TEST REPORT # EMCC-180541BGB, 2019-08-30

EQUIPMENT UNDER TEST:

Trade Name:	Edge FCR 3
Type:	110012
Serial Number(s):	00001101
Application:	Edge Computing Device
FCC ID:	2ASE6EDGEFCR3
Manufacturer:	MYNXG Product GmbH
Address:	Friedhofstraße 72 63263 Neu-Isenburg GERMANY
Name:	Mr Christian Winkelmeyr
Phone:	+49 911 990 876 22
E-Mail:	christian.winkelmeyr@mynxg.com
RELEVANT STANDARD(S) :	47 CFR § 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013

TEST REPORT PREPARED BY:

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Tested:

Patrick Reusch

Checked:

Reinhard Sauerschell
- Head of Laboratory -

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0 REVISION HISTORY

Project number	Issue date	Chapter	Description
180541BGB	2019-08-30	n.a.	Initial issue

1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance with the 47 CFR §15.247 requirements applicable to intentional radiators (subpart C).

1.2 Limits and Reservations

The test results in this report apply only to the particular equipment under test (EUT) as declared in this report. This test report shall not be reproduced except in full without the written permission of EMCCons DR. RAŠEK GmbH & Co. KG.

1.3 Test Laboratory

Test Laboratory:	EMCCons DR. RAŠEK GmbH & Co. KG
Accreditation No.:	D-PL-12067-01-04
Address of Labs I, II, III and Head Office:	EMCCons DR. RAŠEK GmbH & Co. KG Boelwiese 8 91320 Ebermannstadt GERMANY
Address of Labs IV and V:	EMCCons DR. RAŠEK GmbH & Co. KG Stoernhofer Berg 15 91364 Unterleinleiter GERMANY
Phone:	+49 9194 7262-0
Fax:	+49 9194 7262-199
E-Mail:	info@emcc.de
Web:	www.emcc.de

1.4 Customer

Company Name:	MyOmega Systems GmbH
Street:	Neumeyerstraße 28 - 34
City:	90411 Nuremburg
Country:	GERMANY
Name:	Ms Gaby Möller
Phone:	+49 911 990 876-21
Fax:	n/a
E-Mail:	gaby.moeller@mynxg.com

1.5 Manufacturer

Company Name:	MYNXG Product GmbH
Street:	Friedhofstraße 72
City:	63263 Neu-Isenburg
Country:	Germany
Phone:	+49 911 990 876 22
E-Mail:	christian.winkelmeyr@mynxg.com

1.6 Dates and Test Location

Date of receipt of EUT: 2019-07-02
Test Date: CW27 to CW31/2019
Test Location: Lab IV

1.7 Ordering Information

Purchase Order: DE20190701_067
Date: 2019-07-01
Vendor-Number: n/a

1.8 Climatic Conditions

Date	Temperature	Relative Humidity	Air Pressure	Lab	Customer attended tests
--	°C	%	hPa	--	--
2019-07-02	27	42	979	IV	Yes, Mr Tragkas
2019-07-03	27	35	981	IV	Yes, Mr Tragkas
2019-07-04	26	34	982	IV	Yes, Mr Tragkas
2019-07-08	25	34	976	IV	No
2019-08-01	26	44	977	IV	Yes, Mr Tragkas

2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

The following data is based on customer's information.

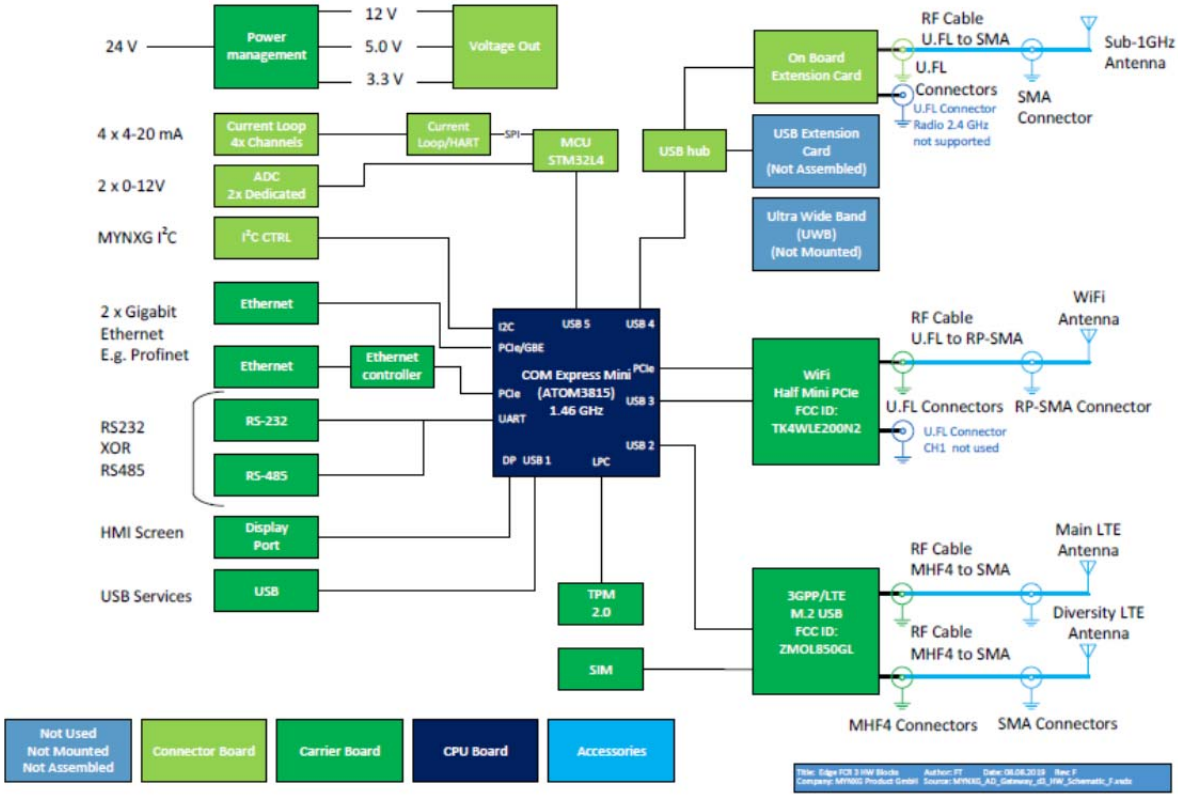
Manufacturer:	MYNXG Product GmbH
Trade Name:	Edge FCR 3
Type:	110012
Application:	Edge Computing Device
No of variants:	0
Serial No(s):	00001101
Firmware version:	2.2.5
Hardware version:	2.4
FCC ID:	2ASE6EDGEFCR3
Internal clock:	1.46 GHz (CPU)
Radio Technologies:	ISM Radio WIFI – not subject of this test report UMTS/LTE – not subject of this test report
Operating Frequency Range:	913 ... 917 MHz
Tested Channel(s):	low: 913 MHz high: 917 MHz
Max TX output power:	19 dBm
Power source:	DC Power Supply 24 V
Ports:	Port 1: USB, for service, only Port 2: Ethernet RJ45 (ETH0) Port 3: Ethernet RJ45 (ETH1) – is for development and debugging only. It is deactivated for productive parts in BIOS Port 4: I2C Port 5: Current loop with HART interface, 4 channels, unlimited cable length Port 6: Analog terminal block, 2 channels Port 7: RS 323/485 Port 8: DC Power (DC jack for table top use) Port 9: DC Power (2 pin connector for DIN Rail use) Port 10: Display Port, for service, only
Antenna(s):	external, SMA, type: V-Torch VT4GLTE-R-1
Max. antenna gain:	0 dBi
Remarks:	None

2.2 Intended Use

The following description was delivered by customer on 2019-08-26:

3 General Info

The MYNXG Edge FCR 3 is easy to install in any electrical cabinet. The Edge FCR 3 is optimized for machinery and shop floor monitoring. It is **the** smart edge computing solution. Through its rich wired and wireless interfaces, it can be integrated in any industrial environment. It is powered with the MYNXG Gateway OS combining the benefits of Android® and Linux® environments.



3.2 Intended use and typical operation mode

The Gateway d3 collects sensor data through the cable interfaces of the device and/or through wireless connections via the ISM or WiFi radio. The sensor data is processed and forwarded to a cloud server through a mobile (3G/4G) or WiFi connection.

The Edge FCR 3 does in normal operation mode poll or measure the sensor input approximately every 5 minutes and processes the data. About every 60 minutes the Gateway does forward the current status and data to a cloud server via WiFi or 3G/4G mobile network.

The ISM, WiFi and 3G/4G radios are operating independent and may therefore transmit simultaneously.

2.3 EUT Peripherals/Simulators

None.

2.4 Mode of operation during testing and test setup

The equipment under test (EUT) was operated during the tests under the following conditions:

Mode: Continuous Transmission
The EUT was set to continuous transmission by special test software.

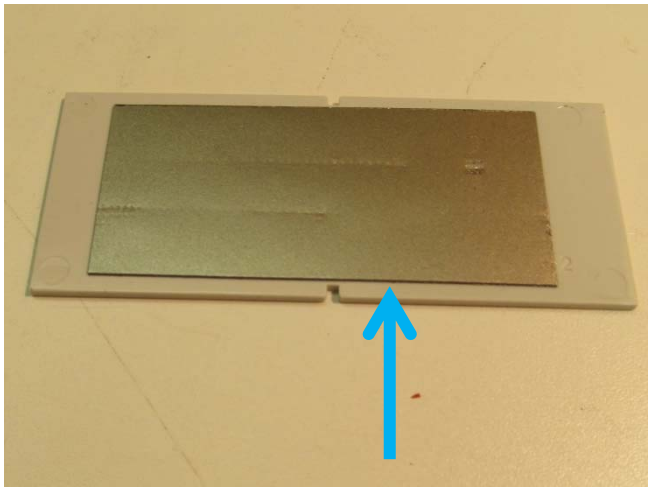
2.5 Modifications required for compliance

In order to comply with FCC regulations for radiated emissions, the following modifications were applied:

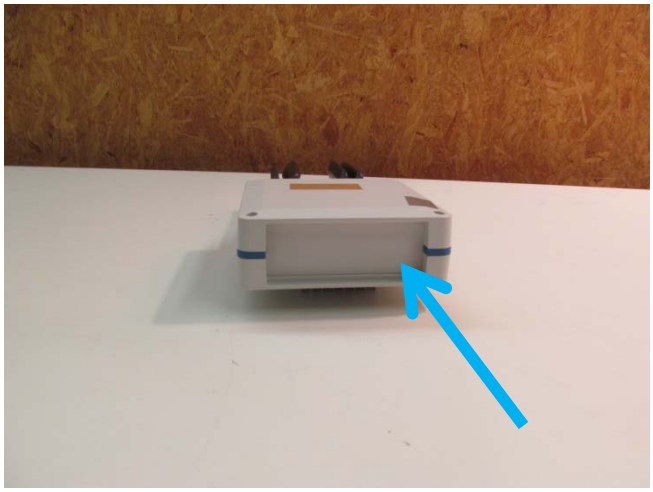
- One Ethernet port (the marked one) was deactivated in EUT's BIOS by disabling the corresponding PCIe lane.

- Some adhesive shielding material (type Thora elektronik A25000) was put on the lower and the rear part of the housing.

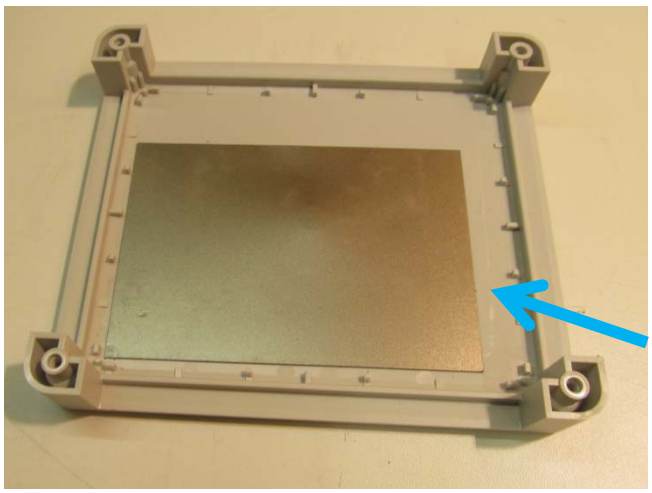
-the output power setting was changed in the software from 27 dBm to 19 dBm during the measurements. Please refer to the corresponding test chapters for test settings.



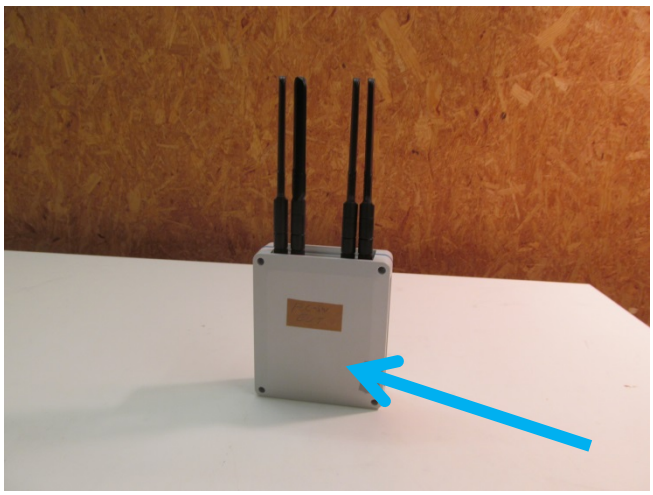
Shielding material at lower part of EUT housing (inside)



Installed lower part of EUT housing



Shielding material at rear part of EUT housing (inside)



Installed rear part of EUT housing

Deactivated Ethernet Port

All tests in this report were performed with these modifications.

Note: the brown paper tape on the back side of the housing was used to identify the EUT during measurements. It is not part of the device.

3 TEST RESULTS SUMMARY

Summary of test results for the following EUTs:

Manufacturer: MYNXG Product GmbH
Type: 110012
Serial No.: 00001101

Requirement	47 CFR Section	Report Section	Result
Antenna Requirement	§ 15.203	4.1	Passed
DTS Bandwidth	§ 15.247(a)	4.2	Passed
DTS fundamental emission output power	§ 15.247(b)	4.3	Passed
Power Spectral Density	§ 15.247(e)	4.4	Passed
DTS band-edge emission	§ 15.247(d)	4.5	Passed
Radiated Emissions	§ 15.247(d)	4.6	Passed
AC Power Line Conducted Emissions	§15.207	4.7	Passed

N.A. – not applicable; N.T. – Not tested acc. to applicant's order.

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units and meet the requirements of the specifications referenced herein.
Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.
The measurements contained in this report were made in accordance with the procedures described in ANSI C63.10-2013 and all applicable Public Notices received prior to the date of testing. All requirements were found to be within the limits outlined in this report.

The test results in this report apply only to the particular equipment under test (EUT) as declared in this report.

Test personnel: Patrick Reusch
Issuance date: 2019-08-30

4 DETAILED TEST RESULTS

4.1 Antenna Requirement

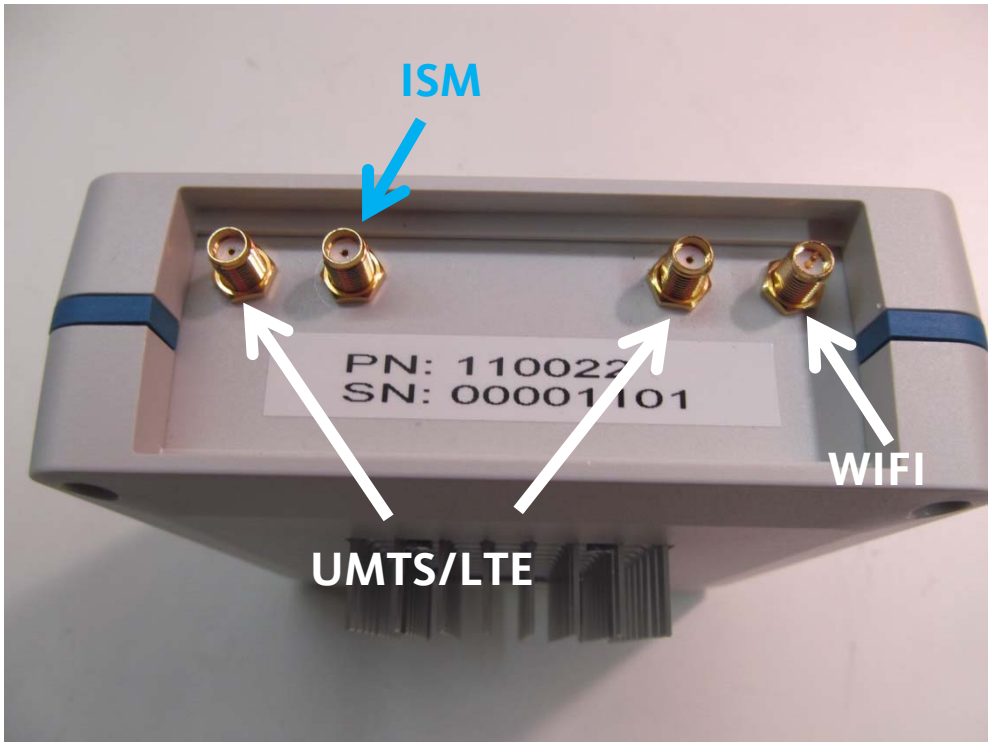
4.1.1 Regulation

47 CFR § 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.1.2 Detailed Test Data

The antenna of the ISM system is directly connected via a standard SMA connector to the radio module.
According to customer's information, this device is professionally installed intentional radiator and, in accordance with 47 CFR § 15.203, excluded from the requirement to ensure that no antenna other than that furnished could be used with the device. However, this device must be measured at the installation site and the installer shall be responsible for ensuring that the proper antenna is employed.



