

Report No.: KES-RF1-21T0008 Page (1 ) of (51)

# **TEST REPORT**

# Part 15 Subpart C 15.247

Equipment under testInstant Square PrinterModel nameP300Derivative nameP300RFCC IDPO5P300RApplicantPrinics Co.LtdManufacturerPrinics Co.LtdDate of test(s)2021.01.19 ~ 2021.01.28Date of issue2021.02.02

# Issued to Prinics Co.Ltd

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Issued by

KES Co., Ltd.

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Test and report completed by :	Report approval by :
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Report No.: KES-RF1-21T0008 Page (2) of (51)

# **Revision history**

Revision	Date of issue	Test report No.	Description
-	2021.02.02	KES-RF1-21T0008	Initial



Report No.: KES-RF1-21T0008 Page (3) of (51)

# **TABLE OF CONTENTS**

1.	General in	formation	.4
	1.1.	EUT description	.4
	1.2.	Test configuration	
	1.3.	Device modifications	.5
	1.4.	Frequency/channel operations	.5
	1.5.	Accessory information	
	1.6.	Software and Firmware description	.5
	1.7.	Information about derivative model	.6
	1.8.	Measurement results explanation example	.6
	1.9.	Measurement Uncertainty	.6
2.	Summary	of tests	.7
3.	Test result	S	.8
	3.1.	20  dB bandwidth	. 8
	3.2.	Output power	12
	3.3.	Carrier frequency separation	16
	3.4.	Number of hopping frequency	18
	3.5.	Time of occupancy	20
	3.6.	Radiated restricted band and emissions	24
	3.7.	Conducted band edge and out of band emissions	43
	3.8.	AC conducted emissions	
App	endix A.	Measurement equipment	
App	endix B.	Test setup photo	51



#### 1. **General information** Prinics Co.Ltd Applicant: Applicant address: 228-92, Saneop-ro 155beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, 16648, Korea Test site: KES Co., Ltd. Test site address: 3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea FCC Accreditation Designation No.: KR0100, Registration No.: 444148 Test Facility ECC ----1 15 047 .....

FCC rule part(s):	15.247		
FCC ID:	PO5P300R		
Test device serial No.:	Production	Pre-production	Engineering

# 1.1. EUT description

Equipment under test	Instant Square Printer
Frequency range	2 402 MHz ~ 2 480 MHz (BDR/EDR)
Model	P300
Derivative name	P300R
Modulation technique	GFSK, π/4DQPSK, 8DPSK
Number of channels	79 ch
Antenna specification	Antenna type : PCB antenna, Peak gain : -0.37 dBi
Power source	DC 7.4 V (Li-ion Battery)

15.247(a)(1) that the rx input bandwidths shift frequencies in synchronization with the transmitted signals.

15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.

15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate it channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.



#### **Pseudorandom frequency hopping sequence**

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1 600 hops/s.

#### **Equal hopping frequency use**

The channels of this system will be used equally over the long-term distribution of the hopsets.

#### System receiver input bandwidth

Each channel bandwidth is 1 Mtz.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

#### **1.2.** Test configuration

The <u>Prinics Co.Ltd P300 FCC ID: PO5P300R</u> was tested according to the specification of EUT, the EUT must comply with following standards and KDB documents.

FCC Part 15.247 KDB 558074 D01 v05 r02 ANSI C63.10-2013

#### **1.3.** Device modifications

N/A

### **1.4.** Frequency/channel operations

Ch.	Frequency (Mb)	Rate(Mbps)
00	2402	1,2,3
40	2442	1,2,3
78	2480	1,2,3

#### **1.5.** Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

### 1.6. Software and Firmware description

The software and firmware installed in the EUT is version 3.0.



# **1.7.** Information about derivative model

- P300R

The circuit diagram and software of the basic model and derivative are fundamentally the same. It is for model management purpose per business partner.

### **1.8.** Measurement results explanation example

For all conducted test items

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

Offset(dB) = RF cable loss(dB) = 0.76

### **1.9.** Measurement Uncertainty

Test Item		Uncertainty			
Uncertainty for Conduction emission test		2.46 dB			
Uncertainty for Radiation emission test	Below 1 GHz	4.40 dB			
(include Fundamental emission)	Above 1 GHz	5.94 dB			
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95%					
confidence level using a coverage factor	of k=2.				



Report No.: KES-RF1-21T0008 Page (7 ) of (51)

2. Summary of	tests	
Reference	Test description	Test results
15.247(a)(1)	20 dB bandwidth	Pass
15.247(b)(1)	Output power	Pass
15.247(a)(1)	Channel separation	Pass
15.247(a)(1)(iii)	Number of channels	Pass
15.247(a)(1)(iii)	Time of occupancy	Pass
15.205, 15.209	Radiated restricted band and emission	Pass
15.247(d)	Conducted band edge and out of band emissions	Pass
15.207(a)	AC conducted emissions	Pass



Report No.: KES-RF1-21T0008 Page (8 ) of (51)

#### 3. Test results

#### 3.1. 20 dB bandwidth

#### **Test procedure**

ANSI C63.10-2013 clause 6.9.2 and 6.9.3

#### Test setup



#### Test setting

- 1. Span = The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 2.0 times and 5.0 times the OBW.
- 2. RBW = The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW.
- 3. VBW = Shall be approximately three times the RBW.
- 4. Sweep = auto
- 5. Detector function = peak
- 6. Trace mode = max hold

#### Limit

Not applicable



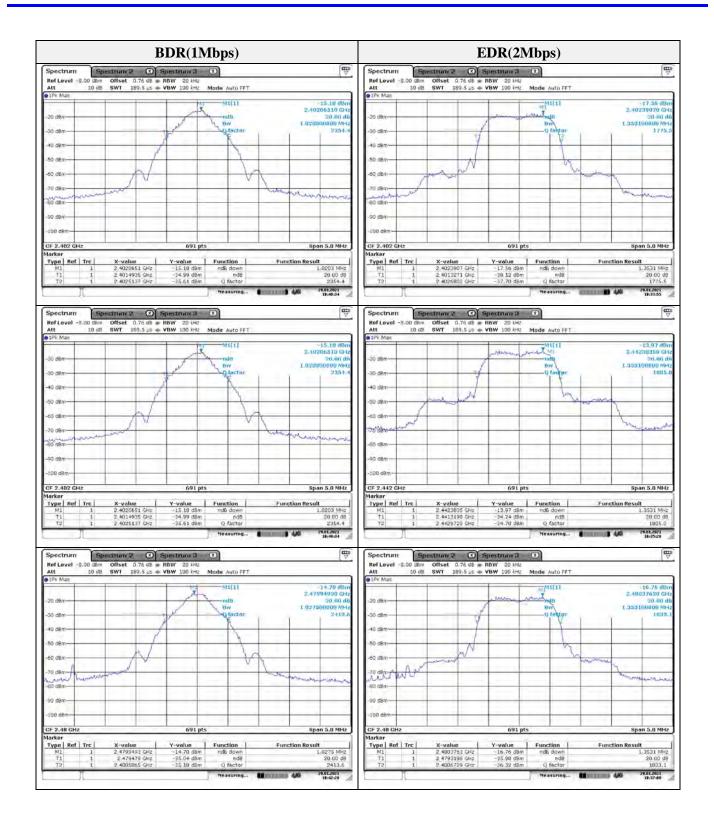
Report No.: KES-RF1-21T0008 Page (9 ) of (51)

Test results			
Frequency(Mbz)	Channel no.	Data rate(Mbps)	Measured bandwidth(Mz)
2 402	00		1.020
2 442	40	1	1.020
2 480	78		1.028
2 402	00		1.353
2 442	40	2	1.353
2 480	78		1.353
2 402	00		1.360
2 442	40	3	1.353
2 480	78		1.360



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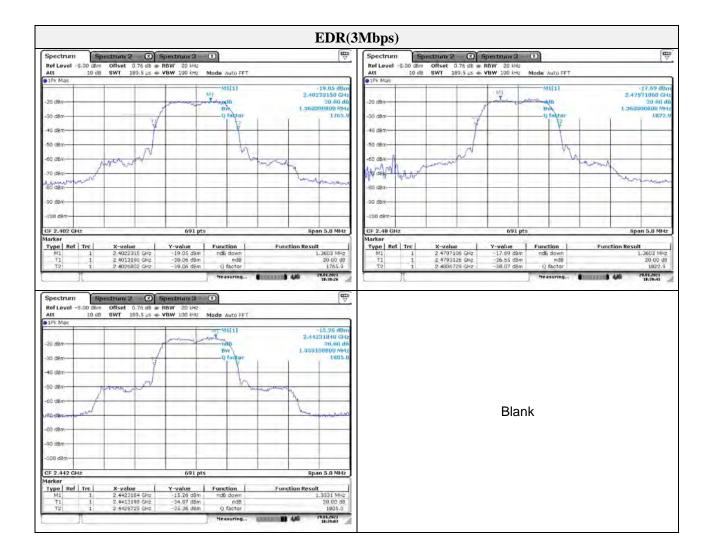
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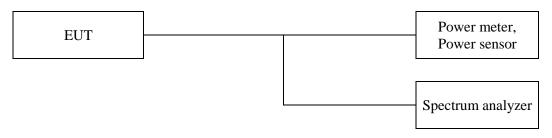




## 3.2. Output power

**Test procedure** ANSI C63.10-2013 - Section 7.8.5

### Test setup



### **Test setting**

- 1. Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
- 2. RBW > the 20 dB bandwidth of the emission being measured
- 3. VBW  $\geq$  RBW
- 4. Sweep = Auto
- 5. Detector function = Peak
- 6. Trace = Max hold

#### Limit

According to \$15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

According to \$15.247(b)(1), For frequency hopping systems operating in the 2 400 ~ 2 483.5 Mz employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725 ~ 5 805 Mz band: 1 Watt.



