TEST REPORT # EMCC-910036.1F, 2019-01-28

EQUIPMENT UNDER TEST:

Trade Name:	RFID Reader Module M21
Type/Model (EUT number):	MP02001 with antennas: 8609751 (#1) 8609761 (#2) 8609741 (#3) 8609721 (#5) 8609931 (#6)
Application:	RFID Reader
FCC:	FCC ID: UVFEASTM21
ISED:	IC: 5895C-M21
Manufacturer:	Drägerwerk AG & Co. KGaA
Address:	Moislinger Allee 53-55 23558 Lübeck GERMANY
Phone:	+49 451 882-5957
E-Mail:	volker.biermann@draeger.com
RELEVANT STANDARD(S) :	47 CFR §§ 15.225 RSS-210 Issue 9 Limited tests performed only
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013, RSS-Gen Issue 5

TEST REPORT PREPARED BY:

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Tested:

Ludwig Kraft

Checked:

Wolfgang Döring
-Senior Head of Radio/EMC Dept. -

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1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance with the 47 CFR §15.225 and RSS-210 requirements for the certification of licence-exempt 15C Intentional Radiator.

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-12067-01-02
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:	Drägerwerk AG & Co. KGaA
Street:	Moislinger Allee 53-55
City:	23558 Lübeck
Country:	GERMANY
Name:	Volker Biermann
Phone:	+49 451 882-5957
Fax:	+49 451 882-75957
E-Mail:	volker.biermann@draeger.com

1.5 Manufacturer

Company name:	Drägerwerk AG & Co. KGaA
Street:	Moislinger Allee 53-55
City:	23558 Lübeck
Country:	GERMANY
Phone:	+49 451 882-5957
E-Mail:	volker.biermann@draeger.com

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1.6 Dates and Test Location

Date of Receipt of EUT: 2018-10-29
Test Date: CW 46, 50/2018
Test Location: Lab IV

1.7 Ordering Information

Purchase Order: M6HNB4301509658
Date: 2018-10-01
Vendor-Number: 118562

1.8 Climatic Conditions

Date	Temperature	Relative Humidity	Air Pressure	Lab	Customer attended tests
--	°C	%	hPa	--	--
2018-11-12	22	40	977	IV	No
2018-11-13	22	41	984	IV	No
2018-11-14	22	39	989	IV	No
2018-12-11	22	33	978	IV	No
2018-12-12	22	32	980	IV	No

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2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

The following data is based on customer's information.

Manufacturer:	Drägerwerk AG & Co. KGaA
Type, Serial No(s), EUT No(s):	MP02001, 2106187489 (RFID Reader M21) with antennas: 8609751, ASLD-0020, #1 (Antenna CO2) 8609761, ASLD-0007, #2 (Antenna WAL) 8609741, ASLD-0025, #3 (Antenna Breath Insp) 8609721, ASLC-0004, #5 (Antenna Flow Insp) 8609931, ASLC-0012, #6 (Antenna Flow Exp)
Application:	RFID Reader
No of variants:	None
Firmware Version:	1.1.8
Hardware Version:	MP02001, 21 8609751, 01 8609761, 01 8609741, 02 8609721, 02 8609931, 01
Transmit Frequency:	13.56 MHz
Modulation:	ASK
Power supply:	24 VDC*
FCC:	FCC ID: UVFEASTM21
ISED:	IC: 5895C-M21
Input voltage for DRÄGER power supply:	115V / 60 Hz
Ports RFID Reader M21:	Signal and supply – 5 pin connector Antenna ports A1 … A8 U.FL series miniaturized SMD coaxial connectors (sockets, male)
Ports, Antennas:	U.FL series miniaturized SMD coaxial connector (socket, male), fitted with U.FL series miniaturized coaxial connector cable (f-f)
Remarks:	None

* nominal voltage, test performed with DRÄGER power supply model M7.3 with a typical DC voltage of 26 V.

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2.2 Intended Use

The following information was delivered by the customer:

The EUT consist of the RFID Reader Module M21 and connected antennas. This system is intended to read RFID tags on medical devices.

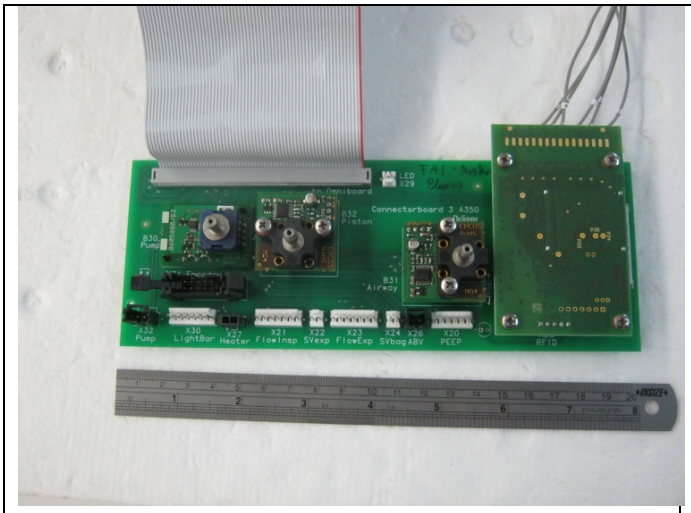
2.3 EUT Peripherals/Simulators

The EUT was tested connected with

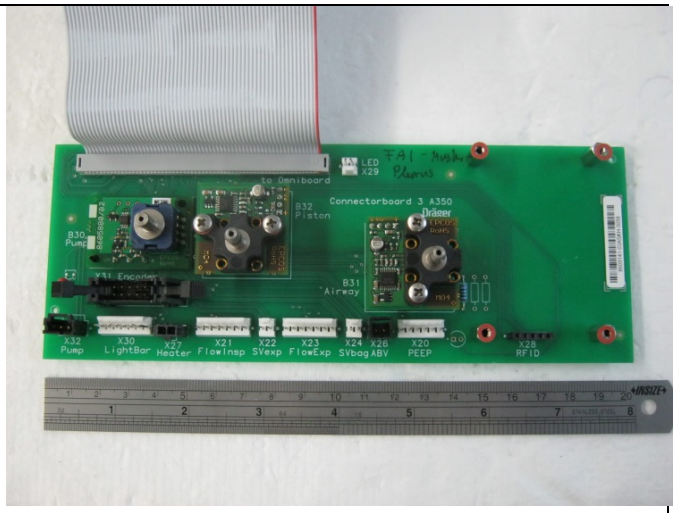
- Power supply M7.3 (Dräger)
- RS232 to TTL Converter
- Connection board
- Connection cable with ferrits (F1: Würth 742 712 21, F2: 742 711 12)
- Laptop personal computer (Fujitsu Siemens) with test software as RS-232 controller for the M21

Photograph 2.3-1: Power supply M7.3 (Dräger)

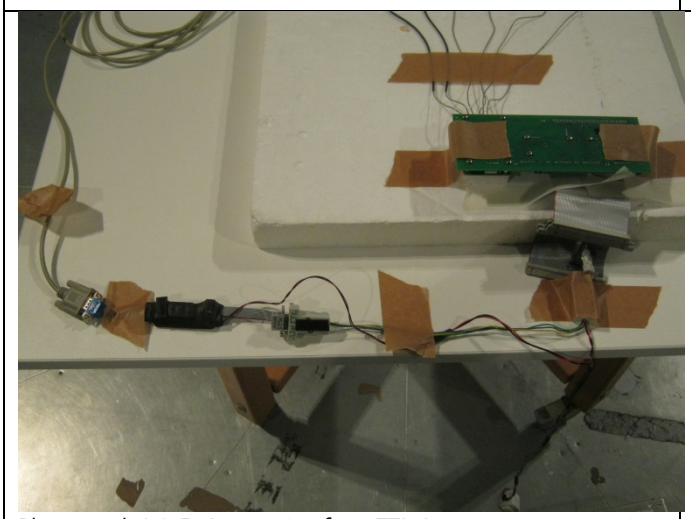
Photograph 2.3-2: RS232 to TTL Converter



Photograph 2.3-3: Connection board with M21 connected

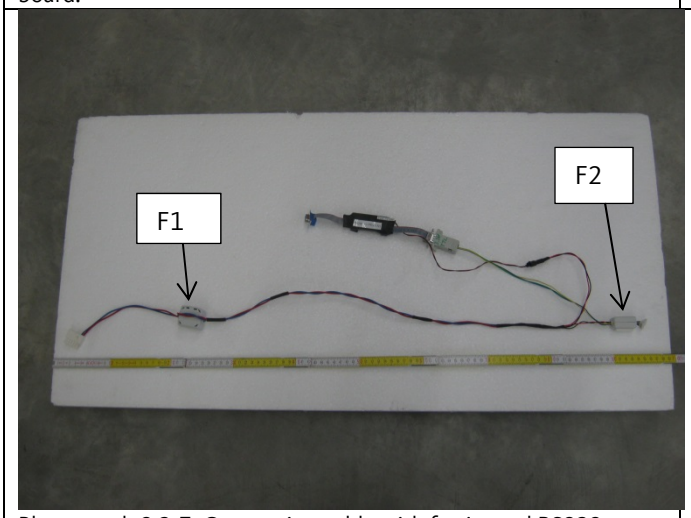


Photograph 2.3-4 Connection board without M21



Photograph 2.3-5: Connection from TTL Converter to connection board.

Photograph 2.3-6: Connection cable from Axon Control unit to Axon Stator Unit used



Photograph 2.3-7: Connection cable with ferrits and RS232 to TTL Converter to connection board.

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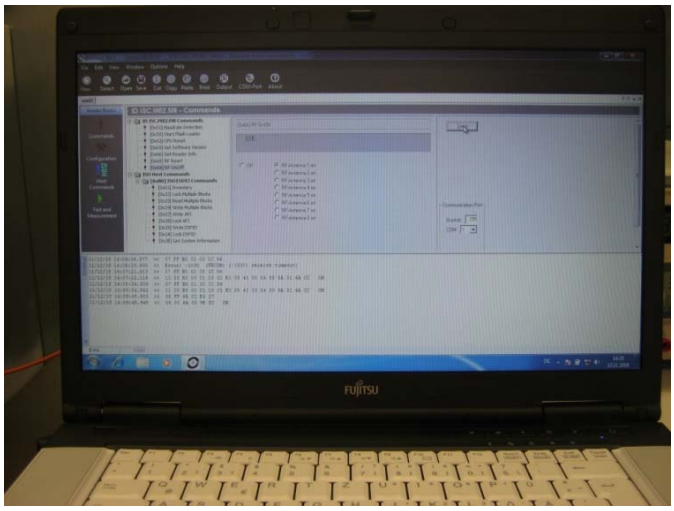
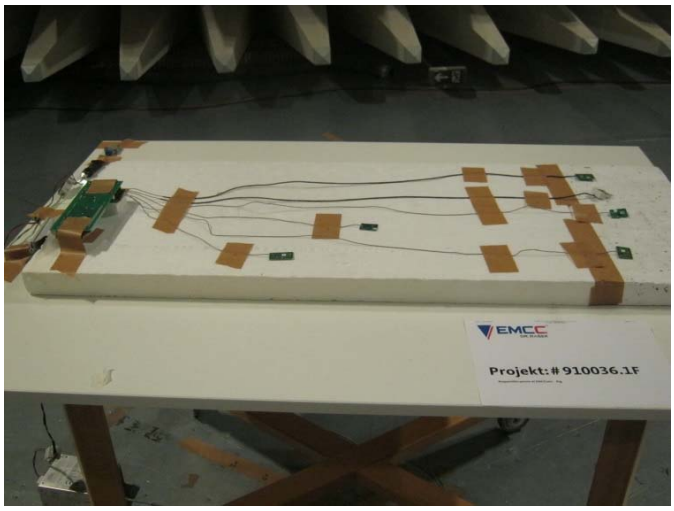
2.4 Mode of operation during testing and test setup

The equipment under test (EUT) was operated during the tests under the following conditions:
Continuous operation mode without tag.
The antennas were connected to the M21 connector with the original RF cables:
A1: #1 (Antenna CO2)
A2: #2 (Antenna WAL)
A3: #3 (Antenna Breath Insp)
A4: Antenna Breath Exp MK07476, connected but not tested
Antenna type MK07476 was covered with test report EMCC-910036IBB, dated 2011-06-16.
A5: #5 (Antenna Flow Insp)
A6: #6 (Antenna Flow Exp)
A7: not connected
A8: not connected

All modes were set via RS-232 from the PC using test software "ISOStart 2013" version 09.05.03.
The antenna port and RFOn was selected and the send button pressed. See examples screenshot below.



Photograph 2.4-1: Examples screenshot antenna 1.



Photograph 2.4-2: Example of the test setup with all antennas connected to M21

2.5 Modifications required for compliance

None.

3 TEST RESULTS SUMMARY

Summary of test results for the following EUT:

Manufacturer:	Drägerwerk AG & Co. KGaA
Device:	RFID Reader Module M21, with antennas
Type(s), Serial No(s):	MP02001, 2106187489 8609751, ASLD-0020, #1 8609761, ASLD-0007, #2 8609741, ASLD-0025, #3 8609721, ASLC-0004, #5 8609931, ASLC-0012, #6

Requirement	RSS, Section	47 CFR Section	Report Section	Result
Antenna Requirement	RSS-Gen, 6.8	15.203	4	Passed
Spectrum Mask	RSS-210, B6	15.255(a)-(d)	5	Passed
Radiated Emissions 9 kHz – 30 MHz	RSS-210, B6 RSS-Gen, 8.9	15.205, 15.209, 15.255(d)	6	Passed
Radiated Emissions 30 MHz – 1000 MHz	RSS-210, B6 RSS-Gen, 6.13, 8.9	15.205, 15.209	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 C63.4-2014 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: Ludwig Kraft
Issuance Date: 2019-01-28

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4 DETAILED TEST RESULTS

4.1 Antenna Requirement

4.1.1 Regulation

FCC 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 Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, 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 Sections 15.211, 15.213, 15.217, 15.219, or 15.221.
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 Section 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 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.

