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Nemko Spa Via del Carroccio, 4 – I 20046 Biassono (Italy)

Report number: **141978TRFWL**

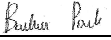
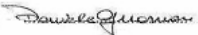
Apparatus: GPS/GSM Vehicle Tracking Systems

Applicant: **Meta System S.p.A.**  
Via Galimberti, 9 42100 Reggio Emilia (RE)

FCC ID: **P3O97802**

**Test specification:**

Title 47 – Telecommunication  
Chapter I – Federal Communications Commission  
Subchapter A – General  
Part 24 – Personal Communication Services  
Subpart E – Broadband PCS

Reviewed by:		<u>2010-06-01</u>
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## Section 1: Report summary

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko S.p.A.

**Test specification:**  
FCC Part 24 Subpart E, Broadband PCS

Compliance status:	Complies
Exclusions:	None
Non-compliances:	None
Report release history:	first release
Test location:	Nemko Spa Via del Carroccio, 4 – I 20046 Biassono (Italy)

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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Section 2: Equipment under test


Report number: 141978TRFWL

Specification: FCC 24 Subpart E

## Section 2: Equipment under test


### 2.1 Identification of equipment under test (EUT)

The following information identifies the EUT under test:

Type of equipment:	GPS/GSM Vehicle Tracking Systems
Product marketing name:	
Model number:	SAT RC09
Serial number:	100200230260544101
Nemko sample number:	141978
FCC ID:	P3O97802
Date of receipt:	2010-03-31

### 2.2 Accessories and support equipment

The following information identifies accessories used to exercise the EUT during testing:

Item # 1	
Type of equipment:	Universal Radio Communication Tester
Brand name:	R&S
Model name or number:	CMU200
Serial number:	33277
Nemko sample number:	1.584
Connection port:	RF 4
Cable length and type:	Coaxial "N" cable 30 cm
Item # 2	
Type of equipment:	Sat programmer
Brand name:	
Model name or number:	XG5S6902
Serial number:	84100429159
Nemko sample number:	--
Connection port:	Sat programmer cable
Cable length and type:	1.9 m, three wires



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Section 2: Equipment under test

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Specification: FCC 24 Subpart E

## Section 2: Equipment under test, continued

Item # 3	
Type of equipment:	Bidirectional Coaxial coupler
Brand name:	Amplifier Research
Model name or number:	DC7435
Serial number:	301045
Nemko sample number:	1.514
Connection port:	RF Input, RF output, Forward output
Cable length and type:	30 cm, "N" cable.
Item # 4	
Type of equipment:	Bidirectional Coaxial coupler
Brand name:	Amplifier Research
Model name or number:	DC7144
Serial number:	301249
Nemko sample number:	1.513
Connection port:	RF Input, RF output, Forward output
Cable length and type:	30 cm, "N" cable.
Item # 5	
Type of equipment:	Dual Directional coupler
Brand name:	BONN Elektronik
Model name or number:	BDC 0100-40/500
Serial number:	066518
Nemko sample number:	2.445
Connection port:	RF Input, RF output, Forward output
Cable length and type:	30 cm, "N" cable.

## 2.3 EUT description

GPS/GSM Vehicle Tracking Systems containing GSM module Telit GE 864-Quad

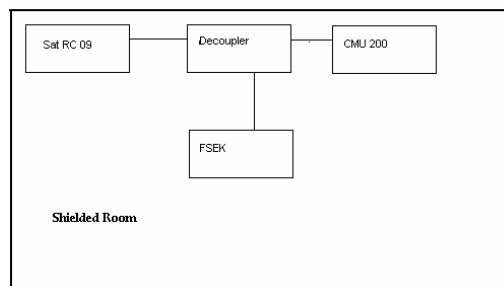
## 2.4 Technical specifications of the EUT

Operating band:	1850–1910 MHz	
Operating frequencies:	1850.2–1909.8 MHz	
Modulation type:	GSM	
Occupied bandwidth:	200 kHz	
Channel spacing:	200 kHz	
Emission designator:	--	
Antenna data:	Monopole antenna	
Antenna type:	Detachable, External Antenna Removable antenna supplied and type tested with the radio equipment (Equipment that has an external 50 $\Omega$ RF connector)	
Power source	7.2VDC internal Ni Cd battery	12VDC external

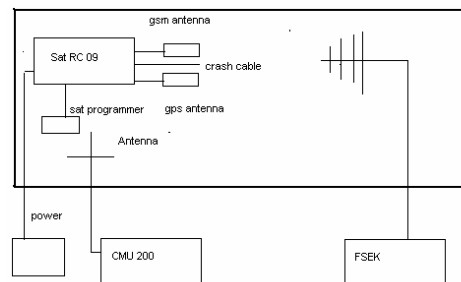
## Section 2: Equipment under test, continued

### 2.5 EUT setup diagram

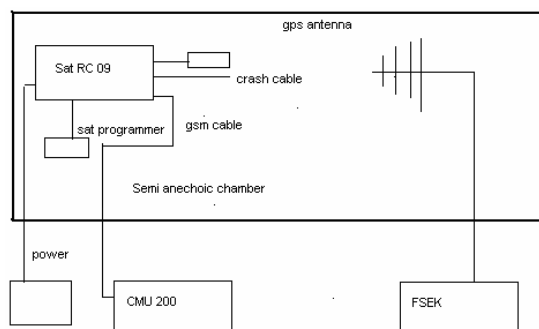
#### Conducted emission




#### Radiated emission: erp



#### Radiated emission: spurious



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## Section 2: Equipment under test, continued

### 2.6 Operation of the EUT during testing

E.u.t. tuned at channels 512, 661, 810, modulated GSMK and forced to transmit at maximum power

### 2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

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## Section 3: Test conditions

### 3.1 Deviations from laboratory tests procedures

No deviations were made from laboratory tests procedures.

### 3.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	Temperature: 18–33 °C Relative humidity: 30–60 % Air pressure: 86–106 kPa  When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
Power supply range:	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$ , for which the equipment was designed.



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## Section 3: Test conditions, continued

### 3.3 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements” and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

### 3.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Emi Test Receiver 20 Hz ÷ 5 GHz	R&S	ESBI	828038/003	11/2010
Spectrum Analyzer 9 KHz ÷ 40 GHz	R&S	FSEK	848255/005	09/2010
Universal Radio Communication Tester	R&S	CMU200	33277	10/2010
Semi-anechoic chamber	Nemko	3m semi-anechoic chamber	70	03/2011
Shielded room	Siemens	3m control room	3	03/2011
Bidirectional Coaxial coupler	Amplifier Research	DC7435	301045	09/2011
Bidirectional Coaxial coupler	Amplifier Research	DC7144	301249	09/2011
Dual Directional coupler	BONN Elektronik	BDC 0100-40/500	066518	12/2010
High pass filter	Wainwright Instrument GmbH	WHK 2.6/18G-10EF	001	06/2010
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	05/2011
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	12/2010

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use



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## Section 4: Result summary

Report number: 141978TRFWL

Specification: FCC 24 Subpart E

## Section 4: Result summary

### 4.1 Test results

The apparatus was assessed against the following specifications:

FCC Part 2 Subpart J, Equipment Authorization Procedures  
FCC Part 24 Subpart E, Broadband PCS

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See report summary)

Part	Test method	Test description	Required	Result
§24.232(c)	2.1046	EIRP limits	Y	P
–	2.1047	Modulation characteristics	Y	P
§24.238(b)	2.1049	Occupied bandwidth	Y	P
§24.238(b)	2.1051	Spurious emissions at the antenna terminal	Y	P
§24.238(b)	2.1053	Field strength of spurious radiation	Y	P
§24.234	2.1055	Frequency stability	Y	P

Notes:

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## Appendix A: Test results

### Clause 24.232(c) Equivalent isotropically radiated power limits

Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

Assigned frequency range, MHz	Maximum EIRP	
	W	dBm
1850–1910	2.0	33.0

Test date: 2010-04-26, 2010-04-27

Test results: Pass

### Special notes

Radiated measurements were performed:

- The EUT was measured on three orthogonal axis.
- All measurements were performed at a distance of 3 m.
- All measurements were performed:
  - using a peak detector with RBW wider than emission bandwidth: conducted emission (red curve: "max hold", blue curve "clear write"); radiated emissions: upper blue curve "max hold", lower blue curve "clear write")
- Only the worst data presented in the test report.



