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Nemko Italy S.p.A., Via del Carroccio 4, 20853, Biassono, Italy.

Report number: 273821-1R1TRFWL

Apparatus: ECOSD RBS4000I U4110DA0C14W2E1C3S1V1G2

Applicant: SELEX ES SPA  
Piazza Montegrappa, 4  
00195 Roma- Italy

FCC ID: X5YF467DHDE-IP

Test specification:

## **Subpart S—Regulations Governing Licensing and Use of Frequencies in the 851-869 MHz Band**

Title 47-Telecommunication  
Chapter I - Federal Communications Commission  
Subchapter D – Safety and special radio services  
Part 90 – Private land mobile services

## **Subpart S—Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands**

Reviewed by: 2014-12-23  
Signature Date  
G. Curioni, Wireless/EMC Specialist

Tested by: 2014-12-23  
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Section 1: Report summary

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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 Italy SpA.

### Test specification:

FCC Part 90 Private land mobile services  
Subpart I – General technical standards

Compliance status:	Complies
Exclusions:	None
Non-compliances:	None
Report release history:	Original release
Test location:	Nemko Italy S.p.A. Via del Carroccio 4, 20853, Biassono, Italy.
Registration number:	481407 (10 m Semi anechoic chamber)

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted in accordance with ANSI C63.4-2003.

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. All results contained in this report are within Nemko Italy's ISO/IEC 17025 accreditation.

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Section 2: Equipment under test

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## Section 2: Equipment under test

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

The following information identifies the EUT under test:

Type of equipment:	Radio Base Station UHF (851÷ 869 MHz), 110W
Product marketing name:	--
Code number:	
Model number:	ECOSD RBS4000I U4110DA0C14W2E1C3S1V1G2
Serial number:	
FCC ID:	X5YF467DHDE-IP
Date of receipt:	2014-11-20
Label	



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Section 2: Equipment under test

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## 2.2 Accessories and support equipment

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

Item # 1

Type of equipment:

Brand name:

Model name or number:

Serial number:

Nemko sample number:

Connection port:

Cable length and type:

Item # 2

Type of equipment:

Brand name:

Model name or number:

Serial number:

Nemko sample number:

Connection port:

Cable length and type:



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Section 2: Equipment under test

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## Section 2: Equipment under test, continued

### 2.3 EUT description

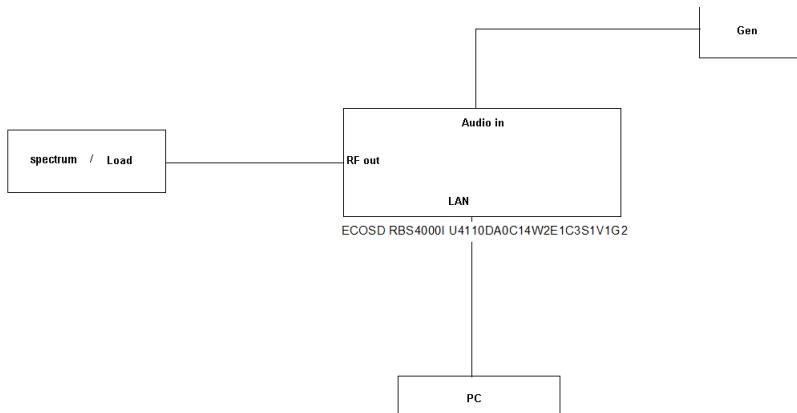
Radio Base Station UHF (851-869 MHz), 110W

### 2.4 Technical specifications of the EUT

Operating frequency:	851 ÷ 869 MHz
Modulation type:	Analog: FM, PM Digital: 4FSK
Occupied bandwidth:	11 kHz, /16 KHz for analog; 7 kHz for digital
Emission designator:	Analog modulation: FM 11K0F3E / 16K0F3E (12,5 / 25 kHz) PM 11K0G3E / 16K0G3E (12,5 / 25 kHz) Digital modulation: 4FSK Voice and Data 7K60FXE 4FSK Data only 7K60FXD C4FM Voice and Data 8K10F1E C4FM Data only 8K10F1D
Antenna type:	Equipment that has an external 50 Ω RF connector
Power source	48 Vdc (35 ÷ 75 Vdc)
Temperature range:	-30 to + 60°C
Synchronization:	GPS, OCXO

## Section 2: Equipment under test, continued

### 2.5 EUT setup diagram



### 2.6 Operation of the EUT during testing

Transmitting at maximum power and normal modulation to:

- 1) 851 MHz
- 2) 860 MHz
- 3) 869 MHz

### 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

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## Section 3: Test conditions

### 3.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

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

Normal temperature, humidity and air pressure test conditions	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 860–1060 hPa  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

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### Section 3: Test conditions, continued

#### 3.3 Measurement uncertainty

Nemko S.p.A. measurement uncertainty has been calculated using the standard CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Uncertainty in EMC measurements". All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko S.p.A. document WML1002.

#### 3.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	2015/02
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR
Turning-table	R&S	HCT	835 803/03	NCR
Antenna mast	R&S	HCM	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
Spectrum Analyzer 9kHz ÷ 40GHz	R&S	FSEK	848255/005	2015/08
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2016/09
Shielded room	Siemens	10m control room	1947	NCR
Dummy load	Celwave	HL300D	2185	2015/07
High Pass Filter	Wainwright	WHK1.1/15G-10EE	SN2	NCR
Climatic chamber	Espec	ARS 1100	4100000067	2015/02
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	2015/10
Microwave Horn Antenna 1 ÷ 18 GHz	Schwarzbeck	STLP9148	STLP9148-123	2015/02
Trilog Broad Band Antenna	Schwarzbeck	VULB 9162	VULB 9162-025	2015/05

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use  
(\*) Equipment supplied by manufacturer's



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Section 4: Results summary

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## Section 4: Result summary

### 4.1 FCC Part 90: Test results

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
§90.635	§2.1046	Output power	Y	Pass
§90.207	§2.1047	Modulation Characteristics	Y	N
§90.209	§2.1049	Bandwidth limitations	Y	Pass
§90.210	§2.1051	Spurious Emissions at the antenna terminal	Y	Pass
§90.210	§2.1053	Field strength of spurious radiation	Y	Pass
§90.213	§2.1055	Frequency stability	Y	Pass
§90.214	---	Transient Behaviour	N	--
§90.219	---	Use of boosters	N	---



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Appendix A: Test results

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## Appendix A: Test results

### Clause 90.635 Output power

"(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested." For measurements conducted pursuant to paragraphs (a) and (b) of § 2.1046, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

Test date: 2015-01-16

Test results: Pass

### Test data

– Power supply used + 48Vdc

Frequency [MHz]	Measured Output power [W]	Manufacturer's Rated Power [W]	LIMIT [W] (Manufacturer's rated Power + 20%)
851	109.9	110	132
860	111.9	110	132
869	111.2	110	132



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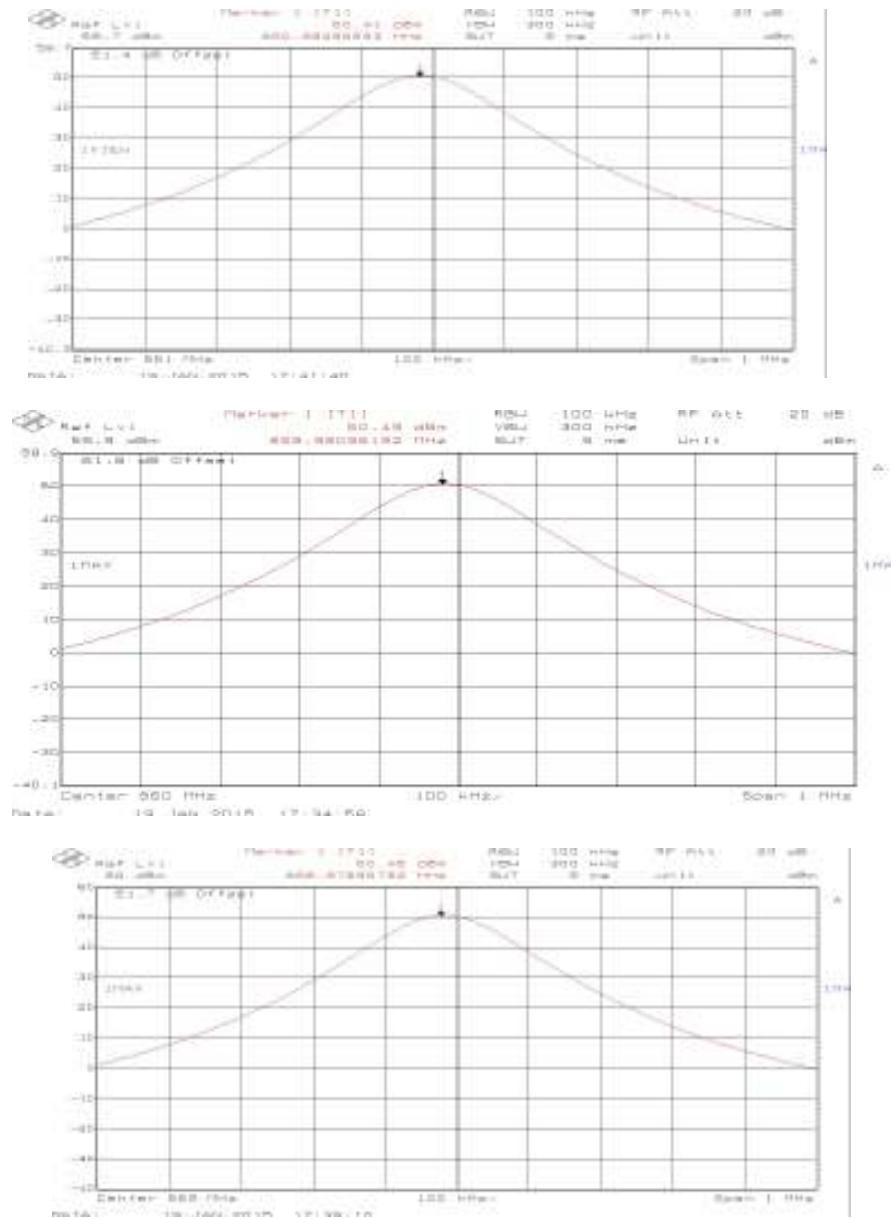
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## Test data

Power supply used: 48 Vdc





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### Set up photo





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Specification: FCC 90

## Clause 90.207 Modulation characteristics

Unless specified elsewhere in this part, stations will be authorized emissions as provided for in paragraphs (b) through (n) of this section.

