FLEXTRONICS

Radio Permissive Change Test Report
for
Horizon Compact CUSP24UFC

Tested to: **CFR 47 FCC Part 15 Subpart C**

Document Number: **K0002048-TR-RAD-01-02**
Release Date: **2012 June 4**

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About this document

The release control record, document approvals, and laboratory Accreditations are as follows.

Throughout this document, text in blue font is a clickable navigation button.

Release control record

This document is based on DVC document template KG000347-TR-EMC-06-20.

Release no.	Reason for change	Date released
01-01	Initial Release	2012 March 9
01-02	Re-issued to add the sections • Test procedure for 20 dB Bandwidth on page 17 • Test procedure for Field Strength Measurements on page 20 • added item 15 in the section References on page 26	2012 June 4

Approvals

Function	Name	Job title	Signature	Date
Document Release Approval	Steve Tippet	Lab Operations Manager		4th June 2012
Technical reviewer	Jacques Rollin	EMC Discipline Leader		June 4 2012
Author	Philippe Lafleur	RF Engineer		June 4th 2012

Accreditations

The Design Validation Centre (DVC) test facilities are accredited by the Standards Council of Canada (SCC) to ISO/IEC 17025 in accordance with the scope of accreditation outlined at the web site http://palcan.scc.ca/Specs/PDF/95_e.pdf [17]. The SCC is a signatory of the APLAC [4] and ILAC [14] Mutual Recognition Arrangements. The SCC's Laboratory Accreditation Program has been evaluated and has demonstrated its competence to operate according to the requirements of ISO/IEC 17011.

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1. Introduction

This document is written and distributed by Flextronics Canada Design Services Inc. Whenever Flextronics is mentioned in this document it shall be taken as referring to Flextronics Canada Design Services Inc.

1.1 Purpose and scope

This document reports the Electromagnetic Compatibility (EMC) test activities done by the DVC on the product called Horizon Compact CUSP24UFC for the customer DragonWave Inc. per DVC project number K0002048.

Testing was performed in support of a permissive change to allow the use of new modulations schemes and a new larger diameter antenna. The subset of tests is selected by the TCB.

1.2 Executive summary

The Horizon Compact CUSP24UFC is verified to comply with the requirements of the standard FCC Part 15 Subpart C [13].

The requirements for each standard and the summary of the test results for the Horizon Compact CUSP24UFC against these requirements are listed in the section Test results summary on page 8.

The tested components of the Horizon Compact CUSP24UFC are identified in the sections Assessed hardware on page 9 and Inventory of the EUT on page 15. The test results in this report apply only to the tested components that are identified in these sections.

The configuration, operation, and setup of the Horizon Compact CUSP24UFC with support equipment for the test samples are described in the section Equipment under test on page 9.

1.3 Test lab information

Lab Name	Flextronics Design Validation Centre
Mailing / Shipping Address	21 Richardson Side Road, Kanata, Ontario, K2K 2C1, Canada
Primary Technical Contact	Steve Tippet
Title	Manager of Regulatory Design & Compliance
Phone	613-895-2050, extension 2820

1.4 Customer information

Company Name	DragonWave Inc.
Mailing Address	600-411 Legget Drive, Ottawa, Ontario, K2K 3C9
Primary Technical Contact	Jerry Potera
Title	Technical Staff
Phone	613-599-9991 X 2267
E-mail	jpotera@dragonwaveinc.com

2. Test results summary

Table 1 summarizes the test results for test cases performed on the Horizon Compact CUSP24UFC. In all tested configurations radiated levels from the EUT were found to be within the FCC-prescribed limits.

Table 1: Summary of test results

Test case description	Specification	Test result
New 10 MHz bandwidth modulations	Clause 15.215(c) 20 dB Bandwidth	Pass
New 20 MHz bandwidth modulations	Clause 15.215(c) 20 dB Bandwidth	Pass
30 cm antenna, with new 10 MHz bandwidth modulations	Clause 15.249(b) Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	Pass
30 cm antenna, with new 20 MHz bandwidth modulations	Clause 15.249(b) Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	Pass
90 cm antenna, previously approved 40 MHz bandwidth modulations	Clause 15.249(b) Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	Pass
90 cm antenna, new 20 MHz bandwidth modulations	Clause 15.249(b) Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	Pass
90 cm antenna, new 10 MHz bandwidth modulations	Clause 15.249(b) Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	Pass

3. Equipment under test

This section identifies:

- the equipment under test (EUT) and its basic operation
- the hardware and software components of the EUT
- any equipment that enables testing the EUT

3.1 Assessed hardware

Table 2 indicates the hardware components that were assessed.

Table 2: Assessed hardware

Hardware component	Serial number	Date code
Horizon Compact CUSP24UFC	DW141ACK1062	Oct 2009

3.2 Product details

FCC IDENTIFIER: QB8HC-24UL

Name of Grantee: DragonWave Inc.

Equipment Class: Part 15 Low Power Communication Device Transmitter

Notes: Horizon Compact, CUSP24UFC

Frequency Range (MHz): 24078.5 to 24221.5

Frequency tolerance: 0.001%

Figure 1: Horizon Compact CUSP24UFC

3.3 System modifications

The EUT was not modified.

3.4 Power and grounding requirements

The Horizon Compact CUSP24UFC was powered and grounded through the supplied Power Over Ethernet (POE) adaptor provided with the product.

3.5 Product port definition and EUT cable information

Table 3 identifies all the cables and ports on the system tested.

Table 3: System port definition

Port or cable designation	Interface description	Port location	Permanent connection	Shielded cable	Max cable length (m)	Max quantity	Environ-ment
P1	Ethernet	Back	No	Yes	> 10	1/system	Outdoor
P2	Ethernet	Back	No	Yes	> 10	1/system	Outdoor
RF	Waveguide	Front	No	Yes	0	1/system	Outdoor
Table notes							
1. The cable is a permanent connection if the customer requests this optional feature to be installed.							

3.6 Software and operations of the EUT

Revisions for the 3 components of the software load are provided below:

- Application OMNI version 1.04.06
- Modem OMNI version 1.04.22
- Frequency File version 29e

3.7 Configurations of the EUT

Figure 3 shows Configuration 1 of the EUT and the host equipment. Configuration 1 was used for all 30-cm diameter antenna test cases.

Figure 2: Connectivity to the EUT for all configurations

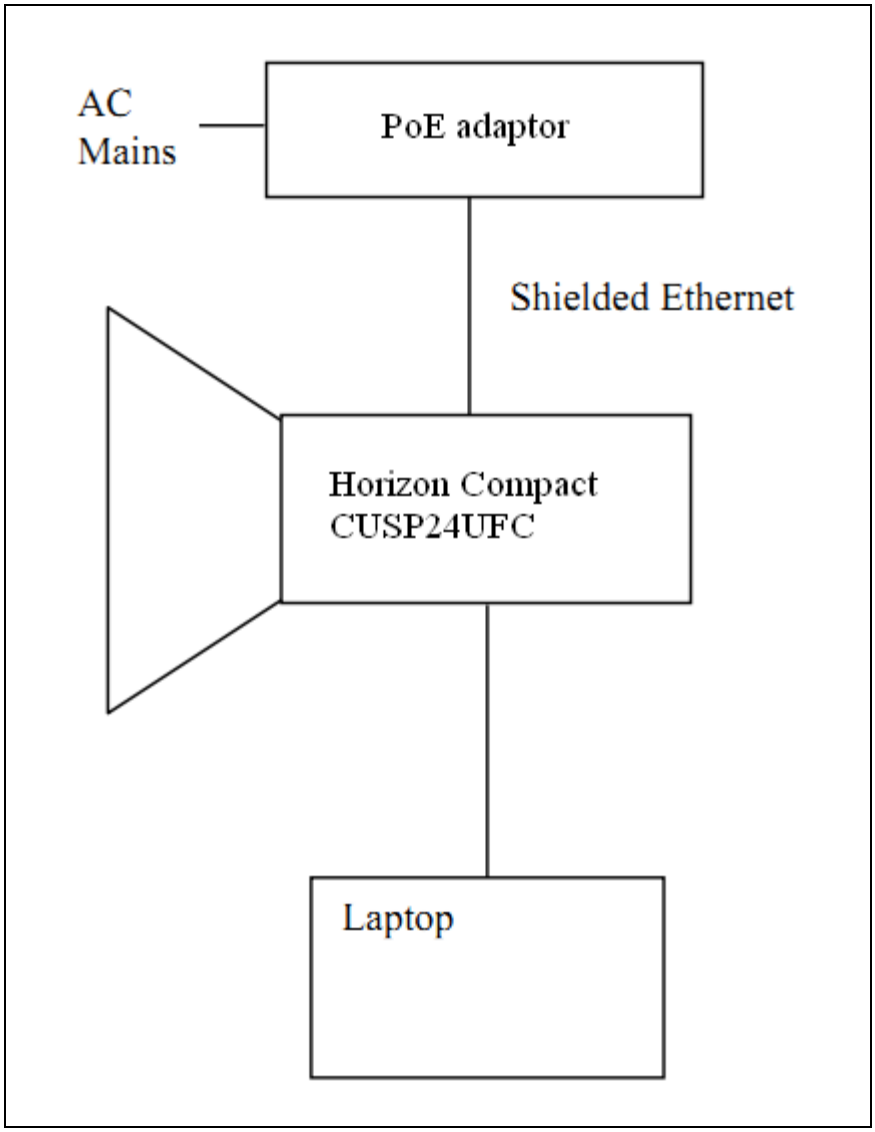
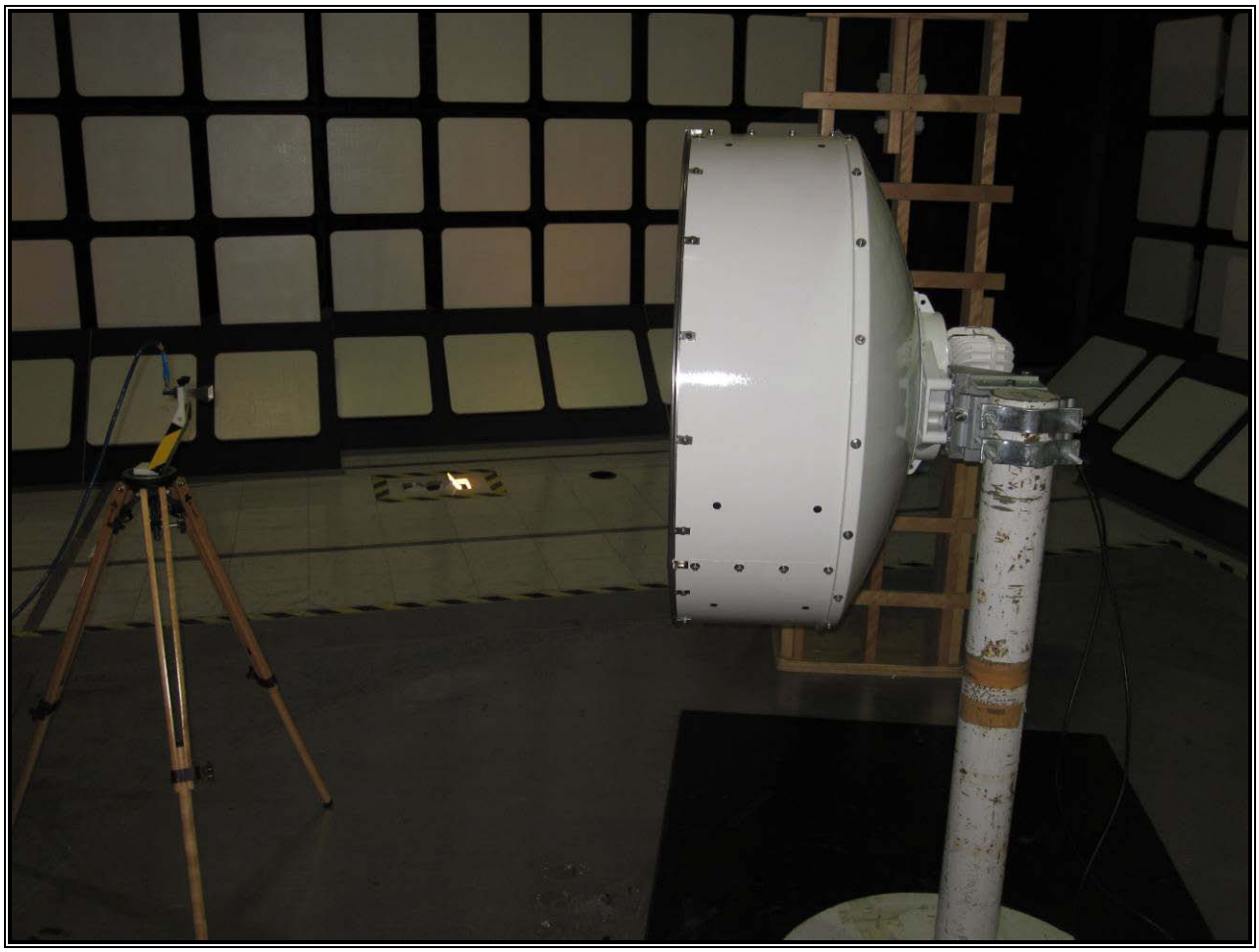