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## Appendix A: Test results

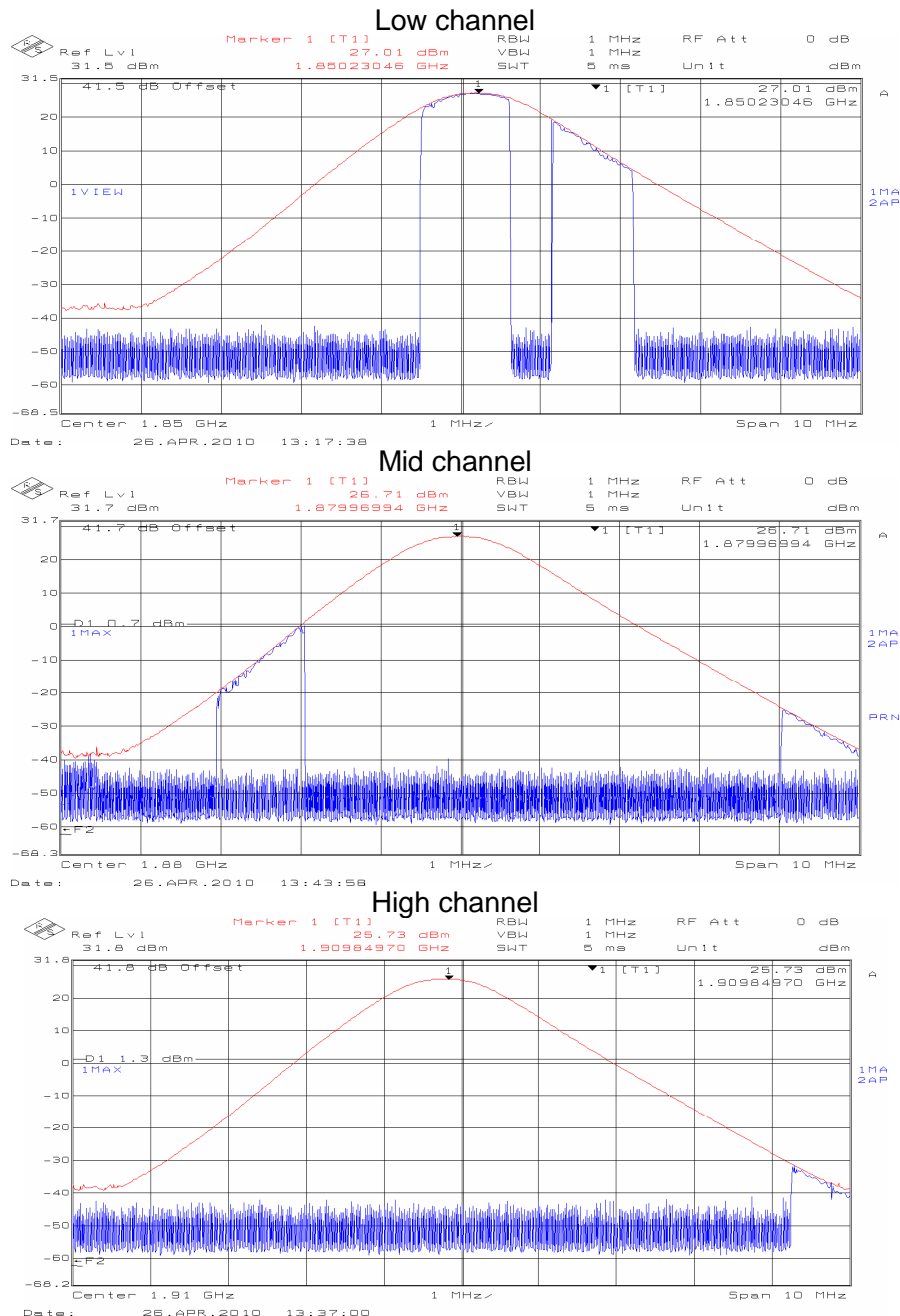
Report number: 141978TRFWL

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### Clause 24.232(c) Equivalent isotropically radiated power limits, continued

#### Test data

##### Conducted measurements



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Clause 24.232(c) Equivalent isotropically radiated power limits, continued

Test data									
<b>Conducted measurements</b>									
<table><tr><th>Frequency, MHz</th><th>Output power, dBm</th></tr><tr><td>1850</td><td>27</td></tr><tr><td>1880</td><td>26.7</td></tr><tr><td>1910</td><td>25.7</td></tr></table>		Frequency, MHz	Output power, dBm	1850	27	1880	26.7	1910	25.7
Frequency, MHz	Output power, dBm								
1850	27								
1880	26.7								
1910	25.7								
The values indicated were measured with peak detector									



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## Appendix A: Test results

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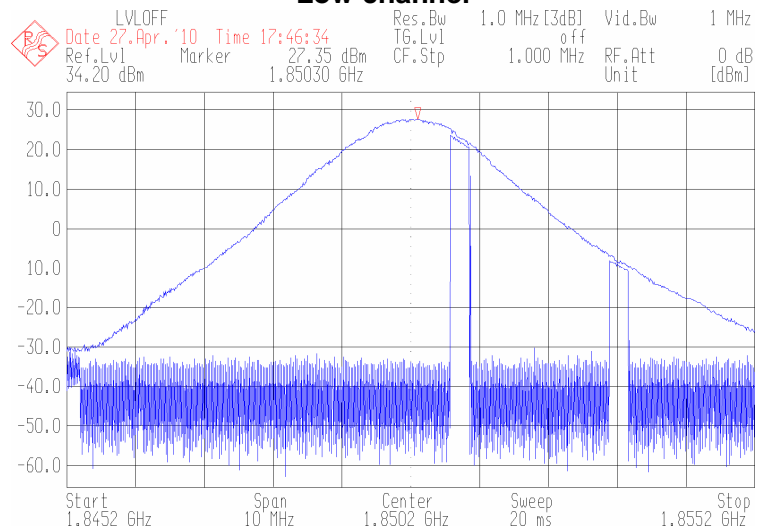
Specification: FCC 24 Subpart E

### Clause 24.232(c) Equivalent isotropically radiated power limits, continued

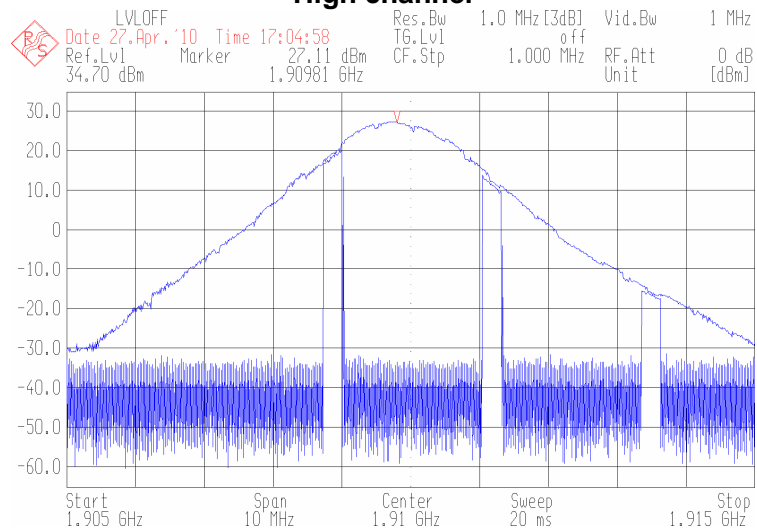
#### Test data

##### Radiated measurements

###### Low channel



###### High channel





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## Appendix A: Test results

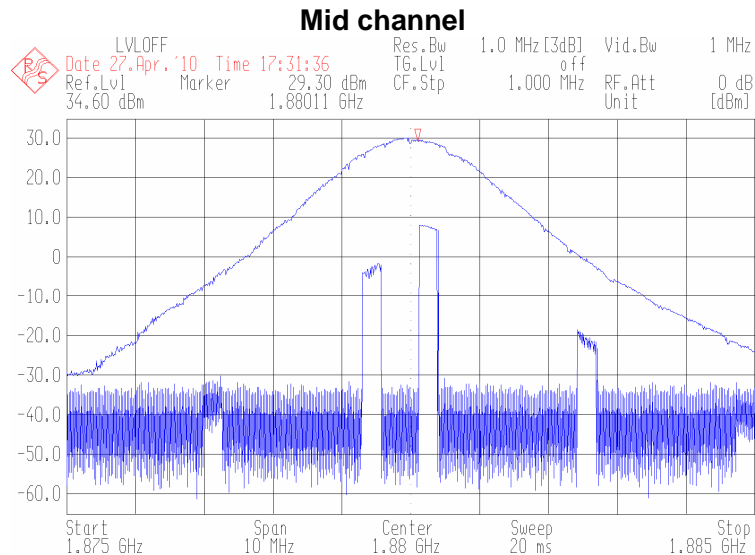
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### Clause 24.232(c) Equivalent isotropically radiated power limits, continued

