

EMC TEST REPORT

No. 1413872STO-001, Ed. 2

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment : Combination Microwave oven
Tested type / model : BM450710
Additional type / model* : BM451710
Manufacturer : Panasonic Manufacturing UK Ltd
Tested by request of : Panasonic Manufacturing UK Ltd

*See opinions and interpretations clause 2.3


SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to the following standards.


ICES-001 Issue 4: (2006)
FCC Part 18: (2013)

Date of issue: April 16, 2015

Tested by:


Samuel Lundgren

Compiled by:


Andreas Isaksson

Approved by:


Hans Köhlén

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Intertek Semko AB

Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden

Telephone +46 8 750 00 00, Fax +46 8 750 60 30

www.intertek.se

Registered in Sweden: No: SE556024059901, Registered office: As address

Revision History

Edition	Date	Description
1	2015-04-02	First release
2	2015-04-16	Addition of Test equipment list

CONTENTS

	Page
1. Client information.....	4
2. Equipment under test (EUT).....	4
2.1 Identification of the EUT.....	4
2.2 Additional information about the EUT	4
2.3 Opinions and interpretations	4
3. Test specifications.....	5
3.1 Standards.....	5
3.2 Additions, deviations and exclusions from standards	5
3.3 Mode of operation during the test	5
3.4 Compliance	6
4. Test summary.....	8
5. Tables and diagrams.....	10
6. Photos	22
7. Test equipment.....	24
8. Intertek Semko EMC Center measurement uncertainties.....	25

1. CLIENT INFORMATION

The EUT has been tested by request of

Company: Panasonic Manufacturing UK Ltd.
Home Appliance Division,
Wyncliffe Road, Pentwyn Industrial Estate,
Cardiff, South Glamorgan.
CF23 7XB, United Kingdom

Name of contact: David Hadley

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: Combination Microwave oven
Tested type / model : BM450710
Additional type / model : BM451710
Brand name: Gaggenau
Serial number: -
Manufacturer: Panasonic Manufacturing UK Ltd
Rating: 208/240 V, 60 Hz, 3300 W
Class: I

2.2 Additional information about the EUT

The EUT was tested in a table top configuration.

The EUT was tested with the following cables:

Cable	Type	Length
Mains power	Five-core	1.5 m

2.3 Opinions and interpretations

The following type is also included as additional type in this test report: BM451710

The difference as compared to the tested type is (according to the manufacturer): The 24 inch BM450710 & BM451710 model variants differ in that the cavity door is of either a RH or LH opening respectively.

The difference is considered not to imply different EMC-characteristics when compared to the tested type. Therefore, this type is not tested, but considered to have the same EMC-characteristics as the tested type.

3. TEST SPECIFICATIONS

3.1 Standards

Requirements:

ICES-001: (2006), Spectrum Management and Telecommunications
Interference-Causing Equipment Standard

Test methods:

CAN/CSA CISPR 11: (2004) + A1 (2010) + A2 (2010), Industrial, scientific and medical equipment -
radio-frequency disturbance characteristics -limits and methods of measurement

47 CFR: (2013), Telecommunication, Chapter I – FCC Part 18 – Industrial, Scientific and Medical
equipment

Test methods:

ANSI C.63.4-2009 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 MHz

FCC/OST MP-5 (1986): FCC methods of measurements of radio noise emissions from industrial,
scientific, and medical equipment

The standards above refer to basic standards. These are found in section 4, Test Summary, by name
and edition.

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

3.3 Mode of operation during the test

The EUT was supplied with 208 V, 60 Hz.

The EUT was tested with the program 1000 W, Microwave.

The EUT was operating with a non-conductive glass beaker in the middle of the heating area.

3.4 Compliance

EMC limit requirements of FCC part 18

Conducted emission FCC part 18:

Frequency range (MHz)	Quasi-Peak (dBμV)	Average (dBμV)
0.009 – 0.050	110	-
0.05 – 0.15	90-80	-
0.15 – 0.50	66-56	56-46
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Radiated emission:

P=661.7 W, see clause 6.1, FCC/OST MP-5 (1986)

$$\text{Limit} = 25 * \sqrt{\frac{P}{500}} \approx 28.8 \mu V / m \approx 29.2 \text{ dB}\mu V / m$$

Frequency range	300 m distance Quasi-Peak	300 m distance Quasi-Peak	3 m distance Quasi-Peak
MHz	μV/m	dBμV/m	dBμV/m
30 – 2400	28.8	29.2	69.2
2500 – 26500	28.8	29.2	69.2

In the frequency range of 30-26500 MHz the values for 300 m distance are re-calculated to 3 m by adding 40 dB to the limit.

EMC limit requirements of CISPR 11

Conducted emission Class B:

Frequency range MHz	Quasi-Peak dBμV	Average dBμV
0.15 – 0.50	66 Decreasing linearly with logarithm of frequency to 56	56 Decreasing linearly with logarithm of frequency to 46
0.50 – 5	56	46
5 – 30	60	50

Radiated emission 0.15 – 30 MHz at 3 m distance Group 2 Class B:

Frequency range MHz	Quasi-Peak dBμA/m
0.15 – 30	39 Decreasing linearly with logarithm of frequency to 3

Radiated emission 30 – 1000 MHz at 3 m distance Group 2 Class B

Frequency range MHz	Quasi-Peak dB μ V/m	Average dB μ V/m
30.000 – 80.872	30	25
80.872 – 81.848	50	45
81.848 – 134.786	30	25
134.786 – 136.414	50	45
136.414 – 230.0	30	25
230.000 – 1000.0	37	32

Radiated emission 1 – 18 GHz at 3 m distance Group 2 Class B

Frequency range GHz	Peak dB μ V/m	Weighted Peak dB μ V/m
1.0 – 2.3	92	60
2.3 – 2.4	110	60
2.5 – 5.725	92	60
5.875 – 11.7	92	60
11.7 – 12.7	73	60
12.7 – 18.0	92	60

