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February 8, 2012

Prüfbericht / *Test Report* Nr. / *No.* 69861-04041-5 (Edition 3)

Applicant:	IDENTEC Solutions AG
Type of equipment:	Active Transponder Tag
Type designation:	i-B350L Wristband
Order No.:	1130378
Test standards:	FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.107, 15.109, 15.205, 15.207, 15.215 and 15.249 Industry Canada Radio Standards Specifications RSS-GEN Issue 3, Sections 6.2, 7.2.2, 7.2.4 and RSS-210 Issue 8, Section A2.9 (Category I Equipment)

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1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation[1]:	i-B350L Wristband
Parts[2]:	
Serial number(s):	0.777.000.004
Manufacturer:	IDENTEC Solutions AG
Type of equipment:	Active Transponder Tag
Version:	As received
FCC ID:	OO4-ILR-IB350LW
Additional parts/accessories:	

Technical data of EUT		
Application frequency range:	902 - 928 MHz	
Frequency range:	919 MHz, 920 MHz	
Operating frequency:	919 MHz, 920 MHz	
Type of modulation:	FSK	
Pulse train:	---	
Pulse width:	---	
Number of RF-channels:	2	
Channel spacing:	1 MHz	
Designation of emissions[3]:	2M82F1D	
Type of antenna:	Integrated on printed board	
Size/length of antenna:	2 x 1 cm	
Connection of antenna:	☐ detachable	☒ not detachable
Type of power supply:	Battery supply	
Specifications for power supply:	nominal voltage:	3.00 V

[1] Type designation of the system if EUT consists of more than one part.
[2] Type designations of the parts of the system, if applicable.
[3] Also known as "Class of Emission".

2 Administrative Data

Application details	
Applicant (full address):	IDENTEC Solutions AG Millennium Park 2, A-6890 Lustenau, Österreich
Contact person:	Herr Daniel Egger
Order number:	1130378
Receipt of EUT:	05 October 2011
Date(s) of test:	January 2012
Note(s):	

Report details	
Report number:	69861-04041-5
Edition:	3
Issue date:	08 February 2012

3 Identification of the Test Laboratory

Details of the Test Laboratory	
Company name:	TÜV SÜD SENTON GmbH
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
Laboratory accreditation:	DAR-Registration No. DAT-PL-171/94-03
FCC test site registration number	90926
Industry Canada test site registration:	3050A-2
Contact person:	Mr. Johann Roidt Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

4 Summary

Summary of test results
The tested sample complies with the requirements set forth in the **Code of Federal Regulations CFR 47, Part 15, Sections 15.107, 15.109, 15.205, 15.215 and 15.249** of the Federal Communication Commission (FCC) and the **Radio Standards Specifications** **RSS-GEN Issue 3, Sections 6.2, 7.2.2 and** **RSS-210 Issue 8, Section A2.9 (Category I Equipment)** of Industry Canada (IC).

Personnel involved in this report	
Laboratory Manager:	Mr. Johann Roidt
Responsible for testing:	Mr. Thomas Eberl
Responsible for test report:	Mr. Thomas Eberl

5 Operation Mode and Configuration of EUT

Operation Mode(s)
The EUT was operated in continuous transmitting mode on lowest and highest channel.

Configuration(s) of EUT
The EUT was configured as stand alone device..

List of ports and cables				
Port	*Description*	*Classification*[4]	*Cable type*	*Cable length*
1	Temporary DC supply	dc power	Unshielded	1.5 m

List of devices connected to EUT				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*

List of support devices				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
1	RFID reader for active UHF tags	i-PORT M350 ETH / USB Mod.	09435M0394	Identec Solutions
2	Laptop PC	DELL dimension		DELL

[4] Ports shall be classified as ac power, dc power or signal/control port

6 Measurement Procedures

6.1 Bandwidth Measurements

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.202(a) CFR 47 Part 15, section 15.215(c) IC RSS-Gen Issue 3, sections 4.6.1 and 4.6.2 IC RSS-210 Issue 8, section A1.1.3 ANSI C63.4, annex H.6
Guide:	ANSI C63.4 / IC RSS-Gen Issue 3, sections 4.6.1 and 4.6.2
Measurement setup:	☐ Conducted: See below ☒ Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.3)

If antenna is detachable bandwidth measurements shall be performed at the antenna connector (conducted measurement) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.

If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range.

The analyzer settings are specified by the test description of the appropriate test record(s).

6.2 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.231(b)(3) IC RSS-210 Issue 8, section A1.1.2(b)
Guide:	ANSI C63.4

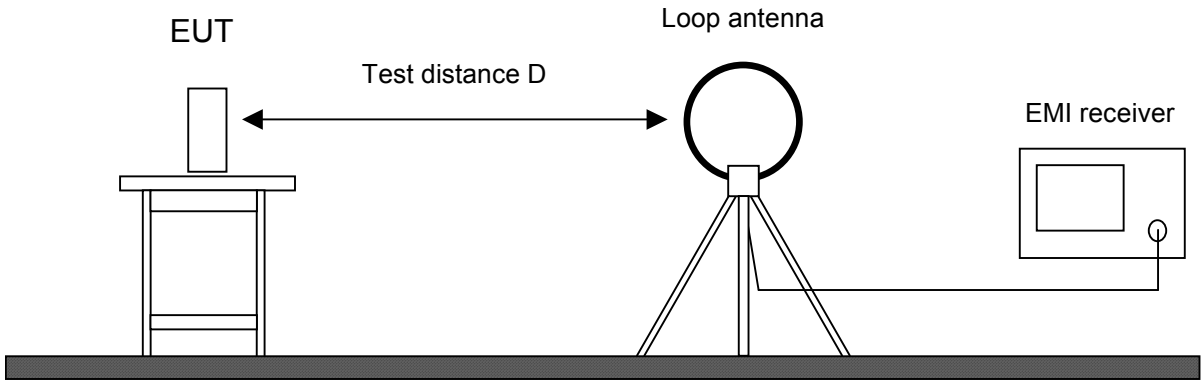
Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.
If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.



Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	Spectrum analyzer		FSP30	1666	100036	Rohde & Schwarz
☐	EMI test receiver		ESMI	1569	839379/013 839587/006	Rohde & Schwarz
☐	Test receiver		ESHS 10	1028	860043/016	Rohde & Schwarz
☐	Preamplifier	Cabin no. 2	CPA9231A	1651	3393	Schaffner
☒	Loop antenna		HFH2-Z2	1016	882964/1	Rohde & Schwarz
☒	Fully anechoic room		No. 2	1452	---	Albatross
☐	Semi anechoic room		No. 3	1453	---	Siemens
☐	Semi anechoic room		No. 8	2057	---	Albatross

6.3 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.109, 15.215(b) and 15.249 IC RSS-GEN Issue 3, section 6.1 IC RSS-210 Issue 8, section A2.9
Guide:	ANSI C63.4

Radiated emission in fully or semi anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).

Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.

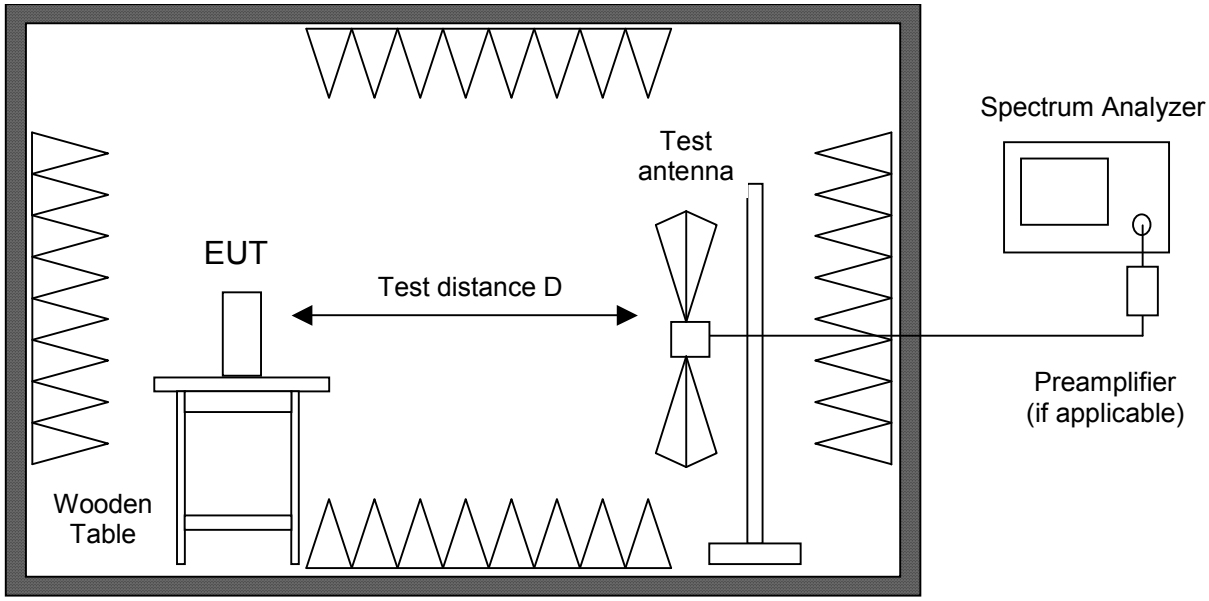
All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 for alternative test sites is used (see 6.4). If prescans are recorded in fully anechoic room they are indicated appropriately.



Fully or semi anechoic room

Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	Spectrum analyzer		FSP30	1666	100036	Rohde & Schwarz
☐	EMI test receiver	Cabin no. 3	ESPI7	2010	101018	Rohde & Schwarz
☐	EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
☐	EMI test receiver		ESMI	1569	839379/013 839587/006	Rohde & Schwarz
☒	Preamplifier	Cabin no. 2	CPA9231A	1651	3393	Schaffner
☐	Preamplifier		R14601	1142	13120026	Advantest
☒	Preamplifier (1 - 8 GHz)		AFS3-00100800-32-LN	1684	847743	Miteq
☐	Preamplifier (0.5 - 8 GHz)		AMF-4D-005080-25-13P	1685	860149	Miteq
☒	Preamplifier (8 - 18 GHz)		ACO/180-3530	1484	32641	CTT
☐	External Mixer		WM782A	1576	845881/005	Tektronix
☐	Harmonic Mixer Accessories		FS-Z30	1577	624413/003	Rohde & Schwarz
☒	Trilog antenna	Cabin no. 2	VULB 9163	1722	9163-188	Schwarzbeck
☐	Trilog antenna	Cabin no. 3	VULB 9163	1802	9163-214	Schwarzbeck
☐	Trilog antenna	Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
☒	Horn antenna		3115	1516	9508-4553	EMCO
☐	Horn antenna		3160-03	1010	9112-1003	EMCO
☐	Horn antenna		3160-04	1011	9112-1001	EMCO
☒	Horn antenna		3160-05	1012	9112-1001	EMCO
☒	Horn antenna		3160-06	1013	9112-1001	EMCO
☒	Horn antenna		3160-07	1014	9112-1008	EMCO
☐	Horn antenna		3160-08	1015	9112-1002	EMCO
☐	Horn antenna		3160-09	1265	9403-1025	EMCO
☐	Horn antenna		3160-10	1575	399185	EMCO
☐	Fully anechoic room		No. 2	1452	---	Albatross
☐	Semi anechoic room		No. 3	1453	---	Siemens
☐	Semi anechoic room		No. 8	2057	---	Albatross

6.4 Radiated Emission at Alternative Test Site

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.109, 15.215(b) and 15.249 IC RSS-GEN Issue 3, section 6.1 IC RSS-210 Issue 8, section A2.9
Guide:	ANSI C63.4

