

TEST REPORT

FCC PART 15 SUBPART C 15.247

Test report On Behalf of GolfzonDeca Inc. For Golf Rangefinder

Model No.: AIMH10

FCC ID: 2ALG4AIMH10

Prepared for : GolfzonDeca Inc. 98, Yatap-ro, Bundang-Gu, Seongnam-si, Gyeonggi-do, 13517, Korea

Prepared By : Shenzhen HUAK Testing Technology Co., Ltd. 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

 Date of Test:
 Jan. 02, 2019 ~ Jan. 08, 2019

 Date of Report:
 Jan. 08, 2019

 Report Number:
 HK1901090070E



TEST RESULT CERTIFICATION

Applicant's name	GolfzonDeca Inc.
Address	98, Yatap-ro, Bundang-Gu, Seongnam-si, Gyeonggi-do, 13517, Korea
Manufacture's Name	PKtech
Address	Room 507, 537, Dunchon-daero, Jungwon-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Product description	
Trade Mark:	GOLFBUDDY
Product name	Golf Rangefinder
Model and/or type reference	AIMH10
Standards	47 CFR FCC Part 15 Subpart C 15.247

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen HUAK Testing Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen HUAK Testing Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Result:	Pass
Date of Issue:	Jan. 08, 2019
Date (s) of performance of tests:	Jan. 02, 2019 to Jan. 08, 2019
Date of Test	

2

:

Testing Engineer

Goog Fim (Gary Qian) Edon Mu

Technical Manager

(Eden Hu)

Authorized Signatory :

(Jason Zhou)



Table of Contents

Page

1.	SUI	MMARY	.4
	1.1.	TEST STANDARDS	
	1.2.	Test Description	
	TEST FA	ACILITY	
	1.3.	STATEMENT OF THE MEASUREMENT UNCERTAINTY	. 5
2.	GE	NERAL INFORMATION	6
۷.	2.1.	Environmental conditions	
	2.1.	GENERAL DESCRIPTION OF EUT	
	2.2.	Description of Test Modes and Test Frequency	-
	2.4.	RELATED SUBMITTAL(S) / GRANT (S)	
	2.5.	Modifications	
	2.6.	Receiver Input Bandwidth	
	2.7.	Example of a Hopping Sequence in Data Mode	
	2.8.	Equally Average Use of Frequencies and Behaviour	
	2.9.	Equipment Used	. 9
3.			10
5.	э.1.	Measurement Procedure	-
	3.2.	Test Set-Up (Block Diagram of Configuration)	
	3.2. 3.3.	LIMITS AND MEASUREMENT RESULT	
4.	-	DB BANDWIDTH	
	4.1.	Measurement Procedure.	
	4.2.	Test Set-Up (Block Diagram of Configuration)	
	4.3.		
5.		NDUCTED SPURIOUS EMISSION	
	5.1.	Measurement Procedure	
	5.2.	Test Set-Up (Block Diagram of Configuration)	
	5.3.	Limits and Measurement Result	24
6.	RAI	DIATED EMISSION	34
	6.1.	Measurement Procedure	34
	TEST SE	TUP	36
	6.2.	LIMITS AND MEASUREMENT RESULT	37
7.	FCC	LINE CONDUCTED EMISSION TEST	47
/.	7.1.	LIMITS OF LINE CONDUCTED EMISSION TEST	
		BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	
	7.3.	PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	
	7.4.	FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	
	7.5.	TEST RESULT OF LINE CONDUCTED EMISSION TEST	
8.	NILL	MBER OF HOPPING FREQUENCY	C 1
0.	8.1.	Measurement Procedure	
	8.2.	Test Setup (Block Diagram of Configuration)	
	8.3.	Limits and Measurement Result	
9.	TIN	IE OF OCCUPANCY (DWELL TIME)	52
9.	9.1.	Measurement Procedure	
	9.2.	Test Setup (Block Diagram of Configuration)	
	9.3.	Limits and Measurement Result	
10	10.1.	REQUENCY SEPARATION	
	10.1.	Test Setup (Block Diagram of Configuration)	
	10.2.	LIMITS AND MEASUREMENT RESULT	
11	. 1	TEST SETUP PHOTOS OF THE EUT	57
12	. F	PHOTOGRAPH OF EUT	59



1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices

1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(1)(i)	20dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247(b)	Pseudorandom Frequency Hopping Sequence	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency& Time of Occupancy	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.205/15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS



Test Facility

1.3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd. Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 21210

The 3m alternate test site of Shenzhen HUAK Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 21210 on May 24, 2016.

FCC Registration No.: CN1229

Test Firm Registration Number : 616276

1.3. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen HUAK Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for HUAK laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

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



2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Golf Rangefinder
Model/Type reference:	AIMH10
Power supply:	DC 5V
Version:	V4.0
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PIFA Antenna
Antenna gain:	-0.08dBi
Hardware Version:	V 2.0
Software Version:	Golf Buddy_H10_V0_0_2

Note: For more details, refer to the user's manual of the EUT.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

There are 79 channels provided to the EUT and Channel 00/39/78 was selected for testing.

Operation Frequency :

Channel	Frequency (MHz)	
00	2402	
01	2403	
:	:	
38	2440	
39	2441	
40	2442	
:	:	
77	2479	
78	2480	

Note: The line display in grey were the channel selected for testing



NO.	TEST MODE DESCRIPTION	
1	Low channel TX	
2	Middle channel TX	
3	High channel TX	
4	Normal Operating (BT)	

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.

2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

Radiated Emission Configure :

EUT

Conducted Emission Configure :

EUT	Accessory
	,

Item	Equipment	Model No.	ID or Specification	Remark
1	Adapter	NTR-S01	DC 5V	Support



2.4. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.5. Modifications

No modifications were implemented to meet testing criteria.

2.6. Receiver Input Bandwidth

The input bandwidth of the receiver is 1.3MHZ, In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection(e.g. single of multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

2.7. Example of a Hopping Sequence in Data Mode

Example of a 79 hopping sequence in data mode: 40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67 56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59 72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75 09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06 01, 51, 03, 55, 05, 04

2.8. Equally Average Use of Frequencies and Behaviour

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection.

2. Internal master clock

The LAP(lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP(upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For ehavior zation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about one day(23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire. LAP(24 bits),4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations) are performed to generate te Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following8ehavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended. The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer(and it Cannot be shorter) than the minimum resolution of the clock(312.5us).The hopping sequence will always Differ from the first one.



2.9. Equipment Used

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 27, 2018	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 27, 2018	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 27, 2018	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 27, 2018	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2018	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 27, 2018	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 27, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 27, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 27, 2018	1 Year
10.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Dec. 27, 2018	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 27, 2018	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 27, 2018	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 27, 2018	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 27, 2018	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2018	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 27, 2018	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 27, 2018	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 27, 2018	3 Year

The calibration interval was one year



3. Peak Output Power

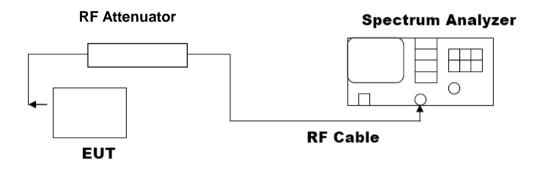
3.1. Measurement Procedure

For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 3. RBW > 20 dB bandwidth of the emission being measured.
- 4. VBW \geq RBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

3.2. Test Set-Up (Block Diagram of Configuration)





3.3. Limits and Measurement Result

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION						
Frequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or Fail						
2.402	5.989	30	Pass			
2.441	5.436	30	Pass			
2.480	5.039	30	Pass			





CH39

Keysight Spectrum Analyzer - Swept SA R L RF 50 Ω AC		ISE:INT	ALIGN AUTO		Peak Search
Marker 1 2.44089000000	O GHZ PNO: Fast IFGain:Low Atten: 30	Run Avg	Type: Log-Pwr Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET PNNNNN	
10 dB/div Ref 20.00 dBm			Mkr1	2.440 890 GHz 5.436 dBm	Next Peak
10.0	1				Next Pk Right
-10.0				n mar and a second s	Next Pk Left
20.0 					Marker Delta
40.0					Mkr→CF
60.0					Mkr→RefLv
-70.0 Center 2.441000 GHz	#\/D\\\ 5 0.044		Swaan-4	Span 5.000 MHz 000 ms (1001 pts)	More 1 of 2
#Res BW 1.5 MHz	#VBW 5.0 MHz		Sweep 1.	ooo ms (toot pts)	

CH78

Keysight Spectrum Analyzer - Swept SA				
X RL RF 50 Ω AC Marker 1 2.479885000000	GHz	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	Peak Search
	PNO: Fast Trig: Free Ru IFGain:Low Atten: 30 dB		DET P N N N N N	
10 dB/div Ref 20.00 dBm		Mkr1	2.479 885 GHz 5.039 dBm	NextPeak
10.0				Next Pk Right
10.0				3
0.00				
				Next Pk Left
-10.0				
-20.0				
			Jan San San San San San San San San San S	Marker Delta
-30.0				
-40.0				
-40.0				Mkr→CF
-50.0				
-60.0				Mkr→RefLvl
-70.0				
				More
Center 2.480000 GHz			Span 5.000 MHz	1 of 2
#Res BW 1.5 MHz	#VBW 5.0 MHz	Sweep	Span 5.000 MHz .000 ms (1001 pts)	
MSG		STATU	5	



PEAK OUTPUT POWER MEASUREMENT RESULT FOR Π /4-DQPSK MODULATION						
FrequencyPeak PowerApplicable Limits(GHz)(dBm)(dBm)						
2.402	4.326	30	Pass			
2.441	3.776	30	Pass			
2.480	3.345	30	Pass			





