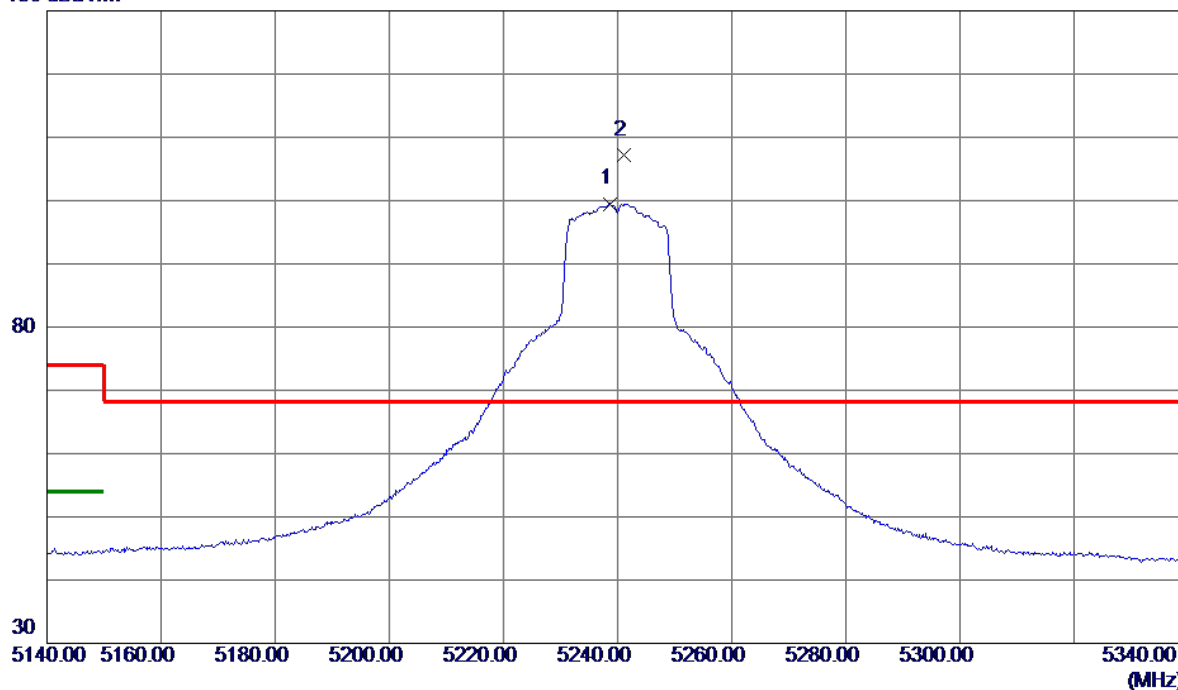


No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10393.0300	35.44	12.96	48.40	68.30	-19.90	Peak	

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5240 MHz

Vertical

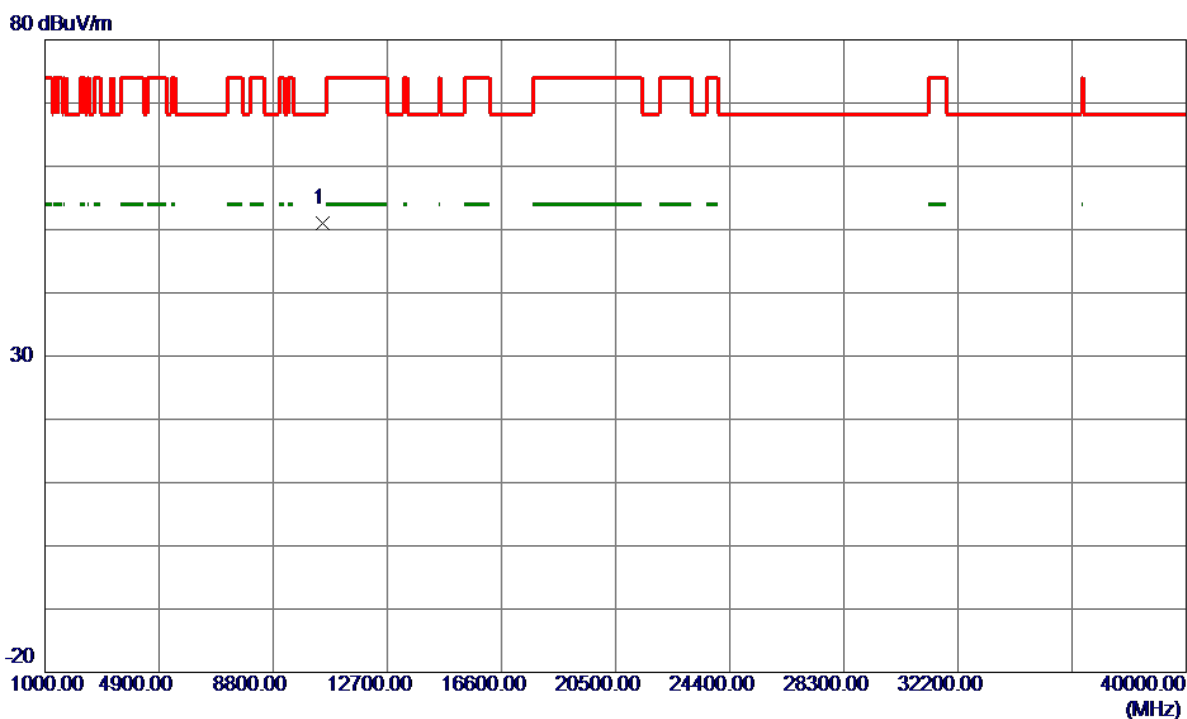
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5238.6000	84.41	15.09	99.50	999.00	-899.50	AVG	No Limit
2 *	5241.1000	92.16	15.10	107.26	68.30	38.96	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5240 MHz

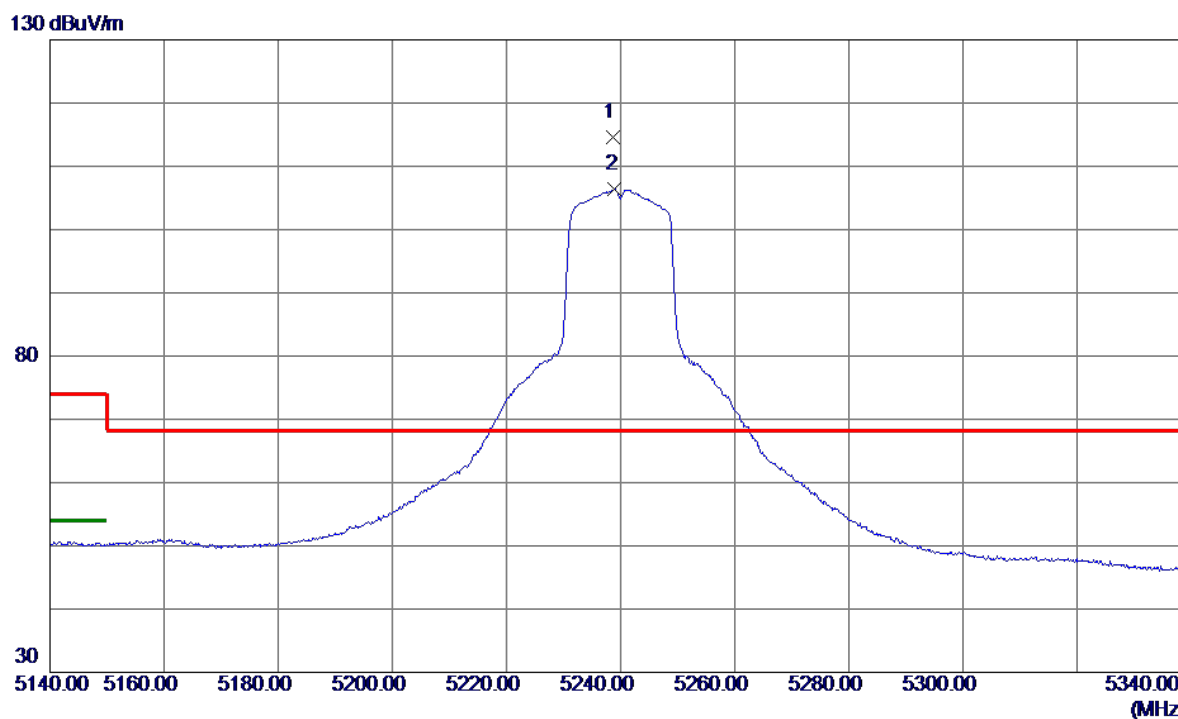
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10481.1200	37.84	13.14	50.98	68.30	-17.32	Peak	

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5240 MHz

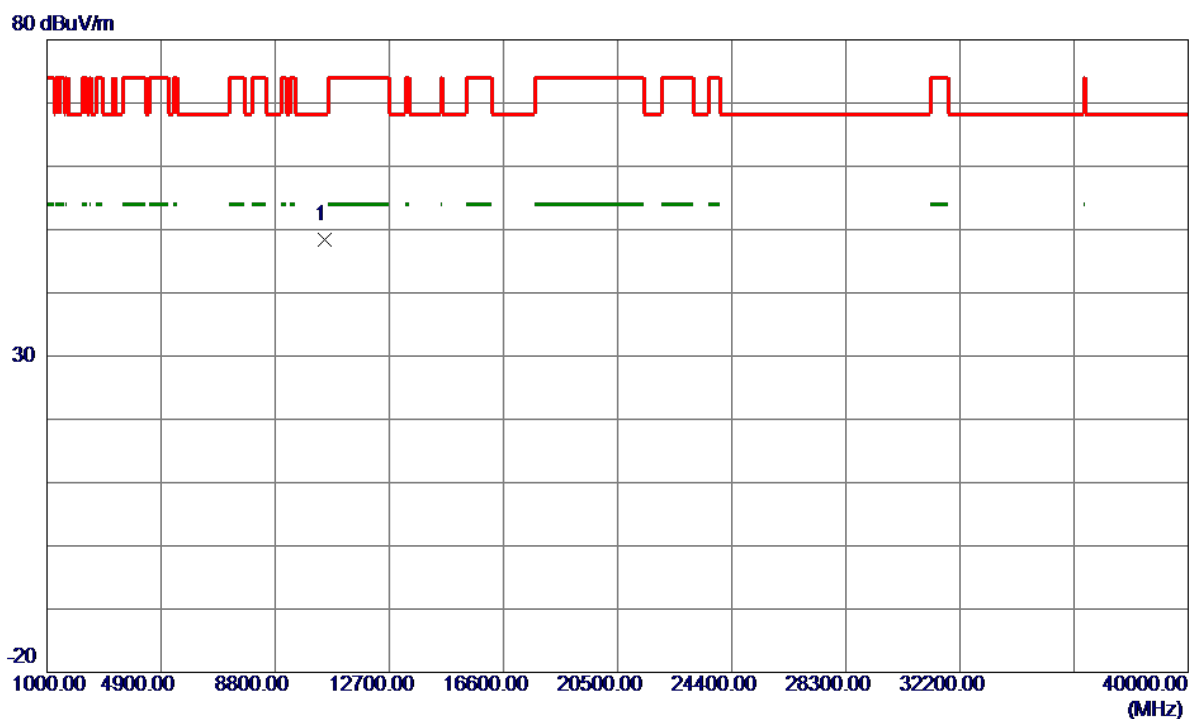
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5238.7000	99.47	15.09	114.56	68.30	46.26	Peak	No Limit
2	5239.0000	91.33	15.09	106.42	999.00	-892.58	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX N20 Mode 5240 MHz

Horizontal

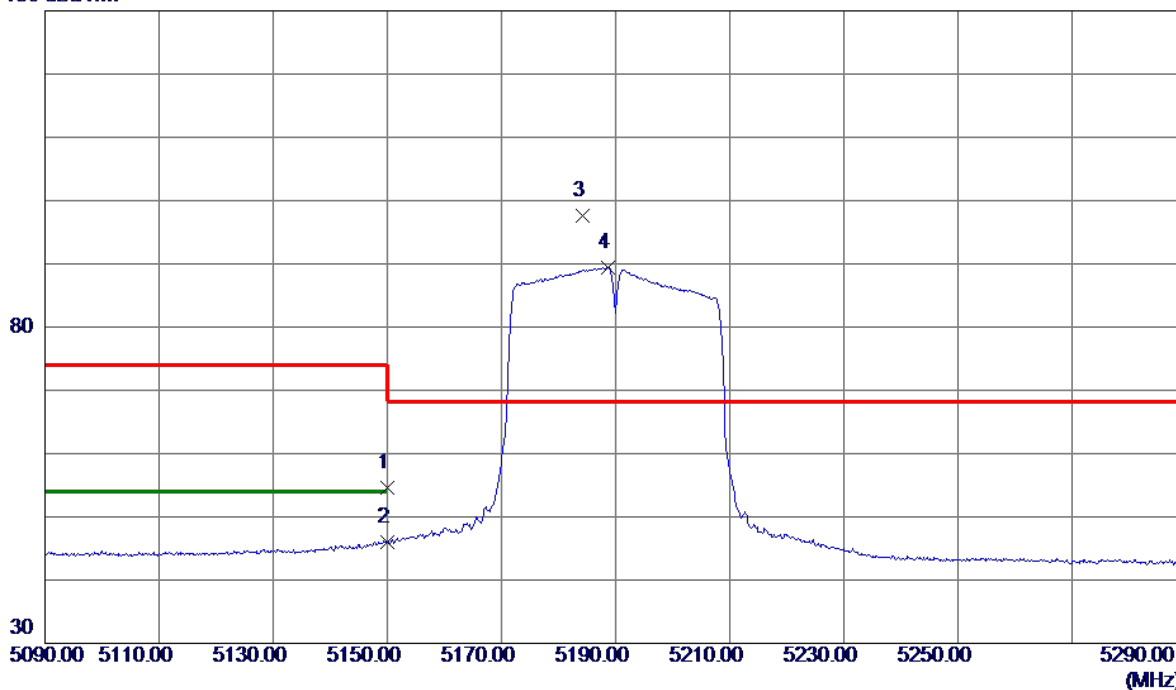


No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10479.0199	35.26	13.13	48.39	68.30	-19.91	Peak	

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5190MHz

Vertical

130 dBuV/m

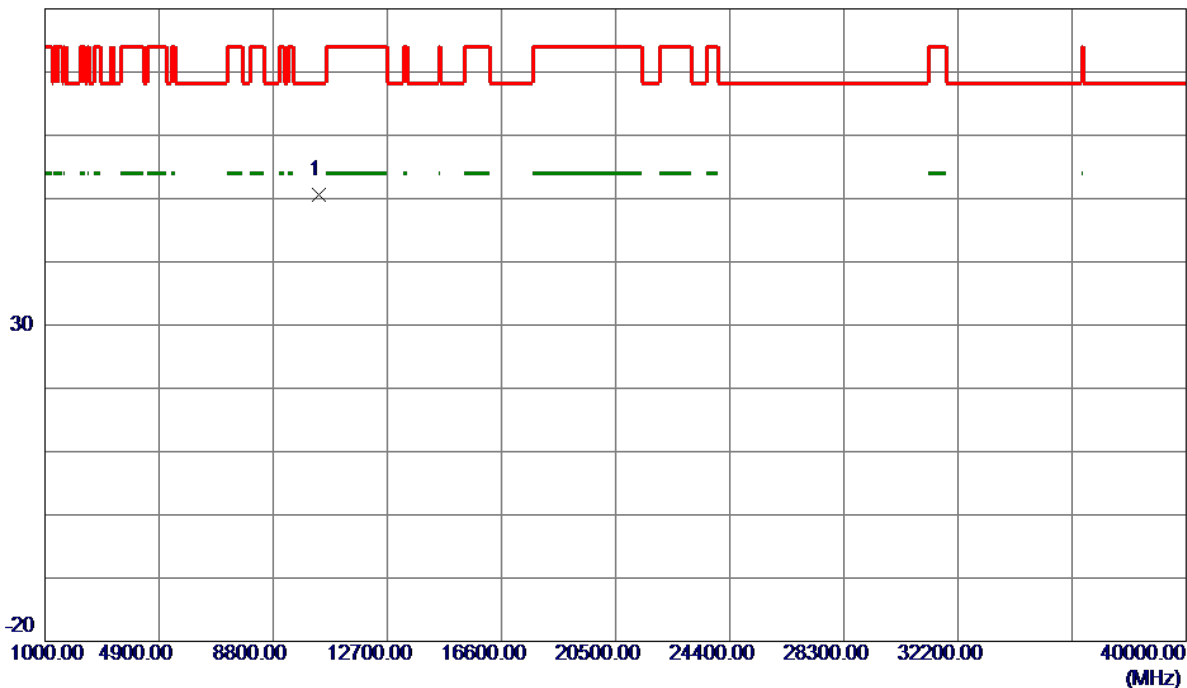


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	39.78	14.91	54.69	74.00	-19.31	Peak	
2	5150.0000	31.12	14.91	46.03	54.00	-7.97	AVG	
3 *	5184.3000	82.65	14.98	97.63	68.30	29.33	Peak	No Limit
4	5188.6000	74.46	14.99	89.45	999.00	-909.55	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5190MHz

Vertical

80 dBuV/m

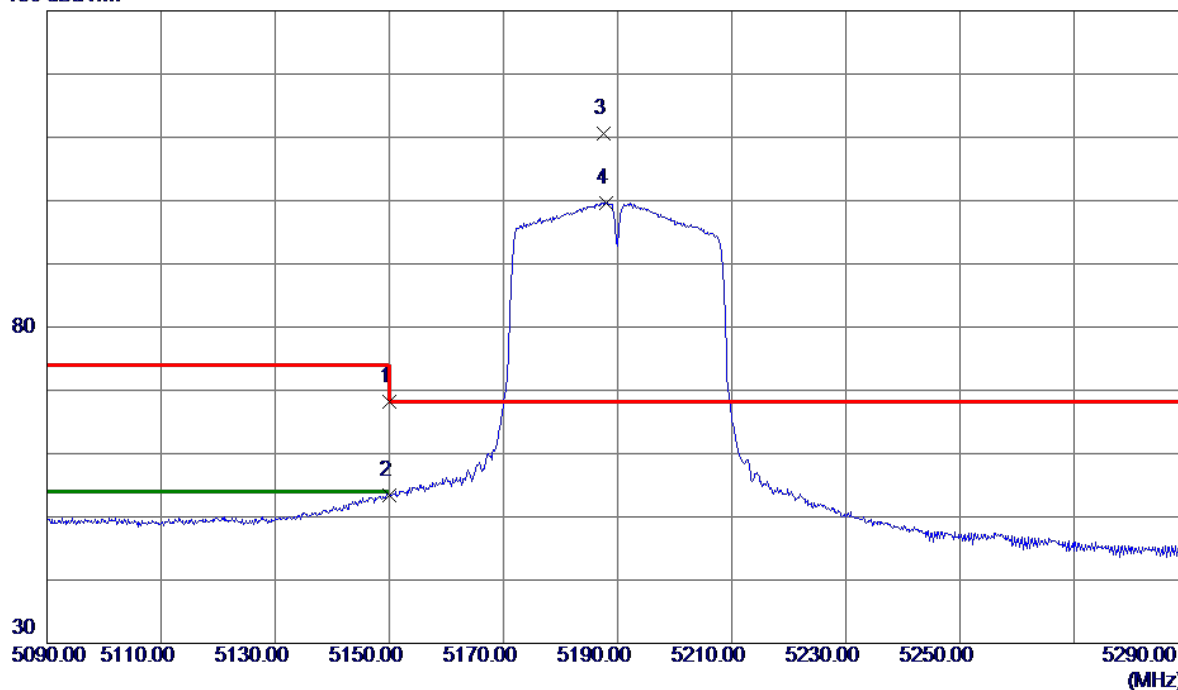


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10380.1500	37.65	12.93	50.58	68.30	-17.72	Peak	

