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Test report

237982-1TRFWL

Date of issue: January 22, 2014

Applicant:

ALCOMA a.s.

Product:

ZENITH 80

Model:

ZENITH80

FCC ID:

2ABD6AL80GMPBDP

Specification:

- FCC 47 CFR Part 101

  Fixed Microwave Services

Test location

Company name:	Nemko Canada Inc.
Address:	303 River Road
City:	Ottawa
Province:	Ontario
Postal code:	K1V 1H2
Country:	Canada
Telephone:	+1 613 737 9680
Facsimile:	+1 613 737 9691
Toll free:	+1 800 563 6336
Website:	www.nemko.com
Site number:	FCC: 176392; (3 m semi anechoic chamber)

Tested by:	Kevin Rose, Wireless/EMC Specialist
Reviewed by:	Andrey Adelberg, Senior Wireless/EMC Specialist
Date:	January 22, 2014
Signature:	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name:	ALCOMA a.s.
Address:	Vinsova 11
City:	Prague 10
Postal/Zip code:	106 00
Country:	Czech Republic

1.2 Test specifications

FCC 47 CFR Part 101	Fixed Microwave Services

1.3 Test methods

ANSI C64.3 v 2003	American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.5 Exclusions

None

1.6 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 101, intentional radiators test results

Part	Test description	Verdict
§2.1055	Frequency Stability	Pass
§101.109(c)	Occupied Bandwidth	Pass
§101.111(a)(2)	Emission Mask	Pass
§101.111(a)(2)	Spurious Emissions	Pass
§101.113(a)	ERIP	Pass
§101.113(a)	Spectral Density	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	July 8, 2013
Nemko sample ID number	1 and 2

3.2 EUT information

Product name	ZENITH 80
Model	ZENITH80
Serial number	355157, and 373080

3.3 Technical information

Operating band	71–76 GHz and 81–86 GHz
Operating frequency	72–74.5 GHz and 82–84.5 GHz
Modulation type	BPSK
Emission designator	W7D
Power requirements	–48 Vdc
Antenna information	The EUT is professionally installed. Antenna gains are 52 and 47 dBi

3.4 Product description and theory of operation

Point to point radio link

3.5 EUT exercise details

The EUT was controlled by ASD software for power and channels.

3.6 EUT setup diagram

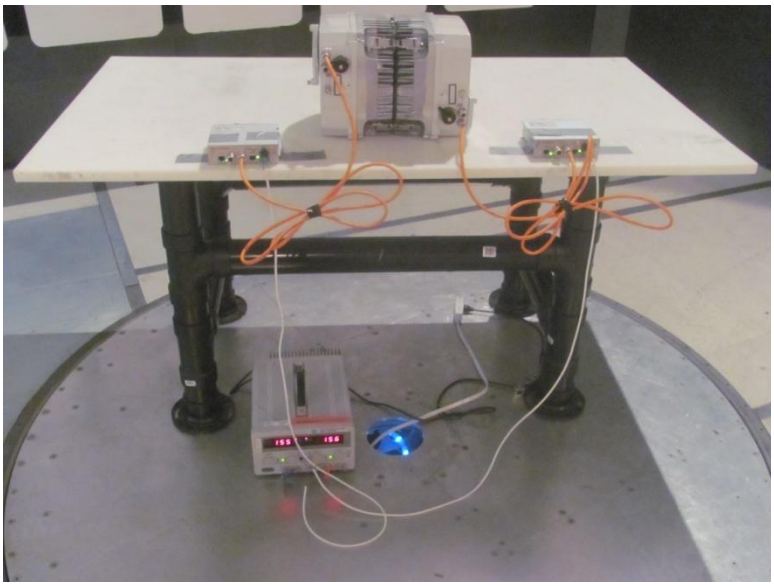

Figure 3.6-1: *Setup diagram*

3.7 EUT sub assemblies

Table 3.7-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
Control Box	Alcoma	-	-

