TIMCO ENGINEERING, Inc.

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TEST REPORT
PER FCC PT 15.247 AND
IC RSS-210 ISSUE 8 FHSS

APPLICANT	DIGITAL MONITORING PRODUCTS
ADDRESS	2500 N. PARTNERSHIP BLVD. SPRINGFIELD MISSOURI 65802 USA
FCC ID	CCKPC0132
IC	5251A-PC0132
MODELS	9800
PRODUCT DESCRIPTION	DIGITAL KEYPAD
DATE SAMPLE RECEIVED	7/29/2014
DATE TESTED	7/ 29-30/2014
TESTED BY	Cory Leverett
APPROVED BY	Sid Sanders
REPORT ISSUE DATE	7/30/2014
TIMCO REPORT NO.	1262AZUT14TestReport.docx
TEST RESULTS	☒ PASS ☐ FAIL

TABLE OF CONTENTS

ATTESTATION

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

AUTHORIZED BY: Cory Leverett

FUNCTION: Project Manager

DATE: 7/30/2014

REPORT SUMMARY

Disclaimer:	The test results relate only to the items tested.
Purpose of Test:	To demonstrate that the EUT is compliant with FCC Pt 15.247 requirements for a FHSS radio.
Applicable Standards:	FCC Pt 15.247, ANSI C63.10: 2009, ANSI TIA-603-D: 2010, FCC Pt 15.109, IC RSS-210, RSS-GEN
Related Reports:	N/A

TEST ENVIRONMENT AND TEST SETUP

Test Facilities:	All measurements were made at one or more of the test sites of: TIMCO ENGINEERING INC. 849 N.W. State Road 45 Newberry, FL 32669.
Laboratory Test Conditions:	Temperature: 26°C Humidity: 55%
Test Exercise:	The EUT was set in continuous transmit mode of operation.
Deviation to the Standards:	There was no deviation from the standard.
Modification to the EUT:	No modification was made.
Supporting Accessories:	None

EUT DESCRIPTION

EUT Description	DIGITAL KEYPAD
FCC ID	CCKPC0132
IC	5251A-PC0132
Model Number	9800
Maximum Output Power	50mW
Operating Frequency	903.3 - 927.1 MHz
Type of Modulation	FSK
EUT Power Source	☒ 110–120Vac/50– 60Hz
	☐ DC Power
	☒ Battery Operated (as backup)
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable
Antenna	Integrated PCB Antenna
Antenna Connector	Fixed

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Shielded Enclosure Screen Room	Timco	Shielded Enclosure	N/A	N/A	N/A
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Coaxial Cable - Chamber 3 cable set	Semiflex	N/A	Chamber 3 cable set	1/26/12	1/26/15
EMI Test Receiver	Rhode & Schwarz	*ESU40	1302.6005.40	3/21/13	3/21/15
Antenna: Biconnical	Eaton	94455-1	1096	5/10/13	5/10/15
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	5/09/13	5/09/15
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	10/05/12	10/05/14
Coaxial Cable #65	General Cable Co.	E9917 RG233/U	Timco #65	6/26/13	6/26/15
LISN	Electro-Metrics	EM-7820	2682	6/5/13	6/5/15

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

TEST PROCEDURES

The procedures of DA-00-705 were used as applicable.

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed with the EUT transmitting. The resolution bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

BANDWIDTH 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

RF Power Output: Power was measured by converting the field strength in dBuv/m @ 3m to EIRP.

RADIATION INTERFERENCE: The test procedure used was ANSI C63.10-2010 using an Rohde & Schwarz EMI/EMC receiver. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz when peak detection is used. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

RADIATED SPURIOUS EMISSIONS INTO THE ADJACENT RESTRICTED BANDS: An in-band field strength measurement of the fundamental emission was made at the band edges. The RBW and detector function as required by ANSI C63.4-2003 and the FCC procedure DA-00-705 was used.

POWER LINE CONDUCTED INTERFERENCE

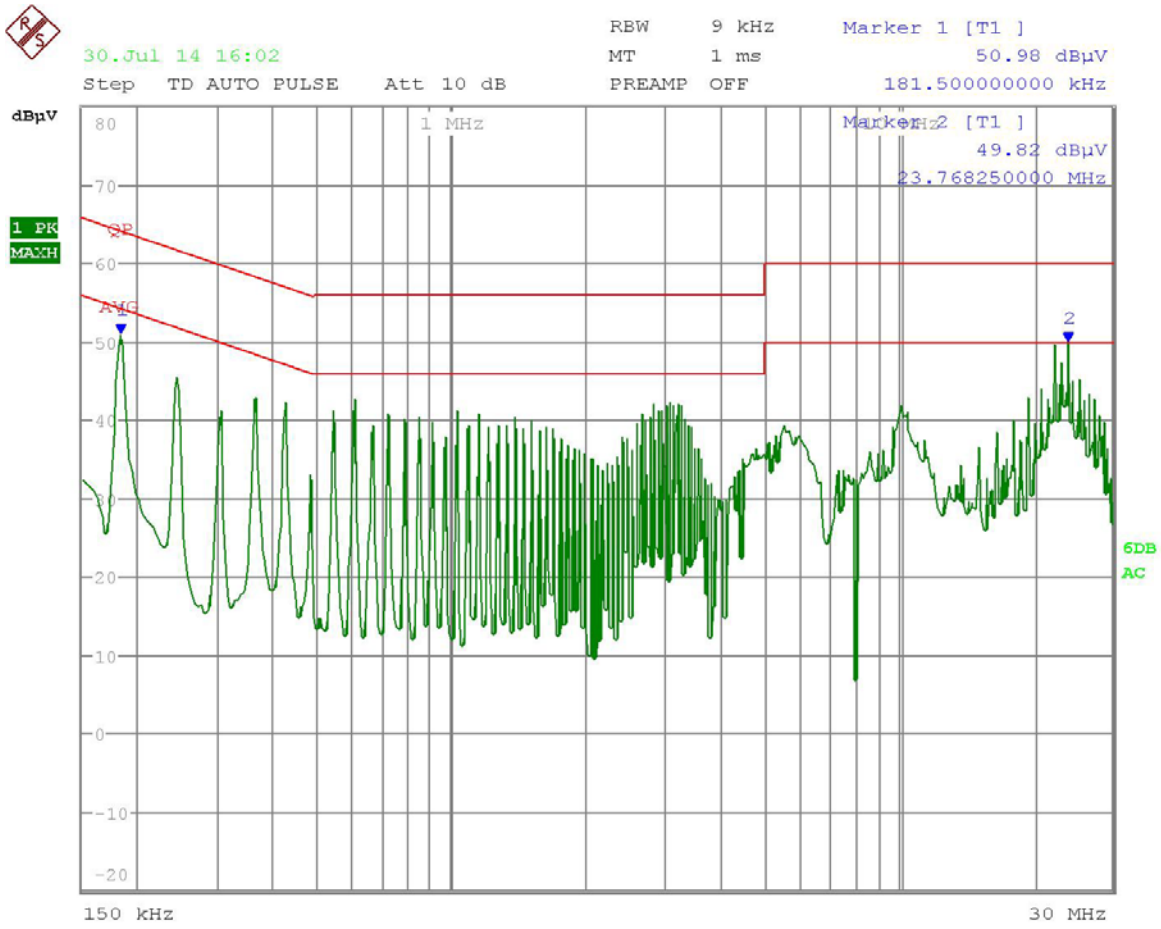
RULES PART NO.: 15.207, RSS-GEN

REQUIREMENTS:

Emission Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-peak (QP)	Average (Ave)
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50
* Decreases with the logarithm of the frequency.		