4. TEST SUMMARY

The test has been carried out at the Intertek Semko AB premises in Kista, Sweden.
The results in this report apply only to sample tested:

Basic standard	Description	Result
Emission		
CAN/CSA CISPR 11: (2004) + A1 + A2	AC power port continuous disturbance voltage in the frequency range 0.15 MHz to 30 MHz The EUT complies with Class B limits. The margin to the limit was at least 8.0 dB, found at 0.339 MHz. See diagram 1 and table 1.	PASS
FCC part 18 (2013)	AC power port continuous disturbance voltage in the frequency range 0.009 MHz to 30 MHz The EUT complies with the limits. The margin to the limit was at least 8.0 dB, found at 0.339 MHz. See diagram 2 and table 2.	PASS
CAN/CSA CISPR 11: (2004) + A1 + A2	Radiated electromagnetic field in the frequency range 0.15 MHz to 30 MHz The EUT complies with the Class B limits. The margin to the limit was at least 11.4 dB found at 0.178 MHz. See diagram 3 and table 3.	PASS
CAN/CSA CISPR 11: (2004) + A1 + A2	Radiated electromagnetic field in the frequency range 30 MHz to 1000 MHz The EUT complies with the Class B limits. The margin to the limit was at least 0.9 dB found at 31.343 MHz. The margin is within the measurement uncertainty interval. See diagram 4 and table 4.	PASS
FCC part 18 (2013)	Radiated electromagnetic field in the frequency range 30 MHz to 1000 MHz The EUT complies with the limits. The margin to the quasi-peak limit was at least 29.5 dB found at 663.547 MHz. See diagram 5 and table 5.	PASS

Basic standard	Description	Result
Emission		
CAN/CSA CISPR 11: (2004) + A1 + A2	Radiated electromagnetic field in the frequency range 1 GHz to 18 GHz The EUT complies with the Class B limits. The margin to the limit was at least 22.2 dB found at 7100.2 MHz. See diagram 6 and table 6.	PASS
FCC part 18 (2013)	Radiated electromagnetic field in the frequency range 1 GHz to 26.5 GHz The EUT complies with the limits. The margin to the average limit was at least 20.9 dB found at 7100.6 MHz See diagram 7-8 and table 7-8.	PASS
FCC part 18 (2013)	Fundamental frequency The fundamental frequency complies within the frequency limits and is found inside the frequency-range 2400 – 2500 MHz. See diagram 9.	PASS
FCC part 18 (2013)	Radiation leakage, 2.45 GHz The radiation leakage complies with the limits See table 10.	PASS
FCC part 18 (2013)	Power output (microwave power) See table 11.	PASS

