



**ZHONE TECHNOLOGIES, INC. ADDENDUM  
TO FC01-007**

**FOR THE**

**SKYZHONE 45, SZ-045-N-5G-LNK-X**

**FCC PART 15 SUBPARTS C & D  
SECTIONS 15.207, 15.209 & 15.407**

**COMPLIANCE**

**DATE OF ISSUE: APRIL 16, 2001**

**PREPARED FOR:**

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Date of test: January 16-18, 2001

**Report No: FC01-007A**

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## TABLE OF CONTENTS

Administrative Information .....	4
Summary of Results.....	5
Frequency Range Tested .....	5
EUT Operating Frequency.....	5
Approvals.....	5
Equipment Under Test (EUT) Description.....	6
Peripheral Devices .....	7
Report Of Measurements.....	8
Table 1: FCC 15.407(a)(3) Power Output (E.I.R.P.) .....	8
Table 2: FCC 15.407(a)(3) Peak Power Spectral Density.....	11
Table 3: FCC 15.407(b)/15.209 Six Highest Spurious Emission Levels - ODU-A .....	13
Table 4: FCC 15.407(b)/15.209 Six Highest Radiated Emission Levels - ODU-A (1MHz-40GHz)..	14
Table 5: FCC 15.207 Six Highest Conducted Emission Levels - ODU-A.....	15
Table 6: FCC 15.407(b)/15.209 Six Highest Spurious Emission Levels - ODU-B .....	16
Table 7: FCC 15.407(b)/15.209 Six Highest Radiated Emission Levels - ODU-B (1MHz-40GHz)..	17
Table 8: FCC 15.207 Six Highest Conducted Emission Levels - ODU-B .....	18
Table A : List Of Test Equipment .....	19
Measurement Uncertainty.....	20
Temperature And Humidity During Testing .....	20
EUT Setup .....	20
Test Instrumentation And Analyzer Settings.....	21
Table B : 15.35 Analyzer Bandwidth Settings Per Frequency Range.....	21
Spectrum Analyzer Detector Functions.....	21
Peak .....	22
Quasi-Peak.....	22
Average.....	22
Test Methods .....	22
15.203 Antenna Requirements .....	23
Radiated Emissions Testing.....	23
Conducted Emissions Testing .....	23
FCC 15.407(a)(6) Peak Excursion.....	24
FCC 15.407(a) Peak Power Density and Output Power at Antenna Terminal....	24
Occupied Bandwidth .....	24
E.I.R.P. Testing.....	25
Sample Calculations .....	25
Appendix A: Information About The Equipment Under Test.....	26
SZ-045-N-5G-IDU .....	27
I/O Ports.....	27
Crystal Oscillators .....	27
Printed Circuit Boards .....	27
Cable Information.....	27

SZ-045-N-5G-ODU-B .....	28
I/O Ports.....	28
Crystal Oscillators .....	28
Printed Circuit Boards .....	28
Cable Information.....	28
SZ-045-N-5G-ODU-B.....	29
I/O Ports.....	29
Crystal Oscillators .....	29
Printed Circuit Boards .....	29
Cable Information.....	29
Photograph Showing Dirrect Connect Testing - ODU-A .....	30
Photograph Showing Radiated & E.R.I.P. Emissions - ODU-A.....	31
Photograph Showing Radiated & E.R.I.P. Emissions - ODU-A.....	32
Photograph Showing E.R.I.P. Emissions - ODU-A .....	33
Photograph Showing Conducted Emissions - ODU-A.....	34
Photograph Showing Dirrect Connect Testing - ODU-B .....	35
Photograph Showing Radiated & E.R.I.P. Emissions - ODU-B .....	36
Photograph Showing Radiated & E.R.I.P. Emissions - ODU-B .....	37
Photograph Showing E.R.I.P. Emissions - ODU-B .....	38
Photograph Showing Conducted Emissions - ODU-B.....	39
Photograph Showing Conducted Emissions - ODU-B.....	40
Appendix B : Measurement Data Sheets .....	41

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DATEch (Germany); A2LA (USA); FCC (USA); VCCI (Japan); BSMI (Taiwan); HOKLAS (Hong Kong).  
**CKC Laboratories, Inc. has Letters of Acceptance through an MRA for the following agencies:**  
ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); TUV Rheinland-Germany; TUV Rheinland-Korea; TUV Rheinland-Russia; Radio Communications Agency (RA); NEMKO (Norway).

## ADMINISTRATIVE INFORMATION

**DATE OF TEST:** January 16-18, 2001

**DATE OF RECEIPT:** January 16, 2001

**PURPOSE OF TEST:** To demonstrate the compliance of the SkyZhone 45, SZ-045-N-5G-LNK-X, with the requirements for FCC Part 15 Subparts C & D for Sections 15.207, 15.209 & 15.407 devices.  
Purpose of the addendum is to add clarifications to data in tables and include additional test method paragraphs.

**MANUFACTURER:** Zhone Technologies, Inc.  
7100 Oakport Street, BLD 1  
Oakland, CA 94621

**REPRESENTATIVE:** Rich Synder

**TEST LOCATION:** CKC Laboratories, Inc.  
480 Los Viboras Road  
Hollister, CA 95023

## SUMMARY OF RESULTS

As received, the Zhone Technology, Inc. SkyZhone 45, SZ-045-N-5G-LNK-X was found to be fully compliant with the following standards and specifications:

### United States

- FCC Part 15 Subpart C Section 15.207
- FCC Part 15 Subpart C Section 15.209
- FCC Part 15 Subpart D Section 15.407
- ANSI C63.4 1992 method

The results in this report apply only to the items tested, as identified herein.

### **FREQUENCY RANGE TESTED:**

Conducted = 450 kHz – 30 MHz

Radiated = 1 MHz – 40 GHz

**EUT OPERATING FREQUENCY:** The SZ-045-N-5G-ODU-A was operating at 5.725-5.825 GHz and the SZ-045-N-5G-ODU-B was operating at 5.25-5.35 GHz.

## APPROVALS

### QUALITY ASSURANCE:



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Dennis Ward, Quality Manager



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Christine Nicklas, EMC/Lab Manager

### TEST PERSONNEL:



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Conan Boyle, EMC/Lab Supervisor



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Dustin Oaks, EMC/Evaluation Engineer

## **EQUIPMENT UNDER TEST (EUT) DESCRIPTION**

The SkyZhone 45 is a point-to-point U-NII wireless transport comprised of two indoor components, part number SZ-045-N-5G-IDU, two outdoor components, part numbers SZ-045-N-5G-ODU-A, and SZ-045-N-5G-ODU-B. One indoor unit mated with outdoor unit A will transmit in the 5.7GHz Band and receive in the 5.25GHz Band. Another indoor unit will mate with outdoor unit B and will transmit in the 5.25GHz Band and receive in the 5.75GHz Band. The two halves, when placed a distance apart, allow two way point to point communication. The entire system is part number SZ-045-N-5G-LNK-X, where the X signifies a 2, 4 or 6 foot circular antennas.

During CKC Laboratories testing, the SZ-045-N-5G-ODU-A and SZ-045-N-5G-ODU-B were referred to as the Radio Up-Converter/Diplexer. The SZ-045-N-5G-IDU was referred to as the DS3 Data Interface. The two models (ODU A and ODU B) are identical electrically to the one. The difference between the units is in the transmit and receive frequency. The differences between them do not affect their EMC characteristics, and therefore comply with the level of testing equivalent to the tested models. The SkyZhone 45, SZ-045-N-5G-LNK-X that was tested is representative of a production unit produced by Zhone Technology, Inc.

### **EQUIPMENT UNDER TEST:**

#### **SYSTEM: SKYZHONE 45, SZ-045-N-5G-LNK-X**

##### **Radio Up-Converter/Diplexer**

Manuf: Zhone Technologies, Inc.  
Model: SZ-045-N56-ODU-A  
Serial: 02  
FCC ID: (pending)

##### **DS3 Data Interface**

Manuf: Zhone Technologies, Inc.  
Model: Sky Zhone 45  
Serial: 3  
FCC ID: (pending)

##### **Radio Up-Converter/Diplexer**

Manuf: Zhone Technologies, Inc.  
Model: SZ-045-N56-ODU-B  
Serial: 01  
FCC ID: (pending)

##### **DS3 Data Interface**

Manuf: Zhone Technologies, Inc.  
Model: Sky Zhone 45  
Serial: 4  
FCC ID: (pending)

##### **Antenna Feedhorn, 2-ft**

Manuf: Gabriel Electronics  
Model: 118047  
Serial: 90483  
FCC ID: N/A

##### **Antenna, 2ft**

Manuf: Gabriel Electronics  
Model: SSP2-52B  
Serial: T92209  
FCC ID: N/A

**Antenna, 4-ft**

Manuf: Gabriel Electronics  
Model: SSP4-52B  
Serial: 493350  
FCC ID: N/A

**Antenna Feedhorn, 4-ft**

Manuf: Gabriel Electronics  
Model: 90703  
Serial: 118045  
FCC ID: N/A

**Antenna, 6-ft**

Manuf: Gabriel Electronics  
Model: SSP6-52A  
Serial: 692828  
FCC ID: N/A

**Antenna Feedhorn, 6-ft**

Manuf: Gabriel Electronics  
Model: 91240  
Serial: 118046  
FCC ID: N/A

**Coaxial Cable, 6-ft**

Manuf: Times Microwave Systems  
Model: LMR-600  
Serial: None  
FCC ID: N/A

**PERIPHERAL DEVICES**

The EUT was tested with the following peripheral device(s):

**Notebook PC**

Manuf: Dell  
Model: Inspiron 3500  
Serial: 0009653D  
FCC ID: DoC

**AC-DC Adapter**

Manuf: Dell  
Model: P/N 7832D  
Serial: 17972-94Q-1QZ1  
FCC ID: N/A

**AC-DC Adapter**

Manuf: IBM  
Model: P/N 02K6657  
Serial: 1Z0ZA022ZM8  
FCC ID: N/A

**Notebook PC**

Manuf: IBM  
Model: Thinkpad T20  
Serial: Zhone Tech. Inc. Asset #11057  
FCC ID: DoC

## REPORT OF MEASUREMENTS

The following tables report the highest worst case levels recorded during the tests performed on the SkyZhone 45, SZ-045-N-5G-LNK-X.

**Table 1: FCC 15.407(a)(3) Power Output (E.I.R.P.)**

**FCC 15.407(a)(3) Power output**

EUT: ODU-A

Test Condition:

The ODU-A was directly connected to the Spectrum Analyzer via a Coax Cable. The RBW and VBW of the spectrum analyzer were set to 1MHz. The loss of this cable was measured to be 8.14dB between 5.0GHz and 6.0GHz. This cable factor was accounted for in the measured values listed on this data sheet. The unit was tested with 3 antennas (28.5dBi, 34.2dBi, and 37.5dBi).

**BW Correction Calculation:**

Due to the bandwidth limitations of the measuring analyzer, a bandwidth correction factor was used.  $=10\text{LOG}(20/1) = 13\text{dB}$

**Measured 26dB Bandwidth :**

5.741GHz    23.2MHz

5.774GHz    24.75MHz

5.805GHz    24.0MHz

**Antenna: 28.5 dBi Gain**

Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results	Measured Output + Antenna Gain	Defacto Limit	Margin
5.741GHz	0.3	24.50	-24.20	<b>PASS</b>	28.8	53	-24.2
5.774GHz	0.6	24.50	-23.90	<b>PASS</b>	29.1	53	-23.9
5.805GHz	-1.4	24.50	-25.90	<b>PASS</b>	27.1	53	-25.9

Limit Calculation =  $17\text{dBm} + 10\text{Log}(B) = 30.65\text{dBm}$ , Therefore must use 1Watt = 30dBm

The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 23dBi, IAW 15.407(a)(3) for Direction gain UNII devices.

**Limit =  $30.0 - (28.5-23) = 24.5\text{dBm}$**

**Defacto Limit =  $30\text{dBm} + 23\text{dB (Allowed Antenna Gain)} = 53\text{dBm}$**



<b>Antenna: 34.2 dBi Gain</b>							
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results	Measured Output + Antenna Gain	Defacto Limit	Margin
5.741GHz	-6.23	18.80	-25.03	<b>PASS</b>	27.97	53	-25.03
5.774GHz	-5.07	18.80	-23.87	<b>PASS</b>	29.13	53	-23.87
5.805GHz	-5.4	18.80	-24.20	<b>PASS</b>	28.8	53	-24.2

Limit Calculation = 17dBm + 10Log(B) = 30.93dBm, Therefore must use 1Watt = 30dBm

The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 23dBi, IAW 15.407(a)(3) for Direction gain UNII devices.