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

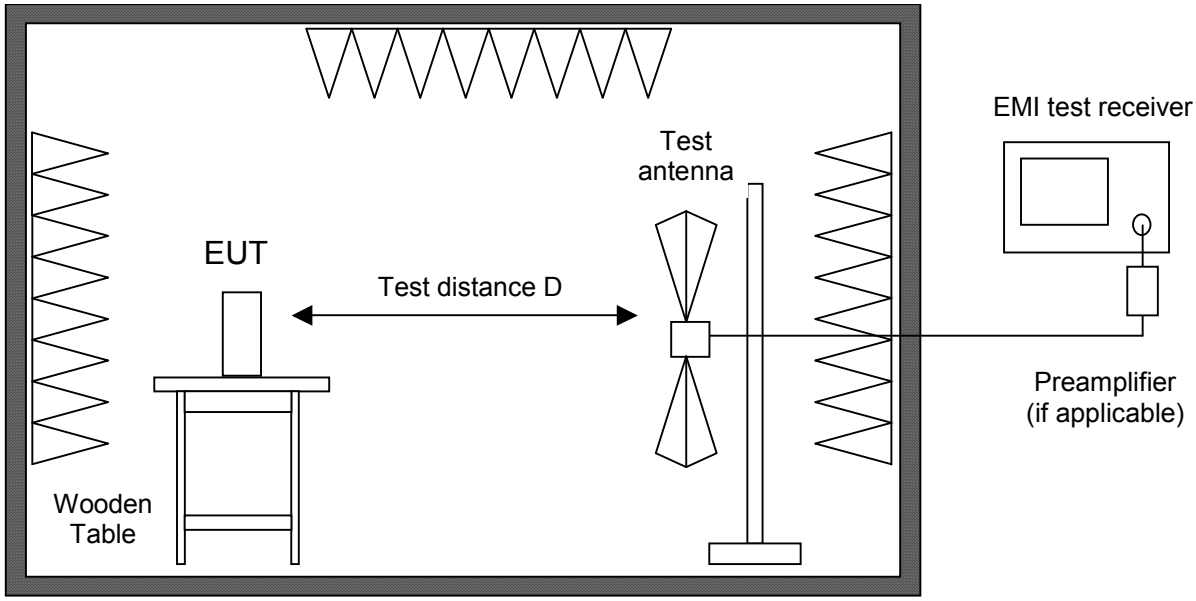
If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.
With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is dircharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.



Alternate test site (semi anechoic room)

Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
☒	Trilog antenna	Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
☒	Semi anechoic room		No. 8	2057	---	Albatross

7 Photographs Taken During Testing

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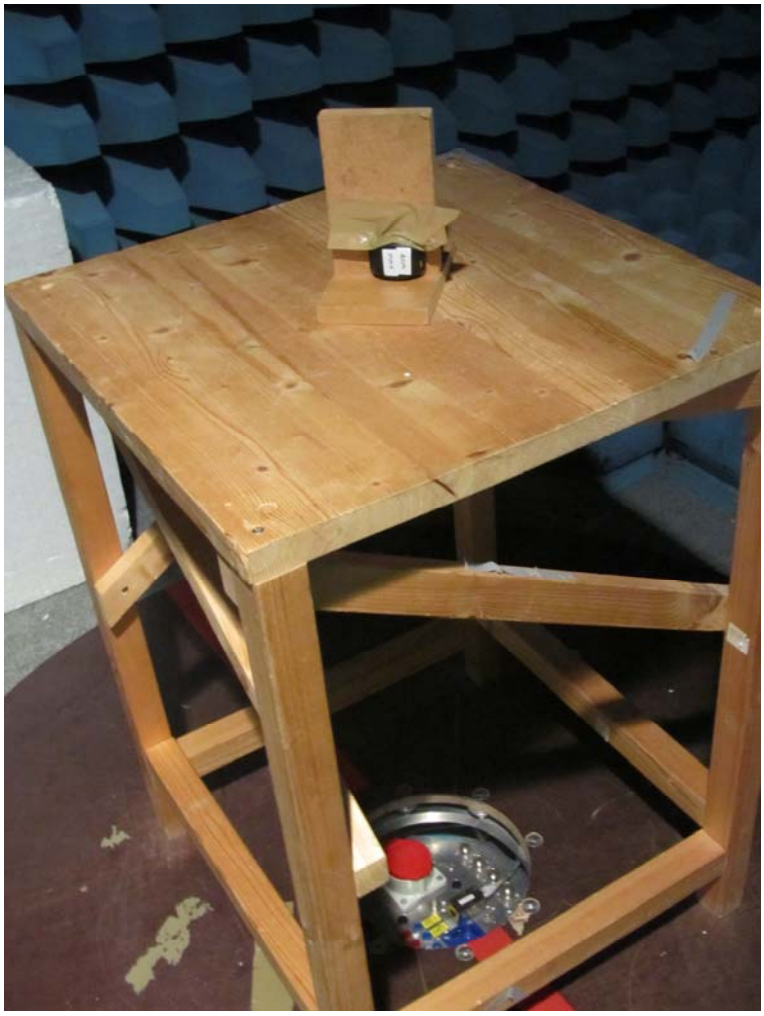
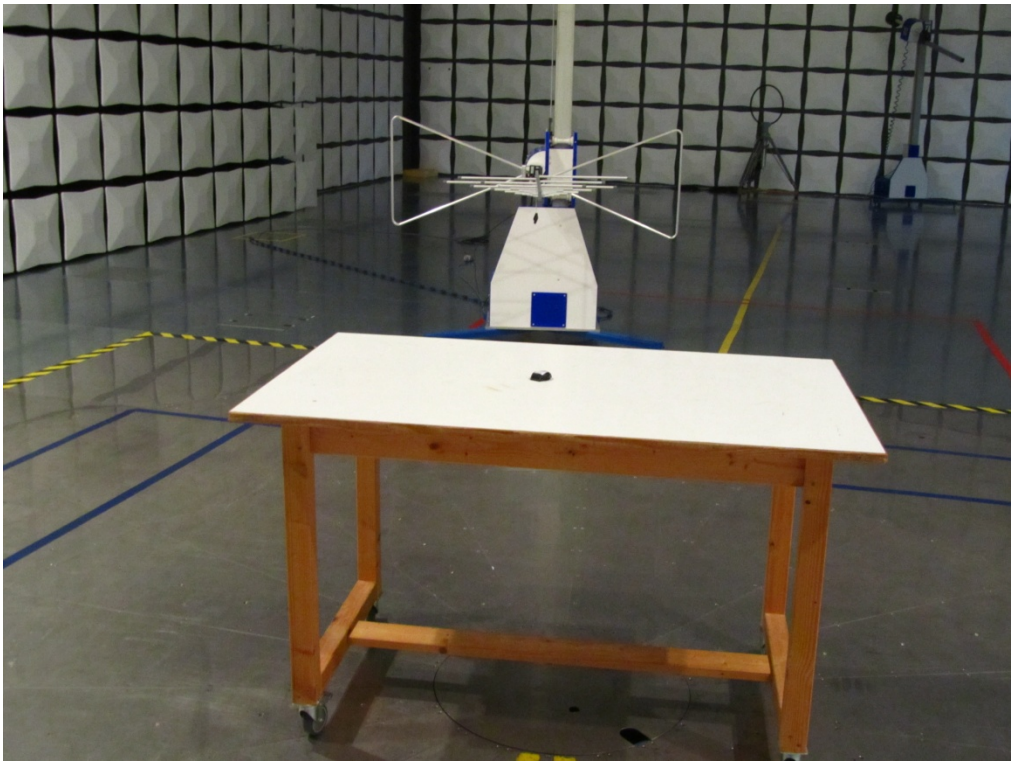
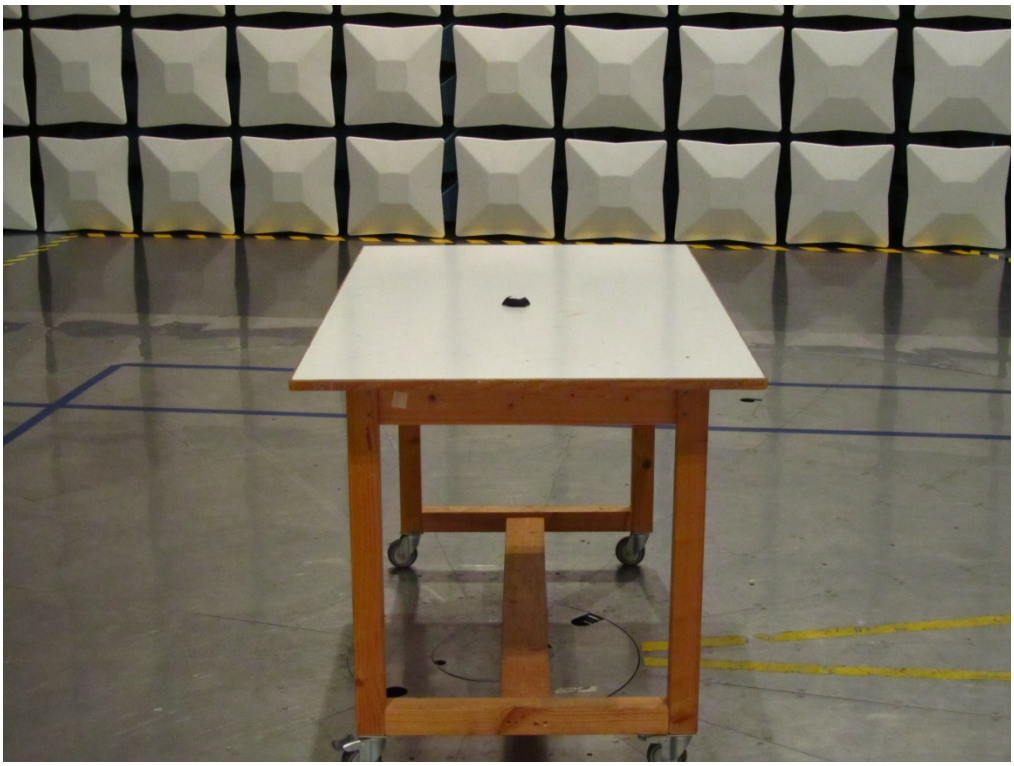
Test setup for radiated emission measurement 9 kHz – 30 MHz

Test setup for radiated emission measurement (fully anechoic room)



Test setup for radiated emission measurement (alternate test site)





8 Test Results for Transmitter

FCC CFR 47 Parts 2 and 15			
Section(s)	*Test*	*Page*	*Result*
2.1046(a)	Conducted output power	---	Not applicable
2.202(a)	Occupied bandwidth	21	Recorded
15.215(c)	Bandwidth of the emission	25	Test passed
2.201, 2.202	Class of emission	27	Calculated
15.35(c)	Pulse train measurement for pulsed operation	---	Not applicable
15.205(a)	Restricted bands of operation	28	Test passed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	---	Not applicable
15.205(b) 15.249	Radiated emission 9 kHz to 30 MHz	30	Test passed
15.205(b) 15.215(b) 15.249	Radiated emission 30 MHz to 10 GHz	32	Test passed

IC RSS-Gen Issue 3			
Section(s)	*Test*	*Page*	*Result*
4.8	Transmitter output power (conducted)	---	Not applicable
4.6.1	Occupied Bandwidth	21	Recorded
8	Designation of emissions	27	Calculated
4.5	Pulsed operation	---	Not applicable
7.2.4	Conducted AC powerline emission 150 kHz to 30 MHz	---	Not applicable
2.2(a)	Restricted bands and unwanted emission frequencies	28	Test passed
7.2.2(b)(c), 7.2.5	Unwanted emissions 9 kHz to 30 MHz	30	Test passed
7.2.2(b)(c), 7.2.5	Unwanted emissions 30 MHz to 10 GHz	32	Test passed
5.5	Exposure of Humans to RF Fields	44	Exempted from SAR and RF evaluation

IC RSS-210 Issue 8			
Section(s)	*Test*	*Page*	*Result*
A2.9	Unwanted emissions 9 kHz to 30 MHz	30	Test passed
A2.9	Unwanted emissions 30 MHz to 10 GHz	32	Test passed

8.1 Occupied Bandwidth

Rules and specifications:	CFR 47 Part 2, section 2.202(a) ANSI C63.4, annex H.6
Guide:	ANSI C63.4
Description:	The occupied bandwidth according to CFR 47 Part 2, section 2.202(a), is measured as the 99% emission bandwidth, i.e. below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission. The occupied bandwidth according to ANSI C63.4, annex H.6; is measured as the frequency range defined by the points that are 26 dB down relative to the maximum level of the modulated carrier. The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 MHz to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

The video bandwidth shall be at least three times greater than the resolution bandwidth.

Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	
Date of test:	November 30, 2011
Test site:	Fully anechoic room, cabin no. 2

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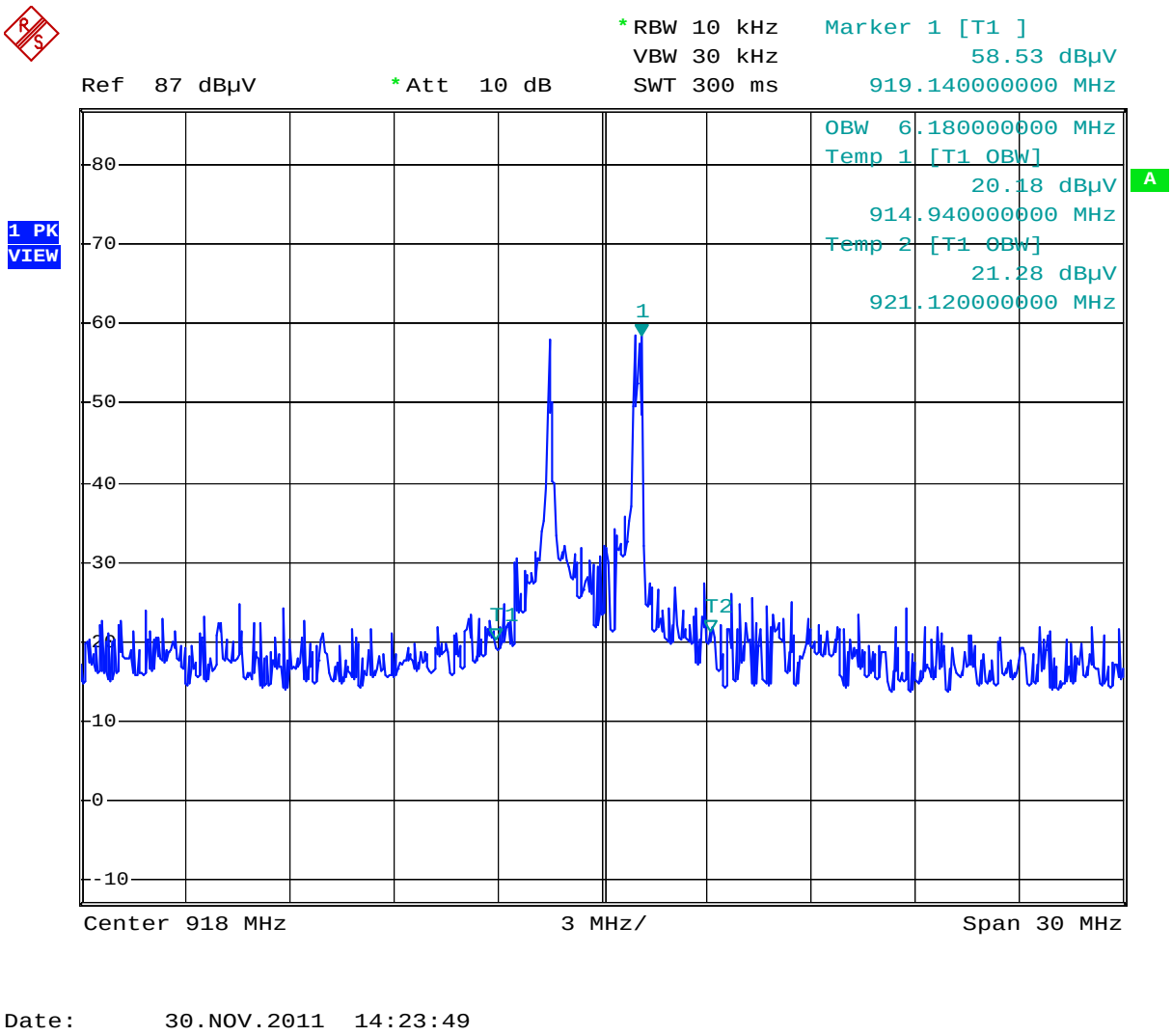
Occupied Bandwidth (99 %):



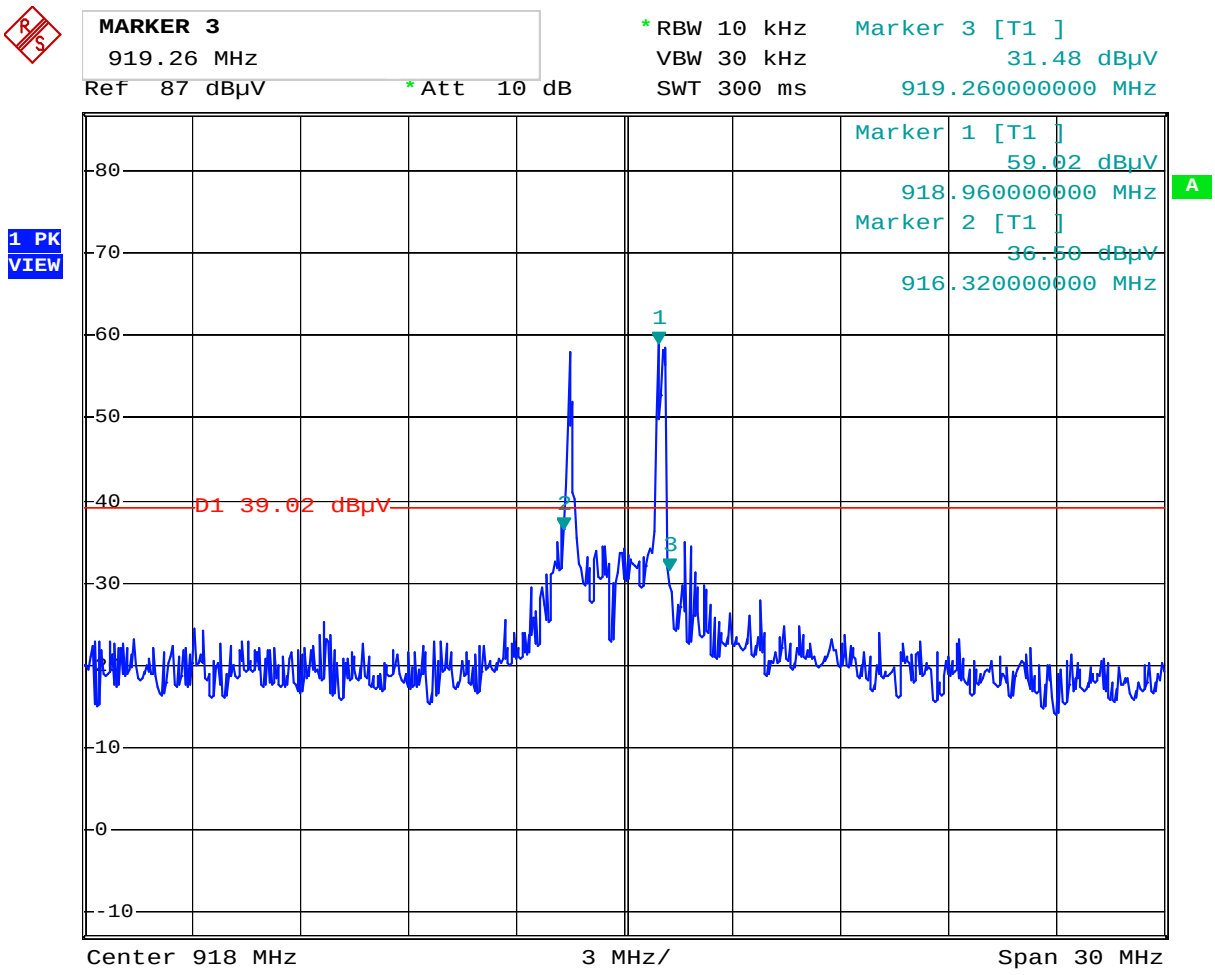
Occupied Bandwidth (99 %):	**6.18 MHz**

Occupied Bandwidth (continued)

Rules and specifications:	IC RSS-Gen Issue 3, section 4.6.1
Guide:	IC RSS-Gen Issue 3, section 4.6.1
Description:	If not specified in the applicable RSS the occupied bandwidth is measuredas the 99% emission bandwidth. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is also recorded. The span between the two recorded frequencies is the occupied bandwidth.
Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	
Date of test:	October 17, 2011
Test site:	Fully anechoic room, cabin no. 2

Occupied Bandwidth (99 %):



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8.2 Bandwidth of the Emission

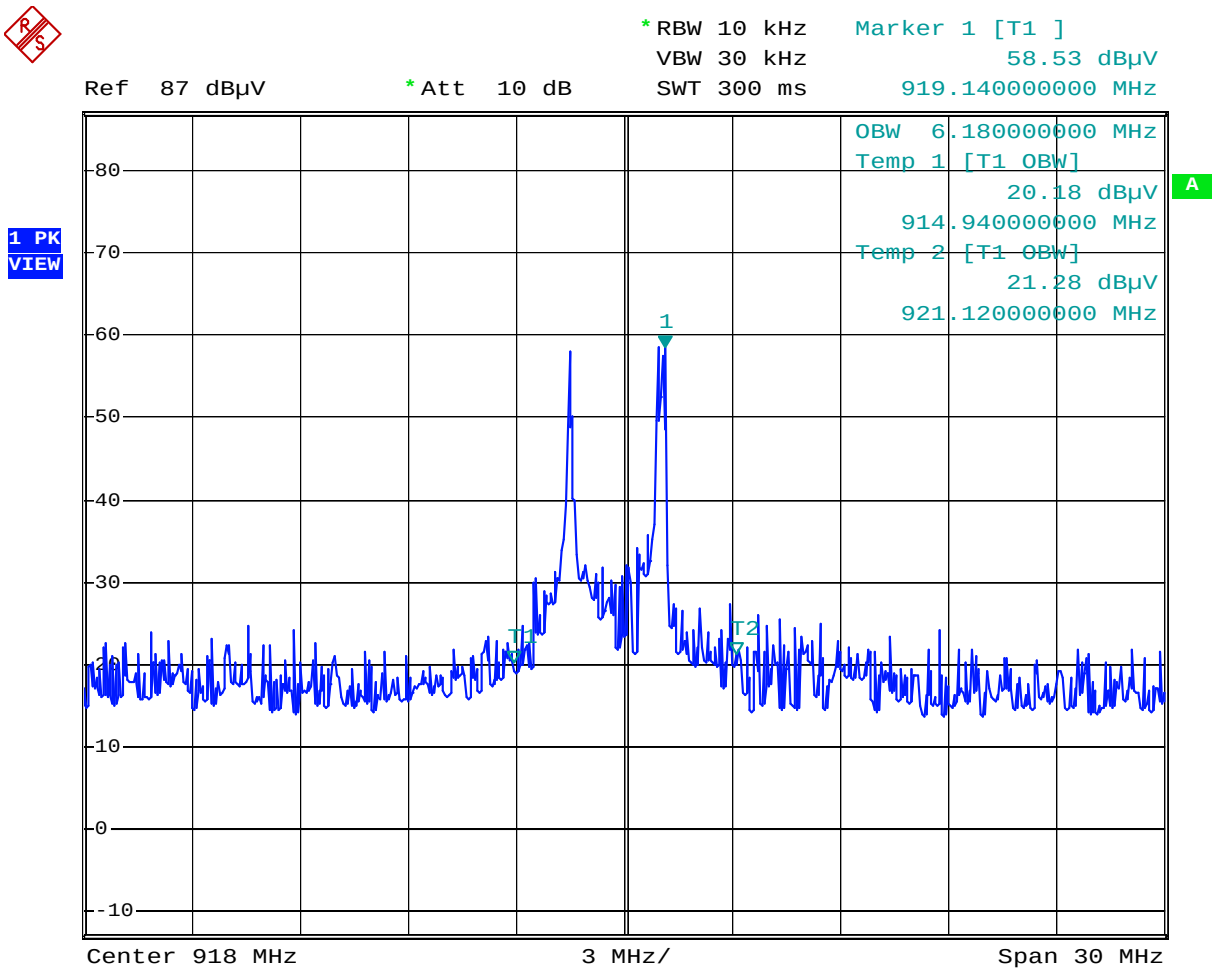
Rules and specifications:	CFR 47 Part 15, section 15.215(c)
Guide:	ANSI C63.4
Description:	The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier. For intentional radiators operating under the alternative provisions to the general emission limits the requirement to contain the 20 dB 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. The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 MHz to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

