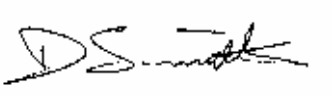
TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Zinwave Ltd
2700 DAS

To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

Test Report Serial No:
RFI/RPTE4/RP48409JD10A

Supersedes Test Report Serial No:
RFI/RPTE3/RP48409JD10A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: **pp** 	
Tested By: Jamie Huckerby **pp** 	**Checked By: Steven Wong** **pp** 
Report Copy No: PDF01	
Issue Date: 08 January 2007	**Test Dates: 31 August 2006 to 02 October 2006**

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Registered in England and Wales. Company number:2117901

Test of: **Zinwave Ltd**
2700 DAS
To: **FCC Part 90: 2005**
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2700 DAS
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Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

1. Client Information

Company Name:	Zinwave Ltd
Address:	Harston Mill Harston Cambridge CB2 5GG
Contact Name:	Mr D Parkinson

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Description:	Hub Unit (HU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	00-17-68-00-01-00
Serial Number:	0005256371
Hardware Revision:	1.06
Software Revision:	1.05
FCC ID Number:	UPO2700
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 10F54BEB
Serial Number:	0005256326
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Test of: **Zinwave Ltd**
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Identification of Equipment Under Test (EUT) (Continued)

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 32CF5825
Serial Number:	0005256279
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 10F549E7
Serial Number:	0005256290
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 10F54D25
Serial Number:	0005256317
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

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Identification of Equipment Under Test (EUT) (Continued)

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 10F337D5
Serial Number:	0005256323
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 10F54B62
Serial Number:	0005256282
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 32CFB658
Serial Number:	0005256327
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

Identification of Equipment Under Test (EUT) (Continued)

Description:	Antenna Unit (AU)
Brand Name:	Zinwave
Model Name or Number:	2700 DAS
Unique Type Identification:	MID: 10F54C66
Serial Number:	0005256344
Hardware Revision:	1.08
Software Revision:	1.05
FCC ID Number:	UPO2760
Country of Manufacture:	UK
Date of Receipt:	31 August 2006

2.2. Description of EUT

The equipment under test is a broadband Distributed Antenna System operating from 370 MHz to 2.5 GHz. The system utilises multiple technologies including iDEN, GSM 850 & 1900.

All of the above technology options were connected and operating during the test. The results of this test report refer only to the measurements made in the 806 to 825 MHz band with iDEN.

2.3. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

2.4. Additional Information Related to Testing

Power Supply Requirement:	Nominal 115 V, 60 Hz AC Mains Supply		
Intended Operating Environment:	Commercial, Light Industry, Heavy Industry		
Equipment Category:	"Distributed Antenna System" (DAS).		
Type of Unit:	Base Station (fixed use)		
Transmit Frequency Range:	806.025 to 823.975 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	-	806.025
	Middle	-	815.500
	Top	-	823.975
Maximum Power Output (EIRP)	+14.0 dBm		

2.5. Port Identification

Port	Description
1	I/O Ports (4 x Input, 4 x Output)
2	Serial Port for Comms
3	Ethernet Port
4	8 x Fibre Optic Ports

2.6. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	Inspiron 1300
Serial Number:	FF559A01
Cable Length and Type:	Cat 5 – 2 Metres
Connected to Port:	Ethernet

Description:	802.11G
Brand Name:	Cisco Systems
Model Name or Number:	Aironet 1200 Series
Serial Number:	FCZ0937Z15E
Cable Length and Type:	SMA – 2 Metres
Connected to Port:	Input of HU/AU

3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 90: 2005
Title:	Code of Federal Regulations, Part 15 (47CFR90) Radio Frequency Devices.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-C-2004
Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

As the system is a broadband amplifier covering multiple bands, the system for spurious emissions was only tested on the middle channel. For radiated spurious emissions the system was only tested fully loaded.

5. Operation of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

The system was tested in single bands at a time (iDEN, GSM 850 and PCS 1900) and also a fully loaded system was tested for proof of compliance.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration unless otherwise stated:

The equipment was set at maximum gain and the input from iDEN was adjusted to give maximum nominal output power. The equipment was set to 1x2 (1 input on the HU through to 2 outputs on 2 AU) for testing to FCC Part 90.

Additionally, the fully loaded system spurious emissions was tested on 4 configurations:
1 – Conducted, set to maximum gain on a 4x8 configuration with 4 different technology types (uplink and downlink)
2 – Conducted, set to maximum gain on a 1x2 configuration with 4 different technology types (downlink only)
3 – Conducted, set to maximum gain on a 4x8 configuration with the 4 inputs having different iDEN channels (downlink only)
4 – Radiated, set to maximum gain on a 4x8 configuration with 4 different technology types (uplink and downlink)

6. Summary of Test Results

Range of Measurements	Specification Section Reference	Port Type	Compliancy Status
Receiver/Idle AC Conducted Spurious Emissions	15.107	AC Mains Input	Note 1
Receiver/Idle Radiated Emissions	15.109	Enclosure	Note 1
Transmitter AC Conducted Emissions	15.207	AC Mains	Complied
Transmitter Carrier Output Power (ERP)	90.205/90.267 TIA-603-C Section 2.2.1	Antenna Terminals	Complied
Transmitter Frequency Stability (Temperature & Voltage Variation)	90.213/2.1055 TIA-603-C Section 2.2.2	Antenna Terminals	Complied
Transmitter Occupied Bandwidth (Bandwidth Limitations)	90.209/90.267/2.1049	Antenna Terminals	Complied
Transmitter Conducted Emissions (Out of Band)	90.210 TIA-603-C Section 2.2.13	Antenna Terminals	Complied
Transmitter Conducted Emissions (Band Edge)	90.210 TIA-603-C Section 2.2.13	Antenna Terminals	Complied
Transmitter Radiated Emissions (Out of Band)	90.210 TIA-603-C Section 2.2.12	Antenna Terminals	Complied
Intermodulation	90.210 TIA-603-C Section 2.2.13	Antenna	Complied
Out of Band Rejection	N/A	Antenna	For Reference Purpose
Fully Loaded with 4 x Signals	90.210 TIA-603-C Section 2.2.13	Antenna	Complied

Note(s):

1. *Testing had already been performed on a separate report covering only FCC part 15.107 & 15.109 (*RFI/RPTE1/RP48409JD13A*). Therefore, No further Receiver Radiated Emissions tests were performed in this report.*

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%.
Please refer to Section 8 for details of measurement uncertainties.

7.2. Test Results

7.2.1. Transmitter AC Conducted Spurious Emissions: Section 15.207

The EUT was configured for ac conducted emission measurements as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
8.149189	Live	41.2	60.0	18.8	Complied
8.152074	Neutral	40.9	60.0	19.1	Complied
12.318868	Live	41.6	60.0	18.4	Complied
12.483958	Neutral	42.4	60.0	17.6	Complied
12.691032	Live	42.8	60.0	17.2	Complied
12.707766	Neutral	44.2	60.0	15.8	Complied
13.081734	Live	43.5	60.0	16.5	Complied
13.266263	Neutral	44.4	60.0	15.6	Complied
13.439429	Neutral	44.2	60.0	15.8	Complied
13.460892	Live	44.5	60.0	15.5	Complied
13.630091	Neutral	43.9	60.0	16.1	Complied
13.631934	Live	44.6	60.0	15.4	Complied
13.829048	Neutral	41.8	60.0	18.2	Complied
13.842615	Live	43.1	60.0	16.9	Complied
14.346864	Live	39.7	60.0	20.3	Complied
14.370452	Neutral	39.6	60.0	20.4	Complied

