



**TEST REPORT  
FROM  
RFI GLOBAL SERVICES LTD**

Test of: Datalogic Scanning Group S.r.l.  
Quickscan M Family

To: FCC Part 15.249

**Test Report Serial No:**  
RFI/RPTE1/RP49576JD01A

<b>This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:</b>		
<b>Checked By:</b> Brian Watson		<b>Report Copy No: PDF01</b>
<b>Issue Date: 06 December 2007</b>		<b>Test Dates: 06 November 2007 to 09 November 2007</b>

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The results in this report apply only to the sample(s) tested.

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Registered in England and Wales. Company number:2117901

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## 1. Client Information

<b>Company Name:</b>	Datalogic Scanning Group S.r.l.
<b>Address:</b>	Via San Vitalino 13 Lippo di Calderara 40012 Bologna Italy
<b>Contact Name:</b>	Mr R Cacioppo

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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)

<b>Description:</b>	Quicksan M2130/Kit (Radio barcode reader)
<b>Brand Name:</b>	Datalogic Scanning Inc.
<b>Model Name or Number:</b>	M2130/Kit
<b>Serial Number:</b>	Batch Sample
<b>FCC ID Number:</b>	U4F0016
<b>Country of Manufacture:</b>	Slovakia
<b>Date of Receipt:</b>	06 November 2007

<b>Description:</b>	Gun / Cradle couple @ 910 MHz
<b>Brand Name:</b>	Datalogic Scanning Inc.
<b>Model Name or Number:</b>	M2130/Kit (Cradle)
<b>Serial Number:</b>	Batch Sample
<b>FCC ID Number:</b>	U4F0017
<b>Country of Manufacture:</b>	Slovakia
<b>Date of Receipt:</b>	06 November 2007

<b>Description:</b>	RS232 Serial Cable (2m length)
<b>Brand Name:</b>	Shin AN
<b>Model Name or Number:</b>	2990
<b>Serial Number:</b>	E106016
<b>Date of Receipt:</b>	06 November 2007

<b>Description:</b>	Power Supply Unit (with integral 3m twin core cable)
<b>Brand Name:</b>	Ontop
<b>Model Name or Number:</b>	SAL115A-0525U-6
<b>Serial Number:</b>	E164369
<b>Date of Receipt:</b>	06 November 2007

### 2.2. Description of EUT

The equipment under test consists of a radio gun and radio cradle. The gun reads bar codes and transmits them to the cable using the radio link. The cradle is cable connected to a host computer, the cradle has the possibility to recharge the battery of the gun inserted into it.

### 2.3. Modifications Incorporated in the EUT

There were no modifications from the test specification.

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#### 2.4. Additional Information Related to Testing

<b>Power Supply Requirement:</b>	DC supply of 5 V DC (Cradle) Internal battery supply of 3.6 V DC 700 mAh lithium battery (Scanner)		
<b>Equipment Category:</b>	Narrow band short range devices		
<b>Type of Unit:</b>	Base Station (fixed use - Cradle) Portable (standalone battery powered device - Scanner)		
<b>Transmit Frequency Range:</b>	902 MHz to 928 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Single	-	910
<b>Receive Frequency Range:</b>	902 MHz to 928 MHz		
<b>Receive Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Single	-	910
<b>Occupied Bandwidth:</b>	Approx. 300 kHz		

#### 2.5. Support Equipment

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

<b>Description:</b>	PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude D610
<b>Serial Number:</b>	PC370NT
<b>Cable Length and Type:</b>	Serial Cable RS-232, 2m
<b>Connected to Port:</b>	Serial RS 232

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### **3. Test Specification, Methods and Procedures**

#### **3.1. Test Specifications**

<b>Reference:</b>	FCC Part 15 Subpart C: 2006 (Sections 15.249).
<b>Title:</b>	Code of Federal Regulations, Part 15 (47CFR215) Radio Frequency Devices.
<b>Comments:</b>	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.

#### **3.2. 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 (1996)

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.

#### **3.3. 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 of the EUT During Testing**

### **5.1. Operating Modes**

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

- Transmit and receive.

### **5.2. Configuration and Peripherals**

The EUT was tested in the following configuration:

- The cradle was connected to a PC via an RS-232 cable and powered by an external AC / DC adapter. The Scanner was tested as standalone.

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## 6. Summary of Test Results

### Cradle

Range of Measurements	Specification Reference	Port Type	Compliance Status
Receiver AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.107	AC Mains	Complied
Receiver Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Enclosure	Complied
Transmitter AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.207	AC Mains	Complied
Transmitter Fundamental Fieldstrength	C.F.R. 47 FCC Part 15: 2004 Section 15.249(a)	Antenna	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 2: 2004 Section 2.1049	Antenna	Complied
Transmitter Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.249(a)(d)(e) & 15.209	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.249(d) & 15.209	Antenna	Complied

### Scanner

Range of Measurements	Specification Reference	Port Type	Compliance Status
Receiver Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2006 Section 15.109	Enclosure	Complied
Transmitter Fundamental Fieldstrength	C.F.R. 47 FCC Part 15: 2006 Section 15.249(a)	Antenna	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 2: 2006 Section 2.1049	Antenna	Complied
Transmitter Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2006 Section 15.249(a)(d)(e) & 15.209	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2006 Section 15.249(d) & 15.209	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, England.

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## **7. Measurements, Examinations and Derived Results**

### **7.1. General Comments**

7.1.1. This section contains test results only.

7.1.2. 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 - Cradle**

### **7.2.1. Receiver AC Conducted Spurious Emissions**

7.2.1.1. The EUT was configured for AC conducted emissions measurements as described in Section 8 of this report.

7.2.1.2. Tests were performed to identify the maximum emission levels on the AC mains line of the EUT.

#### **Results:**

#### **Quasi-Peak Detector Measurements on Live and Neutral Lines**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.170000	Live	36.1	64.9	28.8	Complied
0.174000	Live	33.7	64.7	31.0	Complied
0.226000	Live	27.8	62.4	34.6	Complied
0.282000	Live	22.1	60.4	38.3	Complied
0.338000	Live	18.9	58.9	40.0	Complied
0.450000	Live	17.3	56.5	39.2	Complied
1.758000	Live	27.8	56.0	28.2	Complied
2.386000	Live	14.2	56.0	41.8	Complied
3.542000	Neutral	35.3	56.0	20.7	Complied
3.682000	Neutral	30.4	56.0	25.6	Complied

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### Receiver AC Conducted Spurious Emissions (Continued)

#### Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.170000	Live	21.1	54.9	33.8	Complied
0.338000	Live	10.1	48.9	38.8	Complied
0.450000	Live	11.3	46.5	35.2	Complied
0.846000	Neutral	23.7	46.0	22.3	Complied
0.898000	Neutral	28.9	46.0	17.1	Complied
1.010000	Neutral	26.0	46.0	20.0	Complied
1.078000	Neutral	11.4	46.0	34.6	Complied
1.134000	Live	13.1	46.0	32.9	Complied
1.646000	Live	16.4	46.0	29.6	Complied
1.758000	Neutral	18.2	46.0	27.8	Complied

