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## CERTIFICATION TEST REPORT

In Accordance With:	FCC Part 95 Subpart I
Applicant:	Spinal Modulation Inc. 1135 O'Brien Dr. Menlo Park, CA 94025
Equipment Under Test (EUT):	Clinical Programmer Model: MN0700, MN0600
FCC ID:	Y8L-MN0700
Tested By:	Nemko USA Inc. 11696 Sorrento Valley Road, Suite F San Diego, CA 92121
PREPARED ON	January 17, 2011
REPORT NUMBER:	2011 01160678 FCC1
PROJECT NUMBER:	53259
NEx Number:	160678
Total Number of Pages:	20

## 1. Section1: Summary of Test Results

### 1.1 General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 95 Subpart I. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	Clinical Programmer
Model:	MN0700
Serial:	EB0664
Specifications:	FCC Part 95 Subpart I
Date Received in Laboratory:	January 4, 2011
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

## 1.2 Document History

REVISION	DATE	COMMENTS
-	January 17, 2011	Prepared By: Alan Laudani
-	January 17, 2011	Initial Release: Alan Laudani

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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TESTED BY:  Date: January 17, 2011  
Alan Laudani, RF/EMC Engineer

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## 2. Section 2: Equipment Under Test

### 1.3 Product Identification

The Equipment Under Test was identified as follows:

Description	Serial No.
Clinical Programmer Model: MN0700	EB0659

### 1.4 Technical Specifications of the EUT

Manufacturer:	Spinal Modulation Inc.
Transmit Frequency:	402.150 MHz to 404.850 MHz
Rated Power:	1.81 $\mu$ W
Modulation:	2FSK
Emission Designator:	245KF1D
Antenna:	helix type antenna
Antenna Connector:	Integral to circuitry
Power Source:	BATTERY



### 3. Section 3: Test Conditions

#### 3.1 Test Environment

All tests were performed under the following environmental conditions:

Temperature range : 21-31 °C  
Humidity range : 18-70 %  
Pressure range : 101.2 kPa  
Power supply range : 102-132 Vac 60 Hz

#### 3.2 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
111	Antenna, LPA	EMCO	3146	1382	11/29/2010	11/29/2012
128	Antenna, Bicon	EMCO	3104	2882	2/9/2009	2/9/2011
317	Preamplifier	HP	8449A	2749A00167	5/7/2010	5/7/2011
752	Antenna, DRWG	EMCO	3115	4943	12/2/2010	12/2/2012
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	7/12/2010	7/12/2011
836	Signal Generator	Agilent	E8254A	US41140229	2/5/2010	2/5/2011
815	Multimeter	Fluke	111	78130066	8/4/2010	8/4/2011
877	Antenna, DRG Horn, .7-18GHz	AH Systems	SAS-571	688	8/16/2010	8/16/2011
919	Preamplifier	Spacek Labs MM-Wave Technology	100MHz to 40GHz	3M12 (SLK-35-3) and 3M13 (SLKa-35-4)	12/14/2010	12/14/2011
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	6/22/2010	6/22/2011
926	UWave Freq Counter	Anritsu	MF2512B	6200229301	2-Mar-10	2-Mar-11
E1013	DRG Horn (Small)	EMCO	3116	00119488	12/23/2009	12/23/2011
E1018	9kHz to 7GHz Spectrum Analyzer	Rohde & Schwarz	FSP7	835363/0003	1/22/2010	1/22/2011
911	Spectrum Analyzer	Agilent	E4440A	US41421266	10/26/2010	10/26/2011
client	DC Power Supply	Gwinstek	GPS-30300	NA	NCR	NCR
NA	20 dB Attenuator	Winschel	24-20-234	NA	Verified	Verified

NVLAP LAB CODE: 200116-0.

Registration of the OATS are on file with the Federal Communications Commission, under the VCCI under registration number R-3027, and are also registered with Industry Canada under Site Numbers 2040B-1 and 2040B-2.