Photograph of the rf connectors

Note: the UMTS/LTE and WIFI antennas are not regarded in this test report.

4.1.3 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
Test date:	2019-07-08
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.2 DTS Bandwidth

4.2.1 Regulation

47 CFR §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.2.2 Test Procedures

KDB 558074 v05r02, 8.2 DTS bandwidth

Subclause 11.8 of ANSI C63.10 is applicable.

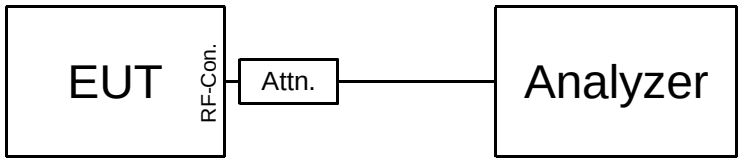
ANSI C63.10-2013, 11.8 DTS bandwidth

One of the following procedures may be used to determine the modulated DTS bandwidth.

11.8.1 Option 1
The steps for the first option are as follows:
a) Set RBW = 100 kHz.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

[...]

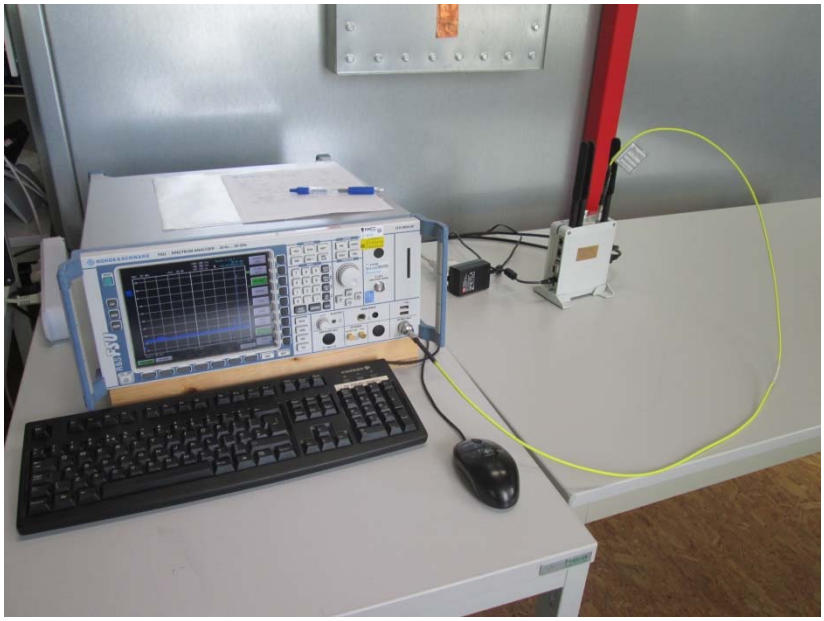
4.2.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.247
Procedure: ANSI C63.10-2013
KDB 558074 v05r02

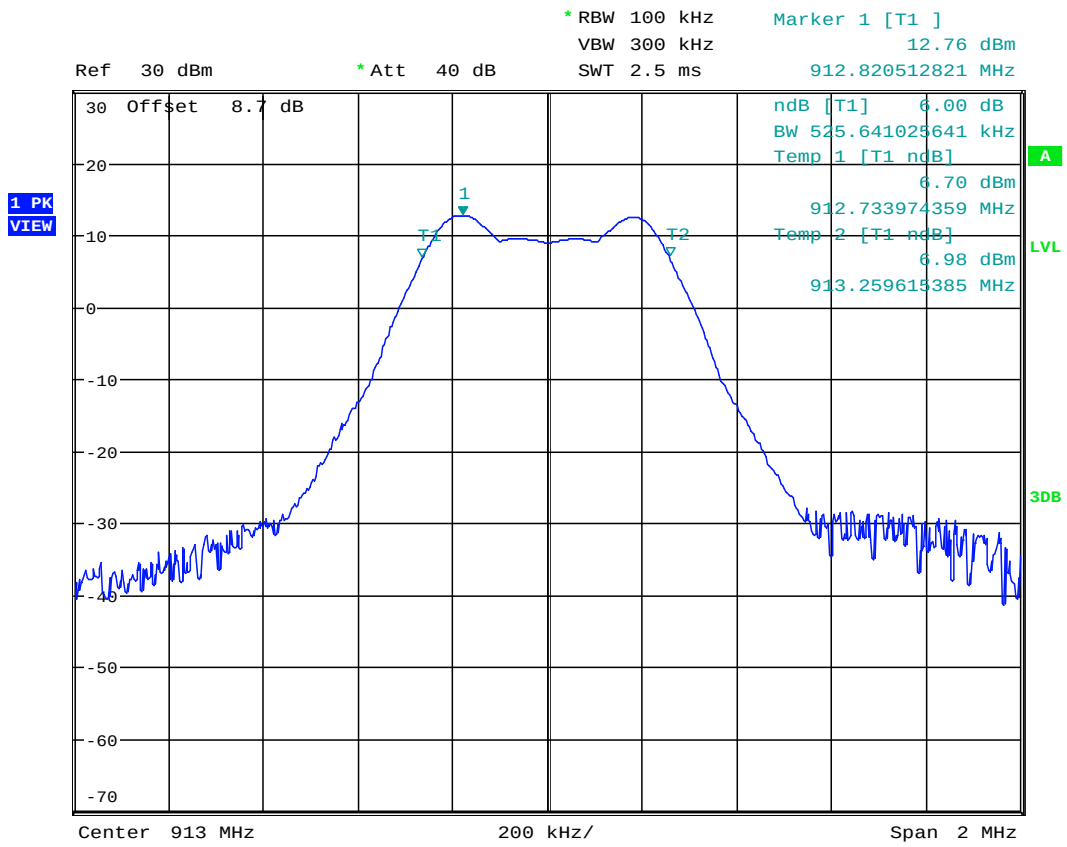
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 2891, 3061, 3831, 3880, 4717



Sample photo of setup

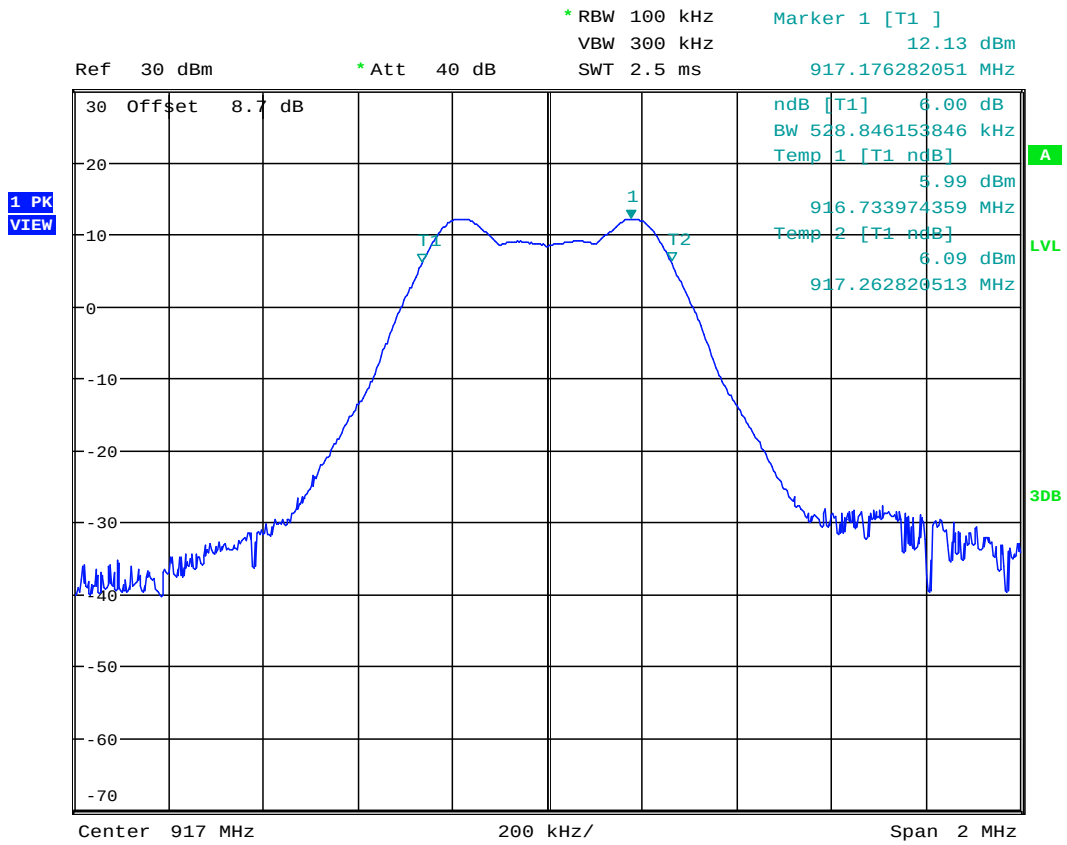
4.2.4 Detailed Test Data

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No:	00001101
Channel:	Low (913 MHz)



Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No:	00001101
Channel:	High (917 MHz)



Final Result:

Center Frequency [MHz]	Lower 6 dB Freq. Edge [MHz]	Upper 6 dB Freq. Edge [MHz]	6 dB Bandwidth [kHz]	Limit ---
913	912.7340	913.2596	525.6	≥ 500 kHz
917	916.7340	917.2628	528.8	≥ 500 kHz

4.2.5 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-07-08
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.3 DTS fundamental emission output power

4.3.1 Regulation

47 CFR §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

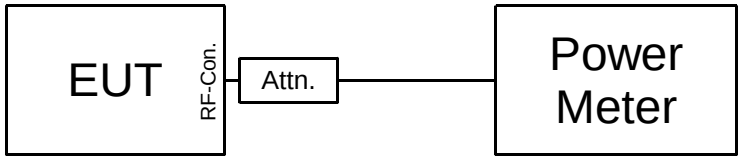
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.3.2 Test Procedures

KDB 558074 v05r02, 8.3 DTS fundamental emission output power
8.3.1 Maximum peak conducted output power
One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.
[...]
8.3.1.3 PKPM1 Peak-reading power meter method
Subclause 11.9.1.3 of ANSI C63.10 is applicable.
[...]

ANSI C63.10-2013, 11.9.1 Maximum peak conducted output power
One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.
[...]
11.9.1.3 PKPM1 Peak power meter method
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

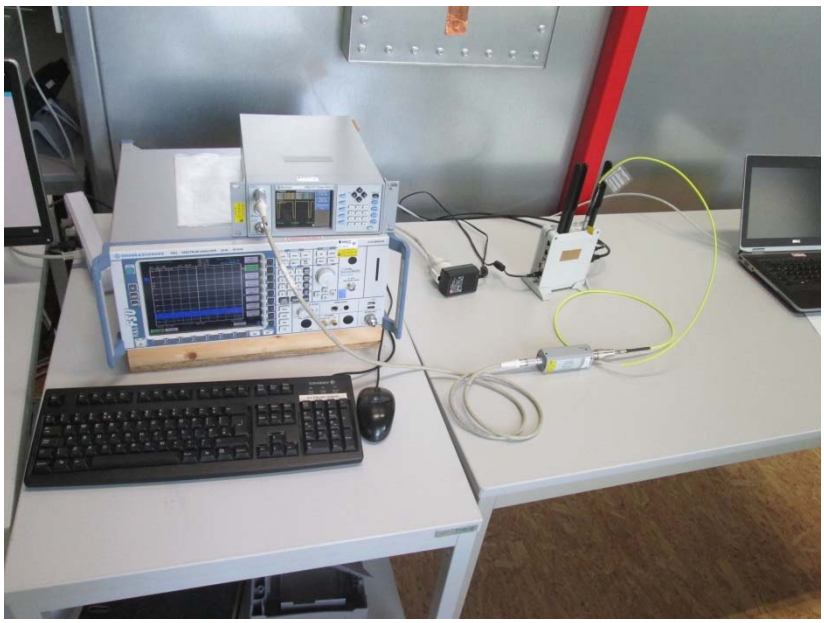
4.3.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.247
Procedure: ANSI C63.10-2013
KDB 558074 v05r02

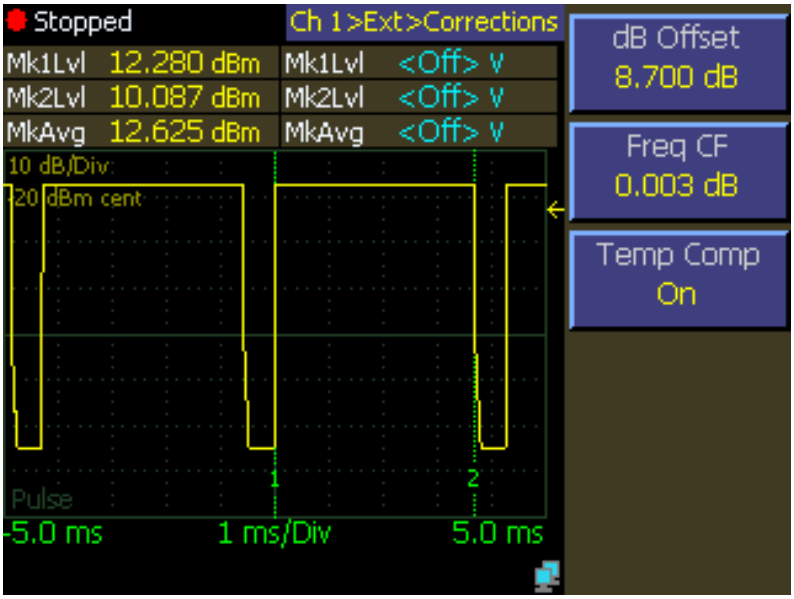
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 2891, 3061, 3857, 3858, 3880, 4524, 4717



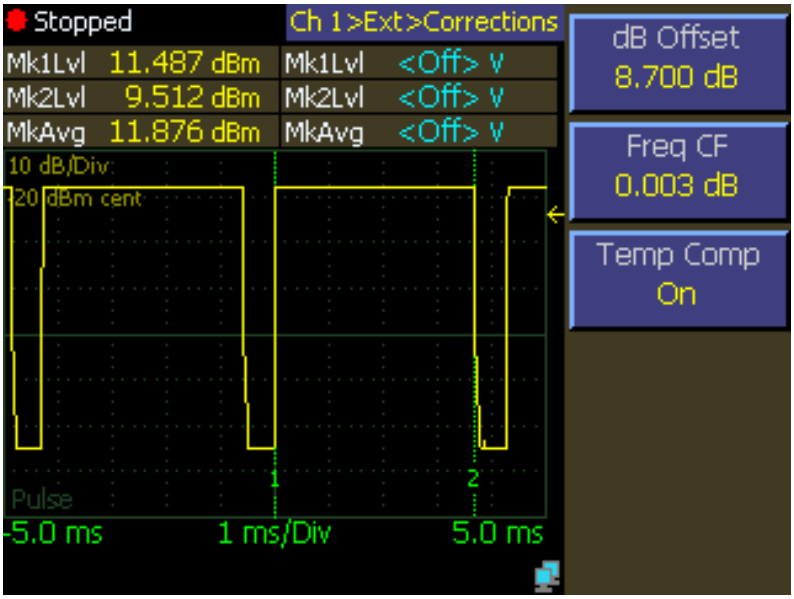
Sample photo of setup

4.3.4 Detailed Test Data

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH 110012 00001101 Low (913 MHz)



Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH 110012 00001101 High (917 MHz)



Result:

Center Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Power [dBm]	Limit [dBm]	Margin [dB]
913	12.6	0.0	12.6	30	17.4
917	11.9	0.0	11.9	30	18.1

Note: the Correction Factor was taken into account by the power meter's offset setting capability. The correction factor contains the loss of the rf cable of 0.7 dB and the external attenuator of 8.0 dB.

Max. Antenna Gain: 0 dBi

4.3.5 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-07-08
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.4 Power Spectral Density

4.4.1 Regulation

47 CFR §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

4.4.2 Test Procedures

KDB 558074 v05r02, 8.4 DTS maximum power spectral density level in the fundamental emission

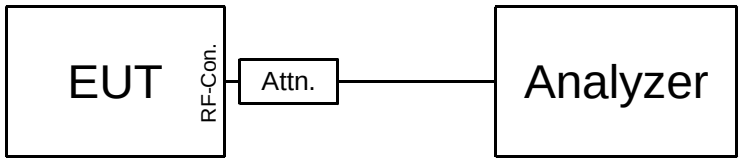
Subclause 11.10 of ANSI C63.10 is applicable.