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	Feb. 28/14
Bilog antenna	Sunol	JB3	FA002108	1 year	Feb. 21/14
Horn antenna #2	EMCO	3115	FA000825	1 year	Feb. 21/14
Horn antenna 18–40 GHz	EMCO	3116	FA001847	1 year	Sept. 06/13
40–60 GHz Harmonic mixer	OML	WR19 M19HWD	FA002322	3 year	Mar. 16/14
40–60 GHz Standard gain horn	Millitech	U SGH-19	FA002322	—	VOU
60–90 GHz Harmonic mixer	OML	WR12 M12HWD	FA001524	3 year	Mar. 16/14
60–90 GHz Standard gain horn	Millitech	U SGH-12	FA001524	—	VOU
90–140 GHz Harmonic mixer	OML	WR08 M08HWD	FA001525	3 year	Mar. 16/14
90–140 GHz Standard gain horn	Millitech	U SGH-08	FA001525	—	VOU
140–220 GHz Harmonic mixer	OML	WR05 M05HWD	FA001526	3 year	Mar. 16/14
140–220 GHz Standard gain horn	Millitech	U SGH-05	FA001526	—	VOU
Temperature chamber	Thermotron	SM-16C	FA001030	1 year	NCR
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/14
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/14
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 101.107(a) Frequency Stability

8.1.1 Definitions and limits

Equipment authorized to be operated in the 71,000–76,000 MHz, 81,000–86,000 MHz, 92,000–94,000 MHz and 94,100–95,000 MHz bands is exempt from the frequency tolerance requirement noted in the table of paragraph (a) of this section.

8.1.2 Test summary

Test date:	July 10, 2013	Temperature:	23 °C
Test engineer:	Kevin Rose	Air pressure:	1003 mbar
Verdict:	Pass	Relative humidity:	36 %

8.1.3 Observations, settings and special notes

The test is required in Part 2.1055 and therefore performed with the limit to be the authorized frequency bands.

Spectrum analyser settings:

Resolution bandwidth:	1 MHz
Video bandwidth:	≥3 × RBW
Frequency span:	1.5 time OBW
Detector mode:	Peak
Trace mode:	Max Hold

8.1.4 Test data

Table 8.1-1: *Frequency Stability*

Test conditions	20 dB point, High, GHz	20 dB point, Low, GHz	Center point, GHz	Frequency Drift, MHz
+55 °C, Nominal Voltage	86.919086	84.032868	84.032868	-24.038
+20 °C, Nominal Voltage +15%	86.957548	84.047292	84.047292	0
+20 °C, Nominal Voltage	86.957548	84.047292	84.047292	0
+20 °C, Nominal Voltage -15%	86.957548	84.047292	84.047292	0
–30 °C, Nominal Voltage	86.981586	83.996009	83.996009	-75.321

8.2 FCC 101.109 (c) Occupied bandwidth

8.2.1 Definitions and limits

(a) Each authorization issued pursuant to these rules will show, as the emission designator, a symbol representing the class of emission which must be prefixed by a number specifying the necessary bandwidth. This figure does not necessarily indicate the bandwidth actually occupied by the emission at any instant. The occupied bandwidth may be used in the emission designator.

(b) Stations in this service will be authorized any type of emission, method of modulation, and transmission characteristic, consistent with efficient use of the spectrum and good engineering practice, except that Type B, damped-wave emission will not be authorized.

(c) The maximum bandwidth which will be authorized per frequency assigned is set out in the table that follows. Regardless of the maximum authorized bandwidth specified for each frequency band, the Commission reserves the right to issue a license for less than the maximum bandwidth if it appears that a lesser bandwidth would be sufficient to support an applicant's intended communications.

Table 8.2-1: *Occupied Bandwidth Limit*

Frequency, GHz	Limit, MHz
71–76	5000
81–86	5000

8.2.2 Test summary

Test date:	July 11, 2013	Temperature:	22 °C
Test engineer:	Kevin Rose	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	33 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	1 MHz
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

8.2.4 Test data

Table 8.2-2: *Occupied bandwidth results*

Frequency, GHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz
72.0	2476	5000	2524
74.5	3252	5000	1748
82.0	2803	5000	2197
84.5	2821	5000	2179

