



EMI - T E S T R E P O R T

- FCC Part 90, Subpart I-

Type / Model Name : COR PT-3A-913-469 & COR PT-3B-913-469

Product Description : Mobile device for recording and transmitting
leak noises

Applicant : Seba Dynatronic Mess- und Ortungstechnik GmbH
Address : Dr.-Herbert-Iann-Str. 6
96148 BAUNACH, GERMANY

Manufacturer : Seba Dynatronic Mess- und Ortungstechnik GmbH
Address : Dr.-Herbert-Iann-Str. 6
96148 BAUNACH, GERMANY

Licence holder : Seba Dynatronic Mess- und Ortungstechnik GmbH
Address : Dr.-Herbert-Iann-Str. 6
96148 BAUNACH, GERMANY

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. :

T40171-00-00KJ

09. March 2016

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
without the written permission of the test laboratory.

Contents

1 TEST STANDARDS	3
2 EQUIPMENT UNDER TEST	4
2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A	4
2.2 Short description of the equipment under test (EUT)	4
2.3 Variants of the EUT	4
2.4 Test Jig	5
2.5 Technical description of the equipment under test (EUT)	5
2.6 Test software	5
2.7 Transmit operating modes	6
2.8 Peripheral devices and interface cables	6
2.9 Determination of worst case conditions for final measurement	6
3 Test result summary	7
3.1 List of measurements	7
3.2 FINAL ASSESSMENT	7
4 TEST ENVIRONMENT	8
4.1 Address of the test laboratory	8
4.2 Environmental conditions	8
4.3 Statement of the measurement uncertainty	8
5 TEST RESULTS	9
5.1 Conducted emissions	9
5.2 RF power output	10
5.3 Type of emissions & Bandwidth limitations	12
5.4 Occupied bandwidth	15
5.5 Audio frequency response	18
5.6 Modulation limiting	21
5.7 Spurious emissions at antenna terminals	25
5.8 Radiated spurious emissions	29
5.9 Frequency stability	34
5.10 Transient frequency behavior	38
6 USED TEST EQUIPMENT AND ACCESSORIES	42
ATTACHMENT (PHOTO DOCUMENTATION OF THE EUT)	A
ATTACHMENT (RF EXPOSURE EVALUATION)	B

Attachment A & B as separately supplement

FCC ID: OV8-CORPT3

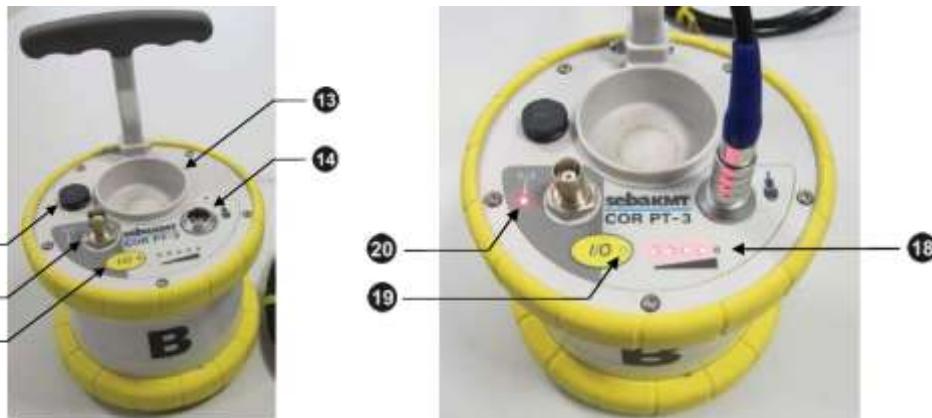
1 TEST STANDARDS

The tests were performed according to following standards:

FCC 47 CFR Part 2: 2015	Frequency allocations and radio treaty matters; General rules and regulations
FCC 47 CFR Part 15: 2015	Radio frequency devices
FCC 47 CFR Part 90: 2015	Private land mobile radio services
ANSI/TIA-603-C: 2004	Land Mobile FM or PM-Communications Equipment - Measurement and Performance Standards
ANSI C63.4: 2014	Methods of Measurement of Radio-Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
KDB 412172 D01: 2010	Determining ERP and EIRP

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A



Item	Description
13	Sensor storage place
14	Sensor socket for connecting the microphone / hydrophone
15	I/O pushbutton short pressing ... switches the device on long pressing ... switches the device off
16	Ventilation / venting membrane
17	Antenna socket for connecting the analog radio antenna
18	Row of LEDs lit green ... represents the current battery level lit red ... represents the noise level

Item	Description
19	Radio LED lit green ... the device is switched on flashing ... the device is charging not lit ... the device is switched off
20	I/O LED lit red ... the device is in "Active" mode, noise measurement in progress measurement data is being sent to the correlator not lit ... the device is in "Stand-by" mode, no measurement in progress, no radio traffic

2.2 Short description of the equipment under test (EUT)

The COR PT-3 is a portable device which is recording noise data for leak detection in water pipes. It has a socket for connecting an external microphone.

The device can be configured and readout via digital radio by Correlator C-3. Integrated is an already approved radio module (FCC ID: X7J-A10040601), which has an internal antenna and operate at 913 MHz (bidirectional radio), which is integrated on the mainboard.

It also can transmit real-time audio data via analogue radio at 469 MHz. Therefore a lambda/2 antenna is used. The COR PT-3 is powered by an internal lithium-ion rechargeable battery, charged wireless in the transport case.

2.3 Variants of the EUT

- There are no other variants.

FCC ID: OV8-CORPT3

2.4 Test Jig

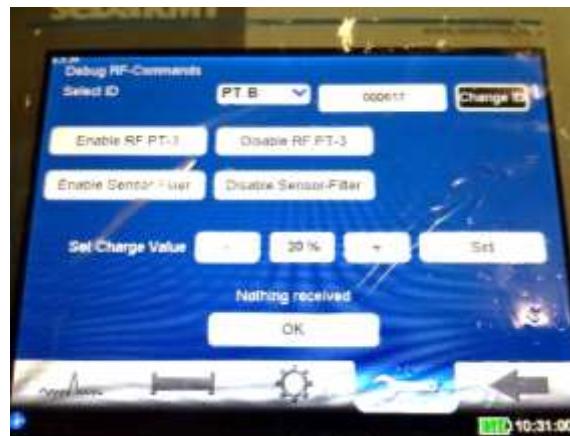
- No test jig is used.

2.5 Technical description of the equipment under test (EUT)

Items	Description
Power supply - internal	7.2 V DC (Li-ion rechargeable battery)
Digital radio:	FCC ID: X7J-A10040601
Type of modulation	FSK
Operating frequency	913.02 MHz
Frequency band	902 MHz to 928 MHz
Data rate	9.6 kBd
Channel spacing	-
Number of channels	1
Antenna type	PCB antenna
Antenna connector	-
Antenna gain	2 dBi
Analog radio:	
Type of modulation	analog FM
Operating frequency digital radio	468,5 MHz / 469,6 MHz
Frequency band	468,5 - 496,6 MHz
Data rate	
Channel spacing	25 kHz
Number of channels	1 per Transmitter UNIT
Antenna type	Antenne lambda ½ 460MHz
Antenna connector	BNC
Antenna gain	7 dBi
Lowest internal frequency	32.768 kHz
Highest internal frequency	26.000 MHz
Serial number	0889000616 (COR PT-3A-913-469) 0889000617 (COR PT-3B-913-469)
Firmware version	2.010
Number of tested samples	2 (COR PT-3A-913-469 & COR PT-3B-913-469)

2.6 Test software

- A special test software was used, to perform the different radio tests.



FCC ID: OV8-CORPT3**2.7 Transmit operating modes**

The equipment under test was operated during the measurement under the following conditions:

- cont. TX at 468.5 MHz - PT-A (modulated & unmodulated)

- cont. TX at 469.6 MHz - PT-B (modulated & unmodulated)

-

2.8 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- Microphone Model : sebaKMT PAM CORP-2
- RF Antenna 469 MHz Model : Procom FSP 70/460
- _____ Model : _____

2.9 Determination of worst case conditions for final measurement

Measurements have been made in vertical and horizontal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions.

For the further radiated measurement, the EUT is set in horizontal position with TX antenna in horizontal orientation.

3 Test result summary

3.1 List of measurements

FCC Rule Part	Test Procedure	Appendix No. Test report	Description	Result
15.107 (a)	ANSI C63.4 - 5.2	5.1	Conducted emissions	N/A
2.1046 & 90.205	ANSI/TIA-603-C - 2.2.17	5.2	RF power output	No limit
2.210 & 90.207 2.202 & 90.209	-	5.3	Type of emissions & Bandwidth limitations	Passed
2.1049 & 90.210	-	5.4	Occupied bandwidth	Passed
2.1047	ANSI/TIA-603-C - 2.2.6	5.5	Audio frequency response	No limit
2.1047	ANSI/TIA-603-C - 2.2.3	5.6	Modulation limiting	No limit
2.1051 & 90.210	ANSI/TIA-603-C - 2.2.13	5.7	Spurious emissions at antenna terminals	Passed
2.1053 & 90.210	ANSI/TIA-603-C - 2.2.12	5.8	Radiated spurious emissions	Passed
2.1055 & 90.213	ANSI/TIA-603-C - 2.2.2	5.9	Frequency stability	Passed
90.214	ANSI/TIA-603-C - 2.2.19	5.10	Transient frequency behavior	Passed

3.2 FINAL ASSESSMENT

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 14 September 2015

Testing concluded on : 09 March 2016

Checked by:

Tested by:

Thomas Weise
Laboratory Manager

Josef Knab
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

5 TEST RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: None

5.1.2 Applicable standard

According to FCC Part 15, Section 15.107(a):

Except for Class A devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.3 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.4 Test result

Remarks: Not applicable, because the EuT has no AC mains connection and no external periphery plug.

FCC ID: OV8-CORPT3

5.2 RF power output

For test instruments and accessories used see section 6 Part CPR 2.

5.2.1 Description of the test location

Test location: OATS 1

Test distance: 10 m

5.2.2 Photo documentation of the test set-up



OATS 1 – 10 m – 30 MHz to 1 GHz



OATS 1 – 10 m – 30 MHz to 1 GHz

FCC ID: OV8-CORPT3

5.2.3 Applicable standard

According to FCC Part 2.1046 and FCC Part 90.205:

5.2.4 Description of Measurement

The maximum output power from the EUT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 10 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.

The final level in dBm is calculated by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors (cable loss, antenna gain, free space attenuation). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The substitution antenna is used to replace the EUT for test the effective radiated. For measurements in the frequency band 30 MHz to 1 000 MHz, the substitution antenna is a $\frac{1}{2}$ wave dipole antenna. The centre of this antenna should coincide with either the phase centre or volume centre. A signal generator is connected to the dipole and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain.

The radiated power of the fundamental emission from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.17.

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz: RBW: 120 kHz

5.2.5 Test result

COR PT-3A-913-469 - TX antenna vertical

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)
468.50	95.5	120	-71.5	24.0

COR PT-3A-913-469 - TX antenna horizontal

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)
468.50	97.9	120	-72.4	25.5

COR PT-3B-913-469 - TX antenna vertical

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)
469.60	97.6	120	-71.5	26.1

COR PT-3B-913-469 - TX antenna horizontal

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)
469.60	98.6	120	-72.3	26.3

Remarks: There are no limits specified in the standard.

