

CHOMERICS

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TEST SERVICES

**EMC EVALUATION OF THE
SIEMENS
BIOMEDICAL TELEMETRY TRANSMITTER (608-614MHZ)
IN ACCORDANCE WITH
FCC PART 15 SUBPART B AND C**

Prepared For: **SIEMENS MEDICAL SYSTEMS, INC.**
 ELECTROMEDICAL GROUP
 16 ELECTRONICS AVENUE
 DANVERS, MASSACHUSETTS 01923
 ATTENTION: JIM GRECO

Prepared By: **WILLIAM TORRENCE/ROBERT FOSTER**
 CHOMERICS TEST SERVICES
 77 DRAGON COURT
 WOBURN, MASSACHUSETTS 01888

Date: **MAY 10, 2000**

Test Report Number: **TR2585.00**

Test Technician or Engineer: _____

CTS Approved Signatory: _____

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LIST OF DEFINITIONS/ABBREVIATIONS

AC	Alternating Current
BB	Broadband
BW	Bandwidth
cm	Centimeter
CPU	Calibrate Prior to Use
dB	Decibel
DC	Direct Current
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ER	Electric Radiation
EUT	Equipment Under Test
GHz	Gigahertz
Hz	Hertz
I-face	Interface
kHz	Kilohertz
m	Meter
MHz	Megahertz
mm	Millimeter
mS	Millisecond
mV	Millivolt
MR	Magnetic Radiation
NB	Narrowband
NCR	No Calibration Required
PLC	Power Line Conduction
PPS	Pulses Per Second
uF	Microfarad
uH	Microhenry
uS	Microsecond
uV	Microvolt
UWC	Use With Calibrated Equipment

1.0 GENERAL**1.1 Introduction****1.1.1 Purpose**

The purpose of this report is to document the performance of the Siemens Biomedical Telemetry Transmitter (608-614MHz) during an electromagnetic interference (EMI) test and record the test requirements and procedures used. At the request of Siemens, the tests were performed by Chomerics Test Services (CTS) of Woburn, Massachusetts. The assessment will determine the compliance or non-compliance with the requirements set up by the FCC Part 15 Subparts B and C.

George Kokovidis from Siemens was present during testing. Testing was performed on April 28, 2000.

1.1.2 Requirements

The requirements for the sequence of tests performed on the Biomedical Telemetry Transmitter (608-614MHz) are as follows:

FCC Subpart B Radiated Electromagnetic Emissions

FCC Part 15 Subpart B radiated emission requirements for Information Technology Equipment (ITE).

FCC Subpart C Radiated Electromagnetic Emissions

The limit for the fundamental signal is FCC Part 15 Subpart C 15.242 paragraph C.

200mV/m or 86dBuV/m

The limit for all other signals including spurious and harmonic emissions is FCC Part 15 Subpart C 15.209.

1.2 TEST SUMMARY

The terms "Passed" or "Failed" in this section are intended to guide the reader as to whether or not the EUT met the minimum requirements that can be interpreted from the in Section 1.5. The "Results" paragraph in each test section to follow and the test data sheets will outline specifically how the EUT performed during each test.

FCC Subpart B Radiated Emissions	PASSED
FCC Subpart C Radiated Emissions	PASSED

1.2.1 Summary of Recommendations

The Siemens Biomedical Telemetry Transmitter (608-614MHz) will require no modifications in order to insure compliance with the FCC Part 15 Subparts B and C.

Please note that if any modifications and or fixes were implemented to the EUT to achieve compliance, other approaches to solving the problem may exist. In addition, any EMI/EMC shielding products listed in this report may be substituted with an equivalent.

