



Page: 1 / 54 Rev.: 02

FCC 47 CFR PART 15 SUBPART C AND ANSI C63.10: 2013

TEST REPORT

For

BR33 Wireless Panic Button

Model: BR33-HW



Issued for

Verkada Inc

405 E. 4th Ave., San Mateo, California, United States, 94401

Issued by Compliance Certification Services Inc. Tainan Lab. No.8, Jiucengling, Xinhua Dist., Tainan City, Taiwan Issued Date: December 15, 2021

Note: This report shall not be reproduced except in full, without the written approval of Compliance Certification Services Inc. Ltd. This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document.

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. 除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com.tw/Terms-and-Conditions and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at http://www.sgs.com.tw/Terms-and-Conditions. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instruction, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced, except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Compliance Certification Services Inc.	No.8, Jiucengling, Xinhua Dist., Tainan City, Taiwan /台南市新化區礁坑里九層嶺8號
	t (886-6) 5802-201 f (886-6) 5802-202 www sas com tw_www.ccsrf.com
程智科技股份有限公司-	



Page: 2 / 54 Rev.: 02

Report No.: TMTN2111000549NR

REVISION HISTORY

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 22, 2021	Initial Issue	ALL	Gina Lin
01	December 01, 2021	See the following note rev.01	ALL	Gina Lin
02	December 15, 2021	See the following note rev.02	Page 22	Gina Lin

Note:

- Rev.01 Issue Date: December 01, 2021
 Revise Typo.
 Update Test Data of Conducted Spurious Emission.
- Rev.02 Issue Date: December 15, 2021
 Update Calculation formula of Duty Factor.



	Page.	3 / 54
Report No.: TMTN2111000549NR TABLE OF CONTENTS	Rev.:	
1. TEST REPORT CERTIFICATION		4
2. EUT DESCRIPTION		5
3. DESCRIPTION OF TEST MODES		6
4. TEST METHODOLOGY		8
5. FACILITIES AND ACCREDITATIONS		8
5.1 FACILITIES		8
5.2 EQUIPMENT		8
5.3 LABORATORY ACCREDITATIONS LISTINGS		
5.4 TABLE OF ACCREDITATIONS AND LISTINGS		-
5.5 MEASUREMENT EQUIPMENT USED		10
6. CALIBRATION AND UNCERTAINTY		11
6.1 MEASURING INSTRUMENT CALIBRATION		11
6.2 MEASUREMENT UNCERTAINTY		11
7. SETUP OF EQUIPMENT UNDER TEST		12
7.1 SETUP CONFIGURATION OF EUT		12
7.2 SUPPORT EQUIPMENT		12
7.3 EUT OPERATING CONDITION		12
8. APPLICABLE LIMITS AND TEST RESULTS		13
8.1 6dB BANDWIDTH		13
8.2 MAXIMUM PEAK OUTPUT POWER		17
8.3 DUTY CYCLE		
8.4 POWER SPECTRAL DENSITY		
8.5 CONDUCTED SPURIOUS EMISSION		
8.6 RADIATED EMISSIONS		
8.6.2 WORST-CASE RADIATED EMISSION BELOW 1 GHZ		
8.6.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHZ		
8.7 POWERLINE CONDUCTED EMISSIONS		
9. ANTENNA REQUIREMENT		
9.1 STANDARD APPLICABLE		
9.2 ANTENNA CONNECTED CONSTRUCTION		
APPENDIX I SETUP PHOTOS		51



Page: 4 / 54 Rev.: 02

Report No.: TMTN2111000549NR 1. TEST REPORT CERTIFICATION

Applicant	:	Verkada Inc 405 E. 4th Ave., San Mateo, California, United States, 94401
Manufacturer	:	Vision Automobile Electronics Industrial Co Ltd. No.78, Gongye 3rd Rd., Technology Industrial Park, Tainan , Taiwan , 70955
Equipment Under Test Model Brand	:	BR33 Wireless Panic Button BR33-HW
Date of Test	:	November 08, 2021

APPLICABLE STANDARD			
STANDARD	TEST RESULT		
FCC Part 15 Subpart C AND ANSI C63.10: 2013	No non-compliance noted		
Statements of Conformity			
Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.			

FCC Standard Section	Report Section	Test Item	Result
15.247(a)	8.1	6dB BANDWIDTH	Pass
15.247(b)	8.2	MAXIMUM PEAK OUTPUT POWER	Pass
-	8.3	DUTY CYCLE	-
15.247(e)	8.4	POWER SPECTRAL DENSITY	Pass
15.247(d)	8.5	CONDUCTED SPURIOUS EMISSION	Pass
15.205(a)	8.6	RADIATED EMISSIONS	Pass
15.207(a)	8.7	POWERLINE CONDUCTED EMISSIONS	N/A

Approved by:

Eric Huang Section Manager



Page: 5 / 54 Rev.: 02

2. EUT DESCRIPTION

Product Name	BR33 Wireless Panic Button
Model	BR33-HW
Brand	Verkada
Received Date	November 05, 2021
Frequency Range	915.0MHz ~915.7MHz
Transmit Power	9.41dBm (8.736mW)
Channel Spacing	0.35 MHz
Channel Number	3 Channels
Transmit Data Rate	80k bps
Type of Modulation	OQPSK
Antenna Type	Type: Chip Antenna Model: BR33 Manufacturer: YAGEO Gain: 1.59 dBi
Power Rating	3Vdc (Powered from battery)
MCU CHIP Brand /Model	N/A
RF Module Brand /Model	EFR32MG13/ Silicon Labs
Software Version	Rev.0
Firmware Version	1.100
Temperature Range	-20°C ~ +60°C
Reported Date	November 15, 2021

REMARK:

1. The sample (BR33-HW) selected for test was engineering sample that approximated to production product and was provided by manufacturer.

This submittal(s) (test report) is intended for FCC ID: <u>2AWUU6058001</u>, filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules. 2.

3. For more details, please refer to the User's manual of the EUT.



3. DESCRIPTION OF TEST MODES

The EUT is a BR33 Wireless Panic Button.

The RF chipset is manufactured by Silicon Labs.

The antenna peak gain 1.59 dBi (highest gain) were chosen for full testing.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	915
Middle	915.35
High	915.7

Radiated Emission Test (Below 1 GHz):

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type
Low, Mid, High	OFDM	OQPSK

Radiated Emission Test (Above 1 GHz):

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type
Low, Mid, High	OFDM	OQPSK

Page: 6 / 54 Rev.: 02



Page: 7 / 54 Rev.: 02

Bandedge Measurement :

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type
Low, Mid, High	OFDM	OQPSK

Antenna Port Conducted Measurement :

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type
Low, Mid, High	OFDM	OQPSK



Page: 8 / 54 Rev.: 02

Report No.: TMTN2111000549NR

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10 and FCC CFR 47 15.207, 15.209 and 15.247.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 1109 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: TW1109).



Page: 9 / 54 Rev.: 02

Report No.: TMTN2111000549NR

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada (TW1109)
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, <u>http://www.ccsrf.com</u>



5.5 MEASUREMENT EQUIPMENT USED

For §8.6

	Cha	mber 966 Room (Radi	ation Test)		
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Active Loop Antenna	ETS-LINDREN	6502	8905-2356	09/06/2021	09/05/2023
Bilog Antenna With 6dB Attenator	SUNOL SCIENCES & EMCI	JB1 & N-6-06	A070506-1 & AT-N0681	10/07/2021	10/06/2022
Cable	Suhner	SUCOFLEX104PEA	20520/4PEA&O6	01/29/2021	01/28/2022
Double Ridged Guide Horn Antenna	ETS-LINDGREN	3116	00078900	03/30/2021	03/29/2022
EMI Test Receiver	R&S	ESCI	100960	02/05/2021	02/04/2022
Horn Antenna	Com-Power	AH-118	071032	05/04/2021	05/03/2022
MXA Signal Analyzer	KEYSIGHT	N9020A	MY56060171	08/23/2021	08/22/2022
Pre-Amplifier	EMCI	EMC012645	980098	01/29/2021	01/28/2022
Pre-Amplifier	HP	8447F	2443A01683	01/19/2021	01/18/2022
Pre-Amplifier	Com-Power	PAM-840A	461378	07/05/2021	07/04/2022
Type N coaxial cable	Suhner	CHA9513	6	01/19/2021	01/18/2022
Notch Filter	MICRO-TRONICS	BRM50702-01	018	N.C.R	N.C.R
Software		Excel(ccs-o6-2020	v1.1),e3(v6.10122	22)	

For §8.1~8.5

	Chamber 966 Room (Conducted Test)						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due		
EXA Spectrum Analyzer	KEYSIGHT	N9020A	MY56060171	08/23/2021	08/22/2022		
Power Meter	Anritsu	ML2487A	6K00003888	05/18/2021	05/17/2023		
Power Sensor	Anritsu	MA2491A	033265	05/18/2021	05/17/2023		
SMA Cable + 10dB Attenuator	CCS	SMA+10dB ATT	SMA/10dB	01/29/2021	01/28/2022		
Software		Exc	el(ccs-o6-2020	v1.1)			

For §8.7

Conducted Emission room #1								
Name of Equipment	Manufacturer	Manufacturer Model Serial Number Calibration Date Calibration Du						
-	-	-	-	-				
-	-	-	-	-				
-	-	-	-	-				
Test S/W			-					



Page: 11 / 54 Rev.: 02

6. CALIBRATION AND UNCERTAINTY

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report

has been calibrated in accordance with the manufacturer's recommendations,

and is traceable to recognized national standards.