5. TABLES AND DIAGRAMS

Diagram 1, Conducted emission, AC power port, Peak overview sweep, CISPR 11

Date of test: November 19, 2014

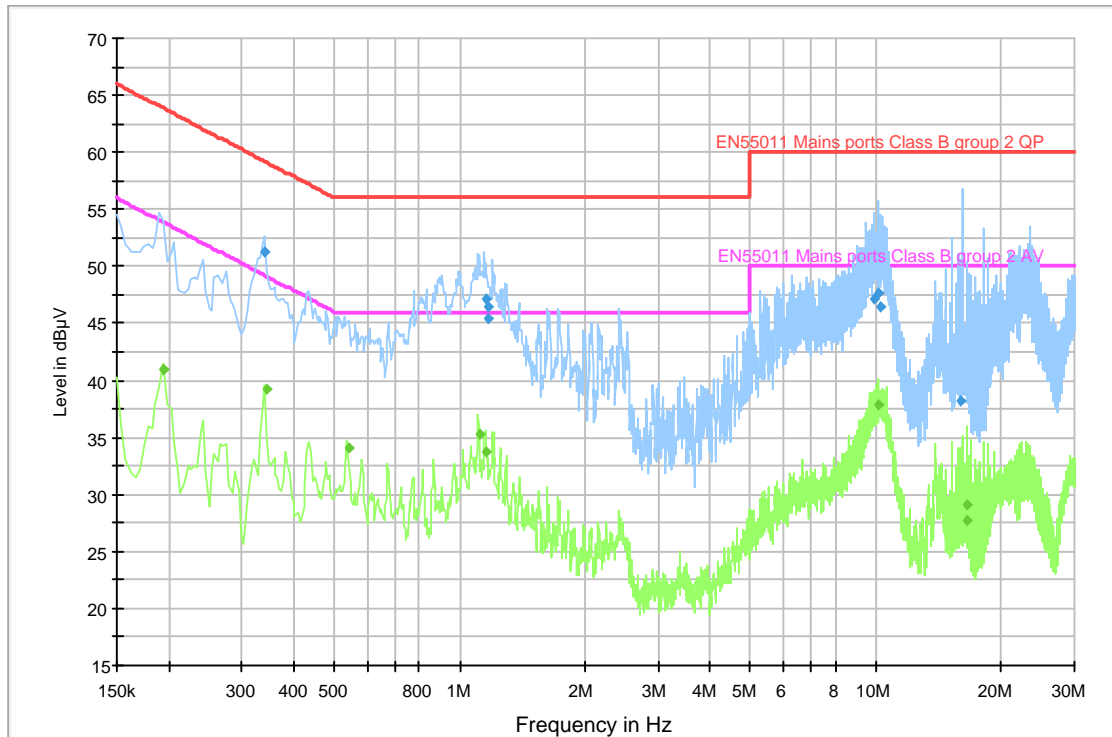


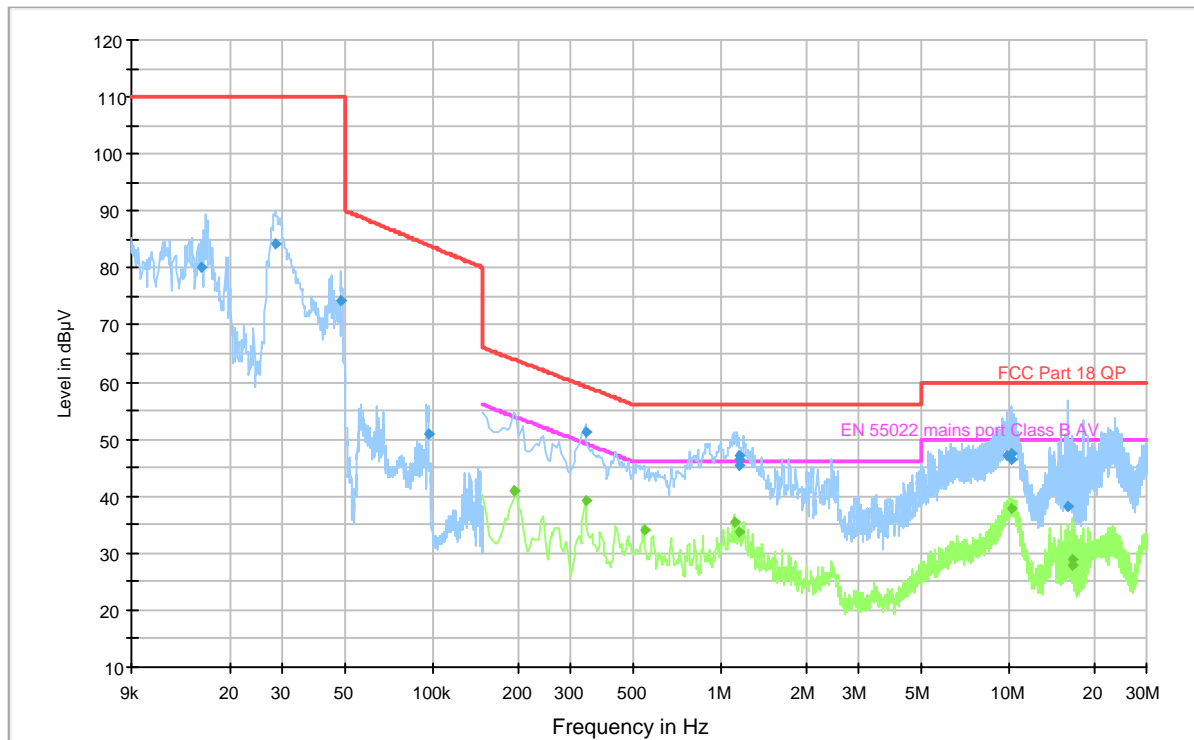
Table 1, Conducted emission, AC power port, Measurement results, CISPR 11

Frequency [MHz]	Quasi-Peak		Line L1, L2, L3, N	Margin [dB]
	Disturbance level [dBμV]	Limit [dBμV]		
0.339	51.2	59.2	L2	8.0
1.156	47.1	56.0	L2	8.9
1.167	46.5	56.0	L2	9.5
9.894	47.2	60.0	L2	12.8
10.147	47.6	60.0	L2	12.4
10.278	46.4	60.0	N	13.6

Frequency [MHz]	Average		Line L1, L2, L3, N	Margin [dB]
	Disturbance level [dBμV]	Limit [dBμV]		
0.193	41.0	53.9	L1	12.9
0.342	39.3	49.2	L2	9.9
0.541	34.0	46.0	L2	12.0
1.111	35.4	46.0	L2	10.6
1.161	33.8	46.0	L2	12.2
10.151	37.8	50.0	N	12.2

Diagram 2, Conducted emission, AC power port, Peak overview sweep, FCC

Date of test: November 19, 2014

**Table 2, Conducted emission, AC power port, Measurement results, FCC**

Frequency [MHz]	Quasi-Peak		Line L1, L2, L3, N	Margin [dB]
	Disturbance level [dBμV]	Limit [dBμV]		
0.339	51.2	59.2	L2	8.0
1.156	47.1	56.0	L2	8.9
1.167	46.5	56.0	L2	9.5
9.894	47.2	60.0	L2	12.8
10.147	47.6	60.0	L2	12.4
10.278	46.4	60.0	N	13.6

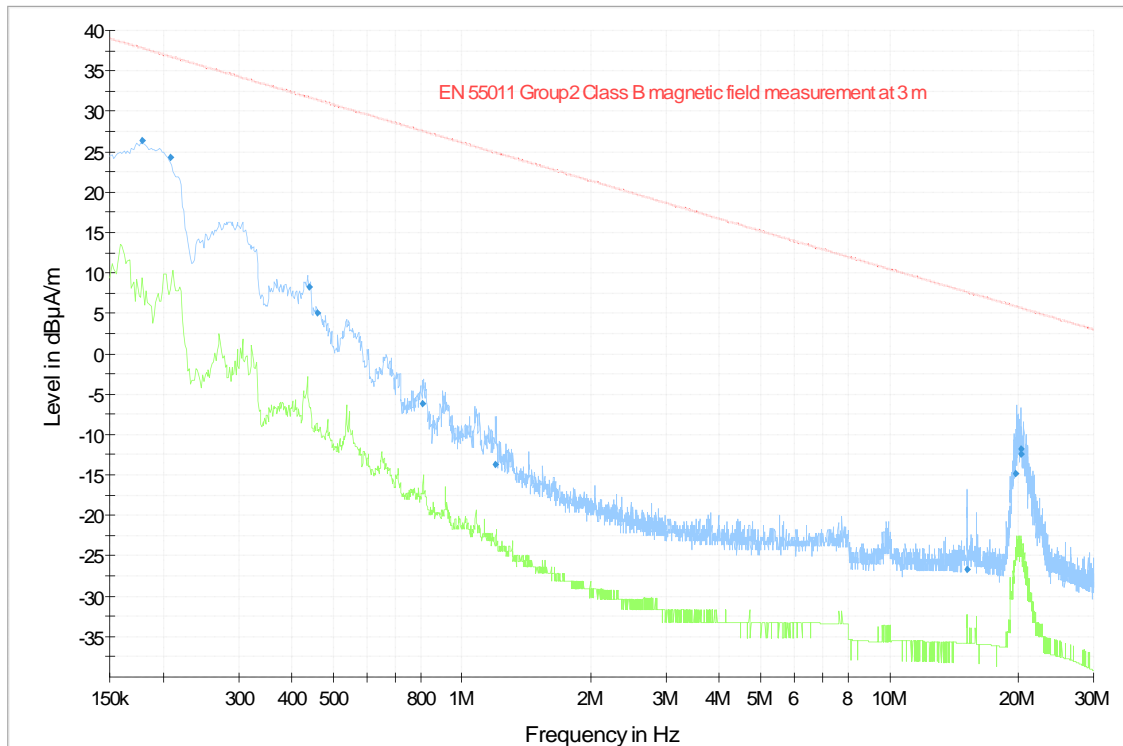
Frequency [MHz]	Average		Line L1, L2, L3, N	Margin [dB]
	Disturbance level [dBμV]	Limit [dBμV]		
0.193	41.0	53.9	L1	12.9
0.342	39.3	49.2	L2	9.9
0.541	34.0	46.0	L2	12.0
1.111	35.4	46.0	L2	10.6
1.161	33.8	46.0	L2	12.2
10.151	37.8	50.0	N	12.2

