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STS 0001

Schweizerischer Prüfstellendienst
 Service suisse d'essai
 Swiss testing service



Report:	Electromagnetic compatibility and Radio spectrum Matters		Report no:	17-MO-0258.R03
Product name:	Roger Select (DM part)		Mandate no:	17-MO-0258
Serial no:	17XXPM014	Model number:	TX27	
Customer:	Phonak Communications AG Länggasse 17 3280 Murten SWITZERLAND	Date of test:	December 6 – 15, 2017	

Standards		Result
47 CFR, Part 15	(Subpart C, Intentional radiators: §§ 15.207/209/247)	Pass
	(Subpart B, Class B digital devices: § 15.109)	Pass
Industry Canada	RSS-247, Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices	Pass
	RSS-Gen, General Requirements and Information for the Certification of Radio Apparatus	

These results were achieved without modification of EUT

Test performed by
 Mr B. Itzcovich
 EMC Test Engineer



Report prepared by
 Mr B. Itzcovich
 EMC Test Engineer



Report controlled and approved by
 Mr T. Houriet
 EMC Test Engineer



Rossens, April 10, 2018

(Issue Date)

Main language : English

The present document results from tests on one specimen and does not prejudice to the conformity of all the manufactured products.

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Contents

	<i>Page</i>
1. SUMMARY OF TEST RESULTS.....	3
2. APPLIED STANDARDS	3
3. CLIENT.....	4
4. EQUIPMENT UNDER TEST	4
4.1 Identification.....	4
4.2 Pictures of the EUT.....	5
4.3 Classification.....	6
4.4 Transmitter characteristics (according to Phonak Communications AG)	7
4.5 Receiver characteristics (according to Phonak Communications AG)	7
4.6 Ports.....	7
5. TEST CONDITIONS.....	8
5.1 Climatic conditions, location and date	8
5.2 Test facility and methodology	8
5.3 Attendant persons.....	8
5.4 Test configuration	8
5.5 Operating conditions.....	9
5.6 Auxiliary equipment.....	9
6. TEST RESULTS	10
6.1 Channel 20dB-bandwidth	11
6.2 Carrier frequency separation	13
6.3 Number of hopping channels.....	15
6.4 Time of occupancy (dwell time)	17
6.5 Antenna gain & effective isotropic radiated power	19
6.6 Maximum output power (conducted)	21
6.7 Band-edge emission (conducted).....	23
6.8 Band-edge emission (radiated).....	25
6.9 Spurious emissions – conducted (transmitter – 9 kHz to 26 GHz).....	30
6.10 Spurious emissions, transmit mode – radiated.....	32
6.10.1 9 kHz to 30 MHz.....	32
6.10.2 30 MHz to 1 GHz.....	36
6.10.3 1 GHz to 18 GHz.....	39
6.10.4 18 GHz to 26 GHz.....	44
6.11 Spurious emissions, receive mode - radiated.....	49
6.11.1 30 MHz to 1 GHz.....	49
6.11.2 1 GHz to 13 GHz.....	52
6.12 Conducted emission - Interference voltage	55
6.13 Designation of emission.....	60
7. APPENDIX	61
7.1 Test equipment	62

1. Summary of test results

- ✓ Pass
- ✗ Fail
- ∅ Not applicable to this product
- Not tested
- # No requirements / not required

§	Test Type	Result
6	Emission	CFR 47 Part 15 Industry Canada
6.1	Channel 20dB-bandwidth CFR 47 § 15.247 (a)(1) RSS-247 § 5.1 a)	1.60 MHz
6.2	Carrier frequency separation CFR 47 § 15.247 (a)(1) RSS-247 § 5.1 b)	✓
6.3	Number of hopping channels CFR 47 § 15.247 (a)(1)(iii) RSS-247 § 5.1 c)	✓
6.4	Time of occupancy (dwell time) CFR 47 § 15.247 (a)(1)(iii) RSS-247 § 5.1 d)	✓
6.5	Antenna gain & effective radiated power CFR 47 § 15.247 (b)(4) RSS-247 § 5.4 (2) and (6)	≤ 0.03 dBi
6.6	Maximum output power (conducted) CFR 47 § 15.247 (b)(1) RSS-247 § 5.4 b)	✓
6.7	Band-edge emission (conducted) CFR 47 § 15.247 (d) RSS-247 § 5.5	✓
6.8	Band-edge emission (radiated) CFR 47 § 15.247 (d) CFR 47 § 15.205 RSS-Gen Table 6	✓
6.9	Spurious emissions – conducted (transmitter) CFR 47 § 15.247 (d) RSS-247 § 5.5	✓
6.10	Spurious emissions – radiated (transmitter) CFR 47 § 15.247 (d) CFR 47 § 15.209 (a) CFR 47 § 15.205 RSS-247 § 5.5 RSS-Gen Tables 4 and 5	✓
6.11	Radiated emission – receiver CFR 47 § 15.109 RSS-Gen Table 2	✓
6.12	Conducted emission CFR 47 § 15.207 RSS-Gen Table 3	✓
6	Emission	CFR 47 Part 2
6.13	Designation of emission FCC 47 §2.201 FCC 47 §2.202	1M89FXD

2. Applied standards

47 CFR Part 15 Subpart C	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart C: "Intentional Radiators"
47 CFR Part 15 Subpart B	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart B: "Unintentional Radiators"
RSS-Gen issue 4, November 2014	Spectrum Management and Telecommunications - Radio Standards Specification General Requirements and Information for the Certification of Radio Apparatus
RSS-247 issue 2, February 2017	Digital Transmission Systems (DTs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

3. Client

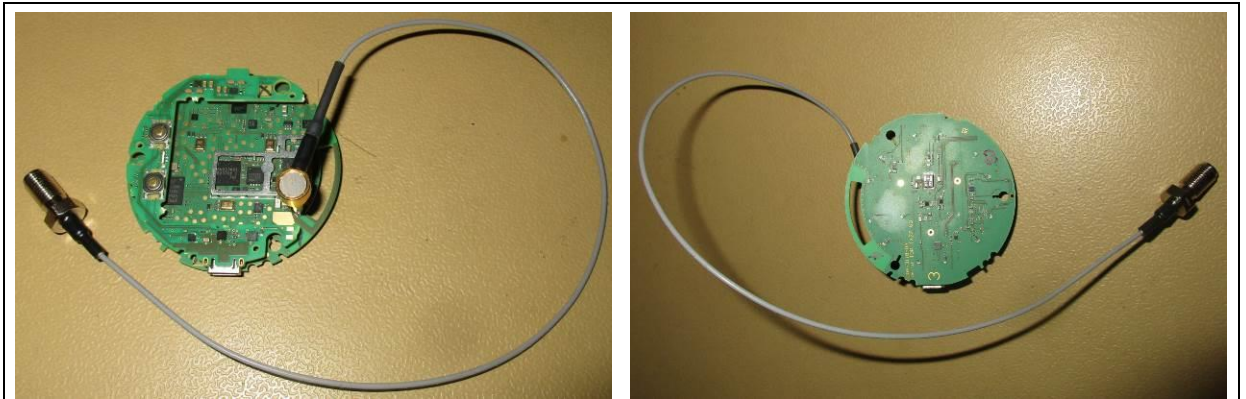
Client name and address	<i>Phonak Communications AG Länggasse 17 3280 Murten SWITZERLAND</i>
Contact Person	<i>Mr Josuah Wicht</i>
Telephone	<i>+41 26 672 92 78</i>
Fax	<i>+41 26 672 93 80</i>
E-mail	<i>Josuah.Wicht@phonak.com</i>
Mandate no	<i>17-MO-0258</i>

4. Equipment under test

4.1 Identification

Manufacturer name and address	<i>Phonak Communications AG Länggasse 17 3280 Murten SWITZERLAND</i>
Production country	<i>Vietnam</i>
Brand name	<i>Phonak</i>
Product name	<i>Roger Select (DM part)</i>
Product description	<i>Wireless microphone 2.4 GHz</i>
Model number	<i>TX27</i>
Serial no	<i>17XXPM014</i>
Software version	<i>SVN_17000_v.1.0.36358_beta01</i>
FCC ID IC ID	<i>FCC: KWCTX27 IC: 2262A-TX27</i>
Lowest Frequency	<i>20 kHz (charge pump for LED driver)</i>
Highest frequency	<i>16 MHz (uC Xtal) / 26 MHz (RF chip) / 2.48 GHz (RF Transmitter carrier)</i>
Supply	<i>U = 3.8 V_{DC} / P_{max} = 0.25 W (Lithium Polymer Battery) or U = 5 V_{DC} / P_{max} = 2.5 W (USB)</i>
Dimension	<i>~55 mm x ~13 mm (Ø x h)</i>
Technical	<i>None. The equipment is completely identified by the above-mentioned information. Phonak Communications AG assures the traceability of the documentation and is responsible for the product identification.</i>

4.2 Pictures of the EUT



Electronic board with temporary antenna connector



Top view



Bottom view

4.3 Classification

CFR 47 Part 15	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Unintentional radiator (Subpart B), Receive mode<ul style="list-style-type: none"><input type="checkbox"/> Class A digital device<input checked="" type="checkbox"/> Class B digital device<input checked="" type="checkbox"/> The highest frequency of the internal sources of the EUT is less than 108 MHz (measurement shall be made up to 1 GHz).<input type="checkbox"/> The highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz (measurement shall be made up to 2 GHz).<input type="checkbox"/> The highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz (measurement shall be made up to 5 GHz).<input type="checkbox"/> The highest frequency of the internal sources of the EUT is above 1 GHz (measurement shall be made up to 5 times the highest frequency or 40 GHz, whichever is lower).<input checked="" type="checkbox"/> Intentional radiator (Subpart C), Transmit mode<ul style="list-style-type: none"><input checked="" type="checkbox"/> The highest fundamental frequency of the EUT is less than 10 GHz (measurement shall be made up to the tenth harmonic or 40 GHz, whichever is lower).<input type="checkbox"/> The highest fundamental frequency of the EUT is between 10 GHz and 30 GHz (measurement shall be made up to the fifth harmonic or 100 GHz, whichever is lower).<input type="checkbox"/> The highest fundamental frequency of the EUT is above 30 GHz (measurement shall be made up to the fifth harmonic or 200 GHz, whichever is lower).
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5. Test conditions

5.1 Climatic conditions, location and date

Location	Date	Temp.	Pressure	Rel. humidity
<i>Eurofins Electrosuisse Product Testing AG 1728 Rossens SWITZERLAND</i>	<i>December 6 - 15, 2017</i>			<i>See § 6</i>

5.2 Test facility and methodology

<p><i>The test site is accepted by FCC:</i></p> <ul style="list-style-type: none"> - Test Firm Registration Number: 683197 - Designation Number: CH5001 <p><i>The test site is accepted by Industry Canada:</i></p> <ul style="list-style-type: none"> - ISED Assigned Code: 3625A - Ferrite chamber (06-01): 3625A-2 - Foam chamber (06-00): 3625A-3 <p><i>Conducted and radiated measurements are performed according to the ANSI C63.4-2014 and C63.10-2013 procedures.</i></p>

5.3 Attendant persons

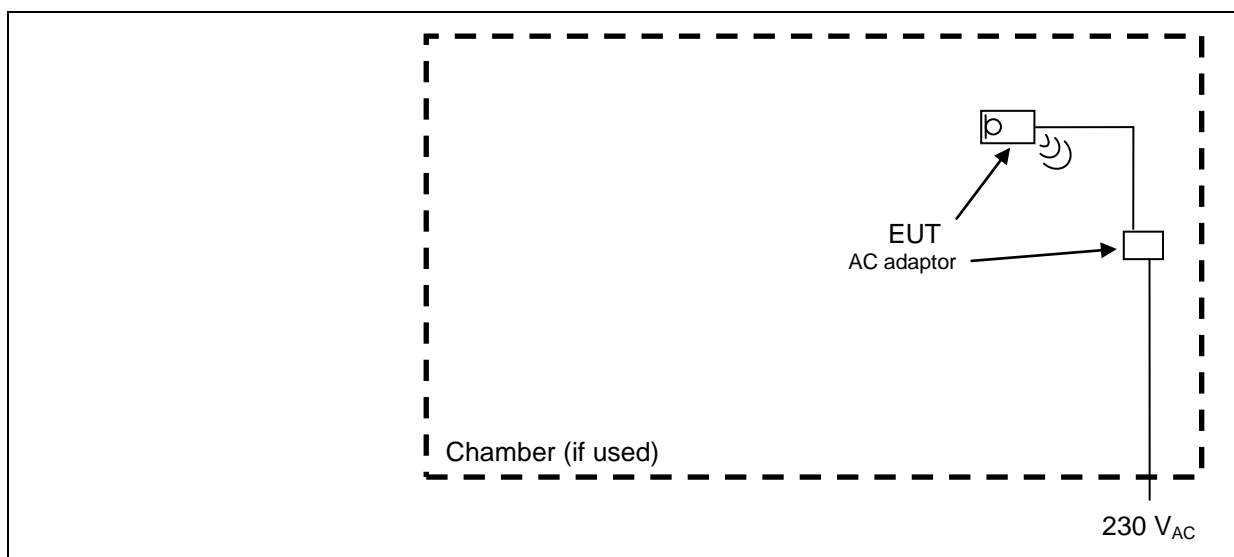
Test Engineer(s):

<i>Mr B. Itzcovich EMC Test Engineer</i>
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Other(s):

Name	Company
<i>Mr Josuah Wicht (partially)</i>	<i>Phonak Communications AG</i>

5.4 Test configuration



5.5 Operating conditions

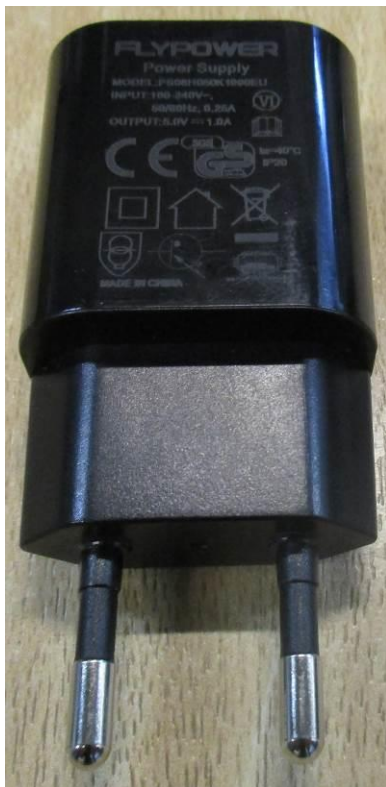
Power supply during tests if not stated otherwise in § 6 : 5 V_{DC} (USB)

- Continuous transmission of random data with single frequencies (2.402, 2.440 and 2.480 GHz)
- Continuous reception on single frequency (2.44 GHz)
- Normal operation: transmission of random data with hopping sequence

5.6 Auxiliary equipment

The following pieces of equipment are used for the monitoring of the EUT or are necessary for the EUT but they are not part of the EUT

Product	Brand	Model No.	ID	Remark
AC adaptor	FLYPOWER	PS06H050K 1000EU	---	5 V _{DC} output (USB)
Cradle	Phonak	Roger Select	---	To provide connectivity with cables



AC adaptor



Marking on AC adaptor

6. Test results

6.1 Channel 20dB-bandwidth

Introduction: Channel-bandwidth measured at -20 dBc.

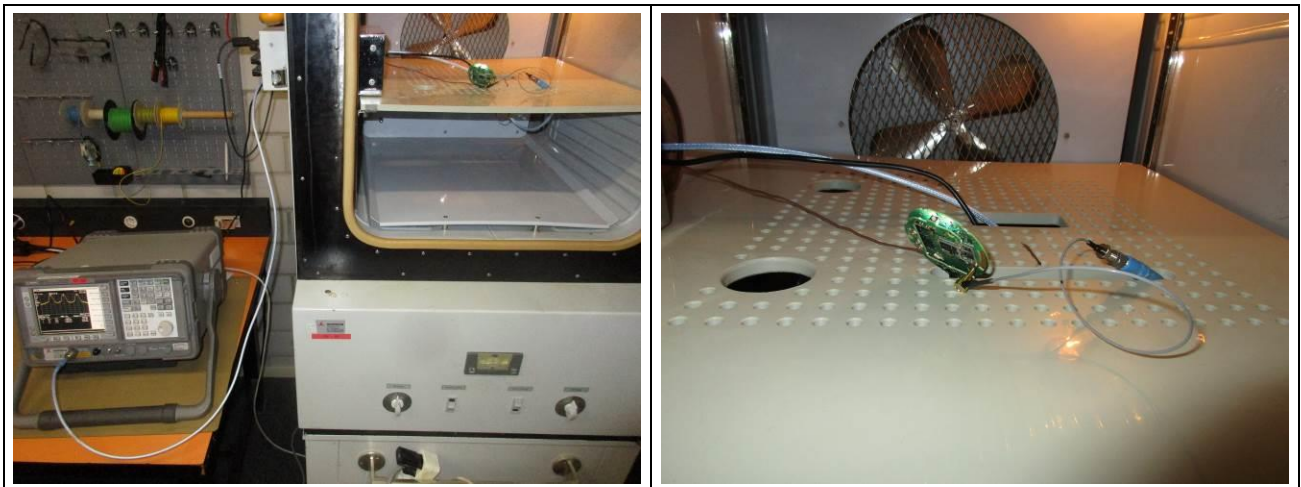
Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Method: Measurement of the conducted power on the antenna connector or a test fixture.

Limit: - - -

Test set-up:



Remarks: - - -

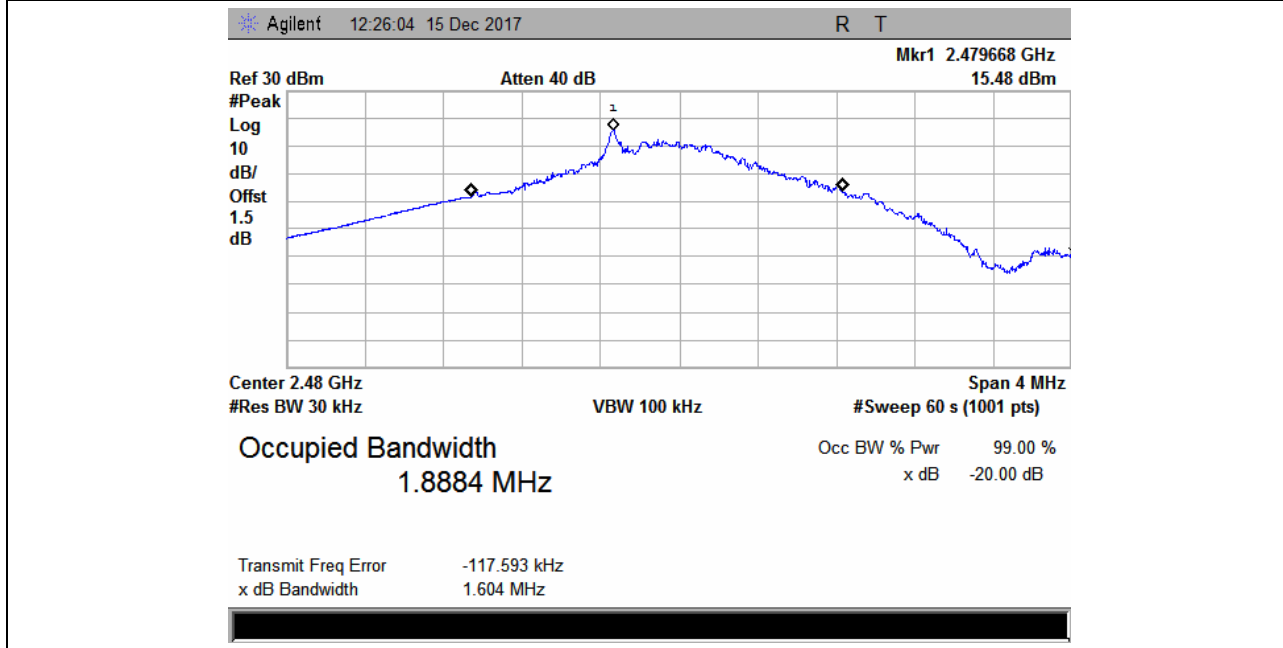
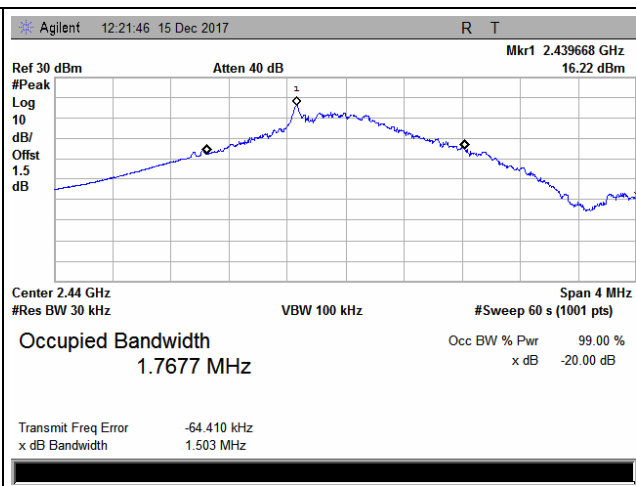
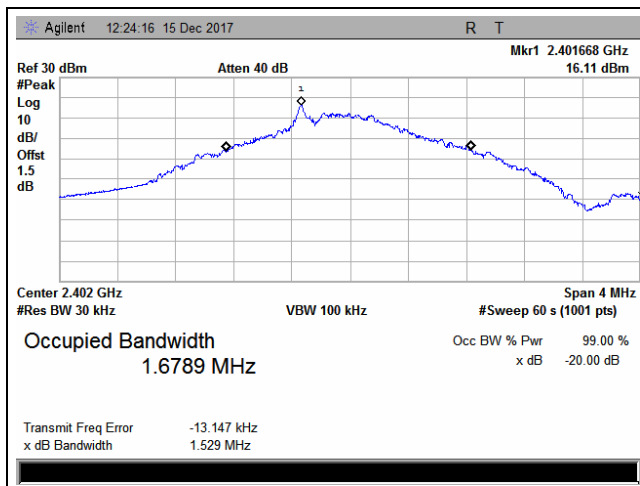
Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Results of the test

Client: *Phonak Communications AG*
 Apparatus: *Roger Select (DM part), proto 20*
 Operating mode: *Single frequencies (2.402, 2.440 and 2.480 GHz), modulated, Pmax (05)*
 Cables connected to the EUT: *USB and temporary antenna cables*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5
 Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 915 - 925 hPa

frequency [GHz]	20 dB bandwidth [MHz]	Remarks
2.402	1.529	---
2.440	1.503	---
2.480	1.604	---

