



**TEST REPORT
FROM
RFI GLOBAL SERVICES LTD**

Test of: Datalogic Mobile S.r.l
JOYA +

To: FCC Part 15.247: 2008 (Subpart C)

Test Report Serial No:
RFI/RPT1/RP73643JD01B

<p>This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:</p>	 pp
<p>Checked By: Tony Henriques</p>  pp	<p>Report Copy No: PDF01</p>
<p>Issue Date: 25 August 2009</p>	<p>Test Dates: 19 November 2008 to 6 February 2009</p>

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Test Report

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1. Customer Information

Company Name:	Datalogic Mobile S.r.l
Address:	Via Candini, 2 Lippo di Calderara di Reno Bologna 40012 Italy

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2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

Description:	Mobile Computer
Brand Name:	Datalogic Mobile S.r.l
Model Name or Number:	JOYA +
Serial Number:	D08X00004
Hardware Version Number:	Not applicable
Software Version Number:	3.02.83.20081007
FCC ID Number:	U4G0026

2.2. Description of EUT

The equipment under test was a mobile computer with barcode scanner using Bluetooth technology operating in the 2.4 GHz band.

2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

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2.4. Support Equipment

The following support equipment was used to support the measurement of AC mains conducted emissions from the EUT whilst its battery was being charged.

Description:	Cradle prototype with serial interface RS232 and RS232 power cable
Brand Name:	Datalogic (prototype)
Connected to Port:	Interface port

Description:	AC Power Adapter and power cord for battery charging through cradle prototype
Brand Name:	Power supply and power cable
Model Name or Number:	PW-06A2-1Y15A

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2.5. Additional Information Related to Testing

Technology Tested:	Bluetooth		
Power Supply Requirement:	Internal battery supply 3.7 V nominal		
Type of Unit:	Transceiver		
Modulation Type:	GFSK		
Channel Spacing:	1 MHz		
Data Rate:	1 Mbps		
Maximum RF Power Output:	-12.3 dBm (Measured)		
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

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3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	FCC Part 15.247: 2008 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR15) (Intentional Radiators operating within the band 2400 MHz to 2483.5 MHz)

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1996)

Title: American National Standard for Instrumentation - Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz.

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.

3.3. 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 and Configuration of the EUT during Testing

5.1. Operating Modes

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

- Transmitter mode operating at maximum output power with a modulated carrier. The EUT was tested using DH5 packet type.
- Idle mode.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- For transmitter tests the EUT was tested standalone. A test mode was enabled on the EUT to allow continuous transmission / hopping with options for different channels via BlueTest software package.
- For idle mode tests the EUT was tested standalone. A test mode was enabled on the EUT via BlueTest software package, that allowed the module to be enabled and not transmitting. AC mains conducted emissions were performed with the EUT being charged whilst sat in the cradle prototype supplied by the client.

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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 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: Section 15.109	Enclosure	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: Section 15.247(a)(1)	Antenna	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: Section 15.247(a)(1)	Antenna	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: Section 15.247(a)(1)(iii)	Antenna	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: Section 15.247(b)(1)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: Sections 15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 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, Wade Road, Basingstoke, Hampshire, RG24 8AH.

6.2. Site Registration Numbers

FCC: 209735

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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