Figure 3: Setup for testing Configuration 1, 30 cm EUT antenna

Figure 4: Setup for testing Configuration 2, 90 cm EUT antenna



Configuration 3 is a bench-top measurement of conducted emissions from the radio itself via the waveguide port. Configuration 3 was used only for 20 dB bandwidth conducted measurements.

Photographs of the test configurations are in section Appendix B: Test setup photographs on page 42.

3.8 Inventory of the EUT

The following tables identify the assessed and test-enabling components of the Horizon Compact CUSP24UFC's EUT.

Table 4: Inventory of Configuration 1

Item	Component	Part number	Release number	Serial number
1	Horizon compact 24 GHz radio	CUSP24UFC	Oct 2009	DW141ACK1062
2	30 cm diameter antenna	VHLP1-26-DW1	not applicable	09DESA0011050

Table 5: Inventory of Configuration 2

Item	Component	Part number	Release number	Serial number
1	Horizon compact 24 GHz radio	CUSP24UFC	Oct 2009	DW141ACK1062
2	90 cm diameter antenna	VHLP3-26-DW1	not applicable	11DESA1734977

4. General test conditions

4.1 Description of test facilities

Radiated Emissions (RE) testing is done in a 10-meter Ambient Free Chamber (AFC). The AFC consists of a shielded room lined with ferrite tiles and anechoic material.

The temperature and humidity in these test facilities are controlled and maintained between 15 ºC and 35 ºC with a relative humidity between 30 % and 60 %. Levels are recorded and any exceptions are included in the detailed test results sections of this report.

The above facilities are located at 21 Richardson Side Road, Kanata, Ontario, Canada.

Facility accreditation information is located in the section Accreditations on page 2 of this test report.

4.2 Measurement instrumentation

The measurement instrumentation conforms to ANSI C63.2 [1] and CISPR 16 [6]. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

5. Test results

For information on test facilities and measurement instrumentation, see the section General test conditions on page 16.

5.1 Clause 15.215(c) 20 dB Bandwidth

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

5.1.1 Test procedure for 20 dB Bandwidth

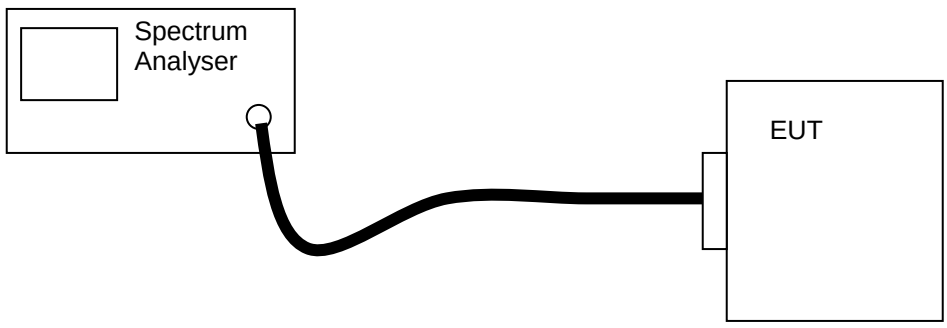
The RF signal was set at both extremities and in the middle of the frequency band in each transmission modes.

For all of these measurements, the radio module output was connected to the spectrum analyzer through a RF cable and waveguide adapter. The measurements were performed on the main antenna port.

The 20 dB bandwidth was measured using the spectrum analyzer and comparing the recorded Tx power. The test was done by the relevant procedures described in ANSI C63.10 [3].

The actual spectrum analyzer settings used are recorded on the measurement plots in the appendix.

Figure 5: Test Set up for Bandwidth Measurements



5.1.2 Test results

Test location: Test bench

Date tested: Feb 8th, 2012

Tested by: Philippe Lafleur

Test setup: Configuration 3: Conducted measurements to ESU 40

Test configurations are identified in the section Configurations of the EUT on page 11.

Table 6: 20 dB bandwidth (MHz) for 10 MHz modes

Mode	Low Channel 24,065,000 kHz (MHz)	Mid Channel 24,144,310 kHz (MHz)	High Channel 24,235,000 kHz (MHz)	Maximum (MHz)
hc10_ul_14_qpsk	10.5	10.5	10.5	10.5
hc10_ul_22_16qam	10.5	10.4	10.6	10.6
hc10_ul_48_64qam	11.5	11.6	11.5	11.6
hc10_ul_65_256qam	11.5	11.6	11.3	11.6
Maximum	11.5	11.6	11.5	**11.6**

Lower edge of lowest channel: 24,065,000 - 11,600/2 = 24,0592,00 kHz
Upper edge of highest channel: 24,235,000 + 11,600/2 = 24,240,800 kHz

Table 7: 20 dB bandwidth (MHz) for 20 MHz modes

Mode	Low Channel 24070000 kHz (MHz)	Mid Channel 24138550 kHz (MHz)	High Channel 24230000 kHz (MHz)	Maximum (MHz)
hc20_ul_28_qpsk	19.8	19.7	19.9	19.9
hc20_ul_54_16qam	21.6	21.9	21.8	21.9
hc20_ul_71_32qam	22.2	22.3	22.3	22.3
hc20_ul_108_128qam	23.7	23.5	23.5	23.7
hc20_ul_136_256qam	23.9	24.3	24.0	24.3
Maximum	23.9	24.3	24.0	**24.3**

Lower edge of lowest channel: 24,070,000 - 24,300/2 = 24,057,850 kHz
Upper edge of highest channel: 24,230,000 + 24,300/2 = 24,242,150 kHz

Measurement plots are included for reference in section Appendix A: Plots of conducted measurements on page 27.

5.1.3 Test equipment

The test equipment used for this configuration was as follows.

Table 8: Test equipment for Radiated Emissions testing in Configuration 1

Description	Make	Model number	Asset ID	Calibr. due
EMI Test Receiver	Rohde & Schwarz	ESU40	SSG013672	11/14/2012

5.2 Clause 15.249(b) Fixed Point-to-Point Operation in the 24.0-24.25 GHz Band

(b) Fixed, point-to-point operation as referred to in this paragraph shall be limited to systems employing a fixed transmitter transmitting to a fixed remote location. Point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information are not allowed. Fixed, point-to-point operation is permitted in the 24.05–24.25 GHz band subject to the following conditions:

(1) The field strength of emissions in this band shall not exceed 2500 millivolts/meter.

(2) The frequency tolerance of the carrier signal shall be maintained within ±0.001% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Antenna gain must be at least 33 dBi. Alternatively, the main lobe beamwidth must not exceed 3.5 degrees. The beamwidth limit shall apply to both the azimuth and elevation planes. At antenna gains over 33 dBi or beamwidths narrower than 3.5 degrees, power must be reduced to ensure that the field strength does not exceed 2500 millivolts/meter.

(c) Field strength limits are specified at a distance of 3 meters.

5.2.1 Test procedure for Field Strength Measurements

The EUT was installed in the 10 meter Ambient Free Chamber. The test was done by the relevant procedures described in ANSI C63.10 [3] and KDB Publication 200443 [17]

- The EUT was placed on an 80 cm high insulated table which was set on a turntable inside the AFC and was configured in normal operation. The 90 cm antenna was mounted on a pole due to its weight.
- The receive horn antenna was placed at a 1 m distance from the EUT. An initial scan was done to find emissions (frequencies) requiring detailed measurement. A prescan was performed to determine the orientation and polarization for the highest field strength.
  - In all cases the peak frequency and polarization matched the intended transmission of the EUT. In all cases, the peak orientation was near the intended radiation axis of the antenna (boresight)
- The final optimized measurements were done based on the pre-scan results; prescan frequency, polarization, orientation and height. The horn antenna was placed on a dielectric tripod and its positioning was optimized to within millimeters to maximize field strength.
- All measurements were done with a resolution bandwidth (IF BW) of 1 MHz on the receiver.

The following example illustrates the manner in which the emissions levels are calculated.

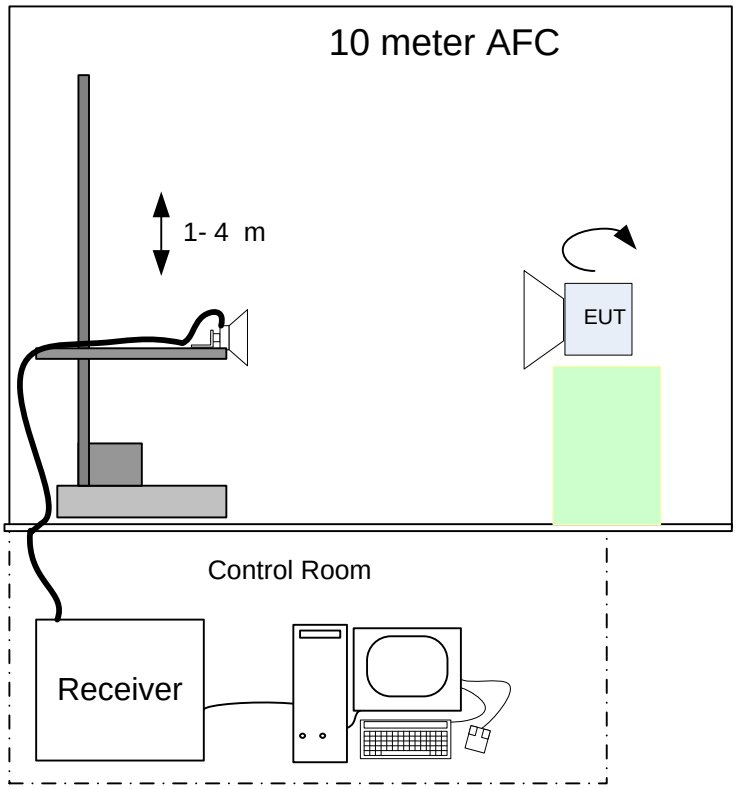
The rows in these tables are defined as follows.

