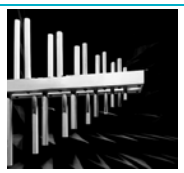
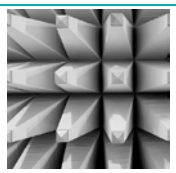




CTC advanced
member of RWTÜV group

TEST REPORT

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

Test report no.: 1-1467/20-03-02

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: https://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-03

Applicant

Payter B.V.
Rozenlaan 115
3051 LP Rotterdam / NETHERLANDS
Phone: -/-
Contact: Stefan Schoenmaker
e-mail: Stefan@payter.nl

Manufacturer

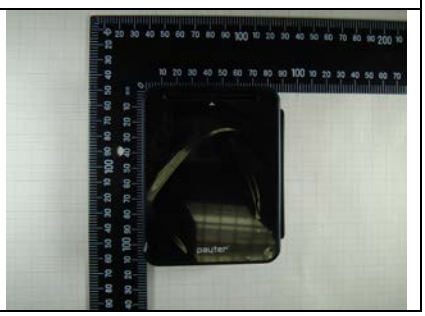
Payter B.V.
Rozenlaan 115
3051 LP Rotterdam / NETHERLANDS

Test standard

ETSI EN 300 330 V2.1.1	Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Test Item

Kind of test item:	**Payment Terminal**
Model name:	**Apollo Max Terminal APM01**
Frequency:	13.56 MHz
Technology tested:	RFID
Antenna:	Integrated loop antenna
Power supply:	12 V DC by external power supply
Temperature range:	-20°C to +55°C



This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

cn=Christoph Schneider, o=CTC advanced GmbH, ou=SND-161128, email=Christoph.Schneider@ctcadvanced.com, c=DE
2021.11.16 07:18:34 +01'00'

Christoph Schneider
Lab Manager
Radio Communications

Test performed:

cn=Wolsdorfer Hans-Joachim, o=CTC advanced GmbH, ou=WLD-200810, email=joachim.wolsdorfer@ctcadvanced.com, c=DE
2021.11.16 07:09:12 +01'00'

Hans-Joachim Wolsdorfer
Lab Manager
Radio Communications

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2021-10-26
Date of receipt of test item:	2021-11-03
Start of test:*	2021-11-05
End of test:*	2021-11-09
Person(s) present during the test:	-/-

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Test laboratories sub-contracted

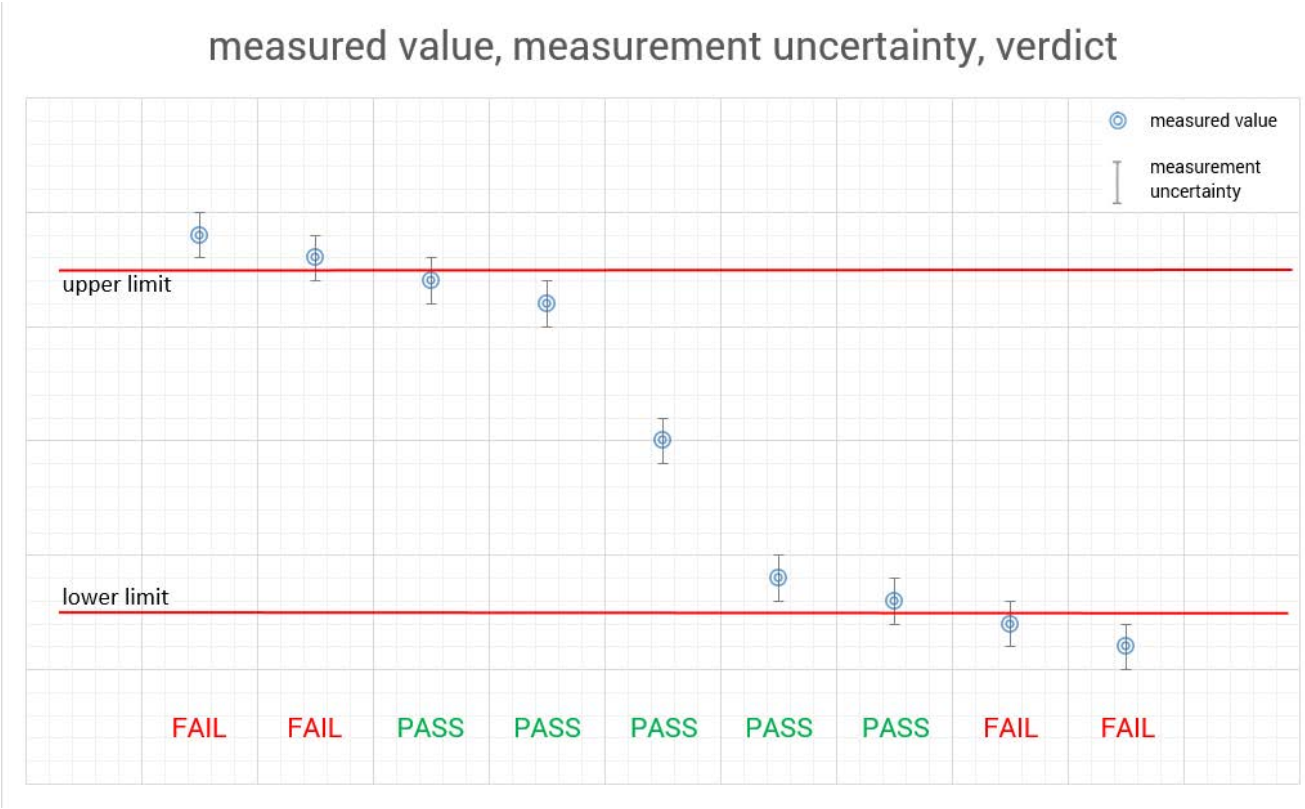
None

3 Test standard

Test standard	Date	Description
ETSI EN 300 330 V2.1.1	2017-02	Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter 8, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +55 °C during high temperature tests -20 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	12 V DC by external power supply 34 V 12 V

6 Test item

6.1 General description

Kind of test item	:	Payment Terminal
Model name:	:	Apollo Max Terminal APM01
S/N serial number	:	Rad. APM20211500008-80 Cond. APM20211500008-80
Hardware status	:	APM01.BL.PAY V1.0
Software status	:	1.0.0-b35
Firmware status	:	-/-
Frequency band	:	13.56 MHz
Type of radio transmission **Use of frequency spectrum**	: :	On off keying
Type of modulation	:	ASK
Number of channels	:	1
Antenna	:	Integrated loop antenna
Power supply	:	12 V DC by external power supply
Temperature range	:	-20°C to +55°C

6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-1467/20-03-01_AnnexA
1-1467/20-03-01_AnnexB
1-1467/20-03-01_AnnexC

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

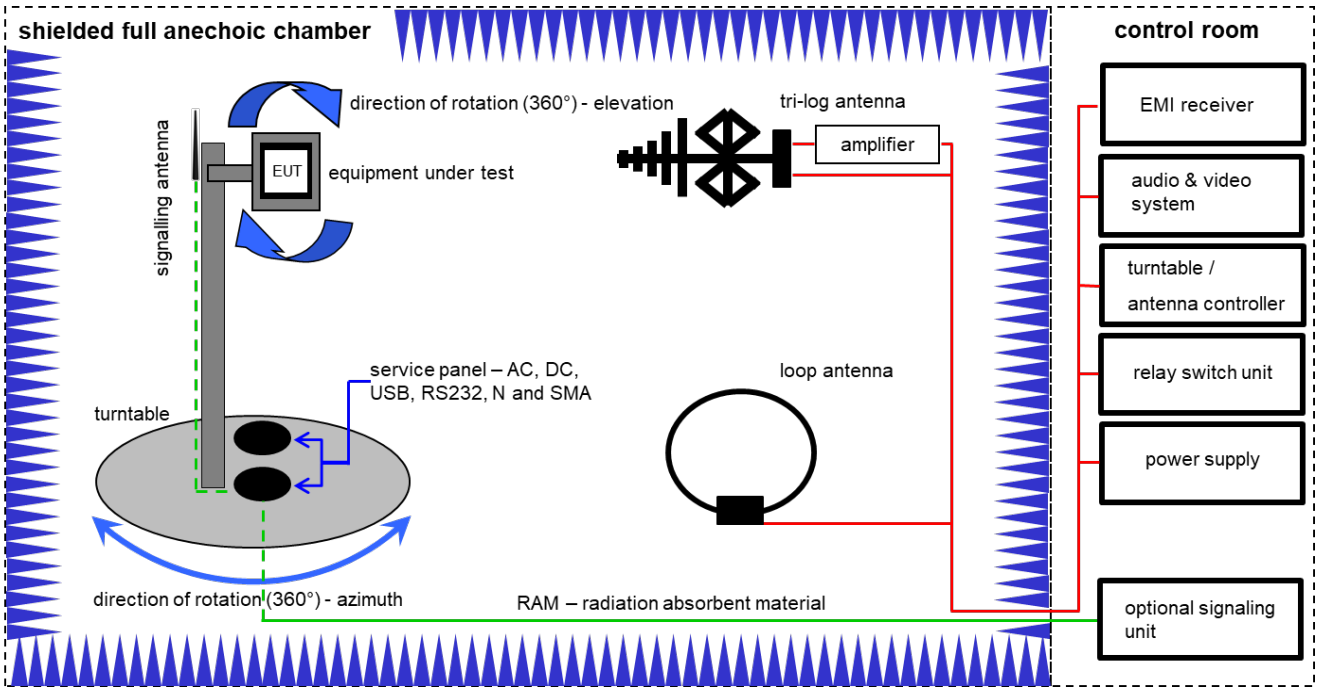
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded fully anechoic chamber