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Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
8.149189	Live	34.6	50.0	15.4	Complied
8.152074	Neutral	35.5	50.0	14.5	Complied
12.318868	Live	33.2	50.0	16.8	Complied
12.483958	Neutral	32.5	50.0	17.5	Complied
12.691032	Live	35.0	50.0	15.0	Complied
12.707766	Neutral	37.0	50.0	13.0	Complied
13.081734	Live	34.4	50.0	15.6	Complied
13.266263	Neutral	34.8	50.0	15.2	Complied
13.439429	Neutral	37.2	50.0	12.8	Complied
13.460892	Live	36.0	50.0	14.0	Complied
13.630091	Neutral	35.9	50.0	14.1	Complied
13.631934	Live	36.9	50.0	13.1	Complied
13.829048	Neutral	33.0	50.0	17.0	Complied
13.842615	Live	32.8	50.0	17.2	Complied
14.346864	Live	31.6	50.0	18.4	Complied
14.370452	Neutral	30.0	50.0	20.0	Complied

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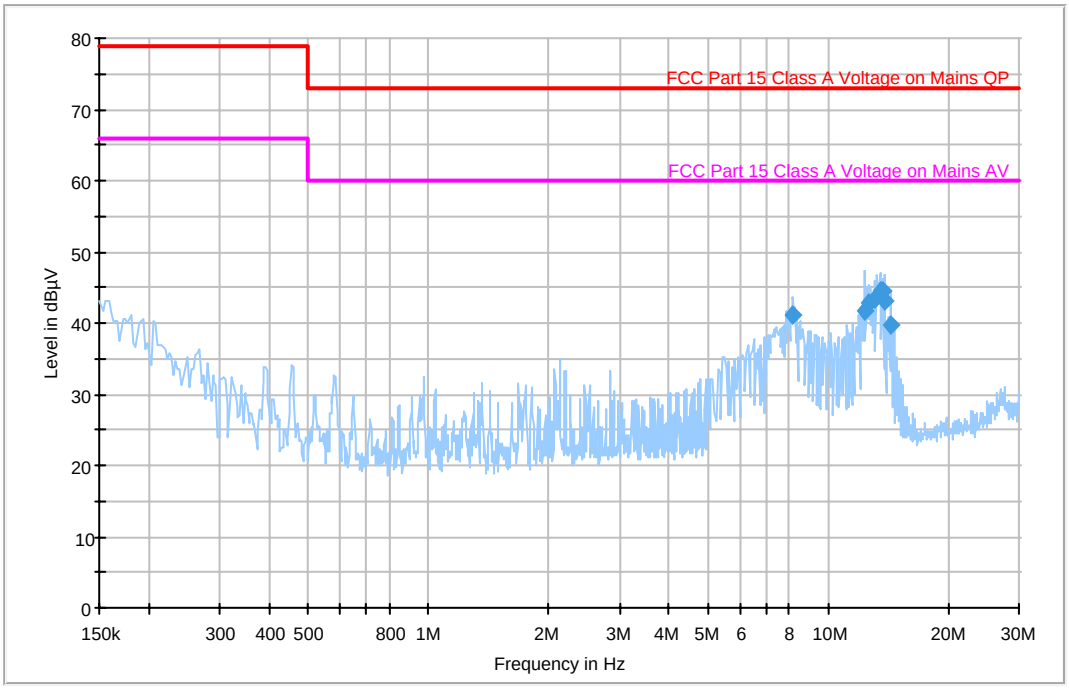
Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)

Live Line



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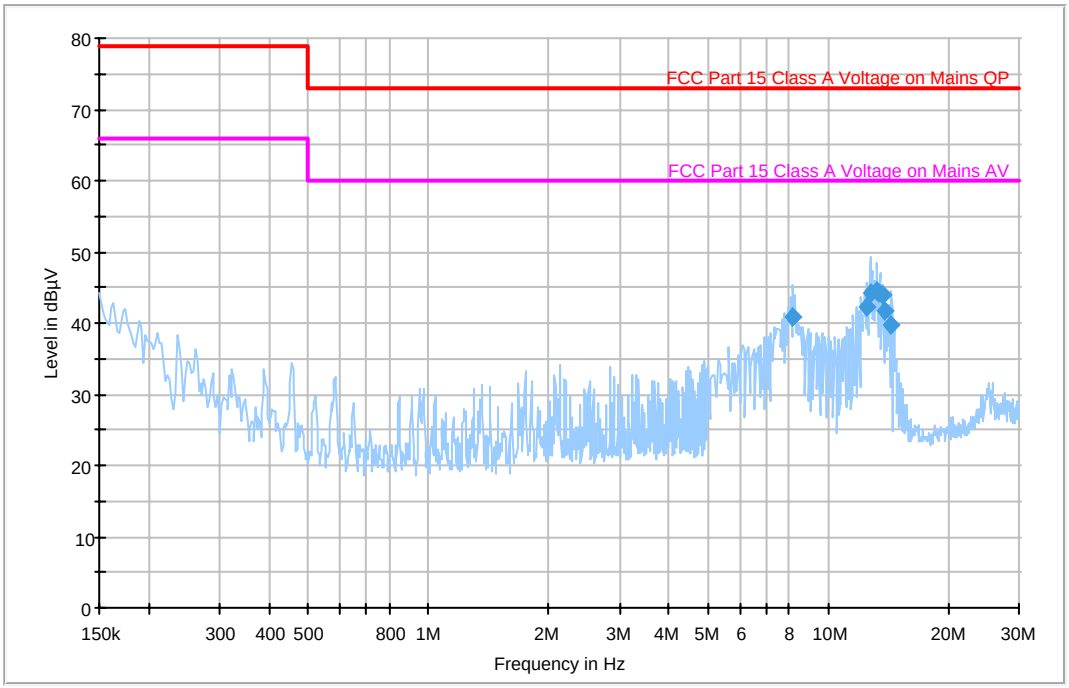
Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)

Neutral Line



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

7.3. Transmitter Carrier Output Power (ERP): 90.205/90.267

The EUT was configured as for conducted RF output power as described in Section 9 of this report.

Tests were performed to identify the EUT's maximum conducted transmit power.

Power levels expressed in EIRP.

Results:

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
Bottom	806.025	6.0	8.0	14.0	33.0	19.0	Complied
Middle	815.500	6.0	8.0	14.0	33.0	19.0	Complied
Top	823.975	5.9	8.0	13.9	33.0	19.1	Complied

Note(s):

1. Due to the measurements being made via a power sensor, no graphs are available.

7.4. Transmitter Frequency Stability (Temperature Variation): Section 90.213/2.1055

The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

Results:

Bottom Channel (806.025 MHz)

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	823.975	0.0	0.0	2.5	2.5	Complied
-20	823.975	0.0	0.0	2.5	2.5	Complied
-10	823.975	0.0	0.0	2.5	2.5	Complied
0	823.975	0.0	0.0	2.5	2.5	Complied
10	823.975	0.0	0.0	2.5	2.5	Complied
20	823.975	0.0	0.0	2.5	2.5	Complied
30	823.975	0.0	0.0	2.5	2.5	Complied
40	823.975	0.0	0.0	2.5	2.5	Complied
50	823.975	0.0	0.0	2.5	2.5	Complied

Transmitter Frequency Stability (Temperature Variation): Section 90.213/2.1055 (Continued)

Results:

Middle Channel (815.5 MHz)

