TÜV AMERICA

EMC - TEST REPORT
UNITED STATES STANDARD FCC PART 95

Test Report File No.	:	**SC602042-08** Date of Issue: 18 April 2006
Model / Serial No.	:	**9400-02 / --**
Product Type	:	STS Transmitter
Applicant	:	DEXCOM INCORPORATED
Manufacturer	:	DEXCOM INCORPORATED
License holder	:	DEXCOM INCORPORATED
Address	:	5555 Oberlin Drive
	:	San Diego, CA 92121
Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number Reference(s)	:	**SC602042-08**
Total pages - Test Report	:	30

NOTE: All test equipment used during testing is calibrated and traceable to NIST.

TÜV America, Inc. and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

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TÜV AMERICA

DIRECTORY
Test Report

Technical Documentation

Appendices

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TEST REGULATIONS:

The tests were performed according to the following regulations:

☐ - EN 50081-1: 1991		
☐ - EN 55011: 1998, Amendment A2: 2002	☐ - Group 1 ☐ - Class A	☐ - Group 2 ☐ - Class B
☐ - EN 55013: 1990		
☐ - EN 55014: 1993	☐ - Household appliances and similar ☐ - Portable tools ☐ - Semiconductor devices	
☐ - EN 55022: 1987	☐ - Class A	☐ - Class B
☐ - EN 55022: 1998, Amendment A2: 2003	☐ - Class A	☐ - Class B
☐ - VCCI	☐ - Class A ITE	☐ - Class B ITE
☐ - CNS 13438: 1994	☐ - Class A	☐ - Class B
■ - FCC Part 95		
☐ - AS/NZS 3548: 1995	☐ - Class A	☐ - Class B
☐ - CISPR 11: 1997	☐ - Group 1 ☐ - Class A	☐ - Group 2 ☐ - Class B
☐ - CISPR 22: 1997	☐ - Class A	☐ - Class B

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Environmental Conditions In The Laboratory:

	Actual
Temperature	: 23 °C
Relative Humidity	: 50 %
Atmospheric Pressure	: 100.0 kPa

Power Supply Utilized:

Power supply system : Battery Operated

Symbol Definitions:

■ - Applicable
☐ - Not Applicable

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Test Conditions: FCC Part 95, Paragraph 95.628(e) - Frequency Stability
FCC Part 95, Paragraph 95.633(e)(1) - Emission Bandwidth
FCC Part 95, Paragraph 95.635(d)(1) - Radiated Spurious Emissions
FCC Part 95, Paragraph 95.636(d)(4) - Unintentional within Band (402-405 MHz)
FCC Part 95, Paragraph 95.636(d)(5) - Low Band Edge
FCC Part 95, Paragraph 95.636(d)(5) - High Band Edge
FCC Part 95, Paragraph 95.639(f)(1) - Maximum Transmitter Power

The measurements were performed in the following locations at the San Diego Testing Facility:

☐ **- Test not applicable**

■ - TR-2, Test Room, 16' x 10' x 9'
■ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber
■ - Roof (Small Open Area Test Site)

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Date Cal'ed
E4446A	6823	Spectrum Analyzer	Agilent	US44300486	04/05
E4440A	6814	Spectrum Analyzer	Hewlett Packard	MY42510441	02/06
T30RC	6225	Environmental Chamber	Tenney Environmental	27244-02	05/05
E3612A	6456	DC Power Supply	Hewlett Packard	KR83006892	N/A
34401A	6709	Digital Volt Meter	Hewlett Packard	3146A03945	07/05
8648C	6586	Signal Generator	Hewlett Packard	3642U01074	12/05
7405	6437	Near-Field Probe	EMCO	9812-4261	N/A
8566B	6522	Spectrum Analyzer	Hewlett Packard	2304A04531	04/05
3146	6641	Log Periodic Antenna	EMCO	106X	06/05
3115	6669	Double Ridge Antenna	EMCO	9412-4364	08/05
CBL 6111	6527	Bilog Antenna	Chase Electronics	--	08/05

Remarks: One year calibration cycle for all test equipment and sites.

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Equipment Under Test (EUT) Test Operation Mode:

The equipment under test was operated under the following conditions during testing:

☐ - Standby

☐ - Test Program (H - Pattern)

☐ - Test Program (Color Bar)

☐ - Test Program (Customer Specified)

☐ - Practice Operation

■ - Normal Operating Mode

☐ - _____

Configuration of the equipment under test:

☐ - See Constructional Data Form in Appendix B

■ - See Product Information Form(s) in Appendix B

The following peripheral devices and interface cables were connected during the testing:

☐ - _____ Type: _____

☐ - _____ Type: _____

☐ - _____ Type: _____

☐ - _____ Type: _____

☐ - _____ Type: _____

☐ - _____ Type: _____

☐ - Unshielded power cable

☐ - Unshielded cables

☐ - Shielded cables MPS. No.: _____

☐ - Customer specific cables

☐ - _____

☐ - _____

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GENERAL REMARKS:

NOTE: All photographs are representative of setup for maximum emissions.

SUMMARY:

All tests according to the regulations cited on page 3 were

■ - **Performed**

☐ - Performed with the following **exceptions**

The Equipment Under Test

■ - **Fulfills** the general approval requirements cited on page 3.

☐ - **Does not** fulfill the general approval requirements cited on page 3.