FCC ID: OV8-CORPT3

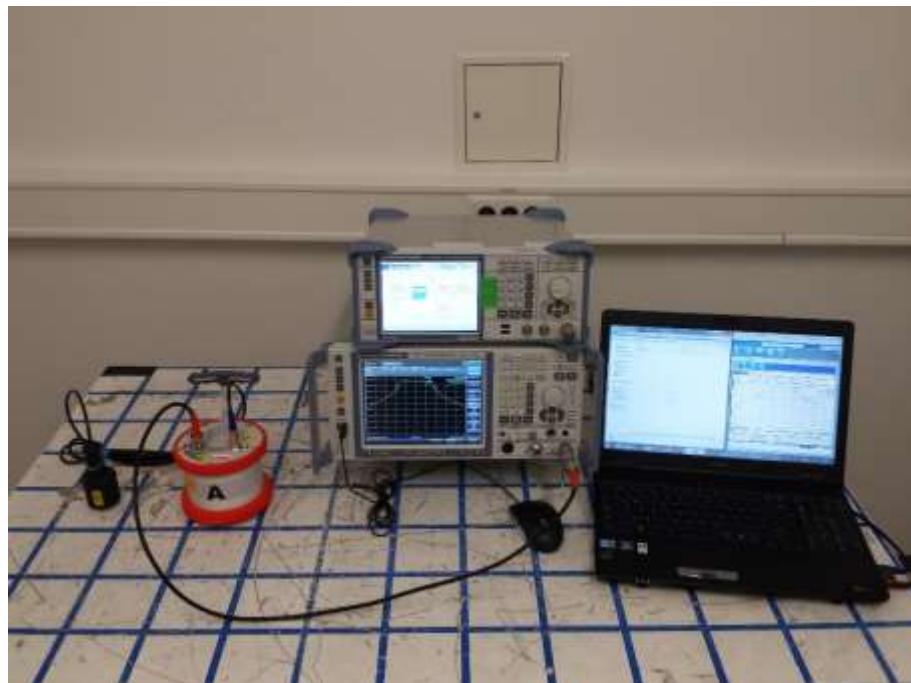
5.3 Type of emissions & Bandwidth limitations

For test instruments and accessories used see section 6 Part **MB**.

5.3.1 Description of the test location

Test location: Shielded Room S6

5.3.2 Photo documentation of the test set-up



FCC ID: OV8-CORPT3

5.3.3 Applicable standard

According to FCC Part 2.201, FCC Part 90.207 and FCC Part 2.202, FCC Part 90.209:

FCC Part 90.209 (a) Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where §2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.

(b) The maximum authorized single channel bandwidth of emission corresponding to the type of emission specified in §90.207 is as follows:

The bandwidth was measured conducted with the function "bandwidth measurement" of the spectrum analyser.

Spectrum analyser settings:

RBW: 300 Hz, VBW: 1 kHz, Detector: PK sampling detector, Sweep time: auto

5.3.4 Test result

COR PT-3A-913-469

Channel number	Fundamental frequency (MHz)	99 % Bandwidth (kHz)	Type of emission
1	468.5	7.40	7K4F3E

COR PT-3B-913-469

Channel number	Fundamental frequency (MHz)	99 % Bandwidth (kHz)	Type of emission
1	469.6	7.94	7K9F3E

Bandwidth limitations according to FCC Part 90.209 (b):

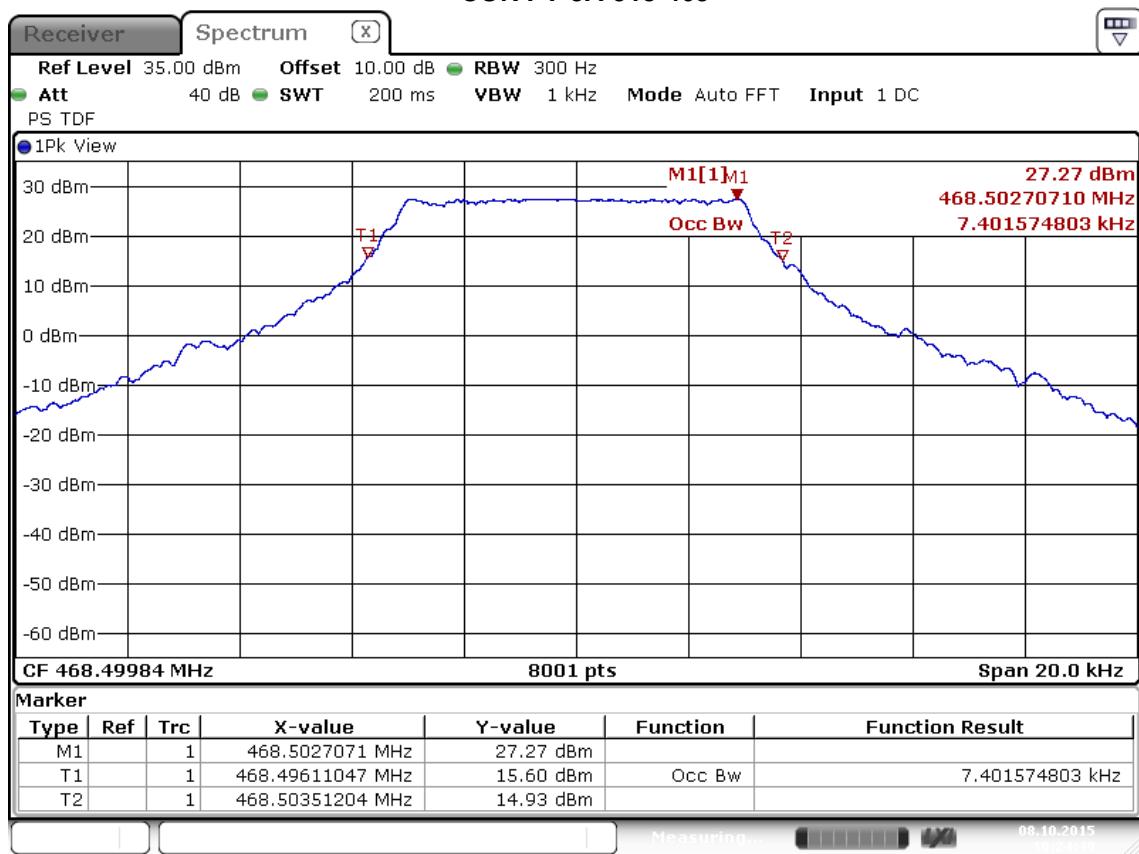
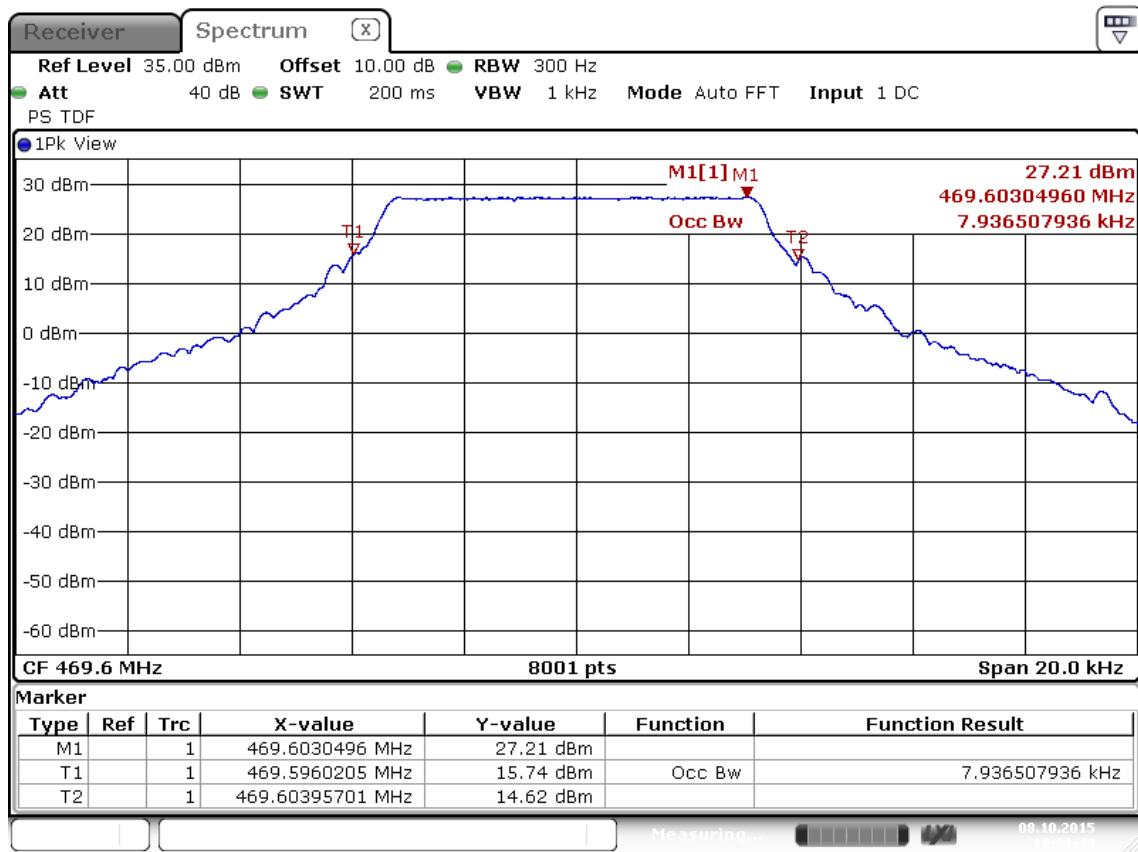
Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
406-512 ²	16.25	1 ³ 20/11.25/6

¹For stations authorized on or after August 18, 1995.

³Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth. All stations must operate on channels with a bandwidth of 12.5 kHz or less beginning January 1, 2013, unless the operations meet the efficiency standard of §90.203(j)(3).

The requirements are **FULFILLED**.

Remarks:

FCC ID: OV8-CORPT3
5.3.5 Test protocol
COR PT-3A-913-469

COR PT-3B-913-469


FCC ID: OV8-CORPT3

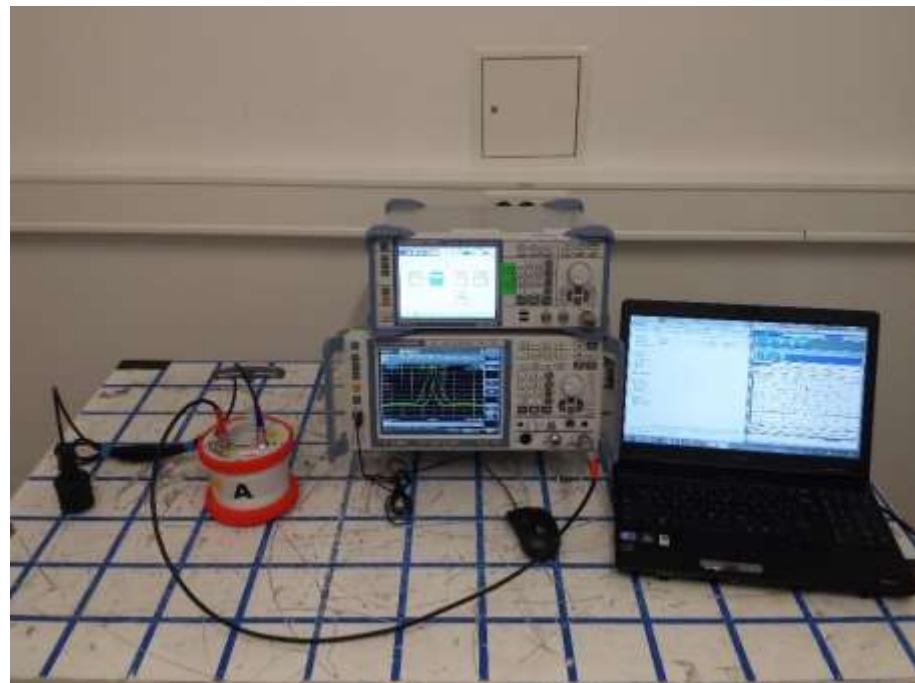
5.4 Occupied bandwidth

For test instruments and accessories used see section 6 Part **MB**.

