



FCC ID: APIINFIMS

EMI -- TEST REPORT

- FCC Part 15.247 FHSS -

Test Report No. : T33200-00-04HS	18. March 2009 Date of issue
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Type / Model Name : Infinity IMS Car Audio system

Product Description : Input Management System

Applicant : Harman Consumer Group

Address : 250 Crossways Park Drive
WOODBURY, NY 11797-2015, USA

Manufacturer : Meiloon Industrial Co. Ltd.

Address : No. 77, Lane 1775, Chuen-Rhy Rd.
TAOYUAN CITY, TAIWAN

Licence holder : Harman Consumer Group

Address : 250 Crossways Park Drive
WOODBURY, NY 11797-2015, USA

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October 01, 2007)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2007)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1: 1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

The EUT uses a NF2301 Bluetooth module which is fully compliant to Bluetooth V2.1 (+EDR disabled by firmware) and has an integrated printed antenna, a temporary connector can not implemented due to the small size of the module. A suitable test fixture can also not used to convert radiated measurements to conducted measurements therefore all measurements were performed radiated. Due to the TDD methode of the Bluetooth a TX answer of the device could not be suppressed in RX mode, therefore the measurements were performed in TX mode only. The USB connection is for charging issues only and was not tested.

Items	Description
BT Module type	NF2301
Power type	12 VDC car application
Modulation	FHSS (GFSK)
Frequency range	2400 MHz to 2483.5 MHz
Channel numbers	79
Data rate (Mbps)	1 (GFSK) {2 ($\pi/4$ -DQPSK), 3 (8DPSK) disabled by firmware}
Antenna type	Integrated
Bluetooth version compliant to	V2.1 (+EDR disabled by firmware)
Bluetooth conformance test	EB/2008/30014

Operation modes:

- synchronous mode (SCO or eSCO traffic, for HV, DV or EV packets) for transmitting voice or data,
- asynchronous mode (ACL traffic, for DM or DH packets) for transmitting data,
- mixed transfer mode (for voice and data)

The most important mode is the ACL mode at a data rate of 1 Mbps for the worst case.

Packets:

A summery of the packets in ACL mode and their characteristics is shown in the following table:

Type	Payload Header (bytes)	User Payload (bytes)	FEC	CRC	Symmetric Max. Rate (kb/s)	Asymmetric Max. Rate (kb/s)	
						Forward	Reverse
DM1	1	0-17	2/3	yes	108.8	108.8	108.8
DH1	1	0-27	no	yes	172.8	172.8	172.8
DM3	2	0-121	2/3	yes	258.1	387.2	54.4
DH3	2	0-183	no	yes	390.4	585.6	86.4
DM5	2	0-224	2/3	yes	286.7	477.8	36.3
DH5	2	0-339	no	yes	433.9	723.2	57.6
AUX1	1	0-29	no	no	185.6	185.6	185.6

Modulation types:

The modulation used of the EUT is GFSK, other modulation types are disabled.

The frequency range was scanned from the lowest frequency generated 10 MHz to 25000 MHz. All emissions not reported in this test report were more than 20 dB below the specified limit.

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 20 January 2009

Testing concluded on : 27 January 2009

Checked by:

Tested by:

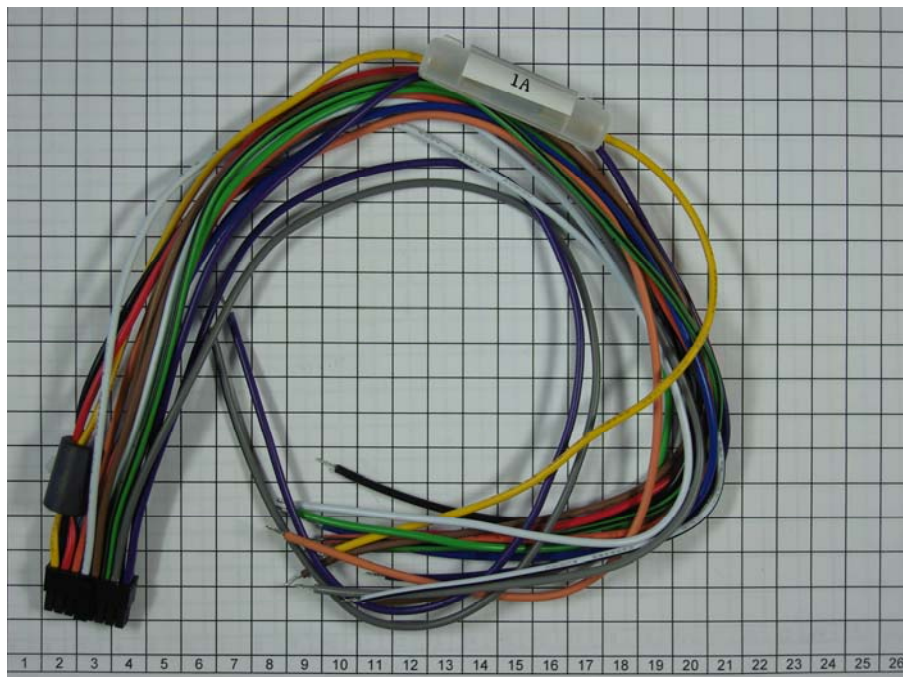
Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Hermann Smetana
Dipl.-Ing.(FH)
Radio Expert

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT

External views:



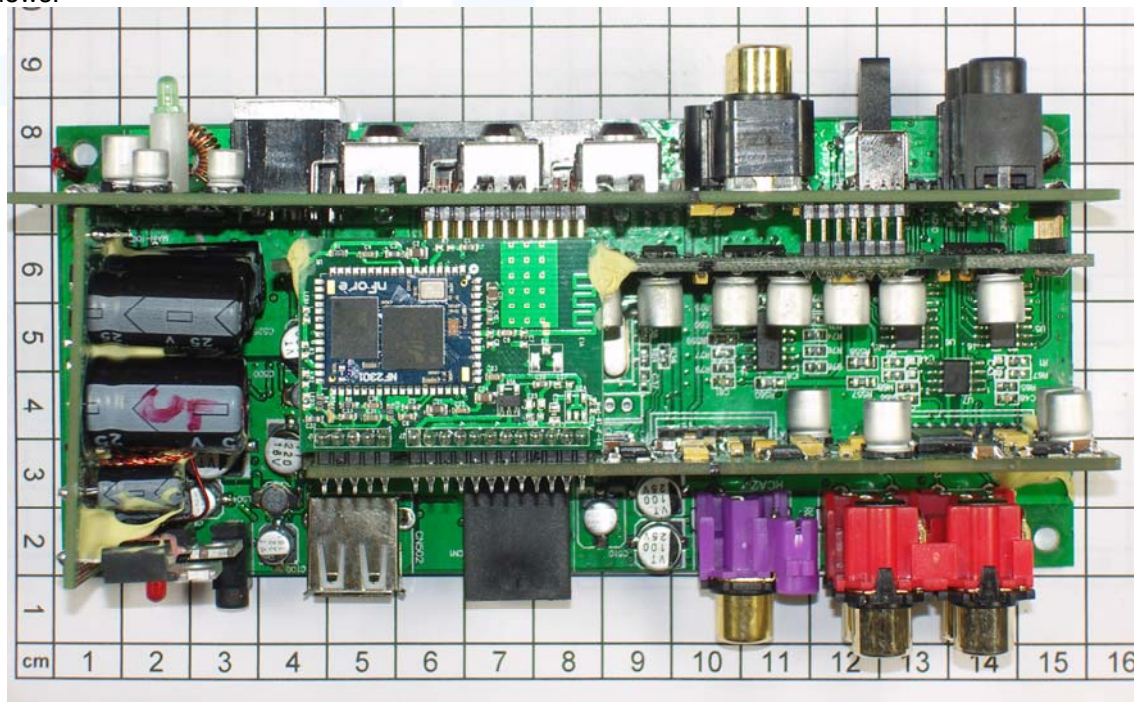
FCC ID: APIINFIMS



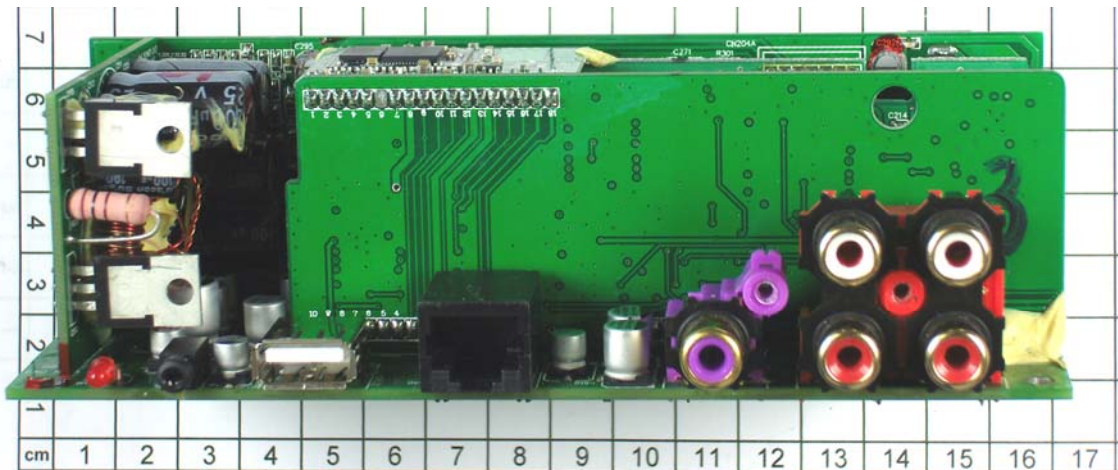
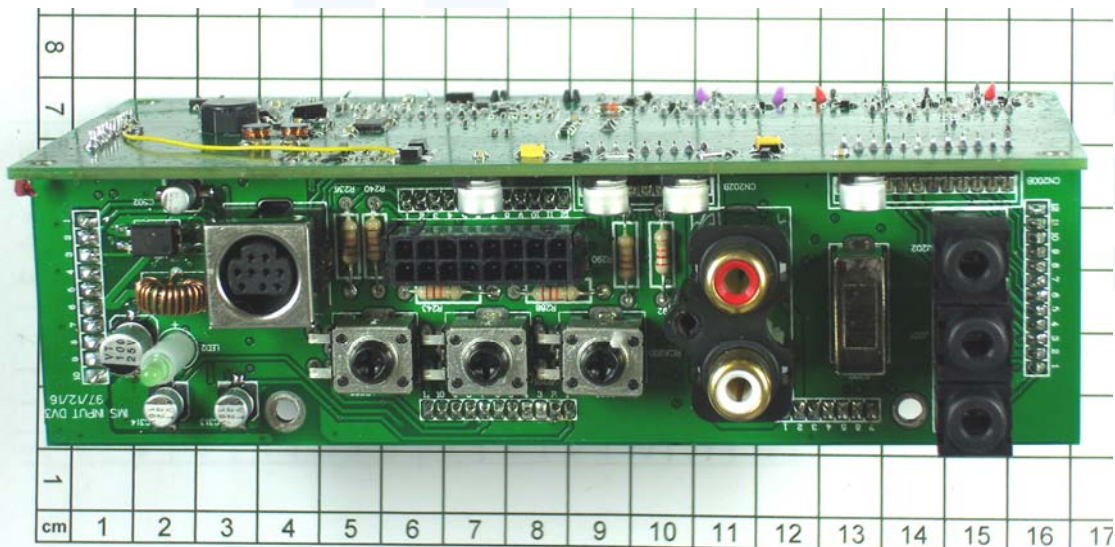
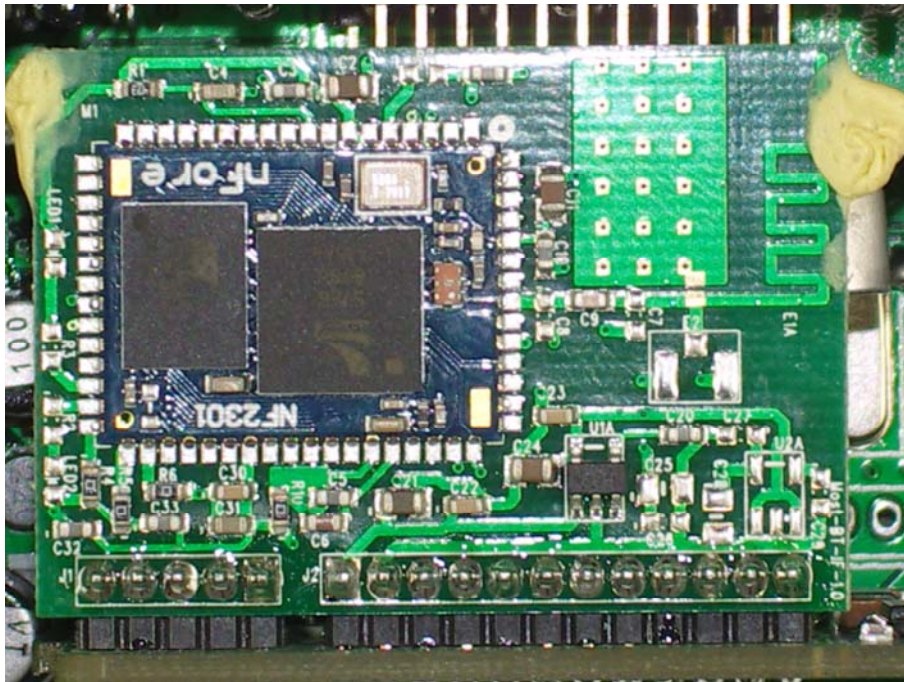
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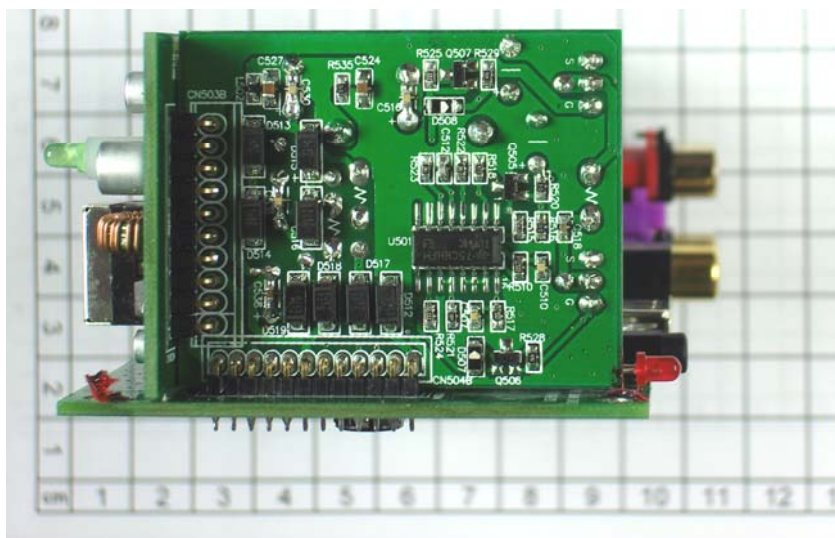
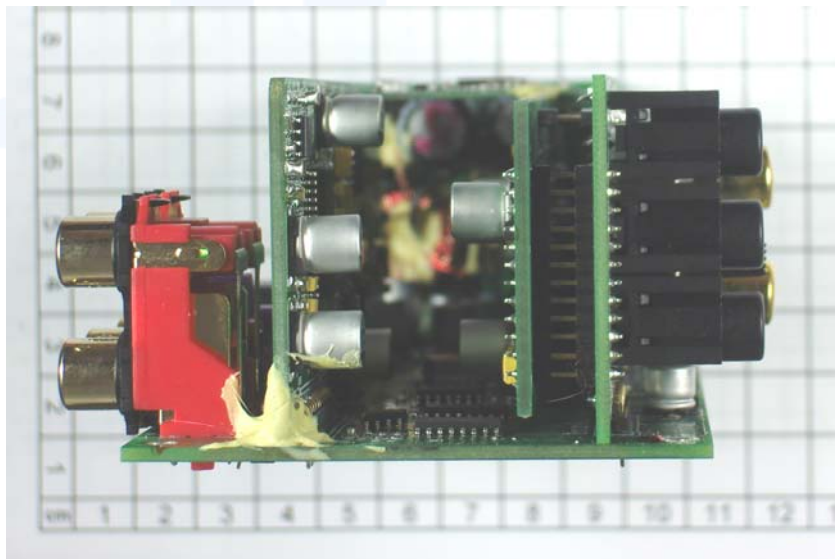
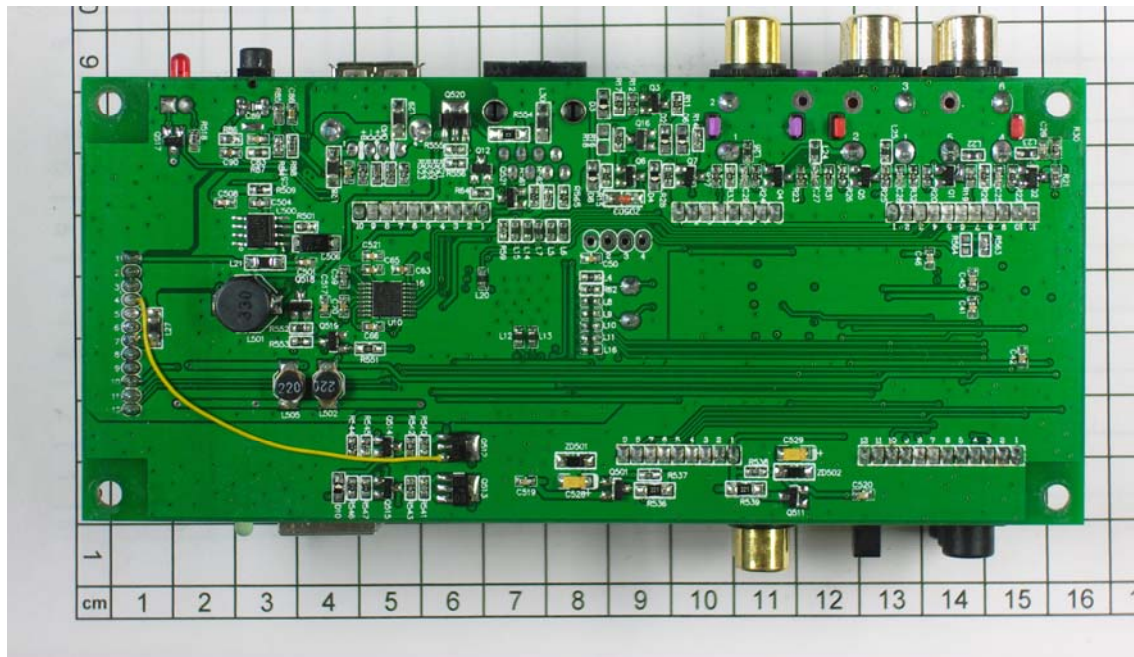
Internal views:



FCC ID: APIINFIMS



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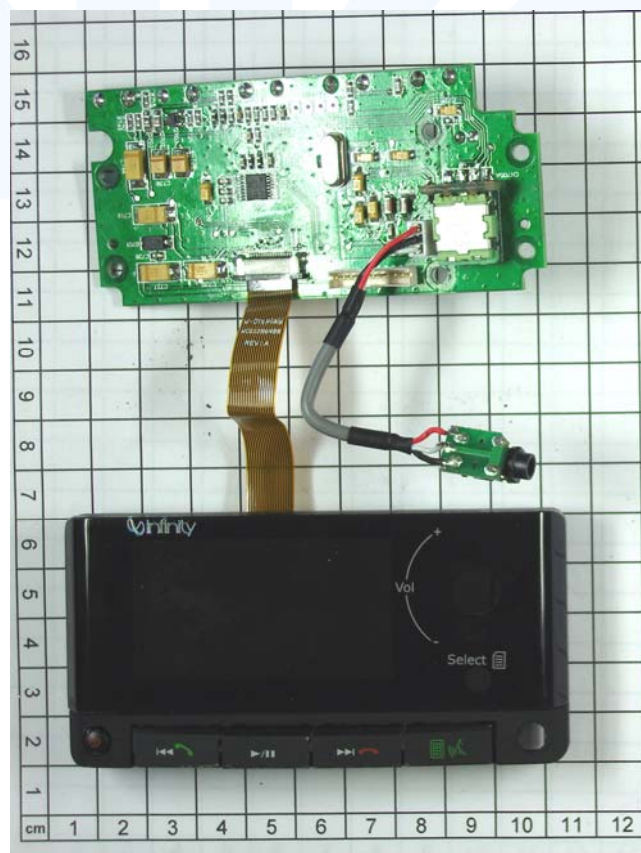
FCC ID: APIINFIMS

Control unit external view:

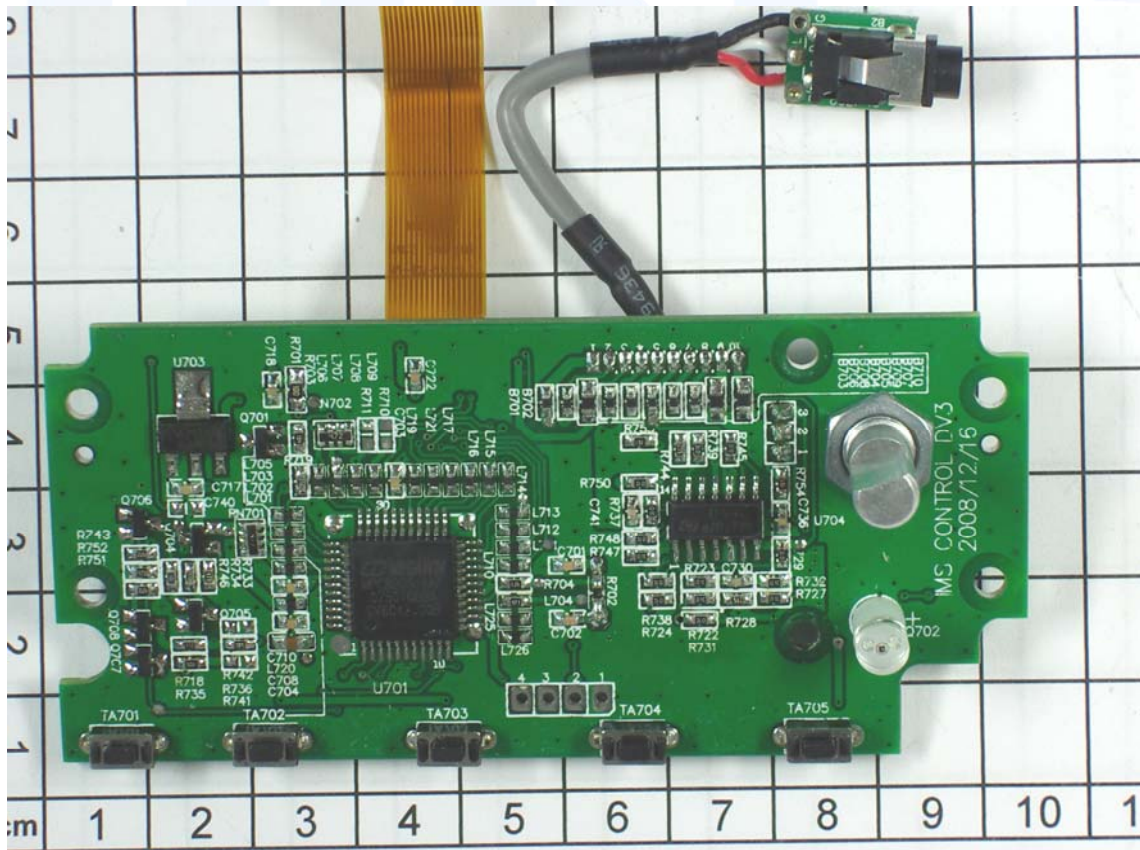
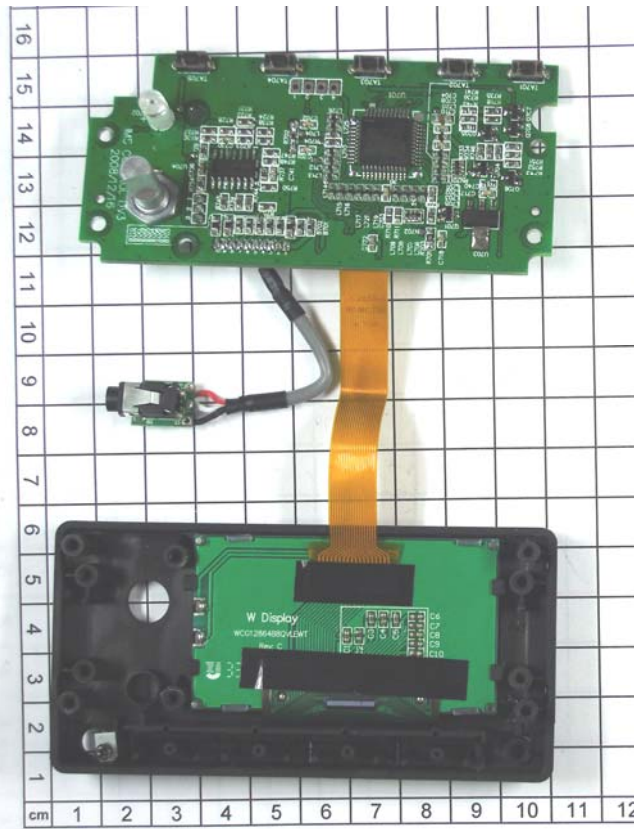


FCC ID: APIINFIMS

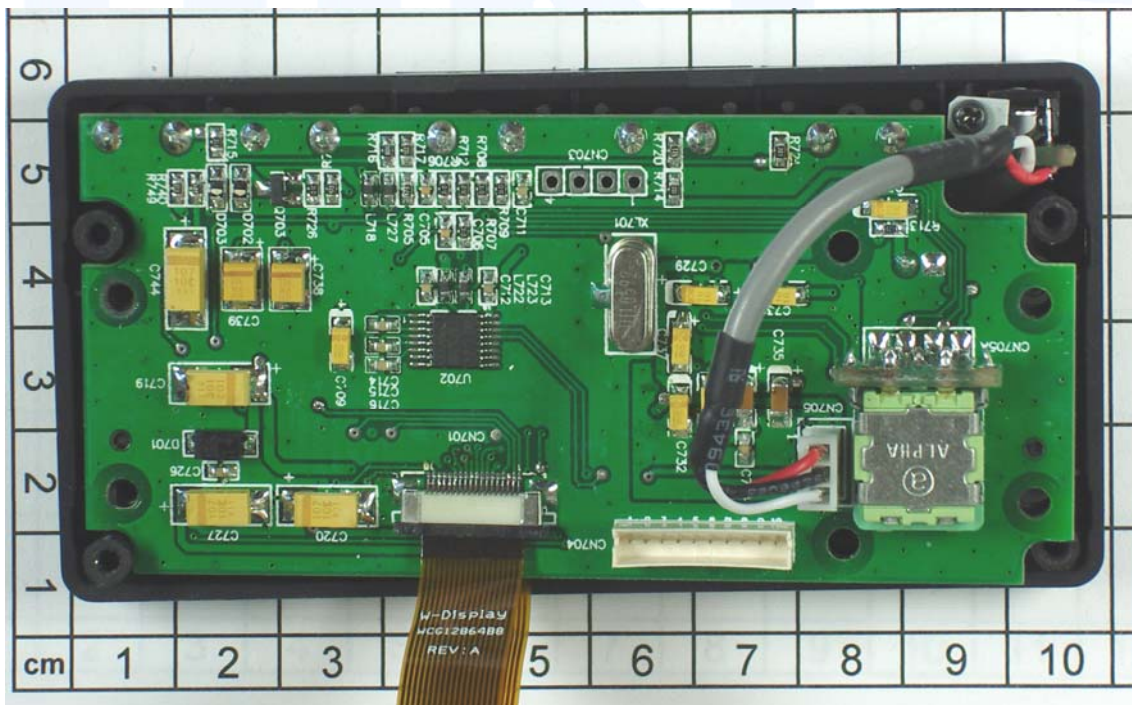
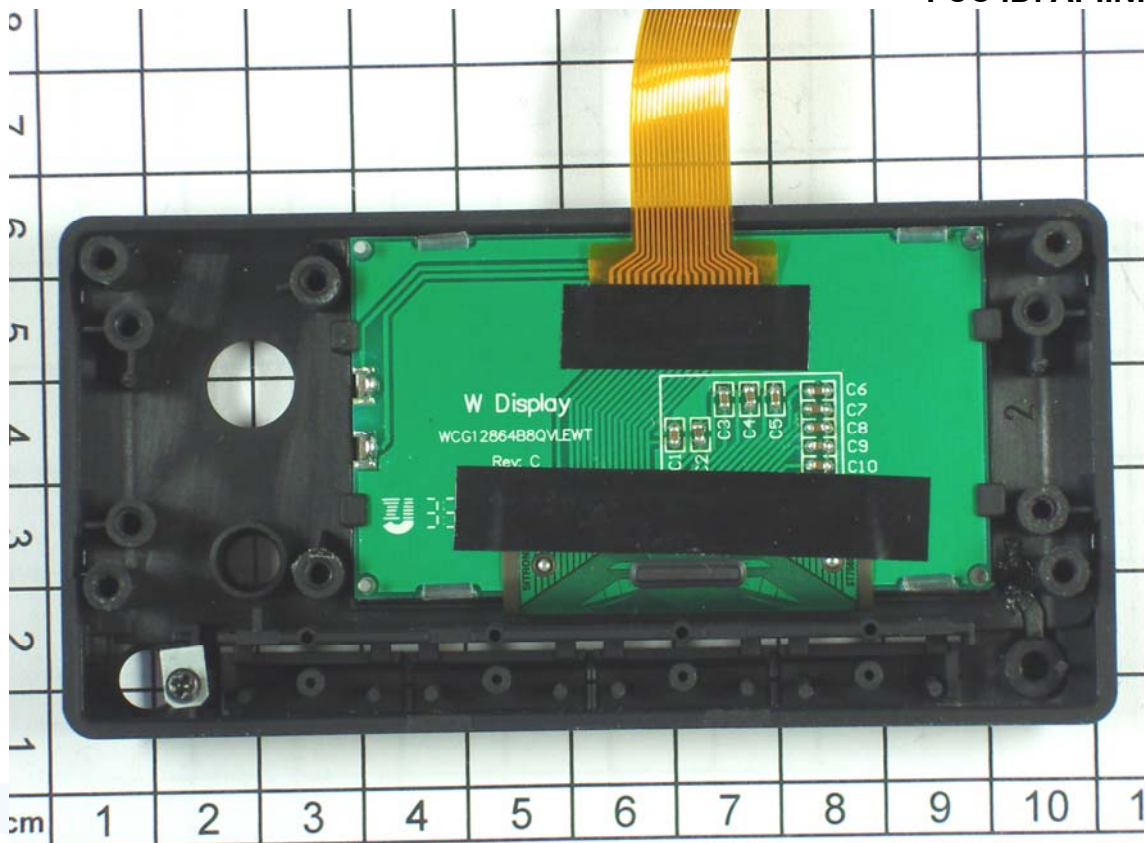
Internal views:



FCC ID: APIINFIMS



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3.2 Power supply system utilised

Power supply voltage: : 12 VDC (car application)

3.3 Short description of the EUT

The EUT manage the various possible audio inputs in case of upgrade poor initial car equipment. The main function is a hands free Bluetooth phone kit switching in case of a call automatically to the audio channel.

Number of tested samples: 1
Serial number: Prototype 2

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- TX mode

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- _____ Model : _____
- _____ Model : _____
- _____ Model : _____
- _____ Model : _____
- _____ Model : _____
- _____ Model : _____

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 Strasskirchen
Germany

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.2 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

mikes

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: NONE

Remarks: The measurement is not applicable. The EuT has no AC mains connections.

5.2 Maximum peak output power

For test instruments and accessories used see section 6 Part CPR 3.

5.2.1 Description of the test location

Test location: Anechoic Chamber A2

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15C, Section 15.247(b)(1, 2):

The maximum peak output power of an intentional radiator shall not exceed the limit defined in dependency of the channel separation and of the number of hopping channels.

5.2.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode using the assigned frequency.

Alternative test procedure: Radiated maximum peak output power:

If conducted tests cannot be performed on the EUT, radiated tests to show compliance with the various requirements of FCC Part 15C, Section 15.247 are performed. Radiated maximum peak output power from the EUT is measured above 1 GHz, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 cm above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4. The Interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. Measurements are made in both the horizontal and vertical polarization in a fully anechoic chamber using a spectrum analyser. During the tests the EUT is rotated 360 degrees to find the maximum level of emission.

Analyzer Settings:

Trace: Max. hold
 Detector: Max. peak
 RBW: greater than 20 dB bandwidth
 VBW: ≥ RBW
 Sweep Time: Coupled

5.2.5 Test result

Channel	Frequency (MHz)	Peak Power (dBm)	Correct. (dB)	Corr. peak power (dBm)	Limit (dBm)	Delta (dB)
1	2402	-1.7	2.15	0.5	30	29.5
40	2441	-1.5	2.15	0.6	30	29.4
79	2480	-1.4	2.15	0.8	30	29.2

Peak Power Limit according to FCC Part 15C, Section 15.247(b)(1, 2):

Frequency (MHz)	Hopping channels	Hop. CH carrier frequency separation	Peak Power Limit	
			(dBm)	(W)
2400-2483.5		25 kHz ≤ fs 2/3 20dB BW	21	0.125
2400-2483.5	min. 75		30	1.0
5725-5850	-		30	1.0

The requirements are **FULFILLED**.

Remarks: It was used the alternative test procedure “radiated maximum peak output power” because
the EUT has only an integrated antenna without any external antenna connectors.

5.3 Spurious emissions

For test instruments and accessories used see section 6 Part SER 2, SER 3.

5.3.1 Description of the test location

Test location: OATS1
Test location: Anechoic Chamber A2
Test distance: 3 metres

5.3.2 Photo documentation of the test set-up

Open area test site



Anechoic chamber

**5.3.3 Applicable standard**

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.3.4 Description of Measurement

Radiated spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linear polarized antennas. The measurements are made with 120 kHz bandwidth and quasi-peak detection. The EUT is placed on a 1.0 X 1.5 m non-conducting table 80 cm above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. To locate maximum emissions from the EUT the antenna is shifted in height from 1 to 4 m, after the EUT is rotated 360 degrees. The measurement scan is made in horizontal and vertical polarization of the antenna. For the radiated measurement up from 1 GHz to maximum frequency as specified in Section 15.33, a spectrum analyzer and appropriate linear polarized antennas are used. The EUT is placed on a 1.0 X 1.5 m non-conducting table 80 cm above the ground plane. The set up of the EUT will be in accordance to ANSI C63.4. To locate maximum emissions the EUT was rotated 360 degrees in the fully anechoic chamber. The measurement scan is made in horizontal and vertical polarization of the antenna. For testing above 1 GHz, if the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

Spectrum analyzer settings:

RBW: 100 kHz for $f < 1$ GHz and 1 MHz for $f > 1$ GHz
 VBW: 300 kHz for $f < 1$ GHz and 3 MHz for $f > 1$ GHz
 Detector: Max. peak
 Trace: Max. hold
 Sweep: Auto

5.3.5 Test result

5.3.5.1 Radiated emission test $f < 1$ GHz)

Corrected field strength of fundamental wave as reference for radiated emissions: 107.5 dB μ V/m

Frequency (MHz)	Level PK (dB μ V)	Level QP (dB μ V)	Correct. factor (dB)	Corrected level QP dB(μ V/m)	Corrected level AV dB(μ V/m)	Limit PK dB(μ V/m)	Limit AV dB(μ V/m)	Delta (dB)

All not recorded emissions in the frequency range to 1 GHz are more than 20 dB below the limit.