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	815.5	0.0	0.0	2.5	2.5	Complied
-20	815.5	0.0	0.0	2.5	2.5	Complied
-10	815.49999	1.0	0.0	2.5	2.5	Complied
0	815.5	0.0	0.0	2.5	2.5	Complied
10	815.5	0.0	0.0	2.5	2.5	Complied
20	815.5	0.0	0.0	2.5	2.5	Complied
30	815.5	0.0	0.0	2.5	2.5	Complied
40	815.5	0.0	0.0	2.5	2.5	Complied
50	815.5	0.0	0.0	2.5	2.5	Complied

Transmitter Frequency Stability (Temperature Variation): Section 90.213/2.1055 (Continued)

Results:

Top Channel (823.975 MHz)

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	823.975	0.0	0.0	2.5	2.5	Complied
-20	823.975	0.0	0.0	2.5	2.5	Complied
-10	823.975	0.0	0.0	2.5	2.5	Complied
0	823.975	0.0	0.0	2.5	2.5	Complied
10	823.975	0.0	0.0	2.5	2.5	Complied
20	823.975	1.0	0.0	2.5	2.5	Complied
30	823.975	0.0	0.0	2.5	2.5	Complied
40	823.975	0.0	0.0	2.5	2.5	Complied
50	823.975	0.0	0.0	2.5	2.5	Complied

7.5. Transmitter Frequency Stability (Voltage Variation): Section 90.213/2.1055

The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

Results:

Bottom Channel (806.025 MHz)

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
93.5	806.025	0.0	0.0	2.5	2.5	Complied
110.0	806.025	0.0	0.0	2.5	2.5	Complied
126.5	806.025	0.0	0.0	2.5	2.5	Complied

Middle Channel (815.500 MHz)

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
93.5	815.500	0.0	0.0	2.5	2.5	Complied
110.0	815.500	0.0	0.0	2.5	2.5	Complied
126.5	815.500	0.0	0.0	2.5	2.5	Complied

Top Channel (823.975 MHz)

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
93.5	823.975	0.0	0.0	2.5	2.5	Complied
110.0	823.975	0.0	0.0	2.5	2.5	Complied
126.5	823.975	0.0	0.0	2.5	2.5	Complied

7.6. Transmitter Occupied Bandwidth: Section 90.209/90.267/2.1049

The EUT was configured as for Occupied Bandwidth measurements as described in Section 9 of this report.

Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom	806.025	0.2	0.2	28.457
Middle	815.500	0.2	0.2	28.257
Top	823.975	0.2	0.2	28.657

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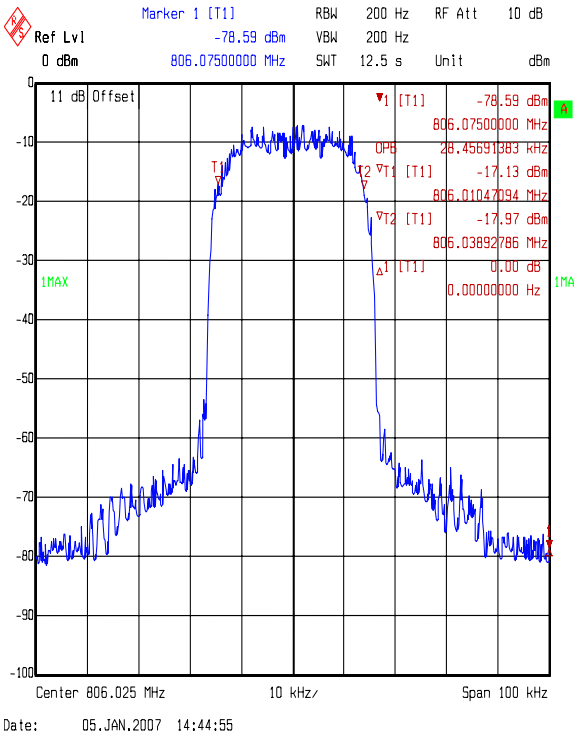
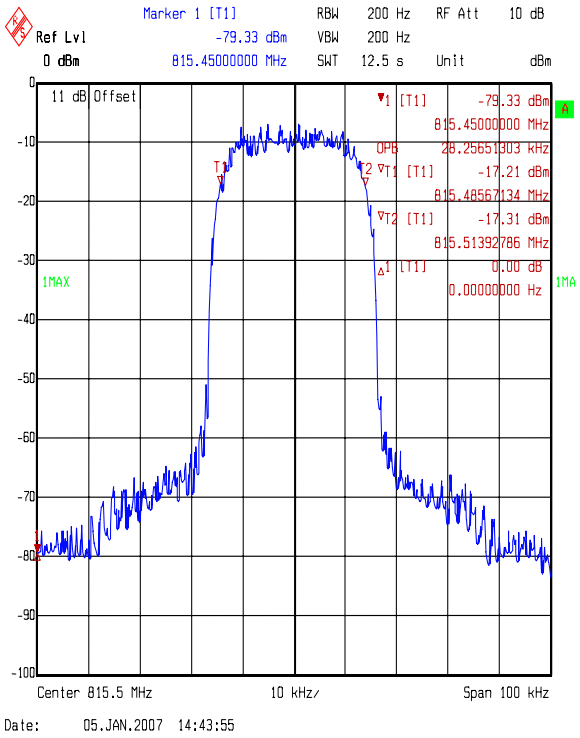
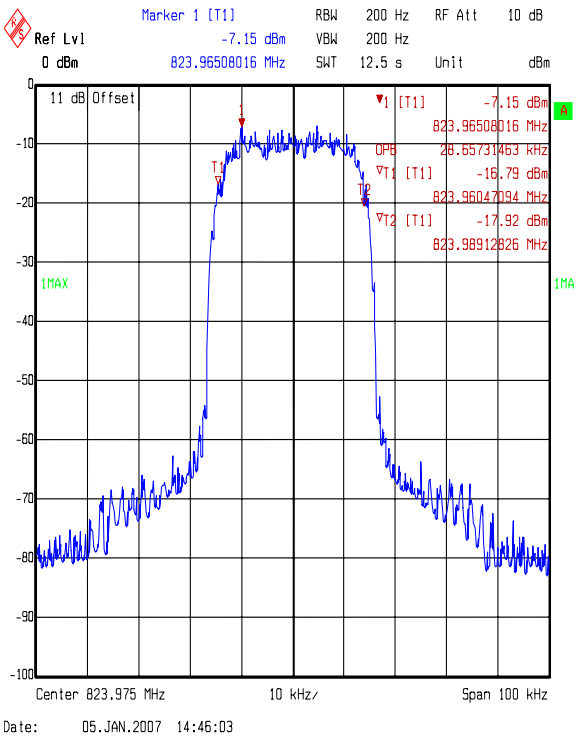
Transmitter Occupied Bandwidth: Section 90.209/90.267/2.1049 (Continued)







7.7. Transmitter Out of Band Conducted Emissions: Section 90.210

The EUT was configured as for transmitter conducted emissions measurements as described in Section 9 of this report.

Tests were performed to identify the maximum transmitter conducted emission levels.