5.4.1 Description of the test location

Test location: Shielded Room S6

5.4.2 Photo documentation of the test set-up



FCC ID: OV8-CORPT3

5.4.3 Applicable standard

According to FCC Part 2.1049 and FCC Part 90.210:

(b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

5.4.4 Description of Measurement

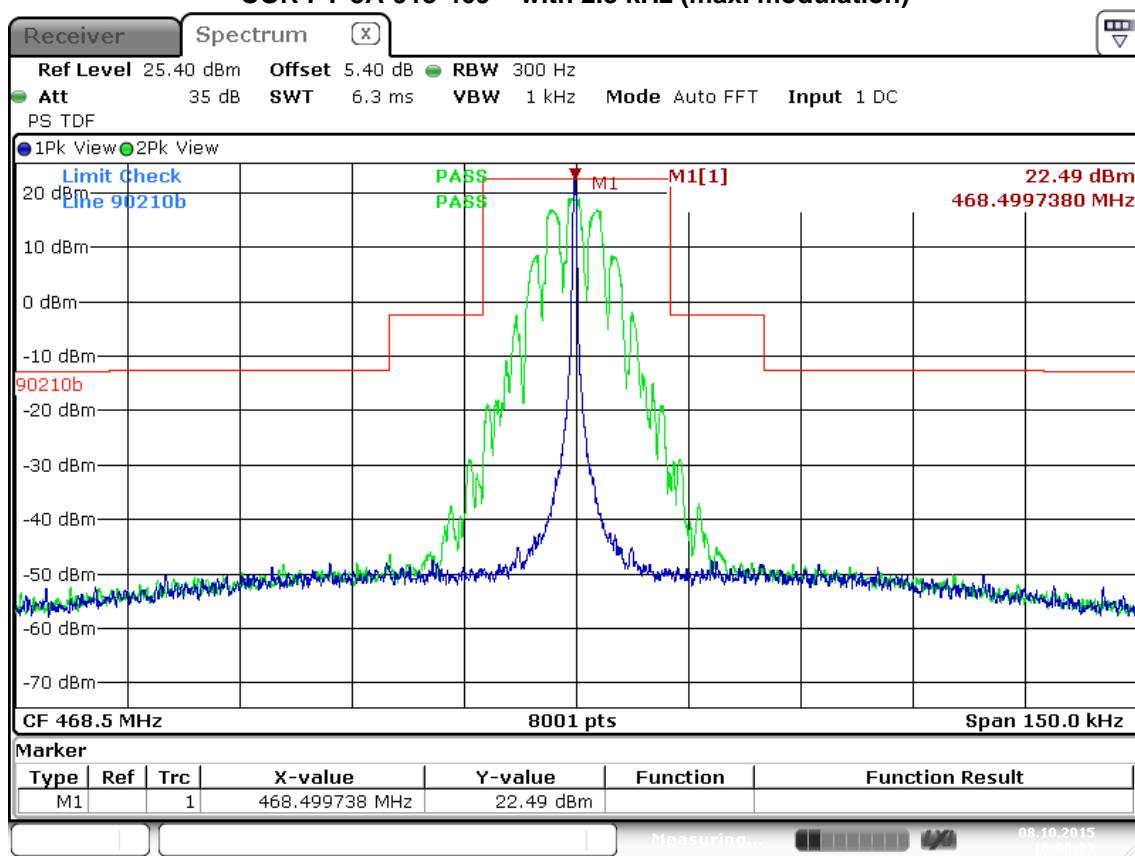
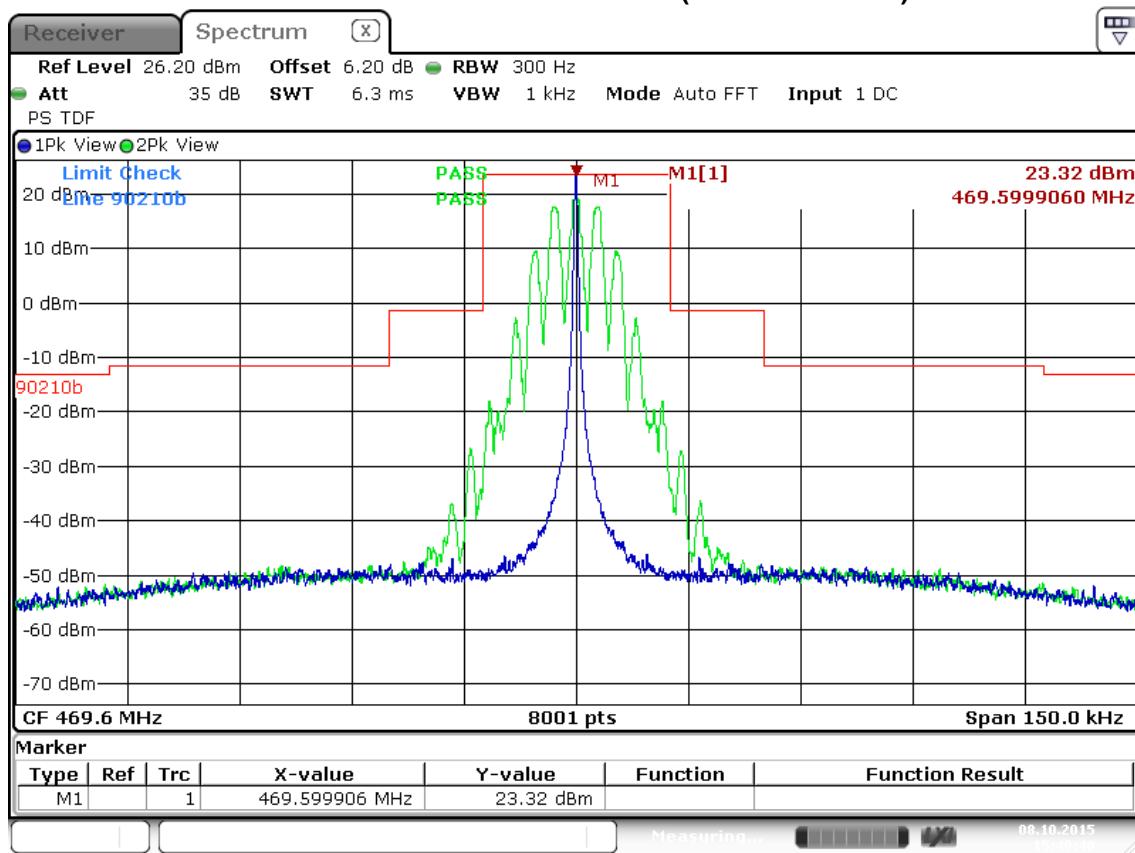
The measurement was performed conducted with intentional modulation on and off. The emission mask defined for 25 kHz channel bandwidth devices is shown on each plot. The 0 dB reference for the mask is the measured output power of the unmodulated carrier at that frequency.

Spectrum analyser settings:

RBW: 300 Hz VBW: 1 kHz Detector: PK sampling detector Sweep time: auto

The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols.

FCC ID: OV8-CORPT3
5.4.5 Test result
COR PT-3A-913-469 – with 2.8 kHz (max. modulation)

COR PT-3B-913-469 – with 2.8 kHz (max. modulation)


FCC ID: OV8-CORPT3

5.5 Audio frequency response

For test instruments and accessories used see section 6 Part **MB**.

5.5.1 Description of the test location

Test location: Shielded Room S6

5.5.2 Photo documentation of the test set-up



FCC ID: OV8-CORPT3

5.5.3 Applicable standard

According to FCC Part 2.1047:

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

5.5.4 Description of Measurement

The audio frequency response is measured using a spectrum analyser with the function "analog demod measurement" following the procedure set out ANSI/TIA-603-C Section 2.2.6.2.2. The EUT is set in TX continuous mode while measuring. The external microphone of the EUT was direct coupled to a loudspeaker which is placed in a noise reduction box.

Spectrum analyser settings (analog demod):

RBW: 38.337 Hz

DBW: 100 kHz

Detector: PK sampling detector

Sweep time: auto

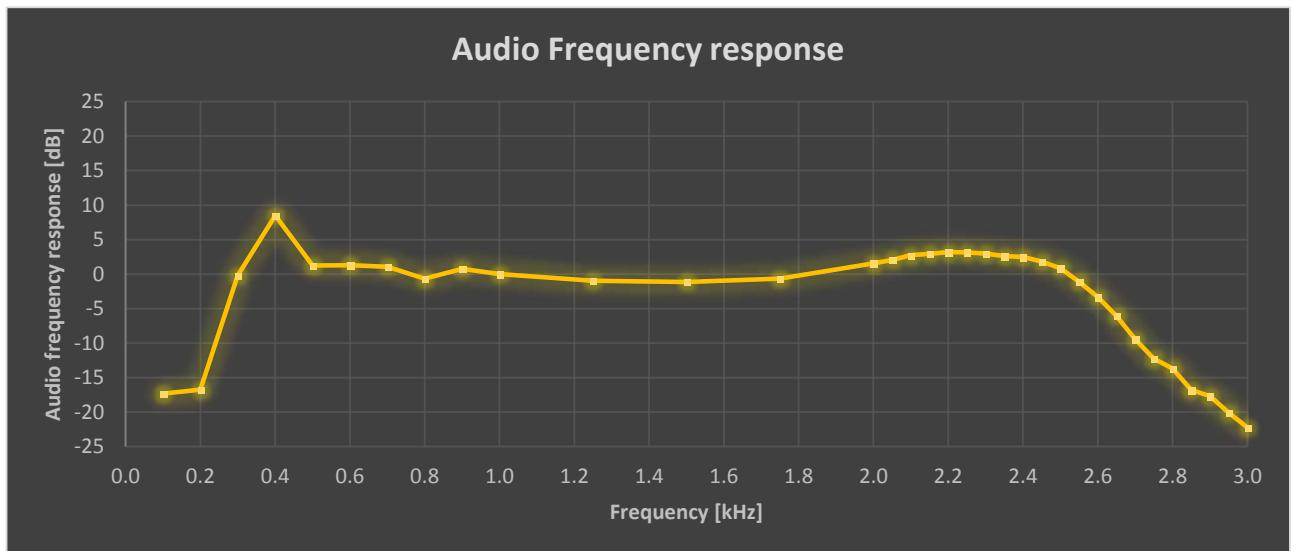
Remarks: There are no limits specified in the standard.

For detailed test results please see the following test protocols.

