# **TEST REPORT**

of

# FCC Part 15 Subpart C AND CANADA RSS-210

 $\boxtimes$  New Application;  $\square$  Class I PC;  $\square$  Class II PC

Product :	Navigation Device		
Brand:	Magellan, Mio, Navman, Mitac		
Model:	N476		
Model Difference:	N/A		
FCC ID:	P4Q-N476		
IC:	2420C-N476		
FCC Rule Part:	§15.247, Cat: DSS		
IC Rule Part:	RSS-210 issue 8:2010, Annex 8		
Applicant:	Mitac International Corporation		
Address:	Building B, No. 209, Sec. 1, Nan Gang Rd., Nan Gan, Taipei, Taiwan		

### **Test Performed by: International Standards Laboratory**

<Lung-Tan LAB> \*Site Registration No. BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3; \*Address: No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd. Lung-Tan Hsiang, Tao Yuan County 325, Taiwan \*Tel: 886-3-407-1718; Fax: 886-3-407-1738 Report No.: ISL-14LR096FCDSS

Issue Date : 2014/04/30



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.

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# **VERIFICATION OF COMPLIANCE**

Applicant:	Mitac International Corporation
Product Description:	Navigation Device
Brand Name:	Magellan, Mio, Navman, Mitac
Model No.:	N476
Model Difference:	N/A
FCC ID:	P4Q-N476
IC:	2420C-N476
Date of test:	2014/04/08~2014/04/29
Date of EUT Received:	2014/04/08

# We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	DinoChen	Date:	2014/04/30
Prepared By:	Dion Chang / Engineer Gigi Jeh	Date:	2014/04/30
Approved By:	Gigi Yeh / Specialist	Date:	2014/04/30

Vincent Su / Technical Manager



# Version

Version No.	Date	Description
00	2014/04/30	Initial creation of document



# **Table of Contents**

1.	GEN	ERAL INFORMATION	6
	1.1.	Product Description	6
	1.2.	Related Submittal(s) / Grant (s)	8
	1.3.	Test Methodology	8
	1.4.	Test Facility	8
	1.5.	Special Accessories	8
	1.6.	Equipment Modifications	8
2.	SYST	TEM TEST CONFIGURATION	9
	2.1.	EUT Configuration	9
	2.2.	EUT Exercise	9
	2.3.	Test Procedure	9
	2.4.	Configuration of Tested System	10
3.	SUM	IMARY OF TEST RESULTS	
4.	DES	CRIPTION OF TEST MODES	
5.	AC F	POWER LINE CONDUCTED EMISSION TEST	
	5.1.	Standard Applicable:	
	5.2.	Measurement Equipment Used:	
	5.3.	EUT Setup:	
	5.4.	Measurement Procedure:	
	5.5.	Measurement Result:	13
6.	PEA	K OUTPUT POWER MEASUREMENT	
	6.1.	Standard Applicable:	16
	6.2.	Measurement Equipment Used:	16
	6.3.	.Test Set-up:	17
	6.4.	Measurement Procedure:	
	6.5.	Measurement Result:	
7.	100K	KHz BANDWIDTH OF BAND EDGES MEASUREMENT	
	7.1.	Standard Applicable:	19
	7.2.	Measurement Equipment Used:	20
	7.3.	Test SET-UP:	
	7.4.	Measurement Procedure:	
	7.5.	Field Strength Calculation	
	7.6.	Measurement Result:	
8.	SPU	RIOUS EMISSION TEST	
	8.1.	Standard Applicable:	
	8.2.	Measurement Equipment Used:	
	8.3.	Test SET-UP:	
	8.4.	Measurement Procedure:	
	8.5.	Field Strength Calculation	
	8.6.	Measurement Result:	



9.	FRE(	QUENCY SEPARATION	40
	9.1.	Standard Applicable:	40
	9.2.	Measurement Equipment Used:	40
	9.3.	Test Set-up:	40
	9.4.	Measurement Procedure:	40
	9.5.	Measurement Result:	40
10.	NUM	BER OF HOPPING FREQUENCY	42
	10.1.	Standard Applicable:	42
	10.2.	Measurement Equipment Used:	42
	10.3.	Test Set-up:	42
	10.4.	Measurement Procedure:	42
	10.5.	Measurement Result:	42
11.	TIME	E OF OCCUPANCY (DWELL TIME)	44
	11.1.	Standard Applicable:	44
	11.2.	Measurement Equipment Used:	44
	11.3.	Test Set-up:	44
	11.4.	Measurement Procedure:	44
	11.5.	Measurement Result:	45
12.	20dB	Bandwidth & 99% Bandwidth	51
	12.1.	Standard Applicable:	51
	12.2.	Measurement Equipment Used:	51
	12.3.	Test Set-up:	51
	12.4.	Measurement Procedure:	51
	12.5.	Measurement Result:	52
13.	ANTI	ENNA REQUIREMENT	61
	13.1.	Standard Applicable:	61
	13.2.	Antenna Connected Construction:	61
14.	RF E	XPOSURE	62
	14.1.	Standard Applicable	
	14.2.	Measurement Result:	62



# 1. GENERAL INFORMATION

# **1.1. Product Description**

General:

Product Name	Navigation Device		
Brand Name	Magellan, Mio, Navman, Mitac		
Model Name	N476		
Model Difference	N/A		
USB port	One provided for Data link and battery charger		
AV in port	One provided		
Audio out port	One provided		
	5Vdc from AC/DC adapter or 3.7Vdc, 1100mAh Li-ion Battery		
Power SupplyModel: QII050200B; Supplier: TPT Car Charger: Model: CA-052-00U-19; Supplier: M			
VOIP	N/A		

#### Bluetooth:

Bluetooth Version	V2.1 + EDR (GFSK + $\pi$ /4 DQPSK + 8DPSK)	V4.0(GFSK)	
Frequency Range	2402 – 2480MHz	2402 – 2480MHz	
Channel number	79 channels	40 channels	
Modulation type	Frequency Hopping Spread Spec- trum	Wide band Modulation	
Rated power	0 dBm(Peak)	6 dBm(Peak)	
Max Measured Trans- mit Power	-3.01 (Peak)	5.37 dBm (Peak)	
Dwell Time	<= 0.4s	N/A	
Antenna Designation	Chip Antenna 1.34dBi, share the same antenna with Wifi		

The EUT is compliance with Bluetooth EDR V2.1 +V4.0 Standard.



WLAN: 1Tx / 1Rx

Frequency Range:	802.11b/g/n HT20: 2412 – 2462MHz			
Channel number:	802.11b/g/n HT2	0: 11 channels		
		Measured Peak Power at each Chain	Rated AV Power at each Chain	Tolerance
Transmit Power:	802.11b:	16.73dBm	13.0 dBm	+/- 1dB
	802.11g:	22.95dBm	12.0 dBm	+/- 1dB
	802.11n HT20 :	23.67dBm	10.0 dBm	+/- 1dB
Modulation Tech- nology	11b/g: DSSS, OFDM 11n: OFDM			
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM. 16QAM, QPSK, BPSK for OFDM			
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n HT20MHz: 6.5 – 65Mbps			
Antenna Designa- tion:	Chip Antenna, 1.34dBi			

The EUT is compliance with IEEE 802.11 b/g/n Standard.

The report applies for Bluetooth EDR V2.0 mode.

**Remark:** The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



### **1.2.** Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID:** <u>P4Q-N476</u> filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And IC: <u>2420C-N476</u> filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8.

#### 1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2009 and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC Public Notice DA 00-705

#### 1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd., Lung-Tan Hsiang, Tao Yuan County 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

#### **1.5.** Special Accessories

Not available for this EUT intended for grant.