1.3 Administrative Data

1.3.1 Test Facility

Chomerics test facility is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for NVLAP Codes 12F01; FCC test methods – 47 CFR Part 15 – Digital Devices, 12F01a; Conducted Emissions, and 12F01b; Radiated Emissions under NVLAP Accreditation Number 100296-0. Tests within this report not conforming to these NVLAP Codes are not covered under Chomerics NVLAP accreditation. Chomerics NVLAP accreditation covers test method 12/CIS22 for IEC/CISPR 22:1993, 12/CIS22a for IEC/CISPR 22 Amendment 1:1995 and Amendment 2:1996. Chomerics NVLAP accreditation code 12/CIS22b covers Chinese National Standard CNS 13438:1997.

Chomerics Radiated and Conducted Emissions testing to AS/NZS3548 is accredited to the Australian Telecommunications Authority (AUSTEL) under file number A92/TH/0048.

Chomerics' Open Area Test Sites A and B are accredited for Radiated and Conducted Emissions through Industry Canada under file numbers IC2959A and IC2959B respectively.

Chomerics' Open Area Test Site A is accredited to the Voluntary Control Council for Interference (VCCI) in Japan for Radiated and Conducted Emissions testing under file R-749 and C-770 respectively. Open Area Test Site B is also accredited to the Voluntary Control Council for Interference for Radiated and Conducted Emissions testing under file R-738 and C-758 correspondingly.

Chomerics test facility operates under the current revision of Chomerics Quality Assurance (QA) Manual Document Number QA002.

The QA Manual has been constructed to reflect a quality program in accordance with the requirements of the National Institute of Standards and Technology (NIST), ISO 9002, ISO Guide 25, NIST Handbook 150, EN 45001, MIL-I-45208A, MIL-STD-461D, 462D and Chomerics Quality Assurance Program (QAP).

The QA Manual outlines and describes the procedures for establishing and maintaining the quality of analysis, research, inspection, and testing within Chomerics Test Service (CTS).

This test report does not represent an endorsement by the U.S. Government.

The results and/or conclusions within this test report refer and/or apply only to the unit(s) tested as defined by this report.

Measurements performed for this test are traceable to the National Institute of Standards and Technology (NIST) based on the fact that all test equipment used for the measurements were previously calibrated using standards traceable to NIST.

No conducted emissions tests were performed because the EUT is a battery powered device. No other deviations, additions to, or exclusions from the test specification(s) were made.

The system amplitude accuracy for the measurements made during the radiated emission tests was ± 3 dB. Chomerics Test Services measurement uncertainty calculations are available for review upon request.

1.3.2 Equipment Calibration

The calibration of Chomerics test facility equipment is controlled under the current edition of Chomerics Laboratory Test Equipment Calibration Manual Document Number QA001.

The test equipment used throughout this test sequence conforms to laboratory calibration standards, MIL-STD-45662, traceable to the National Institute of Standards and Technology (NIST). The date of the next due scheduled calibration is listed in each test section for the applicable equipment.

All test equipment is calibrated in one year intervals.

1.3.3 Test Personnel

The test personnel used to perform or supervise the tests are accredited by the National Association of Radio and Telecommunications Engineers, Inc. (NARTE) as Certified Electromagnetic Compatibility Engineers (N.C.E.) and Technicians (N.C.T.).

1.4 Test Set-up

1.4.1 Test Site Matrix

The specific test locations used for the emissions testing of the Siemens Biomedical Telemetry Transmitter (608-614MHz) are as follows: (Refer to Section 1.4.2 for test site descriptions).

Emissions Test

FCC Subpart B
FCC Subpart C

Test Site

Open Area Test Site B
Open Area Test Site B

1.4.2 Test Site Descriptions

The following is a list of test sites and descriptions of each. Refer to Section 1.4.1 for specific test sites used for testing.

Open Area Test Site A: Chomerics' Open Area Test Site "A" if used for this test program is located in the lower parking lot attached to the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 1). Parking is permitted on one side of Test Site "A" at a discrete distance from the imaginary ellipse.

The Open Area Test Site "A" enclosure is a wooden structure measuring 56 x 30 x 25 feet in size with galvanized steel sheet metal used as the ground plane. The structure is sized to allow 3 meter measurements and is heated and/or air conditioned.