### **§ 2.1047 Measurements required: Modulation characteristics.**

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.

(d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

Test date: 2014-11-27

Test results: Pass



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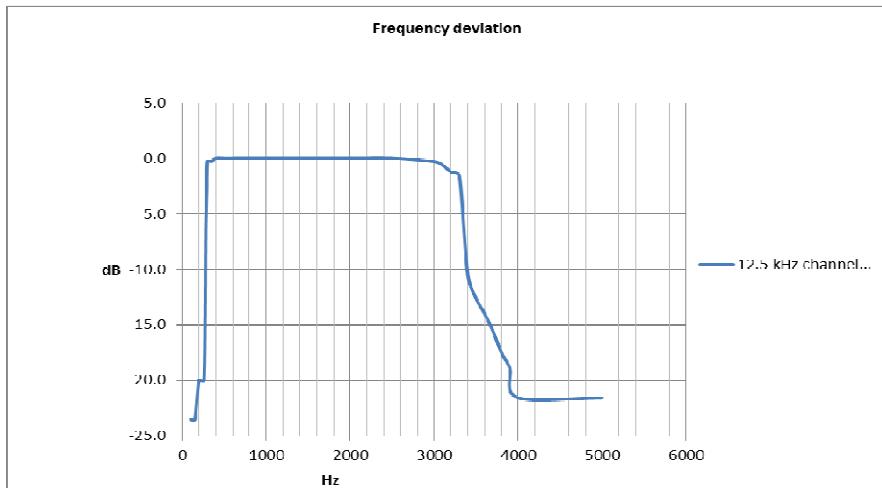
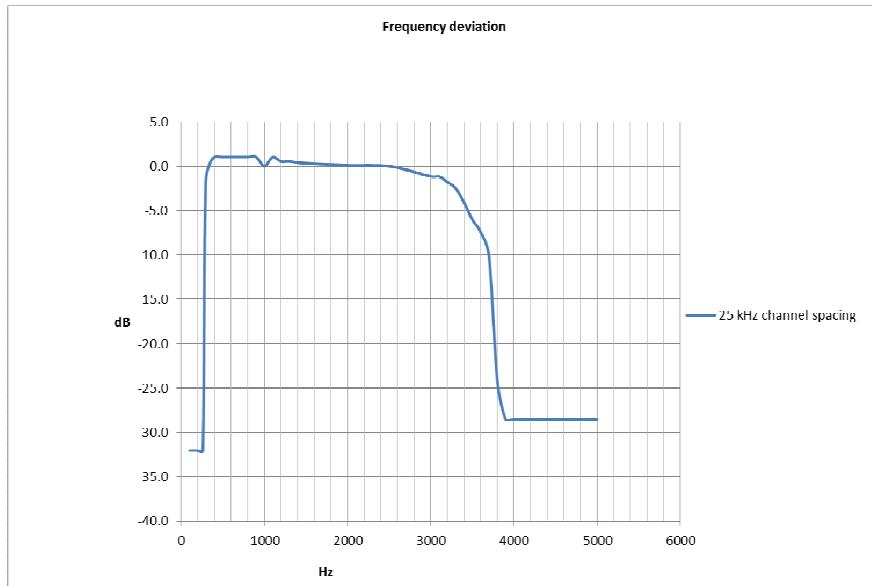
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## Test data

Audio frequency response, Constant input test method of section 2.2.6 of ANSI/TIA-603-B-2002





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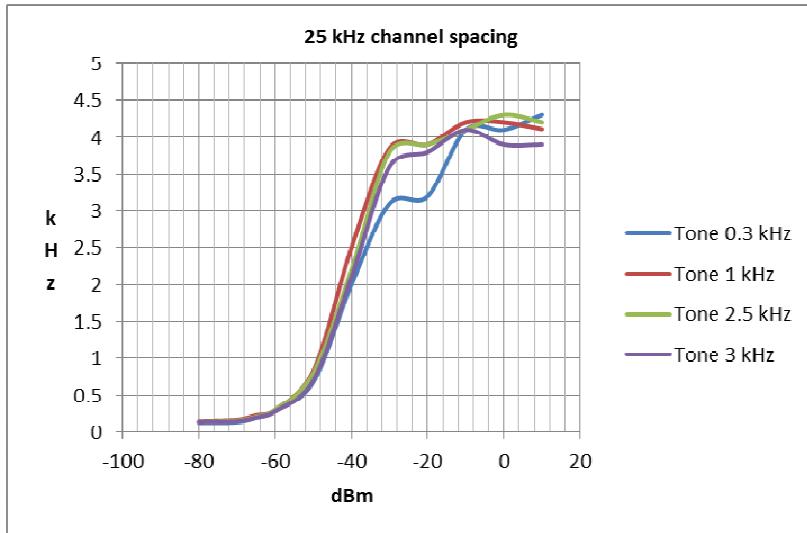
Appendix A: Test results

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## Test data

25 kHz channel spacing				
Audio Level dBm	Deviation (kHz)			
	TONE 300 Hz	TONE 1000 Hz	TONE 2500 Hz	TONE 3000 Hz
-80	0.13	0.15	0.14	0.14
-70	0.14	0.17	0.16	0.15
-65	0.2	0.23	0.21	0.2
-60	0.29	0.3	0.3	0.28
-50	0.68	0.83	0.8	0.7
-40	2	2.5	2.2	2.1
-30	3.1	3.85	3.8	3.6
-20	3.2	3.9	3.9	3.8
-10	4.1	4.2	4.1	4.1
0	4.1	4.2	4.3	3.9
10	4.3	4.11	4.2	3.9





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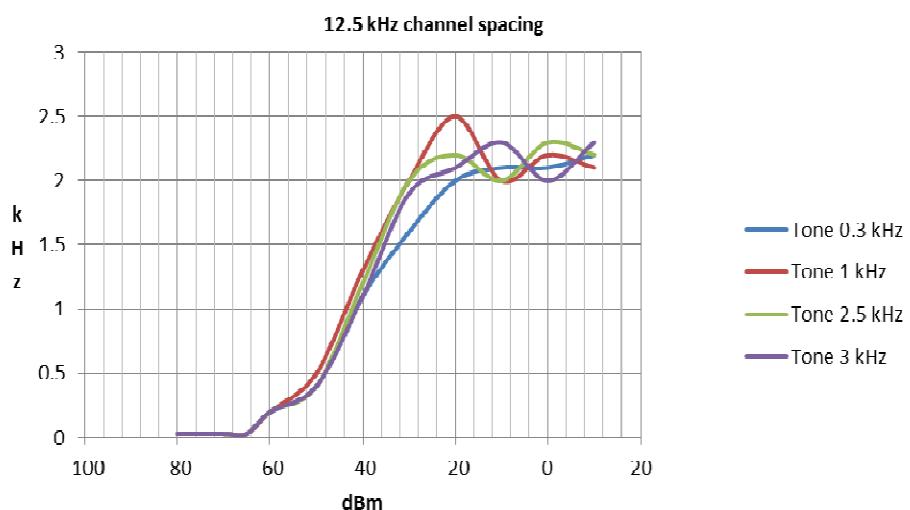
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Specification: FCC 90

## Test data

12.5 kHz channel spacing					
Audio Level dBm	Deviation (kHz)				
	TONE 300 Hz	TONE 1000 Hz	TONE 2500 Hz	TONE 3000 Hz	
-80	0.03	0.03	0.03	0.03	
-70	0.03	0.03	0.03	0.03	
-65	0.03	0.03	0.03	0.03	
-60	0.2	0.2	0.2	0.2	
-50	0.4	0.5	0.4	0.4	
-40	1.1	1.3	1.2	1.1	
-30	1.6	2	2	1.9	
-20	2	2.5	2.2	2.1	
-10	2.1	2	2	2.3	
0	2.1	2.2	2.3	2	
10	2.2	2.1	2.2	2.3	





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Appendix A: Test results

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## Clause 90.209 Occupied bandwidth

Unless specified elsewhere, channel spacing and bandwidths that will be authorized in the following frequency bands are given in the following table:

### Standard Channel Spacing/Bandwidth

Frequency Band (MHz)	Channel Spacing (kHz)	Authorized Bandwidth (kHz)
Below 25	—	—
25–50	20	20
72–76	20	20
150–174	7.5	20/11.25/6
216–220	6.25	20/11.25/6
220–222	5	4
406–512	6.25	20/11.25/6
806–809/851–854	12.5	20
809–824/854–869	25	20
896–901/935–940	12.5	13.6
902–928	—	—
929–930	25	20
1427–1432	12.5	12.5
2450–2483.5	—	—
Above 2500	—	—

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Test date: 2014-11-27

Test results: Pass



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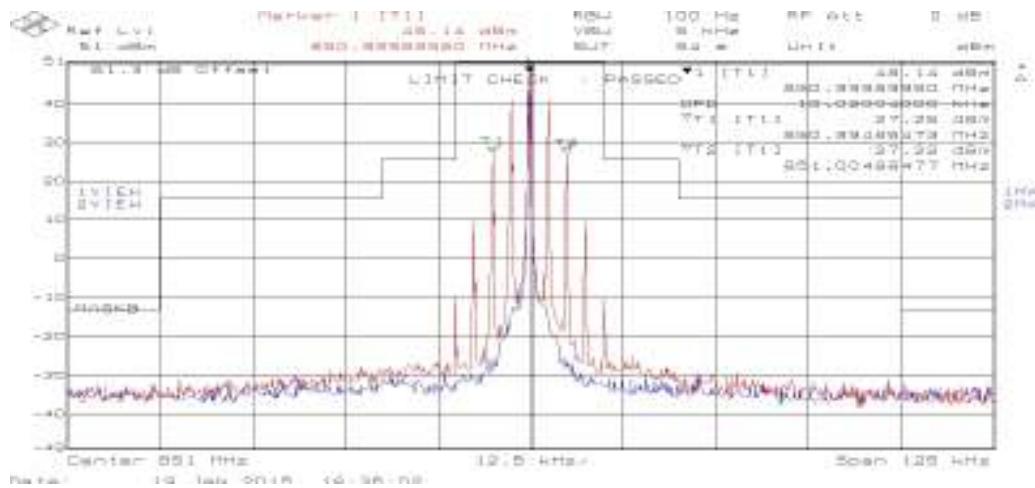
## Appendix A: Test results

