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# **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT CLASS II PERMISSIVE CHANGE REPORT

OF

**Applicant:** Barco NV

Barco NV President Kennedypark 35, 8500 Kortrijk, Belgium

Product Name: ClickShare CSE-200+, ClickShare

Brand Name: Barco

Model No.: CSE-200+, C 5010S

**Model Difference:** For the detail, please refer to product diversity table in page 4.

 FCC ID:
 2AAED-R9861521

 Report Number:
 ER/2019/60051

 FCC Rule Part:
 §15.407, Cat: NII

**Issue Date:** Dec. 20, 2019

**Date of Test:** Jun. 18, 2019 ~ Nov. 11, 2019

Date of EUT Re-

ceived: Jun. 18, 2019

#### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Approved By:

Jay Lin / Asst. Supervisor





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Revision History				
Revision	Description	Issue Date	Remark	
Rev.00	Original.	Dec. 20, 2019	Revised By: Karen Huang	

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# **GENERAL INFORMATION**

#### 1.1 **Product Description**

Product Name:	ClickShare CSE-200+, ClickShare		
Brand Name:	Barco		
Model No.:	CSE-200+, C 5010S		
Model Difference:	For the detail, please refer to product diversity table below.		
Product SW/HW Version:	N/A / EVT2		
Scope:	The test report covers the conducted and radiated emissions requirements of the standards referenced in the report to allow system enabling UNII-2A & UNII-2C by firmware		
Class II Permissive Change:	Enabling UNII-2A & UNII-2C by firmware		
WLAN Module:	Model No.: WCBN807A		
	120Vac input / 12Vdc output from AC/DC adapter		
Power Supply:	1. Model No.:, BA070-120417GXX Supplier:.BILLION 2. Model No.: ATS050T-A121 Supplier: Adapter Technology		

# **Product Diversity Description Table:**

Product Name:	Product name for CSE-200+ us ClickShare CSE-200+; Product name for C 5010S is ClickShare.	
PCB and Hardware	- USB audio codec IC	
changes:	- Stereo class-D audio amplifier	
	- USB2.0 hub controller IC	
	- 1 watt speaker through wire connection	

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Wi-Fi 802.11	Frequency Range	Channels	Rated Power (	Avg.) (dBm)	Modulation Technology
	5250~5350	4	17.96		OFDM
а	5470~5725	12	18.00		
n_HT	5250~5350	4	HT: 18.19	(Worst case)	
ac_VHT 20M	5470~5725	11	HT: 18.24	(Worst case)	OFDM
n_HT	5250~5350	2	HT: 17.25	(Worst case)	
ac_VHT 40M	5470~5725	5	HT: 17.01	(Worst case)	OFDM
ac_VHT	5250~5350	1	12.93		
80M			16.63		OFDM
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Antenna Designation		Antenna 1: 0.64dBi (525	a, Peak Gain: 50~5350MHz) 70~5725MHz)		
		Antenna 2: -1.10dBi (5250~5350MHz) 0.24dBi (5470~5725MHz)			
Transition Rate:  80 80 80 80		802.11 a: 6/9 802.11 n_20 802.11 n_40 802.11 ac_2 802.11 ac_4	9/12/18/24/36/48/5 MHz: 6.5 – 144.4  MHz: 13.5 – 300.0 0MHz: 6.5 –173.3 0MHz: 13.5 –400.0 0MHz: 29.3 – 866	Mbps OMbps Mbps OMbps	

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#### 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules V02r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10:2013

#### Note:

All test items have been performed and record as per the above standards.

#### 1.3 **Test Facility**

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Designation number: TW0001

#### 1.4 **Special Accessories**

There are no special accessories used while test was conducted.

#### 1.5 **Equipment Modifications**

There was no modification incorporated into the EUT.

#### 1.6 **Multiple Model numbers**

The variant model numbers are assessed as identical in hardware and software to each other, hence all variants are fully covered by the test results in this test report without furher verification test.

#### 1.7 **Disclaimer**

Variant information between model numbers is provided by the applicant, test results of this report are applicable to the sample EUT received.

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## SYSTEM TEST CONFIGURATION

# 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

#### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

## 2.3 Test Procedure

#### 2.1.1 **Conducted Emissions**

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.1.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

#### 2.1.3 **Radiated Emissions**

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max, emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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# 2.4 Measurement Results Explanation Example

## For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

#### Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

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# 2.5 Configuration of Tested System

# Fig. 2-1 Radiated Emission Configuration

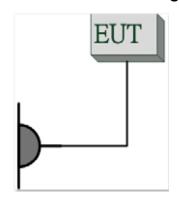


Fig. 2-2 Conducted (Antenna Port) Emission Configuration



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

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# **SUMMARY OF TEST RESULT**

FCC Rules	Description Of Test	Result
§15.403(i) §15.407(e)	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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# **DESCRIPTION OF TEST MODES**

# 4.1 Operated in U-NII Bands

# Operated band in 5250 MHz ~5350 MHz:

802.11a / n HT20 Mode		
channel	Frequency	
52	5260	
56	5280	
60	5300	
64	5320	

802.11 n HT40 Mode		
channel	Frequency	
54	5270	
62	5310	

802.11ac VHT80 Mode	
Channel	Frequency
58	5290

# Operated band in 5470 MHz ~5725 MHz:

802.11a / n HT20 Mode		
Channel	Frequency	
100	5500	
104	5520	
108	5540	
112	5560	
116	5580	
120	5600	
124	5620	
128	5640	
132	5660	
136	5680	
140	5700	

802.11 n HT40 Mode		
channel	Frequency	
102	5510	
110	5550	
118	5590	
126	5630	
134	5670	

802.11ac VHT80 Mode			
channel	Frequency		
106	5530		
122	5610		

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#### 4.2 The Worst Test Modes and Channel Details

- The EUT has been tested under operating condition.
- 2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
- 3. Investigation has been done on all the possible configurations for searching the worst case. The given UE is pre-scanned among below modes.

Modulation	Transmiss	ion Chain	Multiple Transmission Spatial
⊠ 802.11 a	⊠ Ch0	⊠ Ch1	⊠ 2TX
⊠ 802.11 n	⊠ Ch0	⊠ Ch1	⊠ MIMO
⊠ 802.11 ac	⊠ Ch0	⊠ Ch1	⊠ MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

#### RADIATED EMISSION TEST

RADIATED EMISSION TEST:						
	RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	FREQUENCY		TESTED	MODULATION	DATA RATE	
IVIODL	BAND (MHz)	CHANNEL	CHANNEL	WODULATION	(Mbps)	PORT
802.11a	5260~5320	52 to 64	60	OFDM	6	2TX
802.11a	5500~5720	100 to 140	116	OFDM	6	2TX
	RADI	ATED EMISS	SION TEST (A	BOVE 1 GHz)		
MODE	FREQUENCY	AVAILABLE	TESTED	MODULATION	DATA RATE	ANTENNA
IVIODE	BAND (MHz)	CHANNEL	CHANNEL	MODULATION	(Mbps)	PORT
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	2TX
802.11n_HT20	5200~5520	32 10 04	52,00,04	OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS0	MIMO
802.11a	5500~5720	100 to 144	100,116,140	OFDM	6	2TX
802.11n_HT20	5500~5720	100 to 144	100,110,140	OFDM	MCS8	MIMO
802.11n_HT40	5510~5710	102 to 142	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS0	MIMO

#### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

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# ANTENNA PORT CONDUCTED MEASUREMENT:

ANTENNATION ON CONSCIENCE MEXICON CONTENT OF THE PROPERTY OF T							
	CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT	
802.11a	F260- F220	52 to 64 52,60,64		OFDM	6	2TX	
802.11n_HT20	5260~5320			OFDM	MCS8	MIMO	
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO	
802.11ac_VHT80	5290	58	58	OFDM	MCS0	MIMO	
802.11a	5500~5700 100 to 140	100 to 140	100,116,140	OFDM	6	2TX	
802.11n_HT20	5500~5700	100 to 140	100,110,140	OFDM	MCS8	MIMO	
802.11n_HT40	5510~5670	102 to 134	102,110,134	OFDM	MCS8	MIMO	
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS0	MIMO	

The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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# **MEASUREMENT UNCERTAINTY**

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Meas- urement	+/- 0.96 dB
Peak Power Spectral Density Meas- urement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission Measurement Uncertainty				
	9kHz~30MHz: +-2.3dB			
Polarization: Vertical	30MHz - 180MHz: +/- 3.37dB			
	180MHz -417MHz: +/- 3.19dB			
	0.417GHz-1GHz: +/- 3.19dB			
	1GHz - 18GHz: +/- 4.04dB			
	18GHz - 40GHz: +/- 4.04dB			
	9kHz~30MHz: +-2.3dB			
	30MHz - 167MHz: +/- 4.22dB			
Polarization: Horizontal	167MHz -500MHz: +/- 3.44dB			
Polarization: Horizontal	0.5GHz-1GHz: +/- 3.39dB			
	1GHz - 18GHz: +/- 4.08dB			
	18GHz - 40GHz: +/- 4.08dB			

## Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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# **6 DUTY CYCLE TEST SIGNAL**

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

#### Formula:

Duty Cycle = Ton / (Ton+Toff)

#### **Measurement Procedure:**

- 1. Set span = Zero
- 2. RBW = 8MHz
- 3. VBW = 8MHz,
- 4. Detector = Peak

# **Duty Cycle:**

ACC.					
Mode	Duty Cycle (%)  Duty Factor (dB) =10*log ( 1/Duty Cycle )		1/T (kHz)	VBW setting (kHz)	
802.11a	96.16	0.17	0.48	1.00	
802.11n_20	96.15	0.17	0.52	1.00	
802.11ac_20	96.14	0.17	0.52	1.00	
802.11n_40	91.83	0.37	1.05	2.00	
802.11ac_40	91.80	0.37	1.05	2.00	
802.11ac_80	83.73	0.77	2.16	3.00	

Duty Cycle Factor: 10 \* log(1/0.9616) = 0.17 Duty Cycle Factor: 10 \* log(1/0.9615) = 0.17 Duty Cycle Factor: 10 \* log(1/0.9614) = 0.17 Duty Cycle Factor: 10 \* log(1/0.9183) = 0.37 Duty Cycle Factor: 10 \* log(1/0.918) = 0.37 Duty Cycle Factor: 10 \* log(1/0.8373) = 0.77

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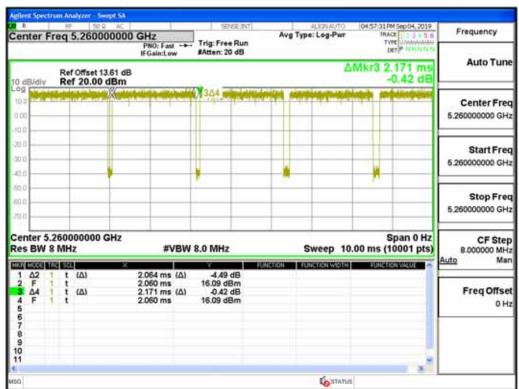
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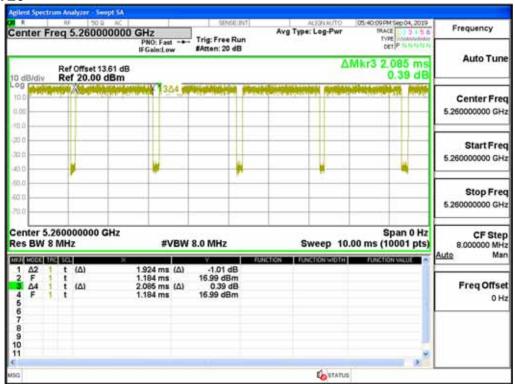


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# **DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT** 802.11a



# 802.11n\_HT20



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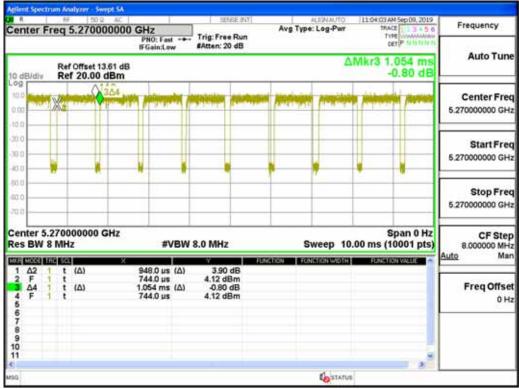
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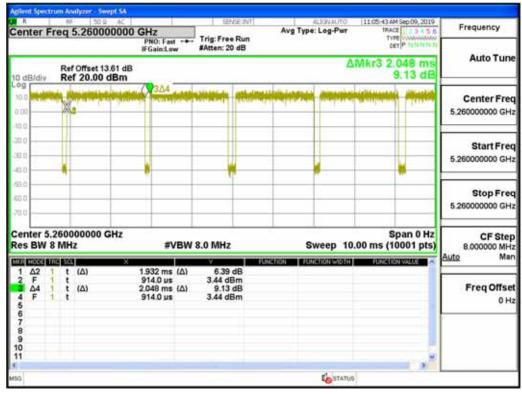


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# 802.11n HT40



# 802.11ac VHT20



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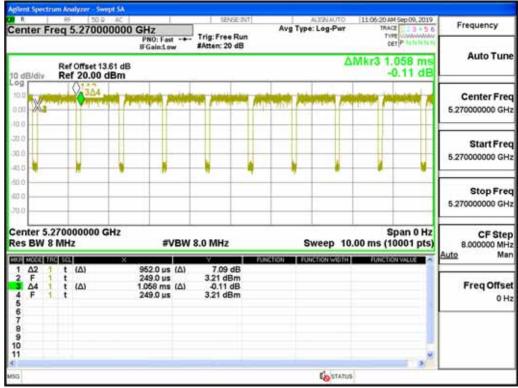
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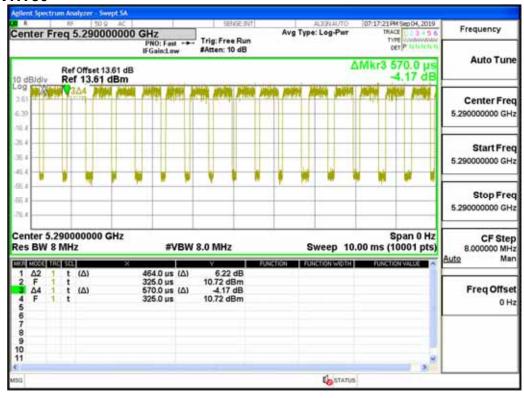


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# 802.11ac\_VHT40



# 802.11ac\_VHT80



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# 26DB & 6DB EMISSION BANDWIDTH MEASUREMENT

# 8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C. The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

#### 8.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
  - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
  - b. Mark the peak frequency and -26dB (upper and lower) frequency.
- 4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
- 5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
  - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Peak,
    - Sweep=auto
  - b. Mark the peak frequency and -6dB (upper and lower) frequency.
- 6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all frequency of interest measured was complete.