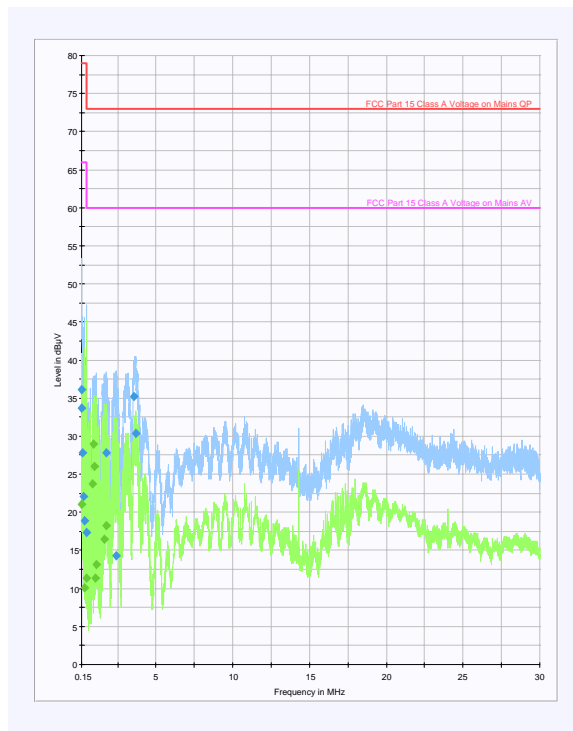
#### Note(s):

1. The graph shows the 15.107 Class A limit but the Class B limit applies. It can be seen from the results that the EUT complies with the 15.107 Class B limit shown in the results table.

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**Receiver 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. Receiver Radiated Spurious Emissions**

### **7.2.3. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)**

7.2.3.1. The EUT was configured for radiated emissions testing as described in Section 8 of this report.

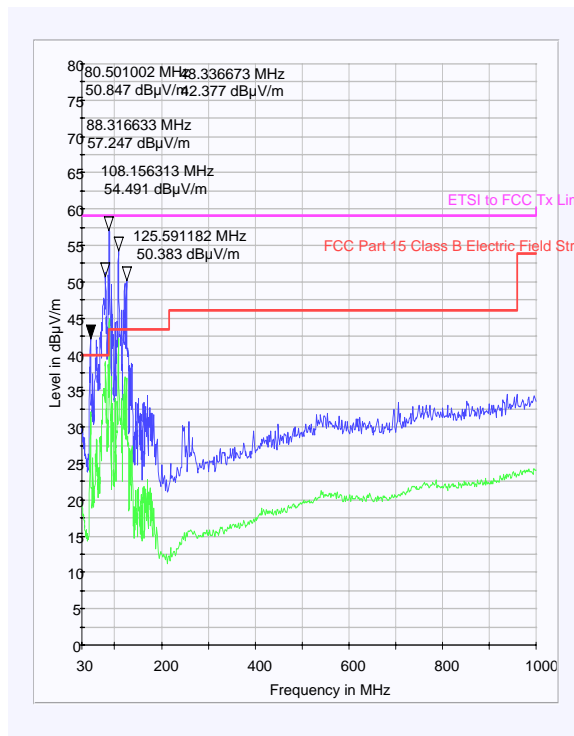
7.2.3.2. Tests were performed to identify the maximum receiver or standby radiated emission levels.

#### **Results:**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
49.162	Vertical	24.9	40.0	15.1	Complied
80.149	Horizontal	31.0	40.0	9.0	Complied
88.250	Horizontal	32.4	43.5	11.1	Complied
108.580	Horizontal	28.1	43.5	15.4	Complied
125.270	Vertical	26.9	43.5	16.6	Complied

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**Receiver Radiated Spurious Emissions (Continued)**



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



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#### **7.2.4. Receiver Radiated Spurious Emissions (Continued)**

#### **7.2.5. Electric Field Strength Measurements (Frequency Range: 1 to 5 GHz)**

##### **Results:**

##### **Highest Peak Level:**

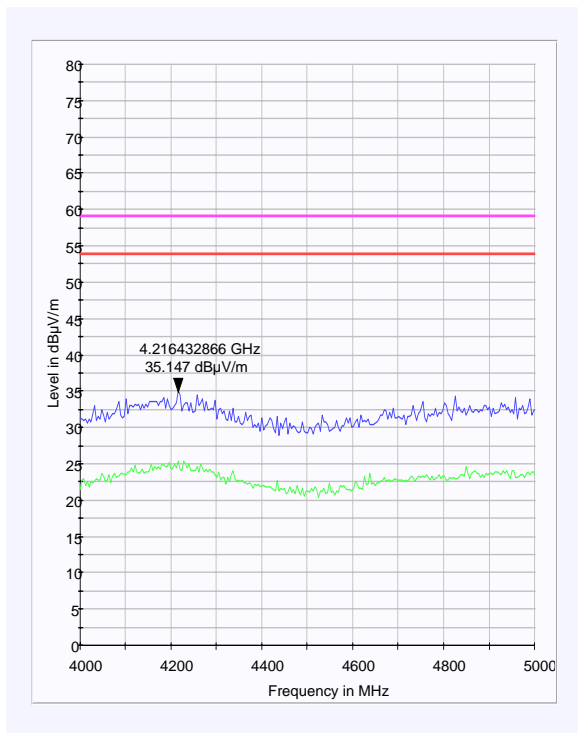
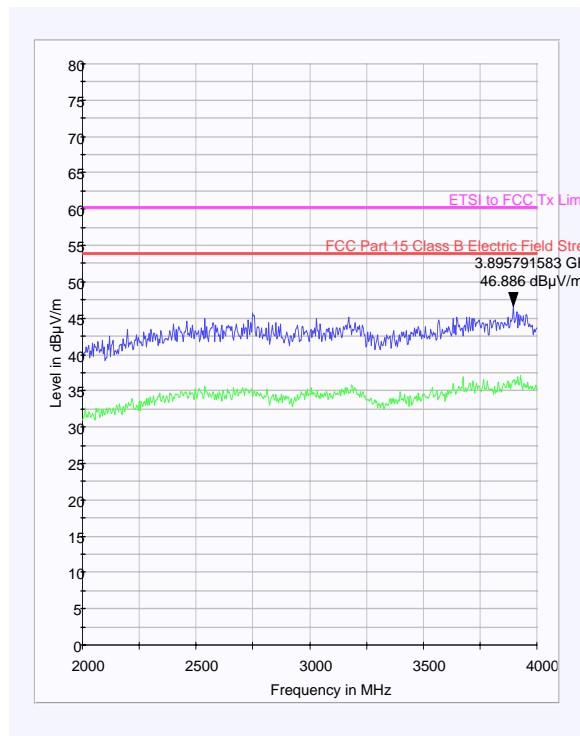
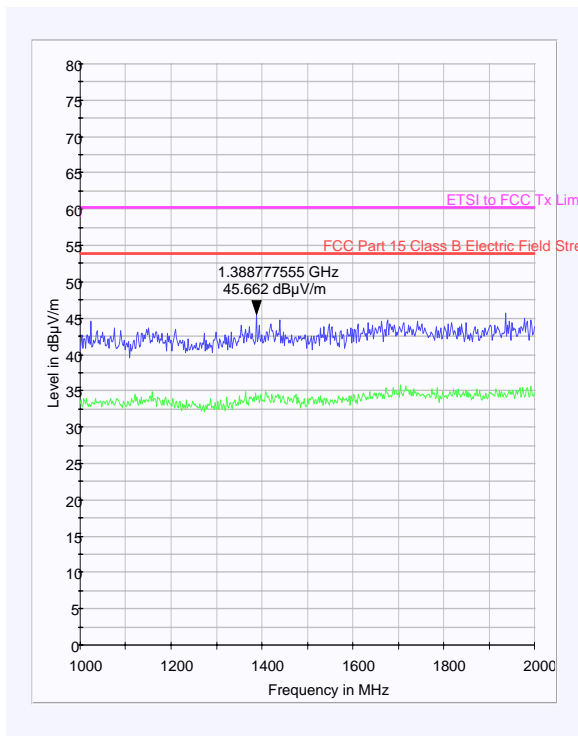
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
3895.792	Vertical	53.0	-6.1	46.9	54.0	7.1	Complied