#### Test data

##### Radiated measurements



Frequency, MHz	EIRP, dBm	EIRP limit, dBm	Margin, dB
1850	27.3	33	5.7
1880	29.3	33	3.7
1910	27.1	33	5.9

Frequency, MHz	Output power, dBm	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	Margin, dB
1850	27	0.3	27.3	33	5.7
1880	26.7	2.6	29.3	33	3.7
1910	25.7	1.4	27.1	33	5.9

Antenna gain (dBi)=eirp-conducted output power.

The values indicated were measured with peak detector

Radiated measurements have been performed applying the substitution method: a table containing the values received at 3 m of distance when a 0 dBm eirp have been transmitted by calibrated dipole, have been used to estimate the eirp radiated by E.U.T.



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Appendix A: Test results

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## Clause 24.238(b) Occupied bandwidth

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Assigned frequency range, MHz	Occupied bandwidth, dBc
1850–1910	–26

Test date: 2010-04-26

Test results: Pass

### Special notes

Resolution bandwidth was set wider than occupied bandwidth. Reference peak power was measured. Resolution bandwidth was set to 3 kHz and video bandwidth was set to 10 kHz with max-peak mode. The transmitter occupied bandwidth was measured between reference points on modulation envelope. Red curve: "maxhold", blue curve: "clear write"





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## Appendix A: Test results

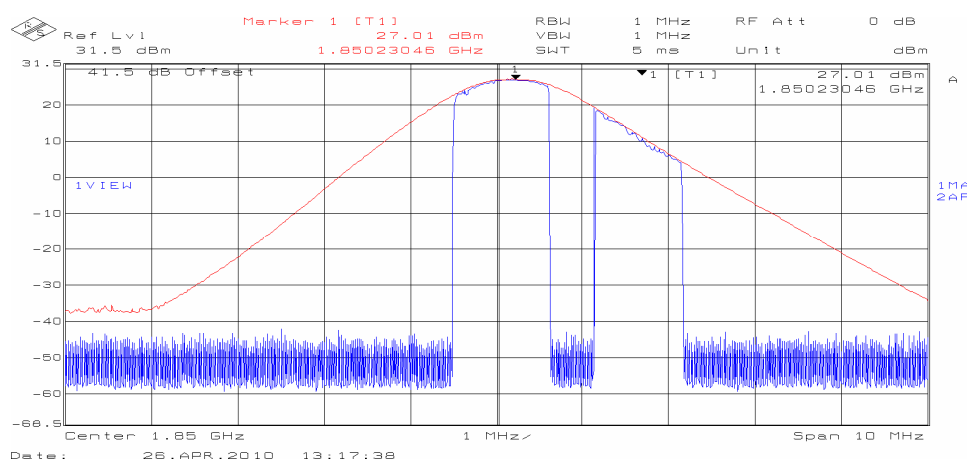
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

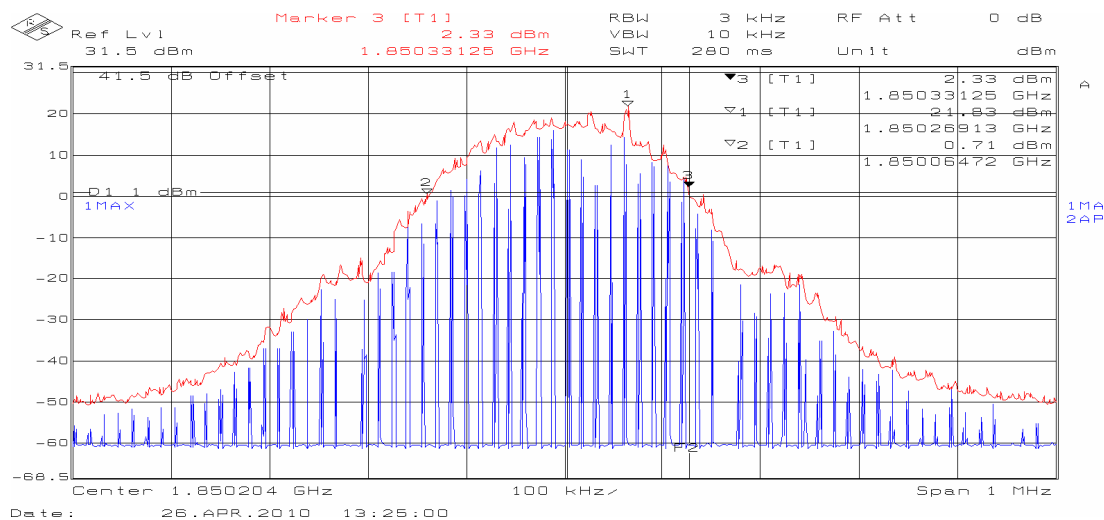
### Clause 24.238(b) Occupied bandwidth, continued

#### Test data

Low channel reference level:



Low channel occupied bandwidth:



Display line 1: 1850.06472, Display line 2: 1850.33125 Bandwidth: 266.5 kHz



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## Appendix A: Test results

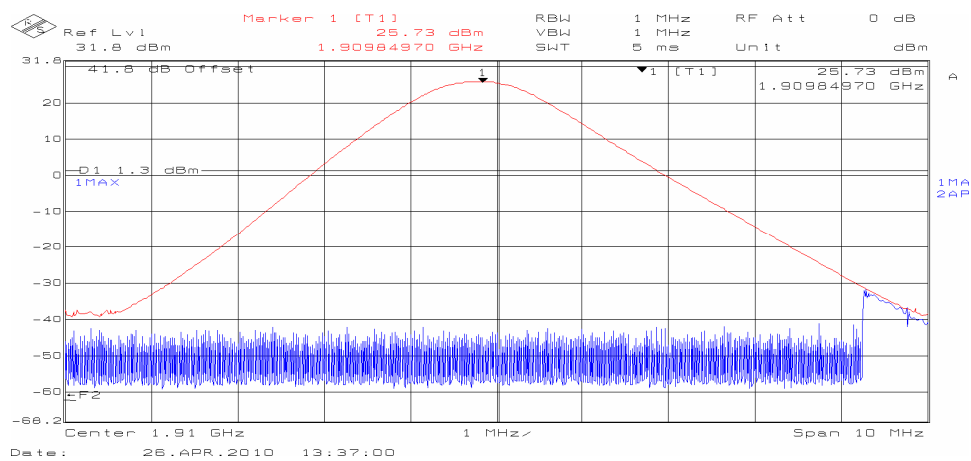
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