Statement of Measurement Uncertainty

The data and results referenced in this document are true and accurate. The measurement uncertainty is calculated to be ±2 dB for conducted emissions and ±4 dB for radiated emissions.

Equipment Received Date: 10 April 2006

Testing Start Date: 10 April 2006

Testing End Date: 17 April 2006

- TÜV AMERICA, INC. -

Reviewing Engineer:

David Gray
(EMC Engineer In Charge)

Test Engineer:

Jim Owen
(EMC Manager)

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Technical Documentation

Test Data Sheets

and

Test Setup Drawing(s)

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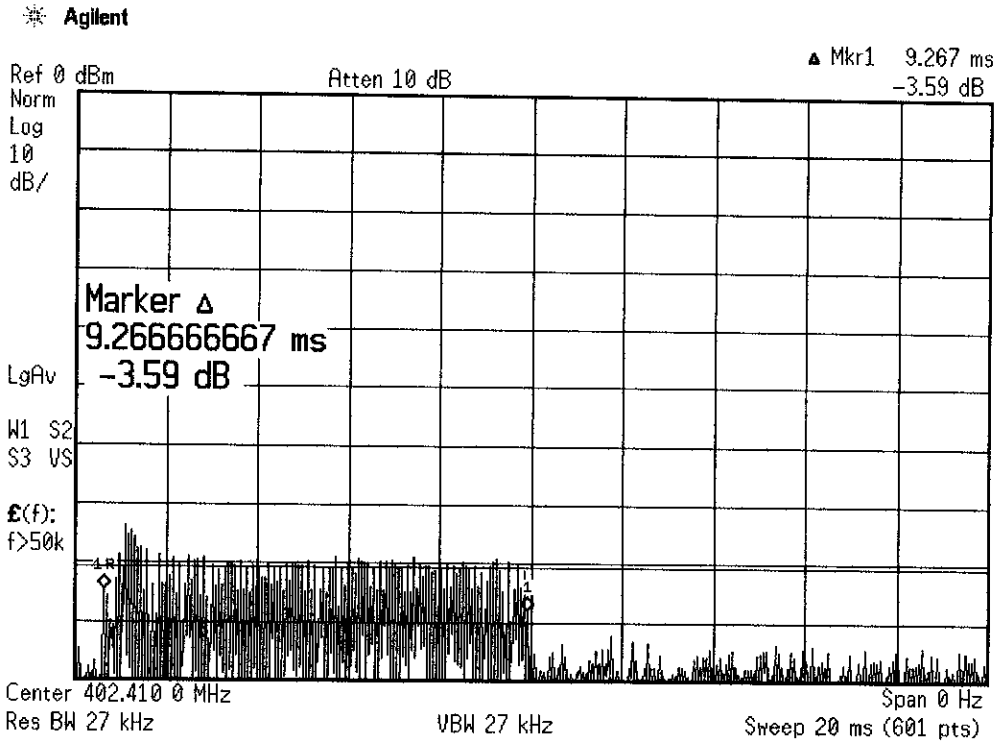

ID Nr. 033237

Pulse Duration
< 100mS

Agilent E4440A
Asset Nr. 6814
Chase bilog Asset 6527
SR3

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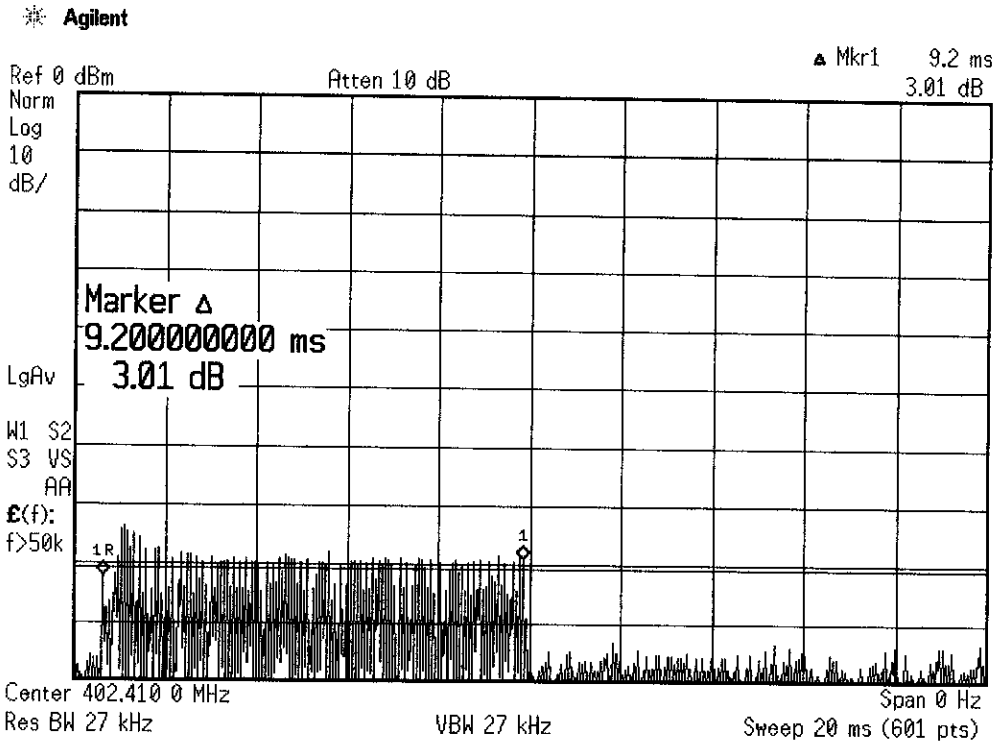