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5190MHz

Horizontal

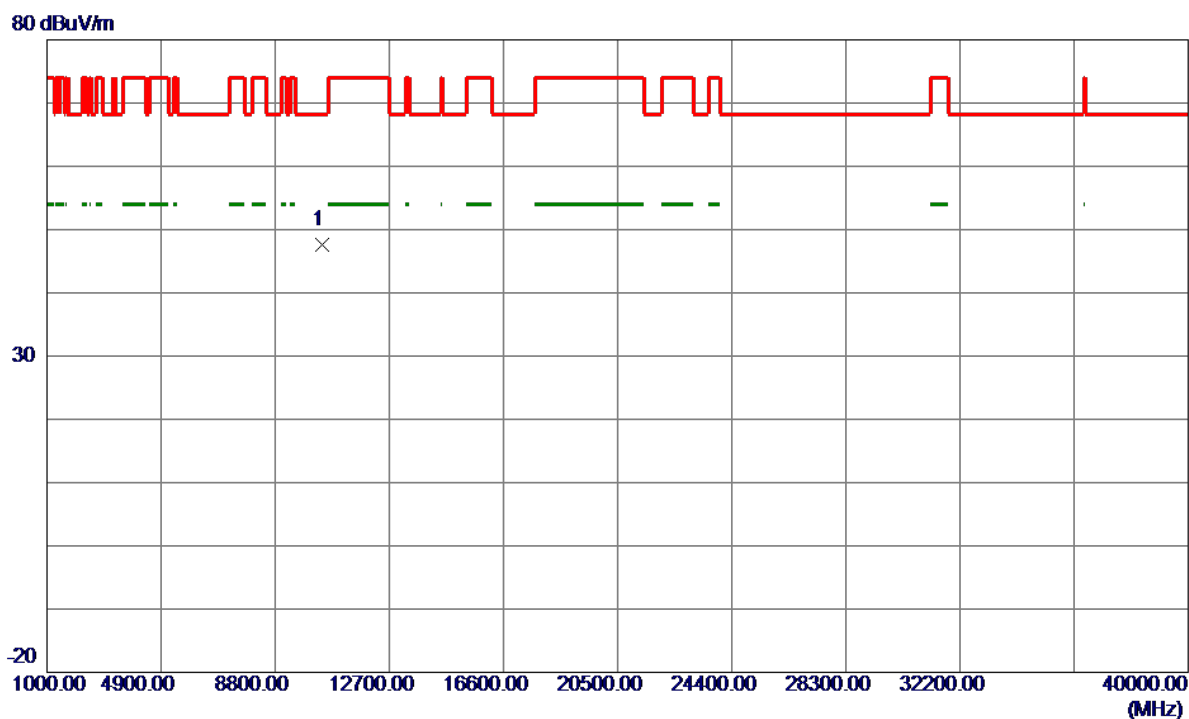
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	53.27	14.91	68.18	74.00	-5.82	Peak	
2	5150.0000	38.58	14.91	53.49	54.00	-0.51	AVG	
3 *	5187.5000	95.55	14.99	110.54	68.30	42.24	Peak	No Limit
4	5188.1000	84.65	14.99	99.64	999.00	-899.36	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5190MHz

Horizontal

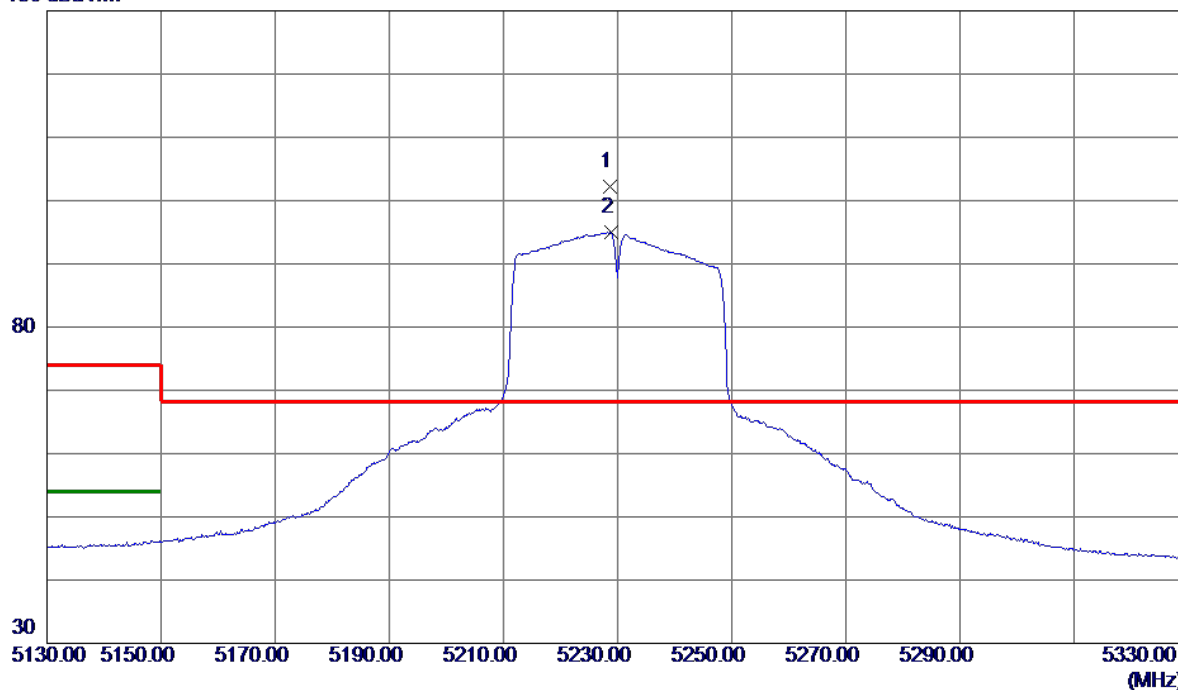


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10384.2500	34.70	12.94	47.64	68.30	-20.66	Peak	

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5230MHz

Vertical

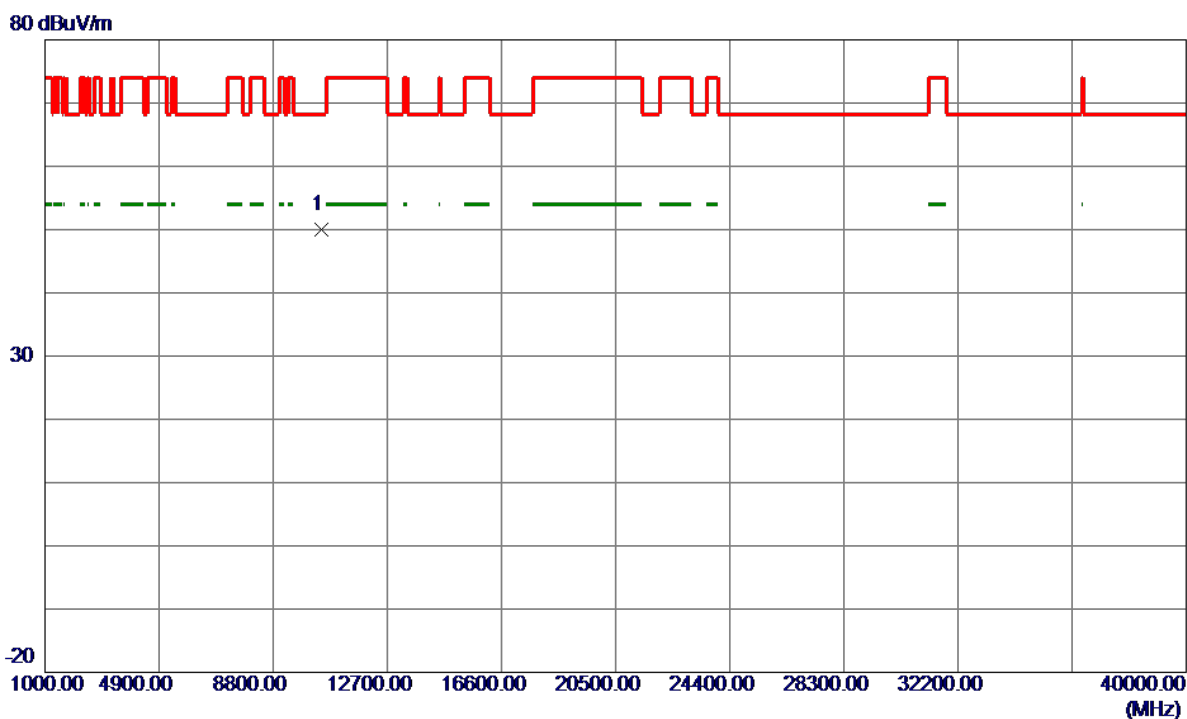
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5228.6000	87.07	15.07	102.14	68.30	33.84	Peak	No Limit
2	5228.8000	79.91	15.07	94.98	999.00	-904.02	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5230MHz

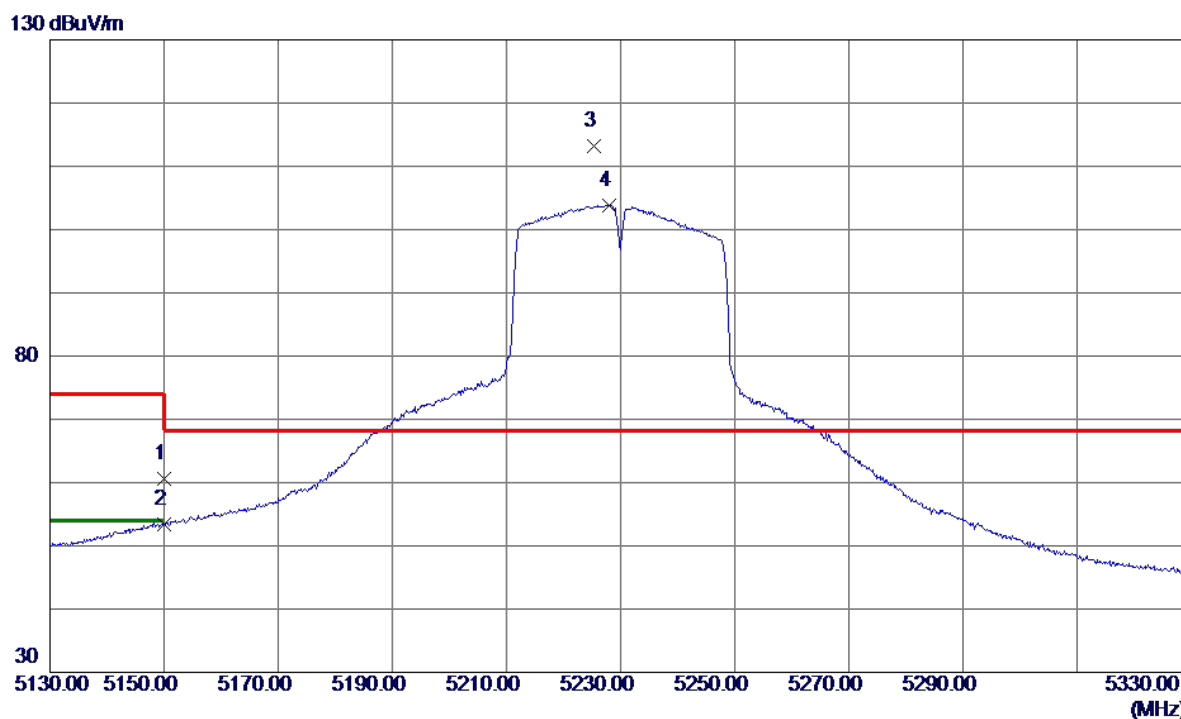
Vertical



No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10456.8099	36.95	13.09	50.04	68.30	-18.26	Peak	

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5230MHz

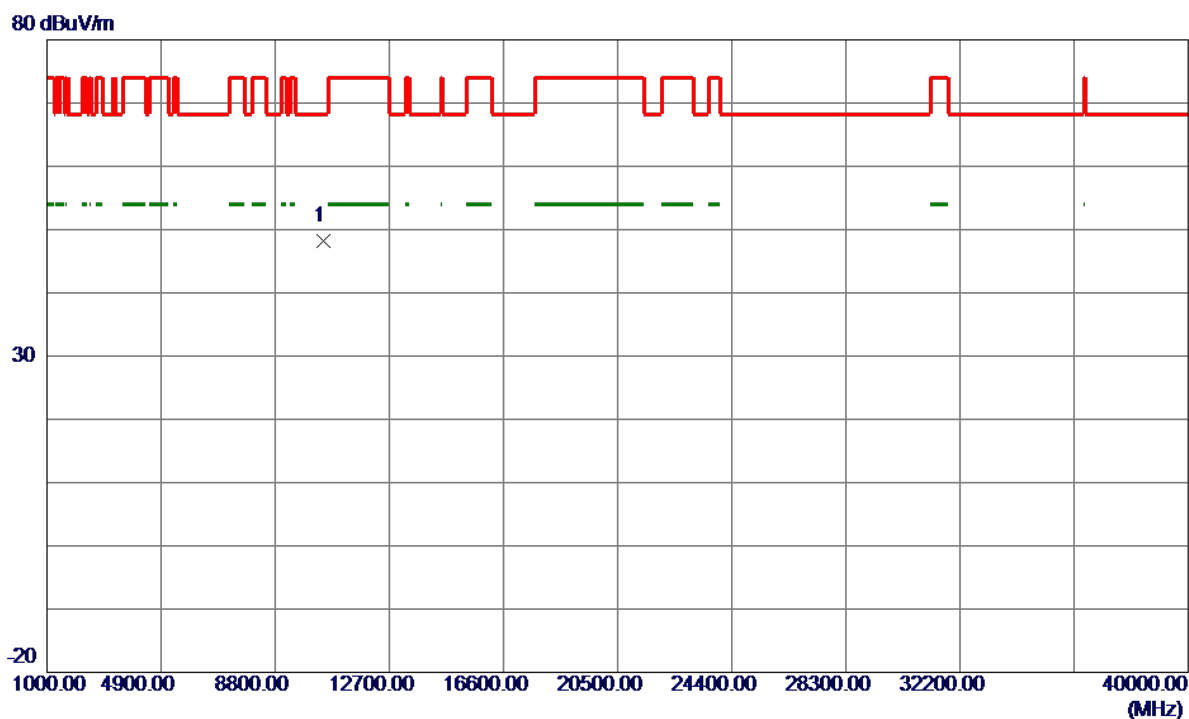
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	45.78	14.91	60.69	74.00	-13.31	Peak	
2	5150.0000	38.51	14.91	53.42	54.00	-0.58	AVG	
3 *	5225.4000	98.16	15.07	113.23	68.30	44.93	Peak	No Limit
4	5227.9000	88.78	15.07	103.85	999.00	-895.15	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX N40 Mode 5230MHz

Horizontal

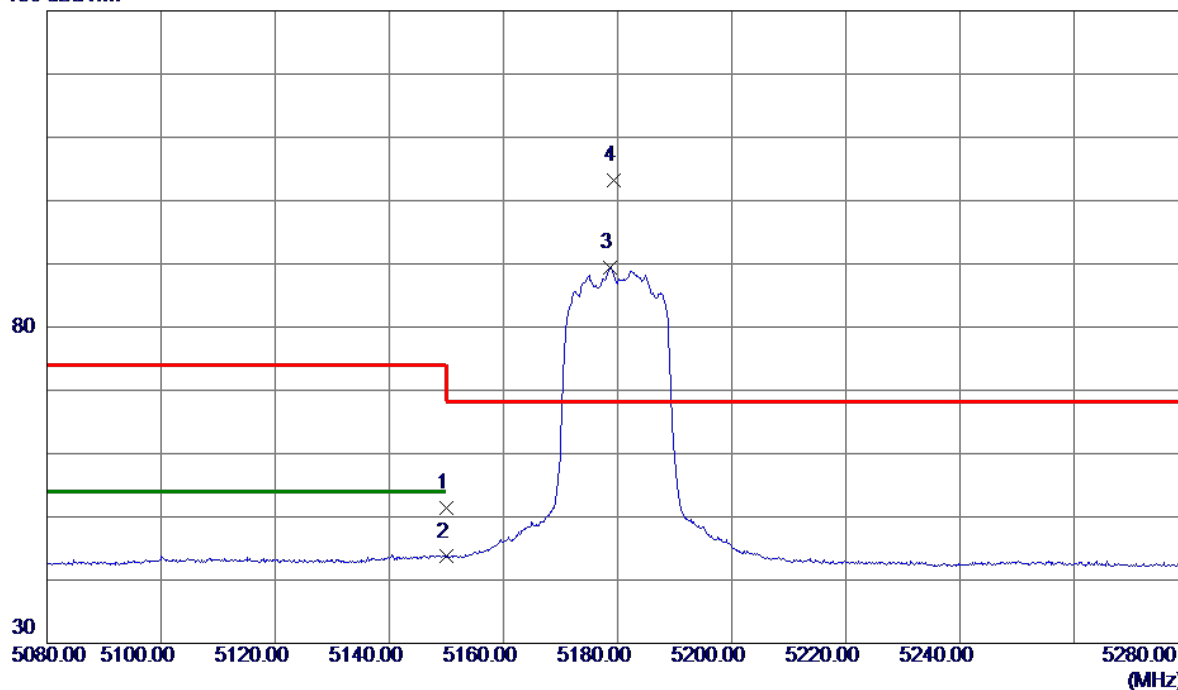


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10460.2200	35.20	13.09	48.29	68.30	-20.01	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5180 MHz

