

Test Report

Electromagnetic Compatibility

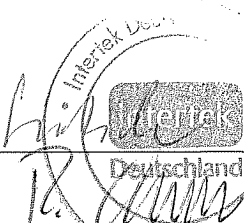
Test Report - Nr.: 07KFE007857-Y-FCC-02

Date: 08-05-29

Type:	JA-80BT
Description:	Bluetooth adapter
Production numbers:	0711431-003 (Sample 1), 0706248-002 (Sample 2), 0706248-003 (Sample 3)

Manufacturer:	Jablotron s.r.o.
Customer:	Jablotron s.r.o.
Address (Customer):	Pod Skalkou 33 CZ 646601 Jablonec nad Nisou Czech Republic

Test Laboratory:	Intertek Deutschland GmbH, Innovapark 20, D- 87600 Kaufbeuren
FCC registration number:	90714
Compiled by:	Marek Svoboda Technical Leader
Approved by:	R. Dressler Project Engineer



This test report consists of 30 pages. All measurement results exclusively refer to the equipment, which was tested.
Reproduction of this report except in its entirety is not permitted without written approval of Intertek Deutschland GmbH.

Table of Contents

1. General description.....	4
1.1. Product description	4
1.2. Related submittal(s) Grants.....	4
1.3. Test Methodology.....	4
1.4. Test Facility	4
1.5. List of exhibits	5
2. Measurements And Test Specifications.....	6
3. Description Of EUT	7
3.1. Configuration / Operating Conditions	7
3.2. Major Subassemblies Or Internal Peripherals.....	8
3.3. Peripheral Devices Used For Testing.....	8
3.4. Supply- And Interconnecting Cables	8
4. Test Results - Overview	9
5. Measurement results detailed	10
5.1. Radiated Emission 30 MHz – 25 GHz.....	10
5.1.1 <i>Field strength calculation</i>	10
5.1.2 <i>Normative references</i>	12
5.1.3 <i>Emission Test results : Transmitter</i>	13
5.1.4 <i>Emission Test results : digital parts and receiver</i>	24
5.2. Conducted emissions JA-80BT attached to control panel JA-82K	26
5.2.1 <i>Normative references</i>	26
5.2.2 <i>Conducted Emission TX + RX on: graphics</i>	27
6. Test setup Photo documentation.....	28
7. EUT Photo documentation	30
8. Technical specification	30

8.1. Block Diagram Of The EUT	30
8.2. Circuit Diagram Of The Layout.....	30
8.3. Instruction manual.....	30
8.4. Product Labelling	30

1. General description

1.1. Product description

The JA-80BT Bluetooth adapter (interface) allows establishing a wireless connection between control units of the JA-8x series or the JA-6x series and PCs equipped with Bluetooth connectivity.

The adapter is connected to the control panel's digital bus connector via an RJ cable supplied with the package. The control unit is assumed to have all the hardware/software part necessary for Bluetooth installed.

The device has no internal power source and is powered from the control unit.

Antenna type : monopole type , Internal, Integral on PCB.

1.2. Related submittal(s) Grants

This is application for certification of the transmitter.

No related devices are present.

1.3. Test Methodology

☒ The test setup and test was done according to: **ANSI C63.4: 2003**
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

☐ The test setup and test was done according to: **CISPR 22: 1998 + Corrigendum: 2003 + A1: 2000 + A2: 2003 and ANSI C63.4: 2003**
Compliance with CISPR 22 is being used to demonstrate conformity with FCC DoC requirements. This conforms with FCC Part 15.109(g).

The test results detailed in this report apply only to the JA-80BT with the test setup described. Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.

The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

1.4. Test Facility

The test site was semi-anechoic chamber Intertek Germany (PM KF 1150).
Measurement distance EUT – Antenna was $d = 3$ m.

1.5. List of exhibits

Following exhibits are delivered as separate pdf files. The name of file corresponds with description of exhibit with extension **.pdf**

EXHIBIT 1	Test setup photo documentation
EXHIBIT 2	External Photos
EXHIBIT 3	Internal Photos
EXHIBIT 4	Operational description
EXHIBIT 5	Block diagram
EXHIBIT 6	Circuit diagram
EXHIBIT 7	Instruction manual
EXHIBIT 8	Product label
EXHIBIT 9	Confidentiality request

2. **Measurements And Test Specifications**

Emission - Requirements according to

- ☐ FCC, Part 15, Class A, verification
- ☐ FCC, Part 15, Class B, DoC
- ☒ FCC, Part 15, Class B, verification
- ☒ FCC, Part 15, intentional radiator, certification

2.1. **Modifications to Test Report 07KFE007857-Y-FCC-01**

Added measurements for low and high channel of the band (Ch. 5) both in graphical form tables.

3. Description Of EUT

3.1. Configuration / Operating Conditions

☒ table-top EUT

☐ floor-standing EUT

The device is powered from the control unit of alarm system (JA-80K or JA-82K). The connection between the control unit and the device is made by producer delivered cable.

The manufacturer delivered 3 samples:

Sample 1: operates on 2.402 GHz

Sample 2 : operates on 2.44 GHz

Sample 3 : operates on 2.48 GHz

All samples were modified by manufacturer to transmit continuously .

The equipment under test (EUT) is placed on wooden table 0,8 m above ground plane.

At all interference frequencies the height of the antenna is scanned in the range 1 m to 4 m with horizontal and vertical polarization and the turntable is rotated in the range 0° to 360° to obtain the highest field strength.

Measurements in frequency range 30 MHz – 3 GHz were performed with bilog antenna HL 562.

Measurements in frequency range 3 GHz – 18 GHz were performed with horn antenna HF 906 with preamplifier.

Measurements in frequency range 18 GHz – 25 GHz were performed with horn antenna BBHA 9170. Since no emissions were found with measuring distance $d = 3$ m, the measurements in this frequency band were repeated with $d = 0,3$ m and accordingly modified limits.

3.2. Major Subassemblies Or Internal Peripherals

Device	Manufacturer	Type	SN	FCC ID
none				

3.3. Peripheral Devices Used For Testing

Device	Manufacturer	Type	SN	FCC ID
Control panel	Jablotron s.r.o.	JA-82K US	0709016-002	---

3.4. Supply- And Interconnecting Cables

Line	Length	shielded	non shielded	Shield on GND / PE
JA-80BT – control unit cable	1,0 m	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
Mains cable AC (JA-82K US)	1,50 m	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-

4. Test Results - Overview

	required	passed	passed with modification	not passed
Emission radiated transmitter				
30 MHz - 3000 MHz	FCC 15.249	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 GHz – 25 GHz	FCC 15.249	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emission radiated digital parts and receiver				
30 MHz - 3000 MHz	FCC 15.109	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 GHz – 25 GHz	FCC 15.109	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emission conducted transmitter and receiver both in operation:				
150 kHz – 30 MHz : control panel JA-82K with attached JA-80BT	FCC 15.107	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Measurement results detailed

5.1. Radiated Emission 30 MHz – 25 GHz

Data was measured for worst case configuration which resulted in highest emission levels. A sample calculation, configuration photographs and data tables of emissions are included.