<b>Test results</b>					
Frequency(Mz)	Channel no.	Data rate(Mbps)	Peak Power (dBm)	Average Power (dBm) Note1	Power Limit (dBm)
2 402	00		-11.60	-12.62	20.97
2 442	40	1	-8.21	-9.42	20.97
2 480	78		-10.66	-11.45	20.97
2 402	00		-8.74	-10.72	20.97
2 442	40	2	-5.07	-7.55	20.97
2 480	78		-7.77	-9.72	20.97
2 402	00		-8.64	-10.60	20.97
2 442	40	3	-5.03	-7.48	20.97
2 480	78		-8.10	-9.66	20.97

#### Note.

1. The average power was tested using an average power meter.



BDR(1Mbps)			EDR(2Mbps)			
pectrum Spectrum S			Spectrum Sp	spectrum 2 🛞 Spectrum 3 🛞		
Att 15 da SWT	2.76 dB # RBW 2 MHz 2.ms VBW 2 MHz Mode Auto Sweep		Ref Level 0.00 dam Att 15 dB	Offset 0.76 dB # RBW 2 MHz SWT 1 ms VBW 2 MHz Mode Auto 5	awaep	
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20 dBm			-30 020			
i0 dBm-			-30 d8m			
10 dBm			-40 dBm			
10 dBm			-50 cBm-			
0 d8m			-60 dBm			
70 dBm			-70 dBm			
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0 dBm						
.00 dBm			-50 dBm-			
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0.487	and a second second second		-30 dBm-			
0 dem			-40 cBm			
ic asm-			-S0 dBm			
0 d8m+			-60 dBm			
0 d9m-			-70 dBm			
			-60 d8m			
90 gBm	1221/122 LT11 E2	12.22	-90 d8m			
00 dBm	691 pts	Span 5.0 MHz	CF 2,442 GHz	691 pts	Span 5.0 Mi	
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0.48m			-30 dBm			
0 dBm+	1 1 1 1		-40 d8m			
C dBm			-50 dBm			
0 dBm-			-60 @Bm			
No. 10, 10, 10, 11			-70 cBm			
0 dBm			-90 dBm			
90 dBm		1	-90 dBm			
00 dBm	691 pts	Span 5.0 MHz	CF 2.48 GHz	691 pts	Span 5.0 Mi	
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rker ypa   Ref   Trc.   X-valı	ve Y-value Function	Function Result	Type Ref Trc	X-value         Y-value         Functi           2:4801375 GHz         -7.77 dBm	n Function Result	



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ker per Ref Trc   Mi i i ectrum Bg f teval -3.00 dbm t 15 dB % Max dBm dBm dBm dBm dBm dBm	2.4020941 GHz	Y-value -8.64 #8m Spectnum 3 (8) RBW 2 MHz VBW 2 MHz VBW 2 MHz	Heasuring Spectrum 4 - 0 uuto Sweep	Function Result	Marker Type Ref Trc		Y-value -8.10 5	Fund			ion Result	
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Ker         Frc           0         Rof Frc           1         1           1 <td< td=""><td>2.4020941 GHz</td><td>Y-value -8.64 #8m Spectnum 3 (8) RBW 2 MHz VBW 2 MHz VBW 2 MHz</td><td>Heasuring Spectrum 4 - 0 uuto Sweep</td><td>Function Result</td><td>Marker Type Ref Trc</td><td></td><td>  Y-value -8.10 5</td><td>Fund</td><td></td><td></td><td>ion Result</td><td></td></td<>	2.4020941 GHz	Y-value -8.64 #8m Spectnum 3 (8) RBW 2 MHz VBW 2 MHz VBW 2 MHz	Heasuring Spectrum 4 - 0 uuto Sweep	Function Result	Marker Type Ref Trc		Y-value -8.10 5	Fund			ion Result	
Ref         Trc           M1         1           M1         1           Sectrum         Sign           Sectrum         Sectrum           Sectrum	2.4020941 GHz	Y-value Per -8.64 dBm - Spectnam () () () () () () () () () () () () ()	Heasuring Spectrum 4 - 0 uuto Sweep	Function Result	Marker Type Ref Trc		Y-value -8.10 5	Fund			ion Result	
rker ype Ruf Trc MI 1 Dectrum Sp of Level -3.00 dBm tt 15 dB	2.4020941 GHz	Y-value -8.64 #8m Spectnum 3 (8) RBW 2 MHz VBW 2 MHz VBW 2 MHz	Heasuring Spectrum 4 - 0 uuto Sweep	Function Result	Marker Type Ref Trc		Y-value -8.10 5	Fund			ion Result	



# **3.3.** Carrier frequency separation

Test procedure ANSI C63.10-2013 - Section 7.8.2

#### Test setup



#### **Test Setting**

- 1. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
- 2. Span = wide enough to capture the peaks of two adjacent channels
- 3. RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- 4. Video (or Average) Bandwidth (VBW)  $\ge$  RBW
- 5. Sweep = auto
- 6. Detector function = peak
- 7. Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

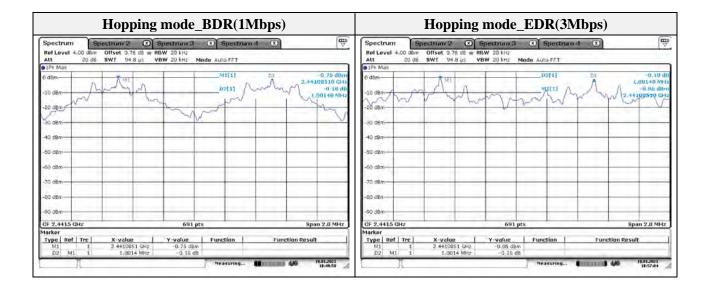
#### Limit

According to 15.247(a)(1), frequency hopping system operating in 2 400 ~ 2 483.5 Mz. Band may have hopping channel carrier frequencies that are separated by 25 kHz or two-third of 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.



#### **Test results**

Mode	Data rate(Mbps)	Channel Separation (Mz)	Minimum limit (ME2)
BDR (Hopping)	1	1.001	0.685
EDR (Hopping)	3	1.001	0.907





# **3.4.** Number of hopping frequency

Test procedure ANSI C63.10-2013 - Section 7.8.3

### Test setup



#### **Test setting**

- 1. The EUT must have its hopping function enabled.
- 2. Frequency range: 2 400 Mtz ~ 2 441.5 Mtz, 2 441.5 Mtz ~ 2 483.5 Mtz
- 3. Span = the frequency band of operation  $\frac{1}{2}$
- 4. RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- 5. VBW  $\ge$  RBW
- 6. Sweep = auto
- 7. Detector function = peak
- 8. Trace = max hold

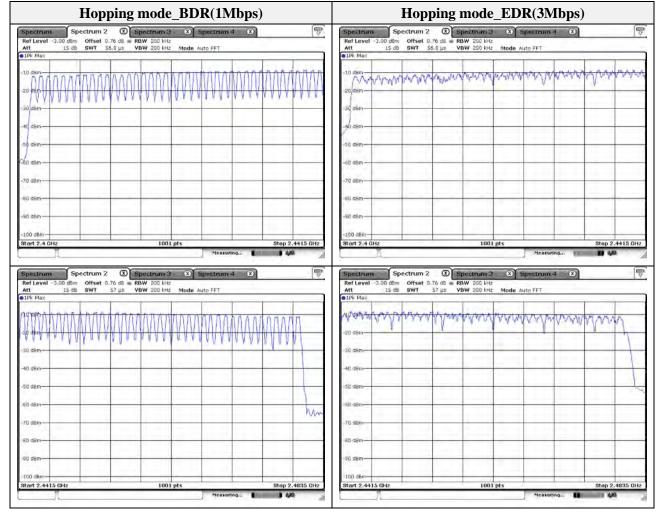
Allow the trace to stabilize. It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

#### Limit

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2 400 ~ 2 483.5 Mz bands shall use at least 15 hopping frequencies.



#### **Test results**





# **3.5.** Time of occupancy

Test procedure ANSI C63.10-2013 - Section 7.8.4

#### Test setup



#### **Test setting**

- 1. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
- 2. Span = zero span, centered on a hopping channel
- 4. RBW = shall be  $\leq$  channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
- 5. VBW = 1 MHz ( $\geq$  RBW)
- 6. Sweep = as necessary to capture the entire dwell time per hopping channel
- 7. Detector function = peak
- 8. Trace = max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

#### Limit

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2 400 ~ 2 483.5 Mz band, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 31.6 second period.