ID NR. 033245

Pulse Duration
< 10mS

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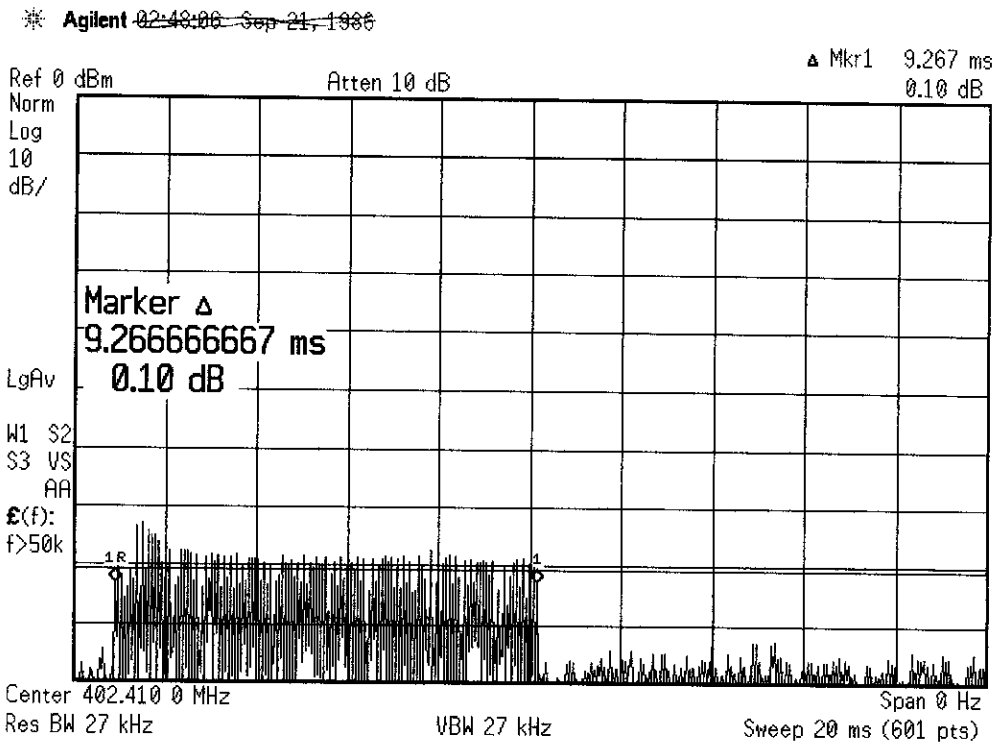

ID # 033247

Pulse Duration
< 10 mS

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FCC Part 95, Paragraph 95.628(e) - Frequency Stability

Temperature °C	**Frequency (Hz)**
0 (V_N)	402 141 000
+5 (V_N)	402 139 000
+15 (V_N)	402 143 000
+25 (V_N)	402 144 000
+25 (V_{Min})*	402 144 000*
+35 (V_N)	402 143 000
+45 (V_N)	402 142 000
+55 (V_N)	402 142 000

V_N = 3.0 VDC
V_{Min} = 2.6 VDC**

(*) Deviation of -5 kHz.
(**) Used G2Q41 unit for voltage variation. Used G2Q3P unit for temperature variation.

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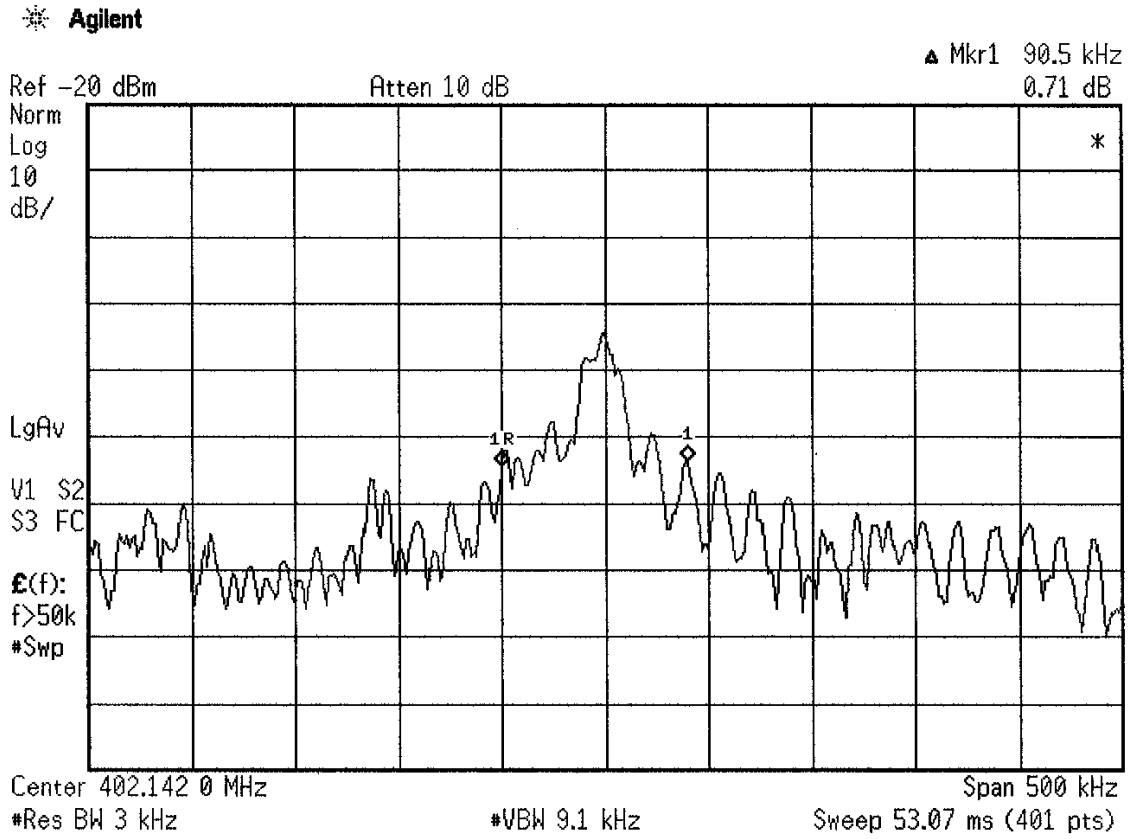
FCC Part 95, Paragraph 95.633(e)(1) - Emission Bandwidth, ≤ 300 kHz, 20dB BW measured