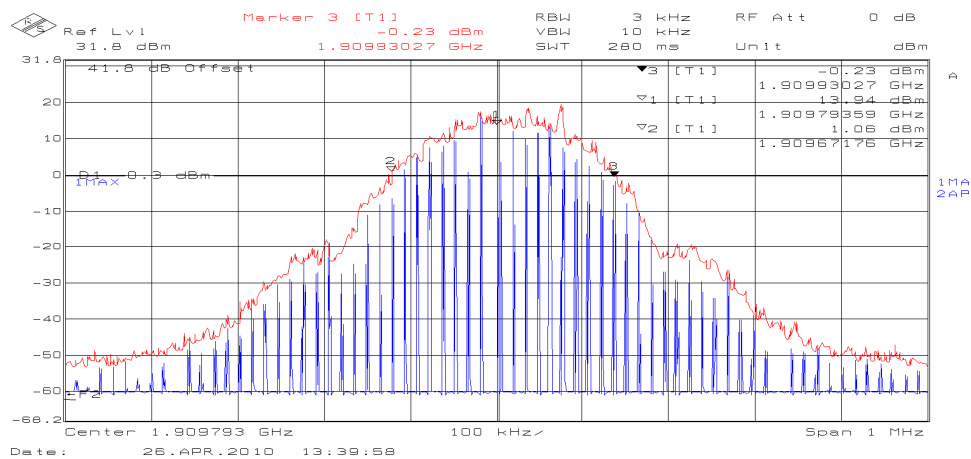
### Clause 24.238(b) Occupied bandwidth, continued

#### Test data

High channel reference level:



High channel occupied bandwidth:



Display line 1: 1909.67176, Display line 2: 1909.93027 Bandwidth: 258.5 kHz



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## Appendix A: Test results

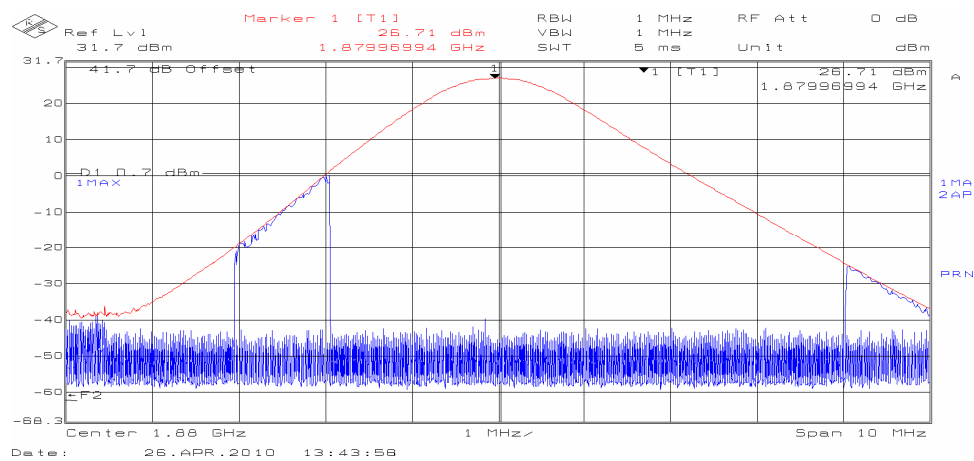
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

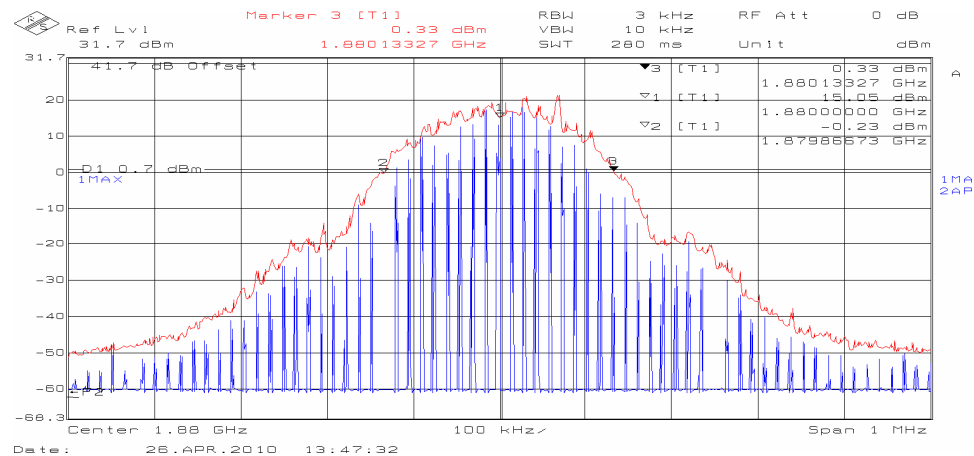
### Clause 24.238(b) Occupied bandwidth, continued

#### Test data

Mid channel reference level:



Mid channel occupied bandwidth:



Display line 1: 1879.86673, Display line 2: 1880.13327 Bandwidth: 266.5kHz

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Clause 24.238(b) Occupied bandwidth, continued

Test data, continued	
Frequency, MHz	26 dB bandwidth, kHz
1850	266.5
1880	266.5
1910	258.5



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Appendix A: Test results

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## Clause 24.238(a) Spurious emissions at antenna terminal

a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm
30–10 <sup>th</sup> harmonic	$43 + 10 \log(P)$	-13

Test date: 2010-04-26

Test results: Pass

### Special notes

- The spectrum was searched from 30 MHz up to 10<sup>th</sup> harmonic
- Only the worst data presented in the test report.
  - All measurements were performed using a peak detector (red curve: "maxhold", blue curve "clear write")

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth ( *i.e.* 1 MHz or 1 percent of emission bandwidth, as specified).



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## Appendix A: Test results

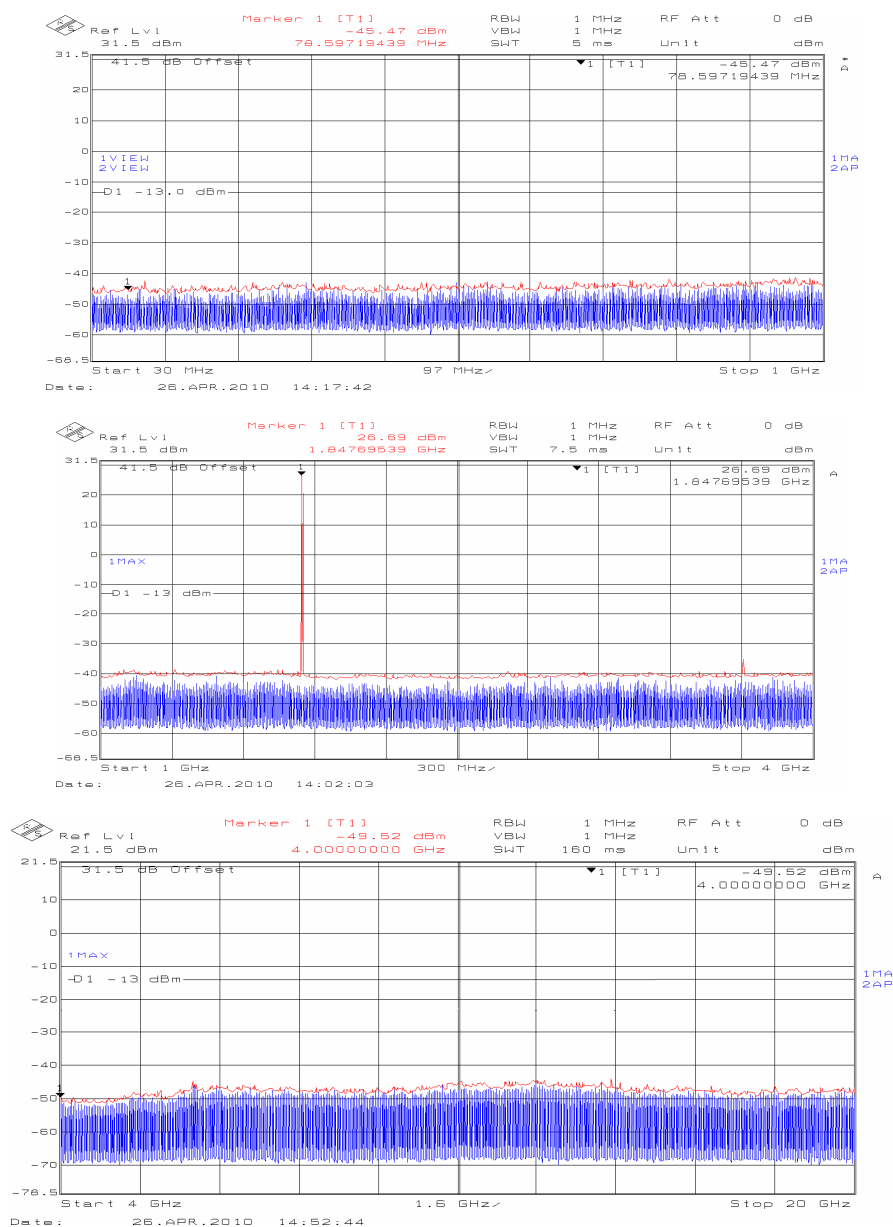
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### Clause 24.238(a) Spurious emissions at antenna terminal, continued