6.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.3456dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±2.6828dB
Radiated Emission, 1 to 8 GHz	± 2.6485dB
Radiated Emission, 8 to 18 GHz	± 2.6852dB
Radiated Emission, 18 to 26.5 GHz	± 2.6485dB
Radiated Emission, 26 to 40 GHz	± 3.0295dB
Power Line Conducted Emission	±1.91dB
Band Width	136.49kHz
Peak Output Power MU	±1.904dB
Band Edge MU	±0.302dBuV
Channel Separation MU	361.69Hz
Duty Cycle MU	0.064ms
Frequency Stability MU	0.223kHz

Uncertainty figures are valid to a confidence level of 95%, K=2



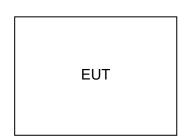
Page: 12 / 54 Rev.: 02

Report No.: TMTN2111000549NR

7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

FOR RF TEST



7.2 SUPPORT EQUIPMENT

RF test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	N/A	N/A	N/A	N/A	N/A

No.	o. Signal cable description			
А	N/A	N/A		

REMARK:

- 1. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

7.3 EUT OPERATING CONDITION

RF Setup

- 1. Set up a whole system as the setup diagram.
- 2. Turn on power.



Page: 13 / 54 Rev.: 02

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6dB BANDWIDTH

<u>LIMIT</u>

§ 15.247(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

TEST SETUP



TEST PROCEDURE

- 1. Set resolution bandwidth (RBW) = 100kHz
- 2. Set the video bandwidth (VBW) \geq 3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



TEST RESULTS

No non-compliance noted.

Model Name	BR33-HW	Test By	Ted Huang
Temp & Humidity	26.2℃, 50%	Test Date	2021/11/08

TX mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	915	506	500	PASS
Middle	915.35	513	500	PASS
High	915.7	514	500	PASS

NOTE :

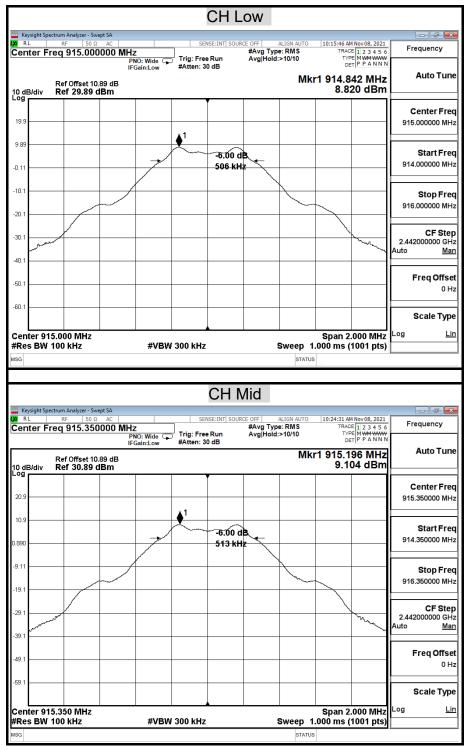
1. At finial test to get the worst-case emission at 80kbps long.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.



Page: 15 / 54 Rev.: 02

6dB BANDWIDTH





Page: 16 / 54 Rev.: 02

Keysight : XI R L	Spectrum Analyzer - Sw RF 50 Ω			SEI	NSE:INT SOUR	CE OFF	ALIGN AUTO	10:36:30 A	M Nov 08, 2021	- 6 -
Center	Freq 915.700	Р	Z NO: Wide 🕞	Trig: Free #Atten: 3		#Avg Typ Avg Hold:	e: RMS >10/10	TYP	E 1 2 3 4 5 6 E M WM WWW T P P A N N N	Frequency
10 dB/div	Ref Offset 10 Ref 30.89 (Mk	r1 915.5 8.9	48 MHz 58 dBm	Auto Tun
20.9				â1						Center Fre 915.700000 MH
10.9			-	*	-6.00 d 514 kH					Start Fre 914.700000 MH
9.11										Stop Fre 916.700000 MH
29.1 39.1									And and a second second	CF Ste 2.442000000 GH Auto <u>Ma</u>
49.1									32	Freq Offso 0 ⊦
59.1										Scale Typ
	915.700 MHz V 100 kHz		#\/D\\	300 kHz			Durson (Span 2 1.000 ms (.000 MHz	Log <u>Li</u>



8.2 MAXIMUM PEAK OUTPUT POWER

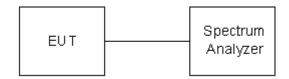
<u>LIMIT</u>

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following :

§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

§ 15.247(b) (4) Except as shown in paragraphs (c) of this section , if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST SETUP



TEST PROCEDURE

The tests were performed in accordance with KDB 558074 5.2.1.2 and 5.2.2.1.

5.2.1.2 Measurement Procedure PK2:

- 1. Set the RBW = 1 MHz.
- 2. Set the VBW \ge 3 RBW
- 3. Set the span \geq 1.5 x DTS bandwidth.
- 4. Detector = peak.
- 5. Sweep time = auto couple.
- 6. Trace mode = max hold.
- 7. Allow trace to fully stabilize.
- 8. Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function,
- 9. Sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

Page: 17 / 54 Rev.: 02



TEST RESULTS

No non-compliance noted

Model Name	BR33-HW	Test By	Ted Huang
Temp & Humidity	26.2° C, 50%	Test Date	2021/11/08

TX mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	915	9.10	30.00	PASS
Middle	915.35	9.41	30.00	PASS
High	915.7	9.22	30.00	PASS

NOTE : 1. At finial test to get the worst-case emission at 80kbps long.
 2. The cable assembly insertion loss of 10.89dB (including 10 dB pad and 0.89 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

Average Power Data

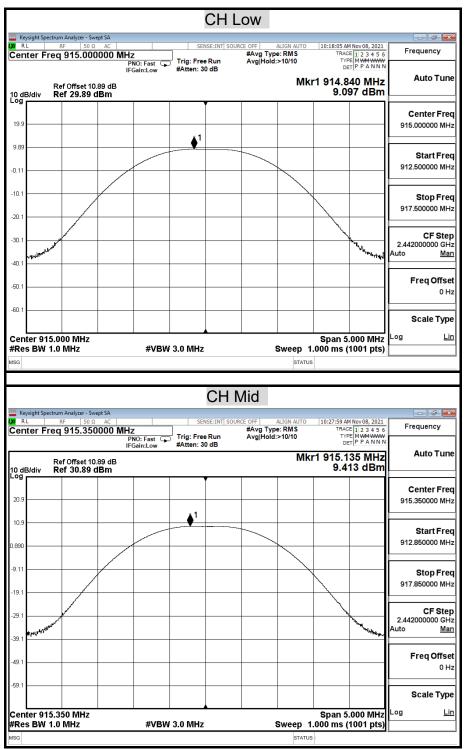
TX mode

Channel	Channel Frequency (MHz)	Average Power (dBm)
Low	915	8.50
Middle	915.35	9.05
High	915.7	8.88



Page: 19 / 54 Rev.: 02

MAXIMUM PEAK OUTPUT POWER





Page: 20 / 54 Rev.: 02

Frequency	M Nov 08, 2021 E 1 2 3 4 5 6 M WM WWW T P P A N N N	TRAC		URCE OFF #Avg Tyj Avg Hold	SENSE:INT SC		PNO: Fast	lyzer - Swept SA 50 Ω AC 5.700000 N	RF	RL
Auto Tun	90 MHz 20 dBm	r1 915.4	Mk		n: 30 dB	, #Atti	IFGain:Low	fset 10.89 dB 60.89 dBm		dB/div
Center Fre 915.700000 MH					1					0.9
Start Fre 913.200000 MH					<u>,</u>					0.9 390
Stop Fre 918.200000 MH										.11
CF Ste 2.442000000 GH Auto <u>Ma</u>	Marker Warker								Warderand	9.1
Freq Offse 0 H										9.1
Scale Typ	.000 MHz								915.700	9.1



8.3 DUTY CYCLE

Page: 21 / 54 Rev.: 02

<u>LIMIT</u>

Nil (No dedicated limit specified in the Rules) **TEST EQUIPMENTS**

TEST SETUP



TEST PROCEDURE

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)



Page: 22 / 54 Rev.: 02

TEST RESULTS

No non-compliance noted.