ANSI C63.10-2013, 11.10.2 Method PKPSD (peak PSD)

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

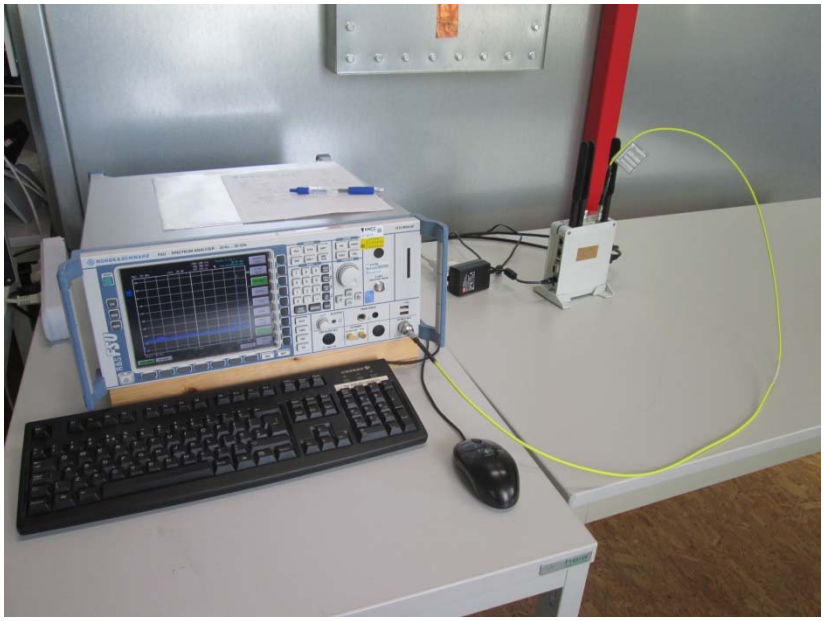
4.4.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.247
Procedure: ANSI C63.10-2013
KDB 558074 v05r02

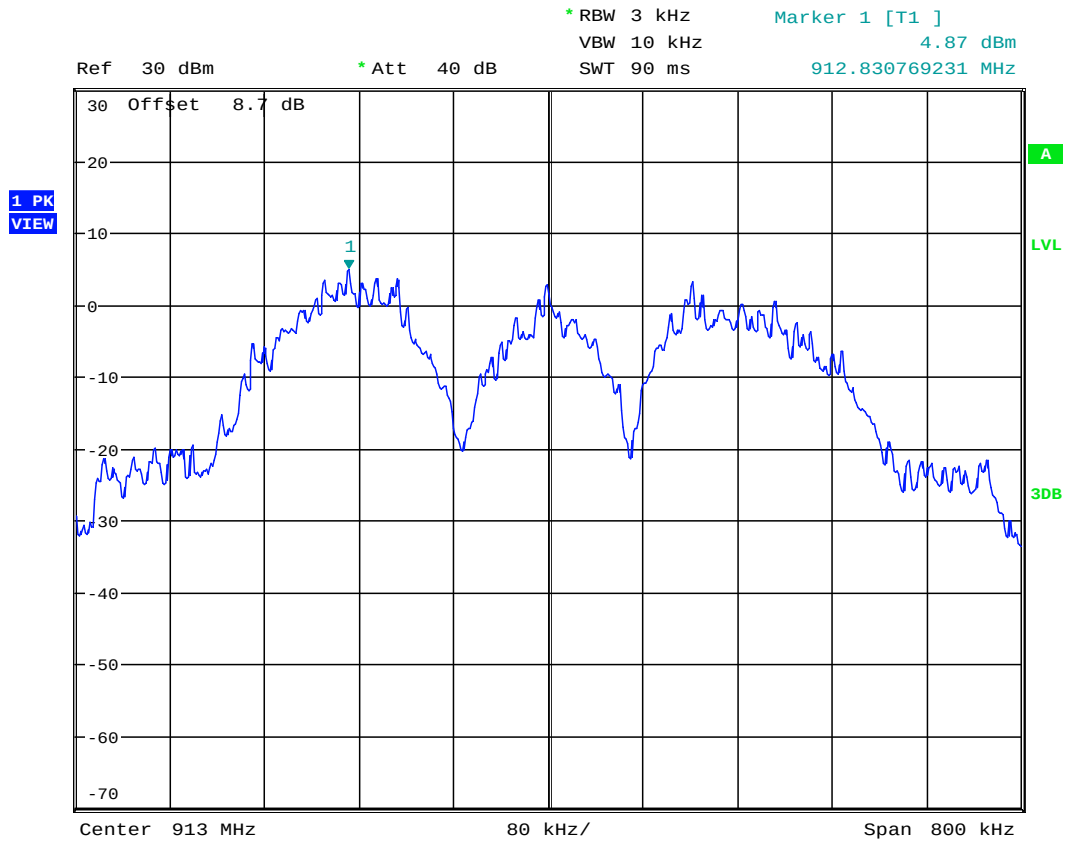
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 2891, 3061, 3831, 3880, 4524, 4717



Sample photo of setup

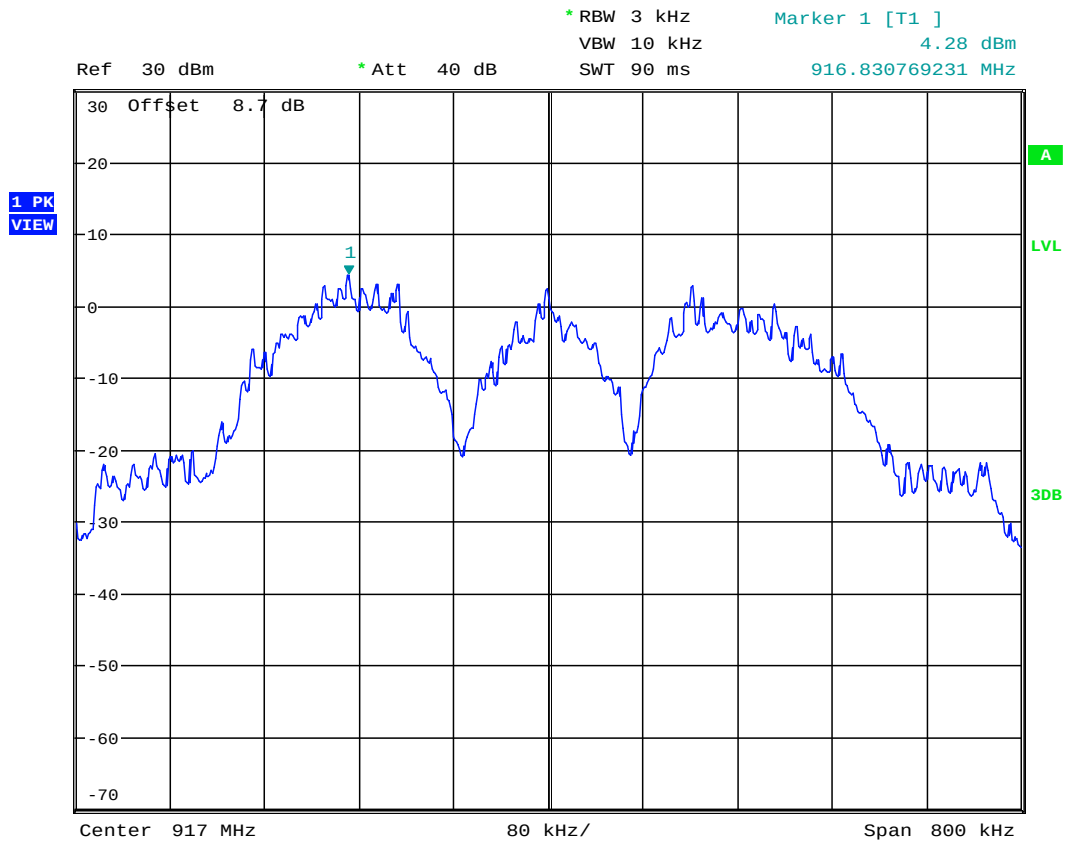
4.4.4 Detailed Test Data

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH 110012 00001101 Low (913 MHz)



Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH 110012 00001101 High (917 MHz)



Result:

Center Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Power [dBm]	Limit [dBm]	Margin [dB]
913	4.9	0.0	4.9	8	3.1
917	4.3	0.0	4.3	8	3.7

Note: the Correction Factor was taken into account by the spectrum analyzer's offset setting capability. The correction factor contains the loss of the rf cable of 0.7 dB and the external attenuator of 8.0 dB.

4.4.5 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-07-08
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.5 DTS band-edge emission

4.5.1 Regulation

47 CFR §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)

4.5.2 Test Procedures

ANSI C63.10-2013, 11.13 Band-edge measurements

11.13.1 General
Emissions within a restricted band and within 2 MHz of an authorized band edge may be measured using either the marker-delta method or the integration method, which is described in 11.13.3, provided that the DTS bandwidth (or EBW) edge falls within 2 MHz of the band edge. Otherwise, all unwanted emissions
measurements shall be performed using the standard methods.

ANSI C63.10-2013, 11.11 Emissions in nonrestricted frequency bands

11.11.2 Reference level measurement

Establish a reference level by using the following procedure:

a) Set instrument center frequency to DTS channel center frequency.

b) Set the span to ≥ 1.5 times the DTS bandwidth.

c) Set the RBW = 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum PSD level.

11.11.3 Emission level measurement

Establish an emission level by using the following procedure:

a) Set the center frequency and span to encompass frequency range to be measured.

b) Set the RBW = 100 kHz.

c) Set the VBW ≥ [3 × RBW].

d) Detector = peak.

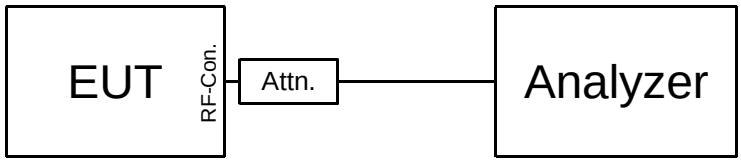
e) Sweep time = auto couple.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level.

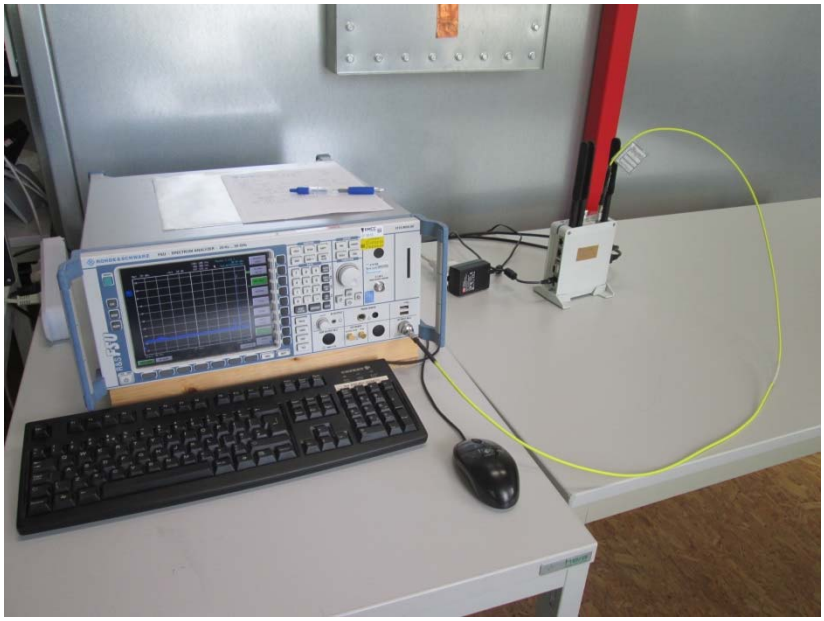
4.5.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.247
Procedure: ANSI C63.10-2013
KDB 558074 v05r02

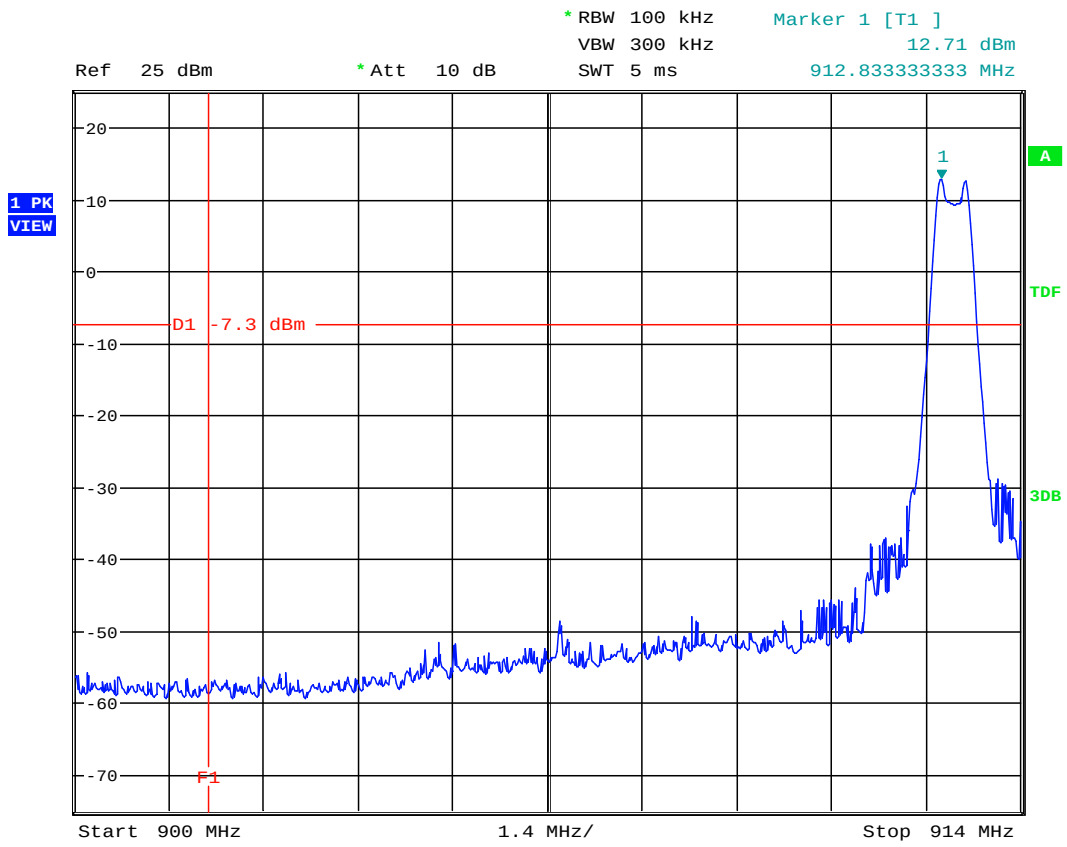
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 2891, 3061, 3831, 3880, 4524, 4717



Sample photo of setup

4.5.4 Detailed Test Data

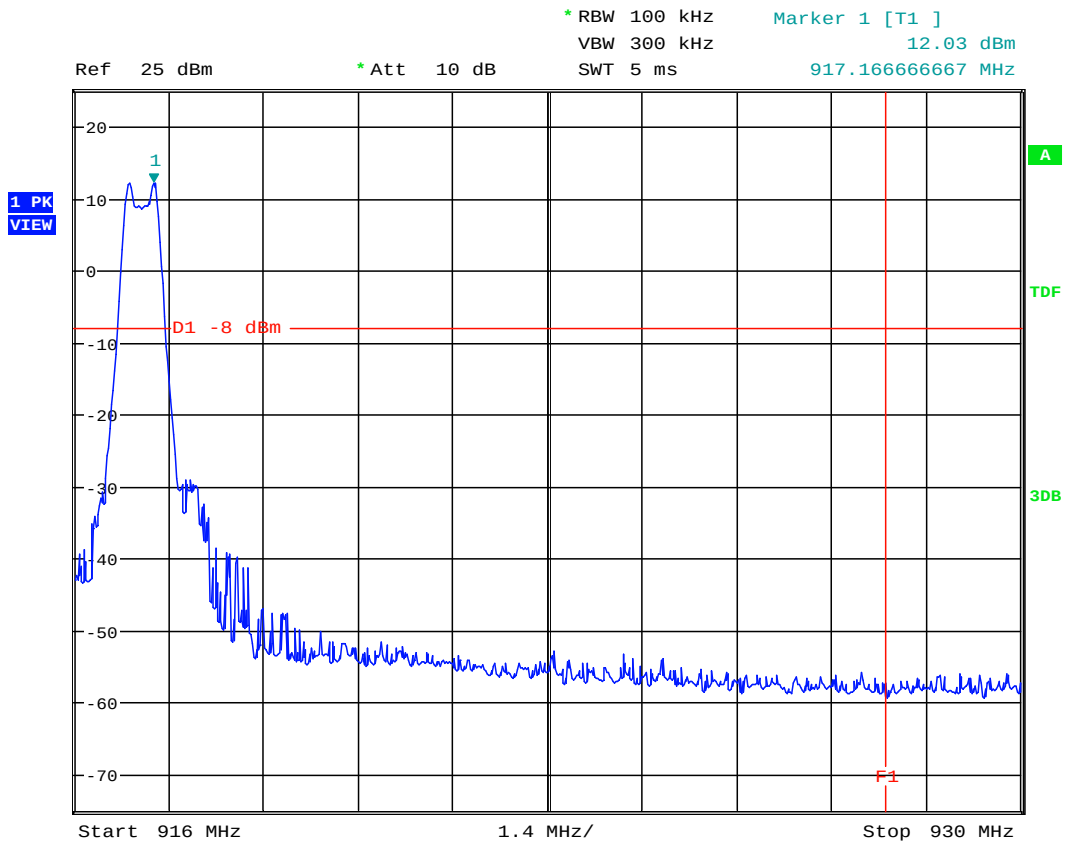
Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH 110012 00001101 Low (913 MHz)



Note: the Correction Factor was taken into account by the spectrum analyzer's offset setting capability.