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4.1.2 Test Result

Manufacturer:	Drägerwerk AG & Co. KGaA
Device:	RFID Reader Module M21, with antennas
Type(s), Serial No(s):	MP02001, 2106187489
	8609751, ASLD-0020, #1
	8609761, ASLD-0007, #2
	8609741, ASLD-0025, #3
	8609721, ASLC-0004, #5
	8609931, ASLC-0012, #6

Antenna connectors are commercial available U.FL series miniaturized SMD coaxial connectors. The antennas are fixed installed and not accessible for end users. The equipment however requires professional installation.

The EUT meets the requirements of this section.

4.2 Spectrum Mask

4.2.1 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.

RSS-210 B.6 Band 13.110-14.010 MHz
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.

...

→ The ISED limits are equal to the FCC limits.

4.2.2 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 C63.4 clause 4.5 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. 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
Receive antenna polarization	Vertical

* 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.

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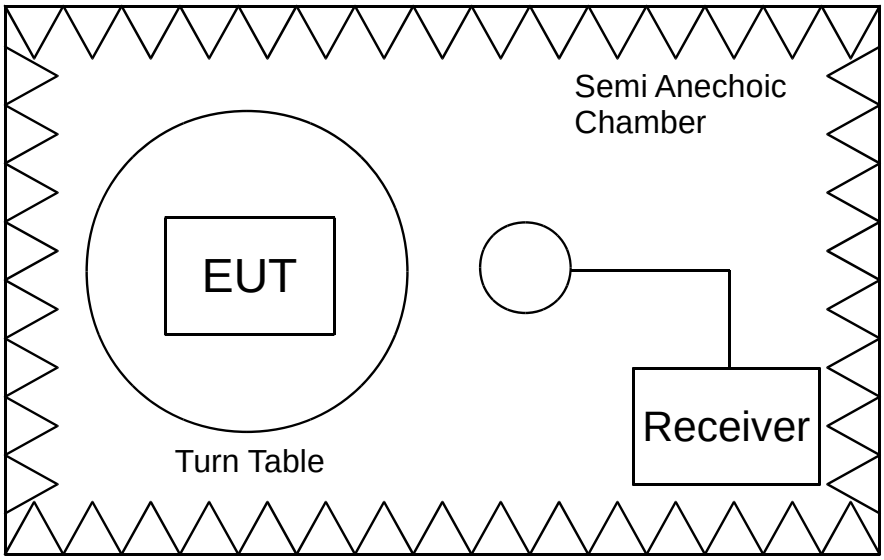
4.2.3 Test Setup



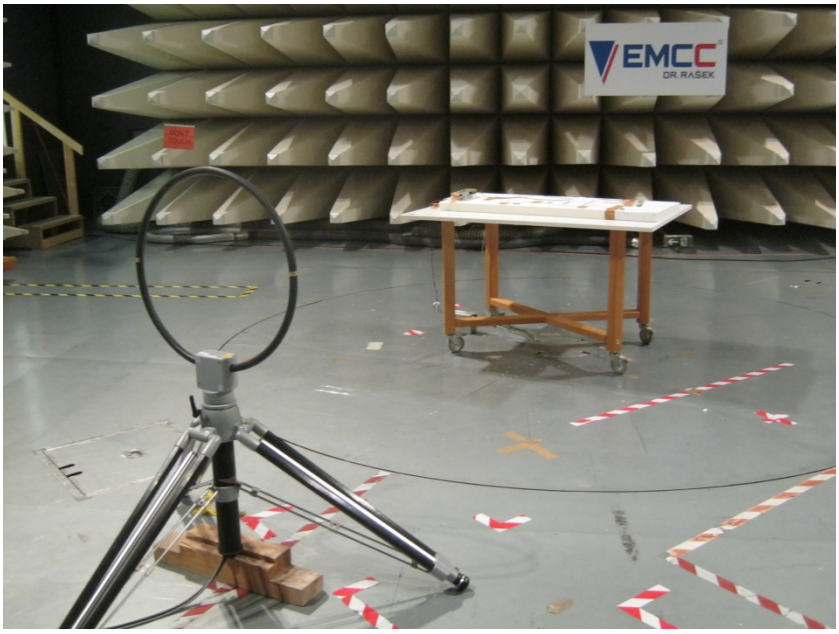
SCHEMATIC TEST SETUP

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

Receiver: #516
Antenna: #2965

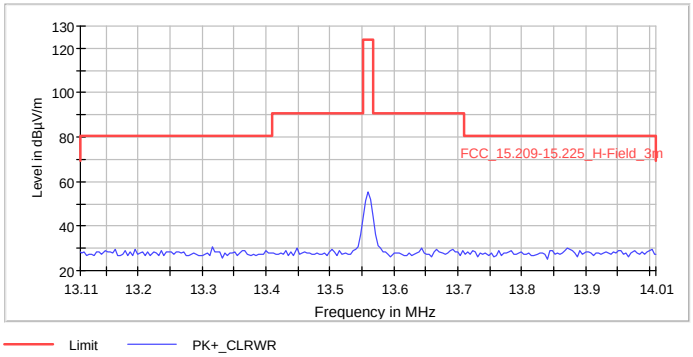
Test distance: 3 m

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 516, 1291, 1889, 2720, 2965, 4075, 4717, 5392

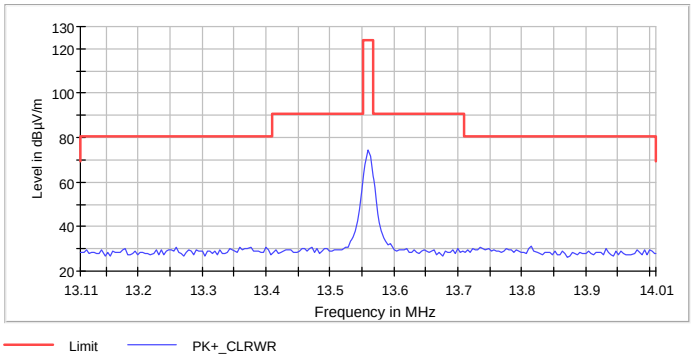


4.2.4 Measurement Plots

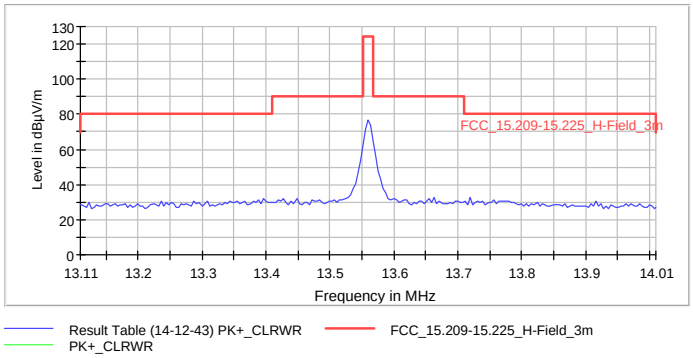
- EUT #1 Antenna Type: 8609751, Serial number ASLD-0020:



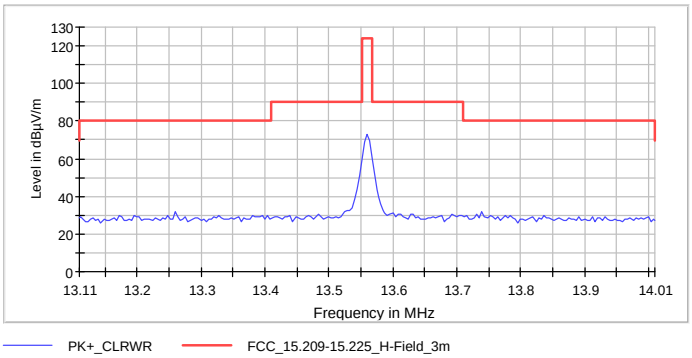
- EUT #2 Antenna Type: 8609761, Serial number ASLD-0007:



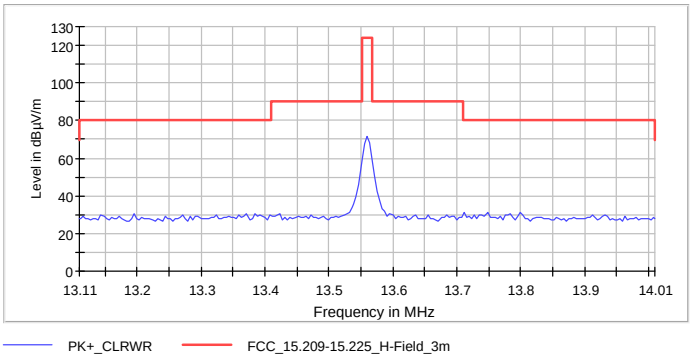
- EUT #3 Antenna Type: 8609741, Serial number ASLD-0025:



- EUT #5 Antenna Type: 8609721, Serial number ASLC-0004:



- EUT #6 Antenna Type: 8609931, Serial number ASLC-0012:



4.2.5 Test Result

EUT	Frequency MHz	Detector	3m_Result dBµV/m	Distance Correction dB	30m_Result dBµV/m	30m_Limit dBµV/m	Margin dB
#1	13.56	QP	54.2	-40	14.2	84	69.8
#2	13.56	QP	73.4	-40	33.4	84	50.6
#3	13.56	QP	75.4	-40	35.4	84	48.6
#5	13.56	QP	71.4	-40	31.4	84	52.6
#6	13.56	QP	71.9	-40	31.9	84	52.1

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

Manufacturer:	Drägerwerk AG & Co. KGaA
Device:	RFID Reader Module M21, with antennas
Type(s), Serial No(s):	MP02001, 2106187489
	8609751, ASLD-0020, #1
	8609761, ASLD-0007, #2
	8609741, ASLD-0025, #3
	8609721, ASLC-0004, #5
	8609931, ASLC-0012, #6
Test date:	2018-11-12, 13, 14
Test Personal:	Ludwig Kraft

The EUT meets the requirements of this section.

4.3 Radiated Emissions 9 kHz – 30 MHz

4.3.1 Regulation

47CFR § 15.33 Frequency range of radiated measurements

(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:
(3) Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this section.

Highest frequency generated or used in the device or on which the device operates or tunes / MHz	Upper frequency of measurement range / 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.

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	Field Strength		Measurement distance
MHz	µV/m	dBµV/m	m
0.009–0.490	2400/F[kHz]	67.6 – 20 logF[kHz]	300
0.490–1.705	24000/F[kHz]	87.6 – 20 logF[kHz]	30
1.705–30.0	30	29.5	30

(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.

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 § 15.225

(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.

RSS-210 B.6 Band 13.110-14.010 MHz

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.

RSS-Gen, 8.9 Transmitter Emission Limits for Licence-Exempt Radio Apparatus

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

...

Table 6 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Below 30 MHz			
Frequency	Electric Field Strength µV/m	Magnetic Field Strength (H-Field) µA/m	Measurement Distance m
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1,705-30 MHz	30	N/A	30

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector. Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the relevant RSS.

4.3.2 Calculation of Field Strength Limits

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

150 µV/m at 10 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.

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.

In case of testing being 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 10 m and a measurement performed at 3 m: The distance correction factor is 20 log (10 / 3) = 10.5. This factor is mathematically added to the limit by the following equation:
$E_{dBµV/m_new} = E_{dBµV/m} + DF$
where

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

$E_{dBµV/m_new}$ = Corrected Field Strength limit in logarithmic units (in dBµV/m)

DF = Distance Extrapolation Factor (in dB)

Example: Assume a limit of 49.5 dBµV/m specified in 10 m distance and the measurement performed at 3 m. The limit is adjusted by the distance correction factor of 10.5 dB to the new limit of 60 dBµV/m.

4.3.3 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 and 10 m with the same calibrated loop antenna The measurement was performed with set-up an antenna with a diameter of 0.122 m and 0.249 m,
These measurements were used for evaluate a correction of the open field measurement to the semi-anechoic room measurement.

Ant. Diameter	Freq MHz	Detector	Distance m	F_{SAC} dBµV/m	F_{open} dBµV/m	f_c 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.

4.3.4 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 + fc
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)
fc = correlation factor from SAC to open field site field strength (not taken into account see 4.3.3)

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)
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 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.

4.3.5 Test Procedures

Measurement was performed in a semi-anechoic room at a test distance of 3 m. A calibrated loop antenna as specified in ANSI C63.4 clause 4.5 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. 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 and IC listed semi-anechoic room at the specified 3 m test distance. Pre-scan and final measurement performed in modulated mode with and without RFID tags.
Worst case emissions are listed under chapter: Final test results.

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.

