TEST REPORT # EMCC-980535CCD, 2020-09-04

EQUIPMENT UNDER TEST:

Trade Name:	alphaJET 5
Type/Model:	HS 1040.6308
Serial Number(s):	EUT #1: MI5050-000001
Application:	Inkjet printer for industrial applications
FCC ID:	2AWS3CCM10404715
Manufacturer:	Koenig&Bauer Coding GmbH
Address:	Benzstraße 11 97209 Veitshoechheim GERMANY
Phone:	+49 931 9085-262
E-Mail:	christian.schmitt2@koenig-bauer.com
RELEVANT STANDARD(S) :	47 CFR Part 15 C RSS-210 Issue 10 RSS-Gen Issue 5
MEASUREMENT PROCEDURE:	ANSI C63.10-2013

TEST REPORT PREPARED BY:

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Approved:

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0 REVISION HISTORY

Project number	Issue date	Chapter	Description
980535CCD	2020-09-04	n.a.	Initial issue

1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance with the 47 CFR §15.225 and ISED RSS-210 requirements for the certification of licence-exempt intentional radiators.

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
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
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1.4 Customer and Manufacturer

Company name:	Koenig&Bauer Coding GmbH
Street:	Benzstraße 11
City:	97209 Veitshoechheim
Country:	GERMANY
Name:	Christian Schmitt
Fax:	+49 931 9085-100
Phone:	+49 931 9085-262
E-Mail:	christian.schmitt2@koenig-bauer.com

1.5 Dates and Test Location

Date of Receipt of EUT: 2020-02-10
Test Date: 2020-02-17 to 2020-02-20
Test Location: Lab IV

1.6 Ordering Information

Purchase Order: 4500122740
Date: 2019-12-06
Vendor-Number: 7000222

1.7 Climatic Conditions

Date	Temperature	Relative Humidity	Air Pressure	Lab	Customer attended tests
--	°C	%	hPa	--	--
2020-02-17	22	35	977	IV	Mr Schmitt
2020-02-18	22	33	984	IV	Mr Schmitt
2020-02-19	22	32	975	IV	Mr Schmitt
2020-02-20	22	31	980	IV	Mr Schmitt

2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

The following data is based on customer's information.

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Application:	Inkjet printer for industrial applications
No of variants:	1
Serial No(s):	EUT #1: MI5050-000001
Firmware Version:	EUT #1: 4.0.0.2_01_27
Hardware Version:	EUT #1: Mainboard: 002, Baseboard: 0x0004, FPGA: 00.11, Controller: 00.21
FCC ID:	2AWS3CCM10404715
Equipment Class:	A
Highest internal frequency:	1000 MHz (CPU)
Carrier frequency:	13.56 MHz
Carrier modulation:	ASK
Type of tag:	Passive
Power source:	110 – 230 VAC (50 / 60 Hz)
Voltage for testing:	120 VAC 60 Hz
Remarks:	RFID according to ISO 14443A

Port	Description	Length of cable	shielded	Remarks
AC_In	Power input	n.a.	☐yes / ☒no	
X1	Signal line (RS232)	Max. 10 m	☒yes / ☐no	
X2	Signal line (digital I/O)	Max. 10 m	☒yes / ☐no	
X3	Signal line Productsensor, Encoder	Max. 10 m	☒yes / ☐no	
X4	Signal line (Signal lights output)	Max. 10 m	☒yes / ☐no	
X5	Signal line (Ethernet)	More than 10 m	☒yes / ☐no	
X6	Signal line (USB)	0 m (Stick)	☐yes / ☐no	

2.2 Intended Use

The following information was delivered by the customer
(excerpt from document “Short Description_1040.7567_alphaJET-5_V1.0-EN”):

The inkJET is a freely programmable ink-jet printer for industrial applications, which can be used to mark products in contact-free mode.

- The machine's uses range from simple applications such as the printing of dates to complex applications in which the inkjet machine is networked, e.g. with a PC, a barcode reader, an image detection system and an x/y-axis system.
- Application examples:
- Production data such as date, time, and shift ID, etc.
    - Consecutive numbering
    - Best before" date
    - Batch numbers
    - Barcodes: EAN, 2/5i, Code 39, etc.
    - Data matrix codes
    - Printing TrueType Fonts
- Printing on many different materials is possible, e.g. on foils, glass, metal, plastic and paper etc.
- Designed to be installed in any position, the optimized print head produces a printed image in constant high quality, even on irregular or structured surfaces.

2.3 EUT Peripherals/Simulators

The EUT was connected to the following peripherals (for detailed pictures see Annex 4):

- Network (Ethernet)
- IO-Box
- RS232 (was connect on the EUT, only; no data transmission according to customer)
- Product Encoder
- Observation Notebook

2.4 Mode of operation during testing and test setup

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

Mode: Ready/Printing

The device runs as intended, all systems are controlled and monitored.
The ink jet in the print head is on and charge values are output and measured back.

The RFID-module inside the printer detects which consumables are installed. The system works continuously while the printer is switched on. Data from the consumables are read in intervals. Every 100ms a new read cycle starts. The RFID-tags are sticked on the consumables bottles. If these bottles are removed the RFID-module continued with read cycles in the normal interval to detect when the bottles are inserted again.
The Module reads consumable related data from the tags and writes back information like ink level in the bottles."

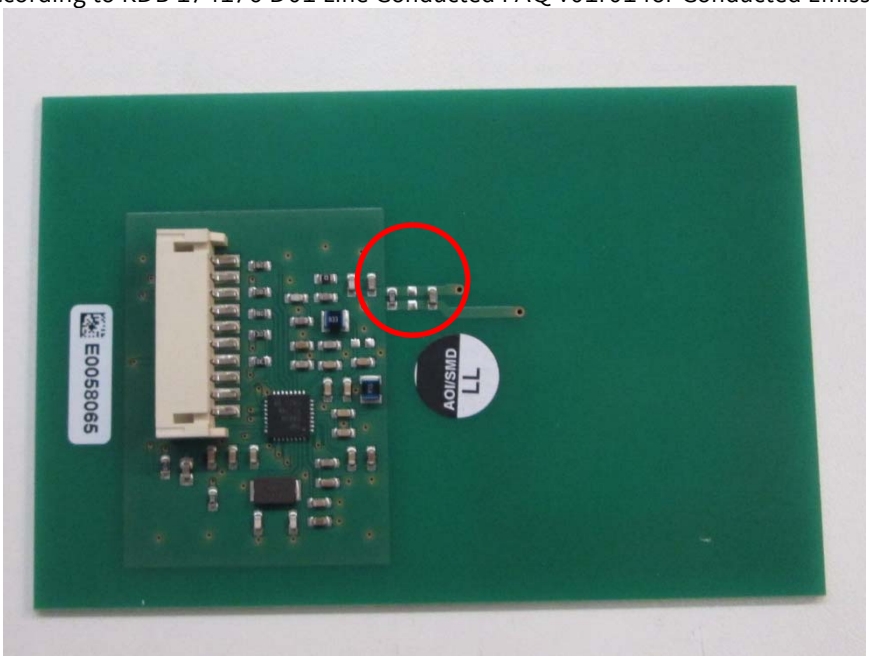
Mode: Service Mode (for frequency stability tests)

The device (software/electronics/RFID communication) is running, but the ink system is not active (hydraulics are off, no ink jet in the print head)
For the RFID module the state is identical to the Ready/Printing state.

2.5 Modifications required for compliance

Modification #1

RFID Dummy load according to KDB 174176 D01 Line Conducted FAQ v01r01 for Conducted Emissions test:



3 TEST RESULTS SUMMARY

Summary of test results for the following EUT:

Manufacturer: Koenig&Bauer Coding GmbH
Type: HS 1040.6308
Serial No.: EUT #1: MI5050-000001

Requirement	47 CFR Section	RSS / ICES Section	Report Section	Tested EUT	Result
Antenna Requirement	§ 15.203	RSS-Gen, 6.8	4.1	EUT #1	Passed
AC Power Line Conducted Emissions 150 kHz - 30 MHz	§ 15.207	RSS-GEN, 8.8	4.2	EUT #1, Mod #1	Passed
Radiated Emissions 9 kHz – 30 MHz	§ 15.205 § 15.209 § 15.225(d)	RSS-210, B.6 RSS-Gen, 8.9	4.3.1	EUT #1	Passed
Radiated Emissions 30 MHz – 1000 MHz	§ 15.209	RSS-Gen, 8.9	4.3.2	EUT #1	Passed
Radiated Emissions 1 GHz – 6 GHz	§ 15.209	RSS-Gen, 8.9	4.3.4	EUT #1	Passed
Radiated Emissions 6 GHz – 10 GHz	§ 15.209	RSS-Gen, 8.9	4.3.4	EUT #1	Passed
Spectrum Mask	§ 15.225 (a) – (d)	RSS-210, B.6	4.4	EUT #1	Passed
Occupied Bandwidth	§ 15.215	RSS-Gen, 6.7	4.5	EUT #1	Passed
Carrier Frequency Stability	§ 15.225 (e)	RSS-210, B.6 RSS-Gen, 8.11	4.6, 4.7	EUT #1	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: Dominik Krüger
Issuance Date: 2020-09-04

4 DETAILED TEST RESULTS

4.1 Antenna Requirement

Test requirement: 47 CFR §15.203, ISED RSS-Gen 6.8

4.1.1 Regulation

47 CFR § 15.203 Antenna requirement

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.

RSS-Gen 6.8 Transmit antenna

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

> *This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.*

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

4.1.2 Test Result

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-20
Test Personnel:	Dominik Krüger

The EUT's antenna is a PCB antenna which is in a potted enclosure.

The EUT meets the requirements of this section.

4.2 AC Power Line Conducted Emissions

Test requirement: 47 CFR §15.207, ISED RSS-Gen 8.8

Test procedure: ANSI C63.10-2013, KDB 174176, ISED RSS-Gen 8.8

4.2.1 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.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

FCC KDB 174176 D01 Line Conducted FAQ v01r01

Q5. How should the RF power output port of a Part 15 intentional radiator be configured when making AC power-line conducted emissions measurements?

The method used for AC power-line conducted measurements with suitable dummy loads will differ for detachable and non-detachable antennas, depending on whether the operating frequency is above or below 30 MHz.

A suitable dummy load is a radio frequency termination used in place of the antenna, which has the same electrical properties as the intended antenna without radiated emissions. A device with a suitable dummy load must supply identical signals to the dummy load, as it would if an antenna were connected. In the test report, results obtained using a suitable dummy antenna shall be so noted.

Devices Operating Above 30 MHz
For a device with a permanent or detachable antenna operating above 30 MHz, measurements must be performed with the antenna connected as specified in clause 6.2 of ANSI C63.10-2013.

Devices Operating Below 30 MHz
For a device with a permanent or detachable antenna operating at or below 30 MHz, the FCC will accept measurements performed with a suitable dummy load in lieu of the antenna under the following conditions: (1) perform the AC power-line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the antenna to determine compliance with Section

15.207 limits within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network which simulates the antenna in the fundamental frequency band.

All measurements must be performed as specified in clause 6.2 of ANSI C63.10-2013.

RSS-Gen 8.8 AC power-line conducted emissions limits

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

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.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.
(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

→ ISED limits are equal to FCC limits.

4.2.2 Test Procedures

Testing is performed acc. to ANSI C63.4-2014.

Tabletop and their ancillary devices are placed on a nonconducting table with nominal dimension of 1.0 m by 1.5 m, height 0.8 m above the ground plane. The EUT is centered laterally (left to right facing the tabletop) on the tabletop and its rear is flush with the rear of the table. Accessories or peripherals that are part of a system tested on a tabletop are being placed in a test arrangement on one or both sides of the host with a 10 cm separation between the nearest points of the cabinets.

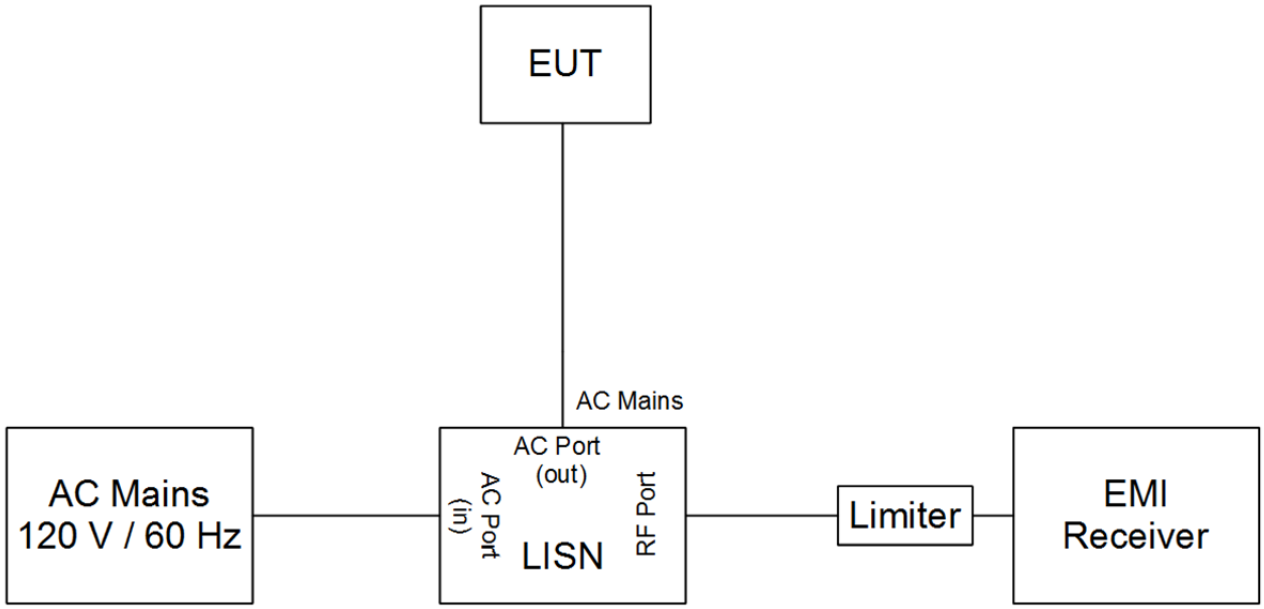
Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center forming a bundle 30 cm to 40 cm long.

The EUT's AC mains is connected to a LISN.

The measurement receiver is connected to the 50 Ω RF port of the LISN.

According to FCC KDB 174176 Q5 and RSS-Gen clause 8.8, respectively, the measurement was performed twice, a) with the antenna connected and b) with a dummy load (50 Ω resistor) in lieu of the antenna.