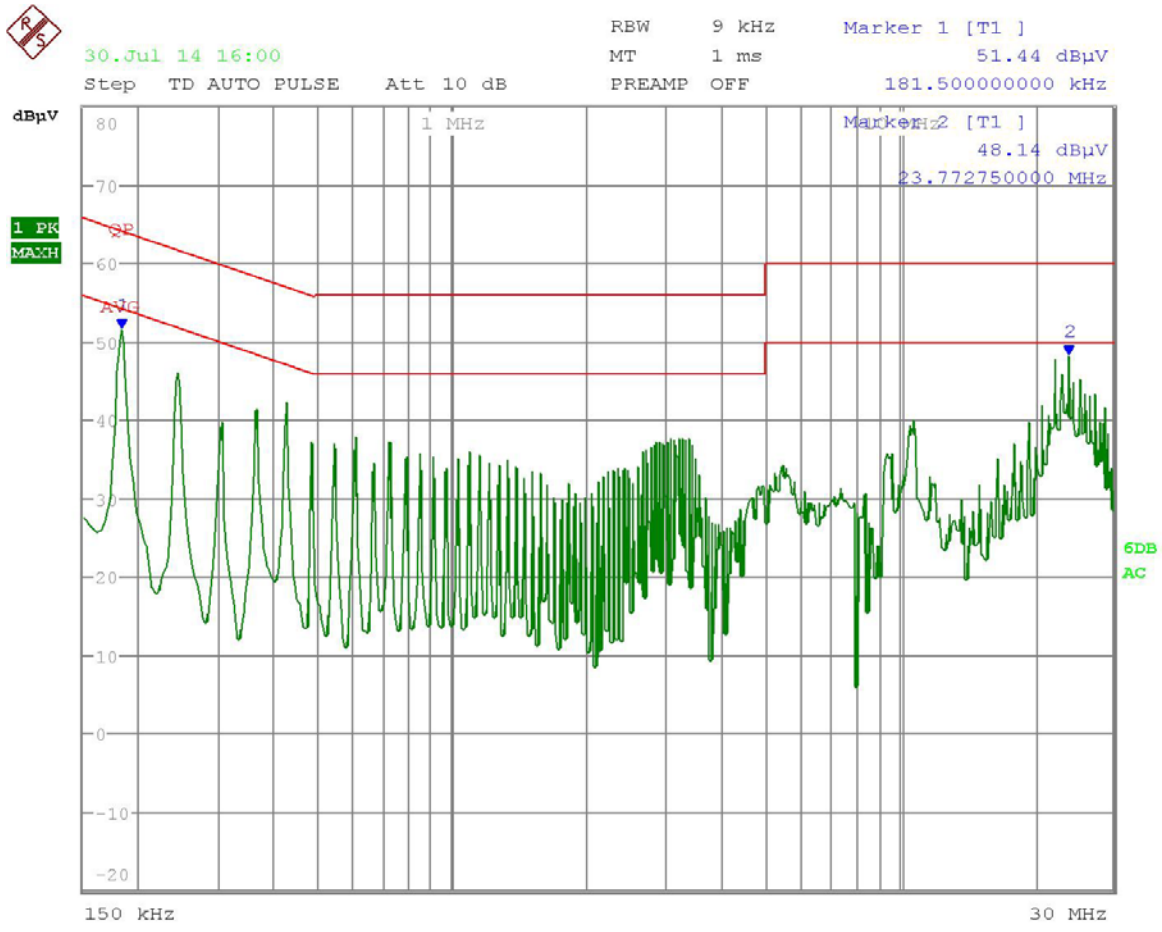
TEST DATA: The following plots represent the emissions read for power line conducted. Both lines were observed

Line 1 Peak



Date: 30.JUL.2014 16:02:04

Line 2 Peak



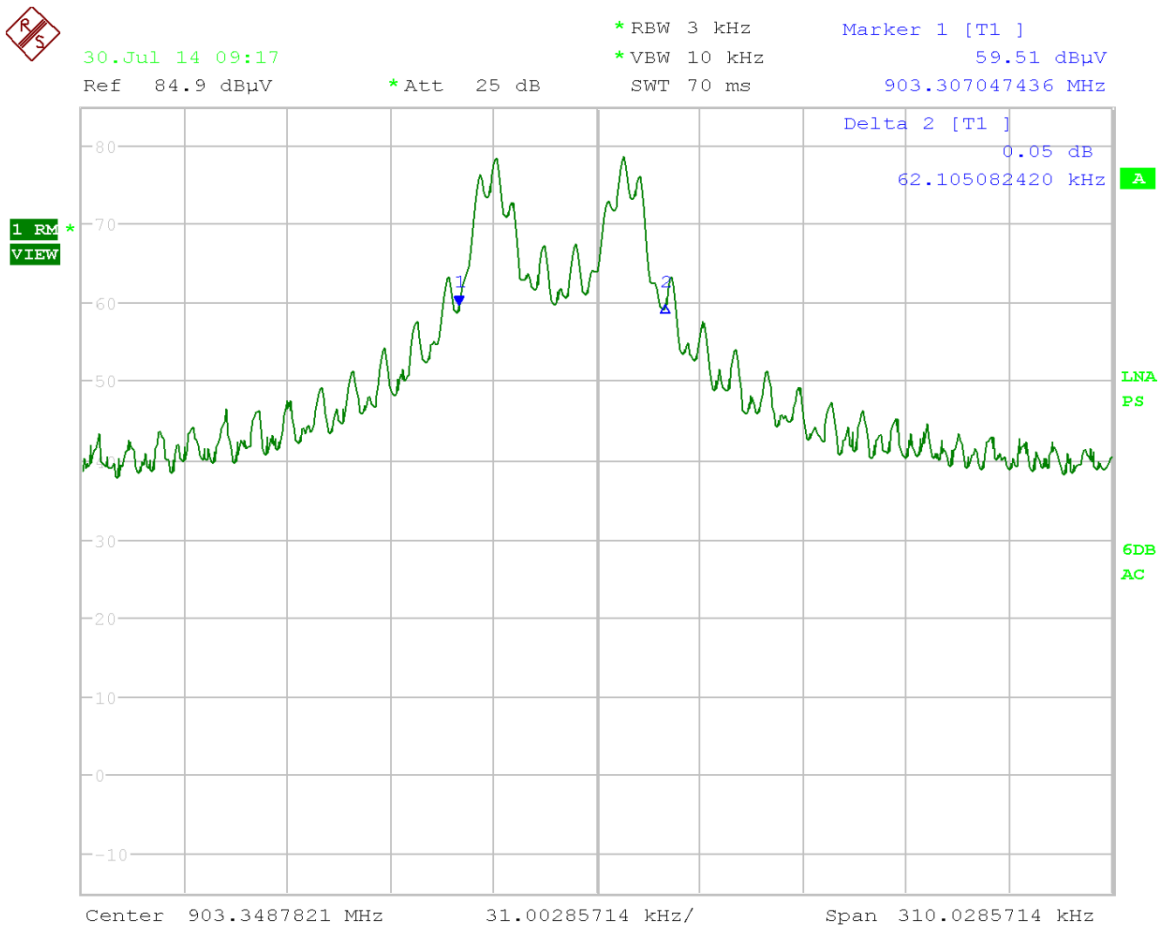
Date: 30.JUL.2014 16:00:58

20 dB BANDWIDTH

RULES PART NO.: 15.247(a)(2), RSS-210, ANNEX 8

REQUIREMENTS: The 20 dB bandwidth must be less than 500 kHz.

TEST DATA:



Date: 30.JUL.2014 09:17:33

RESULTS: 20Db bandwidth 62.1kHz

NUMBER OF HOPPING CHANNELS

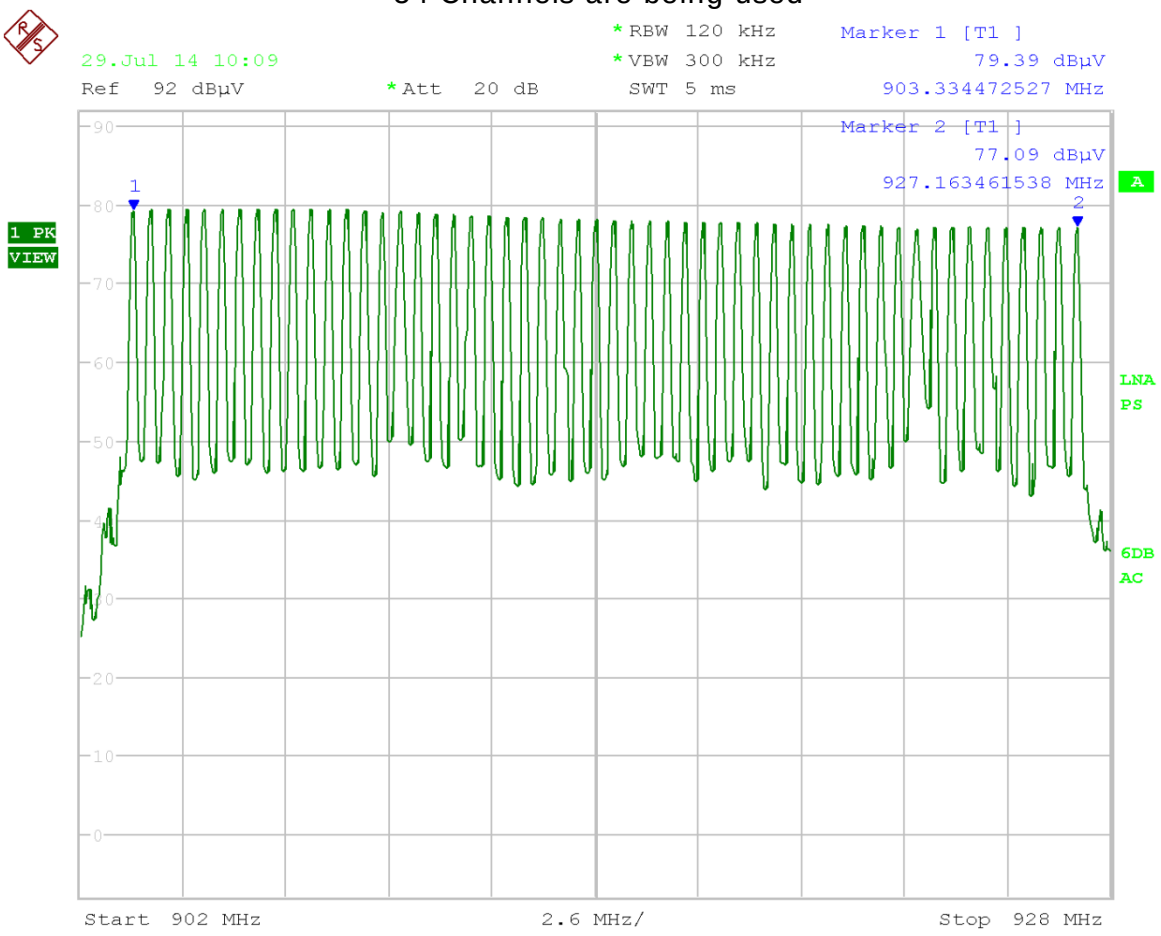
Rules Part No.: 15.247(a)(1), RSS-210, Annex 8

Requirements:

902-928 MHz	If the 20 dB bandwidth is < 250 kHz, the system shall use at least 50 hopping frequencies.
	If the 20 dB bandwidth is 250 kHz or greater, the system shall use at least 25 hopping frequencies.
2400-2483.5 MHz	At least 15 channels
5725-5850 MHz	At least 75 channels

Test Data: SEE BELOW

54 Channels are being used



Date: 29.JUL.2014 10:09:02

RESULTS: MEETS REQUIREMENTS

DWELL TIME OF A HOPPING CHANNEL

RULES PART NO.: 15.247(a)(1)(i), RSS-210, ANNEX 8

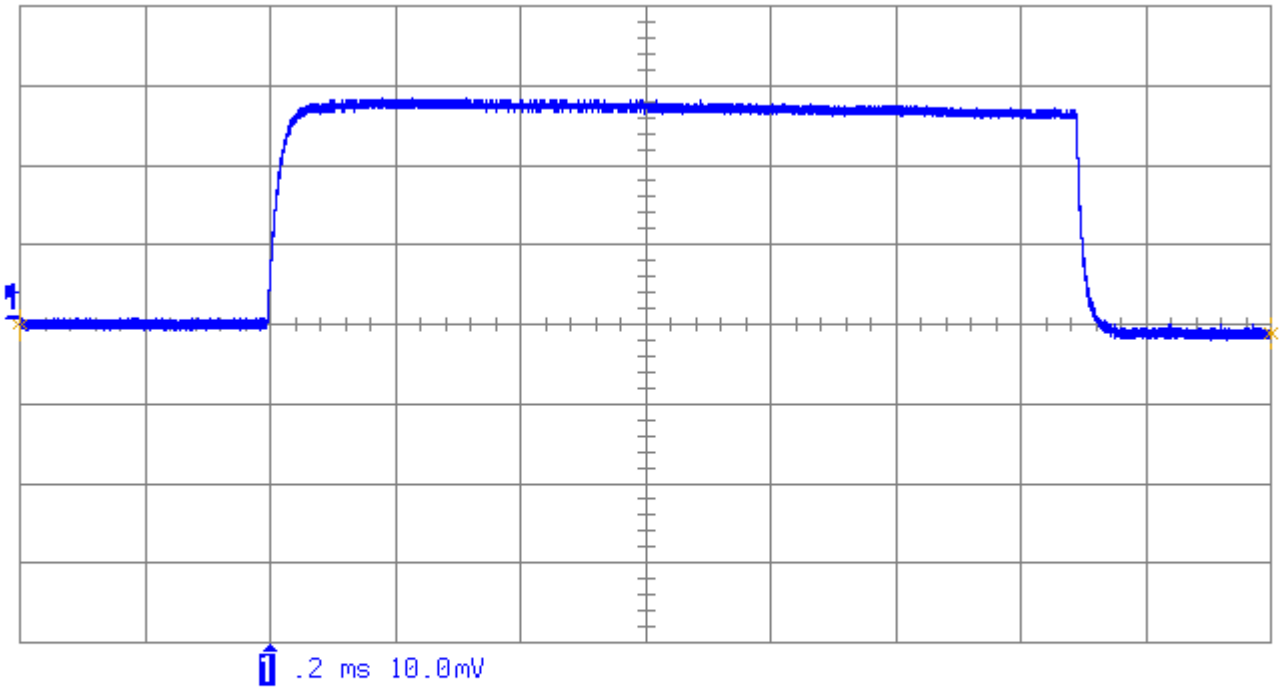
REQUIREMENTS:

902-928 MHz	If 20 dB bandwidth is < 250 kHz, average time of occupancy of any frequency shall not exceed 0.4 sec in 20 seconds.
	If 20 dB bandwidth is 250 kHz or greater, dwell time < = 0.4 seconds in a 10 second period.
2400-2483.5 MHz	< = 0.4 seconds in a 0.4 seconds multiplied the number of hopping channels employed.
5725-5850 MHz	< = 0.4 seconds in a 30 second period.

TEST DATA:

Dwell time in 20second period
12 hops @ 1.3ms each = **12.36ms**

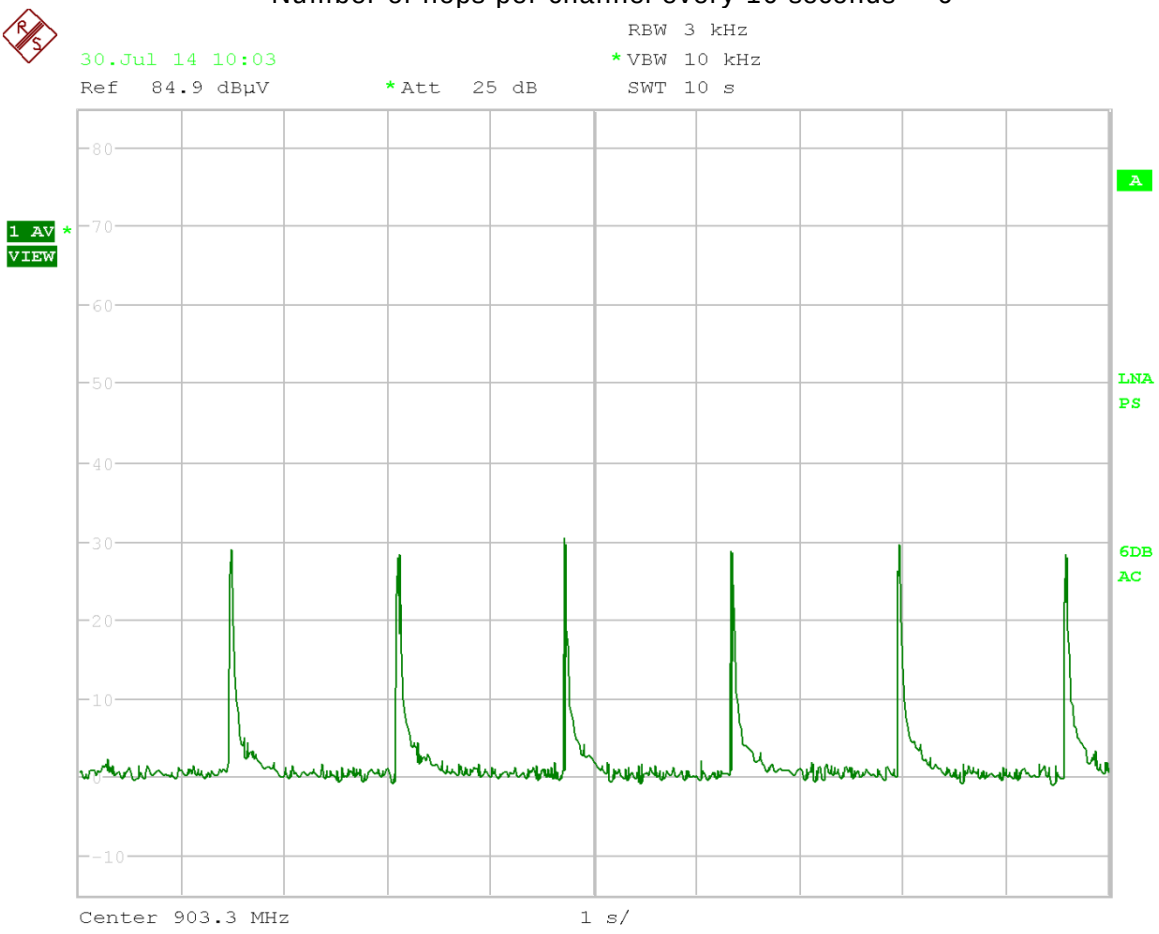
Channel dwell time per hop= 1.28ms



period(1)	- - -
width(1)	1.28874 ms
rise(1)	30.172 µs
Fall(1)	20.510 µs
delay(1)	8.132 µs