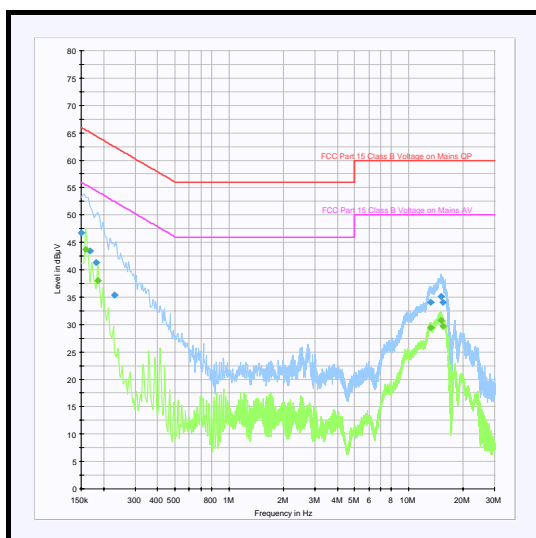
Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150000	Live	46.7	66.0	19.3	Complied
0.168000	Live	43.4	65.1	21.7	Complied
0.181500	Live	41.3	64.4	23.1	Complied
0.231000	Neutral	35.4	62.4	27.0	Complied
13.240500	Neutral	34.1	60.0	25.9	Complied
15.207000	Live	35.2	60.0	24.8	Complied
15.535500	Neutral	34.0	60.0	26.0	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.159000	Live	43.7	55.5	11.8	Complied
0.186000	Live	38.0	54.2	16.2	Complied
13.281000	Neutral	29.4	50.0	20.6	Complied
15.094500	Live	30.7	50.0	19.3	Complied
15.499500	Live	29.7	50.0	20.3	Complied



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7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109

Ambient Temperature: 23°C

Relative Humidity: 34%

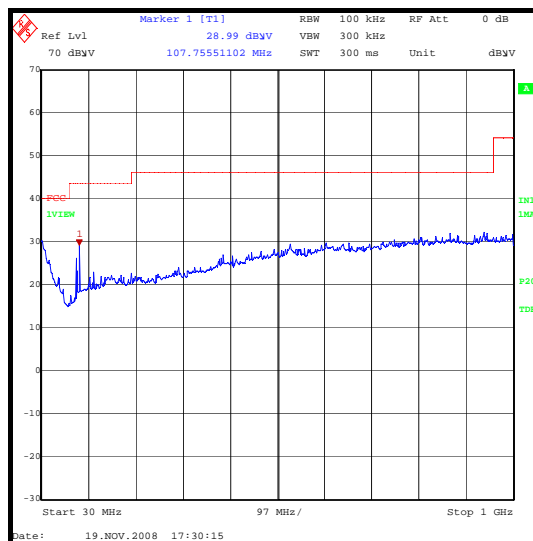
Results:

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

Frequency (MHz)	Antenna Polarity	Quasi-Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
101.294	Horizontal	25.9	43.5	17.6	Complied
107.755	Horizontal	29.0	43.5	14.5	Complied

Note(s):

1. All other emissions were at least 20 dB below the relevant specification limit.



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

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7.2.3. Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

Electric Field Strength Measurements (Frequency Range: 1 GHz to 12.75 GHz)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
12.1408	Vertical	44.8	1.7	46.5	54.0	27.5	Complied

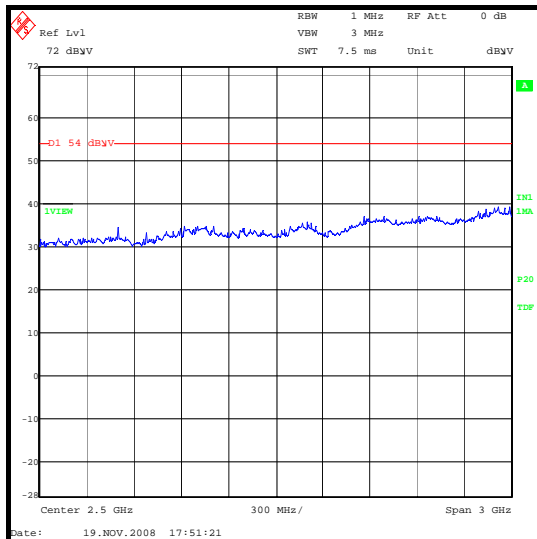
Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver, therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.
The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

