TEST REPORT

Test report no.: 1-2773/16-01-02-B

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

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: http://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 (2005) 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

Philips Medizin Systeme Böblingen GmbH
Hewlett-Packard-Strasse 2
71034 Böblingen / GERMANY
Phone: -/-
Fax: +49 7031 463-2944
Contact: Hansjörg Geywitz
e-mail: hansjoerg.geywitz@philips.com
Phone: +49 7031 463-1879

Manufacturer

Philips Medizin Systeme Böblingen GmbH
Hewlett-Packard-Strasse 2
71034 Böblingen / GERMANY

Test standard/s

47 CFR Part 95 Personal radio services – medical device Radiocommunication service (MedRadio)

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**2.4 GHz Transceiver + MBAN**
Model name:	**IV2-FLEX PCA SRR Board**
FCC ID:	**PQC-OBBSBV1**
IC:	**-/-**
Frequency:	MBAN bands: 2360 MHz to 2390 MHz & 2390 MHz to 2400 MHz
Technology tested:	MBAN
Antenna:	Chip antenna
Power supply:	3.3 V DC
Temperature range:	-20°C to +55°C

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

Test report authorized:

p.o.

cn=Marco Bertolino, o=CTC advanced GmbH, ou=BTL-161128, email=Marco.Bertolino@ctcadvanced.com, c=DE
2018.03.02 10:04:45 +01'00'

Stefan Bös
Lab Manager
Radio Communications & EMC

Test performed:

cn=Mihail Dorongovskij, o=CTC advanced GmbH, ou=DOR-281116, email=Mihail.Dorongovskij@ctcadvanced.com, c=DE
2018.03.02 09:49:13 +01'00'

Mihail Dorongovskij
Lab Manager
Radio Communications & EMC

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.
The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.
The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".
CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.
Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.
Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.
All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH.
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.

This test report replaces the test report with the number 1-2773/16-01-02-A and dated 2018-02-28.

2.2 Application details

Date of receipt of order:	2016-11-14
Date of receipt of test item:	2016-11-24
Start of test:	2017-02-01
End of test:	2017-06-26
Person(s) present during the test:	-/-

2.3 Test laboratories sub-contracted

None

3 Test standard/s and references

Test standard	Date	Description
47 CFR Part 95	May-14-2009	Personal radio services – medical device Radiocommunication service (MedRadio)

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
KDB 550599 D01 v01r01	December-08-2017	Medical body area network (MBAN) measurement procedures

4 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	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	5.00 V DC by USB 5.25 V DC by USB 4.00 V DC by USB

5 Test item

5.1 General description

Kind of test item	:	2.4 GHz Transceiver + MBAN
Type identification	:	IV2-FLEX PCA SRR Board
HMN	:	-/-
PMN	:	-/-
HVIN	:	-/-
FVIN	:	-/-
S/N serial number	:	Rad. 318 000413 Cond. 318 000371
HW hardware status	:	1
SW software status	:	D.00.69
Frequency band	:	MBAN bands: 2360 MHz to 2390 MHz & 2390 MHz to 2400 MHz (lowest channel 2363 MHz, highest channel 2397 MHz)
Type of radio transmission Use of frequency spectrum	: :	modulated carrier, DSSS
Type of modulation	:	OQPSK
Number of channels	:	15
Antenna	:	Chip antenna
Power supply	:	3.3 V DC
Temperature range	:	-20°C to +55°C

5.2 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: 1-2773/16-01-01_AnnexA
1-2773/16-01-01_AnnexB
1-2773/16-01-01_AnnexD

6 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).

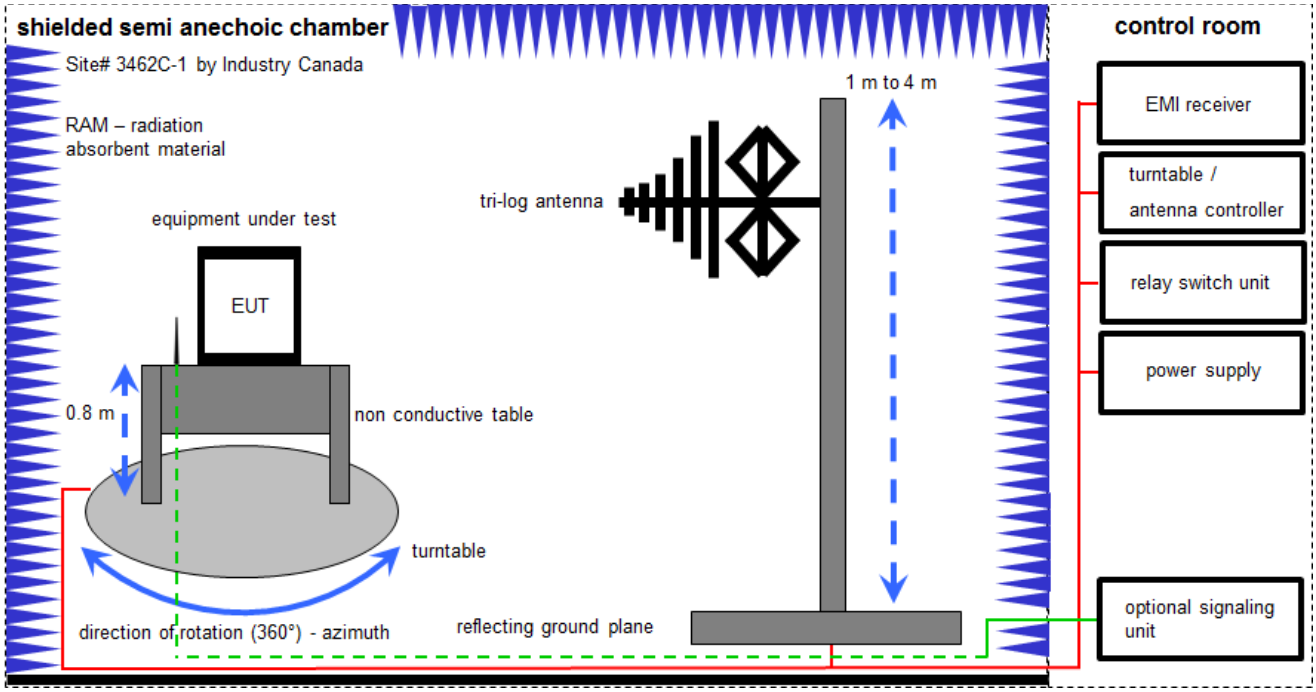
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

6.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

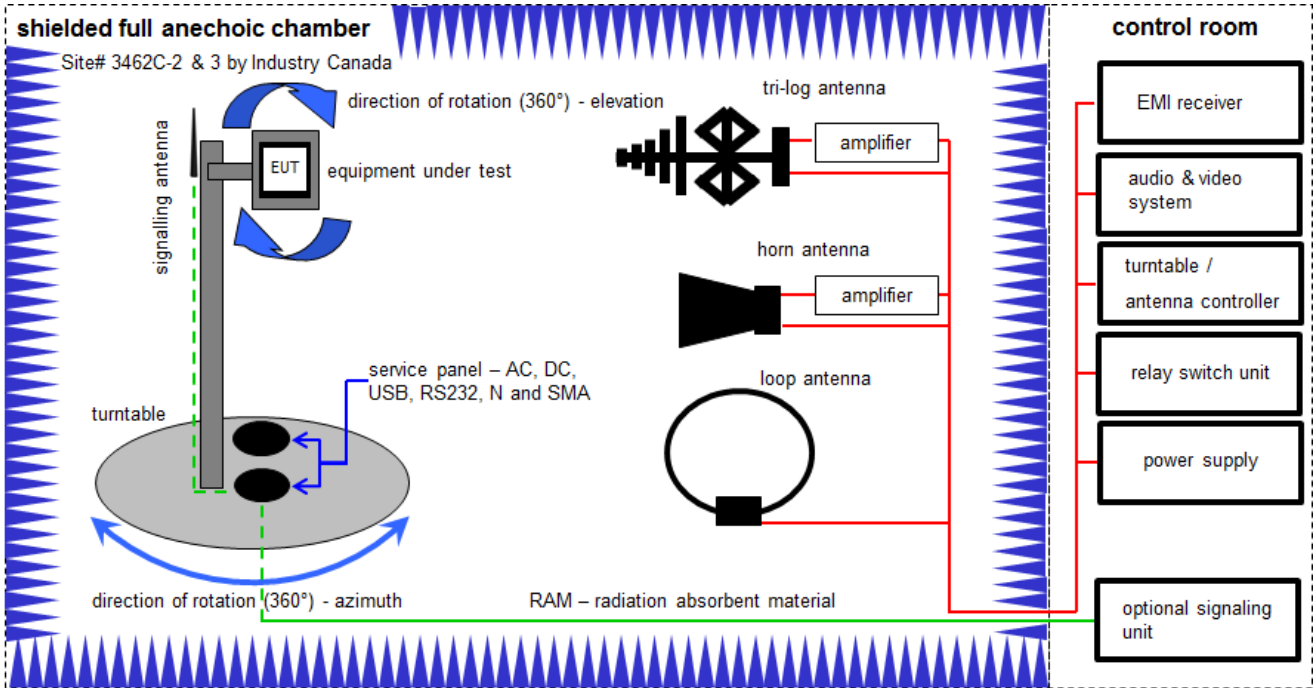
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
3	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
4	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
5	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018

6.2 Shielded fully anechoic chamber



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

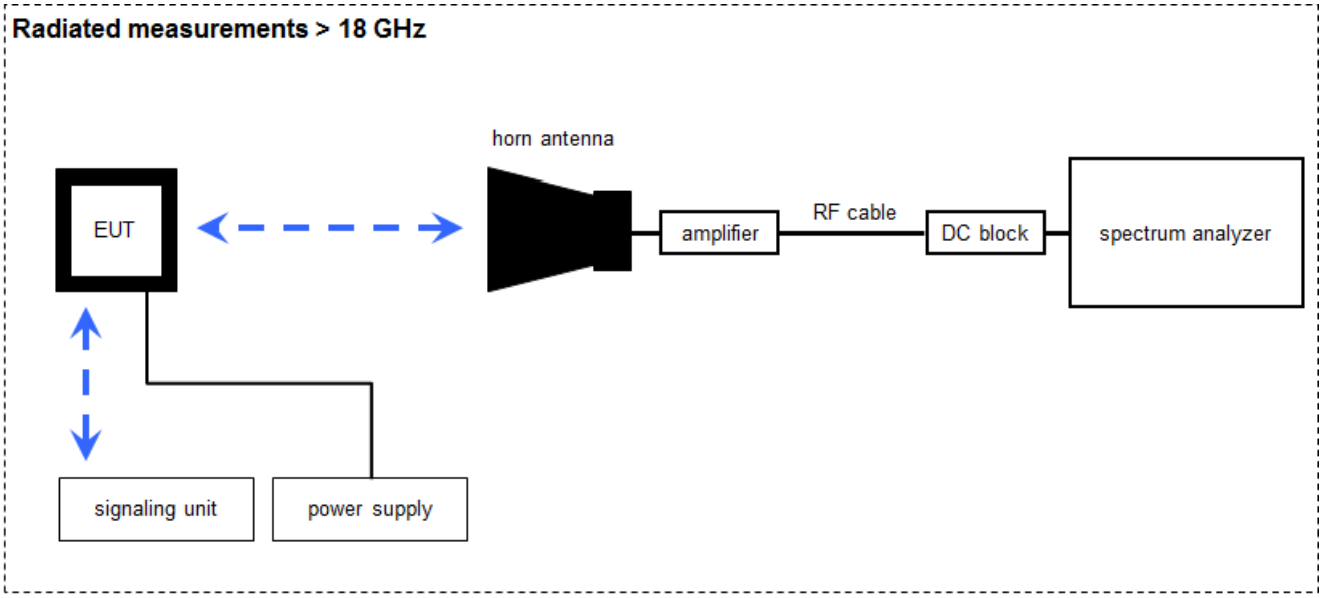
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	20.05.2015	20.05.2017
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	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
5	A	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne	-/-	-/-
6	A	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev	-/-	-/-
7	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
8	B	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	29.10.2014	29.10.2017
9	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
10	A, B, C	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	vIKI!	13.09.2016	13.03.2018

6.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

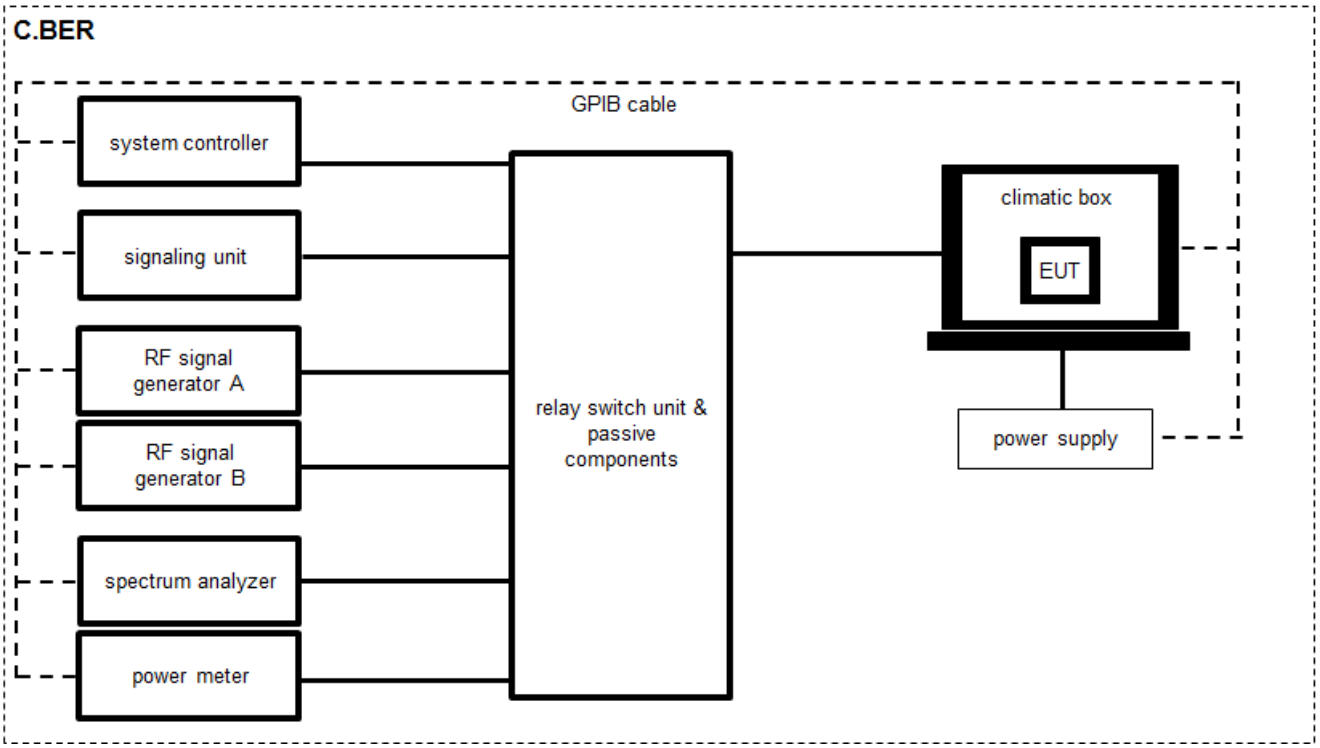
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	-/-	300000486	k	10.09.2015	10.09.2017
2	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	27.01.2017	26.01.2018
3	A	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP	00419	300002268	ev	-/-	-/-
4	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
6	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-

6.4 Conducted measurements C.BER system



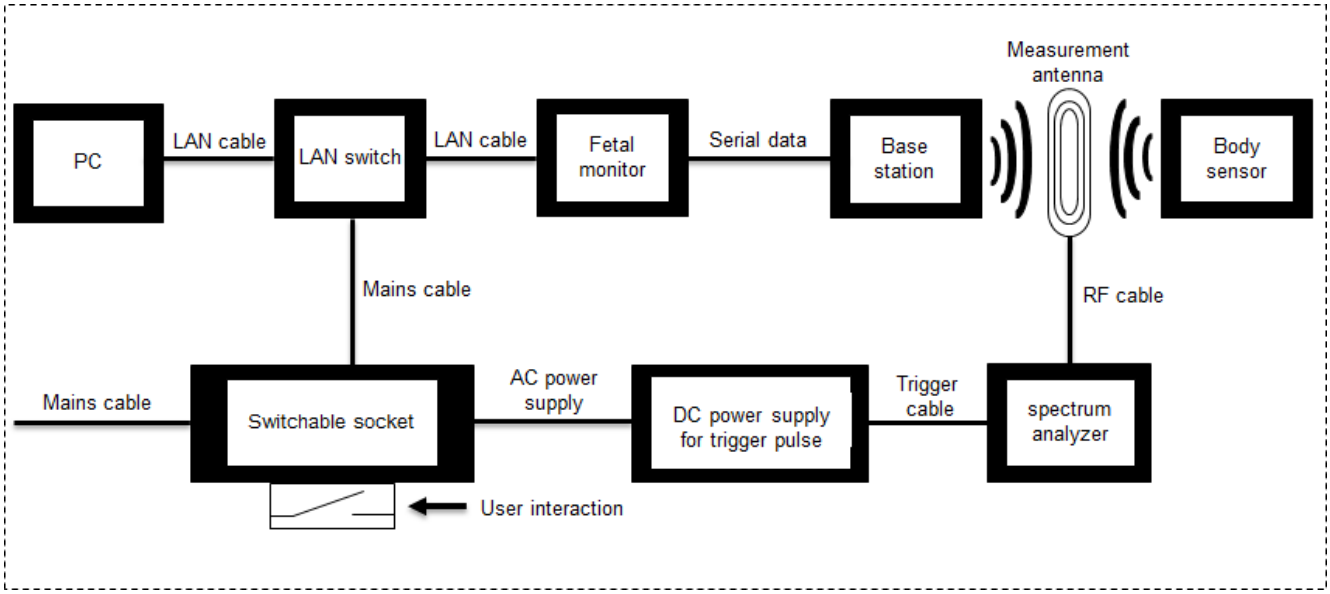
OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	Switch / Control Unit	3488A	HP	-/-	300001691	ne	-/-	-/-
2	A,	Directional Coupler	101020010	Krytar	70215	300002840	ev	-/-	-/-
3	A, B	DC-Blocker	8143	Inmet Corp.	none	300002842	ne	-/-	-/-
4	A, B	Powersplitter	6005-3	Inmet Corp.	none	300002841	ev	-/-	-/-
5	A, B	USB/GPIB interface	82357B	Agilent Technologies	MY52103346	300004390	ne	-/-	-/-
6	A, B	Messplatzrechner	Tecline	F+W	102585	300003580	ne	-/-	-/-
7	A, B	RF-Cable	ST18/SMAm/SMAm/72	Huber & Suhner	Batch no. 605505	400001187	ev	-/-	-/-
8	A, B	RF-Cable	Sucoflex 104	Huber & Suhner	147636/4	400001188	ev	-/-	-/-
9	B	Temperature Test Chamber	VT 4002	Heraeus Voetsch	5856604682001 0	300003019	ev	03.09.2015	03.09.2017
10	A, B	Signal Analyzer 30GHz	FSV30	R&S	103170	300004855	k	30.01.2017	29.01.2019

6.5 Test setup for the timing behavior



Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Antenna	-/-	-/-	-/-	-/-	ne	-/-	-/-
2	A	Switchable socket	-/-	-/-	-/-	-/-	ne	-/-	-/-
3	A	Switch	-/-	-/-	-/-	-/-	ne	-/-	-/-
4	A	PC	Elitebock 480	hp	CNU416B860	Customer provided	ne	-/-	-/-
5	A	Power supply	EA-PS 3032-65	Elektro Automatik	-/-	300002318	ne	-/-	-/-
6	A	Spectrum analyser	FSV30	R&S	100763	300003950	k	31.01.2017	30.01.2018

7 Sequence of testing

7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

7.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

7.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

7.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Frequency stability	± 100 Hz
Emission bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Band edge	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

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	47 CFR Part 2 47 CFR Part 95 H	See table	2018-03-02	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	C	NC	NA	NP	Remark
FCC 47 CFR § 95.2565(b)	Frequency stability	Nominal and extreme	Nominal	☒	☐	☐	☐	-/-
FCC 47 CFR § 95.2573(e)	Emission bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC 47 CFR § 95.2567(e) and (f)	Maximum transmit power	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC 47 CFR § 95.2579(a)(5) and (f)	Band edge measurements	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC 47 CFR § 95.2579(a)(5) and (f)	Transmitter unwanted radiation	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC 47 CFR § 95.2579(a)(5) and (f)	Receiver spurious emissions (radiated)	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC 47 CFR § 15.107(a) § 15.207	Conducted emissions below 30 MHz (AC conducted)	Nominal	Nominal	☐	☐	☒	☐	Battery operated only
550599 D01 Medical Body Area Network v01 § 95.2559 (f)	Connection interrupt test	Nominal	Nominal	☒	☐	☐	☐	*1

***1: The test has been performed with a body-worn sensor which contains a IV2-FLEX PCA SRR Board.**

Note: C = Compliant; NC = Not compliant; NA = Not Applicable; NP = Not Performed

10 Additional comments

Reference documents: Test report no. 1-9941/15-01-06-C

Special test descriptions: Used power settings during tests:

Channel 0 (2363 MHz):	0
Channel 10 (2382 MHz):	-1
Channel 11 (2387 MHz):	-1
Channel 12 (2393 MHz):	0
Channel 13 (2397 MHz):	0

Configuration descriptions: None

Test mode:

☒ Special software is used.
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)

- *Equipment with 1 antenna,*
- *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
- *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*

☐ Operating mode 2 (multiple antennas, no beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*

☐ Operating mode 3 (multiple antennas, with beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.*
  In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

11 Measurement results

11.1 Frequency stability

Measurement:

Measurements in accordance with the procedure detailed in KDB 550599 D01 v01r01 (V) (A).

