TÜVRheinland®
Electronic Products and Services (EPS) B.V.

Test Report No.:	**13031902.fcc03**		*Page 1 of 41*
Client:	**N.V. Nederlandsche Apparatenfabriek "Nedap"** Parallelweg 2, 7141 DC Groenlo Netherlands		
Test Item:	**Spread Spectrum Transmitter (DSS)** **UHF RFID Reader**		
Identification:	**!D POS Region 2**	*Serial No.:*	**D422 A001**
Project No.:	**13031902**	*Date of Receipt:*	**2013-04-25**
Testing Location:	**TÜV Rheinland EPS B.V.** Eiberkamp 10 9351VT Leek		
Test Specification:	FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-12 Edition) RSS-Gen (issue 3, December 2010) an RSS-210 (Issue 8, December 2010) ANSI C63.10: 2009		
Test Result:	*The test item **passed** the test specification(s).*		
Testing Laboratory:	**TÜV Rheinland EPS B.V.** Eiberkamp 10 9351 VT Leek		

Tested by:			*Reviewed by:*		
2013-06-07	R. van der Meer / Inspector		2013-06-07	O. Hoekstra / Reviewer	
Date	*Name/Position*	*Signature*	*Date*	*Name/Position*	*Signature*

Other Aspects: N/A

Abbreviations:

P(ass)	=	***passed***
F(ail)	=	***failed***
N/A	=	***not applicable***
N/T	=	***not tested***

TEST SUMMARY

5.1.1 CONDUCTED OUTPUT POWER
RESULT: PASS

5.1.2 20DB BANDWIDTH
RESULT: PASS

5.1.3 CONDUCTED SPURIOUS EMISSION
RESULT: PASS

5.1.4 BAND EDGE CONDUCTED EMISSIONS
RESULT: Pass

5.1.5 RADIATED SPURIOUS EMISSIONS OF THE TRANSMITTER IN RESTRICTED BANDS
RESULT: PASS

5.1.6 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER
RESULT: PASS

5.2 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER
RESULT: PASS

***6* Number of hopping channels, Carrier frequency separation, Average time of occupancy**
RESULT: PASS

Contents

1. General Remarks

1.1 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland EPS B.V., located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-2. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

Normal test conditions:

Temperature (*) : +15°C to +35°C
Relative humidity(*) : 20 % to 75 %
Supply voltage : 120VAC/60Hz
Air pressure : 950 – 1050 hPa

When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For Antenna Port Conducted Emission					
Spectrum Analyzer	Rohde & Schwarz	FSV	99733	05-24/2012	05-24/2013
Temperature-Humiditymeter	Extech	SD500	99857	02/2013	02/2014
RF Cable	S+H	ST18	99736	04/2013	04/2014
20 dB attenuator	S+H	6620	--	04/2013	04/2014
For Radiated Emission					
Measurement Receiver	Rohde & Schwarz	ESCI	99699	03/2013	03/2014
RF Cable S-AR	Gigalink	APG0500	99858	02/2013	02/2014
Controller	Heinrich Deisel	4630-100	99107	N/A	N/A
Test fascility	Comtest	FCC listed: 90828 IC listed: 2932G-2	99580	02/2012	02/2015
Spectrum Analyzer	Rohde & Schwarz	FSV	99733	05-24/2012	05-24/2013
Spectrum Analyzer	Rohde & Schwarz	FSP	99538	12/2012	12/2013
Controller	EMCS	DOC202	99608	N/A	N/A
Antenna mast	EMCS	AP-4702C	99609	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	99855	02/2013	02/2014
Guidehorn 1-18 GHz	EMCO	3115	12484	04/2013	04/2014
Controller turntable			99861	N/A	N/A
Biconilog Testantenna	Chase	CBL 6111B	15633	01/2013	01/2014
Bandpass filter 4-10 GHz	Reactel	7AS-7G-6G-511	99076	N/A	N/A
Preamplifier 0.5 - 18 GHz	Miteq	AMF-5D-005180-28-13p	99596	N/A	N/A
For AC Line Conducted Emission					
Measurement Receiver	Rohde & Schwarz	ESCS30	15667	10-2012	10-2013
LISN	EMCO	3625/2	12512	01/2012	01/2014
Pulse limiter	R&S	ESH3-Z2	13313	01/2013	01/2014
Shielded room for Conducted emissions	--	--	99858	--	--
Variac 250V 6A	RFT	LTS006	99161	--	--

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.5dB
	> 1GHz	±0.7dB
AC Line Conducted emissions	150kHz - 30MHz	±3.5dB
Radiated Emission	150kHz - 30MHz	±5.0dB
	30MHz - 1GHz	±5.0dB
	> 1GHz	±5.5dB

3. General Product Information

3.1 Product Function and Intended Use

The brand Nedap model !D POS Region 2, hereafter refered to as EUT, is a Spread Spectrum Transmitter (DSS) intended to be used in a building access system.
The EUT is a UHF RFID reader and is factory configured for the 902.75-927.25 MHz band.

The content of this report and measurement results have not been changed other than the way of presenting the data.

3.2 System Details

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Spread Spectrum Transmitter (DSS)
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek “Nedap”
Brand	:	Nedap
Model	:	!D POS Region 2
Serial number	:	D422 A001
Voltage input rating	:	
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	external antenna.
Operating frequency range	:	902.75-927.25 MHz
Modulation	:	GFSK
Spreading technique	:	FHSS
Remarks	:	n.a.

Table 3: Interfaces present on the EUT

There is a Ethernet and an USB interface present on the EUT.
The USB interface is for servicing purposes only.

No.	Port	From	To	Remarks
1.	Mains	Mains	Laptop (AUX1)	Through a AC/DC power supply
2.	Mains	Mains	AUX2	--
3.	DC power	AUX2	EUT	--
4.	Data com.	Laptop USB or Ethernet	EUT	--

3.3 Clock Frequencies

The highest clock frequency generated by the EUT is 24.000 MHz.

3.4 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247 and RSS-Gen and RSS-210.

The test methods, which have been used, are based on ANSI C63.10: 2009.

During pretests no significant differences were observed in testresults while varying supply voltage from 85% to 115%.

For details, see under each test item.

4.2 Operation Modes

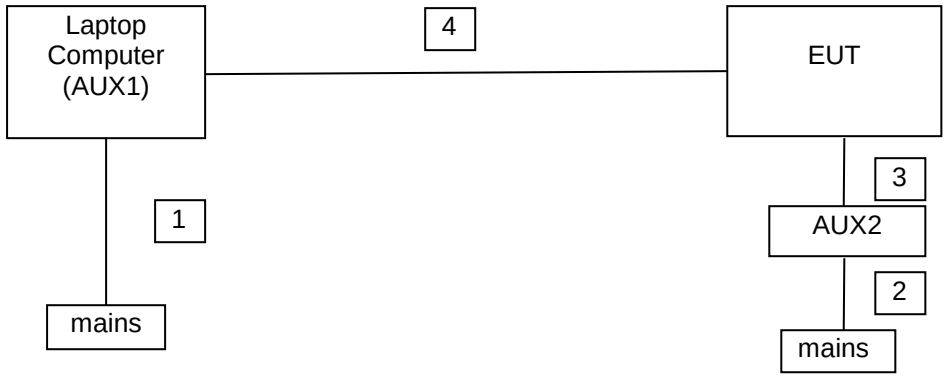
Testing was performed at the lowest operating frequency (902.75), at the operating frequency in the middle of the specified frequency band (915.00 MHz) and at the highest operating frequency (927.25 MHz).

4.3 Physical Configuration for Testing

The EUT was tested on a stand-alone basis and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10:2009.

Figure 1: Test Setup Diagram



Notes:

For more details, refer to the document: Test Set-Up Photographs document.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

Software used for testing: !D Reader Test Application.

This software was running on a laptop computer (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. AUX1
   Product: Laptop Computer
   Brand: HP
   Model: Compaq 610
   Serial Number: CNU94710W B
   Remark: property TR-EPS, host for testsoftware

2. AUX2
   Product: AC Power Adapter
   Brand: Power-WIN Technology Corp.
   Model: PW-024A-1Y240K
   Output Voltage: 24 Vdc
   Remarks: connects to EUT

5. Test Results

5.1 Conducted and Radiated Measurements

5.1.1 Conducted Output Power

RESULT: PASS

Date of testing: 2013-05-03

Requirements:

FCC 15.247(b)(2) and RSS-210 Section A8.4 (1)

For systems using frequency hopping in the 902-928 MHz band, the maximum peak output power is 1W (+30dBm) for systems employing at least 50 hopping channels.

Test procedure:

ANSI C63.10: 2009.

The Peak Conducted Output Power was measured using the method stated in section 6.10.1 in ANSI C63.10: 2009.

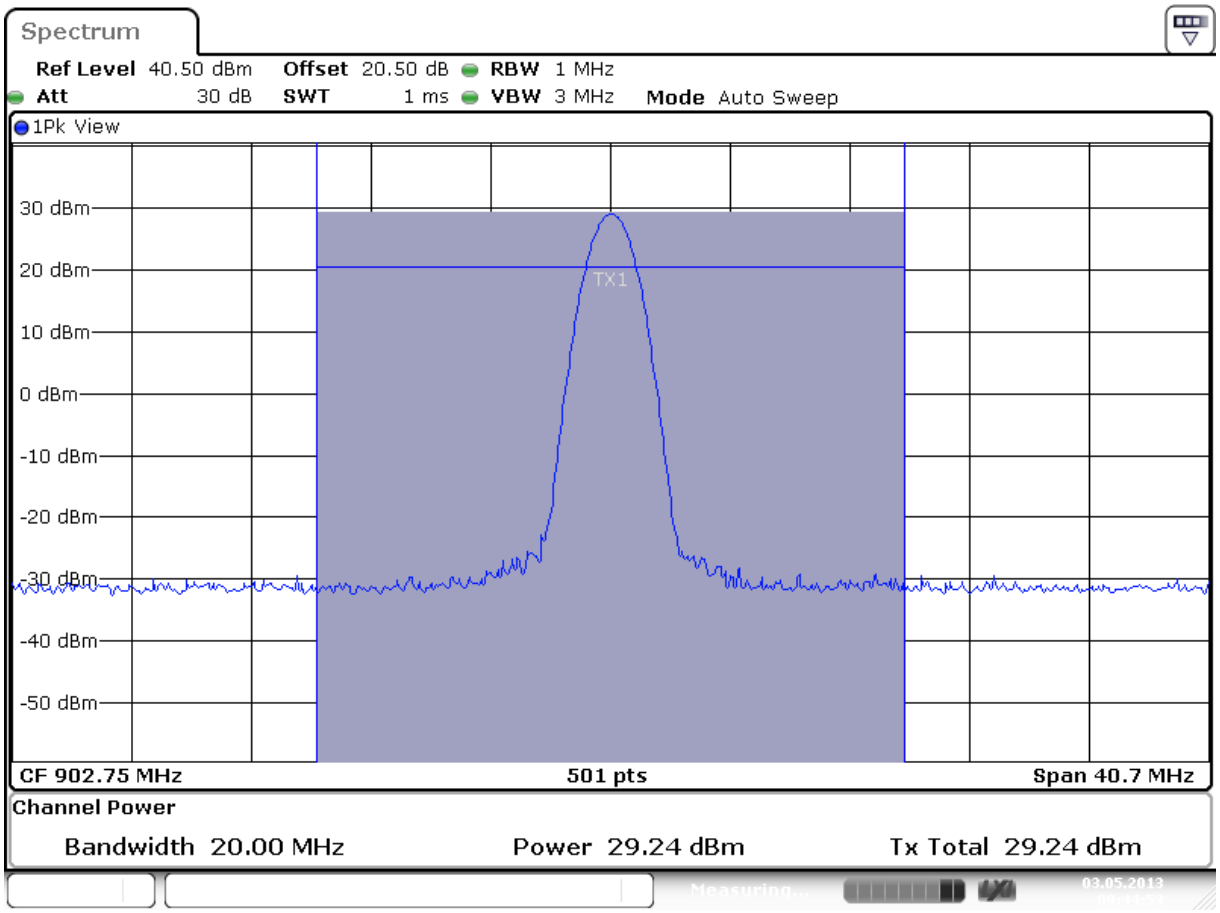
The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The final measurement takes into account the loss generated by all the involved cables and the attenuator.