## 4. Section 4: Observations

### 4.1 Modifications Performed During Assessment

None

### 4.2 Record Of Technical Judgments

No technical judgments were made during the assessment.

### 4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

### 4.4 Test Deleted

No Tests were deleted from this assessment.

### 4.5 Additional Observations

There were no additional observations made during this assessment.

## 5. Section 5: Results Summary

### 5.1. Test Result summary table

FCC Part 95 Subpart I:

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 test.

N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

FCC	Test/Requirement Description	Required	Result
95.628 (a)	Frequency Monitoring	Y	LBT TR*
95.628 (e)(2)	Frequency vs Temperature	Y	Complies
95.628 (a) (6) (i); 95.633 (e) (3)	Emission Bandwidth	Y	Complies
95.635 (d)	Unwanted Radiation	Y	Complies
95.639 (f)	Maximum Transmitter Power	Y	Complies
95.631 (h)	Emission Types	Y	Complies
95.603 (f); 95.605	Certification Required	Y	Complies

\*Listen Before Talk Test Verification Report 167-1 Rev. A by Spinal Modulation, Inc.



## 6. Appendix A: Test Results

### A1. Frequency Monitoring

95.628 (a) (a) *Frequency monitoring.* Except as provided in (b) of this section, all MedRadio programmer/control transmitters operating in the 401–406 MHz band must operate under the control of a monitoring system that incorporates a mechanism for monitoring the channel or channels that the MedRadio system devices intend to occupy. The monitoring system antenna shall be the antenna normally used by the programmer/control transmitter for a communications session. Before the monitoring system of a MedRadio programmer/control transmitter initiates a MedRadio communications session, the following access criteria must be met:

- (1) The monitoring system bandwidth measured at its 20 dB down points must be equal to or greater than the emission bandwidth of the intended transmission.
- (2) Within 5 seconds prior to initiating a communications session, circuitry associated with a MedRadio programmer/control transmitter must monitor the channel or channels the system devices intend to occupy for a minimum of 10 milliseconds per channel.
- (3) Based on use of an isotropic monitoring system antenna, the monitoring threshold power level must not be more than  $10\log B(\text{Hz}) - 150 \text{ (dBm/Hz)} + G(\text{dBi})$ , where B is the emission bandwidth of the MedRadio communications session transmitter having the widest emission and G is the MedRadio programmer/control transmitter monitoring system antenna gain relative to an isotropic antenna. For purposes of showing compliance with the above provision, the above calculated threshold power level must be increased or decreased by an amount equal to the monitoring system antenna gain above or below the gain of an isotropic antenna, respectively.
- (4) If no signal in a MedRadio channel above the monitoring threshold power level is detected, the MedRadio programmer/control transmitter may initiate a MedRadio-communications session involving transmissions to and from a medical implant or medical body-worn device on that channel. The MedRadio communications session may continue as long as any silent period between consecutive data transmission bursts does not exceed 5 seconds. If a channel meeting the criteria in paragraph (a)(3) of this section is unavailable, MedRadio transmitters that are capable of operating on multiple channels may transmit on the alternate channel accessible by the device with the lowest monitored ambient power level. Except as provided in paragraph (b) of this section, MedRadio transmitters that operate on a single channel and thus do not have the capability of operating on alternate channels may not transmit unless no signal on the single channel of operation exceeds the monitoring threshold power level.
- (5) When a channel is selected prior to a MedRadio communications session, it is permissible to select an alternate channel for use if communications are interrupted, provided that the alternate channel selected is the next best choice using the above criteria. The alternate channel may be accessed in the event a communications session is interrupted by interference. The following criteria must be met:
  - (i) Before transmitting on the alternate channel, the channel must be monitored for a period of at least 10 milliseconds.
  - (ii) The detected power level during this 10 millisecond or greater monitoring period must be no higher than 6dB above the power level detected when the channel was chosen as the alternate channel.
  - (iii) In the event that this alternate channel provision is not used by the MedRadio system or if the criteria in paragraphs (a)(5)(i) and (ii) are not met, a channel must be selected using the access criteria specified in paragraphs (a)(1) through (a)(4) of this section.
- (6) As used in this section, the following definitions apply:
  - (i) *Emission bandwidth* — Measured as the width of the signal between the points on either side of carrier center frequency that are 20 dB down relative to the maximum level of the modulated carrier. Compliance will be determined using instrumentation employing a peak detector function and a resolution bandwidth approximately equal to 1% of the emission bandwidth of the device under test.
  - (ii) *MedRadio channel* — Any continuous segment of spectrum in the MedRadio band that is equal to the emission bandwidth of the device with the largest bandwidth that is to participate in a MedRadio communications session. Note to paragraph (a)(6)(ii): The rules do not specify a channeling scheme for use by MedRadio systems.
  - (iii) *MedRadio communications session* — A collection of transmissions, that may or may not be continuous, between MedRadio system devices.