4.2.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.207, RSS-Gen 8.8
Procedure: ANSI C63.10-2013

Power Source: #1
Receiver: #516
LISN: #1901

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 516, 1519, 1890, 1901, 2107, 4717, 5392, 5404, 5541, 5551

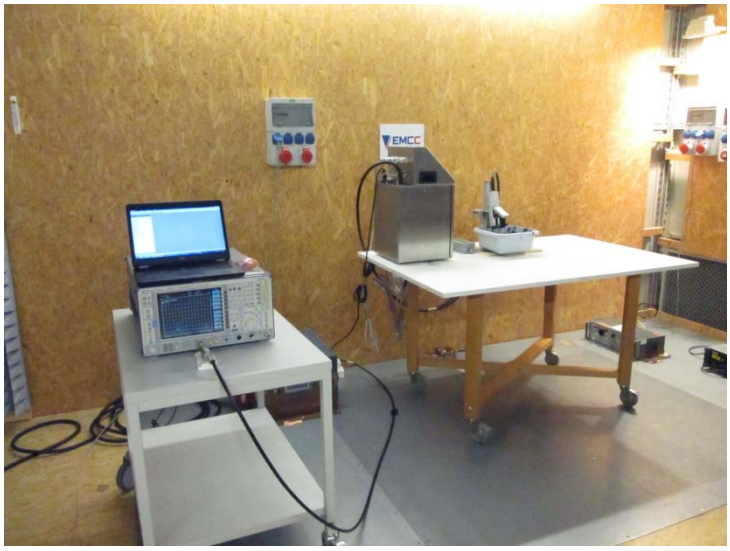
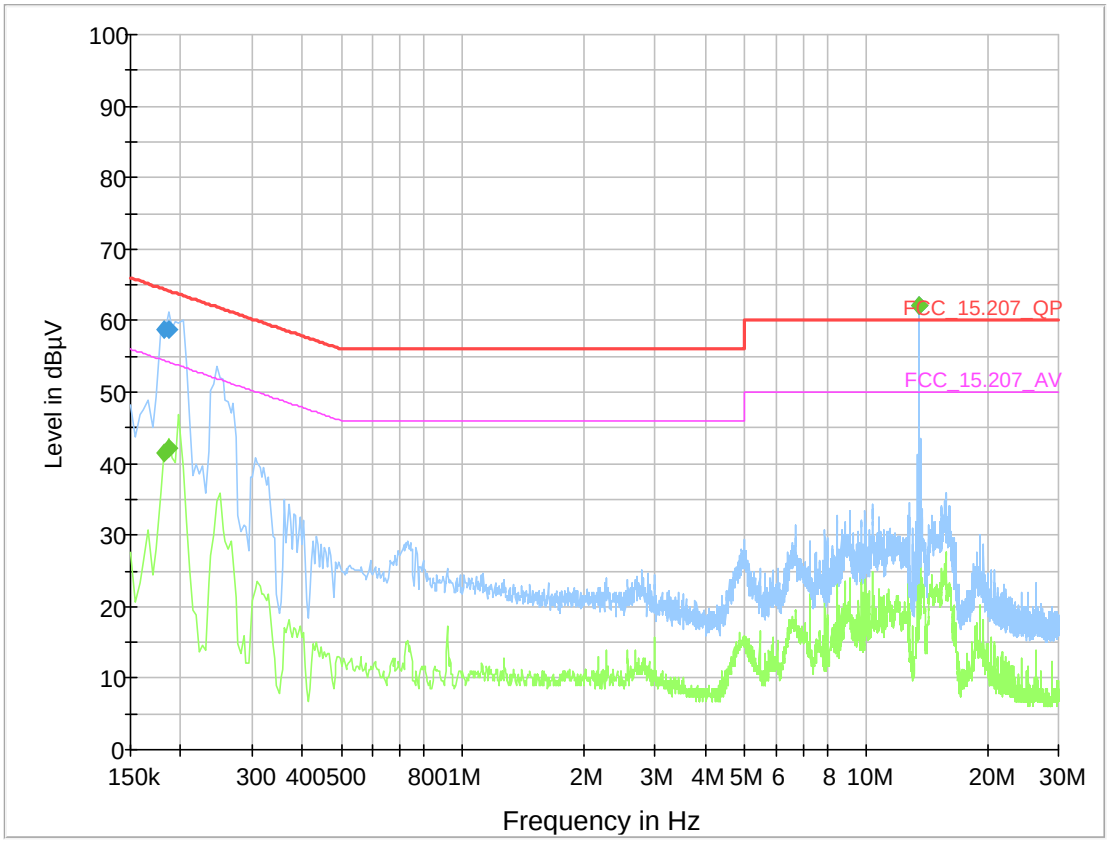


Photo of Setup

4.2.4 Detailed Test Data with antenna connected

Manufacturer: Type: Serial No: Line:	Koenig&Bauer Coding GmbH HS 1040.6308 EUT #1: MI5050-000001 L and N (max hold)



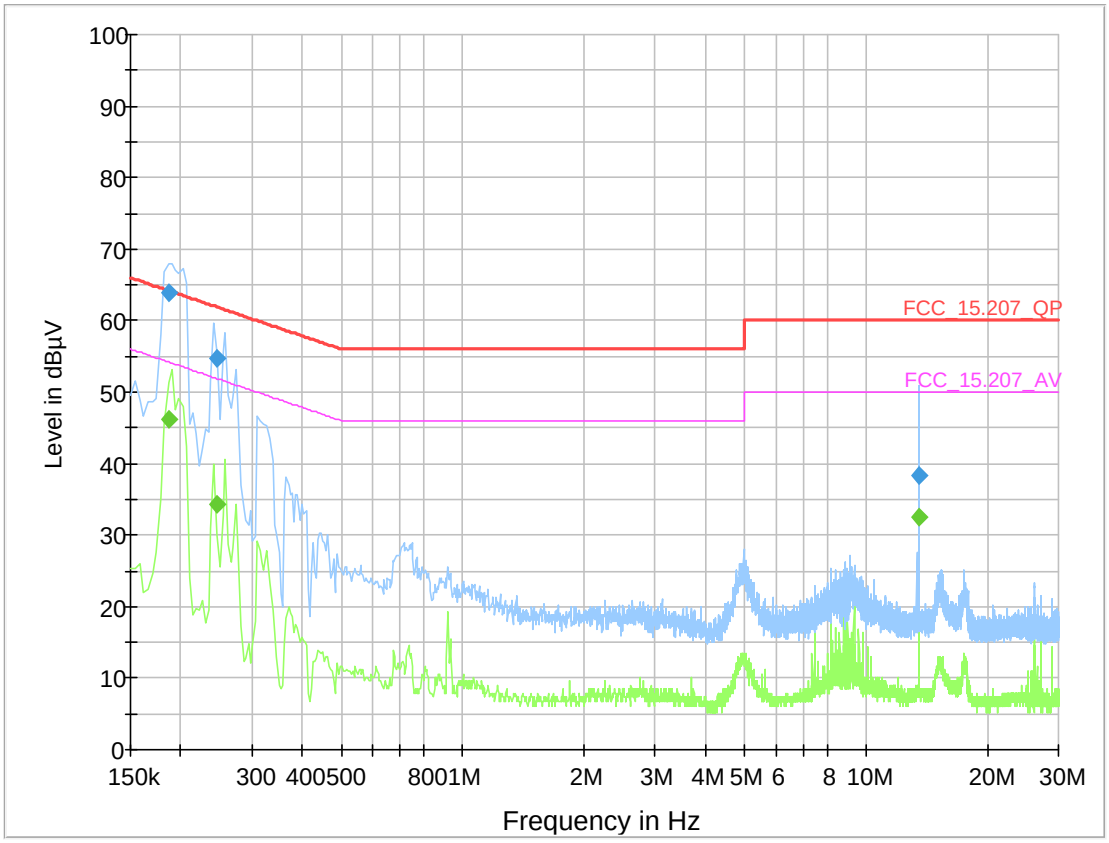
Frequency MHz	Detector	Result dBµV	Margin dB
0.182	QP	58.71	5.68
0.186	QP	58.78	5.43
13.562	QP	62.08	-2.08

Frequency MHz	Detector	Result dBµV	Margin dB
0.182	AV	41.55	12.84
0.186	AV	42.23	11.98
13.562	AV	62.07	-2.08

Worst case results listed, only.

4.2.5 Detailed Test Data with dummy load in lieu of antenna

Manufacturer: Type: Serial No: Line:	Koenig&Bauer Coding GmbH HS 1040.6308 EUT #1: MI5050-000001 with Modification #1 L and N (max hold))



Frequency MHz	Detector	Result dBµV	Margin dB
0.186	QP	63.85	0.36
0.245	QP	54.74	7.17
13.562	QP	38.43	21.57

Frequency MHz	Detector	Result dBµV	Margin dB
0.186	AV	46.10	8.11
0.245	AV	34.40	17.51
13.562	AV	32.43	17.57

Worst case results listed, only.

4.2.6 Test Result

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
	EUT #1: MI5050-000001 with Modification #1
Test date:	2020-02-13, 2020-02-20
Test Personnel:	Dominik Krüger

The EUT meets the requirements of this section.

4.3 Radiated Emissions

4.3.1 Radiated Emissions 9 kHz – 30 MHz

Test requirements: § 15.205, § 15.209, § 15.225(d), RSS-210, B.6, RSS-Gen, 8.9

Test procedure: ANSI C63.10-2013

4.3.1.1 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.

RSS-Gen 6.13.1 Detector

When the unwanted emissions limits are defined in relative terms, the same parameter, peak power or average power, shall be used as the reference for both the transmitter's output power and the unwanted emissions measurements.

When the unwanted emissions limits are expressed in absolute terms, unless otherwise stated in the applicable RSS, the following conditions shall apply:
Below 1 GHz, compliance with the limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth (see section 6.10).

47 CFR § 15.225 Operation within the band 13.110-14.010 MHz

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

47 CFR § 15.209 Radiated emission limits; general requirements

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 of emission (MHz)	Field strength (µV/m)	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.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(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.

RSS-210 B.6 Band 13.110-14.010 MHz

Devices shall comply with the following requirements:

a) the field strength of any emission shall not exceed the following limits:

i. 15.848 mV/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz

RSS-Gen 8.9 Transmitter emission limits

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 6 – General field strength limits at frequencies below 30 MHz:

Frequency	Field Strength	Equivalent Field Strength[Note2]	Measurement distance
	[µA/m]	[µV/m]	[m]
9 – 490 kHz[1]	6.37/F[kHz]	2401/F[kHz]	300
490 – 1705 kHz	63.7/F[kHz]	24015/F[kHz]	30
1.705–30 MHz	0.08	30.16	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Note 2: Equivalent electrical field strength according to ANSI C63.10-2013 chapter 4.3.2:
"For the United States, the regulatory limits below 30 MHz are in terms of µV/m. By convention, magnetic field strength is converted to an electric field strength based on free-space impedance."

→ The ISED limits are in practice identical with the FCC limits (deviations below 1 %). Measurements in this report are related to the insignificant stronger FCC limits.

4.3.1.2 Test Site Correlation for H Field Measurement in Semi-Anechoic Chamber (SAC)

Test procedure following KDB 414788.

The carrier at 13.56 MHz was measured in the semi-anechoic room (SAC) at a test distance of 3 m and at an open field site at a test distance of 3 m with the same calibrated loop antenna. The measurement was performed in a set-up with transmit antennas with a diameter of 0.122 m and 0.249 m, respectively.

These measurements were used to evaluate a correction of the open field measurement to the semi-anechoic room measurement.

Ant. Diameter	Freq	Detector	Distance	FSAC	Fopen	fc
	[MHz]		[m]	[dBµV/m]	[dBµV/m]	[dB]
0.122 m	13.56	QP	3	72.2	70.8	-1.4
0.249 m	13.56	QP	3	71.8	68.5	-3.3

Test date: 2016-09-14

As the correction factor fc is negligible compared to the margin found below the correction has not been taken into account.

4.3.1.3 Calculation of Field Strength Limits

E.g. radiated emissions field strength limits for the frequency band 1.705–30.0 MHz:

30 µV/m at 30 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 30 µV/m corresponds with 29.5 dBµV/m.

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

In case of testing being performed in a distance other than specified, the limit may be adjusted by a Distance Extrapolation Factor DF of 40 dB per decade, which is calculated by the following equation:

$DF = 40 \log (D_{test}/D_{specification})$
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 30 m and a measurement performed at 3 m: The distance correction factor is 40 log (30 / 3) = 40. 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 29.5 dBµV/m specified in 30 m distance and the measurement performed at 3 m. The limit is adjusted by the distance correction factor of 40 dB to the new limit of 69.5 dBµV/m.

4.3.1.4 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 40 dBµV is obtained. The Antenna Factor of 10 dB(1/m) and a Cable Factor of 0.5 dB are added, giving a field strength of 50.5 dBµV/m in the measurement distance. The field strength of 50.5 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 40 + 10 + 0.5 = 50.5
Level (in µV/m) = Common Antilogarithm (50.5/20) = 335

Distance correction (field strength)
Remark: The preferred method is the correction of the measured field strength instead of limit correction. 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:

$FS_{Dspecified} = FS_{Dtest} + 40 \log (D_{test}/D_{specified})$
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 50.5 dBµV/m in a distance of 3 m. If the rules are specifying a limit in a distance of 30 m, the field strength recorded in 3 m is corrected by the distance. Therefore, the field strength $FS_{Dspecified}$ is 50.5 + 40 log (3 / 30) = 10.5 (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.

4.3.1.5 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

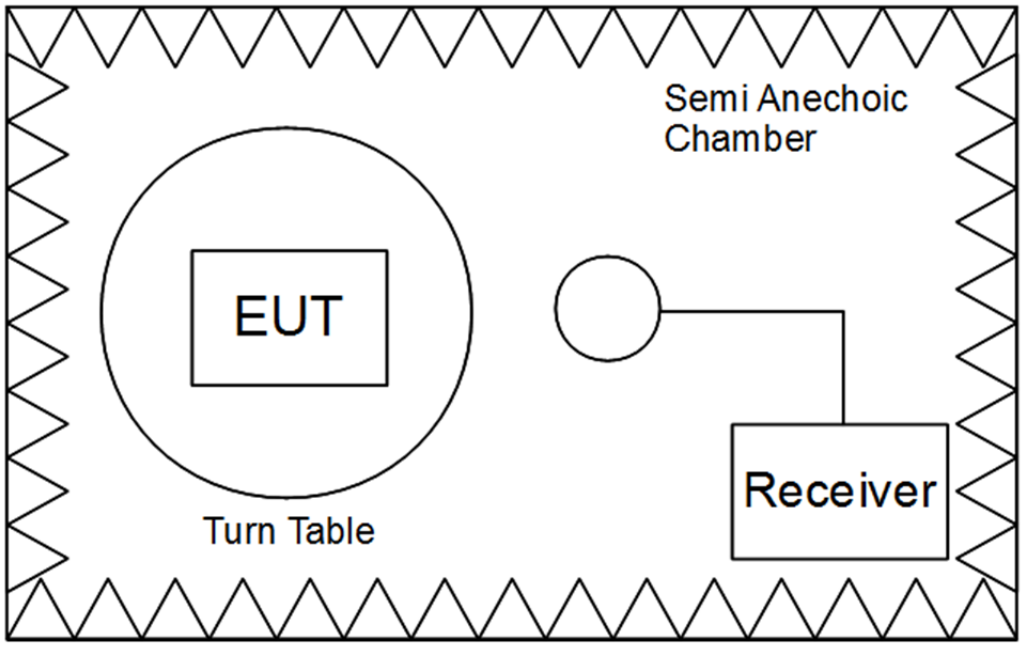
Using the orientation and equipment arrangement of the EUT determined in 6.4.6, and applying the appropriate modulating signal to the EUT, perform final radiated emission measurements on the fundamental and highest spurious emissions.

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*
Test instrumentation resolution bandwidth	200 Hz (9 kHz - 150 kHz)
	10 kHz (150 kHz - 30 MHz)
Receive antenna height	1 m
Receive antenna polarization	Vertical
Measurement location	Semi Anechoic Chamber (SAC)

* According to Section 15.31 (f)(2): At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The 40 dB/decade factor was used.

4.3.1.6 Test Setup

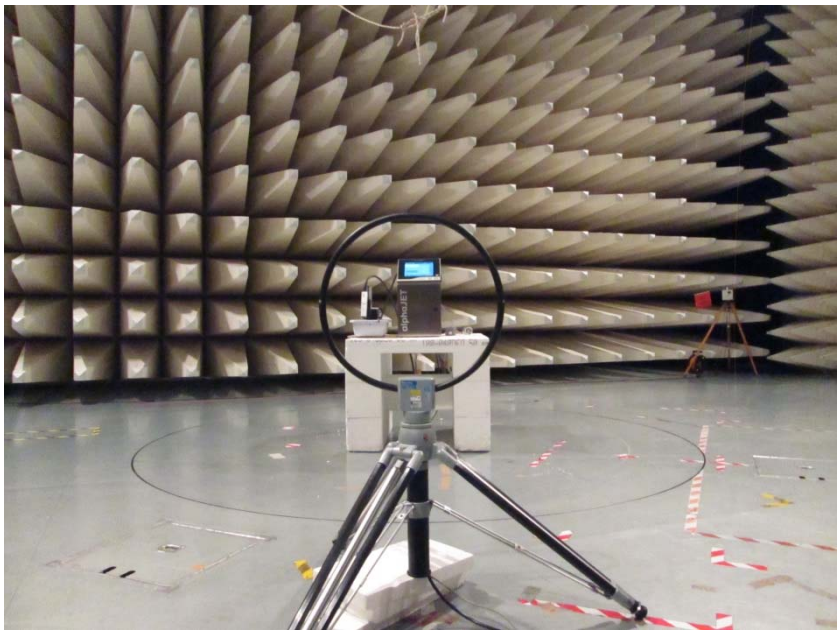


SCHEMATIC TEST SETUP

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

Receiver: #3846
Antenna: #374

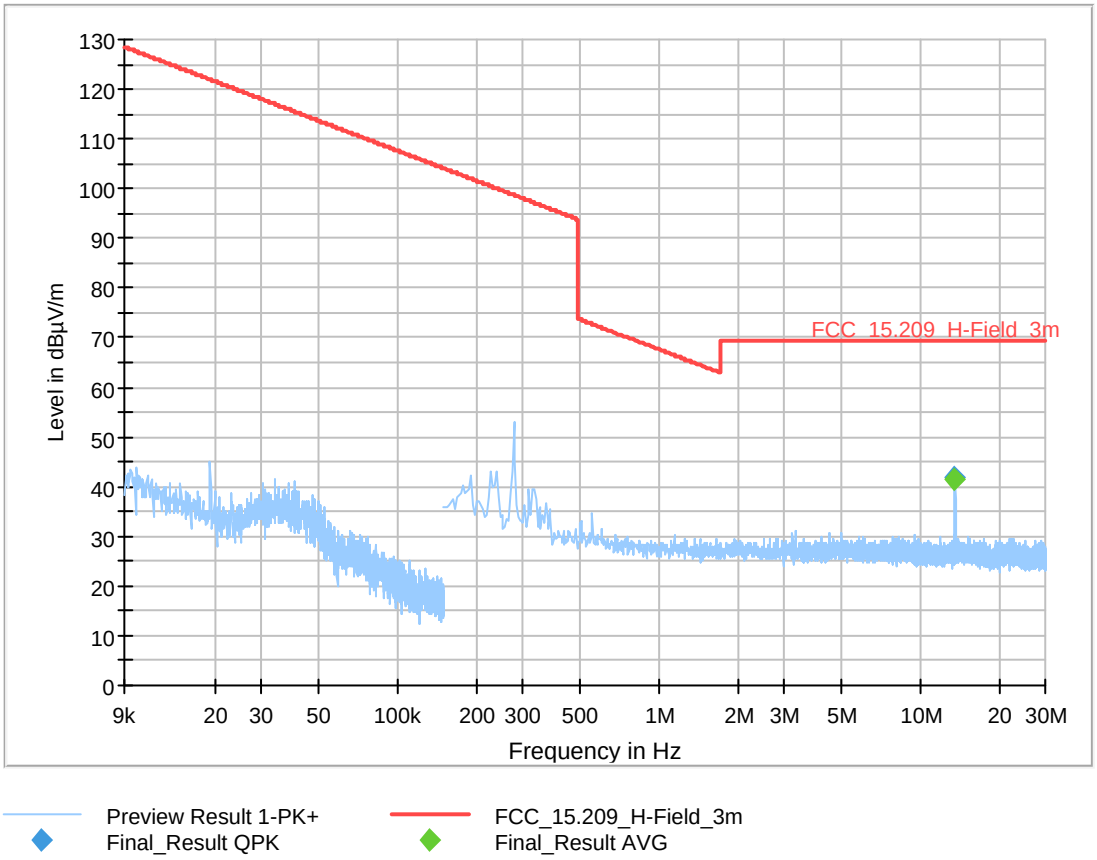
Test distance: 3 m



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

4.3.1.7 Detailed Test Data

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No:	EUT #1: MI5050-000001



Final Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
13.56	---	41.4	---	---	1000	10.0	100.0	H
13.56	41.7	---	69.5	27.8	1000	10.0	100.0	H

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

4.3.1.8 Test Result

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-18
Test Personnel:	Dominik Krüger

The EUT meets the requirements of this section.