Measurements based on a measurement time of 1 s (QP detector) and 100 ms (AV and PK detector).

Measurement bandwidth is 120 kHz below 1 MHz, and 1 MHz above 1000 MHz.

Measuring distance $d = 3$ m unless otherwise noted.

5.1.1 Field strength calculation

The field strength is calculated by adding the reading on the measuring receiver to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when the specified limit is related to average detector and measurements are made with peak detector).

A sample of calculation is included below :

$$E = RR + AF + CF - AG + PD + AV$$

Where

E	field strength in dB μ V/m
RR	receiver reading including preamplifier in dB μ V
CF	cable attenuation factor in dB
AF	antenna factor in dB/m
AG	amplifier gain in dB
PD	pulse desensitization in dB
AV	average factor in dB

Example :

Assume that measured values and factors are as follows :

RR	= 60 dB μ V
CF	= 1.2 dB
AF	= 12.6 dB/m
AG	= 20 dB
PD	= 0 dB
AV	= -10 dB

Then

$$E = 60 + 1.2 + 12.6 - 20 + 0 - 10 = 43.8 \text{ dB}\mu\text{V/m}$$

The radiated emission tables which follow the graphical presentation of results were created by the EMC 32 software by Rohde-Schwarz. The data of field strength (peak detector) include the components given above with the exception of PD and AV.

5.1.2 Normative references

Limits equivalent:	FCC, Part 15.249, Part 15.209 where appropriate
Methods of Measurement equivalent:	ANSI C63.4, CISPR 22

Test requirement

Distance Antenna – EUT	3 m at $f < 18$ GHz , 0.3 m at $f > 18$ GHz
Frequency range	30 MHz – 25 000 MHz

Place of measurement

- ☒ Semi anechoic chamber Intertek Germany PM KF 1150.
☐ Open Area Test Site

Measurement devices

Measurement device	Manufacturer	Type	SN	Asset No.	Last Calibr. at ion	Interval
<input checked="" type="checkbox"/> Test receiver, 20Hz-26GHz	ESIB26	Rohde & Schwarz	100150	PM KF 0948	07-03	2
<input checked="" type="checkbox"/> Antenna, 30-3000 MHz	HL562	Rohde & Schwarz	100354	PM KF 1123	07-03	2
<input checked="" type="checkbox"/> Horn antenna, 1-18 GHz	Rohde & Schwarz	HF906	100188	PM KF 0947	07-05	2
<input checked="" type="checkbox"/> Horn antenna preamp.	Bonn	BLMA0118-4A	35352	PM KF 0946	07-05	2
<input checked="" type="checkbox"/> Horn antenna, 18-40 GHz	Schwarzbeck	BBHA 9170	BBHA91703 61	PM KF 1204	08-01	2

5.1.3 Emission Test results : Transmitter

Test requirements

☒ passed

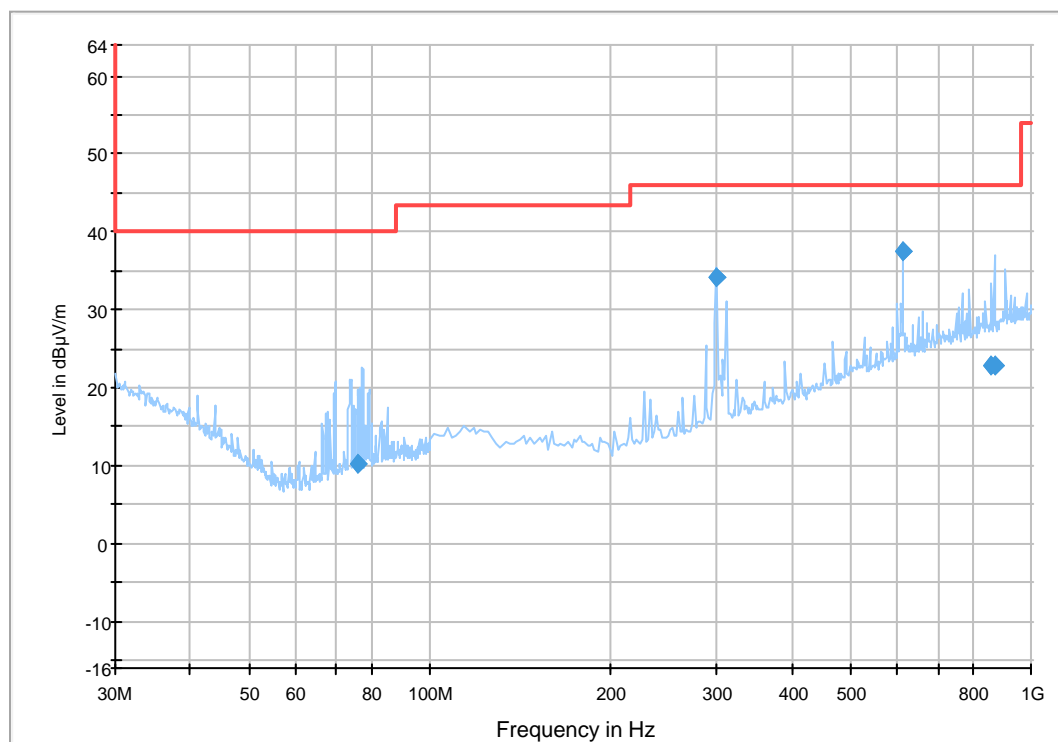
☐ passed with
modification

☐ not passed

Comment:

The radiated emissions between 30 MHz and 25 000 MHz are under limits
specified in FCC 15.249

5.1.3.1 Radiated Emission 30 MHz – 1 GHz Transmitter 2.4 GHz on : graphics



Graphical representation of results for samples 1 – 3 is similar with little visible deviations. Results are presented in tables only (ch. 5.1.3.2)