**Conditions:**

Model:	The Clinical Programmer MN0700 (FD0038) and Patient Programmer MN0600 (FD0039)		
Date:	1/19/2011	Tester:	Jim Judkins
Modification State:		Laboratory:	Spinal Modulation, Inc.

Observations: Listen Before Talk Test Report 167-1 Rev. A by Spinal Modulation, Inc.

## A2. Frequency vs Temperature

95.628 (e) (2)

(e) Frequency stability. Each transmitter in the MedRadio service must maintain a frequency stability of  $\pm 100$  ppm of the operating frequency over the range:

(2) 0 °C to 55 °C in the case of MedRadio programmer/control transmitters and MedRadio body-worn transmitters.

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### Conditions:

Model:	MN0700	Temperature:	19°C
Date:	1-11-2011	Humidity:	33%
Modification State:	None	Tester:	Alan Laudani
		Laboratory:	Nemko

### Observations:

#### Method of Measurement:

Modulation: CW.

Spectrum Analyzer settings: 3 kHz RBW, 10 kHz VBW and/or use of frequency counter.

The Base Station Circuit Board, model AD1480 Rev 3, SN 201270 was used as a representative sample of the Clinical Programmer.

Test Conditions: Ambient Temperature: 19°C  
Relative Humidity: 33%

Measurement Data: Table below.

Limits: The frequency shall remain within 100 ppm of the channel frequency.  
 $\pm 100 \text{ ppm} \times 405 \text{ MHz} = \pm 40,500 \text{ Hz}$

EUT complies

Voltage Input Test Conditions	Frequency (MHz)	Frequency Delta (Hz)
3.93 VDC	402.162070	12070
3.88 VDC	402.162050	12050
3.79 VDC	402.162030	12030
3.70 VDC	402.162020	12020
3.59 VDC	402.162000	12000
3.49 VDC	402.162020	12020
3.39 VDC	402.162020	12020
3.29 VDC	402.162000	12000
3.24 VDC	402.162000	12000
3.19 VDC	402.161990	11990
3.13 VDC	402.161990	11990
3.10 VDC	402.161990	11990
3.05 VDC	OFF	

Temperature Test Condition	Frequency (MHz)	Frequency Delta (Hz)
20°C	402.152370	2370
30°C	402.149320	-680
40°C	402.145800	-4200
50°C	402.141800	-8200
55°C	402.140800	-9200
-10°C	402.157800	7800
-0°C	402.158800	8800
10°C	402.155800	5800
20°C	402.152800	2800

### A3. Emission Bandwidth

95.628 (a) (6) (i) *Emission bandwidth* — Measured as the width of the signal between the points on either side of carrier center frequency that are 20 dB down relative to the maximum level of the modulated carrier. Compliance will be determined using instrumentation employing a peak detector function and a resolution bandwidth approximately equal to 1% of the emission bandwidth of the device under test.

