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Report On

FCC and Industry Canada Testing of the
DragonWave Inc. Microwave Outdoor Unit Harmony Lite 3GHz (3650 –
3700MHz) In accordance with FCC CFR 47 Part 90Z and Industry
Canada RSS-197: Issue 1

COMMERCIAL-IN-CONFIDENCE

FCC ID: QB8LT3G
IC ID: 4679A-LT3G

Document 57014125 Report 01 Issue 2

September 2014





Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC and Industry Canada Testing of the
DragonWave Inc.
Microwave Outdoor Unit Harmony Lite 3GHz

Document 57014125 Report 01 Issue 2

September 2014

PREPARED FOR

DragonWave Inc.
600-411 Legget Drive, Kanata ON, K2K 3C9, CANADA

PREPARED BY

Y He
Test Engineer

APPROVED BY

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Test Manager

DATED

16 September 2014

This report has been up-issued to Issue 2 to supply IC MODEL NUMBER in Clause 1.4.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 90Z and Industry Canada RSS-197. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Y He

C Zhang



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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the DragonWave Inc.
Microwave Outdoor Unit Harmony Lite 3GHz



Product Service

1.1 REPORT DETAILS

The information contained in this report is intended to show verification of the DragonWave Inc. Microwave Outdoor Unit Harmony Lite 3GHz to the requirements of FCC CFR 47 Part 90Z and Industry Canada RSS-197.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Microwave Outdoor Unit Harmony Lite 3GHz.

Manufacturer	DragonWave Inc.
Address	600-411 Legget Drive, Kanata ON, K2K 3C9, CANADA
Product Name	Microwave Outdoor Unit
Product Type	Harmony Lite 3GHz
Serial Number(s)	F1003GHA0140
Software Version	1.6.23
Hardware Version	Rev A
Test Specification/Issue/Date	FCC CFR 47 Part 90Z: 2013 Industry Canada RSS-197 Issue 1: 2010
Start of Test	13 August 2014
Finish of Test	27 August 2014
Name of Engineer(s)	Yuanjie He
Related Document(s)	ANSI C63.4: 2009 ANSI/TIA-603-C-2004 FCC CFR 47 Part 2: 2013 Industry Canada RSS-Gen Issue 3: 2010 Industry Canada SRSP-303.65 Issue 2: 2010



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 90Z and Industry Canada RSS-197 is shown below.

Section	Spec Clause				Test Description	Result
	Part 2	Part 90Z	RSS Gen	RSS 197		
2.1	2.1046	90.1321	4.8	5.6	Transmitter Output Power and E.I.R.P	Pass
2.2	2.1049(h)	90.1323	4.6.1	5.2	Occupied Bandwidth	Pass
2.3	2.1047	90.210	-	-	Emission Masks	Pass
2.4	2.1053	90.1323	4.9	5.7	Conducted Spurious Emissions	Pass
2.5	2.1051	90.1323	4.9	5.7	Radiated Spurious Emissions	Pass
2.6	2.1055	90.213	4.7	5.3	Frequency Stability	Pass

N/A – Not Applicable



1.3 CONFIGURATION DESCRIPTION

Configuration Code	Carrier(s)	Configuration Description
O-MIMO-20	1C	TDD/OFDM MIMO, 20MHz OBW, Single carrier
O-MIMO-40	1C	TDD/OFDM MIMO, 40MHz OBW, Single carrier

O-MIMO-20

Configuration 1:

TDD/OFDM, Modulation BPSK 1/2 with 99% duty cycle and 14.4Mbps transmit rate.

Configuration 2:

TDD/OFDM, Modulation QPSK 3/4 with 99% duty cycle and 43.3Mbps transmit rate.

Configuration 3:

TDD/OFDM, Modulation 16QAM 3/4 with 99% duty cycle and 86.7Mbps transmit rate.

Configuration 4:

TDD/OFDM, Modulation 64QAM 5/6 with 99% duty cycle and 144Mbps transmit rate.

O-MIMO-40

Configuration 1:

TDD/OFDM, Modulation BPSK 1/2 with 99% duty cycle and 30Mbps transmit rate.

Configuration 2:

TDD/OFDM, Modulation QPSK 3/4 with 99% duty cycle and 90Mbps transmit rate.

Configuration 3:

TDD/OFDM, Modulation 16QAM 3/4 with 99% duty cycle and 180Mbps transmit rate.

Configuration 4:

TDD/OFDM, Modulation 16QAM 5/6 with 99% duty cycle and 300Mbps transmit rate.

Configuration 2 was found to be representative for all traffic scenarios when different modulation types were tested to find the worst case setting. The settings were used for all measurements if not otherwise noted.



Product Service

1.4 DECLARATION OF BUILD STATUS

MAIN EUT	
APPLICANT	DragonWave Inc.
MANUFACTURER	DragonWave Inc.
PRODUCT NAME	Microwave Outdoor Unit
IC MODEL NUMBER	Harmony Lite 3GHz
SERIAL NUMBER	F1003GHA0140
FCC ID	QB8LT3G
IC ID	4679A-LT3G
RADIO ACCESS TECHNOLOGY	TDD
HARDWARE VERSION	Rev A
SOFTWARE VERSION	1.6.23
TRANSMITTER OPERATING RANGE	TX/RX: 3650MHz – 3700MHz
MODULATIONS	BPSK,QPSK,16QAM,64QAM
ITU DESIGNATION OF EMISSION	20M0D7W, 40M0D7W
SUPPORTED CHANNEL BANDWIDTH CONFIGURATION	20MHz, 40MHz
OUTPUT POWER (RMS) (W or dBm)	MIMO: 2 x 22dBm (2 x 0.158W)
ANTENNA GAIN	Antenna MT–384022/SVH/A: 14.5dBi Antenna MT–385006/SVH/A: 19.5dBi Antenna MT–405042/NVH/D: 21.0dBi
ENVIRONMENT TEMP. RANGE	-40°C - 55°C
DC Power source	-48V
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Microwave Outdoor Unit Harmony Lite 3GHz is a point to point product utilizes OFDM and MIMO technology.
NOTES	The upper part of the allocated band from 3675 – 3700 MHz requires the device to use an unrestricted contention-based protocol. This device employs an unrestricted contention-based protocol.

No responsibility will be accepted by TÜV SÜD Certification and Testing (China) Co.,Ltd. Beijing Branch as to the accuracy of the information declared in this document by the manufacturer.



Product Service

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) is DragonWave's sub-6GHz small-cell backhaul solution, which employ frequency band TX/RX: 3650MHz – 3700MHz. This point to point product utilizes OFDM and MIMO technology, making it ideal for LOS, nLOS and NLOS packet microwave and microcell backhaul applications. The Lite system is an all-outdoor solution that combines high capacity packet microwave, with an integrated antenna in an optimized form factor. The aesthetic design and physical specifications of the Lite Link ensure compliance with strict city-zoning regulations and ensure that the unit blends perfectly into the urban landscape.

The Microwave Outdoor Unit Harmony Lite 3GHz is likely to use integrated or detachable Dual Polarization Subscriber Antenna.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



Equipment Under Test



Product Service

1.6 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

All test cases were tested with the EUT supplied with -48V DC by an external power supply.

1.7 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.8 MODIFICATION RECORD

Modification State 0 - No modifications were made to the EUT during testing.

1.9 ALTERNATIVE TEST SITE

All the testing was conducted at following site registrations:

FCC Accreditation 910917:

The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.

Industry Canada Accreditation 7308A-1:

The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.



Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the DragonWave Inc.
Microwave Outdoor Unit Harmony Lite 3GHz



Product Service

2.1 TRANSMITTER OUTPUT POWER AND E.I.R.P

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 90, Clause 90.1321
Industry Canada RSS-Gen, Clause 4.8
Industry Canada RSS-197, Clause 5.6

2.1.2 Equipment Under Test

Microwave Outdoor Unit Harmony Lite 3GHz, S/N: F1003GHA0140

2.1.3 Date of Test and Modification State

13 to 15 August 2014 – Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 90Z and Industry Canada RSS-197.

The path loss between the EUT and the power sensor was measured and recorded for the test band. The path loss was entered as an offset into the Power Meter and Spectrum Analyzer. The EUT was configured to transmit on Maximum Power on the configurations defined in the tables below. Using a power meter and attenuator(s), the output power of the EUT was measured at the antenna terminal.

In the case of MIMO devices, the power was measured from each antenna port and the results summed in accordance with FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

2.1.6 Environmental Conditions

Ambient Temperature	22.5 - 24.0°C
Relative Humidity	40.0 - 45.5%



2.1.7 Test Results

Configuration O-MIMO-20

Transmitter Output Power 19.0dBm per port-Conducted

PSD, EIRP with Antenna: MT-384022/SVH/A, assembly gain 14.5dBi

Antenna Port	Modulation / Carrier Bandwidth (MHz)	Transmitter Output Power / PSD / EIRP								
		Channel Position B 3660MHz			Channel Position M 3675MHz			Channel Position T 3690MHz		
		Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)
Ch1	BPSK / 20MHz	18.27	19.76	32.77	18.63	20.12	33.13	18.04	19.53	32.54
Ch2		18.71	20.20	33.21	18.08	19.57	32.58	17.52	19.01	32.02
Total		21.51	23.00	36.01	21.37	22.86	35.87	20.80	22.29	35.30
Ch1	QPSK / 20MHz	18.30	19.79	32.80	18.63	20.12	33.13	18.05	19.54	32.55
Ch2		18.71	20.20	33.21	18.60	20.09	33.10	17.55	19.04	32.05
Total		21.52	23.01	36.02	21.63	23.12	36.13	20.82	22.31	35.32
Ch1	16QAM / 20MHz	18.32	19.81	32.82	18.63	20.12	33.13	18.05	19.54	32.55
Ch2		18.72	20.21	33.22	18.16	19.65	32.66	17.54	19.03	32.04
Total		21.53	23.02	36.03	21.41	22.90	35.91	20.81	22.30	35.31
Ch1	64QAM / 20MHz	18.23	19.72	32.73	18.61	20.10	33.11	18.06	19.55	32.56
Ch2		18.71	20.20	33.21	18.11	19.60	32.61	17.50	18.99	32.00
Total		21.49	22.98	35.99	21.38	22.87	35.88	20.80	22.29	35.30

PSD, EIRP with Antenna: MT-385006/SVH/A, assembly gain 19.5dBi

Antenna Port	Modulation / Carrier Bandwidth (MHz)	Transmitter Output Power / PSD / EIRP								
		Channel Position B 3660MHz			Channel Position M 3675MHz			Channel Position T 3690MHz		
		Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)
Ch1	BPSK / 20MHz	18.27	24.76	37.77	18.63	25.12	38.13	18.04	24.53	37.54
Ch2		18.71	25.20	38.21	18.08	24.57	37.58	17.52	24.01	37.02
Total		21.51	28.00	41.01	21.37	27.86	40.87	20.80	27.29	40.30
Ch1	QPSK / 20MHz	18.30	24.79	37.80	18.63	25.12	38.13	18.05	24.54	37.55
Ch2		18.71	25.20	38.21	18.60	25.09	38.10	17.55	24.04	37.05
Total		21.52	28.01	41.02	21.63	28.12	41.13	20.82	27.31	40.32
Ch1	16QAM / 20MHz	18.32	24.81	37.82	18.63	25.12	38.13	18.05	24.54	37.55
Ch2		18.72	25.21	38.22	18.16	24.65	37.66	17.54	24.03	37.04
Total		21.53	28.02	41.03	21.41	27.90	40.91	20.81	27.30	40.31
Ch1	64QAM / 20MHz	18.23	24.72	37.73	18.61	25.10	38.11	18.06	24.55	37.56
Ch2		18.71	25.20	38.21	18.11	24.60	37.61	17.50	23.99	37.00
Total		21.49	27.98	40.99	21.38	27.87	40.88	20.80	27.29	40.30



PSD, EIRP with Antenna: MT-405042/NVH/D, assembly gain 21.0dBi

Antenna Port	Modulation / Carrier Bandwidth (MHz)	Transmitter Output Power / PSD / EIRP								
		Channel Position B 3660MHz			Channel Position M 3675MHz			Channel Position T 3690MHz		
		Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)
Ch1	BPSK / 20MHz	18.27	26.26	39.27	18.63	26.62	39.63	18.04	26.03	39.04
Ch2		18.71	26.70	39.71	18.08	26.07	39.08	17.52	25.51	38.52
Total		21.51	29.50	42.51	21.37	29.36	42.37	20.80	28.79	41.80
Ch1	QPSK / 20MHz	18.30	26.29	39.30	18.63	26.62	39.63	18.05	26.04	39.05
Ch2		18.71	26.70	39.71	18.60	26.59	39.60	17.55	25.54	38.55
Total		21.52	29.51	42.52	21.63	29.62	42.63	20.82	28.81	41.82
Ch1	16QAM / 20MHz	18.32	26.31	39.32	18.63	26.62	39.63	18.05	26.04	39.05
Ch2		18.72	26.71	39.72	18.16	26.15	39.16	17.54	25.53	38.54
Total		21.53	29.52	42.53	21.41	29.40	42.41	20.81	28.80	41.81
Ch1	64QAM / 20MHz	18.23	26.22	39.23	18.61	26.60	39.61	18.06	26.05	39.06
Ch2		18.71	26.70	39.71	18.11	26.10	39.11	17.50	25.49	38.50
Total		21.49	29.48	42.49	21.38	29.37	42.38	20.80	28.79	41.80

Configuration O-MIMO-40

Transmitter Output Power 22.0dBm per port-Conducted

PSD, EIRP with Antenna: MT-384022/SVH/A, assembly gain 14.5dBi

Antenna Port	Modulation / Carrier Bandwidth (MHz)	Transmitter Output Power / PSD / EIRP								
		Channel Position B 3670MHz			Channel Position M 3675MHz			Channel Position T 3680MHz		
		Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)
Ch1	BPSK / 40MHz	21.50	19.98	36.00	21.41	19.89	35.91	21.37	19.85	35.87
Ch2		21.00	19.48	35.50	20.90	19.38	35.40	20.85	19.33	35.35
Total		24.27	22.75	38.77	24.17	22.65	38.67	24.13	22.61	38.63
Ch1	QPSK / 40MHz	21.51	19.99	36.01	21.44	19.92	35.94	21.33	19.81	35.83
Ch2		20.95	19.43	35.45	20.95	19.43	35.45	20.85	19.33	35.35
Total		24.25	22.73	38.75	24.21	22.69	38.71	24.11	22.59	38.61
Ch1	16QAM / 40MHz	21.49	19.97	35.99	21.45	19.93	35.95	21.33	19.81	35.83
Ch2		21.02	19.50	35.52	20.92	19.40	35.42	20.82	19.30	35.32
Total		24.27	22.75	38.77	24.20	22.68	38.70	24.09	22.57	38.59
Ch1	64QAM / 40MHz	21.50	19.98	36.00	21.43	19.91	35.93	21.35	19.83	35.85
Ch2		21.00	19.48	35.50	20.94	19.42	35.44	20.80	19.28	35.30
Total		24.27	22.75	38.77	24.20	22.68	38.70	24.09	22.57	38.59



PSD, EIRP with Antenna: MT-385006/SVH/A, assembly gain 19.5dBi

Antenna Port	Modulation / Carrier Bandwidth (MHz)	Transmitter Output Power / PSD / EIRP								
		Channel Position B 3670MHz			Channel Position M 3675MHz			Channel Position T 3680MHz		
		Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)
Ch1	BPSK / 40MHz	21.50	24.98	41.00	21.41	24.89	40.91	21.37	24.85	40.87
Ch2		21.00	24.48	40.50	20.90	24.38	40.40	20.85	24.33	40.35
Total		24.27	27.75	43.77	24.17	27.65	43.67	24.13	27.61	43.63
Ch1	QPSK / 40MHz	21.51	24.99	41.01	21.44	24.92	40.94	21.33	24.81	40.83
Ch2		20.95	24.43	40.45	20.95	24.43	40.45	20.85	24.33	40.35
Total		24.25	27.73	43.75	24.21	27.69	43.71	24.11	27.59	43.61
Ch1	16QAM / 40MHz	21.49	24.97	40.99	21.45	24.93	40.95	21.33	24.81	40.83
Ch2		21.02	24.50	40.52	20.92	24.40	40.42	20.82	24.30	40.32
Total		24.27	27.75	43.77	24.20	27.68	43.70	24.09	27.57	43.59
Ch1	64QAM / 40MHz	21.50	24.98	41.00	21.43	24.91	40.93	21.35	24.83	40.85
Ch2		21.00	24.48	40.50	20.94	24.42	40.44	20.80	24.28	40.30
Total		24.27	27.75	43.77	24.20	27.68	43.70	24.09	27.57	43.59

PSD, EIRP with Antenna: MT-405042/NVH/D, assembly gain 21.0dBi

Antenna Port	Modulation / Carrier Bandwidth (MHz)	Transmitter Output Power / PSD / EIRP								
		Channel Position B 3670MHz			Channel Position M 3675MHz			Channel Position T 3680MHz		
		Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)	Power (dBm)	PSD (dBm/MHz)	EIRP (dBm)
Ch1	BPSK / 40MHz	21.50	26.48	42.50	21.41	26.39	42.41	21.37	26.35	42.37
Ch2		21.00	25.98	42.00	20.90	25.88	41.90	20.85	25.83	41.85
Total		24.27	29.25	45.27	24.17	29.15	45.17	24.13	29.11	45.13
Ch1	QPSK / 40MHz	21.51	26.49	42.51	21.44	26.42	42.44	21.33	26.31	42.33
Ch2		20.95	25.93	41.95	20.95	25.93	41.95	20.85	25.83	41.85
Total		24.25	29.23	45.25	24.21	29.19	45.21	24.11	29.09	45.11
Ch1	16QAM / 40MHz	21.49	26.47	42.49	21.45	26.43	42.45	21.33	26.31	42.33
Ch2		21.02	26.00	42.02	20.92	25.90	41.92	20.82	25.80	41.82
Total		24.27	29.25	45.27	24.20	29.18	45.20	24.09	29.07	45.09
Ch1	64QAM / 40MHz	21.50	26.48	42.50	21.43	26.41	42.43	21.35	26.33	42.35
Ch2		21.00	25.98	42.00	20.94	25.92	41.94	20.80	25.78	41.80
Total		24.27	29.25	45.27	24.20	29.18	45.20	24.09	29.07	45.09

Limit	
Power	EIRP: 44dBm/25MHz or 25W/25MHz EIRP Power Density(PSD):30dBm/MHz or 1W/MHz

Remark:

EIRP compliance was addressed at the time of testing, as required by the responsible IC Bureau(s). Licensees are also required to take into account maximum allowed antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits if any other antenna be used at the time of licensing.



