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December 11, 2014

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Prüfbericht / Test Report

Nr. / No. 67627-52612-1 (Edition 1)

Applicant: Vectron International GmbH & Co. KG
Type of equipment: Wireless Sensor Reader - TempTrackr
Type designation: WSR-T2-A4B7
Order No.: --
Test standards: FCC Code of Federal Regulations,
CFR 47, Part 15,
Sections 15.107, 15.109, 15.207, 15.209

Note:

The test data of this report is related only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.

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1 Description of the Equipment Under Test (EUT)

General data of EUT

Type designation ¹ :	WSR-T2-A4B7
Parts ² :	--
Serial number(s):	Prototype
Manufacturer:	Vectron Internationa GmbH & Co. KG
Type of equipment:	Wireless Sensor Reader - TempTrackr
Version:	As received
FCC ID:	X3I-WSRT2
Additional parts/accessories:	--

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.

Technical data of EUT	
Application frequency range:	428.0 to 438.9 MHz
Frequency range:	428.0 to 438.9 MHz
Operating frequencies:	428.7 MHz; 433.5 MHz; 438.9 MHz
Type of modulation:	FM
Number of RF-channels:	12
Channel spacing:	26.3 kHz
Designation of emissions ³ :	120KF7D
Type of antenna:	ANT-PIF-0001 / ANT-PIF-0002
Size/length of antenna:	20x18x3,5cm / 15x15x3cm
Antenna gain:	3.1 dBi
Connection of antenna:	<input checked="" type="checkbox"/> detachable <input type="checkbox"/> not detachable
General power supply of system:	AC supply
The EUT was supplied via USB port of the Notebook:	nominal voltage: 120 V AC minimum voltage: 100 V AC maximum voltage: 240 V AC nominal frequency: 50 Hz
Type of power supply of EUT:	DC supply
Specifications for power supply connector (1):	nominal voltage: 5 V DC minimum voltage: 4.5 V DC maximum voltage: 5 V DC nominal frequency: --
Specifications for power supply connector (2):	nominal voltage: 12 V DC minimum voltage: 9 V DC maximum voltage: 30 V DC nominal frequency: --

³ Also known as "Class of Emission".

2 Administrative Data

Application details

Applicant (full address):	Vectron International GmbH & Co. KG Landstrasse D-74924 Neckarbischofsheim
Contact person:	Mr. Ralf Olbert
Order number:	--
Receipt of EUT:	2014-11-13
Date(s) of test:	2014-11-13 to 2014-12-05
Note(s):	--

Report details

Report number:	67627-52612-1
Edition:	1
Issue date:	December 11, 2014

3 Identification of the Test Laboratory

Details of the Test Laboratory	
Company name:	TÜV SÜD Product Service GmbH
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
Laboratory accreditation:	DAkkS Registration No. D-PL-11321-11-01
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 FCC Code of Federal Regulations,
CFR 47, Part 15, Sections 15.107, 15.109, 15.207, 15.209**

of the Federal Communication Commission (FCC).

Personnel involved in this report

Laboratory Manager:



Mr. Johann Roidt



Responsible for testing:

Mr. Markus Biberger

Responsible for test report:

Mr. Markus Biberger

5 Operation Mode and Configuration of EUT

Operation Mode(s)
<p>Conducted power line emission measurement: (operating modes 1, 2) WSR-T2 Software is running with all sensors at one antenna (12 pieces – standard operation) to perform the worst case scenario. The conducted emission have been measured from a test notebook, which is the normal method of operation.</p>
<p>Operating mode 1: 5 V DC supplied from Notebook, RS485 interface, Transmitting at all channels and all antenna ports</p>
<p>Operating mode 2: 9...30 V DC supplied via Notebook PSU, CAN interface, Transmitting at all channels and all antenna ports</p>
<p>Radiated emission measurement: (operating modes 3, 4, 5, 6) The EUT is running in continuous transmitting mode with the operating frequencies of 429.00 MHz (lower frequency) / 433.5 MHz (middle frequency) / 438.9 MHz (upper frequency). The antenna connectors 1, 2, 3 are technical identical. Measurement were carried out on antenna port 1.</p>
<p>Operating mode 3: DC supply 5 V, RS485 interface, Antenna connector 1 with antenna ANT-PIF-0001, lower frequency</p>
<p>Operating mode 4: DC supply 5 V, RS485 interface, Antenna connector 1 with antenna ANT-PIF-0001, middle frequency</p>
<p>Operating mode 5: DC supply 5 V, RS485 interface, Antenna connector 1 with antenna ANT-PIF-0001, upper frequency</p>
<p>Operating mode 6: 9...30 V DC supplied via Notebook PSU, CAN interface, Antenna connector 3 with antenna ANT-PIF-0002, lower frequency</p>
<p>Operating mode 7: 9...30 V DC supplied via Notebook PSU, CAN interface, Antenna connector 3 with antenna ANT-PIF-0002, middle frequency</p>
<p>Operating mode 8: 9...30 V DC supplied via Notebook PSU, CAN interface, Antenna connector 3 with antenna ANT-PIF-0002, higher frequency</p>

Configuration(s) of EUT

The EUT is connected via USB and RS485 to a Notebook with WSR-T2 Software setting "All sensor modules" "TX: -36dBm".
All antenna ports connected to listed antennas. The supply voltage of the EUT is 5V DC and 12V DC.

List of ports and cables

Port	Description	Classification ⁴	Cable type	Cable length
1	+5 VDC supply	dc power	Unshielded	3m
2	+9..30V DC supply	dc power	Unshielded	3m
3	RS485	signal/control port	Unshielded	3m
4	CAN	signal/control port	Unshielded	3m
5	Antenna port 1	signal/control port	Shielded	2m
6	Antenna port 2	signal/control port	Shielded	2m
7	Antenna port 3	signal/control port	Shielded	2m

List of devices connected to EUT

Item	Description	Type Designation	Serial no. or ID	Manufacturer
1	Test Notebook	N130	ZJJF93LS903821K	Samsung
2	Antenna	ANT-PIF-0001	--	Vectron
3	Antenna	ANT-PIF-0002	--	Vectron
4	RS485 to USB converter	USB-RS485-WE	--	Vectron
5	CAN to USB converter	IPEH-002021	--	PEAK

List of support devices

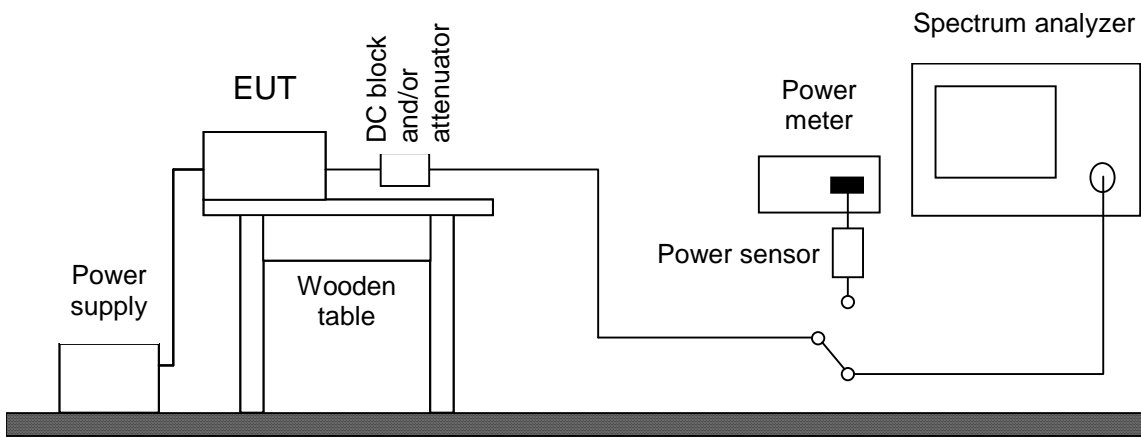
Item	Description	Type Designation	Serial no. or ID	Manufacturer
--	--	--	--	--

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

6 Measurement Procedures

6.1 Conducted Output Power

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.1046(a)
Guide:	ANSI C63.10 / CFR 47 Part 2, section 2.1046
<p>Conducted output power is measured at the RF output terminals (e.g. antenna connector if antenna is detachable) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer and/or a power meter with appropriate sensor. 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.</p> <p>If a spectrum analyzer is used and no other settings are specified resolution bandwidth shall be selected according to the carrier frequency f_c and set to 10 kHz ($150\text{ kHz} \leq f_c < 30\text{ MHz}$), 100 kHz ($30\text{ MHz} \leq f_c < 1\text{ GHz}$) or 1 MHz ($f_c \geq 1\text{ GHz}$). The video bandwidth shall be at least three times greater than the resolution bandwidth. The settings used have to be indicated within the appropriate test record(s).</p>	

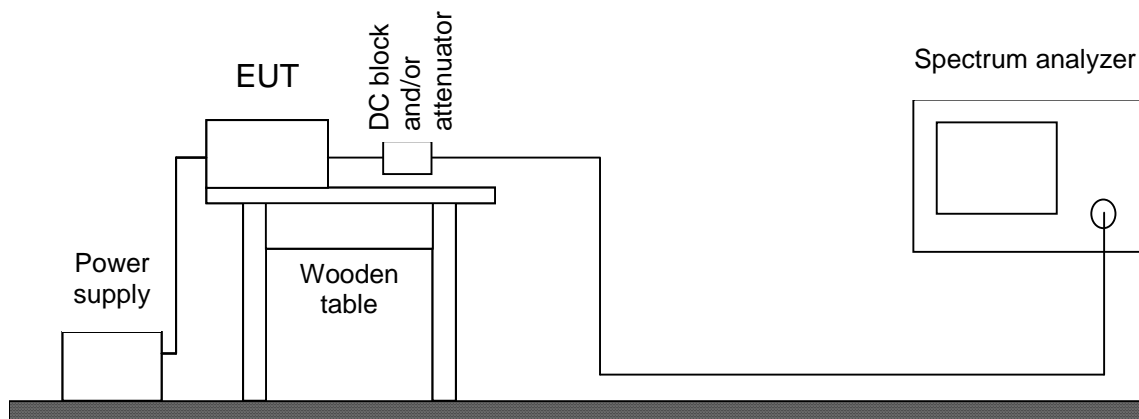


Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Spectrum analyzer	FSP30	1666	100063	Rohde & Schwarz
<input checked="" type="checkbox"/> EMI test receiver	ESPI7	1711	836914/0002	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/> Power meter	NRVS	1264	836856/015	Rohde & Schwarz
<input type="checkbox"/> Peak power sensor	NRV-Z31	1701	8579604.03	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z52	1499	837901/030	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z4	1034	863828/015	Rohde & Schwarz
<input checked="" type="checkbox"/> Microwave cable	ST-18/SMAm/SMAm/48	1949	696378	Huber+Suhner
<input type="checkbox"/> DC-block	7006	1636	A2798	Weinschel
<input type="checkbox"/> Attenuator	4776-10	1638	9412	Narda
<input type="checkbox"/> Attenuator	4776-20	1639	9503	Narda

6.2 Bandwidth Measurements

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.202(a) CFR 47 Part 15, section 15.215(c) ANSI C63.10, section 6.9.1
Guide:	ANSI C63.10
Measurement setup:	<input checked="" type="checkbox"/> Conducted: See below <input type="checkbox"/> Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.5)
<p>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.</p> <p>If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range.</p> <p>The analyzer settings are specified by the test description of the appropriate test record(s).</p>	



Test instruments used for conducted measurements:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Spectrum analyzer	FSP30	1666	100063	Rohde & Schwarz
<input checked="" type="checkbox"/> EMI test receiver	ESPI7	1711	836914/0002	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/> Power meter	NRVS	1264	836856/015	Rohde & Schwarz
<input type="checkbox"/> Peak power sensor	NRV-Z31	1701	8579604.03	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z52	1499	837901/030	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z4	1034	863828/015	Rohde & Schwarz
<input type="checkbox"/> DC-block	7006	1636	A2798	Weinschel
<input checked="" type="checkbox"/> Microwave cable	ST-18/SMAm/SMAm/48	1949	696378	Huber+Suhner
<input type="checkbox"/> Attenuator	4776-10	1638	9412	Narda
<input type="checkbox"/> Attenuator	4776-20	1639	9503	Narda

6.3 Conducted AC Powerline Emission

Measurement Procedure:

Rules and specifications: CFR 47 Part 15, sections 15.107 and 15.207

Guide: ANSI C63.4 (CISPR 22)

Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:

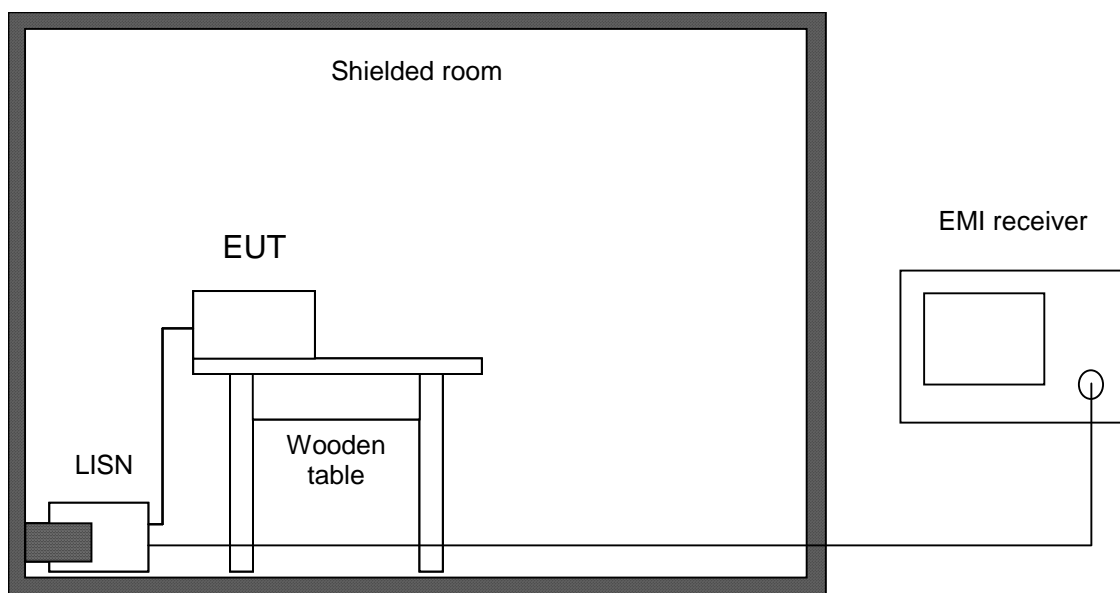
First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with detector set to quasi-peak.

If average limit is kept with quasi-peak levels no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average is performed.

According to ANSI C63.4, section 13.1.3.1, testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended.

Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN.

Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.



Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
<input checked="" type="checkbox"/> V-network	ESH 3-Z5	1060	894785/005	Rohde & Schwarz
<input checked="" type="checkbox"/> V-network	ESH 3-Z5	1218	830952/025	Rohde & Schwarz
<input type="checkbox"/> Artificial mains network	ESH 2-Z5	1536	842966/004	Rohde & Schwarz
<input checked="" type="checkbox"/> Microwave cable	FB293C1080005050	2157	72110-02	Rosenberger Micro-Coax
<input checked="" type="checkbox"/> Coax cable	RG214 N/N 5m	1188	---	Senton
<input type="checkbox"/> Shielded room	No. 1	1451	---	Albatross
<input checked="" type="checkbox"/> Shielded room	No. 4	1454	3FD 100 544	Euroshield

6.4 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:

Rules and specifications: CFR 47 Part 15, section 15.35(c)

Guide: ANSI C63.10

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.

