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STS 0001

Schweizerischer Prüfstellendienst
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 Swiss testing service

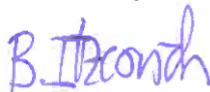


Report:	Electromagnetic compatibility and Radio spectrum Matters		Report no:	18-MO-0156.R03
Product name:	TV Connector V2		Mandate no:	18-MO-0156
Serial no:	Proto 92 (PCB V2.0)	Model number:	TX30	
Customer:	Phonak Communications AG Länggasse 17 3280 Murten SWITZERLAND	Date of test:	July 6 – 16, 2018	

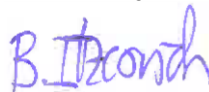
Standards		Result
47 CFR, Part 15	Subpart C, Intentional radiators: §§ 15.207/209/247	Pass
	Subpart B, Class B digital devices: § 15.109	Pass
Industry Canada	RSS-247, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices	Pass
	RSS-Gen,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

These results were achieved with out modifications 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 C. Mauron
 EMC Test Engineer



Rossens, July 27, 2018

(Issue Date)

2015-04-10_Rev01

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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1. Summary of test results

✓ Pass * Fail ∅ Not applicable to this product — Not tested # Not required / No requirements

§	Test Type	Result
6	Emission	CFR 47 Part 15 Industry Canada
6.1	Minimum 6 dB bandwidth CFR 47 § 15.247 (a)(2) RSS-247 § 5.2 a)	✓
6.2	Time of occupancy (dwell time) CFR 47 § 15.247 (f) RSS-247 § 5.3 a)	✓
6.3	Antenna gain & effective radiated power CFR 47 § 15.247 (b)(4) RSS-247 § 5.4 (2) and (6)	✓
6.4	Maximum output power (conducted) CFR 47 § 15.247 (b)(1) (3) RSS-247 § 5.4 d)	✓
6.5	Band-edge emission (conducted) CFR 47 § 15.247 (d) RSS-247 § 5.5	✓
6.6	Band-edge emission (radiated) CFR 47 § 15.247 (d) CFR 47 § 15.205 RSS-Gen Table7	✓
6.7	Maximum power spectral density CFR 47 § 15.247 (e) and (f) RSS-247 §5.2 b) and 5.3 b)	✓
6.8	Spurious emissions – conducted (transmitter) CFR 47 § 15.247 (d) RSS-247 § 5.5	✓
6.9	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 5 and 6	✓
6.10	Radiated emission – receiver CFR 47 § 15.109 RSS-Gen Table 3	✓
6.11	Conducted emission CFR 47 § 15.207 RSS-Gen Table 4	✓
6	Emission	CFR 47 Part 2
6.12	Designation of emission FCC 47 §2.201 FCC 47 §2.202	1M69FXD

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 5, April 2018	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 (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

3. Client

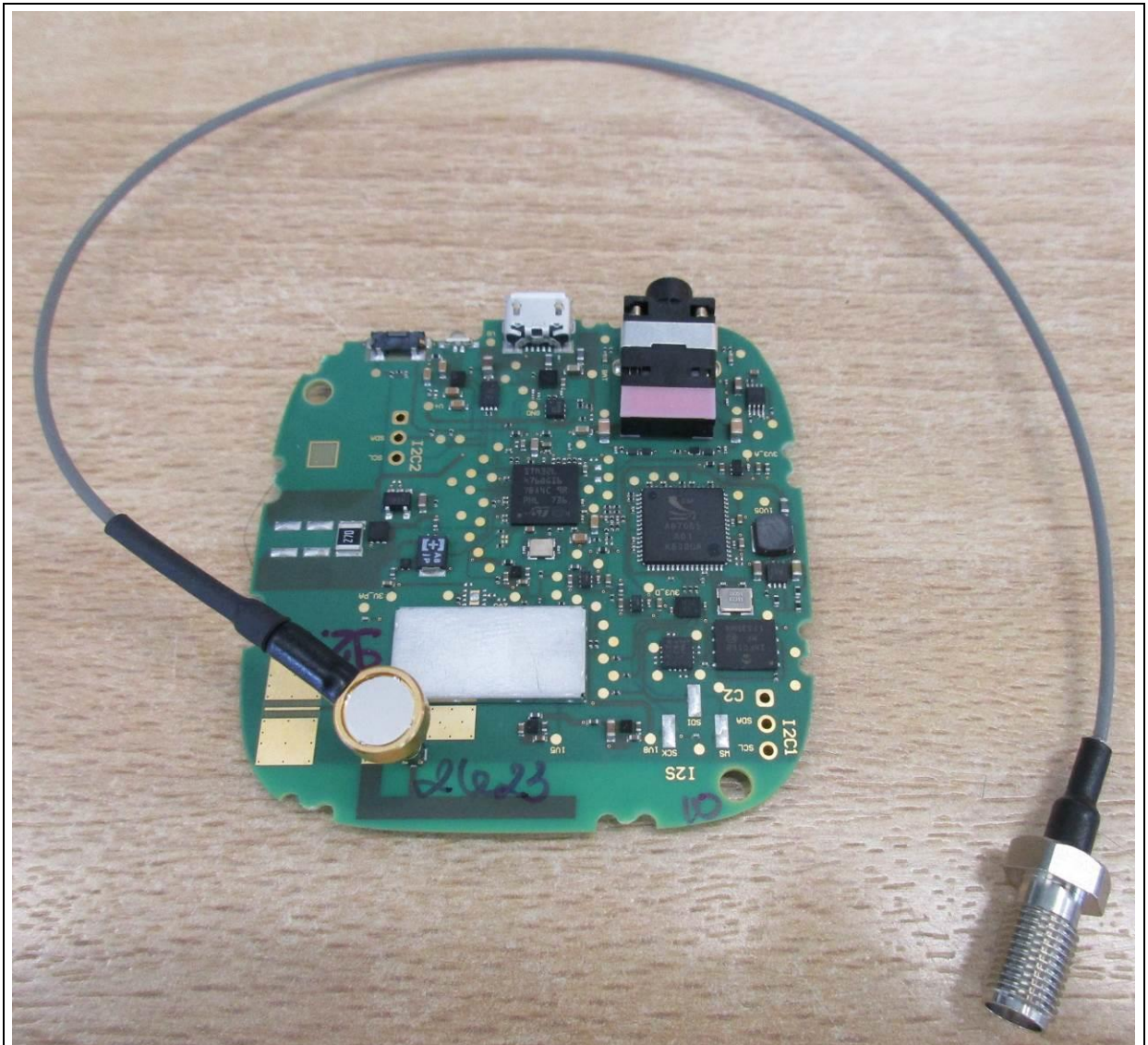
Client name and address	<i>Phonak Communications AG Länggasse 17 3280 Murten SWITZERLAND</i>
Contact Person	<i>Mr Olivier Hautier</i>
Telephone	<i>+41 26 672 92 73</i>
Fax	<i>+41 26 672 93 80</i>
E-mail	<i>olivier.hautier@phonak.com</i>
Mandate no	<i>18-MO-0156</i>

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>TV Connector V2</i>
Product description	<i>Wireless audio signal transmitter 2.4 GHz</i>
Model number	<i>TX30</i>
Serial no	<i>Proto 92 (PCB V2.0)</i>
FCC ID IC ID	<i>FCC: KWC-TVCONNECTV2 IC: 2262A-TVCONNECTV2</i>
Software version	<i>V1.0.37782</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>$U = 5 V_{DC} / P_{max} = 1 W$ (DC In USB)</i>
Dimension	<i>~63 mm x ~63 mm x ~12 mm (l x w 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



EUT (rear-top view)



EUT (bottom view with marking example)

4.3 Classification

CFR 47 Part 15	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Unintentional radiator (Subpart B), Receive and Standby 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 [QFE]	Rel. humidity
<i>Eurofins Electrosuisse Product Testing AG 1728 Rossens SWITZERLAND</i>	<i>July 6 – 16, 2018</i>	<i>23 – 28 °C</i>	<i>920 – 940 hPa</i>	<i>30 – 55 %</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>The test site is accepted by Industry Canada:</p> <ul style="list-style-type: none"> - ISED Assigned Code: 3625A - Ferrite chamber (06-01): 3625A-2 - Foam chamber (06-00): 3625A-3 <p>Conducted and radiated measurements are performed according to the ANSI C63.4-2014 and C63.10-2013 procedures.</p>

5.3 Attendant persons

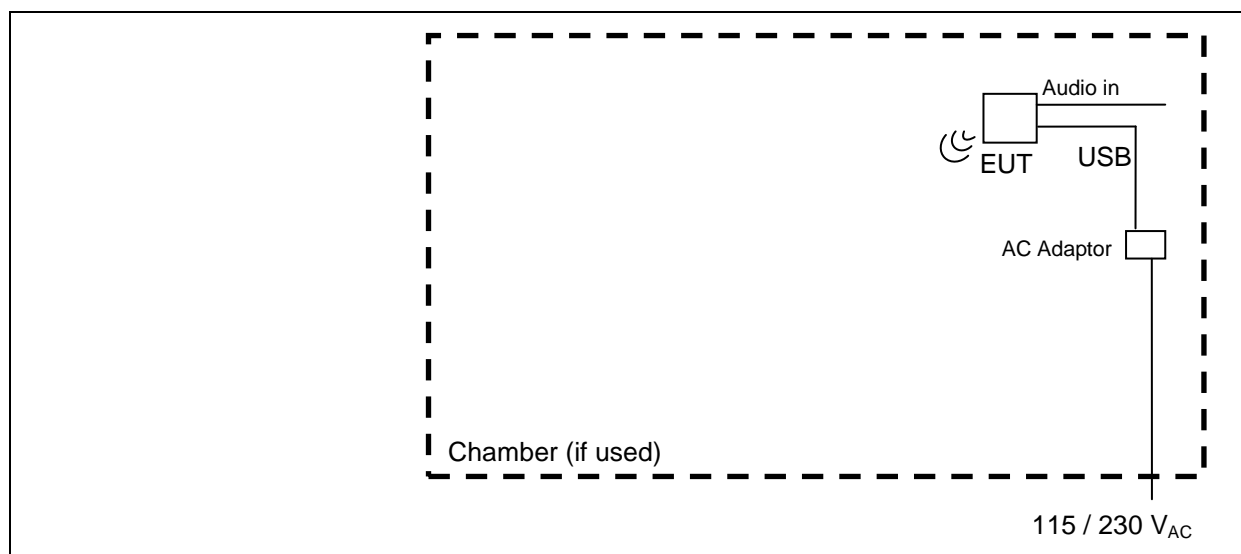
Test Engineer(s):

<i>Mr B. Itzcovich EMC Test Engineer</i>

Other(s):

Name	Company
<i>Mr Olivier Hautier (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 hopping transmission of random data on three frequencies
- Normal operation: transmission of data (audio streaming) with hopping sequence
- Continuous reception on single frequency (2.440 GHz)
- Standby: DSP off, controller running, RF module disabled
- Continuous transmission of random data on one frequency (f = 2.404/2.478 GHz), Duty 100%

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)
Audio source	SanDisk	Clip Sport	- - -	To generate audio signal for streaming



AC adaptor



Marking on AC adaptor

6. Test results

6.1 Minimum 6 dB bandwidth

Introduction: Channel-bandwidth measured at -6 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, according to KDB 558074 §8.2

Limit: For systems using digital modulation techniques, the minimum 6 dB bandwidth shall be at least 500 kHz.

Test set-up:

Remarks: - - -

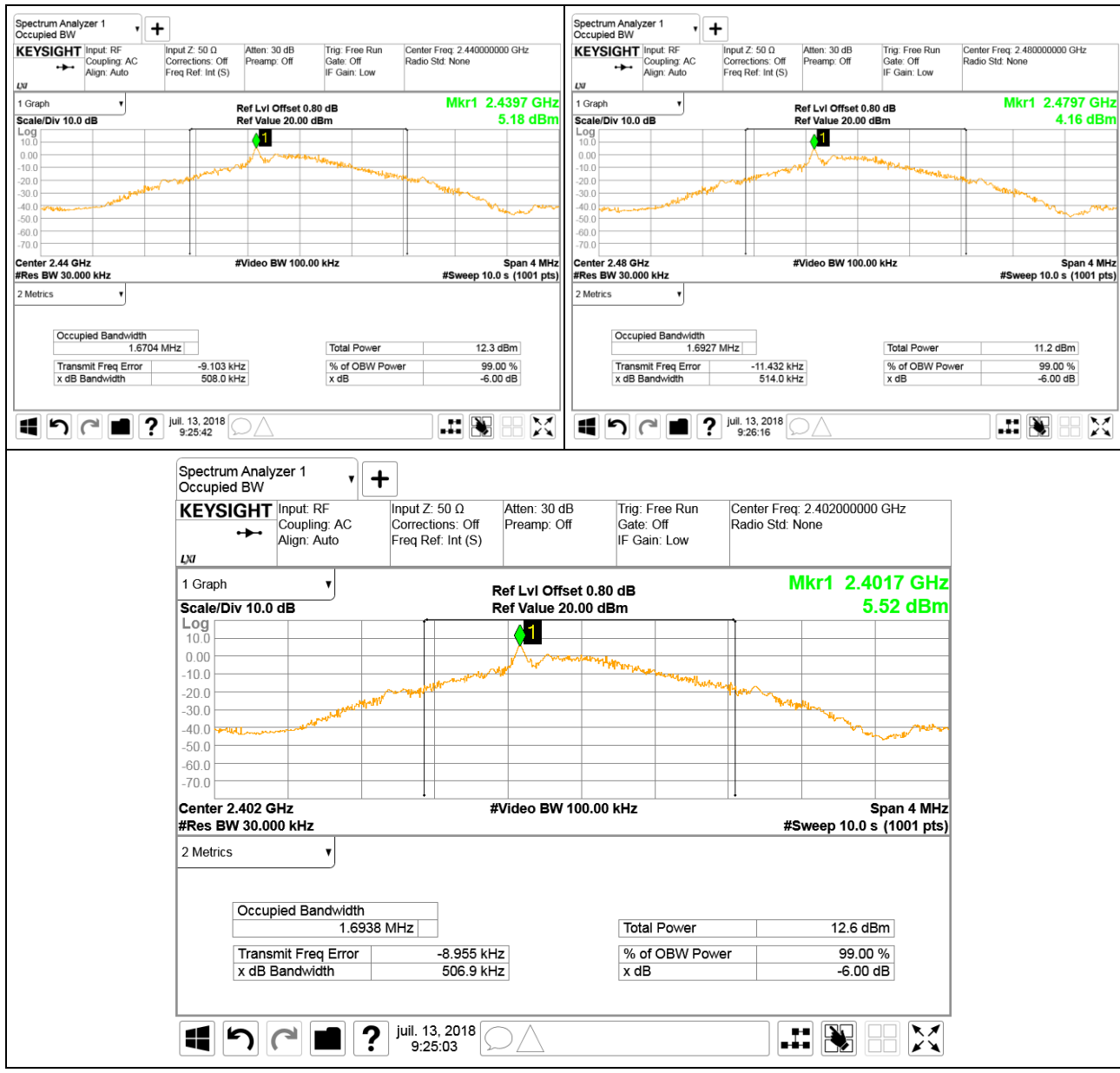
Test equipment:

Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input 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: *TV Connector V2*
 Operating mode: *TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax*
 Cables connected to the EUT: *All (see § 4.6 and § 5.4)*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5

frequency [GHz]	6 dB bandwidth [kHz]	Remarks
2.402	506.9	Minimum 6 dB bandwidth
2.440	514.0	---
2.480	508.0	---



Place and date of test: *Rossens, July 13, 2018*
 Operator: *B. Itzcovich*

6.2 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 frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

Test set-up:

--	--

Remarks: ---

Test equipment:

Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Result: <input checked="" type="checkbox"/> pass	<input type="checkbox"/> fail	<input type="checkbox"/> not applicable	<input type="checkbox"/> not tested
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Results of the test

Client: *Phonak Communications AG*

Apparatus: *TV Connector V2, proto 92*

Operating mode: *Continuously hopping*

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

Remarks: *Measured on temporary antenna connector*

Modifications: None 1 2 3 4 5

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

Number of channels: 38

Period of observation: $Number\ of\ channels * 0.4\ s = 38 * 0.4s = 15.2\ s$

Single occupancy time during one hop (measured): 173.1 μ s

Pulses in 2.9h: $2^{16} * 38 * 10 = 24'903'680$

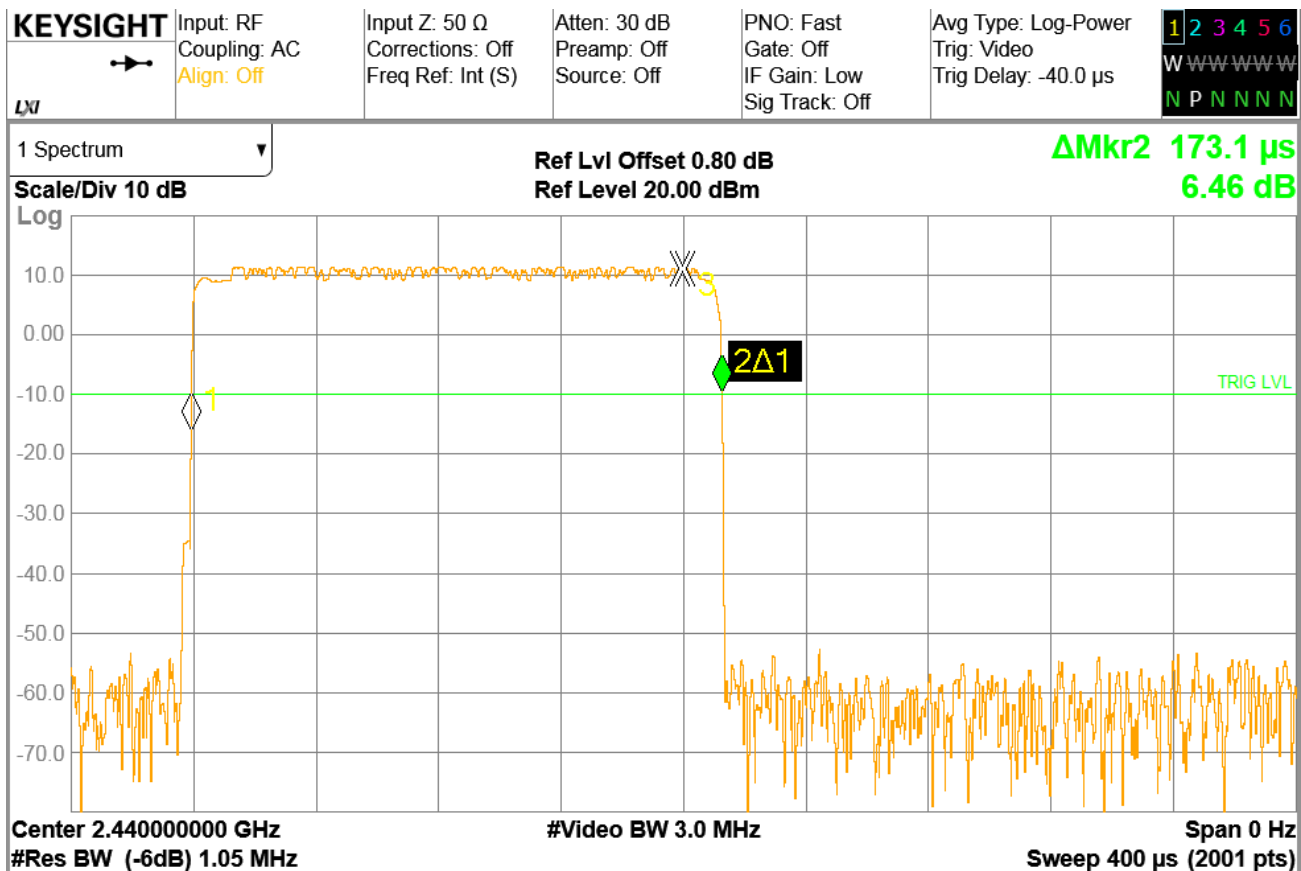
Pulses in 16 s: $(Pulses\ in\ 2.9h / 2.9) / 3'600 * 15.2s = 36'258.2$

Pulses in 16 s of one channel: $Pulses\ in\ 16\ s / Number\ of\ channels = 954.2$

Time of occupancy: $Pulse\ in\ 16\ s\ of\ one\ channel * occupancy\ time = 954.2 * 173.1\ \mu s = 0.165\ s$

RESULT 0.165 s < 0.4 s => **Pass**

Example of pulse duration at frequency 2.44 GHz



Windows taskbar icons: Start, Back, Forward, File Explorer, Help, Date/Time: juil. 12, 2018 2:32:22, Chat, Network, Volume, Brightness, Touchpad, Mouse, Keyboard, Window Management.