### **1.6.** Equipment Modifications

Not available for this EUT intended for grant.



# 2. SYSTEM TEST CONFIGURATION

# **2.1. EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

# 2.2. EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the TX/RX frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

# 2.3. Test Procedure

# **2.3.1 Conducted Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7, 13 of ANSI C63.4-2009 and RSS-Gen:2010. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

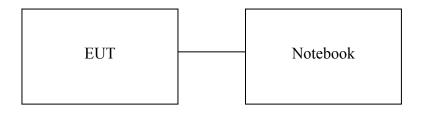
# 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 of ANSI C63.4-2009 and DA 00-705.



# 2.4. Configuration of Tested System

# Fig. 2-1 Configuration of Tested System (Fixed channel)



# Table 1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Lenovo	X220i	NA	shield	Non-shield



# 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result	
§15.207(a)/	AC Power line Conducted Emission	Compliant	
RSS-Gen §7.2.2	AC Power line Conducted Emission		
§15.247(b)(1)/	Pools Output Power	Comuliant	
RSS-210 issue 8,§A8.4(2)	Peak Output Power	Compliant	
§15.247(d)	100 KHz Bandwidth Of	Compliant	
RSS-210 issue 8,§A8.5	Frequency Band Edges	Compliant	
§15.247(c)			
RSS-Gen §7.2.3	Spurious Emission	Compliant	
RSS-210 issue 8,§A2.9			
§15.247(a)(1)/	Fraguency Separation	Compliant	
RSS-210 issue 8,§A8.1(b)	Frequency Separation		
§15.247(a)(1)(iii)/	Number of hopping frequency	Compliant	
RSS-210 issue 8,§A8.1(d)	Number of nopping frequency	Compliant	
§15.247(a)(1)(ii)/	Time of Occupancy	Compliant	
RSS-210 issue 8,§A8.1(d)	Time of Occupancy	Compliant	
§15.247/	Peak Power Density	Compliant	
RSS-210 issue 8,§A8.2(b)	Feak Fower Density	Compliant	
§15.247(a)(1)	20dB Bandwidth		
RSS-Gen §4.6.1,	&	Compliant	
RSS210 issue ,§A8.1(b)	99% Power Bandwidth		
§15.203, §15.247(c)/			
RSS-GEN 7.1.4,	Antenna Requirement	Compliant	
RSS-210 issue 8,§A8.4			

# 4. DESCRIPTION OF TEST MODES

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low (2402MHz), mid (2441MHz) and high (2480MHz) with each modulation were chosen for full testing.

The worst case BDR mode was reported for Radiated Emission.

In comparison with which EUT deposits on the surface of turned table. The Y plane is found to be the worst case.





# 5. AC POWER LINE CONDUCTED EMISSION TEST

### 5.1. Standard Applicable:

According to §15.207 and RSS-Gen §7.2.2, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range	Limits dB(uV)				
MHz	Quasi-peak	Average			
0.15 to 0.50	66 to 56	56 to 46			
0.50 to 5	56	46			
5 to 30	60	50			
Note					
1. The lower limit shall apply at the transition frequencies					

2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 5.2. Measurement Equipment Used:

	(	Conducted Emission	n Test Site		
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE	MIF K	NUMBER	NUMBER	CAL.	CAL DUE.
Conduction 04-1 Cable	WOKEN	CFD 300-NL	Conduction 04 -1	09/24/2013	09/23/2014
EMI Receiver 16	Rohde & Schwarz	ESCI	101221	06/13/2013	06/12/2014
LISN 18	ROHDE & SCHWARZ	ENV216	101424	03/13/2014	03/12/2015
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/13/2014	03/12/2015

### 5.3. EUT Setup:

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.



#### **5.4. Measurement Procedure:**

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

### 5.5. Measurement Result:

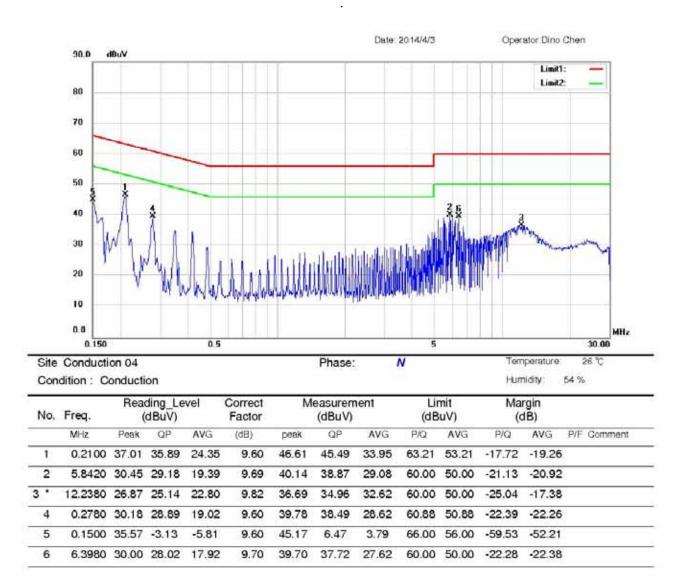
The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.



# AC POWER LINE CONDUCTED EMISSION TEST DATA

)per	ation M	loue.	1	ration	Mode					16	est Date	Z. Z	2014/	01/05
est	By:		Ding	)										
	80	1BuV						Date	20 14/4/3		Oper	Limit1	r:Dino Chen Limit1: Limit2:	
	70 60	-												
	50	1	-											
		A	20 T							45				
	40 30	h	Â	11.	1						MT	and and		4
	NS	M	<b>Å</b>	M	Juli	indelief						n -	~~~	J
	30 20 10 0.0	M	Å.	M	Juli	unger	ta in the line					n -		MHz
Site	30 20 10 0.0 0.150		Å M	A.J.	Juli	utht	Phase					ncerature:		0.00
	30 20 10 0.0		Ś.	0.5	Juli	inthia	Phase:		5		Ter	nperature:	34 26 54 %	0.00
Con	30 20 10 0.0 0.150 Conducti	onducti Read	on ding_Le		Correct	M	Phase: (dBuV)		- P.0822		Terr		26	0.00
Con	30 20 10 0.150 Conducti dition : C	onducti Read	ling_Le			M pesk	easurem		L1 Lir		Terr	nidity: rgin	26 54 %	0.00
Con	30 20 10 0.0 0.150 Conducti dition : Co	onductio Read (0 Peak	ding_Le dBuV)	vel	Factor	~	easurem (dBuV)	ient	L1 Lir (dB	uV)	Terr Hun Ma (c	nidity: rgin dB)	26 54 %	0.00 T
Con No. 2	30 20 10 0.0 0.150 Conducti dition : Co Freq. MHz 0.2100 0.2780	Pesk 37.57 30.18	ding_Le dBuV) QP 36.67 29.66	vel AVG 25.55 19.84	(dB)	pesk	easurem (dBuV) QP 46.25 39.24	AVG 35.13 29.42	Lir (dB P/Q 63.21 60.88	uV) AVG 53.21 50.88	Terr Hun (c P/Q -16.96 -21.64	nidity: 1B) AVG -18.08 -21.46	26 54 % P/F C	0.00 T
Con No.	30 20 10 0.150 Conducti dition : Co Freq. MHz 0.2100	Pesk 37.57 30.18	ding_Le dBuV) QP 36.67 29.66	vel AVG 25.55	(dB) 9.58	реек 47.15	easurem (dBuV) QP 46.25 39.24 36.86	AVG 35.13 29.42 28.90	L1 (dB P/Q 63.21 60.88 56.00	uV) AVG 53.21 50.88 46.00	Terr Hun Ma (c P/Q -16.96 -21.64 -19.14	nidity: rgin dB) AVG -18.08	26 54 % P/F C	0.00 T
Con No.	30 20 10 0.0 0.150 Conducti dition : Co Freq. MHz 0.2100 0.2780	Pesk 37.57 30.18 28.81	ding_Le dBuV) QP 36.67 29.66 27.20	vel AVG 25.55 19.84	Factor (dB) 9.58 9.58	pesk 47.15 39.76	easurem (dBuV) QP 46.25 39.24	AVG 35.13 29.42	Lir (dB P/Q 63.21 60.88	uV) AVG 53.21 50.88	Terr Hun (c P/Q -16.96 -21.64	nidity: 1B) AVG -18.08 -21.46	26 54 % P/F C	0.00 T
Con No. 2 3	30 20 10 0.150 Conducti dition : Co Freq. MHz 0.2100 0.2780 4.9340	enductii Read (r Peak 37.57 30.18 28.81 31.69	ding_Le dBuV) QP 36.67 29.66 27.20	AVG 25.55 19.84 19.24	Factor (dB) 9.58 9.58 9.66	pesk 47.15 39.76 38.47	easurem (dBuV) QP 46.25 39.24 36.86	AVG 35.13 29.42 28.90	L1 (dB P/Q 63.21 60.88 56.00	uV) AVG 53.21 50.88 46.00	Terr Hun Ma (c P/Q -16.96 -21.64 -19.14	nidity: rgin dB) AVG -18.08 -21.46 -17.10	26 54 % P/F C	0.00 T







