

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Applicant:	Targus International LLC 1211 North Miller Street Anaheim,CA 92806 USA
Product Name:	Wireless Presenter
Brand Name:	TARGUS
Model No.:	AMP09B
Model Difference:	N/A
FCC ID:	OXM000092
Report Number:	E2/2018/90067
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	Dec. 14, 2018
Date of Test:	Oct. 08, 2018 ~ Dec. 07, 2018
Date of EUT Received:	Sep. 25, 2018

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.

Tested By:

Aken Huang / Engineer Approved By:

Jazz Huang /Asst. Supervisor



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/90067	Rev.00	Initial creation of document	All	Dec. 14, 2018	Susan Lin

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GENERAL INFORMATION 1

1.1 Product Description

General:

Product Name:	Wireless Presenter
Brand Name:	TARGUS
Model No.:	AMP09B
Model difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
Power Supply:	1.5Vdc from AAA battery

2.4GHz:

Channel number:	5 channels
Modulation type:	GFSK
Transmit Power:	-0.35 dBm
Frequency Range:	2417 – 2463MHz

Antenna Designation

Antenna Type	Part Number	Supplier	Peak Gain (dBi)
Printed	AMP09-B	BTL INC.	-0.61

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v05.

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.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Number and Designation number are: 735305 / TW0002

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.

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SYSTEM TEST CONFIGURATION 2

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

2.3.1 **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.

2.3.2 **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.

2.3.3 **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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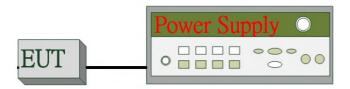
2.4 Measurement Results Explanation Example

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.

2.5 Configuration of Tested System

Fig. 2-1 Conducted (Antenna Port) Emission Configuration





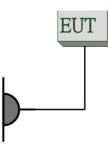


Table 2-1 Equipment Used in Tested System

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Ca- ble	Power Cord
1.	2.4G Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Unshielded

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SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.205 §15.209 §15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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DESCRIPTION OF TEST MODES 4

4.1 Operated in 2417 ~ 2463MHz Band

5 channels are provided for 2.4GHz

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2417 MHz	2	2431 MHz	3	2443 MHz
4	2451 MHz	5	2463 MHz		

4.2 The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- 2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

RADIATED EMISSION TEST:

MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)	
RADIATED EMISSION TEST (BELOW 1 GHz)					
2.4GHz	2417 to 2463	2417, 2443, 2463	GFSK	1	
	RADIATED EMISSION TEST (ABOVE 1 GHz)				
2.4GHz	2417 to 2463	2417, 2443, 2463	GFSK	1	
Note:					

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

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)
2.4GHz	2417 to 2463	2417, 2443, 2463	GFSK	1

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MEASUREMENT UNCERTAINTY 5

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

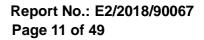
	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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CONDUCTED EMISSION TEST 6

6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range		nits μV)				
MHz	Quasi-peak	Average				
0.15 to 0.50	66 to 56	56 to 46				
0.50 to 5	56	46				
5 to 30	60	50				
Note 1.The lower limit shall apply at the transition frequencies						

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used:

N/A

6.3 EUT Setup:

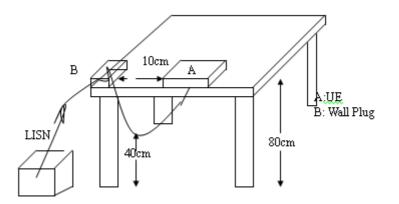
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure:

- 1. The EUT was placed on a table which is 0.8m above ground plan.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed

6.6 Measurement Result:

N/A, the device is power from 1.5V AAA battery.

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PEAK OUTPUT POWER MEASUREMENT 7

7.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

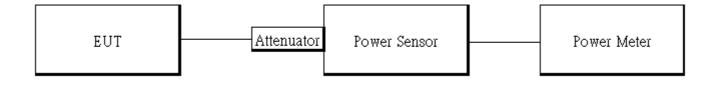
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

7.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02
Splitter	Woken	DOM35LW1A2	RF36	2017/12/26	2018/12/25
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25

7.3 Test Set-up:



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7.4 Measurement Procedure:

- 1.Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Power Meter.

5. Repeat above procedures until all test default channel measured was complete.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Duty Factor:

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
2.4G	40.13	3.97	2.69	3.00

0.0											Amalyzer - Swe		ight Spect	
Frequency	E 1 2 3 4 5 6	TRAC		Type: Log	Avg	SE:INT		-	GHz	0000	2.44300	eq 2	er Fre	Rent
Auto Tu	PNNNNN						Trig: Free #Atten: 20		PNO: Fast IFGain:Low					
Auto Tu	200 ms 6.05 dB		Δ								Offset 10. f 20.00 d		/div	
Center Fr							2	~14				-		0.0
2.443000000 G				-	♦3∆4			¥ I		12	2	+		.00
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Stop Fr														0.0
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CF St	pan 0 Hz									Hz	00000 G			
8.000000 N Auto N	1001 pts)	.000 ms (*	-	Swe	OTION		8.0 MHz	BW	#V		-	_	BW 8	_
		FORGUE		PONCTO	of ton	IB	0.40 -1.31 dB	(A)	498.0 µs 612.0 µs	~	(<u>A</u>)		12 1	1 4
Freq Off			_			IB	-6.05	(A)	1.200 ms 612.0 µs		(<u>A</u>)	t	4 1 F	3 /
	*													5 6
			_			-							-	7
			_			-						_	_	9
			-		_	-						-	-	0

Duty Cycle Factor:10*log(1/(40.1294498381877/100))=3.97

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7.5 Measurement Result:

2.4G mode:

СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
Low	2417	-0.45	1 Watt = 30 dBm
Mid	2443	-0.36	1 Watt = 30 dBm
High	2463	-0.35	1 Watt = 30 dBm
2.4G mo	de:		
СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
Low	2417	-0.87	1 Watt = 30 dBm
Mid	2443	-0.63	1 Watt = 30 dBm
High	2463	-0.75	1 Watt = 30 dBm

*Note: Measured by power meter, cable loss as 10.5 dB that offsets on the power meter in Peak *Note: Measured by power meter, as cable loss+ Duty cycle factor that offsets on the power meter *Note: Max. Output include tune up tolerance Power is average power

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8 **6DB BANDWIDTH MEASUREMENT**

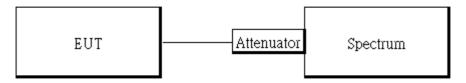
8.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20
DC Block	PASTERNACK	PE8210	RF81	2017/12/26	2018/12/25
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25

8.3 Test Set-up:



8.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. For 6dB Bandwidth:

Set the spectrum analyzer as RBW=100 kHz, VBW= 3*RBW, Span = 5MHz, Detector=Peak, Sweep=auto.