Table 4: Conducted Output Power

Frequency [MHz]	Configured Average Output Power [dBm]	Output Peak Power [dBm]	Output Peak Power [mW]	Limit [dBm]	Limit [mW]	Result
902.75	28.0	29.2	831.8	+30	1000	Pass
915.00	28.0	29.2	831.8	+30	1000	Pass
927.25	28.0	29.0	794.3	+30	1000	Pass

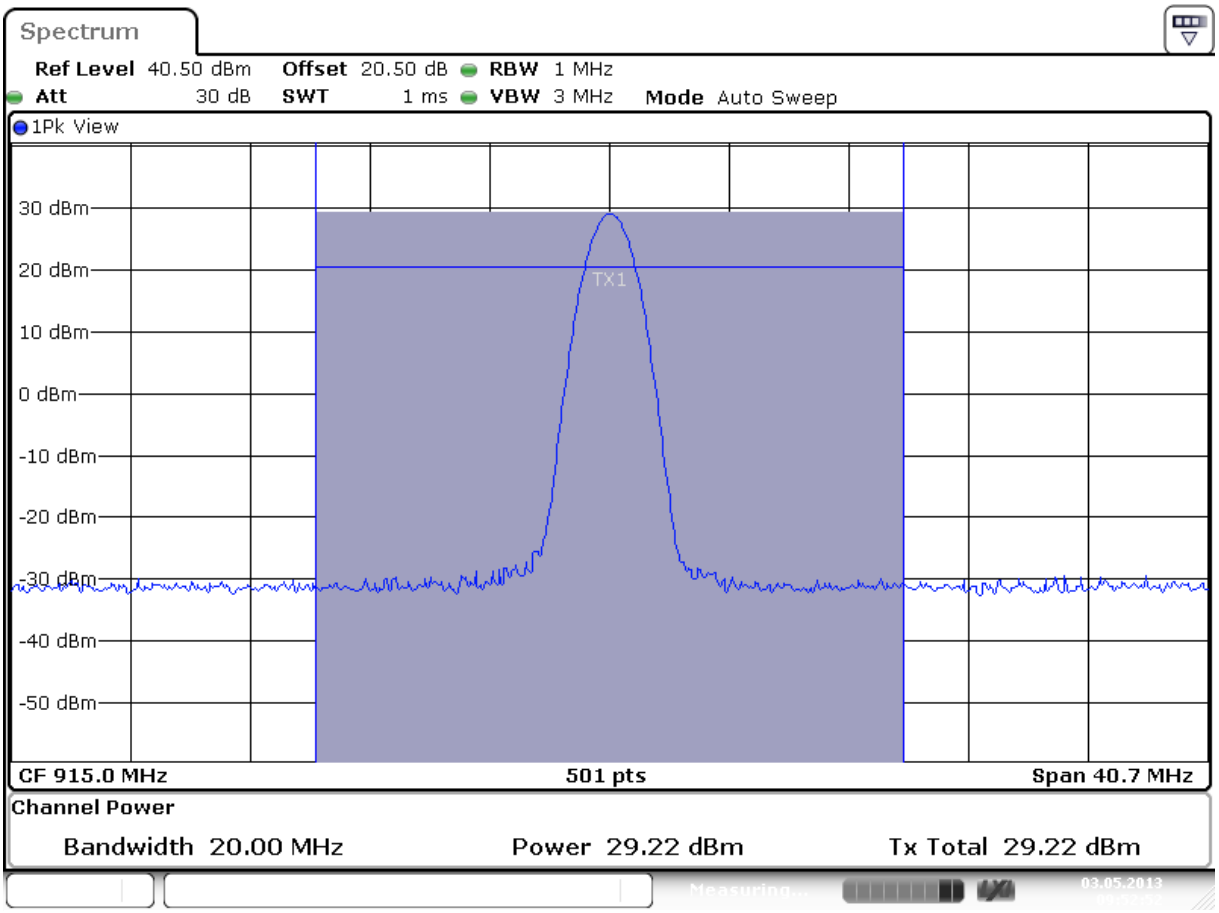
Notes: mW = 10 ^ (dBm/10)
dBm = 10 x log(mW)

plots : Peak power plots,
Plots on the next pages show the Peak Power outputs, correction factors included in the reading. Offset in the plots shown is 20.5 dB, this is the total loss of attenuators and cable used.



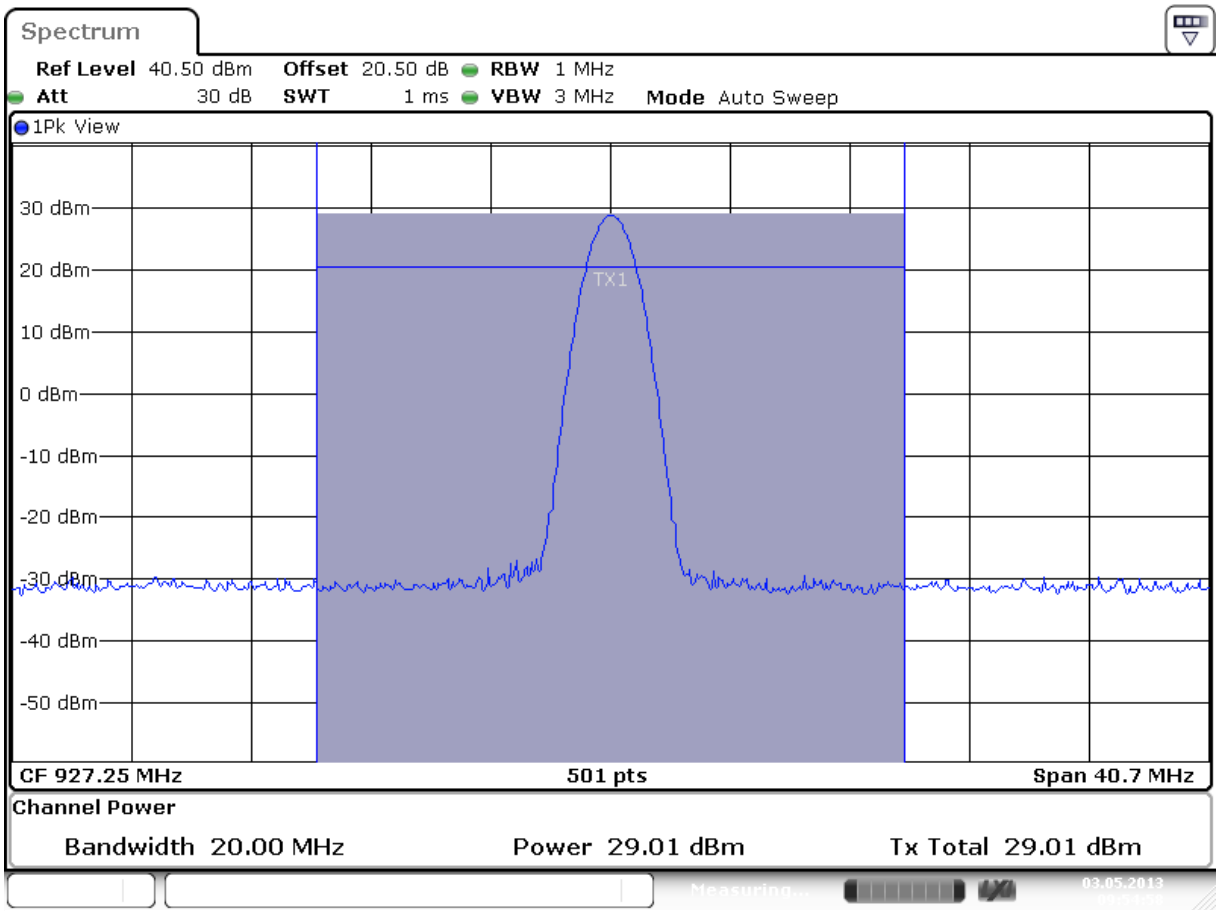
Date: 3.MAY.2013 09:44:53

Figure 2a Plot: Output Power (902.75 MHz)



Date: 3.MAY.2013 09:52:52

Figure 2b Plot: Output Power (915.00 MHz)



Date: 3.MAY.2013 09:54:58

Figure 2c Plot: Output Power (927.25 MHz)

5.1.2 20dB Bandwidth

RESULT: PASS

Date of testing: 2013-05-03

Requirements:

FCC 15.247(a)(1)(i) and RSS-210 Section A8.1(c).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall have at least have 50 hopping channels and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test procedure:

ANSI C63.10: 2009.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 10kHz and the span between 2 – 5 times the emission bandwidth.

Offset in the plots shown is 20.5 dB, this is the total loss of attenuators and cable used.

Note: 99% bandwidth is provided for info.