5.3.5.2 Radiated emission test $f > 1$ GHz

Corrected field strength of fundamental wave as reference for radiated emissions: 107.5 dB μ V/m

Frequency (MHz)	L: PK (dB μ V)	Duty Cycle (dB)	L: AV (dB μ V)	Correction (dB)	L: PK dB(μ V/m)	L: AV dB(μ V/m)	Limit PK dB(μ V/m)	Delta (dB)
4964	52.5	1		1.7	54.2		74	19.8

All not recorded emissions in the frequency range > 1 GHz are more than 20 dB below the limit.

Peak-Limit according to FCC Part 15C, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band 2400 – 2483.50 MHz, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

Final radiated limits for spurious emissions which fall not in restricted band:

Frequency (MHz)	Limits acc. 15.209 dB(μ V/m)	Measurement distance (m)	Limits acc. 15.247(d) dB(μ V/m)			Final radiated limits dB(μ V/m)		
			Ch 1	Ch 40	Ch 79	Ch 1	Ch 40	Ch 79
	Limit							
0.009-0.490	2400/ f (kHz)	300						
0.490-1.705	24000/ f (kHz)	30						
1.705-30	30	30						
30-88	40	3						
88-216	43,5	3						
216-960	46	3						
Above 960	54	3	87.5	87.6	87.8	87.5	87.6	87.8

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Radiated limits according to FCC Part 15C, Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(μ V/m)	dB(μ V/m)	
0.009 - 0.490	2400/f (kHz)		300
0.490 - 1.705	24000/f (kHz)		30
1.705 - 30	30	29,5	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED**.

Remarks: During the test the EUT was set into TX continuous mode with normal modulation.
The measurement was performed up to the 10th harmonic (25000 MHz).

5.4 Hopping sequence

Requirement according to FCC Part 15C, Section 15.247(a):

The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

Remarks: The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF-
channels.

5.5 Equal hopping frequency use

Requirement according to FCC Part 15C, Section 15.247(a):

Each frequency must be used equally on the average by each transmitter.

Remarks: The EUT complies with the Bluetooth V2.1 RF specifications.

5.6 Receiver input bandwidth

Requirement according to FCC Part 15C, Section 15.247(a):

The system receivers shall have input bandwidth that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signal.

Remarks: The receiver bandwidth is equal to the transmitter bandwidth in the 79 hopping channel mode,
which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.

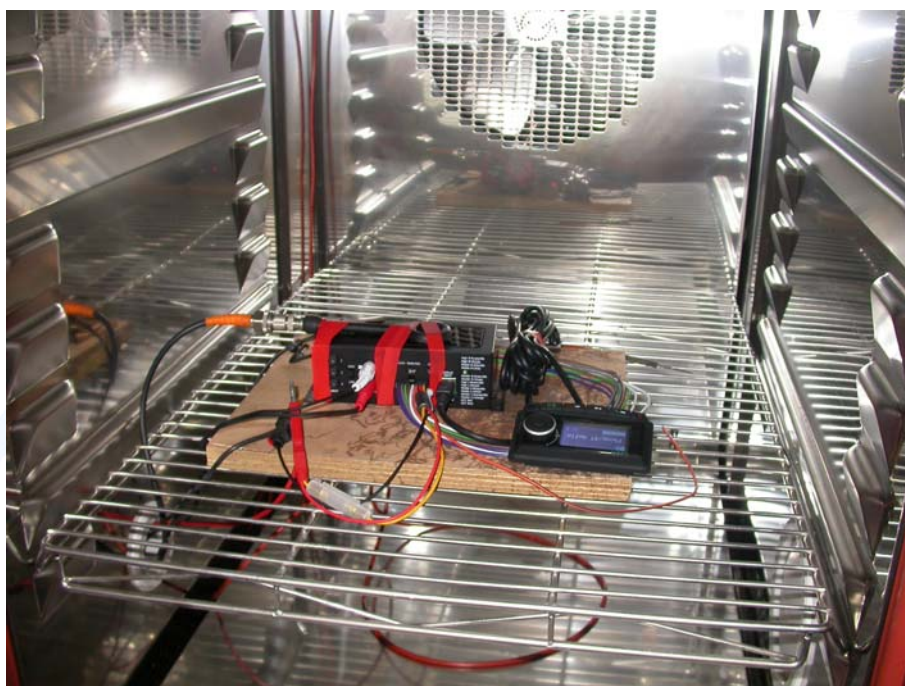
5.7 Band edge emission

For test instruments and accessories used see section 6 Part MB.

5.7.1 Description of the test location

Test location: AREA4

5.7.2 Photo documentation of the test set-up



5.7.1 Applicable standard

According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.7.2 Description of Measurement

The EUT was connected to the spectrum analyzer with a suitable attenuator. The span of the spectrum analyzer was set wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The highest amplitude appearing on spectral display was measured and it was set as the reference level for the emission mask. It was allowed the trace to stabilize and after then it was set the emission mask on the reference level to show the compliance with the band edge requirements.

Spectrum analyzer settings:

RBW: $\geq 1\%$ of the span

VBW: \geq RBW

Sweep: Auto

Detector function: Peak

5.7.3 Test result

Frequency (MHz)	Peak Power Output (dB μ V/m)	Spurious emission reading (dB μ V/m)	Result of Band edge (dB μ V/m)	Band edge LIMIT (dB μ V/m)
< 2400	107.5		39.2	54
> 2483.5	107.8		40.0	54

Peak-Limit according to FCC Part 15C, Section 15.205(a):

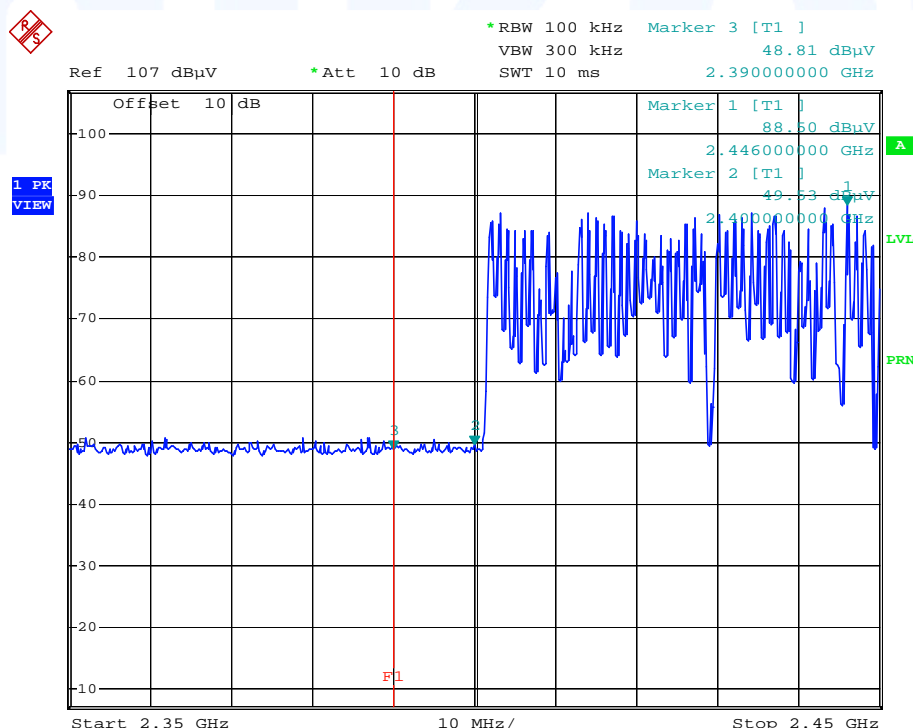
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