- 5. 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 = 2MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all test default channel is completed.

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8.5 Measurement Result:

2.4G mode			
Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2417	0.8012	> 0.5	PASS
2443	0.8001	> 0.5	PASS
2463	0.8041	> 0.5	PASS

6dB Band Width Test Data CH-Low

Keysight Spect	RF 50 D DC	1		NSE:1NT		IGN AUTO	10.83.30 44	Dec 04, 2018		
n	eq 2.417000000	GHz #IFGain:Low	Center F	req: 2.41700 e Run			Radio Std: Radio Devi	None	Fred	luency
10 dB/div	Ref Offset 10.5 dE Ref 20.00 dBm									
10.0 0.00			\sim	~						nter Fred 00000 GHz
-20.0			/	\ 		~				
-40.0										
-70.0 Center 2.4								n 5 MHz		CF Step
Res BW 100 kHz Occupied Bandwidth		h	#V	#VBW 300 kHz Total Power 5.00			Sweep 1 ms 5.06 dBm			500.000 kH Auto Ma
	9	72.17 kH	z						Fr	eq Offse
Transm	it Freq Error	14.068 k	Hz	OBW P	ower	99	.00 %			0 H:
x dB Bandwidth		801.2 k	Hz xdB			-6.00 dB				
MSG						STATUS				

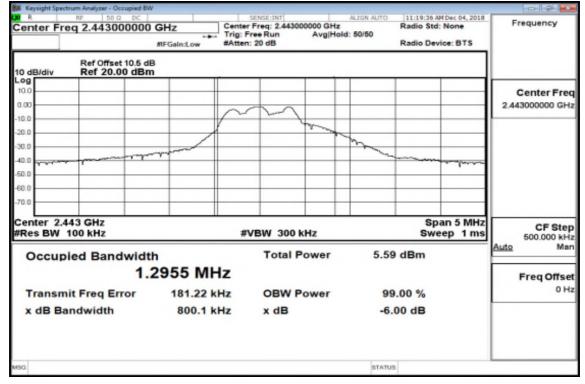
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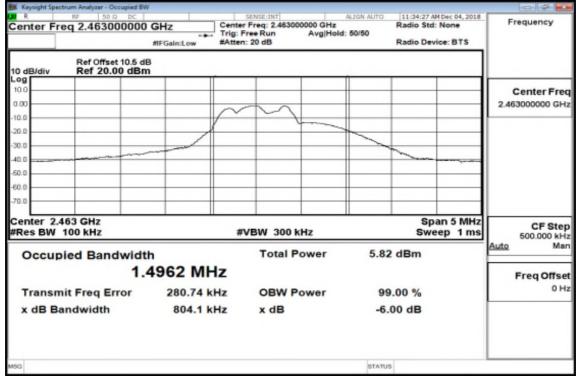
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT 9

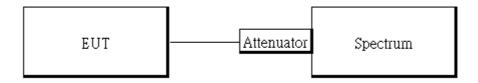
9.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

9.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20
DC Block	PASTERNACK	PE8210	RF81	2017/12/26	2018/12/25
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25

9.3 Test SET-UP:



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9.4 Measurement Procedure

Reference Level of Emission Limit:

- Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

Conducted Band Edge:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
- 6. Mark the highest reading of the emission as the reference level measurement.
- 7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5MHz) be attenuated by 20dB at least relative to the maximum emission of power.
- 8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

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Conducted Spurious Emission:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- Set RBW = 100 kHz & VBW=300 kHz, Detector =Peak, Sweep = Auto
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

9.5 Measurement Result

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)						
2417	-1.58	-21.58						
2443	-1.353	-21.35						
2463	-1.31	-21.31						

Reference Level of Limit

NOTE: cable loss as 10.5dB that offsets in the spectrum NOTE: Refer to next page for plots.

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Reference Level of Emission Limit (CH-Low)

Keysight Spectrum Analyzer - Swept SA			11:00:19 AM Dec 04, 2018	
R NP 50 D DC Center Freq 2.417000000	GHz PNO: Wide IFGainLow #Atten: 20 dB	Auton Auto Avg Type: Log-Pwr	11:00:19 MDec 04, 2018 THACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Frequency
Ref Offset 10.5 dB	i denten ar de	Mkr1 2	.417 007 5 GHz -1.58 dBm	Auto Tune
10.0				Center Fre 2.417000000 GH
0.00				Start Fre 2.416250000 GH
20.0			1	Stop Fre 2.417750000 GH
40.0				CF Ste 150.000 kH Auto Ma
60.0				Freq Offse 0 H
70.0				
Start 2.4162500 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 1	op 2.4177500 GHz .000 ms (1001 pts)	

Reference Level of Emission Limit (CH-Mid)

- 0					ctrum Analyzer - Swept SA	
Frequency	11:27:12 AM Dec 04, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	ALIGN AUTO Avg Type: Log-Pwr Avg[Hold:>100/100	SENSE:INT	GHz PNO: Wide	eq 2.442995500	XI R Center F
Auto Tune	.442 995 5 GHz -1.353 dBm		Atten: 20 dB	IFGain:Low	Ref Offset 10.5 dB Ref 20.00 dBm	10 dB/div
Center Fre 2.442995500 GH						10.0
Start Fre 2.442245500 GH						10.0
Stop Fre 2.443745500 GH						20.0 30.0
CF Ste 150.000 kH Auto Ma						
Freq Offs 0 H						0.0
z	Span 1.500 MHz				429955 GHz	
2	.000 ms (1001 pts)	Sweep 1	300 kHz	#VBW	100 kHz	Res BW