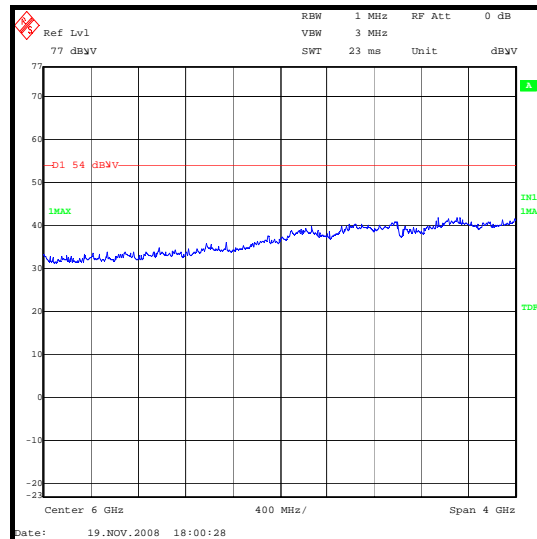
Test of: Datalogic Mobile S.r.l
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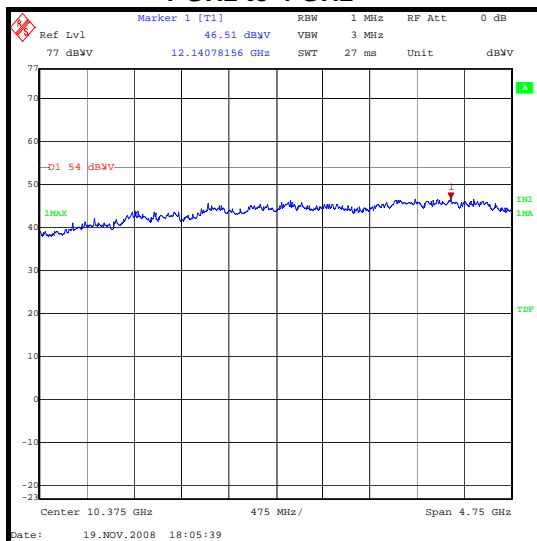
Idle Mode Radiated Spurious Emissions (Continued)



1 GHz to 4 GHz



4 GHz to 8 GHz



8 GHz to 12.75 GHz

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

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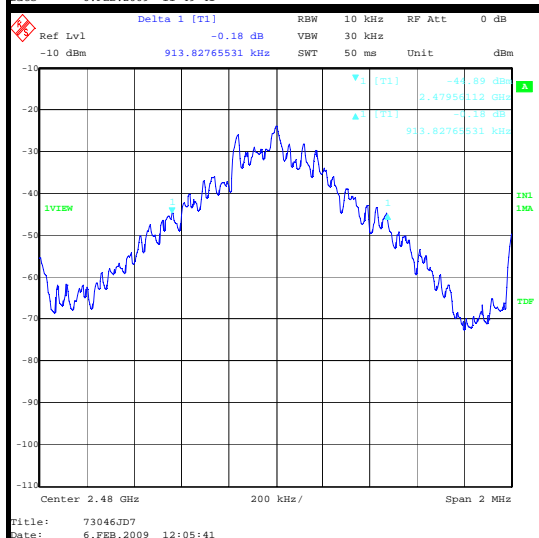
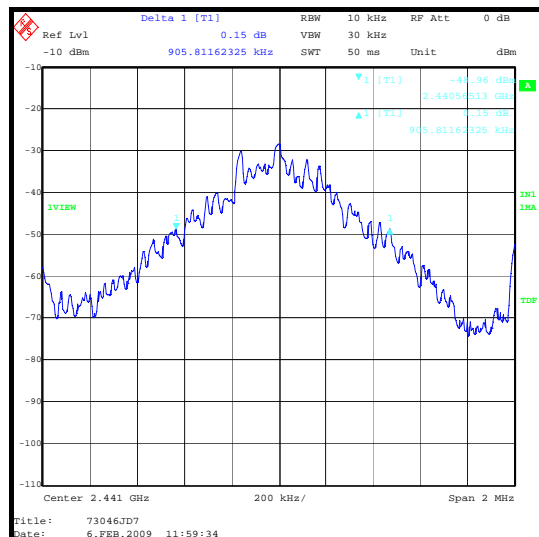
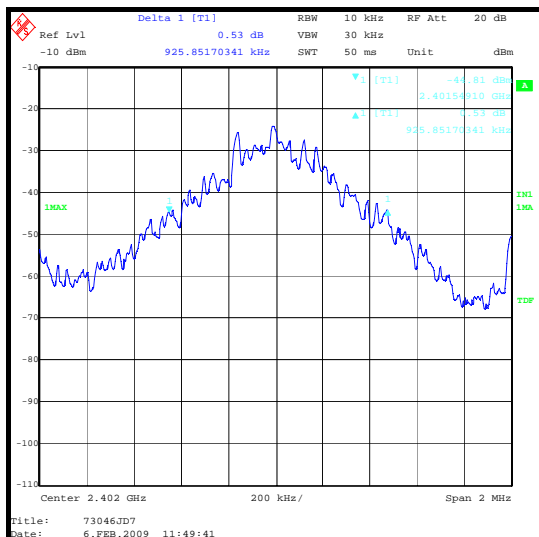
7.2.4. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