Table 5: 20dB Bandwidth

Operating Frequency [MHz]	20dB Bandwidth [kHz]	Limit [kHz]
902.75	71.06	<500
915.00	69.86	<500
927.25	74.65	<500

Figure 3: 20dB Bandwidth, 902.75 MHz

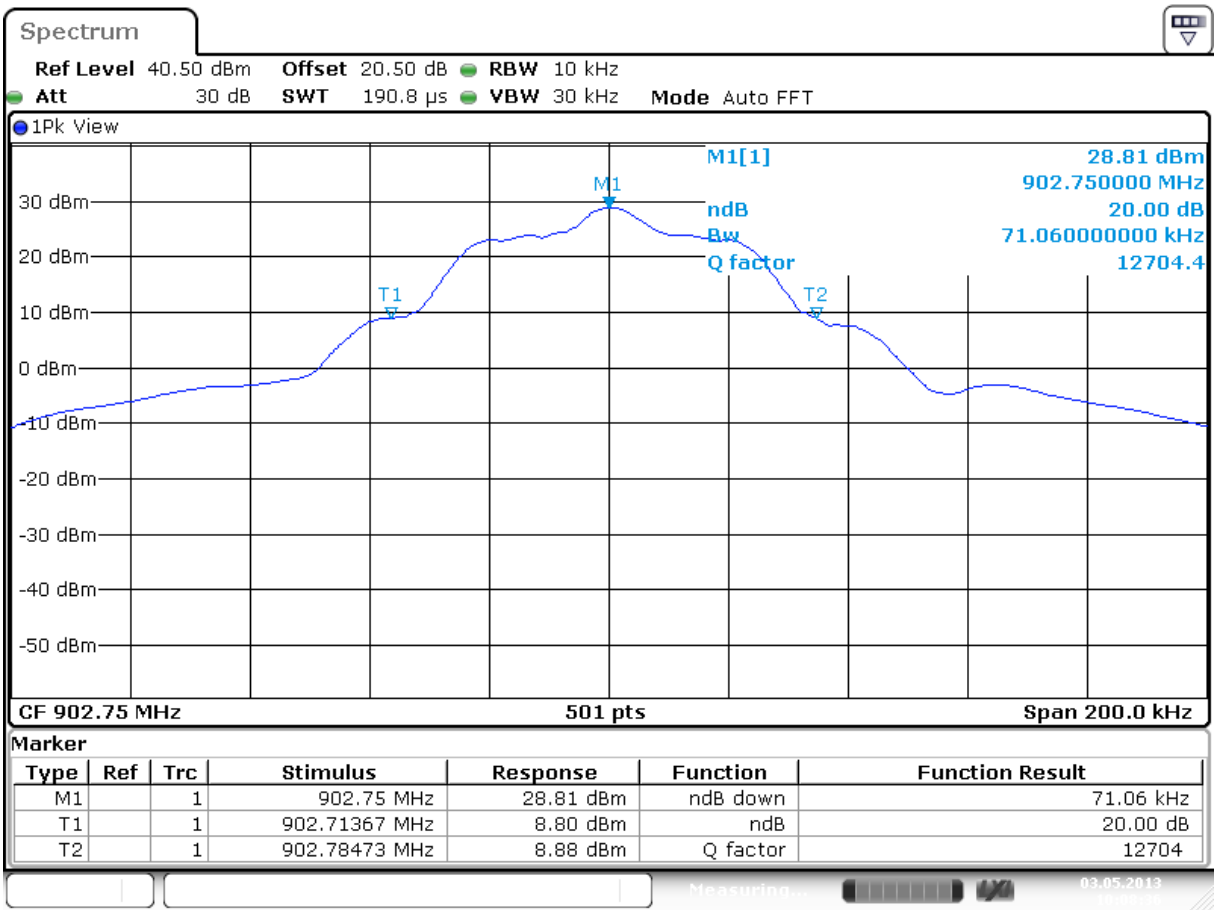


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Figure 4: 20dB Bandwidth, 915.00 MHz

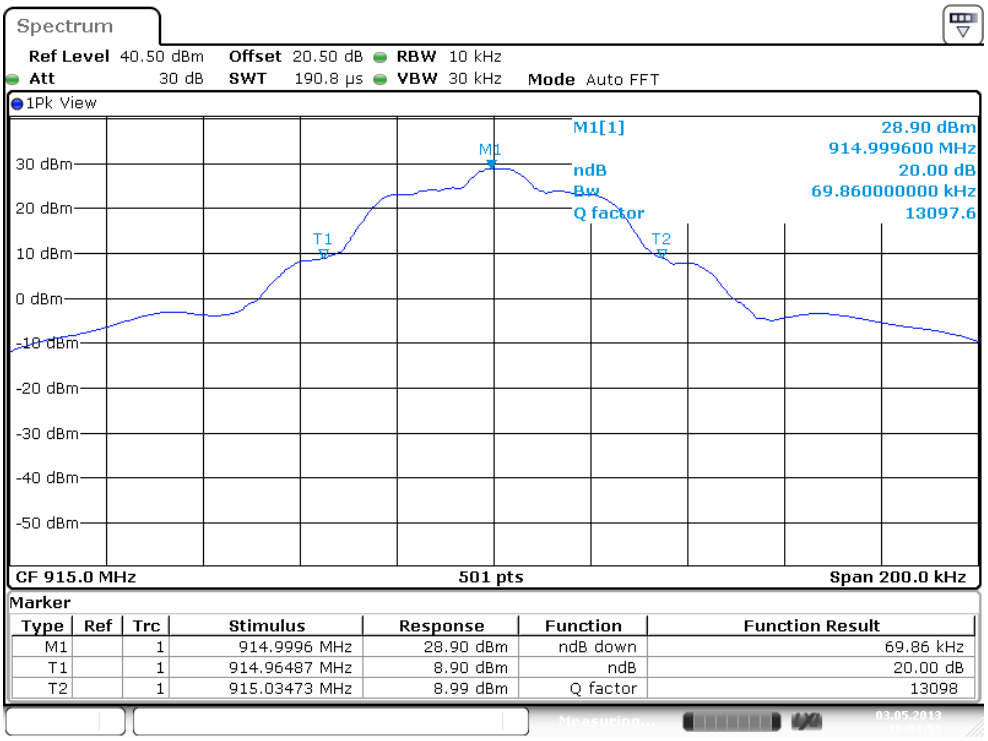


Figure 5: 20dB Bandwidth, 927.25 MHz

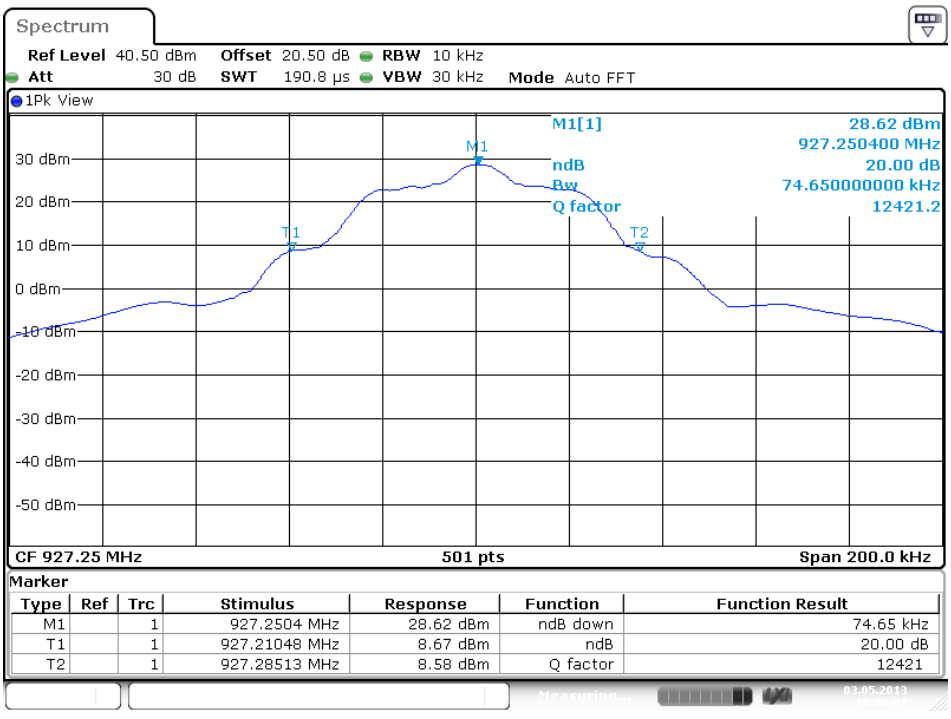
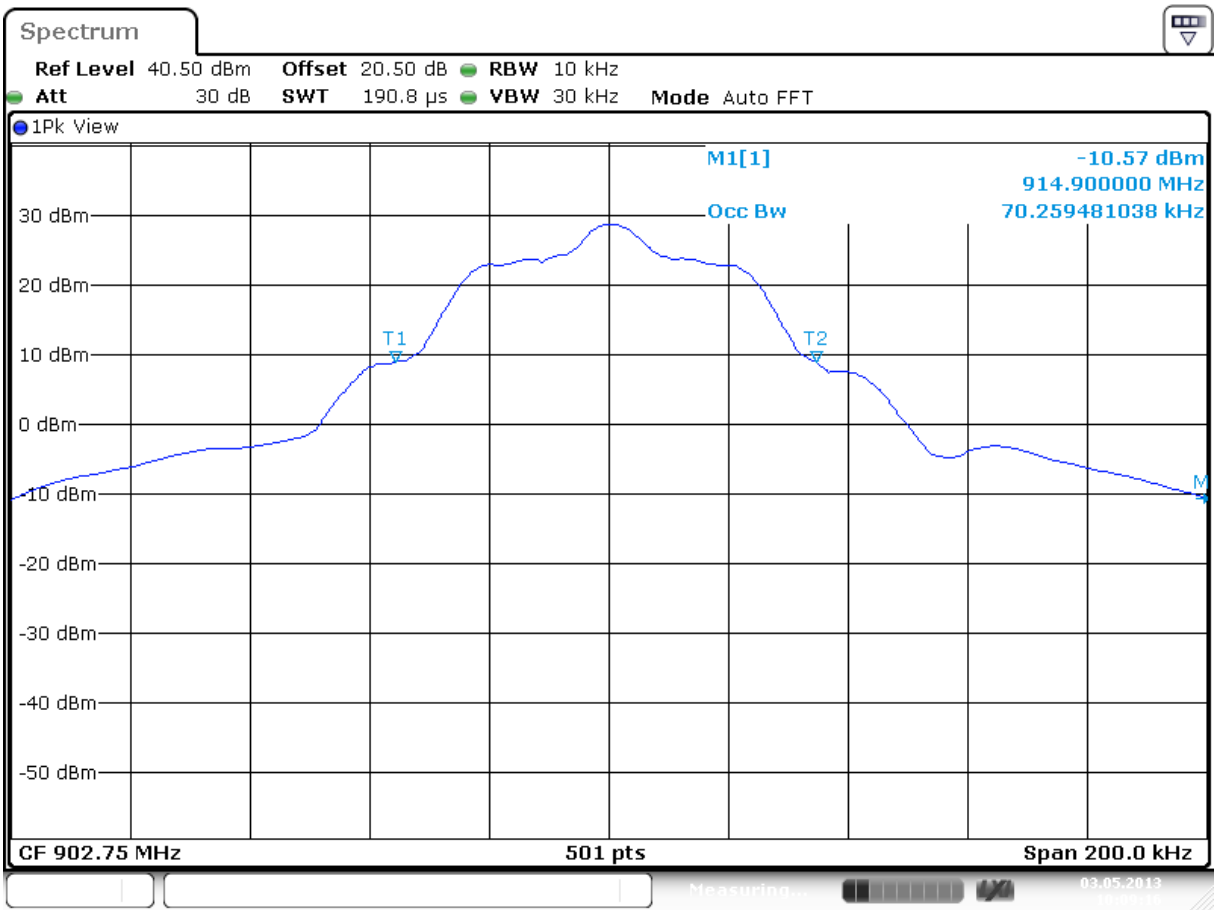