Reference Level of Emission Limit (CH-High)

Frequency	11:35:17 AM Dec 04, 2018	LIGN AUTO		SENSE:INT		2 DC		R	
Frequency	TRACE 1 2 3 4 5 6 TYPE NUMBER	Log-Pwr	Avg Typ	Trig: Free Run	NO: Wide	1	req 2.4630	Center F	
Auto Tun	462 994 0 GHz -1.31 dBm	#Atten: 20 dB	Ref Offset 10.5 dB 10 dB/div Ref 20.00 dBm						
Center Fre 2.463000000 GH								10.0	
Start Fre 2.462250000 GH			-	-	~	-		10.0	
Stop Fre 2.463750000 GH								20.0	
CF Ste 150.000 kH								40.0	
Freq Offse 0 H								60.0	
			-			-		70.0	
	op 2.4637500 GHz 000 ms (1001 pts)			300 kHz	#VBW		22500 GHz 100 kHz	Start 2.46 Res BW	

Band Edges Test Data CH-Low

R	Spectrum Analyze	50 Q DC		SENSE:II	ar l	ALIGN AUTO	144-47-05-44	4 Dec 04, 2018	
		0000000 GHz		SENSEI		Type: Log-Pwr		E 1 2 3 4 5 6	Frequency
enter	Freq 2.36	PN	C: Fast -+ ain:Low	Atten: 20 dB		Hold: 100/100	TVE	PNNNN	
0 dB/div		et 10.5 dB 00 dBm				Mkr		00 GHz 89 dBm	Auto Tun
o.o									Center Fre 2.360000000 GH
0.0								-21.58.dBm	Start Fre 2.285000000 GH
0.0						. ^2	1	N I	
	where the second se	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	and provident of the second	and the state of the	Contraction and the second	arabert Samerat and And	mu .	1)[T]mir-	
enter 2	2.36000 GH W 100 kHz			300 kHz	Carl Martin Carl State			50.0 MHz	2.435000000 GH CF Ste 15.000000 MH
enter 2 Res BV	2.36000 GH W 100 kHz				Part 19 Part of Southern	The South State of the State of	4.40 ms (50.0 MHz	2.435000000 GH CF Ste 15.000000 MH
enter 2 Res BV	2.36000 GH W 100 kHz	1z 2.417 00 2.399 90	#VBW	300 kHz		Sweep 1	4.40 ms (50.0 MHz 1001 pts)	2.435000000 GH CF Ste 15.000000 MH <u>Auto</u> Ma
enter 2 Res BV Res BV 1 N 2 N 3 N 4 5	2.36000 GH W 100 kHz	1z X 2.417 00	#VBW	300 kHz		Sweep 1	4.40 ms (50.0 MHz 1001 pts)	2.43500000 GF CF Ste 15.000000 MF <u>Auto</u> Ma
enter 2 Res BV 2 MODE 1 N 2 N 3 N 4 5 6 7	2.36000 GH W 100 kHz	1z 2.417 00 2.399 90	#VBW	300 kHz		Sweep 1	4.40 ms (50.0 MHz 1001 pts)	2.43500000 GF CF Ste 15.000000 MF <u>Auto</u> Ma
enter 2 Res BV 8 8 8 8 9 0	2.36000 GH W 100 kHz	1z 2.417 00 2.399 90	#VBW	300 kHz		Sweep 1	4.40 ms (50.0 MHz 1001 pts)	Stop Fre 2.43500000 GH 15.00000 MH <u>Auto</u> Ma Freq Offso 0 H
enter 2 Res BV MODE 1 N 2 N 3 N 4 5 6 7 7 8 9	2.36000 GH W 100 kHz	1z 2.417 00 2.399 90	#VBW	300 kHz		Sweep 1	4.40 ms (50.0 MHz 1001 pts)	2.43500000 GH CF Ste 15.000000 MH <u>Auto</u> Ma

Band Edges Test Data CH-High

Frequency	PM Dec 04, 2018	12:08:35 P	ALIGN AUTO		NSE:INT	SEI		50 Ω DC			2
	DET P NNNNN	TV	ype: Log-Pwr old: 100/100			#Atten: 2	Hz PNO: Fast FGain:Low		2.480	Fred	nter
Auto Tur	60 GHz 99 dBm		Mkr					t 10.5 dB 00 dBm			B/div
Center Fre 2.480000000 Gi				-					1	A	
Start Fre 2.46000000 GB	-21.31 dBm									ſ	
Stop Fr 2.50000000 G	idente se suche	-herein bei		A more and	monte	a aller franker kan for			-		
CF St 4.000000 M	40.00 MHz (1001 pts)		Sweep 3			V 300 kHz	#VB	z	000 GH 0 kHz		L
Freq Offs		FUNCTI	FUNCTION WIDTH	UNCTION	3m 3m	-0.943 di -55.781 di -56.699 di	96 GHz 50 GHz 60 GHz	2.483	GU f f f	1	NODE N N N
0	2										
01	E										
01						m					

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Conducted Spurious Emission Measurement Result CH-Low 30MHz – 3GHz

									nalyzar - Sive		night.Sp	M Ke
Frequency	15 AM Dec 04, 2018		ALIGN AUTO	1	INC: 1NC	50		DC [jtr		R
	RACE 1 2 3 4 5 6 TYPE NWWWW DET P NNNNN	TI	Avg Type: Log-Pwr T			Trig: Free #Atten: 2	enter Freq 1.515000000 GHz PNO: Fast IFGain(Low				Cen	
Auto Tun	17 9 GHz 1.54 dBm		Mk						Offset 10		B/div	
Center Fre												10.0
1.515000000 GH		•1								_		0.00
										-	-	10.0
Start Fre	-71.50.dBs			-						-	-	20.0
30.000000 MH			-									-30.0
Oton Fre		1	1	1						_		50.D
Stop Fre 3.000000000 GH	adama and a star	bleanst	- Alerta				فأحسا فاستينانهم		and and all in		man	60,D
												0.07
CF Ste 297.000000 MH	1 2.970 GHz s (1001 pts)		Sweep 2			300 kHz	#VBW			515 G		
Auto Ma	DIGN WARE	EU7in	INTERNINGTH	CTION FI		Y		i.	_	- 50		NO P
Freq Offse				_	Bm	-1.54 di	GHz	2.417		1 1	N	2
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	1			_	-		_				-	67
					-		-				-	8
										-		10 11
						**						1

