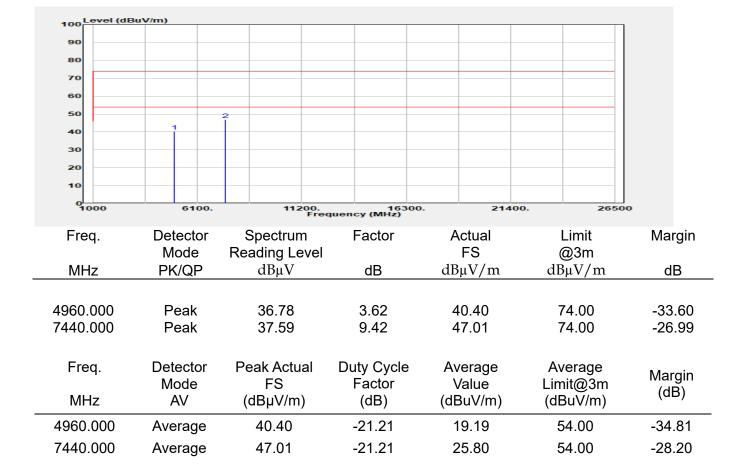


Report Number	:TERF2303000621E2
Operation Mode	:EDR 3M
Test Frequency	:2480 MHz
Test Mode	:Tx
EUT Pol	:H Plane

Test Site	:SAC G Chamber
Test Date	:2023-04-21
Temp./Humi.	:24.3°C / 63%
Antenna Pol.	:Vertical
Engineer	:Temo Chen



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Report Number	:TERF2303000621E2
Operation Mode	:EDR 3M
Test Frequency	:2480 MHz
Test Mode	:Tx
EUT Pol	:H Plane

Test Site	:SAC G Chamber
Test Date	:2023-04-21
Temp./Humi.	:24.3°C / 63%
Antenna Pol.	:Horizontal
Engineer	:Temo Chen

100 Level (dE	8uV/m)					
90						
80						
70						
60						
50		2				
40	1	Î				
30						
20						
10						
0						
1000	6100.	11200. Fred	16300. Juency (MHz)	21400	0. 26500	D
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margir
	Mode	Reading Level		FS	@3m	
MHz	PK/QP	dBμV	dB	dBµV/m	dBµV/m	dB
4960.000	Peak	37.58	3.62	41.19	74.00	-32.81
7440.000	Peak	37.69	9.42	47.11	74.00	-26.89
Freq.	Detector	Peak Actual	Duty Cycle	Average	Average	Margin
MHz	Mode AV	FS (dBµV/m)	Factor (dB)	Value (dBuV/m)	Limit@3m (dBuV/m)	(dB)
4960.000	Average	41.19	-21.21	19.98	54.00	-34.02
7440.000	Average	47.11	-21.21	25.90	54.00	-28.10

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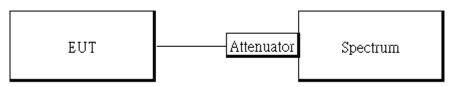


12 FREQUENCY SEPARATION

12.1 Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

12.2 Test Setup



12.3 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = middle of hopping channel.
- 5. Set the RBW approximately 30% of the channel spacing, $VBW \ge RBW$.
- 6. Adjust Span to Wide enough to capture the peaks of two adjacent channels.
- 7. Sweep = auto.
- 8. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