5.1.3.2 Radiated Emission 30 MHz – 1 GHz Transmitter 2.4 GHz on : table

Sample 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
75.810000	10.3	1000.00	120.000	157.0	V	108.0	8.5	-29.7	40.0
300.140000	34.2	1000.00	120.000	118.0	H	0.0	13.3	-11.8	46.0
611.984449	37.5	1000.00	120.000	120.0	H	157.0	20.5	-8.5	46.0
859.318637	22.7	1000.00	120.000	400.0	V	60.0	23.7	-23.3	46.0
869.040000	22.8	1000.00	120.000	300.0	V	60.0	23.8	-23.2	46.0

Sample 2

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
75.810000	10.3	1000.00	120.000	157.0	V	108.0	8.5	-29.7	40.0
300.140000	32.2	1000.00	120.000	118.0	H	0.0	13.3	-13.8	46.0
612.169371	25.9	1000.00	120.000	123.0	H	119.0	20.5	-20.1	46.0
857.992365	23.6	1000.00	120.000	345.0	V	60.0	23.7	-22.4	46.0

Sample 3

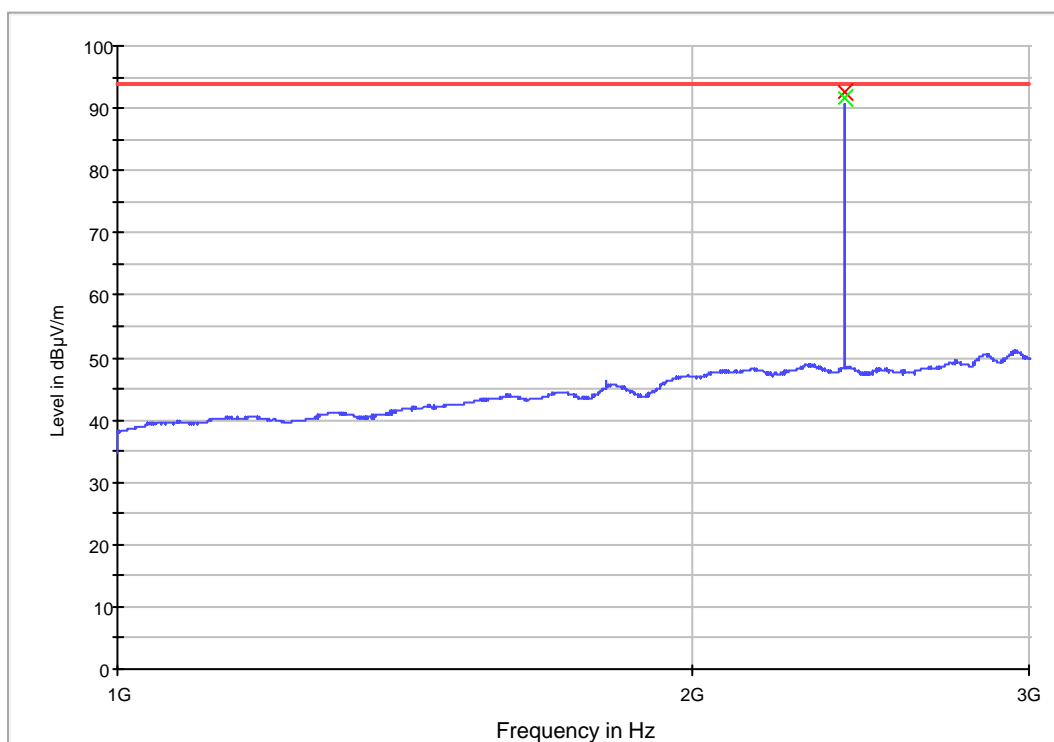
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
70.541082	7.0	1000.00	120.000	195.0	V	108.0	7.5	-33.0	40.0
300.140000	18.9	1000.00	120.000	118.0	H	0.0	13.3	-27.1	46.0
612.160000	19.0	1000.00	120.000	118.0	H	119.0	20.5	-27.0	46.0
858.000000	29.8	1000.00	120.000	345.0	V	57.0	23.7	-16.2	46.0

5.1.3.3 Radiated Emission 1 GHz – 3 GHz Bluetooth Transmitters: graphics

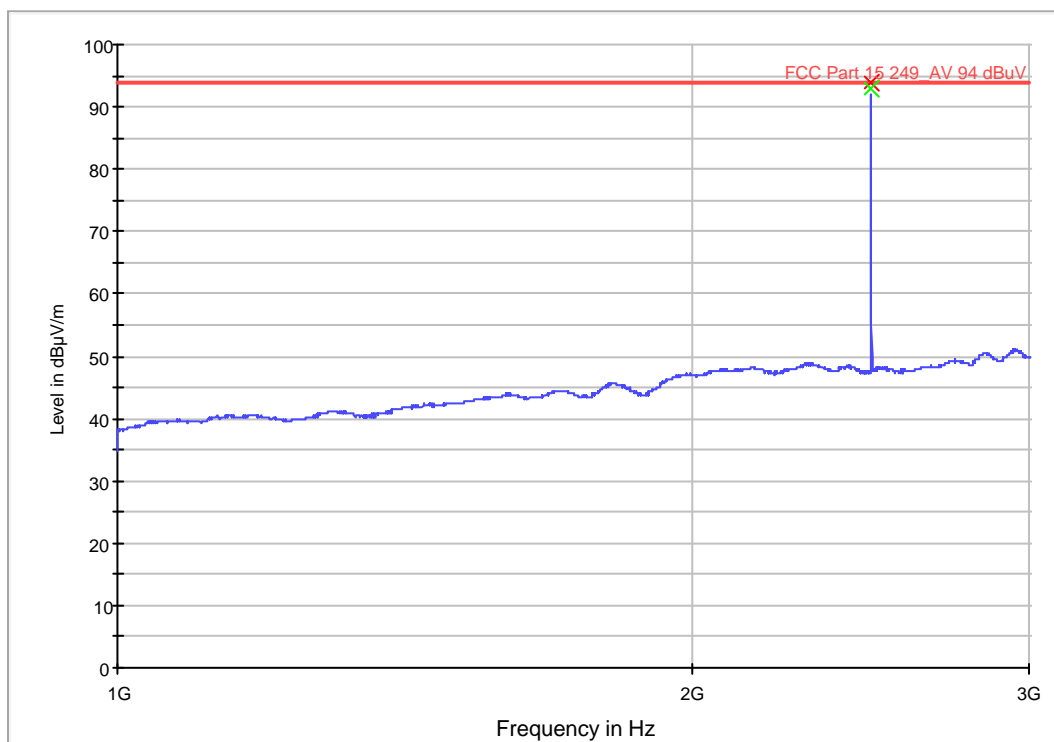
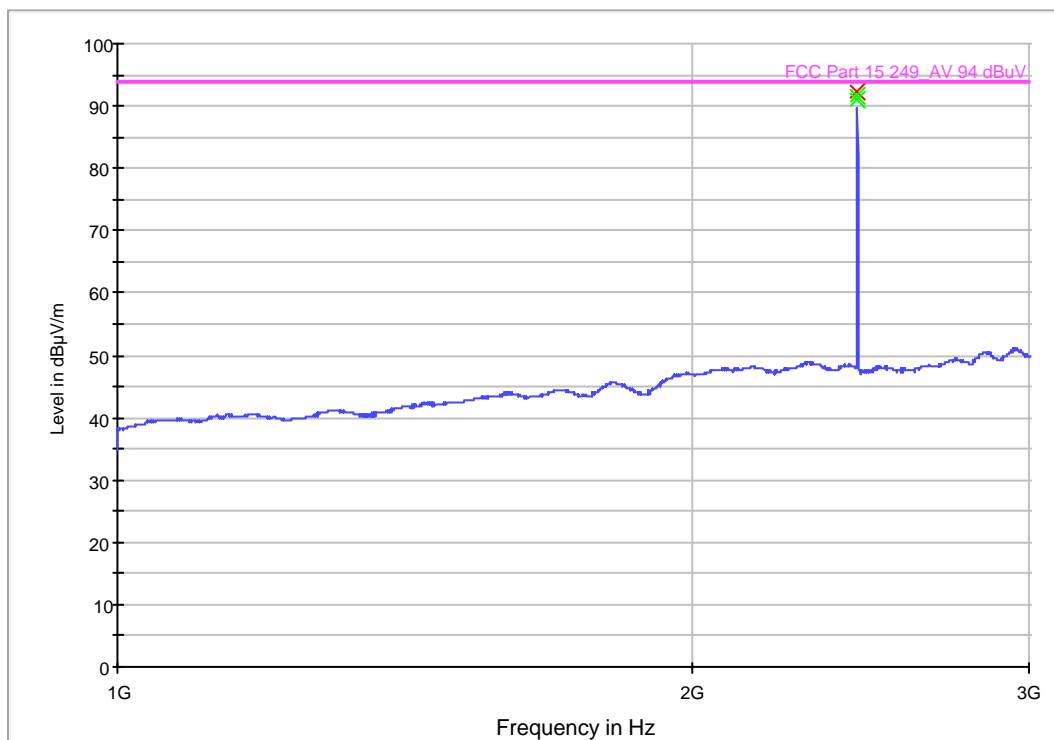
Legend to all Figures :