The structure used to support equipment under test is an EMCO 4 foot diameter motorized turntable. For tabletop equipment, a wooden table measuring 1.5 x 1 meter in size is positioned at the center of the turntable, at the proper height above the ground plane.

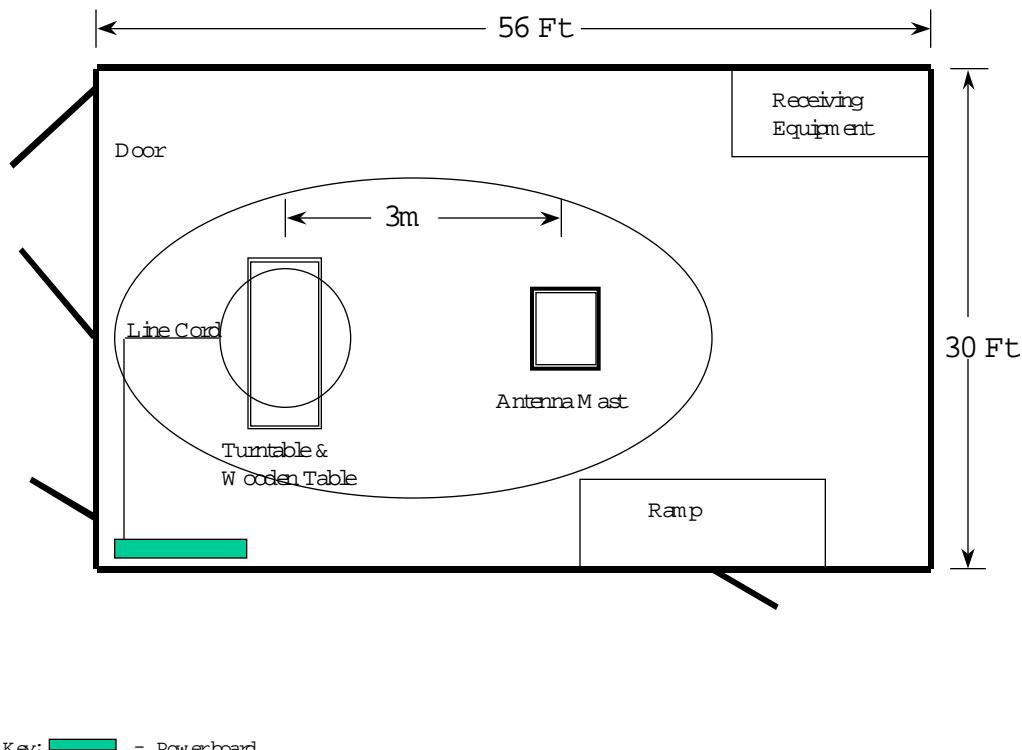
The area at the end of the Open Area Test Site "A" is the location for the test personnel and equipment to ensure they are outside the imaginary ellipse.

The available AC power within Open Area Test Site "A" is 120V 60Hz Single Phase 60Amps; 208V 60Hz Three Phase 60Amps; 208V 60Hz Single Phase 60Amps; 230V 50Hz Single Phase 50Amps.

This Site is listed with the Federal Communications Commission (FCC) and approved by BSMI, VCCI, AUSTEL and CSA.

OPEN AREA TEST SITE A

Figure 1



Open Area Test Site B: Chomerics' Open Area Test Site "B" if used for this test program is located in the lower parking lot behind the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 2). Parking is permitted on one side of Test Site "B" at a discrete distance from the imaginary ellipse.

The Open Area Test Site "B" enclosure is a wooden structure measuring 56 x 30 x 25 feet in size with galvanized steel sheet metal used as the ground plane. The structure is sized to allow both 3 and 10 meter measurements and is heated and/or air conditioned.

