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September 21, 2010

Prüfbericht / *Test Report* Nr. / *No.* 14912-02340-2 (Edition 3)

Applicant:	Siemens AG
Type of equipment:	Antennas for UHF RFID Reader
Type designation:	RF670R with RF640A and RF642A
Order No.:	
Test standards:	FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.205, 15.215 and 15.247 Industry Canada Radio Standards Specifications RSS-210 Issue 7, Sections 2.2, 2.6 and A8 (Category I Equipment)

TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

Table of Contents

1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation[1]:	RF670R with RF640A and RF642A
Parts[2]:	Reader: RF670R Antenna 1: RF640A: (antenna gain: 4.3 dBi) Antenna 2: RF642A: (antenna gain: 7.0 dBi)
Serial number(s):	Test sample
Manufacturer:	Siemens AG
Type of equipment:	Antennas for UHF RFID Reader
Version:	As received
FCC ID:	NXW-RF670R
Additional parts/accessories:	

Technical data of EUT		
Application frequency range:	902 - 928 MHz	
Frequency range:	902.25 - 927.75 MHz	
Operating frequency:	914.75 MHz	
Type of modulation:	DSB-ASK and SSB-ASK	
Pulse train:	---	
Pulse width:	---	
Number of RF-channels:	50	
Channel spacing:	500 kHz	
Designation of emissions[3]:	56K9A1D	
Type of antenna:	External antenna	
Size/length of antenna:	185 x 185 mm	
Connection of antenna:	☒ detachable	☐ not detachable
Type of power supply:	DC supply	
Specifications for power supply:	nominal voltage:	24 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):	Siemens AG Siemensstraße 2 - 4 D-90766 Fürth
Contact person:	Dr. Thomas Erik Schilhabel
Contract identification:	
Receipt of EUT:	August 24, 2010
Date(s) of test:	August 24, 2010
Note(s):	This test report is intended for a permissive change. For further details please refer to the original test report.

Report details	
Report number:	14912-02340-2
Edition:	3
Issue date:	September 21, 2010

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
Contact person:	Mr. Johann Roidt Phone: (+49) (0)9421 5522-0 Fax: (+49) (0)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 15.205, 15.215 and 15.247(d)** of the Federal Communication Commission (FCC) and the **Radio Standards Specifications** **RSS-210 Issue 7, Sections 2.2, 2.6 and A8.5 (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)
Transmitting continuously with 915.25 MHz

Configuration(s) of EUT
The EUT was configured as antenna of a RF670R tag reader system.

List of ports and cables				
Port	*Description*	*Classification*[4]	*Cable type*	*Cable length*
1	AC supply of AC/DC converter	ac power	Unshielded	2 m
2	DC supply	dc power	Unshielded	1 m
3	TCP/IP interface	signal/control port	Shielded	2 m
4	Antenna 6GT2815-0BH30	signal/control port	Shielded	3 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	UHF RFID Reader	RF670R	SJNA/X5063695	Siemens
2	AC/DC adapter 24 V	6GT2898-0AA20-USA	--	Siemens

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

6 Measurement Procedures

6.1 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.205(b) and 15.247 IC RSS-210 Issue 7, sections 2.2(b)(c), 2.6 and A8.5
Guide:	ANSI C63.4

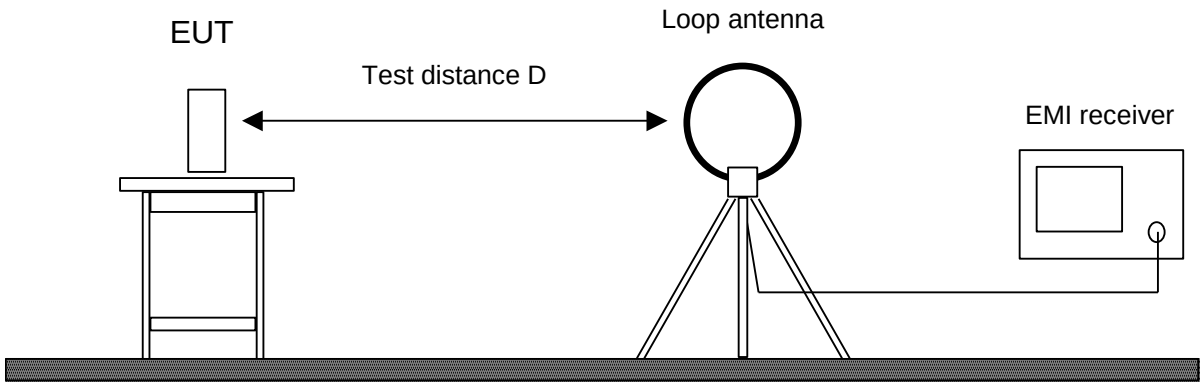
Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak.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

Used	Type	Model	Serial No. or ID	Manufacturer
☒	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
☐	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
☒	Test receiver	ESHS 10	860043/016	Rohde & Schwarz
☐	Preamplifier	CPA9231A	3393	Schaffner
☒	Loop antenna	HFH2-Z2	882964/1	Rohde & Schwarz
☒	Fully anechoic room	No. 2	1452	Albatross Projects
☐	Semi-anechoic room	No. 3	1453	Siemens
☒	Open field test site	EG 1	1450	Senton

6.2 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 2, sections 6(a), 7.2.3.2 IC RSS-210 Issue 7, 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 in a fully or semi anechoic room 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). Final measurements in the frequency range from 30 MHz to 1 GHz are made in both the horizontal and vertical planes of polarization in a semi anechoic room using a EMI receiver with the detector function set to quasi-peak and the measurement bandwidth of the test receiver is set to 120 kHz.

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.

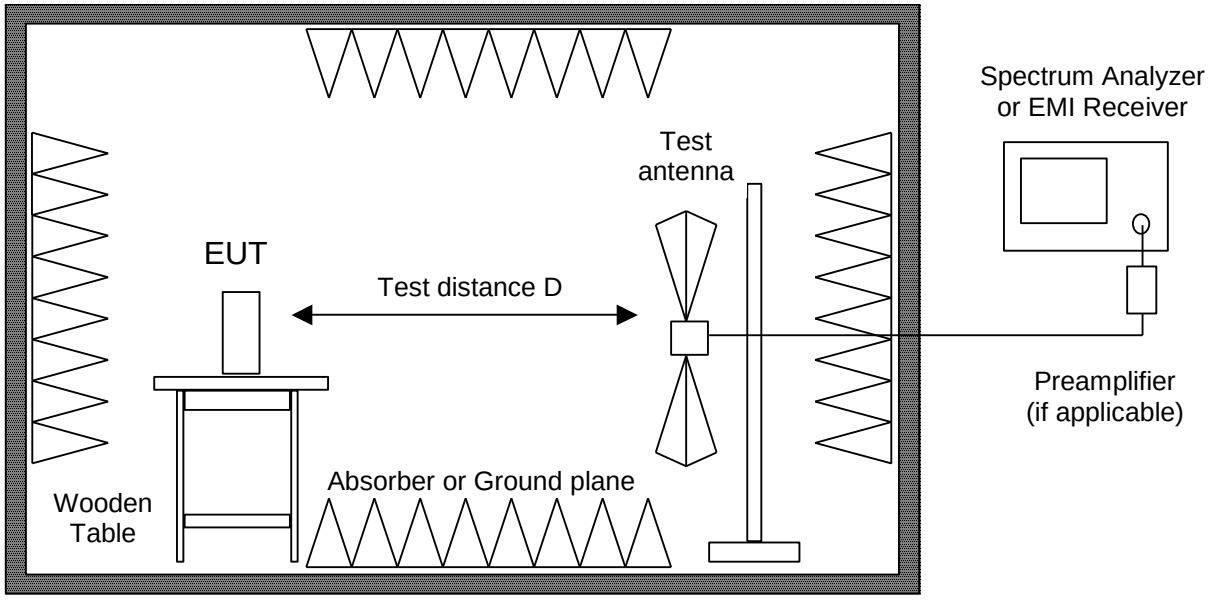
All tests below 18 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance is reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation 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 an open field test-site is used and the plots recorded in the fully or semi anechoic room are indicated as prescans.



Fully or semi anechoic room

Test instruments used:

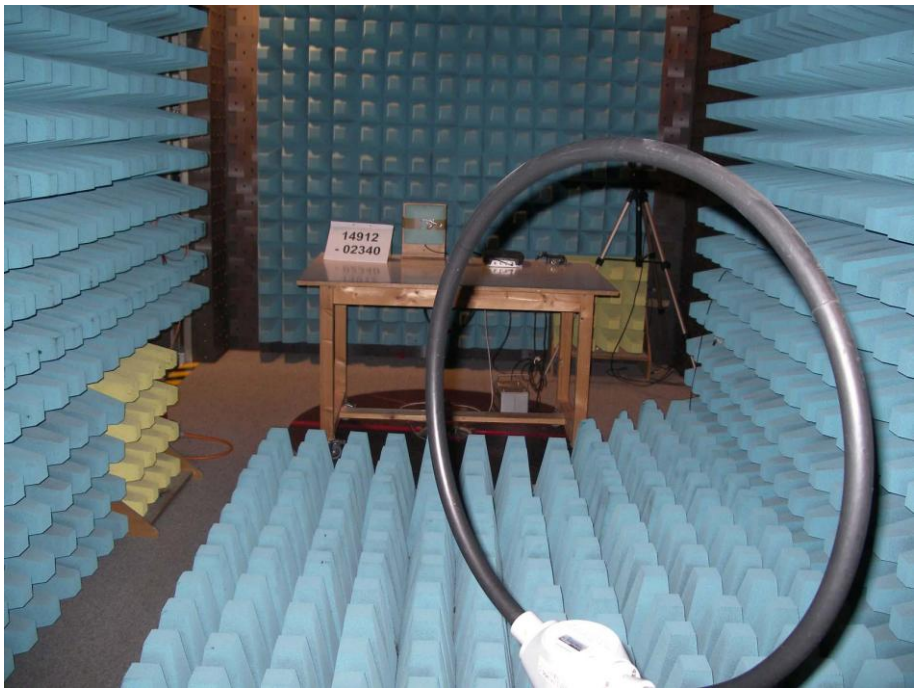
Used	Type	Model	Serial No. or ID	Manufacturer
☒	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
☐	Spectrum analyzer	R 3271	05050023	Advantest
☐	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
☒	EMI test receiver	ESU8	100232	Rohde & Schwarz
☒	Preamplifier	CPA9231A	3393	Schaffner
☐	Preamplifier	R14601		Advantest
☒	Preamplifier 1-8 GHz	AFS3-00100800-32-LN	847743	Miteq
☐	Preamplifier 0.5-8 GHz	AMF-4D-005080-25-13P	860149	Miteq
☒	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
☐	External Mixer	WM782A	845881/005	Tektronix
☐	Harmonic Mixer	FS-Z30	843389/007	Rohde & Schwarz
	Accessories			
☒	Trilog broadband antenna	VULB 9163	9163-188	Schwarzbeck
☒	Trilog broadband antenna	VULB 9163	9163-214	Schwarzbeck
☒	Horn antenna	3115	9508-4553	EMCO
☐	Horn antenna	3160-03	9112-1003	EMCO
☒	Horn antenna	3160-04	9112-1001	EMCO
☒	Horn antenna	3160-05	9112-1001	EMCO
☒	Horn antenna	3160-06	9112-1001	EMCO
☒	Horn antenna	3160-07	9112-1008	EMCO
☐	Horn antenna	3160-08	9112-1002	EMCO
☐	Horn antenna	3160-09	9403-1025	EMCO
☐	Horn antenna	3160-10	399185	EMCO
☒	Fully anechoic room	No. 2	1452	Albatross Projects
☐	Semi-anechoic room	No. 3	1453	Siemens
☒	Semi-anechoic room	No. 8	2057	Albatross Projects

7 Photographs Taken During Testing

TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

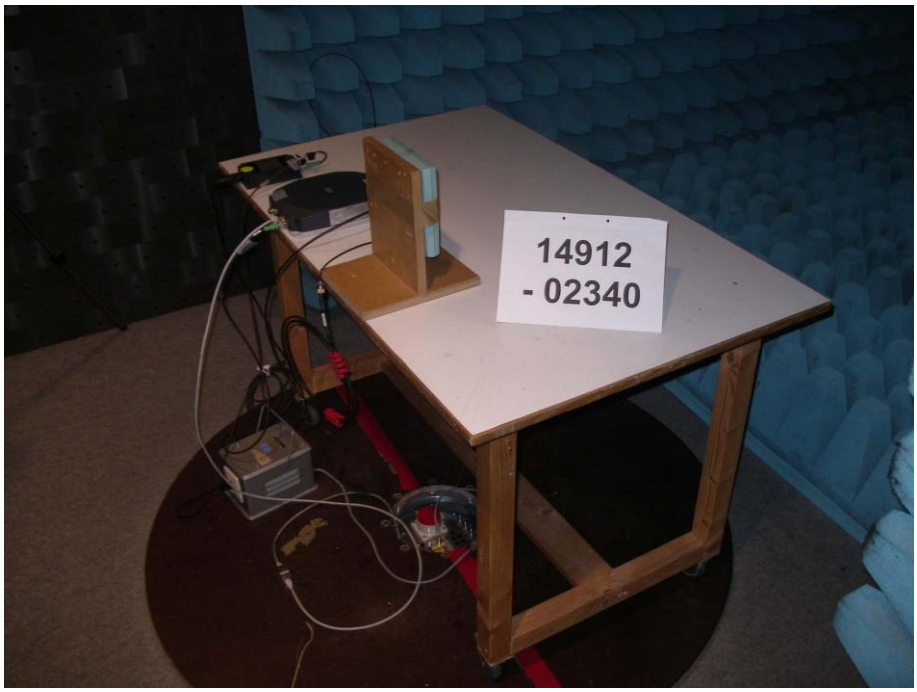
Test setup for radiated emission measurement 9 kHz – 30 MHz

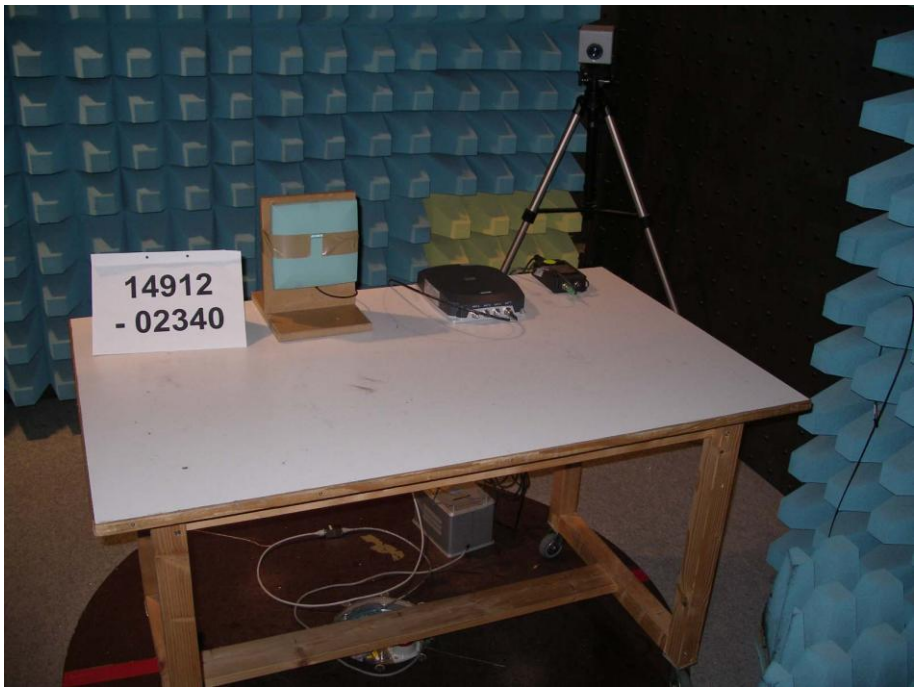


TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

Test setup for radiated emission measurement (fully anechoic room)