Measurement distance: tri-log antenna 3 meter; loop antenna 3 meter

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

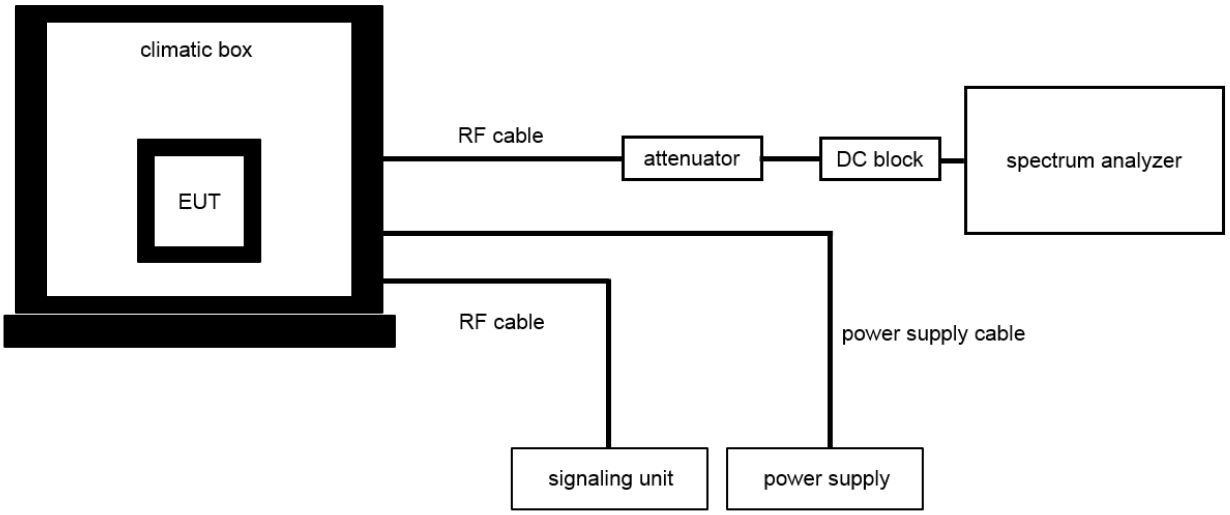
Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vlKl!	01.07.2021	30.06.2023
2	A,B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A,B	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	A,B	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2020	10.12.2021
5	B	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	371	300003854	vlKl!	14.01.2020	13.01.2022
6	B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
7	A,B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
8	A,B	NEXIO EMV-Software	BAT EMC V3.20.0.26	EMCO		300004682	ne	-/-	-/-
9	A,B	PC	ExOne	F+W		300004703	ne	-/-	-/-

7.2 Conducted measurements normal and extreme conditions

Conducted measurements normal & extreme conditions



OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Loop Antenna		ZEG TS Steinfurt		400001208	ev	-/-	-/-
2	A	Power Supply	HMP2020	Rohde & Schwarz	101961	300006102	k	04.08.2020	03.08.2022
3	A	Signal analyzer	FSV30	Rohde&Schwarz	104365	300005923	k	16.12.2020	15.12.2021
4	A	Temperature Test Chamber	VT 4011	Voetsch Industrietechnik	585662306000 10	300005363	ev	08.05.2020	07.05.2022

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Occupied bandwidth	± used RBW
RF frequency	± 1 x 10^{-7}
RF power, conducted	± 1 dB
RF power, radiated	± 6 dB
Temperature	± 1 °C
Humidity	± 5 %

9 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC identifier	Description	verdict	date	Remark
RF-Testing	ETSI EN 300 330 V2.1.1 (2017-02)	See table!	2021-11-16	-/-

Test Specification Clause	Test Case	temperature conditions	power source voltages	Mode	C	NC	NA	NP	Remark
4.3.1	Permitted range of operating frequencies	Nominal	Nominal	-/-	Declared by the provider (see 11.1.2)				-/-
4.3.2	Operating frequency ranges	Nominal	Nominal	-/-	☒	☐	☐	☐	-/-
		Low	Low		☒	☐	☐	☐	
		Low	High		☒	☐	☐	☐	
		High	Low		☒	☐	☐	☐	
		High	High		☒	☐	☐	☐	
4.3.3	Modulation bandwidth	Nominal	Nominal	-/-	☒	☐	☐	☐	-/-
		Low	Low		☒	☐	☐	☐	
		Low	High		☒	☐	☐	☐	
		High	Low		☒	☐	☐	☐	
		High	High		☒	☐	☐	☐	
4.3.4	Transmitter H-field requirements	Nominal	Nominal	-/-	☒	☐	☐	☐	Product class 1 & 2 only
		Low	Low		☒	☐	☐	☐	
		Low	High		☒	☐	☐	☐	
		High	Low		☒	☐	☐	☐	
		High	High		☒	☐	☐	☐	
4.3.5	Transmitter RF carrier current	Nominal	Nominal	-/-	☐	☐	☒	☐	Product class 3 only
		Low	Low		☐	☐	☒	☐	
		Low	High		☐	☐	☒	☐	
		High	Low		☐	☐	☒	☐	
		High	High		☐	☐	☒	☐	
4.3.6	Transmitter radiated E-field	Nominal	Nominal	-/-	☐	☐	☒	☐	Product class 4 only
		Low	Low		☐	☐	☒	☐	
		Low	High		☐	☐	☒	☐	
		High	Low		☐	☐	☒	☐	
		High	High		☐	☐	☒	☐	
4.3.7	Transmitter conducted spurious emissions	Nominal	Nominal	-/-	☐	☐	☒	☐	Product class 3 only

4.3.8	Transmitter radiated spurious domain emission limits < 30 MHz	Nominal	Nominal	-/-	☒	☐	☐	☐	-/-
4.3.9	Transmitter radiated spurious domain emission limits > 30 MHz	Nominal	Nominal	-/-	☒	☐	☐	☐	Product class 1, 2 & 4 only
4.3.10	Transmitter Frequency stability	Nominal	Nominal	-/-	☐	☐	☒	☐	Only for channelized systems
		Low	Low		☐	☐	☒	☐	
		Low	High		☐	☐	☒	☐	
		High	Low		☐	☐	☒	☐	
		High	High		☐	☐	☒	☐	
4.4.2	Receiver spurious emissions	Nominal	Nominal	-/-	☐	☐	☒	☐	Only apply to receivers which are not co-located transmitter
4.4.3	Adjacent channel selectivity	Nominal	Nominal	-/-	☐	☐	☒	☐	Only for channelized systems
4.4.4	Receiver blocking or desensitization	Nominal	Nominal	-/-	☐	☐	☒	☐	Not for tagging systems

Note:

C Compliant
NC Not compliant
NA Not applicable
NP Not performed

10 Additional comments

Reference documents: EN300330testApollo.docx; Filled_Customer Questionnaire_1-1467-20_3.docx

Special test descriptions: None

Configuration descriptions: None

11 RF measurements

11.1 Transmitter test results

11.1.1 EUT classification

Product Class: (ETSI EN 300 330 V2.1.1 (2017-02) table B.1)

Product Class	1	2	3	4
Description of transmitter	Inductive loop coil transmitter	Inductive loop coil transmitter	Customized, large size loop antennas only	E-field transmitter
Antenna to be tested	Integral antenna (antenna type 1) or dedicated antenna supplied with the equipment (antenna type 2); (see note 1)	Two representative antennas supplied with the equipment (see note 2)	Test without an antenna by using an artificial antenna	Each type of antenna to be used
Freq. range	9 kHz to 30 MHz	9 kHz to 30 MHz	9 kHz to 135 kHz	9 kHz to 30 MHz
Loop antenna area	< 30 m²	< 30 m² (See note 3)	> 30 m²	n.a.
Length of antenna	< λ/4 (75 meters/f where f is in MHz) or < 30 m, whichever is shorter	< λ /4 (75 meters/f where f is in MHz) or < 30 m, whichever is shorter	n.a.	n.a.
Customization of antenna design allowed	No	Yes (See note 3)	Yes	n.a.
Transmitter carrier output limits	H-field at 10 m (see clause 4.3.4.3)	H-field at 10 m (see clause 4.3.4.3)	Current in artificial antenna (see note 4 & 4.3.4.3 and 4.3.6.3)	H-field at 10 m (see clause 4.3.6.3)
Spurious limits	H-field at 10 m (see clauses 4.3.8.3 and 4.3.9.3)	H-field at 10 m (see clauses 4.3.8.3 and 4.3.9.3)	Current in artificial antenna (see note 4 & clauses 4.3.7.3 & 4.3.19.3)	H-field at 10 m (see clauses 4.3.8.3 and 4.3.9.3)

NOTE 1: Where a manufacturer provides a range of standard antennas, the equipment will be tested as Product Class 1 equipment, with the antenna(s) attached. The measurements shall be repeated for each antenna.
NOTE 2: The two antennas shall meet the manufacturer's design rules published in the equipment manual and shall have maximum and minimum loop areas respectively. Both antennas shall have the maximum magnetic dipole moment as declared by the manufacturer.
NOTE 3: Customization is only allowed according to the manufacturer's antenna design rules published in the equipment manual.
NOTE 4: ON-site measurements may be required.

Product Classes: (ETSI EN 300 330 V2.1.1 (2017-02) table B.1)

☒ Class 1

☐ Class 2

☐ Class 3

☐ Class 4

Temperature range: (ETSI EN 300 330 V2.1.1 (2017-02) sub clause 5.6.1.2)

☒ Category 1 - 20 °C to + 55 °C

☐ Category 2 - 10°C to + 55 °C

☐ Category 3 0 °C to + 35 °C

☐ other X °C to +X °C

11.1.2 Permitted range of operating frequencies §4.3.1

Description:

The permitted range of operating frequencies is the frequency range over which the equipment is authorized to operate.

Conformance:

Customer declaration	
Operational frequency band*:	13.553 MHz to 13.567 MHz
Nominal Operating Frequencies:	13.56 MHz

*) Frequency range according ETSI EN 300 330 V2.1.1 (2017-02), table 1

11.1.3 Operating frequency ranges §4.3.2

Description:

The operating frequency range (OFR) is the frequency range over which the EUT is transmitting. The operating frequency range of the EUT is determined by the lowest (f_L) and highest frequency (f_H) as occupied by the power envelope. With the center frequency of the OFR as: $f_C = (f_H+f_L)/2$.
An EUT could have more than one operating frequency range.

Measurement:

The measuring receiver may be a spectrum analyzer, oscilloscope, selective power meter or any measuring receiver which is appropriate to perform the intended measurement of the EUT. The measurement antenna shall be placed at one point of the setup up. Alternatively, a current probe could be used. The 99 % OBW function shall be used to determine the operating frequency range.

Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	200 Hz
Video bandwidth:	≥ RBW
Span:	-/-
Trace-Mode:	Max hold
Measurement uncertainty	See chapter 8
Test setup	See chapter 7.2A

Limits: ETSI EN 300 330 V2.1.1 (2017-02), table 1

Frequency Bands / frequencies		
Transmit and Receive	9 kHz to 90 kHz	Inductive devices, Generic use
Transmit and Receive	90 kHz to 119 kHz	Inductive devices, Generic use
Transmit and Receive	119 kHz to 140 kHz	Inductive devices, Generic use
Transmit and Receive	140 kHz to 148.5 kHz	Inductive devices, Generic use
Transmit and Receive	148.5 kHz to 5 MHz	Inductive devices, Generic use
Transmit and Receive	400 kHz to 600 kHz	RFID only
Transmit and Receive	5 MHz to 30 MHz	Inductive devices, Generic use
Transmit and Receive	3 155 kHz to 3 400 kHz	Inductive devices, Generic use
Transmit and Receive	984 kHz to 7 484 kHz (Note 3, Centre frequency is 4 234 kHz)	Inductive devices, Railway applications
Transmit and Receive	4 516 kHz	Inductive devices, Railway applications
Transmit and Receive	6 765 kHz to 6 795 kHz	Inductive devices, Generic use
Transmit and Receive	7 400 kHz to 8 800 kHz	Inductive devices, Generic use
Transmit and Receive	10.200 MHz to 11.000 MHz	Inductive devices, Generic use
Transmit and Receive	11.810 MHz to 15.310 MHz (Centre frequency is 13.56 MHz)	RFID only
Transmit and Receive	12.5 MHz to 20 MHz	Inductive devices, Wireless healthcare
Transmit and Receive	13.553 MHz to 13.567 MHz	Inductive devices, Generic use
Transmit and Receive	26.957 MHz to 27.283 MHz	Inductive devices, Generic use
Transmit and Receive	27.090 MHz to 27.100 MHz	Inductive devices, Railway applications

NOTE 1: In addition, it should be noted that other frequency bands may be available in a country within the frequency range 9 kHz to 30 MHz.
NOTE 2: On non-harmonised parameters, national administrations may impose certain conditions such as the type of modulation, frequency, channel/frequency separations, maximum transmitter radiated power, duty cycle, and the inclusion of an automatic transmitter shut-off facility, as a condition for the issue of an Individual Rights for use of spectrum or General Authorization, or as a condition for use under "licence exemption" as it is in most cases for Short Range Devices.
NOTE 3: Transmitting only on receipt of a Balise/Eurobalise tele-powering signal from a train. cases for Short Range Devices.

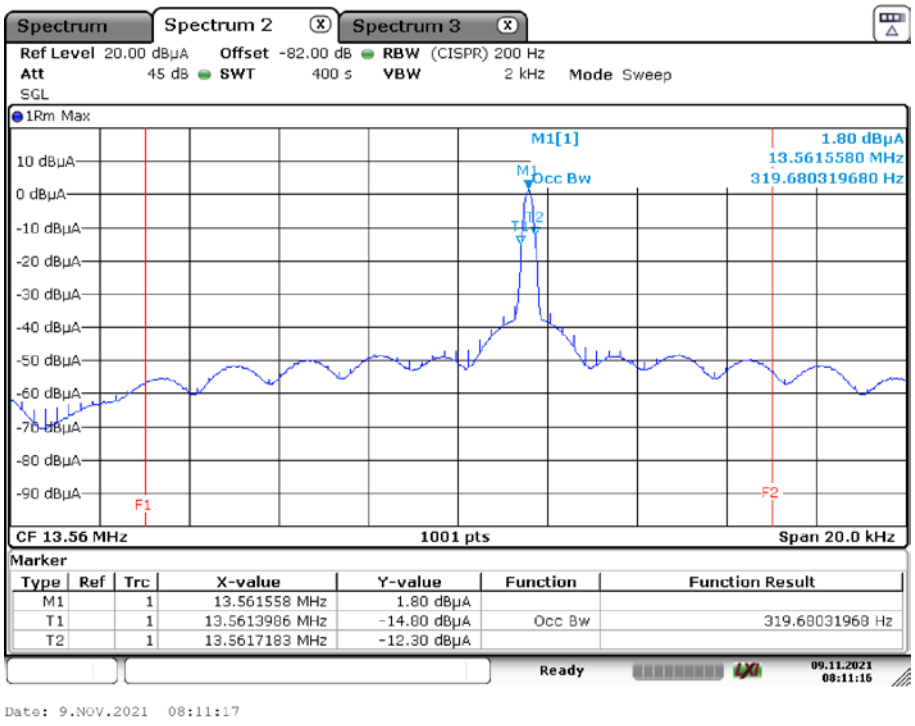
Results:

TEST CONDITIONS		Marker frequencies / MHz					
		without card		with card		-/-	
		F_l	F_h	F_l	F_h	F_l	F_h
T_{nom}	V_{nom}	13.56139	13.56171	13.56139	13.56171	-/-	-/-
T_{low}	V_{low}	13.56147	13.56177	13.56147	13.56177	-/-	-/-
	V_{high}	13.56147	13.56179	13.56147	13.56179	-/-	-/-
T_{high}	V_{low}	13.56145	13.56177	13.56149	13.56181	-/-	-/-
	V_{high}	13.56145	13.56177	13.56151	13.56183	-/-	-/-
Min. F_{low}		13.56139	-/-	13.56139	-/-	-/-	-/-
Max. F_{high}		-/-	13.56179	-/-	13.56171	-/-	-/-
Limit		13.55300	13.56700	13.55300	13.56700	-/-	-/-

Where: F_l = is the lower edge of the OBW / MHz
F_h = is the upper edge of the OBW / MHz

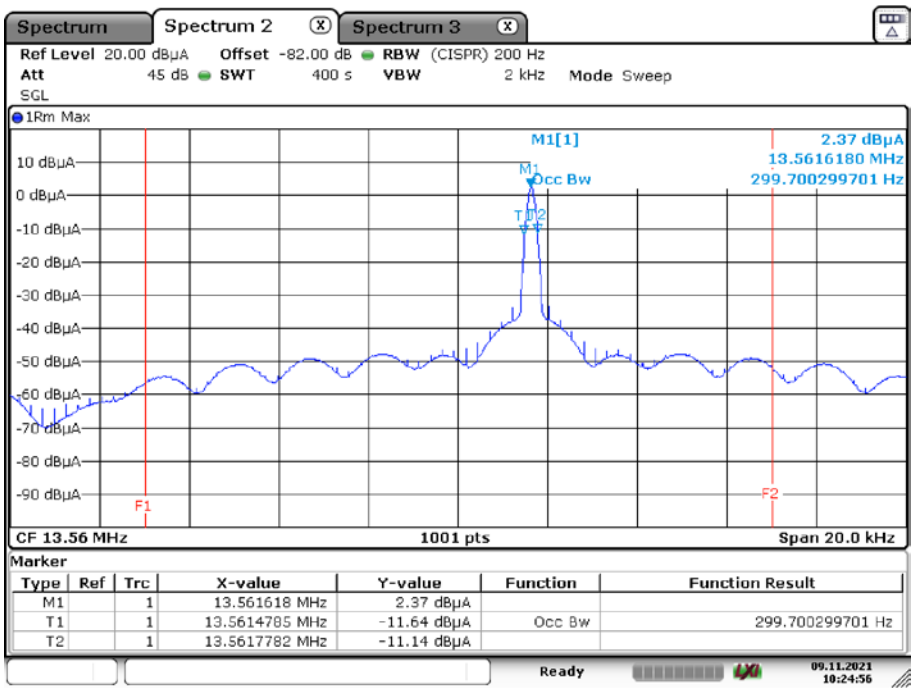
Plots: Operating frequency ranges without card

Plot 1 (T_{nom} / V_{nom}):



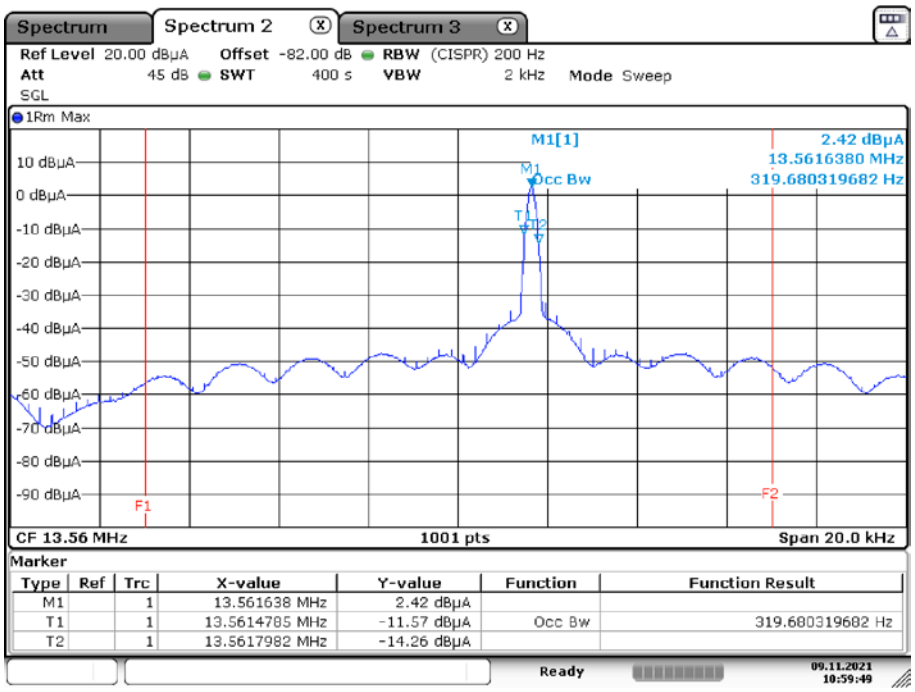
Date: 9.NOV.2021 08:11:17

Plot 2 (T_{min} / V_{min}):



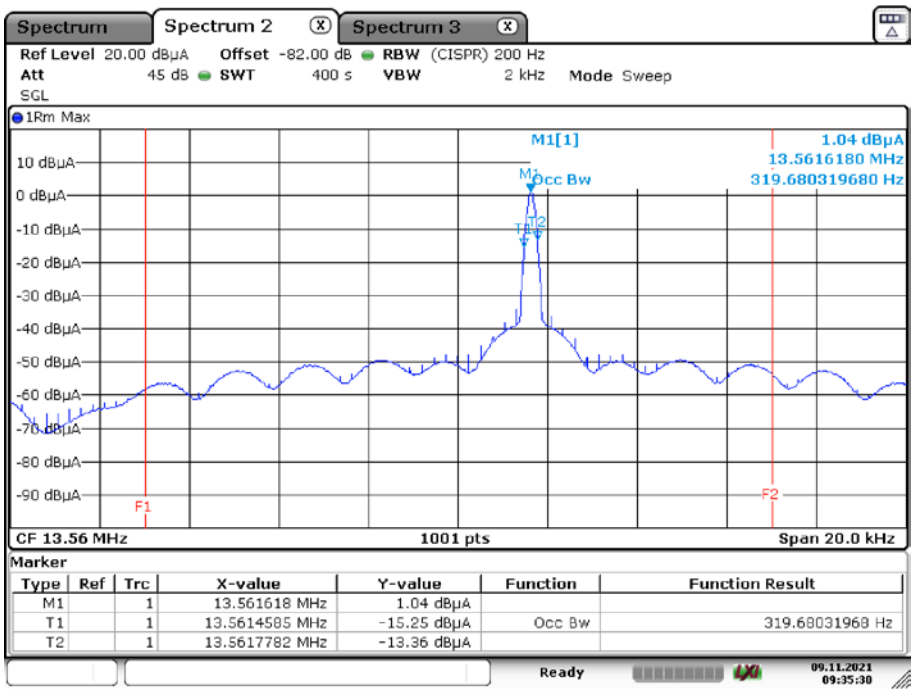
Date: 9.NOV.2021 10:24:57

Plot 3 (T_{min} / V_{max}):



