COMLAB
Accredited Testing and Certification
EMC, Radio and Telecommunications

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Test report	**: 03/510/3**
Item tested	**: BeoCom2**
Type of equipment	**: Frequency Hopping Transmitter**
FCC ID	**: BV5BEOCOM2**
Client	**: Bang & Olufsen Telecom A/S**

Tested according to :

FCC part 15, subpart C
Frequency Hopping Transmitters

RSS-210, Issue 5
Low Power Licence-Exempt Radiocommunication Devices

Date of issue : 18 NOVEMBER 2003

Authorised by : .....
Kjell G. Haga
Managing Director

.....
Frode Sveinsen
Technical Supervisor

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1 GENERAL INFORMATION

1.1 Testhouse Info

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Managing Director:	Kjell G. Haga
FCC test firm registration # :	994405
IC OATS registration # :	4443

1.2 Client Information

Name :	Bang & Olufsen Telecom A/S
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Telephone :	+45 9684 4400
Fax :	+45 9684 4401

Contact:

Name :	Lars Nielsen
Telephone :	+45 9684 4612
E-mail :	lne@bang-olufsen.dk

1.3 Manufacturer

Name :	Bang & Olufsen Telecom A/S
Address :	Kjeldmarksvej 1, DK-2600 STRUER, DENMARK
Telephone :	+ 45 9684 4400
Fax :	+ 45 9684 4401
E-mail :	lne@bang-olufsen.dk

2 Test Information

2.1 Tested Item

Name :	Bang & Olufsen
FCC ID :	BV5BEOCOM2
Industry Canada ID :	3775A-BEOCOM2
Model/version :	BeoCom 2
Serial number :	Comlab 3
Hardware identity and/or version:	Raw PCB: 6143369; Mount PCB: 8000234 v.A2
Software identity and/or version :	0.07
Frequency Range :	2400 - 2483.5 MHz
Tunable Bands :	1
Number of Channels :	79[1]
Modulation :	GFSK
Emissions Designator :	1MF1D
User Frequency Adjustment :	None, Software controlled.
Rated Output Power :	320 mW

1) 75 channels in use.

Theory of Operation

The BeoCom2 handset is designed to work together with the BeoLine base, which has already been approved for use in USA and Canada as part of BeoCom1 (FCC ID: BV5BEOCOM1; IC: 3775A-BEOCOM1). The theory of operation including assignment of unique ID's, use of encryption and hopping scheme is the same as for BeoCom1.

The EUT is based on the ETSI DECT standards ETSI EN 300 175-1 to EN 300 175-8 and is improved by implementing additional features to combat interference at 2.4 GHz. The system is implemented with unique IDs and encryption based on the DECT standard, ETSI EN 300 175-6.

2.2 Test Environment

2.2.1 Normal test condition

Temperature:	20 - 23 °C
Relative humidity:	30 - 50 %
Normal test voltage:	115 V AC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2003-10-03

Test period : from 2003-10- 06 to 2003-10- 27

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Bang & Olufsen

Model No.: BeoCom 2

Serial No.: Comlab 3

All measurements are tracable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC Part 15, Subpart C, paragraph 15.247 for Frequency Hopping Spread Spectrum devices and Industry Canada RSS-210 Frequency Hopping Spread Spectrum.

Radiated tests were conducted in accordance with ANSI C63.4-1992. The radiated tests were made in a semi-anechoic chamber at measuring distances of 3 and 10 metres.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-production Unit

DSS Equipment Code ☐ Family Listing

THIS TEST REPORT RELATES ONLY TO THE ITEM (S) TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

COMLAB

NEMKO COMLAB REF: 03/510/3

TESTED BY: Egil Hauger, Test engineer DATE: 18 NOVEMBER 2003

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3.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 reference	Result
Powerline Conducted Emission	15.207(a)	7.4, 9	Complies
Channel Separation	15.247(a)(1)	6.2.2(o)(a1)	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)	6.2.2(o)(a1)	Complies
Time of Occupancy	15.247(a)(1)(iii)	Amendment, para I (ii)	Complies
Occupied Bandwidth	15.247(a)(1)	Amendment, para I (ii)	Complies
Peak Power Output	15.247(b)	6.2.2 (o)(a3)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	6.2.2 (o)(e1)	N/A[1]
Spurious Emissions (Radiated)	15.247(c)	6.2.2 (o)(e1)	Complies

[1] The tested equipment has integrated antennas only.