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Span:	5 MHz
Trace-Mode:	Max. hold
Test setup	See sub clause 6.4 – B
Measurement uncertainty	See sub clause 8

Limits:

FCC	IC
CFR § 95.2565 (b)	-/-
Frequency stability	
All MBAN devices must maintain a frequency stability of ±100 ppm over a temperature range of 0°C to + 55°C.	

Results: **Channel low (2363 MHz), lower band**

Temp [°C]	Time	Measured Frequency [MHz]	Deviation [ppm]	Verdict
0	Startup	2363.004	1.7	Compliant
	After 2 minutes	2363.004	1.7	Compliant
	After 5 minutes	2363.004	1.7	Compliant
	After 10 minutes	2363.004	1.7	Compliant
10	Startup	2363.004	1.7	Compliant
	After 2 minutes	2363.004	1.7	Compliant
	After 5 minutes	2363.004	1.7	Compliant
	After 10 minutes	2363.004	1.7	Compliant
20	Startup	2363.004	1.7	Compliant
	After 2 minutes	2363.004	1.7	Compliant
	After 5 minutes	2363.004	1.7	Compliant
	After 10 minutes	2363.004	1.7	Compliant
30	Startup	2362.995	-2.1	Compliant
	After 2 minutes	2362.995	-2.1	Compliant
	After 5 minutes	2362.995	-2.1	Compliant
	After 10 minutes	2362.995	-2.1	Compliant
40	Startup	2362.991	-3.8	Compliant
	After 2 minutes	2362.991	-3.8	Compliant
	After 5 minutes	2362.991	-3.8	Compliant
	After 10 minutes	2362.991	-3.8	Compliant
50	Startup	2362.987	-5.5	Compliant
	After 2 minutes	2362.987	-5.5	Compliant
	After 5 minutes	2362.987	-5.5	Compliant
	After 10 minutes	2362.987	-5.5	Compliant
55	Startup	2362.987	-5.5	Compliant
	After 2 minutes	2362.987	-5.5	Compliant
	After 5 minutes	2362.987	-5.5	Compliant
	After 10 minutes	2362.987	-5.5	Compliant

Results: **Channel mid (2382 MHz), lower band**

Temp [°C]	Time	Measured Frequency [MHz]	Deviation [ppm]	Verdict
0	Startup	2382.004	1.7	Compliant
	After 2 minutes	2382.004	1.7	Compliant
	After 5 minutes	2382.004	1.7	Compliant
	After 10 minutes	2382.004	1.7	Compliant
10	Startup	2382.004	1.7	Compliant
	After 2 minutes	2382.004	1.7	Compliant
	After 5 minutes	2382.004	1.7	Compliant
	After 10 minutes	2382.004	1.7	Compliant
20	Startup	2382.004	1.7	Compliant
	After 2 minutes	2382.004	1.7	Compliant
	After 5 minutes	2382.004	1.7	Compliant
	After 10 minutes	2382.004	1.7	Compliant
30	Startup	2381.995	-2.1	Compliant
	After 2 minutes	2381.995	-2.1	Compliant
	After 5 minutes	2381.995	-2.1	Compliant
	After 10 minutes	2381.995	-2.1	Compliant
40	Startup	2386.991	-3.8	Compliant
	After 2 minutes	2386.991	-3.8	Compliant
	After 5 minutes	2386.991	-3.8	Compliant
	After 10 minutes	2386.991	-3.8	Compliant
50	Startup	2387.987	-5.5	Compliant
	After 2 minutes	2387.987	-5.5	Compliant
	After 5 minutes	2387.987	-5.5	Compliant
	After 10 minutes	2387.987	-5.5	Compliant
55	Startup	2387.987	-5.5	Compliant
	After 2 minutes	2387.987	-5.5	Compliant
	After 5 minutes	2387.987	-5.5	Compliant
	After 10 minutes	2387.987	-5.5	Compliant

Results: **Channel high (2387 MHz), lower band**

Temp [°C]	Time	Measured Frequency [MHz]	Deviation [ppm]	Verdict
0	Startup	2387.004	1.7	Compliant
	After 2 minutes	2387.004	1.7	Compliant
	After 5 minutes	2387.004	1.7	Compliant
	After 10 minutes	2387.004	1.7	Compliant
10	Startup	2387.004	1.7	Compliant
	After 2 minutes	2387.004	1.7	Compliant
	After 5 minutes	2387.004	1.7	Compliant
	After 10 minutes	2387.004	1.7	Compliant
20	Startup	2387.004	1.7	Compliant
	After 2 minutes	2387.004	1.7	Compliant
	After 5 minutes	2387.004	1.7	Compliant
	After 10 minutes	2387.004	1.7	Compliant
30	Startup	2386.995	-2.1	Compliant
	After 2 minutes	2386.995	-2.1	Compliant
	After 5 minutes	2386.995	-2.1	Compliant
	After 10 minutes	2386.995	-2.1	Compliant
40	Startup	2386.997	-3.8	Compliant
	After 2 minutes	2386.997	-3.8	Compliant
	After 5 minutes	2386.997	-3.8	Compliant
	After 10 minutes	2386.997	-3.8	Compliant
50	Startup	2386.987	-5.5	Compliant
	After 2 minutes	2386.987	-5.5	Compliant
	After 5 minutes	2386.987	-5.5	Compliant
	After 10 minutes	2386.987	-5.5	Compliant
55	Startup	2386.987	-5.5	Compliant
	After 2 minutes	2386.987	-5.5	Compliant
	After 5 minutes	2386.987	-5.5	Compliant
	After 10 minutes	2386.987	-5.5	Compliant

Results: **Channel low (2392 MHz), upper band**

Temp [°C]	Time	Measured Frequency [MHz]	Deviation [ppm]	Verdict
0	Startup	2392.004	1.7	Compliant
	After 2 minutes	2392.004	1.7	Compliant
	After 5 minutes	2392.004	1.7	Compliant
	After 10 minutes	2392.004	1.7	Compliant
10	Startup	2392.004	1.7	Compliant
	After 2 minutes	2392.004	1.7	Compliant
	After 5 minutes	2392.004	1.7	Compliant
	After 10 minutes	2392.004	1.7	Compliant
20	Startup	2392.004	1.7	Compliant
	After 2 minutes	2392.004	1.7	Compliant
	After 5 minutes	2392.004	1.7	Compliant
	After 10 minutes	2392.004	1.7	Compliant
30	Startup	2391.995	-2.1	Compliant
	After 2 minutes	2391.995	-2.1	Compliant
	After 5 minutes	2391.995	-2.1	Compliant
	After 10 minutes	2391.995	-2.1	Compliant
40	Startup	2391.991	-3.8	Compliant
	After 2 minutes	2391.991	-3.8	Compliant
	After 5 minutes	2391.991	-3.8	Compliant
	After 10 minutes	2391.991	-3.8	Compliant
50	Startup	2391.987	-5.4	Compliant
	After 2 minutes	2391.987	-5.4	Compliant
	After 5 minutes	2391.987	-5.4	Compliant
	After 10 minutes	2391.987	-5.4	Compliant
55	Startup	2391.987	-5.4	Compliant
	After 2 minutes	2391.987	-5.4	Compliant
	After 5 minutes	2391.987	-5.4	Compliant
	After 10 minutes	2391.987	-5.4	Compliant

Results: **Channel high (2397 MHz), upper band**

Temp [°C]	Time	Measured Frequency [MHz]	Deviation [ppm]	Verdict
0	Startup	2397.004	1.7	Compliant
	After 2 minutes	2397.004	1.7	Compliant
	After 5 minutes	2397.004	1.7	Compliant
	After 10 minutes	2397.004	1.7	Compliant
10	Startup	2397.004	1.7	Compliant
	After 2 minutes	2397.004	1.7	Compliant
	After 5 minutes	2397.004	1.7	Compliant
	After 10 minutes	2397.004	1.7	Compliant
20	Startup	2397.004	1.7	Compliant
	After 2 minutes	2397.004	1.7	Compliant
	After 5 minutes	2397.004	1.7	Compliant
	After 10 minutes	2397.004	1.7	Compliant
30	Startup	2396.995	-2.1	Compliant
	After 2 minutes	2396.995	-2.1	Compliant
	After 5 minutes	2396.995	-2.1	Compliant
	After 10 minutes	2396.995	-2.1	Compliant
40	Startup	2396.991	-3.8	Compliant
	After 2 minutes	2396.991	-3.8	Compliant
	After 5 minutes	2396.991	-3.8	Compliant
	After 10 minutes	2396.991	-3.8	Compliant
50	Startup	2396.987	-5.4	Compliant
	After 2 minutes	2396.987	-5.4	Compliant
	After 5 minutes	2396.987	-5.4	Compliant
	After 10 minutes	2396.987	-5.4	Compliant
55	Startup	2396.987	-5.4	Compliant
	After 2 minutes	2396.987	-5.4	Compliant
	After 5 minutes	2396.987	-5.4	Compliant
	After 10 minutes	2396.987	-5.4	Compliant

11.2 Emission bandwidth

Measurement:

Measurements were made in accordance with ANSI C63.26-2015 (5.4.3).

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	30 kHz
Video bandwidth:	30 kHz
Span:	5 MHz
Trace-Mode:	Max. hold
Test setup	See sub clause 6.4 – A
Measurement uncertainty	See sub clause 8

Limits:

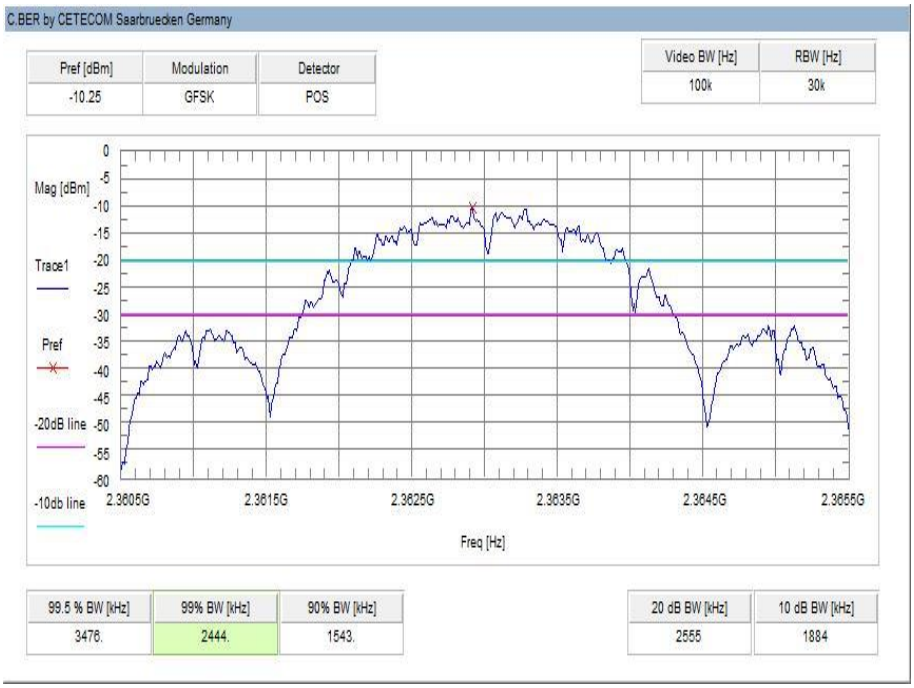
FCC	IC
CFR § 95.2573 (e)	-/-
Emission bandwidth will be determined by measuring the width of the signal between points, one below the carrier center frequency and one above the carrier center frequency, that are 20 dB down relative to the maximum level of the modulated carrier. Compliance with the emission bandwidth limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. For stations operating in 2360-2400 MHz, the maximum authorized emission bandwidth is 5 megahertz.	

Results:

Channel	Frequency [MHz]	Emission bandwidth [kHz]
Low (lower band)	2363	2555
Mid (lower band)	2382	2555
High (lower band)	2387	2555
Low (upper band)	2392	2585
High (upper band)	2397	2595

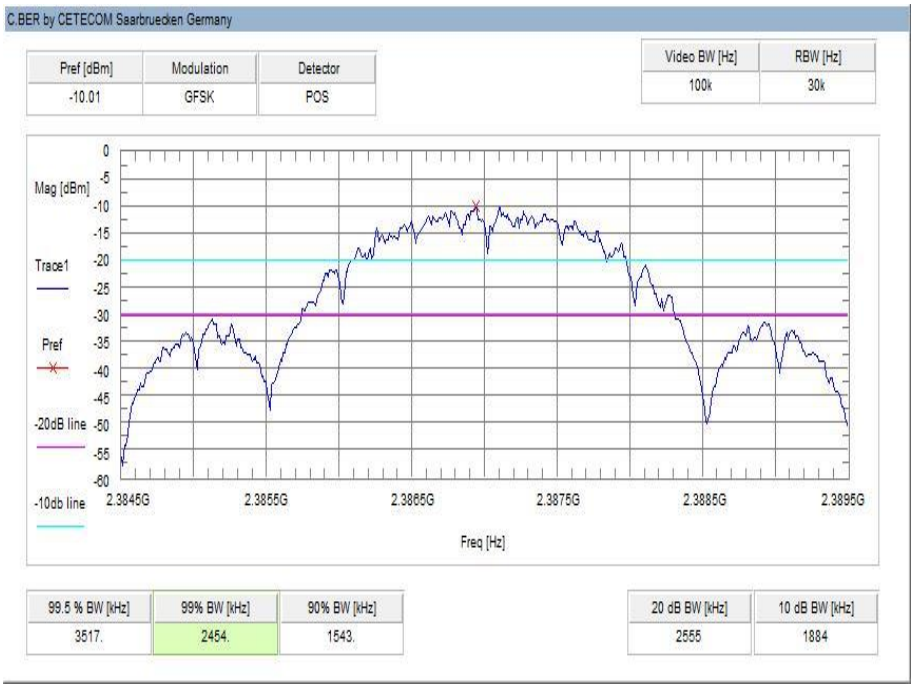
Plots:

Plot 1: lowest channel, lower band

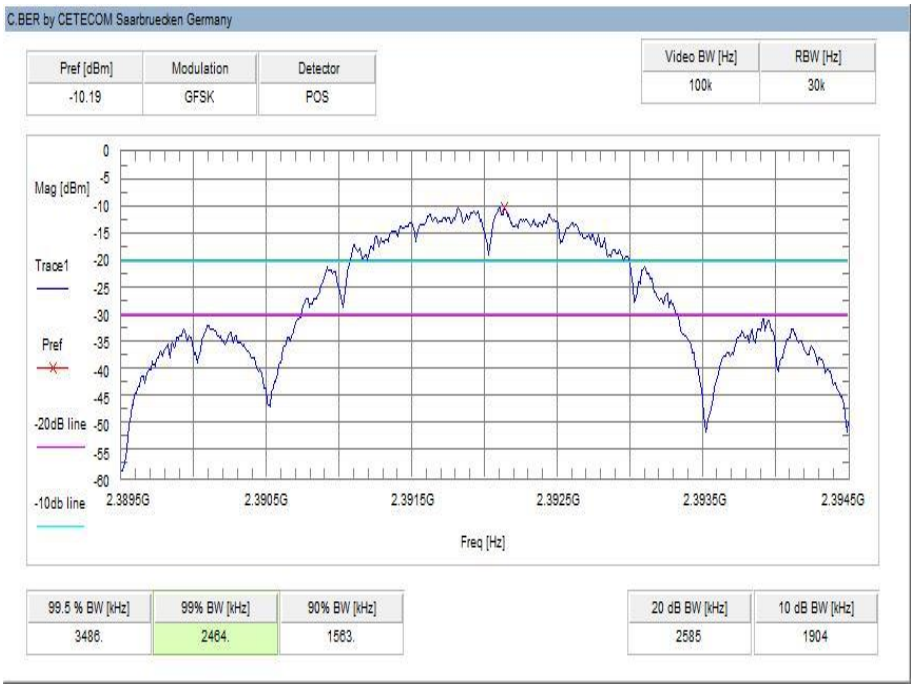


Plot 2: mid channel, lower band

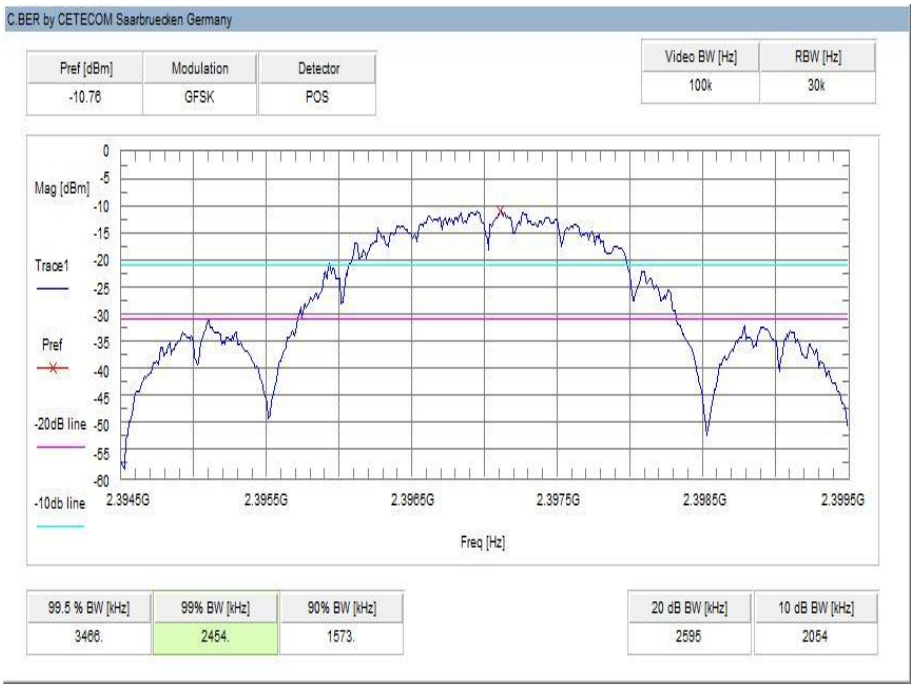
Plot 3: highest channel, lower band



Plot 4: lowest channel, upper band



Plot 5: highest channel, upper band



11.3 Maximum transmit power

Measurement:

Measurements were made in accordance with the procedures detailed in FCC 95.2567 (e) and (f), 5.2.5.5 of ANSI C63.26- 2015 and FCC OET 971168 – Measurement Guidance for Certification of Licensed Digital Transmitters, Section 5.1.

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	10 MHz
Span:	20 MHz
Trace-Mode:	Max. hold
Test setup	See sub clause 6.2 – B & 6.4 – A
Measurement uncertainty	See sub clause 8

Limits:

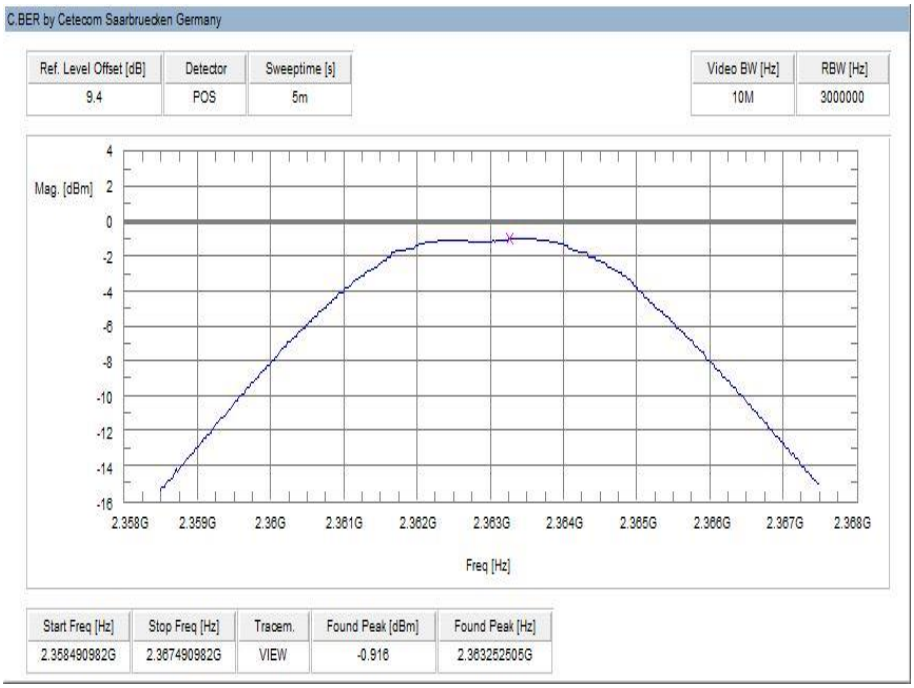
FCC	IC
47 CFR § 95.2567 (e) and (f)	-/-
95.2567(e): For MedRadio transmitters operating in the 2360-2390 MHz band, the M-EIRP over the bands of operation must not exceed the lesser of zero dBm (1 mW) or 10 log (B) dBm, where B is the MedRadio 20 dB emission bandwidth in megahertz. 95.2567(f): For MedRadio transmitters operating in the 2390-2400 MHz band, the M-EIRP over the bands of operation must not exceed the lesser of 13 dBm (20 mW) or 16 + 10 log (B) dBm, where B is the MedRadio 20 dB emission bandwidth in megahertz.	