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FCC Part 95, Paragraph 95.635(d)(1) - Radiated Spurious Emissions

REPORT No: SC602042 TESTER: Jim Owen SPEC: FCC 95.635(d)(1)

CUSTOMER: Dexcom Incorporated TEST DIST: 3 Meters

E U T: 9400-02 TEST SITE: Roof

EUT MODE: Transmit - 4 second interval BICONICAL: N/A

DATE: April 10, 2006 LOG: 243

NOTES: OTHER: 453

above 1GHz: RBW & VBW 1 MHz for Pk; RBW 1MHz and VBW 10Hz for AVG

below 1GHz: RBW & VBW 100 kHz for Pk; RBW 100kHz and VBW 10Hz for AVG

CF = Antenna Factor + Cable Loss - Preamplifier Gain + Preselector Loss

v.beta1a

FREQ (MHz)	VERTICAL (dBuv) pk	qp	HORIZONTAL (dBuv) pk	qp	CF (dB/m)	MAX LEVEL (dBuV/m) pk	qp	SPEC LIMIT (dBuV/m) pk	qp	MARGIN (dB) pk	qp	EUT Rotation	Antenna Height	Notes
402.142	42.6		58.64		16.2428	**74.88**		85.2		-10.3		0	1	Fundamental
	pk	qp	pk	qp										
804.284	20.2		20.2		22.6643	**42.86**	**22.7**	46	46	-3.14	-23.3			
	pk	av	pk	av										
1206.426	68		71.5	44.1	-13.3596	**58.14**	**30.7**	74	54	-15.9	-23.3	0	1	
1608.568	59.3		60.9		-9.90516	**50.99**	**-9.9**	74	54	-23	-63.9	0	1	
2010.71	66.4		72.2	45	-7.36359	**64.84**	**37.6**	74	54	-9.16	-16.4	12	1.2	
2412.852	40		72.3	40	-5.9963	**66.3**	**34**	74	54	-7.7	-20			
2814.994	54.3		54.6		-3.74704	**50.85**	**-3.7**	74	54	-23.1	-57.7			ambient
3217.136	29.2		30.8		-1.81831	**28.98**	**-1.8**	74	54	-45	-55.8			ambient
3619.278	29.2		29.2		-0.63301	**28.57**	**-0.6**	74	54	-45.4	-54.6			ambient
4021.42	29.2		29.2		-0.17283	**29.03**	**-0.2**	74	54	-45	-54.2			ambient

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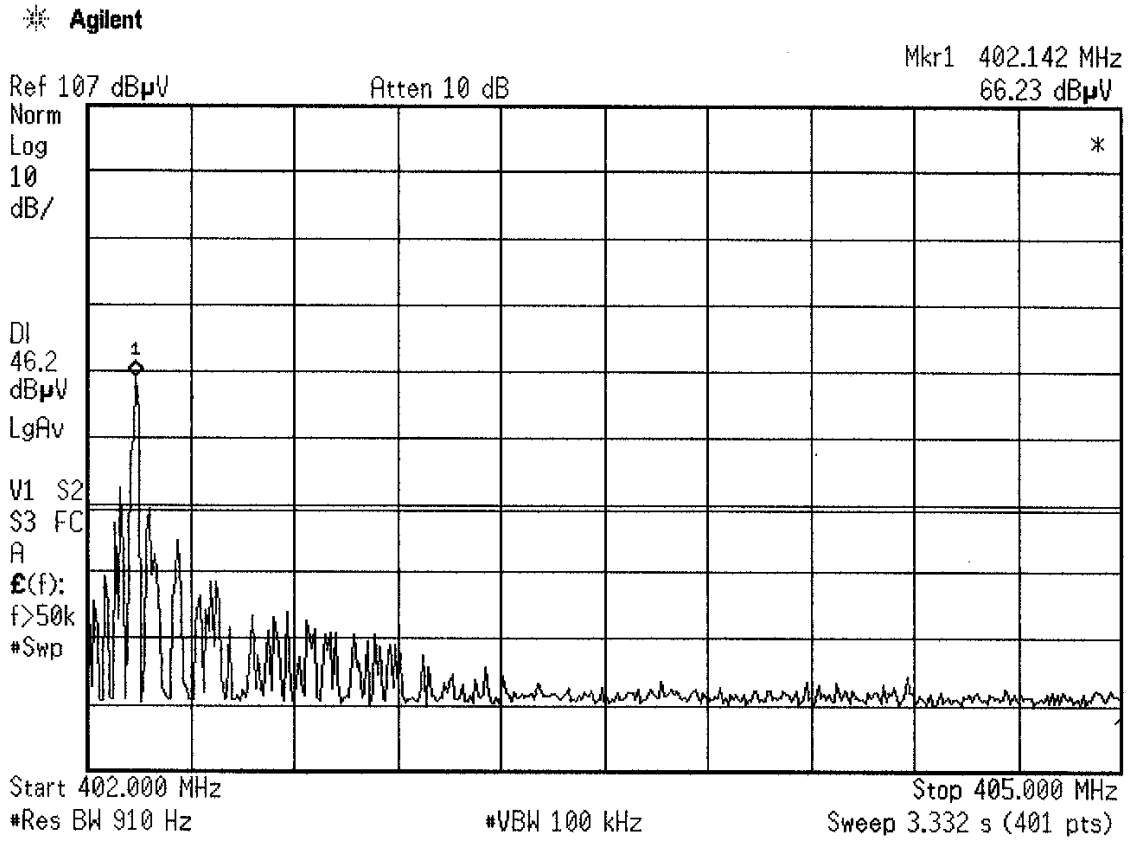
FCC Part 95, Paragraph 95.636(d)(4) - Unintentional within Band (402-405 MHz)