3.3 Description of modification for Modification Filing

Not Applicable.

3.4 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Powerline Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Egil Hauger	**Date of Test: 28 October 2003**

Measurement procedure: CISPR 22 1997 Clause 5.1 Class B ITE using 50 μH/50 ohms LISN.

Test Results: **Complies.**

Measurement Data: **See attached graph, (Peak detector).**

Highest measured value:

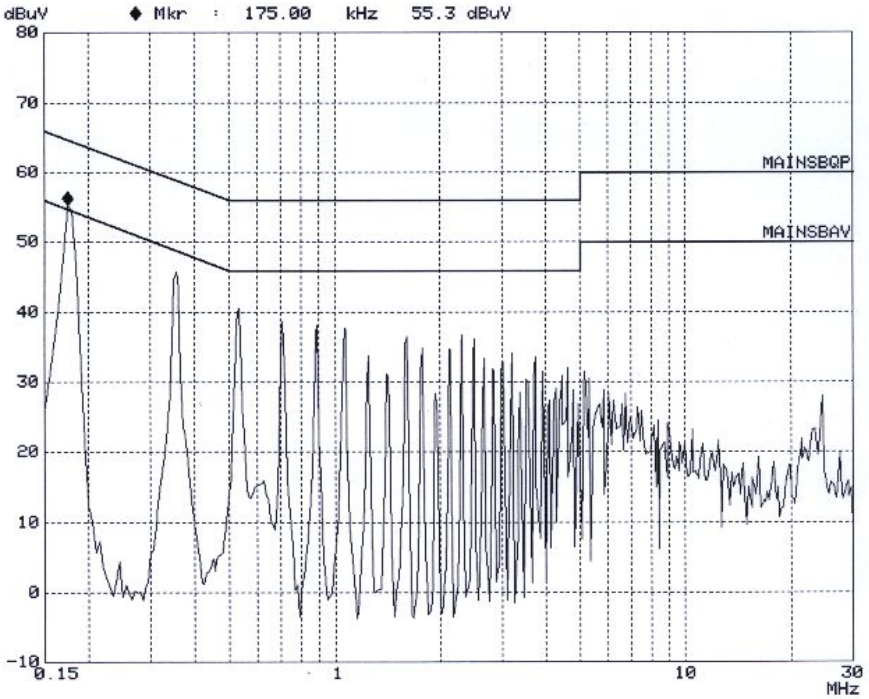
Frequency	Line	Detector	Measured value	Limit	Margin
KHz	L1/N	Peak/QP/AV	dBμV	dBμV	dB
178	N	QP	53.1	64.5	11,4
178	N	AV	41.2	54.5	13,3
353	N	QP	43.3	58.5	15,2
353	N	AV	35.2	48.5	13,3
530	N	QP	37.3	56	18,7
530	N	AV	31.7	46	14,3
709	N	QP	35.7	56	20,3
709	N	AV	30.6	46	15,4
886	N	QP	35.0	56	21
886	N	AV	31.5	46	14,5
178	L1	QP	52.9	64,5	11,6
178	L1	AV	38.9	54,5	15,6
353	L1	QP	43.3	58,5	15,2
353	L1	AV	32.5	48,5	16
530	L1	QP	37.6	56	18,4
530	L1	AV	28.8	46	17,2
709	L1	QP	35.8	56	20,2
709	L1	AV	27.4	46	18,6
886	L1	QP	35.5	56	20,5
886	L1	AV	26.5	46	19,5