# 6. PEAK OUTPUT POWER MEASUREMENT

### 6.1. Standard Applicable:

According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

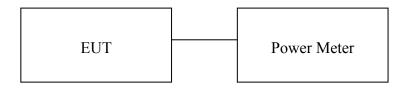
According to RSS-210 issue 8,§A8.4(2), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

	Cond	ucted Emission	n Test Site		
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
Power Meter 05	Anritsu	ML2495A	1116010	04/19/2014	04/18/2015
Power Sensor 05	Anritsu	MA2411B	34NKF50	04/19/2014	04/18/2015
Power Sensor 06	DARE	RPR3006W	13I00030SNO33	10/18/2013	10/17/2014
Power Sensor 07	DARE	RPR3006W	13I00030SNO34	10/18/2013	10/17/2014
Temperature Chamber	KSON	THS-B4H100	2287	03/17/2014	03/16/2015
DC Power supply	ABM	51850	N/A	08/16/2013	08/15/2014
AC Power supply	EXTECH	CFC105W	NA	12/19/2013	12/18/2014
Attenuator	Woken	Watt-65m3502	11051601	NA	NA
Splitter	MCLI	PS4-199	12465	12/27/2013	12/26/2014
Spectrum analyzer	Agilent	N9030A	MY51360021	03/29/2014	03/28/2015

# 6.2. Measurement Equipment Used:



### 6.3. .Test Set-up:



### **6.4. Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel power function, RBW, VBW = 1MHz)
- 3. Record the max. reading.
- 4. Repeat above procedures until all frequency measured were complete.



### 6.5. Measurement Result:

## **BDR Mode**

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-3.84	0.00	-3.84	0.00041	1
2441.00	-3.57	0.00	-3.57	0.00044	1
2480.00	-3.01	0.00	-3.01	0.00050	1

#### EDR 2M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-4.12	0.00	-4.12	0.00039	1
2441.00	-3.88	0.00	-3.88	0.00041	1
2480.00	-3.32	0.00	-3.32	0.00047	1

#### EDR 3M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-4.10	0.00	-4.10	0.00039	1
2441.00	-3.85	0.00	-3.85	0.00041	1
2480.00	-3.30	0.00	-3.30	0.00047	1

Offset: 0.5dB



# 7. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

### 7.1. Standard Applicable:

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

According to RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



# 7.2. Measurement Equipment Used:

# 7.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

### 7.2.2. Radiated emission:

	Ch	amber 14(966)	)		
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/18/2013	07/17/2014
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/26/2013	05/25/2014
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/03/2013	05/02/2014
Dipole antenna	SCHWARZBECK	VHAP,30-300	919	12/03/2013	12/02/2015
Dipole antenna	SCHWARZBECK	UHAP,300-100 0	1195	12/03/2013	12/02/2015
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	03/07/2013	03/06/2015
Bilog Antenna30-1G	Schaffner	CBL 6112B	2756	01/08/2014	01/07/2015
Horn antenna1-18G(06)	EMCO	3117	0006665	11/04/2013	11/03/2014
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/15/2013	05/14/2015
Preamplifier9-1000M	HP	8447D	NA	02/20/2014	02/19/2015
Preamplifier1-18G	MITEQ	AFS44-001018 00-25-10P-44	1329256	07/18/2013	07/17/2014
Preamplifier1-26G	EM	EM01M26G	NA	02/20/2014	02/19/2015
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/17/2014	02/16/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/14/2013	10/13/2014
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&3742 1/2	10/03/2013	10/02/2015
Signal Generator	R&S	SMU200A	102330	02/19/2014	02/18/2015
Signal Generator	Anritsu	MG3692A	20311	10/30/2013	10/29/2014
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2013	12/26/2014



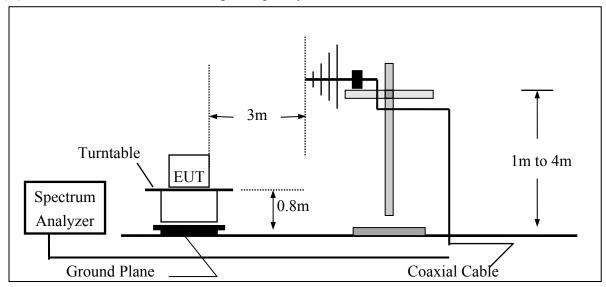
## 7.3. Test SET-UP:

# 7.3.1. Conducted Emission at antenna port:

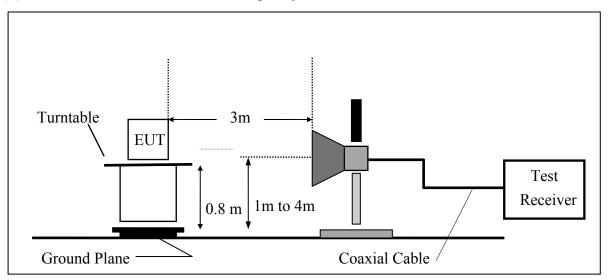
Refer to section 6.3 for details.

### 7.3.2. Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



-22 of 62-



### 7.4. Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = operating frequency.
- 4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
- 5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
- 6. Repeat above procedures until all frequency measured were complete.

### 7.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

#### $\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$

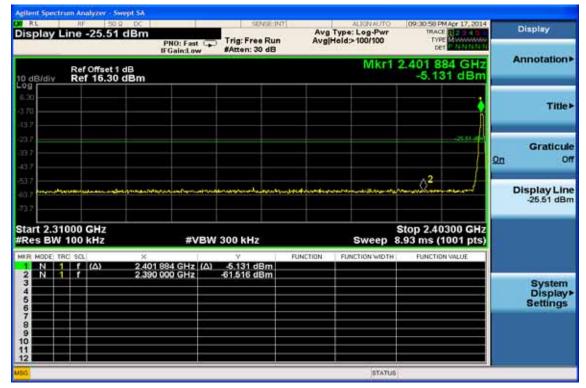
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

#### 7.6. Measurement Result:

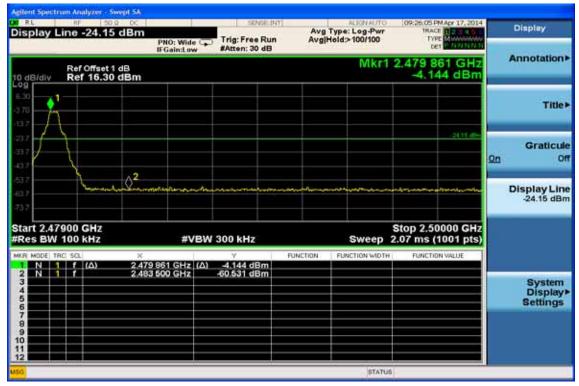
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.