Place and date of test: *Rossens, July 12, 2018*

Operator: *B. Itzcovich*

6.3 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

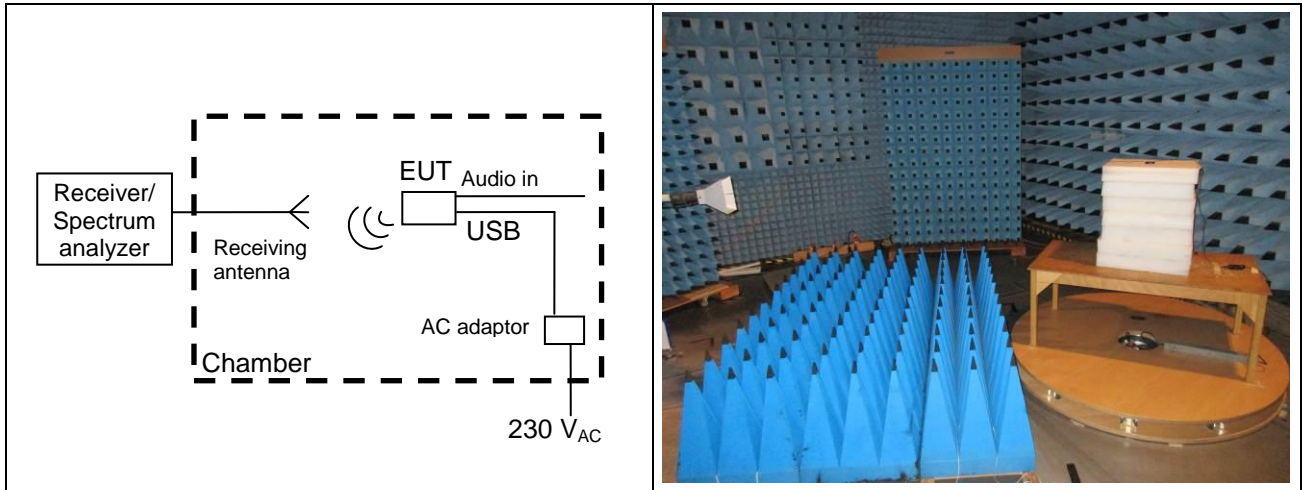
Position of EUT: 1.5 m (height of the equipment under test above floor)

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 analyser 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 ERP / EIRP values are determined replacing the EUT by a substitution antenna (dipole or other).

Limit: Antenna gain 6 dBi (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: *Measurement with EUT in position showing maximum emission at 2.44 GHz*

Test equipment:

Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 16-03
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"/> 13-16	<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: *TV Connector V2*

Operating mode: *Hopping f = 2.402/2.440/2.480 GHz, modulated, Pmax (00, 02)*

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

Remarks: *RBW = 5 MHz; Span = 140 MHz; ST = 10 s; RefLev = 87 dBuV
Detector = Peak; Nb points = 1401*

Modifications: None 1 2 3 4 5

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	65.6	0.0	10.0	0	72.3	2.15	0	-60.15	5.40	3.47 mW	Vertical
2.402	75.2	0.0	10.0	0	72.7	2.15	0	-60.55	14.65	29.17 mW	Horizontal
2.440	66.9	0.0	10.0	0	72.3	2.15	0	-60.15	6.79	4.78 mW	Vertical
2.440	75.5	0.0	10.0	0	72.8	2.15	0	-60.65	14.80	30.20 mW	Horizontal
2.480	64.9	0.0	10.0	0	72.8	2.15	0	-60.65	4.21	2.64 mW	Vertical
2.480	73.5	0.0	10.0	0	73.1	2.15	0	-60.95	12.56	18.03 mW	Horizontal

The antenna gain is the difference (in dB) of the radiated EIRP power and the conducted power of § 6.4 :

frequency [GHz]	Conducted power [dBm]	Radiated power EIRP [dBm]	Antenna gain [dBi]	Remarks
2.402	12.10	14.65	2.55	---
2.440	11.80	14.80	3.00	---
2.480	10.86	12.56	1.70	---

Maximum Antenna Gain = 3.0 dBi (< 6 dBi)

Maximum e.i.r.p. = 30.2 mW (< 4 W)

Place and date of test: *Rossens, July 6 and 12, 2018*
Operator: *B. Itzcovich*

6.4 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:

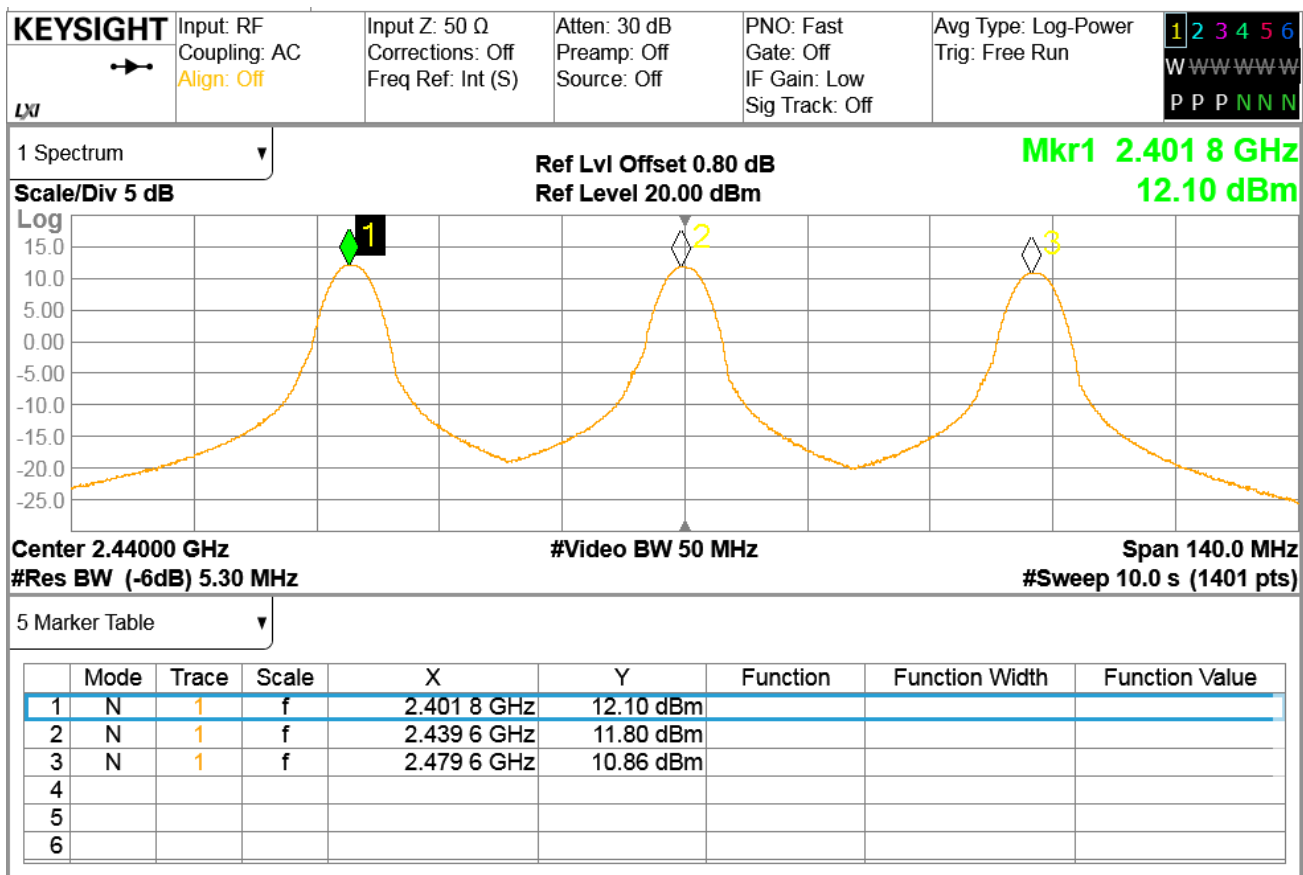
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<input checked="" type="checkbox"/> 11-13					

Result: pass fail not applicable not tested

Results of the test

Client: *Phonak Communications AG*
 Apparatus: *TV Connector V2, proto 92*
 Operating mode: *Hopping f = 2.402/2.440/2.480 GHz, modulated, max. power (00, 02)*
 Cables connected to the EUT: *All (see § 4.6 and § 5.4)*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5

f normal [GHz]	Temp [°C]	U [V]	P [dBm]	Limit [dBm]	Remarks	Pass	
						Yes	No
2.402	26	5.0	12.10	21	Maximum conducted emission	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.440	26	5.0	11.80	21	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.480	26	5.0	10.86	21	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Windows taskbar icons: Start, Back, Forward, File Explorer, Help, Date/Time: *juil. 12, 2018 2:53:15*, Chat, Network, Volume, Brightness, and other system icons.

Place and date of test: *Rossens, July 12, 2018*
 Operator: *B. Itzcovich*

6.5 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 in which the intentional radiator is operating, 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: - - -

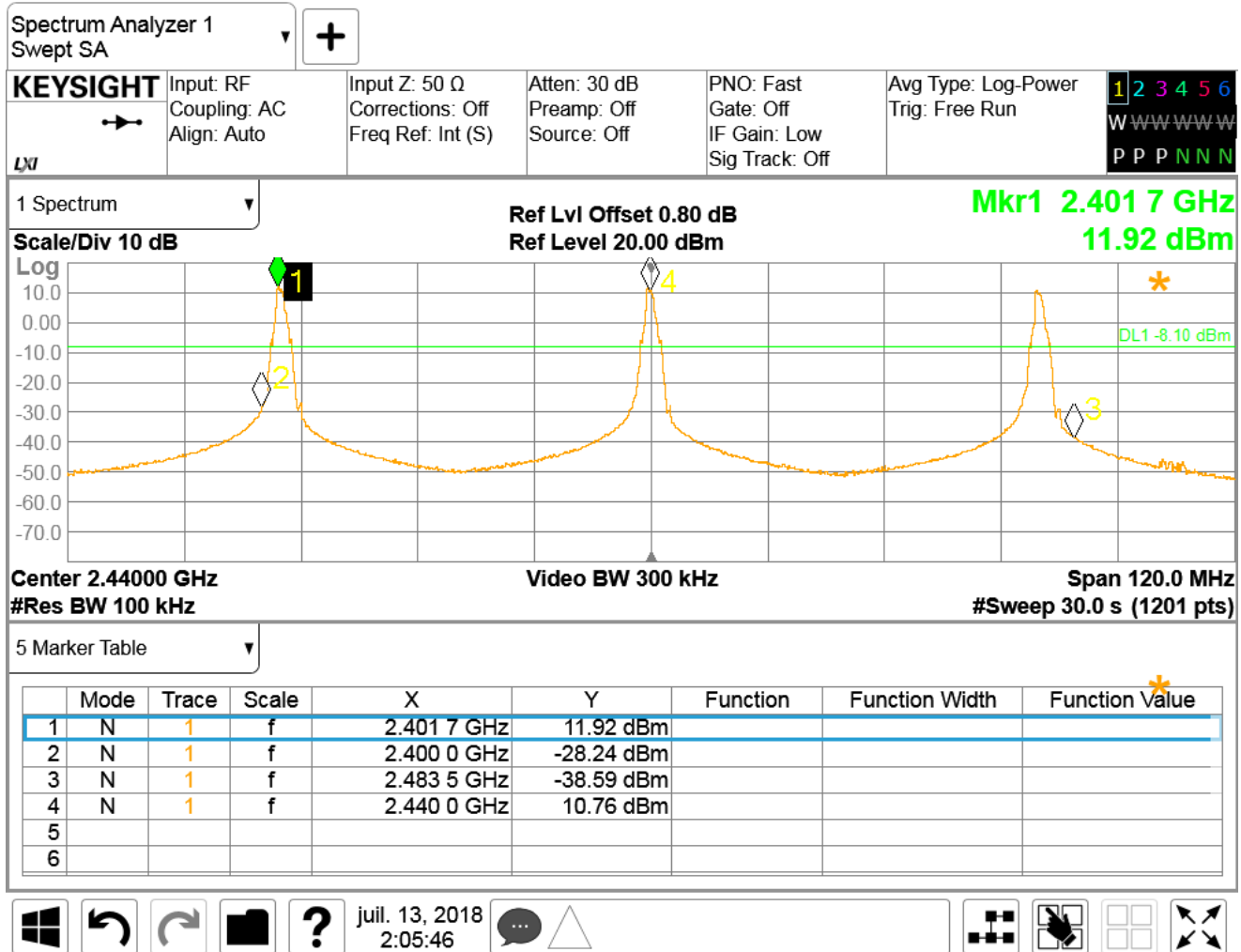
Test equipment:

Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input 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: *TV Connector V2, proto 92*
 Operating mode: *Hopping f = 2.402/2.440/2.480 GHz, modulated, max. power (00, 02)*
 Cables connected to the EUT: *All (see § 4.6 and § 5.4)*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5



Place and date of test: *Rossens, July 13, 2018*
 Operator: *B. Itzcovich*

6.6 Band-edge emission (radiated)

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

Distance: 1 m 3 m 10 m 30 m

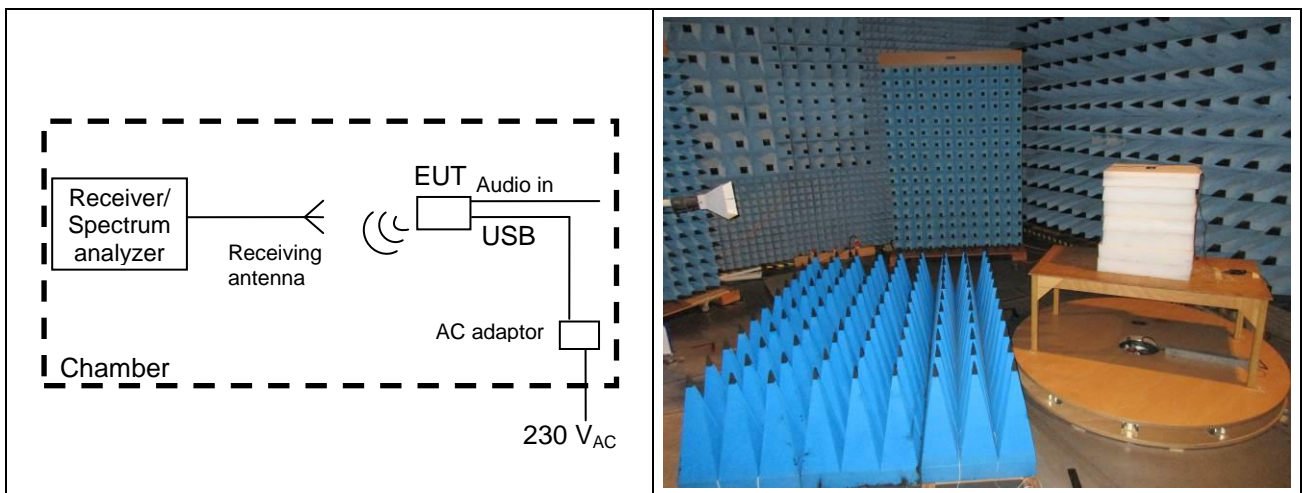
Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. uncertainty: ± 4.7 dB

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyser and a wide band antenna. The antenna is placed at the same height as the EUT successively with horizontal and vertical polarisations, 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 of all the disturbances appearing while the EUT 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 MHz the limit is 500 µV/m at 3 m;*

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

Test equipment:

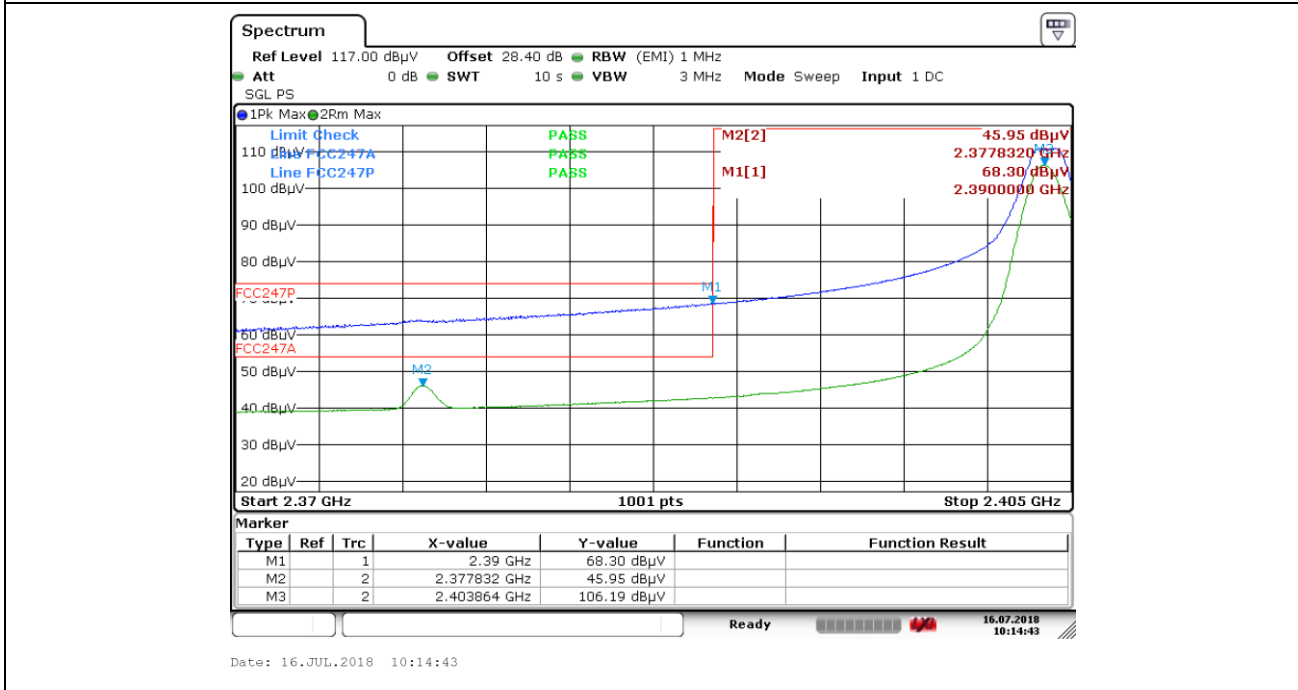
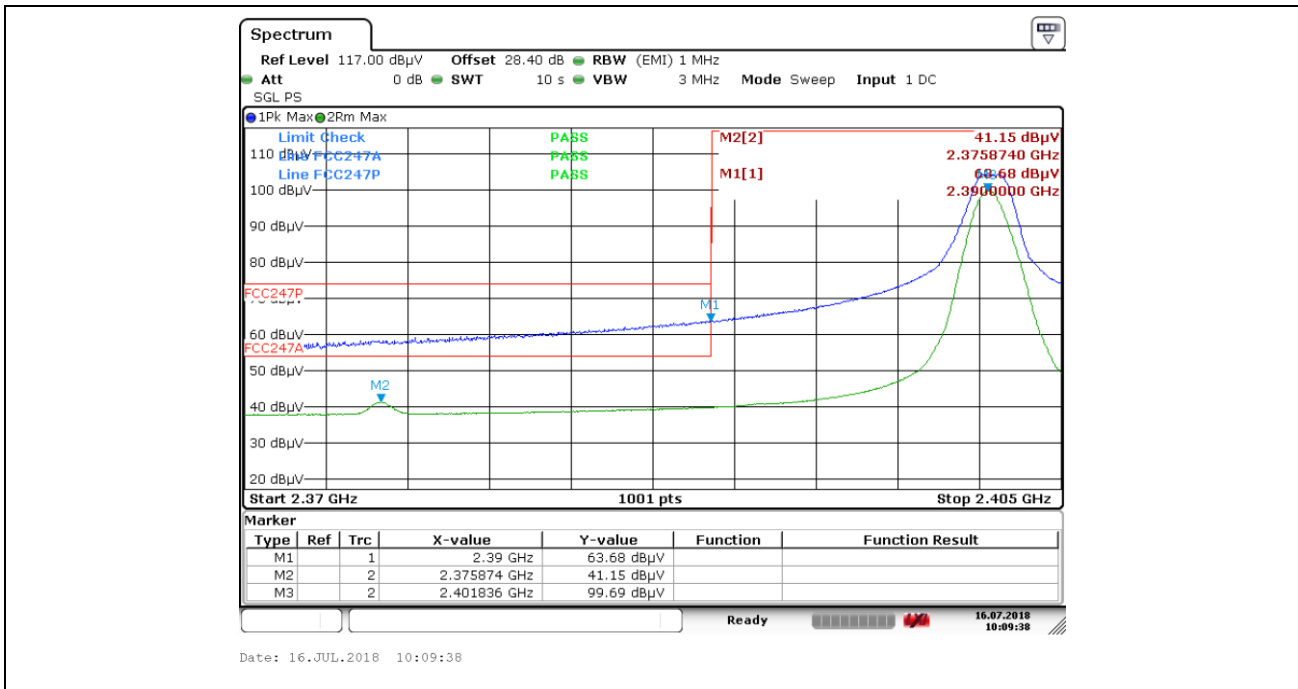
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input checked="" type="checkbox"/> 16-03	<input type="checkbox"/> 07-53
Preamplifier	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-87	<input type="checkbox"/> 14-27			
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			

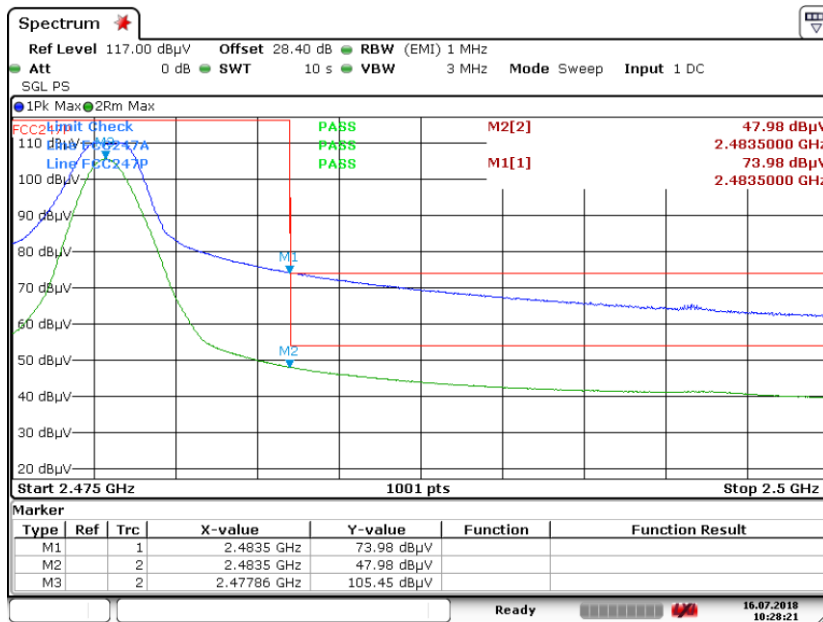
Result: pass fail not applicable not tested

Results of the test

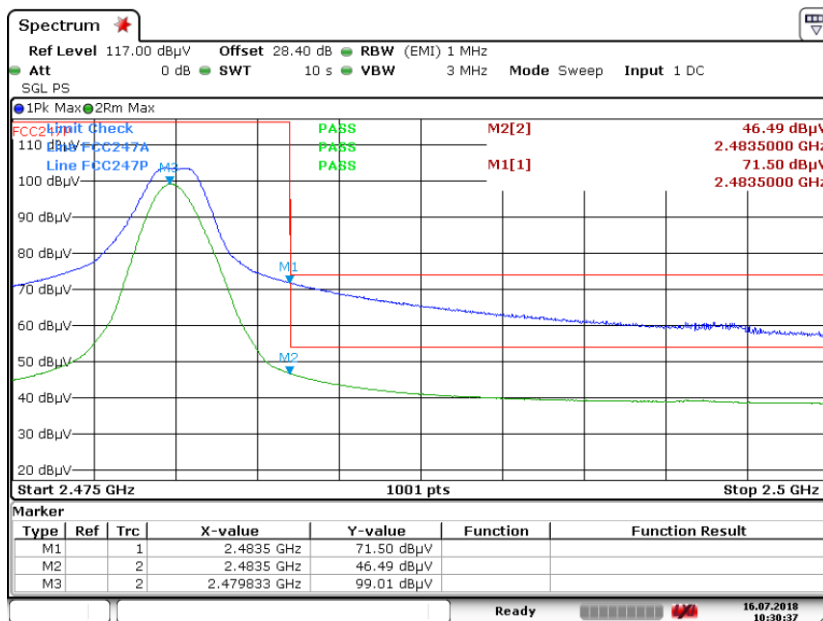
Client: *Phonak Communications AG*
 EUT: *TV Connector V2*
 Operating mode: *TX (f = 2.402/2.480 GHz), modulated, Pmax (00, 02)*
 Cables connected to the EUT: *All (see § 4.6 and § 5.4)*
 Remarks: *1001 Sweep Points*
 Modifications: None 1 2 3 4 5

	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	68.30	73.98	74	5.70	0.02	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Average RMS detector	45.95	47.98	54	8.05	6.02	<input checked="" type="checkbox"/>	<input type="checkbox"/>





Date: 16.JUL.2018 10:28:22



Date: 16.JUL.2018 10:30:37

Place and date of test:
Operator:

Rossens, July 16, 2018
B. Itzcovich

6.7 Maximum power spectral density

Introduction: The maximum power spectral density is defined as the highest power level in Watts per Hertz generated by the transmitter within the power envelope.

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

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

Test method: Measurement at the antenna connector or a test fixture, according to KDB 558074 §10.2

Limit: The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

Test set-up:

Remarks: ---

Test equipment:

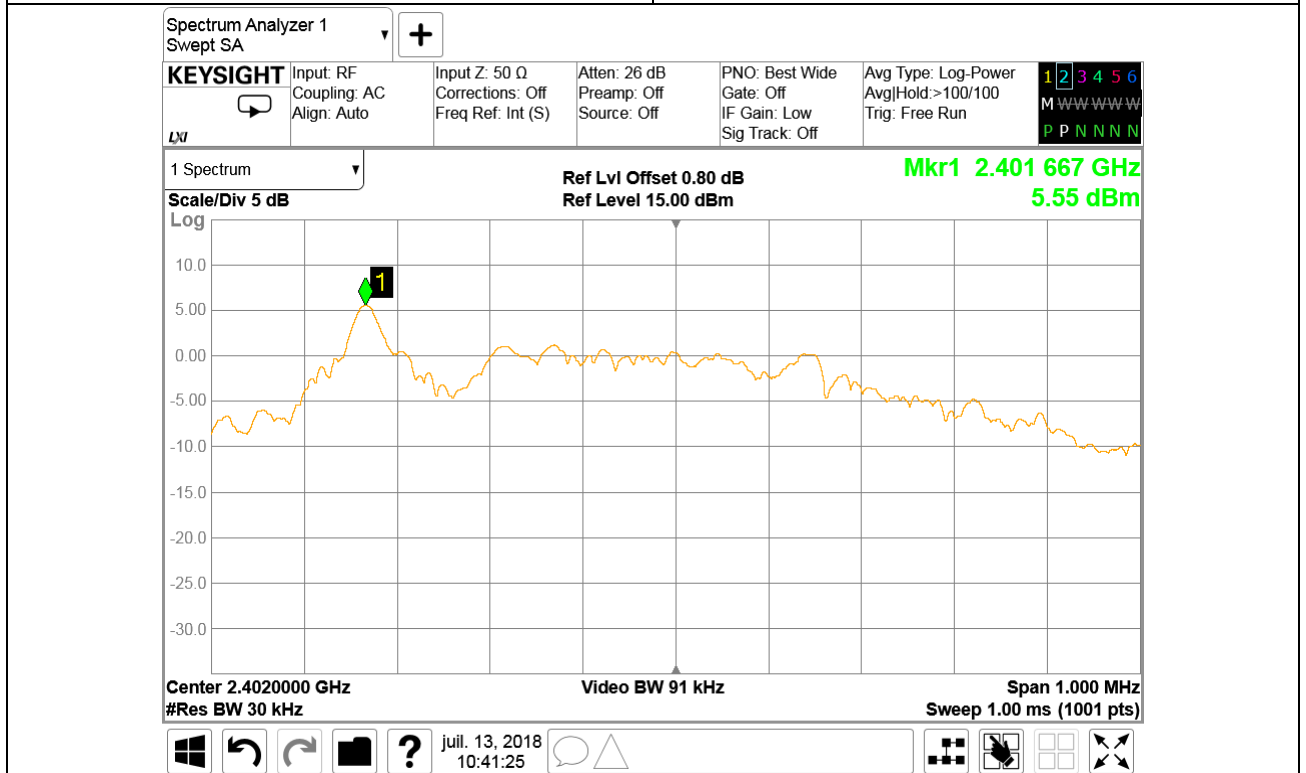
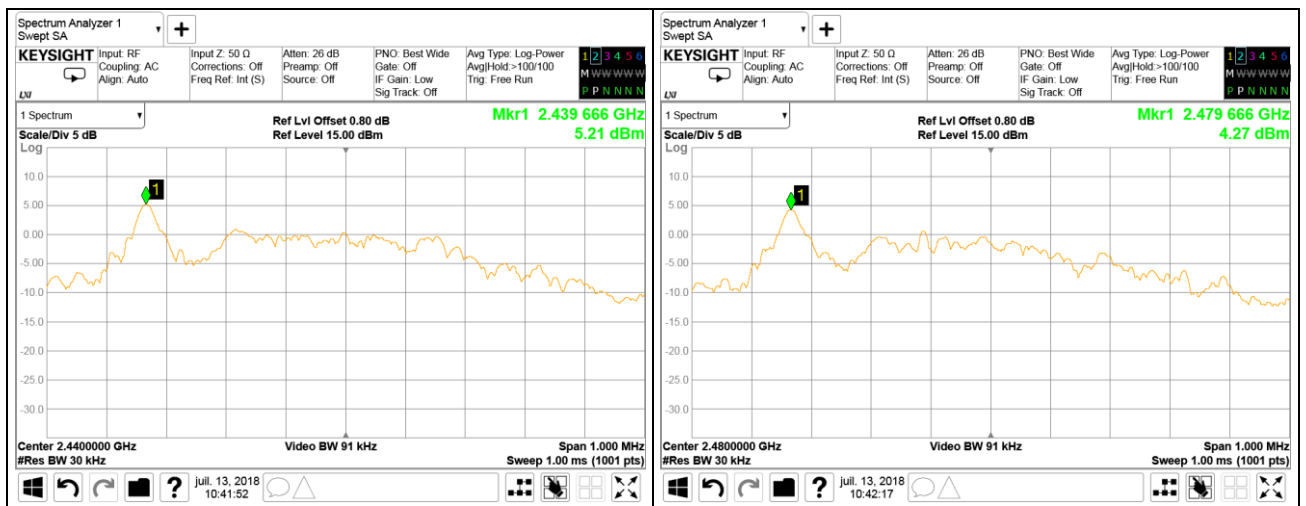
Spectrum analyser	<input type="checkbox"/> 88-14	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input type="checkbox"/> 07-53	<input type="checkbox"/> 10-70
Attenuator	<input type="checkbox"/> 07-36	<input type="checkbox"/> 11-37				
Cables	<input type="checkbox"/> 10-75	<input type="checkbox"/> 10-79	<input type="checkbox"/> 11-61	<input checked="" type="checkbox"/> 11-13		

Result: pass fail not applicable partly tested

Results of the test

Client: *Phonak Communications AG*
 Apparatus: *TV Connector V2, proto 92*
 Operating mode: *DTS mode, TX (f = 2.402 / 2.440 / 2.480 GHz), modulated*
 Cables connected to the EUT: *All (see § 4.6 and § 5.4)*
 Remarks: *Measured on temporary antenna connector*
 Modifications: None 1 2 3 4 5

f [GHz]	Peak power [dBm]	Limit [dBm/3kHz]	Pass	
			Yes	No
2.402	5.55	8	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.440	5.21	8	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.480	4.27	8	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Place and date of test: *Rossens, July 13, 2018*
 Operator: *B. Itzcovich*

6.8 Spurious emission – 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

Test set-up:

Remarks: *Emissions near band-edges are checked under § 6.5*

Test equipment:

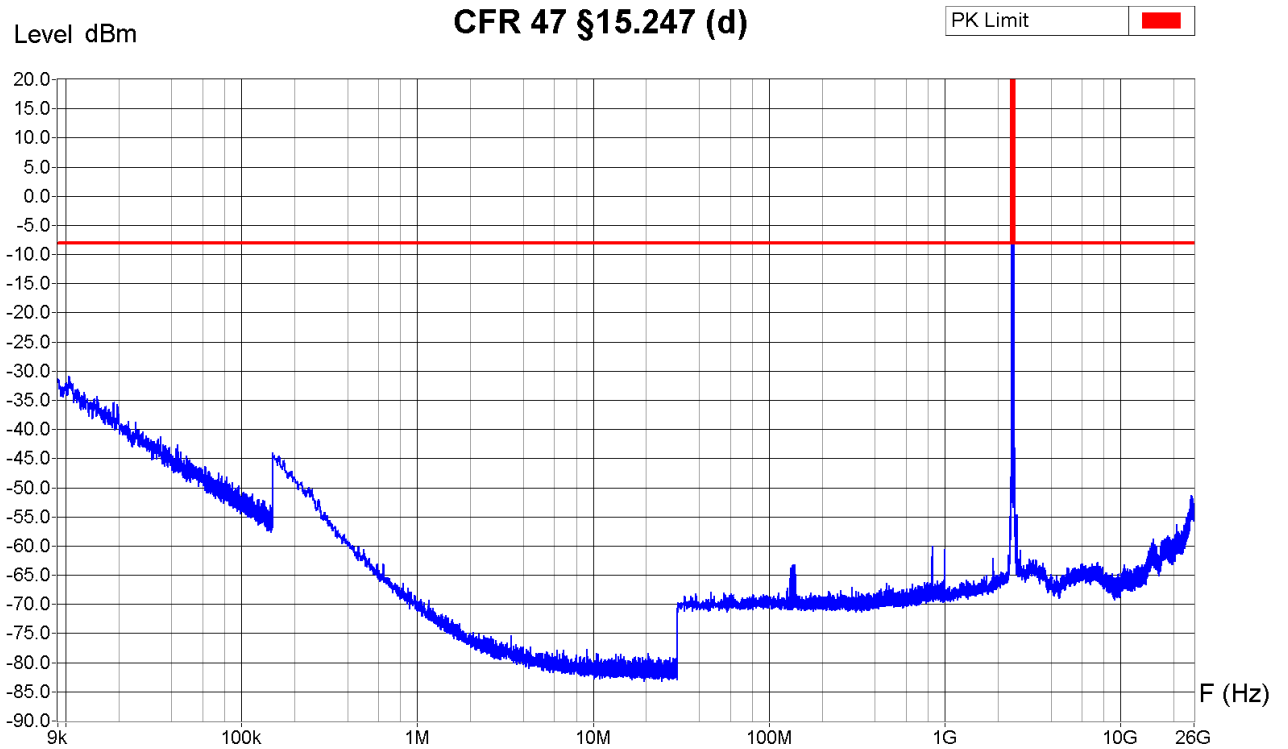
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input type="checkbox"/> 07-53
Power supply	<input type="checkbox"/> 99-07	<input type="checkbox"/> 04-31				
Cables	<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 : TV Connector V2 (TX30), proto 92
Set-Up : See photos
Operating Conditions : Hopping TX, modulated, Pmax
Remarks : Peak detector sweep, 8001 Pts/zone