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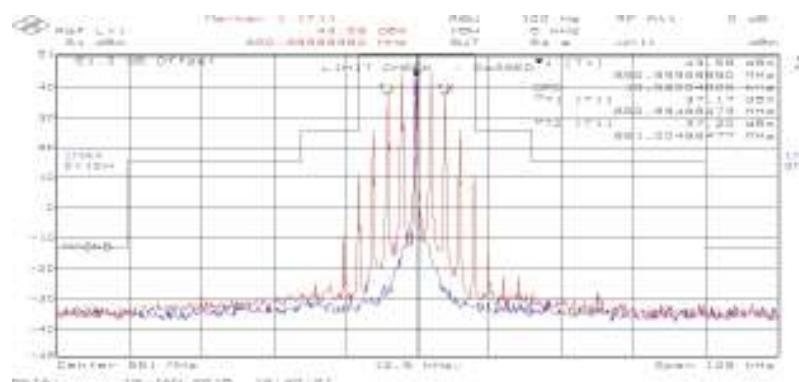
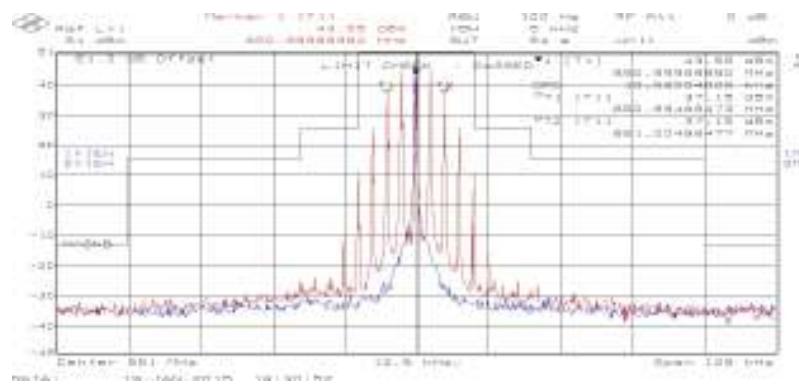
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### Test data

851 MHz, 110 W, 12,5 kHz, 2500 Hz Tone 16 dB above 50% Deviation



851 MHz, 110 W, 25 kHz, 2500 Hz Tone 16 dB above 50% Deviation





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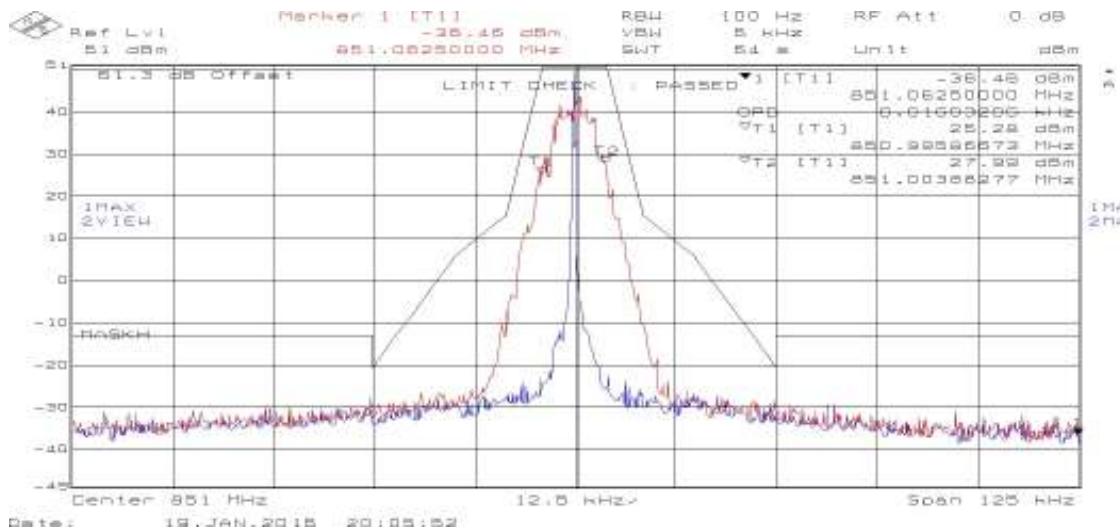
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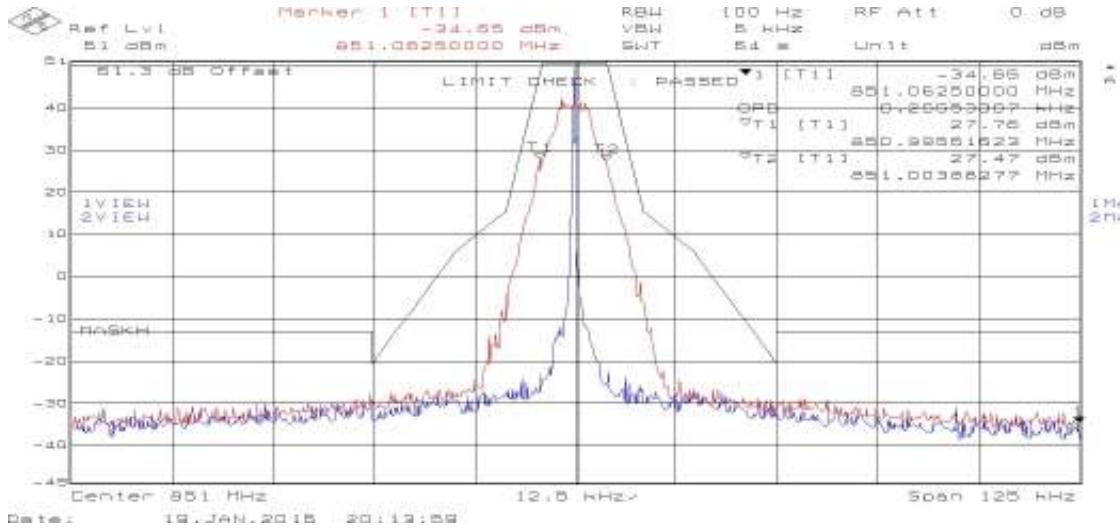
Specification: FCC 90

## Test data

851 MHz, 110 W, 12.5 kHz, DMR 4FSK



851 MHz, 110 W, 25 kHz, C4FM





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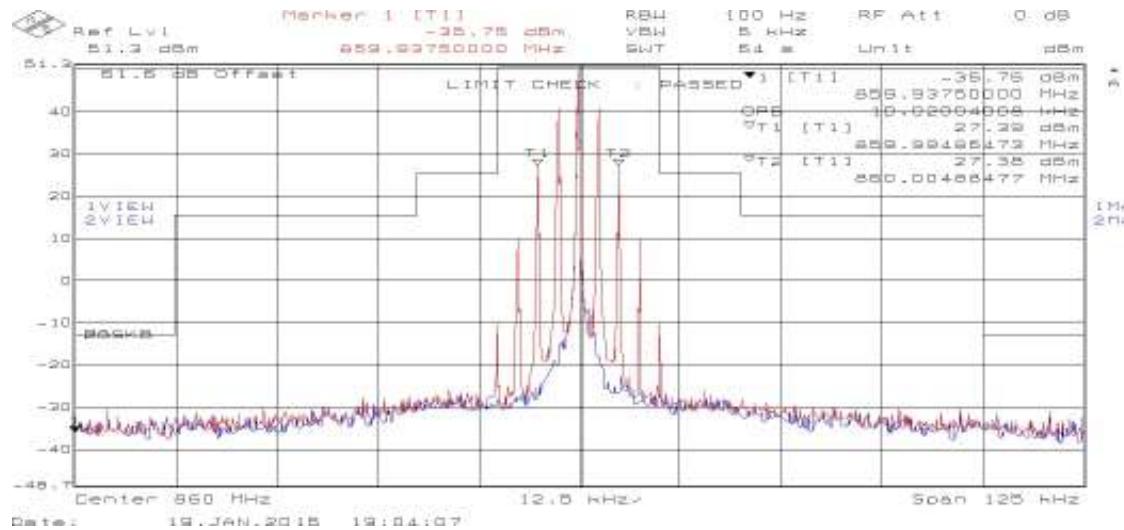
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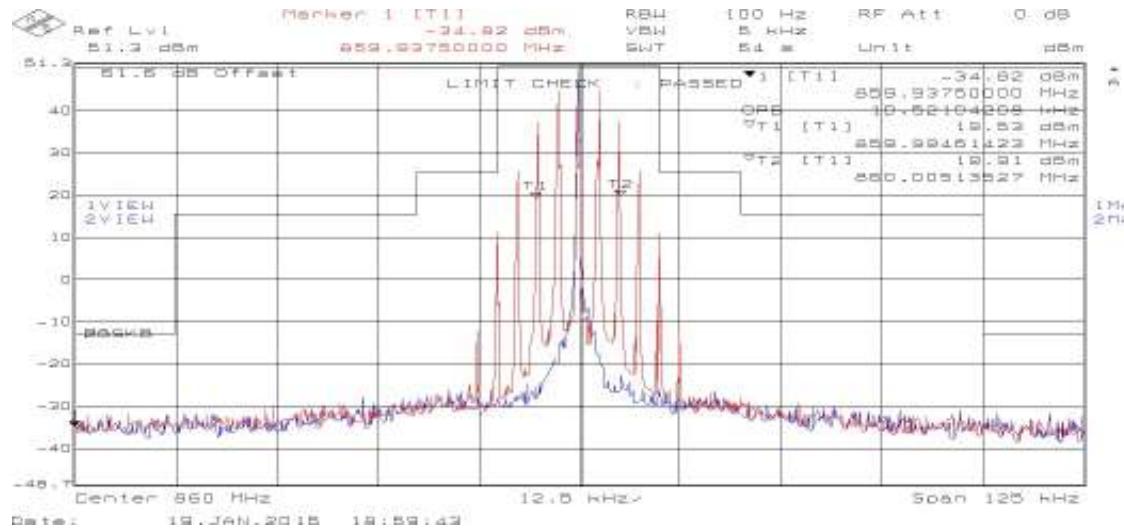
Specification: FCC 90