# BDR Mode Band Edges Test Data CH-Low



Band Edges Test Data CH-High





### -24 of 62-

### **Radiated Emission: (BDR mode)**

Funda	ation Mode amental Fre perature		X CH Low 02 MHz 5	I		Te	st By	2014/04/24 Dino 60 %
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	2389.49	57.35	-7.10	50.25	74.00	-23.75	Peak	VERTICAL
2	2390.00	53.84	-7.09	46.75	74.00	-27.25	Peak	VERTICAL
1	2319.84	54.21	-7.23	46.98	74.00	-27.02	Peak	HORIZONTAL
2	2390.00	52.83	-7.09	45.74	74.00	-28.26	Peak	HORIZONTAL
Funda	ation Mode amental Fre perature		X CH Hig 80 MHz	h		Te: Hu	st By	2014/04/24 Dino 60 %
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	2483.50	52.33	-6.90	45.43	74.00	-28.57	Peak	VERTICAL
2	2484.18	55.18	-6.90	48.28	74.00	-25.72	Peak	VERTICAL
1	2483.50	51.93	-6.90	45.03	74.00	-28.97	Peak	HORIZONTAL
2	2488.98	54.37	-6.89	47.48	74.00	-26.52	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- <sup>3</sup> "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



# EDR 2M Mode Band Edges Test Data CH-Low

isplay Li	ne -27.64 dB		Trig: Free Run #Atten: 30 dB	Avg	Type: Log-Pwr Hold>100/100	09:15:19 PM Apr 17, 2014 TRACE 12:2:4:9 TYPE MUMMANN DET E MINNIM	Display
0 dB/div	Ref Offset 1 dB Ref 16.30 dBr	n			Mkr1	2.402 163 GHz -7.636 dBm	Annotation
100							Title
37						-2738189	Graticul On O
37 3.7 3.7	www.tacaa.la.tu		4	5. A	B14.0-4-(7449)07994900	man Q <sup>2</sup> man and	Display Lin -27.64 dBr
tart 2.310 Res BW 1		#VE	W 300 kHz		Sweep 8	Stop 2.40300 GHz 3.93 ms (1001 pts)	
	f (Δ) 2	× 402 163 GHz (	∨ ∆) -7.636 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 34 5 6	1 2	.390 000 GHz	-61,513 dBm				System Display Settings
7							
2					STATUS		

Band Edges Test Data CH-High

Marker	MApr 17, 2014	TRAC	>100/100	Avg	Run	Trig: Free			000000	01340	2.48	r 1 .	RL rke
Select Marker		ce 2.480 1		- Contain		#Atten: 30	Wide 🕞 n:Low	IFGair					
	67 dBm		WINT							Offset 1 16.30		iv -	d8/c
Norm											1	N.	0
Dell	-34) 77 (#Dw									<	l		
Fixed					non.	un m	Annen a s	~~~~	Q <sup>2</sup>	La			7 — 7 — 7 —
0	in the second	2.07 ms (1	Sweep 2			300 kHz	#VBV				900	3W 1	es
_	N VALUE	FUNCTIO	NCTION WIDTH	UNCTION		-6.767 de -60.817 de	Hz (A)	0 134 G 3 500 G		(Δ)	1	E TRO	N
Properties												E	
Mor 1 of													
		0	STATUS		-			_					



### Radiated Emission (EDR 2M mode):

Funda	ation Mode amental Fre perature		X CH Low 02 MHz	V		Te	st By	2014/04/24 Dino 50 %
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	2389.67	57.05	-7.10	49.95	74.00	-24.05	Peak	VERTICAL
2	2390.00	54.87	-7.09	47.78	74.00	-26.22	Peak	VERTICAL
1	2389.30	54.32	-7.10	47.22	74.00	-26.78	Peak	HORIZONTAL
2	2390.00	52.74	-7.09	45.65	74.00	-28.35	Peak	HORIZONTAL

Operation ModeTX CH HighFundamental Frequency2480 MHzTemperature25

Test Date2014/04/24Test ByDinoHumidity60 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	2483.50	53.99	-6.90	47.09	74.00	-26.91	Peak	VERTICAL
2	2485.00	56.65	-6.89	49.76	74.00	-24.24	Peak	VERTICAL
1	2483.50	52.80	-6.90	45.90	74.00	-28.10	Peak	HORIZONTAL
2	2486.12	54.45	-6.89	47.56	74.00	-26.44	Peak	HORIZONTAL

#### Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- <sup>2</sup> Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



# EDR 3M Mode Band Edges Test Data CH-Low

Marker	09:22:57 PM Apr 17, 2014 TRACE R 2 DE 9 TYPE MONTAN	Type: Log-Pwr fold>100/100	Ave	Trig: Free Run	PNO: Fast		.4020260	er 1
Select Marker 1	402 026 GHz -7.501 dBm	Mkr1 :		#Atten: 30 dB	FGain:Low	dB	Ref Offset 1 Ref 16.30	/div
Norma	Ŷ							
Delt	-27.50 \$5							
Fixed	2 marson of the	an madan Nati Awar maninga	den het work			handaaraa	and the second	n an aber
o	op 2.40400 GHz 10 ms (1001 pts) FUNCTION VALUE	Sweep 9	FUNCTION	300 kHz	#VBW	×	00 GHz 00 kHz	
Properties				-7.501 dBm -61.254 dBm	26 GHz (ム) 100 GHz	2,402 0	f (Δ)	
Mor 1 of								
		STATUS		1				

Band Edges Test Data CH-High

Marker	EMWWWW	TRACI	Log-Pwr >100/100	Avg T Avg H		Trig: Free		PNO: Wide	000000	10008	2.48	er 1	RL ark
Select Marker		2.480.0	Mkr1	1.12.201	dB	#Atten: 30	w	IFGain:Lov	dB	Offset 1 16.30		/div	dB
Norm													30 70
Det	-300.027 cellared									٨	J	ļ .	17
Fixed	~~~~	4						han an a	Q <sup>2</sup>	Len	v		17 17 17
C	1001 pts)	Stop 2.50 2.07 ms (1 FUNCTIO	Sweep 2	CTION		300 kHz Y	15		×	kHz	100 c sci	2.47 BW	Res
Properties						-6.671 dE -60.352 dE		008 GHz 500 GHz		(Δ)	1		
Mo 1 of													
		1	STATUS									-	-



#### Radiated Emission (EDR 3M mode):

Funda	ation Mode amental Fre perature		X CH Low 02 MHz	V		Tes	st By	2014/04/24 Dino 60 %
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	2390.00	54.87	-7.09	47.78	74.00	-26.22	Peak	VERTICAL
1	2390.00	52.39	-7.09	45.30	74.00	-28.70	Peak	HORIZONTAL

Operation Mode	TX CH High
Fundamental Frequency	2480 MHz
Temperature	25

Test Date2014/04/24Test ByDinoHumidity60 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	2483.50	54.75	-6.90	47.85	74.00	-26.15	Peak	VERTICAL
2	2483.80	56.04	-6.90	49.14	74.00	-24.86	Peak	VERTICAL
1	2483.50	52.20	-6.90	45.30	74.00	-28.70	Peak	HORIZONTAL
2	2488.60	54.67	-6.89	47.78	74.00	-26.22	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- <sup>2</sup> Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



# 8. SPURIOUS EMISSION TEST

## 8.1. Standard Applicable:

According to \$15.247(d), all other emissions outside these bands shall not exceed the general radiated emission limits specified in \$15.209(a). And according to \$15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-Gen §7.2.5 and RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### 8.2. Measurement Equipment Used:

### 8.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.8.2.2. Radiated emission:Refer to section 7.2 for details.

### 8.3. Test SET-UP:

### **8.3.1.** Conducted Emission at antenna port:

Refer to section 6.3 for details.