A period time =  $0.4(s) \times 79 = 31.6(s)$ 

Time of occupancy on the TX channel in 31.6 sec = time domain slot length  $\times$  (hop rate  $\div$  number of hop per channel)  $\times$  31.6



Test results				
Packet type	Frequency (MHz)	Dwell time (ms)	Time of occupancy on the Tx channel in 31.6 sec (ms)	Limit for time of occupancy on the Tx channel in 31.6 sec (ms)
DH1	2 442	0.256	81.92	400
DH3	2 442	1.256	200.96	400
DH5	2 442	2.949	314.56	400
2-DH1	2 442	0.257	82.24	400
2-DH3	2 442	0.754	120.64	400
2-DH5	2 442	1.009	107.63	400
3-DH1	2 442	0.247	79.04	400
3-DH3	2 442	0.577	92.32	400
3-DH5	2 442	1.142	121.81	400

#### Note:

DH1:	Dwell time (ms) × $[(1 600 \div 2) \div 79] \times 31.6(s) =$	81.92
DH3:	Dwell time (ms) × $[(1 600 \div 4) \div 79] \times 31.6(s) =$	200.96
DH5:	Dwell time (ms) × $[(1 600 \div 6) \div 79] \times 31.6(s) =$	314.56
2-DH1:	Dwell time (ms) × $[(1 600 \div 2) \div 79] \times 31.6(s) =$	82.24
2-DH3:	Dwell time (ms) × $[(1 600 \div 4) \div 79] \times 31.6(s) =$	120.64
2-DH5:	Dwell time (ms) × $[(1 600 \div 6) \div 79] \times 31.6(s) =$	107.63
3-DH1:	Dwell time (ms) × $[(1 600 \div 2) \div 79] \times 31.6(s) =$	79.04
3-DH3:	Dwell time (ms) × $[(1 600 \div 4) \div 79] \times 31.6(s) =$	92.32
3-DH5:	Dwell time (ms) × $[(1 600 \div 6) \div 79] \times 31.6(s) =$	121.81



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Report No.: KES-RF1-21T0008 Page (22 ) of (51)

В	DR(1Mbps)		EDR(2Mbps)				
		S) 💬	Spectrum Spectrum 2	() Spectrum 3 () Spectr	1 (8) F mur		
Rel Level 2.00 dBm Offset 0.75 dB # P Alt 20 dB # SWT 500 p4	BW 1 MHz			d8 🗰 RBW 1 MHz	1		
TRG:VID	an the		SGL TRGIVID	in an inter			
191	-02(1) T DE	0,97 dB 255,797 US	For-		-0,00 257,246		
10 dBm-		-2.80 dBm 2.500942 ms	-10 dBm-		-2.80 dB		
30 dBm		2:500912115	-20 dBm		0.7306701		
30 dBm			-30 dBm				
40 dBm			-40 d8m				
2 All marine			-S0 dBm				
50 dBm			Jeaker Michar Marina		La Arason Almost		
ro dem-			-70 dBm		ALL D. W. Mars		
00 dBm			-60 dBm				
0 dBm-			-90 d8m-				
F 2.442 GHz	691 pts	50.0 ps/	CF 2.442 GHz	691 pts	50.0 ps		
arker			Marker				
Yppe         Ref         Trc         X-value           M1         1         2.500942 ms           D2         M1         1         255.797 µs	Y-value Function     -2.86 dBm     0.97 dB	Function Result	Type         Ref         Trc         X-value           M1         1         3,75087           D2         M1         1         257.246	Y-value         Function           7 ms         -2,86 dBm           6 µs         -0.33 dB	Function Result		
12 M1 1 235.797 µ5	Neasuring-	1 44	U2 M1 1 -207-24		Ready Concerns 440		
		X		Spectrum 3 (X) Spectr	1 P mur		
tel Level 2.00 dBm Offset 0.76 dB = R Mt 20 dB = SWT 2 ms V			Att 20 dB - SWT 2	d8 RBW 1 MHz ms VBW 1 MHz			
RG:VID IPk Mas			SGL TRG1VID DIv Max				
Tor	02(1)	0.27 dB	Tim		-0,19 7 753.62		
0 dBm	-M1[1]	-2.30 dBm -2.50091 ms	-10 dBm-		-2,77 d \$.08035		
0 dBm			-30 dBm-				
i0 dBm-			-30 dBm				
40 dBm			-40 dBm				
Bill Comproving		Manus miser which	-S0 dBm		tre tre		
50 dBm-			werding and the first of the fi		Westerney way and the		
70 dBm-			-70 d8m				
90 dBm			-80 d8m				
0 dBm			-90 dBm-				
F 2.442 GHz	691 pts	200.0 ps/	CF 2.442 GHz	691 pts	200.D pr		
ype Ref Trc X-value		Function Result	Marker Type Ref Trc X-value	Y-value Function	Function Result		
M1 1 2 50094 ms D2 M1 1 1.2558 ms	-2.33 dBm 0.27 da	Function Result	M1 1 5.00036 D2 M1 I 753.65	5 ms -2.77 dBm	Function Reson		
	Neasuring	<b>61</b> 4,44			Ready Concerned 444		
tel Level 2.00 dBm Offset 0.76 dB = R	and the second sec	8	Ref Level 2.00 dBm Offset 0.75	Spectrum 3 Spectrum	un 4 (8)		
ALL 20 dB SWT 4 mi V			AIL 20 dB . SWT 4				
IPk Mas			10 19k Mas				
MI	11320-	0,54 dB 234935 ms		M	-0,09 1,00870		
0 dBm		-2:80 dBm 3.74652 ms	-10 dBm 7RG -14.000 dBm		-2.52 di 7.49935		
30 dBm			-20 dBm				
iti dBm			-30 dBm-				
0 dBm			-40 dBm-				
2 demand		homeogene	-50 dBm	ala	an in the design war war and a state of the second		
50 dBm			and the second of the second	ndew. MA	With Constraints Constraints Constraints Constraints		
70 dem			-70 d8m-				
o sen			-80 dBm				
eo dem			-90 dBm-				
eo dem			-30 001				
10 dem	691 pts	400.0 µs/	GF 2.442 GHz	691 pts	400.D g		
10 dBm 10 dBm F 2.442 GHz arker		400.0 µs/	GF 2.442 GHz Marker				
	- Charles - Char	400.0 ps/	CF 2.442 GHz	Y-value Function	400.D p		



