

## TEST REPORT

Test report no.: 1-3558/17-01-02-C

BNetzA-CAB-02/21-102

### Testing laboratory

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**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

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### 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:** CTG Base Station PQC-OBBSBV1 including 2x 2.4GHz Transceiver PQC-SRRBV6  
**Model name:** 866074  
**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:** 7.5 V DC by power supply  
**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.

Stefan Bös  
Lab Manager  
Radio Communications & EMC

### Test performed:

Mihail Dorongovskij  
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## 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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This test report replaces the test report with the number 1-3558/17-01-02-B and dated 2018-02-28

### 2.2 Application details

Date of receipt of order:	2017-04-10
Date of receipt of test item:	2017-04-18
Start of test:	2017-04-20
End of test:	2017-04-28
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 <sub>nom</sub> T <sub>max</sub> T <sub>min</sub>	+22 °C during room temperature tests No tests under extreme conditions performed. No tests under extreme conditions performed.
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V <sub>nom</sub> V <sub>max</sub> V <sub>min</sub>	7.5 V DC by power supply No tests under extreme conditions performed. No tests under extreme conditions performed.

## 5 Test item

### 5.1 General description

Kind of test item	:	CTG Base Station PQC-OBBSBV1 including 2x 2.4GHz Transceiver PQC-SRRBV6	
Type identification	:	866074	
HMN	:	-/-	
PMN	:	-/-	
HVIN	:	-/-	
FVIN	:	-/-	
S/N serial number	:	Rad.	DE32000515
HW hardware status	:	1	
SW software status	:	B.00.39 / B.02.60	
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	:	modulated carrier, DSSS	
Use of frequency spectrum	:		
Type of modulation	:	QPSK	
Number of channels	:	15	
Antenna	:	Chip antenna	
Power supply	:	7.5 V DC by power supply	
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:

1-3558/17-01-01\_AnnexA  
1-3558/13-01-03  
1-3558/17-01-01\_AnnexD

**6 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

## 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).

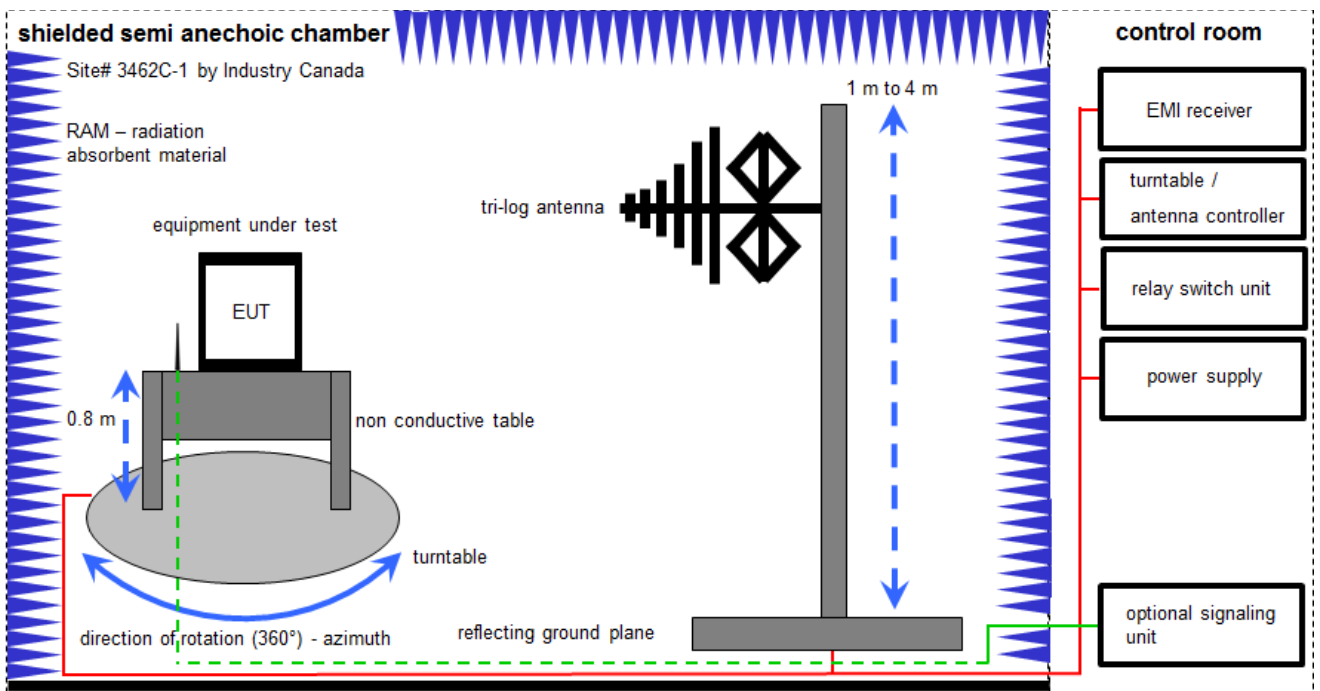
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

### 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
vkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

## 7.1 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:

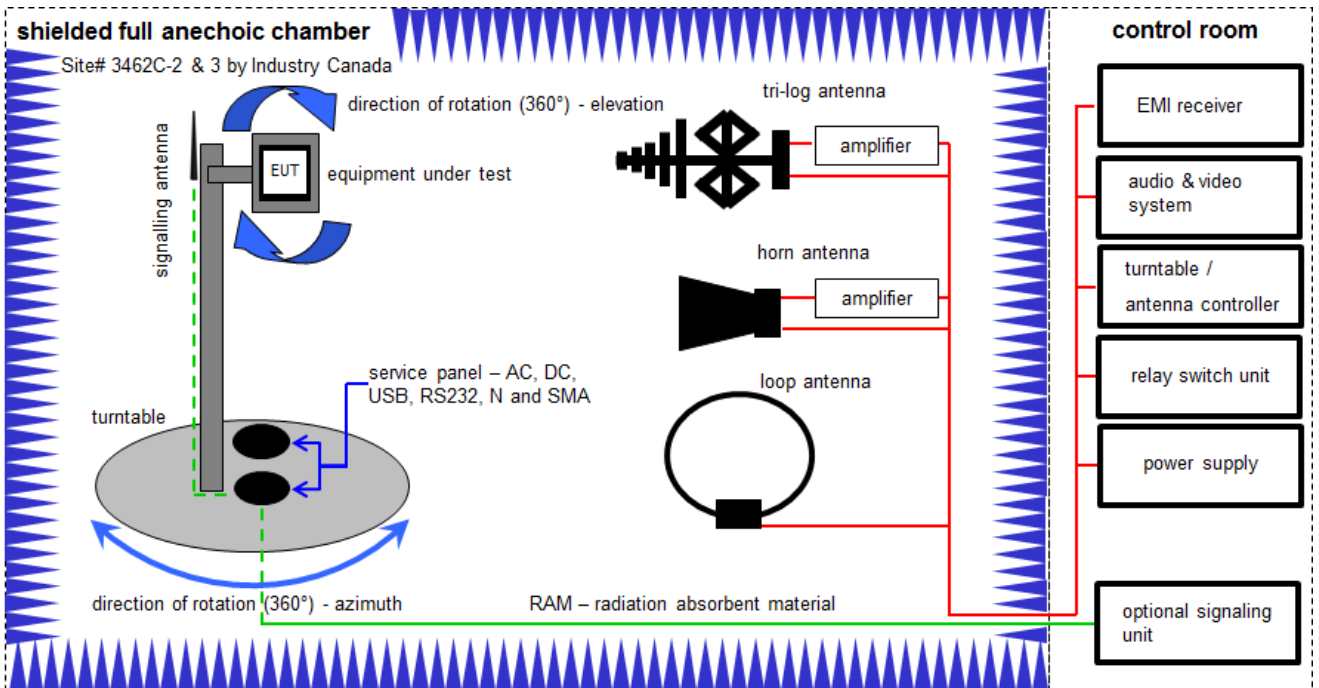
$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

### 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	Meßkabine 1	HF-Absorberhalle	MWB AG 300023	101042	300000551	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	01.02.2017	31.01.2018
4	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018
5	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
6	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
7	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
8	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018



## 7.2 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)

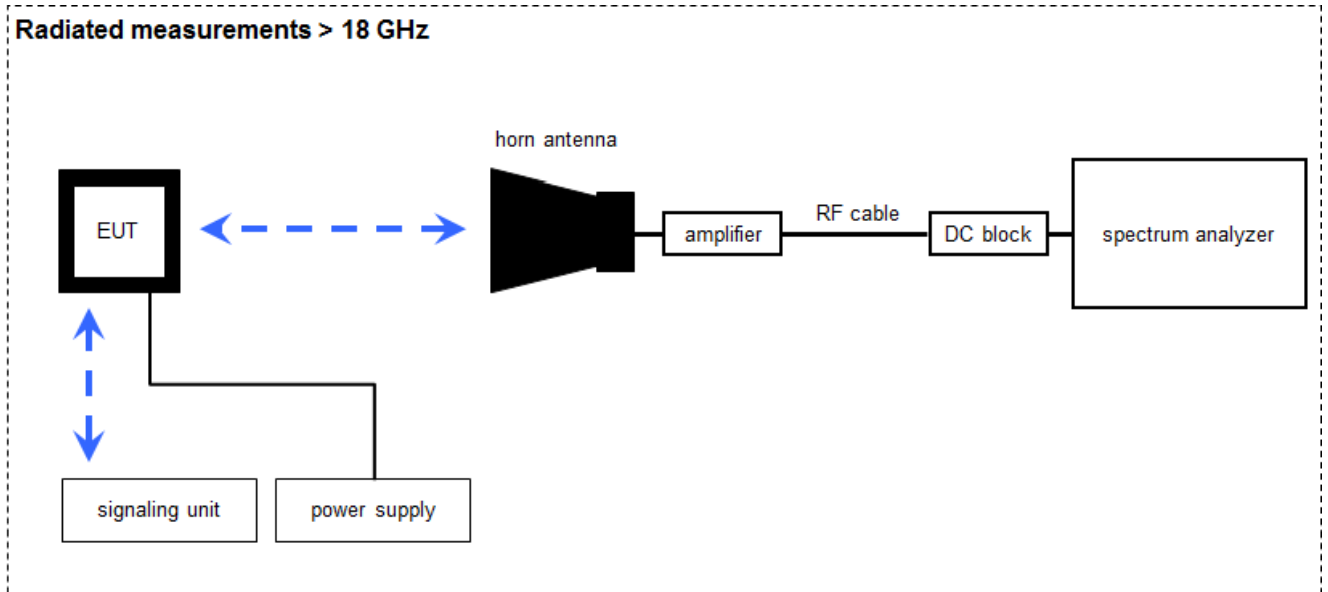
Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$$

### Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	C	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO	2210	300001015	k	20.05.2015	20.05.2017
2	A	Double-Ridged Wavguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	13.08.2015	13.08.2017
3	A	Highpass Filter	WHK1.1/15G-10SS	Wainwright	37	400000148	ne	-/-	-/-
4	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
5	B	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	v IKI!	29.10.2014	29.10.2017
6	A, B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22051	300004483	ev	-/-	-/-
7	A, B, C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
8	A, B, C	Messrechner und Monitor	Intel Core i3 3220/3,3 GHz, Prozessor	Huber & Suhner	2V2403033A54 21	300004591	ne	-/-	-/-
9	A, B, C	NEXIO EMV- Software	BAT EMC V3.16.0.49	EMCO	Batch no. 14844	300004682	ne	-/-	-/-
10	A, B, C	Anechoic chamber	ESH3-Z5	IDK	893045/004	300003726	ne	-/-	-/-
11	A, B, C	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	v IKI!	13.09.2016	13.03.2018

### 7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

$$FS = U_R + CA + AF$$

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

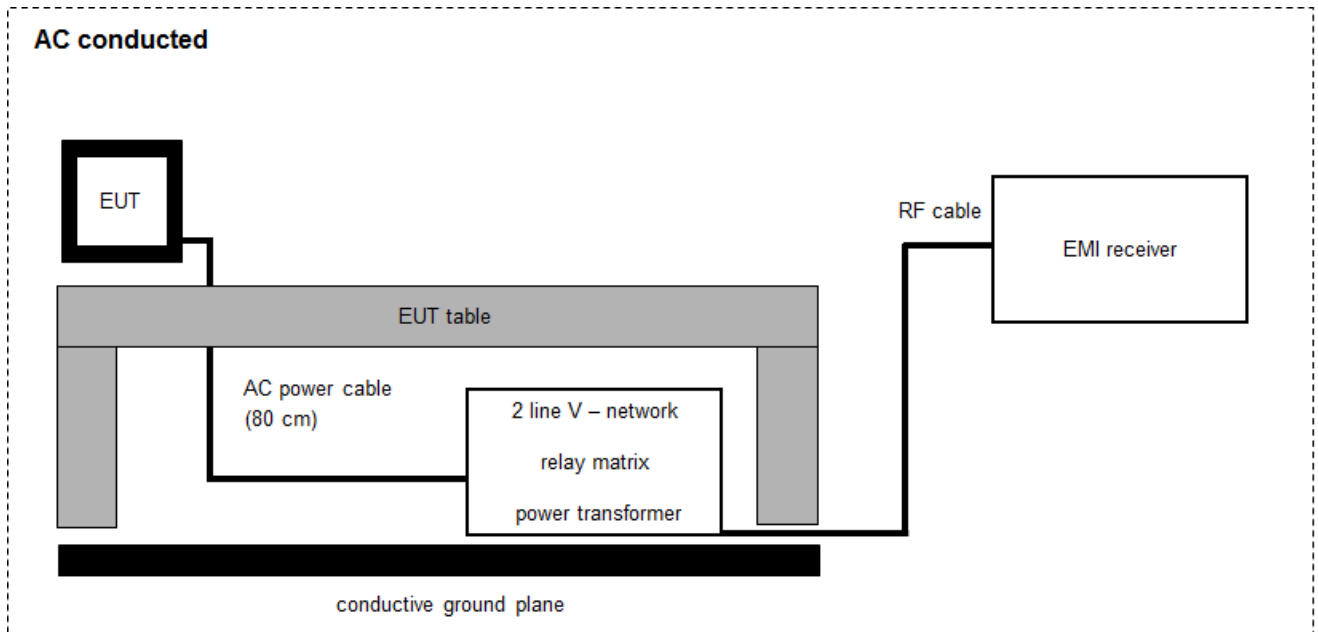
Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB\mu V/m] (6.79 \mu V/m)$$

#### 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	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	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	-/-	-/-

## 7.4 AC conducted



$$FS = UR + CF + VC$$

(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

**Equipment table:**

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	893045/004	300000584	k	31.01.2017	30.01.2018
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	-/-
3	A	EM-Injection Clamp	FCC-203i	emv	232	300000626	ev	18.05.2001	-/-
4	A	AC-Spannungsquelle variabel	MV2616-V	EM-Test	0397-12	300003259	k	11.12.2015	11.12.2017
5	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	08.04.2008	-/-
6	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	16.08.2016	16.08.2017

## 8 Sequence of testing

### 8.1 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.

## 8.2 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  $\pm 45^\circ$  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.

### 8.3 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.

## 8.4 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.

## 9 Summary of measurement results

<input type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input checked="" type="checkbox"/>	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	Tests according to customer's demand

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*1
FCC 47 CFR § 95.2573(e)	Emission bandwidth	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*1
FCC 47 CFR § 95.2567(e) and (f)	Maximum transmit power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
FCC 47 CFR § 95.2579(a)(5) and (f)	Band edge measurements	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	*1
FCC 47 CFR § 95.2579(a)(5) and (f)	Transmitter unwanted radiation	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
FCC 47 CFR § 95.2579(a)(5) and (f)	Receiver spurious emissions (radiated)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
FCC 47 CFR § 15.107(a) § 15.207	Conducted emissions below 30 MHz (AC conducted)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

\*1: For conducted results please see main report 1-2773/16-01-02

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



## 10 Additional comments

- Reference documents: Customer\_Questionnaire\_1-3558\_17-01\_Base.docx  
Main test report 1-2773/16-01-02-A
- Special test descriptions: The EUT contains two radio modules (left and right). The tests were performed on both modules.
- Configuration descriptions: Used power settings: Lower band: -5 dBm for all channels  
Upper band: 0 dBm for all channels
- 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 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 7.2 – B & 7.4 – A
Measurement uncertainty	See sub clause 9

**Limits:**

FCC	IC
47 CFR § 95.2567 (e) and (f)	-/-
<p>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 <math>10 \log(B)</math> dBm, where B is the MedRadio 20 dB emission bandwidth in megahertz.</p> <p>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 <math>16 + 10 \log(B)</math> dBm, where B is the MedRadio 20 dB emission bandwidth in megahertz.</p>	

**Result:** main report 1-2773/16-01-02-A

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

**Result:** left module

Frequency [MHz]	Output power conducted [dBm]	Gain [dBi]	EIRP [dBm]	Limit [dBm]
2363	-/-	-/-	-2.1	0.0
2382	-/-	-/-	-0.9	0.0
2387	-/-	-/-	-0.9	0.0
2392	-/-	-/-	3.0	13.0
2397	-/-	-/-	2.9	13.0

**Result:** right module

Frequency [MHz]	Output power conducted [dBm]	Gain [dBi]	EIRP [dBm]	Limit [dBm]
2363	-/-	-/-	-2.3	0.0
2382	-/-	-/-	-0.9	0.0
2387	-/-	-/-	-0.9	0.0
2392	-/-	-/-	4.1	13.0
2397	-/-	-/-	4.2	13.0

## 11.2 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 7.1 – A & 7.2 – A & 7.3 – A	
Measurement uncertainty	See sub clause 9	

### Limits:

FCC		IC
47 CFR § 15.109 47 CFR §95.2579 (a)(5)		-/-
Transmitter unwanted radiation (radiated)		
Frequency (MHz)	Field strength ( $\mu\text{V/m}$ ) <sup>1</sup>	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 dB $\mu\text{V/m}$ )	3
30 - 88	31.6 (30 dB $\mu\text{V/m}$ )	10
88 - 216	150 (43.5 dB $\mu\text{V/m}$ )	3
88 - 216	47.3 (33.5 dB $\mu\text{V/m}$ )	10
216 - 960	200 (46 dB $\mu\text{V/m}$ )	3
216 - 960	63.1 (36 dB $\mu\text{V/m}$ )	10
above 960	500 (54 dB $\mu\text{V/m}$ )	3

<sup>1</sup> 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, left module

Transmitter unwanted radiation [dBµV/m]								
2363 MHz			2382 MHz			2387 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please look at the table below the 1 GHz plot.								
1619	Peak	40.0	1619	Peak	40.0	1619	Peak	40.0
	QPK	-/-		QPK	-/-		QPK	-/-
1680	Peak	37.3	1680	Peak	38.1	1680	Peak	38.1
	QPK	-/-		QPK	-/-		QPK	-/-
1800	Peak	38.5	1800	Peak	38.2	1800	Peak	38.2
	QPK	-/-		QPK	-/-		QPK	-/-
1860	Peak	40.2	1860	Peak	39.8	1860	Peak	42.1
	AVG	-/-		AVG	-/-		AVG	-/-
1919	Peak	41.6	1919	Peak	41.6	1919	Peak	42.0
	AVG	-/-		AVG	-/-		AVG	-/-
1980	Peak	39.3	1980	Peak	39.1	1980	Peak	39.1
	AVG	-/-		AVG	-/-		AVG	-/-
2730	Peak	36.7	2730	Peak	36.7	2730	Peak	36.7
	AVG	-/-		AVG	-/-		AVG	-/-
2790	Peak	37.2	2790	Peak	37.2	2790	Peak	36.0
	AVG	-/-		AVG	-/-		AVG	-/-
2850	Peak	35.0	2850	Peak	35.0	2850	Peak	35.0
	AVG	-/-		AVG	-/-		AVG	-/-
4726	Peak	48.0	4763	Peak	50.1	4774	Peak	50.0
	AVG	-/-		AVG	-/-		AVG	-/-
6917	Peak	40.8	6917	Peak	40.8	6917	Peak	40.3
	AVG	-/-		AVG	-/-		AVG	-/-
17878	Peak	43.9	17878	Peak	43.9	17878	Peak	43.7
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
For emissions above 18 GHz, please look at the plots.								