#### Test data

##### Low channel:





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## Appendix A: Test results

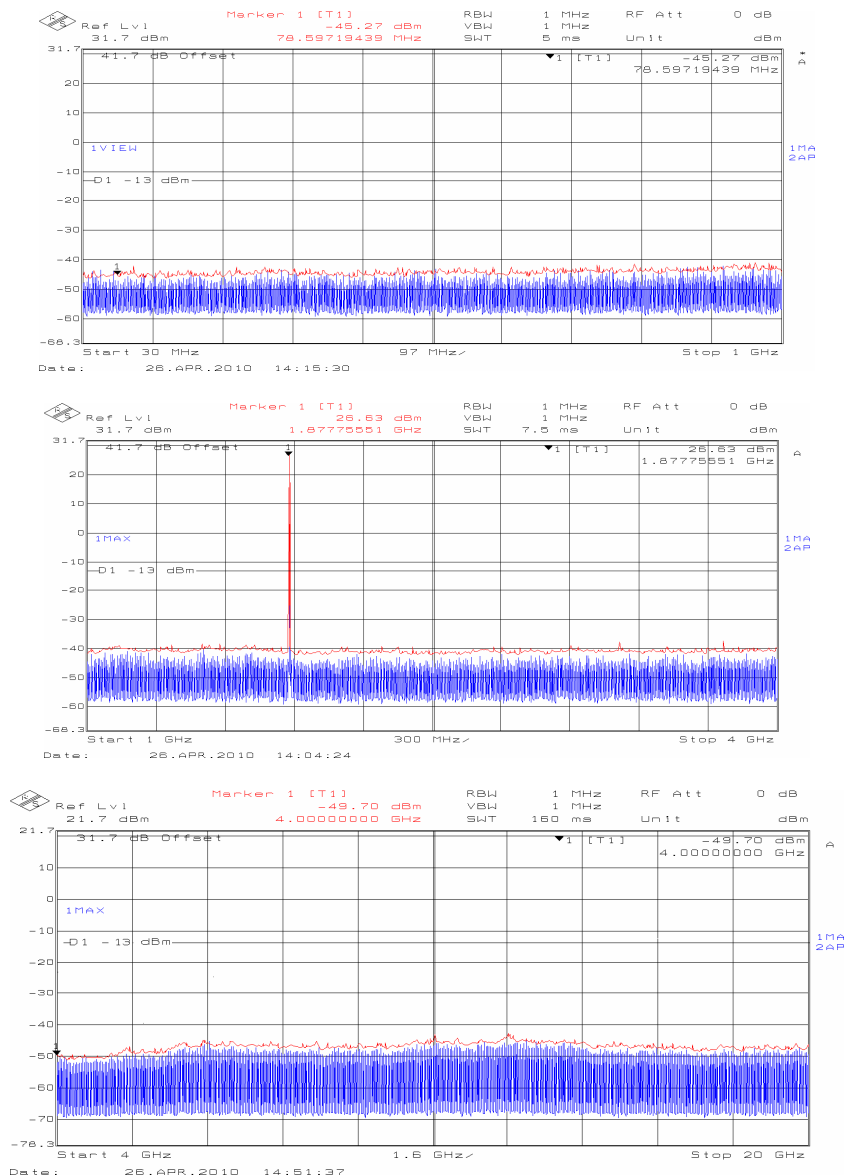
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### Clause 24.238(a) Spurious emissions at antenna terminal, continued

#### Test data

##### Mid channel:





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## Appendix A: Test results

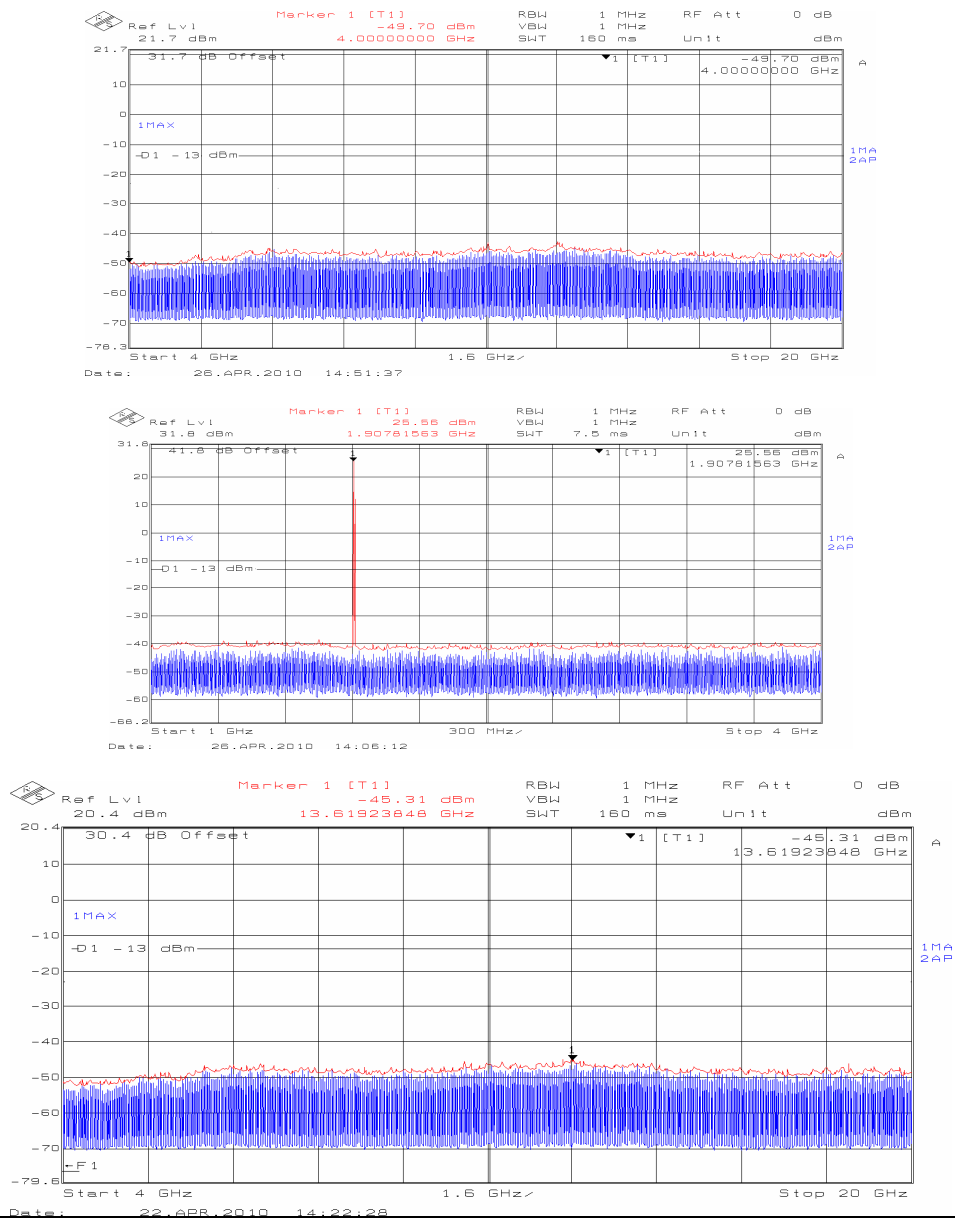
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### Clause 24.238(a) Spurious emissions at antenna terminal, continued