Operator: B. Itzcovich
Date/Time: 13.07.2018 14:55
Filename:
CP_9k-26G_TX3f_v2.png/.txt

6.9 Spurious emission transmit mode – radiated

6.9.1 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

Test set-up:

Perpendicular

Remarks: *Limit values expressed in dBµV/m and transformed to a measuring distance of 3 m (factor used = 40 dB/decade) if necessary*
 e.g.: for f = 10 MHz the limit is 30 µV/m at 30 m;

$$20 \log \left(\frac{30 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 40 \log \left(\frac{30 m}{3 m} \right) = 69.5 \frac{dB\mu V}{m} \text{ at } 3m$$

Test equipment:

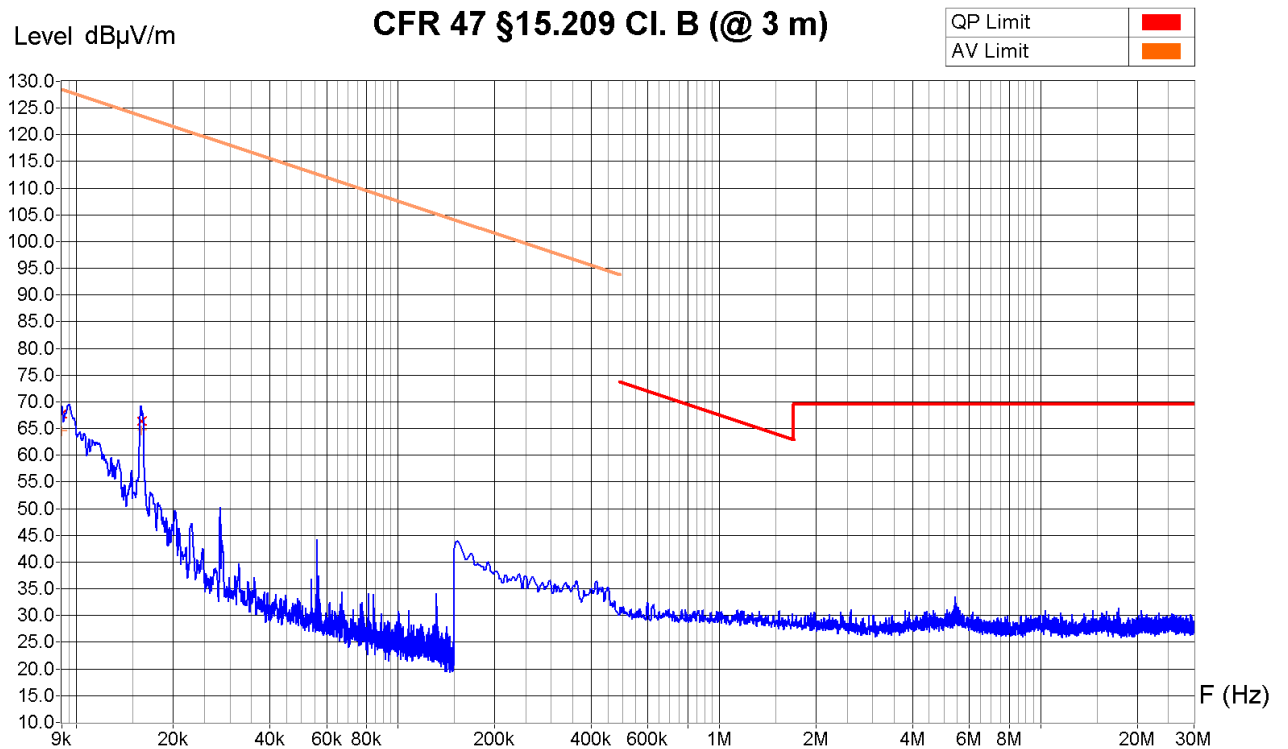
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 16-03
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 94-35	<input checked="" type="checkbox"/> 16-03		
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"/> 06-00	<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 : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4401 Pts/zone, Chamber 06-00



Zone	9 KHz - 150 KHz	150 KHz - 8 MHz	8 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Receiver Measures

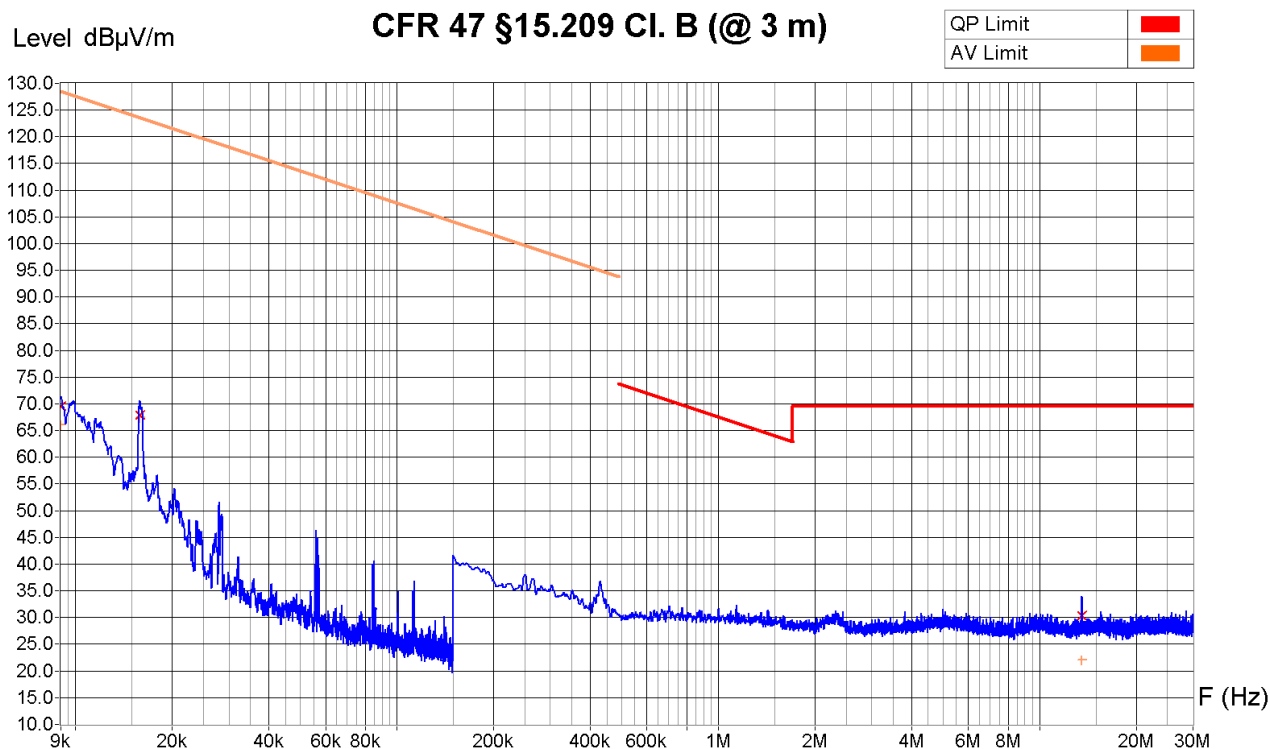
Frequency	Peak	QuasiPeak (x)	Average (+)
9 KHz	74.7 dBµV/m	67.7 dBµV/m	64.5 dBµV/m
15.90 KHz	69.5 dBµV/m	66.4 dBµV/m	64.8 dBµV/m

Operator: B. Itzcovich
 Date/Time: 10.07.2018 09:45
 Filename:
 17_RE_9k-30M_TX3f_Par.png/.txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4401 Pts/zone, Chamber 06-00



Zone	9 KHz - 150 KHz	150 KHz - 8 MHz	8 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Receiver Measures

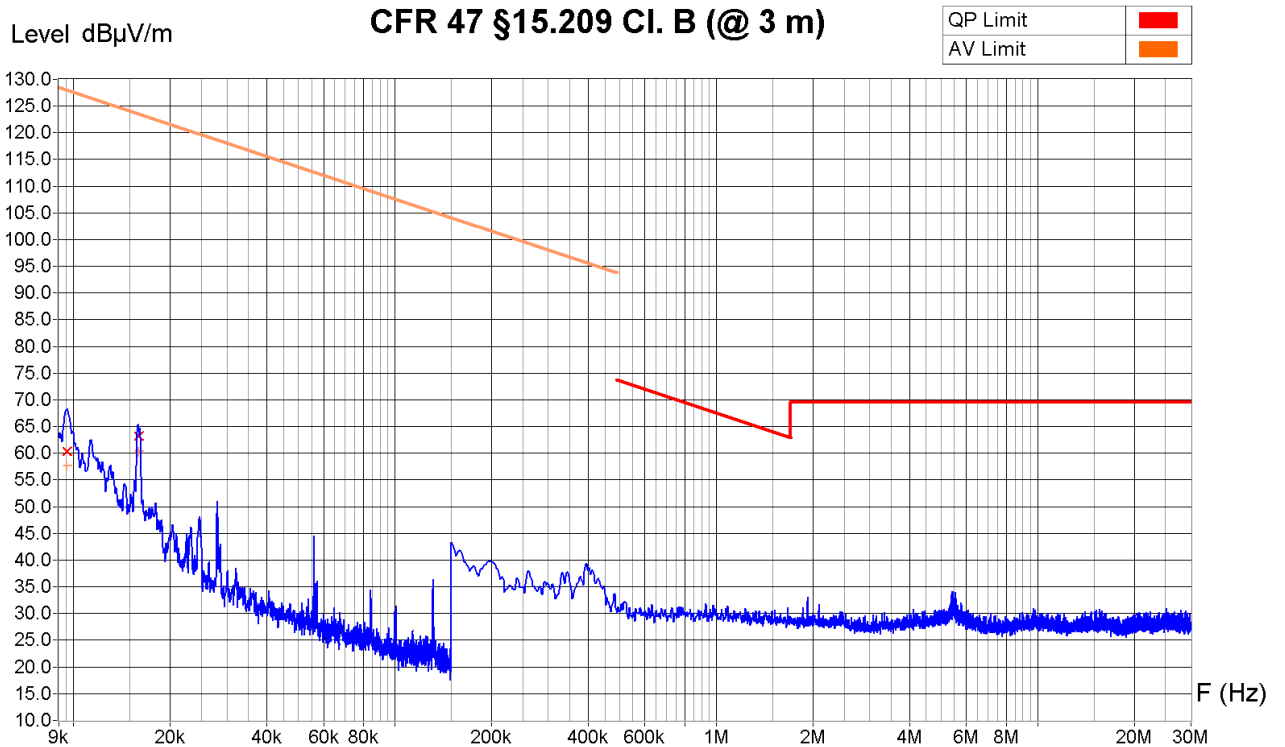
Frequency	Peak	QuasiPeak (x)	Average (+)
9 KHz	77.4 dBµV/m	69.6 dBµV/m	66.1 dBµV/m
15.86 KHz	70.7 dBµV/m	68.0 dBµV/m	67.5 dBµV/m
13.56 MHz	37.1 dBµV/m	30.4 dBµV/m	22.0 dBµV/m

Operator: B. Itzcovich
 Date/Time: 10.07.2018 10:09
 Filename:
 18_RE_9k-30M_TX3f_Per.png/.txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4401 Pts/zone, Chamber 06-00



Zone	9 KHz - 150 KHz	150 KHz - 8 MHz	8 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 (+)
9.53 KHz	68.6 dBµV/m	60.4 dBµV/m	57.7 dBµV/m
15.93 KHz	66.3 dBµV/m	63.2 dBµV/m	60.4 dBµV/m

Operator: B. Itzcovich
 Date/Time: 10.07.2018 09:56
 Filename:
 19_RE_9k-30M_TX3f_Hor.png/.txt

6.9.2 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

Test set-up:

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

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) = 40 \frac{dB\mu V}{m} \text{ at } 3m$$

Test equipment:

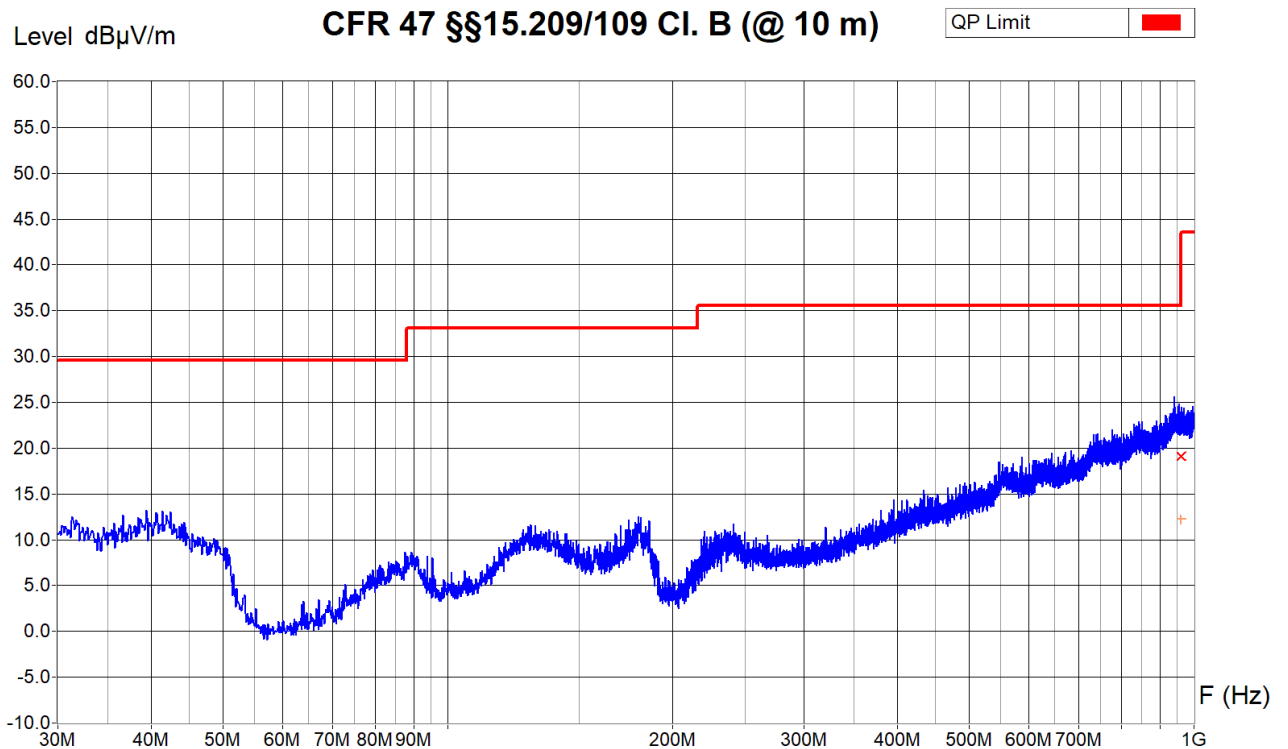
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 10-70
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 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 checked="" type="checkbox"/> 05-59	<input type="checkbox"/> 05-62	
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 : TV Connector V2 (TX30)
 Set-Up : Chamber 06-01. With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 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
960 MHz	25.9 dBµV/m	19.1 dBµV/m	12.2 dBµV/m	16.5 dB