##### **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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**Receiver Radiated Spurious Emissions (Continued)**



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

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### Transmitter AC Conducted Spurious Emissions

#### Results:

#### Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.162000	Live	34.4	65.3	30.9	Complied
0.186000	Neutral	47.4	64.1	16.7	Complied
0.230000	Neutral	41.2	62.3	21.1	Complied
0.326000	Neutral	39.7	59.3	19.6	Complied
0.370000	Neutral	41.7	58.2	16.5	Complied
0.462000	Neutral	44.4	56.2	11.8	Complied
0.510000	Neutral	36.7	56.0	19.3	Complied
1.206000	Live	35.2	56.0	20.8	Complied
1.898000	Live	33.9	56.0	22.1	Complied
3.570000	Live	32.4	56.0	23.6	Complied

#### Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.186000	Neutral	38.1	54.1	16.0	Complied
0.370000	Neutral	40.7	48.2	7.5	Complied
0.418000	Neutral	39.8	47.1	7.3	Complied
0.462000	Neutral	43.6	46.2	2.6	Complied
0.510000	Neutral	35.4	46.0	10.6	Complied
0.554000	Neutral	33.8	46.0	12.2	Complied
0.694000	Live	33.0	46.0	13.0	Complied
1.066000	Live	30.6	46.0	15.4	Complied
1.110000	Neutral	30.9	46.0	15.1	Complied
1.202000	Live	33.0	46.0	13.0	Complied

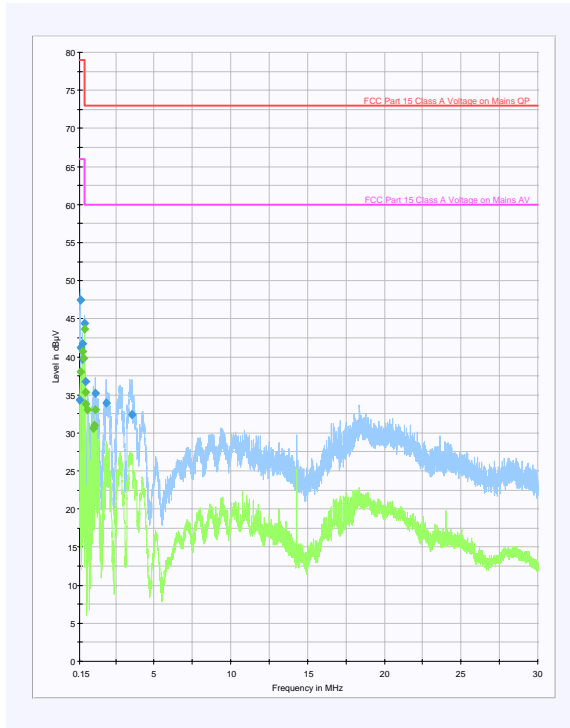
#### Note(s):

1. The graph shows the incorrect limit whereas the limit shown in 15.207 applies. It can be seen from the results that the EUT complies with the 15.207 limit shown in the results table.

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**Transmitter AC Conducted Spurious Emissions (Continued)**



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

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### **7.2.6. Transmitter Fundamental Fieldstrength**

7.2.6.1. The EUT was configured for radiated emissions testing as described in Section 8 of this report.

7.2.6.2. Tests were performed to identify the maximum fieldstrength of the fundamental frequency.

#### **Results:**

##### **AC Powered Devices**

Frequency (MHz)	Antenna Polarity	Input Voltage (AC)	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
909.960	Horizontal	110.0	90.6	94.0	3.4	Complied
909.960	Horizontal	93.5	90.6	94.0	3.4	Complied
909.960	Horizontal	126.5	90.6	94.0	3.4	Complied

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**7.2.7. Transmitter 20 dB Bandwidth**

7.2.7.1. The EUT was configured for 20 dB bandwidth measurements as described in Section 8 of this report.

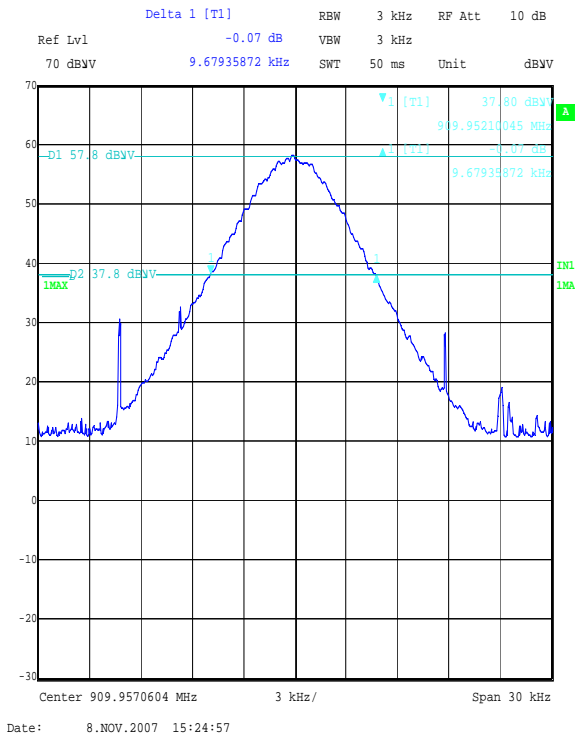
7.2.7.2. Tests were performed to identify the 20 dB bandwidth.