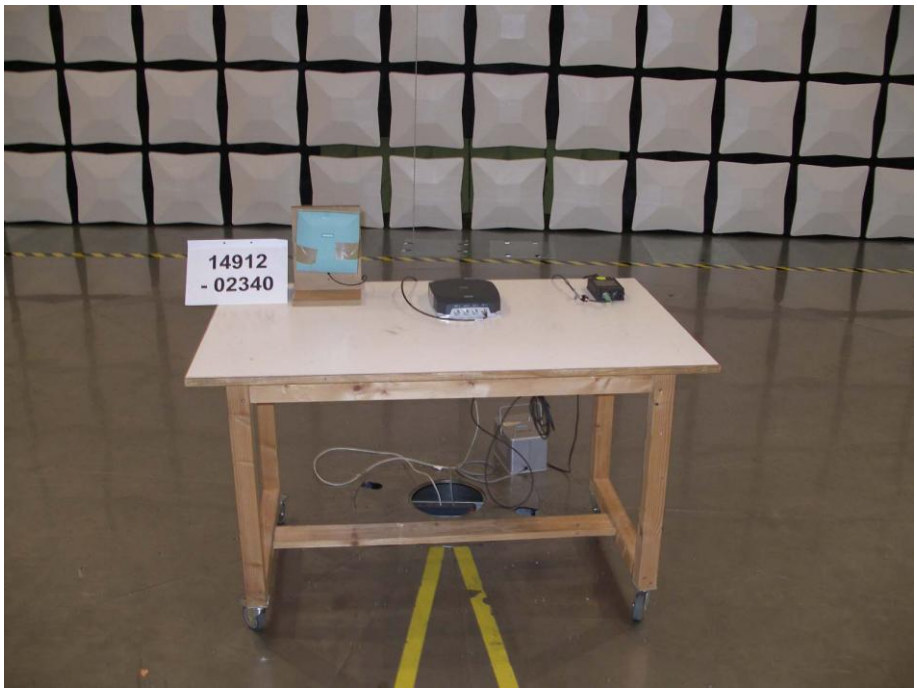


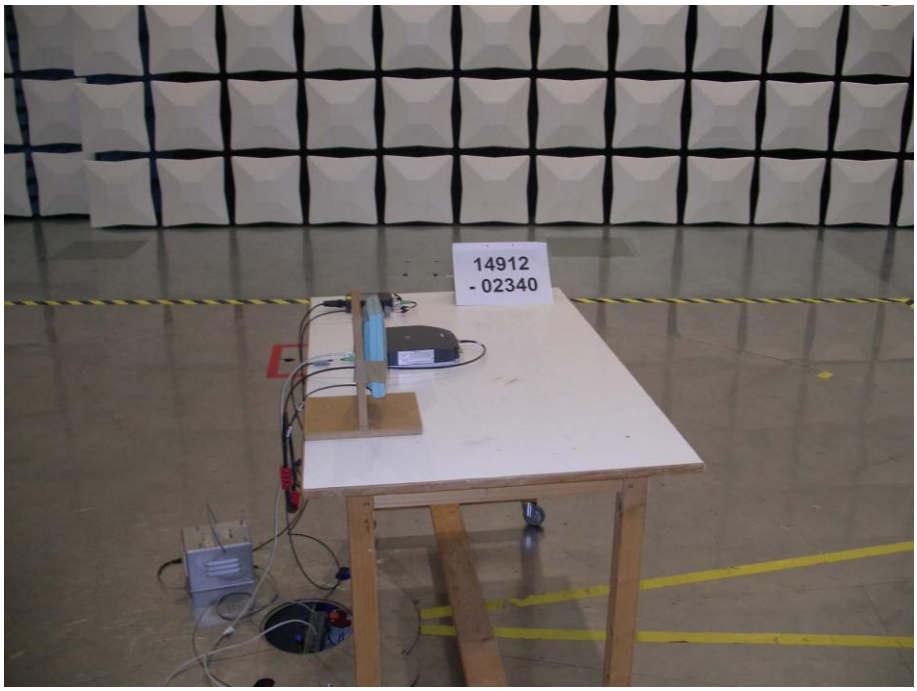


TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

Test setup for radiated emission measurement (semi anechoic room)

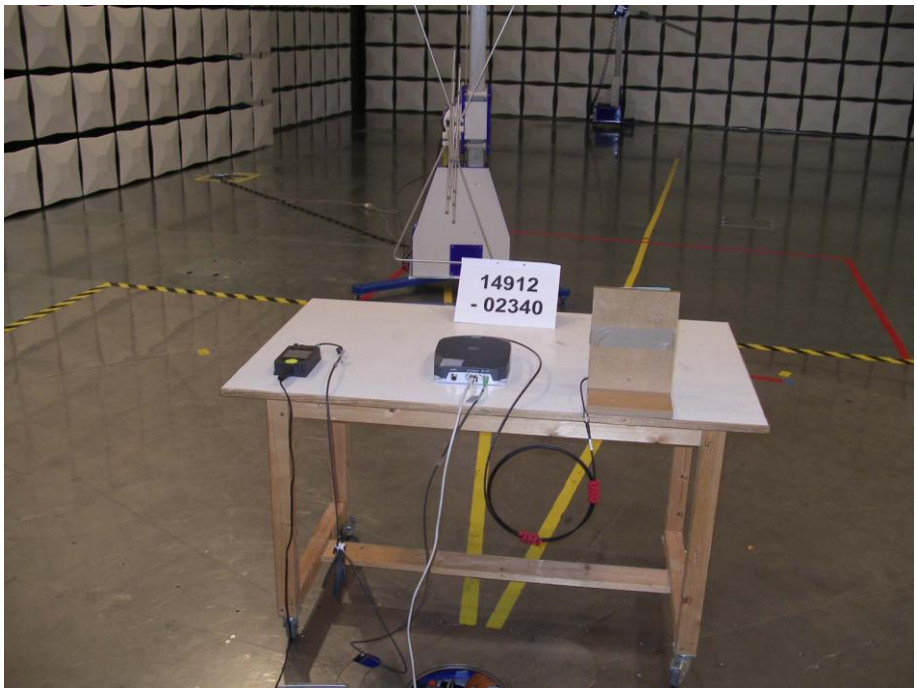


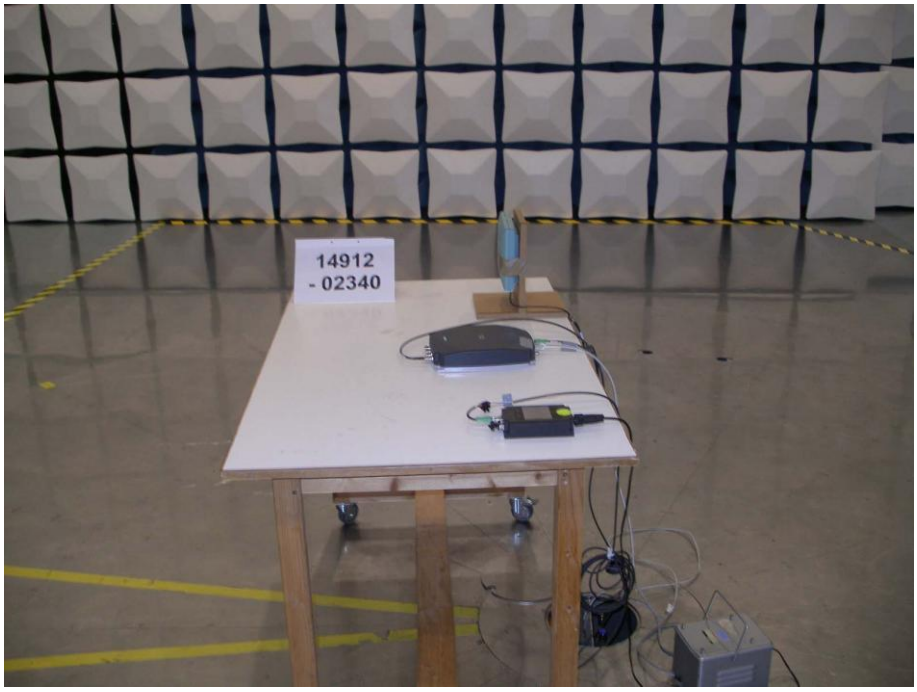


TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

Test setup for radiated emission measurement (semi anechoic room) - continued -





8 Test Results

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		Not performed
15.204	Antenna requirement		Not performed
15.215(c)	Bandwidth of the emission		Not performed
2.201, 2.202	Class of emission		Calculated
15.35(c)	Pulse train measurement for pulsed operation		Not applicable
15.205(a)	Restricted bands of operation		Not performed
15.247(a)(1)(i)	Channel Bandwidth		Not performed
15.247(a)(1)	Hopping channel separation		Not performed
15.247(a)(1)(i)	Number of hopping frequencies used		Not performed
15.247(a)(1)(i)	Time occupancy on any channel		Not performed
15.247(b)(2)	Maximum peak output power		Not performed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz		Not performed
15.247(d)	Conducted emissions		Not performed
15.205(b) 15.247(d)	Radiated emission 9 kHz to 30 MHz	21	Test passed
15.205(b) 15.215(b) 15.247(d)	Radiated emission 30 MHz to 10 GHz	22	Test passed
15.247(i) 2.1093	RF exposure requirement	25	Test passed

IC RSS-Gen Issue 2			
Section(s)	*Test*	*Page*	*Result*
4.8	Transmitter output power (conducted)		Not applicable
4.6.1	Occupied Bandwidth		Not performed
3.2(h), 8	Designation of emissions		Not performed
4.5	Pulsed operation		Not applicable
7.2.2	Transmitter AC power lines conducted emissions 150 kHz to 30 MHz		Not performed
5.5	Exposure of Humans to RF Fields	28	

IC RSS-210 Issue 7			
Section(s)	*Test*	*Page*	*Result*
2.2(a)	Restricted bands and unwanted emission frequencies		Not performed
7.1.4	Antenna requirement		Not performed
A8.1(c)	Channel bandwidth		Not performed
A8.1(b)	Hopping channel separation		Not performed
A8.1(c)	Number of hopping frequencies used		Not performed
A8.1(c)	Time occupancy on any channel		Not performed
A8.4(1)	Maximum output power		Not performed
A8.5	Conducted emissions		Not performed
2.2(b)(c) 2.6 A8.5	Unwanted emissions 9 kHz to 30 MHz	21	Test passed
2.2(b)(c) 2.6 A8.5	Unwanted emissions 30 MHz to 10 GHz	22	Test passed

8.1 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.209 IC RSS-210 Issue 7, sections 2.2 and 2.6			
Guide:	ANSI C63.4			
Limit:	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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).			
Limit 15.209:	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 (6.1)			

Comment:	
Date of test:	August 24, 2010
Test site:	Open field test site

All emissions show more than 20 dB margin to the limit, no values recorded.

Test Result:	Test passed

8.2 Radiated Emission Measurement 30 MHz to 10 GHz

Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.247 IC RSS-210 Issue 7, section A8		
Guide:	ANSI C63.4		
Limit:	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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).		
Limit 15.209:	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 (6.2)		

Test Result:	Test passed

TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

Antenna R640A

Comment:	
Date of test:	August 25, 2010
Test site:	Frequencies ≤ 1 GHz: Semi anechoic room, cabin no. 8 Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	Frequencies ≤ 8.2 GHz: 3 meters Frequencies > 8.2 GHz: 1 meters

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)
30.630	vertical	Quasi-Peak	21.0	14.7		35.7	108.2	72.5
48.990	vertical	Quasi-Peak	14.8	14.6		29.4	108.2	78.8
50.430	vertical	Quasi-Peak	20.8	14.5		35.3	108.2	72.9
51.060	vertical	Quasi-Peak	16.0	14.5		30.5	108.2	77.7
62.520	vertical	Quasi-Peak	17.2	12.1		29.3	108.2	78.9
85.470	vertical	Quasi-Peak	23.8	10.9		34.7	108.2	73.5
94.380	vertical	Quasi-Peak	28.8	12.5		41.3	108.2	66.9
148.110	horizontal	Quasi-Peak	28.1	9.7		37.8	108.2	70.4
209.460	vertical	Quasi-Peak	21.9	12.4		34.3	108.2	73.9
914.750	horizontal	Quasi-Peak	103.6	24.6		128.2		
1828.000	vertical	Peak	16.8	31.4		48.2	108.2	60.0
2746.000	horizontal	Peak	14.1	34.8		48.9	54.0	**5.1**

Sample calculation of final values:

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

Antenna R642A

Comment:	
Date of test:	August 25, 2010
Test site:	Frequencies ≤ 1 GHz: Semi anechoic room, cabin no. 8 Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	Frequencies ≤ 8.2 GHz: 3 meters Frequencies > 8.2 GHz: 1 meters

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)
30.630	vertical	Quasi-Peak	21.4	14.7		36.1	109.7	73.6
51.160	vertical	Quasi-Peak	23.4	14.5		37.9	109.7	71.8
51.060	vertical	Quasi-Peak	23.9	14.5		38.4	109.7	71.3
85.500	vertical	Quasi-Peak	23.4	10.9		34.3	109.7	75.4
94.380	vertical	Quasi-Peak	30.2	12.5		42.7	109.7	67.0
98.430	vertical	Quasi-Peak	24.2	12.9		37.1	109.7	72.6
148.110	horizontal	Quasi-Peak	25.3	9.7		35.0	109.7	74.7
209.310	vertical	Quasi-Peak	17.0	12.4		29.4	109.7	80.3
914.750	vertical	Quasi-Peak	105.1	24.6		129.7		
929.100	vertical	Quasi-Peak	26.1	24.6		50.7	109.7	59.0
1828.000	horizontal	Peak	23.8	31.4		55.3	109.7	54.4
2746.000	vertical	Peak	14.0	34.8		48.8	54.0	**5.2**

Sample calculation of final values:

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

8.3 RF exposure requirement

Rules and specifications:	CFR 47 Part 15, section 15.247(i) CFR 47 Part 1, sections 1.1307(b)(1)				
Guide:	OET Bulletin 65, Edition 97-01				
Limits:	Limits for general population / uncontrolled exposure				
	Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm²)	Averaging Time (minutes)
	0.3 - 1.34	614	1.63	(100)*	30
	1.34 - 30	824 / f	2.19 / f	(180 / f²)*	30
	30 - 300	27.5	0.073	0.2	30
	300 - 1500	---	---	f/1500	30
	1500 - 100000	---	---	1.0	30
	f = frequency in MHz * Plane-wave equivalent power density				