Example calculation:

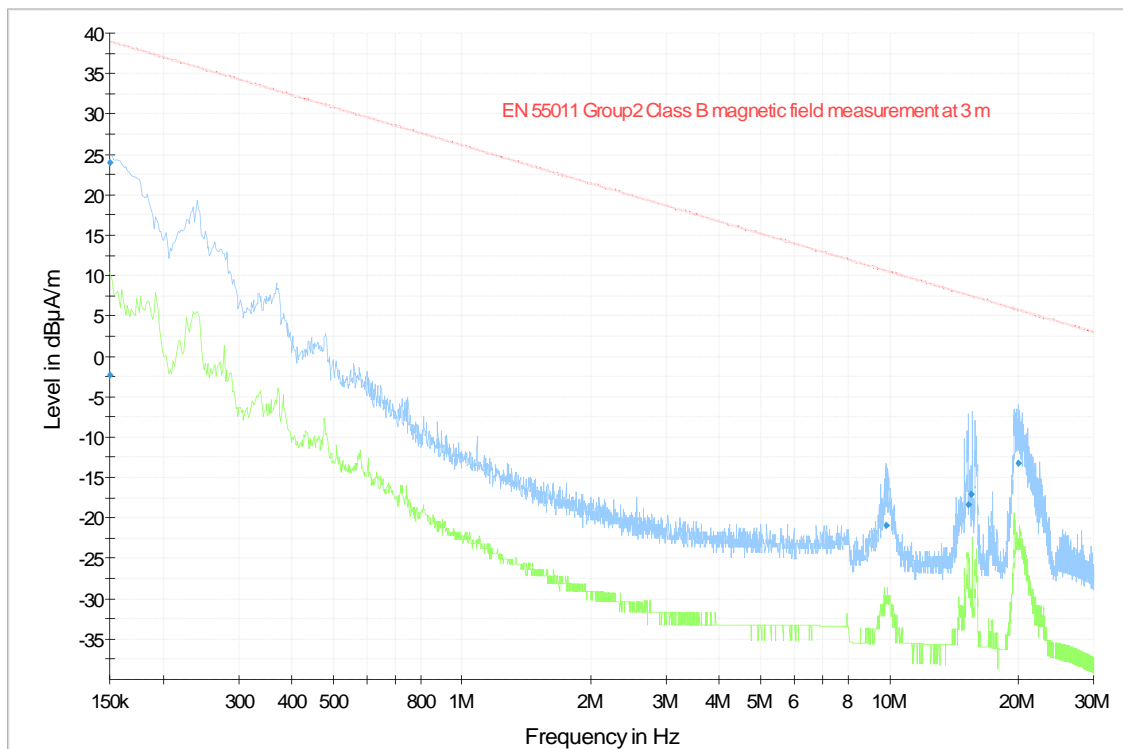
Measured level [dBμV/m] = Analyser reading [dBμV] + cable loss [dB]