Meter Reading (dBµV) =	Voltage measured using the receiver
Gain/Loss Factor (dB) =	Cumulative loss of cables used in the measurement path (a negative value indicates gain)
Transducer Factor (dB) =	Receive Antenna factor
Level (dBµV/m) =	Corrected value or field strength

The values in the Level row are calculated as follows:

Level = Meter Reading + Gain/Loss Factor + Transducer Factor

Figure 6: Test setup for Field Strength Measurements



5.2.2 Test results for 30 cm antenna for new 10 MHz and 20 MHz Bandwidth Modes

Test location: DVC 10-meter AFC

Date tested: Feb 10th, 2012

Tested by: Martin Lee

Test setup: Configuration 1

Test configurations are identified in the section Configurations of the EUT on page 11.

Measurements were performed at a distance of 1 m. Data in the tables below have been corrected to 3 m (20log(1/3) = -9.5 dB).

Table 9: Field strength (dBuV/m) at 3 m from 30 cm antenna for 10 MHz modes

Antenna diameter: 30 cm	Low Channel	Mid Channel	High Channel	Maximum
Mode	24,065,000 kHz	24,144,310 kHz	24,235,000 kHz	
	(dBuV)	(dBuV)	(dBuV)	(dBuV)
hc10_ul_14_qpsk	123.3	122.2	122.2	123.3
hc10_ul_22_16qam	123.2	123.8	123.7	123.8
hc10_ul_48_64qam	122.6	123.3	122.4	123.3
hc10_ul_65_256qam	121.7	122.4	122.0	122.4
Maximum	123.3	123.8	123.7	**123.8**

Table 10: Field strength (dBuV) at 3 m from 30 cm antenna for 20 MHz modes

Antenna diameter: 30 cm	Low Channel	Mid Channel	High Channel	Maximum
Mode	24,070,000 kHz	24,138,550 kHz	24,230,000 kHz	
	(dBuV)	(dBuV)	(dBuV)	(dBuV)
hc20_ul_28_qpsk	125.4	125.1	125.0	125.4
hc20_ul_54_16qam	125.2	125.3	125.4	125.4
hc20_ul_71_32qam	125.8	126.5	125.9	126.5
hc20_ul_108_128qam	124.1	124.9	124.7	124.9
hc20_ul_136_256qam	124.2	124.7	124.6	124.7
Maximum	125.8	126.5	125.9	**126.5**

5.2.3 Test equipment

The test equipment used for this configuration was as follows.

Table 11: Test equipment for radiated emissions testing in Configuration 1

Description	Make	Model number	Asset ID	Calibr. due
EMI Test Receiver	Rohde & Schwarz	ESU40	SSG013672	11/14/2012
Coaxial Cable	Huber & Suhner	101 PEA, Sucoflex	SSG012290	4/11/2012
Horn Antenna (18 - 26.5 GHz, Tx Only)	Emco	3160-09	SSG012293	4/1/2013

5.2.4 Measurement uncertainties for radiated measurements

Uncertainty evaluation has been calculated according to the method described in CISPR 16 [6].

The expanded measurement instrumentation uncertainty (with a 95 % level of confidence) on E-field RE is:

- ± 3.5 dB between 10 kHz and 30 MHz
- ± 4.8 dB between 30 MHz and 1 GHz
- ± 4.6 dB between 1 GHz and 10 GHz
- ± 4.6 dB between 10 GHz and 18 GHz
- ± 4.2 dB between 18 GHz and 26.5 GHz
- ± 4.8 dB between 26.5 GHz and 40 GHz

5.2.5 Test results for new 90 cm Antenna for 40 MHz Bandwidth Modes, and new 10 MHz and 20 MHz Bandwidth Modes

Test location: DVC 10-meter AFC

Date tested: Feb 13th, 2012

Tested by: Martin Lee

Test setup: Configuration 2

Test configurations are identified in the section Configurations of the EUT on page 11.

Measurements were performed at a distance of 1m. Data in the tables below have been corrected to 3 m (20log(1/3) = -9.5 dB).

Table 12: Field strength (dBuV) at 3 m from 90 cm antenna for 40 MHz modes

Antenna diameter: 90 cm	Low Channel	Mid Channel	High Channel	Maximum
Mode	24,078,500 kHz	24,126,170 kHz	24,221,500 kHz	
	(dBuV)	(dBuV)	(dBuV)	(dBuV)
hc40_ul_57_qpsk	109.7	106.1	104.2	109.7
hc40_ul_111_16qam	107.8	108.0	105.9	108.0
hc40_ul_142_32qam	107.2	108.2	105.8	108.2
hc40_ul_181_64qam	107.1	106.6	105.3	107.1
hc40_ul_212_128qam	106.4	105.9	104.2	106.4
hc40_ul_277_256qam	106.4	106.5	104.1	106.5
Maximum	109.7	108.2	105.9	**109.7**

Table 13: Field strength (dBuV) at 3 m from 90 cm antenna for 20 MHz modes

Antenna diameter: 90 cm	Low Channel	Mid Channel	High Channel	Maximum
Mode	24,070,000 kHz	24,138,550 kHz	24,230,000 kHz	
	(dBuV)	(dBuV)	(dBuV)	(dBuV)
hc20_ul_28_qpsk	107.2	104.2	102.3	107.2
hc20_ul_54_16qam	104.9	105.6	103.6	105.6
hc20_ul_71_32qam	105.0	105.5	103.7	105.5
hc20_ul_108_128qam	103.6	104.1	102.0	104.1
hc20_ul_136_256qam	103.6	104.4	102.3	104.4
Maximum	107.2	105.6	103.7	**107.2**

Table 14: Field Strength (dBuV) at 3 m from 90 cm antenna for 10 MHz modes

Antenna diameter: 90 cm	Low Channel	Mid Channel	High Channel	Maximum
Mode	24,065,000 kHz	24,144,310 kHz	24,235,000 kHz	
	(dBuV)	(dBuV)	(dBuV)	(dBuV)
hc10_ul_14_qpsk	105.9	102.4	104.6	105.9
hc10_ul_22_16qam	102.8	103.2	101.9	103.2
hc10_ul_48_64qam	102.2	102.7	101.4	102.7
hc10_ul_65_256qam	101.8	102.1	100.7	102.1
Maximum	105.9	103.2	104.6	**105.9**

5.2.6 Test equipment

The test equipment used for this configuration was as follows.

Table 15: E-field RE test equipment

Description	Make	Model number	Asset ID	Calibr. due
EMI Test Receiver	Rohde & Schwarz	ESU40	SSG013672	11/14/2012
Coaxial Cable	Huber & Suhner	101 PEA, Sucoflex	SSG012290	4/11/2012
Horn Antenna (18 - 26.5 GHz, Tx Only)	Emco	3160-09	SSG012293	4/1/2013

5.2.7 Measurement uncertainties for radiated measurements

Uncertainty evaluation has been calculated according to the method described in CISPR 16 [6].

The expanded measurement instrumentation uncertainty (with a 95 % level of confidence) on E-field RE is:

- ± 3.5 dB between 10 kHz and 30 MHz
- ± 4.8 dB between 30 MHz and 1 GHz
- ± 4.6 dB between 1 GHz and 10 GHz
- ± 4.6 dB between 10 GHz and 18 GHz
- ± 4.2 dB between 18 GHz and 26.5 GHz
- ± 4.8 dB between 26.5 GHz and 40 GHz

6. References

The documents, regulations, and standards that are referenced throughout this test report are listed alphabetically as follows.

1. ANSI C63.2-2009, American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.
2. ANSI C63.4-2003, Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
3. ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices.
4. APLAC, Asia Pacific Laboratory Accreditation Cooperation, Website (http://www.aplac.org)
5. AS/NZS CISPR 22 (2009) Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
6. CISPR 16 Publications (all parts and sections), Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 1: Radio Disturbance and Immunity Measuring Apparatus.
7. DVC K0002048-QT-PM-01-01, Quotation: December 6, 2011.
8. DVC K0002048-TP-EMC-01-01, EMC Test Plan for, January 10, 2012.
9. DVC Lab Operations Manual KG000347-QD-LAB-01-10, April 17, 2008.
10. DVC Quality Manual, K0000608-QD-QM-01-10, Oct 5, 2007.
11. EMC General Lab Test Procedure, KP000270-LP-EMC-01-14, October 2009.
12. EN 55022 (2010), Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (CISPR22: 20058).
13. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, U.S. Federal Communications Commission, 2012.
14. ILAC, International Laboratory Accreditation Cooperation, Website (http://www.ilac.org/)
15. KDB Publication 200443, Millimeter Wave Test Procedures, FCC OET, (http://transition.fcc.gov/oet/ea/eameasurements.html)
16. Lab34 Edition 1, “The Expression of Uncertainty in EMC Testing”, UKAS, August 2002.
17. Standards Council of Canada, Scope of Accreditation for the Design Validation Centre of Flextronics Canada Design Services Inc. outlined at the following web site http://palcan.scc.ca/Specs/PDF/95_e.pdf

7. Appendices

The Appendices contain information that supports other sections in this document. A section refers to an Appendix as appropriate.

7.1 Appendix A: Plots of conducted measurements

Table 16: Measurement plot look-up tables

Mode	24065000 (kHz)	24144310 (kHz)	24235000 (kHz)
hc10_ul_14_qpsk	hc10	hc10_020	hc10_010
hc10_ul_22_16qam	hc10_002	hc10_022	hc10_012
hc10_ul_48_64qam	hc10_004	hc10_024	hc10_014
hc10_ul_65_256qam	hc10_006	hc10_026	hc10_016

Mode	24070000 (kHz)	24138550 (kHz)	24230000 (kHz)
hc20_ul_28_qpsk	hc20_056	hc20_002	hc20_046
hc20_ul_54_16qam	hc20_057	hc20_004	hc20_048
hc20_ul_71_32qam	hc20_058	hc20_006	hc20_050
hc20_ul_108_128qam	hc20_042	hc20_008	hc20_052
hc20_ul_136_256qam	hc20_044	hc20_010	hc20_054