4.3.2 Radiated Emissions 30 MHz – 1000 MHz

Test Requirement: § 15.205, § 15.209, § 15.225(d), ISED RSS-210 B.6, RSS-Gen 6.7
Test Procedure: ANSI C63.10-2013

4.3.2.1 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.
(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.
(b) For unintentional radiators:
(1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3) of this section, for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes	Upper frequency of measurement range (MHz)
[MHz]	[MHz]
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

47CFR § 15.205 Restricted bands of operation
(d)(7) Devices operated pursuant to § 15.225 are exempt from complying with this section for the 13.36–13.41 MHz band only.

47CFR § 15.225 Operation within the band 13.110–14.010 MHz.
(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

47CFR § 15.209 Radiated emission limits.

(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	Field Strength		Measurement distance
[MHz]	[µV/m]	[dBµV/m]	[m]
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
(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.

ISED RSS-210 B.6 Band 13.110-14.010 MHz
The field strength of any emission shall not exceed the following limits:
15.848 mV/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz;
334 µV/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;
106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz; and
RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

ISED RSS-Gen 8.9 Transmitter emission limits

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency	Field Strength
[MHz]	[µV/m at 3 m]
30–88	100
88–216	150
216–960	200
above 960	500

→ The ISED limits are identical with the FCC limits.

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.

ISED RSS-Gen 6.13.1 Detector
When the unwanted emissions limits are defined in relative terms, the same parameter, peak power or average power, shall be used as the reference for both the transmitter's output power and the unwanted emissions measurements.
When the unwanted emissions limits are expressed in absolute terms, unless otherwise stated in the applicable RSS, the following conditions shall apply:
(a) Below 1 GHz, compliance with the limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth (see section 6.10).
(b) Above 1 GHz, compliance with the limits shall be demonstrated using a linear average detector (see section 6.10) with a minimum resolution bandwidth of 1 MHz.

4.3.2.2 Calculation of Field Strength Limits

E.g. radiated emissions field strength limits for the frequency band 88 - 216 MHz:

150 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 150 µV/m corresponds with 43.5 dBµV/m.

4.3.2.3 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)

If the measurement unit is dBm instead of dBµV, the conversation constant of 107 dB has to be added to the reading in dBm.

Assume a receiver reading of -30.1 dBm is obtained. The Antenna Factor of 39.2 dB(1/m) and a Cable Factor of 1.2 dB are added, giving a field strength of 117.3 dBµV/m in the measurement distance. The field strength of 117.3 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = -30.1 + 39.2 + 1.2 + 107 = 117.3
Level (in µV/m) = Common Antilogarithm (117.3/20) = 732825

Distance correction (field strength)

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 117.3 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 117.3 + 20 log (1 / 3) = 107.8 (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.

4.3.2.4 Test Procedures

According to customer information the highest fundamental frequency of the intentional radiator is 1000 MHz.
With this frequency and taking 47CFR § 15.33 (a) (1) into account the spectrum shall be investigated up to 10 GHz.

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

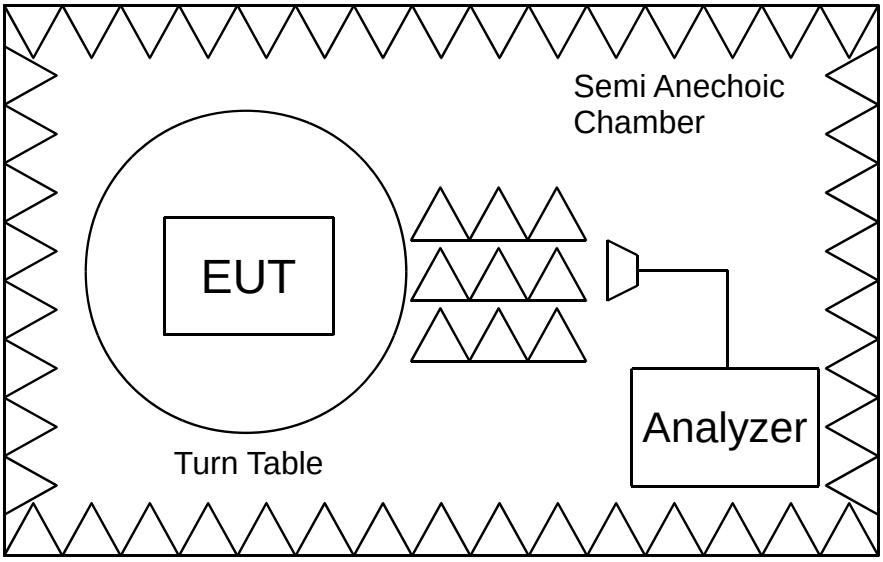
Exploratory measurements are used to identify the frequencies and amplitudes of the emissions while manipulating and rotating the EUT.
Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission 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
Test instrumentation resolution bandwidth	120 kHz
Receive antenna height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal
Measurement location	Semi Anechoic Chamber (SAC)

4.3.2.5 Test Setup

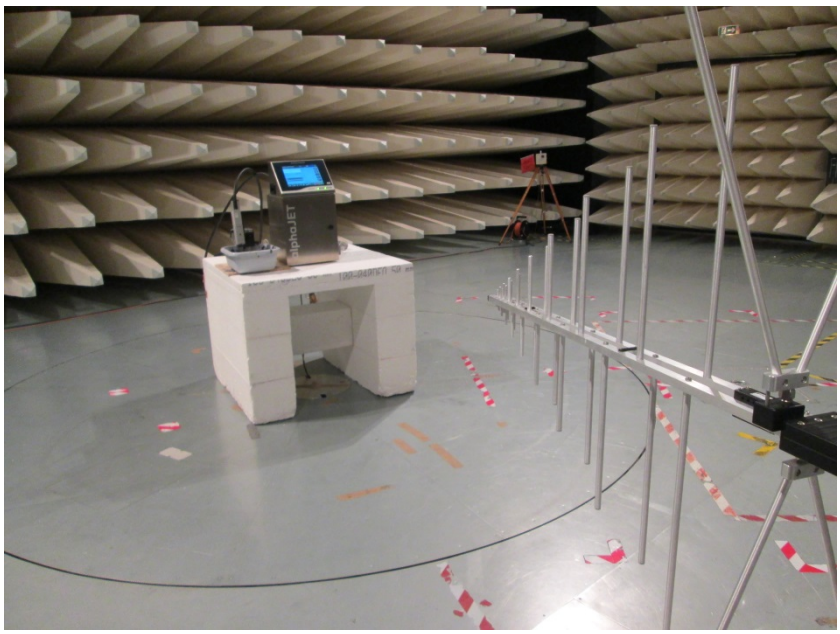


SCHEMATIC TEST SETUP

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

Receiver: #3846
Antenna: #3235

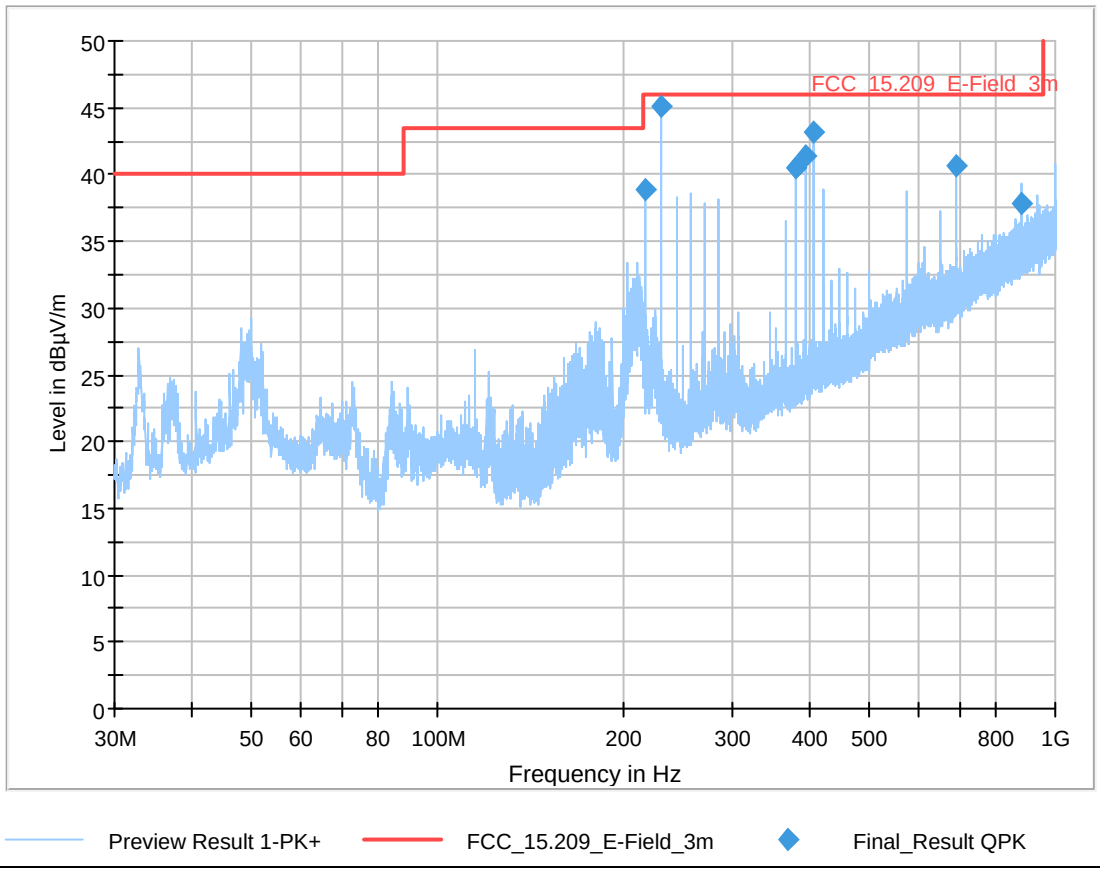
Test distance: 3 m



TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 1889, 2724, 3235, 4075, 4717, 5392, 5544, 5545, 5615

4.3.2.6 Detailed Test Data

Manufacturer: Type: Serial No:	Koenig&Bauer Coding GmbH HS 1040.6308 EUT #1: MI5050-000001



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)
216.94	38.8	46.0	7.2	1000	120.0	100.0	H	70	17.9
230.50	45.2	46.0	0.9	1000	120.0	103.0	H	119	18.8
379.66	40.5	46.0	5.5	1000	120.0	203.0	H	-17	22.8
393.22	41.4	46.0	4.6	1000	120.0	111.0	H	87	23.1
406.78	43.1	46.0	2.9	1000	120.0	100.0	H	98	23.5
691.18	40.7	46.0	5.3	1000	120.0	103.0	V	142	28.3
883.18	37.9	46.0	8.1	1000	120.0	178.0	V	-180	30.8

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

4.3.2.7 Test Result

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-17
Test Personnel:	Dominik Krüger

The EUT meets the requirements of this section.

4.3.3 Radiated Emissions above 1000 MHz

4.3.3.1 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.

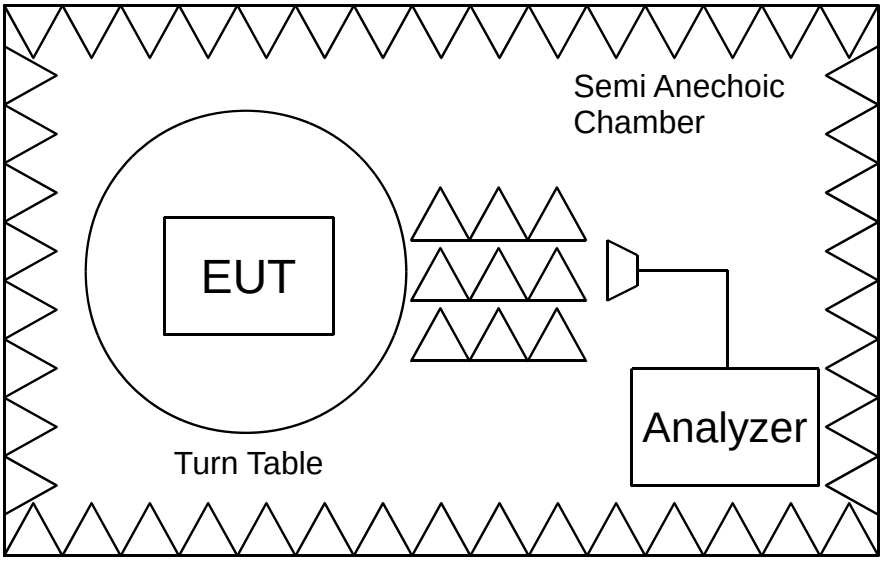
Measurements are performed with the EUT rotated from 0° to 360°; the antenna height scanned in accordance with 6.6.3.1, 6.6.3.2, or 6.6.3.3, as appropriate; and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement 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 – 10 GHz (10th harmonic of highest internal)
Test distance	4.5 m (1 – 6 GHz)*, 1 m (6- 10 GHz)
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

* According to Section 15.31 (f)(1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. (...) When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.3.3.2 Test Setup 1 – 6 GHz