5.7.4 Test protocol

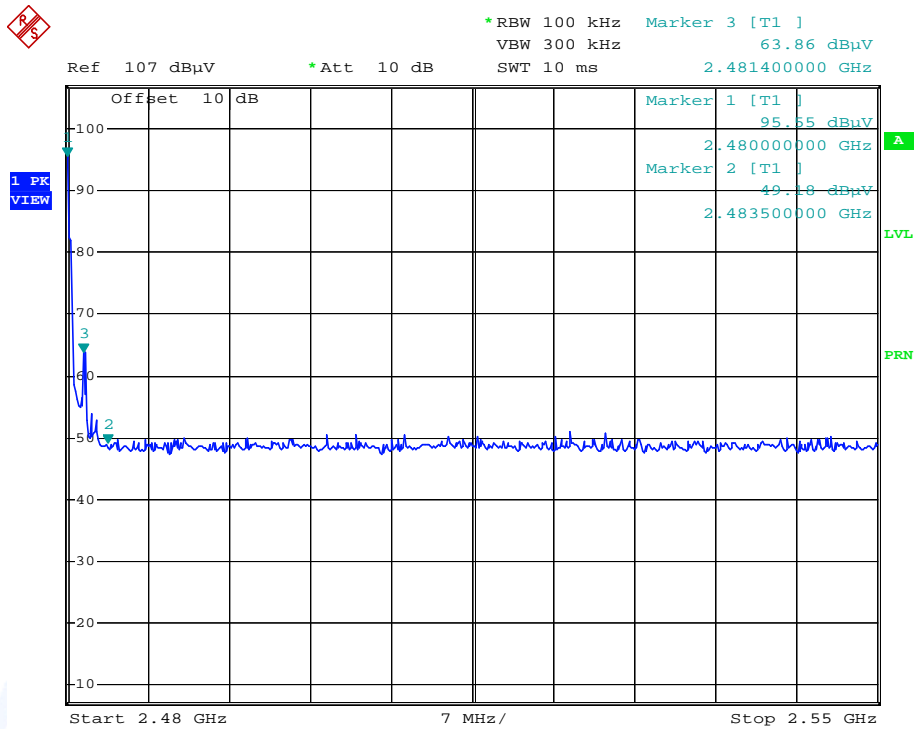
Lower Channel



Comment: SER3 Edge, Pos Y, 10 dB Daempfung
Date: 20.JAN.2009 16:22:29

FCC ID: APIINFIMS

Higher Channel



Comment: SER3 Edge, Pos Y, 10 dB Daempfung
 Date: 20.JAN.2009 16:14:21

5.8 Dwell time

For test instruments and accessories used see section 6 Part MB.

5.8.1 Description of the test location

Test location: NONE

5.8.2 Applicable standard

According to FCC Part 15, Section 15.247(a):

In Section 15.247(a)(1i)(1ii) and (1iii) are dwell times defined for the special frequency ranges should not exceed by a frequency hopping system.

5.8.3 Description of Measurement

The measurement was done using a spectrum analyser in time domain function on one channel frequency in the middle of the band. A trigger takes care of display the dwell time of this channel when the hop set applies the channel at once. The measurement has been done again for the occupancy of one channel over the whole period and recorded. The particular time intervals are added over the value of occupancy in the several operation modes.

Operation modes:

DH1 Packet mode permits maximum 1600 hops per second in each channel, supporting 1 TX- and 1 RX-channel.

Hops per second $1600/79/2 = 10.13$

Occupancy per period: $10.13 * 31.6 = 320.10$ times

DH3 Packet mode permits maximum 1600 hops per second in each channel, supporting 3 TX- and 1 RX-channel.

Hops per second $1600/79/4 = 5.06$

Occupancy per period: $5.06 * 31.6 = 159.9$ times

DH5 Packet mode permits maximum 1600 hops per second in each channel, supporting 5 TX- and 1 RX-channel.

Hops per second $1600/79/6 = 3.37$

Occupancy per period: $3.37 * 31.6 = 106.5$ times

5.8.4 Test result

The worst case of burst length is one time slot = 0.625 ms, this was taken for the calculation of the dwell time.

Operating mode	Time of period (s)	Time of 1 burst (ms)	Number of Bursts (per period)	Dwell time per period (ms)
DH1	$0.4 \text{ ms} * 79 = 31.6$	0.625	320	200
DH3	$0.4 \text{ ms} * 79 = 31.6$	1.875	160	300
DH5	$0.4 \text{ ms} * 79 = 31.6$	3.125	107	334

Requirement according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	time of one period (s)	Limit dwell time, AV (ms)
2400-2483.5	≥ 15	$0.4 * (\text{number of channels})$	< 400
5725-5850	≥ 75	30	< 400

The requirements are **FULFILLED**.

Remarks: This item is part of the compliance according to Bluetooth Core Specifications V2.1 and approved.

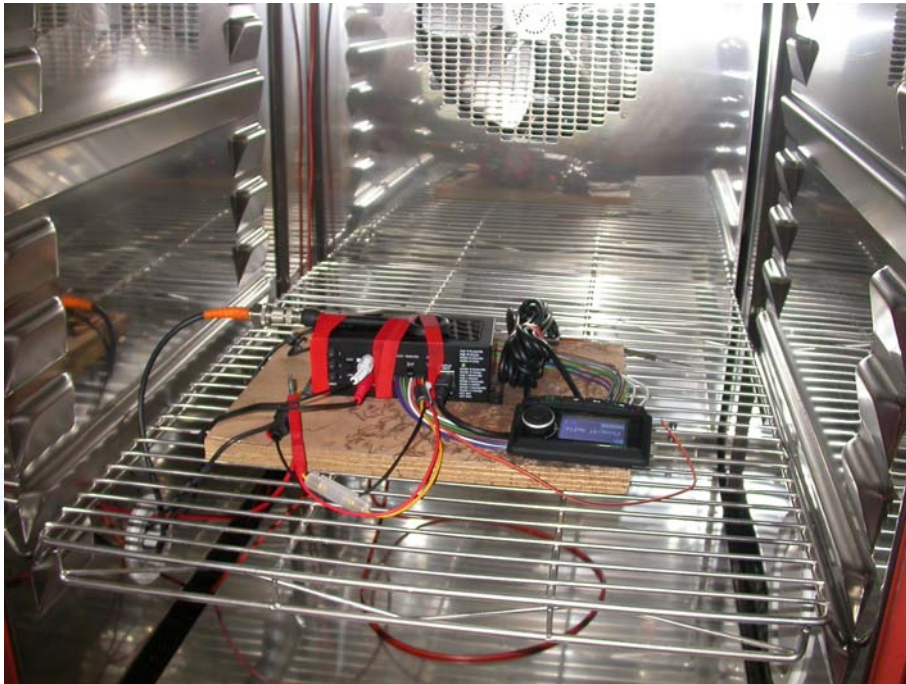
5.9 Channel separation

For test instruments and accessories used see section 6 Part MB.