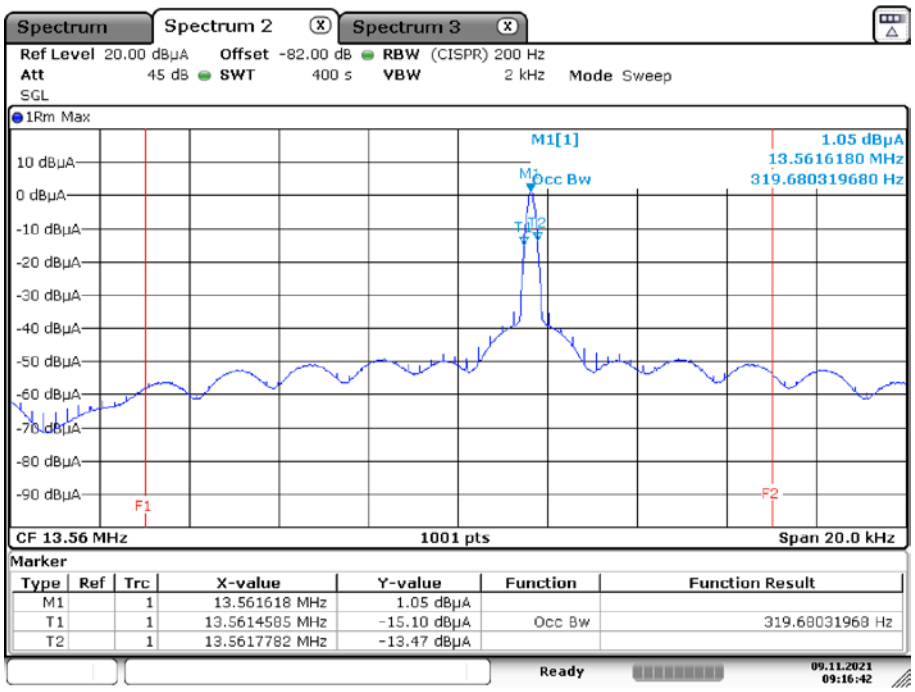
Date: 9.NOV.2021 10:59:50

Plot 4 (T_{max} / V_{min}):



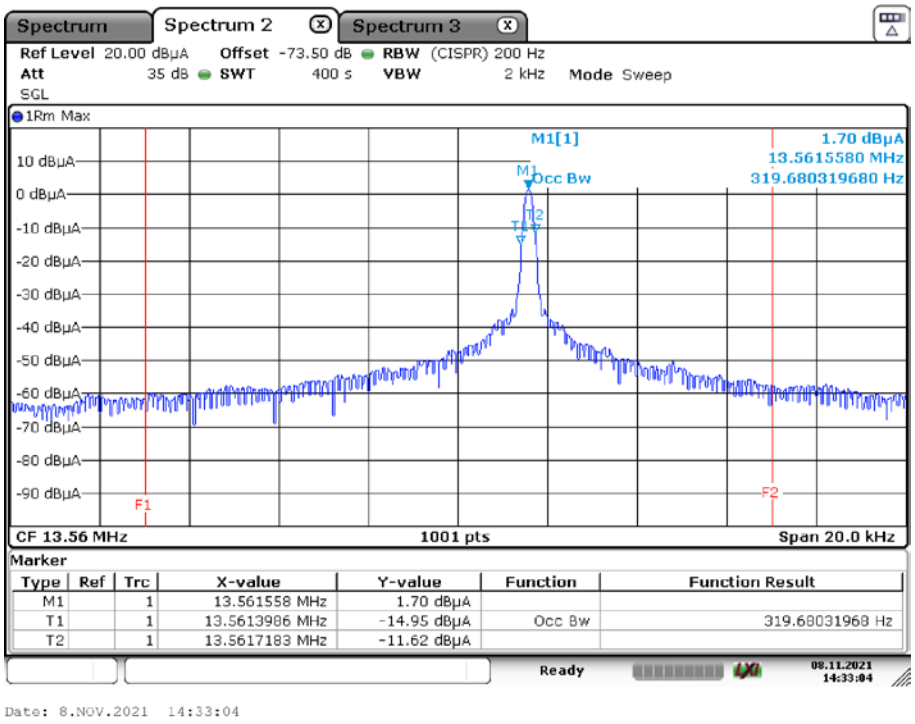
Date: 9.NOV.2021 09:35:31

Plot 5 (T_{max} / V_{max}):



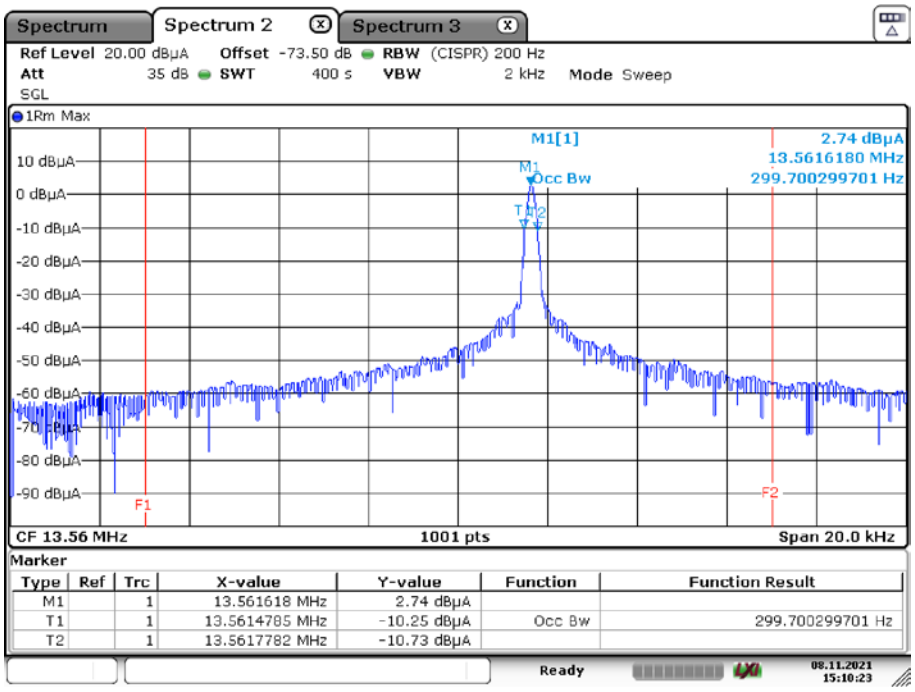
Plots: Operating frequency ranges with card

Plot 1 (T_{nom} / V_{nom}):



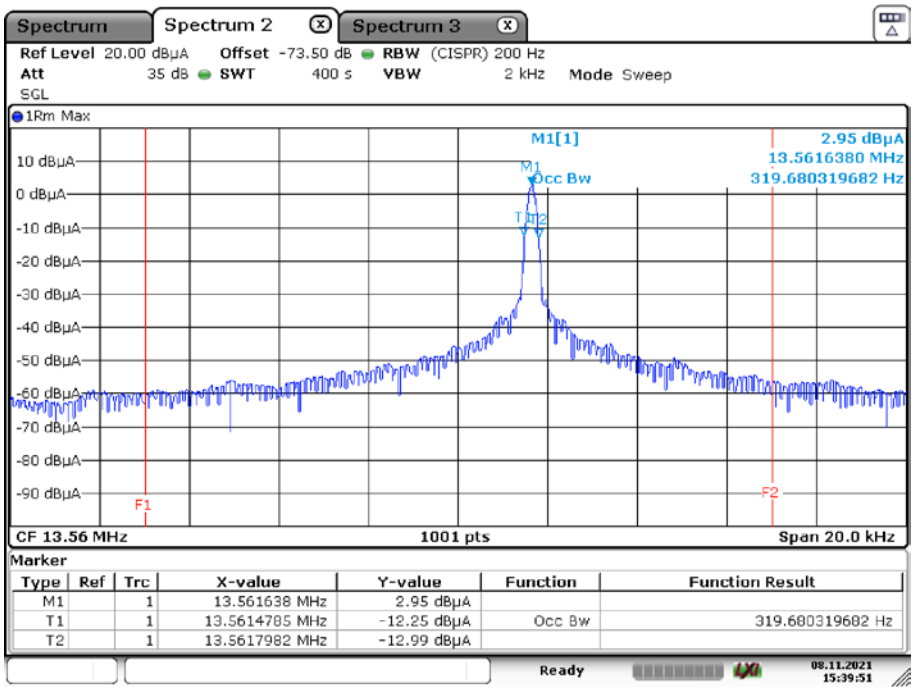
Date: 8.NOV.2021 14:33:04

Plot 2 (T_{min} / V_{min}):



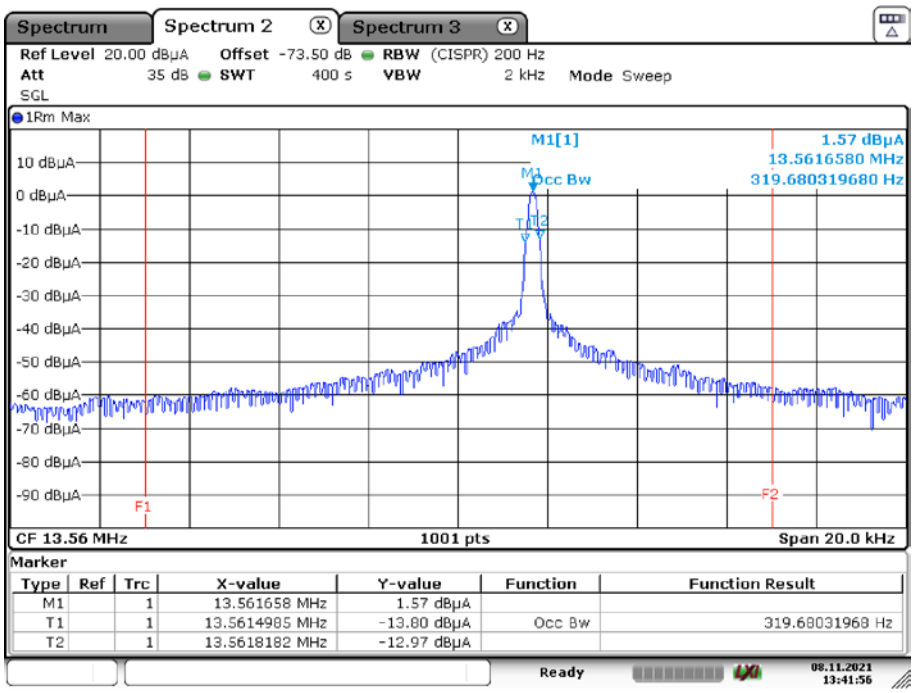
Date: 8.NOV.2021 15:10:22

Plot 3 (T_{min} / V_{max}):