### Test data

860 MHz, 110 W, 12,5 kHz, 2500 Hz Tone 16 dB above 50% Deviation



860 MHz, 110 W, 25 kHz, 2500 Hz Tone 16 dB above 50% Deviation





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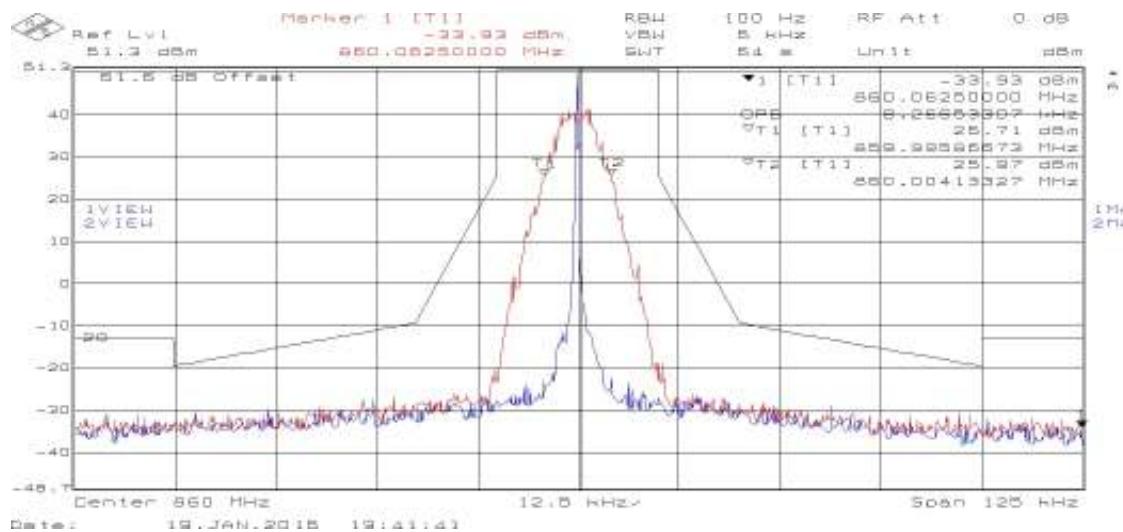
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## Test data

860 MHz, 110 W, C4FM





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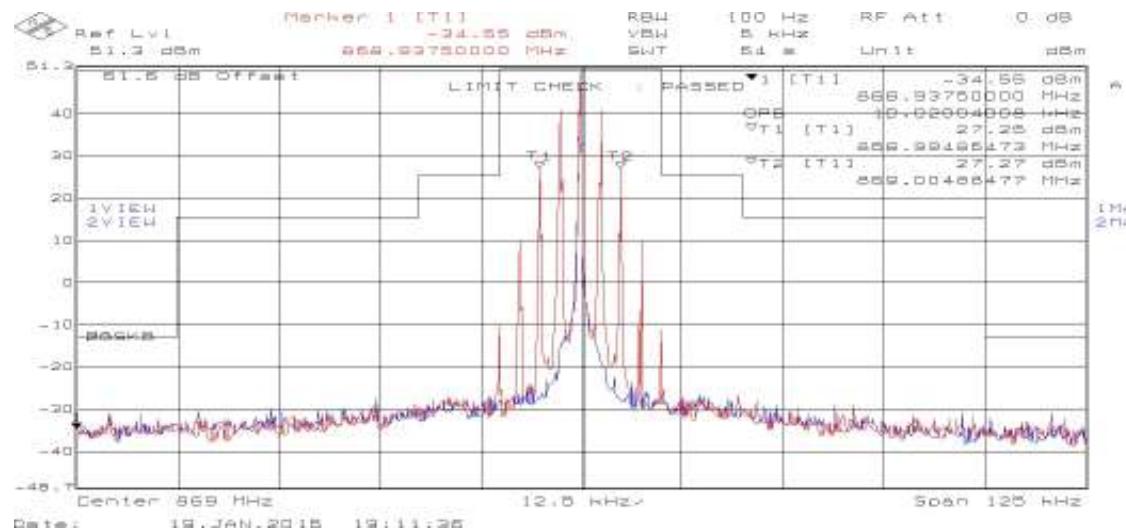
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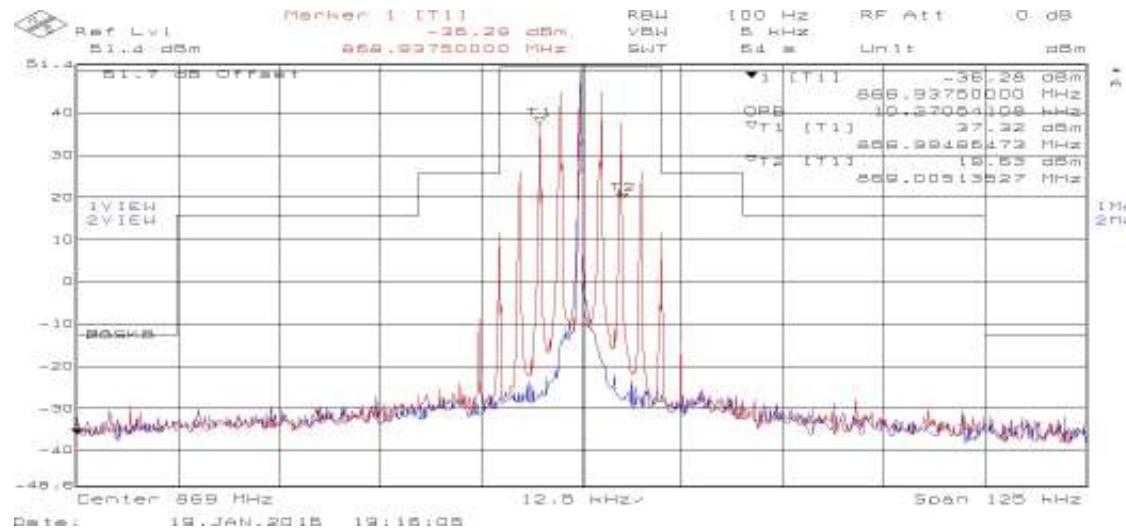
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### Test data

869 MHz, 110 W, 12.5 kHz, 2500 Hz Tone 16 dB above 50% Deviation



869 MHz, 110 W, 25 kHz, 2500 Hz Tone 16 dB above 50% Deviation





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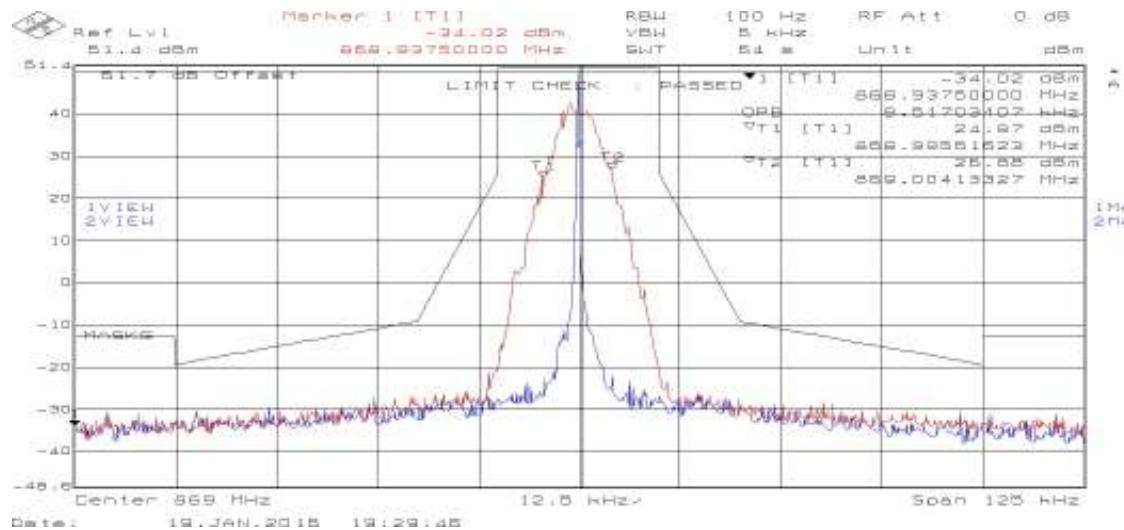
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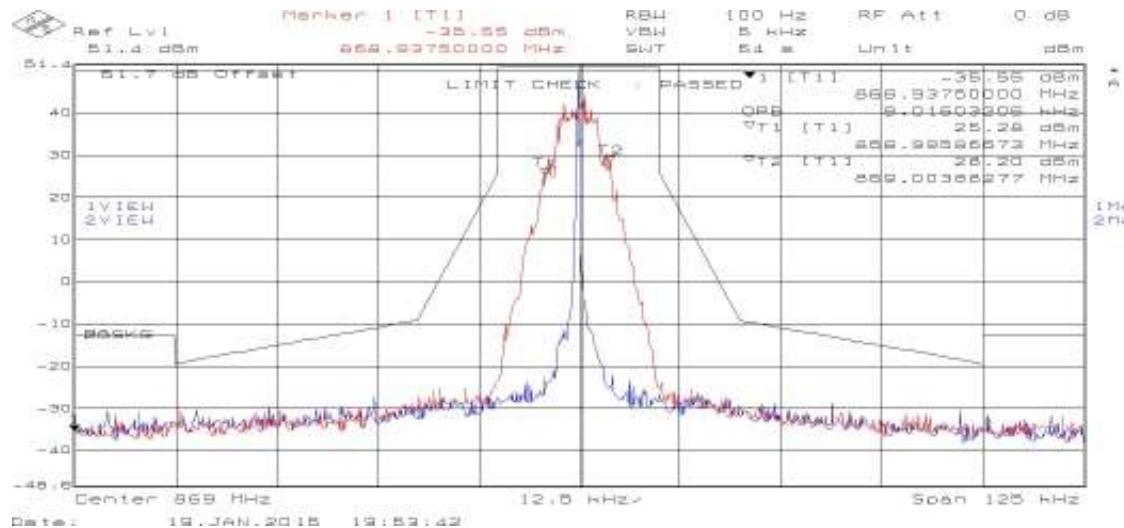
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### Test data