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No:	00001101
Channel:	High (917 MHz)



Note: the Correction Factor was taken into account by the spectrum analyzer's offset setting capability.

4.5.5 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-07-08
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.6 Radiated Emissions

4.6.1 Regulation

47CFR § 15.33 Frequency range of radiated measurements

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

47 CFR § 15.35 Measurement detector functions and bandwidths.

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see §15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long at the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

47 CFR § 15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

47CFR §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

4.6.2 Calculation of Field Strength Limits

E.g. radiated emissions field strength limits for the frequency band 30 - 88 MHz:

100 µV/m at 3 meters

Using the equation:

$E_{dB\mu V/m} = 20 \log (E_{\mu V/m})$

where

$E_{dB\mu V/m}$ = Field Strength in logarithmic units (in dBµV/m)

$E_{\mu V/m}$ = Field Strength in linear units (in µV/m)

A field strength limit of 100 µV/m corresponds with 40.0 dBµV/m.

Distance correction (limit)
Remark: The preferred method is the correction of the measured field strength (refer to 4.2.3) instead of limit correction. Only one correction method shall be applied to a particular measurement.

If a measurement is performed in a distance other than specified, the limit may be adjusted by a Distance Extrapolation Factor DF of 20 dB per decade, which is calculated by the following equation:

$DF = 20 \log (D_{test}/D_{specification})$
where

DF = Distance Extrapolation Factor (in dB)

D_{test} = Distance, where measurement was performed (in m)

$D_{specification}$ = Distance acc. to specification (in m)

Example: Assume a limit specified in 3 m and a measurement performed at 1 m: The distance correction factor is 20 log (3 / 1) = 9.5. This factor is mathematically added to the limit by the following equation:
$E_{dB\mu V/m\_new} = E_{dB\mu V/m} + DF$
where

$E_{dB\mu V/m}$ = Field Strength limit in logarithmic units (in dBµV/m)

$E_{dB\mu V/m\_new}$ = Corrected Field Strength limit in logarithmic units (in dBµV/m)

DF = Distance Extrapolation Factor (in dB)

Example: Assume a limit of 40.0 dBµV/m specified in 3 m distance and the measurement performed at 3 m. The limit is adjusted by the distance correction factor of 9.5 dB to the new limit of 49.5 dBµV/m.

4.6.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF
where
FS = Field Strength (in dBµV/m)
RA = Receiver Amplitude (in dBµV)
AF = Antenna Factor (in dB (1/m))
CF = Cable Attenuation Factor (in dB)

Assume a receiver reading of 30 dBµV is obtained. The Antenna Factor of 10 dB(1/m) and a Cable Factor of 1.2 dB are added, giving a field strength of 41.2 dBµV/m in the measurement distance. The field strength of 41.2 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 30 + 10 + 1.2 = 41.2
Level (in µV/m) = Common Antilogarithm (41.2/20) = 114.8

For average measurements, the measured peak field strength is corrected by an AV correction factor. Please refer to chapter 2.6 for details.

Distance correction (field strength)
Remark: The preferred method is the correction of the measured field strength instead of limit correction (refer to 4.2.2). Only one correction method shall be applied to a particular measurement..

If a measurement is performed at a different distance other than specified, the field strength at the specified distance can be obtained by the following equation:

$FS_{Dspecified} = FS_{Dtest} + 20 \log (D_{test}/D_{specified})$
where
$FS_{Dspecified}$ = Field Strength at specified distance $D_{specified}$ (in dBµV/m)
FS_{DTest} = Field Strength at specified distance D_{Test} (in dBµV/m)
D_{test} = Measurement distance where test was performed (in m)
$D_{specified}$ = Measurement distance as specified by the rules (in m)

Assuming a recorded field strength of 41.2 dBµV/m in a distance of 1 m. If the rules are specifying a limit in a distance of 3 m, the field strength recorded in 1 m is corrected by the distance. Therefore, the field strength $FS_{Dspecified}$ is 41.2 + 20 log (1 / 3) = 31.7 (in dBµV/m).

Remark: Using EMC32 software corrections are combined in the Corr. Factor as listed in the results' table. "Result" represents the FS Result), "Corr." is the combined correction factor.

4.6.4 Radiated Emissions 9 kHz – 30 MHz

4.6.4.1 Test Procedures

ANSI C63.10-2013, 6.4.3 Measuring antenna selection, location, and test distance
Radiated emission tests shall be performed in the frequency range of 9 kHz to 30 MHz, using a calibrated loop antenna as specified in 4.3.2, at a suitable site and measurement distance as specified in 5.3. This method is applicable for measuring radiated RF emissions from all units, cables, power cords, and interconnect cabling or wiring of the EUT, by applying the guidance provided in 5.10 along with guidance provided subsequently.

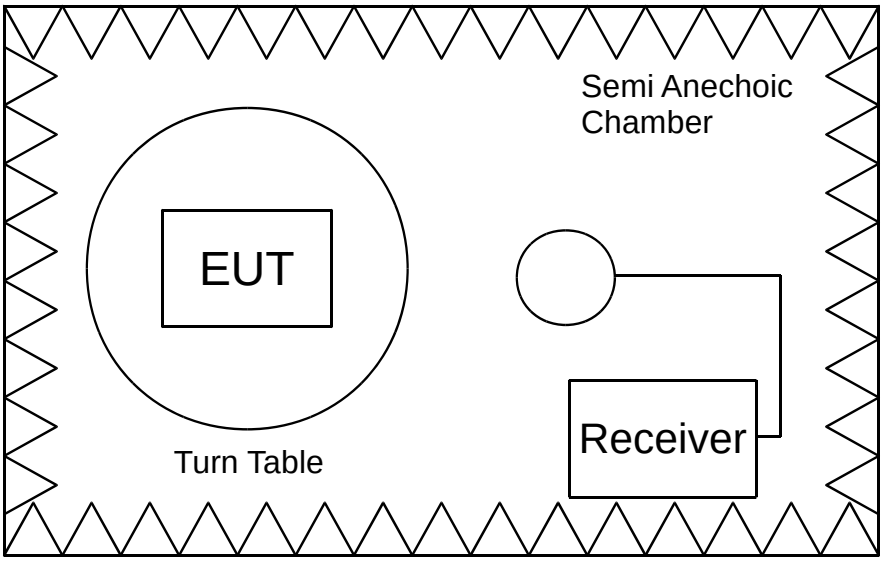
ANSI C63.10-2013, 6.4.6 Exploratory radiated emission tests
The tests shall be performed in the frequency range specified in 5.5 and 5.6, using the procedures in Clause 5, applying the appropriate modulating signal to the EUT, to determine cable or wire positions of the EUT system that produce the emission with the highest amplitude relative to the limit.
Exploratory measurements below 30 MHz are useful in determining the maximum level of emissions while manipulating and rotating the EUT; however, exploratory and final measurements may be made concurrently, provided care is taken to determine the maximum level of emissions for all configurations and orientations.
The test arrangement, measuring antenna guidelines and operational configurations in 6.3.1 and 6.3.2, shall be followed. The measurement antenna shall be positioned with its plane perpendicular to the ground at the specified distance. When perpendicular to the ground plane, the lowest height of the magnetic antenna shall be 1 m above the ground and shall be positioned at the specified distance from the EUT. When the EUT contains a loop antenna that can only be placed in a vertical axis, normal measurements shall be made aligning the measurement antenna along the site axis, and then orthogonal to the axis. For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable. When the EUT contains a loop antenna that can be placed in a horizontal or vertical axis, normal measurements shall be made aligning the measurement antenna along the site axis, orthogonal to the axis, and then with the measurement antenna horizontal. For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable. The report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB, then the following statement shall be made: “all emissions were greater than 20 dB below the limit.”

ANSI C63.10-2013, 6.4.7 Final radiated emission tests
Using the orientation and equipment arrangement of the EUT determined in 6.4.6, and applying the appropriate modulating signal to the EUT, perform final radiated emission measurements on the fundamental and highest spurious emissions. Unless otherwise specified by the regulatory authority, the instrumentation, detector functions, and bandwidths specified in 4.1.4.2.1 shall be used. For pulsed emissions, the procedure in 4.1.4.2.4 shall be used.

Radiated Emissions Test Characteristics	
Frequency range	9 kHz – 30 MHz
Test distance	3 m
EUT height	0.8 m
Test instrumentation resolution bandwidth	200 Hz (< 150 kHz) 9 kHz (≥ 150 kHz)
Receive antenna height	1 m
Receive antenna orientations	2
Measurement chamber	Semi anechoic chamber (SAC)

Following the test procedure described in KDB 414788, an open field measurement has to be performed in addition to the measurements performed in a semi anechoic chamber to evaluate a correction of the open field measurement to the semi-anechoic chamber measurement.
Since laboratory experience has shown, that the correction factor is always negative, resulting in a lower level at the open field, these open field measurements are omitted, if there are all measurement emissions more than 20 dB below the limit.

4.6.4.2 Test Setup

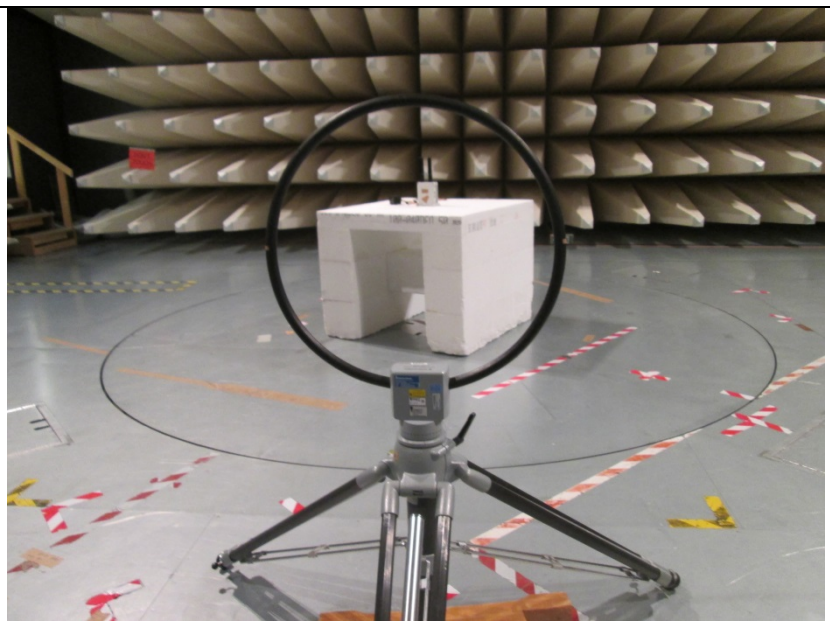


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.209
Procedure: ANSI C63.10-2013

Test distance: 3 m
EUT height: 0.8 m

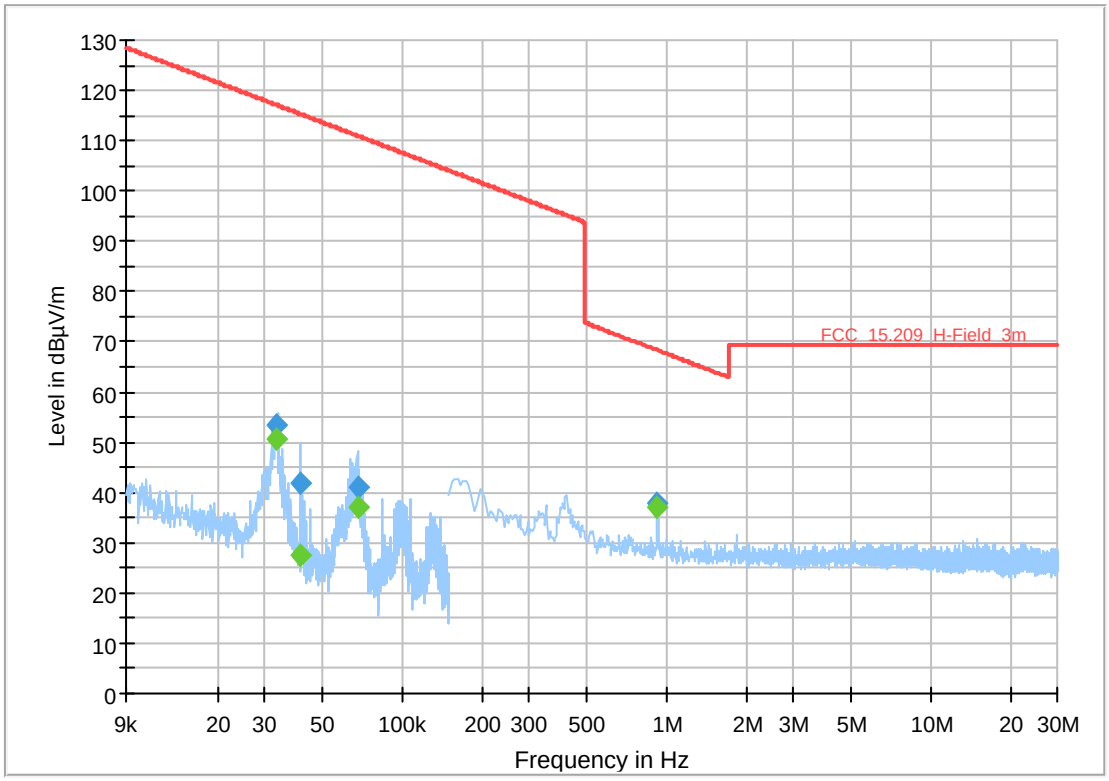
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 374, 1889, 1292, 3846, 3880, 4075, 4717, 5392



Sample photo of setup

4.6.4.3 Detailed Test Data

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Low (913 MHz)

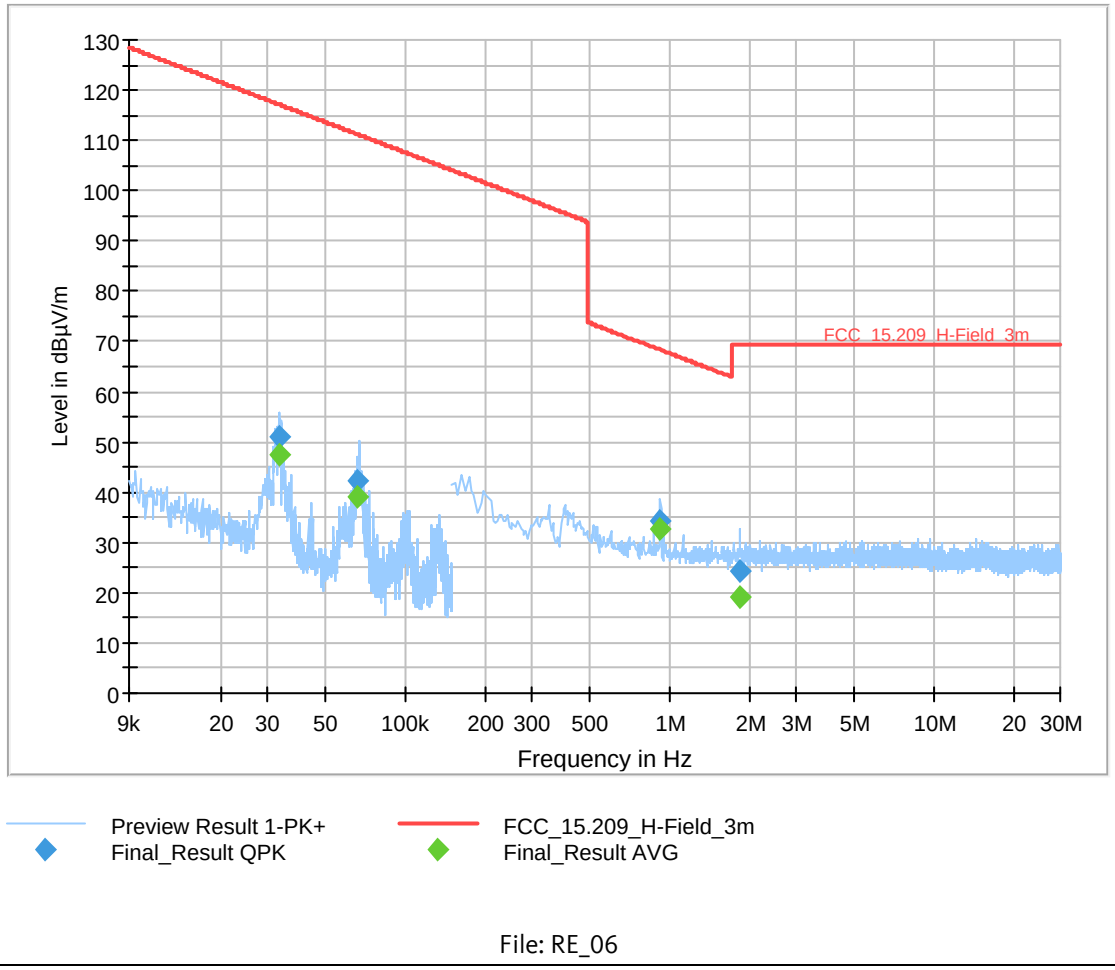


File: RE_07

All tests performed at the distance of 3m. The limit was adjusted to correspond with the test distance.