Ambient Temperature: 22°C

Relative Humidity: 33%

Results:

Channel	Transmitter 20 dB Bandwidth (kHz)
Bottom	925.852
Middle	905.812
Top	913.828



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

Ambient Temperature: 22°C

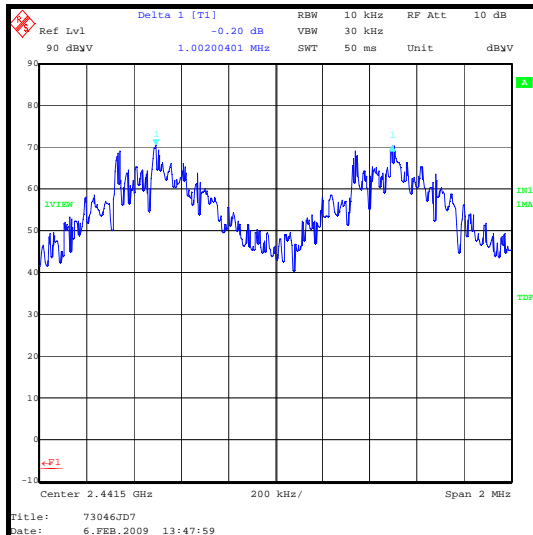
Relative Humidity: 33%

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit ($2/3$ of 20 dB BW) (kHz)	Margin (kHz)	Result
1002.004	603.875	398.129	Complied

Note(s):

- The 20 dB bandwidth measured for the middle channel operating at 2441 MHz was used to calculate the limit



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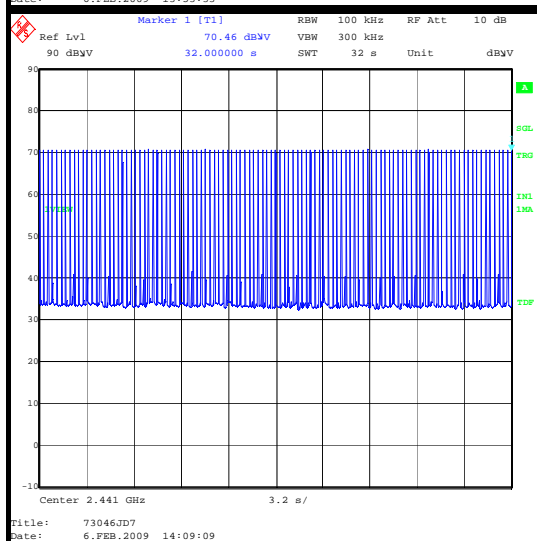
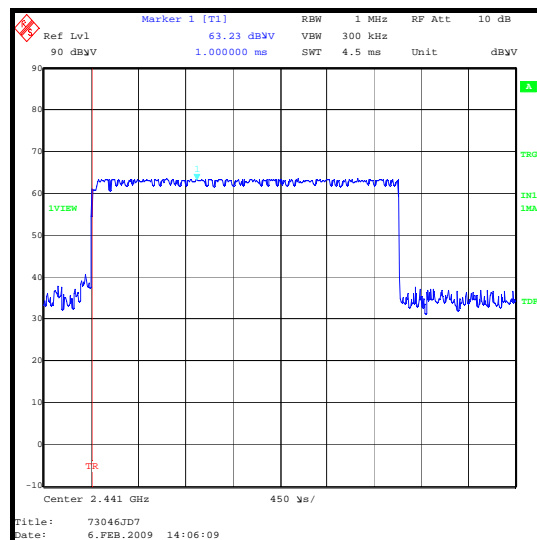
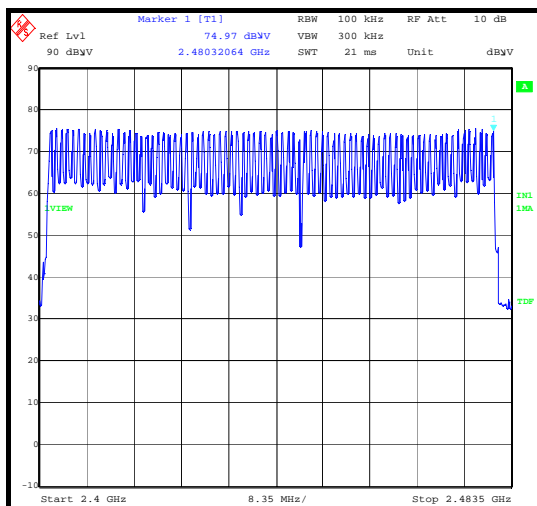
7.2.6. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