Blue line , green cross : Average detector

Red cross : peak detector



Sample 1



5.1.3.4 Radiated Emission 1 GHz – 3 GHz Bluetooth Transmitters: tables

Sample 1

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Margin PK (dB)	Margin AV (dB)	Limit PK (dBμV/m)	Limit AV (dBμV/m)
2402.00000	92.8	91.7	1000.000	-21,2	-2.3	114	94.0

Sample 2

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Margin PK (dB)	Margin AV (dB)	Limit PK (dBμV/m)	Limit AV (dBμV/m)
2440.40000	92.4	91.1	1000.000	-21,6	-2.9	114	94.0

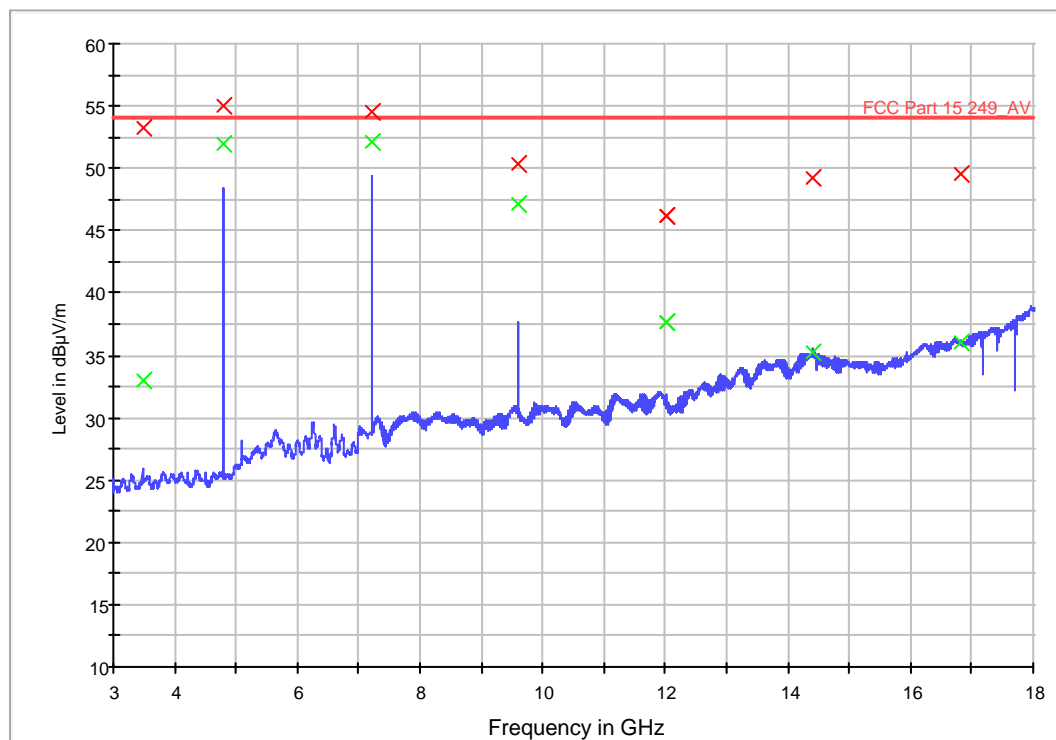
Sample 3

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Margin PK (dB)	Margin AV (dB)	Limit PK (dBμV/m)	Limit AV (dBμV/m)
2480.40000	93,8	92.8	1000.000	-20.2	-1.2	114	94.0