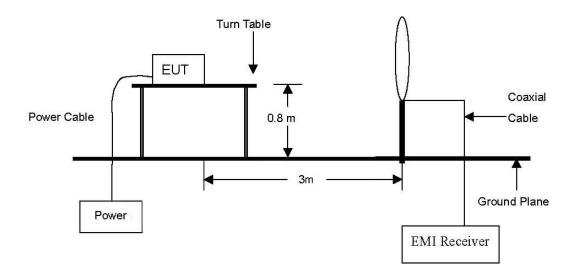
Spectrum Spectrum 2 (3) Spectrum :	3 (8) Spectrum 4	x	Spectru	n ) Con	ectrum ? - (8)	Spectrum		number	4 ×		(W
Ref Level 2.00 dBm Offset 0.75 dB = RBW 1 MHz	a Coll Spectrum 4			n Sp 2.00 d8m	Offset 0.76 d8		a col si	iecinin.	4		1
Alt 20 dB = SWT 500 µs VBW 1 MHz			Att	20 dB		VBW 1 MHZ					
SGL TRGIVID 1Pk Max			SGL TRGI	210							
IPE MAN	-02[1]	-0.58	DiPk Mas	r			Jourpe 02	11.70			-0.64
10	And Mart	247.101	us			MINNE		- T		1	1,14280 (
0 dBm	-MJ[1]	-2.81 d		TPG -14 00	0 dBm		-511	[1]			-2.36 dł 7.50072 i
0 dBm			-20 dBm-				+ +	-	-	1	1
O dBm-	1		-30 dBm					-			
0.000			500 500			_					
dBm-			-40 dBm-								-
D dBits-			-S0 dBin-			-	-	-	-		-
Sandraha Martin M. M. Stand		all as able a star	A. A	MANAN	and standing and	V		1421	Harris	port Acally	haven
a fille of the first of the fir		www. Wanth	460 BBM*		a) and the			-	a designed	-	
dem		1 1 1	-70 dBm-	-		-	-	_		-	-
) dBm			-80 dBm-		1						
			1	1 1							
) dBm			-90 dBm-	-		-					-
2.442 GHz 69	1 pts	50.0 p	/ GF 2.442	GHz		60	1 pts		-	-	400.0 p
rker	103		Marker					_			
the second se		Cancer 44	M1 D2	41 1 )(	7,50072 ms 1,14203 ms	-2.36 c -0.64		Read	dy Kam	10000 V	0.
Pectrum Spectrum 2 @ Spectrum ef Level 2.00 dkm Offset 0.76 dd = RBW 1 MHz tt 20 db = SWT 2 md VBW 1 MHz	Ready		D2	ni î J	1.14203 ms			Read	dy Car	CILLER 44	6
Spectrum         Spectrum 2         O         Spectrum 3           tel Level         2.00 dRm         Offset         0.76 dR         RHW 1 MHz           tt         20 dB         SWT         2 md         VBW 1 MHz           (at, TRG+VID)         (at, TRG+VID)         2 md         VBW 1 MHz	Ready		D2	MI I N	1.14203 ms			Read	dy kan	0009 4	0
R pectrum Spectrum 2 Spectrum el Level 2.00 dem Offset 0.76 dB = RBW 1 MHz tt 20 dB = BWT 2 ms VBW 1 MHz GL TRG:VID Pk Max	Ready			MI I J(	1,14203 ms			Read	dy kom	10009 44	0.
R pectrum Spectrum 2 Spectrum 3 S	Ready Ready	-1. tp 577.54		MI I JC	1,14203 ms			Read	dy kom		0.
R  pectrum Spectrum 2.00 8km Offset 0.76 dB RAW 1 Met C SL F8GrVID PK Max	Ready	·1. tp		м <u>а</u> 1 Л	1, 14203 ms			Read	dy Ka		0
Image: Constraint 2	Ready Ready	-1. tp 577.54 -2.84		м <u>а</u> <u>т</u>	1.14203 ms			Read	dy Kal		6
Spectrum         Spectrum         Spectrum           of Leval 2.00 dBm         Offset 0.76 dB, m RHW 1 MHz         20 dB = 8WT         2 ms         VBW 1 MHz           20 dB = 8WT         2 ms         VBW 1 MHz         2 ms         VBW 1 MHz           21 ffig:v1D         0 m         0 m	Ready Ready	-1. tp 577.54 -2.84		м <u>і</u> Т	1.14203 ms			Read	dy 💼	44	6
Image: Constraint 2	Ready Ready	-1. tp 577.54 -2.84		ni î R	1.14203 ms			Read	dy.		a
Image: Constraint 2	Ready Ready	-1. tp 577.54 -2.84		41 Î	1,14203 ms			Read	dy.	anni 4	a
N         Spectrum         Spectrum           of Level 2.00 dBm         Offset 0.76 dB, = RHW 3 MHz         20 dB = BWT         2 md         VBW 1 MHz           t         20 dB = BWT         2 md         VBW 1 MHz         1 MHz           t         20 dB = BWT         2 md         VBW 1 MHz           t         20 dB = BWT         2 md         VBW 1 MHz           t         1 dBm         mt         adVr           i dBm         0 dBm         0 dBm         0 dBm	Ready	-1.10 577.54 -2.48 d 5.00130		411 <b>1</b>	1.14003 ms	-0.64	de	Read	dy.	ana 4	a
Spectrum         Spectrum         Spectrum           of Level 2.00 dBm         Offset 0.76 dB, with MHz         20 dB with 2 ms         WBW 1 MHz           20 dB with 2 ms         VBW 1 MHz         20 dB with 2 ms         VBW 1 MHz           20 dB with 2 ms         VBW 1 MHz         0 ms         VBW 1 MHz           20 dB with 2 ms         VBW 1 MHz         0 ms         VBW 1 MHz           20 dB m         0 ms         0 ms         0 ms           0 dBm         0 dBm         0 dBm         0 dBm         0 dBm           0 dBm         0 dBm         0 dBm         0 dBm         0 dBm	Ready	-1.10 577.54 -2.48 d 5.00130			1.14203 ms	-0.64		Read	dy Co	*****	a
Image: Constraint 2         Operations 2         Spectrum           of Level 2.00 dbm         Offset 0.76 db = KRW 1 MHz         20 db = SWT         2 ms         VBW 1 MHz           20 db = SWT         2 ms         VBW 1 MHz         2 ms         VBW 1 MHz           20 db = SWT         2 ms         VBW 1 MHz         0 ms         0 ms           0 dbm         0 ms         0 ms         0 ms         0 ms           0 dbm         0 dbm         0 dbm         0 dbm         0 dbm           0 dbm         0 dbm         0 dbm         0 dbm         0 dbm	Ready	-1. tp 577.54 -2.84		41 1	1,14203 ms	-0.64	de	Read	ty is	annai 4	66
Spectrum         Spectrum         Spectrum           of Level 2.00 dBm         Offset 0.76 dB = KRW 1 MHz         20 dB = SWT         2 ms         VBW 1 MHz           1 FBG-VID         PK Max         7 ms         VBW 1 MHz         1 MHz           0 dBm         7 ms         VBW 1 MHz         1 ms         VMV           0 dBm         7 ms         VBW 1 MHz         1 ms         VMV           0 dBm         7 ms         VMV         1 ms         VMV           0 dBm         7 ms         1 ms         VMV         1 ms         VMV           0 dBm         7 ms         1 ms         VMV         1 ms         VMV           0 dBm         7 ms         1 ms         VMV         1 ms         VMV           0 dBm         7 ms         1 ms         1 ms         VMV         1 ms           0 dBm         7 ms         1 ms         1 ms         1 ms         VMV	Ready	-1.10 577.54 -2.48 d 5.00130			1,14203 ms	-0.64	de	Read	fy in	annai 4	66
Spectrum         Spectrum         Spectrum           of Level 2:00 Bin         Offset 0:76 dB = RHW 3 MHz           20 dB = SWT         2 ms         VBW 1 MHz           1 HB2/VD         2 ms         VBW 1 MHz           0 dB m         0 dB m         1 ms           0 dB m         1 ms         0 Mm           0 dB m         0 dB m         1 ms           0 dB m         0 dB m         0 dB m           0 dB m         0 dB m         0 dB m	Ready	-1.10 577.54 -2.48 d 5.00130		41 1	1.14003 ms	-0.64	de	Read	iv .		8
N         Spectrum         Spectrum         Spectrum           of Level 2.00 dBm         Offset 0.76 dB = 8 kW 3 MHz         20 dB = 8 WT         2 md         VBW 1 MHz           1 1 162/01         2 md         VBW 1 MHz         2 md         VBW 1 MHz           0 dBm         0 dBm         1 mt	Ready	-1.10 577.54 -2.48 d 5.00130		41 1	1.14003 ms	-0.64	de	Read	fy:		8
N         Spectrum         O         Spectrum           of Leval 2.00 dBm         Offset 0.76 dB = 8 kW 3 MHz         20 dB = 8 WT         2 md         VBW 3 MHz           1 FBc-VID         20 dB = 8 WT         2 md         VBW 3 MHz           0 dBm         0 dBm         0 dBm         0 dBm         0 dBm           0 dBm         0 dBm         0 dBm         0 dBm         0 dBm           0 dBm         0 dBm         0 dBm         0 dBm         0 dBm	Ready	-1.10 577.54 -2.48 d 5.00130			1.14203 ms	-0.64	de	Kead	dy:	uuu 4	6
Image: Constraint 2	Ready	-1.10 577.54 -2.48 d 5.00130			1.14003 ms	-0.64	de	Keas	dy:	4	6
Restrum         Spectrum         Spectrum           of Level 2.00 dBm         Offset 0.76 dB = 88W 1 MHz         Statution           (I Level 2.00 dBm         Offset 0.76 dB = 88W 1 MHz         Statution           (I RG-VD)         2 MB         WW 1 MHz           (I RG-VD)         2 MB         WW 1 MHz           (I RG-VD)         0 MB         I RG-VD           (I RG-VD)         I RG-VD         I RG-VD	Ready	-1.10 577.54 -2.48 d 5.60130			1.14003 ms	-0.64	de	Read	dy:		6
Spectrum         Spectrum         Spectrum           ef Level 2.00 f/set         0.05 et         0.75 df         = 8.8W 1 MHz           20 d5 = SWT         2 ms         VBW 1 MHz           20 d5 = SWT         2 ms         VBW 1 MHz           20 d5 = SWT         2 ms         VBW 1 MHz           0 d5m         0 d5m         1 ms         vm/s           0 d5m         0 d5m         0 d5m         0 d5m	Ready	-1.10 577.51 -2.48 d -5.00130 -2.48 d -2.48 d -2.49 d			1.1400 ms	-0.64	de	Keat	5y:	4	6
N         Spectrum 2*         Spectrum 3*         Spectrum 3*           of Loval 2.00 dBm         Offset 0.76 dB = 8KW 1 MHz         Status 1 MHz         Status 1 MHz           1 TGC/D         20 dB = 8KW 1 2 ms         VBW 1 MHz         Status 1 MHz         Status 1 MHz           1 TGC/D         20 ms         VBW 1 MHz         Status 1 MHz         Status 1 MHz         Status 1 MHz           0 dBm         0 dBm         Interview         Interview         Status 1 MHz         Status 1 MHz           0 dBm         0 dBm         Interview         Interview         Status 1 MHz         Status 1 MHz           0 dBm         0 dBm         Interview         Interview         Status 1 MHz         Status 1 MHz           0 dBm         0 dBm         Interview         Interview         Interview         Status 1 MHz           0 dBm         0 dBm         Interview         Interview         Interview         Status 1 MHz           0 dBm         Interview         Interview         Interview         Interview         Status 1 MHz           0 dBm         Interview         Interview         Interview         Interview         Status 1 MHz           0 dBm         Interview         Interview         Interview         Interview         Status 1	Ready	-1.10 577.54 -2.48 d 5.60130			1.1400 ms	-0.64	de	Reas	δγ: 		6



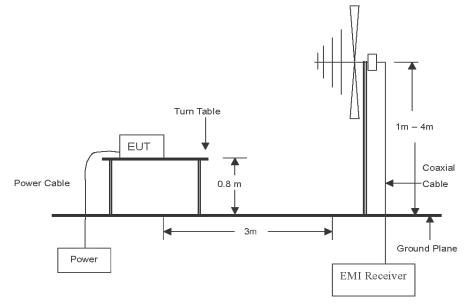
# 3.6. Radiated restricted band and emissions

#### Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



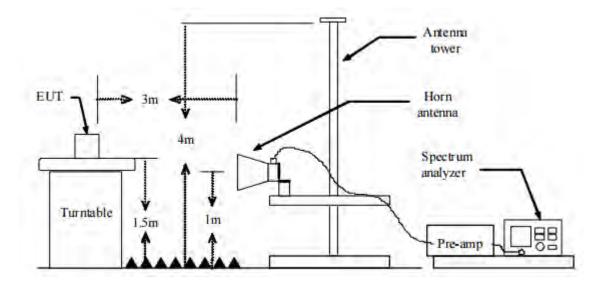
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 Mz to 1 Gz emissions.