Ambient Temperature: 22°C

Relative Humidity: 33%

Results:

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2925	107	0.313	0.4	0.087	Complied



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

Ambient Temperature: 22°C

Relative Humidity: 33%

Results:

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-12.3	30.0	42.3	Complied
Middle	-12.9	30.0	42.9	Complied
Top	-12.9	30.0	42.9	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.

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

Ambient Temperature: 23°C

Relative Humidity: 34%

Results:

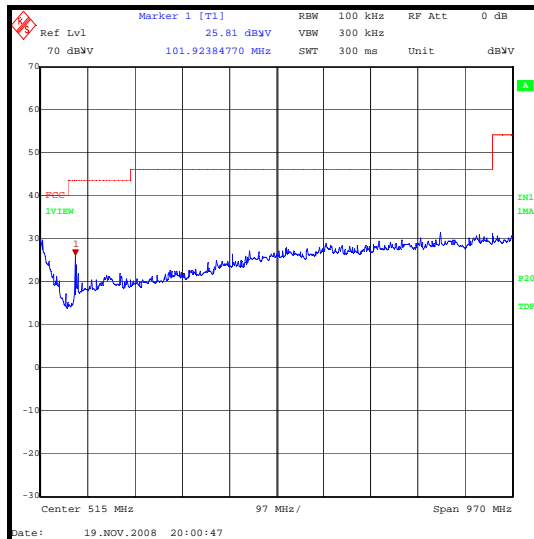
Electric Field Strength Measurements: 30 MHz to 1000 MHz

Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
101.924	Vertical	25.8	55.6	29.8	Complied
107.756	Vertical	21.6	55.6	34.0	Complied

Note(s):

1. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
2. All other emissions were at least 20 dB below the relevant specification limit.



30 MHz to 1 GHz

Note: These plots are pre-scans 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)

Results:

**Electric Field Strength Measurements (Frequency Range: 1 GHz to 26.5 GHz)
(Emissions Outside the Restricted Bands)**

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
11.960	Vertical	44.9	2.4	47.3	54.0	6.7	Complied

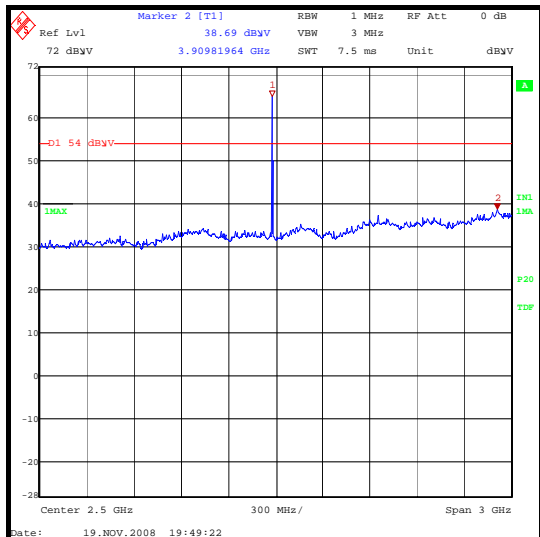
Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver, therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.
The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