Result:

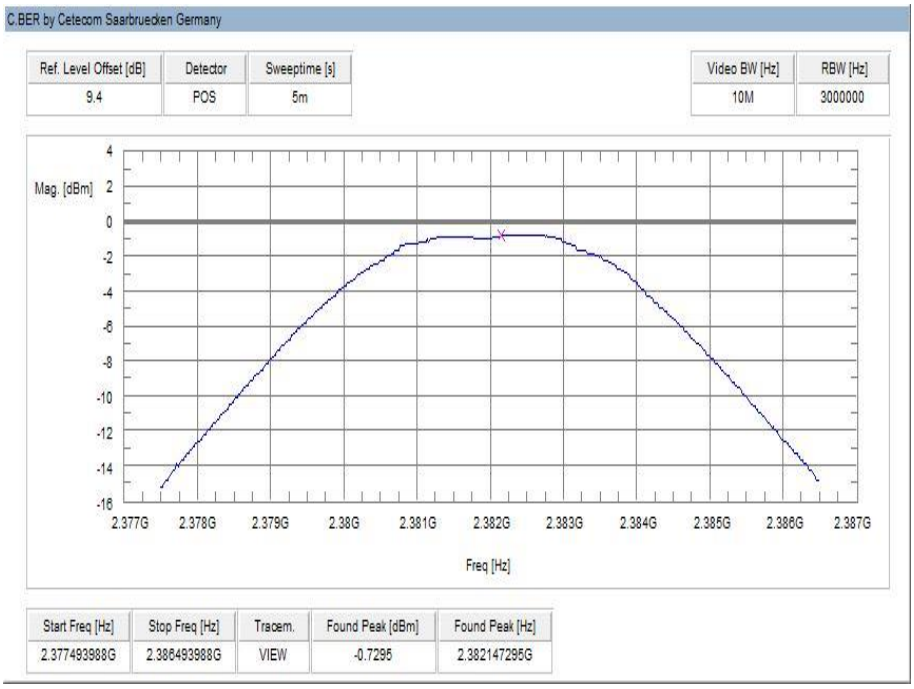
Frequency [MHz]	Output power conducted [dBm]	Gain [dBi]	EIRP [dBm]	Limit [dBm]
2363	-0.9	0.2	-0.7	0.0
2382	-0.7	-0.1	-0.8	0.0
2387	-0.5	-0.2	-0.7	0.0
2392	-0.5	0.8	0.3	13.0
2397	-0.6	0.3	-0.3	13.0

Plots:

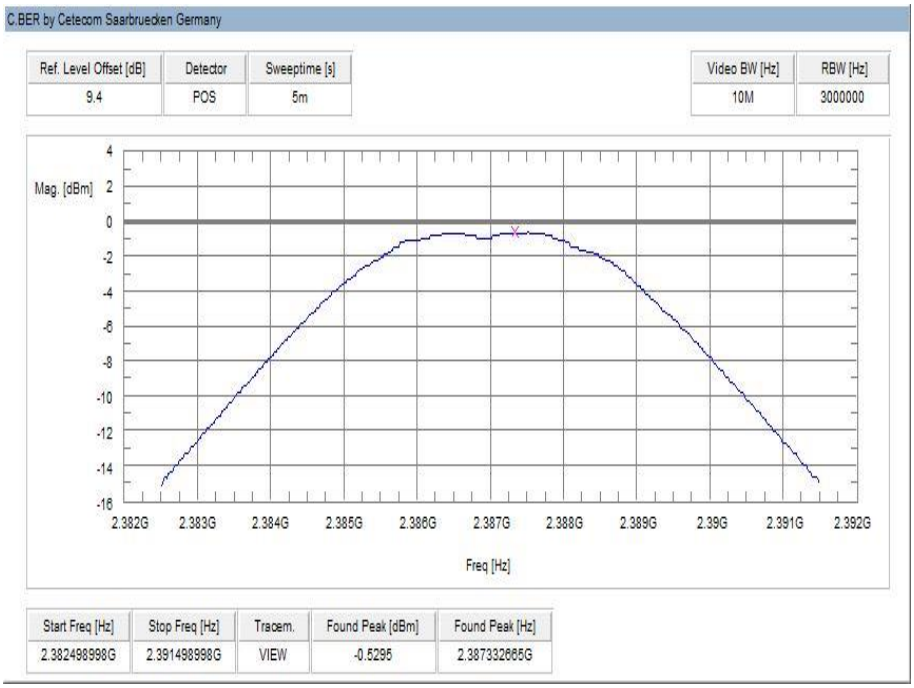
Plot 1: lowest channel, lower band



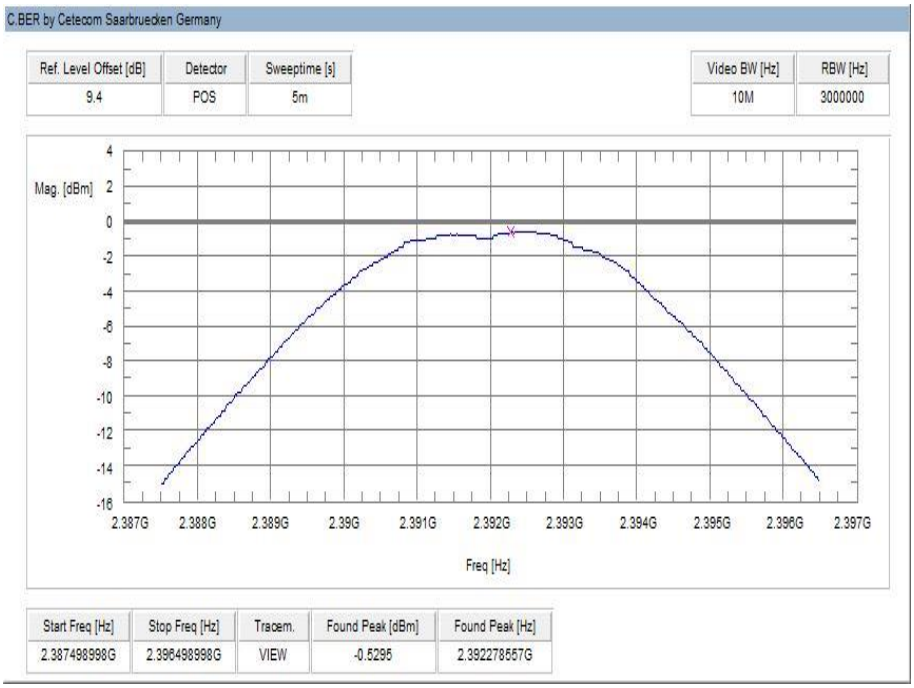
Plot 2: mid channel, lower band



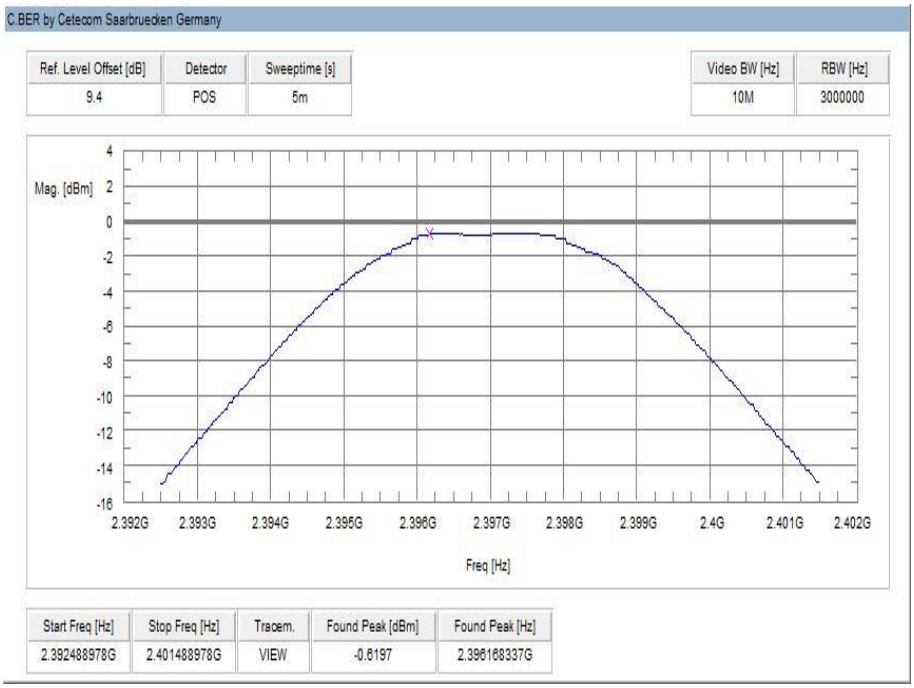
Plot 3: highest channel, lower band



Plot 4: lower channel, upper band



Plot 5: highest channel, upper band



11.4 Band edge measurement

Measurement:

Measurements were made in accordance with 5.7 of ANSI C63.26-2015.

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	2357.5 MHz – 2392.5 MHz
Trace-Mode:	Max. hold
Measurement distance:	1 m
Test setup	See sub clause 6.4 – A
Measurement uncertainty	See sub clause 8

Limits:

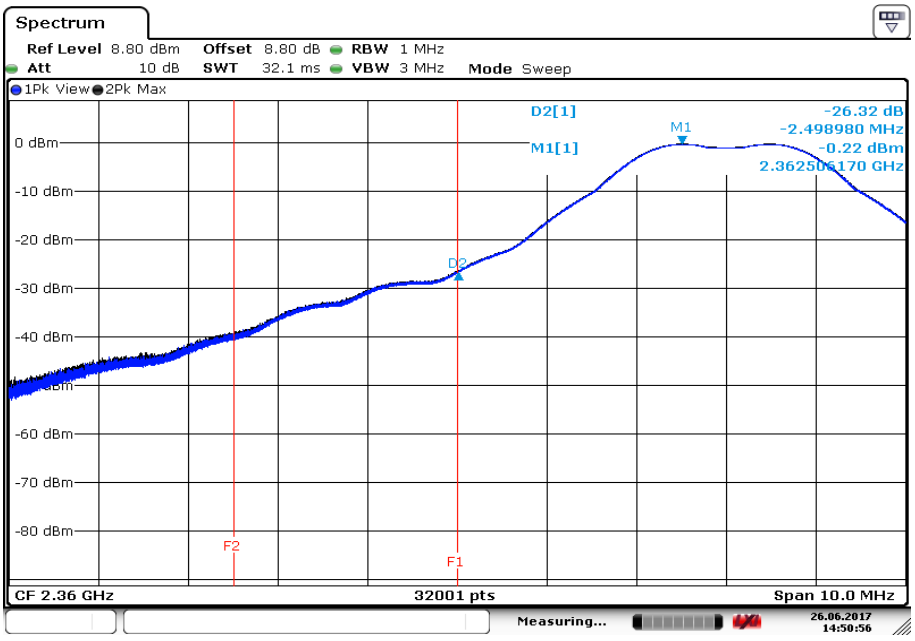
FCC	IC
47 CFR § 95.2579 (f)	-/-
In the first 2.5 MHz beyond any of the frequency bands authorized for MBAN operation, the EIRP level associated with any unwanted emissions must be attenuated within a 1 MHz bandwidth by at least 20 dB relative to the maximum EIRP level within any 1 MHz of the fundamental emission (i.e., 20 dBc).	

Results:

Channel	Band edge frequency range [MHz]	Frequency [MHz]	Effective attenuation [dBc]	Required attenuation [dBc]
Low	2357.5 - 2360	2363	-26.3	≥ 20
Low	2400 – 2402.5	2363	-39.7	≥ 20
High	2357.5 - 2360	2397	-26.0	≥ 20
High	2400 – 2402.5	2397	-38.2	≥ 20

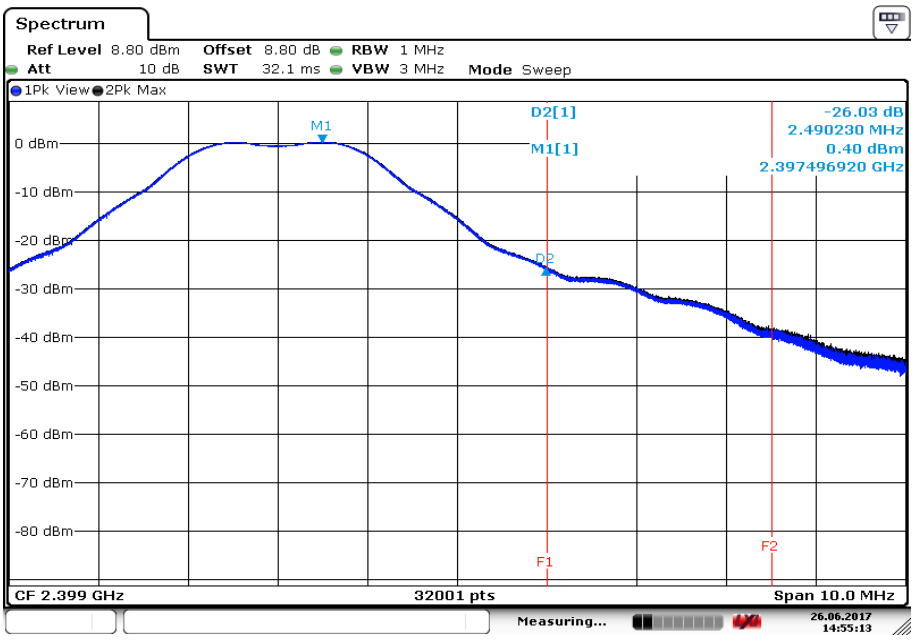
Plots:

Plot 1: lowest channel, lower band edge



Date: 26.JUN.2017 14:50:56

Plot 2: highest channel, upper band edge



Date: 26.JUN.2017 14:55:14

11.5 Transmitter unwanted radiation (radiated)

Measurement:

Measurement parameter		
Detector:	Prescan: Final:	Peak QPK below 960 MHz RMS above 960 MHz
Resolution bandwidth:	9 kHz – 150 kHz: 150 kHz – 30 MHz: 30 MHz – 1 GHz: 1 GHz – 26 GHz:	200 Hz 9 kHz 100 kHz 1 MHz
Video bandwidth:	9 kHz – 150 kHz: 150 kHz – 30 MHz: 30 MHz – 1 GHz: 1 GHz – 26 GHz:	1 kHz 30 kHz 300 kHz 3 MHz
Span:	See plots	
Trace-Mode:	Max Hold	
Test setup	See sub clause 6.1 – A & 6.2 – A & 6.3 – A	
Measurement uncertainty	See sub clause 8	

Limits:

FCC	IC	
47 CFR § 15.109 47 CFR §95.2579 (a)(5)	-/-	
Transmitter unwanted radiation (radiated)		
Frequency (MHz)	**Field strength (µV/m)** [1]	**Measurement distance (m)**
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 - 88	100 (40 dBµV/m)	3
30 - 88	31.6 (30 dBµV/m)	10
88 - 216	150 (43.5 dBµV/m)	3
88 - 216	47.3 (33.5 dBµV/m)	10
216 - 960	200 (46 dBµV/m)	3
216 - 960	63.1 (36 dBµV/m)	10
above 960	500 (54 dBµV/m)	3

[1] Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector. Otherwise a quasi-peak detector is used.

Results: Transmitter mode, lower band

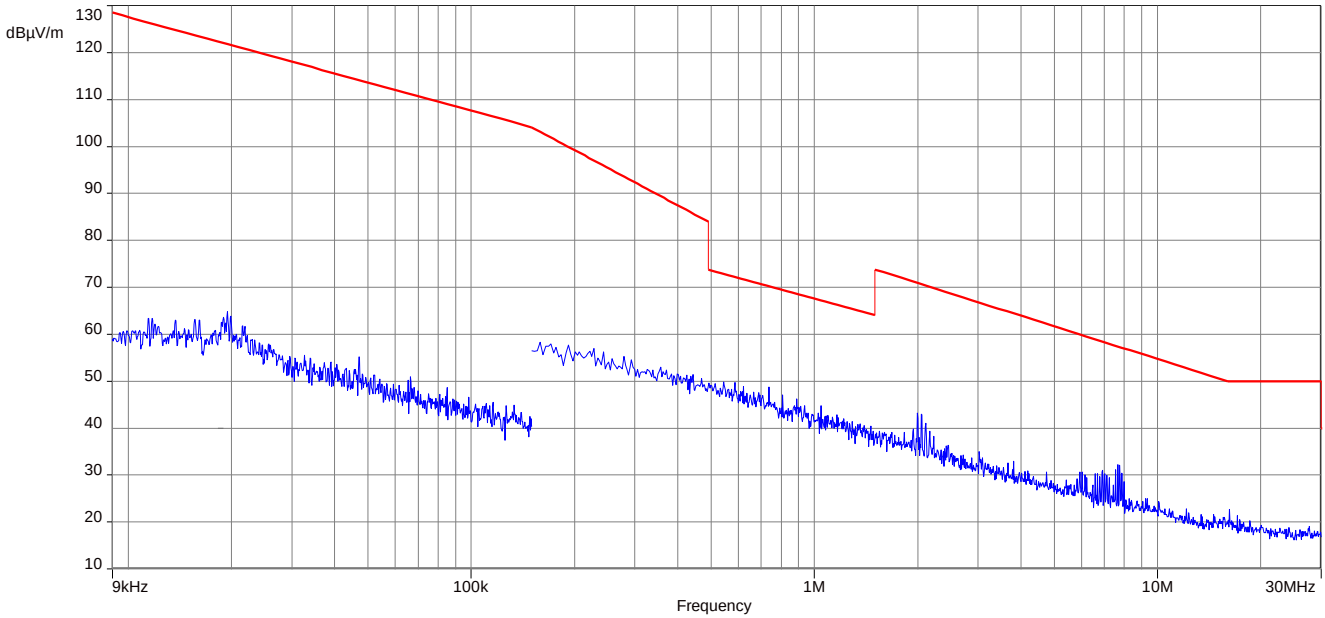
Transmitter unwanted radiation [dBµV/m]								
2463 MHz			2382 MHz			2387 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1039	Peak	29.3	1016	Peak	26.9	1053	Peak	25.7
	AVG	-/-		AVG	-/-		AVG	-/-
1094	Peak	36.3	1167	Peak	26.5	1121	Peak	25.8
	AVG	-/-		AVG	-/-		AVG	-/-
1320	Peak	32.5	1326	Peak	25.6	1243	Peak	25.5
	AVG	-/-		AVG	-/-		AVG	-/-
1353	Peak	36.6	1471	Peak	27.4	1526	Peak	25.7
	AVG	-/-		AVG	-/-		AVG	-/-
1381	Peak	31.5	1822	Peak	29.3	1662	Peak	26.4
	AVG	-/-		AVG	-/-		AVG	-/-
1429	Peak	30.8	2168	Peak	30.7	2074	Peak	28.8
	AVG	-/-		AVG	-/-		AVG	-/-
2507	Peak	38.4	3486	Peak	34.7	4567	Peak	36.2
	AVG	-/-		AVG	-/-		AVG	-/-
4726	Peak	49.5	4764	Peak	50.9	6210	Peak	39.5
	AVG	46.6		AVG	48.4		AVG	-/-
7089	Peak	41.5	7146	Peak	47.3	11347	Peak	44.9
	AVG	-/-		AVG	-/-		AVG	-/-
9452	Peak	54.2	9528	Peak	49.7	13515	Peak	47.3
	AVG	49.0		AVG	-/-		AVG	-/-
14435	Peak	45.0	14336	Peak	43.1	14316	Peak	47.6
	AVG	-/-		AVG	-/-		AVG	-/-
17979	Peak	53.7	17978	Peak	52.1	17995	Peak	53.5
	AVG	40.8		AVG	41.1		AVG	41.7
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: Transmitter mode, upper band

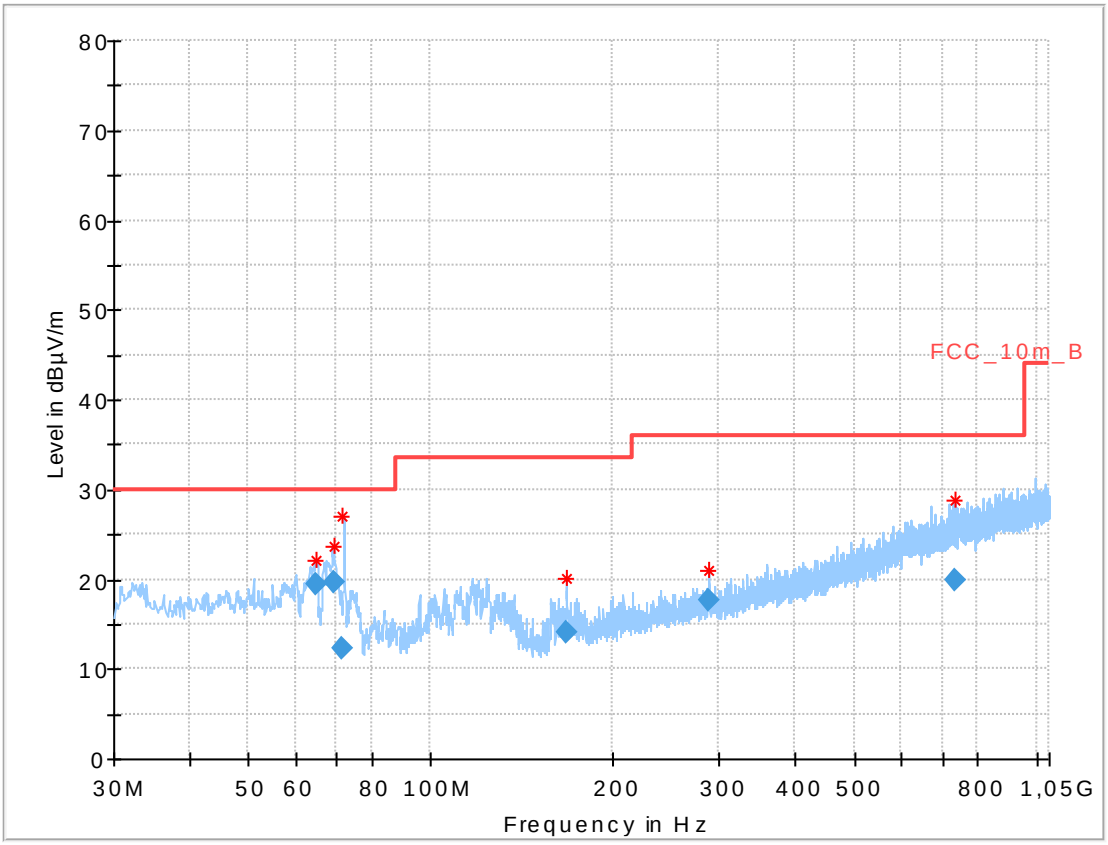
Transmitter unwanted radiation [dBµV/m]								
2392 MHz			MHz			2397 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1074	Peak	25.4		Peak		1088	Peak	25.7
	AVG	-/-		AVG			AVG	-/-
1424	Peak	24.9		Peak		1244	Peak	26.0
	AVG	-/-		AVG			AVG	-/-
1499	Peak	25.4		Peak		1355	Peak	25.2
	AVG	-/-		AVG			AVG	-/-
1730	Peak	26.9		Peak		1508	Peak	25.5
	AVG	-/-		AVG			AVG	-/-
1891	Peak	28.6		Peak		1845	Peak	28.3
	AVG	-/-		AVG			AVG	-/-
2034	Peak	28.6		Peak		1954	Peak	28.9
	AVG	-/-		AVG			AVG	-/-
2793	Peak	41.2		Peak		4743	Peak	36.5
	AVG	-/-		AVG			AVG	-/-
6833	Peak	40.7		Peak		6285	Peak	39.3
	AVG	-/-		AVG			AVG	-/-
7408	Peak	41.6		Peak		8624	Peak	42.8
	AVG	-/-		AVG			AVG	-/-
11735	Peak	45.3		Peak		13088	Peak	47.8
	AVG	-/-		AVG			AVG	-/-
14189	Peak	47.9		Peak		16105	Peak	47.3
	AVG	-/-		AVG			AVG	-/-
17997	Peak	53.4		Peak		17995	Peak	52.9
	AVG	42.2		AVG			AVG	42.5
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Plots:

Plot 1: 9 kHz – 30 MHz, channel low, lower band



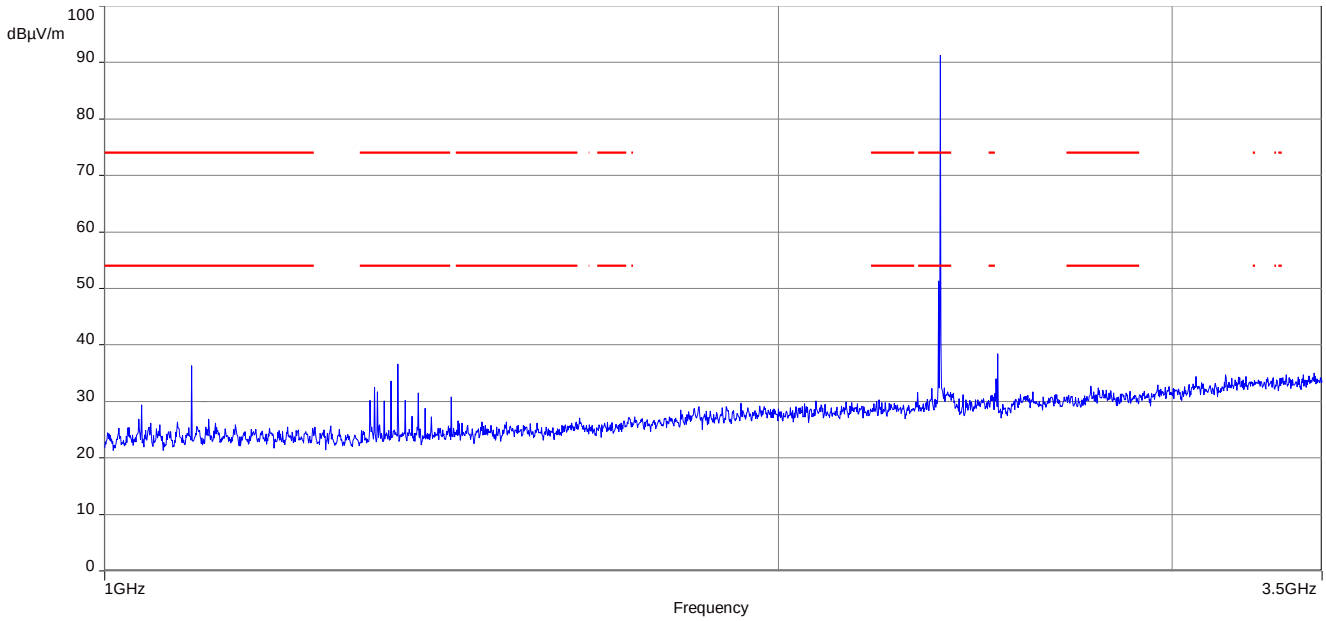
Plot 2: 30 MHz – 1 GHz, channel low, lower band



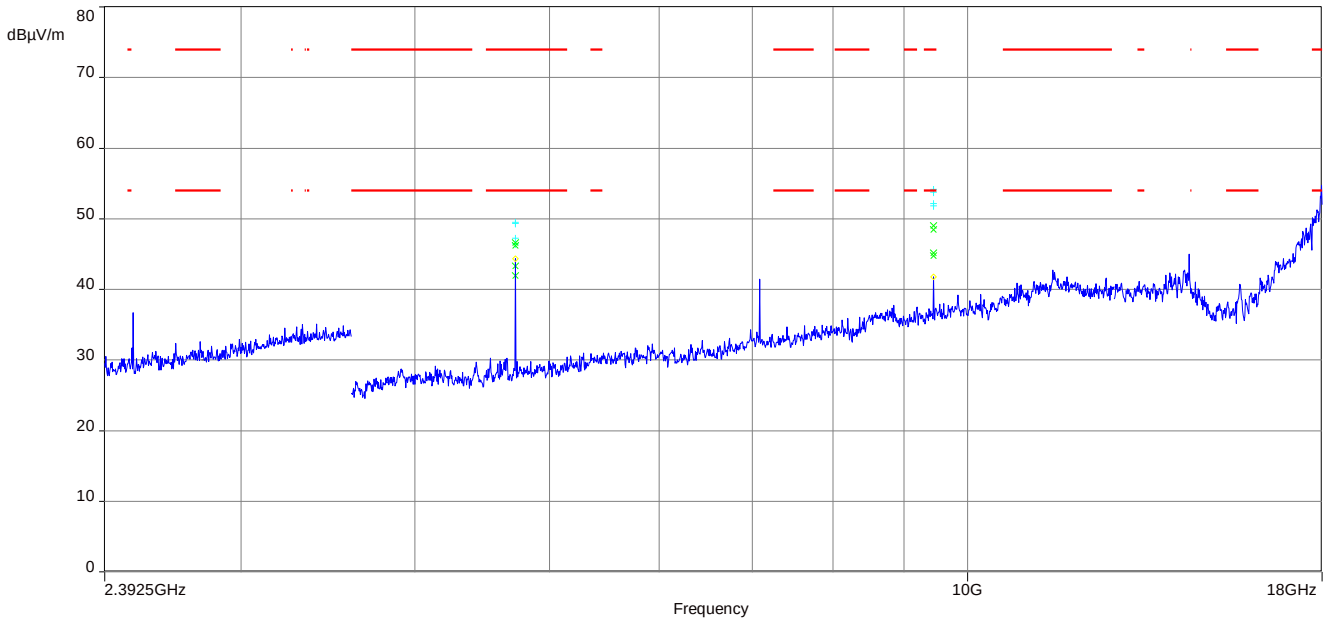
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.489500	19.39	30.00	10.61	1000.0	120.000	170.0	V	171.0	10.9
69.112500	19.66	30.00	10.34	1000.0	120.000	101.0	V	-9.0	9.9
71.504550	12.29	30.00	17.71	1000.0	120.000	101.0	V	260.0	9.5
167.551200	14.18	33.50	19.32	1000.0	120.000	101.0	V	170.0	10.1
288.756300	17.61	36.00	18.39	1000.0	120.000	98.0	V	10.0	14.2
733.345500	19.98	36.00	16.02	1000.0	120.000	101.0	V	260.0	22.3

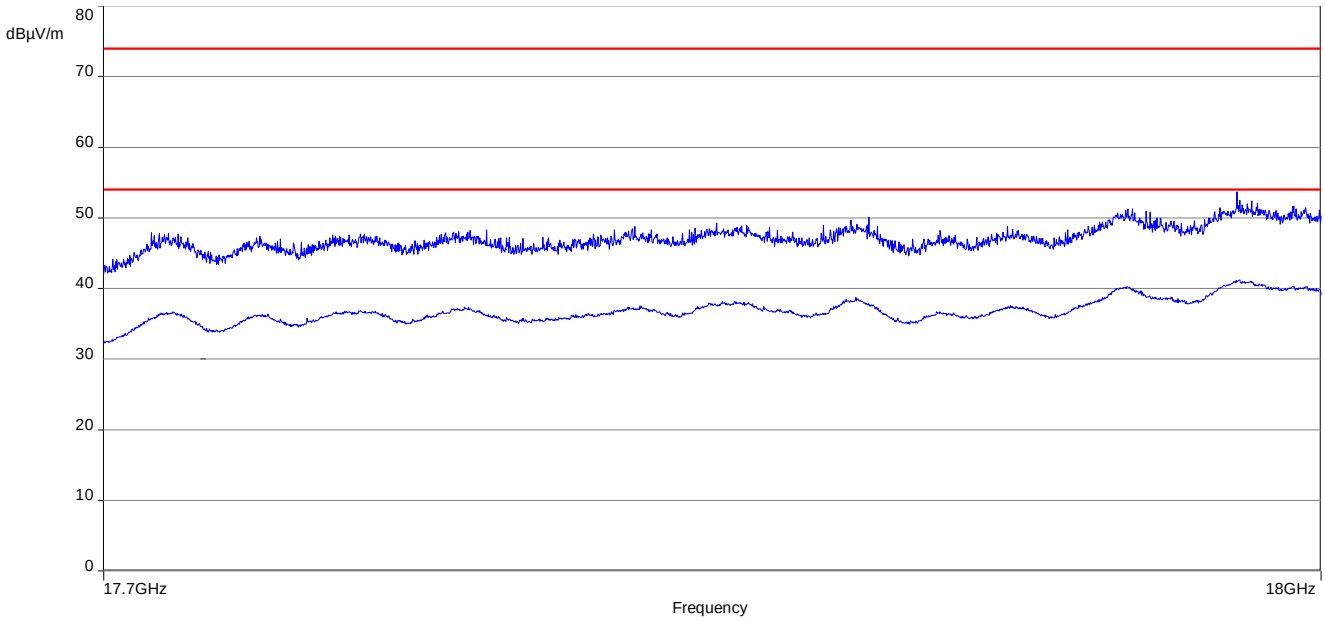
Plot 3: 1 GHz – 3.5 GHz, antenna horizontal/vertical, channel low, lower band



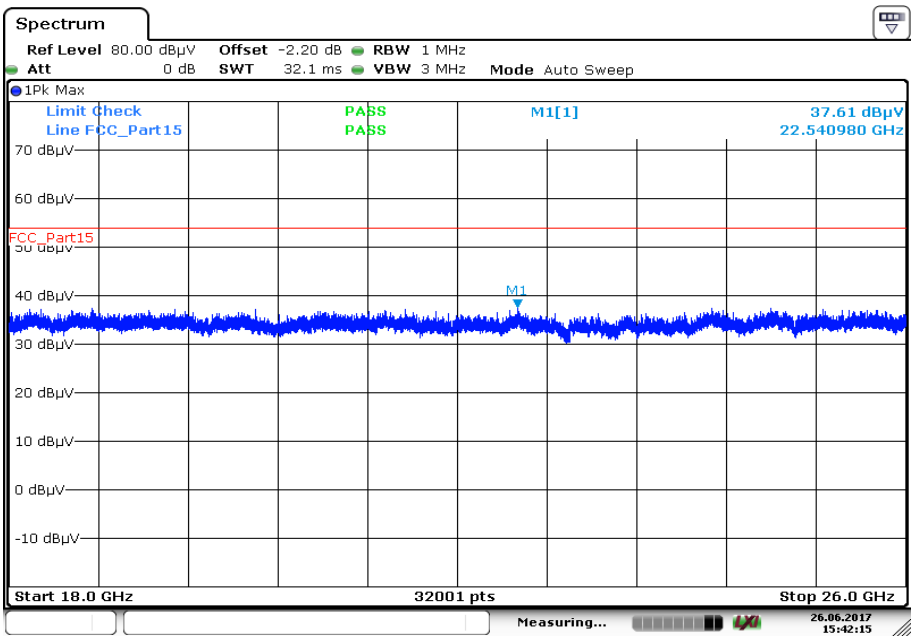
Plot 4: 2392.5 GHz – 18 GHz, antenna horizontal/vertical, channel low, lower band



Plot 5: 17.7 GHz – 18 GHz, antenna horizontal/vertical, channel low, lower band

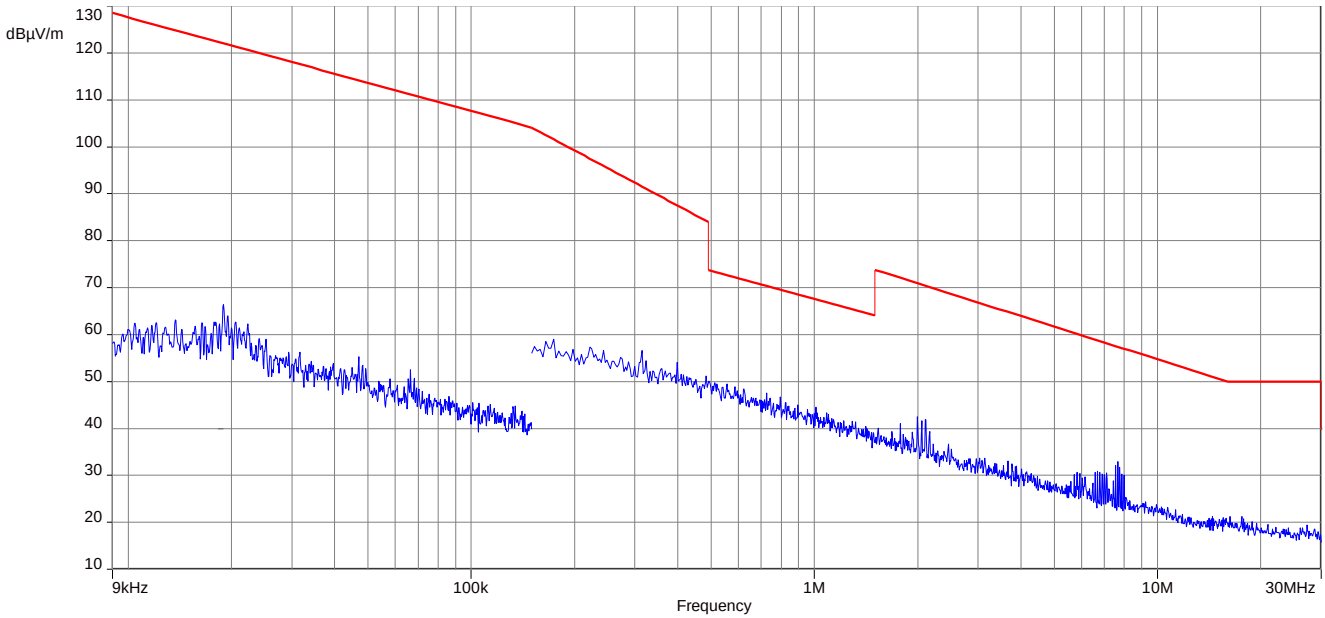


Plot 6: 18 GHz – 26 GHz, antenna horizontal/vertical, channel low, lower band

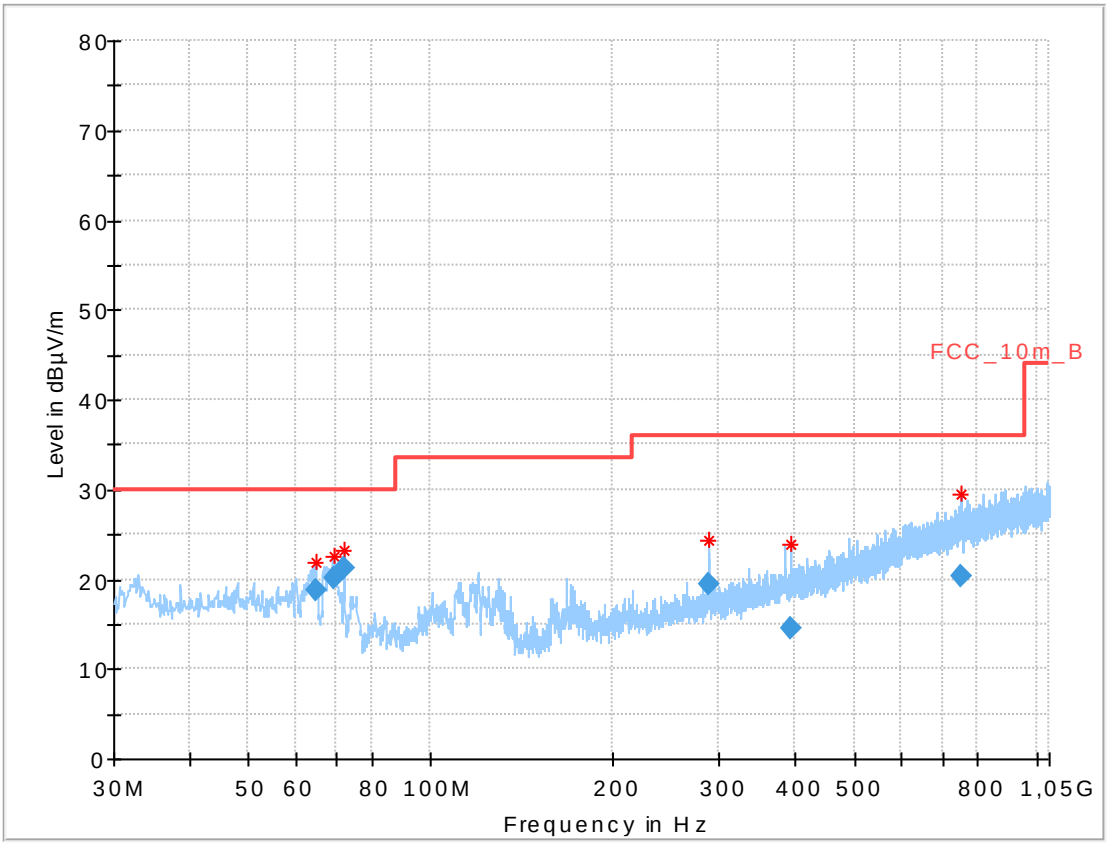


Date: 26.JUN.2017 15:42:14

Plot 7: 9 kHz – 30 MHz, channel mid, lower band



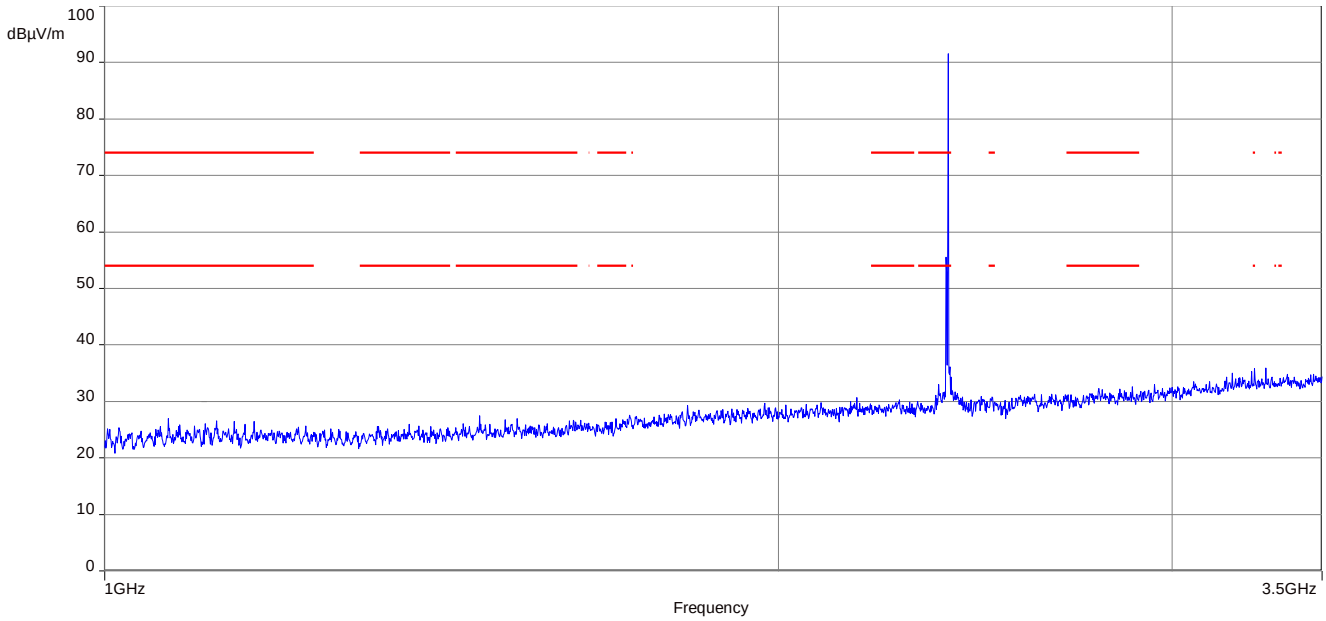
Plot 8: 30 MHz – 1 GHz, channel mid, lower band