120
പാള

Keysight Spe	ectrum Analyzer - Swept SA RF 50 Ω AC		astras turi			
	RF 50 Ω AC 2.44101500000		SENSE:INT	ALIGN AUTO	TRACE 1 2 3 4 5 6	Peak Search
			Trig: Free Run Atten: 30 dB	Avg Hold:>100/100	DET P NNNN	
				Mkr1	2.441 015 GHz	NextPeak
10 dB/div Log	Ref 20.00 dBm		•		3.776 dBm	
						Next Pk Right
10.0			1			next i knight
0.00						
						Next Pk Left
-10.0	*Mom					
-20.0					anther the	
						Marker Delta
-30.0						
-40.0						
						Mkr→CF
-50.0						
-60.0						Mkr→RefLvl
-70.0						
						More 1 of 2
Center 2.₄ #Res BW	141000 GHz	#VBW 5		Swoon 1	Span 5.000 MHz .000 ms (1001 pts)	1012
#RES DW		#VDVV 0		Sweep		
				onatod		

	ectrum Analyzer - Swept SA					
X/ RL Marker 1	RF 50 Ω AC 2.48001000000) GHz	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	Peak Search
		PNO: Fast 🖵 IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold:>100/100	DET P N N N N	
				Mkr1	2.480 010 GHz 3.345 dBm	Next Peak
10 dB/div Log	Ref 20.00 dBm				3.345 dBm	
			Ĭ			Next Dis Disekt
10.0			1			Next Pk Right
0.00						
0.00	and the second sec	ALL				Next Pk Left
-10.0					monore and the second s	NEXTERLEN
L KI MAN	1 American and the second s				Multin market	
-20.0						Marker Delta
-30.0						
-40.0						Mkr→CF
-50.0						
-50.0						
-60.0						Mkr→RefLv
-70.0						
						More 1 of 2
Center 2. #Res BW	480000 GHz	#\/D14	5.0 MHz	Swoon	Span 5.000 MHz	1012
		#VBW	3.0 WINZ	Sweep	.000 ms (1001 pts)	
				STATU		



PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION						
Frequency (GHz)Peak Power (dBm)Applicable Limits (dBm)Pass or Fail						
2.402	4.028	30	Pass			
2.441	3.800	30	Pass			
2.480	3.446	30	Pass			

Keysight Spectrum Analyzer - Swept SA SENSE:INT Marker 1 2.402040000000 GHz FNO: Fast PNO: Fast Free Run IFGein:Low Atten: 30 dB CH0 - F - 2 ALIGN AUTO Avg Type: Log-Pwr Avg|Hold:>100/100 Peak Search TYPE MWWWW DET P NNNNN Next Peak Mkr1 2.402 040 GHz 4.028 dBm 10 dB/div Log Ref 20.00 dBm Next Pk Right 1 Next Pk Left 1 n and a ~4 Marker Delta Mkr→CF Mkr→RefLvl More 1 of 2 Center 2.402000 GHz #Res BW 1.5 MHz Span 5.000 MHz Sweep 1.000 ms (1001 pts) #VBW 5.0 MHz STATUS





	120
U	างษ

Keysight Spectrum Analyzer - Swept SA R L RF 50 Ω AC	CEN	SE:INT	ALIGN AUTO		
arker 1 2.44099000000	0 GHz	Avg T	ype: Log-Pwr old:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWW	Peak Search
	PNO: Fast Trig: Free IFGain:Low Atten: 30			DET P NNNNN	NextPeak
dB/div Ref 20.00 dBm			Mkr1 2.	440 990 GHz 3.800 dBm	Nextrear
					Next Pk Righ
0.0		1			J
0.0	All Marine Concernent		and the second s	and the second s	Next Pk Lef
				. Markara .	
0.0 				n n	Marker Delta
0.0					
0.0					Mkr→Cf
0.0					Mkr→RefLv
0.0					
					More 1 of 2
enter 2.441000 GHz Res BW 1.5 MHz	#VBW 5.0 MHz		Sweep 1.00	Span 5.000 MHz 10 ms (1001 pts)	TOT
G			STATUS		

	ectrum Analyzer - Swept SA					
Marker 1	RF 50 Ω AC 2.479995000000	GHz	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	Peak Search
		PNO: Fast 😱 IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold:>100/100	DET P NNNN	
				Mkr1	2.479 995 GHz	Next Peak
10 dB/div Log	Ref 20.00 dBm				3.446 dBm	
10.0			1			Next Pk Right
0.00	TTT IN	The Manual Contraction of the State of the S				
-10.0	way way				www.	Next Pk Left
la lu	Andrewson				and a second sec	
-20.0	ñ1				the state of the s	
۲Ŷ						Marker Delta
-30.0						
-40.0						
						Mkr→CF
-50.0						
						Mire Doff of
-60.0						Mkr→RefLvl
-70.0						
						More
Center 2.4	180000 GHz				Span 5.000 MHz	1 of 2
#Res BW		#VBW	5.0 MHz	Sweep 1	.000 ms (1001 pts)	
MSG				STATUS		

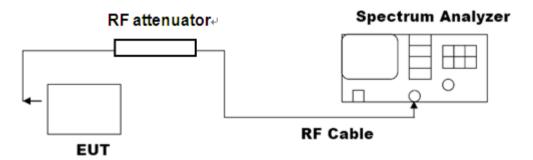


4. 20dB Bandwidth

4.1. Measurement Procedure

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

4.2. Test Set-Up (Block Diagram of Configuration)





4.3. Limits and Measurement Results

MEASUREMENT RESULT FOR GFSK MOUDULATION						
Annlinghla Limita		Measurement Result				
Applicable Limits	Test Da	ita (MHz)	Criteria			
	Low Channel	0.8288	PASS			
N/A	Middle Channel	0.7039	PASS			
	High Channel	0.7075	PASS			

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

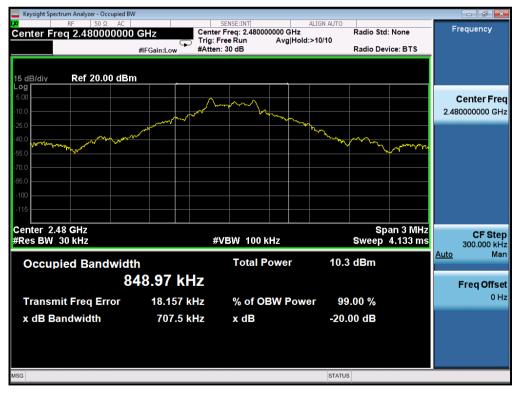




TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL





MEASUREMENT RESULT FOR 74-DQPSK MODULATION				
Annlinghle Limite		Measurement Resu	ılt	
Applicable Limits	Test Da	ita (MHz)	Criteria	
	Low Channel	1.121	PASS	
N/A	Middle Channel	1.140	PASS	
	High Channel	1.144	PASS	

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL





Page 21 of 65

TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



Keysight Spectrum Analyzer - Occupied BW Radio Std: None

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL





MEASUREMENT RESULT FOR 8-DPSK MODULATION				
Annlinghin Limite		Measurement Resu	ılt	
Applicable Limits	Test Da	ta (MHz)	Criteria	
	Low Channel	1.147	PASS	
N/A	Middle Channel	1.149	PASS	
	High Channel	1.152	PASS	

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL





TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



Keysight Spectrum Analyzer - Occupied BW GHz Center Freq: 2.48000000 GHz #IFGain:Low #Atten: 30 dB Avg|Hold:>10/10 Frequency Center Freq 2.480000000 GHz Radio Std: None Radio Device: BTS Ref 20.00 dBm 15 dB/div **Center Freq** 2.480000000 GHz Center 2.48 GHz #Res BW 30 kHz Span 3 MHz CF Step 300.000 kHz #VBW 100 kHz Sweep 4.133 ms <u>Auto</u> Man **Total Power** 8.34 dBm **Occupied Bandwidth** 1.0742 MHz Freq Offset 0 Hz Transmit Freq Error 18.168 kHz % of OBW Power 99.00 % x dB Bandwidth 1.152 MHz x dB -20.00 dB STATUS

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



5. Conducted Spurious Emission

5.1. Measurement Procedure

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
- Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic. RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
- 4. Set SPA Trace 1 Max hold, then View.

5.2. Test Set-Up (Block Diagram of Configuration)

The same as described in section 4.2

5.3. Limits and Measurement Result

LIMITS AND MEASUREMENT RESULT				
Annlinghin Linsite	Measurement Result			
Applicable Limits	Test Data	Criteria		
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit			
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS		
intentional radiator is operating, the radio	Channel			
frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS		



TEST RESULT FOR ENTIRE FREQUENCY RANGE TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF GFSK MODULATION IN LOW CHANNEL