The structure used to support equipment under test is a 14 foot diameter motorized turntable. The sheet metal surface is flush with the ground plane. To ground the turntable, copper fingers (1" x 1.5") are mounted around the outer edge of the turntable using machine screws. The spring fingers are equally spaced and provide a uniform interface between the turntable metal surface and ground plane. For tabletop equipment, a wooden table measuring 1.5 x 1 meter in size is positioned at the center of the turntable, at the proper height above the ground plane.

Siemens Biomedical Telemetry Transmitter (608-614MHz)

Document #: TR2585.00

Date: May 10, 2000

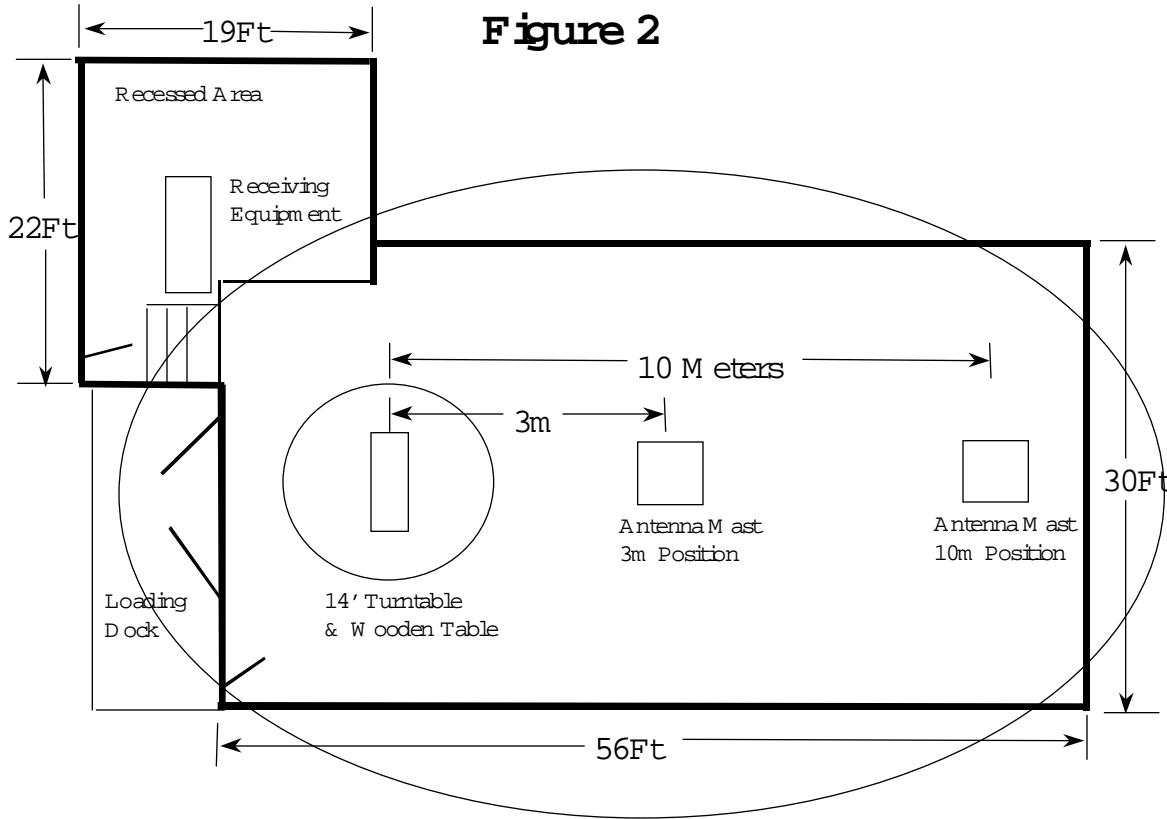
The addition at the end of the Open Area Test Site "B" is the location for the test personnel and equipment to ensure they are outside the imaginary ellipse.