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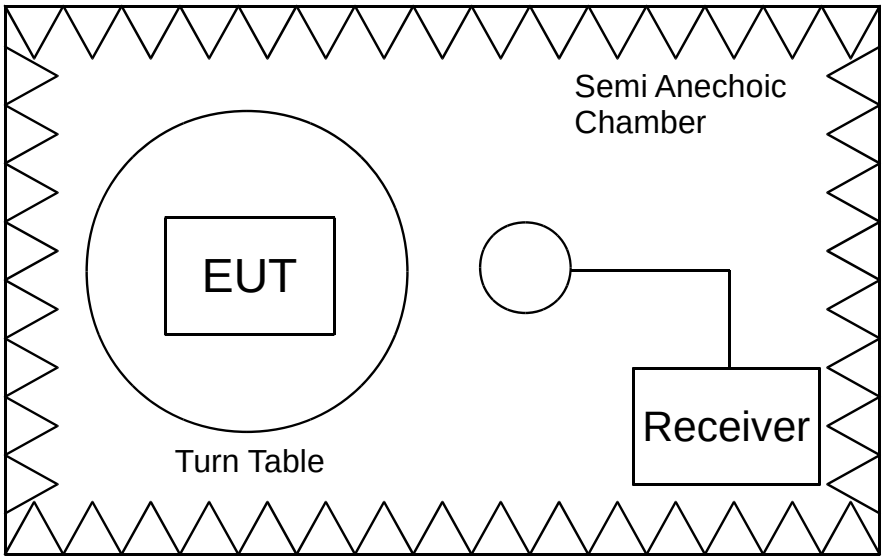
4.3.6 Test Setup



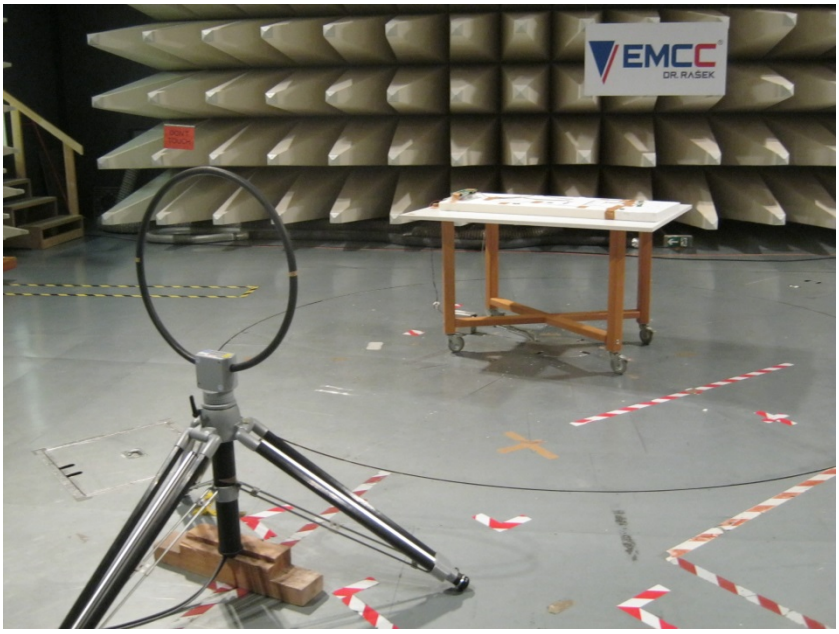
SCHEMATIC TEST SETUP

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

Receiver: #516
Antenna: #2965

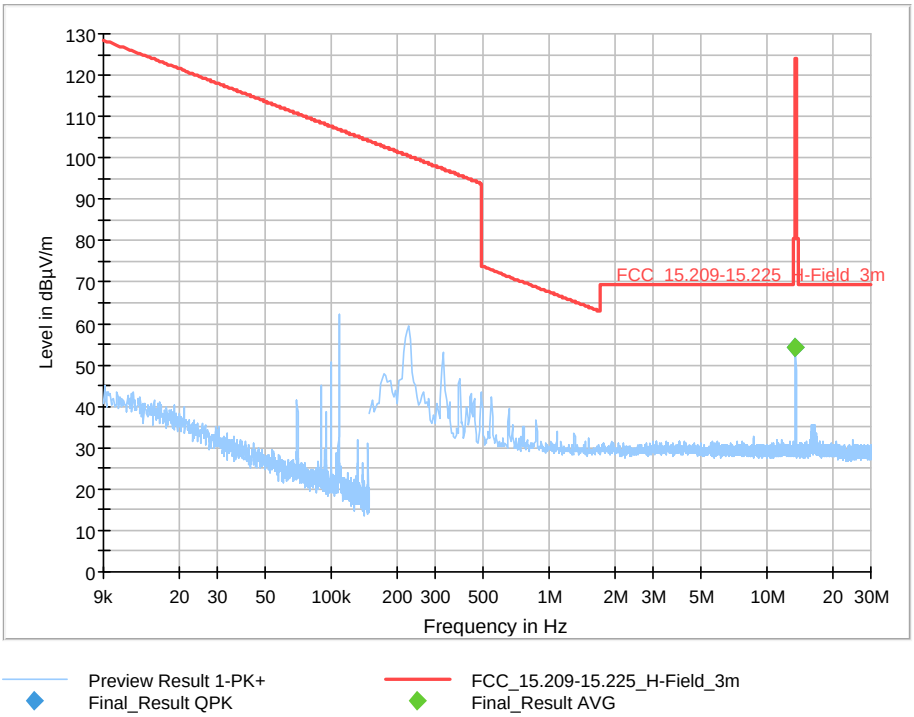
Test distance: 3 m

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
1, 516, 1291, 1889, 2720, 2965, 4075, 4717, 5392



4.3.7 Detailed Test Data

- EUT #1 Antenna Type: 8609751, Serial number ASLD-0020:



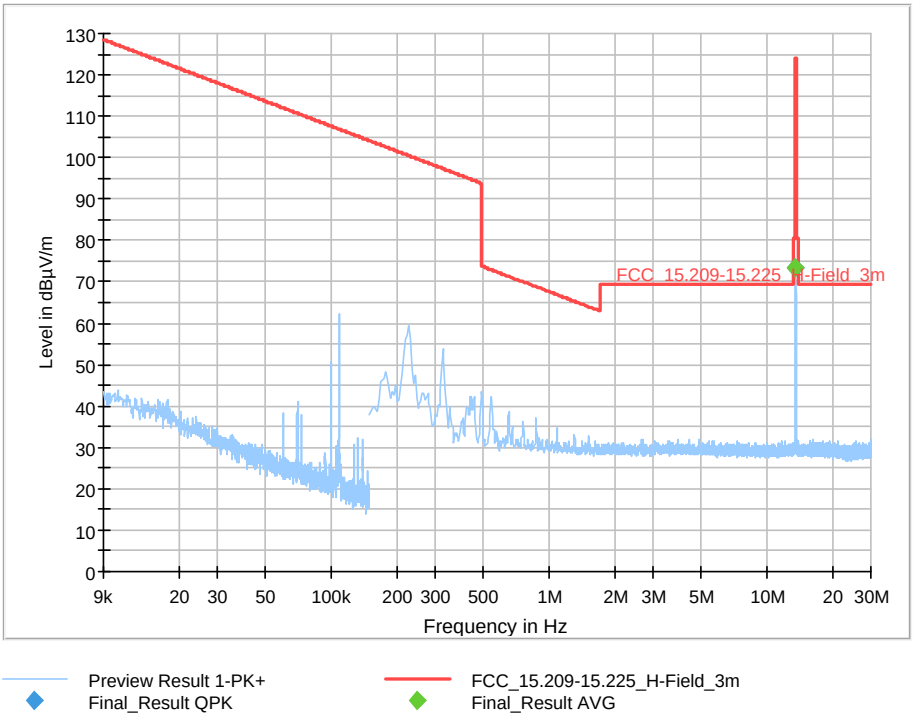
Measurements were performed at 3 m distance. Plots show field strength reading at 3 m distance.
In order to compare the 3 m reading with the specified field strength limits a distance correction as described in 9.5 (40 dB/decade) was applied to the limit (represented by the limit line „FCC_15.209-15.225_HField_3m“).

Final Result

Freq. MHz	Detector	3m_Result dBµV/m	Distance Correction dB	30m_Result dBµV/m	30m_Limit dBµV/m	Margin dB
13.56	QP	54.2	-40	14.2	84	69.8
		All other emissions more than 20 dB below margin				

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

- EUT #2 Antenna Type: 8609761, Serial number ASLD-0007:



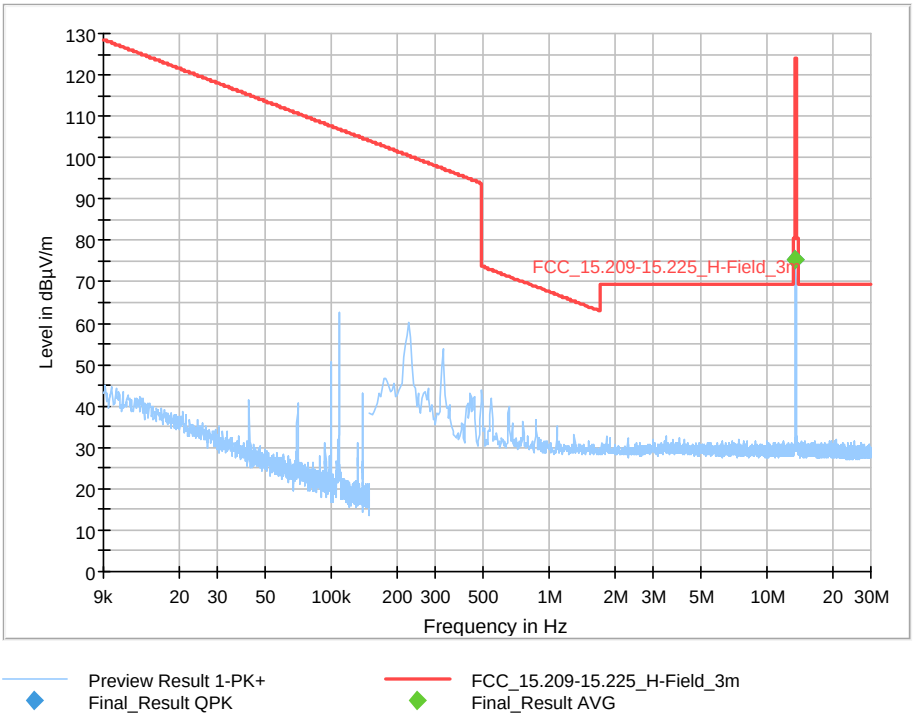
Measurements were performed at 3 m distance. Plots show field strength reading at 3 m distance.
In order to compare the 3 m reading with the specified field strength limits a distance correction as described in 9.5 (40 dB/decade) was applied to the limit (represented by the limit line „FCC_15.209-15.225_HField_3m“).

Final Result

Freq. MHz	Detector	3m_Result dBµV/m	Distance Correction dB	30m_Result dBµV/m	30m_Limit dBµV/m	Margin dB
13.56	QP	73.4	-40	33.4	84	50.6
		All other emissions more than 20 dB below margin				

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

- EUT #3 Antenna Type: 8609741, Serial number ASLD-0025:



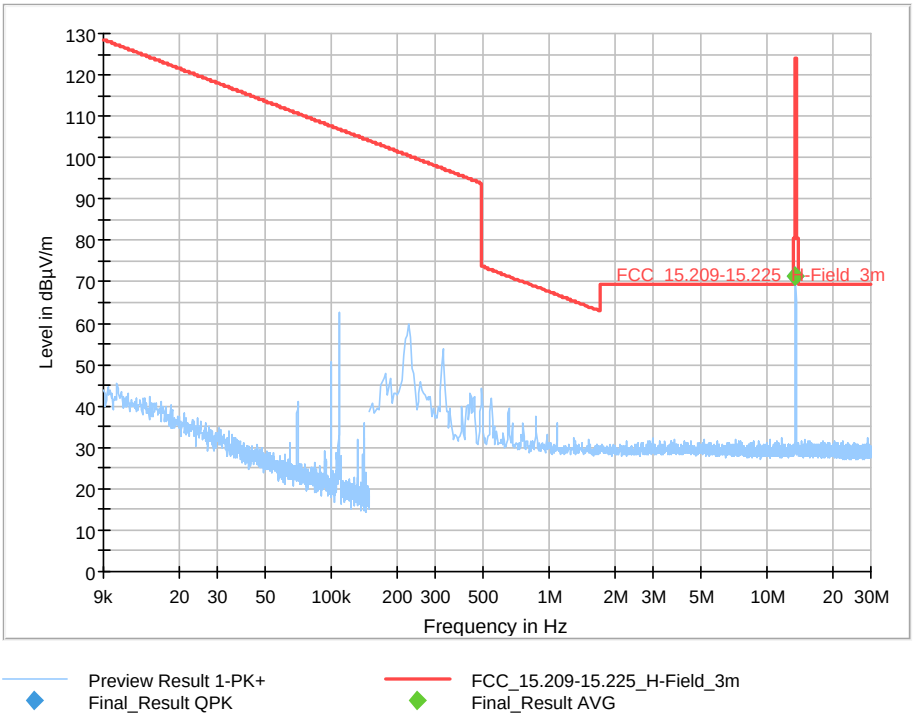
Measurements were performed at 3 m distance. Plots show field strength reading at 3 m distance.
In order to compare the 3 m reading with the specified field strength limits a distance correction as described in 9.5 (40 dB/decade) was applied to the limit (represented by the limit line „FCC_15.209-15.225_HField_3m“).