### 8.3.2. Radiated emission:

Refer to section 7.3 for details.





### 8.4. Measurement Procedure:

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Repeat above procedures until all frequency measured were complete.

#### 8.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

#### $\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

#### 8.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.



Conducted Spurious Emission Measurement Result (Worst case: BDR Mode) Ch Low 30MHz – 3GHz

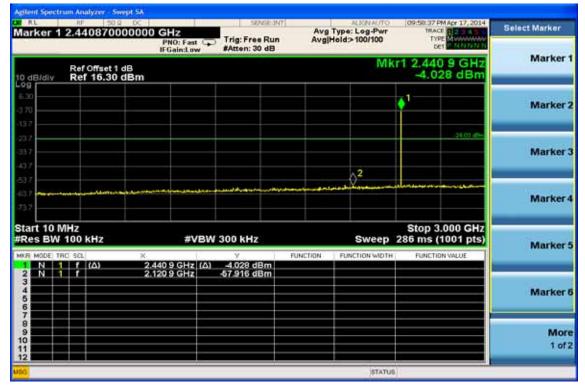
splay L	ine -25.0	08 dBm	PNO: Fast	Trig: Free R #Atten: 30 d	Avg un Avg	Type: Log-Pwr  Hold>100/100	TRACI	Apr 17, 2014		Display
dB/div	Ref Offse Ref 16.3					MI	(r1 2.402 -5.07	0 GHz 8 dBm	A	nnotation
io							• <sup>1</sup>			Title
7									Qn	Graticul
7		i anala ana a fa dana.	and the second second			2	ند	1	D	isplay Lin -25.08 dBr
art 10 N es BW	/Hz 100 kHz		#VE	W 300 kHz		Sweep	Stop 3. 286 ms (1	000 GHz 001 pts)		
N 1	f (A)	× 2.4 2.0	02 0 GHz (/	√ ∆) -5.078 dBm -58.362 dBm		FUNCTION WIDTH	FUNCTIO	N VALUE		
										System Display Settings
-	ment Comp	pleted			Ar.	STATU	6		-	

# Ch Low 3GHz – 26.5GHz

Peak Search	09:56:30 PMApr 17, 2014 TRACI 12 2 11 5 TYPE MUMMANN DET 2 MININIM	Type: Log-Pwr Iold: 14/100	Avg	Trig: Free Run #Atten: 30 dB	12 : Fast 😱	00000 G PN IFG	710000	25.4	er 1 2	RL ark
Next Pea	1 25.471 GHz -49.149 dBm	Mk					Offset 1 d 16.30 d		div	dBi 9 F
Next Pk Righ										50 - 70 -
Next Pk Le	n									7 7 7 - 7 -
Marker Delt	22.49.49.49.49.49.49.49.49.49.49.49.49.49.			and a star of the star of the star	nerra a da	فارددويلغ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		and and a	7 1
Mkr→C	Stop 26.00 GHz 2.20 s (1001 pts)			300 kHz	#VBW		kHz	100	3,00 ( BW 1	les
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	√ 49.149 dBm	GHz (Δ)	× 25.471			DE TRO	
Mkr→RefL										
Mor 1 of										
		STATUS		1	10				<u>d</u> = 0	-



# Ch Mid 30MHz – 3GHz



# Ch Mid 3GHz – 26.5GHz

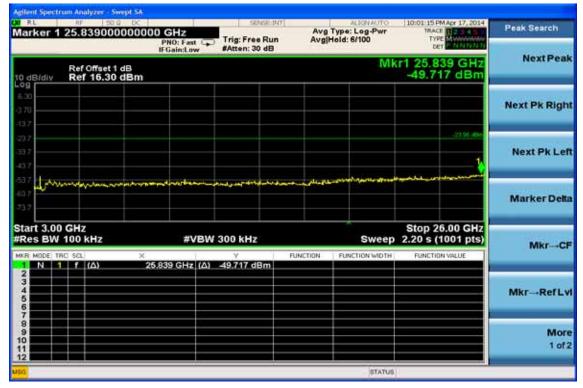
arker 1 25.954	PN	IO: East	Trig: Free Run Atten: 30 dB	Avg	Type: Log-Pwr Hold: 12/100	TRACE	Acr 17, 2014	Peak Search
Ref Offs dB/div Ref 16	et 1 dB .30 dBm				MI	(r1 25.9) -49.05	54 GHz 7 dBm	NextPeal
30 70								Next Pk Righ
7							-24.00 (12) 1	Next Pk Le
37								
Turnerstown	wellowheren	han an a	water from the former of	and the second secon		elan second	- And	Marker Del
art 3.00 GHz		#VBW 3		L			5.00 GHz	100400 000
tart 3.00 GHz Res BW 100 kHz R MODE TRC SCL	×		00 kHz	FUNCTION		Stop 26	5.00 GHz 001 pts)	Marker Delt Mkr⊶C
art 3.00 GHz Res BW 100 kHz R MODE TAC SCLI	×	#VBW 3	00 kHz		Sweep	Stop 26 2.20 s (1	5.00 GHz 001 pts)	Mkr→C
tart 3.00 GHz Res BW 100 kHz	×	#VBW 3	00 kHz		Sweep	Stop 26 2.20 s (1	5.00 GHz 001 pts)	100-100 C



# Ch High 30MHz – 3GHz

RACE	TIS	Type: Log-Pwr	Avg	Trig: Free Run #Atten: 30 dB	NO: Fast		
79 7 GHz 929 dBm	1 2.4	Mki				1 dB	Ref Offset Ref 16.30
	• <sup>1</sup>						
-2156 mm							
s (1001 pts)	286 ms		BINCTION		#VBW	~	IHZ 100 kHZ
LINH VALUE	TUNL	PORCHOR WIDTH	PUNCTION	-3.929 dBm	7 GHz (Δ) 7 GHz	2.479	f (Δ)
	ACE 0 2 3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 2.479 7 GHz -3.929 dBm -3.929 d	Heid>100/100 Mkr1 2.479 7 GHz -3.929 dBm -3.929 dBm -2156 allo -2156 allo Stop 3.000 GHz Sweep 286 ms (1001 pts)	Avg Type: Log-Pwr Avg Heid>100/100 Mkr1 2.479 7 GHz -3.929 dBm -1 -21% en -21% en Stop 3.000 GHz Sweep 286 ms (1001 pts)	Avg Type:         Log.Pwr         TRACE         12.54.55           Atten:         30 dB         TYPE         TYPE         TYPE           Mkr1 2.479 7 GHz         -3.929 dBm         -3.929 dBm         -3.929 dBm	Hz         Avg Type: Log-Pwr         TRACE ID2 Set 0           NO: Fast ID2         Trig: Free Run #Atten: 30 dB         Avg[Held>100/100         TYPE ID2 Set 0           Mkr1 2.479 7 GHz - 3.929 dBm         Mkr1 2.479 7 GHz - 3.929 dBm         Image: Comparison of the set of the	OUDDOOD GHz PNO: Fast         Trig: Free Run #Atten: 30 dB         Avg Type: Log Pwr Avg Held>100/100         TRACE         Iter to the top