#### Test data

##### High channel:







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## Appendix A: Test results

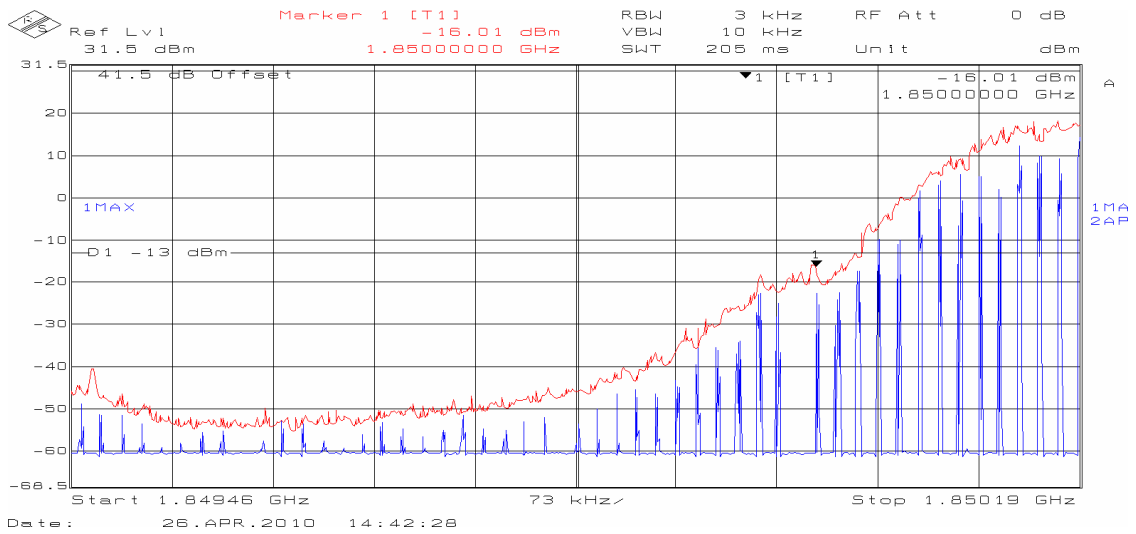
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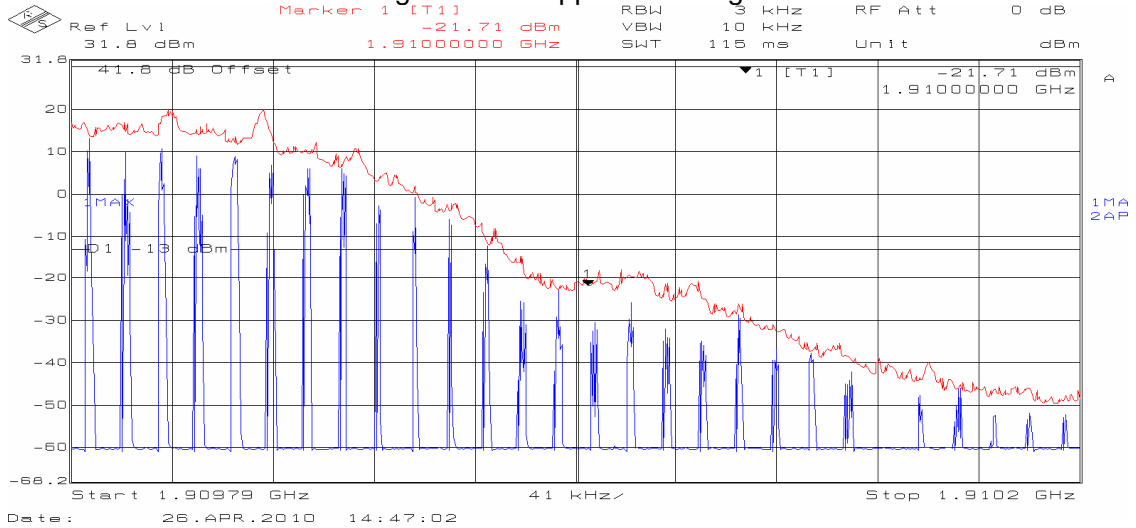
### Clause 24.238(a) Spurious emissions at antenna terminal, continued

#### Test data, continued

##### Low channel lower band edge:



##### High channel upper band edge:



Frequency, MHz	Spurious emission, dBm	Limit, dBm	Margin, dB
1850	-16	-13.0	3
1910	-21.7	-13.0	8.7



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## Appendix A: Test results

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### Clause 24.238(a) Field strength of spurious radiation

a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm	Equivalent field strength limit* at 3 m, dBμV/m
30–10 <sup>th</sup> harmonic	$43 + 10 \log(P)$	-13	84.4

\* - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:

$$E = \sqrt{\frac{30 \times P \times 1.64}{r}}$$
, where  $P$  is ERP in W, 1.64 is numeric gain of ideal dipole and  $r$  is antenna to EUT distance in m.

Test date: 2010-04-28

Test results: Pass

### Special notes

- The spectrum was searched from 30 MHz up to 10<sup>th</sup> harmonic
- The EUT was measured on three orthogonal axis.
- All measurements were performed at a distance of 3 m.
- Only the worst data presented in the test report.
- The EUT's antenna port was terminated with 50 Ω termination.
- All measurements were performed using a peak detector

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth ( i.e. 1 MHz or 1 percent of emission bandwidth, as specified).



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## Appendix A: Test results

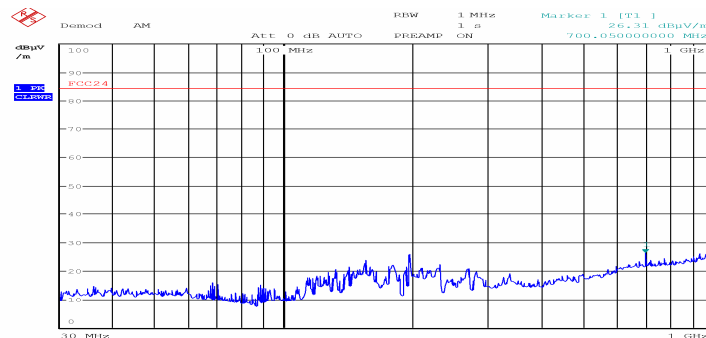
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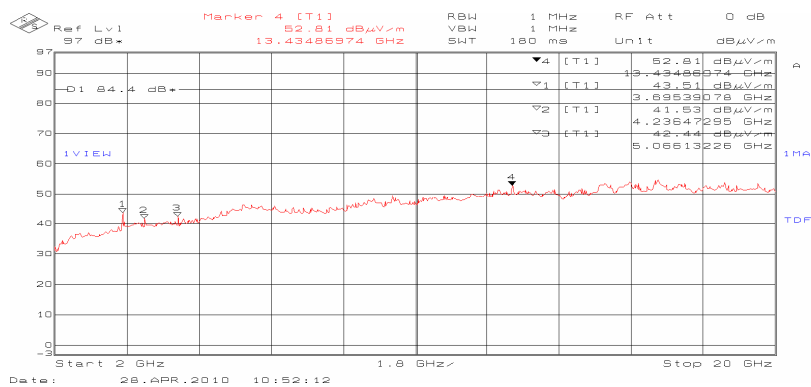
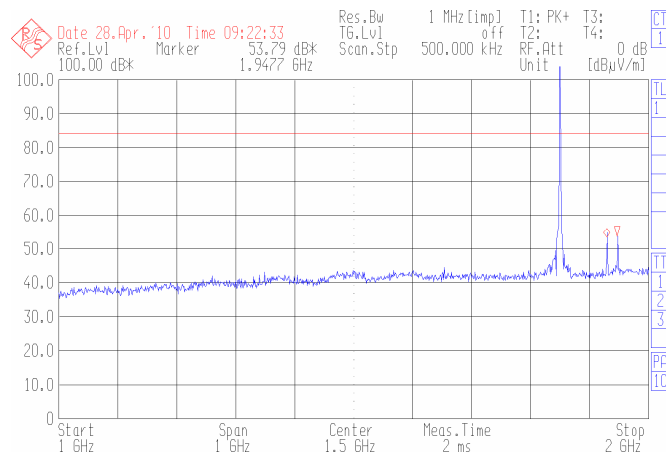
### Clause 24.238(a) Field strength of spurious radiation, continued