Keysight Sp	RF 50 Ω AC		SENSE:INT		LIGN AUTO			
	1 2.40186000000		Trig: Free Run	Avg Type: Avg Hold:>	Log-Pwr	TRAC	E 1 2 3 4 5 6 E M WWWW	Peak Search
		PNO: Wide G	Atten: 30 dB	, toginerali		DE	T P NNNNN	NextPeak
	Ref 20.00 dBm				Mkr1	2.401 8 5.4	60 GHz 43 dBm	NextFeak
10 dB/div Log	Ker 20.00 dBill		Ţ					
10.0			1					Next Pk Right
0.00								
-10.0				λ				Next Pk Left
-20.0								Marker Delta
30.0		M		mar				
40.0	many marine	م الم		4.00	الاسماس \	n	ma -	
40.0	1 WWW	√			\sim	"hyper-	"Marine	Mkr→CF
50.0								
60.0								Mkr→RefLvl
70.0								
								More
	.402000 GHz		▲			Span 5	.000 MHz	1 of 2
	100 kHz	#VBV	V 300 kHz	S		000 ms (1001 pts)	
ISG					STATUS			
RL	pectrum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT		LIGN AUTO			Peak Search
larker 3	3 21.0446201540	PNO: Fast G	Trig: Free Run Atten: 30 dB	Avg Type: Avg Hold:>		TYP	E 1 2 3 4 5 6 E M WWWWWW T P N N N N N	
		IFGain:Low	Atten: 30 dB		Mkr		6 GHz	Next Peak
I0 dB/div	Ref 20.00 dBm					-50.7	11 dBm	
.og 10.0			<u> </u>					
0.00								Next Pk Right
10.0							DL1 -14.56 dBm	
20.0								Next Pk Left
40.0								
50.0	\\Q ² Q'						dauta and different	
60.0 	and the state of the second state of the secon							Marker Delta
70.0								
		^			ļ	Stop 2	5.00 GHz	
∜Res BW	/ 100 kHz	#VBV	V 300 kHz		· · ·	.388 s (3		MKr→CF
	I 100 kHz		Y F		Sweep 2		0000 pts)	MKr→CF
Res BW	I 100 kHz rrc scl x 1 f 4 1 f 3	#VBV 4.803 6 GHz 3.602 5 GHz 1.044 6 GHz	Y F		· · ·			
Res BW	I 100 kHz rrc scl x 1 f 4 1 f 3	4.803 6 GHz 3.602 5 GHz	F -50.130 dBm -50.321 dBm		· · ·			
Res BW MKR MODE T 1 N 2 2 N 3 3 N 4 5 5 6 6 7 1	I 100 kHz rrc scl x 1 f 4 1 f 3	4.803 6 GHz 3.602 5 GHz	F -50.130 dBm -50.321 dBm		· · ·		DN VALUE	
#Res BW MKR MODE T 1 N 2 2 N 2 3 N 2 4 5 5 6 7 8 9 9 1	I 100 kHz rrc scl x 1 f 4 1 f 3	4.803 6 GHz 3.602 5 GHz	F -50.130 dBm -50.321 dBm		· · ·		DN VALUE	Mkr→RefLvl More
#Res BW 1 N 1 2 N 2 3 N 1 5 1 1 6 1 1 9 10 10 11 1 1	I 100 kHz rrc scl x 1 f 4 1 f 3	4.803 6 GHz 3.602 5 GHz	Y FI -50.130 dBm -50.321 dBm -50.711 dBm		· · ·		DN VALUE	Mkr→RefLvl
MKR MODE T 1 N 2 2 N 4 5 5 6 7 8 5	I 100 kHz rrc scl x 1 f 4 1 f 3	4.803 6 GHz 3.602 5 GHz	F -50.130 dBm -50.321 dBm		· · ·		DN VALUE	Mkr→Ref Lvi More



Keysight Spectrum Analyzer - Swept SA μ RF 50 Ω AC SENSE:INT			
	ALIGN AUTO		
Marker 1 2.440862362362 GHz PNO: Wide C IFGein:Low Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	Peak Search
IFGail.LUW Atten. 66 dB	Mkr1 2	.440 862 GHz	NextPea
10 dB/div Ref 20.00 dBm		5.288 dBm	
10.0			Next Pk Righ
0.00			
-10.0			Next Pk Let
-20.0			Marker Delf
-30.0	Ma		Marker Den
n when when a	I'm when	million	
-40.0		WWWWW CONNer	Mkr→C
-50.0			
-30.0			
-60.0			Mkr→RefL
-70.0			Mor
			1 of
Center 2.441000 GHz #Res BW 100 kHz #VBW 300 kHz	Sweep 1.0	Span 5.000 MHz 66 ms (1000 pts)	
MSG	STATUS		
🤤 Keysight Spectrum Analyzer - Swept SA			
M RF 50 Ω AC SENSE:INT Marker 3 4.881832727758 GHz Sense:INT Sense:INT Sense:INT	ALIGN AUTO Avg Type: Log-Pwr		
PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB		TRACE 1 2 3 4 5 6	Peak Search
IFGail.Low / ttell. of up	Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Peak Search
	Avg Hold:>100/100	3 4.881 8 GHz	
10 dB/div Ref 20.00 dBm	Avg Hold:>100/100		
10 dB/div Ref 20.00 dBm	Avg Hold:>100/100	3 4.881 8 GHz	Next Pea
Log	Avg Hold:>100/100	3 4.881 8 GHz	Next Pea
10.0	Avg Hold:>100/100	3 4.881 8 GHz	Next Pea
Log 10.0 0.00 -10.0 -20.0	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm	Next Pea Next Pk Rigf
Log 10.0 0.00 -10.0 -20.0 -30.0	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm	Next Pea Next Pk Rigf
Log 10.0 0.00 -10.0 -20.0 -30.0 -40.0 -33.0 -40.0	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm	Next Pea Next Pk Righ
Log 10.0 .000 .10.0 .20.0 .20.0 .30.0 .10.0	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm	Next Pea Next Pk Righ Next Pk Le
Log 100 .000 .100 .200 .300 .400 .5000 .500 .500 .500 .500 .500 .500	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm	Next Pea Next Pk Righ Next Pk Le
Log 100 -000 -100 -200 -200 -300 -400 -5	Avg Hold:>100/100	0.1 -14.71 d6m	Next Pea Next Pk Rigi Next Pk Le
Log 100 .000 .100 .200 .200 .300 .400 .3000 .300 .300 .300 .300 .300 .300 .300 .300 .300	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm	Next Pea Next Pk Righ Next Pk Le Marker Dell
Log 100 200 -100 -100 -200 -300 -400 -50	Avg Hold:>100/100	2 2 3 4.881 8 GHz -50.562 dBm 0(1-14-71 dbm 0(1-14-71 dbm 0(1-14-71 dbm 0(1-14-71 dbm 0(1-14-71 dbm 0(1-14-71 dbm 0(1-14-71 dbm	Next Pea Next Pk Righ Next Pk Le Marker Dell
Log 100 200 300 400 -500 -700 -500 -500 -500 -700 -500 -700 -500 -700 -500 -700 -500 -700 -500 -700 -500 -700 -500 -700	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm 0.1-14.71 dbm	Next Pea Next Pk Righ Next Pk Le Marker Dell
Log 100 100 200 300 400 400 500 500 500 500 500 5	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm 0.1-14.71 dbm	Next Pea Next Pk Righ Next Pk Le Marker Def Mkr→C
Log 100 000 -100 -200 -200 -200 -300 -400 -300 -400 -50	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm 0.1-14.71 dbm	Next Pea Next Pk Righ Next Pk Le Marker Def Mkr→C
Log 10.0 0.00 -10.0 -20.0	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm 0.1-14.71 dbm	Next Pea Next Pk Righ Next Pk Lei Marker Delt Mkr→C
Log 10.0 20.0 30.0 40.0 5	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm 0.1-14.71 dbm	Next Pea Next Pk Righ Next Pk Lei Marker Delt Mkr→C Mkr→Ref Lv Mor
Log 100 100 200 300 400 500 500 500 500 500 500 5	Avg Hold:>100/100	3 4.881 8 GHz -50.562 dBm 0.1-14.71 dbm	Peak Search Next Peal Next Pk Right Next Pk Lef Marker Dett Mkr→Ct Mkr→Ref Ly Mor