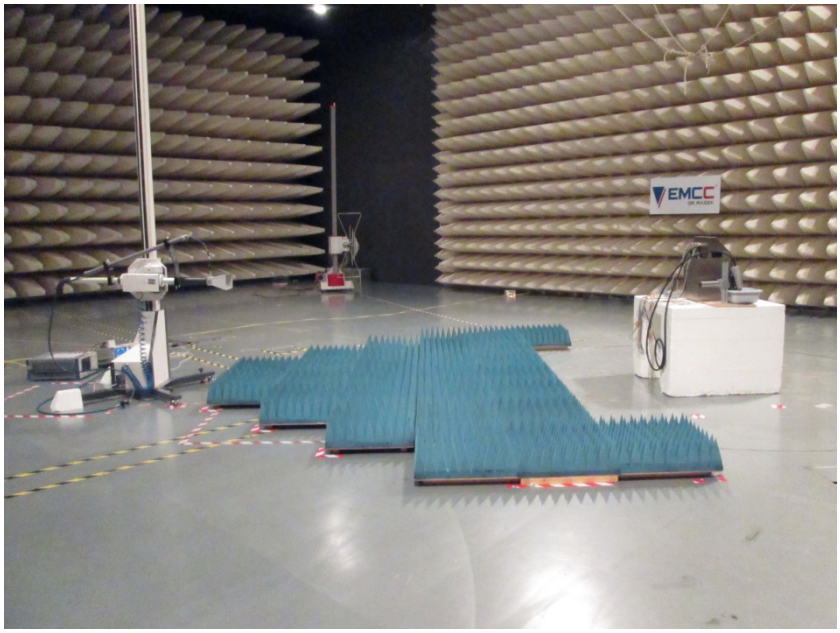
SCHEMATIC TEST SETUP

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

Receiver: #3846
Antenna: #3235

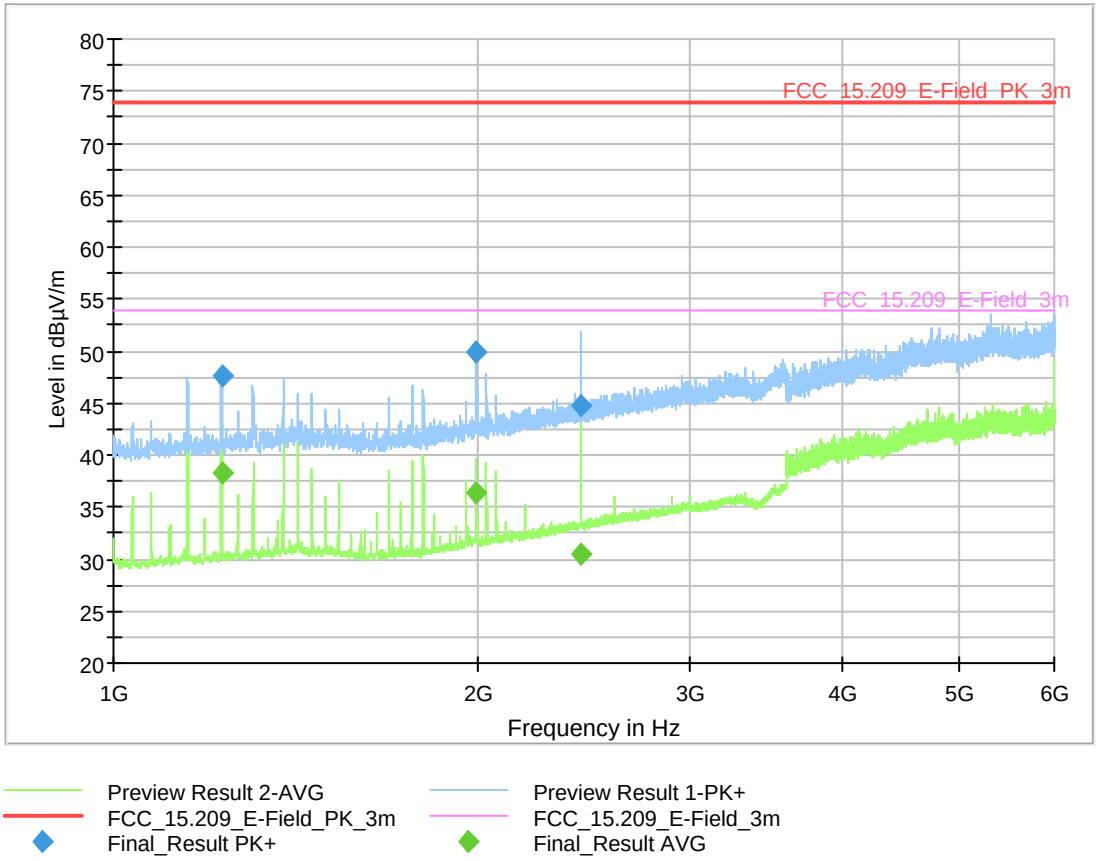
Test distance: 4.5 m

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 1889, 3235, 4075, 4717, 5392, 5544, 5545, 5615



4.3.3.3 Detailed Test Data

Manufacturer: Type: Serial No:	Koenig&Bauer Coding GmbH HS 1040.6308 EUT #1: MI5050-000001

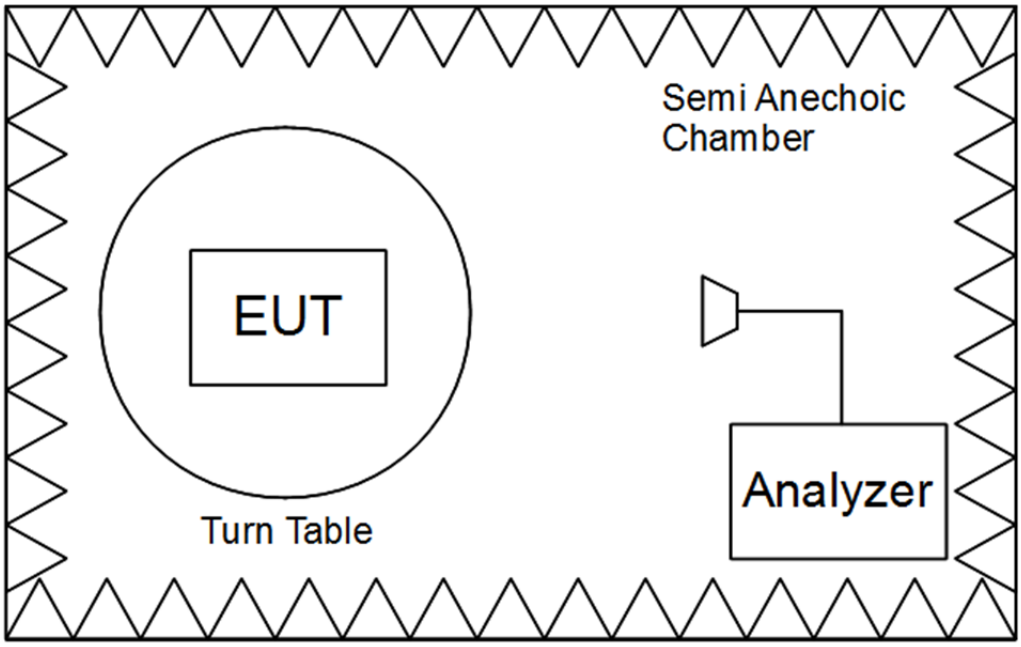


Final Result:

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol --	Azimuth deg
1229.06	47.6	---	74.0	26.4	1000	1000.0	100.0	V	-59
1229.06	---	38.4	54.0	15.7	1000	1000.0	100.0	V	-59
1996.90	49.9	---	74.0	24.1	1000	1000.0	365.0	V	-168
1996.90	---	36.4	54.0	17.6	1000	1000.0	365.0	V	-168
2436.71	---	30.4	54.0	23.6	1000	1000.0	156.0	H	-160
2436.71	44.7	---	74.0	29.3	1000	1000.0	156.0	H	-160

All tests performed at a distance of 4.5 m. The result 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.

4.3.3.4 Test Setup 6 – 10 GHz



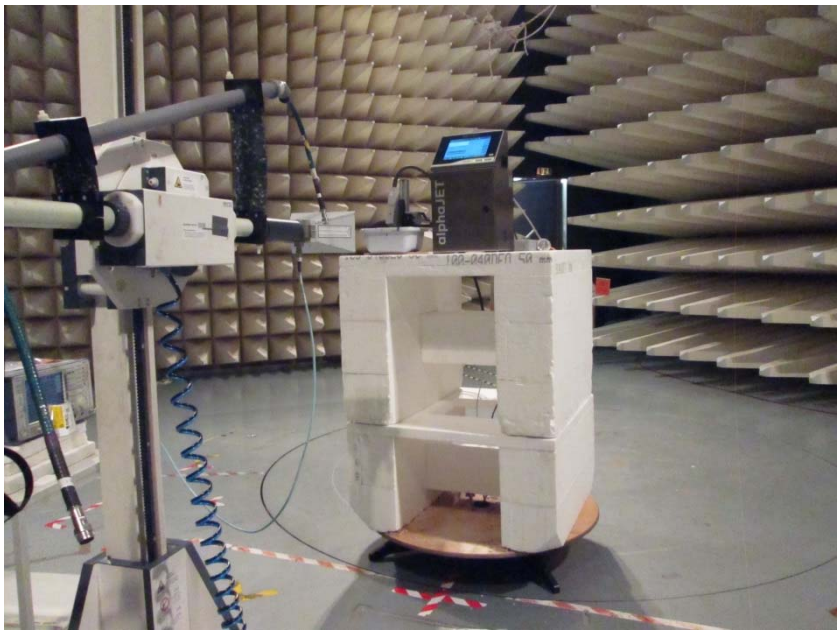
SCHEMATIC TEST SETUP

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

Receiver: #516
Antenna: #3235

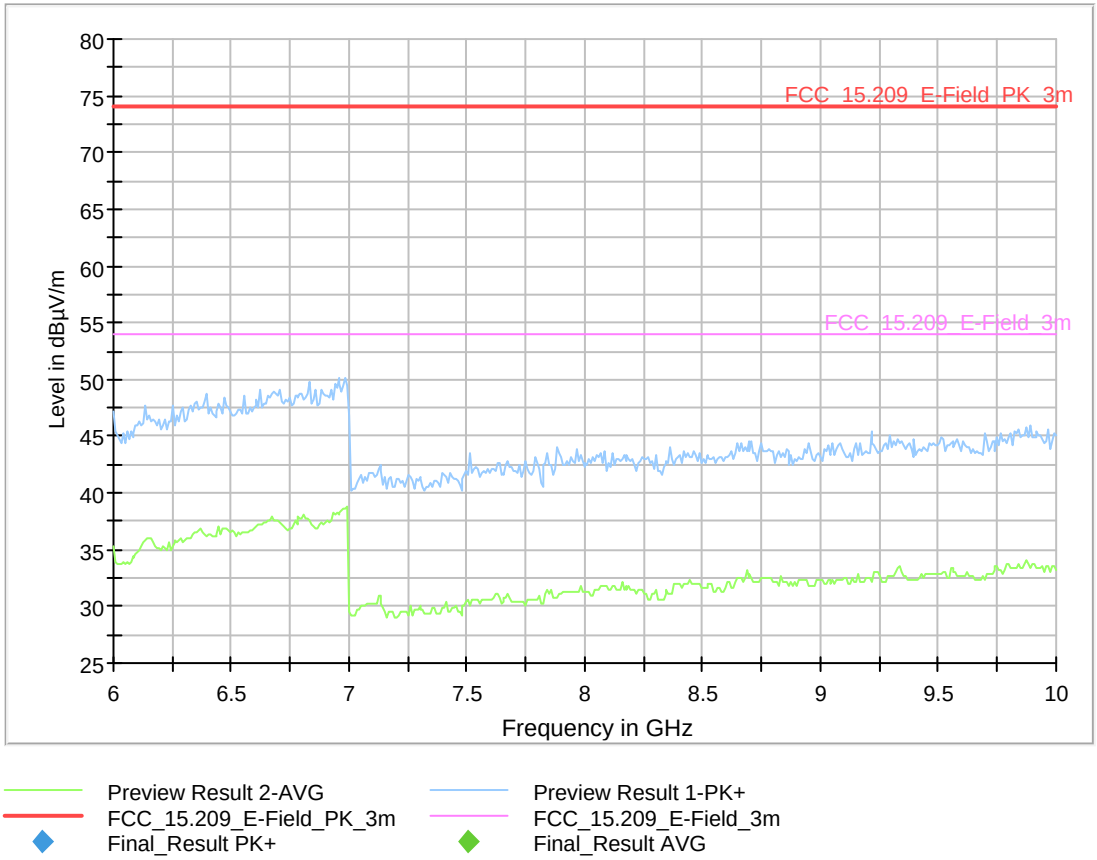
Test distance: 1 m

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 516, 1889, 3235, 4075, 4717, 5392, 5544, 5545



4.3.3.5 Detailed Test Data

Manufacturer: Type: Serial No:	Koenig&Bauer Coding GmbH HS 1040.6308 EUT #1: MI5050-000001



Final Result:

All tests performed at a distance of 1 m. The result was adjusted to correspond with the test distance.

No final measurements were performed since the measured values are too close to the noise floor. For further details refer to the pre-scan test plot above.

4.3.3.6 Test Result

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-17
Test Personnel:	Dominik Krüger

The EUT meets the requirements of this section.

4.4 Spectrum Mask

Test Requirement: FCC 47 CFR §15.225, ISED RSS-210 B.6
Test Procedure: ANSI C63.10-2013

4.4.1 Regulation

47 CFR § 15.225

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.
(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz band shall not exceed the general radiated emission limits in§ 15.209.

ISED RSS-210 B.6
The field strength of any emission shall not exceed the following limits:

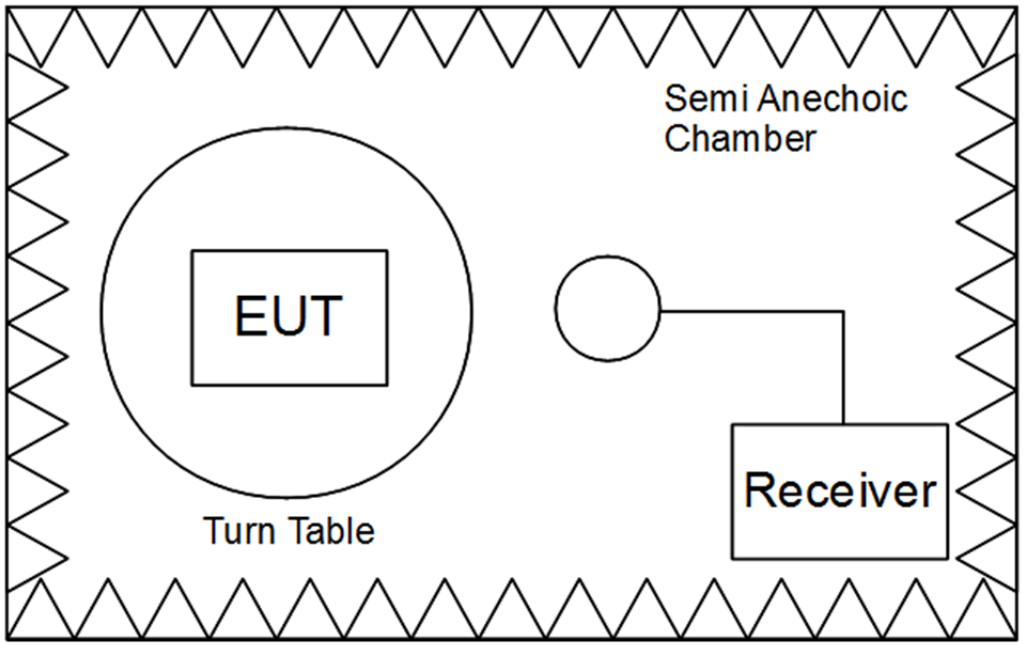
(a) 15,848 mV/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz;
(b) 334 µV/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;
(c) 106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz; and
(d) RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

4.4.2 Test Procedures

The measurement was performed in a semi-anechoic room at a test distance of 3 m. A calibrated loop antenna as specified in ANSI C63.10 clause 4.3 was positioned with its plane vertical at the test distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT. Instead of changing the loop antenna polarization to horizontal the EUT antenna was rotated by 90 degrees. I.e. tests performed for 2 EUT antenna polarizations (EUT in 3 orientations). The center of the loop antenna was 1 m above the ground.
The EUT was tested on a 0.8 meter high tabletop.
The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter.
In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference groundplane or, if normally installed beneath the reference groundplane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.
Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC listed semi-anechoic room at the specified 3 m test distance.
Worst case emissions are listed under chapter: test results.