# Ch High 3GHz – 26.5GHz





Operation ModeTX CH LowFundamental Frequency2402MHzTemperature25							Test Date2014/04/24Test ByDinoHumidity60 %			
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H		
1	88.20	36.93	0.78	37.71	43.50	-5.79	Peak	VERTICAL		
2	115.36	38.11	0.89	39.00	43.50	-4.50	Peak	VERTICAL		
3	142.52	40.32	0.98	41.30	43.50	-2.20	Peak	VERTICAL		
4	279.29	37.73	1.35	39.08	46.00	-6.92	Peak	VERTICAL		
5	399.57	37.00	1.61	38.61	46.00	-7.39	Peak	VERTICAL		
6	572.23	34.01	1.94	35.95	46.00	-10.05	Peak	VERTICAL		
1	61.04	35.16	0.65	35.81	40.00	-4.19	Peak	HORIZONTAL		
2	91.11	37.87	0.79	38.66	43.50	-4.84	Peak	HORIZONTAL		
3	145.43	39.81	0.99	40.80	43.50	-2.70	Peak	HORIZONTAL		
4	239.52	43.06	1.25	44.31	46.00	-1.69	Peak	HORIZONTAL		
5	399.57	34.47	1.61	36.08	46.00	-9.92	Peak	HORIZONTAL		
6	913.67	27.31	2.45	29.76	46.00	-16.24	Peak	HORIZONTAL		

### Radiated Spurious Emission Measurement Result: (below 1GHz) (Worst case: BDR Mode)

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.



HORIZONTAL

Opera Funda Temp	2014/04/24 Dino 60 %							
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	81.41	37.24	0.75	37.99	40.00	-2.01	Peak	VERTICAL
2	118.27	39.81	0.90	40.71	43.50	-2.79	Peak	VERTICAL
3	279.29	37.32	1.35	38.67	46.00	-7.33	Peak	VERTICAL
4	399.57	37.12	1.61	38.73	46.00	-7.27	Peak	VERTICAL
5	572.23	32.52	1.94	34.46	46.00	-11.54	Peak	VERTICAL
6	698.33	27.50	2.14	29.64	46.00	-16.36	Peak	VERTICAL
1	58.13	36.17	0.63	36.80	40.00	-3.20	Peak	HORIZONTAL
2	91.11	38.95	0.79	39.74	43.50	-3.76	Peak	HORIZONTAL
3	131.85	40.44	0.95	41.39	43.50	-2.11	Peak	HORIZONTAL
4	238.55	40.62	1.25	41.87	46.00	-4.13	Peak	HORIZONTAL
5	283.17	35.91	1.35	37.26	46.00	-8.74	Peak	HORIZONTAL

## **Radiated Spurious Emission Measurement Result (below 1GHz)**

Remark:

6

399.57

33.88

1.61

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

46.00

-10.51

Peak

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

35.49

- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.



Operation ModeTX CH HighFundamental Frequency2480MHzTemperature25								2014/04/24 Dino 60 %
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	58.13	36.25	0.63	36.88	40.00	-3.12	Peak	VERTICAL
2	115.36	39.33	0.89	40.22	43.50	-3.28	Peak	VERTICAL
3	194.90	34.19	1.13	35.32	43.50	-8.18	Peak	VERTICAL
4	283.17	38.93	1.35	40.28	46.00	-5.72	Peak	VERTICAL
5	399.57	37.28	1.61	38.89	46.00	-7.11	Peak	VERTICAL
6	572.23	33.69	1.94	35.63	46.00	-10.37	Peak	VERTICAL
1	62.01	33.54	0.65	34.19	40.00	-5.81	Peak	HORIZONTAL
2	75.59	34.26	0.72	34.98	40.00	-5.02	Peak	HORIZONTAL
3	88.20	37.05	0.78	37.83	43.50	-5.67	Peak	HORIZONTAL
4	127.00	39.55	0.93	40.48	43.50	-3.02	Peak	HORIZONTAL
5	225.94	41.11	1.22	42.33	46.00	-3.67	Peak	HORIZONTAL
6	399.57	34.41	1.61	36.02	46.00	-9.98	Peak	HORIZONTAL

## **Radiated Spurious Emission Measurement Result (below 1GHz)**

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.



VERTICAL

VERTICAL

HORIZONTAL

HORIZONTAL

Operation ModeTX CH LowFundamental Frequency2402 MHzTemperature25						Test Date Test By Humidity	2014/04/24 Dino 60 %	
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H

74.00

74.00

74.00

74.00

-36.75

-31.49

-37.04

-31.97

Peak

Peak

Peak

Peak

37.25

42.51

36.96

42.03

### **Radiated Spurious Emission Measurement Result (above 1GHz)**

1.27

8.23

1.27

8.23

Remark:

1

2

1

2

4804.00

7206.00

4804.00

7206.00

35.98

34.28

35.69

33.80

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- <sup>3</sup> "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Funda	ation Mode amental Fre erature		CH Mid 1 MHz			- ,	Test Date Test By Humidity	2014/04/24 Dino 60 %
No	Errog	Daadin	 Factor	Laval	Limit	Over	Domoriz	Dal

### **Radiated Spurious Emission Measurement Result (above 1GHz)**

No	o Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	4882.00	35.03	1.53	36.56	74.00	-37.44	Peak	VERTICAL
2	7323.00	33.94	8.30	42.24	74.00	-31.76	Peak	VERTICAL
1	4882.00	35.15	1.53	36.68	74.00	-37.32	Peak	HORIZONTAL
2	7323.00	32.80	8.30	41.10	74.00	-32.90	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- <sup>2</sup> Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- <sup>3</sup> "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



V/H

VERTICAL

VERTICAL

HORIZONTAL

HORIZONTAL

Funda	ation Mode amental Fre erature		K CH Higl 80 MHz	'n			Test Date Test By Humidity	2014/04/24 Dino 60 %
No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol

dBuV/m

74.00

74.00

74.00

74.00

dB

-37.75

-32.46

-37.87

-32.10

Peak

Peak

Peak

Peak

dBuV/m

36.25

41.54

36.13

41.90

### **Radiated Spurious Emission Measurement Result (above 1GHz)**

dB

1.81

8.37

1.81

8.37

dBuV

34.44

33.17

34.32

33.53

MHz

4960.00

7440.00

4960.00

7440.00

Remark:

1

2

1

2

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- <sup>2</sup> Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- <sup>3</sup> "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



### 9. FREQUENCY SEPARATION

### 9.1. Standard Applicable:

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 20dB bandwidth of the hopping channel, whichever is greater.

According to RSS 210 issue 8, A8.1(b), frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

### 9.2. Measurement Equipment Used:

Refer to section 6.2 for details.

### 9.3. Test Set-up:

Refer to section 6.3 for details.

#### 9.4. Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = middle of hopping channel.
- 4. Set the spectrum analyzer as RBW,VBW=100KHz, Adjust Span to 3.0 MHz, Sweep = auto.
- 5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

#### 9.5. Measurement Result:

Channel separation	T ::4	D o se lá
(MHz)	Limit	Result
	>=25KHz or	
1	2/3 times 20dB bandwidth	PASS

Note: Refer to next page for plots.