The available AC power within Open Area Test Site "B" is 120V 60Hz Single Phase 60Amps; 208V 60Hz Three Phase 60Amps; 208V 60Hz Single Phase 60Amps; 230V 50Hz Single Phase 50Amps.

This Site is listed with the Federal Communications Commission (FCC) and approved by BSMI, VCCI, AUSTEL and CSA.

OPEN AREA TEST SITE B

Figure 2



1.4.3 Equipment Under Test

The Siemens Biomedical Telemetry Transmitter (608-614MHz) is a medical device.

The support equipment needed to run the Siemens Biomedical Telemetry Transmitter (608-614MHz) in the normal mode of operation consisted of the following:

- a. Siemens ECG patient simulator

The Biomedical Telemetry Transmitter (608-614MHz) operates on 9VDC battery power. There are no I/O connections other than the Simulator connection.

A normal transmit mode of operation was used for testing the fundamental, spurious, and harmonics emissions. The Biomedical Telemetry Transmitter was tested at three frequencies 608, 611 and 614MHz. The transmitter's output was at full power and a new 9V battery placed in the EUT. This is the only mode of operation for the Biomedical Telemetry Transmitter.

The Biomedical Telemetry Transmitter (608-614MHz) was monitored during the tests by George Kokovidis of Siemens.

The equipment under test was setup as illustrated on CTS-Form-014.