NEMKO COMLAB AS
PEAK

Operator: Egh
Comment: B&O Charger BeoCom2 N
E135498
Portable as load
Date: 28. Oct 03 17:50

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	9k	PK	20ms	AUTO	LN ON	60dB



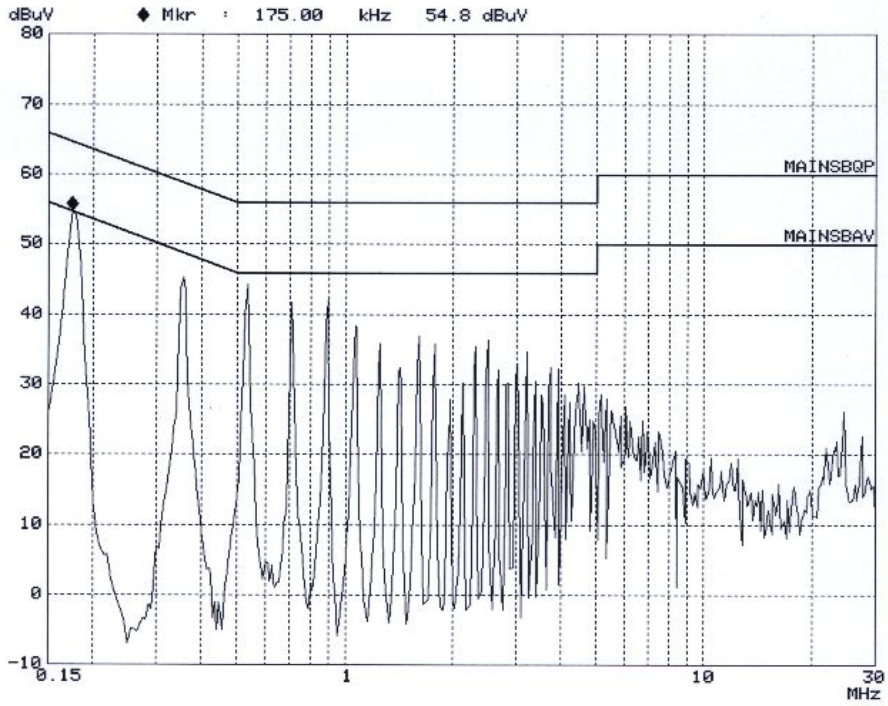
Mains phase N

NEMKO COMLAB AS
PEAK

Operator: Egh
Comment: B&O Charger BeoCom2 L!
E135498
Portable as load
Date: 28. Oct 03 18:06

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	9k	PK	20ms	AUTO	LN ON	60dB



Mains phase L1

4.2 Channel Separation

Para. No.: 15.247 (a)(1)

Test Performed By: Egil Hauger	**Date of Test: 20 October 2003**

Test Results: **Complies**

Measurement Data: Channel Separation: 1.029 MHz

20 dB Bandwidth of hopping channel: 0.985 MHz

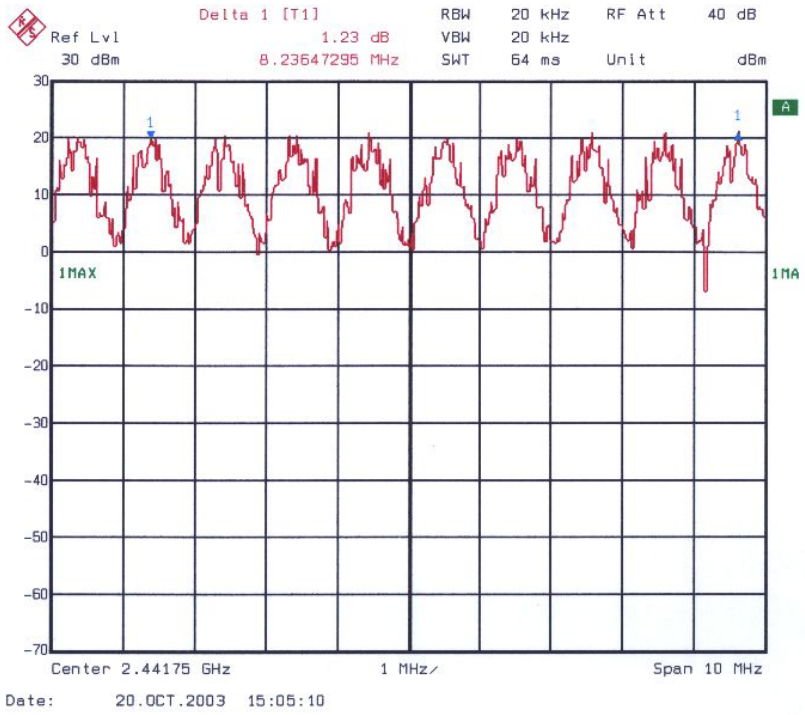
RF channel (1 to 79) has no influence on 20 dB bandwidth.