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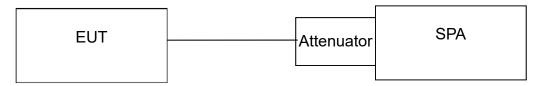


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# 8.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equip- ment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Ana- lyzer	Agilent	N9010A	MY50420195	05/02/2019	05/01/2020
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2019	05/16/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

# 8.4 Test Set-up



# 8.5 Measurement Result 26dB Bandwidth

802.11a Ch0

802.11a Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5260	30	14.771	5260	30	14.771
5300	30	14.771	5300	30	14.771
5320	18.95	12.776	5320	25.3	14.031
5500	18.84	12.751	5500	19.13	12.817
5580	30	14.771	5580	24.09	13.818
5700	19.58	12.918	5700	19.5	12.900
5720	18.82	12.746	5720	18.7	12.718

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#### 802.11n HT20 Ch0

#### 802.11n HT20 Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5260	30	14.771
5300	30	14.771
5320	19.92	12.993
5500	19.68	12.940
5580	30	14.771
5700	19.7	12.945
5720	19.57	12.916

26dB BW (MHz)	10 Log (B) (dB)
30	14.771
23.75	13.757
20.04	13.019
19.61	12.925
23.24	13.662
19.64	12.931
19.73	12.951
	BW (MHz)  30  23.75  20.04  19.61  23.24  19.64

#### 802.11n \_HT40\_Ch0

802.111	n HT40	Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5270	46.43	16.668
5310	42.32	16.265
5510	42.73	16.307
5550	50	16.990
5670	44.52	16.486
5710	40.17	16.039

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5270	49.24	16.923
5310	40.79	16.106
5510	42.02	16.235
5550	41.06	16.134
5670	42.46	16.280
5710	40.74	16.100

#### 802.11ac \_VHT80\_Ch0

802.11ac \_VHT80\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5290	80.23	19.043
5530	80.56	19.061
5610	100	20.000
5690	80.1	19.036

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5290	82.65	19.172
5530	83.09	19.195
5610	84.53	19.270
5690	82.25	19.151

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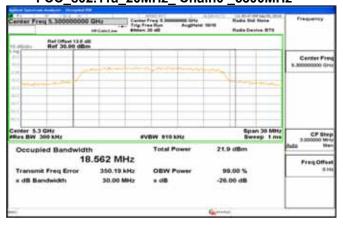


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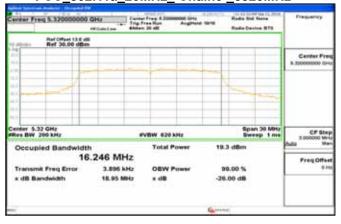
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# FCC\_802.11a\_20MHz\_ Chain0 \_5300MHz



## FCC\_802.11a\_20MHz\_ Chain0 \_5320MHz



#### FCC\_802.11a\_20MHz\_Chain0\_5500MHz



#### FCC\_802.11a\_20MHz\_Chain0\_5580MHz



# FCC\_802.11a\_20MHz\_Chain0\_5700MHz



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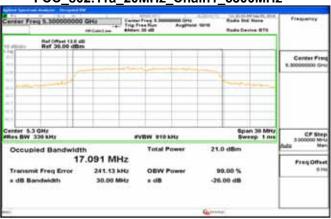
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# FCC\_802.11a\_20MHz\_Chain1\_5260MHz



#### FCC\_802.11a\_20MHz\_Chain1\_5300MHz



#### FCC\_802.11a\_20MHz\_Chain1\_5320MHz



#### FCC\_802.11a\_20MHz\_Chain1\_5500MHz



# FCC\_802.11a\_20MHz\_Chain1\_5580MHz



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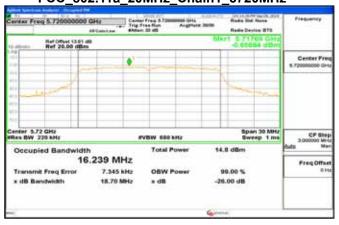


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#### FCC\_802.11a\_20MHz\_Chain1\_5700MHz



# FCC\_802.11a\_20MHz\_Chain1\_5720MHz



## FCC 802.11n 20MHz Chain0 5260MHz



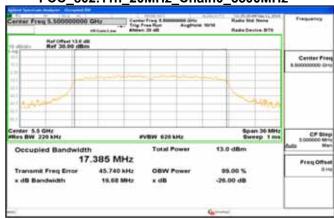
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#### FCC\_802.11n\_20MHz\_Chain0\_5320MHz



# FCC\_802.11n\_20MHz\_Chain0\_5500MHz



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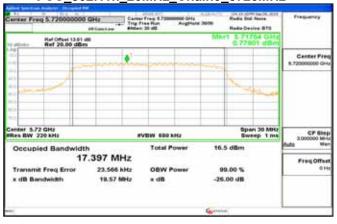
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# FCC\_802.11n\_20MHz\_Chain0\_5700MHz



#### FCC\_802.11n\_20MHz\_Chain0\_5720MHz



#### FCC\_802.11n\_20MHz\_Chain1\_5260MHz



#### FCC\_802.11n\_20MHz\_Chain1\_5300MHz



# FCC\_802.11n\_20MHz\_Chain1\_5320MHz



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#### FCC\_802.11n\_20MHz\_Chain1\_5500MHz



# FCC\_802.11n\_20MHz\_Chain1\_5580MHz



## FCC\_802.11n\_20MHz\_Chain1\_5700MHz



#### FCC 802.11n 20MHz Chain1 5720MHz



#### FCC\_802.11n\_40MHz\_Chain0\_5270MHz



## FCC\_802.11n\_40MHz\_Chain0\_5310MHz



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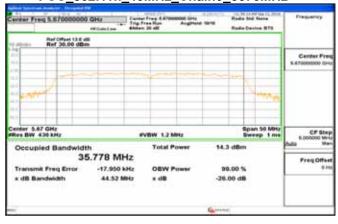
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#### FCC\_802.11n\_40MHz\_Chain0\_5550MHz



#### FCC\_802.11n\_40MHz\_Chain0\_5670MHz



#### FCC\_802.11n\_40MHz\_Chain0\_5710MHz



## FCC\_802.11n\_40MHz\_Chain1\_5270MHz



## FCC\_802.11n\_40MHz\_Chain1\_5310MHz



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#### FCC\_802.11n\_40MHz\_Chain1\_5510MHz



#### FCC\_802.11n\_40MHz\_Chain1\_5550MHz



#### FCC\_802.11n\_40MHz\_Chain1\_5670MHz



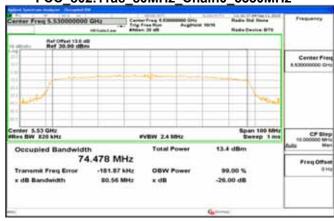
#### FCC\_802.11n\_40MHz\_Chain1\_5710MHz



# FCC\_802.11ac\_80MHz\_Chain0\_5290MHz



# FCC\_802.11ac\_80MHz\_Chain0\_5530MHz



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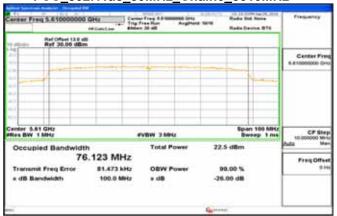
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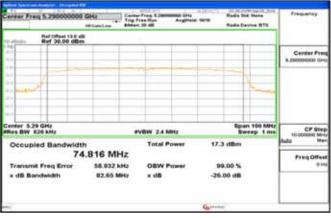
#### FCC\_802.11ac\_80MHz\_Chain0\_5610MHz



# FCC\_802.11ac\_80MHz\_Chain0\_5690MHz



# FCC\_802.11ac\_80MHz\_Chain1\_5290MHz



#### FCC\_802.11ac\_80MHz\_Chain1\_5530MHz



#### FCC\_802.11ac\_80MHz\_Chain1\_5610MHz



# FCC\_802.11ac\_80MHz\_Chain1\_5690MHz



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# 8 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

# 9.1 Standard Applicable

OPERZTION Band	EUT CATEGORY	LIMIT
	Access Point (Master device )	1 Watt(30dBm)
U-NII-1	Fixed point-to-point Access Ponit	1 Watt(30dBm)
	Mobile and portable client device	250mW(23.98dBm)
U-NII-2A		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3		1 Watt(30dBm)

If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.

#### Note:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

(i) If transmit signals are correlated, then Directional gain

=  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/N_{ANT}] dBi$ 

[Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is not granter than 6 dBi. Therefore, reduction of power is not required.

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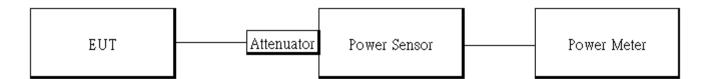
#### 9.2 **Measurement Procedure**

- Place the EUT on the table and set it in transmitting mode.
- The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
- 4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
- Record the max. reading and add 10 log(1/duty cycle). 5.
- Repeat above procedures until all frequency (low, middle, and high channel) measured were complete. 6.

#### 9.3 **Measurement Equipment Used**

	SGS Conducted Room											
Name of Equip- ment	Manufacturer	Model	Serial Num- ber	Calibration Date	Calibration Due							
Power Meter	Anritsu	ML2496A	1804001	02/13/2019	02/12/2020							
Power Sensor	Anritsu	MA2411B	1726104	02/13/2019	02/12/2020							
Power Sensor	Anritsu	MA2411B	1726107	02/13/2019	02/12/2020							
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020							

#### **Test Set-up** 9.4



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#### 9.5 **Measurement Result** Conducted output power (FCC)

802 11a Ch0

	Frequency	Data	TOTAL	TOTAL		REQUIRED		RESULT
СН	CH (MHz) Rat		POWER (dBm)	POWER (mW)		LIMIT (dBm)		
52	5260	6	14.64	29.108	23.98	or 11+10log(B) =	25.77	PASS
60	5300	6	14.76	29.923	23.98	or 11+10log(B) =	25.77	PASS
64	5320	6	13.94	24.775	23.98	or 11+10log(B) =	23.78	PASS
100	5500	6	12.96	19.770	23.98	or 11+10log(B) =	23.75	PASS
116	5580	6	14.73	29.717	23.98	or 11+10log(B) =	25.77	PASS
140	5700	6	13.55	22.647	23.98	or 11+10log(B) =	23.92	PASS
144	5720(U-NII 2C)	6	8.95	7.85	23.98	or 11+10log(B) =	23.75	PASS
144	5720 (U-NII 3)	6	3.81	2.40		30		PASS

802.11a Ch1

_	_		TOTAL	TOTAL		REQUIRED		
СН	Frequency (MHz)	Data Rate	POWER (dBm)	POWER (mW)				RESULT
52	5260	6	14.22	26.424	23.98	or 11+10log(B) =	25.77	PASS
60	5300	6	14.55	28.511	23.98	or 11+10log(B) =	25.77	PASS
64	5320	6	13.55	22.647	23.98	or 11+10log(B) =	25.03	PASS
100	5500	6	13.65	23.174	23.98	or 11+10log(B) =	23.82	PASS
116	5580	6	15.04	31.916	23.98	or 11+10log(B) =	24.82	PASS
140	5700	6	14.00	25.119	23.98	or 11+10log(B) =	23.90	PASS
144	5720(U-NII 2C)	6	8.71	7.43	23.98	or 11+10log(B) =	23.72	PASS
144	5720 (U-NII 3)	6	3.53	2.25		30		PASS

802.11a 2Tx

	Frequency	Data	vg. POW	/ER (dBr		TOTAL		REQUIRED		RESULT
СН	(MHz)	Rate	CH 0	CH 1	POWER (dBm)	POWER (mW)		LIMIT (dBm)		
52	5260	6	14.7	14.9	17.96	62.539	23.98	or 11+10log(B) =	25.77	PASS
60	5300	6	14.3	15.1	17.92	61.913	23.98	or 11+10log(B) =	25.77	PASS
64	5320	6	13.3	12.8	16.20	41.709	23.98	or 11+10log(B) =	23.78	PASS
100	5500	6	7.83	6.95	10.59	11.462	23.98	or 11+10log(B) =	23.75	PASS
116	5580	6	14.5	15.2	18.00	63.082	23.98	or 11+10log(B) =	24.82	PASS
140	5700	6	4.79	3.26	7.27	5.336	23.98	or 11+10log(B) =	23.90	PASS
144	5720(U-NII 2C)	6	8.23	9.38	12.02	15.915	23.98	or 11+10log(B) =	23.72	PASS
144	5720 (U-NII 3)	6	3.09	4.20	6.88	4.871		30		PASS

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#### 802.11n\_HT20\_Ch0

СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)			RESULT
52	5260	MCS0	15.05	31.993	23.98	or 11+10log(B) =	25.77	PASS
60	5300	MCS0	14.73	29.720	23.98	or 11+10log(B) =	25.77	PASS
64	5320	MCS0	14.06	25.471	23.98	or 11+10log(B) =	23.99	PASS
100	5500	MCS0	13.13	20.561	23.98	or 11+10log(B) =	23.94	PASS
116	5580	MCS0	15.33	34.123	23.98	or 11+10log(B) =	25.77	PASS
140	5700	MCS0	13.41	21.931	23.98	or 11+10log(B) =	23.94	PASS
144	5720(U-NII 2C)	MCS0	9.33	8.58	23.98	or 11+10log(B) =	23.92	PASS
144	5720 (U-NII 3)	MCS0	4.43	2.78		30		PASS

## 802.11n\_HT20\_Ch1

СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)		REQUIRED LIMIT (dBm)		
52	5260	MCS0	14.99	31.554	23.98	or 11+10log(B) =	25.77	PASS
60	5300	MCS0	14.76	29.926	23.98	or 11+10log(B) =	24.76	PASS
64	5320	MCS0	14.24	26.549	23.98	or 11+10log(B) =	24.02	PASS
100	5500	MCS0	13.23	21.040	23.98	or 11+10log(B) =	23.92	PASS
116	5580	MCS0	15.45	35.079	23.98	or 11+10log(B) =	24.66	PASS
140	5700	MCS0	13.60	22.911	23.98	or 11+10log(B) =	23.93	PASS
144	5720(U-NII 2C)	MCS0	9.23	8.38	23.98	or 11+10log(B) =	23.95	PASS
144	5720 (U-NII 3)	MCS0	4.38	2.74		30	•	PASS