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 High (917 MHz)



File: RE_06

All tests performed at the distance of 3m1. The limit was adjusted to correspond with the test distance.

Final Result:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol --	Azimuth deg	Corr. dB/m

All emissions were greater than 20 dB below the limit.
Therefore, no final measurement performed.

All tests performed at the distance of 3m. The limit was adjusted to correspond with the test distance.
The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

4.6.4.4 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	27
Test date:	2019-07-03
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.6.5 Radiated Emissions 30 MHz – 1000 MHz

4.6.5.1 Test Procedures

ANSI C63.10-2013 6.5 Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz

This subclause specifies conditions for compliance testing in the frequency range above 30 MHz and below 1 GHz. The following subclauses describe the procedures that shall be used for making exploratory and final radiated emission tests for frequencies between 30 MHz and 1000 MHz. Measurements may be performed at a distance closer than that specified in the requirements, provided the measuring antenna is beyond its near-field range as determined by the Rayleigh criteria.

ANSI C63.10-2013, 6.5.3 Exploratory radiated emission tests

Exploratory measurements are used to identify the frequencies and amplitudes of the emissions while manipulating and rotating the EUT.

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. Exploratory measurements shall be made on a test site per 5.2. Shielded rooms, not treated with RF absorption material, shall not be used for exploratory measurements.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.

ANSI C63.10-2013, 6.5.4 Final radiated emission tests

Using the orientation and equipment arrangement of the EUT, and based on the measurement results found during the exploratory measurement in 6.5.3, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement. The final measurement shall follow all the procedures in 6.3 with the EUT operating on frequencies per 5.6. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable) and the frequency and amplitude of the six highest spurious emissions relative to the limit; emissions more than 20 dB below the limit do not need to be reported.

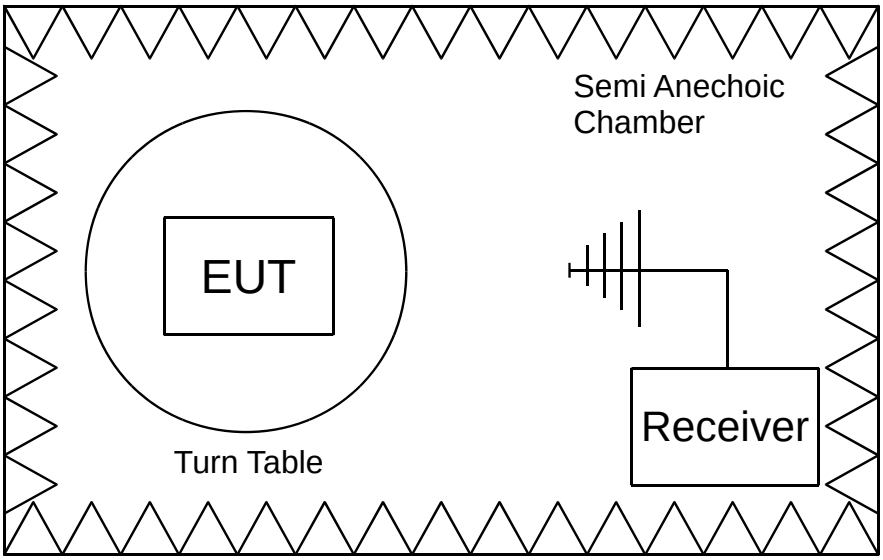
Measurements are performed with the EUT rotated from 0° to 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Variations in cable or wire placement shall be explored to maximize the measured emissions.

Unless specified otherwise by the regulatory authority, the instrumentation, detector functions, and bandwidths specified in 4.1.4.2.1 and 4.1.4.2.2 shall be used. For pulsed emissions, the procedure in 4.1.4.2.4 shall be used.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 1000 MHz
Test distance	3 m
EUT height	0.8 m
Test instrumentation resolution bandwidth	120 kHz
Receive antenna height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal
Measurement location	Semi Anechoic Chamber (SAC)

4.6.5.2 Test Setup

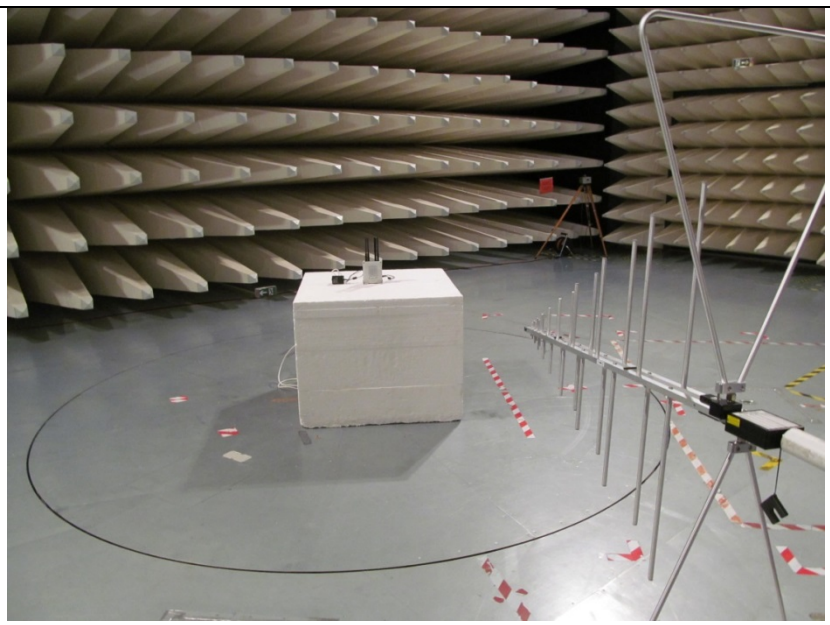


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.209
Procedure: ANSI C63.10-2013

Test distance: 3 m
EUT height 0.8 m

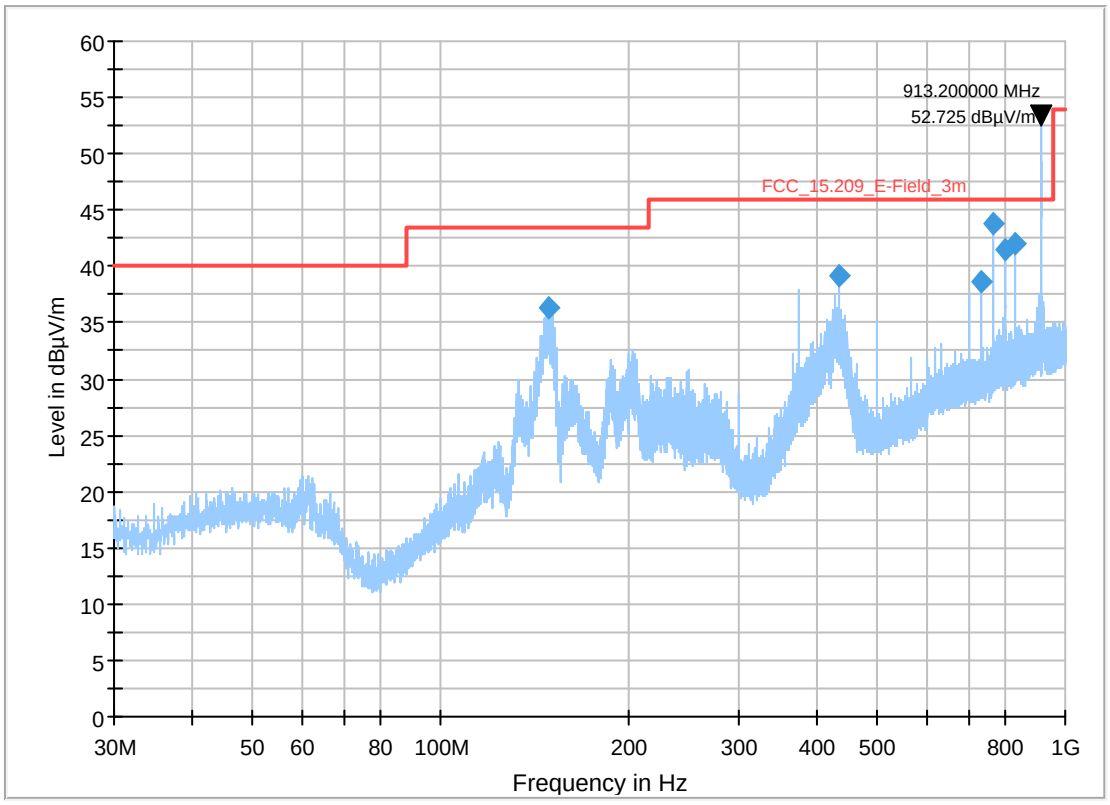
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 54, 1291, 1292, 1807, 1889, 2724, 3846, 3880, 4075, 4717, 5392, 6041



Sample photo of setup

4.6.5.3 Detailed Test Data

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Low (913 MHz)

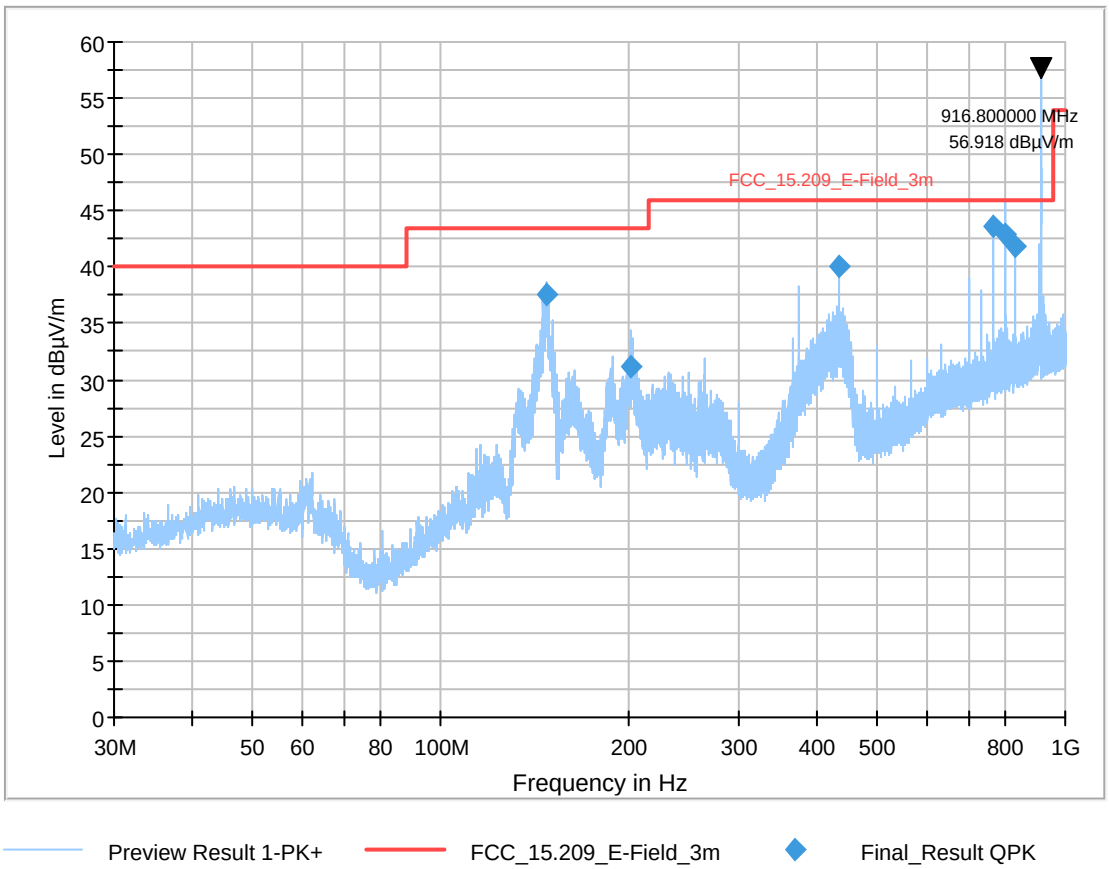


File: RE_04

The carrier frequency was attenuated by a notch filter and not taken into account for spurious emission results.

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 High (917 MHz)



File: RE_05

The carrier frequency was attenuated by a notch filter and not taken into account for spurious emission results

Final Result:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth Hz	Height cm	Pol --	Azimuth deg	Corr. dB/m
147.94	37.5	43.5	6.0	1000	120.0	219.0	H	69	13.8
201.70	31.2	43.5	12.4	1000	120.0	204.0	H	-134	17.5
433.38	40.0	46.0	6.0	1000	120.0	100.0	V	115	23.2
733.38	38.7	46.0	7.3	1000	120.0	100.0	H	-90	28.0
766.74	43.8	46.0	2.2	1000	120.0	100.0	H	-90	28.4
800.06	42.9	46.0	3.1	1000	120.0	101.0	H	-90	28.6
833.38	42.0	46.0	4.0	1000	120.0	100.0	H	-105	28.9

The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

4.6.5.4 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	27
Test date:	2019-07-02/03
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.6.6 Radiated Emissions 1 – 6 GHz

4.6.6.1 Test Procedures

ANSI C63.10-2013, 6.6.4.1 General

Subclauses 6.6.4.2 and 6.6.4.3 describe the procedures that shall be used for making exploratory and final radiated emission tests for frequencies above 1 GHz. Measurements may be performed at a distance closer than that specified in the requirements; however, an attempt shall be made to avoid making measurements in the near field of both the measurement antenna and the EUT for final measurements.

In performing these measurements, the sensitivity of the complete measurement system relative to the limit shall be determined before the test. If the overall measurement sensitivity does not provide a noise floor more than 6 dB below the limit, then low-noise preamplifiers, closer test distances, higher gain antennas, or narrower bandwidths might be required. If closer measurement distances are used, then the beamwidth of the measurement antenna versus the size of the EUT shall be taken into account. Also, measurement system overload protection shall be determined to be adequate when preamplifiers are used [see item b) of 4.1.3]. The effects of using bandwidths different from those specified shall also be determined (see also 6.3). Any changes from the specific measurement conditions shall be described in the report of the measurements (see also Annex E).

Install an appropriate filter at the input of the measurement system power amplifier. This filter shall attenuate the fundamental emission of the EUT and allow an accurate measurement of the associated harmonics and spurious emissions. The filter shall be characterized, and any attenuation/loss factors shall be accounted for in the measurement results.

Data shall be recorded in peak and average detection upto the highest measurement frequency required (unless stated otherwise in the applicable requirements).

ANSI C63.10-2013, 6.6.4.2 Exploratory radiated emissions measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

Preliminary tests shall be performed following the procedures in 6.3 on a site meeting the requirements of 5.2. For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of test. If either antenna height or EUT azimuth are not fully measured during exploratory testing, then complete testing can be required at the OATS or semi-anechoic chamber when the final full spectrum testing is performed.

ANSI C63.10.2013, 6.6.4.3 Final radiated emissions measurements

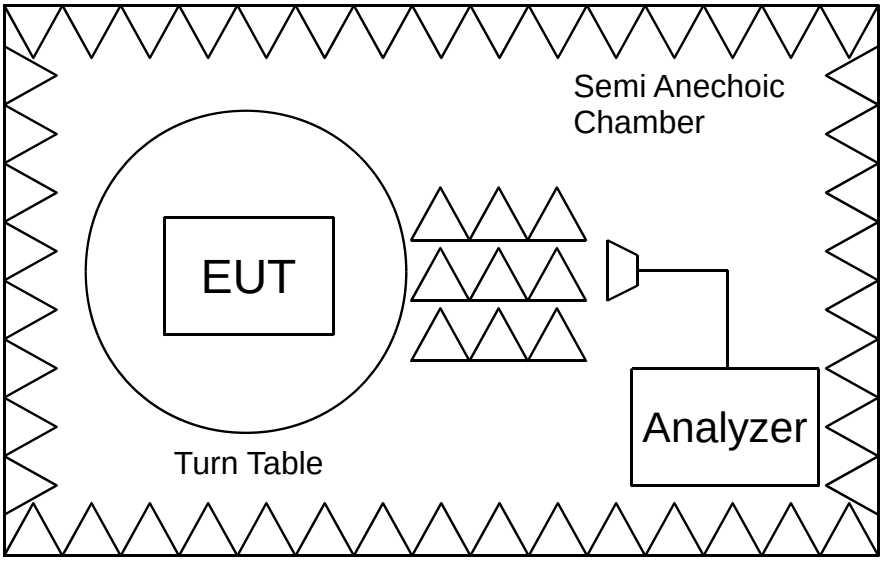
The final measurements are performed on a site meeting the requirements of 5.2. Using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements per 6.6.4.2, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement. The final measurement shall follow all the procedures in 6.3 with the EUT operating on frequencies per 5.6. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

Measurements are performed with the EUT rotated from 0° to 360°; the antenna height scanned in accordance with 6.6.3.1, 6.6.3.2, or 6.6.3.3, as appropriate; and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement shall be explored to maximize the measured emissions.