TEST DATA

Model Name	BR33-HW	Test By	Ted Huang
Temp & Humidity	26.2°C, 50%	Test Date	2021/11/08

	us	Times	Ton	Total Ton time(ms)
Ton1	5800	1	5800	
Ton2		0	0	
Ton3			0	5.8
Тр				100

Ton	5.8
Tp(Ton+Toff)	100
Duty Cycle	0.058
Duty Factor	-24.73

Duty Factor = 20log(Duty Cycle)



TEST PLOT

<u>Plot</u>

Keysight Sp	ectrum Analyzer - Sw	ept SA								- 6
RL		AC			VSE:INT SOUR		ALIGN AUTO		Nov 08, 2021	Frequency
enter F	req 915.000	Р	NO: Fast 🔸	Trig: Vide	0	#Avg iyp	e. RWS	TYP	EWWMWWW PPANNN	
		IF	Gain:Low	#Atten: 3	0 dB					Auto Tune
	Ref Offset 10						Δ	Mkr1 5.	800 ms).06 dB	Auto Tulk
dB/div	Ref 29.89	dBm						-1	J.00 UB	
										Center Free
9.9										915.000000 MH
N.77	▲ 1∆2									
89 7 2										Start Free
										915.000000 MH
11										
0.1										Stop Free
									TRIG LVL	915.000000 MH
0.1										313.000000 Mil 1.
									li li	CF Ster
).1										2.442000000 GH
										Auto <u>Ma</u>
0.1 v4	www.www.www.	huduhhan	alw when his laid	~helder-likeler	Anthen Walter of	\$.LMAN.MP	P. Leviller and Landard Ma	monthelighter	aliative and	
0.1					-					Freq Offse
										0 H
0.1										
										Scale Type
A	5.000000 M	 H7						<u> </u>	pan 0 Hz	Log <u>Lii</u>
es BW 1		12	#\/B)A(3.0 MHz			Sween 1	00.0 ms (1		

									CH N	lid				
	ight Spec		Analyzer -											
RL Cent	or Fr	R		0Ω 500	AC NH	17			VSE:INT SOUR	#Avg Typ	ALIGN AUTO e: RMS		M Nov 08, 2021	Frequency
Jenno		eq	315.5	500		PNO: Fa	ist 🔸		20			TY		
					I	FGain:L	.ow	#Atten: 3	Udb		,		- ,	Auto Tur
10 dB/	/div		Offset								4		.800 ms 0.01 dB	
^{og}			2010											
														Center Fre
19.9 -		• 1	<u>م</u> 2											915.350000 MH
9.89	×2	¢ï	32											
′	12													Start Fre
0.11		++		_		_								915.350000 Mi
10.1		++											TRIG LVL	Stop Fre
														915.350000 Mi
20.1														
30.1														CF Ste
														2.442000000 Gł Auto Ma
40.1		hub	u Almi i Mara	ومأأحل	مليان ويعرب	مطعامه	diana	a kazarika lurr	14 talika sa tasihi ba	منعالية معر بريا أراية	a . Intel ^a tion and a log the	lilles , en la baileart	and the states	
ľ	Ψ	144	L	41.41	վերկերը։	uli sen rut	. առաներերին։	ንዮግጥነ ዝ" - ግዛ ው	a million allowed by a state	erille - Asultanita	tario lo se ol col	adolf the All and		Freq Offs
50.1		+				_								01
60.1 -														Scale Ty
Ļ														Log L
	er 91: 3W 1.		0000 Hz	MHz	1	#	¢VB₩	3.0 MHz		:	Sweep 1		pan 0 Hz 1001 pts)	
SG											STATU			

Page: 23 / 54 Rev.: 02



Page: 24 / 54 Rev.: 02

Keysight R L	Spectrum /	Analyzer - Swe 50 Ω	pt SA AC		CEN	ISE:INT SOUR	CE OFF	ALIGN AUTO	00:52:26 44	1 Nov 08, 2021	- F
			000 MHz	:	Trig Dela	y-1.000 ms			TRAC	E123456	Frequency
0 dB/div		Offset 10. 29.89 d	IFC 89 dB	NO: Fast ↔ Gain:Low	Trig: Vide #Atten: 30			Δ	Mkr1 5.	800 ms 0.01 dB	Auto Tui
.og	▲ 1Δ	2									Center Fr 915.700000 Mi
9.89 × 2 9.11											Start Fr 915.700000 M
20.1										TRIG LVL	Stop Fr 915.700000 M
40.1											CF Sto 2.442000000 G Auto <u>M</u>
50.1	1994-1	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	~}/{@_}}/{@_}	rhundiseriander	hardeleftyppel	¢/₩₩.₽.₩	Marielander	t for the sum to be a for	her-antrendedity.	WWA-WWA-ANT	Freq Offs 0
50.1											Scale Ty
	915.70 1.0 M	0000 MH Hz	z	#VBW	3.0 MHz		 :	Sweep 1	S 00.0 ms (Log <u>l</u>



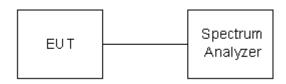
Page: 25 / 54 Rev.: 02

8.4 POWER SPECTRAL DENSITY

<u>LIMIT</u>

§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST SETUP



TEST PROCEDURE

The tests were performed in accordance with KDB 558074 5.3.1.

5.3.1 Measurement Procedure PKPSD:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to 1.5 times the *DTS bandwidth*.
- 3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- 4. Set the VBW \geq 3*RBW.
- 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 within the RBW.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



TEST RESULTS

Model Name	BR33-HW	Test By	Ted Huang
Temp & Humidity	26.2℃, 50%	Test Date	2021/11/08

TX mode

Channel	Frequency (MHz)	PPSD/3kHz (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	915	-2.62	8.00	-10.62	PASS
Middle	915.35	-2.24	8.00	-10.24	PASS
High	915.7	-2.59	8.00	-10.59	PASS

NOTE: 1. At finial test to get the worst-case emission at 80kbps long.

2. The cable assembly insertion loss of 10.89dB (including 10 dB pad and 0.89 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.



Page: 27 / 54 Rev.: 02

POWER SPECTRAL DENSITY (TX MODE)

					CHL	.ow				
Keysight Sp R L	ectrum Analyzer - Swept RF 50 Ω			SEI	NSE:INT SOUP		ALIGN AUTO		AM Nov 08, 2021	
	req 915.0000	00 MHz	IO:Wide 🕞	Trig: Free	e Run	#Avg Typ Avg Hold	e:RMS	TR/	CE 1 2 3 4 5 6 PE M WM WWW DET P P A N N N	Frequency
		IFO	Gain:Low	#Atten: 3						Auto Tur
) dB/div	Ref Offset 10.8 Ref 29.89 dE						Mkr1		8 5 MHz 319 dBm	Auto Tur
					Ť					Center Fre
9.9										915.000000 MH
.89										Start Fre
								≜ 1		914.750000 MH
.11	- A.	~ .405	λο. ο Λ	1.0 100.			un ⁱⁿ	Å.		
0.1	www.www.	mw	**** LV	www.	Land Court	h marine	. Mrununith	he rown	www.	Oton Era
				{	Y					Stop Fre 915.250000 MH
0.1					(010.200000 111
										CF Ste
0.1									<u> </u>	2.442000000 GH
0.1										Auto <u>Ma</u>
0.1										
0.1										Freq Offs
										0 H
0.1										
										Scale Typ
	15.0000 MHz								500.0 kHz	Log <u>L</u>
Res BW	3.0 kHz		#VBW	10 kHz			Sweep 5	2.73 ms	(1001 pts)	
							-		•••	
ŝĠ					CHN	Vid	STATUS	60	,	
Keysight Sp	iectrum Analyzer - Swept RF 50 Ω			SEF			-	10:27:30	AM Nov 08, 2021	
Keysight Sp R L		AC DOO MHZ PN	IO: Wide 🗔		NSE:INT SOUF		ALIGN AUTO	10:27:30 TRJ		Frequency
Keysight Sp RL enter F	RF 50 Ω	AC DOO MHz PN IFC 9 dB	Z IO: Wide ⊂ ↓ Gain:Low	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6	
Keysight Sp RL enter F	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6 IPE M WH WWW ET P P A N N 99 0 MHZ	Frequency Auto Tur
Keysight Sp RL enter F	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6 IPE M WH WWW ET P P A N N 99 0 MHZ	Frequency Auto Tur Center Fre
Keysight Sp RL enter F	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6 PE M WH WWW ET P P A N N 99 0 MHZ	Frequency
Keysight Sp RL enter F	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6 PE M WH WWW ET P P A N N 99 0 MHZ	Frequency Auto Tur Center Fre 915.350000 MH
Contraction of the second seco	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6 PE M WH WWW ET P P A N N 99 0 MHZ	Frequency Auto Tur Center Fre
Contraction of the second seco	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PPE M WAWWWW ET P P A NN N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre
A Reysight Sp RL enter F 0 dB/div 0.9 0.9	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 ICE 1 2 3 4 5 6 PE M WH WWW ET P P A N N 99 0 MHZ	Frequency Auto Tur Center Fre 915.350000 MH Start Fre 915.100000 MH
Keysight Sp RL enter F	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PPE M WAWWWW ET P P A NN N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre
Keysight Sp RL enter F 0 dB/div 0.9	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PPE M WAWWWW ET P P A NN N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre 915.100000 MH Stop Fre
Keysight Sp RL enter F 0 dB/div 9 0.9 .0.9 .11	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PPE M WAWWWW ET P P A NN N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH 915.100000 MH 915.600000 MH
Keysight Sp RL enter F 0 dB/div 9 0.9 .0.9 .11	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 M- Start Fre 915.100000 M- Stop Fre 915.600000 M- CF Ste 2.44200000 G+
Keysight Sp RL enter F 0 dB/div 00 </td <td>RF 50 Ω Freq 915.3500 Ref Offset 10.8</td> <td>AC DOO MHz PN IFC 9 dB</td> <td>IO: Wide 🗔</td> <td>Trig: Free</td> <td>NSE:INT SOUF</td> <td>RCE OFF</td> <td>ALIGN AUTO e: RMS :>10/10</td> <td>10:27:30 TRJ 7 915.50</td> <td>AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm</td> <td>Frequency Auto Tur Center Fre 915.350000 MH 915.100000 MH 915.600000 MH</td>	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH 915.100000 MH 915.600000 MH
Keysight Sp R L	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 Mi Start Fre 915.100000 Mi Stop Fre 915.600000 Mi CF Ste 2.442000000 Gf Auto
Keysight Sp RL enter F 0 dB/div 0 g 0 0 9 0 10.9 0 9 0.11 9.1 9.1	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre 915.100000 MH Stop Fre 915.600000 GH Auto Ms Freq Offse
Keysight Sp RL enter F 0 dB/div 9 00.9 9 9.1 9.1 9.1 9.1	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre 915.100000 MH Stop Fre 915.600000 GH Auto Ms Freq Offse
Keysight Sp RL enter F 0 dB/div 9 00.9 9 9.1 9.1 9.1 9.1	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	AM Nov 08, 2021 GE [1 2 3 4 5 6 PE M MAN WWW ET P P A N N N 9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre 915.100000 MH Stop Fre 915.600000 MH CF Ste 2.442000000 GH Auto Mato Freq Offsa 0 H
Keysight Sp RL enter F 0 dB/div 9 0.9 .11 9.1 9.1 9.1	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	IO: Wide 🗔	Trig: Free	NSE:INT SOUF	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:27:30 TRJ 7 915.50	M Nov 08, 2021 CCE [1 2 3 4 5 6 PPE M VM WWW PP P A NN N P9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 M- Start Fre 915.100000 M- Stop Fre 915.600000 M- CF Ste 2.442000000 G- Auto Mato Freq Offs: 0 - Scale Typ
Keysight Sp RL enter F 0 dB/div 90 00.9 0.11 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1	RF 50 Ω Freq 915.3500 Ref Offset 10.8	AC DOO MHz PN IFC 9 dB	O: Wide ⊂ Sain:Low	Trig: Free	NSE:INT SOUF	Avg Hold	ALIGN AUTO e: RMS >10/10 Mkr1	10:27:30 TRA T 915.50 -2.2	M Nov 08, 2021 CCE [1 2 3 4 5 6 PPE M VM WWW PP P A NN N P9 0 MHz 241 dBm	Frequency Auto Tur Center Fre 915.350000 MH Start Fre 915.100000 MH Stop Fre 915.600000 MH CF Ste 2.442000000 GH Auto Mato Freq Offsa 0 H