STOPPED

Number of hops per channel every 10 seconds = 6



Date: 30.JUL.2014 10:03:42

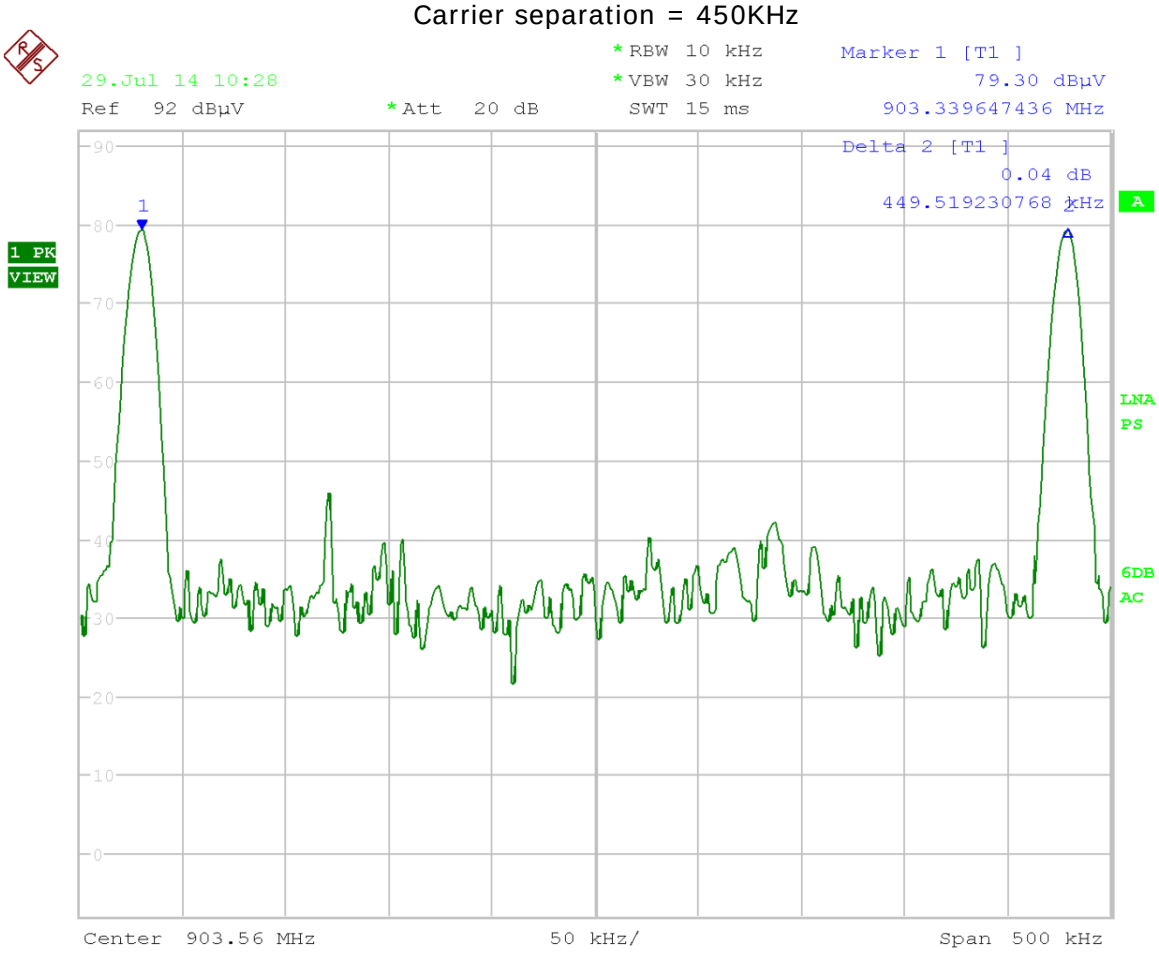
CARRIER FREQUENCY SEPARATION

RULES PART NO.: 15.247(a)(2), RSS-210, ANNEX 8

REQUIREMENTS: The hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST DATA:

Carrier separation = 450KHz



Date: 29.JUL.2014 10:28:43

RESULTS: MEETS REQUIREMENTS

POWER OUTPUT

Rules Part No.: 15.247(b), RSS-210, ANNEX A8.4

Requirements: The maximum peak output power shall not exceed 1 watt (30 dBm). If directional transmitting antennas with a gain of more than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Data:

Radiated RF power:

Frequency in MHz	Field Strength dBuv/m @ 3m	EIRP dBm	EIRP mW
903.3	112.22	16.99	50.01
915	112	16.77	47.54
927.1	109.23	14	25.12

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

RULES PART NO.: 15.247(c), RSS-210, ANNEX 8, RSS-GEN

REQUIREMENTS: Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

Note: The spectrum was scanned from 9 kHz or the lowest frequency generated to the 10th harmonic of the fundamental. Harmonics not represented in the table were > 20dB below the FCC limit and not represented.

TEST DATA

Not Applicable the Device has a fixed antenna

FIELD STRENGTH OF SPURIOUS EMISSIONS

RULES PART NO.: 15.247(c), 15.205 & 15.209(b), RSS-210 ANNEX 8, RSS-GEN

REQUIREMENTS:

§15.247(c)& §15.205	
(Fundamental) Frequency	(Field Strength) Limits
902 – 928 MHz 2.4 – 2.4835 GHz	127.37 dBµV/m
§15.209	
30 - 88 MHz	40 dBµV/m @3M
88 -216 MHz	43.5 dBµV/m @3M
216 -960 MHz	46 dBµV/m @3M
ABOVE 960 MHz	54dBuV/m

Emissions that fall in the restricted bands (15.205) must be less than or equal to 500 µV/m (54 dBµV/m). Spurious not in a restricted band must be 20 dBc.

Emissions were measured from 9 kHz or the lowest frequency generated to the 10th harmonic.

* Denotes Restricted Band

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	EUTy Cycle Applied	Correction Factor dB/m	Field Strength dBuV/m	Margin dB	Detector used
903.3	903.3	78.4	V	2.38	0	23.3	104.06	23.33	QPK
903.3	903.3	86.5	H	2.38	0	23.3	112.22	15.17	QPK
903.3	1,806.60	20.2	V	2.93	20	30.56	33.69	50.37	PK
903.3	1,806.60	25.5	H	2.93	20	30.56	38.99	45.07	PK
*903.3	2,709.90	15.3	V	3.4	20	33.04	31.74	22.26	PK
*903.3	2,709.90	15.6	H	3.4	20	33.04	32.04	21.96	PK
*903.3	3,613.20	17.5	V	4.15	20	33.36	35.01	18.99	PK
*903.3	3,613.20	18.5	H	4.15	20	33.36	36.01	17.99	PK
903.3	4,516.50	20.3	H	4.76	20	34.1	39.16	44.9	PK
903.3	4,516.50	21.1	V	4.76	20	34.1	39.96	44.1	PK
*903.3	5,419.80	28.2	V	5.13	20	34.6	47.93	6.07	PK