TEST PLOT OF OUT OF BAND EMISSIONS OF GFSK MODULATION IN MIDDLE CHANNEL



Keysight Spo R L	RF 50 Ω	AC		SENSE:		ALIGN AUTO			
	req 2.480000	0000 GH	Z NO: Wide 🕞	Trig: Free Ru	Avg Ty un Avg Ho	pe: Log-Pwr ld:>100/100		E 1 2 3 4 5 6 MWWWW	Frequency
		IFO	Gain:Low	Atten: 30 dE		Mileret			Auto Tur
) dB/div	Ref 20.00 di	3m				WIKIT	4.7	62 GHz 56 dBm	
^{og}									Comton Em
10.0				1					Center Fre 2.48000000 GH
					\wedge				
									Start Fre
10.0									2.477500000 Gł
			/		n and a second sec				
20.0									Stop Fre 2.482500000 GH
0.0		<u>л</u> ,	white			Mrz			2.482500000 Gr
40.0 W	Mary Mary and Mar	"The second seco				- Marine	Mana and	What a work	CF Ste
+0.0	Ŷ					V	- the factor	Marrie	500.000 kH Auto Ma
50.0									
50.0									Freq Offs
									0 H
70.0									Scale Typ
							Span 5	.000 MHz	Log <u>L</u>
	480000 GHz 100 kHz		#VBW	300 kHz		Sweep 1	.066 ms (
	480000 GHz 100 kHz		#VBW	300 kHz		Sweep 1			
Res BW	100 kHz ectrum Analyzer - Swep		#VBW			STATUS			
Res BW sg Keysight Sp RL	100 kHz	AC 9156 GI		SENSE	Avg Ty	STATUS	TRAC	1000 pts)	Peak Search
Res BW sg Keysight Sp RL	100 kHz ectrum Analyzer - Swep RF 50 Ω	AC 9156 GI PI		SENSE	Avg Ty un Avg Ho	STATUS ALIGN AUTO	TRAC	1000 pts)	Peak Search
Res BW Reysight Spr RL Iarker 3	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search
Res BW R RL Iarker 3 0 dB/div	100 kHz ectrum Analyzer - Swep RF 50 Ω	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	
Res BW Keysight Spr RL Iarker 3 0 dB/div og	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search Next Pea
Res BW G Keysight Spo RL Iarker 3 O dB/div G O dB/div O dB/div O dB/div	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search Next Pea
Res BW sc keysight Spr RL larker 3 0 dB/div 0 0 0.00 0.00 0.00	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search
Res BW SG Keysight Sp RL	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search Next Pea Next Pk Rig
Res BW 3G Keysight Spin RL Iarker 3 0 dB/div 99 10.0 20.0 30.0 40.0	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search Next Pea
Res BW 3G Keysight Spr RL Iarker 3 0 0.00 0.00 0.00 0.00 0.00 0.00 0.00	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC Bm	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le
Res BW 3G Keysight Spin RL Iarker 3 0 dB/div 0 0 10.0 20.0 30.00 30.00 30.00 50.00	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.96007466	AC 9156 GH PI IFC Bm	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TRAC TYI DI r3 4.96	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le
Res BW sa Keysight Spi RL RL Sa RL Sa RL Sa RL Sa RL Sa RL Sa RL Sa RL Sa Sa Sa Sa Sa Sa Sa S	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.960074663 Ref 20.00 dl	AC 9156 GH PI IFC Bm	−Z NO: Fast ⊂	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TR40 TVI DI r3 4.960 -51.7	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le
Res BW SG Keysight Sp RL RL Iarker 3 C 0B/div 0 0 0 0	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.960074663 Ref 20.00 dl	AC 9156 GH PI IFC Bm	Z NO: Fast C Sain:Low	SENSE:	Avg Ty un Avg Ho	ALIGN AUTO pe: Log-Pwr Id:>100/100	TR40 TY D T3 4.960 -51.7 ↓ 2 ↓ 2 ↓	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le Marker Del
Res BW 3G Keysight Spi RL RL Iarker 3 0 dB/div 0 0<	100 kHz ectrum Analyzer - Swep RF 50 Ω 4.960074663 Ref 20.00 dl 4.960074663 Ref 20.00 dl 4.960074653 Ref 20.00 dl 4.960074655 Ref 20.00 dl 4.960074655 Ref 20.00 dl 4.960074555 Ref 20.00 dl 4.960074555 Ref 20.00 dl 4.960074555 Ref 20.00 dl 4.960074555 Ref 20.00 dl 4.9600745555 Ref 20.00 dl 4.96007555555 Ref 20.00 dl 4.9600755555555555555555555555555555555555	AC 9156 GH IF(Bm 3	Hz NO: Fast Gain:Low #VBM	SENSE: Trig: Free R Atten: 30 dE	Avg Ty an Avg Ho 3	ALIGN AUTO pe: Log-Pwr id:>100/100	TRAC TYI D T3 4.960 -51.7 -51.	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le Marker Del
Res BW sa Keysight Spr RL Iarker 3 10.0 10.0 0.000 10.0 0.000 10.0 0.000 10.0	100 kHz RF 50 Ω 4.960074663 Ref 20.00 dl MHz 100 kHz RC SCL f	AC 9156 GH PI IF(Bm 3 3	Iz NO: Fast Gain:Low #VBW #VBW	SENSE: Trig: Free Rt Atten: 30 dE	Avg Ty an AvgHo 3	ALIGN AUTO pe: Log-Pwr Id:>100/100 MK Sweep 2	TRAC TYI D T3 4.960 -51.7 -51.	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le Marker Del MkrC
Res BW sa Keysight Spr RL Iarker 3 10.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0	100 kHz RF 50 Ω 4.960074663 Ref 20.00 dl MHz 100 kHz RC SCL f	AC 9156 GH PI IF(Bm 3 3	I GHz	SENSE: Trig: Free Rt Atten: 30 dE	Avg Ty an AvgHo 3	ALIGN AUTO pe: Log-Pwr Id:>100/100 MK Sweep 2	TRAC TYI D T3 4.960 -51.7 -51.	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le Marker Del MkrC
Res BW Keysight Spi RL RL Iarker 3 0 dB/div 0 g 0 dB/div 0 g 10 0 0 dB/div 0 g 10 0 10 0	100 kHz RF 50 Ω 4.960074663 Ref 20.00 dl MHz 100 kHz RC SCL f	AC 9156 GH PI IF(Bm 3 3	Iz NO: Fast Gain:Low #VBW #VBW	SENSE: Trig: Free Rt Atten: 30 dE	Avg Ty an AvgHo 3	ALIGN AUTO pe: Log-Pwr Id:>100/100 MK Sweep 2	TRAC TYI D T3 4.960 -51.7 -51.	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le Marker Del MkrC
Res BW 3G Keysight Spi RL RL Iarker 3 0 dB/div 0 g 10 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	100 kHz RF 50 Ω 4.960074663 Ref 20.00 dl MHz 100 kHz RC SCL f	AC 9156 GH PI IF(Bm 3 3	Iz NO: Fast Gain:Low #VBW #VBW	SENSE: Trig: Free Rt Atten: 30 dE	Avg Ty an AvgHo 3	ALIGN AUTO pe: Log-Pwr Id:>100/100 MK Sweep 2	TRAC TYI D T3 4.960 -51.7 -51.	1000 pts)	Peak Search Next Pea Next Pk Rig Next Pk Le Marker Del Mkr→C Mkr→Ref L
Res BW Reysight Spi RL RL Iarker 3 0 dB/div 9 0 0 0	100 kHz RF 50 Ω 4.960074663 Ref 20.00 dl MHz 100 kHz RC SCL f	AC 9156 GH PI IF(Bm 3 3	Iz NO: Fast Gain:Low #VBW #VBW	SENSE: Trig: Free Rt Atten: 30 dE	Avg Ty an AvgHo 3	ALIGN AUTO pe: Log-Pwr Id:>100/100 MK Sweep 2	TRAC TYI D T3 4.960 -51.7 -51.	1000 pts)	Peak Search Next Pea Next Pk Rig

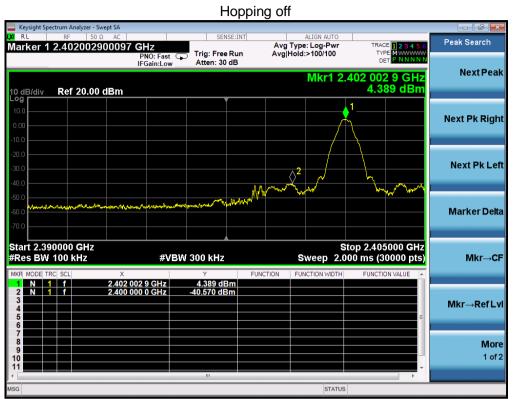
TEST PLOT OF OUT OF BAND EMISSIONS OF GFSK MODULATION IN HIGH CHANNEL

Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit. The GFSK modulation is the worst case and only those data recorded in the report.



TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL



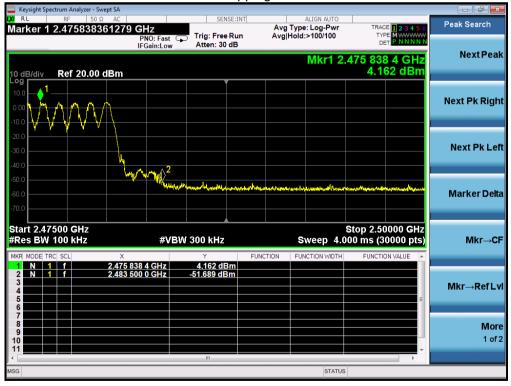




Page 29 of 65

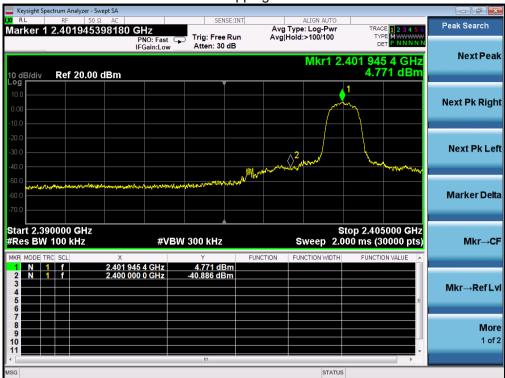
	Hop	oping off		
Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω AC Arker 1 2.479995999867		Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW	Peak Search
0 dB/div Ref 20.00 dBm	PNO: Fast Figure Run IFGain:Low Atten: 30 dB	-,	479 996 0 GHz 3.764 dBm	Next Pea
				Next Pk Rig
				Next Pk Le
	V V V V V V V V V V V V V V V V V V V	มรักแข ^{รัก} กรับเขาได้ เริ่า () เขา 265 (ได้) แต่ได้ (ได้) แต่ 265 (ได้)	tonsállarisettenette	Marker Del
tart 2.47500 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep 4.0	Stop 2.50000 GHz 00 ms (30000 pts)	Mkr→C
	996 0 GHz 3.764 dBm 500 0 GHz -52.322 dBm		E	Mkr→RefL
7 8 8 9 9 0 1				Mo 1 of
G		STATUS		

GFSK MODULATION IN HIGH CHANNEL Hopping off





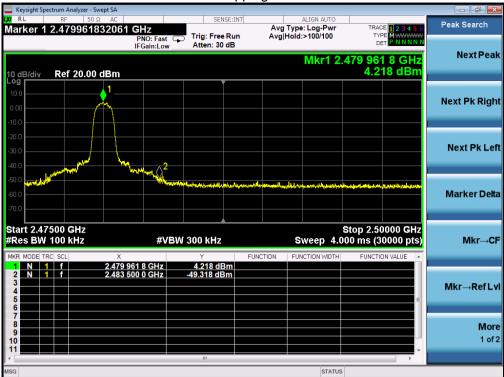
π /4-DQPSK MODULATION IN LOW CHANNEL Hopping off