CH-Low 3GHz - 26.5GHz

e 4 🛯							n Analyzar - S		Keysig
Frequency	11:08:39 AM Dec 04, 2018 TRACE 1 2 3 4 5 6 TYPE N NNNN DET P NNNNN	Type: Log-Pwr	n	Trig: Free R	SHz	000000			
Auto Tun	26.147 5 GHz -49.91 dBm	Mkr		#Atten: 20 d	Gain Low	1F 0.5 dB	ef Offset 1 ef 20.00		0 dB/
Center Fre 14.750000000 GH									10,0 0.00
Start Fre 3.000000000 GH	.31.53.49a								30.0
Stop Fre 26.50000000 GH	have providente	-	فسرير جنور يعدي	- Marine		moundance		Acure	60.0 60.0 70.0
CF Ste 2.350000000 GH Auto Ma	Span 23.50 GHz 2.246 s (1001 pts)	Sweep	ELUCIO	300 kHz	#VBV		0 kHz	r 14.74 3W 10	Res
Freq Offse 0 H				-49.91 dBm	5 GHz			1	1 N 2 2 4
				**					6 7 8 9 10
		STATUS							90

CH-Mid 30MHz - 3GHz

Keynight Spectrum Anal					0.00
Center Freq 1.5	515000000 GHz PN0: Fast	Trig: Free Run	Avg Type: Log-Pwr	11:32:12 AM Dec 04, 2018 TRACE 1 2 3 4 5 6 Type M 0404040	Frequency
10 dB/div Ref 2	FNU: Fast C+ IFGein;Low	#Atten: 20 dB	Mk	r1 2.441 6 GHz -1.36 dBm	Auto Tune
0.00				1	Center Free 1.515000000 GH
20.0				-21.31.031	Start Free 30.000000 MH
60.0 60.0 70.0	معدومه وروسته والمتروفين والمروم و		- James and the second	Additional and a second	Stop Fre 3.000000000 GH
Center 1.515 GH Res BW 100 kH		300 kHz	Sweep 2	Span 2.970 GHz 83.9 ms (1001 pts)	CF Ste 297.000000 MH Auto Ma
1 N 1 f 2 4 5 6 7	2.441 6 GHz	-1,36 dBm			Freq Offse 0 H
8 9 10 11		8			

CH-Mid 3GHz - 26.5GHz

							nalyzar - Sive		yaight S	M Ke
Frequency	1:32:43 AM Dec 04, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW	Log-Pwr		Trig: Free Run	Hz	000000 G	4.7500	Freq 1	ter l	Cer
Auto Tune	DET P NNNNN			#Atten: 20 dB	NO: Fast 😱 Gain:Low	PH IF(
Auto Turk	5.983 0 GHz -50.05 dBm	Mkr1					Offset 10. 20.00 c		B/div	
Center Free			_				_		_	10.0
14.750000000 GH								-		0.00 -10.0
StartFree	-21.35.051							_		-20.0
3.000000000 GH							_	-	-	-30.0
	at a subscription of the second									-40.0
Stop Free 26.50000000 GH	al a barren an an	dament of	degrees always	and have been	ereiner	- and the	the same	ween a fe		-60,0
										-70.0
2.350000000 GH	Span 23.50 GHz 246 s (1001 pts)	Sweep 2		300 kHz	#VBW			4.75 G		
Auto Mar	FUNCTION VALUE	CTEDRI WEDTH	FUNCTION	-60.05 dBm	0 GHz	25.983		1 f	N	MIDE:
Freq Offse										2746
0 H:					_				-	5
										6 7 8 9
								_		9 10 11
		STATUS			· ·					490

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com



CH-High 30MHz – 3GHz

F	MDec 04,2018		ALIGN AUTO		ETSE IN	1 5	1	DC [50.0	, HE		R.
Frequency	E 123456 E NWWWW T P NNNNN	g Type: Log-Pwr TRACE 1 2 3 4 5 6 TYPE NWWWW DET P N/N/N/P			Trig: Free Run #Atten: 20 dB		enter Freq 1.515000000 GHz PND: Fast IFGainiLow					
Auto Tun	2 4 GHz 34 dBm		Mk						Offset 10 20.00 c		3/div	dE
Center Fre 1.515000000 GH		• ¹					_			_		0.0
Start Fre 30.000000 MH	-21.31.dBs				-							
Stop Fre 3.000000000 GH	+13- <u>8-15-</u> 40	Amer	moning	لمجهرين		agaga baana	and the fact of the second	- Aprill-Plans				0,0
CF Ste 297.000000 MH Auto Ma	.970 GHz 1001 pts)	83.9 ms (Sweep 2		z	300 kH	#VBW			.515 G	BW	Res
Freq Offs		FOREIO		FONCTION	1Bm	-1.34	GHz	2.462		1 1		
					-							6 7 8 9
					_					_	-	0

CH- High 3GHz – 26.5GHz

								malyzar - S		pht Spect	Keys
Frequency	41:59 AM Dec 04, 2018 TRACE 1 2 3 4 5 6 TVPE NWWWW DET P NNNNN	Log-Pwr	Avg Ty	Run	Trig: Free	Hz NO: Fast C	000000	4.750	eq 1	er Fre	ent
Auto Tune	6.476 5 GHz -49.62 dBm	Mkr1		0 dB	#Atten: 2	GeiniLow	1 0.6 dB	Offset 1 20.00			0 dB
Center Fred 14.750000000 GHz	1.21.60								_		0.00
Start Fred 3.000000000 GHz	1								-		20.0 30.0
Stop Free 26.50000000 GHz	and a start of the		i landar	-		in mente		A #1	-	~~	50,0 50,0
CF Step 2.350000000 GHz Auto Mar	pan 23.50 GHz 16 s (1001 pts)	Sweep 2.	4C104		300 kHz	#VBV		kHz	100	r 14.1 BW 1	Res
Freq Offsel 0 Hz					-49.62 di	5 GHz	26,479		1		1 2 2 4 5 6 7 8 9
		TATUS		1	n	1				+	