Page: 28 / 54 Rev.: 02

		ctrum Analy										- F x
ø ℝ Cen		^{RF} req 915	50 Ω 5.700	AC 000 MHz			NSE:INT SOUR	#Avg Typ		TRAC	M Nov 08, 2021 E 1 2 3 4 5 6 E M WM WWW	Frequency
					NO: Wide 🕞 Gain:Low	Trig: Free #Atten: 3		Avg Hold	:>10/10	D	PPANNN	
	3/div	Ref Off							Mkr1		9 0 MHz 87 dBm	Auto Tun
.og												Center Free
20.9												915.700000 MH
10.9												Start Free
.890			. ħ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					<u>,</u>	.Å ¹		915.450000 MH
9.11	www	m		$\gamma_{m}\gamma_{m}\gamma_{m}\gamma_{m}\gamma_{m}\gamma_{m}\gamma_{m}\gamma_{m}$	Mr Mr	how when he had	mm	have	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	h why we	J.WWWWWWWW	Stop Free
-19.1												915.950000 MH
29.1												CF Stej 2.442000000 GH
39.1												Auto <u>Ma</u>
49.1												Freq Offse
59.1												0 H
uə. I												Scale Typ
		5.7000 3.0 kHz			#\/D\/	10 kHz			Sweep 5	Span (500.0 kHz	Log <u>Li</u>



8.5 CONDUCTED SPURIOUS EMISSION

LIMITS

§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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 and that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. 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) (see § 15.205(c)).

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 900MHz band.

Page: 29 / 54 Rev.: 02



Page: 30 / 54 Rev.: 02

Report No.: TMTN2111000549NR TEST RESULTS

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

Model Name	BR33-HW	Test By	Ted Huang
Temp & Humidity	26.2°C , 50%	Test Date	2021/11/08

Keyright Car			СН	Low (3	30MH	z~10Gł	Hz)		
R L	ectrum Analyzer - Sw RF 50 Ω			SENSE	INT SOURCE O	FF ALIGN AUT	0 10:15:46 A	M Nov 08, 2021	
Center F	req 915.00	0000 MHz	IO: Wide G		#/	Avg Type: RMS vg Hold:>10/10	TY	E 1 2 3 4 5 6	Frequency
I0 dB/div	Ref Offset 10 Ref 29.89	0.89 dB	Gain:Low	#Atten: 30 d			lkr1 914.8	42 MHz 20 dBm	Auto Tur
									Center Fre
19.9		_		+					915.000000 MH
				≜ 1					
9.89				\prec	-6.00 dB				Start Fre
-0.11			\nearrow		506 kHz	<			914.000000 MH
						\sim			
-10.1		$+ \nearrow$		+					Stop Fre
-20.1		~							916.000000 MH
-20.1									
-30.1		_						have a	CF Ste 2.442000000 GH
بتعمير								and the second	Auto <u>Ma</u>
-40.1				+					
-50.1									Freq Offs
									0 H
-60.1				+					Ocela Tra
									Scale Typ
	15.000 MHz		<i>(</i> 2) (3)					.000 MHz	Log <u>L</u>
#Res BW	100 kHz		#VB\	N 300 kHz			1.000 ms (1001 pts)	
WSG	ectrum Analyzer - Sw					STA	105		
XI RL	RF 50 Ω	Ω AC		SENSE	INT SOURCE O		0 10:21:52 A	M Nov 08, 2021	Frequency
Start Fre	eq 30.00000	PN	NO: Fast G	Trig: Free R	tun A	Avg Type: RMS vg Hold:>10/10	TV	E 1 2 3 4 5 6 E M WM WWW T P P A N N N	
	Ref Offset 10	0.89 dB	Gain:Low	#Atten: 20 d	B		Mkr1 914.	84 MHz	Auto Tur
10 dB/div Log	Ref 20.89 ▲1	dBm					7.9	41 dBm	
	i	- I	í.						
10.9	Ť			+					1
0.890									1
-9.11								-11.18 dBm	1
0.890 -9.11 -19.1								-11.18 dBm	5.015000000 GF Start Fre
-9.11 -19.1 -29.1								11.18 dBm	5.015000000 GF Start Fre
0.890 -9.11 -19.1		, ² ∂ ³						11.18 dBm	5.015000000 G⊦ Start Fre
0.890 -9.11 -19.1 -29.1 -39.1) ² 3							5.015000000 Gł Start Fre 30.000000 Mł Stop Fre
-9.11 -9.11 -19.1 -29.1 -39.1 -49.1		×2 ×2 ×3 ×2 ×3 ×2 ×3 ×3 ×3 ×3 ×3 ×3 ×3 ×3 ×3 ×3						-11.18 dBm	5.015000000 Gł Start Fre 30.000000 Mł Stop Fre
0.890		,2 ,2 ,4 ,4 ,4 ,4 ,4 ,4 ,4 ,4 ,4 ,4 ,4 ,4 ,4					Ston 10	24 Marso 1994 - 1, 1974	5.01500000 GH Start Fre 30.000000 MH Stop Fre 10.00000000 GH
0.890 -9.11 -19.1 -29.1 -39.1 -49.1 -59.1 -59.1 -59.1 Start 0.03		→ ² → ³	#*****	N 300 kHz		Sweep	Stop 10 954.7 ms (4	.000 GHz	5.01500000 GH Start Fre 30.000000 MH Stop Fre 10.00000000 GH CF Ste 2.44200000 GH
0.890 -9.11 -9.11 -29.1 -39.1 -39.1 -49.1 -59.1	100 kHz	×		Y		Sweep	954.7 ms (4	.000 GHz 0001 pts)	5.01500000 GH Start Fre 30.000000 MH Stop Fre 10.00000000 GH CF Ste 2.44200000 GH
0.690 -9.11 -9.11 -9.1 -9.1 -9.1 -9.1 -9.1 -9	100 kHz RC SCL 1 f 1 f	× 914.84 1.829 55	4 MHz 9 GHz	7.941 dBm -49.257 dBm	1 1	· · ·	954.7 ms (4	.000 GHz 0001 pts)	
0.890 -9.11 -19.1 -29.1 -39.1 -49.1 -59.1	100 kHz RCISCL		4 MHz 9 GHz	۲ 7.941 dBm	1 1	· · ·	954.7 ms (4	.000 GHz 0001 pts)	5.015000000 GF Start Fre 30.000000 MF 10.000000000 GF 2.442000000 GF Auto Mi Freq Offsi
0.890 9.11 -19.1 -29.1 -39.1 -49.1 -59	100 kHz RC SCL 1 f 1 f	1.829 59	4 MHz 9 GHz	7.941 dBm -49.257 dBm	1 1	· · ·	954.7 ms (4	.000 GHz 0001 pts)	5.015000000 GF Start Fre 30.000000 MF 10.000000000 GF 2.442000000 GF Auto Mi Freq Offsi
0.890 -9.11 -19.1 -29.1 -39.1 -49.1 -59.1	100 kHz RC SCL 1 f 1 f	1.829 59	4 MHz 9 GHz	7.941 dBm -49.257 dBm	1 1	· · ·	954.7 ms (4	.000 GHz 0001 pts)	5.01500000 GH Start Fre 30.000000 MH 0.00000000 GH 0.00000000 GH 2.44200000 GH Auto Ma Freq Offso 0 H
0.890 -9.11 -19.1 -29.1 -39.1 -49.1 -5	100 kHz RC SCL 1 f 1 f	1.829 59	4 MHz 9 GHz	7.941 dBm -49.257 dBm	1 1	· · ·	954.7 ms (4	.000 GHz 0001 pts)	5.015000000 GH Start Fre 30.000000 MH Stop Fre 10.00000000 GH CF Ste 2.442000000 GH Auto Ms Freq Offs: 0 H Scale Typ
0.890 -9.11 -19.1 -29.1 -39.1 -39.1 -49.1 -5	100 kHz RC SCL 1 f 1 f	1.829 59	4 MHz 9 GHz	7.941 dBm -49.257 dBm	1 1	· · ·	954.7 ms (4	.000 GHz 0001 pts)	5.01500000 GF Start Fre 30.000000 MF 10.00000000 GF 2.442000000 GF Auto Ma Freq Offse