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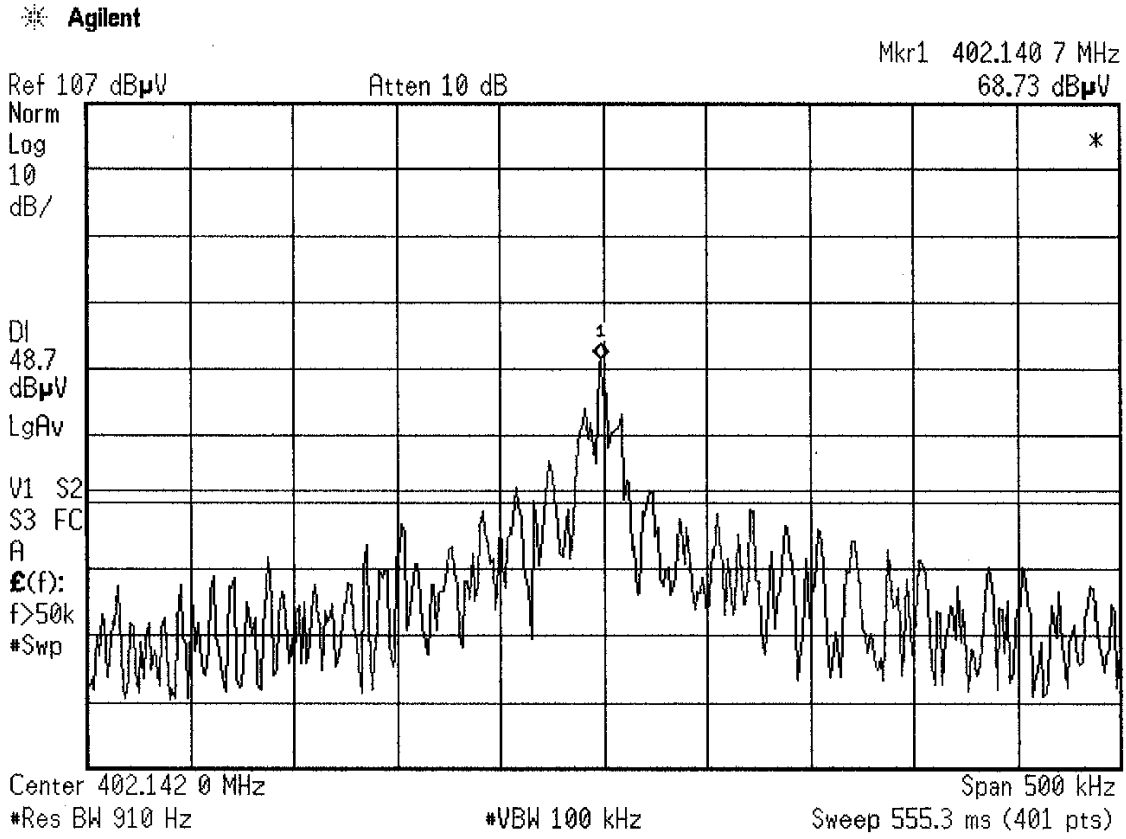
FCC Part 95, Paragraph 95.636(d)(4) - Unintentional within band (402-405 MHz)
FCC Part 95, Paragraph 95.636(d)(5) - Low Band Edge