869 MHz, 110 W, 12.5 kHz, C4FM



869 MHz, 110 W, 12.5 kHz, DMR 4FSK





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### Set up photo





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Appendix A: Test results

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Specification: FCC 90

## Clause 90.210 Spurious emissions at the antenna terminal

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Applicable Emission Masks:

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter
Below 25	A or B	A or C
25–50	B	C
72–76	B	C
150–174	B, D, or E	C, D, or E
150 Paging-only	B	C
220–222	F	F
421–512	B, D, or E	C, D, or E
450 Paging-only	B	G
806–809/851–854	B	H
809–824/854–869	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990	L or M	L or M.
5850–5925	—	—
All other bands	B	C

### § 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Test date: 2014-11-25

Test results: Pass

Special notes



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Appendix A: Test results

Report Number 273821-1R1TRFWL

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### Set up photo





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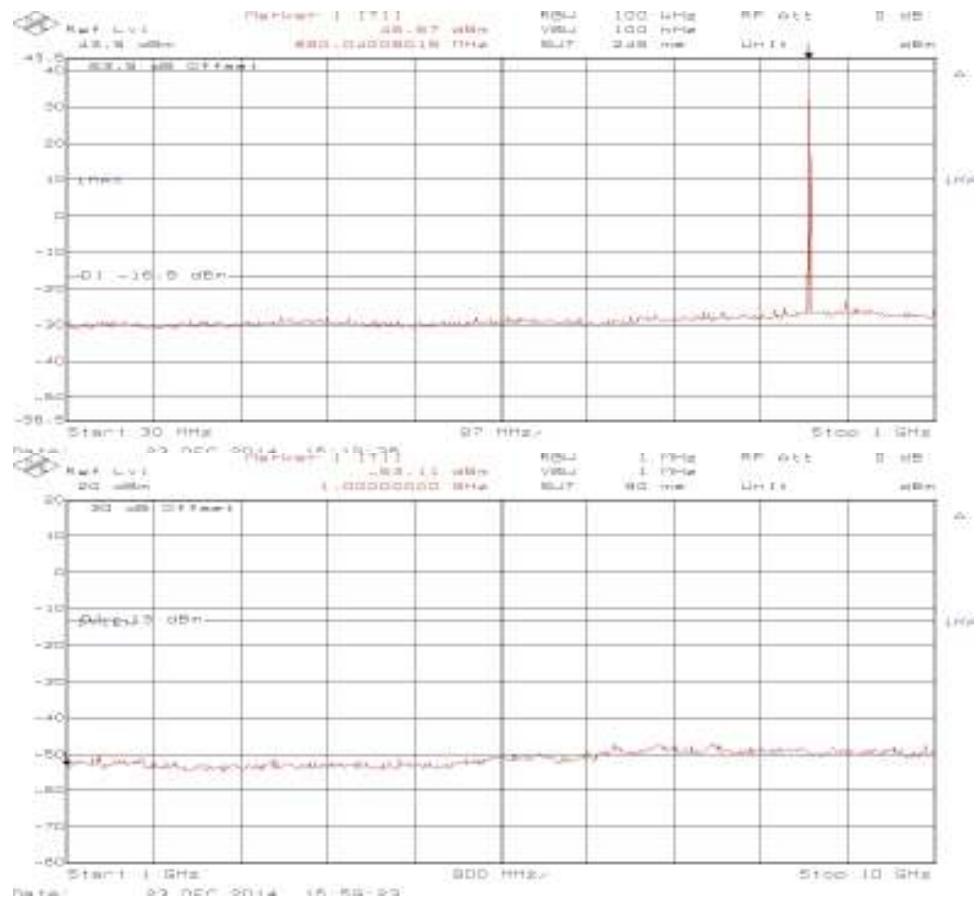
Appendix A: Test results

Report Number 273821-1R1TRFWL

Specification: FCC 90

## Test data

860 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm	dB	dBm		
823.9875	--	--	--	PK	carrier



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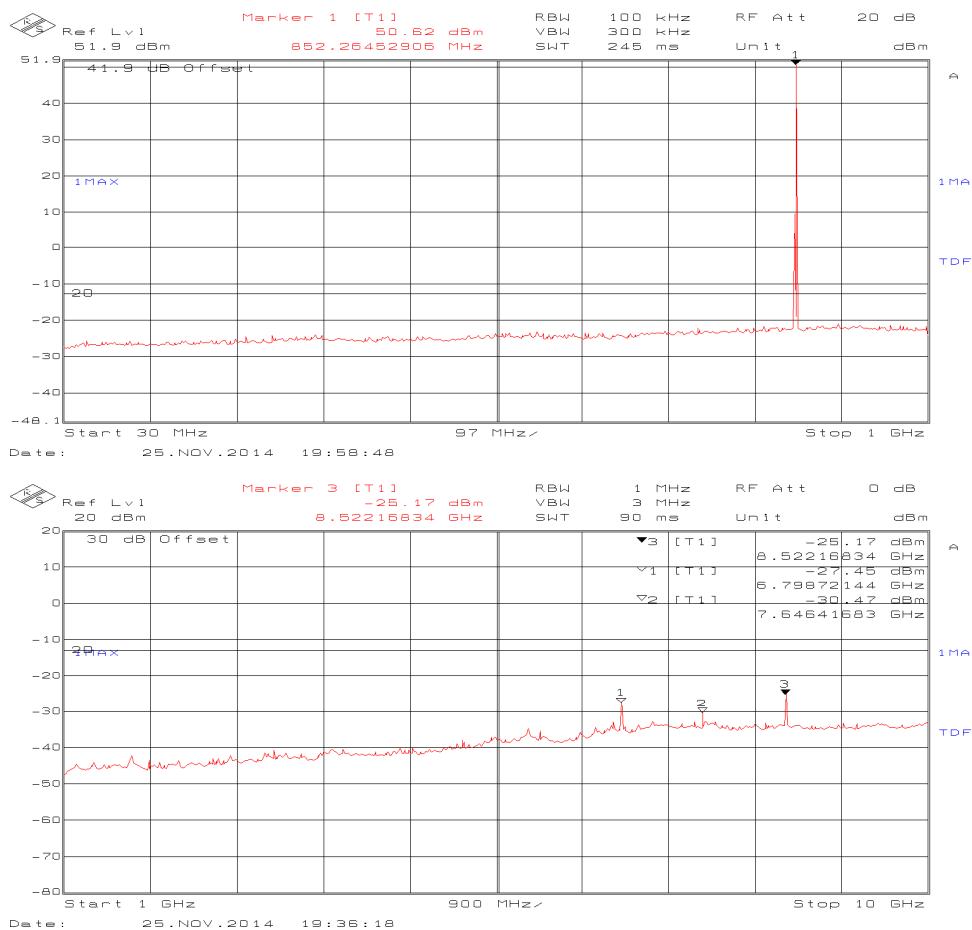
### Appendix A: Test results

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Specification: FCC 90

### Test data

851 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm	dB	dBm		
854.01250	--	--	--	PK	carrier
6798.92	-27.4	40.5	-13	PK	
7646.41	-30.5	41.4	-13	PK	
8522.16	-25.1	41.5	-13	PK	



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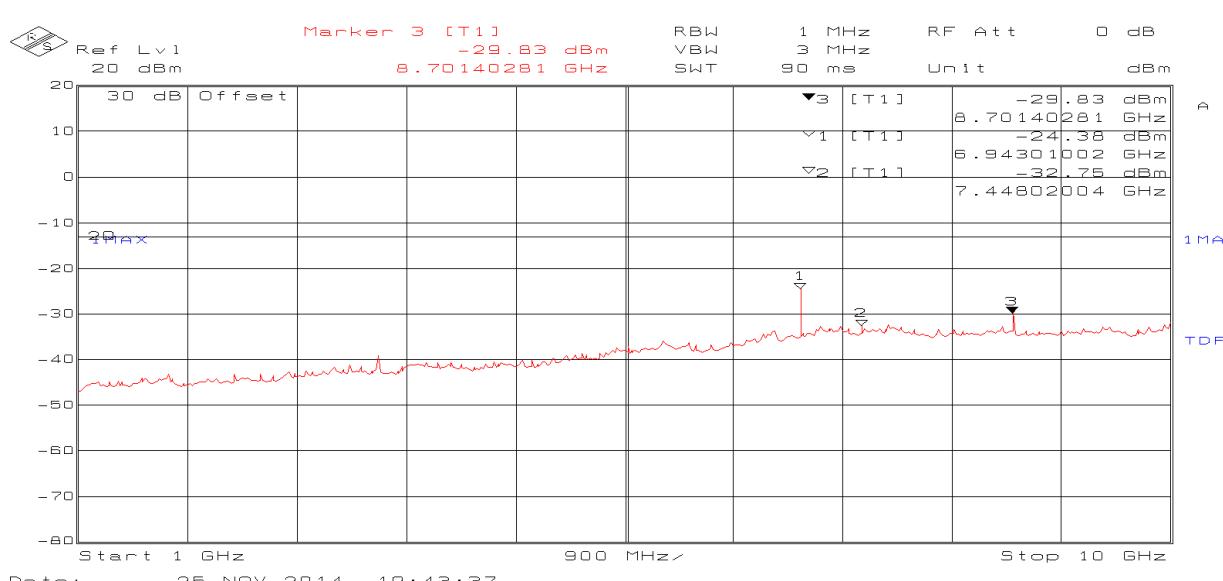
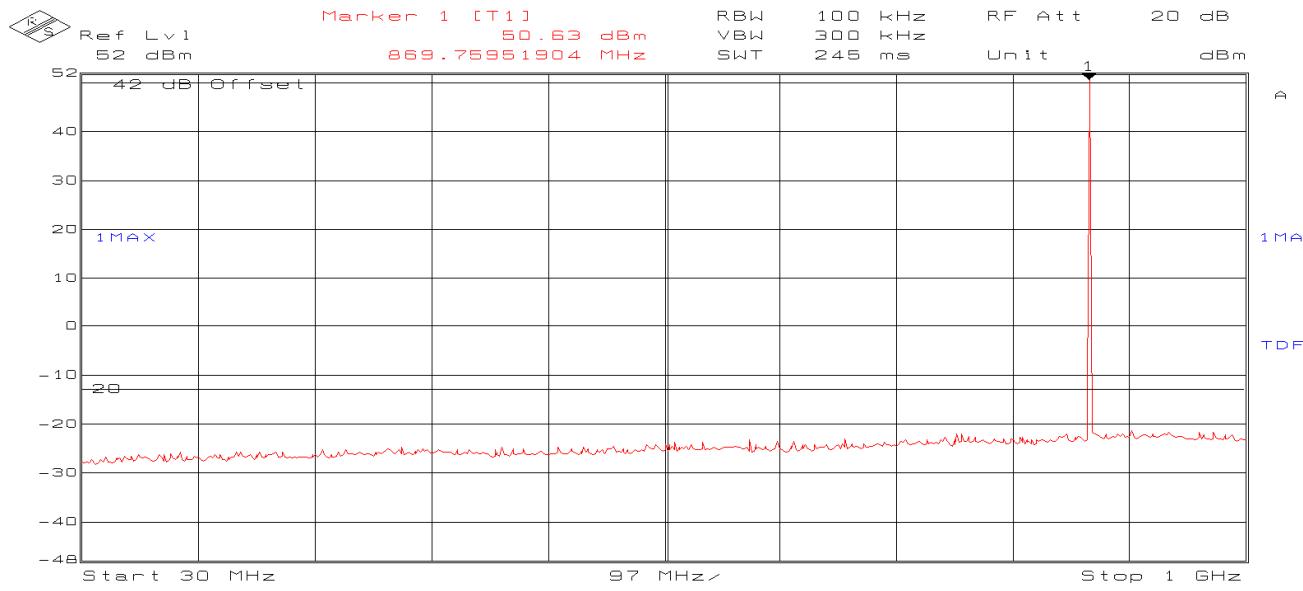
### Appendix A: Test results