**Results:** Transmitter mode, left module

Transmitter unwanted radiation [dBµV/m]								
2392 MHz			-/-			2397 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please look at the table below the 1 GHz plot.								
1619	Peak	38.5	-/-	Peak	-/-	1619	Peak	38.5
	QPK	-/-		QPK	-/-		QPK	-/-
1680	Peak	37.0	-/-	Peak	-/-	1680	Peak	37.0
	QPK	-/-		QPK	-/-		QPK	-/-
1800	Peak	38.3	-/-	Peak	-/-	1800	Peak	38.3
	AVG	-/-		AVG	-/-		AVG	-/-
1860	Peak	41.1	-/-	Peak	-/-	1860	Peak	41.1
	AVG	-/-		AVG	-/-		AVG	-/-
1919	Peak	41.0	-/-	Peak	-/-	1919	Peak	41.0
	AVG	-/-		AVG	-/-		AVG	-/-
1980	Peak	39.8	-/-	Peak	-/-	1980	Peak	39.8
	AVG	-/-		AVG	-/-		AVG	-/-
2489	Peak	35.3	-/-	Peak	-/-	2489	Peak	35.3
	AVG	-/-		AVG	-/-		AVG	-/-
2790	Peak	35.2	-/-	Peak	-/-	2790	Peak	35.2
	AVG	-/-		AVG	-/-		AVG	-/-
4784	Peak	51.0	-/-	Peak	-/-	4794	Peak	42.0
	AVG	42.5		AVG	-/-		AVG	-/-
7174	Peak	45.3	-/-	Peak	-/-	7192	Peak	46.9
	AVG	-/-		AVG	-/-		AVG	-/-
9565	Peak	39.9	-/-	Peak	-/-	9586	Peak	39.3
	AVG	-/-		AVG	-/-		AVG	-/-
17860	Peak	43.0	-/-	Peak	-/-	17880	Peak	43.0
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
For emissions above 18 GHz, please look at the plots.								

**Results:** Transmitter mode, right module

Transmitter unwanted radiation [dBµV/m]								
2363 MHz			2382 MHz			2387 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please look at the table below the 1 GHz plot.								
1619	Peak	38.6	1619	Peak	38.6	1619	Peak	44.0
	QPK	-/-		QPK	-/-		QPK	-/-
1800	Peak	38.1	1800	Peak	38.1	1800	Peak	38.1
	QPK	-/-		QPK	-/-		QPK	-/-
1860	Peak	41.5	1860	Peak	41.5	1860	Peak	41.5
	QPK	-/-		QPK	-/-		QPK	-/-
1919	Peak	43.1	1919	Peak	43.1	1919	Peak	43.1
	AVG	-/-		AVG	-/-		AVG	-/-
1979	Peak	39.0	1979	Peak	39.0	1979	Peak	39.0
	AVG	-/-		AVG	-/-		AVG	-/-
2130	Peak	37.8	2130	Peak	37.8	2130	Peak	37.8
	AVG	-/-		AVG	-/-		AVG	-/-
2430	Peak	36.0	2430	Peak	36.0	2430	Peak	36.0
	AVG	-/-		AVG	-/-		AVG	-/-
2790	Peak	36.6	2790	Peak	36.6	2790	Peak	36.6
	AVG	-/-		AVG	-/-		AVG	-/-
4726	Peak	50.0	4764	Peak	52.5	4774	Peak	50.2
	AVG	42.8		AVG	44.9		AVG	42.0
7090	Peak	39.0	7147	Peak	44.2	6926	Peak	39.7
	AVG	-/-		AVG	-/-		AVG	-/-
14133	Peak	40.1	14133	Peak	40.1	14133	Peak	40.1
	AVG	-/-		AVG	-/-		AVG	-/-
17740	Peak	43.5	17740	Peak	43.5	17740	Peak	43.5
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
For emissions above 18 GHz, please look at the plots.								

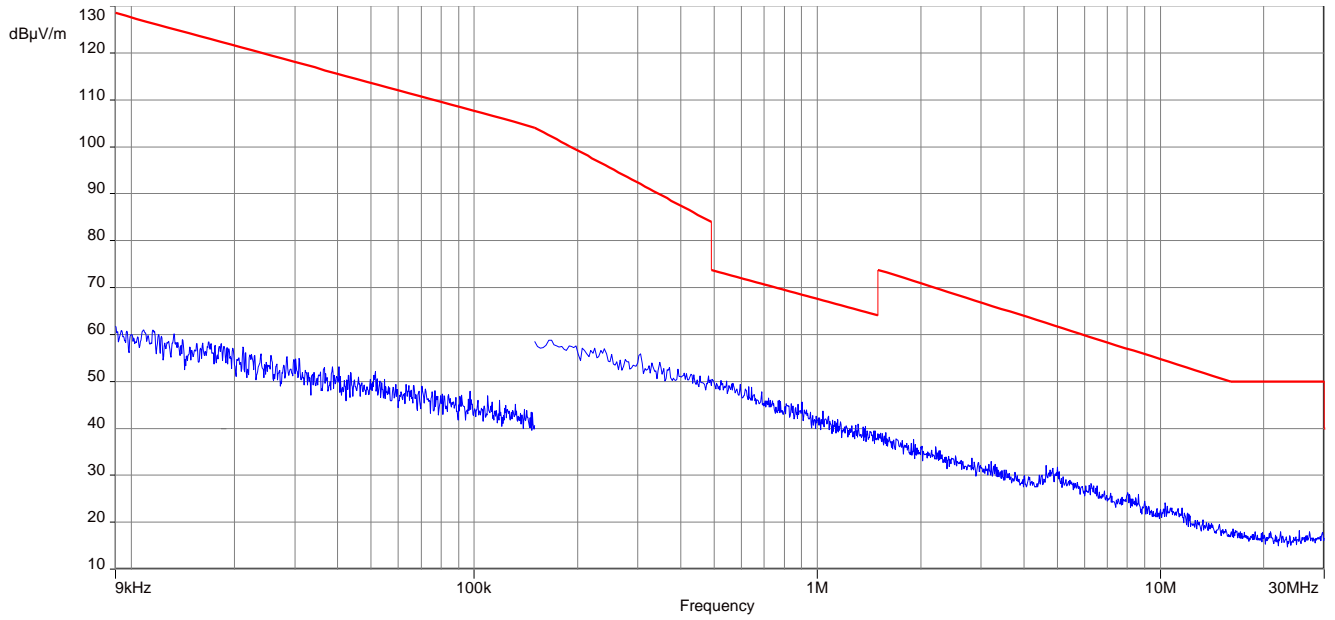
**Results:** Transmitter mode, right module

Transmitter unwanted radiation [dBµV/m]								
2392 MHz			-/-			2397 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please look at the table below the 1 GHz plot.								
1619	Peak	44.0	-/-	Peak	-/-	1619	Peak	44.0
	QPK	-/-		QPK	-/-		QPK	-/-
1800	Peak	38.1	-/-	Peak	-/-	1800	Peak	38.1
	QPK	-/-		QPK	-/-		QPK	-/-
1860	Peak	41.5	-/-	Peak	-/-	1860	Peak	41.5
	QPK	-/-		AVG	-/-		QPK	-/-
1919	Peak	43.1	-/-	Peak	-/-	1919	Peak	43.1
	AVG	-/-		AVG	-/-		AVG	-/-
1979	Peak	39.0	-/-	Peak	-/-	1979	Peak	39.0
	AVG	-/-		AVG	-/-		AVG	-/-
2130	Peak	37.8	-/-	Peak	-/-	2130	Peak	37.8
	AVG	-/-		AVG	-/-		AVG	-/-
2430	Peak	36.0	-/-	Peak	-/-	2430	Peak	36.0
	AVG	-/-		AVG	-/-		AVG	-/-
2790	Peak	36.6	-/-	Peak	-/-	2790	Peak	36.6
	AVG	-/-		AVG	-/-		AVG	-/-
4782	Peak	53.1	-/-	Peak	-/-	4795	Peak	53.5
	AVG	44.9		AVG	-/-		AVG	45.7
7177	Peak	56.9	-/-	Peak	-/-	7191	Peak	45.7
	AVG	48.9		AVG	-/-		AVG	-/-
14133	Peak	40.1	-/-	Peak	-/-	14133	Peak	40.1
	AVG	-/-		AVG	-/-		AVG	-/-
17740	Peak	43.5	-/-	Peak	-/-	17740	Peak	43.5
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
For emissions above 18 GHz, please look at the plots.								

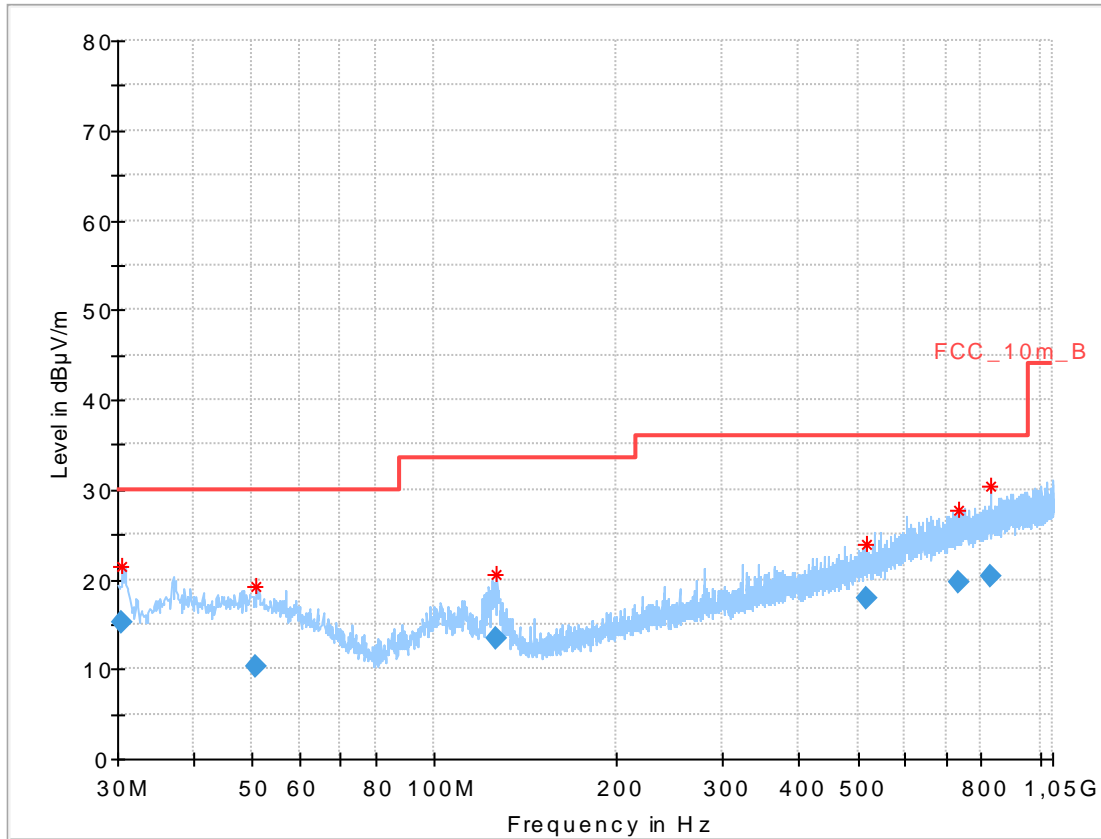


**Plots:** left module

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



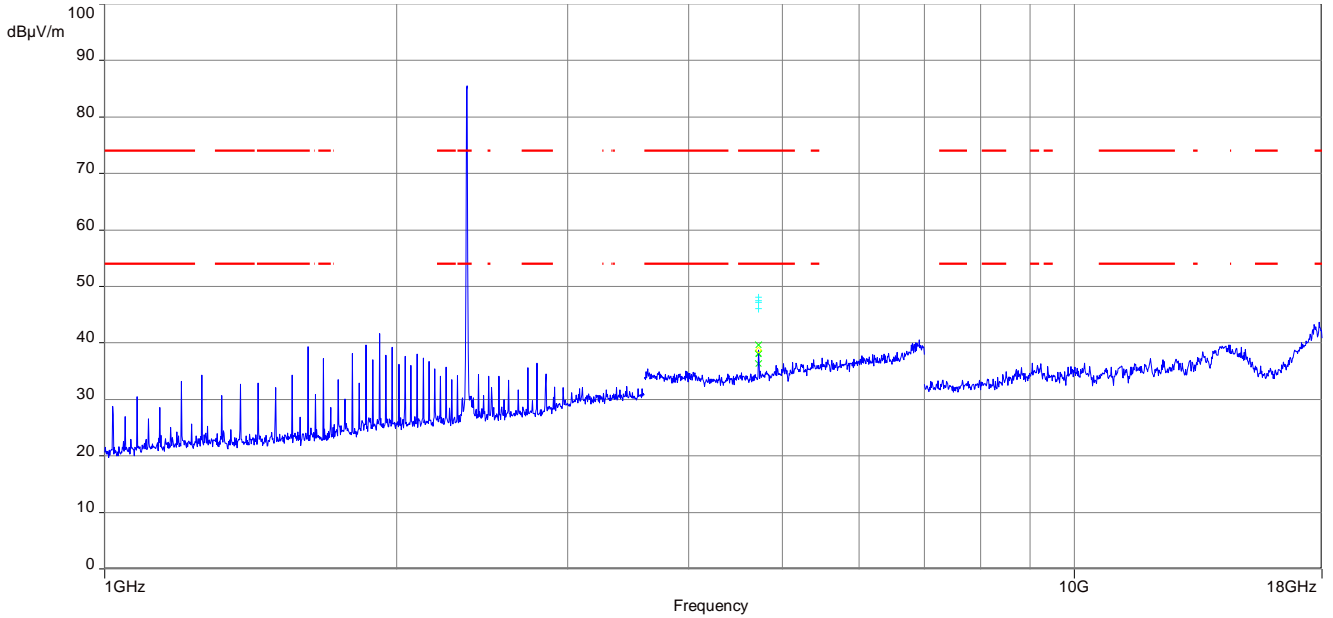
**Plot 2:** 30 MHz – 1 GHz, channel low, lower band



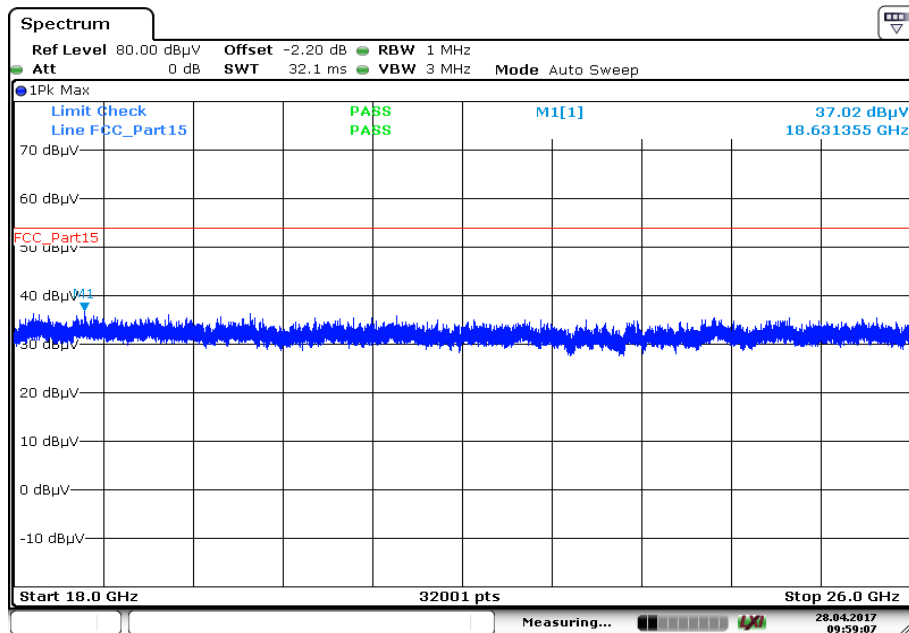
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.380250	15.13	30.00	14.87	1000.0	120.000	101.0	V	139.0	11.9
50.573700	10.31	30.00	19.69	1000.0	120.000	101.0	H	125.0	13.7
126.712650	13.46	33.50	20.04	1000.0	120.000	101.0	V	46.0	9.8
515.427150	17.86	36.00	18.14	1000.0	120.000	178.0	H	176.0	18.9
731.585100	19.58	36.00	16.42	1000.0	120.000	180.0	H	46.0	22.3
829.966500	20.44	36.00	15.56	1000.0	120.000	185.0	V	346.0	23.2

**Plot 3:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel low, lower band

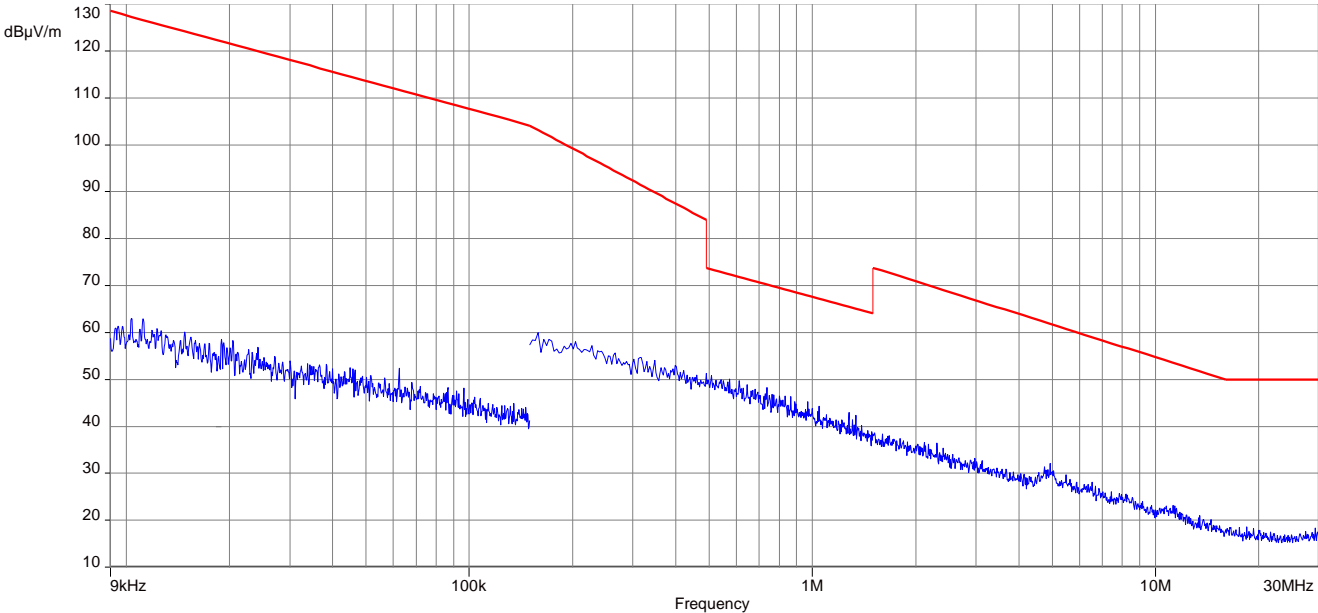


**Plot 4:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel low, lower band

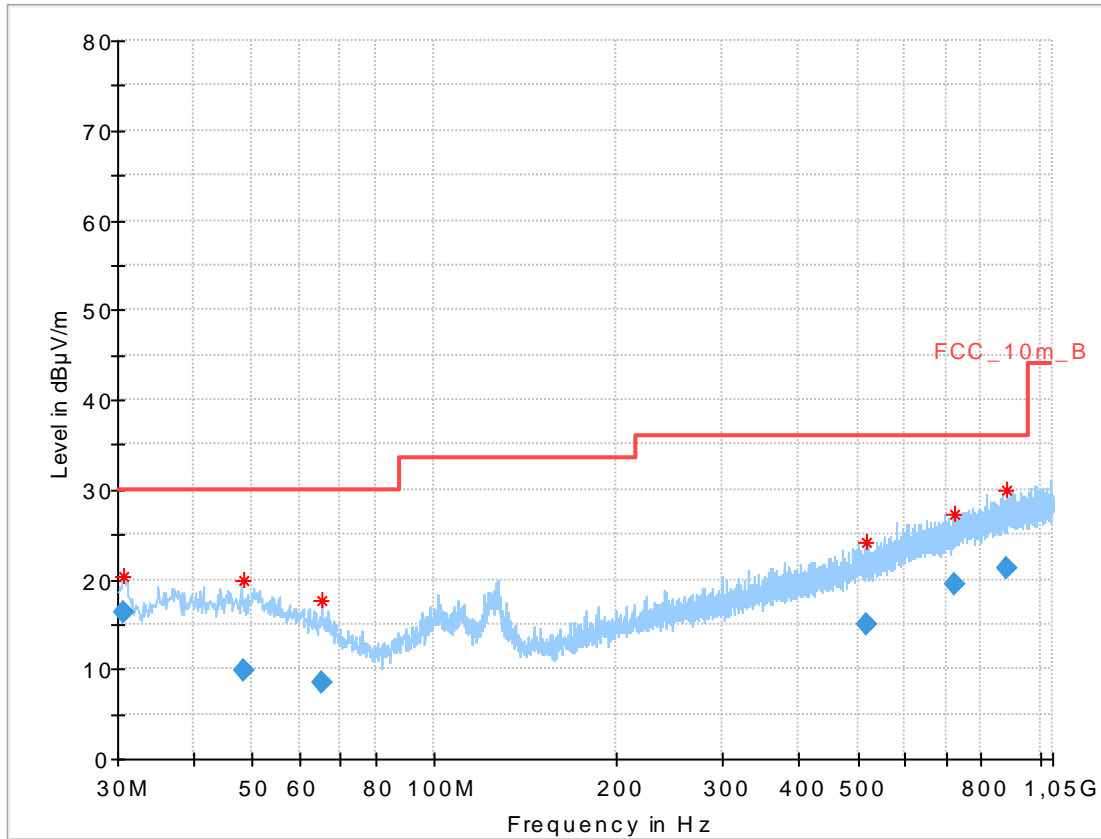


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**Plot 5:** 9 kHz – 30 MHz, channel mid, lower band