8.2.4 Test data, continued

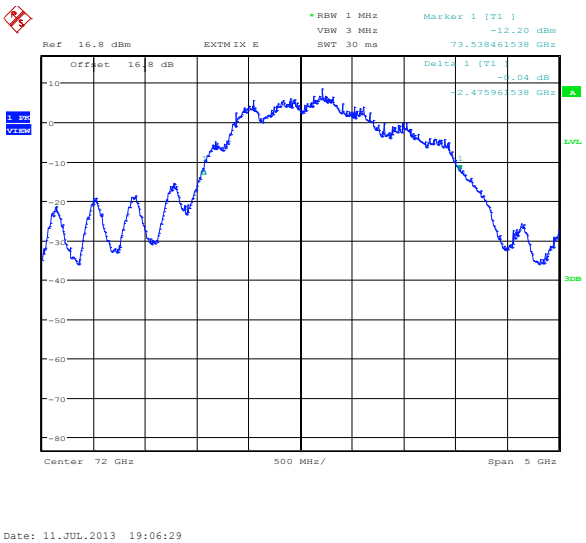

Figure 8.2-1: *Occupied bandwidth, 71–76 GHz sample plot*

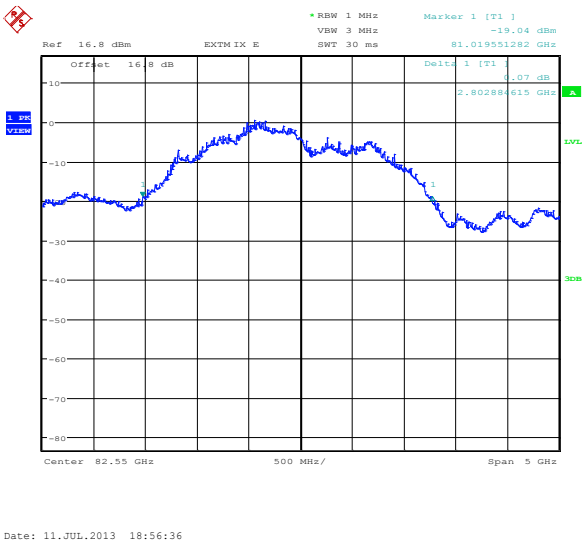

Figure 8.2-2: *Occupied bandwidth, 81–86 GHz sample plot*

8.3 FCC 101.113 (a) Transmitter output power and e.i.r.p. requirements

8.3.1 Definitions and limits

(a) On any authorized frequency, the average power delivered to an antenna in this service must be the minimum amount of power necessary to carry out the communications desired. Application of this principle includes, but is not to be limited to, requiring a licensee who replaces one or more of its antennas with larger antennas to reduce its antenna input power by an amount appropriate to compensate for the increased primary lobe gain of the replacement antenna(s). In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the values specified below. In cases of harmful interference, the Commission may, after notice and opportunity for hearing, order a change in the effective radiated power of this station. Further, the output power of a transmitter on any authorized frequency in this service may not exceed the following:

Table 8.3-1: *EIRP limits*

Frequency, GHz	Limit, dBW
71–76	55
81–86	55

The maximum transmitter power is limited to 3 watts (5 dBW) unless a proportional reduction in maximum authorized EIRP.
101.115(b)(2)-15) Antenna gain less than 50 dBi (but greater than or equal to 43 dBi) is permitted only with a proportional reduction in maximum authorized EIRP in a ratio of 2 dB of power per 1 dB of gain, so that the maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain becomes +55 − 2 × (50 − G), where G is the antenna gain in dBi.

8.3.2 Test summary

Test date:	July 11, 2013	Temperature:	22 °C
Test engineer:	Kevin Rose	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	33 %

8.3.3 Observations, settings and special notes

Spectrum analyzer settings were:

Resolution bandwidth:	1 MHz
Video bandwidth:	≥3 × RBW
Power integration:	3 GHz
Detector mode:	RMS
Trace mode:	Max Hold

8.3.4 Test data

Table 8.3-2: *EIRP measurements results*

Frequency, GHz	Conducted Power, dBm	Antenna gain, dBi	EIRP, dBm	EIRP, dBW	EIRP limit, dBW	EIRP margin, dB
72.0	18.01	47	65.01	35.01	49	13.99
74.5	18.07	47	65.07	35.07	49	13.93
72.0	18.01	52	70.01	40.01	55	14.99
74.5	18.07	52	70.07	40.07	55	14.93
82.0	18.49	47	65.49	35.49	49	13.51
84.5	17.10	47	64.10	34.10	49	14.90
82.0	18.49	52	70.49	40.49	55	14.51
84.5	17.10	52	69.10	39.10	55	15.90

Note: dBW equals dBm plus 30 dB. For 47 dBi antenna the limit was calculated as follows: +55 – 2 × (50 – 47) = 49 dBW.

