

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Cobra Automotive Technologies SpA
HelloBiker® by Spyball®, Bluetooth Wireless Intercom

To: FCC Part 15.247: 2005 (Subpart C)

Test Report Serial No:
RFI/RPTE1/RP48547JD08A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: pp. 	
Tested By: Frank Kane 	Checked By: Michael Derby 
Report Copy No: PDF01	
Issue Date: 28 November 2006	Test Dates: 19 September 2006 to 13 November 2006

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1. Client Information

Company Name:	Cobra Automotive Technologies spa
Address:	Business Unit Spyball Via Astico n. 41 21100 Varese Italy
Contact Name:	Mr B Sjöberg

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2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Description:	Wireless Intercom and Hands Free Equipment
Brand Name:	Spyball®
Model Name or Number:	HelloBiker®
Serial Number:	None stated
Hardware Version:	A3A
Software Version:	HB 1.0
FCC ID Number:	NWDC6715
Country of Manufacture:	Italy
Date of Receipt:	19 September 2006

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	Battery Charger
Brand Name:	RRC Power Solutions
Model Name or Number:	EPC06WC003/UK/M (07AC0021A (Cobra P/N)) – UK Plug EPC06WC003/EU/M (07AC0019A (Cobra P/N)) – EU Plug EPC06WC003/US/M (07AC0020A (Cobra P/N)) – US Plug EPC06WC003/AUS/M – Australian Plug
Serial Number:	Not Applicable
Cable Length and Type:	2m, Screened Single Core
Connected to Port:	3468B

2.3. Description of EUT

The equipment under test was a HelloBiker® wireless intercom with hands free function for mobile phones, using *Bluetooth* technology. When audio connection is been activated, rider and pillion can talk without any wires hindering their movements. When an incoming call reaches either mobile phone, HelloBiker® switches into 'hands free' mode and mutes the intercom facility. At the end of the phone call, the intercom function is reinstated. Hellobiker® is suitable for most brands and models of helmets, with DIY fitting.

2.4. Modifications Incorporated in EUT

No modifications were made during the testing.

Prior to testing, the device had been set to enable a test mode. For extreme voltage tests, the battery terminals were connected to an external power supply.

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2.5. Additional Information Related to Testing

Power Supply Requirement:	Internal Battery supply of 3.6 V DC, nominal		
Intended Operating Environment:	Residential and Commercial		
Equipment Category:	Bluetooth		
Type of Unit:	Portable (Standalone battery powered device)		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Receive Frequency Range:	2402 MHz to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Maximum Power Output (EIRP)	-7.6 dBm (measured)		

2.6. Port Identification

Port	Description	Type/Length	Applicable
1	Battery	Molex – 2pins	Transmit Mode
2	Battery – Charger	3468B	Idle Mode
3	Microphone / Speaker / General signal	JST – 10 pins	All Modes

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2.7. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Lithium-Polymer Battery 1100mAh – 3.7 V
Brand Name:	Varta Microbattery
Model Name or Number:	Poliflex 2P/PLF 443441 (Cobra P/N 05BA0030A)
Serial Number:	None stated
Cable Length and Type:	Fitted Internally
Connected to Port:	2 pin Molex connector

Description:	Headset (Microphone and Earphone)
Brand Name:	Not Applicable
Model Name or Number:	07AC0018A (Cobra P/N) 07AC0022A (Cobra P/N)
Serial Number:	None stated
Cable Length and Type:	1m, 2 core headphone cable
Connected to Port:	JST – 10 pins

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3. Test Specification

Reference:	FCC Part 15.247: 2005 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR22) (Intentional Radiators operating within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz)

3.1. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)

Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

3.2. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

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4. Deviations from the Test Specification

There were no deviations from the test specification.

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5. Operation of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated:

During transmit tests, the EUT was communicating with a *Bluetooth* test set.

During idle mode test, the EUT receiver was active.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

Headphones and microphone connected.

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6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliance Status
Idle Mode AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2005 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2005 Section 15.109	Antenna	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2005 Section 15.247(a)(1)	Antenna	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2005 Section 15.247(a)(1)	Antenna	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2005 Section 15.247(a)(1)(iii)	Antenna	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2005 Section 15.247(b)(1)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2005 Sections 15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2005 Sections 15.247(d) & 15.209(a)	Antenna	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ.

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7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

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7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

The EUT was configured for AC conducted emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.158	Live	39.6	65.6	26.0	Complied
0.170	Live	53.3	65.0	11.7	Complied
0.178	Live	55.6	64.6	9.0	Complied
0.214	Live	54.8	63.0	8.2	Complied
0.318	Live	46.1	59.8	13.7	Complied
0.426	Live	45.1	57.3	12.2	Complied
0.526	Neutral	42.6	56.0	13.4	Complied
0.562	Live	25.8	56.0	30.2	Complied
0.726	Neutral	41.8	56.0	14.2	Complied
0.750	Neutral	44.1	56.0	11.9	Complied

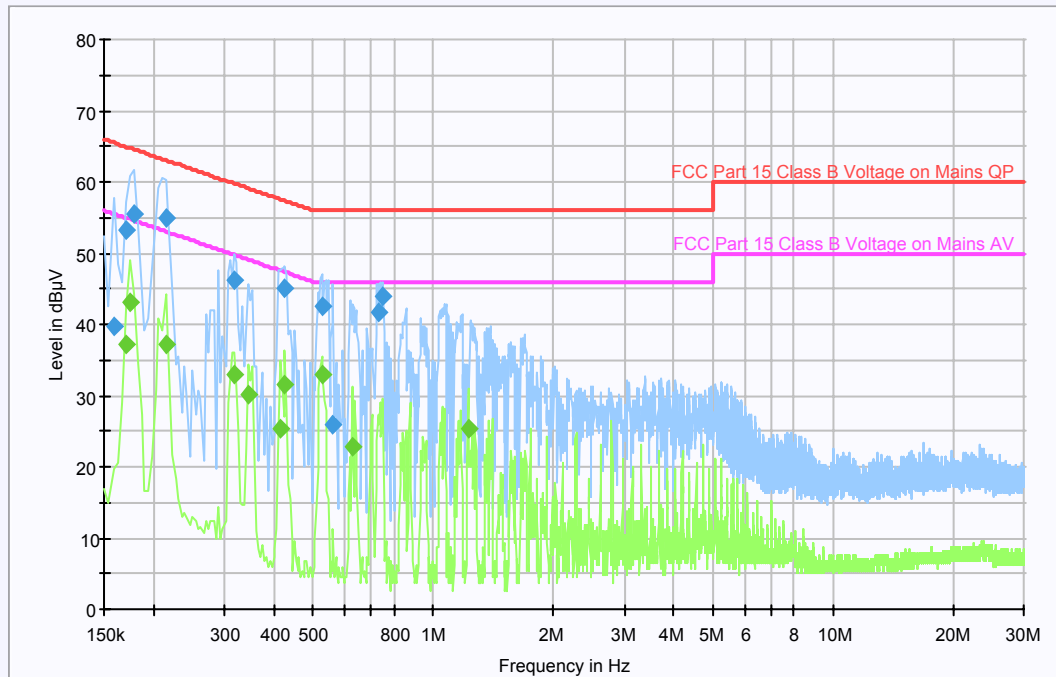
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Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)**Average Detector Measurements on Live and Neutral Lines**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.170	Neutral	37.2	55.0	17.8	Complied
0.174	Neutral	43.1	54.8	11.7	Complied
0.214	Live	37.3	53.0	15.7	Complied
0.318	Neutral	33.0	49.8	16.8	Complied
0.346	Neutral	30.2	49.1	18.9	Complied
0.414	Live	25.3	47.6	22.3	Complied
0.426	Live	31.6	47.3	15.7	Complied
0.526	Live	33.1	46.0	12.9	Complied
0.626	Live	22.7	46.0	23.3	Complied
1.222	Neutral	25.3	46.0	20.7	Complied

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Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109

The EUT was configured for radiated emission testing, as described in section 9 of this report.