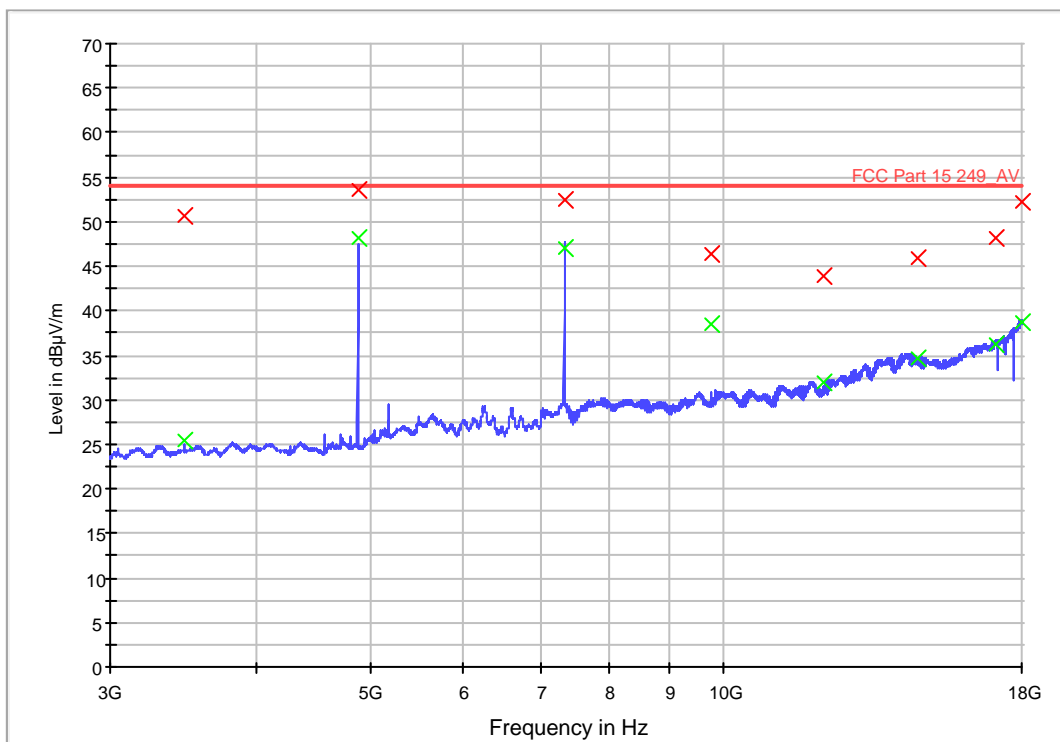
5.1.3.5 Radiated Emission 3 GHz – 18 GHz Transmitter 2.4 GHz: graphics

Legend to all Figures :

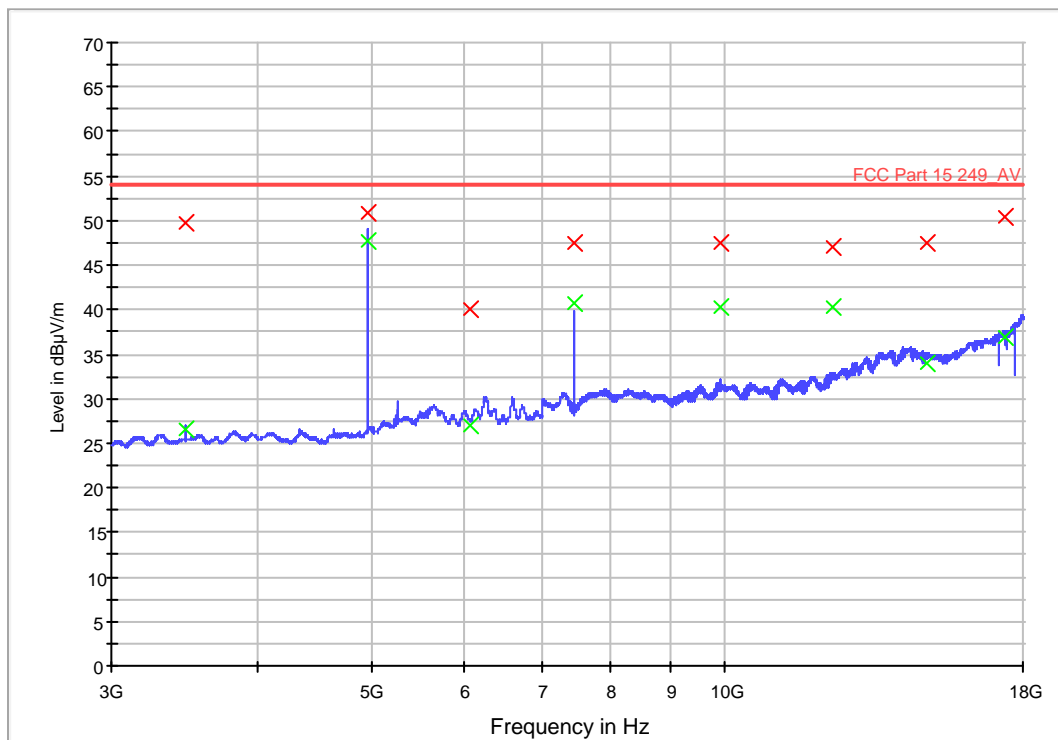
Green cross : Average detector values
Red cross : Peak detector values



Sample 1



Sample 2



Sample 3

5.1.3.6 Radiated Emission 3 GHz – 18 GHz Transmitter 2.4 GHz: tables

Sample 1

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Margin PK (dB)	Margin AV (dB)	Limit PK (dBμV/m)	Limit AV (dBμV/m)
3474	53,2	33	1000	-20,8	-21	74	54
4804	55,1	52	1000	-18,9	-2	74	54
7206,5	54,5	52,1	1000	-19,5	-1,9	74	54
9608	50,3	47,1	1000	-23,7	-6,9	74	54
12010,5	46,1	37,7	1000	-27,9	-16,3	74	54
12010,5	46,1	37,7	1000	-27,9	-16,3	74	54
14412	49,3	35,2	1000	-24,7	-18,8	74	54
16814,5	49,5	36	1000	-24,5	-18	74	54

Sample 2

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Margin PK (dB)	Margin AV (dB)	Limit PK (dBμV/m)	Limit AV (dBμV/m)
3474,5	50,7	25,5	1000	-23,3	-28,5	74	54
4880,5	53,5	48,2	1000	-20,5	-5,8	74	54
7320,5	52,3	47,1	1000	-21,7	-6,9	74	54
9760	46,4	38,5	1000	-27,6	-15,5	74	54
12200	43,8	32	1000	-30,2	-22	74	54
14640	45,9	34,6	1000	-28,1	-19,4	74	54
17080	48,3	36,3	1000	-25,7	-17,7	74	54
18000	52,2	38,8	1000	-21,8	-15,2	74	54

Sample 3

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Margin PK (dB)	Margin AV (dB)	Limit PK (dBμV/m)	Limit AV (dBμV/m)
3473,5	49,7	26,6	1000	-24,3	-27,4	74	54
4960	50,8	47,8	1000	-23,2	-6,2	74	54
6080	40,2	27	1000	-33,8	-27	74	54
7440	47,5	40,8	1000	-26,5	-13,2	74	54
9920	47,6	40,4	1000	-26,4	-13,6	74	54
12400	47	40,4	1000	-27	-13,6	74	54
14879	47,4	34,1	1000	-26,6	-19,9	74	54
17360	50,4	37	1000	-23,6	-17	74	54

5.1.3.7 Radiated Emission 18 GHz – 25 GHz Transmitters 2.4 GHz : graphics

Radiated measurements were measured at distance EUT- antenna $d = 3$ m. Since no emissions were found the measurement was repeated at $d = 0,3$ m.