Table 8.3-3: *Maximum transmitter power measurements results*

Frequency, GHz	Conducted Power, dBm	Output power limit, dBm	Margin, dB
72.0	18.01	35	16.99
74.5	18.07	35	16.93
72.0	18.01	35	16.99
74.5	18.07	35	16.93
82.0	18.49	35	16.51
84.5	17.10	35	17.90
82.0	18.49	35	16.51
84.5	17.10	35	17.90

8.4 FCC 101.111 Emission limitations.

8.4.1 Definitions and limits

For operating frequencies above 15 GHz, in any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 11 decibels:

The emission mask for the 71–76 GHz, 81–86 GHz, 92–94 GHz, and 94.1–95 GHz bands used in the equation in paragraph (a)(2)(ii) of this section applies only to the edge of each channel, but not to sub-channels established by licensees. The value of P in the equation is for the percentage removed from the carrier frequency and assumes that the carrier frequency is the center of the actual bandwidth used. The value of B will always be 500 MHz. In the case where a narrower sub-channel is used within the assigned bandwidth, such sub-carrier will be located sufficiently far from the channel edges to satisfy the emission levels of the mask. The mean output power used in the calculation is the sum of the output power of a fully populated channel.

8.4.2 Test summary

Test date:	July 11, 2013	Temperature:	22 °C
Test engineer:	Kevin Rose	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	33 %

8.4.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 220 GHz. No unintentional emissions were detected.
EUT was set to transmit with 100 % duty cycle.
A 50 ohm matching impedance network and attenuation was used during testing.
Both radios were investigated and worst case sample plots were selected for the report.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