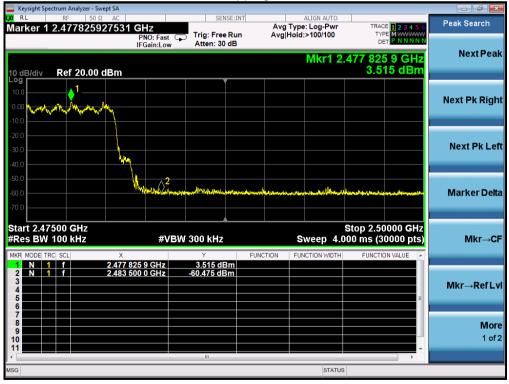






π /4-DQPSK MODULATION IN HIGH CHANNEL Hopping off

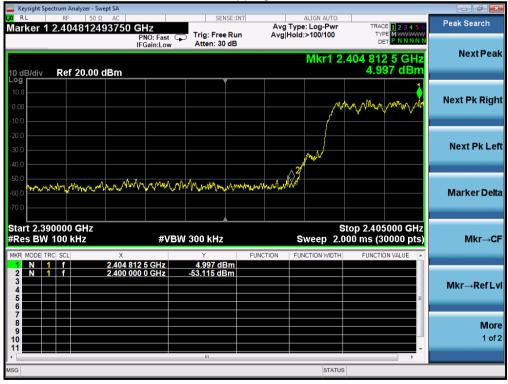






8-DPSK MODULATION IN LOW CHANNEL Hopping off

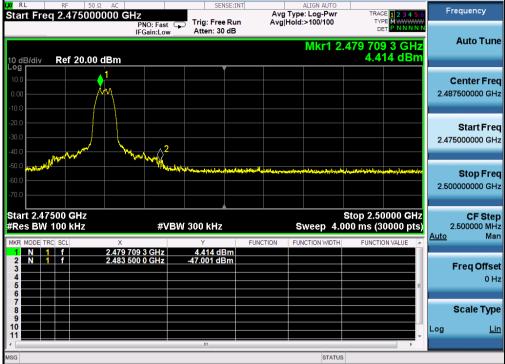
RL RP S0.0 AC SENSE:INT ALIGN AUTO arker 1 2.401706890230 GHz PRO: Fast Coll Trig: Free Run Avg Type: Log-PWr TRACE 2.343 Km Dd Bldiv Ref 20.00 dBm Mkr1 2.401706 9 GHz Next Pk Right Od Bldiv Ref 20.00 dBm Mkr1 2.401706 9 GHz Next Pk Right Og Aug Type: Log-PWr Trig: Free Run Avg Type: Log-PWr Ref 20.00 dBm Od Bldiv Ref 20.00 dBm Mkr1 2.401706 9 GHz Mkr1 2.401706 9 GHz Next Pk Right Og Aug Type: Log-PWr Stop 2.405000 GHz Marker Delt Res BW 100 kHz WBW 300 kHz Sweep 2.000 ms (30000 gHz) MkrC N 1 f 2.400 000 0 GHz 41.353 dBm MkrRef L More Tricl Sci X Y Function Function Value MkrRef L More Tricl Sci X Y Function Function Value MkrRef L More Tricl Sci X Y Function Function Value MkrRef L			тюр	ping on			
arker 1 2.401706890230 GHz Avg Type: Log-Pvr Avg Hold:>100/100 Trace 12.3 & 50 mic Peak Search PND: Fast IFGain:Low Trig: Free Run Atten: 30 dB Mkr1 2.401 706 9 GHz 4.976 dBm Next Pk Right 00 00 00 00 00 00 00 00 00 00 00 00 00							
IFGain:Low Atten: 30 dB Mkr1 2.401 706 9 GHz 4.976 dBm Next Pea 00 00 0		230 GHz PNO: Fast	Trig: Free Run	Avg Type	: Log-Pwr	TYPE MWWWW	Peak Search
00 00 <td< td=""><td>10 dB/div Ref 20.00 dB</td><td></td><td>Atten: 30 dB</td><td></td><td>Mkr1 2.40</td><td>1 706 9 GHz</td><td>NextPeal</td></td<>	10 dB/div Ref 20.00 dB		Atten: 30 dB		Mkr1 2.40	1 706 9 GHz	NextPeal
00 00 <td< td=""><td>Log 10.0 0.00 -10.0</td><td></td><td></td><td></td><td></td><td></td><td>Next Pk Righ</td></td<>	Log 10.0 0.00 -10.0						Next Pk Righ
Stop 2.405000 GHz Res BW 100 kHz \$\$\$\$ \$\$\$ \$\$\$ \$	-20.0			10 montal 2	haynar		Next Pk Lef
Res BW 100 kHz #VBW 300 kHz Sweep 2.000 ms (30000 pts) XR MODE TRC SCL X Y 1 N 1 2 N 1 1 1 1 2 X Y 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 1 1 2 X 2 X 3 1 4 1 5 1 6 1 7 1 8 1 9 1 1 1 1 1 1 1 1 1	-50.0	e./www.anderestandae.estal	Managen martin dan bagin				Marker Delt
2 N 1 f 2.400 000 0 GHz -41.353 dBm 4 A A A A A A A A A A A A A A A A A A A	Start 2.390000 GHz #Res BW 100 kHz	Х	Y		weep 2.000	ms (30000 pts)	Mkr→C
	1 N 1 f 2.4 2 N 1 f 2.4 3 - - - - 4 - - - - 5 - - - - 6 - - - -	401 706 9 GHz 400 000 0 GHz	4.976 dBm -41.353 dBm			<u></u> е	Mkr→RefLv
	7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9					-	Mor 1 of
	MSG				STATUS		

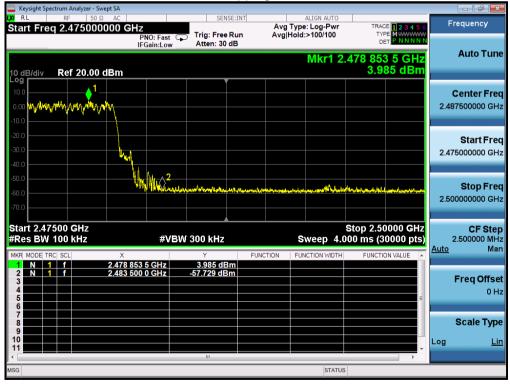




Page 33 of 65

8-DPSK MODULATION IN HIGH CHANNEL Hopping off Wexsight Spectrum Analyzer - Swept SA RL RF 50 Ω AC SENSE:INT ALIGN AUTO Start Freq 2.475000000 GHz Trig: Free Run Atten: 30 dB Avg Type: Log-Pwr Avg|Hold:>100/100 TRACE 12.345 g Type I Cog-Pwr Det PNO: Fast Cog







6. Radiated Emission

6.1. Measurement Procedure

- 1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
- 4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- 5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
- 6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- 7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
- 8.If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
- 9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High Low scan is not required in this case.



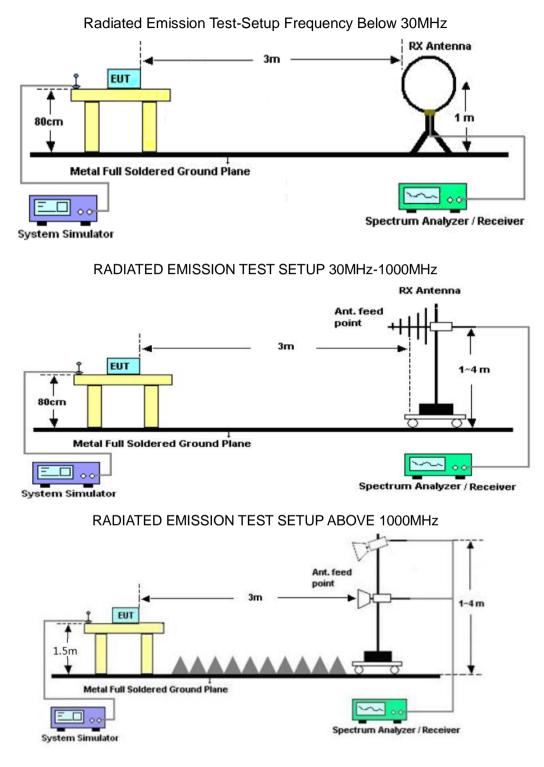
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz
	1MHz/3MHz for Peak, 1MHz/10Hz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP



Test Setup





6.2. Limits and Measurement Result

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission,

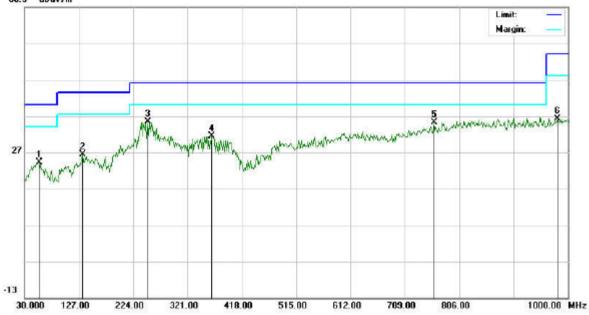
the test records reported below are the worst result compared to other modes.



RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz. RADIATED EMISSION BELOW 1GHZ

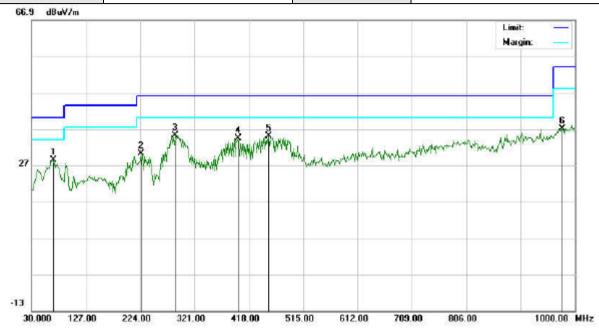
EUT	Golf Rangefinder	Model Name	AIMH10		
Temperature	25°C	Relative Humidity	55.4%		
Pressure	960hPa	Test Voltage	Normal Voltage		
Test Mode	Mode 4	Antenna	Horizontal		
66.9 dBuV/m					



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	•	MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB		cm	degree	
1		55.8667	3.30	20.89	24.19	40.00	-15.81	peak			
2		133.4667	7.22	19.16	26.38	43.50	-17.12	peak			
3	*	249.8667	15.38	19.93	35.31	46.00	-10.69	peak			
4		364.6500	7.95	23.52	31.47	46.00	-14.53	peak			
5		760.7333	3.00	32.22	35.22	46.00	-10.78	peak			
6		980.6000	0.77	35.48	36.25	54.00	-17.75	peak			



EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Vertical



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector		Antenna r Height	Table Degree	Comment
	•	MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB		cm	degree		
1		68.8000	10.28	18.17	28.45	40.00	-11.55	peak				
2		225.6167	11.09	19.05	30.14	46.00	-15.86	peak				
3	*	287.0500	13.97	21.31	35.28	46.00	-10.72	peak				
4		398.6000	9.56	24.79	34.35	46.00	-11.65	peak				
5		453.5667	8.97	26.07	35.04	46.00	-10.96	peak				
6		977.3667	1.66	35.44	37.10	54.00	-16.90	peak				

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. All test modes had been pre-tested. The mode 4 is the worst case and recorded in the report.



EUT	Golf Rangefinder	Model Name	AIMH10			
Temperature	25°C	Relative Humidity	55.4%			
Pressure	960hPa	Test Voltage	Normal Voltage			
Test Mode	Mode 1	Antenna	Horizontal			

RADIATED EMISSION ABOVE 1GHZ

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)			
4804.062	47.59	3.76	51.35	74.00	-22.65	peak		
4804.062	44.89	3.76	48.65	54.00	-5.35	AVG		
7206.093	37.15	8.17	45.32	74.00	-28.68	peak		
7206.093	7206.093 31.94 8.17 40.11 54.00 -13.89 AVG							
Remark:								
Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type		
4804.062	49.46	3.76	53.22	74.00	-20.78	peak		
4804.062	43.76	3.76	47.52	54.00	-6.48	AVG		
7206.093	38.15	8.17	46.32	74.00	-27.68	peak		
7206.093	36.98	8.17	45.15	54.00	-8.85	AVG		
Remark:								
Factor = Antenna Factor + Cable Loss – Pre-amplifier.								



EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)			
4882.062	47.00	3.78	50.78	74.00	-23.22	peak		
4882.062	42.67	3.78	46.45	54.00	-7.55	AVG		
7323.093	41.02	8.23	49.25	74.00	-24.75	peak		
7323.093	39.52	8.23	47.75	54.00	-6.25	AVG		
Remark:								
Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4882.062	48.00	3.78	51.78	74.00	-22.22	peak
4882.062	42.76	3.78	46.54	54.00	-7.46	AVG
7323.093	40.42	8.23	48.65	74.00	-25.35	peak
7323.093	37.46	8.23	45.69	54.00	-8.31	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						



EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4960.062	46.83	3.81	50.64	74.00	-23.36	peak
4960.062	44.63	3.81	48.44	54.00	-5.56	AVG
7440.093	40.38	8.27	48.65	74.00	-25.35	peak
7440.093	36.94	8.27	45.21	54.00	-8.79	AVG
Remark:	Remark:					
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Jeres Jeres
4960.062	47.21	3.81	51.02	74.00	-22.98	peak
4960.062	44.84	3.81	48.65	54.00	-5.35	AVG
7440.093	39.16	8.27	47.43	74.00	-26.57	peak
7440.093	37.34	8.27	45.61	54.00	-8.39	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

All test modes had been tested. The GFSK modulation is the worst case and recorded in the report.



EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal





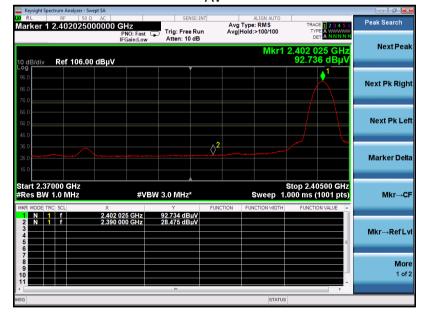
AV sight Spectrum Analyzer - Swept SA Registro spectrum R L RF 50 Q AC Warker 1 2.401990000000 GHz PROS Fast FrGain:Low Trig: Free Run Atten: 10 dB ALIGN AUTO Avg Type: RMS Avg|Hold:>100/100 Peak Search TYPE A WWW DET A NNN Next Peak Mkr1 2.401 990 GHz 94.856 dBµV 10 dB/div Ref 106.00 dBµV <mark>ہ</mark>۱ Next Pk Right Next Pk Lef _____<mark>2</mark> Marker Delta Stop 2.40500 GHz Sweep 1.000 ms (1001 pts) Start 2.37000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz* Mkr→CF 2.401 990 GHz 2.390 000 GHz 94.853 dBµV 29.821 dBµV Mkr→RefLvi More 1 of 2



EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

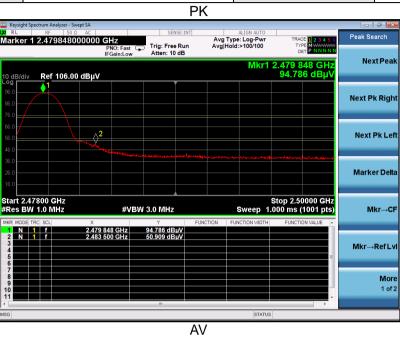


AV





EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal



A C SENSE:INT ALIGN AUTO	- 0
DO GHZ SERVELINI AUGUAUO PNO: Fast Trig: Free Run Avg[Hold:>100/100 Trace 12:3:4:5:0 PNO: Fost Drig: Free Run Avg[Hold:>100/100 Trace 12:3:4:5:0 Det A NUNNI 1	Peak Search
Mkr1 2.480 002 GHz عبلا 94.153 dBμV	NextPe
	Next Pk Rig
δ ²	Next Pk L
	Marker De
Stop 2.50000 GHz #VBW 3.0 MHz* Sweep 1.000 ms (1001 pts) X Y Function Function width	Mkr⊸
2480 002 GHz 94.150 dBuV 2483 500 GHz 34.858 dBuV	Mkr→Refi
	Мс 1 с
m	



EUT	Golf Rangefinder	Model Name	AIMH10
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical



RESULT: PASS

Note: The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μ V) to represent the Amplitude. Use the F dB(μ V/m) to represent the Field Strength. So A=F. All test modes had been pre-tested. The GFSK modulation is the worst case and recorded in the report.

7. FCC LINE CONDUCTED EMISSION TEST

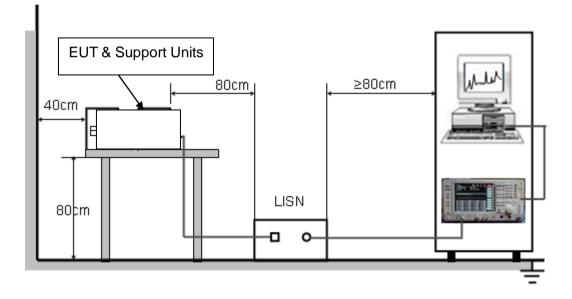
7.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Framman	Maximum RF Line Voltage		
Frequency	Q.P.(dBuV)	Average(dBuV)	
150kHz~500kHz	66-56	56-46	
500kHz~5MHz	56	46	
5MHz~30MHz	60	50	

Note:

- 1. The lower limit shall apply at the transition frequency.
- 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

7.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST





7.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

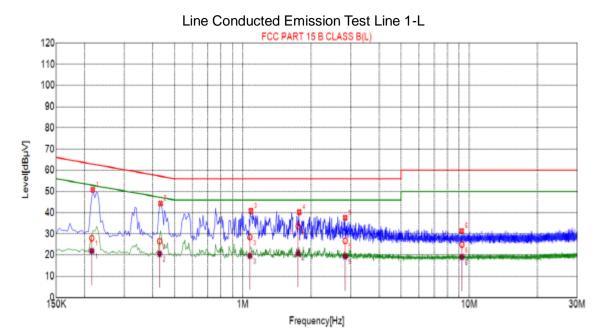
- The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2. Support equipment, if needed, was placed as per ANSI C63.10.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4. All support equipments received AC120V/60Hz power from a LISN, if any.
- 5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
- 6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.
- 9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

7.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3. The test data of the worst case condition(s) was reported on the Summary Data page.