Vertical

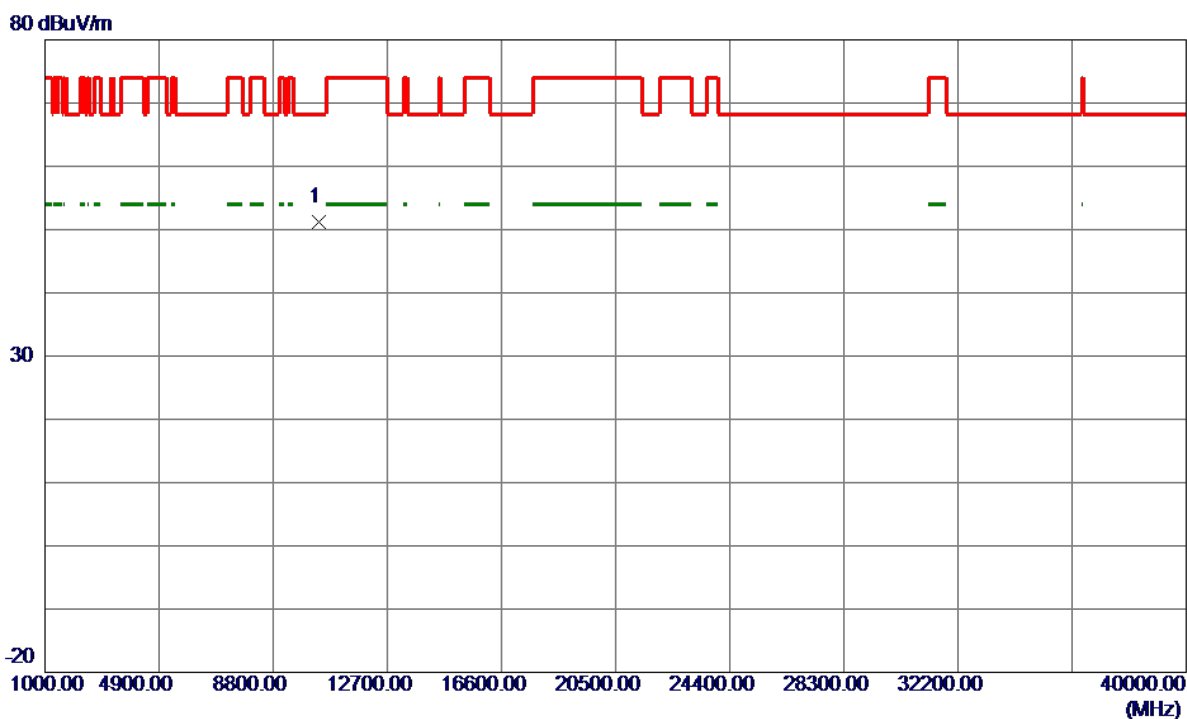
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	36.40	14.91	51.31	74.00	-22.69	Peak	
2	5150.0000	28.79	14.91	43.70	54.00	-10.30	AVG	
3	5178.7000	74.47	14.97	89.44	999.00	-909.56	AVG	No Limit
4 *	5179.4000	88.16	14.97	103.13	68.30	34.83	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5180 MHz

Vertical

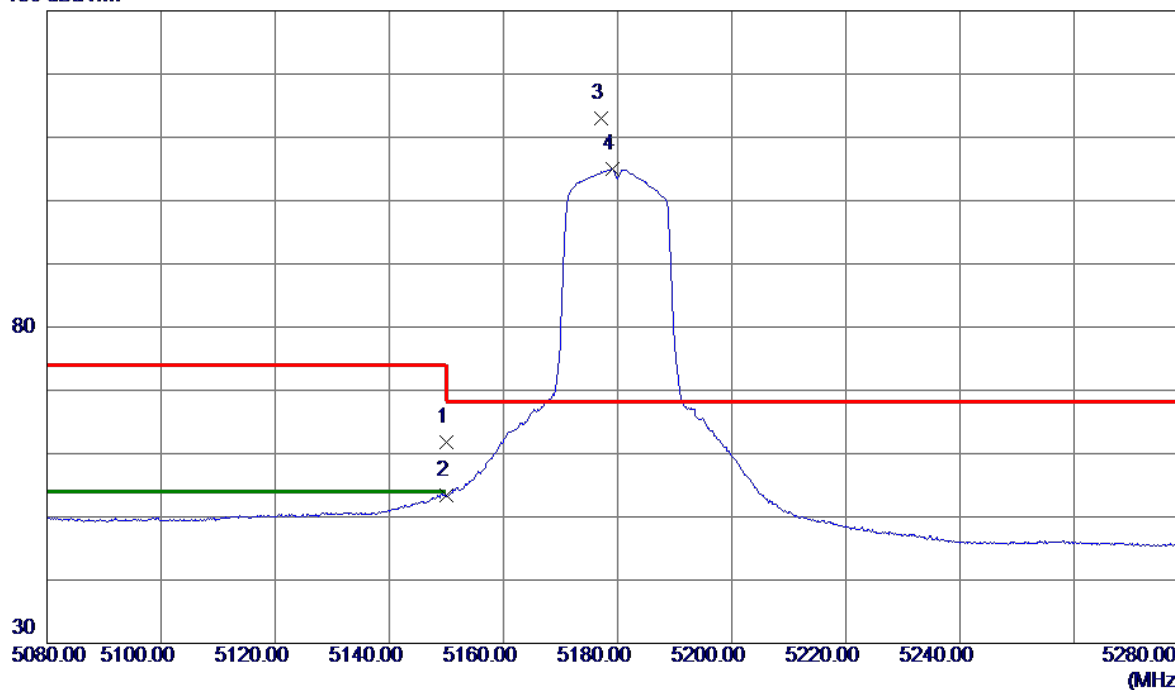


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10358.0000	38.24	12.89	51.13	68.30	-17.17	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5180 MHz

Horizontal

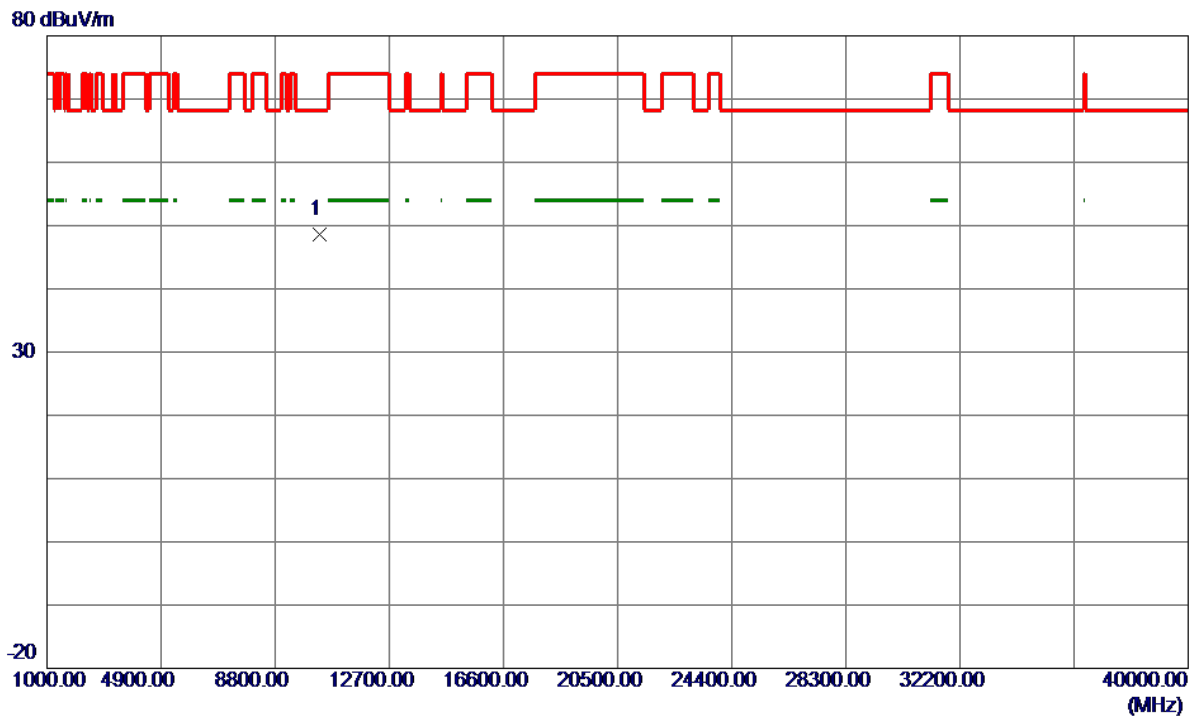
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	46.96	14.91	61.87	74.00	-12.13	Peak	
2	5150.0000	38.44	14.91	53.35	54.00	-0.65	AVG	
3 *	5177.2000	98.13	14.97	113.10	68.30	44.80	Peak	No Limit
4	5179.2000	90.00	14.97	104.97	999.00	-894.03	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5180 MHz

Horizontal

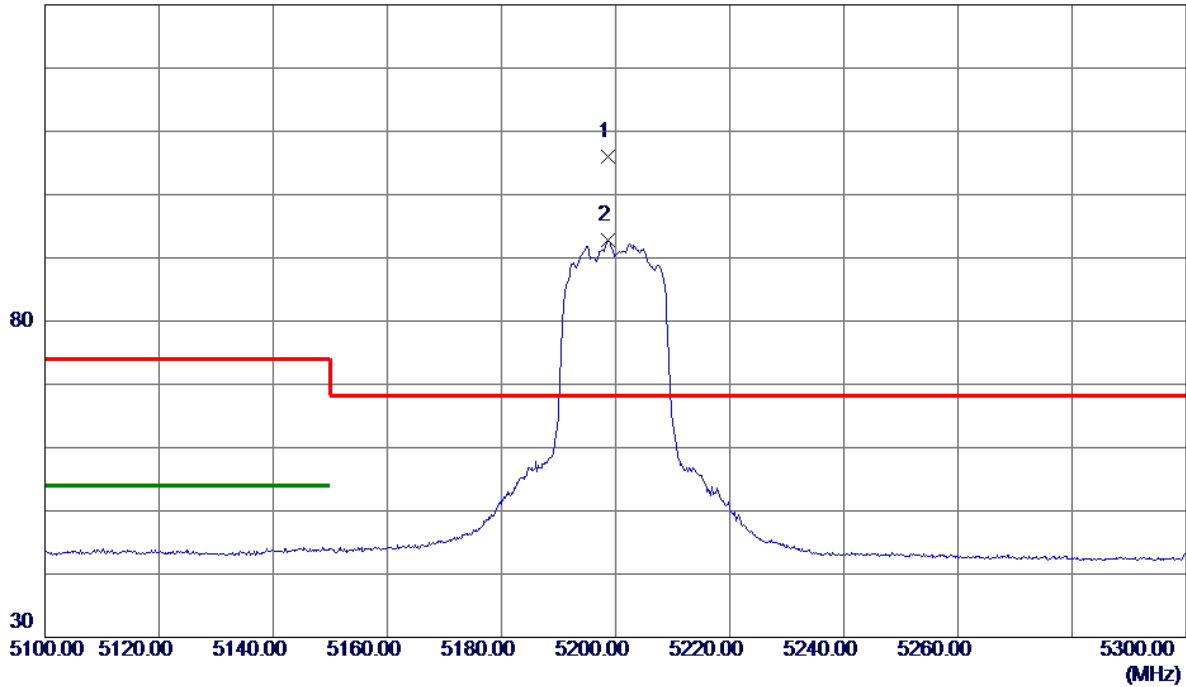


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10326.4000	35.84	12.82	48.66	68.30	-19.64	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5200 MHz

Vertical

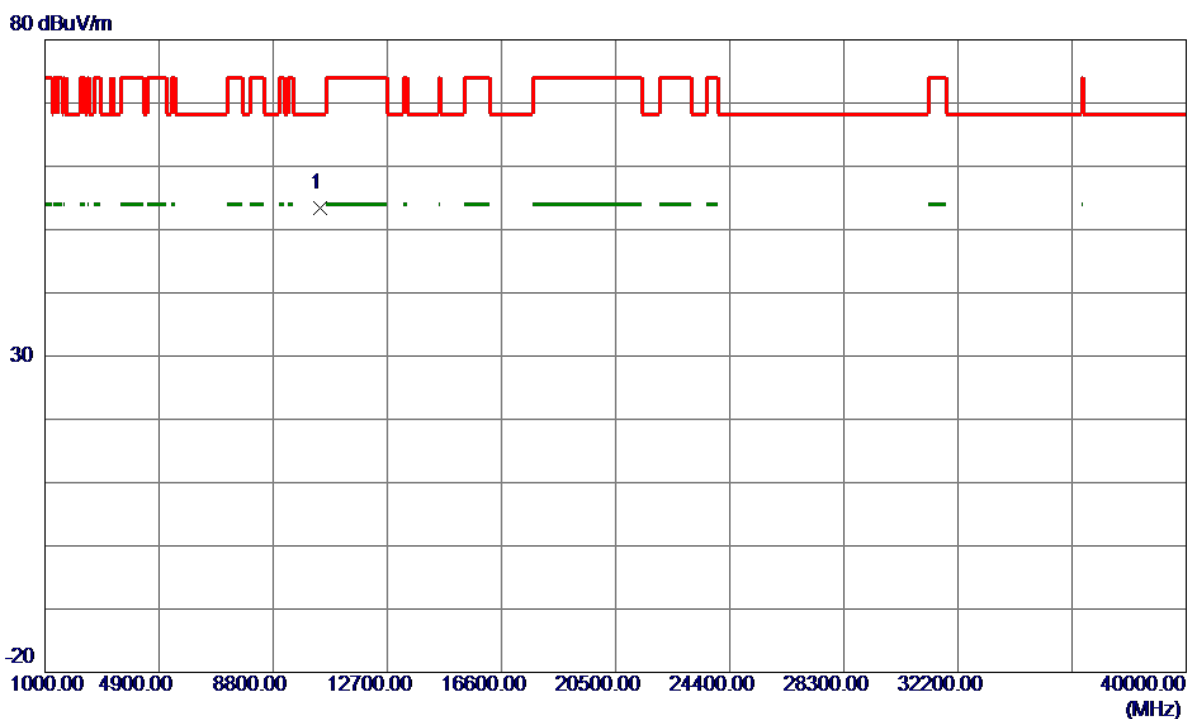
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5198.6000	90.99	15.01	106.00	68.30	37.70	Peak	No Limit
2	5198.7000	77.75	15.01	92.76	999.00	-906.24	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5200 MHz

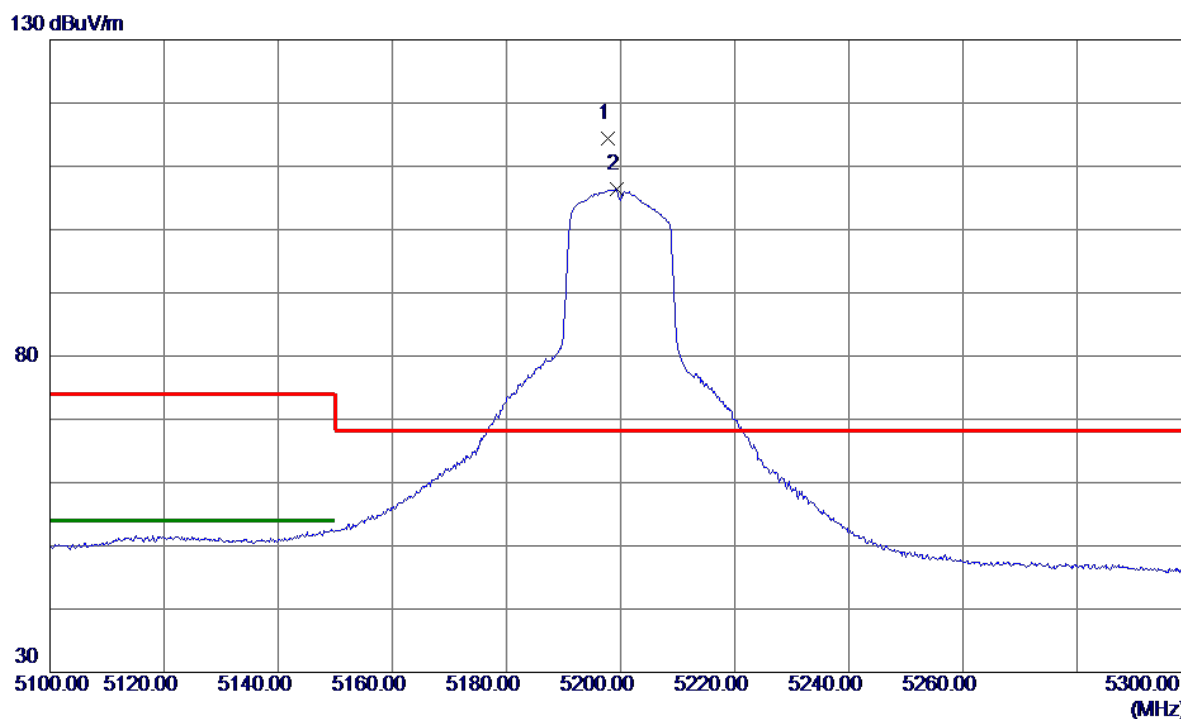
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10399.4500	40.38	12.97	53.35	68.30	-14.95	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5200 MHz

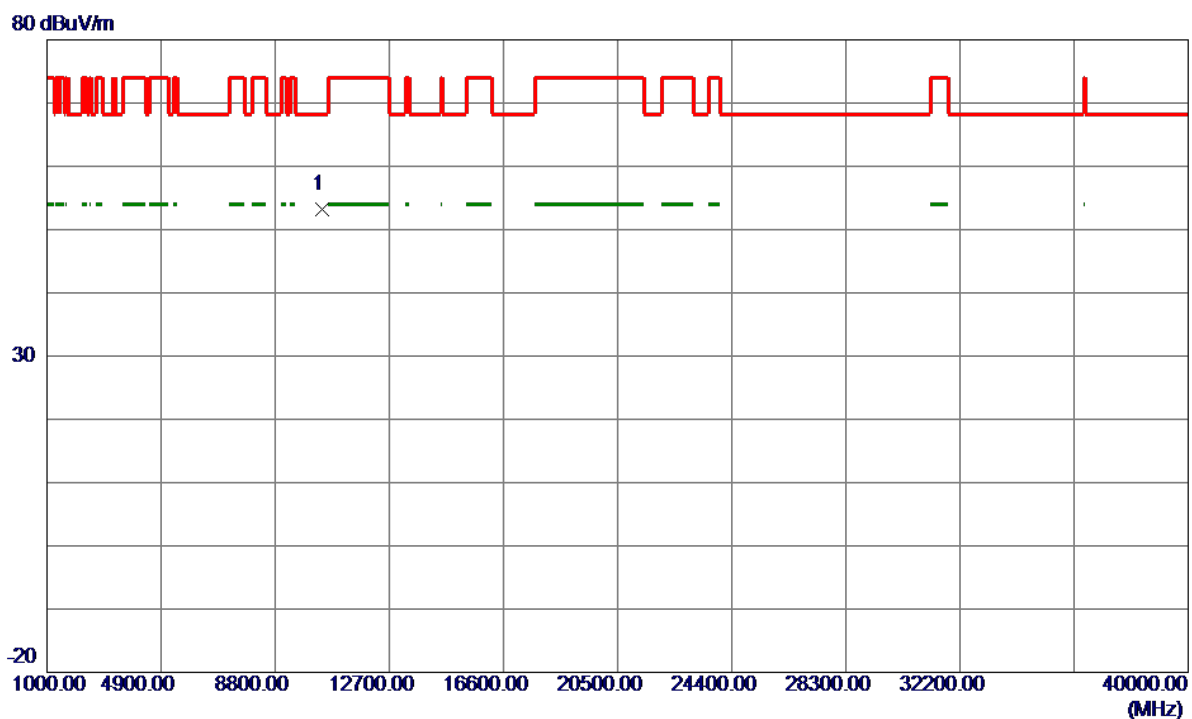
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5197.7000	99.37	15.01	114.38	68.30	46.08	Peak	No Limit
2	5199.3000	91.36	15.01	106.37	999.00	-892.63	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5200 MHz