Test Result:	Test passed

Antenna R640A

Spectral power density			Declared by applicant	Measured
Prediction [5]:	S	= P G / 4 π R²		
Where:	S	= Power density		
	P	= Power input of antenna		
	G	= Power gain of the antenna relativ to an isotropic radiator		
	R	= Distance to the center of radiation of the antenna		
Maximum output power:	P	= 941.9 mW	☒	☒
Antenna gain:	G	= 2.138		
Prediction distance:	R	= 20 cm		
Power density at 20 cm:	**S**	**= 0.4010 mW/cm²**		
Limit	**S_{lim}**	**= 0.60983 mW/cm²**		

Test Result:	Test passed

[5] MPE Prediction of MPE according to equation from page 19 of OET Bulletin 65, Ed. 97-01

Antenna R642A

Spectral power density				Declared by applicant	Measured
Prediction [6]:	S	=	P G / 4 π R²		
Where:	S	=	Power density		
	P	=	Power input of antenna		
	G	=	Power gain of the antenna relativ to an isotropic radiator		
	R	=	Distance to the center of radiation of the antenna		
Maximum output power:	P	=	941.9 mW	☒	☒
Antenna gain:	G	=	3.98		
Prediction distance:	R	=	30 cm		
Power density at 30 cm:	**S**	**=**	**0.3316 mW/cm²**		
Limit	**S_{lim}**	**=**	**0.60983 mW/cm²**		

Test Result:	Test passed

[6] MPE Prediction of MPE according to equation from page 19 of OET Bulletin 65, Ed. 97-01

8.4 Exposure of Humans to RF Fields

Rules and specifications:	IC RSS-Gen Issue 2, section 5.5
Guide:	IC RSS-102 Issue 2, section 2.5

Exposure of Humans to RF Fields for antenna R640A	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☒ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: CP = **941.9 mW**			☒	
The effective isotropic radiated power (EIRP in watts) is calculated using				
☒ the numerical antenna gain: G = **2.138**; $EIRP = G \cdot CP \Rightarrow EIRP$ = **2.01 W**		☒		
☒ the field strength[7] in V/m: FS = **2.57 V/m**; $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **1.98 W**			☒	
with: Distance between the antennas in m: D = **3 m**			☒	
☐ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by[7]: $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **.....** **W**				
with: Field strength in V/m: FS = **.....** **dBµV/m**			☐	
Distance between the two antennas in m: D = **.....** **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 = **2.01 W**				

[7] 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.

Exposure of Humans to RF Fields for antenna R640A (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 its source-based time-averaged output power is less than, or equal to 200 mW for General Public Use and 1000 mW for Controlled Use.				☐
☐ The device operates above 1 GHz up to 2.2 GHz inclusively and its source-based time-averaged output power is less than, or equal to 100 mW for General Public Use and 500 mW for Controlled Use.				☐
☐ The device operates above 2.2 GHz up to 3 GHz inclusively and its source-based time-averaged output power is less than, or equal to 20 mW for General Public Use and 100 mW for Controlled Use.				☐
☐ The device operates above 3 GHz up to 6 GHz inclusively and its source-based time-averaged output power) 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 its e.i.r.p. is equal to or less than 2.5 W.				☒
☐ The device operates at or above 1.5 GHz and the e.i.r.p. of the device is equal to or less than 5 W.				☐
☐ RF exposure evaluation is documented in test report no.				

Exposure of Humans to RF Fields for antenna R642A	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☐ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: CP = **941.9 mW**			☒	
The effective isotropic radiated power (EIRP in watts) is calculated using				
☒ the numerical antenna gain: G = **3.98** $EIRP = G \cdot CP \Rightarrow EIRP$ = **3.75 W**		☒		
☒ the field strength[8] in V/m: FS = **3.055 V/m** $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **2.80 W** with: Distance between the antennas in m: D = **3 m**			☒ ☒	
☐ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by[7]: $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **..... W** with: Field strength in V/m: FS = **..... dBµV/m** Distance between the two antennas in m: D = **..... 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 = **3.75 W**				

[8] 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.

Exposure of Humans to RF Fields for antenna R642A (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 its source-based time-averaged output power is less than, or equal to 200 mW for General Public Use and 1000 mW for Controlled Use.				☐
☐ The device operates above 1 GHz up to 2.2 GHz inclusively and its source-based time-averaged output power is less than, or equal to 100 mW for General Public Use and 500 mW for Controlled Use.				☐
☐ The device operates above 2.2 GHz up to 3 GHz inclusively and its source-based time-averaged output power is less than, or equal to 20 mW for General Public Use and 100 mW for Controlled Use.				☐
☐ The device operates above 3 GHz up to 6 GHz inclusively and its source-based time-averaged output power) 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 its e.i.r.p. is equal to or less than 2.5 W.				☐
☐ The device operates at or above 1.5 GHz and the 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, 2009
☒	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2009
☒	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)
☒	RSS-Gen	Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equimpment, published by Industry Canada	June 2007
☒	RSS-210	Radio Standards Specification RSS-210 Issue 7 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada	June 2007
☐	RSS-310	Radio Standards Specification RSS-310 Issue 2 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	June 2007
☒	RSS-102	Radio Standards Specification RSS-102 Issue 3: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) , published by Industry Canada	June 2009
☐	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	2002

☒	TRC-43	Notes Regarding Designation of Emission (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service, published by Industry Canada	October 9, 1982

10 Revision History

Revision History			
Edition	*Date*	*Issued by*	*Modifications*
1	September 9, 2010	T. Eberl (cj)	First edition
2	September 14, 2010	M. Steindl (cj)	Edition 2 required for FCC-IC-Certification RF Exposure Requirement attached Exposure of Humans to RF Fields attached
3	September 21, 2010	T. Eberl (cj)	Edition 3 RF Exposure recalculation in case of corrected antenna gain done by applicant

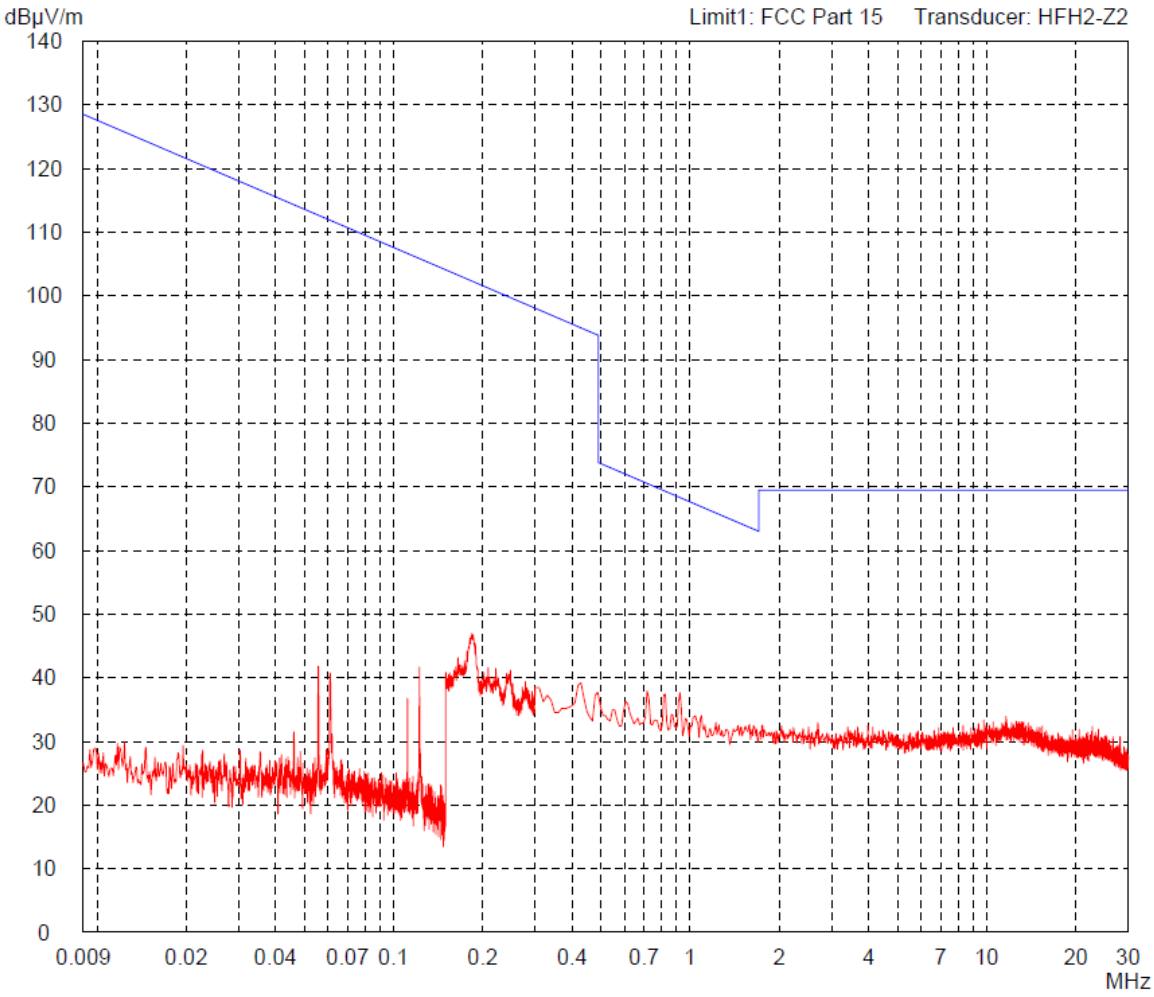
11 Charts taken during testing

TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
D-94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
eMail: senton@tuev-sued.de
Web: www.tuev-sued.de/senton

Radiated Emission Test 9 kHz - 30 MHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: by hand / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin 50 Subranges

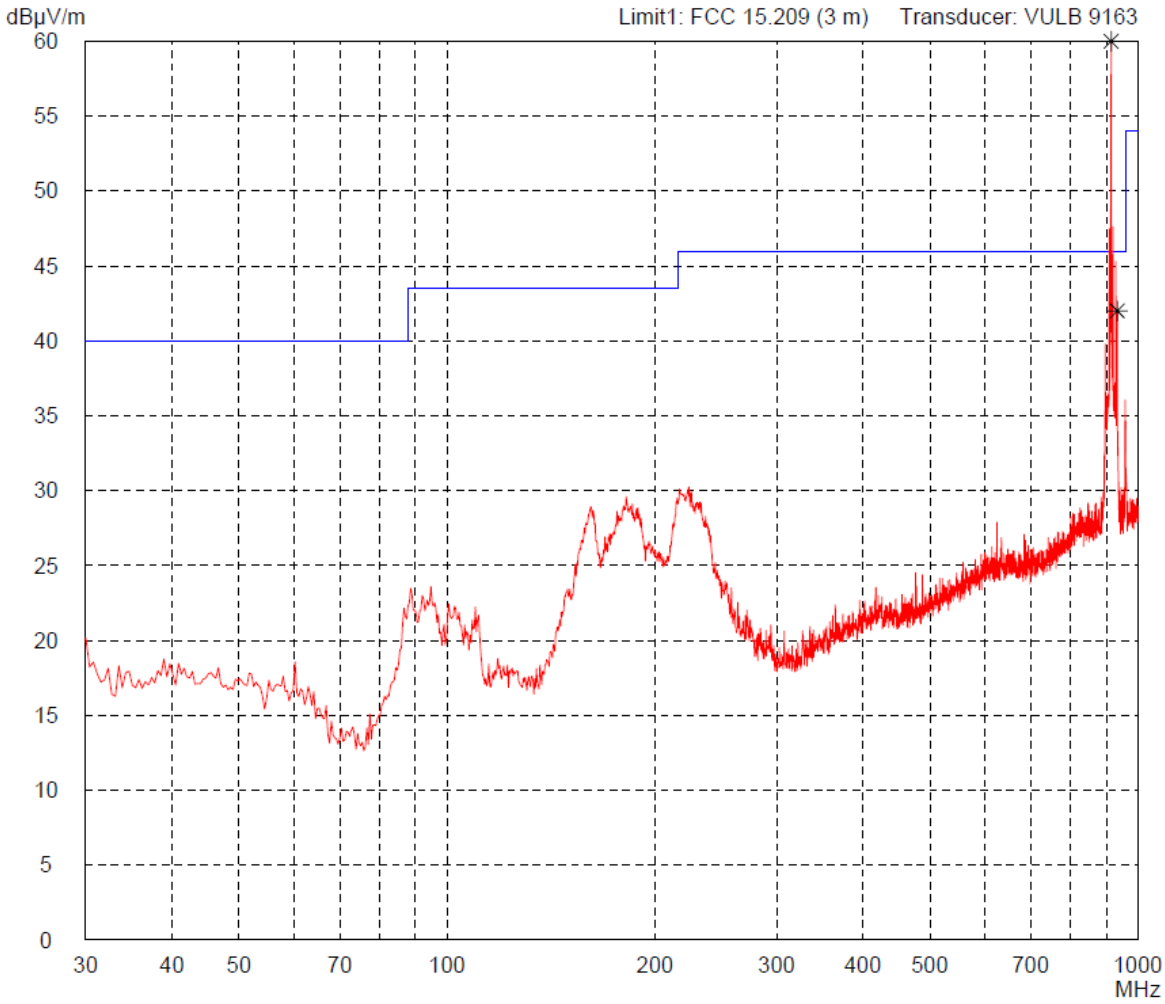


Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 30 MHz - 1 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R wit RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.754 MHz - with noch-filter set to carrier frequency
Serial no.: --	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/25/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