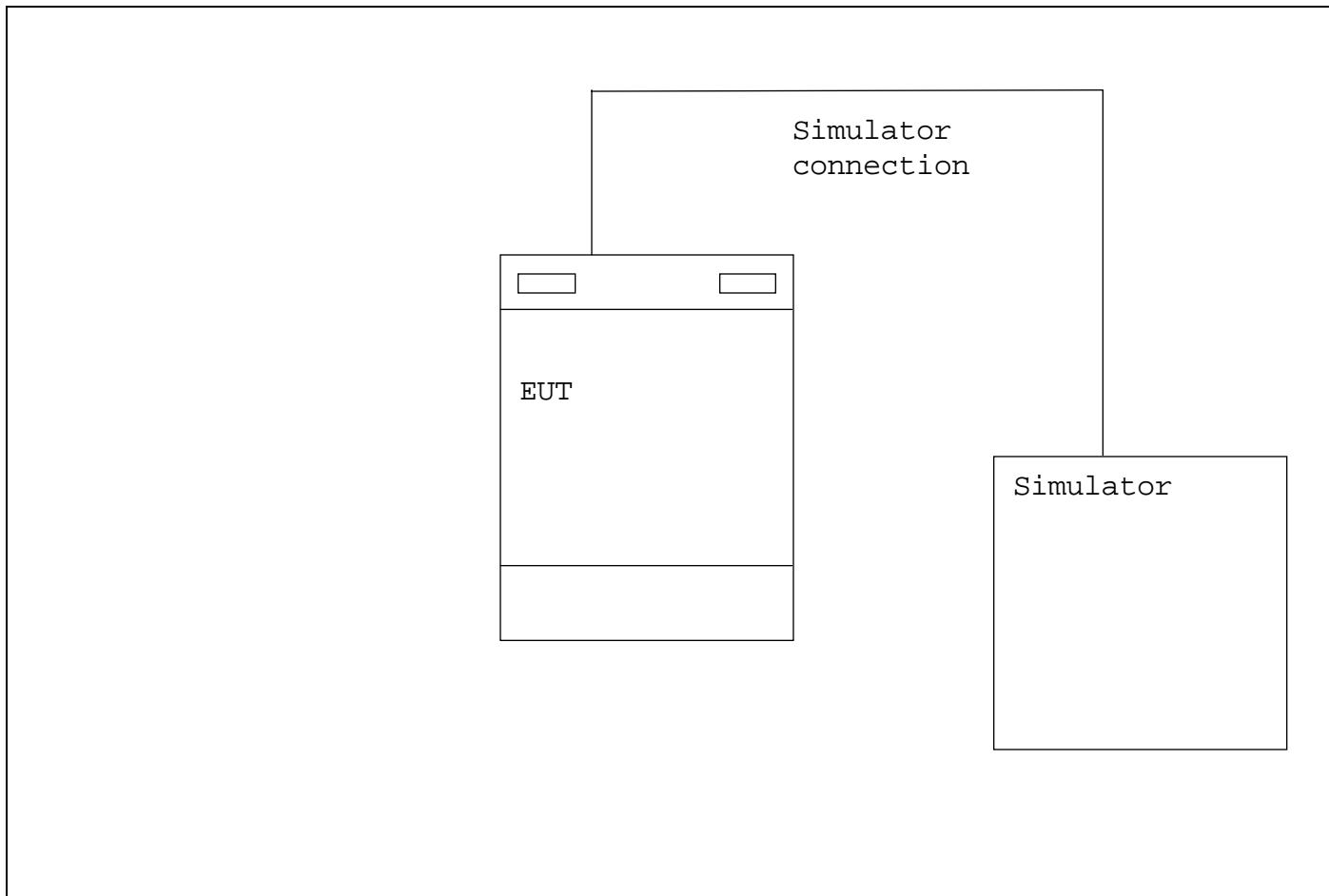
1.4.4 Block Diagram

CUSTOMER: SIEMENS

EQUIPMENT: BIOMEDICAL TELEMETRY TRANSMITTER
(608-614MHz)

DATE: APRIL 28, 2000

TESTED BY: WILLIAM TORRENCE



System Configuration Block Diagram – Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside the testing field.

FORM CTS-014

Siemens Biomedical Telemetry Transmitter (608-614MHz)
Document #: TR2585.00
Date: May 10, 2000

1.5 Pass/Fail Criteria**FCC Part 15 Subpart B**

Any radiated emissions except the fundamental shall not exceed FCC Subpart B radiated emission requirements for Information Technology Equipment (ITE).

FCC Part 15 Subpart C

The fundamental field strength shall not exceed 200mV/m or 86dBuV/m

The field strength of harmonic or spurious emissions shall not exceed the limits listed in FCC Part 15 Subpart C 15.209.

2.0 EMISSIONS TESTS PERFORMED**2.1 FCC Part 15 Subparts B and C Radiated Electromagnetic Emissions****2.1.1 Equipment Used**

Equipment Used		Asset #	Serial #	Cal Date
	Tektronix 496 Spectrum Analyzer	1	B010559	10/00
	Tektronix 496 Spectrum Analyzer	77	B020852	1/01
	Tektronix 496 Spectrum Analyzer	56	B010206	4/01
X	Tektronix 494 Spectrum Analyzer	543	B010201	9/00
	Rhode and Schwartz ESV Test Receiver	15	875931049	9/00
X	Rhode and Schwartz ESV Test Receiver	521	979531/031	1/01
	Hewlett Packard 8559A Spectrum Analyzer	472	2019A00461	1/01
	Hewlett Packard 182T Analyzer Main Frame	352	1931A003349	1/01
	Hewlett Packard 8447D Pre Amp	12	2944A06414	1/01
X	Hewlett Packard 8447D Pre Amp	4	2727A06065	1/01
	Electro Metrics ALR-25M Loop Antenna	17	4706	1/01
	EMCO 3120 Tuned Dipole Antenna B1	477	56	1/01
	EMCO 3121 Tuned Dipole Antenna B2	478	176	1/01
	EMCO 3121 Tuned Dipole Antenna B3	479	728	1/01
X	EMCO 3120 Tuned Dipole Antenna B1	453	42	1/01
X	EMCO 3120 Tuned Dipole Antenna B2	454	65	1/01
X	EMCO 3121 Tuned Dipole Antenna B3	455	9501-1101	1/01
	EMCO 3120 Tuned Dipole Antenna B1	474	21	1/01
	EMCO 3121 Tuned Dipole Antenna B2	475	177	1/01
	EMCO 3121 Tuned Dipole Antenna B3	476	698	1/01
X	EMCO 3115 Microwave Horn Antenna	376	2796	1/01
	EMCO 3105 Microwave Horn Antenna	78	2118	1/01
	Polarad MDS21 Absorbing Clamp	435	301404/013	NCR

2.1.2 Test Conditions

Radiated emissions testing was performed with the EUT set up on a wooden table above the turntable at a distance of 3 meters from a tuned dipole antenna within Open Area Test Site B.