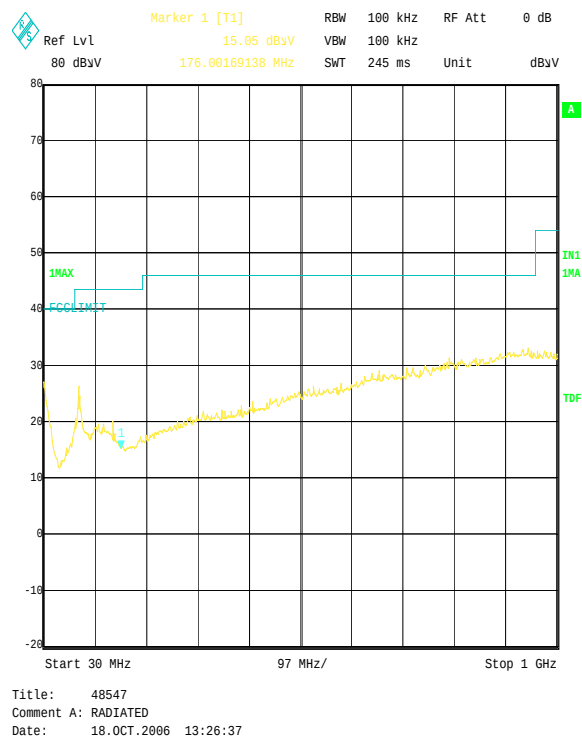
Tests were performed to identify the maximum receiver or standby radiated emission levels.

Results:**Electric Field Strength Measurements (Frequency Range: 30 MHz to 1000 MHz)**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
94.368	Vertical	37.5	43.5	6.0	Complied
96.003	Vertical	28.3	43.5	15.2	Complied
98.395	Horizontal	31.7	43.5	11.8	Complied

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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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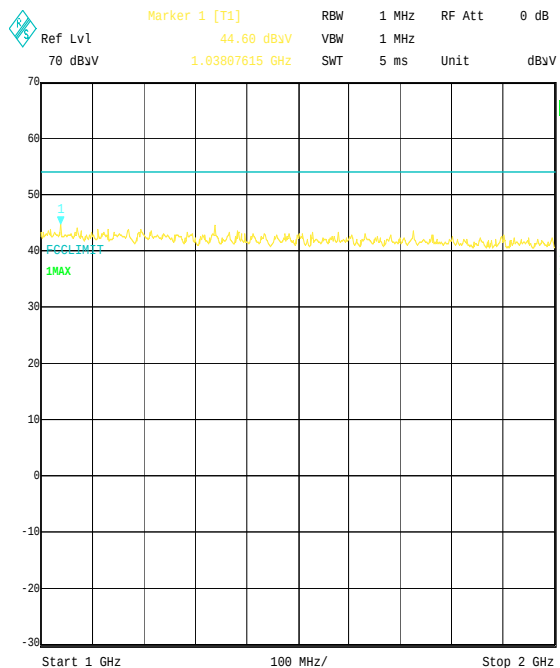
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)**Results:****Electric Field Strength Measurements (Frequency Range: 1 GHz to 12.5 GHz)****Highest Peak Level:**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3.24924	Vertical	42.8	-11.1	31.7	74.0	42.3	Complied

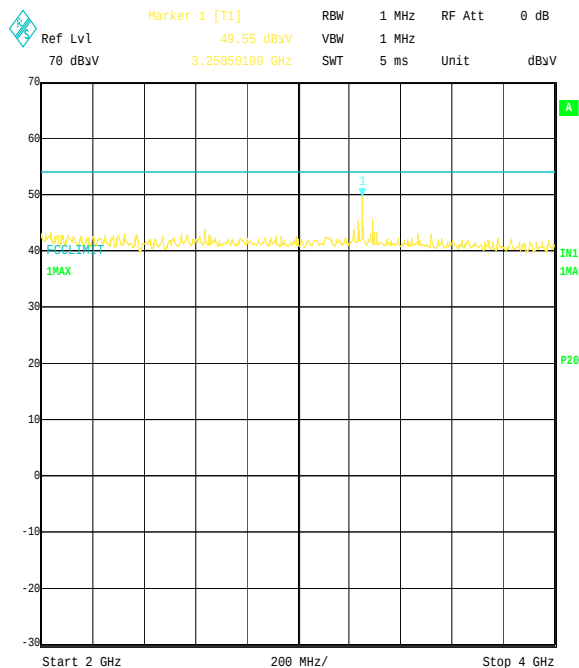
Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3.24924	Vertical	33.0	-11.1	21.9	54.0	32.1	Complied

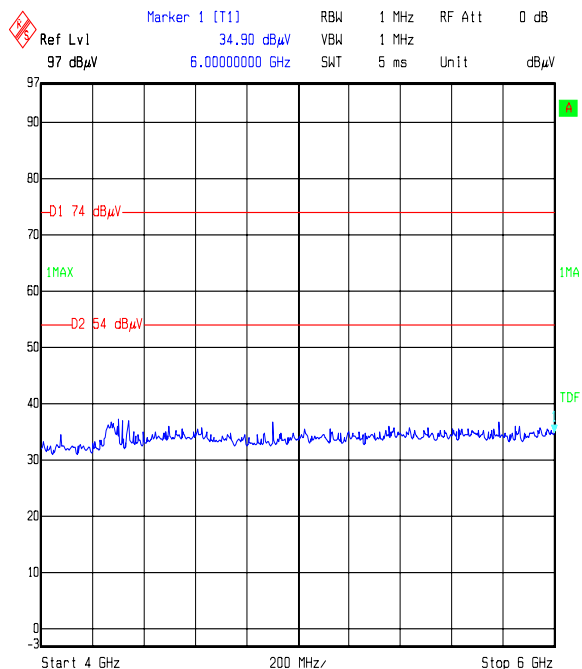
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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

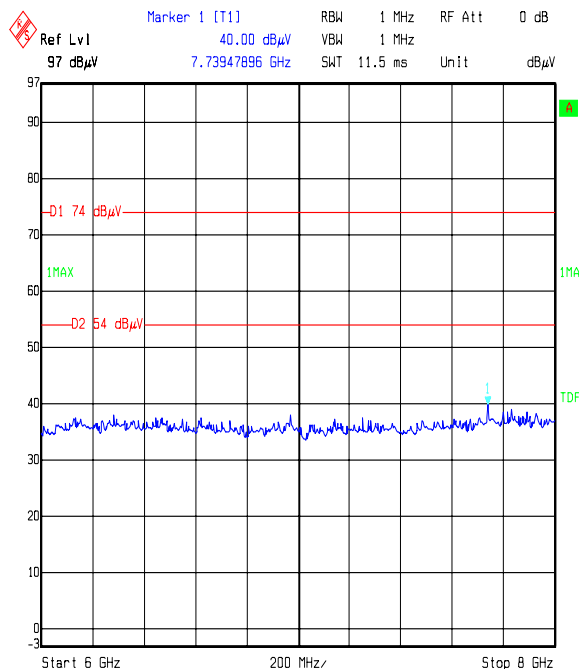
Title: 48547
Comment A: RADIATED
Date: 18.OCT.2006 16:12:55