Final Result

Freq. MHz	Detector	3m_Result dBµV/m	Distance Correction dB	30m_Result dBµV/m	30m_Limit dBµV/m	Margin dB
13.56	QP	75.4	-40	35.4	84	48.6
		All other emissions more than 20 dB below margin				

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

- EUT #5 Antenna Type: 8609721, Serial number ASLC-0004:



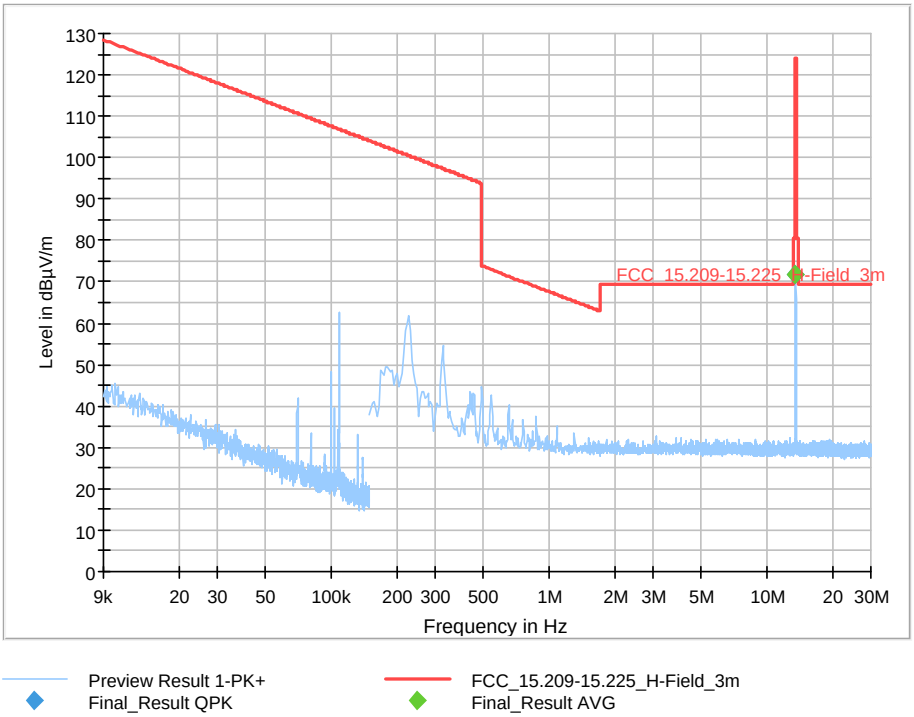
Measurements were performed at 3 m distance. Plots show field strength reading at 3 m distance.
In order to compare the 3 m reading with the specified field strength limits a distance correction as described in 9.5 (40 dB/decade) was applied to the limit (represented by the limit line „FCC_15.209-15.225_HField_3m“).

Final Result

Freq. MHz	Detector	3m_Result dBµV/m	Distance Correction dB	30m_Result dBµV/m	30m_Limit dBµV/m	Margin dB
13.56	QP	71.5	-40	31.5	84	52.5
	All other emissions more than 20 dB below margin					

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

- EUT #6 Antenna Type: 8609931, Serial number ASLC-0012:



Measurements were performed at 3 m distance. Plots show field strength reading at 3 m distance.
In order to compare the 3 m reading with the specified field strength limits a distance correction as described in 9.5 (40 dB/decade) was applied to the limit (represented by the limit line „FCC_15.209-15.225_HField_3m“).

Final Result

Freq. MHz	Detector	3m_Result dBµV/m	Distance Correction dB	30m_Result dBµV/m	30m_Limit dBµV/m	Margin dB
13.56	QP	71.9	-40	31.9	84	52.1
		All other emissions more than 20 dB below margin				

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

4.3.8 Test Result

Manufacturer:	Drägerwerk AG & Co. KGaA
Device:	RFID Reader Module M21, with antennas
Type(s), Serial No(s):	MP02001, 2106187489
	8609751, ASLD-0020, #1
	8609761, ASLD-0007, #2
	8609741, ASLD-0025, #3
	8609721, ASLC-0004, #5
	8609931, ASLC-0012, #6
Test date:	2018-11-12, 13, 14
Test Personal:	Ludwig Kraft

The EUT meets the requirements of this section.

4.4 Radiated Emissions 30 MHz – 1000 MHz

4.4.1 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.

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.

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

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employing a peak detector function as long at the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

4.4.2 Calculation of Field Strength Limits

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

150 µV/m at 10 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.

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.

In case of testing being 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 10 m and a measurement performed at 3 m: The distance correction factor is 20 log (10 / 3) = 10.5. 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 49.5 dBµV/m specified in 10 m distance and the measurement performed at 3 m. The limit is adjusted by the distance correction factor of 10.5 dB to the new limit of 60 dBµV/m.

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4.4.3 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)
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 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.

4.4.4 Test Procedures

ANSI C63.4-2014, 8.2.3 Electric field radiated emissions (30 MHz to 1 GHz)

Electric field measurements are made in the frequency range of 30 MHz to 1000 MHz using a calibrated linearly polarized antenna as specified in 4.5.4, which shall be positioned at the specified distance from the periphery of the EUT. The specified distance is the distance between the horizontal projection onto the ground plane of the closest periphery of the EUT and the projection onto the ground plane of the center of the axis of the elements of the receiving antenna. However, if the receiving antenna is an LPDA antenna, the specified distance shall be the distance between the closest periphery of the EUT and the front-to-back center (midpoint along boom/feeder transmission line) of the array of elements.

Measurements shall be made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna shall be varied in height above the reference ground plane to obtain the maximum signal strength. Unless otherwise specified, the measurement distance shall be 3 m or 10 m. At either measurement distance, the antenna height shall be varied from 1 m to 4 m.

These height scans apply for both horizontal and vertical polarizations, except that for vertical polarization, the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the lowest antenna element clears the site reference ground plane by at least 25 cm. For a tuned dipole, the minimum heights as measured from the center of the antenna are shown in Table D.3.

ANSI C63.4-2014, 8.3.1.1 Exploratory radiated emission measurements (9 kHz to 1 GHz)

a) 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 (see also 10.2.8 and Annex E) and recorded in tabular or graphical form. Significant emissions are identified using a remote-controlled turntable and antenna positioner and monitoring the spectrum while changing the EUT (turntable) azimuth, antenna polarity, and height. This spectrum exploratory monitoring can also be performed by manually moving the receiving antenna around the EUT to pick up significant emissions. A shielded room may be used for exploratory testing, but care must be taken to account for shielded room reflections that can lead to significant errors in amplitude measurements.

b) Broadband antennas and a spectrum analyzer or an EMI receiver with a panoramic display are most often used in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed at an OATS with strong ambient signals. Caution should be taken if either antenna heights between 1 m and 4 m or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

c) The EUT should be set up in its typical configuration and arrangement and operated in its various modes. For tabletop systems, cables or wires not bundled in the initial setup shall be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to reduce the maximum level of emissions.

d) Exploratory radiated emissions testing of handheld and/or body-worn devices shall include rotation of the EUT through three orthogonal axes to determine the orientation (attitude) that maximizes the emissions. Subclause 6.3.6 applies for exploratory radiated emissions testing of ceiling-mounted devices. This equipment arrangement shall be used in the final measurements of radiated emission from the EUT.

e) For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 m and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A suggested step-by-step technique for determining maximum radiated emission is given in Annex E.

ANSI C63.4-2014, 8.3.2.1 Final radiated emission measurements (9 kHz to 1 GHz)

Based on the exploratory radiated emissions measurement results (i.e., see 8.3.1.1), the single EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit are selected for the final measurement. The final measurements are then performed on a site meeting the requirements of 5.3 or 5.4, as appropriate. If the EUT is relocated from an exploratory test site to a final test site, the highest emission relative to the limit shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarization and EUT azimuth are to be varied. In addition, the full frequency range to be checked for meeting compliance shall be investigated.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated by 90° relative to the ground plane to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency range investigation, particular focus should be made on the frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full range test constitutes the compliance measurement.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 1000 MHz
Test distance	10 m
Test instrumentation resolution bandwidth	120 kHz
Receive antenna height	1 m - 4 m
Angular steps size during prescan:	45°
Receive antenna polarization	Vertical/Horizontal
Measurement location	Semi Anechoic Chamber (SAC)

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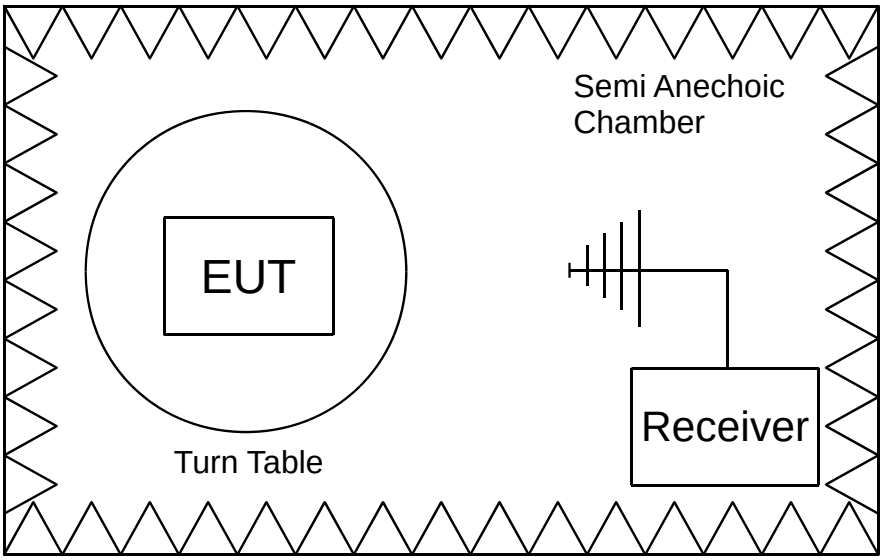
4.4.5 Test Setup



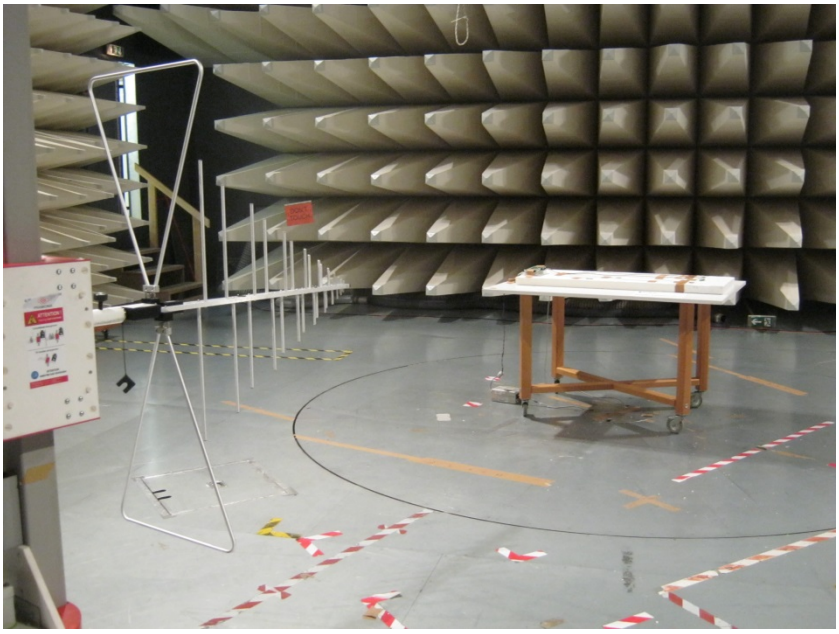
SCHEMATIC TEST SETUP

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

Receiver: #3846
Antenna: #6041

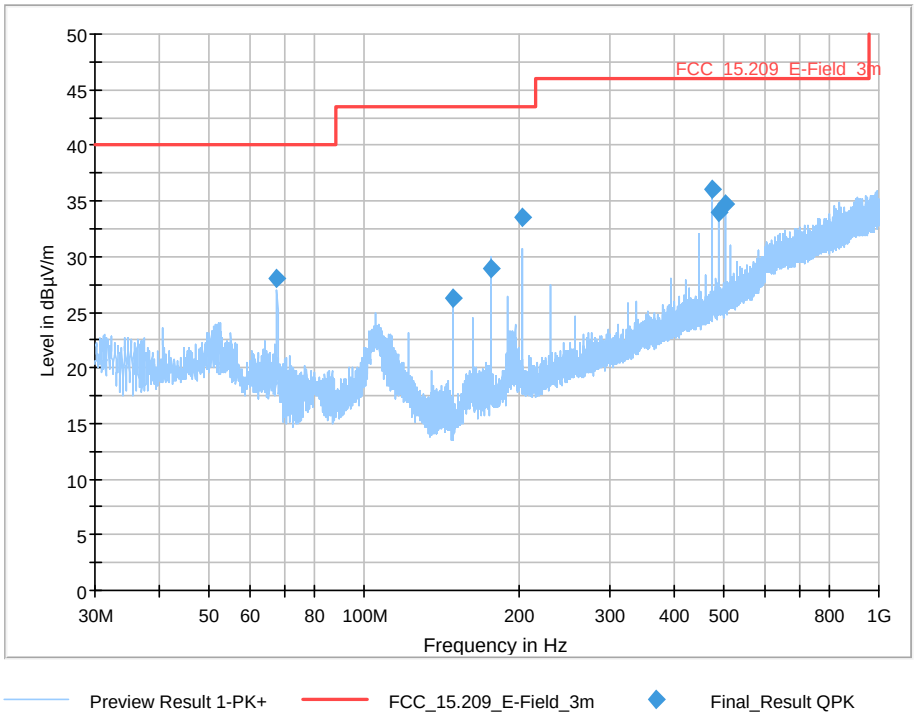
Test distance: 10 m

TEST EQUIPMENT USED:
Refer to chapter 5 of this document.
001, 54, 1291, 1292, 1889, 2724, 3846, 4717, 5392, 6041



4.4.6 Detailed Test Data

- EUT #1 Antenna Type: 8609751, Serial number ASLD-0020:

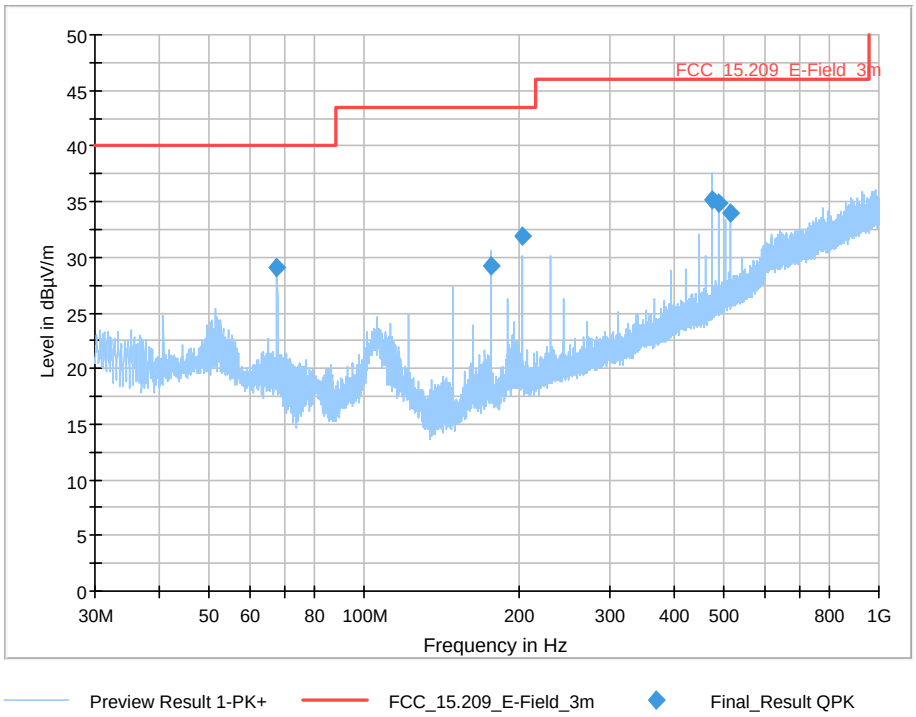


Final Result:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB/m
67.78	28.0	40.0	12.0	1000	120.0	294.0	H	-135	16.2
176.30	29.0	43.5	14.5	1000	120.0	178.0	H	37	15.2
203.42	33.5	43.5	10.0	1000	120.0	141.0	H	24	17.4
474.58	36.0	46.0	10.0	1000	120.0	174.0	H	3	23.8
488.18	34.0	46.0	12.0	1000	120.0	165.0	H	6	24.1
501.74	34.7	46.0	11.3	1000	120.0	165.0	H	12	24.4

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.

- EUT #2 Antenna Type: 8609761, Serial number ASLD-0007:

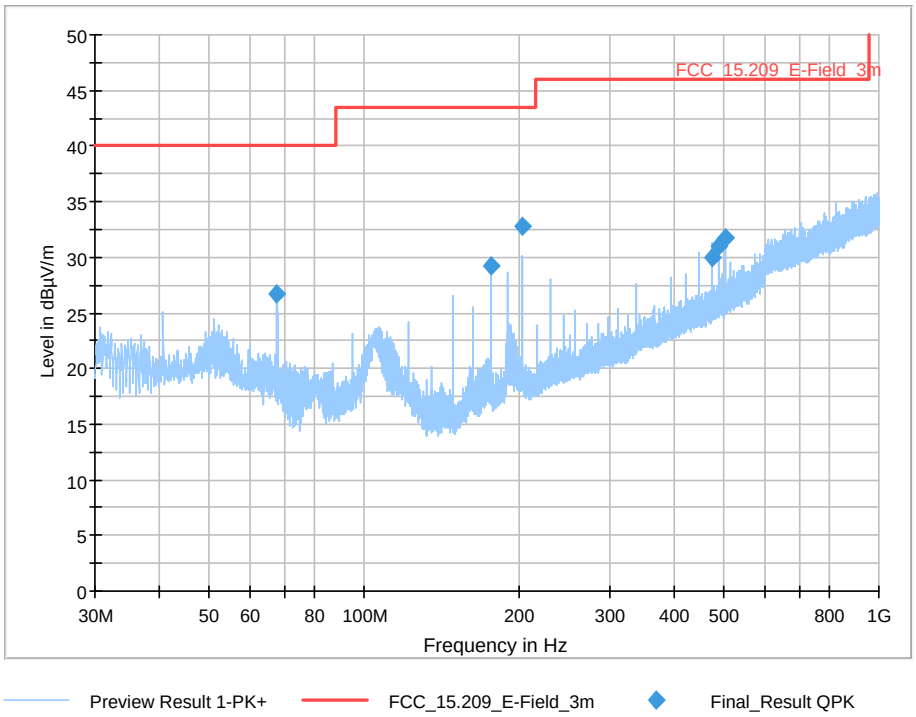


Final Result:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB/m
67.82	29.1	40.0	10.9	1000	120.0	291.0	H	-137	16.2
176.26	29.2	43.5	14.3	1000	120.0	142.0	H	24	15.2
203.42	31.9	43.5	11.6	1000	120.0	129.0	H	43	17.4
474.62	35.2	46.0	10.8	1000	120.0	174.0	H	3	23.8
488.18	34.9	46.0	11.1	1000	120.0	183.0	H	-3	24.1
515.26	34.0	46.0	12.0	1000	120.0	152.0	V	90	24.6

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.

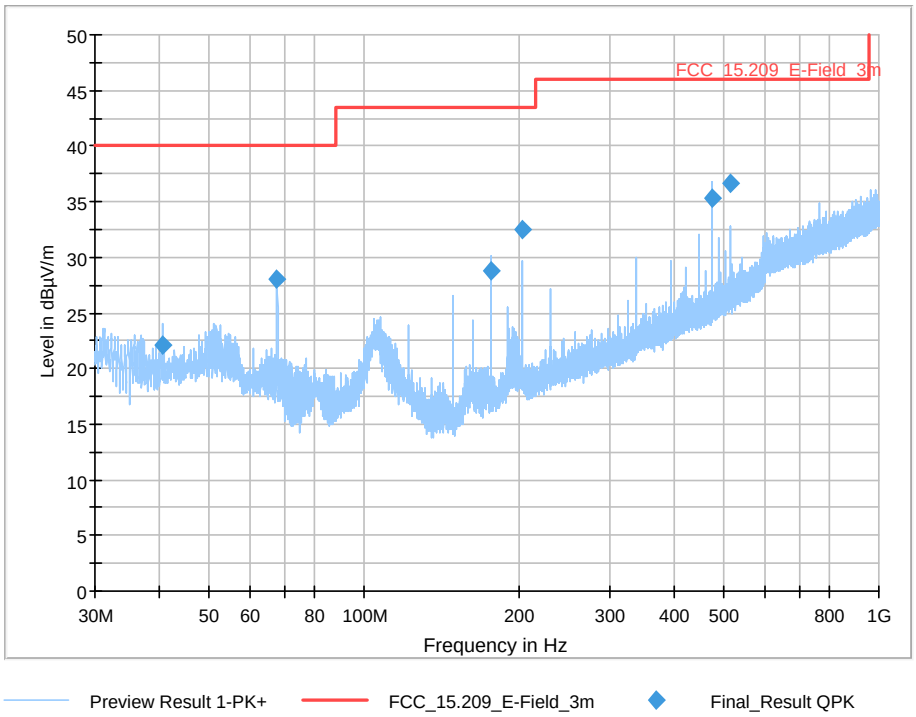
- EUT #3 Antenna Type: 8609741, Serial number ASLD-0025:



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
67.78	26.8	40.0	13.2	1000	120.0	325.0	H	-134	16.2
176.26	29.2	43.5	14.3	1000	120.0	166.0	H	16	15.2
203.42	32.8	43.5	10.7	1000	120.0	121.0	H	33	17.4
474.58	30.0	46.0	16.0	1000	120.0	166.0	V	93	23.8
488.18	31.1	46.0	14.9	1000	120.0	166.0	H	5	24.1
501.70	31.7	46.0	14.3	1000	120.0	164.0	H	10	24.4

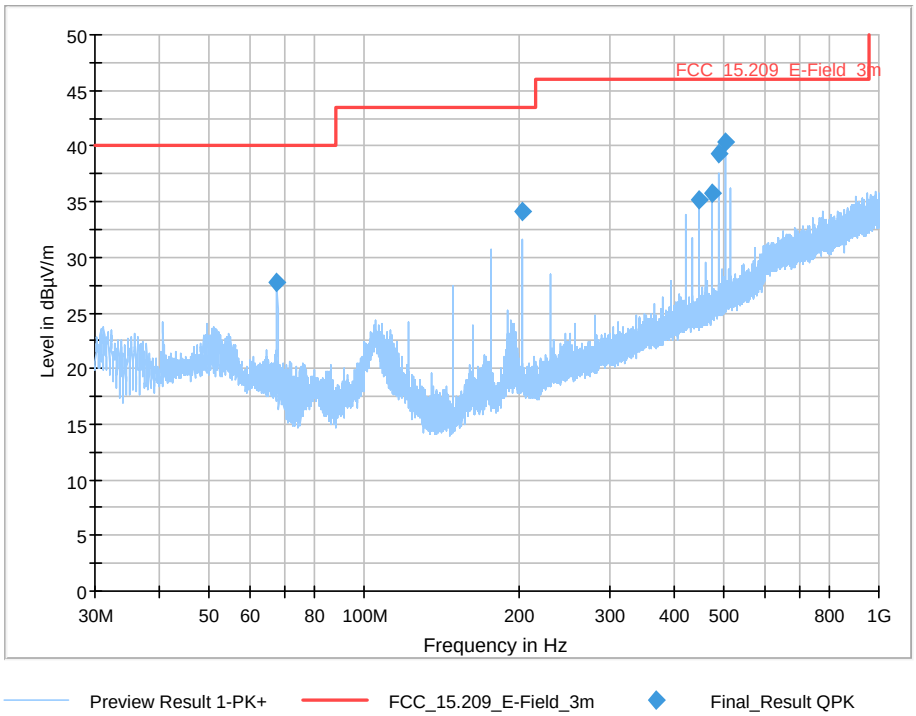
- EUT #5 Antenna Type: 8609721, Serial number ASLC-0004:



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
40.66	22.2	40.0	17.8	1000	120.0	100.0	V	-141	18.8
67.78	28.1	40.0	11.9	1000	120.0	347.0	H	-140	16.2
176.30	28.8	43.5	14.7	1000	120.0	194.0	H	17	15.2
203.38	32.5	43.5	11.0	1000	120.0	143.0	H	39	17.4
474.62	35.3	46.0	10.7	1000	120.0	165.0	H	2	23.8
515.30	36.6	46.0	9.4	1000	120.0	158.0	H	-12	24.6

- EUT #6 Antenna Type: 8609931, Serial number ASLC-0012:



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
67.78	27.7	40.0	12.3	1000	120.0	329.0	H	-135	16.2
203.38	34.2	43.5	9.3	1000	120.0	143.0	H	36	17.4
447.50	35.1	46.0	10.9	1000	120.0	188.0	H	8	23.3
474.62	35.7	46.0	10.3	1000	120.0	172.0	H	2	23.8
488.14	39.4	46.0	6.6	1000	120.0	167.0	H	-12	24.1
501.70	40.4	46.0	5.6	1000	120.0	164.0	H	-1	24.4

4.4.7 Test Result

Manufacturer:	Drägerwerk AG & Co. KGaA
Device:	RFID Reader Module M21, with antennas
Type(s), Serial No(s):	MP02001, 2106187489
	8609751, ASLD-0020, #1
	8609761, ASLD-0007, #2
	8609741, ASLD-0025, #3
	8609721, ASLC-0004, #5
	8609931, ASLC-0012, #6
Test date:	2018-12-11/12
Test Personal:	Ludwig Kraft

All emissions in the range 30 MHz to 1000 MHz are below the specified limits.

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
516	EMI Test Receiver	Rohde & Schwarz	ESIB40	2018-03	2019-03
1291	Antenna Mast	Frankonia	FAM4	n/a	n/a
1292	Multi Device Controller	Frankonia	FC02	n/a	n/a
1889	Anechoic Room SAC	EMCC/FRANK.	SAC-10	n/a	n/a
2720	Digital Multimeter	Agilent	U1241A	2017-03	2019-03
2724	5 W Attenuator 6dB	Weinschel	2	2017-06	2019-06
2965	Loop Antenna with cable set	Rohde & Schwarz	HFH-Z2	2018-06	2020-06
3846	EMI Test Receiver	Rohde & Schwarz	ESU8	2018-01	2019-01
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
5392	EMC Measurement Software	Rohde & Schwarz	EMC32, v10.35.02	n/a	n/a
6041	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	2017-09	2019-09

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6 MEASUREMENT UNCERTAINTY

Measurement	Measurement Uncertainty
Radiated Emissions, H field (9 kHz – 30 MHz)	±3.0 dB
Radiated Emissions 30 – 1000 MHz	±5.6 dB

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.

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7 LIST OF ANNEXES

The following annexes are separated parts from this test report.