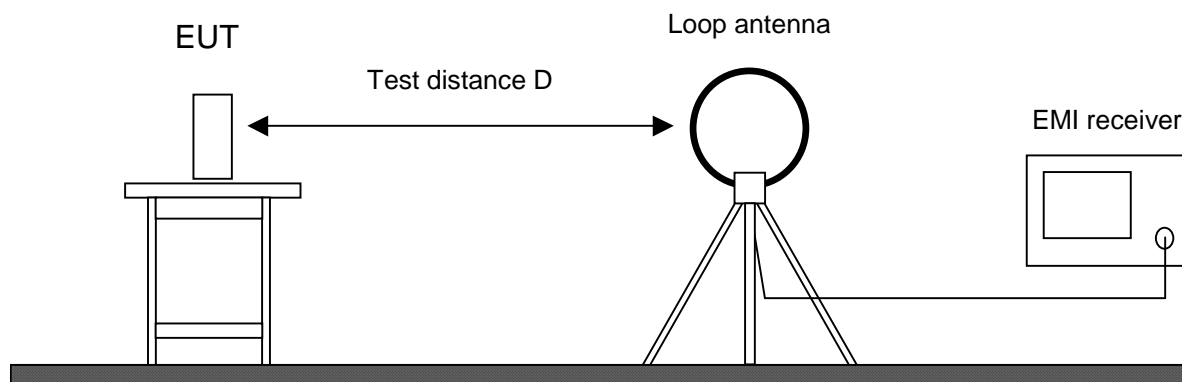
Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

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
<input type="checkbox"/> Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/> Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
<input checked="" type="checkbox"/> EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
<input type="checkbox"/> Preamplifier Cabin no. 2	CPA9231A	1716	3557	Schaffner
<input checked="" type="checkbox"/> Loop antenna	HFH2-Z2	1016	882964/1	Rohde & Schwarz
<input type="checkbox"/> Microwave cable Cabin no. 2	UFA210A-FG	1681	23516	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 2	KKSF1040016	2020	289854/4	Huber + Suhner
<input type="checkbox"/> Microwave cable Cabin no. 2	FA210AF020000000	2060	64566-2	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	EF393	2053	---	Albatross Projects
<input type="checkbox"/> Microwave cable Cabin no. 8	FB293C1050005050	2054	63834-1	Rosenberger Micro-Coax
<input checked="" type="checkbox"/> Microwave cable Cabin no. 8	FB293C1080005050	2055	63833-1	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.3.9	RFS
<input checked="" type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.4.12	RFS
<input type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.6.19	RFS
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF040005050G	2127	72061-01	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505G	2056	64567-01	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505	2068	64610-1	Rosenberger Micro-Coax
<input type="checkbox"/> Fully anechoic room	No. 2	1452	---	Albatross
<input type="checkbox"/> Semi anechoic room	No. 3	1453	---	Siemens
<input checked="" type="checkbox"/> Semi anechoic room	No. 8	2057	---	Albatross

6.5 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:

Rules and specifications: CFR 47 Part 15, sections 15.215(b) and 15.231

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.

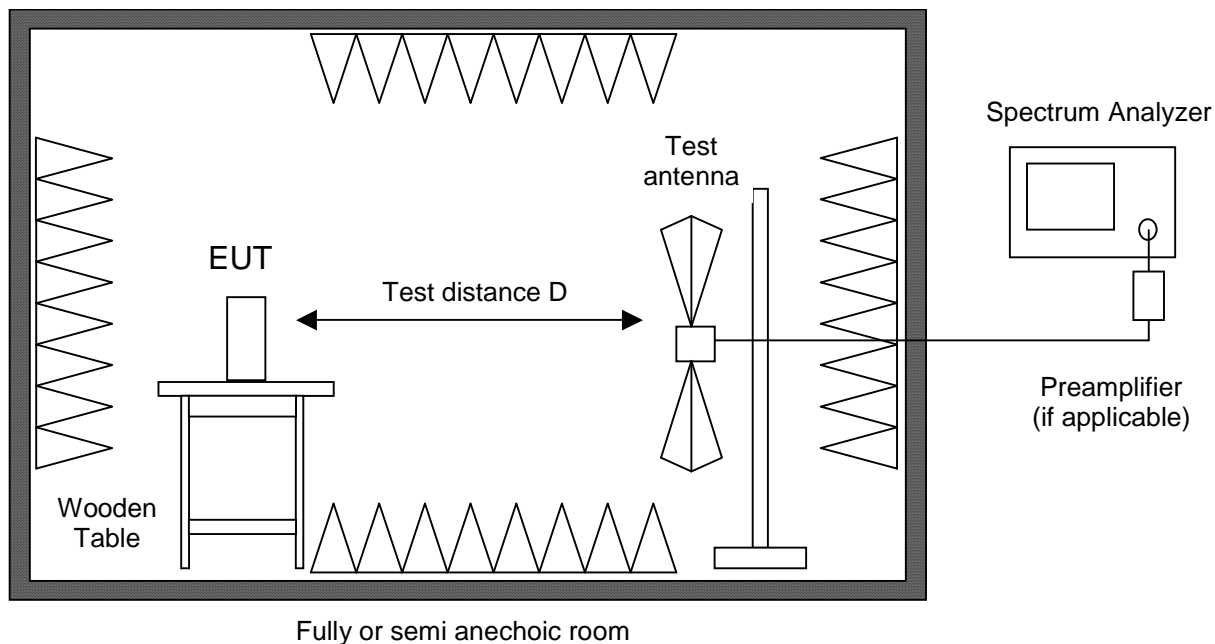
All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation 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 6.6). If prescans are recorded in fully anechoic room they are indicated appropriately.



Test instruments used:

Type		Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
<input checked="" type="checkbox"/>	EMI test receiver	Cabin no. 3 ESPI7	2010	101018	Rohde & Schwarz
<input type="checkbox"/>	EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
<input type="checkbox"/>	EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/>	Preamplifier	Cabin no. 2 CPA9231A	1716	3557	Schaffner
<input type="checkbox"/>	Preamplifier	R14601	1142	13120026	Advantest
<input checked="" type="checkbox"/>	Preamplifier (1 - 8 GHz)	AFS3-00100800-32-LN	1684	847743	Miteq
<input type="checkbox"/>	Preamplifier (0.5 - 8 GHz)	AMF-4D-005080-25-13P	1685	860149	Miteq

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Preamplifier (8 - 18 GHz)	ACO/180-3530	1484	32641	CTT
<input type="checkbox"/> External Mixer	WM782A	1576	845881/005	Tektronix
<input type="checkbox"/> Harmonic Mixer Accessories	FS-Z30	1577	624413/003	Rohde & Schwarz
<input type="checkbox"/> Trilog antenna Cabin no. 2	VULB 9163	1802	9163-214	Schwarzbeck
<input type="checkbox"/> Trilog antenna Cabin no. 3	VULB 9163	1722	9163-188	Schwarzbeck
<input type="checkbox"/> Trilog antenna Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
<input type="checkbox"/> Trilog antenna Cabin no. 2	VULB 9162	2256	9162-048	Schwarzbeck
<input checked="" type="checkbox"/> Horn antenna	3115	1516	9508-4553	EMCO
<input type="checkbox"/> Horn antenna	3160-03	1010	9112-1003	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-04	1011	9112-1001	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-05	1012	9112-1001	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-06	1013	9112-1001	EMCO
<input type="checkbox"/> Horn antenna	3160-07	1014	9112-1008	EMCO
<input type="checkbox"/> Horn antenna	3160-08	1015	9112-1002	EMCO
<input type="checkbox"/> Horn antenna	3160-09	1265	9403-1025	EMCO
<input type="checkbox"/> Horn antenna	3160-10	1575	399185	EMCO
<input checked="" type="checkbox"/> Microwave cable Cabin no. 2	UFA210A-FG	1681	23516	Rosenberger Micro-Coax
<input checked="" type="checkbox"/> Microwave cable Cabin no. 2	KKSF1040016	2020	289854/4	Huber + Suhner
<input checked="" type="checkbox"/> Microwave cable Cabin no. 2	FA210AF020000000	2060	64566-2	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	EF393	2053	---	Albatross Projects
<input type="checkbox"/> Microwave cable Cabin no. 8	FB293C1050005050	2054	63834-1	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	FB293C1080005050	2055	63833-1	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.3.9	RFS
<input type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.4.12	RFS
<input type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.6.19	RFS
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF040005050G	2127	72061-01	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505G	2056	64567-01	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505	2068	64610-1	Rosenberger Micro-Coax
<input checked="" type="checkbox"/> Fully anechoic room	No. 2	1452	---	Albatross
<input type="checkbox"/> Semi anechoic room	No. 8	2057	---	Albatross

6.6 Radiated Emission at Alternative Test Site

Measurement Procedure:

Rules and specifications: CFR 47 Part 15, sections 15.215(b) and 15.231

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.

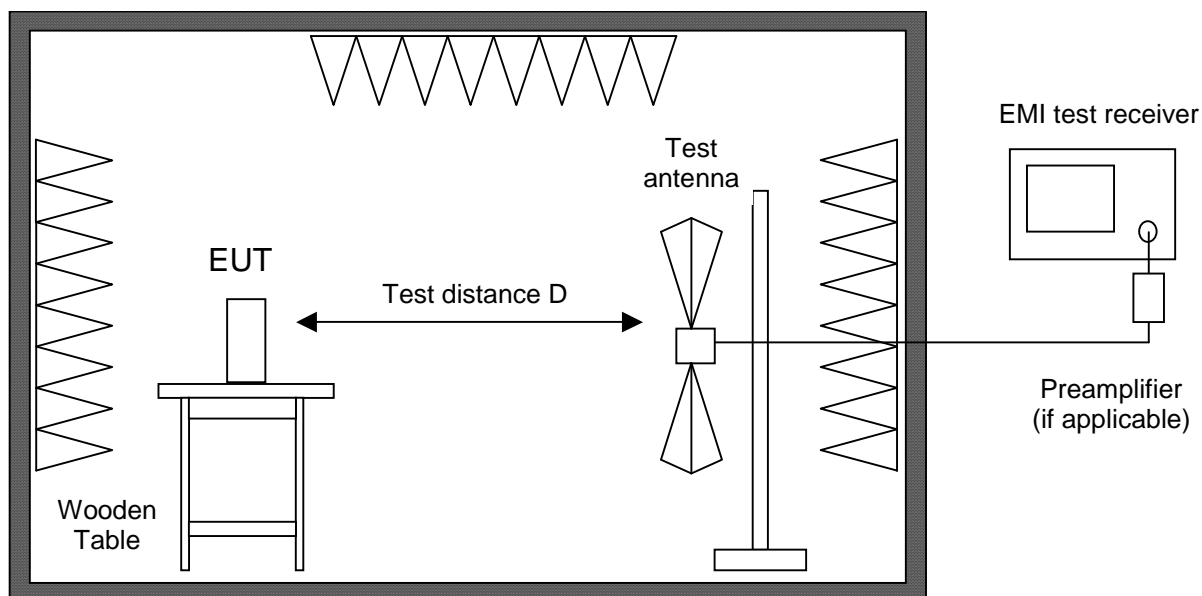
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

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 discharged 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.



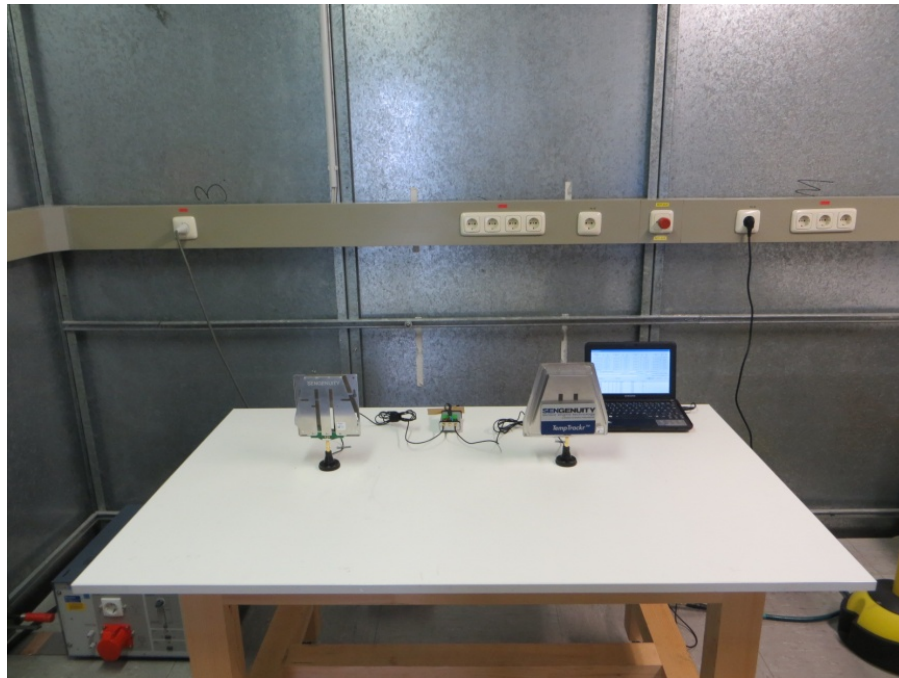
Alternate test site (semi anechoic room)

Test instruments used:

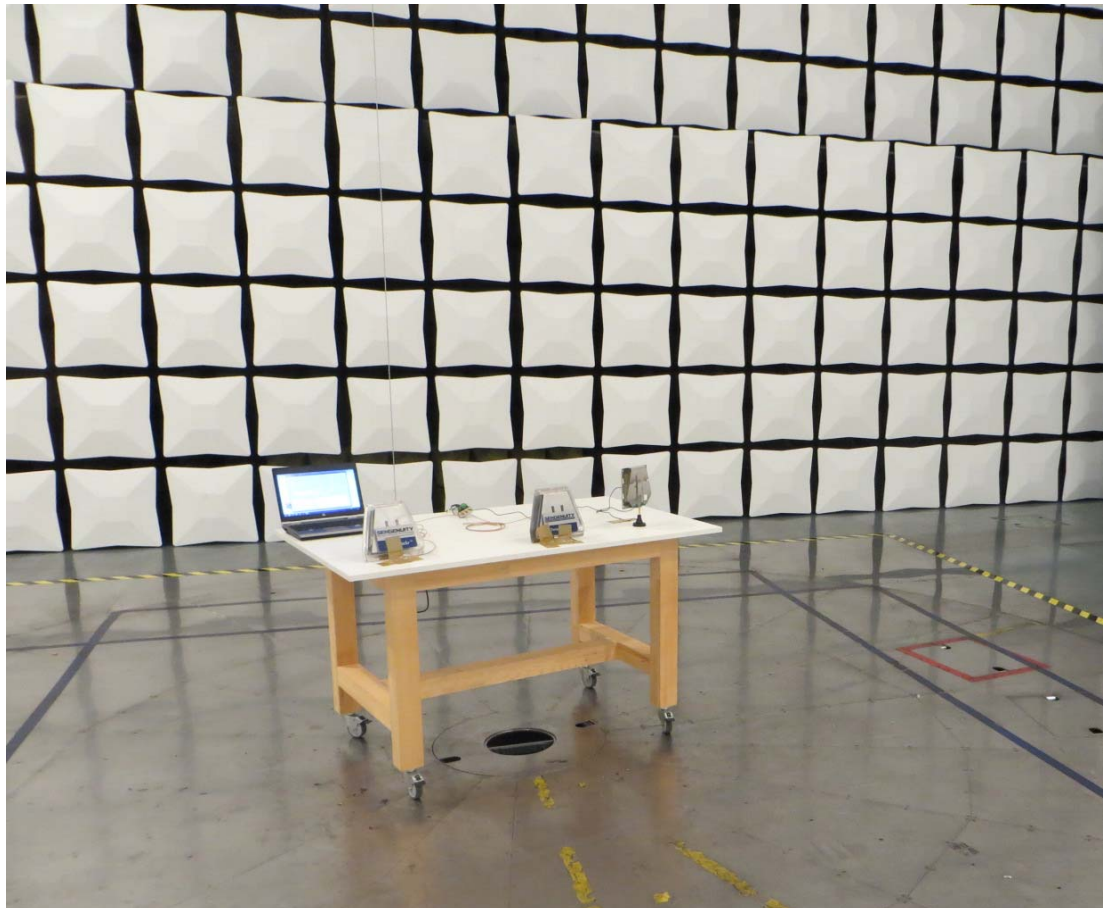
Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
<input checked="" type="checkbox"/> Trilog antenna Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
<input checked="" type="checkbox"/> Microwave cable Cabin no. 8	EF393	2053	---	Albatross Projects
<input checked="" type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505G	2056	64567-01	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.6.19	RFS
<input checked="" type="checkbox"/> Microwave cable Cabin no. 8	LCF12-50	2057	P1.3.9	RFS
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505	2068	64610-1	Rosenberger Micro-Coax
<input type="checkbox"/> Microwave cable Cabin no. 8	FA210AF04000505G	2127	72061-01	Rosenberger Micro-Coax
<input type="checkbox"/> Semi anechoic room	No. 8	2057	---	Albatross

7 Photographs Taken During Testing

Test setup for conducted AC powerline emission measurement



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	29	Recorded
2.202(a)	Occupied bandwidth	30	Recorded
15.215(c) 15.231(c)	Bandwidth of the emission	37	Test passed
2.201, 2.202	Class of emission	41	Calculated
15.35(c)	Pulse train measurement for pulsed operation	--	Not applicable
15.205(a)	Restricted bands of operation	42	Test passed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	43	Test passed
15.205(b) 15.231(b) 15.231(e)	Radiated emission 9 kHz to 30 MHz	46	Test passed
15.205(b) 15.215(b) 15.231(b) 15.231(e)	Radiated emission 30 MHz to 4.5 GHz	48	Test passed
15.231(d)	Carrier frequency stability	---	Not applicable

8.1 Conducted Output Power

Rules and specifications:	CFR 47 Part 2, section 2.1046(a)
Guide:	ANSI C64.10 / CFR 47 Part 2, section 2.1046
Description:	Conducted output power shall be measured at the RF output terminals (e.g. antenna connector if antenna is detachable) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.
Measurement procedure:	Conducted Output Power (6.1)

Comment:	Operating modes 3, 4, 5
Date of test:	December 2, 2014
Test site:	Unshielded room

Test Result:	Test passed
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Antenna gain: 3,1 dBi							
Mode	Frequency (MHz)	Power Type	Reading (dBm)	Correction (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
3	429,0	Peak	-39,9	2,1	-37,8		
4	434,9	Peak	-37,6	2,1	-35,5		
5	439,4	Peak	-37,5	2,1	-35,4		

Note 1: If applicable, PEP (peak envelope power) and RMS values are measured using a power meter with appropriate sensor.