#### 802.11n\_HT20\_MIMO

011	Frequency	Data	Data 'g. POWER (			TOTAL		REQUIRED		DEOU! T
СН	(MHz) Rate		CH 0	CH 1	POWER (dBm)	POWER (mW)	LIMIT (dBm)			RESULT
52	5260	MCS8	14.9	15.1	18.37	68.713	23.98	or 11+10log(B) =	25.77	PASS
60	5300	MCS8	14.6	14.8	18.04	63.685	23.98	or 11+10log(B) =	24.76	PASS
64	5320	MCS8	13	12.2	15.97	39.582	23.98	or 11+10log(B) =	23.99	PASS
100	5500	MCS8	7.65	6.43	10.44	11.071	23.98	or 11+10log(B) =	23.92	PASS
116	5580	MCS8	14.7	15.4	18.42	69.436	23.98	or 11+10log(B) =	24.66	PASS
140	5700	MCS8	4.62	2.74	7.14	5.176	23.98	or 11+10log(B) =	23.93	PASS
144	5720(U-NII 2C)	MCS8	9.20	9.08	12.51	17.811	23.98	or 11+10log(B) =	23.92	PASS
144	5720 (U-NII 3)	MCS8	4.30	4.23	7.61	5.764		30		PASS

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#### 802.11n HT40 Ch0

СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)		REQUIRED LIMIT (dBm)		RESULT
54	5270	MCS0	14.44	27.798	23.98	or 11+10log(B) =	27.67	PASS
62	5310	MCS0	11.61	14.488	23.98	or 11+10log(B) =	27.27	PASS
102	5510	MCS0	8.85	7.674	23.98	or 11+10log(B) =	27.31	PASS
110	5550	MCS0	14.26	26.670	23.98	or 11+10log(B) =	27.99	PASS
134	5670	MCS0	13.04	20.138	23.98	or 11+10log(B) =	27.49	PASS
142	5710(U-NII 2C)	MCS0	8.60	7.25	23.98	or 11+10log(B) =	27.04	PASS
142	5710 (U-NII 3)	MCS0	0.21	1.05		30		PASS

802.11n HT40 Ch1

<u> </u>	1140_0111							
СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)			RESULT
54	5270	MCS0	14.44	27.798	23.98	or 11+10log(B) =	27.92	PASS
62	5310	MCS0	11.60	14.455	23.98	or 11+10log(B) =	27.11	PASS
102	5510	MCS0	9.58	9.079	23.98	or 11+10log(B) =	27.23	PASS
110	5550	MCS0	14.34	27.165	23.98	or 11+10log(B) =	27.13	PASS
134	5670	MCS0	13.57	22.752	23.98	or 11+10log(B) =	27.28	PASS
142	5710(U-NII 2C)	MCS0	8.77	7.53	23.98	or 11+10log(B) =	27.10	PASS
142	5710 (U-NII 3)	MCS0	0.58	1.14		23.98		PASS

#### 802.11n\_HT40\_MIMO

CH	CH Frequency		Data 'g. POW		TOTAL POWER	TOTAL POWER	REQUIRED LIMIT			RESULT
Сп	(MHz)	Rate	CH 0	CH 1	_	(mW)	(dBm)			RESULT
54	5270	MCS8	13.9	13.8	17.25	53.099	23.98	or 11+10log(B) =	27.67	PASS
62	5310	MCS8	8.3	8.29	11.68	14.708	23.98	or 11+10log(B) =	27.11	PASS
102	5510	MCS8	3.86	3.02	6.84	4.831	23.98	or 11+10log(B) =	27.23	PASS
110	5550	MCS8	13.4	13.9	17.01	50.201	23.98	or 11+10log(B) =	27.13	PASS
134	5670	MCS8	7.67	6.41	10.47	11.133	23.98	or 11+10log(B) =	27.28	PASS
142	5710(U-NII 2C)	MCS8	8.32	8.27	11.69	14.749	23.98	or 11+10log(B) =	27.04	PASS
142	5720 (U-NII 3)	MCS8	-0.07	0.08	3.30	2.138		30		PASS

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#### 802.11ac VHT80 Ch0

СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)		REQUIRED LIMIT (dBm)		RESULT
58	5290	MCS0	9.86	9.685	23.98	or 11+10log(B) =	30.04	PASS
106	5530	MCS0	9.60	9.123	23.98	or 11+10log(B) =	30.06	PASS
122	5610	MCS0	13.56	22.705	23.98	or 11+10log(B) =	31.00	PASS
138	5690(U-NII 2C)	MCS0	7.76	5.97	23.98	or 11+10log(B) =	30.04	PASS
138	5690 (U-NII 3)	MCS0	-3.96	0.40		30		PASS

802.11ac VHT80 Ch1

	<u> </u>	<u> </u>							
	СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)		REQUIRED LIMIT (dBm)		RESULT
ĺ	58	5290	MCS0	9.90	9.775	23.98	or 11+10log(B) =	30.17	PASS
ĺ	106	5530	MCS0	10.14	10.330	23.98	or 11+10log(B) =	30.20	PASS
ĺ	122	5610	MCS0	13.80	23.995	23.98	or 11+10log(B) =	30.27	PASS
ĺ	138	5690(U-NII 2C)	MCS0	7.83	6.06	23.98	or 11+10log(B) =	30.15	PASS
ı	138	5690 (U-NII 3)	MCS0	-3.12	0.49		23.98		PASS

802.11ac VHT80 MIMO

002.11dc_V11100_WINNO										
СН	Frequency	Data	/g. POW	ER (dBr	TOTAL POWER	TOTAL POWER		REQUIRED LIMIT		RESULT
011	(MHz)	Rate	CH 0	CH 1	-	(mW)		(dBm)		KLOOLI
58	5290	MCS0	9.61	8.63	12.93	19.629	23.98	or 11+10log(B) =	30.04	PASS
106	5530	MCS0	5.31	4.74	8.82	7.613	23.98	or 11+10log(B) =	30.06	PASS
122	5610	MCS0	12.4	13.3	16.63	46.007	23.98	or 11+10log(B) =	30.27	PASS
138	5690(U-NII 2C)	MCS0	6.74	7.45	10.92	12.362	23.98	or 11+10log(B) =	30.04	PASS
138	5690 (U-NII 3)	MCS0	-4.98	-3.49	-0.80	0.832		30		PASS

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# 9 MAXIMUM POWER SPECTRAL DENSITY

# 10.1 Standard Applicable

OPERZTION Band		EUT CATEGORY	LIMIT		
		Access Point (Master device )	17dBm/ MHz		
U-NII-1	Fixed point-to-point Access Ponit		TABITI/ WITE		
		Mobile and portable client device	11dBm/ MHz		
U-NII-2A	$\checkmark$		11dBm/ MHz		
U-NII-2C			11dBm/ MHz		
U-NII-3			30dBm/ 500kHz		

If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### Note:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

(i) If transmit signals are correlated, then Directional gain

=  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/N_{ANT}] dBi$ 

[Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

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#### 10.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.

# 4. For U-NII1, U-NII-2A, U-NII-2C Band:

Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth) For U-NII-3 Band:

Set RBW=500 kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

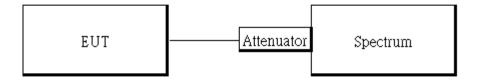
- 5. User the cursor on spectrum to peak search the highest level of trace
- 6. Record the max. reading and add 10 log(1/duty cycle).
- 7. Repeat above procedures until all default test channel (low, middle, and high) was complete.
- 8. 802.11n MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

# 10.3 Measurement Equipment Used

SGS Conducted Room								
Name of Equipment	Manufacturer	Model	Serial Num- ber	Calibration Date	Calibration Due			
Power Meter	Anritsu	ML2496A	1804001	02/13/2019	02/12/2020			
Power Sensor	Anritsu	MA2411B	1726104	02/13/2019	02/12/2020			
Power Sensor	Anritsu	MA2411B	1726107	02/13/2019	02/12/2020			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020			

#### 10.4 Test Set-up



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#### 10.5 Measurement Result

illent Result	POWER DE	NSITY 802.	11a MODE		
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5260.00	6.86	0.17	7.03	11.00	-3.97
5300.00	6.99	0.17	7.16	11.00	-3.84
5320.00	4.57	0.17	4.74	11.00	-6.26
5500.00	-0.78	0.17	-0.61	11.00	-11.61
5580.00	6.69	0.17	6.86	11.00	-4.14
5700.00	-5.68	0.17	-5.51	11.00	-16.51
5720 (U-NII 2C)	1.55	0.17	1.72	11.00	-9.28
5720 (U-NII 3)	-2.60	0.17	-2.43	30.00	-32.43
	POWER DENS	ITY 802.11ı	1 HT20 MOD	E	
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5260	6.66	0.17	6.83	11	-4.17
5300	6.17	0.17	6.34	11	-4.66
5320	4.18	0.17	4.35	11	-6.65
5500	-1.85	0.17	-1.68	11	-12.68
5580	6.23	0.17	6.40	11	-4.60
5700	-5.93	0.17	-5.76	11	-16.76
5720 (U-NII 2C)	1.81	0.17	1.98	11	-9.02
5720 (U-NII 3)	-2.12	0.17	-1.95	30	-31.95
	POWER DENS	ITY 802.11ı	n HT40 MOD	E	
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5270	2.11	0.37	2.48	11	-8.52
5310	-2.14	0.37	-1.77	11	-12.77
5510	-8.13	0.37	-7.76	11	-18.76
5550	2.85	0.37	3.22	11	-7.78
5670	-4.50	0.37	-4.13	11	-15.13
5710 (U-NII 2C)	-2.11	0.37	-1.73	11	-12.73
5710 (U-NII 3)	-8.03	0.37	-7.66	30	-37.66

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POWER DENSITY 802.11ac VHT80 MODE								
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)			
5290	-6.48	0.77	-5.71	11	-16.71			
5530	-9.50	0.77	-8.73	11	-19.73			
5610	-0.33	0.77	0.44	11	-10.56			
5690 (U-NII 2C)	-6.38	0.77	-5.61	11	-16.61			
5690 (U-NII 3)	-14.25	0.77	-13.48	30	-43.48			

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#### 802.11a 20MHz 5260MHz



#### 802.11a\_20MHz\_5300MHz



# 802.11a\_20MHz\_5320MHz



#### 802.11a 20MHz 5500MHz



#### 802.11a\_20MHz\_5580MHz



# 802.11a\_20MHz\_5700MHz

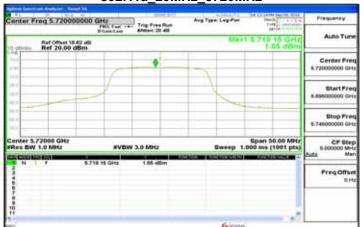


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#### 802.11a 20MHz 5720MHz



# 802.11a 20MHz 5720MHz



# 802.11n 20MHz 5260MHz



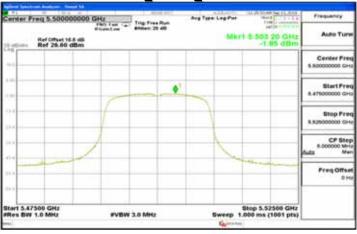
### 802.11n 20MHz 5300MHz



#### 802.11n\_20MHz\_5320MHz



# 802.11n\_20MHz\_5500MHz



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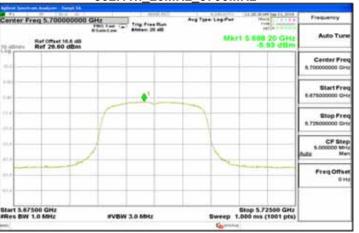


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#### 802.11n 20MHz 5580MHz



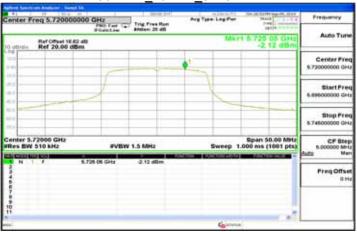
### 802.11n\_20MHz\_5700MHz



# 802.11n\_20MHz\_5720MHz



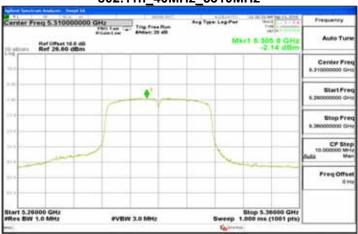
#### 802.11n 20MHz 5720MHz



# 802.11n\_40MHz\_5270MHz



# 802.11n\_40MHz\_5310MHz



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#### 802.11n 40MHz 5510MHz



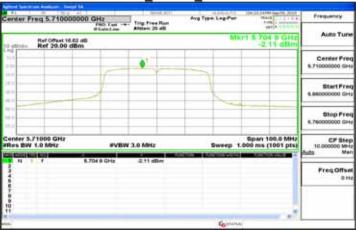
#### 802.11n\_40MHz\_5550MHz



# 802.11n\_40MHz\_5670MHz



### 802.11n 40MHz 5710MHz



# 802.11n\_40MHz\_5710MHz



# 802.11ac 80MHz 5290MHz



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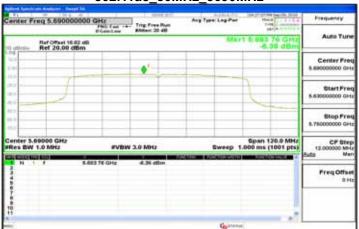
#### 802.11ac 80MHz 5530MHz



#### 802.11ac\_80MHz\_5610MHz



#### 802.11ac 80MHz 5690MHz



802.11ac\_80MHz\_5690MHz



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# 10 UNDESIRABLE RADIATED EMISSION MEASUREMENT

# Standard Applicable

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- 1. For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
- 2. For transmitters operating in the 5.725-5.85 GHz band: 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 25 MHz 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 27 dBm/MHz at the band edge.

APPLICABLE TO	APPLICABLE TO LIMIT			
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m			
	PK: 74 (dBμV/m)	AV 54 (dBµV/m)		
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m		
15.407(b)(1)				
15.407(b)(2)	PK: -27 (dBm/MHz)	PK: 68.3 (dBµV/m)		
15.407(b)(3)				
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4		

<sup>\*1</sup> beyond 75 MHz or more above of the bandedge.

EIRP = ( (E\*d)^2) / 30, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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<sup>\*2</sup> below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.

<sup>\*3</sup> below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.

<sup>\*4</sup> from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.