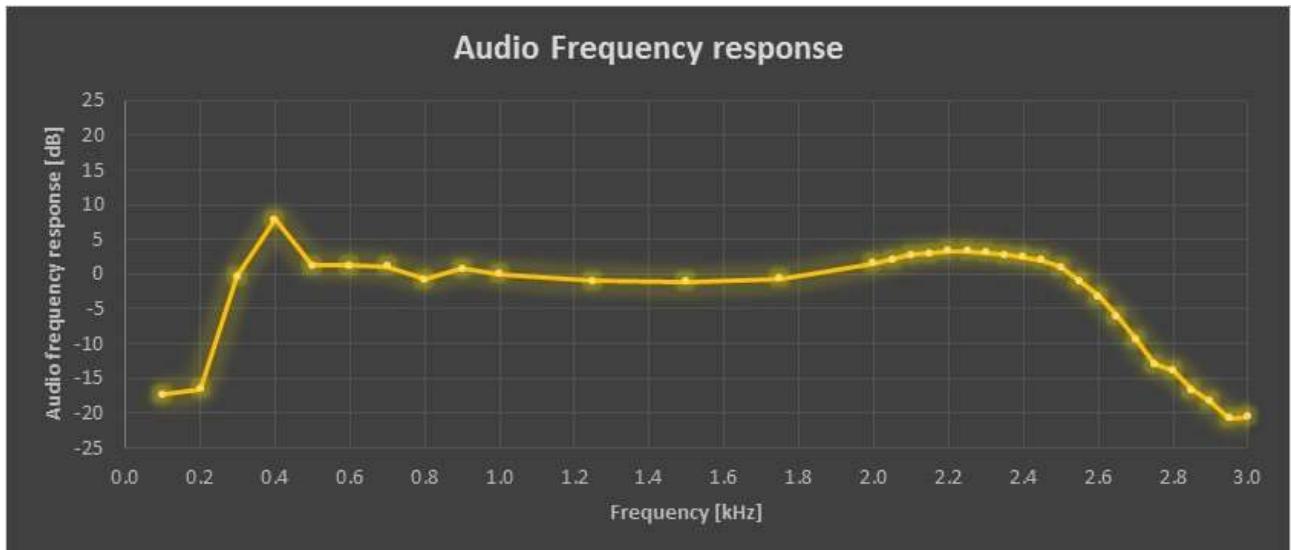
FCC ID: OV8-CORPT3

5.5.5 Test result

COR PT-3A-913-469



COR PT-3B-913-469



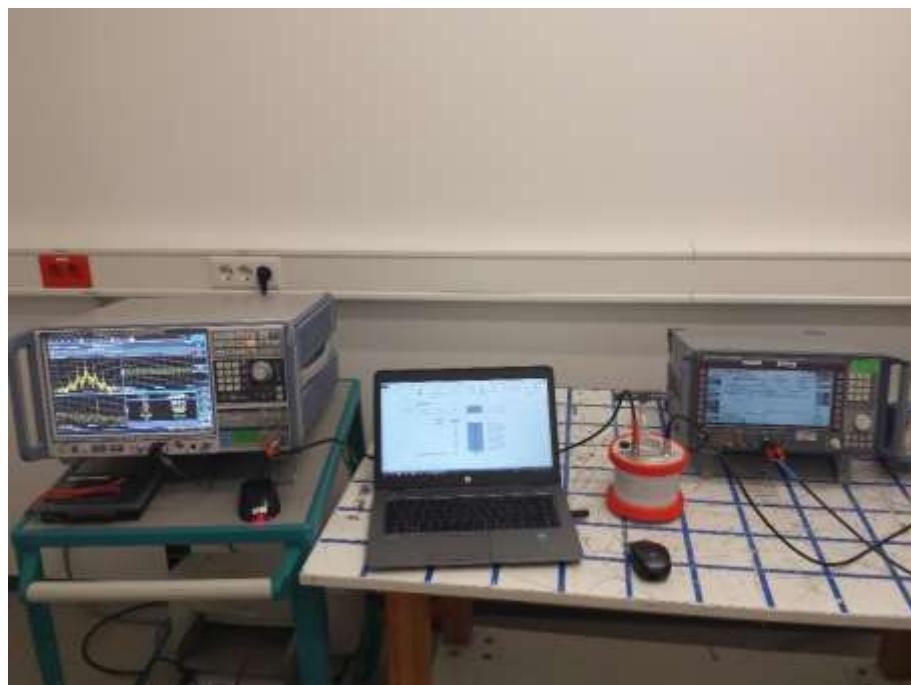
5.6 Modulation limiting

For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: Shielded Room S6

5.6.2 Photo documentation of the test set-up



FCC ID: OV8-CORPT3

5.6.3 Applicable standard

According to FCC Part 2.1047:

(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

5.6.4 Description of Measurement

The audio frequency response is measured using a spectrum analyser with the function "analog demod measurement" following the procedure set out ANSI/TIA-603-C Section 2.2.3. The EUT is set in TX continuous mode while measuring. The external microphone of the EuT was direct coupled to a loudspeaker which is placed in an noise reduction box.

Spectrum analyser settings (analog demod):

RBW: 38.337 Hz

DBW: 100 kHz

Detector: PK sampling detector

Sweep time: auto

EuT	Modulation limiting	
	PK+ (kHz)	PK- (kHz)
COR PT-3A-913-469	3.23	3.28
COR PT-3B-913-469	3.71	3.71

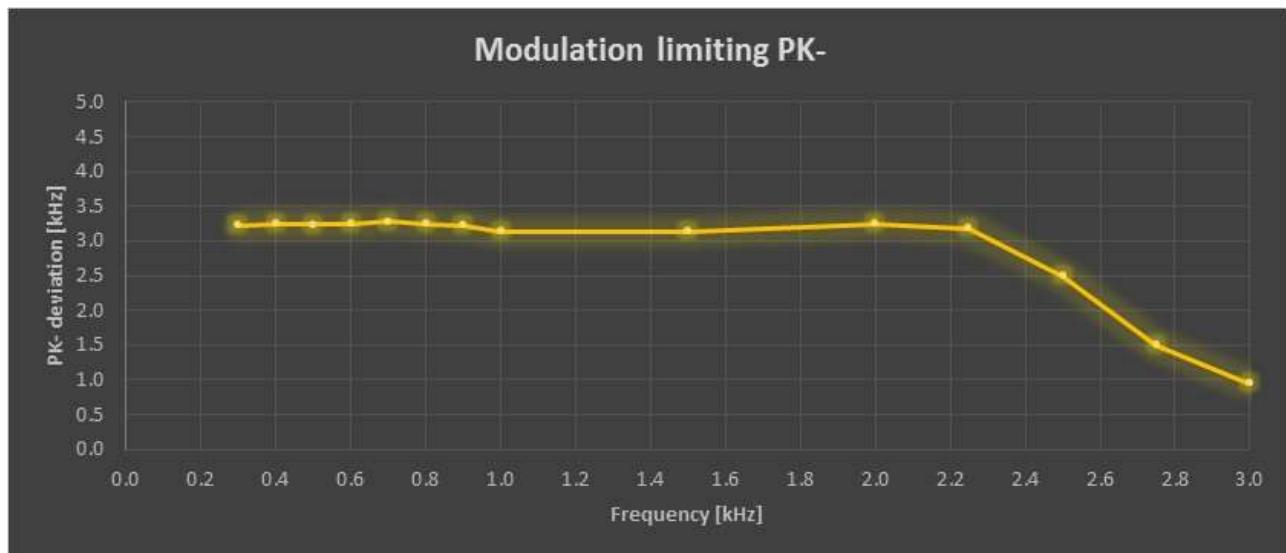
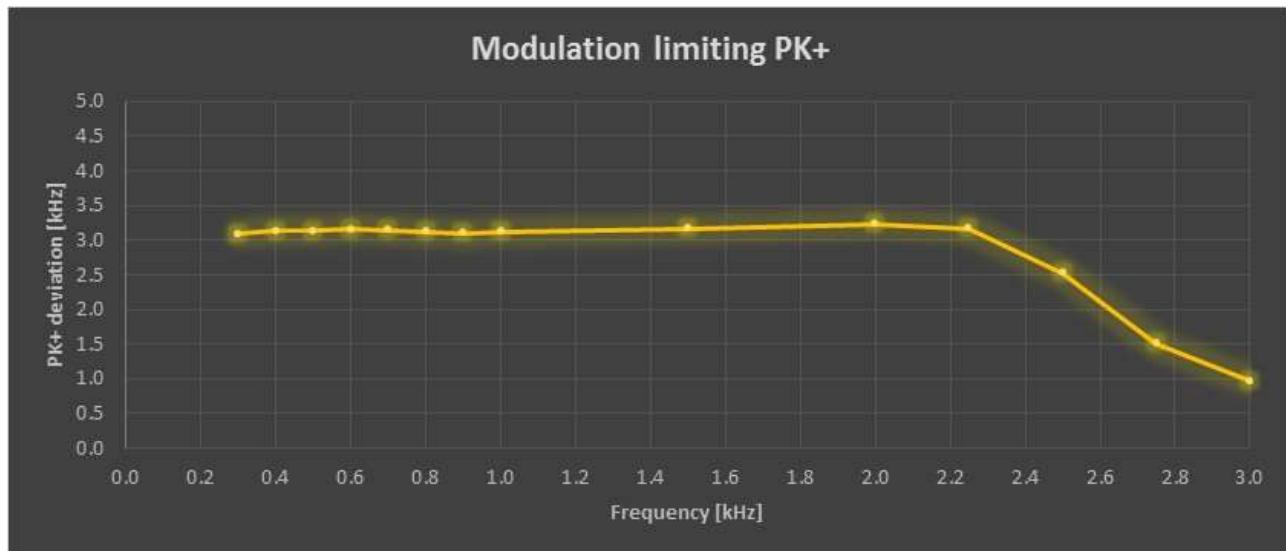
Remarks: There are no limits specified in the standard.

For detailed test results please see the following test protocols.