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10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

Standard Applicable 10.1

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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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10.2 **Measurement Equipment Used**

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35243	2018/10/30	2019/10/29
Horn Antenna	Schwarzbeck	BBHA9120D	1187	2018/01/04	2019/01/03
Horn Antenna	SCHWAZBECK	BBHA9170	185	2018/08/02	2019/08/01
Loop Antenna	ETS.LINDGREN	6502	148045	2018/04/19	2019/04/18
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/04/10
Pre-Amplifier	EMC Instruments	EMC330	980096	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC0011830	980199	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Marvelous	WATT-218FS-10	RF246	2017/12/26	2018/12/25
Highpass Filter	Micro Tronics	BRM50701-01	G008	2017/12/26	2018/12/25
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25
Notebook	Lenovo	T470	P0001293	N/A	N/A

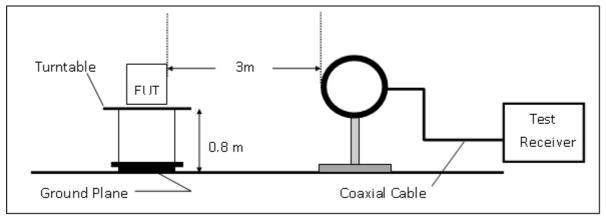
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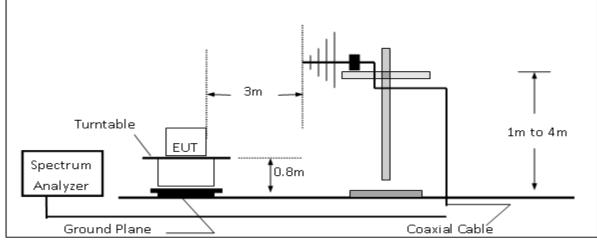


10.3 Test SET-UP

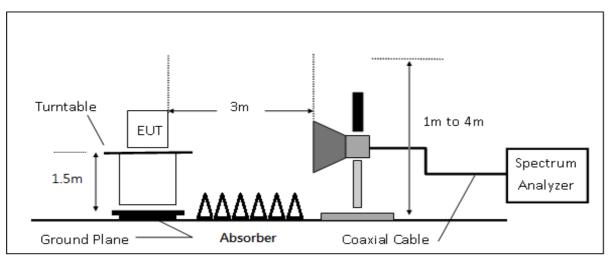
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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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10.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plan.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. 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.
- 6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 7. 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.
- 8. When 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.
- 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. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 11. Repeat above procedures until all default test channel measured were complete.

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10.5 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	5	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	
A . (

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

Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

10.6 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.

10.7 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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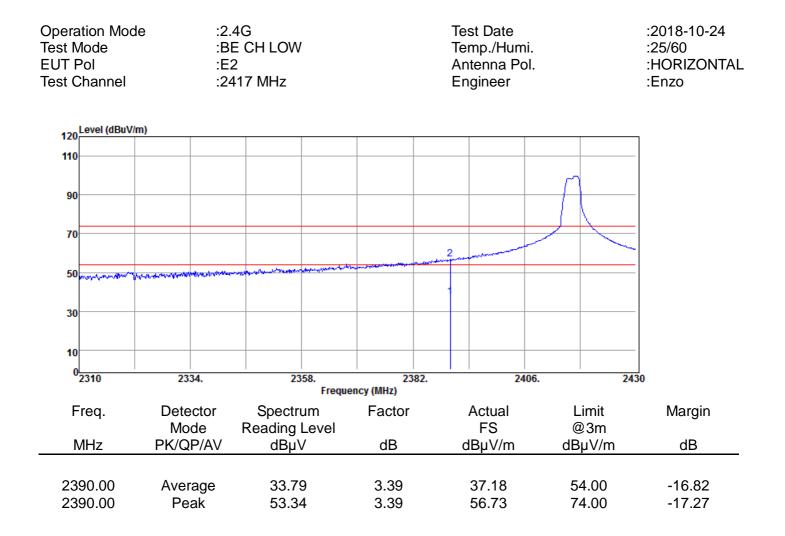
Radiated Band Edge Measurement Result

Operatio Test Moo EUT Pol Test Cha	de		:Bl :E2	4G E CH LOW 2 417 MHz	1		T A	est Date emp./Hun ntenna Po ngineer	:2018-10-24 :25/60 :VERTICAL :Enzo					
Leve	120 Level (dBuV/m)													
		·												
110											-			
90									ſ		_			
70										K	_			
							2	Cherry Control of Cont	Mundana	- where a start and				
50	en and encoded and any of	an a	Henry Marries			an a	and many man	appellant for which we want			-			
							13							
30											_			
10														
0 231	D	23	34.	23	358. Freque		82.	24	130					
Fred	r	Dete	octor	Frequency (MHz) Spectrum Factor				Actual	_imit	Margin				
1100	1.	Mo		Spectrum Reading Level		Facior		FS		2)3m	Margin			
MH:	z	PK/Q		dBµ\		dB		dBµV/m		βμV/m	dB			
2389.	20	Ave	age	32.1	8	3.39		35.57	5	4.00	-18.43			
2389.		Pe	ak	47.1		3.39		50.49		4.00	-23.51			
2390.		Aver	•	32.5		3.39		35.91		4.00	-18.09			
2390.	.00	Peak		45.46		3.39		48.85	48.85 7		-25.15			