Title: 48547
Comment A: RADIATED
Date: 18.OCT.2006 15:43:14



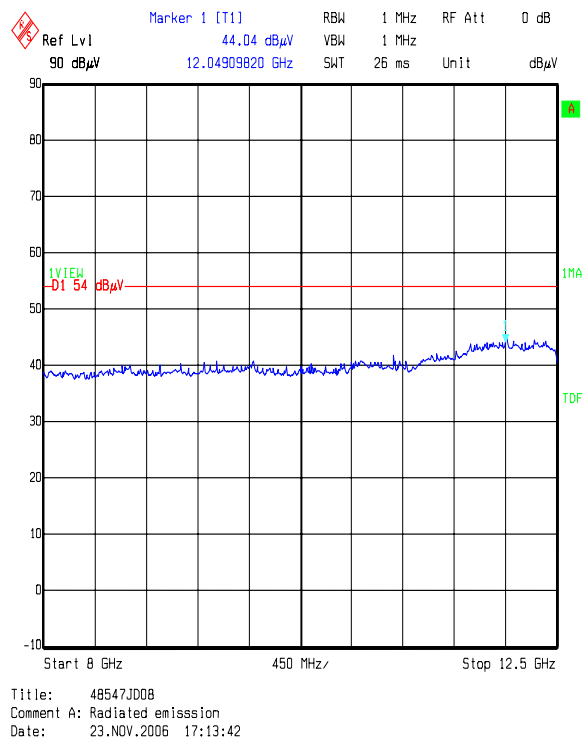
Title: 48547JD08 FCC15.247
Comment A: TX RADIATED EMISSION
Date: 10.NOV.2006 15:41:01



Title: 48547JD08 FCC15.247
Comment A: TX RADIATED EMISSION
Date: 10.NOV.2006 15:43:09

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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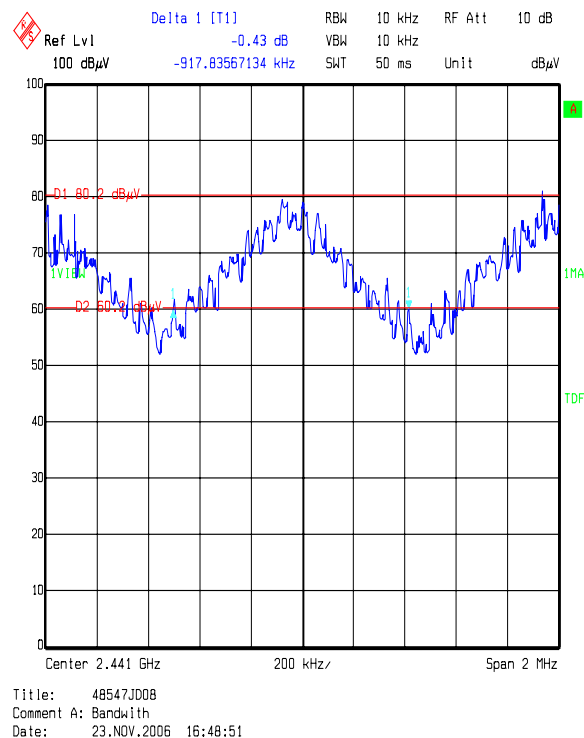
7.2.3. Transmitter 20 dB Bandwidth: Section 15.247(a) (1)

The EUT was configured for 20 dB bandwidth measurements, as described in section 9 of this report.

Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)
917.836



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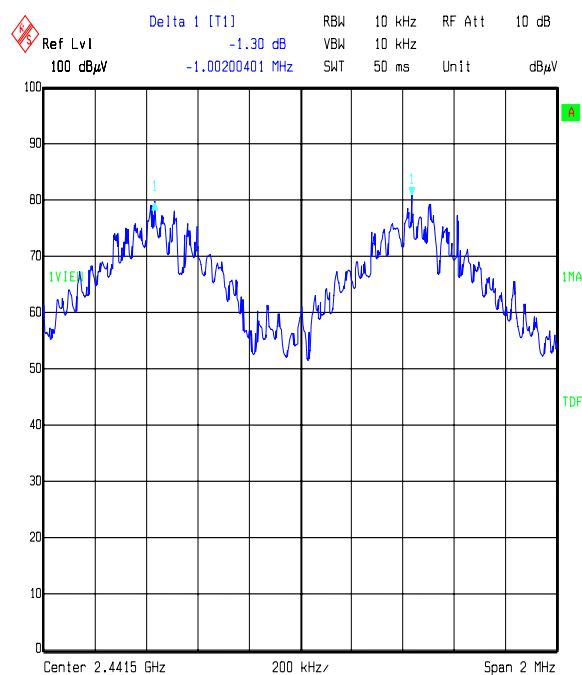
7.2.4. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

The EUT was configured for carrier frequency separation measurements, as described in section 9 of this report.

Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit ($> \frac{2}{3}$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	611.891	390.113	Complied



Title: 48547JD08
Comment A: Bandwidth
Date: 23.NOV.2006 16:54:50

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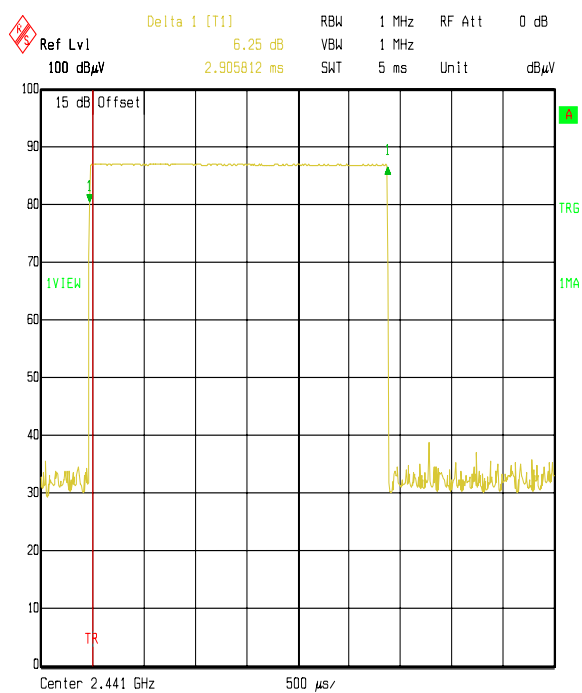
7.2.5. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

The EUT was configured for average time of occupancy measurements, as described in section 9 of this report.

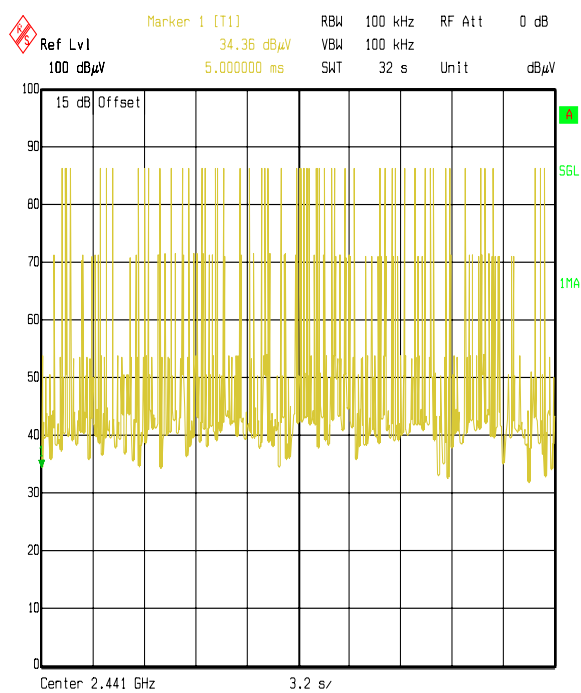
Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Results:

Emission Width (μ s)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2905.81	116	0.337	0.4	0.063	Complied



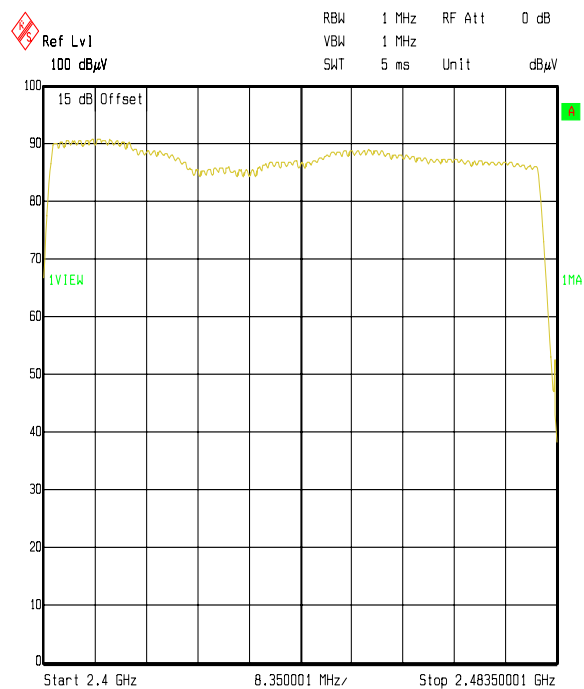
Title: 48547JD08
Date: 13.NOV.2006 13:05:19



Title: 48547JD08
Date: 13.NOV.2006 12:59:01

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Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)



Title: 48547JD08
Date: 13.NOV.2006 12:52:06

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7.2.6. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1)

The EUT was configured for transmitter peak output power measurements, as described in Section 9 of this report.