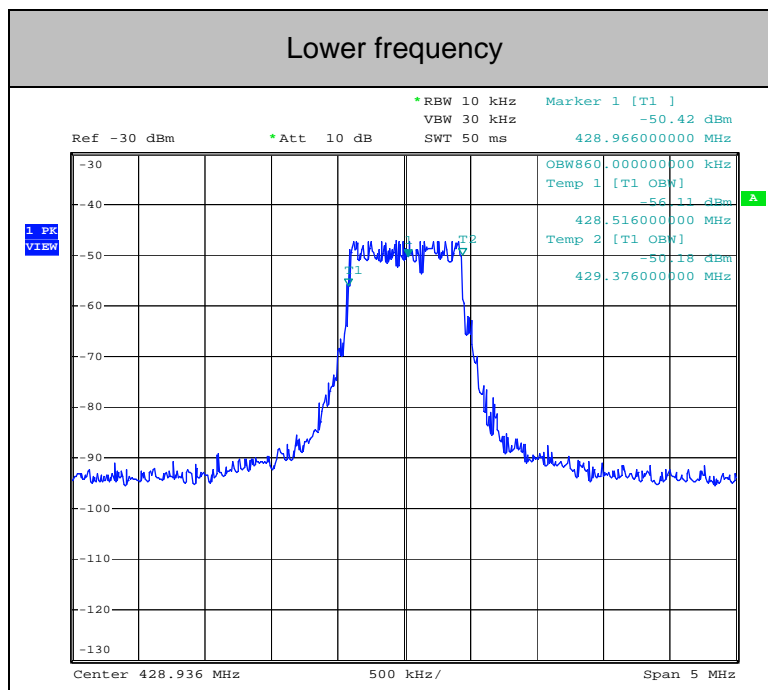
Note 2: If applicable, peak or average values are measured using a spectrum analyzer with resolution and video bandwidth set to: RBW = 10MHz, VBW = 10MHz.

Note 3: If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power limit is reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

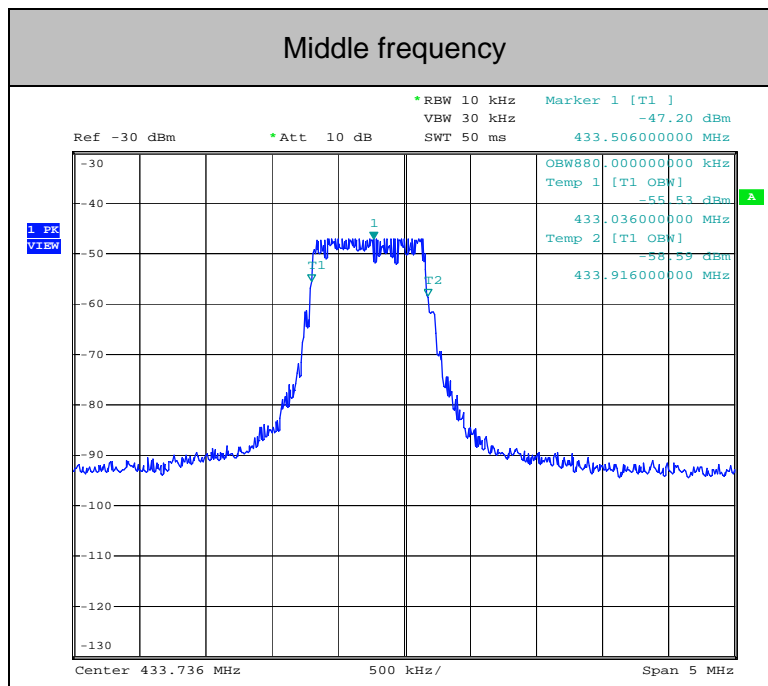
8.2 Occupied Bandwidth

Rules and specifications:	CFR 47 Part 2, section 2.202(a) ANSI C63.10, section 6.9.1
Guide:	ANSI C63.10
Description:	<p>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.</p> <p>The occupied bandwidth according to ANSI C63.10, section 6.9.1; is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier.</p> <p>The span range of the spectrum analyser display shall be between two times and five times of the occupied bandwidth. The resolution bandwidth of the spectrum analyzer should be approximately 1 % to 5 % of the occupied bandwidth, unless otherwise specified, depending on the applicable requirement. The video bandwidth shall be at least three times greater than the resolution bandwidth. The dynamic range of the spectrum analyzer at the selected resolution bandwidth shall be more than 10 dB below the target "dB down" (attenuation) requirement.</p>
Measurement procedure:	Bandwidth Measurements (6.2)
Comment:	--
Date of test:	December 2, 2014
Test site:	Fully anechoic room, cabin no. 2

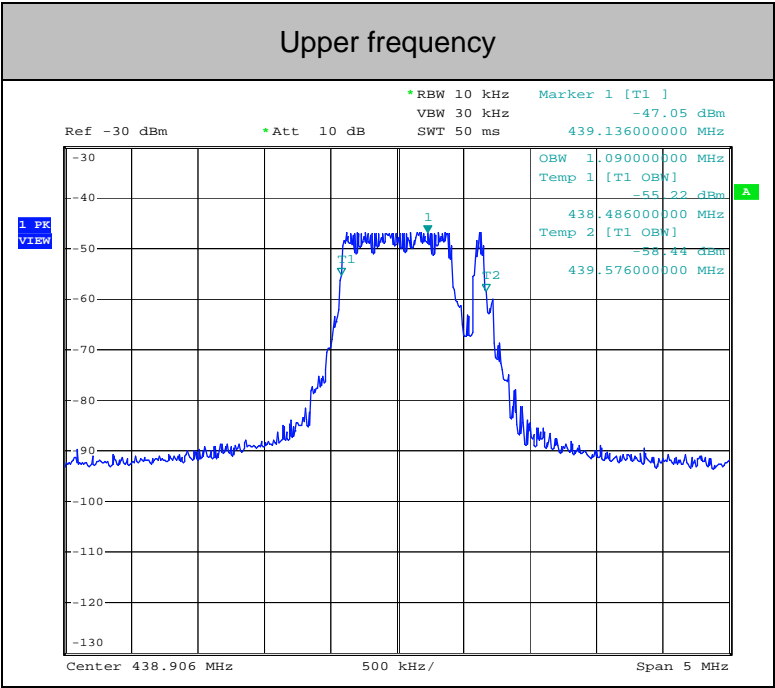
Occupied Bandwidth (99 %):



Occupied Bandwidth (99 %): **860.0 kHz**

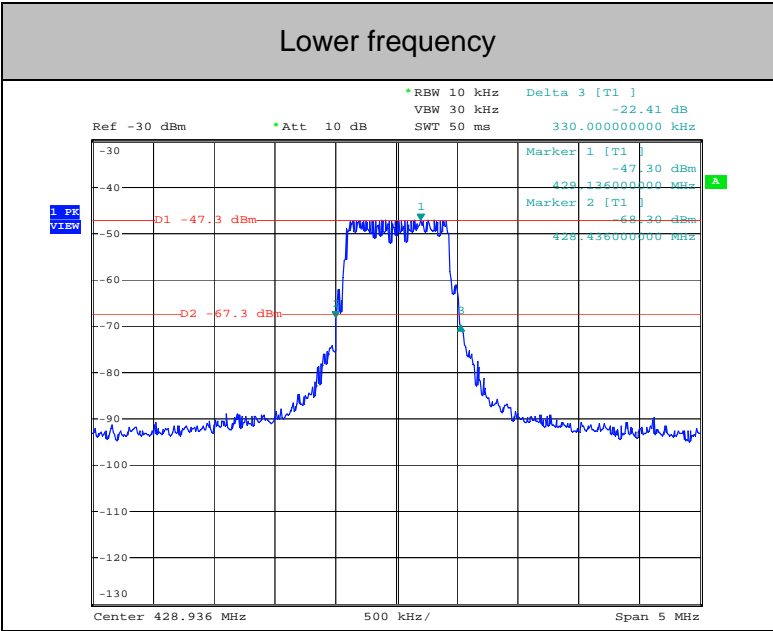


Occupied Bandwidth (99 %): **880.0 kHz**

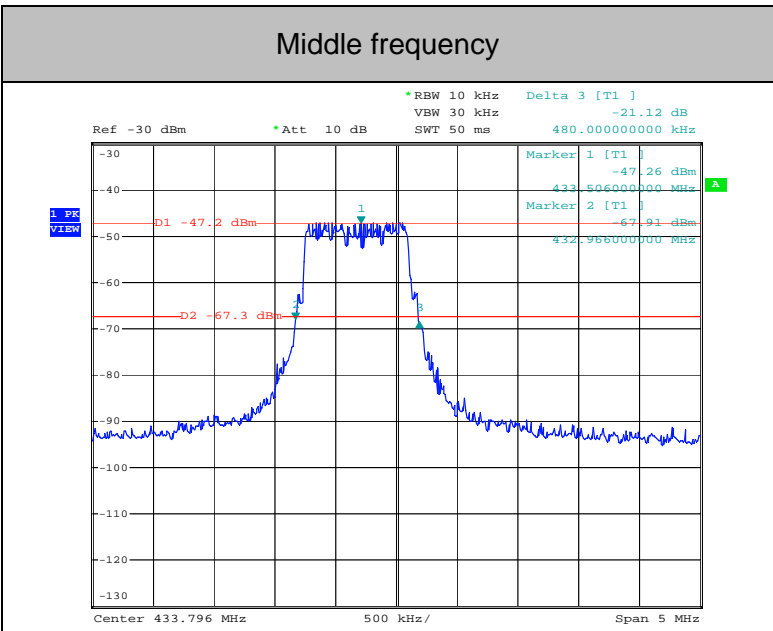


Occupied Bandwidth (99 %): **1090.0 kHz**

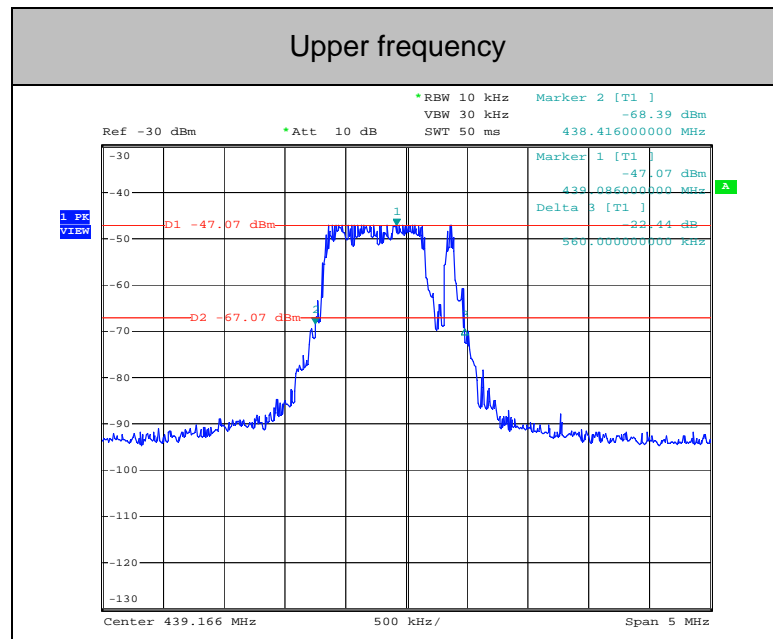
Occupied Bandwidth (-20 dB):



Occupied Bandwidth (-20 dB): **330.0 kHz**



Occupied Bandwidth (-20 dB): **480.0 kHz**



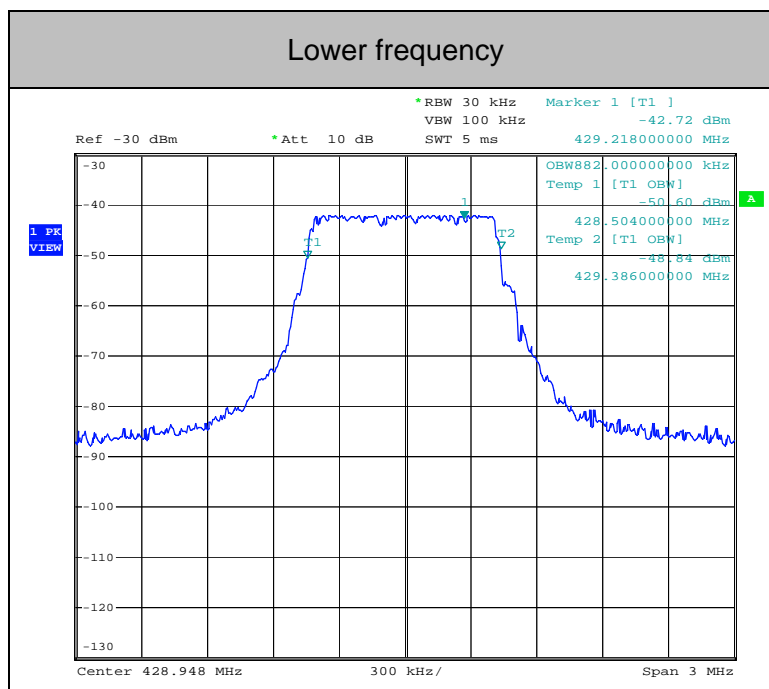
Occupied Bandwidth (-20 dB): **560.0 kHz**

Occupied Bandwidth (continued)