12.4 Measurement Result

Channel separation (MHz)	Limit	Result
1	≧25 kHz or 2/3 times 20dB bandwidth	PASS

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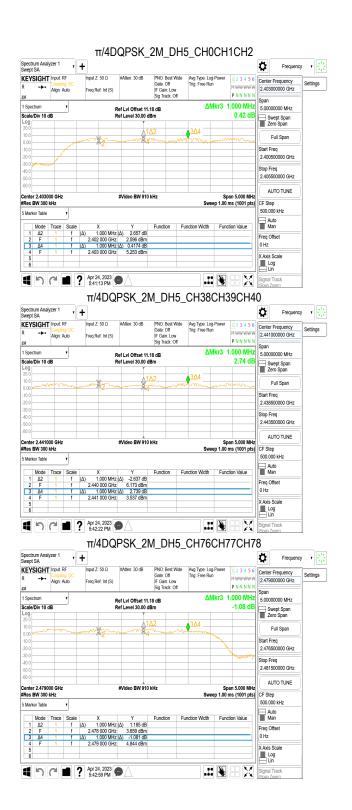
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8DPSK 3M DH5 CH0CH1CH2 Spectrum Analyzer 1 Swept SA - 2 · + Ö Frequency KEYSIGHT Input: RF wt 7:50.0 PNO: Best Wide Gate: Off #Atten: 30 dB Avg Type: Log-Po Trig: Free Rup Center Fr Settings IODO CH-÷ 2 40300 Align: Auto IF Gain: Low Sig Track: Off PNNNN ΔMkr3 1.000 MHz 5.0000000 MHz 1 Spectrun Ref Lvi Offset 11.18 dE Ref Level 30.00 dBm Scale/Div 10 dE 2.85 d Swept Span Zero Span Full Span Start Freq 2.400500 Stop Freq 2.4055000 AUTO TUNE Center 2.403000 GHz #Video BW 910 kHz Span 5.000 MHz Sweep 1.00 ms (1001 pts) #Res BW 300 kHz CF Step 500.000 kHz Auto Man Mode Trace Scal Function Width Function Value Function X Y 1.000 MHz (Δ) -1.834 dB 2.402 000 GHz 4.706 dBm 1.000 MHz (Δ) 2.851 dB 2.403 000 GHz 2.871 dBm . (Δ) Δ2 Freq Offse 3 (Δ) 0 Hz X Axis Scale Log 4 っ ペ I ? Apr 24, 2023 の X 8DPSK_3M_DH5_CH38CH39CH40 Spectrum Analyzer 1 Swept SA Ö Frequency • · + KEYSIGHT Input: RF put Z: 50 Ω PNO: Best Wide Gate: Off IF Gain: Low 30 dB Avg Type: Log-Powe Trig: Free Run Center Frequency ettings Freq Ref: Int (S) 2.441000000 GHz Align: Aut PNNNN Sig Track: Off Soan ΔMkr3 1.000 MHz Ref Lvi Offset 11.18 dB Ref Level 30.00 dBm 5.00000000 MHz Scale/Div 10 dB -1.63 dB Swept Span Zero Span Full Span Start Fred 2.438500000 GHz Stop Freq 2.443500000 GHz AUTO TUNE enter 2.441000 G Res BW 300 kHz BW 910 kH Span 5.000 MHz Sweep 1.00 ms (1001 pts) CF Step 500.000 kH 5 Marker Table Auto Man Function Function Width Function Value Trace So ie X Y (Δ) 1.000 MHz (Δ) 1.352 dB 2.440 000 GHz 4.146 dBm (Δ) 1.000 MHz (Δ) -1.631 dB 2.441 000 GHz 5.498 dBm Freq Offs 0 Hz 3 Δ4 X Axis Scale 「へ」 ■ ? Apr 24, 2023 ● Х # 😽 1 8DPSK_3M_DH5_CH76CH77CH78 Spectrum Analyzer 1 Swept SA Ö - 23 • **+** Frequency KEYSIGHT Input RF Avg Type Trig: Free r Frequency Cente 2.479 Settings Gate: Off IF Gain: Low Sig Track: O ++-Align: Auto req Ref: Int (S) PNNNN L)0 AMkr3 1 000 MHz 5.00000000 MHz Ref Lvi Offset 11.18 dB Ref Level 30.00 dBm . Scale/Div 10 dl -2.06 dl Swept Spar Full Spa 2.476500000 GHz Stop Freq 2.481500000 GHz AUTO TUNE r 2 479000 GH o BW 910 kH E 000 N #Res BW 300 kH Sweep 1.00 ms (10 ots) CF Step 500.000 kHz Marker Tabl Auto Man Function Width Function Trace So le A (Δ) 1.000 MHz (Δ) 1.500 ω... 2.478 000 GHz 4.037 dBm (Δ) 1.000 MHz (Δ) -2.056 dB 2.479 000 GHz 5.575 dBm Function Δ2 E Frea Offse 0 Hz 3 <u>1</u>4 X Axis Sc Log Apr 24, 2023 .# 😵 X

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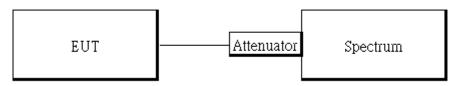


13 NUMBER OF HOPPING FREQUENCY

Standard Applicable 13.1

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

13.2 Test Setup



13.3 **Measurement Procedure**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- 5. Set the spectrum analyzer as RBW = 30% of the channel spacing, VBW \geq RBW., Detector = Peak
- 6. Max hold, view and count how many channel in the band.