95.633 (e) (3) Emission bandwidth will be determined by measuring the width of the signal between points, one below the carrier center frequency and one above the carrier center frequency, that are 20 dB down relative to the maximum level of the modulated carrier. Compliance with the emission bandwidth limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

#### Conditions:

Model:	MN0700	Temperature:	19°C
Date:	1-11-2011	Humidity:	33%
Modification State:	Normal	Tester:	Alan Laudani
		Laboratory:	Nemko

#### Observations:

Peak, max hold emission, continuous test mode.

The Base Station Circuit Board, model AD1480 Rev 3, SN 201270 was used as a representative sample of the Clinical Programmer.

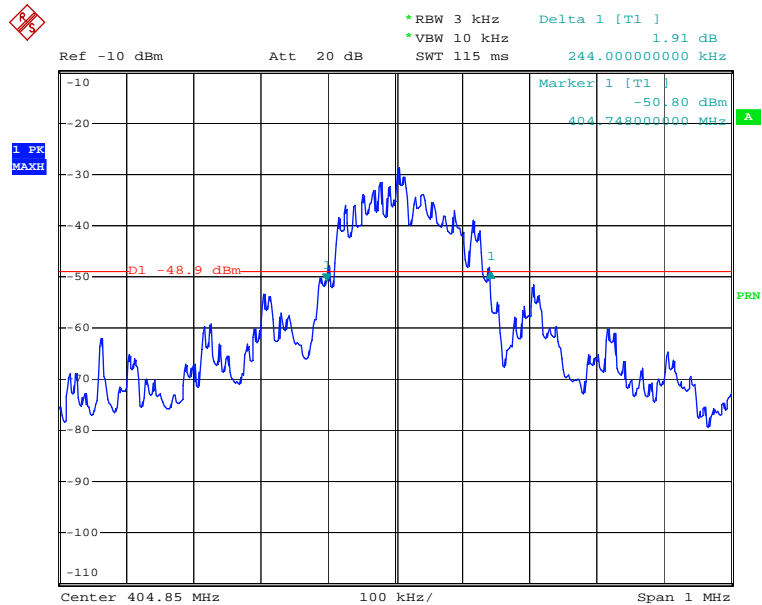
Test Results: Complies

Test Data: See attached plots.

Base



Date: 1.JAN.1997 05:35:07



Date: 1.JAN.1997 05:42:30

## A4. Unwanted Radiation

Para. No.: 95.635 (d)

(d) For transmitters designed to operate in the MedRadio service, emissions shall be attenuated in accordance with the following: (paragraphs (d)(1) through (d)(5) pertain to MedRadio transmitters operating in the 402–405 MHz band; paragraphs (d)(6) through (d)(10) pertain to MedRadio transmitters operating in the 401–402 MHz or 405–406 MHz bands).

(1) Emissions from a MedRadio transmitter more than 250 kHz outside of the 402–405 MHz band shall be attenuated to a level no greater than the following field strength limits:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
30–88	100	3
88–216	150	3
216–960	200	3
960 and above	500	3

Note—At band edges, the tighter limit applies.

(2) The emission limits shown in the table of paragraph (d)(1) are based on measurements employing a CISPR quasi-peak detector except that above 1 GHz, the limit is based on measurements employing an average detector. Measurements above 1 GHz shall be performed using a minimum resolution bandwidth of 1 MHz. *See also* §95.605.

(3) The emissions from a MedRadio transmitter must be measured to at least the tenth harmonic of the highest fundamental frequency designed to be emitted by the transmitter.

### Conditions:

Model:	MN0700	Temperature:	20°C
Date:	1/12/2011	Humidity:	55%
Modification State:	Normal	Tester:	Alan Laudani
		Laboratory:	Nemko

Observations: Peak hold detection worst case over quasi-peak detector.

Test Results: Complies

Test Data:

Emissions were searched for between 30 MHz and 10x the transmit frequencies of 402.15 to 404.85 MHz or 4100 MHz. No other emissions found within 20 dB of the above margins.