Detector: Peak	List of values: 10 dB Margin 50 Subranges

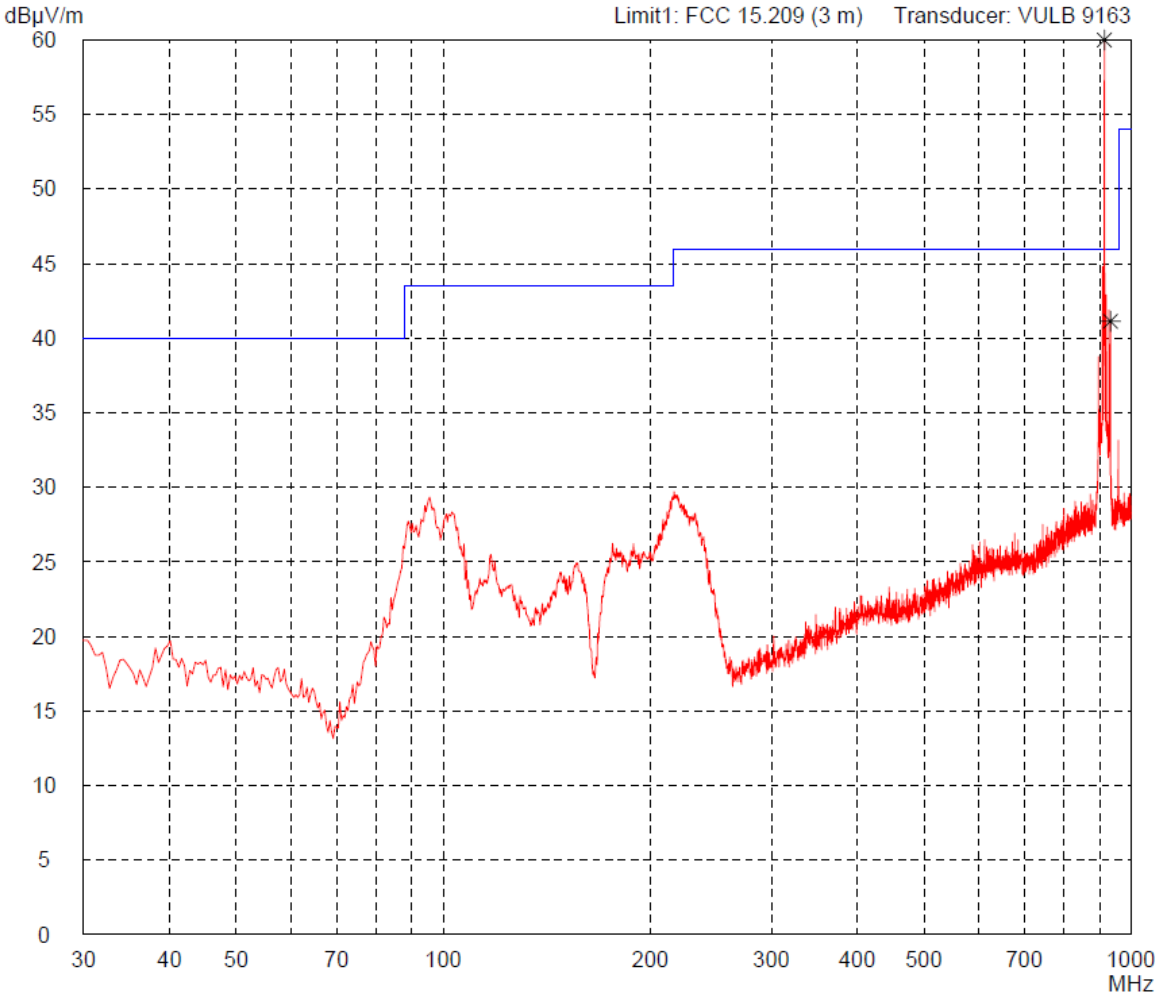


Result: Prescan	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 30 MHz - 1 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R wit RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.754 MHz - with noch-filter set to carrier frequency
Serial no.: --	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/25/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

Detector: Peak	List of values: 10 dB Margin 50 Subranges

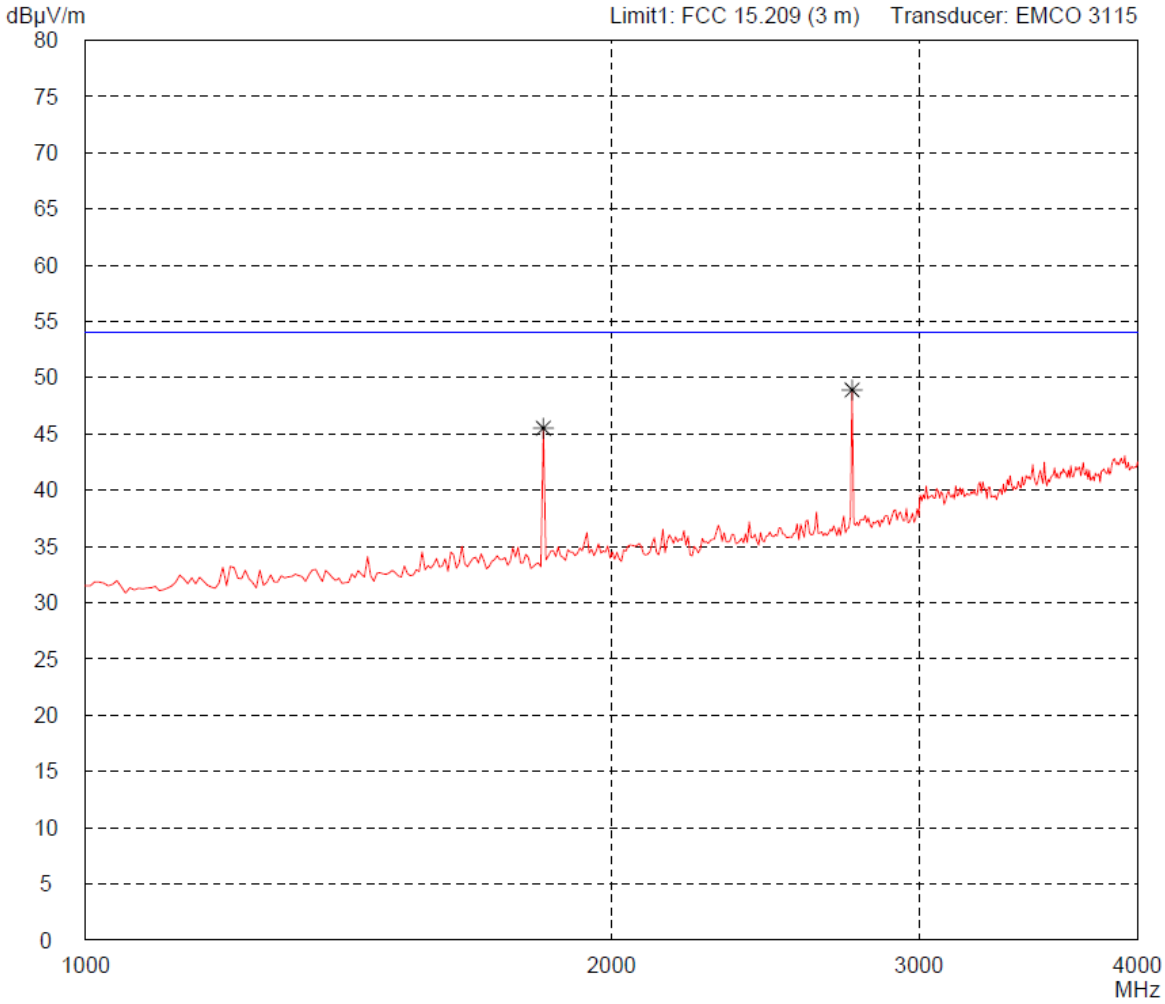


Result: Prescan	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 1 GHz - 4 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment:
Serial no.: ---	- DC 24 V power supply with AC/DC adaptor
Applicant: Siemens AG, Fürth	- Transmitting continuously on single frequency
Test site: Fully anechoic room, cabin no. 2	- Frequency: 914.745 MHz
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

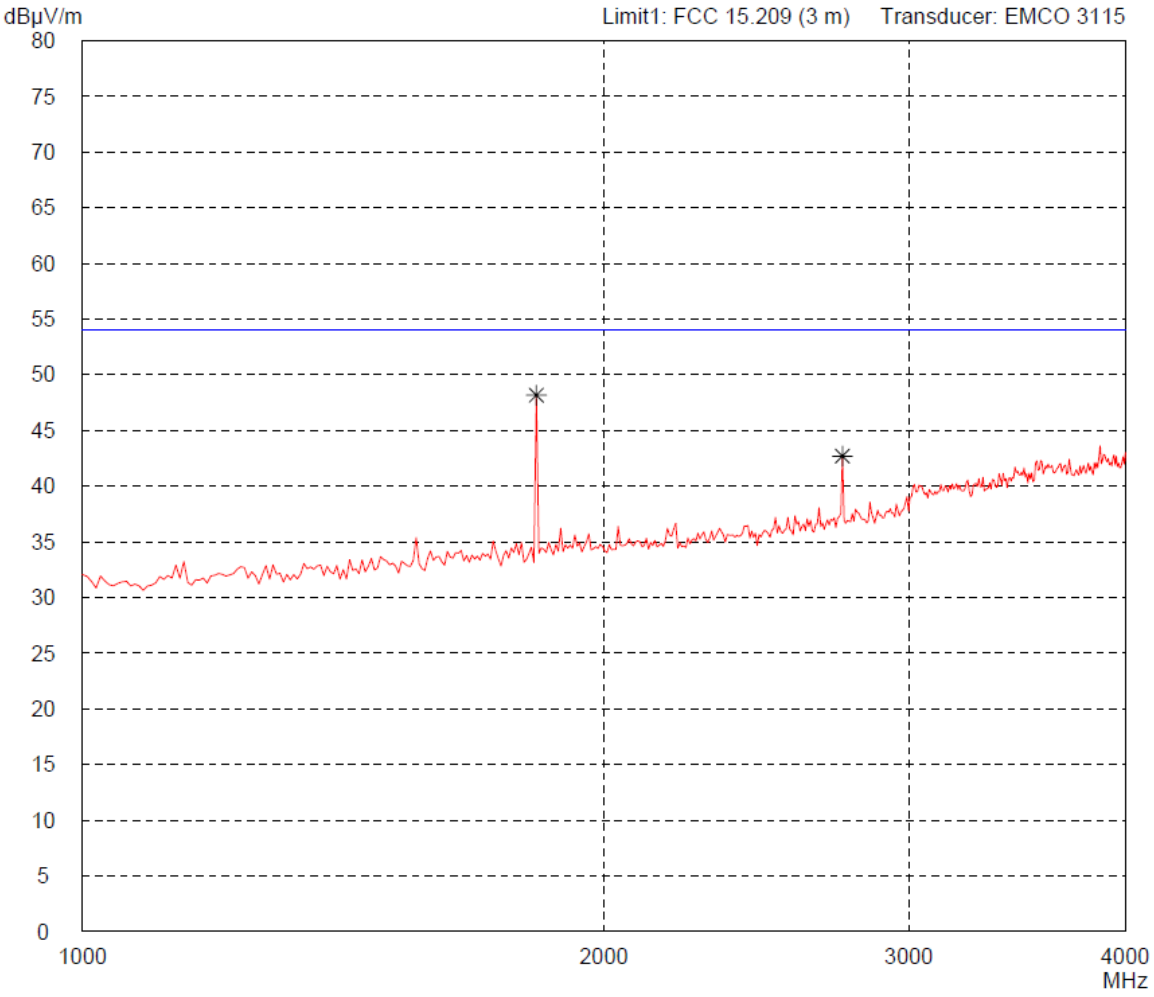
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 1 GHz - 4 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment:
Serial no.: ---	- DC 24 V power supply with AC/DC adaptor
Applicant: Siemens AG, Fürth	- Transmitting continuously on single frequency
Test site: Fully anechoic room, cabin no. 2	- Frequency: 914.745 MHz
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand

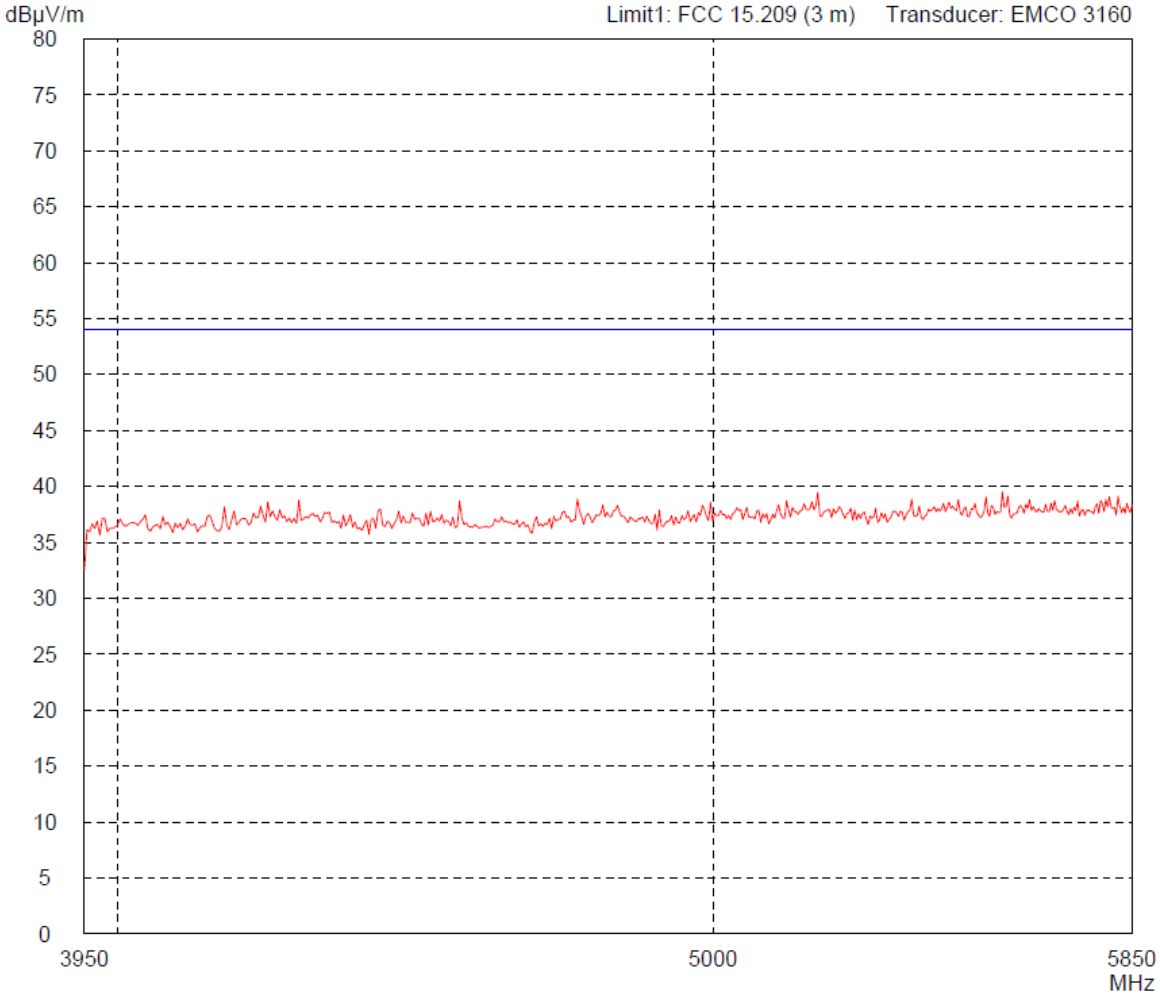


Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

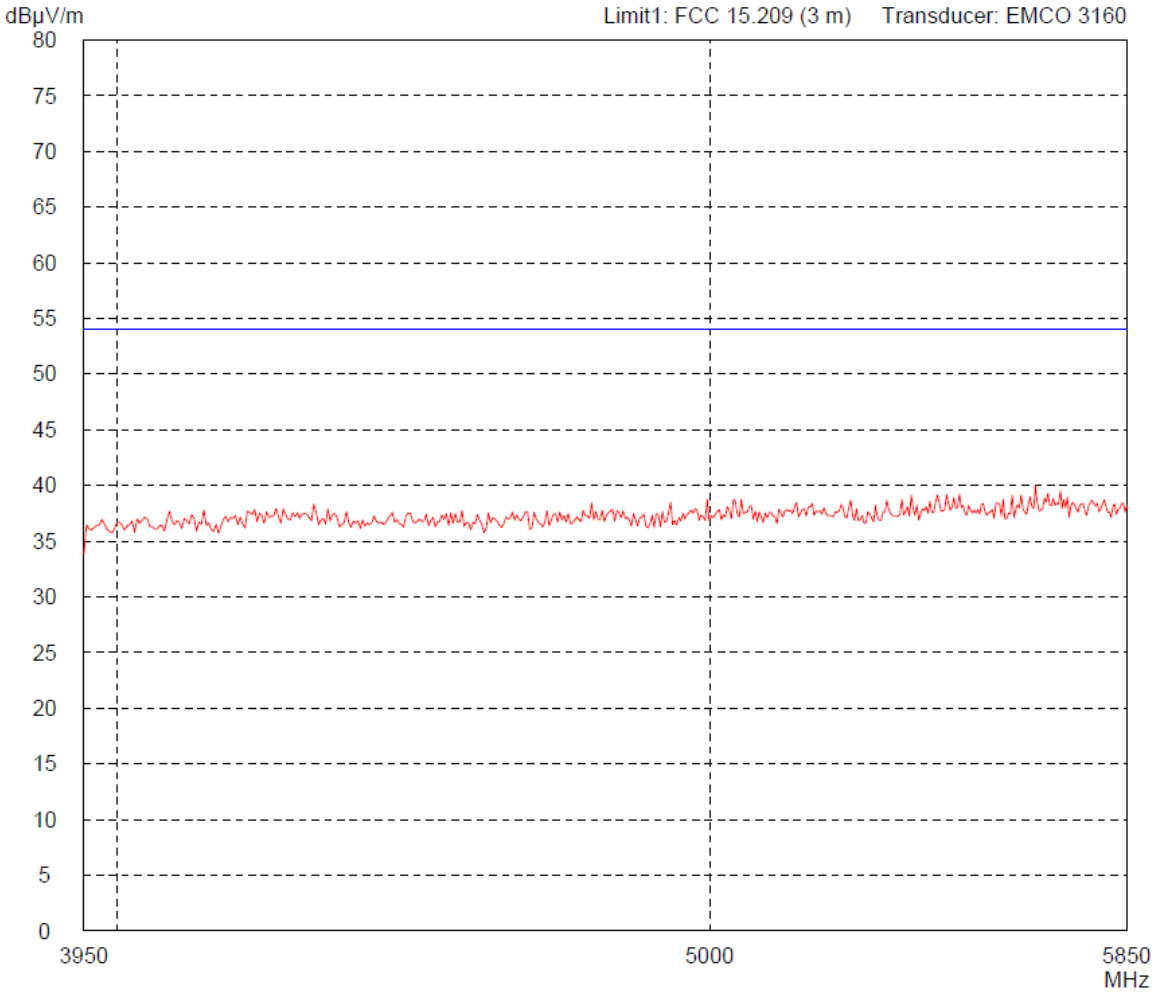
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

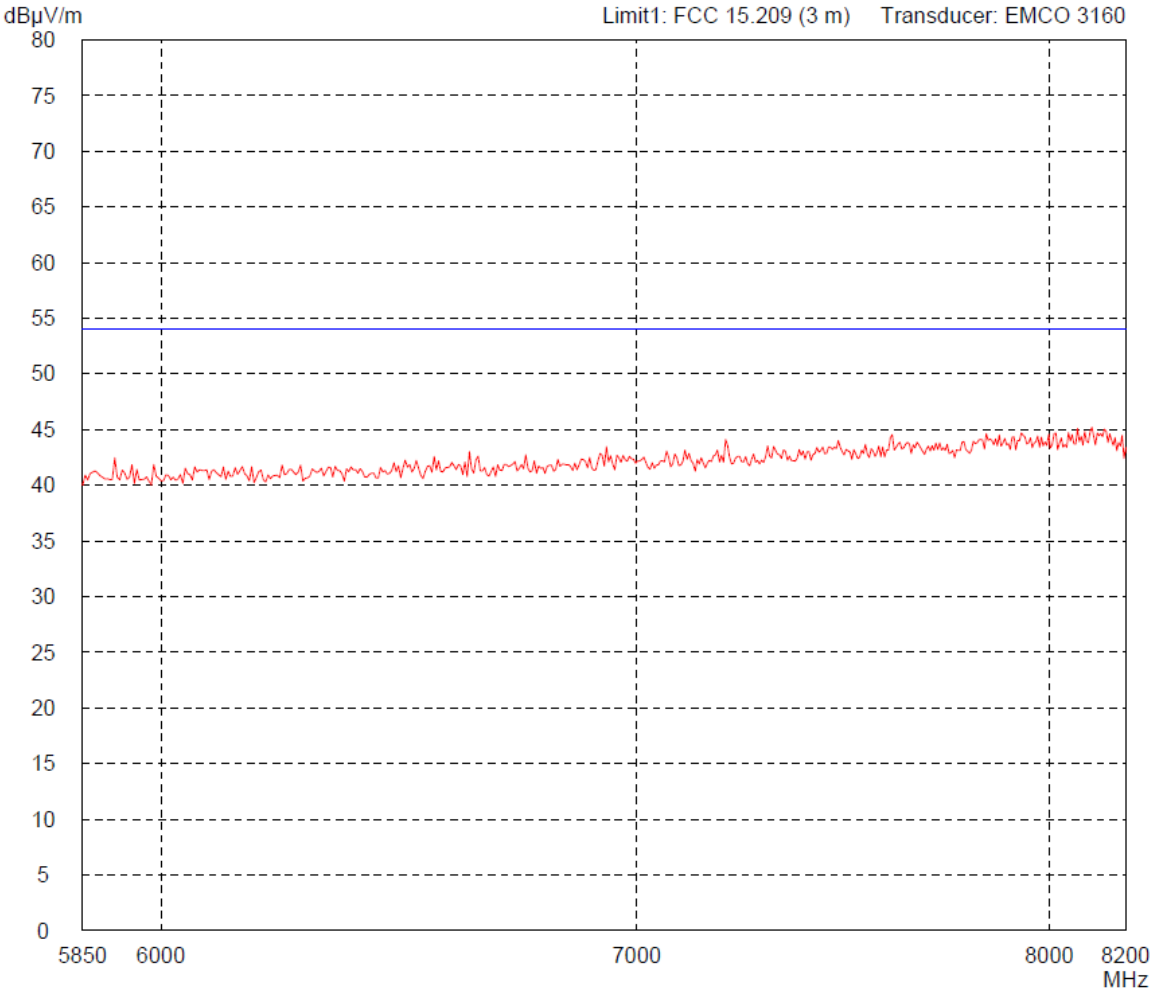
Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz
acc. to FCC Part 15 Subpart C (FAR)

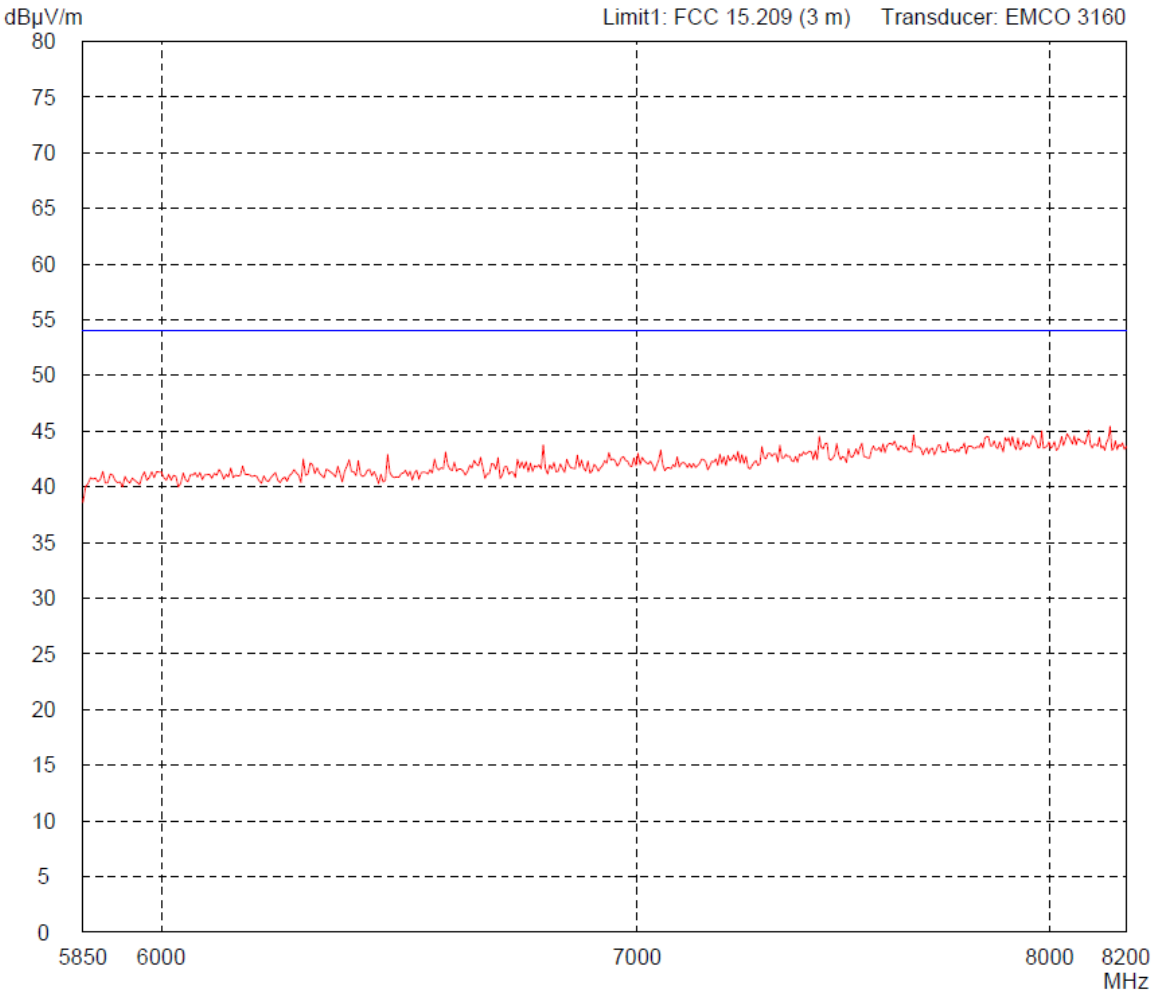
Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz
acc. to FCC Part 15 Subpart C (FAR)

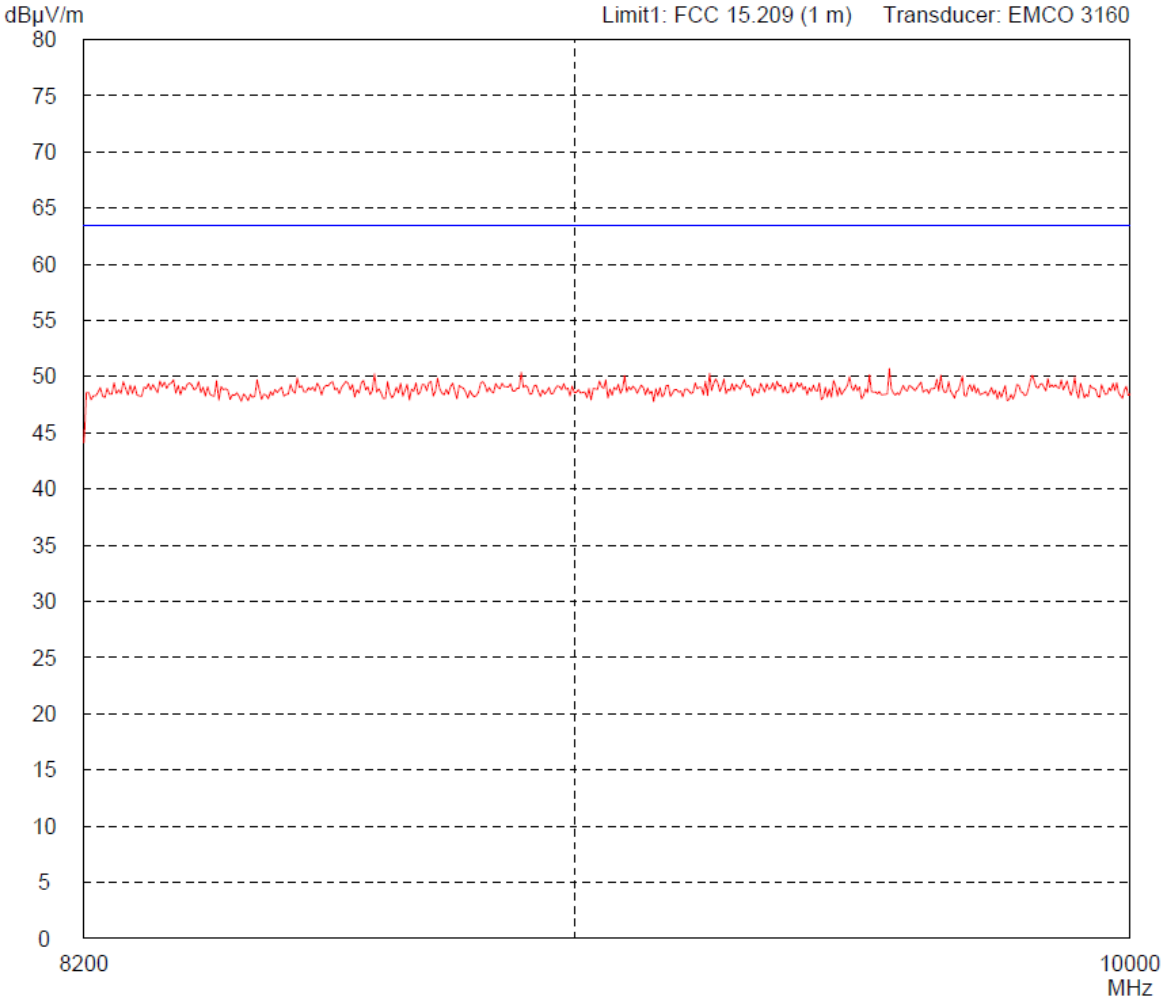
Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 8.2 GHz - 10 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin 50 Subranges