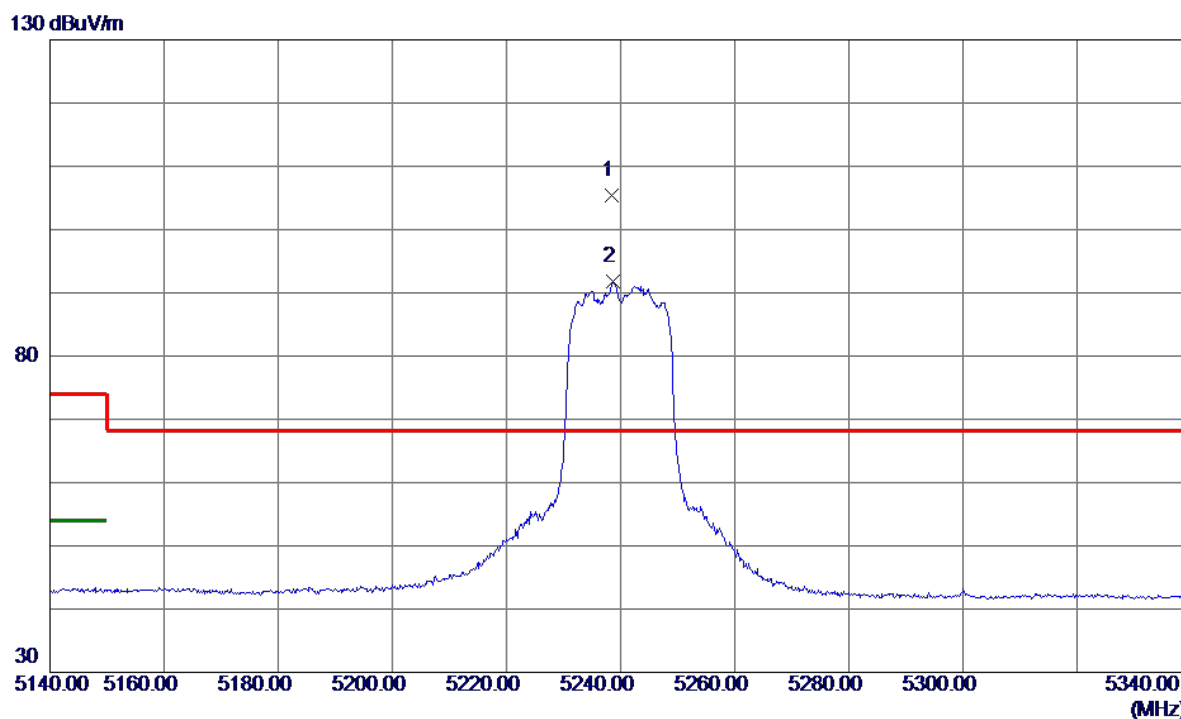
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10404.2250	40.16	12.98	53.14	68.30	-15.16	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5240 MHz

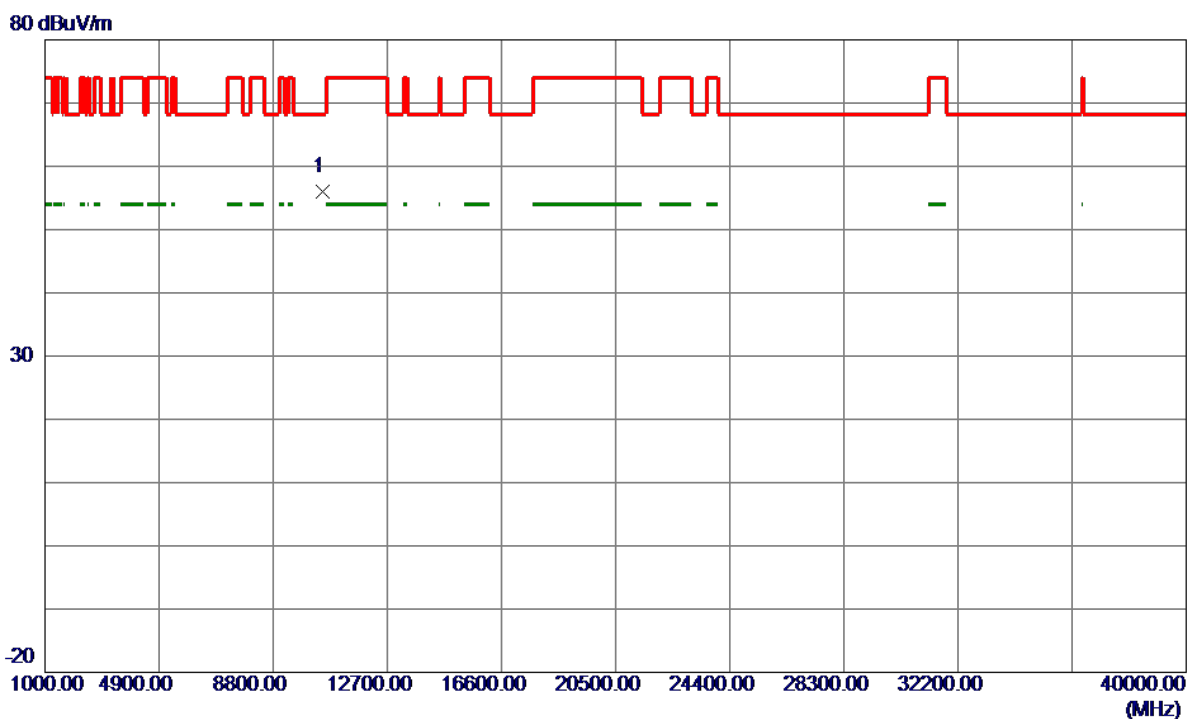
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5238.5000	90.36	15.09	105.45	68.30	37.15	Peak	No Limit
2	5238.7000	76.69	15.09	91.78	999.00	-907.22	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5240 MHz

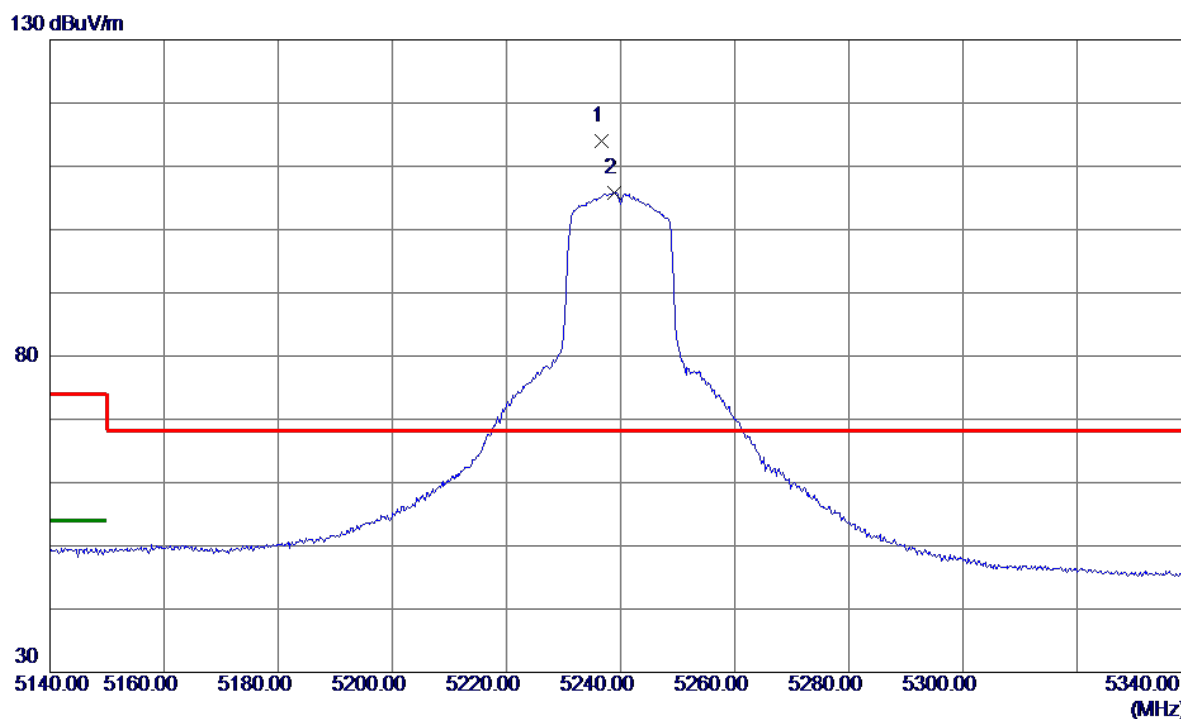
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10478.8000	42.84	13.13	55.97	68.30	-12.33	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5240 MHz

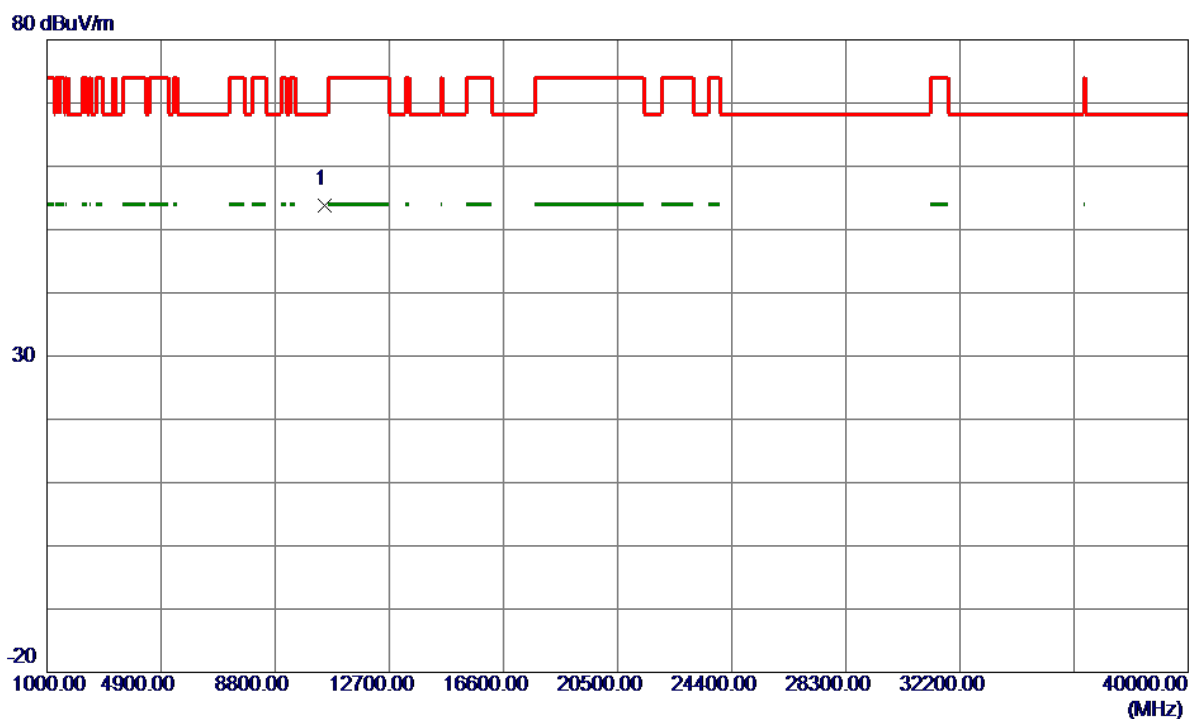
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	5236.7000	98.88	15.09	113.97	68.30	45.67	Peak	No Limit
2	5238.9000	90.79	15.09	105.88	999.00	-893.12	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC20 Mode 5240 MHz

Horizontal

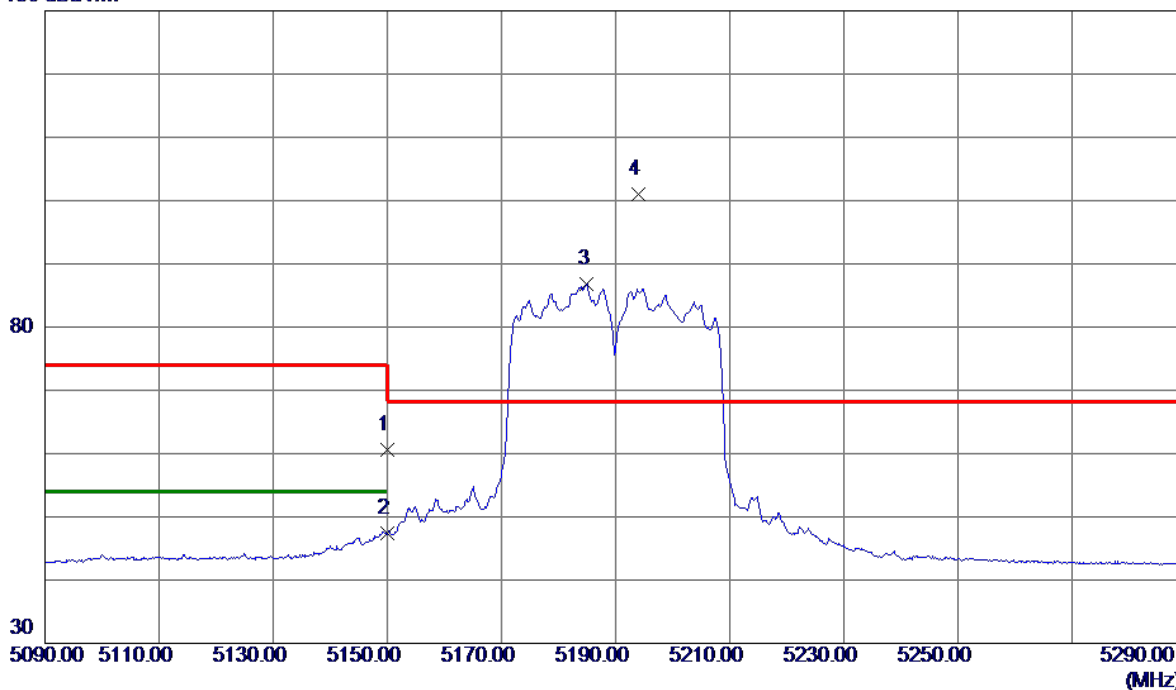


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10481.3250	40.76	13.14	53.90	68.30	-14.40	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5190MHz

Vertical

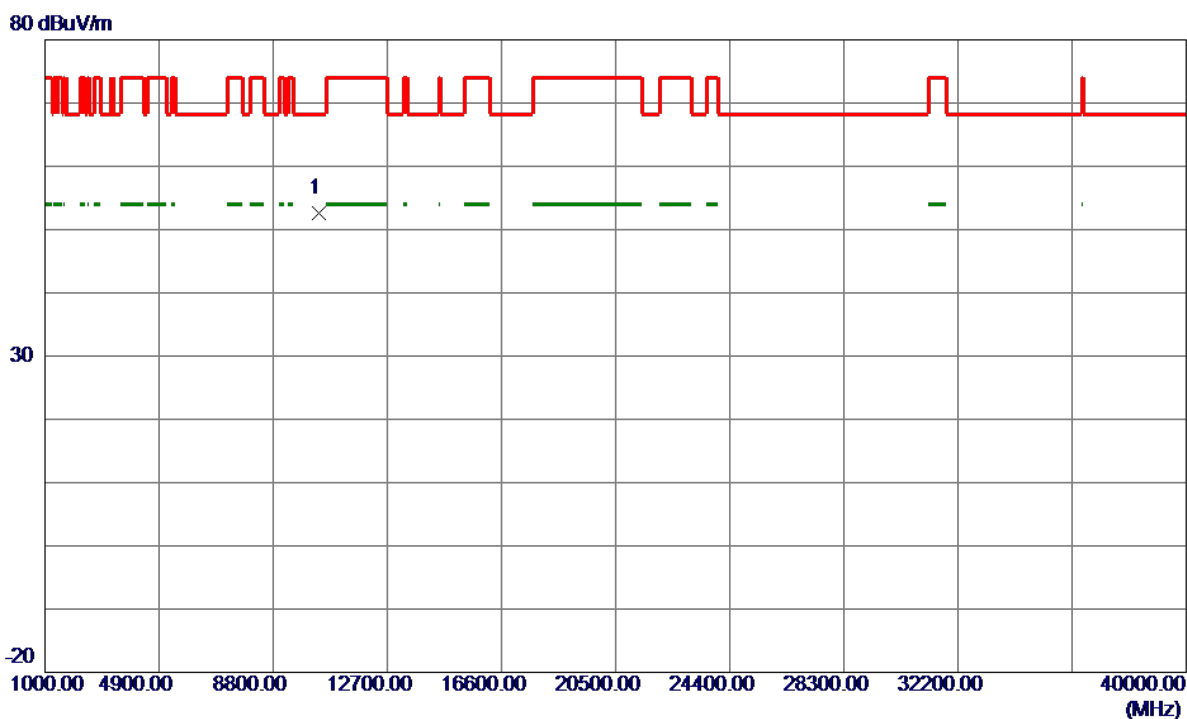
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	45.74	14.91	60.65	74.00	-13.35	Peak	
2	5150.0000	32.45	14.91	47.36	54.00	-6.64	AVG	
3	5185.0000	71.80	14.98	86.78	999.00	-912.22	AVG	No Limit
4 *	5193.9000	85.96	15.00	100.96	68.30	32.66	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5190MHz

Vertical

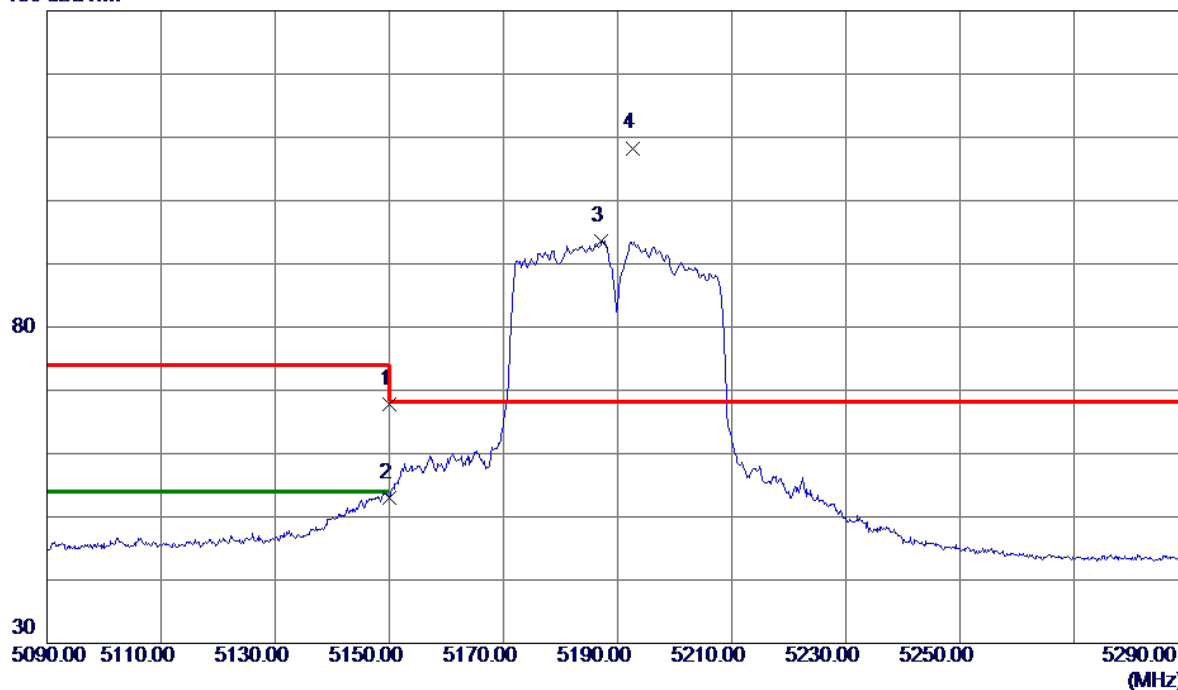


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10376.6000	39.67	12.92	52.59	68.30	-15.71	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5190MHz