Tests were performed to identify the transmitter maximum peak output power (EIRP) of the EUT.

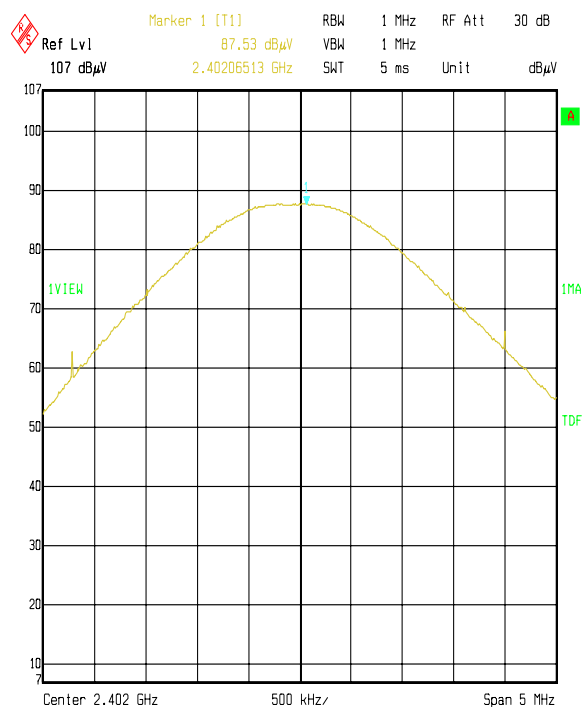
Results:**Battery Powered Devices**

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-7.7	30.0	37.7	Complied
Middle	-8.2	30.0	38.1	Complied
Top	-7.6	30.0	37.6	Complied

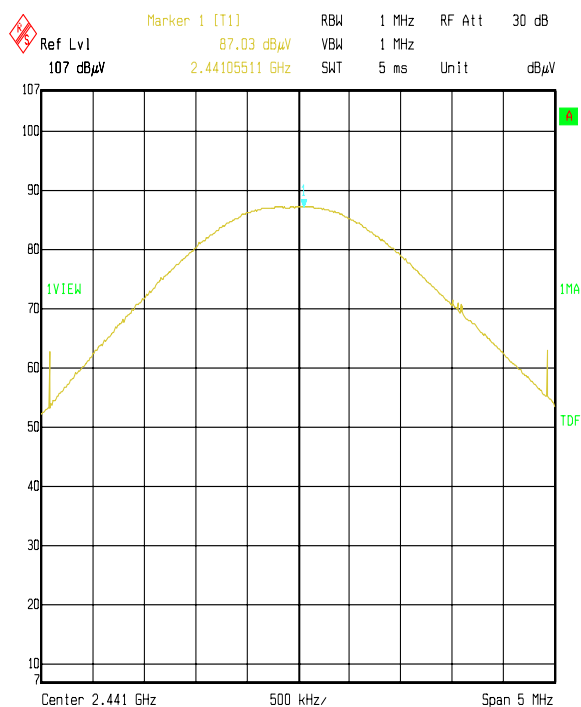
Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable
2. Cobra Automotive Technologies SpA confirmed that although the Bluetooth module rated output is 0 dBm, the levels shown here are what they would expect from the final product.

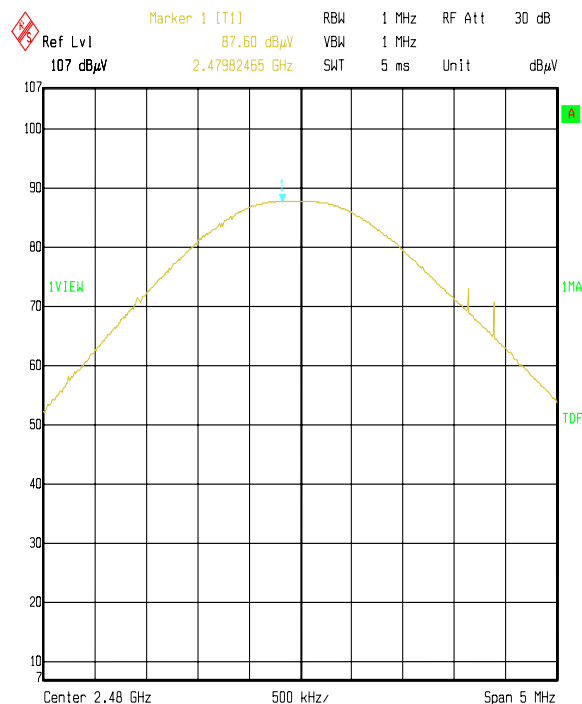
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Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)

Date: 31.OCT.2006 17:19:36



Date: 31.OCT.2006 16:06:14



Date: 31.OCT.2006 16:14:08

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7.2.7. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a)

The EUT was configured for radiated emission testing, as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:**Electric Field Strength Measurements: 30 MHz to 1000 MHz
(emissions occurring in the restricted bands)****Top Channel**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
112.002	Vertical	20.8	43.5	22.7	Complied

Note(s):

1. The preliminary scans showed similar emission levels for each channel of operation below 1 GHz, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.

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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

The EUT was configured for radiated emission testing, as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

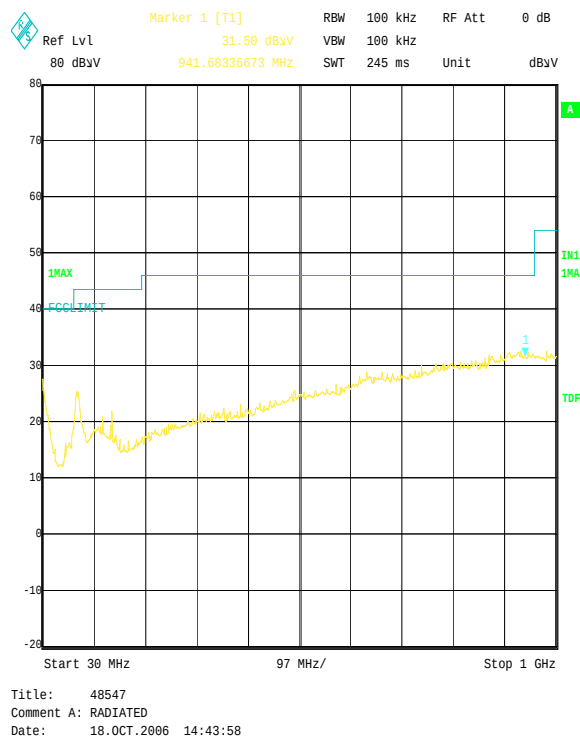
Results:**Electric Field Strength Measurements: 30 MHz to 1000 MHz
(emissions outside the restricted bands)****Top Channel**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
96.009	Horizontal	24.1	67.6	43.5	Complied
160.001	Horizontal	24.3	67.6	43.3	Complied
144.002	Horizontal	21.0	67.6	46.6	Complied
176.002	Horizontal	23.8	67.6	43.8	Complied

Note(s):

1. The preliminary scans showed similar emission levels for each channel of operation below 1 GHz, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.