Page: 31 / 54

Rev.: 02

	ectrum Analyzer -									- 6 💌
a RL	RF 50 q 850.000	Ω AC 1000 MHz		SENSE:INT SO	#Avg Type		TRACI	Nov 26, 2021	Freq	uency
0 dB/div	Ref Offset Ref 20.89	PNO: F IFGain:I 10.89 dB	ast	Free Run n: 20 dB	Avg Hold:		DE 15.167	50 MHz 30 dBm	А	uto Tun
			1					-11.18 dBm		nter Fre
9.1										tart Fre
9.1 9.1 9.1		Manhamman titra production		₩	and an a spectrum that	unatari) in dan				Stop Fre
Res BW	000 GHz 100 kHz		#VBW 300 H			veep 16	Stop 1.00 .00 ms (40	0001 pts)	2.45200 Auto	CF Ste 00000 GI <u>M</u>
MODE MODE <th< td=""><td>f f f</td><td>X 915.167 50 MH 902.0 MH 928.0 MH</td><td>lz -61.52</td><td>0 dBm 7 dBm 2 dBm</td><td></td><td>CTION WIDTH</td><td>FUNCTIO</td><td></td><td>Fr</td><td>eq Offs 0 I</td></th<>	f f f	X 915.167 50 MH 902.0 MH 928.0 MH	lz -61.52	0 dBm 7 dBm 2 dBm		CTION WIDTH	FUNCTIO		Fr	eq Offs 0 I
7 8 9									Sc	ale Typ
10 11									Log	L
								P P		
<						STATUS				



Page: 32 / 54 Rev.: 02

Report No.: TMTN2111000549NR

				C⊦	l Mid (30M	Hz~1	0GHz	z)		
Keysight S	RF	50 Ω	AC 0000 MHz			ISE:INT SOUF	#Avg Typ		TRAC	E 1 2 3 4 5 6	Frequency
10 dB/div		Offset 10. f 30.89 d	.89 dB	NO:Wide ⊂ Gain:Low	Atten: 30		Avg Hold		^{□∎}	96 MHz 04 dBm	Auto Tune
20.9					▲ 1						Center Freq 915.350000 MHz
10.9 0.890				-	*	-6.00 c 513 kH					Start Freq 914.350000 MHz
-9.11											Stop Freq 916.350000 MHz
-29.1	an and the second s	/								and the second s	CF Step 2.442000000 GHz Auto <u>Man</u>
-49.1											Freq Offset 0 Hz
-59.1	46.26	0.0411-							Cmon 2	000 5411-	Scale Type
#Res BV				#VB	W 300 kHz			Sweep 1	span 2 .000 ms (.000 MHz 1001 pts)	<u> </u>
		K112								,	
MSG			ept SA					STATUS			
	Spectrum A	Analyzer - Swe	AC D MHz		SEN			ALIGN AUTO	10:34:56 Al TRAC	4 Nov 08, 2021 E 1 2 3 4 5 6	Frequency
MSG Keysight S XI RL Start Fr 10 dB/div	Spectrum / RF eq 30 Ref	Analyzer - Swe	AC D MHz IF	NO: Fast C Gain:Low	SEN	Run	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:34:56 AU TRAC TYF DE kr1 915.	1 Nov 08, 2021 E 1 2 3 4 5 6 E M WWWW T P P A N N N	
MSG Keysight S XX RL Start Fr	Spectrum / RF eq 30 Ref	Analyzer - Swe 50 Ω 1.000000 1.000000 1.000000 1.000000 0000000 00000000	AC D MHz IF	NO: Fast C	SEN	Run	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:34:56 AU TRAC TYF DE kr1 915.	1 Nov 08, 2021 E 1 2 3 4 5 6 M WM WWW T P P A N N N 59 MHz	Frequency
MSG Keysight S X RL Start Fr 10 dB/div Log 10.9 0.890	Spectrum A RF eq 30 Ref <u>R</u> ef	Analyzer - Swe 50 Ω 1.000000 1.000000 1.000000 1.000000 0000000 00000000	AC D MHz IF	NO: Fast C	SEN	Run	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:34:56 AU TRAC TYF DE kr1 915.	4 Nov 08, 2021 E [1 2 3 4 5 6 E M M WWW TP P A N N N 59 MHz 75 dBm	Frequency Auto Tune Center Freq
MSG Keysight S X RL Start Fr 10 dB/div Log 10.9 0.890 -9.11 -19.1 -29.1	Spectrum A RF eq 30 Ref <u>R</u> ef	Analyzer - Swe 50 Ω 1.000000 1.000000 1.000000 1.000000 0000000 00000000	AC P IF0 .89 dB JBm	NO: Fast C	SEN	Run	RCE OFF	ALIGN AUTO e: RMS :>10/10	10:34:56 AU TRAC TYF DE kr1 915.	4 Nov 08, 2021 E [1 2 3 4 5 6 E M M WWW TP P A N N N 59 MHz 75 dBm	Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq
MSG Keysight Start Fr 10 dB/div Log 10.9 0.890 -9.11 -19.1 -29.1 -39.1 -69.1 Start 0.0 #Res BV	Ref Reg Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q	Analyzer - Sweet 50 2 000000 00ffset 10 f 20.89 c 0 12 12 KHz	AC P IF0 .89 dB JBm	NO: Fast C Gain:Low	SEN		KCE OFF #Avg Typ Avg Hold	status alien auto e: RMS >10/10 MI weep 95	kr1 915. 8.7	4 Nov 05, 2021 E [] 2 3 4 5 6 E MANWAW T P P A N N 59 MHz 75 dBm 	Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq 30.000000 MHz Stop Freq
Keysight S Keysight S Start Fr 10 dB/div 10.9 10.9 0.890 -9.11 -19.1 -29.1 -39.1 -69.1 Start 0.0 Mx8 M005 1 2 1 -9.1 -39.1 -39.1 -39.1 -39.1 -39.1 -39.1 -39.1 -39.1 -39.1 -39.1 -31 N 2 3 4 5	Ref Reg Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q	Analyzer - Sweet 50 Q 0000000 00ffset 10 f 20.89 c 0 12 kHz	AC D MHz P IF4 89 dB 1Bm	NO: Fast C Gain:Low #VBI	SEN Trig: Free #Atten: 20	Run D dB	CCE OFF #Avg Ypp Avg Hold	status alien auto e: RMS >10/10 MI weep 95	kr1 915. 8.7	4 Nov 05, 2021 E [1 2 3 4 5 6 E M M WWWW TO P A NN N 59 MHz 75 dBm 	Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq 30.000000 MHz Stop Freq 10.000000000 GHz 2.442000000 GHz
MSG Keysight Start Fr 10 dB/div Log 10.9 0.890 -9.11 -19.1 -29.1 -39.1 -49.1 -59.1 Start 0.0 #Res BV MSF M005 1 N -2 N -3 N -4 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	Ref Reg 030 Ref Ref 01 030 GF V 100	Analyzer - Sweet 50 Q 0000000 00ffset 10 f 20.89 c 0 12 kHz	AC D MHz P IF4 .89 dB IBm 2 	NO: Fast C Gain:Low #VBI	SEN Trig: Free #Atten: 20 W 300 kHz 8.775 dE -50.656 dE	Run D dB	CCE OFF #Avg Ypp Avg Hold	status alien auto e: RMS >10/10 MI weep 95	kr1 915. 8.7	4 Nov 05, 2021 E [1 2 3 4 5 6 E M M W W W TO P A NN N 59 MHz 75 dBm 	Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq 30.000000 MHz Stop Freq 10.000000000 GHz 2.442000000 GHz Auto Man Freq Offset 0 Hz Scale Type
MSG Keysight Start Fr Start Fr 10 dB/div Log 10.9 0.890 -9.11 -19.1 -29.1 -39.1 -39.1 -59.1 Start 0.0 Start 0.0 MSG MODE 1 N -2 N -3 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	Ref Reg 030 Ref Ref 01 030 GF V 100	Analyzer - Sweet 50 Q 0000000 00ffset 10 f 20.89 c 0 12 kHz	AC D MHz P IF4 .89 dB IBm 2 	NO: Fast C Gain:Low #VBI	SEN Trig: Free #Atten: 20 W 300 kHz 8.775 dE -50.656 dE	Run D dB	CCE OFF #Avg Ypp Avg Hold	status alien auto e: RMS >10/10 MI weep 95	kr1 915. 8.7	4 Nov 05, 2021 E [1 2 3 4 5 6 E M M W W W TO P A NN N 59 MHz 75 dBm 	Frequency Auto Tune Center Freq 5.015000000 GHz Start Freq 30.000000 MHz U.000000000 GHz CF Step 2.442000000 GHz Auto Man Freq Offset 0 Hz