**Results:**

Transmitter 20 dB Bandwidth (kHz)
9.679

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**Transmitter 20 dB Bandwidth (Continued)**



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

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### **7.2.8. Transmitter Radiated Emissions**

### **7.2.9. Electric Field Strength Measurements: 30 to 1000 MHz**

7.2.9.1. The EUT was configured for radiated emissions testing as described in Section 8 of this report.

7.2.9.2. Tests were performed to identify the maximum radiated spurious emission levels.

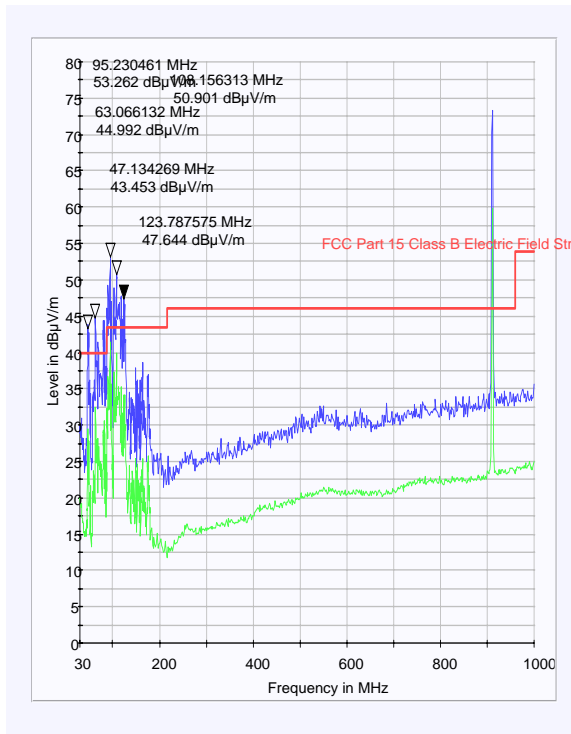
### **Results:**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
47.046	Vertical	26.6	40.0	13.4	Complied
63.120	Vertical	28.0	40.0	12.0	Complied
95.110	Horizontal	28.4	43.5	15.1	Complied
108.580	Horizontal	25.7	43.5	17.8	Complied
123.933	Vertical	30.6	43.5	12.9	Complied



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**Transmitter Radiated Emissions (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 (Continued)

#### 7.2.10. Electric Field Strength Measurements (Frequency Range: 1 to 9.3 GHz)

#### Results:

##### Highest Peak Level:

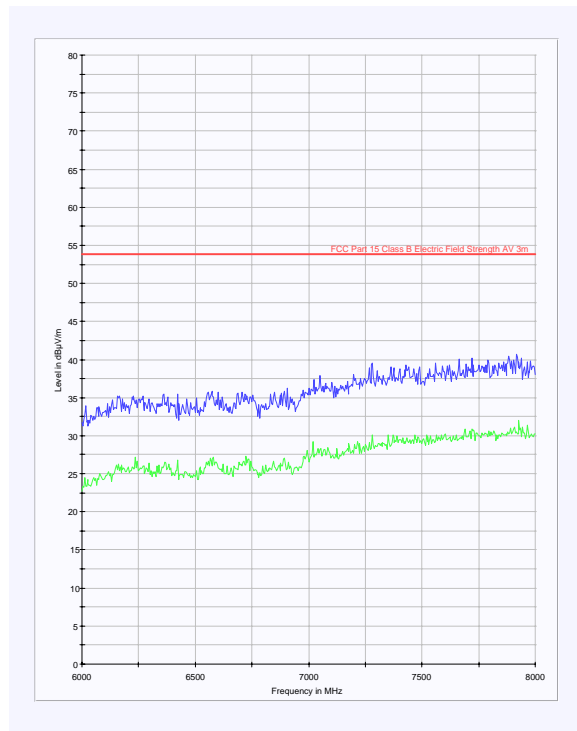
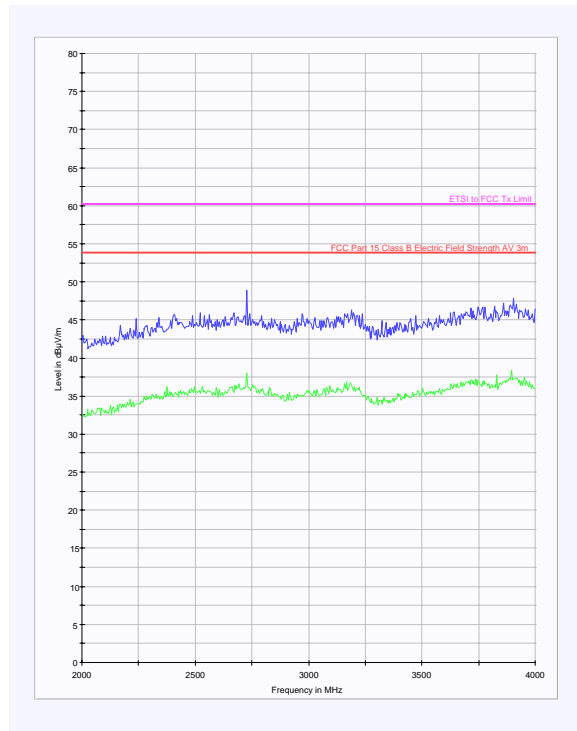
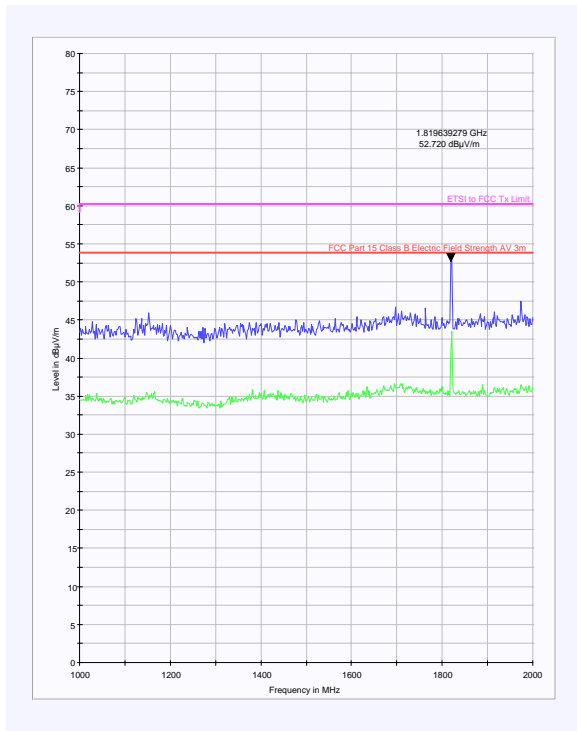
Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1819.920	Horizontal	27.7	23.9	3.6	55.2	74.0	18.8	Complied
2729.880	Vertical	14.3	22.0	4.2	40.5	74.0	33.5	Complied
4549.800	Horizontal	56.5	25.1	30.4	51.2	74.0	22.8	Complied
5459.760	Horizontal	58.4	25.6	30.1	53.9	74.0	20.1	Complied

##### Highest Average Level:

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1819.920	Horizontal	24.9	23.9	3.6	52.1	54.0	1.9	Complied
2729.880	Vertical	14.3	22.0	4.2	40.5	54.0	13.5	Complied
4549.800	Vertical	54.5	25.1	30.4	49.2	54.0	4.8	Complied
5459.760	Horizontal	57.0	25.6	30.1	52.5	54.0	1.5	Complied