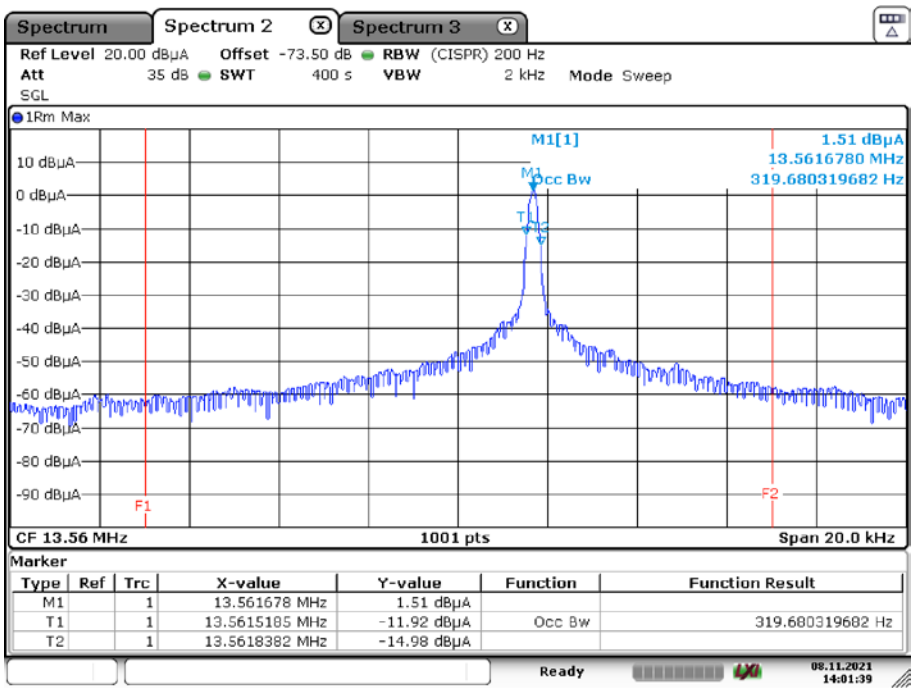
Date: 8.NOV.2021 15:39:51

Plot 4 (T_{max} / V_{min}):



Date: 8.NOV.2021 13:41:56

Plot 5 (T_{max} / V_{max}):



11.1.4 Modulation bandwidth §4.3.3

Description:

The modulation bandwidth contains all associated side bands above the following level:

a) For carrier frequencies below 135 kHz:
- 23 dB below the carrier or the appropriate spurious limit as defined in clauses 4.3.7, 4.3.8, 4.3.9.

b) For carrier frequencies in the range 135 kHz to 30 MHz:
- 15 dB below the carrier or the appropriate spurious limit as defined in clauses 4.3.7, 4.3.8, 4.3.9.

c) For RFID within the transmitter emission boundary of figure I.1, and for RFID and EAS systems within the transmitter mask of figures I.2, I.3 and I.4, see CISPR 16-1-4 [2]

Measurement:

Measurement parameters	
Detector:	Max peak
Sweep time:	Auto
Resolution bandwidth:	200Hz
Video bandwidth:	≥ RBW
Trace-Mode:	Max Hold
Measurement uncertainty	See chapter 8
Test setup	See chapter 7.2 A

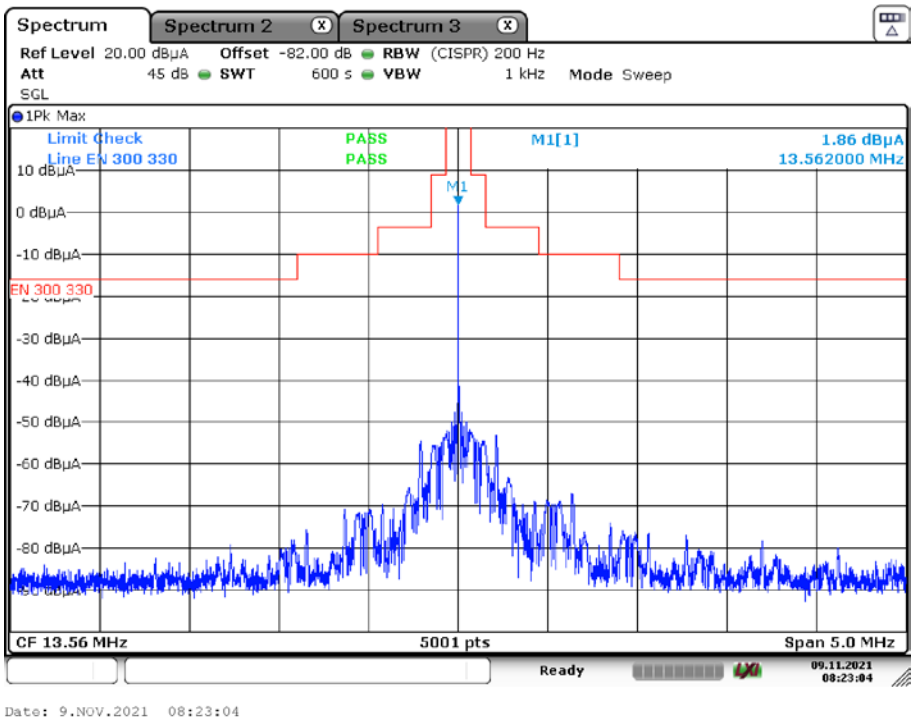
Limits:

The modulation bandwidth shall be within the assigned frequency band see table 1 or ±7.5 % of the carrier frequency whichever is the smallest. For RFID and EAS Systems, the modulation bandwidth shall be within the transmitter emission boundary of figures I.1, I.2, I.3 and I.4. For further information, see CEPT/ERC/REC 70-03 [i.1] or ERC/ECC/CEPT Decisions as implemented through National Radio Interfaces (NRI) and additional NRI as relevant.

carrier frequency ± 7.5 %	
-/-	-/-
assigned frequency band according ETSI EN 300 330 V2.1.1 (2017-02) table 1	
-/-	
RFID / EAS System	
See ETSI EN 300 330 V2.1.1 (2017-02) figures I.1, I.2, I.3 and I.4	

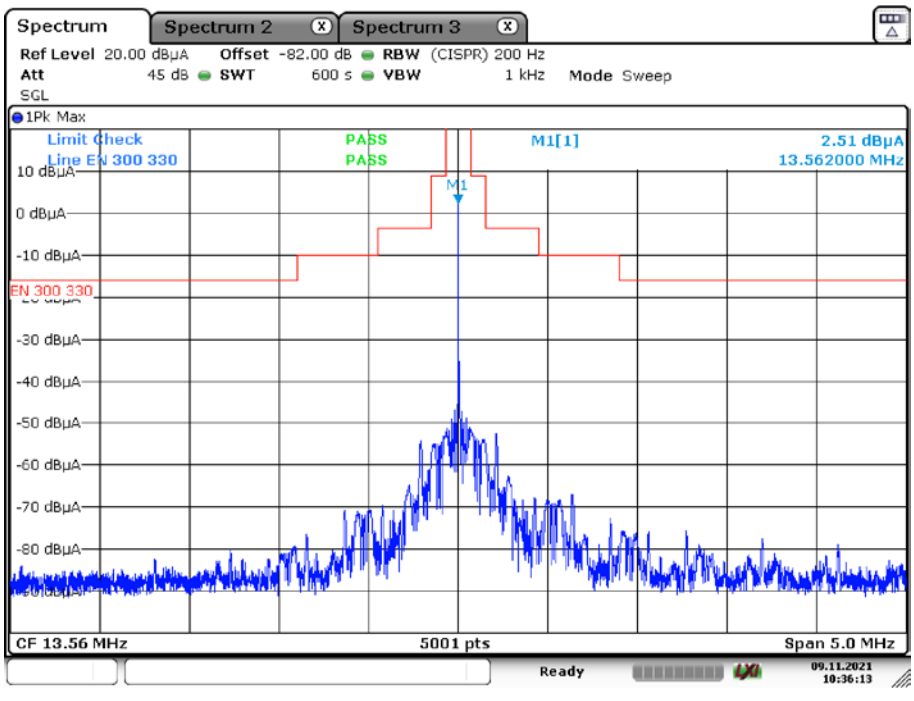
Results: Modulation bandwidth without card

Plot 1: (T_{nom} / V_{nom})



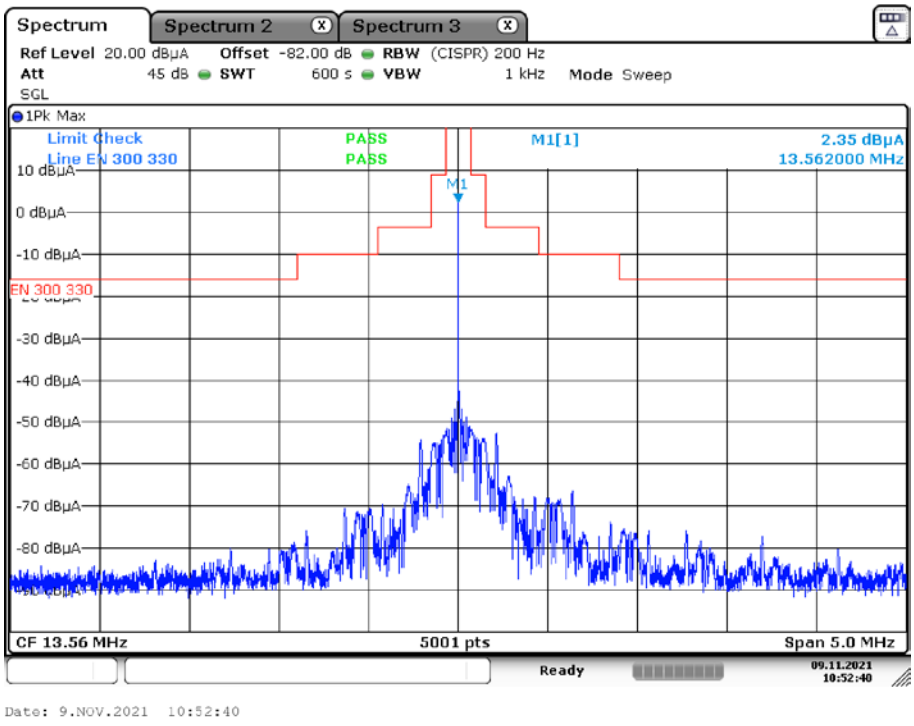
Date: 9.NOV.2021 08:23:04

Plot 2: (T_{min} / V_{min})

