

**Exhibit 6: Test Report**

**TEST REPORT FROM:**

COMMUNICATION CERTIFICATION LABORATORY  
1940 W. Alexander Street  
Salt Lake City, Utah  
84119-2039

Type of Report: Certification

TEST OF: IBS / 4070 IO-3AC36116

FCC ID: OYOPWTB

To Part 15 Subpart D  
of the FCC Rules and Regulations

Test Report Serial No: 73-7159

Applicant:

Alcatel  
7 Stiles Road  
2<sup>nd</sup> Floor  
Salem, NH 03079

Date(s) of Test: January 24 - 28, 2000

Issue Date: April 12, 2000

Equipment Receipt Date: January 21, 2000

CERTIFICATION OF ENGINEERING REPORT

This report has been prepared by Communication Certification Laboratory to evaluate the device described below with the requirements of FCC Part 15, Subpart D. Specific identifying information for the device tested is given below.

- Applicant            Alcatel  
                         7 Stiles Road  
                         2<sup>nd</sup> Floor  
                         Salem, NH 03079
- Manufacturers: Alcatel Business Systems  
                         1, Route du Dr. A. Schweitzer  
                         Illkirch Ce  
                         Cedex, 67408  
                         France  
  
                         Alcatel Citesa S.A.  
                         Parque Tecnologico de Andalucia  
                         Campanillas  
                         Malaga, SP-29590  
                         Spain
- Trade Name:        ALCATEL
- Model Number:    IBS / 4070 IO-3AC36116
- FCC ID Number:   OYOPWTB

On this 12<sup>th</sup> day of April 2000, I, individually, and for Communication Certification Laboratory, certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

COMMUNICATION CERTIFICATION LABORATORY

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Checked by: William S. Hurst, P.E.  
Vice President

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Tested by: Roger J. Midgley  
EMC Engineering Manager

**SECTION 1 GENERAL INFORMATION****1.1 Product Description**

The IBS / 4070 IO-3AC36116 is the base station portion of a wireless system telephone system. The system consists of a controller, base station and wireless handset. The base station is hard wired to the controller. The controller connects to a PBX to provide all of the PBX functions to the wireless handset.

This application is for the base station, which is identified by FCC ID: OYOPWTB. The handset, which is identified by FCC ID: OYOPWTH, application is being submitted concurrently with this application.

**1.2 Test Specification**

The IBS / 4070 IO-3AC36116 is an Isochronous device that operates in the 1920-1930 MHz sub-band; therefore the IBS / 4070 IO-3AC36116 is subject to the provisions of FCC Part 15, Subpart D. Unlicensed Personal Communications Service Devices.

**1.3 Test Methods & Procedures**

The IBS / 4070 IO-3AC36116 was tested in accordance with ANSI C63.17-1998.

**SECTION 2. SUMMARY OF TEST RESULTS:****2.1 Summary of Tests:**

FCC Section	Description	Report Section	ANSI C63.17 Section	Result
15.307	Affidavit from UTAM, Inc. certifying participation in UTAM, Inc.	3.2.1	N/A	Complies
15.309	Cross Reference to Subpart B	3.2.2	6.1.6.3	Complies
15.311	Labelling Requirements	3.2.3	N/A	Complies
15.315	AC power line conducted limits	3.2.4	N/A	Complies
15.317	Antenna requirement	3.2.5	N/A	Complies
15.319 (a)	Frequency of operation	3.2.6	N/A	Complies
15.319 (b)	Modulation technique	3.2.7	6.1.4	Complies
15.319 (c)	Peak transmit power and emission bandwidth	3.2.8	6.1.2	Complies
15.319 (d)	Power spectral density	3.2.9	6.1.5	Complies
15.319 (e)	Directional gain of antenna	3.2.10	N/A	Complies
15.319 (f)	Automatic discontinuance of transmission	3.2.11	N/A	Complies
15.319 (i)	IEEE C95.1-1991 and IEEE C95.3-1991	3.2.12	N/A	Complies
15.323 (a)	Channel allocation	3.2.13	N/A	Complies

<b>FCC Section</b>	<b>Description</b>	<b>Report Section</b>	<b>ANSI C63.17 Section</b>	<b>Result</b>
15.323 (b)	Channel packing	3.2.14	8.1.2	Complies
15.232 (c)	Time and Spectrum monitoring	3.2.15	Sections 7 and 8	Complies
15.323 (c)(1)	Transmit window monitoring	3.2.16	7.3.2.2 7.5	Complies
15.323 (c)(2)	Monitoring threshold	3.2.17	7.3.2.1	Complies
15.323 (c)(3)	Transmission duration	3.2.18	N/A	Complies
15.323 (c)(4)	Acknowledgments	3.2.19	8.2.1 8.1.3	Complies
15.323 (c)(5)	Least interfered channel	3.2.20	7.3.2.1, 7.3.2.2 8.2.1	Complies
15.323 (c)(6)	Random waiting interval	3.2.21	8.1.3 8.2.1	Complies
15.323 (c)(7)	Threshold monitoring bandwidth, Threshold monitoring reaction time	3.2.22	7.4 7.5	Complies
15.323 (c)(8)	Threshold monitoring antenna	3.2.23	N/A	Complies
15.323 (c)(9)	Monitoring threshold relaxation	3.2.24	N/A	Complies
15.323 (c)(10)	Duplex connections	3.2.25	8.2.3	Complies
15.323 (c)(11)	Alternative monitoring interval	3.2.26	8.2.4	Complies
15.323 (c)(12)	Limitation on use of Section (c)(10) or (c)(11)	3.2.27	N/A	Complies

<b>FCC Section</b>	<b>Description</b>	<b>Report Section</b>	<b>ANSI C63.17 Section</b>	<b>Result</b>
15.323 (d)	Spurious emissions	3.2.28	6.1.6	Complies
15.323 (e)	Frame repetition stability / frame period and jitter	3.2.29	6.2.3 6.2.4	Complies
15.323 (f)	Frequency stability	3.2.30	6.2.2	Complies

**SECTION 3. MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS:****3.1 General Comments**

This section contains the test results only. Details of the test methods used, etc., can be found in Appendix A of this report.

**3.2 Test Results****3.2.1 Coordination with fixed microwave service § 15.307****Measurement Data:**

The affidavit from UTAM, Inc. is enclosed in Exhibit 12.

**3.2.2 Cross Reference to Subpart B § 15.309**

The requirements of Subpart D apply only to the radio transmitter contained in the PCS device. Other aspects of the operation of a PCS device may be subject to requirements contained elsewhere in this Chapter. In particular, a PCS device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in Subpart B. The IBS / 4070 IO-3AC36116 tunes up to 1930 MHz; therefore, in accordance with § 15.33 (b)(1), the EUT was tested from 30 MHz to 10 GHz.

The IBS / 4070 IO-3AC36116 complies with the limits shown below for a class A unintentional radiator:

**§ 15.109 Radiated Emission Limits Class A**

Frequency (MHz)	Field Strength at 10 m( $\mu$ V/m)	Field Strength at 3 m (dB $\mu$ V/m)
30 - 88	90	49.1
88 - 216	150	53.5
216 - 960	210	56.4
960 - 10,000	300	59.5

**Measurement Data:**

The radiated spurious emissions were pre-scanned with the IBS / 4070 IO-3AC36116 in the receive, idle and transmit modes, also the unit was tested with the three different antennas. The data below represents the worst case emissions, with the IBS / 4070 IO-3AC36116 in the transmit mode and the MAT Equipment antenna connected.

Frequency MHz	Polarity H/V	Uncorr Level dBμV	Correction Factor dB	Corrected Level dBμV/m	Criteria dBμV/m
43.1	H	18.4	11.8	30.2	49.1
73.2	H	15.8	14.8	30.6	49.1
111.3	H	25.3	15.6	40.9	53.5
153.1	H	22.5	17.2	39.7	53.5
167.0	H	23.3	18.2	41.5	53.5
170.4	H	27.3	18.0	45.3	53.5
194.9	H	24.2	18.2	42.4	53.5
220.8	H	23.4	19.5	42.9	56.4
248.0	H	23.9	20.7	44.6	56.4
300.0	H	22.5	22.9	45.4	56.4
440.0	H	19.0	26.1	45.1	56.4
467.2	H	16.8	27.3	44.1	56.4
43.3	V	34.2	11.8	46.0	49.1
72.8	V	25.6	14.7	40.3	49.1
153.1	V	23.2	17.2	40.4	53.5
170.4	V	25.0	18.0	43.0	53.5
181.1	V	23.0	17.7	40.7	53.5
209.6	V	24.6	18.8	43.4	53.5
220.8	V	24.2	19.5	43.7	56.4
248.0	V	24.3	20.7	45.0	56.4
380.8	V	15.6	25.0	40.6	56.4
422.4	V	16.3	25.5	41.8	56.4
467.2	V	16.4	27.3	43.7	56.4

Note 1: There were no emissions detected above 1000 MHz.

**EUT Configuration**

The IBS / 4070 IO-3AC36116 was placed in the transmit mode



and placed on the table. The IBS / 4070 IO-3AC36116 was tested in the transmit, receive and idle modes to determine which configuration produced the worst case emissions.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 2, 3, 4, and 5.

### Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

where      FS = Field Strength  
            RA = Receiver Amplitude  
            AF = Antenna Factor  
            CF = Cable Attenuation Factor  
            AG = Amplifier Gain

Assume a receiver reading of 52.5 dBμV is obtained. The correction factor of -8.9 dB is added to the receiver reading giving field strength of 32 dBμV/m.

The correction factor is obtained by adding the Antenna Factor of 15.7 and a Cable Factor of 2.2 is added and subtracting the Amplifier Gain of 26.8 dB, giving a correction factor of -8.9 dB.

### RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

#### 3.2.3 Labeling Requirements § 15.311

In addition to the labeling requirements of Section 15.19 (a) (3), all devices authorized under this subpart must bear a prominently located label with the following statement:

Installation of this equipment is subject to notification  
Exhibit 6

and coordination with UTAM, Inc. Any relocation of this equipment must be coordinated through, and approved by UTAM. UTAM may be contacted at telephone number 1-800-429-8826.

