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TEST REPORT

Part 15 Subpart C 15.247

Equipment under test DUAL-MODE BABY MONITOR

Model name SEM-3057WN

Derivative model SEM-3055WN

FCC ID NLMSEM3057WN

Applicant Hanwha Techwin Co., Ltd.

Manufacturer RDI Technology (Shenzhen) Co., Ltd.

Date of test(s) 2016.12.29 ~ 2017.01.09

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Revision history

Revision	Date of issue	Test report No.	Description
-	2017.01.10	KES-RF-17T0003	Initial



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1. General info	ormation			
Applicant:	Hanwha Techwin Co., Ltd.			
Applicant address:	1204, Changwon-daero, Seongsan-gu, Changwon-si			
	Gyeongsangnam-do, South Ko	rea		
Test site:	KES Co., Ltd.			
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	473-21, Gayeo-ro, Yeoju-si, G	yeonggi-do, Korea		
FCC rule part(s):	15.247			
FCC ID:	NLMSEM3057WN			
Test device serial No.:	Production	Pre-production	Engineering	

1.1. EUT description

Equipment under test	DUAL-MODE BABY MONITOR
Frequency range	FHSS: 2 408 Mz ~ 2 468 Mz
	BT: 2 402 MHz ~ 2 480 MHz
Model:	SEM-3057WN
Derivative model	SEM-3055WN
Modulation technique	FHSS, GFSK
Number of channels	FHSS : 16
	BT : 40
Antenna specification	FHSS Antenna type : Dipole, Peak gain: 2.0 dBi
	BT Antenna type : Patch, Peak gain: 2.14 dBi
Power source	DC 3.7 V (Rechargeable Battery)

1.2. Test configuration

The <u>Hanwha Techwin Co., Ltd. DUAL-MODE BABY MONITOR FCC ID: NLMSEM3057WN</u> was tested per the guidance of KDB 558074 D01 v03r05. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.



1.3. Frequency/channel operations

Ch.	Frequency (Mb)	Rate(Mbps)
00	2 402	1
20	2 442	1
		•
39	2 480	1

1.4. Accessory information

Applicant	Equipment	Manufacturer	Model	Power source
-	-	-	-	-

1.5. Device modifications

N/A

1.6. Derivation model information

Software of derivation model is different from the basic model. The circuit diagram and hardware are fundamentally same. It is for model management purpose.



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2. Summary of	tests	
Reference	Parameter	Test results
15.247(a)(2)	6 dB bandwidth and 99% occupied bandwidth	Pass
15.247(b)(3)	Peak output power	Pass
15.247(e)	Power spectral density	Pass
15.205 15.209	Radiated restricted band and emission	Pass
15.247(d)	Conducted spurious emission and band edge	Pass
15.207(a)	AC conducted emissions	Pass



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3. Test results

3.1. 6 dB bandwidth

Test procedure

KDB 558074 D01 v03r05 – Section 8.1 or 8.2 Used test method is section 8.1.

Section 8.1

- 1. RBW = 100 kHz.
- 2. VBW \geq 3 \times 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 frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Section 8.2

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW \ge 3 \times RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \ge 6 dB.

Limit

According to \$15.247(a)(2), systems using digital modulation techniques may operate $902 \sim 928$ Mb, $2400 \sim 2483.5$ Mb, and $5725 \sim 5850$ Mb bands. The minimum 6 dB bandwidth shall be at least 500 kb.



Test results

Frequency(Mz)	6 dB bandwidth(Mz)	Limit(Mz)
2 402	0.677	
2 442	0.674	0.5
2 480	0.683	