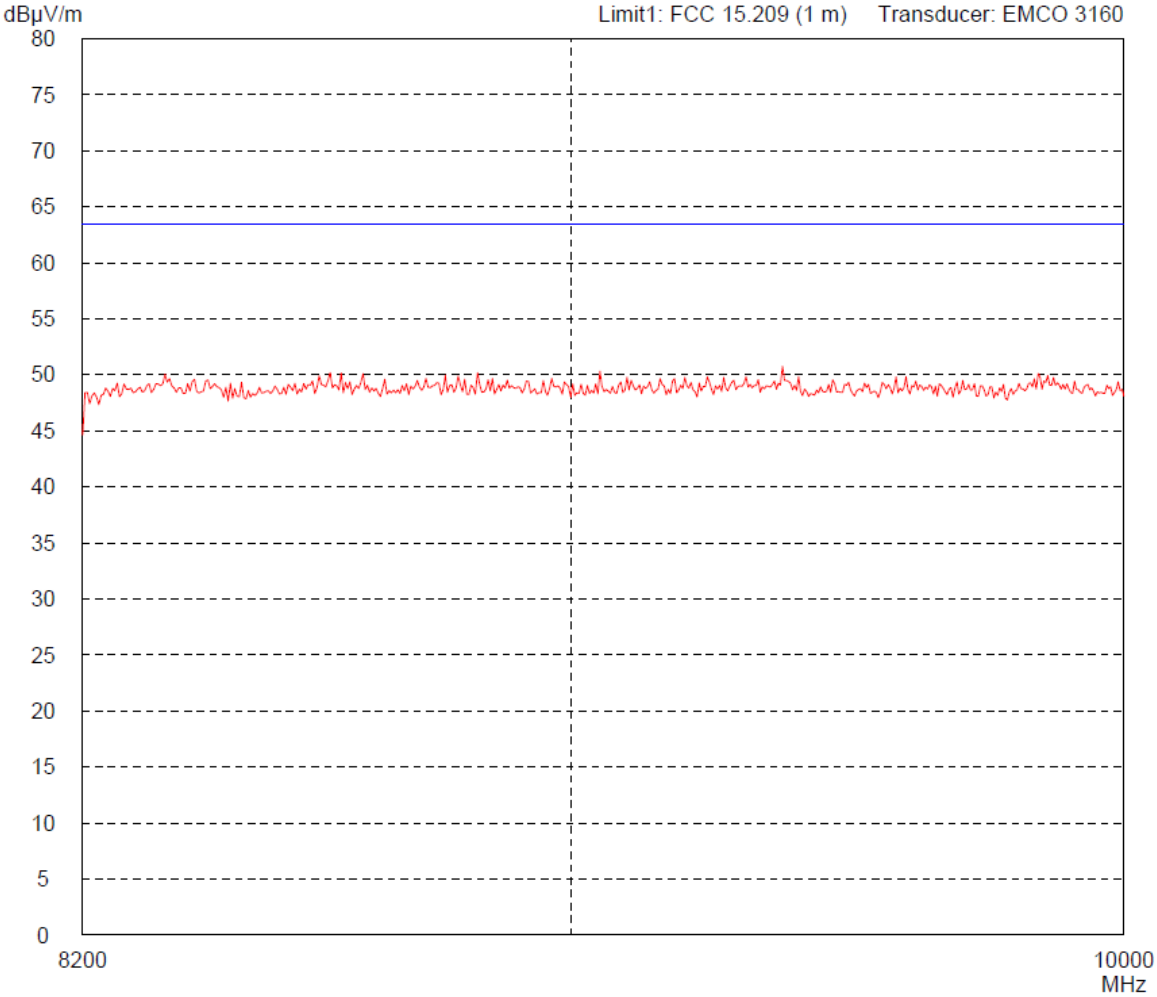


Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 8.2 GHz - 10 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

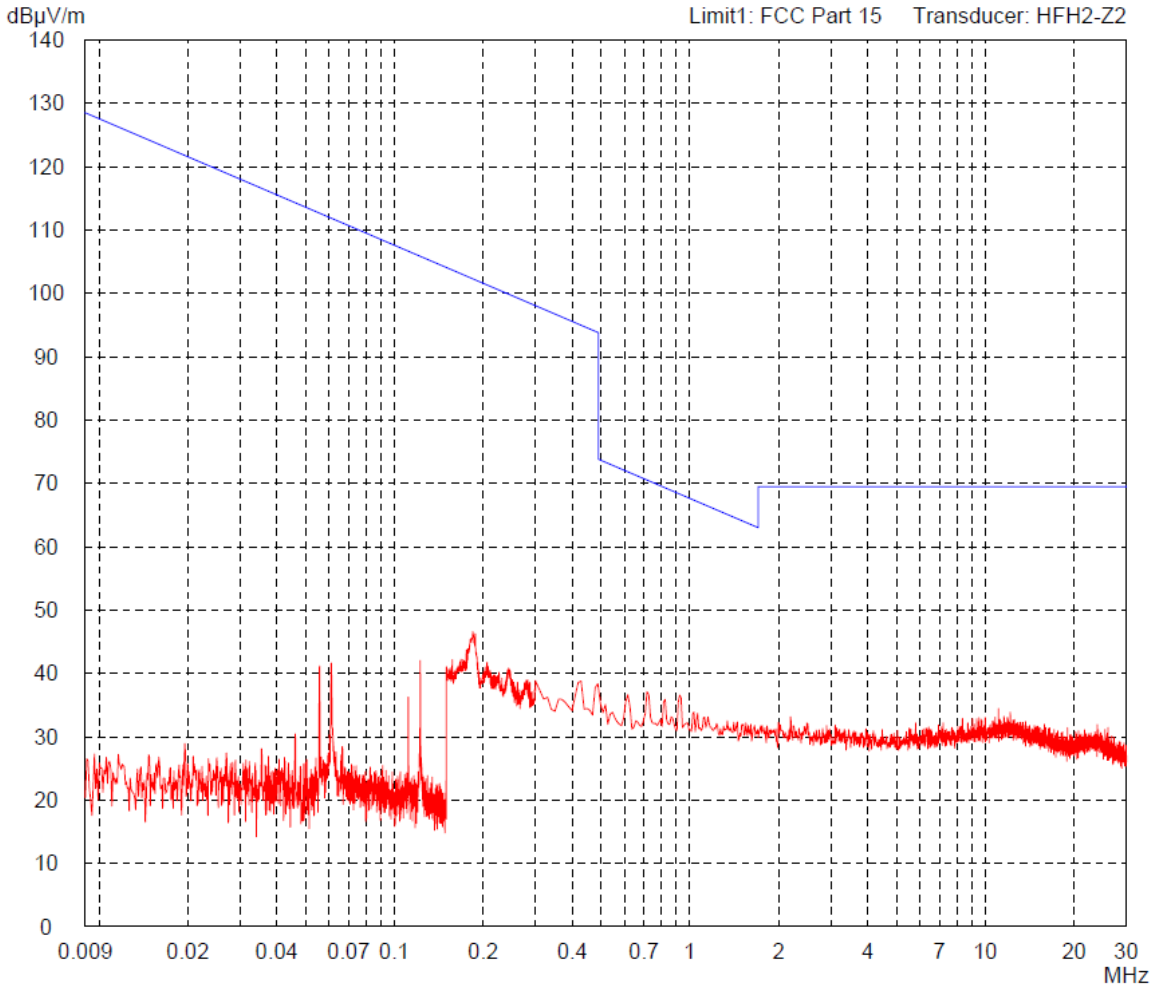
Detector: Peak	List of values: 10 dB Margin 50 Subranges



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 9 kHz - 30 MHz
acc. to FCC Part 15 Subpart C (FAR)

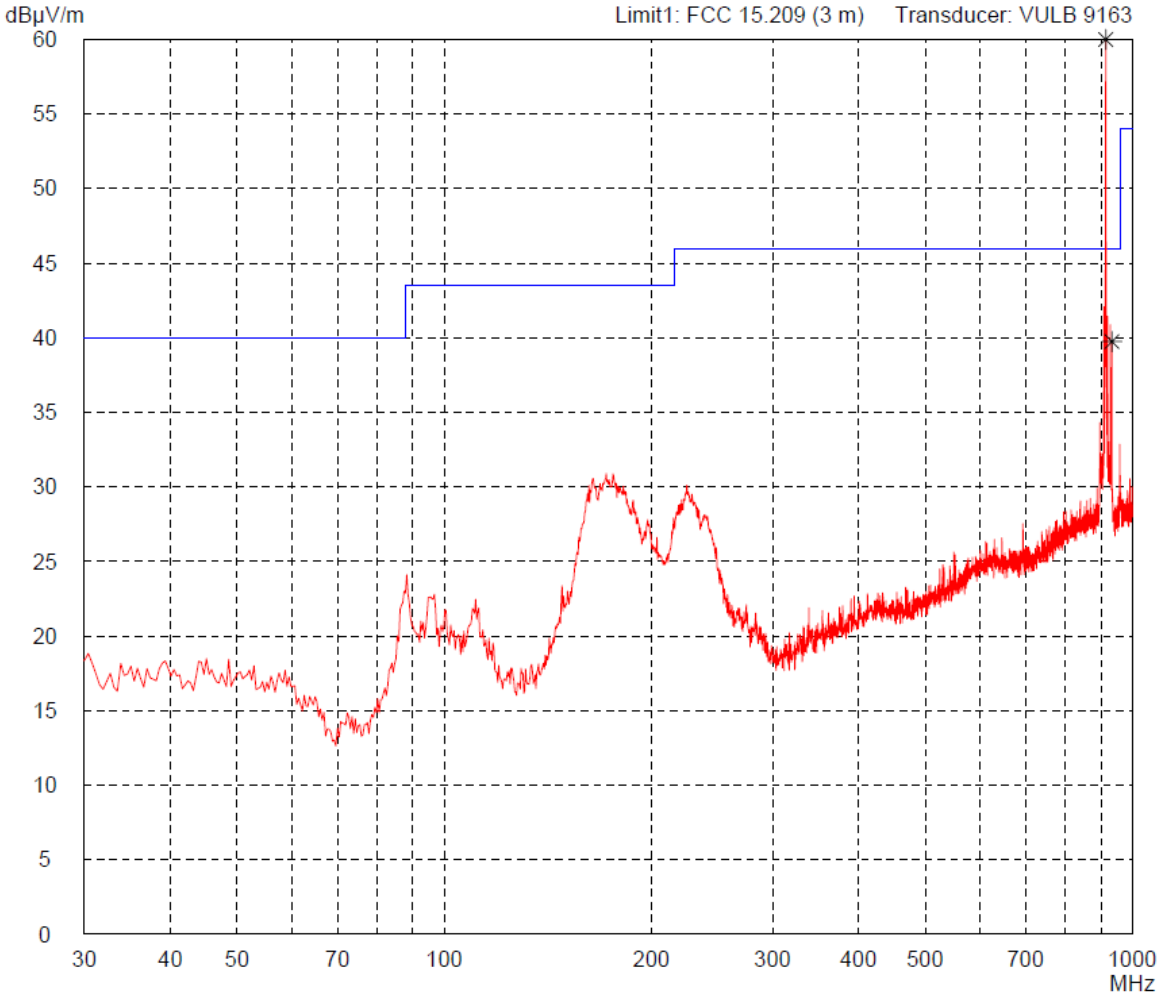
Model: RF670R with RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: by hand / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin 50 Subranges



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 30 MHz - 1 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R wit RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.754 MHz - with noch-filter set to carrier frequency
Serial no.: --	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/25/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin 50 Subranges

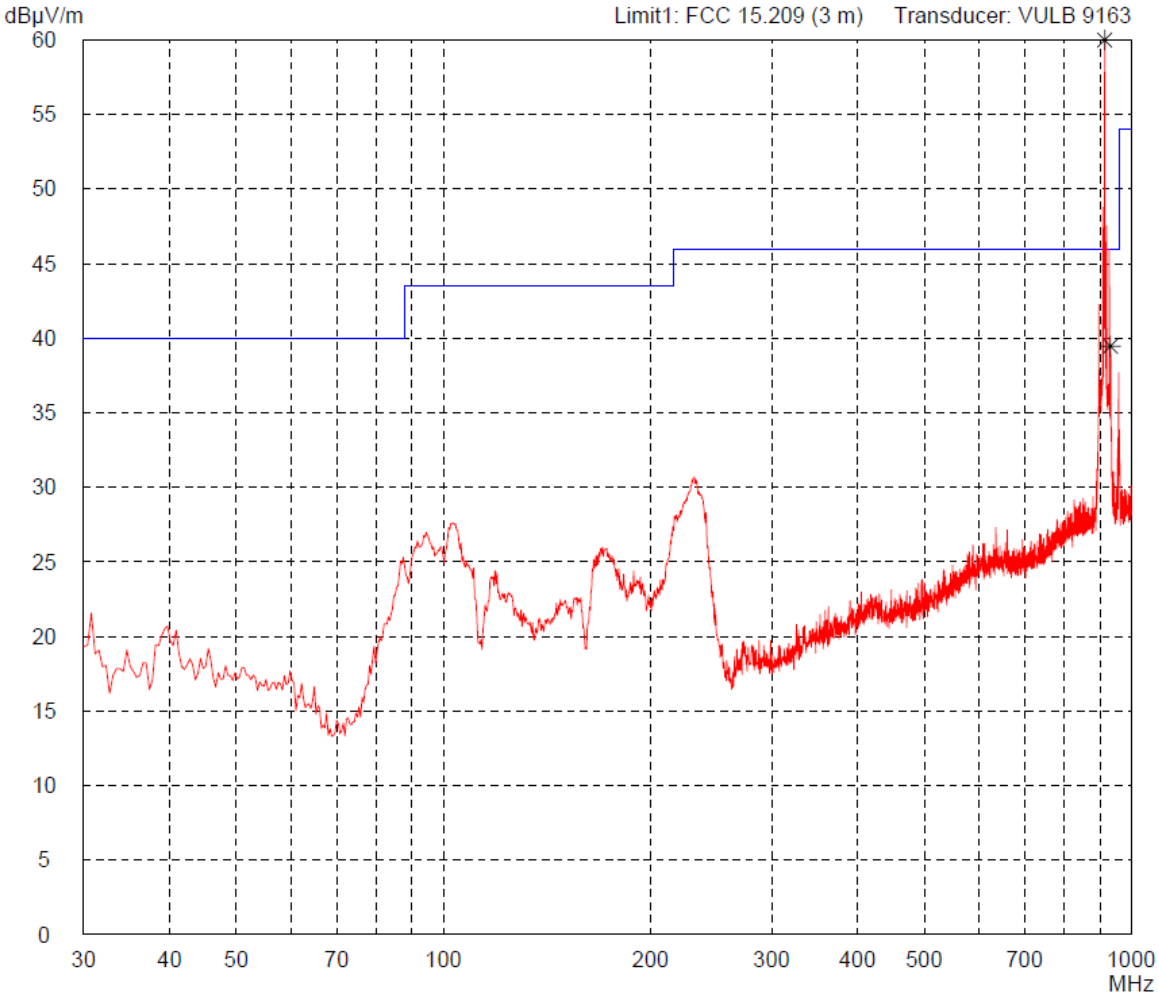


Result: Prescan	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 30 MHz - 1 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R wit RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.754 MHz - with noch-filter set to carrier frequency
Serial no.: --	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/25/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