**Demonstration of Compliance:**

See labels in Exhibit 1 of this report.

**3.2.4 Conducted Emissions § 15.315**

An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in § 15.207.

**§ 15.207 Conducted Emission Limits**

Frequency	Conducted Limit ( $\mu$ V)	Conducted Limit (dB $\mu$ V)
450 kHz to 30 MHz	250	48.0

**Measurement Data:**

The IBS / 4070 IO-3AC36116 operates on either 48 VDC supplied by the system controller or via an AC to DC power supply therefore; the AC line conducted testing was performed with the IBS / 4070 IO-3AC36116 powered from the AC to DC power supply.

**EUT Configuration**

The conducted emissions testing was performed with the IBS / 4070 IO-3AC36116 in the following configurations, idle mode, receive mode and transmit mode. The worst case emissions were with the IBS / 4070 IO-3AC36116 in the transmit mode. Shown below are the conducted emissions from the IBS / 4070 IO-3AC36116 in this worst case configuration.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 12 and 13.

Test Point	Frequency MHz	Detector	Measured Level dBµV	Limit dBµV
Hot Lead	0.51	Peak	26.3	48.0
	0.54	Peak	28.2	48.0
	0.68	Peak	24.3	48.0
	0.89	Peak	23.4	48.0
	6.05	Peak	19.9	48.0
	17.30	Peak	20.4	48.0
	20.78	Peak	22.3	48.0
	24.26	Peak	23.2	48.0
	24.65	Peak	22.1	48.0
Neutral	1.37	Peak	19.7	48.0
	3.48	Peak	20.4	48.0
	10.43	Peak	23.3	48.0
	11.76	Peak	20.2	48.0
	17.30	Peak	22.1	48.0
	20.78	Peak	23.7	48.0
	24.26	Peak	25.4	48.0
	24.65	Peak	24.1	48.0
	27.33	Peak	20.8	48.0

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.5 Antenna Requirement § 15.317****Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 use a permanently attached antenna . The same type as specified by the manufacturer can only replace this antenna (See Exhibit 12).

The IBS / 4070 IO-3AC36116 uses three different types of antennas as listed below; the maximum directional antenna gain for all three antennas is 3.0 dBi.

<u>Antenna Type</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Gain</u>
Dipole	Calearo	7570015	2.0 dBi Typical 3.0 dBi Max
Dipole	Wiltron	R380.400.110	2.5 dBi
Dipole	MAT Equipment	MA300x06	2.0 dBi

**§ 15.319 General Technical Requirements****3.2.6 Frequency of Operation § 15.319 (a)****Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 is an Isochronous devise that transmits from 1920 - 1930 MHz. The spectrum has been split into eight 1.25 MHz sub-bands starting with 1920-1921.25 MHz and ending with 1928.75-1930 MHz. The IBS / 4070 IO-3AC36116 operates on these eight channels as listed below:

Channel Number	Center Frequency (MHz)
0	1929.375
1	1928.125
2	1926.875
3	1925.625
4	1924.375
5	1923.125
6	1921.875
7	1920.625

Exhibit 6

The IBS / 4070 IO-3AC36116 uses Time Division Multiple Access (TDMA) technology. Each channel is divided into 10 msec frame periods, which are further divided into 24 time-slots of 416 µsec per time-slot. The frame is divided in half, the first 12 slots of the frame are allocated for transmit and the last 12 for receive. The IBS / 4070 IO-3AC36116 uses only even numbered slots to TX and RX. Duplex voice traffic channels are established on slot pairs having a separation of 12 (e.g. 0&12, 2&14, 4&16, etc.).

The base station to enable handsets to synchronize to the system broadcasts control channels. The control channel can be broadcast in any of the even numbered TX slots. The number of available time frequency windows for the control channel is therefore 48 (6 even TX slots x 8 frequency channels).

The handset performs all of the monitoring and assigning of the voice channel.

### 3.2.7 Digital Modulation Technique § 15.319 (b)

#### Demonstration of Compliance:

The IBS / 4070 IO-3AC36116 uses a Differential Pi/4 QPSK Quadrature Phase Shift Keying digital modulation. The signal transmission rate is 384 kbit/s.

### 3.2.8 Peak Transmit Power and Emission Bandwidth § 15.319 (c)

#### Demonstration of Compliance:

The peak transmit power is determined by the following formula:

$$Peak\ Transmit\ Power = 100\ mW \times \sqrt{BW}$$

BW = Emission Bandwidth in Hz.

The peak transmit power is required to be less than 19.7 dBm (as determined by the formula shown below).

$$Peak\ Transmit\ Power = 100\ mW \times \sqrt{882000} = 93.91\ mW = 19.7\ dBm$$

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Sections 6.1.2 and 6.1.3. The IBS / 4070 IO-3AC36116 is equipped with two antenna ports for diversity purposes. The output power to both these antennas is the same; therefore, testing was performed on only one of the antenna ports.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1 and 17.

Frequency (MHz)	Maximum Peak Transmit Power (dBm)	Measured Emission Bandwidth (kHz)
1920.625	17.0	876.0
1924.375	17.1	882.0
1929.375	17.2	882.0

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.9 Power Spectral Density § 15.319 (d)****Requirement:**

Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

$$3 \text{ mW} = 4.7 \text{ dBm}$$

Exhibit 6

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 6.1.5. The IBS / 4070 IO-3AC36116 is equipped with two antenna ports for diversity purposes. The output power to both these antennas is the same; therefore, testing was performed on only one of the antenna ports.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1 and 17.

Frequency (MHz)	Maximum Power Spectral Density - Peak Detection (dBm)	Maximum Power Spectral Density - Sample Detection (dBm)
1920.625	4.8	-4.5
1924.375	6.3	-2.3
1929.375	6.2	-4.8

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.10 Directional Gain of Antenna § 15.319 (e)****Requirement:**

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

**Demonstration of Compliance:**

The uses three different types of antennas as listed below; the maximum directional antenna gain for all three antennas is 3.0 dBi.

<u>Antenna Type</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Gain</u>
Dipole	Calearo	7570015	2.0 dBi Typical 3.0 dBi Max
Dipole	Wiltron	R380.400.110	2.5 dBi
Dipole	MAT Equipment	MA300x06	2.0 dBi

### 3.2.11 Automatic Discontinuance of Transmission § 15.319 (f)

#### Requirement:

The device shall automatically discontinue transmission on case of either absence of information to transmit or operational failure. The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

#### Measurement Data:

The IBS / 4070 IO-3AC36116 ceased to transmit under the following conditions:

1. The handset was placed in the on-hook mode
2. Removed power from Base Station
3. A call was placed from the wireless handset to an additional wired handset, the wired handset was placed in the on-hook mode and both the base station and the wireless handset ceased to transmit after 30 seconds.

#### RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

### 3.2.12 IEEE C95.1-1991 § 15.319 (i)

#### Requirement:

The device must comply with IEEE C.95.1-1991, (ANSI/IEEE C.95.1-1992), "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz". Measurement methods are specified in IEEE C95.3-1991, "Recommended Practice for the Measurement of Potentially



Hazardous Electromagnetic Fields-RF and Microwave".

**Measurement Data:**

The IBS / 4070 IO-3AC36116 is classified as a mobile device, which is installed so that a minimum separation distance of 20 centimeters is maintained between the transmitter's radiating structure and the body of the user or nearby persons, and the ERP of the IBS / 4070 IO-3AC36116 is less than 3 watts. Therefore, the IBS / 4070 IO-3AC36116 is categorically excluded from routine environmental evaluation for RF exposure as per § 2.1091(c).

The installation manual contains the following statement to instruct the installer that the 20 centimeter separation distance must be maintained in order to comply with the RF exposure requirement.

See Manual in Exhibit 8.

**§ 15.323 Specific Requirements for Isochronous Devices Operating in the 1920-1930 MHz sub-band****3.2.13 Channel Allocation § 15.323 (a)****Requirement:**

Operation shall be contained within one of eight 1.25 MHz channels starting with 1920-1921.25 MHz and ending with 1928.75-1930 MHz. Further sub-division of a 1.25 MHz channel is permitted with a reduced power level, as specified in § 15.319 (c), but in no event shall the emission bandwidth be less than 50 kHz.

**Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 is an Isochronous device that transmits from 1920 - 1930 MHz. The spectrum has been split into eight 1.25 MHz sub-bands starting with 1920-1921.25 MHz and ending with 1928.75-1930 MHz. The IBS / 4070 IO-3AC36116 operates on these eight channels as listed below:

Channel Number	Center Frequency (MHz)
0	1929.375
1	1928.125

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Channel Number	Center Frequency (MHz)
2	1926.875
3	1925.625
4	1924.375
5	1923.125
6	1921.875
7	1920.625

The IBS / 4070 IO-3AC36116 uses Time Division Multiple Access (TDMA) technology. Each channel is divided into 10 msec frame periods, which are further divided into 24 time-slots of 416  $\mu$ sec per time-slot. The frame is divided in half, the first 12 slots of the frame are allocated for transmit and the last 12 for receive. The IBS / 4070 IO-3AC36116 uses only even numbered slots to TX and RX. Duplex voice traffic channels are established on slot pairs having a separation of 12 (e.g. 0&12, 2&14, 4&16, etc.).

The base station to enable handsets to synchronize to the system broadcasts control channels. The control channel can be broadcast in any of the even numbered TX slots. The number of available time frequency windows for the control channel is therefore 48 (6 even TX slots x 8 frequency channels).

The handset performs all of the monitoring and assigning of the voice channel.

#### **Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 6.1.3. The IBS / 4070 IO-3AC36116 is equipped with two antenna ports for diversity purposes. The output power to both these antennas is the same; therefore, testing was performed on only one of the antenna ports.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1 and 17.

Frequency (MHz)	Measured Emission Bandwidth (kHz)
1920.625	876.0
1924.375	882.0
1929.375	882.0

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.14 Time and Spectrum Window § 15.323 (b)****Requirement:**

Intentional radiators with an intended emission bandwidth less than 625 kHz shall start searching for an available time and spectrum window within 3 MHz of the sub-band edge at 1920 MHz and search upward from that point. Devices with an intended emission bandwidth greater than 625 kHz shall start searching for an available time and spectrum window within 3 MHz of the sub-band edge at 1930 MHz and search downward from that point.