**Limit = 30 - (34.2-23) = 18.8dBm**

**Defacto Limit = 30dBm + 23dB (Allowed Antenna Gain) = 53dBm**

<b>Antenna: 37.5 dBi Gain</b>							
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results	Measured Output + Antenna Gain	Defacto Limit	Margin
5.741GHz	-8.9	15.00	-23.90	<b>PASS</b>	28.6	53	-24.4
5.774GHz	-9.4	15.00	-24.40	<b>PASS</b>	28.1	53	-24.9
5.805GHz	-9.73	15.00	-24.73	<b>PASS</b>	27.77	53	-25.23

Limit Calculation = 17dBm + 10Log(B) = 29.5dBm

The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 23dBi, IAW 15.407(a)(3) for Direction gain UNII devices.

**Limit = 29.5 - (37.5-23) = 15.0dBm**

**Defacto Limit = 30dBm + 23dB (Allowed Antenna Gain) = 53dBm**

#### **FCC 15.407(a)(2) Power output**

EUT: ODU-B

Test Condistion:

The ODU-B was directly connected to the Spectrum Analyzer via a Coax Cable. The RBW and VBW of the spectrum analyzer were set to 1MHz. The loss of this cable was measured to be 8.14dB between 5.0GHz and 6.0GHz. This cable factor was accounted for in the measured values listed on this data sheet. The unit was tested with 3 antennas (28.5dBi, 34.2dBi, and 37.5dBi).

BW Correction Calculation:

Due to the bandwidth limitations of the measuring analyzer, a bandwidth correction factor was used. =10LOG(20/1) = 13dB

<b>Measured 26dB Bandwidth</b>							
5.265GHz	19.7MHz						
5.301GHz	19.8MHz						
5.331GHz	19.83MHz						
<b>Antenna: 28.5 dBi Gain</b>							
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results	Measured Output + Antenna Gain	Defacto Limt	Margin
5.265GHz	0.3	1.40	-1.10	<b>PASS</b>	28.8	30	-1.2
5.301GHz	0.6	1.40	-0.80	<b>PASS</b>	29.1	30	-0.9
5.331GHz	-1.4	1.40	-2.80	<b>PASS</b>	27.1	30	-2.9
Limit Calculation = 11dBm + 10Log(B) = 23.9dBm							
The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 6dBi, IAW 15.407(a)(2)							
<b>Limit = 23.9 - (28.5-6) = 1.4dBm</b>							
<b>Defacto Limit = 24dBm + 6dB (Allowed antenna gain) = 30dBm</b>							

<b>Antenna: 34.2 dBi Gain</b>							
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results	Measured Output + Antenna Gain	Defacto Limt	Margin
5.265GHz	-6.23	-4.20	-2.03	<b>PASS</b>	27.97	30	-2.03
5.301GHz	-5.07	-4.20	-0.87	<b>PASS</b>	29.13	30	-0.87
5.331GHz	-5.4	-4.20	-1.20	<b>PASS</b>	28.8	30	-1.2
Limit Calculation = 11dBm + 10Log(B) = 23.96dBm = 24dBm							
The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 6dBi, IAW 15.407(a)(2)							
<b>Limit = 24.0 - (34.2-6) = -4.2dBm</b>							
<b>Defacto Limit = 24dBm + 6dB (Allowed antenna gain) = 30dBm</b>							

<b>Antenna: 37.5 dBi Gain</b>							
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results	Measured Output + Antenna Gain	Defacto Limt	Margin
5.265GHz	-8.9	-7.50	-1.40	<b>PASS</b>	28.6	30	-1.4
5.301GHz	-9.4	-7.50	-1.90	<b>PASS</b>	28.1	30	-1.9
5.331GHz	-9.73	-7.50	-2.23	<b>PASS</b>	27.77	30	-2.23
Limit Calculation = 11dBm + 10Log(B) = 23.97dBm = 24dBm							
The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 6dBi, IAW 15.407(a)(2)							
<b>Limit = 24.0 - (37.5-6) = -7.5dBm</b>							
<b>Defacto Limit = 24dBm + 6dB (Allowed antenna gain) = 30dBm</b>							

**Table 2: FCC 15.407(a)(3) Peak Power Spectral Density**

**FCC 15.407(a)(3) Peak Power Spectral Density**

EUT: ODU-A

Test Condition:

The ODU-A was directly connected to the Spectrum Analyzer via a Coax Cable. The RBW and VBW of the spectrum analyzer was set to 1MHz. The loss of this cable was measured to be 8.14dB between 5.0GHz and 6.0GHz. This cable factor was accounted for in the measured values listed on this data sheet. The unit was tested with 3 antennas (28.5dBi, 34.2dBi, and 37.5dBi).

**Antenna: 28.5 dBi Gain**

Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results		
5.741GHz	-9.9	11.50	-21.40	<b>PASS</b>		
5.774GHz	-10.07	11.50	-21.57	<b>PASS</b>		
5.805GHz	-10.9	11.50	-22.40	<b>PASS</b>		

Limit Calculation = 17dBm

The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 23dBi, IAW 15.407(a)(3) for Direction gain UNII devices.

**Limit = 17 - (28.5-23) = 11.5dBm**

**Antenna: 34.2 dBi Gain**

Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results		
5.741GHz	-16.07	5.80	-21.87	<b>PASS</b>		
5.774GHz	-15.9	5.80	-21.70	<b>PASS</b>		
5.805GHz	-16.9	5.80	-22.70	<b>PASS</b>		

Limit Calculation = 17dBm

The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 23dBi, IAW 15.407(a)(3) for Direction gain UNII devices.

**Limit = 17.0 - (34.2-23) = 5.8dBm**

The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 23dBi, IAW 15.407(a)(3) for Direction gain UNII devices.

**Limit = 17.0 - (37.5-23) = 2.5dBm**

<b>Antenna: 37.5 dBi Gain</b>						
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results		
5.741GHz	-19.07	2.50	-21.57	<b>PASS</b>		
5.774GHz	-18.9	2.50	-21.40	<b>PASS</b>		
5.805GHz	-20.07	2.50	-22.57	<b>PASS</b>		
Limit Calculation = 17dBm						

**FCC 15.407(a)(2) Peak Power Spectral Density**  
 EUT: ODU-B  
 Test Condition:  
 The ODU-B was directly connected to the Spectrum Analyzer via a Coax Cable. The RBW and VBW of the spectrum analyzer was set to 1MHz. The loss of this cable was measured to be 8.14dB between 5.0GHz and 6.0GHz. This cable factor was accounted for in the measured values listed on this data sheet. The unit was tested with 3 antennas (28.5dBi, 34.2dBi, and 37.5dBi).

<b>Antenna: 28.5 dBi Gain</b>						
Channel	Recorded Reading (dBm)	Density Limit (dBm)	Margin	Results		
5.265GHz	-12.7	-11.50	-1.20	<b>PASS</b>		
5.301GHz	-12.4	-11.50	-0.90	<b>PASS</b>		
5.331GHz	-14.4	-11.50	-2.90	<b>PASS</b>		

Limit = 11dBm in any 1MHz  
 The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 6dBi, IAW 15.407(a)(2)  
**Limit = 11.0 - (28.5-6) = -11.5dBm**

<b>Antenna: 34.2 dBi Gain</b>						
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results		
5.265GHz	-19.23	-17.20	-2.03	<b>PASS</b>		
5.301GHz	-18.07	-17.20	-0.87	<b>PASS</b>		
5.331GHz	-18.4	-17.20	-1.20	<b>PASS</b>		

Limit = 11dBm in any 1MHz  
 The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 6dBi, IAW 15.407(a)(2)  
**Limit = 11.0 - (34.2-6) = -17.2dBm**

<b>Antenna: 37.5 dBi Gain</b>						
Channel	Recorded Reading (dBm)	Power Output Limit (dBm)	Margin	Results		
5.265GHz	-21.9	-20.50	-1.40	<b>PASS</b>		
5.301GHz	-22.4	-20.50	-1.90	<b>PASS</b>		
5.331GHz	-22.73	-20.50	-2.23	<b>PASS</b>		

Limit = 11dBm in any 1MHz  
 The Limit was then Corrected for EACH antenna based on the amount in dB exceeding 6dBi, IAW 15.407(a)(2)  
**Limit = 11.0 - (37.5-6) = -20.5dBm**

**Table 3: FCC 15.407(b)/15.209 Six Highest Spurious Emission Levels - ODU-A**

FREQUENCY MHz	METER READING dB $\mu$ V	CORRECTION FACTORS				CORRECTED READING dB $\mu$ V/m	SPEC LIMIT dB $\mu$ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
15374.980	35.5	0.0		14.7		50.2	54.0	-3.8	NA
15479.980	32.4	0.0		15.3		47.7	54.0	-6.3	NA
17419.500	36.0	0.0		11.1		47.1	54.0	-6.9	N
20639.970	26.3	0.0		21.5		47.8	54.0	-6.2	NA
23094.500	12.3	0.0		39.4		51.7	54.0	-2.3	NA
23226.980	13.0	0.0		38.7		51.7	54.0	-2.3	N

Test Method: ANSI C63.4 1992  
 Spec Limit : FCC Part 15.407(b)/15.209  
 Test Distance: Direct Connect

NOTES: N = No Polarization  
 A = Average Reading

**COMMENTS:** Frequency range tested: 1MHz – 40GHz. The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-A S/N 02 and IDU S/N 3 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. **The table represents the results of readings from the low, middle and high channels.**

**Table 4: FCC 15.407(b)/15.209 Six Highest Radiated Emission Levels - ODU-A (1MHz-40GHz)**

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS				CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
40.047	43.7	13.6	-27.9	1.6		31.0	40.0	-9.0	VQ
60.058	53.6	5.4	-27.9	2.0		33.1	40.0	-6.9	V
80.033	51.6	6.8	-27.8	2.4		33.0	40.0	-7.0	HQ
400.055	45.1	16.4	-27.5	6.1		40.1	46.0	-5.9	VQ
1112.967	21.7	23.5		3.4		48.6	54.0	-5.4	V
2746.608	10.8	27.5		6.1		44.4	54.0	-9.6	V

Test Method: ANSI C63.4 1992  
 Spec Limit : FCC Part 15.407(b)/15.209  
 Test Distance: 3 Meters

NOTES: H = Horizontal Polarization  
 V = Vertical Polarization  
 Q = Quasi Peak Reading

COMMENTS: Frequency range tested: 1MHz – 40GHz. This data sheet comprises the following configuration: ODU-A operating on its LOW channel, which is the highest output power channel for that set. The set was tested using the highest and lowest gain antennas on the channels listed above. The lowest gain antenna represents the highest output power of the device and the highest gain antenna represents the lowest output power of the device. Test Setup: The EUT is comprised of a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit), coaxial cable, and either a 2-ft (highest gain) or 6-ft (lowest gain) antenna, along with support equipment that includes two notebook PC's. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable. On the IDU, an RG-58 cable connects DS3 IN and DS3 OUT in loopback. The set is constantly transmitting and receiving autonomously. The RF signal port of the ODU is connected to the antenna connector port of either the 2-ft (high gain) or 6-ft (low gain) antenna via a 6-ft coaxial cable. The unit was tested with both antennas and the data sheet comprises the highest readings from both antenna configurations.