# **Frequency Separation Test Data**

nker 1 Δ -999.00000	PNO: Wide G	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	07:59-46 PM Apr 10, 2014 TRACE 1 2 2 4 5 TYPE MUNICIPAL OF	Marker
Ref Offset 5.2 dB dB/dly Ref 10.00 dBr		Atten: 16 dB	Δ	Mkr1 -999 kHz 0.145 dB	Select Marker
		X2~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Norma
0 0					Delta
0					Fixed
nter 2.441000 GHz es BW 100 kHz	#VB\	W 300 kHz	Sweep	Span 3.000 MHz 1.53 ms (1001 pts) FUNCTION VALUE	0
Δ2 1 f (Δ)	-999 kHz (Δ .441 000 GHz	) 0.145 dB -2.341 dBm			Properties
					Mor 1 of
			STATUS		



### **10. NUMBER OF HOPPING FREQUENCY**

### **10.1. Standard Applicable:**

According to 15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

According to RSS-210 issue 8,§A8.1(d), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

#### 10.2. Measurement Equipment Used:

Refer to section 6.2 for details.

#### 10.3. Test Set-up:

Refer to section 6.3 for details.

#### **10.4. Measurement Procedure:**

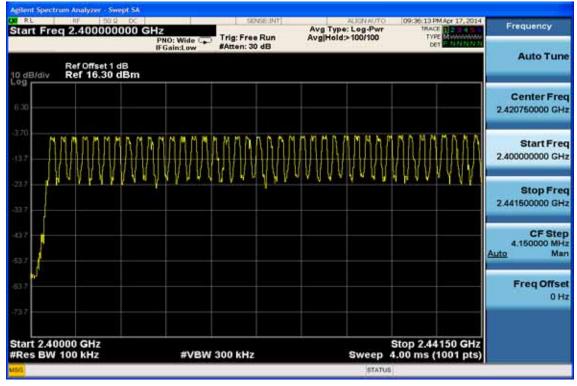
- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set spectrum analyzer Start=2400MHz, Stop = 2441MHz and Start=2441MHz, Stop = 2483.5MHz, Sweep = auto.
- 4. Set the spectrum analyzer as RBW=300KHz, VBW=1MHz
- 5. Max hold, view and count how many channel in the band.

#### **10.5. Measurement Result:**

Note: Refer to next page for plots.



### Channel Number 2.4 GHz – 2.441GHz



# 2.441 GHz – 2.4835GHz



-44 of 62-



# 11. TIME OF OCCUPANCY (DWELL TIME)

### **11.1. Standard Applicable:**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. 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.

According to RSS-210 issue 8,§A8.1(d), Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

### **11.2. Measurement Equipment Used:**

Refer to section 6.2 for details.

### 11.3. Test Set-up:

Refer to section 6.3 for details.

### **11.4. Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = operating frequency.
- 4. Set the spectrum analyzer as RBW / VBW =1MHz, Span = 0Hz , Adjust Sweep = 2.5ms.
- 5. Repeat above procedures until all frequency measured were complete.



### **11.5. Measurement Result:**

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

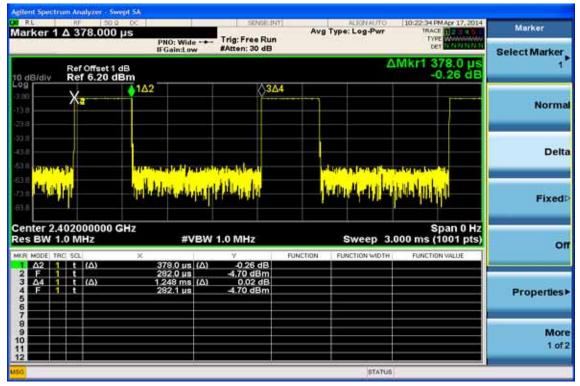
CH Low	DH1 time slot	= 0.378 (ms) * $(1600/2/79)$ * $31.6 = 120.96$	(ms)
	DH3 time slot	= 1.642 (ms) * $(1600/4/79)$ * $31.6 = 262.72$	(ms)
	DH5 time slot	= 2.880  (ms) * (1600/6/79) * 31.6 = 307.20	(ms)
CH Mid	DH1 time slot	= 0.384  (ms) * (1600/2/79) * 31.6 = 122.88	(ms)
	DH3 time slot	= 1.642 (ms) * $(1600/4/79)$ * $31.6 = 262.72$	(ms)
	DH5 time slot	= 2.850  (ms) * (1600/6/79) * 31.6 = 304.00	(ms)
CH High	DH1 time slot	= 0.384  (ms) * (1600/2/79) * 31.6 = 122.88	(ms)
	DH3 time slot	= 1.635 (ms) * $(1600/4/79)$ * $31.6 = 261.60$	(ms)
	DH5 time slot	= 2.880  (ms) * (1600/6/79) * 31.6 = 307.20	(ms)

Note: Refer to next page for plots.



# Low Channel

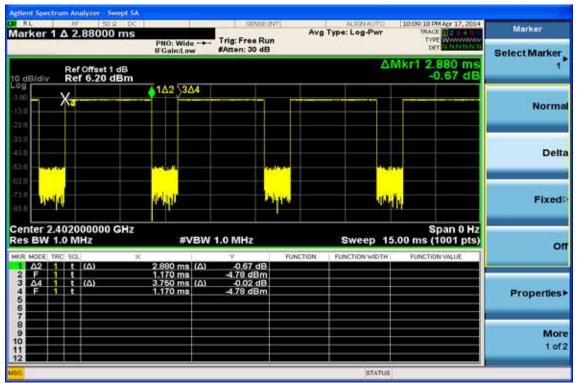




			Avg Type: Log-Pwr	TRACE DESCRIPTION	Marker	
		<ul> <li>Trig: Free Run</li> <li>#Atten: 30 dB</li> </ul>	5900 - 5	DET DET MANNEN	Select Marker	
			Δ	Mkr1 1.642 ms -0.50 dB	1	
X4	X2	1∆2	\3∆4		Norma	
					Delta	
in lin	H <sup>2</sup>	10 <sup>1</sup> 0 <sup>4</sup> 0 <sup>41</sup> 10		wpp.th	Fixed	
		W 1.0 MHz	Sweep 7	Span 0 Hz 533 ms (1001 pts)	01	
t (A)		-0.50 dB	UNCTION FUNCTION WIDTH	FUNCTION VALUE		
	3.184 ms (/ 1.170 ms	3) 0.01 dB -4.78 dBm			Properties	
					Mor 1 of	
	Ref Offset 1 dB Ref 6.20 dBn	IFGain:Low           Ref Offset 1 dB           Ref 6.20 dBm           X4           X2           X4           X2           X4           X4	PNO: Wide     Trig: Free Run #Atten: 30 dB       Ref Offset 1 dB Ref 6.20 dBm     1Δ2       X4     X2       Value     1Δ2       Value     1Δ2	Avg Type: Log-Pwr       PN0: Wide +++       If Gain:Low       Ref Offset 1 dB       Ref 6.20 dBm       X4       X2       102       X4       X2       102       304       102       304       104 </td <td>Avg Type: Log-Pwr       Trace of Photomy attention of the second second</td>	Avg Type: Log-Pwr       Trace of Photomy attention of the second	



### DH5



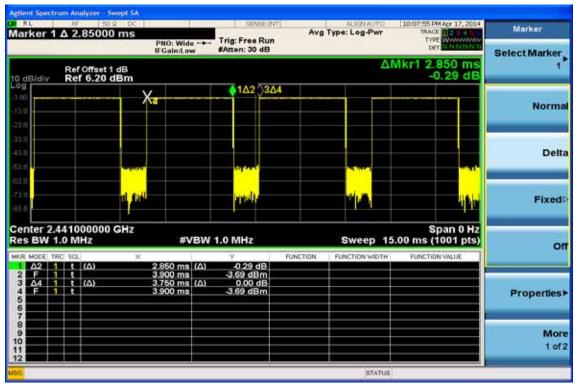
# Mid Channel

arker 1 Δ 384.000 µs	PNO: Wide	Trig: Free Run	Avg Type: Log-Pwr	10:21:26 PM Apr 17, 2014 TRACE 2014	Marker
Ref Offset 1 dB	IFGain:Low	#Atten: 30 dB	۵	Mkr1 384.0 µs -0.41 dB	Select Marker
a dB/div Ref 6.20 dBm	1∆2	¢3	∆4	-0.41 05	Norma
3 # 3 # 3 #					Delt
	ar produced		- Philippine	alaber	Fixed
enter 2.441000000 GHz es BW 1.0 MHz		1.0 MHz	Sweep 3.	Span 0 Hz 000 ms (1001 pts) FUNCTION VALUE	0
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	384.0 μs (Δ) 425.0 μs 1.257 ms (Δ) 426.1 μs	-0.41 dB -3.61 dBm -0.18 dB -3.61 dBm	ACTION WD3H	FUNCTION VALUE	Properties
7					Mor 1 of