Description	Pages
Annex 1: Photographs of test setup	4
Annex 2: Photographs of equipment under test	7

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ANNEX 1 TO TEST REPORT # EMCC-910036.1F, 2019-01-28

PHOTOGRAPHS OF TEST SETUP

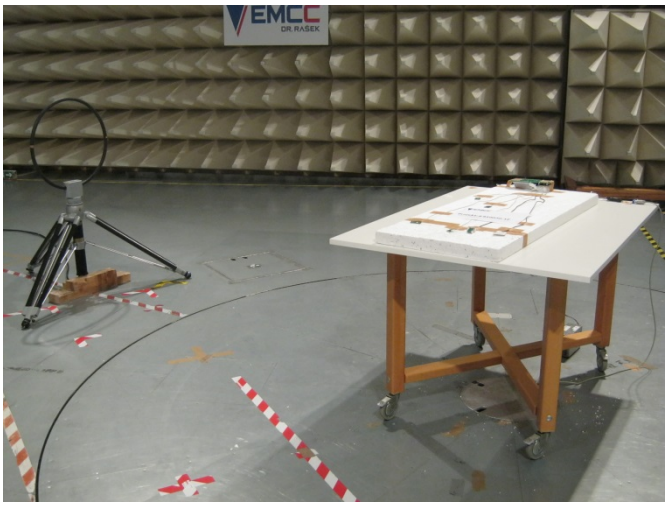
EQUIPMENT UNDER TEST:

Trade Name:	RFID Reader Module M21
Type/Model (EUT number):	MP02001 with antennas: 8609751 (#1) 8609761 (#2) 8609741 (#3) 8609721 (#5) 8609931 (#6)
Application:	RFID Reader
FCC:	FCC ID: UVFEASTM21
ISED:	IC: 5895C-M21
Manufacturer:	Drägerwerk AG & Co. KGaA
Address:	Moislinger Allee 53-55 23558 Lübeck GERMANY
Phone:	+49 451 882-5957
E-Mail:	volker.biermann@draeger.com
RELEVANT STANDARD(S) :	47 CFR §§ 15.225 RSS-210 Issue 9 Limited tests performed only
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013, RSS-Gen Issue 5

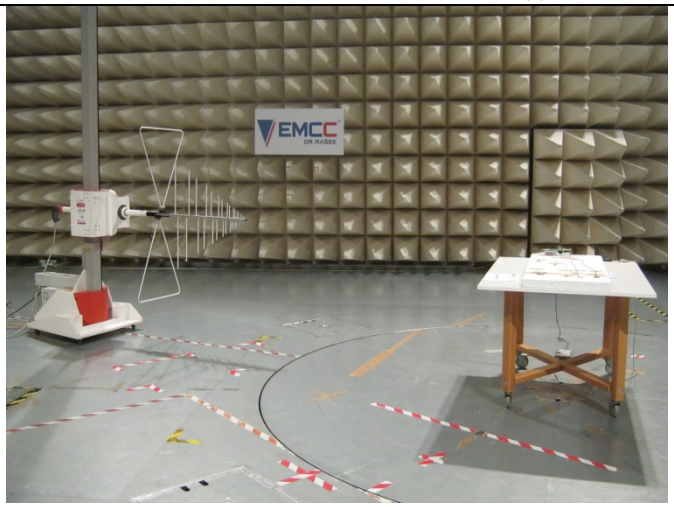
ILLUSTRATION LIST ANNEX 1

Photograph A1-1: Setup of EUT M21 with all antennas connected 2
Photograph A1-2: Radiated emissions measurement at 3 m distance in semi anechoic chamber (SAC)9 kHz – 30 MHz 2
Photograph A1-3: Radiated emissions measurement at 3 m distance, 30 MHz – 1000 MHz 3
Photograph A1-4: EUT #5 orientation 1 3
Photograph A1-5: EUT #6 orientation 2 3
Photograph A1-6: EUT #3 orientation 3 4

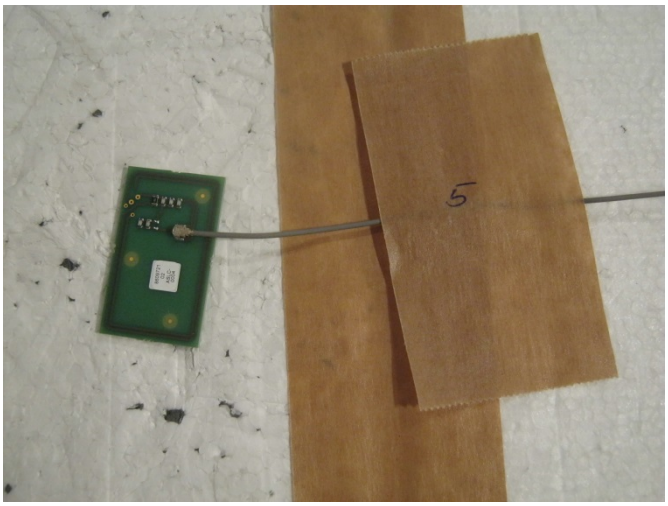
Photograph A1-1: Setup of EUT M21 with all antennas connected



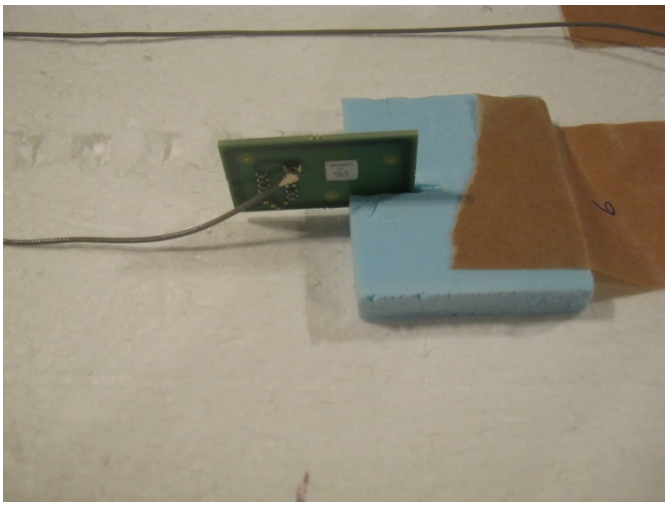
Photograph A1-2: Radiated emissions measurement at 3 m distance
in semi anechoic chamber (SAC) 9 kHz – 30 MHz



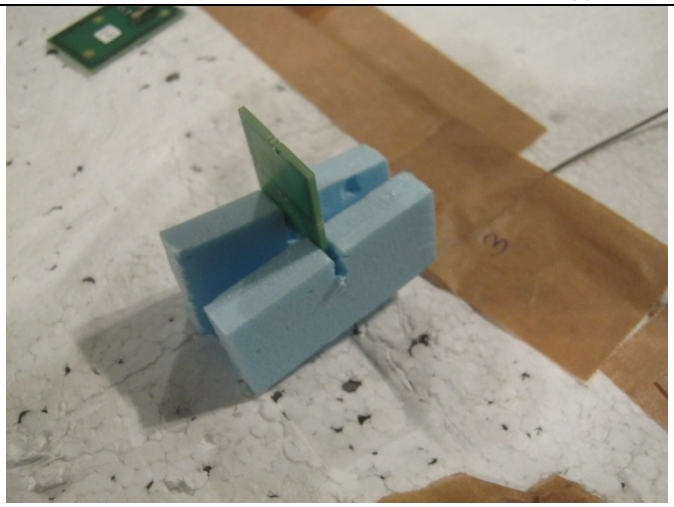
Photograph A1-3: Radiated emissions measurement at 3 m distance,
30 MHz – 1000 MHz



Photograph A1-4: EUT #5 orientation 1



Photograph A1-5: EUT #6 orientation 2



Photograph A1-6: EUT #3 orientation 3

ANNEX 2 TO TEST REPORT # EMCC-910036.1F, 2019-01-28

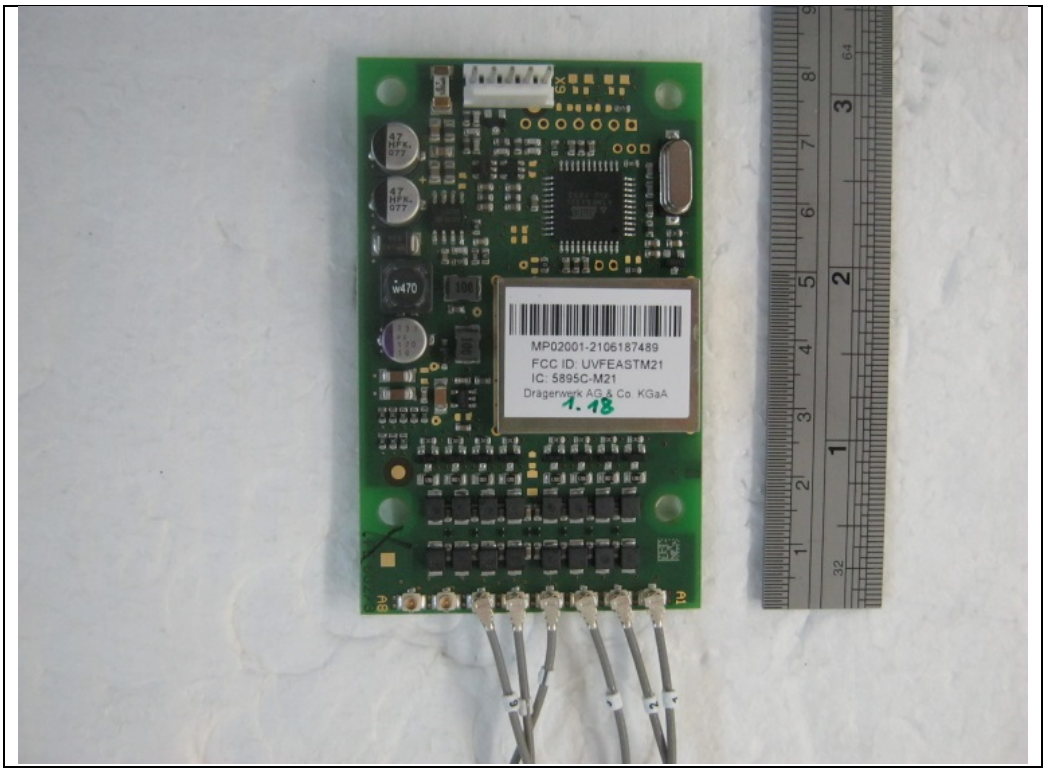
EXTERNAL PHOTOGRAPHS OF EQUIPMENT UNDER TEST

EQUIPMENT UNDER TEST:

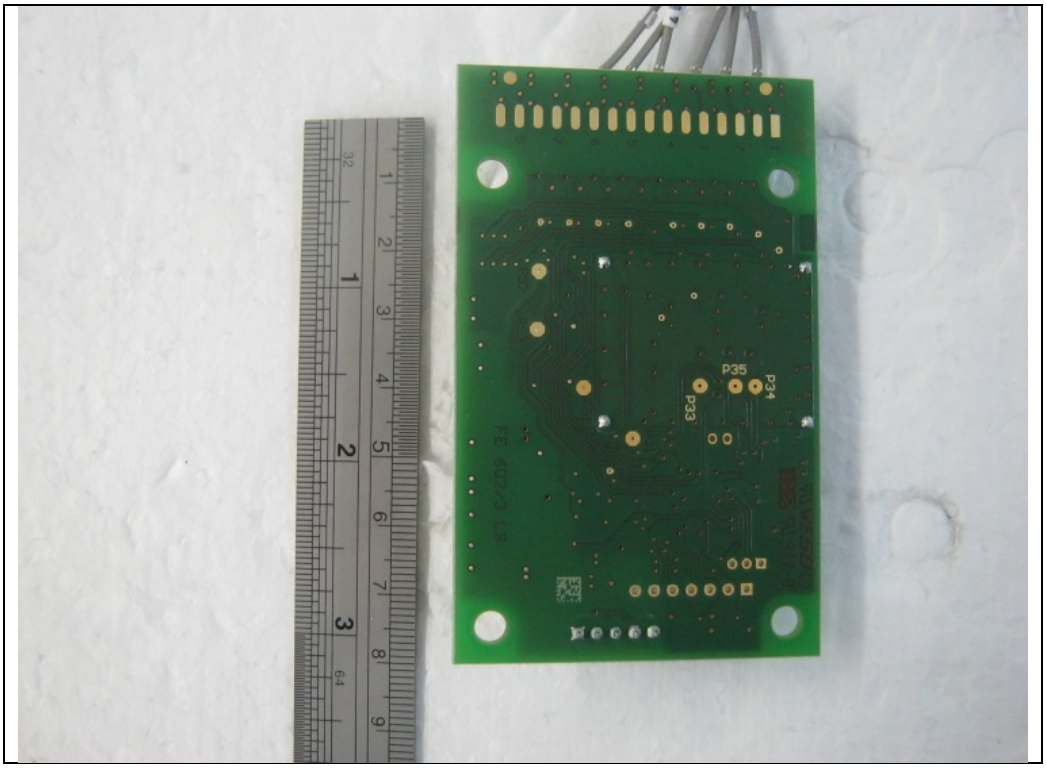
Trade Name:	RFID Reader Module M21
Type/Model (EUT number):	MP02001 with antennas: 8609751 (#1) 8609761 (#2) 8609741 (#3) 8609721 (#5) 8609931 (#6)
Application:	RFID Reader
FCC:	FCC ID: UVFEASTM21
ISED:	IC: 5895C-M21
Manufacturer:	Drägerwerk AG & Co. KGaA
Address:	Moislinger Allee 53-55 23558 Lübeck GERMANY
Phone:	+49 451 882-5957
E-Mail:	volker.biermann@draeger.com
RELEVANT STANDARD(S) :	47 CFR §§ 15.225 RSS-210 Issue 9 Limited tests performed only
MEASUREMENT PROCEDURE: :	ANSI C63.10-2013, RSS-Gen Issue 5