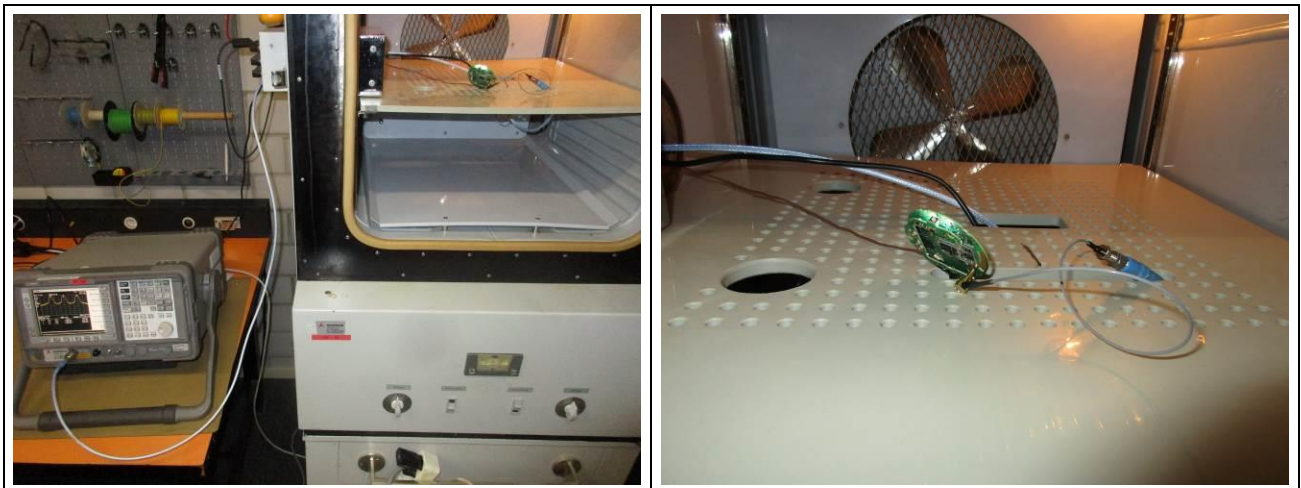


Place and date of test: *Rossens, December 15, 2017*
 Operator: *B. Itzcovich*

6.2 Carrier frequency separation

Introduction: Determination of the frequency separation of two adjacent channels.
 Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory
 Meas. uncertainty: ± 2.6 µHz/Hz
 Method: Measurement of the frequency separation on the antenna connector or a test fixture.
 Limit: Minimum 25 kHz two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test set-up:



Remarks: ---

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

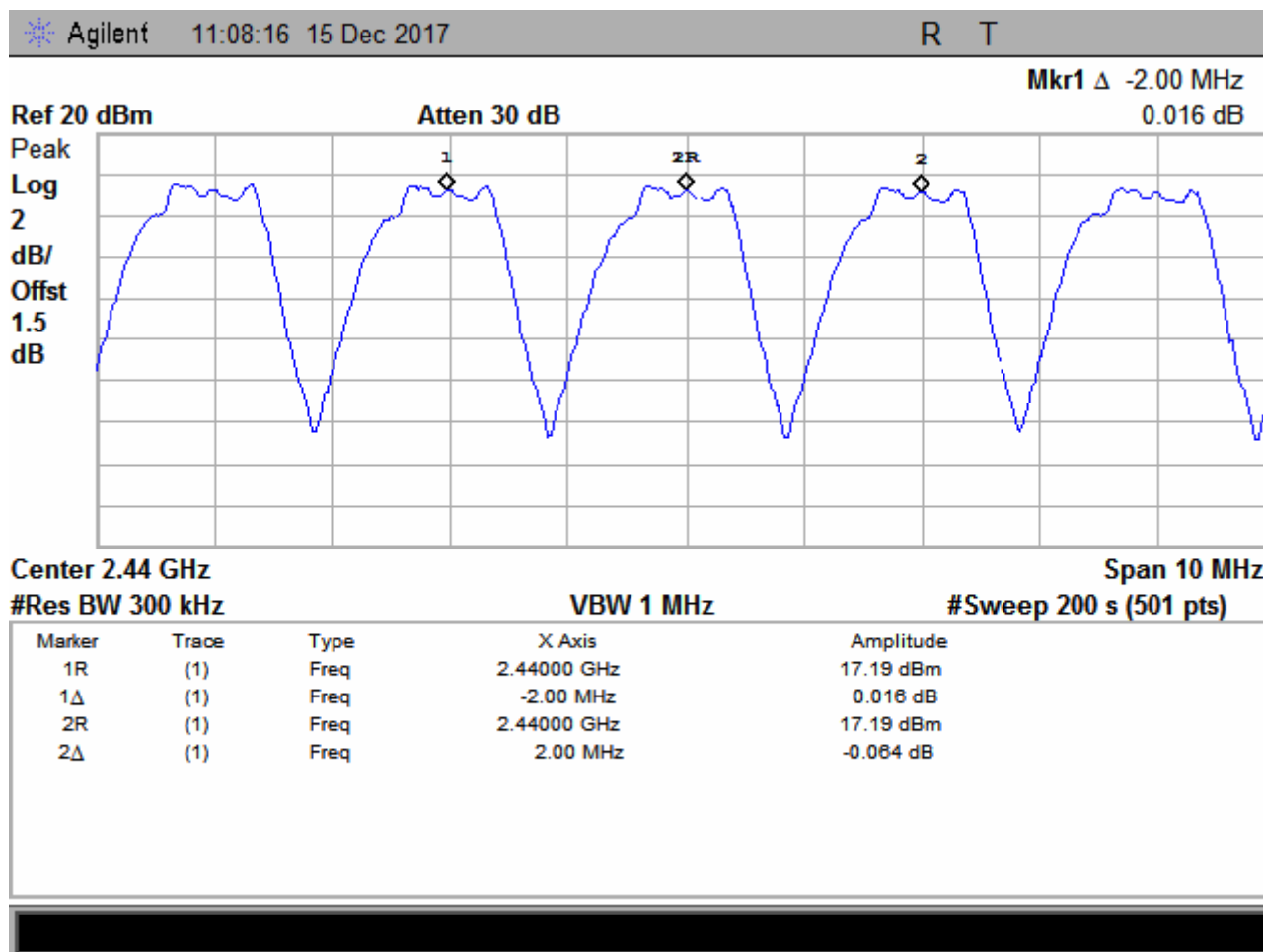
Result: pass fail not applicable not tested

Results of the test

Client: *Phonak Communications AG*
 Apparatus: *Roger Select (DM part), proto 20*
 Operating mode: *Continuously hopping on all channels*
 Cables connected to the EUT: *USB and temporary antenna cables*
 Remarks: *Measured on temporary antenna connector*

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 915 - 925 hPa



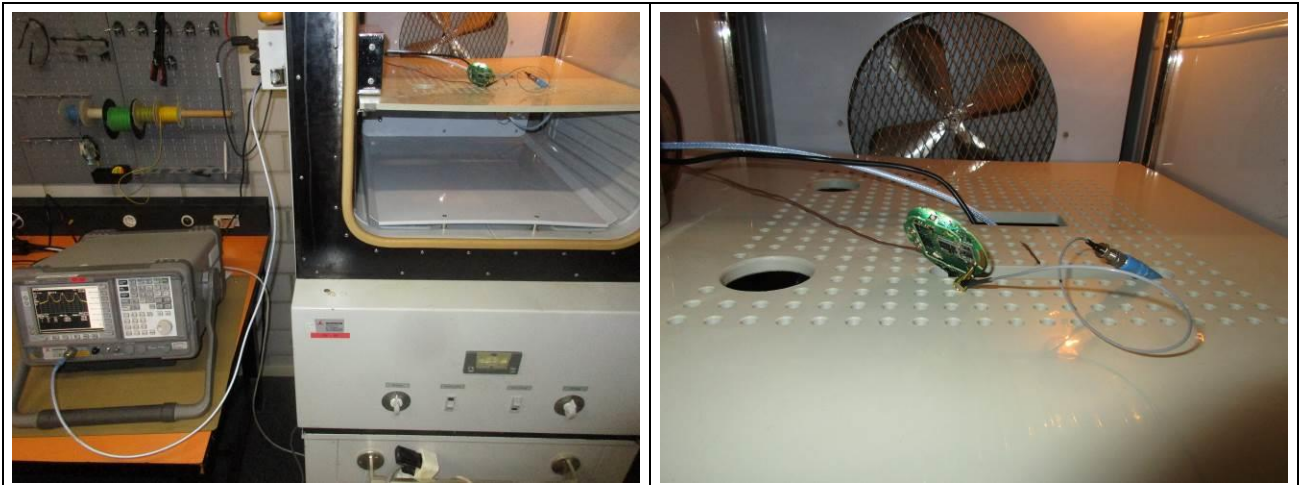
Carrier frequency separation = **2.00 MHz** > (2/3) x 1.60 MHz (see § 6.1)

Place and date of test: *Rossens, December 15, 2017*
 Operator: *B. Itzcovich*

6.3 Number of hopping channels

Introduction: Number of hopping channels used in the frequency hopping system.
 Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory
 Meas. uncertainty: ± 2.6 µHz/Hz
 Method: Measurement of the frequency separation on the antenna connector or a test fixture.
 Limit: Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Result: pass fail not applicable not tested

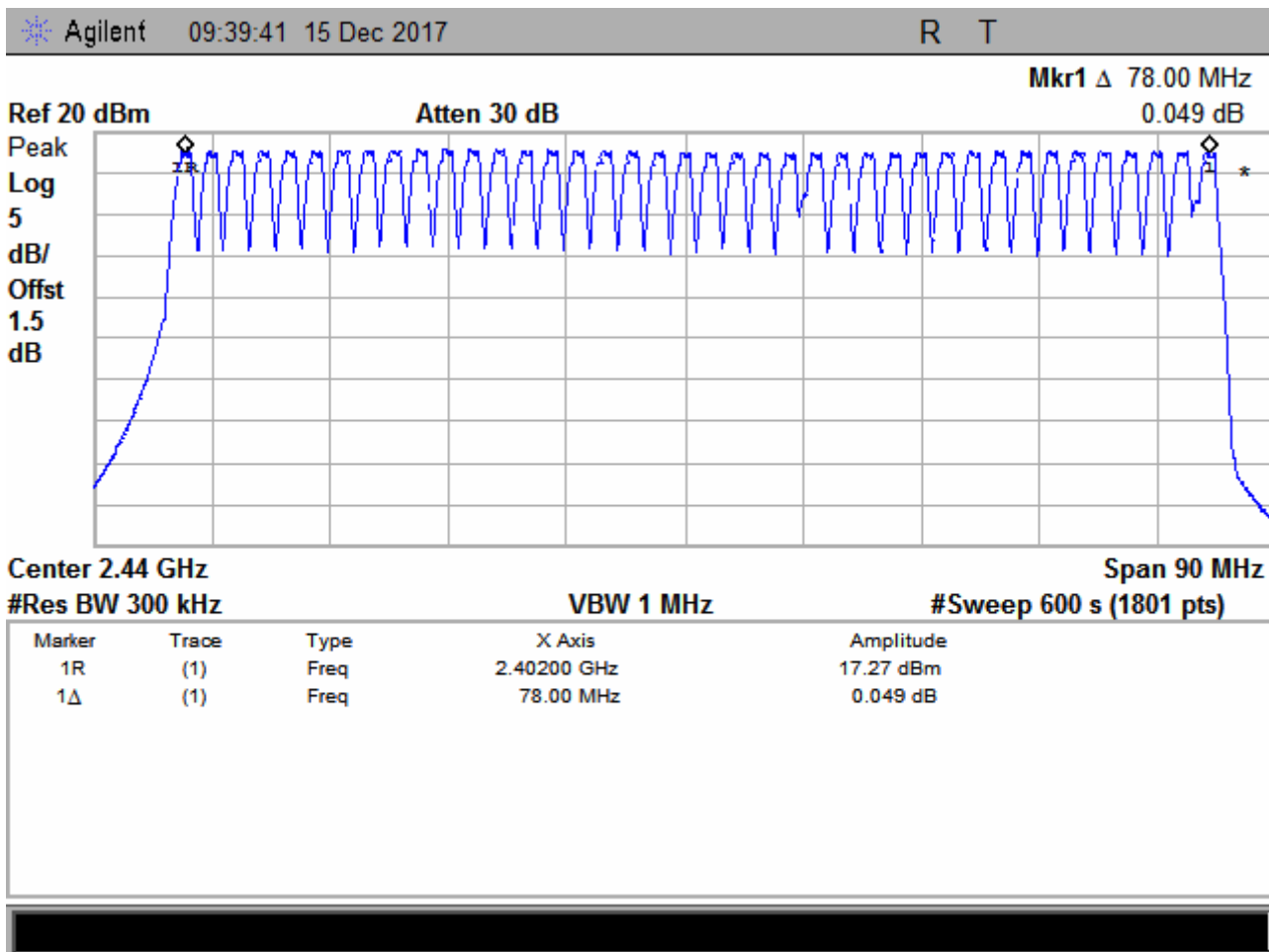
Results of the test

Client: *Phonak Communications AG*
 Apparatus: *Roger Select (DM part), proto 20*
 Operating mode: *Continuously hopping on all channels*
 Cables connected to the EUT: *Temporary supply & antenna cables*

Remarks: *Measured on temporary antenna connector*

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 915 - 925 hPa



Number of hopping channels = 40 (≤ 15)

Place and date of test: *Rossens, December 15, 2017*
 Operator: *B. Itzcovich*

6.4 Time of occupancy (dwell time)

Introduction: Average duration during which the system stays on one channel.

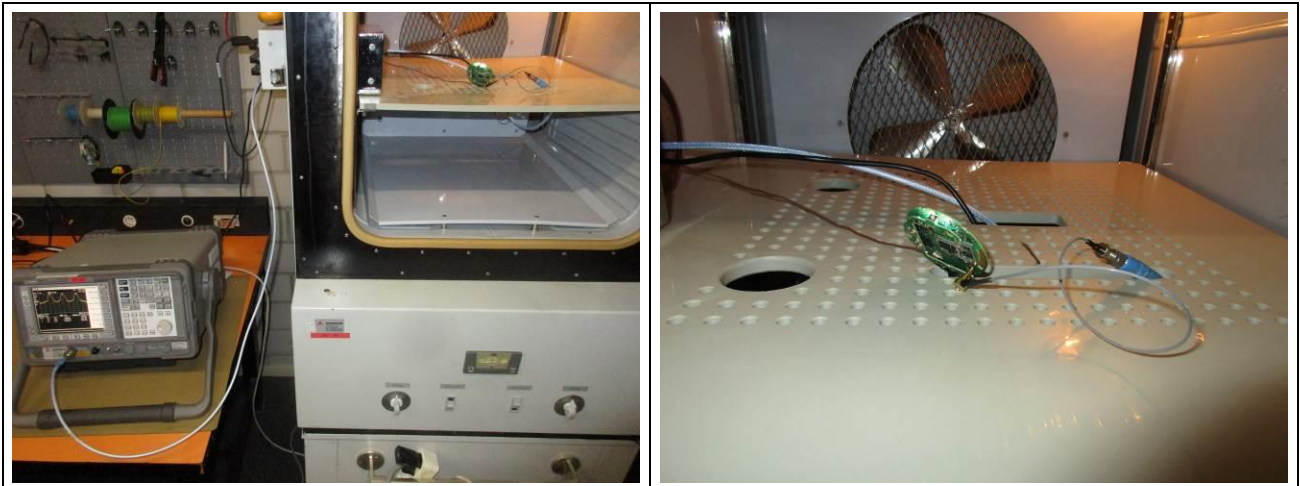
Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory

Meas. uncertainty: ± 2.6 µs/s

Method: Measurement on the antenna connector or a test fixture.

Limit: The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test set-up:



Remarks: ---

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Result: pass fail not applicable not tested

Results of the test

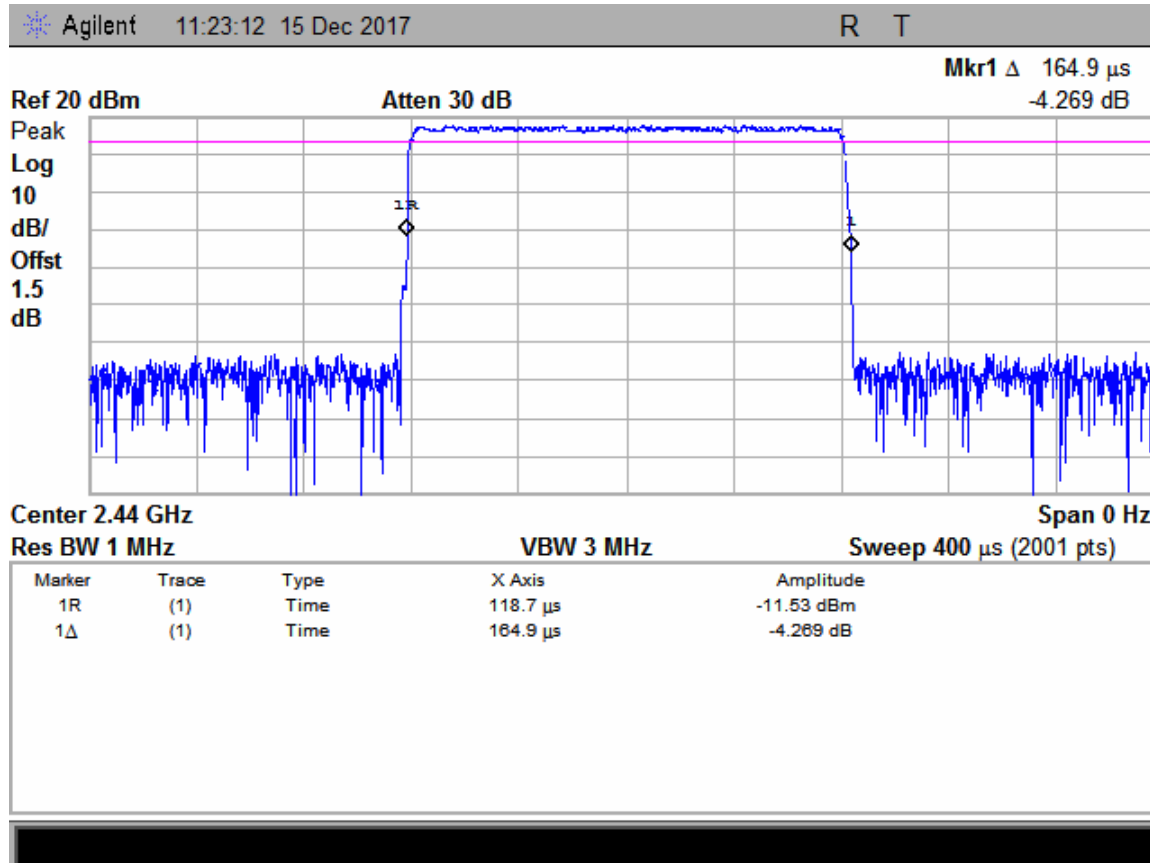
Client: *Phonak Communications AG*
 Apparatus: *Roger Select (DM part), proto 20*
 Operating mode: *Continuously hopping on all channels*
 Cables connected to the EUT: *USB and temporary antenna cables*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5
 Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 915 - 925 hPa

Calculation based on information from Phonak Communications AG and measurement of the pulse duration

Number of channels: 40
 Period of observation: $Number\ of\ channels * 0.4\ s = 40 * 0.4s = 16\ s$
 Single occupancy time during one hop (measured): 165 μ s
 Pulses in 2.9h: $2^{16} * 40 * 10 = 26'214'400$
 Pulses in 16 s: $(Pulses\ in\ 2.9h / 2.9) / 3'600 * 16s = 40'175.3$
 Pulses in 16 s of one channel: $Pulses\ in\ 16\ s / Number\ of\ channels = 1004.4$
 Time of occupancy: $Pulse\ in\ 16\ s\ of\ one\ channel * occupancy\ time = 1004.4 * 165\ \mu s = 0.166\ s$

RESULT $0.166\ s < 0.4\ s \Rightarrow Pass$

Example of pulse duration at frequency 2.44 GHz



Place and date of test: *Rossens, December 15, 2017*
 Operator: *B. Itzcovich*

6.5 Antenna gain & effective isotropic radiated power

Introduction: The effective radiated power is the power radiated by the antenna of an interrogator in its direction of maximum gain under specified conditions of measurement.

Test site: semi-anechoic chamber (ferrites) semi-anechoic chamber (foam)

Distance: 1 m 3 m 10 m 30 m

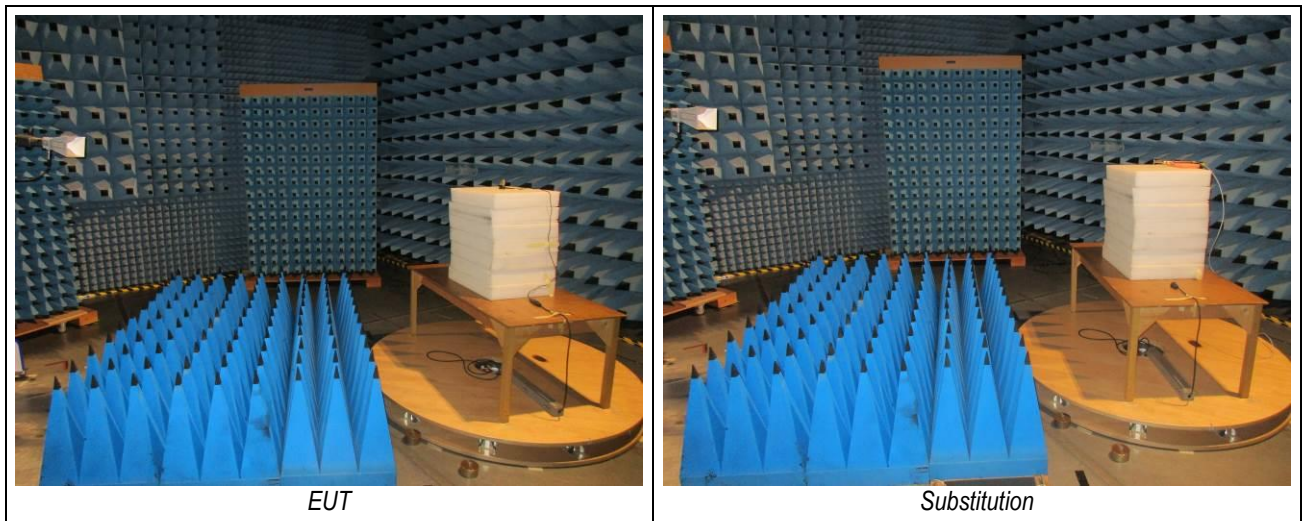
Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. uncertainty: ± 1.3 dB (f < 300 MHz) / ± 1.6 dB (f > 300 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The ERP / EIRP values are determined replacing the EUT by a substitution antenna (dipole or other). The limits on the plots represent the equivalent field levels for the required power limits.