Limit line (average detector) $54 \text{ dB}\mu\text{V/m}$ @ 3 m was accordingly increased by 20 dB to $74 \text{ dB}\mu\text{V/m}$ @ 0.3 m .

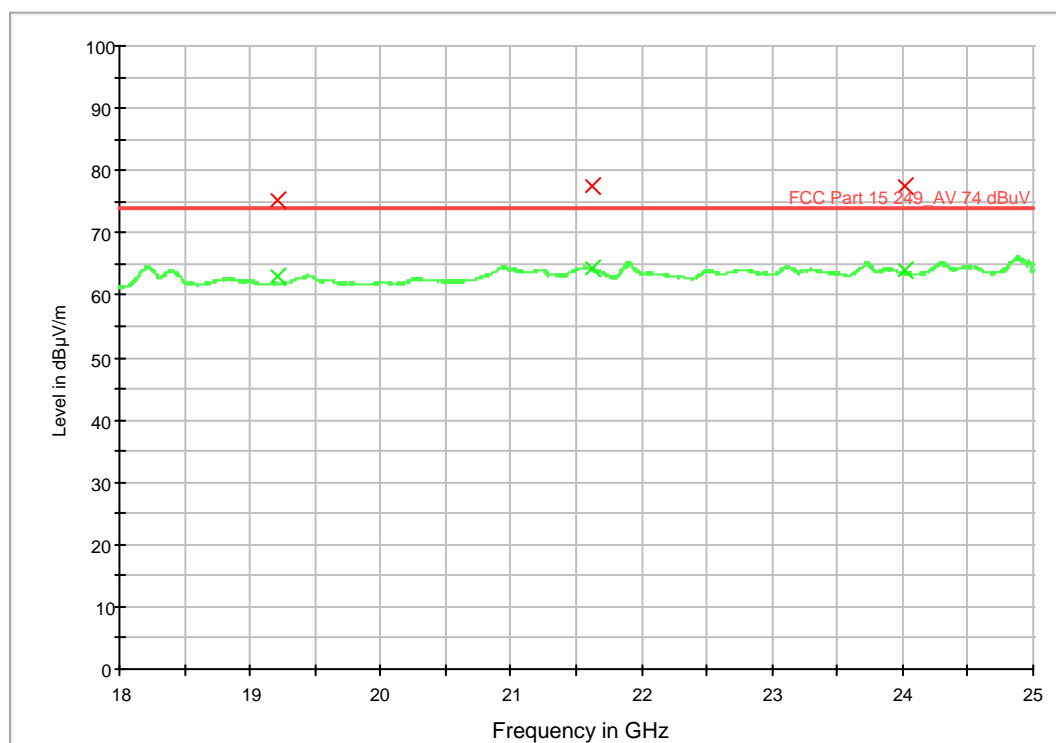
Green line, green crosses: measurements with average detector
Red crosses: measurement with peak detector.

Graphics below concerns measurement at $d = 0,3 \text{ m}$ with AV limits calculated to measuring distance $d = 0,3 \text{ m}$.

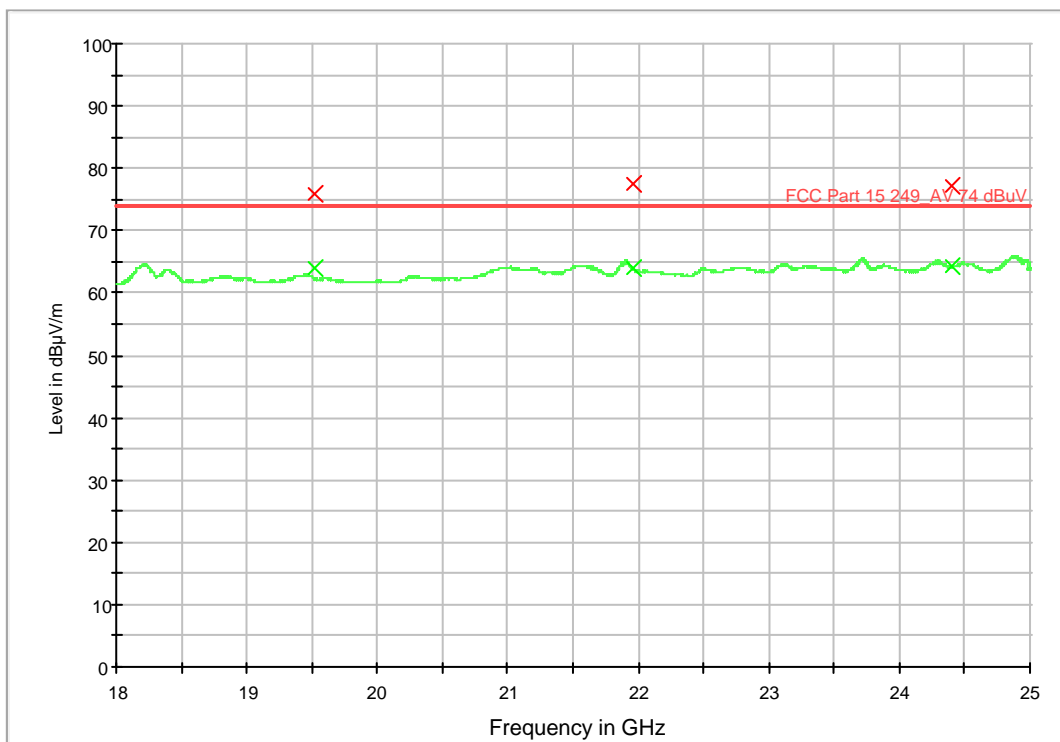
Detailed measurement results performed on harmonic frequencies are given in the table below. Values in the table were recalculated to nominal distance $d = 3 \text{ m}$ by means of 20 dB/decade formula.