ILLUSTRATION LIST ANNEX 2

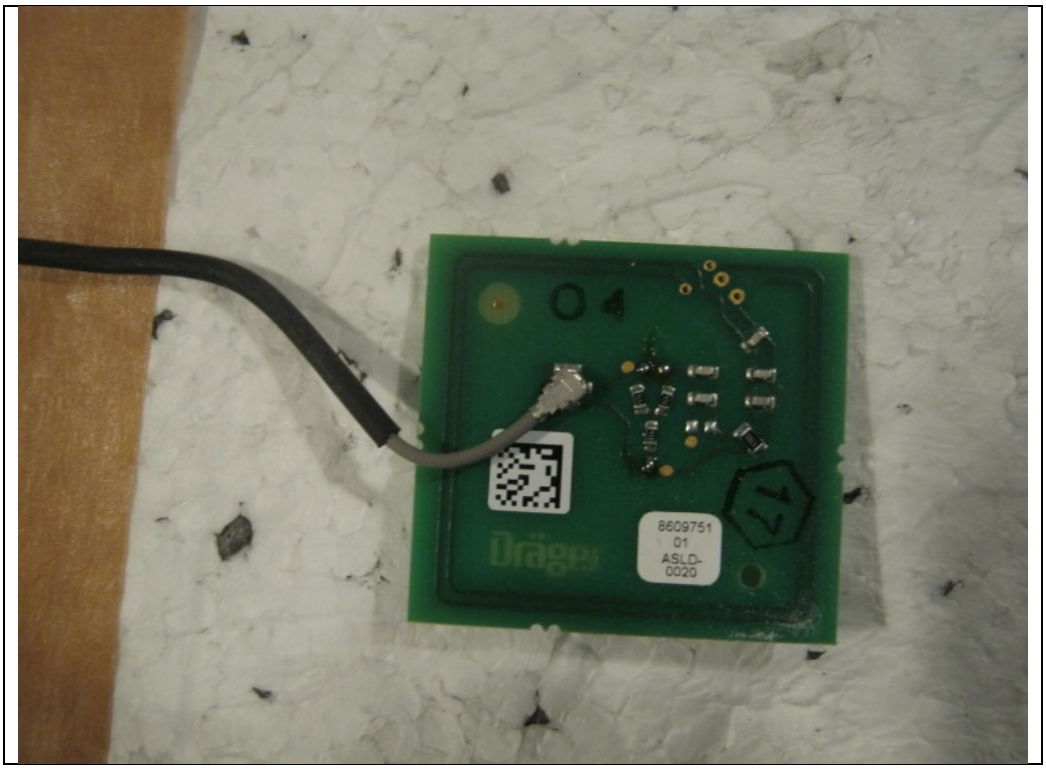
Photograph A2-1: RFID reader Module M21 side 1 2
Photograph A2-2: RFID reader Module M21 side 2 2
Photograph A2-3: EUT #1, antenna CO2, type designation 8609751 side1 3
Photograph A2-4: EUT #1, antenna CO2 type designation 8609751 side 2 3
Photograph A2-5: EUT #2, antenna WAL, type designation 8609761 side 1 4
Photograph A2-6: EUT #2, antenna WAL, type designation 8609761 side 2 4
Photograph A2-7: EUT #3, antenna Breath Insp, type designation 8609741 side 1 5
Photograph A2-8: EUT #3, antenna Breath Insp, type designation 8609741 side 2 5
Photograph A2-9: EUT #5, antenna Flow Insp, type designation 8609721 side 1 6
Photograph A2-10: EUT #5, antenna Flow Insp, type designation 8609721 side 2 6
Photograph A2-9: EUT #6, antenna Flow Exp, type designation 8609931 side 1 7
Photograph A2-10: EUT #6, antenna Flow Exp, type designation 8609931 side 2 7



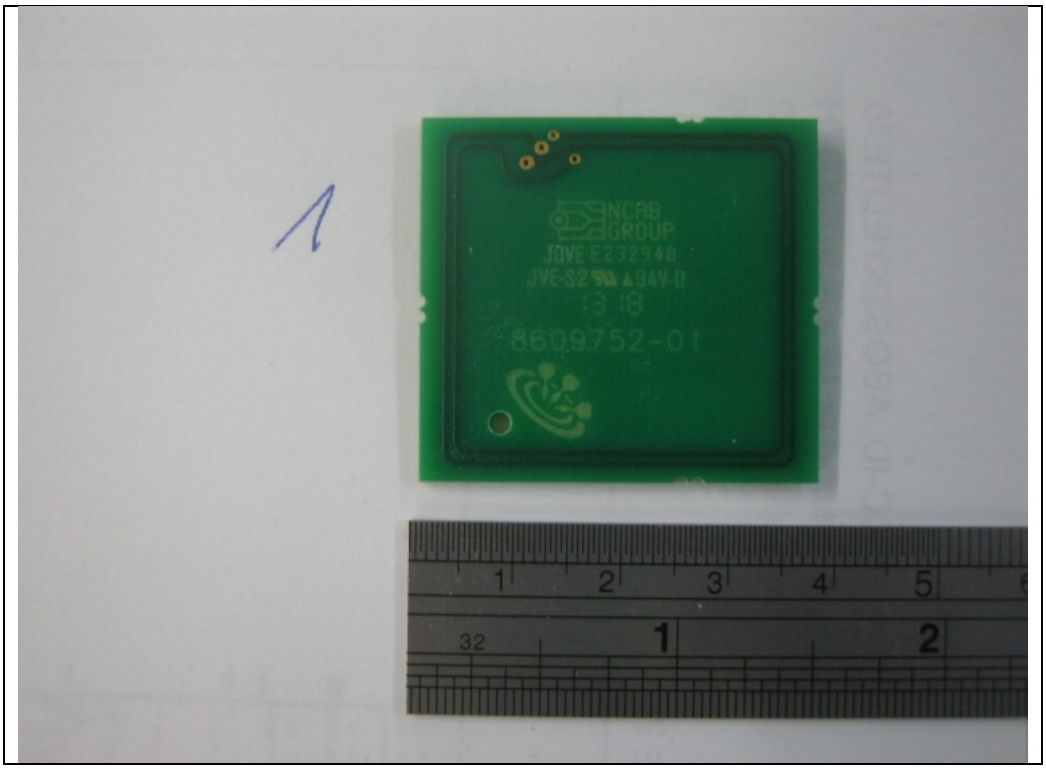
Photograph A2-1: RFID reader Module M21 side 1



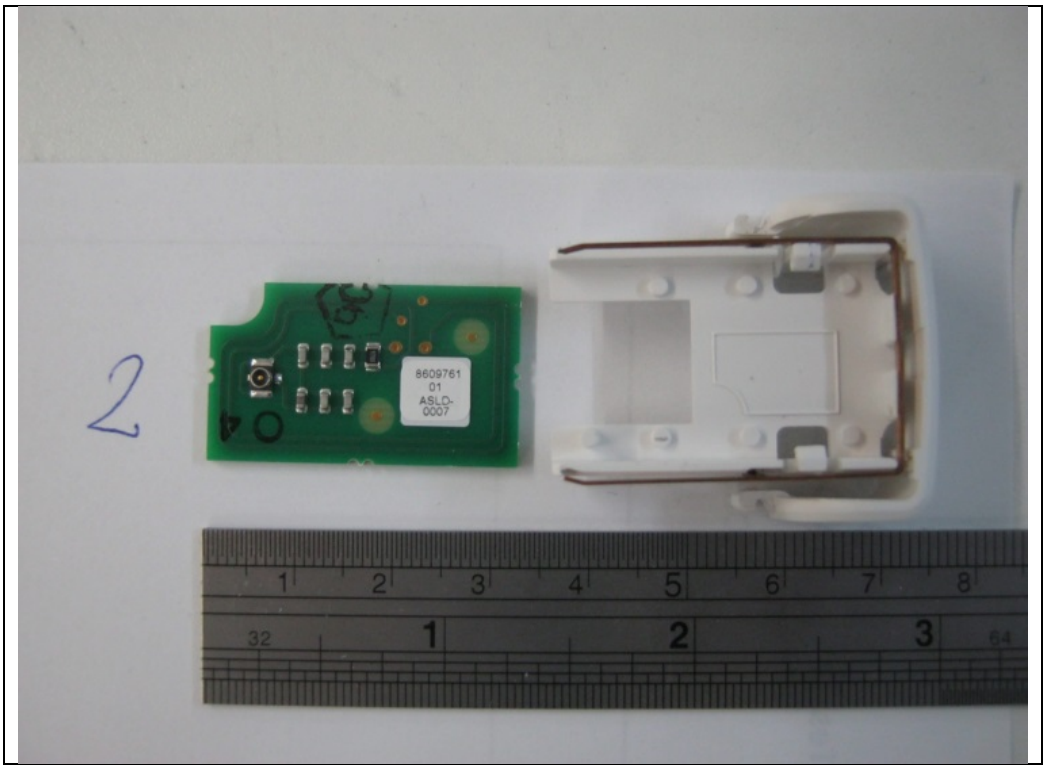
Photograph A2-2: RFID reader Module M21 side 2



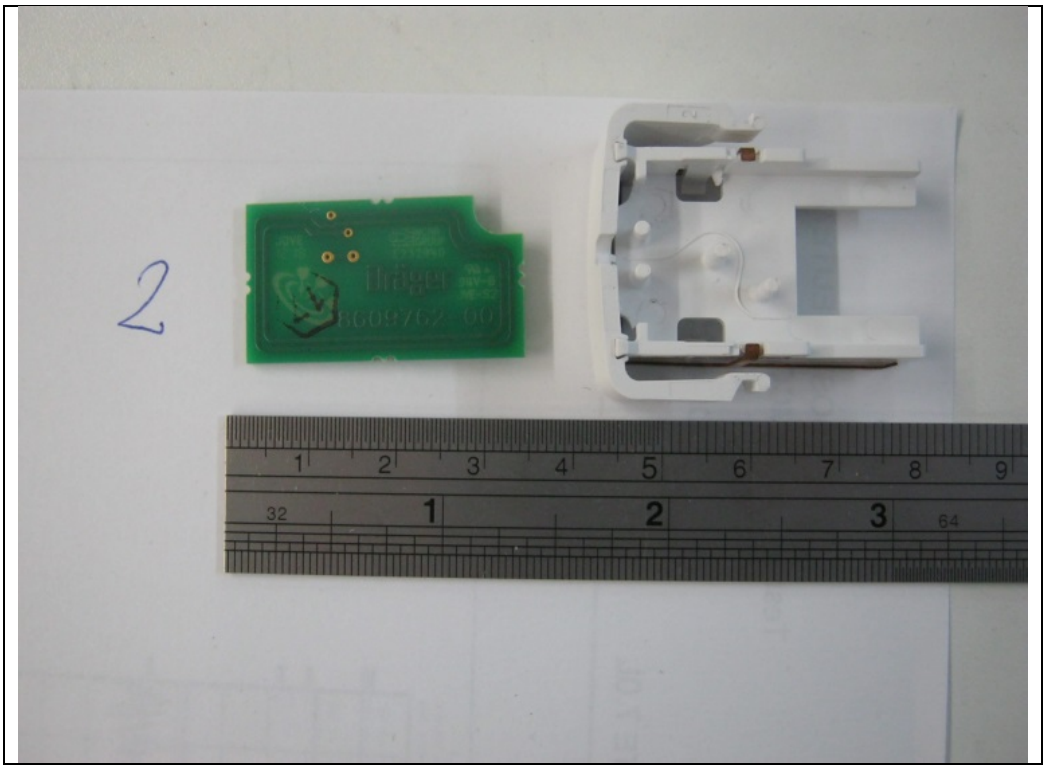
Photograph A2-3: EUT #1, antenna CO2, type designation 8609751 side1



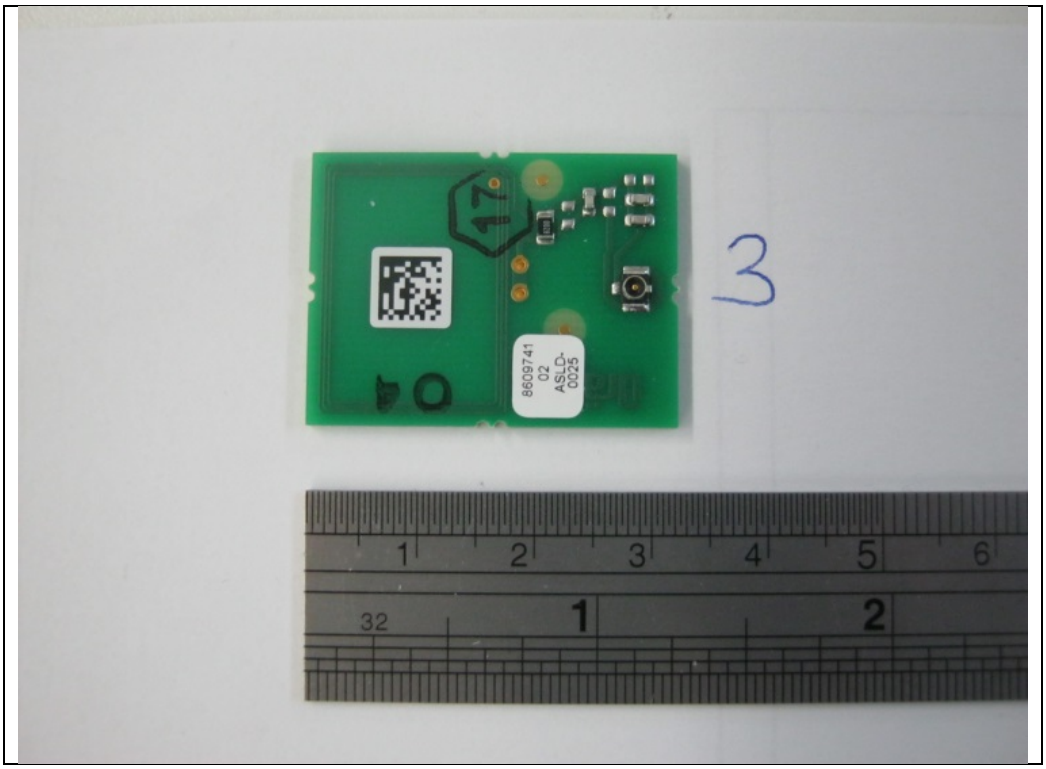
Photograph A2-4: EUT #1, antenna CO2 type designation 8609751 side 2