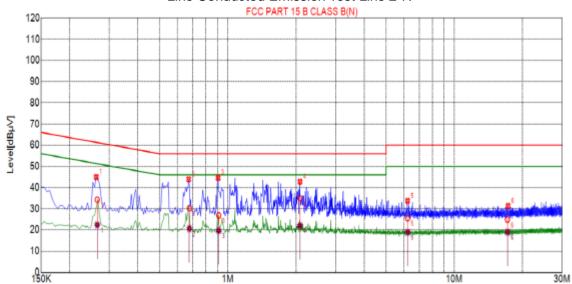




Suspected List							
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector	
1	0.2175	50.83	10.05	62.91	12.08	PK	
2	0.4335	44.37	10.05	57.19	12.82	PK	
3	1.0860	40.85	10.07	56.00	15.15	PK	
4	1.7745	40.25	10.14	56.00	15.75	PK	
5	2.8320	37.63	10.21	56.00	18.37	PK	
6	9.2625	31.40	10.10	60.00	28.60	PK	

Final Data List								
NO.	Freq. (MHz)	Factor (dB)	QP Value [dBµV]	QP Limit (dBµV)	QP Margin [d8]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin (dB)
1	0.2153	10.05	27.92	63.00	35.08	21.92	53.00	31.08
2	0.4292	10.05	26.52	57.27	30.75	20.58	47.27	26.69
3	1.0752	10.07	28.42	56.00	27.58	19.66	46.00	26.34
4	1.7568	10.14	33.64	56.00	22.36	20.86	46.00	25.14
5	2.8349	10.21	26.71	56.00	29.29	19.31	46.00	26.69
6	9.2821	10.10	24.96	60.00	35.04	19.06	50.00	30.94





Line Conducted Emission Test Line 2-N

Suspected List							
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector	
1	0.2625	44.94	10.03	61.35	16.41	РК	
2	0.6720	43.97	10.05	56.00	12.03	PK	
3	0.9060	44.61	10.06	56.00	11.39	РК	
4	2.0850	42.77	10.15	56.00	13.23	PK	
5	6.2250	33.72	10.22	60.00	26.28	РК	
6	17.2905	31.34	10.01	60.00	28.66	PK	

Frequency[Hz]

Final	Final Data List							
NO.	Freq. (MHz)	Factor (dB)	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]
1	0.2651	10.03	34.23	61.27	27.04	22.45	51.27	28.82
2	0.6764	10.05	30.27	56.00	25.73	20.62	46.00	25.38
3	0.9116	10.06	26.91	56.00	29.09	19.69	46.00	26.31
4	2.0832	10.15	35.00	56.00	21.00	22.18	46.00	23.82
5	6.2263	10.22	25.56	60.00	34.44	18.93	50.00	31.07
6	17.1754	10.00	24.95	60.00	35.05	19.05	50.00	30.95

RESULT: PASS

Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.



8. Number of Hopping Frequency

8.1. Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.

2. 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.

3. VBW \geq RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.

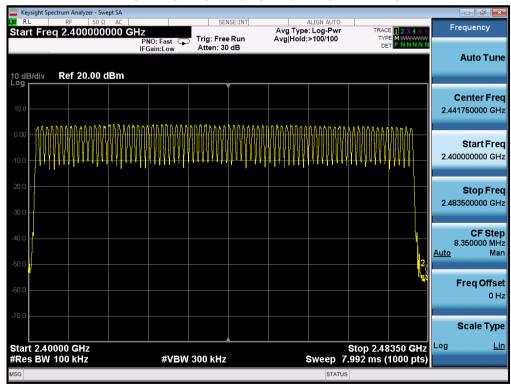
4. Allow the trace to stabilize.

8.2. Test Setup (Block Diagram of Configuration)

Same as described in section 4.2

8.3. Limits and Measurement Result

TOTAL NO. OF	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT		
HOPPING CHANNEL	>=15	79	PASS		
TEST PLOT FOR NO. OF TOTAL CHANNELS					



Note: The 8-DPSK modulation is the worst case and recorded in the report.



9. Time Of Occupancy (Dwell Time)

9.1. Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.

2. RBW shall be \leq channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.

3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

4. Detector function: Peak. Trace: Max hold.

5. Use the marker-delta function to determine the transmit time per hop.

6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) \times (period specified in the requirements / analyzer sweep time)

7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

9.2. Test Setup (Block Diagram of Configuration)

Same as described in section 4.2

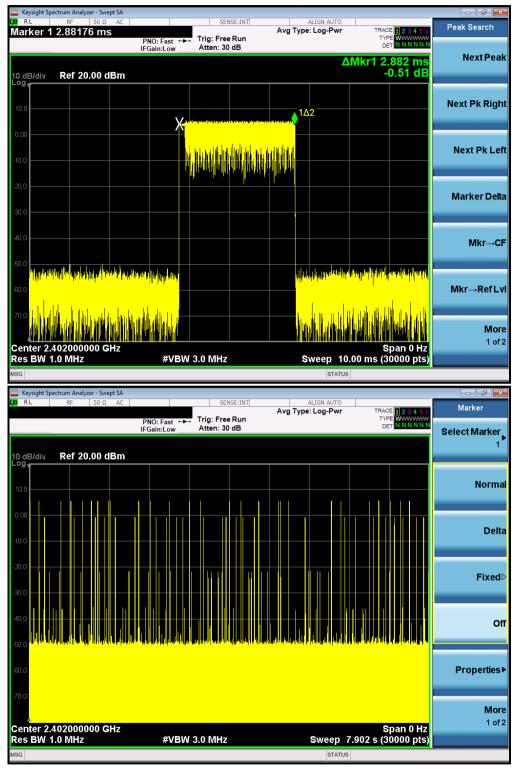
9.3. Limits and Measurement Result

Channel	Time of Pulse for DH5 (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)
Low	2.882	27*4	311.256	400
Middle	2.869	26*4	298.376	400
High	2.892	26*4	300.768	400

Note: The 8-DPSK modulation is the worst case and recorded in the report.



TEST PLOT OF LOW CHANNEL





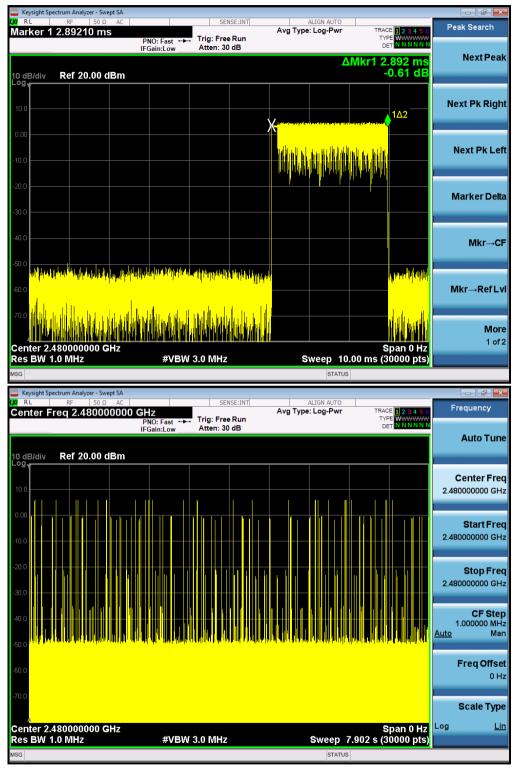
Page 54 of 65

Keysight Spectrum Analyzer - Swept SA Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω AC Marker 1 2.86910 ms Free Run Avg Type: Log-Pwr PNO: Fast Trig: Free Run LGaind.ow Atten: 30 dB	
Marker 1 2.86910 ms PNO: Fast +++ Trig: Free Run Avg Type: Log-Pwr	
PNO: Fast +++ Trig: Free Run	Peak Search
IFGain:Low Atten: to db	NextPeal
ΔMkr1 2.869 ms 10 dB/div Ref 20.00 dBm 0.78 dB	
10 dB/div Ref 20.00 dBm U. /8 dB	
10.0	Next Pk Righ
alka da	Next Pk Lef
-20.0	
	Marker Delta
-30.0	
-40.0	Mkr→CF
	Miki →Ci
-50.0 <mark>Market Market and an and an </mark>	
a data angka	
-60.0 It tuble diverse in the second se	Mkr→RefLv
LAN MARANA MARANA MANANA M	More
4 Center 2.441000000 GHz Span 0 Hz	1 of 2
Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.00 ms (30000 pts)	
MSG STATUS	
Keysight Spectrum Analyzer - Swept SA	
120 RL RF 50 Ω AC SENSE:INT ALIGN AUTO	
Center Freq 2.441000000 GHz PNO: East Trig: Free Run Avg Type: Log-Pwr TRACE 2 3 4 5 6 TYPE WWWWWW	Frequency
PNO: Fast	
	Auto Tune
10 dB/div Ref 20.00 dBm	
10 dB/div Ref 20.00 dBm	
	Center Fred
10 dB/div Ref 20.00 dBm	Center Fred 2.441000000 GH;
	2.441000000 GH:
	2.441000000 GH: Start Free
	2.441000000 GH: Start Free
	2.441000000 GH: Start Fred 2.441000000 GH: Stop Fred
	2.441000000 GH: Start Fred 2.441000000 GH;
	2.441000000 GH: Start Fred 2.441000000 GH: Stop Fred
	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step
	2.441000000 GH; Start Free 2.441000000 GH; Stop Free 2.441000000 GH; CF Step 1.000000 MH;
Log	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step
	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step 1.000000 MH: Auto Mar
Log	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step 1.000000 MH: Auto Mar Free Offse
Log	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step 1.000000 MH: Auto Mar
Log	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step 1.000000 MH: Auto Mar Free Offse
Log	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step 1.000000 MH: Auto Mar Freq Offse 0 H:
Log	2.441000000 GH: Start Free 2.441000000 GH: 2.441000000 GH: 2.441000000 GH: 1.000000 MH: Auto Mar Freq Offse 0 H: Scale Type
Log 100 100 100 100 100 100 100 10	2.441000000 GH: Start Free 2.441000000 GH: Stop Free 2.441000000 GH: CF Step 1.000000 MH: Auto Mar Freq Offse 0 H:
Log	2.441000000 GH: Start Free 2.441000000 GH: 2.441000000 GH: 2.441000000 GH: 1.000000 MH: Auto Mar Freq Offse 0 H: Scale Type

TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL





10. Frequency Separation

10.1. Measurement Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.

2. 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.

3. Video (or average) bandwidth (VBW) \geq RBW.

4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.