**Table 5: FCC 15.207 Six Highest Conducted Emission Levels - ODU-A**

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Lisn dB							
0.751189	40.2	0.3		0.1		40.6	48.0	-7.4	B
0.789675	41.5	0.3		0.1		41.9	48.0	-6.1	B
2.932000	39.7	0.5		0.3		40.5	48.0	-7.5	B
3.716000	40.9	0.6		0.3		41.8	48.0	-6.2	B
4.042000	39.8	0.6		0.4		40.8	48.0	-7.2	B
27.169670	35.0	4.7		1.0		40.7	48.0	-7.3	B

Test Method: ANSI C63.4 1992  
 Spec Limit : FCC Part 15.207

NOTES: B = Black Lead

COMMENTS: The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-A S/N 02 and IDU S/N 3 - is tested for conducted emissions. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is connected to the IBM notebook via a 6-ft serial cable. The units are constantly transmitting and receiving autonomously. An RG-58 cable connects DS3 IN and DS3 OUT in loopback. A 6-ft coaxial cable is connected to the IDU RF connector port and is terminated with a 50-ohm dummy load. The units are constantly transmitting and receiving autonomously. AC Power = 120vac, 60-Hz

**Table 6: FCC 15.407(b)/15.209 Six Highest Spurious Emission Levels - ODU-B**

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS				CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
15900.830	25.2	0.0		16.2		41.4	54.0	-12.6	H
15991.860	28.3	0.0		16.4		44.7	54.0	-9.3	V
17744.970	32.8	0.0		13.4		46.2	54.0	-7.8	H
21001.670	24.2	0.0		19.3		43.5	54.0	-10.5	N
21200.830	22.3	0.0		18.5		40.8	54.0	-13.2	H
21345.030	24.8	0.0		18.0		42.8	54.0	-11.2	V

Test Method: ANSI C63.4 1992  
 Spec Limit : FCC Part 15.407(b)/15.209  
 Test Distance: Direct Connect

NOTES: H = Horizontal Polarization  
 V = Vertical Polarization

**COMMENTS:** Frequency range tested: 1MHz – 40GHz. The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. **The table represents the results of readings from the low, middle and high channels.**



**Table 7: FCC 15.407(b)/15.209 Six Highest Radiated Emission Levels - ODU-B (1MHz-40GHz)**

FREQUENCY MHz	METER READING dB $\mu$ V	CORRECTION FACTORS				CORRECTED READING dB $\mu$ V/m	SPEC LIMIT dB $\mu$ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
40.047	43.7	13.6	-27.9	1.6		31.0	40.0	-9.0	VQ
60.058	53.6	5.4	-27.9	2.0		33.1	40.0	-6.9	V
80.033	51.6	6.8	-27.8	2.4		33.0	40.0	-7.0	HQ
400.055	45.1	16.4	-27.5	6.1		40.1	46.0	-5.9	VQ
1112.967	21.7	23.5		3.4		48.6	54.0	-5.4	V
2746.608	10.8	27.5		6.1		44.4	54.0	-9.6	V

Test Method: ANSI C63.4 1992  
 Spec Limit : FCC Part 15.407(b)/15.209  
 Test Distance: 3 Meters

NOTES: H = Horizontal Polarization  
 V = Vertical Polarization  
 Q = Quasi Peak Reading

COMMENTS: Frequency range tested: 1MHz – 40GHz. This data sheet comprises the following configuration: ODU-B operating on its MID channel, which is the highest output power channel for that set. The set was tested using the highest and lowest gain antennas on the channels listed above. The lowest gain antenna represents the highest output power of the device and the highest gain antenna represents the lowest output power of the device. Test Setup: The EUT is comprised of a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit), coaxial cable, and either a 2-ft (highest gain) or 6-ft (lowest gain) antenna, along with support equipment that includes two notebook PC's. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable. On the IDU, an RG-58 cable connects DS3 IN and DS3 OUT in loopback. The set is constantly transmitting and receiving autonomously. The RF signal port of the ODU is connected to the antenna connector port of either the 2-ft (high gain) or 6-ft (low gain) antenna via a 6-ft coaxial cable. The unit was tested with both antennas and the data sheet comprises the highest readings from both antenna configurations.

**Table 8: FCC 15.207 Six Highest Conducted Emission Levels - ODU-B**

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Lisn dB							
0.721200	41.2	0.2		0.2		41.6	48.0	-6.4	W
1.884000	41.6	0.3		0.2		42.1	48.0	-5.9	W
3.442132	40.8	0.6		0.3		41.7	48.0	-6.3	B
3.549840	44.0	0.5		0.3		44.8	48.0	-3.2	WQ
6.920000	40.4	0.7		0.5		41.6	48.0	-6.4	W
20.014170	38.2	3.1		0.9		42.2	48.0	-5.8	WQ

Test Method: ANSI C63.4 1992  
 Spec Limit : FCC Part 15.207

NOTES: Q = Quasi Peak Reading  
 W = White Lead  
 B = Black Lead

COMMENTS: The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for conducted emissions. The fundamental frequency is 5.300GHz. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is connected to the IBM notebook via a 6-ft serial cable. The units are constantly transmitting and receiving autonomously. An RG-58 cable connects DS3 IN and DS3 OUT in loopback. A 6-ft coaxial cable is connected to the IDU RF connector port and is terminated with a 50-ohm dummy load. The units are constantly transmitting and receiving autonomously. AC Power = 120vac, 60-Hz

**TABLE A**  
**LIST OF TEST EQUIPMENT**

**Hollister Site D**

<b>Equipment</b>	<b>Mfg.</b>	<b>Model #</b>	<b>Asset #</b>	<b>Serial #</b>	<b>Cal Date</b>	<b>Cal Due</b>
Spectrum Analyzer	HP	8564E	01406	3623A00539	12/12/00	12/12/01
Horn Ant., 1-18	EMCO	3115	02157	9901-5655	10/20/00	10/20/01
Horn Ant., 18-26.5	HP	84125-80008	01413	942126-003	2/2/00	2/2/01
Horn Ant., 26.5-40	HP	84125-80001	01414	951559-008	2/2/00	2/2/01
Mag Loop	EMCO	6502	0432	2078	8/17/00	8/17/01
50-Ft High Freq. Cable	Andrews	None	None	Hol-hf-050-08	9/21/00	9/21/01
Spec. An.	HP	85680A	00446	2237A02391	9/17/00	9/17/01
Spec. An. Display	HP	85662A	00446	2235A02391	9/17/00	9/17/01
QPA	HP	85650A	00445	2043A00286	9/17/00	9/17/01
Preamplifier	HP	8447D	00705	2944A06739	12/15/00	12/15/01
Bilog Ant.	Schaffner	CBL6111C	01995	2451	10/12/00	10/12/00
10-M Radiated Cable	Andrews	None	None	rad cable_10M	8/11/00	8/11/01
LISN a	Solar	8616-50-TS-24-BNC	33204	905814	9/8/00	9/8/01
LISN b	Solar	8616-50-TS-24-BNC	33204	905815	9/8/00	9/8/01
Conducted Cable	Andrews	None	None	cond_cbl_hd_00	11/13/00	11/13/01

## **MEASUREMENT UNCERTAINTY**

Associated with data in this report is a  $\pm 4$ dB measurement uncertainty.

## **TEMPERATURE AND HUMIDITY DURING TESTING**

The temperature during testing was within  $+15^{\circ}\text{C}$  and  $+35^{\circ}\text{C}$ .  
The relative humidity was between 20% and 75%.

## **EUT SETUP**

The equipment under test (EUT) and the peripheral(s) listed were set up in a manner that represented their normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the Tables for emissions. Additionally, a complete description of all the ports and I/O cables is included on the information sheets contained in Appendix A.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

I/O cables were connected to the EUT and peripherals in the manner required for normal operation of the system. Excess cabling was bundled in the center in a serpentine fashion using 30-40 centimeter lengths.

During conducted emissions testing, the EUT was located 80 centimeters above the conducting ground plane on the same nonconducting table as was used for radiated testing. The metal plane was grounded to the earth through the green wire safety ground. Power to the EUT was provided via 3 meters of shielded power cable from a filter grounded to the metal plane to a LISN. The LISN was also grounded to the plane and attached to the LISN was a 4 ganged grounded outlet whose source was also shielded and 60 cm in length. All other objects were kept a minimum of 1 meter away from the EUT during the conducted test.

## TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect both the radiated and conducted emissions data for the SkyZhone 45, SZ-045-N-5G-LNK-X. For radiated measurements from 30 to 1000 MHz, the bilog antenna was used. For frequencies above 1000 MHz, the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT. Conducted emissions tests required the use of the FCC type LISNs.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. For conducted emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. A 10 dB external attenuator was also used during conducted tests, with internal offset correction in the analyzer. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB $\mu$ V, and a vertical scale of 10 dB per division.

TABLE B : 15.35 ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	450 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	1MHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	40 GHz	1 MHz
15.407(a) POWER LIMITS	5GHz	6 GHz	1 MHz

## SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1-8 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the SkyZhone 45, SZ-045-N-5G-LNK-X.

## **Peak**

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

## **Quasi-Peak**

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

## **Average**

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

## **TEST METHODS**

The radiated and conducted emissions data of the SkyZhone 45, SZ-045-N-5G-LNK-X, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15 Subparts C & D for Sections 15.209 & 15.407 emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

### **15.203 Antenna Requirements**

The EUT system is comprised of three antennas. The antennas have different gains but are the same type of antenna. The EUT's output power is adjusted to comply with the power requirements for each antenna. Power output testing was performed using all three power settings. Spurious emissions testing was performed using the lowest and highest gain antennas, representing the lowest and highest power settings.

### **Radiated Emissions Testing**

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode with the I/O cables and line cords facing the antenna. The frequency range of 30 - 1000 MHz was then scanned with the bilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks, which were at or near the limit, were recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The bilog antenna was changed to the horizontal polarity and the above steps were repeated. The horn antenna was used to scan for frequencies above 1000 MHz. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned with its I/O and power cables facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation, antenna height and configuration of the peripherals and cables. Maximizing of the cables was achieved by monitoring the spectrum analyzer on a closed circuit television monitor while the EUT cables were being moved and rearranged on the EUT table for maximum emissions. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

### **Conducted Emissions Testing**

For conducted emissions testing, a 30 to 50 second sweep time was used for automated measurements in the frequency bands of 450 kHz to 1.705 MHz, 1.705 MHz to 3 MHz, and 3 MHz to 30 MHz. All readings within 20 dB of the limit were recorded. At frequencies where the recorded emissions were close to the limit, further investigation was performed manually at a slower sweep rate.

### **FCC 15.407(a)(6) – Peak Excursion**

In accordance with Part 15.407(a)(6), the ratio of the peak excursion of the modulation envelope to the peak transmit power did not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### **FCC 15.407(a) Peak Power Density and Output Power at Antenna Terminal**

The RF output of the EUT was connected directly to the RF input of the spectrum analyzer. The spectrum analyzer bandwidth settings were set to 1 MHz as per FCC Part 15.407(a)(5) and the center frequency was adjusted to the fundamental frequency of the EUT. The peak power spectral density was recorded. The output power was also recorded and adjusted for bandwidth limitations of the spectral analyzer.

### **Occupied Bandwidth (Used for calculations only)**

EUT was directly connected to the spectrum analyzer via coax cable. Spectrum analyzer bandwidth setting was set to 1 MHz and the center frequency adjusted to find the frequency of the EUT. The 26dB bandwidth was recorded and a plot captured.