Page: 33 / 54

Rev.: 02

- 6 본										nalyzer - Swe		t Spect		
Frequency	M Nov 26, 2021 E 1 2 3 4 5 6 E M WM WWW	TRACI		E OFF #Avg Typ AvalHold	E:INT SOL	SENS				50 Ω 0.0000	RF 85	req		tar
Auto Tune	T P P A N N N	DE 15.205		Avginoia		en: 20		NO:Fast C Bain:Low	1F4	Offset 10 20.89 (B/div	0 dE
Center Free 925.000000 MH	-10.90 dBm													. og 10.9 .890 9.11
Start Free 850.000000 MH:														19.1 29.1 39.1
Stop Fred 1.000000000 GH;		Manaandadii		aly danta di co	∕ ³	And and the second s	and h	,() ² .	ey an the boy with disards	unturna ¹ ia	-	lun di		49.1 59.1 69.1
CF Step 2.452000000 GH: Auto Mar	0001 pts)	Stop 1.00 .00 ms (40	weep 16			kHz	N 300	#VB		GHz kHz	00	W 1	s B	Re
Freq Offse		FUNCTIO	ICTION WIDTH	ION FUN	n n	13 dBi 16 dBi 07 dBi	-61.7) MHz 0 MHz 0 MHz			f f f	1 1 1	N N N	1 2 3 4 5
Scale Type														6 7 8 9
Log <u>Lir</u>	• •		STATUS			11	I							11 sg
		•	STATUS											30



Page: 34 / 54 Rev.: 02

Report No.: TMTN2111000549NR

		Hz)	~10GF	30MF	High	СН	ant SA	mum Anatore	Vousielet
Frequency	0:36:30 AM Nov 08, 2021		ALIGN AUTO	E:INT SOURCE	SEM		AC	rum Analyzer - Sw RF 50 Ω	RL
Frequency	TYPE MWMWWW DET PPANNN	Т	Type: RMS lold:>10/10	Run /	Trig: Free #Atten: 30	Z NO: Wide G Gain:Low	Р	eq 915.700	enter F
Auto Tui	915.548 MHz 8.958 dBm		М					Ref Offset 10 Ref 30.89 (0 dB/div
Center Fre									.og
915.700000 M									20.9
Start Fro				. ~					10.9
914.700000 M				-6.00 dB 514 kHz					.890
			\mathbf{n}						
Stop Fr 916.700000 MI		~							9.11
									19.1
CF Ste 2.442000000 G	-	_						part -	29.1
Auto <u>M</u>	- Andrew -								39.1
Freq Offs	<u>32</u>								
01	*								49.1
Scale Ty									59.1
Log <u>L</u>	pan 2.000 MHz	Snar						.700 MHz	Center 01
	0 ms (1001 pts)		_						
			Sweep		/ 300 kHz	#VBV			Res BW
			Sweep		/ 300 kHz	#VBV		00 kHz	Res BW
Frequency	0:41:42 AM Nov 08, 2021	TUS	STATI	E:INT SOURCE		#VBV	AC	00 kHz trum Analyzer - Sw RF 50 Ω	Res BW
1	0:41:42 AM Nov 08, 2021 TRACE 1 2 3 4 5 6 TYPE MWWW DET P P A N N N	TUS	STAT	Run /		#VBV	AC OMHz P	00 kHz	Res BW
1	TRACE 1 2 3 4 5 6	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz trum Analyzer - Sw RF 50 Ω	Res BW sg Keysight Sp RL Start Fre 0 dB/div
Frequency	TRACE 1 2 3 4 5 6 TYPE MW44WW4 DET P P A N N N 915.59 MHz	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rrum Analyzer - Sw RF 50 Ω 30.000000 Ref Offset 10	Res BW
Frequency Auto Tu	915.59 MHz 7.243 dBm	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rum Analyzer - Sw RF 50 Ω 30.00000 Ref Offset 10 Ref 20.89 0	Keysight Sp RL C dB/div 0 dB/div 0.99 10.9 .890
Frequency Auto Tur Center Fre 5.015000000 Gi	TRACE 1 2 3 4 5 6 TYPE MW44WW4 DET P P A N N N 915.59 MHz	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rum Analyzer - Sw RF 50 Ω 30.00000 Ref Offset 10 Ref 20.89 0	Res BW sg RL Cart Fre 0 dB/div 0 dB/div
Frequency Auto Tur Center Fre	915.59 MHz 7.243 dBm	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rum Analyzer - Sw RF 50 Ω 30.00000 Ref Offset 10 Ref 20.89 0	Res BW SG Keysight Sp RL Itart Fre 0 dB/div 09 9.11
Frequency Auto Tur Center Fre 5.01500000 Gi Start Fre	915.59 MHz 7.243 dBm	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rum Analyzer - Sw RF 50 Ω 30.00000 Ref Offset 10 Ref 20.89 0	Res BW sq
Frequency Auto Tur Center Fre 5.015000000 Gl Start Fre 30.000000 Mi	915.59 MHz 7.243 dBm	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rum Analyzer - Sw RF 50 Ω 30.00000 Ref Offset 10 Ref 20.89 0	Res BW sq
Frequency Auto Tur Center Fri 5.01500000 Gl Start Fri 30.000000 Mi	915.59 MHz 7.243 dBm	ития 10:41:4 т Mkr1 91	ALIGN AUTO Type: RMS Hold:>10/10	Run /	SEM	PNO: Fast	AC OMHZ IF 0.89 dB	00 kHz rum Analyzer - Sw RF 50 Ω 30.00000 Ref Offset 10 Ref 20.89 0	Res BW sc Keysight Spint
Frequency Auto Tur Center Fri 5.015000000 Gl Start Fri 30.000000 Ml Stop Fri 10.000000000 Gl CF Ste 2.442000000 Gl	915.59 MHz 7.243 dBm	NTUS Mkr1 91 7 5 5 5 7		Run /	SEM	PNO: Fast C Gain:Low	AC OMHZ IF 0.89 dB	00 kHz	Res BW SG Keysight Spi RL Itart Fre 0 dB/div 99 10.9 9.11 19.1 29.1 39.1 49.1 59.1
Frequency Auto Tut Center Fre 5.015000000 Gl Start Fre 30.000000 MI Stop Fre 10.00000000 Gl CF Ste	тиче (12 а 4 5 6 7 туче (14 чичком) оет (14 он 14 чичком) 7.243 dBm 	Mkr1 91 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7			SEN Trig: Free #Atten: 21	PNO: Fast Creation Control Con	AC 0 MHz P F F F F F F F F F F F F F F F F F F	00 kHz rum Analyzer - Sw RF 50 Ω 30.000000 Ref Offset 10 Ref 20.89 (1 1 1 1 1 1 1 1 1 1 1 1 1	Res BW SG Keysight Sp RL Itart Fre 0 dB/div 0 g 10.9 9.11 19.1 9.11 19.1 9.11 19.1 9.11 19.1 1
Frequency Auto Tur Center Fri 5.015000000 Gl Start Fri 30.000000 Ml Stop Fri 10.000000000 Gl CF Ste 2.442000000 Gl	тиче (12.3 4 5 6 7 туче (Мичикон оет (Р. Р. А. N. N. 915.59 MHz 7.243 dBm 	Mkr1 91 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	ALIGN AUTO Type: RMS told:>10/10		SEN Trig: Free #Atten: 2	PNO: Fast C Gain:Low	AC 0 MHz P F F F F F F F F F F F F F F F F F F	00 kHz rum Analyzer - Sw №F [50 Ω 30.000000 Ref Offset 10 Ref 20.89 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	Res BW SG Keysight Sp RL Itart Fre 0 dB/div 90 911 921 932 933 933 934 935
Frequency Auto Tur Center Fre 5.015000000 Gl Start Fre 30.000000 Ml Stop Fre 10.000000000 Gl 2.44200000 Gl Auto Mato Freq Offs	тиче (12.3 4 5 6 7 туче (Мичикон оет (Р. Р. А. N. N. 915.59 MHz 7.243 dBm 	Mkr1 91 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	ALIGN AUTO Type: RMS told:>10/10		SEN Trig: Free #Atten: 21	PNO: Fast Creation Control Con	AC 0 MHz P F F F F F F F F F F F F F F F F F F	00 kHz rum Analyzer - Sw RF 50 Ω 30.000000 Ref Offset 10 Ref 20.89 (1 1 1 1 1 1 1 1 1 1 1 1 1	Res BW G Keysight Sp. RL RL Itart Fre 0 dB/div 90 10.9 9.11 19.1 29.1 39.1 49.1 59.1 Start 0.02 Res BW 10.9 10.9 9.11 9.1 9.1
Frequency Auto Tur Center Fre 5.015000000 Gl Start Fre 30.000000 Ml Stop Fre 10.000000000 Gl 2.44200000 Gl Auto Freq Offs 0 I	тиче (12.3 4 5 6 7 туче (Мичикон оет (Р. Р. А. N. N. 915.59 MHz 7.243 dBm 	Mkr1 91 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	ALIGN AUTO Type: RMS told:>10/10		SEN Trig: Free #Atten: 20	PNO: Fast Creation Control Con	AC 0 MHz P F F F F F F F F F F F F F F F F F F	00 kHz rum Analyzer - Sw RF 50 Ω 30.000000 Ref Offset 10 Ref 20.89 (1 1 1 1 1 1 1 1 1 1 1 1 1	Res BW SG Keysight Sp RL Itart Fre 0 dB/div 9 10.9 9.11 9.1 9.1 9.1 9.1