Product Service

2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049(h)
FCC CFR 47 Part 90Z, Clause 90.1323
Industry Canada RSS-Gen, Clause 4.6.1
Industry Canada RSS-197, Clause 5.2

2.2.2 Equipment Under Test

Microwave Outdoor Unit Harmony Lite 3GHz, S/N: F1003GHA0140

2.2.3 Date of Test and Modification State

13 to 15 August 2014 – Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 90Z and Industry Canada RSS-197.

The EUT was set to transmit at maximum power and testing was carried out on Bottom, Middle and Top Channels. Using the Occupied Bandwidth measurement function in the Spectrum Analyser, the Occupied Bandwidth is defined as the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency. The 99% Occupied Bandwidth was measured.

In addition, the 26dB bandwidth was measured in accordance with FCC KDB 971168 DO1 V0201 Clause 4.1. The RBW was configured to 1% of the theoretical channel bandwidth, meeting the requirement of being between 1 to 5% of the Occupied Bandwidth described in the KDB aforementioned.

2.2.6 Environmental Conditions

Ambient Temperature	22.5 - 24.0°C
Relative Humidity	40.0 - 45.5%



2.2.7 Test Results

Configuration O-MIMO-20

Maximum Output Power 19.0dBm per port.

Modulation / Bandwidth	99% Occupied Bandwidth (MHz)		
	Channel Position B 3660MHz	Channel Position M 3675MHz	Channel Position T 3690MHz
QPSK / 20 MHz	17.69	17.69	17.69
Modulation / Bandwidth	26 dB Occupied Bandwidth (MHz)		
	Channel Position B 3660MHz	Channel Position M 3675MHz	Channel Position T 3690MHz
QPSK / 20 MHz	23.94	23.56	23.94

Channel Position M 3675MHz / Bandwidth	99% Occupied Bandwidth (MHz)		
	Modulation BPSK	Modulation 16QAM	Modulation 64QAM
20 MHz	17.69	17.69	17.69
Channel Position M 3675MHz / Bandwidth	26dB Occupied Bandwidth (MHz)		
	Modulation BPSK	Modulation 16QAM	Modulation 64QAM
20 MHz	24.23	23.46	23.37

Configuration O-MIMO-40

Maximum Output Power 22.0dBm per port.

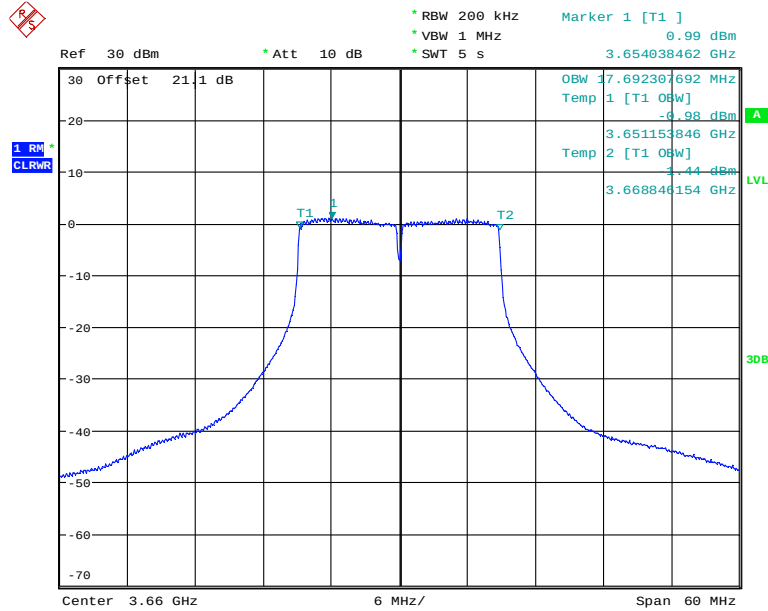
Modulation / Bandwidth	99% Occupied Bandwidth (MHz)		
	Channel Position B 3670MHz	Channel Position M 3675MHz	Channel Position T 3680MHz
QPSK / 40 MHz	36.54	36.54	36.54
Modulation / Bandwidth	26dB Occupied Bandwidth (MHz)		
	Channel Position B 3670MHz	Channel Position M 3675MHz	Channel Position T 3680MHz
QPSK / 40 MHz	49.81	50.00	50.96

Channel Position M 3675MHz / Bandwidth	99% Occupied Bandwidth (MHz)		
	Modulation BPSK	Modulation 16QAM	Modulation 64QAM
40 MHz	36.54	36.54	36.54
Channel Position M 3675MHz / Bandwidth	26dB Occupied Bandwidth (MHz)		
	Modulation BPSK	Modulation 16QAM	Modulation 64QAM
40 MHz	52.11	49.04	49.42