## E.I.R.P. Testing

The spectrum analyzer was set to the fundamental frequency of the EUT. The signal was maximized by table rotation and antenna height adjustment. The maximum level was recorded and adjusted for bandwidth limitations of the spectrum analyzer, cable losses, and amplifier gain and antenna factor. The corrected reading was in the following formula to obtain E.I.R.P.:

$$P = \frac{(Ed)^2}{30G}$$

Where:

P = power in watts

E = corrected reading in volts

d = distance

G = gain of antenna

## SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the emissions readings in Tables 1-8. For radiated emissions in dB $\mu$ V/m, the spectrum analyzer reading in dB $\mu$ V was corrected by using the following formula:

$$\begin{aligned} & \text{Meter reading (dB}\mu\text{V)} \\ & + \text{Antenna Factor (dB)} \\ & + \text{Cable Loss (dB)} \\ & - \text{Distance Correction (dB)} \\ & - \text{Pre-amplifier Gain (dB)} \\ & = \text{Corrected Reading (dB}\mu\text{V/m)} \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dB $\mu$ V	Cable	HP-84	CHASE	Horn	Dist	Corr dB $\mu$ V/m	Spec	Margin	Polar
		Hol-h	con_	rad_c	WHT-L	LISN		BLK-L			

# means reading number

**Freq MHz** is the frequency in MHz of the obtained reading.

**Rdng dB $\mu$ V** is the reading obtained on the spectrum analyzer in dB $\mu$ V.

**HP-84** is short for the preamplifier factor or gain in dB.

**CHASE** is the biconical antenna factor in dB.

**Horn** is the horn antenna factor in dB.

**Hol-h, rad\_c & con\_** are the cable losses in dB of the coaxial cables on the OATS.

**Dist** is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.

**Corr dB $\mu$ V/m** is the corrected reading which is now in dB $\mu$ V/m (field strength).

**Spec** is the specification limit (dB) stated in the regulations.

**Margin** is the closeness to the specified limit in dB; + is over and - is under the limit.

**Polar** is the Polarity of the antenna with respect to earth.

**LISN, BLK-L & WHT-L** are the line impedance stabilization network factor in dB.

**APPENDIX A**  
**INFORMATION ABOUT THE EQUIPMENT UNDER TEST**

**SZ-045-N-5G-IDU**

<b>INFORMATION ABOUT THE EQUIPMENT UNDER TEST</b>	
Test Software/Firmware:	V 1.1
CRT was displaying:	Not Applicable
Power Supply Manufacturer:	Condor
Power Supply Part Number:	100-41935
AC Line Filter Manufacturer:	Not Applicable
AC Line Filter Part Number:	
Line voltage used during testing:	120V 60Hz

<b>I/O PORTS</b>	
Type	#
DS-3 payload in (BNC)	1
DS-3 payload out (BNC)	1
10baseT (RJ-45)	1
Craft (DB-9 carrying RS-232)	1
IF (TNC)	1
Alarms (Form C dry contact)	3

<b>CRYSTAL OSCILLATORS</b>	
Type	Freq In MHz
Master Clock	40
DS-3 reference	44.736

<b>PRINTED CIRCUIT BOARDS</b>				
Function	Model & Rev	Clocks, MHz	Layers	Location
System	800-00183-01 Rev 5	40 MHz, 44.736 MHz	8	IDU
Modem	800-00281-01 Rev Z2	None	8	Mezzanine

**CABLE INFORMATION**

Cable #:	1	Cable(s) of this type:	1
Cable Type:	RG-6	Shield Type:	Braided + foil
Construction:	Coaxial	Length In Meters:	100
Connected To End (1):	IDU IF port	Connected To End (2):	ODU IF port
Connector At End (1):	TNC	Connector At End (2):	TNC
Shield Grounded At (1):	Yes	Shield Grounded At (2):	Yes
Part Number:	N/A	Number of Conductors:	2
Notes and/or description:	Cable furnished by professional installer, Zhone P/N N/A		

**SZ-045-N-5G-ODU-A**

<b>INFORMATION ABOUT THE EQUIPMENT UNDER TEST</b>	
Test Software/Firmware:	V 1.1
CRT was displaying:	Not Applicable
Power Supply Manufacturer:	Not Applicable
Power Supply Part Number:	Not Applicable
AC Line Filter Manufacturer:	Not Applicable
AC Line Filter Part Number:	Not Applicable
Line voltage used during testing:	120V 60Hz

<b>I/O PORTS</b>	
Type	#
Antenna (N-F)	1
Craft (DB-9 carrying RS-232)	1
IF (TNC)	1

<b>CRYSTAL OSCILLATORS</b>	
Type	Freq In MHz
Crystal Resonator	5.0688

<b>PRINTED CIRCUIT BOARDS</b>				
Function	Model & Rev	Clocks, MHz	Layers	Location
CPU	800-00185-01 Rev 6	None	8	Upper stack
IF-A	800-00187-01 Rev 8	None	8	Within shield
Duplexer	800-00186	None	1	Within shield

**CABLE INFORMATION**

Cable #:	1	Cable(s) of this type:	1
Cable Type:	LMR-600	Shield Type:	
Construction:		Length In Meters:	2
Connected To End (1):	ODU Ant Port	Connected To End (2):	Antenna
Connector At End (1):	N-F	Connector At End (2):	N-F
Shield Grounded At (1):	Yes	Shield Grounded At (2):	Yes
Part Number:	TBD	Number of Conductors:	2
Notes and/or description:			

**SZ-045-N-5G-ODU-B**

<b>INFORMATION ABOUT THE EQUIPMENT UNDER TEST</b>	
Test Software/Firmware:	V 1.1
CRT was displaying:	Not Applicable
Power Supply Manufacturer:	Not Applicable
Power Supply Part Number:	Not Applicable
AC Line Filter Manufacturer:	Not Applicable
AC Line Filter Part Number:	Not Applicable
Line voltage used during testing:	120V 60Hz

<b>I/O PORTS</b>	
Type	#
Antenna (N-F)	1
Craft (DB-9 carrying RS-232)	1
IF (TNC)	1

<b>CRYSTAL OSCILLATORS</b>	
Type	Freq In MHz
Crystal Resonator	5.0688

<b>PRINTED CIRCUIT BOARDS</b>				
Function	Model & Rev	Clocks, MHz	Layers	Location
CPU	800-00185-01 Rev 6	None	8	Upper stack
IF-A	800-00290-01 Rev 8	None	8	Within shield
Duplexer	800-00289-01	None	1	Within shield

**CABLE INFORMATION**

Cable #:	1	Cable(s) of this type:	1
Cable Type:	LMR-600	Shield Type:	
Construction:		Length In Meters:	2
Connected To End (1):	ODU Ant Port	Connected To End (2):	Antenna
Connector At End (1):	N-F	Connector At End (2):	N-F
Shield Grounded At (1):	Yes	Shield Grounded At (2):	Yes
Part Number:	TBD	Number of Conductors:	2
Notes and/or description:			

**PHOTOGRAPH SHOWING DIRECT CONNECT TESTING - ODU-A**



Front View

**PHOTOGRAPH SHOWING RADIATED & E.R.I.P EMISSIONS- ODU-A**



2 Foot Antenna

**PHOTOGRAPH SHOWING RADIATED & E.R.I.P EMISSIONS- ODU-A**



6 Foot Antenna



**PHOTOGRAPH SHOWING E.R.I.P EMISSIONS - ODU-A**



4 Foot Antenna

**PHOTOGRAPH SHOWING CONDUCTED EMISSIONS - ODU-A**



Front View

**PHOTOGRAPH SHOWING DIRECT CONNECT TESTING - ODU-B**



Front View



**PHOTOGRAPH SHOWING RADIATED & E.R.I.P EMISSIONS- ODU-B**



2 Foot Antenna

**PHOTOGRAPH SHOWING RADIATED & E.R.I.P EMISSIONS- ODU-B**



6 Foot Antenna

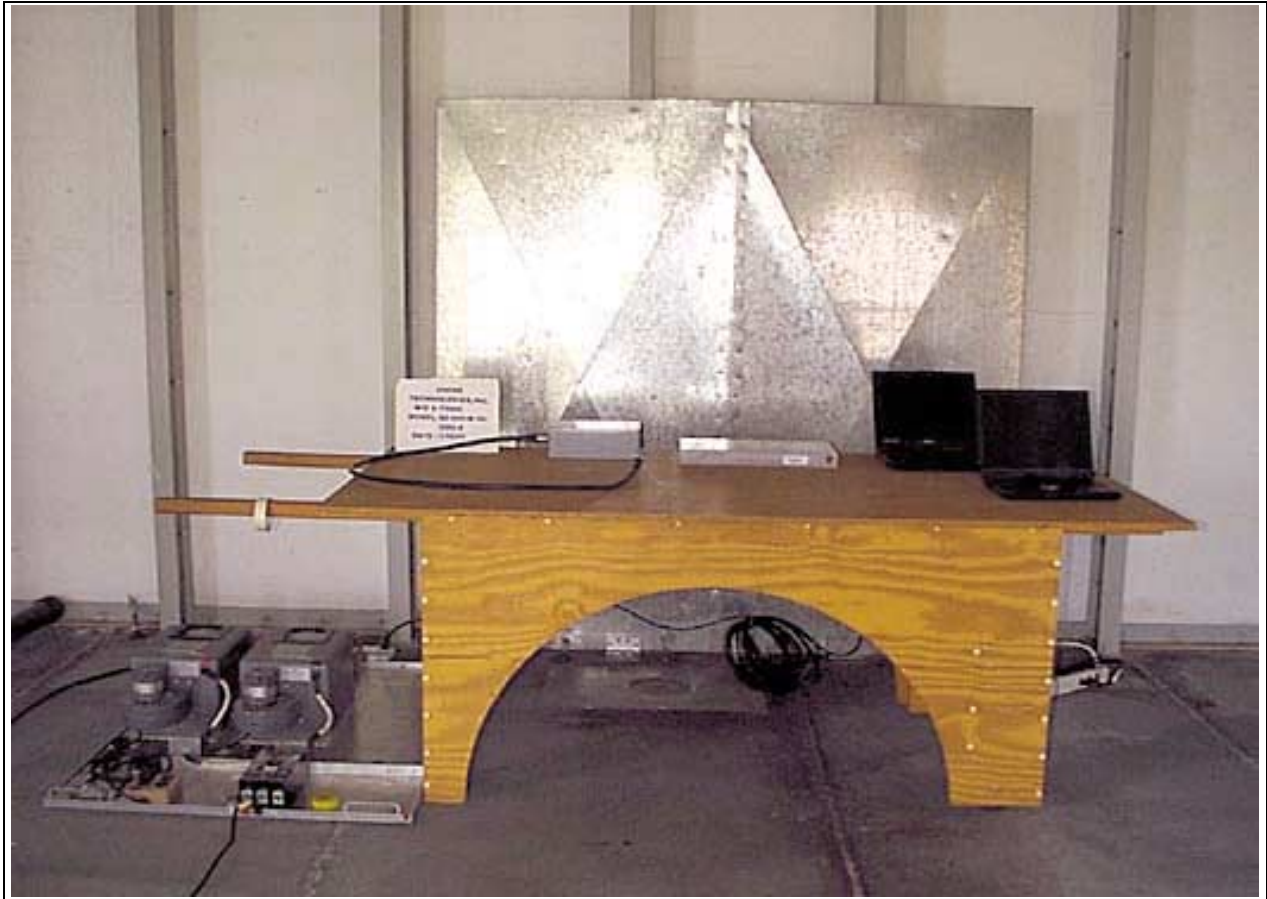
**PHOTOGRAPH SHOWING E.R.I.P EMISSIONS - ODU-B**