Limit: Antenna gain 6dBi (for a maximum conducted power of 125 mW = 21 dBm). If antennas with directional gains exceeding 6 dBi are used, the maximum peak output power shall be reduced as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test set-up:



Remarks: ---

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 94-35	<input type="checkbox"/> 04-29		
Preamplifier	<input type="checkbox"/> 11-29	<input type="checkbox"/> 95-86	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-59	<input type="checkbox"/> 05-62	<input type="checkbox"/> 05-87
Antenna (horn)	<input type="checkbox"/> 90-24	<input type="checkbox"/> 98-12	<input type="checkbox"/> 98-13	<input checked="" type="checkbox"/> 07-31		
HF-wattmeter	<input type="checkbox"/> 95-97	<input type="checkbox"/> 01-15	<input type="checkbox"/> 01-17	<input type="checkbox"/> 03-07	<input checked="" type="checkbox"/> 03-12	<input type="checkbox"/> 05-20
Thermocouple detector	<input checked="" type="checkbox"/> 09-04	<input type="checkbox"/> 05-74	<input type="checkbox"/> 05-88	<input type="checkbox"/> 07-03	<input type="checkbox"/> 10-27	<input type="checkbox"/> 03-14
Substitution antenna	<input type="checkbox"/> 89-01	<input checked="" type="checkbox"/> 00-52				
Oscilloscope	<input type="checkbox"/> 90-14	<input type="checkbox"/> 93-85	<input type="checkbox"/> 93-86	<input type="checkbox"/> 01-20	<input type="checkbox"/> 04-06	<input type="checkbox"/> 04-50
Multimeter	<input type="checkbox"/> 03-22	<input type="checkbox"/> 04-47	<input type="checkbox"/> 04-104	<input type="checkbox"/> 04-105	<input type="checkbox"/> 06-51	<input type="checkbox"/> 06-52
Frequency generator	<input checked="" type="checkbox"/> 15-21	<input type="checkbox"/> 00-42	<input type="checkbox"/> 03-39	<input type="checkbox"/> 07-02	<input type="checkbox"/> 04-89	<input type="checkbox"/> 05-78
Cables	<input checked="" type="checkbox"/> 06-00	<input type="checkbox"/> 06-01	<input checked="" type="checkbox"/> 10-51	<input type="checkbox"/> SMK		
Attenuator 10dB	<input type="checkbox"/> 11-36					

Result: pass fail not applicable not tested

Results of the test

Client: *Phonak Communications AG*

Apparatus: *Roger Select (DM part), proto 20*

Operating mode: *Hopping f = 2.402/2.440/2.480 GHz, modulated, max. power*

Cables connected to the EUT: *All (see § 4.6 and § 5.4)*

Remarks: *RBW = 5 MHz, VBW = 3 MHz; Peak detector*

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 24 °C Humidity: 30 - 35 % Pressure QFE: 920 - 950 hPa

f [GHz]	Measurement with EUT		Power at substitution ant.		Meas. with subst. ant.	Parameters of substitution ant.		Result			Polarisation
	U [dBuV]	preamp [dB]	P [dBm]	factor [dB]	U [dBuV]	gain [dB]	att. Cable [dB]	corr. [dB]	P EIRP [dBm]	P EIRP [W]	
2.402	74.8	0.0	10.0	0	72.8	2.15	0	-60.65	14.15	26.00 mW	Vertical
2.402	76.5	0.0	10.0	0	73.1	2.15	0	-60.95	15.55	35.89 mW	Horizontal
2.440	75.5	0.0	10.0	0	73.0	2.15	0	-60.85	14.65	29.17 mW	Vertical
2.440	77.6	0.0	10.0	0	73.4	2.15	0	-61.25	16.35	43.15 mW	Horizontal
2.480	75.0	0.0	10.0	0	72.2	2.15	0	-60.05	14.95	31.26 mW	Vertical
2.480	75.7	0.0	10.0	0	72.5	2.15	0	-60.35	15.35	34.28 mW	Horizontal

The antenna gain is the difference (in dB) of the radiated EIRP power and the conducted power of § 6.6 :

frequency [GHz]	Conducted power [dBm]	Radiated power EIRP [dBm]	Antenna gain [dBi]	Remarks
2.402	16.35	15.55	-0.80	---
2.440	16.32	16.35	0.03	---
2.480	15.64	15.35	-0.29	---

Place and date of test: *Rossens, December 6 and 14, 2017*
 Operator: *B. Itzcovich*

6.6 Maximum output power (conducted)

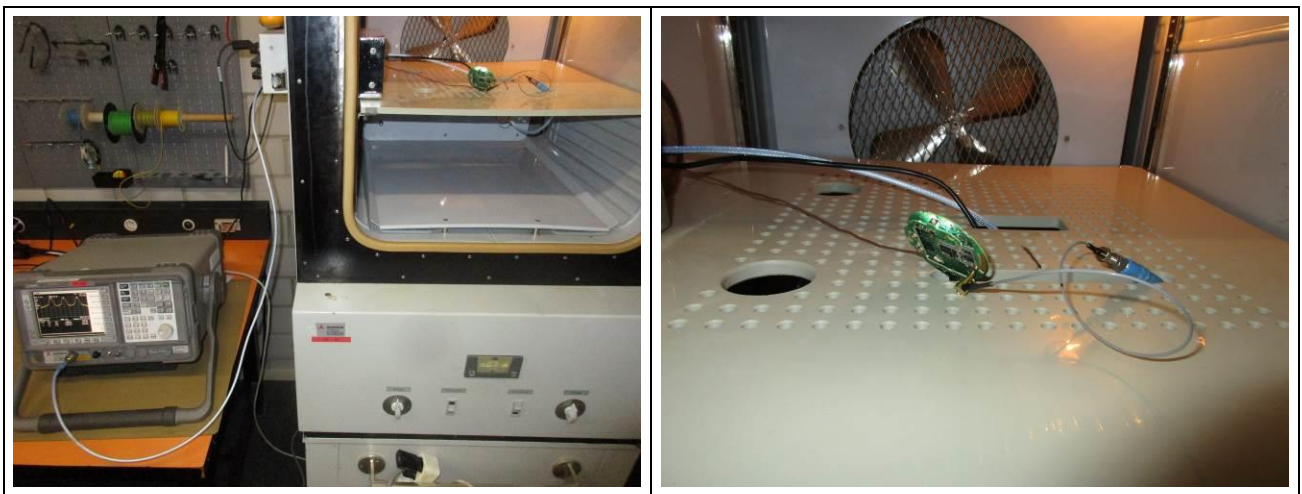
Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Limit: Maximum 0.125 Watt (= 21 dBm) for systems using antennas with directional gains that do not exceed 6 dBi. If antennas with directional gains exceeding 6 dBi are used, the maximum peak output power shall be reduced as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test set-up:



Remarks: ---

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Result: pass fail not applicable not tested

Results of the test

Client: *Phonak Communications AG*

Apparatus: *Roger Select (DM part), proto 20*

Operating mode: *Hopping f = 2.402/2.440/2.480 GHz, modulated, Pmax (05)*

Cables connected to the EUT: *USB and temporary antenna cables*

Remarks: *Measured on temporary antenna connector*

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 920 - 930 hPa

f normal [GHz]	Temp [°C]	U [V]	P [dBm]	Limit [dBm]	Remarks	Pass	
						Yes	No
2.402	21	5.0	16.35	21	Maximum conducted emission	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.440	21	5.0	16.32	21	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.480	21	5.0	15.64	21	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Place and date of test: *Rossens, December 14, 2017*
 Operator: *B. Itzcovich*

6.7 Band-edge emission (conducted)

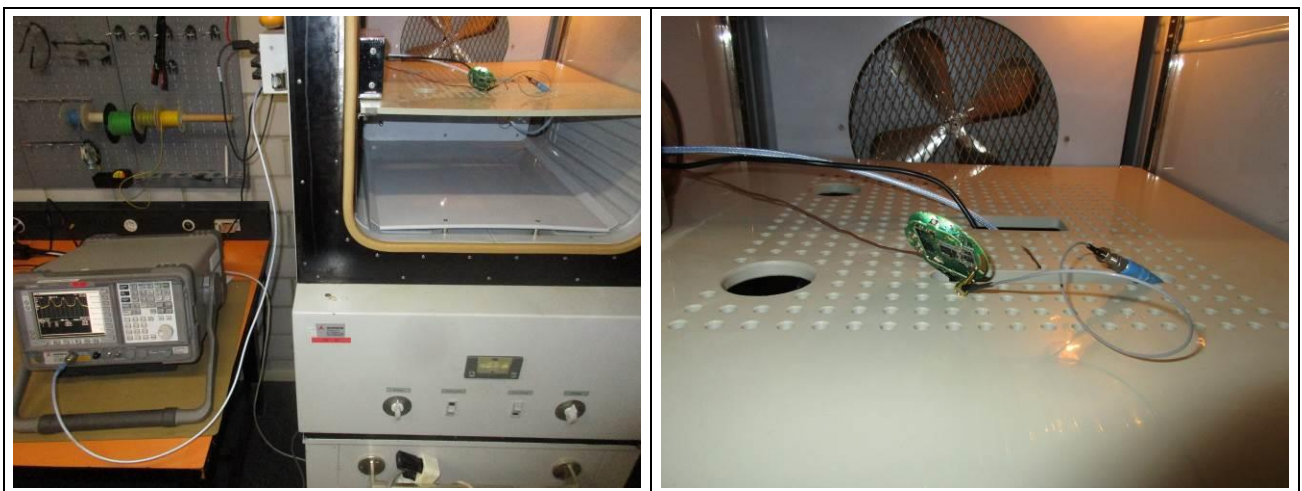
Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Limit: In any 100 kHz bandwidth outside the frequency band, the radio frequency power shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Test set-up:



Remarks: ---

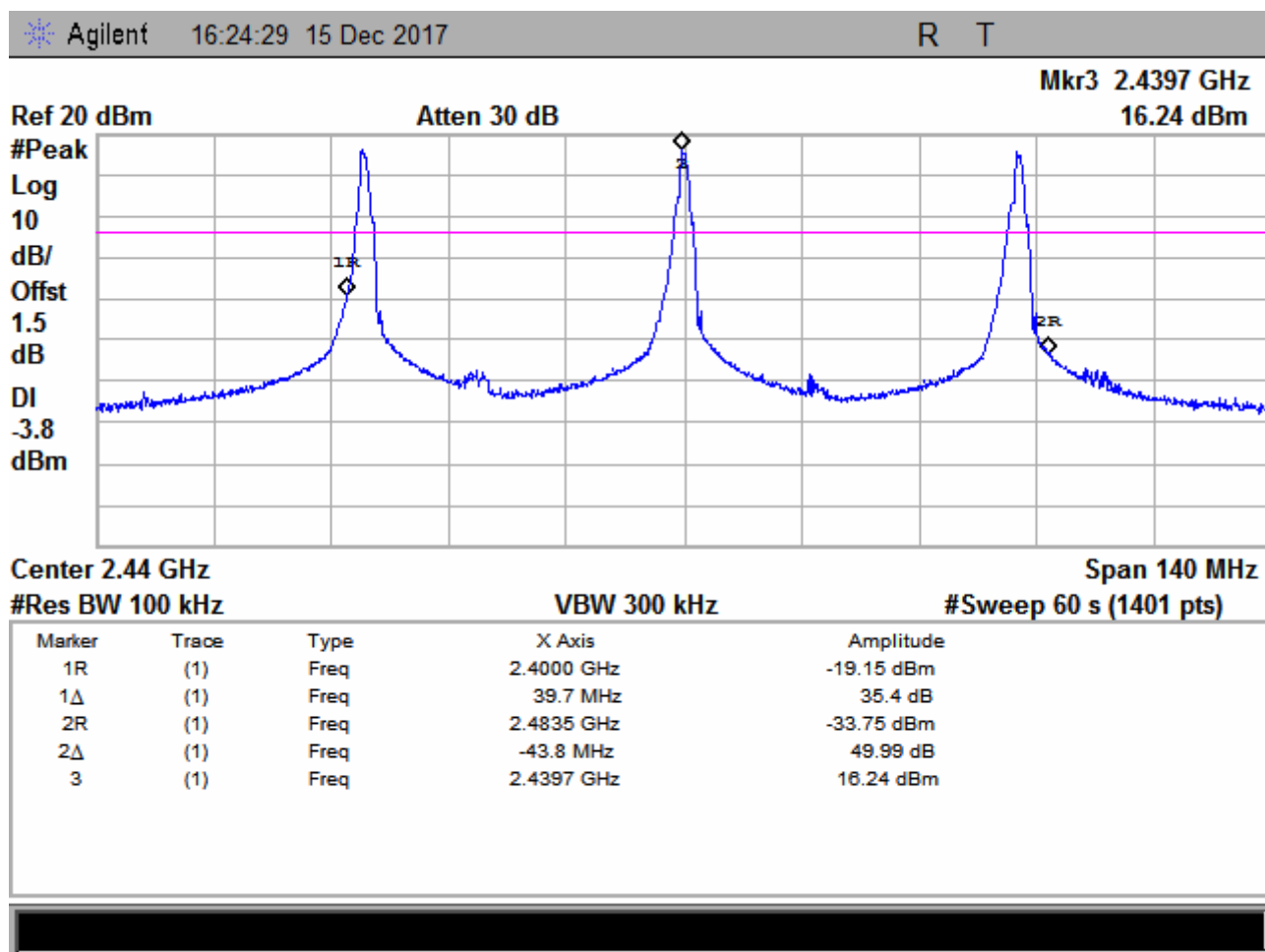
Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Result: pass fail not applicable not tested

Results of the test

Client: *Phonak Communications AG*
 Apparatus: *Roger Select (DM part), proto 20*
 Operating mode: *Hopping f = 2.402/2.440/2.480 GHz, modulated, Pmax (05)*
 Cables connected to the EUT: *USB and temporary antenna cables*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5
 Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 910 - 920 hPa



Place and date of test: *Rossens, December 15, 2015*
 Operator: *B. Itzcovich*

6.8 Band-edge emission (radiated)

Test site: semi-anechoic chamber (ferrites) semi-anechoic chamber (foam)

Distance: 1 m 3 m 10 m 30 m

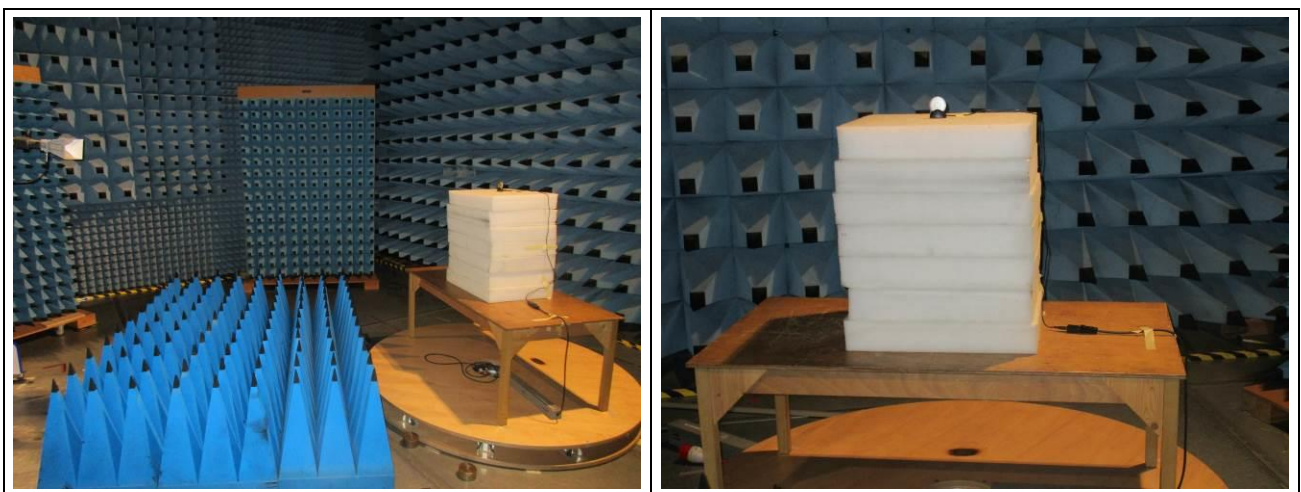
Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. uncertainty: ± 4.7 dB

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is placed at the same height as the EUT successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Limit: Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

Test set-up:



Remarks: *Limit values expressed in dBμV/m and transformed to a measuring distance of 3 m (factor used = 20 dB/decade) if necessary*
 e.g.: for $f = 40 \text{ MHz}$ the limit is $500 \mu\text{V/m}$ at 3 m ;

$$20 \log \left(\frac{500 \frac{\mu\text{V}}{\text{m}}}{1 \frac{\mu\text{V}}{\text{m}}} \right) = 54 \frac{\text{dB}\mu\text{V}}{\text{m}} \text{ at } 3\text{m}$$

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input checked="" type="checkbox"/> 10-70	<input type="checkbox"/> 07-53
Preamplifier	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-87	<input type="checkbox"/> 11-29			
Antenna (horn)	<input type="checkbox"/> 90-24	<input checked="" type="checkbox"/> 07-31				
Cables	<input type="checkbox"/> 06-00	<input type="checkbox"/> 11-61	<input checked="" type="checkbox"/> 10-75			

Result: pass fail not applicable not tested

Results of the test

Client: *Phonak Communications AG*

Apparatus: *Roger Select (DM part)*

Operating mode: *TX (f = 2.402/2.480 GHz), modulated, Pmax (05), Duty 100%*

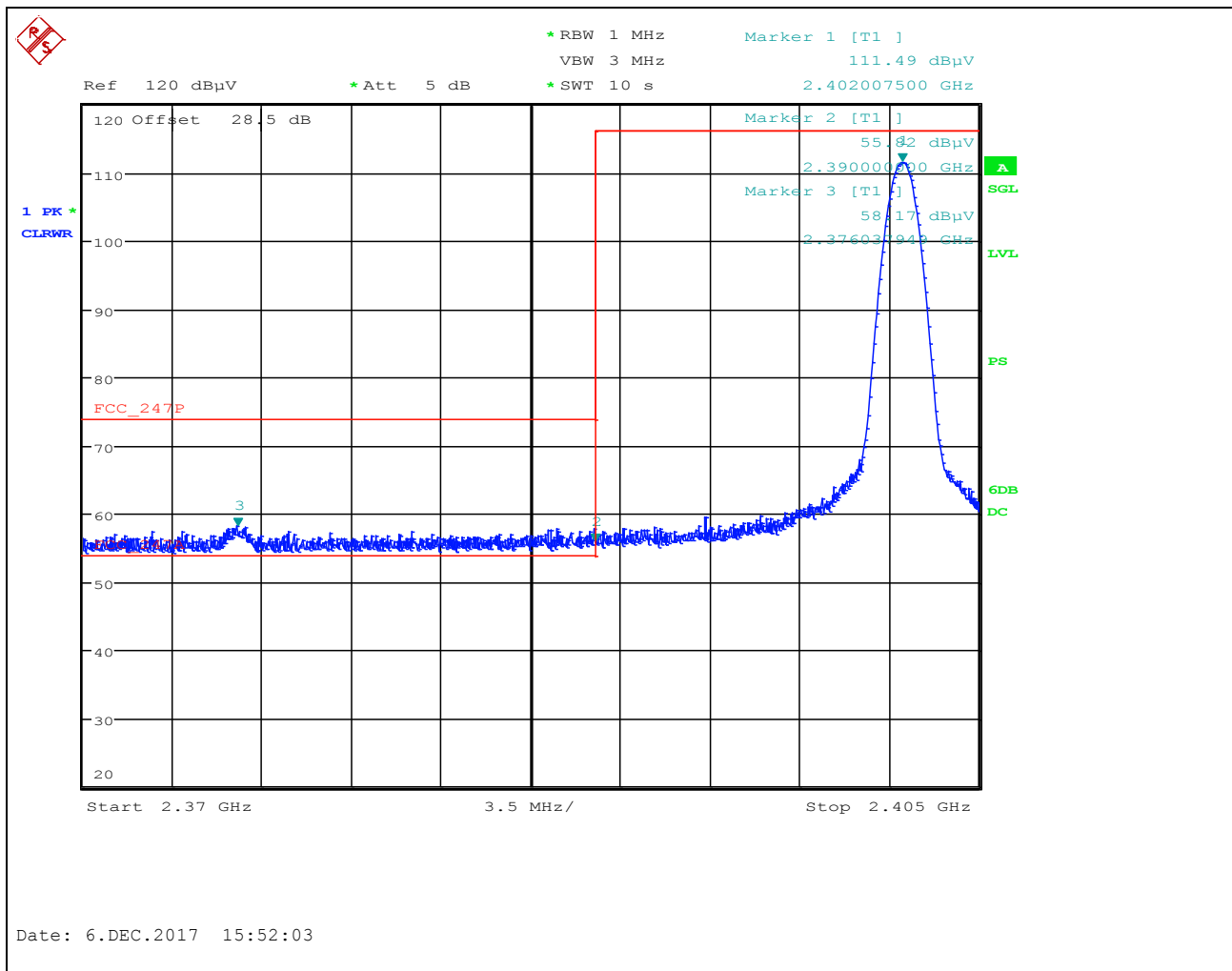
Cables connected to the EUT: *All (see § 4.6 and § 5.4)*