**Demonstration of Compliance:**

The base station performs all of the time and spectrum window access monitoring for the control channel, to enable handsets to synchronize to the system broadcasts control channels. The control channel can be broadcast in any of the even numbered TX slots. The number of available time frequency windows for the control channel is therefore 48 (6 even TX slots x 8 frequency channels).

The handset performs all of the monitoring and assigning of the voice channel (for both the handset and base station). Therefore the monitoring tests and time and spectrum window access procedure tests were performed on both the base station and the handset. Shown below are the results of these tests.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 8.1.2.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, and 17.

Step	Test Condition	Result
1	No Interference	Call Established channel 0 (1929.375 MHz)
2	Interference at lower threshold (-82.1 dBm) 3 MHz from upper edge of sub-band (1927-1930 MHz)	Call Established channel 2 (1926.875 MHz)
3	Interference at lower threshold (-82.1 dBm) 4 MHz from lower edge of sub-band (1926-1930 MHz)	Call Established channel 3 (1925.625 MHz)
4	No Interference	Call Established channel 0 (1929.375 MHz)

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.15 Time and Spectrum Monitoring § 15.323 (c)****Requirement:**

Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

**Demonstration of Compliance:**

The base station performs all of the time and spectrum window access monitoring for the control channel, to enable handsets to synchronize to the system broadcasts control

channels. The control channel can be broadcast in any of the even numbered TX slots. The number of available time frequency windows for the control channel is therefore 48 (6 even TX slots x 8 frequency channels).

The handset performs all of the monitoring and assigning of the voice channel (for both the handset and base station). Therefore the monitoring tests and time and spectrum window access procedure tests were performed on both the base station and the handset. Shown below are the results of these tests.

Sections 3.2.16 through 3.2.27 of this report show compliance to FCC § 15.323 (c)(1) through § 15.323 (c)(12).

### **3.2.16 Isochronous Reaction Time and Monitoring Interval § 15.323 (c)(1)**

#### **Requirement:**

Immediately prior to initiating a transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter time frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

#### **Measurement Data:**

To verify that the device was operating as described above the IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Sections 7.3.2.2 and 7.5.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, 11 and 17.

### **ANSI C63.17 Section 7.3.2.2**

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were designated as f1 (channel 3 1925.625 MHz) and f2 (channel 5 1923.125 MHz). The test set-up allowed interference to be placed

on f1 and f2 independent of each other.

Step	Test Condition	Result
1	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)
2	Interference on f1 3 dB above threshold and interference on f2 10 dB above threshold	No Call Established
3	Interference on f2 removed (f2 available)	Call Established f2 (channel 5 1923.125 MHz)
4	Connection terminated	No Call Established
5	Interference on f2 re- applied, EUT attempted transmission	Call Established f1 (channel 3 1925.625 MHz)

#### ANSI C63.17 Section 7.5

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were designated as f1 (channel 3 1925.625 MHz) and f2 (channel 5 1923.125 MHz). The pulse was synchronized to the 10 msec frame in order to ensure that there was an interference pulse on every time slot.

Step	Test Condition	Result
1	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)
2	Interference on Channel f1 at threshold level, pulse modulated with 59.7 $\mu$ s pulse width	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
3	Interference on Channel f1 6 dB above threshold level, pulse modulated with 41.8 $\mu$ s pulse width	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)

Step	Test Condition	Result
4	Interference on Channel f1 10 dB above threshold level, pulse modulated with 89.6 us pulse width	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
5	Step 4 was repeated 5 times with the synchronization of the pulsed interference randomly varied with respect to the EUT frame.	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
6	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)

**SAMPLE CALCULATIONS**

$$\text{Pulse Width} \bullet 35\sqrt{1.25 / B}$$

$$\text{Pulse Width} \bullet 50\sqrt{1.25 / B}$$

$$\text{Pulse Width} \bullet 75\sqrt{1.25 / B}$$

Where B = Emission Bandwidth in MHz

$$\text{Pulse Width} = 35\sqrt{1.25 / 0.876} = 41.8 \text{ msec}$$

$$\text{Pulse Width} = 50\sqrt{1.25 / 0.876} = 59.7 \text{ msec}$$

$$\text{Pulse Width} = 75\sqrt{1.25 / 0.876} = 89.6 \text{ msec}$$

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.17 Monitoring Threshold § 15.323 (c)(2)****Requirement:**

The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

**Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 operates in the Listen Before Talk (LBT) mode only and does not use the Least Interfered Channel (LIC) mode. Shown below is the calculation for the LBT threshold level:

*Threshold Level for Isochronous (LBT) devices*  $15\log_{10} B - 184 + 30 - P$  dBm

B = Emission Bandwidth (Hz)

P = Measured Transmitter Power Level (dBm)

*Threshold Level for Isochronous (LBT) devices* =  $15\log_{10} 876000 - 184 + 30 - 17.2 = -82.1$  dBm

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 7.3.2.1.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, and 17.

**ANSI C63.17 Section 7.3.2.1**

Since the IBS / 4070 IO-3AC36116 does not use the LIC threshold, the following steps were performed to measure the threshold level and verify that the threshold level did not exceed -82.1 dBm as calculated above.

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were designated as f1 (channel 3 1925.625 MHz) and f2 (channel 5 1923.125 MHz). The test set-up allowed interference to be placed



on f1 and f2 independent of each other.

Step	Test Condition	Result
1	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)
2	Interference on f1 10 dB below threshold level (calculated)	Call Established f1 (channel 3 1925.625 MHz)
3	Interference level on f1 increased 1 dB	Call Established f1 (channel 3 1925.625 MHz)
4	Step 3 repeated until the call was established on f2	Call Established f2 (channel 5 1923.125 MHz)
5	Interference level on f1 reduced 1 dB	Call Established f1 (channel 3 1925.625 MHz)
6	Interference level on f1 increased 1 dB	Call Established f2 (channel 5 1923.125 MHz)
7	Steps 5 and 6 repeated 5 times	Same as steps 5 and 6
8	Threshold level measured	Threshold level = -95.0 dBm
9	Interference on f1 and f2 at the calculated threshold. The interference on f1 occurred only during the transmit portion of the frame	No Call Established
10	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)

## RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

### 3.2.18 Transmission Duration § 15.323 (c)(3)

#### Requirement:

If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating

devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

**Demonstration of Compliance:**

The handset incorporates a software program that does not allow the handset to transmit longer than 8 hours. The software program will repeat the access criteria every 2 hours to move the communication channel to a new time slot and/or frequency channel. The handset and base station both stop transmitting within 1.0 second once the voice call has being terminated, as demonstrated in Section 3.2.19 of this report (ANSI Section 8.2.1); therefore, the handset and base station complies with this requirement.

**Measurement Data:**

A call was placed from each handset to the base station to monitor the duration of each call. The base station and handset were connected to a computer that monitored the time that the call was started and when the call was moved to a new time slot and/or frequency channel. Both the base station and the handset move the communication channel to a new time slot and/or frequency channel every 2 hours. This test was repeated for 16 hours to verify that the communication channel was moved every 2 hours.

**RESULT**

In the configuration tested, the EUT transmitted for less than 8 hours; therefore, the EUT complied with the requirements of the specification.

**3.2.19 Acknowledgments § 15.323 (c)(4)****Requirement:**

Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgments must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgment, at which time the access criteria must be repeated.

**Measurement Data:**

The control channel of the IBS / 4070 IO-3AC36116 repeats the access criteria every 25 sec. To ensure that the IBS / 4070 IO-3AC36116 meets the requirements of this section it was tested as per ANSI C63.17-1998 Sections 8.1.3 and 8.2.1. Section 8.1.3 applies on to the control channel of the base station, enclosed below is the results of the test on the base station.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6 and 17.

**ANSI C63.17 Section 8.1.3**

Step	Test Condition	Result
1	Interference on all time and frequency channels except channel 0 time slot 1	Control channel transmitting on Channel 0 (1929.375 MHz)
2	Interference on all time and frequency channels except channel 0 time slot 1. Time from end of repetitive transmission to start of control channel transmission measured	See results below
3	Steps 2 and 3 repeated 5 times	See results below
4	Interference 6 dB above lower threshold (-76.1 dBm) 3 MHz from upper edge of sub-band (1927-1930 MHz)	Call Established channel 2 (1926.875 MHz) Time slot 2
5	Interference 6 dB above lower threshold (-76.1 dBm) 3 MHz from upper edge of sub-band (1927-1930 MHz) for more than 30 sec	Call Established channel 2 (1926.875 MHz) Time slot 4
6	Interference removed 10 seconds before the current control channel transmission was due to expire	Control channel transmitting on Channel 0 (1929.375 MHz)

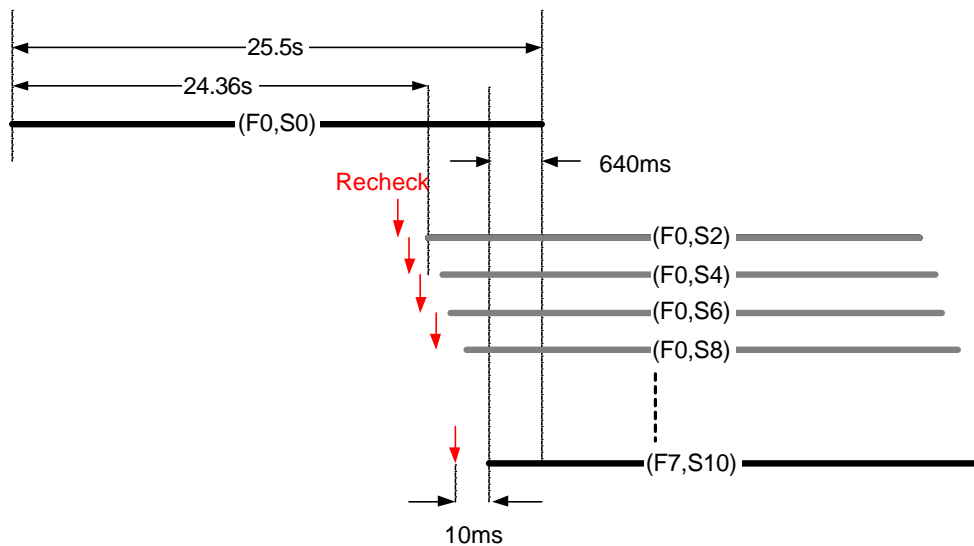
Attempt	Time msec
1	200
2	200
3	200
4	200
5	200

All 5 of these measurements are greater than 150 msec; therefore, the EUT meets the requirements of this section.