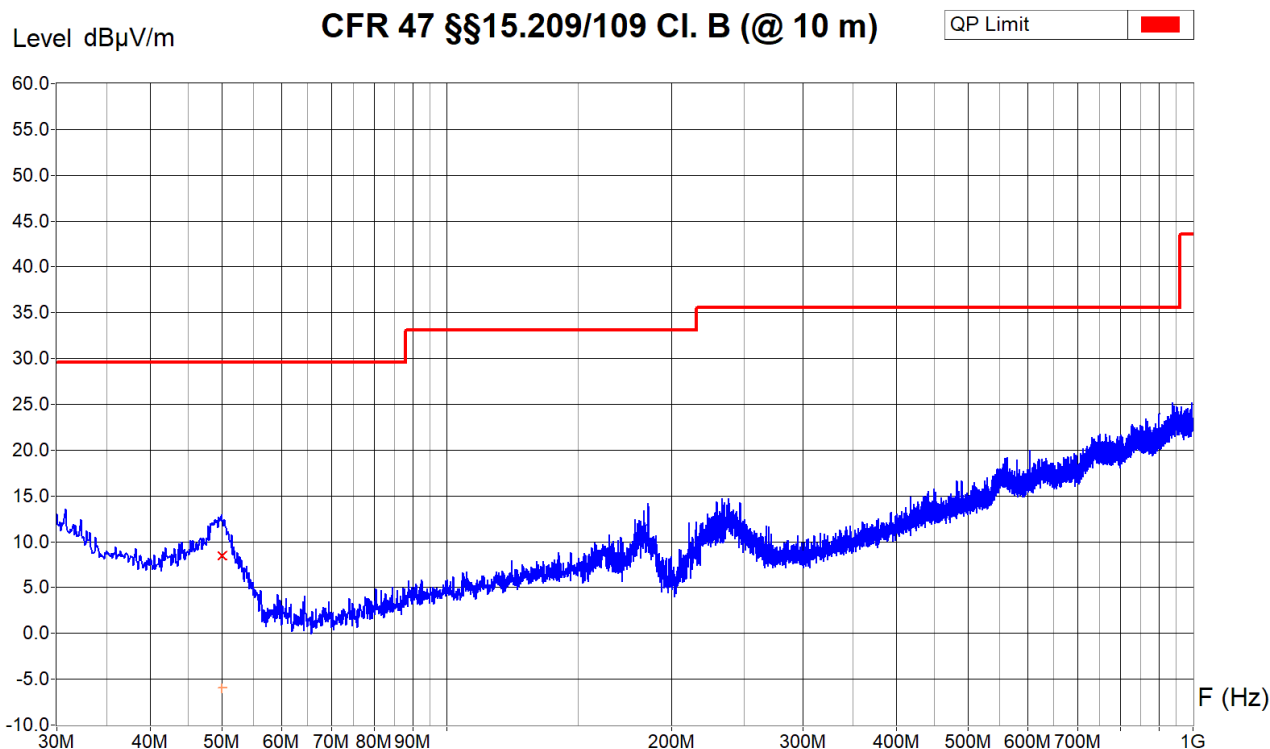
Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver QP value [dBµV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	QP field [dBµV/m]
960	19.3	+4.4	-28.9	+24.3	= 19.1

Operator: B. Itzcovich
 Date/Time: 06.07.2018 11:35
 Filename:
 05_RE_30M-
 1G_TX3f_V_FCC.png.txt

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



Equipment Under Test : TV Connector V2 (TX30)
 Set-Up : Chamber 06-01. With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 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
49.95 MHz	14.7 dBµV/m	8.4 dBµV/m	-6.0 dBµV/m	21.1 dB

Operator: B. Itzcovich
 Date/Time: 06.07.2018 11:48
 Filename:
 06_RE_30M-
 1G_TX3f_H_FCC.png/.txt

6.9.3 1 GHz to 18 GHz

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

Distance: 1 m 3 m 10 m 30 m

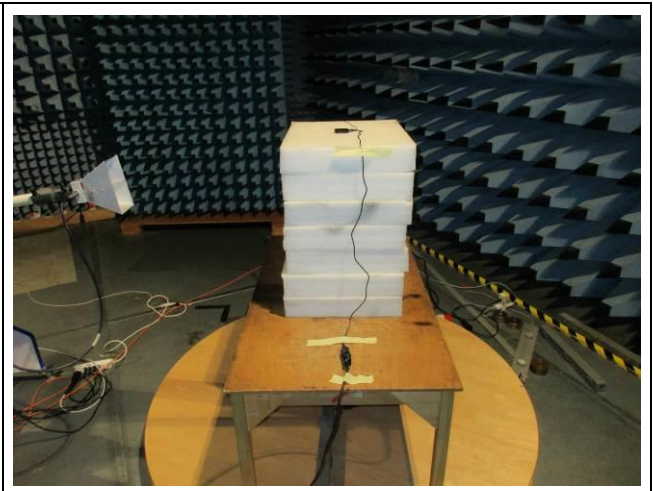
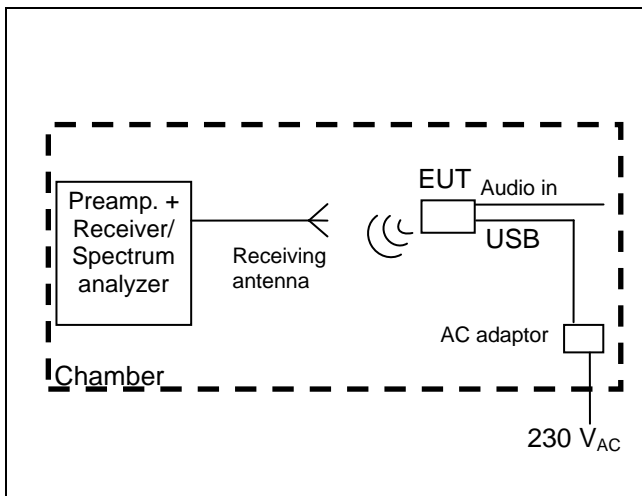
Position of EUT: 1.5 m (height of the equipment under test above floor)

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

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 hopping emission, selectivity of 18-01 Analyzer at 1 MHz RBW and notch filter. They are checked under §§ 6.5 and 6.6

Test equipment:

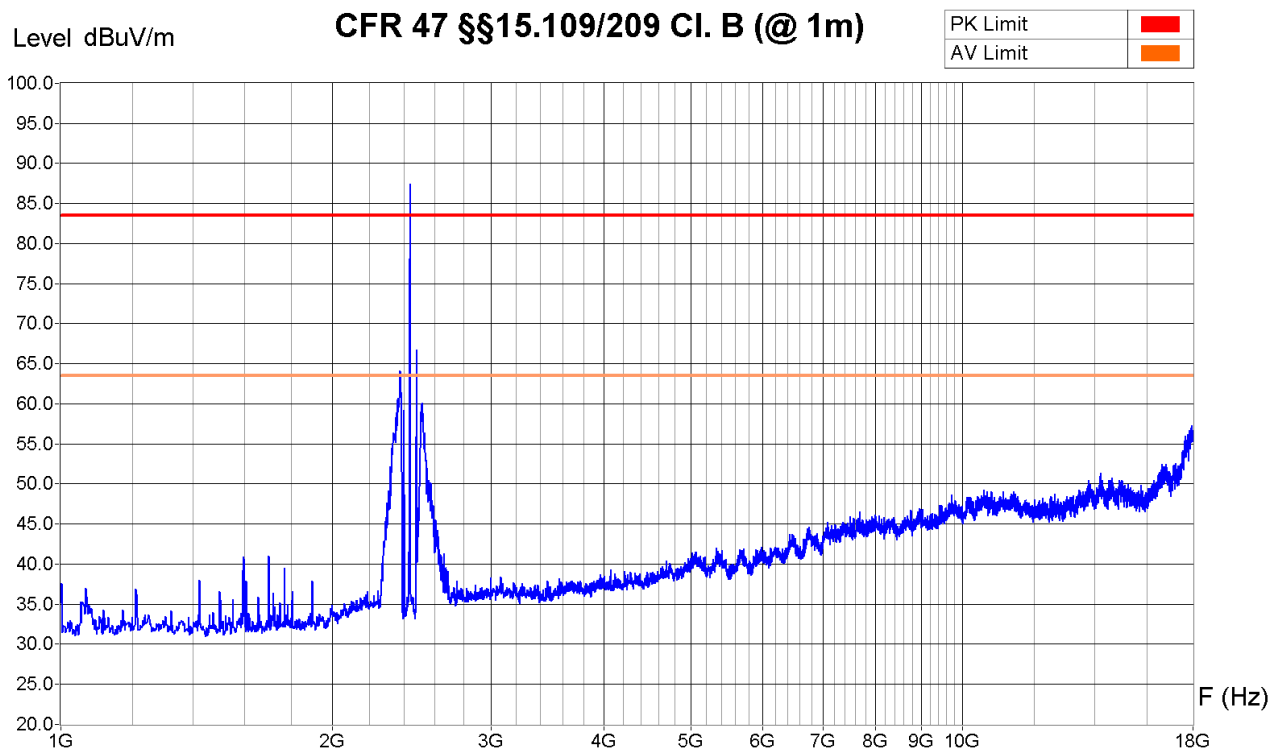
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input type="checkbox"/> 07-53
Preamplifier	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-87	<input checked="" type="checkbox"/> 14-27			
Antenna (horn)	<input type="checkbox"/> 90-24	<input checked="" type="checkbox"/> 07-31				
Cables	<input checked="" type="checkbox"/> 10-75	<input checked="" type="checkbox"/> 11-61				
Filters	<input checked="" type="checkbox"/> 13-14	<input checked="" 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 : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (00, 02)
 Remarks : Zone 1 - 7 GHz with Notch filter
 Zone 7 - 18 GHz with HP filter
 Peak detector sweep, 3001 Pts/zone. Chamber 06-00



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

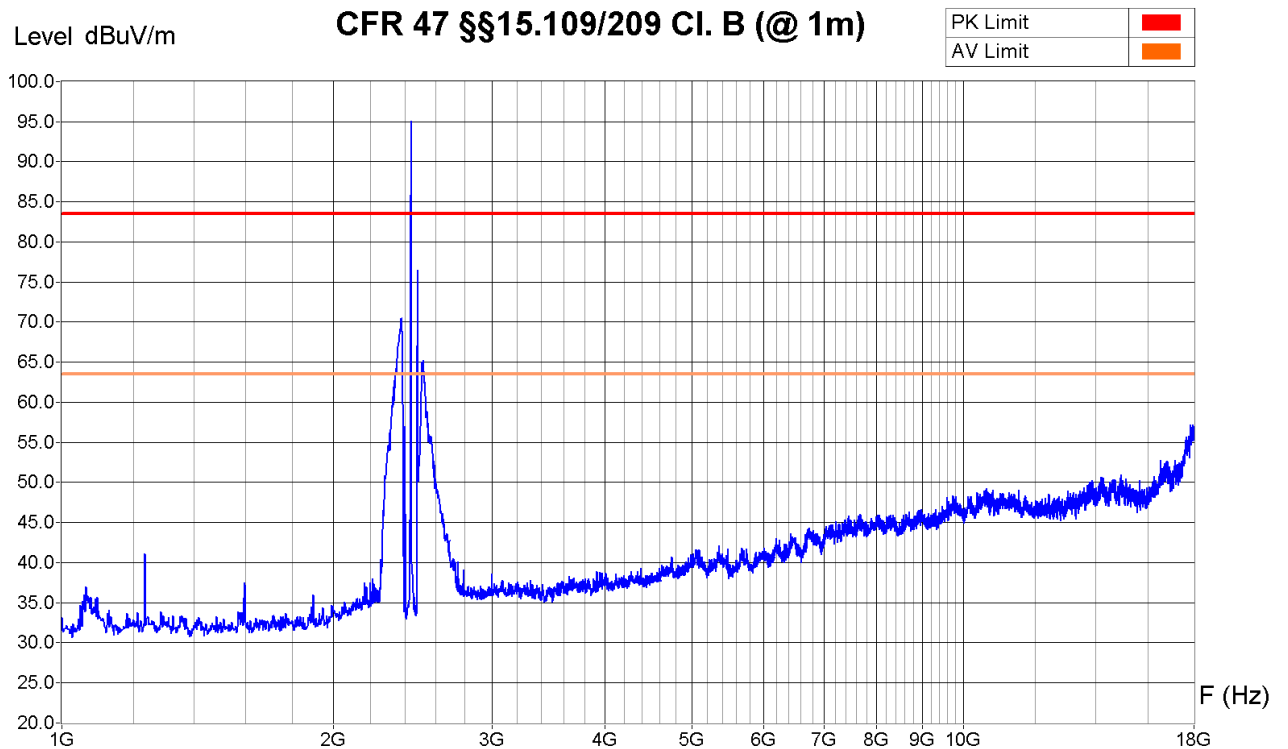
Sample calculation with all conversion and correction factors used						
Frequency [GHz]	Analyzer Peak value [dBuV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	Attenuator corr. [dB]	Peak field [dBuV/m]
18.0	40.4	+2.2	-33.5	+46.8	0.0	= 55.9

Operator: B. Itzcovich
 Date/Time: 09.07.2018 11:39
 Filename:
 07_RE_1-18G_TX3f_V_ETSI.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 : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (00, 02)
 Remarks : Zone 1 - 7 GHz with Notch filter
 Zone 7 - 18 GHz with HP filter
 Peak detector sweep, 3001 Pts/zone. Chamber 06-00



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: 09.07.2018 11:27
Filename: 08_RE_1-18G_TX3f_H_FCC.png/ .txt

6.9.4 18 GHz to 26.5 GHz

Test 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 lying and standing 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

Test set-up:

EUT lying

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 = 18 GHz the limit is 500 µV/m at 3 m;

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

Test equipment:

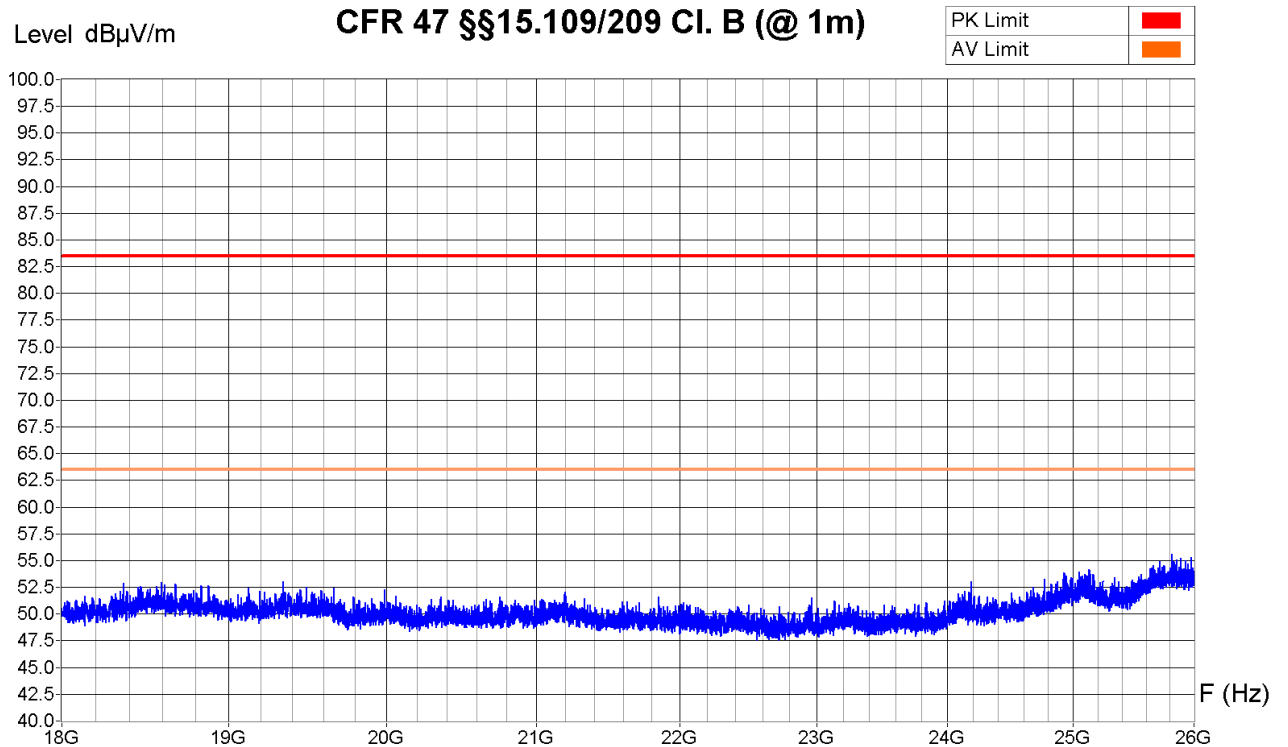
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 07-53
Antenna with mixer & preamp.	<input checked="" type="checkbox"/> 98-12					
Cables	<input checked="" type="checkbox"/> 11-62	<input checked="" type="checkbox"/> 10-81				
Power supply	<input checked="" type="checkbox"/> 06-62					

Result: pass fail not applicable not tested

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1.5m



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : EUT lying, cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 8001 Pts/zone. Chamber 06-00



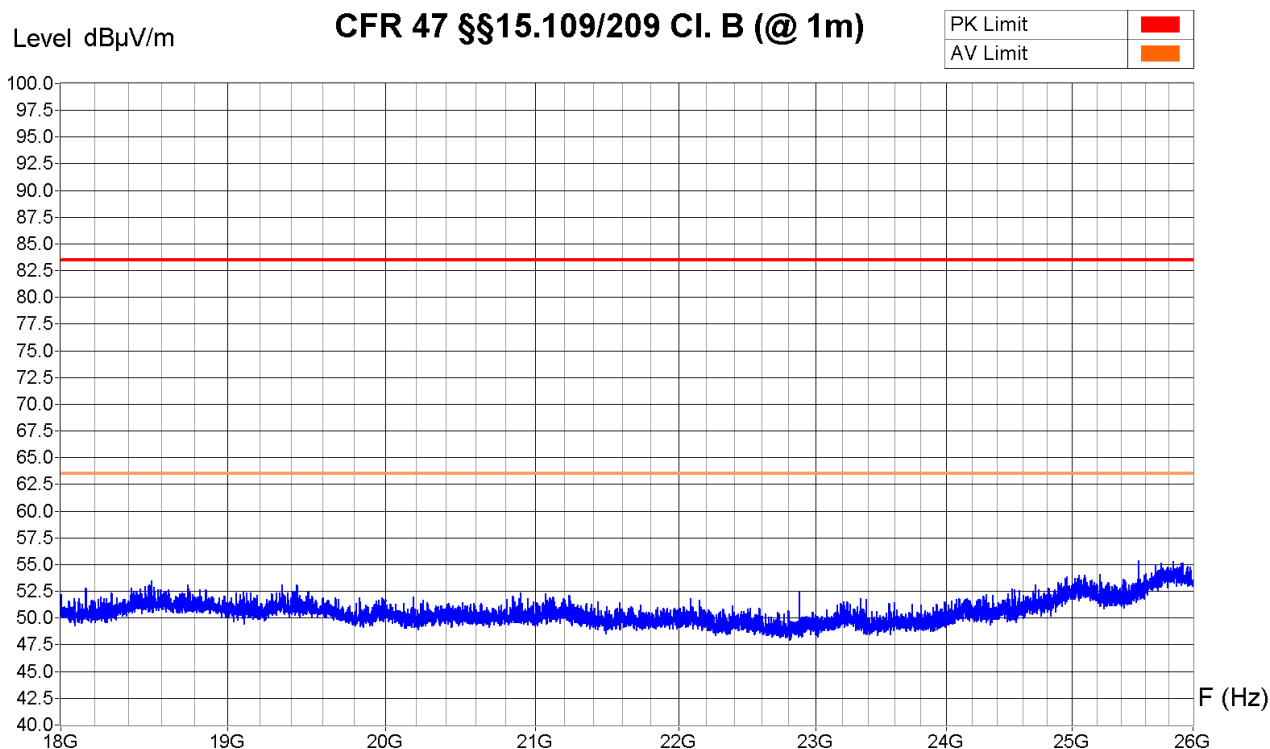
Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