The Siemens Biomedical Telemetry Transmitter (608-614MHz) was configured to operate in the normal mode of operation to maximize the emissions. The Biomedical Telemetry Transmitter (608-614MHz) was set up and powered by 9VDC battery for radiated emission tests. The worst case signals detected were recorded.

2.1.3 Test Method

The test method of ANSI C63.4 FCC was followed. For the radiated emission measurements, a manual scan was performed from 30MHz to 6.2GHz. During this scan, the antenna, turntable and the EUT's cable positions were manipulated to maximize the emission levels in a given frequency band displayed on the spectrum analyzer.

Three scans were performed in total. The scans were performed with the EUT in three different transmitting frequencies 698MHz, 611MHz, and 614MHz.

2.1.4 Results

The Siemens Biomedical Telemetry Transmitter (608-614MHz) meets the requirements for radiated emissions as required by FCC Subparts B and C equipment.

2.1.5 Test Data

RADIATED E FIELD EMISSION MEASUREMENTS

CUSTOMER: SIEMENS

EQUIPMENT: BIOMEDICAL TELEMETRY TRANSMITTER

TESTED BY: B. TORRENCE

OPERATING MODE: TRANSMITTING

BANDWIDTH: [] 100 kHz (PEAK)/120 kHz (OP)

OTHER (SPECIFY)

FREQUENCY RANGE: [] 30MHz - 1 GHz

[111.76 GHz = 12.7 GHz]

OTHER (SPECIFY) 30MHz THRU 6.1GHz

OTHER (SPEC 1) - 30MM HHS 0.01%

DATE: APRIL 28, 2000

TEST NUMBER: ONE (1)

COUPLING DEVICE: EMCO

TEST SPEC: FCC PART 15 SUBPARTS B AND C

PROCEDURE: ANSIC63.4

ANTENNA DISTANCE: [] 3 METERS [] 10 METERS

★ ★ All signals greater than 3dB from the limit are calculate to the nearest whole number.

★★ Field Level (dBuV/m) = [107 – Measured level (dBm)] + Antenna Factor/Cable Loss (dB)

Ambient Temperature: 69°F Humidity: 38% Atmospheric Pressure: 29.9"

NOTES: EUT Transmitting at 608Mhz

FORM CTS-DS-001R

Siemens Biomedical Telemetry Transmitter (608-614MHz)

Document #: TR2585 00

Date: May 10, 2000

RADIATED E FIELD EMISSION MEASUREMENTS

CUSTOMER: SIEMENS

EQUIPMENT: BIOMEDICAL TELEMETRY TRANSMITTER

TESTED BY: B. TORRENCE

OPERATING MODE: TRANSMITTING

BANDWIDTH: [] 1100 kHz (PEAK)/120 kHz (QP)

OTHER (SPECIFY)

FREQUENCY RANGE: [] 30MHz - 1 GHz

FREQUENCY RANGE: [] 100

OTHER (SPECIFY) 30MHz THRU 6.1GHz

DATE: APRIL 28, 2000

TEST NUMBER: ONE (1)

COUPLING DEVICE: EMCO

TEST SPEC: FCC PART 15 SUBPARTS B AND C

PROCEDURE: ANSI C63.4

ANTENNA DISTANCE: [] 3 METERS [] 10 METERS

★ ★ All signals greater than 3dB from the limit are calculate to the nearest whole number.