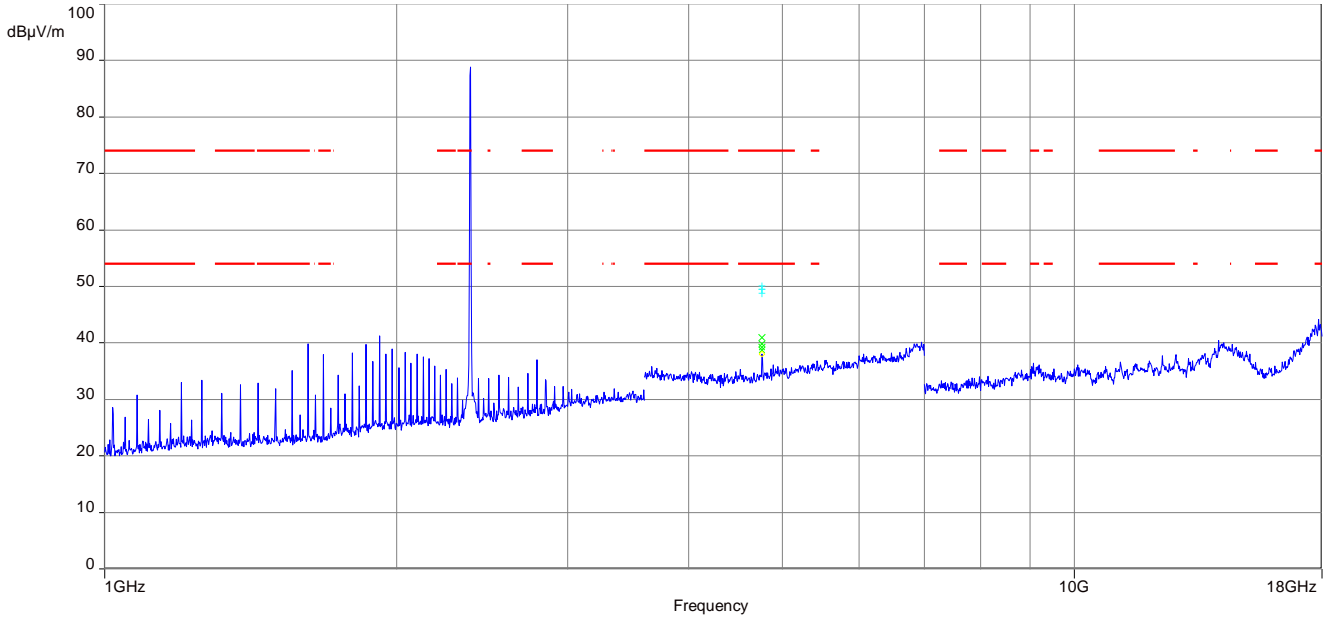
**Plot 6:** 30 MHz – 1 GHz, channel mid, lower band



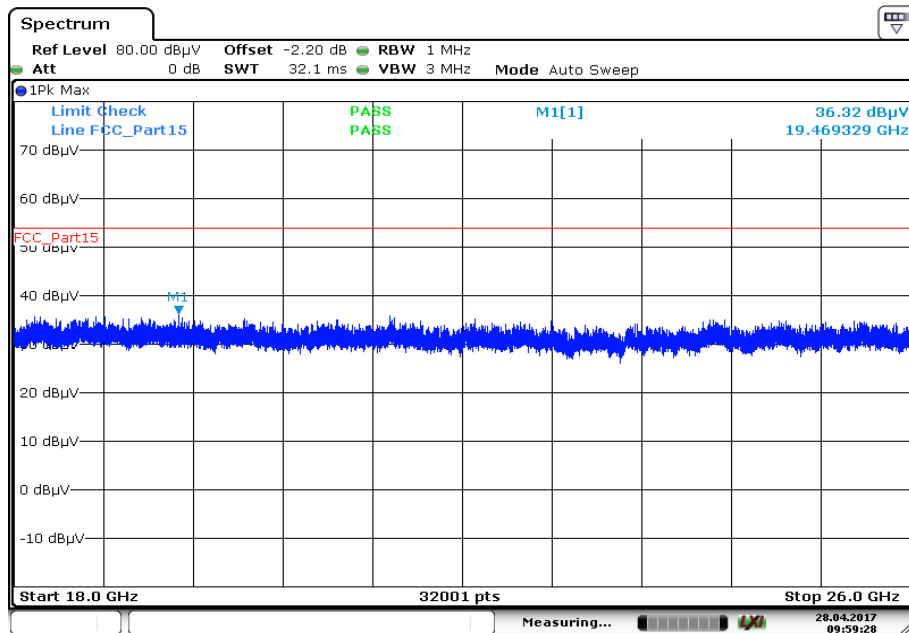
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.740648	16.24	30.00	13.76	1000.0	120.000	101.0	V	331.0	12.0
48.478500	9.76	30.00	20.24	1000.0	120.000	101.0	V	176.0	13.7
65.027700	8.48	30.00	21.52	1000.0	120.000	98.0	V	208.0	10.7
515.725200	15.08	36.00	20.92	1000.0	120.000	178.0	V	54.0	18.9
724.745850	19.44	36.00	16.56	1000.0	120.000	179.0	V	112.0	22.1
879.490950	21.25	36.00	14.75	1000.0	120.000	101.0	H	36.0	23.9

**Plot 7:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel mid, lower band

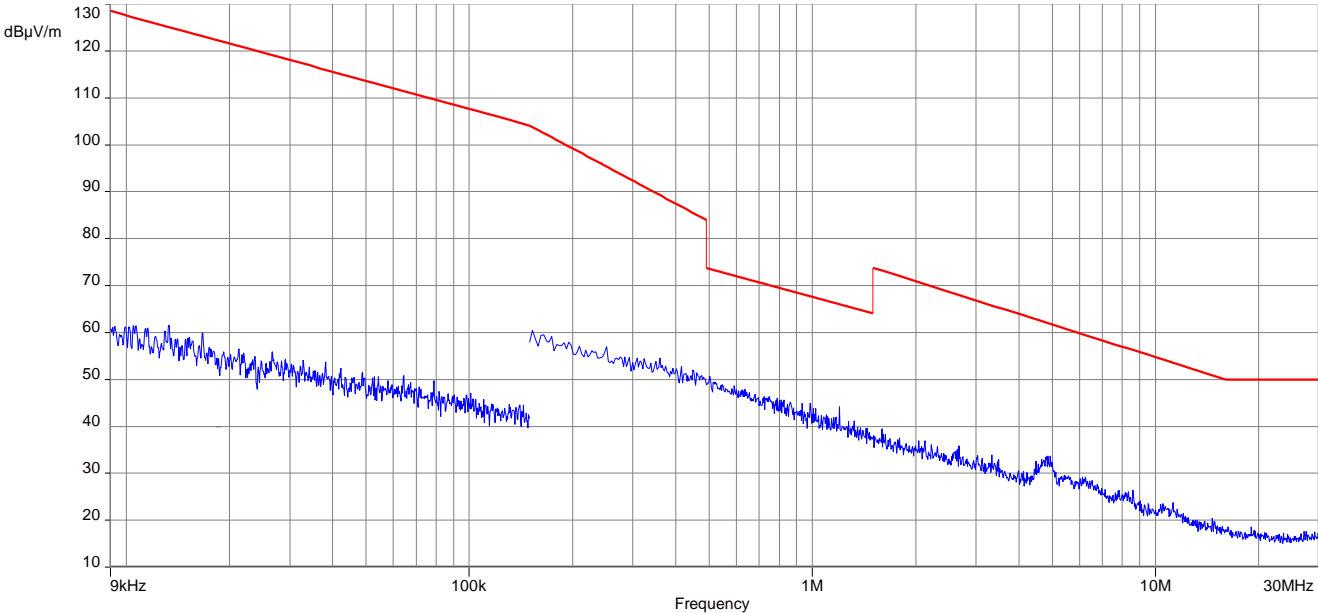


**Plot 8:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel mid, lower band

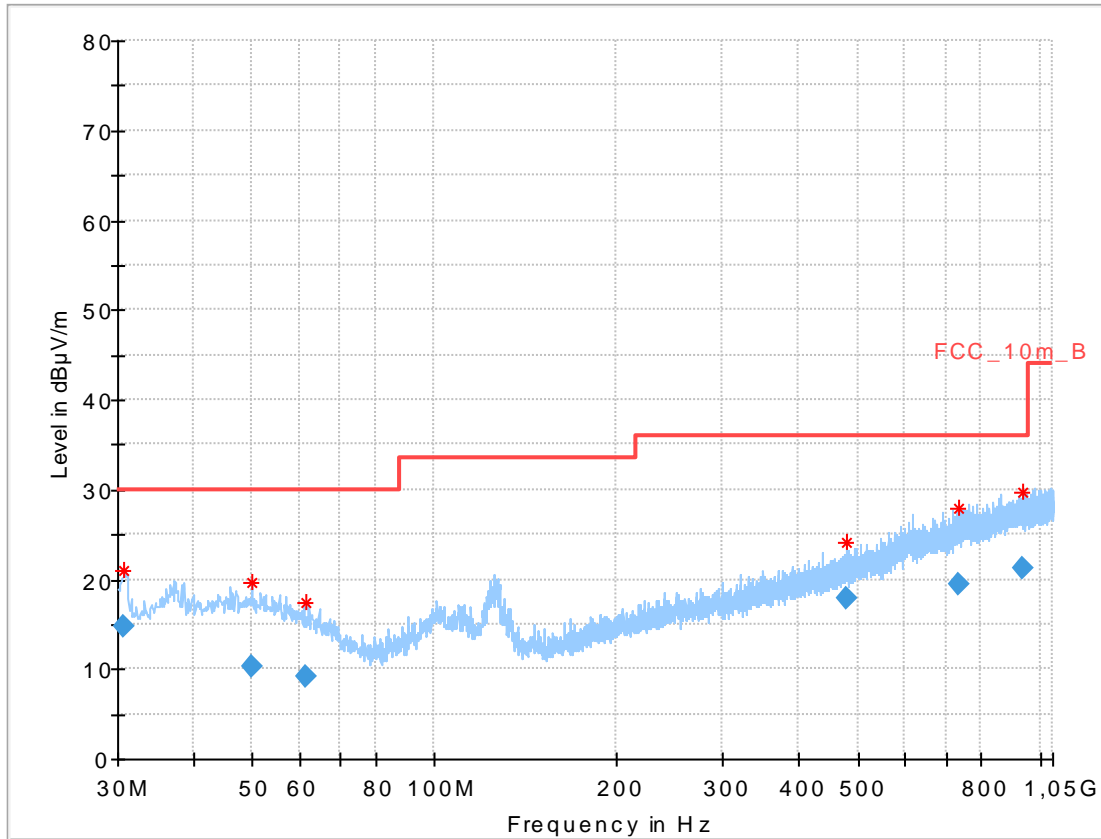


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**Plot 9:** 9 kHz – 30 MHz, channel high, lower band



**Plot 10:** 30 MHz – 1 GHz, channel high, lower band

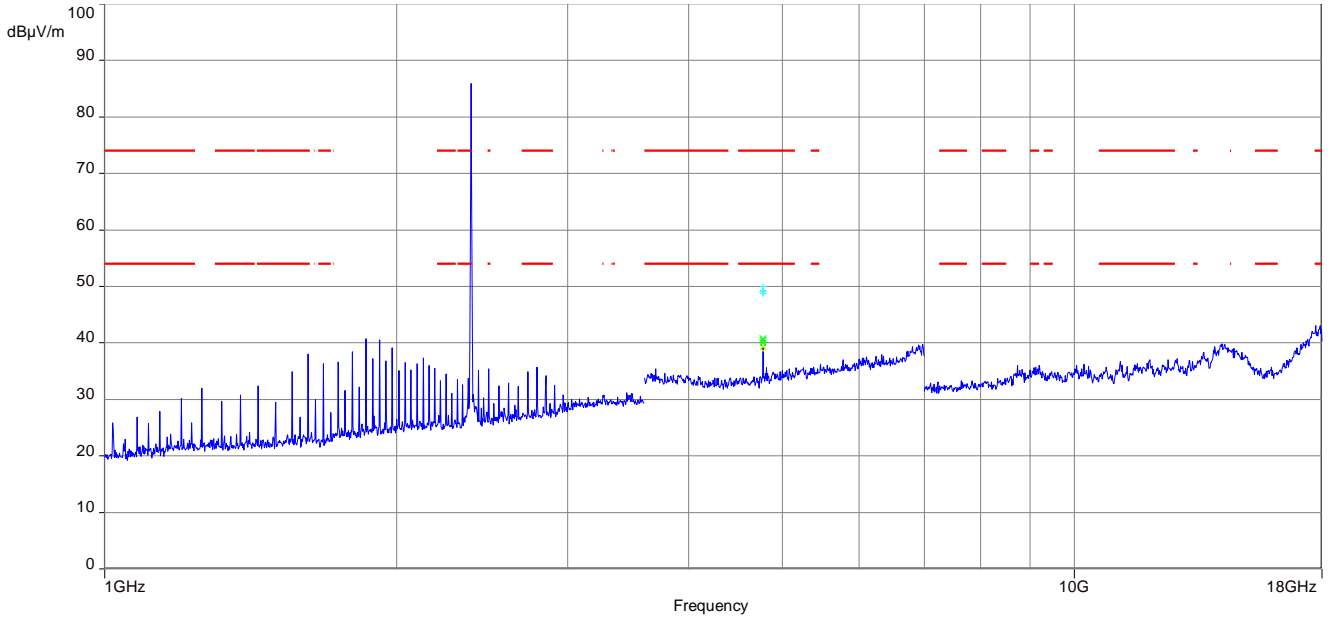


**Final results:**

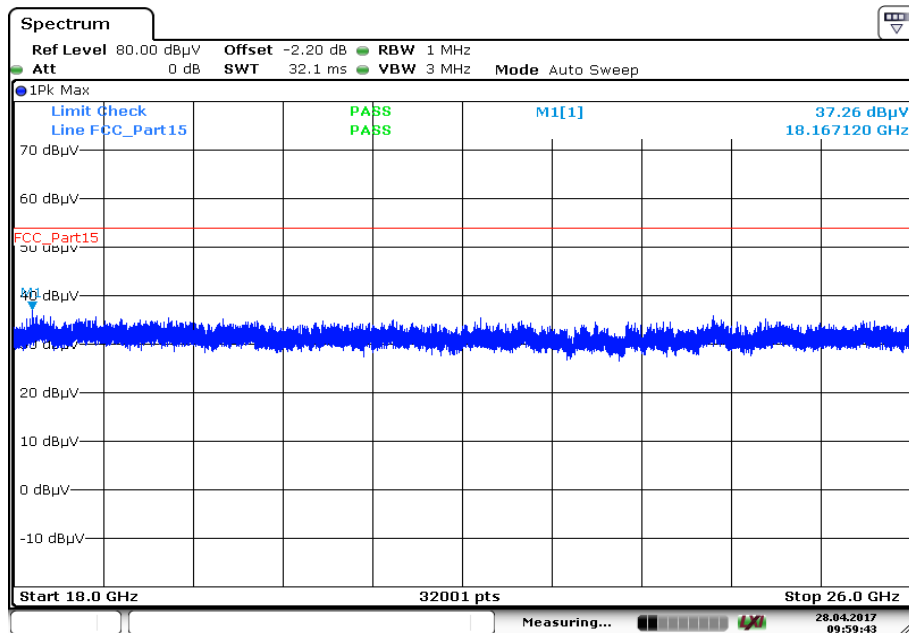
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.637050	14.77	30.00	15.23	1000.0	120.000	179.0	V	208.0	11.9
50.094000	10.29	30.00	19.71	1000.0	120.000	98.0	H	260.0	13.7
61.409250	9.15	30.00	20.85	1000.0	120.000	101.0	V	53.0	11.5
480.034800	17.90	36.00	18.10	1000.0	120.000	100.0	V	353.0	18.3
731.881950	19.52	36.00	16.48	1000.0	120.000	185.0	H	340.0	22.3
935.071350	21.27	36.00	14.73	1000.0	120.000	185.0	V	292.0	24.3



**Plot 11:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel high, lower band

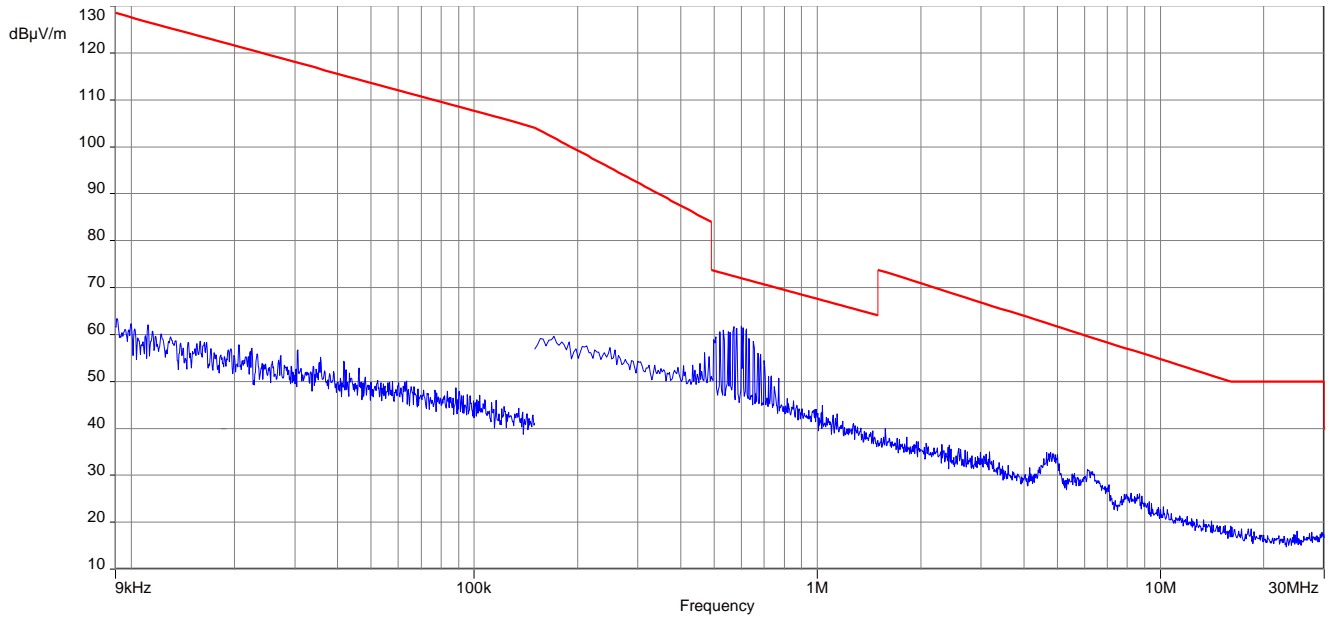


**Plot 12:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel high, lower band

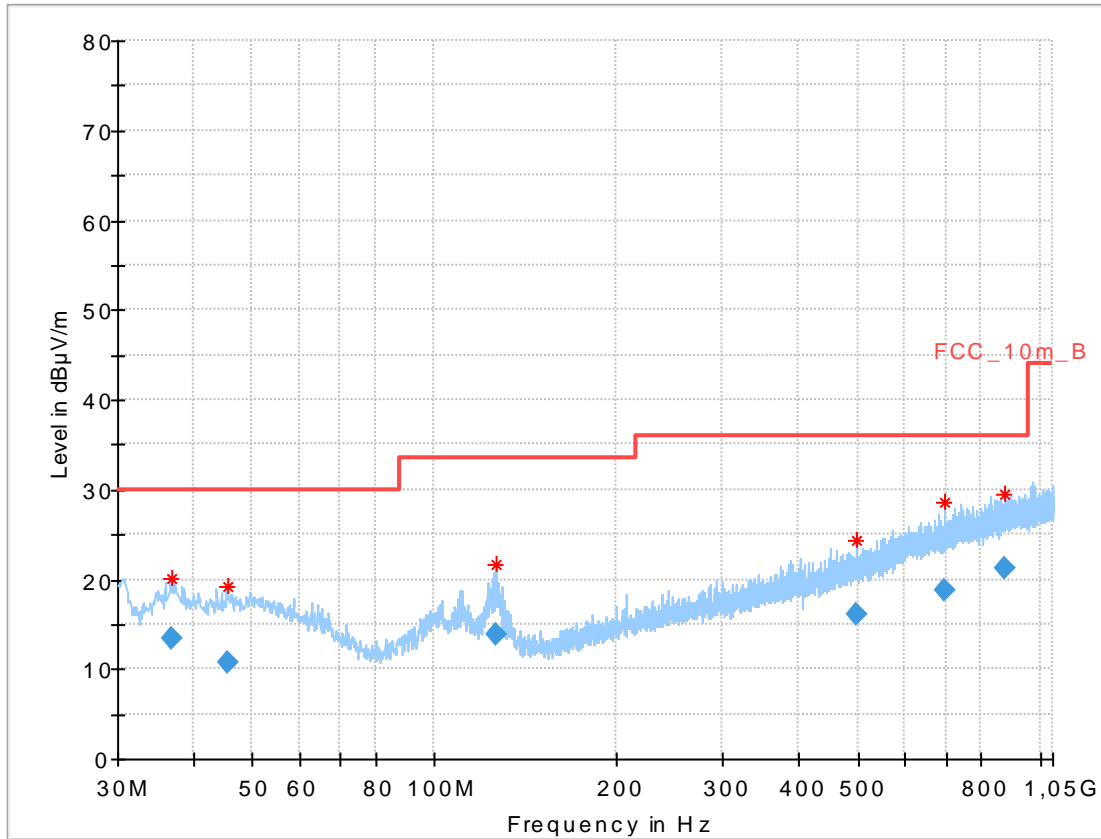


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**Plot 13:** 9 kHz – 30 MHz, channel low, upper band