#### Test data

##### Low channel: horizontal polarization



Date: 28.APR.2010 15:17:40



Date: 28.APR.2010 10:52:12



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## Appendix A: Test results

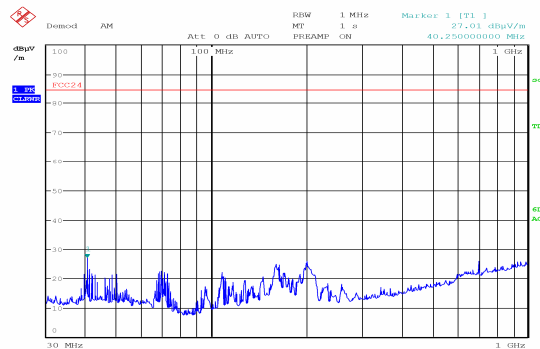
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

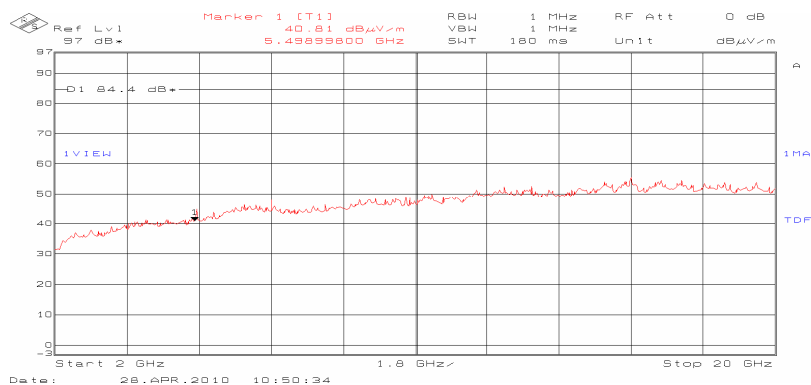
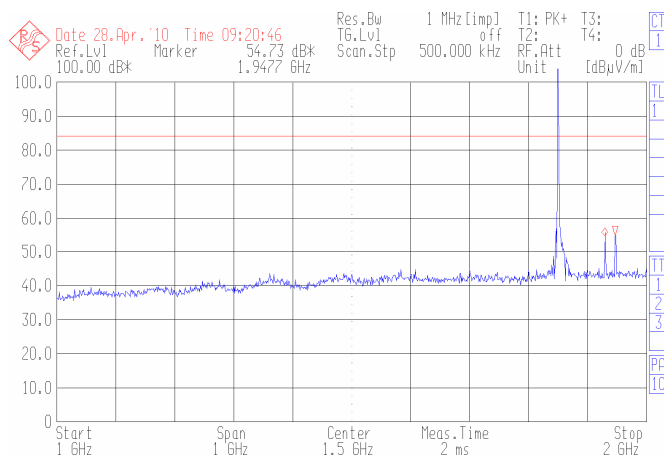
### Clause 24.238(a) Field strength of spurious radiation, continued

#### Test data

##### Low channel: vertical polarization



Date: 28.APR.2010 15:15:51





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## Appendix A: Test results

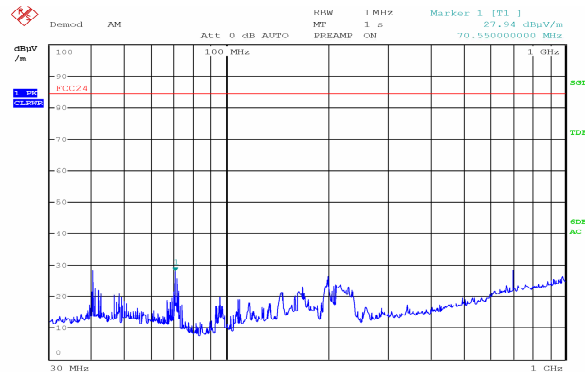
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

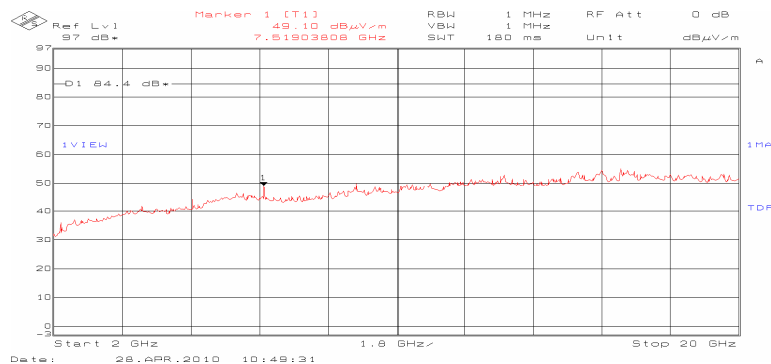
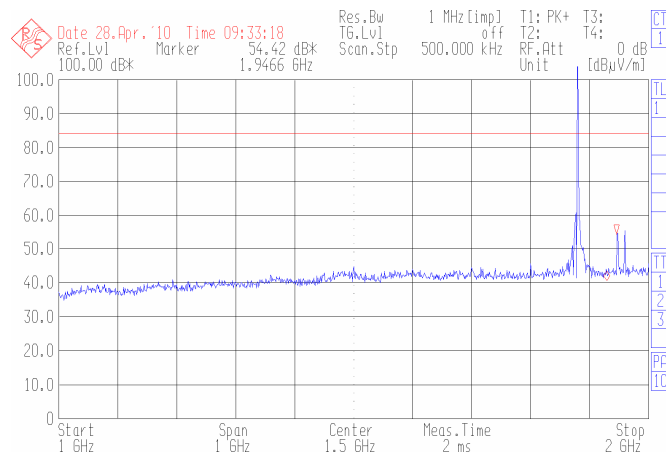
### Clause 24.238(a) Field strength of spurious radiation, continued

#### Test data

##### Middle channel: vertical polarization



Date: 28.APR.2010 15:26:08





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## Appendix A: Test results

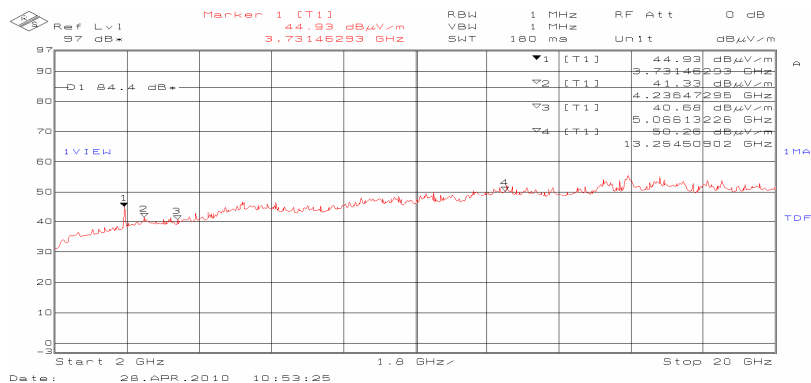
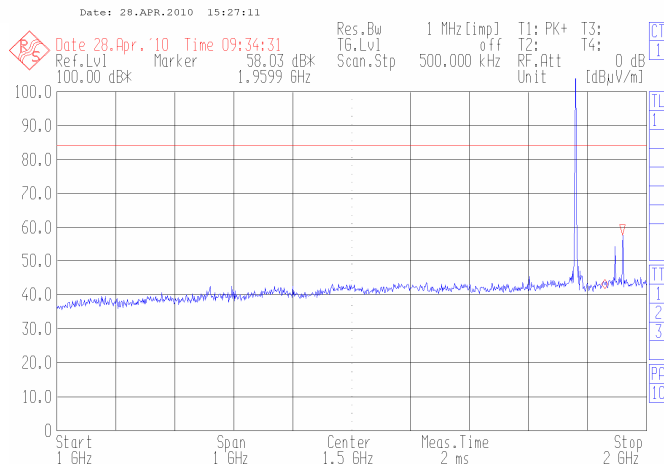
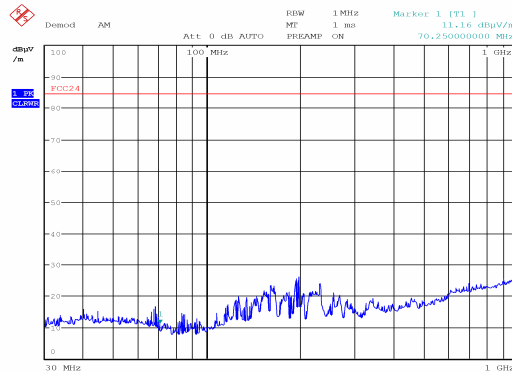
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