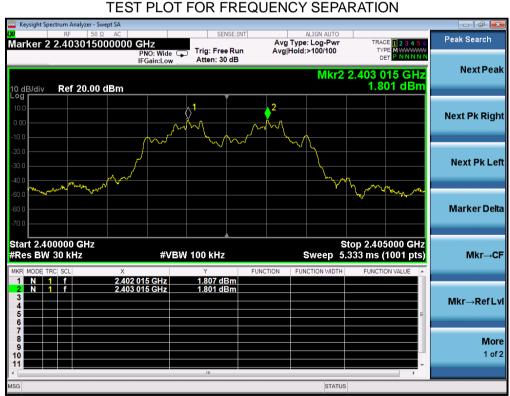
Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

10.2. Test Setup (Block Diagram of Configuration)

Same as described in section 4.2

10.3.Limits and Measurement Result

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	Dasa
CH01-CH02 1000		>=25 KHz or 2/3 20 dB BW	Pass



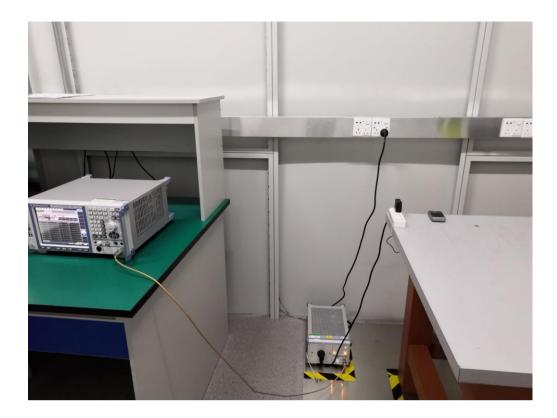
Note: The 8-DPSK modulation is the worst case and recorded in the report.



11. Test Setup Photos of the EUT





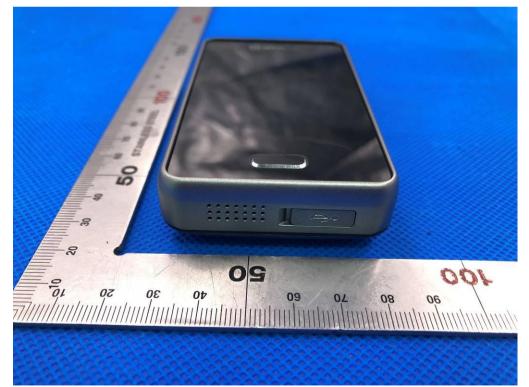




12. Photograph of EUT

TOP VIEW OF EUT

BOTTOM VIEW OF EUT

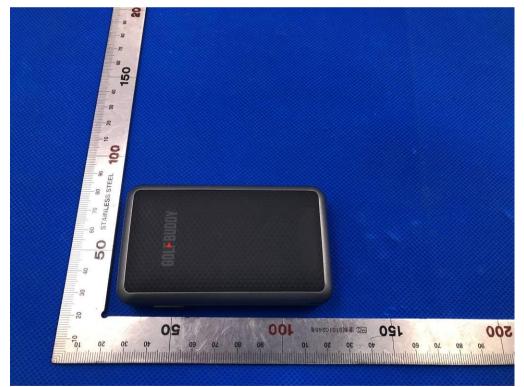




FRONT VIEW OF EUT

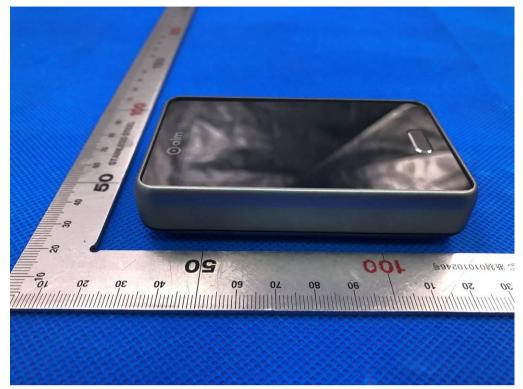


BACK VIEW OF EUT





LEFT VIEW OF EUT

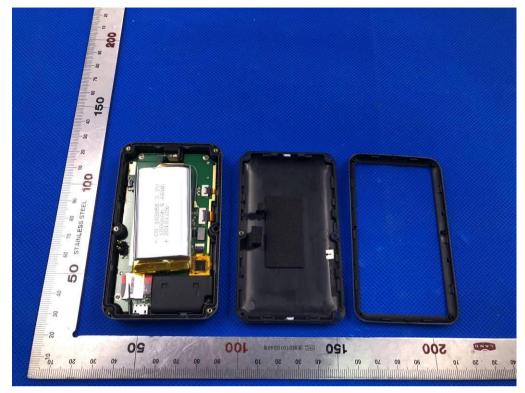


RIGHT VIEW OF EUT

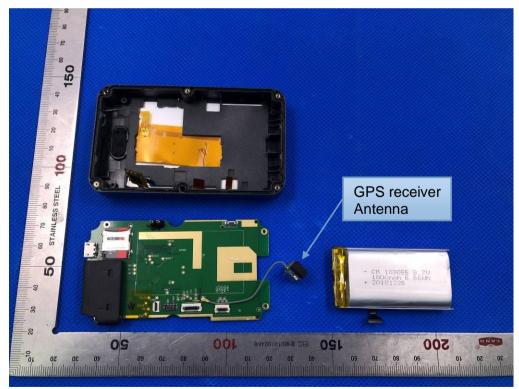




OPEN VIEW-1 OF EUT

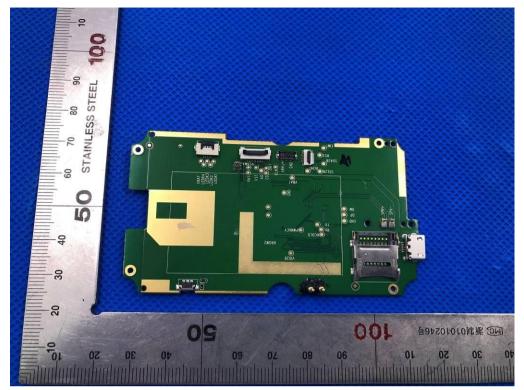


OPEN VIEW-2 OF EUT

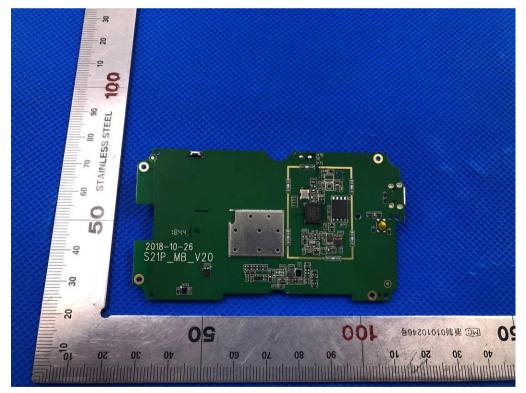




INTERNAL VIEW-1 OF EUT

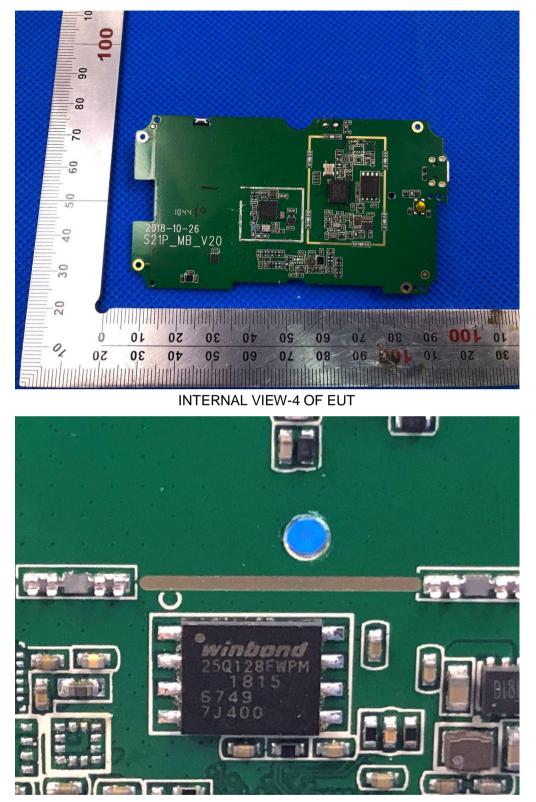


INTERNAL VIEW-2 OF EUT



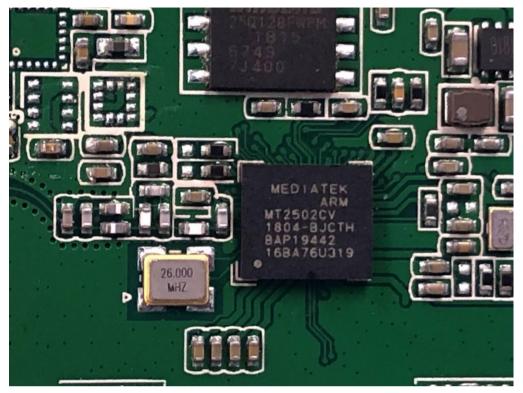


INTERNAL VIEW-3 OF EUT

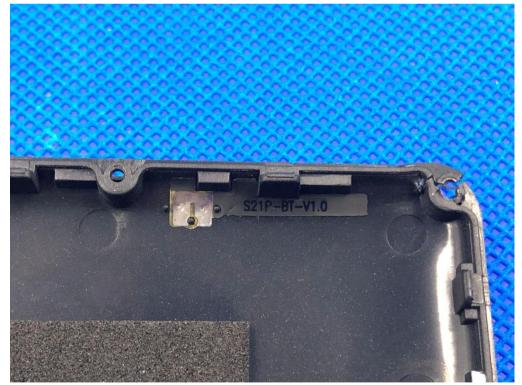




INTERNAL VIEW-5 OF EUT



BT ANTENNA



----END OF REPORT----