Results:

Bottom Channel

Frequency (GHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1.613	-30.8	-13.0	17.8	Complied

Middle Channel

Frequency (GHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1.627	-29.0	-13.0	16.0	Complied

Top Channel

Frequency (GHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2.473	-30.7	-13.0	17.7	Complied

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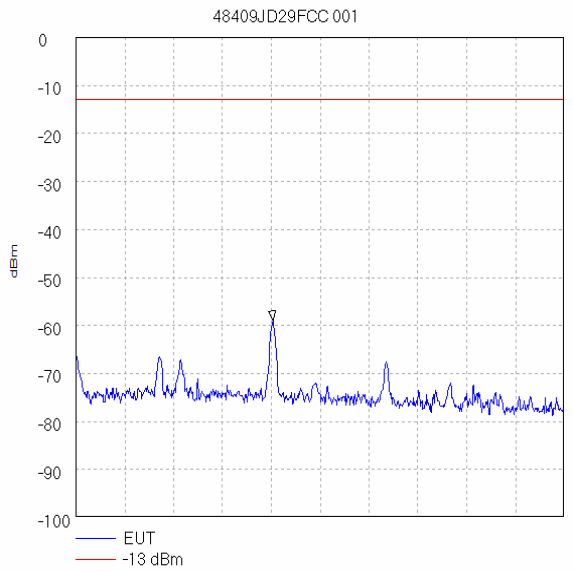
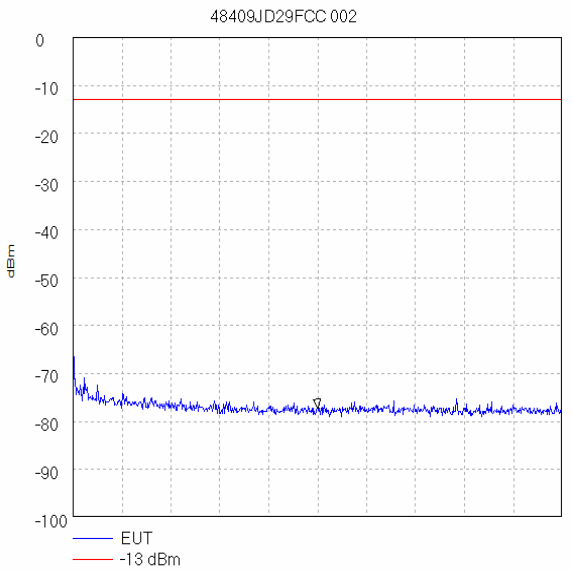
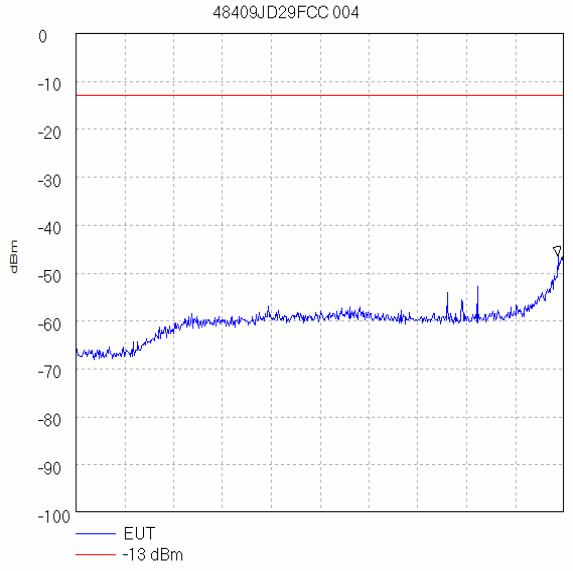
Transmitter Out of Band Conducted Emissions – Bottom Channel: Section 90.210 (Continued)



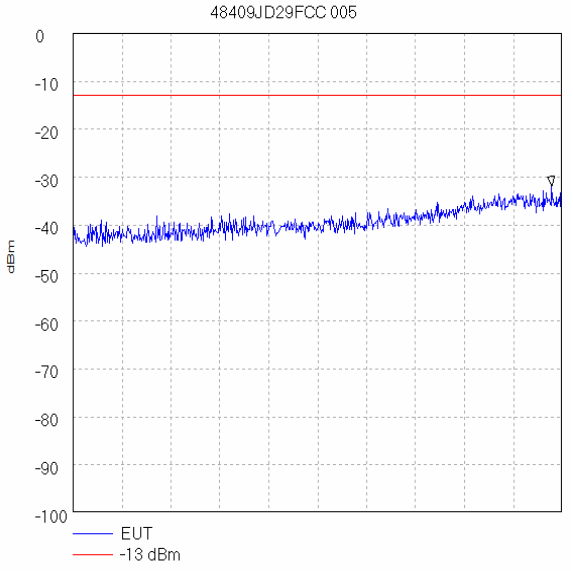
Start 9.0 kHz; Stop 150.0 kHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 kHz; VBW 1.0 kHz; Att 10 dB; Swp 360.0 mS
Peak 65.87 kHz, -59.0 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:25:49



Start 150.0 kHz; Stop 30.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 10.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 750.0 mS
Peak 15.075 MHz, -77.33 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:26:37



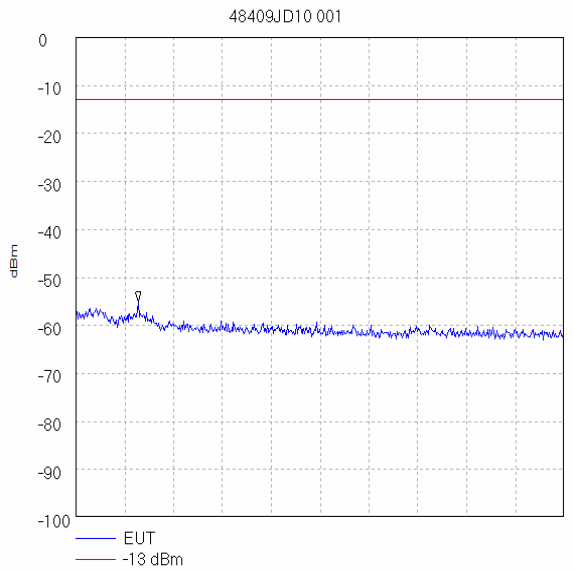
Start 30.0 MHz; Stop 800.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 200.0 mS
Peak 789.733 MHz, -46.33 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:28:43



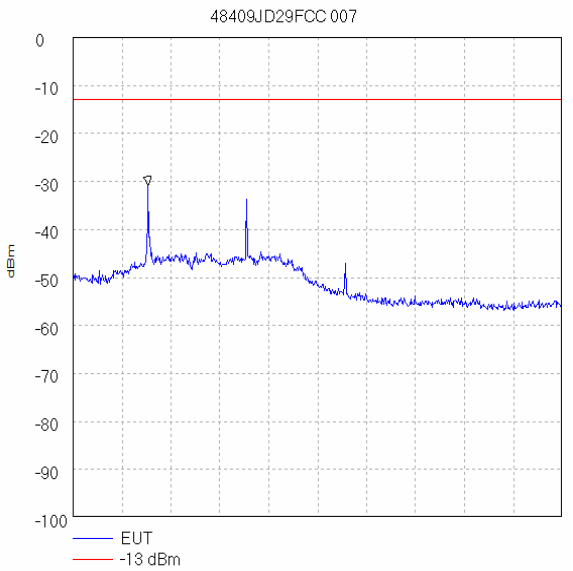
Start 800.0 MHz; Stop 806.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 50.0 mS
Peak 805.87 MHz, -31.83 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:29:32

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

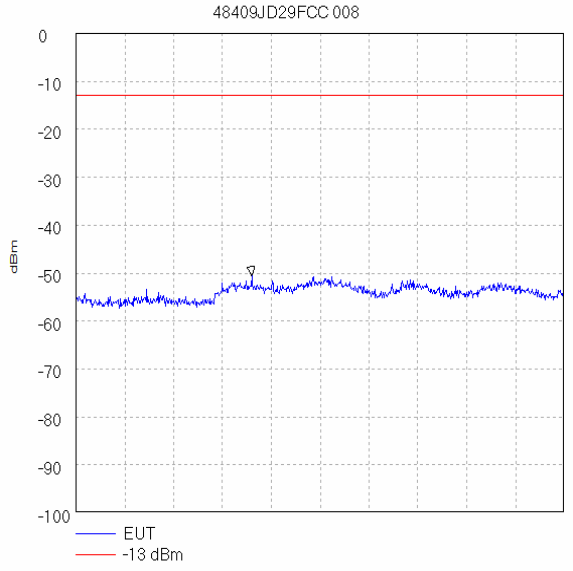
Transmitter Out of Band Conducted Emissions – Bottom Channel: Section 90.210 (Continued)