Diagram 3, Radiated emission, 150 kHz - 30 MHz, Peak overview sweep, CISPR 11

Date of test: November 17, 2014



Horizontal polarisation



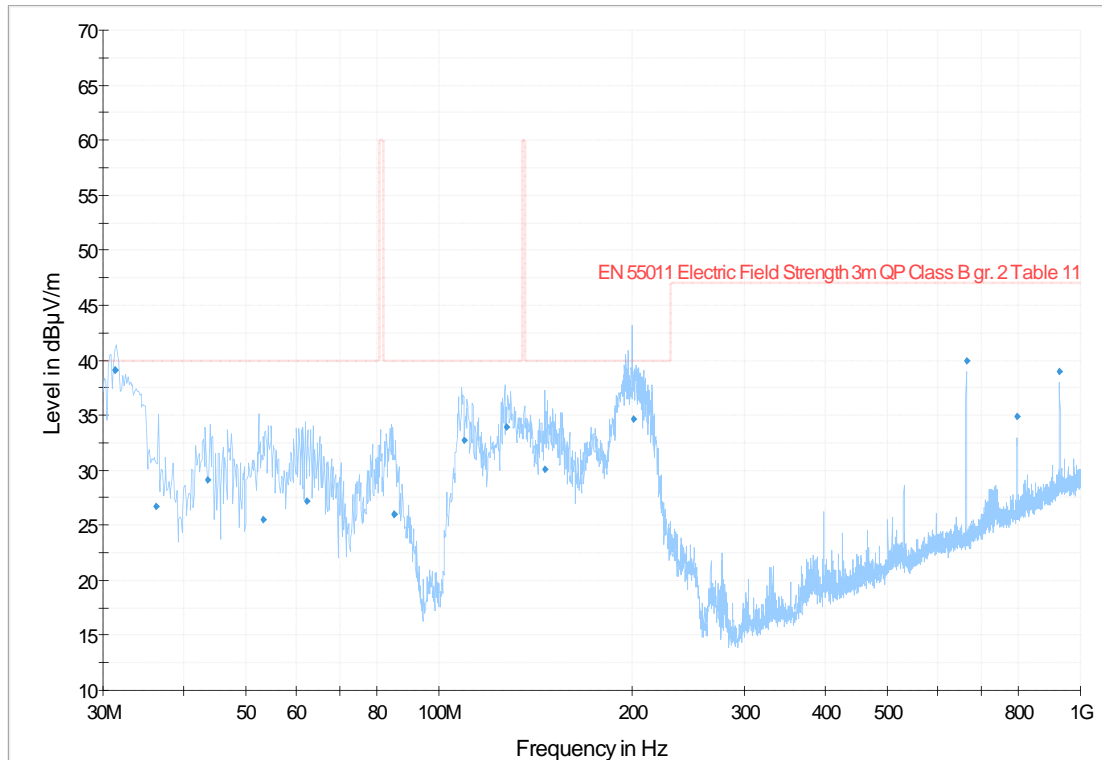
Vertical polarisation

Table 3, Radiated emission, 150 kHz - 30 MHz, Measurement results, CISPR 11

Frequency [MHz]	Quasi-Peak		Polarisation H/V	Margin [dB]
	Disturbance level [dBμA/m]	Limit [dBμA/m]		
0.150	24.0	39.0	V	15.0
0.178	26.4	37.8	H	11.4
0.208	24.2	36.8	H	12.6
19.762	-14.9	5.8	H	20.7
19.976	-13.2	5.8	V	19.0
20.303	-11.8	5.7	H	17.5

Diagram 4, Radiated emission, 30 MHz - 1000 MHz, Peak overview sweep, CISPR 11

Date of test: November 17, 2014

**Table 4, Radiated emission, Measurement results, CISPR 11**

Frequency [MHz]	Quasi-Peak		Polarisation H/V	Margin [dB]
	Disturbance level [dBµV/m]	Limit [dBµV/m]		
31.343	39.1*	40.0	V	0.9
109.617	32.7	40.0	H	7.3
127.753	34.0	40.0	H	6.0
201.040	34.6	40.0	H	5.4
663.547	40.0	47.0	V	7.0
928.998	39.0	47.0	H	8.0

*The measured result is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

Diagram 5, Radiated emission, 30 MHz - 1000 MHz, Peak overview sweep, FCC Part 18