Figure 7: HC10

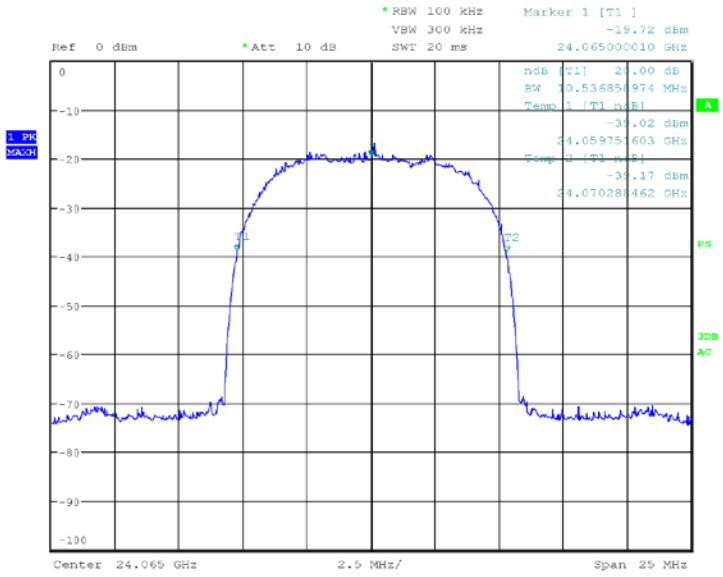


Figure 8: HC10_002

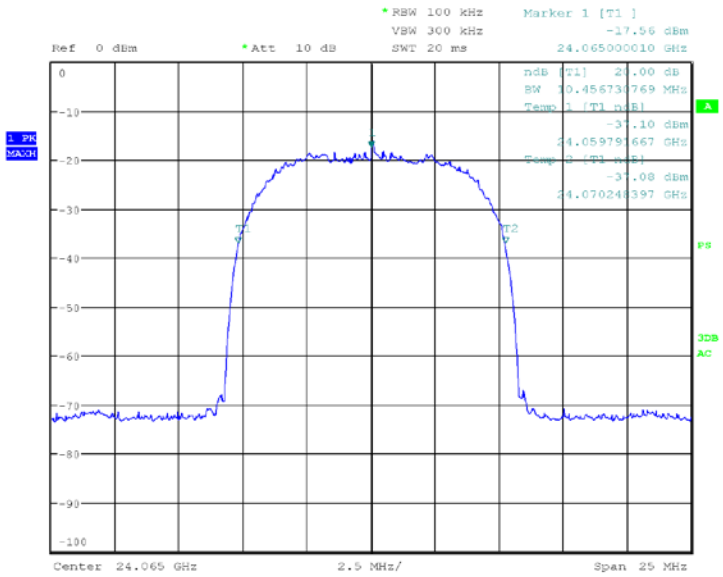


Figure 9: HC10_004

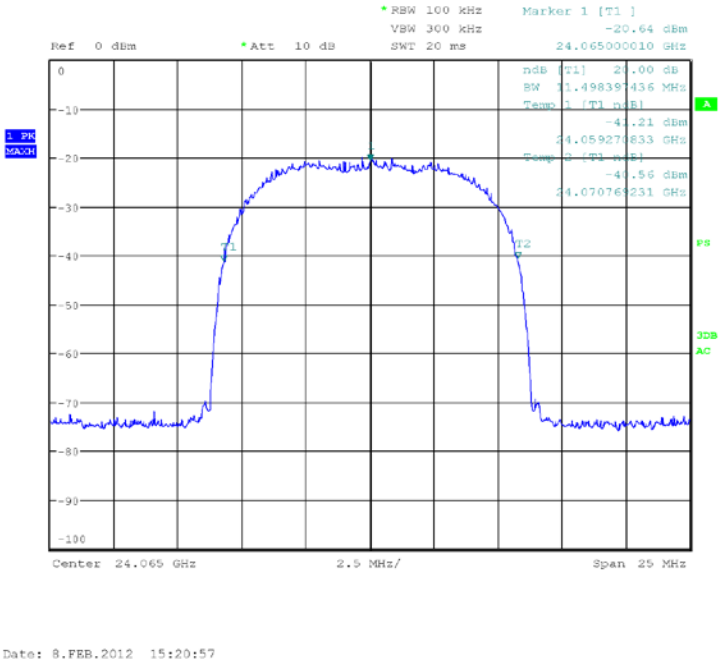


Figure 10: HC10_006

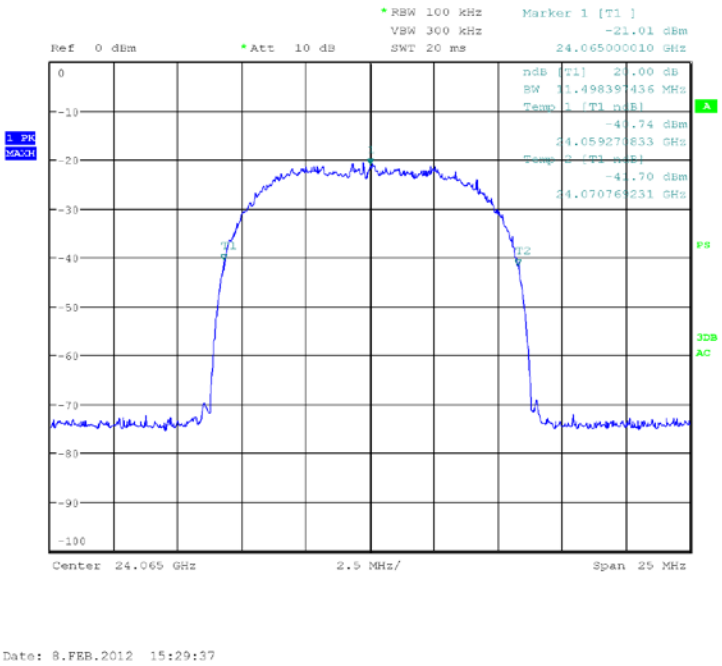


Figure 11: HC10_010

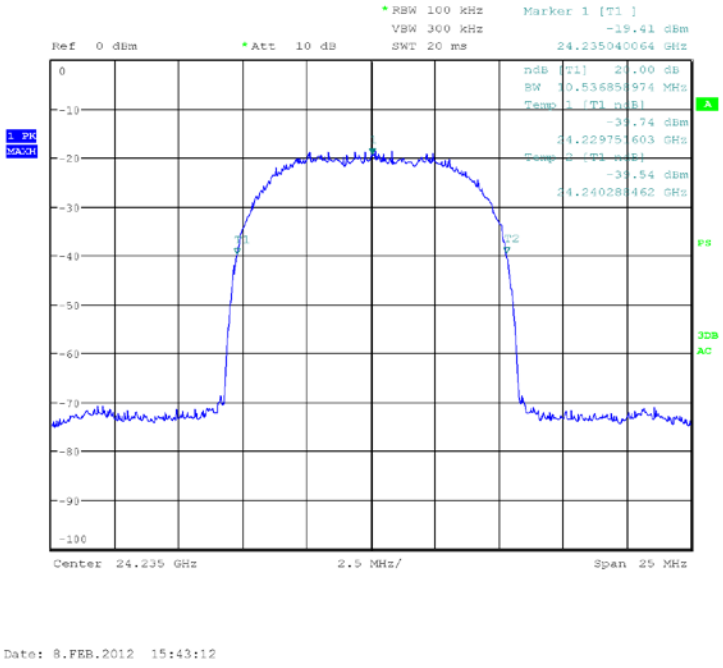


Figure 12: HC10_012

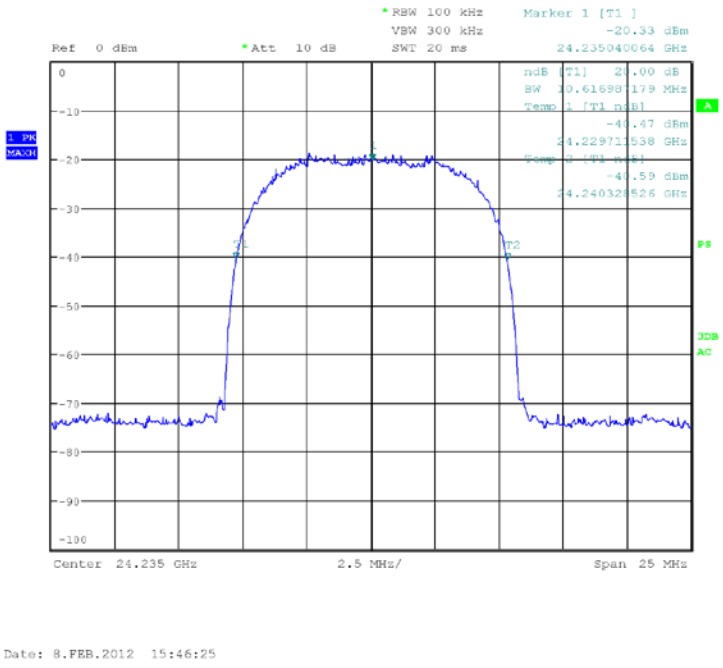


Figure 13: HC10_014

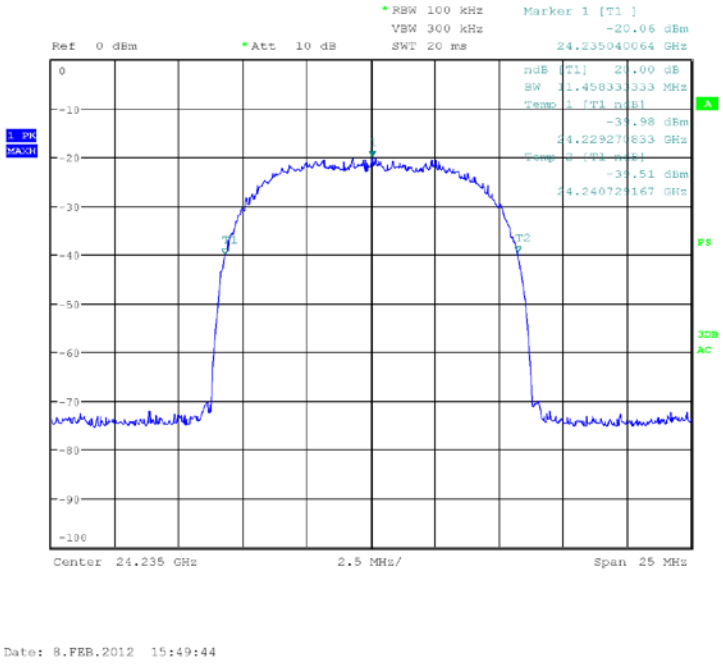


Figure 14: HC10_016

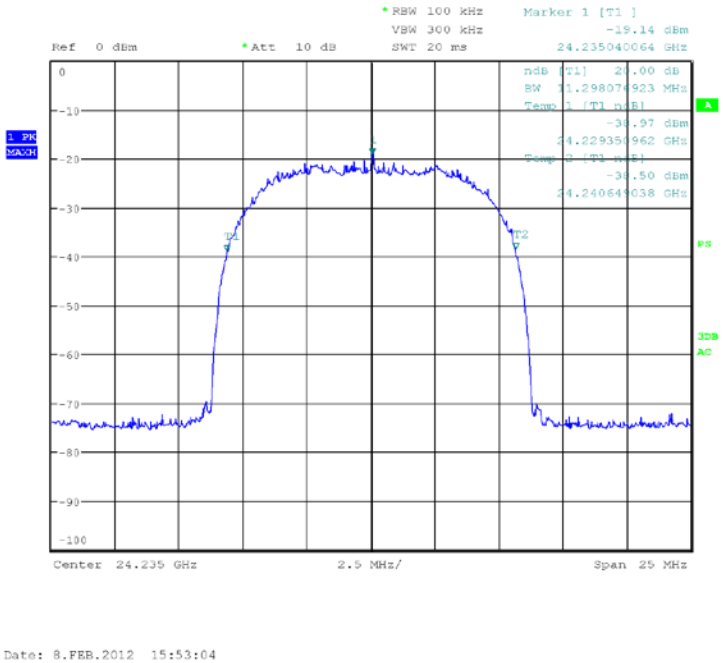


Figure 15: HC10_020

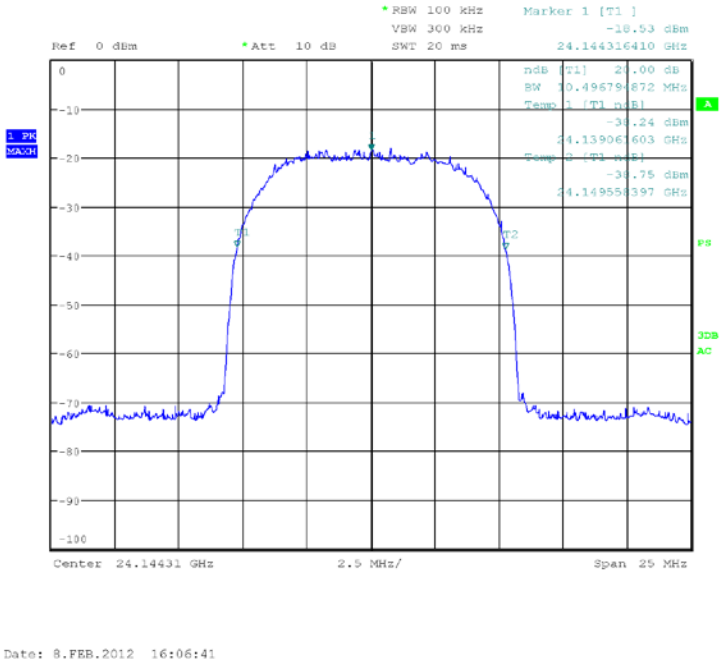