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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

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

# Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level  $(dB\mu V/m) = 20 \log Emission level (dB\mu V/m)$

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# 11.2 Measurement Equipment Used

	SGS SAC-III								
Name of Equip- ment	Manufacturer	Model	Serial Num- ber	Calibration Date	Calibration Due				
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT- N0555	01/10/2019	01/09/2020				
Horn Antenna	Schwarzbeck	BBHA9170	07/02/1900	12/27/2018	12/26/2019				
Horn Antenna	Schwarzbeck	BBHA9120D	D803	12/24/2018	12/23/2019				
3m Site NSA	SGS	966 chamber	N/A	01/02/2019	01/01/2020				
Loop Antenna	ETS.LINDGREN	6502	148045	10/08/2018	10/07/2019				
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/22/2019	04/21/2020				
EMI Test Receiver	R&S	ESCI 3	100335	02/12/2019	02/11/2020				
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2019	01/01/2020				
Pre-Amplifier	EMC Instruments	EMC051825	980152	01/02/2019	01/01/2020				
Pre-Amplifier	HP	8447D	2944A09469	01/02/2019	01/01/2020				
Filter 5150-5350 MHz	Micro-Tronics	BRM50703	1	01/02/2019	01/01/2020				
Filter 5470-5725 MHz	Micro-Tronics	BRM50704	1	01/02/2019	01/01/2020				
High Pass Filter	WI	WHKX7.0/18G- 8SS	45	01/02/2019	01/01/2020				
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	01/02/2019	01/02/2020				
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	01/02/2019	01/02/2020				
Coaxial Cable	Huber Suhner	EMC 104-SM- SM-2000	160123	01/02/2019	01/02/2020				
Software	e3 V6.11-20180413								

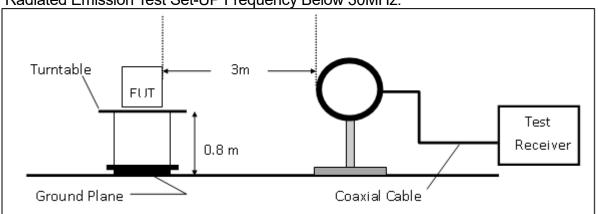
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



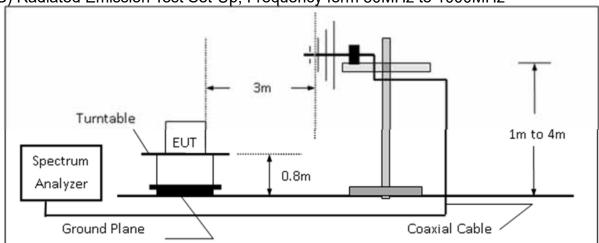
Page: 48 of 128

#### 11.3 Test SET-UP

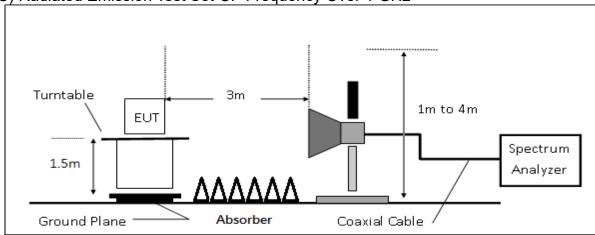
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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#### 11.4 Measurement Procedure

- The EUT was placed on a turn table which is 0.8m above ground plane.
- The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules. 2.
- The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
- The turn table shall rotate 360 degrees to determine the position of maximum emission 4. level.
- EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency 7. above 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 11. Repeat above procedures until all frequency measured were complete.

# 11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

#### FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

#### 11.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

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:2019-09-11

:VERTICAL

:24.5/64

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### 11.7 Measurement Result

# **Radiated Spurious Emission Measurement Result Below 1GHz Worst-Case Data:**

Report Number :ER-2019-60051 **Operation Mode** :802.11a :CH60 5300 MHz Test Channel

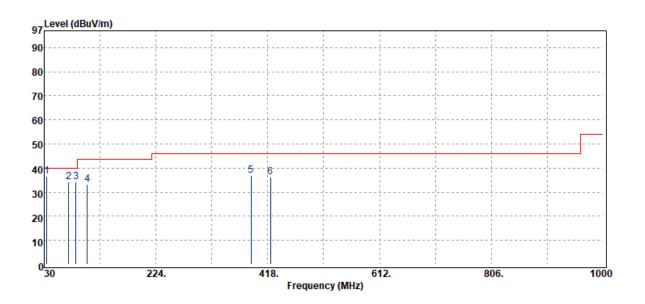
:Tx CH Mid Test Mode Engineer :Nick

**Test Date** 

Temp./Humi.

Antenna Pol.

**EUT Pol** :E2 Plane



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
34.85	Peak	43.19	-6.55	36.64	40.00	-3.36
72.68	Peak	50.97	-16.73	34.24	40.00	-5.76
85.29	Peak	49.78	-15.66	34.12	40.00	-5.88
104.69	Peak	44.94	-11.76	33.18	43.50	-10.32
388.90	Peak	43.02	-6.03	36.99	46.00	-9.01
422.85	Peak	40.86	-4.64	36.22	46.00	-9.78

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

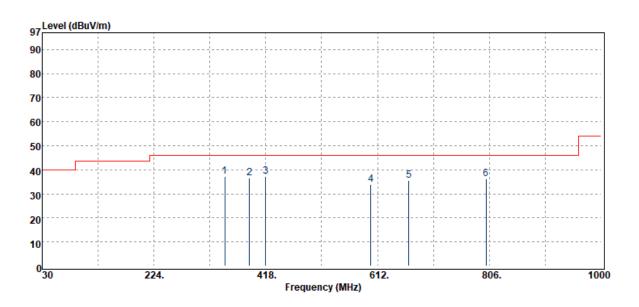
:ER-2019-60051 :802.11a

:CH60 5300 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμ̈V	dB	dBµV/m	dΒμV/m	dB
347.19	Peak	44.32	-6.96	37.36	46.00	-8.64
389.87	Peak	42.50	-5.99	36.51	46.00	-9.49
418.00	Peak	41.87	-4.57	37.30	46.00	-8.70
600.36	Peak	36.97	-3.13	33.84	46.00	-12.16
666.32	Peak	38.60	-2.94	35.66	46.00	-10.34
800.18	Peak	36.80	-0.45	36.35	46.00	-9.65

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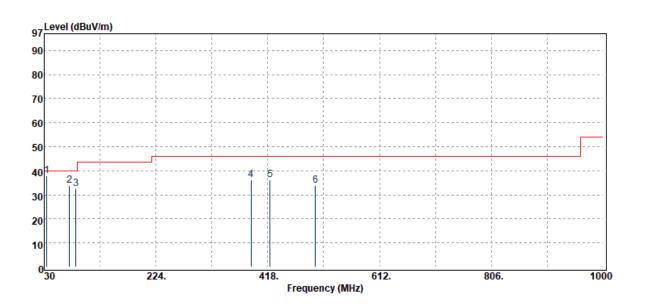
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a

:CH116 5580 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
34.85	Peak	44.49	-6.55	37.94	40.00	-2.06
73.65	Peak	50.75	-16.70	34.05	40.00	-5.95
85.29	Peak	48.09	-15.66	32.43	40.00	-7.57
388.90	Peak	42.32	-6.03	36.29	46.00	-9.71
421.88	Peak	40.68	-4.58	36.10	46.00	-9.90
500.45	Peak	37.77	-3.81	33.96	46.00	-12.04

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

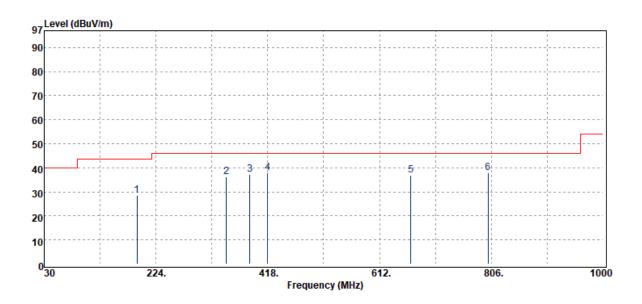
:ER-2019-60051 :802.11a

:CH116 5580 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
191.02	Peak	41.51	-12.88	28.63	43.50	-14.87
346.22	Peak	43.18	-6.99	36.19	46.00	-9.81
386.96	Peak	43.31	-6.10	37.21	46.00	-8.79
418.00	Peak	42.44	-4.57	37.87	46.00	-8.13
666.32	Peak	39.92	-2.94	36.98	46.00	-9.02
800.18	Peak	38.25	-0.45	37.80	46.00	-8.20

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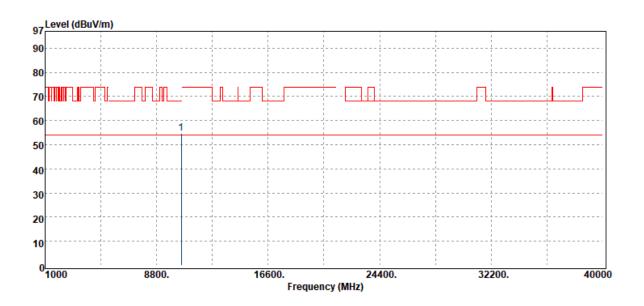
# **Above 1GHz Worst-Case Data:**

Report Number :ER-2019-60051 **Operation Mode** :802.11a **Test Channel** :CH52 5260 MHz

:Tx CH Low Test Mode

**EUT Pol** :E2 Plane **Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	_
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
10520.00	Peak	28.97	25.66	54.63	68.20	-13.57

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

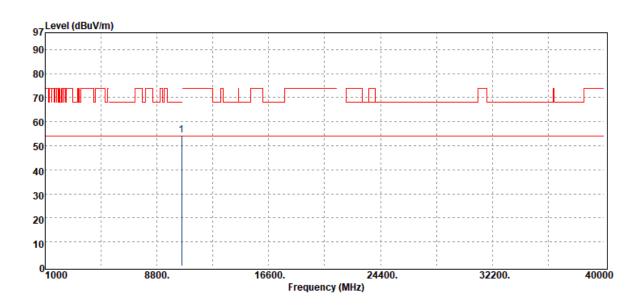
:ER-2019-60051 :802.11a

:CH52 5260 MHz

:Tx CH Low :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	_
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
10520.00	Peak	28.87	25.66	54.53	68.20	-13.67

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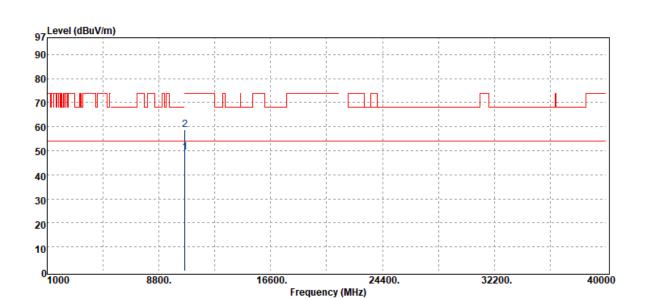
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a

:CH60 5300 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
10600.00	Average	22.61	26.57	49.18	54.00	-4.82
10600.00	Peak	32.04	26.57	58.61	74.00	-15.39

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

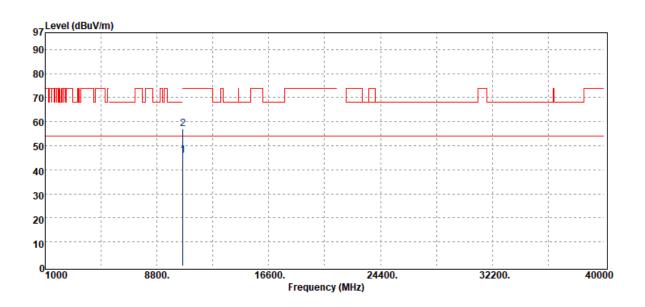
:ER-2019-60051 :802.11a

:CH60 5300 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
10600.00	Average	19.57	26.57	46.14	54.00	-7.86
10600.00	Peak	30.50	26.57	57.07	74.00	-16.93

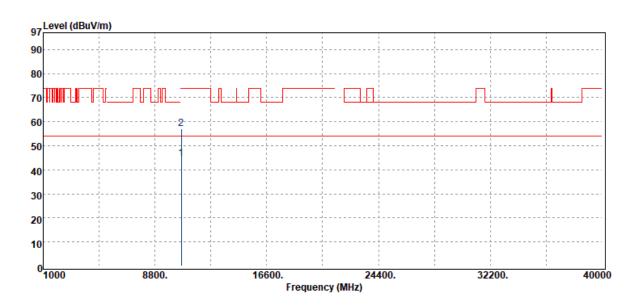
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Report Number :ER-2019-60051 **Operation Mode** :802.11a **Test Channel** :CH64 5320 MHz Test Mode :Tx CH High **EUT Pol** :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
10640.00	Average	17.38	27.27	44.65	54.00	-9.35
10640.00	Peak	29.65	27.27	56.92	74.00	-17.08

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

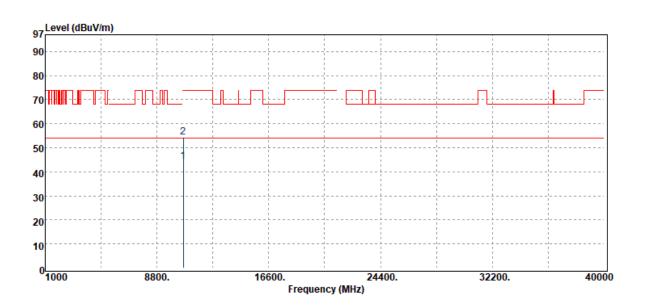
:ER-2019-60051 :802.11a

:CH64 5320 MHz

:Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
10640.00	Average	17.19	27.27	44.46	54.00	-9.54
10640.00	Peak	27.25	27.27	54.52	74.00	-19.48

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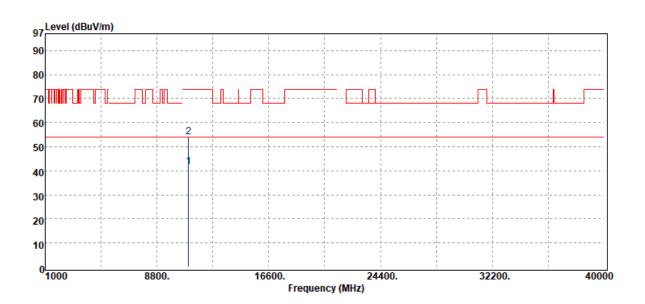
Page: 60 of 128

Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH100 5500 MHz :Tx CH Low

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11000.00	Average	14.25	27.21	41.46	54.00	-12.54
11000.00	Peak	26.74	27.21	53.95	74.00	-20.05

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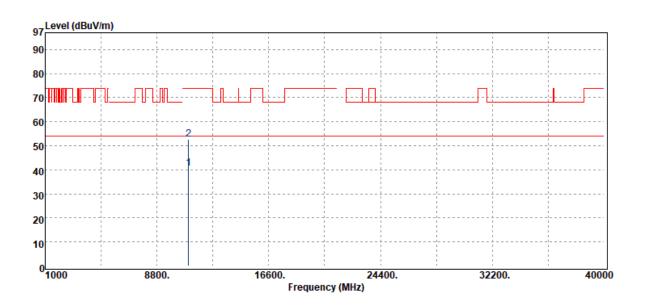
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH100 5500 MHz

:Tx CH Low :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11000.00	Average	13.44	27.21	40.65	54.00	-13.35
11000.00	Peak	25.41	27.21	52.62	74.00	-21.38