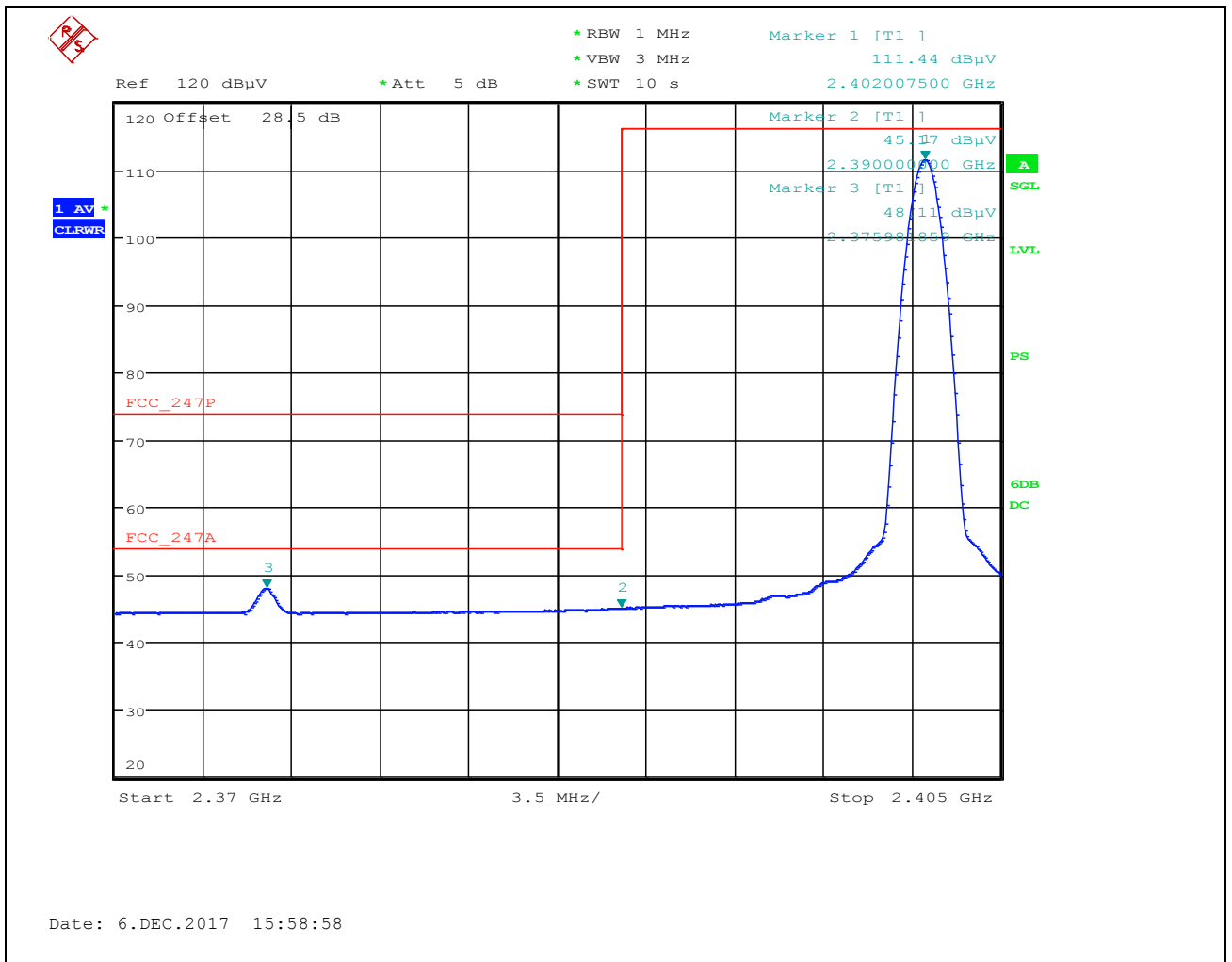
Remarks: *---*

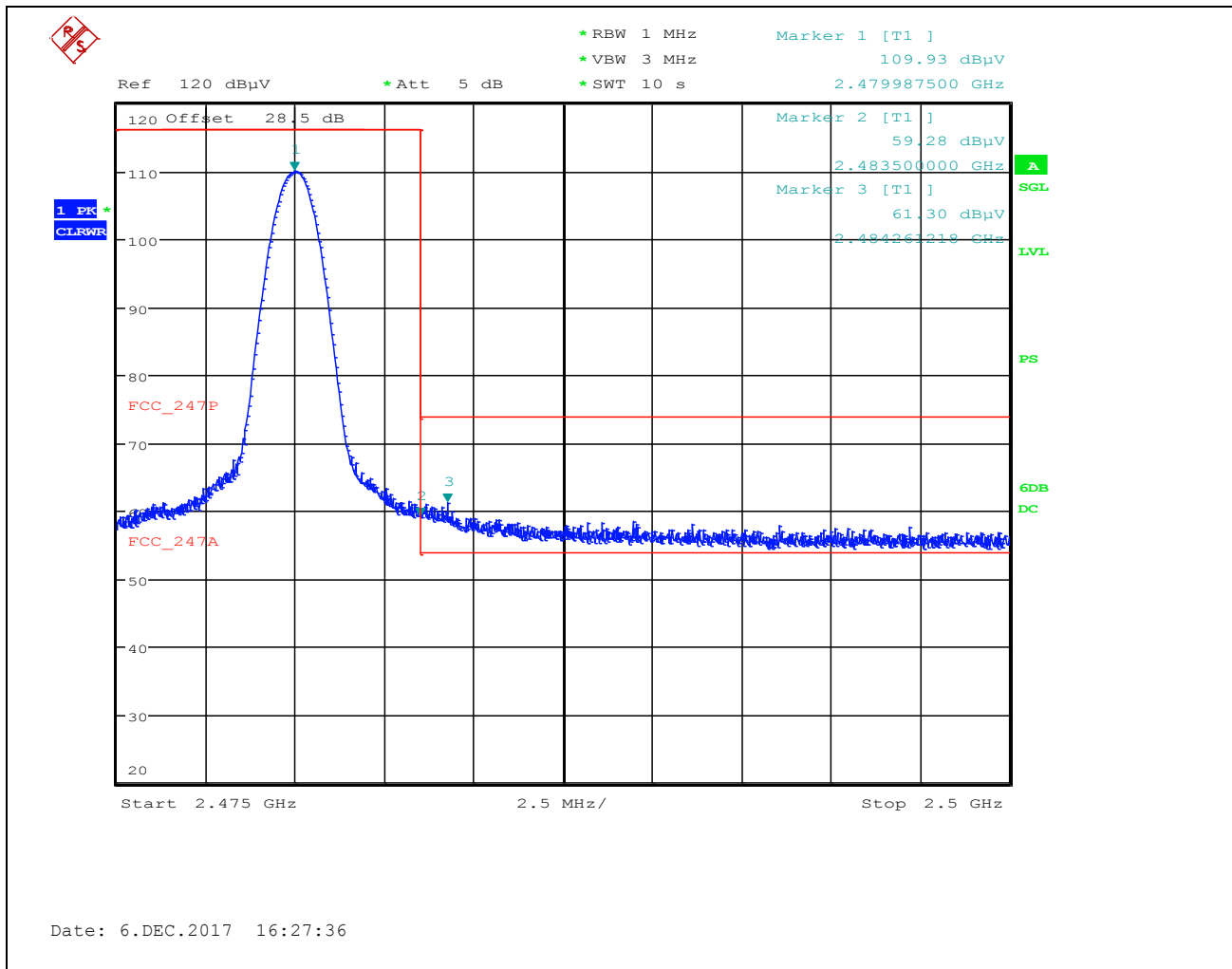
Modifications: None 1 2 3 4 5

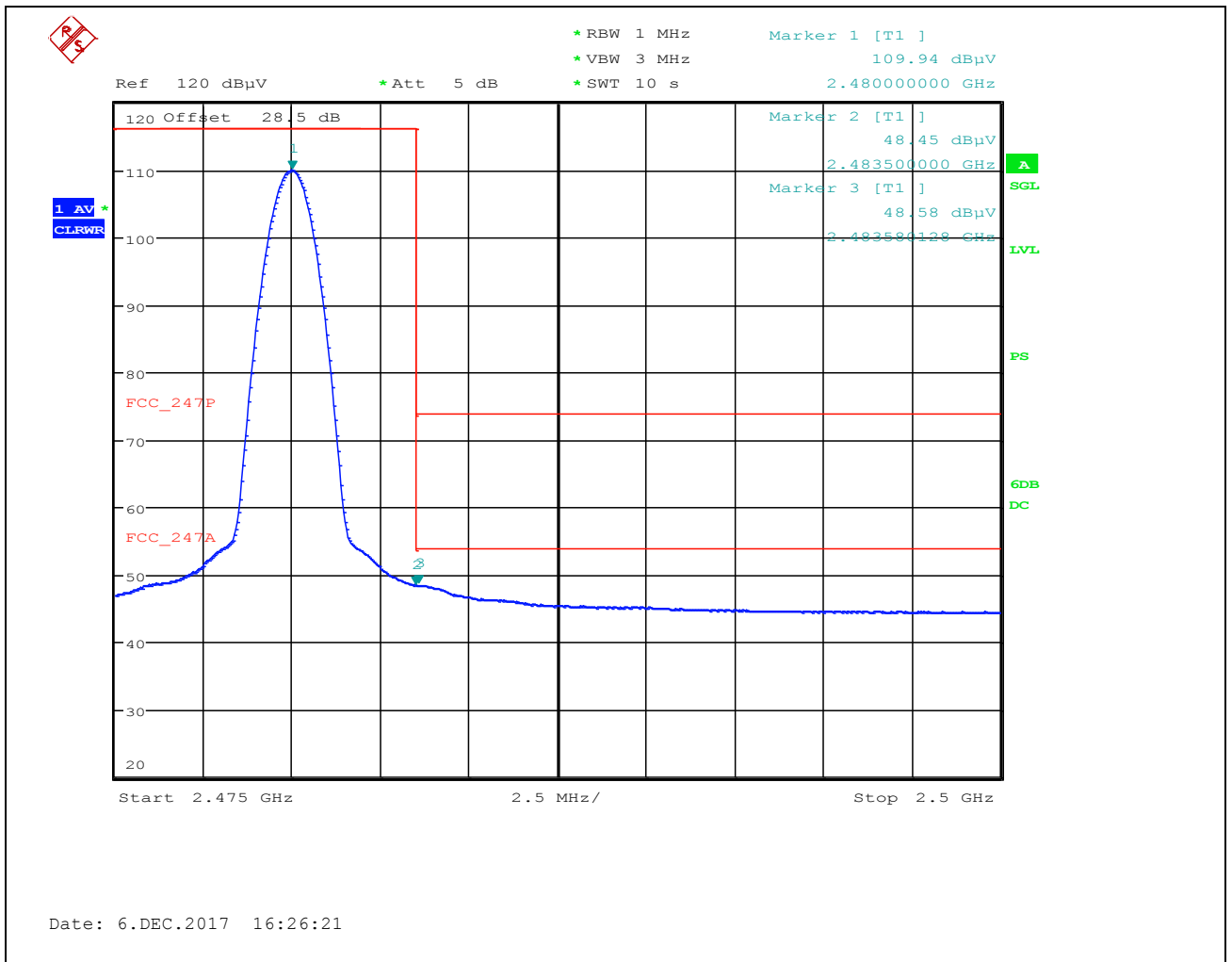
Climatic conditions: Temperature: 22 - 24 °C Humidity: 30 - 35 % Pressure QFE: 940 - 950 hPa

	Measured field strength [dBµV/m]		Limit [dBµV/m]	Margin [dB]		Pass	
	≤2390.0 MHz	≥2483.5 MHz		≤2390.0 MHz	≥2483.5 MHz	Yes	No
Peak detector	58.17	61.30	74	15.83	12.70	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Average RMS detector	48.11	48.58	54	5.89	5.42	<input checked="" type="checkbox"/>	<input type="checkbox"/>









Place and date of test:
Operator:

Rossens, December 6, 2017
B. Itzcovich

6.9 Spurious emissions – conducted (transmitter – 9 kHz to 26 GHz)

Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites) laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

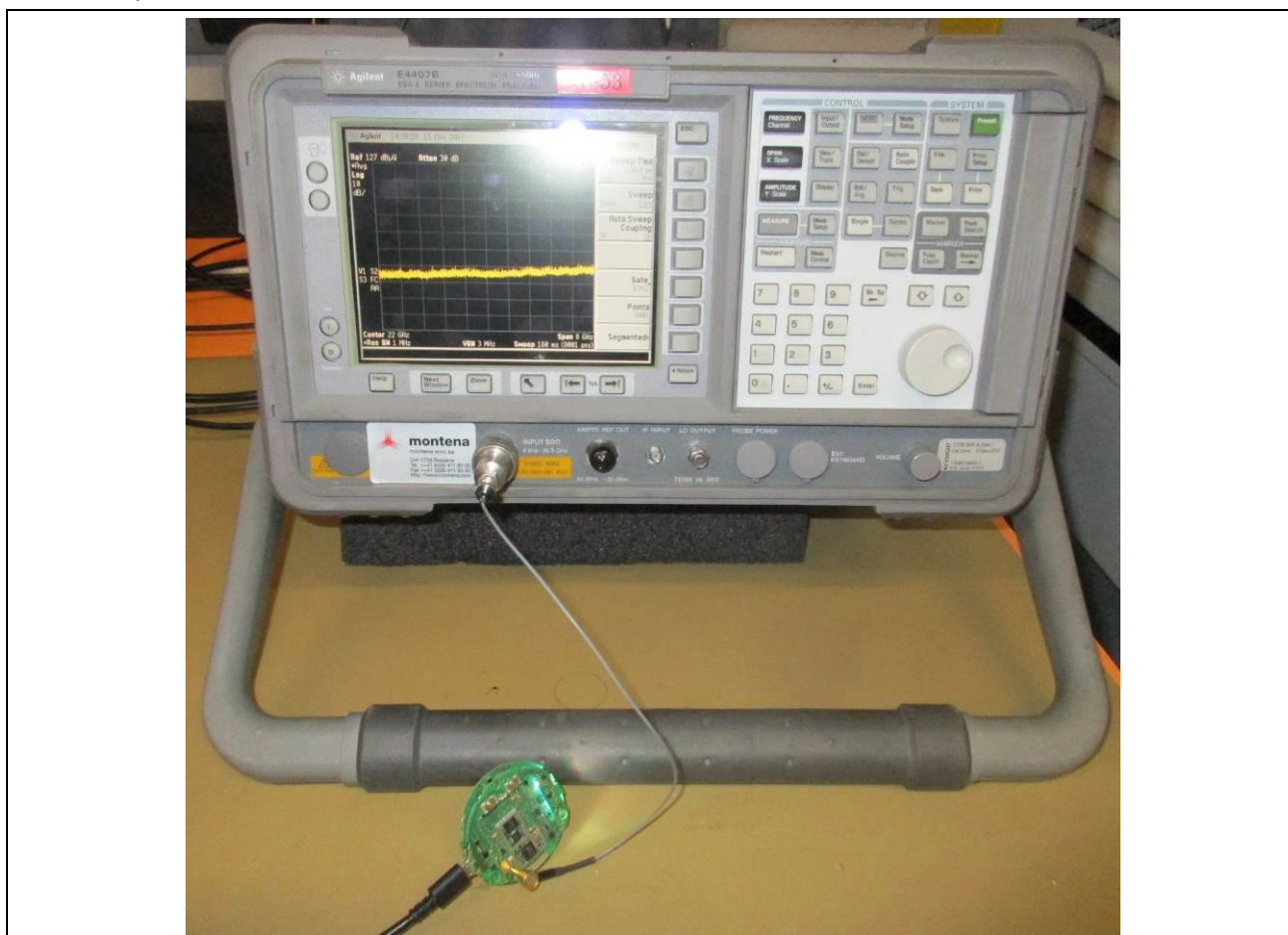
Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Limit: In any 100 kHz bandwidth outside the frequency band, the radio frequency power shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 910 - 920 hPa

Test set-up:



Remarks: Emissions near band-edges are checked under § 6.7

Test equipment:

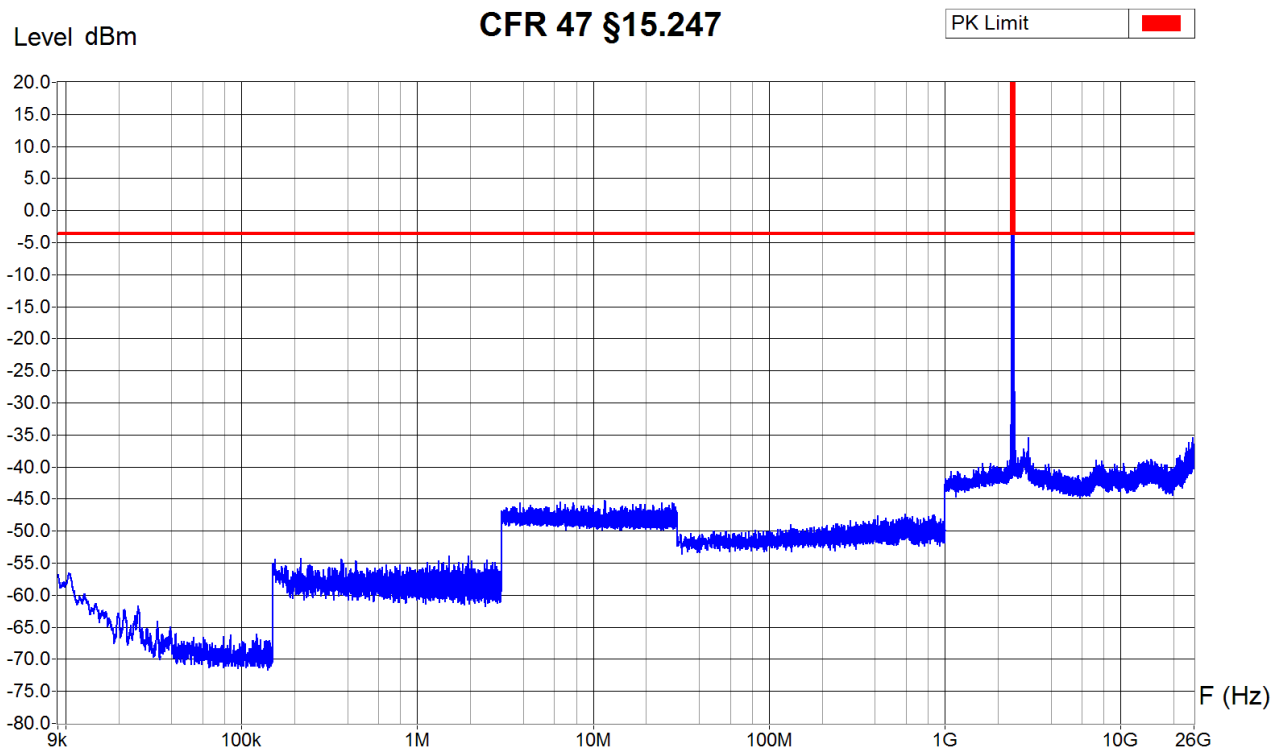
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input type="checkbox"/> 11-13					

Result: pass fail not applicable not tested

Measurement Type : Power Interference
Port : Temporary antenna connector
Clamp position : -



Equipment Under Test : Roger Select (TX27), DM part
Set-Up : See photos
Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
Remarks : Peak detector sweep, 8001 Pts/zone



Operator: B. Itzcovich
Date/Time: 15.12.2017 16:42
Filename:
CP_9k-26G_DMTXP05.png/.txt

6.10 Spurious emissions, transmit mode – radiated

6.10.1 9 kHz to 30 MHz

Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites)

Distance: 3 m 10 m 30 m

Position of EUT: 0.8 m (height of the equipment under test above floor)

Meas. uncertainty: ± 2.8 dB

Test method: The magnetic disturbance radiated by the equipment under test is measured using a spectrum analyzer and a wide band magnetic antenna. The antenna is placed at 1 m height, first in the direction of the apparatus under test, then at 90° to the apparatus and if required also horizontally. If possible the turning table is operated through 360° during the measurement. The recording is carried out taking into account the maximum value of the disturbance appearing during the functioning of the apparatus under test. The peak values are recorded continuously on a graph. The values exceeding the limits are remeasured using a measuring receiver.

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 40 - 50 % Pressure QFE: 925 - 945 hPa

Test set-up:



Remarks: *Limit values expressed in dBµV/m and transformed to a measuring distance of 10 m (factor used = 40 dB/decade) if necessary*
 e.g.: for f = 10 MHz the limit is 30 µV/m at 30 m;

$$20 \log \left(\frac{30 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 40 \log \left(\frac{30 m}{10 m} \right) = 48.6 \frac{dB\mu V}{m} \text{ at } 10 m$$

Test equipment:

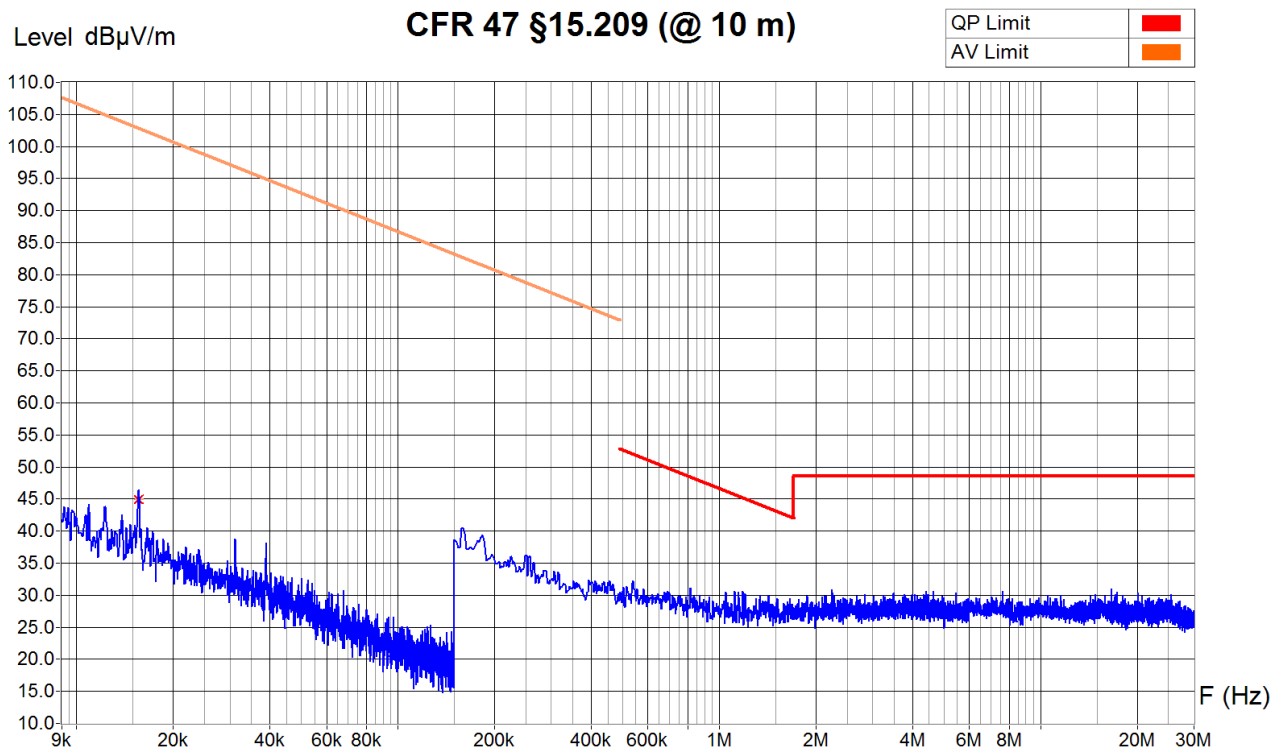
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 10-70
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 94-35	<input checked="" type="checkbox"/> 10-70		
Preamplifier	<input type="checkbox"/> 90-01	<input type="checkbox"/> 95-86	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-59	<input type="checkbox"/> 05-62	
Antenna (type: magnetic)	<input type="checkbox"/> 90-25	<input type="checkbox"/> 90-28	<input type="checkbox"/> 99-32	<input checked="" type="checkbox"/> 04-79		
Cables	<input checked="" type="checkbox"/> 06-01	<input type="checkbox"/> 06-206				

Result: pass fail not applicable not tested

Measurement Type : Radiated Field
 Polarisation : Parallel
 Table Angle : 0 - 360°
 Antenna Height : 1 m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : "Parallel" means "loop antenna axis towards EUT"
 Peak detector sweep, 9701 Pts/zone



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)
15.62 KHz	49.0 dBµV/m	45.0 dBµV/m	44.9 dBµV/m

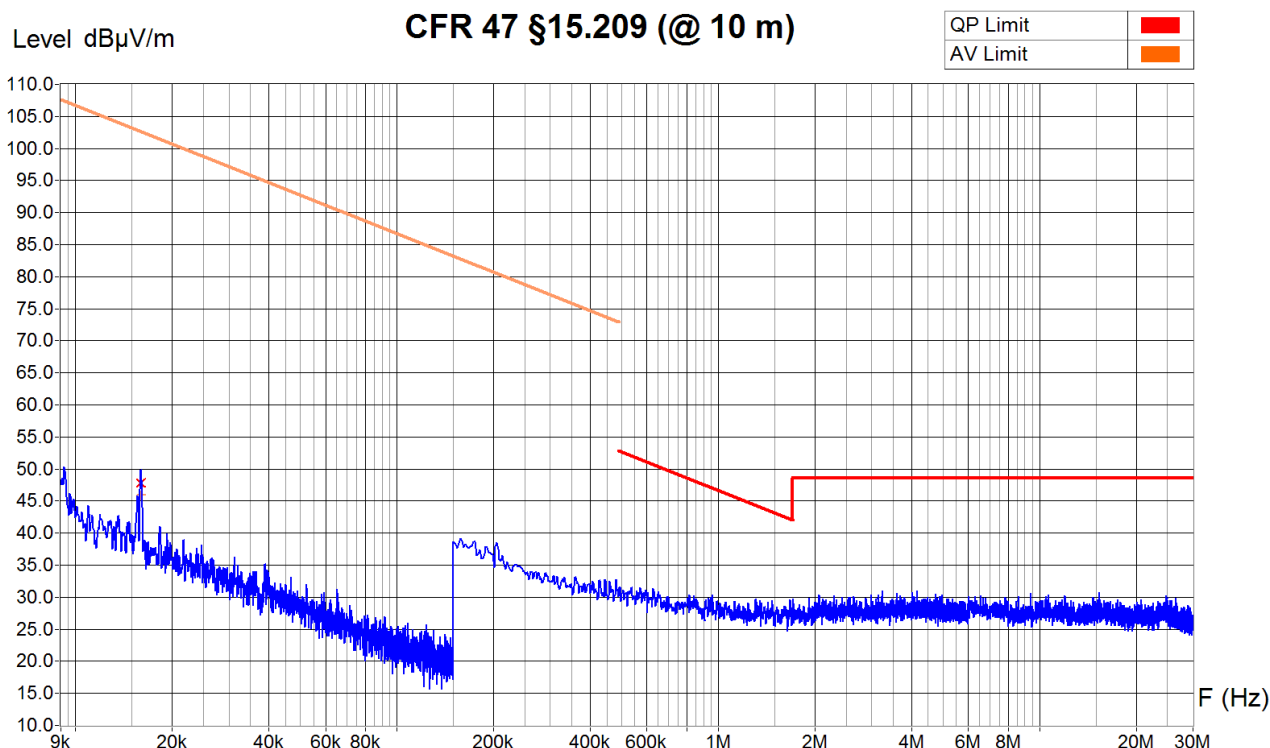
Sample calculation with all conversion and correction factors used				
Frequency [kHz]	Analyzer Peak value [dBµV]	Cable att. corr. [dB]	Antenna factor corr. [dB]	Peak field [dBµV/m]
15.62	27.5	+0.0	+21.5	= 49.0