Spectrum 2	×			Spectrum	Spectrum 2	×					
tef Level 10.75 dBm Offset :	10.75 dB RBW 100 kHz	Mode Auto FET		Ref Level 10	0.75 dBm Offset 1	0.75 dB 👄 R	BW 100 kHz	Mode à	uto FET		
Pk View	ters pr e tert see and	Mode Haterry		• 1Pk View			277 999 mile	Mode a	acorri		
		M1[1]	-2.65	5 dBm 8 GHz				M1[1]		-3.67
IBm		ndB T2	6.0	00 dB 0 dBm		**	M1	ndB	- 70		6.0
) dBm	-		677.30000000	546.6 -10 dBm-		P P		Q fa	ctor		674.400000000
D d8m				20 d8m						~	
				-20 dbm						-	
) dBm				-30 dBm					-		
dBm				-40 dBm-							~
10				to dow							
uom				-50 ubin-							
dBm				-60 dBm							
dBm-				-70 dBm-							
10-1				00 40 -							
usm				-80 aBm-							
2.402 GHz	691 pts	5	Span 2.0	MHz CF 2.442 GHz			691 pts				Span 2.0
ker	1			Marker							
pe Ref Trc X-value M1 1 2.4020	e Y-value 126 GHz -2.65 dBm	ndB down	Function Result 677.3	3 kHz M1	1 2.44202	26 GHz	-3.67 dBm	Function ndB de	own	Functi	ion Result 674.4
T1 1 2.40166	71 GHz -8.59 dBm	ndB	6.0				and the second se		ndB		6.0
2 1 2 41230		O fastes	0.04	00 dB T1	1 2.441667	71 GHz	-9.64 dBm	0.61	TIUD		0.00
ectrum Spectrum 2	(X)	Q factor	354 354 82.01.20 12:29:1	10 dB 46.6 172 116	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	ring		362 362 12:28:2
ectrum Spectrum 2 of Level 10.75 dBm Offset 1 tt 10 dB SWT	(¥4 GH2 -3.62 dbm (¥4 GH2 -3.62 dbm (¥6 GH2 -3.62 dbm))	Q factor Measuring Mode Auto FFT	354 622120 122201	00 dB T1 46.6 T2 110 ₩ ♥	1 2.441667 1 2.442341	71 GHz	-9.64 dBm -9.70 dBm	Q fai	iring	ABARBAR 4	62.01.201 12:28:2
sctrum Spectrum 2 f Level 10.75 dBm Offset : t 10 dB SWT view	(8) -8.62 dbm (8) -8.62 dbm 10.75 db ● RBW 100 kHz 18.9 µs • VBW 300 kHz	Q factor Measuring Mode Auto FFT M1[1]	354 (111111) (4) (2012) 11231	00 dB 171 146.6 T2 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 172 171 175 172 171 175 175 175 175 175 175 175	1 2.441667 1 2.442341	1 GHZ	-9.64 dBm -9.70 dBm	Q fai	ring		6.00 362 42.01.201 12:28:2
sctrum Spectrum 2 fi Level 10.75 dbm Offset 1 t 10 db SWT < View	(¥) -8.62 dbm (¥) -8.62 dbm (10.75 dB ● RBW 100 kHz 18.9 µs ● VBW 300 kHz 18.9 µs ● VBW 300 kHz 442	Q factor Measuring Mode Auto FFT M1[1]	354 ••••••••••••••••••••••••••••••••••••	0 db T1 T2 T1 T2 T1 T2 T2 T2 T2 T2 T2 T2 T2 T2 T2	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	ring		0.00 362 02.01.201 12:28:2
sctrum Spectrum 2 fLevel 10.75 dBm Offset t 10 dB SWT c View	Image: Weight of the second	Q factor Measuring Mode Auto FFT M1[1] ndB Bw [2	354 2354 2364 2364 2364 2364 2364 2365 248022032 6.6 6.623.100000000 6.633.100000000	00 d8 . T1 T2 11 15 10 10 10 10 10 10 10 10 10 10	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	iring		0.00 362 92,01,201 12:28:2
Spectrum 2 fLevel 10.75 dBm Offset t 10 dB SWT View m dBm	Image: Sec: Sec: Sec: Sec: Sec: Sec: Sec: Se	Q factor Measuring Mode Auto FFT M1[1] ndB Byr Q factor	354 354 2330 2300 2300 2300 2300 -4.29 2.4800203 6.6 683.10000000 380 380 380 380 380 380 3	00 db (6, 6) (71) (72) (72) (72) (72) (72) (72) (72) (72	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	iring	ARREAD 4	6.0.0 362 201.201 12:20:2
sctrum Spectrum 2 Hevel 10.75 dbm Offset t 10 db SWT Klew dbm dbm dbm	Image: Second secon	Q factor Measuring Mode Auto FFT M1[1] ndB BW Q factor Q factor	354 	00 db 12 T2 12 T2	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	ring		0.00 362 0.01.20 12:20:2
setrum Spectrum 2 # Level 10.75 dBm Offset t 10 dB SWT View m dBm dBm dBm		Q factor Messuring Mode Auto FFT M1[1] nd8 Q factor Q factor	-4.23 -4.23 -4.9002033 -4.9002033 6.683.100000000 	00 dB T2 T2 T2 T2 T2 T2 T2 T2 T2 T2	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	ring	ALANAHAN 4	0.00 362 0.01.20 12:28:2
sctrum Spectrum 2 filevel 10.75 dBm Offset t 10 dB SWT Wew m JBm JBm		Q factor Measuring Mode Auto FFT MI[1] nd8 Bwr 12 Q factor	354 2007 2	00 d8 T1 T2 T2 T2 T2 T2 T2 T2 T2 T2 T2	1 2.441667 1 2.442341	21 GHz 15 GHz	-9.64 dBm -9.70 dBm	Q fat	ring		0.00 362 12282
sctrum Spectrum 2 f Level 10.75 dBm Offset t 10 dB SWT Wew m J8m J8m J8m	•••••••••••••••••••••••••	Q factor Measuring Mode Auto FFT Mi[1] ndB Ber Q factor	-4.29 2.480c203C 6.6 6.3.10000000 38	20 dBm 20 dBm 20 dBm 00 dHz 00 dHz 10 kHz 1630.7	1 2.441667 1 2.442341	1 GHz 5 GHz	-9.64 dBm -9.70 dBm	Q fat	ring		362 362 1212812
sctrum Spectrum 2 flowel 10.75 dbm Offset t 10 db SWT View m dbm dbm dbm dbm dbm dbm dbm dbm dbm d	€ -8.62 dBm 0.75 dB ● RBW 100 kHz 18.9 μs ● VBW 300 kHz 11.75 dB ● RBW 100 kHz 14.1	Q factor Measuring Mode Auto FFT M1[1] ndB Bwr Q factor Q factor	-4.29 -4.29 2.48002037 6.6 683.10000000 38	00 d8 00 d8 172 172 172 172 172 172 172 172	1 2.441667 1 2.442341	1 GHz 5 GHz	-9.64 dBm -9.70 dBm	Q far	ring		362 12.202
setrum Spectrum 2 f Level 10.75 dBm Offset t lo dB SWT View m dBm dBm dBm dBm dBm dBm dBm	-8.62 dbm -8.62 dbm	Q factor Nessuring Mode Auto FFT M1[1] nd8 8w Q factor Q factor	354 	00 db (6.) T1 (72) (72) (72) (72) (72) (72) (72) (72)	1 2.441667 1 2.442341	11 GHz	-9.64 dBm -9.70 dBm	Q far	ring		0.00 302 12.202
Spectrum 2 f Level 10.75 dBm Offset t 10 dB SWT View m JBm JBm JBm JBm JBm JBm JBm		Q factor Q factor Mode Auto FFT MI[1] nd8 Bw Q factor 2 Q factor	354 2007 2	00 dB T2 T2 T2 T2 T2 T2 T2 T2 T2 T2	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fa	ring		362 362 12,282
setrum Spectrum 2 fteel 10.75 dBm Offset t 10 dB SWT View m dBm dBm dBm dBm dBm dBm dBm	€ -8.62 dBm 0.75 dB ● RBW 100 kHz 18.9 μs ● VBW 300 kHz T1 42	Q factor Q factor Measuring Mode Auto FFT MI[1] ndB Byr I2 Q factor	-4.29 2.48002031 6.6 6.83.10000000 38 	20 dB 72 72 72 72 72 72 72 72 72 72	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fa	ring		362 201201 112002
ctrum Spectrum 2 [tevel 10.75 dbm Offset 10 db SWT View n n lbm lbm lbm lbm lbm	•••••••••••••••••••••••••	Q factor Measuring Mode Auto FFT MI[1] MI[1] Q factor Q factor	-4.29 -4.29 2.48002036 6.6 6.63.10000000 38	00 dB 12 12 15 15 15 15 15 15 15 15 15 15	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fat	ittor		362 2012
Spectrum 2 Spectrum 2 f Lovel 10.75 dbm Offset t 10 db SWT View m dbm dbm dbm dbm dbm dbm dbm	-8.62 dbm -8.62 dbm	Q factor Measuring Mode Auto FFT M1[1] ndB Bwr T2 Q factor	-4.29 -4.29 2.48002037 6.6 6.63.1000000 -38 -4.29 -	00 d8 d6 d6 d6 d7 T1 d7	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fat	ring		362 202 12:202
sctrum Spectrum 2 f Level 10.75 dBm Offset t lo dB SWT View m dBm dBm dBm dBm dBm dBm dBm		Q factor Measuring Mode Auto FFT MI[1] nd8 Bw Q factor Q factor S	354 2007 2	00 db T1 T2 T2 0 dbm 0 db 0 db	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fat	into interior		362 362 12.202
Spectrum 2 flevel 10.75 dBm Offset t 10 dB SWT View m dBm		Q factor Measuring Mode Auto FFT Mi[1] nd We Q factor S Function		00 dB T1 T2 T2 T2 T2 T2 T2 T2 T2 T2 T2	1 2.441667	1 GHz	-9.64 dBm -9.70 dBm	Q fat	into interior interio		362 201291 112002
Spectrum Spectrum 2 of Level 10.75 dBm Offset 10 dB SWT k View 10 dB SWT dBm dBm dBm 10 dB SWT		Q factor Q factor Measuring Mode Auto FFT Mi[1] nd8 Ber I2 Q factor S Function nd8 down nd8	354 12253 12555 122555 122555 12255 12255 12255 12255 12255 12255 12255 12	00 dB 172 172 173 174 175 175 175 175 175 175 175 175	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	iring		362 2012
actrum Spectrum 2 of Lavel 10.75 dbm of Lavel 10.8 wirw 10 db dbm 0db dbm 0db <		Q factor Q factor Measuring Mode Auto FFT M1[1] ndB Bwr Cf factor Q factor s Function ndB down ndB Q factor	354 23300 23300 23300 23300 23300 2400 2400 2400 2400 36 635,10000000 37 64 685,10000000 38 64 685,10000000 38 64 65 65 65 65 65 65 65 65 65 65	00 db (6, 6) T1 (72) T2 (72) T	1 2.441667 1 2.442341	1 GHz	-9.64 dBm -9.70 dBm	Q fai	itto		362 362 12.202