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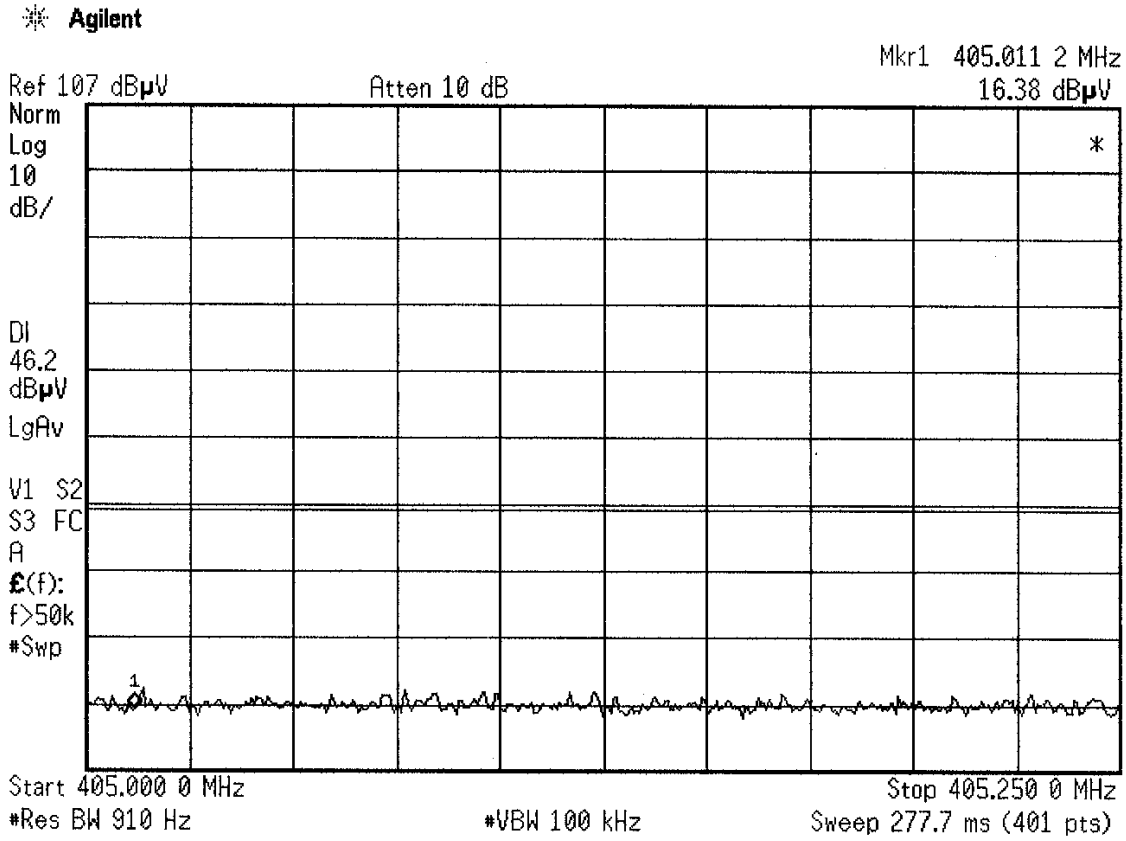
FCC Part 95, Paragraph 95.636(d)(5) - High Band Edge



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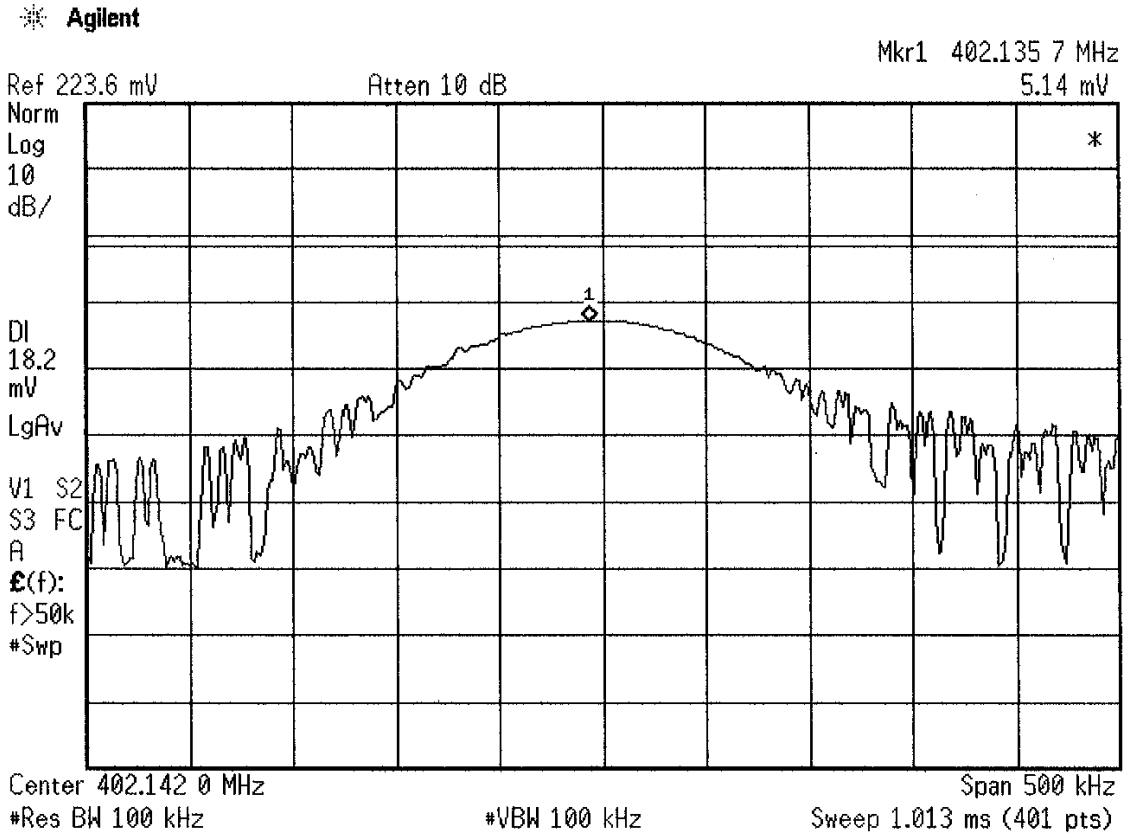
FCC Part 95, Paragraph 95.639(f)(1) - Maximum Transmitter Power
7.862 microwatts (requirement is to be below 25 microwatts)