Radiated Emissions Test Characteristics	
Frequency range	13.11 MHz – 14.01 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	10 kHz (150 kHz - 30 MHz)
Receive antenna height	1 m

4.4.3 Test Setup

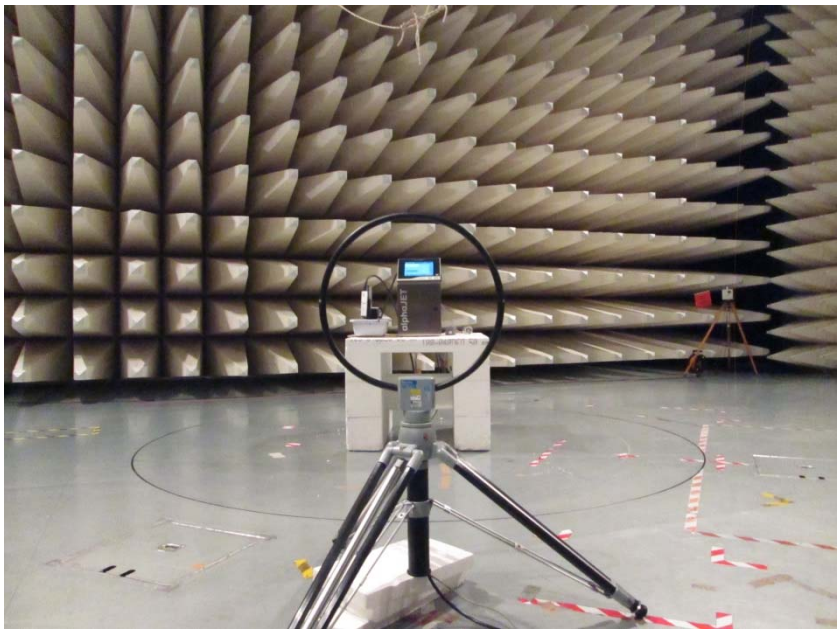


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.225
Procedure: ANSI C63.10-2013

Receiver: #3846
Antenna: #374

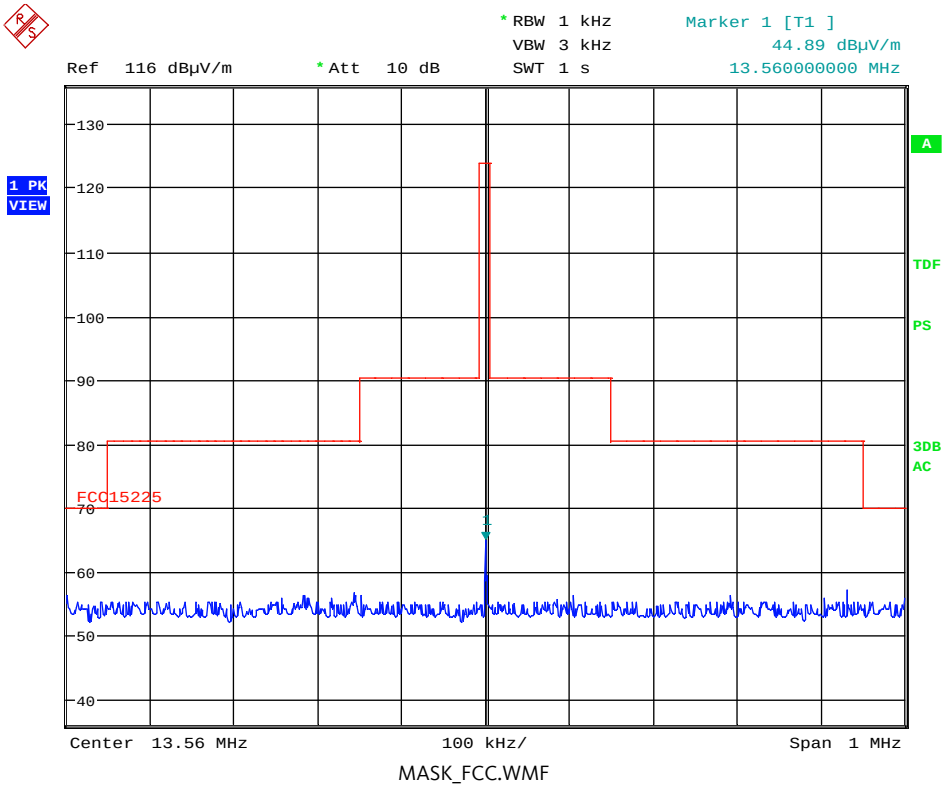
Test distance: 3 m



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

4.4.4 Measurement Plot(s)

Prescan:



MASK_FCC.WMF

4.4.5 Test Result

Frequency [MHz]	Detector	Receiver Bandwidth [kHz]	3m_Result [dBµV/m]	Distance Correction [dB]	30m_Result [dBµV/m]	30m_Limit [dBµV/m]	Margin [dB]
13.56	QP	10	43.2	40	3.2	84	80.8

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-18
Test personnel:	Dominik Krüger

The EUT meets the requirements of this section.

4.5 Occupied Bandwidth

Test Requirement: FCC 47 CFR §15.215, ISED RSS-Gen 6.7
Test Procedure: ANSI C63.10-2013

4.5.1 Regulation

47 CFR § 15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.
(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.
(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

ISED RSS-Gen 6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth
The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.
Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

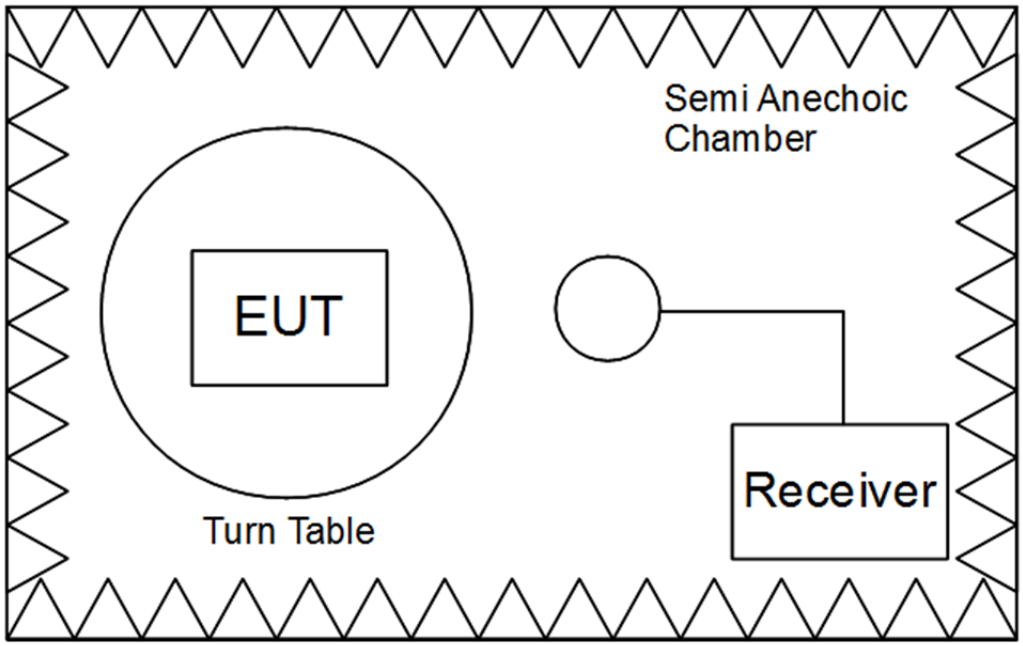
For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the

total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

4.5.2 Test Procedures

Measurement was performed in a semi-anechoic room. The EUT was tested on a 0.8 meter high tabletop and was connected to its associated peripherals. A calibrated loop antenna was positioned with its plane vertical at about 3 m distance from the EUT. The span was 1000 Hz, the resolution bandwidth 100 Hz and the video bandwidth 300 Hz. A max peak hold was used to measure the occupied bandwidth.
Worst case emissions are listed under chapter: test results.

4.5.3 Test Setup

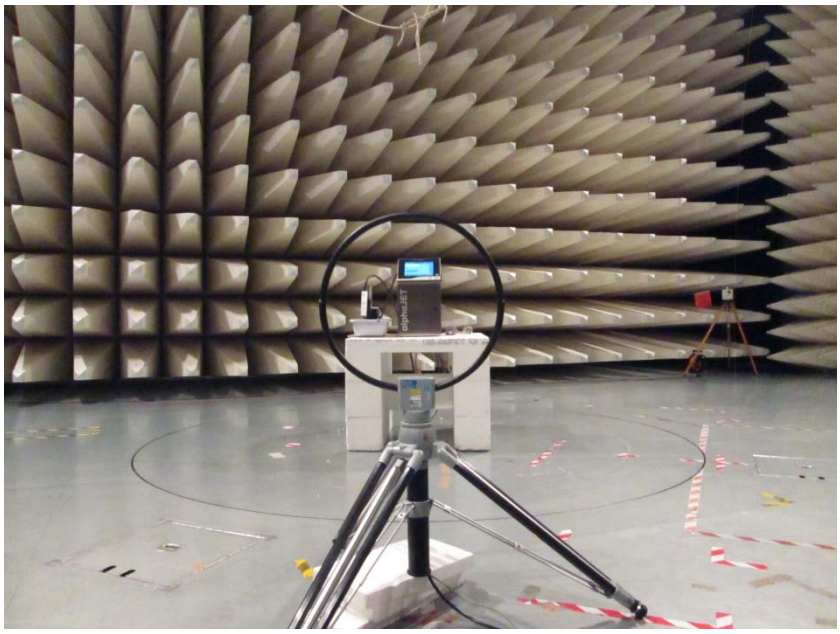


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.215
Procedure: ANSI C63.10-2013

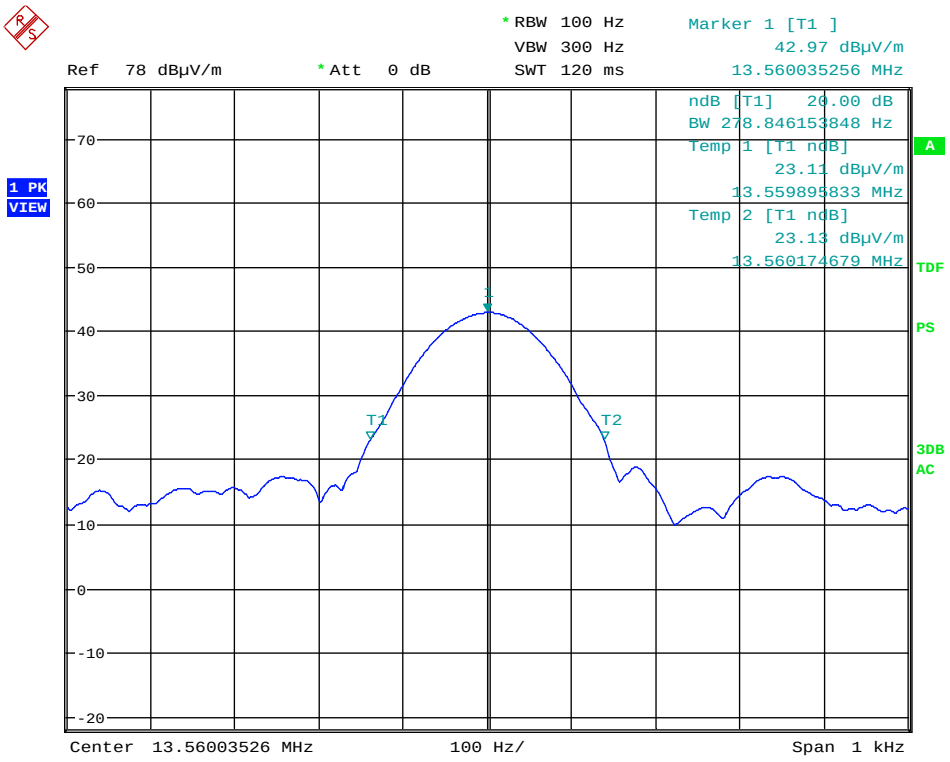
Receiver: #3846
Antenna: #374

Test distance: 3 m

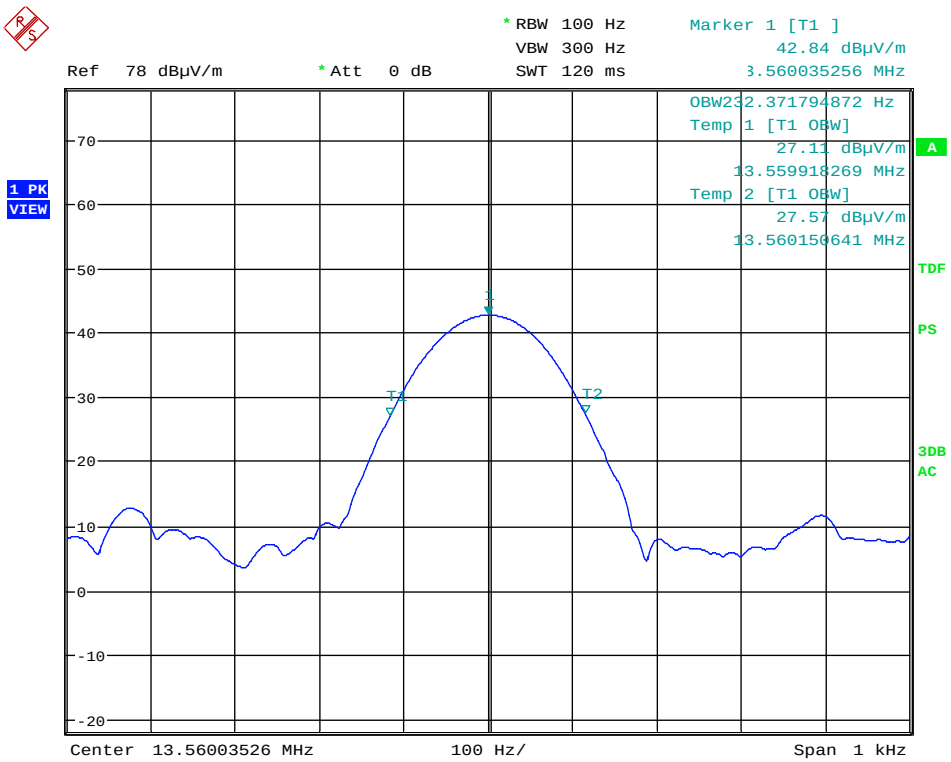


TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
374, 1889, 3846, 4717, 5392

4.5.4 Measurement Plots



Occupied Bandwidth (20 dB)



Occupied Bandwidth (99%)

4.5.5 Test Result

Occupied Bandwidth (20 dB) [Hz]
279

Occupied Bandwidth (99%) [Hz]
232

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-18
Test personnel:	Dominik Krüger

The EUT meets the requirements of this section.

4.6 Carrier Frequency Stability vs Temperature

Test Requirement: FCC 47 CFR §15.225(e), ISED RSS-210 B.6
Test Procedure: ANSI C63.10-2013, RSS-Gen 6.11

4.6.1 Regulation

47 CFR § 15.225 Operation within the band 13.110–14.010 MHz.

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

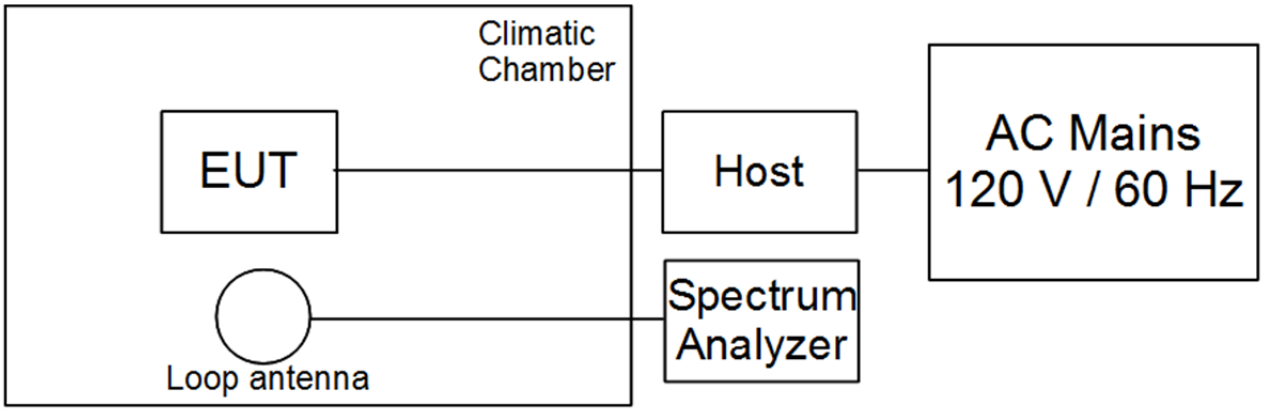
RSS-210 B.6 Band 13.110-14.010 MHz
Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

4.6.2 Test Procedures

Frequency stability with respect to ambient temperature:
The EUT (Host) was supplied with the nominal AC voltage of 120 V at 60 Hz. The RFID radio module was placed in the centre of the environmental test chamber. The measurement antenna was placed in the environmental test chamber next to the EUT and connected to a receiver. It was verified that the receiver had an adequate signal level to allow the measurement.

a) The temperature was set to + 50 °C.
While maintaining a constant temperature inside the environmental chamber, the EUT was turned on and the operating frequency was measured at start-up, two, five and ten minutes after the EUT was energized. Four measurements in total were made.
b) The EUT was switched off.
c) The chamber temperature was lowered by 10 °C and sufficient time was waited until the test chamber and the EUT did stabilize at the temperature.
d) The step a) through step c) were repeated down to the lowest specified temperature.
The highest deviation from the nominal carrier frequency was reported in the test result table.