4 Foot Antenna



**PHOTOGRAPH SHOWING CONDUCTED EMISSIONS - ODU-B**



Front View

**PHOTOGRAPH SHOWING CONDUCTED EMISSIONS - ODU-B**

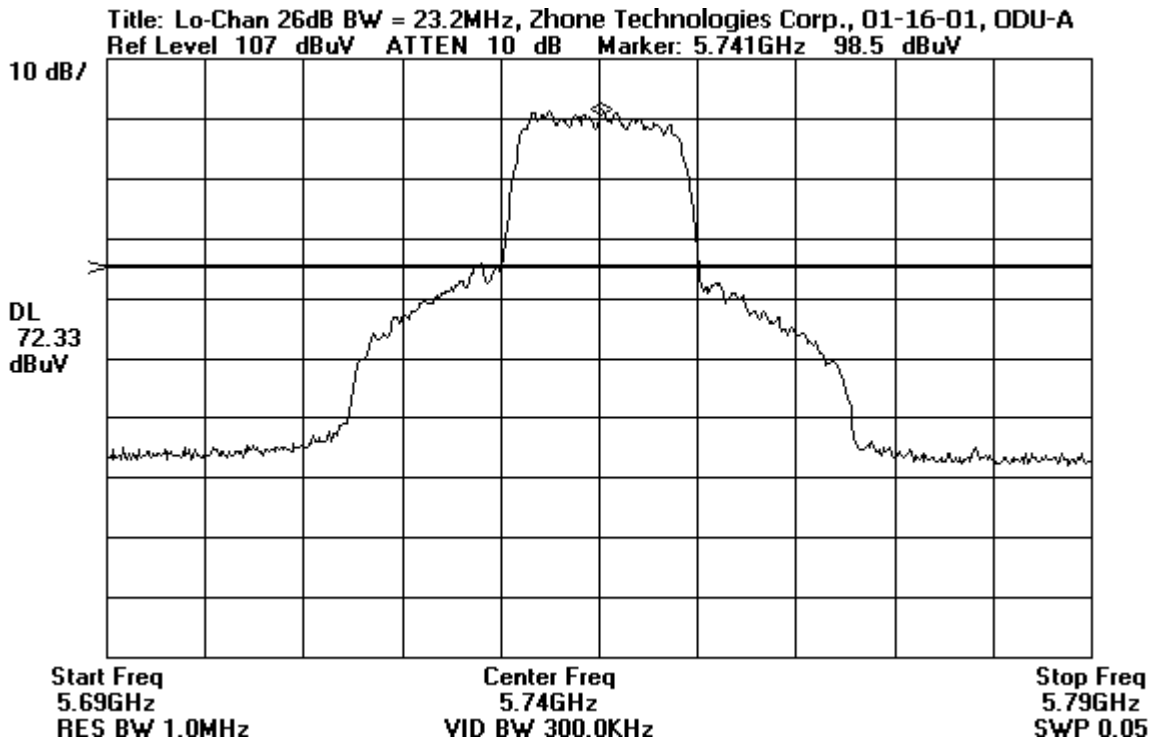


Side View

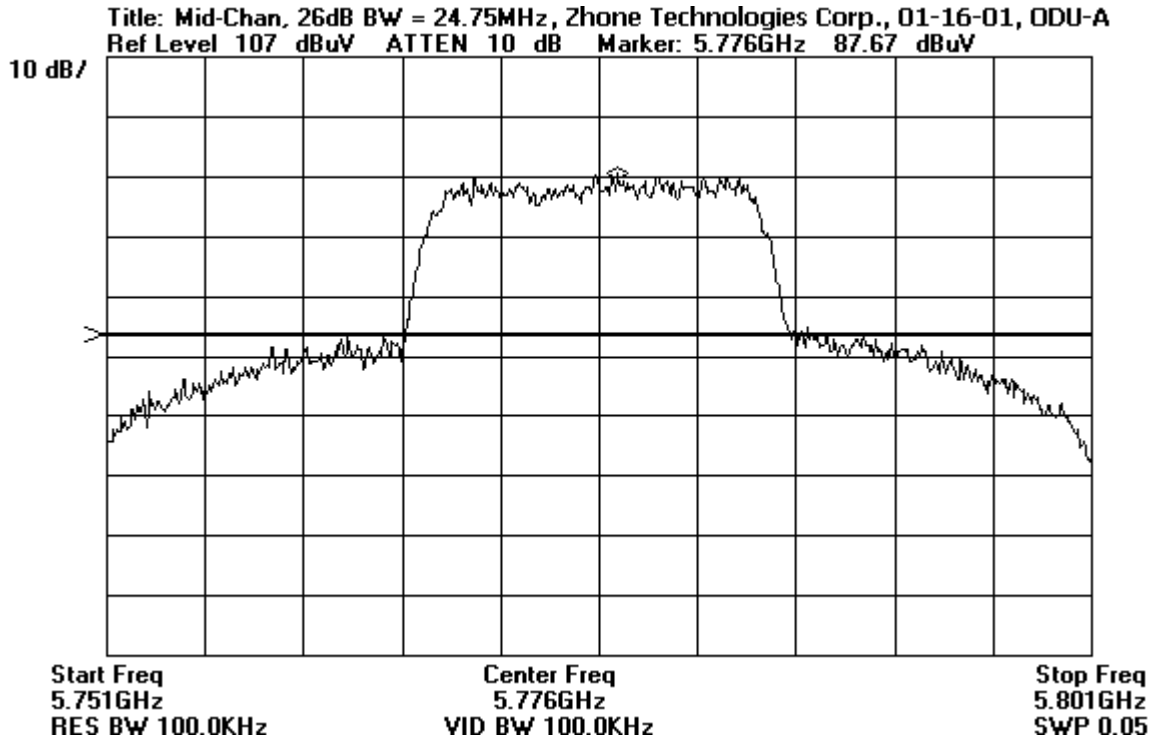


**APPENDIX B**  
**MEASUREMENT DATA SHEETS**

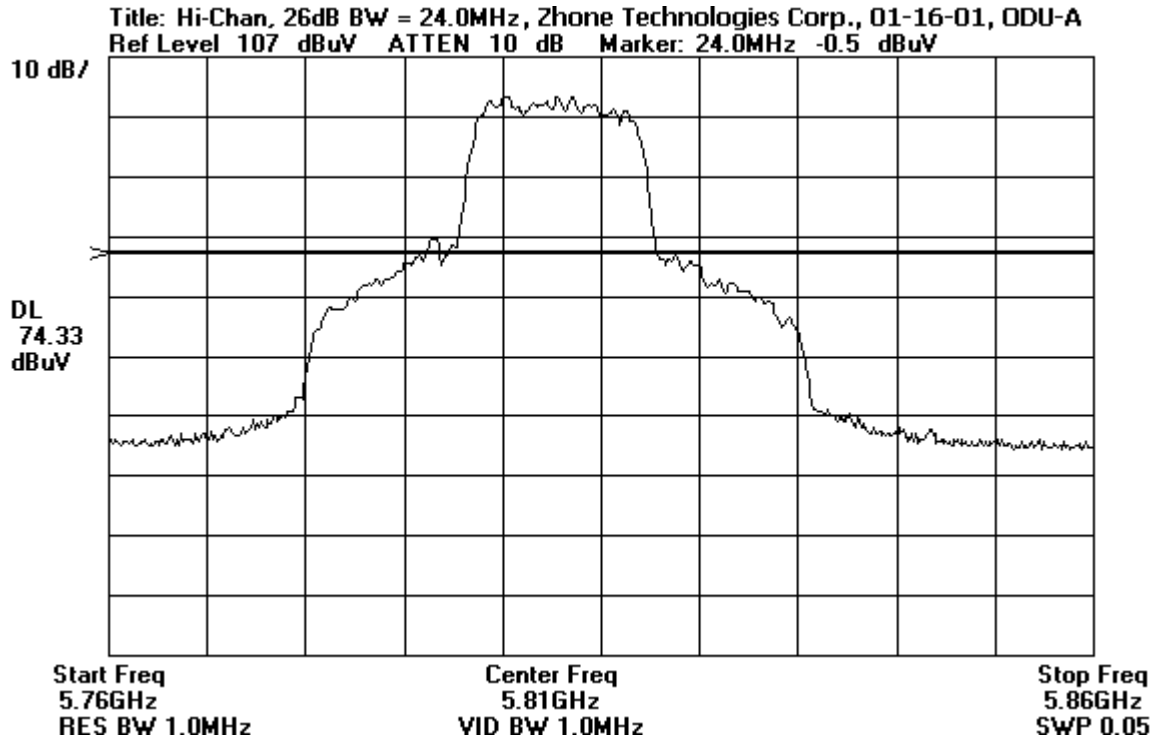
# Occupied Bandwidth Plot



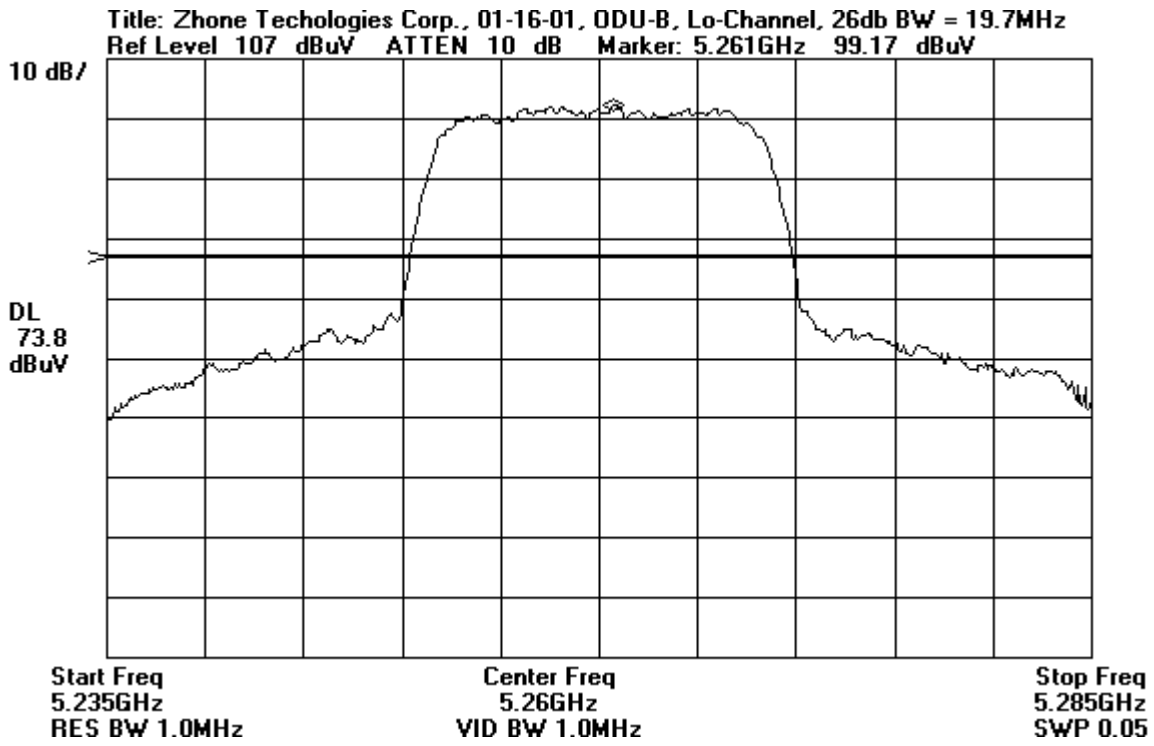
# Occupied Bandwidth Plot



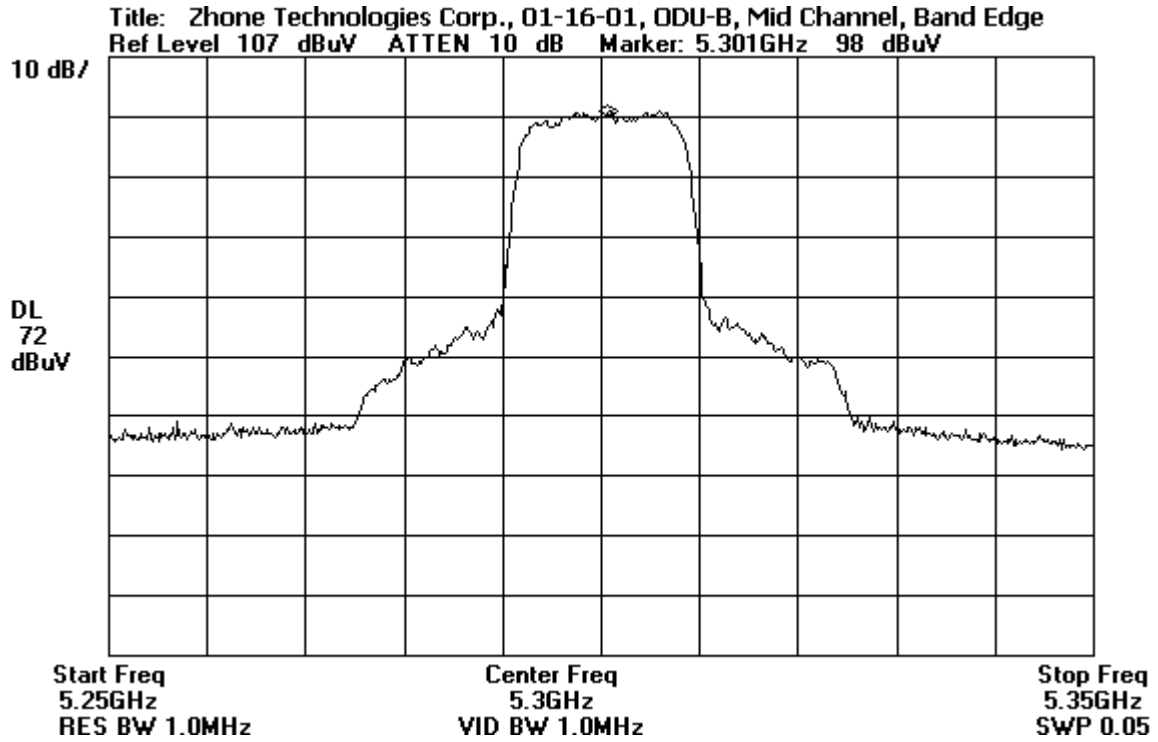
# Occupied Bandwidth Plot



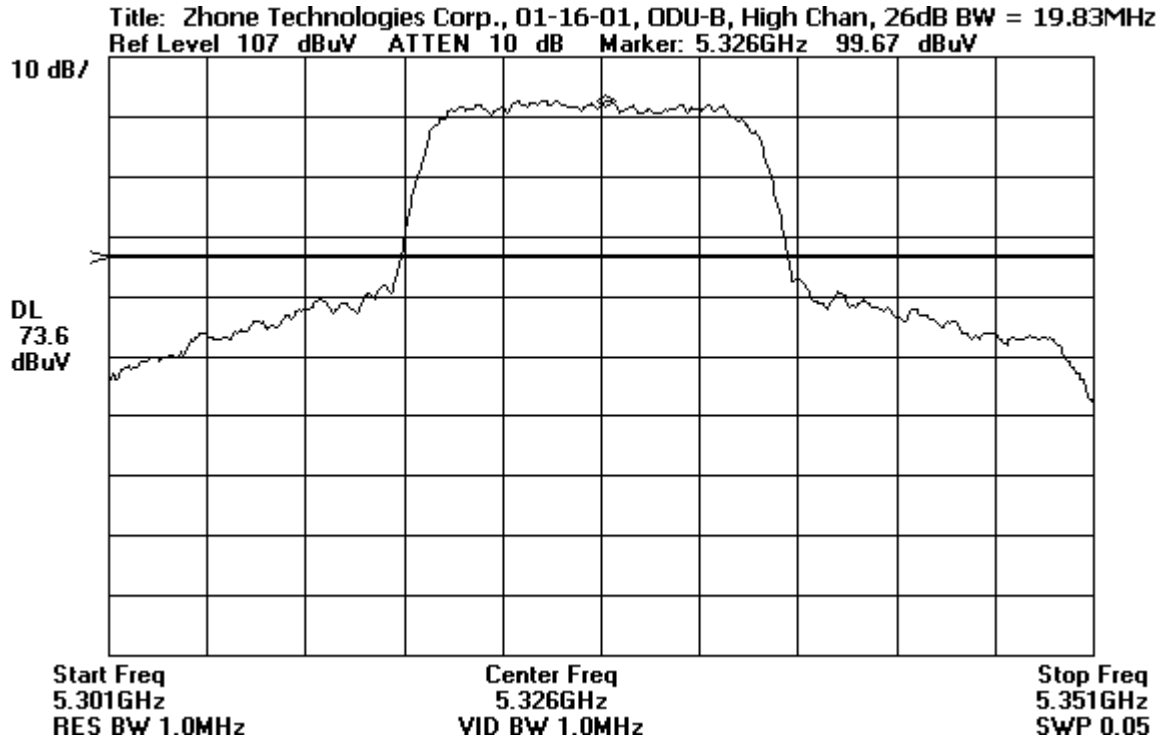
# Occupied Bandwidth Plot



# Occupied Bandwidth Plot



# Occupied Bandwidth Plot



Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC15.209 Direct**  
 Work Order #: **75966** Date: 02/23/2001  
 Test Type: **Radiated Scan** Time: 10:28:00  
 Equipment: **Digital Microwave System** Sequence#: 2  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 02

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-A	02
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	3

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
Notebook PC	Dell	Inspiron 3500	0009653D

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-A S/N 02 and IDU S/N 3 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. The EUT is transmitting on low-channel.

**Measurement Data:** Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dBµV	hol-h				Dist Table	Corr DBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	15374.980M	35.5	+14.7				+0.0	50.2	54.0	-3.8	None
	Ave										
^	15374.970M	37.8	+14.7				+0.0	52.5	54.0	-1.5	None
3	11481.080M	35.8	+9.2				+0.0	45.0	54.0	-9.0	None
4	17214.000M	31.5	+12.2				+0.0	43.7	54.0	-10.3	None
5	22952.330M	4.0	+38.0				+0.0	42.0	54.0	-12.0	None
	Ave										
^	22952.330M	15.0	+38.0				+0.0	53.0	54.0	-1.0	None
7	34428.340M	15.0	+0.0				+0.0	15.0	54.0	-39.0	None
8	28690.330M	11.8	+0.0				+0.0	11.8	54.0	-42.2	None



Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC15.209 Direct**  
 Work Order #: **75966** Date: 02/23/2001  
 Test Type: **Radiated Scan** Time: 10:25:00  
 Equipment: **Digital Microwave System** Sequence#: 3  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 02

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-A	02
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	3

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
Notebook PC	Dell	Inspiron 3500	0009653D

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-A S/N 02 and IDU S/N 3 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. The EUT is transmitting on mid channel.

**Measurement Data:** Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dBµV	hol-h				Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	23094.500M	12.3	+39.4				+0.0	51.7	54.0	-2.3	None
	Ave										
^	23094.500M	23.3	+39.4				+0.0	62.7	54.0	+8.7	None
3	20639.970M	26.3	+21.5				+0.0	47.8	54.0	-6.2	None
	Ave										
^	20639.970M	31.7	+21.5				+0.0	53.2	54.0	-0.8	None
5	15479.980M	32.4	+15.3				+0.0	47.7	54.0	-6.3	None
	Ave										
^	15479.980M	35.3	+15.3				+0.0	50.6	54.0	-3.4	None
7	11551.130M	35.0	+9.4				+0.0	44.4	54.0	-9.6	None
8	17318.500M	28.2	+11.6				+0.0	39.8	54.0	-14.2	None

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC15.209 Direct**  
 Work Order #: **75966** Date: 01/17/2001  
 Test Type: **Radiated Scan** Time: 10:29:10  
 Equipment: **Digital Microwave System** Sequence#: 4  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 02

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-A	02
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	3

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
Notebook PC	Dell	Inspiron 3500	0009653D

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one se ODU-A S/N 02 and IDU S/N 3 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. The EUT is transmitting on high channel.

**Measurement Data:** Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dBµV	hol-h				Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	15569.950M	23.2	+15.5				+0.0	38.7	54.0	-15.3	None
Ave											
^	15569.980M	45.3	+15.5				+0.0	60.8	54.0	+6.8	None
2	23226.500M	2.0	+38.7				+0.0	40.7	54.0	-13.3	None
Ave											
^	23226.980M	13.0	+38.7				+0.0	51.7	54.0	-2.3	None