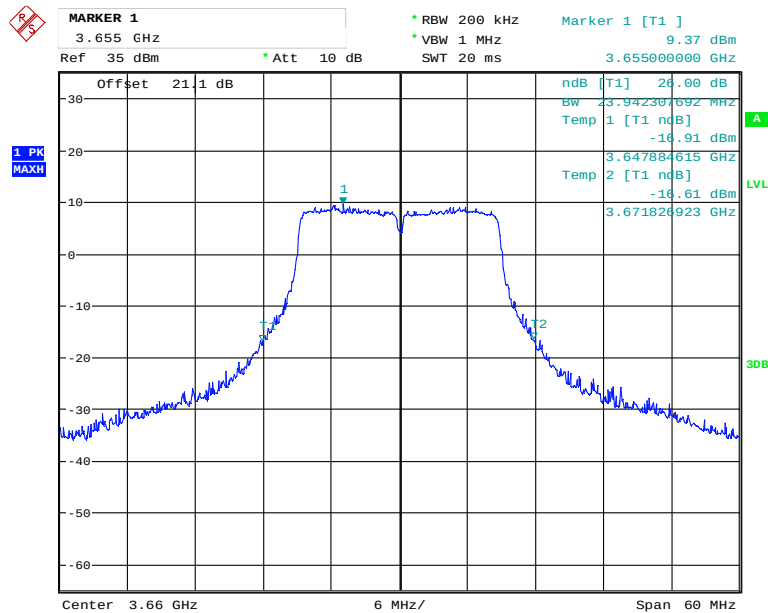


Product Service

Channel Position B - QPSK / Bandwidth 20 MHz



Date: 13.AUG.2014 15:16:52

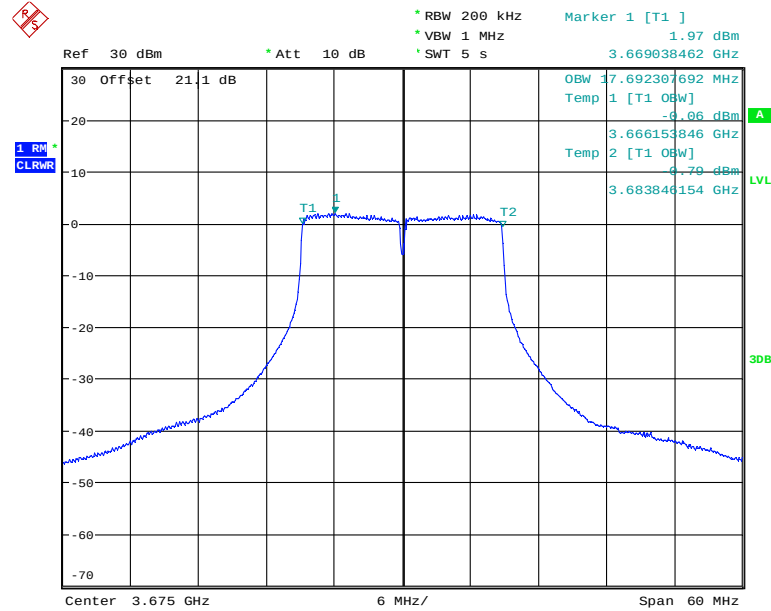


Date: 13.AUG.2014 15:17:44

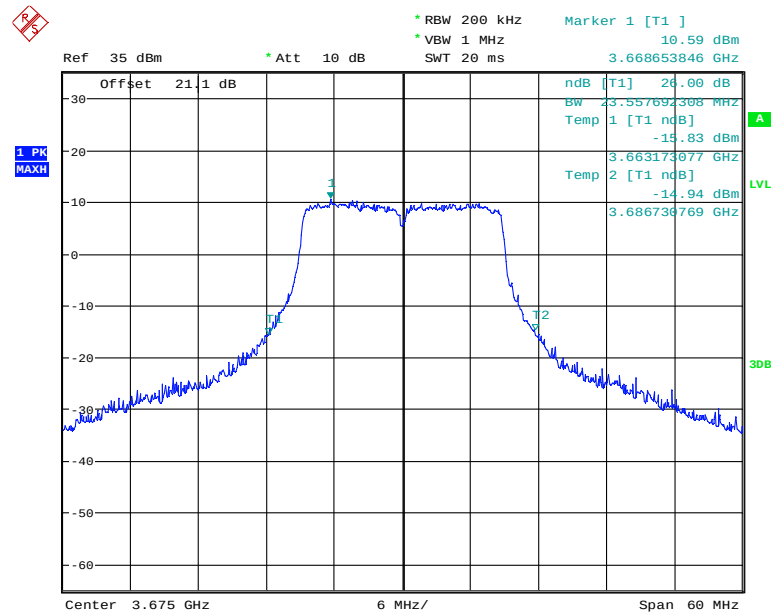


Product Service

Channel Position M - QPSK / Bandwidth 20 MHz



Date: 13.AUG.2014 15:11:53

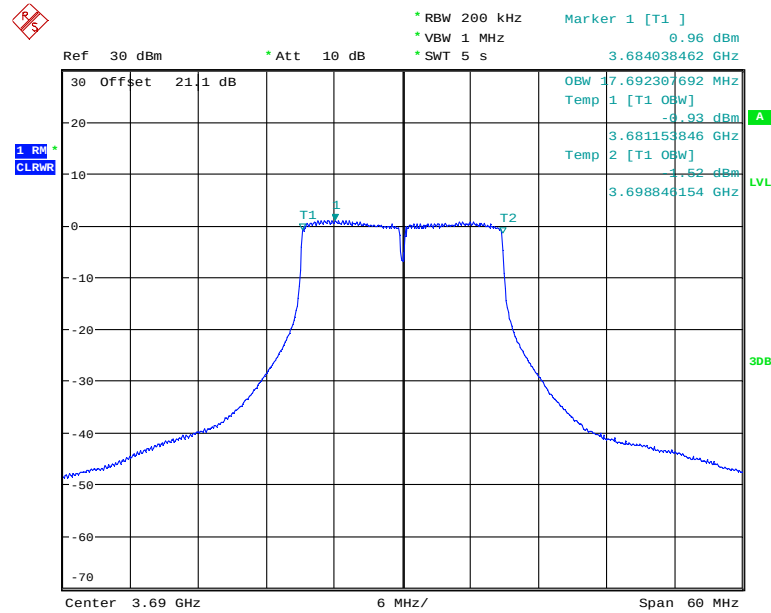


Date: 13.AUG.2014 15:06:14

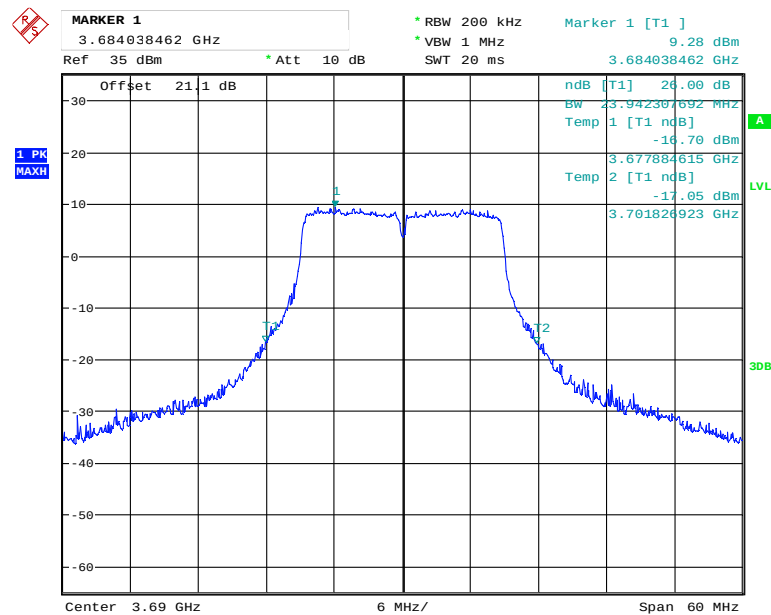


Product Service

Channel Position T - QPSK / Bandwidth 20 MHz



Date: 13.AUG.2014 15:18:59

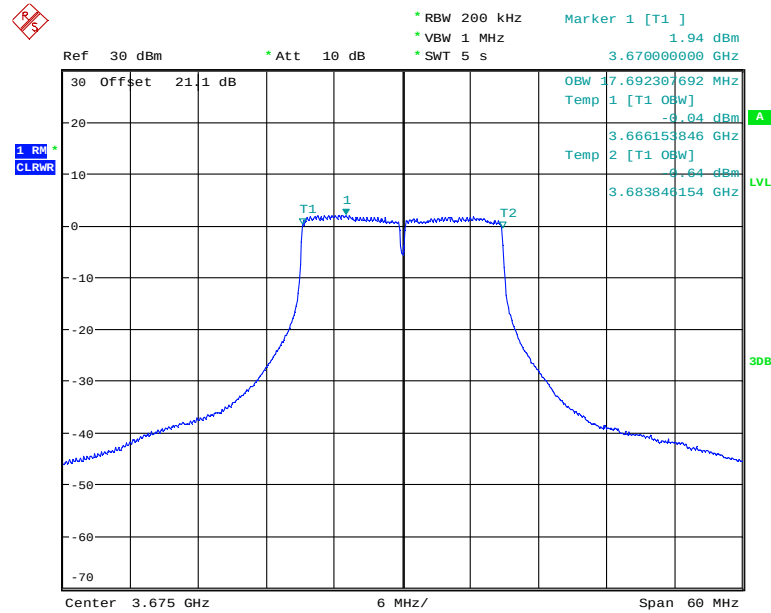


Date: 13.AUG.2014 15:18:26

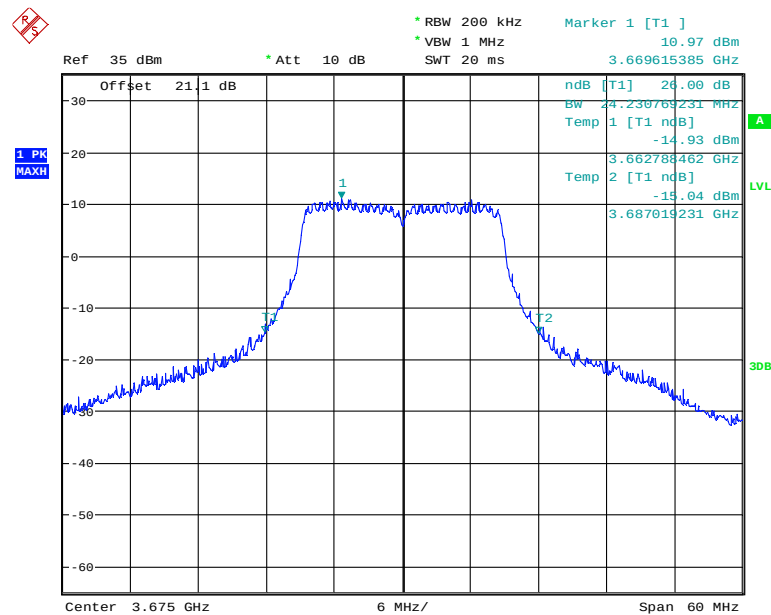


Product Service

Channel Position M - BPSK / Bandwidth 20 MHz



Date: 13.AUG.2014 15:01:41

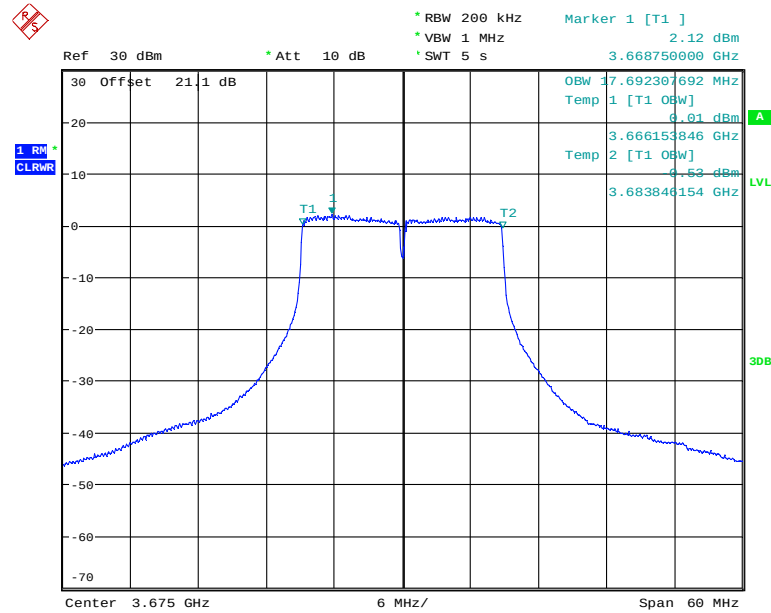


Date: 13.AUG.2014 15:04:57

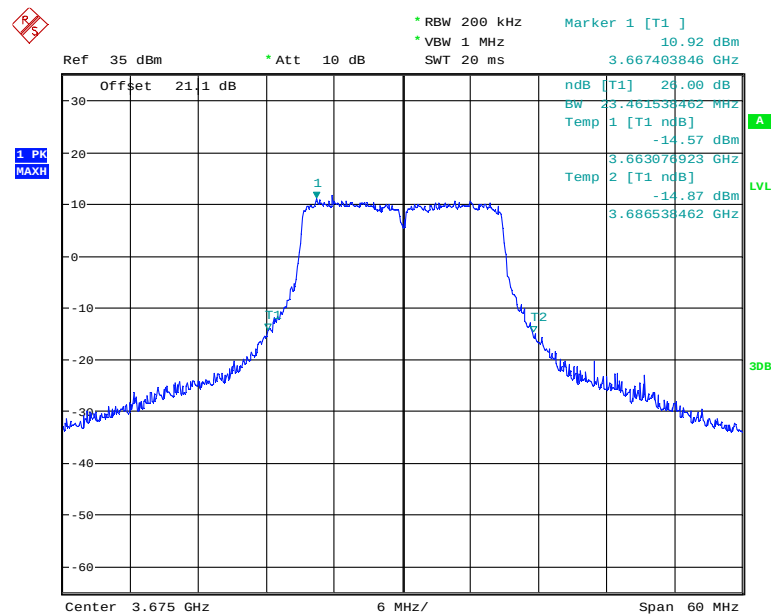


Product Service

Channel Position M – 16QAM / Bandwidth 20 MHz



Date: 13.AUG.2014 15:12:35

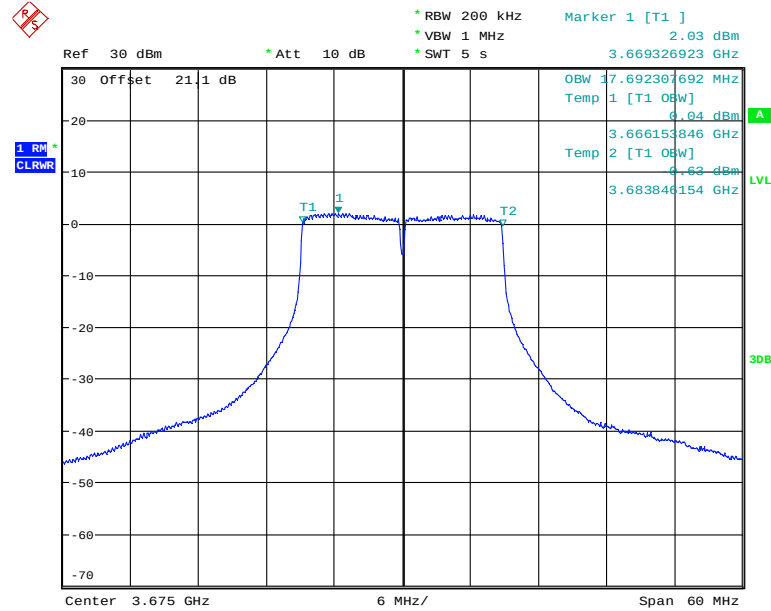


Date: 13.AUG.2014 15:13:28

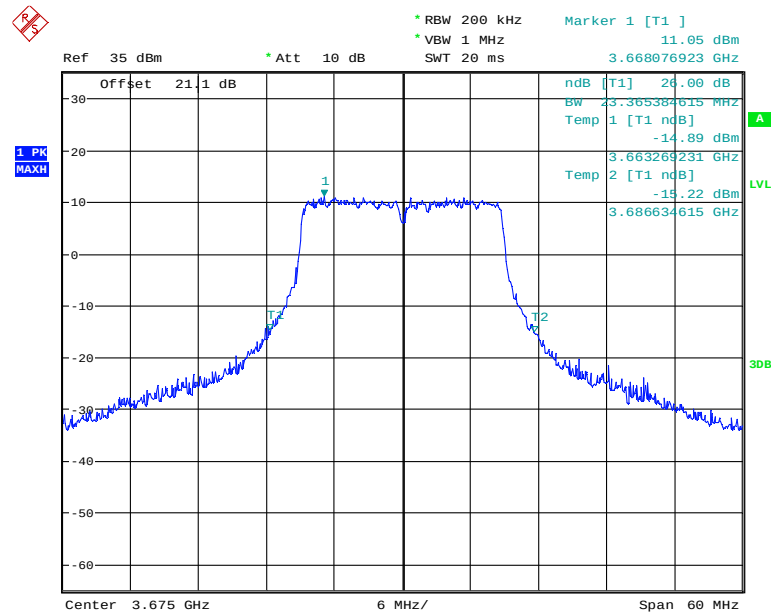


Product Service

Channel Position M – 64QAM / Bandwidth 20 MHz



Date: 13.AUG.2014 15:14:53

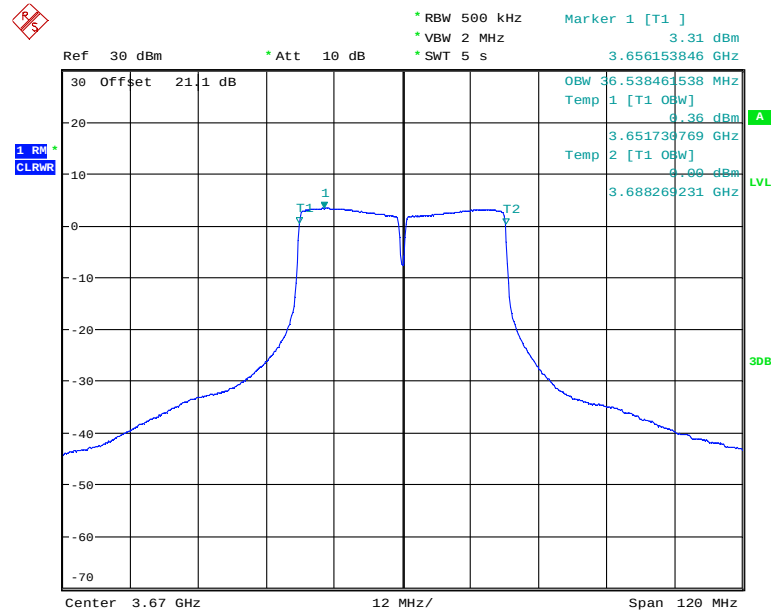


Date: 13.AUG.2014 15:14:18

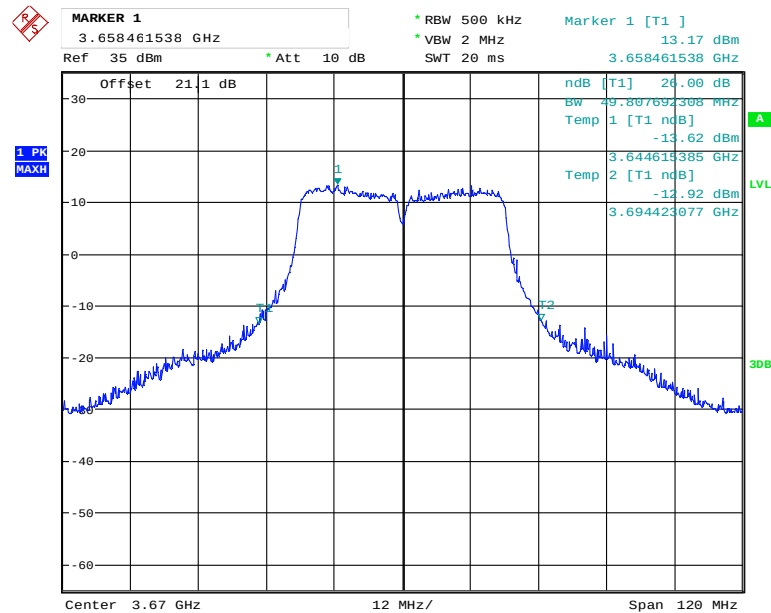


Product Service

Channel Position B - QPSK / Bandwidth 40 MHz



Date: 13.AUG.2014 15:23:17

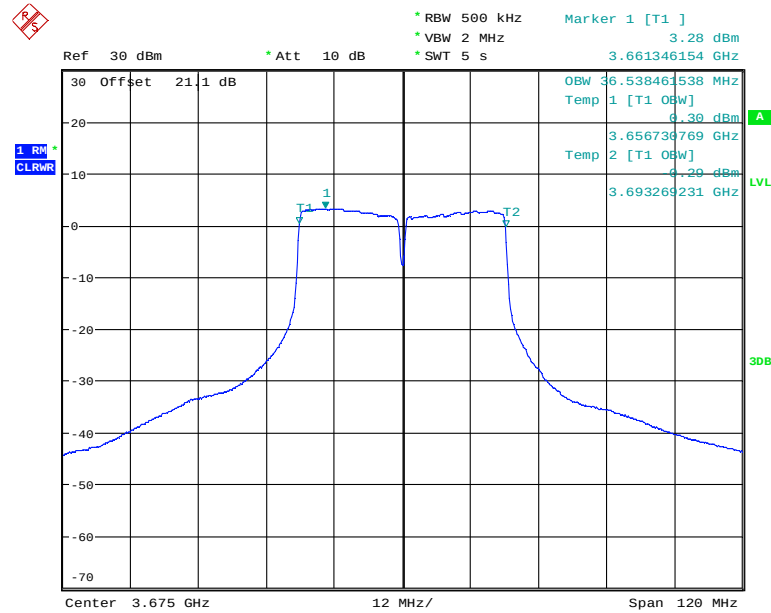


Date: 13.AUG.2014 15:22:39

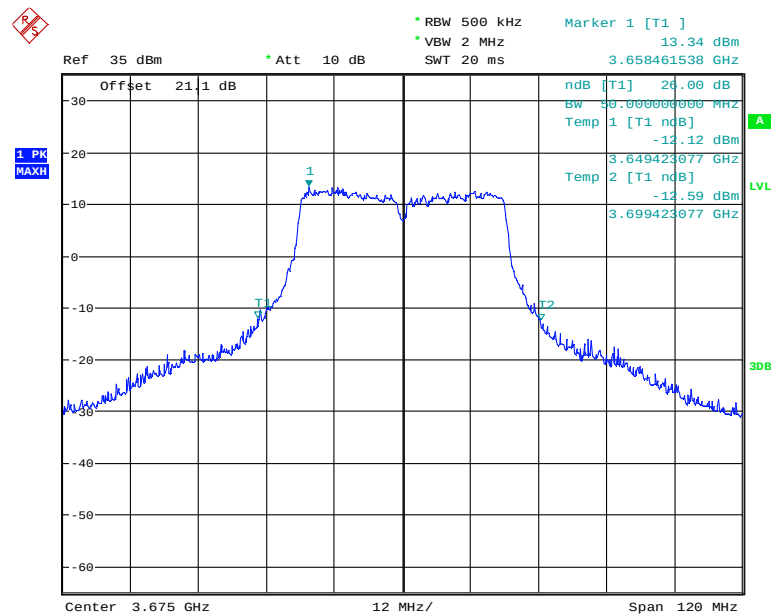


Product Service

Channel Position M - QPSK / Bandwidth 40 MHz



Date: 13.AUG.2014 15:29:14

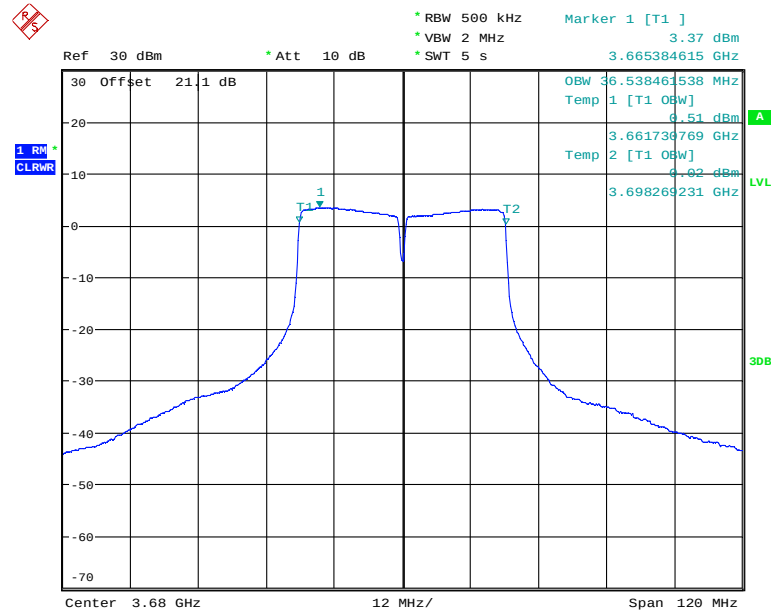


Date: 13.AUG.2014 15:28:39

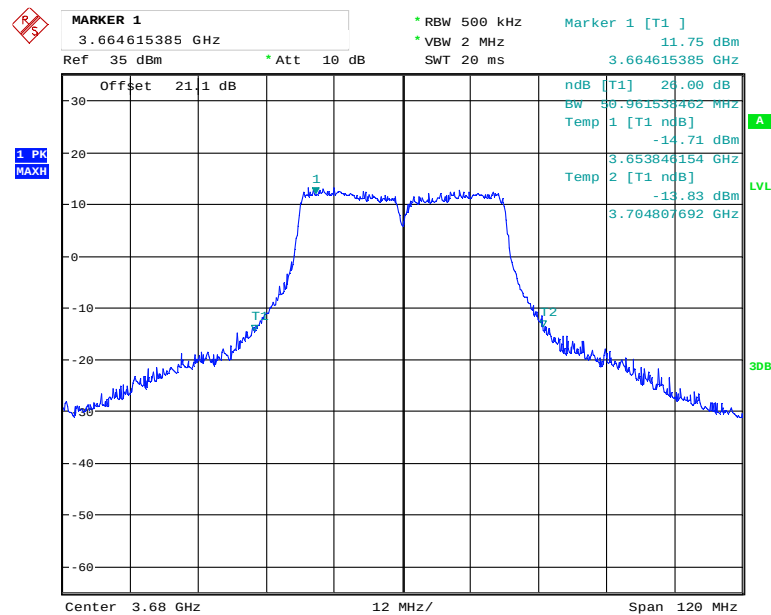


Product Service

Channel Position T - QPSK / Bandwidth 40 MHz



Date: 13.AUG.2014 15:21:19

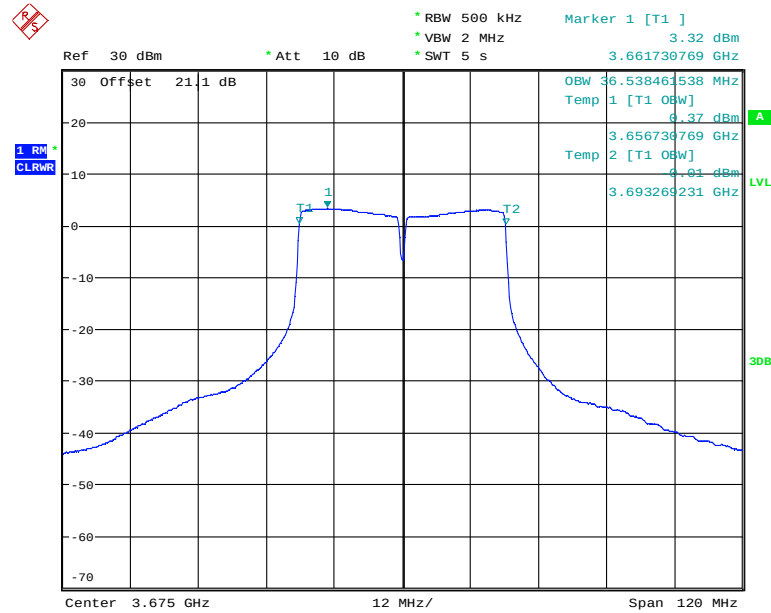


Date: 13.AUG.2014 15:21:58

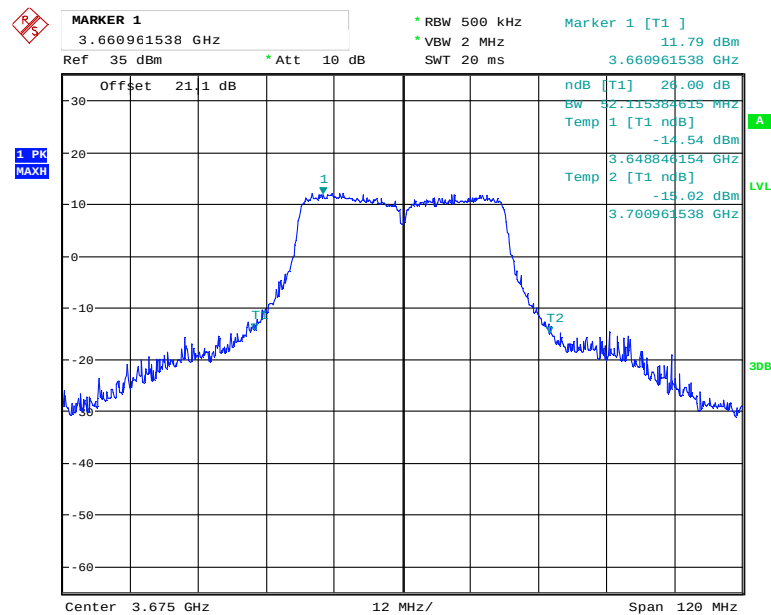


Product Service

Channel Position M - BPSK / Bandwidth 40 MHz



Date: 13.AUG.2014 15:24:07

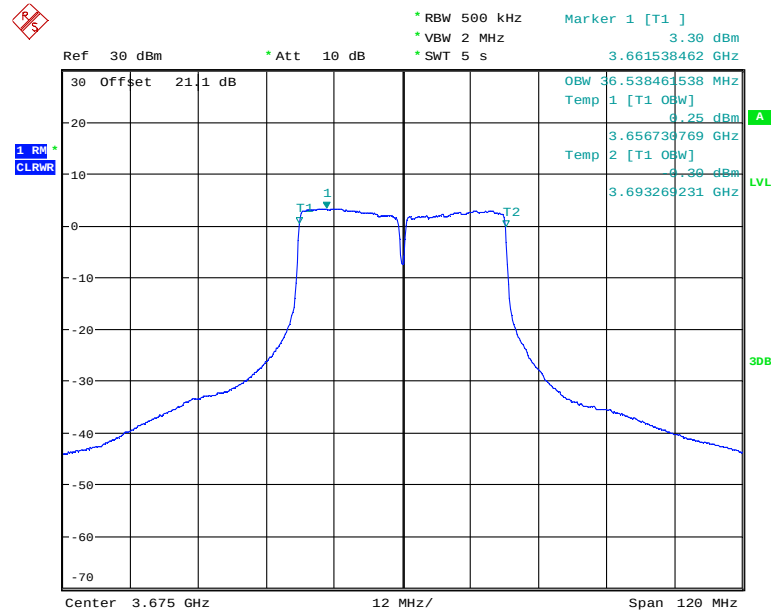


Date: 13.AUG.2014 15:24:52

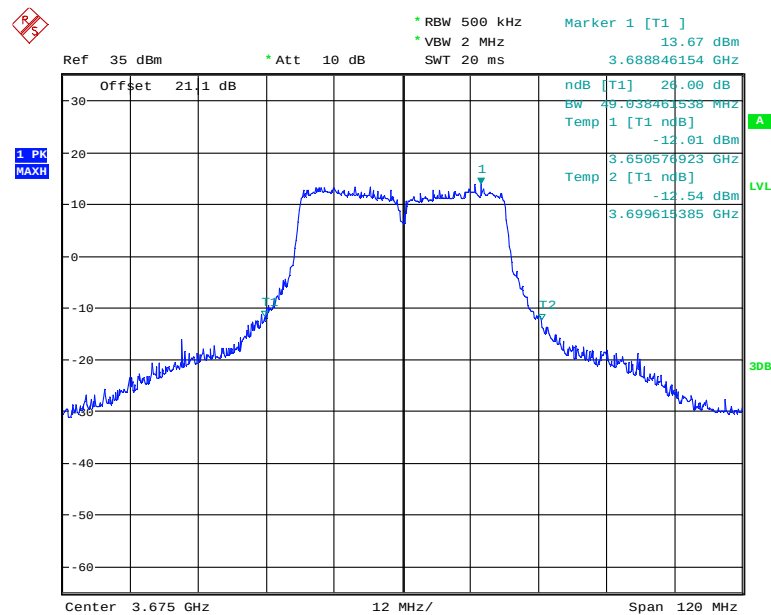


Product Service

Channel Position M - 16QAM / Bandwidth 40 MHz



Date: 13.AUG.2014 15:29:46

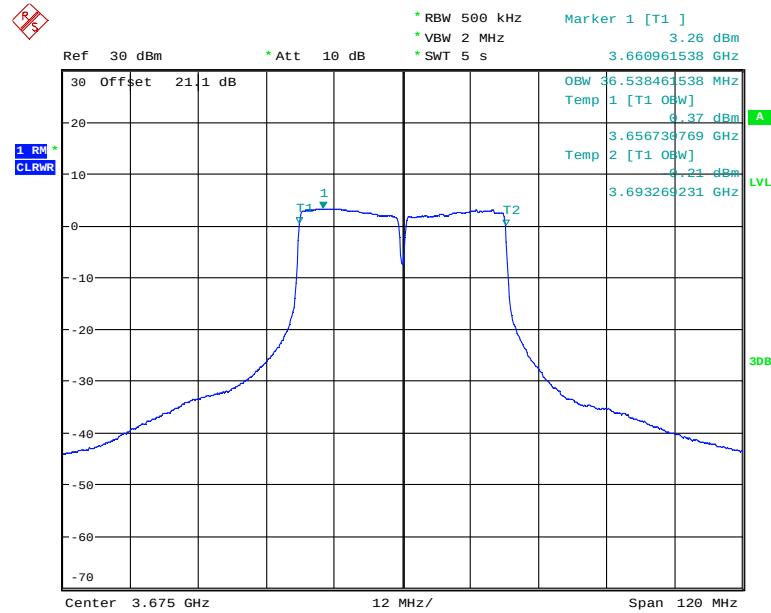


Date: 13.AUG.2014 15:30:51

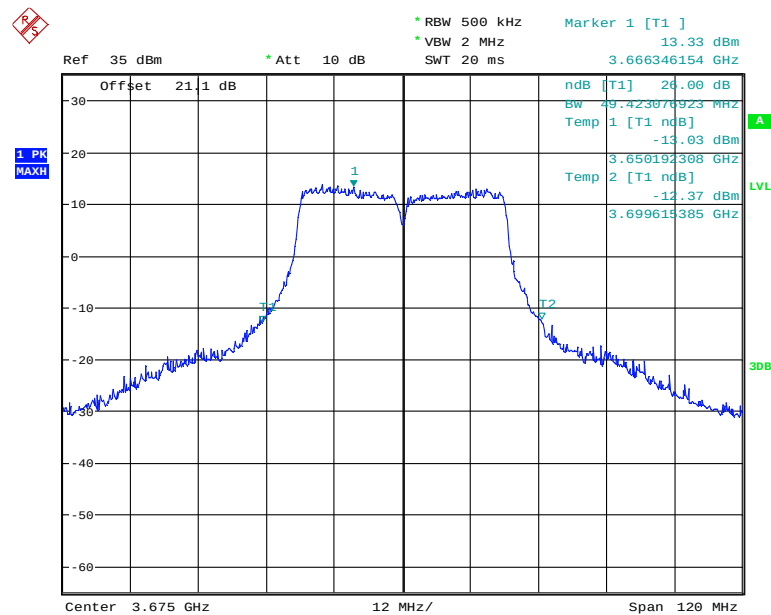


Product Service

Channel Position M - 64QAM / Bandwidth 40 MHz



Date: 13.AUG.2014 15:32:09



Date: 13.AUG.2014 15:31:26



Product Service

2.3 EMISSION MASKS