FCC ID: OV8-CORPT3

5.6.5 Test result

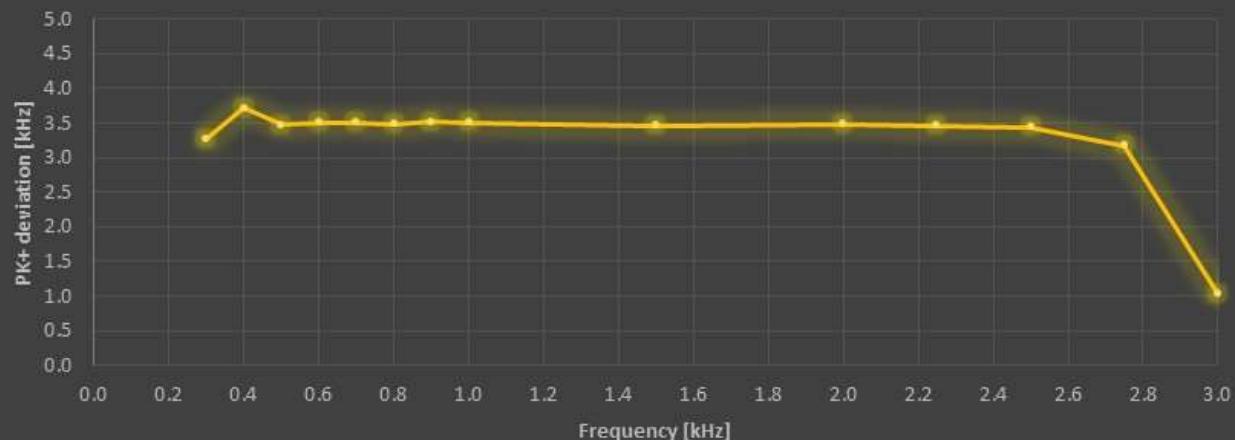
COR PT-3A-913-469



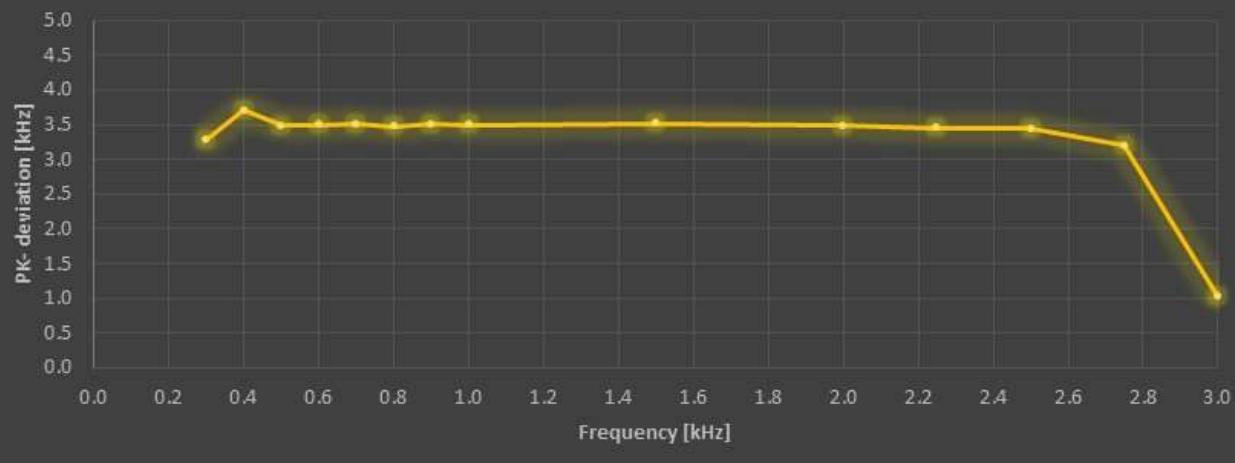
FCC ID: OV8-CORPT3

COR PT-3B-913-469

Modulation limiting PK+



Modulation limiting PK-

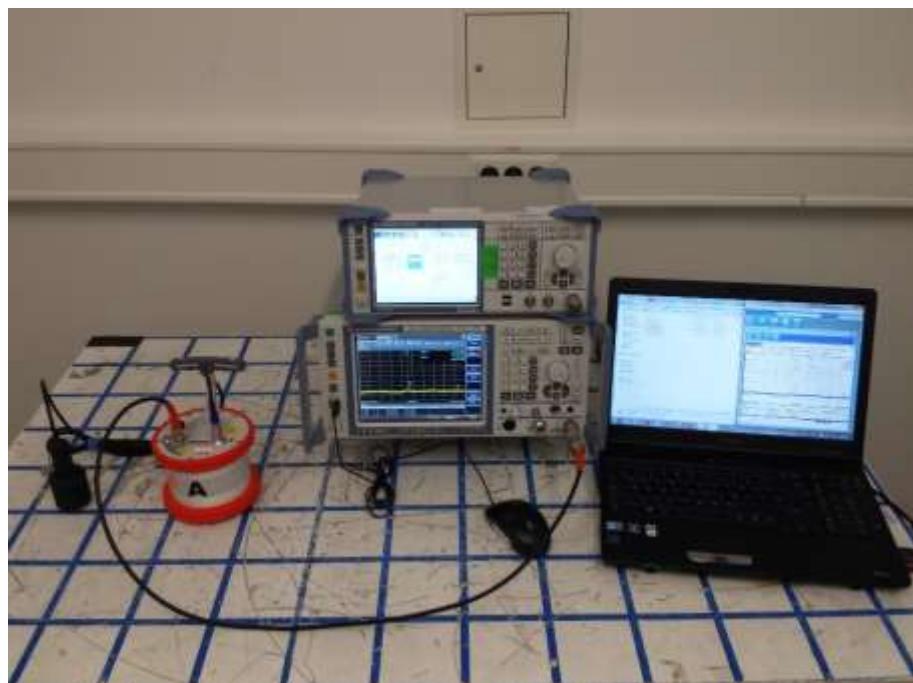


FCC ID: OV8-CORPT3**5.7 Spurious emissions at antenna terminals**

For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

5.7.1 Description of the test location

Test location: Shielded Room S6

5.7.2 Photo documentation of the test set-up

FCC ID: OV8-CORPT3

5.7.3 Applicable standard

According to FCC Part 2.1051 and Part 90.210 (b):

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth:
At least $43 + 10 \log (P)$ dB.

5.7.4 Description of Measurement

The spurious emissions are measured conducted using a spectrum analyser. The measurement was performed at normal test conditions with intentional modulation on. The emissions are measured in dBm and the cable attenuation are considered in the final results.

The conducted spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.13.

Instrument settings:

30 MHz – 1 GHz:	RBW: 10 kHz	VBW: 30 kHz	Detector: RMS	Sweep time: auto
1000 MHz – 6 GHz	RBW: 1 MHz	VBW: 3 MHz	Detector: RMS	Sweep time: auto

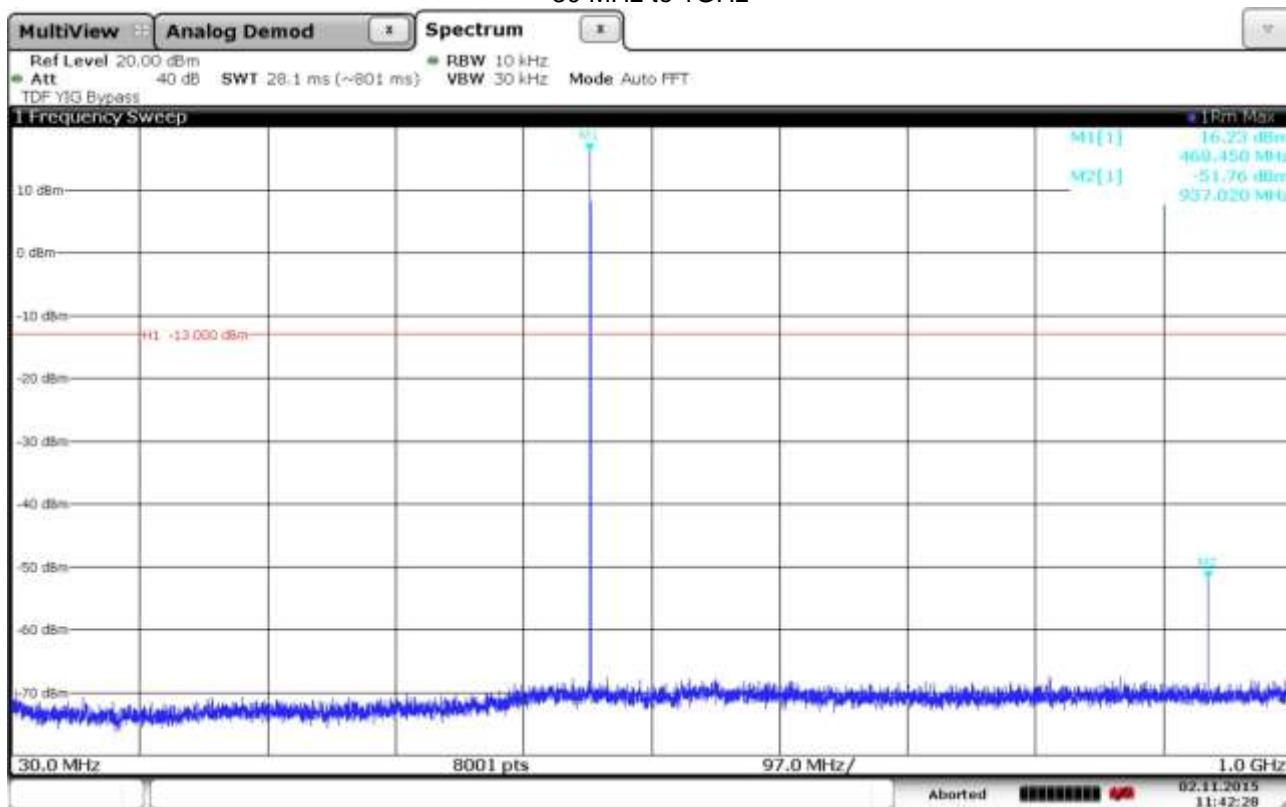
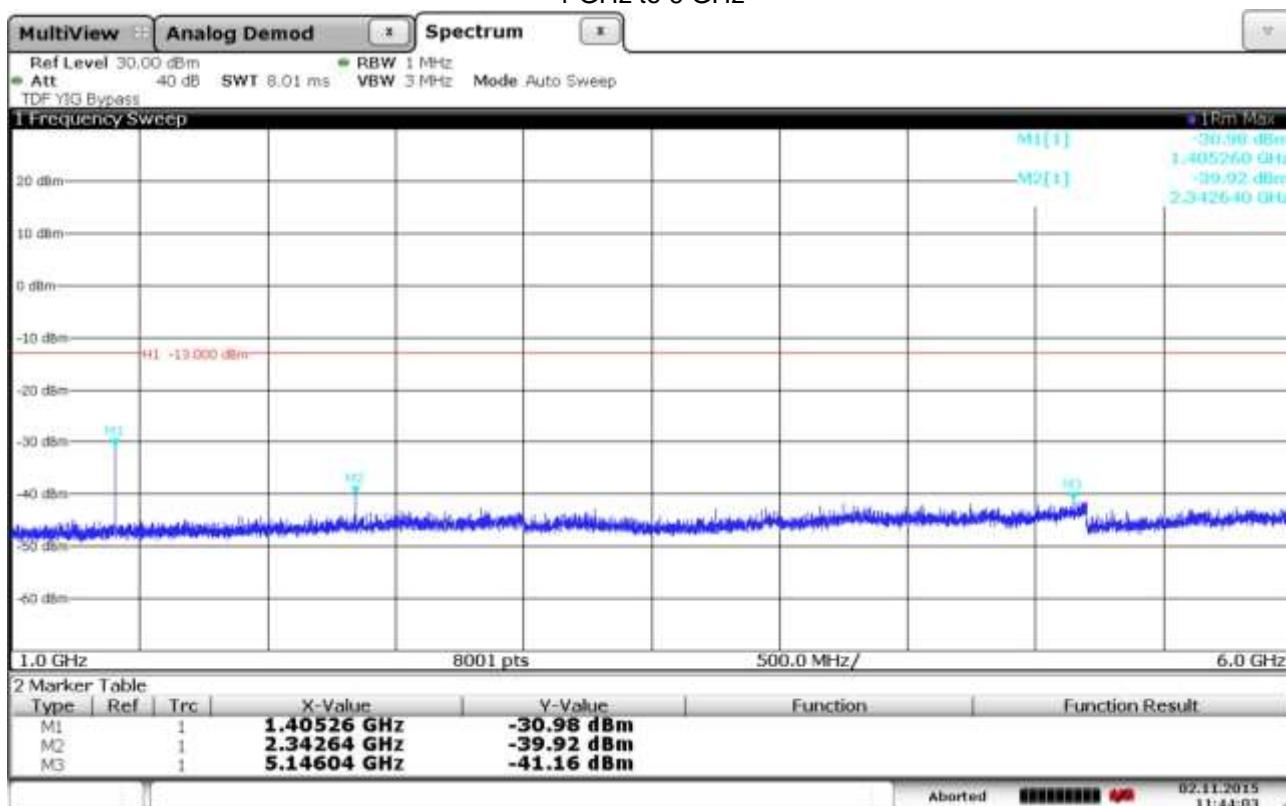
Spurious emission limit according to FCC Part 90.210 (b)(3):