3.2. 99% occupied bandwidth

Test procedure

ANSI C63.10-2013

Limit

None; for reporting purpose only.

Test results

Frequency(Mz)	99% occupied bandwidth(Mz)	Limit(MHz)
2 402	1.010	
2 442	1.013	-
2 480	1.016	



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3.3. Peak output power

Test procedure KDB 558074 D01 v03r05 – section 9.1.1 or 9.1.2 Used test method is section 9.1.1.

Section 9.1.1

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is gr eater than the DTS bandwidth.

- 1. Set the RBW \geq DTS bandwidth.
- 2. Set VBW \geq 3 \times RBW.
- 3. Set span \geq 3 \times RBW
- 4. Sweep time = auto couple
- 5. Detector = peak
- 6. Trace mode = max hold
- 7. Allow trace to fully stabilize
- 8. Use peak marker function to determine the peak amplitude level

Section 9.1.2

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS ba ndwidth and shall utilize a fast-responding diode detector.

Limit

According to §15.247(b)(3), For systems using digital modulation in the 902~928 MŁ, 2 400~2 483.5 MŁ, and 5 725~5 850 MŁ bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted out-put power. Maximum Conducted Out-put Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to \$15.247(b)(4), The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmit-ting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (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.



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Frequency(Mz)	Peak output power(dBm)	Limit(dBm)
2 402	-2.56	
2 442	-3.58	30
2 480	-4.21	





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3.4. Power spectral density Test procedure KDB 558074 D01 v03r05 – section 10.2

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

Limit

According to \$15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.



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Frequency(Mz)	PSD (dBm)	Limit(dBm)
2 402	-7.06	
2 442	-9.64	8
2 480	-10.00	





3.5. 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.



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



Test procedure below 30 Mz

- 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- 3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum hold mode.

Test procedure above 30 Mbz

- 1. Spectrum analyzer settings for f < 1 GHz:
 - ① Span = wide enough to fully capture the emission being measured
 - 2 RBW = 100 kHz
 - ③ VBW \ge RBW
 - ④ Detector = quasi peak
 - 5 Sweep time = auto
 - 6 Trace = max hold
- 2. Spectrum analyzer settings for $f \ge 1$ GHz: Peak
 - ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
 - 2 RBW = 1 M/z
 - ③ VBW \ge 3 ML
 - (4) Detector = peak
 - (5) Sweep time = auto
 - 6 Trace = max hold
 - \bigcirc Trace was allowed to stabilize

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- 3. Spectrum analyzer settings for $f \ge 1$ GHz: Average
 - ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
 - (2) RBW = 1 M/z
 - (3) VBW $\geq 3 \times RBW$
 - ④ Detector = RMS, if span/(# of points in sweep) \leq (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak. Detector function = peak
 - 5 Averaging type = power (i.e., RMS).
 - 6 Sweep time = auto.
 - \bigcirc Perform a trace average of at least 100 traces.
 - 8 A correction factor shall be added to the measurement results prior to comparing to the emission limit.

Note.