Detector: Peak	List of values: 10 dB Margin 50 Subranges

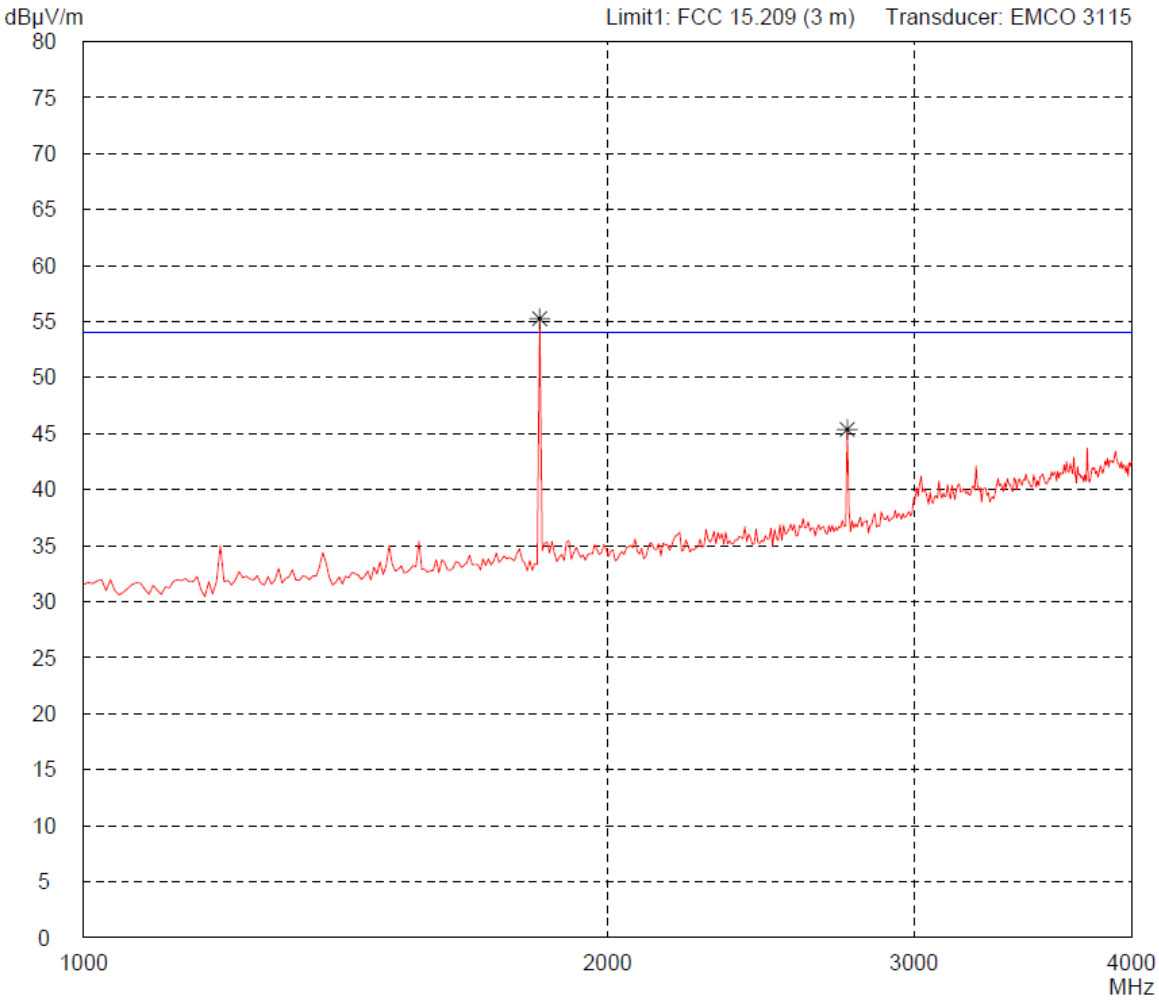


Result: Prescan	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 1 GHz - 4 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment:
Serial no.: ---	- DC 24 V power supply with AC/DC adaptor
Applicant: Siemens AG, Fürth	- Transmitting continuously on single frequency
Test site: Fully anechoic room, cabin no. 2	- Frequency: 914.745 MHz
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

Detector: Peak	List of values: 10 dB Margin / 50 Subranges

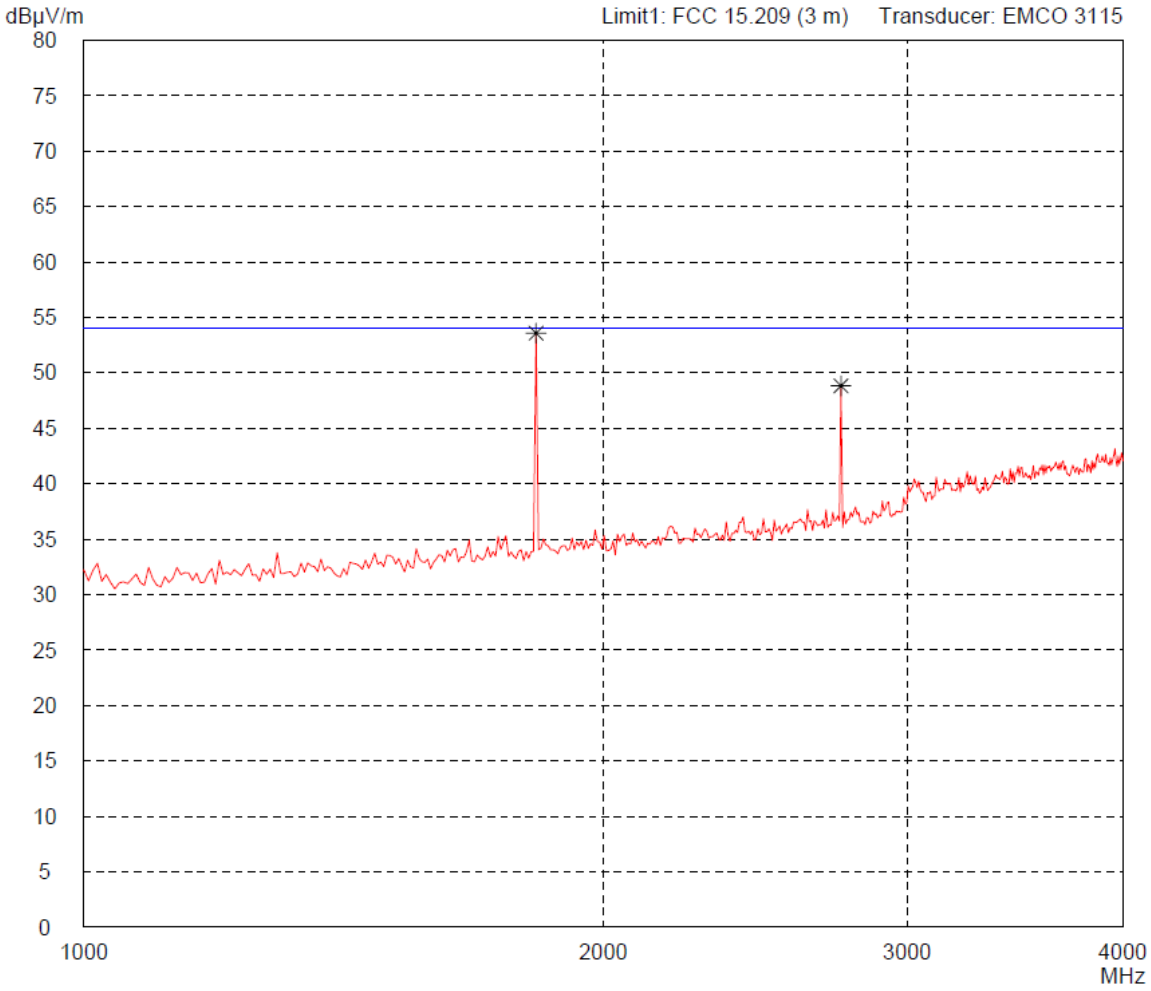


Result: Limit kept (§15.247)	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 1 GHz - 4 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment:
Serial no.: ---	- DC 24 V power supply with AC/DC adaptor
Applicant: Siemens AG, Fürth	- Transmitting continuously on single frequency
Test site: Fully anechoic room, cabin no. 2	- Frequency: 914.745 MHz
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

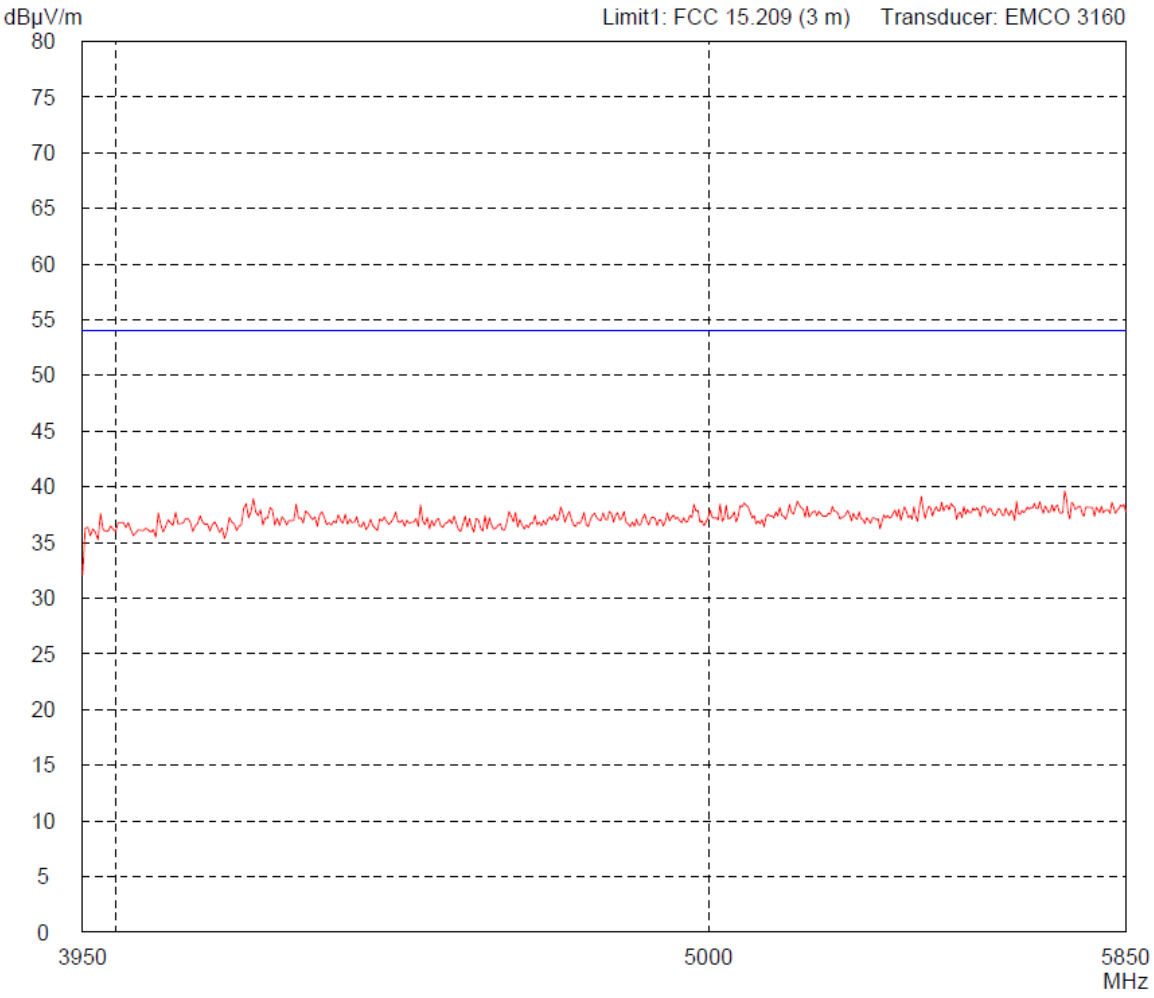
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Limit kept (§15.247)	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin / 50 Subranges