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	EUTy Cycle Applied	Correction Factor dB/m	Field Strength dBuV/m	Margin dB	Detector used
*903.3	5,419.80	31	H	5.13	20	34.6	50.73	3.27	PK
903.3	6,323.10	12.5	V	5.4	20	35.76	33.66	50.4	PK
903.3	6,323.10	12.7	H	5.4	20	35.76	33.86	50.2	PK
903.3	7,226.40	16.8	H	5.74	20	35.81	38.35	45.71	PK
903.3	7,226.40	16.8	V	5.74	20	35.81	38.35	45.71	PK
*903.3	8,129.70	12.6	H	6.25	20	35.93	34.78	19.22	PK
*903.3	8,129.70	13.2	V	6.25	20	35.93	35.38	18.62	PK
*903.3	9,003.30	10.5	H	6.6	20	36.1	33.2	20.8	PK
*903.3	9,003.30	10.6	V	6.6	20	36.1	33.3	20.7	PK
915	915	78.2	V	2.4	0	23.35	103.98	23.4	QPK
915	915	86.3	H	2.4	0	23.35	112	15.38	QPK
915	1,830.00	18.4	V	2.99	20	30.68	32.07	51.91	PK
915	1,830.00	22.5	H	2.99	20	30.68	36.17	47.81	PK
*915	2,745.00	15.2	V	3.42	20	33.09	31.71	22.29	PK
*915	2,745.00	15.6	H	3.42	20	33.09	32.11	21.89	PK
*915	3,660.00	20.1	H	4.19	20	33.42	37.71	16.29	PK
*915	3,660.00	21.7	V	4.19	20	33.42	39.31	14.69	PK
915	4,575.00	20.9	H	4.79	20	34.1	39.79	44.19	PK
915	4,575.00	21.5	V	4.79	20	34.1	40.39	43.59	PK
915	5,490.00	28.4	H	5.15	20	34.69	48.24	35.74	PK
915	5,490.00	31.1	V	5.15	20	34.69	50.94	33.04	PK
915	6,405.00	13.8	H	5.42	20	35.82	35.04	48.94	PK
915	6,405.00	13.9	V	5.42	20	35.82	35.14	48.84	PK
*915	7,320.00	16.3	V	5.79	20	35.77	37.86	16.14	PK
*915	7,320.00	16.9	H	5.79	20	35.77	38.46	15.54	PK
*915	8,235.00	12.1	V	6.29	20	35.95	34.34	19.66	PK
*915	8,235.00	12.5	H	6.29	20	35.95	34.74	19.26	PK
*915	9,150.00	10.3	V	6.65	20	36.25	33.2	20.8	PK
*915	9,150.00	10.6	H	6.65	20	36.25	33.5	20.5	PK
927.1	927.1	76	V	2.42	0	23.47	101.85	25.53	QPK
927.1	927.1	83.3	H	2.42	0	23.47	109.23	18.15	QPK
927.1	1,854.20	17.7	V	3.04	20	30.81	31.55	50.3	PK
927.1	1,854.20	21.8	H	3.04	20	30.81	35.65	46.2	PK
*927.1	2,781.30	14.7	V	3.45	20	33.15	31.3	22.7	PK
*927.1	2,781.30	15.9	H	3.45	20	33.15	32.5	21.5	PK
*927.1	3,708.40	19.5	H	4.24	20	33.49	37.23	16.77	PK

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	EUTy Cycle Applied	Correction Factor dB/m	Field Strength dBuV/m	Margin dB	Detector used
*927.1	3,708.40	20.2	V	4.24	20	33.49	37.93	16.07	PK
927.1	4,635.50	21	V	4.82	20	34.1	39.92	41.93	PK
927.1	4,635.50	21.3	H	4.82	20	34.1	40.22	41.63	PK
927.1	5,562.60	26.5	V	5.17	20	34.8	46.47	35.38	PK
927.1	5,562.60	30	H	5.17	20	34.8	49.97	31.88	PK
927.1	6,489.70	13.4	H	5.45	20	35.89	34.74	47.11	PK
927.1	6,489.70	14	V	5.45	20	35.89	35.34	46.51	PK
927.1	7,416.80	16	V	5.85	20	35.73	37.58	44.27	PK
927.1	7,416.80	17.5	H	5.85	20	35.73	39.08	42.77	PK
*927.1	8,343.90	11.3	H	6.34	20	35.97	33.61	20.39	PK
*927.1	8,343.90	12.4	V	6.34	20	35.97	34.71	19.29	PK
927.1	9,271.00	11.6	V	6.68	20	36.37	34.65	47.2	PK
927.1	9,271.00	11.8	H	6.68	20	36.37	34.85	47	PK

RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

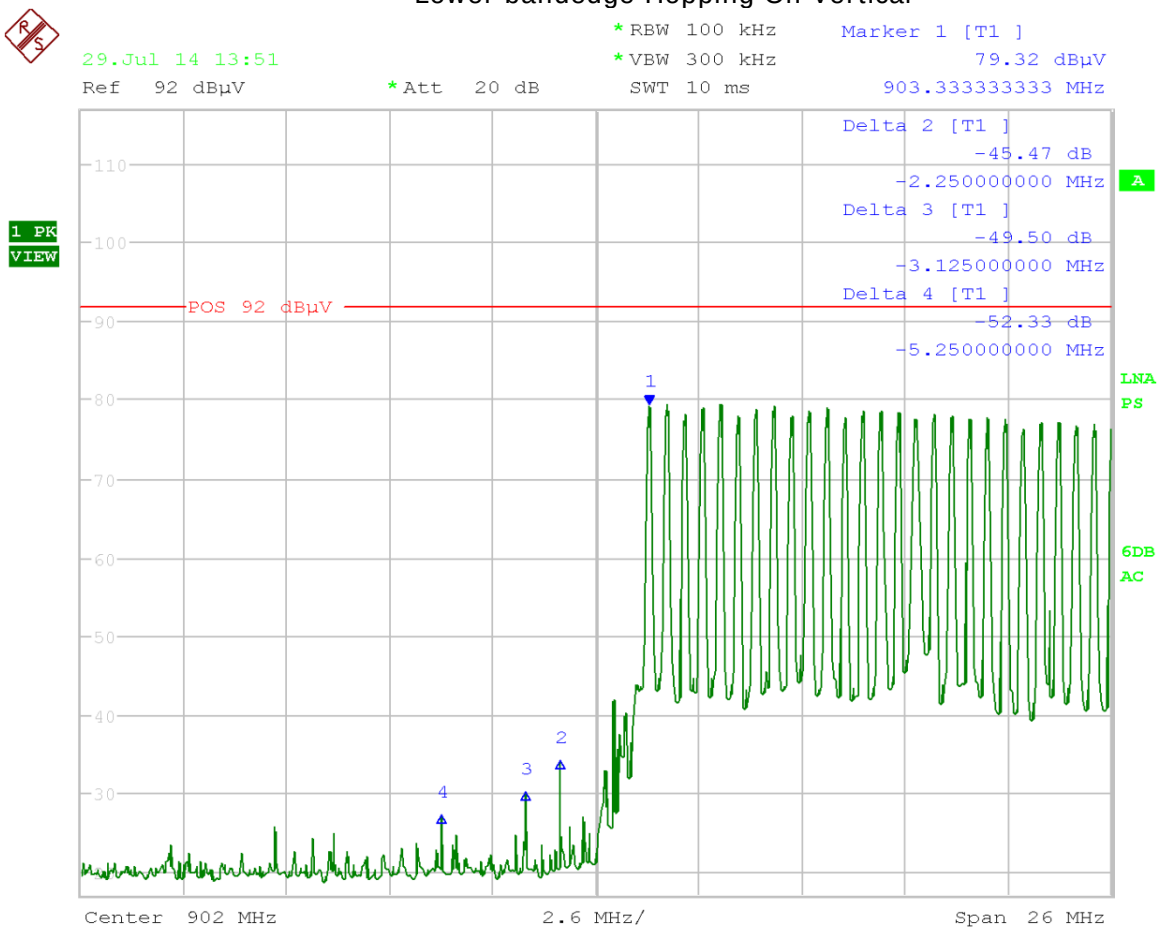
RULES PART NO.: 15.247(c), 15.205 RSS-210 ANNEX 8, RSS-GEN

REQUIREMENTS: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 µV/m (54 dBµV/m). Emissions not in the restricted band must be 20 dBc.

TEST DATA: In the 902 to 928 MHz band the emissions need only meet 20 dBc in the adjacent bands as they are not in a restricted band.

See plots on the following pages.