### Clause 24.238(a) Field strength of spurious radiation, continued

#### Test data

##### Middle channel: horizontal polarization





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## Appendix A: Test results

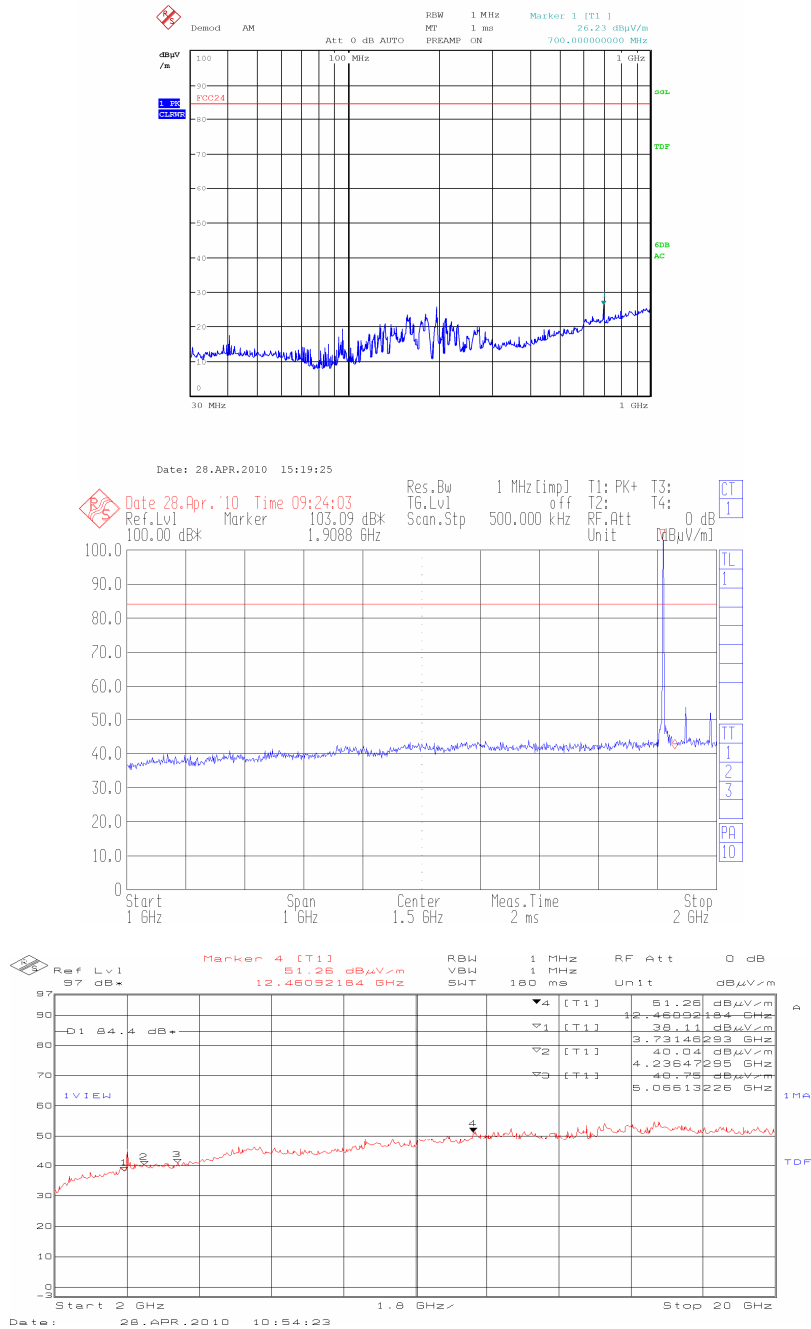
Report number: 141978TRFWL

Specification: FCC 24 Subpart E

### Clause 24.238(a) Field strength of spurious radiation, continued

#### Test data

##### High channel: horizontal polarization








 Nemko Spa Via del Carroccio, 4 – I 20046 Biassono (Italy)	Appendix A: Test results
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Test data, continued					
Frequency, MHz	Field strength, dBµV/m	Field strength to ERP factor, dB	Spurious emission, dBm	Limit, dBm	Margin, dB
1959.9	58	- 97.8	-39.2	-13.0	26.3
The values indicated were measured with peak detector					

 Nemko Spa Via del Carroccio, 4 – I 20046 Biassono (Italy)	Appendix A: Test results
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## Clause 24.235 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Assigned frequency, MHz	Limits
1850.2	26 dBc points including frequency drift shall remain within the authorized frequency block
1880.0	
1909.8	

Test date: 2010-05-28

Test results: Pass

### Special notes

The resolution bandwidth was set to 100 kHz, video bandwidth was set to 100 kHz



Nemko Spa  
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Appendix A: Test results

Report number: 141978TRFWL

Specification: FCC 24 Subpart E

Clause 24.235 Frequency stability, continued

Test data

Conditions	Frequency (MHz)	Maximum drift (Hz)
+50 °C, Nominal power	1850.201000	1000.000000
+40 °C, Nominal power	1850.206015	6015.000000
+30 °C, Nominal power	1850.201505	1505.000000
+20 °C, +15% power	1850.201000	1000.000000
+20 °C, Nominal power	1850.200000	Reference
+20 °C, -15% power	1850.200000	0.000000
+10 °C, Nominal power	1850.200500	500.000000
0 °C, Nominal power	1850.204505	4505.000000
-10 °C, Nominal power	1850.201500	1500.000000
-20 °C, Nominal power	1850.201020	1020.000000
-30 °C, Nominal power	1850.201085	1085.000000

Conditions	Frequency (MHz)	Maximum drift (Hz)
+50 °C, Nominal power	1880.002005	1505.000000
+40 °C, Nominal power	1879.998995	-1505.000000
+30 °C, Nominal power	1880.002005	1505.000000
+20 °C, +15% power	1880.000500	0.000000
+20 °C, Nominal power	1880.000500	Reference
+20 °C, -15% power	1880.000500	0.000000
+10 °C, Nominal power	1880.001000	500.000000
0 °C, Nominal power	1879.999000	-1500.000000
-10 °C, Nominal power	1880.000000	-500.000000
-20 °C, Nominal power	1880.000000	-500.000000
-30 °C, Nominal power	1879.999950	-550.000000

Conditions	Frequency (MHz)	Maximum drift (Hz)
+50 °C, Nominal power	1909.801600	3000.000000
+40 °C, Nominal power	1909.798600	0.000000
+30 °C, Nominal power	1909.797105	-1495.000000
+20 °C, +15% power	1909.800600	2000.000000
+20 °C, Nominal power	1909.798600	Reference
+20 °C, -15% power	1909.798595	-5.000000
+10 °C, Nominal power	1909.799500	900.000000
0 °C, Nominal power	1909.798600	0.000000
-10 °C, Nominal power	1909.799020	420.000000
-20 °C, Nominal power	1909.800040	1440.000000
-30 °C, Nominal power	1909.798925	325.000000

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## Clause 24.235 Frequency stability, continued

### Test data, continued

Carrier frequency, MHz	Lower reference point, MHz	Maximum negative drift, Hz	Frequency tolerance, MHz	Limit, MHz	Margin, kHz
1850.2	1850.200000	0.000000	1850.200000	1850	200

Frequency tolerance = Lower reference point – Maximum negative drift

Carrier frequency, MHz	Upper reference point, MHz	Maximum positive drift, Hz	Frequency tolerance, MHz	Limit, MHz	Margin, kHz
1909.8	1909.93529	1600.000000	1909.93689	1910	63.11

Frequency tolerance = Upper reference point + Maximum positive drift