### DH3

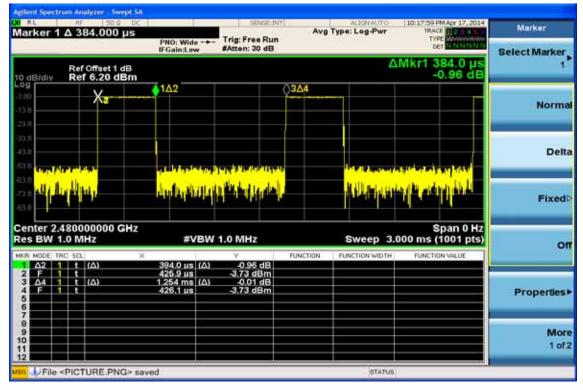
RL arker 1	Δ 1.64227 ms	1.0000000000000000000000000000000000000	SENSE:	Ave	Type: Log-Pwr	10:12:23 PM Apr 17, 2014	Marker
-tranference		PNO: Wide ++- IFGain:Low	Trig: Free Ru #Atten: 30 dB		contract the	DET TATAINITAT	Select Marker
dB/div	Ref Offset 1 dB Ref 6.20 dBm				Δ	Mkr1 1.642 ms -0.43 dB	1
9	Xa		1Δ2	<u>⊘3∆4</u>			Norma
1.0							
3.0							Delt
3.6	A training to the		a la sta de la de		<b>1</b> 900		
9.00 9.00	- Manufit		<b>THAT</b>			in a h	Fixed
enter 2.4 es BW 1	441000000 GHz .0 MHz	#VBW	1.0 MHz		Sweep 7.	Span 0 Hz 533 ms (1001 pts)	0
R MODE TR		1.642 ms (Δ)	-0.43 dB	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	U
2 F 1 3 A4 1 4 F 1	t t (Δ)	1.582 ms 2.501 ms (Δ) 1.582 ms	-3.67 dBm -0.01 dB -3.67 dBm				Properties
6 7 8				1			
							Moi 1 of
					STATUS		

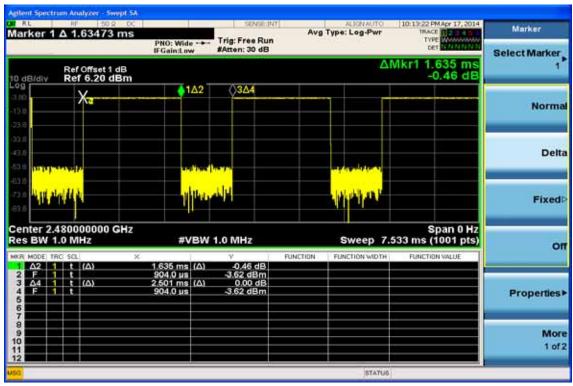




# High Channel

### DH1







RL #F 50.9 0C arker 1 Δ 2.88000 ms		SENSE:INT		pe: Log-Pwr	10:06:25 PM Apr 17, 2014 TRACE	Select Marker
	PNO: Wide ++- IFGain:Low	Trig: Free Run #Atten: 30 dB	(	N 15	DET DET AL NUMBER	
Ref Offset 1 dB				Δ	Mkr1 2.880 ms -0.54 dB	Marker
00 00 00	Xa		162 364		<u>ککی</u>	Marker
9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8						Marker
	<mark>.երլ</mark>		por -		, <b>k</b>	Marker
enter 2.480000000 GHz es BW 1.0 MHz	#VBW	1.0 MHz	FUNCTION	Sweep 15	Span 0 Hz 5.00 ms (1001 pts)	Marker
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.880 ms (Δ) 5.220 ms 3.765 ms (Δ) 5.220 ms	-0.54 dB -3.64 dBm -0.87 dB -3.64 dBm				Marker
7 8 9 0						Mor 1 of



### 12. 20dB Bandwidth & 99% Bandwidth

### **12.1. Standard Applicable:**

According to 15.247(a)(1), and RSS210 A8.1(b) for frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

### 12.2. Measurement Equipment Used:

Refer to section 6.2 for details.

### 12.3. Test Set-up:

Refer to section 6.3 for details.

### **12.4. Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), Span= 3MHz, Sweep=auto
- 4. Mark the peak frequency and –20dB (upper and lower) frequency.
- 5. Repeat above procedures until all frequency measured were complete.



### 12.5. Measurement Result:

### **BDR Mode**

СН	20dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)
Lower	0.5692	0.92963
Mid	0.5658	0.9302
Higher	0.9699	0.93127

#### EDR 2M Mode

СН	20dB Bandwidth (MHz)	2/3* 20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lower	1.118	0.745	1.0779
Mid	1.117	0.745	1.0805
Higher	1.115	0.743	1.0795

### EDR 3M Mode

СН	20dB Bandwidth (MHz)	2/3* 20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lower	1.149	0.766	1.0971
Mid	1.220	0.813	1.1282
Higher	1.221	0.814	1.1274

Note: Refer to next page for plots.



### BDR Mode 20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid







## 20dB Bandwidth Test Data CH-High



# BDR Mode

## 99% Bandwidth Test Data CH-Low



99% Bandwidth Test Data CH-Mid





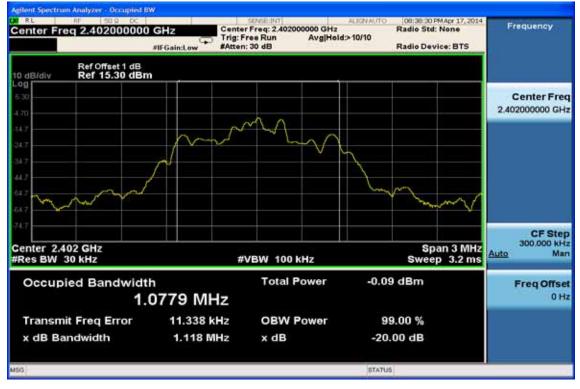


# 99% Bandwidth Test Data CH-High



# EDR 2M Mode

# 20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid







### 20dB Bandwidth Test Data CH-High



# EDR 3M Mode

# 20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid







## 20dB Bandwidth Test Data CH-High



### **13. ANTENNA REQUIREMENT**

### **13.1. Standard Applicable:**

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

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

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

### 13.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is 1.34dBi, and the antenna type is printed antenna which is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.



### **14. RF EXPOSURE**

### 14.1. Standard Applicable

According to \$2.1093 this is a Portable device. According to sections 2.5.1 of RSS-102. According to KDB 447498 D01 V5, Appendix A SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and  $\le 50$  mm, the power level 10mW at 5 mm.

This is a Portable device.

#### 14.2. Measurement Result:

This is a portable device and the Max. peak output power is -3.01dBm (0.5 mW) lower than low threshold 10 mW (24.48mW), d at 5mm in general population category.

The SAR measurement is not necessary.