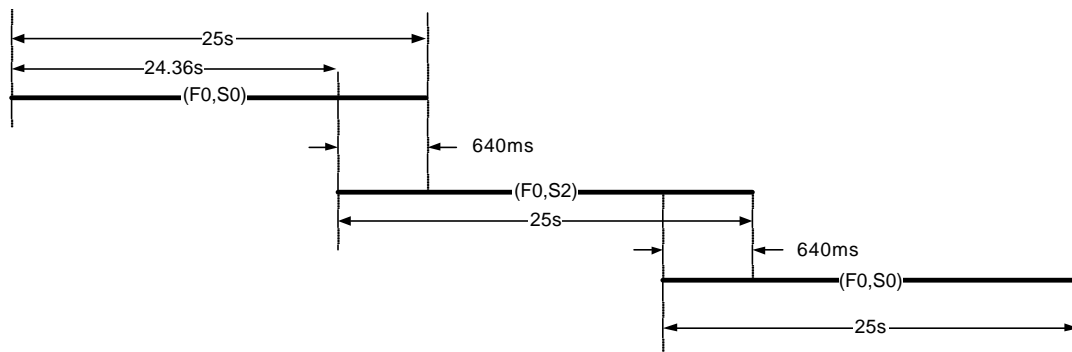
Below is a description of how the system rechecks the access criteria to comply with this section.

To respect FCC 15.323 (c) (4) the system re-checks the access criteria every 25s, and if a preferable window is available (i.e a time slot on a higher frequency) the control channel will transfer to this window. If the system is already operating on the most preferred window, then it will transfer to the next most preferred window. During the 25s the system is broadcasting on (F0,S0) it builds up a table of potentially available windows for the control channel to transfer to. 640ms before the end of the 25s period it rechecks the window it intends to transfer to is still available and if it is, it starts to transmit a control channel in this window in addition to the original window. 640ms after start of transmission on the second control channel, the first control channel is shut down.

If the window the system intends to transfer to is found not to be available when re-checked 10ms before commencement of transmission, it re-checks the next most preferred window, and so on, until a free window is found. The first control channel is shut down 640ms after transmission starts on the second control channel. It can be seen that in the worst case, transmission on the first control channel may be extended by up to 0.5s (47 x 10ms) implying a maximum transmission time of 25.5s. This worst case scenario is depicted in the diagram below. If no available window is found, then transmission on the first control channel will cease for a period of between 200ms and 250ms before repeating the access criteria. In this way the requirements of FCC 15.323 (c) (6) are met.



When operating in a quiet radio environment in which (F0,S0) is always available, the control channel will alternate between (F0,S0) and (F0,S2) every 25s and hence the requirements of FCC 15.323 (c) (4) are met. This scenario is shown in the following diagram.



### ANSI C63.17 Section 8.2.1

After an available time/spectrum window has been assigned both the base station and handset attempt to transmit on the specified time/spectrum window. If either device does not receive an acknowledgment, from the other device, within one second the EUT ceases to transmit. After the call is established if there is not an acknowledgment received, every 30 seconds,

from the other device transmission is ceased.

Step	Test Condition	Result
1	Voice call initiated by the handset, the power to the handset turned off	Base station stopped transmission within 6.1 sec
2	Voice call initiated by the handset, the power to the base station turned off	Handset stopped transmission after 4.8 sec
3	Voice call initiated, to the handset, by an analog telephone that was connected to the base station, the analog phone was placed in the on-hook mode	Handset stopped transmission after 6.1 sec
4	Handset activated with base station turned off	Handset did not transmit for more than 1 sec
5	Base station activated with handset turned off	Base station did not transmit for more than 1 sec

## RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

### 3.2.20 Monitoring Threshold for Systems with a Minimum of 40 Duplex Channels § 15.323 (c)(5)

#### Requirement:

If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed. A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 milliseconds frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum

windows is no higher than the previously detected value. The power measurement resolution for this comparison must be accurate to within 6 dB. No device or group of cooperating devices located within 1 meter of each other shall occupy more than three 1.25 MHz channels during any frame period. Devices in an operational state that are utilizing the provisions of this section are not required to use the search provisions of paragraph (b) of this section.

**Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 does not use the provisions of this section (LIC); it only uses the LBT mode. There are no devices or group of cooperating devices located within 1 meter of each other; this is specified in the installation manual. Testing to demonstrate compliance with this section is the same as § 15.323 (c)(1), shown below are the results of these tests.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Sections 7.3.2.1, 7.3.2.2 and 8.2.1.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, and 17.

**ANSI C63.17 Section 7.3.2.1**

Since the IBS / 4070 IO-3AC36116 does not use the LIC threshold, the following steps were performed to measure the threshold level and verify that the threshold level did not exceed -82.1 dBm as calculated above.

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were designated as f1 (channel 3 1925.625 MHz) and f2 (channel 5 1923.125 MHz). The test set-up allowed interference to be placed on f1 and f2 independent of each other.

Step	Test Condition	Result
1	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)
2	Interference on f1 10 dB below threshold level (calculated)	Call Established f1 (channel 3 1925.625 MHz)
3	Interference level on f1 increased 1 dB	Call Established f1 (channel 3 1925.625 MHz)
4	Step 3 repeated until the call was established on f2	Call Established f2 (channel 5 1923.125 MHz)
5	Interference level on f1 reduced 1 dB	Call Established f1 (channel 3 1925.625 MHz)
6	Interference level on f1 increased 1 dB	Call Established f2 (channel 5 1923.125 MHz)
7	Steps 5 and 6 repeated 5 times	Same as steps 5 and 6
8	Threshold level measured	Threshold level = -95.0 dBm
9	Interference on f1 and f2 at the calculated threshold. The interference on f1 occurred only during the transmit portion of the frame	No Call Established
10	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)

**ANSI C63.17 Section 7.3.2.2**

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were designated as f1 (channel 3 1925.625 MHz) and f2 (channel 5 1923.125 MHz). The test set-up allowed interference to be placed on f1 and f2 independent of each other.

Step	Test Condition	Result
1	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)



Step	Test Condition	Result
2	Interference on f1 3 dB above threshold and interference on f2 10 dB above threshold	No Call Established
3	Interference on f2 removed (f2 available)	Call Established f2 (channel 5 1923.125 MHz)
4	Connection terminated	No Call Established
5	Interference on f2 re-applied, EUT attempted transmission	Call Established f1 (channel 3 1925.625 MHz)

**ANSI C63.17 Section 8.2.1**

After an available time/spectrum window has been assigned both the base station and handset attempt to transmit on the specified time/spectrum window. If either device does not receive an acknowledgment, from the other device, within one second the EUT ceases to transmit. After the call is established if there is not an acknowledgment received, every 30 seconds, from the other device transmission is ceased.

Step	Test Condition	Result
1	Voice call initiated by the handset, the power to the handset turned off	Base station stopped transmission within 6.1 sec
2	Voice call initiated by the handset, the power to the base station turned off	Handset stopped transmission after 4.8 sec
3	Voice call initiated, to the handset, by an analog telephone that was connected to the base station, the analog phone was placed in the on-hook mode	Handset stopped transmission after 6.1 sec
4	Handset activated with base station turned off	Handset did not transmit for more than 1 sec
5	Base station activated with handset turned off	Base station did not transmit for more than 1 sec

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.21 Isochronous Random Waiting Interval § 15.323 (c)(6)****Requirement:**

If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

**Measurement Data:**

The control channel of the IBS / 4070 IO-3AC36116 repeats the access criteria every 25 sec. To ensure that the IBS / 4070 IO-3AC36116 meets the requirements of this section it was tested as per ANSI C63.17-1998 Sections 8.1.3 and 8.2.1. Section 8.1.3 applies on to the control channel of the base station, enclosed below is the results of the test on the base station.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, and 17.

**ANSI C63.17 Section 8.1.3**

Step	Test Condition	Result
1	Interference on all time and frequency channels except channel 0 time slot 1	Control channel transmitting on Channel 0 (1929.375 MHz)
2	Interference on all time and frequency channels except channel 0 time slot 1. Time from end of repetitive transmission to start of control channel transmission measured	See results below

Step	Test Condition	Result
3	Steps 2 and 3 repeated 5 times	See results below
4	Interference 6 dB above lower threshold (-76.1 dBm) 3 MHz from upper edge of sub-band (1927-1930 MHz)	Call Established channel 2 (1926.875 MHz) Time slot 2
5	Interference 6 dB above lower threshold (-76.1 dBm) 3 MHz from upper edge of sub-band (1927-1930 MHz) for more than 30 sec	Call Established channel 2 (1926.875 MHz) Time slot 4
6	Interference removed 10 seconds before the current control channel transmission was due to expire	Control channel transmitting on Channel 0 (1929.375 MHz)

Attempt	Time msec
1	200
2	200
3	200
4	200
5	200

All 5 of these measurements are greater than 150 msec; therefore, the EUT meets the requirements of this section.

#### ANSI C63.17 Section 8.2.1

After an available time/spectrum window has been assigned both the base station and handset attempt to transmit on the specified time/spectrum window. If either device does not receive an acknowledgment, from the other device, within one second the EUT ceases to transmit. After the call is established if there is not an acknowledgment received, every 30 seconds, from the other device transmission is ceased.