Operator: B. Itzcovich
 Date/Time: 13.12.2017 14:21
 Filename:
 15_RE_9k-
 30M_DMTXP05_Par.png/.txt

Measurement Type : Radiated Field
 Polarisation : Perpendicular
 Table Angle : 0 - 360°
 Antenna Height : 1 m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : "Parallel" means "loop antenna axis towards EUT"
 Peak detector sweep, 9701 Pts/zone



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)
15.95 KHz	54.1 dBµV/m	47.9 dBµV/m	46.0 dBµV/m

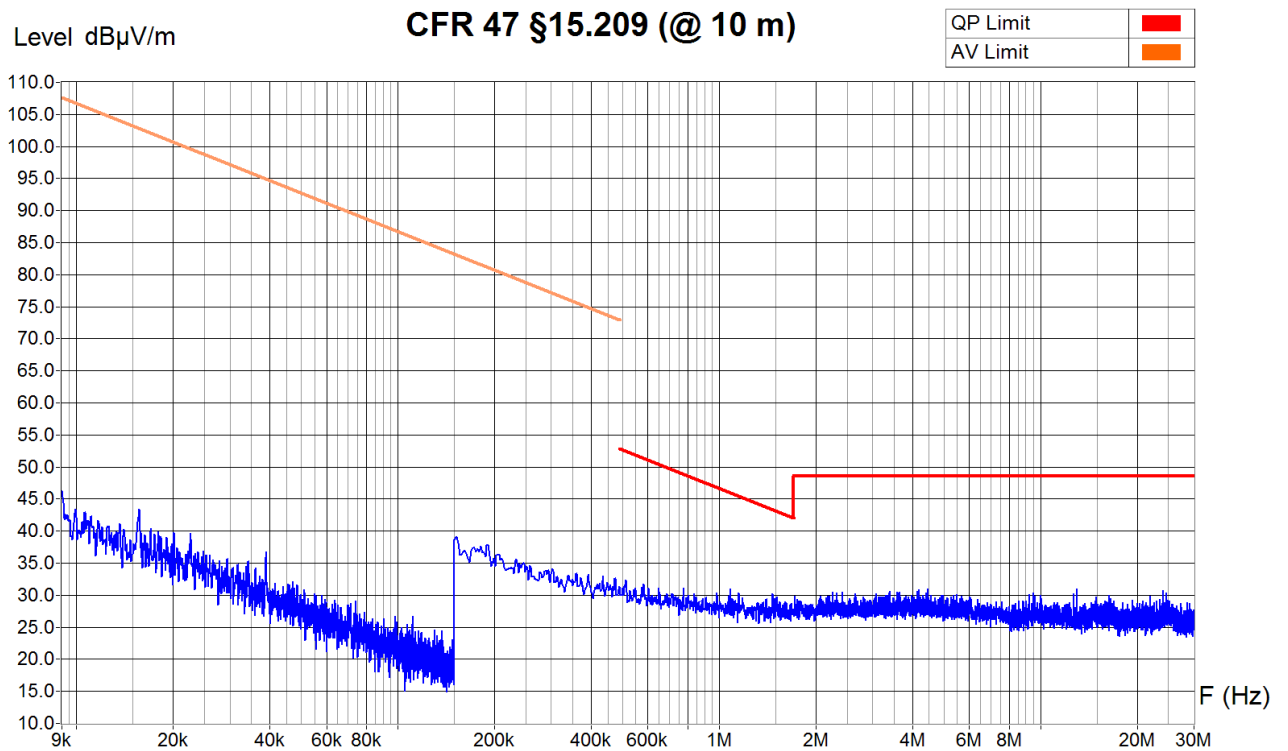
Frequency	Average RMS detector meas. @ 10m	Average RMS detector meas. corrected for 3m
15.95 kHz	46.0 dBuV/m	66.9 dBuV/m

Operator: B. Itzcovich
Date/Time: 13.12.2017 14:44
Filename: 16_RE_9k- 30M_DMTXP05_Per.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : "Parallel" means "loop antenna axis towards EUT"
 Peak detector sweep, 9701 Pts/zone



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
 Date/Time: 13.12.2017 15:31
 Filename:
 17_RE_9k-
 30M_DMTXP05_Hor.png/.txt

6.10.2 30 MHz to 1 GHz

Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites)

Distance: 3 m 10 m 30 m

Position of EUT: 0.8 m (height of the equipment under test above floor)

Meas. uncertainty: ± 4.6 dB (30 - 300 MHz) / ± 3.7 dB (300 - 1000 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit are re-measured manually using a receiver.

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 40 - 50 % Pressure QFE: 925 - 945 hPa

Test set-up:



Remarks: - Limit values expressed in dBµV/m and transformed to a measuring distance of 10 m (factor used = 20 dB/decade) if necessary
 e.g.: for f = 40 MHz the limit is 100 µV/m at 3 m;

$$20 \log\left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}}\right) + 20 \log\left(\frac{3 m}{10 m}\right) = 29.54 \frac{dB\mu V}{m} \text{ at } 10 m$$

Test equipment:

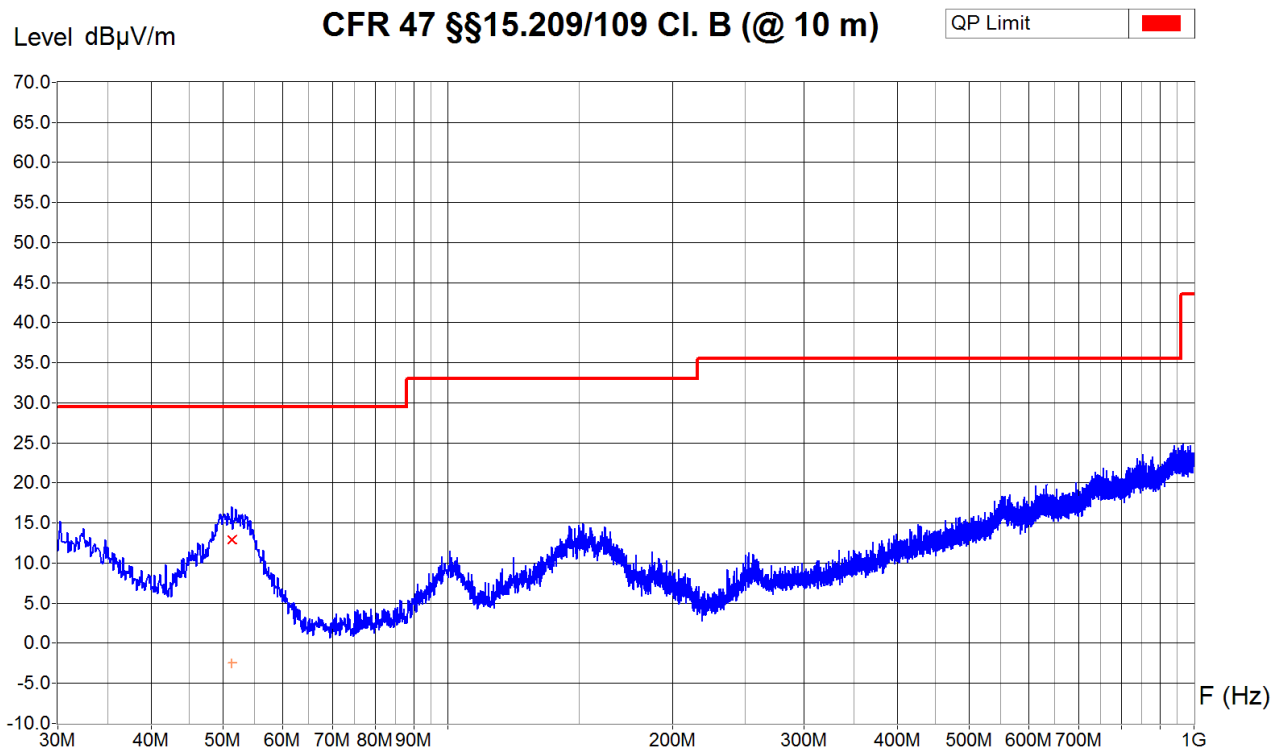
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 10-70
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 94-35	<input type="checkbox"/> 04-29	<input checked="" type="checkbox"/> 10-70	
Preamplifier	<input type="checkbox"/> 90-01	<input type="checkbox"/> 95-86	<input type="checkbox"/> 05-56	<input checked="" type="checkbox"/> 05-59	<input type="checkbox"/> 05-62	<input type="checkbox"/> 05-87
Antenna (bilog)	<input type="checkbox"/> 94-03	<input checked="" type="checkbox"/> 05-38				
Cables	<input checked="" type="checkbox"/> 06-01					

Result: pass fail not applicable not tested

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks :
 Peak detector sweep, 9701 Pts/zone



Zone	30 MHz - 1 GHz
Video Bandwidth	500 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
51.30 MHz	18.5 dBµV/m	12.9 dBµV/m	-2.5 dBµV/m	16.6 dB

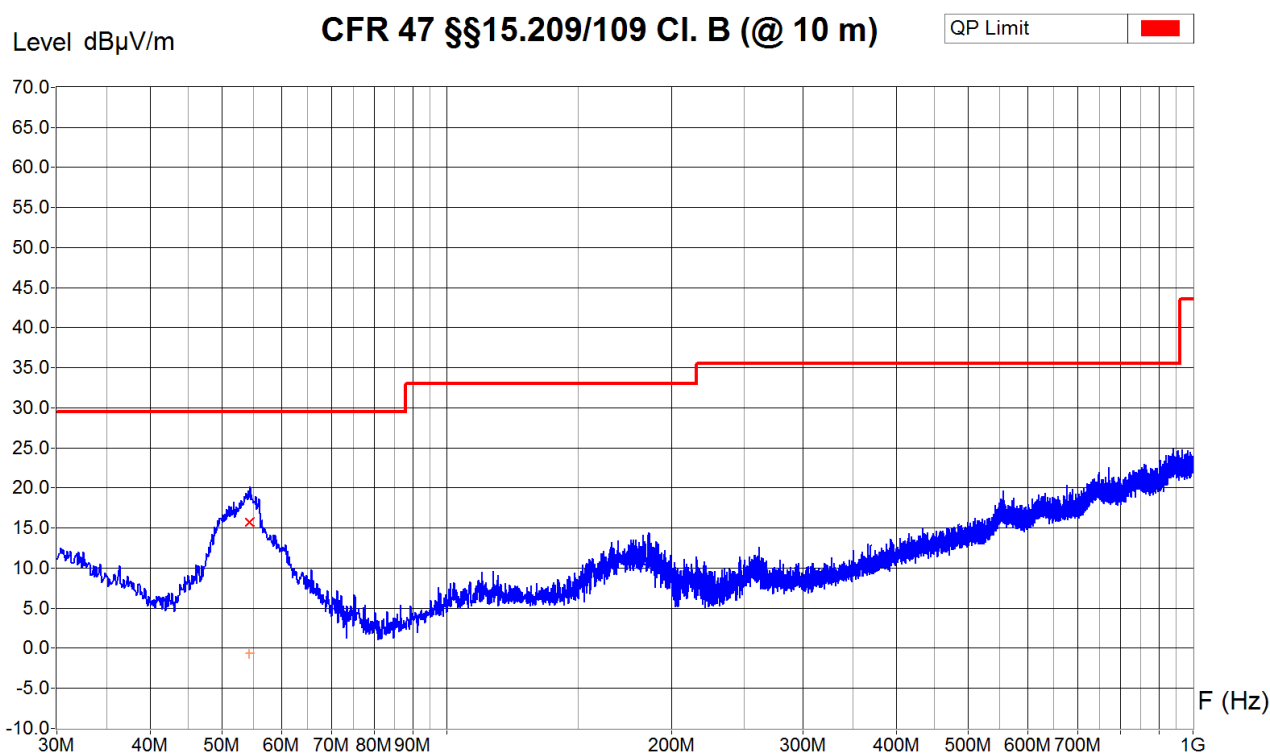
Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Analyzer Peak value [dBµV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	Peak field [dBµV/m]
51.30	40.0	+0.9	-29.1	+6.7	= 18.5

Operator: B. Itzcovich
 Date/Time: 13.12.2017 10:17
 Filename:
 11_RE_30M-
 1G_DMTXP05_V_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : Peak detector sweep, 9701 Pts/zone



Zone	30 MHz - 1 GHz
Video Bandwidth	500 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
54.40 MHz	20.7 dBµV/m	15.7 dBµV/m	-0.6 dBµV/m	13.8 dB

Operator: B. Itzcovich
 Date/Time: 13.12.2017 10:30
 Filename:
 12_RE_30M-
 1G_DMTXP05_H_FCC.png/.txt

6.10.3 1 GHz to 18 GHz

Test site: semi-anechoic chamber (ferrites) semi-anechoic chamber (foam)

Distance: 1 m 3 m 10 m 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

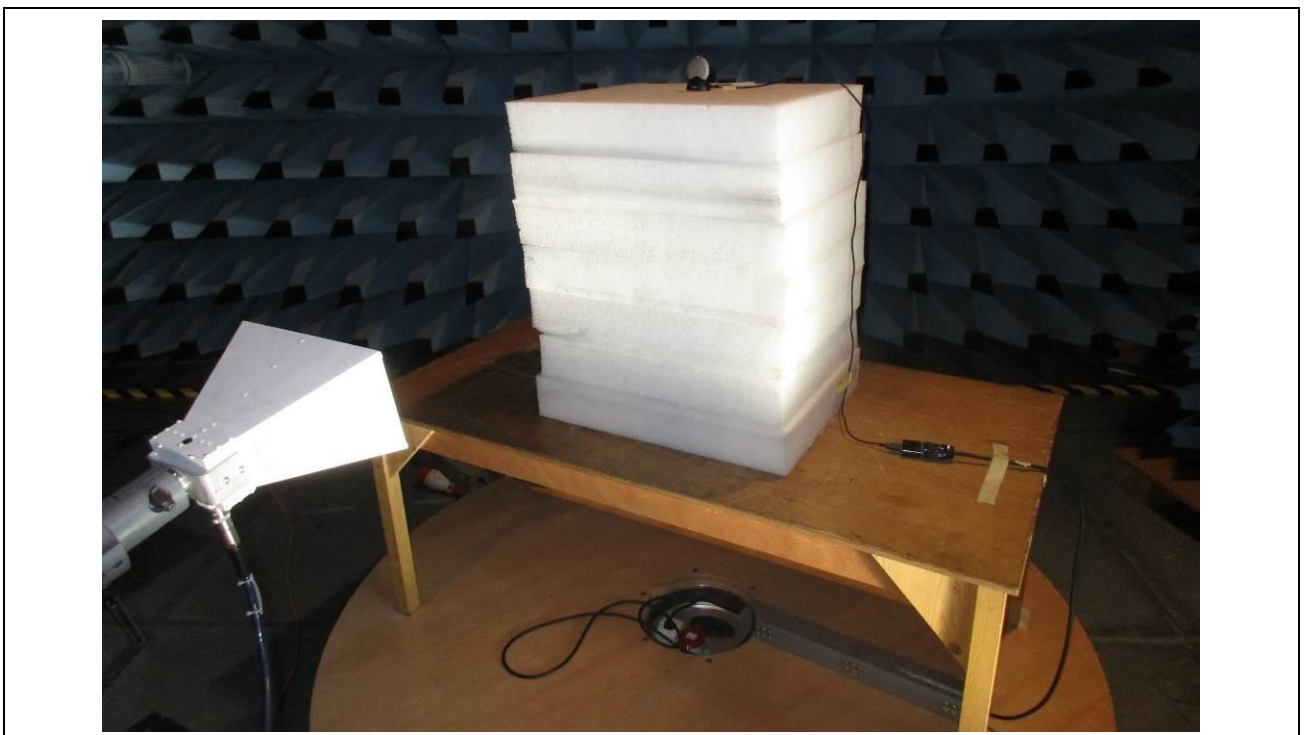
Meas. uncertainty: ± 4.7 dB

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 22 - 24 °C Humidity: 30 - 35 % Pressure QFE: 935 - 945 hPa

Test set-up:



Remarks: - Limit values expressed in dBµV/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary. E.g.: for f = 1 GHz the limit is 500 µV/m at 3 m;

$$20 \log\left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}}\right) + 20 \log\left(\frac{3m}{1m}\right) = 63.5 \frac{dB\mu V}{m} \text{ at } 1m$$

- Emissions near band-edges may seem over limits due to selectivity of 07-53 Analyzer at 1 MHz RBW and notch filter. They are checked under §§ 6.7 and 6.8
- Average measurement determined from the peak field strength after correcting for the worst-case duty cycle according to § 4.1.4.2.4 of ANSI C63.10:2013. Correction factor: $\delta(dB) = 20\log(\Delta) = 20 \log(0.1974) = -14.09 \text{ dB}$

Test equipment:

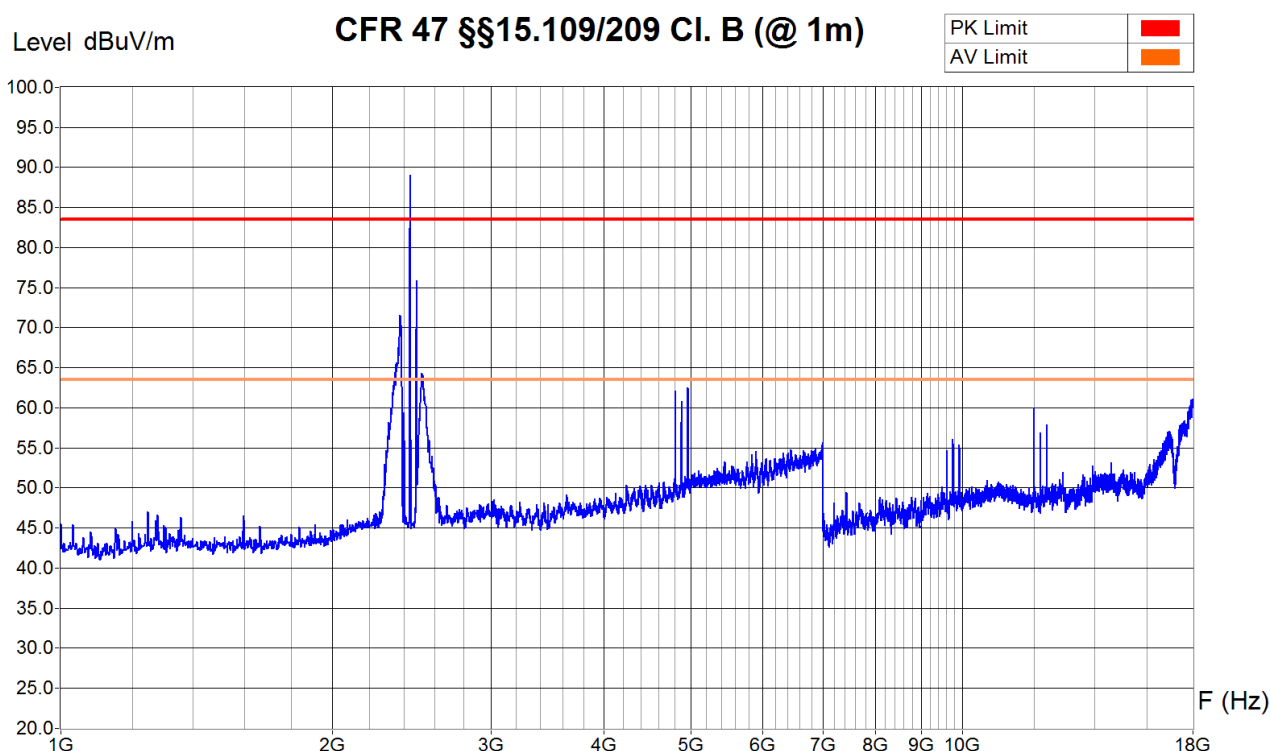
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Preamplifier	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-87	<input checked="" type="checkbox"/> N967			
Antenna (horn)	<input type="checkbox"/> 90-24	<input checked="" type="checkbox"/> 07-31				
Cables	<input checked="" type="checkbox"/> 10-75	<input checked="" type="checkbox"/> 10-79				
Filters	<input checked="" type="checkbox"/> 13-14	<input checked="" type="checkbox"/> 12-06	<input type="checkbox"/> 13-05			
Attenuator 10dB	<input checked="" type="checkbox"/> 11-36					

Result: pass fail not applicable not tested

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m (aimed at the source by tilting)



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks : Zone 1 - 7 GHz with Notch filter and attenuator 10dB
 Zone 7 - 18 GHz with HP filter
 Peak detector sweep, 3001 Pts/zone



Zone	1 GHz - 7 GHz	7 GHz - 13 GHz	13 GHz - 18 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

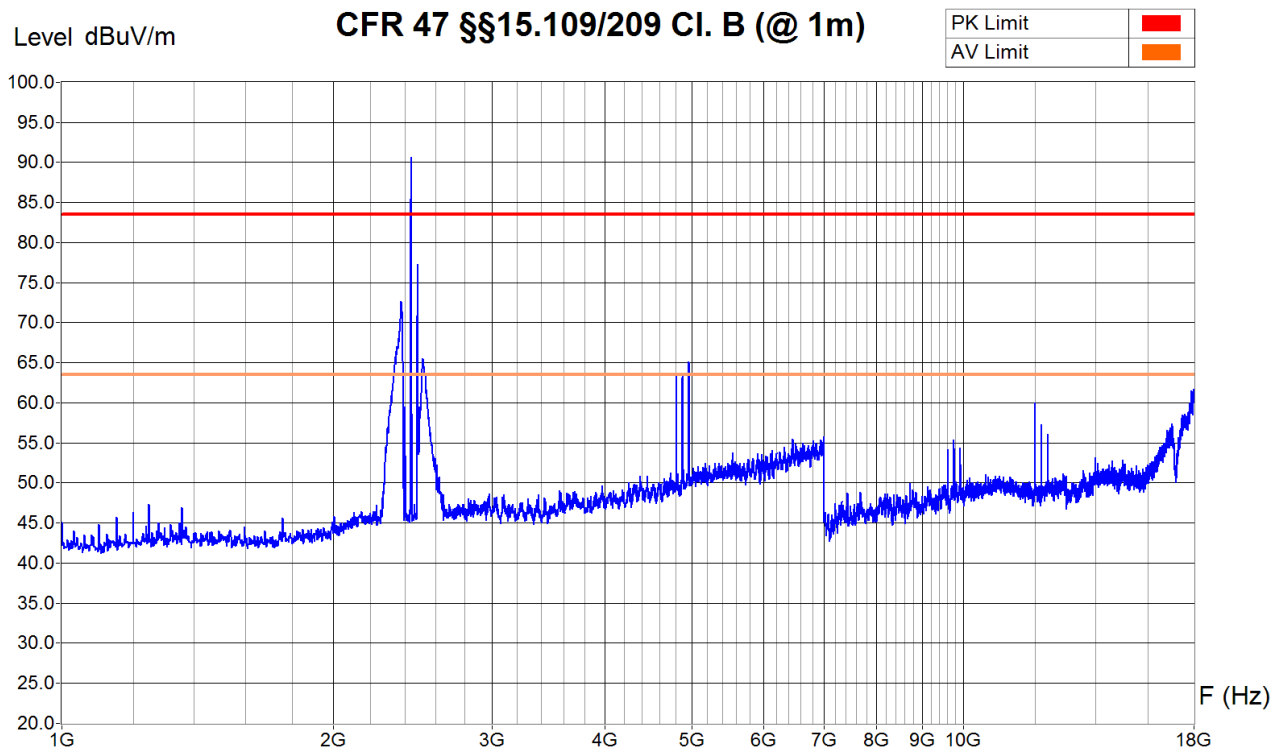
Sample calculation with all conversion and correction factors used						
Frequency [GHz]	Analyzer Peak value [dBuV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	Attenuator corr. [dB]	Peak field [dBuV/m]
4.960	59.2	+1.1	-40.1	+32.3	+ 10.0	= 62.5