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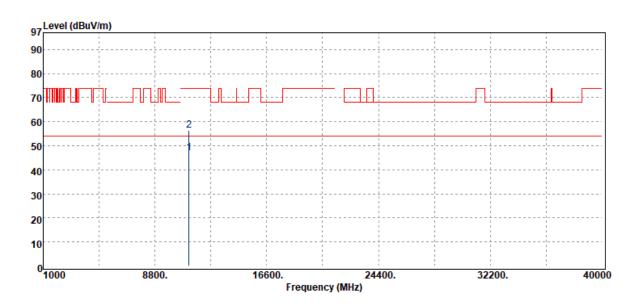
Page: 62 of 128

Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH116 5580 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11160.00	Average	19.96	26.93	46.89	54.00	-7.11
11160.00	Peak	29.43	26.93	56.36	74.00	-17.64

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

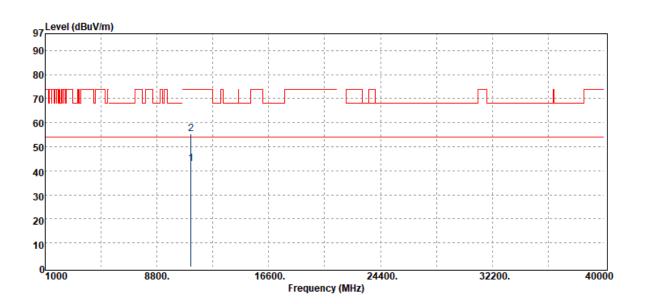
:ER-2019-60051 :802.11a

:CH116 5580 MHz

:Tx CH Mid :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11160.00	Average	15.88	26.93	42.81	54.00	-11.19
11160.00	Peak	28.58	26.93	55.51	74.00	-18.49

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



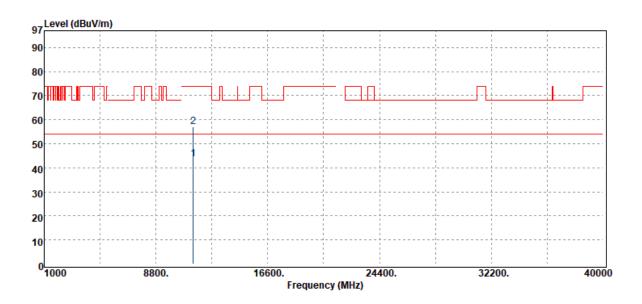
Page: 64 of 128

Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH140 5700 MHz

:Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBμV/m	dBµV/m	dB
11400.00	Average	15.13	28.54	43.67	54.00	-10.33
11400.00	Peak	28.42	28.54	56.96	74.00	-17.04

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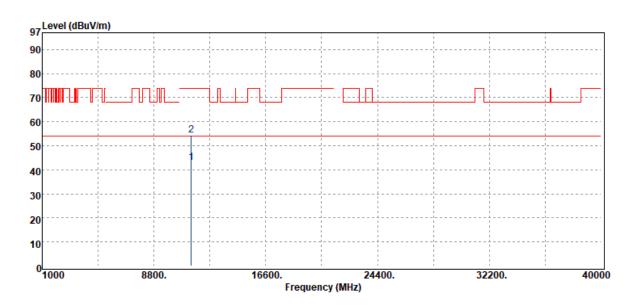
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH140 5700 MHz :Tx CH High

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11400.00	Average	14.56	28.54	43.10	54.00	-10.90
11400.00	Peak	25.84	28.54	54.38	74.00	-19.62

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



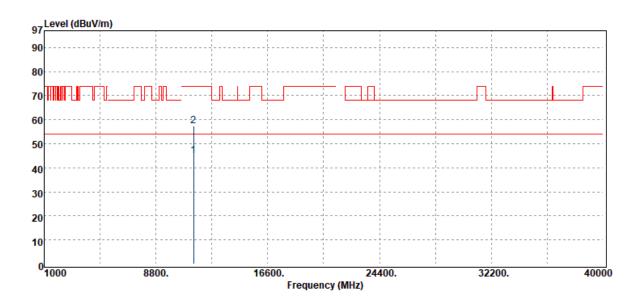
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH144 5720 MHz :Tx CH High

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
 MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11440.00	Average	17.26	27.80	45.06	54.00	-8.94
11440.00	Peak	29.61	27.80	57.41	74.00	-16.59

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



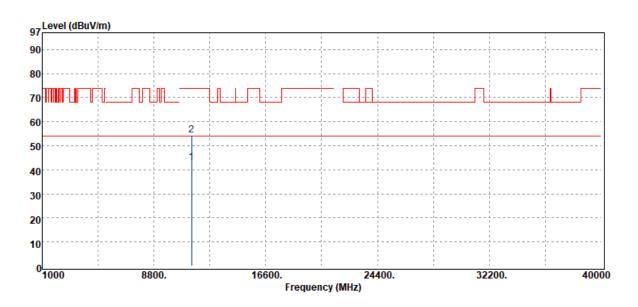
Page: 67 of 128

Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH144 5720 MHz :Tx CH High

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11440.00	Average	15.22	27.80	43.02	54.00	-10.98
11440.00	Peak	26.67	27.80	54.47	74.00	-19.53

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

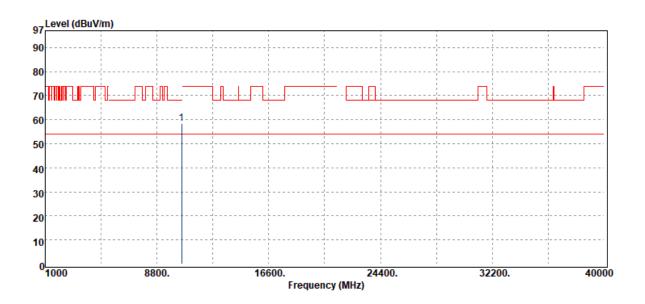


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH52 5260 MHz :Tx CH Low :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m	_	
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	10520.00	Peak	32.87	25.66	58.53	68.20	-9.67	_

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH52 5260 MHz :Tx CH Low

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	10520.00	Peak	27.46	25.66	53.12	68.20	-15.08	

Frequency (MHz)

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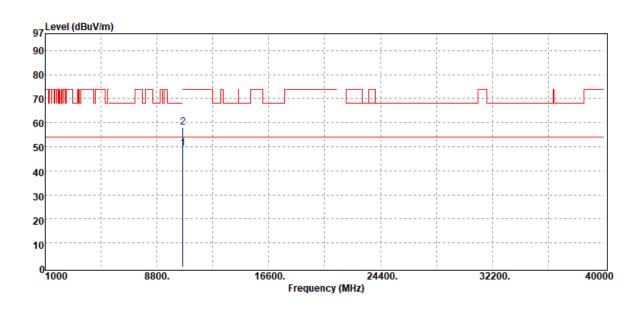
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Report Number :ER-2019-60051 **Operation Mode** :802.11n20 :CH60 5300 MHz **Test Channel** :Tx CH Mid Test Mode **EUT Pol** :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
10600.00	Average	22.71	26.57	49.28	54.00	-4.72
10600.00	Peak	31.43	26.57	58.00	74.00	-16.00

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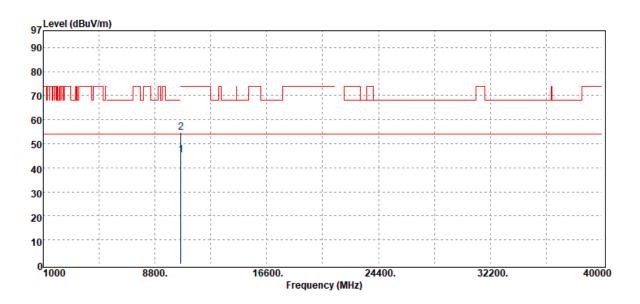


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** :E2 Plane

:ER-2019-60051 :802.11n20 :CH60 5300 MHz :Tx CH Mid

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
10600.00	Average	18.58	26.57	45.15	54.00	-8.85
10600.00	Peak	28.16	26.57	54.73	74.00	-19.27

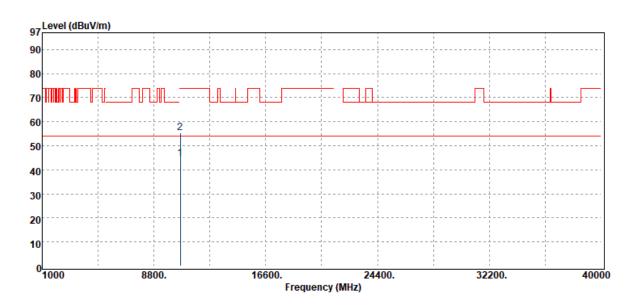
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Report Number **Operation Mode Test Channel** Test Mode :Tx CH High **EUT Pol** :E2 Plane

:ER-2019-60051 :802.11n20 :CH64 5320 MHz **Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
10640.00	Average	17.53	27.27	44.80	54.00	-9.20
10640.00	Peak	28.13	27.27	55.40	74.00	-18.60

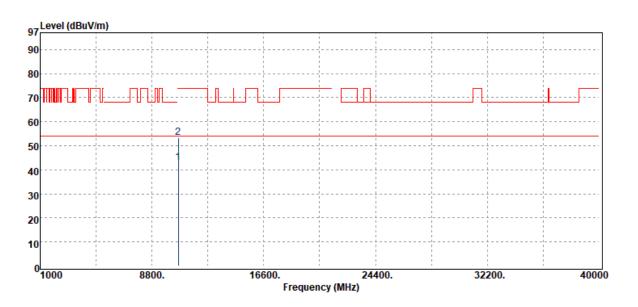
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Report Number :ER-2019-60051 **Operation Mode** :802.11n20 **Test Channel** :CH64 5320 MHz Test Mode :Tx CH High **EUT Pol** :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
10640.00	Average	15.64	27.27	42.91	54.00	-11.09
10640.00	Peak	26.07	27.27	53.34	74.00	-20.66

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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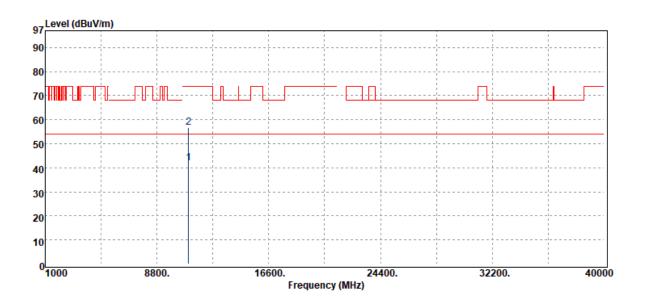
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH100 5500 MHz :Tx CH Low

:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :VERTICAL :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11000.00	Average	14.79	27.21	42.00	54.00	-12.00
11000.00	Peak	29.54	27.21	56.75	74.00	-17.25

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

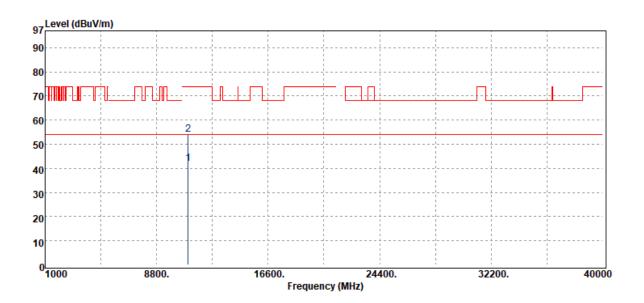
:ER-2019-60051 :802.11n20 :CH100 5500 MHz :Tx CH Low

:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11000.00	Average	14.62	27.21	41.83	54.00	-12.17
11000.00	Peak	26.89	27.21	54.10	74.00	-19.90

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



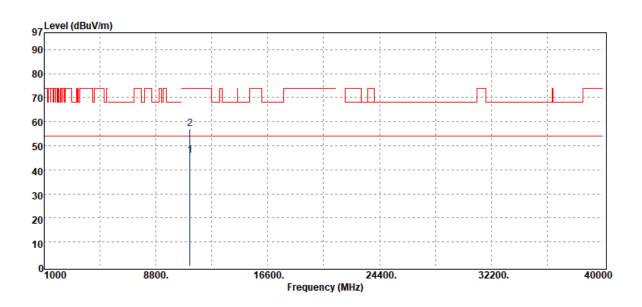
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH116 5580 MHz :Tx CH Mid

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11160.00	Average	19.20	26.93	46.13	54.00	-7.87
11160.00	Peak	30.22	26.93	57.15	74.00	-16.85

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

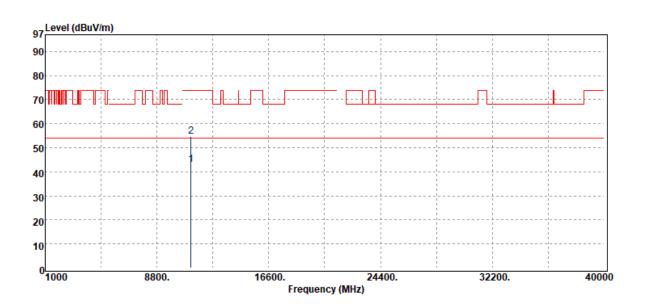
:ER-2019-60051 :802.11n20 :CH116 5580 MHz :Tx CH Mid

:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11160.00	Average	16.05	26.93	42.98	54.00	-11.02
11160.00	Peak	27.64	26.93	54.57	74.00	-19.43

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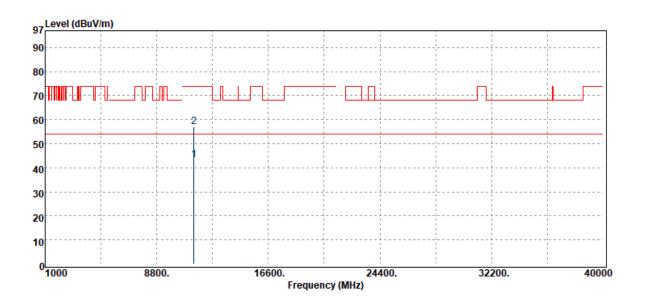


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH140 5700 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11400.00	Average	14.82	28.54	43.36	54.00	-10.64
11400.00	Peak	28.51	28.54	57.05	74.00	-16.95

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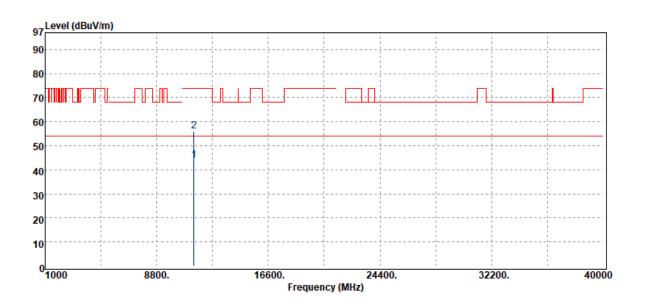
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH140 5700 MHz

:Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11400.00	Average	15.27	28.54	43.81	54.00	-10.19
11400.00	Peak	27.56	28.54	56.10	74.00	-17.90