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047
FCC CFR 47 Part 90Z, Clause 90.210

2.3.2 Equipment Under Test

Microwave Outdoor Unit Harmony Lite 3GHz, S/N: F1003GHA0140

2.3.3 Date of Test and Modification State

13 to 15 August 2014 – Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 90.210.

The EUT was transmitted at maximum power to the Spectrum Analyser. Testing was carried out on Bottom, Middle and Top Channels. The RBW was configured to 1MHz, using the RMS as the detector. On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth at least 25 dB. On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth at least 35 dB. On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth refer to Chapter 2.4.

The measurements were performed on the output connector Ch1. Limited complementary measurement were done at output connector Ch2 to verify identical performance for both transmitter chains in MIMO configurations.

2.3.6 Environmental Conditions

Ambient Temperature	22.5 - 24.0°C
Relative Humidity	40.0 - 45.5%



Product Service

2.3.7 Test Results

Configuration O-MIMO-20

Maximum Output Power 19.0dBm per port.

Modulation / Bandwidth	Emission Masks		
	Channel Position B 3660MHz	Channel Position M 3675MHz	Channel Position T 3690MHz
QPSK / 20 MHz	Pass	Pass	Pass

Channel Position M 3675MHz / Bandwidth	Emission Masks		
	Modulation BPSK	Modulation 16QAM	Modulation 64QAM
20 MHz	Pass	Pass	Pass

Configuration O-MIMO-40

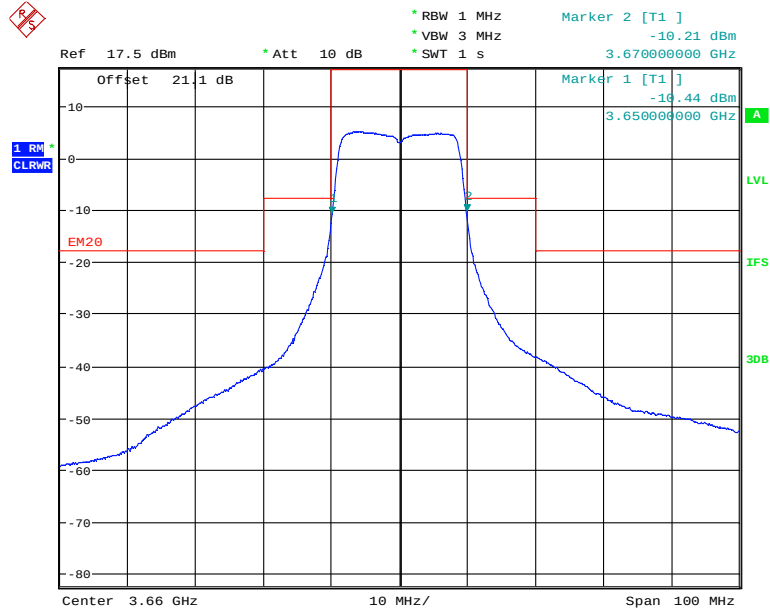
Maximum Output Power 22.0dBm per port.

Modulation / Bandwidth	Emission Masks		
	Channel Position B 3670MHz	Channel Position M 3675MHz	Channel Position T 3680MHz
QPSK / 40 MHz	Pass	Pass	Pass

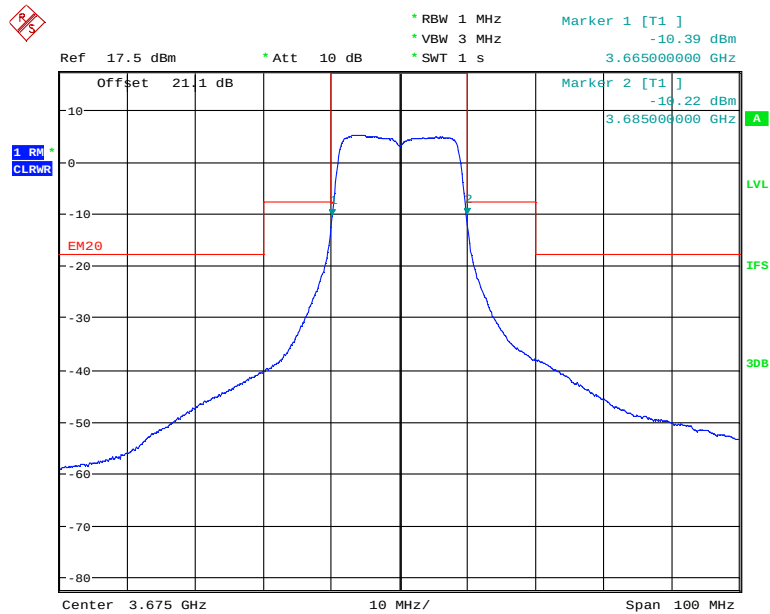
Channel Position M 3675MHz / Bandwidth	Emission Masks		
	Modulation BPSK	Modulation 16QAM	Modulation 64QAM
40 MHz	Pass	Pass	Pass



Product Service

Channel Position B - QPSK / Bandwidth 20 MHz

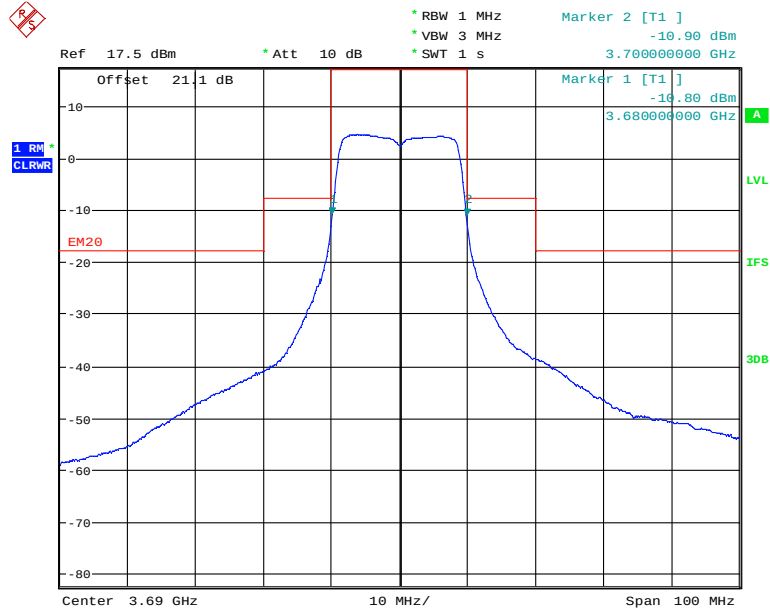
Date: 13.AUG.2014 16:41:19

Channel Position M - QPSK / Bandwidth 20 MHz

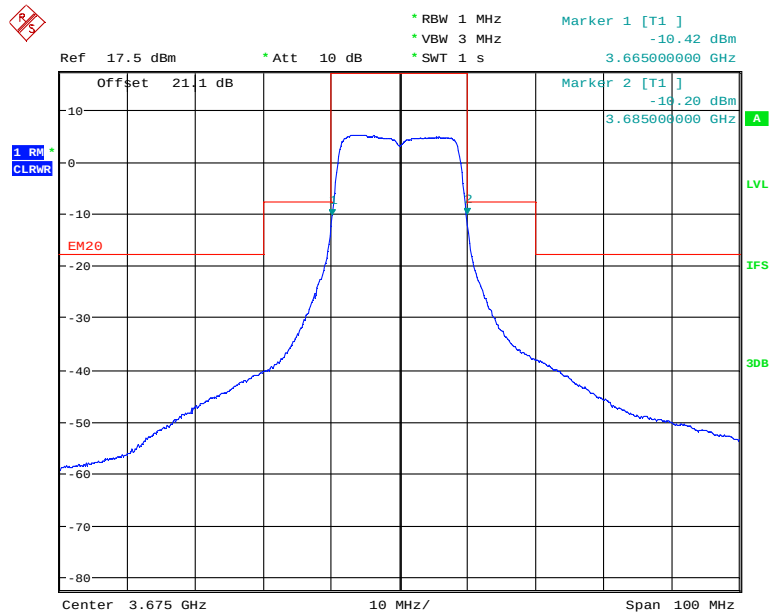
Date: 13.AUG.2014 16:39:37



Product Service

Channel Position T - QPSK / Bandwidth 20 MHz

Date: 13.AUG.2014 16:41:58

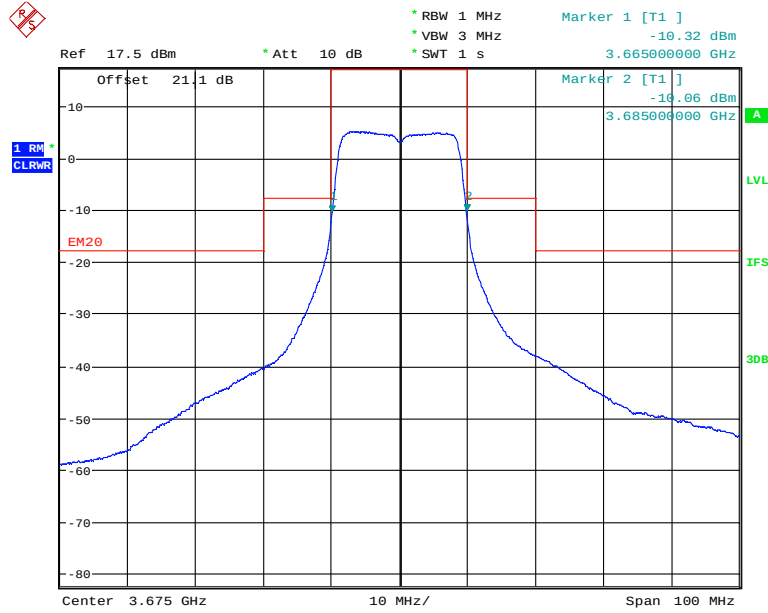
Channel Position M - BPSK / Bandwidth 20 MHz

Date: 13.AUG.2014 16:39:13



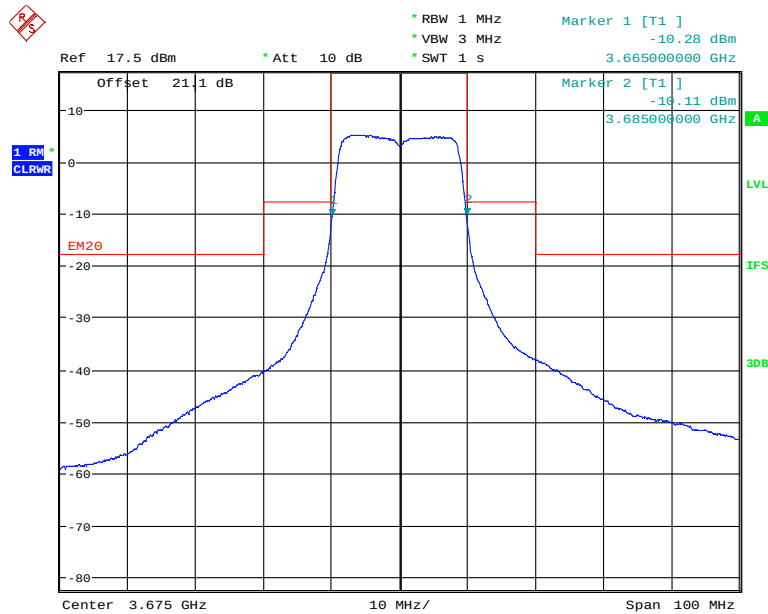
Product Service

Channel Position M - 16QAM / Bandwidth 20 MHz



Date: 13.AUG.2014 16:39:56

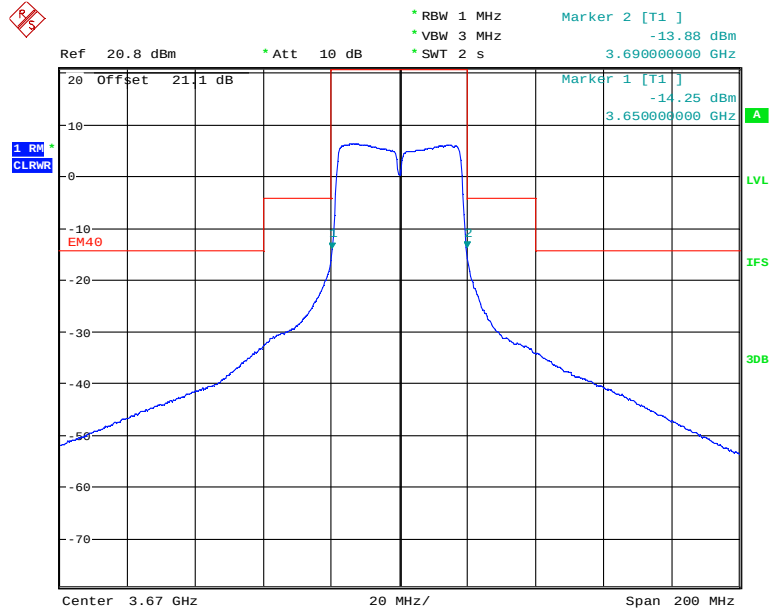
Channel Position M - 64QAM / Bandwidth 20 MHz