1. f < 30 MHz, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/Ds)$

 $f \ge 30$ Mz, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/Ds)$

Where:

- F_d = Distance factor in dB
- $D_m =$ Measurement distance in meters
- Specification distance in meters D_s =
- 2. CF(Correction factors(dB)) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or $F_d(dB)$
- Field strength($dB\mu N/m$) = Level($dB\mu N$) + CF (dB) + or DCF(dB) 3.
- 4. $Margin(dB) = Limit(dB\mu N/m) - Field strength(dB\mu N/m)$
- 5. 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.
- 6. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z, it was determined that **Y** orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in **Y orientation**.
- The worst-case emissions are reported however emissions whose levels were not within 20 dB of 7. respective limits were not reported.



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 (Mb)	Distance (Meters)	Radiated (µV/m)
0.009 ~ 0.490	300	2 400 / F(klz)
0.490 ~ 1.705	30	24 000 / F(klz)
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.



Duty cycle

Regarding to KDB 558074 D01_v03r05, 6.0, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW \geq OBW if possible; otherwise, set RBW to the largest available value. 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.

Ton time	Period	Duty cycle	Duty cycle	Minimum VBW	Duty cycle correction factor
(MS)	(ms)	(Linear)	(%)	(kHz)	(dB)
0.478 3	0.623 2	0.767 4	76.75	2.09	1.15

Note.

- 1. Duty cycle (Linear) = T_{on} time/Period
- 2. Duty cycle(%) = (Tx on time / Tx on + off time) x 100
- 3. Minimum VBW(kHz) = 1/T_{on}, where T is on time in second
- 4. DCF(Duty cycle correction factor (dB)) = 10log(1/duty cycle)

Spectrum	St	bectru	ım 2	×	Spec	trum 3	0	Sp Sp	ectrur	n 4	(X)			□
Ref Level 1 Att SGL	0.75 dBr 10 d	n C B 🕳 S	offset WT	10.75 di 10 m	B 👄 RE 5 VE	W 1 MH	iz Iz	_						
1Pk Clrw			0											
		1						D3[1]				-	4.18 di
dem							aler.						6	23.2 µ
					-		D2	M1[11 ~				-39.	02 dBn
-10 dBm		++-											4.7	101 m
-20 dBm														
-30 dBm		+				MI		_	_			_		_
40 dBm	+			+		-	- pp		+					++
SO dBm							H							
60 dBm														
1 W	4		W	H	L.	J		V	1	5	W	W	U	5
70 dBm	v	0.	•		-	ų	a.					400-0		
-80 dBm		-			-			_		_		-	-	
CF 2.442 GH:	2				_	691	pts	_					1.	0 ms/
1arker														
Type Ref	Trc	X	value		Y-	value		Functio	on		Func	tion Res	sult	
M1	1		4.71	.01 ms	-	39.02 dB	m							
D2 M1 D3 M1	1		47	8.3 µs 3.2 µs		-4.18 (iB							
)	[Rea	ady	BREE	IIIIII III	4/4	02.01.	2017

Middle channel

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Test results (I	Below 30 Mbz)					
Mode:		BLE					
Distance of m	easurement:	3 meter					
Channel:		00 (Worst	case)				
Frequency	Level	Ant. Pol.	CF	Fa	Field strength	Limit	Margin

Frequency	Level	Ant. Pol.	CF	Fd	Field strength	Limit	Margin
(MHz)	(dBµV)	(H/V)	(dB)	(dB)	$(dB\mu V/m)$	$(dB\mu V/m)$	(dB)
No spurious emissions were detected within 20 dB of the limit							

Horizontal	Vertical				
Spectrum 2 🗴	Spectrum Spectrum 2 🗴				
Ref Level 57.00 dBpV	Ref Level 57.00 dBpV RBW (6dB) 200 Hz				
PIPK View	PIPK View				
M1[1] -1.80 dBpV	M1[1] -1.84 dByV				
	So deput				
40 dBµV	40 dBµV				
30 dBµV	30 dBµV-				
00.40.47					
20.0804	20 dbpv-				
10 dBµV	10 dBµV				
0 dBµV	0 dBµV-				
- un remelling and a second seco	when and and and a set of the set				
-10 dBuy - a consequence and a short down and a consequence and the land manual when the short when the	-10 dBW				
-20 dBµV	-20 dBµV				
-30 dBi//	-30 dBuV				
-40 dBµV	-40 dBµV Start 9.0 kHz 691 nts Stor 150.0 kHz				
Marker	Marker				
Type Ref Trc Stimulus Response Function Function Result M1 1 95.62 kHz -1.80 dBuV -1.80 dBuV <td< th=""><th>Type Ref Trc Stimulus Response Function Function Result M1 1 94.4 kHz -1.84 dBuV -1.84 dBuV</th></td<>	Type Ref Trc Stimulus Response Function Function Result M1 1 94.4 kHz -1.84 dBuV				
Measuring	Measuring 📲 ann an 🚧				
Spectrum Spectrum 2 (3)	Spectrum Spectrum 2 🗷				
Ref Level 67.00 dBµV ■ RBW (6dB) 9 kHz Att 0 dB SWT 2.1 ms ■ VBW 100 kHz Mode auto FFT	Ref Level 67.00 dBµV ■ RBW (6dB) 9 kHz Att 0 dB SWT 2.1 ms ■ VBW 100 kHz Mode Auto FFT				
●1Pk View	01Pk View				
60 d8x6/-	60 db //				
50 dBµV	50 dBµV-				
40 dBuV	40 dBu/v				
30 dBµV-	30 dBµV-				
20 dBuV	20 dBuV-				
10 dBµV	10 dBµV				
Menorth more have been about menor the hand have have a set and the strand the stranger and the set and	Unay regenerated with a result of a start of the source of the two of a start and a start of the source of the sou				
-10 dBµV	-10 dBµV				
-20 dBuV	-20 dBµV				
-30 dBµV					
Marker 591 pts Stop 30.0 MHz	Start 150.0 KHZ 691 pts Stop 30.0 MHz				
Measuring Measuring 🔐	Measuring				



Test results (Below 1 000 Mz)				
Mode:	BLE			
Distance of measurement:	3 meter			
Channel:	00 (Worst case)			



Note.