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

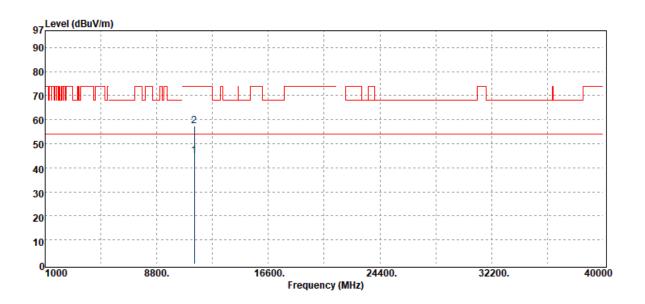


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH144 5720 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11440.00	Average	17.12	27.80	44.92	54.00	-9.08
11440.00	Peak	29.63	27.80	57.43	74.00	-16.57

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Report Number **Operation Mode Test Channel** Test Mode

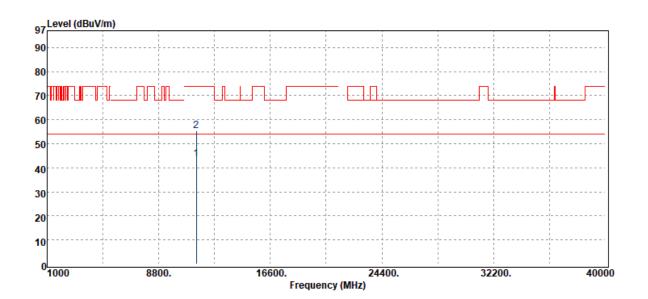
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**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick

**EUT Pol** :E2 Plane



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
_	11440.00	Average	15.72	27.80	43.52	54.00	-10.48
	11440.00	Peak	27.45	27.80	55.25	74.00	-18.75

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

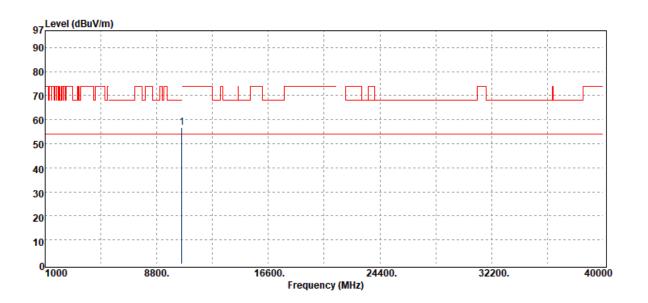


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH54 5270 MHz :Tx CH Low :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m	_	
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	10540.00	Peak	30.72	25.93	56.65	68.20	-11.55	_

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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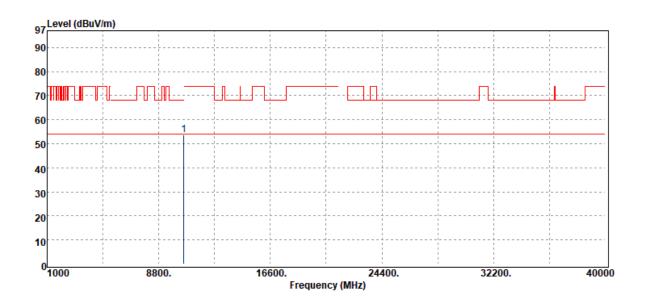
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH54 5270 MHz :Tx CH Low

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m	_	
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	10540.00	Peak	27.62	25.93	53.55	68.20	-14.65	_

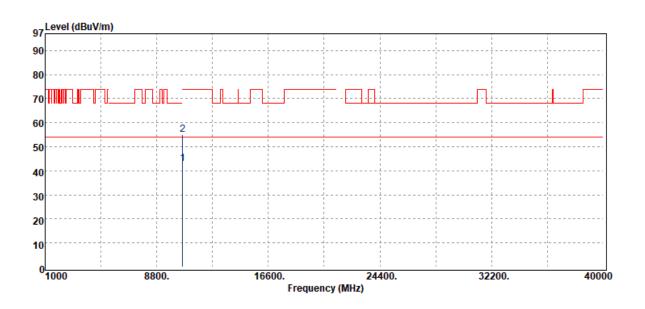
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Report Number :ER-2019-60051 **Operation Mode** :802.11n40 **Test Channel** :CH62 5310 MHz Test Mode :Tx CH High **EUT Pol** :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
10620.00	Average	15.99	26.91	42.90	54.00	-11.10
10620.00	Peak	28.23	26.91	55.14	74.00	-18.86

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

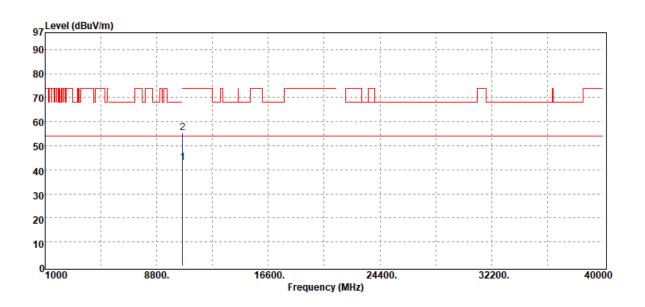


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Report Number :ER-2019-60051 **Operation Mode** :802.11n40 **Test Channel** :CH62 5310 MHz Test Mode :Tx CH High **EUT Pol** :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
10620.00	Average	15.92	26.91	42.83	54.00	-11.17
10620.00	Peak	28.57	26.91	55.48	74.00	-18.52

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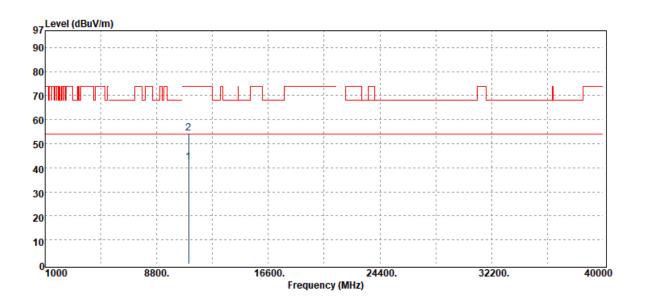
Page: 86 of 128

Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH102 5510 MHz :Tx CH Low

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11020.00	Average	14.61	27.62	42.23	54.00	-11.77
11020.00	Peak	26.65	27.62	54.27	74.00	-19.73

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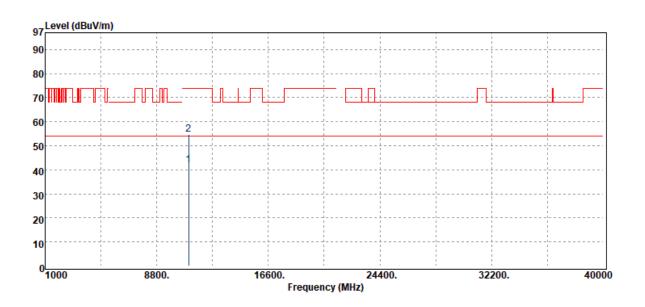
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH102 5510 MHz :Tx CH Low

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11020.00	Average	14.22	27.62	41.84	54.00	-12.16
11020.00	Peak	27.19	27.62	54.81	74.00	-19.19

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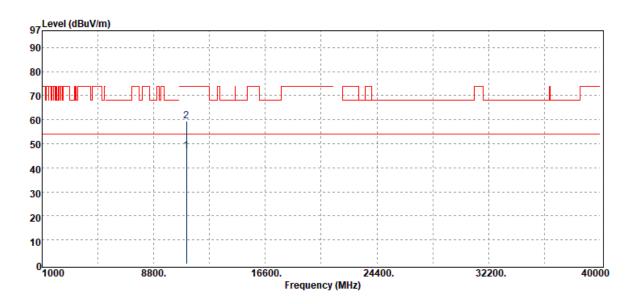
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH110 5550 MHz :Tx CH Mid

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dΒμV/m	dΒμV/m	dB
11100.00	Average	19.53	27.54	47.07	54.00	-6.93
11100.00	Peak	31.78	27.54	59.32	74.00	-14.68

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH110 5550 MHz :Tx CH Mid

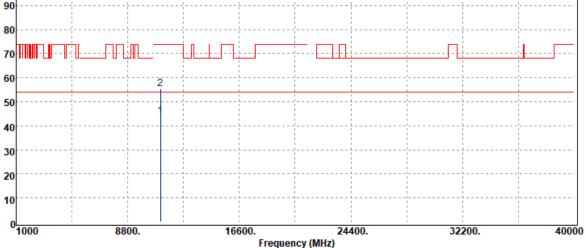
:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick





Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dΒμV/m	dΒμV/m	dB
11100.00	Average	16.48	27.54	44.02	54.00	-9.98
11100.00	Peak	27.97	27.54	55.51	74.00	-18.49

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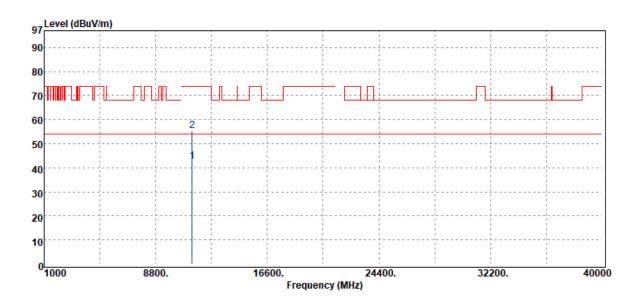


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH134 5670 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBμV/m	dBµV/m	dB
11340.00	Average	14.96	27.52	42.48	54.00	-11.52
11340.00	Peak	27.71	27.52	55.23	74.00	-18.77

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

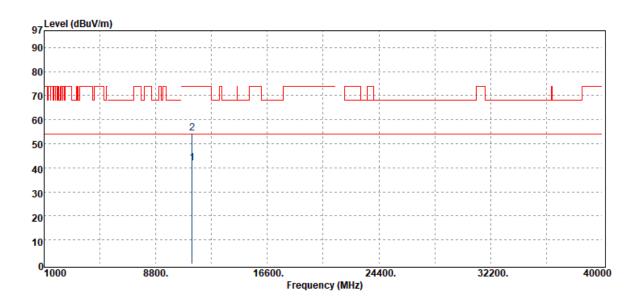
:ER-2019-60051 :802.11n40 :CH134 5670 MHz :Tx CH High

:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBμV/m	dBµV/m	dB
11340.00	Average	14.56	27.52	42.08	54.00	-11.92
11340.00	Peak	26.84	27.52	54.36	74.00	-19.64

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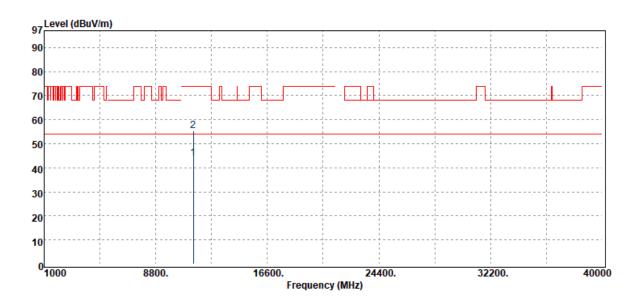


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH142 5710 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	11420.00	Average	15.63	28.25	43.88	54.00	-10.12
	11420.00	Peak	27.14	28.25	55.39	74.00	-18.61

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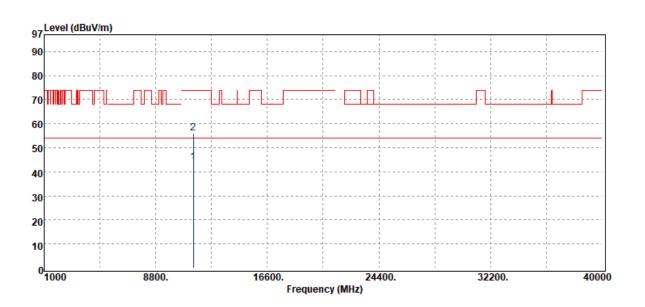
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH142 5710 MHz :Tx CH High

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11420.00	Average	15.72	28.25	43.97	54.00	-10.03
11420.00	Peak	27.83	28.25	56.08	74.00	-17.92

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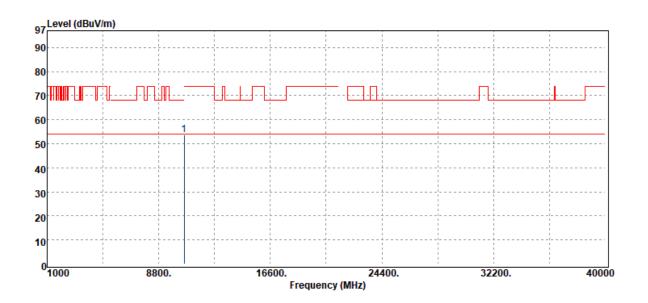


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH58 5290 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m	_	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
10580.00	Peak	27.40	26.29	53.69	68.20	-14.51	_

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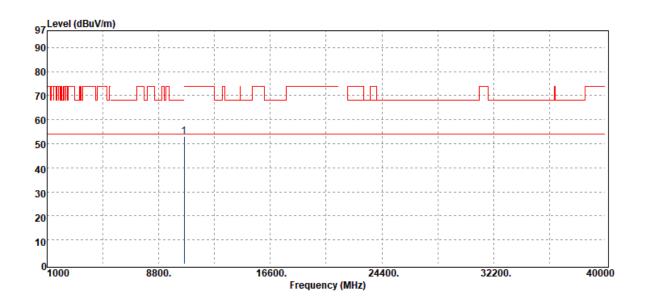
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH58 5290 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
10580.00	Peak	26.68	26.29	52.97	68.20	-15.23

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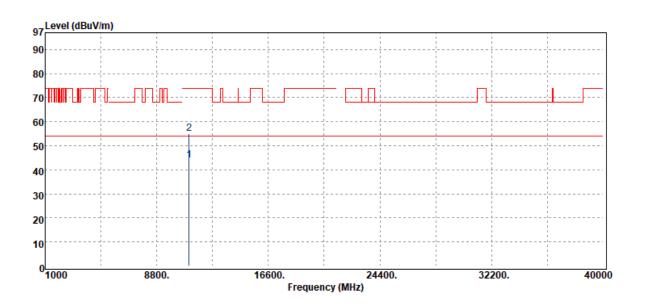
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH106 5530 MHz :Tx CH Low

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11060.00	Average	16.28	27.55	43.83	54.00	-10.17
11060.00	Peak	27.40	27.55	54.95	74.00	-19.05

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

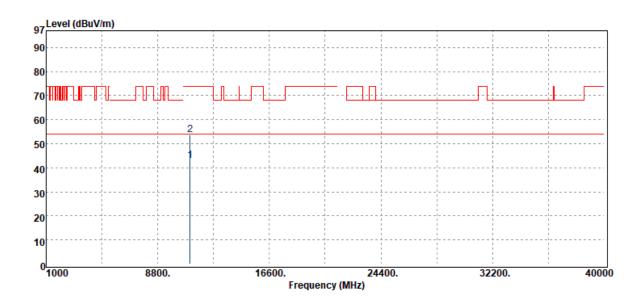
:ER-2019-60051 :802.11ac80 :CH106 5530 MHz :Tx CH Low

:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBuV	dB	FS dBuV/m	@3m dBuV/m	dB
11060.00			27.55	43.10	<u>абрулп</u> 54.00	-10.90
11060.00	Average Peak	15.55 26.20	27.55	53.75	74.00	-20.25

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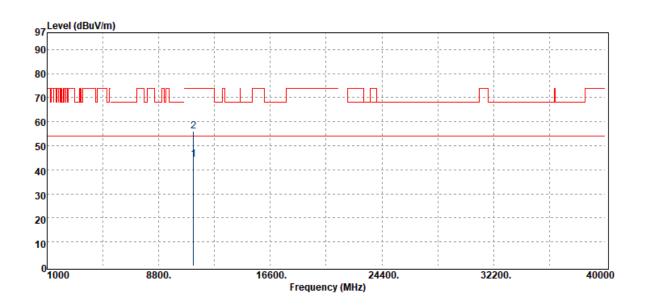
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH122 5610 MHz :Tx CH Mid

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11220.00	Average	17.49	26.91	44.40	54.00	-9.60
11220.00	Peak	29.16	26.91	56.07	74.00	-17.93

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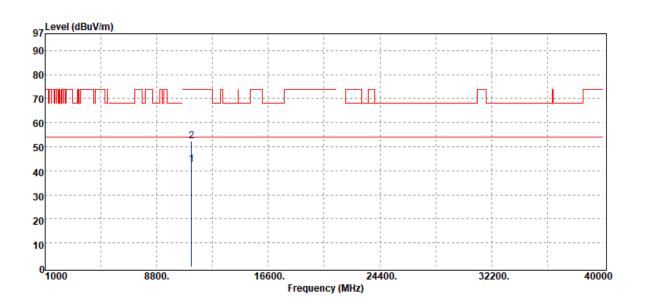
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH122 5610 MHz :Tx CH Mid

:E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11220.00	Average	15.86	26.91	42.77	54.00	-11.23
11220.00	Peak	25.34	26.91	52.25	74.00	-21.75

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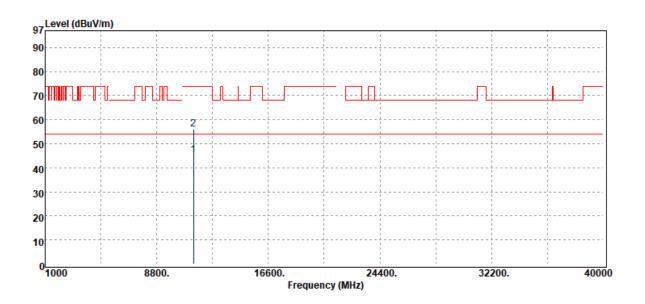


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH138 5690 MHz :Tx CH High :E2 Plane

**Test Date** :2019-09-11 Temp./Humi. :24.5/64 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	-
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
11380.00	Average	17.08	28.30	45.38	54.00	-8.62
11380.00	Peak	27.71	28.30	56.01	74.00	-17.99

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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

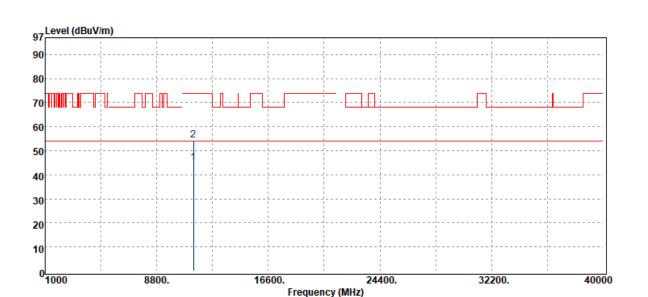
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:E2 Plane

**Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-11 :24.5/64 :HORIZONTAL

:Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
11380.00	Average	16.64	28.30	44.94	54.00	-9.06
11380.00	Peak	26.17	28.30	54.47	74.00	-19.53

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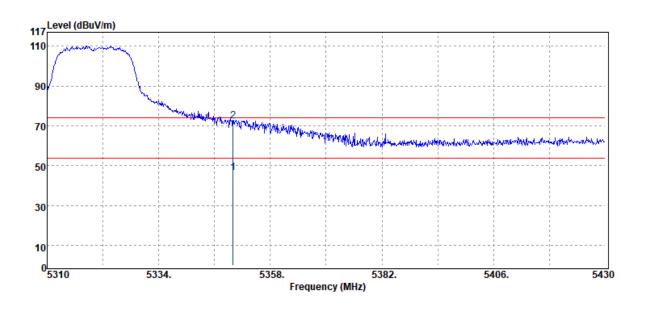


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## Band edge falling to restricted band

:ER-2019-60051 Report Number **Operation Mode** :802.11a **Test Channel** :CH64 5320 MHz Test Mode :Bandedge CH High

**EUT Pol** :E2 Plane **Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5350.00	Average	32.17	14.28	46.45	54.00	-7.55
5350.00	Peak	58.16	14.28	72.44	74.00	-1.56

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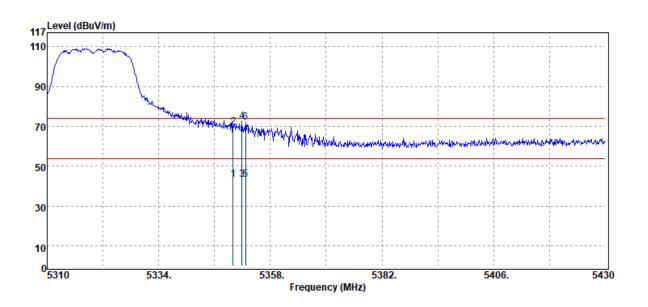
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH64 5320 MHz

:Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5350.00	Average	29.10	14.28	43.38	54.00	-10.62
5350.00	Peak	55.47	14.28	69.75	74.00	-4.25
5351.88	Average	29.13	14.28	43.41	54.00	-10.59
5351.88	Peak	58.01	14.28	72.29	74.00	-1.71
5352.72	Average	28.95	14.29	43.24	54.00	-10.76
5352.72	Peak	57.88	14.29	72.17	74.00	-1.83

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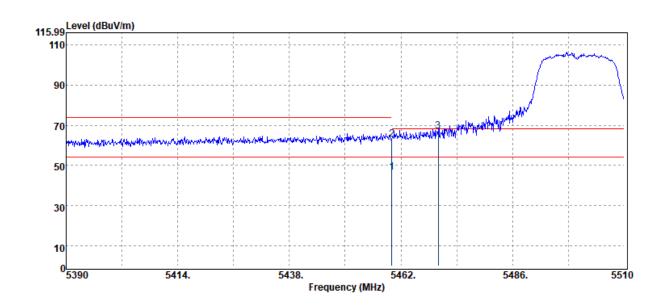
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH100 5500 MHz

:Bandedge CH Low :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5460.00	Average	31.94	14.61	46.55	54.00	-7.45
5460.00	Peak	48.46	14.61	63.07	74.00	-10.93
5470.00	Peak	52.45	14.70	67.15	68.20	-1.05

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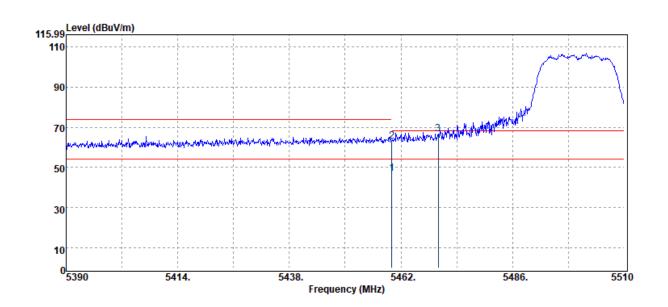
Page: 105 of 128

Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH100 5500 MHz

:Bandedge CH Low :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5460.00	Average	32.39	14.61	47.00	54.00	-7.00
5460.00	Peak	48.55	14.61	63.16	74.00	-10.84
5470.00	Peak	51.97	14.70	66.67	68.20	-1.53

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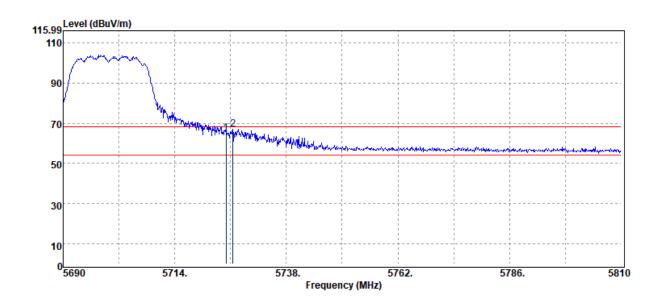
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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH140 5700 MHz :Bandedge CH High

:E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5725.00	Peak	49.68	15.42	65.10	68.20	-3.10
5726.48	Peak	51.70	15.43	67.13	68.20	-1.07

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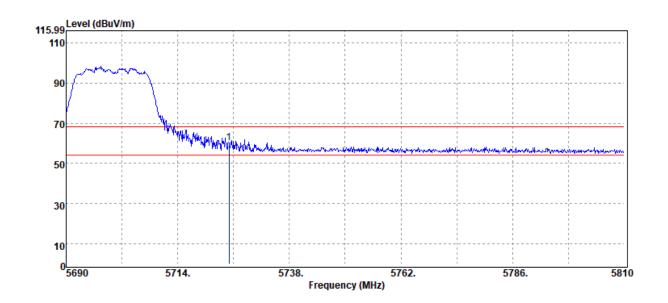
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11a :CH140 5700 MHz :Bandedge CH High

:E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL

Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
-	Mode	Reading Level		FS	@3m	_
 MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5725.00	Peak	44.86	15.42	60.28	68.20	-7.92

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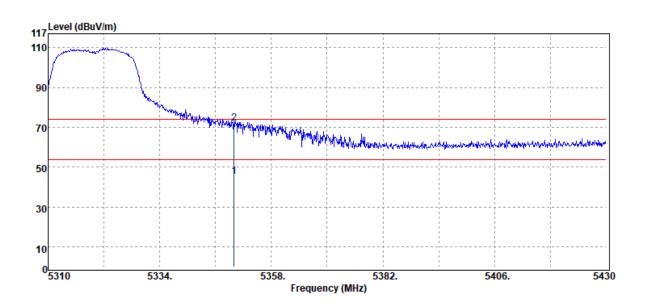


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH64 5320 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
5350.00	Average	31.14	14.28	45.42	54.00	-8.58
5350.00	Peak	57.89	14.28	72.17	74.00	-1.83

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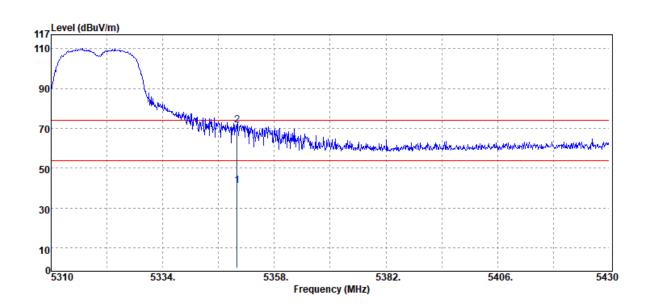


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH64 5320 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5350.00	Average	26.92	14.28	41.20	54.00	-12.80
5350.00	Peak	57.54	14.28	71.82	74.00	-2.18

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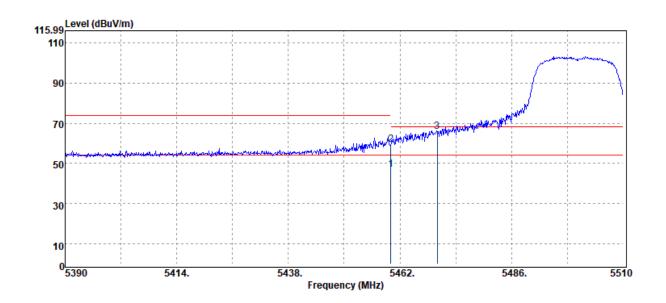
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Report Number Operation Mode Test Channel Test Mode EUT Pol :ER-2019-60051 :802.11n20 :CH100\_5500 MHz :Bandedge CH Low :E2 Plane Test Date :2019-09-10
Temp./Humi. :24.5/63
Antenna Pol. :VERTICAL
Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
5460.00	Average	32.36	14.61	46.97	54.00	-7.03
5460.00	Peak	44.87	14.61	59.48	74.00	-14.52
5470.00	Peak	51.20	14.70	65.90	68.20	-2.30

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Report Number Operation Mode Test Channel Test Mode EUT Pol

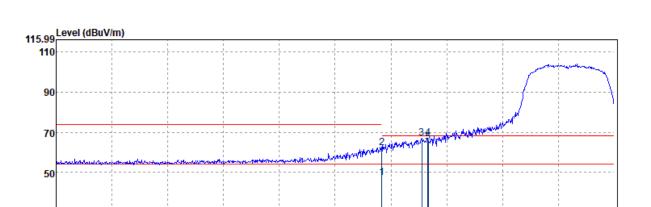
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5414.

:ER-2019-60051 :802.11n20 :CH100\_5500 MHz :Bandedge CH Low :E2 Plane Test Date :2019-09-10
Temp./Humi. :24.5/63
Antenna Pol. :HORIZONTAL
Engineer :Nick

5486.



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
5460.00	Average	32.86	14.61	47.47	54.00	-6.53
5460.00	Peak	47.52	14.61	62.13	74.00	-11.87
5468.60	Peak	52.37	14.69	67.06	68.20	-1.14
5469.92	Peak	52.50	14.70	67.20	68.20	-1.00
5470.00	Peak	50.50	14.70	65.20	68.20	-3.00

Frequency (MHz)

5462.