Report No.: KES-RF1-21T0008 Page (25 ) of (51)

The diagram below shows the test setup that is utilized to make the measurements for emission from 1  $\mathbb{G}$  to the tenth harmonic of the highest fundamental frequency or to 40  $\mathbb{G}$  emissions, whichever is lower.





#### **Test procedure**

- 1. The EUT is placed on a turntable, which is 0.8 m (below 1 GHz) and 1.5 m (above 1 GHz) ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until the measurements for all frequencies are complete.
- 7. Spectrum analyzer settings for f < 1 GHz:

Span = wide enough to fully capture the emission being measured

RBW = 100 kHz  $VBW \ge RBW$ Sweep = auto
Detector function = quasi peak

- Trace = max hold
- 8. Spectrum analyzer settings for  $f \ge 1$  GHz: Peak Span = wide enough to fully capture the emission being measured

RBW = 1 Mb  $VBW \ge RBW$  Sweep = auto Detector function = peakTrace = max hold

9. Spectrum analyzer settings for  $f \ge 1$  GHz: Average

Average value of pulsed emissions.

Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determined from the peak field strength after correcting for the worst-case duty cycle as described in 7.5 in ANSI 63.10-2013 & Procedure 9(b) in the KDB 558074 v05r02.

10. Duty Cycle Correction Factor (79 channel hopping)

a. Time to cycle through all channels =  $\Delta t = \tau [ms] \times 79$  channels = 233.05 ms, where  $\tau =$  pulse width

b. 100 ms/ $\Delta t$ [ms] = H  $\rightarrow$  Round up to next highest integer, H '=1

c. Worst Case Dwell Time =  $\tau$ [ms] × H' = **2.950** ms

d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.60 dB

11. Both 2Mbps & 3Mbps data rate were investigated. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

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#### Note:

- 1. The spectrum is measured from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1 GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20 dB of the respective limits were not reported.
- 2. The loop antenna was investigated with three polarizations, and horizontal and vertical polarizations were reported as the worst case.
- 3. According to 15.35 (c), as a "duty cycle correction factor", pulse averaging with 20 log(duty cycle) has to be used.

Duty cycle correction factor =  $20\log(\text{dwell time}/100 \text{ ms})$ 

- 4. Emissions below 18 GHz were measured at a 3 meter test distance while emissions above 18 GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5. Average test would be performed if the peak result were greater than the average limit.
- 6. Field strength( $dB\mu N/m$ ) = Level( $dB\mu N$ ) + Correction factors(dB/m) + Cable loss(dB) + or F<sub>d</sub>(dB)
- 7. Correction factors(dB/m) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB)
- 8. Margin(dB) = Limit(dB $\mu$ V/m) Field strength(dB $\mu$ V/m)
- 9. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z, it was determined that  $\underline{X}$  orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in  $\underline{X}$  orientation.
- 10. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
- 11. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- 12. f < 30 MHz, extrapolation factor of 40 dB/decade of distance.  $F_d = 40\log(D_m / Ds)$

 $f \ge 30$  MHz, extrapolation factor of 20 dB/decade of distance.  $F_d = 20\log(D_m / D_s)$  Where:

 $F_d$  = Distance factor in dB

 $D_m$  = Measurement distance in meters

 $D_s$  = Specification distance in meters



## Limit

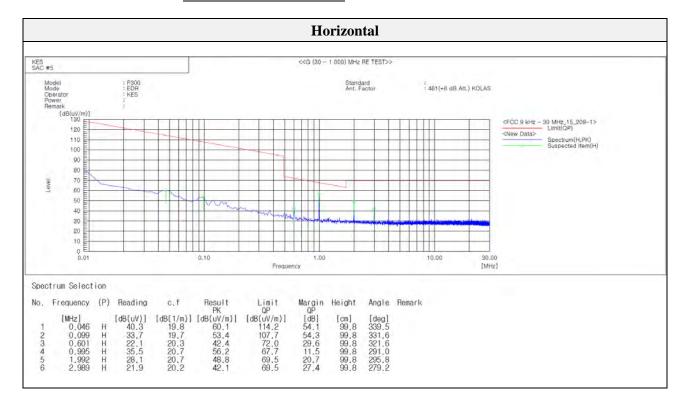
According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

Frequency (Mz)	Distance (Meters)	Radiated (µN/m)
0.009 ~ 0.490	300	2 400 / F(klz)
0.490 ~ 1.705	30	24 000 / F(kHz)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

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



Test results (Below 30 版)					
Mode:	EDR				
Transfer rate:	3 Mbps				
Distance of measurement:	3 meter				
Channel:	40(Worst case)				





Test results (Below 1 000	Test results (Below 1 000 Mz) – Worst case					
Mode:	EDR					
Transfer rate:	3 Mbps					
Distance of measurement:	3 meter					
Channel:	40(Worst case)					

				Н	orizontal // `	Vertical				
KES SAC #5					< <g (30="" -="" 000)="" 1="" mhz="" r<="" th=""><th>E TEST&gt;&gt;</th><th></th><th></th><th></th><th></th></g>	E TEST>>				
Mod Mod Oper Powe Rem	rator : H er ark	300 DR ES			Standar Ant. Fai		art. 15 Class B 3m i dB Att.) KOLAS			
TBMBT	(dB(w/m)) 130 100 100 90 80 80 50 50 40 80 50 50 10 10 30.00	50.00		0.00 Freque	anoy	500.00		Spec Susp	(QP) ctrum(H,PK) trum(V,PK) rected Item(H) rected Item(V)	
Spec No.	trum Select Frequency	ion (P)	Reading	c.f	Result	Limit	Margin	Height	Angle	Remark
1 2 3 4 5 6 7 8 9 10	[MHz] 119.968 167.983 215.998 456.073 503.724 33.395 119.968 167.983 215.998 696.026	エエエ	[dB(uV)] 47.9 55.5 55.8 45.5 41.3 52.2 39.9 53.5 49.7 41.5	[dB(1/m)] -15.3 -13.3 -15.3 -8.0 -7.3 -13.9 -15.3 -13.3 -15.3 -15.3 -4.0	PK [dB(uV/m)] 32.6 42.2 40.5 37.5 34.0 38.3 24.6 40.2 34.4 37.5	QP [dB(uV/m)] 43.5 43.5 43.5 46.0 46.0 40.0 43.5 43.5 43.5 43.5 46.0	QP [dB] 10.9 1.3 3.0 8.5 12.0 1.7 18.9 3.3 9.1 8.5	[cm] 400.3 200.2 200.2 99.7 99.7 149.9 400.3 99.8 149.9 99.8	[deg] 347.9 129.3 358.4 221.1 78.9 245.4 319.3 121.9 319.4 64.1	



#### Test results (Above 1 000 Mb)

Mode:	BDR
Transfer rate:	1 Mbps
Distance of measurement:	3 meter
Channel:	00

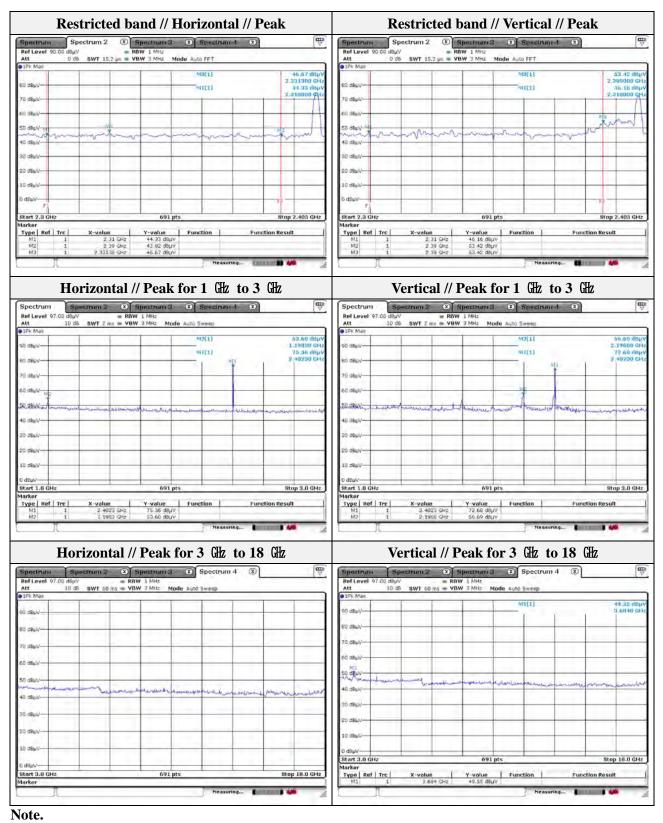
#### - Spurious

Frequency (MHz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1 198.30	53.60	Peak	Н	-10.11	-	43.49	74.00	30.51
2 196.80	56.69	Peak	V	-3.60	-	53.09	74.00	20.91
3 684.00	49.55	Peak	V	0.93	-	50.48	74.00	23.52

#### Band edge

Frequency (Mb)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµV/m)	Limit (dBµN/m)	Margin (dB)
2 331.38	46.67	Peak	Н	-3.02	-	43.65	74.00	30.35
2 390.00	53.42	Peak	V	-2.77	-	50.65	74.00	23.35