- 1. All spurious emission at channels are almost the same below 1 GHz, so that <u>low channel</u> was chosen at representative in final test.
- 2. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.



Test results	(Above	$1\ 000$	MHz)
--------------	--------	----------	------

Mode:	BLE

Distance of measurement: 3 meter Channel: 00

Frequency (Mbz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµV/m)	Margin (dB)
2301.00	54.80	Peak	Н	-2.04	-	52.76	74.00	21.24
2301.00	49.88	Peak	V	-2.04	-	47.84	74.00	26.16
2356.00	55.80	Peak	Н	-1.93	-	53.87	74.00	20.13
2356.00	53.49	Peak	V	-1.93	-	51.56	74.00	22.44
2390.00	46.39	Peak	Н	-1.86	-	44.53	74.00	29.47
2390.00	48.67	Peak	V	-1.86	-	46.81	74.00	27.19
2384.07	60.99	Peak	Н	-1.87	-	59.12	74.00	14.88
2348.97	38.42	Average	Н	-1.94	1.15	37.63	54.00	16.37
2384.07	54.49	Peak	V	-1.87	-	52.62	74.00	21.38
2431.30	55.71	Peak	Н	-1.75	-	53.96	74.00	20.04
2431.30	52.27	Peak	V	-1.75	-	50.52	74.00	23.48
4813.00	41.20	Peak	Н	6.56	-	47.76	74.00	26.24
7222.00	36.32	Peak	Н	13.80	-	50.12	74.00	23.88
4812.60	37.93	Peak	V	6.55	-	44.48	74.00	29.52
7222.00	34.26	Peak	v	13.80	-	48.06	74.00	25.94

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Spectrum						Spectru	n					E
Ref Level 97.00 di	μΥ 🖷 🛚	RBW 1 MHz				Ref Leve	97.00 dBp	Y	RBW 1 MHz			
Att 0	dB 🛛 SWT 45 ms 🖷 V	BW 3 MHz Mode	Auto Sweep			Att	0 di	B SWT 45 ms	VBW 3 MHz	Mode Auto Sweep		
JPK VIEW	1 1	1	M1[1]		0.45 dbull	OTEK VIEW	r 1			M1[1]		27.15 dB
90 dBuV	-		milli		.8130 GHz	90 dBuV-				milil		4.8130 G
30 dBµV	-					80 dBµV-				<u>├──</u>	+	
			_									
O GRHA						70 dBµV-						
50 dBuV			_			60 dBuV-						
50 dBµV	+ +		-++			50 dBµV-				<u> </u>		
MI							1.11					
40 dBµV						40 dBµV-	Y					1
30 dBuy	moderny when we	an promotion	- Henner	march Might way	webscharle	30 dBuV	alyman	martin	march and	and and the	un mener mar	mention
20 dBµV		-				20 dBµV-	-				+	_
10 dBµV						10 dBµV-						_
0 dBuV						0 dBuV						
Start 3.0 GHz		691 pts		Stop	18.0 GHz	Start 3.0	GHz		691	pts		Stop 18.0 GH
larker	10.000 m					Marker				é		
Type Ref Trc	Stimulus	Response F	Function	Function Result		Type R	ef Trc	Stimulus	Response	Function	Function F	tesult



Mode:	BLE
Distance of measurement:	3 meter
Channel:	20

Frequency (Mbz)	Level (dBµV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµV/m)	Margin (dB)
2347.30	53.58	Peak	Н	-1.95	-	51.63	74.00	22.37
2347.30	53.29	Peak	V	-1.95	-	51.34	74.00	22.66
2416.80	54.04	Peak	Н	-1.79	-	52.25	74.00	21.75
2416.80	53.69	Peak	V	-1.79	-	51.90	74.00	22.10
2477.60	51.46	Peak	Н	-1.62	-	49.84	74.00	24.16
2477.60	53.25	Peak	V	-1.62	-	51.63	74.00	22.37
2547.00	53.78	Peak	Н	-1.33	-	52.45	74.00	21.55
3076.00	37.56	Peak	V	0.33	-	37.89	74.00	36.11
4878.00	38.93	Peak	Н	7.01	_	45.94	74.00	28.06

Spectrum Ref Level	Sp 117.00 dB 20	ectrum 2 (X)	Spectrum 3 BW 1 MHz	Spectr	um 4 🛞		Spectrun Ref Leve	n Sj I 117.00 d	BHV PR	Spectrum 3 BW 1 MHz	Spectro	um 4 🛞	(q
1Pk View	20	ab 3971 4 115	DW 1986 MD	de Adto Sweep			1Pk View		1 GD 3 W1 4 IIIS 4	DH I HILL HU	de Adto Sweep		
110 dBµV				M1[1]		53.58 dBµV 2.34730 GHz 54.04 dBuV	110 dBµV-				M3[1]		53.25 dBj 2.47760 GF 53.29 dBr
100 dBµV						2.41680 GHz	100 dBµV—					1	2.34730 G
80 dBµV							90 dBµV					4	
70 dBµV							70 dBµV						
50 dBµV					M1 M2 M3 M4		60 dBµV					M1 M2 M3	
40 dBµV-	للهماسي المستعينا	hallowed and the second s	u phanendisch	- Haddenstradiet de	when the standard	mandered	50 dBuV-	mandwast	el mar and the second second	moternee	helinestron	ul lehenen	and the second second
30 dBµV							30 dBµV						
Start 1.0 CH	7		691 nts	<u> </u>		Stop 3.0 GHz	20 dBuV						
larker			051 pts	<u>, </u>		otop olo driz	Start 1.0	GHz		691 pts	5	-	Stop 3.0 GH
Type Ref	Trc	Stimulus	Response	Function	Function	Result	Marker		1000.000 - 1000				
M1 M2	1	2.3473 GHz 2.4168 GHz	53.58 dBµV 54.04 dBµV				Type Re M1	1 1	2.3473 GHz	Response 53.29 dBµV	Function	Fun	ction Result
M4	1	2.547 GHz	53.78 dBµV				M3	1	2.4776 GHz	53.25 dBµV			