13.4 Measurement Result

Tabular Data of Total Channel Number

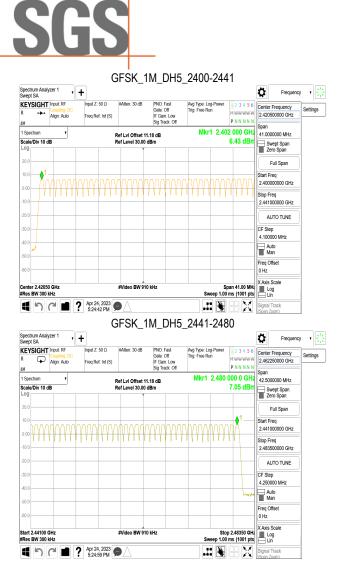
	Channel Number	Limit
2.4 GHz – 2.441 GHz	40	
2.441 GHz – 2.4835 GHz	39	>15
2.4 GHz ~2.4835 GHz	(40+39) = 79	

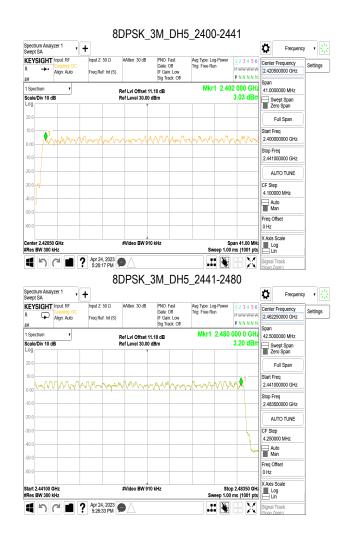
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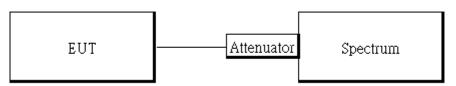


14 TIME OF OCCUPANCY (DWELL TIME)

14.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

14.2 Test Setup



14.3 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3.Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.

5.Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz , Detector = Peak, Adjust Sweep = 2~8ms.

6. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2 DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4 DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

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14.4 **Measurement Result**

GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	DH1	121.60	400ms
Mid	DH3	262.40	400ms
	DH5	307.20	400ms

π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	2DH1	124.80	400ms
Mid	2DH3	262.40	400ms
	2DH5	307.20	400ms

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	3DH1	124.80	400ms
Mid	3DH3	260.80	400ms
	3DH5	307.20	400ms

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GFSK (1Mbps):

CH Mid	DH1 time slot =	0.380 *	(1600/2/79) *	31.6 =	121.60 (ms)
	DH3 time slot =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	DH5 time slot =	2.880 *	(1600/6/79) *	31.6 =	307.20 (ms)

$\pi/4$ -DQPSK (2Mbps):

CH Mid	2DH1 time slo =	0.390 *	(1600/2/79) *	31.6 =	124.80 (ms)
	2DH3 time slo =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	2DH5 time slo =	2.880 *	(1600/6/79) *	31.6 =	307.20 (ms)

8-DPSK (3Mbps):

CH Mid	3DH1 time slo =	0.390 *	(1600/2/79) *	31.6 =	124.80 (ms)
	3DH3 time slo =	1.630 *	(1600/4/79) *	31.6 =	260.80 (ms)
	3DH5 time slo =	2.880 *	(1600/6/79) *	31.6 =	307.20 (ms)

A period time = 0.4 (s) * 79 = 31.6 (s)