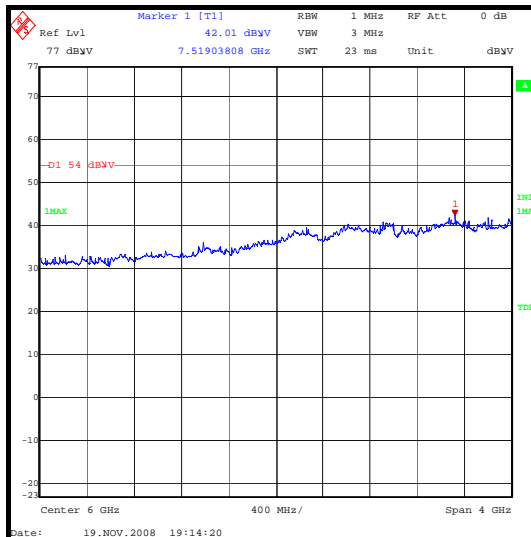
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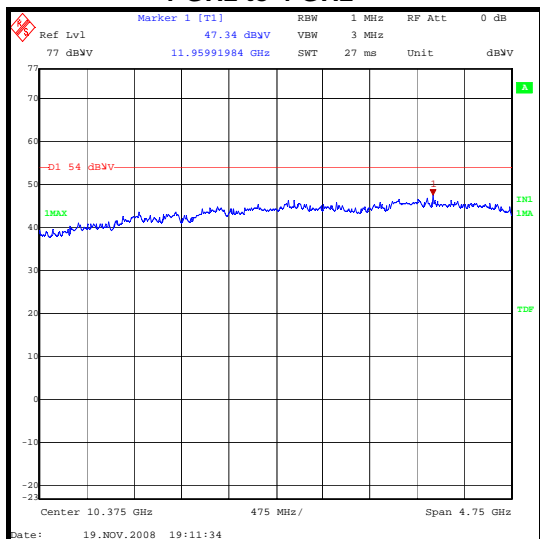
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)



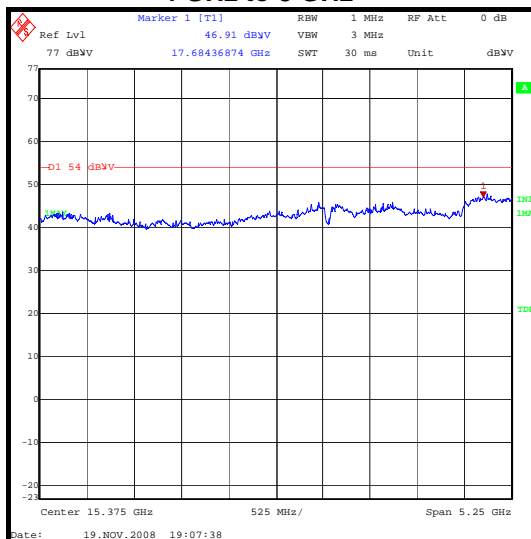
1 GHz to 4 GHz



4 GHz to 8 GHz



8 GHz to 12.75 GHz



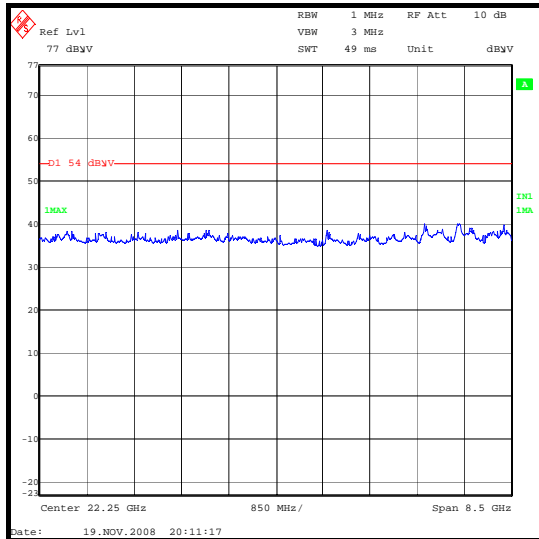
12.75 GHz to 18 GHz

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.
 Note: The emission shown in the 1 GHz to 4 GHz plot is the fundamental transmit frequency