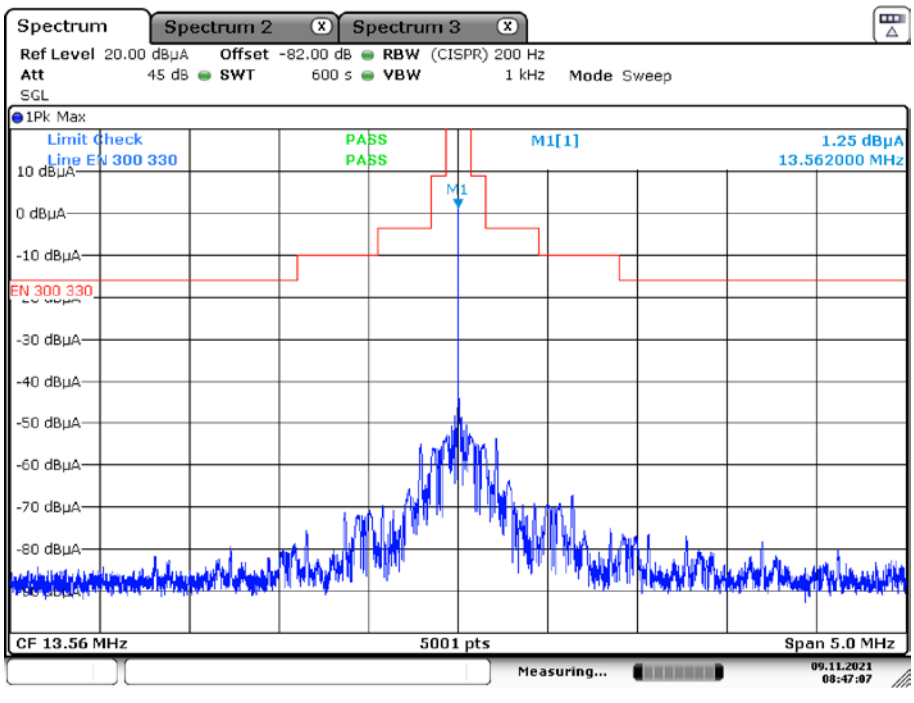


Date: 9.NOV.2021 10:36:13

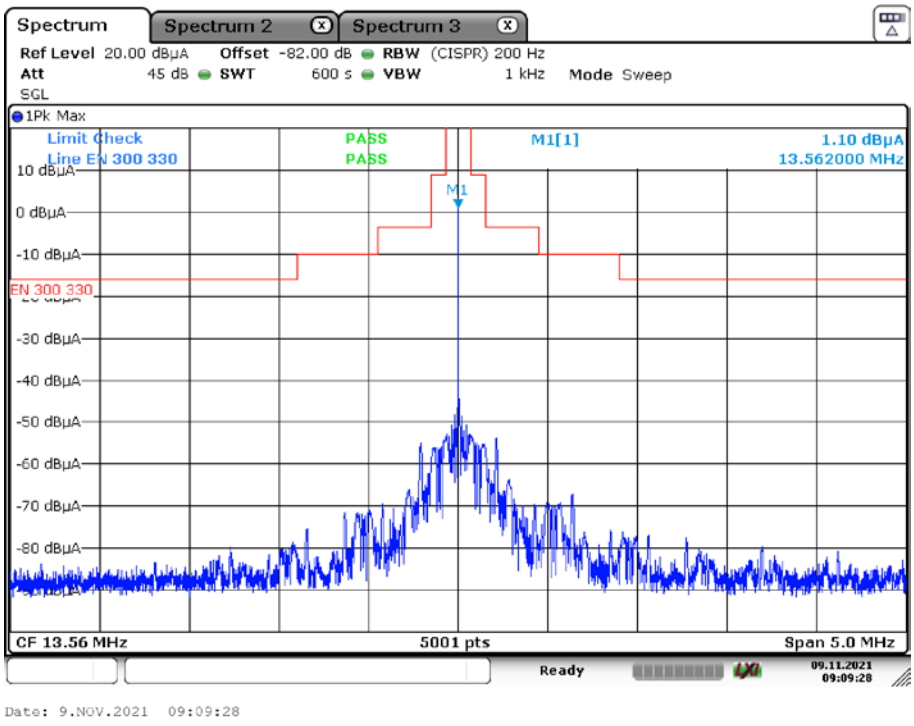
Plot 3: (T_{min} / V_{max})



Plot 4: (T_{max} / V_{min})

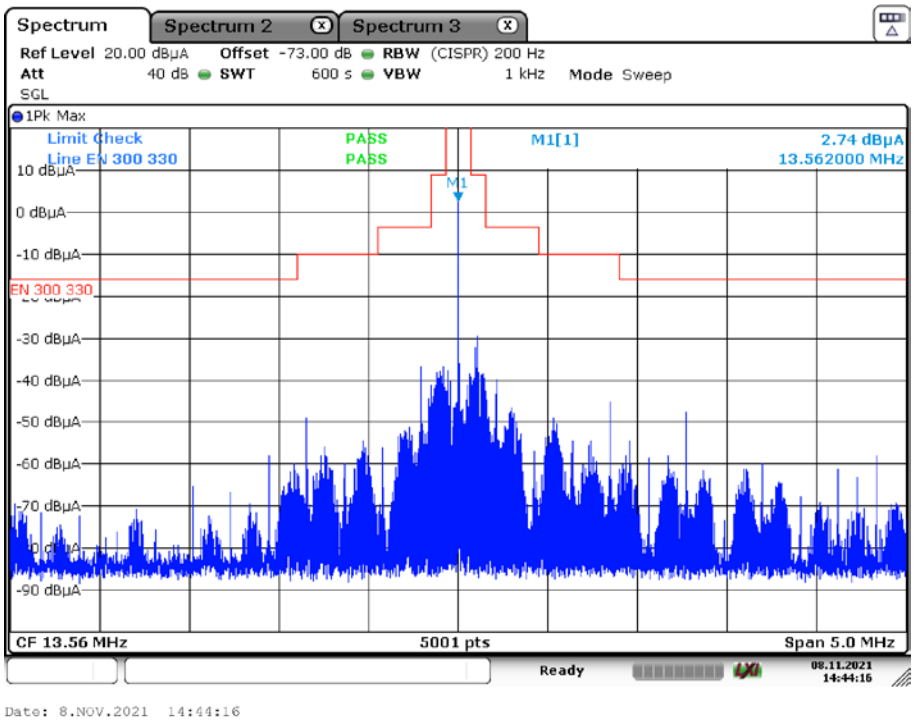


Plot 5: (T_{max} / V_{max})



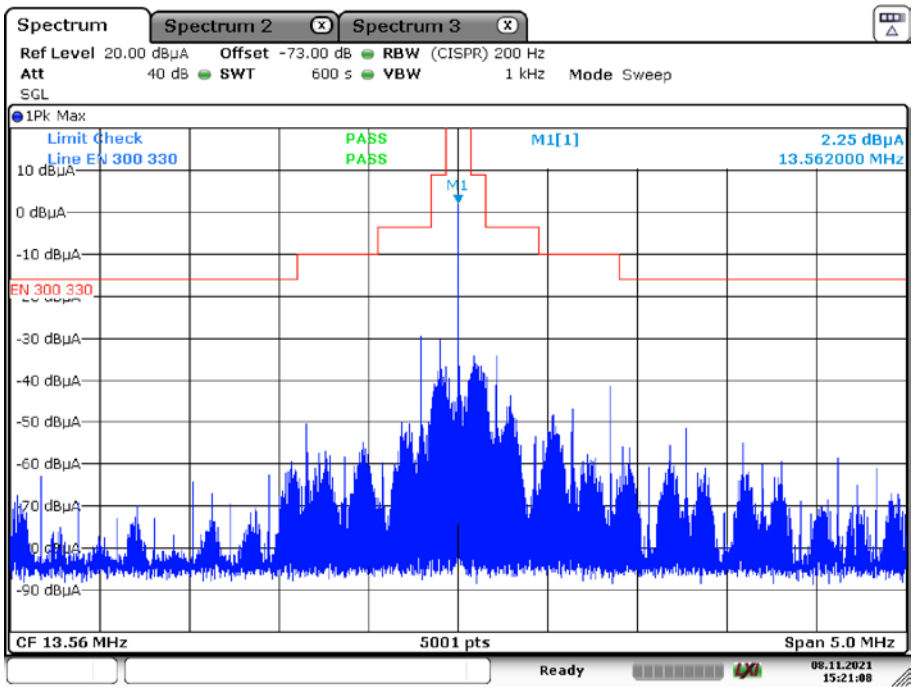
Results: Modulation bandwidth with card

Plot 1: (T_{nom} / V_{nom})



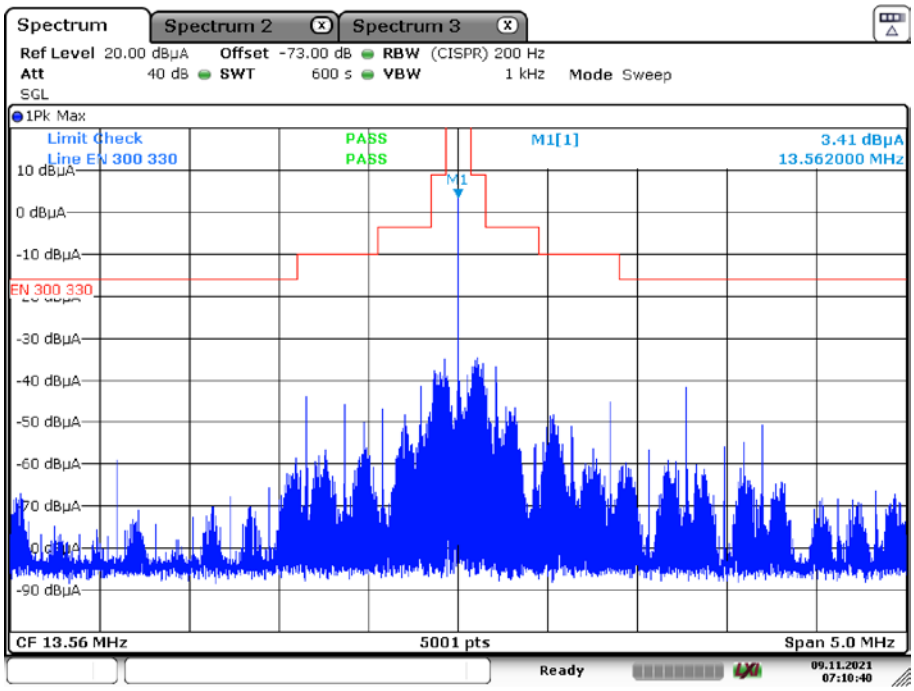
Date: 8.NOV.2021 14:44:16

Plot 2: (T_{min} / V_{min})