3	17419.500M	36.0	+11.1				+0.0	47.1	54.0	-6.9	None
4	11611.330M	37.5	+9.5				+0.0	47.0	54.0	-7.0	None
7	34841.610M	17.2	+0.0				+0.0	17.2	54.0	-36.8	None
8	29033.980M	11.3	+0.0				+0.0	11.3	54.0	-42.7	None

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**

Specification: **FCC15.209**

Work Order #: **75966**

Date: 01/18/2001

Test Type: **Radiated Scan**

Time: 12:19:05

Equipment: **Digital Microwave System**

Sequence#: 16

Manufacturer: Zhone Technologies, Inc.

Tested By: Conan Boyle

Model: SZ-045-N5G-LNK

S/N: 02

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-A	02
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	3
Coaxial Cable, 6-ft	Times Microwave Systems	LMR-600	None
Antenna, 2ft	Gabriel Electronics	SSP2-52B	T92209
Antenna Feedhorn, 2-ft	Gabriel Electronics	118047	90483
Antenna, 6-ft	Gabriel Electronics	SSP6-52A	692828
Antenna Feedhorn, 6-ft	Gabriel Electronics	91240	118046

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	Dell	Inspiron 3500	0009653D
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057

**Test Conditions / Notes:**

This data sheet comprises the following configuration: ODU-A operating on its LOW channel, which is the highest output power channel for that set. The set was tested using the highest and lowest gain antennas on the channels listed above. The lowest gain antenna represents the highest output power of the device and the highest gain antenna represents the lowest output power of the device. Test Setup: The EUT is comprised of a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit), coaxial cable, and either a 2-ft (highest gain) or 6-ft (lowest gain) antenna, along with support equipment that includes two notebook PC's. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable. On the IDU, an RG-58 cable connects DS3 IN and DS3 OUT in loopback. The set is constantly transmitting and receiving autonomously. The RF signal port of the ODU is connected to the antenna connector port of either the 2-ft (high gain) or 6-ft (low gain) antenna via a 6-ft coaxial cable. The unit was tested with both antennas and the data sheet comprises the highest readings from both antenna configurations.

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	hol-h Chase dB	Horn dB	HP-84 dB	rad_c dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1112.967M	21.7	+3.4 +0.0	+23.5	+0.0	+0.0	+0.0	48.6	54.0	-5.4	Vert
2	400.055M QP	45.1	+0.0 +16.4	+0.0	-27.5	+6.1	+0.0	40.1	46.0	-5.9	Vert
^	400.036M	47.7	+0.0 +16.4	+0.0	-27.5	+6.1	+0.0	42.7	46.0	-3.3	Vert
4	60.058M	53.6	+0.0 +5.4	+0.0	-27.9	+2.0	+0.0	33.1	40.0	-6.9	Vert

5	80.033M	51.6	+0.0 +6.8	+0.0	-27.8	+2.4	+0.0	33.0	40.0	-7.0	Horiz
^	80.055M	54.5	+0.0 +6.8	+0.0	-27.8	+2.4	+0.0	35.9	40.0	-4.1	Horiz
7	40.047M	43.7	+0.0 +13.6	+0.0	-27.9	+1.6	+0.0	31.0	40.0	-9.0	Vert
^	40.049M	46.9	+0.0 +13.6	+0.0	-27.9	+1.6	+0.0	34.2	40.0	-5.8	Vert
9	2746.608M	10.8	+6.1 +0.0	+27.5	+0.0	+0.0	+0.0	44.4	54.0	-9.6	Vert

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC 15.207**  
 Work Order #: **75966** Date: 01/18/2001  
 Test Type: **Conducted Emissions** Time: 15:25:34  
 Equipment: **Digital Microwave System** Sequence#: 22  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 02

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-A	02
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	3
Coaxial Cable, 6-ft	Times Microwave Systems	LMR-600	None

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
Notebook PC	Dell	Inspiron 3500	0009653D
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1

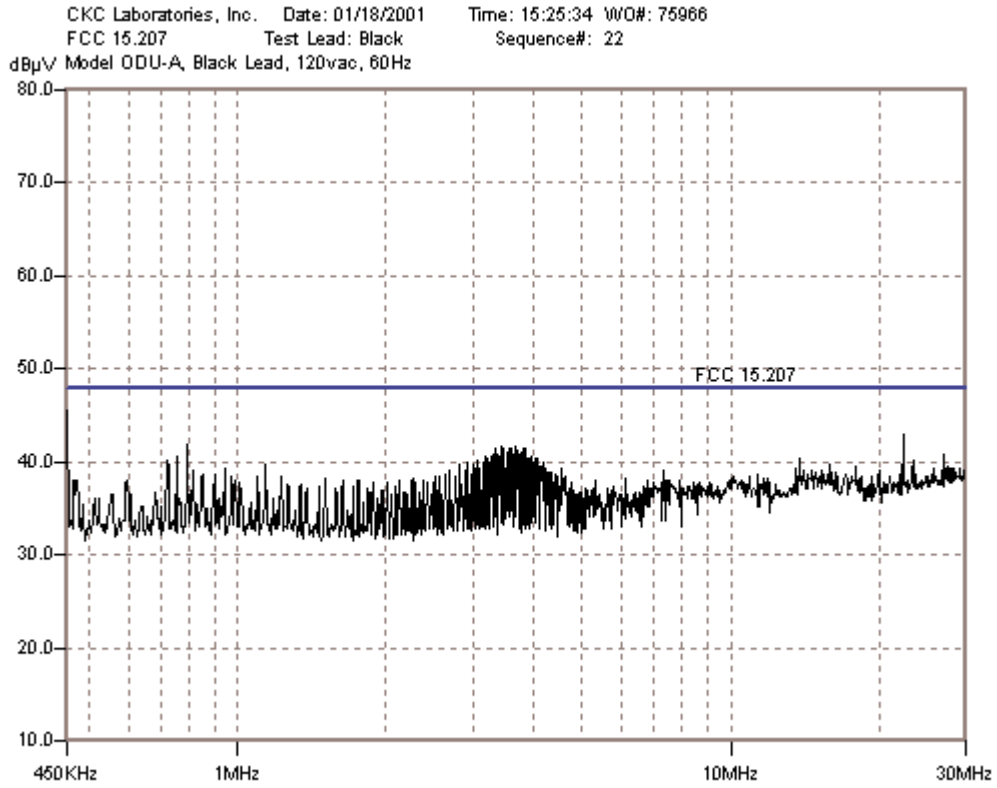
**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-A S/N 02 and IDU S/N 3 - is tested for conducted emissions. The fundamental frequency is 5.775GHz. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is connected to the IBM notebook via a 6-ft serial cable. The units are constantly transmitting and receiving autonomously. An RG-58 cable connects DS3 IN and DS3 OUT in loopback. A 6-ft coaxial cable is connected to the IDU RF connector port and is terminated with a 50-ohm dummy load. The units are constantly transmitting and receiving autonomously. AC Power = 120vac, 60-Hz