Horizontal

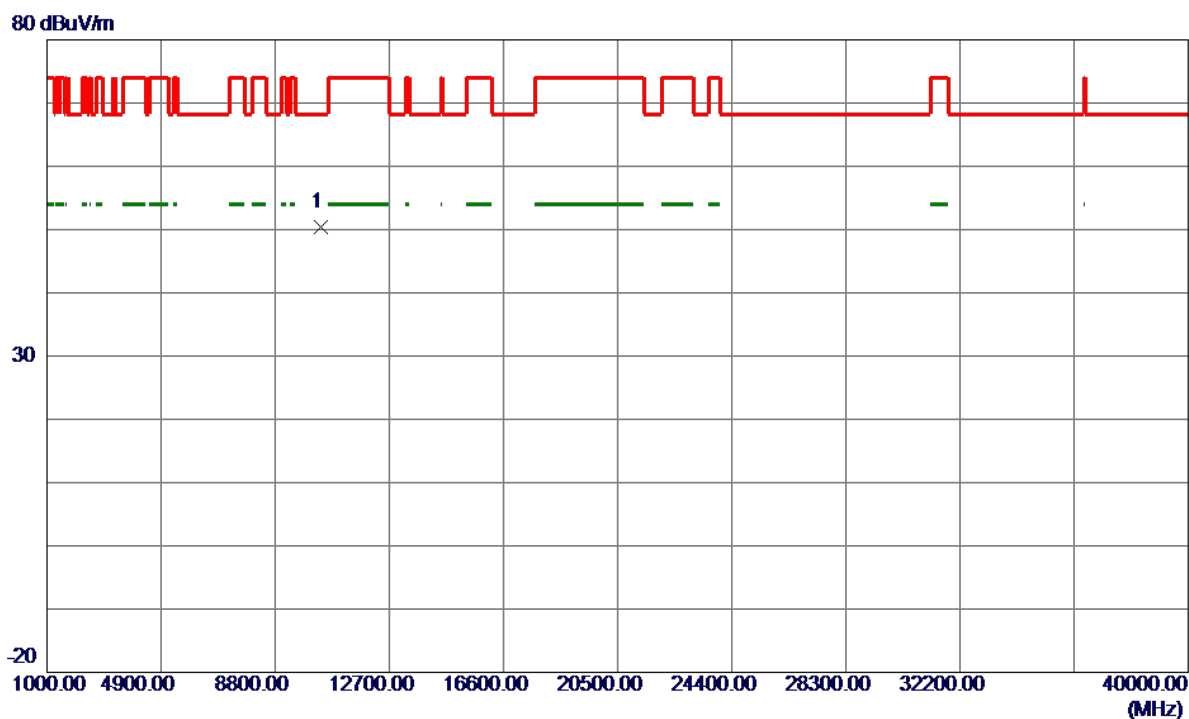
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	52.90	14.91	67.81	74.00	-6.19	Peak	
2	5150.0000	38.14	14.91	53.05	54.00	-0.95	AVG	
3	5187.2000	78.61	14.99	93.60	999.00	-905.40	AVG	No Limit
4 *	5192.7000	93.30	15.00	108.30	68.30	40.00	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5190MHz

Horizontal

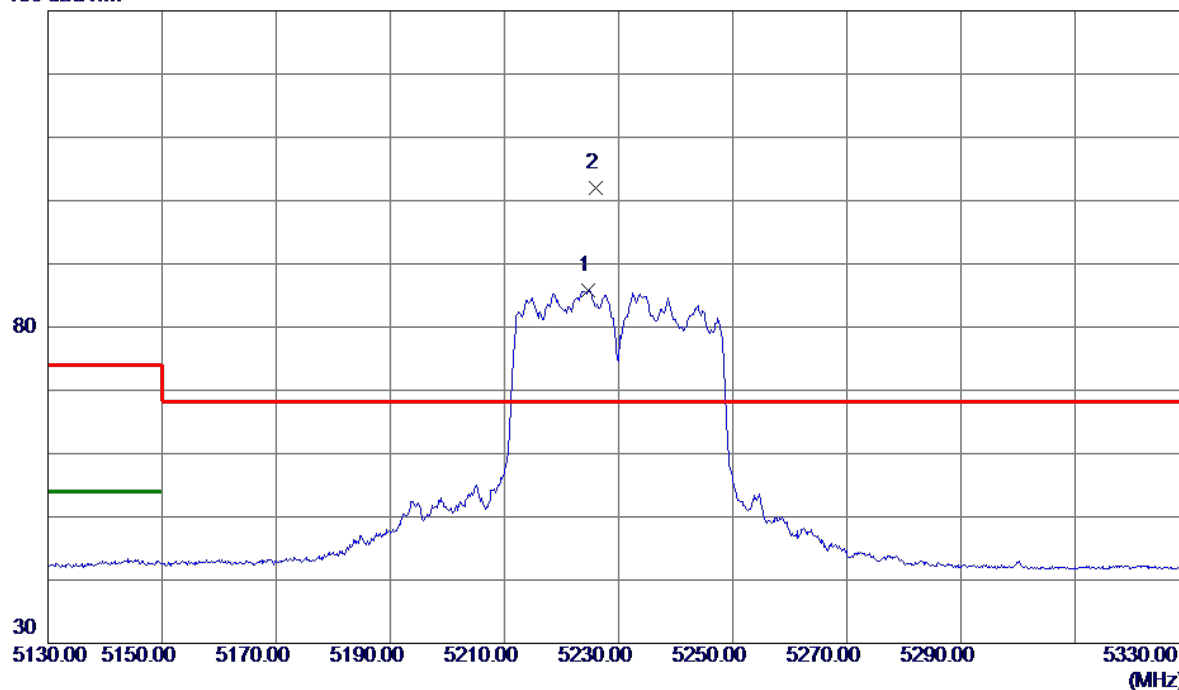


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10371.4500	37.55	12.91	50.46	68.30	-17.84	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5230MHz

Vertical

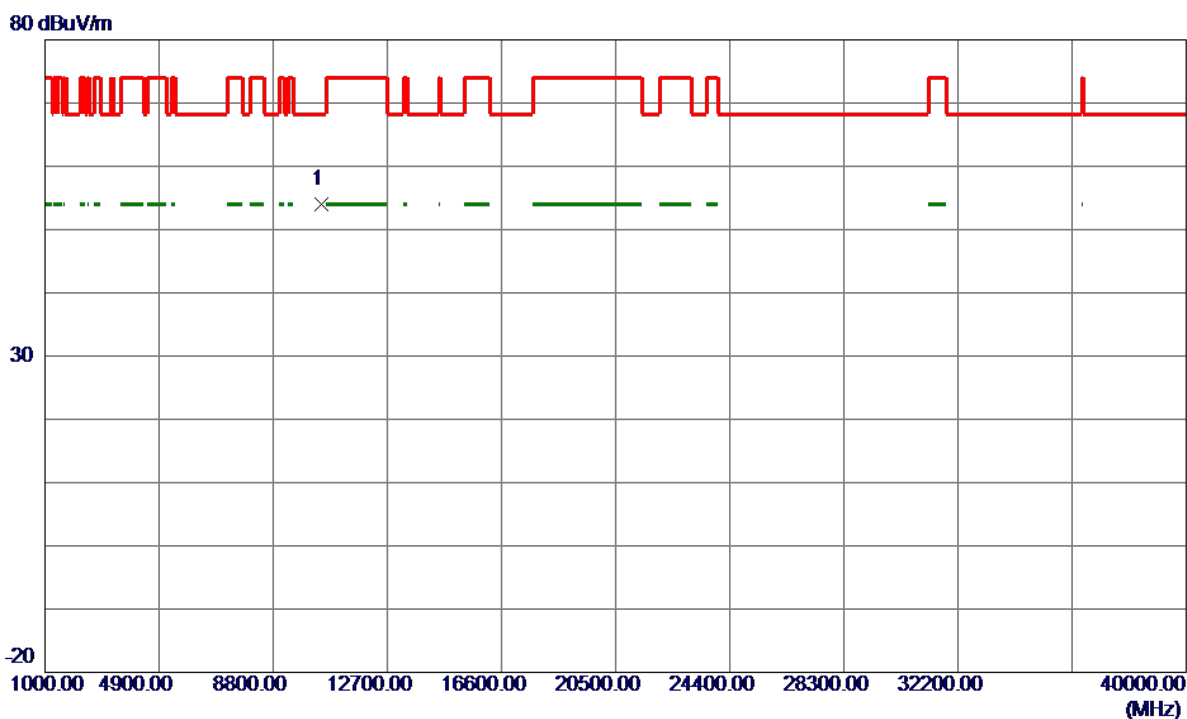
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5224.7000	70.79	15.07	85.86	999.00	-913.14	AVG	No Limit
2 *	5226.1000	86.84	15.07	101.91	68.30	33.61	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5230MHz

Vertical

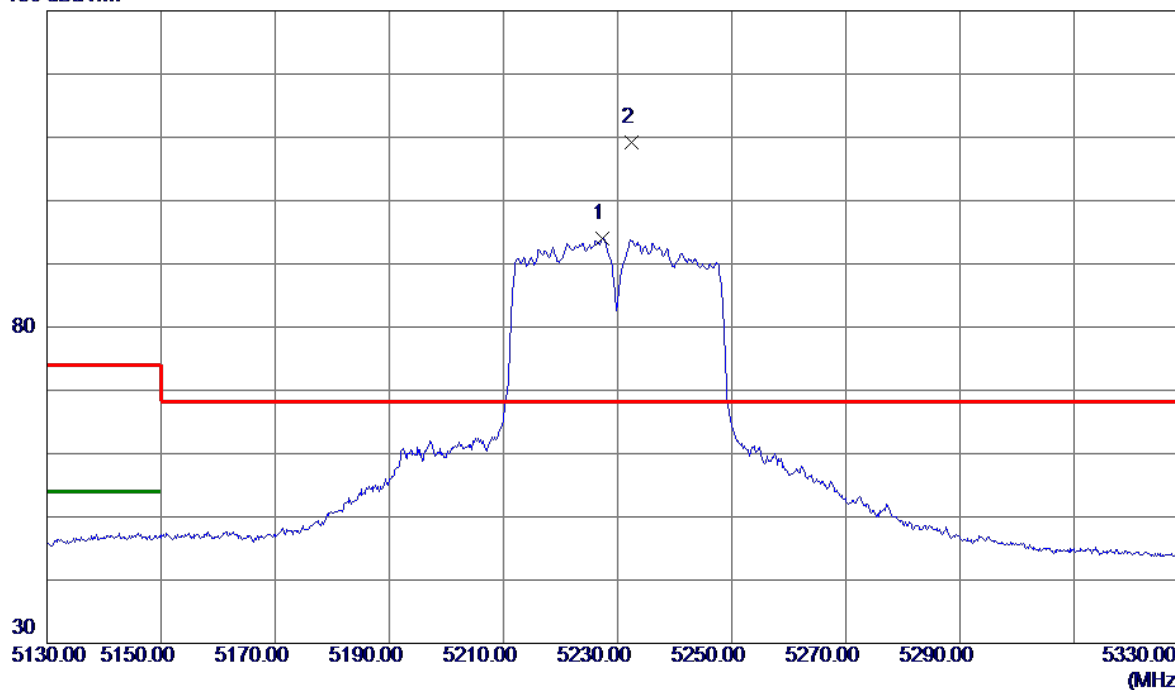


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10456.6000	40.93	13.09	54.02	68.30	-14.28	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5230MHz

Horizontal

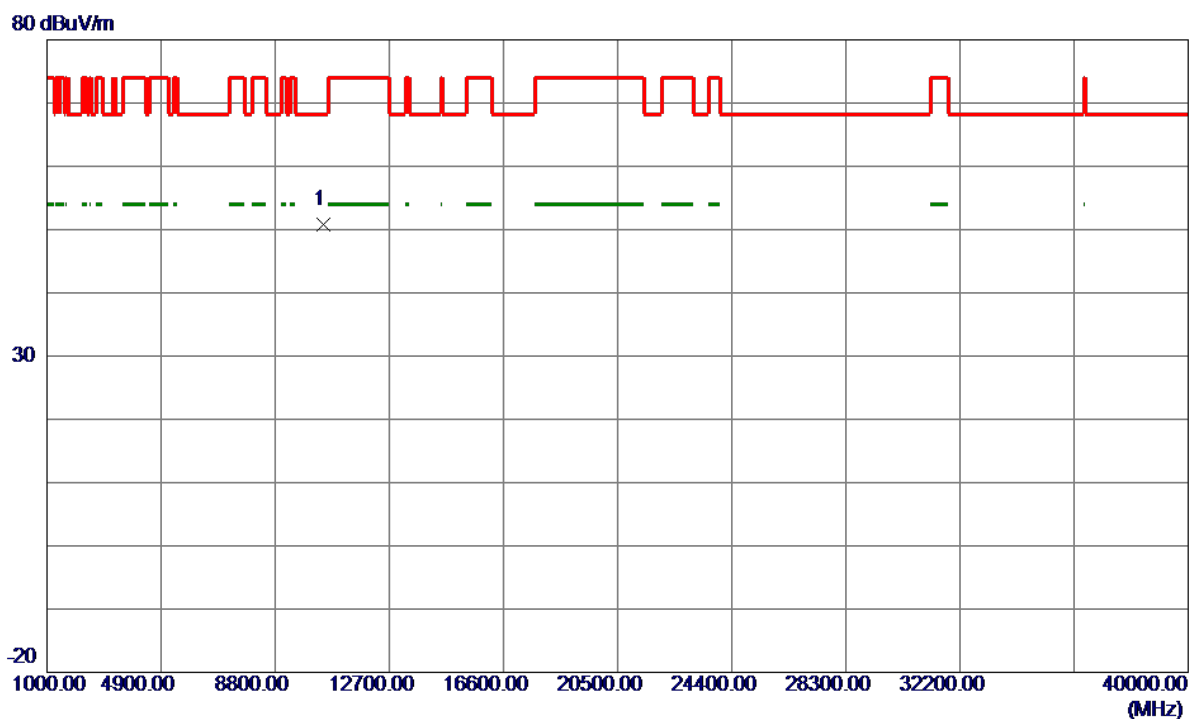
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5227.3000	78.99	15.07	94.06	999.00	-904.94	AVG	No Limit
2 *	5232.4000	94.14	15.08	109.22	68.30	40.92	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC40 Mode 5230MHz

Horizontal

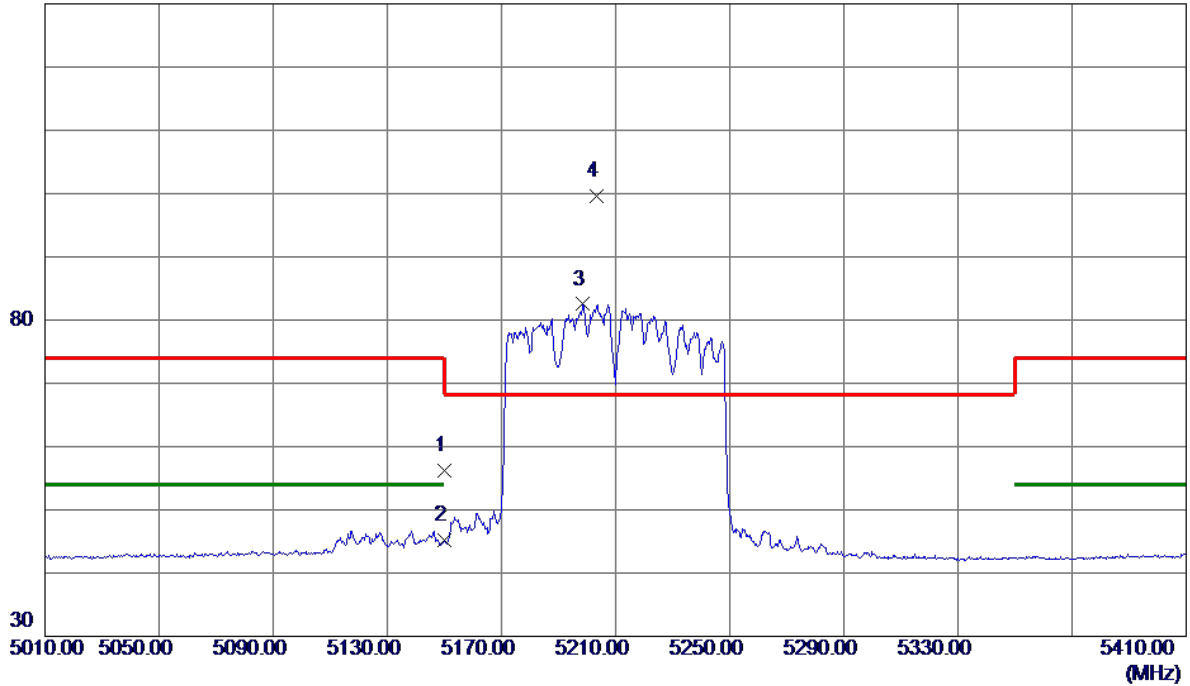


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10460.1500	37.63	13.09	50.72	68.30	-17.58	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC80 Mode 5210MHz