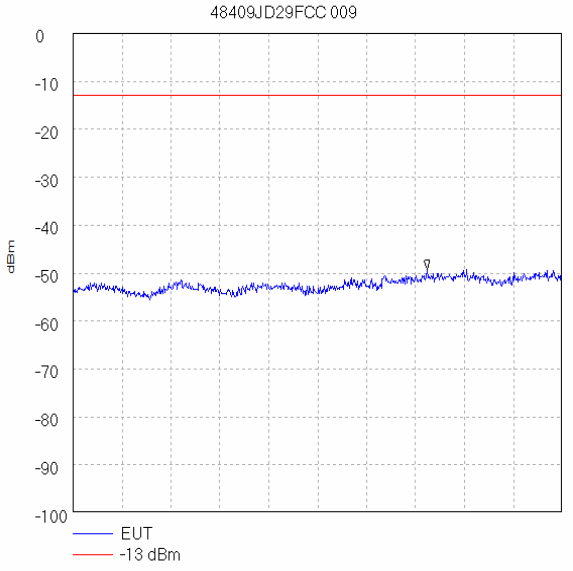
Start 824.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 50.0 mS
Peak 846.573 MHz, -55.047 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 03/01/2007 11:32:32



Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 80.0 mS
Peak 1.613 GHz, -30.83 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:30:44



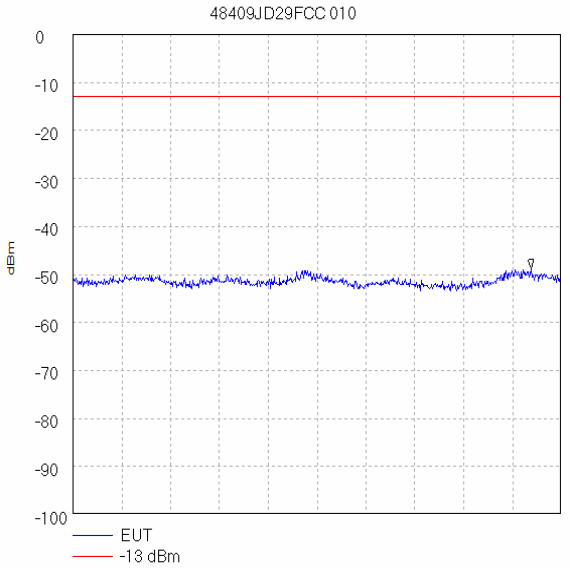
Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 6.8 GHz, -50.5 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:31:14



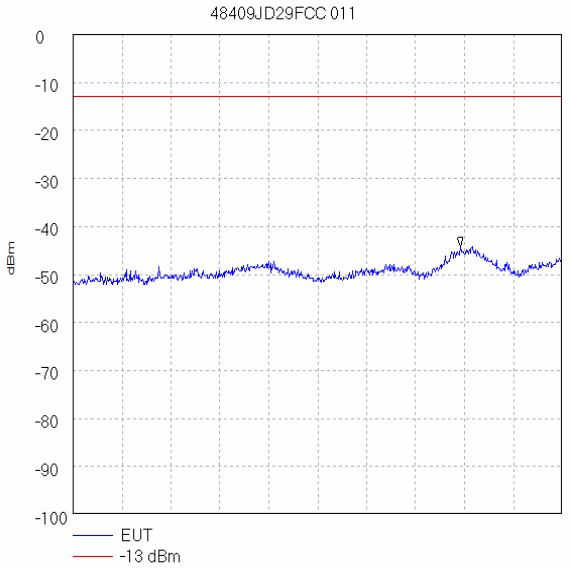
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 13.617 GHz, -49.17 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:31:51

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

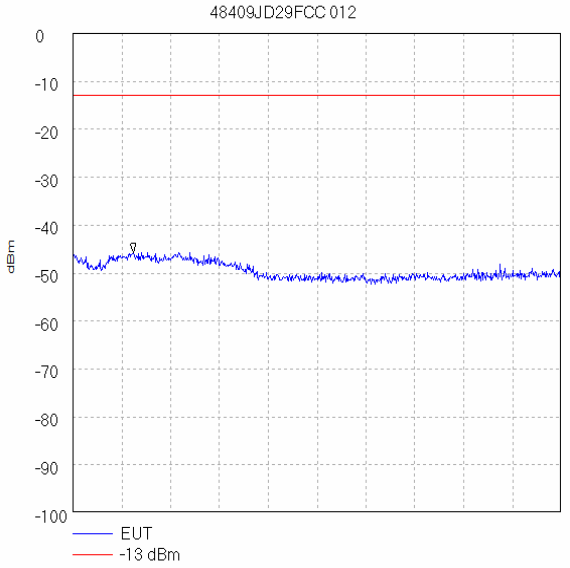
Transmitter Out of Band Conducted Emissions – Bottom Channel: Section 90.210 (Continued)



Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 19.692 GHz, -48.83 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:32:22



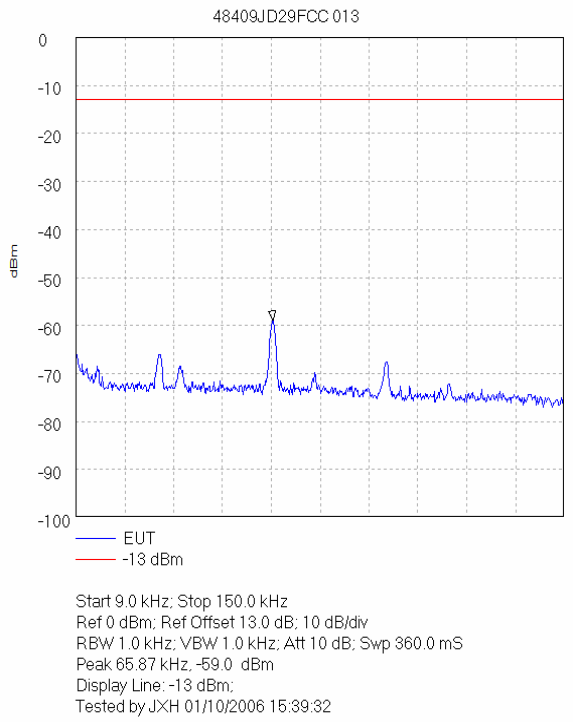
Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 23.958 GHz, -44.17 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:32:48



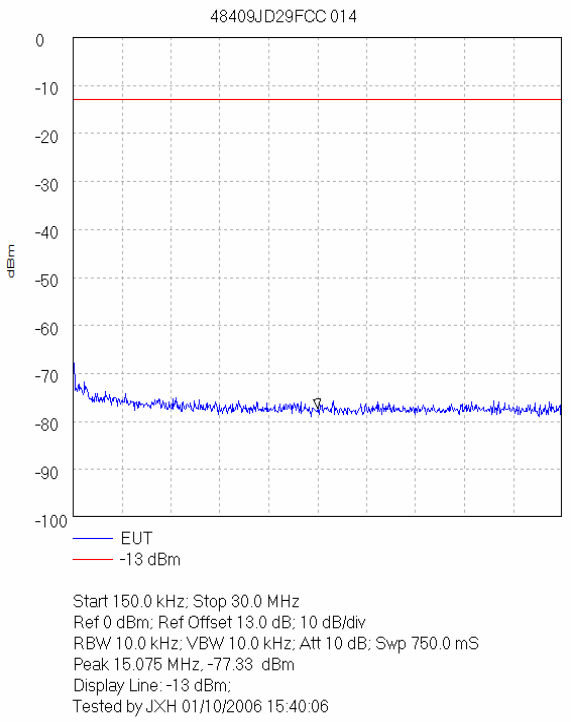
Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 25.617 GHz, -45.67 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:33:17