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### Test data

869 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm	dB	dBm		
869.00	--	--	--	PK	carrier
6943.01	-24.4	40.8	--	PK	
7448.02	-32.7	41.4	--	PK	
8701.40	-29.8	41.5	--	PK	



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Appendix A: Test results

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Specification: FCC 90

## Clause 90.210 Field strength of spurious radiation

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

### § 2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz.
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

Test date: 2014-11-25

Test results: Pass

### Special notes

- The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.
- All measurements were performed at a distance of 3 m.
- Only the worst data presented in the test report.
- Substitution method was used



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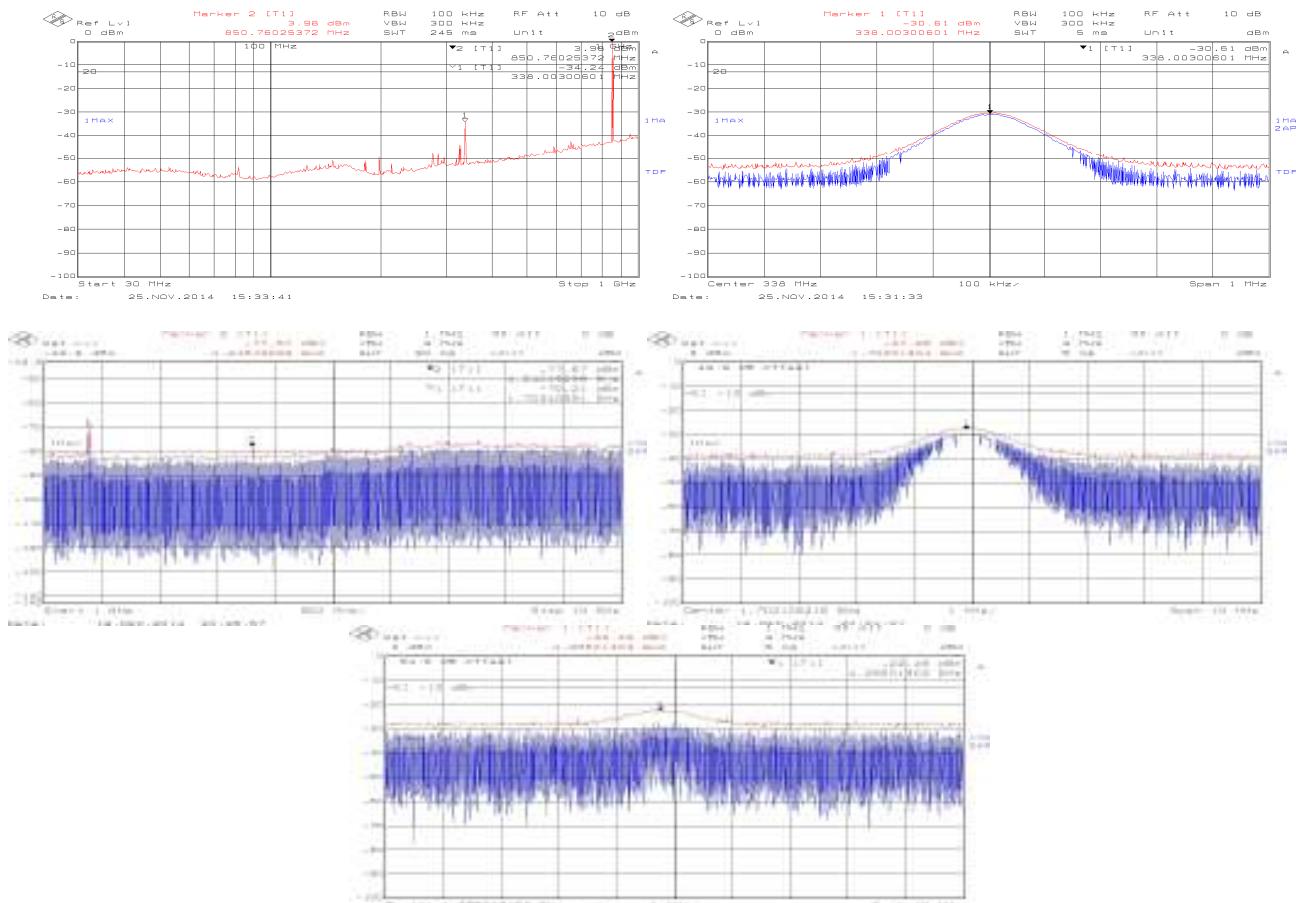
## Appendix A: Test results

Report Number 273821-1R1TRFWL

Specification: FCC 90

### Test data

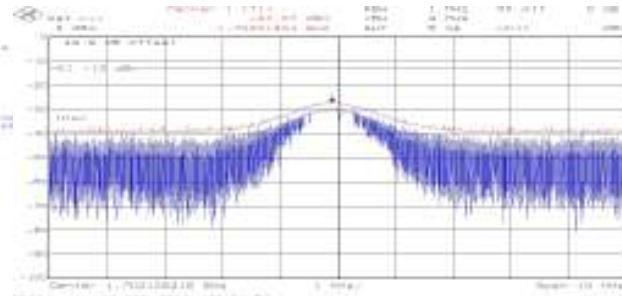
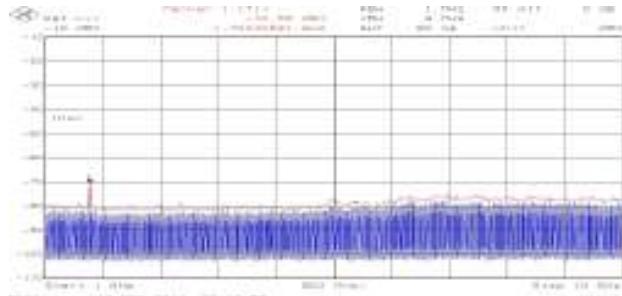
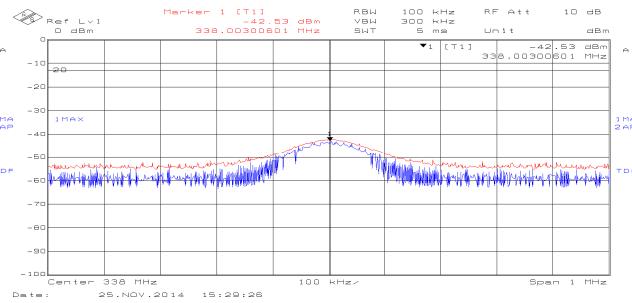
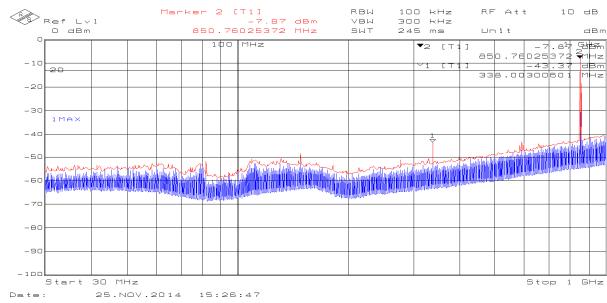
Horizontal polarization, 30 ÷ 10000 MHz, 851 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm erp	dB	dBm erp		
851.000	--	--	--	--	carrier attenuated by high pass
338.003	-30.6	27.2	-13		
1702.054	-27.8	42.9	-13		
4255.234	-22.5	54.6	-13		