Table 6: 99% Bandwidth

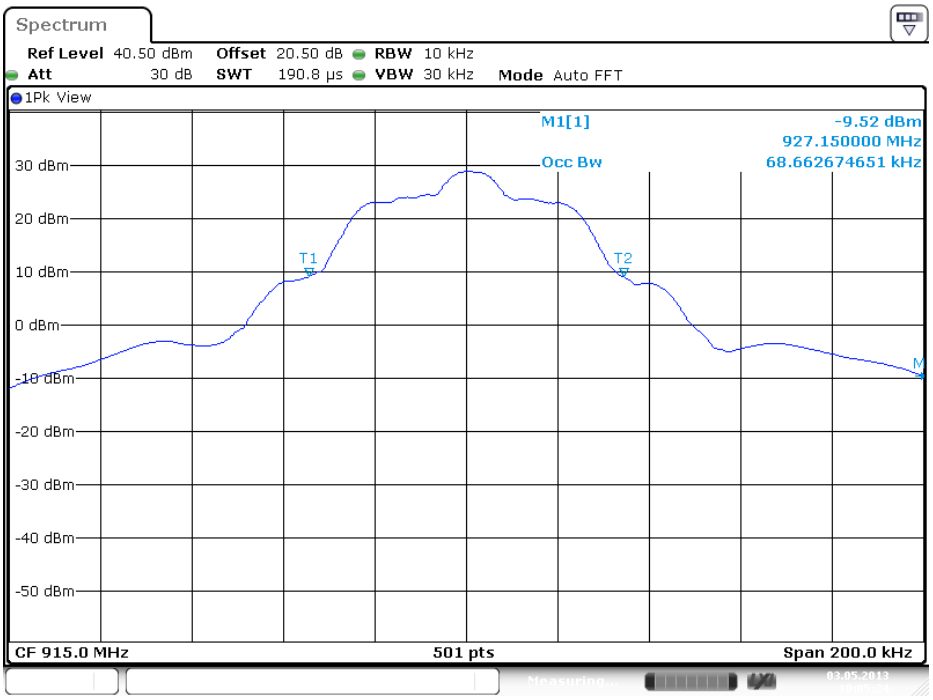
Operating Frequency [MHz]	99% Bandwidth [kHz]	Limit [kHz]
902.75	70.26	<500
915.00	68.66	<500
927.25	69.86	<500

Figure 6: 99% Bandwidth, 902.75 MHz



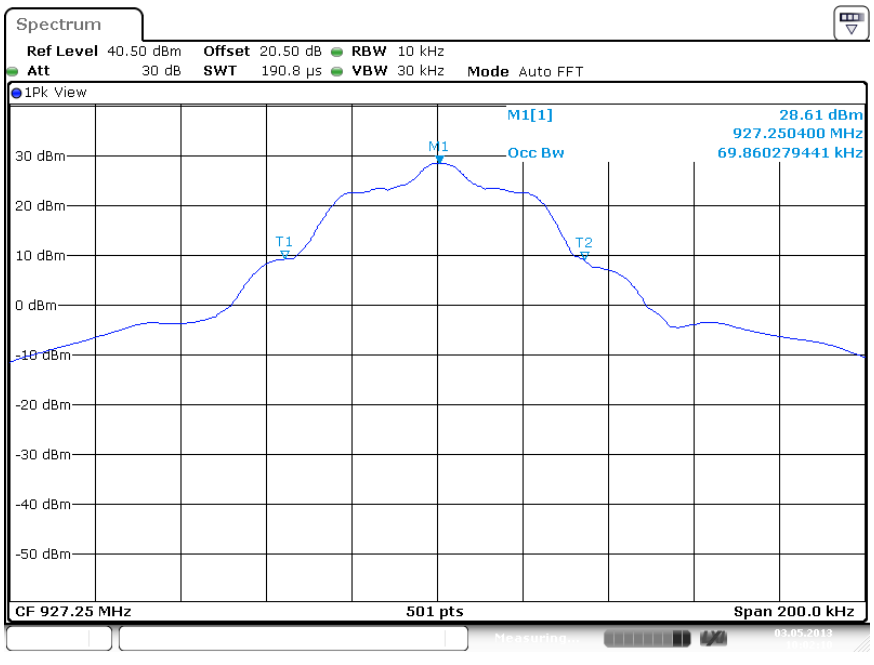
Date: 3.MAY.2013 10:09:16

Figure 7: 99% Bandwidth, 915.00 MHz



Date: 3.MAY.2013 10:05:24

Figure 8: 99% Bandwidth, 927.25 MHz



Date: 3.MAY.2013 10:02:10

5.1.3 Conducted Spurious Emission

RESULT: PASS

Date of testing: 2013-05-13

Requirements:

FCC 15.247(d) and RSS-210 Section A8.5.

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

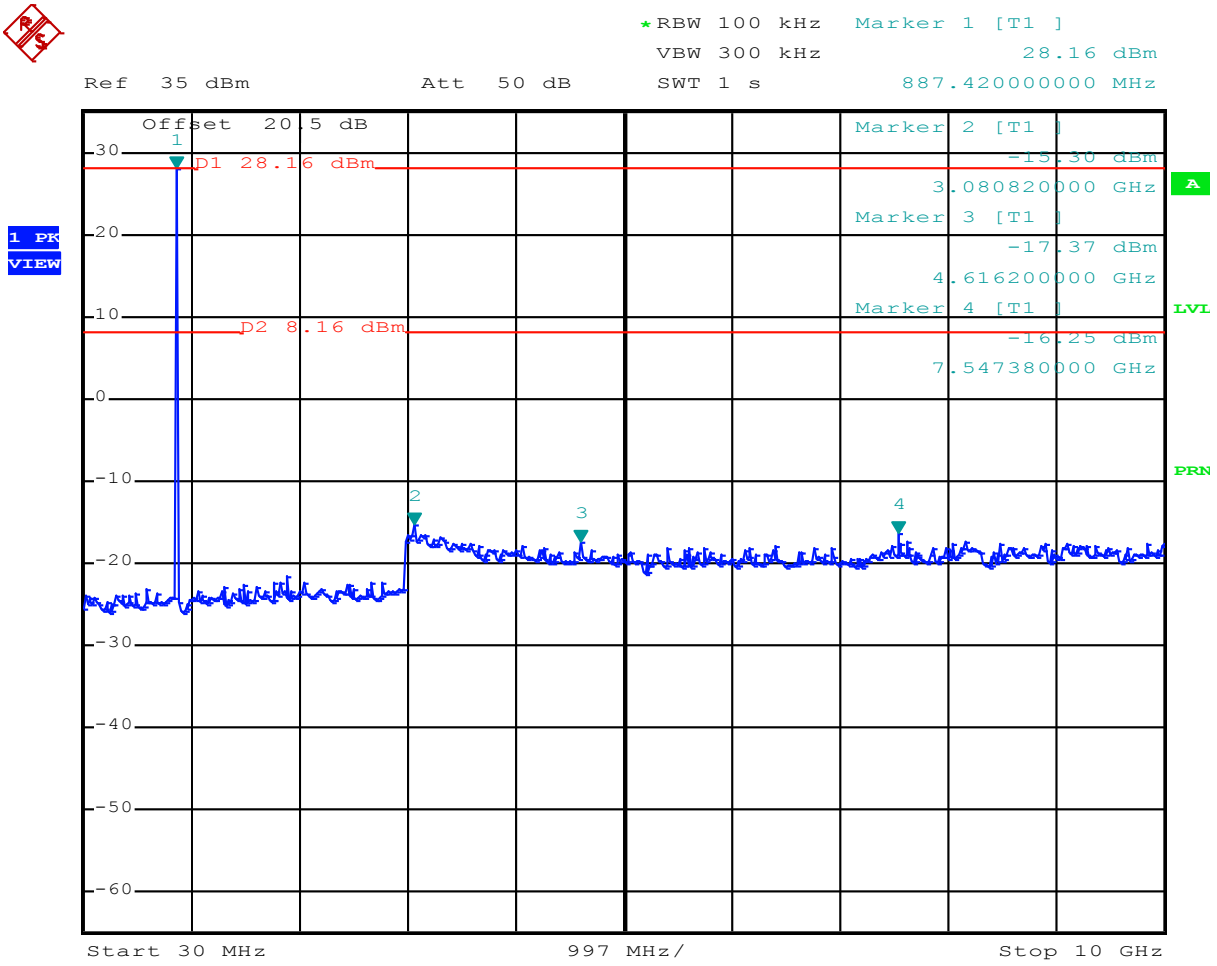
Test procedure:

ANSI C63.10: 2009.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30MHz to 10GHz (10^{th} harmonics).

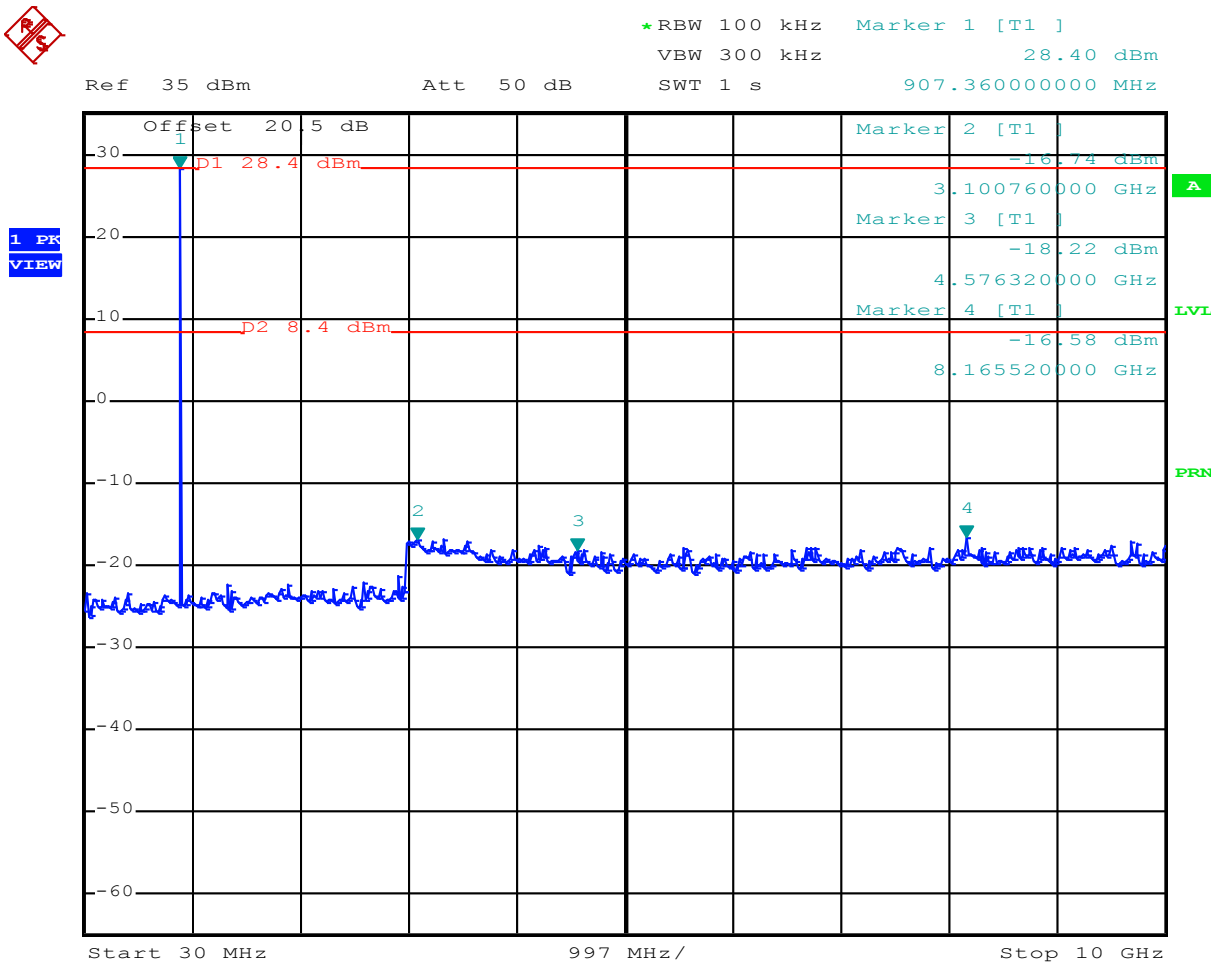
The final measurement takes into account the loss generated by all the involved cables.
Offset in the plots shown is 20.5 dB, this is the total loss of attenuators and cable used.