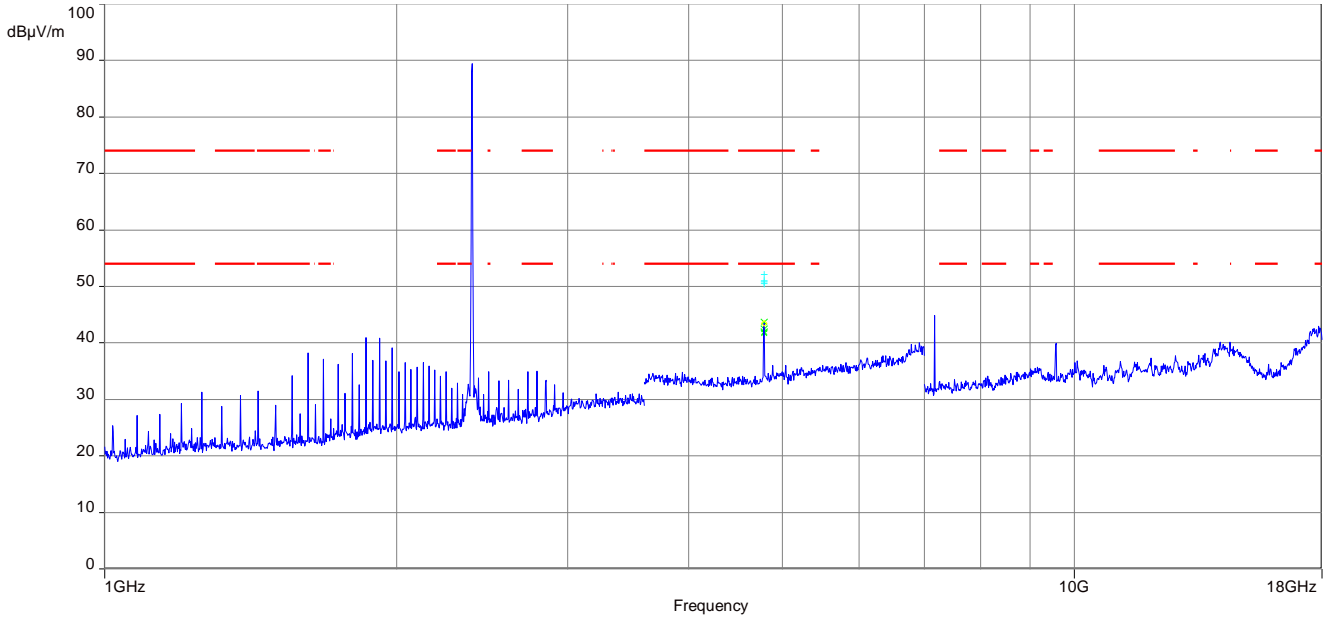
**Plot 14:** 30 MHz – 1 GHz, channel low, upper band



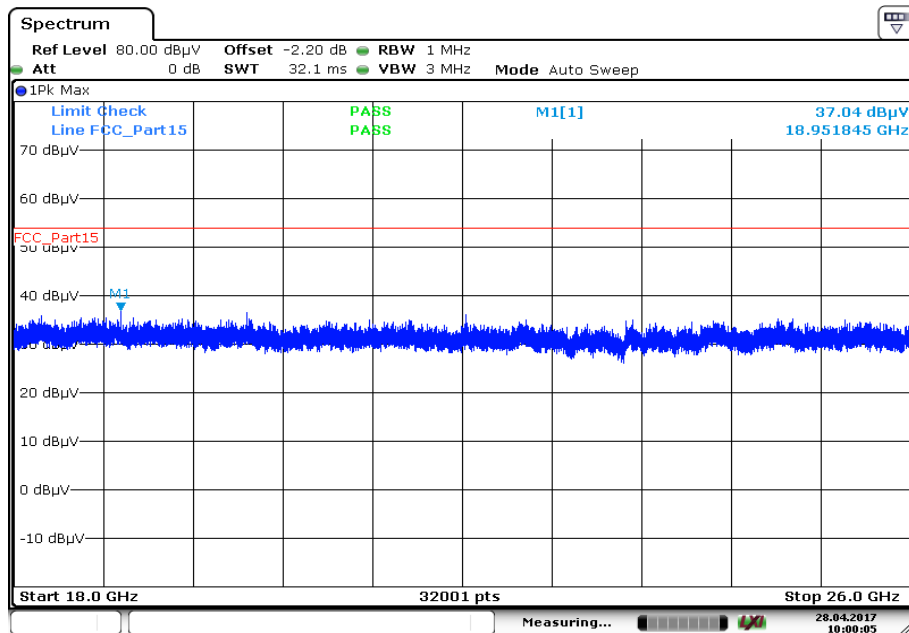
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
36.868950	13.36	30.00	16.64	1000.0	120.000	101.0	V	353.0	12.9
45.730650	10.64	30.00	19.36	1000.0	120.000	101.0	V	11.0	13.6
126.931800	13.94	33.50	19.56	1000.0	120.000	101.0	V	80.0	9.8
497.939850	15.99	36.00	20.01	1000.0	120.000	98.0	V	347.0	18.7
697.958400	18.80	36.00	17.20	1000.0	120.000	101.0	V	39.0	21.5
871.800300	21.21	36.00	14.79	1000.0	120.000	185.0	V	262.0	23.8

**Plot 15:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel low, upper band

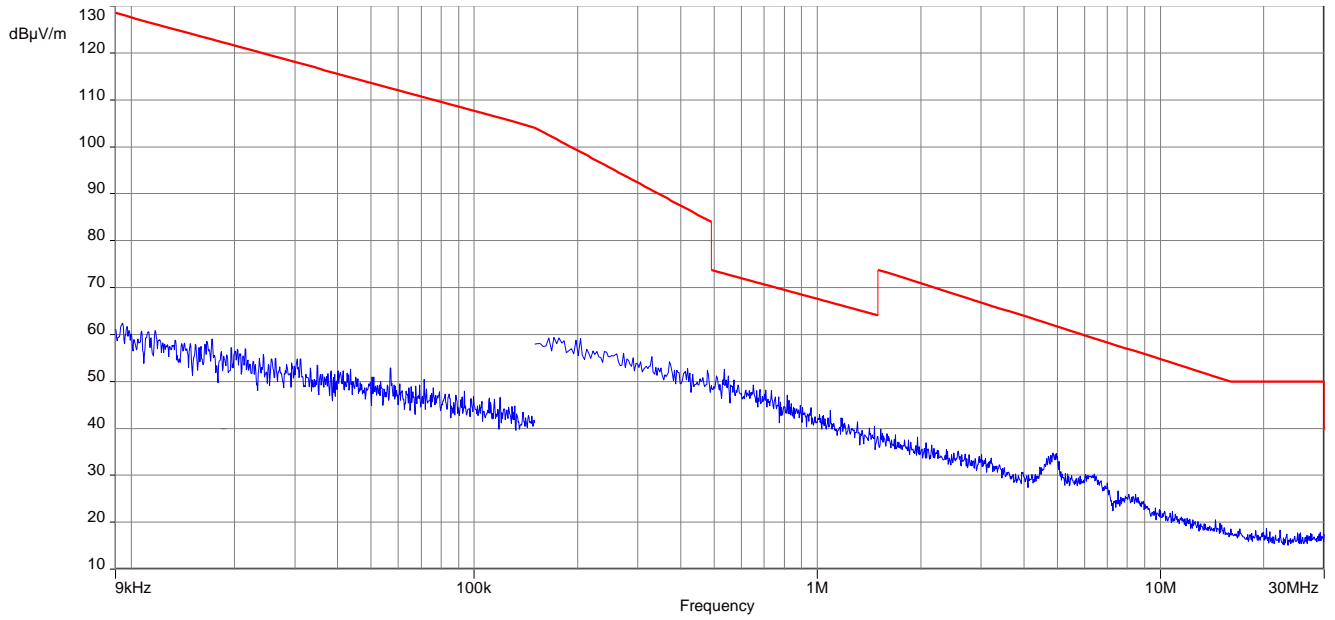


**Plot 16:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel low, upper band

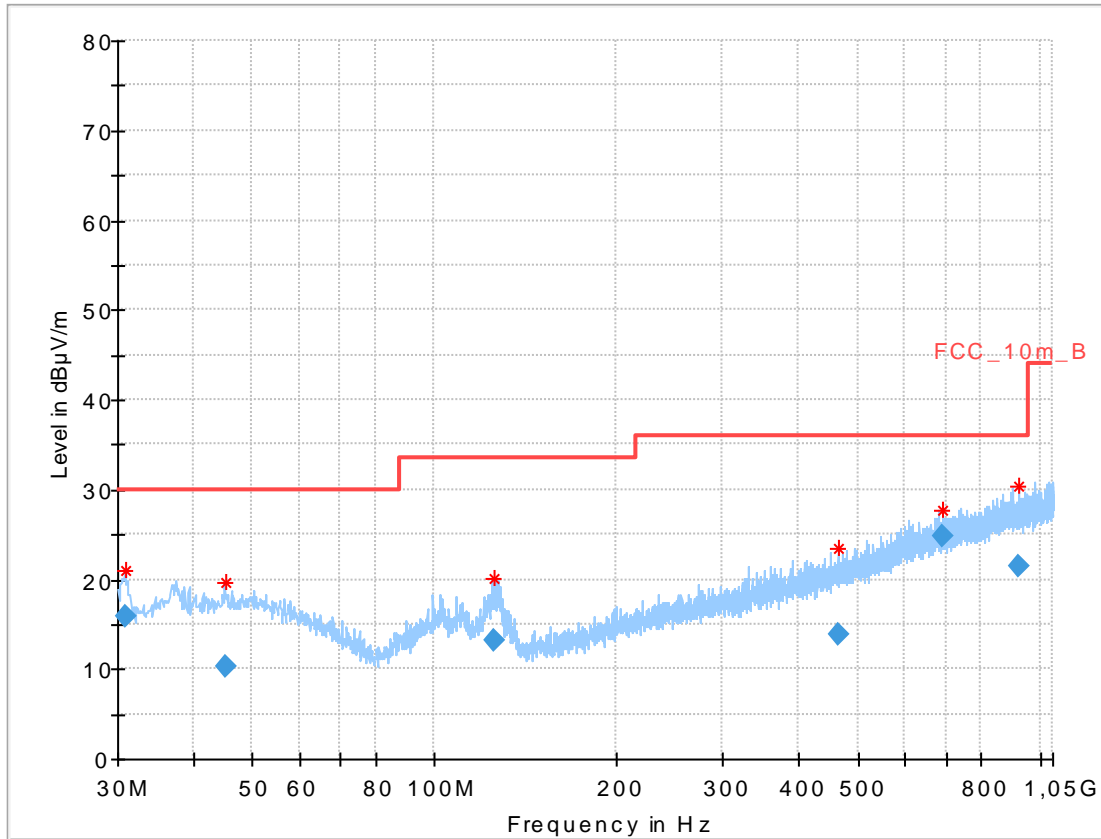


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**Plot 17:** 9 kHz – 30 MHz, channel high, upper band



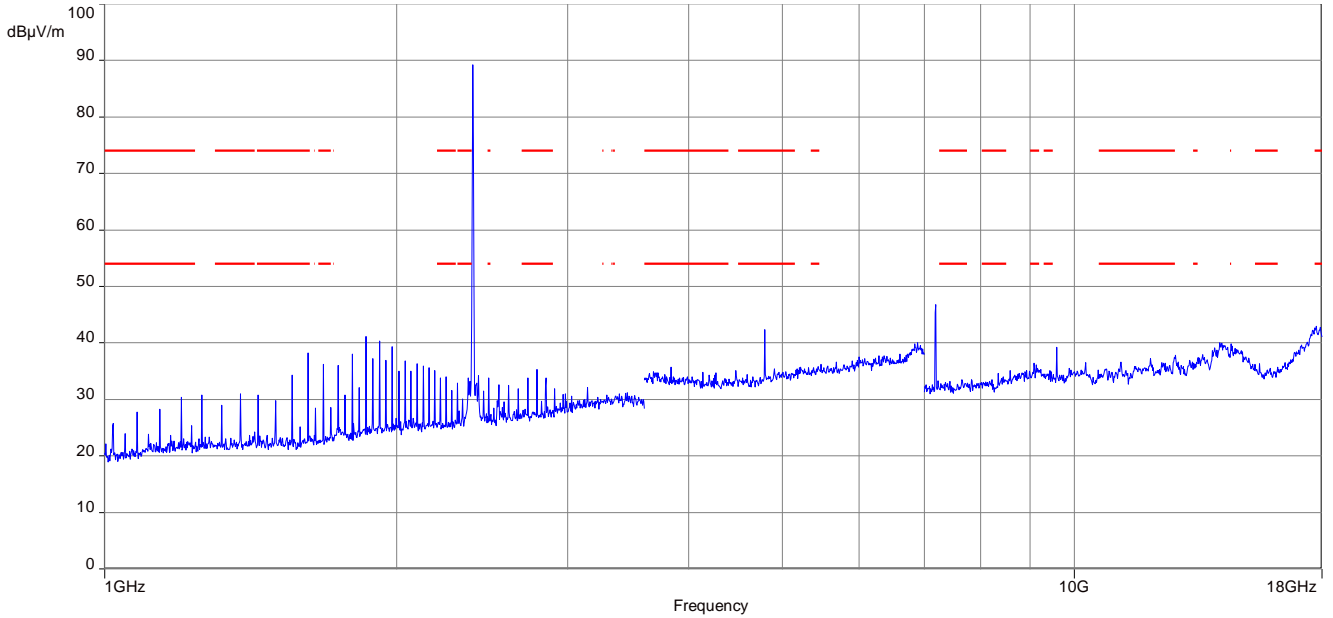
**Plot 18:** 30 MHz – 1 GHz, channel high, upper band



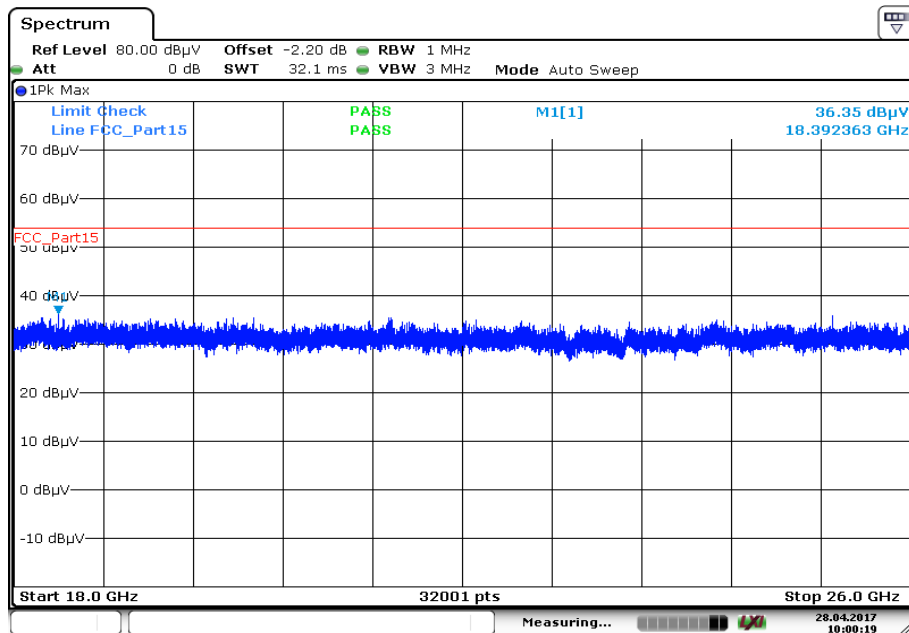
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.982500	15.84	30.00	14.16	1000.0	120.000	101.0	V	70.0	12.0
45.221250	10.27	30.00	19.73	1000.0	120.000	101.0	H	20.0	13.6
125.193450	13.28	33.50	20.22	1000.0	120.000	98.0	V	45.0	9.9
463.558050	13.90	36.00	22.10	1000.0	120.000	98.0	H	288.0	17.9
689.992350	24.81	36.00	11.19	1000.0	120.000	100.0	H	148.0	21.5
925.855650	21.36	36.00	14.64	1000.0	120.000	178.0	H	82.0	24.3

**Plot 19:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel high, upper band



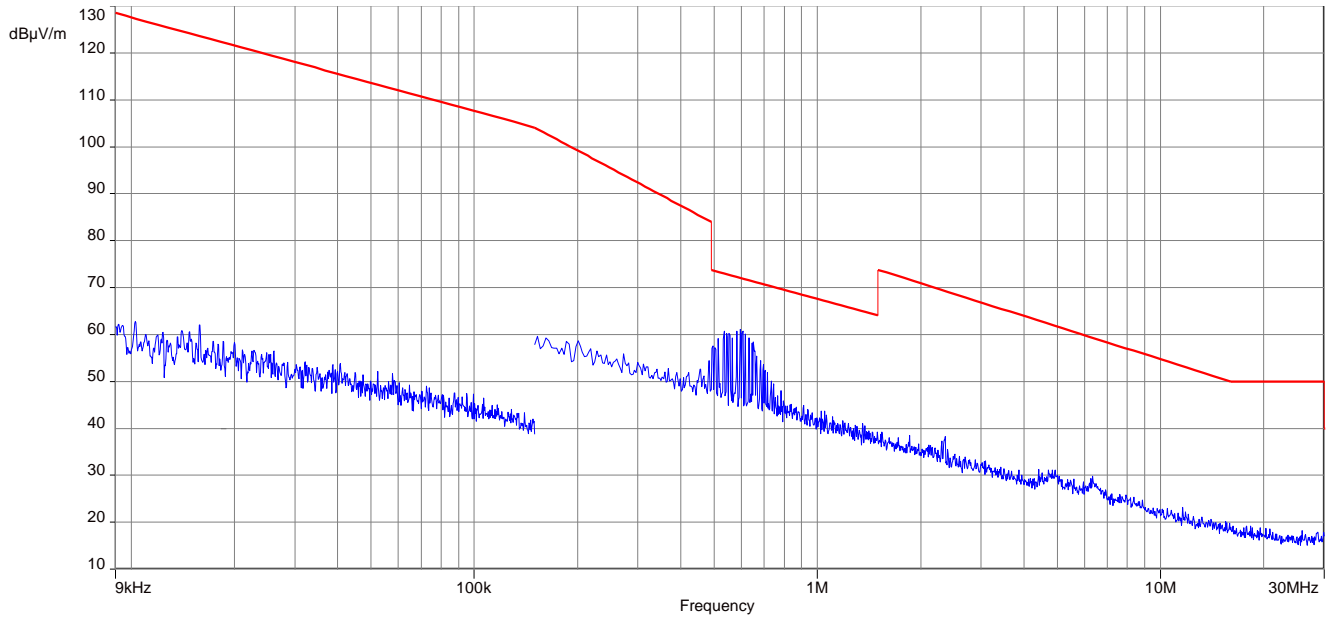
**Plot 20:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel high, upper band