Clinical Programmer Transmitter



NEMKO USA, Inc.

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**Radiated Emissions Data**

Job # : 43259-1 Date : 1-12-2011  
NEX # : 160678 Time : 0920  
Staff : aal  
Client Name : Spinal Modulation, Inc.  
EUT Name : Clinical Programmer  
EUT Model # : MN0700  
EUT Serial # : EB0664  
EUT Config. : Continuous Transmit  
Loop Ant. # : NA  
Bicon Ant.# : 114\_3m Temp. (°C) : 13  
Log Ant.# : 111\_3m Humidity (%) : 36  
DRG Ant. # : NA Spec Analyzer # : E1017  
Cable LF# : soats Analyzer Display # : E1017  
Cable HF# : 877 Quasi-Peak Detector # : E1017  
Preamp LF# : 902 Preselector # : E1017  
Preamp HF# : NA

Page 1 of 1  
NOATS  
SOATS X  
Distance < 1000 MHz: 3 m  
Distance > 1000 MHz: 3 m

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 300 kHz
	Video Bandwidth 1 MHz

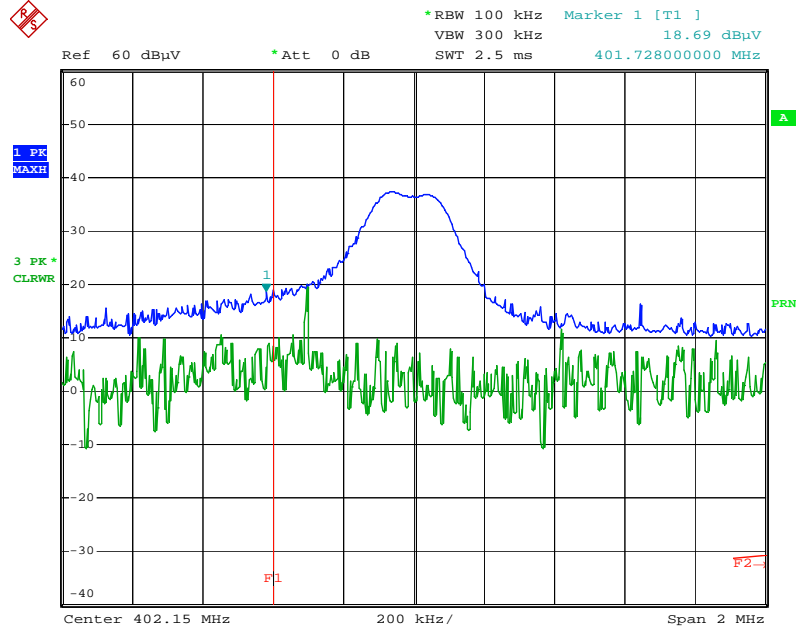
Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBμV)	Corrected Reading (dBμV/m)	Spec. limit (dBμV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
402.15	34.6	50.1	P	-	1.2	50.1	69.4	85.2	-15.8	Pass	channel 0
401.75	15.5	26.6	Q	-	1.2	26.6	45.7	46.0	-0.3	Pass	lower band edge
405.25	10.6	25.8	Q	-	1.2	25.8	44.9	46.0	-1.1	Pass	upper band edge
404.85	34.8	50.3	P	-	1.2	50.3	69.4	85.2	-15.8	Pass	Channel 9

**Substitution Method For Radiated Emissions**

Frequency MHz	Target Level dBμV/m	Dipole ant. gain	Cable loss dB	Signal Generator dBm	Total (EIRP) dBm	Total (EIRP) μW	Spec μW	Margin dB
402.15	50.1	1.68	5.0	-25.1	-28.42	1.44	25	-12.4
404.85	50.3	1.68	5.0	-24.1	-27.42	1.81	25	-11.4