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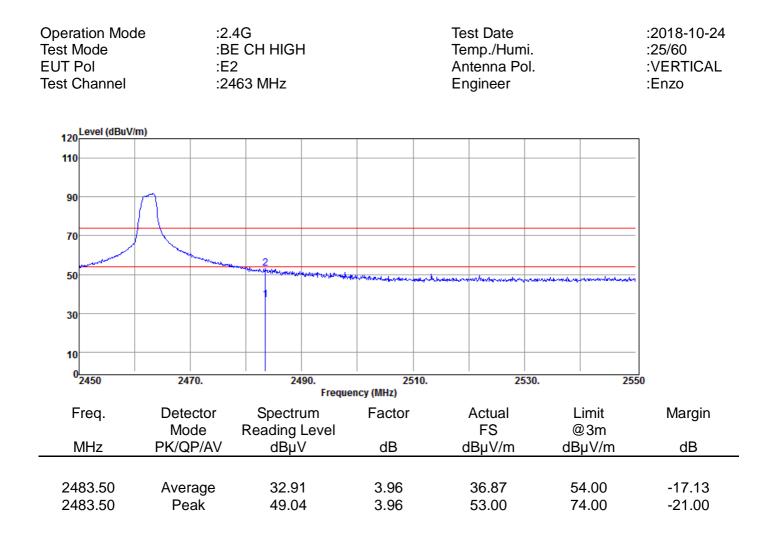
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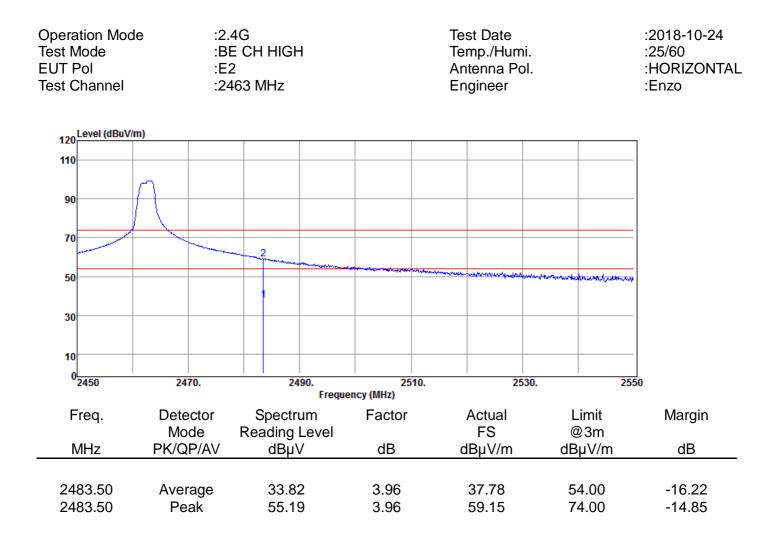
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Radiated Spurious Emission Measurement Result For Frequency form 30MHz to 1000MHz

Operation Mod Test Mode EUT Pol Test Channel	:T. :E	4G X CH LOW 2 417 MHz		Test Date Temp./Humi. Antenna Pol. Engineer									
100 Level (dBuV/	100_Level (dBuV/m)												
90													
80													
70													
60													
50													
40					J								
30 1 2	4			5 6									
20													
10													
0 <mark>30</mark>	224.	418. Freque	612. ency (MHz)	806.	100	0							
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin							
	Mode	Reading Level		FS	@3m								
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB							
00.70	D 1	05.00	7.40	00.74	10.00	44.00							
36.79 54.25	Peak	35.92 44.52	-7.18	28.74	40.00	-11.26							
	Peak		-17.63	26.89	40.00 43.50	-13.11							
93.05 149.31	Peak Peak	49.31 45.51	-15.88 -12.65	33.43 32.86	43.50 43.50	-10.07 -10.64							
729.37	Peak	45.51 34.76	-12.65	32.80 33.31	43.50 46.00	-10.64 -12.69							
771.08	Peak	33.34	-0.93	32.41	46.00 -13.59								
				-									

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Operation M Test Mode EUT Pol Test Channe		:E2	G CH LOW 7 MHz	,			Test Dat Temp./H Antenna Enginee	:2018-10-08 :24/60 :HORIZONTAL :Enzo			
100 Level (dB	uV/m)			1							-
90											
80											
70											
60											
50											
40	r										
30					5			6			
20 30 3	4										
10											
0 <mark>30</mark>	22	24.	4	18. Freque	6 ncy (MHz)	12.		806		100	<u>5</u> 0
Freq.	Dete		Spectr		Factor		Actual		L	.imit	Margin
	Mo		Reading		15		FS		@3m		
MHz	PK/Q	P/AV	dBh	V	dB		dBµV/	m	dB	µV/m	dB
30.97	Pe	ak	32.6	4	-4.16		28.48	ł	4	0.00	-11.52
58.13	Pe		40.0		-19.08		20.92			0.00	-19.08
93.05	Pe	ak	40.1	9	-15.88		24.31	l	4	3.50	-19.19
139.61	Pe		34.1		-11.86		22.31			3.50	-21.19
592.60	Pe		31.5		-3.21		28.36			6.00	-17.64
772.05	Pe	Peak 33.01		1	-0.90		32.11		4	6.00	-13.89

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Test N EUT F	peration Mode :2.4G est Mode :TX CH MID UT Pol :E2 est Channel :2443 MHz						Test Date Temp./Humi. Antenna Pol. Engineer								:2 :V	018-10-0 4/60 ERTICA nzo		
100	Level	(dBuV/	m)	1												_		
90																_		
80																_		
70																_		
60																_		
50																_		
40			ſ													_		
30		2					3			4			5 6		_			
20							_									_		
10							_									_		
	30																	
	30		22	24.	4	18. Freque	612. 806. iency (MHz)							1	000			
F	req		Dete		Spectr		Factor			Actual			Limit				Margin	
Ν	ИНz		Mo PK/Q		Reading dBµ		dB			FS dBµV/m			@3m dBµV/m				dB	
N					uυμ	v				u	Βμν/			ubµv	/111		uD	
6	9.77	7	Pe	ak	48.7	8	-1	7.94			30.84	1	40.00		0		-9.16	
10	0.8	1	Pe	ak	42.7	0	-1-	4.65			28.05	5		43.5	0		-15.45	
	60.5		Pe		31.3			3.16			28.14			46.0			-17.86	
	71.0		Pe		32.2).93		31.30				46.0			-14.70	
	55.4		Pe		29.8			.77			30.60		46.00			-15.40		
96	53.1	4	Peak		30.95		2.39			33.34			54.00				-20.66	