Vertical

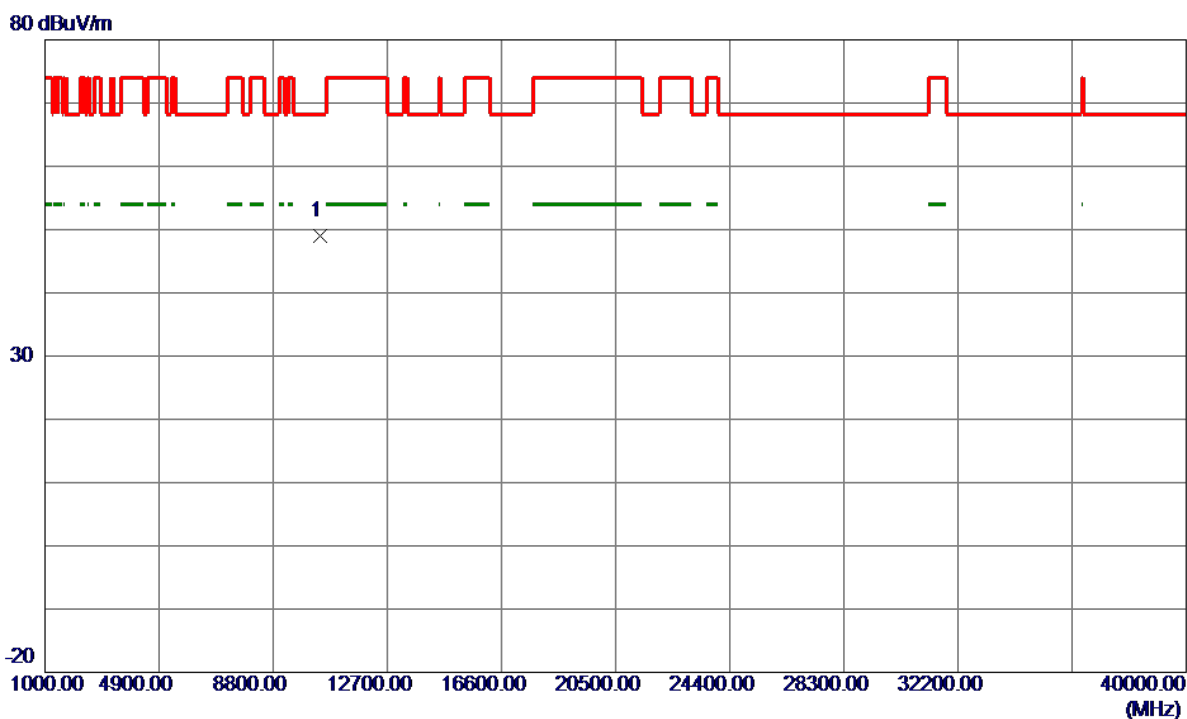
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5150.0000	41.31	14.91	56.22	74.00	-17.78	Peak	
2	5150.0000	30.20	14.91	45.11	54.00	-8.89	AVG	
3	5198.6000	67.49	15.01	82.50	999.00	-916.50	AVG	No Limit
4 *	5203.2000	84.53	15.02	99.55	68.30	31.25	Peak	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC80 Mode 5210MHz

Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	10422.5500	35.91	13.02	48.93	68.30	-19.37	Peak	

Orthogonal Axis:	X
Test Mode:	TX AC80 Mode 5210MHz

Horizontal

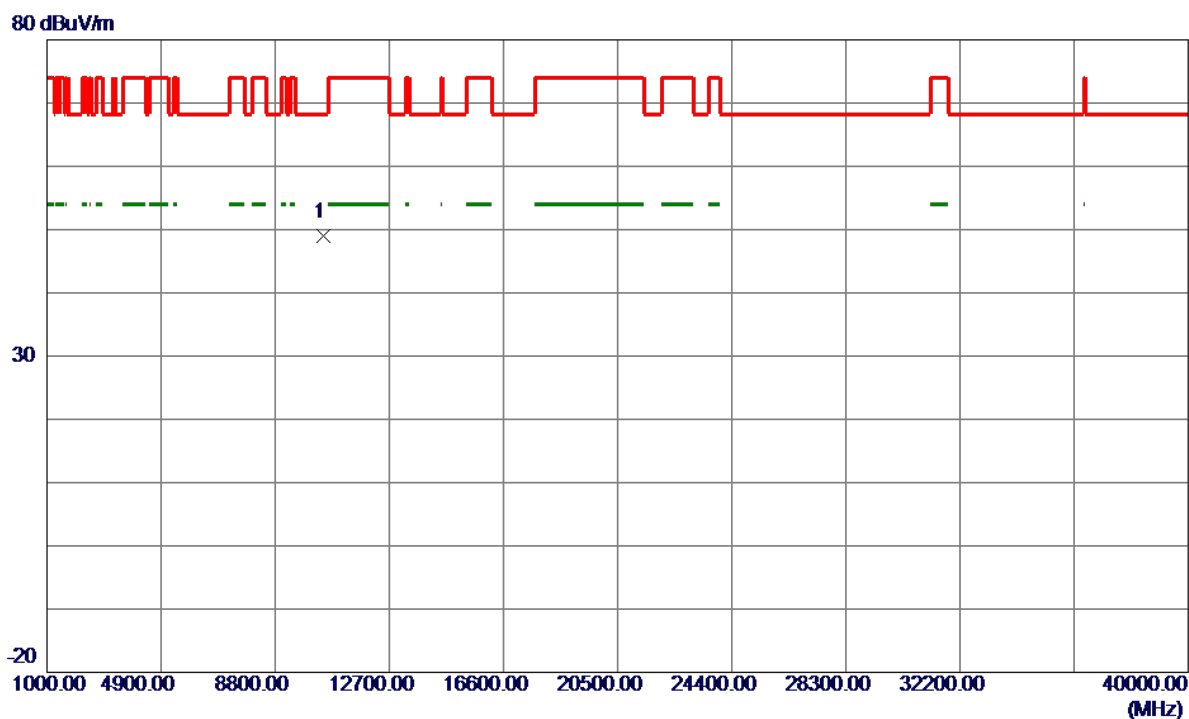
130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	5146.2000	49.73	14.90	64.63	74.00	-9.37	Peak	
2	5146.2000	38.66	14.90	53.56	54.00	-0.44	AVG	
3	5150.0000	48.37	14.91	63.28	74.00	-10.72	Peak	
4	5150.0000	36.40	14.91	51.31	54.00	-2.69	AVG	
5 *	5205.6000	91.89	15.03	106.92	68.30	38.62	Peak	No Limit
6	5214.8000	75.05	15.04	90.09	999.00	-908.91	AVG	No Limit

Orthogonal Axis:	X
Test Mode:	TX AC80 Mode 5210MHz

Horizontal



No.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB		
1 *	10444.1000	35.84	13.06	48.90	68.30	-19.40	Peak	

TX A Mode_DUTY CYCLE

$$\text{Duty cycle} = T_{\text{ON}} / T_{\text{Total}}$$

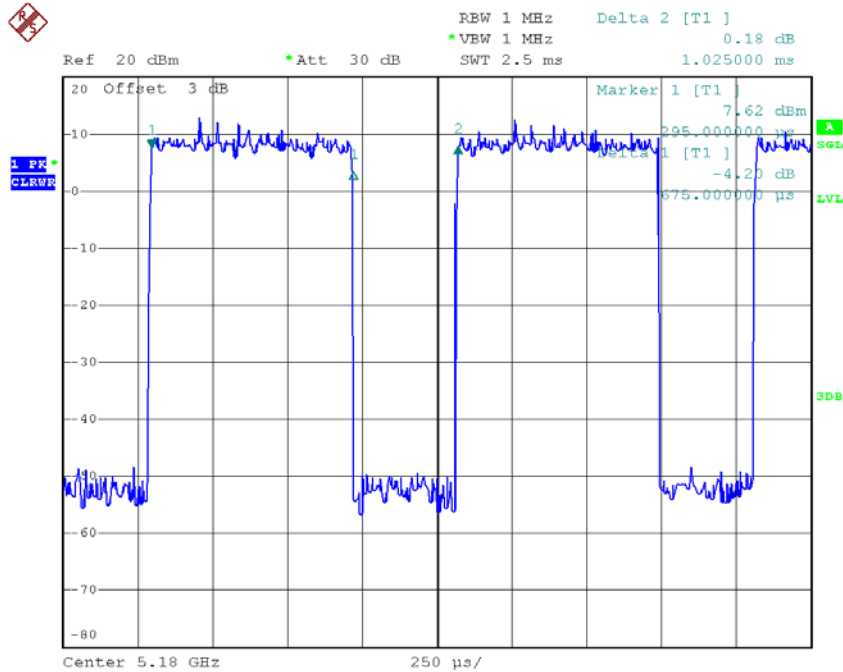
T_{ON} : 0.675 msec

T_{Total} : 1.025 msec

Duty cycle: 65.85%

Duty Factor = $10 \log(1/\text{Duty cycle})$

Duty Factor = 1.81



Date: 15.DEC.2018 18:57:26

Note:

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle < 98 %, so, the output power and power spectral density should be calculated as

Output Power = Measured power + Duty factor

Power Spectral Density = Measured density + Duty factor

TX N20 Mode_DUTY CYCLE

$$\text{Duty cycle} = T_{\text{ON}} / T_{\text{Total}}$$

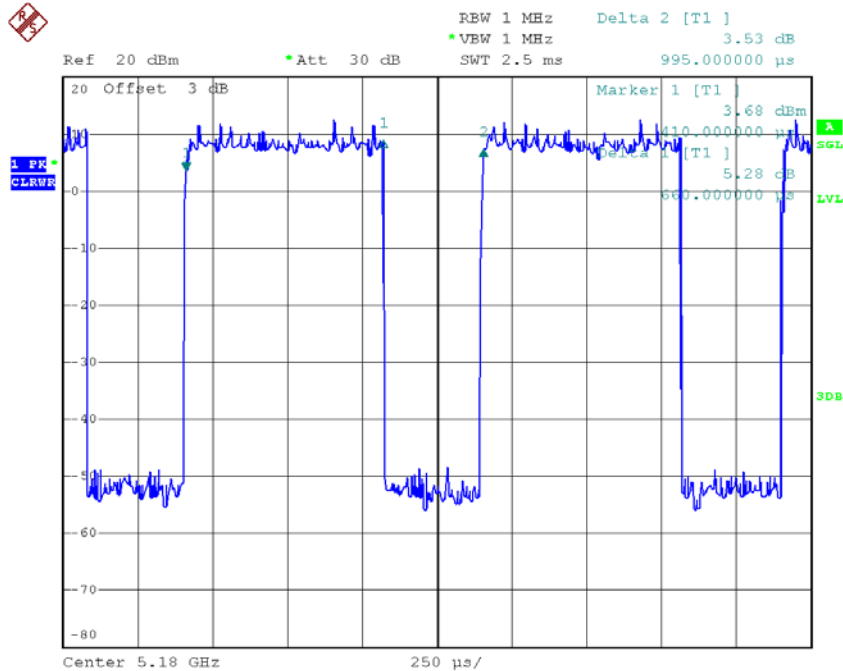
T_{ON}: 0.660 msec

T_{Total}: 0.995 msec

Duty cycle: 66.33%

$$\text{Duty Factor} = 10 \log(1/\text{Duty cycle})$$

Duty Factor = 1.78



Date: 15.DEC.2018 18:57:48

Note:

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle < 98 %, so, the output power and power spectral density should be calculated as

Output Power = Measured power + Duty factor

Power Spectral Density = Measured density + Duty factor

TX N40 Mode_DUTY CYCLE

$$\text{Duty cycle} = T_{\text{ON}} / T_{\text{Total}}$$

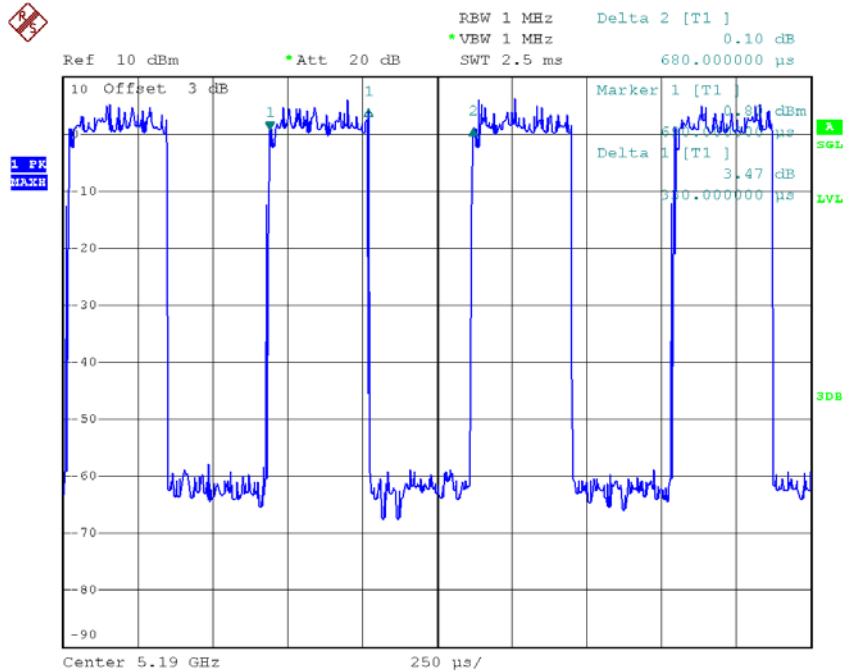
T_{ON}: 0.330 msec

T_{Total}: 0.680 msec

Duty cycle: 48.53%

$$\text{Duty Factor} = 10 \log(1/\text{Duty cycle})$$

Duty Factor = 3.14



Date: 15.DEC.2018 19:08:50

Note:

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle < 98 %, so, the output power and power spectral density should be calculated as

Output Power = Measured power + Duty factor

Power Spectral Density = Measured density + Duty factor

TX AC20 Mode_DUTY CYCLE

$$\text{Duty cycle} = T_{\text{ON}} / T_{\text{Total}}$$

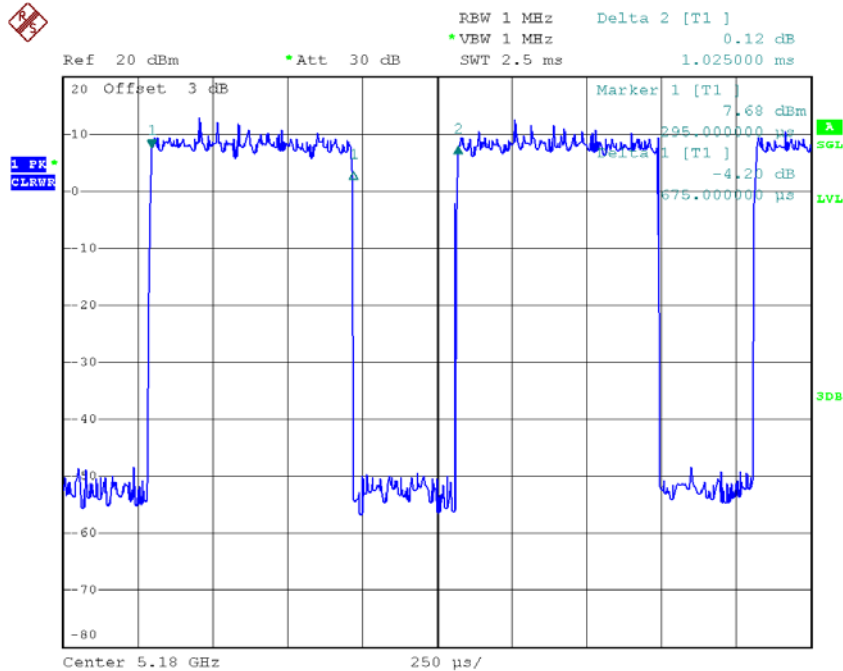
T_{ON} : 0.675 msec

T_{Total} : 1.025 msec

Duty cycle: 65.85%

$$\text{Duty Factor} = 10 \log(1/\text{Duty cycle})$$

$$\text{Duty Factor} = 1.81$$



Date: 15.DEC.2018 18:57:57

Note:

The EUT was programmed to be in countinously transmitting mode and the transmit duty cycle < 98 %, so, the output power and power spectral density should be calculated as

Output Power = Measured power + Duty factor

Power Spectral Density = Measured density + Duty factor

TX AC40 Mode_DUTY CYCLE

$$\text{Duty cycle} = T_{\text{ON}} / T_{\text{Total}}$$

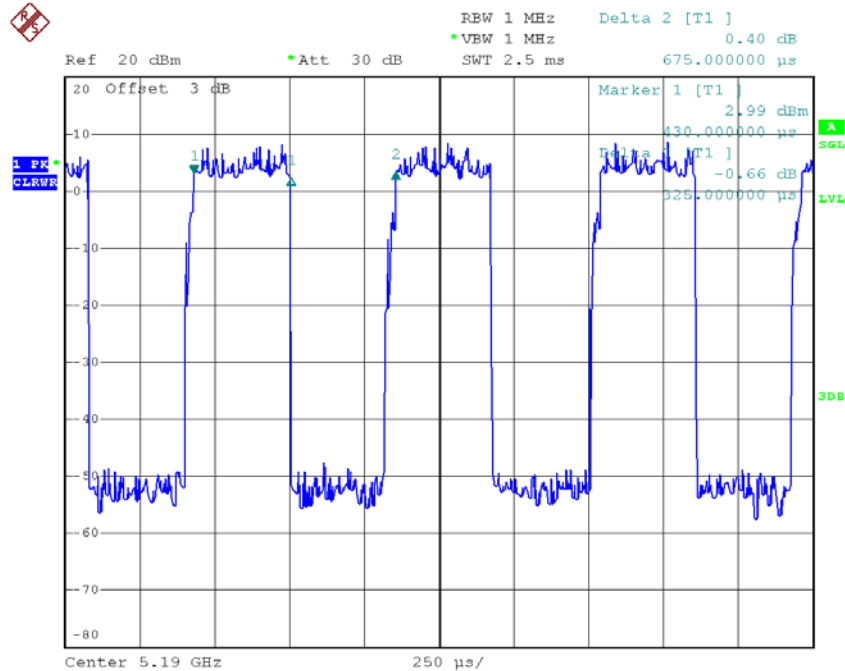
T_{ON} : 0.325 msec

T_{Total} : 0.675 msec

Duty cycle: 48.15%

$$\text{Duty Factor} = 10 \log(1/\text{Duty cycle})$$

Duty Factor = 3.17



Date: 19.DEC.2018 15:53:54

Note:

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle < 98 %, so, the output power and power spectral density should be calculated as

Output Power = Measured power + Duty factor

Power Spectral Density = Measured density + Duty factor

TX AC80 Mode_DUTY CYCLE

$$\text{Duty cycle} = T_{\text{ON}} / T_{\text{Total}}$$

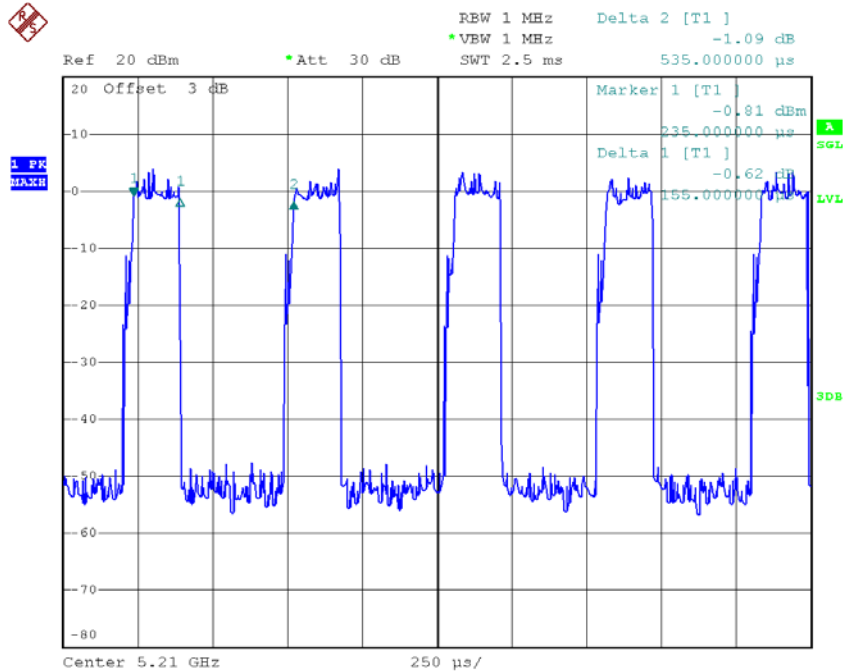
T_{ON} : 0.155 msec

T_{Total} : 0.535 msec

Duty cycle: 28.97%

$$\text{Duty Factor} = 10 \log(1/\text{Duty cycle})$$

$$\text{Duty Factor} = 5.38$$



Date: 19.DEC.2018 15:52:20

Note:

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle < 98 %, so, the output power and power spectral density should be calculated as

Output Power = Measured power + Duty factor

Power Spectral Density = Measured density + Duty factor

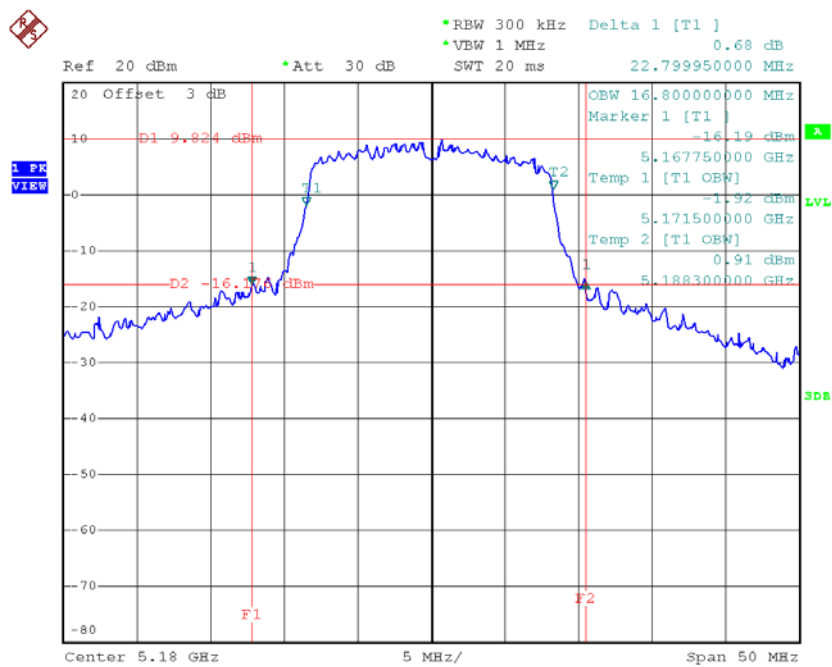
APPENDIX E - BANDWIDTH

Non-Beamforming

Test Mode: TX A Mode_CH36/CH40/CH48

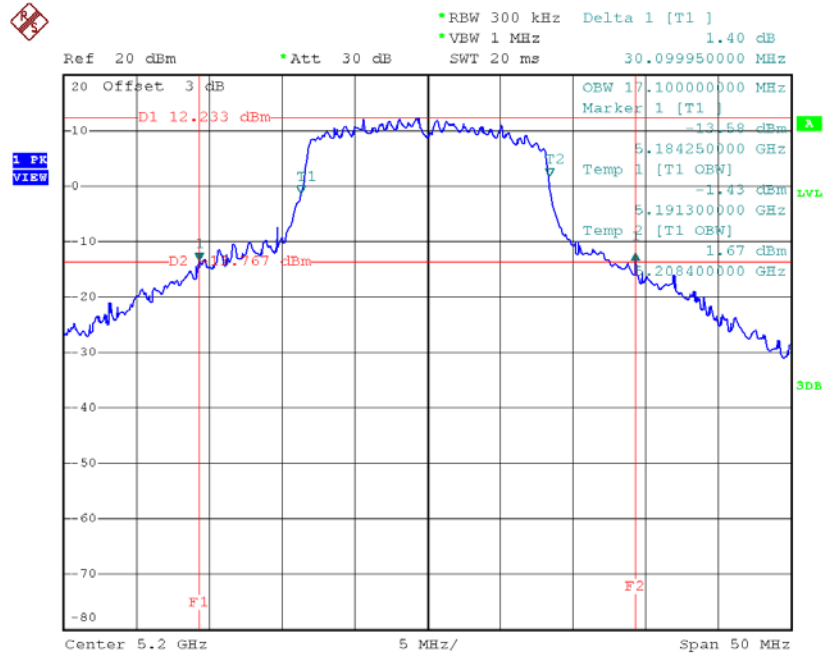
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH36	5180	22.80	16.80
CH40	5200	30.10	17.10
CH48	5240	33.29	18.30

TX CH36



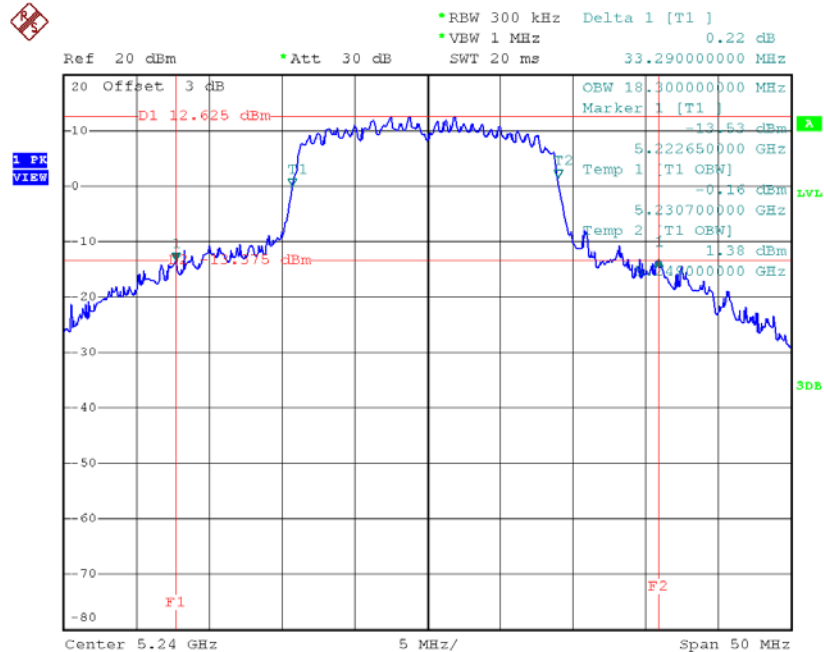
Date: 19.DEC.2018 18:53:38

TX CH40



Date: 19.DEC.2018 18:55:43

TX CH48

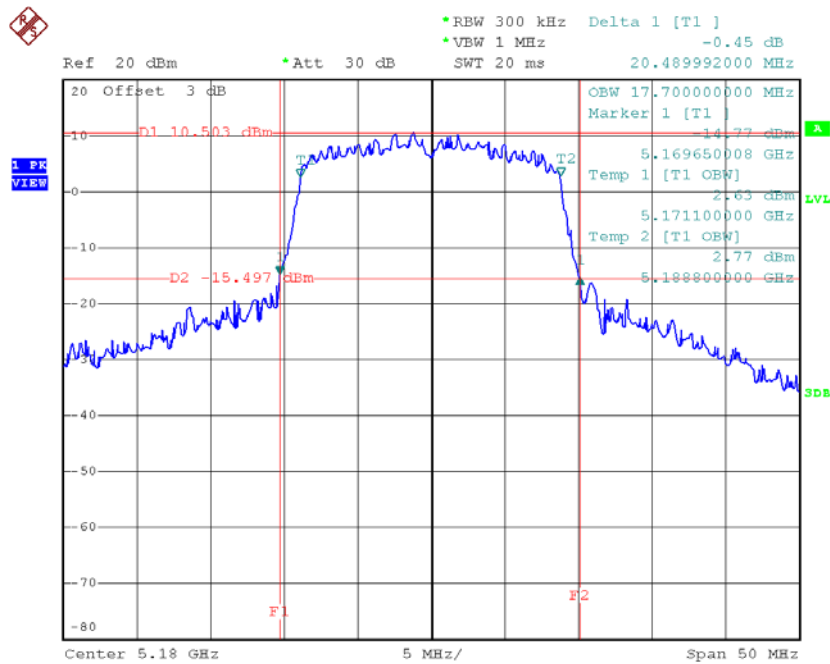


Date: 19.DEC.2018 19:04:12

Test Mode: TX N20 Mode_CH36/CH40/CH48

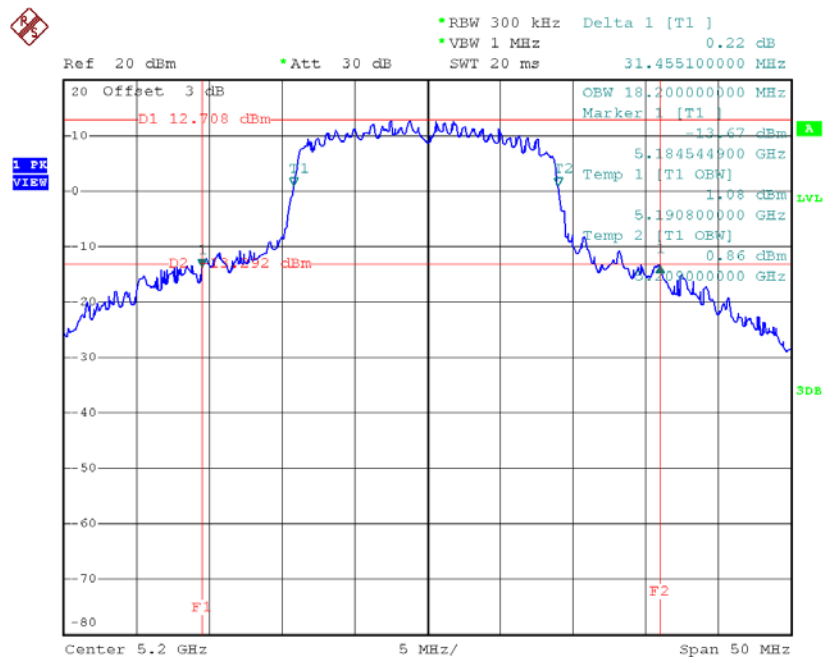
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH36	5180	20.49	17.70
CH40	5200	31.46	18.20
CH48	5240	33.50	18.30

TX CH36



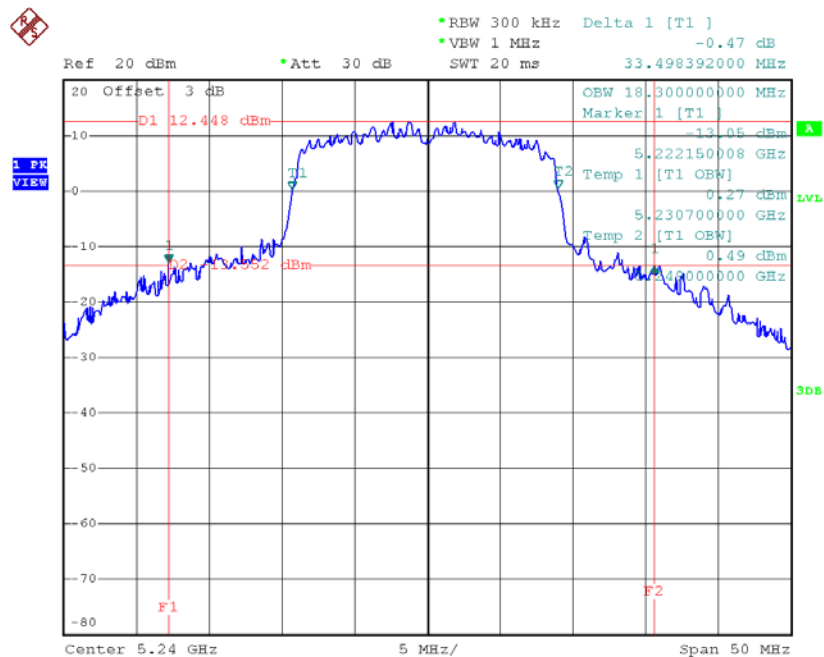
Date: 19.DEC.2018 19:21:01

TX CH40



Date: 19.DEC.2018 19:22:25

TX CH48

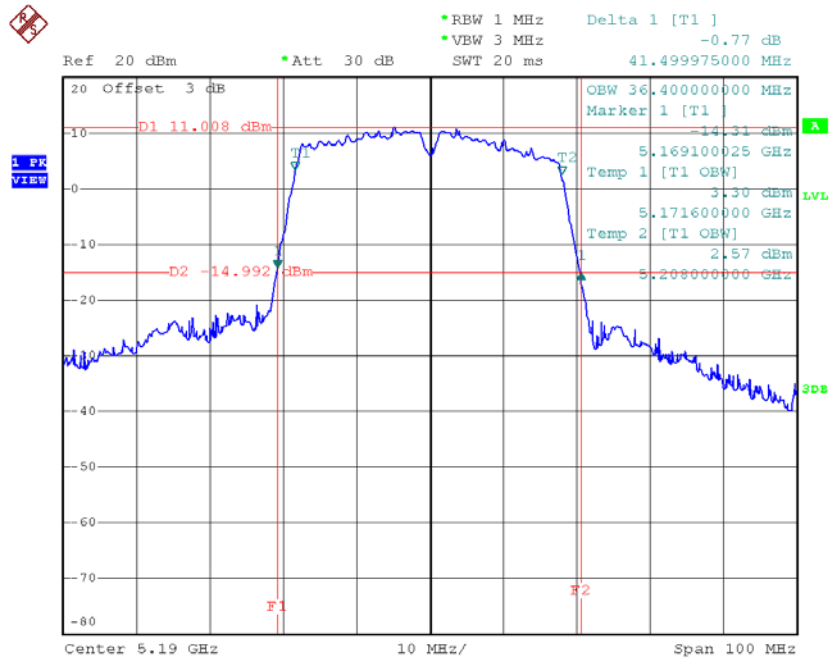


Date: 19.DEC.2018 19:23:12

Test Mode: TX N40 Mode_CH38/CH46

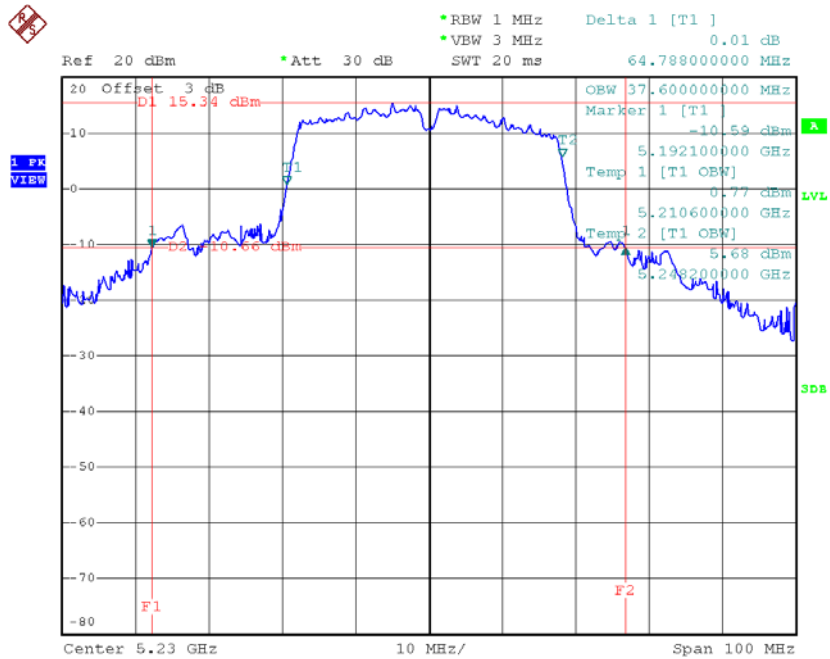
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH38	5190	41.50	36.40
CH46	5230	64.79	37.60

TX CH38



Date: 19.DEC.2018 19:25:11

TX CH46

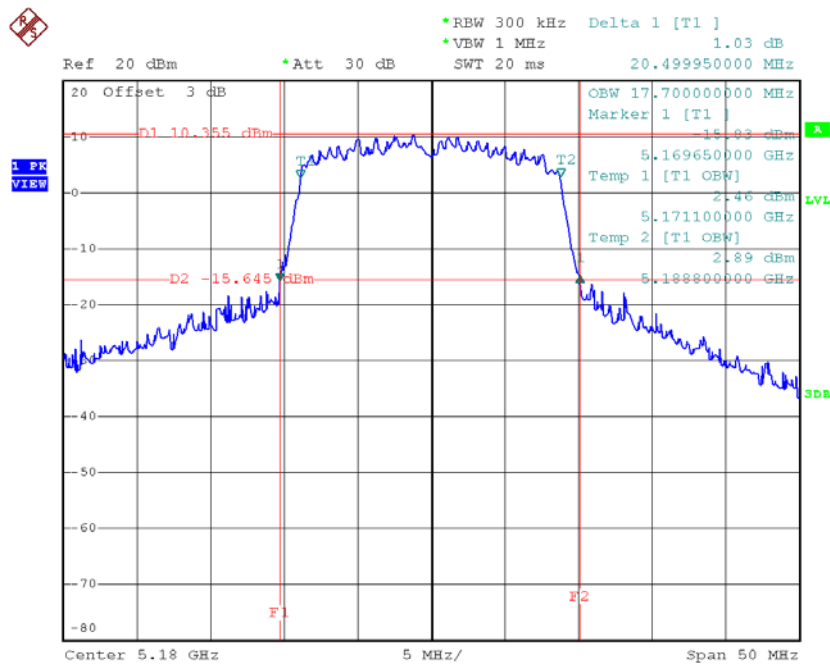


Date: 19.DEC.2018 19:26:36

Test Mode: TX AC20 Mode_CH36/CH40/CH48

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH36	5180	20.50	17.70
CH40	5200	32.79	18.20
CH48	5240	30.80	18.30