Date: 8.NOV.2021 15:21:08

Plot 3: (T_{min} / V_{max})



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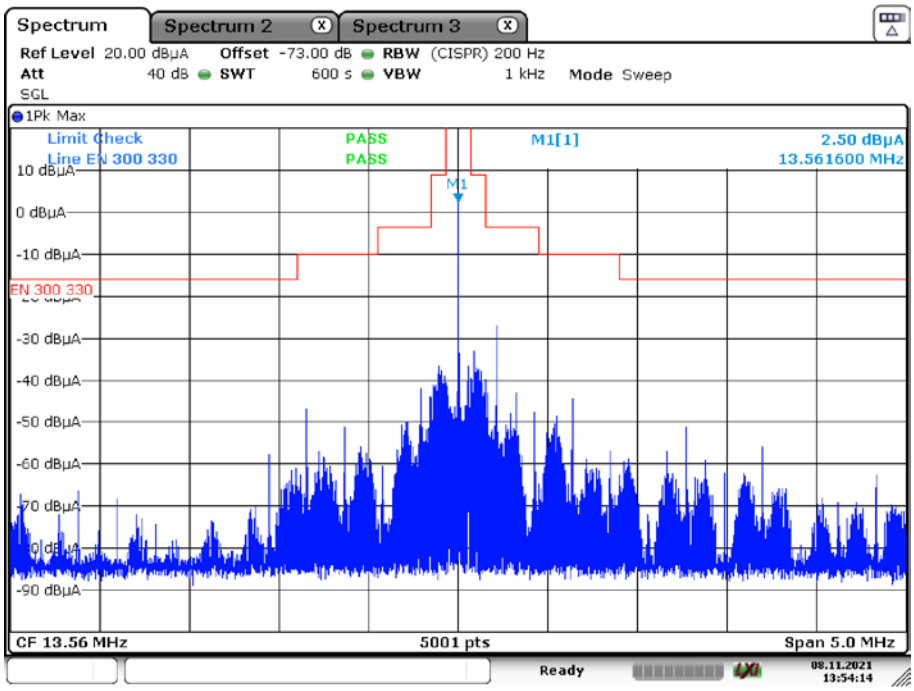
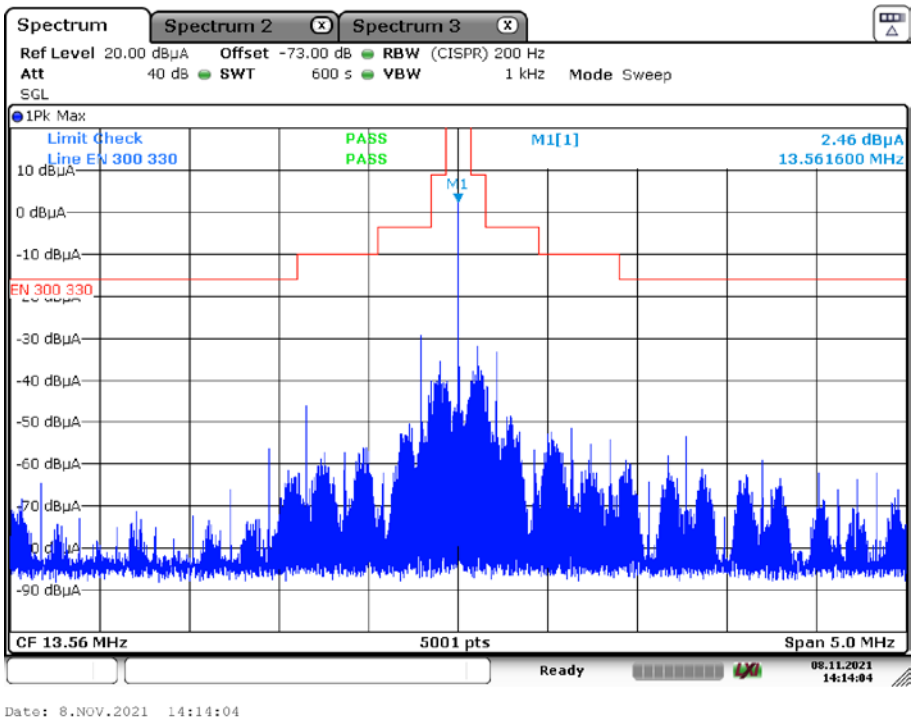
Plot 4: (T_{max} / V_{min})



Date: 8.NOV.2021 13:54:13

Plot 5: (T_{max} / V_{max})



11.1.5 H-field (radiated, product class 1 and 2 only) §4.3.4

Description:

The measurements of the transmitter radiated H-field shall be made on an open field test site as specified in clause C.1.3. Any measured values shall be at least 6 dB above the ambient noise level.
The H-field produced by the equipment shall be measured at standard distance of 10 m. Where this is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex H and these calculations shall be stated in the test report.
For measuring equipment calibrated in dBµV/m, the reading should be reduced by 51.5 dB to be converted to dBµA/m.

Measurement:

The measurements of the transmitter radiated H-field shall be made on an open field test site as specified in clause C.1.3. Any measured values shall be at least 6 dB above the ambient noise level.

Measurement parameters	
Detector:	Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	200 Hz
Video bandwidth:	1 kHz
Span:	-/-
Trace-Mode:	Max Hold
Measurement uncertainty	See chapter 8
Test setup	See chapter 7.1A, 7.2A

Limits:

Frequency range (MHz)	H-field strength limit (Hf) dBµA/m at 10 m or specified in mW e.r.p.
0.009 ≤ f < 0.090	72 descending 3 dB/oct above 0,03 MHz or according to note 1 (see note 5)
0.09 ≤ f < 0.119	42
0.119 ≤ f < 0.135	66 descending 3 dB/oct above 0.119 MHz or according to note 1 (see notes 3 and 5)
0.135 ≤ f < 0.140	42
0.140 ≤ f < 0.1485	37.7
0.1485 ≤ f < 30	-5 without transmitter modulation -15 with transmitter modulation (see note 4)
0.315 ≤ f < 0.600	-5
3.155≤ f < 3.400	13.5
4.234	9 (see note 9)
4.516 7	7
7.400 ≤ f < 8.800	9
10.2 ≤ f < 11.00	9
12.5 ≤ f ≤ 20	-7
6.765 ≤ f ≤ 6.795	42 (see notes 3 and 7)
26.957 ≤ f ≤ 27.283	42 (see note 3)
13.410 ≤ f ≤13.553, 13.567 ≤ f ≤ 13.710	9 (see note 6)
13.110 ≤ f ≤ 13.410, 13.710 ≤ f ≤ 14.010	-3.5 (see note 6)
12.660 ≤ f ≤ 13.110, 14.010 ≤ f ≤ 14.460	-10 (see note 6)
11.810 ≤ f ≤ 12.660, 14.460 ≤ f ≤ 15.310	-16 (see note 6)
13.460 ≤ f ≤ 13.553, 13.567 ≤ f ≤ 13.660	27 (see note 6)
13.360 ≤ f ≤ 13.460, 13.660 ≤ f ≤ 13.760	Linear transition from 27 to -3,5 (see note 6)
13.110 ≤ f ≤ 13.360, 13.760 ≤ f ≤ 14.010	-3,5 (see note 6)
12.660 ≤ f ≤ 13.110, 14.010 ≤ f ≤ 14.460	-5 (see note 6)
13.553 ≤ f ≤ 13.567	42 (see note 3) or 60 (see notes 2 and 3)
27.095	42
26.995, 27.045, 27.095, 27.145, 27.195	100 mW

NOTE 1: For the frequency ranges 9 kHz to 135 kHz, the following additional restrictions apply to limits above 42 dBµA/m:

- for loop coil antennas with an area ≥ 0,16 m2 this table and table B.1 with the antenna limitations apply;
- for loop coil antennas with an area between 0,05 m2 and 0,16 m2 table B.1 applies with a correction factor. The limit is: table value + 10 × log (area/0,16 m2);
- for loop coil antennas with an area < 0,05 m2 the limit is 10 dB below table B.1.

NOTE 2: For RFID (incl. NFC) and EAS applications only.
NOTE 3: Spectrum mask limit, see annex I.
NOTE 4: For further information see annex J.
NOTE 5: Limit is 42 dBµA/m for the following spot frequencies: 60 kHz ± 250 Hz, 66,6 kHz ± 750 Hz, 75 kHz ± 250 Hz, 77,5 kHz ± 250 Hz, and 129,1 kHz ± 500 Hz.
NOTE 6: Only in conjunction with spectrum mask, see annex I.
NOTE 7: The frequency range 6,765 MHz - 6,795 MHz is not a harmonised ISM frequency band according article 5.138 of the ITU Radio Regulations [i.13].
NOTE 8: Center frequencies for channelized systems by using ≤ 10 kHz bandwidth.
NOTE 9: The limit is valid in the range 984 kHz - 7 484 kHz for Transmitting only on receipt of a Balise/Eurobalise tele- powering signal from a train.

Results:

Test Conditions		Transmitter field strength / (dBµA/m) @3m	Transmitter field strength / (dBµA/m) @10m*
T_{nom}	V_{nom}	22.46	1.46
T_{low}	V_{min}	-/-	2.51
	V_{max}	-/-	2.35
T_{high}	V_{min}	-/-	1.25
	V_{max}	-/-	1.10

*) converted from 3 m to 10 m using a correction factor of 21 dB (ETSI EN 300 330 V2.1.1 (2017-02, H.2)

11.1.6 Transmitter radiated spurious domain emission limits < 30 MHz § 4.3.8

Description:

Spurious domain emission limits are limits on emissions at frequencies other than those of the carrier and sidebands associated (clauses 4.3.2 and 4.3.3) with normal test modulation (clause 5.8).