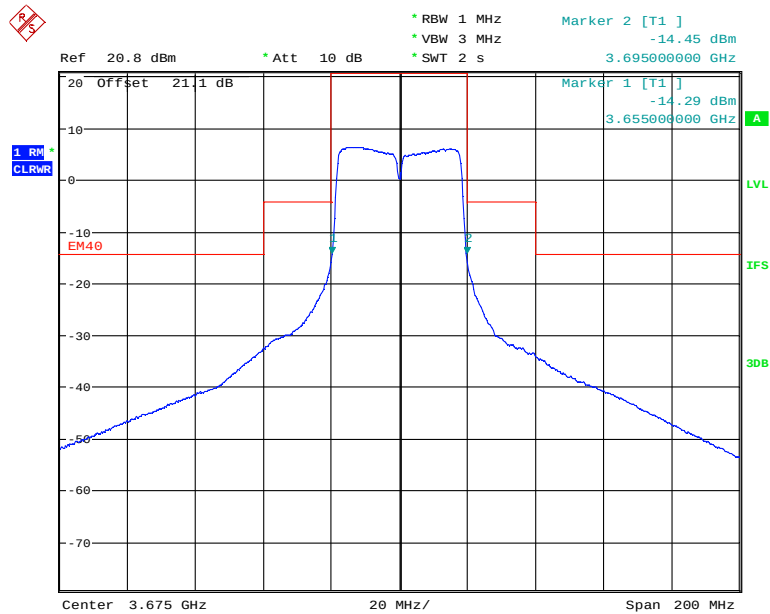
Date: 13.AUG.2014 16:40:19



Product Service

Channel Position B - QPSK / Bandwidth 40 MHz

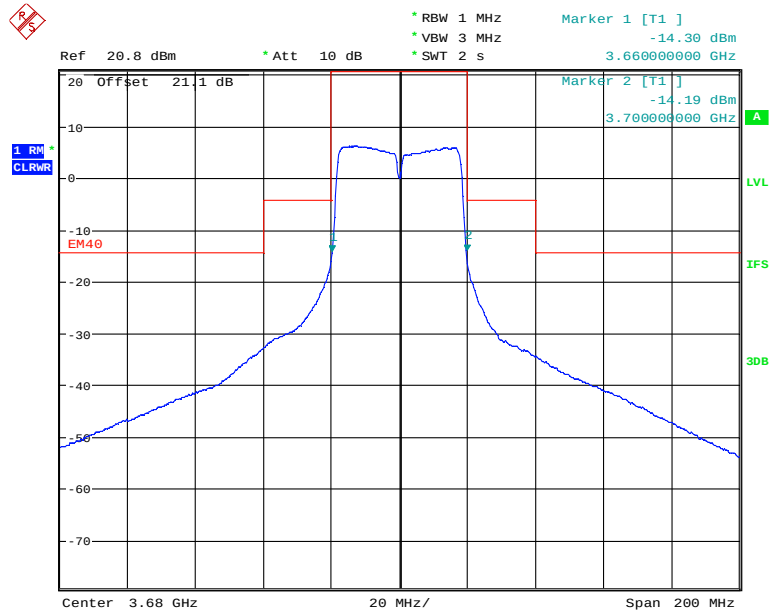
Date: 13.AUG.2014 16:47:12

Channel Position M - QPSK / Bandwidth 40 MHz

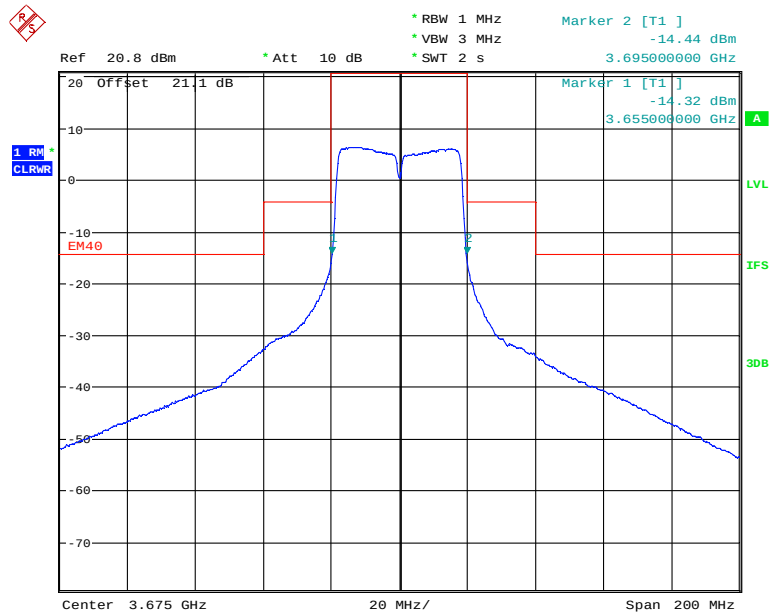
Date: 13.AUG.2014 16:44:54



Product Service

Channel Position T - QPSK / Bandwidth 40 MHz

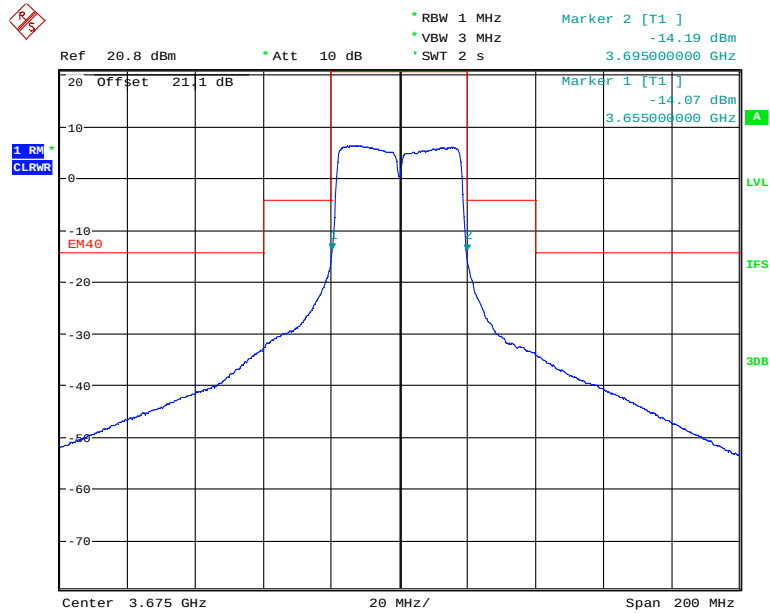
Date: 13.AUG.2014 16:48:36

Channel Position M - BPSK / Bandwidth 40 MHz

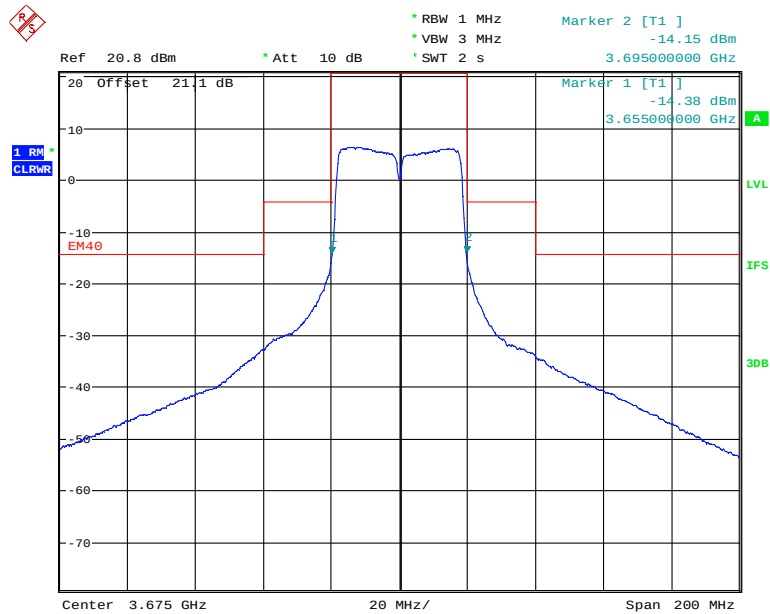
Date: 13.AUG.2014 16:44:23



Product Service

Channel Position M - 16QAM / Bandwidth 40 MHz

Date: 13.AUG.2014 16:45:22

Channel Position M - 64QAM / Bandwidth 40 MHz

Date: 13.AUG.2014 16:45:47



Limit:

20MHz OBW Frequency displacement	Attenuation below carrier (dBc)
0 – 10MHz	0
10 – 20MHz	25
20 – 50MHz	35
>50MHz	$43+10\log(P)$

40MHz OBW Frequency displacement	Attenuation below carrier (dBc)
0 – 20MHz	0
20 – 40MHz	25
40 – 100MHz	35
>50MHz	$43+10\log(P)$

Remarks

The results pass to the limit at the measured frequencies.



Product Service

2.4 CONDUCTED SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 90Z, Clause 90.1323
Industry Canada RSS-Gen, Clause 4.9
Industry Canada RSS-197, Clause 5.7

2.4.2 Equipment Under Test

Microwave Outdoor Unit Harmony Lite 3GHz, S/N: F1003GHA0140

2.4.3 Date of Test and Modification State

13 to 15 August 2014 – Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Method and Operating Modes

The test was applied in accordance with test method requirements of FCC part 90Z and RSS-197.

In accordance with FCC CFR 47 Part 2, Clause 2.1051, the spurious emissions from the antenna terminal were measured. In accordance with FCC CFR 47 Part 90Z, Clause 90.1323 any emissions outside a licensee's frequency band(s) of operation shall be attenuated by at least $43 + 10 \log(P)$, and the measurement was performed with a resolution bandwidth of 1MHz.

The EUT was set to transmit at its maximum rated output power. The path loss between the Spectrum Analyser and the EUT was measured with the worst case level being entered as a Reference Level Offset. Peak detector with the trace set to Max Hold was used. The frequency spectrum was then investigated between 9kHz and 40GHz. Testing was carried out on the Bottom, Middle and Top channels.

For MIMO configurations, the limit was adjusted with a correction of -3dB [10Log2] by using the Measure and Add 10Log(N) dB technique according to FCC KDB662911 D01 accounting for simultaneous transmission from antenna ports Ch1 and Ch2.

The measurements were performed on the output connector Ch1. Limited complementary measurement were done at output connector Ch2 to verify identical performance for both transmitter chains in MIMO configurations.

The maximum path loss across the measurement band was used as the reference level offset to ensure worst case.

The results are shown in the plots below.



Product Service

2.4.6 Environmental Conditions

Ambient Temperature 22.5 - 24.0°C

Relative Humidity 40.0 - 45.5%

2.4.7 Test Results

Configuration O-MIMO-20

Maximum Output Power 19.0dBm per port

Frequency Range	Conducted Spurious Emissions (dBm)		
	Channel Position B 3660MHz	Channel Position M 3675MHz	Channel Position T 3690MHz
9kHz – 1GHz	-45.43	-45.60	-45.83
1GHz – 6GHz	-35.36	-35.30	-35.80
6GHz – 20GHz	-34.54	-35.07	-37.23
20GHz – 40GHz	-41.22	-41.31	-41.16

Note: Only the worst case results plots have been included

Configuration O-MIMO-40

Maximum Output Power 22.0dBm per port

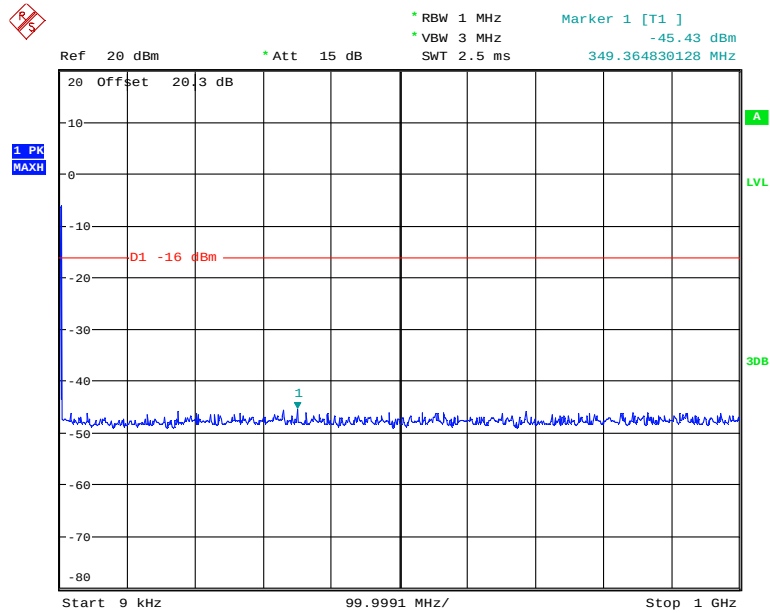
Frequency Range	Conducted Spurious Emissions (dBm)		
	Channel Position B 3670MHz	Channel Position M 3675MHz	Channel Position T 3680MHz
9kHz – 1GHz	-45.32	-45.59	-44.89
1GHz – 6GHz	-35.83	-35.87	-35.47
6GHz – 20GHz	-36.78	-37.83	-37.07
20GHz – 40GHz	-41.19	-40.81	-40.24

Note: Only the worst case results plots have been included



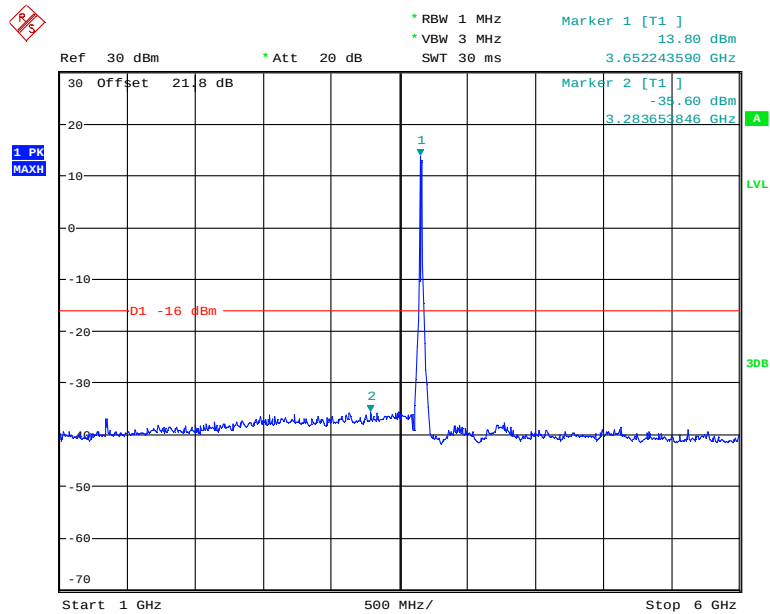
Product Service

Channel Position B - QPSK / Bandwidth 20MHz - 9kHz – 1GHz



Date: 13.AUG.2014 17:53:45

Channel Position B - QPSK / Bandwidth 20MHz - 1GHz – 6GHz



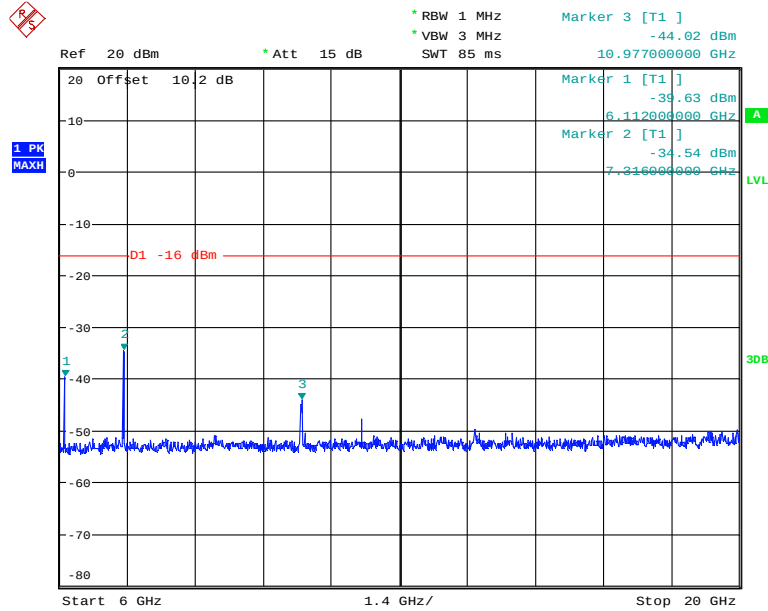
Date: 13.AUG.2014 18:09:15

Note: The emission beyond the limit is within the operating frequency.