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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

The EUT was configured for radiated emission testing, as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

**Electric Field Strength Measurements (Frequency Range: 1 GHz to 25 GHz)
(emissions within restricted bands)**

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.2058	Vertical	43.2	-4.4	38.8	74.0	35.2	Complied

Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.2058	Vertical	31.2	-4.4	26.8	54.0	27.2	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.3228	Vertical	51.1	-4.3	46.8	74.0	27.2	Complied

Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.3228	Vertical	42.9	-4.3	38.6	54.0	15.4	Complied

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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)**Highest Peak Level: Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.4399	Vertical	51.4	-4.3	47.0	74.0	26.9	Complied

Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.4399	Vertical	43.1	-4.3	38.8	54.0	15.2	Complied

Highest Peak Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.3997	Vertical	53.2	-4.3	48.9	74.0	25.1	Complied

Highest Average Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.3882	Vertical	33.4	-4.3	29.1	54.0	24.9	Complied

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HelloBiker® by Spyball®, Bluetooth Wireless Intercom
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

The EUT was configured for radiated emission testing, as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:**Electric Field Strength Measurements (Frequency Range: 1 GHz to 25.0 GHz)
(emissions outside restricted bands)****Highest Peak Level: Bottom Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
3207.5	Vertical	47.4	-11.1	36.3	67.6	31.3	Complied
3306.5	Vertical	46.8	-11.0	35.8	67.6	31.8	Complied

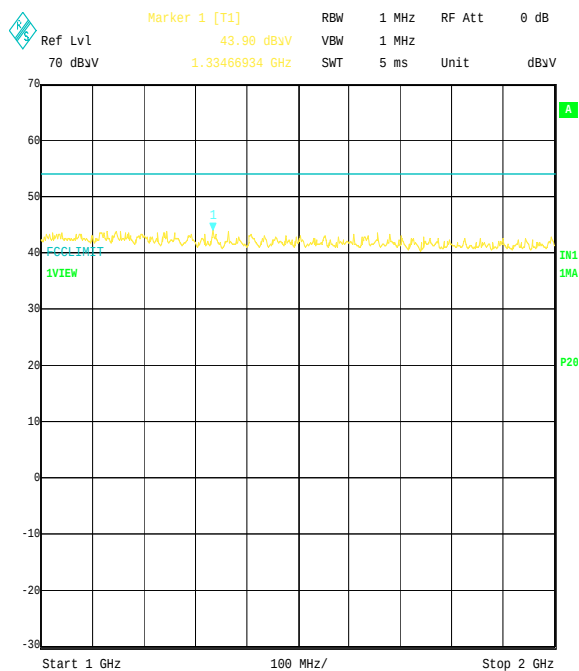
Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
3202.5	Vertical	48.5	-11.1	37.4	67.6	30.2	Complied
3306.5	Vertical	48.6	-11.0	37.6	67.6	30.0	Complied

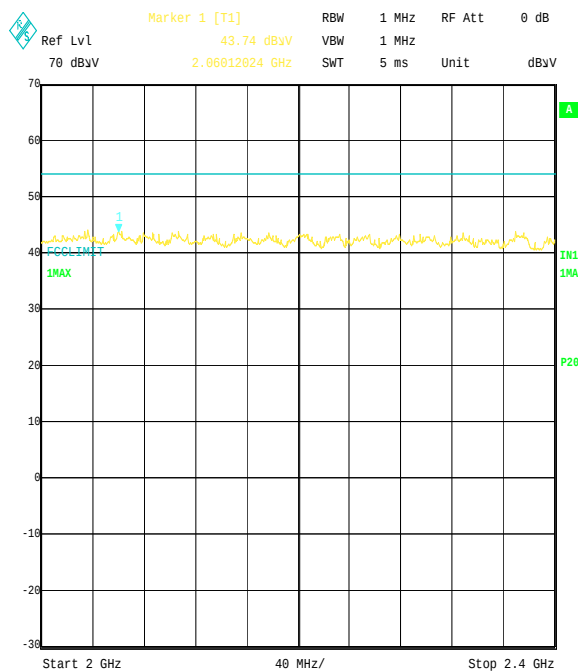
Note(s):

1. All emissions were below 20dB limit.

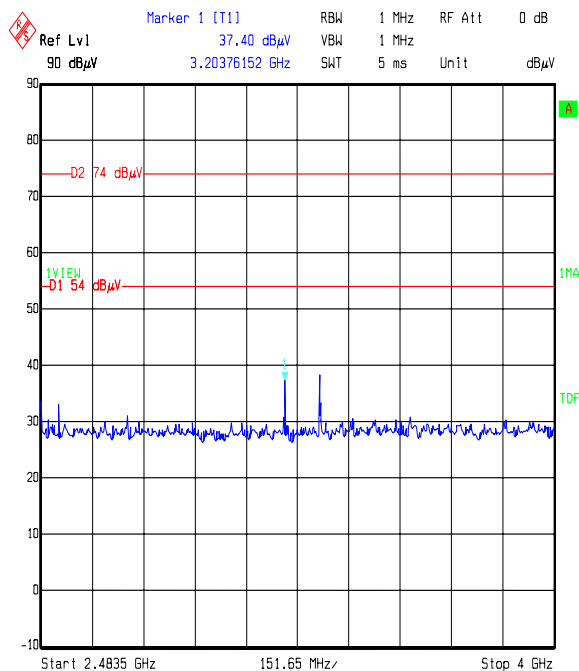
Test of: **Cobra Automotive Technologies SpA**
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

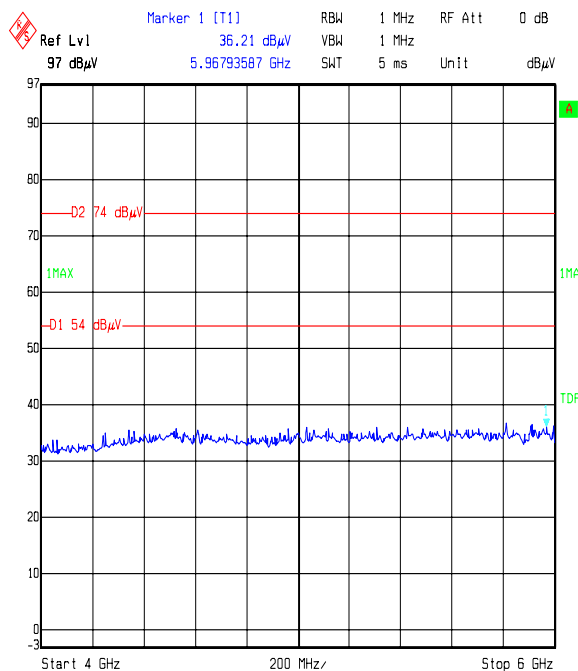
Title: 48547
Comment A: RADIATED
Date: 18.OCT.2006 16:09:45



Title: 48547
Comment A: RADIATED
Date: 18.OCT.2006 15:19:28



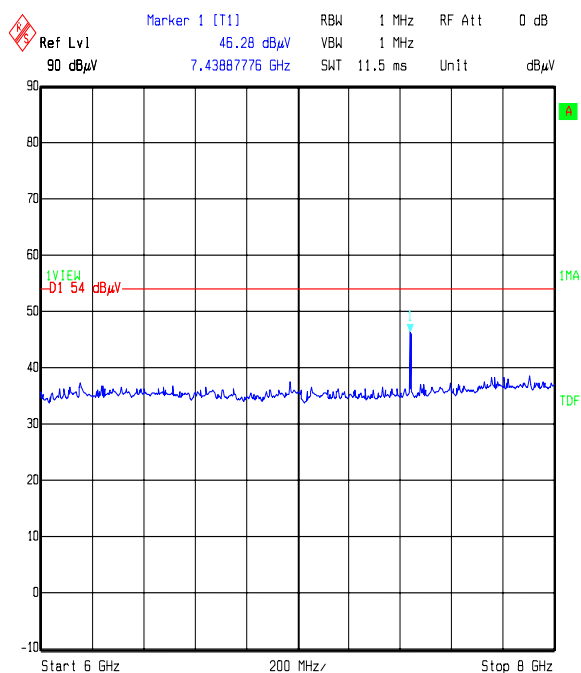
Title: 48547JD08
Comment A: Radiated emission
Date: 23.NOV.2006 17:04:12