Operator: B. Itzcovich
 Date/Time: 07.12.2017 10:21
 Filename:
 01_RE_1-
 18G_DMTXP05_V_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m (aimed at the source by tilting)



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks : Zone 1 - 7 GHz with Notch filter and attenuator 10dB
 Zone 7 - 18 GHz with HP filter
 Peak detector sweep, 3001 Pts/zone



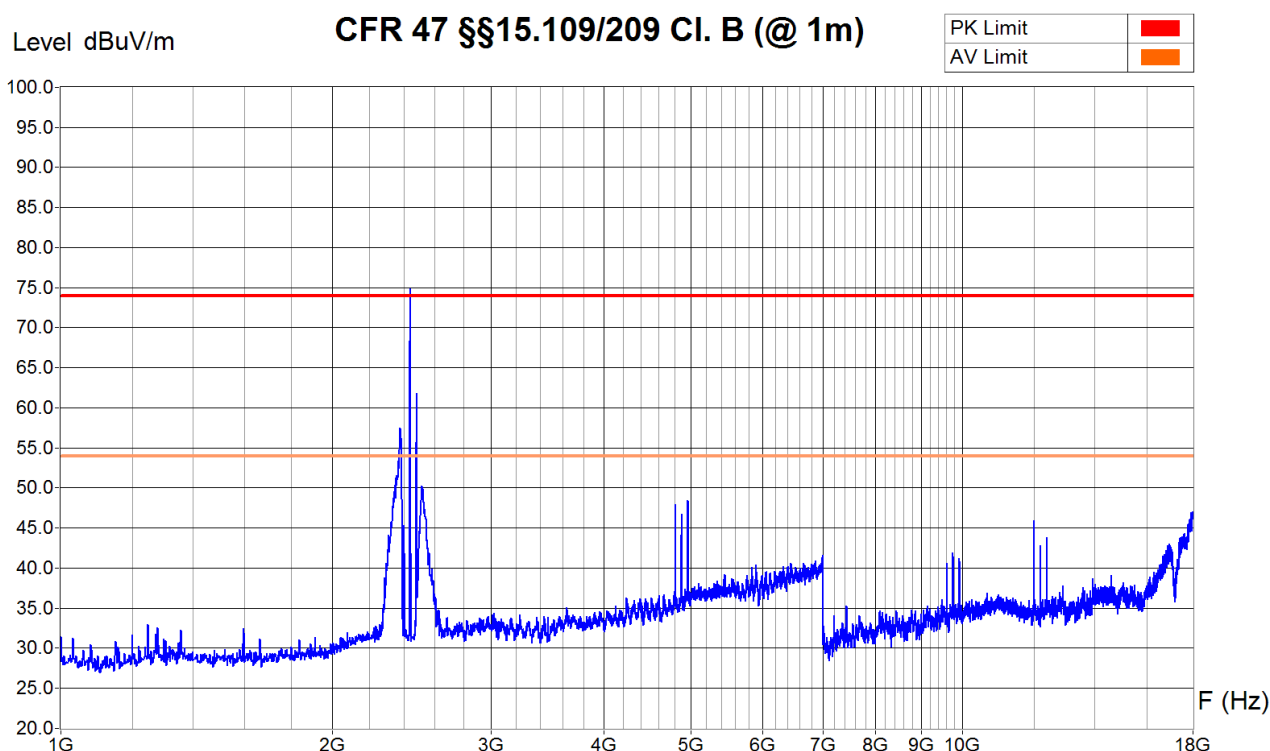
Zone	1 GHz - 7 GHz	7 GHz - 13 GHz	13 GHz - 18 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Operator: B. Itzcovich
 Date/Time: 07.12.2017 10:09
 Filename:
 02_RE_1-
 18G_DMTXP05_H_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m (aimed at the source by tilting)



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks : Zone 1 - 7 GHz with Notch filter and attenuator 10dB
 Zone 7 - 18 GHz with HP filter
 Average measurement computed from peak values with correction factor -14.1dB



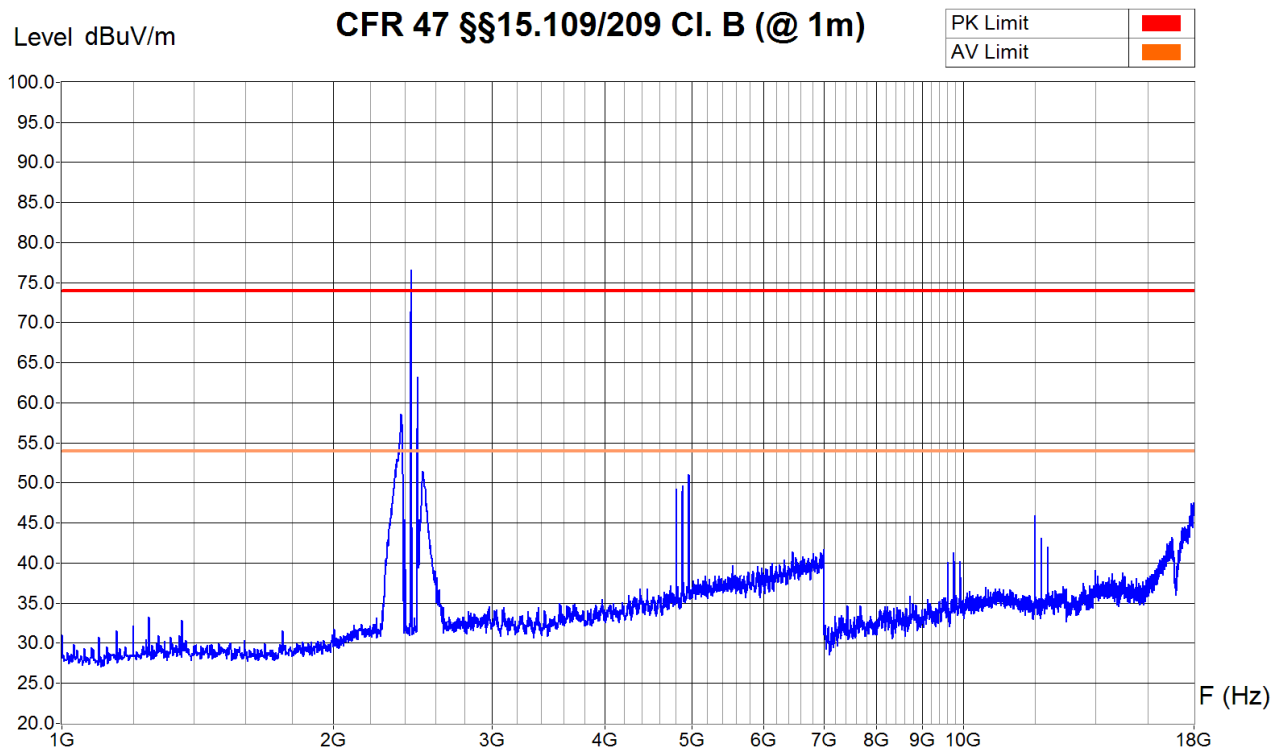
Zone	1 GHz - 7 GHz	7 GHz - 13 GHz	13 GHz - 18 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Operator: B. Itzcovich
Date/Time: 07.12.2017 10:21
Filename: 01_RE_1- 18G_DMTXP05_V_FCC_AV.png/

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m (aimed at the source by tilting)



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks : Zone 1 - 7 GHz with Notch filter and attenuator 10dB
 Zone 7 - 18 GHz with HP filter
 Average measurement computed from peak values with correction factor -14.1dB



Zone	1 GHz - 7 GHz	7 GHz - 13 GHz	13 GHz - 18 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Frequency	Average RMS detector meas. @ 1m	Average RMS detector meas. corrected for 3m
4.960 GHz	51.0 dBuV/m	41.5 dBuV/m

Operator: B. Itzcovich
 Date/Time: 07.12.2017 10:09
 Filename:
 02_RE_1-
 18G_DMTXP05_H_FCC_AV.png/

6.10.4 18 GHz to 26 GHzTest site: semi-anechoic chamber (foam) semi-anechoic chamber (ferrites)Distance: 1 m 3 m 10 m 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

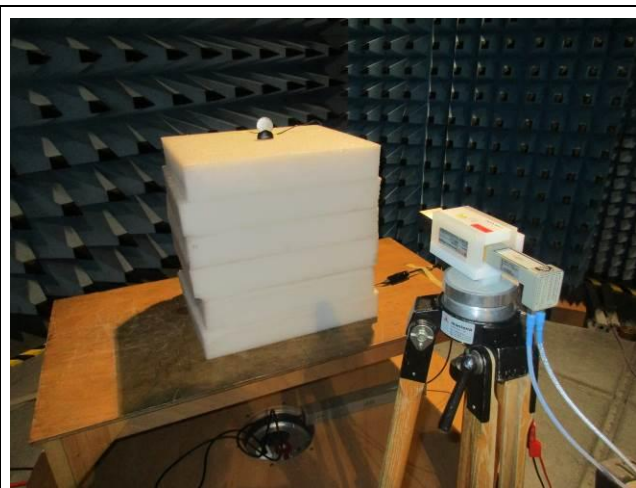
Meas. uncertainty: ± 4.7 dB

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is placed at the same height as the EUT successively with horizontal and vertical polarizations. The EUT is placed successively in standing and lying positions. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

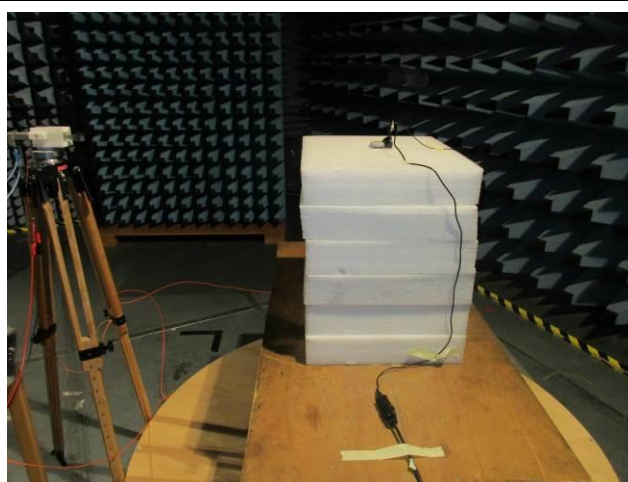
Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 22 - 24 °C Humidity: 30 - 35 % Pressure QFE: 900 - 910 hPa

Test set-up:



EUT standing



EUT lying

Remarks:

Limit values expressed in dB μ V/m and transformed to a measuring distance of 1m
(factor used = 20 dB/decade) if necessary
e.g.: for f = 18 GHz the limit is 500 μ V/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3 m}{1 m} \right) = 63.5 \frac{dB \mu V}{m} \text{ at } 1 m$$

Test equipment:

Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Antenna with mixer & preamp.	<input checked="" type="checkbox"/> 98-12					
Cables	<input checked="" type="checkbox"/> 11-62	<input checked="" type="checkbox"/> 10-81				
Power supply	<input checked="" type="checkbox"/> 06-62					
Multimeter	<input checked="" type="checkbox"/> 09-06					

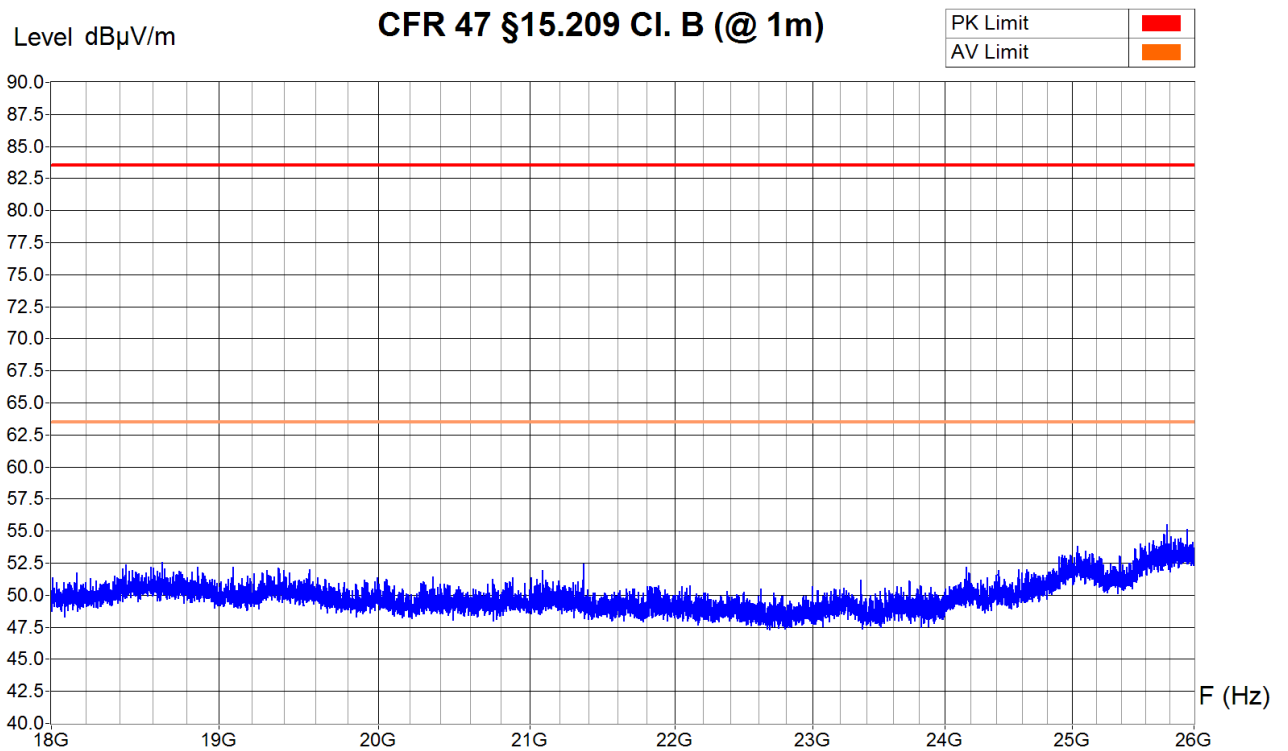
Result:	<input checked="" type="checkbox"/> pass	<input type="checkbox"/> fail	<input type="checkbox"/> not applicable	<input type="checkbox"/> not tested
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Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 2m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : EUT standing. With AC adaptor, all cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks :

Peak detector sweep, 8001 Pts/zone



Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

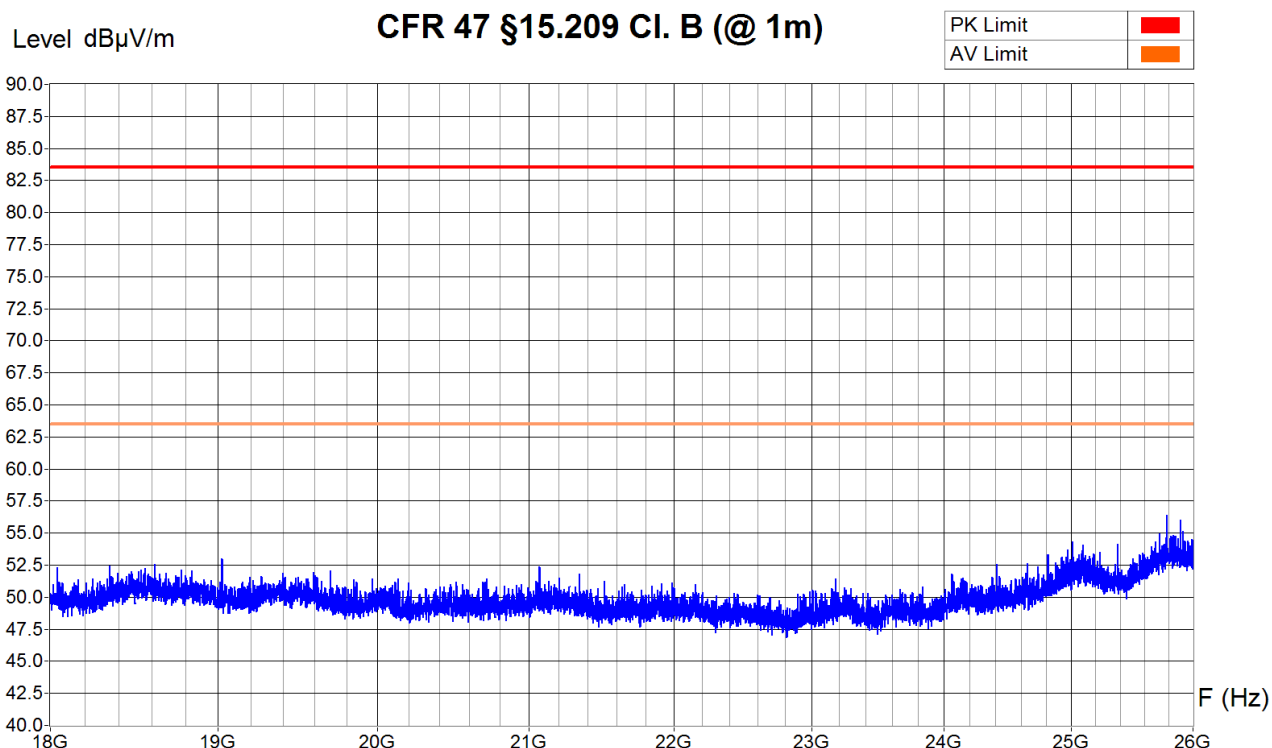
Sample calculation with all conversion and correction factors used			
Frequency [GHz]	Analyzer Peak value [dBµV]	Antenna factor corr. [dB]	Peak field [dBµV/m]
21.367	28.7	+23.7	= 52.4

Operator: B. Itzcovich
 Date/Time: 11.12.2017 10:31
 Filename:
 05_RE_1-
 18G_DMTXP05_stand_V.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 2m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : EUT standing. With AC adaptor, all cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks : Peak detector sweep, 8001 Pts/zone



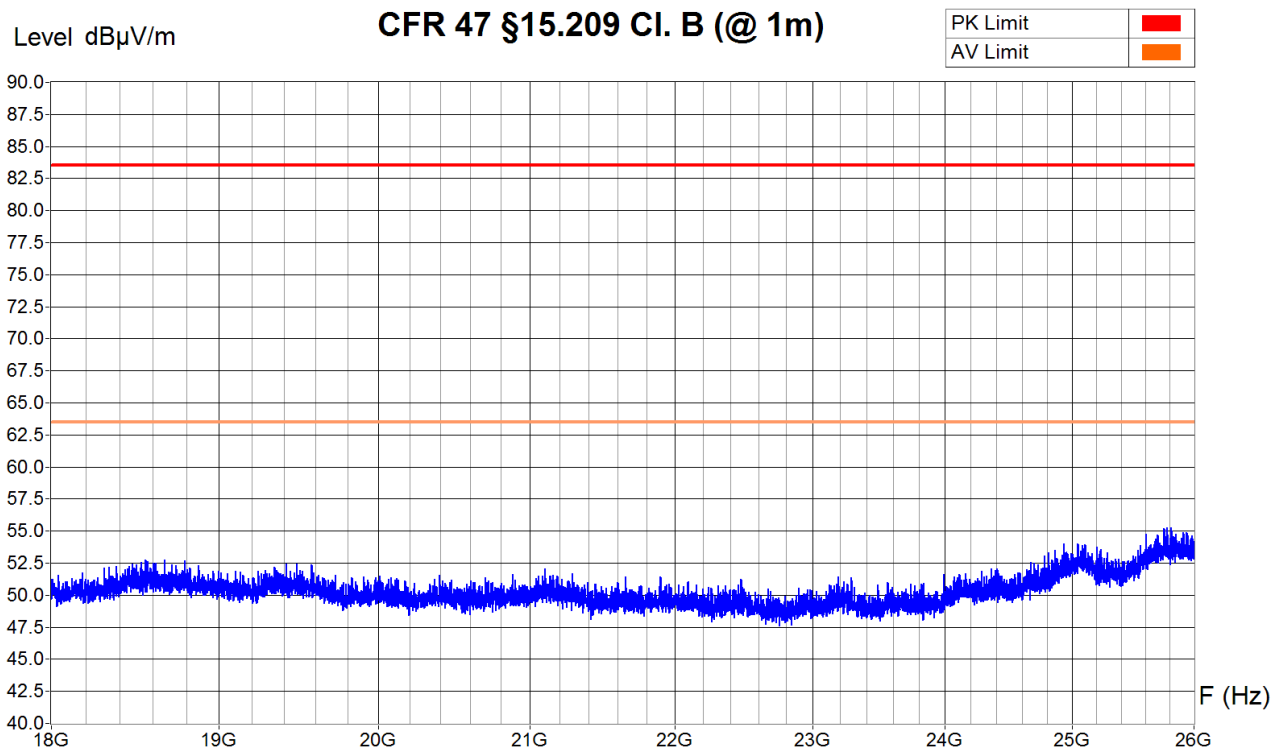
Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

Operator:	B. Itzcovich
Date/Time:	11.12.2017 11:14
Filename:	06_RE_1-18G_DMTXP05_stand_H.png/.txt

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 2m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : EUT lying. With AC adaptor, all cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks :
 Peak detector sweep, 8001 Pts/zone



Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

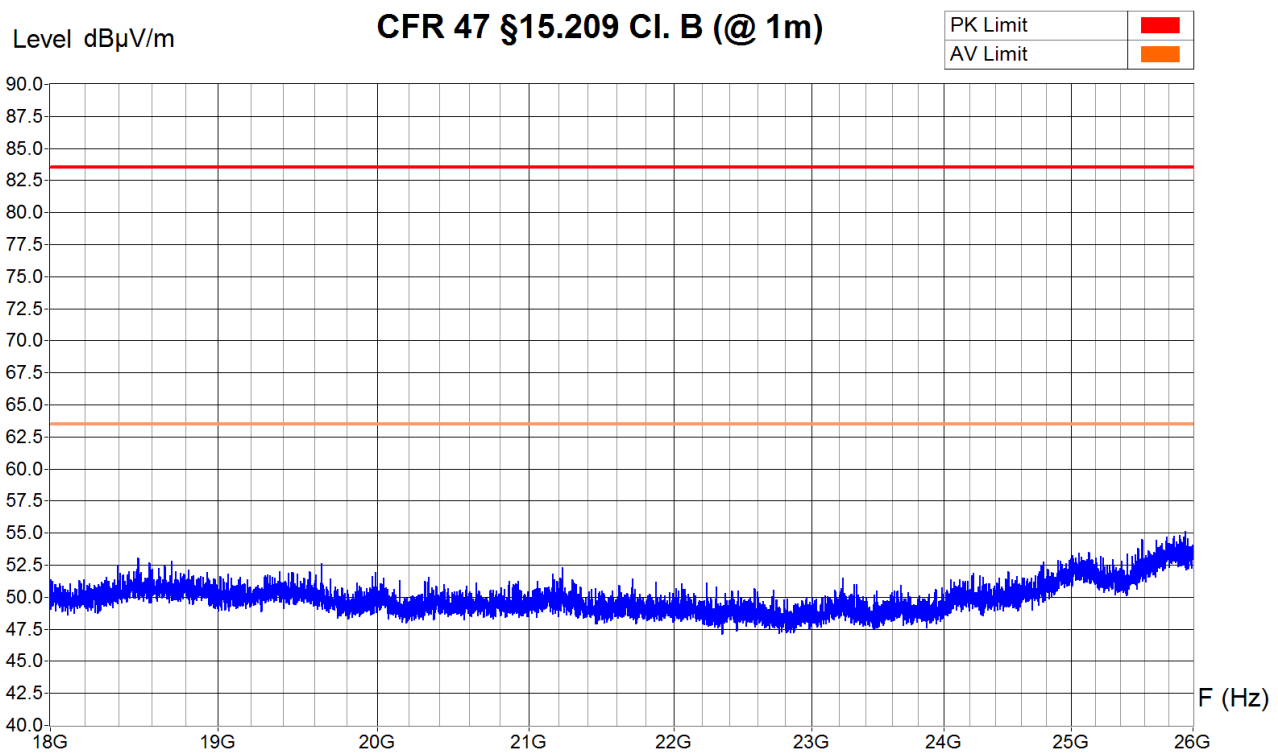
Operator: B. Itzcovich
Date/Time: 11.12.2017 10:37
Filename: 07_RE_1- 18G_DMTXP05_lying_V.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 2m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : EUT lying. With AC adaptor, all cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05)
 Remarks :

Peak detector sweep, 8001 Pts/zone



Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

Operator:	B. Itzcovich
Date/Time:	11.12.2017 11:12
Filename:	08_RE_1-18G_DMTXP05_lying_H.png/.txt

6.11 Spurious emissions, receive mode - radiated

6.11.1 30 MHz to 1 GHz

Test site: semi-anechoic chamber (foam) open test site
 semi-anechoic chamber (ferrites)

Distance: 3 m 10 m 30 m

Position of EUT: 0.8 m (height of the equipment under test above floor)

Meas. uncertainty: ± 4.6 dB (30 - 300 MHz) / ± 3.7 dB (300 - 1000 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit are re-measured manually using a receiver.