4.6.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.225
Procedure: ANSI C63.10-2013

Receiver: #3831
Antenna: #1731

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
34, 1064, 1731, 2627, 2998, 3831, 6498

4.6.4 Test Result

Test conditions: Supply voltage = 120 VAC, 60 Hz
f_{ref} = 13.560033 MHz

Temperature	Time	Frequency	Deviation from reference		Limit	Lower limit	Upper Limit
[°C]	[min]	[MHz]	[Hz]	[ppm]	[ppm]	[MHz]	[MHz]
50	0 (start-up)	13.560010	-23	1.7	±100	13.558677	13.561389
50	2	13.560010	-23	1.7	±100	13.558677	13.561389
50	5	13.560011	-22	1.6	±100	13.558677	13.561389
50	10	13.560012	-21	1.5	±100	13.558677	13.561389
40	0 (start-up)	13.560015	-18	1.3	±100	13.558677	13.561389
40	2	13.560014	-19	1.4	±100	13.558677	13.561389
40	5	13.560012	-21	1.5	±100	13.558677	13.561389
40	10	13.560011	-22	1.6	±100	13.558677	13.561389
30	0 (start-up)	13.560017	-16	1.2	±100	13.558677	13.561389
30	2	13.560016	-17	1.3	±100	13.558677	13.561389
30	5	13.560015	-18	1.3	±100	13.558677	13.561389
30	10	13.560014	-19	1.4	±100	13.558677	13.561389
20	0 (start-up)	13.560037	4	0.3	±100	13.558677	13.561389
20	2	13.560035	2	0.1	±100	13.558677	13.561389
20	5	13.560034	1	0.1	±100	13.558677	13.561389
20	**10**	**13.560033**	**0**	**0.0**	±100	**13.558677**	**13.561389**
10	0 (start-up)	13.560035	2	0.1	±100	13.558677	13.561389
10	2	13.560046	13	1.0	±100	13.558677	13.561389
10	5	13.560045	12	0.9	±100	13.558677	13.561389
10	10	13.560046	13	1.0	±100	13.558677	13.561389
0	0 (start-up)	13.560025	-8	0.6	±100	13.558677	13.561389
0	2	13.560025	-8	0.6	±100	13.558677	13.561389
0	5	13.560027	-6	0.4	±100	13.558677	13.561389
0	10	13.560026	-7	0.5	±100	13.558677	13.561389
-10	0 (start-up)	13.559995	-38	2.8	±100	13.558677	13.561389
-10	2	13.560002	-31	2.3	±100	13.558677	13.561389
-10	5	13.560005	-28	2.1	±100	13.558677	13.561389
-10	10	13.560008	-25	1.8	±100	13.558677	13.561389
-20	0 (start-up)	13.559931	-102	7.5	±100	13.558677	13.561389
-20	2	13.559951	-82	6.0	±100	13.558677	13.561389
-20	5	13.559957	-76	5.6	±100	13.558677	13.561389
-20	10	13.559959	-74	5.5	±100	13.558677	13.561389

Test performed at nominal supply voltage and within the temperature range of -20 °C up to +50 °C starting at nominal ambient temperature and continuing with the highest specified temperature and proceeding with temperature lowered in 10 degree steps down to the lowest specified.

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-19, 2020-02-20
Test personnel:	Dominik Krüger

Carrier frequency stability is within the specified limits.

The EUT meets the requirements of this section.

4.7 Carrier Frequency Stability vs Supply Voltage

Test Requirement: FCC 47 CFR §15.225(e), ISED RSS-210 B.6
Test Procedure: ANSI C63.10-2013, RSS-Gen

4.7.1 Regulation

47 CFR § 15.225 Operation within the band 13.110–14.010 MHz.

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

RSS-210 B.6 Band 13.110-14.010 MHz
Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

4.7.2 Test Procedures

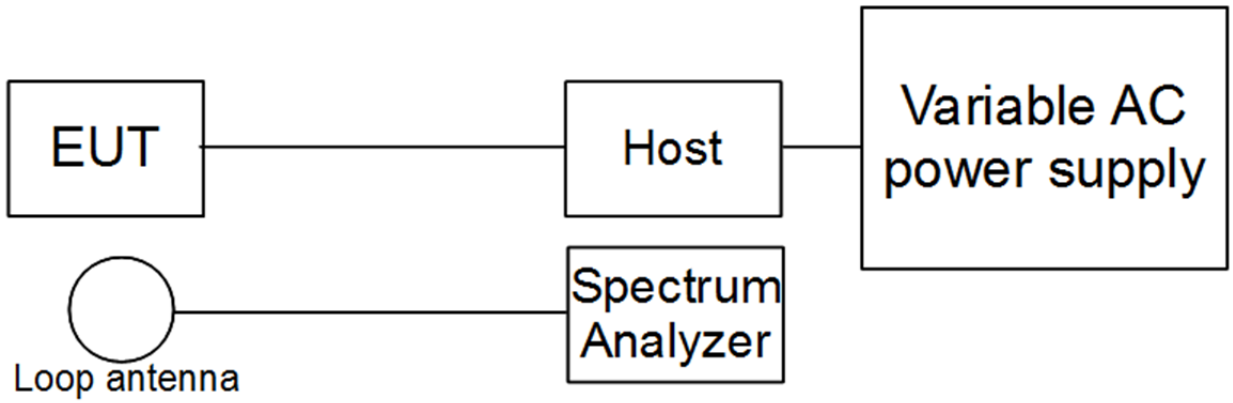
Frequency stability when varying supply voltage:

The tests were made at ambient room temperature (+15 °C to +25 °C). The EUT (Host) was supplied with the nominal AC voltage of 120 V at 60 Hz. The RFID radio module was placed in the centre of the environmental test chamber. An antenna was placed below the EUT antenna and connected to a receiver. It was verified that the receiver had an adequate signal level to allow the measurement.

The primary input voltage of the host was set to 120 V / 60 Hz, 102 V / 60 Hz (U_{nom} - 15 %) and 138V / 60 Hz (U_{nom} + 15 %).

The measurement of the centre frequency was measured at each voltage step.

4.7.3 Test Setup



SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.225
Procedure: ANSI C63.10-2013

Receiver: #3831
Antenna: #1731

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
34, 1731, 2718, 3831, 6498

4.7.4 Test Result

Test conditions: Temperature = 20 °C
f_{ref} = 13.560010 MHz

Supply Voltage	Frequency	Deviation from reference		Limit	Lower limit	Upper Limit
[V]	[MHz]	[Hz]	[ppm]	[ppm]	[MHz]	[MHz]
102	13.560036	26	1.9	±100	13.558677	13.561389
120	**13.560010**	**0**	**0.0**	**±100**	**13.558677**	**13.561389**
138	13.560036	26	1.9	±100	13.558677	13.561389

Test performed at normal ambient temperature and within the manufacturer's specified supply voltage range.

Manufacturer:	Koenig&Bauer Coding GmbH
Type:	HS 1040.6308
Serial No.:	EUT #1: MI5050-000001
Test date:	2020-02-20
Test personnel:	Dominik Krüger

Carrier frequency stability is within the specified limits.

The EUT meets the requirements of this section.

5 TEST INSTRUMENTS

EMCC ID #	Instrument	Manufacturer	Calibration valid until
1	60-Hz-Converter	AEG	n/a
34	AC Power Source	California Instruments	n/a
374	Loop Antenna	Rohde & Schwarz	2021-02
516	EMI Test Receiver	Rohde & Schwarz	2020-04
1064	TC-Sensor	Ahlborn	2020-02
1519	Pulse Limiter	Rohde & Schwarz	2020-08
1731	Sniffer Loop Probe	EMCO	n/a
1889	SR-ULL-01, Semi-Anechoic Chamber (SAC)	EMCC/FRANK.	n/a
1890	SR-ULL-05, Absorber-Lined Shielded Chamber	EMCC / SIEM / FRANK	n/a
1901	V-LISN 50 Ohm//(50 uH + 5 Ohm)	Rohde & Schwarz	2020-12
2107	2 W Termination	Anritsu	2021-09
2627	Data Logger	Ahlborn	2021-05
2718	Digital Multimeter	Agilent	2021-06
2724	5 W Attenuator 6dB	Weinschel	2021-07
2998	Thermal Chamber	Weiss	2021-06
3235	Double Ridged Guide Antenna	Schwarzbeck	2021-11
3831	Spectrum Analyzer	Rohde & Schwarz	2020-10
3846	EMI Test Receiver	Rohde & Schwarz	2020-02
4075	Workstation	Dell	n/a
4717	Web-Thermo-Hygrobarograph	Wiesemann & Theis GmbH WUT	2022-02
5392	EMC Measurement Software	Rohde & Schwarz	n/a
5404	Notebook	DELL	n/a
5541	Impedance Stabilisation Network ISN	Schwarzbeck	2021-03
5544	Antenna Mast	innco systems GmbH	n/a
5545	Antenna Mast Controller	innco systems GmbH	n/a

EMCC ID #	Instrument	Manufacturer	Calibration valid until
5551	BNC cable	EMCC	2020-07
5615	RF cable assembly	Rosenberger	2020-09
6498	N-Cable N/50	EMCC DR. RASEK	2020-06

6 MEASUREMENT UNCERTAINTY

Measurement	Measurement Uncertainty
Conducted Emissions, AC mains (150 kHz – 30 MHz)	±3.5 dB
Radiated Emissions 30 – 1000 MHz	±5.6 dB
Radiated Emissions above 1000 MHz	±4.6 dB
RF frequency (25 MHz – 1 GHz)	± 8.4 * 10^{-8}
Temperature	± 1.8° K
Humidity	± 3.1 %

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:

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.

Description	Pages
Annex 1: Photographs of test setup	3
Annex 2: External photographs of equipment under test	5
Annex 3: Internal photographs of equipment under test	3
Annex 4: Photographs of ancillary equipment	4
Annex 5: Photographs of EUT modifications	2

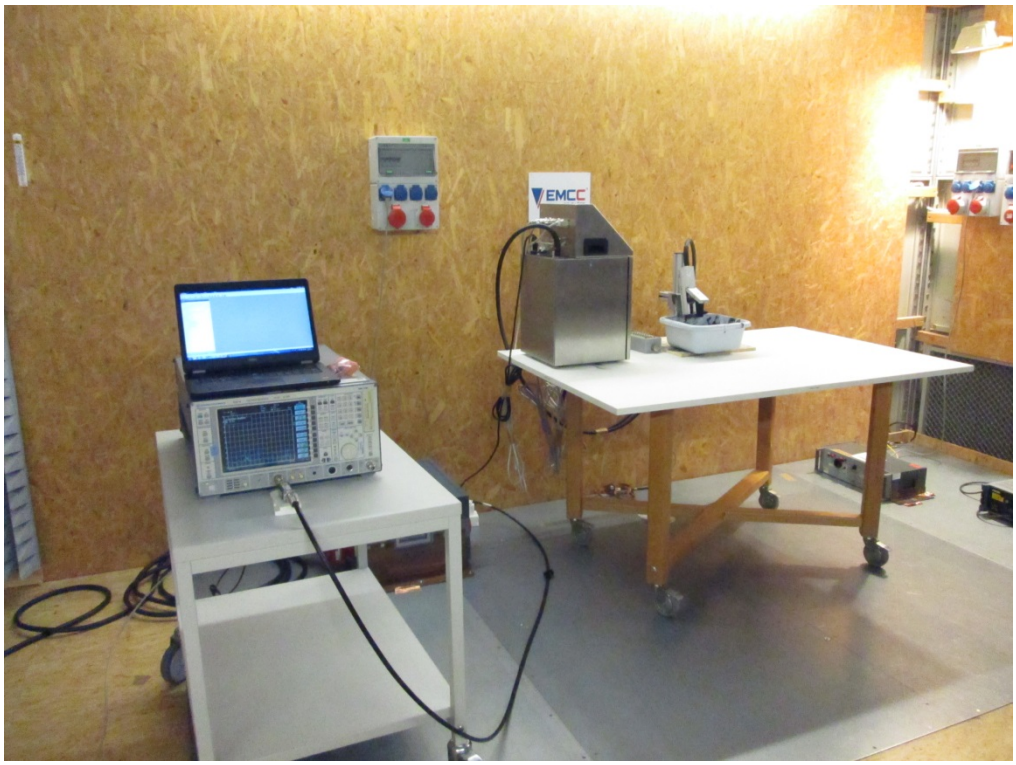
ANNEX 1 TO TEST REPORT # EMCC-980535CCD, 2020-09-04

PHOTOGRAPHS OF TEST SETUP

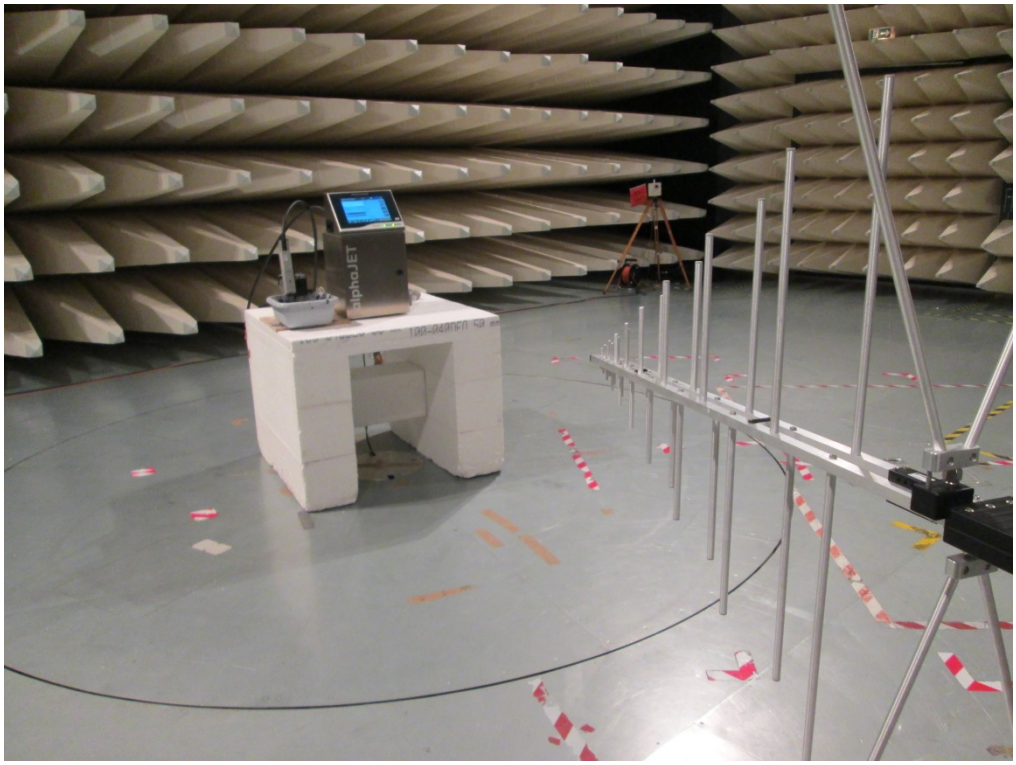
EQUIPMENT UNDER TEST:

Trade Name:	alphaJET 5
Type/Model:	HS 1040.6308
Serial Number(s):	EUT #1: MI5050-000001
Application:	Inkjet printer for industrial applications
FCC ID:	2AWS3CCM10404715
Manufacturer:	Koenig&Bauer Coding GmbH
Address:	Benzstraße 11 97209 Veitshoechheim GERMANY
Phone:	+49 931 9085-262
E-Mail:	christian.schmitt2@koenig-bauer.com
RELEVANT STANDARD(S) :	47 CFR Part 15 C RSS-210 Issue 10
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013