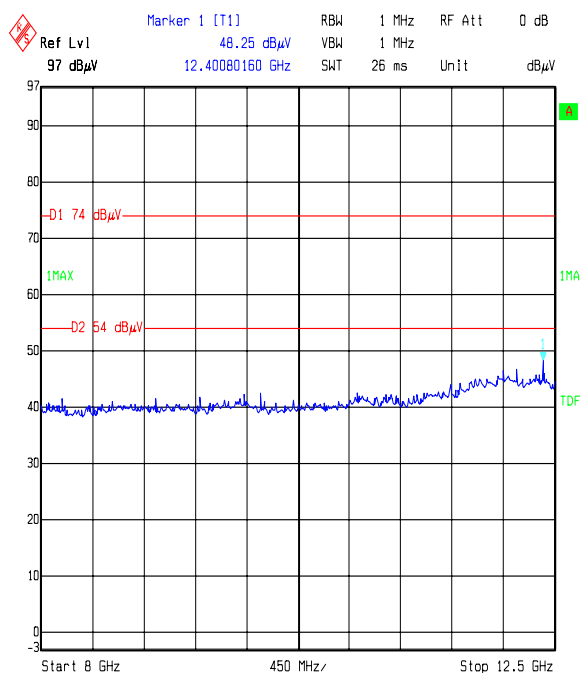
Title: 48547JD08 FCC15.247
Comment A: TX RADIATED EMISSION
Date: 10.NOV.2006 12:53:18

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

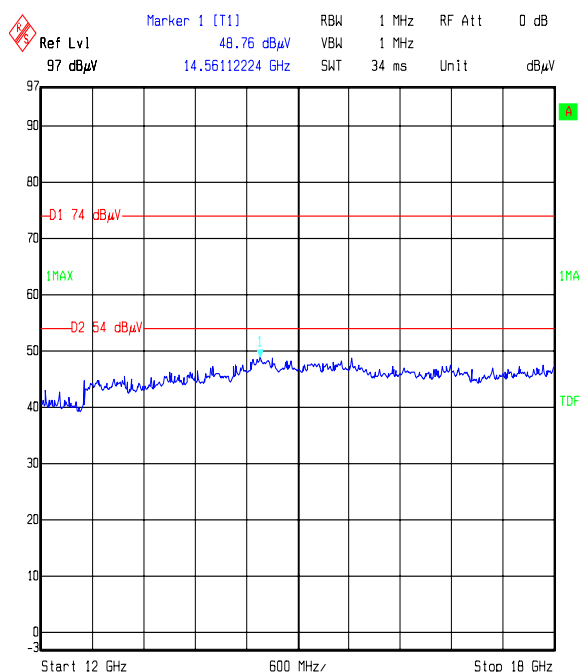
Test of: **Cobra Automotive Technologies SpA**
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Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

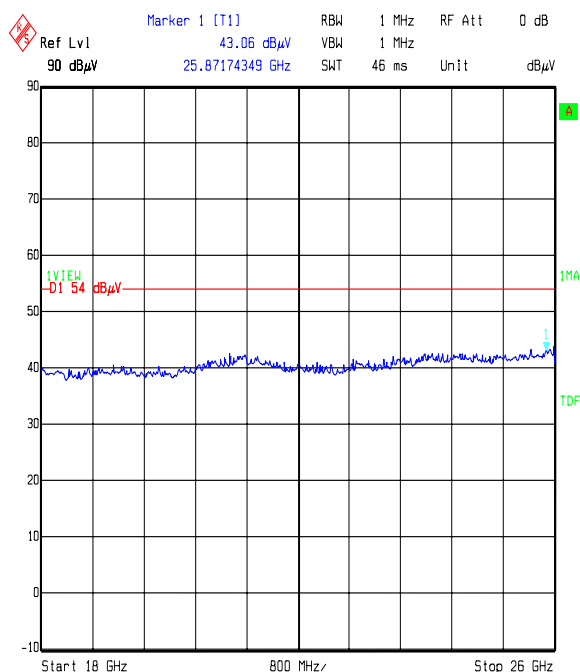
Title: 48547JD08
Comment A: Radiated emission
Date: 23.NOV.2006 17:20:56



Title: 48547JD08 FCC15.247
Comment A: TX RADIATED EMISSION
Date: 10.NOV.2006 15:22:23



Title: 48547JD08 FCC15.247
Comment A: TX RADIATED EMISSION
Date: 10.NOV.2006 15:26:18



Title: 48547JD08
Comment A: Radiated emission
Date: 23.NOV.2006 17:37:15

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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7.2.8. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a)

The EUT was configured for band edge compliance of radiated emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum radiated band edge emissions.

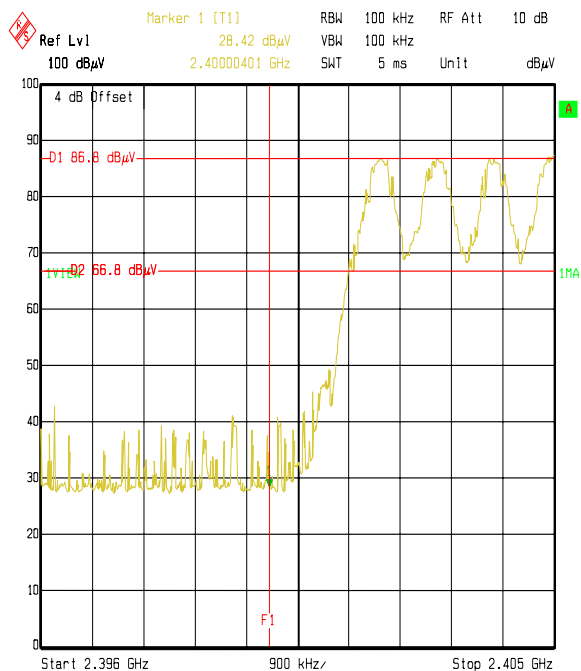
Results:**Electric Field Strength Measurements****Peak Power Level Hopping Mode:**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4000	Horizontal	39.8	-11.4	28.4	66.8*	38.4	Complied
2.4835	Horizontal	56.2	-11.0	45.2	74.0	28.8	Complied

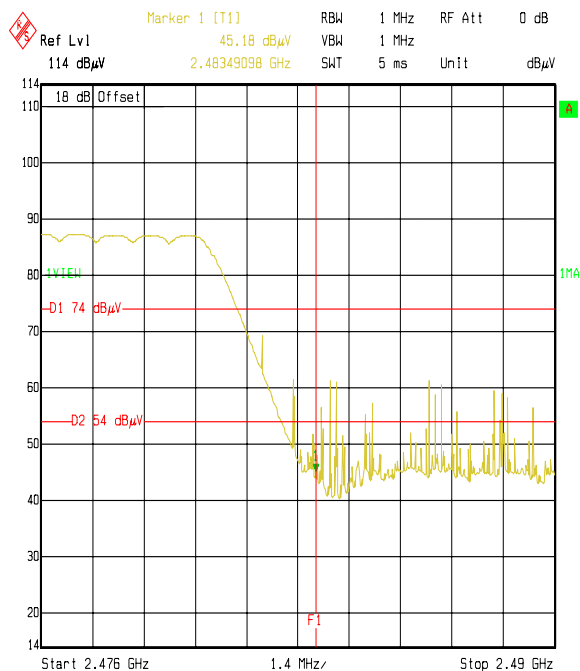
Average Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4835	Horizontal	39.0	-11.0	28.0	54.0	26.0	Complied