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 40 - 50 % Pressure QFE: 925 - 945 hPa

Test set-up:



Remarks: - Limit values expressed in dBµV/m and transformed to a measuring distance of 10 m (factor used = 20 dB/decade) if necessary
 e.g.: for f = 40 MHz the limit is 100 µV/m at 3 m;

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3 m}{10 m} \right) = 29.54 \frac{dB\mu V}{m} \text{ at } 10 m$$

Test equipment:

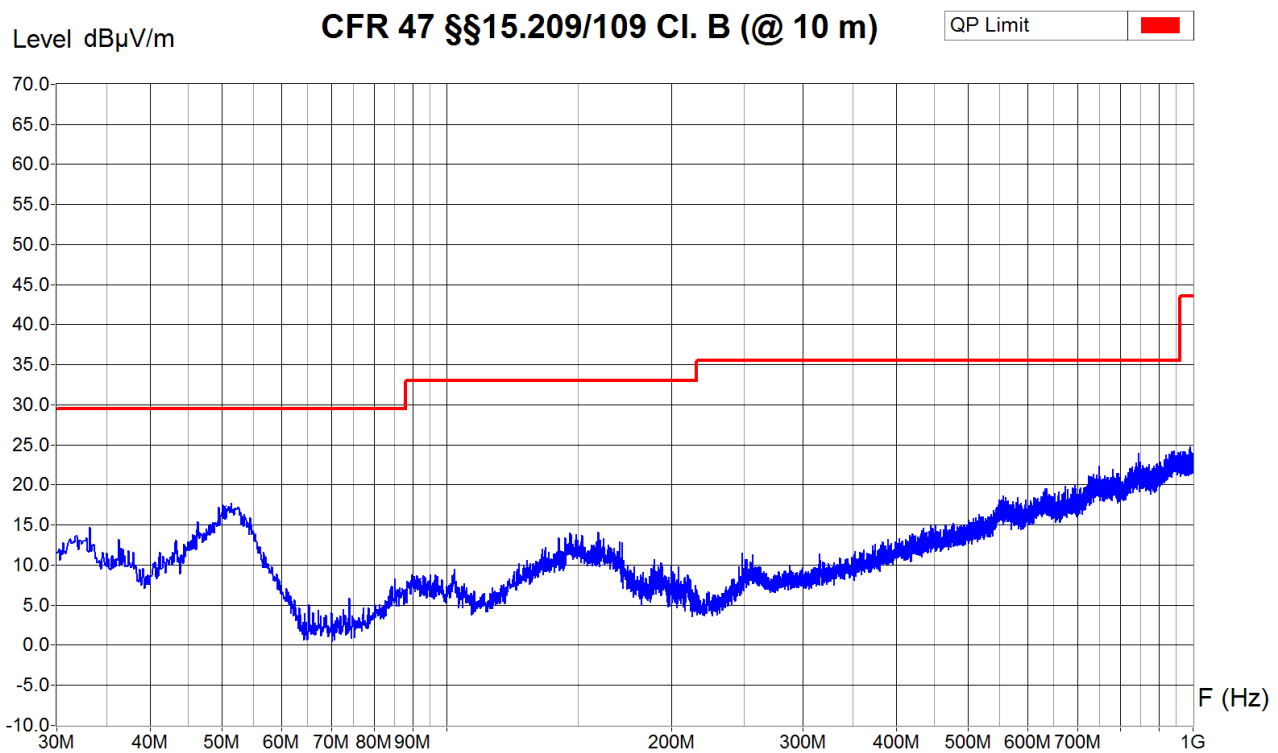
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 10-70
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 94-35	<input type="checkbox"/> 04-29	<input checked="" type="checkbox"/> 10-70	
Preamplifier	<input type="checkbox"/> 90-01	<input type="checkbox"/> 95-86	<input type="checkbox"/> 05-56	<input checked="" type="checkbox"/> 05-59	<input type="checkbox"/> 05-62	<input type="checkbox"/> 05-87
Antenna (bilog)	<input type="checkbox"/> 94-03	<input checked="" type="checkbox"/> 05-38				
Cables	<input checked="" type="checkbox"/> 06-01					

Result: pass fail not applicable not tested

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2.44 GHz), charging
 Remarks : Peak detector sweep, 9701 Pts/zone



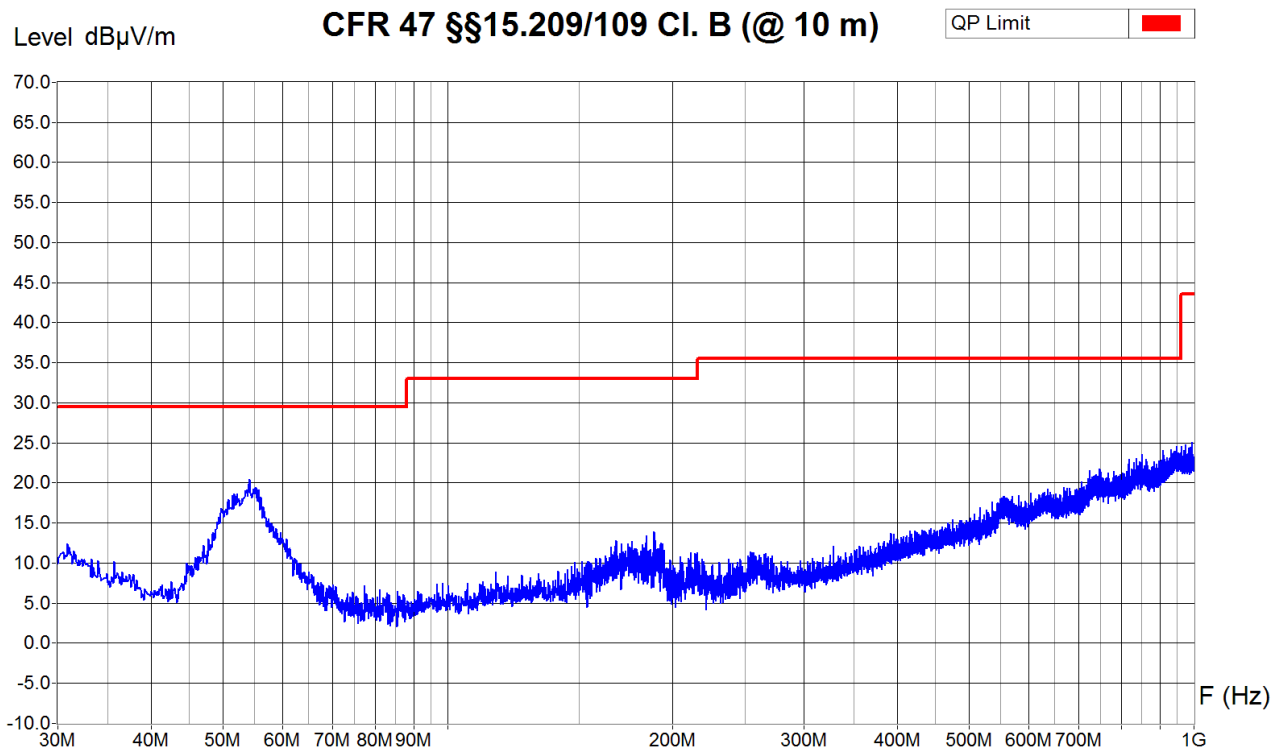
Zone	30 MHz - 1 GHz
Video Bandwidth	500 KHz
Resol Bandwidth	120 KHz

Operator:	B. Itzcovich
Date/Time:	13.12.2017 11:00
Filename:	13_RE_30M-1G_DMRX_V_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2.44 GHz), charging
 Remarks :
 Peak detector sweep, 9701 Pts/zone



Zone	30 MHz - 1 GHz
Video Bandwidth	500 KHz
Resol Bandwidth	120 KHz

Operator: B. Itzcovich
 Date/Time: 13.12.2017 11:08
 Filename:
 14_RE_30M-
 1G_DMRX_H_FCC.png/.txt

6.11.2 1 GHz to 13 GHz

Test site: semi-anechoic chamber (ferrites) semi-anechoic chamber (foam)

Distance: 1 m 3 m 10 m 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

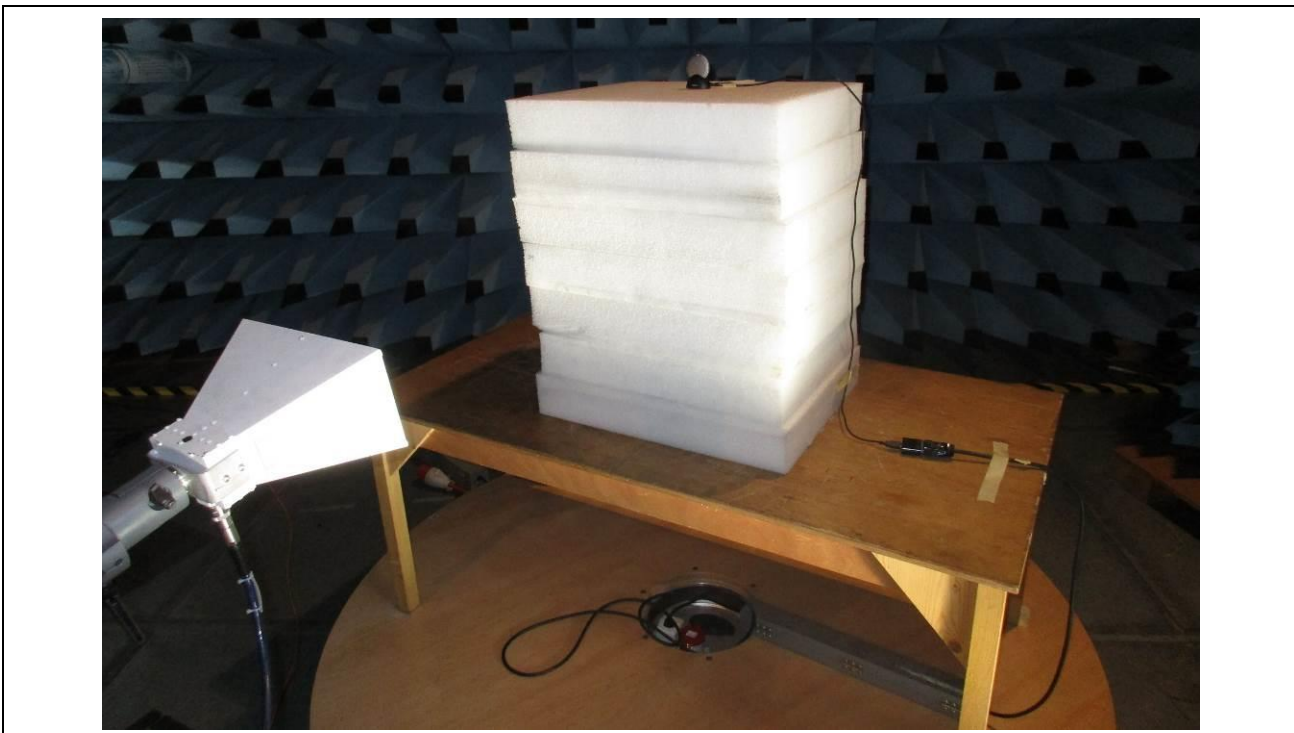
Meas. uncertainty: ± 4.7 dB

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 22 - 24 °C Humidity: 30 - 35 % Pressure QFE: 935 - 945 hPa

Test set-up:



Remarks: *Limit values expressed in dBµV/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary*
 e.g.: for f = 1 GHz the limit is 500 µV/m at 3m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{1m} \right) = 63.5 \frac{dB\mu V}{m} \text{ at } 1m$$

Test equipment:

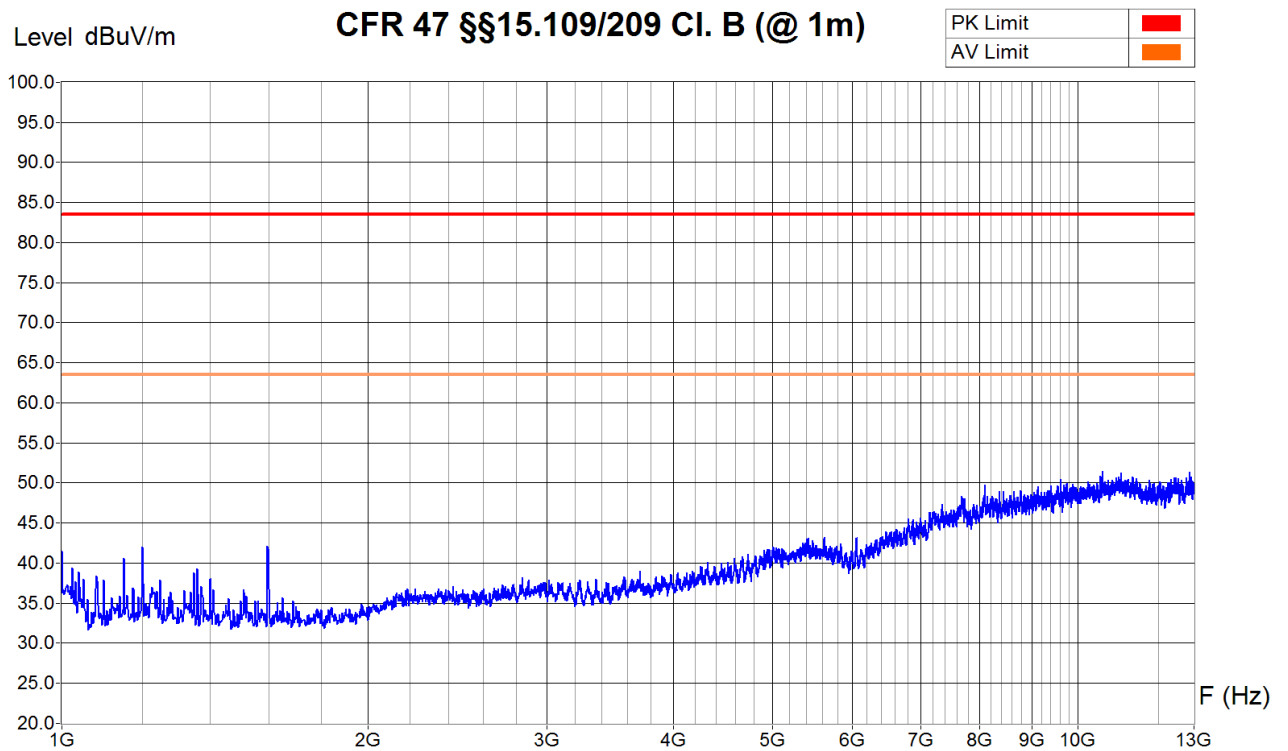
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Preamplifier	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-87	<input checked="" type="checkbox"/> N967			
Antenna (horn)	<input type="checkbox"/> 90-24	<input checked="" type="checkbox"/> 07-31				
Cables	<input checked="" type="checkbox"/> 10-75	<input checked="" type="checkbox"/> 10-79				
Filters	<input type="checkbox"/> 13-14	<input type="checkbox"/> 12-06	<input type="checkbox"/> 13-05			

Result: pass fail not applicable not tested

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m (aimed at the source by tilting)



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2.44 GHz)
 Remarks : Peak detector sweep, 3001 Pts/zone



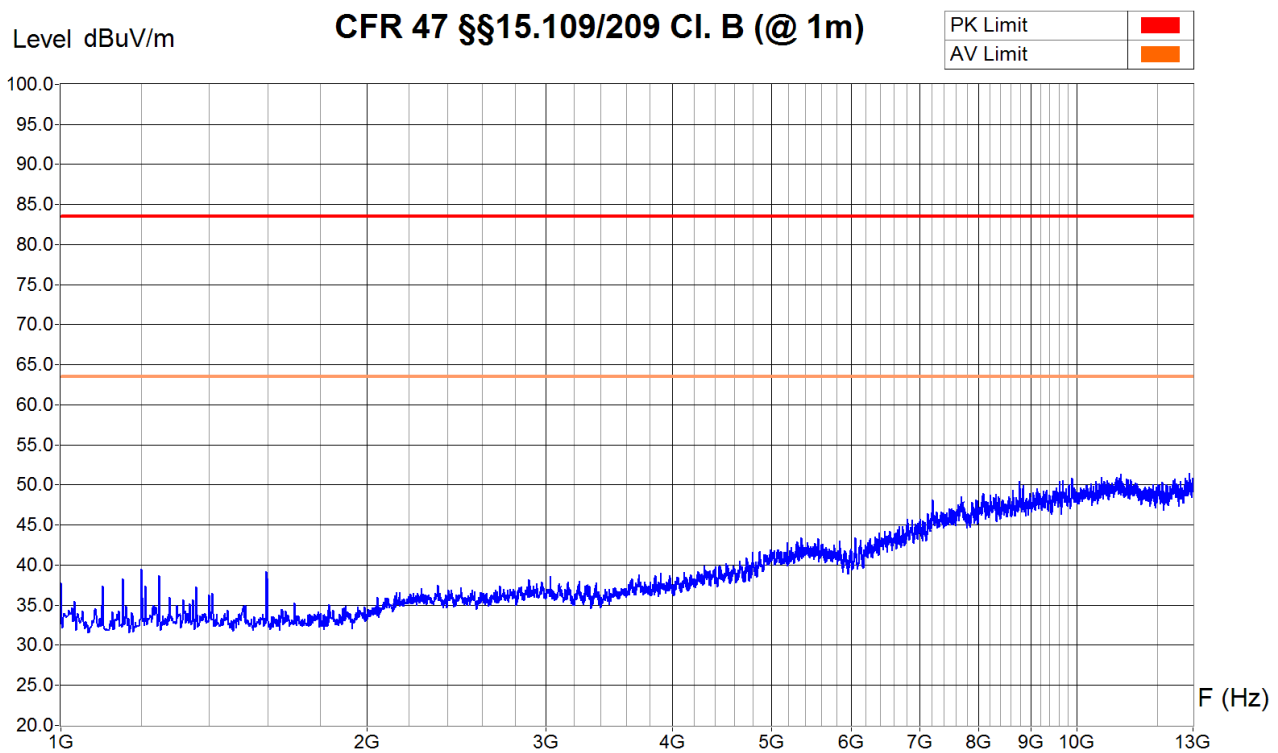
Zone	1 GHz - 7 GHz	7 GHz - 13 GHz
Video Bandwidth	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz

Operator: B. Itzcovich
Date/Time: 07.12.2017 16:12
Filename: 03_RE_1- 13G_DMRX_V_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1 - 4m (aimed at the source by tilting)



Equipment Under Test : Roger Select (TX27), BT part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2.44 GHz)
 Remarks : Peak detector sweep, 3001 Pts/zone



Zone	1 GHz - 7 GHz	7 GHz - 13 GHz
Video Bandwidth	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz

Operator: B. Itzcovich
Date/Time: 07.12.2017 15:58
Filename: 54_RE_1- 13G_BTRX_H_FCC.png/.txt

6.12 Conducted emission - Interference voltage

Test site: semi-anechoic chamber (foam) shielded room
 Semi-anechoic chamber (ferrites) laboratory

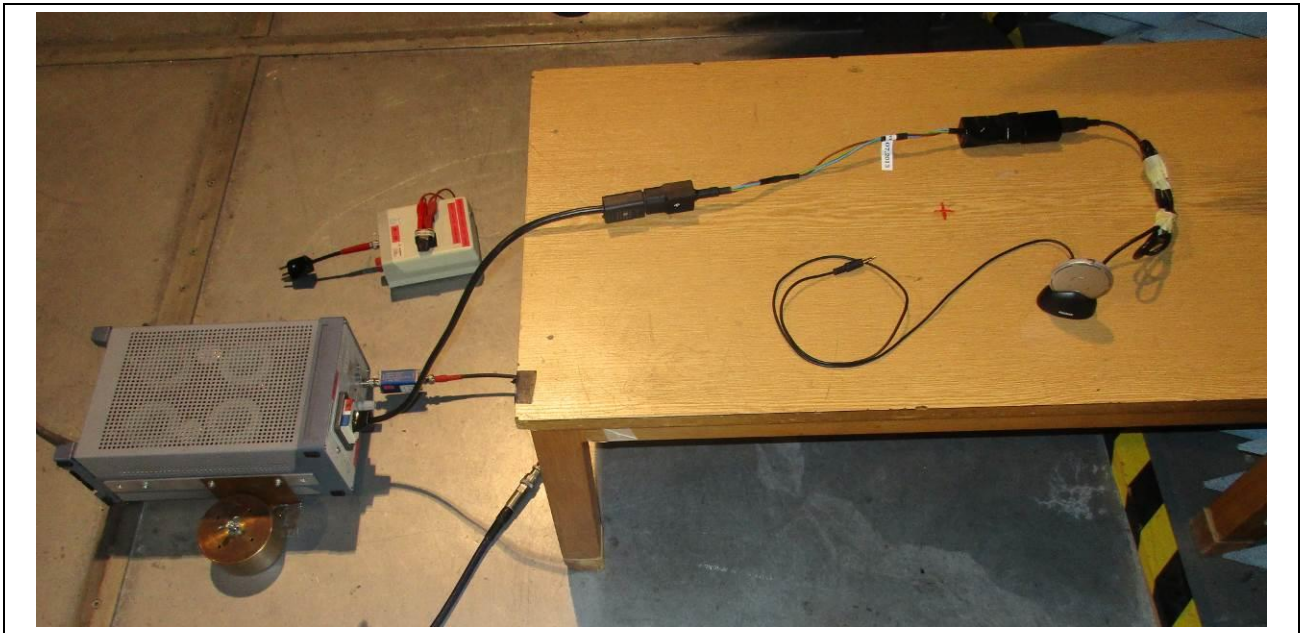
Meas. uncertainty: ± 3.6 dB

Measuring method: The conducted disturbance is measured using a spectrum analyzer and a line impedance substitution network (LISN). The measurement of the voltage against the earth is carried out successively. The peak values are recorded continuously on the graph. The values that exceed the limit are re-measured with a measuring receiver.