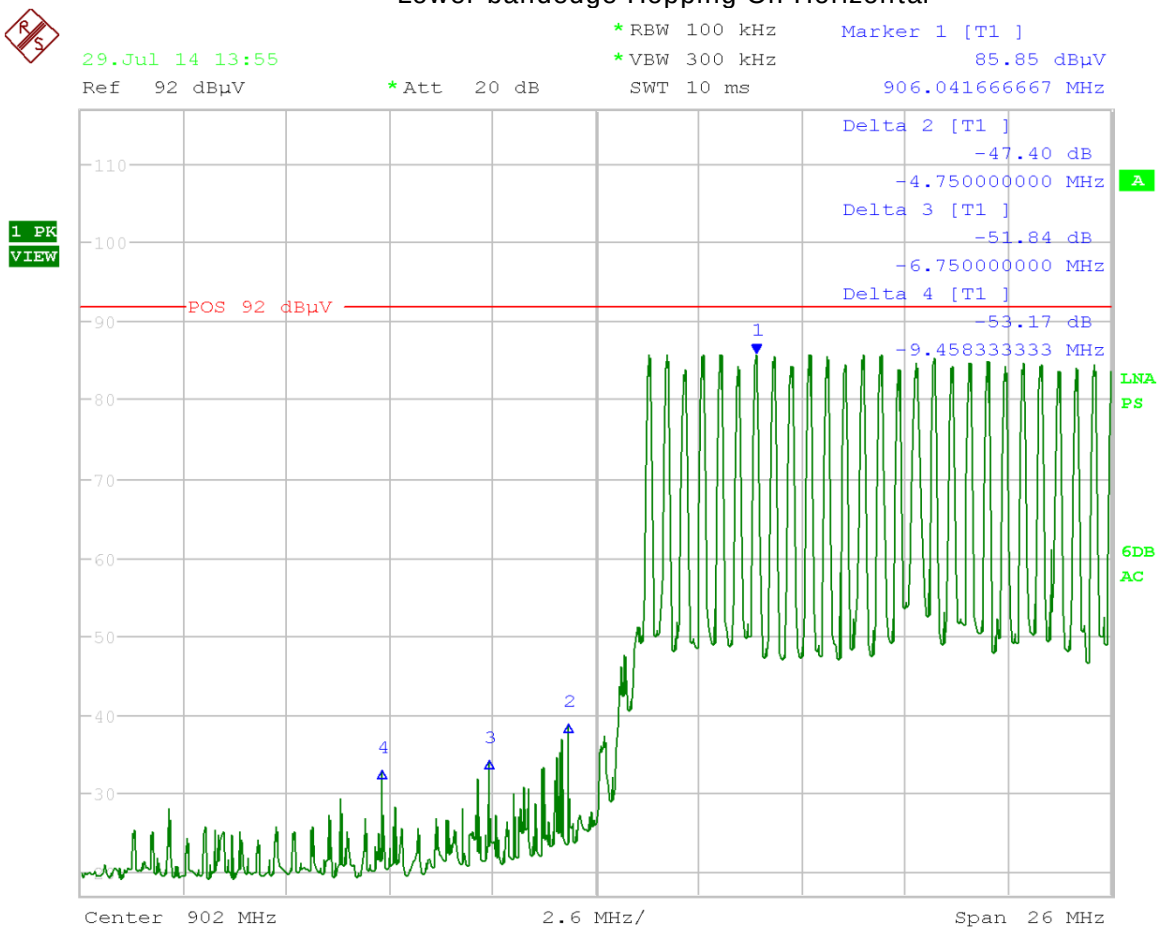
Lower bandedge Hopping On Vertical



Date: 29.JUL.2014 13:51:29

RESULTS: MEETS REQUIREMENTS

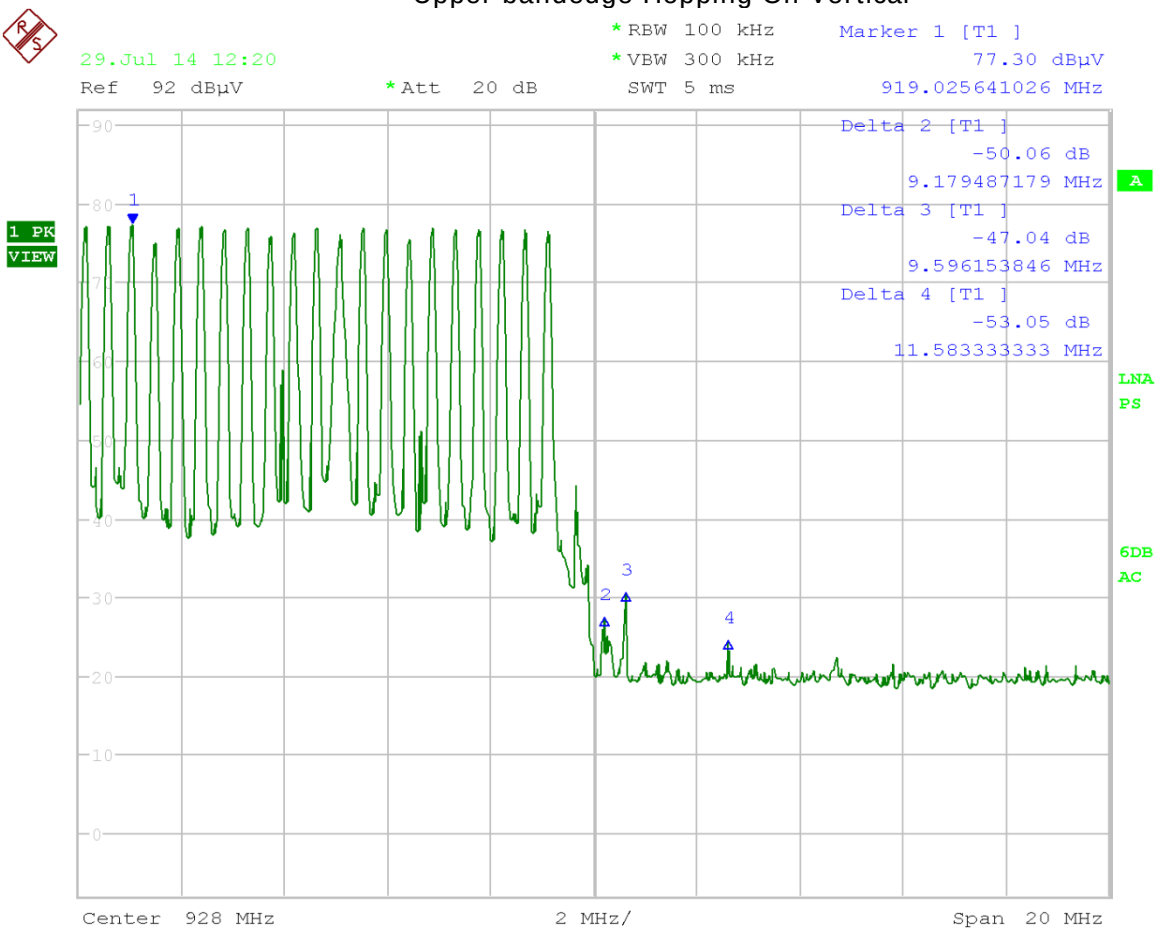
Lower bandedge Hopping On Horizontal



Date: 29.JUL.2014 13:55:08

RESULTS: MEETS REQUIREMENTS

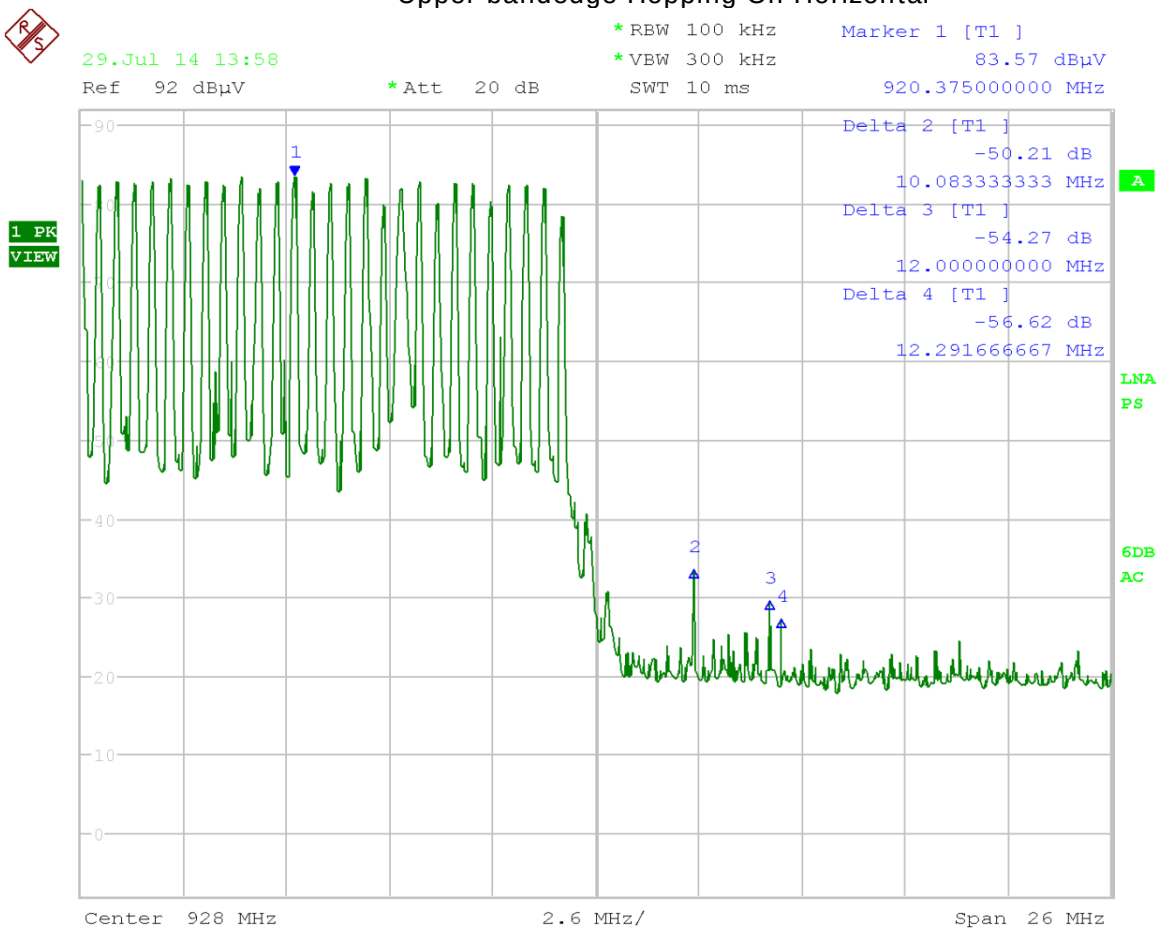
Upper bandedge Hopping On Vertical