Figure 16: HC10_022

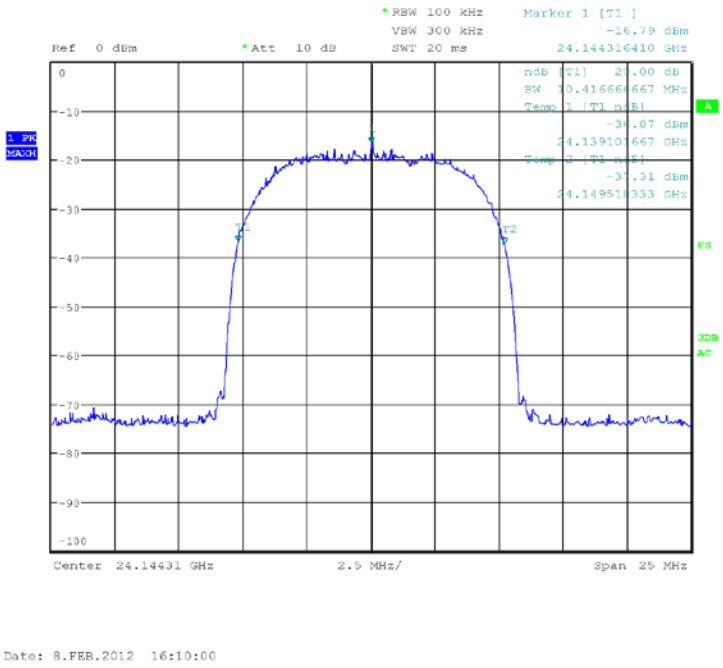


Figure 17: HC10_024

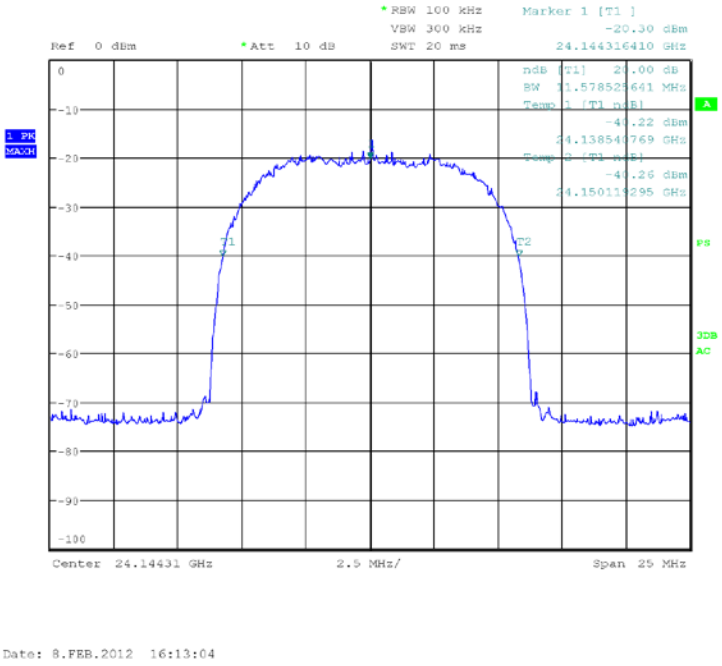


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Figure 18: HC10_026

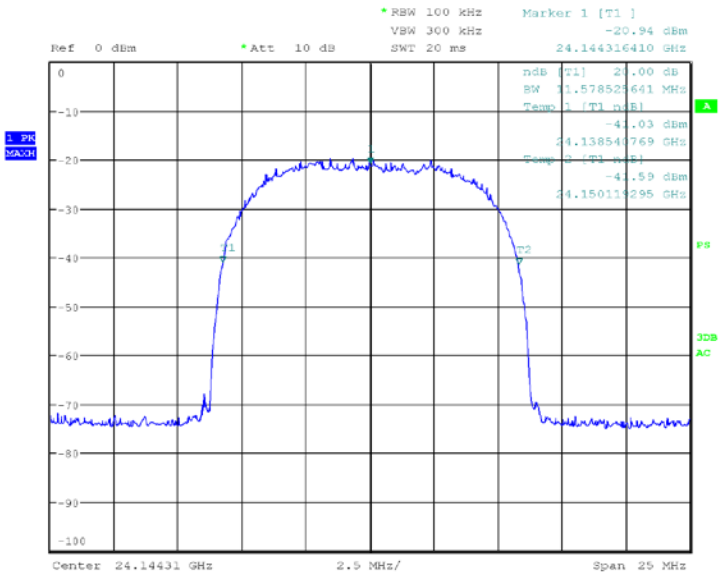

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Figure 19: HC20_002

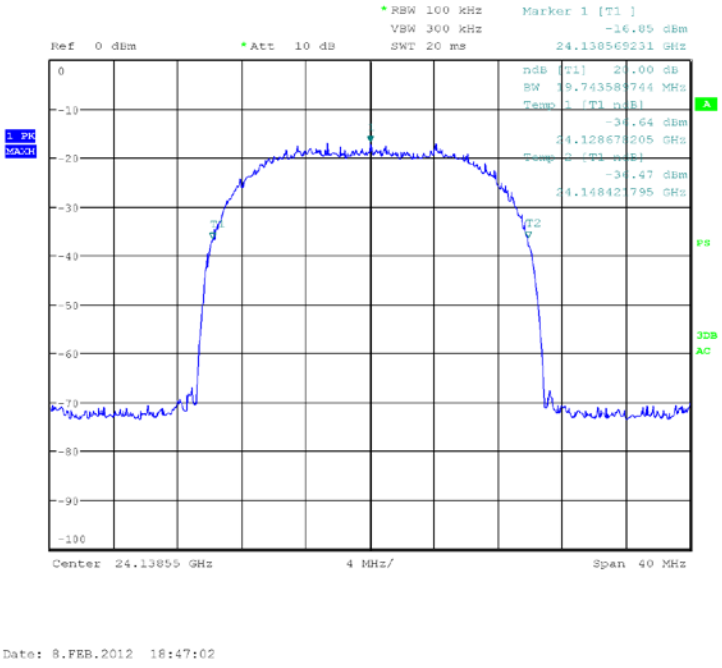

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Figure 20: HC20_004

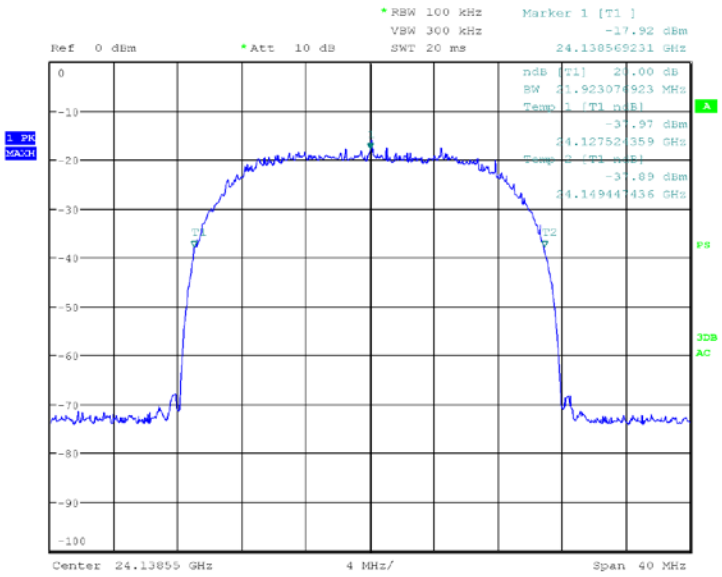

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Figure 21: HC20_006