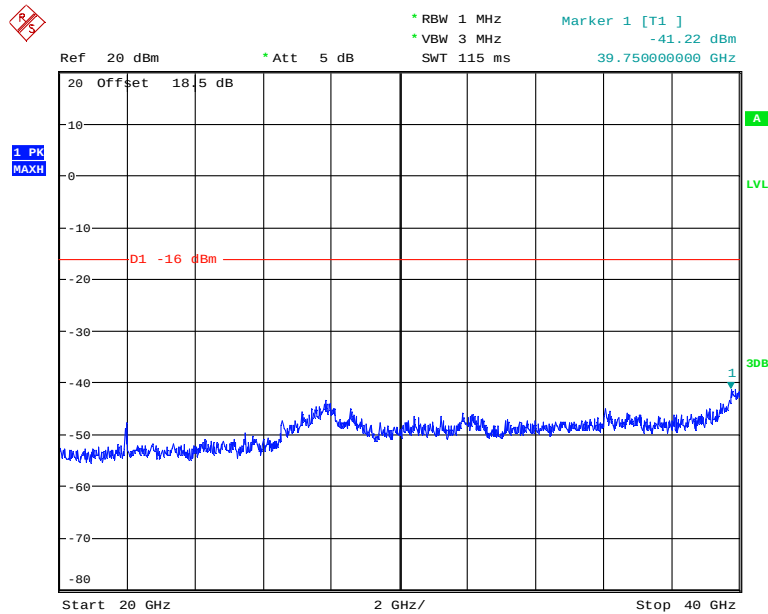
Product Service

Channel Position B - QPSK / Bandwidth 20MHz - 6GHz – 20GHz



Date: 14.AUG.2014 11:09:39

Channel Position B - QPSK / Bandwidth 20MHz - 20GHz – 40GHz

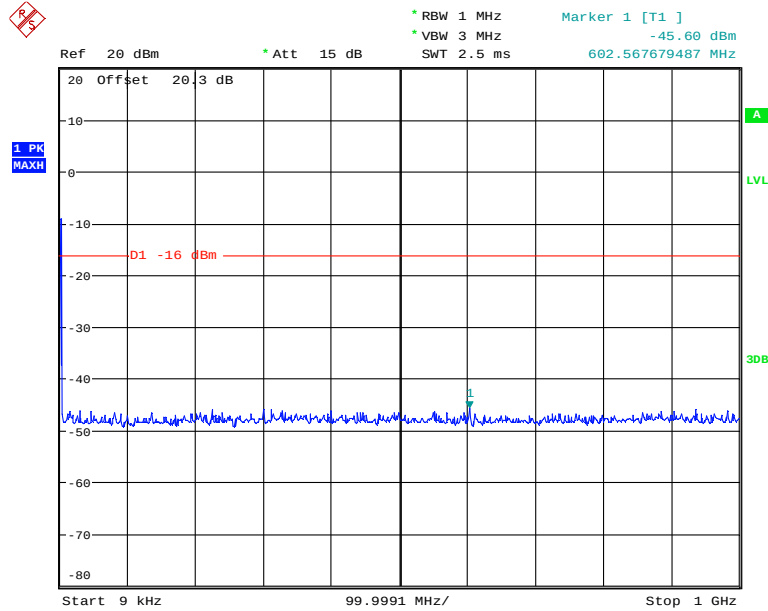


Date: 15.AUG.2014 12:34:05



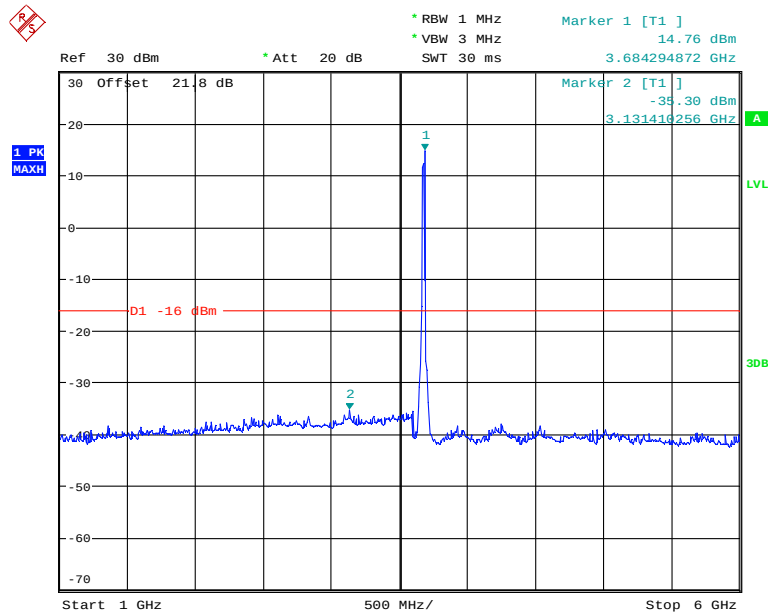
Product Service

Channel Position M - QPSK / Bandwidth 20MHz - 9kHz – 1GHz



Date: 13.AUG.2014 17:48:56

Channel Position M - QPSK / Bandwidth 20MHz - 1GHz – 6GHz

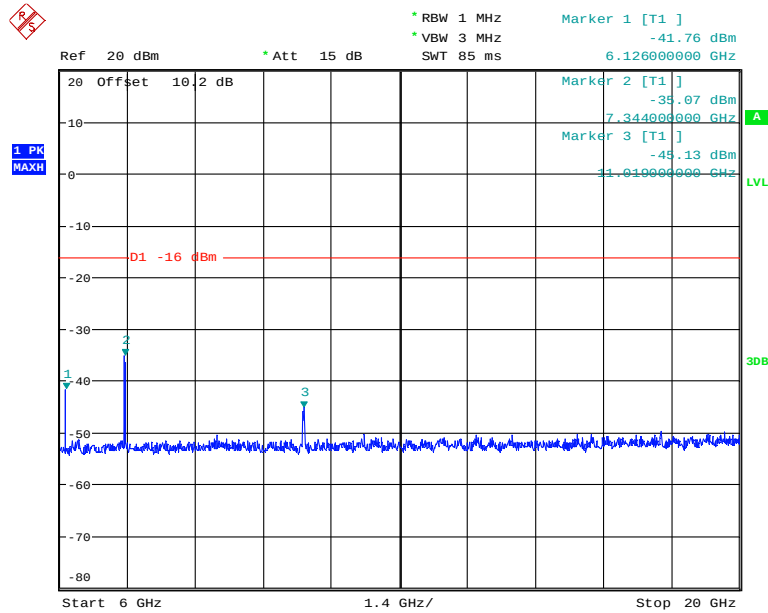


Date: 13.AUG.2014 17:47:50

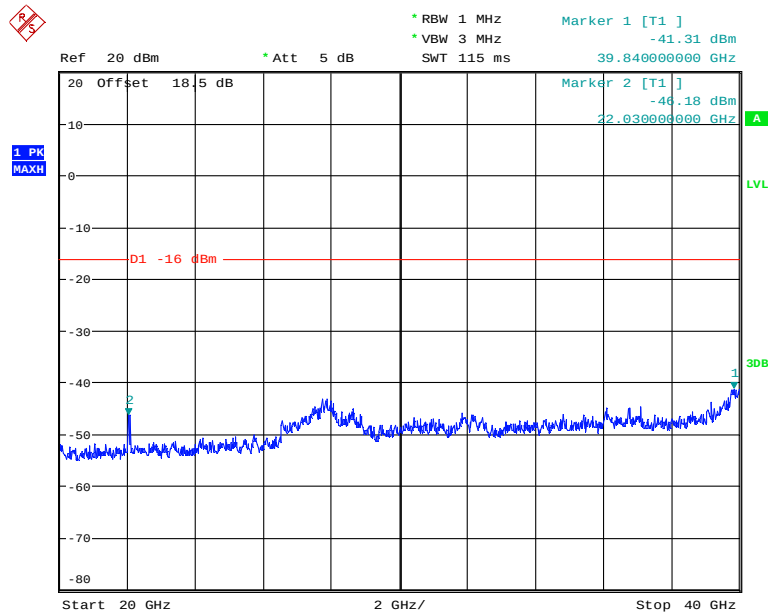
Note: The emission beyond the limit is within the operating frequency.



Product Service

Channel Position M - QPSK / Bandwidth 20MHz - 6GHz – 20GHz

Date: 14.AUG.2014 11:01:40

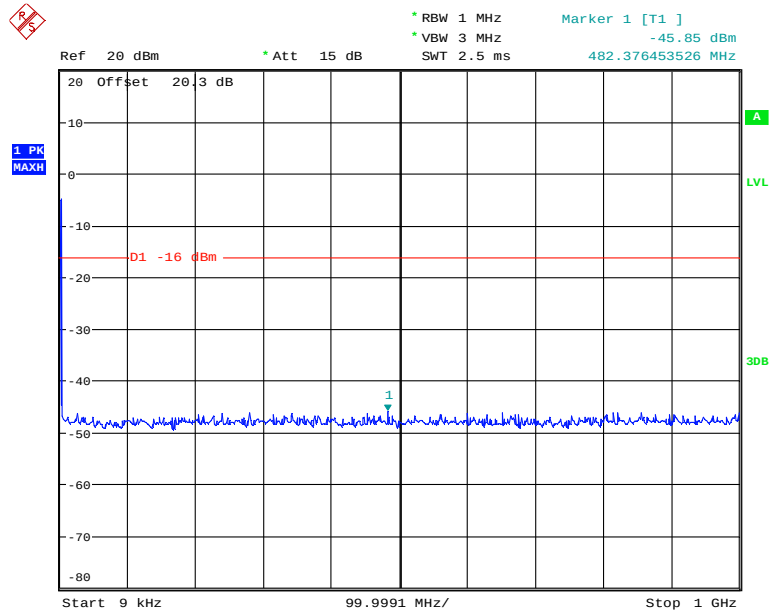
Channel Position M - QPSK / Bandwidth 20MHz - 20GHz – 40GHz

Date: 15.AUG.2014 12:35:05



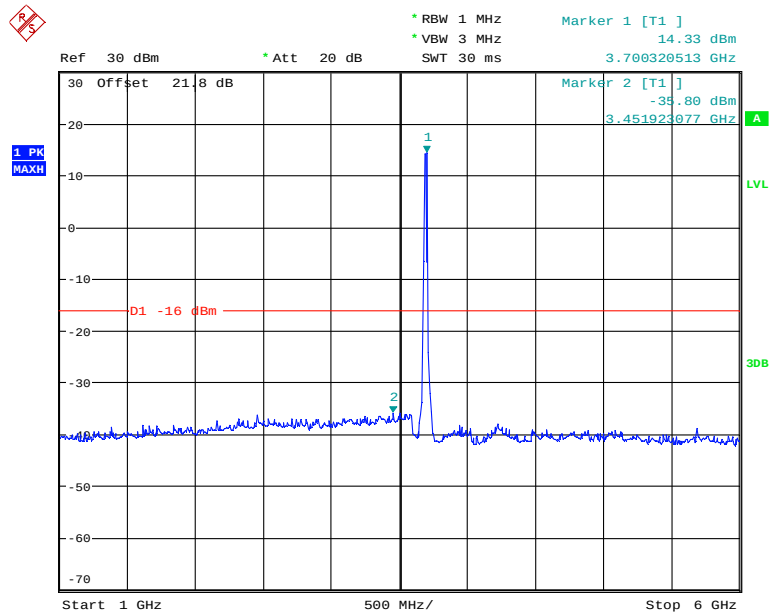
Product Service

Channel Position T - QPSK / Bandwidth 20MHz - 9kHz – 1GHz



Date: 13.AUG.2014 18:01:48

Channel Position T - QPSK / Bandwidth 20MHz - 1GHz – 6GHz



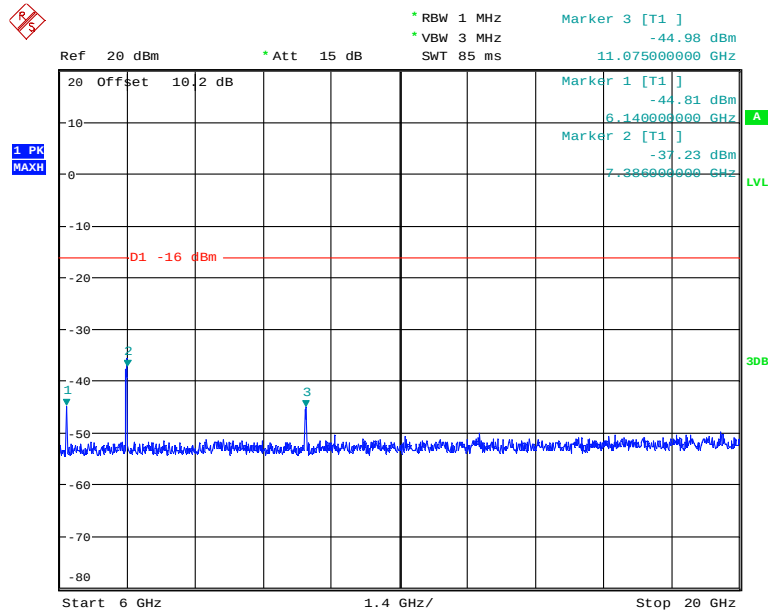
Date: 13.AUG.2014 18:00:52

Note: The emission beyond the limit is within the operating frequency.



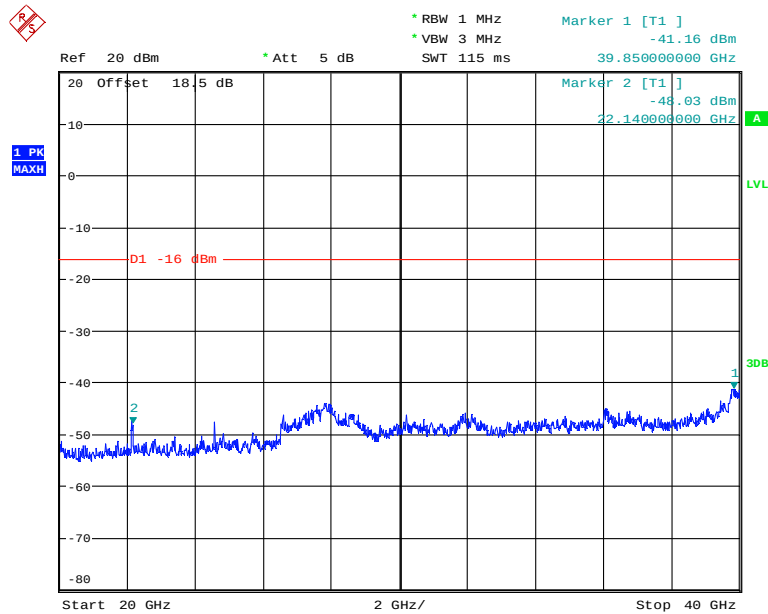
Product Service

Channel Position T - QPSK / Bandwidth 20MHz - 6GHz – 20GHz



Date: 14.AUG.2014 11:10:26

Channel Position T - QPSK / Bandwidth 20MHz - 20GHz – 40GHz

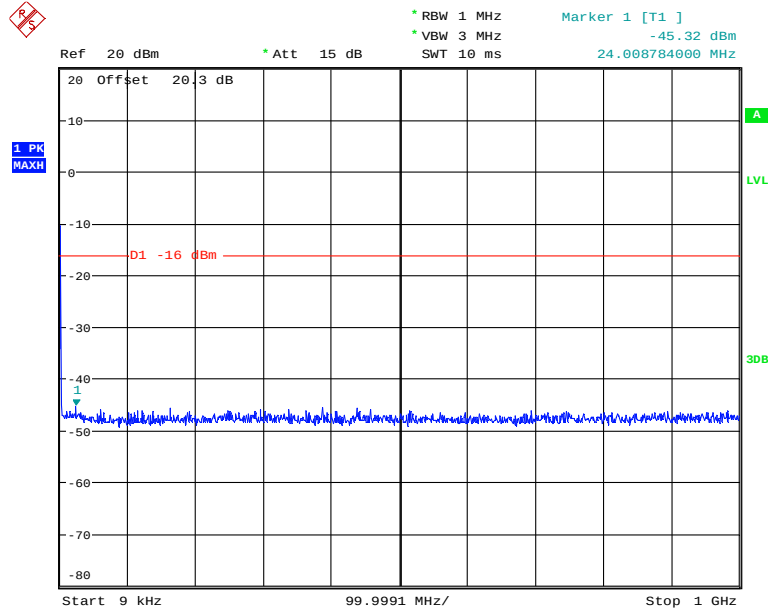


Date: 15.AUG.2014 12:37:58



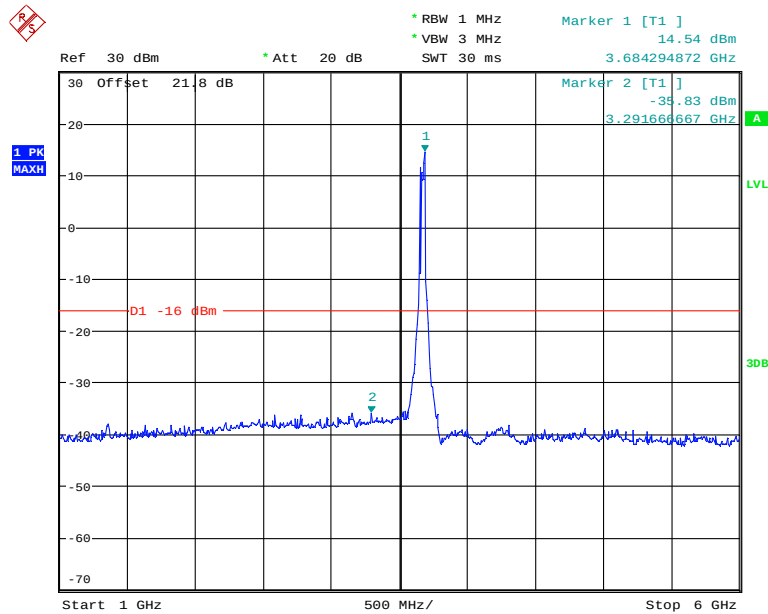
Product Service

Channel Position B - QPSK / Bandwidth 40MHz - 9kHz – 1GHz



Date: 13.AUG.2014 17:24:13

Channel Position B - QPSK / Bandwidth 40MHz - 1GHz – 6GHz



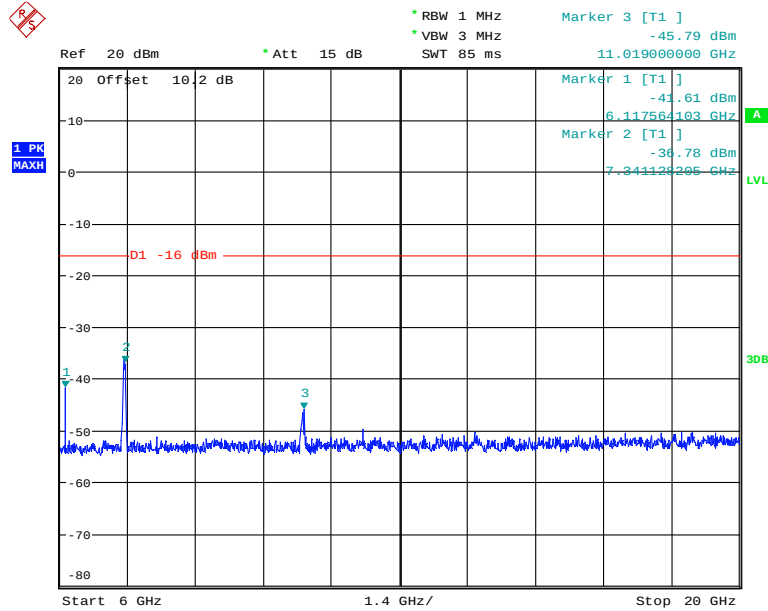
Date: 13.AUG.2014 17:21:55

Note: The emission beyond the limit is within the operating frequency.