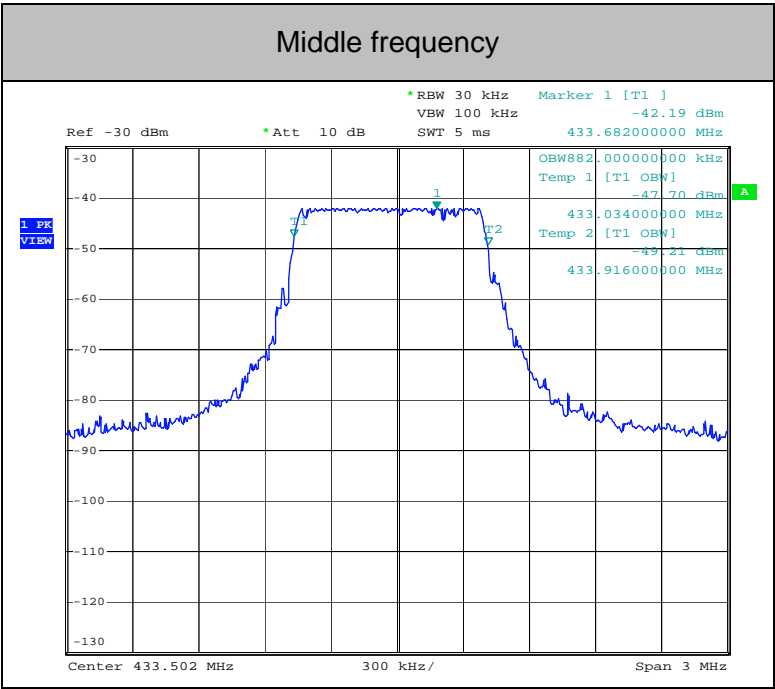
Rules and specifications:	IC RSS-Gen Issue 4, section 6.6
Guide:	IC RSS-Gen Issue 4, section 6.6
Description:	<p>If not specified in the applicable RSS the occupied bandwidth is measured as the 99% emission bandwidth.</p> <p>The span of the analyzer shall be set to capture all products of the modulation 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.</p> <p>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.</p>
Measurement procedure:	Bandwidth Measurements (6.2)

Comment:	TX mode: lower, middle, upper frequency
Date of test:	December 2, 2014
Test site:	Fully anechoic room, cabin no. 2

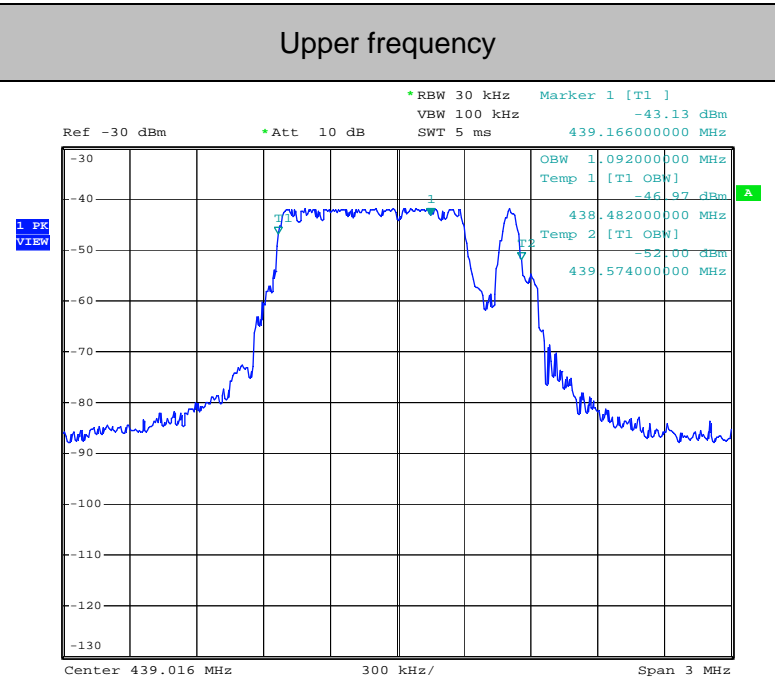
Occupied Bandwidth (99 %):



Occupied Bandwidth (99 %):	882.0 kHz
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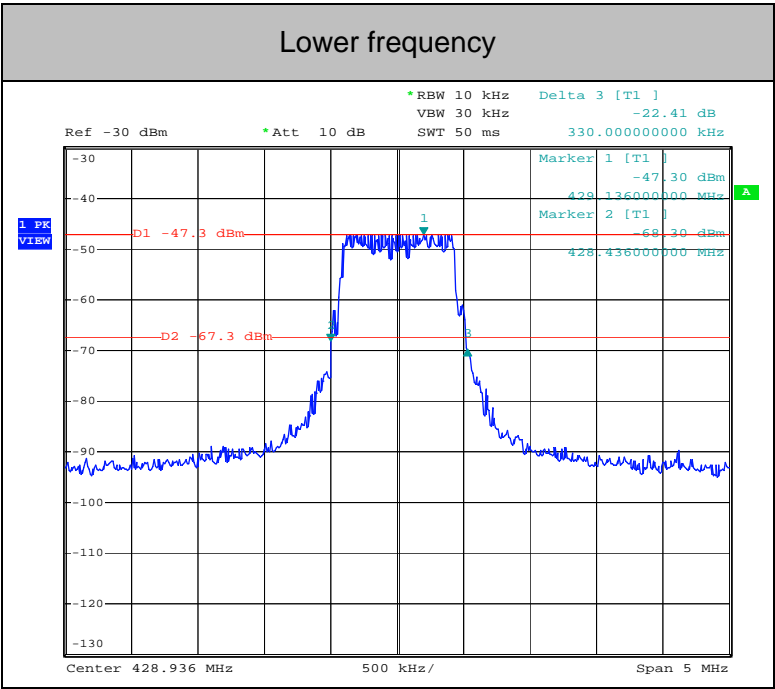
Occupied Bandwidth (99 %): **882.0 kHz**



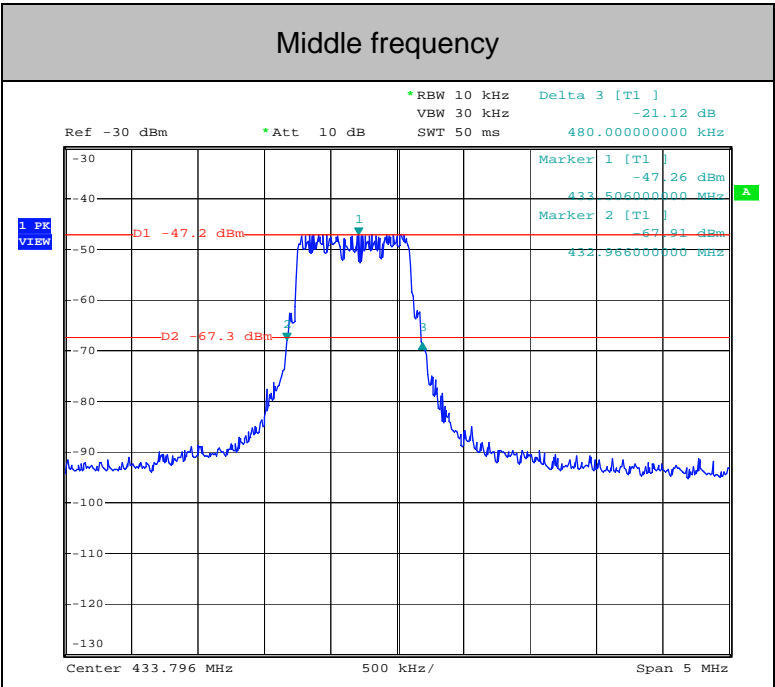
Occupied Bandwidth (99 %): **1092.0 kHz**

8.3 Bandwidth of the Emission

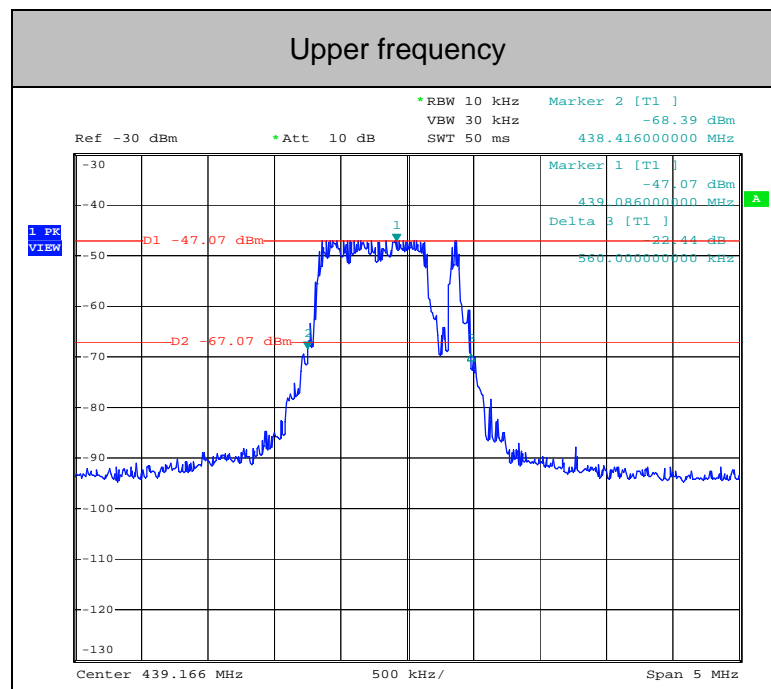
Rules and specifications:	CFR 47 Part 15, section 15.215(c)	
Guide:	ANSI C63.4	
Description:	<p>The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier.</p> <p>For intentional radiators operating 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.</p> <p>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:</p>	
	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 (6.2)	
Comment:	--	
Date of test:	December 2, 2014	
Test site:	Fully anechoic room, cabin no. 2	



Bandwidth of the emission: **330.0 kHz**



Bandwidth of the emission: **480.0 kHz**



Bandwidth of the emission:

560.0 kHz

8.4 Bandwidth of Momentary Signals

Rules and specifications:	CFR 47 Part 15, section 15.231(c)
Guide:	ANSI C63.4
Limit:	For the purpose of Section A1.1, the 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

Frequency [MHz]	99% BW [MHz]	Limit [MHz]	Result
429.00	0.882	1.0725	Pass
433.50	0.882	1.08375	Pass
438.90	1.092	1.09725	Pass

Rules and specifications:	CFR 47 Part 15, section 15.231(c)
Guide:	ANSI C63.10
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz... Bandwidth is determined at the points 20 dB down from the modulated carrier.

Frequency [MHz]	20 dB BW [MHz]	Limit [MHz]	Result
429.00	0.330	1.0725	Pass
433.50	0.480	1.08375	Pass
438.90	0.560	1.09725	Pass

Test Result:	Test passed
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8.5 Designation of Emissions

Rules and specifications:	CFR 47 Part 2, sections 2.201 and 2.202
Guide:	ANSI C63.10 / TRC-43

Frequency Modulation:

Type of modulation:	Frequency Modulation
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B_n = Necessary Bandwidth	$B_n = 2M + 2DK$
M = Modulation frequency	M = 50 kHz
D = Peak deviation	D = 10 kHz
K = Overall numerical factor	K = 1
Calculation:	$B_n = 2 \cdot (50 \text{ kHz}) + 2 \cdot (10 \text{ kHz}) \cdot 1 = 120 \text{ kHz}$

Designation of Emissions:	120KF7D
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8.6 Restricted Bands of Operation

Rules and specifications:	CFR 47 Part 15, section 15.205(a)
Guide:	ANSI C63.10
Limit:	Only spurious emissions are permitted in any of the frequency bands listed in CFR 47 Part 15, section 15.205(a).
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.5)

Comment:	The fundamental is not in a restricted band and the spurious and harmonic emissions in the restricted band comply with the general emission limits of 15.209
Date of test:	December 2, 2014
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters

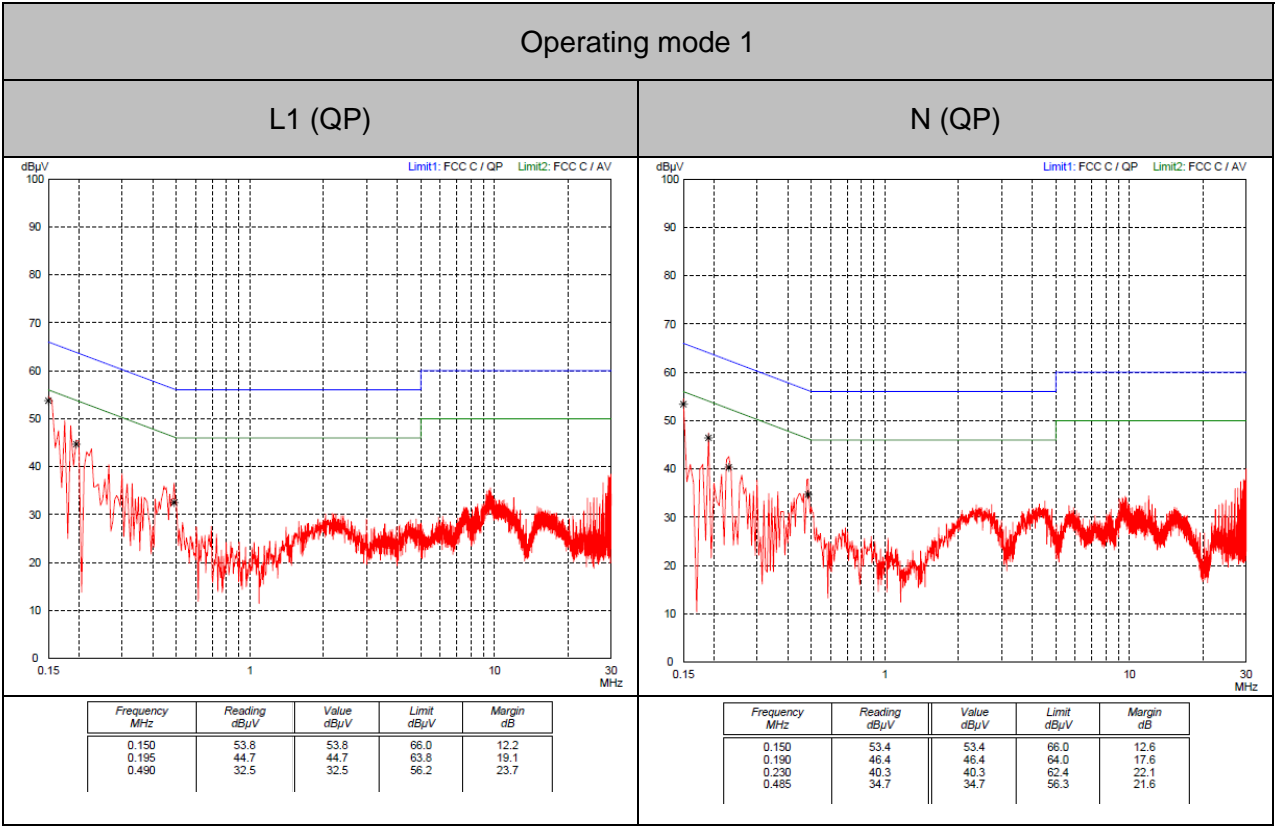
Test Result:	Test passed
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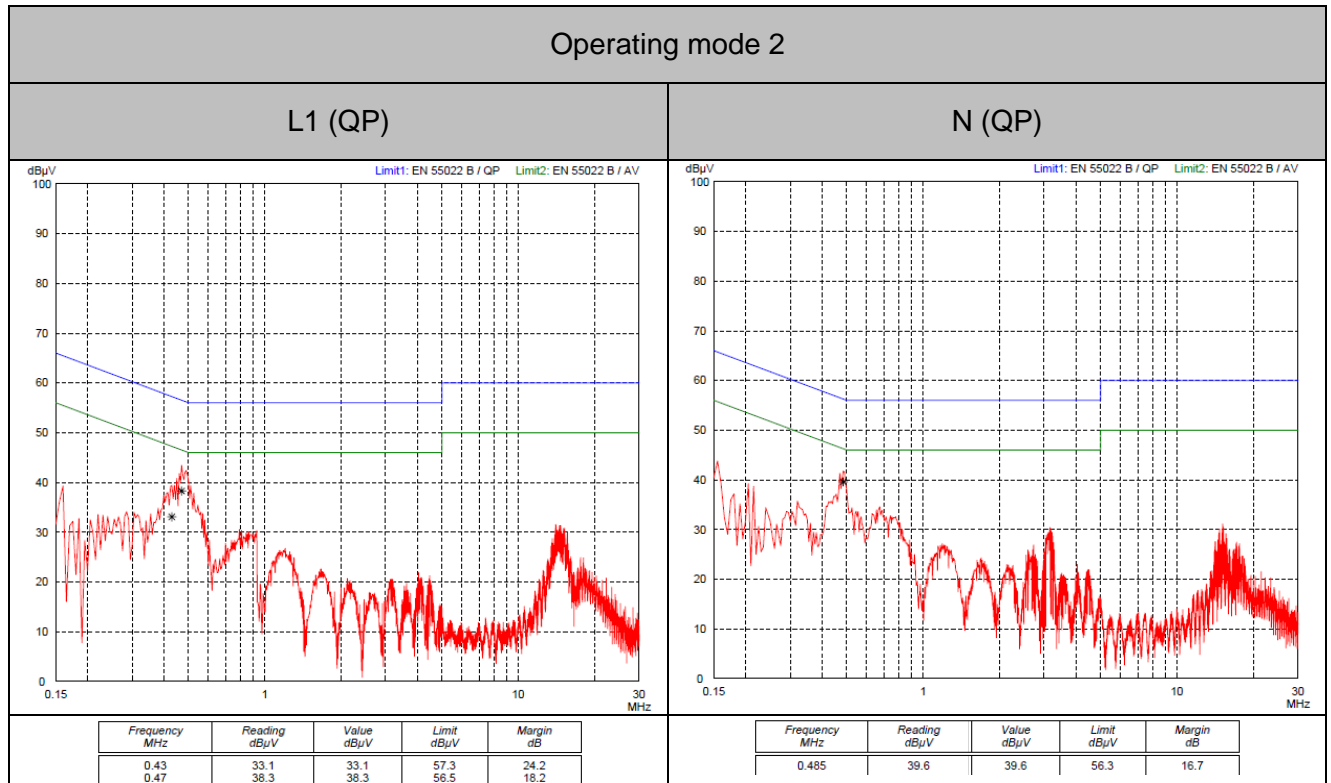
8.7 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, section 15.207		
Guide:	ANSI C63.10 / CISPR 22		
Limit:	Frequency of Emission (MHz)	Conducted Limit (dBμV)	
		Quasi-peak	Average
	0.15 - 0.5	66 to 56	56 to 46
	0.5 - 5	56	46
	5 - 30	60	50
Measurement procedure:	Conducted AC Powerline Emission (6.3)		