Figure 9: Conducted Spurious Emission, 30MHz - 10GHz, 902.75 MHz



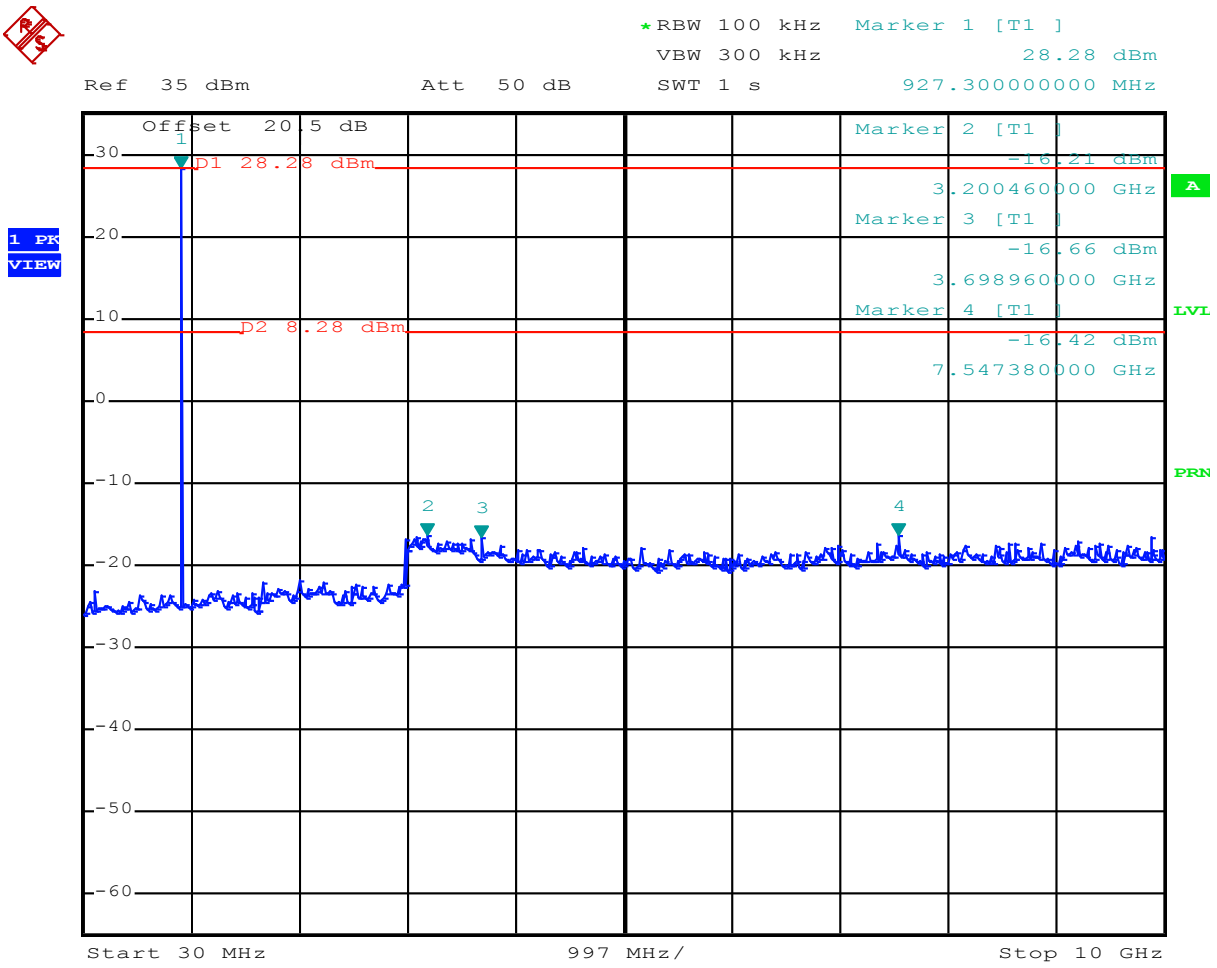
Note: date on spectrum analyzer was accidental (re)set to incorrect date. Correct date should be 13.MAY.2013

Figure 10: Conducted Spurious Emission, 30MHz - 10GHz, 915.00 MHz



Note: date on spectrum analyzer was accidental (re)set to incorrect date. Correct date should be 13.MAY.2013

Figure 11: Conducted Spurious Emission, 30MHz - 10GHz, 927.25 MHz



Note: date on spectrum analyzer was accidental (re)set to incorrect date. Correct date should be 13.MAY.2013

5.1.4 Band Edge Conducted Emissions

RESULT: Pass

Date of testing: 2013-05-03

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-210 section A8.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test procedure:

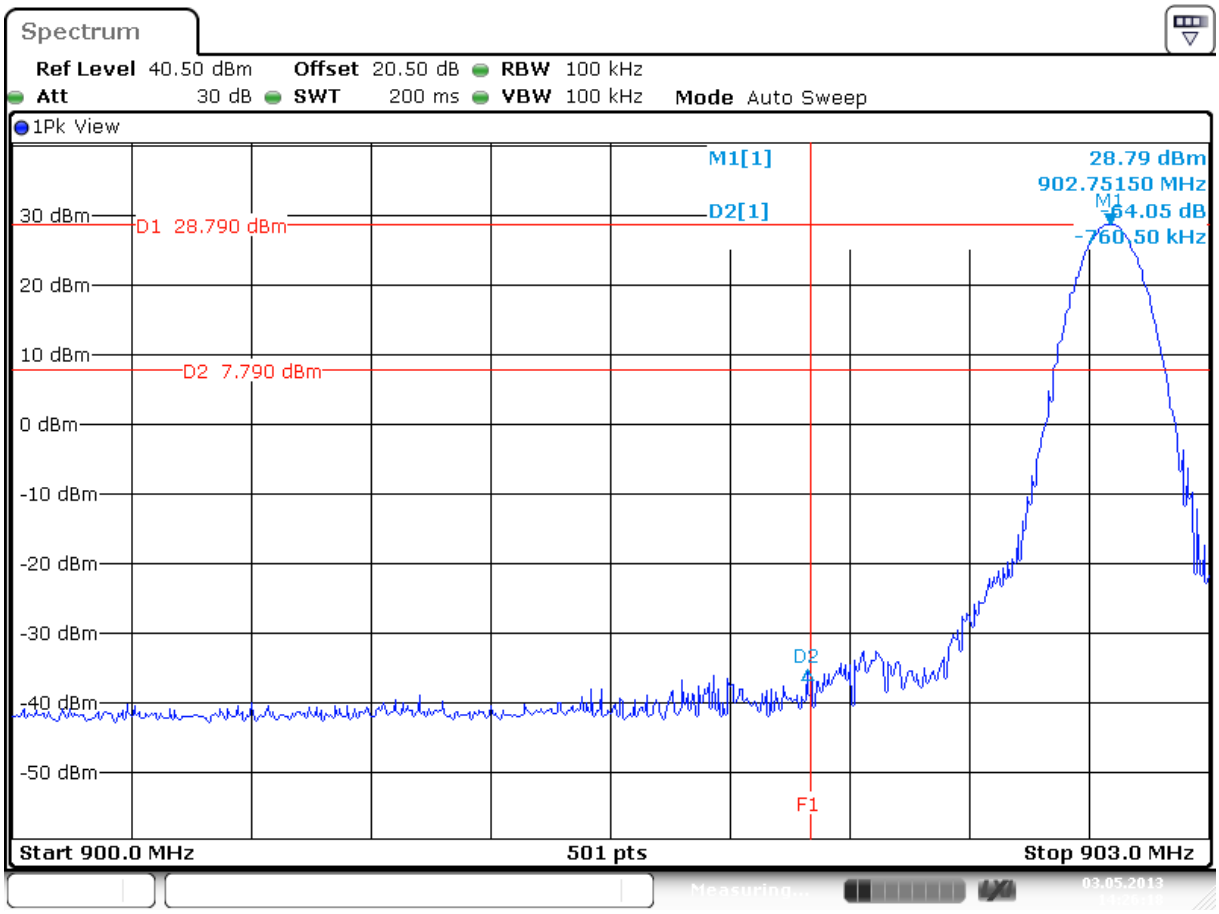
ANSI C63.10: 2009.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:
RBW = 100kHz, VBW = 100kHz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Results: All out of band spurious emissions are more than 20 dB below the fundamental.
See Figures on the following pages.
Offset in the plots shown is 20.5 dB, this is the total loss of attenuators and cable used.