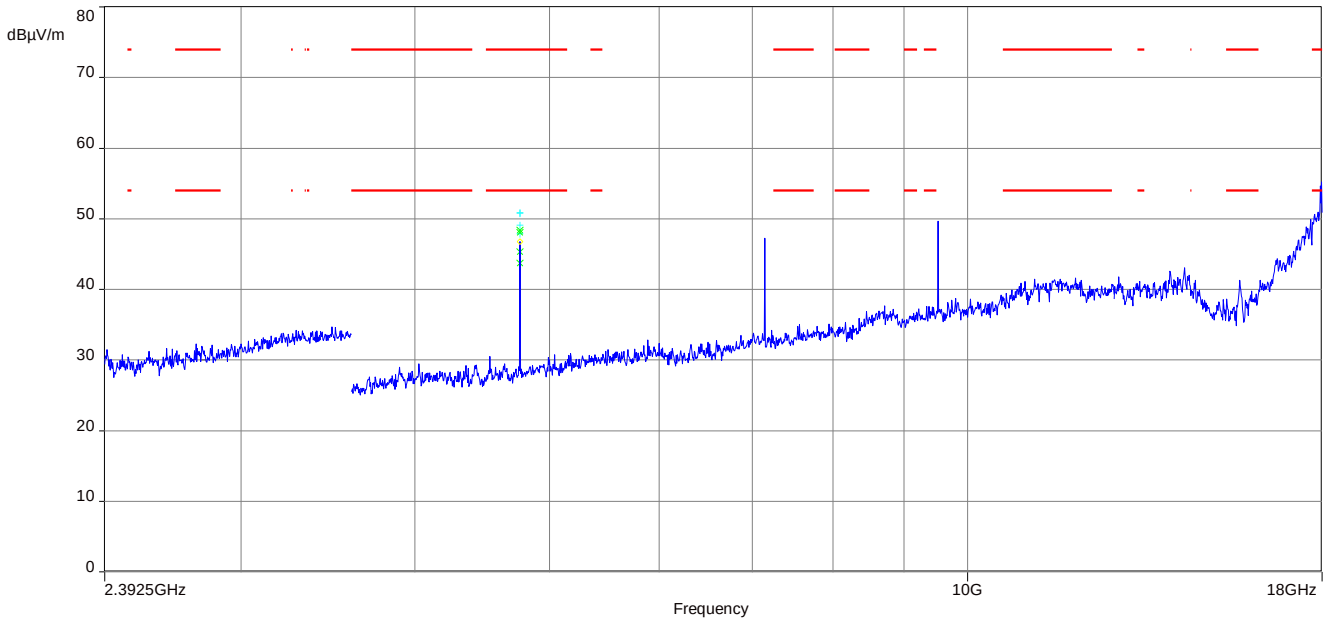
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.623000	18.76	30.00	11.24	1000.0	120.000	101.0	V	170.0	10.8
69.156150	20.04	30.00	9.96	1000.0	120.000	101.0	V	280.0	9.9
71.995200	21.16	30.00	8.84	1000.0	120.000	102.0	V	280.0	9.4
287.546850	19.42	36.00	16.58	1000.0	120.000	98.0	V	10.0	14.2
394.660650	14.47	36.00	21.53	1000.0	120.000	170.0	V	171.0	16.8
751.511250	20.39	36.00	15.61	1000.0	120.000	170.0	V	81.0	22.7

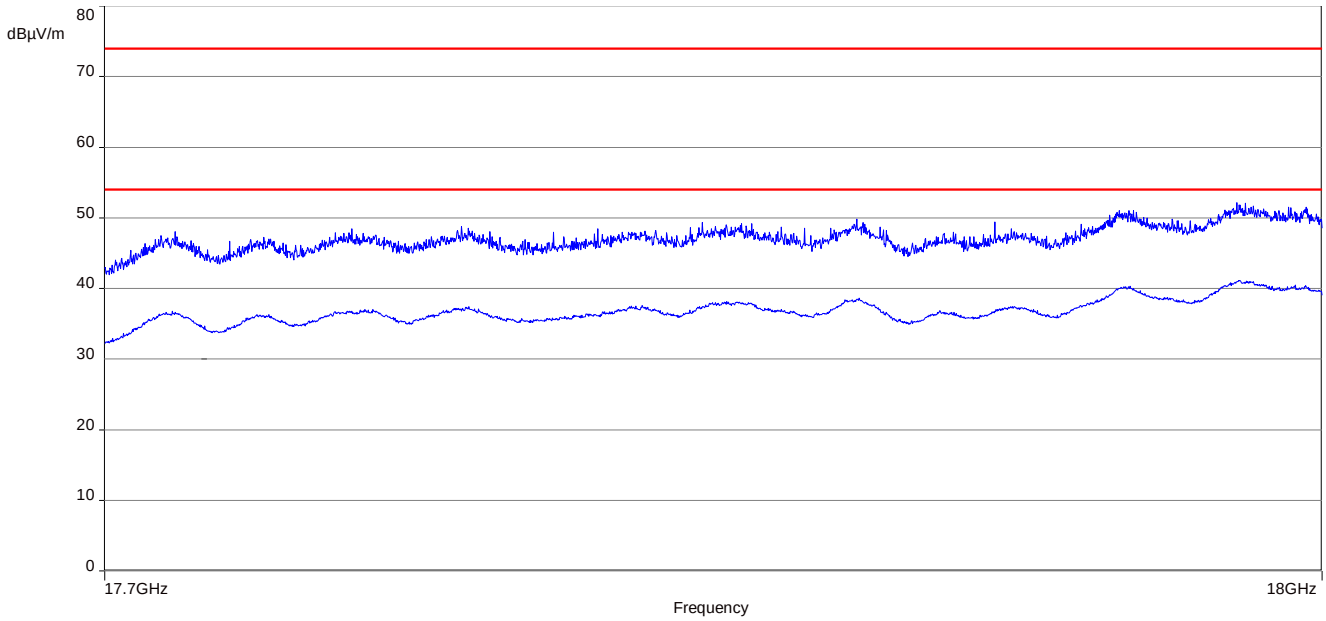
Plot 9: 1 GHz – 3.5 GHz, antenna horizontal/vertical, channel mid, lower band



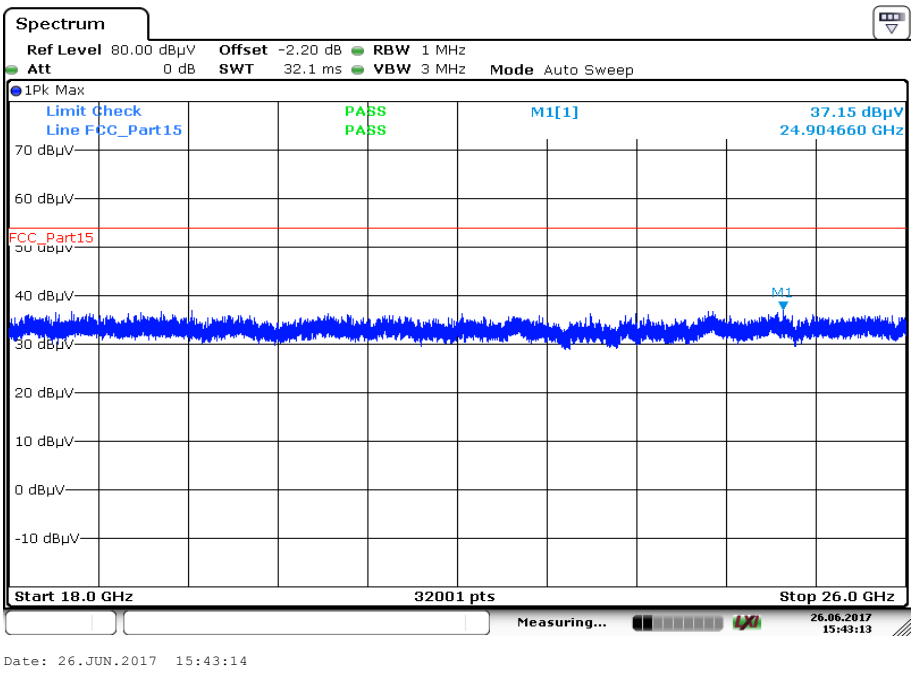
Plot 10: 2392.5 GHz – 18 GHz, antenna horizontal/vertical, channel mid, lower band



Plot 11: 17.7 GHz – 18 GHz, antenna horizontal/vertical, channel mid, lower band

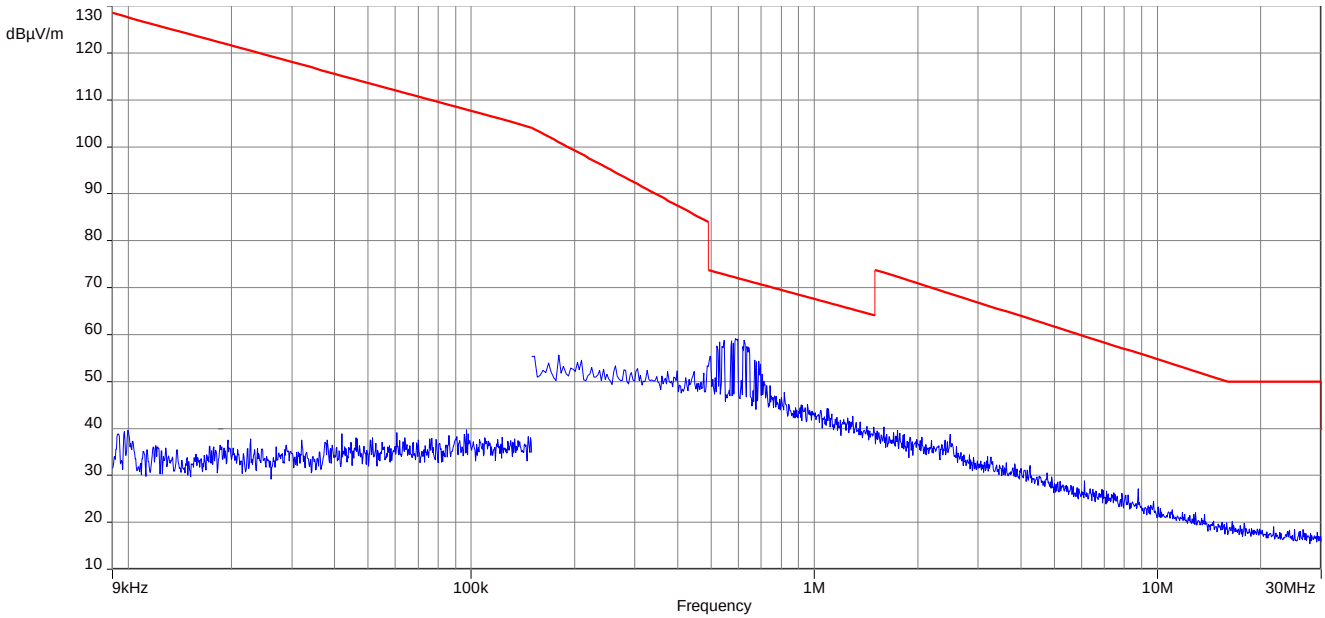


Plot 12: 18 GHz – 26 GHz, antenna horizontal/vertical, channel mid, lower band

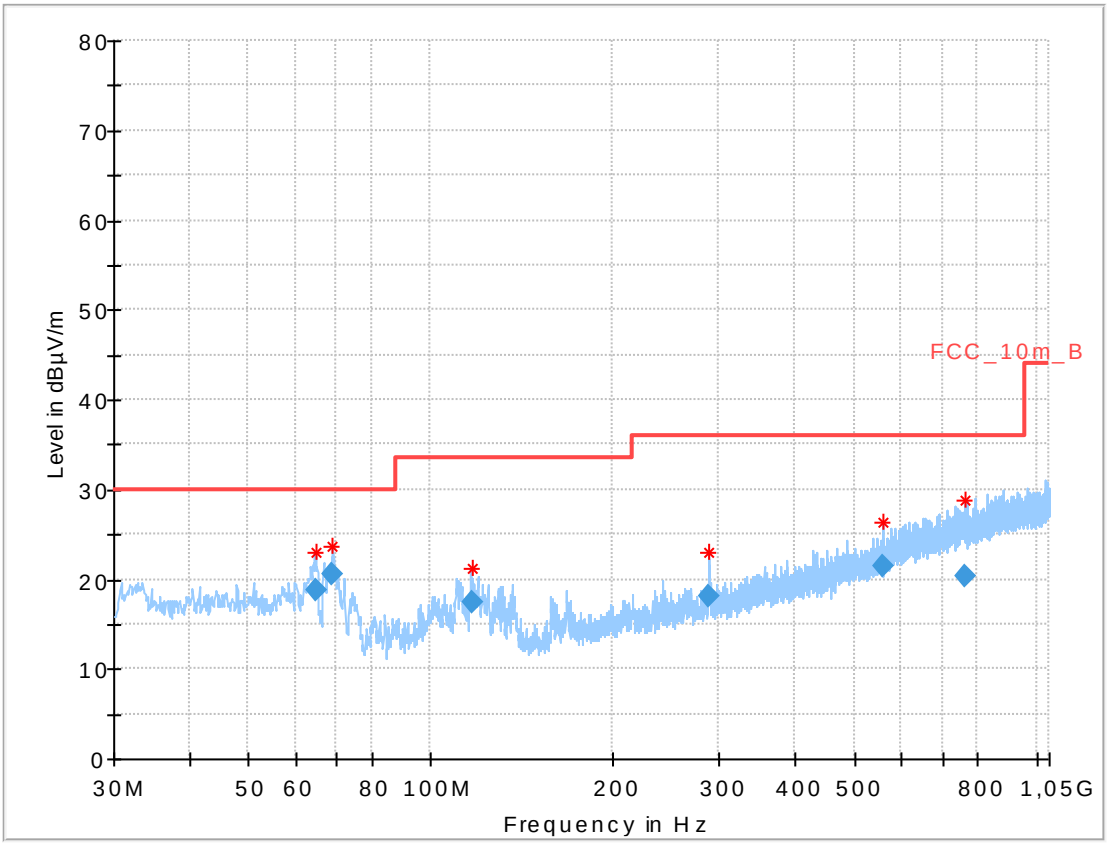


Date: 26.JUN.2017 15:43:14

Plot 13: 9 kHz – 30 MHz, channel high, lower band



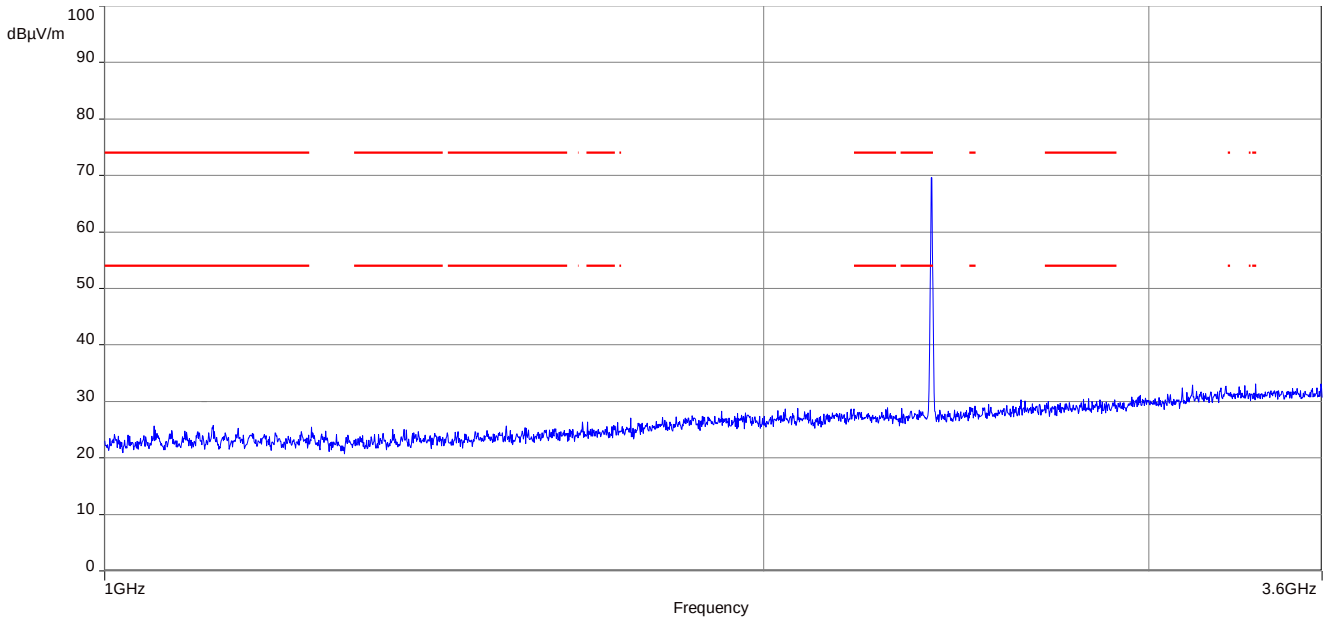
Plot 14: 30 MHz – 1 GHz, channel high, lower band



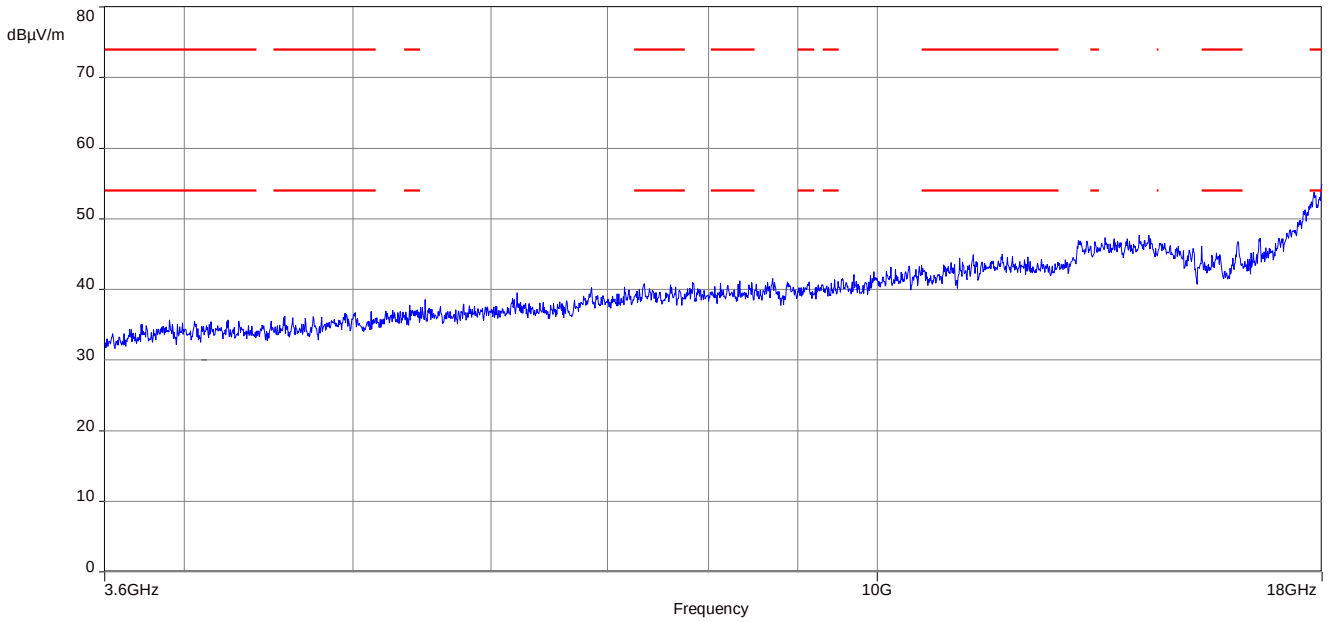
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.673550	18.86	30.00	11.14	1000.0	120.000	170.0	V	10.0	10.8
68.878950	20.61	30.00	9.39	1000.0	120.000	170.0	V	10.0	10.0
116.780850	17.38	33.50	16.12	1000.0	120.000	101.0	V	80.0	10.6
287.011200	18.13	36.00	17.87	1000.0	120.000	98.0	V	10.0	14.2
560.012550	21.52	36.00	14.48	1000.0	120.000	98.0	V	80.0	19.6
764.576850	20.35	36.00	15.65	1000.0	120.000	170.0	V	81.0	22.7

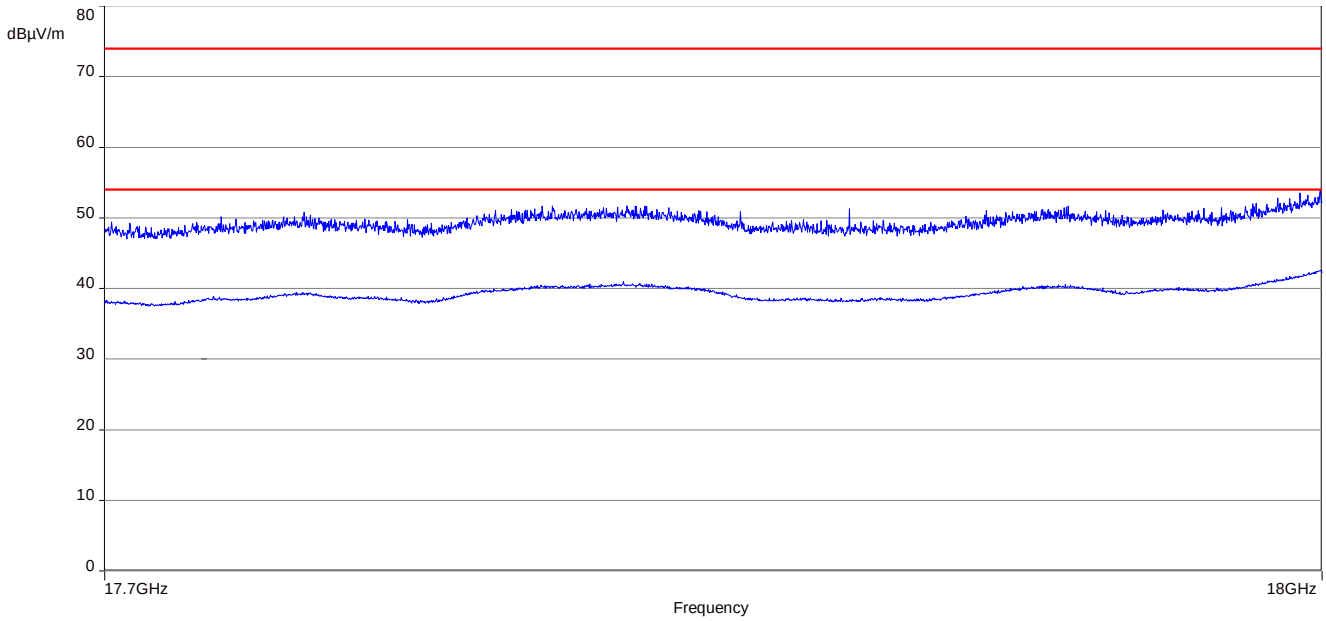
Plot 15: 1 GHz – 3.5 GHz, antenna horizontal/vertical, channel high, lower band