Comment:	With dummy load connected to the antenna output terminals Operating mode 1 & 2
Date of test:	December 3, 2014
Test site:	Shielded room, cabin no. 1

Test Result:	Test passed
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Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB)}$$

8.8 Radiated Emission Measurement 9 kHz to 30 MHz

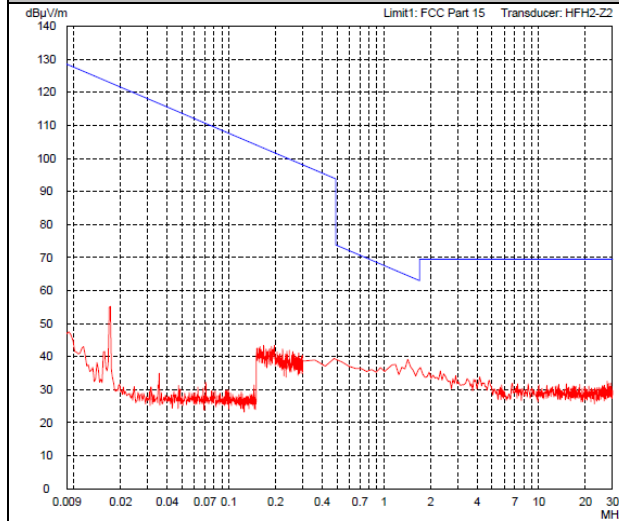
Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.231(b)(3)			
Guide:	ANSI C63.10			
Limit:	Frequency of Emission (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Measurement Distance d (meters)
	0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
	0.490 - 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 (6.4)			

Comment:	Operating mode 3 / 4 / 5 / 6 / 7 / 8
Date of test:	December 2 & 3, 2015
Test site:	Alternative test site

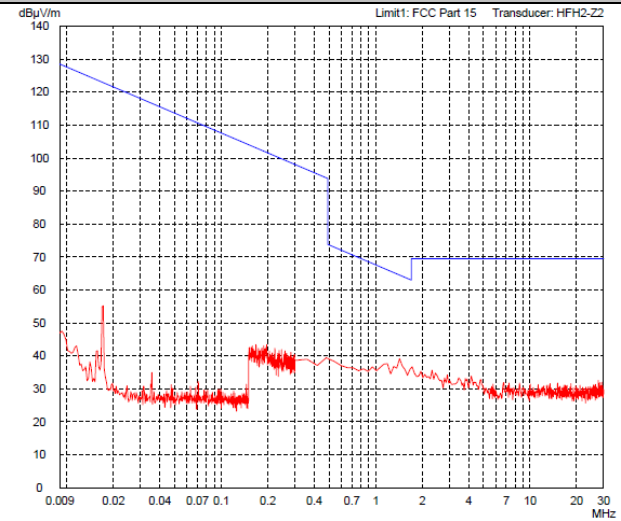
Test Result:	Test passed
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No results!

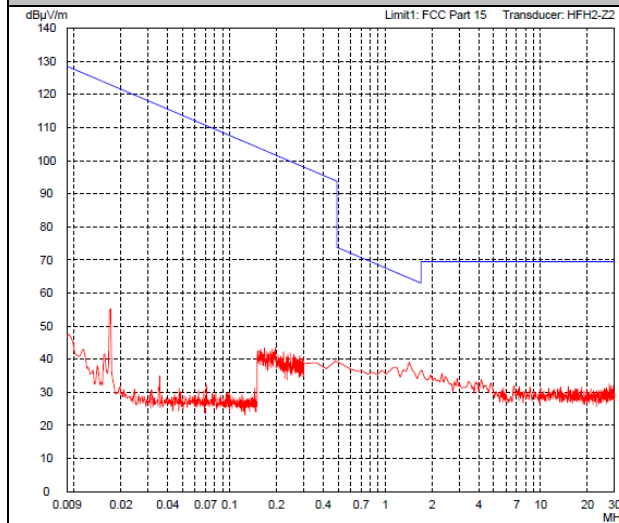
Operating mode 3



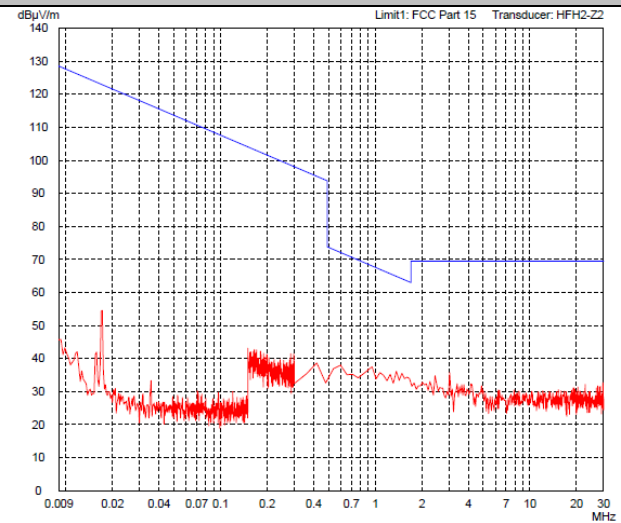
Operating mode 4

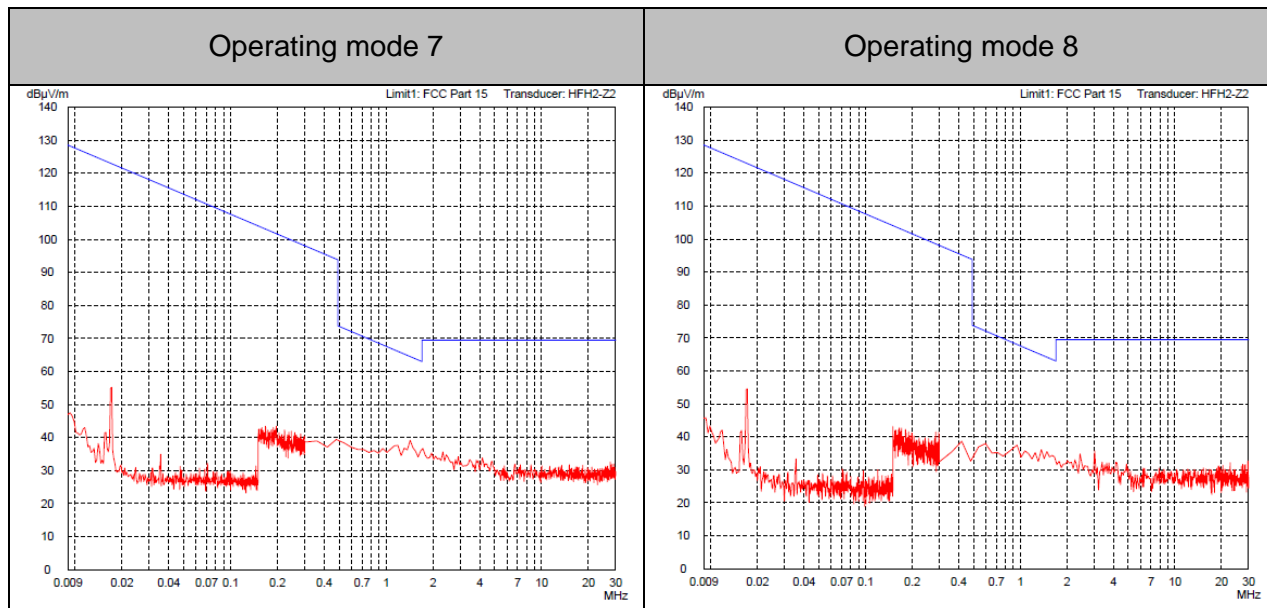


Operating mode 5



Operating mode 6





Sample calculation of final values:

$$\begin{aligned} \text{Extrapolation Factor (dB)} &= (\text{Log}(d) - \text{Log}(d_1)) \cdot \text{Extrapolation Factor (dB/decade)} \\ \text{Final Value (dB}\mu\text{V/m)} &= \text{Reading Value } d_1 \text{ (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ &\quad + \text{Extrapolation Factor (dB)} + \text{Pulse Train Correction (dB)} \end{aligned}$$

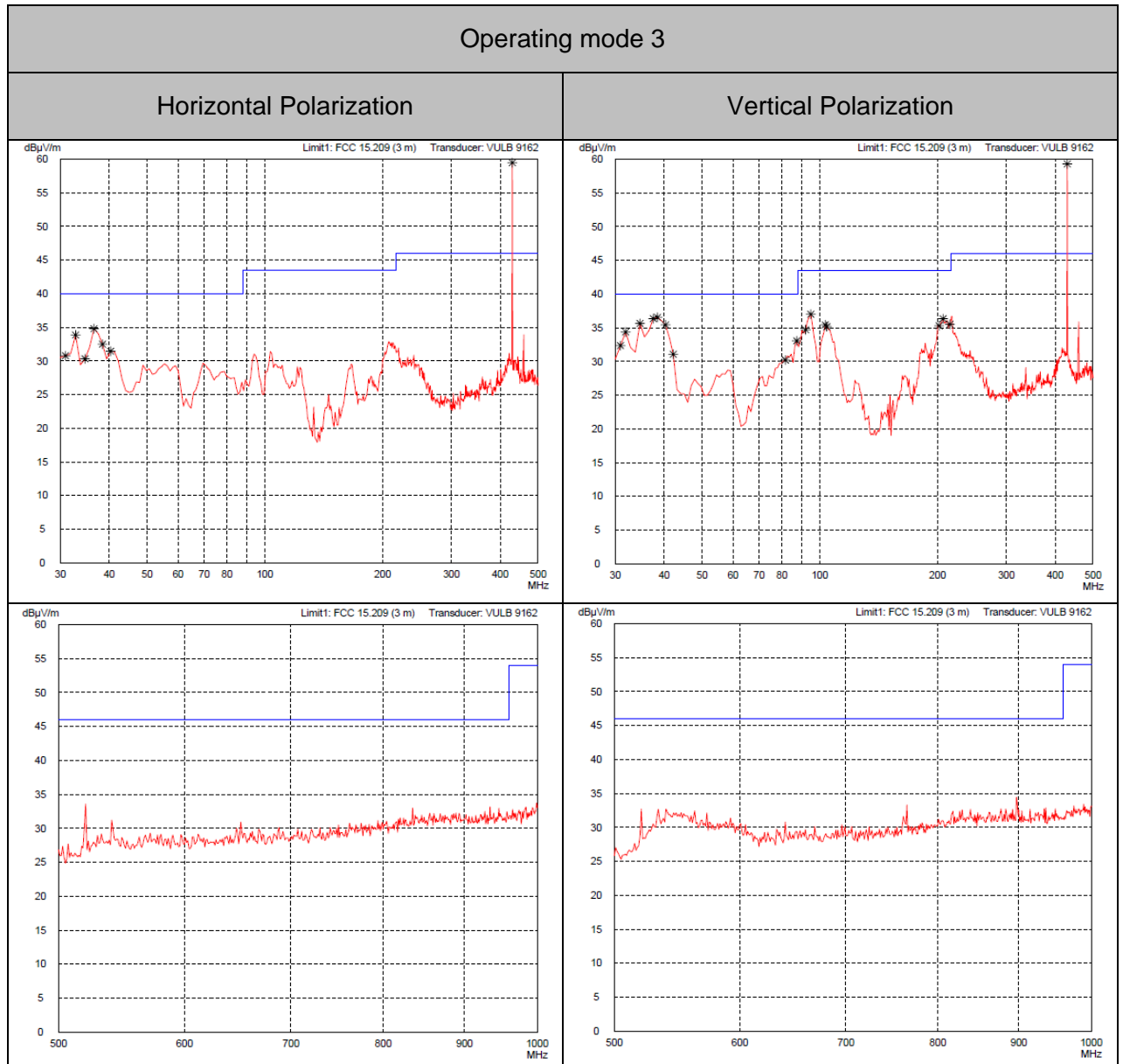
Note: Extrapolation factor (dB) and final value (dBμV/m) are relating to distance d.