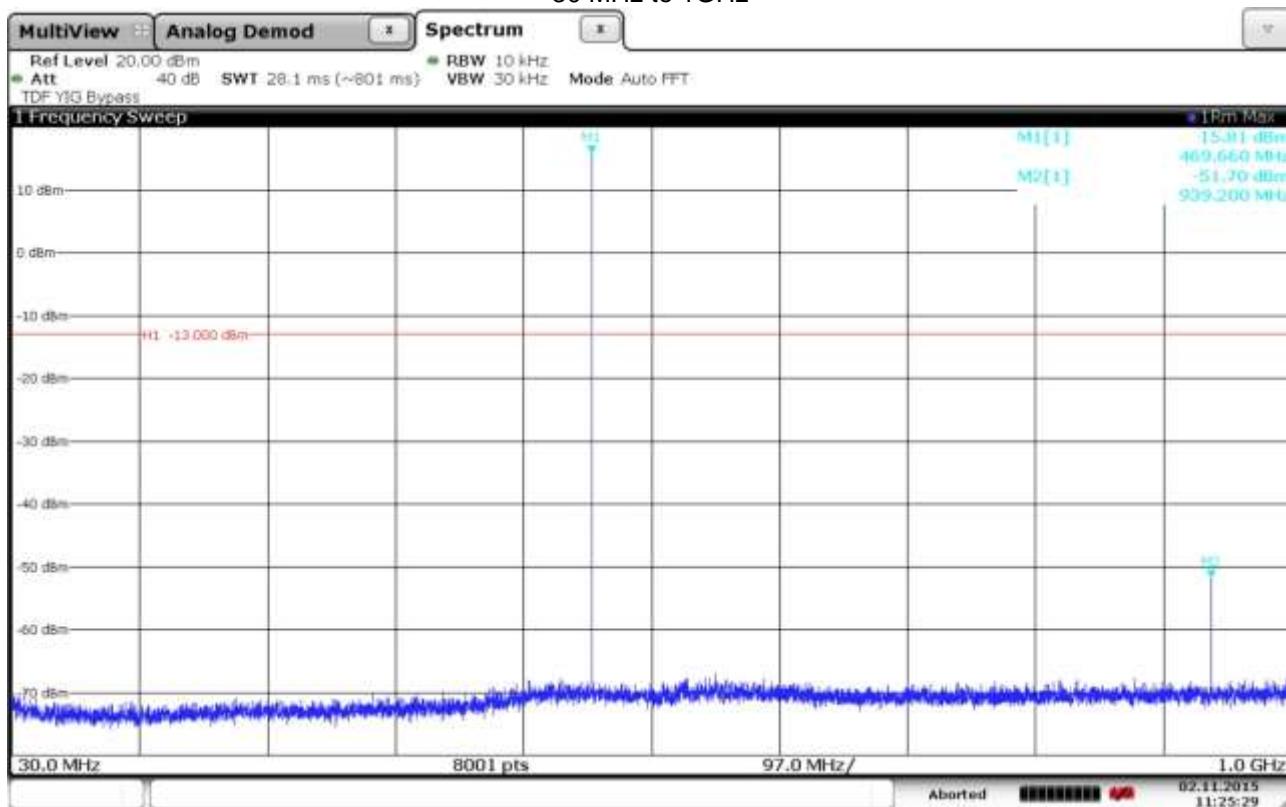
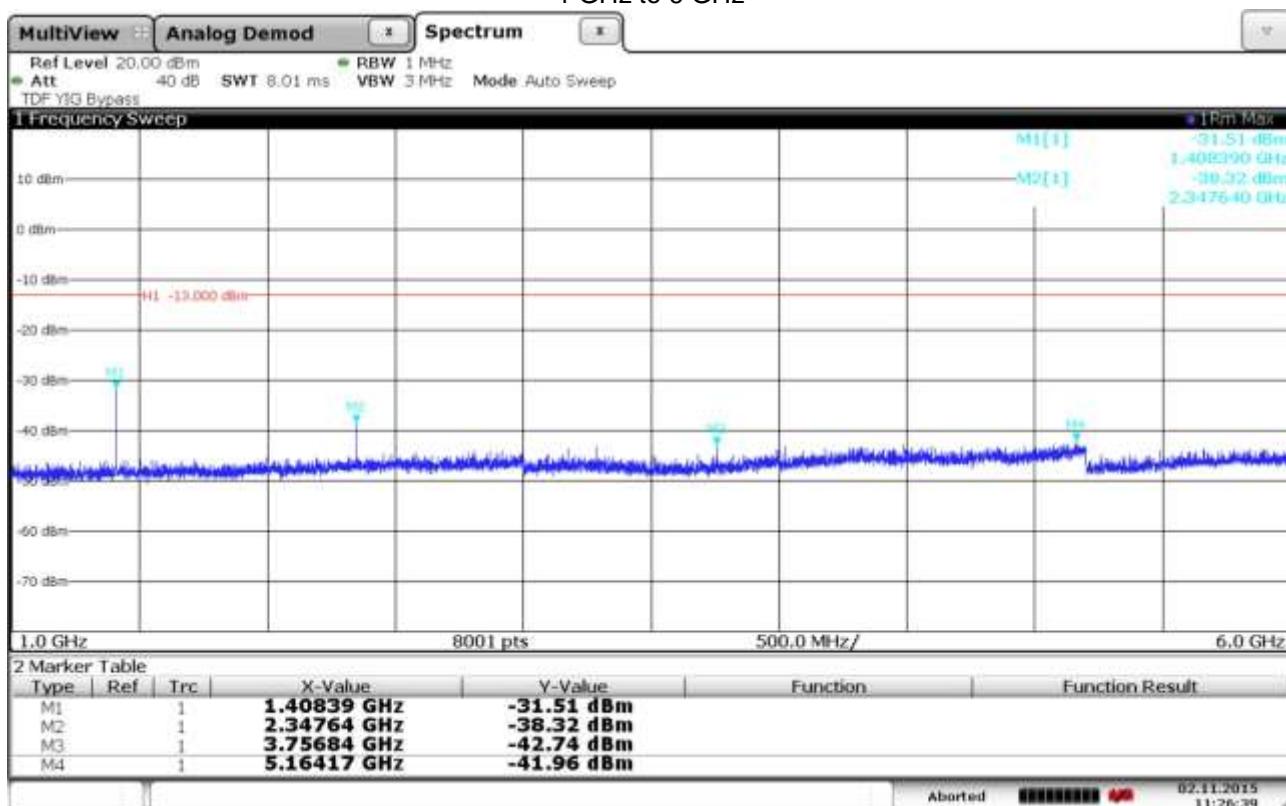
Spurious emission limit (dBm)	
P (dBm) - $43 + 10 \log (P \text{ in W})$ dB	-13

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic.

For detailed test results please see the following test protocols.

FCC ID: OV8-CORPT3
COR PT-3A-913-469
30 MHz to 1GHz

COR PT-3A-913-469
1 GHz to 6 GHz


FCC ID: OV8-CORPT3
COR PT-3B-913-469
30 MHz to 1GHz

COR PT-3B-913-469
1 GHz to 6 GHz


FCC ID: OV8-CORPT3

5.8 Radiated spurious emissions

For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

5.8.1 Description of the test location

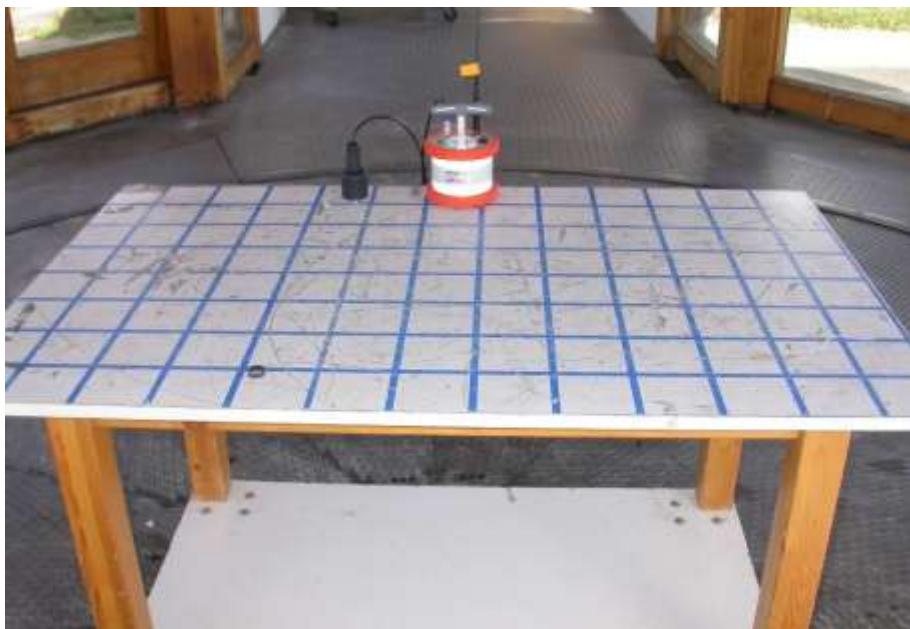
Test location: OATS 1
Test distance: 10 m

Test location: Anechoic chamber 1
Test distance: 3 m

5.8.2 Photo documentation of the test set-up



OATS 1 – 10 m – 30 MHz to 1 GHz

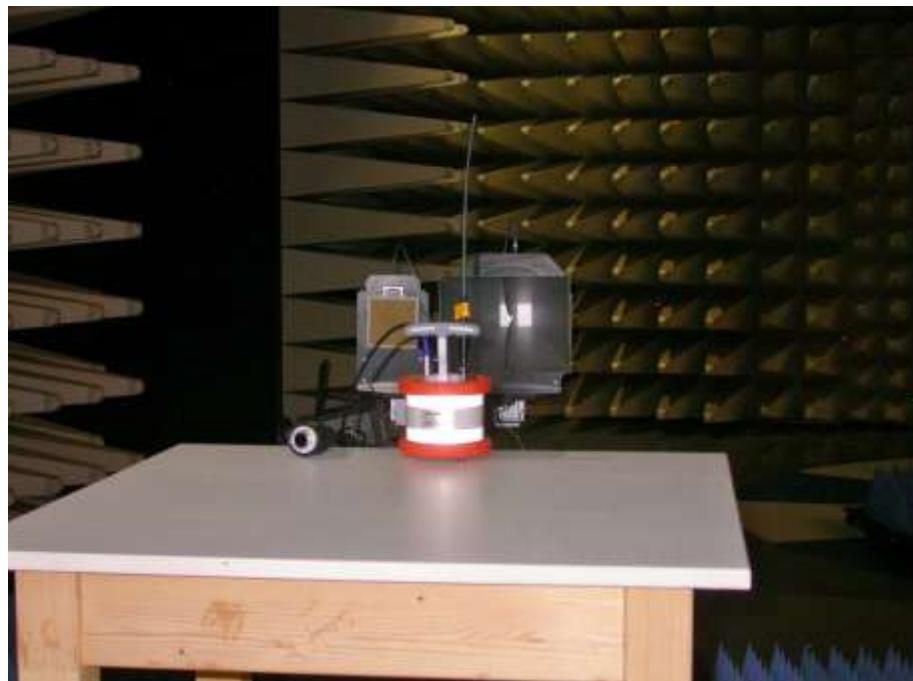


OATS 1 – 10 m – 30 MHz to 1 GHz

FCC ID: OV8-CORPT3



A1 – 3 m – 1 GHz to 6 GHz



A1 – 3 m – 1 GHz to 6 GHz

FCC ID: OV8-CORPT3

5.8.3 Applicable standard

According to FCC Part 2.1053 and Part 90.210 (b):

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth:
At least $43 + 10 \log (P)$ dB.

5.8.4 Description of Measurement

Spurious emission from the EUT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 10 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.

The final level in dBm is calculated by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors (cable loss, antenna gain, free space attenuation). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

Spurious emission from the EUT are measured in the frequency range 1 GHz up to 6 GHz, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 150 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

The final level in dBm is calculated by taking the reading from the spectrum analyser (Level dBm) and adding the correction factors (cable loss, antenna gain, free space attenuation). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The substitution antenna is used to replace the EUT for test the effective radiated power and spurious emissions. For measurements in the frequency band 30 MHz to 1 000 MHz, the substitution antenna is a $\frac{1}{2}$ wave dipole antenna. For measurements above 1000 MHz, a waveguide horn is taken. The centre of this antenna should coincide with either the phase centre or volume centre. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal $\frac{1}{2}$ wave dipole antenna is determined for each radiated spurious emission.

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.12.