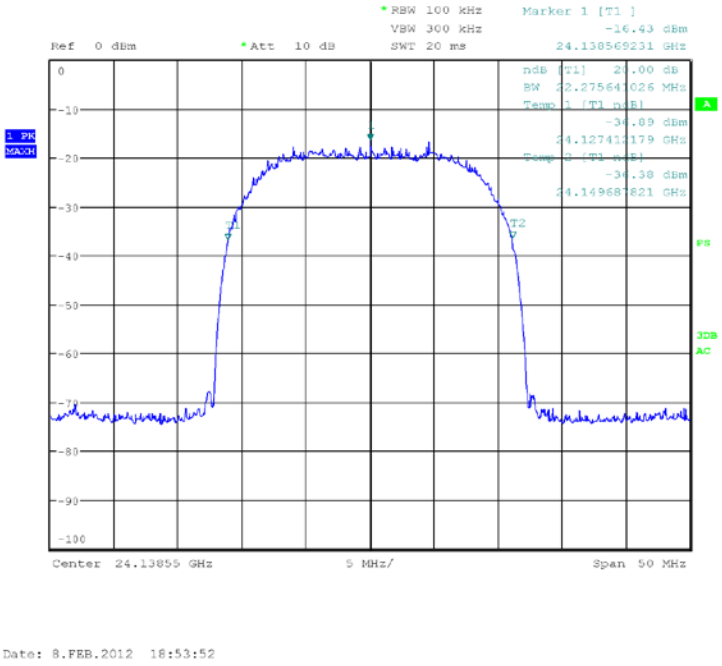

Figure 22: HC20_008

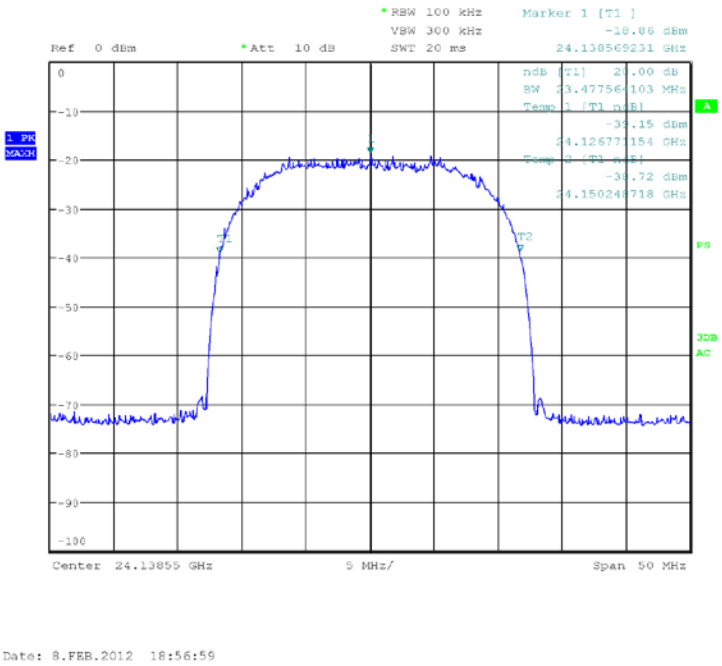

Figure 23: HC20_010

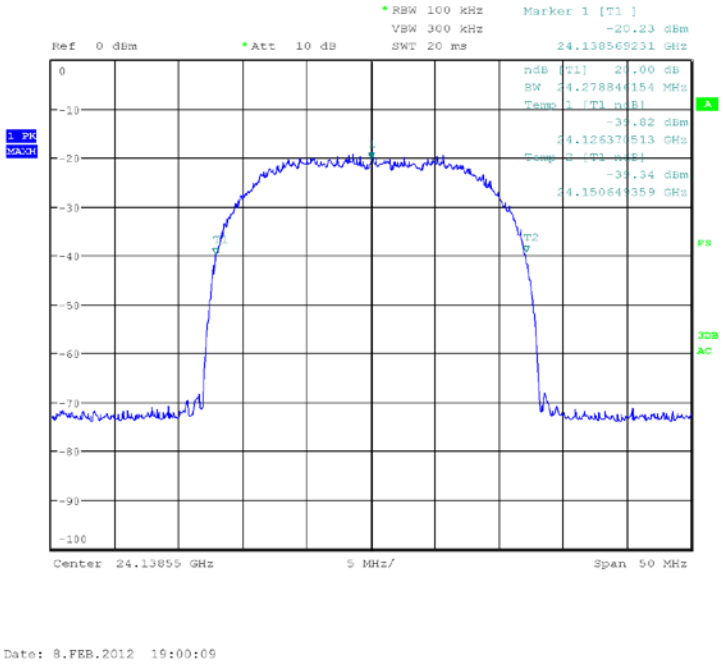

Figure 24: HC20_042

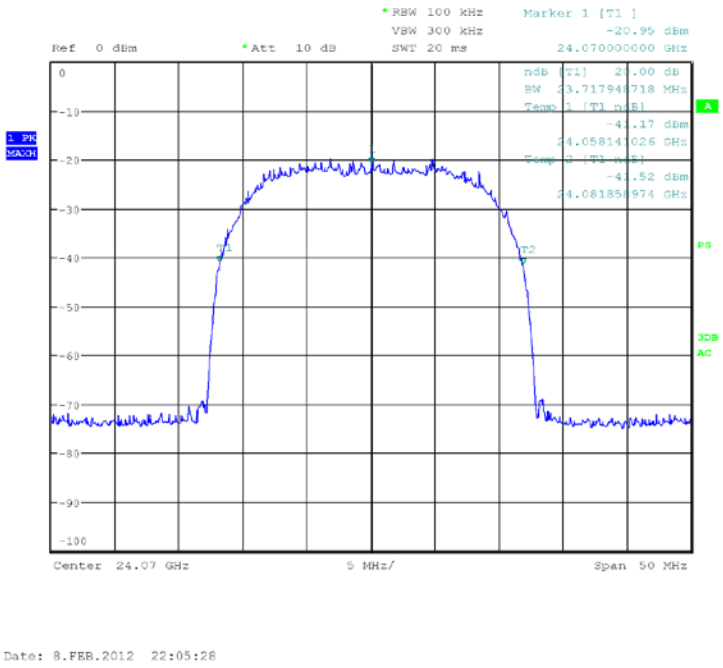

Figure 25: HC20_044

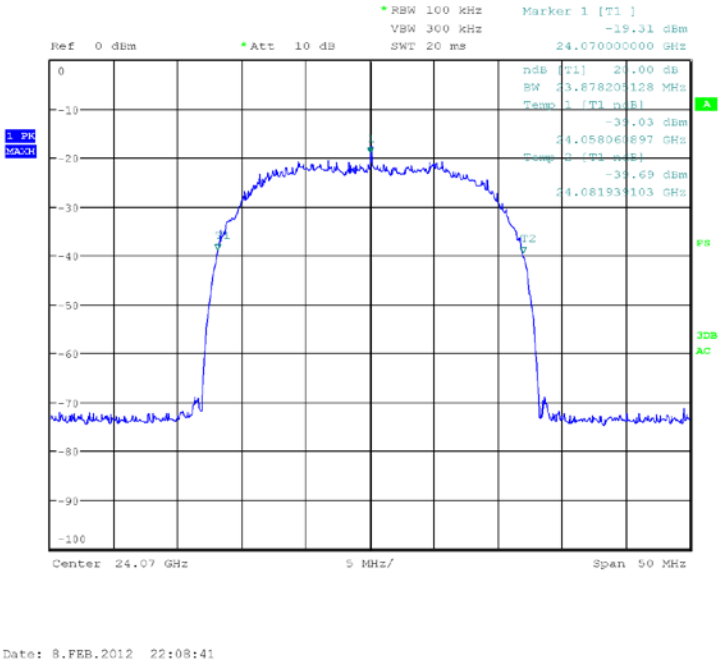

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Figure 26: HC20_046

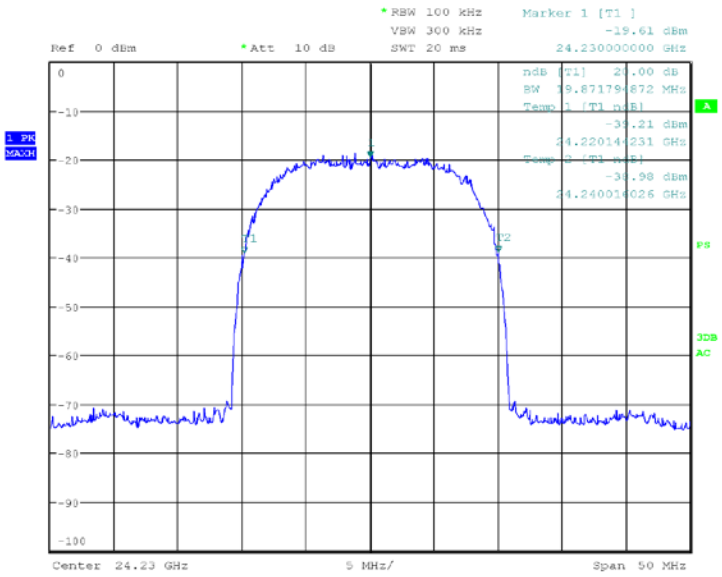

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Figure 27: HC20_048

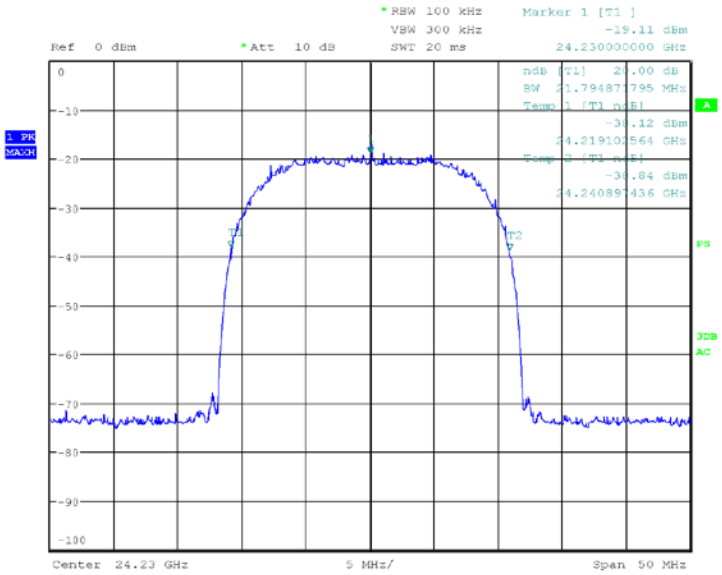

Figure 28: HC20_050