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

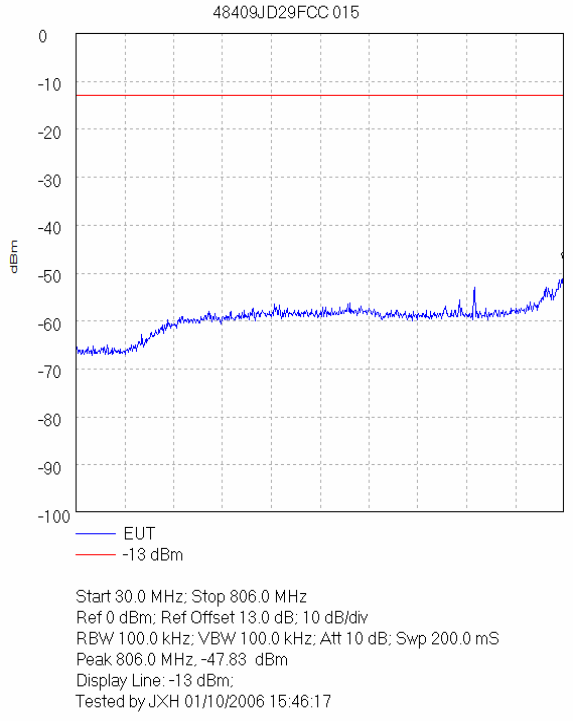
Transmitter Out of Band Conducted Emissions – Middle Channel: Section 90.210 (Continued)



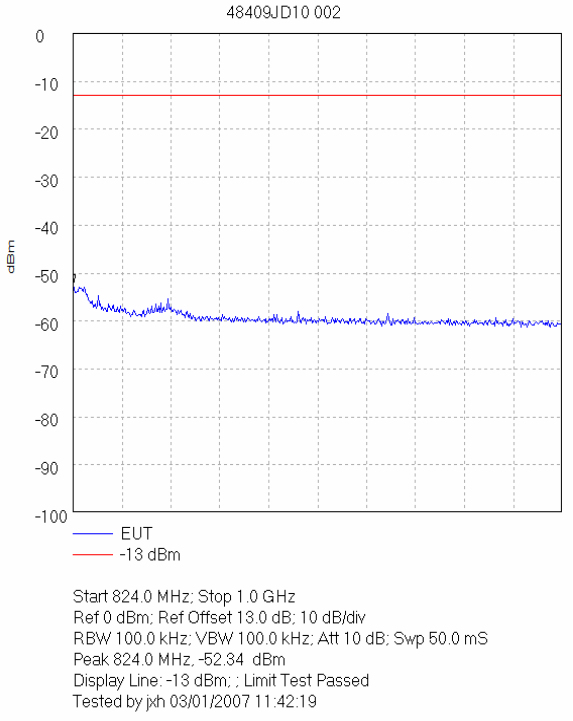
Start 9.0 kHz; Stop 150.0 kHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 kHz; VBW 1.0 kHz; Att 10 dB; Swp 360.0 mS
Peak 65.87 kHz, -59.0 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:39:32



Start 150.0 kHz; Stop 30.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 10.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 750.0 mS
Peak 15.075 MHz, -77.33 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:40:06



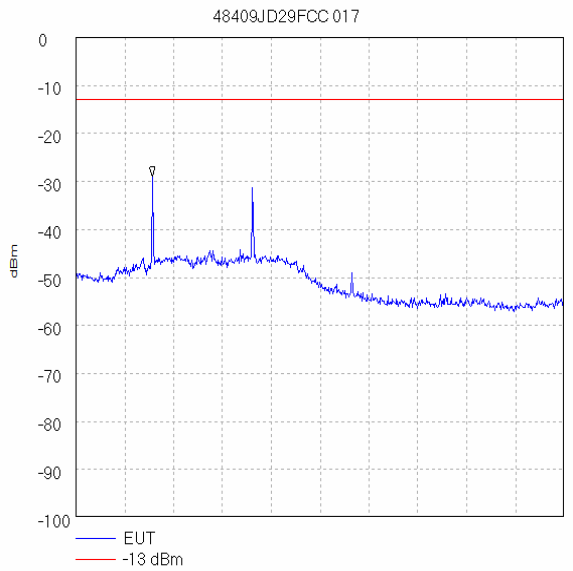
Start 30.0 MHz; Stop 806.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 200.0 mS
Peak 806.0 MHz, -47.83 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:46:17



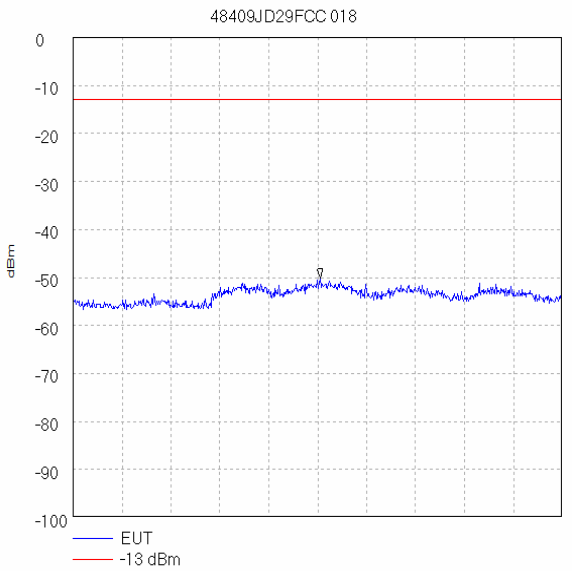
Start 824.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 50.0 mS
Peak 824.0 MHz, -52.34 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 03/01/2007 11:42:19

Test of: **Zinwave Ltd**
2700 DAS
To: **FCC Part 90: 2005**
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

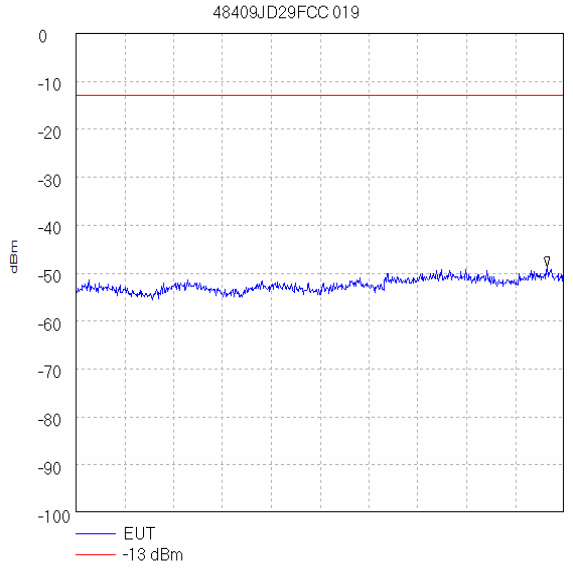
Transmitter Out of Band Conducted Emissions – Middle Channel: Section 90.210 (Continued)