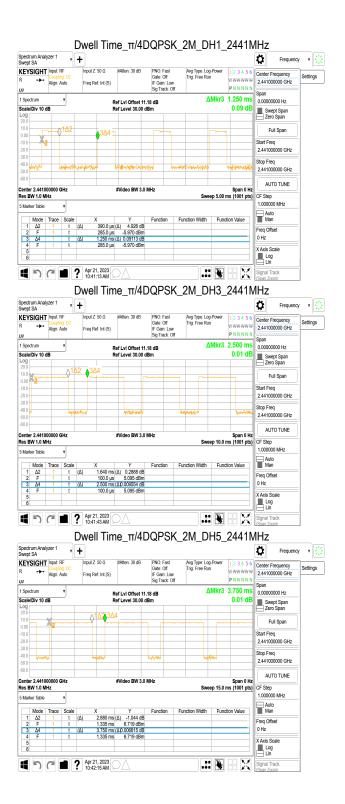
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Align: Auto	Fleq Kel. III. (3)		Sig Track: Off		P N	NNNN	Span	0000 0112	
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Res BW 1.0 MHz				Swee	p 5.00 ms (1		CF Step		
5 Marker Table 🛛 🔻							1.00000		
Mode Trace Scale	X	Y	Function	Function Width	Function V	alue	Auto Mar		
1 Δ2 1 t 2 F 1 t	(Δ) 390.0 µs (Δ 425.0 µs	 -13.79 dB 5.994 dBm 					Freq Offs	set	
3 Δ4 1 t	(Δ) 1.250 ms (Δ)) 0.03234 dB					0 Hz		
4 F 1 t	425.0 µs	5.994 dBm					X Axis S		
6							Log		
	? Apr 21, 2023	Δ		H		X	Signal Tr	ack	
							(Span Zor	(mc	
	Dwell Ti	me_8D	PSK_3	M_DH3	_244′	1MH	Z		
Spectrum Analyzer 1	+						Ö	Frequency	
Swept SA	<u> </u>	#Atten: 30 dB	PNO: Fast	Avg Type: Log-	Prwer 1	3456	<u> </u>		
R + Coupling: DC Align: Auto	Freq Ref: Int (S)		Gate: Off IF Gain: Low Sig Track: Off	Trig: Free Run	W.+#	**** ****	Center F 2.44100	requency 0000 GHz	Settings
tya 1 Spectrum v					Mkr3 2.5	_	Span		
Scale/Div 10 dB		f Lvi Offset 11.1 f Level 30.00 dE		Δ.		01 dB	0.00000		
Log						_	Swe Zero	pt Span Span	
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-10.0							Start Fre 2 44100	q 0000 GHz	
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-40.0	theterit	POLOMAN		hompiling		mhillen	Stop Fre 2.44100	9 0000 GHz	
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Center 2.441000000 GHz	#	Video BW 3.0 N	IHz			an 0 Hz		TO TUNE	
Res BW 1.0 MHz				Swee	p 10.0 ms (1	001 pts)	CF Step 1.00000	0.00	
5 Marker Table V							Auto		
Mode Trace Scale	X (4) 1 000 mm (4	Y	Function	Function Width	Function V	alue	Mar		
1 Δ2 1 t 2 F 1 t	160.0 µs	 -0.9554 dB 6.719 dBm 					Freq Offs	set	
3 <u>∆</u> 4 1 t 4 F 1 t	(Δ) 2.500 ms (Δ) 160.0 µs	0.006614 dB 6.719 dBm					0 Hz		
5							X Axis S Log		
6							Lin		
4 h C l '	P Apr 21, 2023 10:43:24 AM	\wedge			N	X	Signal Tr (Span Zor	ack	
					0444			200	
	Dwell Ti	me_8D	PSK_3	IVI_DH5	_244	INH	Z		
Spectrum Analyzer 1	+						Ö.	Frequency	• • •
KEYSIGHT Input: RF	Input Z: 50 Q	tAtten: 30 dB	PNO: Fast	Avg Type: Log-	Power 12	3456	Center F	requency	
	Freq Ref: Int (S)		Gate: Off IF Gain: Low	Trig: Free Run		₩₩₩₩		0000 GHz	Settings
R + Coupling: DC Align: Auto			Sig Track: Off			NNNN	Span		
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R							2.44100 Stop Fre	0000 GHz	
R → Align Auto U0 Image: Auto of the second se				••••••••••	M		2.44100 Stop Fre	0000 GHz	
R + Align: Aldo U0 Image: Align: Aldo Image: Align: Alido Scale/Div 10 dB Image: Align: Alido Image: Align: Alido 100 Image: Align: Alido Image: Align: Alido 000 Image: Align: Align: Alido Image: Align: Alido 000 Image: Align: Alido Image: Align: Alido 000 Image: Align: Alido Image: Align: Alido 000 Image: Alido Image: Alido				••••••••••••••••••••••••••••••••••••••			2.44100 Stop Fre 2.44100	0000 GHz	