Date: 28.APR.2017 10:00:19

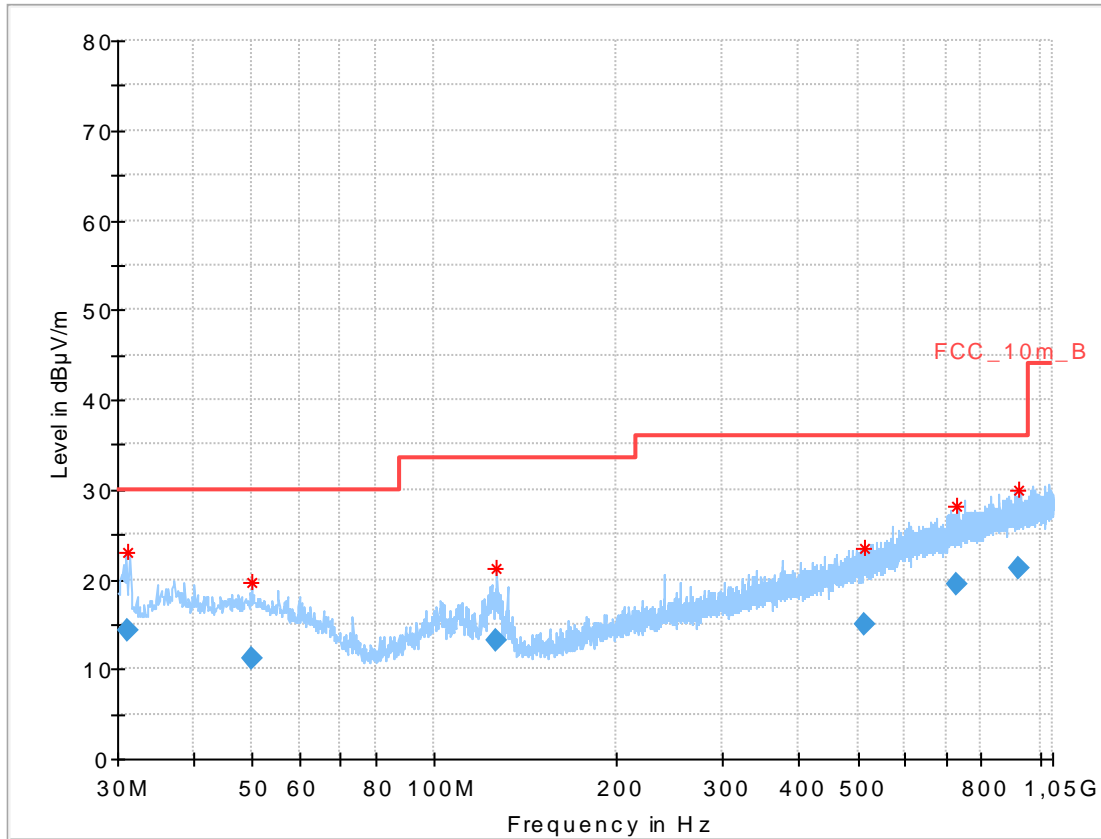
**Plots:** right module

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





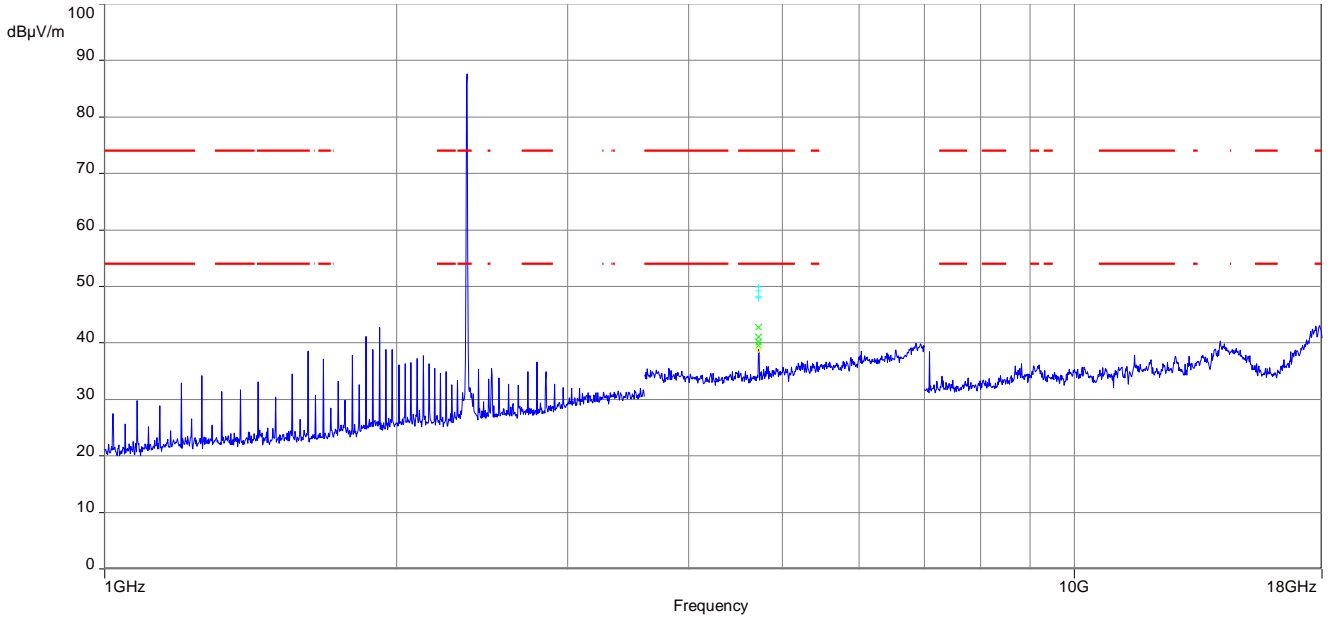
**Plot 2:** 30 MHz – 1 GHz, channel low, lower band



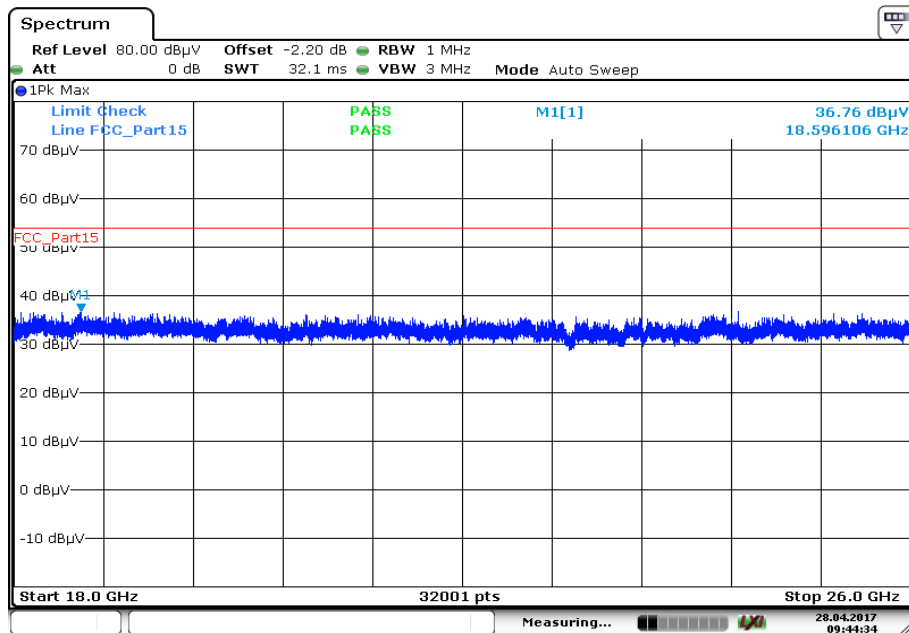
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.131150	14.29	30.00	15.71	1000.0	120.000	101.0	V	295.0	12.0
49.946700	11.14	30.00	18.86	1000.0	120.000	98.0	V	94.0	13.7
126.779250	13.11	33.50	20.39	1000.0	120.000	101.0	V	134.0	9.8
512.538750	15.07	36.00	20.93	1000.0	120.000	185.0	H	101.0	18.9
726.730800	19.39	36.00	16.61	1000.0	120.000	98.0	H	203.0	22.2
924.291300	21.24	36.00	14.76	1000.0	120.000	185.0	H	295.0	24.3

**Plot 3:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel low, lower band

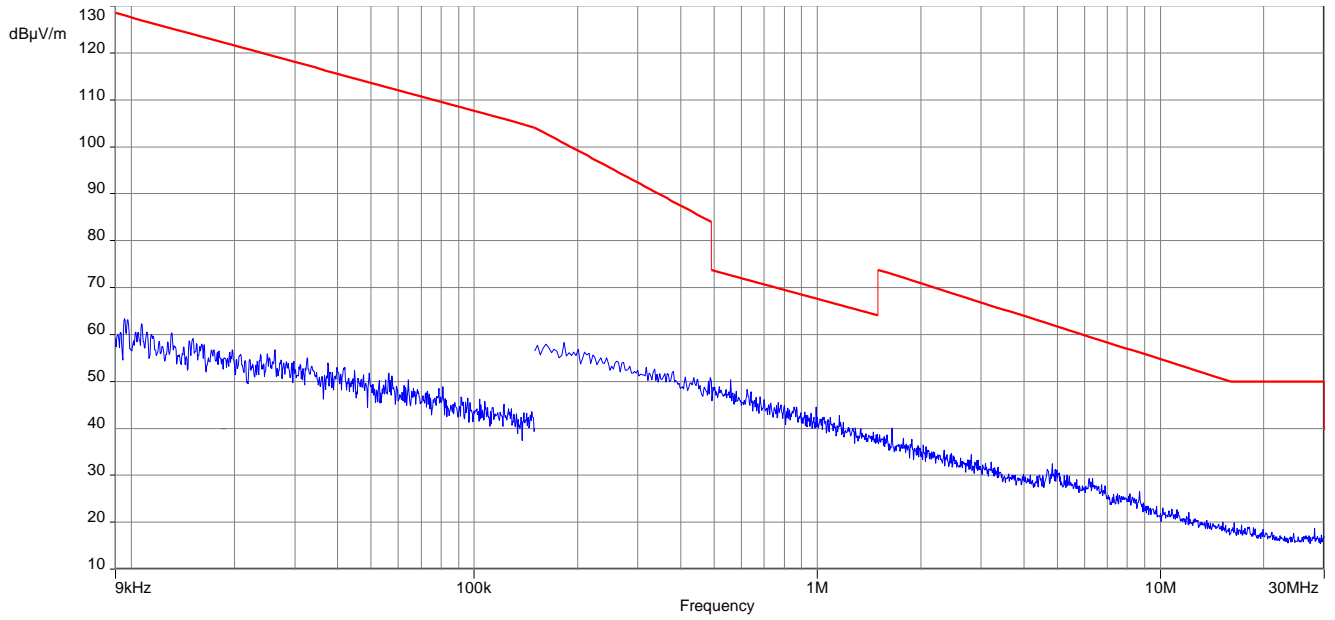


**Plot 4:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel low, lower band

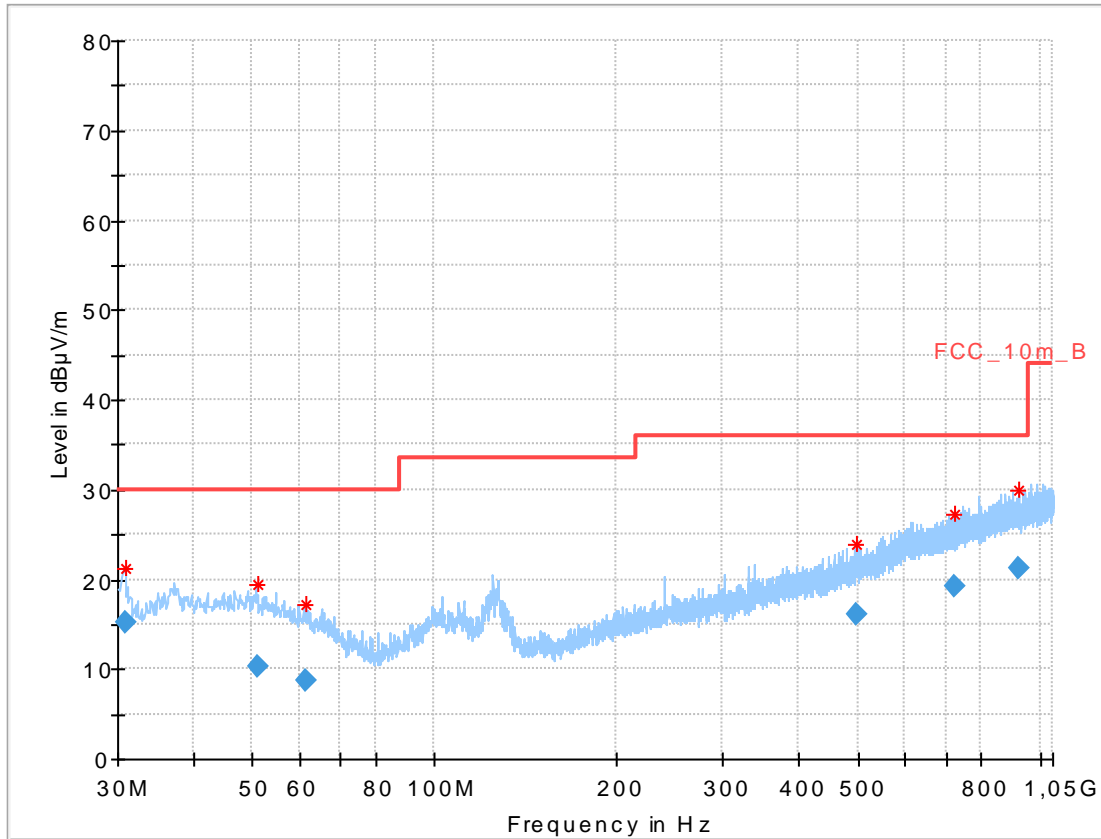


Date: 28.APR.2017 09:44:34

**Plot 5:** 9 kHz – 30 MHz, channel mid, lower band



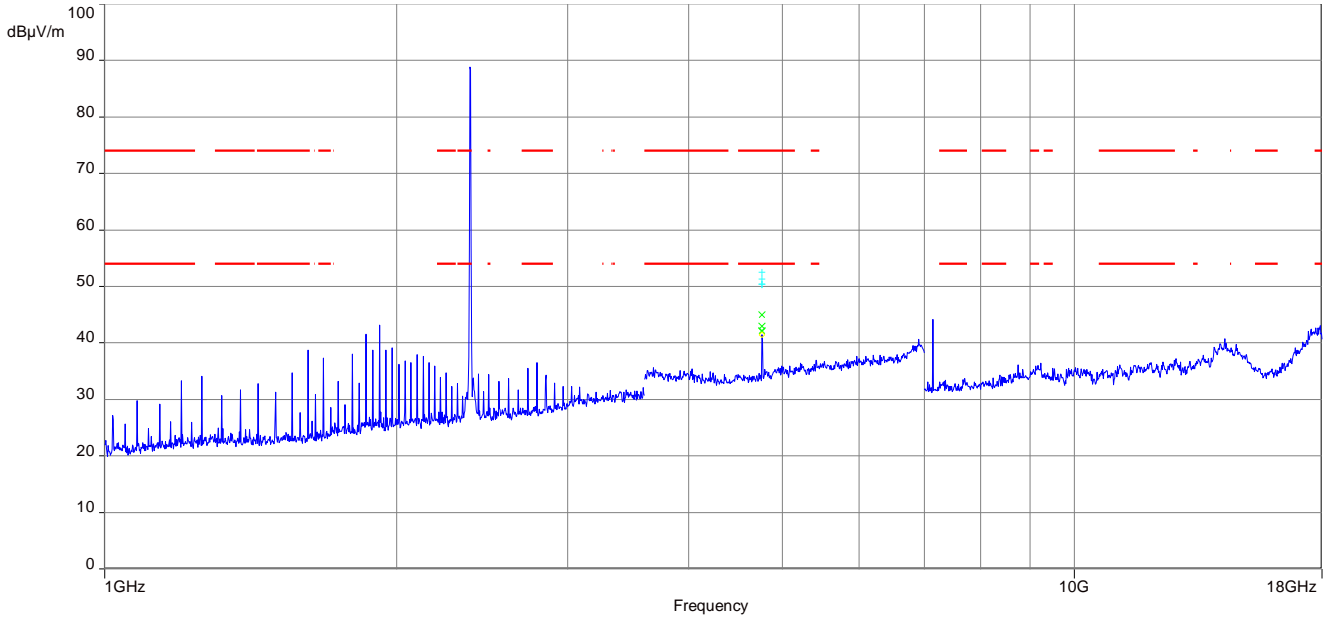
**Plot 6:** 30 MHz – 1 GHz, channel mid, lower band



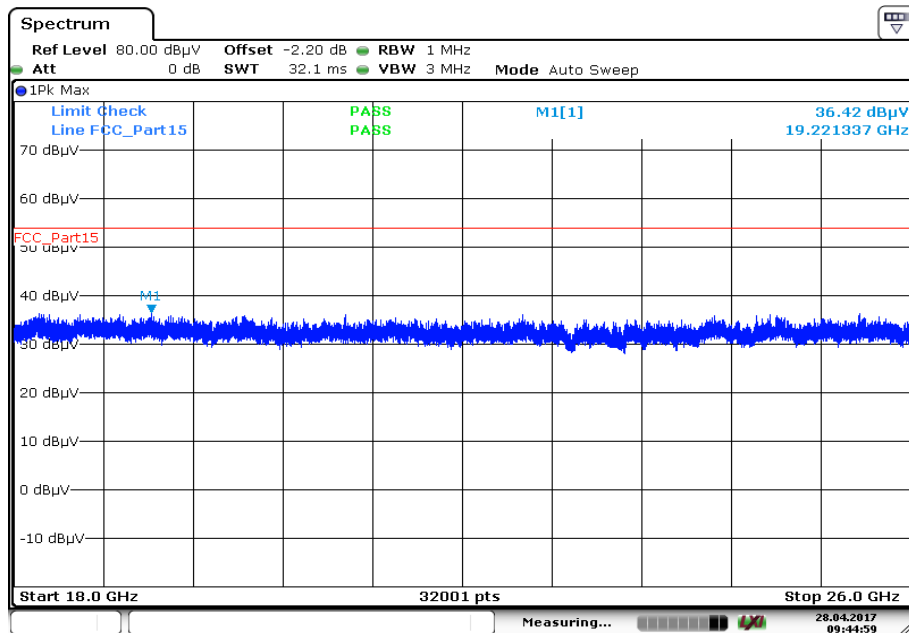
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.893100	15.23	30.00	14.77	1000.0	120.000	101.0	V	318.0	12.0
50.997000	10.28	30.00	19.72	1000.0	120.000	178.0	H	19.0	13.6
61.338150	8.82	30.00	21.18	1000.0	120.000	185.0	V	272.0	11.6
499.124700	16.03	36.00	19.97	1000.0	120.000	179.0	H	345.0	18.7
722.223450	19.30	36.00	16.70	1000.0	120.000	98.0	H	149.0	22.1
924.655950	21.25	36.00	14.75	1000.0	120.000	98.0	V	195.0	24.3