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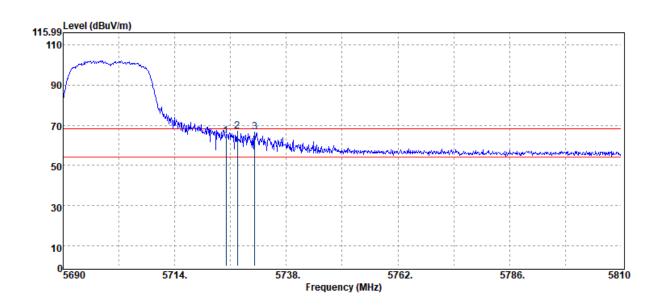


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH140 5700 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5725.00	Peak	49.28	15.42	64.70	68.20	-3.50
5727.44	Peak	51.54	15.44	66.98	68.20	-1.22
5731.16	Peak	50.97	15.48	66.45	68.20	-1.75

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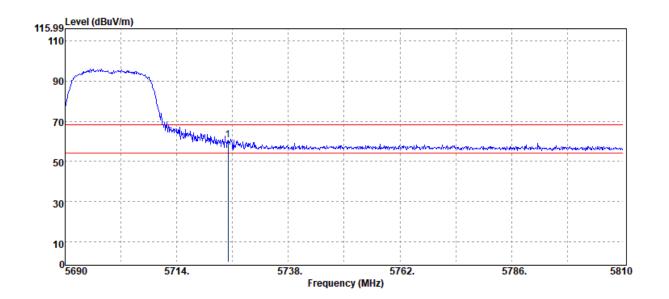
Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n20 :CH140 5700 MHz :Bandedge CH High **Test Date** Temp./Humi. Antenna Pol. Engineer

:2019-09-10 :24.5/63 :HORIZONTAL

:Nick

:E2 Plane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
-	Mode	Reading Level		FS	@3m	_	
 MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
5725.00	Peak	45.37	15.42	60.79	68.20	-7.41	_

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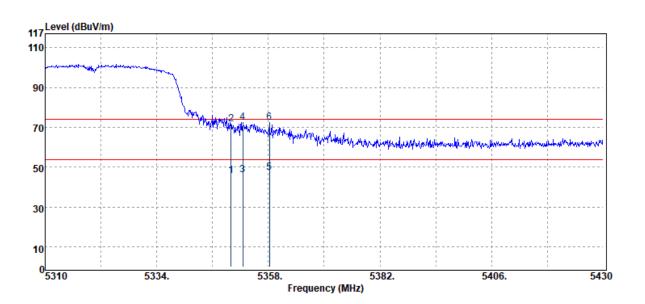


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH62 5310 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
5350.00	Average	31.65	14.28	45.93	54.00	-8.07
5350.00	Peak	57.27	14.28	71.55	74.00	-2.45
5352.48	Average	31.67	14.28	45.95	54.00	-8.05
5352.48	Peak	58.21	14.28	72.49	74.00	-1.51
5358.24	Average	33.05	14.30	47.35	54.00	-6.65
5358.24	Peak	58.31	14.30	72.61	74.00	-1.39

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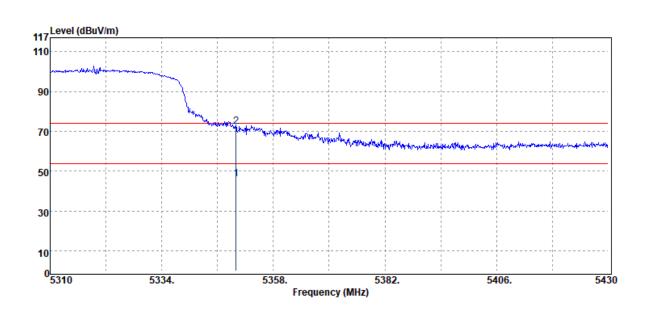


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH62 5310 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
5350.00	Average	31.98	14.28	46.26	54.00	-7.74
5350.00	Peak	58.11	14.28	72.39	74.00	-1.61

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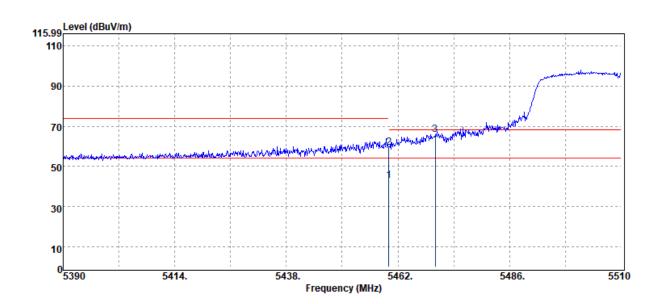


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH102 5510 MHz :Bandedge CH Low :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5460.00	Average	28.53	14.61	43.14	54.00	-10.86
5460.00	Peak	44.92	14.61	59.53	74.00	-14.47
5470.00	Peak	51.27	14.70	65.97	68.20	-2.23

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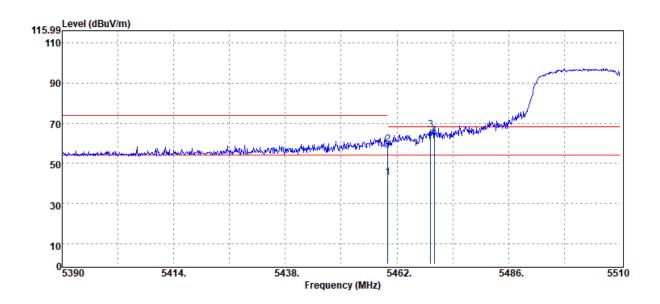


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH102 5510 MHz :Bandedge CH Low :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5460.00	Average	28.53	14.61	43.14	54.00	-10.86
5460.00	Peak	44.93	14.61	59.54	74.00	-14.46
5469.20	Peak	51.92	14.70	66.62	68.20	-1.58
5470.00	Peak	49.12	14.70	63.82	68.20	-4.38

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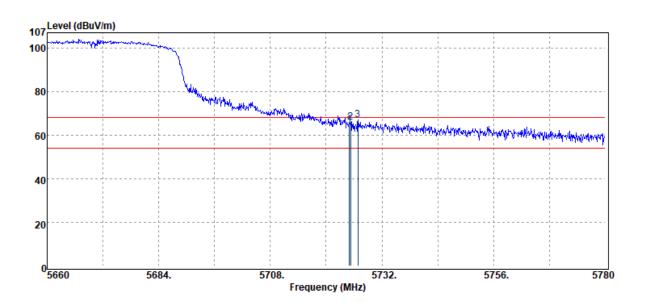


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH134 5670 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
5725.00	Peak	49.27	15.42	64.69	68.20	-3.51
5725.28	Peak	50.42	15.42	65.84	68.20	-2.36
5726.84	Peak	51.43	15.43	66.86	68.20	-1.34

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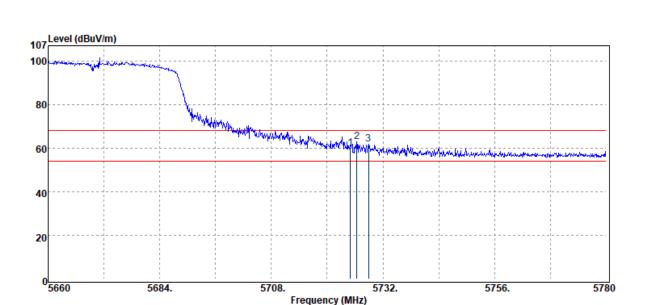


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11n40 :CH134 5670 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
5725.00	Peak	44.54	15.42	59.96	68.20	-8.24
5726.36	Peak	47.34	15.43	62.77	68.20	-5.43
5728.88	Peak	46.45	15.46	61.91	68.20	-6.29

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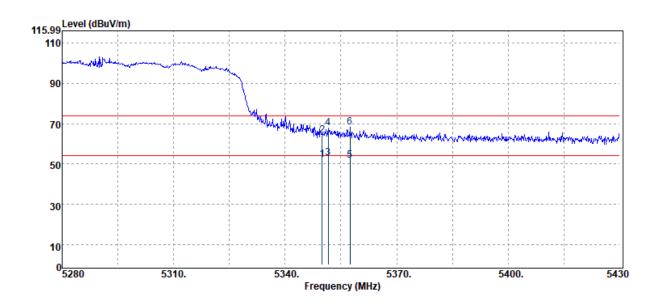


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH58 5290 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
5350.00	Average	37.83	14.28	52.11	54.00	-1.89
5350.00	Peak	49.82	14.28	64.10	74.00	-9.90
5351.55	Average	38.69	14.29	52.98	54.00	-1.02
5351.55	Peak	53.43	14.29	67.72	74.00	-6.28
5357.40	Average	37.32	14.30	51.62	54.00	-2.38
5357.40	Peak	53.88	14.30	68.18	74.00	-5.82

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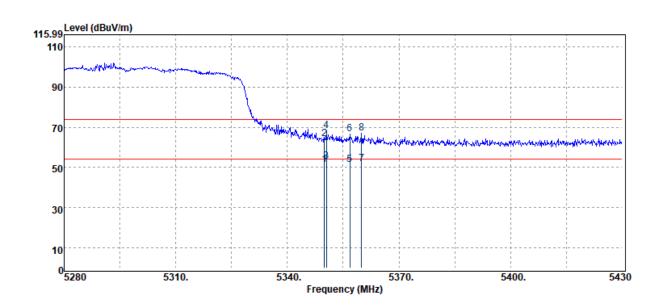


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH58 5290 MHz :Bandedge CH High :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμ̈V	dB	dBμV/m	dΒμV/m	dB
5350.00	Average	37.06	14.28	51.34	54.00	-2.66
5350.00	Peak	50.11	14.28	64.39	74.00	-9.61
5350.50	Average	38.64	14.28	52.92	54.00	-1.08
5350.50	Peak	53.98	14.28	68.26	74.00	-5.74
5356.80	Average	37.16	14.30	51.46	54.00	-2.54
5356.80	Peak	52.25	14.30	66.55	74.00	-7.45
5359.95	Average	37.51	14.30	51.81	54.00	-2.19
5359.95	Peak	52.65	14.30	66.95	74.00	-7.05

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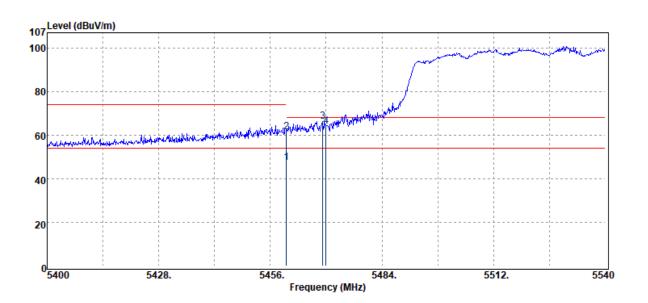


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH106 5530 MHz :Bandedge CH Low :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :VERTICAL Engineer :Nick



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
	5460.00	Average	32.78	14.61	47.39	54.00	-6.61	_
	5460.00	Peak	46.98	14.61	61.59	74.00	-12.41	
	5469.16	Peak	51.67	14.70	66.37	68.20	-1.83	
	5470.00	Peak	49.36	14.70	64.06	68.20	-4.14	

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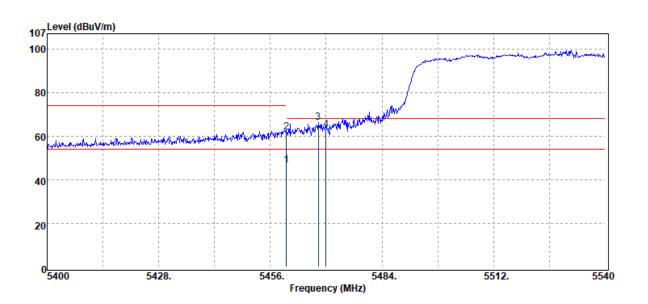


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Report Number **Operation Mode Test Channel** Test Mode **EUT Pol** 

:ER-2019-60051 :802.11ac80 :CH106 5530 MHz :Bandedge CH Low :E2 Plane

**Test Date** :2019-09-10 Temp./Humi. :24.5/63 Antenna Pol. :HORIZONTAL Engineer :Nick



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5460.00	Average	32.09	14.61	46.70	54.00	-7.30
5460.00	Peak	47.28	14.61	61.89	74.00	-12.11
5468.04	Peak	51.69	14.68	66.37	68.20	-1.83
5470.00	Peak	48.19	14.70	62.89	68.20	-5.31

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## 11 TRANSMISSION IN THE ABSENCE OF DATA

# 12.1Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

#### 12.2Result

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

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## 12 FREQUENCY STABILITY

## 13.1 Standard Applicable

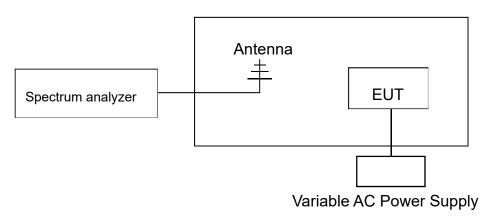
Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

#### 13.2 Measurement Procedure

- 1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
- 2. Set EUT as normal operation.
- 3. Turn the EUT on and couple its output to spectrum.
- 4. Turn the EUT off and set the chamber to the highest temperature specified.
- 5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
- 6. Repeat step with the temperature chamber set to the lowest temperature.

#### 13.3 Test SET-UP

Temperature Chamber



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# 13.4 Measurement Equipment Used:

	SGS Conducted Room							
Name of Equip- ment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due			
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/02/2019	05/01/2020			
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2019	05/16/2020			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020			
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020			

## 13.5 Measurement Result

## **Startup**

Operation Mode	802.11 a	Test Date	2019.09.09
Temperature	: 27.7	Test By	Tom
Humidity	: 53%		

Test Temp.( )	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-10	133.2	52	5260	5,260.02438	-0.00000463
-10	106.8	52	5260	5,260.01591	-0.00000303
25	120	52	5260	5,260.02331	-0.00000443
55	133.2	52	5260	5,260.01647	-0.00000313
55	106.8	52	5260	5,260.01678	-0.00000319

## 2 Minutes

,5			
Operation Mode	802.11 a	Test Date	2019.09.09
Temperature	: 27.7	Test By	Tom
Humidity	: 53%		•

Test Temp.(	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-10	133.2	52	5260	5,260.01865	-0.00000355
-10	106.8	52	5260	5,260.02938	-0.00000559
25	120	52	5260	5,260.02742	-0.00000521
55	133.2	52	5260	5,260.01424	-0.00000271
33	106.8	52	5260	5,260.02235	-0.00000425

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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## **5 Minutes**

Operation Mode	802.11 a	Test Date	2019.09.09
Temperature	: 27.7	Test By	Tom
Humidity	: 53%		

Test Temp.( )	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-10	133.2	52	5260	5,260.02507	-0.00000477
-10	106.8	52	5260	5,260.02754	-0.00000524
25	120	52	5260	5,260.02834	-0.00000539
55	133.2	52	5260	5,260.01434	-0.00000273
55	106.8	52	5260	5,260.02596	-0.00000493

#### 10 Minutes

Operation Mode	802.11 a	Test Date	2019.09.09
Temperature	: 27.7	Test By	Tom
Humidity	: 53%		

Test Temp.(	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
-10	133.2	52	5260	5,260.01895	-0.00000360
-10	106.8	52	5260	5,260.02034	-0.00000387
25	120	52	5260	5,260.02327	-0.00000442
55	133.2	52	5260	5,260.01570	-0.00000298
33	106.8	52	5260	5,260.02304	-0.00000438

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台灣檢驗科技股份有限公司

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# 13 ANTENNA REQUIREMENT

# Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

According to §15.407, 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.

#### 13.2 **Antenna Connected Construction**

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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