See attached graph

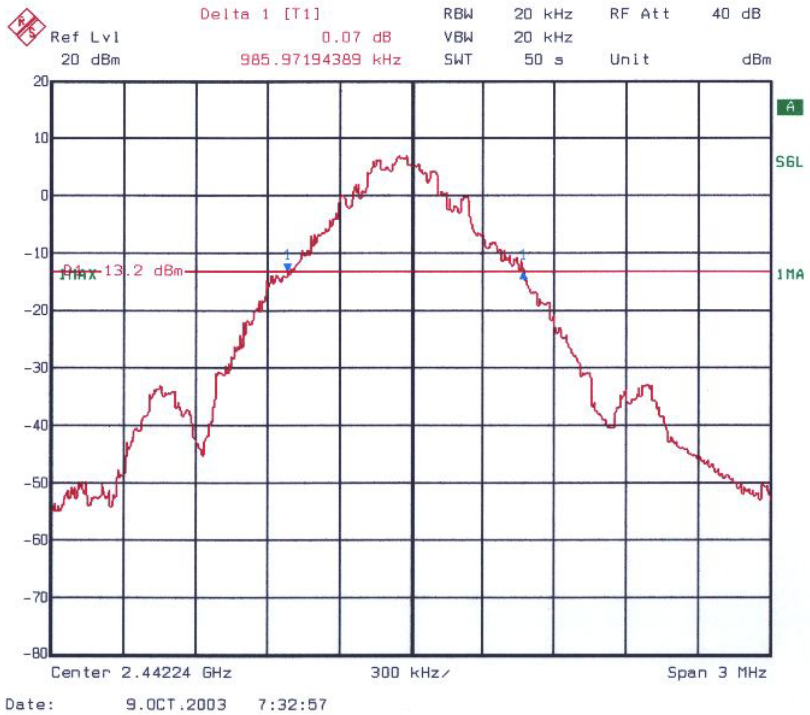
Channel Separation nominal value: 1.024 MHz.

Requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.



Channel separation



Occupied Bandwidth

4.3 Pseudorandom Hopping Algorithm

Para. No.: 15.247 (a)(1)

Test Performed By: Egil Hauger	**Date of Test: 20 October 2003**

Test Results: Complies

Measurement Data:

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

Base Table Hopping Sequence

The following table, arranged as an 8 × 10 grid, is the base table for the hopping sequence. The sequence is 75 hops long.