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Ho	rizontal //	Peak for 3	GHz to 18 GHz	l	V	ertical // P	eak for 3	GHz to 1	8 GHz	
Spectrum Ref Level 97.00 dB	µV ● RB ¹ dB SWT 45 mc ● VB	W 1 MHz W 3 MHz Mode Auto S	w020		Spectrum S Ref Level 97.00 dB	pectrum 2 (X)	W 1 MHz W 3 MHz Mode A	to Sween		
1Pk Max	ab 341 45 ms 6 45	House Mode Auto St	weep		1Pk View	ub 341 45 115 8 45	House Mode Ac	ito Sweep		
90 dBµV-		M1[1]	38.93 dBµV 4.8780 GHz	90 dBµV-			M1[1]	37 3.(1.56 dBµV 0760 GHz
80 dBµV					80 dBµV					
70 dBµV					70 dBµV					
60 dBµV					60 dBµV					
50 dBµV					50 dBµV					
40 dBUV	many between	me of the presence of the	mandament MM	orthownand	30 dBµV	mumor Marine	hanged and providence of the	nd begun un un un solution	www.man	mymm
20 dBµV					20 dBµV					
10 dBµV					10 dBµV					
0 dBµV-					0 dBµV-					
Start 3.0 GHz		691 pts		Stop 18.0 GHz	Start 3.0 GHz		691 pts	k	Stop 1	18.0 GHz
Marker Type Ref Trc M1 1	Stimulus 4.878 GHz	Response Functio	on Function Re	sult	Marker Type Ref Trc M1 1	Stimulus 3.076 GHz	Response Fu 37.56 dBµV	nction	Function Result	
			rieasuring					rieasuring		lh



Mode:	BLE
Distance of measurement:	3 meter
Channel:	39

Frequency (Mbz)	Level (dBµN)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBµN/m)	Limit (dBµV/m)	Margin (dB)
2347.32	50.48	Peak	Н	-1.95	-	48.53	74.00	25.47
2347.32	52.89	Peak	V	-1.95	-	50.94	74.00	23.06
2416.80	54.54	Peak	Н	-1.79	-	52.75	74.00	21.25
2416.80	54.89	Peak	V	-1.79	-	53.10	74.00	20.90
2483.50	52.04	Peak	Н	-1.60	-	50.44	74.00	23.56
2483.50	49.72	Peak	V	-1.60	-	48.12	74.00	25.88
2483.55	51.88	Peak	Н	-1.60	-	50.28	74.00	23.72
2483.55	49.45	Peak	V	-1.60	-	47.85	74.00	26.15
2509.40	53.45	Peak	Н	-1.51	-	51.94	74.00	22.06
2509.40	51.69	Peak	V	-1.51	-	50.18	74.00	23.82
3076.00	38.97	Peak	Н	0.33	-	39.30	74.00	34.70
4965.00	37.74	Peak	Н	7.62	-	45.36	74.00	28.64