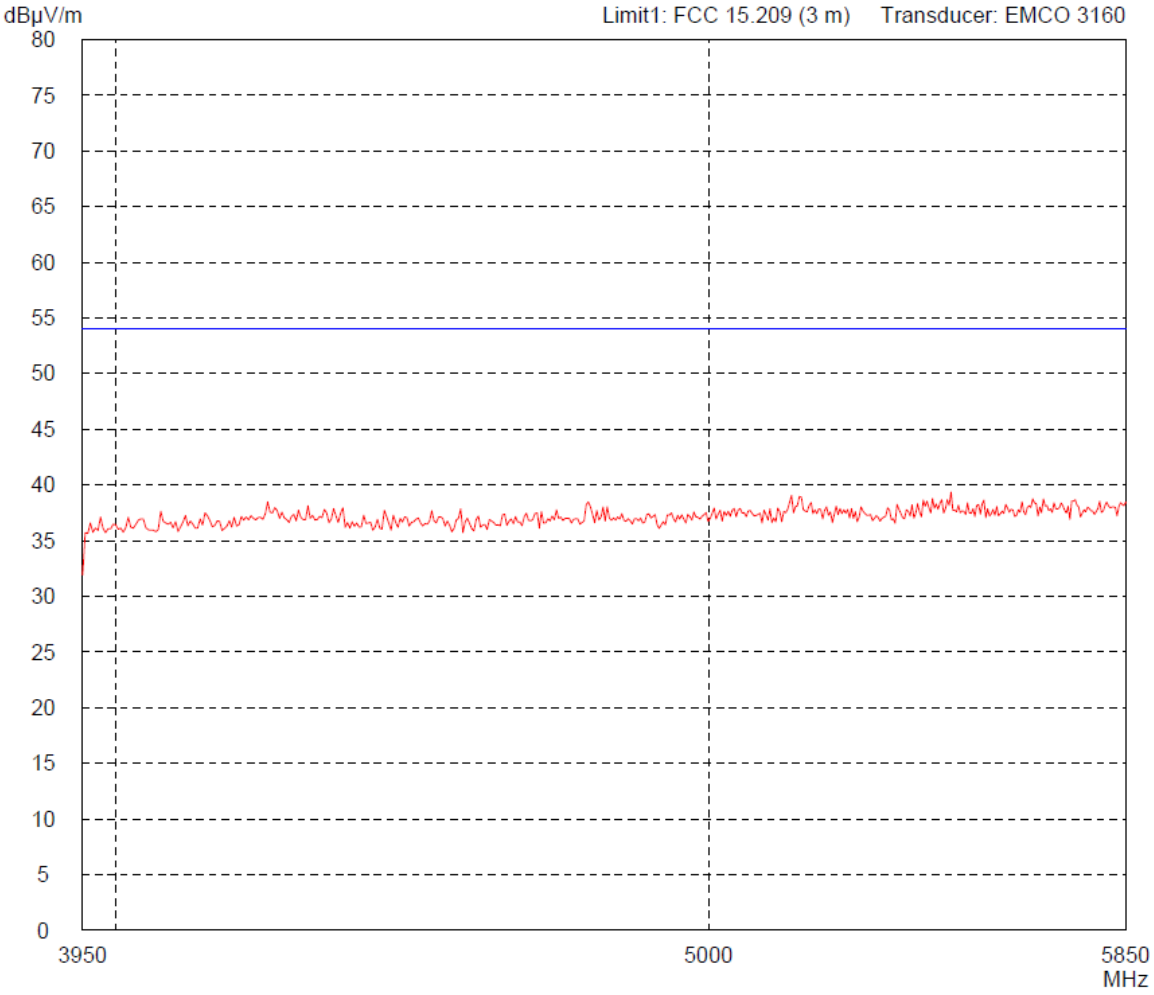


Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

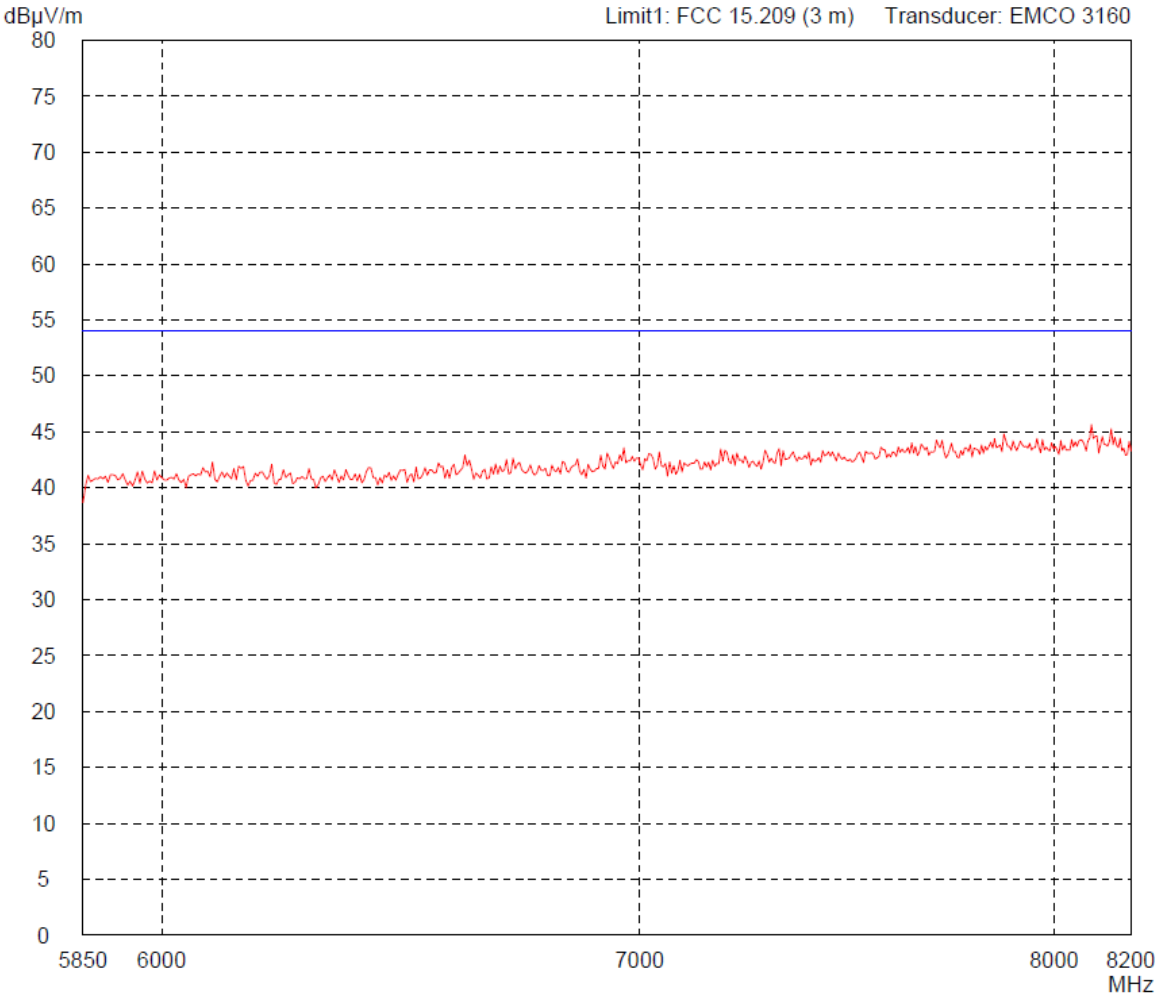
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Limit kept	Project file: 14912-02340-2 Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



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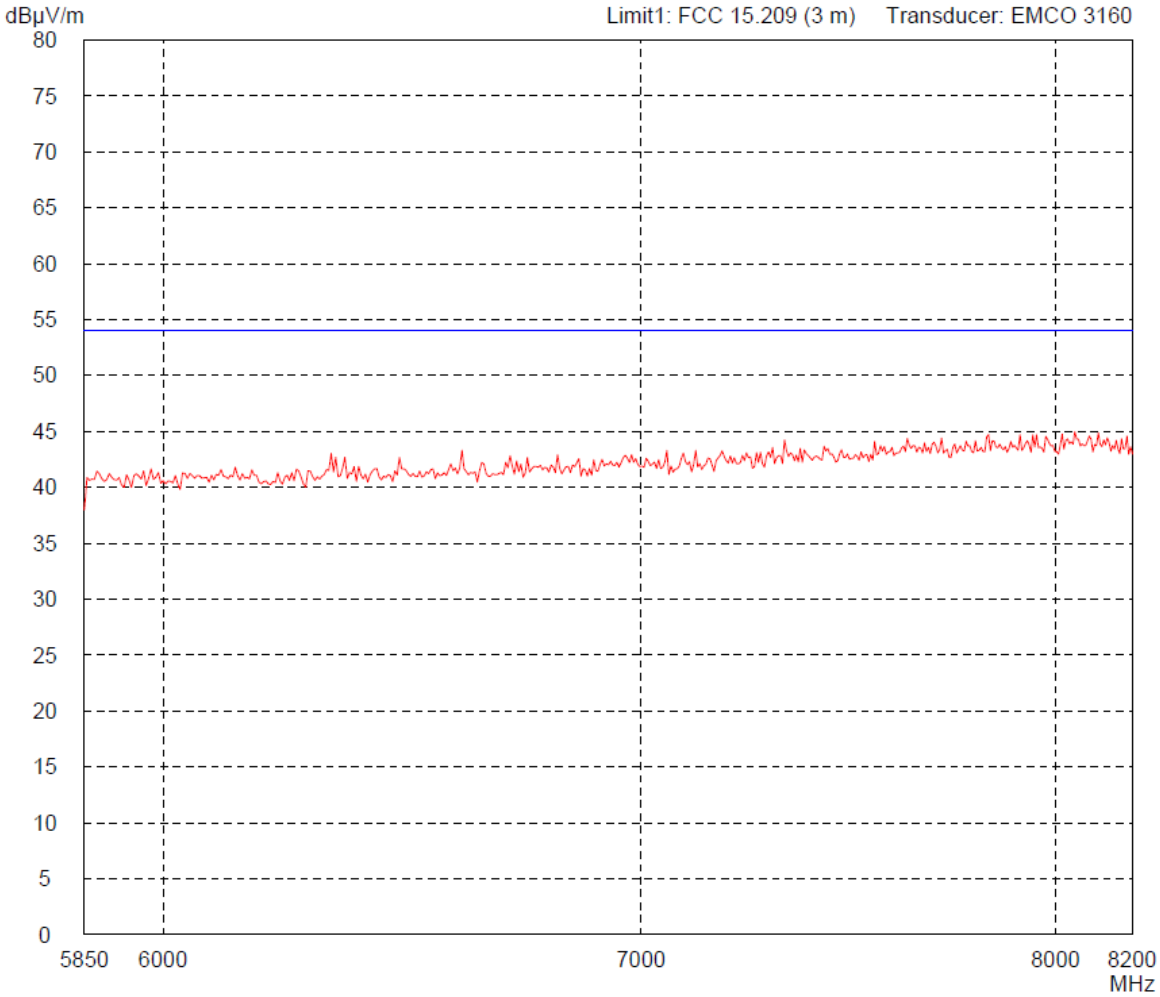
Radiated Emission Test 5.85 GHz - 8.2 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



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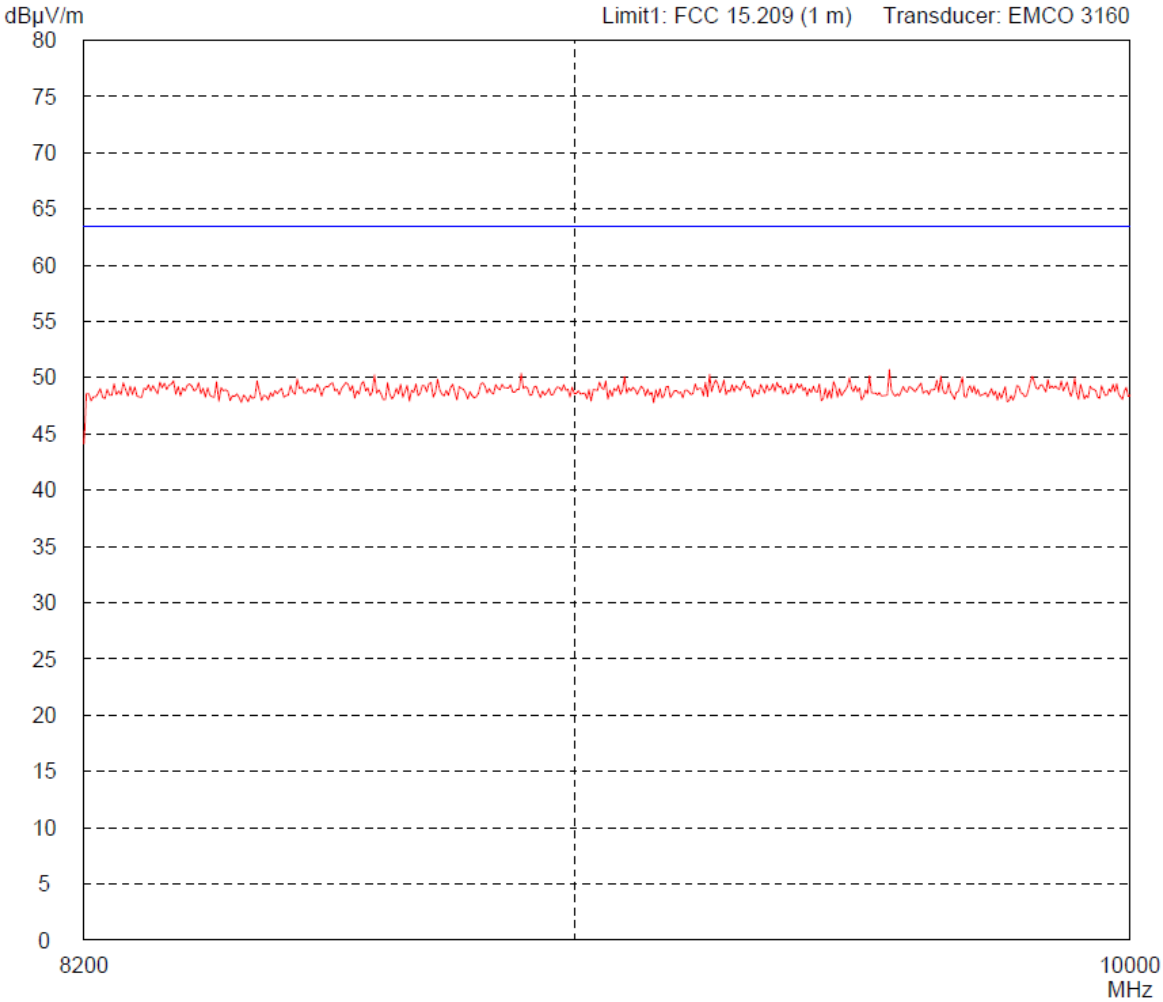
Radiated Emission Test 8.2 GHz - 10 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF640A	Comment:
Serial no.: ---	- DC 24 V power supply with AC/DC adaptor
Applicant: Siemens AG, Fürth	- Transmitting continuously on single frequency
Test site: Fully anechoic room, cabin no. 2	- Frequency: 914.745 MHz
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	

Detector: Peak	List of values: 10 dB Margin / 50 Subranges



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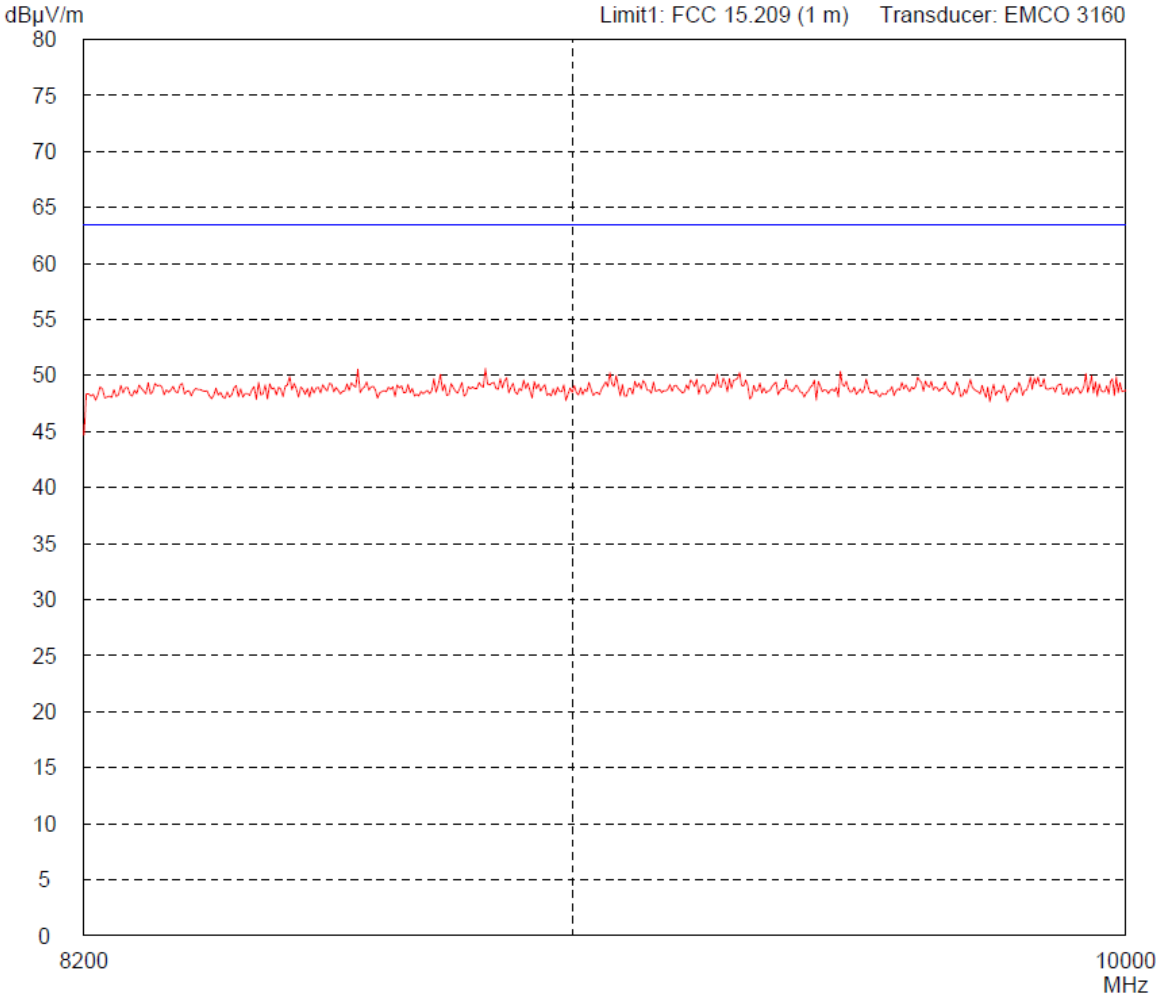
Radiated Emission Test 8.2 GHz - 10 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: RF670R with RF642A	Comment: - DC 24 V power supply with AC/DC adaptor - Transmitting continuously on single frequency - Frequency: 914.745 MHz
Serial no.: ---	
Applicant: Siemens AG, Fürth	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 08/26/2010 / Operator: T. Eberl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: 10 dB Margin 50 Subranges



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