	0	1	2	3	4	5	6	7	8	9
0	0	27	38	14	26	49	13	33	73	55
10	16	1	11	54	8	64	2	48	28	61
20	4	40	65	6	23	67	57	42	12	29
30	62	36	47	5	71	43	32	56	21	59
40	39	15	53	18	45	37	74	63	46	3
50	51	31	72	58	9	70	35	69	25	34
60	50	60	68	22	52	24	41	7	17	30
70	19	10	20	66	44					

4.4 Occupancy Time

Para. No.: 15.247 (a)(1)(iii)

Test Performed By: Egil Hauger	**Date of Test: 6. October 2003**

Test Results: Complies

Measurement Data: Number of RF channel: 75

RF burst pr channel: 438 µs

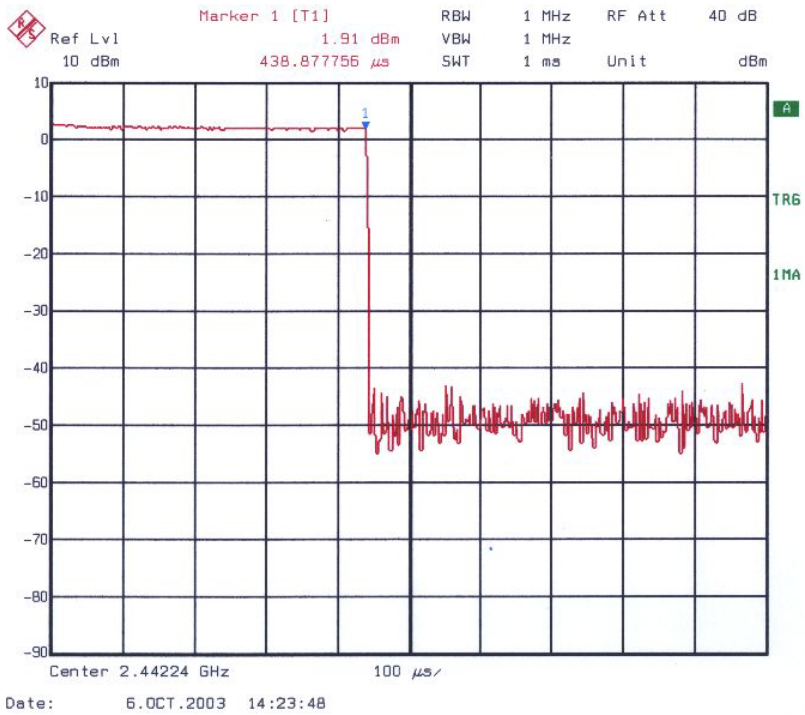
Time between each RF burst on same RF channel: 751 ms

Time of occupancy: (438 µs/751 ms)*0,4*75 sec = 0.01752 s

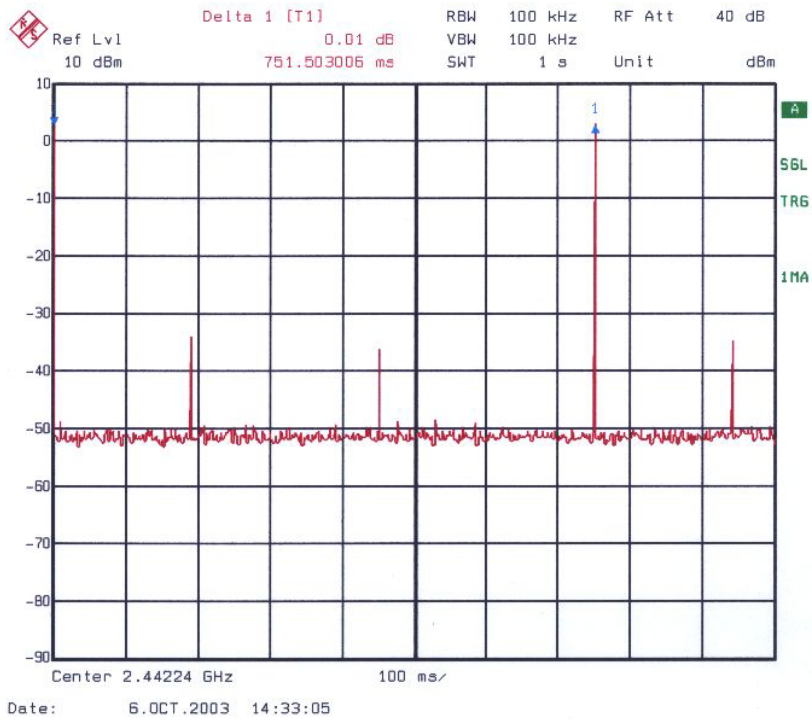
See attached graph.