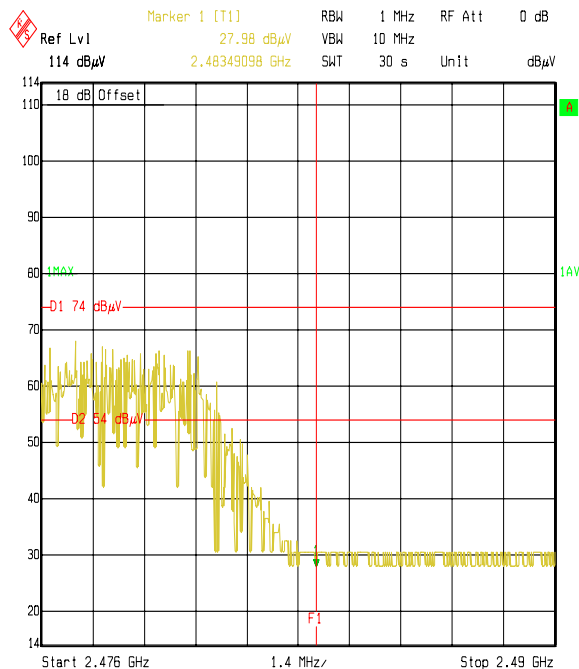
Test of: **Cobra Automotive Technologies SpA**
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Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)

Title: 48547JD08
Comment A: Band edge hopping mode
Date: 13.NOV.2006 11:48:03



Title: 48547JD08
Comment A: Band edge hopping mode
Date: 13.NOV.2006 12:22:31



Title: 48547JD08
Comment A: Band edge hopping mode
Date: 13.NOV.2006 12:28:49

Test of: Cobra Automotive Technologies SpA
HelloBiker® by Spyball®, Bluetooth Wireless Intercom
To: FCC Part 15.247: 2005 (Subpart C)

Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)

The EUT was configured for band edge compliance of radiated emission measurements, as described in section 9 of this report.

Tests were performed to identify the average radiated band edge emissions.

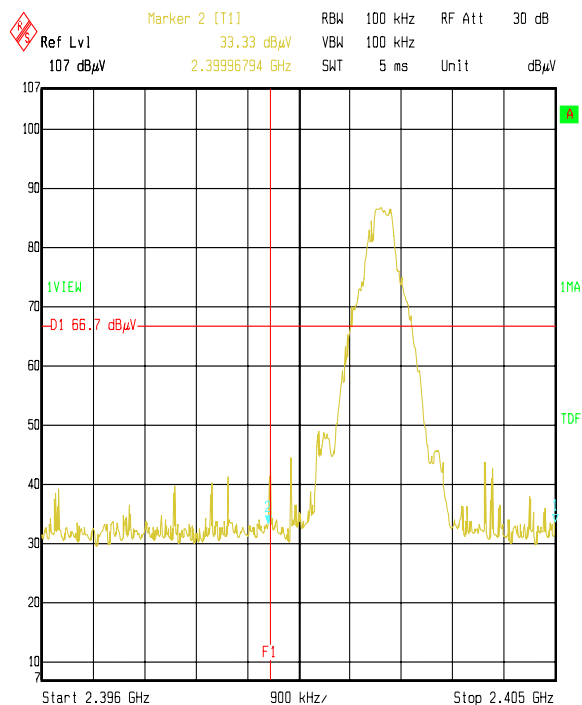
Results:**Peak Power Level Static Mode:**

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Horizontal	44.7	-11.9	33.3	66.7	33.4	Complied
2.4835	Horizontal	51.9	-11.0	40.9	74.0	33.1	Complied

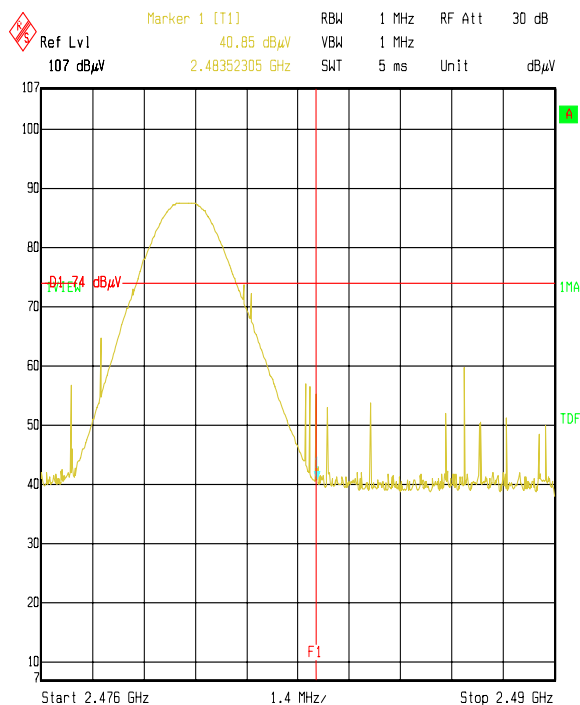
Average Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Horizontal	44.8	-11.0	33.8	54.0	20.2	Complied

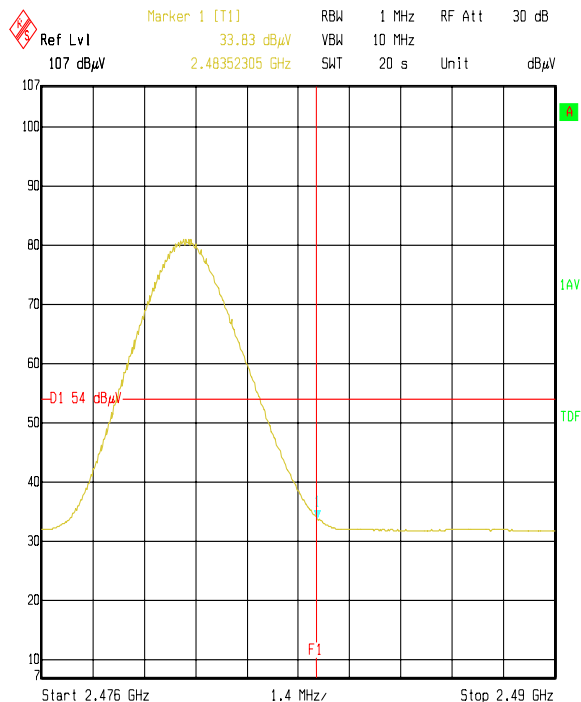
Test of: **Cobra Automotive Technologies SpA**
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Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)

Date: 31.OCT.2006 17:14:11



Date: 31.OCT.2006 17:36:43



Date: 31.OCT.2006 17:38:55

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8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.72 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	±2.94 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	±11.4 ppm
Transmitter Average Time of Occupancy	Not applicable	95%	±0.3 ns
20 dB Bandwidth	Not applicable	95%	± 11.4 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±4.64 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

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9. Measurement Methods

9.1. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 110V 60 Hz ac mains supplied via a line impedance stabilisation network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	>1 s
Observation Time:	Not applicable	>15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

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9.2. Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a quasi peak detector for measurements below 1000 MHz and an average and peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2003 Clause 5.4.

All measurements on the open area test site were performed using broadband antennas in both vertical and horizontal polarisations.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horns.

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Radiated Emissions (Continued)

At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Scans were performed to the upper frequency limits as stated in section 15.33

The final field strength was determined as the indicated level in dB μ V plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements <1 GHz	Final Measurements ≥1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz <1 GHz) (1 MHz ≥1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

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9.3. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured as for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the bandwidth and separation of each transmission channel the measurement analyser was configured to measure two adjacent channels whilst the EUT was in hopping mode. The spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak points on the two adjacent channels were noted and the separation between them recorded.

To determine the occupied bandwidth, a resolution bandwidth of 10 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of, at least, the same value was used.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level.

The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

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9.4. Average Time of Occupancy

The EUT and spectrum analyser was configured as for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

First the maximum packet length was determined on the centre channel.

The measurement analyser was configured to the time domain mode by setting the span to zero with a sweep time sufficiently wide enough to measure one pulse.