Step	Test Condition	Result
1	Voice call initiated by the handset, the power to the handset turned off	Base station stopped transmission within 6.1 sec
2	Voice call initiated by the handset, the power to the base station turned off	Handset stopped transmission after 4.8 sec
3	Voice call initiated, to the handset, by an analog telephone that was connected to the base station, the analog phone was placed in the on-hook mode	Handset stopped transmission after 6.1 sec
4	Handset activated with base station turned off	Handset did not transmit for more than 1 sec
5	Base station activated with handset turned off	Base station did not transmit for more than 1 sec

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.22 Threshold Monitoring Bandwidth § 15.323 (c)(7)****Requirement:**

The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than  $50 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$  microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be  $35 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$  microseconds but shall not be required to be less than 35 microseconds.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-  
Exhibit 6

1998 Sections 7.4 and 7.5.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, 11 and 17.

#### Section 7.4

##### Simple Compliance Test

To test for this section two channels were made interference free, the remaining channels had interference so that they were unavailable. The two channels that were interference free were channel 0 (1929.375 MHz) and channel 3 (1925.625 MHz). The frequency of the interfering signal was determined as shown below:

Center frequency of channel 0 = 1929.375 MHz

Emission bandwidth = 876.0 kHz

40% of emission bandwidth = 350.4 kHz

-40% of emission bandwidth = 1929.025 MHz

+40% of emission bandwidth = 1929.725 MHz

+4 dB level above calculated threshold = -78.1 dBm

Step	Test Condition	Result
1	No Interference	Call Established channel 0
2	Sub-band filled with broadband interference (FM modulated) centered at 1929.025 MHz (-40% of emission bandwidth) 4 dB above threshold level	No Call Established on channel 0, call established on channel 3
3	Sub-band filled with broadband interference (FM modulated) centered at 1929.725 MHz (+40% of emission bandwidth) 4 dB above threshold level	No Call Established on channel 0, call established on channel 3
4	No Interference	Call Established channel 0

**ANSI C63.17 Section 7.5**

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were designated as f1 (channel 3 1925.625 MHz) and f2 (channel 5 1923.125 MHz). The pulse was synchronized to the 10 msec frame in order to ensure that there was an interference pulse on every time slot.

Step	Test Condition	Result
1	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)
2	Interference on Channel f1 at threshold level, pulse modulated with 59.7 $\mu$ s pulse width	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
3	Interference on Channel f1 6 dB above threshold level, pulse modulated with 41.8 $\mu$ s pulse width	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
4	Interference on Channel f1 10 dB above threshold level, pulse modulated with 89.6 $\mu$ s pulse width	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
5	Step 4 was repeated 5 times with the synchronization of the pulsed interference randomly varied with respect to the EUT frame.	No Call Established f1 (channel 3 1925.625 MHz), call established on f2 (channel 5 1923.125 MHz)
6	No Interference on f1 or f2	Call Established f1 (channel 3 1925.625 MHz)

**SAMPLE CALCULATIONS**

$$\text{Pulse Width} \bullet 35\sqrt{1.25 / B}$$

$$\text{Pulse Width} \bullet 50\sqrt{1.25 / B}$$

$$\text{Pulse Width} \bullet 75\sqrt{1.25 / B}$$

Where B = Emission Bandwidth in MHz

$$\text{Pulse Width} = 35\sqrt{1.25/0.876} = 41.8 \text{ msec}$$

$$\text{Pulse Width} = 50\sqrt{1.25/0.876} = 59.7 \text{ msec}$$

$$\text{Pulse Width} = 75\sqrt{1.25/0.876} = 89.6 \text{ msec}$$

## RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

### 3.2.23 Threshold Monitoring Antenna § 15.323 (c)(8)

#### Requirement:

The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

#### Demonstration of Compliance:

The IBS / 4070 IO-3AC36116 uses the same antenna for both monitoring and for transmission; therefore, the IBS / 4070 IO-3AC36116 meets the requirements of this section.

### 3.2.24 Monitoring Detection Threshold for Devices with less than Maximum Output Power § 15.323 (c)(9)

#### Requirement:

Devices that have a power output lower than the maximum permitted under the rules may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 does not use the provisions of this section; therefore, the IBS / 4070 IO-3AC36116 meets the requirements of this section.

**3.2.25 Duplex Connections § 15.323 (c)(10)****Requirement:**

An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 8.2.3.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 6, 7, 8, 9, 11, 16 and 17.

**Section 8.2.3**

The base station (control channel) or the handset (communication channel) can be the initiating device and each monitors its own receive and transmit windows. Therefore, both units were tested; the EUT was configured with a custom software, which allows interference on all of the time slots except for one TX slot and RX slot. These can be a duplex pair (TX slot 3, RX slot 3) or different slots (TX slot 3, RX slot 4).

To test for this section two channels were made interference free; the remaining channels had interference so that they were unavailable. The two channels that were interference free were channel 0 (1929.375 MHz) channel 3 (1925.625 MHz). The interference on the specified time slot was placed on channel 0



with channel 6 interference free.

Step	Test Condition	Result
1	No Interference	Call Established channel 0
2	Interference on all time slots except TX0 (for control channel) and RX2 (for communication channel) was interference free	No Call Established on channel 0, call established on channel 6
3	Interference on all time slots except TX0 (for control channel) and TX2 (for communication channel) was interference free	No Call Established on channel 0, call established on channel 6
4	Interference on all time slots except RX0 (for control channel) and RX2 and TX4 (for communication channel) was interference free	No Call Established on channel 0, call established on channel 6
5	Interference on all time slots except RX0 (for control channel) and RX4 and TX2 (for communication channel) was interference free	No Call Established on channel 0, call established on channel 6
6	Interference on all time slots except RX0 (for control channel) and RX2 and TX2 (for communication channel) was interference free	Call Established channel 0 Time slot 2
7	No Interference	Call Established channel 0

## RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.26 Alternative Monitoring Interval § 15.323 (c)(11)****Requirement:**

An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

**Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 will not be co-located closer than 1 meter; therefore, the requirements of this section do not apply. This requirement is specified in the Installation Manual.

**3.2.27 Limitation on use of Section (c)(10) or (c)(11) - §15.323 (c)(12)****Requirement:**

The provisions of (c) (10) or (c) (11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

**Demonstration of Compliance:**

The IBS / 4070 IO-3AC36116 does not use the provisions of § 15.323 (c)(10) or (c)(11) to extend the range of spectrum occupied; therefore, the IBS / 4070 IO-3AC36116 meets the requirements of this section.

**3.2.28 Spurious Emissions § 15.323 (d)****Requirement:**

Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the channel edges and 1.25 MHz above or below the channel; 50 dB between 1.25 and 2.5 MHz above or below the channel; And 60 dB at 2.5 MHz or greater above or below the channel. Systems that further sub-divide a 1.25 MHz channel into X sub-channels must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and 1.25 MHz channel edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. "B" is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits 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.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 6.1.6.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1 and 17.

The IBS / 4070 IO-3AC36116 tunes up to 1930 MHz; therefore, in accordance with § 15.33 (b)(1), the EUT was tested from 30 MHz to 20 GHz, and in accordance with § 15.31 (m) the EUT was tested with the transmitter tuned near the bottom of the spectrum and tuned near the top of the spectrum.

**Out-of-Channel Emission (Conducted)**  
**Base Station**

Transmitting on Channel 7 (1920.625 MHz)			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 - 200	109.8	-43.0	-39.5
200 - 500	329.6	-67.8	-39.5
500 - 1000	786.7	-48.4	-39.5
1000 - 1800	1070.2	-48.0	-39.5
1800 - 1900	1891.3	-67.7	-39.5
1900 - 1917.50	1917.2	-57.2	-39.5
1917.50 - 1918.75	1918.7	-45.6	-29.5
1918.75 - 1920	1919.9	-17.1	-9.5
1921.25 - 1922.5	1921.4	-16.4	-9.5
1922.5 - 1923.75	1922.6	-43.5	-29.5
1923.75 - 1930	1924.0	-57.0	-39.5
1930 - 2000	1931.4	-48.9	-39.5
2000 - 4000	3841.2	-73.2	-39.5
4000 - 6000	5761.8	-65.6	-39.5
6000 - 8000	7682.5	-79.1 *	-39.5
8000 - 10,000	9603.1	-78.0 *	-39.5
10,000 - 12,000	11,523.7	-78.9 *	-39.5
12,000 - 14,000	13,444.4	-72.4 *	-39.5
14,000 - 16,000	15,365.0	-71.2 *	-39.5
16,000 - 18,000	17,285.6	-72.1 *	-39.5
18,000 - 20,000	19,206.2	-67.5 *	-39.5
* Noise Floor			

**Out-of-Channel Emission (Conducted)  
Base Station**

Transmitting on Channel 0 (1929.375 MHz)			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 - 200	118.6	-40.0	-39.5
200 - 500	474.4	-54.1	-39.5
500 - 1000	801.6	-43.8	-39.5
1000 - 1800	1083.5	-54.4	-39.5
1800 - 1900	1899.2	-55.6	-39.5
1900 - 1917.50	1918.9	-51.2	-39.5
1917.50 - 1918.75	1926.2	-45.0	-29.5
1918.75 - 1920	1927.5	-35.4	-9.5
1921.25 - 1922.5	1928.7	-13.0	-9.5
1922.5 - 1923.75	1930.2	-12.2	-29.5
1923.75 - 1930	1931.3	-31.7	-39.5
1930 - 2000	1932.6	-44.5	-39.5
2000 - 4000	3858.8	-58.8	-39.5
4000 - 6000	5788.1	-56.0	-39.5
6000 - 8000	7717.5	-68.5	-39.5
8000 - 10,000	9646.8	-78.0 *	-39.5
10,000 - 12,000	11,576.2	-78.9 *	-39.5
12,000 - 14,000	13,505.6	-72.4 *	-39.5
14,000 - 16,000	15,435.0	-71.2 *	-39.5
16,000 - 18,000	17,364.4	-72.1 *	-39.5
18,000 - 20,000	19,293.7	-67.5 *	-39.5
* Noise Floor			

**Out-of-UPCS Band Emissions (Radiated)**

See section 3.2.2 of this report for the radiated emissions data.