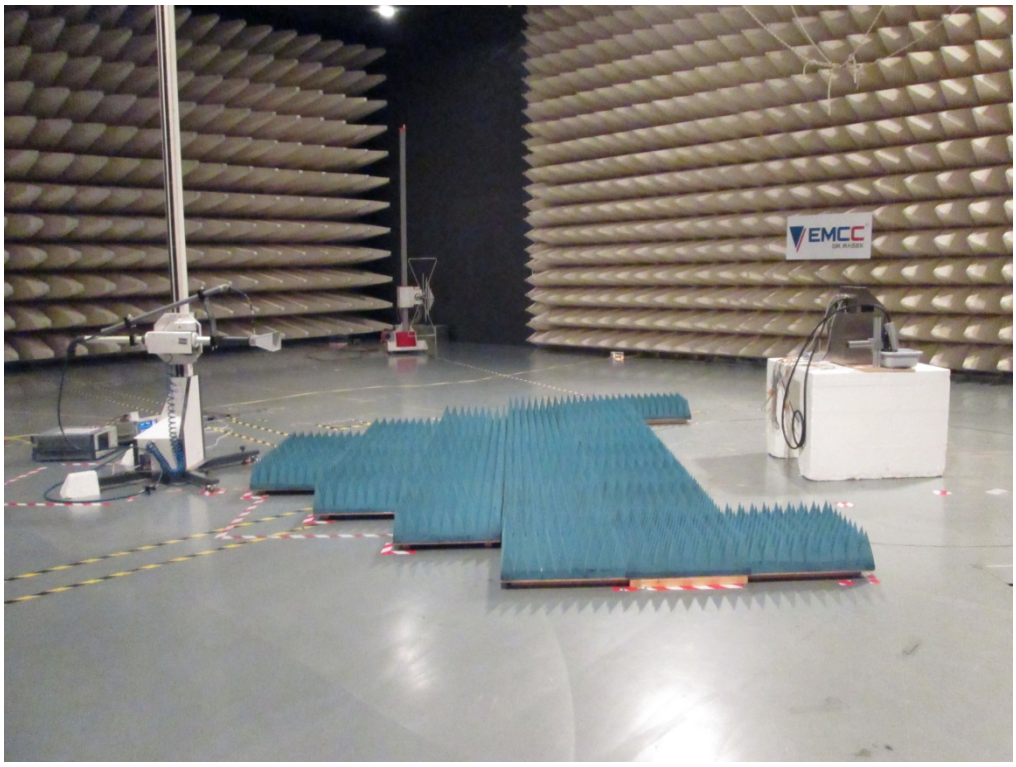
ILLUSTRATION LIST ANNEX 1



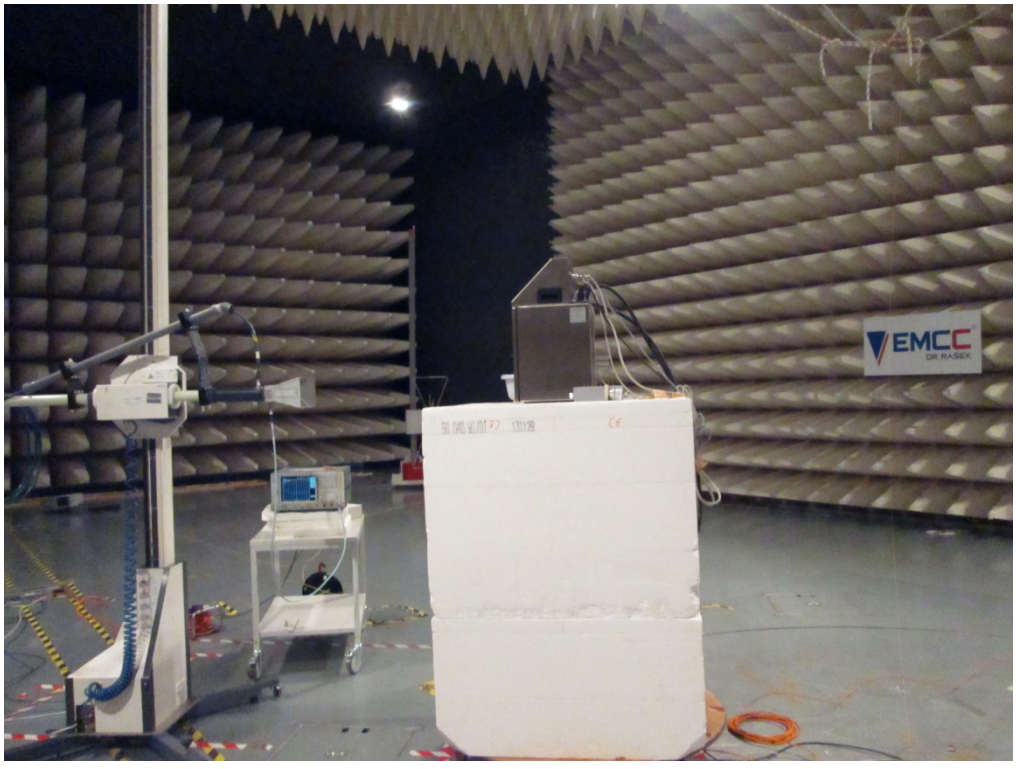
Photograph A1-1: Conducted Emissions



Photograph A1-2: Radiated Emissions 30 – 1000 MHz at 3 m distance



Photograph A1-3: Radiated Emissions 1 - 6 GHz at 3 m distance



Photograph A1-4: Radiated Emissions 6- 10GHz at 1 m distance

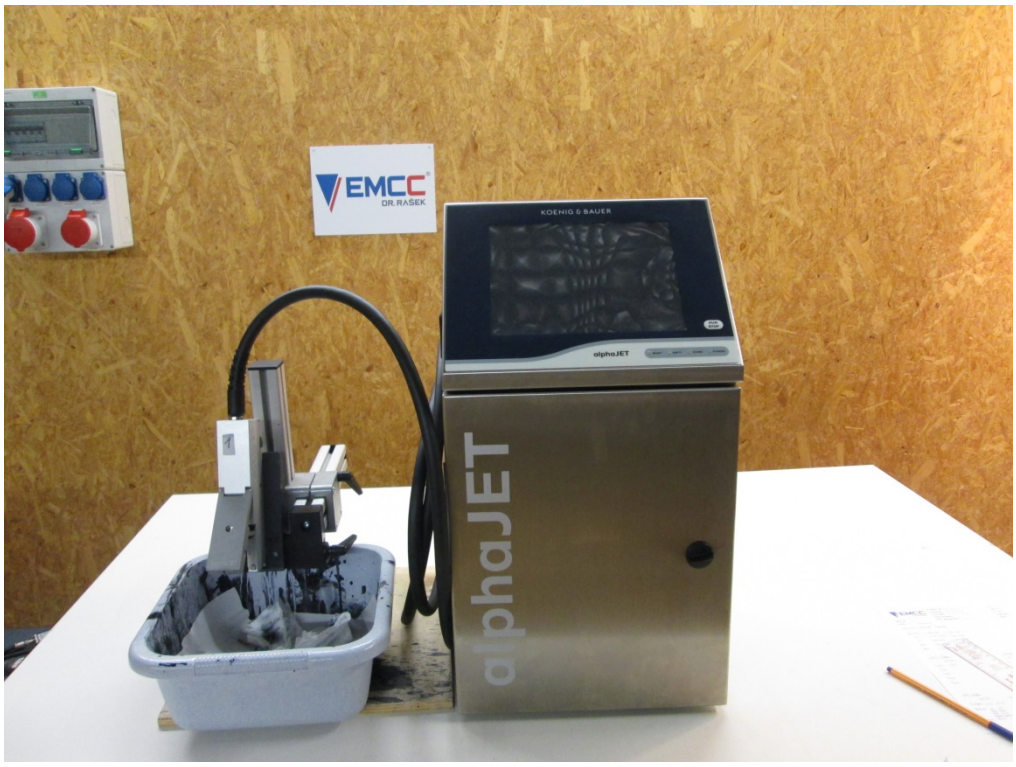
ANNEX 2 TO TEST REPORT # EMCC-980535CCD, 2020-09-04

EXTERNAL PHOTOGRAPHS OF EQUIPMENT UNDER TEST

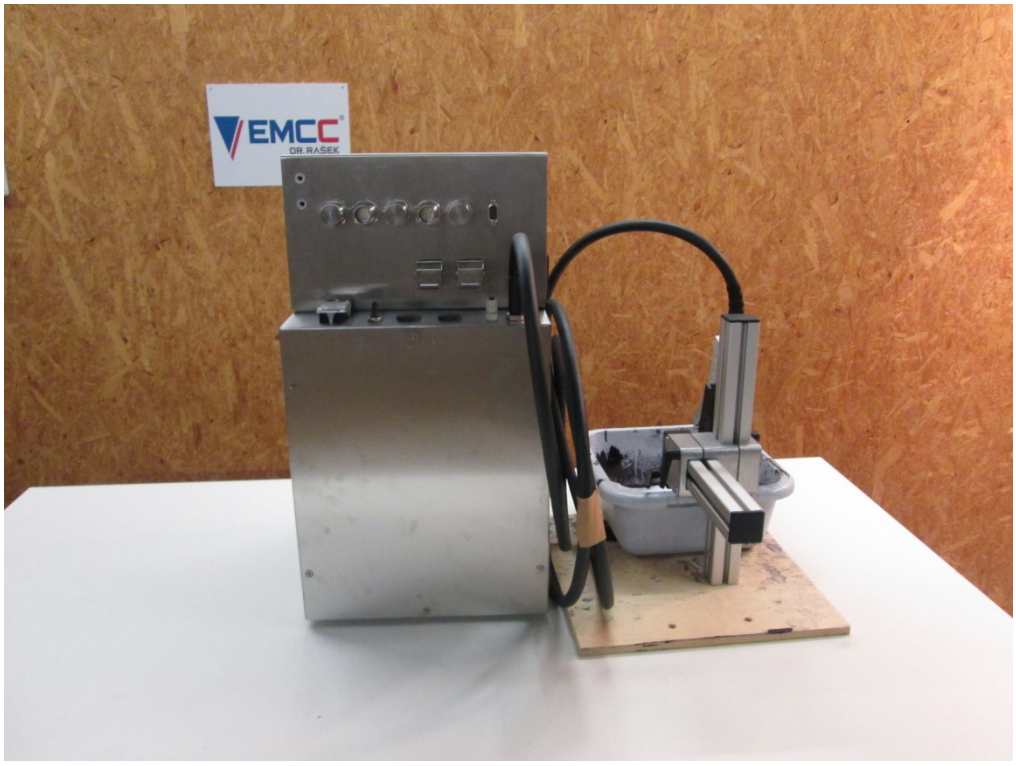
EQUIPMENT UNDER TEST:

Trade Name:	alphaJET 5
Type/Model:	HS 1040.6308
Serial Number(s):	EUT #1: MI5050-000001
Application:	Inkjet printer for industrial applications
FCC ID:	2AWS3CCM10404715
Manufacturer:	Koenig&Bauer Coding GmbH
Address:	Benzstraße 11 97209 Veitshoechheim GERMANY
Phone:	+49 931 9085-262
E-Mail:	christian.schmitt2@koenig-bauer.com
RELEVANT STANDARD(S) :	47 CFR Part 15 C RSS-210 Issue 10
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013

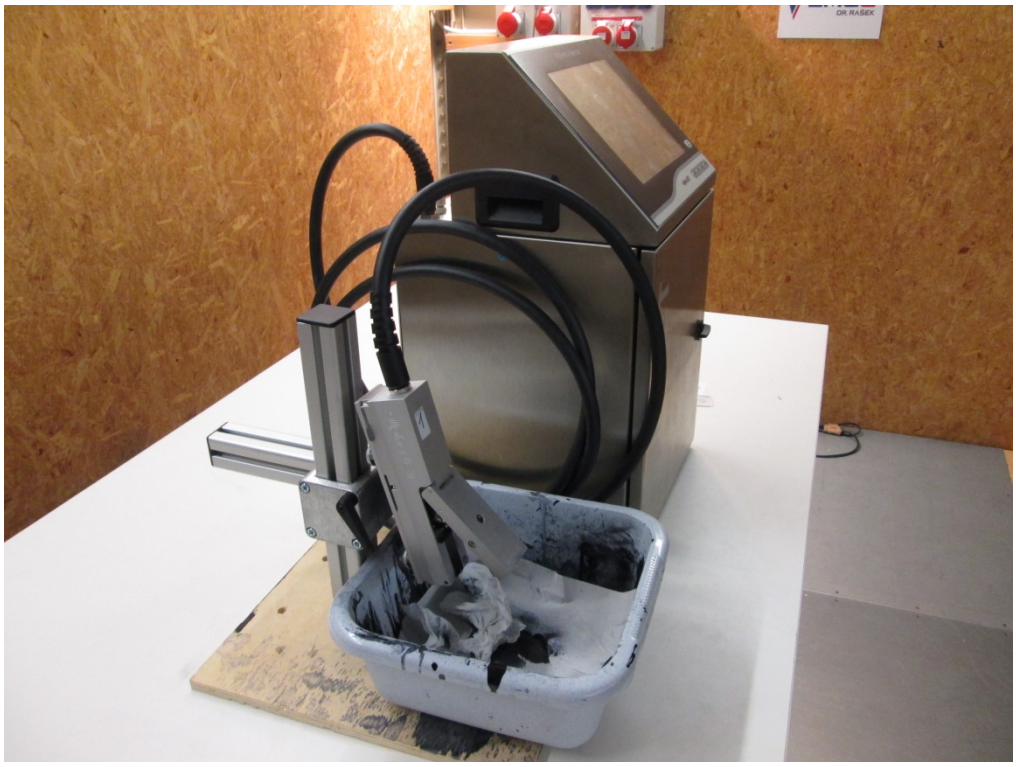
ILLUSTRATION LIST ANNEX 2



Photograph A2-1: EUT #1: MI5050-000001 front



Photograph A2-2: EUT #1: MI5050-000001 back

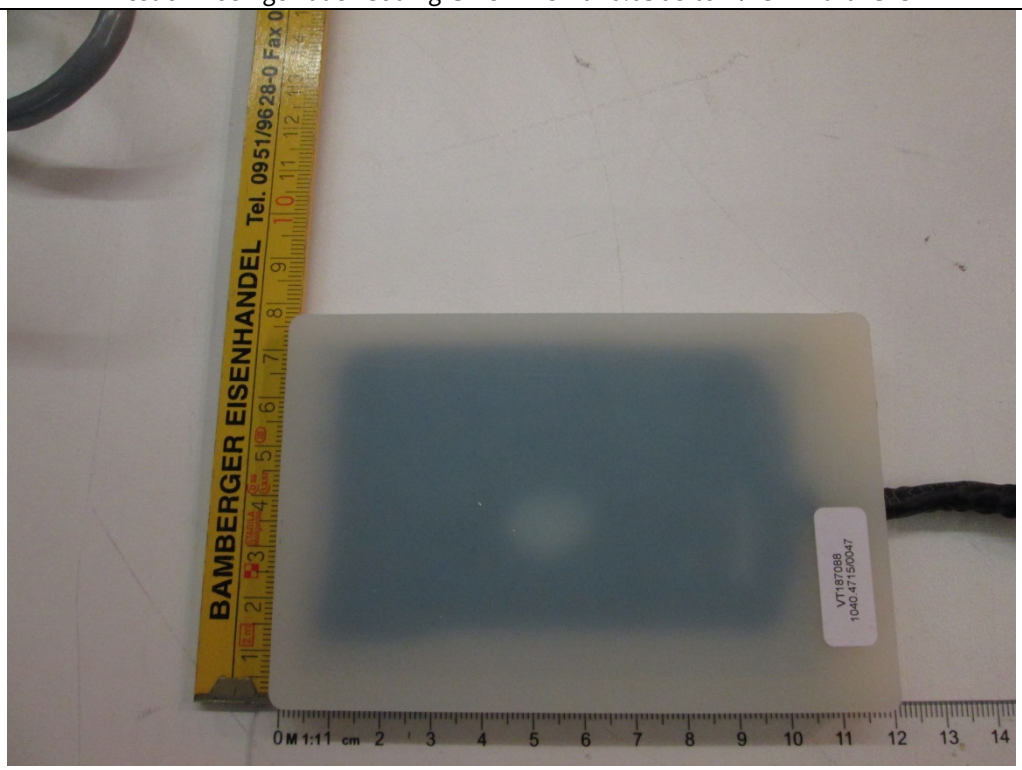


Photograph A2-3: EUT #1: MI5050-000001 left

Photograph A2-4: EUT #1: MI5050-000001 right

Photograph A2-5: EUT #1: MI5050-000001 label

Photograph A2-6: EUT #1: MI5050-000001 label of potted RFID PCB



Photograph A2-7: EUT #1: MI5050-000001 top of potted RFID PCB

Photograph A2-8: EUT #1: MI5050-000001 top of potted RFID PCB

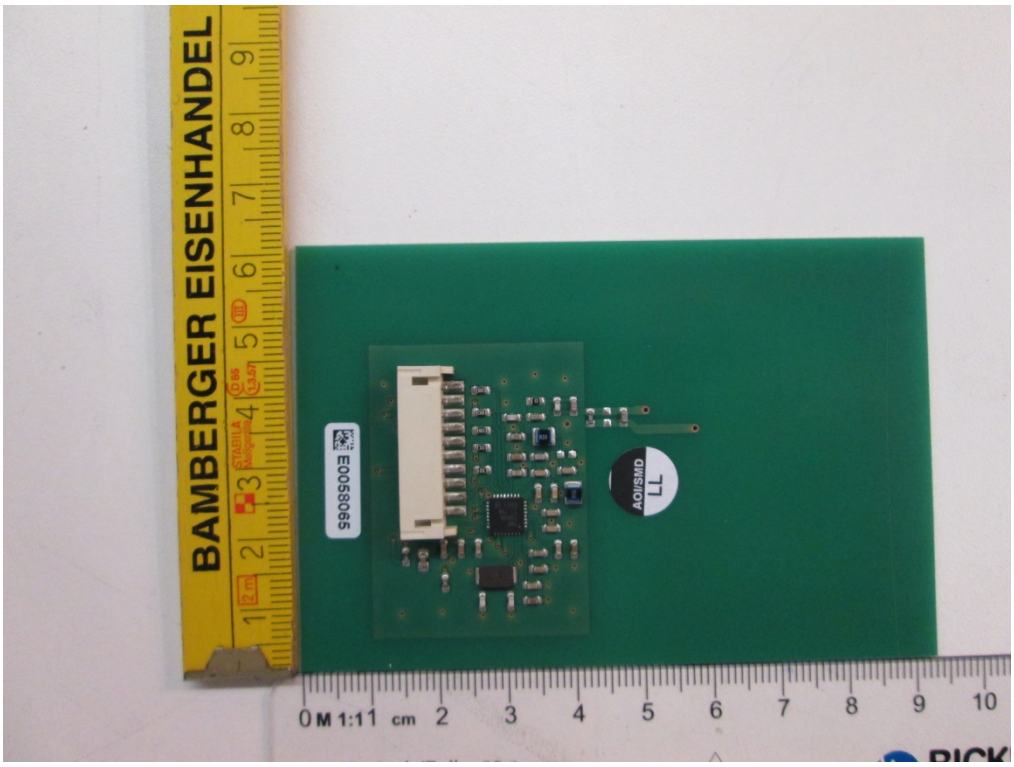
ANNEX 3 TO TEST REPORT # EMCC-980535CCD, 2020-09-04