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**Transmitter Radiated Emissions (Continued)**

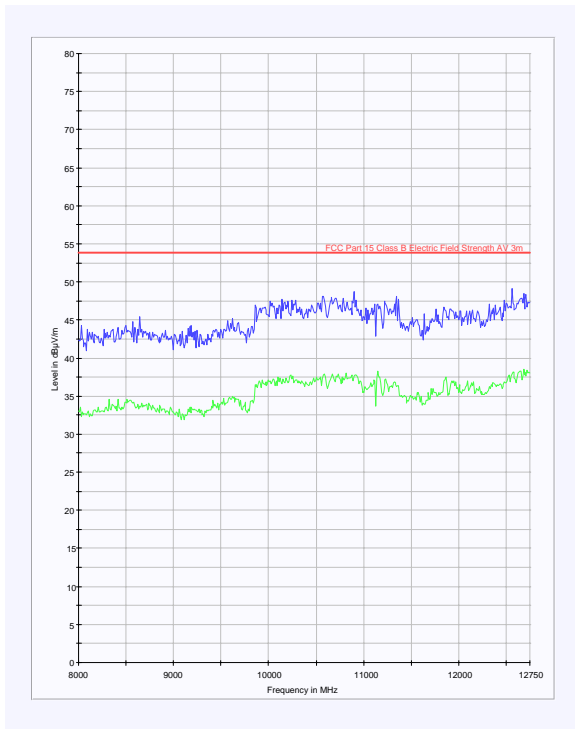


Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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**Transmitter Radiated Emissions (Continued)**



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

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### **7.2.11. Transmitter Radiated Emissions at Band Edges**

7.2.11.1. The EUT was configured for transmitter radiated emissions testing described in Section 8 of this report.

7.2.11.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency band that the EUT will operate over.

#### **Results:**

##### **Bottom Band Edge**

Frequency (MHz)	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
902	31.3	46.0	14.7	Complied

##### **Top Band Edge**

Frequency (MHz)	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
928	34.2	46.0	11.8	Complied

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To: FCC Part 15.249

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### **7.3. Test Results - Scanner**

#### **7.3.1. Receiver Radiated Spurious Emissions**

#### **7.3.2. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)**

7.3.2.1. The EUT was configured for radiated emissions testing as described in Section 8 of this report.

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

#### **Results:**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
742.004	Vertical	34.1	46.0	11.9	Complied

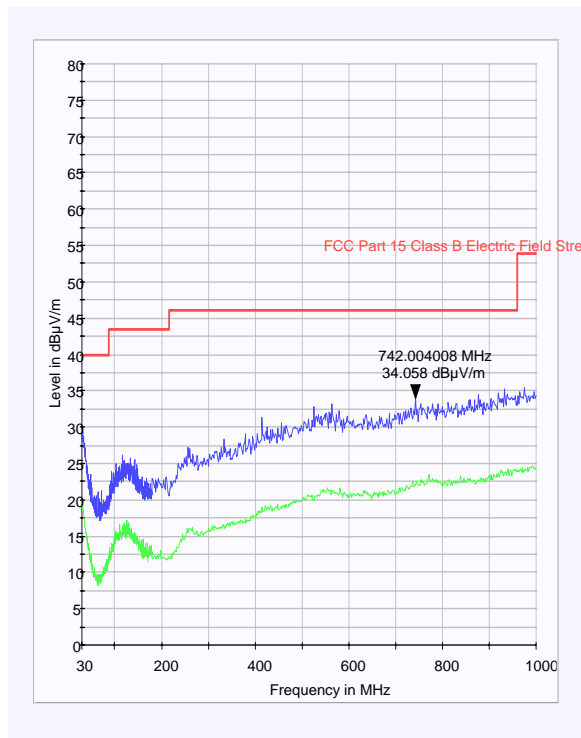
#### **Note(s):**

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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**Receiver Radiated Spurious Emissions (Continued)**



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

Test of: Datalogic Scanning Group S.r.l.  
Quickscan M Family  
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### **7.3.3. Receiver Radiated Spurious Emissions (Continued)**

### **7.3.4. Electric Field Strength Measurements (Frequency Range: 1 to 5 GHz)**

#### **Results:**

#### **Highest Peak Level:**

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
3919.840	Vertical	52.8	-6.1	46.7	54.0	7.3	Complied

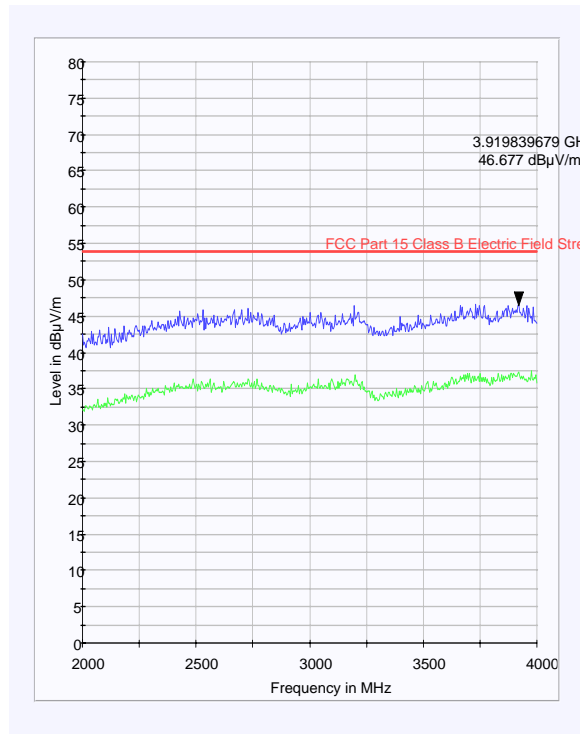
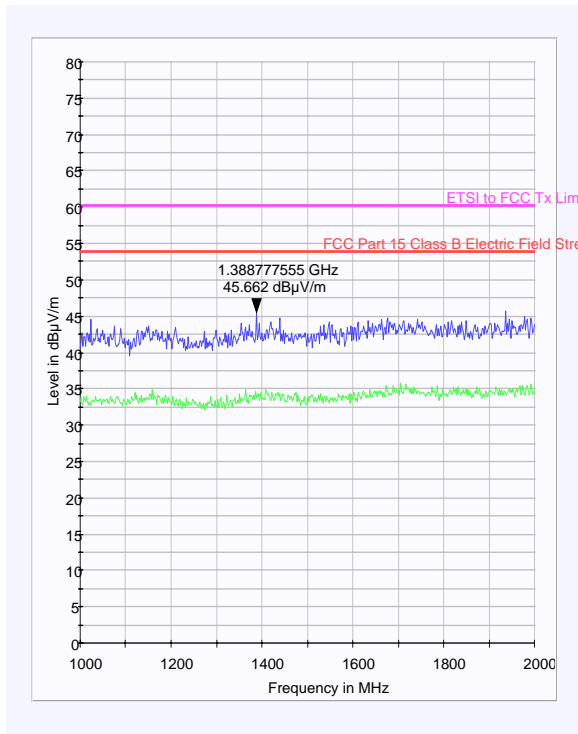
#### **Note(s):**