Instrument settings:

30 MHz – 1 GHz:	RBW: 120 kHz
1 GHz – 6 GHz	RBW: 1 MHz

FCC ID: OV8-CORPT3
5.8.5 Test result
COR PT-3A-913-469

30 MHz to 1 GHz

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
444.52	24.4	120	-71.7	-47.3	-13.0	-34.3
466.41	31.2	120	-71.5	-40.3	-13.0	-27.3
469.68	45.2	120	-71.5	-26.3	-13.0	-13.3
492.48	12.6	120	-71.3	-58.7	-13.0	-45.7
937.00	43.2	120	-61.7	-18.5	-13.0	-5.5

1 GHz to 6 GHz

Frequency (MHz)	Level PK (dBm)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
1405.37	-8.3	1000	-17.9	-26.2	-13.0	-13.2
1874.13	-25.8	1000	-17.5	-43.3	-13.0	-30.3
2342.50	-40.1	1000	-15.3	-55.4	-13.0	-42.4
2811.25	-35.0	1000	-12.8	-47.8	-13.0	-34.8
3279.63	-46.6	1000	-9.6	-56.2	-13.0	-43.2
3748.38	-39.4	1000	-8.7	-48.1	-13.0	-35.1
4216.56	-60.9	1000	2.8	-58.1	-13.0	-45.1
4684.69	-55.6	1000	4.9	-50.7	-13.0	-37.7
5153.91	-56.6	1000	7.0	-49.6	-13.0	-36.6
5622.03	-62.2	1000	7.4	-54.8	-13.0	-41.8

COR PT-3B-913-469

30 MHz to 1 GHz

Frequency (MHz)	Level PK (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
467.94	37.9	120	-71.5	-33.6	-13.0	-20.6
470.53	44.6	120	-71.5	-26.9	-13.0	-13.9
939.20	41.4	120	-61.4	-20.0	-13.0	-7.0

1 GHz to 6 GHz

Frequency (MHz)	Level PK (dBm)	Bandwidth (kHz)	Correct. factor (dB)	Corrected power ERP (dBm)	Power limit (dBm)	Delta (dB)
1408.75	-7.7	1000	-17.9	-25.6	-13.0	-12.6
1878.25	-32.8	1000	-17.5	-50.3	-13.0	-37.3
2348.13	-33.1	1000	-15.4	-48.5	-13.0	-35.5
2817.63	-39.6	1000	-12.8	-52.4	-13.0	-39.4
3287.50	-43.4	1000	-9.8	-53.2	-13.0	-40.2
3757.00	-42.2	1000	-8.8	-51.0	-13.0	-38.0
4226.41	-51.5	1000	2.6	-48.9	-13.0	-35.9
4695.63	-62.9	1000	4.8	-58.1	-13.0	-45.1
5165.94	-56.2	1000	7.4	-48.8	-13.0	-35.8
5476.56	-65.3	1000	6.6	-58.7	-13.0	-45.7

FCC ID: OV8-CORPT3

Spurious emission limit according to FCC Part 90.210 (b)(3):

Spurious emission limit (dBm)	
P (dBm) - 43 + 10 log (P in W) dB	-13

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic.

During radiated emission test, both transmitters are active.

FCC ID: OV8-CORPT3

5.9 Frequency stability

For test instruments and accessories used see section 6 Part **FS**.

5.9.1 Description of the test location

Test location: METROLOGY

5.9.2 Photo documentation of the test set-up



FCC ID: OV8-CORPT3

5.9.3 Applicable standard

According to FCC Part 2.1055 and Part 90.213:

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

5.9.4 Description of Measurement

This test has been performed over variations in temperature and voltage. The temperature stability was measured with the EUT in a climatic chamber and was powered DC voltage supplied externally. The frequency stability of the transmitter was examined at the voltage extremes and for the temperature range of -30°C to +50°C. The carrier frequency was measured conducted with a spectrum analyser.

The frequency stability from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.2.

Frequency stability limit according to FCC Part 90.213(a):

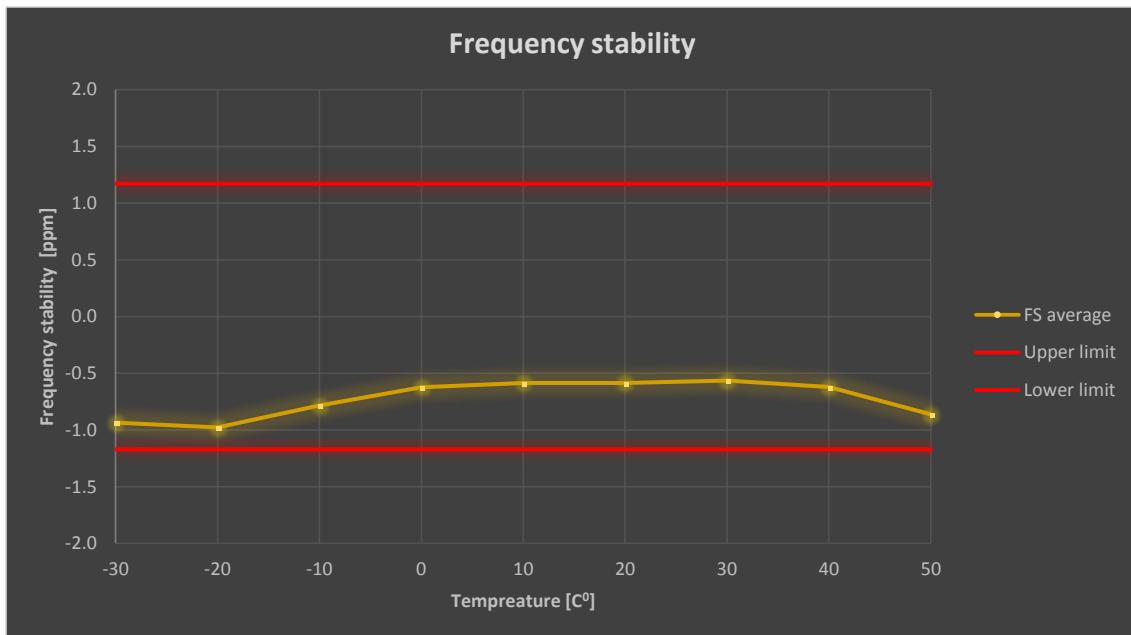
Frequency range (MHz)	Fixed and base statio (ppm)
421 - 512	2.5

The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols.

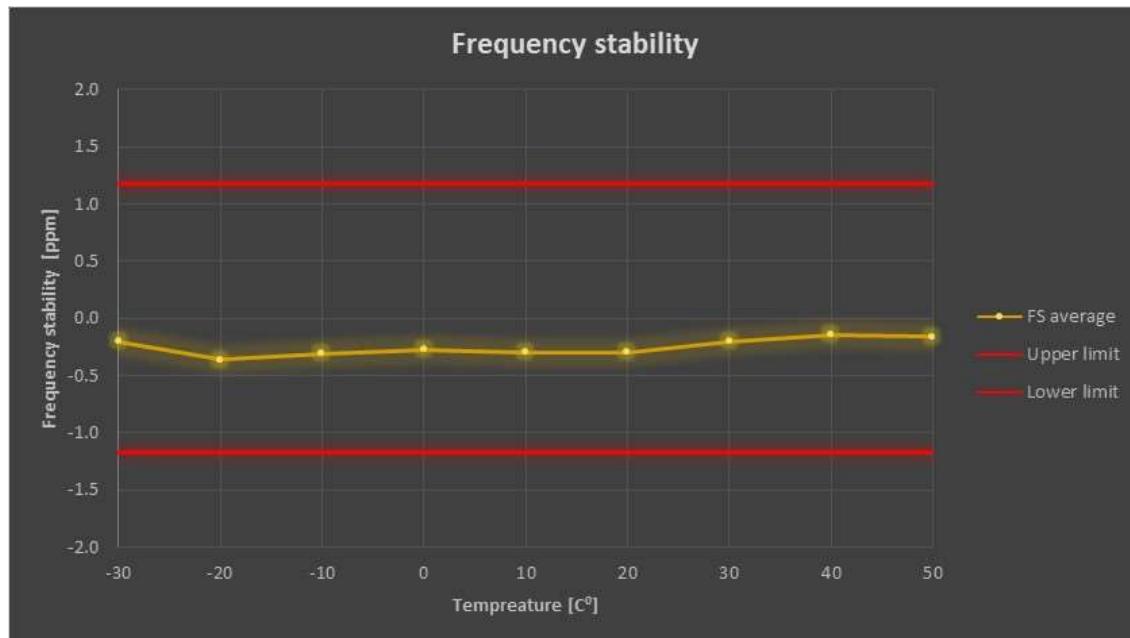
5.9.5 Test result
COR PT-3A-913-469

Tempreature [C°]	Voltage [V]	Measured frequency [MHz]	Frequency error [kHz]	Relative error [ppm]	Upper Limit [ppm]	Lower Limit [ppm]
50	6.6	468.499594	-0.406	-0.866	1.17	-1.17
	7.2	468.499594	-0.406	-0.868	1.17	-1.17
	8.2	468.499600	-0.400	-0.854	1.17	-1.17
40	6.6	468.499710	-0.290	-0.619	1.17	-1.17
	7.2	468.499708	-0.292	-0.623	1.17	-1.17
	8.2	468.499708	-0.292	-0.623	1.17	-1.17
30	6.6	468.499735	-0.265	-0.565	1.17	-1.17
	7.2	468.499735	-0.265	-0.566	1.17	-1.17
	8.2	468.499737	-0.263	-0.562	1.17	-1.17
20	6.6	468.499726	-0.274	-0.585	1.17	-1.17
	7.2	468.499726	-0.274	-0.586	1.17	-1.17
	8.2	468.499726	-0.274	-0.586	1.17	-1.17
10	6.6	468.499726	-0.274	-0.586	1.17	-1.17
	7.2	468.499726	-0.274	-0.584	1.17	-1.17
	8.2	468.499727	-0.273	-0.584	1.17	-1.17
0	6.6	468.499707	-0.293	-0.624	1.17	-1.17
	7.2	468.499709	-0.291	-0.622	1.17	-1.17
	8.2	468.499708	-0.292	-0.623	1.17	-1.17
-10	6.6	468.499633	-0.367	-0.784	1.17	-1.17
	7.2	468.499634	-0.366	-0.782	1.17	-1.17
	8.2	468.499633	-0.367	-0.783	1.17	-1.17
-20	6.6	468.499543	-0.457	-0.976	1.17	-1.17
	7.2	468.499542	-0.458	-0.978	1.17	-1.17
	8.2	468.499541	-0.459	-0.979	1.17	-1.17
-30	6.6	468.499562	-0.438	-0.934	1.17	-1.17
	7.2	468.499562	-0.438	-0.934	1.17	-1.17
	8.2	468.499562	-0.438	-0.935	1.17	-1.17



COR PT-3B-913-469

Tempreture [C°]	Voltage [V]	Measured frequency [MHz]	Frequency error [kHz]	Relative error [ppm]	Upper Limit [ppm]	Lower Limit [ppm]
50	6.6	469.599926	-0.074	-0.157	1.17	-1.17
	7.2	469.599925	-0.075	-0.159	1.17	-1.17
	8.2	469.599927	-0.073	-0.156	1.17	-1.17
40	6.6	469.599935	-0.065	-0.137	1.17	-1.17
	7.2	469.599934	-0.066	-0.140	1.17	-1.17
	8.2	469.599935	-0.065	-0.138	1.17	-1.17
30	6.6	469.599904	-0.096	-0.203	1.17	-1.17
	7.2	469.599905	-0.095	-0.203	1.17	-1.17
	8.2	469.599906	-0.094	-0.200	1.17	-1.17
20	6.6	469.599860	-0.140	-0.298	1.17	-1.17
	7.2	469.599863	-0.137	-0.292	1.17	-1.17
	8.2	469.599862	-0.138	-0.294	1.17	-1.17
10	6.6	469.599860	-0.140	-0.298	1.17	-1.17
	7.2	469.599864	-0.136	-0.289	1.17	-1.17
	8.2	469.599860	-0.140	-0.299	1.17	-1.17
0	6.6	469.599871	-0.129	-0.274	1.17	-1.17
	7.2	469.599871	-0.129	-0.274	1.17	-1.17
	8.2	469.599872	-0.128	-0.272	1.17	-1.17
-10	6.6	469.599857	-0.143	-0.305	1.17	-1.17
	7.2	469.599855	-0.145	-0.308	1.17	-1.17
	8.2	469.599855	-0.145	-0.308	1.17	-1.17
-20	6.6	469.599830	-0.170	-0.362	1.17	-1.17
	7.2	469.599830	-0.170	-0.361	1.17	-1.17
	8.2	469.599829	-0.171	-0.363	1.17	-1.17
-30	6.6	469.599907	-0.093	-0.197	1.17	-1.17
	7.2	469.599907	-0.093	-0.198	1.17	-1.17
	8.2	469.599906	-0.094	-0.200	1.17	-1.17

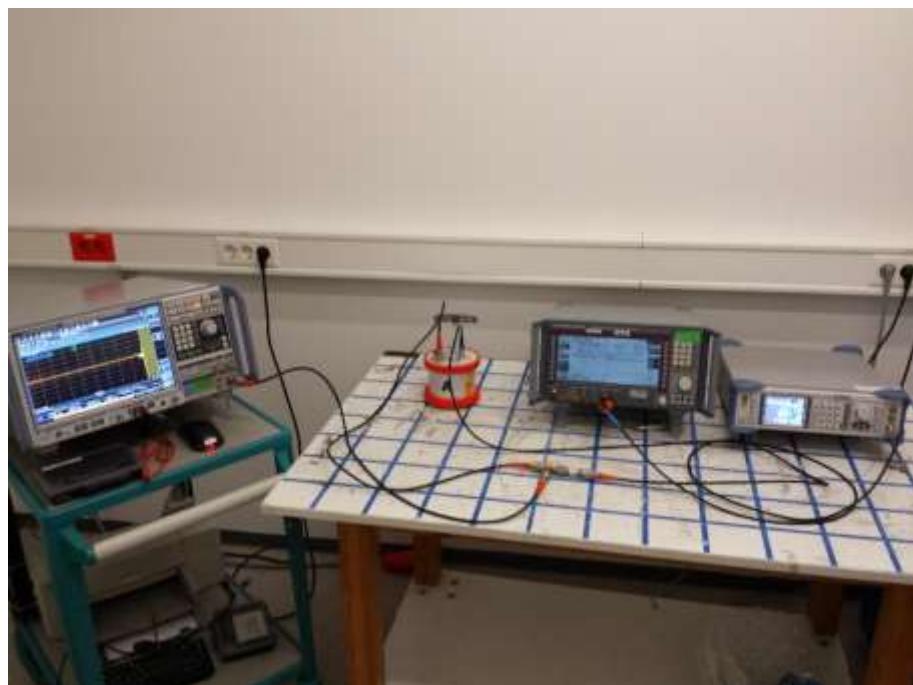


FCC ID: OV8-CORPT3**5.10 Transient frequency behavior**

For test instruments and accessories used see section 6 Part **MB**.