8.4.4 Test data

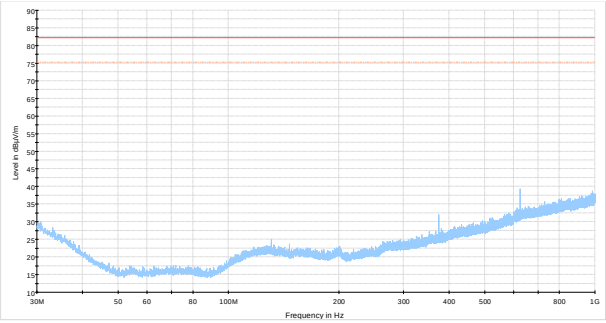

Figure 8.4-1: *Radiated spurious emissions 30–1000 MHz Sample plot*

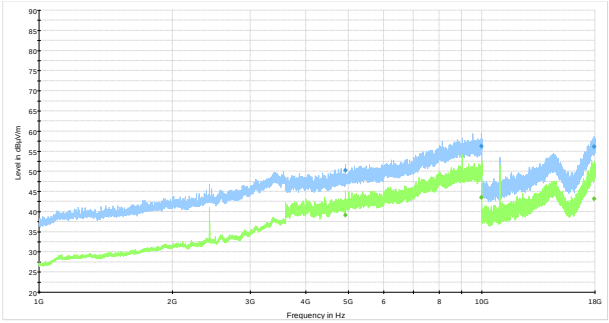

Figure 8.4-2: *Radiated spurious emissions 1–18 GHz Sample plot*

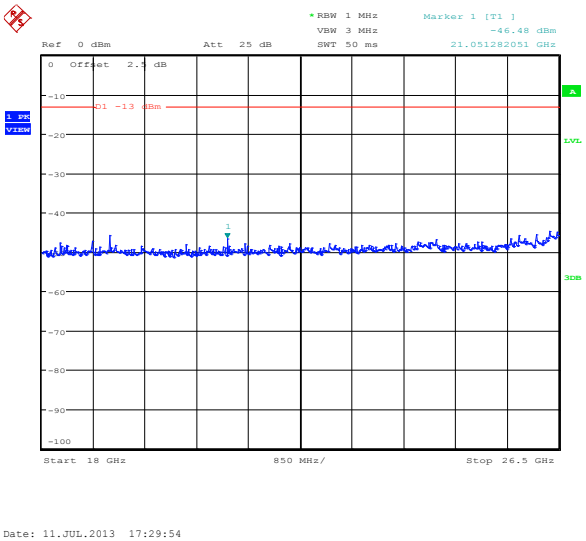

Figure 8.4-3: *Radiated spurious emissions 18–26.5 GHz Sample plot*

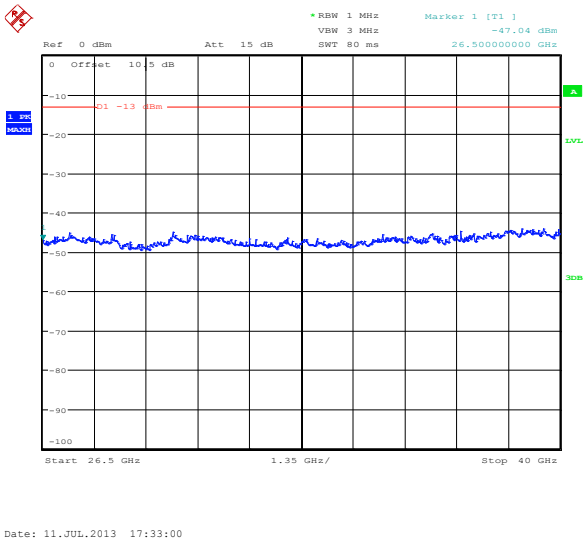

Figure 8.4-4: *Radiated spurious emissions 26.5–40 GHz Sample plot*

8.4.1 Test data, continued

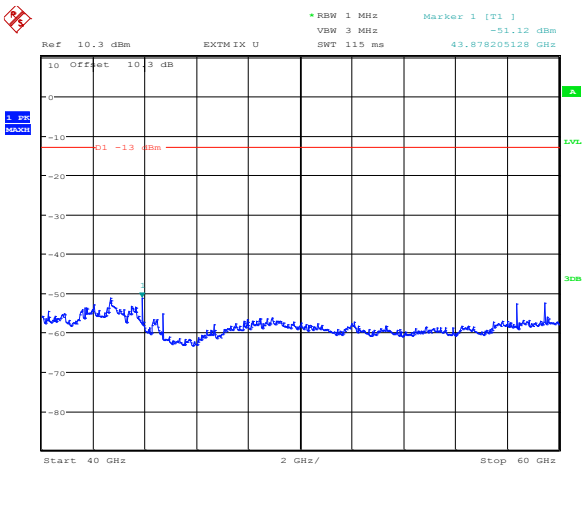

Figure 8.4-5: *Radiated spurious emissions 40–60 GHz Sample plot*

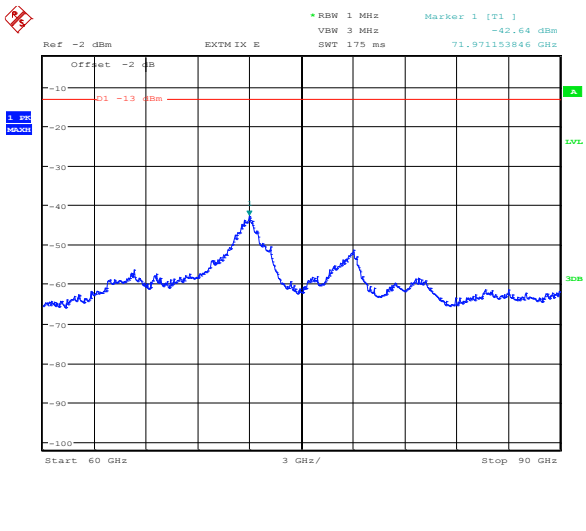

Figure 8.4-6: *Radiated spurious emissions 60–90 GHz Sample plot*