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.29 Frame Repetition Stability/Frame Period and Jitter  
§ 15.323 (e)****Requirement:**

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested in accordance with ANSI C63.17-1998 Sections 6.2.3 and 6.2.4.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 10.

Test Performed	Criteria
Frame period	10 msec
Frame repetition stability	10 ppm
Jitter	12.5 usec

**Section 6.2.3**

The IBS / 4070 IO-3AC36116 was configured as specified in section 6.2.3. Both the mean values of the frame repetition rate and the standard deviation were recorded to determine the frame repetition stability. The data is shown below.

**10 msec Frame Rate**

Frequency MHz	Standard Deviation Hz	Mean Hz	Frame Repetition Stability ppm
1929.375	0.00014720	100.00018750	4.42

**Sample Calculation:**

Frame Repetition Stability (ppm) = ((3 \* Standard Deviation) / Frame Rate) \*  $10^6$

Frame Rate Hz = 1 / 10 ms = 100 Hz

**Section 6.2.4**

The IBS / 4070 IO-3AC36116 was configured as specified in section 6.2.4. The peak to peak, mean and standard deviation values of the frame period distribution were recorded to determine the frame period and jitter.

The mean value shall be the frame period and three times the standard deviation value of the jitter shall not be greater than 12.5  $\mu$ sec. The data is shown below.

**10 msec Frame Rate**

Frequency MHz	Standard Deviation $\mu$ sec	Mean ms	Jitter $\mu$ sec
1929.375	0.678683	9.99999789796	2.036

**Sample Calculation:**

Jitter  $\mu$ sec = 3 \* Standard Deviation  
Exhibit 6

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**3.2.30 Frequency Stability § 15.323 (f)****Requirement:**

The frequency stability of the carrier frequency of the intentional radiator shall be maintained within  $\pm 10$  ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of  $-20^{\circ}$  to  $+50^{\circ}$  C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of  $20^{\circ}$  C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

**Measurement Data:**

The IBS / 4070 IO-3AC36116 was tested as per ANSI C63.17-1998 Section 6.2.2.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 10 and 14.

The carrier frequency measurement at  $20^{\circ}$  C (42 VDC) was used as the reference for the measurements at the two extreme temperatures.

The IBS / 4070 IO-3AC36116 can operate on 42 VDC supplied from the base station controller or from an external 120 VAC power supply that connects to the AC mains. Therefore testing at the extreme power supply voltages was performed on both the 42 VDC line and the 120 VAC external power supply.



Temp C°	Supply Voltage	Frequency of Carrier MHz	Measured Frequency MHz	Deviation ppm
20	102 AC	1924.375	1924.393868	0.46
20	120 AC	1924.375	1924.393313	0.74
20	138 AC	1924.375	1924.393673	0.56
20	35.8 DC	1924.375	1924.393219	0.79
20	42.0 DC	1924.375	1924.394744	N/A
20	48.2 DC	1924.375	1924.394986	-0.13
-20	Nominal	1924.375	1924.394618	0.07
50	Nominal	1924.375	1924.393253	0.77

**SAMPLE CALCULATION**

$$\text{Deviation ppm} = \frac{FR \& FM}{FR} \cdot 10^6$$

FR = Reference frequency of the carrier at 20° C

FM = Measured frequency of the carrier

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

## **Appendix A - Test Procedures**

### **FCC Section 15.309 Cross Reference to Subpart B (Radiated Emissions)**

The radiated emissions were tested as per ANSI C63.4.

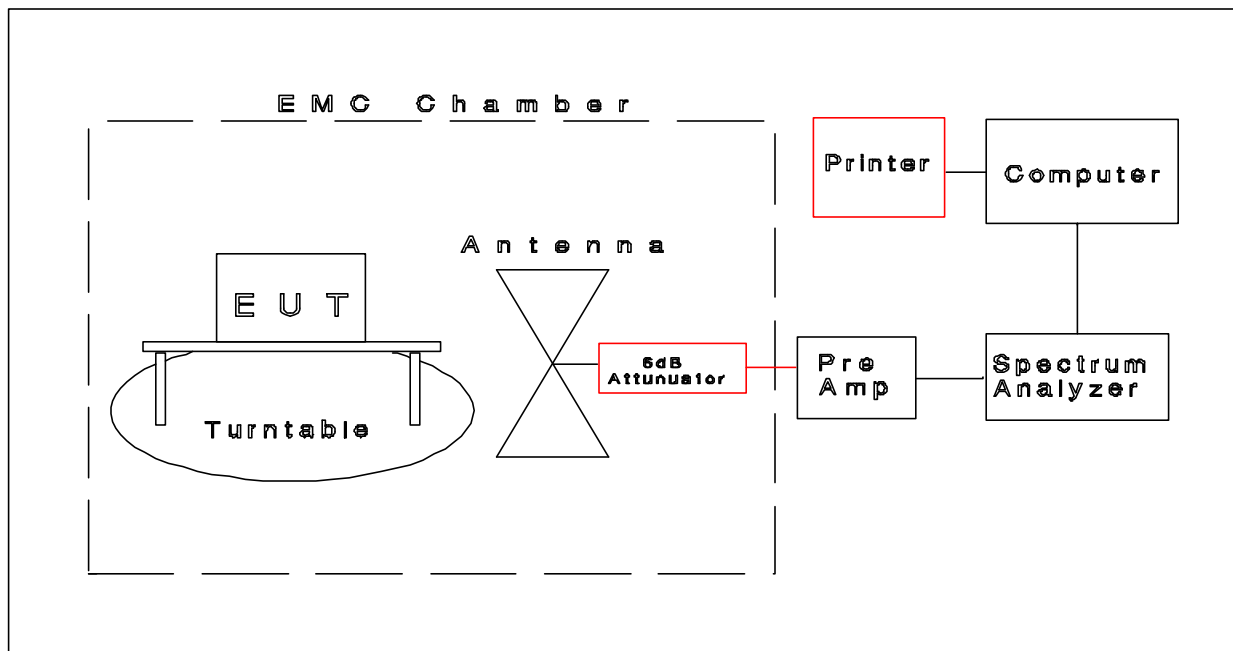
The radiated emissions from the IBS / 4070 IO-3AC36116 were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings. A preamplifier with a fixed gain of 26 dB was used to increase the sensitivity of the measuring instrumentation. The spectrum analyzer's resolution bandwidth was set to 100 kHz and the video bandwidth was set to 300 kHz, for readings in the 30 to 1000 MHz frequency range. Above 1000 MHz the spectrum analyzer's resolution bandwidth was set to 1 MHz and the video bandwidth was set to 3 MHz for peak readings and the resolution bandwidth was set to 1 MHz and the video bandwidth was set to 10 Hz for average readings.

An EMCO Biconical antenna was used to measure the frequency range of 30 to 200 MHz, an EMCO Log Periodic antenna was used to measure the frequency range of 200 to 1000 MHz and a double ridge guide antenna was used to measure the frequency range of 1 to 20 GHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding the antenna factors.

The configuration of the IBS / 4070 IO-3AC36116 was varied to find the maximum radiated emission. All interconnecting cables were moved to search for the worst case radiated emissions. The computing equipment was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

The IBS / 4070 IO-3AC36116 was measured on a non-conducting table 0.8 m above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the computing equipment.

## R a d i a t e d   E m i s s i o n s   T e s t



### FCC Section 15.315 AC Power Line Conducted Emissions

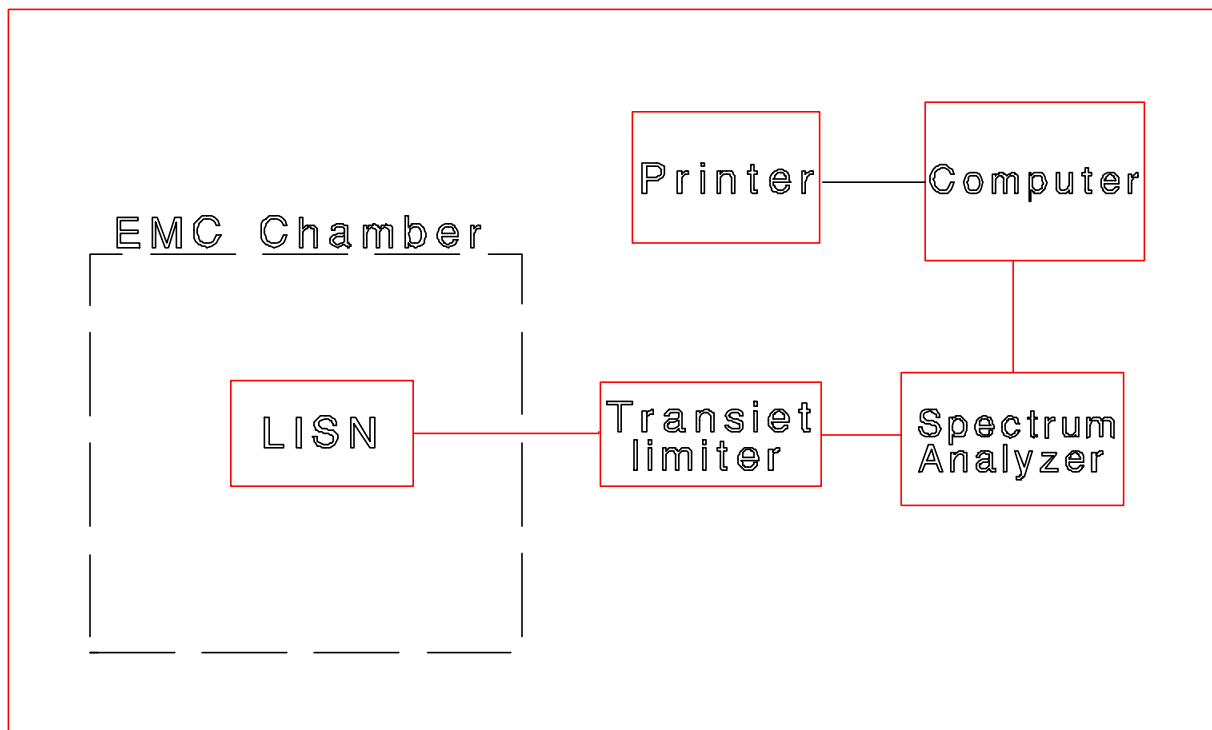
The AC power line conducted emissions were tested as per ANSI C63.4.