The video bandwidth shall be at least three times greater than the resolution bandwidth.

Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	
Date of test:	November 30, 2011
Test site:	Fully anechoic room, cabin no. 2



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Permitted frequency band:	**902 - 928** MHz	
20 dB bandwidth:	**2.82 MHz**	
Carrier frequency stability: Maximum frequency tolerances:	☐ **specified**	☒ **not specified**
Bandwidth of the emission:	**2.82 MHz**	**within permitted frequency band[5]:** ☒ **yes** ☐ **no**

Test Result:	Test passed

[5] If a frequency stability is not specified, it is recommended that the fundamental emission is kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.3 Designation of Emissions

Rules and specifications:	CFR 47 Part 2, sections 2.201 and 2.202 IC RSS-Gen Issue 3, sections 8
Guide:	ANSI C63.4 / TRC-43

Type of modulation:	Frequency Shift Keying (FSK)

B_n = Necessary Bandwidth	$B_n = 2DK + B$
D = Peak deviation	D = 1.39 MHz
K = Overall numerical factor	K = 1
B = Modulation rate	B = 34 kHz
Calculation:	$B_n = 2 \cdot (1.39\ MHz) \cdot 1 + 34\ kHz = 2.82\ MHz$

Designation of Emissions:	**2M82F1D**

8.4 Restricted Bands of Operation

Rules and specifications:	CFR 47 Part 15, section 15.205(a) IC RSS-210 Issue 8, section 7.2.2(a)
Guide:	ANSI C63.4
Limit:	Only spurious emissions are permitted in any of the frequency bands listed in CFR 47 Part 15, section 15.205(a) or IC RSS-210 Issue 7, section 2.2(a).
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.3)

Comment:	
Date of test:	November 30, 2011
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters

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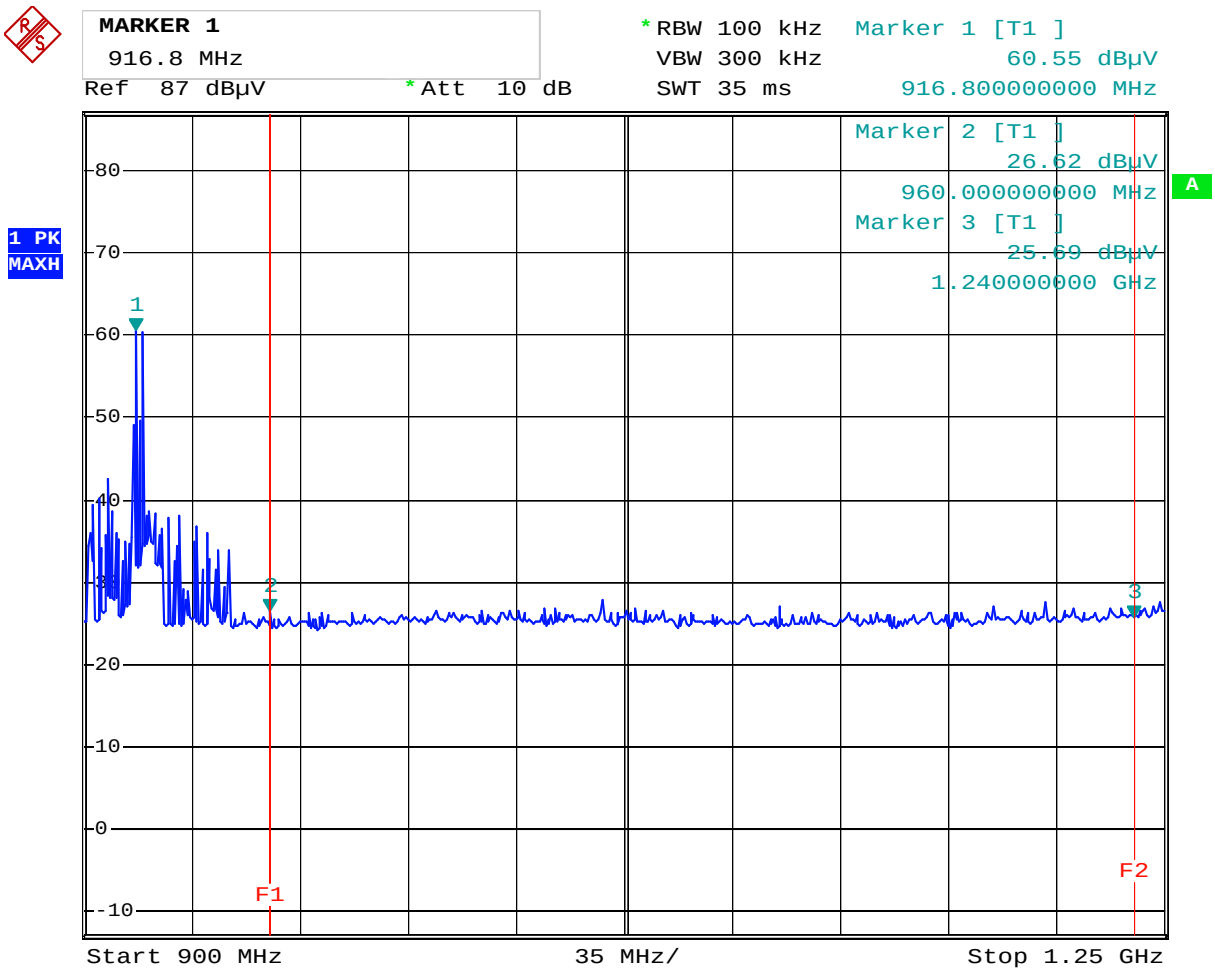


Date: 30.NOV.2011 14:12:07

Test Result:	Test passed

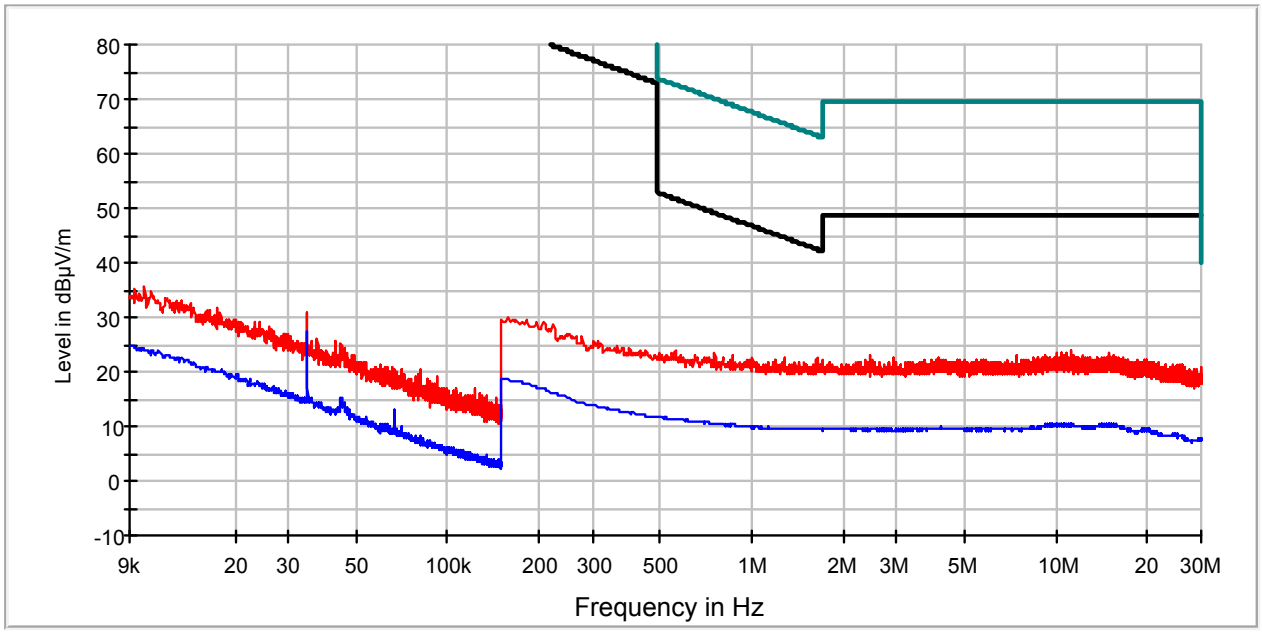
8.5 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.231(b)(3) IC RSS-210 Issue 8, section A1.1.2(b)			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance d (meters)
	0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
	0.490 - 1.705	24000/F(kHz)	87.6 - 20 · log(F(kHz))	30
	1.705 - 30.000	30	29.5	30
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.			
Measurement procedure:	Radiated Emission Measurement 9 kHz to 30 MHz (6.2)			

Comment:	
Date of test:	14 January 2012
Test site:	Open field test site

Test Result:	Test passed

K8 Electric Field Strength 9kHz-30MHz (3m) vertical



Sample calculation of final values:

Extrapolation Factor (dB) = (Log(d) - Log(d_1)) · Extrapolation Factor (dB/decade)

Final Value (dBµV/m) = Reading Value d_1 (dBµV) + Correction Factor (dB/m) + Extrapolation Factor (dB) + Pulse Train Correction (dB)

Note: Extrapolation factor (dB) and final value (dBµV/m) are relating to distance d.