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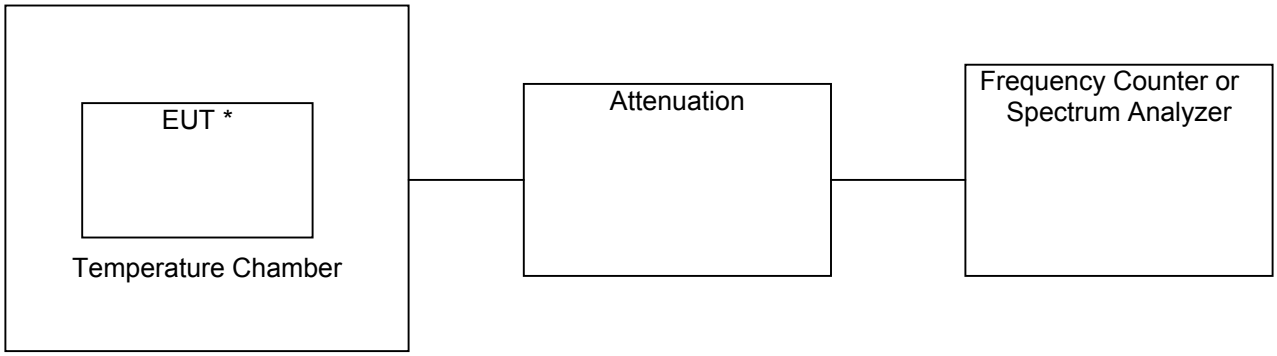
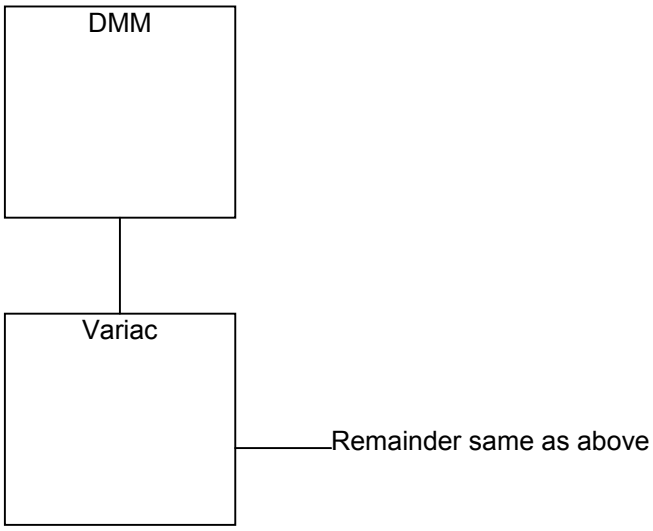
Test Setup for Frequency Stability

Frequency Stability (Variation of Ambient Temperature)



* Could place EUT or the frequency determining part of the EUT inside temperature chamber. The frequency determining part of the EUT is what controls the accuracy of the transmitted frequency.

Frequency stability (variation of supply voltage)



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FREQUENCY STABILITY

Procedure

2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From ´30□to +50□centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(2) From ´20□to +50□centrigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radio beacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to- Point Microwave Radio Service under part 21 of this chapter, and equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter.

(3) From 0□to +50□centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10□centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature
level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(c) In addition to all other requirements of this section, the following information is required for equipment incorporating heater type crystal oscillators to be used in mobile stations, for which type acceptance is first requested after March 25, 1974, except for battery powered, hand carried, portable equipment having less than 3 watts mean output power.

(1) Measurement data showing variation in transmitter output frequency from a cold start and the elapsed time necessary for the frequency to stabilize within the applicable tolerance. Tests shall be made after temperature stabilization at each of the ambient temperature levels; the lower temperature limit, 0□centigrade and +30□centigrade with no primary power applied.

(2) Beginning at each temperature level specified in paragraph (c)(1) of this section, the frequency shall be measured within one minute after application of primary power to the transmitter and at intervals of no more than one minute thereafter until ten minutes have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance, whichever time period is greater. During each test, the ambient temperature shall not be allowed to rise more than 10□centigrade above the respective beginning ambient temperature level.

(3) The elapsed time necessary for the frequency to stabilize within the applicable tolerance from each beginning ambient temperature level as determined from the tests specified in this paragraph shall be specified in the instruction book for the transmitter furnished
to the user.

(4) When it is impracticable to subject the complete transmitter to this test because of its physical dimensions or power rating, only its frequency determining and stabilizing portions need be tested.

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FREQUENCY STABILITY (continued)

Procedure

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any
heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c), and (d) of this section.
(For example measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

Part 95, Paragraph 95.628(e)

Each transmitter in the MICS service must maintain a frequency stability of ±100 ppm of the operating frequency over the range:

25º C to 45º C in the case of medical implant transmitters and 0º C to 55º C in the case of medical implant programmer/control transmitters.