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Horizon	ital // Peak fo	or 1 GHz t	o 3 GHz	Vertie	cal // r eak 10) UTZ
pectrum Spectrum 2	Spectrum 3	Spectrum 4	8	Spectrum Spectrum	12 X Spectrum 3	Spectrum 4 🛛 🛞	
Ref Level 117.00 dBµV	RBW 1 MHz	to the Durane		Ref Level 117.00 dBµV	RBW 1 MHz	tute Cureen	
Att 20 00 owi 1Pk View	4 ms vow 1 mmz moue	Auto sweep]	Att 20 up by	VT4ms vow 1mmz mou	a Auto sweep	
		M2[1]	54.54 dBμV			M2[1]	54.89 dB
10 dBµV		-	2.41680 GHz	110 dBµV		11111	2.41680 G
IO dBuV		MILTI	2.34732 GHz	100 dBµV-		MILII	2.34732 G
normania manazia							
dBµV				90 dBµV			
dBuV-				80 dBµV			
dBµV-				70 dBµV			
dBµV	+	012	10	60 d8µV		Las 612	
		M1 T	Ť			Y 1. W	
dBUV	unanonan manan una	manufinanterflood	Adamment and the second	29 BHV manufacture and a second	in a second with the second	un for a la flat the	manuna marine
dBµV				40 dBµV			
JBµV-				30 gBhA-			
dBµV		_		20 dBµV			
rt 1.0 GHz	691 pts		Stop 3.0 GHz	Start 1.0 GHz	691 pts		Stop 3.0 GH
ker	- 1 - 1			Marker			
Horizon	tal // Peak fo	r 3 GHz to	18 (#z	Vertic	al // Peak for	3 (Hz to 1)	8 GHz
Horizon	tal // Peak fo	or 3 GHz to) 18 GHz	Vertic Spectrum Spectrum	al // Peak for	3 GHz to 1	8 GHz
	tal // Peak fo	or 3 GHz to) 18 GHz	Vertic	al // Peak for	3 GHz to 1	8 GHz
	RBW 1 MHz ms VBW 3 MHz Mode	or 3 GHz to) 18 GHz	Vertic	al // Peak for	3 GHz to 1	8 GHz
Horizon trum Level 97.00 dBµV 0 dB swr 45 riew	ERBW 1 MHZ ms VBW 3 MHZ Mode	Auto Sweep	→ 18 GHz	Vertic Spectrum Ref Level 97.00 dBµV Att 0 dB swr	al // Peak for	a GHz to 1	8 GHz
Horizon	RBW 1 MHz ms VBW 3 MHz Mode	Auto Sweep	→ 18 GHz 37.74 dbµV 4.9650 GHz	Vertic Spectrum Spectrum Ref Level 97.00 dBµV Att 0 dB swr 90 dBµV	al // Peak for	a Auto Sweep	8 GHz
	RBW 1 MHz 5 ms VBW 3 MHz Mode	Auto Sweep M2[1] M1[1]	→ 18 GHz 37.74 dBµV 4.9650 GHz 30.760 GHz 30.97 dBµV	Spectrum Spectrum Ref Level 97.00 dbµ/ Att 0 db swr 91Pk View 90 dbµ/	al // Peak for	3 GHz to 1	8 GHz
Horizon	RBW 1 MHz sms • VBW 3 MHz Mode	Auto Sweep M2[1] M1[1]	37.74 dBµV 4.9650 GHz 38.97 dBµV 38.97 dBµV 3.0760 GHz	Spectrum Spectrum Ref Level 97.00 dBµV 0 dB swr PIPk View 0 dB swr 90 dBµV 0 dB swr	al // Peak for	Auto Sweep	8 GHz
Horizon	RBW 1 MHz s ms • VBW 3 MHz Mode	Auto Sweep M2[1] M1[1]	→ 18 GHz (Spectrum Spectrum Ref Level 97.00 dBµ/ att 0 dB Mt 0 dB swr 90 dBµ/ b b 80 dBµ/ b b	al // Peak for	a Auto Sweep	
Horizon	RBW 1 MHz s ms VBW 3 MHz Mode	Pr 3 CHz to	37.74 dbµV 37.74 dbµV 4.9650 GHz 38.97 dbµV 3.0760 GHz	Spectrum Spectrum Ref Level 97.00 dbµ/ 0 db swr Att 0 db swr 90 dbµ/ 0 80 dbµ/ 0 70 dbµ/ 0	al // Peak for RBW 1 MH2 45 ms • VBW 3 MH2 Mode	• Auto Sweep	
Horizon trum cevel 97.00 dBµV iew v v v	RBW 1 MHz sms • VBW 3 MHz Mode	Pr 3 GHz to	27.74 dBµV 4.9650 dHz 30.760 dHz 3.0760 dHz	Spectrum Spectrum Ref Lovel 97.00 dBµV Att 0 dB w 0 dB w	al // Peak for	a GHz to 18	
Horizon	RBW 1 MHz B RBW 1 MHz S ms • VBW 3 MHz Mode	Pr 3 GHz to	2 18 CHz (₩ 37.74 dBµV 4.9650 GHz 38.97 dBµV 3.0760 GHz 1.0760 GHz	Spectrum Spectrum Ref Level 97.00 dBµV 0 dB swr • IPIC View 0 dB swr • O dBµV 90 dBµV 80 dBµV 90 dBµV 80 dBµV 60 dBµV	al // Peak for	9 Auto Sweep	
Horizon	RBW 1 MHz s ms • VBW 3 MHz Mode	Pr 3 CHz to	→ 18 GHz 37.74 dbµV 4.9650 GHz 38.97 dbµV 3.0760 GHz	Spectrum Spectrum Ref Level 97.00 dbµ/ Att 0 db swr 01Pk View 0 db swr 0 db gy/ 80 dbµ/ 0 db gy/ 0 db gy/ 70 dbµ/ 60 dbµ/ 50 dbµ/	al // Peak for RBW 1 MH2 45 ms • VBW 3 MH2 Mode	2 3 GHz to 18	
Horizon trum Level 97.00 dBµV riew N N N N N N N N N N N N N	RBW 1 MHz RBW 1 MHz Sms VBW 3 MHz Mode	Pr 3 GHz to	18 GHz	Spectrum Spectrum Ref Lovel 97.00 dBµV Att 0 dB W 0 dB SWT 90 dBµV B 80 dBµV B 70 dBµV B 50 dBµV S0 dBµV	al // Peak for	a GHz to 18	
	ERBW 1 MHz BBW 1 MHz Sms VBW 3 MHz Mode	Pr 3 GHz to	0 18 CHz 37.74 dBµV 4.9650 GHz 38.97 dBµV 3.0760 GHz 3.0760 GHz	Spectrum Spectrum Ref Lovel 97.00 dBµ/ Att 0 dB Swr • IPIC View 0 dB W 0 dB W • DIC View 0 dB BWT • DIC View • DIC	al // Peak for	3 GHz to 18	
Horizon	RBW 1 MHz s ms VBW 3 MHz Mode	Pr 3 CHz to	■ 18 GHz 37.74 dbµV 4.9650 GHz 38.97 dbµV 3.0760 GHz 	Spectrum Spectrum Ref Level 97.00 dbµ/ Att 0 db swr 01Pk View 0 db swr 0 db gwr 90 dbµ/ 0 db gwr 0 db gwr 90 dbµ/ 0 db gwr 0 db gwr 90 dbµ/ 0 dbµ/ 0 dbµ/	al // Peak for RBW 1 MH2 45 ms • VBW 3 MH2 Mode	2 3 GHz to 18	
Horizon	RBW 1 MHz RBW 1 MHz S ms VBW 3 MHz Mode	Auto Sweep M2[1] M1[1]	18 GHz	Spectrum Spectrum Ref Lovel 97.00 dBµV Att 0 dB yV 0 dB yW 90 dBµV Bth	al // Peak for	3 GHz to 18	8 GHz
Horizon	tal // Peak fo	Pr 3 GHz to	37.74 dBµV 4.9650 GHz 38.97 dBµV 3.0760 GHz 4.9650 GHz 38.97 dBµV 3.0760 GHz	Spectrum Spectrum Ref Level 97.00 dBµV 0 dB swr Att 0 dB swr PIPk View 0 dB swr 90 dBµV 0 dB swr 80 dBµV 0 dB swr 90 dBµV 0 dBµV	al // Peak for	3 GHz to 18	8 GHz
Horizon	RBW 1 MHz s ms • VBW 3 MHz Mode	Pr 3 CHz to	D 18 GHz 37.74 dbµV 4.9650 GHz 38.97 dbµV 3.0760 GHz 	Spectrum Spectrum Ref Level 97.00 dbµ/ Att 0 db swr 0 db swr 91Pk View 0 db swr 90 dbµ/ 0 dbµ/ 80 dbµ/ 0 dbµ/ 90 dbµ/ 0 dbµ/	al // Peak for	3 GHz to 18	8 GHz
Horizon	RBW 1 MHz RBW 1 MHz S ms VBW 3 MHz Mode	Auto Sweep M2[1] M1[1]	18 GHz	Spectrum Spectrum Ref Lovel 97.00 dBµV Att 0 dB yV 0 dB yW 90 dBµV 0 dB yW	al // Peak for	3 GHz to 18	8 GHz
Horizon	tal // Peak fo	Pr 3 CHz to	D 18 CHz 37.74 dBµV 4.9650 GHz 38.97 dBµV 3.0760 GHz 3.0760 GHz 4.9650 GHz 38.97 dBµV 3.0760 GHz 3.0760	Spectrum Spectrum Ref Level 97.00 dBµV 0 dB swr Att 0 dB swr PIPK View 0 dB swr 90 dBµV 0 dBµV 80 dBµV 0 dBµV 90 dBµV 10 dBµV	al // Peak for	• Auto Sweep	8 GHz
Horizon	RBW 1 MHz RBW 1 MHz S ms VBW 3 MHz Mode	Pr 3 CHz to	D 18 GHz 37.74 dbµV 4.9650 GHz 38.97 dbµV 3.0760 GHz 	Spectrum Spectrum Ref Level 97.00 dbµ/ Att Att 0 db swr 91Pk View 0 db swr 90 dbµ/ 0 dbµ/ 80 dbµ/ 0 dbµ/ 90 dbµ/ 0 dbµ/	al // Peak for	• Auto Sweep	8 GHz
Horizoni	RBW 1 MHz RBW 1 MHz S ms VBW 3 MHz Mode	Pr 3 GHz to	18 GHz	Spectrum Spectrum Ref Level 97.00 dbµV 0 db SWT • IPk View 0 db SWT • IPk View 0 db SWT • O dbµV 0 db SWT • IPk View 0 db SWT • O dbµV 0 db SWT • O dbµV 0 db SWT • O dbµV 0 dbµV	al // Peak for	• Auto Sweep	8 GHz
Horizon	tal // Peak fo	Pr 3 CHz to	18 GHz 37.74 dBµV 4.9650 GHz 38.97 dBµV 3.0760 GHz 3.0760 GHz 3.0760 GHz 5.0760 GHz	Spectrum Spectrum Ref Level 97.00 dBµ/ Att 0 dB swr IPR View 0 dB swr 0 dB swr IPR View 0 dB gwr 0 dB swr IPR View 0 dB gwr 0 dB gwr IPR VIEW IPR VIEW IPR VIEW IPR V	al // Peak for	3 GHz to 18	8 GHz