R → Align: Aldo UU 1 1 Scale/DV 10 dB 0 0 0 0 <td></td> <td>Video BW 3.0 N</td> <td></td> <td></td> <td></td> <td>ian 0 Hz 001 pts)</td> <td>2.44100 Stop Fre 2.44100</td> <td>0000 GHz 9 0000 GHz</td> <td></td>		Video BW 3.0 N				ian 0 Hz 001 pts)	2.44100 Stop Fre 2.44100	0000 GHz 9 0000 GHz	
R →→ Aign Auto uu 1 Spectrum ↓ ScaleDiv 10 dB Log 0.00					Sp	van 0 Hz 001 pts)	2.44100 Stop Fre 2.44100 AUT CF Step 1.00000	9 9 0000 GHz TO TUNE 0 MHz	
R → Align: Aldo UP 1 Spectrum V Scale/DV 10 dB Log V V 20 0 V V 0 0 V V V 0 0 V V V V 0 0 V V V V V 0 0 V		Video BW 3.0 N	IHz	Swee	Sp p 15.0 ms (1	001 pts)	2.44100 Stop Fre 2.44100 AUT CF Step 1.00000	0000 GHz 9 0000 GHz TO TUNE 0 MHz	
R → Align: Aldo UP 1 Spectrum V 1 Spectrum V Spectrum 200 0 0 0 201 0 0 0 0 200 0	μ	Video BW 3.0 N Y 1) -1.479 dB	IHz		Sp	001 pts)	2.44100 Stop Fre 2.44100 AUT CF Step 1.00000 Auto	0000 GHz 9 0000 GHz TO TUNE 0 MHz	
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R → Augn: Aulo UP Image: Aulo Image: Aulo Scale/DIV 10 dB Image: Aulo Image: Aulo 20 Image: Aulo Image: Aulo 000 Image: Aulo Image: Aulo 1 Aulo Image: Aulo 2 F Image: Aulo 2 F Image: Aulo 3 Ad Image: Aulo 4 F Image: Aulo	# (A) 2.880 ms (c) 1.230 ms	Video BW 3.0 N Y 1) -1.479 dB	IHz	Swee	Sp p 15.0 ms (1	001 pts)	2.44100 Stop Fre 2.44100 CF Step 1.00000 Auto Mar Freq Offs 0 Hz	0000 GHz 9 0000 GHz TO TUNE 0 MHz 0 1 1 1 1 1 1 1 1 1 1 1 1 1	
R → Align: Aldo 1 Spectrum V V Scale/DV 10 dB U V 20 - - 20 - - 20 - - 20 - - 20 - - 20 - - 20 - - 20 - - 20 - - 20 - - 20 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <td>(A) 2.880 ms (A) 1.230 ms (A) 3.750 ms (A)</td> <td>Yideo BW 3.0 N Y 1, -1.479 dB 6.710 dBm 0.005879 dB</td> <td>IHz</td> <td>Swee</td> <td>Sp p 15.0 ms (1</td> <td>001 pts)</td> <td>2.44100 Stop Fre 2.44100 AUT CF Step 1.00000 Mar Freq Offs</td> <td>0000 GHz q 0000 GHz TO TUNE 0 MHz 0 MHz 5 1 set cale</td> <td></td>	(A) 2.880 ms (A) 1.230 ms (A) 3.750 ms (A)	Yideo BW 3.0 N Y 1, -1.479 dB 6.710 dBm 0.005879 dB	IHz	Swee	Sp p 15.0 ms (1	001 pts)	2.44100 Stop Fre 2.44100 AUT CF Step 1.00000 Mar Freq Offs	0000 GHz q 0000 GHz TO TUNE 0 MHz 0 MHz 5 1 set cale	

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

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15 ANTENNA REQUIREMENT

15.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

15.2 Antenna Connected Construction

The antenna complies with this requirement and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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