The emission signal shall be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT is measured. This may be achieved by either pointing the antenna at an angle toward the source of the emission or by testing the EUT as described in 6.6.3.3.
If the emission is pulsed, then refer to Annex C for guidelines on selecting bandwidth and determining pulse desensitization factors, as necessary.
As noted in 6.6.4.1, when performing these measurements, the sensitivity of the complete measurement system relative to the limit shall be determined before the test. If the overall measurement sensitivity is inadequate, then low-noise preamplifiers, closer measurement distances, higher gain antennas, or narrower bandwidths may be used. If closer measurement distances or higher gain antennas are used, then the beamwidth of the measurement antenna versus the physical size of the EUT shall be taken into account, so that the physical sizes of the EUT dimensions are encompassed by the beamwidth of the measurement antenna. Also, measurement system overload protection shall be determined to be adequate when preamplifiers are used. The effects on the measured emission value using bandwidths different from those specified shall be determined if such bandwidth changes are made. Any changes from the specific measurement conditions shall be described in the report of the measurements.
Unless specified otherwise by the regulatory authority, the instrumentation, detector functions, and bandwidths specified in 4.1.4.2.1 and 4.1.4.2.2 shall be used. For pulsed emissions, the procedure in 4.1.4.2.4 shall be used.

Radiated Emissions Test Characteristics	
Frequency range	1 GHz – 6 GHz
Test distance	3 m
EUT height	1.5 m
Test instrumentation resolution bandwidth	1 MHz
Receive antenna height	1 m – 4 m
Receive antenna polarization	Vertical/Horizontal
Measurement chamber	Semi anechoic chamber (SAC) with rf absorbers on the floor

4.6.6.2 Test Setup

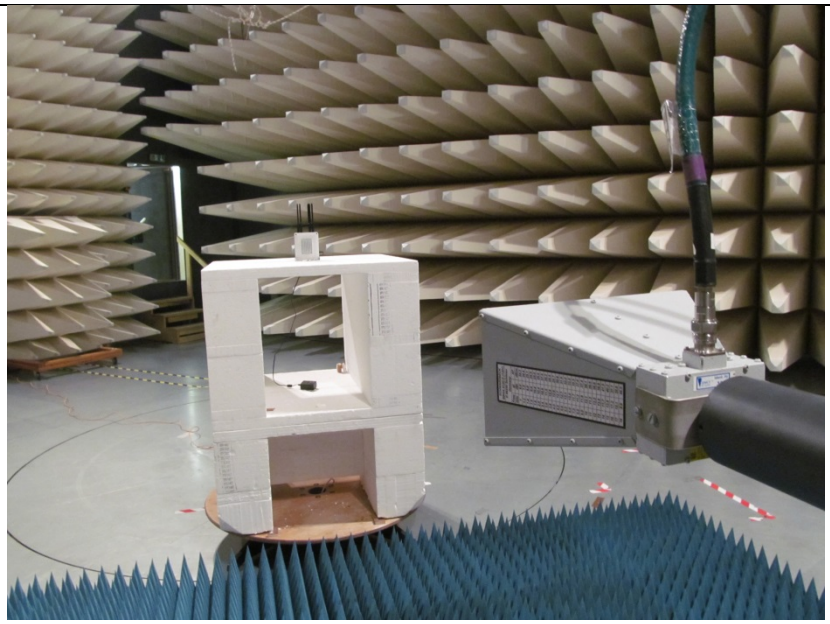


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.209
Procedure: ANSI C63.10-2013

Test distance: 3 m
EUT height: 1.5 m

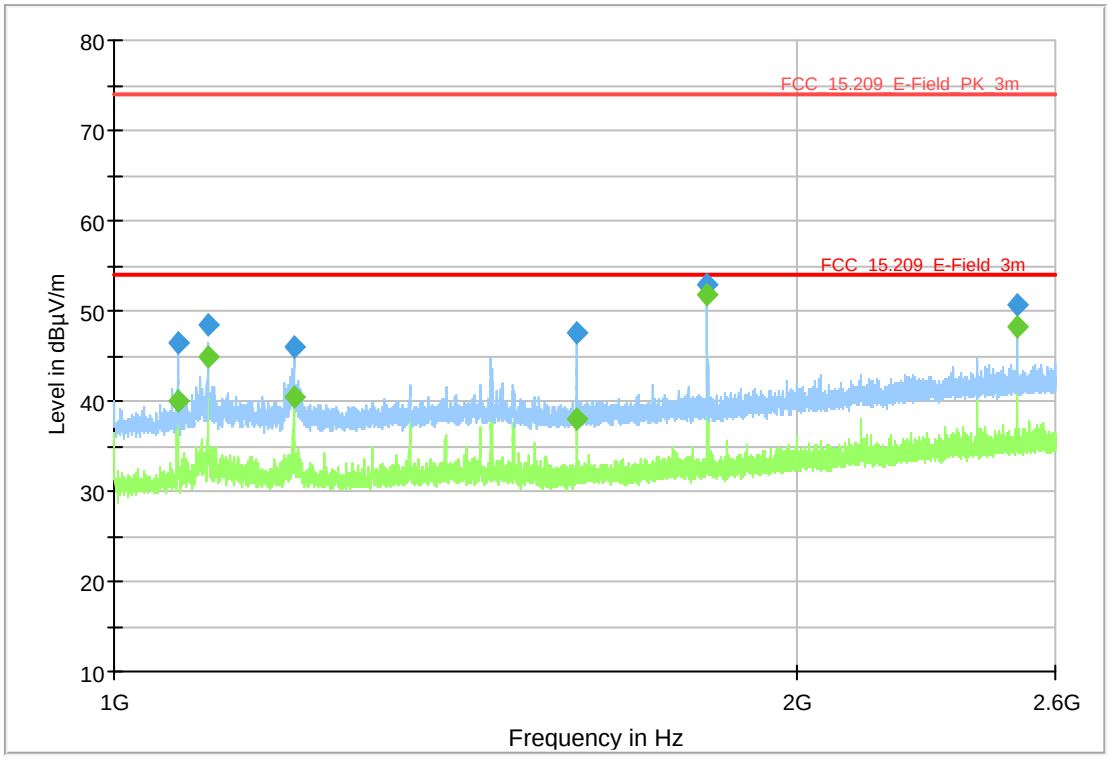
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 1036, 1037, 1889, 3235, 3831, 3880, 4075, 4717, 5366, 5392, 5535, 5536, 5544, 5545, 5616



Sample photo of setup

4.6.6.3 Detailed Test Data

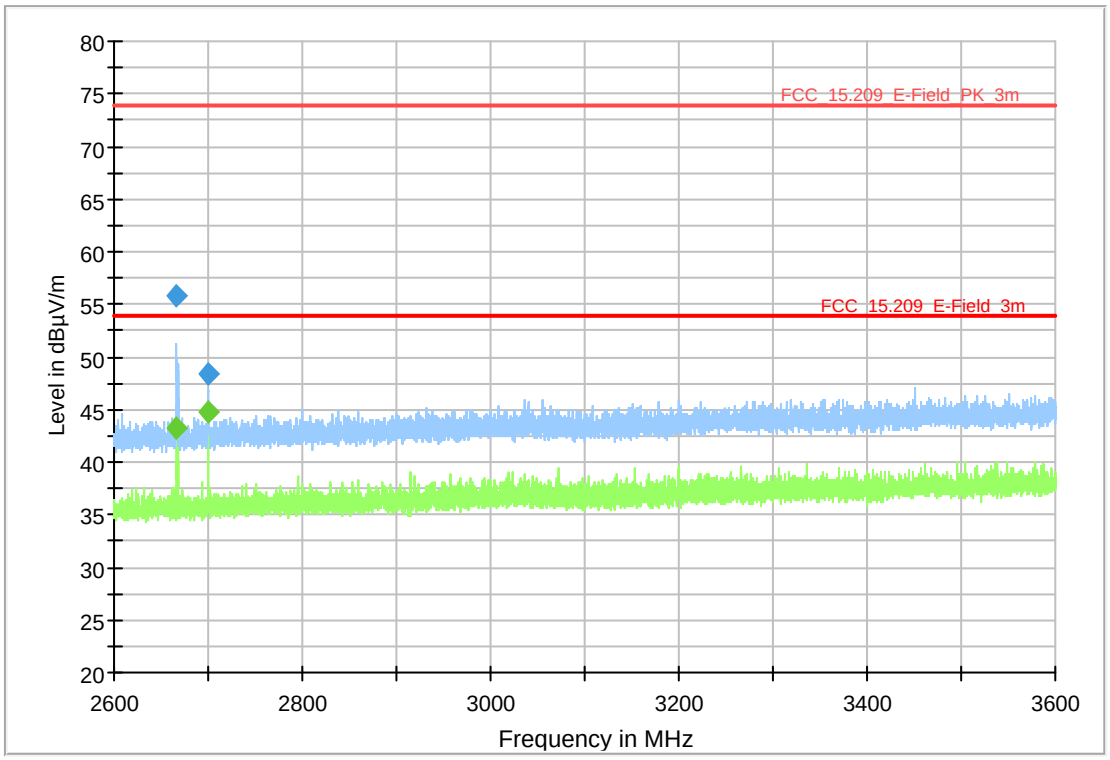
Manufacturer: Type: Serial No:: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Low (913 MHz)



File: RE_17

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

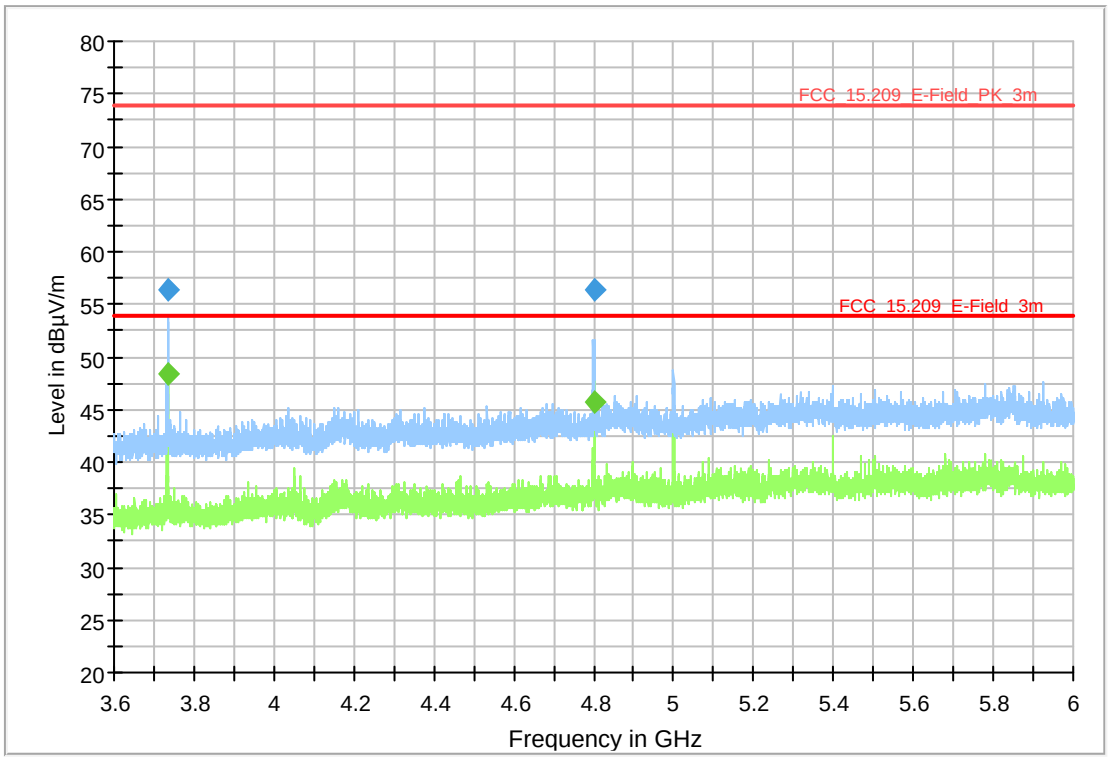
Manufacturer: Type: Serial No:: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Low (913 MHz)



File: RE_18

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

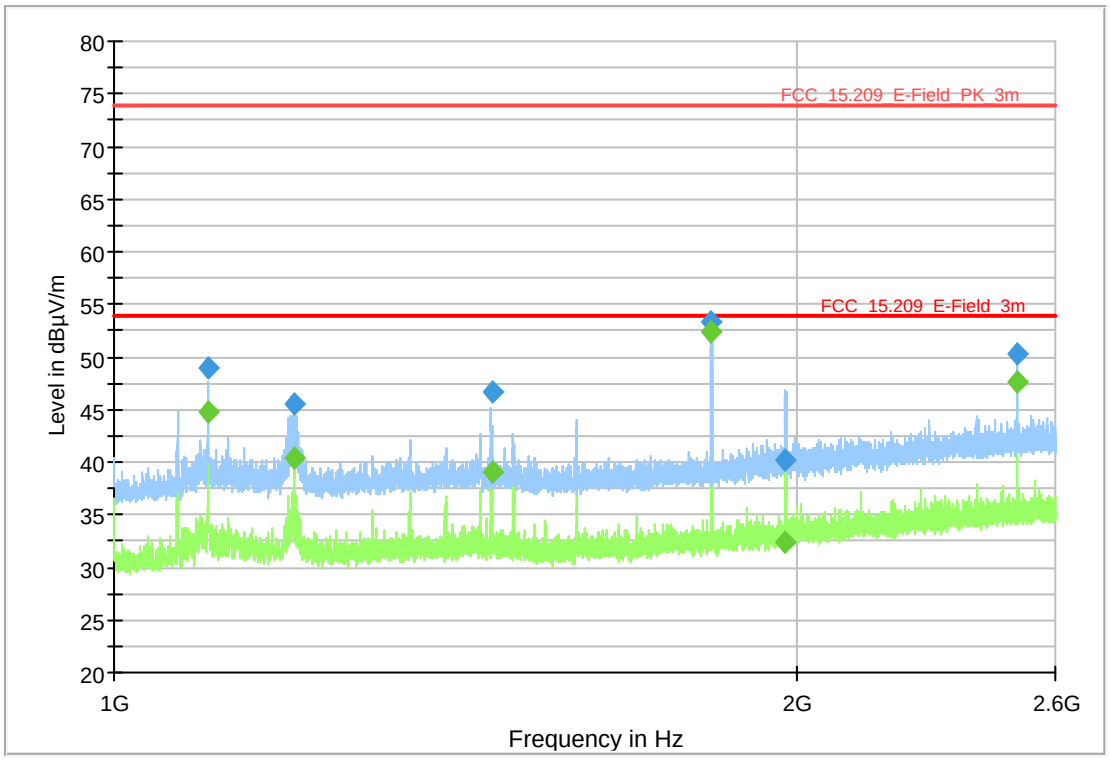
Manufacturer: Type: Serial No:: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Low (913 MHz)