8.6 Radiated Emission Measurement 30 MHz to 10 GHz

Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.249 IC RSS-210 Issue 8, section A2.9		
Guide:	ANSI C63.4		
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	Above 960	500	54.0
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.		
Measurement procedures:	Radiated Emission in Fully or Semi Anechoic Room (6.3) Radiated Emission at Alternative Test Site (6.4)		

Comment:	Transmitting continuously at 919 MHz
Date of test:	October 17, 2011
Test site:	Frequencies ≤ 1 GHz: Semi-anechoic room, cabin no. 8 Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	Frequency ≤ 8.2 GHz: 3 meters Frequency > 8.2 GHz: 1 meter

Test Result:	Test passed

Frequency (MHz)	Antenna Polarization	Detector	Receiver Reading (dBµV)	Correction Factor (dB/m)	Pulse Train Correction (dB)	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
52.010	vertical	Quasi-Peak	6.1	15.6		21.7	40.0	18.3
103.990	vertical	Quasi-Peak	13.8	14.1		27.9	43.5	15.6
130.010	vertical	Quasi-Peak	13.5	10.9		24.4	43.5	19.1
155.980	vertical	Quasi-Peak	15.8	10.1		25.9	43.5	17.6
208.010	vertical	Quasi-Peak	8.7	12.2		20.9	43.5	22.6
260.000	vertical	Quasi-Peak	16.7	14.2		30.9	46.0	15.1
763.560	horizontal	Quasi-Peak	-1.3	23.4		22.1	46.0	23.9
919.000	horizontal	Quasi-Peak	67.9	25.0		92.9	94.0	**1.1**
1840.000	vertical	Peak	11.9	31.5		43.3	54.0	10.7
5515.600	horizontal	Peak	9.3	35.0		44.2	54.0	9.8
7352.436	vertical	Average	11.3	39.1		50.4	54.0	3.7
7354.000	vertical	Peak	13.9	39.1		53.0	74.0	21.0
9190.000	vertical	Peak	17.7	43.8		61.6	63.5	1.9

Sample calculation of final values:

Final Value (dBµV/m) = Reading Value (dBµV) + Correction Factor (dB/m) + Pulse Train Correction (dB)

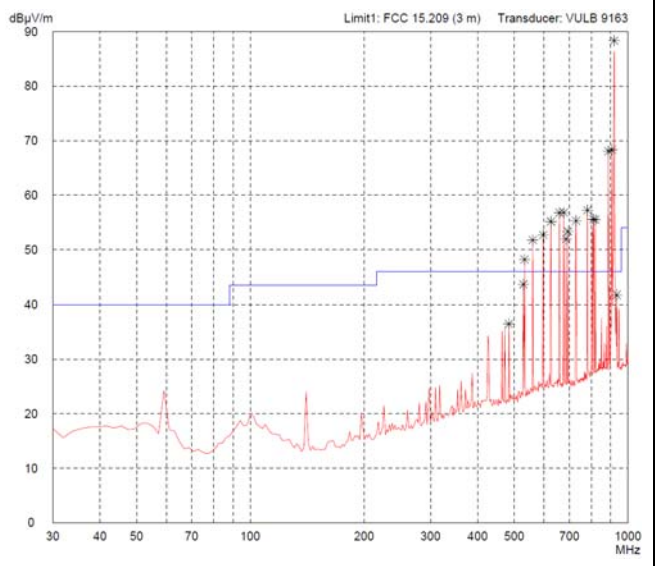
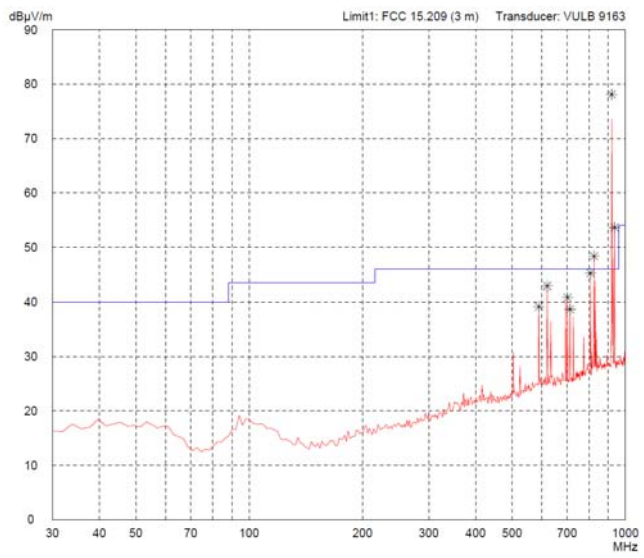
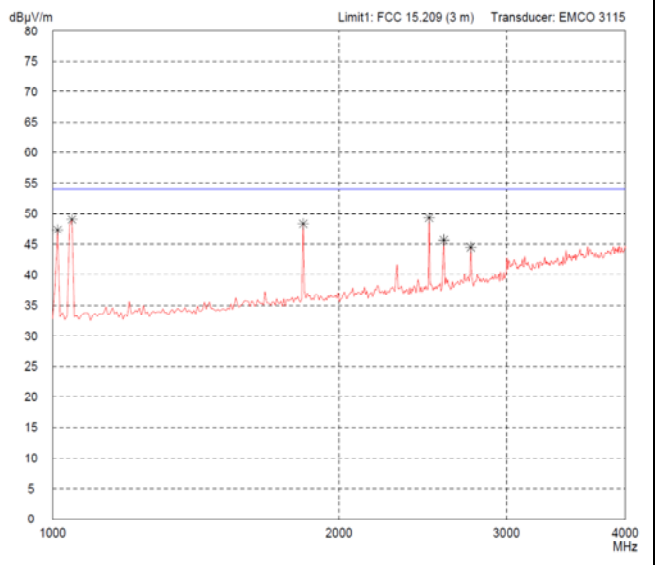
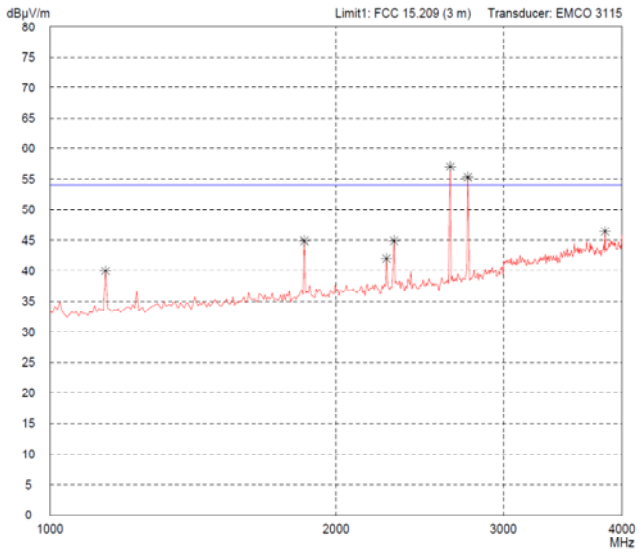
Comment:	Transmitting continuously at 920 MHz
Date of test:	October 17, 2011
Test site:	Frequencies ≤ 1 GHz: Semi-anechoic room, cabin no. 8 Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	Frequency ≤ 8.2 GHz: 3 meters Frequency > 8.2 GHz: 1 meter

Test Result:	Test passed

Frequency (MHz)	Antenna Polarization	Detector	Receiver Reading (dBµV)	Correction Factor (dB/m)	Pulse Train Correction (dB)	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
52.010	vertical	Quasi-Peak	6.1	15.6		21.7	40.0	18.3
103.990	vertical	Quasi-Peak	13.8	14.1		27.9	43.5	15.6
130.010	vertical	Quasi-Peak	13.5	10.9		24.4	43.5	19.1
155.980	vertical	Quasi-Peak	15.8	10.1		25.9	43.5	17.6
208.010	vertical	Quasi-Peak	8.7	12.2		20.9	43.5	22.6
260.000	vertical	Quasi-Peak	16.7	14.2		30.9	46.0	15.1
763.560	horizontal	Quasi-Peak	-1.3	23.4		22.1	46.0	23.9
920.000	horizontal	Quasi-Peak	67.1	25.0		92.1	94.0	1.9
1840.000	vertical	Peak	11.9	31.5		43.4	54.0	10.6
5523.200	horizontal	Peak	9.3	35.0		44.3	54.0	9.7
7360.410	horizontal	Average	13.5	39.1		52.6	54.0	**1.5**
7363.400	vertical	Peak	13.4	39.1		52.5	54.0	1.5
9200.120	vertical	Average	9.3	43.8		53.1	63.5	10.4

Sample calculation of final values:

Final Value (dBµV/m) = Reading Value (dBµV) + Correction Factor (dB/m) + Pulse Train Correction (dB)

Horizontal Polarisation	Vertical Polarisation
DuT Flat on Table	
	
	