Date of test: November 17, 2014

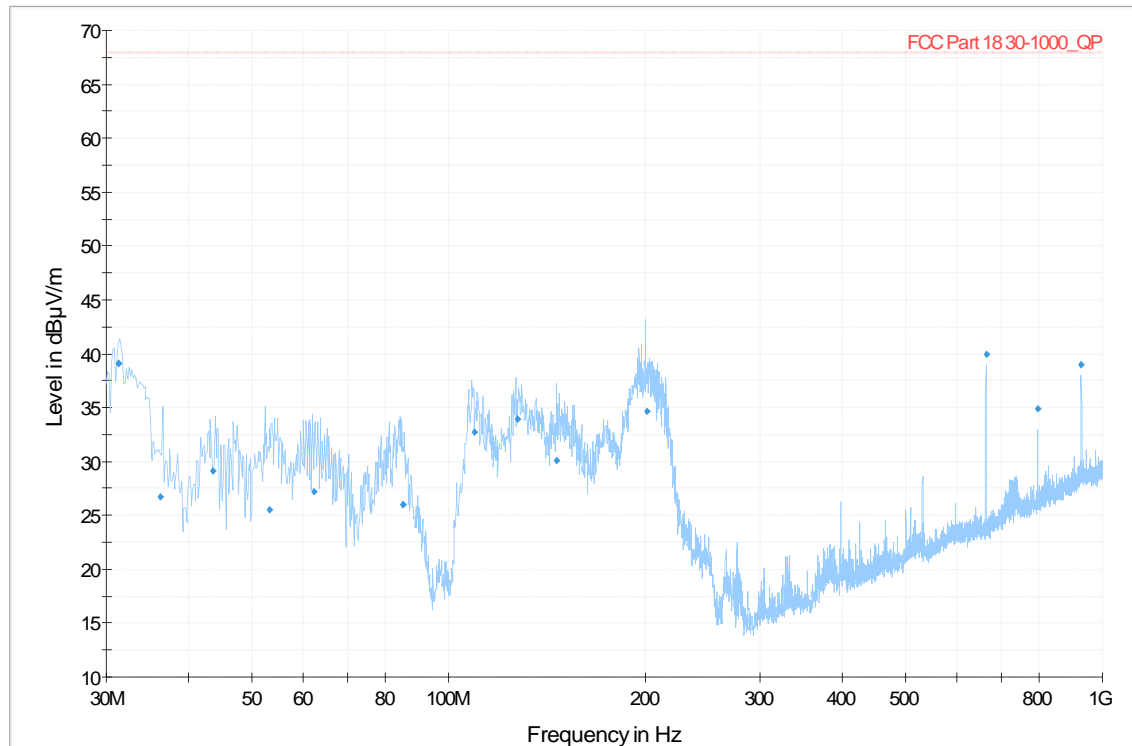


Table 5, Radiated emission, Measurement results, FCC Part 18

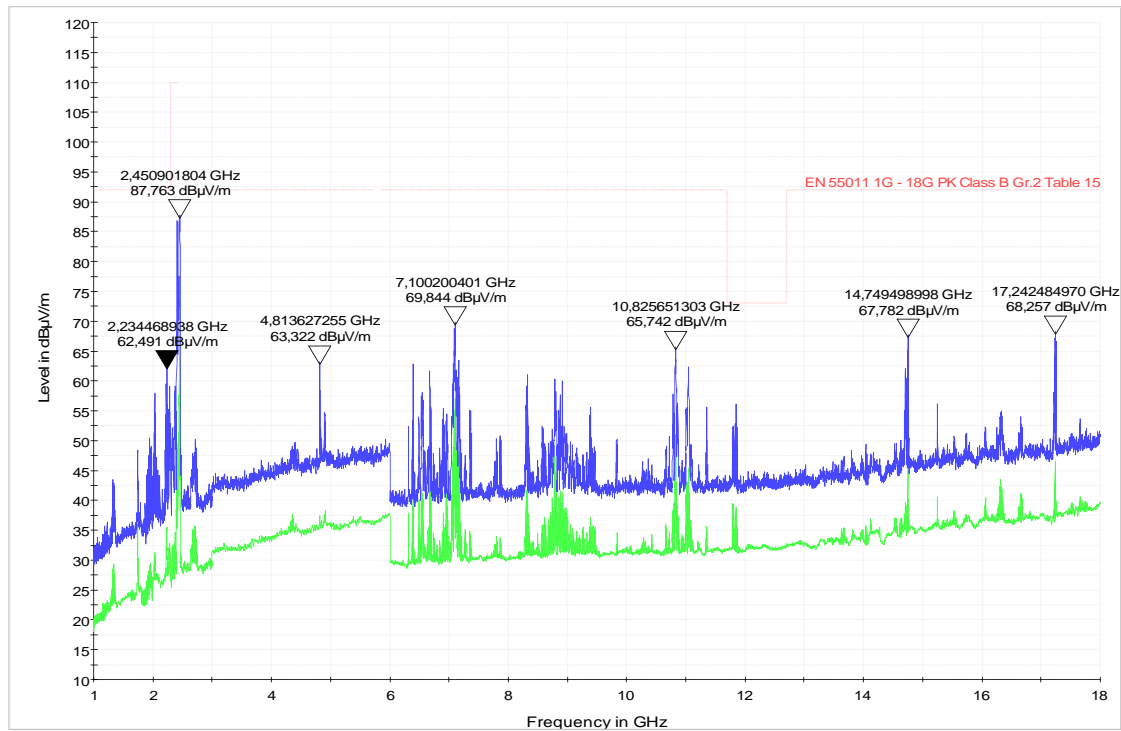
Frequency [MHz]	Quasi-Peak		Polarisation H/V	Margin [dB]
	Disturbance level [dBµV/m]	Limit [dBµV/m]		
31.343	39.1	69.2	V	30.1
109.617	32.7	69.2	H	36.5
127.753	34.0	69.2	H	35.2
201.040	34.6	69.2	H	34.6
663.547	40.0	69.2	V	29.2
796.293	34.9	69.2	V	34.3
928.998	39.0	69.2	H	30.2

Example calculation:

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [dB/m]

Diagram 6, Radiated emission, 1.0 GHz - 18 GHz, Peak overview sweep, CISPR 11

Date of test: November 15, 2014

**Table 6, Radiated emission, Measurement results, CISPR 11**

Frequency [MHz]	Max-Peak		Polarisation H/V	Margin [dB]
	Disturbance level [dBµV/m]	Limit [dBµV/m]		
2234.5	62.5	92.0	H	29.5
4813.6	63.3	92.0	H	28.7
7100.2	69.8	92.0	H	22.2
10825.7	65.7	92.0	H	26.3
14749.5	67.8	92.0	H	24.2
17242.5	68.3	92.0	H	23.7

Frequency [MHz]	Weighted Peak		Polarisation H/V	Margin [dB]
	Disturbance level [dBµV/m]	Limit [dBµV/m]		
2234.5	30.0	60.0	H	30.0
7100.2	47.8	60.0	H	12.2