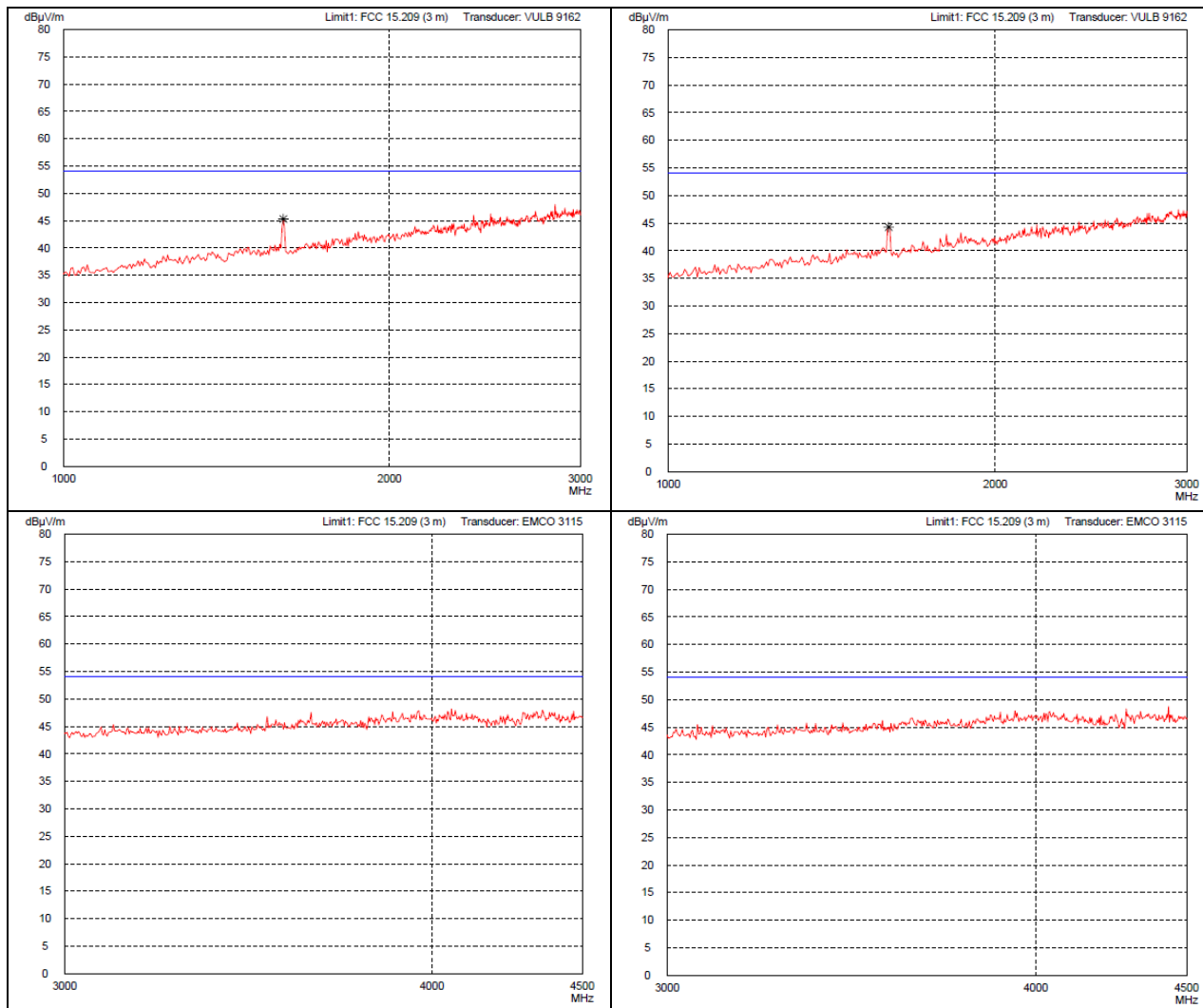
8.9 Radiated Emission Measurement 30 MHz to 4.5 GHz

Rules and specifications:	CFR 47 Part 15, sections 15.205, 15.215(b) and 15.231(b)		
Guide:	ANSI C63.10		
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 (6.5) Radiated Emission at Alternative Test Site (6.6)		

Comment:	Operating mode 3 / 4 / 5 / 6 / 7 / 8
Date of test:	December 2 & 3, 2015
Test site:	Frequencies ≤ 1 GHz: Fully anechoic room, cabin no. 2 (pre-measurement) Semi-anechoic room, cabin no. 8 (QP measurement) Frequencies > 1 GHz: Fully anechoic room, cabin no. 2
Test distance:	3 meters

Test Result:	Test passed
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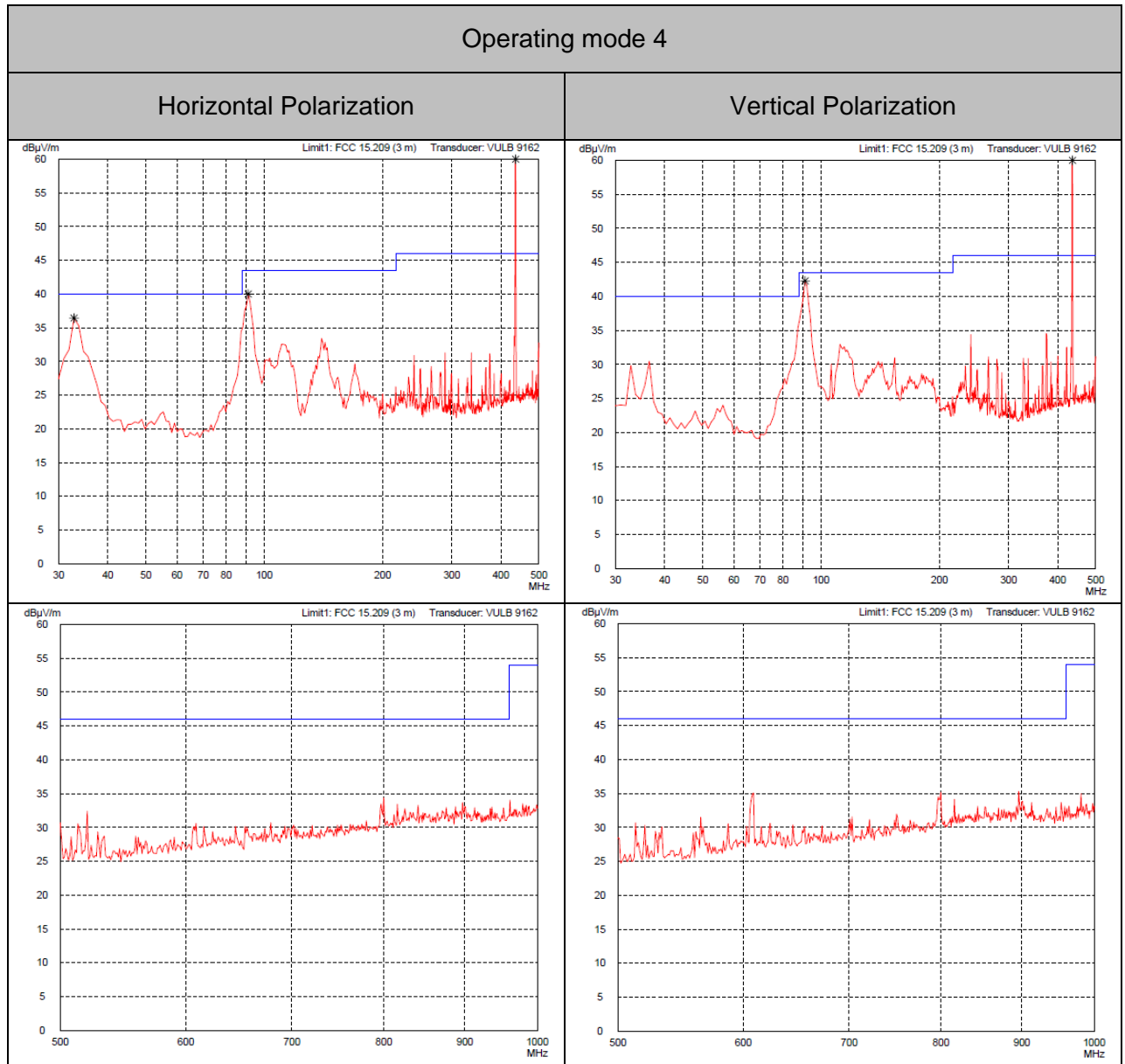


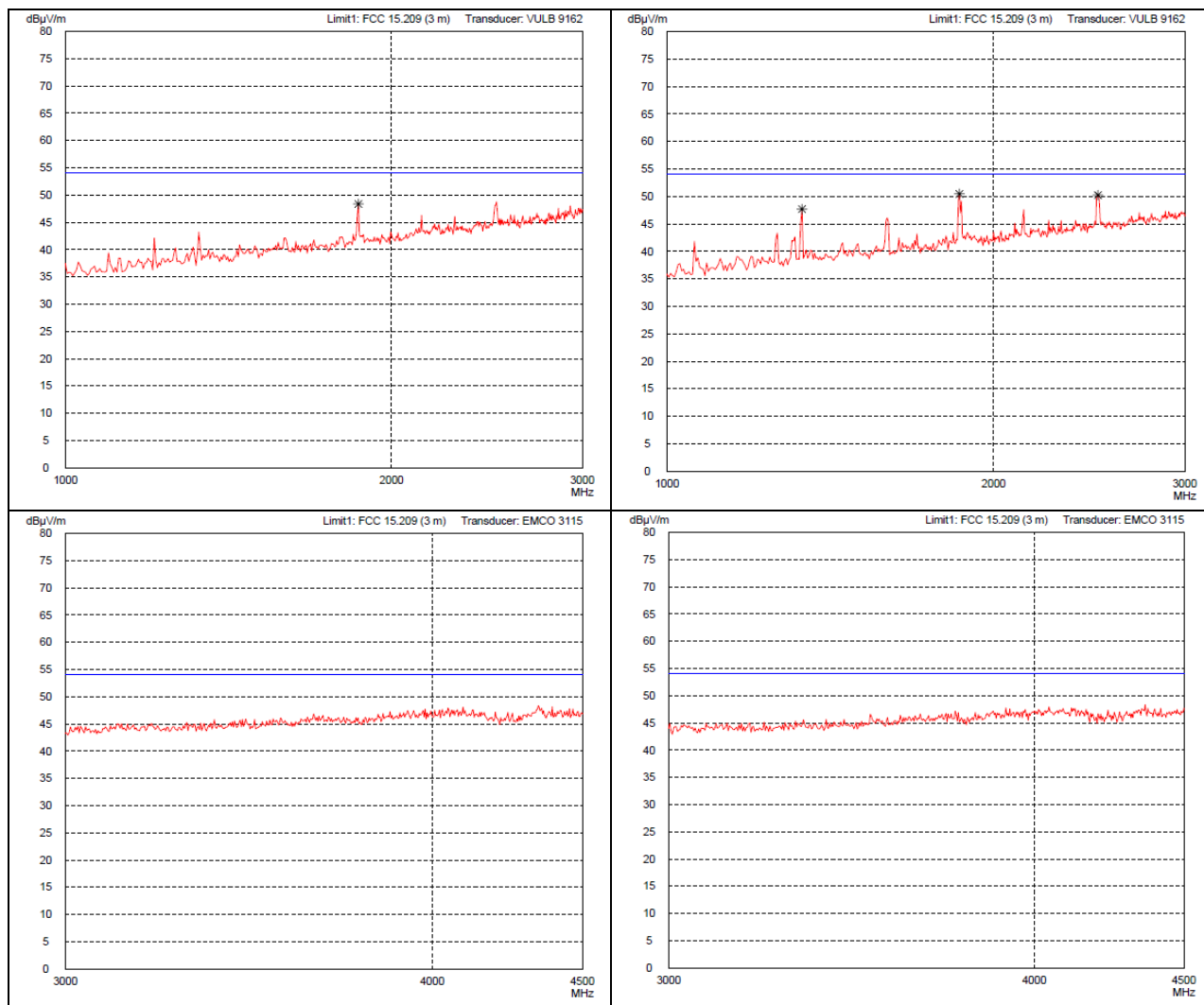
Final measurement values:

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)
36,580	horizontal	Quasi-Peak	18,2	14,2	0,0	32,4	40,0	7,6
38,460	vertical	Quasi-Peak	21,6	14,6	0,0	36,2	40,0	3,8
94,860	horizontal	Quasi-Peak	23,0	12,6	0,0	35,6	43,5	7,9
206,720	horizontal	Quasi-Peak	23,4	12,1	0,0	35,5	43,5	8,1
429,500	horizontal	Quasi-Peak	27,3	18,4	0,0	45,7	46,0	0,3
1596,000	horizontal	Peak	12,8	32,5	0,0	45,3	54,0	8,7

Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$





Final measurement values:

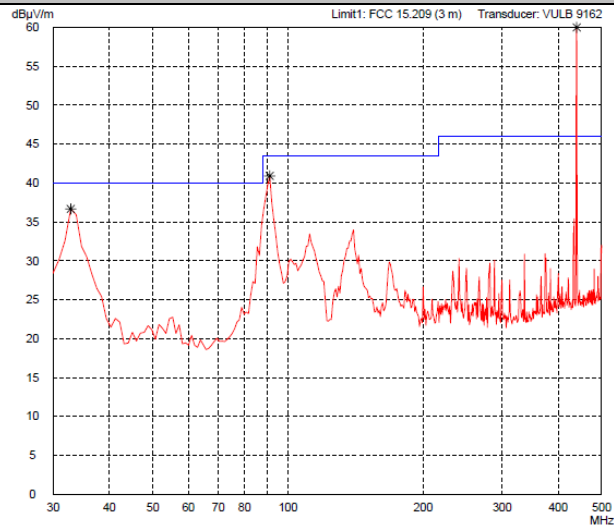
Frequency (MHz)	Antenna Polarization	Detector	Receiver Reading (dBμV)	Correction Factor (dB/m)	Pulse Train Correction (dB)	Final Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)
32,820	horizontal	Quasi-Peak	21,1	13,0	0,0	34,1	40,0	5,9
91,100	vertical	Quasi-Peak	26,5	12,0	0,0	38,5	43,5	5,0
433,500	horizontal	Quasi-Peak	27,4	18,4	0,0	45,8	46,0	0,2
1332,000	horizontal	Peak	17,0	30,7	0,0	47,7	54,0	6,3
1860,000	horizontal	Peak	16,1	34,4	0,0	50,5	54,0	3,6
2496,000	horizontal	Peak	12,5	37,7	0,0	50,2	54,0	3,8

Sample calculation of final values:

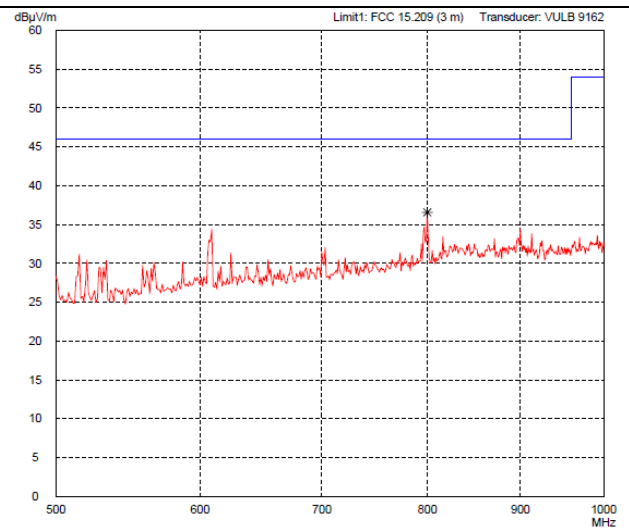
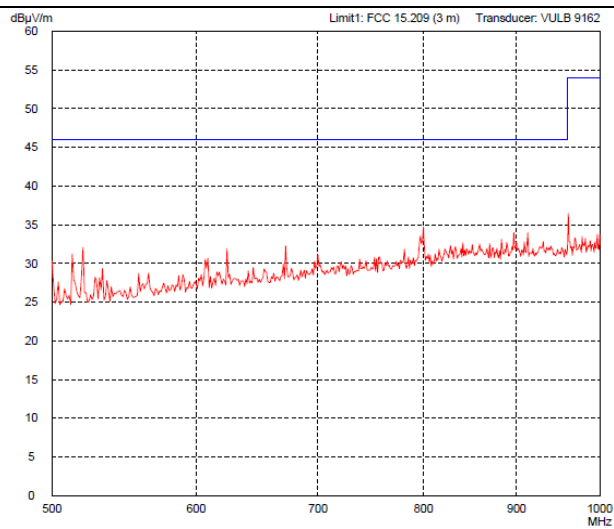
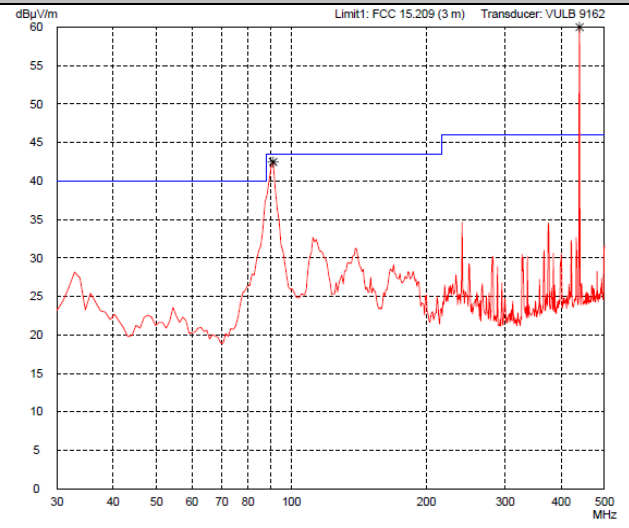
$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$