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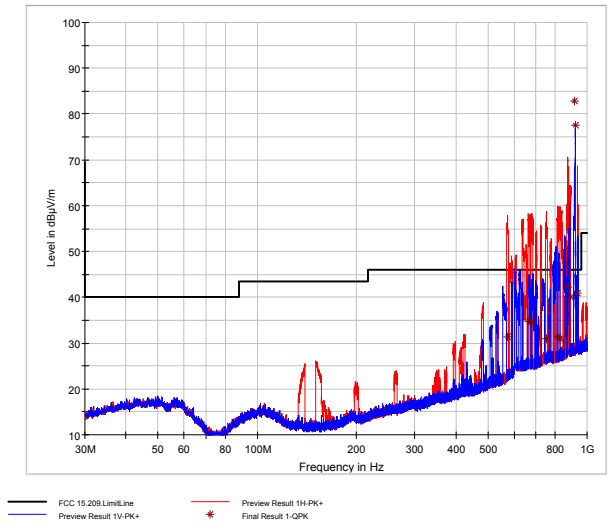
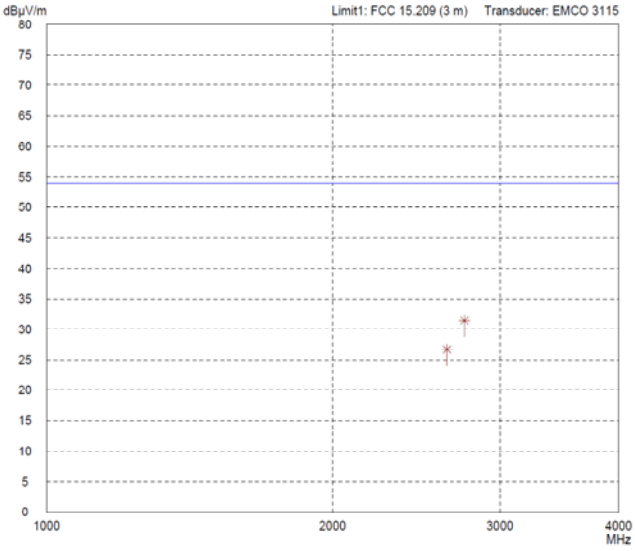
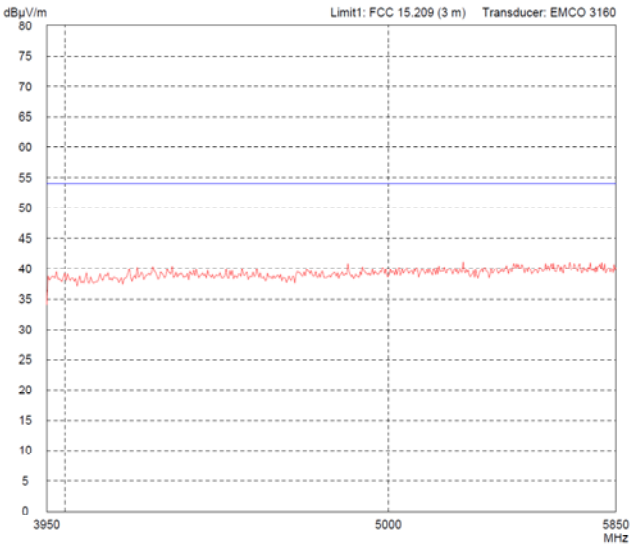
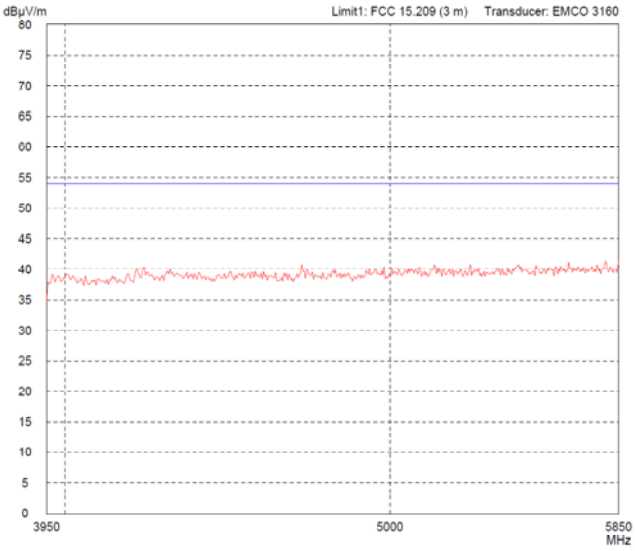
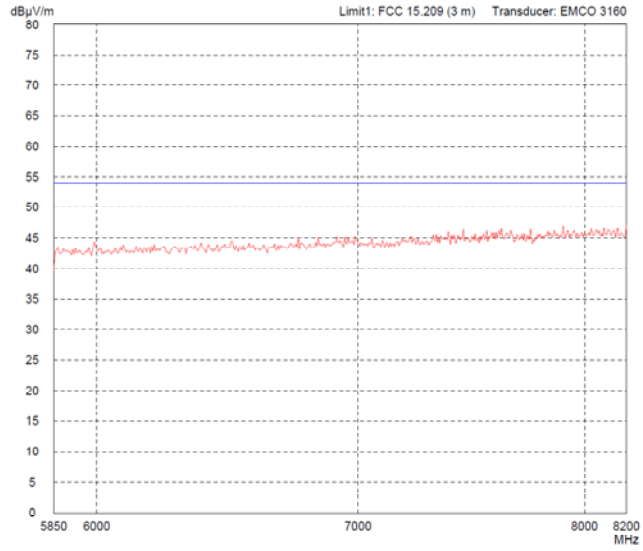
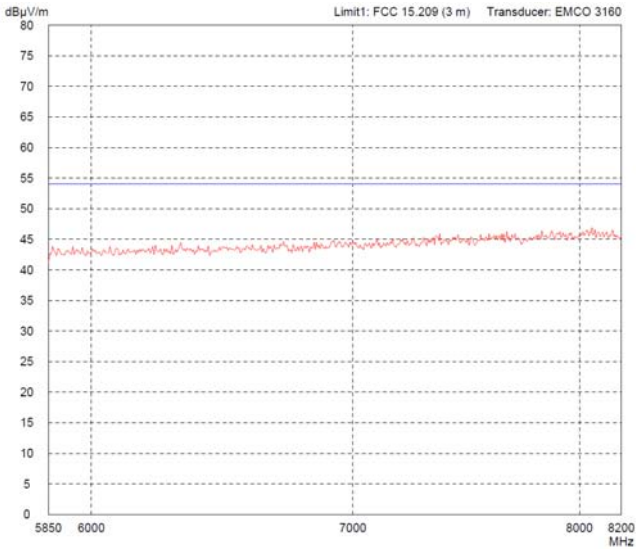
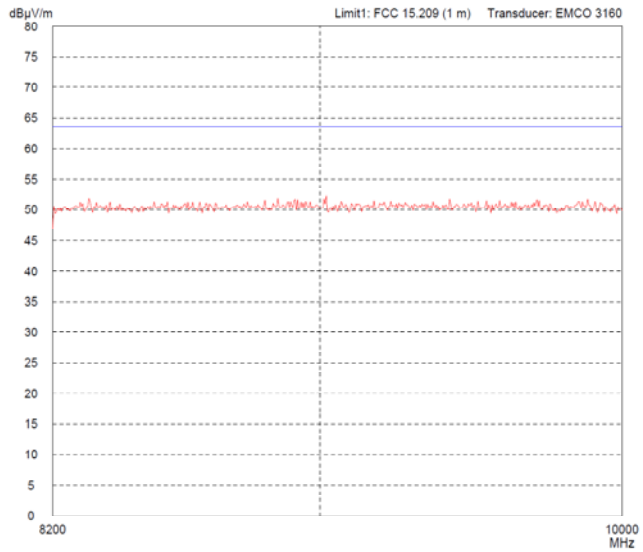
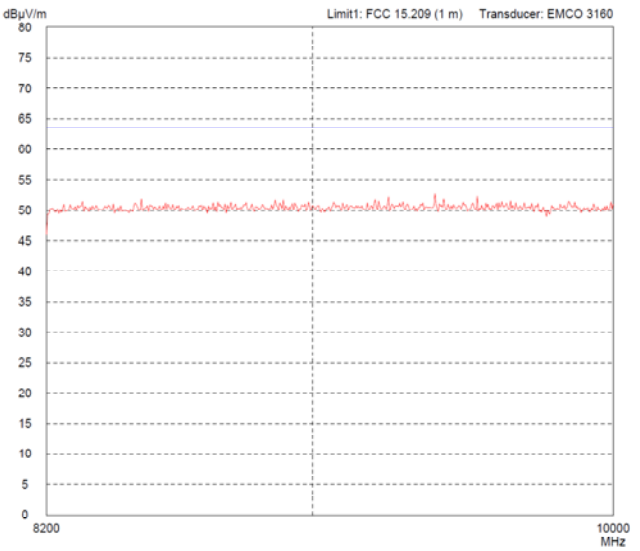
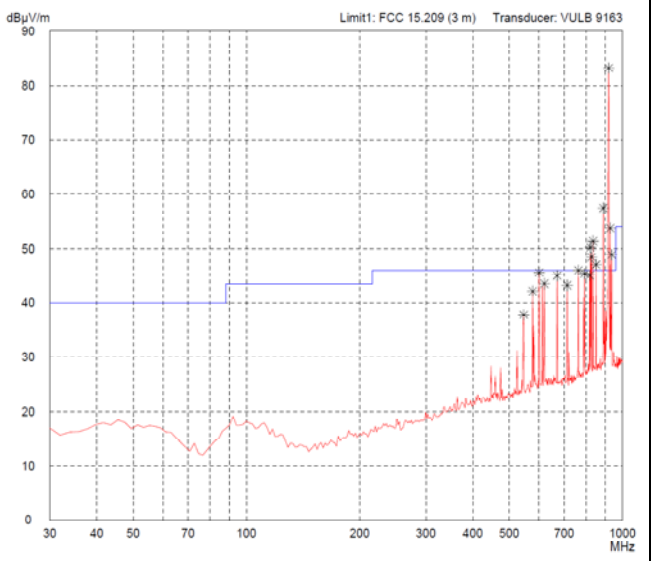
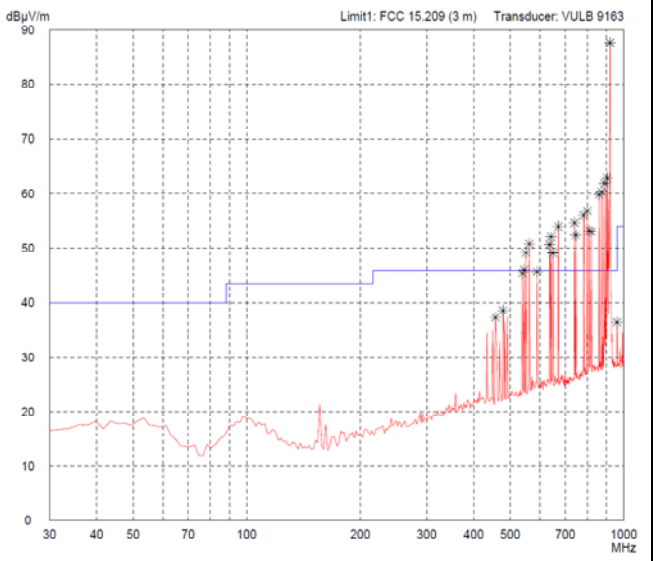
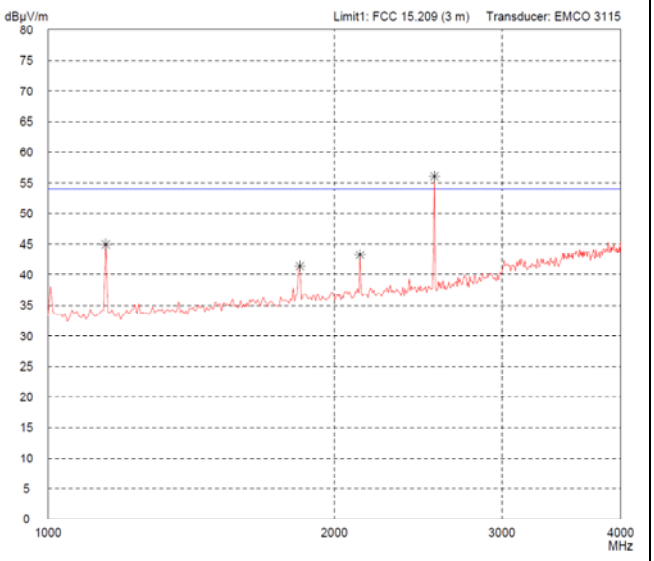
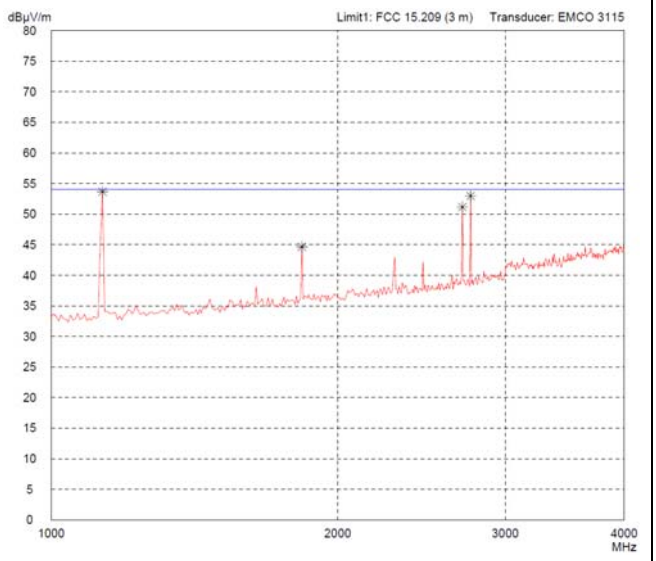
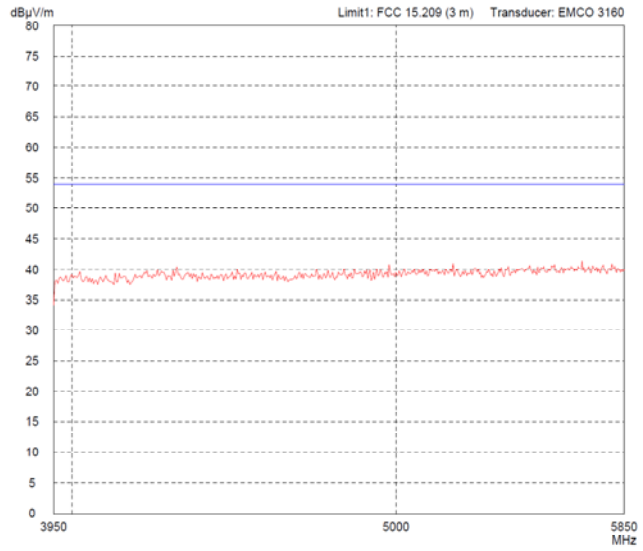
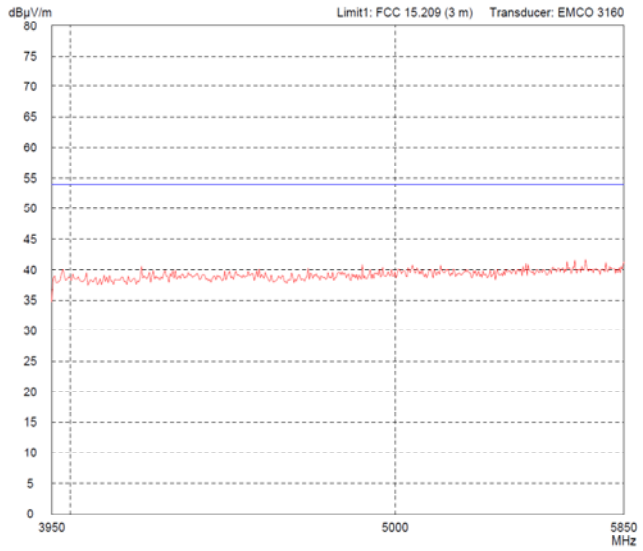
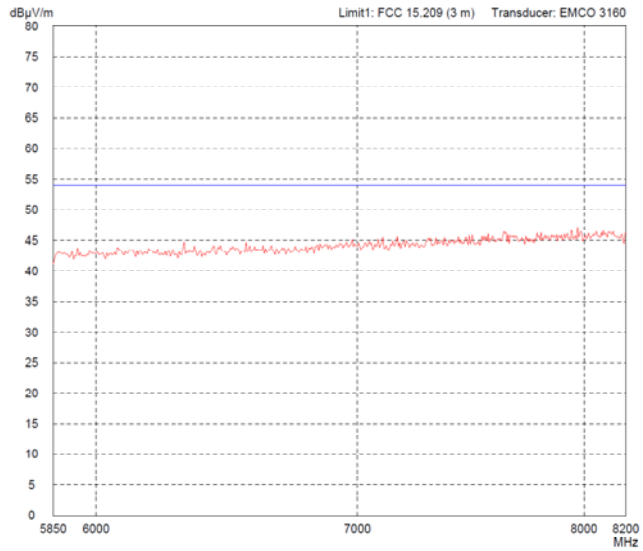
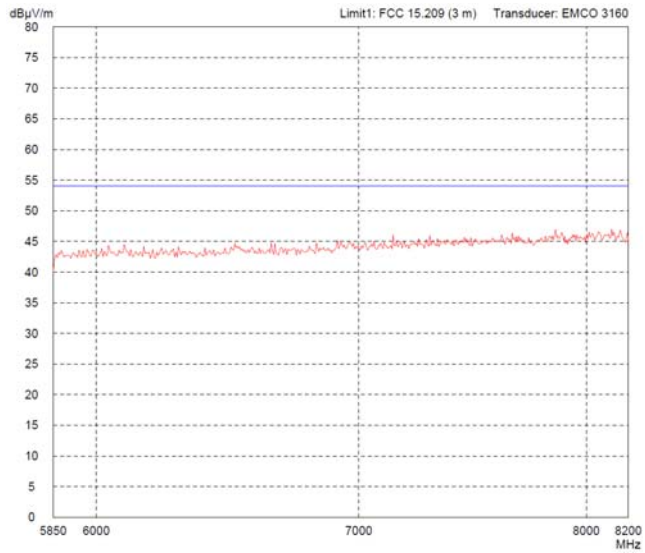
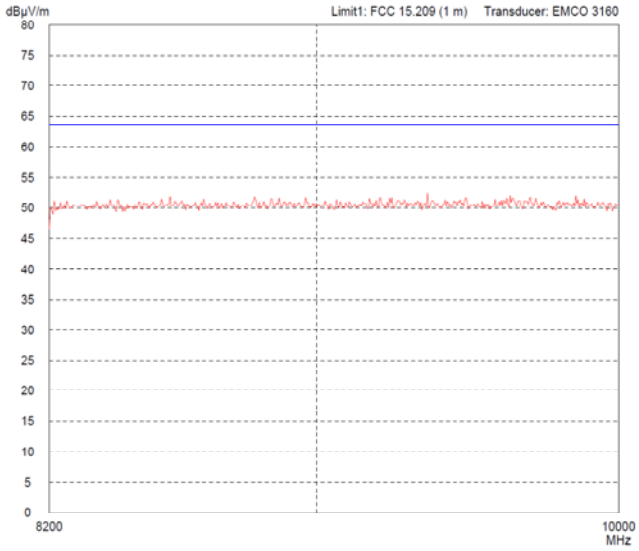
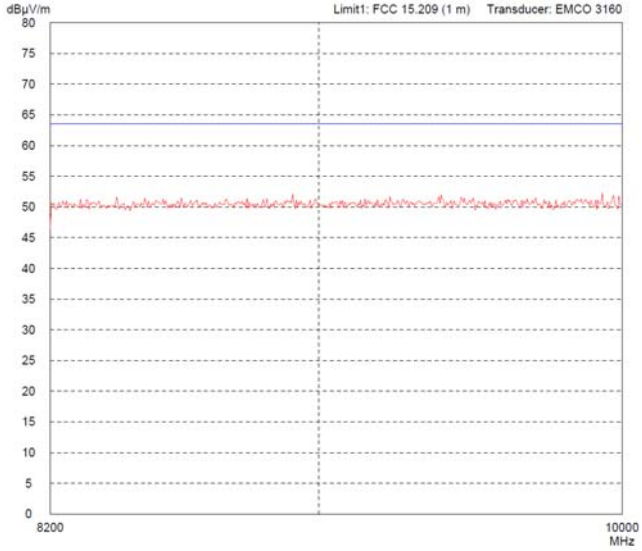
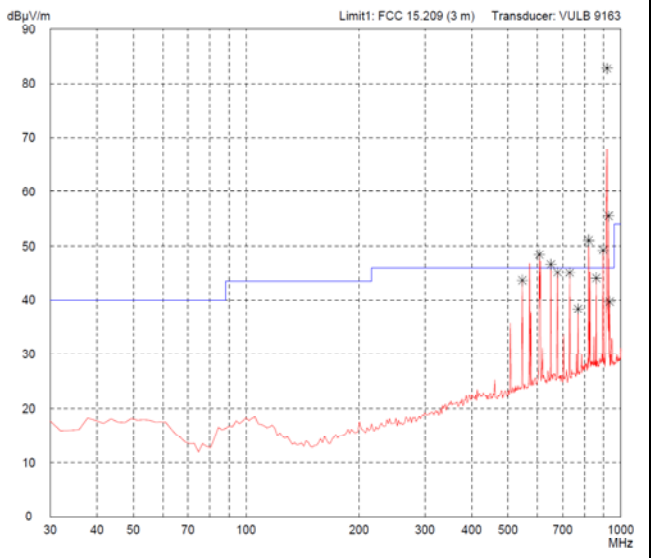
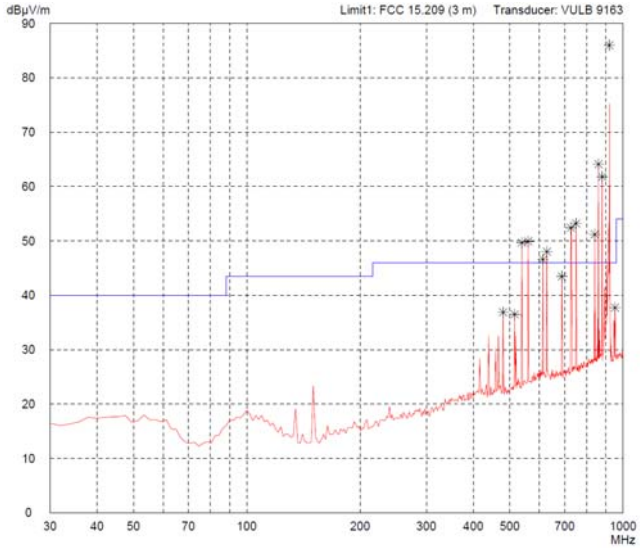
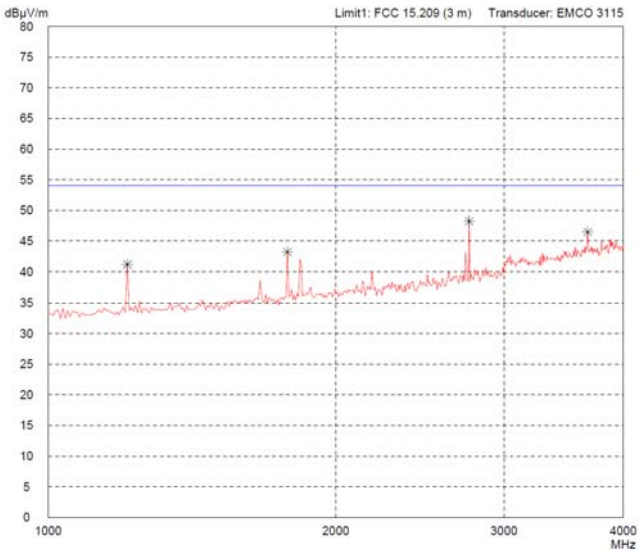
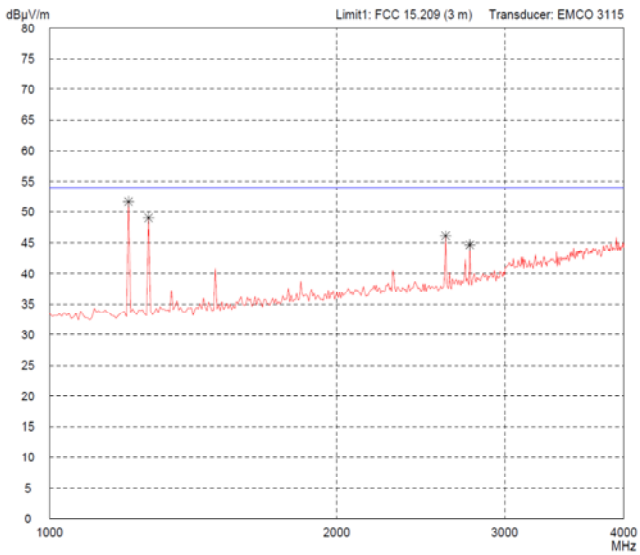
Horizontal Polarisation	Vertical Polarisation
DuT Flat on Table	
	 Note : Retest with average detector
	