Measurement:

The equipment under test shall be switched on with normal modulation. The characteristics of the modulation signal used shall be stated on the test report. The measuring receiver shall be tuned over the frequency range 9 kHz to 30 MHz, except for the frequency band on which the transmitter is intended to operate. At each frequency at which a relevant spurious signal is detected the equipment under test and the test antenna shall be rotated until maximum field strength is indicated on the measuring receiver. This level shall be noted.
If the transmitter can be operated in the standby mode, then the measurements shall be repeated in the standby mode.
For measuring equipment calibrated in dBµV/m, the reading should be reduced by 51,5 dB to be converted to dBµA/m.

Measurement parameters	
Detector:	Quasi Peak (peak pre-scan)
Sweep time:	Auto
Resolution bandwidth:	200 Hz / 9 kHz / 120 kHz 300 Hz / 10 kHz / 100 kHz
Video bandwidth:	> RBW
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold
Measurement uncertainty	See sub clause 8
Test setup	See chapter 7.1A

Limits:

The radiated field strength of the spurious domain emissions below 30 MHz shall not exceed the generated H-field dBµA/m at 10 m given in the table below.

Frequency 9 kHz ≤ f < 10 MHz	Frequency 10 MHz ≤ f < 30 MHz
27 dBµA/m at 9 kHz descending 3 dB/oct	-3.5 dBµA/m

Results:

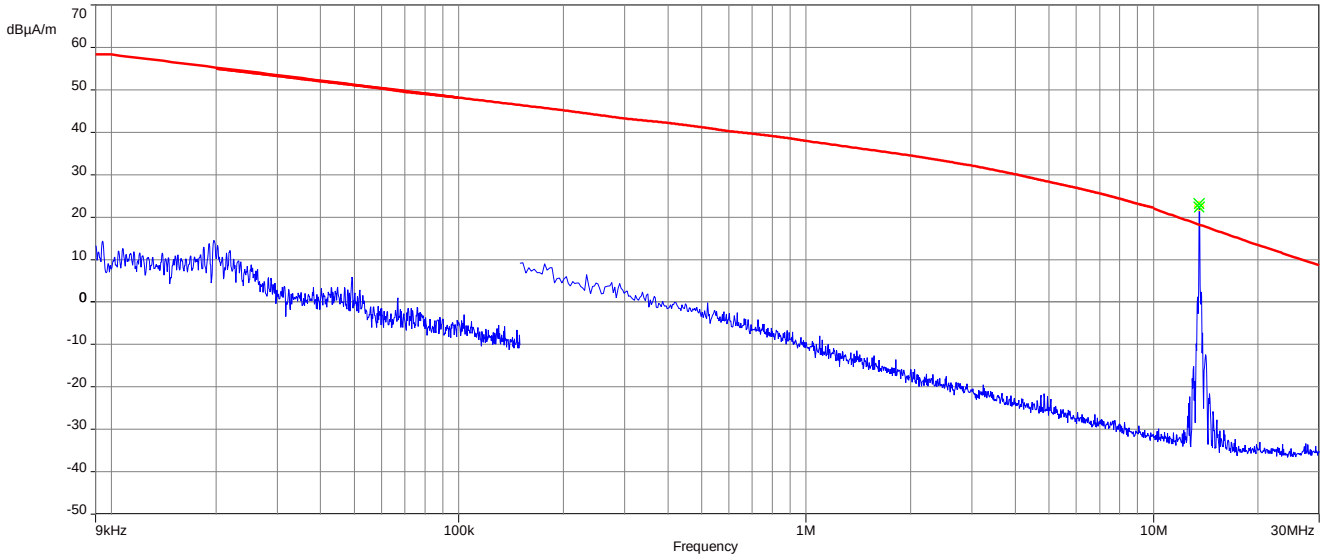
Radiated H-field*								
Channel 1			-/-			-/-		
F	BW	P	F	BW	P	F	BW	P
no peaks detected			-/-	-/-	-/-	-/-	-/-	-/-

*) Values measured at 3 m, thereby the limit in the plot below is adjust according to ETSI EN 300 330 V2.1.1 (2017-02) annex H.2.

Where F = Frequency of spurious, [F] = kHz
BW = Measurement receiver bandwidth, [BW] = Hz
P = Level of spurious, [P] = dBµA/m
PP = Positive peak detector
QP = Quasi peak detector

Plots:

Plot 1: 9 kHz to 30 MHz, magnetic



11.1.7 Transmitter radiated spurious domain emission limits > 30 MHz § 4.3.9

Description:

Spurious domain emission limits are limits on emissions at frequencies other than those of the carrier and sidebands associated with normal test modulation (clause 5.8).

Measurement:

The transmitter shall be switched on with normal modulation, and the measuring receiver shall be tuned over the frequency range 30 MHz to 1 000 MHz.
At each frequency at which a relevant spurious component is detected, the test antenna shall be raised and lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver.

Measurement parameters	
Detector:	Quasi Peak (peak pre-scan)
Sweep time:	auto
Resolution bandwidth:	120 kHz / 100 kHz
Video bandwidth:	> RBW
Span:	30 MHz to 1 GHz
Trace-Mode:	Max Hold
Measurement uncertainty	See chapter 8
Test setup	See chapter 7.1B

Limits:

Max. spurious level	
47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	**Other frequencies between 30 MHz to 1000 MHz**
4.0 nW / -54 dBm	250 nW / -36 dBm

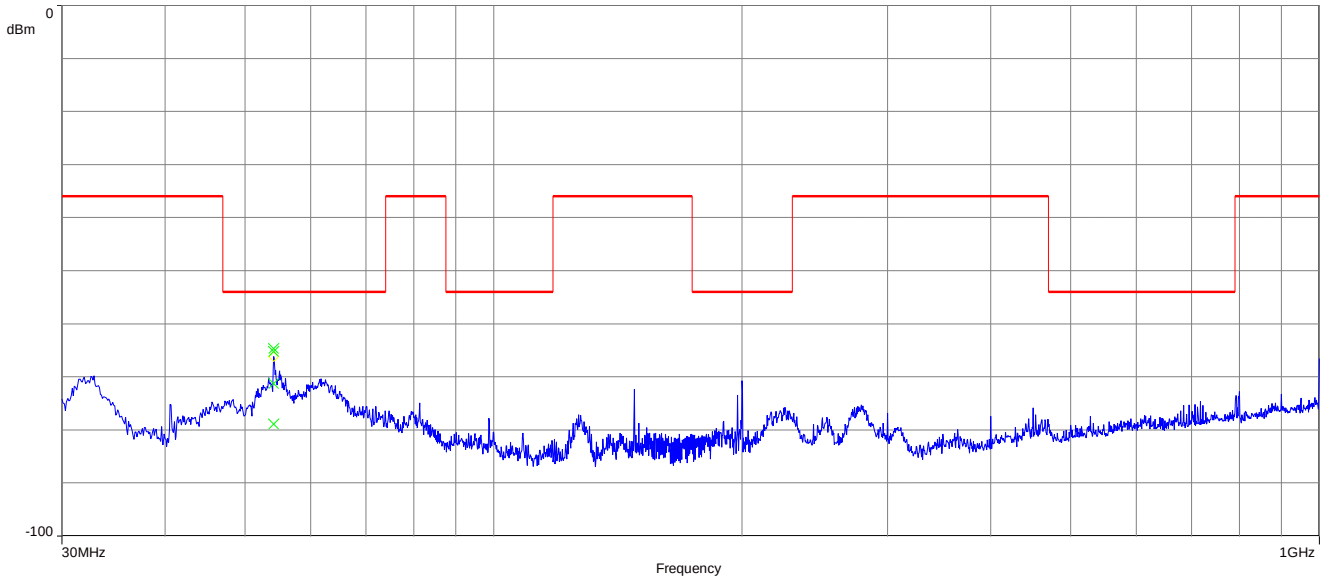
Results:

Radiated Spurious emissions								
Channel 1			Channel 2			Channel 3		
F	BW	P	F	BW	P	F	BW	P
54.15	100	-64.71QP	-/-	-/-	-/-	-/-	-/-	-/-

Where F = Frequency of spurious, [F] = MHz
BW = Measurement receiver bandwidth, [BW] = kHz
P = Level of spurious, [P] = dBm
PP = Positive peak detector
QP = Quasi peak detector

Plot:

Plot 1: 30 MHz to 1 GHz, vertical and horizontal polarization



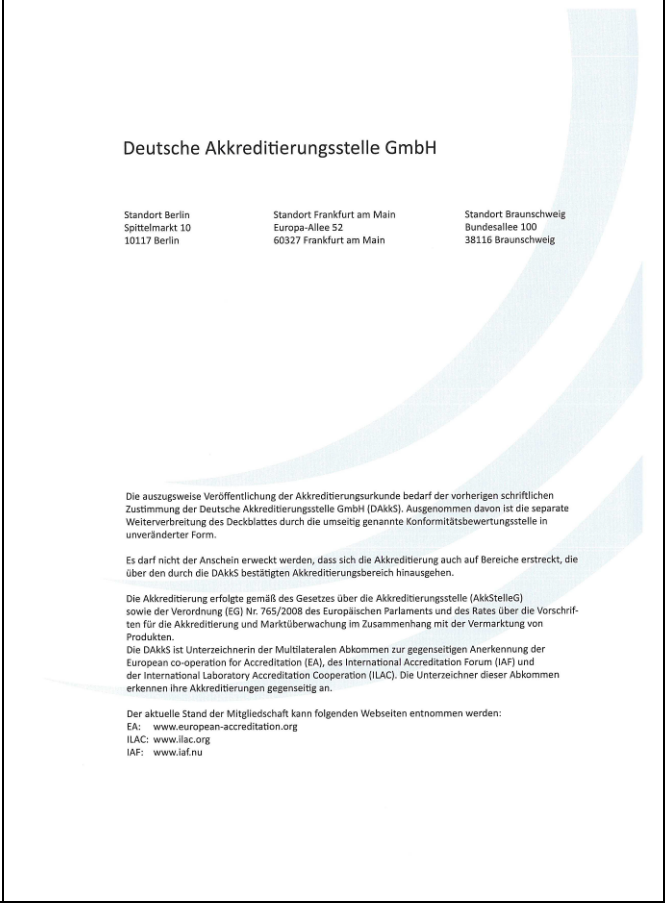
12 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

13 Document history

Version	Applied changes	Date of release
-/-	Initial release	2021-11-16

14 Accreditation Certificate – D-PL-12076-01-03

first page	last page
	

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-03.pdf
or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-03_TK.pdf

################################ END OF TEST REPORT ################################