**Plot 7:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel mid, lower band

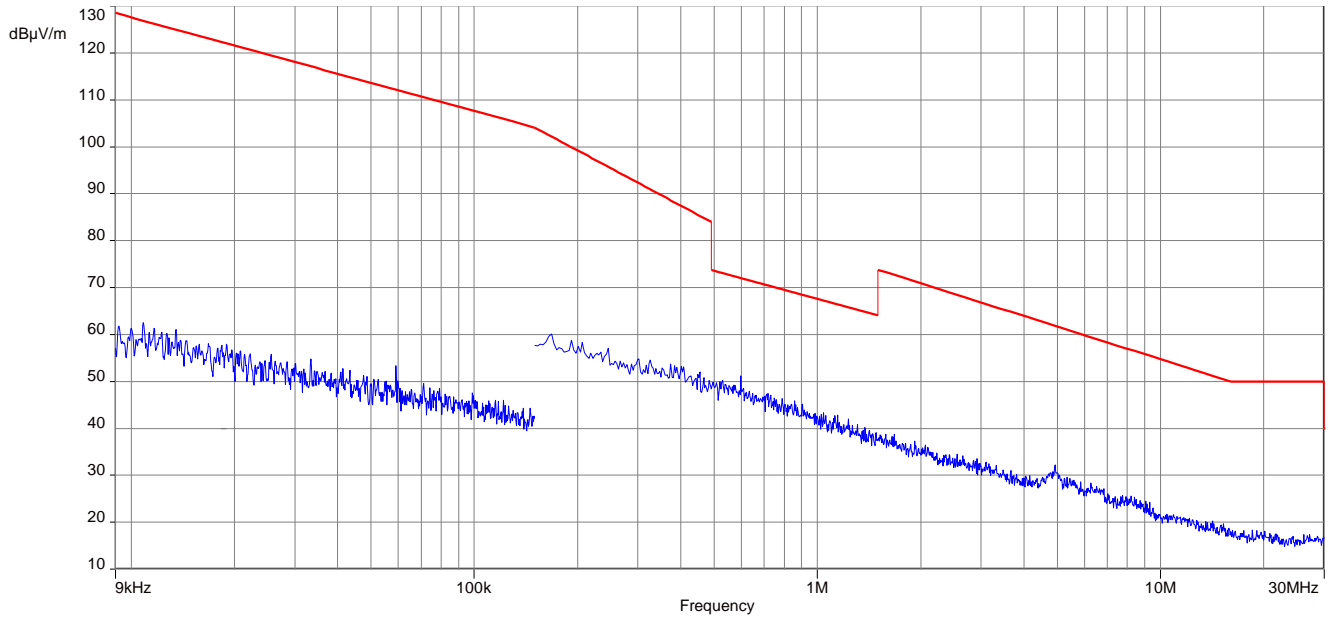


**Plot 8:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel mid, lower band

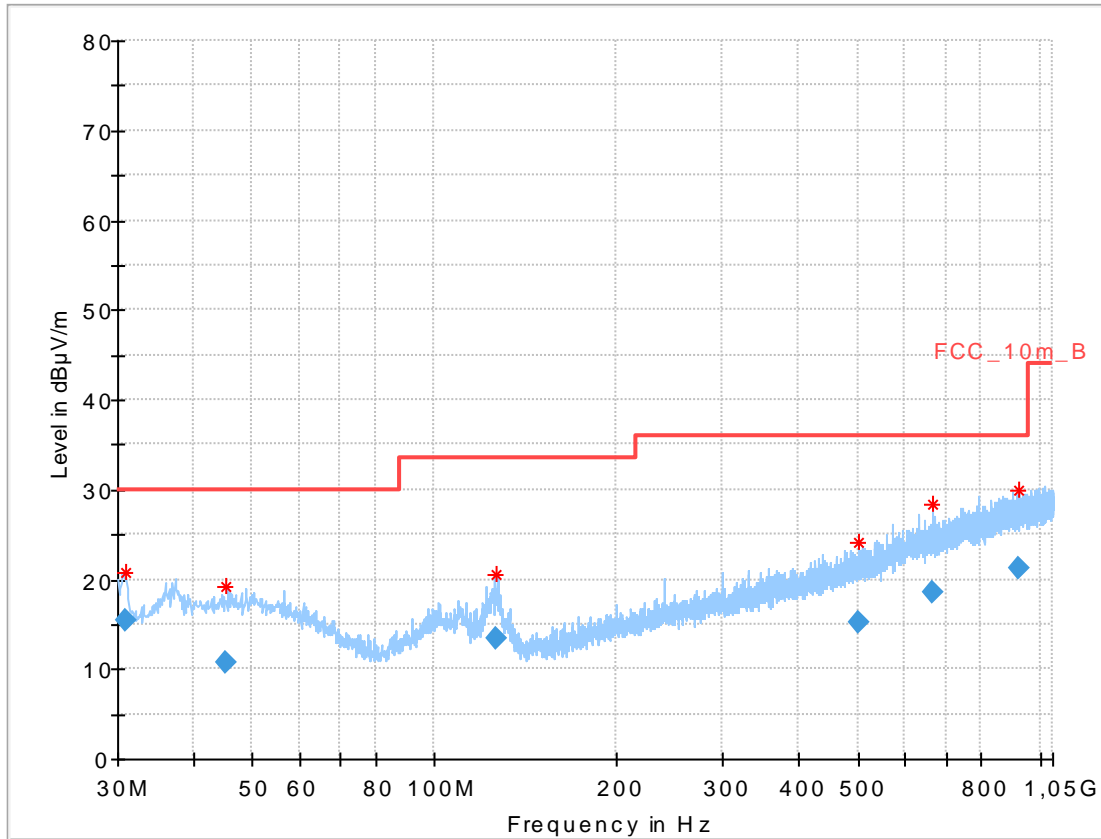


Date: 28.APR.2017 09:44:59

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



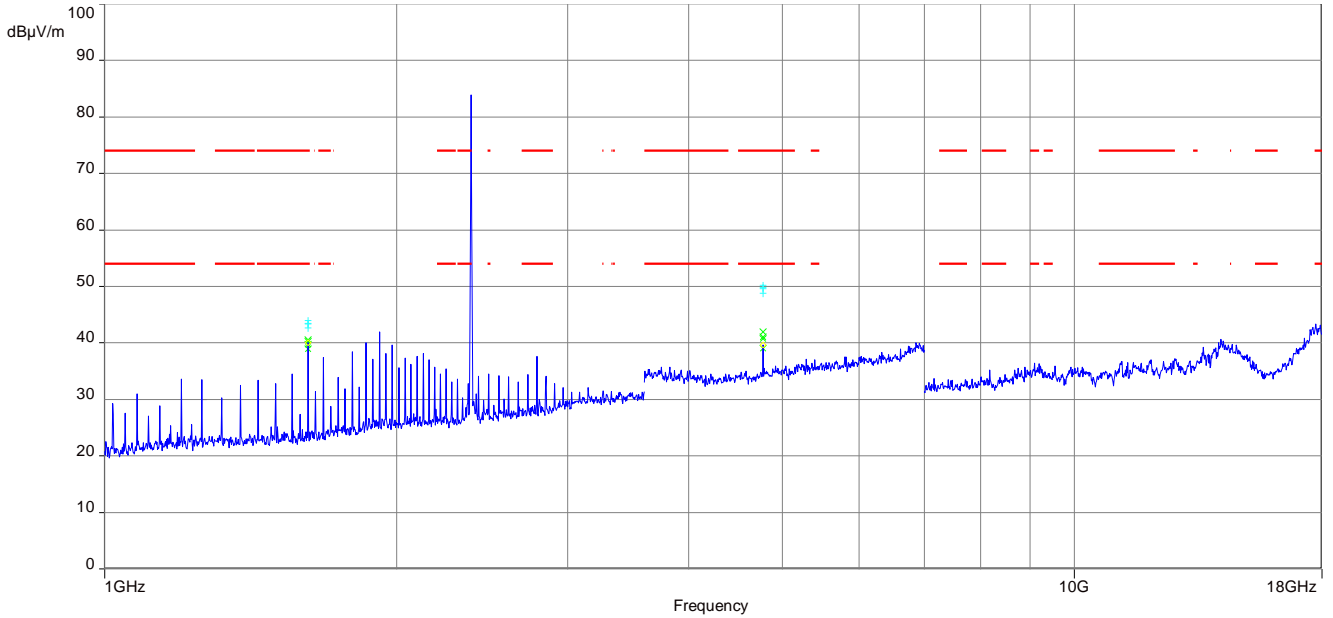
**Plot 10:** 30 MHz – 1 GHz, channel high, lower band



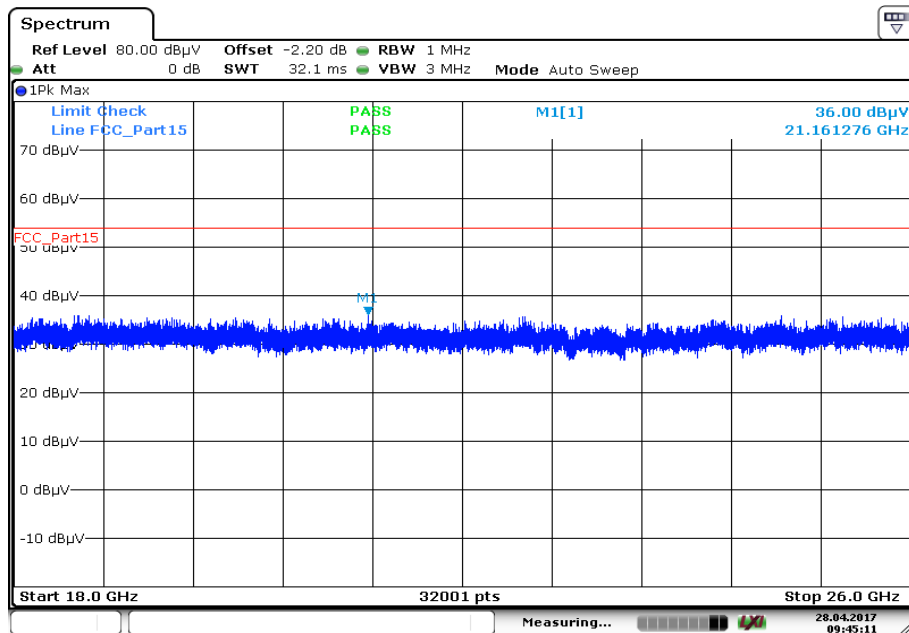
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.817515	15.43	30.00	14.57	1000.0	120.000	101.0	V	20.0	12.0
45.342300	10.63	30.00	19.37	1000.0	120.000	100.0	V	0.0	13.6
126.003000	13.42	33.50	20.08	1000.0	120.000	101.0	V	89.0	9.8
500.232150	15.13	36.00	20.87	1000.0	120.000	101.0	V	55.0	18.7
665.012700	18.44	36.00	17.56	1000.0	120.000	185.0	V	202.0	21.3
919.456500	21.29	36.00	14.71	1000.0	120.000	98.0	H	121.0	24.2

**Plot 11:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel high, lower band



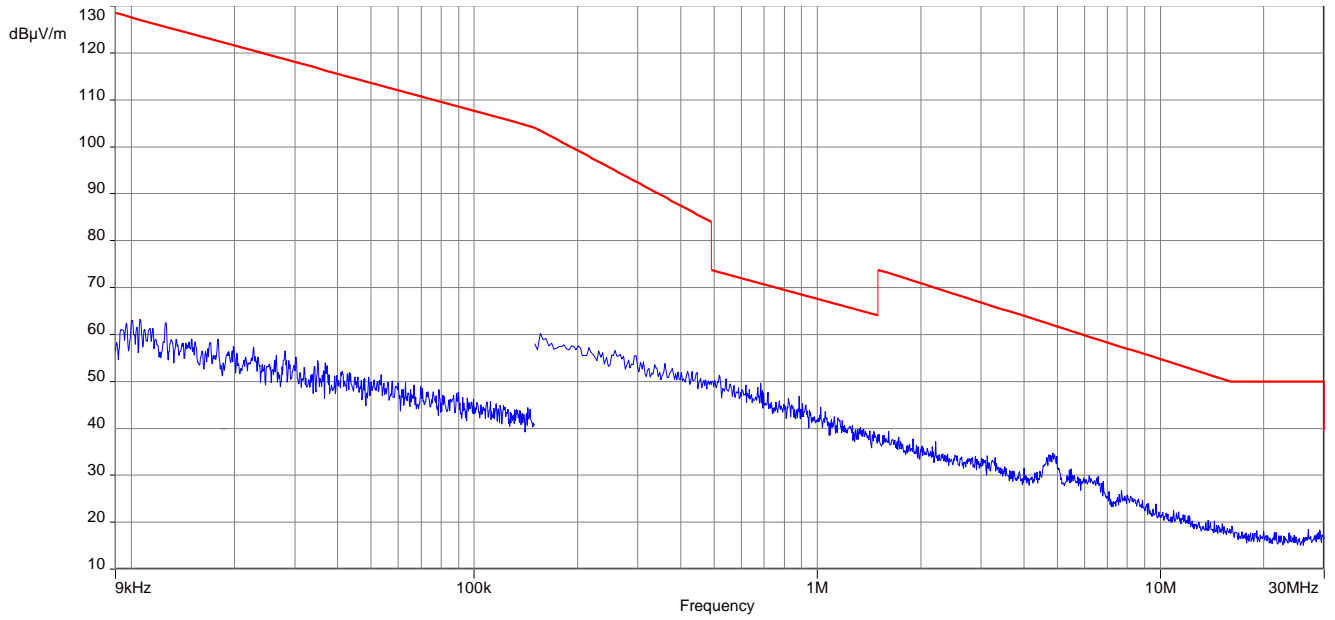
**Plot 12:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel high, lower band



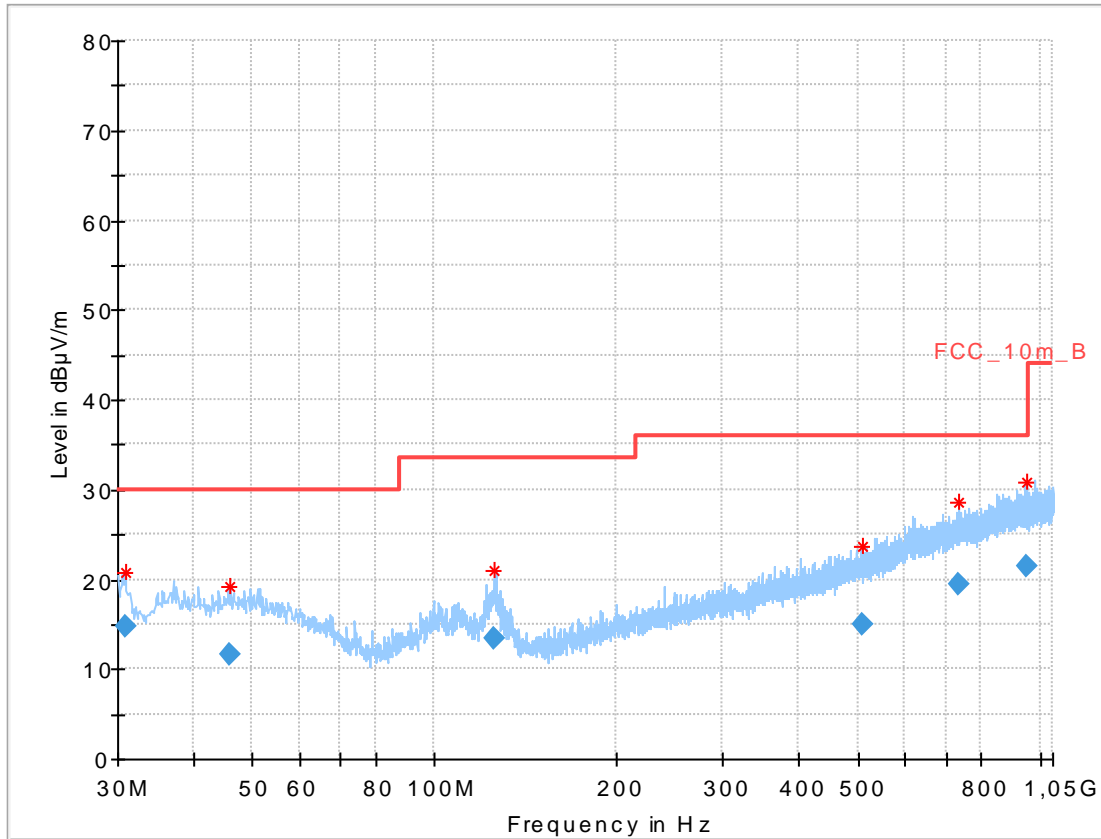
Date: 28.APR.2017 09:45:11



**Plot 13:** 9 kHz – 30 MHz, channel low, upper band



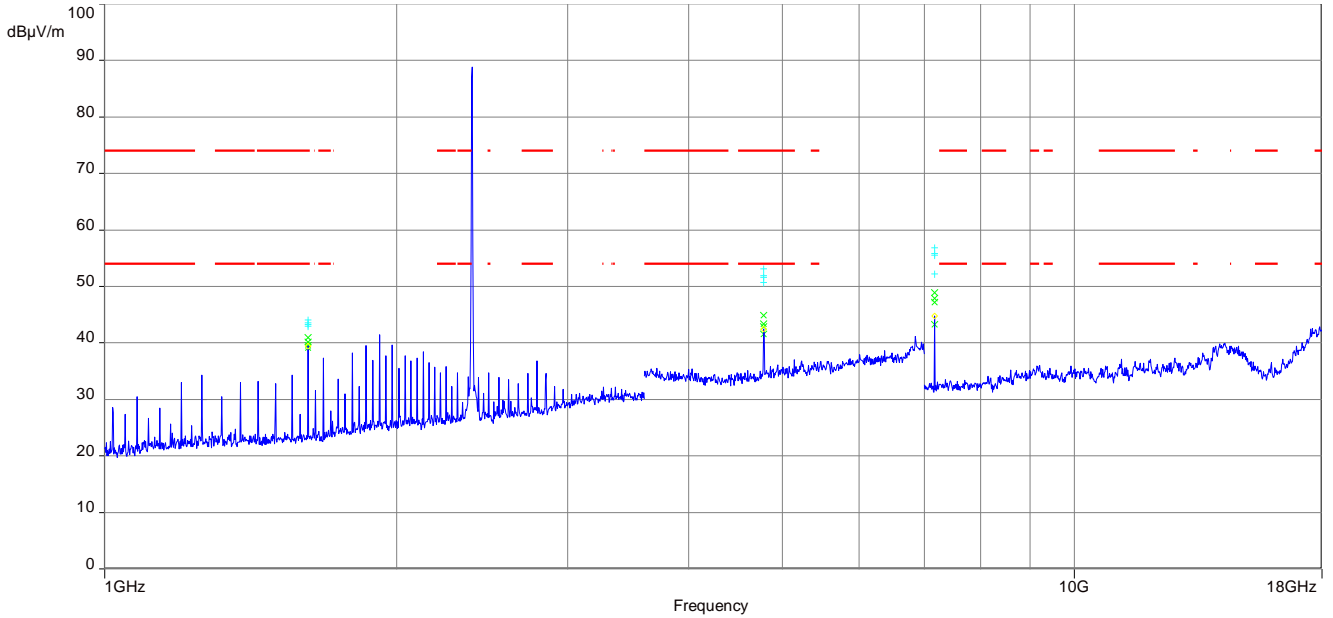
**Plot 14:** 30 MHz – 1 GHz, channel low, upper band



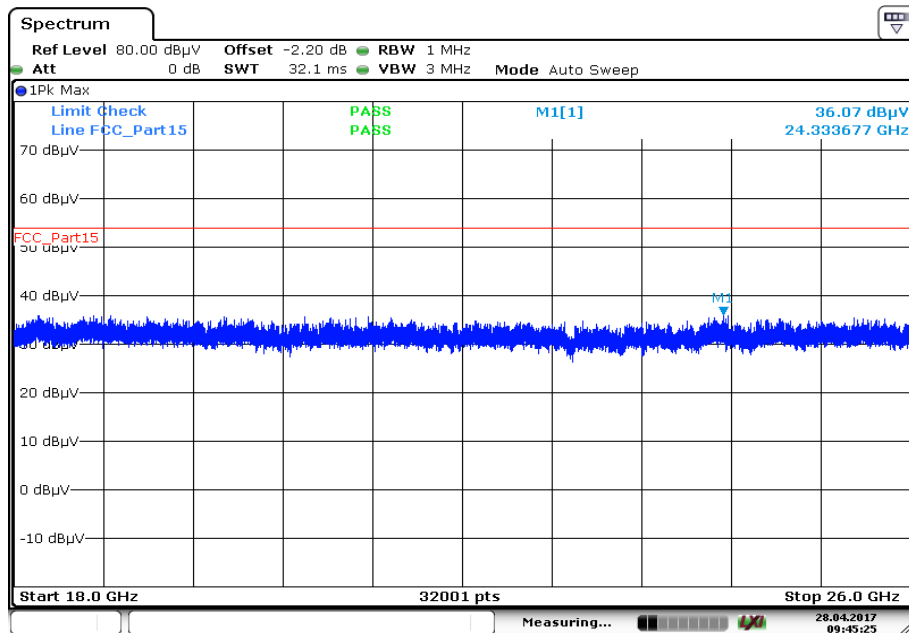
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.845550	14.79	30.00	15.21	1000.0	120.000	101.0	V	114.0	12.0
46.088250	11.60	30.00	18.40	1000.0	120.000	178.0	V	148.0	13.7
125.950650	13.44	33.50	20.06	1000.0	120.000	100.0	V	121.0	9.8
508.053450	14.95	36.00	21.05	1000.0	120.000	185.0	H	172.0	18.8
732.411750	19.43	36.00	16.57	1000.0	120.000	185.0	H	229.0	22.3
950.099400	21.43	36.00	14.57	1000.0	120.000	179.0	H	202.0	24.3