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Operation Mode Test Mode EUT Pol Test Channel	de	:T) :E2	4G (CH MID 2 143 MHz			T A	est Dat emp./H ntenna	lumi. ι Pol.				:2018-10-08 :24/60 :HORIZONTAL :Enzo
100 Level (dBuV	/m)	1		1		1						1
90												
80												
70												
60												
50											_	
40	Г Г											
30	2				4			5		6	j 	
20	3											
10												
0 <mark></mark> 30	22	24.	4	18. Freque	6 ency (MHz)	12.		806			100	0
Freq.	Dete	ector	Spectr	um	Factor		Actua	I	L	imit		Margin
	Mo		Reading				FS			23m		
MHz	PK/Q	P/AV	dBµ\	V	dB		dBµV/ı	m	dB	μV/r	n	dB
93.05	Pe	ak	48.7	1	-15.88		32.83	2	1	3.50		-10.67
147.37	Pe		40.0		-12.50		27.53			3.50 3.50		-15.97
197.81	Pe		37.0		-13.16		23.87			3.50		-19.63
579.99	Pe		31.5		-3.20		28.39			6.00		-17.61
772.05	Pe		32.7		-0.90		31.83			6.00		-14.17
945.68	Pe	ak	30.4	8	1.98		32.46	5	46	6.00		-13.54

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Operat Test M EUT P Test Cl	ol	•	:E2	CH HIGH	ł			Test Da Temp./H Antenna Enginee	Humi. a Pol.			:2 :\	2018-10-08 24/60 /ERTICAL Enzo
100	evel (dBuV/m)											
90-												_	
80												_	
70-												_	
60												_	
50												_	
40											5	6	
30		1			2		3		4			Ť	
20												+	
10												+	
03	0	22	4	4	18.	61	2		806		<u> </u>	1000	
5		22				ncy (MHz)	2.		000	•		1000	
Fr	req.	Dete		Spectro		Factor		Actua	al		mit		Margin
М	lHz	Moo PK/QI		Reading dBµ\		dB		FS dBµV/	′m	-	3m JV/m		dB
			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		-	0.2				0.2	,		
	5.13	Pea		43.47		-12.98		30.49			8.50		-13.01
	1.65	Pea		31.63		-5.02		26.6			6.00		-19.39
	4.61	Pea		30.44		-2.78		27.60			6.00		-18.34
	3.02	Pea		32.38		-0.88		31.50			6.00		-14.50
	3.44	Pea		31.30		2.13		33.43			6.00		-12.57
98	7.39	Pea	ак	31.40	J	2.99		34.39	y	54	.00		-19.61

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Operation Mod Test Mode EUT Pol Test Channel	:T. :E	.4G X CH HIGH 2 463 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-10-08 :24/60 :HORIZONTAL :Enzo
100 Level (dBuV/r	m)					7
90						
80						
70						
60						
50						
40	3		4	5	6	
30 2						
20						
10						
0 <mark></mark> 30	224.	418.	612.	806.	10	_ 00
_			ency (MHz)			
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
		~-µ·			~~~~~	
30.97	Peak	32.52	-4.16	28.36	40.00	-11.64
93.05	Peak	39.17	-15.88	23.29	43.50	-20.21
159.01	Peak	42.82	-13.18	29.64	43.50	-13.86
549.92	Peak	33.27	-3.14	30.13	46.00	-15.87
772.05	Peak	34.46	-0.90	33.56	46.00	-12.44
951.50	Peak	31.33	2.09	33.42	46.00	-12.58

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Radiated Spurious Emission Measurement Result For Frequency above 1GHz

Operation Mode Test Mode EUT Pol Test Channel	:2.4G :TX CH LOW :E2 :2417 MHz	Ti Ti A E	:2018-10-24 :25/60 :VERTICAL :Enzo	
100 Level (dBuV/m)	1 1 1		1 1	
90				
80				
70				
60	4			
50 2	3			
40				
30				
20				
10				
0 <mark>1000 6</mark>	5100. 11200. F	16300. requency (MHz)	21400.	26500

		rieque	ency (MHZ)			
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4834.00	Average	19.78	12.42	32.20	54.00	-21.80
4834.00	Peak	31.70	12.42	44.12	74.00	-29.88
7251.00	Average	24.51	20.04	44.55	54.00	-9.45
7251.00	Peak	34.16	20.04	54.20	74.00	-19.80

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Operation Test Mod EUT Pol Test Cha	le		:T. :E	4G X CH LOW 2 417 MHz	1		۲ A	Test Date Temp./Hum Antenna Po Engineer			:2018-10-24 :25/60 :HORIZONT :Enzo	
100	el (dBuV/m)											
90												
											_	
80												
70											-	
60			4								_	
50		2									-	
40		1									-	
30		_									-	
20											-	
10		_									-	
0 <mark></mark>		61	00.		200.	163	00	21	400.	26	500	
1000			00.			ency (MHz)		21	400.	20.		
Fred	q .		ector	Spectr		Factor		Actual		Limit	Margin	
MH	7	Mo PK/O	de P/AV	Reading dBµ		dB		FS dBµV/m		@3m 3µV/m	dB	
	۷.			υDμ	v	uВ		ασμν/Π	UL	γμν/Π	UD	
4834.	.00	Ave	rade	20.4	7	12.42		32.89	5	54.00	-21.11	
4834.			ak	31.3		12.42		43.77		4.00	-30.23	
7251.		Ave	0	27.4		20.04		47.52		54.00	-6.48	
7251.	.00	Pe	ak	34.3	3	20.04		54.37	7	4.00	-19.63	

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Operation Moo Test Mode EUT Pol Test Channel	:T. :E	.4G X CH MID 2 443 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-10-24 :25/60 :VERTICAL :Enzo
100 Level (dBuV/	m)					7
90						_
80						-
70						-
60	4					-
50	2 3					-
40						-
30						-
20						-
10						-
0 <mark>1000</mark>	6100.	11200. Freque	16300. ency (MHz)	21400.	265	00
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1000 0-				~~~~	- / 00	
4886.00 4886.00	Average Peak	26.21 30.78	12.64 12.64	38.85 43.42	54.00 74.00	-15.15 -30.58
4888.00 7329.00	Average	27.83	20.08	43.42 47.91	74.00 54.00	-30.58 -6.09
7329.00	Peak	35.56	20.08	55.64	74.00	-18.36