1. No spurious emission were detected above 3 GHz.



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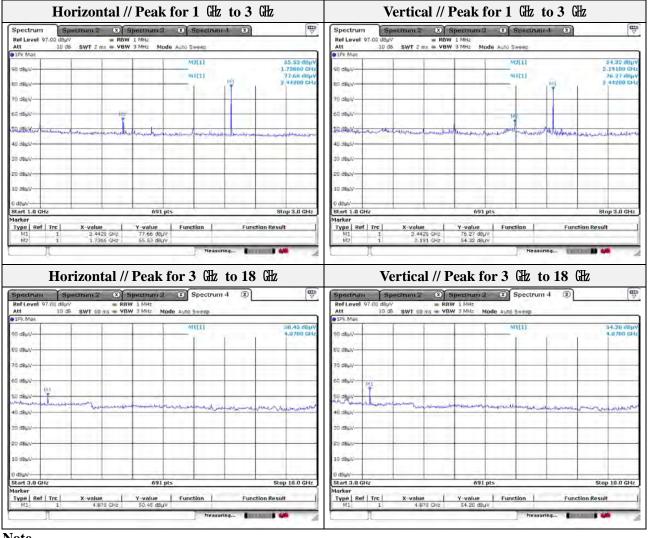
3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea Tel: +82-31-425-6200 / Fax: +82-31-424-0450 www.kes.co.kr

Mode:	BDR
Transfer rate:	1 Mbps
Distance of measurement:	3 meter

Channel:

40

Frequency (Mz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµV/m)	Margin (dB)
1 736.60	55.53	Peak	Н	-6.58	-	48.95	74.00	25.05
2 191.00	54.32	Peak	V	-3.62	-	50.70	74.00	23.30
4 878.00	50.45	Peak	Н	5.39	-	55.84	74.00	18.16
4 878.00	50.45	Average	Н	5.39	-30.60	25.24	54.00	28.76
4 878.00	54.20	Peak	V	5.39	-	59.59	74.00	14.41
4 878.00	54.20	Average	V	5.39	-30.60	28.99	54.00	25.01



#### Note.

1. Average test would be performed if the peak result were greater than the average limit.



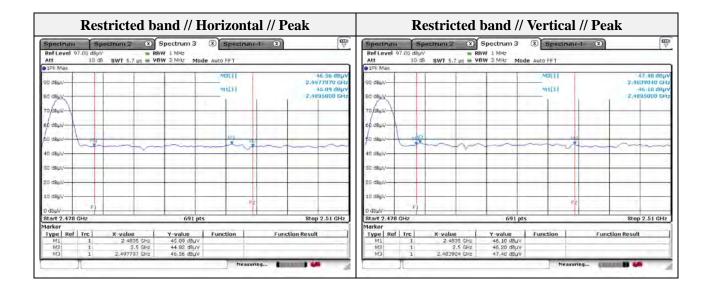
www.kes.co.kr

Mode:	BDR
Transfer rate:	1 Mbps
Distance of measurement:	3 meter
Channel:	78

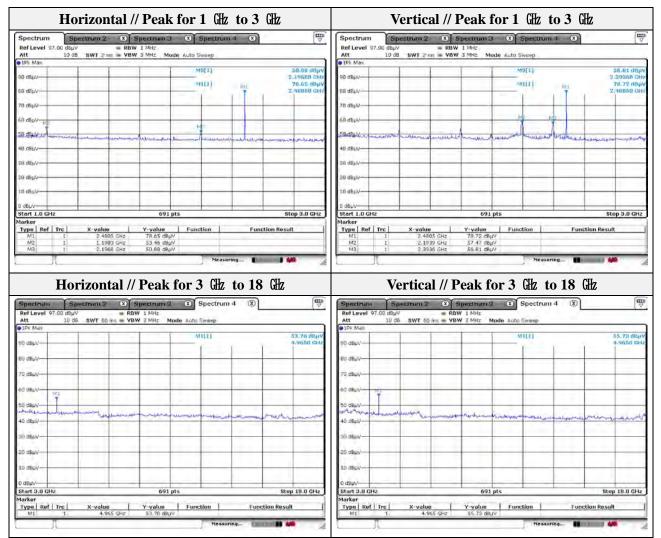
- Spurio	us							
Frequency (MLz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1 198.30	53.46	Peak	Н	-10.11	-	43.35	74.00	30.65
2 196.80	50.88	Peak	Н	-3.60	-	47.28	74.00	26.72
2 193.90	57.47	Peak	V	-3.61	-	53.86	74.00	20.14
2 393.60	56.81	Peak	V	-2.75	-	54.06	74.00	19.94
2 393.60	56.81	Average	V	-2.75	-30.60	23.46	54.00	30.54
4 965.00	53.70	Peak	Н	6.03	-	59.73	74.00	14.27
4 965.00	53.70	Average	Н	6.03	-30.60	29.13	54.00	24.87
4 965.00	55.73	Peak	V	6.03	-	61.76	74.00	12.24
4 965.00	55.73	Average	V	6.03	-30.60	31.10	54.00	22.90

#### - Band edge

Frequency (MLz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµV/m)	Limit (dBµN/m)	Margin (dB)
2 497.80	46.56	Peak	Н	-2.34	-	44.22	74.00	29.78
2 483.90	47.40	Peak	V	-2.40	-	45.00	74.00	29.00







#### Note.

1. Average test would be performed if the peak result were greater than the average limit.



Mode:	EDR
Transfer rate:	3 Mbps(Worst case)
Distance of measurement:	3 meter
Channel:	00

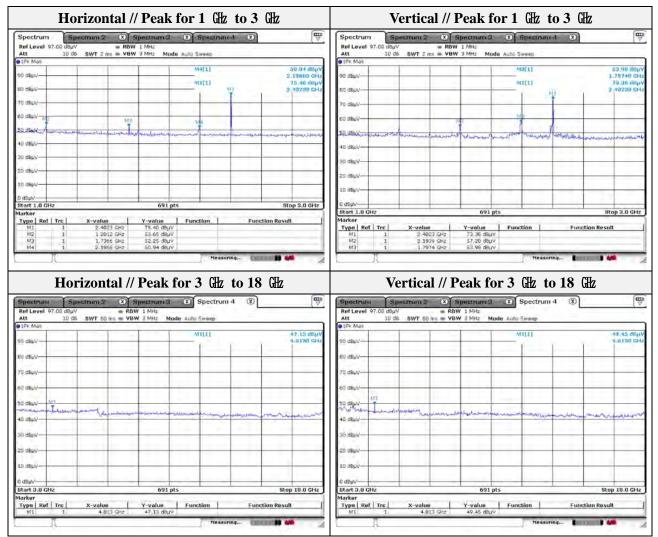
- Spurio	us							
Frequency (Mbz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµN/m)	Margin (dB)
1 201.20	53.65	Peak	Н	-10.09	-	43.56	74.00	30.44
1 736.60	52.25	Peak	Н	-6.58	-	45.67	74.00	28.33
2 196.80	50.94	Peak	Н	-3.60	-	47.34	74.00	26.66
2 193.90	57.20	Peak	V	-3.61	-	53.59	74.00	20.41
1 797.40	53.98	Peak	V	-6.11	-	47.87	74.00	26.13
4 813.00	47.13	Peak	Н	4.92	-	52.05	74.00	21.95
4 813.00	49.45	Peak	V	4.92	-	54.37	74.00	19.63
4 813.00	49.45	Average	V	4.92	-30.60	23.77	54.00	30.23

#### - Band edge

20000								
Frequency (Mbz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµV/m)	Limit (dBµN/m)	Margin (dB)
2 328.34	47.06	Peak	Н	-3.03	-	44.03	74.00	29.97
2 389.42	54.12	Peak	V	-2.77	-	51.35	74.00	22.65

Spectrum	Spectrum 2	() Spectrum 3	Spectrum-1	2	Spectrum	Spectrum 2	() Spectrum 3	× Spectru	n-1 🗵	ſ
Ref Level 90.0 Att		RBW 1 MHz	de Auto FFT				RBW 1 MHz	de Auto FET		
IPk Max		<ul> <li>• • • • • • • • • • • • • • • • • • •</li></ul>			1Pk Max					
80 d8µV			M0[1]	47,06 d9μV 2,329340 GHz 44,10 d8μV 2,310000 β(1z	80 d8µV			M8[1]		54,12 de 2,389420 d 44,34 de 2,310000 g
60 dBµV					ed dBµV			-		Mandal
50 dBµV	ringertyn	many	mynn	minitized t	50 dBµV- 40 dBµV- 30 dBµV-	un and	m	m	nam	
20 dBµV					20 dBµV					
IC dBµV				F2	6 d8pV					ER
Start 2.3 GHz		691 pt	5	Stop 2.405 GHz	Start 2.3 GHz		691 pt	\$		Stop 2.405 GH
larker Type Ref Tr M1 M2 M3	c X-value 1 2.31 G 1 2.39 G 1 9.32834 G	Hz 44.00 daµV	Function	Function Result	Marker           Type         Ref         Trc           M1         1           M2         1           M3         1	X-value 2.31 2.39 7.38942		Function	Function	Result





#### Note.

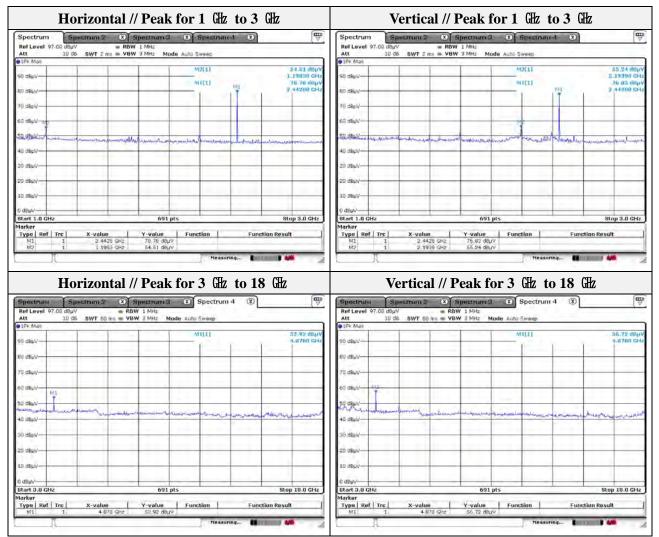
1. Average test would be performed if the peak result were greater than the average limit.