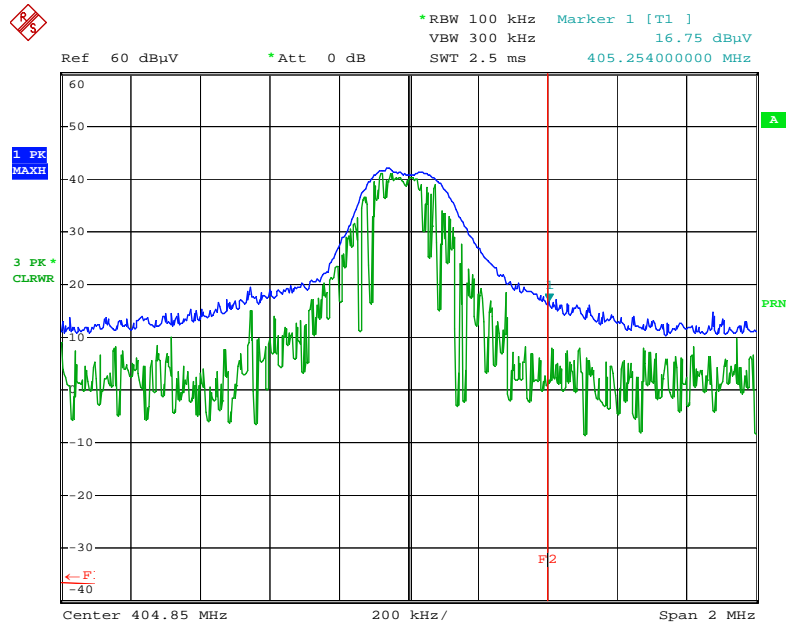


**Radiated Band Edge**  
**Channel 0, 250 kHz below 402 MHz**



Date: 1.JAN.1997 04:02:34

**Channel 9, 250 kHz Above 405 MHz**



Date: 1.JAN.1997 04:04:57

## A5. Maximum Transmitter Power

Para. No.: 95.639 (f)

(f) In the MedRadio Service for transmitters that are not excepted under §95.628(b) from the frequency monitoring requirements of §95.628(a), the maximum radiated power in any 300 kHz bandwidth by MedRadio transmitters operating at 402–405 MHz, or in any 100 kHz bandwidth by MedRadio transmitters operating at 401–402 MHz or 405–406 MHz shall not exceed 25 microwatts EIRP. For transmitters that are excepted under §95.628(b) from the frequency monitoring requirements of §95.628(a), the power radiated by any station operating in 402–405 MHz shall not exceed 100 nanowatts EIRP confined to a maximum total emission bandwidth of 300 kHz centered at 403.65 MHz. For transmitters that are excepted under §95.628(b) from the frequency monitoring requirements of §95.628(a), the power radiated by any station operating in 401–401.85 MHz or 405–406 MHz shall not exceed 250 nanowatts EIRP in any 100 kHz bandwidth and in 401.85–402 MHz shall not exceed 25 microwatts in the 150 kHz bandwidth. See §95.633(e). The antenna associated with any MedRadio transmitter must be supplied with the transmitter and shall be considered part of the transmitter subject to equipment authorization. Compliance with these EIRP limits may be determined as set forth in §95.628(g).

### Conditions:

Model:	MN0700	Temperature:	13°C
Date:	1/12/2011	Humidity:	36%
Modification State:	Normal	Tester:	Alan Laudani
		Laboratory:	Nemko

### Observations:

Field strength was substituted for to result in output power EIRP.

Test Results: Passed

The maximum field strength is 1.81 µW.