The AC power line conducted emissions was measured using a spectrum analyzer with a quasi-peak adapter for quasi-peak readings. The spectrum analyzer's resolution bandwidth was set to 100 kHz, and the video bandwidth was set to 300 kHz for peak readings in the 450 kHz to 30 MHz frequency range.

The line-conducted measurements were made in a screen room using a 50:1 Line Impedance Stabilization Network (LISN).

Desktop computing devices are placed on a non-conducting table 80-cm from the metallic floor. The equipment is placed 40 cm from one wall and at least 80 cm from all other walls. Floor standing equipment is placed directly on the earth grounded floor.

## Line Conducted Emissions Test



### FCC Sections 15.319 (c) Peak Transmit Power, 15.319 (d) Power Spectral Density

The EUT was directly connected to the spectrum analyzer via the antenna output port as shown in the block diagram below. The peak transmit power, emission bandwidth and power spectral density were measured as per sections 6.1.2, 6.1.3 and 6.1.5 of ANSI C63.17-1998, while the base station and handset had a voice link established. The measurements were performed on two channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum and one near the top of the spectrum.

The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

#### Peak Transmit Power (Section 6.1.2)

RBW = 1 MHz

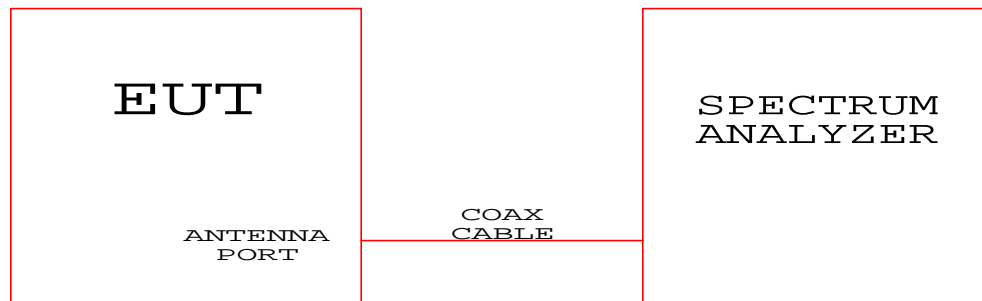
VBW = 3 MHz

**Emission Bandwidth (Section 6.1.3)**

RBW = 3 kHz  
VBW = 10 kHz

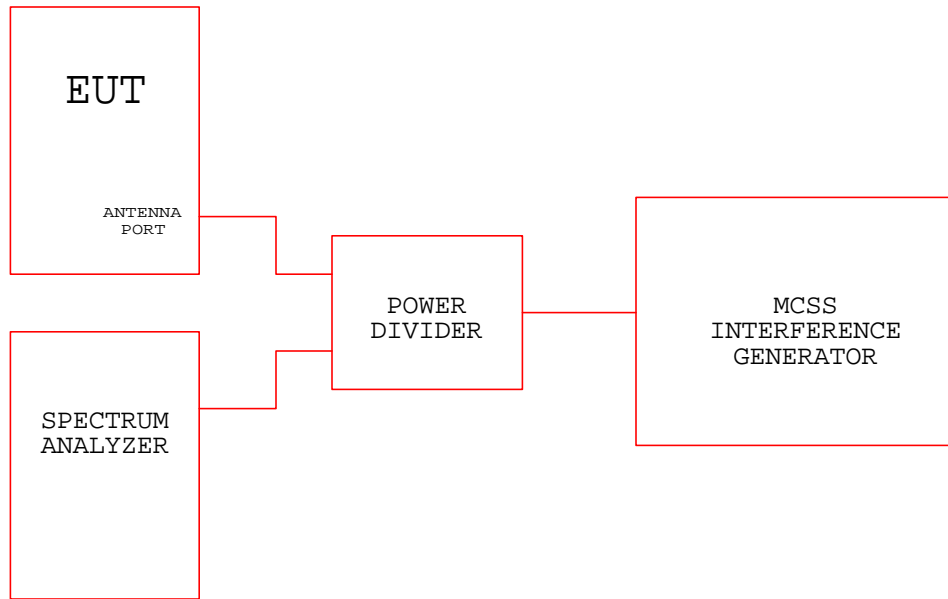
**Power Spectral Density (Section 6.1.5)**

RBW = 3 kHz  
VBW = 10 kHz

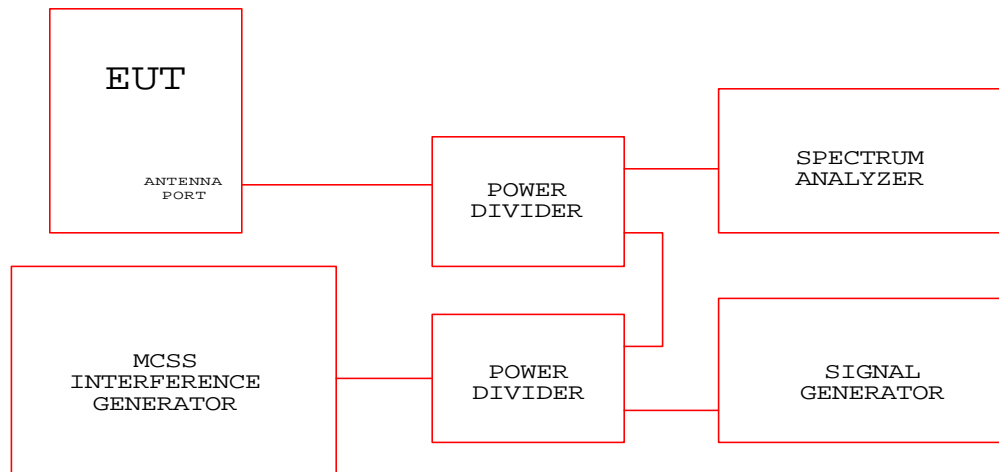
**Test Configuration Block Diagram  
(Sections 6.1.2, 6.1.3 and 6.1.5)****FCC Sections 15.323 (b), 15.323 (c)(1) through 15.323 (c)(12) -  
Sections 7 and 8 of ANSI C63.17-1998**

The EUT connected as shown in the block diagrams below. The MCSS was used to force the EUT to transmit on the desired frequencies and block all the other frequencies. The testing was performed as per sections 7 and 8 of ANSI C63.17-1998, while the base station and handset had a voice link established

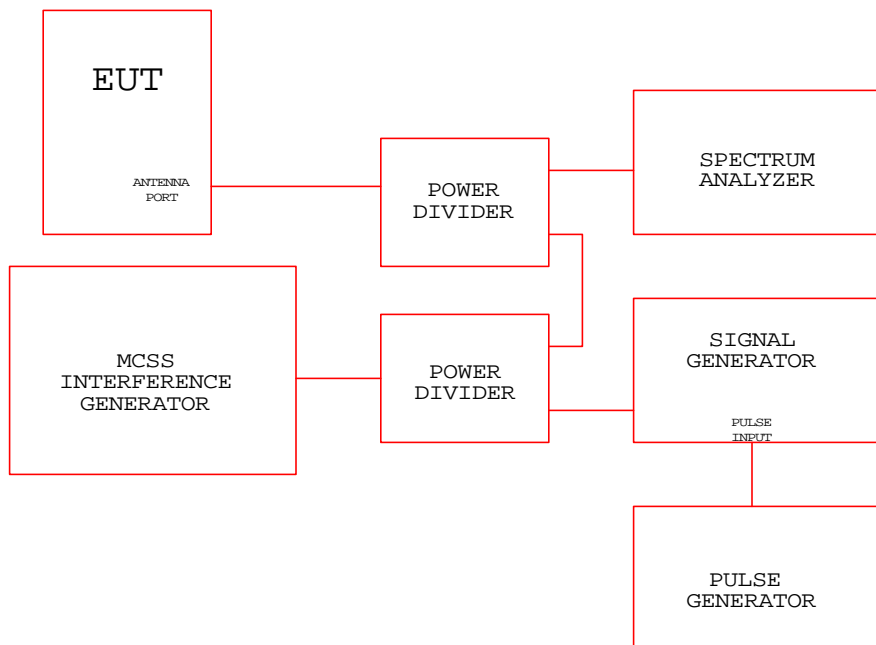
**Test Configuration Block Diagram  
(Sections 8.1.2, 8.1.3 and 8.2.1)**

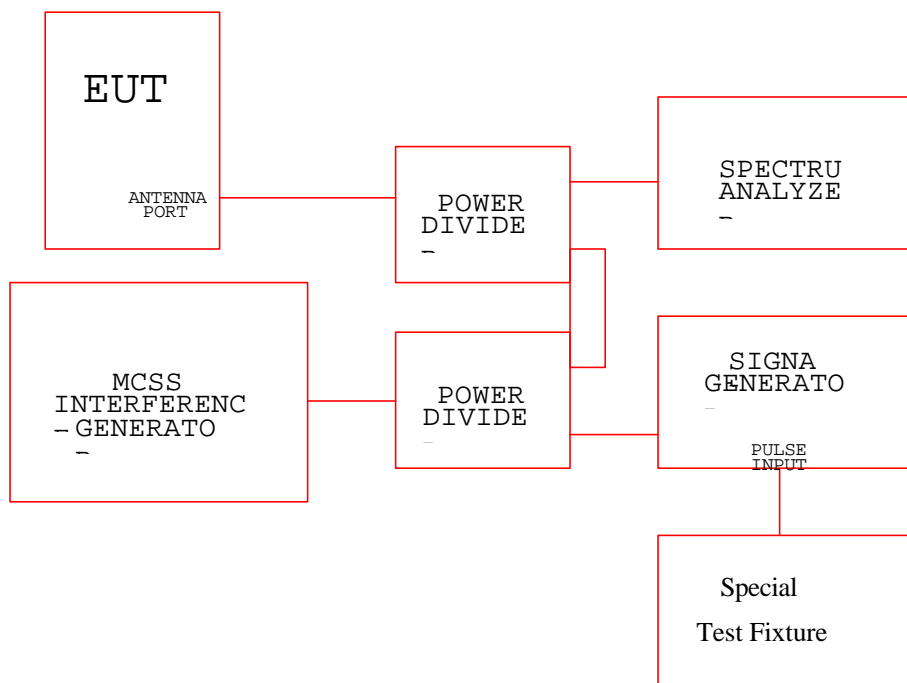


**Test Configuration Block Diagram  
(Sections 7.3.2.1, 7.3.2.2 and 7.4)**



**Test Configuration Block Diagram  
(Section 7.5)**



**Test Configuration Block Diagram  
(Section 8.2.3)****FCC Section 15.323 (d) Spurious Emissions**

The EUT was directly connected to the spectrum analyzer via the antenna output port as shown in the block diagram below. The base station was connected to a computer that was used to control the base station to permit the base station and handset to transmit on predetermined channels. The spurious emissions were measured as per section 6.1.6 of ANSI C63.17-1998, while the base station and handset had a voice link established. The out-of-channel measurements were performed on two channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum and one near the top of the spectrum. The out-of-subchannel measurements were performed on two sub-channels, one near the bottom of the subchannel and one near the top of the sub-channel.