Modifications: None 1 2 3 4 5

Climatic conditions: Temperature: 21 - 23 °C Humidity: 30 - 35 % Pressure QFE: 910 - 920 hPa

Test set-up:



Remarks: - - -

Test equipment:

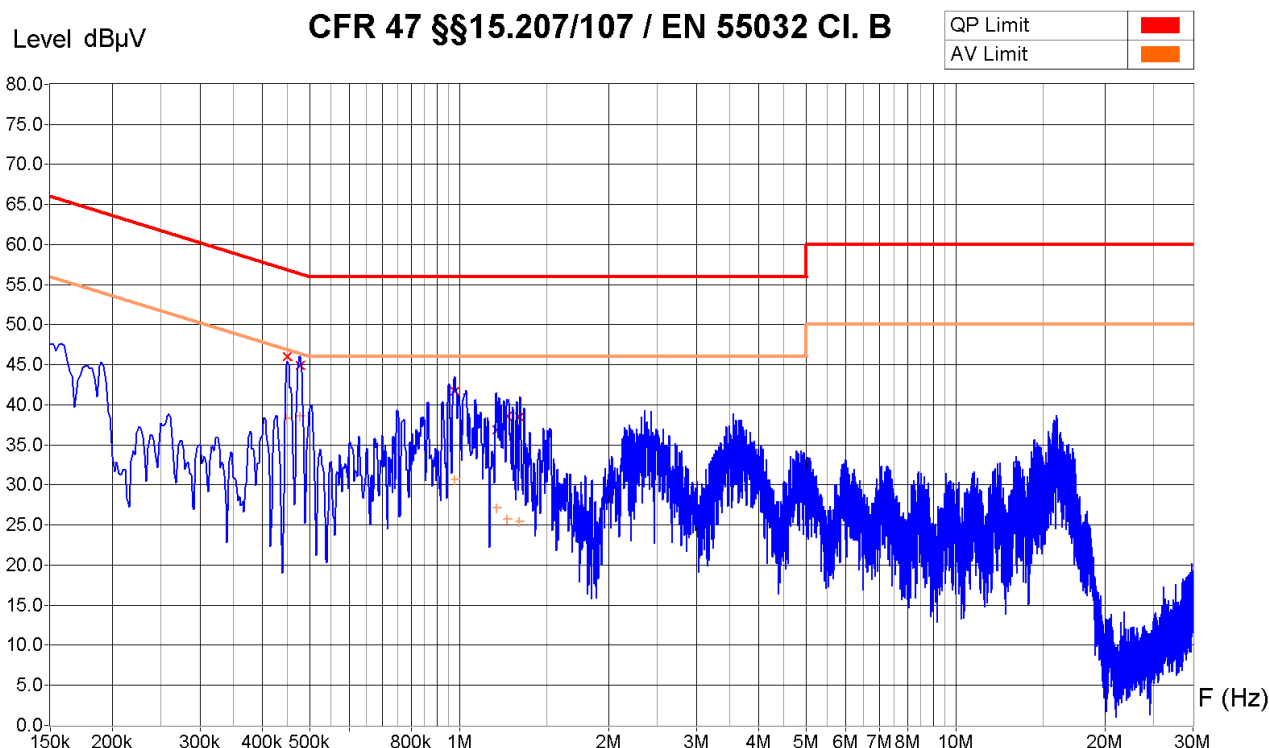
Spectrum analyzer	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 02-06	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 10-70
Receiver	<input type="checkbox"/> 85-12	<input type="checkbox"/> 90-11	<input checked="" type="checkbox"/> 10-70	<input type="checkbox"/> 04-28	<input type="checkbox"/> 06-29	
LISN	<input type="checkbox"/> 85-13	<input type="checkbox"/> 90-08	<input type="checkbox"/> 94-36	<input type="checkbox"/> 94-40	<input type="checkbox"/> 95-12	<input checked="" type="checkbox"/> 00-43
Protection 10 dB	<input type="checkbox"/> 95-33	<input type="checkbox"/> 95-35	<input checked="" type="checkbox"/> 95-30	<input type="checkbox"/> 96-38	<input type="checkbox"/> included in LISN	
Protection 20 dB	<input type="checkbox"/> 91-46	<input type="checkbox"/> 95-33	<input type="checkbox"/> 95-38	<input type="checkbox"/> included in LISN		
Variable transformer	<input checked="" type="checkbox"/> 75-04					
Multimeter	<input checked="" type="checkbox"/> 09-06					
Cables	<input checked="" type="checkbox"/> 06-00	<input type="checkbox"/> 10-41				

Result: pass fail not applicable not tested

Measurement Type : Voltage Interference
 Supply : Line 1
 Other : AC adaptor Mains
 120 V / 50 Hz



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : Peak detector sweep, 14926 Pts/zone



Zone	150 KHz - 30 MHz
Video Bandwidth	300 KHz
Resol Bandwidth	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
450 KHz	47.6 dBµV	46.0 dBµV	38.3 dBµV	10.9 dB
477 KHz	46.7 dBµV	44.9 dBµV	38.6 dBµV	11.5 dB
977 KHz	43.7 dBµV	41.7 dBµV	30.6 dBµV	14.3 dB
1.19 MHz	42.1 dBµV	36.9 dBµV	27.2 dBµV	19.1 dB
1.25 MHz	42.6 dBµV	38.6 dBµV	25.7 dBµV	17.4 dB
1.32 MHz	41.8 dBµV	38.4 dBµV	25.4 dBµV	17.6 dB

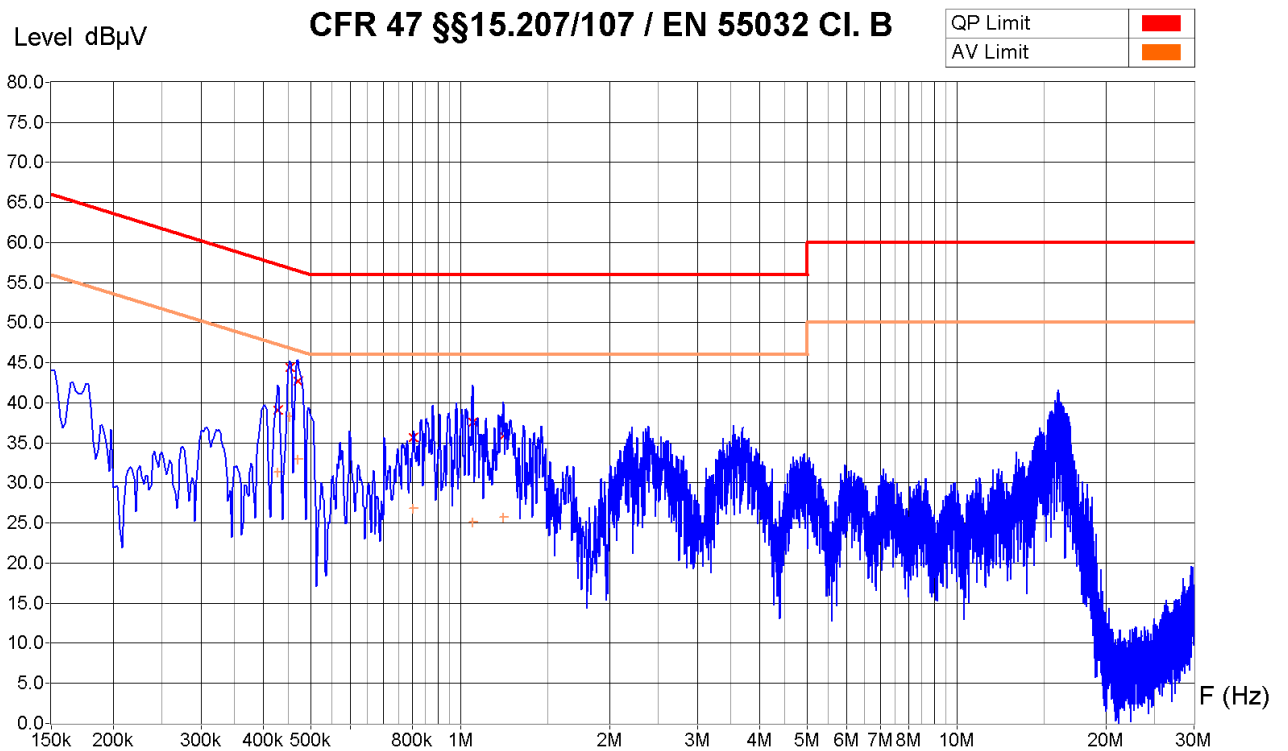
Sample calculation with all conversion and correction factors used				
Frequency [kHz]	Analyzer Peak value [dBµV]	Cable att. corr. [dB]	Attenuator corr. [dB]	Peak voltage [dBµV]
450	37.5	+0.1	+ 10.0	= 47.6

Operator: B. Itzcovich
 Date/Time: 15.12.2017 15:32
 Filename:
 21_CV_150k-
 30M_DMTXP05_120V_L.png/.txt

Measurement Type : Voltage Interference
 Supply : Neutral
 Other : AC adaptor Mains
 120 V / 50 Hz



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : Peak detector sweep, 14926 Pts/zone



Zone	150 KHz - 30 MHz
Video Bandwidth	300 KHz
Resol Bandwidth	9 KHz

Receiver Measures

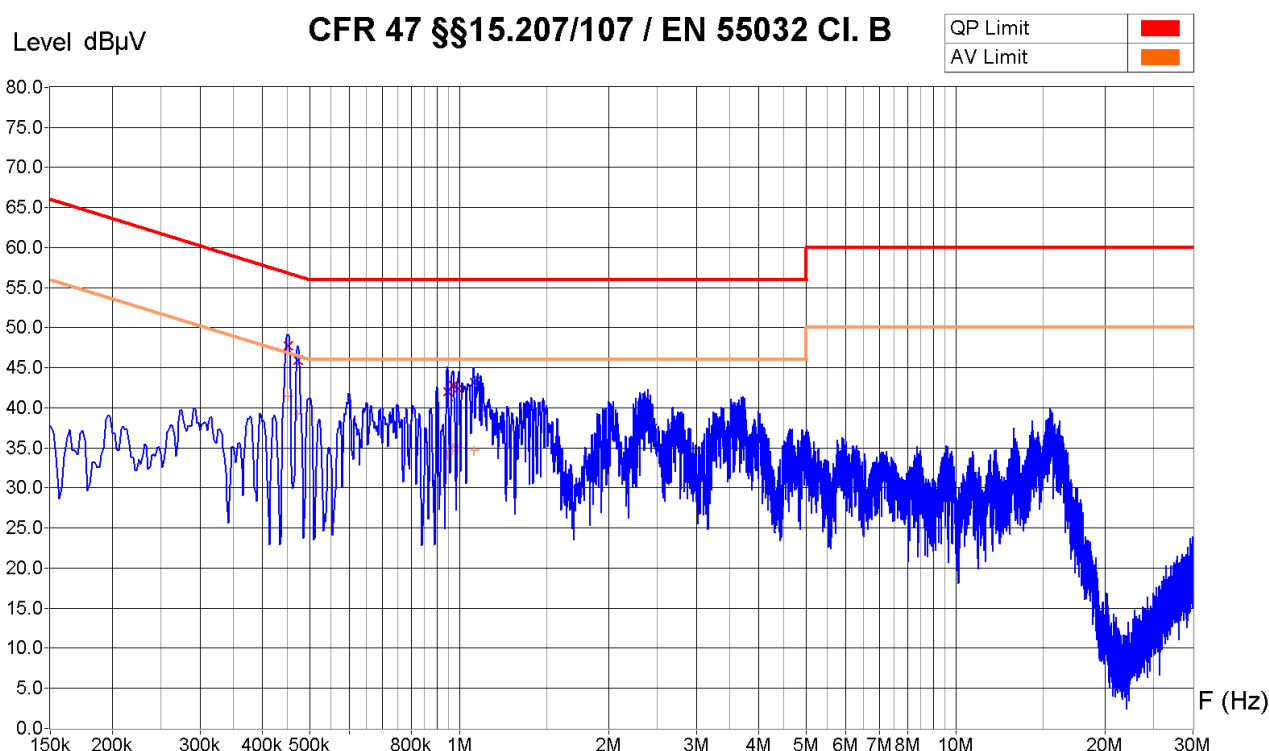
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
429 KHz	42.4 dBµV	39.1 dBµV	31.4 dBµV	18.2 dB
453 KHz	47.2 dBµV	44.5 dBµV	38.3 dBµV	12.4 dB
470 KHz	45.9 dBµV	42.7 dBµV	32.9 dBµV	13.8 dB
804 KHz	40.1 dBµV	35.7 dBµV	26.8 dBµV	20.3 dB
1.06 MHz	42.7 dBµV	37.6 dBµV	25.2 dBµV	18.4 dB
1.22 MHz	41.4 dBµV	35.9 dBµV	25.7 dBµV	20.1 dB

Operator: B. Itzcovich
 Date/Time: 15.12.2017 15:37
 Filename:
 22_CV_150k-
 30M_DMTXP05_120V_N.png/.txt

Measurement Type : Voltage Interference
 Supply : Line 1
 Other : AC adaptor Mains
 230 V / 50 Hz



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks : Peak detector sweep, 14926 Pts/zone



Zone	150 KHz - 30 MHz
Video Bandwidth	300 KHz
Resol Bandwidth	9 KHz

Receiver Measures

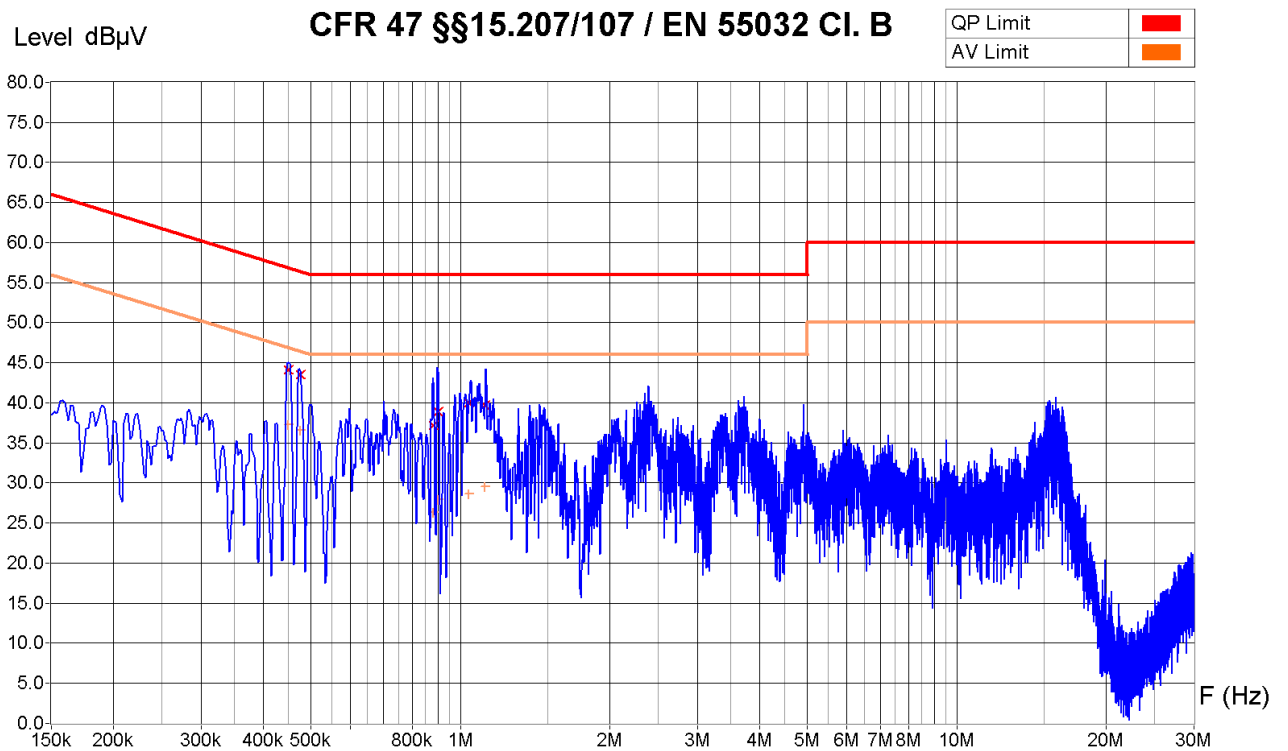
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
452 KHz	49.6 dBµV	47.7 dBµV	41.4 dBµV	9.1 dB
472 KHz	49.1 dBµV	46.0 dBµV	39.2 dBµV	10.5 dB
948 KHz	44.6 dBµV	42.0 dBµV	34.2 dBµV	14.0 dB
973 KHz	45.3 dBµV	42.8 dBµV	35.0 dBµV	13.2 dB
995 KHz	44.4 dBµV	42.5 dBµV	34.9 dBµV	13.5 dB
1.07 MHz	45.5 dBµV	43.2 dBµV	34.6 dBµV	12.8 dB

Operator: B. Itzcovich
 Date/Time: 15.12.2017 15:46
 Filename:
 23_CV_150k-
 30M_DMTXP05_230V_L.png/.txt

Measurement Type : Voltage Interference
 Supply : Neutral
 Other : AC adaptor Mains
 230 V / 50 Hz



Equipment Under Test : Roger Select (TX27), DM part
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (05), charging
 Remarks :
 Peak detector sweep, 14926 Pts/zone



Zone	150 KHz - 30 MHz
Video Bandwidth	300 KHz
Resol Bandwidth	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
450 KHz	48.4 dBµV	44.2 dBµV	37.3 dBµV	12.7 dB
476 KHz	48.1 dBµV	43.5 dBµV	36.6 dBµV	12.9 dB
881 KHz	43.8 dBµV	37.2 dBµV	26.3 dBµV	18.8 dB
900 KHz	45.6 dBµV	38.9 dBµV	28.0 dBµV	17.1 dB
1.04 MHz	45.9 dBµV	40.0 dBµV	28.6 dBµV	16.0 dB
1.12 MHz	50.0 dBµV	39.7 dBµV	29.6 dBµV	16.3 dB

Operator: B. Itzcovich
Date/Time: 15.12.2017 15:43
Filename: 24_CV_150k- 30M_DMTXP05_230V_N.png/.txt

7. Appendix

7.1 Test equipment

Inventory No.	Designation	Manufacturer	Type	Serial No.	Cal. date	Next calibr.	Cal. period [year]
04-79	Loop antenna	Rohde&Schwarz	HFH2-Z2	872 177/39	22 Sep. 2015	22 Sep 2018	3
05-38	Bi-Log antenna	Chase	CBL6111	1056	30 Aug 2017	30 Aug 2019	2
07-31	Horn antenna	Schwarzbeck	BBHA 9120 D	9120D-632	30 Aug 2017	30 Aug 2019	2
98-12	Horn Antenna + Preamp + Mixer	Emco + Miteq + Hewlett Packard	3160-09 + JDM2W-18002650- 27-10P-R + 11970K	9809-1121 + 1707479 + 2332A01295	01 Jun 2017	01 Jun 2022	5
00-52	Dipole antenna	Schwarzbeck	UHA 9125 D	112	11 May 2017	11 May 2022	5
12-06	HP Filter	BSC	SH 6472	2304801	23 May 2017	23 May 2019	2
13-14	Filter	A-INFOMW	Cavity Band Reject Filter	J10811304070 02	19 Apr 2016	19 Apr 2018	2
11-36	Attenuator	Agilent	8491B 10dB	MY39266234	25 Apr 2016	25 Apr 2018	2
95-30	Attenuator						
05-59	Preamplifier	Montena EMC	AM-1300	432972	22 Mar 2017	22 Mar 2019	2
N967	Preamplifier	Montena EMC	AFS42-00101800- 25-S-42	- - -	03 Jul 2017	03 Jul 2018	2
15-21	Signal Generator	Rohde&Schwarz	SML03 (+B3)	102380	16 Dec 2016	16 Dec 2018	2
06-00	Cable	Huber&Suhner	ST18A ST18A SF106PA	6224/18A 8399/18A 463/6PA	02 Jun 2017	02 Jun 2018	1
06-01	Cable	Huber&Suhner	SF106PA SF106PA SF106PA	415/6PA 414/6PA 412/6PA	03 Apr 2017	03 Apr 2018	1
10-75	Cable	Huber&Suhner	ST18A	8385/18A	10 May 2017	10 May 2019	2
10-79	Cable	Huber&Suhner	ST18A	8444/18A	10 May 2017	10 May 2019	2
11-13	Cable	Huber&Suhner	SF104	332033/4	10 May 2017	10 May 2019	2
10-51	Cable	Huber&Suhner	SF104	222093/4	10 May 2017	10 May 2019	2
10-81	Cable	Huber&Suhner	SF104P	44159/4P	01 Jun 2017	01 Jun 2019	2
11-62	Cable	Huber&Suhner	SF104P	51338/4P	01 Jun 2017	01 Jun 2019	2
00-43	LISN	Rohde&Schwarz	ESH3-Z5	890 604/026	12 Oct 2016	12 Oct 2018	2
07-53	Spectr. Analyzer	Hewlett Packard	E4407B	SG45101517	15 Nov 2016	15 Nov 2018	2
10-70	Receiver + Spectr. Analyzer	Rohde&Schwarz	ESU8 1302.6005K08	100231	12 Sep 2017	12 Sep 2019	2
09-04	Power sensor	Agilent	E9304A H19	MY41498789	12 Dec 2016	12 Dec 2020	4
03-12	Wattmeter	Agilent	E4418B	GB40207055	02 Nov 2016	02 Nov 2018	2
09-06	Multimeter	Fluke	87V	96900096	11 Apr 2017	11 Apr 2019	2
06-62	Power supply	Elektro-Automatik	EA-PS 2016-050	2006100338	NO CAL	NO CAL	-
75-04	Transformer	Variac	W10HMT	-	NO CAL	NO CAL	-

Remark: The test equipment, for which no calibration date is defined, is controlled during the test by another calibrated equipment. E.g. the output of a power supply with variable transformer is verified by a calibrated multimeter.