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Test M EUT P		9	:T) :E2	4G K CH MID 2 143 MHz				Test Date Temp./Hum Antenna Po Engineer			:2018-10-24 :25/60 :HORIZONTAL :Enzo
100	evel (dBuV/m)			1				1		7
90-											_
80											_
70											_
60			4								_
50		2	- 3								-
40		1									-
30											-
20											_
10											_
0	000	61	00.	11:	200.	163	00.	21	400.	265	500
						ency (MHz)					
Fr	req.	Dete		Spectr		Factor		Actual		imit	Margin
Μ	1Hz	Mo PK/Q		Reading dBµ ^v		dB		FS dBµV/m		ጀ3m μV/m	dB
			. //	<u></u>	•	40			40	P 7/111	
488	36.00	Avei	age	27.9	1	12.64		40.55	54	4.00	-13.45
	36.00	Pe	ak	32.5	-	12.64		45.19	74	4.00	-28.81
	29.00	Avei	•	27.8		20.08		47.91		4.00	-6.09
732	29.00	Pe	ak	34.3	5	20.08		54.43	74	4.00	-19.57

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Operation Mode Test Mode EUT Pol Test Channel	:T. :E	.4G X CH HIGH 2 463 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-10-24 :25/60 :VERTICAL :Enzo
100 Level (dBuV	//m)	1				7
90						-
80						-
70						-
60	4					-
50	2					-
40	Ĩ					-
30						-
20						-
10						-
0 <mark></mark>	6100.	11200.	16300.	21400.	265	
			ency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
N 41 1-	Mode	Reading Level	٩D	FS	@3m	٩D
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4926.00	Average	26.49	12.81	39.30	54.00	-14.70
4926.00	Peak	32.15	12.81	44.96	74.00	-29.04
7389.00	Average	27.48	20.10	47.58	54.00	-6.42
7389.00	Peak	34.73	20.10	54.83	74.00	-19.17

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Operatio Test Mo EUT Po Test Cha	I		:T) :E)	4G X CH HIGH 2 463 MHz	ł		۲ ب	Fest Date Femp./Hum Antenna Po Engineer			:2018-10-24 :25/60 :HORIZONTAL :Enzo
100	vel (dBuV/m))	1								-
90											_
80											_
70											_
60			4								_
50		2	3								_ _
40		1									_
30											-
20											-
10											-
0	00	61	00.	112	200.	163	00.	21	400.	265	500
		-		•	-	ncy (MHz)		• · •			
Fre	eq.	Dete Mo		Spectro Reading		Factor		Actual FS		.imit ⊉3m	Margin
MF	łz		P/AV	dBµ\		dB		dBµV/m		μV/m	dB
4926		Ave		27.9 [°]		12.81		40.72		4.00	-13.28
4926			ak	34.9		12.81		47.78		4.00	-26.22
7389		Ave	•	27.40		20.10		47.56		4.00	-6.44
7389	9.00	Pe	ak	33.90	ö	20.10		54.06	7	4.00	-19.94

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11 POWER SPECTRAL DENSITY

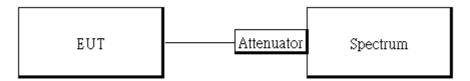
11.1 **Standard Applicable:**

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 **Measurement Equipment Used:**

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02
Splitter	Woken	DOM35LW1A2	RF36	2017/12/26	2018/12/25
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25

11.3 Test Set-up:



11.4 Measurement Procedure:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz. & the VBW = 10 kHz
- 5. For defining Restricted Band Edge Limit:

Set the RBW = 100kHz & VBW = 300 kHz.

- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

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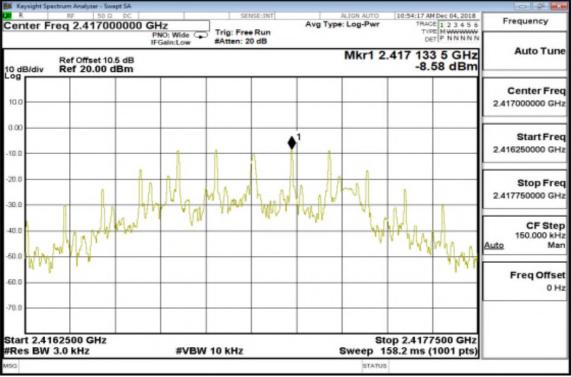
11.5 Measurement Result:

2.4G mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2417	-8.58	8	PASS
2443	-8.40	8	PASS
2463	-8.38	8	PASS

NOTE: cable loss as 10.5dB that offsets in the spectrum

2.4GHz mode Power Spectral Density Test Plot (CH-Low)

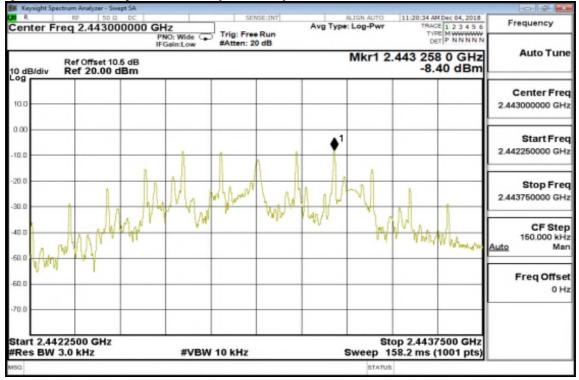


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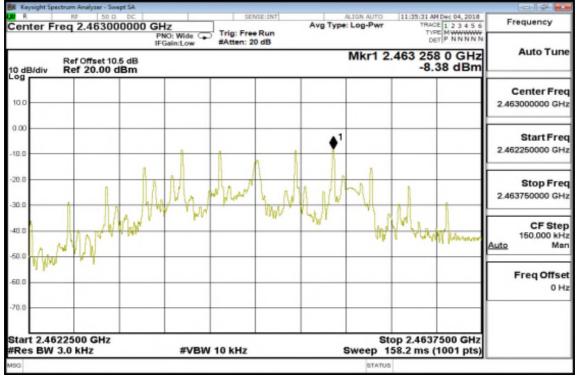
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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12 ANTENNA REQUIREMENT

Standard Applicable: 12.1

For intentional device, 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.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

12.2 **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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