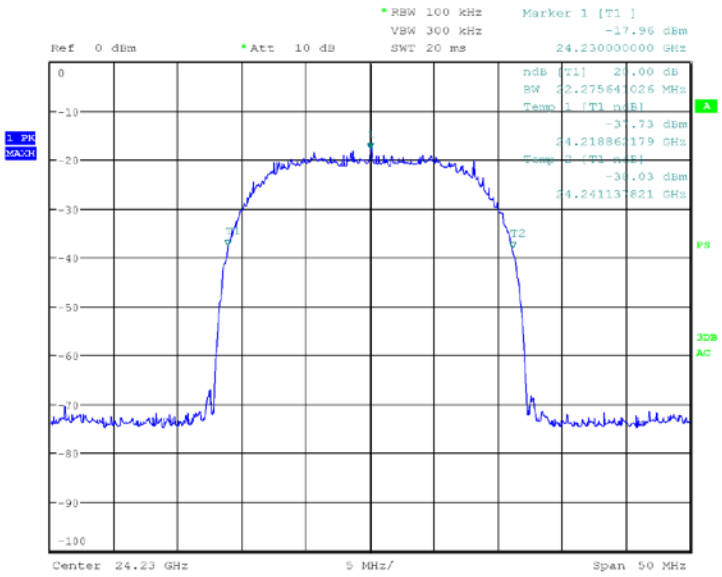

Figure 29: HC20_052

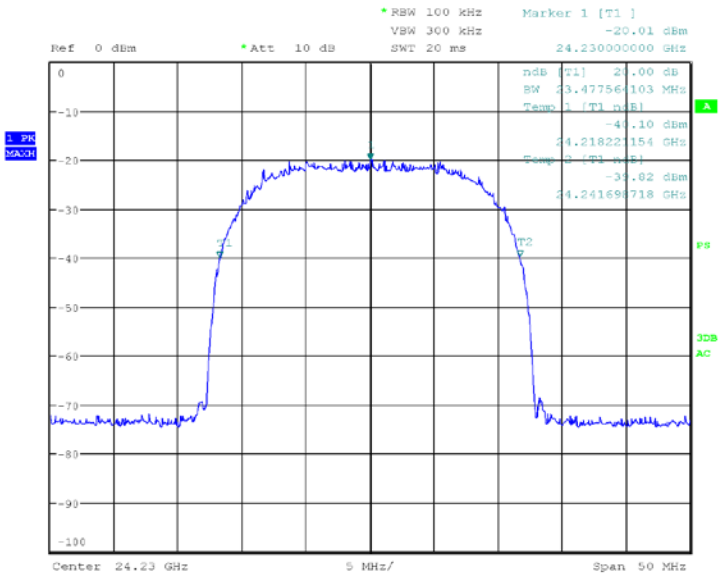

Figure 30: HC20_054

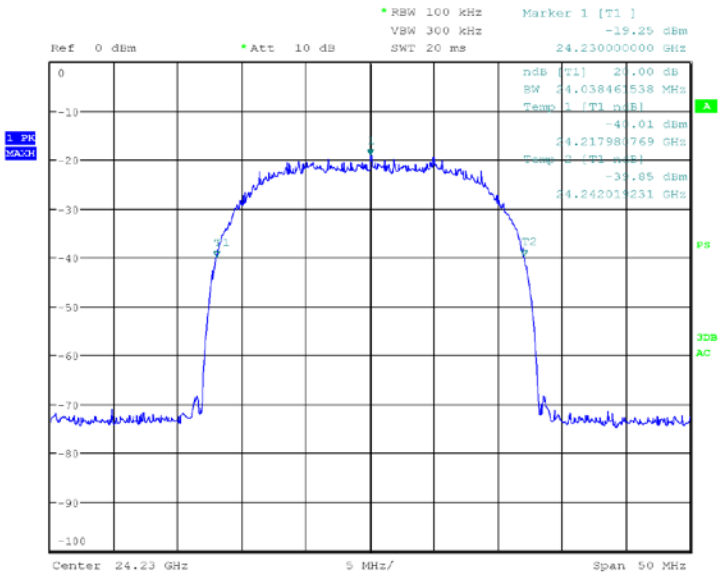

Figure 31: HC20_056

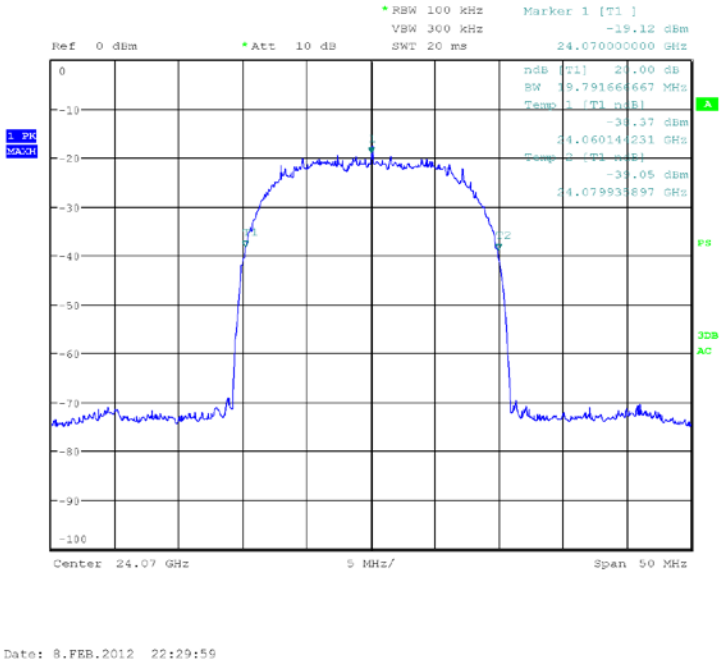

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Figure 32: HC20_057

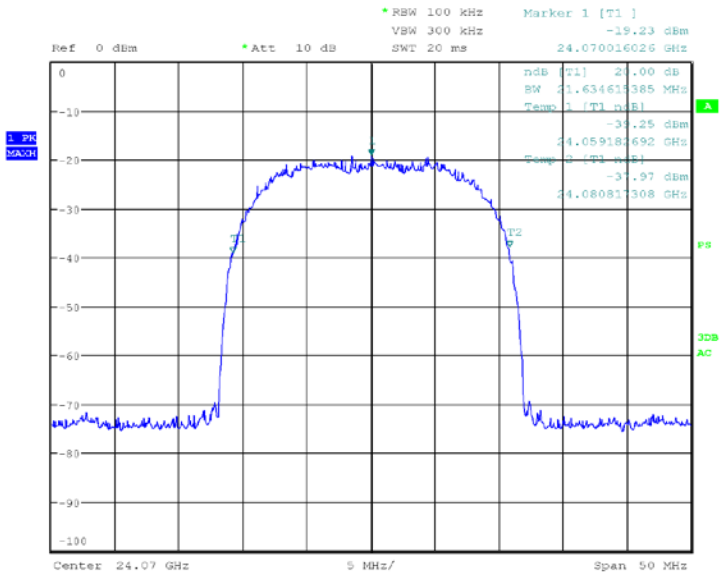

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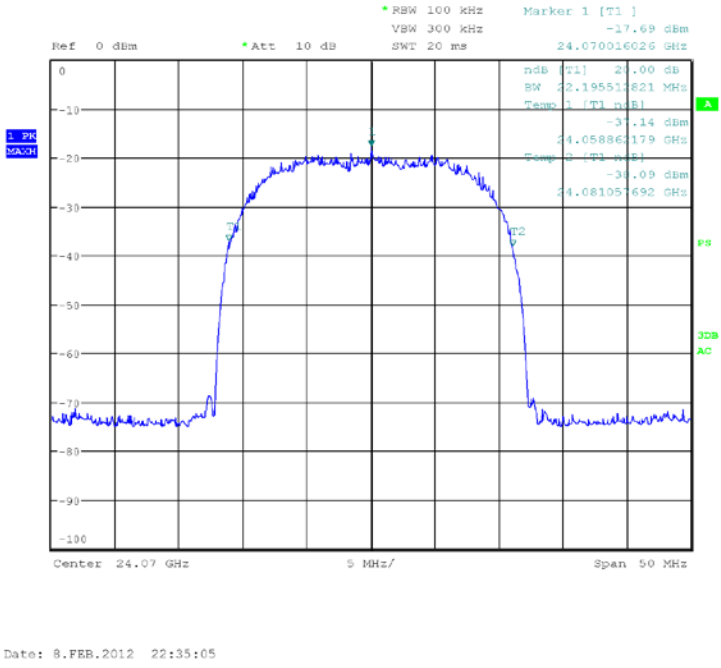
Figure 33: HC20_058



7.2 Appendix B: Test setup photographs

Photographs of the EMC test setups are as follows.