The EUT was configured to operate in normal mode of operation. The pulse width of one transmission was then recorded. The measurement analyser was then configured in zero span i.e. in the time domain and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 31.6 second period was determined by multiplying the number of channels the device operates over (79) by 0.4 seconds.

The number of transmissions within this period was noted and multiplied by the pulse width recorded earlier. This gives the maximum occupancy over 31.6 seconds.

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9.5. Effective Isotropic Radiated Power (EIRP)

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2003 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a horn antenna. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired a power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

$$\text{EIRP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT EIRP is calculated as:

$$\text{EIRP EUT} = \text{EIRP SG} + \text{Delta.}$$

The test equipment settings for EIRP measurements were as follows:

Receiver Function	Setting
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

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9.6. Band Edge Compliance of RF Radiated Emissions

The EUT and spectrum analyser were configured as for radiated measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine band edge compliance, the analyser resolution bandwidth was set to $\geq 1\%$ of the analyser span. The video bandwidth was set to be $\geq$ to the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A plot of the lower band edge of the allocated frequency band was produced. A marker was set to the level of the highest in band emission with a limit line set to 20 dB below this. The marker was then placed on the highest out of band emission (the specification states that either the band edge level must be measured or the highest out of band emission, whichever is the greater). The plots show that the highest out of band emission complies with the -20 dBc limit.

The above procedure was then repeated for the upper band edge except that, as the upper band edge fell on a restricted band edge (as defined in section 15.205(a)), the limit for the restricted band was applied instead of the -20 dBc limit i.e. the general limits defined in section 15.209(a).

Final measurements were performed on the worst-case configuration as described in Part 15.31(i).

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Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
A028	Horn Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	27 Mar 2006	12
A1361	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1361-20112003	29 Apr 2006	12
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	29 Jul 2006	12
A1544	MDS 20	Schwarzbeck	MDS 20	76591	02 Aug 2006	12
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139	06 Oct 2006	36
A259	Bilog Antenna	Chase	CBL611 1	1513	03 Mar 2006	12
A428	WG 12 horn	Flann	12240-20	134	06 Oct 2006	36
A429	WG 16 horn	Flann	16240-20	561	06 Oct 2006	36
C1057	Cable	RS	1	1	29 Jan 2006	12
C1081	Cable 2m	Rosenberger	FA210A 1020M5 050	28463-2	14 Feb 2006	12
C1163	1m N-Type Cable	Rosenberger Micro-Coax	FA210A 1010007 070	43187-1	27 Oct 2006	12
C1166	2m N-Type Cable	Rosenberger Micro-Coax	FA210A 1020007 070	43189-02	27 Oct 2006	12
C151	Cable	Rosenberger	UFA210 A-1-1181-70x70	None	22 Sept 2006	12

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Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
C160	Cables	Rosenberger	UFA210 A-1-1181-70x70	None	29 Jan 2006	12
C348	Cable	Rosenberger	UFA210 A-1-1181-70x70	2993	29 Jan 2006	12
C363	BNC Cable	Rosenberger	RG142	None	29 Jan 2006	12
C454	Cable	Rosenberger	RG142X X-001-RFIB	C454-10081998	29 Jan 2006	12
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027	10 Apr 2006	12
M024	Spectrum Monitor	Rohde & Schwarz	EZM	873 952/006	10 Apr 2006	12
M1149	Bluetooth Test Set	Anritsu	MT8852 A	6K00001529	28 Jan 2006	12
M1190	Temperature Meter	RS	212-124	None Stated	11 Feb 2006	12
M1242	FSEM30 Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986_022	22 Sept 2006	12
M1263	ESIB7	Rohde & Schwarz	ESIB7	100265	12 Jan 2006	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	07 Aug 2006	12
M1273	ESIB 26 EMI Test Receiver	Rhode & Schwarz	ESIB 26	100275	15 Mar 2006	12
S212	Site 12	RFI	12		N/A	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Test of: Cobra Automotive Technologies SpA
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Appendix 2. Test Configuration Drawings

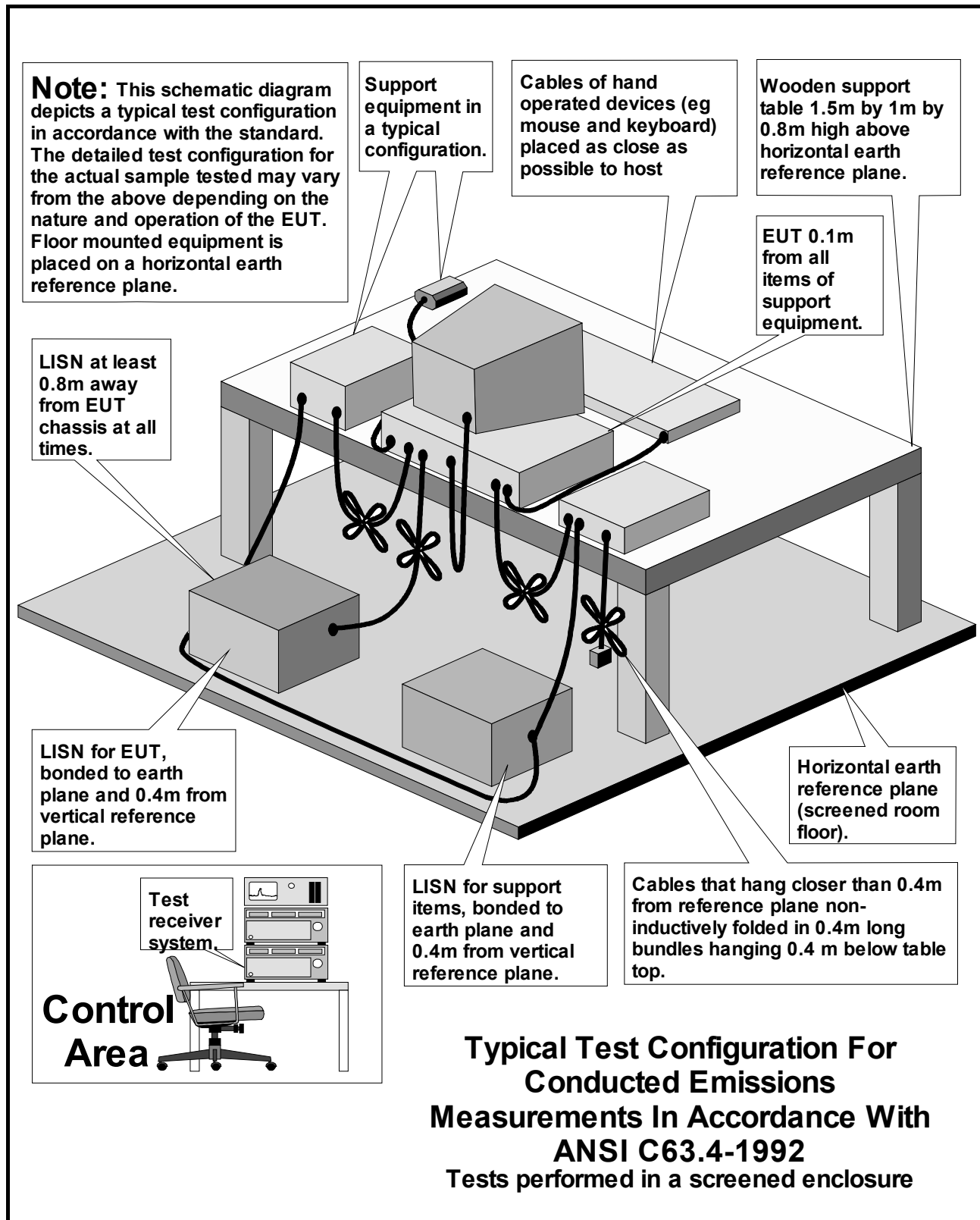
This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\48547JD08A\EMICON	Test configuration for measurement of conducted emissions.
DRG\48547JD08A\EMIRAD	Test configuration for measurement of radiated emissions.

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DRG\48547JD08A\EMICON



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DRG\48547JD08A\EMIRAD