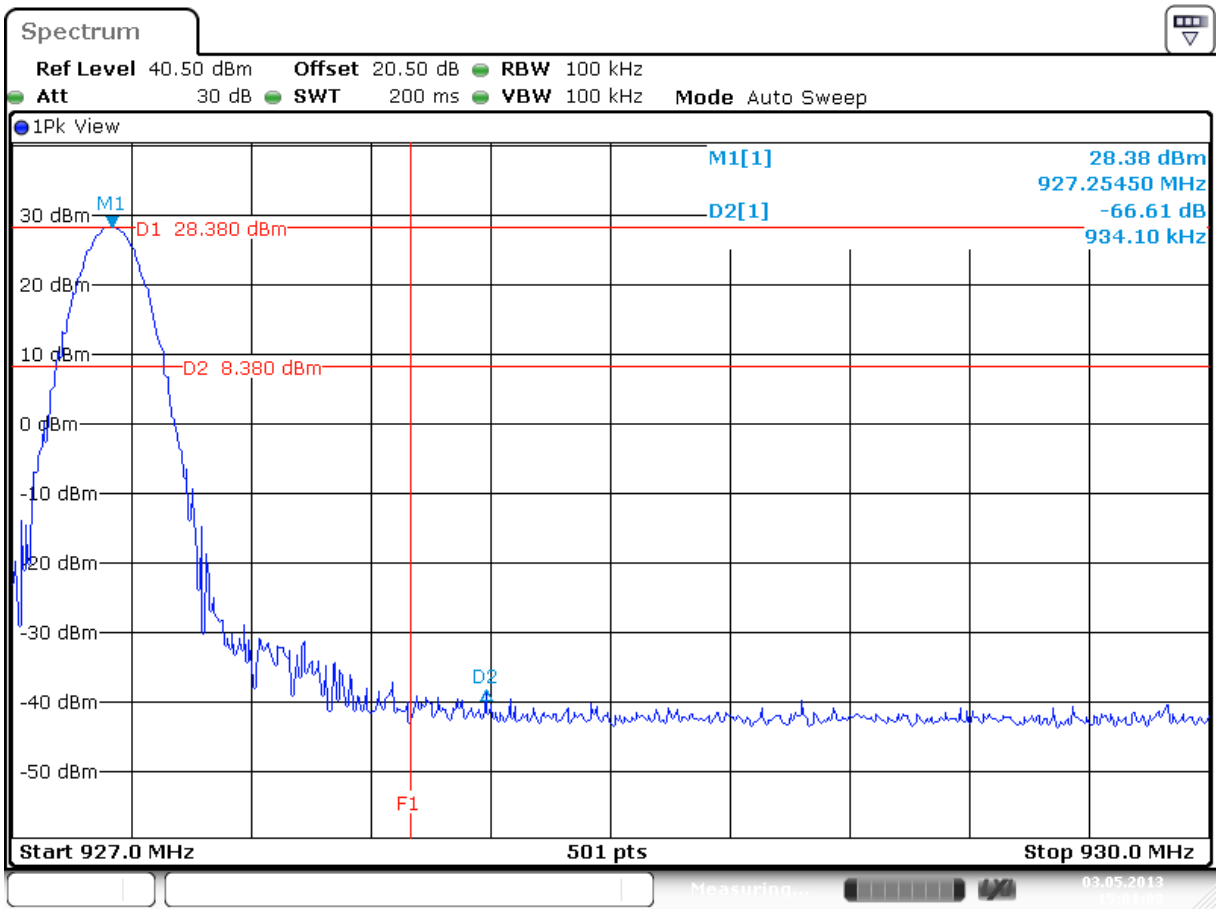
Figure 12: Band Edge Conducted Emission, Spectral Diagram, Mode: Hopping



Date: 3.MAY.2013 14:26:19

Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 902 MHz.

Figure 13: Band Edge Conducted Emission, Spectral Diagram, Mode: Hopping



Date: 3.MAY.2013 15:01:08

Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 928 MHz.

5.1.5 Radiated Spurious Emissions of Transmitter in the restricted bands

RESULT: PASS

Date of testing: 2013-06-04

Frequency range: 30MHz - 10GHz

Requirements:

FCC 15.205, FCC 15.209 and RSS-Gen Section 7.2.2.

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen Table 3, must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen Table 5.

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a)/ RSS Gen Table 5 or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.10: 2009.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Table 7: Radiated Emission of the transmitter in restricted bands, 30MHz - 10GHz, Horizontal and Vertical Antenna Orientations, EUT Mode 1: Hopping

Freq. [MHz]	Antenna Orientation	Level Peak [dBµV/m]	Limit Average [dBµV/m]	Limit Peak [dBµV/m]	Result
1137	Vertical	36.5	54	74	Pass
4054	Horizontal	36.2	54	74	Pass
4810	Vertical	41.8	54	74	Pass
5070	Vertical	40.6	54	74	Pass
7675	Vertical	39.0	54	74	Pass
9342	Horizontal	40.4	54	74	Pass

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ±5.0dB.
3. The EUT was tested as shown in figure 1, the measuring antenna was varied in horizontal and vertical orientations and also around it's axis and height. The reported value is the worst case found at the reported frequency.
4. Tested with EUT in operation mode 1, it's intended use, as described in section 2.2, the 6 worst case values noted.
5. A Peak detector was used with a bandwidth of 1 MHz.
6. Peak values already within Average limits, therefor Average not tested.

Used test equipment and ancillaries:

15453	99699	99861	99847	99855				

5.1.6 Radiated field strength measurements (30 MHz – 1 GHz, E-field),

Freq. [MHz]	Antenna Orientation	Level QP [dBµV/m]	Limit [dBµV/m]	Result Pass/Fail
55.50	Vertical	15.7	40.0	Pass
240.800	Horizontal	26.5	46.0	Pass
344.500	Horizontal	28.5	46.0	Pass
817.100	Horizontal	35.5	46.0	Pass
846.700	Horizontal	39.0	46.0	Pass
876.600	Horizontal	39.8	46.0	Pass

Table 8 Radiated emissions of the EUT, normal mode (sweeping).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 are depicted in Table 8. The system is tested as in whole, being the worst case situation. So with all equipment as shown in Figure1 in place and functioning.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ±5.0dB
3. The reported field strength values are the worst case values at the indicated frequency. The receiving antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
5. The EUT was tested in both passive mode (i.e. without a tag in its proximity) and in activated mode (i.e. with a tag in its proximity). Maximum values have been noted.

Used test equipment and ancillaries:

99608	99699	99847	99861	99858	99580			

Test engineer

Signature :

Name : Richard van der Meer
Date : May 22, 2013

5.2 AC Power Line Conducted Measurements

5.2.1 AC Power Line Conducted Emission of Transmitter

RESULT: Pass

Date of testing: 2013-05-16

Requirements: FCC 15.207 and RSS-Gen Section 7.2.4.

Except when the requirements applicable to a given device state otherwise, for any license-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the following table. The tighter limit applies at the frequency range boundaries.

Frequency of Emission (MHz)	Conducted Limit (dBµV) Quasi-Peak	Conducted Limit (dBµV) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

*Decreases with the logarithm of the frequency.

Frequency (MHz)	Measurement results (dBµV) Neutral/L2		Measurement results (dBµV) Line 1		Limits (dBµV)		Result
	QP	AV (note 4)	QP	AV (note 4)	QP	AV	
0.15000	35.7	--	33.9	--	56.0	46.0	PASS
0.17862	44.3	--	43.8	--	64.5	54.5	PASS
0.23769	38.8	--	38.3	--	62.1	52.1	PASS
0.26984	33.2	--	11.4	--	61.1	51.1	PASS
10.22863	33.1	--	34.1	--	60.0	50.0	PASS
16.46754	31.4	--	30.2	--	60.0	50.0	PASS

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207(a) and RSS-Gen Section 7.2.4, at the 120 Volts/ 60 Hz AC mains connection terminals of the power supply which was connected to the AUX2 which connects to the EUT, are depicted in the table above. The system is tested as in whole, so with all equipment as shown in Figure 1 in place and functioning. Being the worst case situation. See plots on pages 32 – 33.

Notes:

1. Tests were performed with the EUT in Mode1, it's intended use.
2. Tested with USB connection.
3. Measurement uncertainty is ±3.5dB
4. The resolution bandwidth used was 9 kHz.
5. Qp values are already within Av limits, therefor not retested on Av.

Used test equipment and ancillaries:

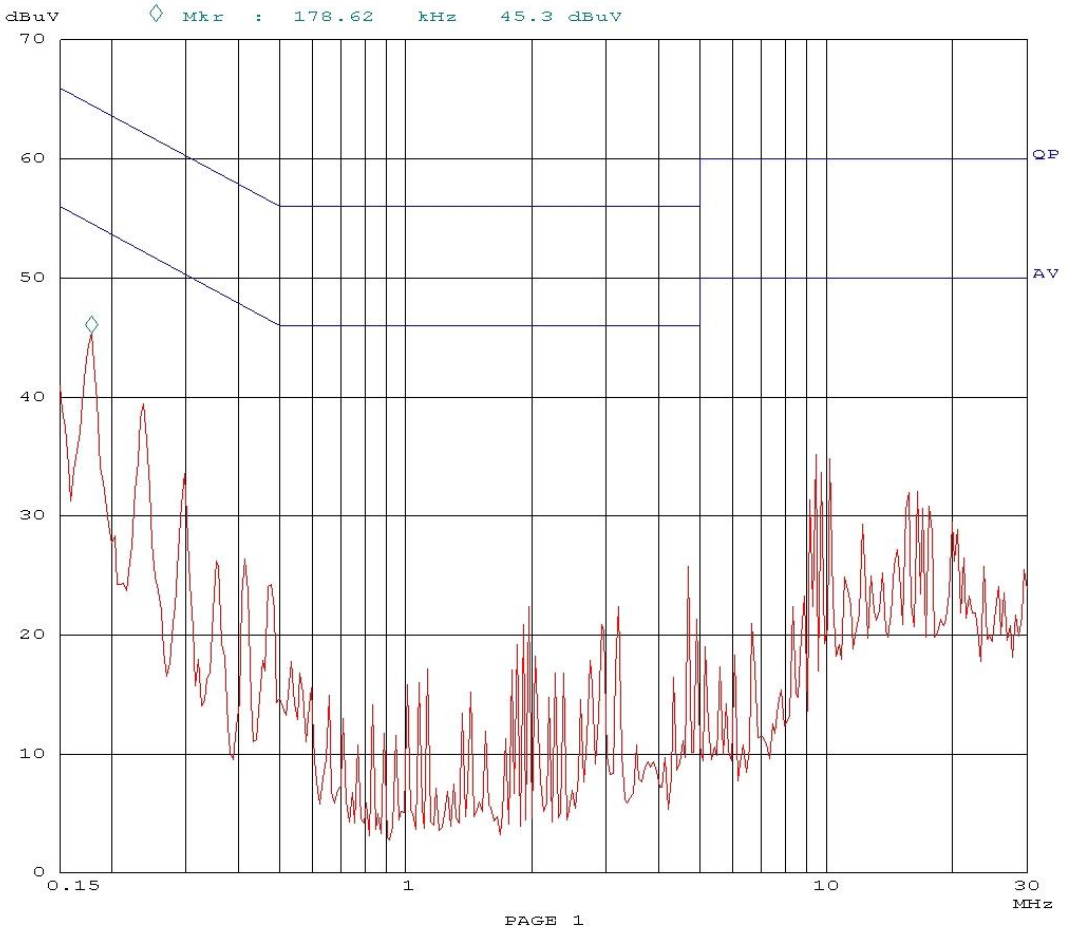
13313	99161	12512	15667	99852	99855	

16. May 13 09:06

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	1.6%	9k	PK	20ms	AUTO	LN OFF