Diagram 7, Radiated emission, 1 GHz - 18 GHz, Peak overview sweep, FCC part 18

Date of test: November 14, 2014

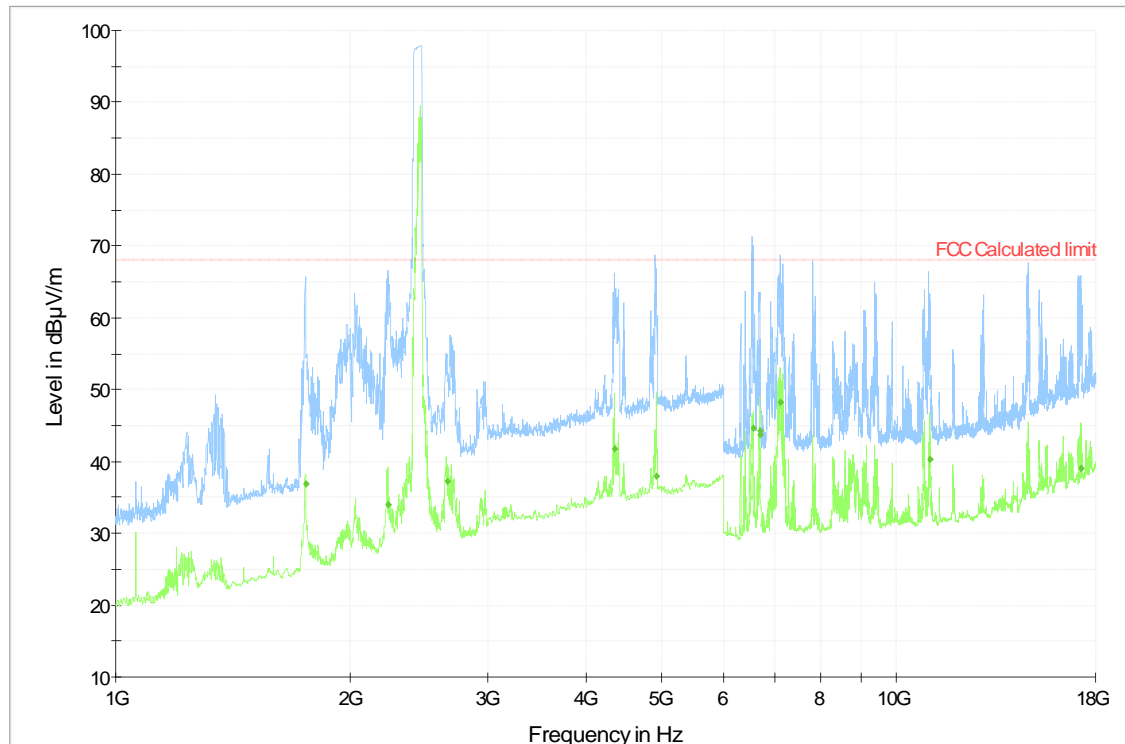
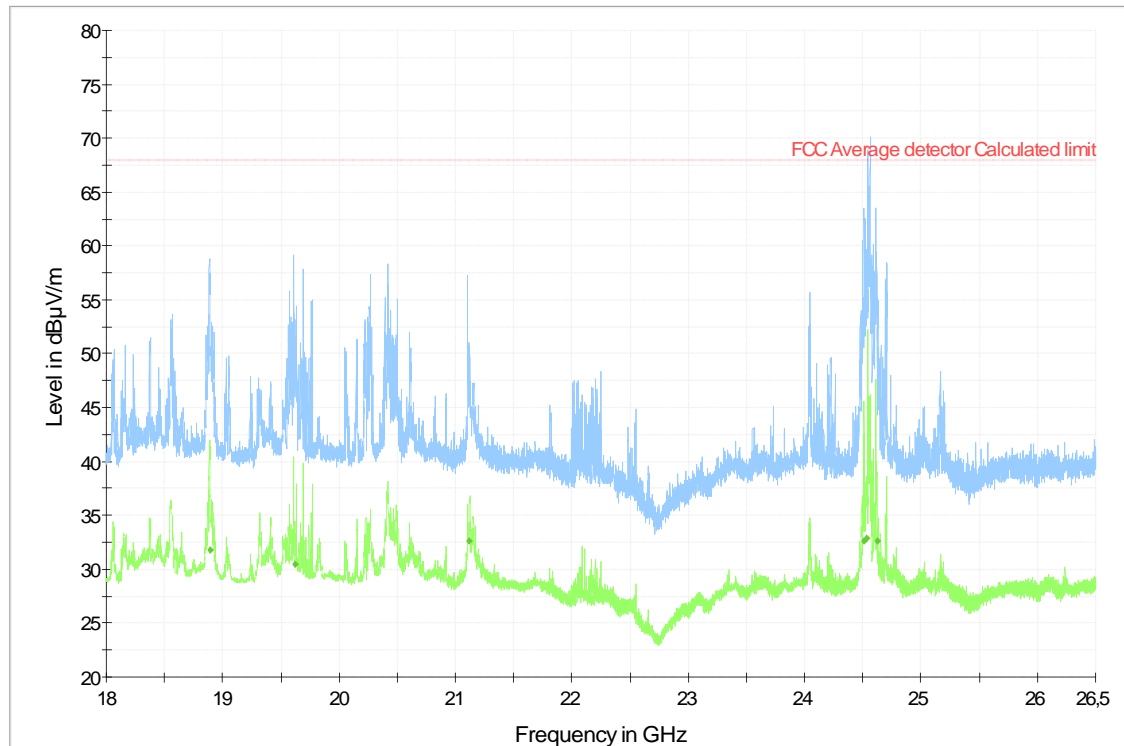


Table 7, Radiated emission, Measurement results, FCC Part 18

Frequency [MHz]	Average		Polarisation H/V	Margin [dB]
	Disturbance level [dBμV/m]	Limit [dBμV/m]		
4350.3	41.8	69.2	H	27.4
4934.5	38.0	69.2	H	31.2
6675.9	44.3	69.2	H	24.9
7100.6	48.3	69.2	H	20.9
11046.7	40.3	69.2	V	28.9
17254.3	39.0	69.2	H	30.2

Diagram 8, Radiated emission, 18 GHz – 26.5 GHz, Peak overview sweep, FCC part 18

Date of test: November 15, 2014

**Table 8, Radiated emission, Measurement results, FCC Part 18**

Frequency [MHz]	Average		Polarisation H/V	Margin [dB]
	Disturbance level [dBµV/m]	Limit [dBµV/m]		
18889.0	31.7	69.2	V	37.5
19619.8	30.4	69.2	H	38.8
21115.8	32.6	69.2	V	36.6
24512.3	32.6	69.2	H	36.6
24534.8	32.9	69.2	H	36.3
24623.5	32.7	69.2	H	36.5