Date: 29.JUL.2014 12:20:19

RESULTS: MEETS REQUIREMENTS

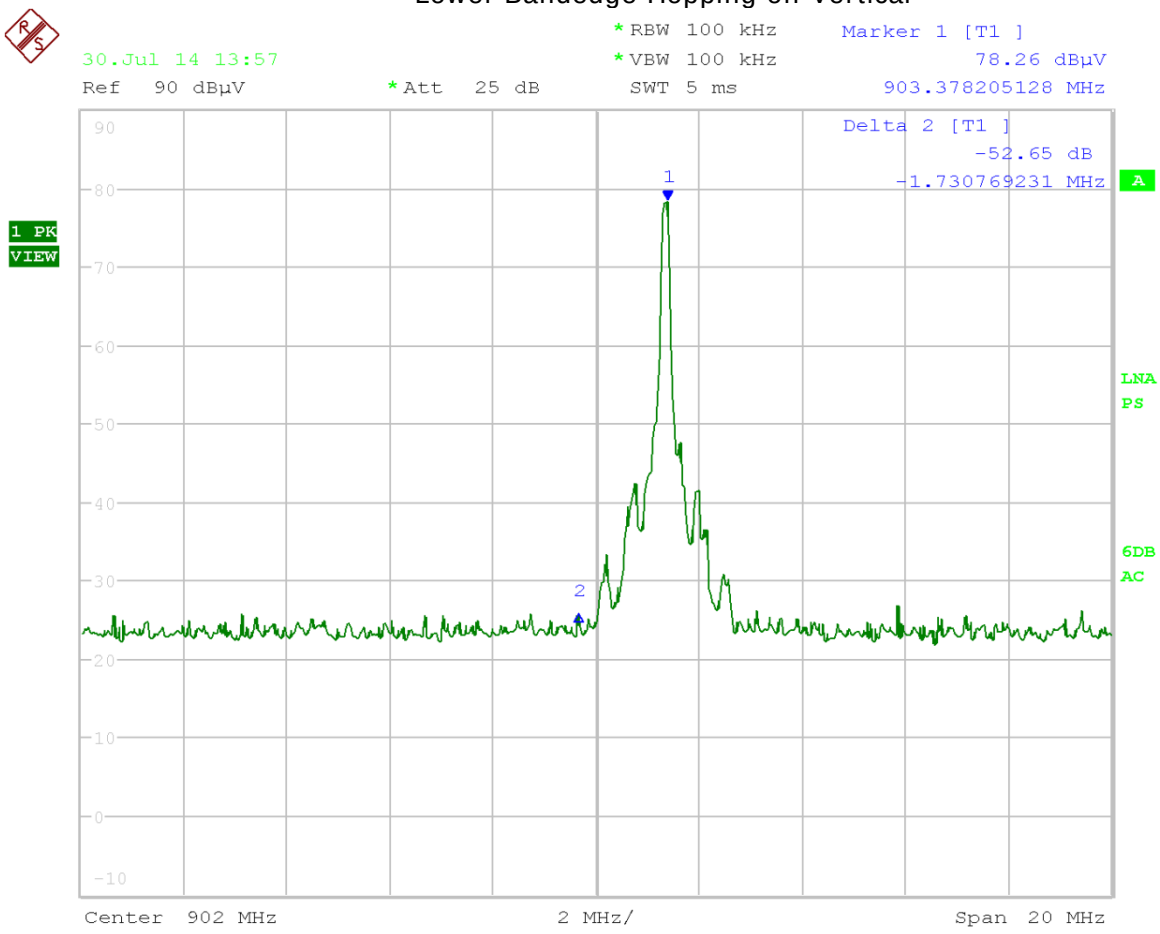
Upper bandedge Hopping On Horizontal



Date: 29.JUL.2014 13:58:26

RESULTS: MEETS REQUIREMENTS

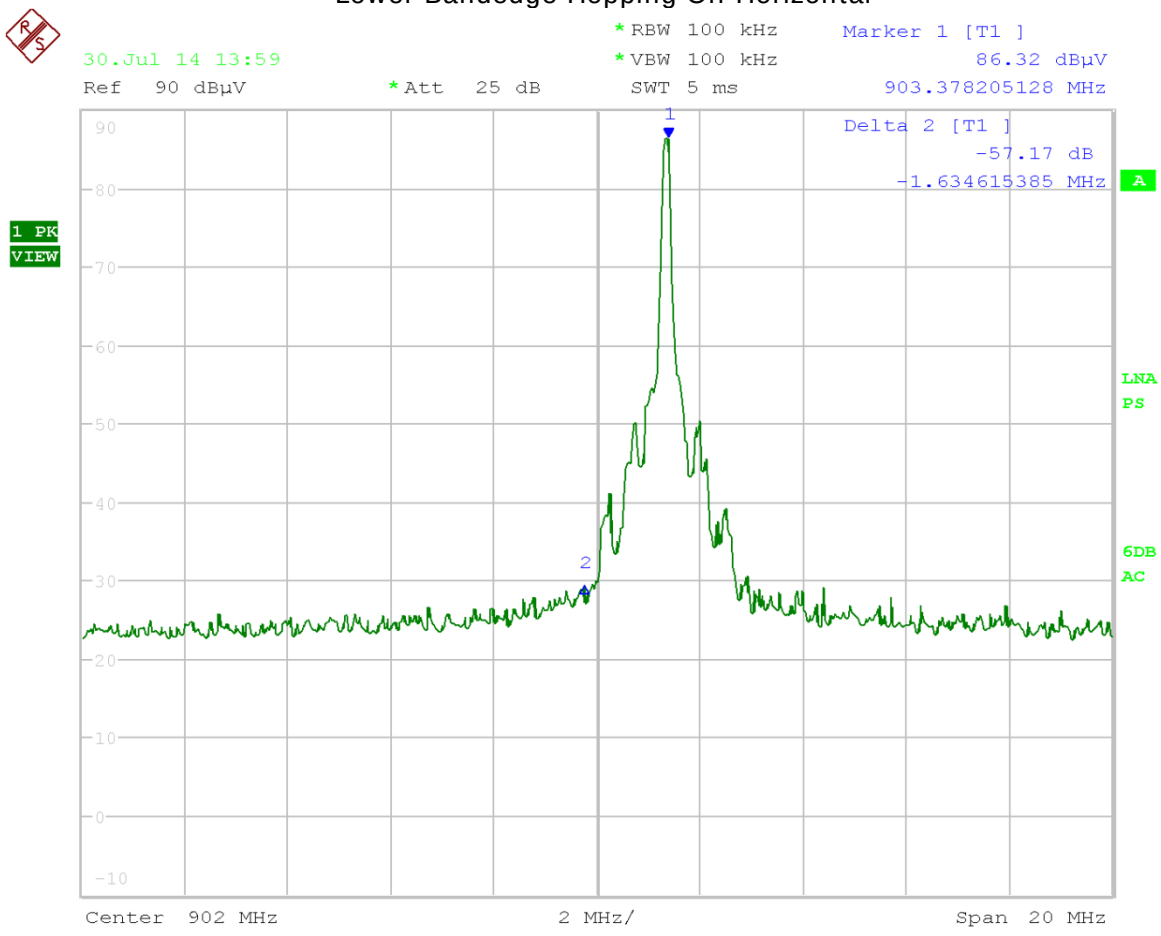
Lower Bandedge Hopping off Vertical



Date: 30.JUL.2014 13:57:43

RESULTS: MEETS REQUIREMENTS