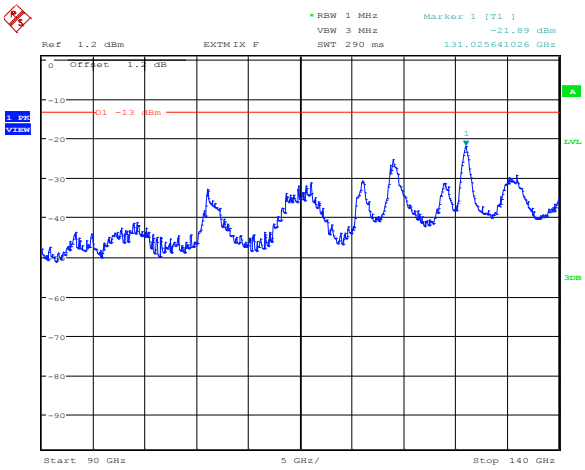

Figure 8.4-7: *Radiated spurious emissions 90–140 GHz Sample plot*

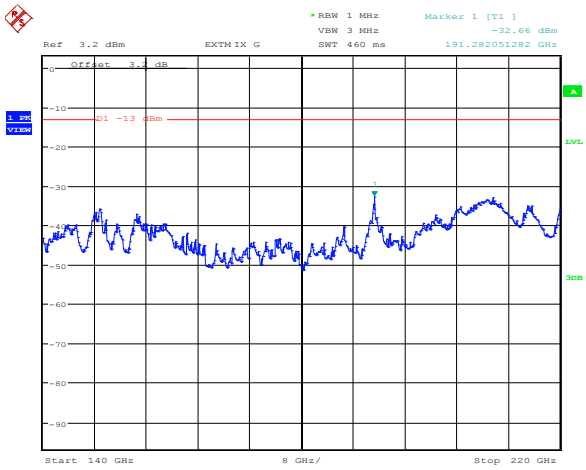

Figure 8.4-8: *Radiated spurious emissions 140–220 GHz Sample plot*

8.4.1 Test data, continued

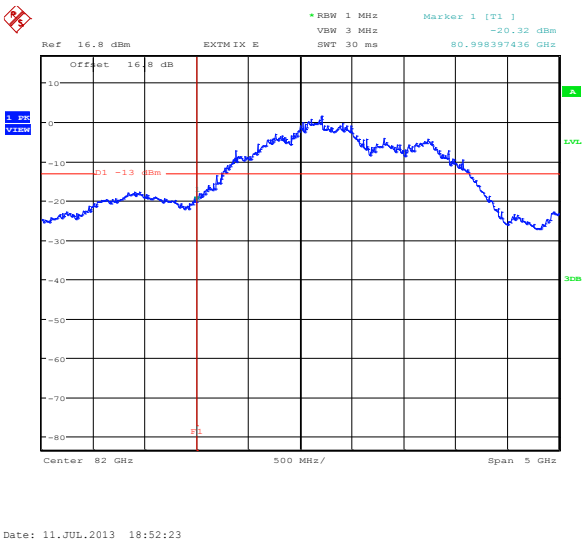

Figure 8.4-9: *81–86 GHz lower band edge*

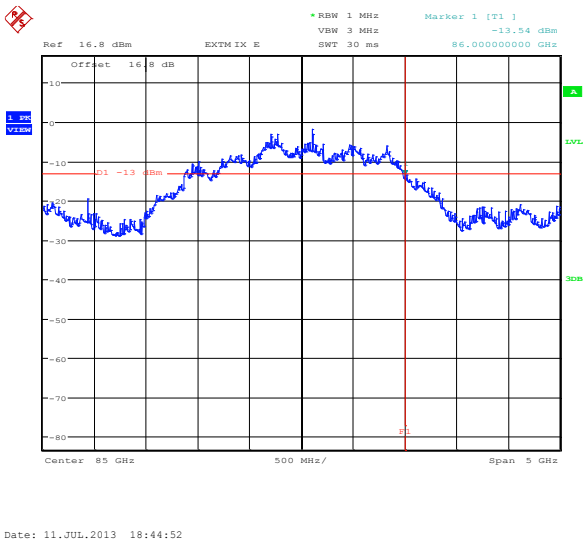

Figure 8.4-10: *81–86 GHz upper band edge*

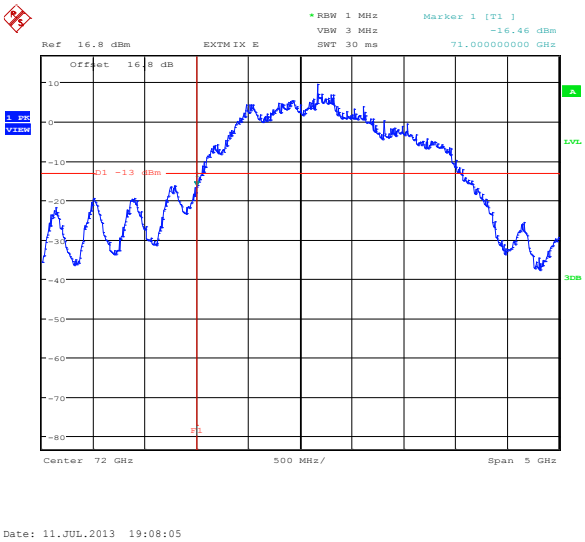

Figure 8.4-11: *71–76 GHz lower band edge*

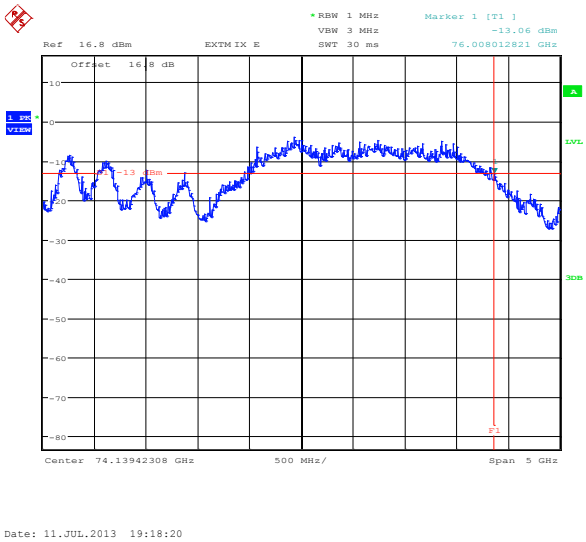

Figure 8.4-12: *71–76 GHz upper band edge*

8.5 FCC 101.113 Power spectral density

8.5.1 Definitions and limits

The maximum transmitter power spectral density is limited to 150 mW per 100 MHz.