Final Measurement: x QP
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



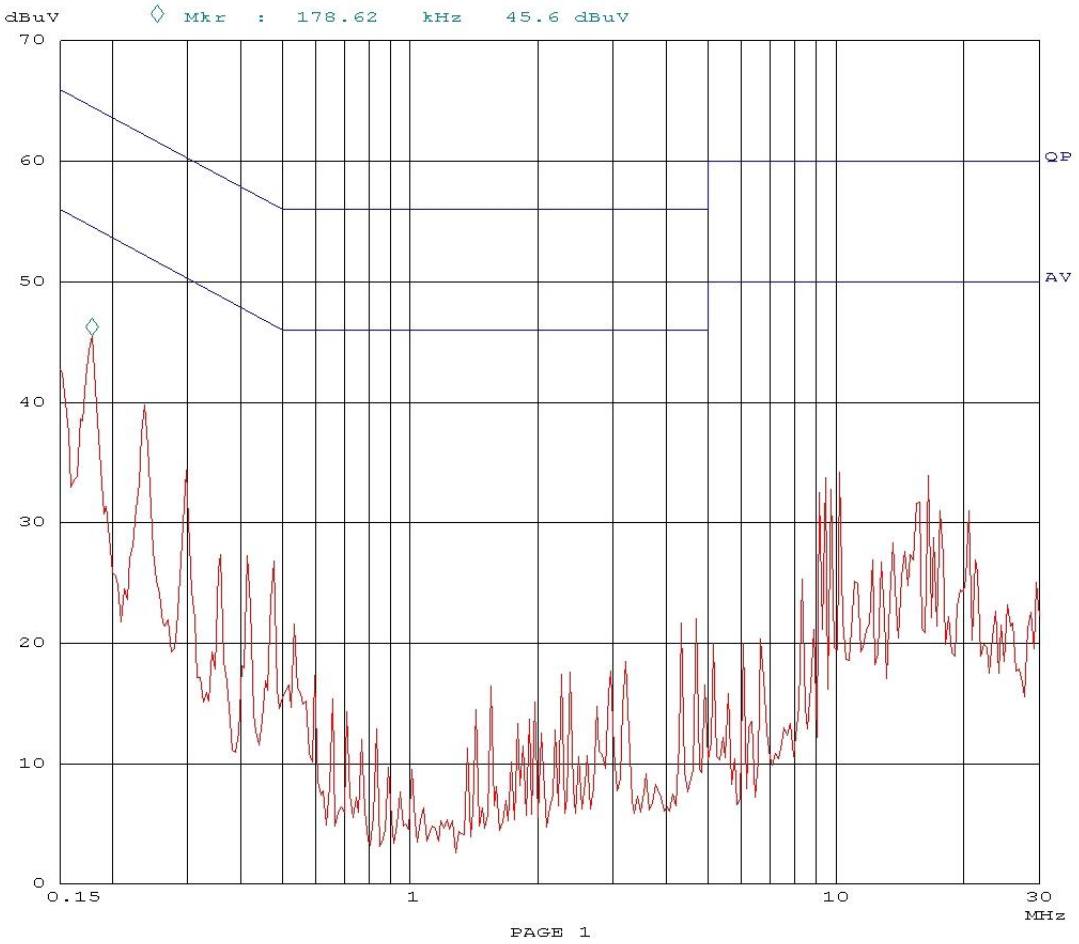
Plot1 Conducted emissions on L1 – with USB

16. May 13 09:01

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	1.6%	9k	PK	20ms	AUTO	LN OFF

Final Measurement: x QP
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



Plot 2 Conducted emissions on L2 –with USB

6. Number of hopping channels, Carrier frequency separation, Average time of occupancy

RESULT: PASS

Date of testing: 2013-05-07 and 2013-05-13

Requirements:

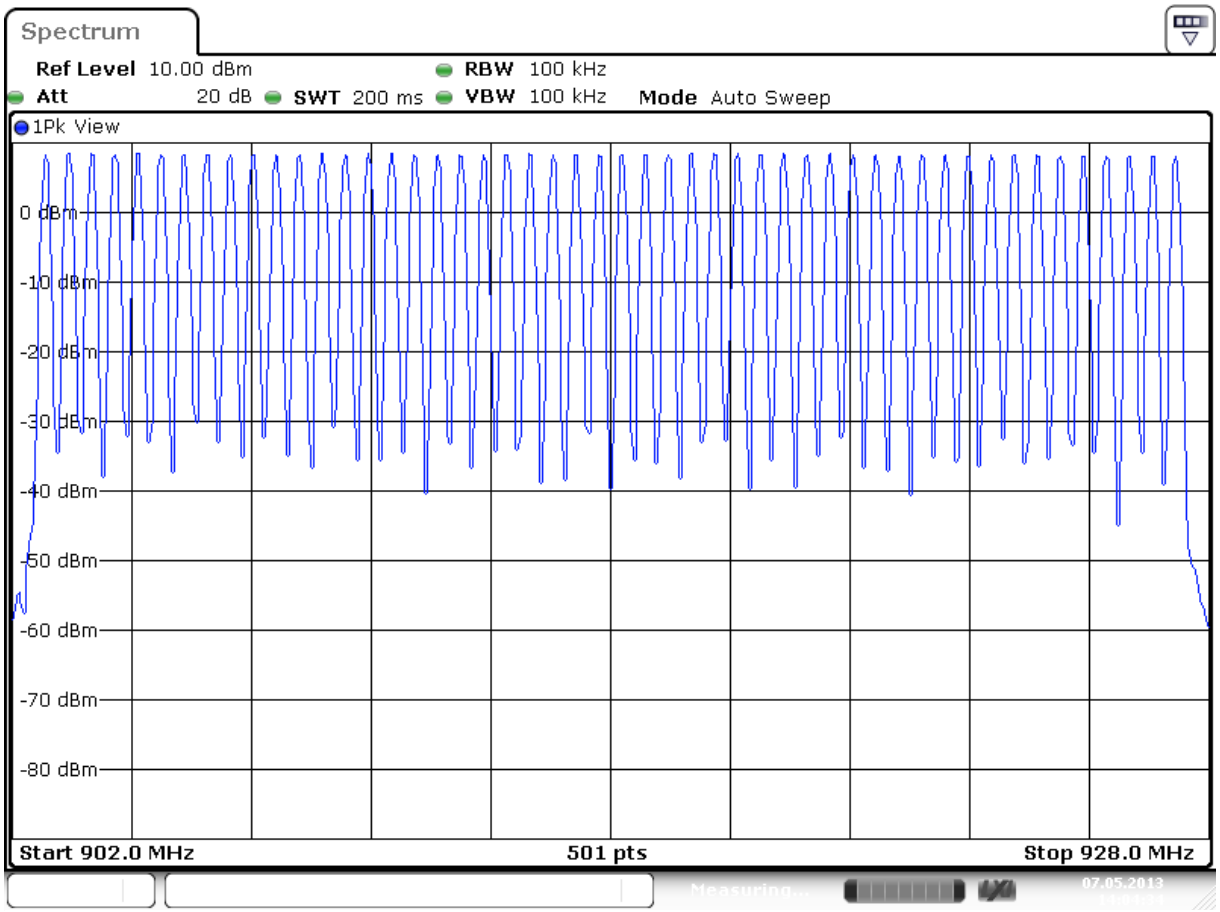
FCC 15.247(a)(1)(i) and RSS-210 A8.1(c).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test procedure:

ANSI C63.10: 2009.

A spectrum analyzer was connected to the antenna port of the EUT.
Offset in the plots shown is 20.5 dB, this is the total loss of attenuators and cable used.

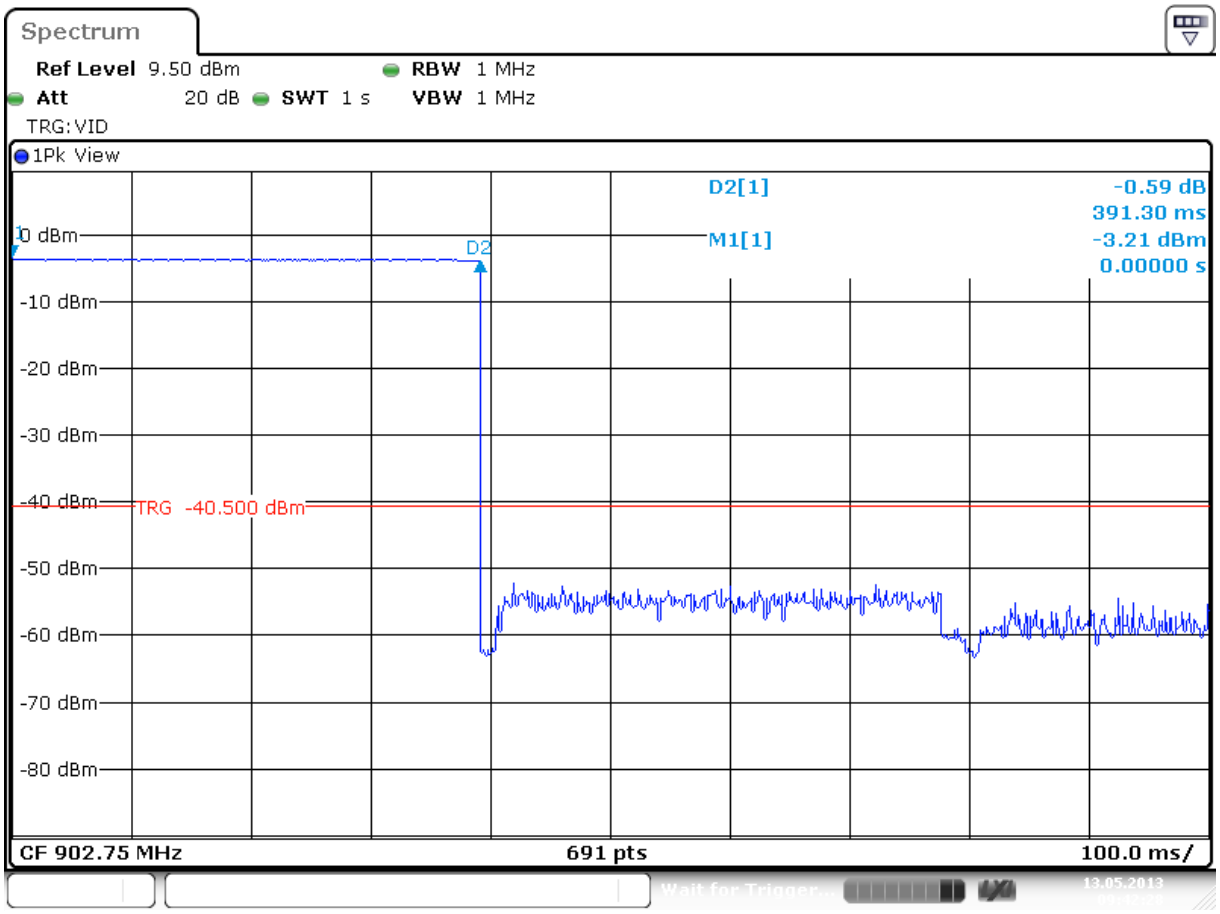


Date: 7.MAY.2013 14:04:34

Plot showing 50 hopping frequencies as required by section FCC 15.247(a)(1)(i) and RSS-210 A8.1(c), as measured on a spectrum analyzer.