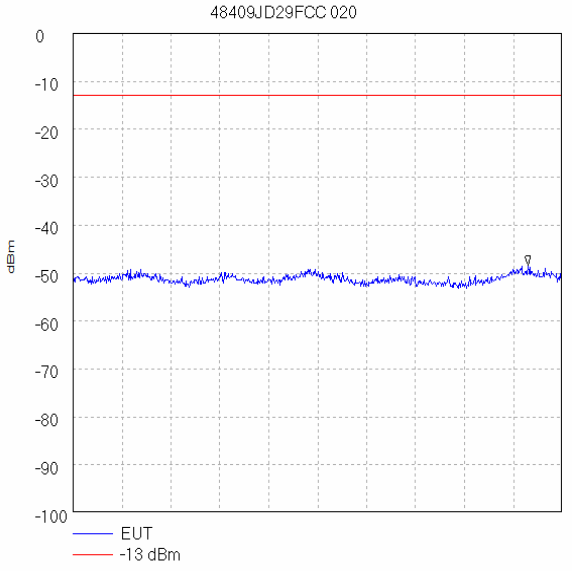
Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 80.0 mS
Peak 1.627 GHz, -29.0 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:47:28



Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 7.525 GHz, -50.17 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:47:56



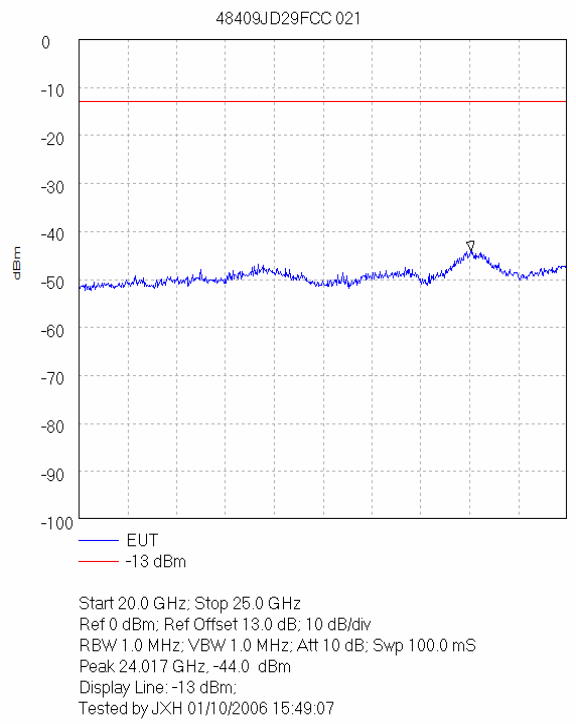
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 14.825 GHz, -48.67 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:48:18



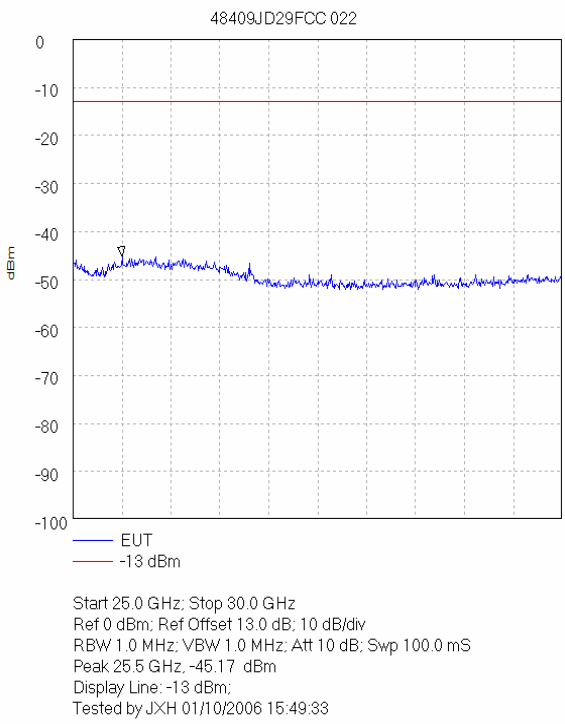
Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 19.65 GHz, -48.33 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:48:45

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

Transmitter Out of Band Conducted Emissions – Middle Channel: Section 90.210 (Continued)



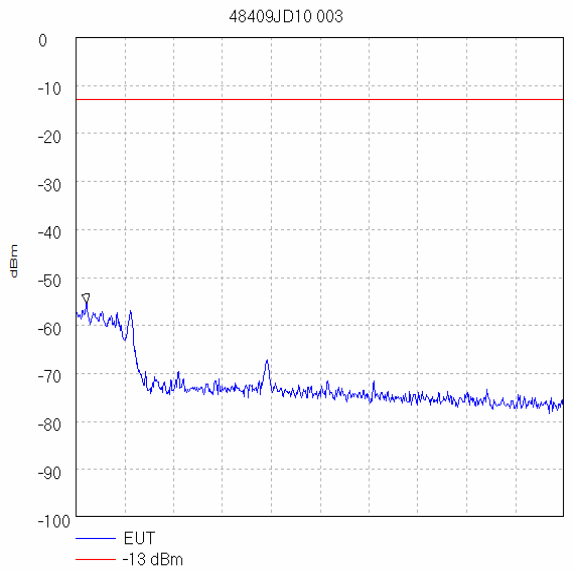
Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 24.017 GHz, -44.0 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:49:07



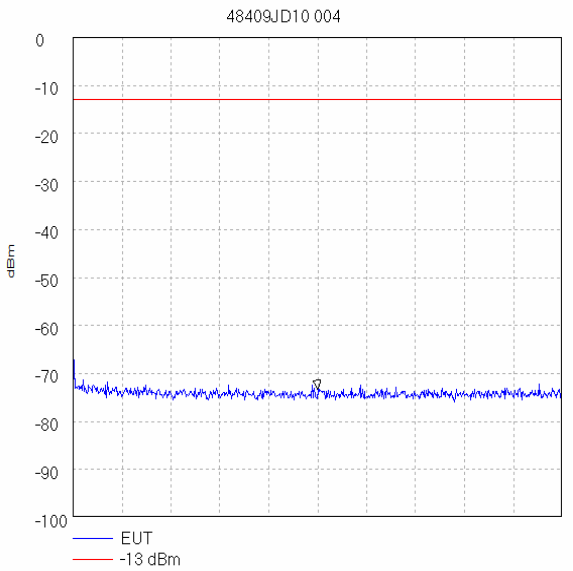
Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 25.5 GHz, -45.17 dBm
Display Line: -13 dBm;
Tested by JXH 01/10/2006 15:49:33

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

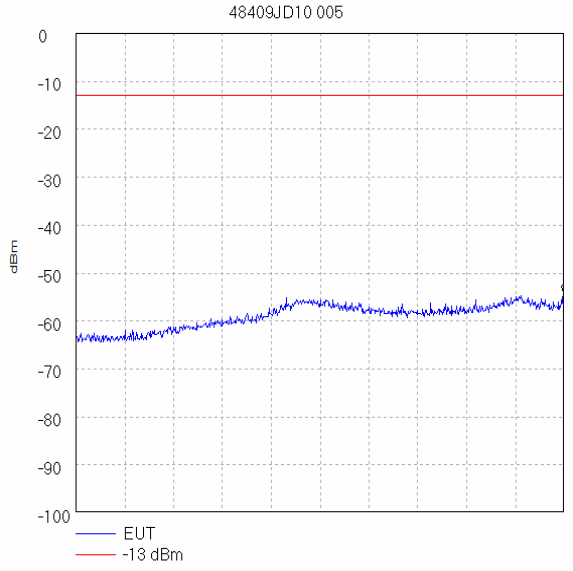
Transmitter Out of Band Conducted Emissions – Top Channel: Section 90.210 (Continued)