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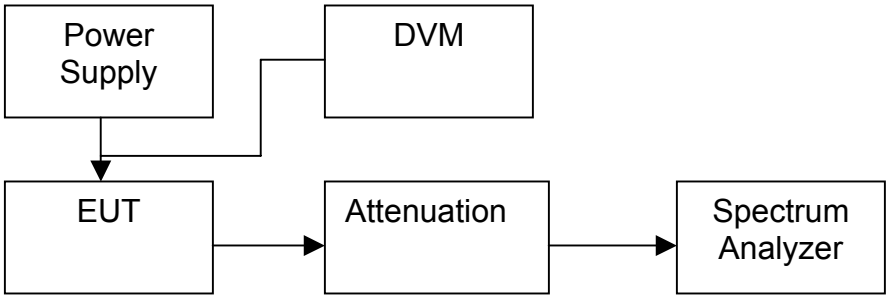
Test Setup for Emission Bandwidth



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EMISSION BANDWIDTH

Procedure

20 dB Bandwidth

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW □ 1% of the 20 dB bandwidth

VBW □ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this section. Submit this plot(s).

Part 95, Paragraph 95.633(e)

For transmitters in the MICS, the maximum authorized emission bandwidth is 300 kHz.

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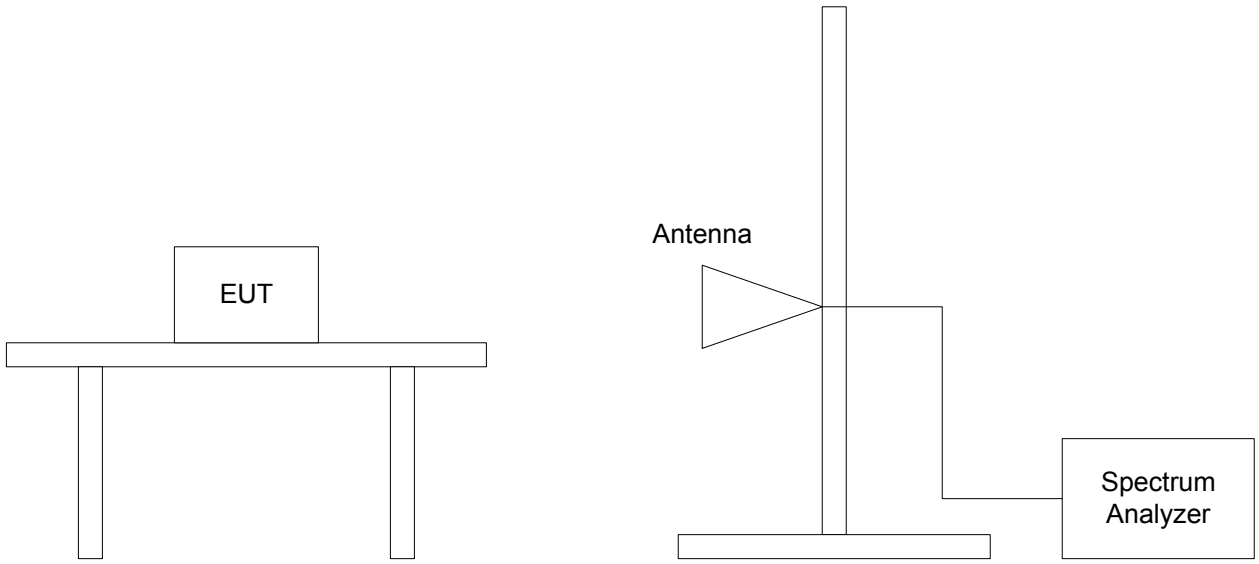
Test Setup for Maximum Transmitter Power



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OUTPUT POWER

Part 95, Paragraph 95.639 - Maximum Transmitter Power.

In the MICS the following limits apply:

(1) The maximum EIRP for MICS transmitter stations is 25 microwatts. (Note: The antenna associated with any MICS transmitter must be supplied with the transmitter and shall be considered part of the transmitter subject to equipment authorization.)

(2) Compliance of MICS transmitters with the 25 microwatts EIRP limit is determined by measuring the radiated field from the EUT at 3 meters and calculating the EIRP. The equivalent radiated field strength at 3 meters for 25 microwatts EIRP is 18.2 mV/meter when measured on an open area test site, or 9.1 mV/meter when measured on a test site equivalent to free space such as a fully anechoic test chamber. For both, compliance is based on measurements using a peak detector function and measured over an interval of time when transmission is continuous and at its maximum power level. In lieu of using a peak detector function, instrumentation techniques set forth in ANSI C63.17–1998, Section 6.1.2.2.1 or Section 6.1.2.2.2 may be used in determining compliance with the above specifications.

(3) The power radiated in any 300 kHz bandwidth shall not exceed 25 microwatts EIRP. See §§95.633(e) and 95.639(g).

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Appendix A

Test Setups
(Photographs)

NOTE: All photographs are representative of setup for maximum emissions.

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Photograph of Test Setup:
Frequency Stability

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Photograph of Test Setup:
Unintentional within Band (402-405 MHz)
Low Band Edge and High Band Edge

Photograph not available. See Technical Documentation page TD12 for test setup.

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Photograph of Test Setup:
Emission Bandwidth
Radiated Spurious Emissions
Maximum Transmitter Power

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Photograph of Test Setup:
Emission Bandwidth
Radiated Spurious Emissions
Maximum Transmitter Power

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Appendix B

Product Information Form(s)

Not Available

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Appendix C

Change History

Not Applicable

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Appendix D

Supplemental Information

Not Applicable

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