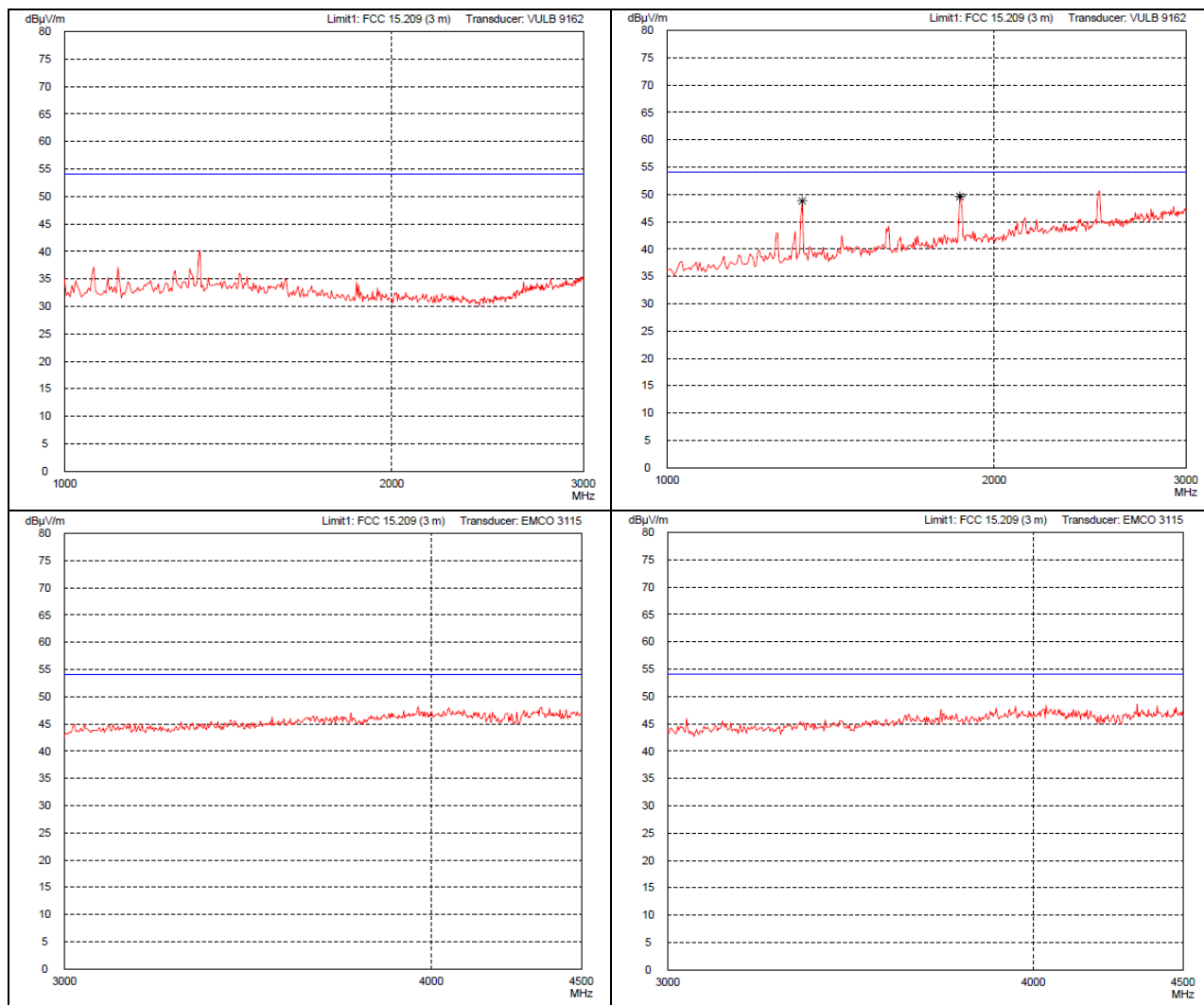
Operating mode 5

Horizontal Polarization



Vertical Polarization



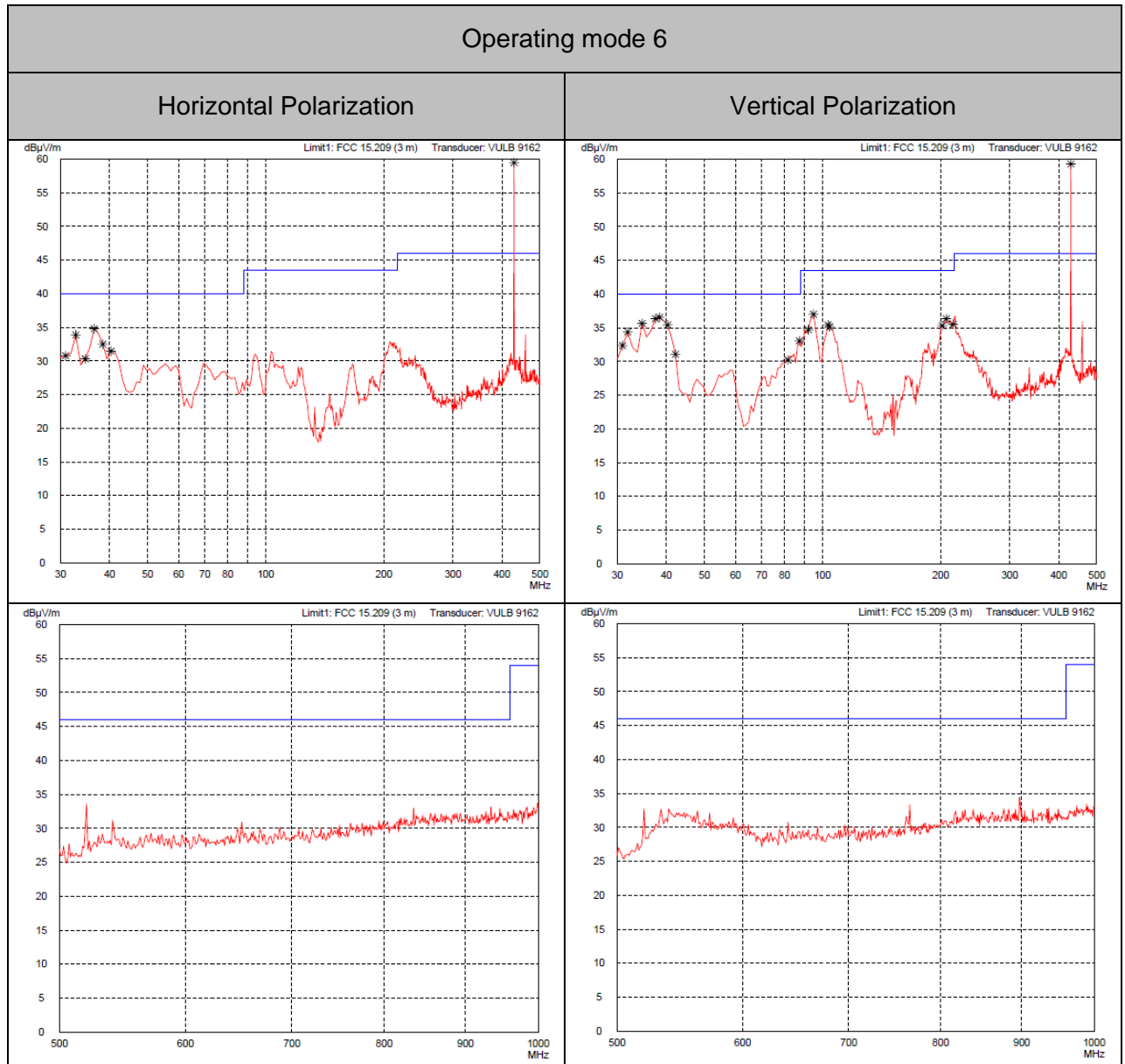


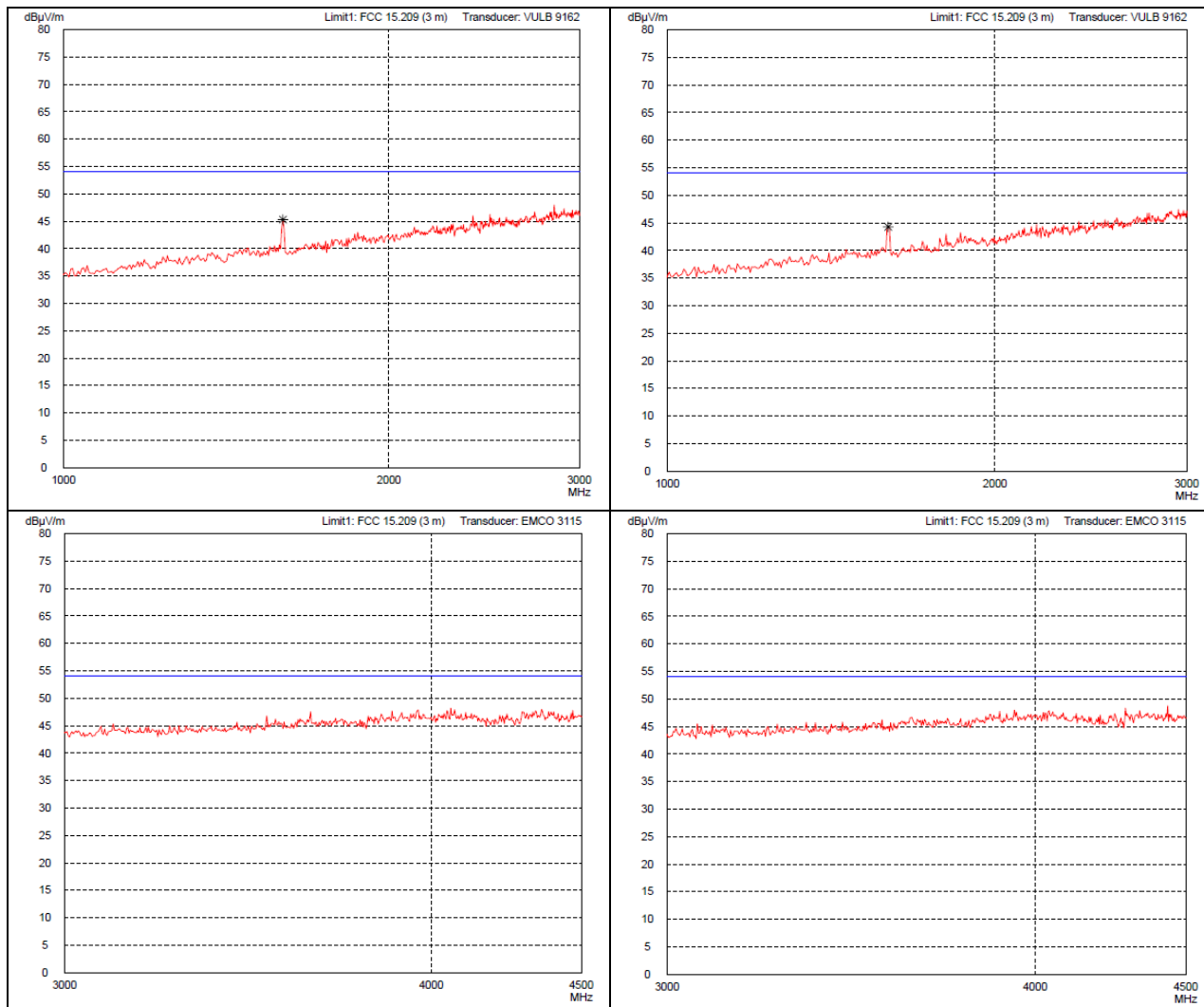
Final measurement values:

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)
32,820	horizontal	Quasi-Peak	21,0	13,0	0,0	34,0	40,0	6,0
91,100	vertical	Quasi-Peak	26,6	12,0	0,0	38,6	43,5	4,9
439,850	horizontal	Quasi-Peak	27,4	18,4	0,0	45,8	46,0	0,2
1332,000	horizontal	Peak	18,1	30,7	0,0	48,8	54,0	5,2
1860,000	horizontal	Peak	15,2	34,4	0,0	49,6	54,0	4,4

Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$



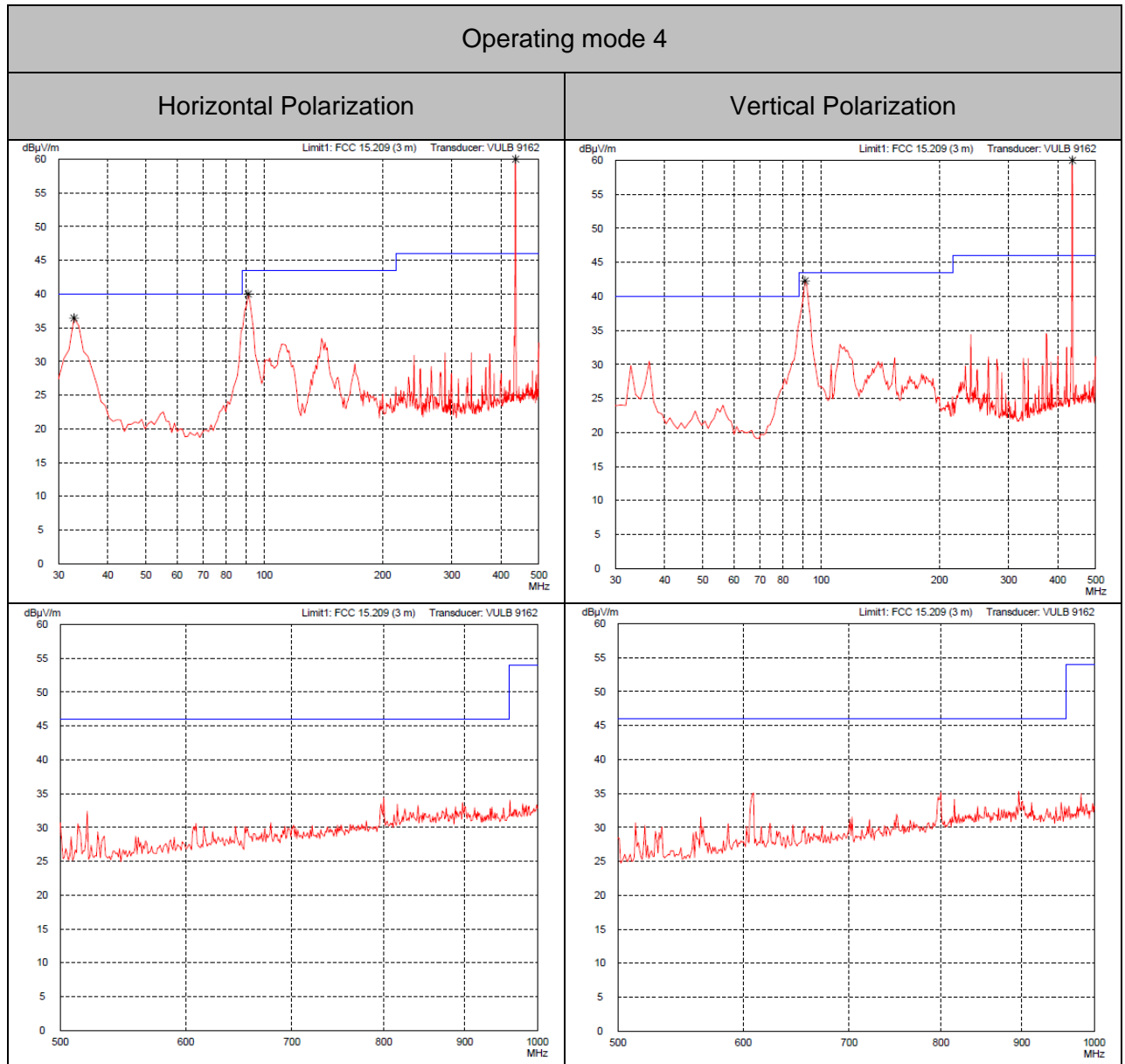


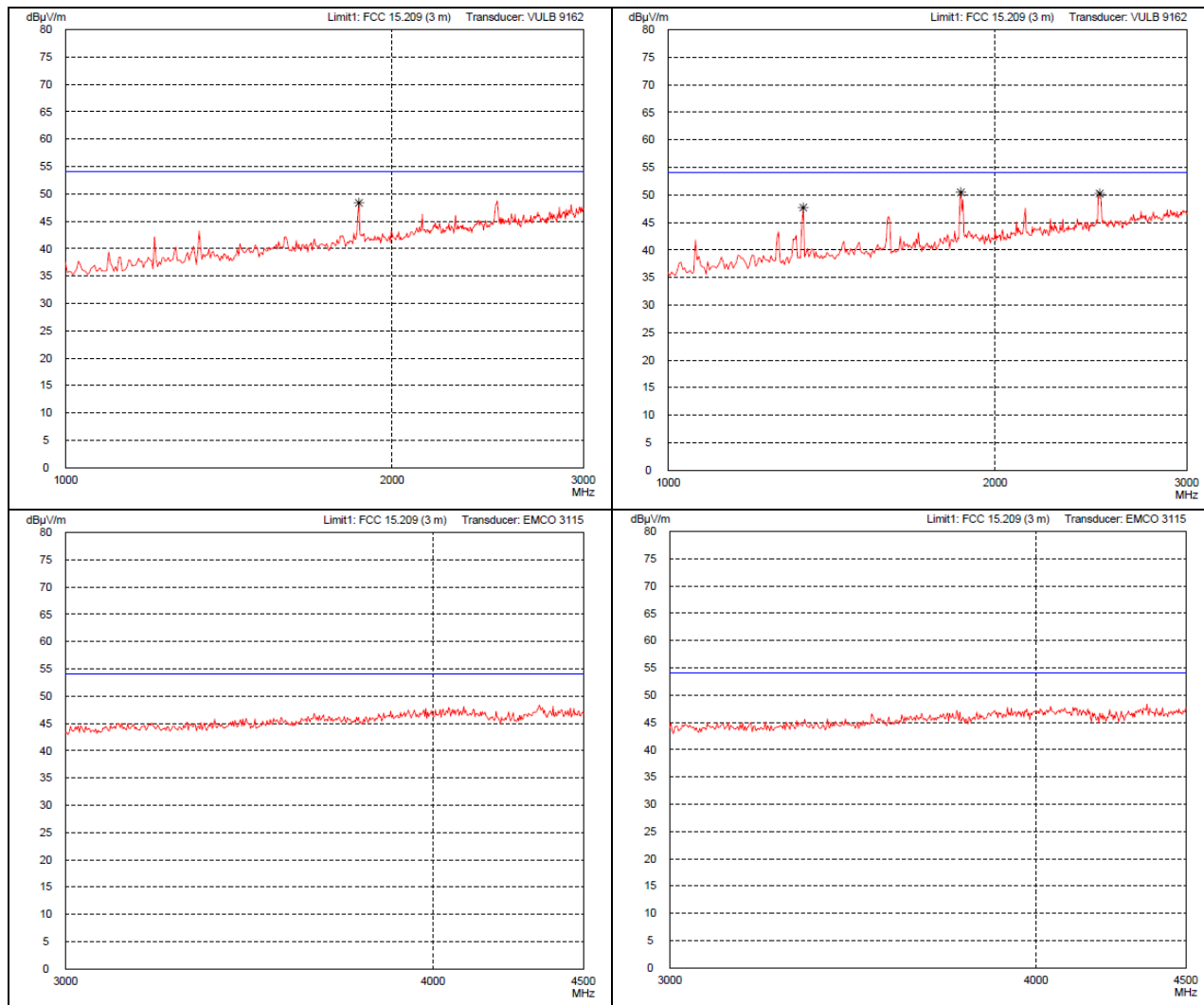
Final measurement values:

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)
34,500	horizontal	Quasi-Peak	17,8	14,1	0,0	31,9	40,0	8,1
96,100	horizontal	Quasi-Peak	18,4	12,9	0,0	31,3	43,5	12,2
205,120	horizontal	Quasi-Peak	22,4	11,9	0,0	34,3	43,5	9,2
429,530	horizontal	Quasi-Peak	26,9	18,4	0,0	45,3	46,0	0,7
1596,000	horizontal	Peak	12,6	32,5	0,0	45,1	54,0	8,9

Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$



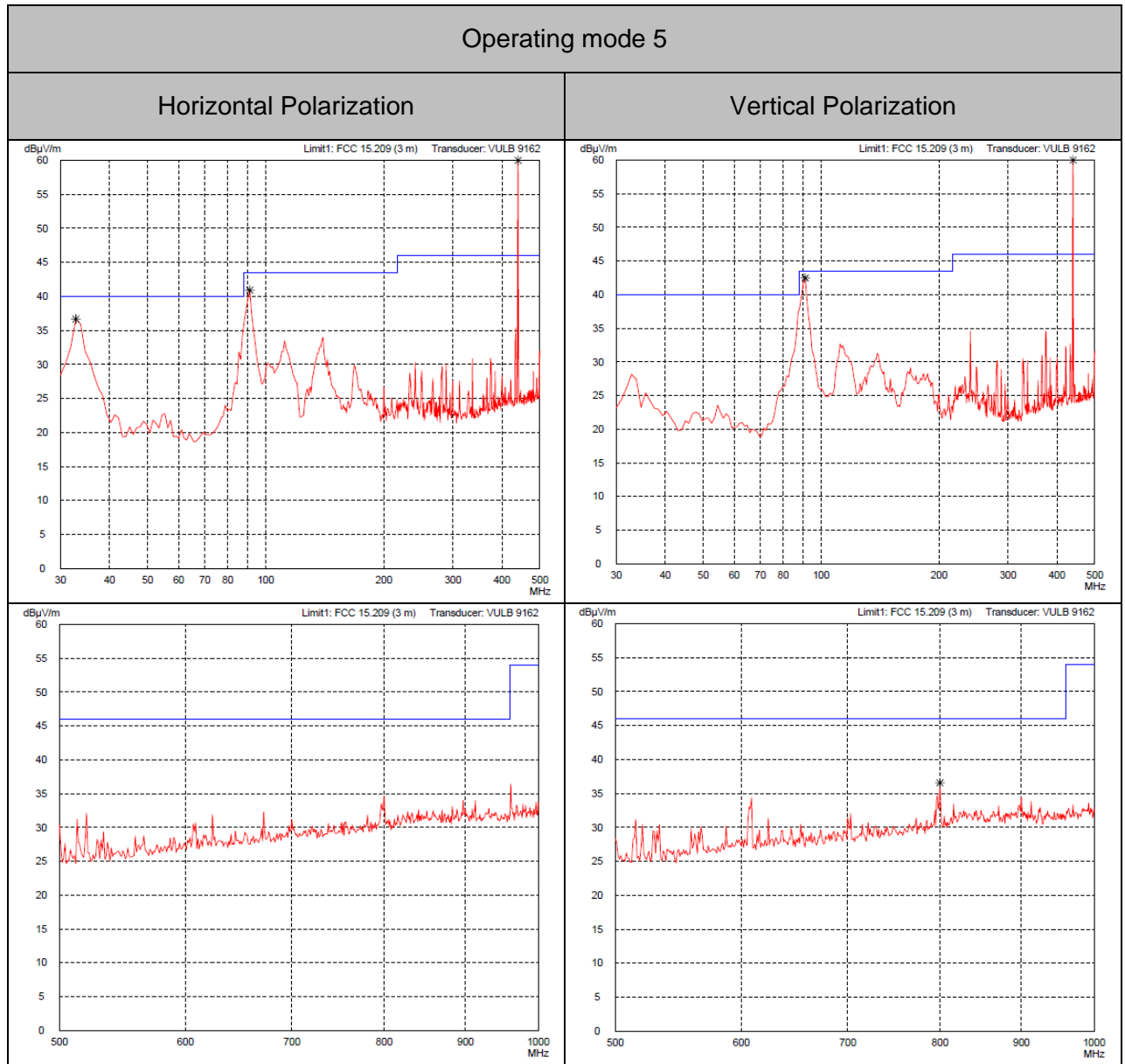


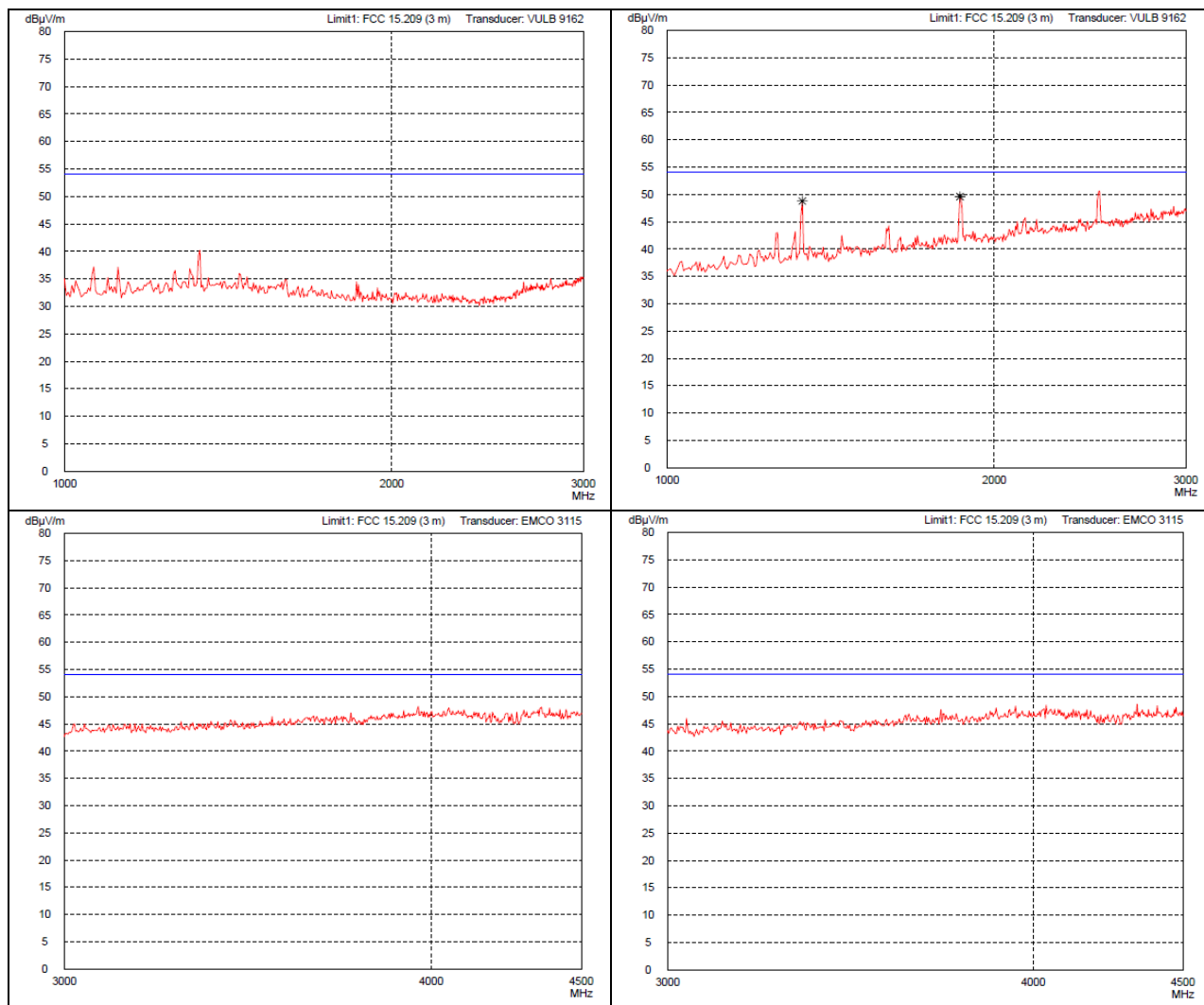
Final measurement values:

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)
32,100	horizontal	Quasi-Peak	20,1	12,9	0,0	33,0	40,0	7,0
91,200	vertical	Quasi-Peak	26,4	12,1	0,0	38,5	43,5	5,0
433,500	horizontal	Quasi-Peak	27,2	18,4	0,0	45,6	46,0	0,4
1330,000	horizontal	Peak	17,6	30,4	0,0	48,0	54,0	6,0
1860,000	horizontal	Peak	16,2	34,4	0,0	50,6	54,0	3,4
2496,000	horizontal	Peak	12,4	37,7	0,0	50,1	54,0	3,9

Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$





Final measurement values:

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)
33,500	horizontal	Quasi-Peak	21,8	13,3	0,0	35,1	40,0	4,9
92,200	vertical	Quasi-Peak	27,0	12,1	0,0	39,1	43,5	4,4
439,850	horizontal	Quasi-Peak	27,1	18,4	0,0	45,5	46,0	0,5
1333,000	horizontal	Peak	18,2	30,8	0,0	49,0	54,0	5,0
1860,000	horizontal	Peak	15,5	34,4	0,0	49,9	54,0	4,1

Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$

Test Results for Receiver

Note:

The EUT does not have a dedicated receive mode, the EUT transmits and receives together. The Spurious emission data is for both transmit and receive mode.

9 Referenced Regulations

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

<input checked="" type="checkbox"/>	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, 2014
<input checked="" type="checkbox"/>	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2014
<input type="checkbox"/>	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)
<input checked="" type="checkbox"/>	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)
<input type="checkbox"/>	RSS-Gen	Radio Standards Specification RSS-Gen Issue 4 containing General Requirements and Information for the Certification of Radiocommunication Equipment, published by Industry Canada	December 2014
<input type="checkbox"/>	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 2010
<input type="checkbox"/>	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
<input type="checkbox"/>	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, footnote 13 updated December 2010
<input type="checkbox"/>	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 5 (Information Technology Equipment (ITE) - Limits and methods of measurement), published by Industry Canada	August 2012
<input checked="" type="checkbox"/>	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

<input type="checkbox"/>	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
<input checked="" type="checkbox"/>	TRC-43	Designation of Emissions, Class of Station and Nature of Service, published by Industry Canada	November 2012

10 Test Equipment List with Calibration Data

Type	Inv.-No.	Type Designation	Serial Number	Manufacturer	Calibration Organization	Last Calibration	Next Calibration
EMI test receiver	1028	ESHS10	860043/016	Rohde & Schwarz	Rohde & Schwarz	09/2014	09/2015
EMI test receiver	2010	ESPI7	101018	Rohde & Schwarz	Rohde & Schwarz	06/2014	12/2015
EMI test receiver	2044	ESU8	100232	Rohde & Schwarz	Rohde & Schwarz	10/2014	10/2015
Spectrum analyser	1666	FSP30	100063	Rohde & Schwarz	Rohde & Schwarz	05/2014	05/2015
Preamplifier	1651	CPA9231A	3393	Schaffner Electrotest	TÜV SÜD PS-EMC-STR	09/2014	03/2016
Preamplifier	1684	AFS3-00100800-32-LN	847743	MITEQ	TÜV SÜD PS-EMC-STR	10/2013	04/2015
Preamplifier	1685	AMF-4D-005080-25-13P	860149	MITEQ	TÜV SÜD PS-EMC-STR	08/2013	11/2015
Preamplifier	1716	CPA9231A	3557	Schaffner EMC Systems	TÜV SÜD PS-EMC-STR	01/2014	06/2015
V-network	1059	ESH3-Z5	894785/005	Rohde & Schwarz	Rohde & Schwarz	08/2013	08/2015
Double ridged waveguide horn antenna	1516	3115	9508-4553	EMCO Elektronik	Seibersdorf Laboratories	01/2013	01/2015
Loop antenna	1016	HFH2-Z2	882964/0001	Rohde & Schwarz	Rohde & Schwarz	05/2014	05/2015
TRILOG Broadband Antenna	1802	VULB 9163	9163-214	Schwarzbeck	Rohde & Schwarz	11/2014	11/2016
TRILOG Broadband Antenna	2256	VULB 9162	9162-048	Schwarzbeck	Schwarzbeck	09/2013	03/2015

Note 1: No calibration required.

Note 2: Not calibrated separately but with the whole test system when recording calibration data.

Note 3: No calibration required. Devices are checked before use.

Note 4: No calibration required. Devices are checked by calibrated equipment during test.

11 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2014-12-11	M. Biberger	First Edition