lest results (18 GHz to 30 GHz)					
Mode:	BLE				
Distance of measurement:	3 meter				
Channel:	00(Worst case)				

Frequency	Level	Ant. Pol.	CF	Fd	Field strength	Limit	Margin	
(MHz)	(dBµN)	(H/V)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
	No spurious emissions were detected within 20dB of the limit							

Horizontal	Vertical
Spectrum (1) Ref Level 87.00 dBµV ● RBW 1 MHz	Spectrum (100) Ref Level 87.00 dBµV • RBW 1 MHz
Att 0 dB SWT 36 ms VBW 3 MHz Mode Auto Sweep Ptk View	Att 0 dB SWT 36 ms VBW 3 MHz Mode Auto Sweep P1Pk View
80 dBµV	80 d8µV
70 dBµV-	70 dBµV
60 dBµV	60 dB ₄ N
50 dBµV	50 dBµV
40 dbw	40 de los
20 dBµV	20 dBµV
10 dBµV	10 dBµV
0 dBµV	0 dBµV
-10 dBµV	-10 dBµV
Marker Measuring	Marker Measuring

Note.

- 1. Average test would be performed if the peak result were greater than the average limit.
- 2. Actual = Reading + AFCL(Ant. factor Amp. gain + Cable loss) + DCF(Duty cycle correction factor)
- 3. Duty cycle correction factor = $20\log(\text{dwell time}/100 \text{ ms})$



3.6. Conducted spurious emissions & band edge

Test procedure Band edge

KDB 558074 D01 v03r05 – Section 11.3

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. **RBW** = 100 kHz
- 4. VBW = 300 kHz
- 5. Detector = Peak
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = max hold
- 8. Sweep time = auto
- 9. The trace was allowed to stabilize

Out of band emissions

KDB 558074 D01 v03r05 - Section 11.3

- 1. Start frequency was set to 30 MHz and stop frequency was set to 25 GHz for 2.4 GHz frequencies and 40 GHz for 5 GHz frequencies (separated into two plots per channel)
- 2. RBW = 100 kHz
- 3. VBW = 300 kHz
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep time = auto couple
- 7. 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))



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Test results



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Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum Analyzer	R&S	FSV30	10076	1 year	2017.07.06
Spectrum Analyzer	R&S	FSV40	101002	1 year	2017.07.06
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2017.01.25
PSG Analog Signal Generator	Agilent	E8257C	US42340237	1 year	2017.07.05
Attenuator	KEYSIGHT	8493C	82509	1 year	2017.01.25
Loop Antenna	R&S	HFH2- Z2.335.4711.52	826532	2 years	2017.03.03
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	9168-713	2 years	2017.05.15
Horn Antenna	A.H.	SAS-571	781	2 years	2017.05.07
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170550	2 years	2017.04.30
High Pass Filter	WAINWRIGHT INSTRUMENT	WHJS3000-10TT	1	1 year	2017.07.04
Low Pass Filter	WEINSCHEL	WLK1.0/18G-10TT	1	1 year	2017.07.04
Preamplifier	HP	8449B	3008A00538	1 year	2017.07.05
Broadband Amplifier	SCHWARZBECK	BBV-9721	PS9721-003	1 year	2017.01.25
EMI Test Receiver	R&S	ESR3	101781	1 year	2017.05.03
EMI Test Receiver	R&S	ESU26	100552	1 year	2017.04.24
EMI Test Receiver	R&S	ESR3	101783	1 year	2017.05.03
LISN	R&S	ENV216	101137	1 year	2017.02.04

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	Samsung Electronics Co., Ltd.	NP-QX411L	HJV993BB905283V