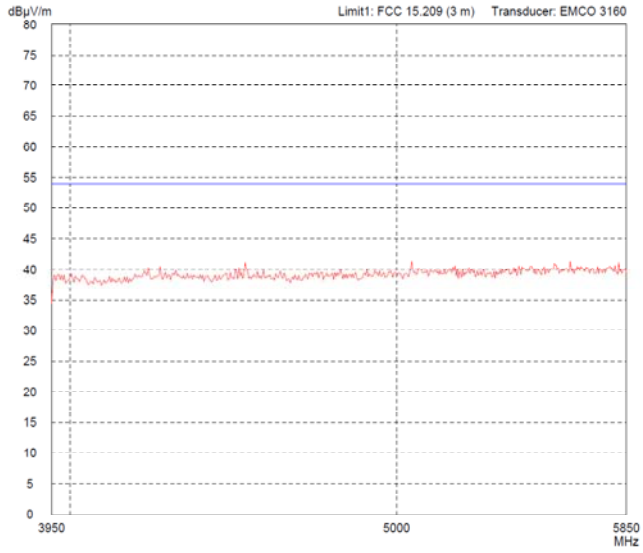
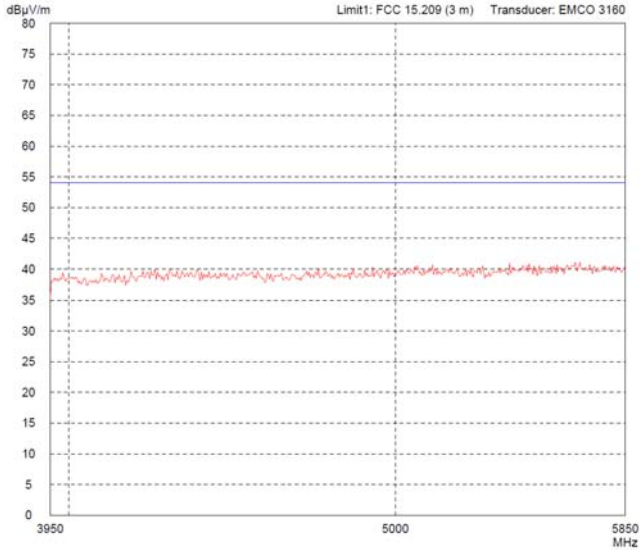
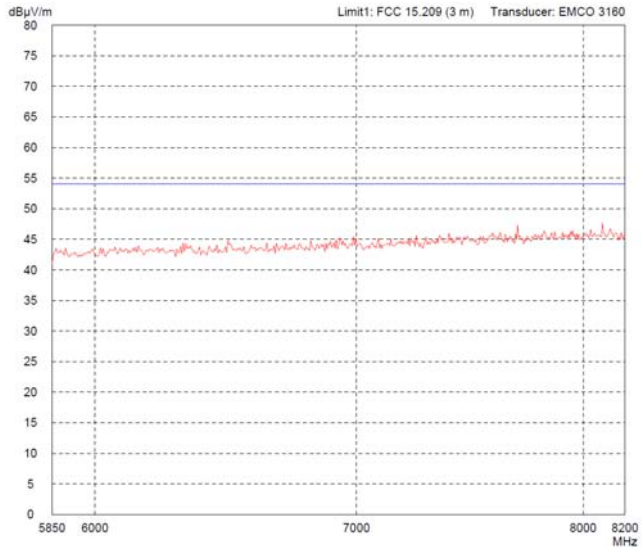
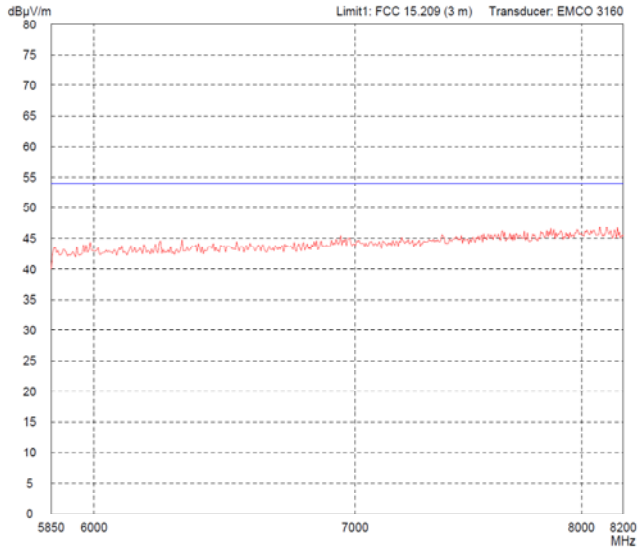
Horizontal Polarisation	Vertical Polarisation
DuT Flat on Table	
	