8.5.2 Test summary

Test date:	July 11, 2013	Temperature:	22 °C
Test engineer:	Kevin Rose	Air pressure:	1005 mbar
Verdict:	Pass	Relative humidity:	33 %

8.5.3 Observations, settings and special notes

None

Resolution bandwidth:	1 MHz
Video bandwidth:	10 MHz
Frequency span:	5 GHz
Detector mode:	RMS
Trace mode:	Power average

8.5.4 Test data

Table 8.5-1: *PSD measurements results*

Frequency, GHz	PSD, dBm/100 MHz	PSD, mW/100 MHz	PSD limit, 150 mW/100 MHz	Margin, mW
72.0	5.21	3.32	150	146.68
74.5	5.48	3.53	150	146.47
82.0	8.08	6.43	150	143.57
84.5	4.94	3.12	150	146.88

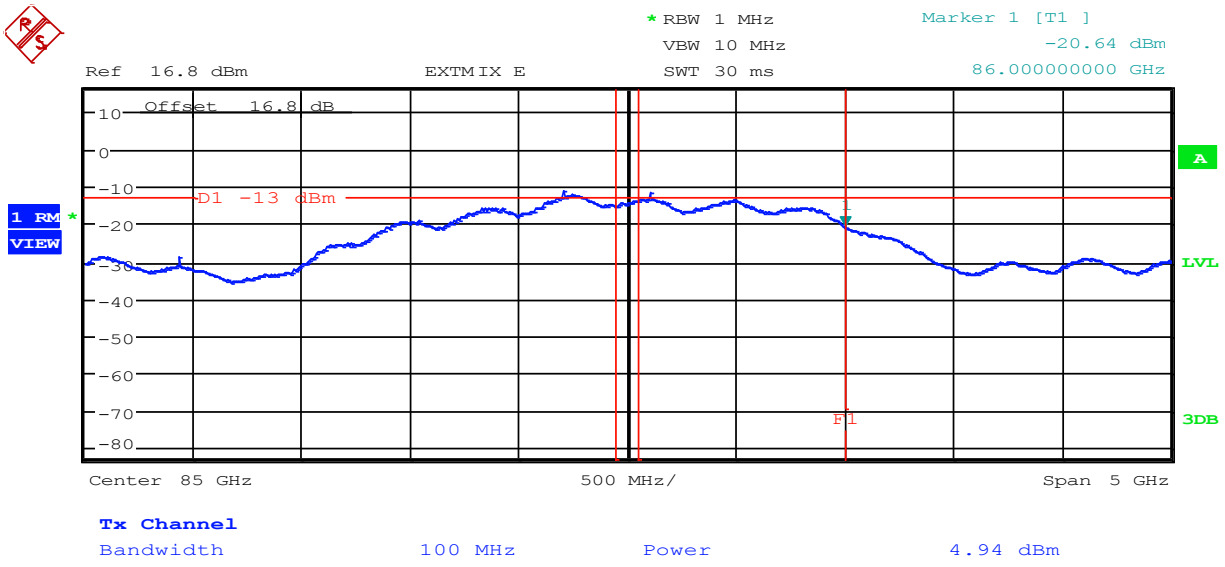

Figure 8.5-1: *PSD sample plot*

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up