Mode:	EDR
Transfer rate:	3 Mbps(Worst case)
Distance of measurement:	3 meter
Channel:	40

- Spurio	us							
Frequency (MHz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµV/m)	Margin (dB)
1 198.30	54.51	Peak	Н	-10.11	-	44.40	74.00	29.60
2 193.90	55.24	Peak	V	-3.61	-	51.63	74.00	22.37
4 878.00	52.92	Peak	Н	5.39	-	58.31	74.00	15.69
4 878.00	52.92	Average	Н	5.39	-30.60	27.71	54.00	26.29
4 878.00	56.72	Peak	V	5.39	-	62.11	74.00	11.89
4 878.00	56.72	Average	V	5.39	-30.60	31.51	54.00	22.49





#### Note.

1. Average test would be performed if the peak result were greater than the average limit.



Mode:	EDR
Transfer rate:	3 Mbps(Worst case)
Distance of measurement:	3 meter
Channel:	78

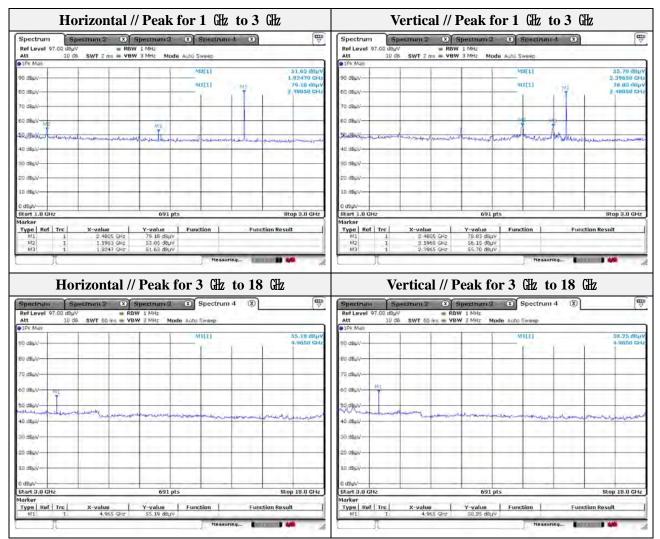
- Spurio	us							
Frequency (Mbz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµN/m)	Margin (dB)
1 198.30	53.05	Peak	Н	-10.11	-	42.94	74.00	31.06
1 924.70	51.63	Peak	Н	-5.05	-	46.58	74.00	27.42
2 196.80	56.15	Peak	Н	-3.60	-	52.55	74.00	21.45
2 396.50	55.70	Peak	V	-2.74	-	52.96	74.00	21.04
4 965.00	55.19	Peak	Н	6.03	-	61.22	74.00	12.78
4 965.00	55.19	Average	Н	6.03	-30.60	30.62	54.00	23.38
4 965.00	58.25	Peak	V	6.03	-	64.28	74.00	9.72
4 965.00	58.25	Average	V	6.03	-30.60	33.68	54.00	20.32

## - Band edge

Frequency (Mbz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµV/m)	Limit (dBµN/m)	Margin (dB)
2 500.00	47.52	Peak	Н	-2.34	-	45.19	74.00	28.82
2 492.98	48.00	Peak	V	-2.36	-	45.64	74.00	28.36

	mr-1 (R)	(X) Spectru	Spectrum 3	m 2 🛛 🛞	Specim	nin -	Spe		ectrum-1 (2)	I Sp	Spectrum 3	ectrum 2 🛛 🛞	Spe	pedrum
		e Auto FFT	BW 1 MHz BW 3 MHz Mod		10 dB . S1		Att		ग	de Auto FFT	BW 1 MHz BW 3 MHz Mo	SWT 5.7 UK . V		tef Level
			i			ax	9 1Pk		-	a contra				IPk Max
40.00 db 2,4929010 G 45,72 db		M0[1]		-			90 d9	47.52 d 2.5000000 15.62 d		M3[1	+ +	_		o deyuv-
2,4605000 0	1 4	_				1	2 80 dB	2,4005000		-1			_	O dBAN
						N	60 dB			_				D dBuV
	en		MS		-	+	50 dB		-	~				Vueb 9
							-40 dB		4					0 dBµV
							- 30 dB							0 dBy/V-
				_	_		- 10 dB			-			_	0 dBjyy
	F2			_	F)		O dBu		E2				FI	dBuV
Stop 2.51 GH			691 pts		12	.478 GH	Marke	Stop 2.51 G		5	691 pt		Hz	tart 2.478 arker
unction Result	Functi	Function	Y-value 45.72 dBµV	2.4835 GHz	rc X	Ref		nction Result	on Fum	Function	Y-value 45.62 dauv	X-value 2.4835 GHz	Trc	Type Ref
			45.05 dauv 48.00 dauv	2.5 GHz	1		M				47.52 dauv	2.5 GHz	1	M2 M3





#### Note.

1. Average test would be performed if the peak result were greater than the average limit.



Test results (18 GHz to 30	(Hz) – Worst case
Mode:	EDR
Transfer rate:	3 Mbps
Distance of measurement:	3 meter
Channel:	40(Worst case)

	Horizontal		Vertical						
Ref Level 93.00 d8µV	Spectrum 3 Spectrum 4     RBW 1 MHz     VBW 3 MHz     Mode Auto Sweep		Spectrum Spectrum Ref Level 93.02 dBµV Att 5 dB SWT	RBW 1 MHz BBW 2 MHZ Mode Auto	Spectrum 4 🛞	<b>∏</b> T			
90 dbµ/		5 8 7 6 5	19 с Карул 50 с Карул 50 с Карул 50 с Карул 50 с Карул 50 с Карул	No Jackan Age and a balan	and some the second	Multin			
40 dBuV 30 dBuV 20 dBuV			Ю авуу- 90 авуу- 25 авуу-						
10 авцу			10 dBuv						
Stort 18.0 GHz	691 pts Neasuring.		Start 18.0 GHz	691 pts	Neasuring	Stop 30.0 GHz			

## Note.

1. No spurious emission were detected above 18 GHz.



# **3.7.** Conducted band edge and out of band emissions

## **Test procedure**

ANSI C63.10-2013 - Section 7.8.4 and 7.8.8

### Test setup



## **Test setting**

- 1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions(e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
- 2. RBW = 100 kHz
- $3. \text{VBW} \geq 300 \text{ kHz}$
- 4. Detector = Peak
- 5. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = max hold
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

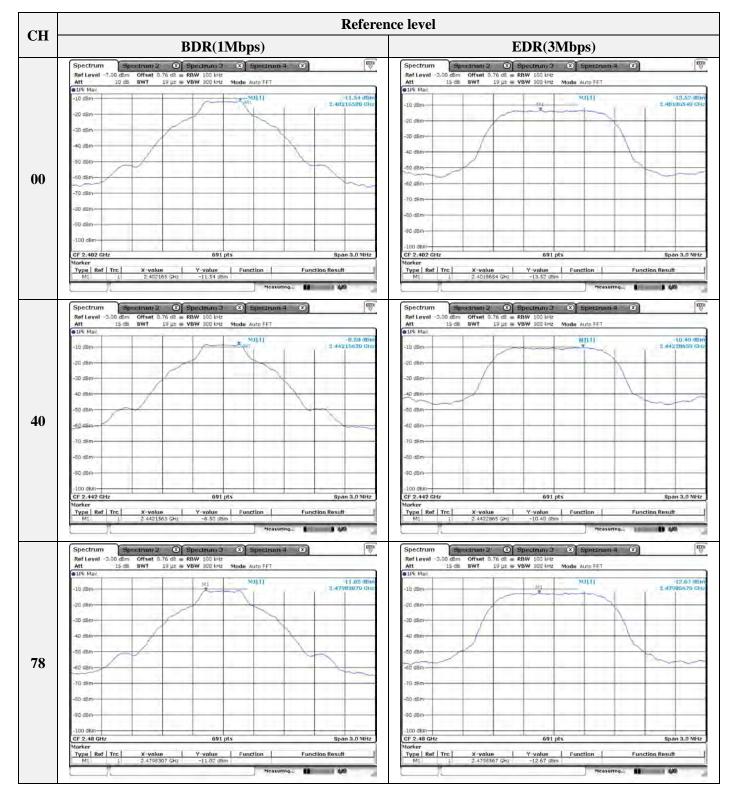
#### Limit

According to 15.247(d), 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see section 15.205(c))