	

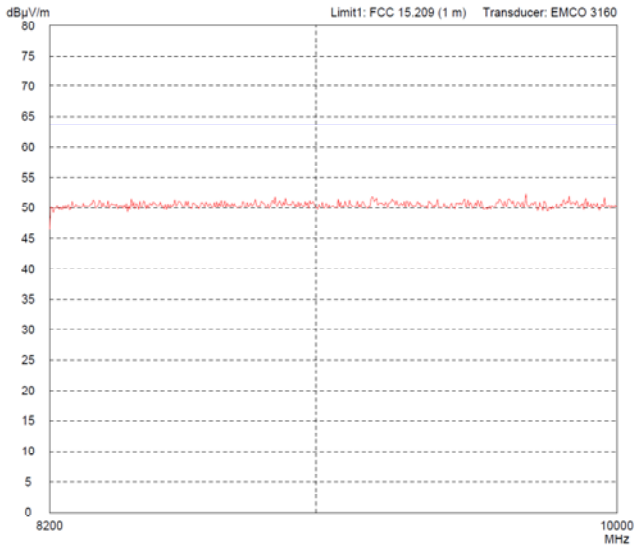
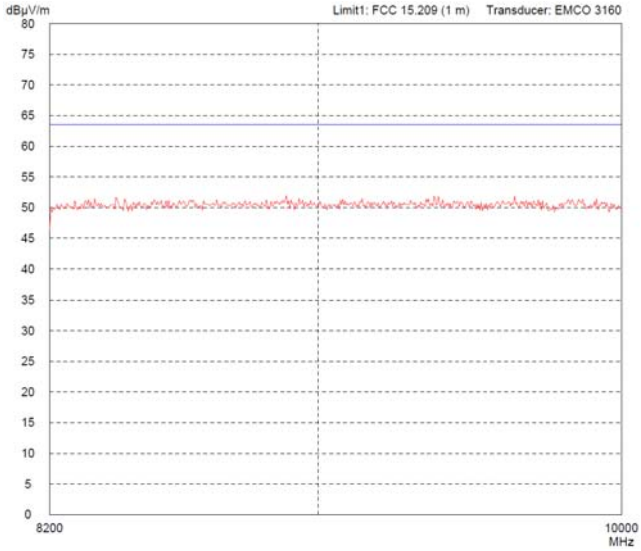
Horizontal Polarisation	Vertical Polarisation
DuT in upright position	
	
	

Horizontal Polarisation	Vertical Polarisation
DuT in upright position	
	
	

Horizontal Polarisation	Vertical Polarisation
DuT in upright position	
	

Horizontal Polarisation	Vertical Polarisation
DuT lying on long side	
	
	

Horizontal Polarisation	Vertical Polarisation
DuT lying on long side	
	
	

Horizontal Polarisation	Vertical Polarisation
DuT lying on long side	
	

8.7 Exposure of Humans to RF Fields

Rules and specifications:	IC RSS-Gen Issue 3, section 5.6
Guide:	IC RSS-102 Issue 4, section 2.5

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☐ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: CP = **..... W**			☐	
The effective isotropic radiated power (EIRP in watts) is calculated using				
☐ the numerical antenna gain: G = **.....** $EIRP = G \cdot CP \Rightarrow EIRP$ = **..... W**		☐		
☐ the field strength[6] in V/m: FS = **..... V/m**			☐	
$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **..... W**				
with: Distance between the antennas in m: D = **..... m**			☐	
☒ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by[6]: $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **585 µW**				
with: Field strength in V/m: FS = **44.16 mV/m**			☒	
Distance between the two antennas in m: D = **3 m**			☒	
Selection of output power				
The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.): TP = **585 µW**				

[6] The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses.
If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.

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Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is				
☐ less than or equal to 20 cm ☒ greater than 20 cm		☒		
Transmitting device is				
☐ in the vicinity of the human head ☐ body-worn		☒		
SAR evaluation				
SAR evaluation is required if the separation distance between the user and the device is less than or equal to 20 cm.				
☐ The device operates from 3 kHz up to 1 GHz inclusively and with output power (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 200 mW for general public use and 1000 mW for controlled use.				☐
☐;				
☐ The device operates above 1 GHz and up to 2.2 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 100 W for general public use and 500 W for controlled use.				☐
☐ The device operates above 2.2 GHz and up to 3 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use and 100 mW for controlled use.				☐
☐ The device operates above 3 GHz and up to 6 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 10 mW for general public use and 50 mW for controlled use.				☐
☐ SAR evaluation is documented in test report no.				
RF exposure evaluation				
RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm.				
☒ The device operates below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W.				☒
☐ The device operates at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.				☐
☐ RF exposure evaluation is documented in test report no.				

9 Referenced Regulations

All tests were performed with reference to the following regulations and standards:

☒	CFR 47 Part 2	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)	October 1, 2011
☒	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2011
☒	ANSI C63.4	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	December 11, 2003 (published on January 30, 2004)
☐	ANSI C63.4	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	June 7, 2009 (published on September 15, 2009)
☒	RSS-Gen	Radio Standards Specification RSS-Gen Issue 3 containing General Requirements and Information for the Certification of Radiocommunication Equimpment, published by Industry Canada	December 2010
☒	RSS-210	Radio Standards Specification RSS-210 Issue 8 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada	December 2011
☐	RSS-310	Radio Standards Specification RSS-310 Issue 3 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	December 2010
☒	RSS-102	Radio Standards Specification RSS-102 Issue 4: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), published by Industry Canada	March 2010
☐	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada	February 7, 2004
☒	CISPR 22	Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, “Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement”	1997

☐	CAN/CSA-CEI/IEC CISPR 22	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment CAN/CSA CISPR 22-10 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (Adopted IEC CISPR 22:2008, sixth edition, 2008-09)	2002
☐	CAN/CSA CISPR 22-10	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (Adopted IEC CISPR 22:2008, sixth edition, 2008-09)	2010
☒	TRC-43	Notes Regarding Designation of Emissions (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service, published by Industry Canada	October, 2008

10 Test Equipment List with Calibration Data

Type	*Inv.-No.*	*Type Designation*	*Serial Number*	*Manufacturer*	*Calibration Organization*	*Last Calibration*	*Next Calibration*
EMI test receiver	2044	ESU8	100232	Rohde & Schwarz	Rohde & Schwarz	12/2010	06/2012
Spectrum analyser	1666	FSP30	100063	Rohde & Schwarz	Rohde & Schwarz	05/2011	11/2012
Preamplifier	1484	ACO/180-3530	32641	CTT	TÜV SÜD SENTON	06/2011	12/2012
Preamplifier	1651	CPA9231A	3393	Schaffner Electrotest	TÜV SÜD SENTON	05/2010	05/2012
Preamplifier	1684	AFS3-00100800-32-LN	847743	MITEQ	TÜV SÜD SENTON	10/2011	04/2013
Loop antenna	1016	HFH2-Z2	882964/0001	Rohde & Schwarz	Rohde & Schwarz	05/2011	11/2012
TRILOG Broadband Antenna	1722	VULB 9163	9163-188	Schwarzbeck	Rohde & Schwarz	08/2010	02/2012
TRILOG Broadband Antenna	2058	VULB 9163	9163-408	Schwarzbeck	Rohde & Schwarz	05/2011	11/2012
Horn antenna	1516	3115	9508-4553	EMCO	Seibersdorf Labor GmbH	10/2010	10/2012
Horn antenna	1012	3160-05	9112-1001	EMCO	---	no calibration required	
Horn antenna	1013	3160-06	9112-1001	EMCO	---	no calibration required	
Horn antenna	1014	3160-07	9112-1008	EMCO	---	no calibration required	

11 Revision History

Revision History			
Edition	*Date*	*Issued by*	*Modifications*
1	07.02.2012	J. Roidt	First Edition
2	08.02.2012	J. Roidt (cb)	Page 3 edited
3	02.08.2012	M. Steindl (cb)	Pages 32, 33, 36 edited