## Test data

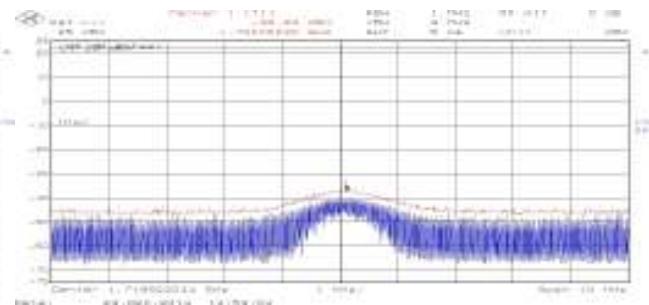
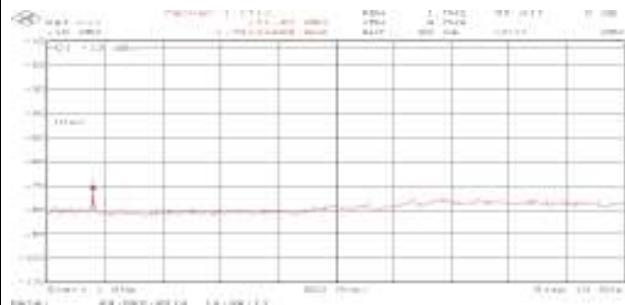
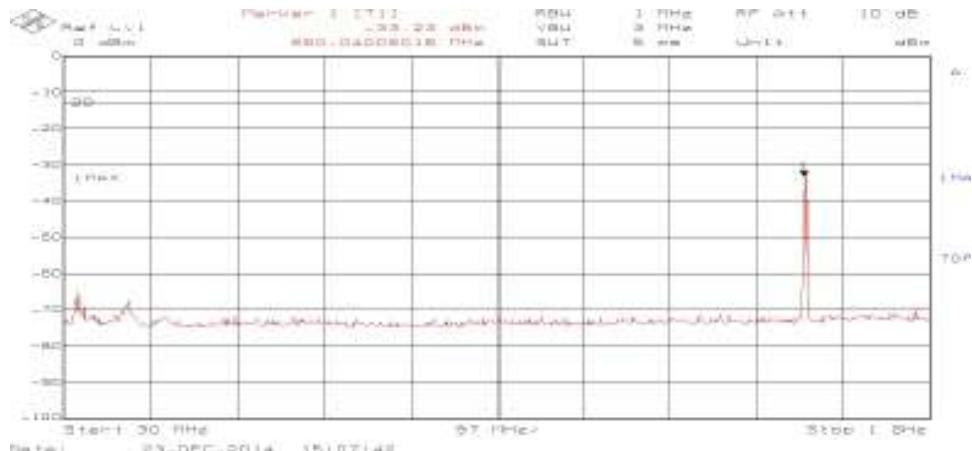
Vertical polarization, 30 ÷ 10000 MHz, 851 MHz



Frequency MHz	Level measured dBm erp	Correction factor dB	Limit dBm erp	Detector	Remarks
851.000	--	--	--	--	carrier attenuated by high pass
1702.064	-27.0	42.9	-13		

## Test data

Vertical polarization, 30 ÷ 10000 MHz, 860 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm erp	dB	dBm erp		
806	--	--	--	--	carrier attenuated by high pass
338.009	-36.7	27.2	-13	--	
1719.9222	-36.9	35.1	-13	--	



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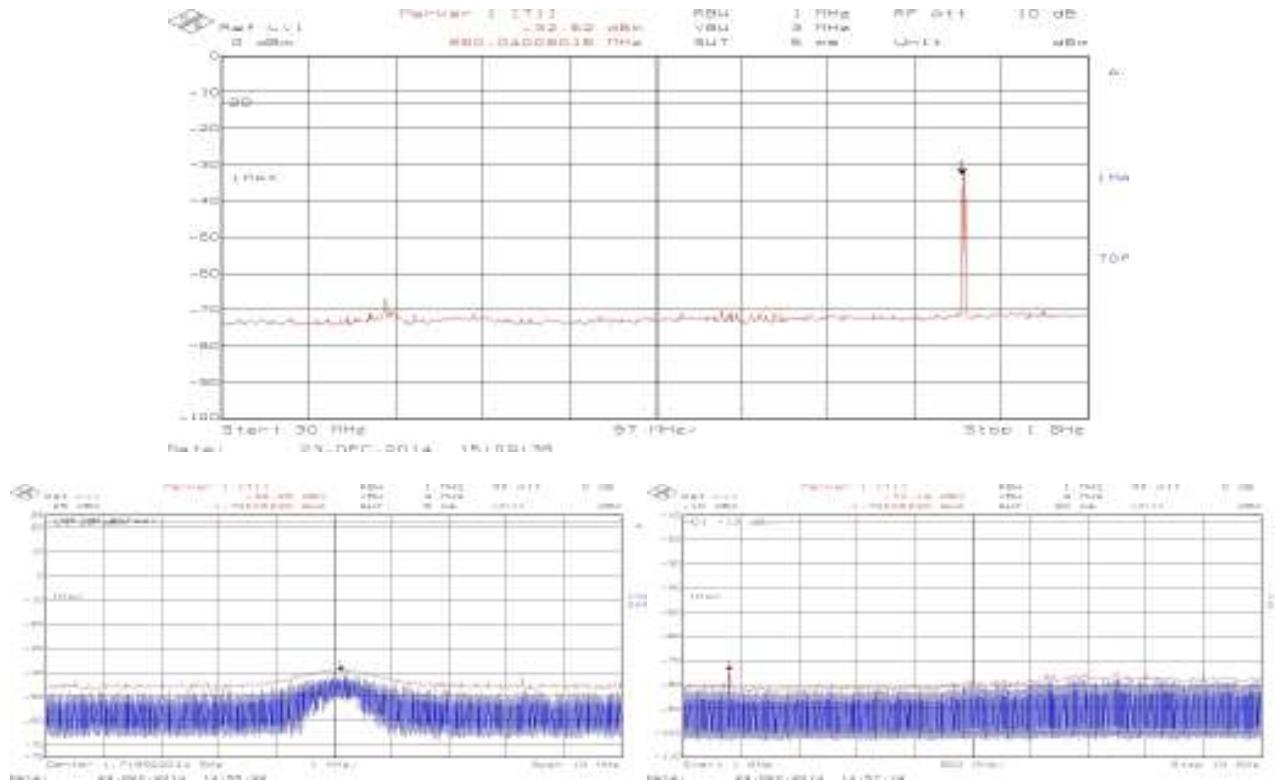
Appendix A: Test results

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## Test data

Horizontal polarization, 30 ÷ 10000 MHz, 860 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm erp	dB	dBm erp		
860.000	--	--	--	--	carrier attenuated by high pass
337.999	-34.1	27.2	-13	--	
1719.9922	-39.2	35.2	-13		



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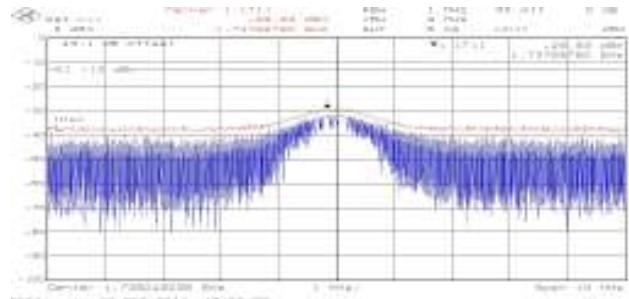
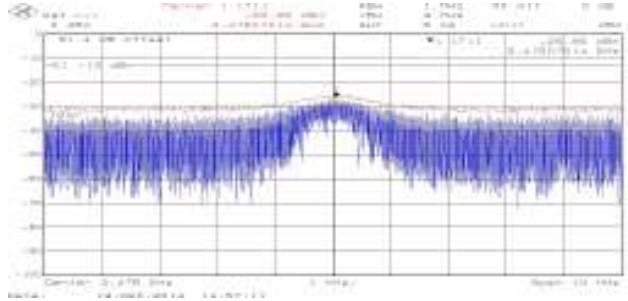
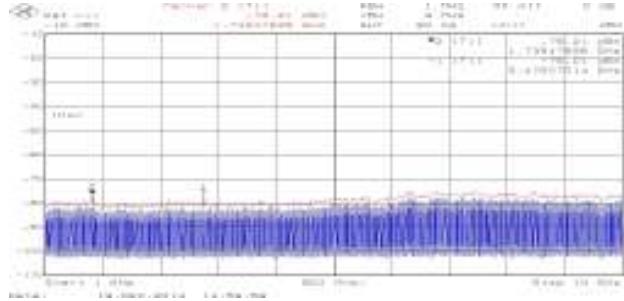
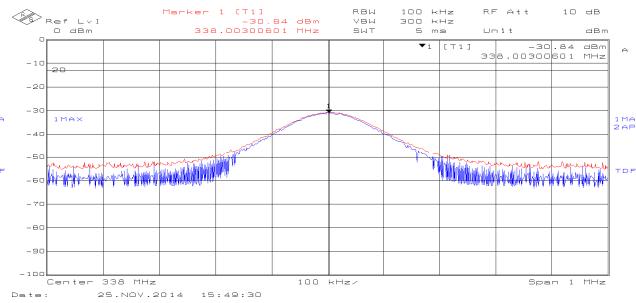
## Appendix A: Test results

Report Number 273821-1R1TRFWL

Specification: FCC 90

### Test data

Horizontal polarization, 30 ÷ 10000 MHz, 869 MHz



Frequency MHz	Level measured dBm erp	Correction factor dB	Limit dBm erp	Detector	Remarks
869.000	--	--	--	--	carrier attenuated by high pass
338.003	-30.8	27.2	-13		
1738.047	-16.4	11.2	-13		
3476.030	-25.9	51.4	-13		