**Plot 15:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel low, upper band

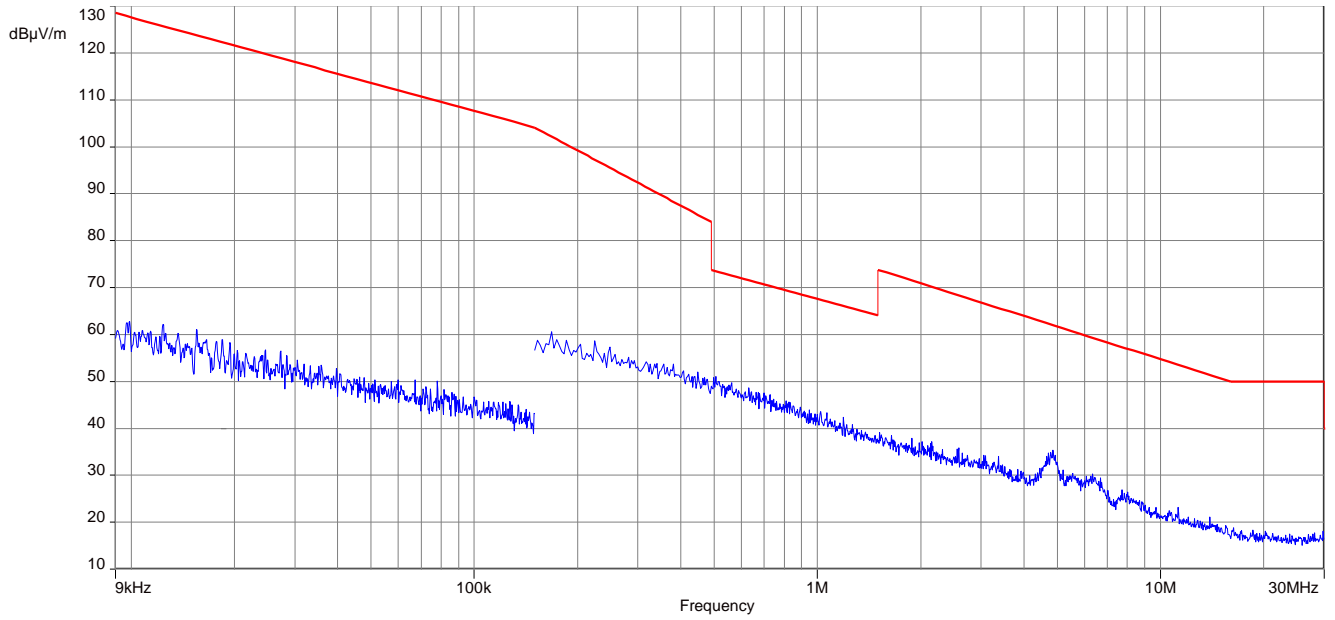


**Plot 16:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel low, upper band

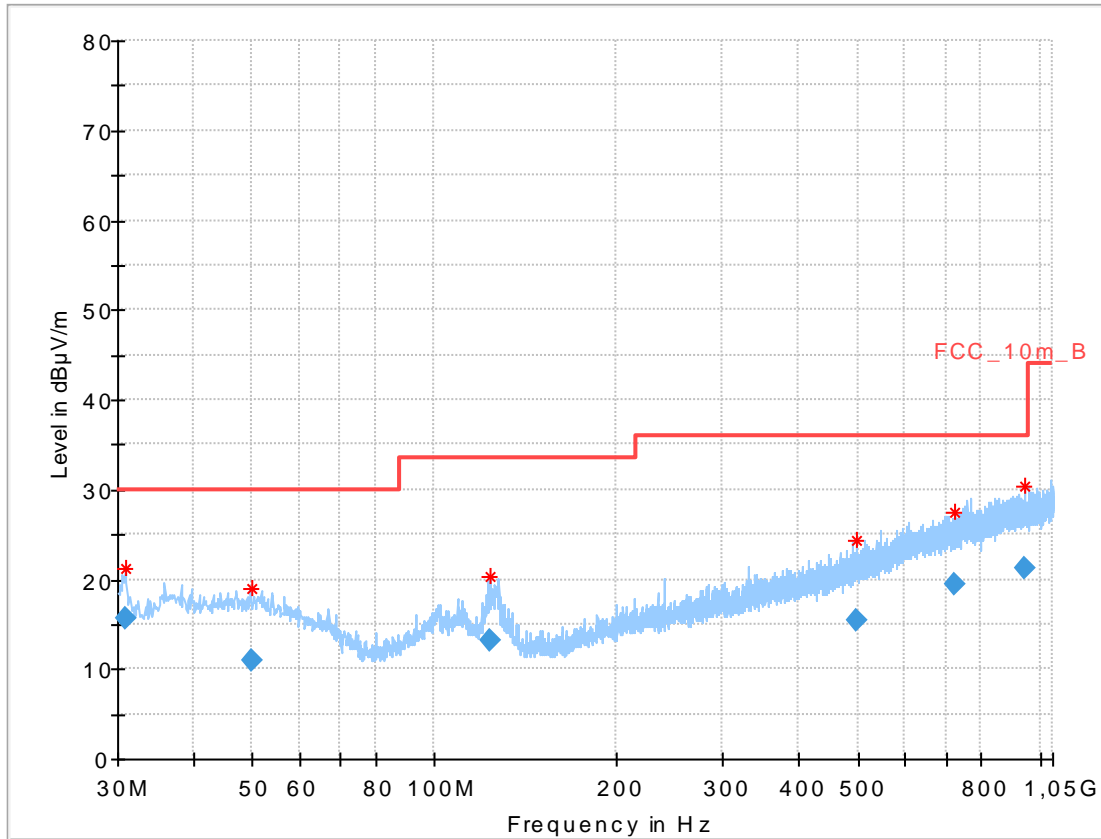


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**Plot 17:** 9 kHz – 30 MHz, channel high, upper band



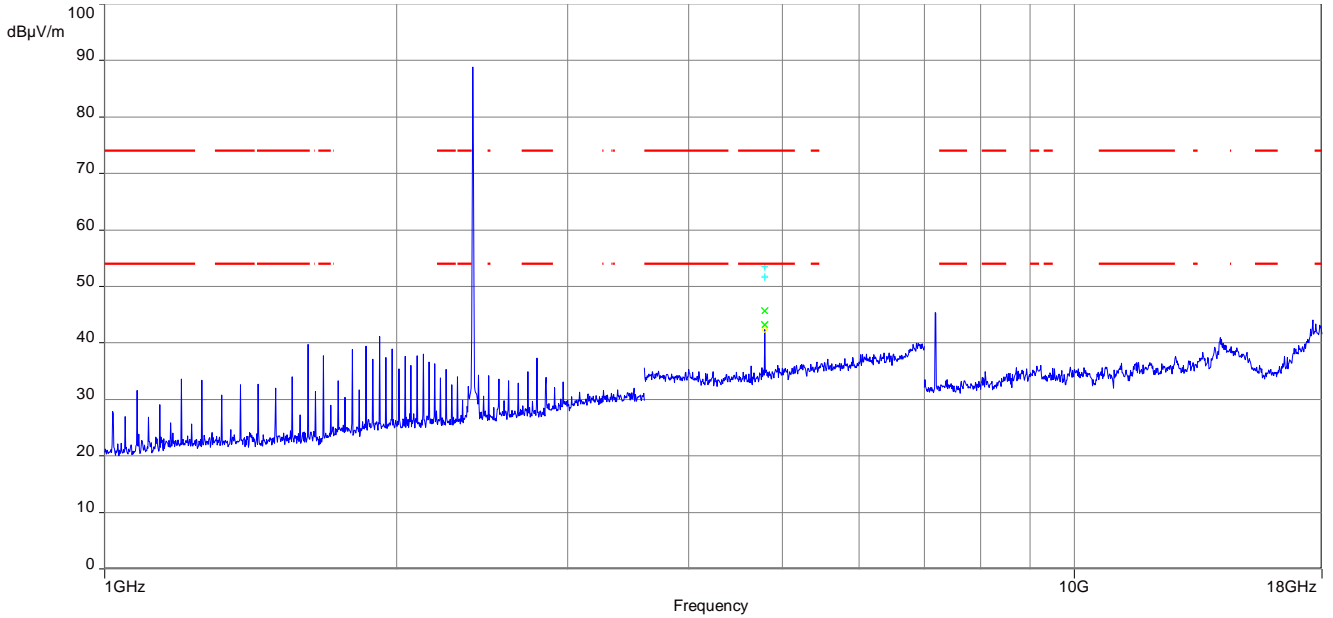
**Plot 18:** 30 MHz – 1 GHz, channel high, upper band



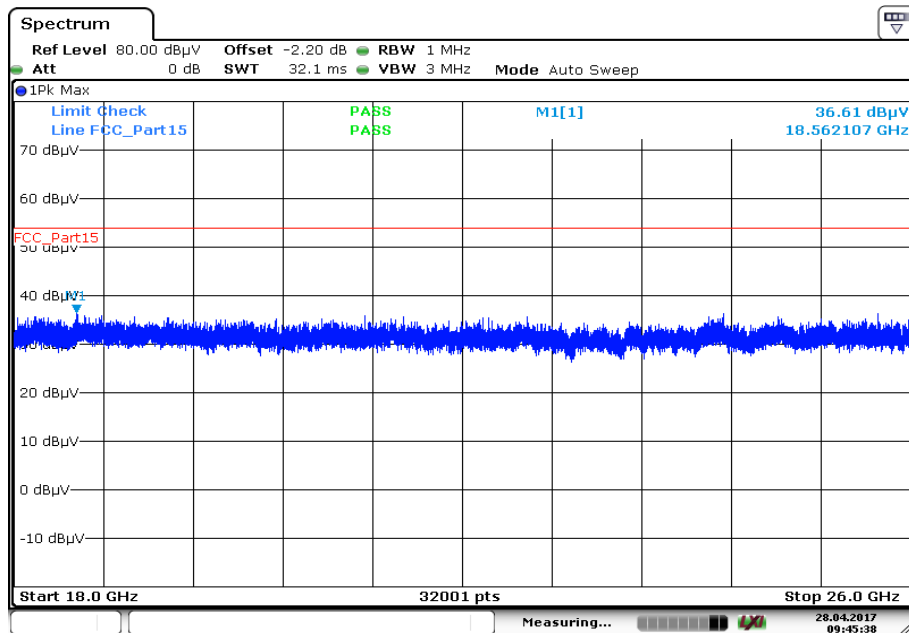
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.972000	15.69	30.00	14.31	1000.0	120.000	101.0	V	297.0	12.0
49.944000	11.00	30.00	19.00	1000.0	120.000	101.0	V	53.0	13.7
123.419700	13.12	33.50	20.38	1000.0	120.000	101.0	V	46.0	10.0
499.380300	15.36	36.00	20.64	1000.0	120.000	185.0	V	227.0	18.7
725.606550	19.39	36.00	16.61	1000.0	120.000	98.0	H	123.0	22.2
944.948700	21.30	36.00	14.70	1000.0	120.000	101.0	H	194.0	24.3

**Plot 19:** 1 GHz – 18 GHz, antenna horizontal/vertical, channel high, upper band



**Plot 20:** 18 GHz – 26 GHz, antenna horizontal/vertical, channel high, upper band



Date: 28.APR.2017 09:45:38

### 11.3 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 7.1 – A & 7.2 – A & 7.3 – A	
Measurement uncertainty	See sub clause 9	

**Limits:**

FCC		IC
47 CFR § 15.109		-/-
Receiver unwanted radiation (radiated)		
Frequency (MHz)	Field strength (µV/m) <sup>1</sup>	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

<sup>1</sup> 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, left module

Receiver unwanted radiation [dB $\mu$ V/m]		
F [MHz]	Detector	Level [dB $\mu$ V/m]
See plots!		
	AVG	
	Peak	
	AVG	

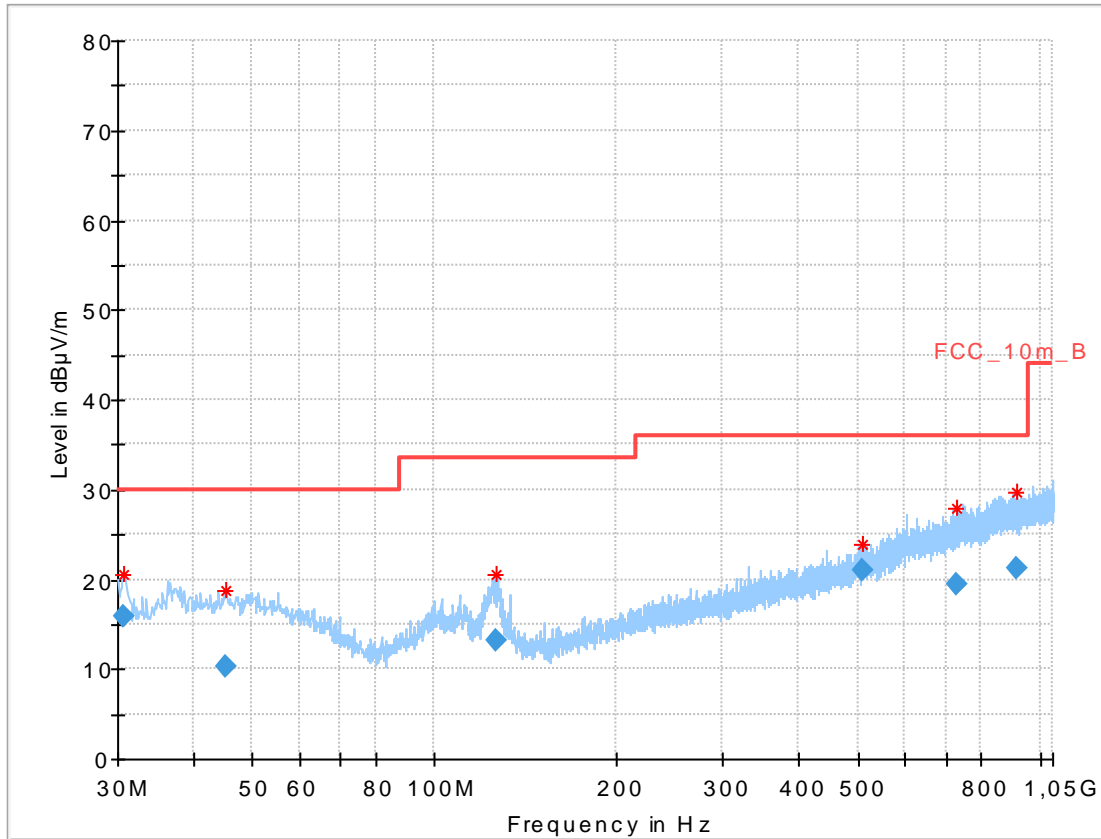
**Results:** Receiver mode, right module

Receiver unwanted radiation [dB $\mu$ V/m]		
F [MHz]	Detector	Level [dB $\mu$ V/m]
See plots!		
	AVG	
	Peak	
	AVG	



**Plots:** left module

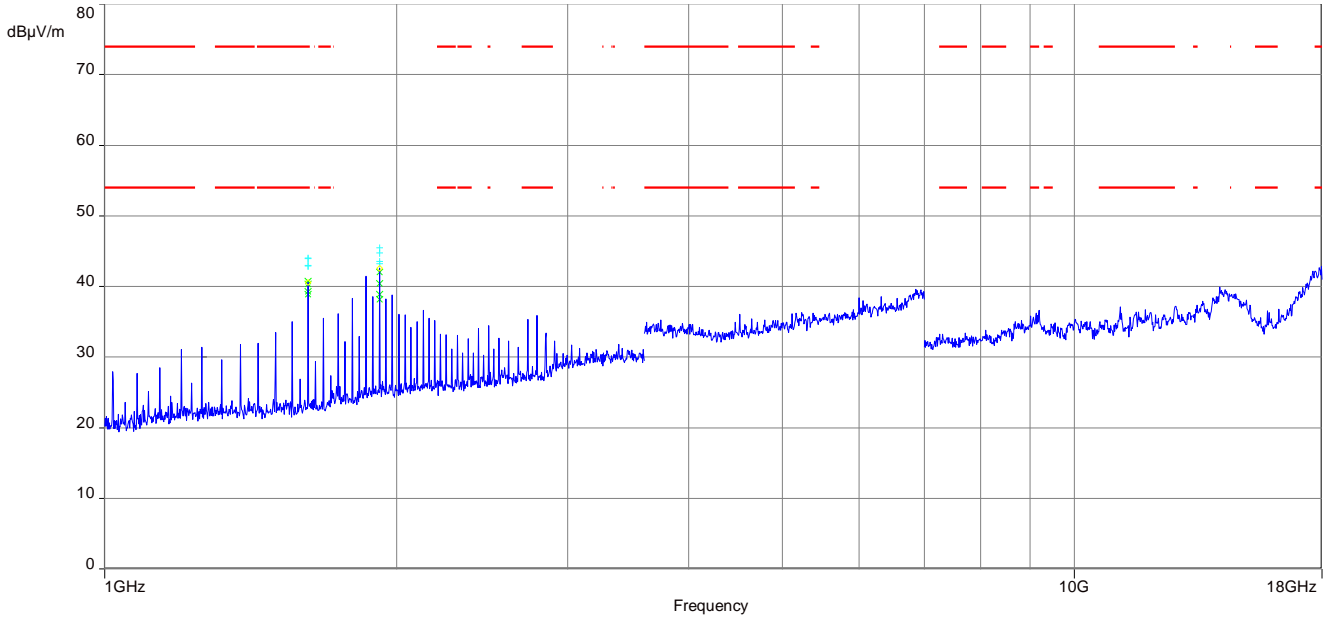
**Plot 1:** 30 MHz – 1 GHz



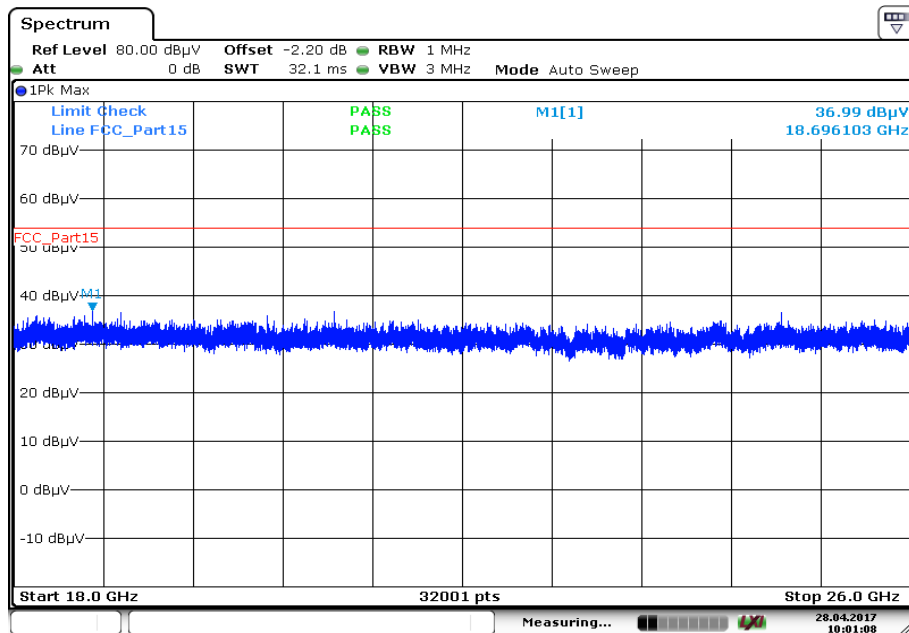
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.640748	15.84	30.00	14.16	1000.0	120.000	98.0	V	154.0	11.9
45.188100	10.26	30.00	19.74	1000.0	120.000	98.0	H	68.0	13.6
126.884700	13.09	33.50	20.41	1000.0	120.000	101.0	V	0.0	9.8
510.019200	21.04	36.00	14.96	1000.0	120.000	185.0	H	204.0	18.8
728.986500	19.49	36.00	16.51	1000.0	120.000	185.0	H	348.0	22.2
914.288700	21.32	36.00	14.68	1000.0	120.000	98.0	H	177.0	24.2

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



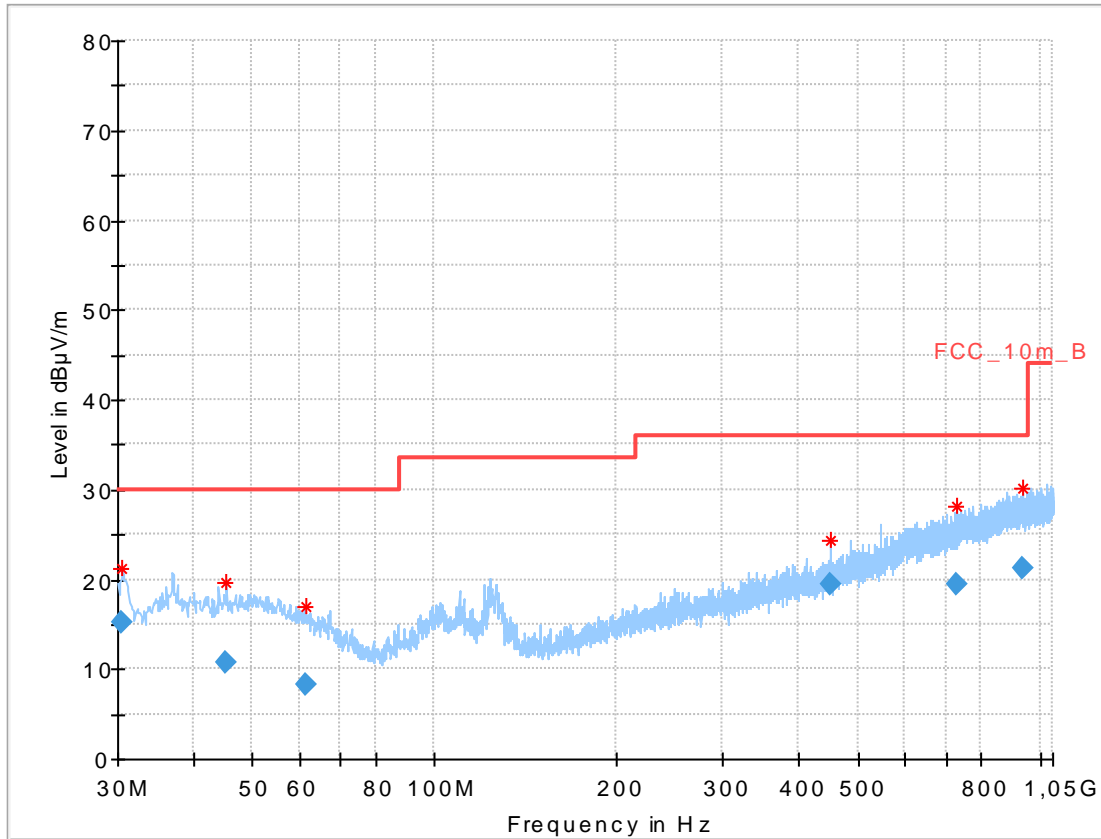
**Plot 3:** 18 GHz – 26 GHz, antenna horizontal/vertical