**Measurement Data:** Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	cond_		LISN		Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
			BLK-L dB	dB	dB	dB					
1	451.673k	45.2	+0.0 -0.2		+0.5		+0.0	45.5	48.0	-2.5	Black
2	22.446M	38.0	+1.0 +2.8		+1.1		+0.0	42.9	48.0	-5.1	Black
3	789.675k	41.5	+0.1 -0.1		+0.4		+0.0	41.9	48.0	-6.1	Black
4	3.716M	40.9	+0.3 +0.1		+0.5		+0.0	41.8	48.0	-6.2	Black
5	4.042M	39.8	+0.4 +0.1		+0.5		+0.0	40.8	48.0	-7.2	Black
6	27.170M	35.0	+1.0 +3.4		+1.3		+0.0	40.7	48.0	-7.3	Black
7	751.189k	40.2	+0.1 -0.1		+0.4		+0.0	40.6	48.0	-7.4	Black
8	2.932M	39.7	+0.3 +0.0		+0.5		+0.0	40.5	48.0	-7.5	Black

9	13.818M	37.7	+0.7 +1.2	+0.8	+0.0	40.4	48.0	-7.6	Black
10	23.500M	34.9	+1.0 +3.0	+1.2	+0.0	40.1	48.0	-7.9	Black
11	718.560k	39.7	+0.2 -0.2	+0.4	+0.0	40.1	48.0	-7.9	Black



Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**

Specification: **FCC 15.207**

Work Order #: **75966**

Date: 01/18/2001

Test Type: **Conducted Emissions**

Time: 14:54:21

Equipment: **Digital Microwave System**

Sequence#: 21

Manufacturer: Zhone Technologies, Inc.

Tested By: Conan Boyle

Model: SZ-045-N5G-LNK

S/N: 02

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-A	02
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	3
Coaxial Cable, 6-ft	Times Microwave Systems	LMR-600	None

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
Notebook PC	Dell	Inspiron 3500	0009653D
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-A S/N 02 and IDU S/N 3 - is tested for conducted emissions. The fundamental frequency is 5.775GHz. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is connected to the IBM notebook via a 6-ft serial cable. The units are constantly transmitting and receiving autonomously. An RG-58 cable connects DS3 IN and DS3 OUT in loopback. A 6-ft coaxial cable is connected to the IDU RF connector port and is terminated with a 50-ohm dummy load. The units are constantly transmitting and receiving autonomously. AC Power = 120vac, 60-Hz

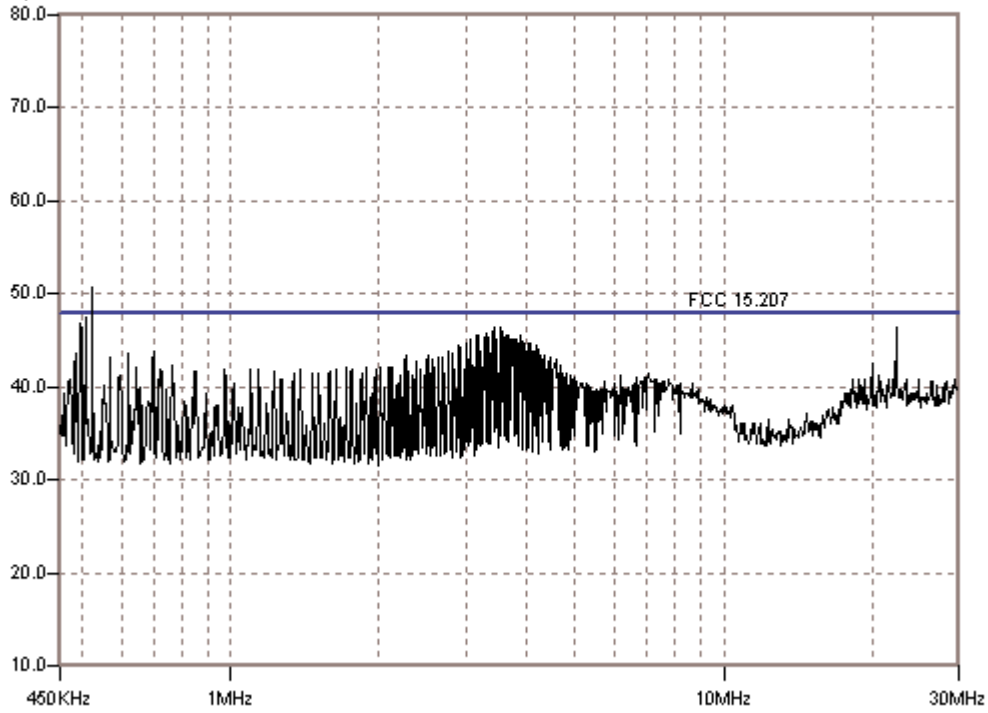
**Measurement Data:** Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	cond_ LISN			WHT-L		Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
			dB	dB	dB	dB	dB					
1	523.624k	50.6	+0.0	+0.4		-0.4	+0.0	50.6	48.0	+2.6	White	
2	508.565k	47.4	+0.0	+0.4		-0.4	+0.0	47.4	48.0	-0.6	White	
3	493.505k	46.9	+0.0	+0.4		-0.4	+0.0	46.9	48.0	-1.1	White	
4	22.446M	41.6	+1.0	+0.9		+2.9	+0.0	46.4	48.0	-1.6	White	
5	3.554M	34.8	+0.3	+0.5		+0.0	+0.0	35.6	48.0	-12.4	White	
6	3.730M	34.8	+0.3	+0.5		+0.0	+0.0	35.6	48.0	-12.4	White	
7	4.030M	33.5	+0.4	+0.5		+0.0	+0.0	34.4	48.0	-13.6	White	
8	2.512M	31.6	+0.3	+0.5		-0.1	+0.0	32.3	48.0	-15.7	White	



9	1.123M	31.6	+0.1	+0.4	-0.2	+0.0	31.9	48.0	-16.1	White
10	975.300k	30.1	+0.1	+0.4	-0.2	+0.0	30.4	48.0	-17.6	White
11	7.054M	28.5	+0.5	+0.5	+0.2	+0.0	29.7	48.0	-18.3	White
12	596.900k	29.1	+0.1	+0.4	-0.4	+0.0	29.2	48.0	-18.8	White
13	514.420k	22.4	+0.0	+0.4	-0.4	+0.0	22.4	48.0	-25.6	White

CKC Laboratories, Inc. Date: 01/18/2001 Time: 14:54:21 WO#: 75966  
FCC 15.207 Test Lead: White Sequence#: 21  
dB $\mu$ V Model ODU-A, White Lead, 120vac, 60Hz



Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC15.209 Direct**  
 Work Order #: **75966** Date: 01/16/2001  
 Test Type: **Radiated Scan** Time: 11:07:26  
 Equipment: **Digital Microwave System** Sequence#: 6  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 01

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-B	01
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	4

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
Notebook PC	Dell	Inspiron 3500	0009653D

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. The EUT is transmitting on low channel.

**Measurement Data:** Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dBµV	hol-h				Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	21001.670M	24.2	+19.3				+0.0	43.5	54.0	-10.5	None
2	15751.670M	23.0	+15.9				+0.0	38.9	54.0	-15.1	None
3	10501.670M	21.5	+8.8				+0.0	30.3	54.0	-23.7	None
4	36751.670M	28.7	+0.0				+0.0	28.7	54.0	-25.3	None
5	26251.670M	25.3	+0.0				+0.0	25.3	54.0	-28.7	None
6	31501.670M	24.3	+0.0				+0.0	24.3	54.0	-29.7	None

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC15.209 Direct**  
 Work Order #: **75966** Date: 01/16/2001  
 Test Type: **Radiated Scan** Time: 11:42:16  
 Equipment: **Radio Up-Converter/Diplexer** Sequence#: 7  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 01

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-B	01
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	4

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
Notebook PC	Dell	Inspiron 3500	0009653D

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. The EUT is transmitting on mid channel.

**Measurement Data:** Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dBµV	hol-h				Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	17744.970M	32.8	+13.4				+0.0	46.2	54.0	-7.8	Horiz
2	15900.830M	25.2	+16.2				+0.0	41.4	54.0	-12.6	Horiz
3	21200.830M	22.3	+18.5				+0.0	40.8	54.0	-13.2	Horiz
4	10600.830M	27.0	+7.6				+0.0	34.6	54.0	-19.4	Horiz
5	37100.840M	27.8	+0.0				+0.0	27.8	54.0	-26.2	Horiz
6	31800.830M	26.0	+0.0				+0.0	26.0	54.0	-28.0	Horiz
7	26500.830M	24.7	+0.0				+0.0	24.7	54.0	-29.3	Horiz

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Customer: **Zhone Technologies, Inc.**  
 Specification: **FCC15.209 Direct**  
 Work Order #: **75966** Date: 01/17/2001  
 Test Type: **Radiated Scan** Time: 09:04:48  
 Equipment: **Digital Microwave System** Sequence#: 8  
 Manufacturer: Zhone Technologies, Inc. Tested By: Conan Boyle  
 Model: SZ-045-N5G-LNK  
 S/N: 01

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-B	01
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	4

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
Notebook PC	Dell	Inspiron 3500	0009653D

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for direct power out. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable and a 12-in RG-58 cable connects DS3 IN and DS3 OUT in loopback. The units are constantly transmitting and receiving autonomously. The RF signal port of the IDU is connected to the RF Input of a spectrum analyzer. The EUT is transmitting on high channel.

**Measurement Data:** Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dB $\mu$ V	hol-h				Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	15991.860M	28.3	+16.4				+0.0	44.7	54.0	-9.3	Vert
2	21345.030M	24.8	+18.0				+0.0	42.8	54.0	-11.2	Vert
3	10657.530M	26.8	+6.9				+0.0	33.7	54.0	-20.3	Vert
4	37301.190M	29.5	+0.0				+0.0	29.5	54.0	-24.5	Vert
5	31972.190M	28.2	+0.0				+0.0	28.2	54.0	-25.8	Vert
6	26674.030M	23.7	+0.0				+0.0	23.7	54.0	-30.3	Vert

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Customer: **Zhone Technologies, Inc.**

Specification: **FCC15.209**

Work Order #: **75966**

Date: 01/18/2001

Test Type: **Radiated Scan**

Time: 12:19:05

Equipment: **Digital Microwave System**

Sequence#: 18

Manufacturer: Zhone Technologies, Inc.

Tested By: Conan Boyle

Model: SZ-045-N5G-LNK

S/N: 01

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-B	01
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	4
Coaxial Cable, 6-ft	Times Microwave Systems	LMR-600	None
Antenna, 2ft	Gabriel Electronics	SSP2-52B	T92209
Antenna Feedhorn, 2-ft	Gabriel Electronics	118047	90483
Antenna, 6-ft	Gabriel Electronics	SSP6-52A	692828
Antenna Feedhorn, 6-ft	Gabriel Electronics	91240	118046

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	Dell	Inspiron 3500	0009653D
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057

**Test Conditions / Notes:**

This data sheet comprises the following configuration: ODU-B operating on its MID channel, which is the highest output power channel for that set. The set was tested using the highest and lowest gain antennas on the channels listed above. The lowest gain antenna represents the highest output power of the device and the highest gain antenna represents the lowest output power of the device. Test Setup: The EUT is comprised of a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit), coaxial cable, and either a 2-ft (highest gain) or 6-ft (lowest gain) antenna, along with support equipment that includes two notebook PC's. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is also connected to the IBM notebook via a 6-ft serial cable. On the IDU, an RG-58 cable connects DS3 IN and DS3 OUT in loopback. The set is constantly transmitting and receiving autonomously. The RF signal port of the ODU is connected to the antenna connector port of either the 2-ft (high gain) or 6-ft (low gain) antenna via a 6-ft coaxial cable. The unit was tested with both antennas and the data sheet comprises the highest readings from both antenna configurations.