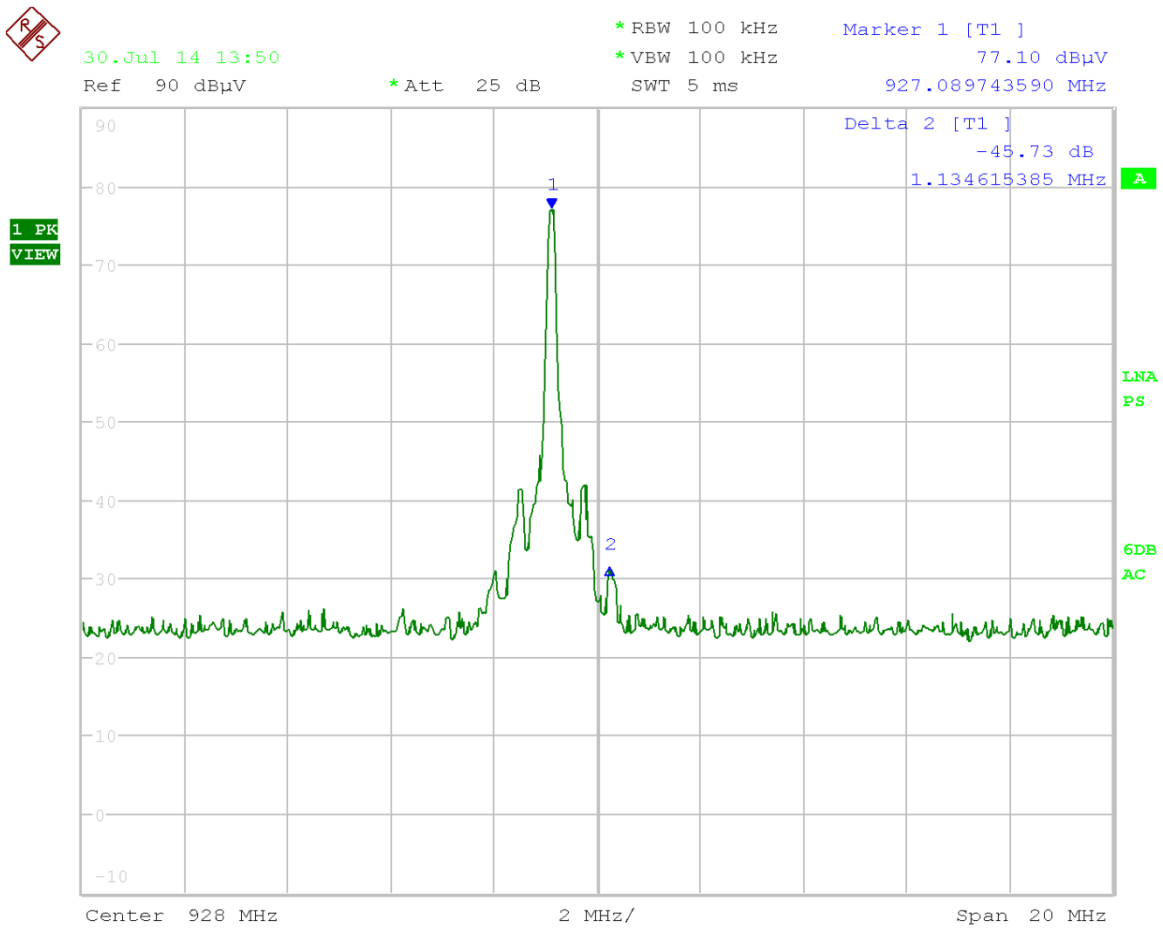
Lower Bandedge Hopping Off Horizontal



Date: 30.JUL.2014 13:59:07

RESULTS: MEETS REQUIREMENTS

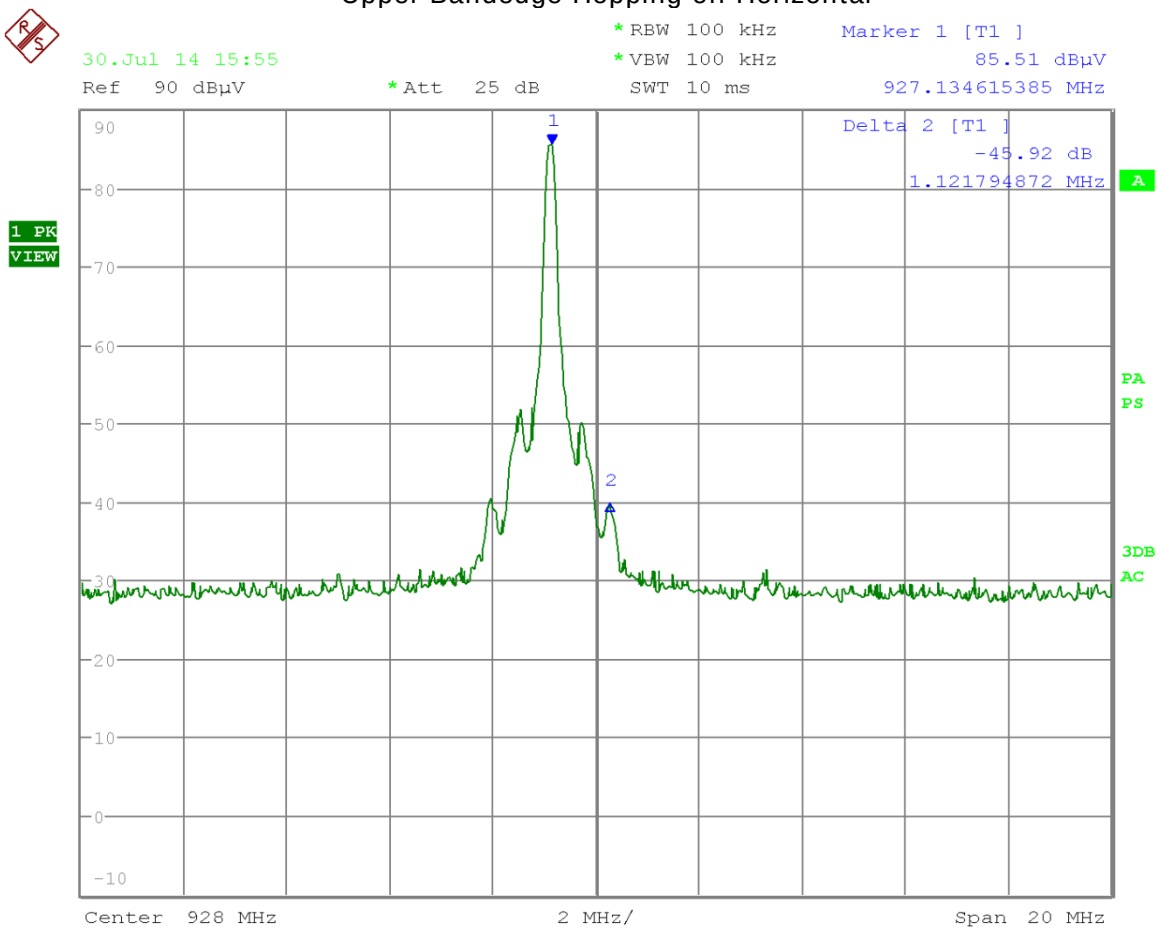
Upper Bandedge Hopping Off Vertical



Date: 30.JUL.2014 13:50:18

RESULTS: MEETS REQUIREMENTS

Upper Bandedge Hopping off Horizontal



Date: 30.JUL.2014 15:55:35

RESULTS: MEETS REQUIREMENTS