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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**Receiver Radiated Spurious Emissions (Continued)**

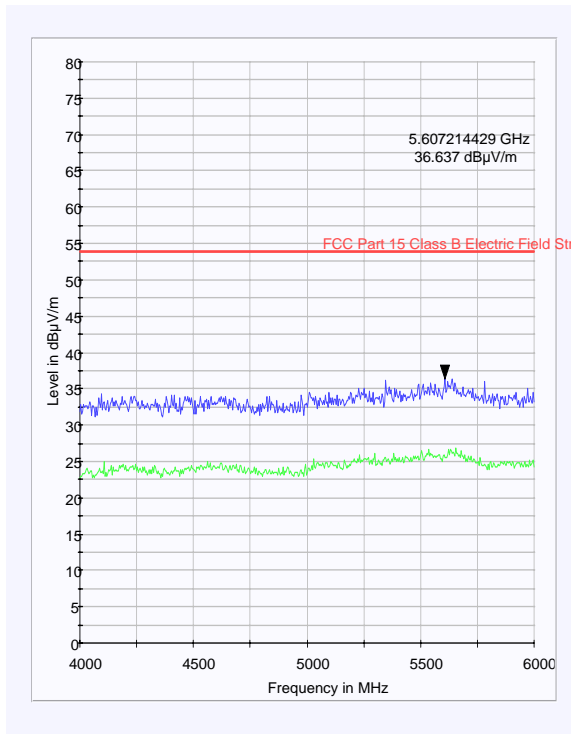


Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Datalogic Scanning Group S.r.l.  
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**Receiver Radiated Spurious Emissions (Continued)**



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

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### **7.3.5. Transmitter Fundamental Fieldstrength**

7.3.5.1. The EUT was configured for radiated emissions testing as described in Section 8 of this report.

7.3.5.2. Tests were performed to identify the maximum fieldstrength of the fundamental frequency.

#### **Results:**

##### **Battery Powered Device**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
909.958	Horizontal	80.6	94.0	13.3	Complied

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**7.3.6. Transmitter 20 dB Bandwidth**

7.3.6.1. The EUT was configured for 20 dB bandwidth measurements as described in Section 8 of this report.

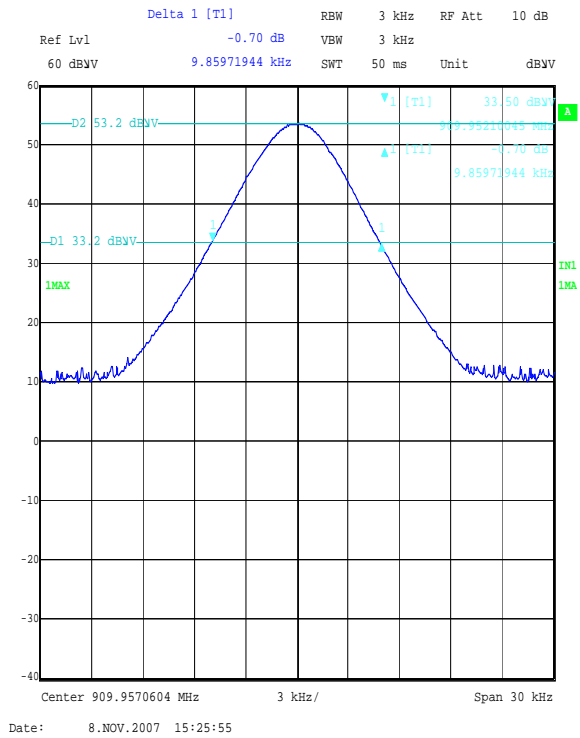
7.3.6.2. Tests were performed to identify the 20 dB bandwidth.

**Results:**

Transmitter 20 dB Bandwidth (kHz)
9.860

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**Transmitter 20 dB Bandwidth (Continued)**



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

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### **7.3.7. Transmitter Radiated Emissions**

#### **7.3.8. Electric Field Strength Measurements: 30 to 1000 MHz**

7.3.8.1. The EUT was configured for radiated emissions testing as described in Section 8 of this report.

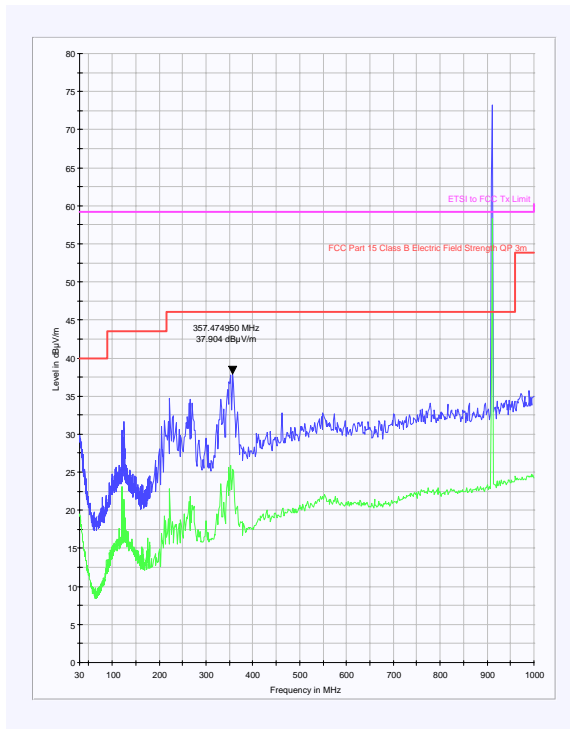
7.3.8.2. Tests were performed to identify the maximum radiated spurious emission levels.

#### **Results:**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
357.475	Horizontal	21.2	46.0	24.8	Complied

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**Transmitter Radiated Emissions (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 (Continued)

#### 7.3.9. Electric Field Strength Measurements (Frequency Range: 1 to 9.3 GHz)

##### Results:

##### Highest Peak Level:

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1819.920	Horizontal	27.3	23.9	3.6	54.8	74.0	19.2	Complied
2729.880	Vertical	14.5	22.0	4.2	40.7	74.0	33.3	Complied
3639.840	Horizontal	21.9	23.7	4.5	50.1	74.0	23.9	Complied
4549.800	Horizontal	56.5	25.1	30.4	51.2	74.0	22.8	Complied
5459.760	Vertical	58.7	25.6	30.1	54.2	74.0	19.8	Complied
7279.680	Vertical	51.2	27.6	29.6	49.2	74.0	24.8	Complied