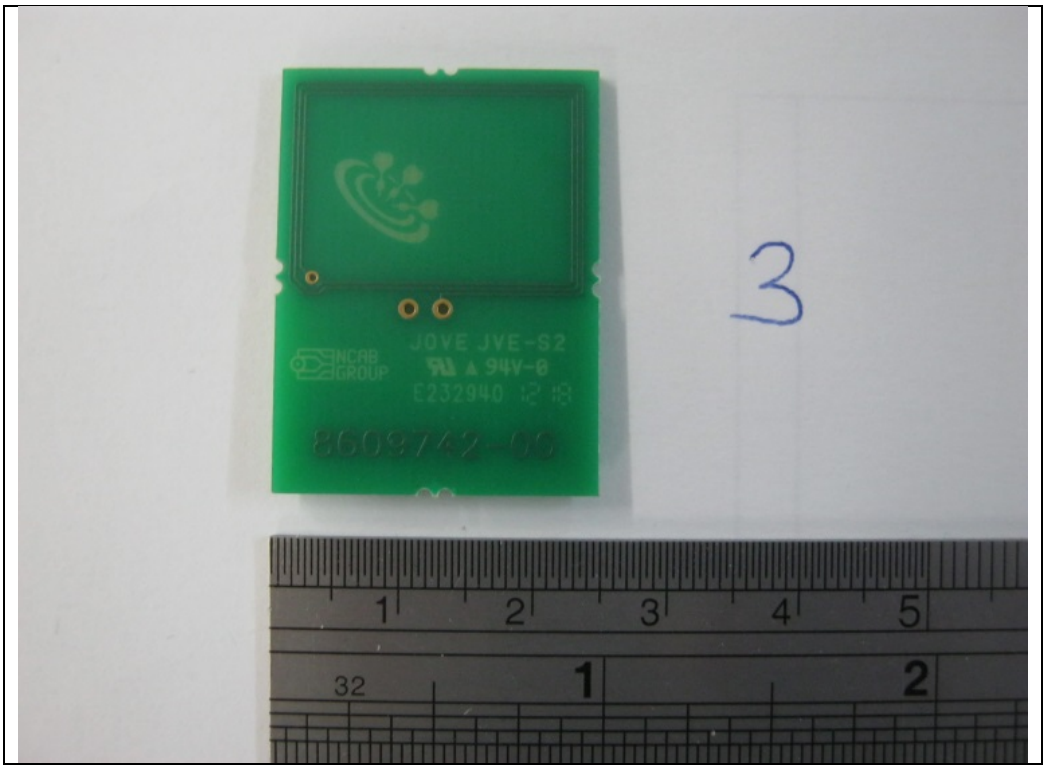
Photograph A2-5: EUT #2, antenna WAL, type designation 8609761 side 1



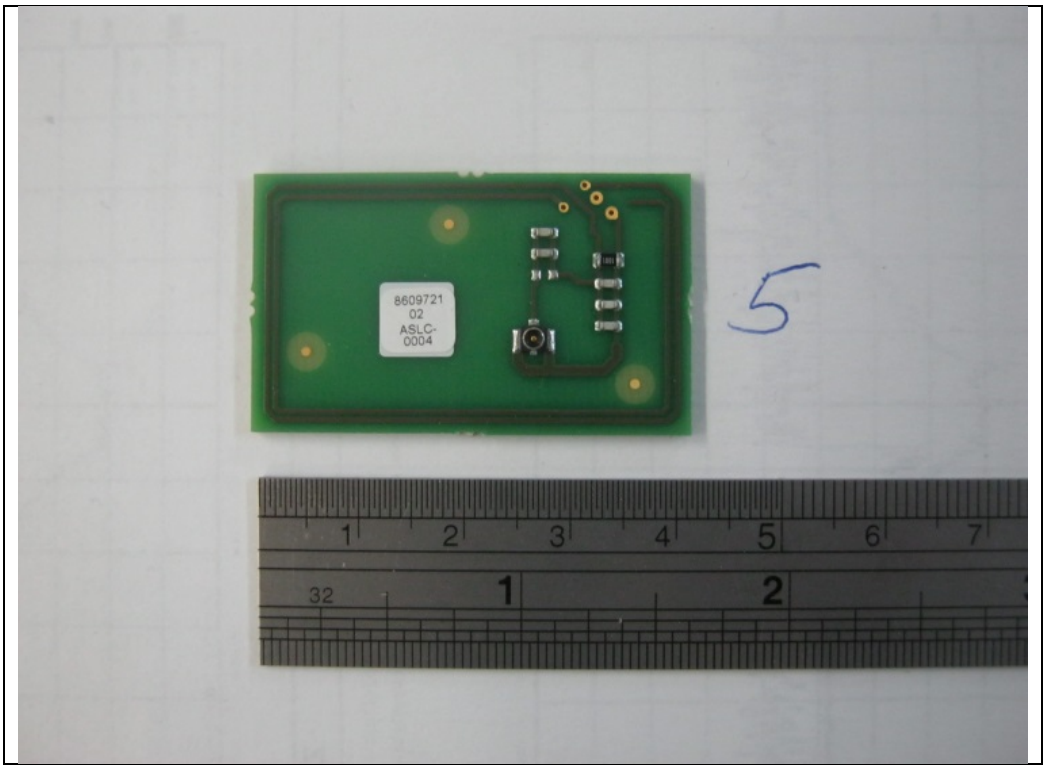
Photograph A2-6: EUT #2, antenna WAL, type designation 8609761 side 2



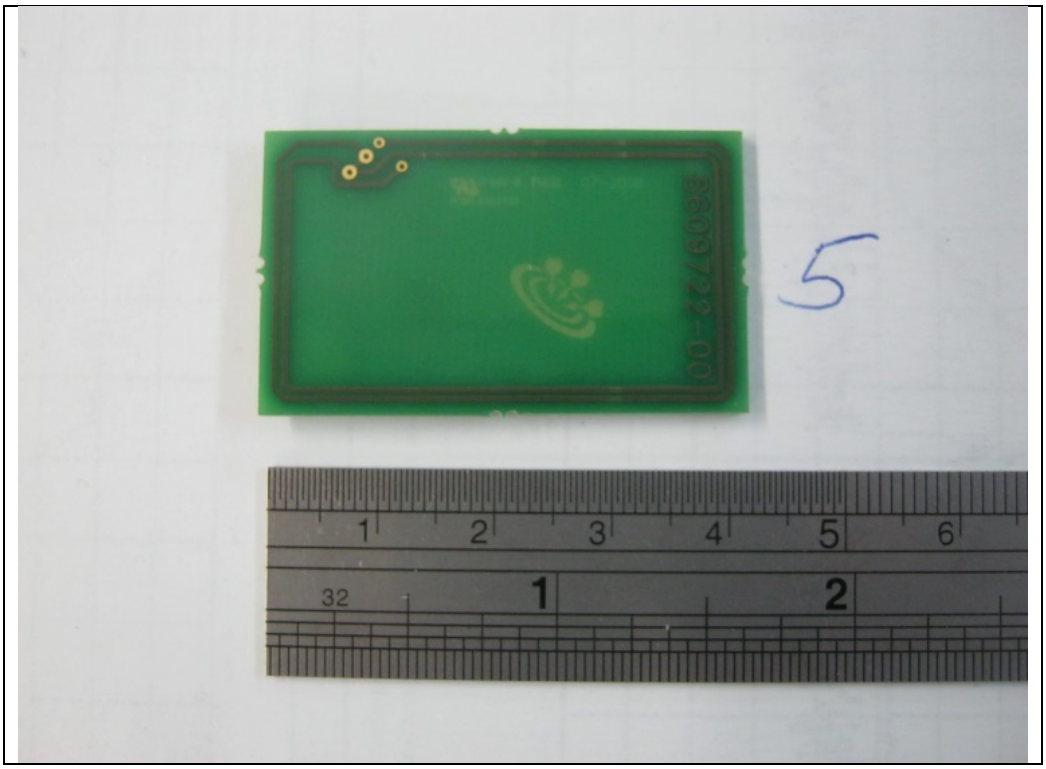
Photograph A2-7: EUT #3, antenna Breath Insp, type designation 8609741 side 1



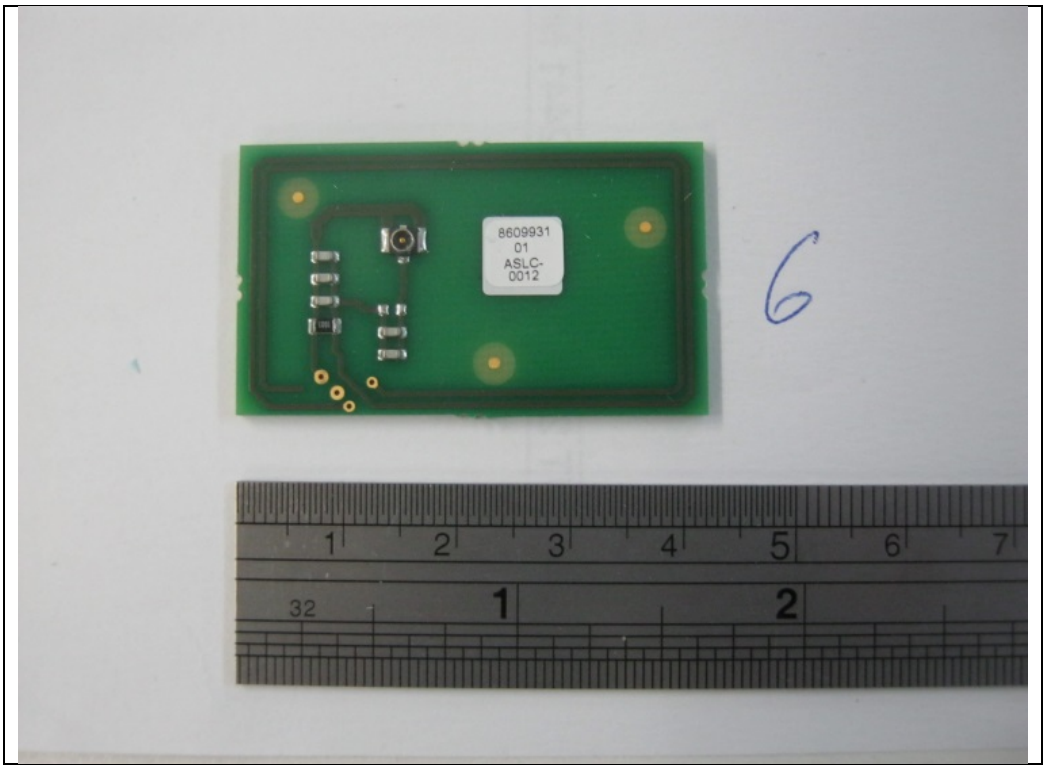
Photograph A2-8: EUT #3, antenna Breath Insp, type designation 8609741 side 2



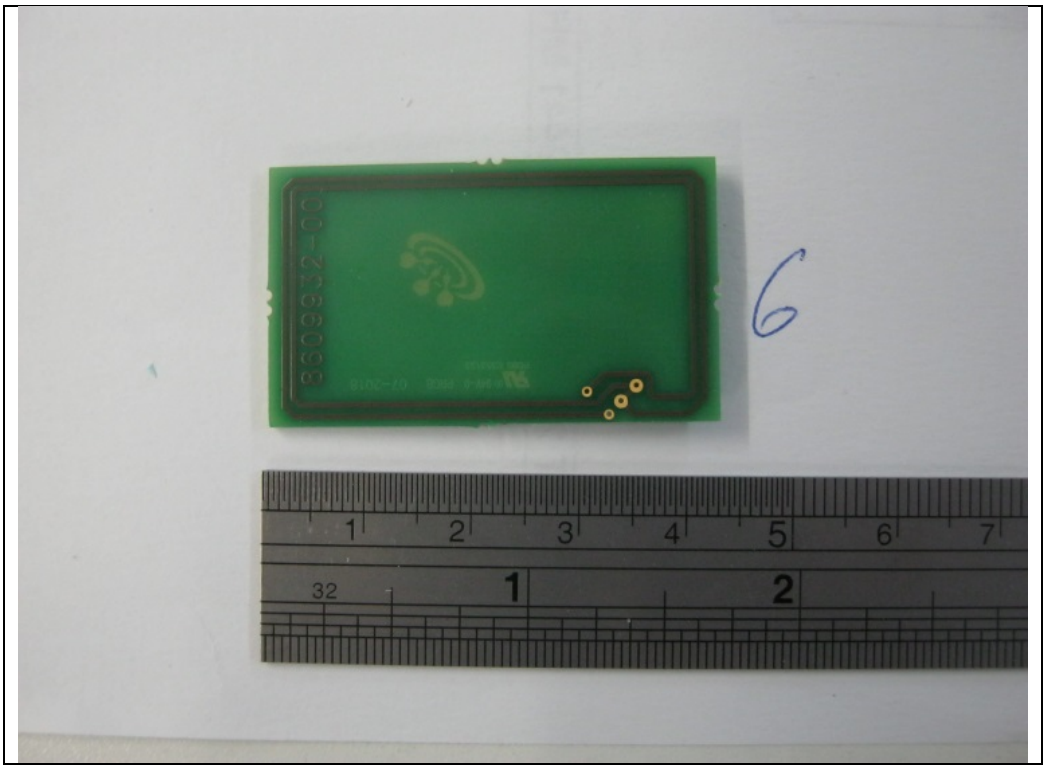
Photograph A2-9: EUT #5, antenna Flow Insp, type designation 8609721 side 1



Photograph A2-10: EUT #5, antenna Flow Insp, type designation 8609721 side 2



Photograph A2-11: EUT #6, antenna Flow Exp, type designation 8609931 side 1



Photograph A2-12: EUT #6, antenna Flow Exp, type designation 8609931 side 2