Page: 35 / 54

Rev.: 02

	ectrum Analyzer -										- 6 🗙
Start Fre	RF 50 q 850.000				SENSE:INT S	#Avg Ty	ALIGN AUTO	TRA	M Nov 26, 2021 CE 1 2 3 4 5 6 PE M WM WWW		equency
10 dB/div	Ref Offset Ref 20.89	10.89 dB	NO:Fast C Sain:Low		ree Run : 20 dB	Avgiho	Mkr1 (₀ •15.561	25 MHz 13 dBm		Auto Tune
10.9 0.890									-10.90 dBm		enter Fre .000000 MH
-19.1 -29.1 -39.1										850.	Start Free .000000 MH
-49.1 -59.1 -69.1	egan#Wittmantamfale	a Vanista and a state of the st	²	and the	ι <u></u> β	41.91 1	ite alequier anti-picet	and the state	ar geward and an	1.000	Stop Fre 0000000 GH
Start 0.85 #Res BW	100 kHz	×	#VB	W 300 kł			Sweep 16	6.00 ms (4	0000 GHz 0001 pts)	2.452 Auto	CF Ste 2000000 GH <u>Ma</u>
1 N 1 2 N 1 3 N 1 4 5 6		915.561 2 902.	5 MHz 0 MHz 0 MHz	7.613 -61.558 -61.513	dBm dBm					F	F req Offse 0 H
7 8 9											Scale Type
10 11										Log	Lii
MSG				III			STATU	5	•		



Page: 36 / 54 Rev.: 02

8.6 RADIATED EMISSIONS

8.6.1 TRANSMITTER RADIATED SUPURIOUS EMSSIONS

<u>LIMITS</u>

§ 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	(2)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



Page: 37 / 54 Rev.: 02

Report No.: TMTN2111000549NR

§ 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz, However, operation within these frequency bands is permitted under other sections of this Part, e-g, Sections 15.231 and 15.241.

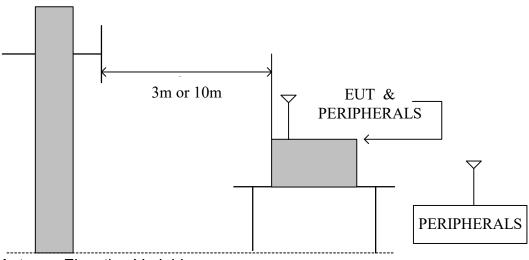
§ 15.209 (b) In the emission table above, the tighter limit applies at the band edges.



Page: 38 / 54 Rev.: 02

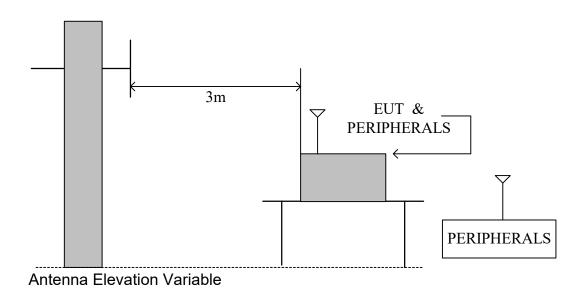
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.



Antenna Elevation Variable

The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.





TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

- b. White measuring the radiated emission below 1GHz, the EUT was set 3/10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. White measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. The tests were performed in accordance with KDB 558074 D01 v05r02.

NOTE :

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
- 3. Average value=Peak value + Duty factor
- No emission is found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)

TEST RESULTS

No non-compliance noted.

Rev.: 02



Page: 40 / 54 Rev.: 02

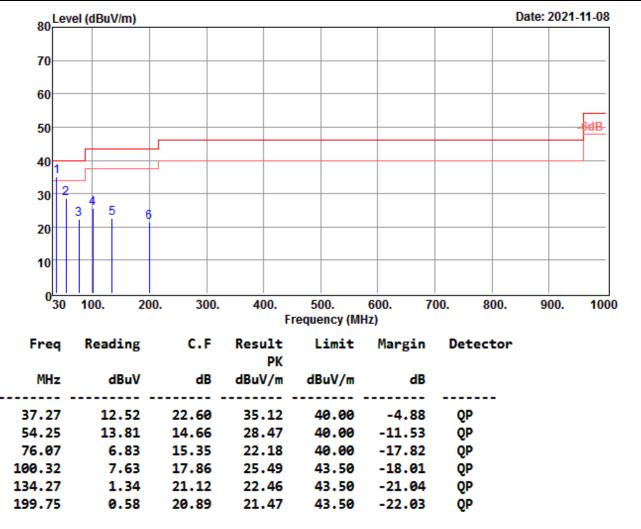
Report No.: TMTN2111000549NR

8.6.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz

Product Name	BR33 Wireless Panic Button	Test Date	2021/11/08
Model	BR33-HW	Test By	Ted Huang
Test Mode	ТХ	TEMP& Humidity	26°∁/50%

Horizontal

(The chart below shows the highest readings taken from the final data.)



Remark:

- 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5. Emission at 3m Level=Meter Reading +Antenna Factor +Cable Loss Margin= Emission at 3m Level -Limits
- 6. That the limit for signals below 1GHz is a QP limit and peak readings are below the QP limit.
- 7. The fundamental signal is not shown in the test data because measurements at fundamental frequency are shown separately and were ignored during the 30 1000 MHz scan.

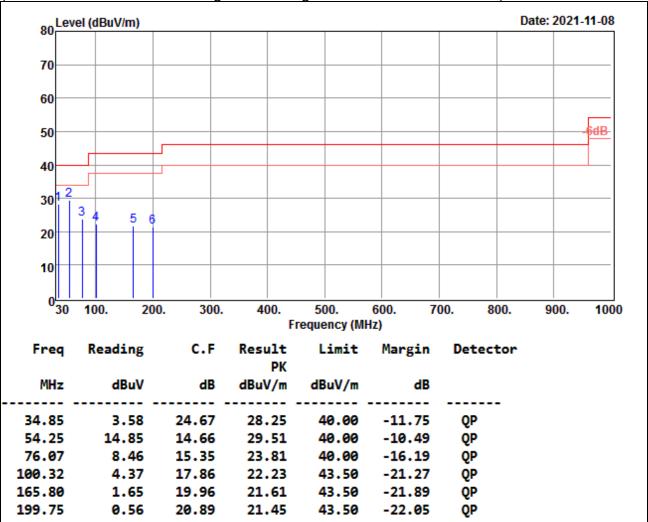


Page:	41 /	54
Rev.:	02	

Product Name	BR33 Wireless Panic Button	Test Date	2021/11/08
Model	BR33-HW	Test By	Ted Huang
Test Mode	ТХ	TEMP& Humidity	26°∁/50%

Vertical

(The chart below shows the highest readings taken from the final data.)



Remark:

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.

3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.

4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

5. Emission at 3m Level=Meter Reading +Antenna Factor +Cable Loss Margin= Emission at 3m Level -Limits

6. That the limit for signals below 1GHz is a QP limit and peak readings are below the QP limit.

7. The fundamental signal is not shown in the test data because measurements at fundamental frequency are shown separately and were ignored during the 30 – 1000 MHz scan.



8.6.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	BR33 Wireless Panic Button	Test Date	2021/11/08
Model	BR33-HW	Test By	Ted Huang
Test Mode	TX (CH Low)	TEMP& Humidity	26.2℃, 50%

		TX mod	e / CH L	_ow	Measur	ement	Distance	at 3m 🛛 🖁	Horizontal polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	915.00	93.08	29.68	6.01	25.64	0.00	103.13	Fundamente		Р
	915.00	0.00	29.68	6.01	25.64	0.00	10.05	Fundamental Frequency-		А
	1830.31	72.34	29.24	3.50	44.29	0.80	61.60	83.13	-21.53	Р
	1830.31	-	-	-	-	-	36.87	63.13	-26.26	А
*	2745.46	59.79	30.15	4.12	43.49	0.87	51.43	74.00	-22.57	Р
*	2745.46	-	-	-	-	-	26.70	54.00	-27.30	А
*	3659.38	67.44	30.59	4.67	42.89	0.27	60.08	74.00	-13.92	Р
*	3659.38	-	-	-	-	-	35.35	54.00	-18.65	А
*	4575.19	54.56	32.34	5.29	42.63	0.20	49.75	74.00	-24.25	Р
*	4575.19	-	-	-	-	-	25.02	54.00	-28.98	А
	5490.37	54.21	33.90	5.86	42.67	0.40	51.70	83.13	-31.43	Р
	5490.37	-	-	-	-	-	26.97	63.13	-36.16	А
	6405.87	53.30	35.31	6.19	42.73	0.24	52.31	83.13	-30.82	Р
	6405.87	-	-	-	-	-	27.57	63.13	-35.55	А

		TX mod	e / CH L	_ow	Measu	remer	nt Distance	e at 3m	Vertical polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	915.00	83.72	29.68	6.01	25.64	0.00	93.77	Fundamente		Р
	915.00	0.00	29.68	6.01	25.64	0.00	10.05	Fundamenta	II Frequency	А
	1829.60	71.96	29.24	3.50	44.29	0.80	61.21	74.00	-12.79	Р
	1829.60	-	-	-	-	-	36.48	54.00	-17.52	А
*	2745.52	58.26	30.15	4.12	43.49	0.87	49.90	74.00	-24.10	Р
*	2745.52	-	-	-	-	-	25.17	54.00	-28.83	А
*	3659.31	64.99	30.59	4.67	42.89	0.27	57.63	74.00	-16.37	Р
*	3659.31	-	-	-	-	-	32.90	54.00	-21.10	А
*	4574.42	54.24	32.34	5.29	42.63	0.20	49.43	74.00	-24.57	Р
*	4574.42	-	-	-	-	-	24.70	54.00	-29.30	А
	5490.85	56.25	33.90	5.87	42.67	0.40	53.74	74.00	-20.26	Р
	5490.85	-	-	-	-	-	29.01	54.00	-24.99	Α
	6404.55	53.29	35.31	6.19	42.73	0.24	52.29	74.00	-21.71	Р
	6408.23	-	-	-	-	-	31.78	63.57	-31.80	Α