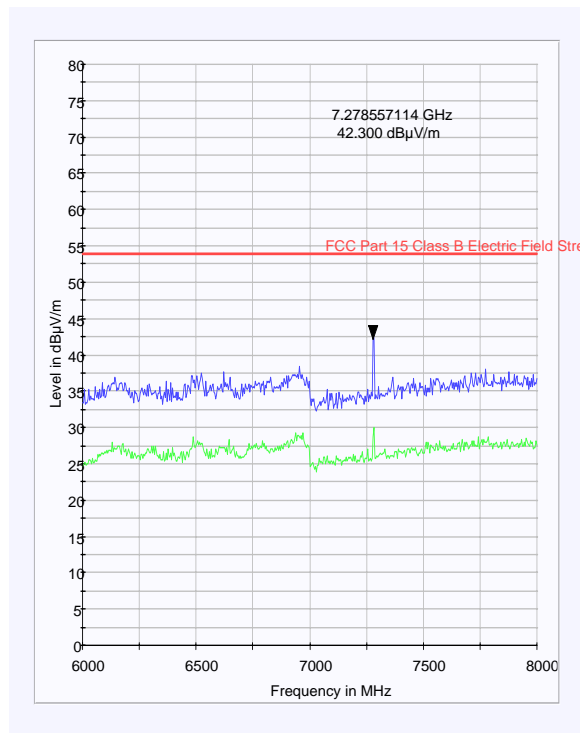
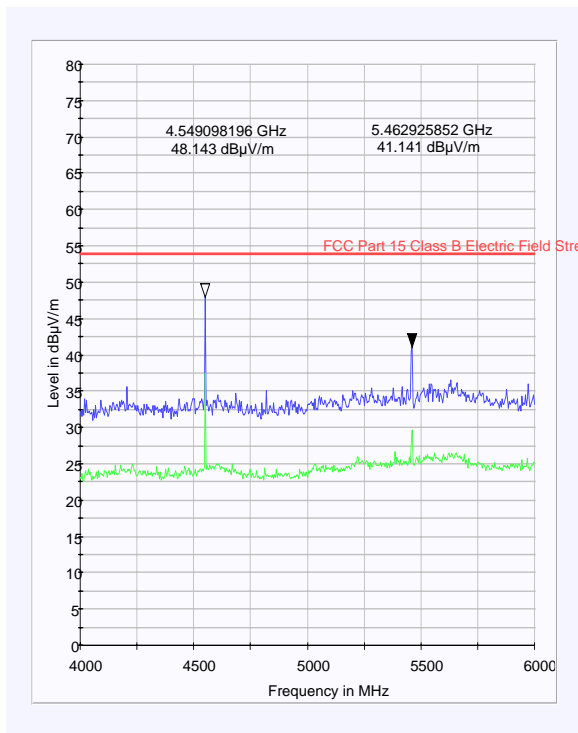
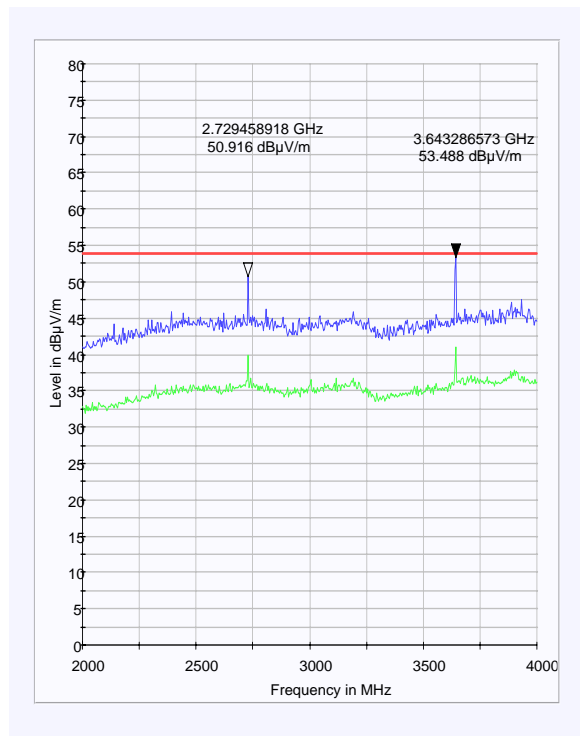
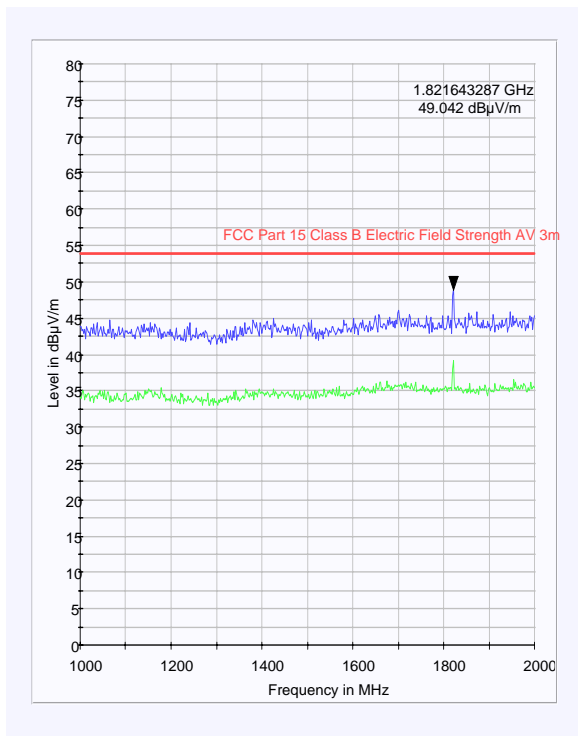
##### Highest Average Level:

Frequency (MHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1819.920	Horizontal	25.1	23.9	3.6	52.6	54.0	1.4	Complied
2729.880	Vertical	14.5	22.0	4.2	40.7	54.0	13.3	Complied
3639.840	Horizontal	13.2	23.7	4.5	41.4	54.0	12.6	Complied
4549.800	Horizontal	55.0	25.1	30.4	49.7	54.0	4.3	Complied
5459.760	Vertical	57.7	25.6	30.1	53.2	54.0	0.8	Complied
7279.680	Vertical	49.0	27.6	29.6	47.0	54.0	7.0	Complied



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**Transmitter Radiated Emissions (Continued)**

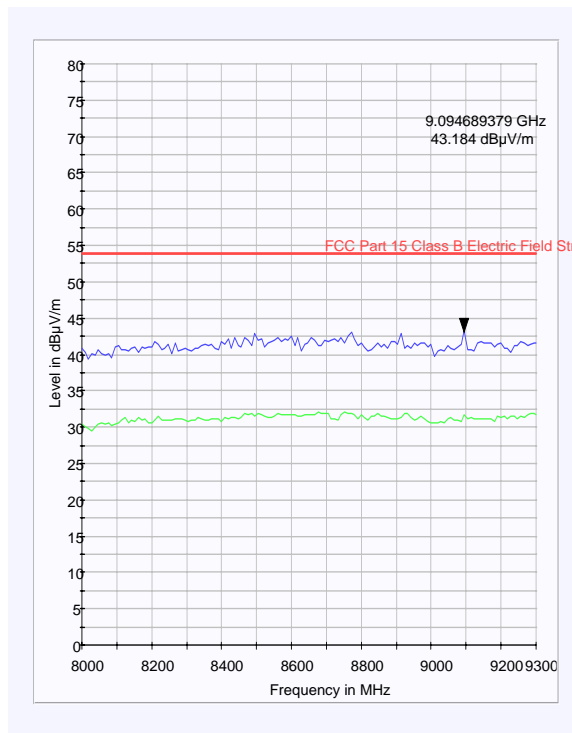


Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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**Transmitter Radiated Emissions (Continued)**



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

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### **7.3.10. Transmitter Radiated Emissions at Band Edges**

7.3.10.1. The EUT was configured for transmitter radiated emissions testing described in Section 8 of this report.

7.3.10.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency band that the EUT will operate over.