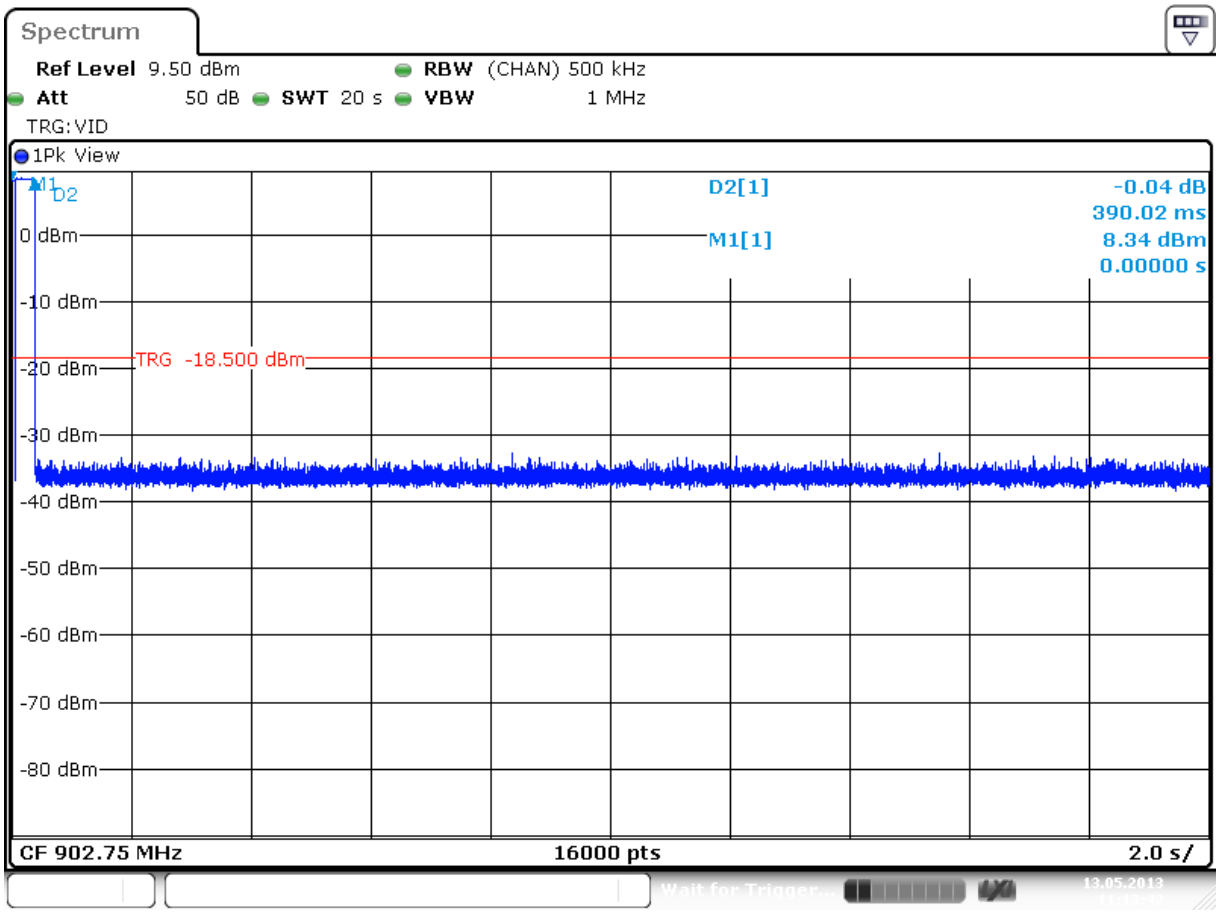
Requirement: the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have at least 50 hopping channels.

Result: **Pass**



Date: 13.MAY.2013 09:42:29

Plot showing Dwell time of a hop as measured on a spectrum analyzer.



Date: 13.MAY.2013 11:13:41

Plot showing average time of occupancy in a 20 second period as measured on a spectrum analyzer.

Note: Not measured in 1 MHz resolution bandwidth to avoid hops from next channel being registred. Instead a RBW of 500 kHz is used with a sharp Channel filter.

Limit: The 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have an average time of occupancy not greater than 0.4 seconds within a 20 second period.

Result: **Pass**

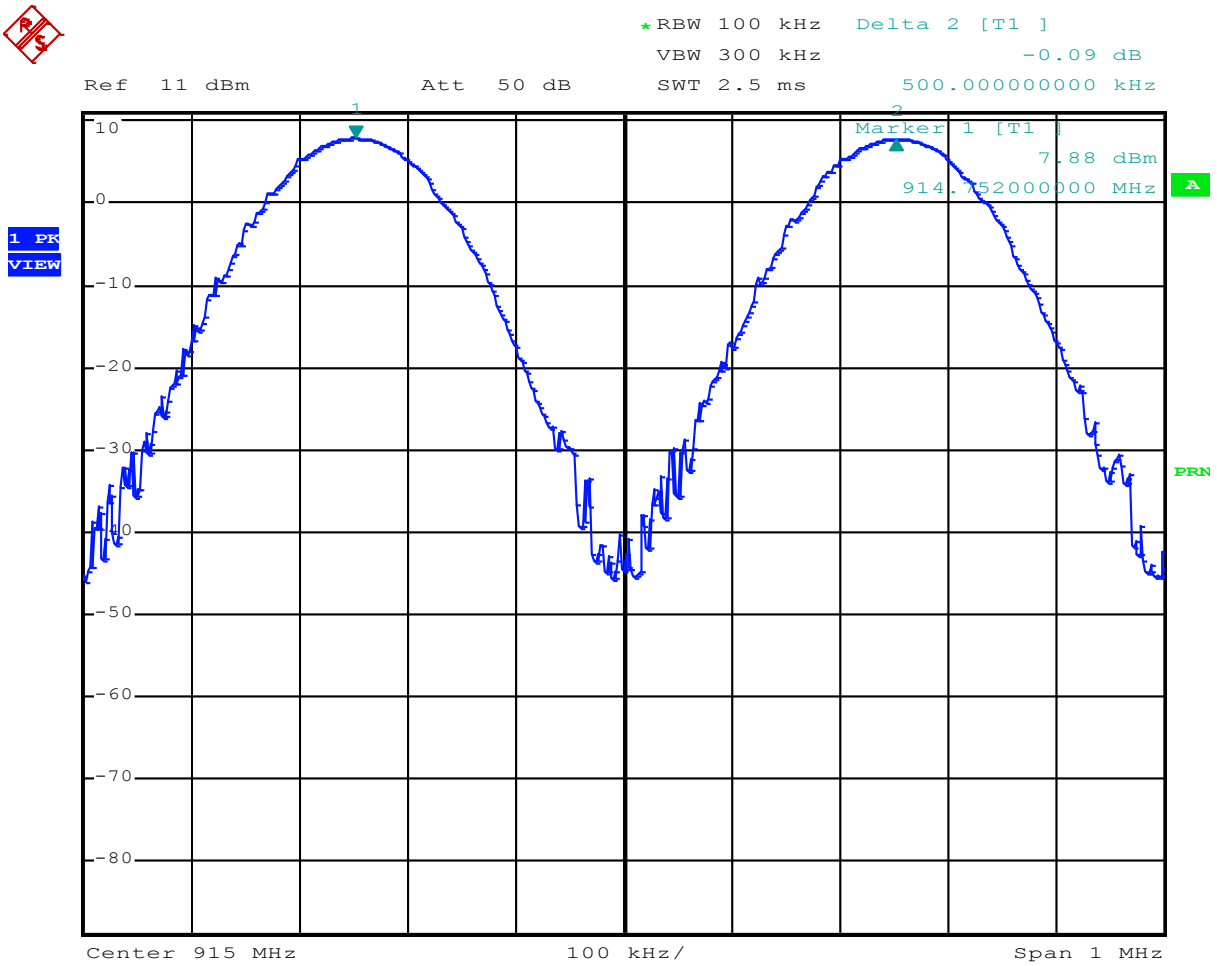
Channel	Frequency (MHz)	Power	Average occupancy time (ms)	Percentage of Total On Time (%)
1	902.75	Full	391.30	1.9565
2	903.25	Full	390.98	1.9549
3	903.75	Full	390.98	1.9549
4	904.25	Full	390.98	1.9549
5	904.75	Full	390.98	1.9549
6	905.25	Full	390.98	1.9549
7	905.75	Full	390.98	1.9549
8	906.25	Full	390.98	1.9549
9	906.75	Full	390.98	1.9549
10	907.25	Full	390.98	1.9549
11	907.75	Full	390.98	1.9549
12	908.25	Full	390.98	1.9549
13	908.75	Full	390.98	1.9549
14	909.25	Full	390.98	1.9549
15	909.75	Full	390.98	1.9549
16	910.25	Full	390.98	1.9549
17	910.75	Full	390.98	1.9549
18	911.25	Full	390.98	1.9549
19	911.75	Full	390.98	1.9549
20	912.25	Full	390.98	1.9549
21	912.75	Full	390.98	1.9549
22	913.25	Full	390.98	1.9549
23	913.75	Full	390.98	1.9549
24	914.25	Full	390.95	1.9548
25	914.75	Full	390.95	1.9548
26	915.25	Full	390.95	1.9548
27	915.75	Full	390.95	1.9548
28	916.25	Full	391.01	1.9551
29	916.75	Full	391.01	1.9551
30	917.25	Full	391.01	1.9551
31	917.75	Full	391.01	1.9551
32	918.25	Full	391.01	1.9551
33	918.75	Full	391.01	1.9551
34	919.25	Full	391.01	1.9551
35	919.75	Full	391.01	1.9551
36	920.25	Full	391.01	1.9551
37	920.75	Full	391.01	1.9551
38	921.25	Full	391.01	1.9551
39	921.75	Full	391.01	1.9551
40	922.25	Full	391.01	1.9551
41	922.75	Full	391.01	1.9551
42	923.25	Full	391.01	1.9551
43	923.75	Full	391.01	1.9551
44	924.25	Full	391.01	1.9551
45	924.75	Full	391.01	1.9551
46	925.25	Full	391.01	1.9551
47	925.75	Full	391.01	1.9551
48	926.25	Full	391.01	1.9551
49	926.75	Full	391.01	1.9551
50	927.25	Full	391.01	1.9551

Table on previous page shows average time of occupancy per channel is less than 0.4 seconds and each frequency is used equally.

Note: Percentage of total On Time = (Dwell time(ms) / Period time (ms) of 1 cycle) * 100%

Limit: The 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall therefore have an average time of occupancy not greater than 0.4 seconds within a 20 second period.

Result: **Pass**



Plot : showing 500 kHz separation between channels as measured on a spectrum analyzer.
Offset in the plots shown is 20.5 dB, this is the total loss of attenuators and cable used.

Limit: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Result: **Pass**