5.10.1 Description of the test location

Test location: Shielded Room S6

5.10.2 Photo documentation of the test set-up

FCC ID: OV8-CORPT3

5.10.3 Applicable standard

According to FCC Part 90.214:

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated.

5.10.4 Description of Measurement

Transient frequency behaviour is a measure off the difference, as a function in time, if the actual transmitter frequency to the assigned transmitter frequency behaviour during the switch on and switch off time.
A spectrum analyser with the function “analog demod measurement” is used.

The transient frequency behavior from the EUT is measured in a test setup following the procedures set out in ANSI/TIA-603-C Section 2.2.19.

Transient frequency behavior limit according to FCC Part 90.213(a):

Time intervals ^{1,2}	Maximum frequency difference ³	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1^4	± 25.0 kHz	5.0 ms	10.0 ms
t_2	± 12.5 kHz	20.0 ms	25.0 ms
t_3^4	± 25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1^4	± 12.5 kHz	5.0 ms	10.0 ms
t_2	± 6.25 kHz	20.0 ms	25.0 ms
t_3^4	± 12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1^4	± 6.25 kHz	5.0 ms	10.0 ms
t_2	± 3.125 kHz	20.0 ms	25.0 ms
t_3^4	± 6.25 kHz	5.0 ms	10.0 ms

t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on} .

t_2 is the time period immediately following t_1 .

t_3 is the time period from the instant when the transmitter is turned off until t_{off} .

t_{off} is the instant when the 1 kHz test signal starts to rise.

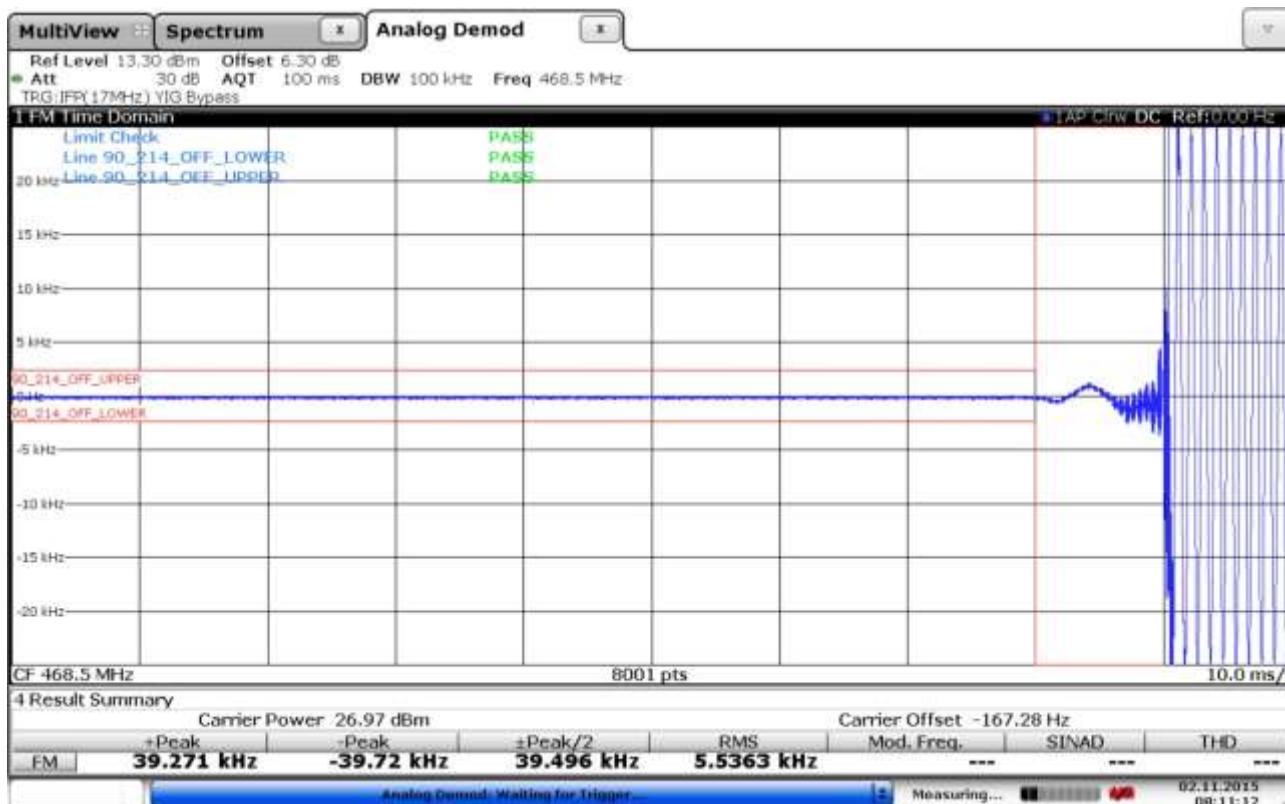
² During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in §90.213.

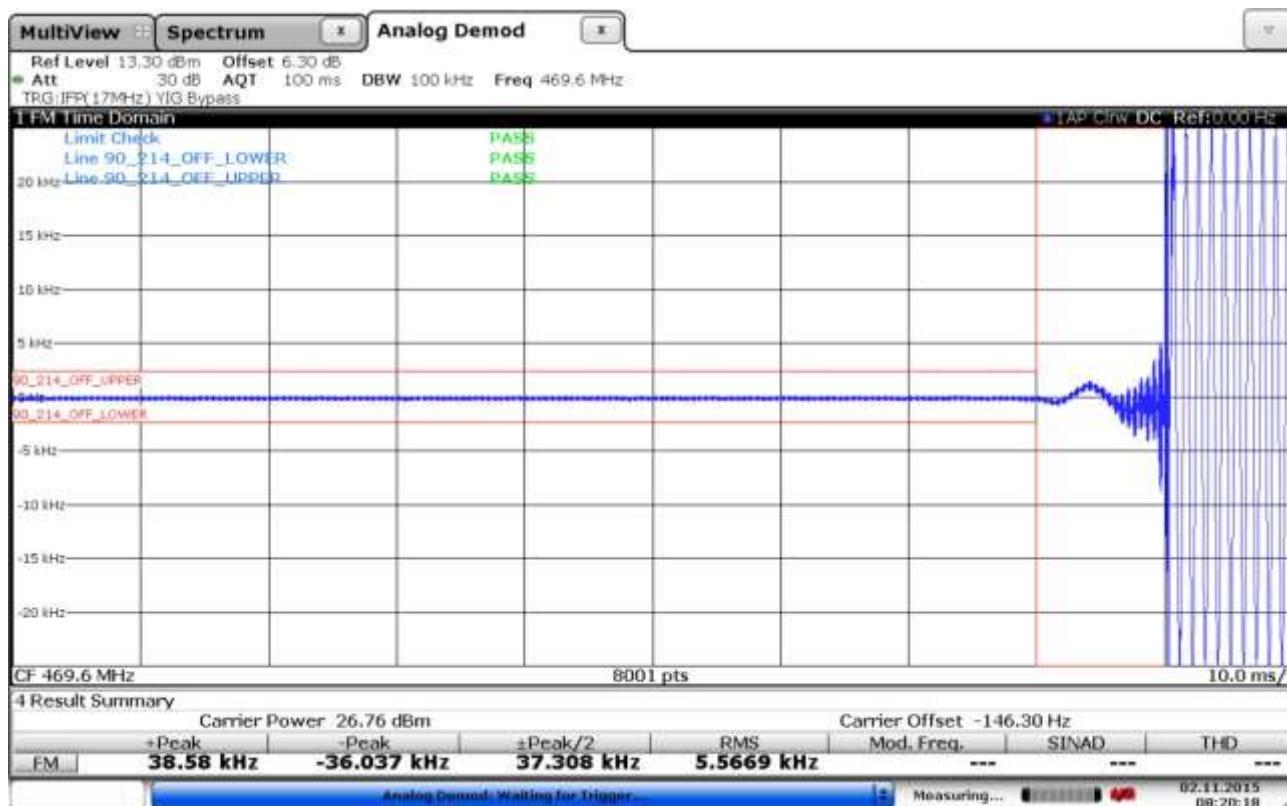
³ Difference between the actual transmitter frequency and the assigned transmitter frequency.

⁴ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols.

FCC ID: OV8-CORPT3
5.10.5 Test result
COR PT-3A-913-469


FCC ID: OV8-CORPT3
COR PT-3B-913-469


FCC ID: OV8-CORPT3

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	17/04/2016	17/04/2015	29/02/2016	31/08/2015
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
FS	ESR 7	02-02/03-13-001	29/05/2016	29/05/2015		
	METRAHIT WORLD	02-02/32-15-001	24/11/2016	24/11/2015		
	WK-340/40	02-02/45-05-001	07/07/2016	07/07/2015		
	HM 8143	02-02/50-10-016				
MB	ESR 7	02-02/03-13-001	29/05/2016	29/05/2015		
	CMS-54	02-02/05-05-011	25/07/2016	25/07/2013	28/09/2016	28/09/2015
	SMBV 100A	02-02/05-09-001	23/03/2018	23/03/2015	23/03/2016	23/03/2015
	SMB100A	02-02/05-14-001	23/04/2016	23/04/2015		
	FSW43	02-02/11-15-001	05/08/2016	05/08/2015		
	AC 1	02-02/50-05-077				
	6011	02-02/50-05-079				
SER 2	18N50W-20 dB	02-02/50-09-017				
	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	17/04/2016	17/04/2015	29/02/2016	31/08/2015
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
	FSP 30	02-02/11-05-001	01/10/2016	01/10/2015		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	BBHA 9120 E 251	02-02/24-05-006	27/04/2016	27/04/2015	19/02/2016	19/08/2015
	WBH2-18NHG	02-02/24-08-002	27/04/2016	27/04/2015	19/02/2016	19/08/2015
	Sucoflex N-2000-SMA	02-02/50-05-075				
	WHK 3.0/18G-10EF	02-02/50-05-180				
	WHKX 7.5/18G-8SS	02-02/50-07-010				
	SF104/11N/11N/1500MM	02-02/50-13-015				
	SF104/11SMA/11N/1500MM	02-02/50-13-016				
	SF104/11SMA/11N/1500MM	02-02/50-13-017				