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



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

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

Ambient Temperature: 22°C

Relative Humidity: 33%

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	33.2	-0.2	33.0	53.0	20.0	Complied
2.4835	Horizontal	47.7	-0.2	47.5	74.0	26.1	Complied

**Note: -20 dBc limit*

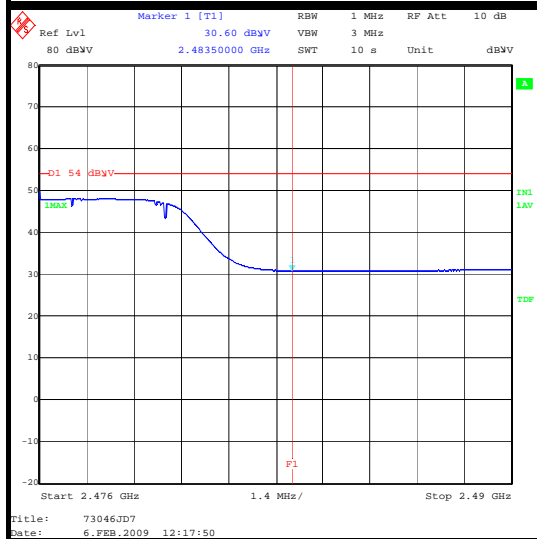
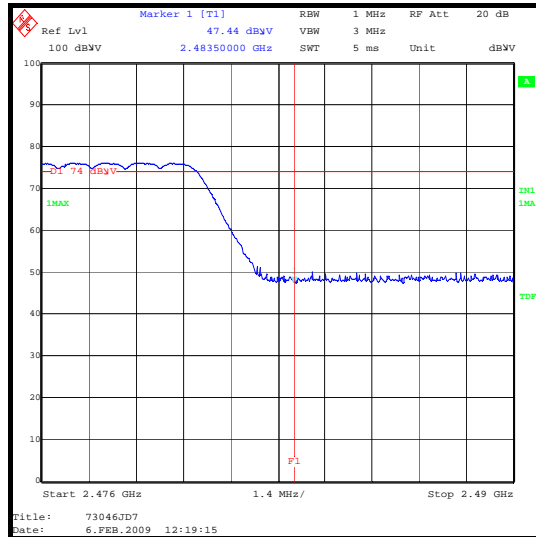
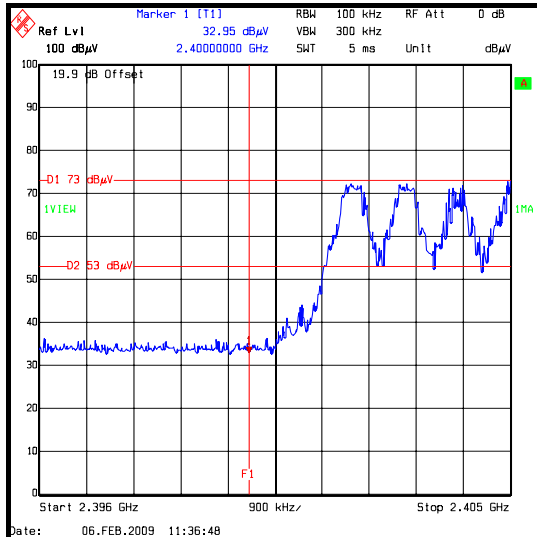
Average Power Level Hopping Mode:

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	30.8	-0.2	30.6	54.0	23.4	Complied