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Reading listed by margin.				Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			hol-h Chase dB	Horn dB	HP-84 dB	rad_c dB					
1	1112.967M	21.7	+3.4 +0.0	+23.5	+0.0	+0.0	+0.0	48.6	54.0	-5.4	Vert
2	400.055M	45.1	+0.0 +16.4	+0.0	-27.5	+6.1	+0.0	40.1	46.0	-5.9	Vert
^	400.036M	47.7	+0.0 +16.4	+0.0	-27.5	+6.1	+0.0	42.7	46.0	-3.3	Vert
4	60.058M	53.6	+0.0 +5.4	+0.0	-27.9	+2.0	+0.0	33.1	40.0	-6.9	Vert

5	80.033M	51.6	+0.0	+0.0	-27.8	+2.4	+0.0	33.0	40.0	-7.0	Horiz
	QP		+6.8								
^	80.055M	54.5	+0.0	+0.0	-27.8	+2.4	+0.0	35.9	40.0	-4.1	Horiz
			+6.8								
7	40.047M	43.7	+0.0	+0.0	-27.9	+1.6	+0.0	31.0	40.0	-9.0	Vert
	QP		+13.6								
^	40.049M	46.9	+0.0	+0.0	-27.9	+1.6	+0.0	34.2	40.0	-5.8	Vert
			+13.6								
9	2746.608M	10.8	+6.1	+27.5	+0.0	+0.0	+0.0	44.4	54.0	-9.6	Vert
			+0.0								

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**

Specification: **FCC 15.207**

Work Order #: **75966**

Date: 01/18/2001

Test Type: **Conducted Emissions**

Time: 14:12:47

Equipment: **Digital Microwave System**

Sequence#: 19

Manufacturer: Zhone Technologies, Inc.

Tested By: Conan Boyle

Model: SZ-045-N5G-LNK

S/N: 01

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-B	01
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	4
Coaxial Cable, 6-ft	Times Microwave Systems	LMR-600	None

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
Notebook PC	Dell	Inspiron 3500	0009653D
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1

**Test Conditions / Notes:**

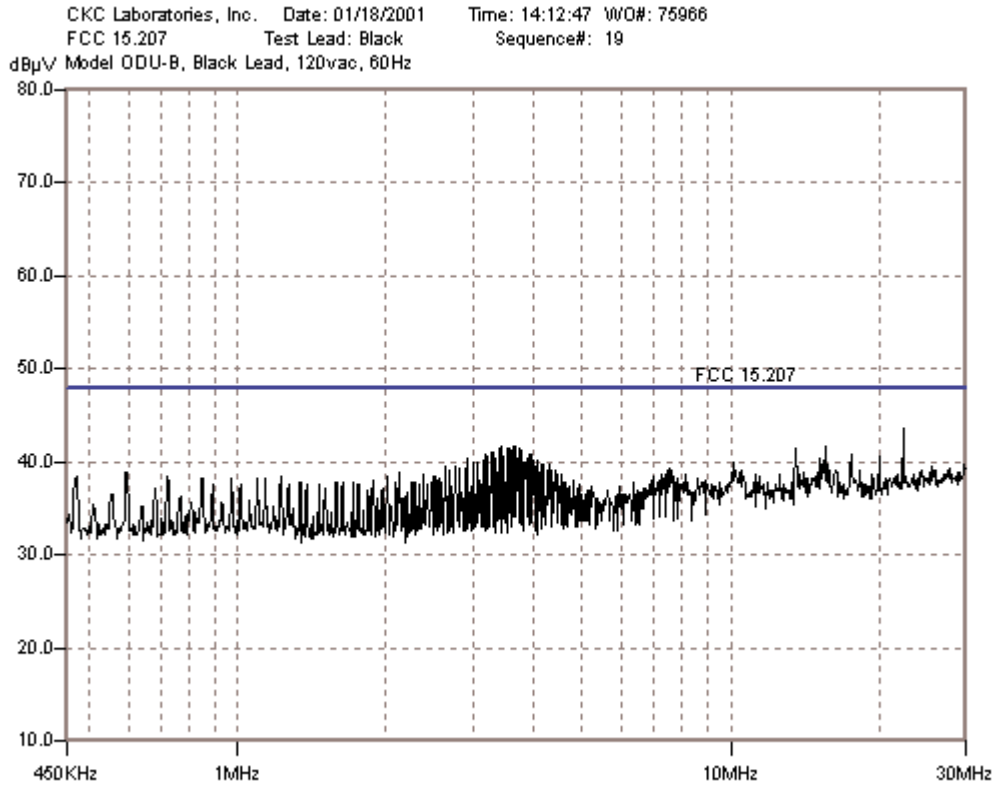
The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for conducted emissions. The fundamental frequency is 5.300GHz. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is connected to the IBM notebook via a 6-ft serial cable. The units are constantly transmitting and receiving autonomously. An RG-58 cable connects DS3 IN and DS3 OUT in loopback. A 6-ft coaxial cable is connected to the IDU RF connector port and is terminated with a 50-ohm dummy load. The units are constantly transmitting and receiving autonomously. AC Power = 120vac, 60-Hz

**Measurement Data:** Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	cond_		LISN		Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
			BLK-L dB	dB	dB	dB					
1	3.442M	40.8	+0.3 +0.1		+0.5		+0.0	41.7	48.0	-6.3	Black
2	15.575M	38.6	+0.7 +1.5		+0.8		+0.0	41.6	48.0	-6.4	Black
3	3.650M	40.7	+0.3 +0.1		+0.5		+0.0	41.6	48.0	-6.4	Black
4	13.584M	38.7	+0.7 +1.2		+0.8		+0.0	41.4	48.0	-6.6	Black
5	3.729M	40.5	+0.3 +0.1		+0.5		+0.0	41.4	48.0	-6.6	Black
6	3.566M	40.5	+0.3 +0.1		+0.5		+0.0	41.4	48.0	-6.6	Black
7	3.523M	40.5	+0.3 +0.1		+0.5		+0.0	41.4	48.0	-6.6	Black



8	3.394M	40.5	+0.3 +0.1	+0.5	+0.0	41.4	48.0	-6.6	Black
9	3.770M	40.4	+0.3 +0.1	+0.5	+0.0	41.3	48.0	-6.7	Black
10	3.609M	40.4	+0.3 +0.1	+0.5	+0.0	41.3	48.0	-6.7	Black
11	3.270M	40.3	+0.3 +0.0	+0.5	+0.0	41.1	48.0	-6.9	Black
12	3.313M	40.2	+0.3 +0.0	+0.5	+0.0	41.0	48.0	-7.0	Black
13	3.947M	39.8	+0.4 +0.1	+0.5	+0.0	40.8	48.0	-7.2	Black
14	17.566M	37.3	+0.8 +1.8	+0.8	+0.0	40.7	48.0	-7.3	Black
15	3.899M	39.7	+0.4 +0.1	+0.5	+0.0	40.7	48.0	-7.3	Black
16	3.189M	39.9	+0.3 +0.0	+0.5	+0.0	40.7	48.0	-7.3	Black
17	20.026M	36.7	+0.9 +2.2	+0.8	+0.0	40.6	48.0	-7.4	Black
18	3.480M	39.6	+0.3 +0.1	+0.5	+0.0	40.5	48.0	-7.5	Black
19	3.232M	39.7	+0.3 +0.0	+0.5	+0.0	40.5	48.0	-7.5	Black
20	15.107M	37.5	+0.7 +1.4	+0.8	+0.0	40.4	48.0	-7.6	Black
21	2.935M	39.6	+0.3 +0.0	+0.5	+0.0	40.4	48.0	-7.6	Black
22	3.865M	39.3	+0.4 +0.1	+0.5	+0.0	40.3	48.0	-7.7	Black
23	3.694M	39.4	+0.3 +0.1	+0.5	+0.0	40.3	48.0	-7.7	Black
24	3.356M	39.4	+0.3 +0.1	+0.5	+0.0	40.3	48.0	-7.7	Black
25	4.070M	39.1	+0.4 +0.1	+0.5	+0.0	40.1	48.0	-7.9	Black
26	3.981M	39.1	+0.4 +0.1	+0.5	+0.0	40.1	48.0	-7.9	Black
27	3.146M	39.3	+0.3 +0.0	+0.5	+0.0	40.1	48.0	-7.9	Black
28	3.824M	39.0	+0.4 +0.1	+0.5	+0.0	40.0	48.0	-8.0	Black
29	3.021M	39.2	+0.3 +0.0	+0.5	+0.0	40.0	48.0	-8.0	Black
30	22.441M	27.7	+1.0 +2.8	+1.1	+0.0	32.6	48.0	-15.4	Black
^	22.446M	38.6	+1.0 +2.8	+1.1	+0.0	43.5	48.0	-4.5	Black



Test Location: CKC Laboratories, Inc. • 480 Los Viboras Rd. • Hollister, CA 95023 • 831-637-8176

Customer: **Zhone Technologies, Inc.**

Specification: **FCC 15.207**

Work Order #: **75966**

Date: 01/18/2001

Test Type: **Conducted Emissions**

Time: 14:31:53

Equipment: **Digital Microwave System**

Sequence#: 20

Manufacturer: Zhone Technologies

Tested By: Conan Boyle

Model: SZ-045-N5G-LNK

S/N: 01

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Radio Up-Converter/Diplexer	Zhone Technologies, Inc.	SZ-045-N56-ODU-B	01
DS3 Data Interface	Zhone Technologies, Inc.	Sky Zhone 45	4
Coaxial Cable, 6-ft	Times Microwave Systems	LMR-600	None

**Support Devices:**

Function	Manufacturer	Model #	S/N
Notebook PC	IBM	Thinkpad T20	Zhone Tech. Inc. Asset #11057
AC-DC Adapter	IBM	P/N 02K6657	1Z0ZA022ZM8
Notebook PC	Dell	Inspiron 3500	0009653D
AC-DC Adapter	Dell	P/N 7832D	17972-94Q-1QZ1

**Test Conditions / Notes:**

The EUT is comprised of two identical sets of equipment. Each set includes a Radio Up-Converter/Diplexer ODU (Outdoor Unit) and a DS3 Data Interface IDU (Indoor Unit) and support equipment that includes two notebook PC's. Test Setup: For this test, one set - ODU-B S/N 01 and IDU S/N 4 - is tested for conducted emissions. The fundamental frequency is 5.300GHz. The ODU is connected to the IDU via a single 50-ft, RG-6, 75-ohm, coaxial cable. The IDU is connected to the Dell PC via a 6-ft, Cat 5, Ethernet cable. The IDU is connected to the IBM notebook via a 6-ft serial cable. The units are constantly transmitting and receiving autonomously. An RG-58 cable connects DS3 IN and DS3 OUT in loopback. A 6-ft coaxial cable is connected to the IDU RF connector port and is terminated with a 50-ohm dummy load. The units are constantly transmitting and receiving autonomously. AC Power = 120vac, 60-Hz

**Measurement Data:** Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	cond_ LISN			WHT-L		Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
			dB	dB	dB	dB	dB					
1	27.131M	43.5	+1.0	+1.2	+3.6	+0.0	49.3	48.0	+1.3	White		
2	22.446M	41.8	+1.0	+0.9	+2.9	+0.0	46.6	48.0	-1.4	White		
3	3.550M	44.0	+0.3	+0.5	+0.0	+0.0	44.8	48.0	-3.2	White		
^	3.549M	45.6	+0.3	+0.5	+0.0	+0.0	46.4	48.0	-1.6	White		
5	20.014M	38.2	+0.9	+0.7	+2.4	+0.0	42.2	48.0	-5.8	White		
^	20.015M	41.8	+0.9	+0.7	+2.4	+0.0	45.8	48.0	-2.2	White		
7	1.884M	41.6	+0.2	+0.4	-0.1	+0.0	42.1	48.0	-5.9	White		

8	6.920M	40.4	+0.5	+0.5	+0.2	+0.0	41.6	48.0	-6.4	White
9	721.200k	41.2	+0.2	+0.4	-0.2	+0.0	41.6	48.0	-6.4	White
10	972.500k	41.2	+0.1	+0.4	-0.2	+0.0	41.5	48.0	-6.5	White
11	4.464M	40.2	+0.4	+0.5	+0.0	+0.0	41.1	48.0	-6.9	White
	QP									
^	4.464M	42.5	+0.4	+0.5	+0.0	+0.0	43.4	48.0	-4.6	White
13	10.150M	36.7	+0.6	+0.6	+0.4	+0.0	38.3	48.0	-9.7	White