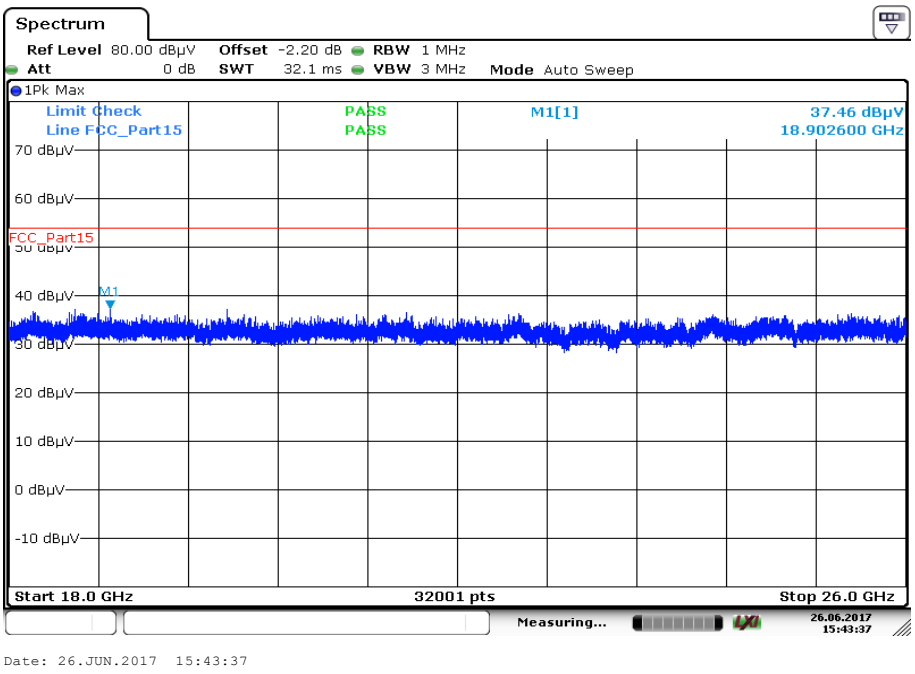
Plot 16: 3.6 GHz – 18 GHz, antenna horizontal/vertical, channel high, lower band



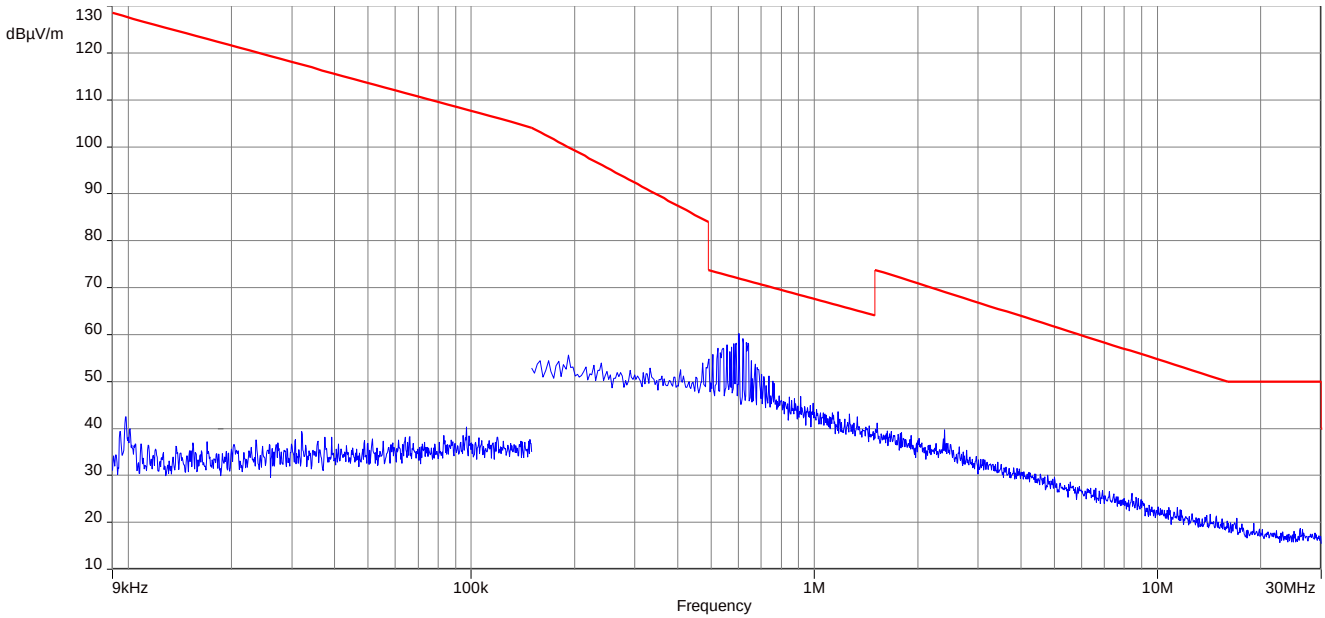
Plot 17: 17.7 GHz – 18 GHz, antenna horizontal/vertical, channel high, lower band



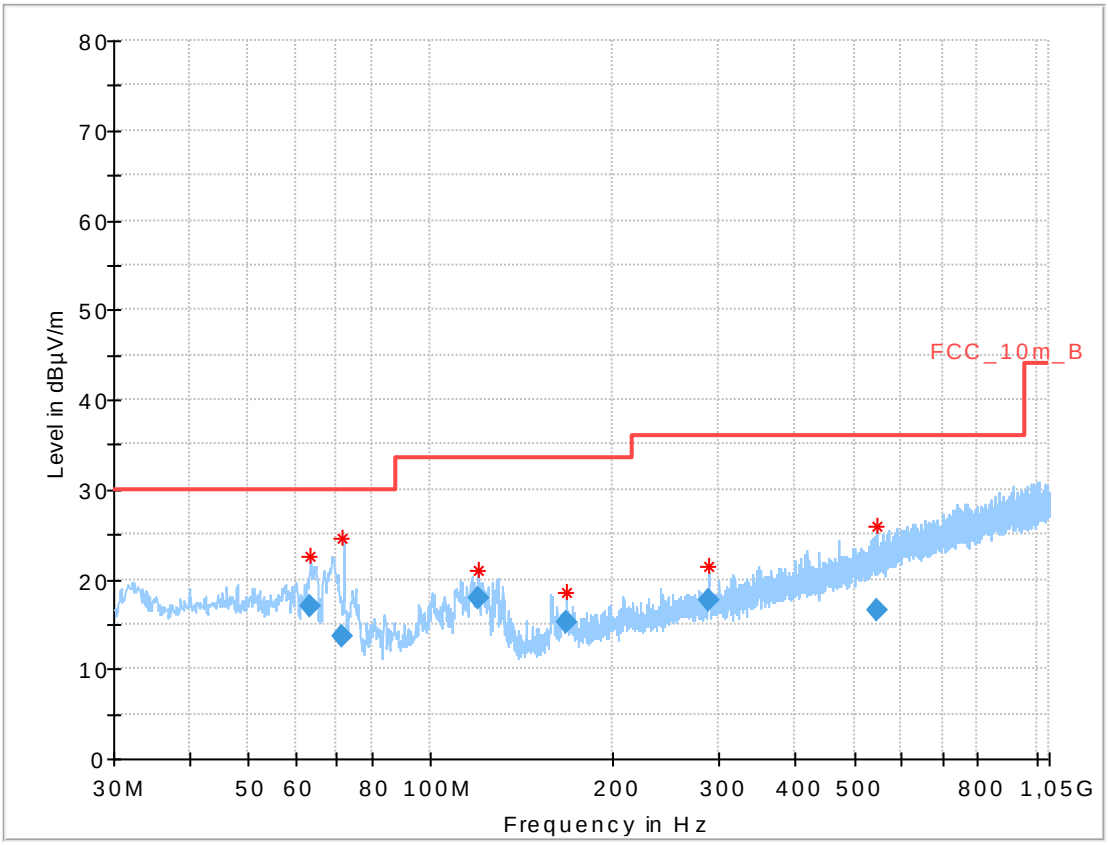
Plot 18: 18 GHz – 26 GHz, antenna horizontal/vertical, channel high, lower band



Plot 19: 9 kHz – 30 MHz, channel low, upper band



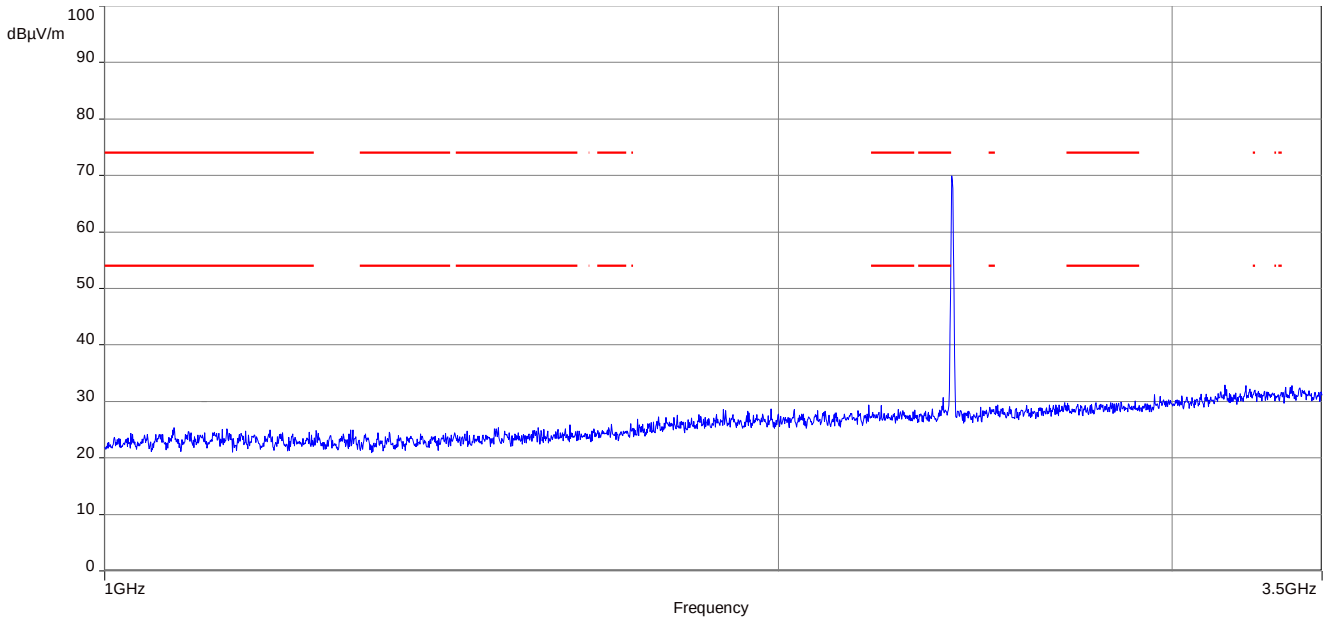
Plot 20: 30 MHz – 1 GHz, channel low, upper band



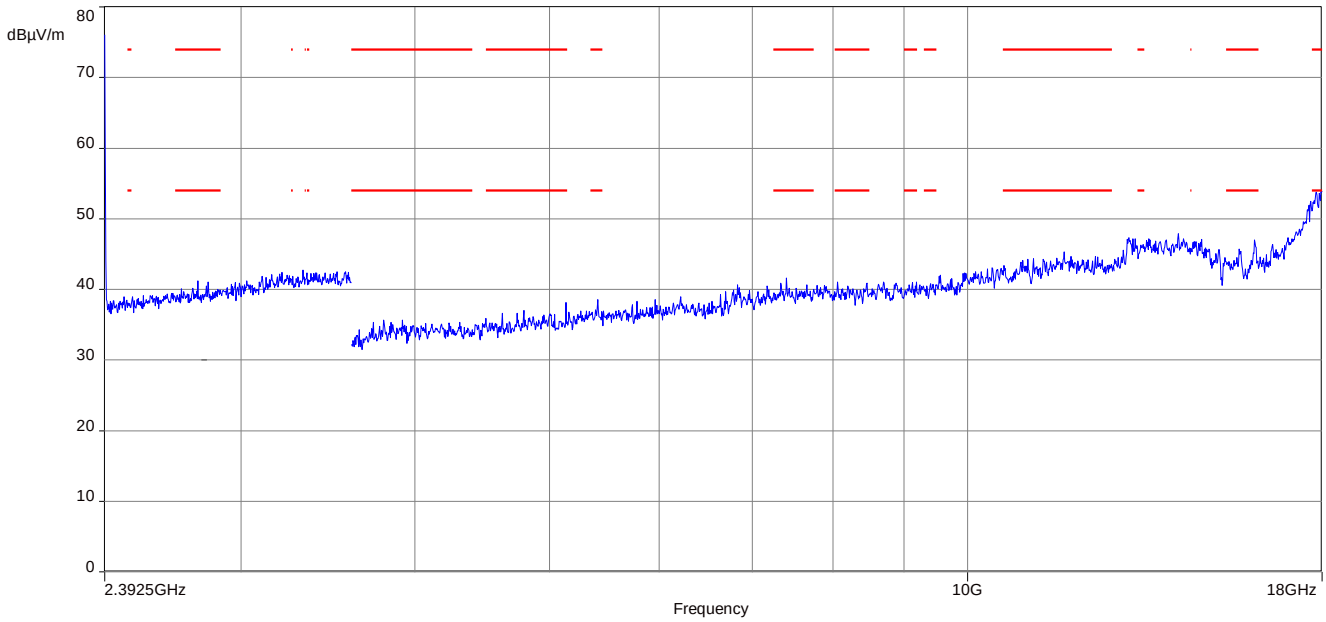
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
63.332400	16.94	30.00	13.06	1000.0	120.000	101.0	V	170.0	11.1
71.678400	13.60	30.00	16.40	1000.0	120.000	101.0	V	280.0	9.4
119.559600	17.93	33.50	15.57	1000.0	120.000	101.0	V	80.0	10.3
167.580150	15.15	33.50	18.35	1000.0	120.000	170.0	V	80.0	10.1
287.359950	17.75	36.00	18.25	1000.0	120.000	98.0	V	10.0	14.2
546.025800	16.58	36.00	19.42	1000.0	120.000	101.0	H	-9.0	19.3

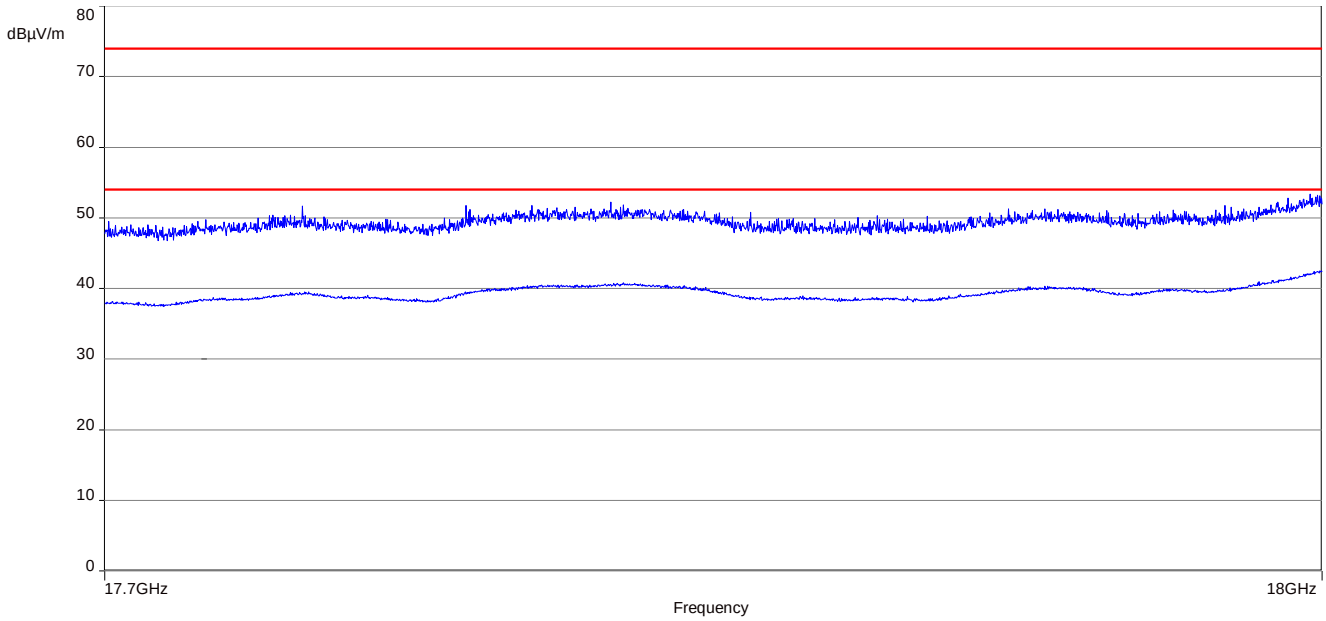
Plot 21: 1 GHz – 3.5 GHz, antenna horizontal/vertical, channel low, upper band



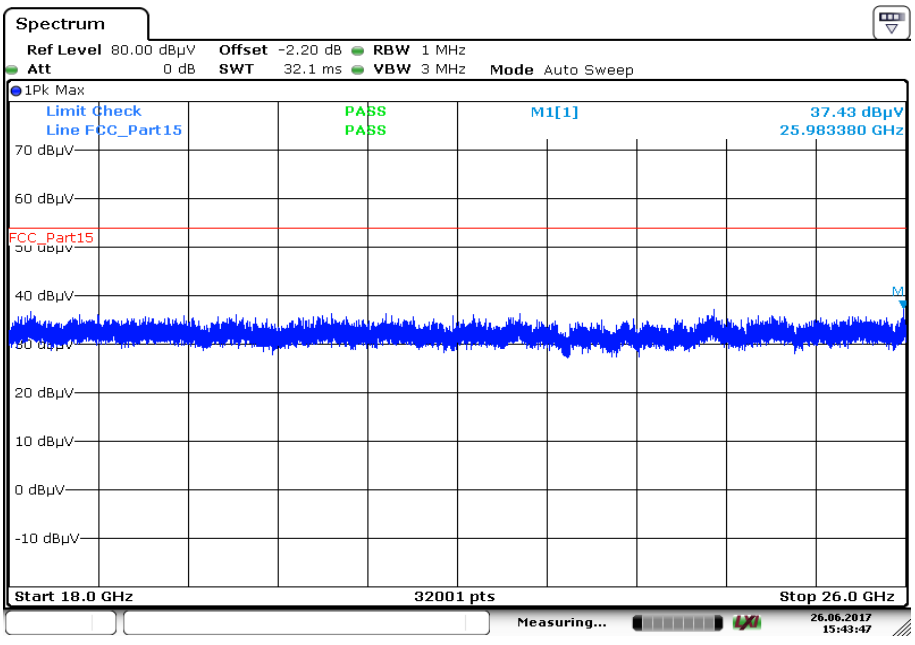
Plot 22: 2392.5 GHz – 18 GHz, antenna horizontal/vertical, channel low, upper band