File: RE_20

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

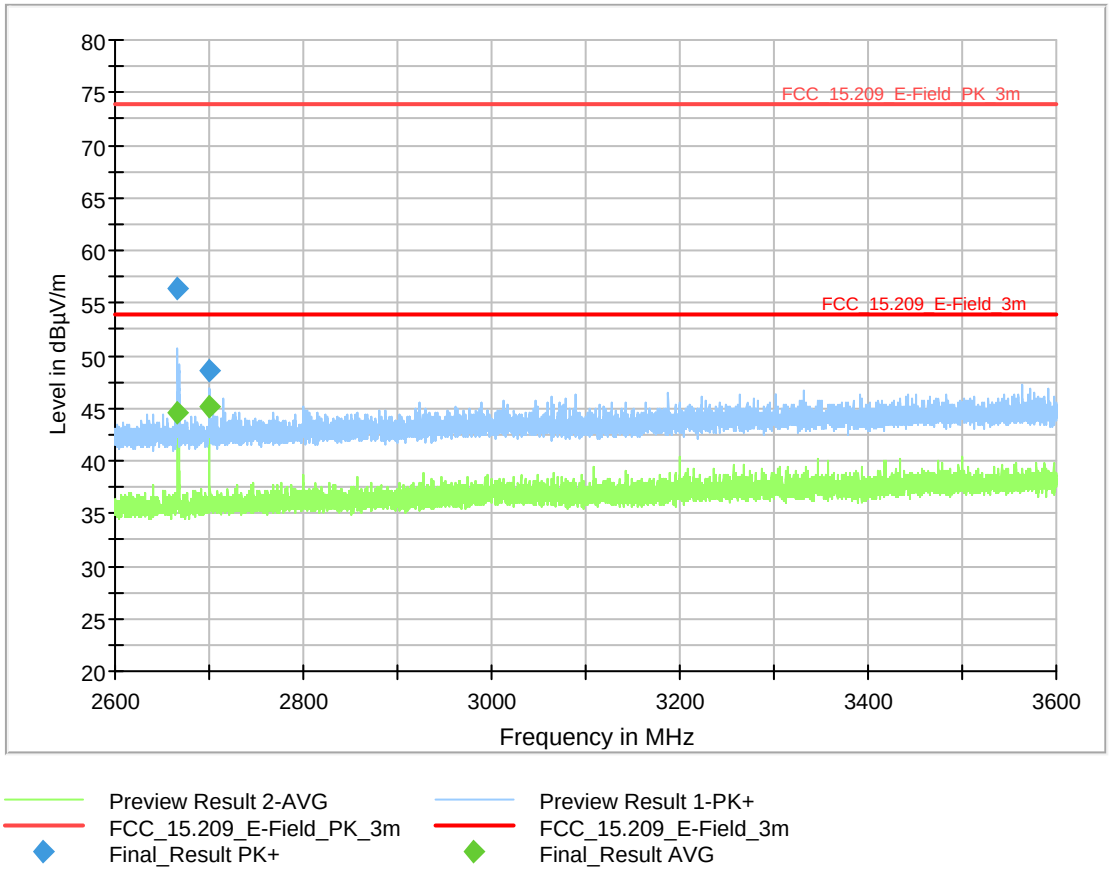
Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 High (917 MHz)



File: RE_16

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

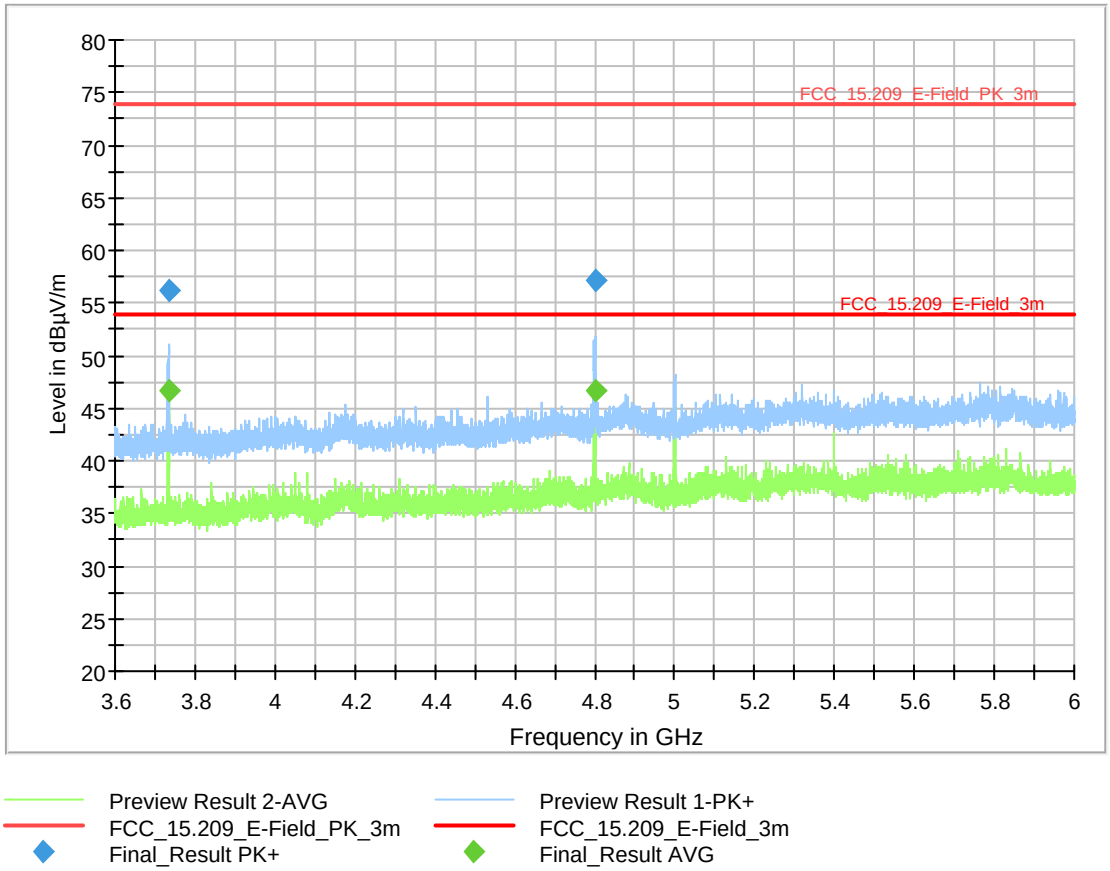
Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 High (917 MHz)



File: RE_19

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 High (917 MHz)



File: RE_21

Final Result:

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth Hz	Height cm	Pol --	Azimuth deg	Corr. dB/m
1066.7	46.5	---	74.0	27.5	100	1000.0	172.0	V	140	25.8
1066.7	---	39.9	54.0	14.1	100	1000.0	172.0	V	140	25.8
1100.1	---	44.8	54.0	9.2	100	1000.0	200.0	V	140	25.9
1100.1	49.0	---	74.0	25.0	100	1000.0	200.0	V	140	25.9
1200.0	46.0	---	74.0	28.0	100	1000.0	150.0	H	314	26.2
1200.0	---	40.4	54.0	13.6	100	1000.0	150.0	H	314	26.2
1467.1	46.7	---	74.0	27.3	100	1000.0	158.0	H	151	26.5
1467.1	---	39.1	54.0	14.9	100	1000.0	158.0	H	151	26.5
1599.9	47.5	---	74.0	26.5	100	1000.0	184.0	H	115	26.3
1599.9	---	37.9	54.0	16.1	100	1000.0	184.0	H	115	26.3
1825.6	---	51.8	54.0	2.2	100	1000.0	224.0	V	0	26.8
1825.6	53.0	---	74.0	21.0	100	1000.0	224.0	V	0	26.8
1834.4	---	52.3	54.0	1.7	100	1000.0	190.0	V	22	26.8
1834.4	53.3	---	74.0	20.7	100	1000.0	190.0	V	22	26.8
2500.2	---	48.3	54.0	5.7	100	1000.0	301.0	H	193	29.2
2500.2	50.6	---	74.0	23.4	100	1000.0	301.0	H	193	29.2
2666.8	56.4	---	74.0	17.6	100	1000.0	256.0	H	188	29.5
2666.8	---	44.6	54.0	9.4	100	1000.0	256.0	H	188	29.5
2700.3	48.5	---	74.0	25.5	100	1000.0	150.0	H	102	29.6
2700.3	---	45.1	54.0	8.9	100	1000.0	150.0	H	102	29.6
3733.7	56.4	---	74.0	17.6	100	1000.0	307.0	H	142	31.4
3733.7	---	48.3	54.0	5.7	100	1000.0	307.0	H	142	31.4
4800.2	57.2	---	74.0	16.9	100	1000.0	219.0	H	198	33.7
4800.2	---	46.7	54.0	7.3	100	1000.0	219.0	H	198	33.7

The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

4.6.6.4 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-07-04
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.6.7 Radiated Emissions 6 – 10 GHz

4.6.7.1 Test Procedures

ANSI C63.10-2013, 6.6.4.1 General

Subclauses 6.6.4.2 and 6.6.4.3 describe the procedures that shall be used for making exploratory and final radiated emission tests for frequencies above 1 GHz. Measurements may be performed at a distance closer than that specified in the requirements; however, an attempt shall be made to avoid making measurements in the near field of both the measurement antenna and the EUT for final measurements.

In performing these measurements, the sensitivity of the complete measurement system relative to the limit shall be determined before the test. If the overall measurement sensitivity does not provide a noise floor more than 6 dB below the limit, then low-noise preamplifiers, closer test distances, higher gain antennas, or narrower bandwidths might be required. If closer measurement distances are used, then the beamwidth of the measurement antenna versus the size of the EUT shall be taken into account. Also, measurement system overload protection shall be determined to be adequate when preamplifiers are used [see item b) of 4.1.3]. The effects of using bandwidths different from those specified shall also be determined (see also 6.3). Any changes from the specific measurement conditions shall be described in the report of the measurements (see also Annex E).

Install an appropriate filter at the input of the measurement system power amplifier. This filter shall attenuate the fundamental emission of the EUT and allow an accurate measurement of the associated harmonics and spurious emissions. The filter shall be characterized, and any attenuation/loss factors shall be accounted for in the measurement results.

Data shall be recorded in peak and average detection upto the highest measurement frequency required (unless stated otherwise in the applicable requirements).

ANSI C63.10-2013, 6.6.4.2 Exploratory radiated emissions measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

Preliminary tests shall be performed following the procedures in 6.3 on a site meeting the requirements of 5.2. For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of test. If either antenna height or EUT azimuth are not fully measured during exploratory testing, then complete testing can be required at the OATS or semi-anechoic chamber when the final full spectrum testing is performed.

ANSI C63.10.2013, 6.6.4.3 Final radiated emissions measurements

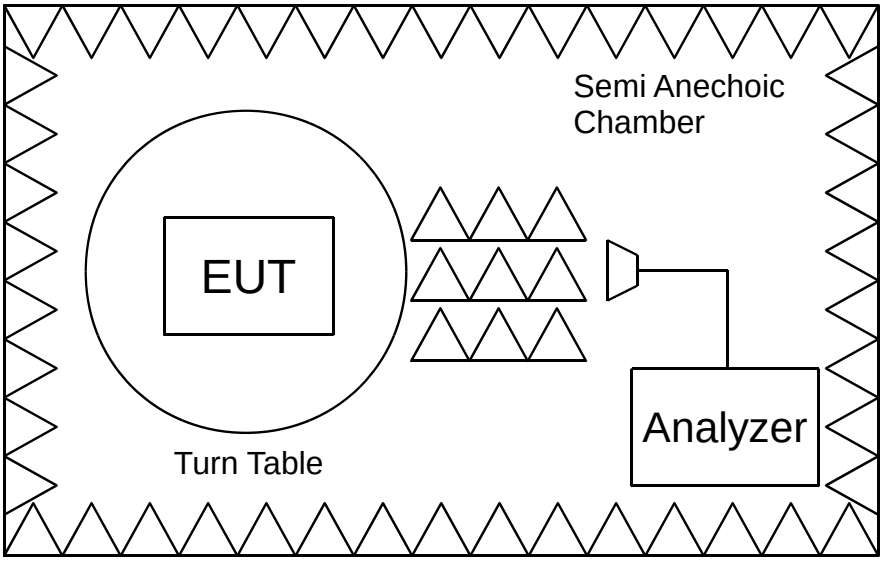
The final measurements are performed on a site meeting the requirements of 5.2. Using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements per 6.6.4.2, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement. The final measurement shall follow all the procedures in 6.3 with the EUT operating on frequencies per 5.6. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

Measurements are performed with the EUT rotated from 0° to 360°; the antenna height scanned in accordance with 6.6.3.1, 6.6.3.2, or 6.6.3.3, as appropriate; and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement shall be explored to maximize the measured emissions.

The emission signal shall be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT is measured. This may be achieved by either pointing the antenna at an angle toward the source of the emission or by testing the EUT as described in 6.6.3.3.
If the emission is pulsed, then refer to Annex C for guidelines on selecting bandwidth and determining pulse desensitization factors, as necessary.
As noted in 6.6.4.1, when performing these measurements, the sensitivity of the complete measurement system relative to the limit shall be determined before the test. If the overall measurement sensitivity is inadequate, then low-noise preamplifiers, closer measurement distances, higher gain antennas, or narrower bandwidths may be used. If closer measurement distances or higher gain antennas are used, then the beamwidth of the measurement antenna versus the physical size of the EUT shall be taken into account, so that the physical sizes of the EUT dimensions are encompassed by the beamwidth of the measurement antenna. Also, measurement system overload protection shall be determined to be adequate when preamplifiers are used. The effects on the measured emission value using bandwidths different from those specified shall be determined if such bandwidth changes are made. Any changes from the specific measurement conditions shall be described in the report of the measurements.
Unless specified otherwise by the regulatory authority, the instrumentation, detector functions, and bandwidths specified in 4.1.4.2.1 and 4.1.4.2.2 shall be used. For pulsed emissions, the procedure in 4.1.4.2.4 shall be used.

Radiated Emissions Test Characteristics	
Frequency range	6 GHz – 10 GHz
Test distance	1 m
EUT height	1.5 m
Test instrumentation resolution bandwidth	1 MHz
Receive antenna height	1 m – 2 m
Receive antenna polarization	Vertical/Horizontal
Measurement chamber	Semi anechoic chamber (SAC) with rf absorbers on the floor

4.6.7.2 Test Setup

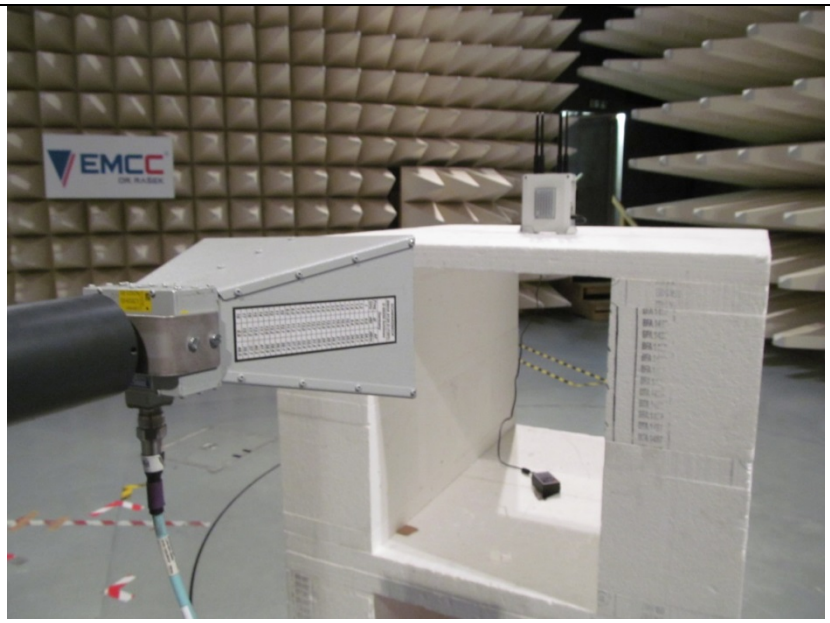


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.209
Procedure: ANSI C63.10-2013

Test distance: 1 m
EUT height: 1.5 m

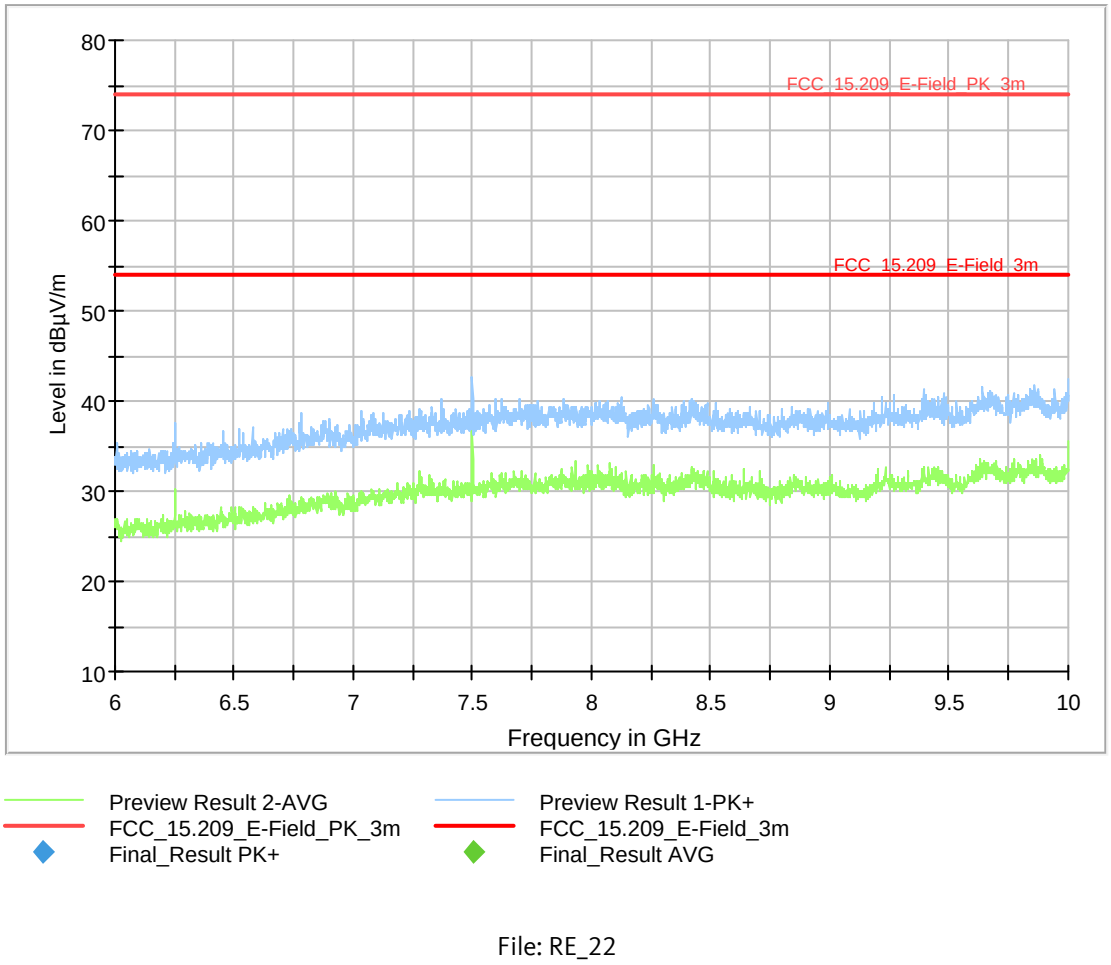
TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 1889, 3235, 3831, 3880, 4075, 4717, 5366, 5392, 5535, 5536, 5544, 5545, 5616