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



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

Ambient Temperature: 22°C

Relative Humidity: 33%

Results:

Peak Power Level Static 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	40.0	-0.2	39.8	56.6*	16.8	Complied
2.4835	Horizontal	47.9	-0.2	47.7	74.0	26.3	Complied

**Note: -20 dBc limit*

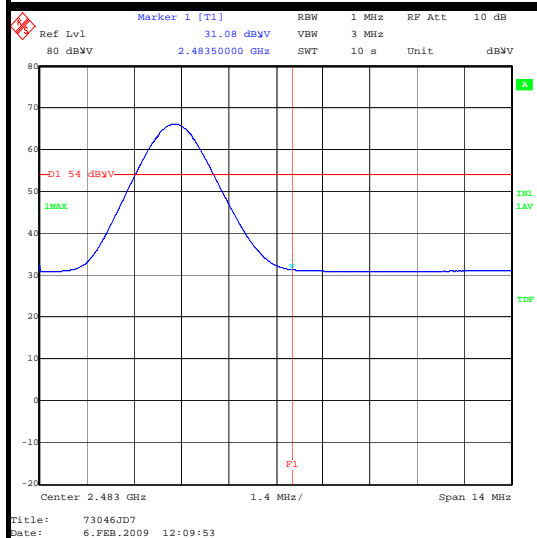
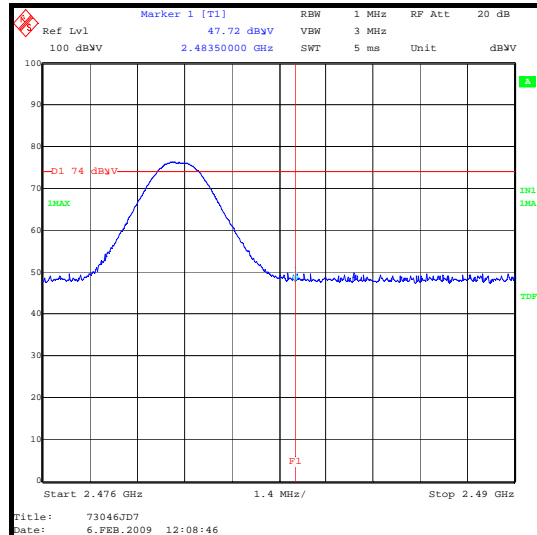
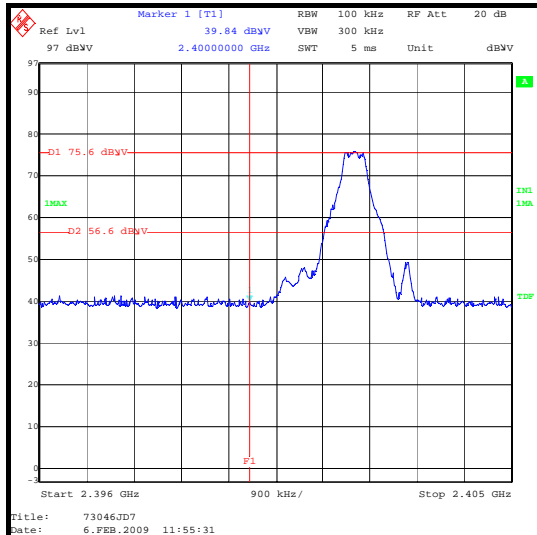
Average Power Level Static Mode:

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	31.3	-0.2	31.1	54.0	22.9	Complied

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



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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.

Test of: Datalogic Mobile S.r.l
JOYA +

To: FCC Part 15.247: 2008 (Subpart C)

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1227	Pre Amplifier	Agilent	8449B	3008A01566	01 Oct 2008	12
A1299	Antenna	Schaffner	CBL6143	5094	28 Jul 2008	12
A1818	Antenna	EMCO	3115	00075692	25 Oct 2008	12
A436	Antenna	Flann	20240-20	330	24 Apr 2006	36
K0002	3m RSE chamber	Rainford EMC	N/A	N/A	26 Aug 2008	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	19 Feb 2008	12

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