Requirements:

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



RF burst



Time between RF burst on same RF channel

4.5 Occupied Bandwidth

Para. No.: 15.247 (a)(1)(iii)

Test Performed By: Egil Hauger	**Date of Test: 20. October 2003**

Test Results: Complies

Measurement Data: 75 RF channels in use

See attached graph.

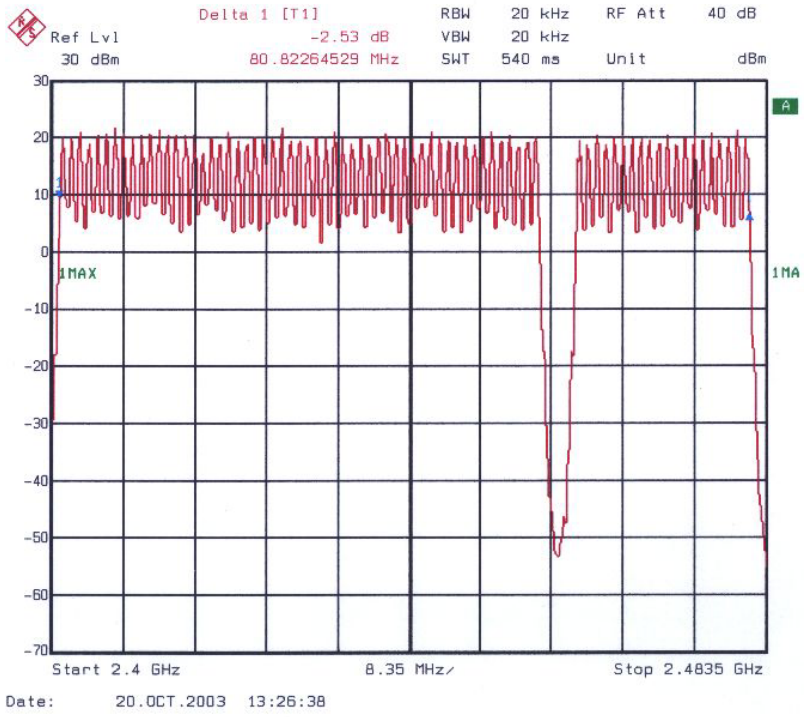
Requirements:

Frequency hopping systems in the 2400 - 2483.5 MHz band shall use at least 15 non-overlapping channels. No requirements for bandwidth for this frequency band.

Channel Centre Frequencies

The following table, arranged as a 10 × 8 grid, lists the 79 channel centre frequencies. The values are in MHz. Only 75 of the 79 are used at a time.

	0	1	2	3	4	5	6	7	8
0	2401,28000	2402,30400	2403,32800	2404,35200	2405,37600	2406,40000	2407,42400	2408,44800	2409,47200
1	2411,52000	2412,54400	2413,56800	2414,59200	2415,61600	2416,64000	2417,66400	2418,68800	2419,71200
2	2421,76000	2422,78400	2423,80800	2424,83200	2425,85600	2426,88000	2427,90400	2428,92800	2429,95200
3	2432,00000	2433,02400	2434,04800	2435,07200	2436,09600	2437,12000	2438,14400	2439,16800	2440,19200
4	2442,24000	2443,26400	2444,28800	2445,31200	2446,33600	2447,36000	2448,38400	2449,40800	2450,43200
5	2452,48000	2453,50400	2454,52800	2455,55200	2456,57600	2457,60000	2458,62400	2459,64800	2460,67200
6	2462,72000	2463,74400	2464,76800	2465,79200	2466,81600	2467,84000	2468,86400	2469,88800	2470,91200
7	2472,96000	2473,98400	2475,00800	2476,03200	2477,05600	2478,08000	2479,10400	2480,12800	2481,15200



RF channel in use