Sample photo of setup

4.6.7.3 Detailed Test Data

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Low (913 MHz)

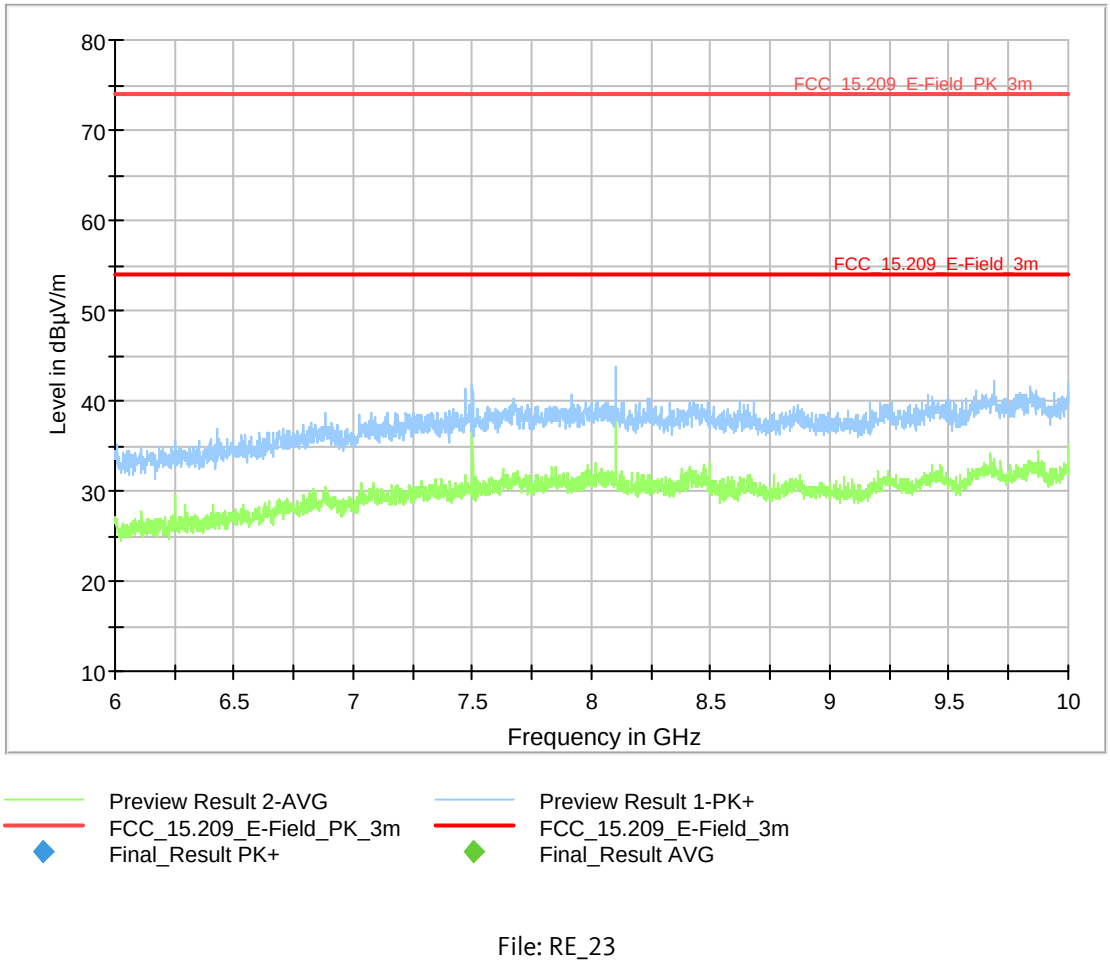


File: RE_22

All tests performed at the distance of 1 m. The measurement value was adjusted to correspond with the 3 m limit.

Test on MYNXG Product GmbH 110012 to 47 CFR § 15.247 and KDB 558074 D01 15.247 Meas Guidance v05r02

Manufacturer: Type: Serial No: Channel:	MYNXG Product GmbH Edge FCR 3 110012 00001101 High (917 MHz)



File: RE_23

All tests performed at the distance of 1 m. The measurement value was adjusted to correspond with the 3 m limit.

Final Result:

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth Hz	Height cm	Pol --	Azimuth deg	Corr. dB/m
		All emissions are far away from the limit, therefore no final measurement performed.								

All tests performed at the distance of 1 m. The measurement value was adjusted to correspond with the 3 m limit.. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

4.6.7.4 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-07-04
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

4.7 AC Power Line Conducted Emissions

4.7.1 Regulation

47 CFR § 15.207 Conducted limits

a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

*Decreases with the logarithm of the frequency.

4.7.2 Test Procedures

ANSI C63.10-2013, 6.2.2 Measurement requirements

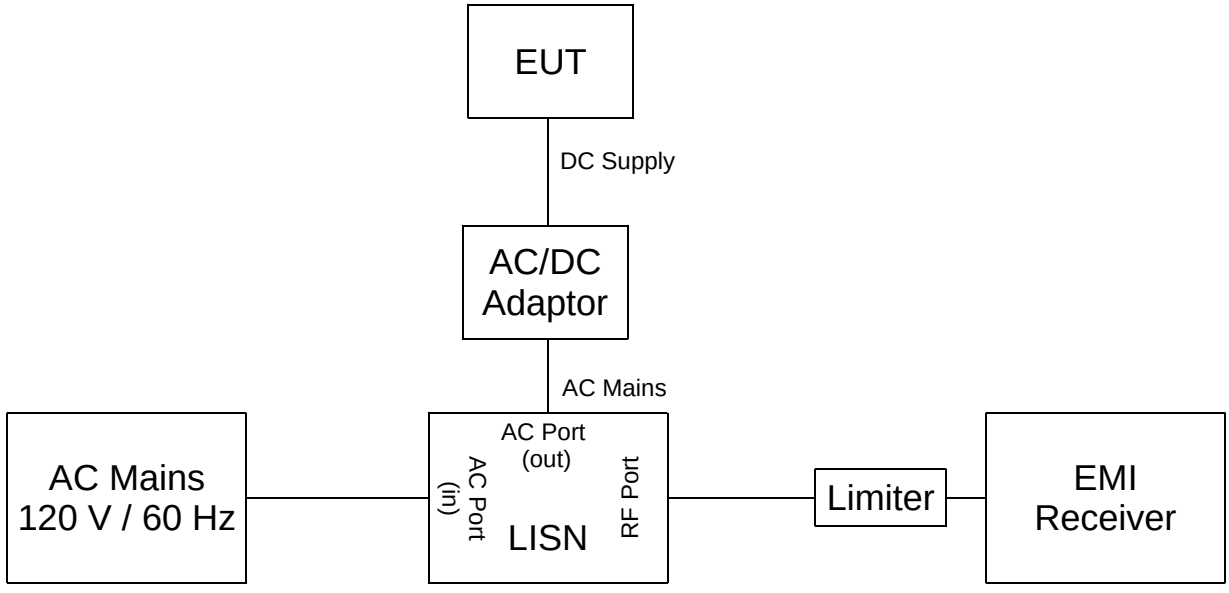
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads. Figure 4 shows typical test setups of radiated measurements. Note the optional LISN in this figure. Figure 5 and Figure 6 show typical test setups for ac power-line conducted emissions testing (see 6.12). For information about the use of an RF-shielded (screened) room, vertical conducting plane, and voltage probe, see ANSI C63.4.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

ANSI C63.10-2013, 6.3.2.2 Placement of tabletop EUTs

A stand-alone EUT shall be placed in the center along the back edge of the tabletop. For multiunit tabletop systems, the EUT shall be centered laterally (left to right facing the tabletop) on the tabletop and its rear shall be flush with the rear of the table.

4.7.3 Test Setup



SCHEMATIC TEST SETUP

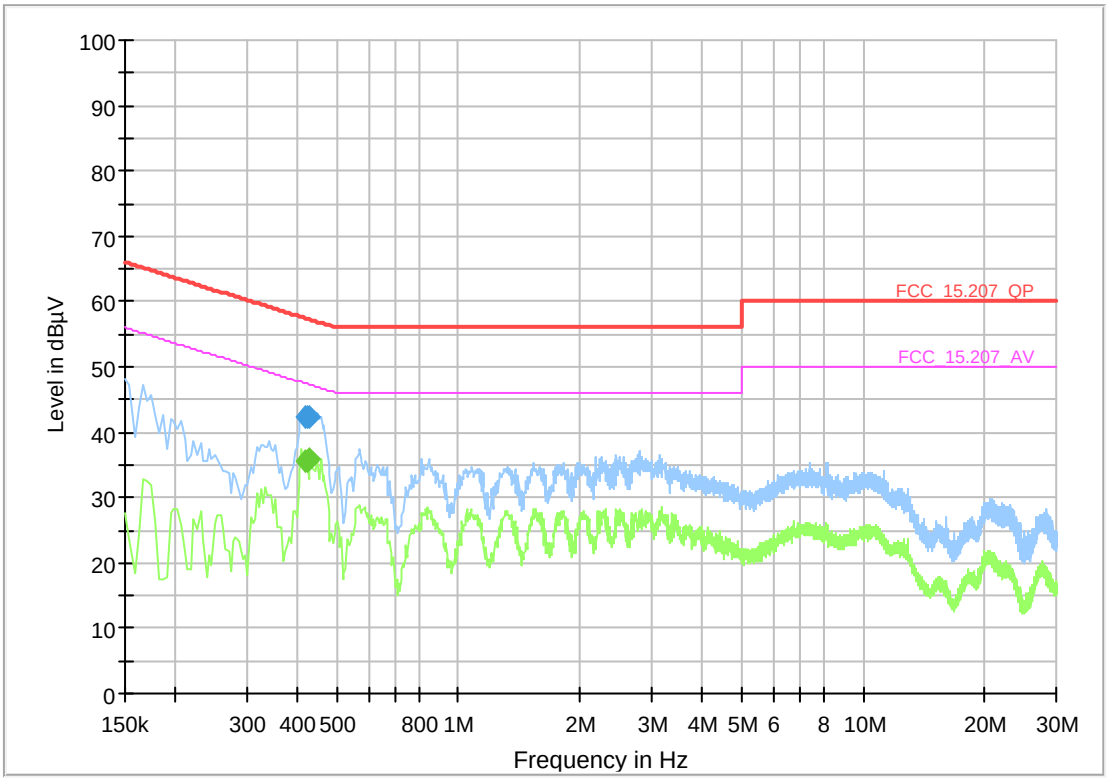
Requirement: 47 CFR, § 15.207
Procedure: ANSI C63.10-2013

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 1519, 1901, 3880, 3846, 4524, 4717, 5392, 5551

Sample photo of setup

4.7.4 Detailed Test Data

Manufacturer: Type: Serial No: Mode:	MYNXG Product GmbH Edge FCR 3 110012 00001101 Continuous Transmission



File: CE_03

Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line
0.4175	42.28	---	57.50	15.22	N
0.4175	---	35.70	47.50	11.80	N
0.4215	42.36	---	57.42	15.06	N
0.4215	---	35.66	47.42	11.76	N
0.4255	---	35.89	47.34	11.45	N
0.4255	42.35	---	57.34	14.99	N

Worst case results listed, only.

4.7.5 Test Result

Manufacturer:	MYNXG Product GmbH
Type:	110012
Serial No.:	00001101
TX Power Setting:	19
Test date:	2019-08-01
Test personnel:	Patrick Reusch

The EUT meets the requirements of this section.

5 TEST INSTRUMENTS

EMCC ID #	Instrument	Manufacturer	Model No.	Last Calibration	Calibration valid until
1	60-Hz-Converter	AEG	DAMK4/DAGK4	n/a	n/a
54	N-Cable N/50	Rohde & Schwarz	HFU2-Z5	n/a	n/a
374	Loop Antenna	Rohde & Schwarz	HFH 2-Z2	2018-11	2021-02
1036	Octave Bandpass Filter	Microphase	K0916	2019-08	2021-08
1037	Octave Bandpass Filter	Microphase	K0917	2019-08	2021-08
1291	Antenna Mast	Frankonia	FAM4	n/a	n/a
1292	Multi Device Controller	Frankonia	FC02	n/a	n/a
1519	Pulse Limiter	Rohde & Schwarz	ESH3-Z2 357.8810.52	2019-08	2020-08
1807	Tunable.Reject Filter 50W	Anthony	ATR 450-1000-3EE	n/a	n/a
1889	SR-ULL-01, Semi-Anechoic Chamber (SAC)	EMCC/FRANK.	SAC-10	n/a	n/a
1901	V-LISN 50 ohms//(50 uH + 5 ohms)	Rohde & Schwarz	ESH2-Z5	2018-11	2019-11
2724	5 W Attenuator 6dB	Weinschel	2	2019-07	2021-07
2891	2 W Attenuator 8 dB	NARDA	4779-8	2018-07	2020-07
3061	K-Cable K/50	Insulated Wire	KPS-1501-600-KPS	2019-02	2020-02
3235	Double Ridged Guide Antenna	Schwarzbeck	BBHA 9120D	2019-01	2021-01
3831	Spectrum Analyzer	Rohde & Schwarz	FSU50	2018-10	2019-10
3846	EMI Test Receiver	Rohde & Schwarz	ESU8	2019-02	2020-02
3857	RF Peak Power Meter	Boonton	4542	2018-09	2019-09
3858	Peak Power Sensor	Boonton	57518	2018-09	2019-09
3880	Digital Multimeter	Agilent	U1241B	2018-07	2020-07
4524	Notebook	Dell	Latitude E6430	n/a	n/a
4075	Workstation	Dell	Optiplex 7010	n/a	n/a
4717	Web-Thermo-Hygrobarograph	Wiesemann & Theis GmbH WUT	57613 Web-T/Rh/P	2018-01	2020-01
5366	High Pass Filter	dBd communications	DBD-FTR-15SH-U3500-O/O	2018-02	2020-02
5392	EMC Measurement Software (v10.35.01 / v10.35.02)	Rohde & Schwarz	EMC32	n/a	n/a
5535	Positioning controller	Rohde & Schwarz	HCC	n/a	n/a
5536	Rotary table	Rohde & Schwarz	HCT12	n/a	n/a
5544	Antenna Mast	innco systems GmbH	MA 5000-XPET	n/a	n/a
5545	Antenna Mast Controller	innco systems GmbH	CO 3000-1D	n/a	n/a
5551	BNC cable	EMCC	BNC003m0	n/a	n/a
5616	RF cable assembly	Rosenberger	LA2-025-7000	n/a	n/a
6041	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	2017-09	2019-09

6 MEASUREMENT UNCERTAINTY

Measurement	Measurement Uncertainty
Conducted Emissions, AC mains (150 kHz – 30 MHz)	±3.5 dB
Radiated Emissions below 1000 MHz	± 5.6 dB
Radiated Emissions above 1000 MHz	± 4.6 dB
Conducted Emissions	± 2.9 dB
RF Frequency (25 MHz – 1 GHz)	$\pm 8.4 \bullet 10^{-8}$

The reported uncertainty values are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of 95%.

The given values have been calculated on the basis of the following documents:

TR 100 028-1 V1.4.1 (2001-12), Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1
TR 100 028-2 V1.4.1 (2001-12), Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2
CISPR 16-4-2:2011+A1:2014, Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty.
JCGM 100:2008, Evaluation of measurement data - Guide to the expression of uncertainty in measurement.

7 LIST OF ANNEXES

The following annexes are separated parts from this test report.

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Annex 1: Photographs of test setup	4
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