#### **Results:**

##### **Bottom Band Edge**

Frequency (MHz)	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
902	31.3	46.0	14.7	Complied

##### **Top Band Edge**

Frequency (MHz)	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
928	34.6	46.0	11.4	Complied

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## **8. Measurement Methods**

### **8.1. 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 115V 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:

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements</b>
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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## **8.2. 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.

In either case the measurement was made at the appropriate distance using a measuring receiver with a Quasi-Peak detector for measurements below 1000 MHz and an Average detector for measurements above 1000 MHz. For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

All measurements on the open area test site were performed using broadband antennas.

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.

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 $\mu$ V plus cable loss and antenna factor.

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

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements Below 1 GHz</b>	<b>Final Measurements Above 1 GHz</b>
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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### **8.3. Transmitter 20 dB Bandwidth**

The EUT and spectrum analyser was configured for transmitter radiated emissions measurements.

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 a 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 crossed the profile of the emission.

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## **9. Measurement Uncertainty**

9.1. 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.

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

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

9.4. 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%	+/- 3.25 dB
Occupied Bandwidth	N/A	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 1.78 dB

9.5. 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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### Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A028	Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Antenna	Eaton	91889-2	557	08 Jun 2006	36
A037	Low Power Filter	RFI Ltd Basingstoke	004	A037	Calibrated before use	12
A1037	Antenna	Chase EMC Ltd	CBL6112B	2413	20 Sep 2006	36
A1069	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	837469/012	09 Feb 2007	12
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	12
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	Calibrated before use	12
A253	Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A259	Antenna	Chase	CBL6111	1513	13 Mar 2007	12
A276	OATS Positioning Controller	Rohde & Schwarz	HCC	None	Calibration not required	-
M024	Spectrum Monitor	Rohde & Schwarz	EZM	873 952/006	Calibration not required	-
M028	Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RF), 860 161/007 (Display)	18 Aug 2007	12
M044	Test Receiver	Rohde & Schwarz	ESVP	891 845/026	06 Mar 2007	12



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**Test Equipment Used (Continued)**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	20 Dec 2006	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020	Calibration not required	-
S201	Open Area Test Site	RFI	1	None	25 May 2007	12
S202	Open Area Test Site	RFI	2	S202-15011990	17 Nov 2006	12

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

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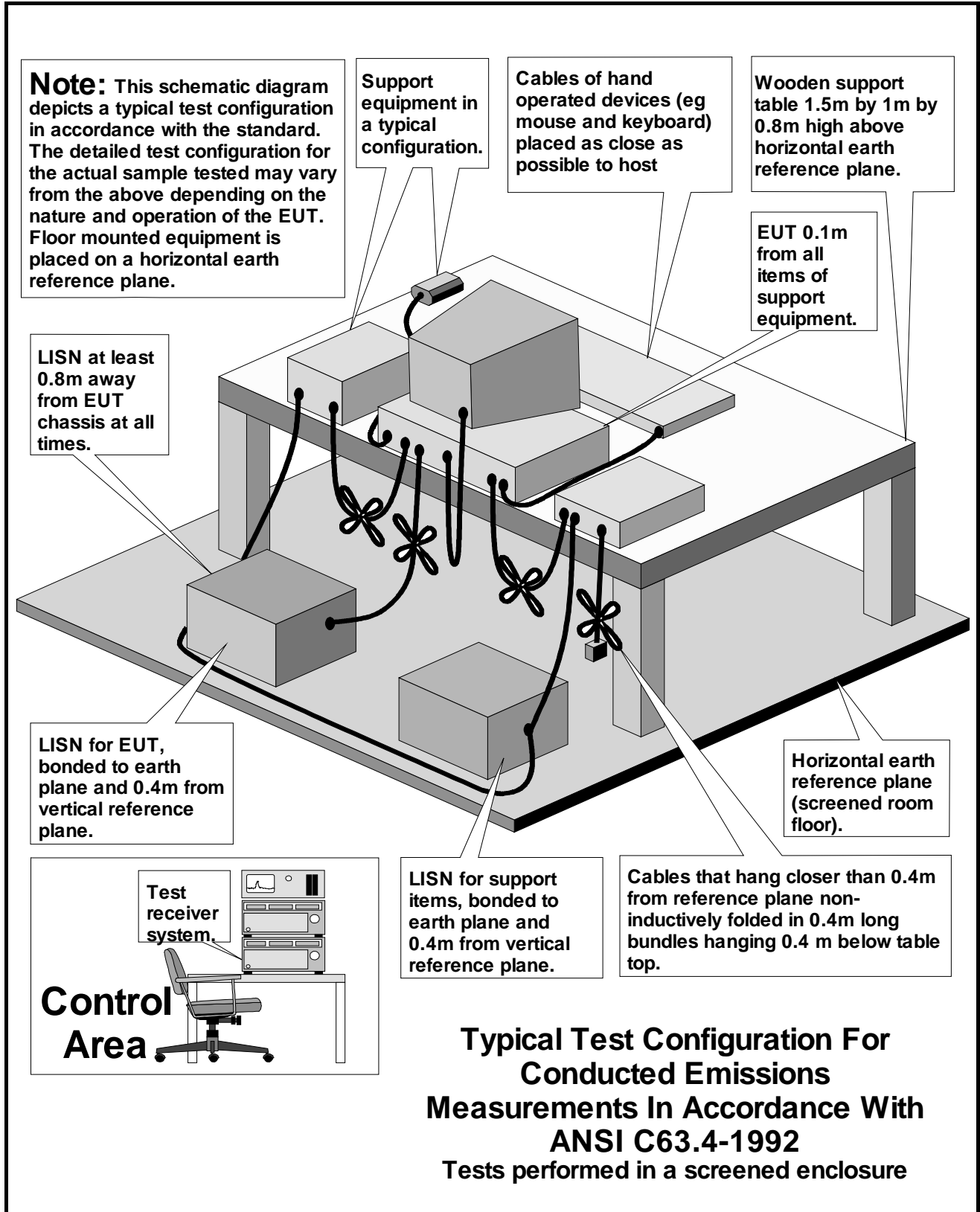
## **Appendix 2. Test Configuration Drawings**

This appendix contains the following drawings:

<b>Drawing Reference Number</b>	<b>Title</b>
DRG\49576JD01\EMICON	Test configuration for measurement of conducted emissions.
DRG\49576JD01\EMIRAD	Test configuration for measurement of radiated emissions.

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DRG\49576JD01\EMICON



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DRG\49576JD01\EMIRAD