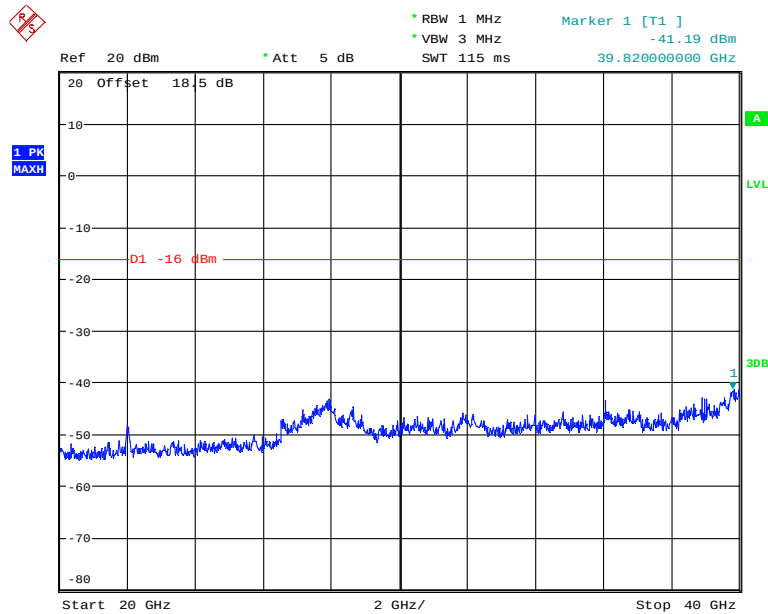
Product Service

Channel Position B - QPSK / Bandwidth 40MHz - 6GHz – 20GHz



Date: 14.AUG.2014 11:11:33

Channel Position B - QPSK / Bandwidth 40MHz - 20GHz – 40GHz

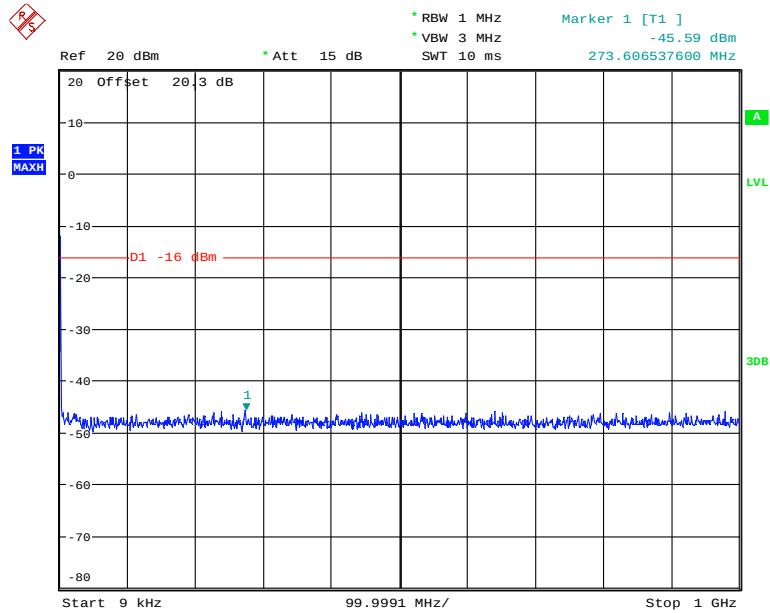


Date: 15.AUG.2014 12:39:02



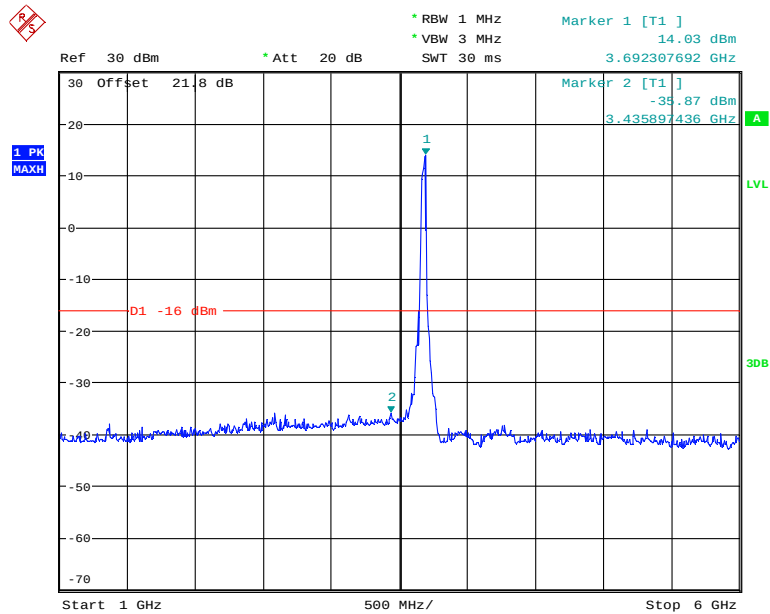
Product Service

Channel Position M - QPSK / Bandwidth 40MHz - 9kHz – 1GHz



Date: 13.AUG.2014 17:25:30

Channel Position M - QPSK / Bandwidth 40MHz - 1GHz – 6GHz



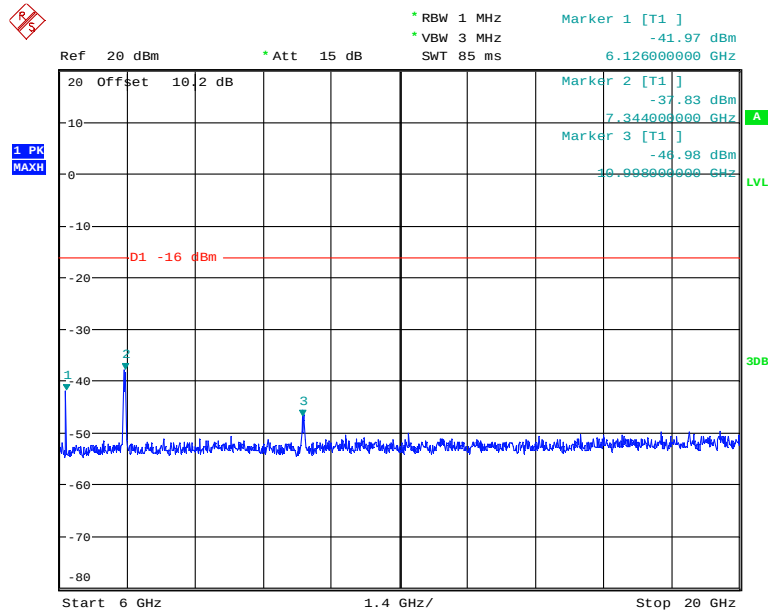
Date: 13.AUG.2014 17:29:35

Note: The emission beyond the limit is within the operating frequency.



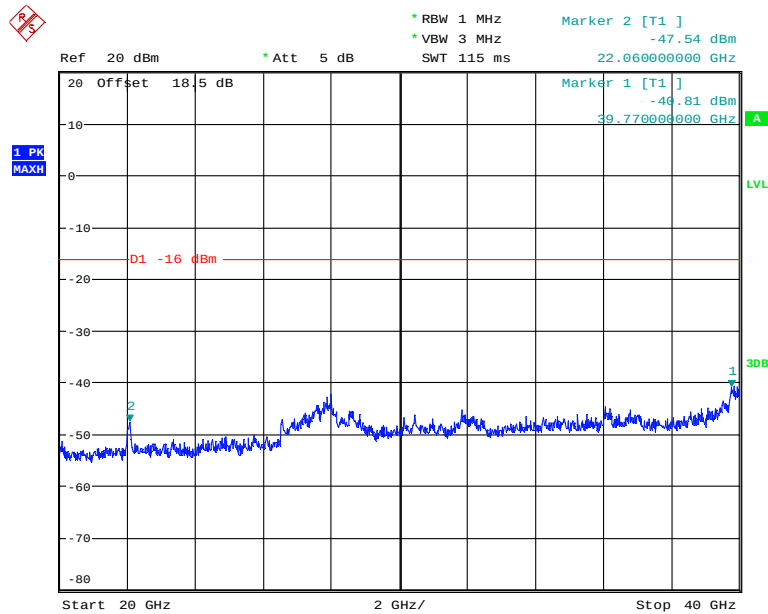
Product Service

Channel Position M - QPSK / Bandwidth 40MHz - 6GHz – 20GHz



Date: 14.AUG.2014 11:05:39

Channel Position M - QPSK / Bandwidth 40MHz - 20GHz – 40GHz

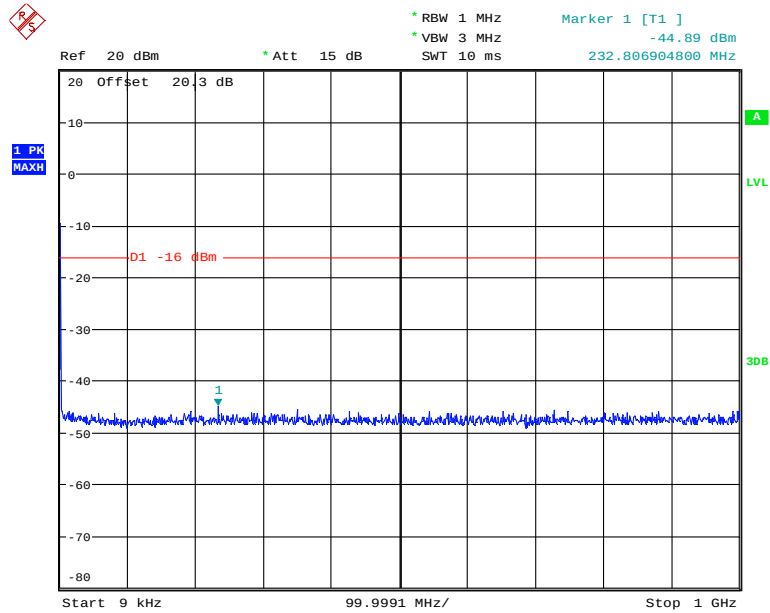


Date: 15.AUG.2014 12:40:22



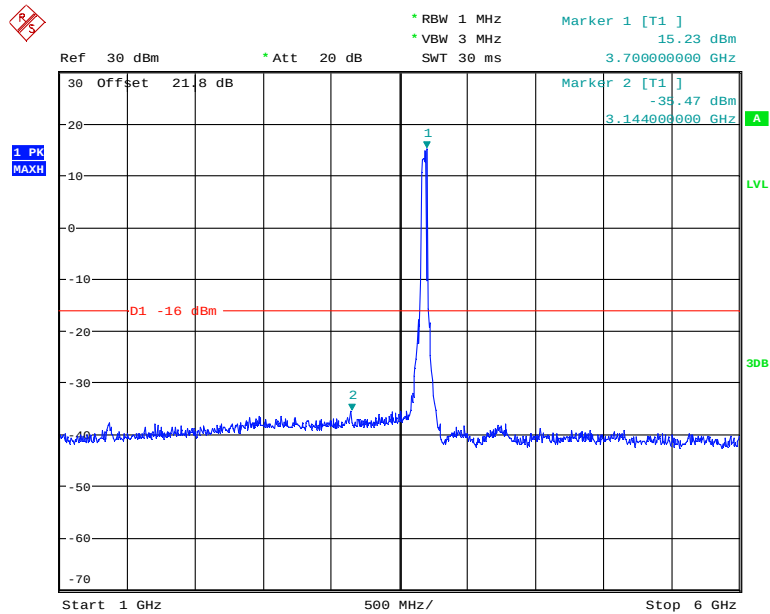
Product Service

Channel Position T - QPSK / Bandwidth 40MHz - 9kHz – 1GHz



Date: 13.AUG.2014 17:15:01

Channel Position T - QPSK / Bandwidth 40MHz - 1GHz – 6GHz



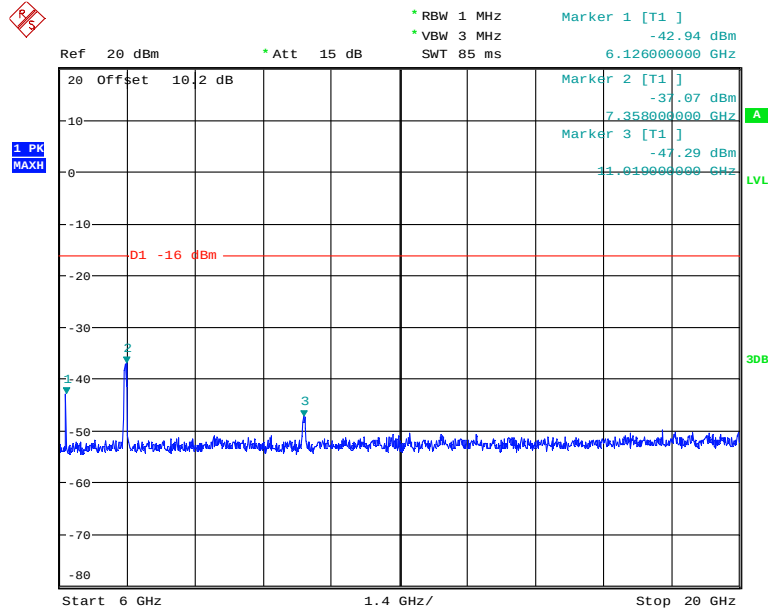
Date: 13.AUG.2014 17:18:42

Note: The emission beyond the limit is within the operating frequency.



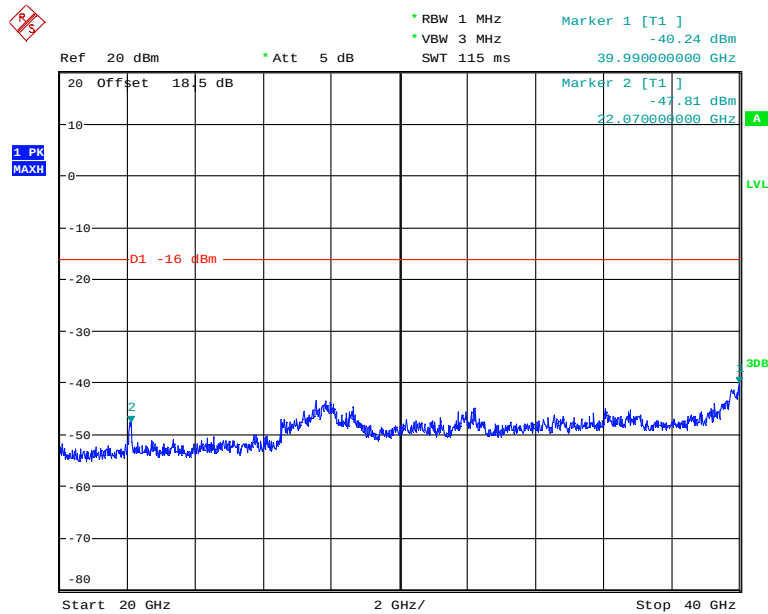
Product Service

Channel Position T - QPSK / Bandwidth 40MHz - 6GHz – 20GHz



Date: 14.AUG.2014 11:12:23

Channel Position T - QPSK / Bandwidth 40MHz - 20GHz – 40GHz



Date: 15.AUG.2014 12:42:16



Product Service

Limit	The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10\log P$ dB.
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Remarks:

The results didn't exceed -16dBm at the frequency range of 9kHz to 40GHz.



Product Service

2.5 RADIATED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
 FCC CFR 47 Part 90Z, Clause 90.1323
 Industry Canada RSS-Gen, Clause 4.9
 Industry Canada RSS-197, Clause 5.7

2.5.2 Equipment Under Test

Microwave Outdoor Unit Harmony Lite 3GHz, S/N: F1003GHA0140

2.5.3 Date of Test and Modification State

27 to 28 August 2014 – Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Method and Operating Modes

The test was applied in accordance with test method requirements of FCC part 90Z and RSS-197 and ANSI/TIA-603-C-2004.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

Emissions identified within the range 30MHz – 40GHz were then formally measured using a Peak detector as the worst case.

The measurement of the outside a licensee's frequency band(s) of operation was performed with a resolution bandwidth of 1MHz.

The EUT was measured with the antenna height varied between 1 and 4m with the turntable rotated between 0 and 360 degrees. The emission of any outside a licensee's frequencies within 10dB of the limit were measured with the substitution method used according to the standard. The limits for outside a licensee's frequency band(s) of operation the power of the Spurious Emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - $(43 + 10\log(P))$ dB

Where:

Field Strength is measured in dB μ V/m

P is measured Transmitter Power in Watts

The measurements were performed at a 3m distance unless otherwise stated.

Determination of Spurious Emission Limit

The field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053 (a).



Product Service

$$E(v/m) = (30 \times G_i \times P_o)^{0.5} / d$$

Where G_i is the antenna gain of ideal half-wave dipole,
 P_o is the power out of the transceiver in W,
 d is the measurement distance in meters.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$$E(v/m) = (30 \times 1.64 \times 0.056)^{0.5} / 3 = 0.553 \text{ V/m} = 114.86 \text{ dB}\mu\text{V/m}$$

The spurious emission must be attenuated by $43 + 10\log(P_o)$ dB this gives:

$$43 + 10\log(0.056) = 30.48 \text{ dB}$$

Therefore the limit at 3m measurement distance is:

$$114.86 - 30.48 = 84.4 \text{ dB}\mu\text{V/m}$$

This limit has been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

The results are shown in the plots below.

2.5.6 Environmental Conditions

Ambient Temperature 24.5 - 26.5°C

Relative Humidity 40.0 - 42.5%



2.5.7 Test Results

Note: Only the worst case results plots have been included as all of the emissions are greater than 20dB below the limit. A set of plots have been included to show the measurement system noise floor.

Configuration O-MIMO-20

Maximum Output Power 19.0dBm per port

Channel Position	Channel Frequencies
Channel Position M	3675MHz

Channel Position M - QPSK / Bandwidth 20MHz

No emissions were detected within 20dB of the limit.