Test Data: See attached tables



### Radiated Emissions Data

Job # : 43259-1 Date : 1-12-2011 Page 1 of 1  
 NEX # : 160678 Time : 0920 NOATS  
 Staff : aal SOATS X  
 Client Name : Spinal Modulation, Inc. Distance < 1000 MHz: 3 m  
 EUT Name : Clinical Programmer Distance > 1000 MHz: 3 m  
 EUT Model # : MN0700  
 EUT Serial # : EB0664  
 EUT Config : Continuous Transmit  
 Loop Ant. # : NA  
 Bicon Ant. # : 114 3m Temp. (°C) : 13  
 Log Ant. # : 111 3m Humidity (%) : 36  
 DRG Ant. # : NA Spec Analyzer # : E1017  
 Cable LF# : soats Analyzer Display # : E1017  
 Cable HF# : 877 Quasi-Peak Detector # : E1017  
 Preamp LF# : 902 Preselector # : E1017  
 Preamp HF# : NA

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 300 kHz
	Video Bandwidth 1 MHz

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBμV)	Corrected Reading (dBμV/m)	Spec. limit (dBμV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
402.15	34.6	50.1	P	-	1.2	50.1	69.4	85.2	-15.8	Pass	channel 0
402.00	18.2	36.4	Q	-	1.2	36.4	23.3	46.0	-22.7	Pass	lower band edge
405.00	18.9	37.0	Q	-	1.2	37.0	23.9	46.0	-22.2	Pass	upper band edge
404.85	34.8	50.3	P	-	1.2	50.3	69.4	85.2	-15.8	Pass	Channel 9

### Substitution Method For Radiated Emissions

Target Frequency MHz	Level dBμV/m	Dipole ant. gain	Cable loss dB	Signal Generator dBm	Total (EIRP) dBm	Total (EIRP) μW	Spec μW	Margin dB
402.15	50.1	1.68	5.0	-25.1	-28.4	1.44	25	-12.4
404.85	50.3	1.68	5.0	-24.1	-27.4	1.81	25	-11.4

## A6. Emission Types

Para. No.: 95.631 (h)

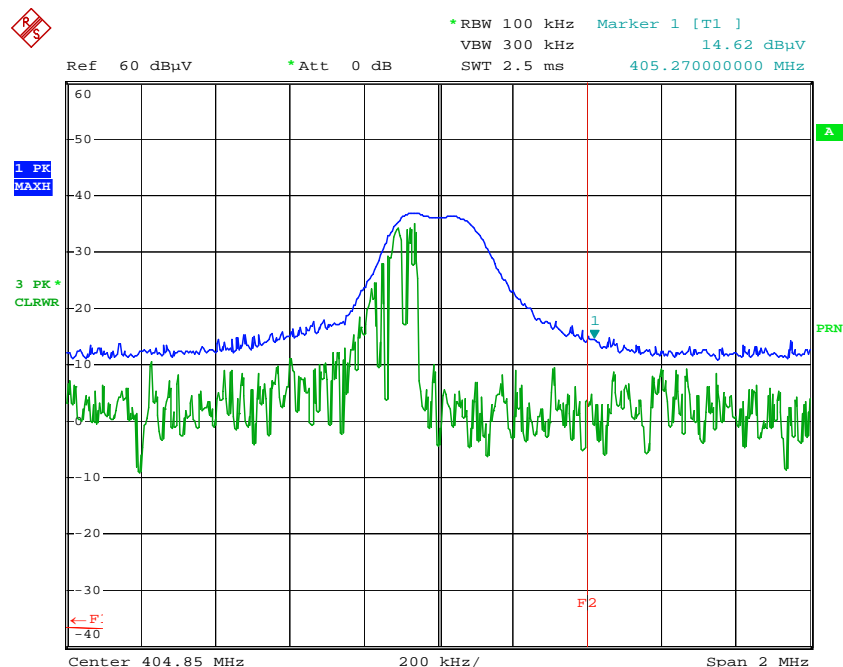
(h) A MedRadio station may transmit any emission type appropriate for communications in this service. Voice communications, however, are prohibited.

### Conditions:

Model:	MN0700	Temperature:	13°C
Date:	10/11/2010	Humidity:	36%
Modification State:	Normal	Tester:	Alan Laudani
		Laboratory:	Nemko

Observations: Not a voice communication.

Test Results: Passed



Date: 1.JAN.1997 04:18:35