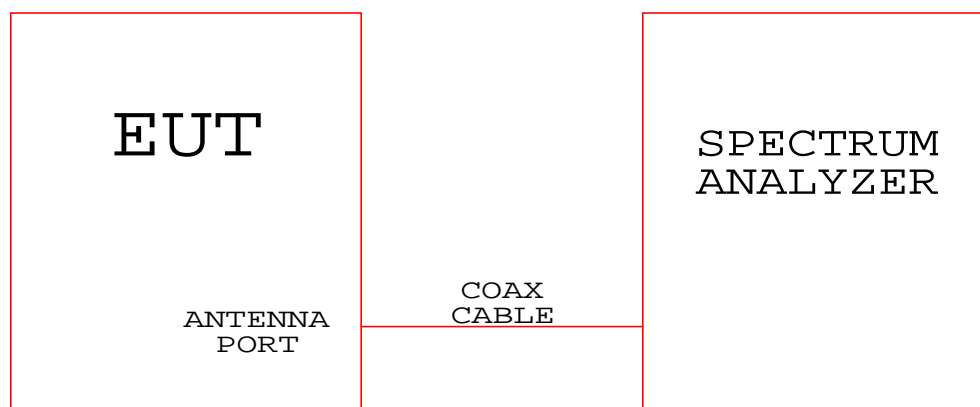
The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

**Spurious Emissions (Section 6.1.6)**

RBW = 3 kHz

VBW = 10 kHz



**Test Configuration Block Diagram  
(Section 6.1.6)****FCC Section 15.323 (e) Frame Period**

The EUT was directly connected to the modulation domain analyzer via the antenna output port as shown in the block diagram below. The base station was connected to a computer that was used to control the base station to permit the base station and handset to transmit on predetermined channels. The frame period, frame repetition stability and jitter were measured as per sections 6.2.3 and 6.2. of ANSI C63.17-1998, while the base station and handset had a voice link established. The computer was used to log the results of the measurements.

Frame related measurements were allowed by the utilization of the modulation domain analyzer's "Envelope Trigger Output" port, which generates a TTL compatible signal that represents the envelope of the transmission bursts.

The modulation domain analyzer's settings were set as follows:

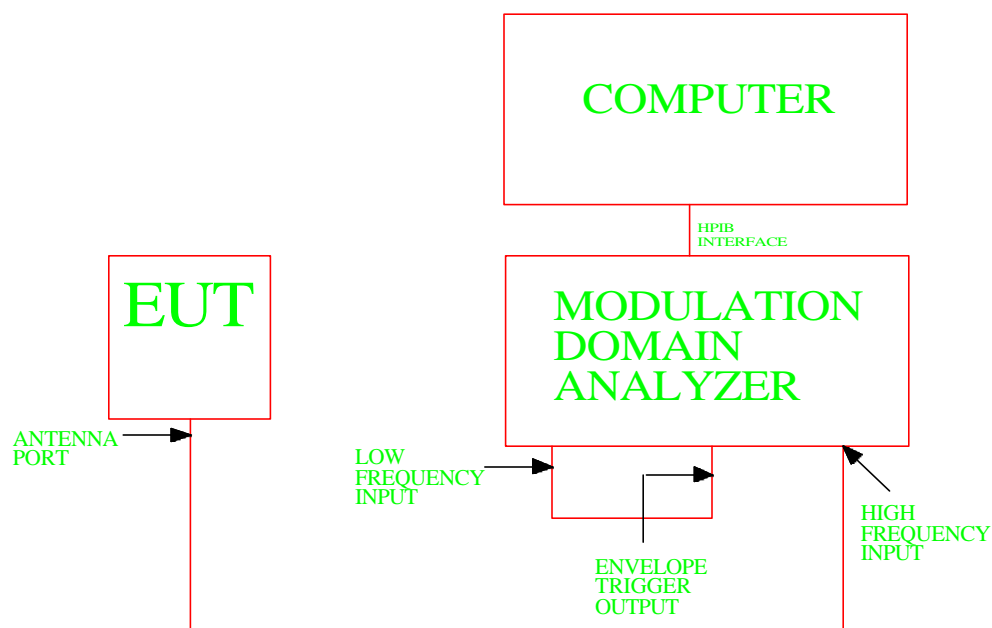
**Frame Repetition Stability**

Mode:	Frequency Measurement
X Axis:	Time
Time Setting:	500 ms
Y Axis:	Frequency
	Exhibit 6

Center Frequency: 200 Hz  
Measurement Interval: 5 ms  
No. of Measurements: 1000

**Frame Period and Jitter**

Mode: Time Measurement  
Y Axis: Time  
Center Time: 5 ms  
X Axis: Time  
Time Setting: 500 ms  
Measurement Interval: 1 ms  
No. of Measurements: 1,000,000

**FCC Section 15.323 (f) Carrier Frequency Stability**

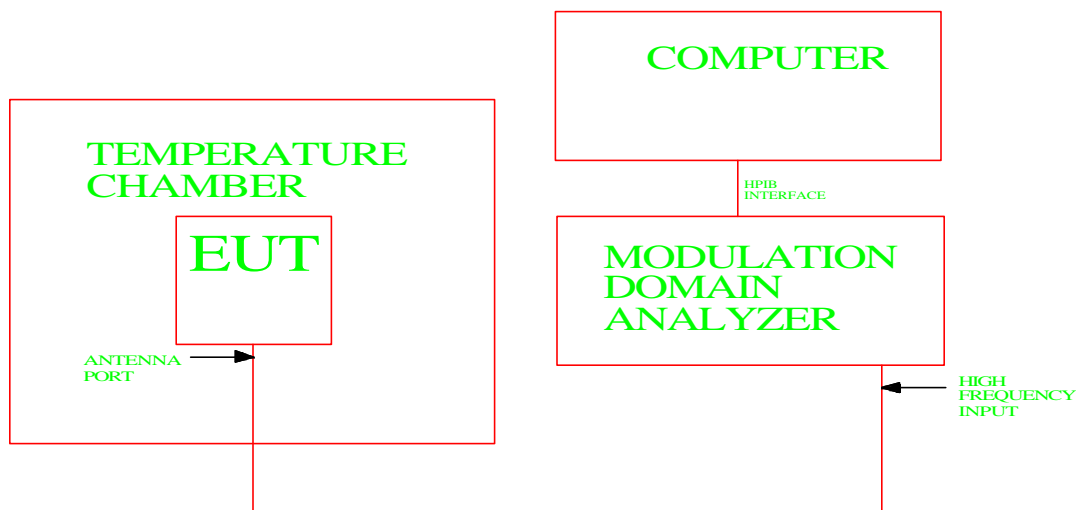
The EUT was placed inside of a temperature chamber and directly connected to the modulation domain analyzer via the antenna output port as shown in the block diagram below. The base station was connected to a computer that was used to control the base station to permit the base station and handset to transmit on predetermined channels. The carrier frequency stability was measured as per section 6.2.2 of ANSI C63.17-1998, while the base station and handset had a voice link established. The computer was used to log the results of the measurements.

The EUT was placed inside of the temperature chamber at 20°C for one hour in order to stabilize the temperature of the chamber and the EUT. This measurement was recorded as a reference for the measurements at the two extreme temperatures and at the two extreme supply voltages using the modulation domain analyzer.

The modulation domain analyzer settings were set as follows:

**Carrier Frequency Stability**

Mode:	Frequency Measurement
Y Axis:	Frequency
Center Frequency:	1920.35 MHz
X Axis:	Time
Time Setting:	625 us
Measurement Interval:	10 us
No. of Measurements:	5000

**Test Configuration Block Diagram  
(Section 6.2.2)**

**Appendix B - List of Test Equipment**

Ref. No.	Instrument	Mfgt.	Model
1	Spectrum Analyzer	Hewlett Packard	8566B
2	Pre Amplifier	Hewlett Packard	8447D
3	Pre Amplifier	Hewlett Packard	8449B
4	Biconilog Antenna	EMCO	3142
5	Double Ridge Guide Antenna	EMCO	3115
6	Power Divider/Combiner	Hewlett Packard	11636A
7	Power Divider/Combiner	Hewlett Packard	87303C
8	Signal Generator	Hewlett Packard	8648C
9	MCSS	Hewlett Packard	60
10	Modulation Domain Analyzer	Hewlett Packard	53310A
11	Pulse Generator	Hewlett Packard	8012B
12	LISN	EMCO	3825/2
13	Transient Limiter	Hewlett Packard	11947A
14	Temperature Chamber	Tenney Inc.	Tenney Jr.
15	Oscilloscope	Tektronix	7603
16	Test Fixture	Alcatel	N/A
17	Coax Cable	Andrews	N/A

An independent calibration laboratory following outlined calibration procedures calibrates all the equipment listed above every 12 months.