Report No.: KES-RF1-21T0008 Page (44 ) of (51)

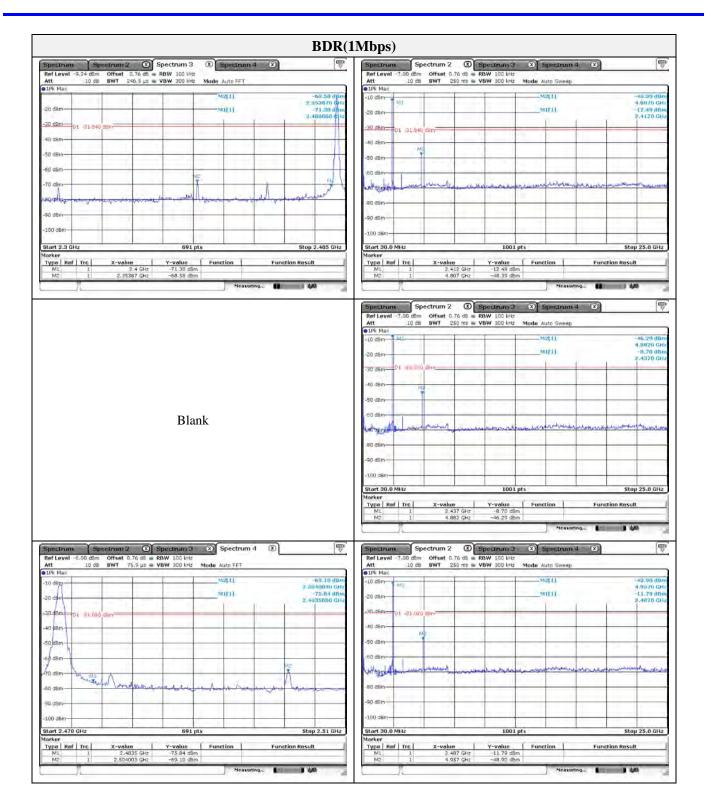
# **Test results**





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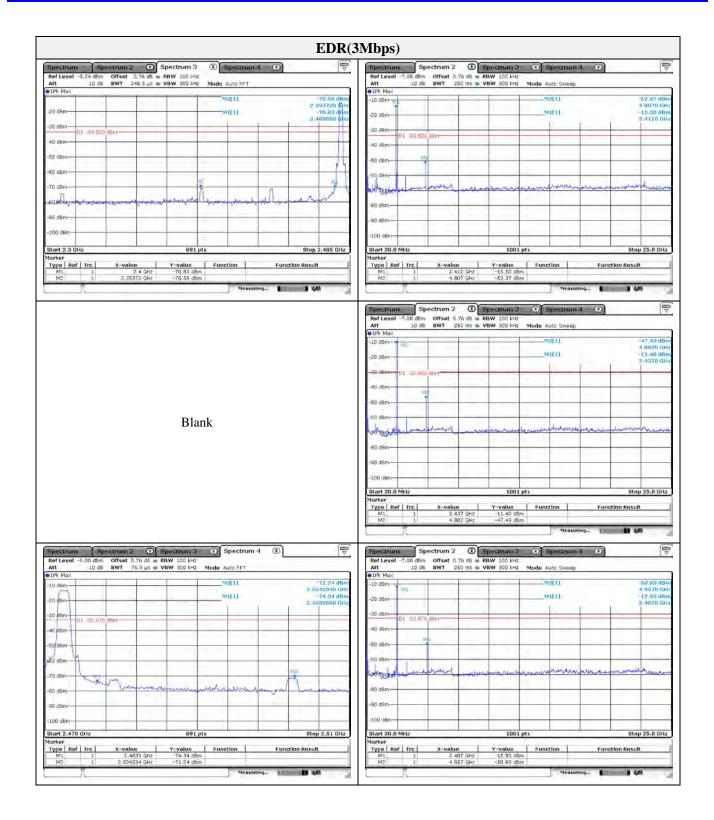
3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea Tel: +82-31-425-6200 / Fax: +82-31-424-0450 www.kes.co.kr Report No.: KES-RF1-21T0008 Page (45 ) of (51)





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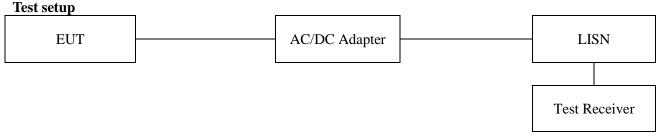


Spectrum 2 Spectrum 3 (Spectrum 4 8)	Spectrum 2 Spectrum 3 Spectrum 4 3
RefLevel -9.24 dBm Offset 0.76 dB = RBW 100 kHz	RefLevel -6.00 dBm Offset 0.76 dB RBW 100 kHz
Att 10 dB SWT 265.5 µs w VBW 300 kHz Mode Auto FFT	Att 10 dB SWT 75.9 µs a VBW 300 kHz Mode Auto FFT a 1Pk Max
-20 dBm- MI(1)	-10 mg/mg
20-05m	-30.286- 01-33.800 mm
50 dBm	-50 dBm
	-50 dBm
35000 ft that have a state of the state of t	-50 dBm
90 /Bm	-90 dBm
Start 2.3 GHz 691 pts Stop 2.42 GHz	Start 2.476 GHz 691 pts Stop 2.51 GHz
tarker	Marker
Type         Ref         Trc.         X-value         Y-unite         Function         Function Result           M1         1         2,4104 G42         -10.25 d6m         -	Type         Ref         Trc         X-value         Y-value         Function         Function           Mt1         1         2.47814 (494 - 10.88 dbm.         Function         Function Result           Mt2         1         2.47814 (494 - 0.03.70 dbm.         Function         Function Result           Mt3         1         2.4835 Gbg - 60.37 dbm.         Function         Function Result

Ref Level -5.24 (		Spectrum 3 d8 = RBW 100 kH	z	8	Spectrum Ref Level -	6.00 dBm	Offset 0.76 d8		Spectrum	4 🛞	_	1 C
Att 10 1Pk Max	dB SWT 265.	5 µs 🖬 VBW 300 kH	Mode Auto FFT		Att	10 dB	SWT 75.9 µs = 1	BW 300 kHz	Mode Auto FFT			
-20 d8m-			M8[1]. M1[1]	-10.01 dBm		M			Ma[1] M1[1]		2.48	-60.80 (B) 835000 CH -10.86 dBr 770090 CH
10 18m D1 80	210 Ben	_			-30 dBm	1 -30 840	dam			1		1
-40 dBm					Sec. Sec. 1	. Jourgeau		1				
-50 dBm-					-40 d6m			1	1.11.11.11			
					-50 dBm-	1	112					<u> </u>
-60 dBm-		1.1	an an at i an at	A P	-50 dBm	~	-	-	-	-	-	-
Radiand Horn Print	paraday maraday	an program for the	and a funder the new high	and the second	-70 dBm	_	V	myn	CANK MARCHIN	ANAM	MANAN	Monthing
-50 dBm-					-50 dBm	_			a to de here a	1.1	-	1.00
-50 dBm	_				-90 d8m-							-
-100 dBm							10.11		-1. The P. C.	1.1		
					-100 dBm-						-	1
Start 2.3 GHz		691	pts	Stop 2.42 GHz	Start 2.476	GHz	•	691	ots	-	Stop	p 2.51 GHz
Type   Ref   Trc	X-value	Y-value	1 Function 1	Function Result	Marker Type   Ref	Trel	X-value	Y-value	Function 1	Fur	ction Result	a.
MI 1 M2 1	2,41783				MTE	1	2.477009 GHz	-10.85 dBr				
	2.4	GHz -63.64 dB	im		M2 M3	1	2.4835 GHz	-60.80 dBr -60.80 dBr				



# **3.8.** AC conducted emissions



# Limit

According to 15.207(a), 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 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

	Conducted limit (dBµN/m)					
Frequency of Emission (Mz)	<b>Quasi-peak</b>	Average				
0.15 - 0.50	66 - 56*	56 - 46*				
0.50 - 5.00	56	46				
5.00 - 30.0	60	50				

# Note:

- 1. All AC line conducted spurious emission are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and the appropriate frequencies. All data rates and modes were investigated for conducted spurious emission. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.
- 3. Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).



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# **Test results**





Appendix A. Mea	asurement equipme	nt			
Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum Analyzer	R&S	FSV40	101002	1 year	2021.07.02
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2022.01.15
DC POWER Supply	AGILENT	6632B	MY43004114	1 year	2021.06.22
Power Meter	Anritsu	ML2495A	1438001	1 year	2022.01.14
Pulse Power Sensor	Anritsu	MA2411B	1339205	1 year	2022.01.14
Loop Antenna	Schwarzbeck	FMZB1513	225	2 years	2021.02.15
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	715	2 years	2022.12.08
Horn Antenna	A.H	SAS-571	414	2 years	2021.02.11
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA 9170550	2 years	2021.02.19
Preamplifier	R&S	SCU01	100603	1 year	2021.11.25
Preamplifier	AGILENT	8449B	3008A01742	1 year	2021.12.29
EMI Test Receiver	R&S	ESU26	100551	1 year	2021.04.01
EMI TEST RECEIVER	R & S	ESR3	101781	1 year	2021.12.29

#### ... ъл 4 - 4 . 1. .

# **Peripheral devices**

Device	Manufacturer	Model No.	Serial No.
Notebook computer	LG Electronics Inc.,	LGS53	306QCZP560949