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**Plots:** right module

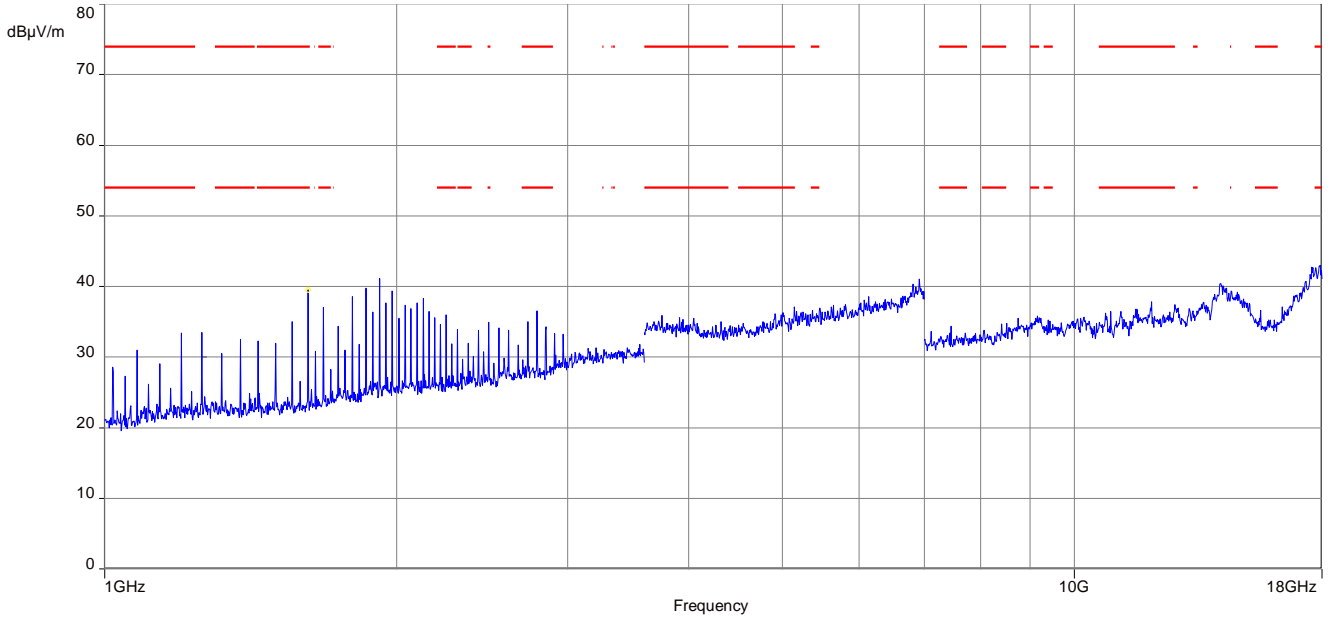
**Plot 1:** 30 MHz – 1 GHz



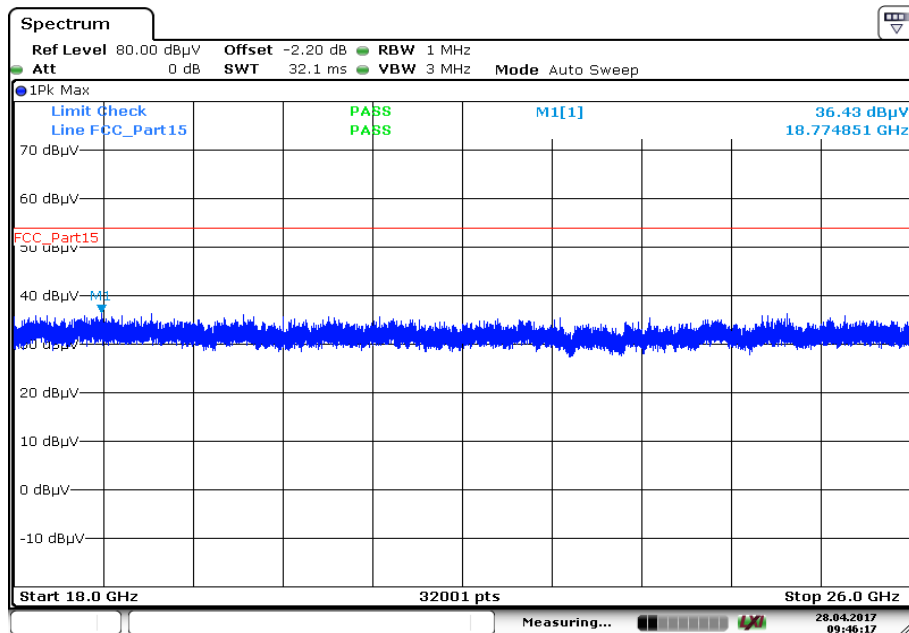
**Final results:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.469530	15.28	30.00	14.72	1000.0	120.000	101.0	V	169.0	11.9
45.141450	10.76	30.00	19.24	1000.0	120.000	101.0	V	284.0	13.6
61.351500	8.24	30.00	21.76	1000.0	120.000	181.0	H	0.0	11.6
449.985750	19.45	36.00	16.55	1000.0	120.000	185.0	H	0.0	17.6
727.285950	19.39	36.00	16.61	1000.0	120.000	98.0	H	291.0	22.2
939.291450	21.29	36.00	14.71	1000.0	120.000	185.0	V	108.0	24.3

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



**Plot 3:** 18 GHz – 26 GHz, antenna horizontal/vertical



Date: 28.APR.2017 09:46:17

### 11.4 Spurious emissions conducted below 30 MHz (AC-conducted)

**Description:**

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channel is channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The measurement is performed in the mode with the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Measurement parameters	
Detector	Peak - Quasi peak / average
Sweep time	Auto
Resolution bandwidth	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max hold
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

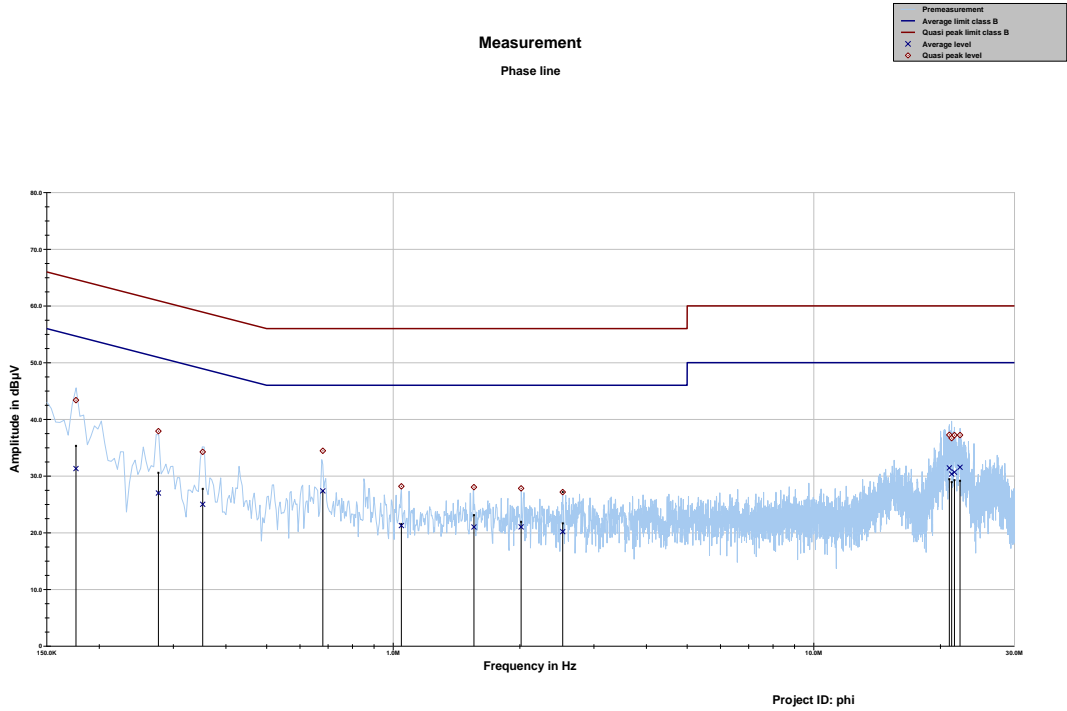
**Limits:**

FCC		IC	
TX spurious emissions conducted < 30 MHz			
Frequency (MHz)	Quasi-peak (dBµV/m)	Average (dBµV/m)	
0.15 – 0.5	66 to 56*	56 to 46*	
0.5 – 5	56	46	
5 – 30.0	60	50	

\*Decreases with the logarithm of the frequency

**Plots:** left module

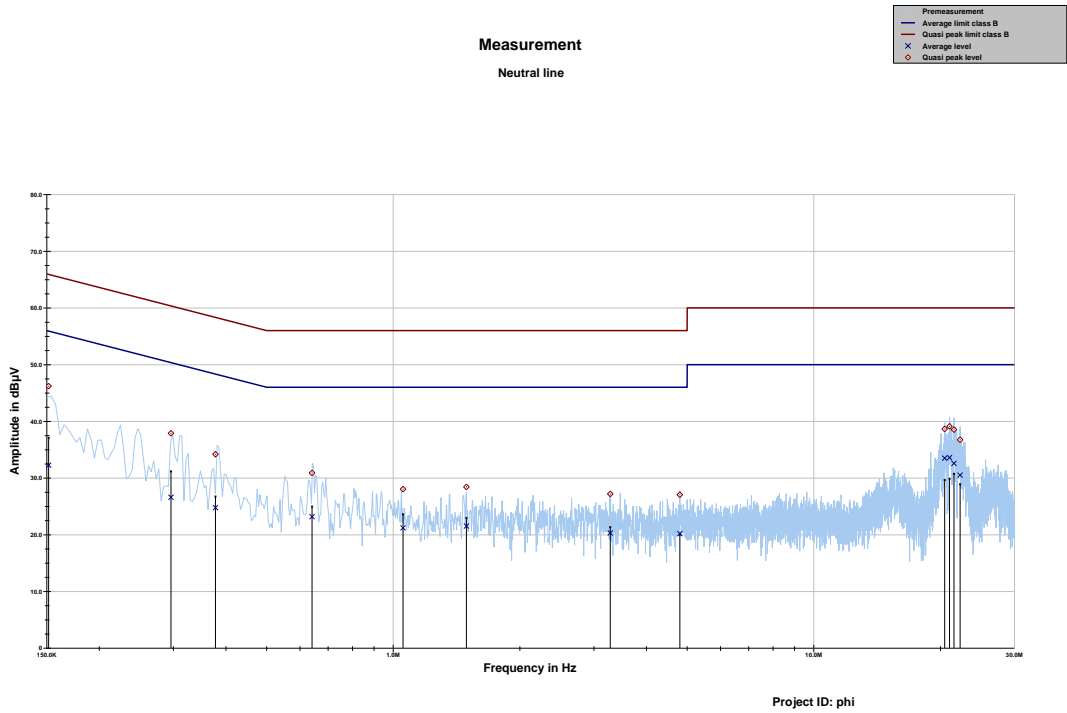
**Plot 1:** 150 kHz to 30 MHz, phase line



**Final results:**

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.176022	43.39	21.28	64.671	31.32	23.94	55.257
0.276508	37.92	23.00	60.920	27.00	25.38	52.385
0.352299	34.25	24.66	58.908	25.01	25.21	50.220
0.680124	34.45	21.55	56.000	27.39	18.61	46.000
1.045714	28.19	27.81	56.000	21.27	24.73	46.000
1.555707	28.04	27.96	56.000	21.01	24.99	46.000
2.014368	27.82	28.18	56.000	21.03	24.97	46.000
2.529923	27.17	28.83	56.000	20.19	25.81	46.000
21.003564	37.26	22.74	60.000	31.43	18.57	50.000
21.272785	36.68	23.32	60.000	30.36	19.64	50.000
21.602943	37.21	22.79	60.000	30.69	19.31	50.000
22.273868	37.22	22.78	60.000	31.55	18.45	50.000

**Plot 2:** 150 kHz to 30 MHz, neutral line

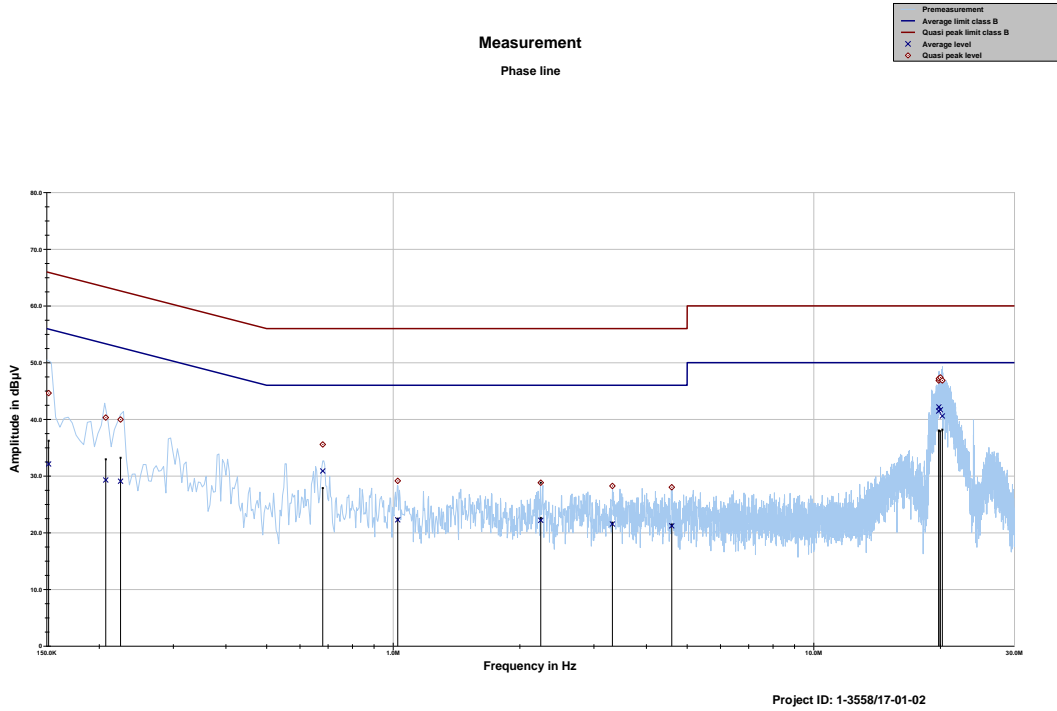


**Final results:**

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.151607	46.20	19.71	65.911	32.27	23.68	55.954
0.296135	37.90	22.45	60.351	26.62	25.21	51.825
0.377938	34.19	24.14	58.325	24.77	24.71	49.487
0.641237	30.89	25.11	56.000	23.18	22.82	46.000
1.055466	28.03	27.97	56.000	21.22	24.78	46.000
1.493025	28.44	27.56	56.000	21.52	24.48	46.000
3.281758	27.20	28.80	56.000	20.30	25.70	46.000
4.803941	27.06	28.94	56.000	20.20	25.80	46.000
20.477843	38.65	21.35	60.000	33.50	16.50	50.000
21.022885	39.11	20.89	60.000	33.60	16.40	50.000
21.544123	38.52	21.48	60.000	32.58	17.42	50.000
22.283881	36.75	23.25	60.000	30.52	19.48	50.000

**Plots:** right module

**Plot 1:** 150 kHz to 30 MHz, phase line

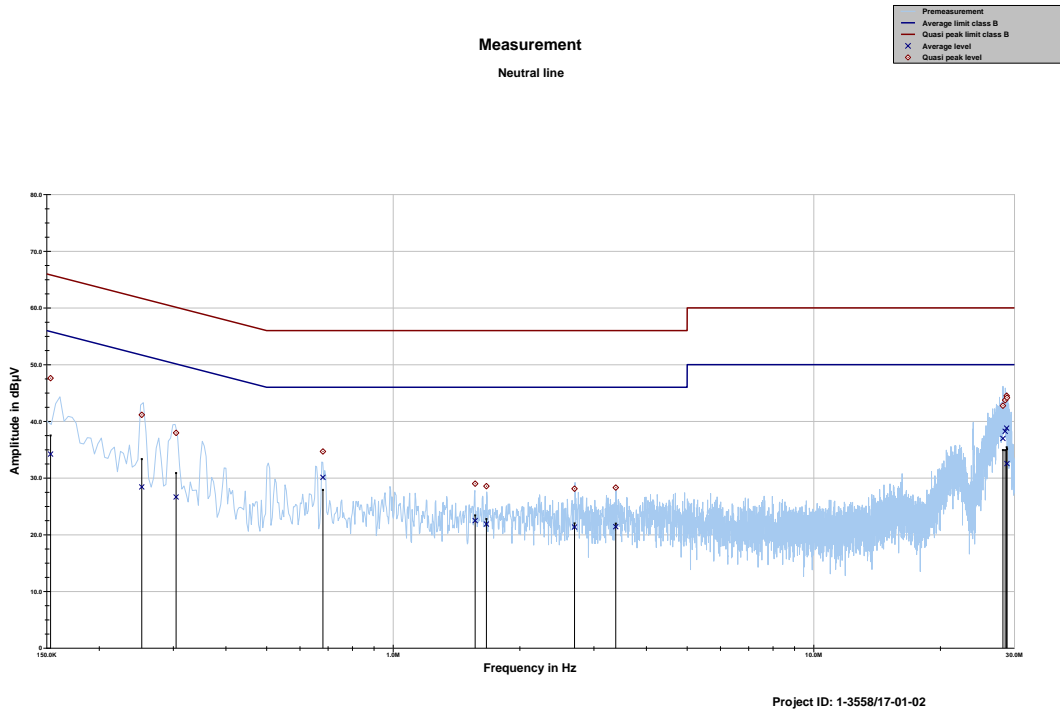


**Final results:**

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.151592	44.63	21.28	65.912	32.12	23.83	55.955
0.207237	40.30	23.01	63.315	29.29	25.07	54.365
0.224703	39.97	22.68	62.643	29.09	24.78	53.866
0.680029	35.57	20.43	56.000	30.89	15.11	46.000
1.025047	29.16	26.84	56.000	22.28	23.72	46.000
2.243176	28.83	27.17	56.000	22.20	23.80	46.000
3.320899	28.26	27.74	56.000	21.54	24.46	46.000
4.594920	28.02	27.98	56.000	21.21	24.79	46.000
19.817912	46.85	13.15	60.000	41.46	8.54	50.000
19.842781	47.19	12.81	60.000	42.18	7.82	50.000
20.000256	47.38	12.62	60.000	41.69	8.31	50.000
20.221435	46.86	13.14	60.000	40.59	9.41	50.000



**Plot 2:** 150 kHz to 30 MHz, neutral line



**Final results:**

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.153217	47.61	18.22	65.824	34.22	21.68	55.908
0.252430	41.15	20.52	61.677	28.43	24.65	53.073
0.304668	37.97	22.14	60.115	26.65	24.93	51.581
0.680513	34.68	21.32	56.000	30.12	15.88	46.000
1.565904	29.01	26.99	56.000	22.50	23.50	46.000
1.665534	28.57	27.43	56.000	21.88	24.12	46.000
2.699182	28.12	27.88	56.000	21.35	24.65	46.000
3.382506	28.32	27.68	56.000	21.42	24.58	46.000
28.176701	42.76	17.24	60.000	36.98	13.02	50.000
28.521265	43.74	16.26	60.000	38.24	11.76	50.000
28.756896	44.52	15.48	60.000	38.80	11.20	50.000
28.802505	44.17	15.83	60.000	32.56	17.44	50.000

## 12 Observations

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

## Annex A Document history

Version	Applied changes	Date of release
	Initial release	2017-05-18
A	Editorial Changes (FCC ID)	2018-02-27
B	Editorial changes	2018-02-28
C	Editorial changes	2018-03-02

## Annex B Further information

### Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software
PMN	-	Product marketing name
HMN	-	Host marketing name
HVIN	-	Hardware version identification number
FVIN	-	Firmware version identification number
OBW		Occupied Bandwidth
OC		Operating Channel
OCW		Operating Channel Bandwidth
OOB		Out Of Band

**Annex C Accreditation Certificate**

first page	last page			
 <p>Deutsche Akkreditierungsstelle GmbH</p> <p>Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition</p>  <p><b>Accreditation</b></p> <p>The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory <b>CTC advanced GmbH</b> Untertürkheimer Straße 6-10, 66117 Saarbrücken</p> <p>is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields: <b>Telecommunication</b></p> <p>The accreditation certificate shall only apply in connection with the notice of accreditation of 02.06.2017 with the accreditation number D-PL-12076-01 and is valid until 21.04.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 43 pages.</p> <p>Registration number of the certificate: D-PL-12076-01-03</p> <p>Frankfurt, 02.06.2017</p>  <p>Dipl.-Ing. (FH) Ralf Peter Head of Division</p> <p><small>See notes on final.</small></p>	<p>Deutsche Akkreditierungsstelle GmbH</p> <table border="0"> <tr> <td>Office Berlin Spittelmarkt 10 10117 Berlin</td> <td>Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main</td> <td>Office Braunschweig Bundesallee 100 38116 Braunschweig</td> </tr> </table> <p>The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.</p> <p>No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.</p> <p>The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.</p> <p>The up-to-date state of membership can be retrieved from the following websites: EA: <a href="http://www.european-accreditation.org">www.european-accreditation.org</a> ILAC: <a href="http://www.ilac.org">www.ilac.org</a> IAF: <a href="http://www.iaf.nu">www.iaf.nu</a></p>	Office Berlin Spittelmarkt 10 10117 Berlin	Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main	Office Braunschweig Bundesallee 100 38116 Braunschweig
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**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>