Operator: B. Itzcovich
Date/Time: 09.07.2018 15:39
Filename: 13_RE_18- 26G_TX3f_lying_V.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1.5m



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : EUT lying, cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 8001 Pts/zone. Chamber 06-00



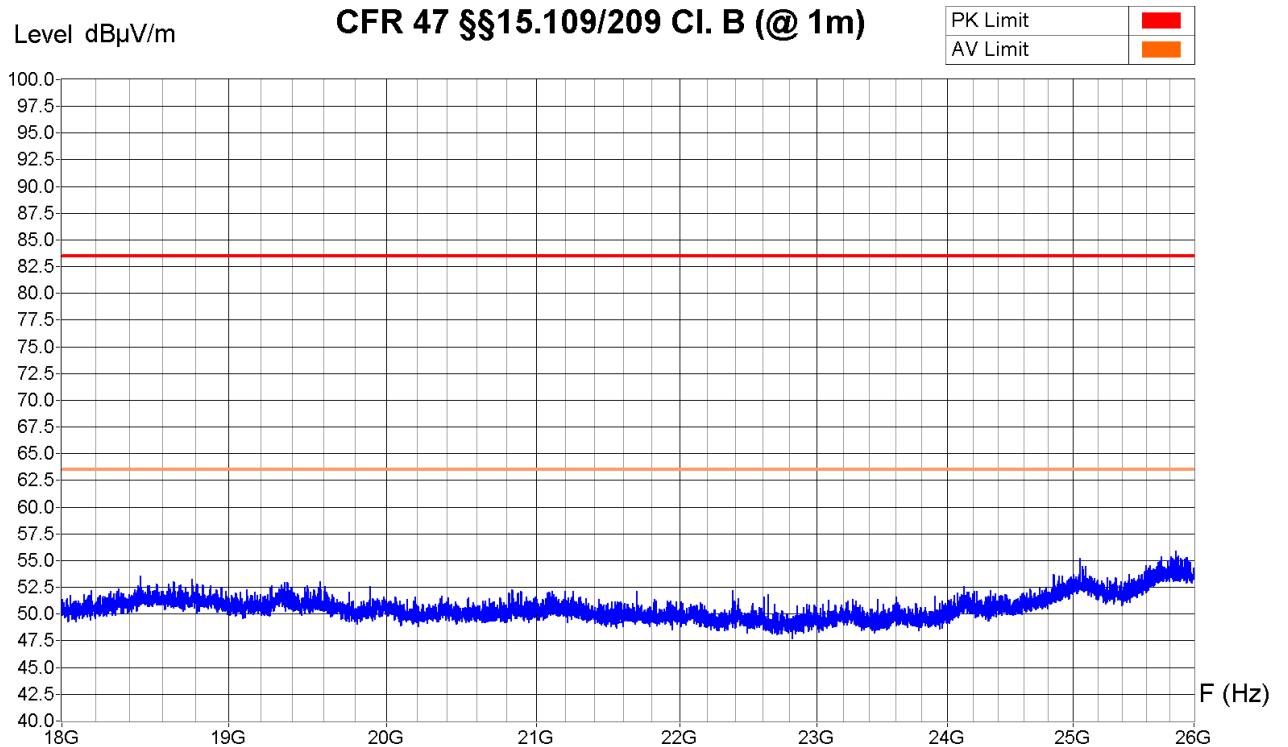
Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

Operator:	B. Itzcovich
Date/Time:	09.07.2018 16:11
Filename:	14_RE_18-26G_TX3f_lying_H.png/.txt

Measurement Type : Radiated Field
 Polarisation : Vertical
 Table Angle : 0 - 360°
 Antenna Height : 1.5m



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : EUT standing, cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 8001 Pts/zone. Chamber 06-00



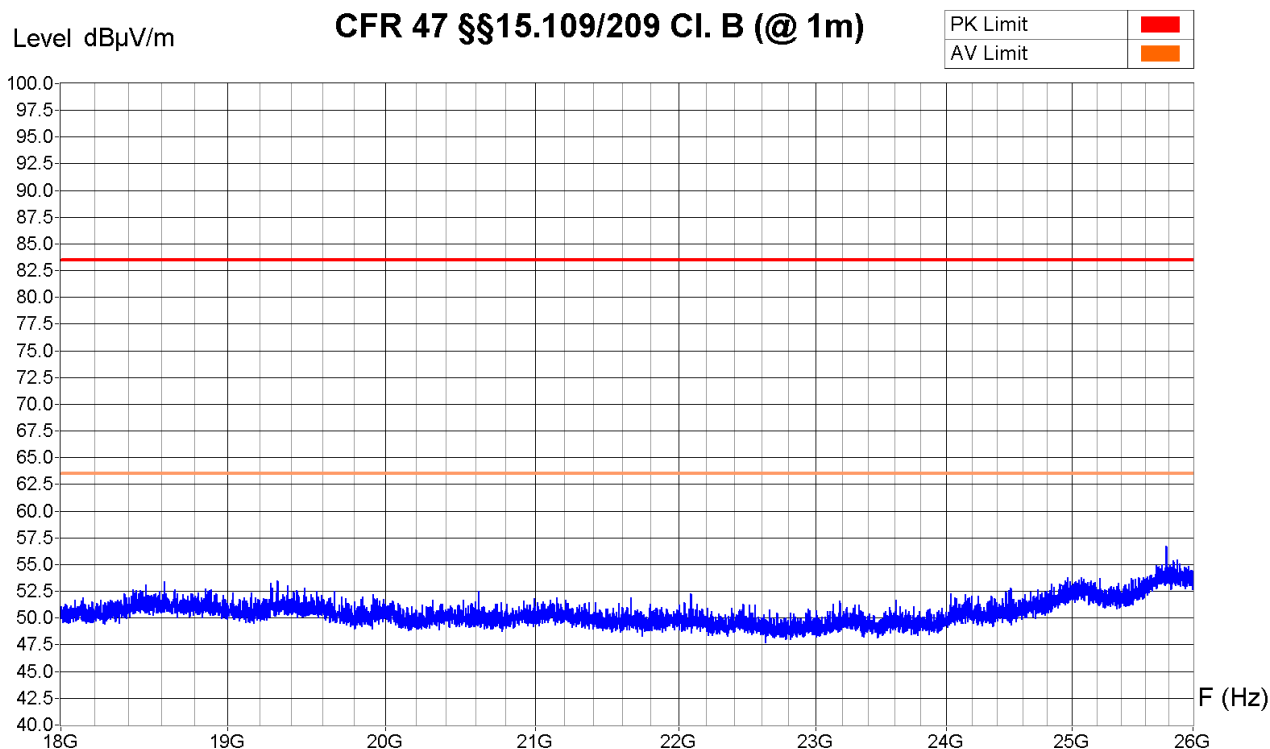
Zone	18 GHz - 26 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

Operator: B. Itzcovich
Date/Time: 09.07.2018 16:03
Filename: 15_RE_18- 26G_TX3f_standing_V.png/.txt

Measurement Type : Radiated Field
 Polarisation : Horizontal
 Table Angle : 0 - 360°
 Antenna Height : 1.5m



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : EUT standing, cables connected. See photos
 Operating Conditions : Hopping TX (f = 2402 / 2440 / 2480 MHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 8001 Pts/zone. Chamber 06-00



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

Operator:	B. Itzcovich
Date/Time:	09.07.2018 16:08
Filename:	16_RE_18-26G_TX3f_standing_H.png/.txt

6.10 Spurious emission receive & standby mode - radiated

6.10.1 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 analyser and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarisations. 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

Test set-up:

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

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) = 40 \frac{dB\mu V}{m} \text{ at } 3m$$

Test equipment:

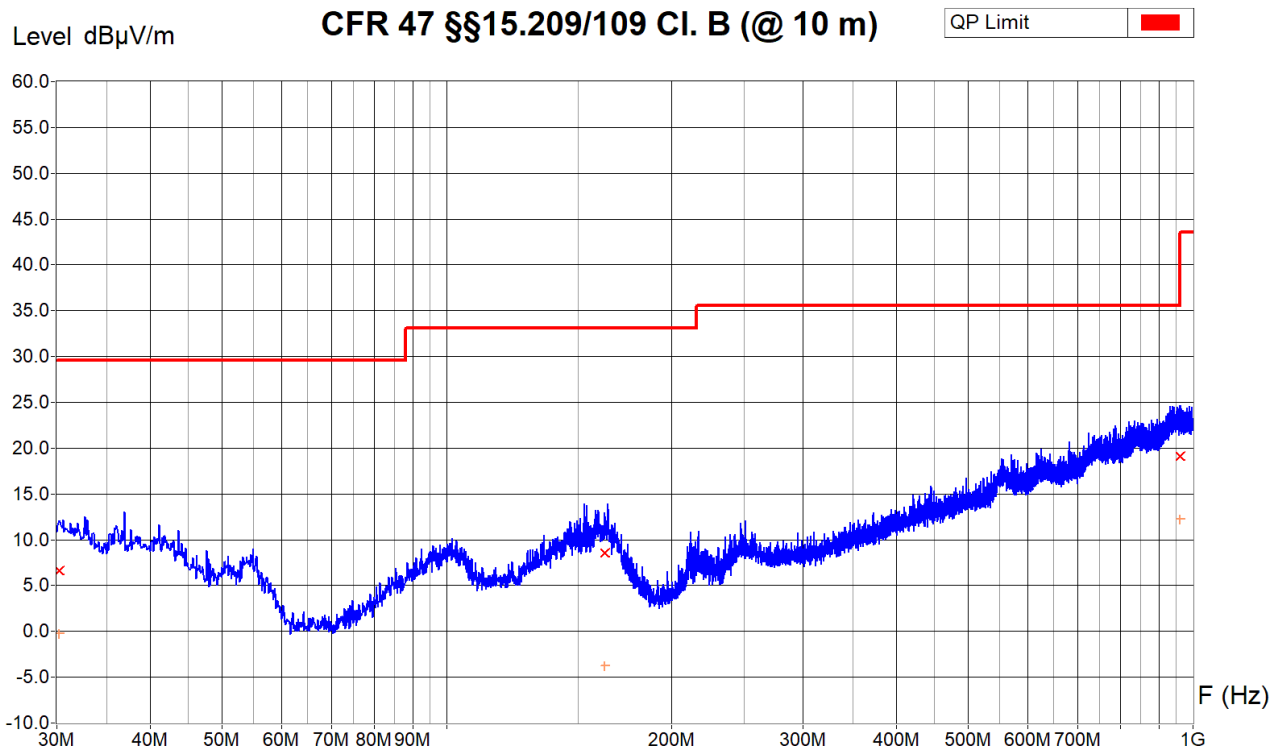
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 10-70
Receiver	<input type="checkbox"/> 85-04	<input type="checkbox"/> 90-43	<input type="checkbox"/> 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 checked="" type="checkbox"/> 05-59	<input type="checkbox"/> 05-62	
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 : TV Connector V2 (TX30)
 Set-Up : Chamber 06-01. With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2.44 GHz)
 Remarks : Peak detector sweep, 9701 Pts/zone



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

Receiver Measures

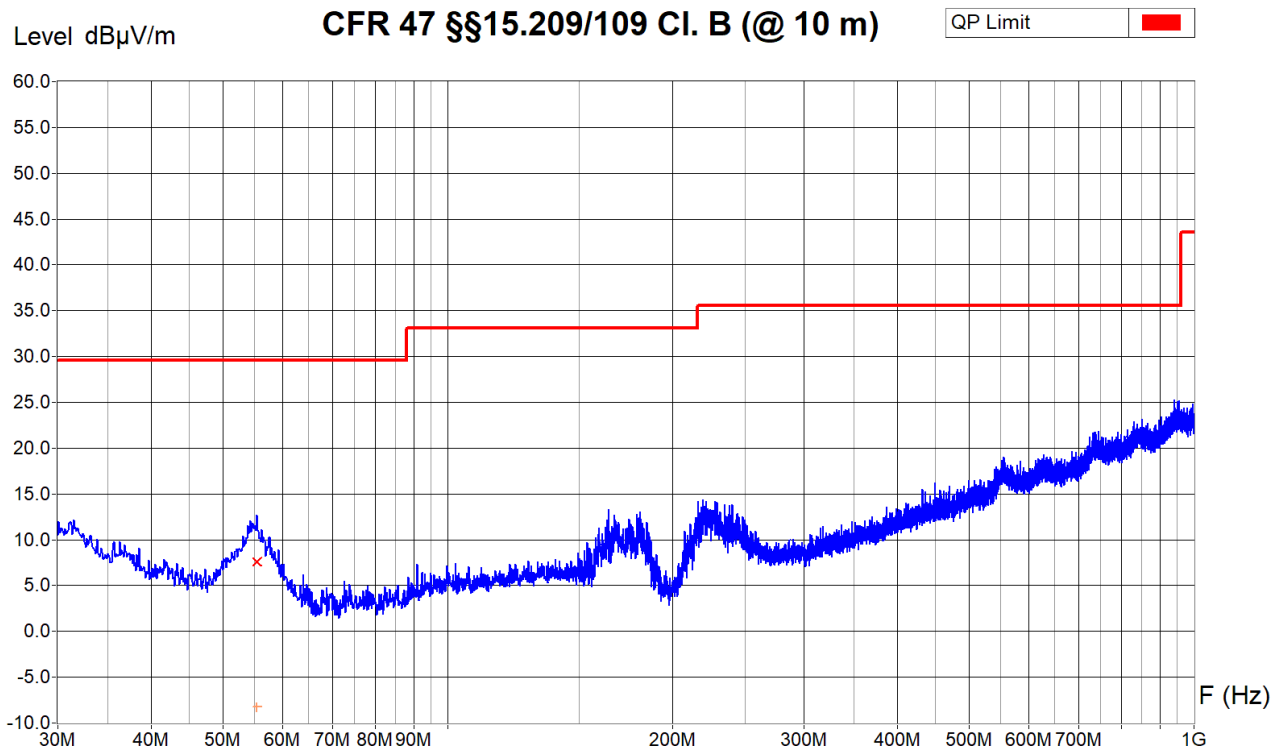
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
30.25 MHz	13.3 dBµV/m	6.6 dBµV/m	-0.2 dBµV/m	22.9 dB
162.90 MHz	15.4 dBµV/m	8.5 dBµV/m	-3.7 dBµV/m	24.5 dB
960 MHz	24.9 dBµV/m	19.1 dBµV/m	12.2 dBµV/m	16.5 dB

Operator: B. Itzcovich
 Date/Time: 06.07.2018 10:13
 Filename:
 01_RE_30M-1G_RX_V_FCC.png/
 .txt

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



Equipment Under Test : TV Connector V2 (TX30)
 Set-Up : Chamber 06-01. With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2.44 GHz)
 Remarks : Peak detector sweep, 9701 Pts/zone



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

Receiver Measures

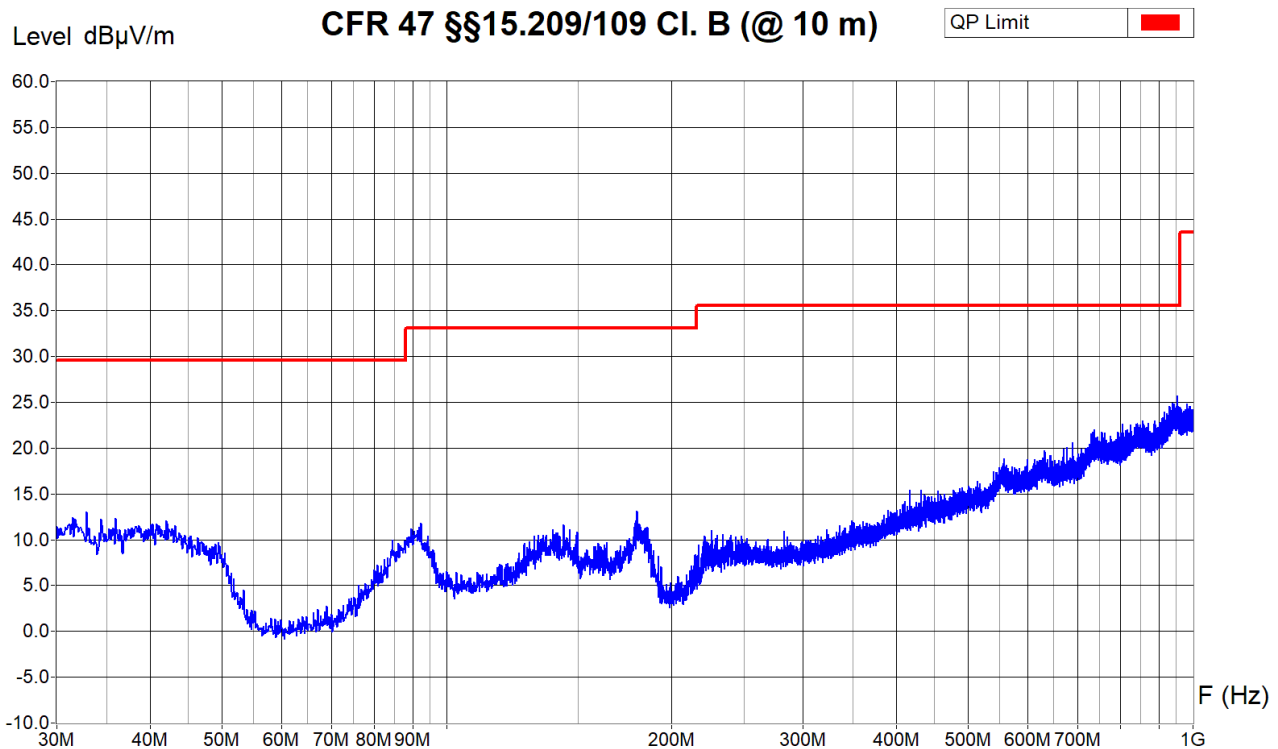
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
55.40 MHz	13.1 dBµV/m	7.5 dBµV/m	-8.2 dBµV/m	22.0 dB