Configuration O-MIMO-40

Maximum Output Power 22.0dBm per port

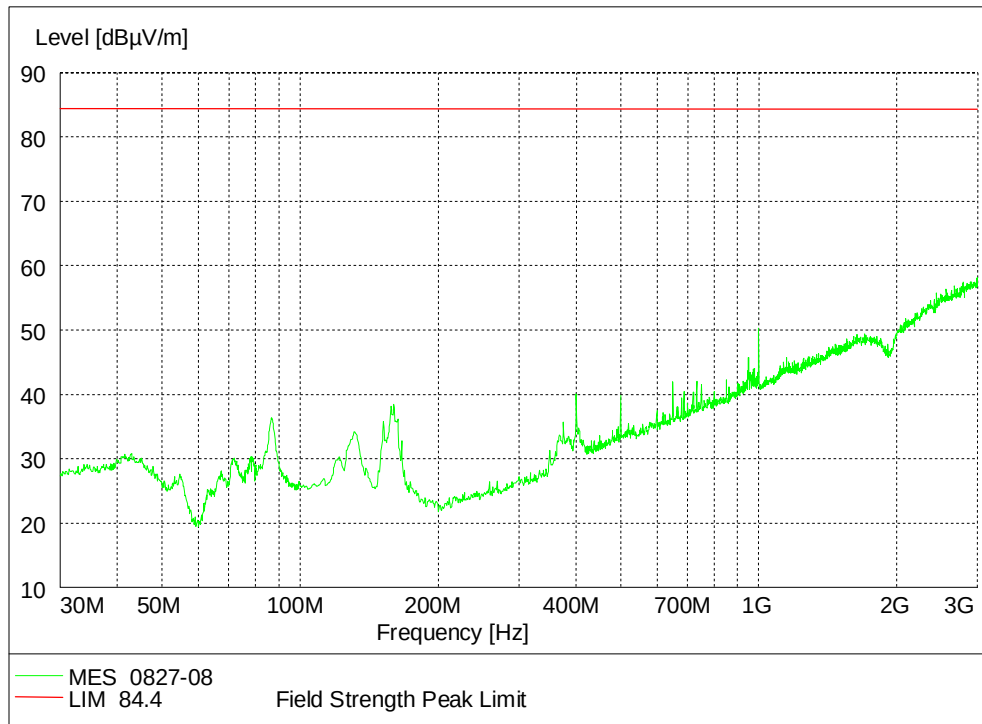
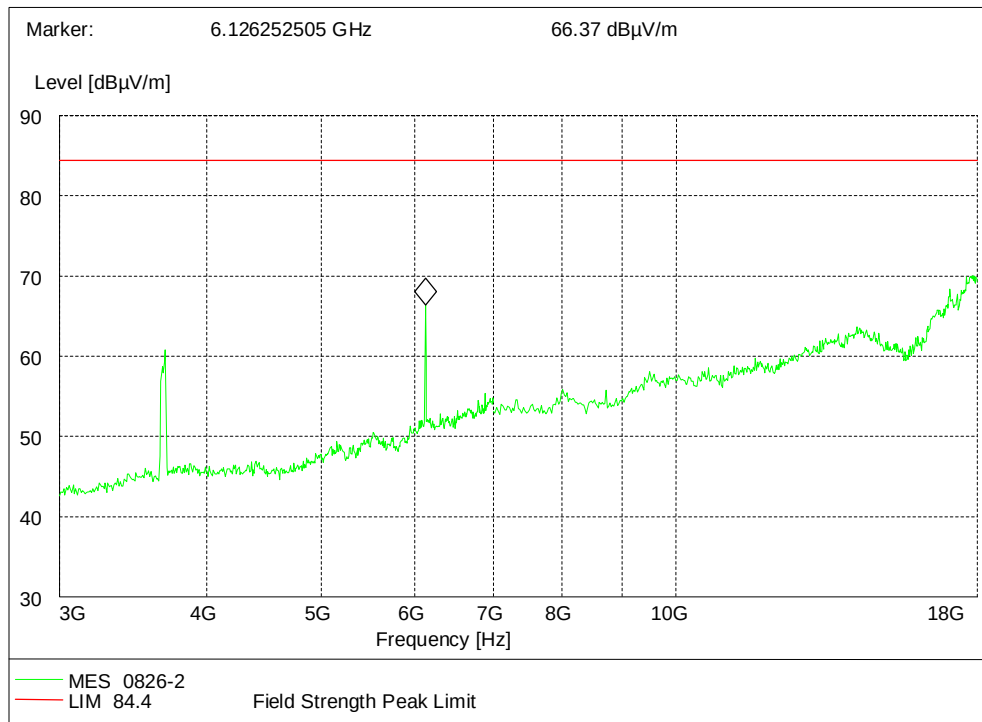
Channel Position	Channel Frequencies
Channel Position B	3660MHz
Channel Position M	3675MHz
Channel Position T	3690MHz

Channel Position M - BPSK / Bandwidth 40MHz

No emissions were detected within 20dB of the limit.

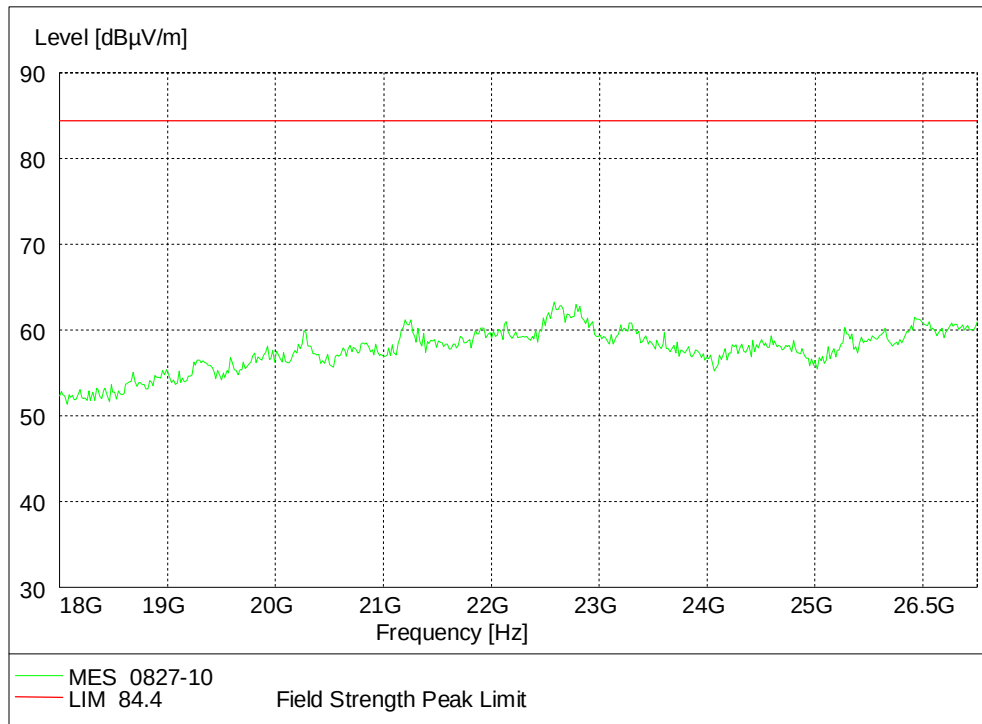
Channel Position B - QPSK / Bandwidth 40MHz

No emissions were detected within 20dB of the limit.

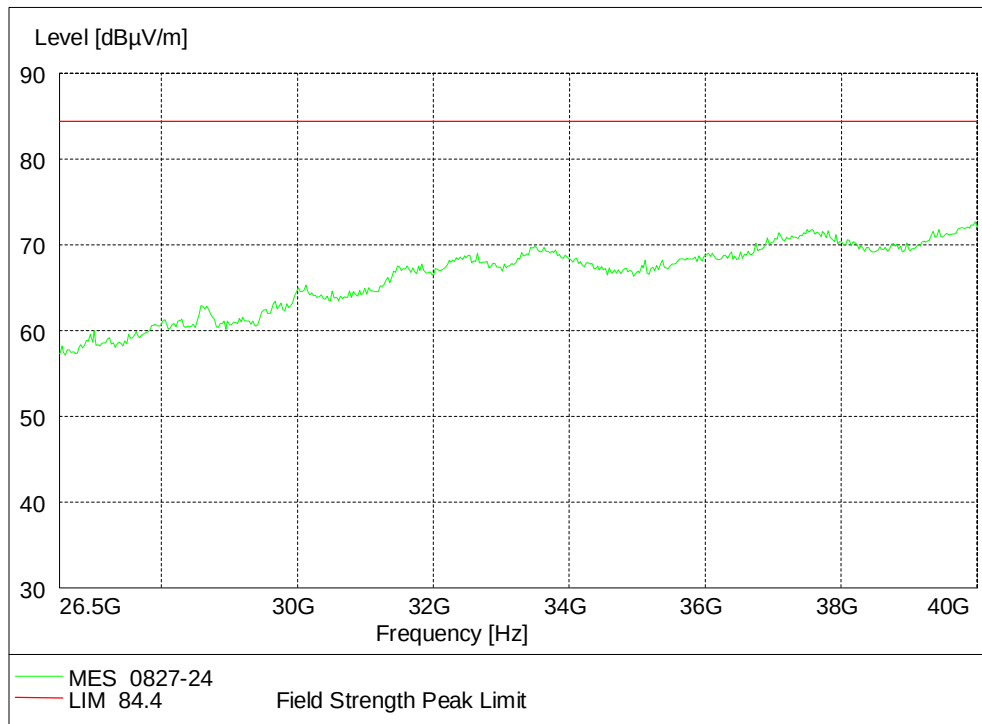
Channel Position M - QPSK / Bandwidth 40MHz - 30MHz – 3GHzChannel Position M - QPSK / Bandwidth 40MHz - 3GHz – 18GHz



Channel Position M - QPSK / Bandwidth 40MHz - 18GHz – 26.5GHz



Channel Position M - QPSK / Bandwidth 40MHz - 26.5GHz – 40GHz





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Channel Position T - QPSK / Bandwidth 40MHz

No emissions were detected within 20dB of the limit.

Channel Position M - 16QAM / Bandwidth 40MHz

No emissions were detected within 20dB of the limit.

Channel Position M - 64QAM / Bandwidth 40MHz

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dBμV/m
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Remarks

The test results didn't exceed -13dBm / 84.4dBμV/m.



Product Service

2.6 FREQUENCY STABILITY

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
 FCC CFR 47 Part 90, Clause 90.213
 Industry Canada RSS-Gen, Clause 4.7
 Industry Canada RSS-197, Clause 5.3

2.6.2 Equipment Under Test

Microwave Outdoor Unit Harmony Lite 3GHz, S/N: F1003GHA0140

2.6.3 Date of Test and Modification State

21 to 25 August 2014 – Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Method and Operating Modes

The test was applied in accordance with test method requirements of FCC part 90Z and RSS-197.

Frequency Error – Temperature Variation

The EUT was tested over the temperature range -30°C to +50°C in 10°C steps with -48 VDC Power Supply. At each temperature step, the EUT was configured to transmit an unmodulated signal at maximum power on the Bottom, Middle and Top channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Frequency Error – Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal values of both -48 VDC power supplies. At +20°C, the EUT was configured to transmit an unmodulated signal at maximum power on the Bottom, Middle and Top channel of the operating band. The average of 200 transmission bursts was measured and the result recorded.

Frequency range

Using a resolution bandwidth of 1% of the occupied bandwidth, a reference point at the unwanted emission level which complies with the attenuation of $43 + 10 \log_{10}(P)$ on the emission mask of the lowest and highest channel shall be selected, and the frequency at these points shall be recorded as F_L and F_H respectively.

2.6.6 Environmental Conditions

Ambient Temperature	22.0 – 23.0°C
Relative Humidity	38.0 – 45.2%



2.6.7 Test Results

The EUT Transmit with unmodulated signal

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B 3660MHz	Channel Position M 3675MHz	Channel Position T 3690MHz
-48.0	-30°C	+3438	+3439	+3453
	-20°C	+2117	+2394	+1980
	-10°C	+2079	+2221	+1973
	0°C	+1006	+1006	+1006
	+10°C	+816	+804	+839
	+20°C	+746	+770	+705
	+30°C	+328	+328	+328
	+40°C	-574	-591	-580
	+50°C	+248	+253	+240

Supply Voltage DC (V)	Temperature	Frequency Stability (Hz)		
		Channel Position B 3660MHz	Channel Position M 3675MHz	Channel Position T 3690MHz
-38.4 V	+20°C	+763	+774	+796
-48.0 V		+746	+770	+705
-57.6 V		+761	+758	+759

Configuration O-MIMO-20

Maximum Output Power 19.0dBm per port

Supply Voltage DC (V)	Channel Position B	Temperature	Frequency offset (Hz)	F _L (MHz)	Frequency Stability (MHz)
-48.0	3660MHz	-30°C	3438	3650.369090	3650.365652
		+20°C	746	3650.782308	3650.781562
		+50°C	248	3650.820513	3650.820265

Supply Voltage DC (V)	Channel Position T	Temperature	Frequency offset (Hz)	F _H (MHz)	Frequency Stability (MHz)
-48.0	3690MHz	-30°C	3453	3699.508013	3699.511466
		+20°C	705	3699.238462	3699.239167
		+50°C	240	3699.236859	3699.237099

Limit	FCC: frequency offset shall be within the frequency range
	IC: F _L minus the frequency offset and F _H plus the frequency offset shall be within the frequency range in which the equipment is designed to operate.

Remarks

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature and voltage interval across the measured range.



Product Service

SECTION 3

TEST EQUIPMENT USED



Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Transmitter Output Power and E.I.R.P					
Network Analyzer	Agilent	E8363B	MY43030474	12	19-Aug-2015
Spectrum Analyzer	Rohde & Schwarz	FSQ	200065	12	10-Mar-2015
Signal Generator	Agilent	E4438C	MY47270108	12	10-Feb-2015
Signal Generator	Agilent	E8275D	MY53400333	12	19-Aug-2015
Power Meter	Agilent	N1911A	MY50000228	12	19-Aug-2015
Power Meter	Agilent	E4416A	MY52370013	12	19-Aug-2015
Power Sensor	Agilent	N1921A	MY50120026	12	19-Aug-2015
Power Sensor	Agilent	E9300A	MY52400003	12	19-Aug-2015
6dB Attenuator	MCE / Weinschel	2	BM8173	-	O/P MON
20dB Attenuator	HP	8491B	31606	-	O/P MON
DC Power Supply	Agilent	6654A	MY40002289	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	24-Dec-2014
Thermo-hygrometer	AZ Instruments	8705	9151655	12	12-Dec-2014
Occupied Bandwidth					
Network Analyzer	Agilent	E8363B	MY43030474	12	19-Aug-2015
Spectrum Analyzer	Rohde & Schwarz	FSQ	200065	12	10-Mar-2015
Power Meter	Agilent	N1911A	MY50000228	12	19-Aug-2015
Power Sensor	Agilent	N1921A	MY50120026	12	19-Aug-2015
6dB Attenuator	MCE / Weinschel	2	BM8173	-	O/P MON
20dB Attenuator	HP	8491B	31606	-	O/P MON
10dB Attenuator	MCL	BW-S10W2	1118	-	O/P MON
DC Power Supply	Agilent	6654A	MY40002289	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	24-Dec-2014
Thermo-hygrometer	AZ Instruments	8705	9151655	12	12-Dec-2014
Emission Masks					
Network Analyzer	Agilent	E8363B	MY43030474	12	19-Aug-2015
Spectrum Analyzer	Rohde & Schwarz	FSQ	200065	12	10-Mar-2015
Power Meter	Agilent	N1911A	MY50000228	12	19-Aug-2015
Power Sensor	Agilent	N1921A	MY50120026	12	19-Aug-2015
6dB Attenuator	MCE / Weinschel	2	BM8173	-	O/P MON
20dB Attenuator	HP	8491B	31606	-	O/P MON
10dB Attenuator	MCL	BW-S10W2	1118	-	O/P MON
DC Power Supply	Agilent	6654A	MY40002289	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	24-Dec-2014
Thermo-hygrometer	AZ Instruments	8705	9151655	12	12-Dec-2014
Conducted Spurious Emission					
Network Analyzer	Agilent	E8363B	MY43030474	12	19-Aug-2015
Spectrum Analyzer	Rohde & Schwarz	FSQ	200065	12	10-Mar-2015
Power Meter	Agilent	N1911A	MY50000228	12	19-Aug-2015
Power Sensor	Agilent	N1921A	MY50120026	12	19-Aug-2015
6dB Attenuator	MCE / Weinschel	2	BM8173	-	O/P MON
20dB Attenuator	HP	8491B	31606	-	O/P MON
10dB Attenuator	MCL	BW-S10W2	1118	-	O/P MON
DC Power Supply	Agilent	6654A	MY40002289	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	24-Dec-2014
Thermo-hygrometer	AZ Instruments	8705	9151655	12	12-Dec-2014



Radiated Spurious Emissions					
Load	Shanghai Huaxiang	SMAF5	-	-	O/P MON
Load	Shanghai Huaxiang	SMAF5	-	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2015
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2015
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2015
Pyramidal Horn Antenna	EMCO	3160-09	760840	12	19-Aug-2015
Pyramidal Horn Antenna	EMCO	3160-10	808234	12	19-Aug-2015
Antenna master	Frankonia	MA 260	-	-	19-Aug-2015
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	19-Aug-2015
DC Power Supply	Dahua	DH1716-5D	2007060047	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	24-Dec-2014
Thermo-hygrometer	AZ Instruments	8705	9151655	12	12-Dec-2014
Frequency Stability					
Network Analyzer	Agilent	E8363B	MY43030474	12	19-Aug-2015
Spectrum Analyzer	Rohde & Schwarz	FSQ	200065	12	10-Mar-2015
Thermal Chamber	Espec	SH-214	92013758	23	22-Dec-2014
Spectrum Analyzer	Rohde & Schwarz	FSQ	200065	12	10-Mar-2015
Power Meter	Agilent	N1911A	MY50000228	12	19-Aug-2015
Power Sensor	Agilent	N1921A	MY50120026	12	19-Aug-2015
6dB Attenuator	MCE / Weinschel	2	BM8173	-	O/P MON
20dB Attenuator	HP	8491B	31606	-	O/P MON
10dB Attenuator	MCL	BW-S10W2	1118	-	O/P MON
DC Power Supply	Agilent	6654A	MY40002289	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	24-Dec-2014
Thermo-hygrometer	AZ Instruments	8705	9151655	12	12-Dec-2014

N/A – Not Applicable

O/P MON – Output Monitored with Calibrated Equipment



Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*
Frequency stability	30MHz to 4GHz	$<\pm 1 \times 10^{-7}$
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10^6		

* In accordance with CISPR 16-4



Product Service

SECTION 4

DISCLAIMERS AND COPYRIGHT



Product Service

4.1 DISCLAIMERS AND COPYRIGHT

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