Legend to all Figures :

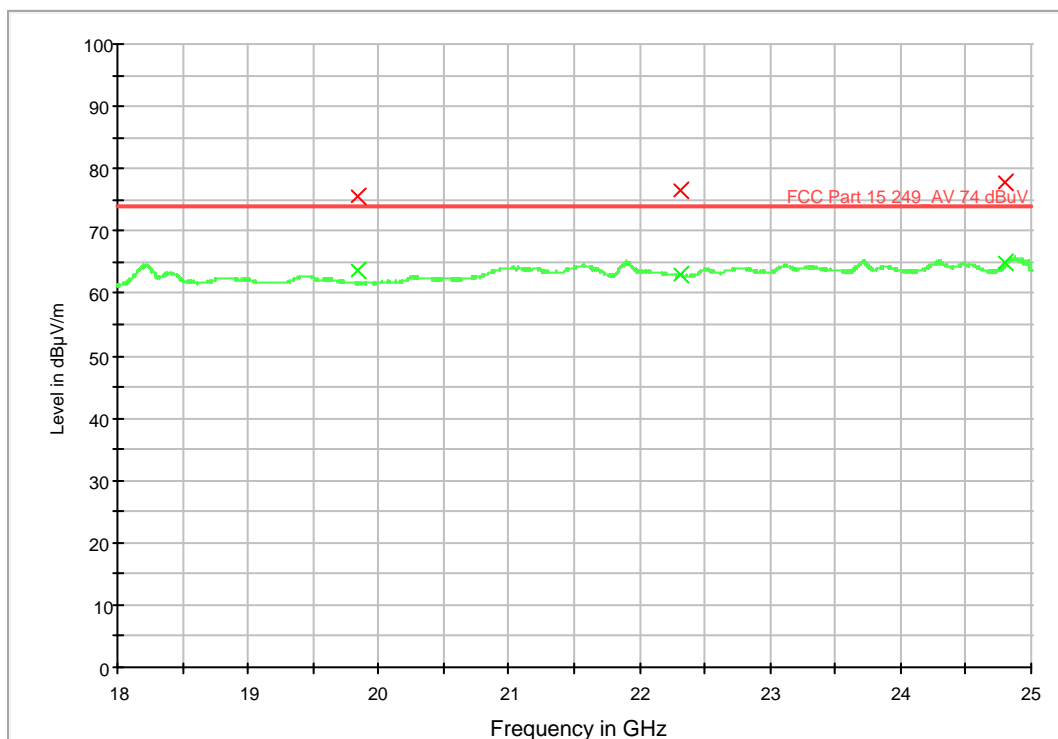
Green line, green cross : Average detector
Red cross : Peak detector



Low channel – sample 1



Center channel – sample 2



High channel – sample 3

5.1.3.8 Radiated Emission 18 GHz – 25 GHz Transmitters 2.4 GHz : tables

Sample 1

Frequency	MaxPeak	Average	Bandwidth	Margin PK	Margin AV	Limit PK@0.3 m	Limit AV@0.3m
(MHz)	(dBμV/m)	(dBμV/m)	(kHz)	(dB)	(dB)	(dBμV/m)	(dBμV/m)
19216	75,2	63,2	1000	-18,8	-10,8	94	74
21618	77,6	64,4	1000	-16,4	-9,6	94	74
24020	77,4	64,1	1000	-16,6	-9,9	94	74

Sample 2

Frequency	MaxPeak	Average	Bandwidth	Margin PK	Margin AV	Limit PK@0.3 m	Limit AV@0.3m
(MHz)	(dBμV/m)	(dBμV/m)	(kHz)	(dB)	(dB)	(dBμV/m)	(dBμV/m)
19520	75,8	64,1	1000	-18,2	-9,9	94	74
21960	77,5	64,1	1000	-16,5	-9,9	94	74
24400	77,2	64,2	1000	-16,8	-9,8	94	74

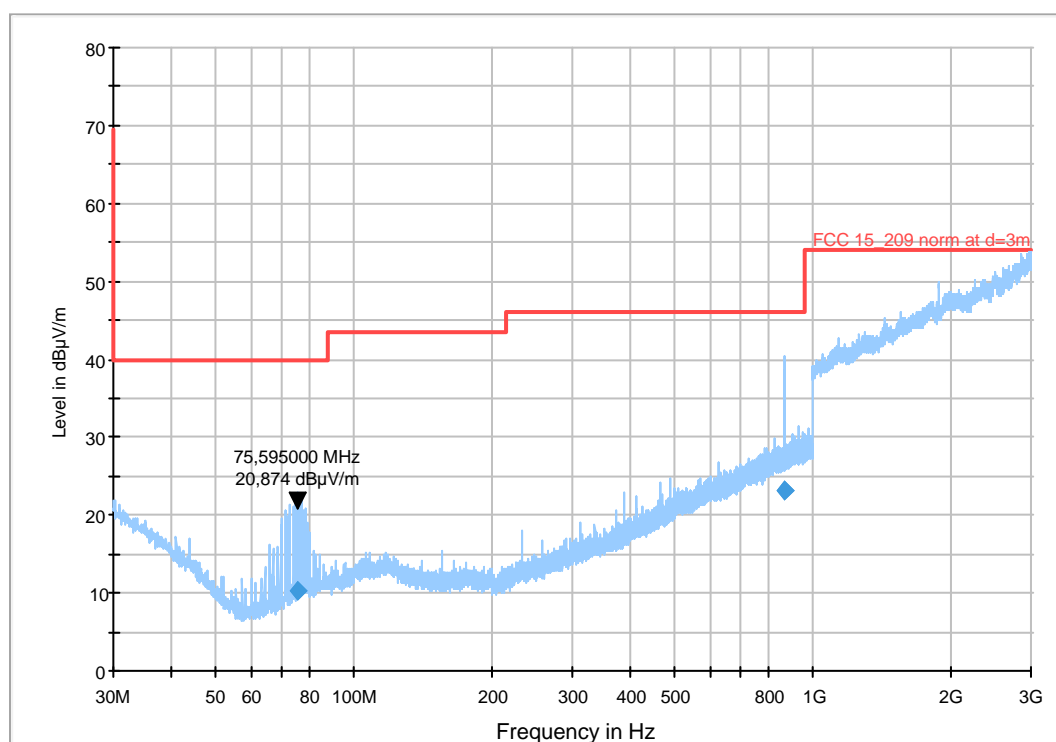
Sample 3

Frequency	MaxPeak	Average	Bandwidth	Margin PK	Margin AV	Limit PK@0.3 m	Limit AV@0.3m
(MHz)	(dBμV/m)	(dBμV/m)	(kHz)	(dB)	(dB)	(dBμV/m)	(dBμV/m)
19840	75,4	63,6	1000	-18,6	-10,4	94	74
22320	76,5	63,1	1000	-17,5	-10,9	94	74
24800	77,7	65	1000	-16,3	-9	94	74