TX CH36



Date: 19.DEC.2018 19:15:11

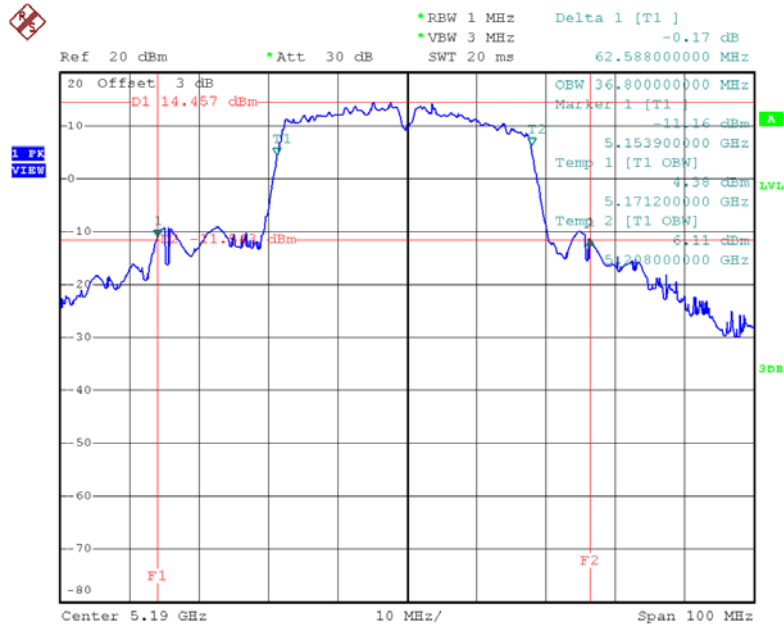
Date: 19.DEC.2018 19:16:03

Date: 19.DEC.2018 19:16:56

Test Mode: TX AC40 Mode_CH38/CH46

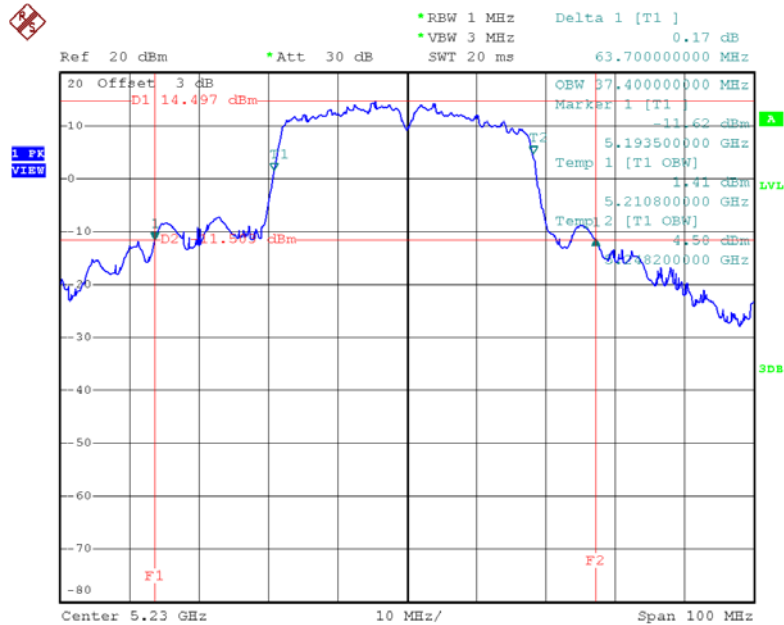
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH38	5190	62.59	36.80
CH46	5230	63.70	37.40

TX CH38



Date: 19.DEC.2018 19:11:37

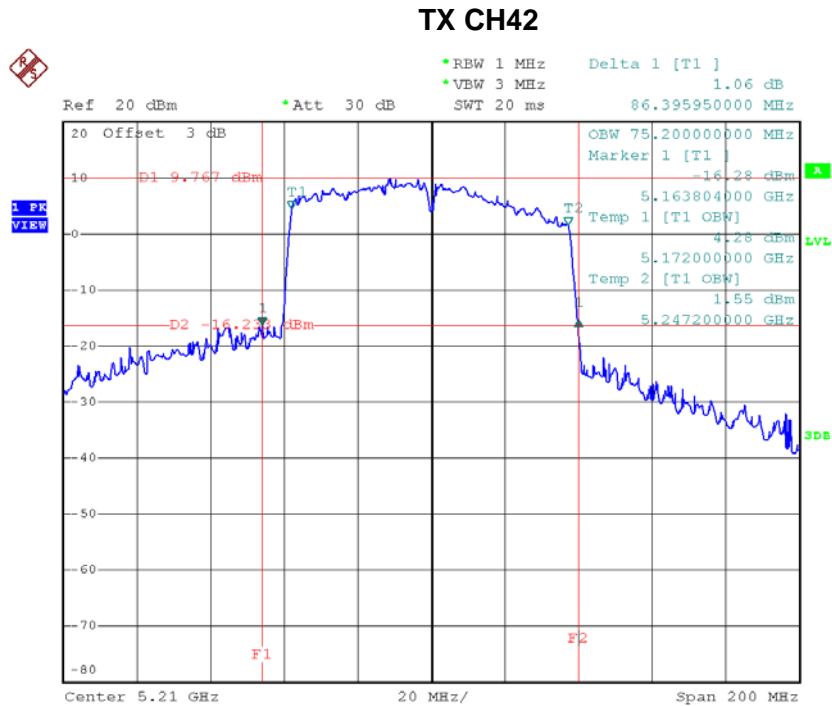
TX CH46



Date: 19.DEC.2018 19:12:48

Test Mode: TX AC80 Mode_CH42

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH42	5210	86.40	75.20



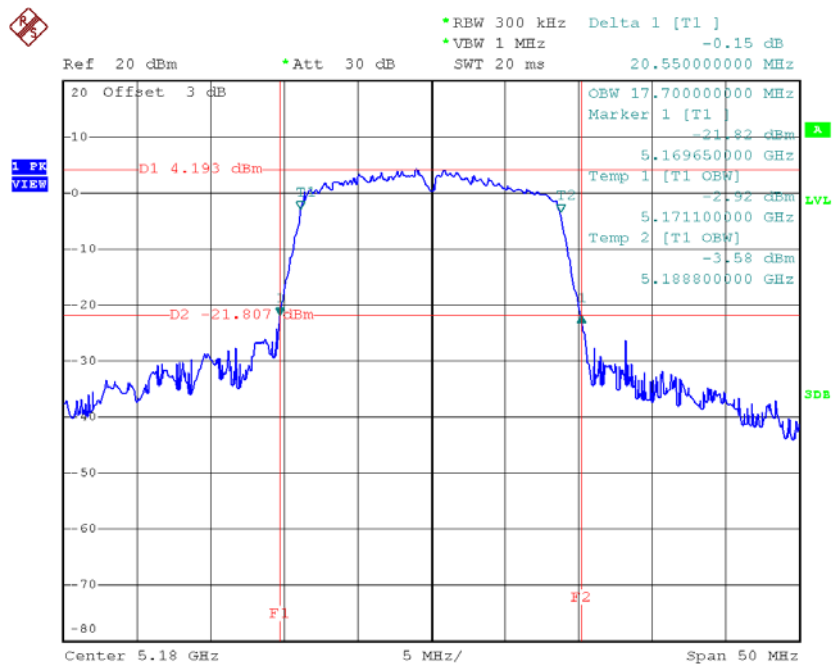
Date: 19.DEC.2018 19:09:09

With Beamforming

Test Mode: TX N20 Mode_CH36/CH40/CH48

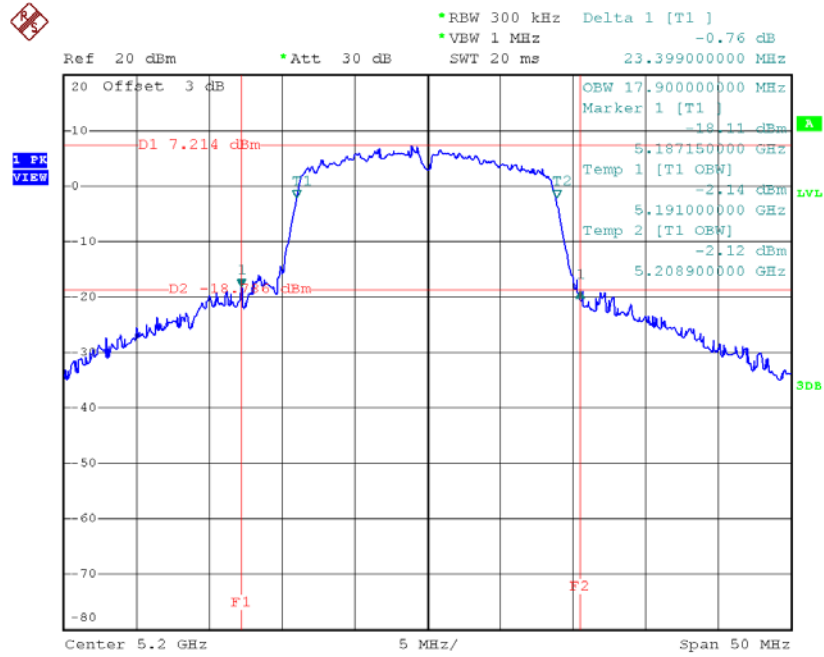
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH36	5180	20.55	17.70
CH40	5200	23.40	17.90
CH48	5240	22.80	17.90

TX CH36



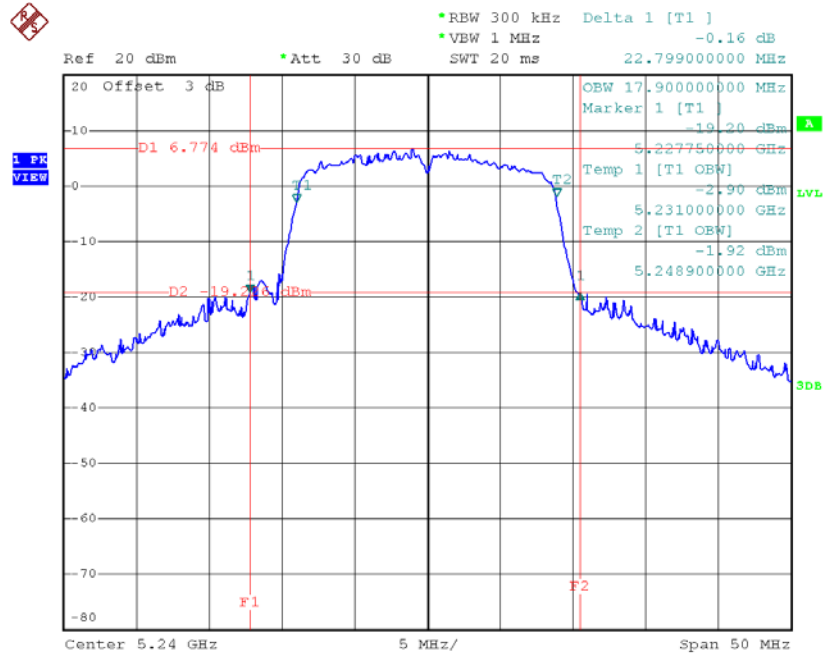
Date: 20.DEC.2018 09:46:50

TX CH40



Date: 20.DEC.2018 09:47:58

TX CH48

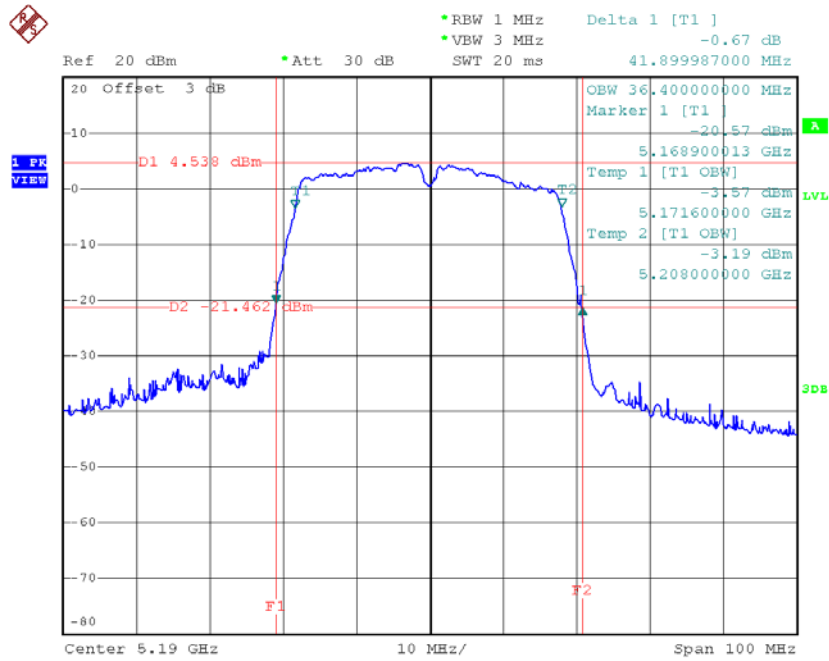


Date: 20.DEC.2018 09:49:05

Test Mode: TX N40 Mode_CH38/CH46

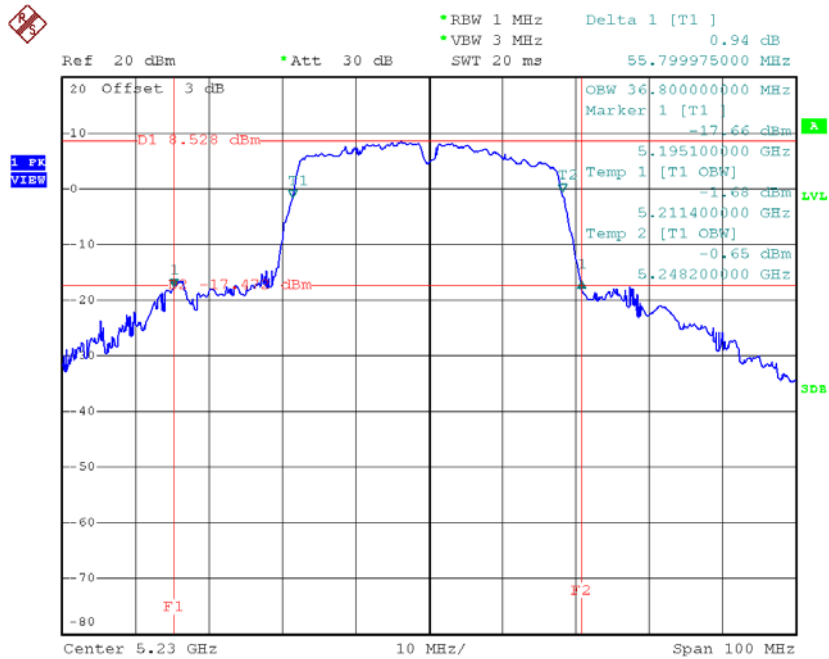
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH38	5190	41.90	36.40
CH46	5230	55.80	36.80

TX CH38



Date: 20.DEC.2018 09:51:05

TX CH46

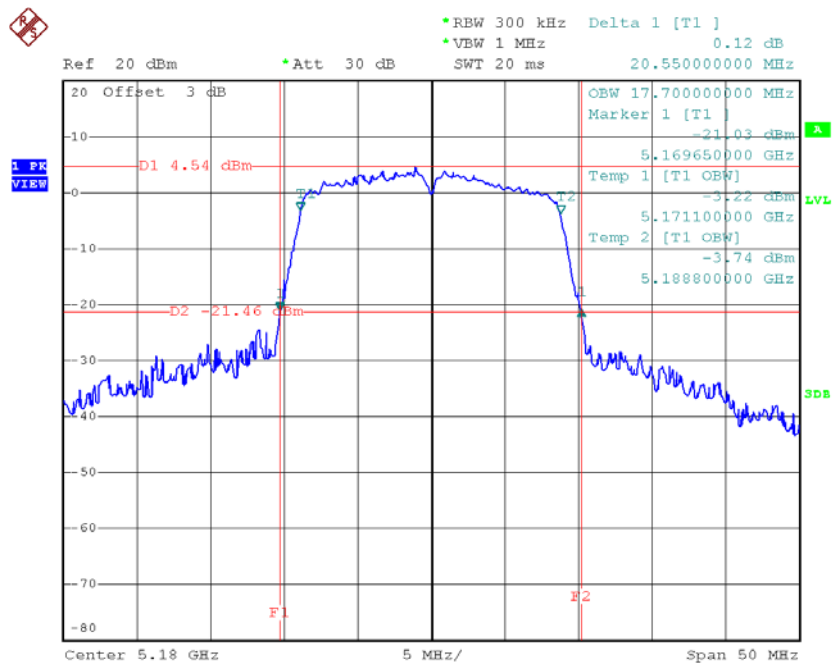


Date: 20.DEC.2018 09:52:29

Test Mode: TX AC20 Mode_CH36/CH40/CH48

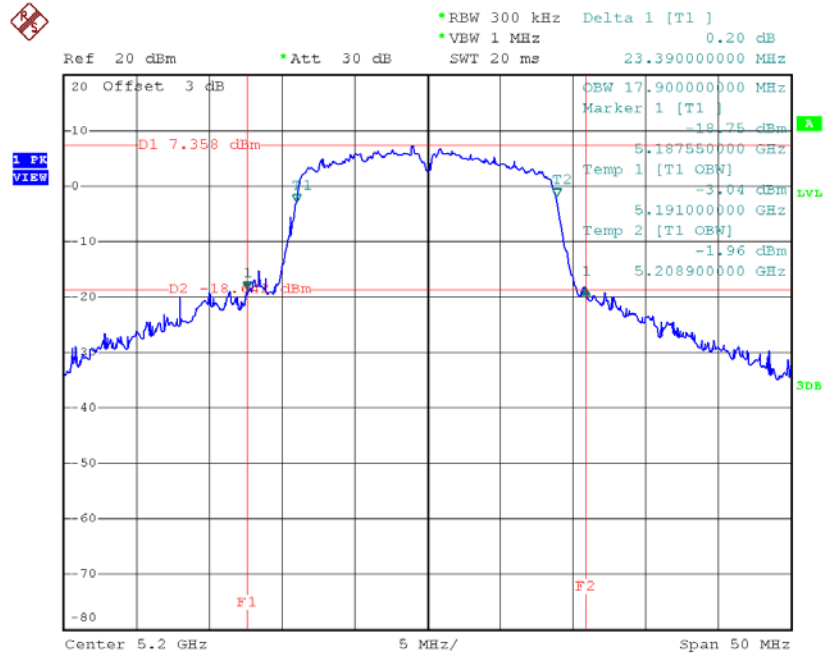
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH36	5180	20.55	17.70
CH40	5200	23.39	17.90
CH48	5240	22.95	17.90

TX CH36



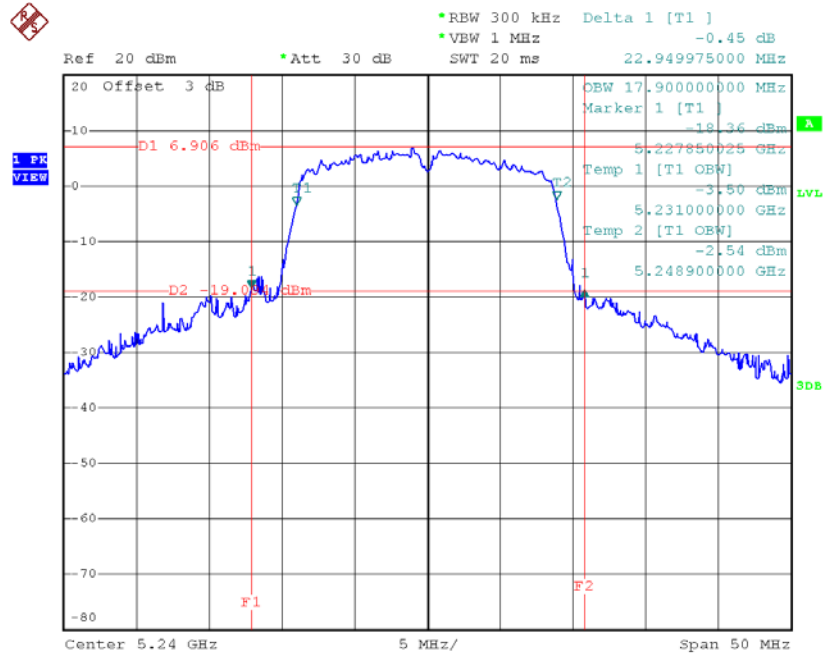
Date: 20.DEC.2018 09:38:23

TX CH40



Date: 20.DEC.2018 09:39:45

TX CH48



Date: 20.DEC.2018 09:41:03

Test Mode: TX AC40 Mode_CH38/CH46

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
CH38	5190	62.41	37.20
CH46	5230	62.79	37.00