Plot 23: 17.7 GHz – 18 GHz, antenna horizontal/vertical, channel low, upper band

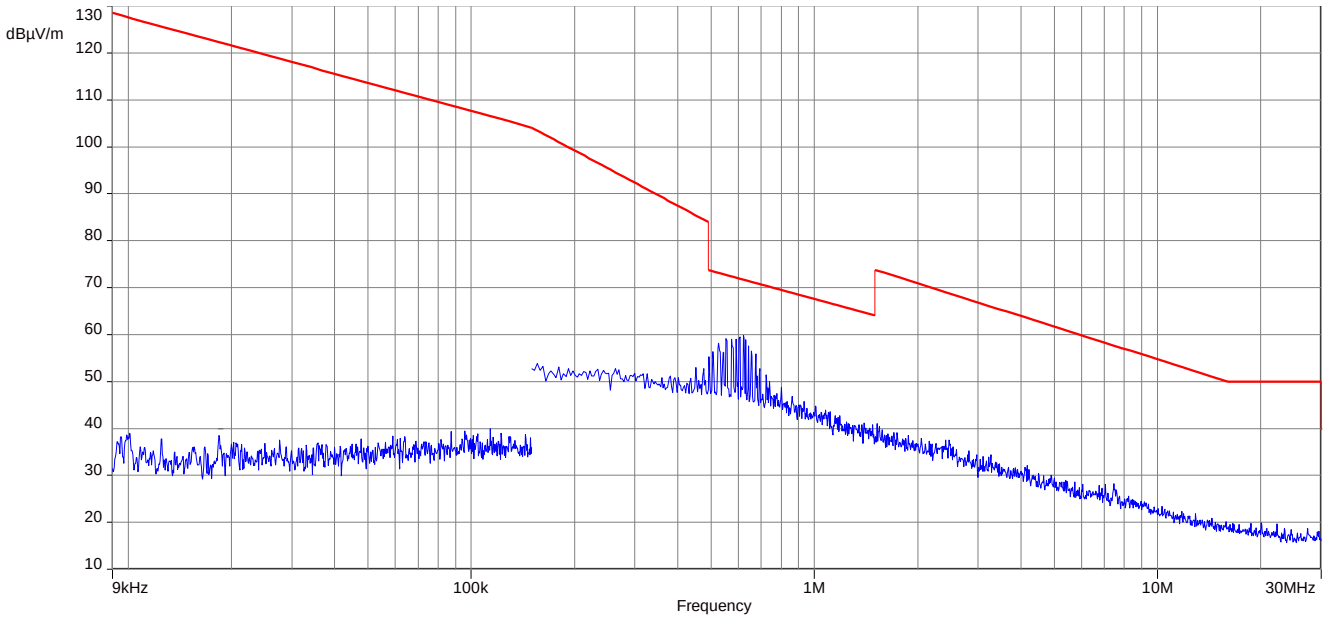


Plot 24: 18 GHz – 26 GHz, antenna horizontal/vertical, channel low, upper band

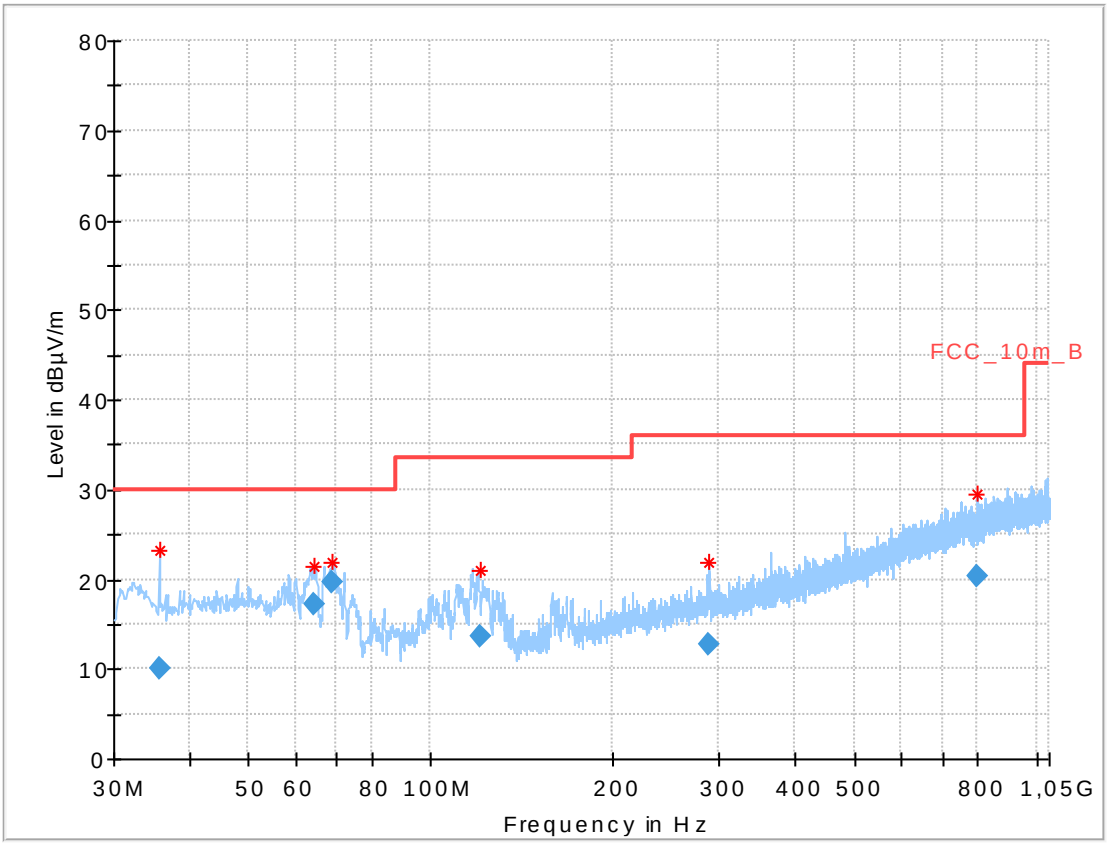


Date: 26.JUN.2017 15:43:47

Plot 25: 9 kHz – 30 MHz, channel high, upper band



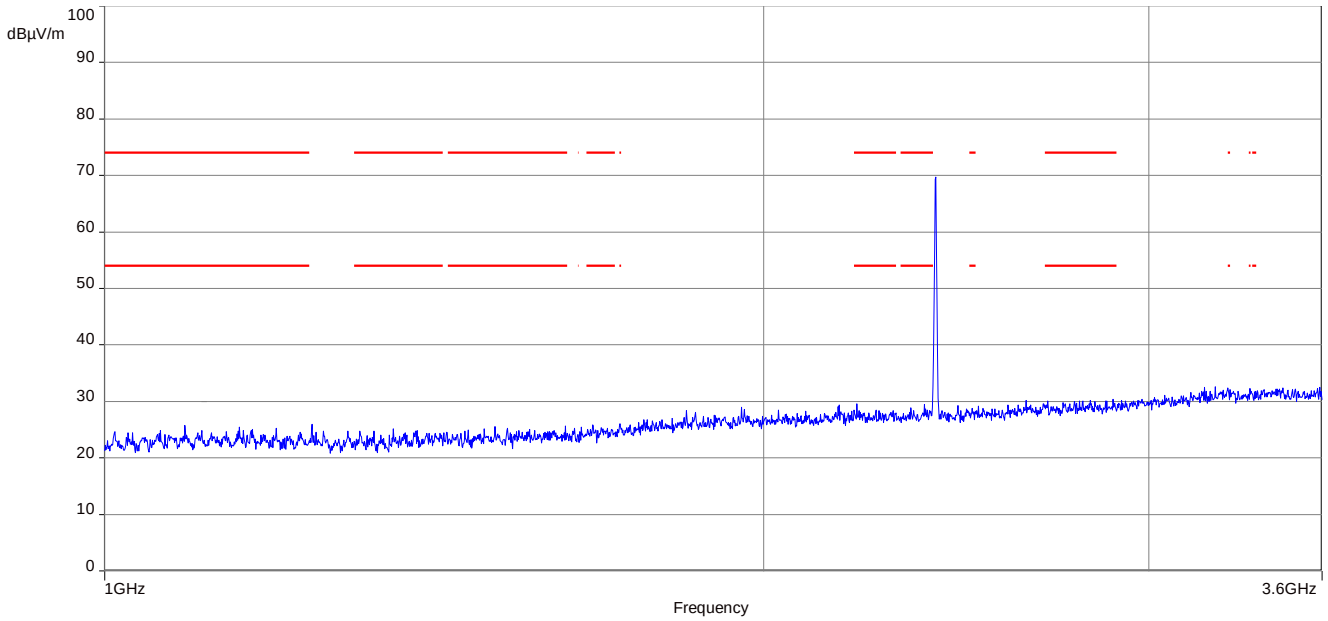
Plot 26: 30 MHz – 1 GHz, channel high, upper band



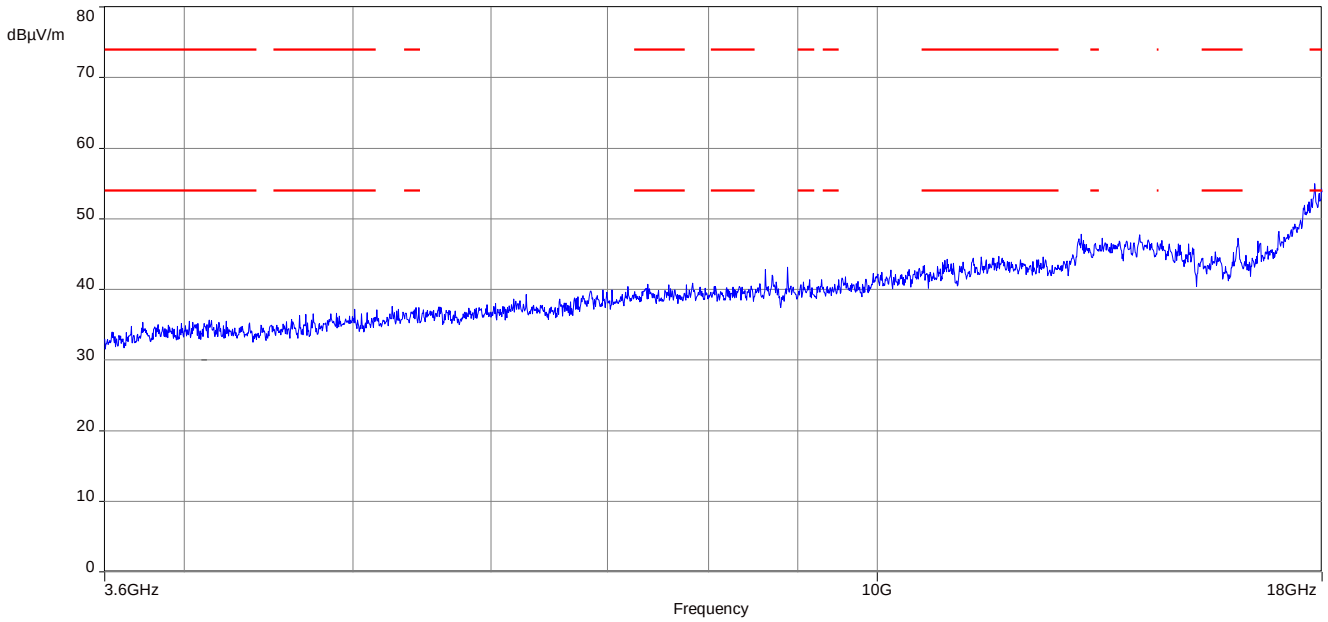
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.796300	10.14	30.00	19.86	1000.0	120.000	101.0	H	261.0	12.7
64.410450	17.26	30.00	12.74	1000.0	120.000	98.0	V	81.0	10.9
68.812950	19.63	30.00	10.37	1000.0	120.000	98.0	V	280.0	10.0
120.510750	13.60	33.50	19.90	1000.0	120.000	101.0	V	190.0	10.2
288.304650	12.75	36.00	23.25	1000.0	120.000	98.0	V	100.0	14.2
800.283900	20.36	36.00	15.64	1000.0	120.000	170.0	H	-10.0	22.8

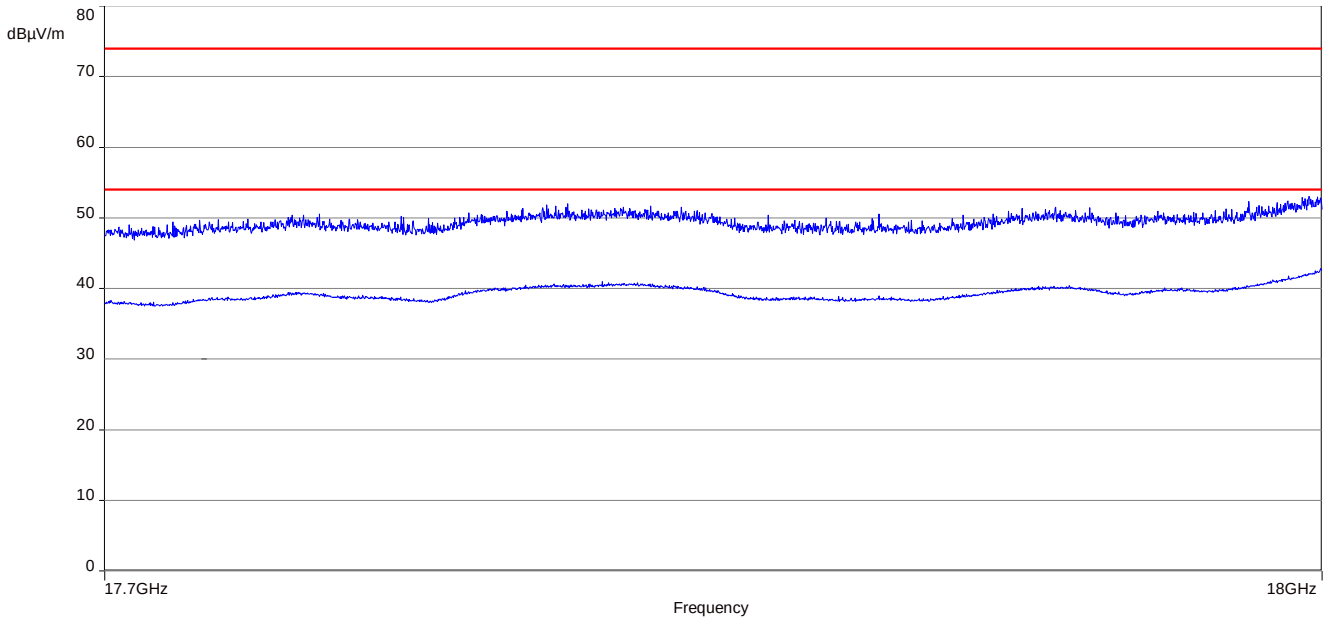
Plot 27: 1 GHz – 3.5 GHz, antenna horizontal/vertical, channel high, upper band



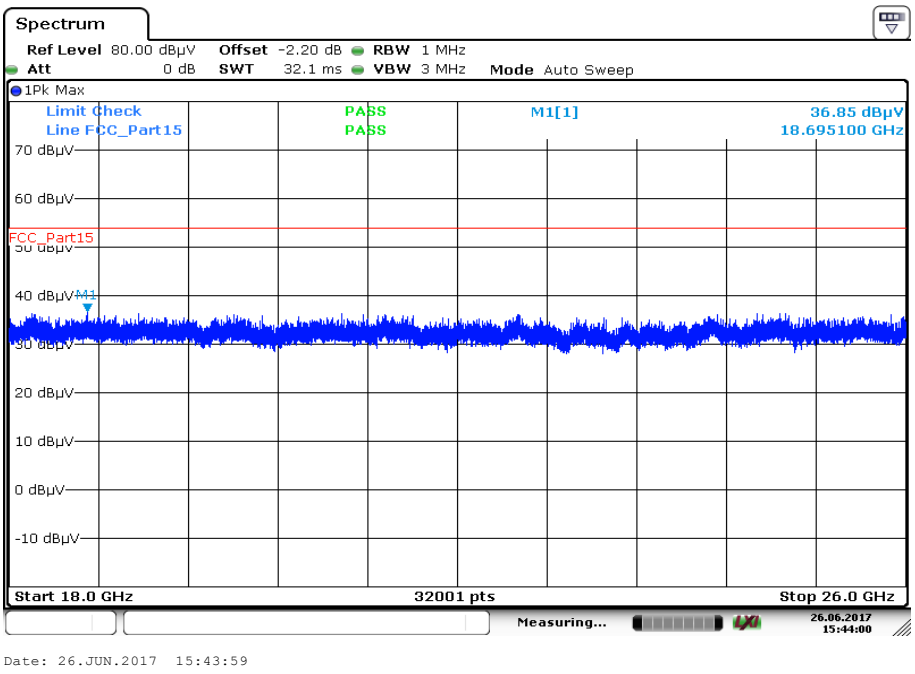
Plot 28: 3.6 GHz – 18 GHz, antenna horizontal/vertical, channel high, upper band



Plot 29: 17.7 GHz – 18 GHz, antenna horizontal/vertical, channel high, upper band



Plot 30: 18 GHz – 26 GHz, antenna horizontal/vertical, channel high, upper band



11.6 Receiver unwanted radiation (radiated)

Measurement:

Measurement parameter		
Detector:	Prescan: Final:	Peak QPK below 960 MHz RMS above 960 MHz
Resolution bandwidth:	9 kHz – 150 kHz: 150 kHz – 30 MHz: 30 MHz – 1 GHz: 1 GHz – 26 GHz:	200 Hz 9 kHz 100 kHz 1 MHz
Video bandwidth:	9 kHz – 150 kHz: 150 kHz – 30 MHz: 30 MHz – 1 GHz: 1 GHz – 26 GHz:	1 kHz 30 kHz 300 kHz 3 MHz
Span:	See plots	
Trace mode:	Max Hold	
Test setup	See sub clause 6.1 – A & 6.2 – A & 6.3 – A	
Measurement uncertainty	See sub clause 8	

Limits:

FCC	IC	
47 CFR § 15.109	-/-	
Receiver unwanted radiation (radiated)		
Frequency (MHz)	**Field strength (µV/m)** [1]	**Measurement distance (m)**
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 - 88	100 (40 dBµV/m)	3
30 - 88	31.6 (30 dBµV/m)	10
88 - 216	150 (43.5 dBµV/m)	3
88 - 216	47.3 (33.5 dBµV/m)	10
216 - 960	200 (46 dBµV/m)	3
216 - 960	63.1 (36 dBµV/m)	10
above 960	500 (54 dBµV/m)	3

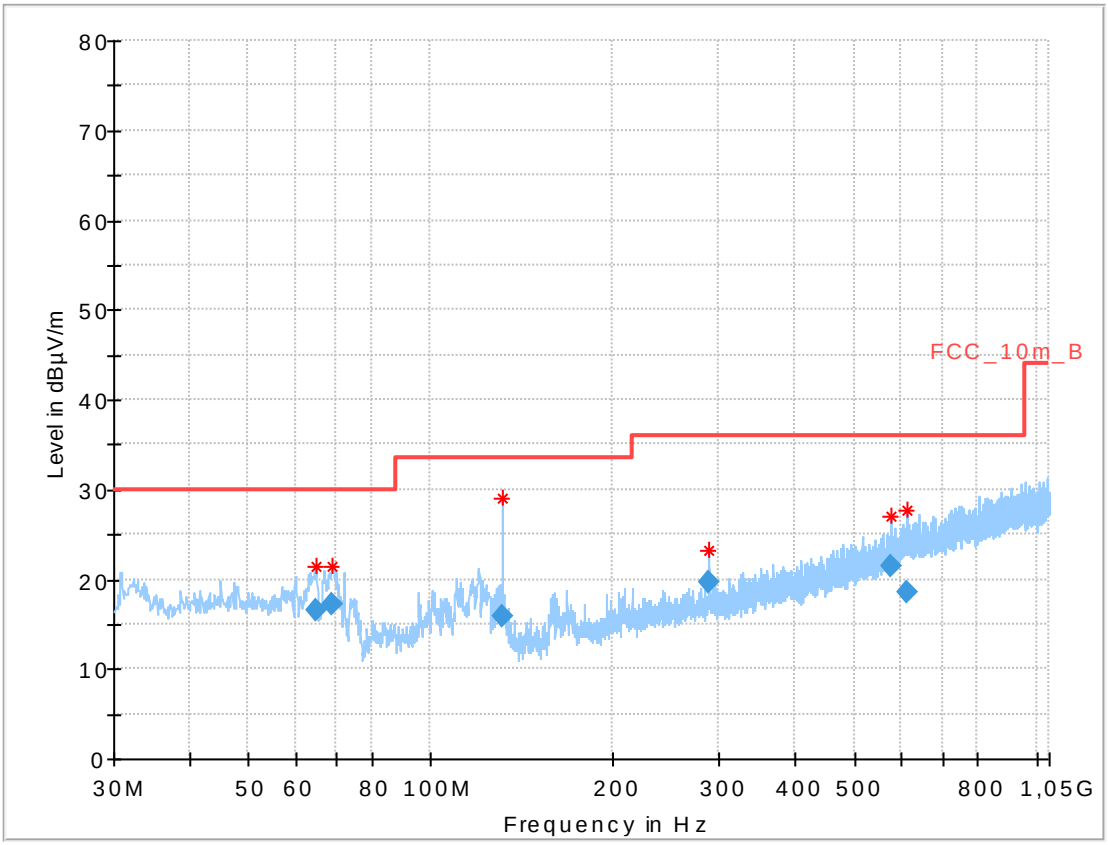
[1] Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector. Otherwise a quasi-peak detector is used.