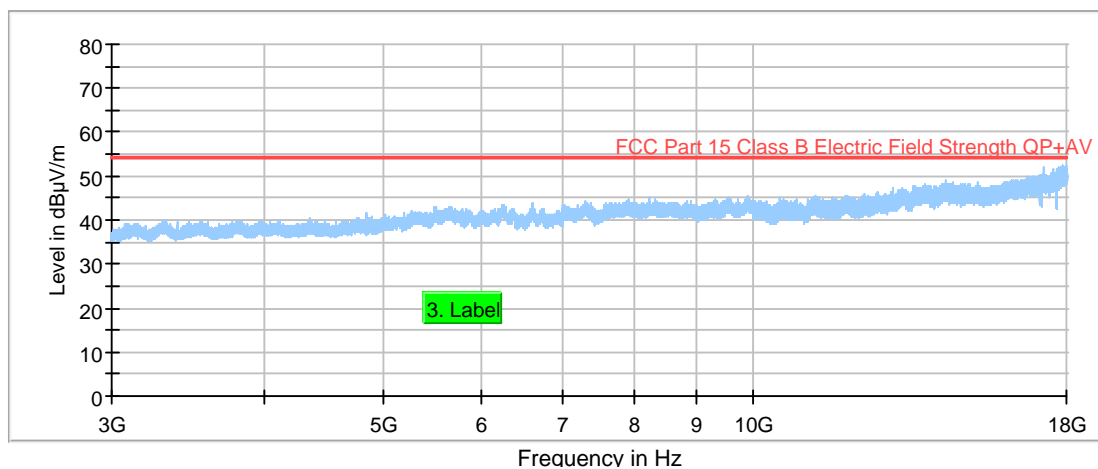
5.1.4 Emission Test results : digital parts and receiver

Receiver radiated emission data were recorded during standby function of transmitter.

5.1.4.1 Radiated Emission 30 MHz – 3 GHz: graphics



5.1.4.2 Radiated Emission 3 GHz - 18 GHz : graphics



5.1.4.3 Radiated Emission 30 MHz –18 GHz digital parts and receiver : table

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
75.300000	10.3	1000.00	120.000	168.0	H	49.0	8.4	-29.7	40.0
868.895000	23.1	1000.00	120.000	200.0	H	90.0	23.8	-22.9	46.0

5.2. Conducted emissions JA-80BT attached to control panel JA-82K

5.2.1 Normative references

Limits equivalent:	FCC, Part 15.107
Methods of Measurement equivalent:	ANSI C63.4, CISPR 22

Test requirement

Class	B
Frequency range	150 kHz – 30 MHz

Place of measurement

- ☒ Shielded chamber Intertek
☐ Open Area Test Site

Measurement devices

Measurement device	Manufacturer	Type	SN	Asset No.	Last Calibr. at ion	Inter- val
<input checked="" type="checkbox"/> Test receiver, 9 kHz - 30 MHz	ESHS 10	Rohde & Schwarz	837356/012	PM KF 0134	08-02	1
<input checked="" type="checkbox"/> V-Artificial mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	838576/016	PM KF 0141	07-03	2

The conducted emissions were measured in configuration transmitter continuously transmitting, receiver on, entire control panel in function (including receiver).

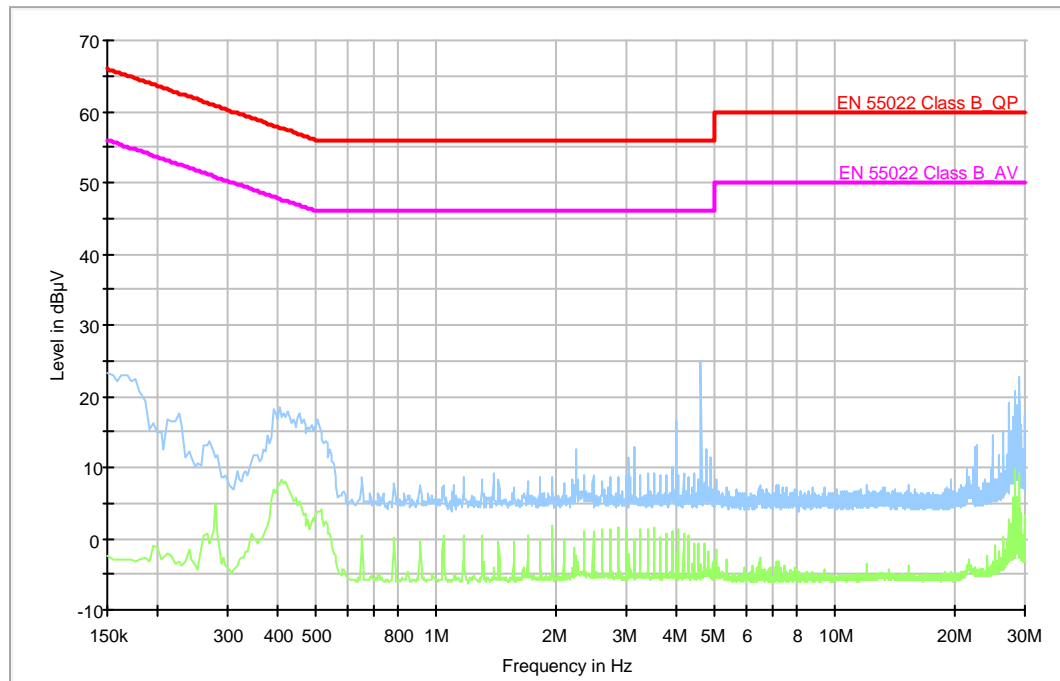
Displayed curves are merged results (worst cases) of L (phase) and N (neutral) measurements.

Blue trace is prescan – peak detector, green trace is prescan – average detector.

The EMC 32 software performs final measurements only at frequencies where prescan values exceed or are close to limits (PK value vs. QP limit, AV value vs. AV limit).

In this case no final measurements were performed.

5.2.2 Conducted Emission TX + RX on: graphics



6. Test setup Photo documentation

EXHIBIT 1



Fig. 1 Front view



Fig. 2 Rear view



Fig. 3 Conducted emissions setup

7. EUT Photo documentation

External Photos : EXHIBIT 2

Internal Photos : EXHIBIT 3

8. Technical specification

Operational description : EXHIBIT 4

8.1. Block Diagram Of The EUT

EXHIBIT 5

8.2. Circuit Diagram Of The Layout

EXHIBIT 6

8.3. Instruction manual

EXHIBIT 7

8.4. Product Labelling

EXHIBIT 8