Operator: B. Itzcovich
 Date/Time: 06.07.2018 10:33
 Filename:
 02_RE_30M-1G_RX_H_FCC.png/
 .txt

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



Equipment Under Test : TV Connector V2 (TX30)
 Set-Up : Chamber 06-01. With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Standby
 Remarks : Peak detector sweep, 9701 Pts/zone



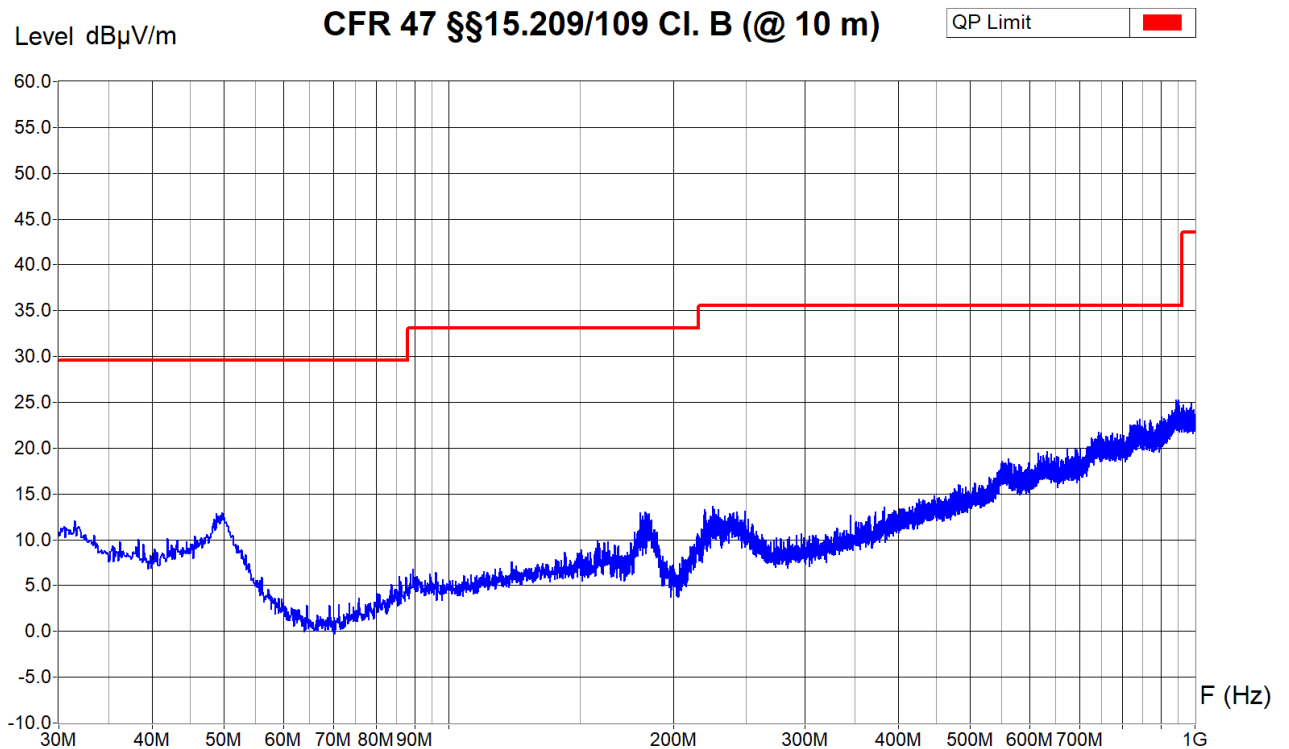
Zone	30 MHz - 1 GHz
Video Bandwidth	500 KHz
Resol Bandwidth	120 KHz

Operator: B. Itzcovich
 Date/Time: 06.07.2018 11:01
 Filename:
 03_RE_30M-
 1G_Stby_V_FCC.png/.txt

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



Equipment Under Test : TV Connector V2 (TX30)
 Set-Up : Chamber 06-01. With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Standby
 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: 06.07.2018 11:09
Filename: 04_RE_30M- 1G_Stby_H_FCC.png/.txt

6.10.2 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

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;

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

Test equipment:

Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input checked="" type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input type="checkbox"/> 07-53
Preamplifier	<input type="checkbox"/> 05-56	<input type="checkbox"/> 05-87	<input checked="" type="checkbox"/> 14-27			
Antenna (horn)	<input type="checkbox"/> 90-24	<input checked="" type="checkbox"/> 07-31				
Cables	<input checked="" type="checkbox"/> 10-75	<input checked="" type="checkbox"/> 11-61				
Filters	<input type="checkbox"/> 13-14	<input type="checkbox"/> 10-66	<input type="checkbox"/> 11-08	<input type="checkbox"/> 12-06		

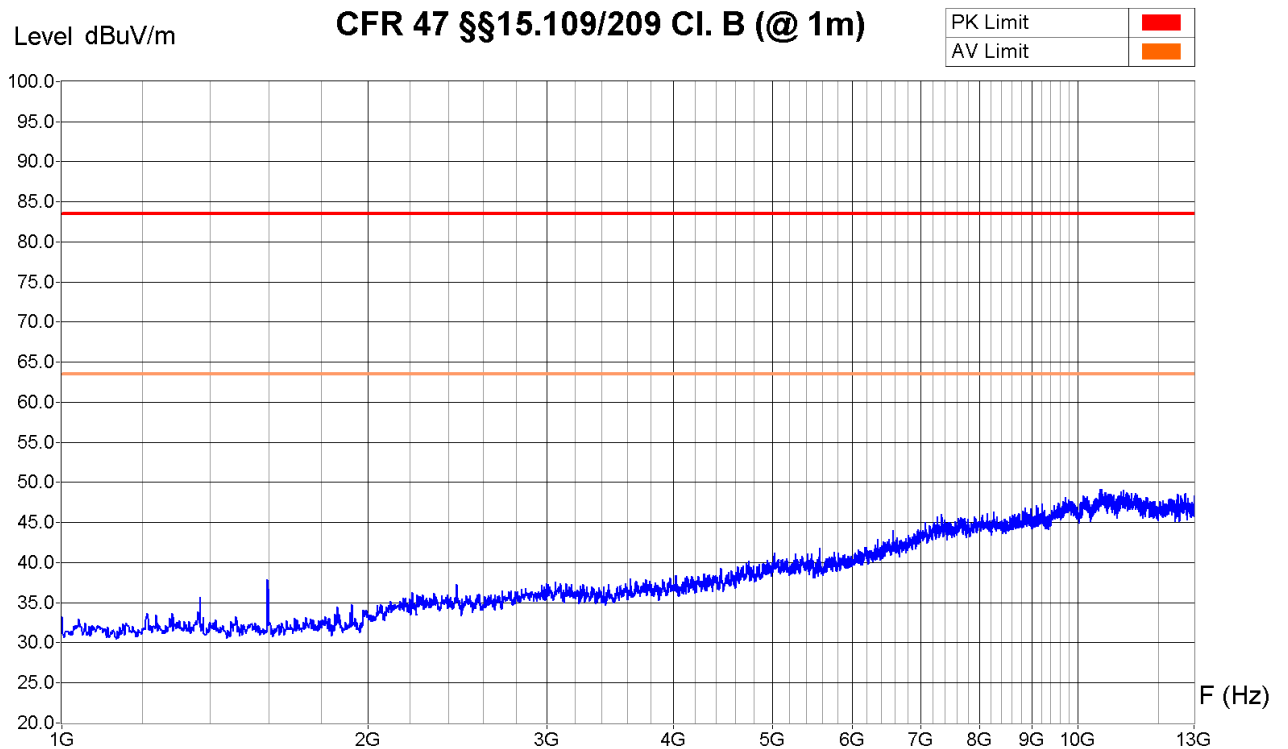
Result: pass fail not applicable not tested

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2440 MHz)
 Remarks :

Peak detector sweep, 3001 Pts/zone. Chamber 06-00



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

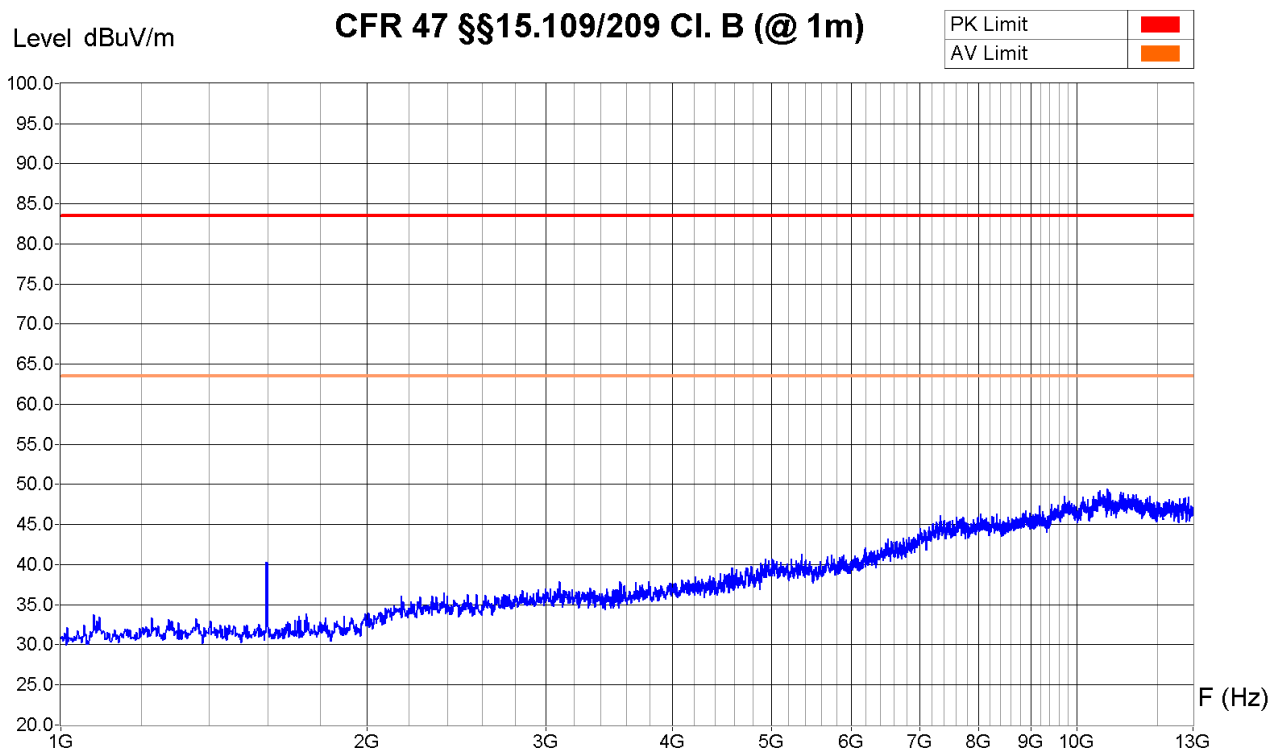
Operator: B. Itzcovich
 Date/Time: 09.07.2018 12:03
 Filename:
 09_RE_1-13G_RX_V_FCC.png/
 .txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : RX (f = 2440 MHz)
 Remarks :

Peak detector sweep, 3001 Pts/zone. Chamber 06-00



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

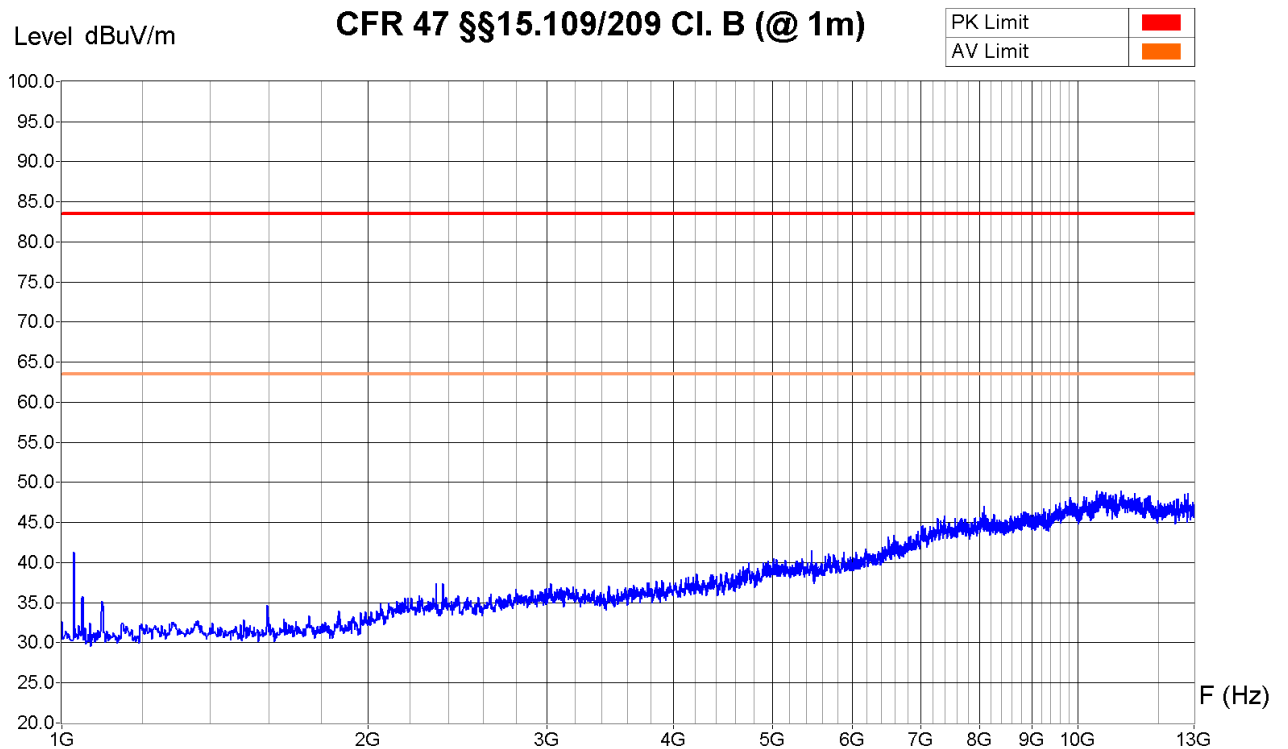
Operator:	B. Itzcovich
Date/Time:	09.07.2018 12:07
Filename:	10_RE_1-13G_RX_H_FCC.png/ .txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Standby
 Remarks :

Peak detector sweep, 3001 Pts/zone. Chamber 06-00



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

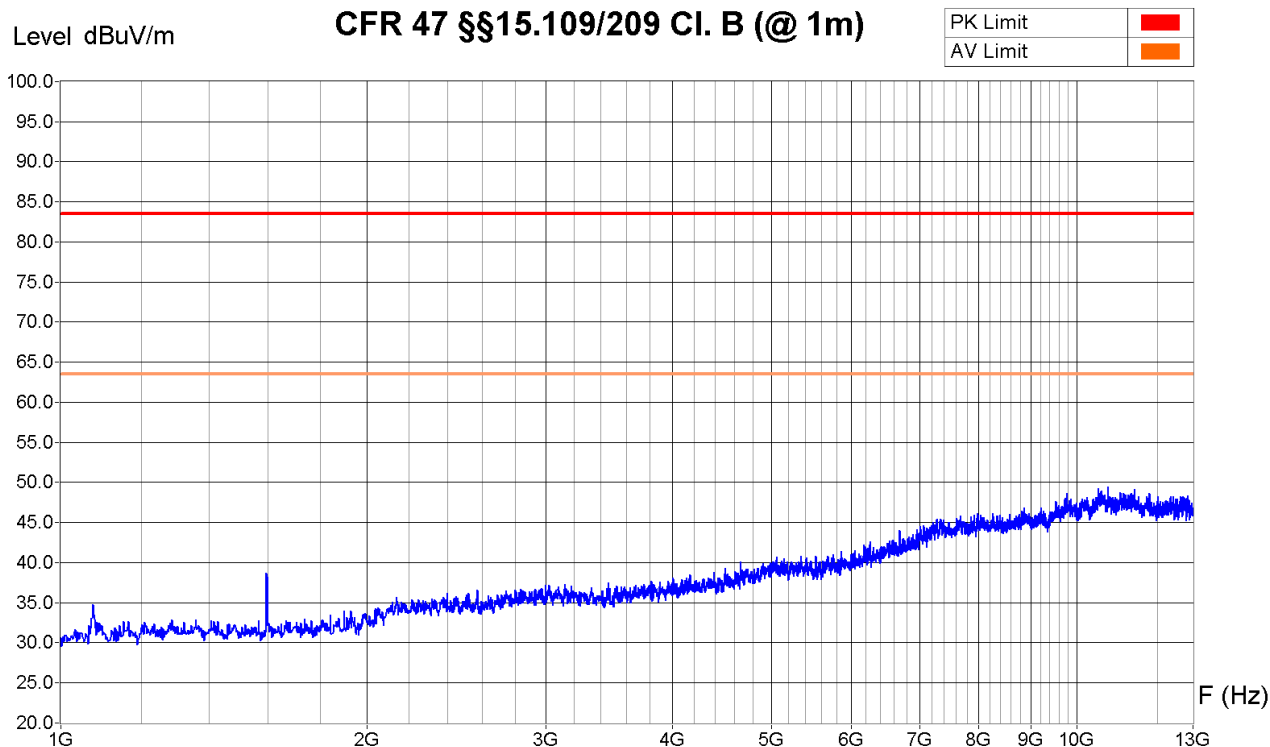
Operator: B. Itzcovich
Date/Time: 09.07.2018 12:20
Filename: 11_RE_1-13G_Stby_V_FCC.png/ .txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Standby
 Remarks :

Peak detector sweep, 3001 Pts/zone. Chamber 06-00



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:	09.07.2018 12:25
Filename:	12_RE_1-13G_Stby_H_FCC.png/ .txt

6.11 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 analyser 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

Test set-up:

Remarks: ---

Test equipment:

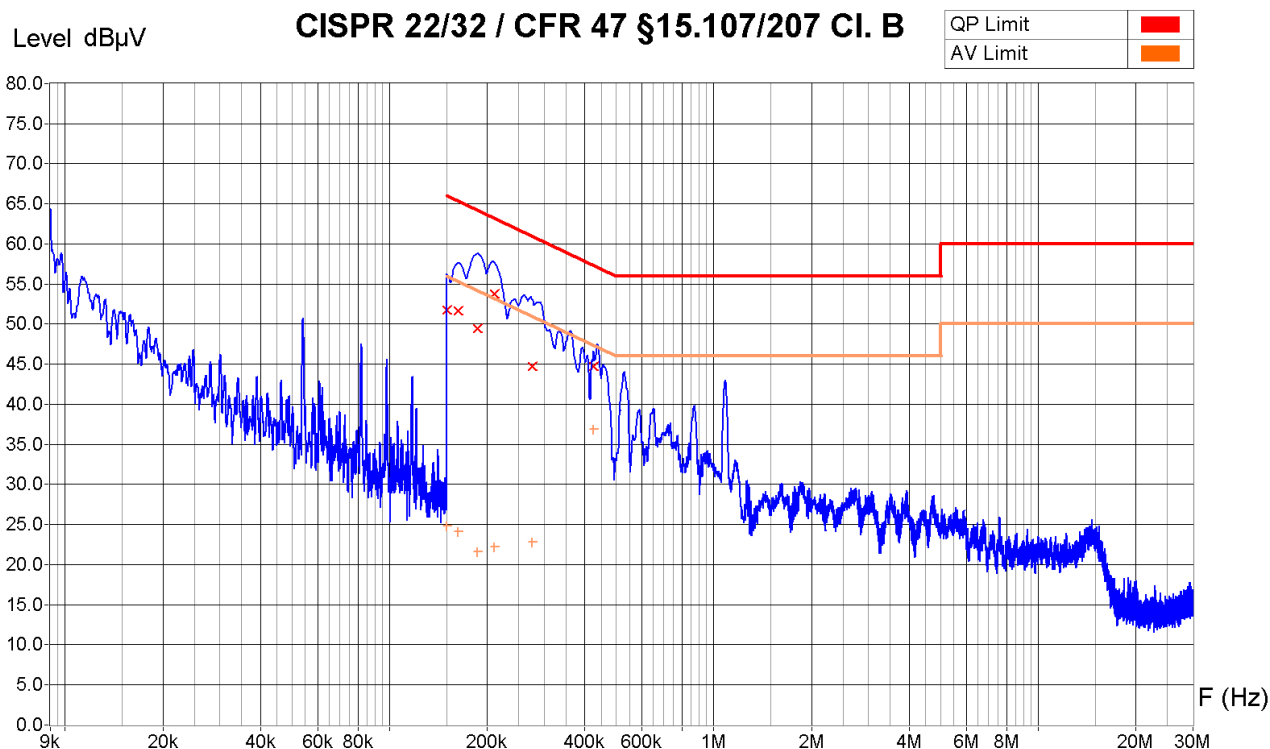
Spectrum analyser	<input type="checkbox"/> 88-14	<input type="checkbox"/> 94-24	<input type="checkbox"/> 18-01	<input type="checkbox"/> 03-45	<input type="checkbox"/> 05-39	<input checked="" type="checkbox"/> 16-03
Receiver	<input type="checkbox"/> 85-12	<input type="checkbox"/> 90-11	<input checked="" type="checkbox"/> 16-03	<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
Attenuator 10 dB	<input checked="" type="checkbox"/> 95-30	<input type="checkbox"/> 95-35	<input type="checkbox"/> 95-36	<input type="checkbox"/> 96-38	<input type="checkbox"/> included in LISN	
Variable transformer	<input checked="" type="checkbox"/> 75-04					
Multimeter	<input checked="" type="checkbox"/> 06-47					
Cables	<input checked="" type="checkbox"/> 06-00	<input type="checkbox"/> 10-41	<input type="checkbox"/> 06-206			

Result: pass fail not applicable not tested

Measurement Type : Voltage Interference
 Supply : Neutral
 Other : 115 V / 50 Hz



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4801 Pts/zone, Chamber 06-00



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

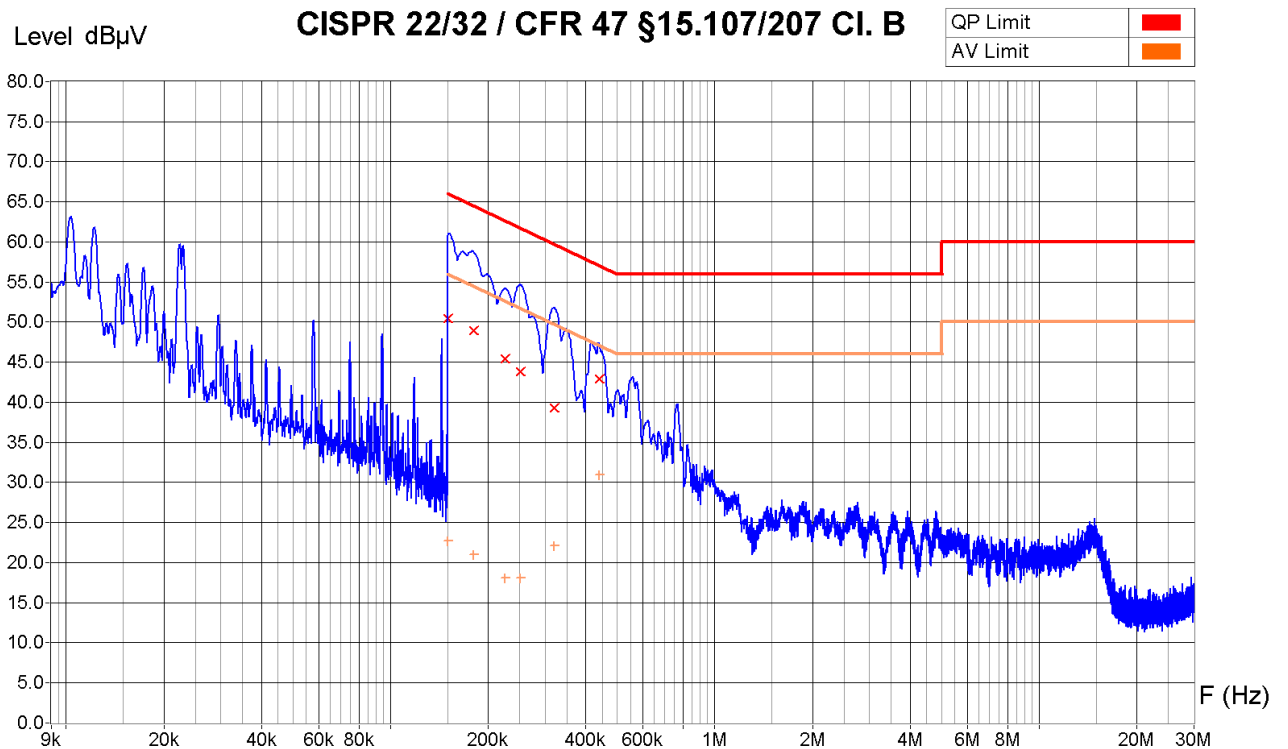
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
150 KHz	63.4 dBµV	51.8 dBµV	24.8 dBµV	14.2 dB
163 KHz	64.0 dBµV	51.6 dBµV	24.2 dBµV	13.7 dB
187 KHz	75.3 dBµV	49.4 dBµV	21.6 dBµV	14.8 dB
210 KHz	74.2 dBµV	53.7 dBµV	22.2 dBµV	9.5 dB
275 KHz	58.9 dBµV	44.8 dBµV	22.9 dBµV	16.2 dB
425 KHz	62.5 dBµV	44.7 dBµV	36.8 dBµV	12.7 dB

Operator: B. Itzcovich
 Date/Time: 10.07.2018 12:08
 Filename:
 21_CV_9k-30M_TX3f_115_N.png/
 .txt

Measurement Type : Voltage Interference
 Supply : Line 1
 Other : 115 V / 50 Hz



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4801 Pts/zone, Chamber 06-00



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

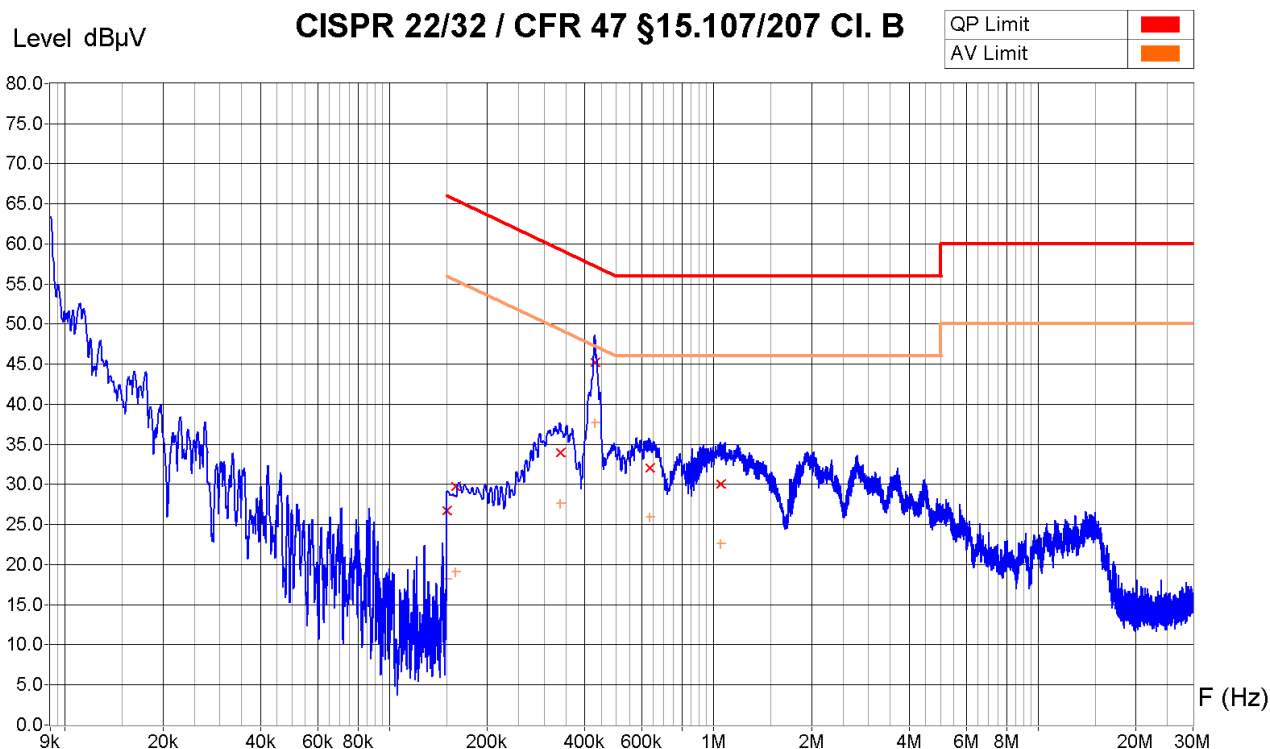
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
150 KHz	61.7 dBµV	50.5 dBµV	22.7 dBµV	15.5 dB
180 KHz	61.2 dBµV	48.9 dBµV	21.0 dBµV	15.5 dB
225 KHz	58.3 dBµV	45.4 dBµV	18.1 dBµV	17.2 dB
252 KHz	57.7 dBµV	43.8 dBµV	18.1 dBµV	17.8 dB
319 KHz	53.3 dBµV	39.3 dBµV	22.1 dBµV	20.5 dB
441 KHz	64.7 dBµV	42.9 dBµV	30.9 dBµV	14.1 dB

Operator: B. Itzcovich
 Date/Time: 10.07.2018 12:56
 Filename:
 22_CV_9k-30M_TX3f_115_L.png/
 .txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4801 Pts/zone, Chamber 06-00



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

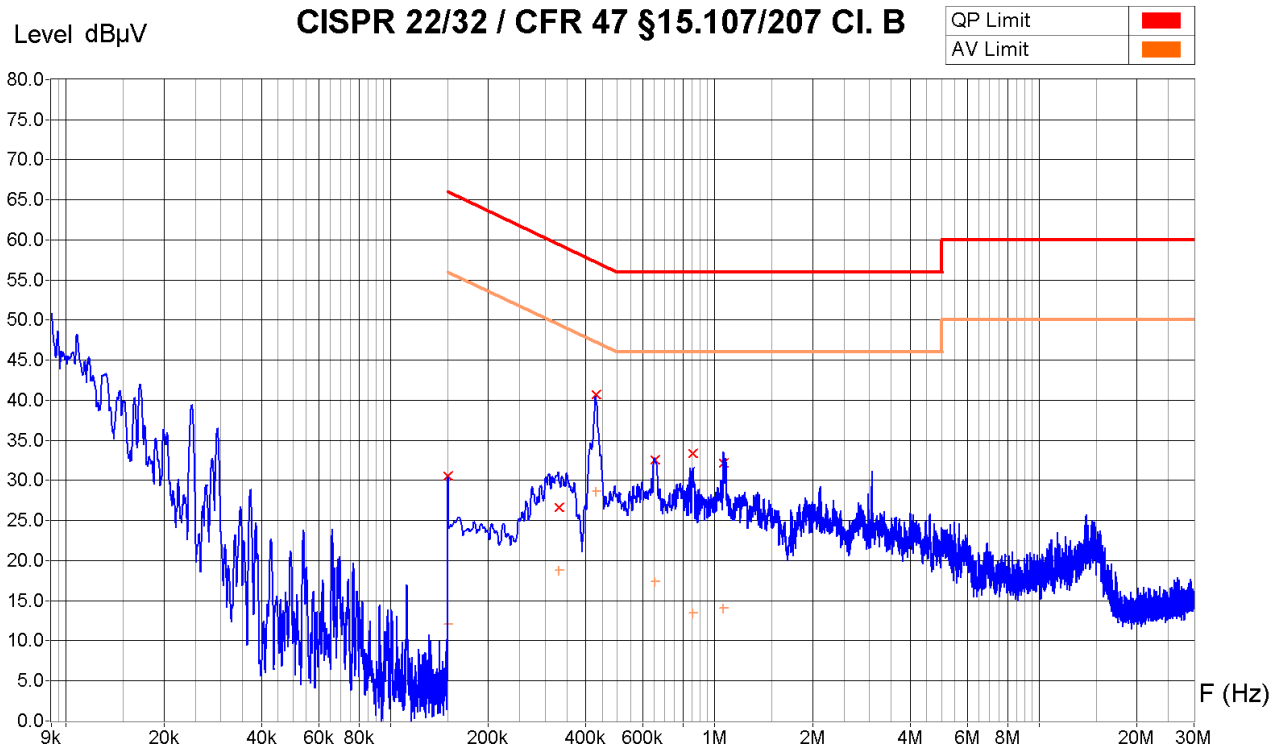
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
150 KHz	47.7 dBµV	26.8 dBµV	18.2 dBµV	39.2 dB
160 KHz	53.5 dBµV	29.7 dBµV	19.1 dBµV	35.7 dB
336 KHz	38.6 dBµV	33.9 dBµV	27.6 dBµV	25.4 dB
431 KHz	48.7 dBµV	45.2 dBµV	37.6 dBµV	12.0 dB
634 KHz	35.8 dBµV	32.0 dBµV	25.9 dBµV	24.0 dB
1.05 MHz	35.9 dBµV	30.1 dBµV	22.6 dBµV	25.9 dB

Operator: B. Itzcovich
 Date/Time: 10.07.2018 13:17
 Filename:
 23_CV_9k-30M_TX3f_230_N.png/
 .txt

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



Equipment Under Test : TV Connector V2 (TX30), proto 92
 Set-Up : With AC adaptor, USB and audio cables connected. See photos
 Operating Conditions : Homming TX (f = 2.402 / 2.440 / 2.480 GHz), modulated, Pmax (00, 02)
 Remarks : Peak detector sweep, 4801 Pts/zone, Chamber 06-00



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 (+)	QP Margin
150 KHz	54.7 dBµV	30.6 dBµV	12.1 dBµV	35.4 dB
330 KHz	39.8 dBµV	26.7 dBµV	18.8 dBµV	32.8 dB
429 KHz	60.5 dBµV	40.7 dBµV	28.6 dBµV	16.6 dB
652 KHz	60.6 dBµV	32.6 dBµV	17.4 dBµV	23.4 dB
857 KHz	52.3 dBµV	33.3 dBµV	13.5 dBµV	22.7 dB
1.06 MHz	51.9 dBµV	32.2 dBµV	14.1 dBµV	23.8 dB

Operator: B. Itzcovich
 Date/Time: 10.07.2018 13:23
 Filename:
 24_CV_9k-30M_TX3f_230_L.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	08 Jun 2018	08 Jun 2021	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	12 Jun 2018	12 Jun 2020	2
95-30	Attenuator	Montena EMC	10 dB	N°1	09 Mar 2017	09 Mar 2019	2
05-59	Preamplifier	Montena EMC	AM-1300	432972	22 Mar 2017	22 Mar 2019	2
14-27	Preamplifier	Montena EMC	AFS42-00101800- 25-S-42	1876512	03 May 2017	03 May 2019	2
13-16	Signal Generator	AnaPico AG	APSIN20G-HC	121-21... 0-0096	10 Jul 2018	10 Jul 2019	2
06-00	Cable	Huber&Suhner	ST18A ST18A SF106PA	6224/18A 8399/18A 463/6PA	02 Jun 2017	02 Jun 2019	2
06-01	Cable	Huber&Suhner	SF106PA SF106PA SF106PA	415/6PA 414/6PA 412/6PA	25 Jan 2018	25 Jan 2020	2
10-75	Cable	Huber&Suhner	ST18A	8385/18A	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
11-61	Cable	Huber&Suhner	SF106PA	413/6PA	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	06 Jun 2018	06 Jun 2020	2
07-53	Spectr. Analyzer	Hewlett Packard	E4407B	SG45101517	15 Nov 2016	15 Nov 2018	2
18-01	Spectr. Analyzer	Keysight	MXA N9020B	MY57120352	11 Mar 2018	11 Mar 2020	2
10-70	Receiver + Spectr. Analyzer	Rohde&Schwarz	ESU8 1302.6005K08	100231	12 Sep 2017	12 Sep 2019	2
16-03	Receiver + Spectr. Analyzer	Rohde&Schwarz	ESR7 1316.3003K07	101497	28 Sep 2016	28 Sep 2018	2
09-04	Power sensor	Agilent	E9304A H19	MY41498789	26 Feb 2018	26 Feb 2020	2
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.