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可,不可部份複製。



Page: 43 / 54 02 Rev.:

REMARK:

- AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High pass-1G Filter Insertion Loss. 1.
- Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=3MHz. Average level=Peak level + Duty factor 2.
- З.
- The result basic equation calculation is as follow: 4. Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
- 5. The other emission levels were 20dB below the limit
- 6 7 The test limit distance is 3m limit.
- *=Restricted bands of operation



Page: 44 / 54 Rev.: 02

Report No.: TMTN2111000549NR

Product Name	BR33 Wireless Panic Button	Test Date	2021/11/08
Model	BR33-HW	Test By	Ted Huang
Test Mode	TX (CH Middle)	TEMP& Humidity	26.2℃, 50%

	-	TX mode	/ CH Mi	ddle	Measure	ement	Distance a	at 3m 🛛 H	Horizontal polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	915.35	93.52	29.68	6.01	25.64	0.00	103.57	Fundament		Р
	915.35	0.00	29.68	6.01	25.64	0.00	10.05	Fundamental Frequency-		А
	1830.37	65.89	29.24	3.50	44.29	0.80	55.15	83.57	-28.43	Р
	1830.37	-	-	-	-	-	30.41	63.57	-33.16	А
*	2746.61	60.08	30.15	4.12	43.49	0.87	51.72	74.00	-22.28	Р
*	2746.61	-	-	-	-	-	26.99	54.00	-27.01	А
*	3660.72	64.00	30.59	4.67	42.89	0.27	56.65	74.00	-17.35	Р
*	3660.72	-	-	-	-	-	31.91	54.00	-22.09	А
*	4577.66	58.60	32.35	5.29	42.63	0.20	53.80	74.00	-20.20	Р
*	4577.66	-	-	-	-	-	29.07	54.00	-24.93	А
	5492.80	58.80	33.90	5.87	42.67	0.40	56.29	83.57	-27.29	Р
	5492.80	-	-	-	-	-	31.56	63.57	-32.02	А
	6408.23	57.50	35.32	6.19	42.73	0.24	56.51	83.57	-27.07	Р
	6408.23	-	-	-	-	-	31.78	63.57	-31.80	А

TX mode / CH Middle **Measurement Distance at 3m** Vertical polarity Reading AF Cable Loss Pre-amp Filter Level Limit Mark Freq. Margin (MHz) (dBµV) (dB/m) (dB) (dB) (dB) (dBµV/m) (dBµV/m) (dB) (P/Q/A) 915.35 Ρ 84.18 29.68 6.01 25.64 0.00 94.23 Fundamental Frequency 915.35 10.05 0.00 29.68 25.64 0.00 А 6.01 1830.53 71.42 29.24 3.50 44.29 0.80 60.68 74.23 -13.56 Ρ 1830.53 35.94 54.23 -18.29 ---А _ _ 2746.55 62.18 43.49 74.00 Ρ 30.15 4.12 0.87 53.82 -20.18 2746.55 29.09 54.00 -24.91 ---А --3660.65 55.49 74.00 -18.51 Р 62.85 30.59 4.67 42.89 0.27 3660.65 30.76 54.00 -23.24 А -----4577.45 54.49 Ρ 59.29 5.29 0.20 74.00 -19.51 32.35 42.63 4577.45 29.76 54.00 -24.24 -----А 5491.05 0.40 57.47 74.23 -16.77 Ρ 59.98 33.90 5.87 42.67 5491.05 32.73 54.23 -21.50 А -----6408.07 57.49 35.32 6.19 42.73 0.24 56.50 74.23 -17.73 Ρ 6408.07 31.77 54.23 -22.47 А -----

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可,不可部份複製。



Page: 45 / 54 02 Rev.:

REMARK:

- AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High pass-1G Filter Insertion Loss. 1.
- Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=3MHz. Average level=Peak level + Duty factor 2.
- З.
- The result basic equation calculation is as follow: 4. Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
- 5. The other emission levels were 20dB below the limit
- 6 7 The test limit distance is 3m limit.
- *=Restricted bands of operation



Page: 46 / 54 Rev.: 02

Report No.: TMTN2111000549NR

Product Name	BR33 Wireless Panic Button	Test Date	2021/11/08
Model	BR33-HW	Test By	Ted Huang
Test Mode	TX (CH High)	TEMP& Humidity	26.2℃, 50%

		TX mode	e / CH F	ligh	Measure	ement	Distance	at 3m 🛛 I	Horizontal polarity		
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)	
	915.70	95.05	29.69	6.01	25.64	0.00	105.11	Fundament		Р	
	915.70	0.00	29.69	6.01	25.64	0.00	10.06	Fundamental Frequency-		А	
	1831.80	75.85	29.25	3.50	44.29	0.81	65.13	85.11	-19.98	Р	
	1831.80	-	-	-	-	-	40.40	65.11	-24.71	А	
*	2747.47	62.03	30.15	4.12	43.49	0.87	53.67	74.00	-20.33	Р	
*	2747.47	-	-	-	-	-	28.94	54.00	-25.06	А	
*	3662.14	69.06	30.59	4.67	42.89	0.27	61.71	74.00	-12.29	Р	
*	3662.14	-	-	-	-	-	36.98	54.00	-17.02	А	
*	4577.96	56.63	32.35	5.29	42.63	0.20	51.83	74.00	-22.17	Р	
*	4577.96	-	-	-	-	-	27.10	54.00	-26.90	А	
	5493.11	58.87	33.90	5.87	42.67	0.40	56.36	85.11	-28.75	Р	
	5493.11	-	-	-	-	-	31.63	65.11	-33.48	Α	
	6410.45	57.70	35.32	6.19	42.73	0.24	56.72	85.11	-28.39	Р	
	6410.45	-	-	-	-	-	31.99	65.11	-33.12	Α	

ľ		TX mode	e / CH H	ligh	Measur	emen	t Distance	at 3m	Vertical p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	915.70	85.57	29.69	6.01	25.64	0.00	95.62	Fundament		Р
	915.70	0.00	29.69	6.01	25.64	0.00	10.06	Fundamental Frequenc		А
	1831.71	76.95	29.25	3.50	44.29	0.81	66.22	75.62	-9.40	Р
	1831.71	-	I	-	-	-	41.49	55.62	-14.13	А
*	2747.68	61.37	30.15	4.12	43.49	0.87	53.01	74.00	-20.99	Р
*	2747.68	-	-	-	-	-	28.28	54.00	-25.72	А
*	3662.20	67.48	30.59	4.67	42.89	0.27	60.13	74.00	-13.87	Р
*	3662.20	-	-	-	-	-	35.39	54.00	-18.61	А
*	4579.48	56.80	32.35	5.29	42.63	0.20	52.01	74.00	-21.99	Р
*	4579.48	-	-	-	-	-	27.28	54.00	-26.72	А
	5495.19	58.21	33.90	5.87	42.67	0.40	55.70	75.62	-19.92	Р
	5495.19	-	-	-	-	-	30.97	55.62	-24.65	А
	6410.14	57.02	35.32	6.19	42.73	0.24	56.04	75.62	-19.59	Р
	6410.14	-	-	-	-	-	31.31	55.62	-24.32	А

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可,不可部份複製。



Page: 47 / 54 02 Rev.:

REMARK:

- AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High pass-1G Filter Insertion Loss. 1.
- Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=3MHz. Average level=Peak level + Duty factor 2.
- З.
- The result basic equation calculation is as follow: 4. Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
- 5. The other emission levels were 20dB below the limit
- 6 7 The test limit distance is 3m limit.
- *=Restricted bands of operation



Page: 48 / 54 Rev.: 02

Report No.: TMTN2111000549NR

8.7 POWERLINE CONDUCTED EMISSIONS

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

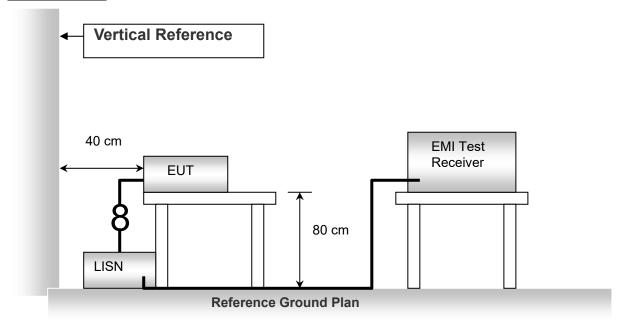
The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dBµv)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50



Page: 49 / 54 Rev.: 02

TEST SETUP



TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT IS CONFIGURED IN ACCORDANCE WITH ANSI C63.10.

The resolution bandwidth is set to 9 kHz for both quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

TEST RESULTS

No non-compliance noted.

※ This EUT is not connected to AC Source directly. Not applicable for this test.



Page: 50 / 54 Rev.: 02

Report No.: TMTN2111000549NR

9. ANTENNA REQUIREMENT

9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 ANTENNA CONNECTED CONSTRUCTION

Type: Chip Antenna Model: BR33 Manufacturer: YAGEO Gain: 1.59 dBi

=== END of Report ===