Diagram 9, Fundamental frequency, Peak overview sweep

Date of test: November 15, 2014

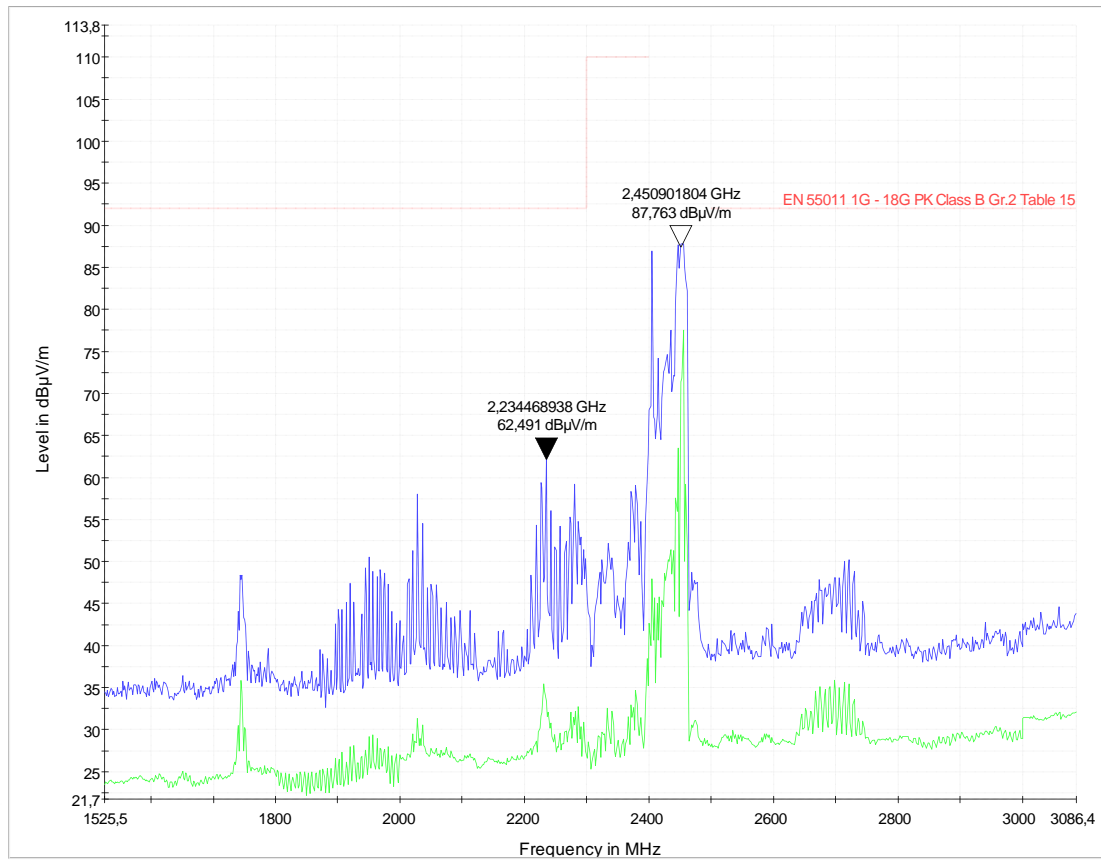


Table 9, Radiation leakage, 2.45 GHz, Measurement results

Disturbance level [mW/cm ²]	Limit [mW/cm ²]
< 0.2	1.0

Table 10, Power output

Mass of the water (M_w):	grams	1000
Mass of the container (M_c):	grams	392
Ambient temperature (T_0):	°C	21.1
Initial temperature of the water (T_1):	°C	11,9
Final temperature of the water (T_2):	°C	31,9
Heating time (t):	s	130
P*:	W	662

$$* P = \frac{4.187 * M_w * (T_2 - T_1) + 0.55 * M_c * (T_2 - T_0)}{t}$$

6. PHOTOS



Photo of the EUT



Photo of the EUT during conducted emission test



Photo of the EUT during radiated emission test below 30 MHz



Photo of the EUT during Radiated emission test 30 MHz – 1000 MHz



Photo of the EUT during radiated emission test above 1 GHz

7. TEST EQUIPMENT

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Receiver	Rohde & Schwarz	ESCI	31686	07 – 2014	1 year
AMN / LISN	Rohde & Schwarz	ESH2-Z5	3017	07 – 2014	3 year
Receiver	Rohde & Schwarz	ESIB26	32291	07 – 2014	1 year
Receiver	Rohde & Schwarz	ESIB26	32288	07 – 2014	1 year
Receiver	Rohde & Schwarz	ESU 40	13178	07 – 2014	1 year
Preamplifier	Rohde & Schwarz	TS-PRE1	32306	07 – 2014	1 year
Horn Antenna	Rohde & Schwarz	HF907	32307	06 – 2012	3 year
Preamplifier + Antenna	BONN Elektronik	BLMA 1826-5A	31247	01 – 2014	3 year
Antenna, Ultralog	Rohde & Schwarz	HL562	30711	12 – 2011	3 year
Loop Antenna	EMCO	6502-02-01	8853	08 – 2012	3 year
Microwave leakage meter	HOLADAY INDUSTRIES	1500	710	01 – 2014	1 year
Thermometer	FLUKE	52 II	31390	06 – 2014	1 year

8. INTERTEK SEMKO EMC CENTER MEASUREMENT UNCERTAINTIES

All uncertainties are given with a level of confidence of approximately 95% (k=2) and are the maximum values within the complete range. Measurement uncertainties are calculated in accordance with EA-4/02:1997.

Continuous conducted disturbances with AMN in the frequency range 9 kHz to 30 MHz	± 3.6 dB
Measurement uncertainty with a passive probe in the frequency range 0.15 - 30 MHz	± 3.0 dB
Measurement uncertainty with a current probe in the frequency range 9 kHz - 30 MHz	± 3.5 dB
Measurement uncertainty on telecommunication ports	± 4.1 dB
According to method C1.1 using an ISN/CDN	± 4.0 dB
According to method C1.1 using a current probe	± 3.3 dB
According to method C1.2 using a 150 Ohm load	
Measurement uncertainty for disturbance power	± 4.3 dB
Measurement uncertainty for radiated emission with a loop antenna in the frequency range 9 kHz - 30 MHz	± 3.2 dB
Measurement uncertainty for radiated emission with a rod antenna in the frequency range 9 kHz - 30 MHz	± 5.7 dB
Measurement uncertainty for radiated disturbance	
Uncertainty for the frequency range 30 to 1000 MHz at 1 m	± 6.3 dB
Uncertainty for the frequency range 30 to 1000 MHz at 3 m	± 4.9 dB
Uncertainty for the frequency range 30 to 1000 MHz at 10 m	± 4.8 dB
Uncertainty for the frequency range 1.0 to 18 GHz at 3 m	± 5.4 dB
Uncertainty for the frequency range 18 to 26 GHz at 3 m	± 5.5 dB
Uncertainty for the frequency range 26 to 40 GHz at 3 m	± 5.6 dB
Measurement uncertainty for radiated power 1 GHz - 18 GHz	± 4.1 dB