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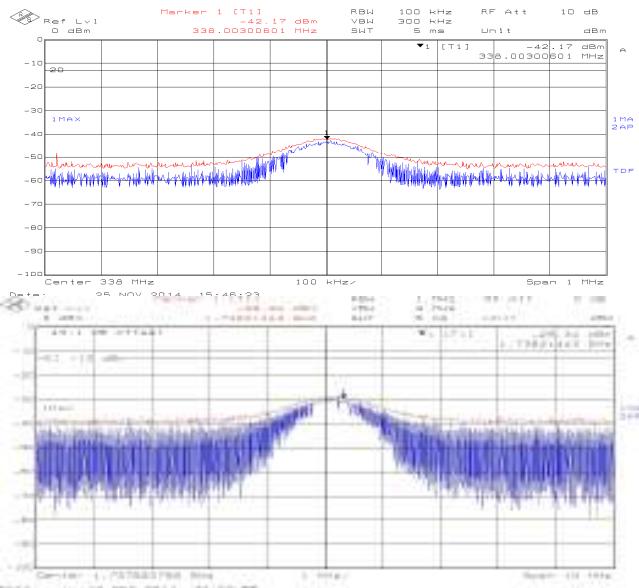
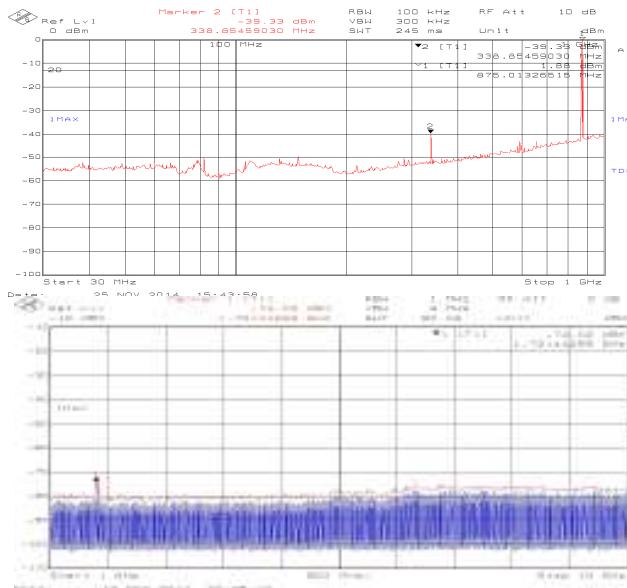
### Appendix A: Test results

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### Test data

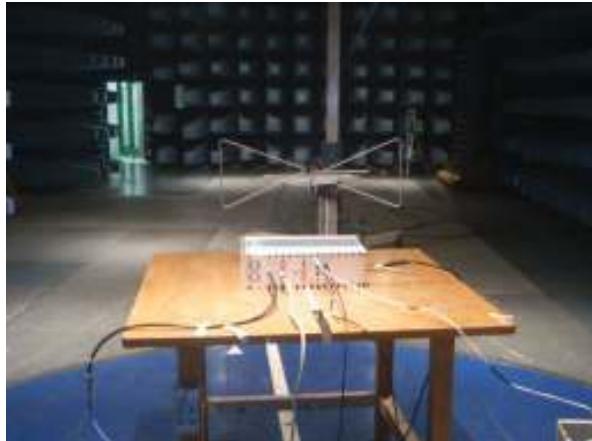
Vertical polarization, 30 ÷ 10000 MHz, 869 MHz



Frequency	Level measured	Correction factor	Limit	Detector	Remarks
MHz	dBm erp	dB	dBm erp		
869.000	--	--	--	--	carrier attenuated by high pass
338.003	-42.1	27.2	-13	--	
1737.883	-29.3	43.1	-13		

## Clause 15. 209 Field Strength, continued

## Set up photo



Log periodic antenna (30MHz ÷ 1000 MHz)  
measurement distance: 3 m



Log periodic antenna 1000 MHz ÷ 10000 MHz)  
measurement distance: 3 m



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Appendix A: Test results

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## Clause 90.213 Frequency stability

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 W output power	2 W or less output power
Below 25	100	100	200
25–50	20	20	50
72–76	(5) 2.5	—	50
150–174	50	5	50
216–220	1.0	—	1.0
220–222	0.1	1.5	1.5
421–512	2.5	5	5
806–809	1.0	1.5	1.5
809–824	1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	0.1	1.5	1.5
902–928	2.5	2.5	2.5
929–930	1.5	—	—
935–940	0.1	1.5	1.5
1427–1435	300	300	300
Above 2450	—	—	—

The units are in ppm

Test date: 2014-11-28

Test results: Pass

Special notes

None



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Appendix A: Test results

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Specification: FCC 90

### Clause 90.213 Frequency stability

#### Test data, continued

Conditions	Frequency (MHz)	Offset (ppm)
+60 °C, Nominal power	851.0001503	-0.062158794
+50 °C, Nominal power	851.0000501	-0.186476381
+40 °C, Nominal power	851.0000503	-0.186228242
+30 °C, Nominal power	851.0000501	-0.186476381
+20 °C, Nominal power	851.0002004	0
+20 °C, 115 % power	851.0002004	1.2407E-05
+20 °C, 85 % power	851.0002004	2.48139E-05
+10 °C, Nominal power	851.0000501	-0.186476381
0 °C, Nominal power	851.0000501	-0.186476381
-10 °C, Nominal power	851.0000501	-0.186476381
-20 °C, Nominal power	851.0000503	-0.186228242
-30 °C, Nominal power	851.0000503	-0.186228242

Offset calculation: 
$$\frac{F_{Measured} - F_{reference}}{F_{reference}} \times 1 \cdot 10^6$$



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Appendix A: Test results

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### Set up photo





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Appendix A: Test results

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Specification: FCC 90

## Clause 90.219 Use of boosters

Licensees authorized to operate radio systems in the frequency bands above 150 MHz may employ signal boosters at fixed locations in accordance with the following criteria:

- (a) The amplified signal is retransmitted only on the exact frequency(ies) of the originating base, fixed, mobile, or portable station(s). The booster will fill in only weak signal areas and cannot extend the system's normal signal coverage area.
- (b) Class A narrowband signal boosters must be equipped with automatic gain control circuitry which will limit the total effective radiated power (ERP) of the unit to a maximum of 5 W under all conditions. Class B broadband signal boosters are limited to 5 W ERP for each authorized frequency that the booster is designed to amplify.
- (c) Class A narrowband boosters must meet the out-of-band emission limits of §90.210 for each narrowband channel that the booster is designed to amplify. Class B broadband signal boosters must meet the emission limits of §90.210 for frequencies outside of the booster's designed passband.
- (d) Class B broadband signal boosters are permitted to be used only in confined or indoor areas such as buildings, tunnels, underground areas, etc., or in remote areas, i.e., areas where there is little or no risk of interference to other users.
- (e) The licensee is given authority to operate signal boosters without separate authorization from the Commission. Certificated equipment must be employed and the licensee must ensure that all applicable rule requirements are met.
- (f) Licensees employing either Class A narrowband or Class B broadband signal boosters as defined in §90.7 are responsible for correcting any harmful interference that the equipment may cause to other systems. Normal co-channel transmissions will not be considered as harmful interference. Licensees will be required to resolve interference problems pursuant to §90.173(b).

Test date: ---

Test results: N

Special notes

None



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Appendix A: Test results

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Specification: FCC 90

## Clause 90.214 Transient frequency behaviour

Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum frequency difference	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t1	±25.0 kHz	5.0 ms	10.0 ms
t2	±12.5 kHz	20.0 ms	25.0 ms
t3	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t1	±12.5 kHz	5.0 ms	10.0 ms
t2	±6.25 kHz	20.0 ms	25.0 ms
t3	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t1	±6.25 kHz	5.0 ms	10.0 ms
t2	±3.125 kHz	20.0 ms	25.0 ms
t3	±6.25 kHz	5.0 ms	10.0 ms

Test date: --

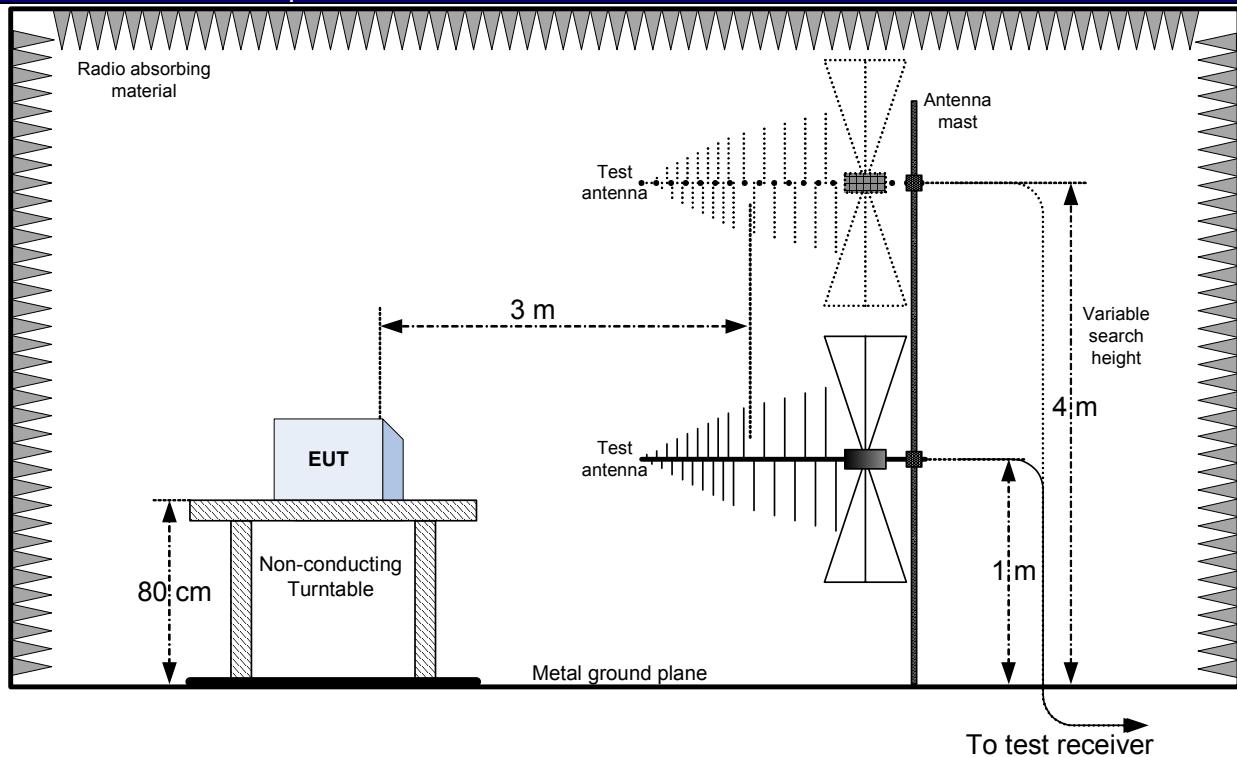
Test results: NA

Special notes

None

## Appendix B: Block diagrams of test set-ups

### Radiated emissions set-up



### Frequency stability set-up