Figure 34: Configuration 1

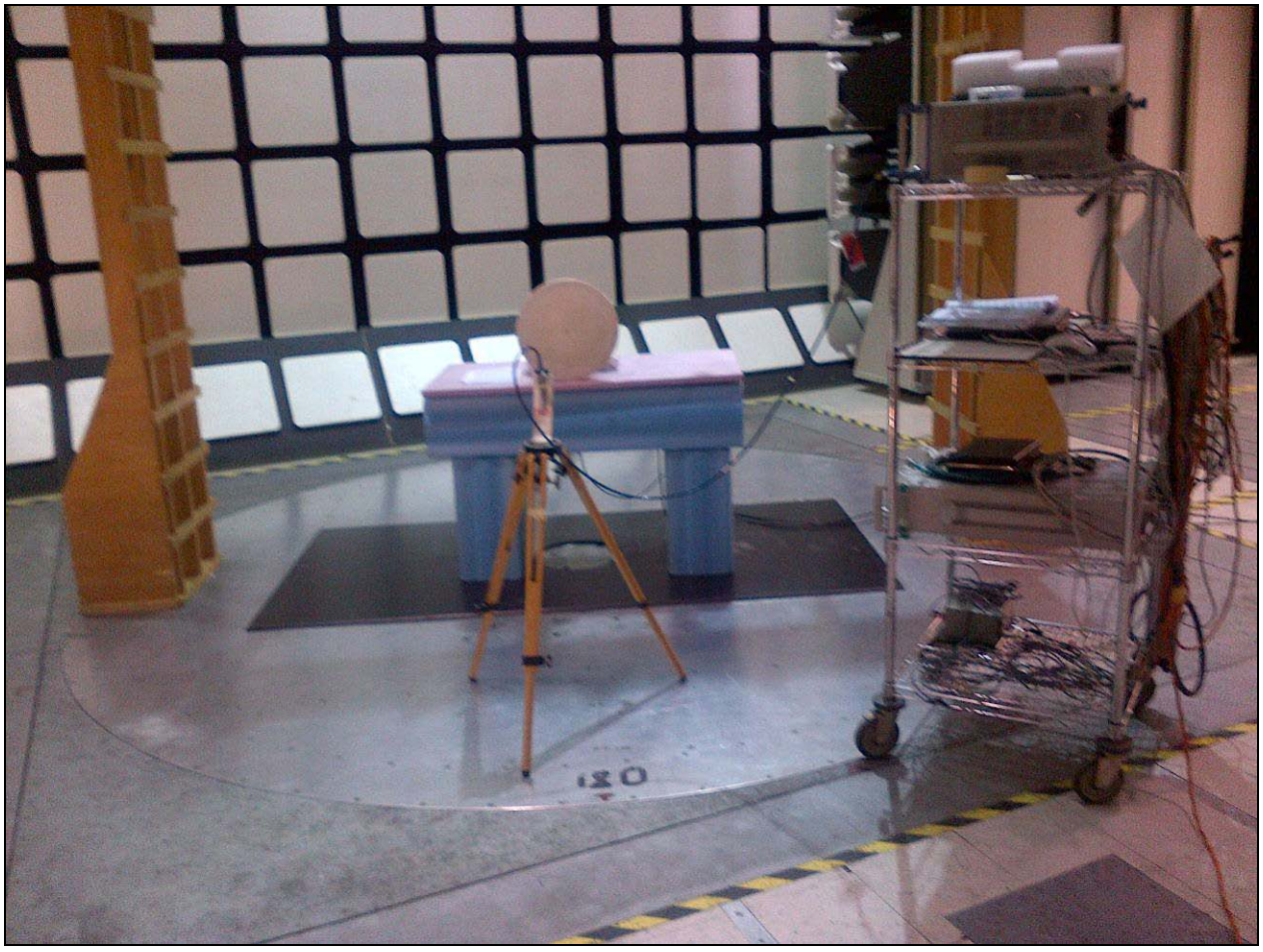


Figure 35: Configuration 1

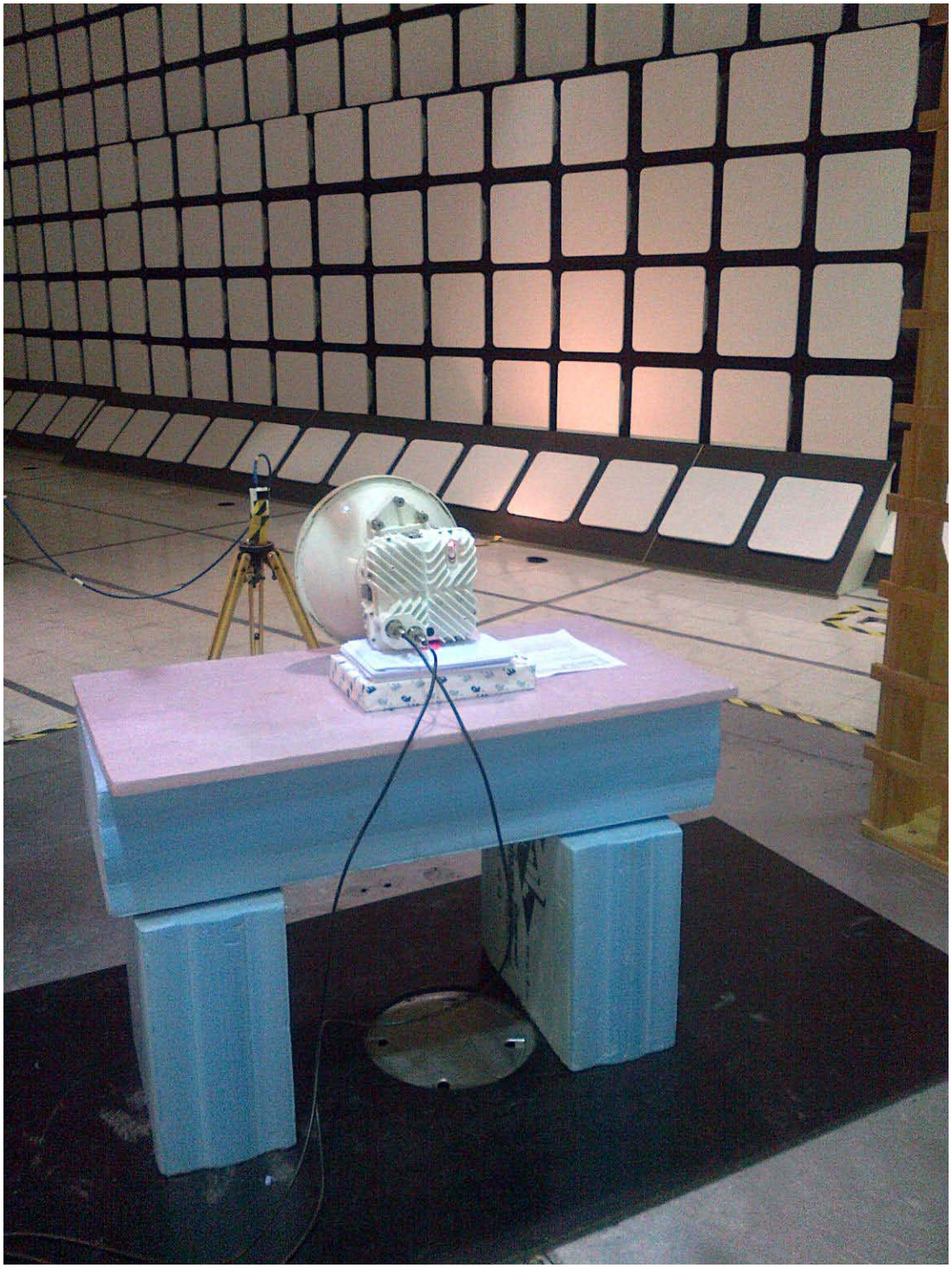


Figure 36: Configuration 2

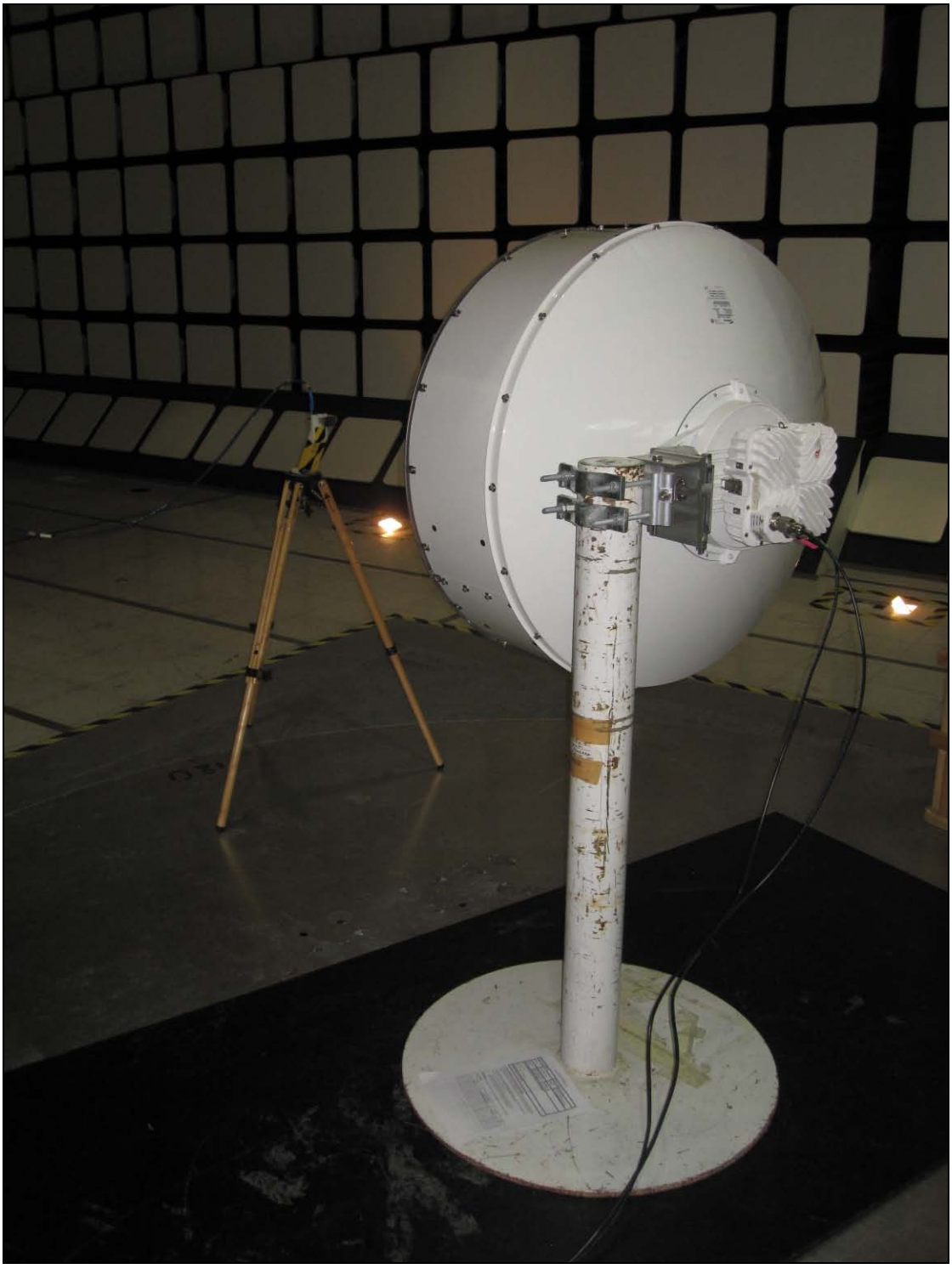
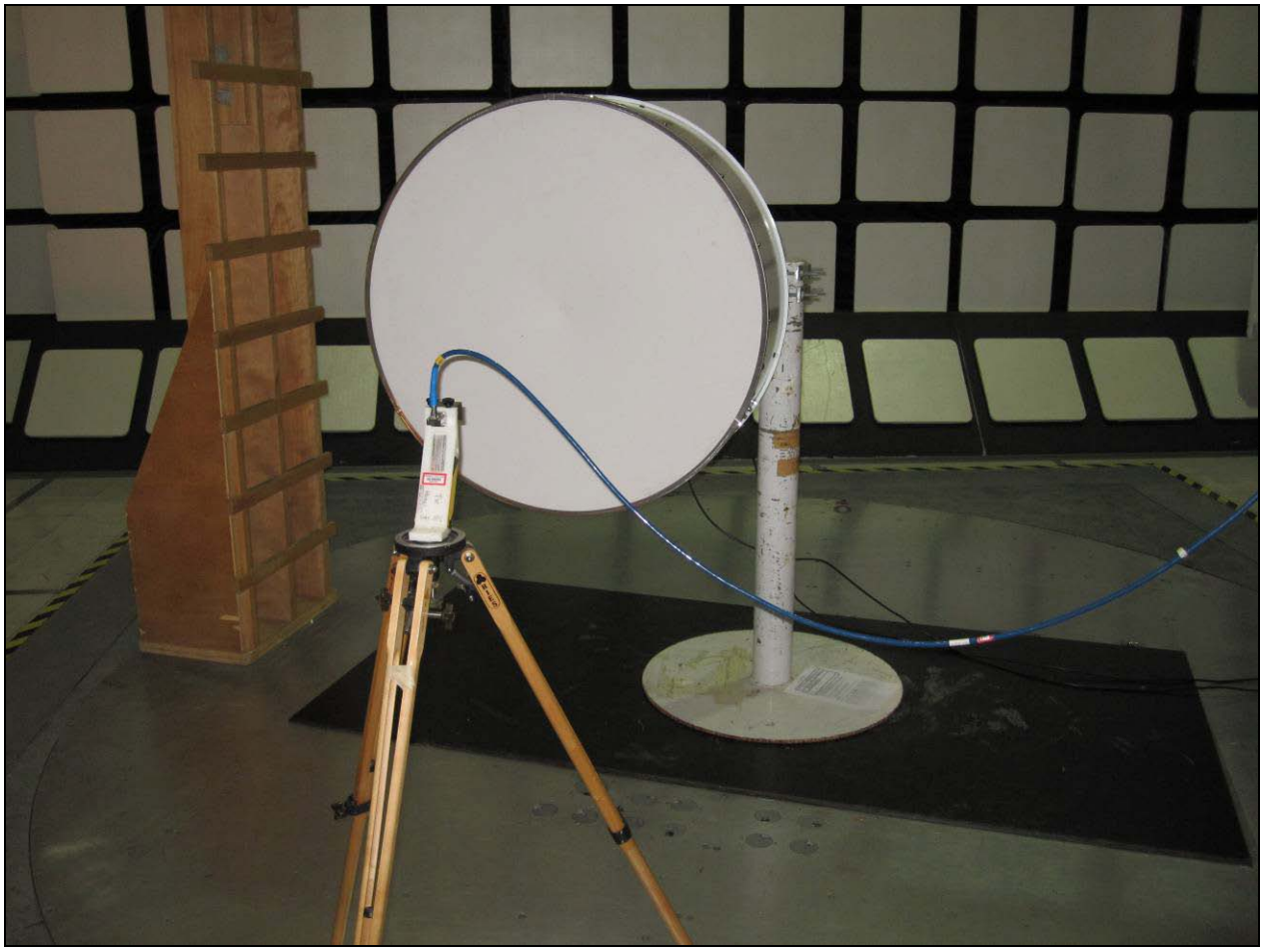


Figure 37: Configuration 2



7.3 Appendix C: Abbreviations

The abbreviations of terms used in this document are as follows.

Term	Definition
A	6 dB Coaxial Attenuator (conducted immunity)
AE	Auxiliary Equipment
AFC	Ambient Free Chamber
ANSI	American National Standards Institute
AVG	Average detector
CE	Conducted Emissions
CI	Conducted Immunity
CISPR	Comité International Spécial Perturbation Radioélectrique (International Special Committee on Radio Interference)
CSA	Canadian Standards Association
dB	Decibel
DVC	Design Validation Centre (Flextronics)
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Normative
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
GND	Ground
IC	Industry Canada
ICES	Canadian Specification: ICES-003, Issue 3, “Spectrum Management: Interference-causing equipment standard (Digital Apparatus)
IEC	International Electro technical Association
LISN	Line Impedance Stabilization Network
NA, na	not applicable
NAMAS	National Measurement Accreditation Service
PK	Peak Detector
PPS	Programmable Power Supply
PS	Power Supply
QP	Quasi-peak Detector

Term	Definition
QPA	Quasi-peak Adapter (for the Spectrum Analyzer)
RBW	Resolution Bandwidth
RE	Radiated Emissions
RF	Radio-Frequency
SA	Spectrum Analyzer, the CISPR 16, ANSI C63.2 Compliant EMI meter
SCC	Standards Council of Canada
TL	Transient Limiter
UKAS	United Kingdom Accreditation Service
VBW	Video Bandwidth

Flextronics Canada Design Services Inc.

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