Results: Receiver mode

Receiver unwanted radiation [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
1894	Peak	28.0
	QPK	-/-
3978	Peak	35.7
	QPK	-/-
7342	Peak	40.9
	QPK	-/-
11785	Peak	46.6
	AVG	-/-
14325	Peak	48.3
	AVG	-/-
17991	Peak	53.3
	AVG	42.1

Plot:

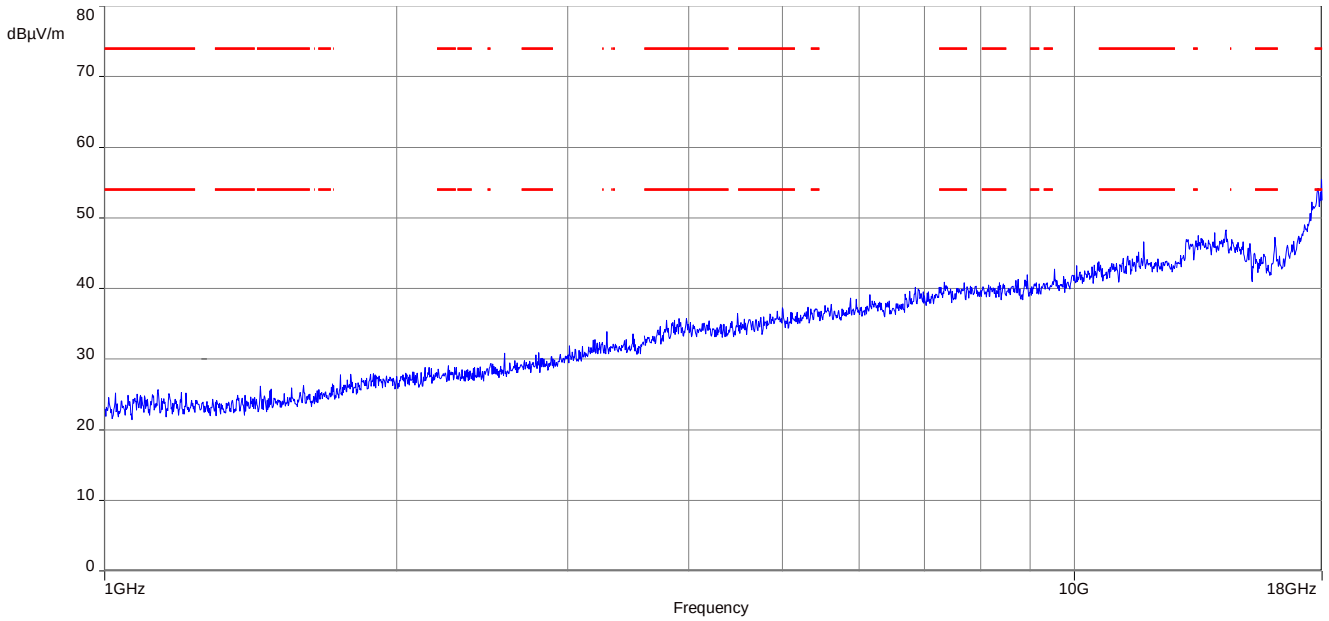
Plot 1: 30 MHz – 1 GHz



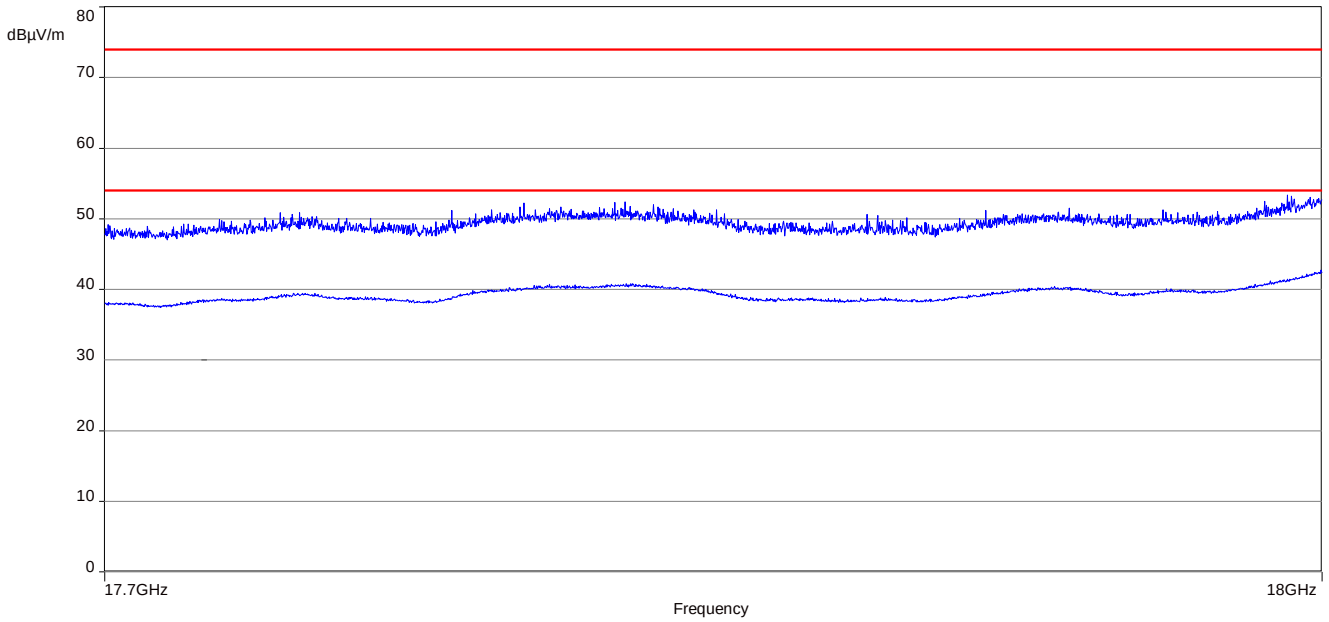
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
64.813050	16.48	30.00	13.52	1000.0	120.000	101.0	V	-9.0	10.8
68.905350	17.13	30.00	12.87	1000.0	120.000	105.0	V	80.0	9.9
131.560200	15.84	33.50	17.66	1000.0	120.000	98.0	V	170.0	9.4
287.799900	19.65	36.00	16.35	1000.0	120.000	98.0	V	-9.0	14.2
575.997150	21.36	36.00	14.64	1000.0	120.000	170.0	H	80.0	20.1
611.506350	18.47	36.00	17.53	1000.0	120.000	170.0	V	81.0	20.8

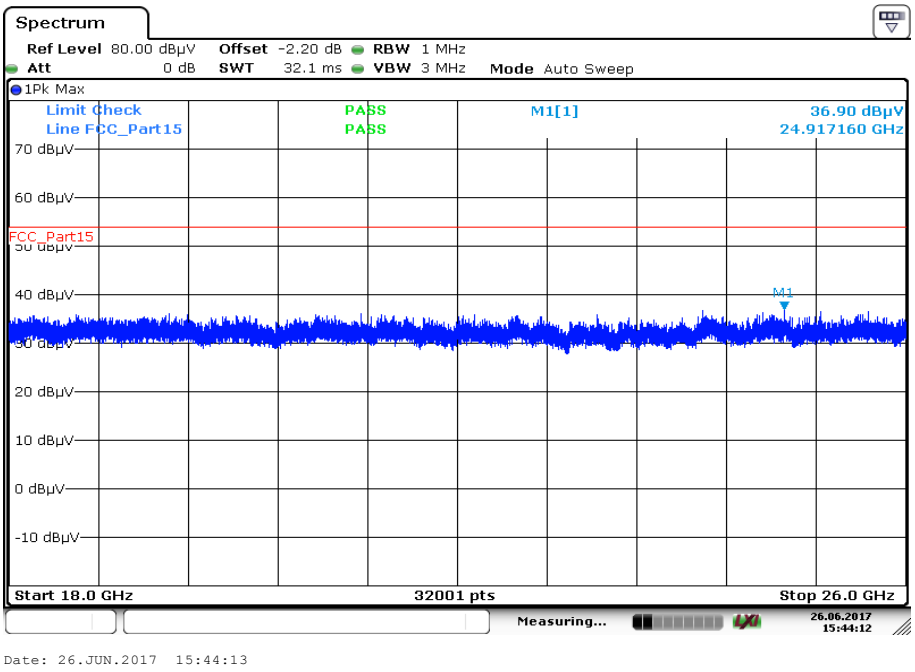
Plot 2: 1 GHz – 18 GHz, antenna horizontal/vertical



Plot 3: 17.7 GHz – 18 GHz, antenna horizontal/vertical



Plot 4: 18 GHz – 26 GHz, antenna horizontal/vertical



11.7 Connection interrupt test (body-worn sensor)

Measurement:

(a) Establish a LAN connection between the MBAN P/C device and the simulated control point.

(b) Establish connection between the MBAN P/C and the body-worn sensor device under test (DUT).

(c) Configure the control message to enable operation in the 2360−2390 MHz band.

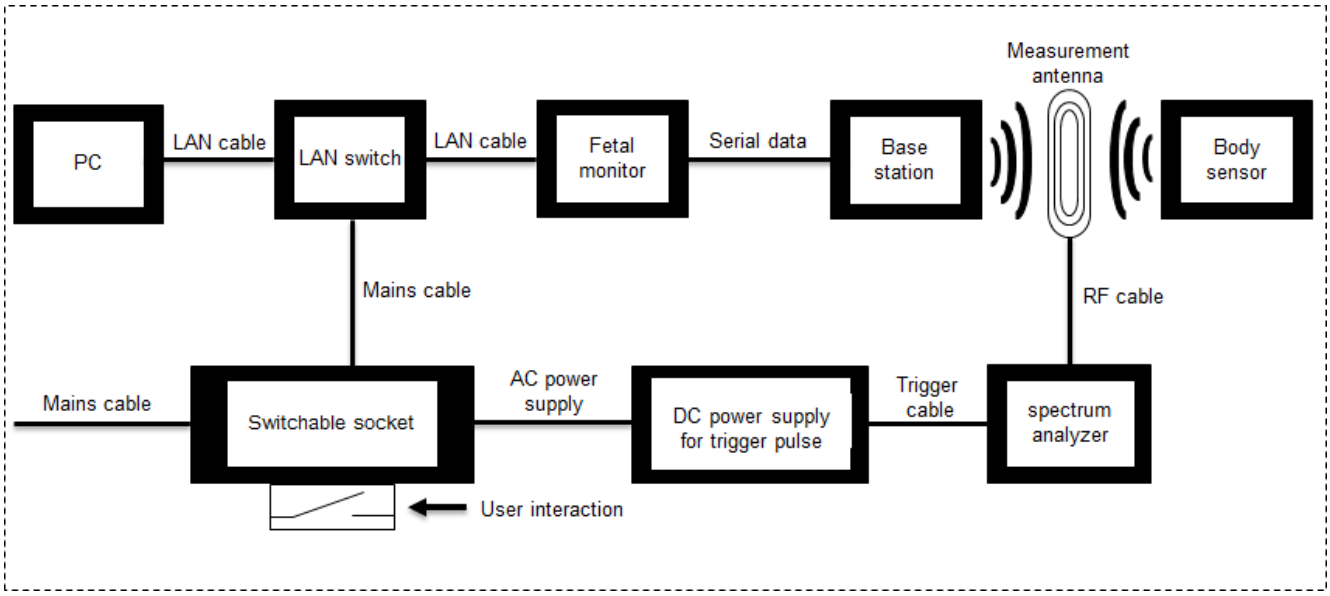
(d) Verify that transmissions between DUT and its associated MBAN P/C are consistent with the control message configuration.

(e) Interrupt the RF and verify that the DUT ceases transmission in the 2360−2390 MHz band with a latency period not exceeding the maximum control message periodicity as specified in the operational description of the device. Additionally, if the DUT operating frequency is now moved to 2390−2400 MHz band verify the channel transition time (latency) is less than the maximum control message periodicity as specified in the operational description of the device.

Measurement parameter	
Detector:	Peak
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	See plots (both MBAN bands)
Trace mode:	Max Hold
Test setup:	See sub clause 6.5 – A

Note: Added from test report:
1-9941/15-01-06-C (Avalon CL fetal and maternal pod 866488) – see customer declaration.

Test setup:



Test description (KDB 550599 D01 v01r01):

1. Switchable socket with manual interaction to switch off the DC power supply and the LAN switch
2. DC power supply for a low ramp trigger pulse to trigger the spectrum analyzer
3. LAN switch to release the connection between PC (Server) and monitor (Main station)
4. Monitor, base station and body sensor – complete test setup in normal use constellation
5. Measurement antenna and spectrum analyzer to perform the test

Test execution:

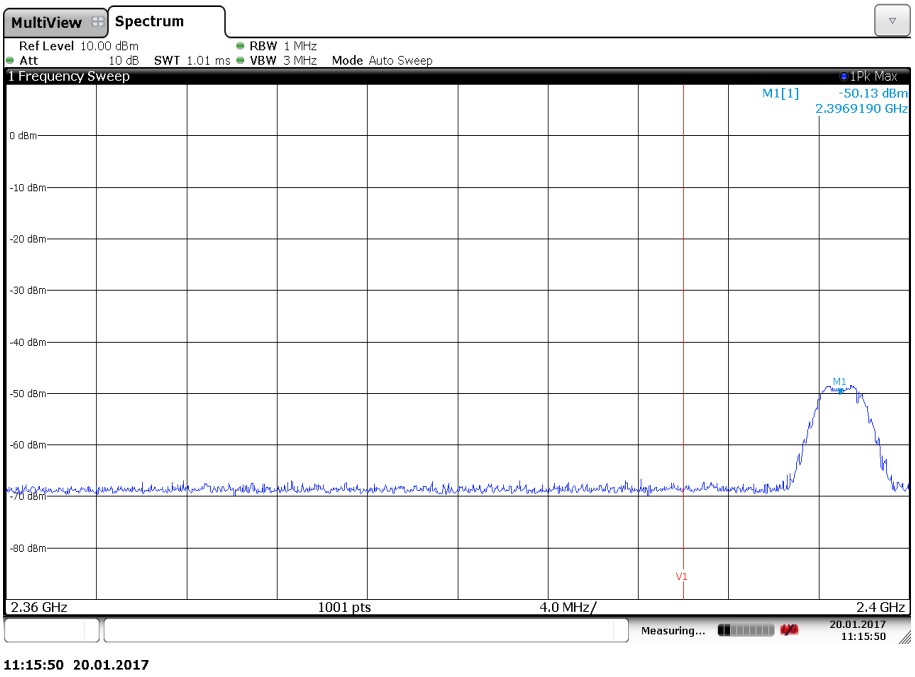
1. Establishing a normal system connection
2. Manual interaction to switch off the DC power supply and the LAN switch
3. Spectrum analyzer – start of the measurement and connection lost between PC and monitor
4. Monitor deactivate the base station RF connection
5. Base station deactivate the body sensor
6. End of test

Step 1 (KDB 550599 D01 v01r01):

(a) Establish a LAN connection between the MBAN P/C device and the simulated control point.

(b) Establish connection between the MBAN P/C and the body-worn sensor device under test (DUT).

Plot 1:



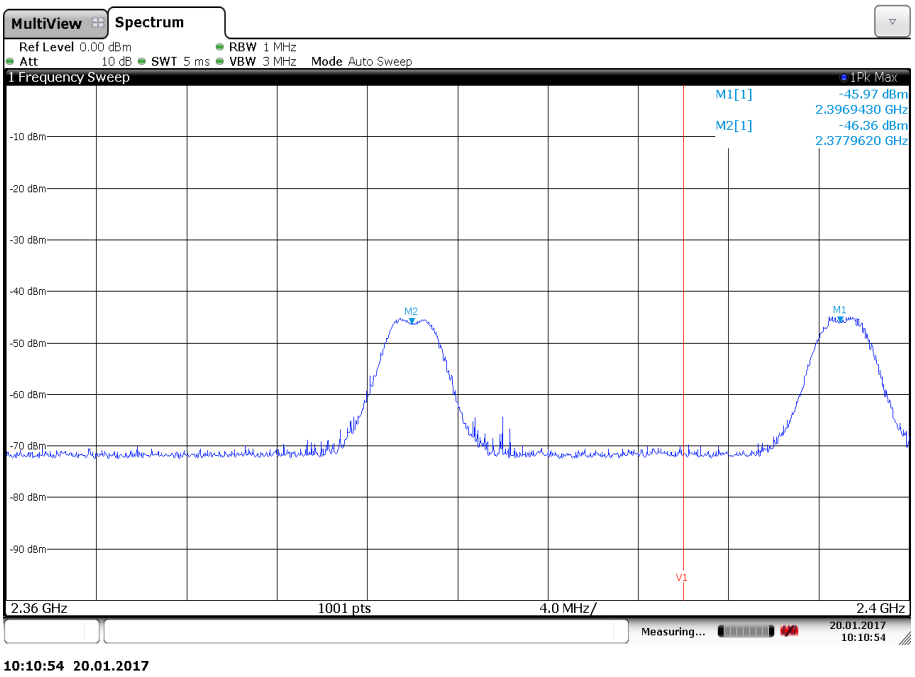
The plot shows the communication of the control message between the MBAN P/C and the body-worn sensor in the 2390-2400 MHz band (Marker 1 @ 2397 MHz). The V1 frequency line marks the end of lower and the start of the upper MBAN band.

Step 2 (KDB 550599 D01 v01r01):

(c) Configure the control message to enable operation in the 2360−2390 MHz band.

(d) Verify that transmissions between DUT and its associated MBAN P/C are consistent with the control message configuration.

Plot 2:

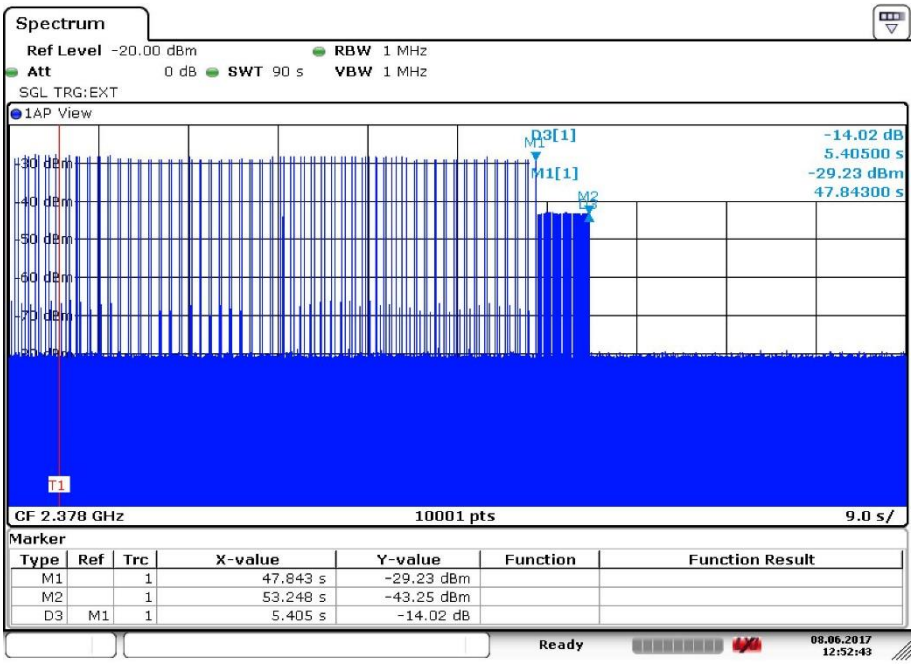


The 2360-2390 MHz band (Marker 2 @ 2378 MHz) was enabled for the body-worn sensor communication and the sensor transmits on the channel defined by the MBAN P/C. The control message of the MBAN P/C is transmitted in the 2390-2400 MHz band (Marker 1 @ 2397 MHz). The V1 frequency line marks the end of lower and the start of the upper MBAN band.

Step 3 (KDB 550599 D01 v01r01):

(e) Interrupt the RF and verify that the DUT ceases transmission in the 2360−2390 MHz band with a latency period not exceeding the maximum control message periodicity as specified in the operational description of the device. Additionally, if the DUT operating frequency is now moved to 2390−2400 MHz band verify the channel transition time (latency) is less than the maximum control message periodicity as specified in the operational description of the device.

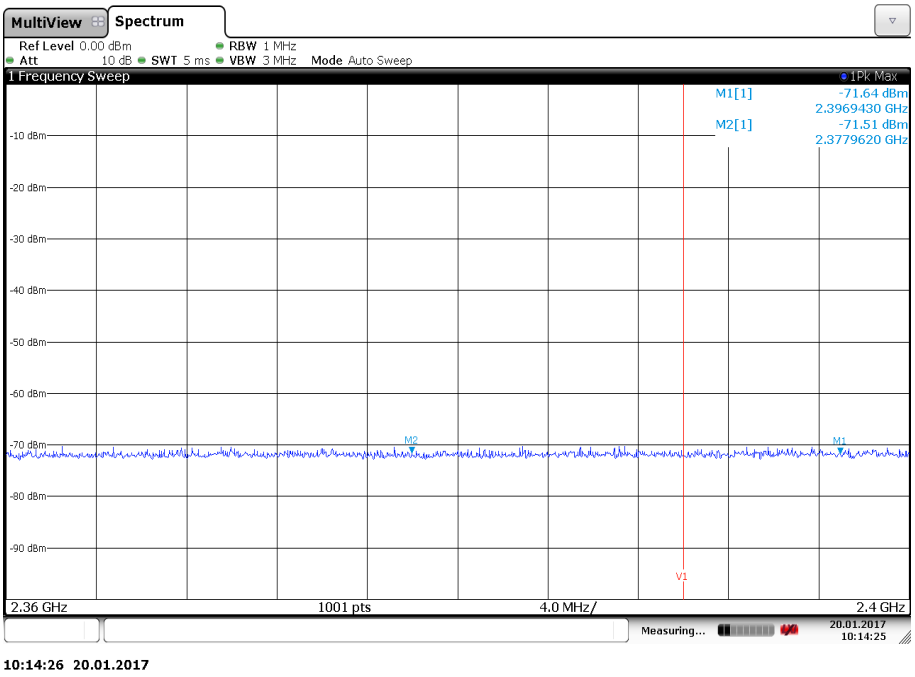
Plot 3:



The communication between the MBAN P/C and the simulated control point was interrupted via LAN disconnection. MBAN P/C and body-worn sensor stop the communication within the MBAN frequency bands.

The plot shows the communication between the MBAN P/C and the body-worn sensor in the 2360-2390 MHz band. The red trigger line (T1) indicates the interrupt between the MBAN P/C and the simulated control point within the communication timeline. The base station stops communication within 47.8 seconds (Marker 1) and the body-worn sensor runs another 5.4 seconds and finished the communication within 53.2 seconds. (Marker 2 and delta marker 3).

Plot 4: Spectrum after marker 2 plot 3



MBAN P/C and body-worn sensor stop the communication within the MBAN frequency bands. The V1 frequency line marks the end of lower and the start of the upper MBAN band.

12 Observations

No observations except those reported with the single test cases have been made.

Annex A Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
ETSI	European Telecommunications Standard Institute
EN	European Standard
FCC	Federal Communication 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

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2017-06-29
A	Editorial changes	2018-02-28
B	Chapter 11.7 added.	2018-03-02

Annex C Accreditation Certificate

first page	last page
	

Note: The current certificate annex is published on the website (link see below) of the Accreditation Body DAkkS or may be received by CTC advanced GmbH on request

http://www.dakks.de/as/ast/d/D-PL-12076-01-03.pdf