INTERNAL PHOTOGRAPHS OF EQUIPMENT UNDER TEST

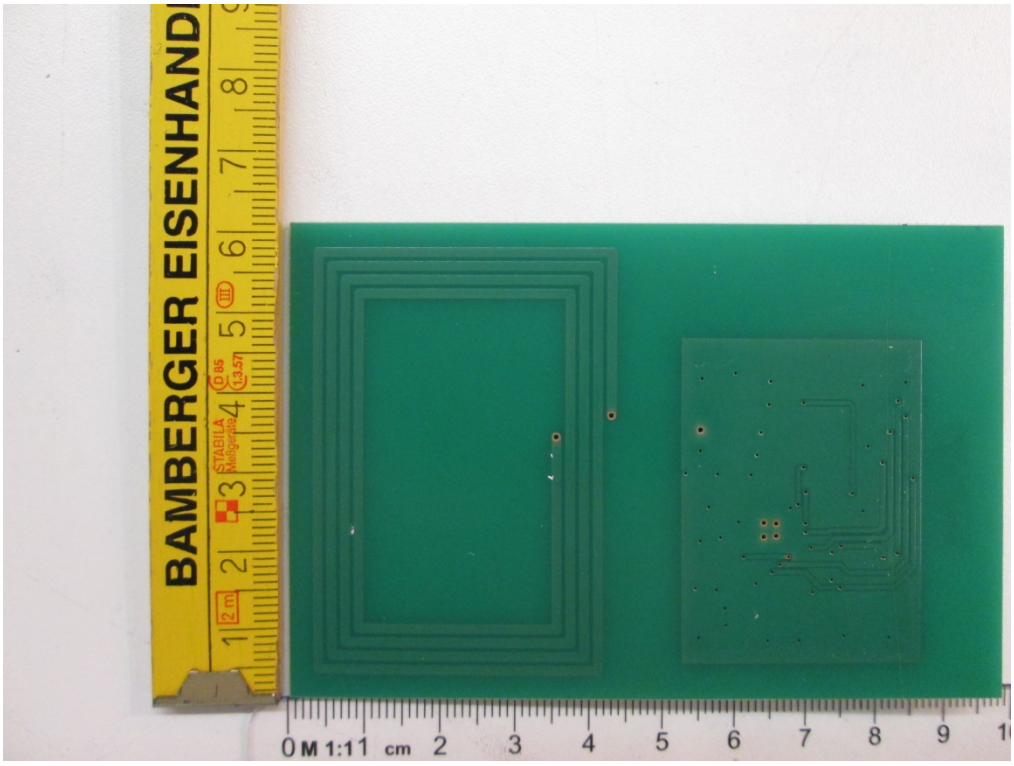
EQUIPMENT UNDER TEST:

Trade Name:	alphaJET 5
Type/Model:	HS 1040.6308
Serial Number(s):	EUT #1: MI5050-000001,
Application:	Inkjet printer for industrial applications
FCC ID:	2AWS3CCM10404715
Manufacturer:	Koenig&Bauer Coding GmbH
Address:	Benzstraße 11 97209 Veitshoechheim GERMANY
Phone:	+49 931 9085-262
E-Mail:	christian.schmitt2@koenig-bauer.com
RELEVANT STANDARD(S) :	47 CFR Part 15 C RSS-210 Issue 10
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013

ILLUSTRATION LIST ANNEX 3



Photograph A3-1: EUT (SN: EUT #1: MI5050-000001), Top Internal View of RFID PCB



Photograph A3-2: (EUT #1: MI5050-000001), Bottom View of PCB of RFID PCB

Photograph A3-3: (EUT #1: MI5050-000001), Internal view (Ink and solvent door)

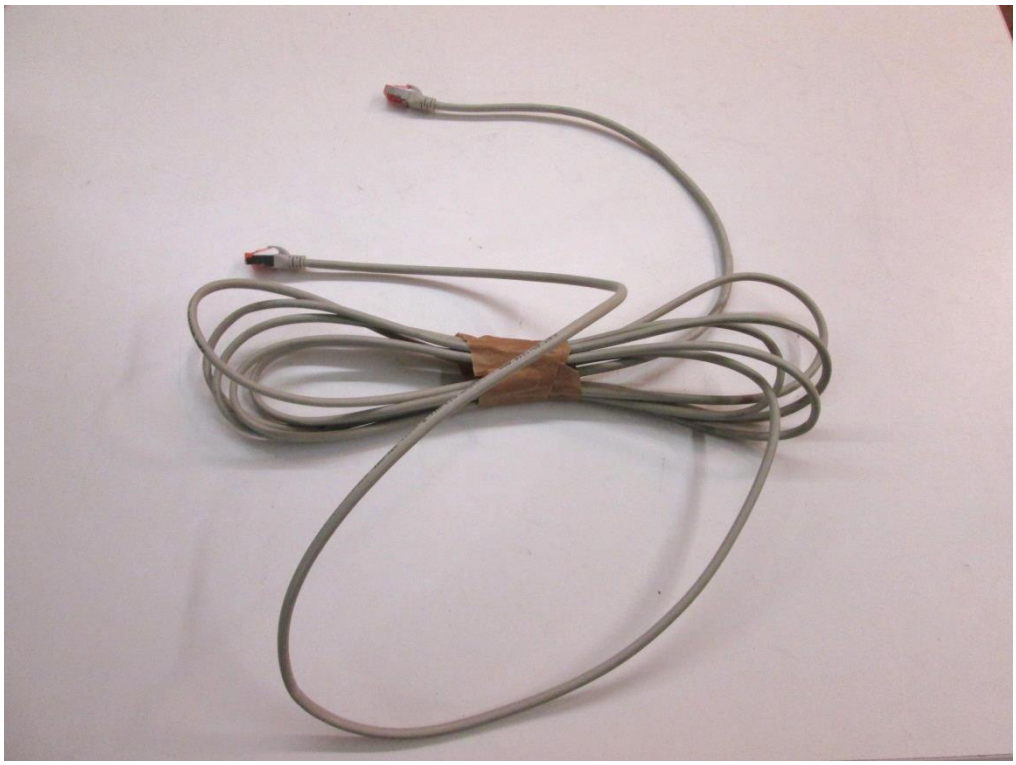
ANNEX 4 TO TEST REPORT # EMCC-980535CCD, 2020-09-04

PHOTOGRAPHS OF ANCILLARY EQUIPMENT

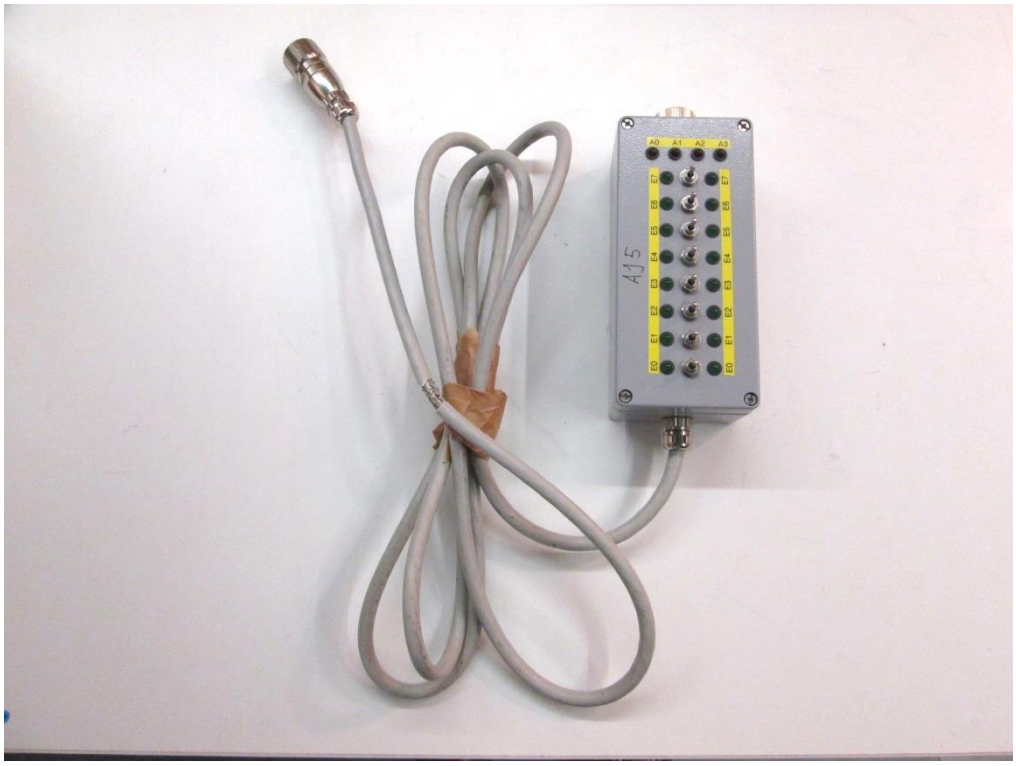
EQUIPMENT UNDER TEST:

Trade Name:	alphaJET 5
Type/Model:	HS 1040.6308
Serial Number(s):	EUT #1: MI5050-000001
Application:	Inkjet printer for industrial applications
FCC ID:	2AWS3CCM10404715
Manufacturer:	Koenig&Bauer Coding GmbH
Address:	Benzstraße 11 97209 Veitshoechheim GERMANY
Phone:	+49 931 9085-262
E-Mail:	christian.schmitt2@koenig-bauer.com
RELEVANT STANDARD(S) :	47 CFR Part 15 C RSS-210 Issue 10
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013

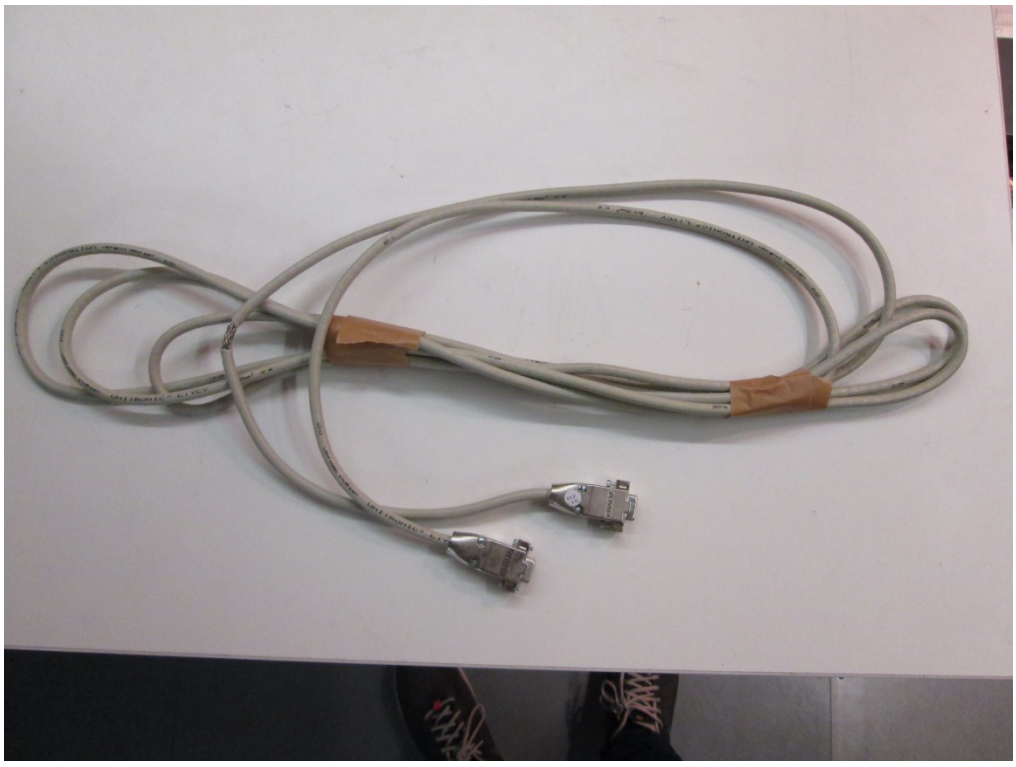
ILLUSTRATION LIST ANNEX 4



Photograph A4-1: Network cable (Ethernet)



Photograph A4-2: IO-Box



Photograph A4-3: RS232 cable

Photograph A4-4: Product Encoder

Photograph A4-5: Observation Notebook (Fujitsu H720)

ANNEX 5 TO TEST REPORT # EMCC-980535CCD, 2020-09-04

PHOTOGRAPHS OF EUT MODIFICATIONS

EQUIPMENT UNDER TEST:

Trade Name:	alphaJET 5
Type/Model:	HS 1040.6308
Serial Number(s):	EUT #1: MI5050-000001
Application:	Inkjet printer for industrial applications
FCC ID:	2AWS3CCM10404715
Manufacturer:	Koenig&Bauer Coding GmbH
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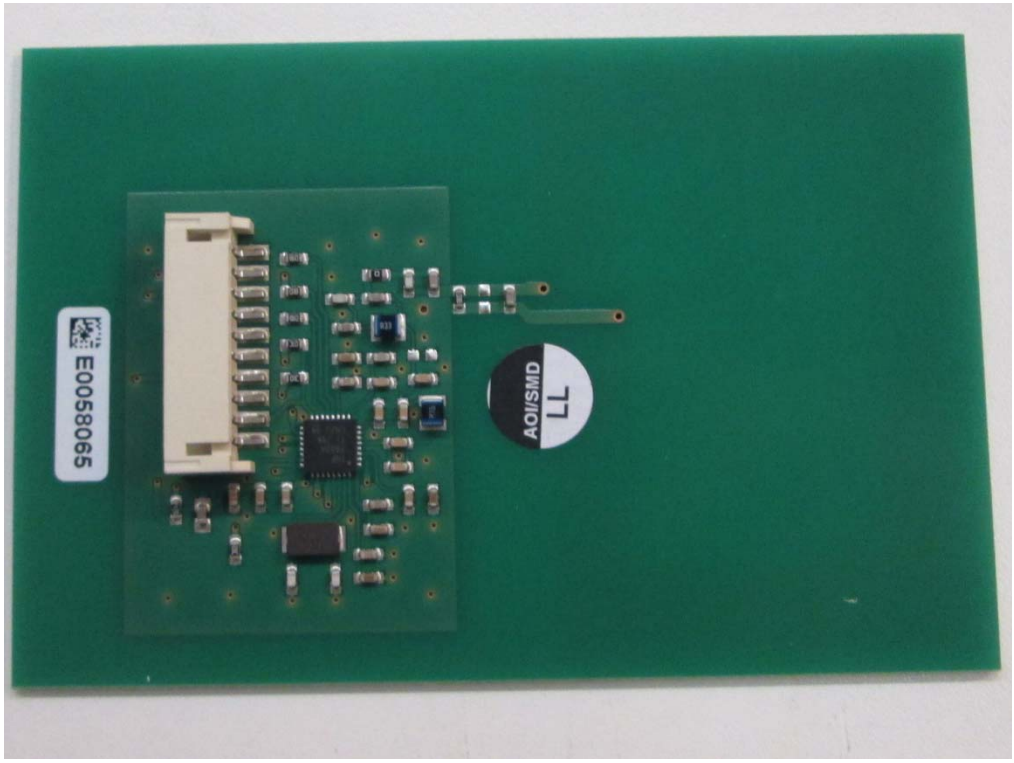
E-Mail:	christian.schmitt2@koenig-bauer.com
RELEVANT STANDARD(S) :	47 CFR Part 15 C RSS-210 Issue 10
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013

ILLUSTRATION LIST ANNEX 5



Photograph A5-1: Modified RFID PCB with dummy load in lieu of the antenna