★★ Field Level (dBuV/m) = [107 – Measured level (dBm)] + Antenna Factor/Cable Loss (dB)

Ambient Temperature: 69°F Humidity: 38% Atmospheric Pressure: 29.9"

NOTES: EUT Transmitting at 611Mhz

FORM CTS-DS-001R

Siemens Biomedical Telemetry Transmitter (608-614MHz)

Transmitter (333-371112)
Document #: TR2585 00

Date: May 10, 2000

RADIATED E FIELD EMISSION MEASUREMENTS

CUSTOMER: SIEMENS

EQUIPMENT: BIOMEDICAL TELEMETRY TRANSMITTER

TESTED BY: B. TORRENCE

OPERATING MODE: TRANSMITTING

BANDWIDTH: [] 100 kHz (PEAK)/120 kHz (QP)

OTHER (SPECIFY)

FREQUENCY RANGE: [] 30MHz – 1 GHz

[] 11.76 GHz – 12.7 GHz

OTHER (SPECIFY) 30MHz thru 6.2GHz

DATE: APRIL 28, 2000

TEST NUMBER: ONE (1)

COUPLING DEVICE: EMCO

TEST SPEC: FCC PART 15 SUBPARTS B AND C

PROCEDURE: ANSIC63.4

ANTENNA DISTANCE: [] 3 METERS [] 10 METERS

★★ All signals greater than 3dB from the limit are calculate to the nearest whole number.

★★ Field Level (dBuV/m) = [107 – Measured level (dBm)] + Antenna Factor/Cable Loss (dB)

Ambient Temperature: 69°F Humidity: 38% Atmospheric Pressure: 29.9"

NOTES: EUT Transmitting at 614Mhz

FORM CTS-DS-001R

Siemens Biomedical Telemetry Transmitter (608-614MHz)

Document #: TR2585.00

Date: May 10, 2000

2.1.6 Photographic Documentation

CUSTOMER: SIEMENS

EQUIPMENT: BIOMEDICAL TELEMETRY TRANSMITTER
(608-614MHz)

TESTED BY: B. TORRENCE

DATE: APRIL 28, 2000

TEST NUMBER: 0NE (1)

OPERATING MODE: NORMAL



Photograph Description: Radiated set-up

FORM CTS-PHOTO

Siemens Biomedical Telemetry Transmitter (608-614MHz)

Document #: TR2585.00

Date: May 10, 2000

APPENDIX A**TEST LOG**

Siemens Biomedical Telemetry Transmitter (608-614MHz)
Document #: TR2585.00
Date: May 10, 2000

TEST LOG

CUSTOMER: SIEMENS

PROGRAM:

EQUIPMENT: BIOMEDICAL TELEMETRY TRANSMITTER (608- TESTED BY: WILLIAM TORRENCE
614MHz)

Pre-Test Checklist	Date	Comments					
	04/28/00	Test Plan/Procedure: ANSI C63.4 Test Specification: FCC Part 15 Subparts B and C Chomerics Procedure: CHO TPEC.295 T1 EUT Power Requirement Verified: Yes Voltage 9 Frequency DC Phase Voltage Frequency Phase EUT Functional Operational Check: [<input checked="" type="checkbox"/>] Pass [<input type="checkbox"/>] Fail Environmental: Bonding/Grounding: None Safety Issues: None					
In-Process Test Checklist	Date	Test #	Test Type	Test Equipment Calibrated	Test Performed Properly – Data Accepted	EUT Set-up Check/Operational Check	EUT Pass/ Fail
	04/28/00	One (1)	Radiated Emission	Yes	Yes	Yes	PASS
Post Test Checklist	Date: 04/28/00	EUT Functional Operation Check: [<input checked="" type="checkbox"/>] Pass [<input type="checkbox"/>] Fail			_____ Test Engineer/Tech _____ Approved Signatory _____		

FORM CTS-010

Siemens Biomedical Telemetry Transmitter (608-614MHz)

Document #: TR2585.00

Date: May 10, 2000