5.9.1 Description of the test location

Test location: AREA4

5.9.2 Photo documentation of the test set-up



5.9.3 Applicable standard

According to FCC Part 15, Section 15.247(a):

For frequency hopping systems in the frequency band of 2400 MHz – 2483.5 MHz are limits in the channel separation defined.

5.9.4 Description of Measurement

The measurement is performed using a spectrum analyser in single sweep mode. A part of the operating frequency was used for better resolution. In normal application mode all the channels of the part of operating frequency are displayed and the separation is measured. The 20 dB OBW has to be measured before to compare whether the OBW requirement is fulfilled.

5.9.5 Test result

20 dB bandwidth (MHz)	Channel separation (MHz)	Hopping channels
0.680	1.000	79

FCC ID: APIINFIMS

Limit according to FCC Part 15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit channel separation (kHz)
All systems		> 25 kHz or 20 dB bandwidth, which ever is greater
2400-2483.5	≥ 15	

The requirements are **FULFILLED**.

Remarks:

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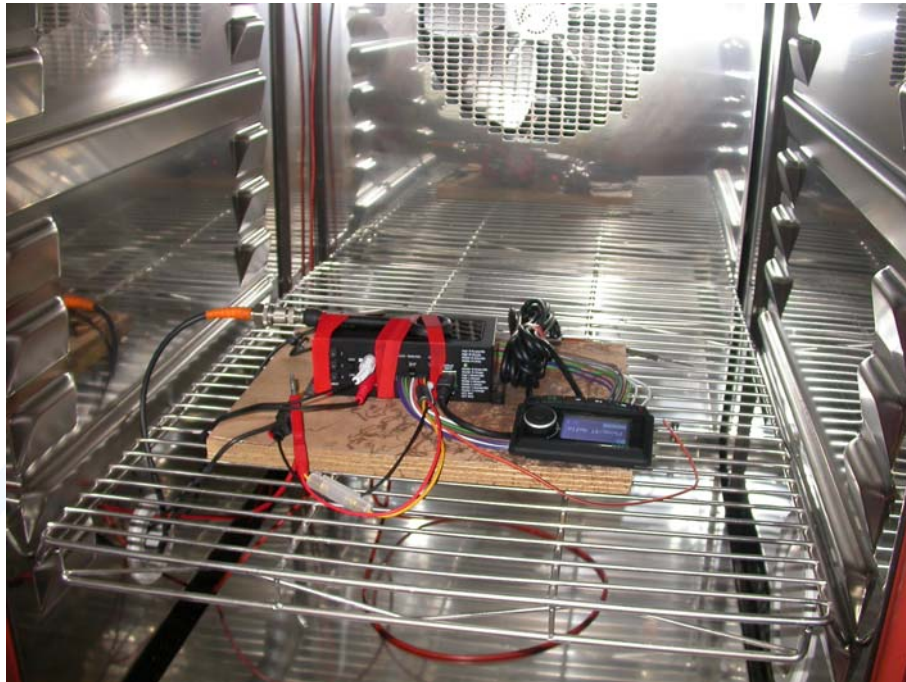
5.10 Quantity of hopping channels

For test instruments and accessories used see section 6 Part MB.

5.10.1 Description of the test location

Test location: AREA4

5.10.2 Photo documentation of the test set-up



5.10.3 Test result

Hopping channel frequency range (MHz)	Quantity of all available hopping channels	Quantity of hopping channels minimum limit
2402 – 2480	79	15

Limit according to FCC Part 15C, Section 15.247(1):

Frequency range (MHz)	LIMIT (Quantity of Hopping Channels)			
	20dB Bandwidth < 250kHz	20dB Bandwidth > 250kHz	20dB Bandwidth < 1 MHz	20dB Bandwidth > 1MHz
2400 – 2483,5	15	15	15	15
5725 - 5850	n.A	n.A	75	---

The requirements are **FULFILLED**.

Remarks: The EUT is conforming to Bluetooth Standard V2.1 and use 79 hopping channels.

5.11 Antenna application

5.11.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT is designed with integrated antenna.

The supplied antenna meets the requirements of part 15.203 and 15.204.

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5.12 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPR 3**.

5.12.1 Description of the test location

Test location: NONE

Remarks: The EUT has so low radiated power that no evaluation of the MPE is necessary.



6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model / Type	Kind of Equipment	Manufacturer	Equipment No.
CPR 3	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	AFS4-01000400-10-10P-4	RF Amplifier 1-4 GHz	PARZICH GMBH	02-02/17-05-003
	AMF-4F-04001200-15-10P	RF Amplifier 4-12 GHz	PARZICH GMBH	02-02/17-05-004
	AFS5-12001800-18-10P-6	RF Amplifier 12-18 GHz	PARZICH GMBH	02-02/17-06-002
	3115	Horn Antenna 1-18 GHz	EMCO Elektronik GmbH	01-02/24-01-011
	Sucoflex N-1600-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-073
	Sucoflex N-2000-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-075
MB	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	WK-340/40	Climatic Chamber	Weiss Umwelttechnik GmbH	02-02/45-05-001
	6543A	Power Supply	HP Hewlett-Packard	02-02/50-05-157
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog Broad Band Anten	Schwarzbeck Mess-Elektron	02-02/24-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 3	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	AFS4-01000400-10-10P-4	RF Amplifier 1-4 GHz	PARZICH GMBH	02-02/17-05-003
	AMF-4F-04001200-15-10P	RF Amplifier 4-12 GHz	PARZICH GMBH	02-02/17-05-004
	AFS5-12001800-18-10P-6	RF Amplifier 12-18 GHz	PARZICH GMBH	02-02/17-06-002
	3115	Horn Antenna 1-18 GHz	EMCO Elektronik GmbH	01-02/24-01-011
	Sucoflex N-1600-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-073
	Sucoflex N-2000-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-075

Equipment No.	Next Calibration	Last Calibration	Next Verification	Last Verification
02-02/11-05-001	04.08.2009	04.08.2008		
02-02/17-05-003				
02-02/17-05-004				
02-02/17-06-002				
01-02/24-01-011	05/08/2009	05/08/2008		
02-02/50-05-073				
02-02/50-05-075				
02-02/11-05-001	04.08.2009	04.08.2008		
02-02/45-05-001	09.01.2010	09.01.2005	07.12.2009	01.12.2009
02-02/50-05-157				
02-02/03-05-006	07/30/2009	07/30/2008		
02-02/24-05-005	05.06.2011	05.06.2008	02/28/2009	08/29/2008
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
02-02/11-05-001	04.08.2009	04.08.2008		
02-02/17-05-003				
02-02/17-05-004				
02-02/17-06-002				
01-02/24-01-011	05/08/2009	05/08/2008		
02-02/50-05-073				
02-02/50-05-075				