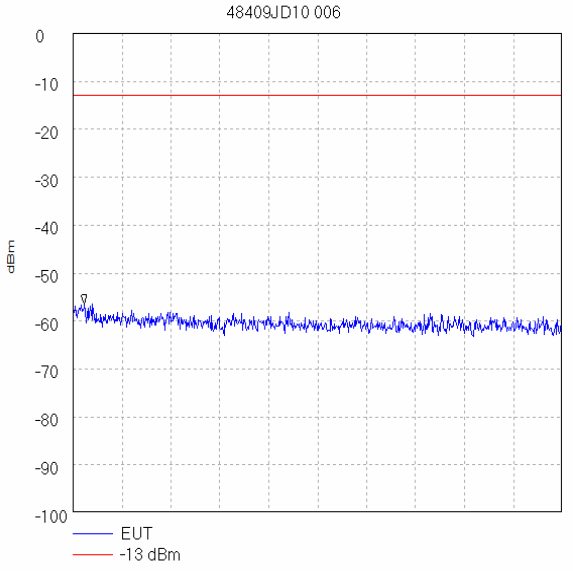
Start 9.0 kHz; Stop 150.0 kHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 kHz; VBW 1.0 kHz; Att 10 dB; Swp 360.0 mS
Peak 12.055 kHz, -55.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:00:10



Start 150.0 kHz; Stop 30.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 10.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 750.0 mS
Peak 15.075 MHz, -73.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:03:03



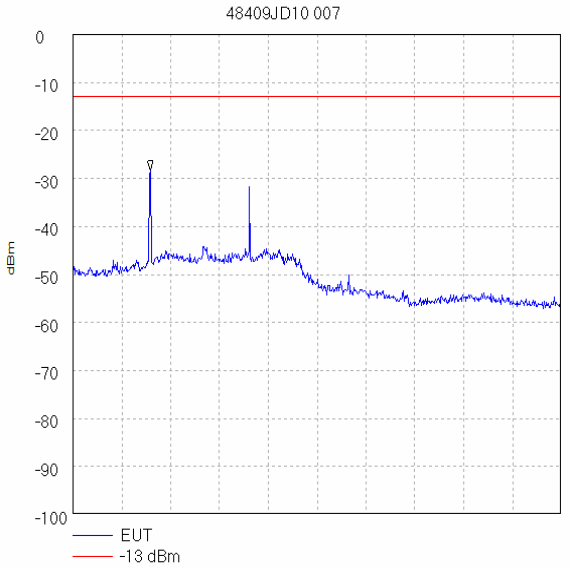
Start 30.0 MHz; Stop 806.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 200.0 mS
Peak 806.0 MHz, -54.5 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:06:22



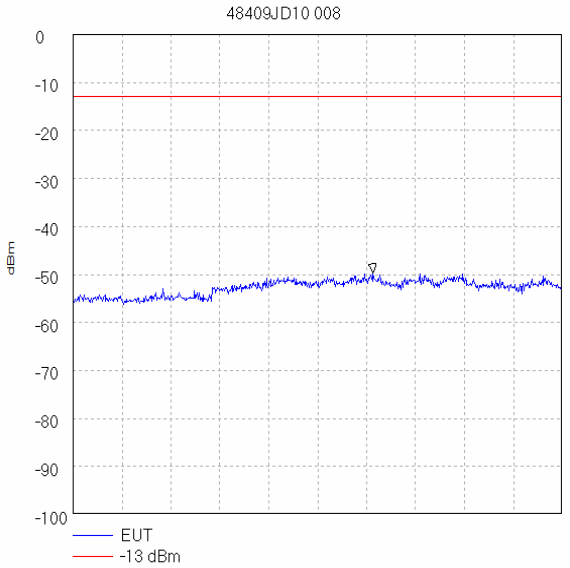
Start 824.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 50.0 mS
Peak 828.107 MHz, -56.5 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:07:57

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

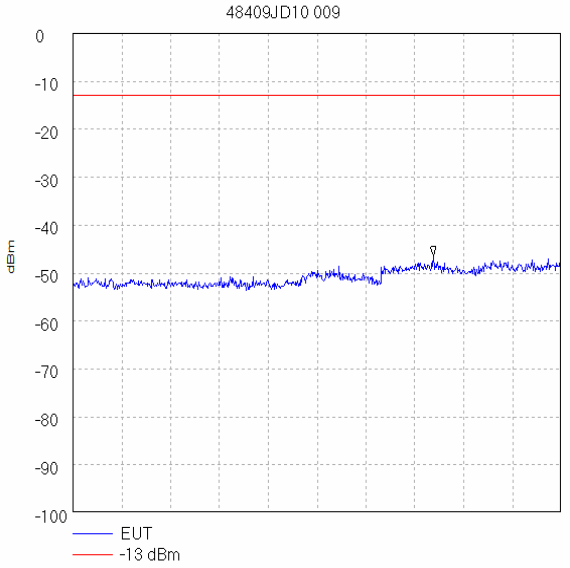
Transmitter Out of Band Conducted Emissions – Top Channel: Section 90.210 (Continued)



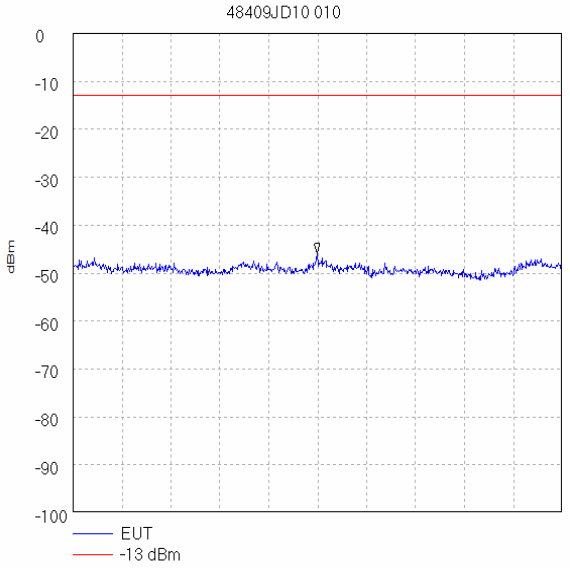
Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 80.0 mS
Peak 1.633 GHz, -28.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:10:11



Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 8.067 GHz, -49.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:12:36



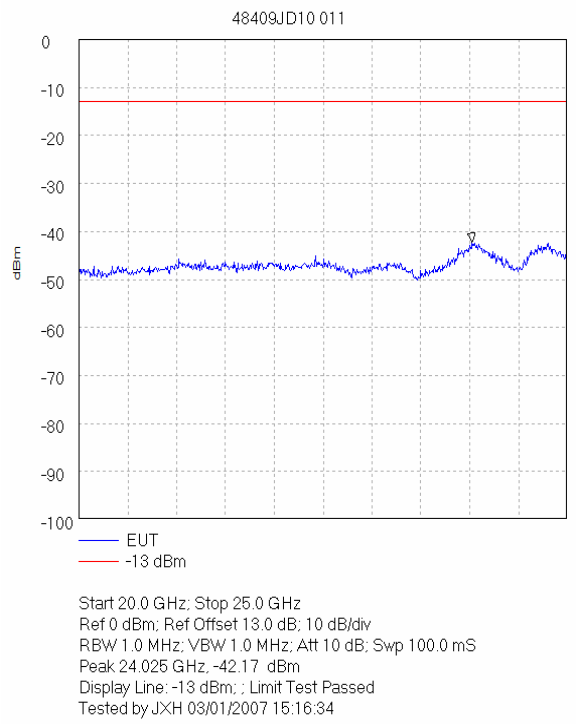
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 13.692 GHz, -46.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:14:23



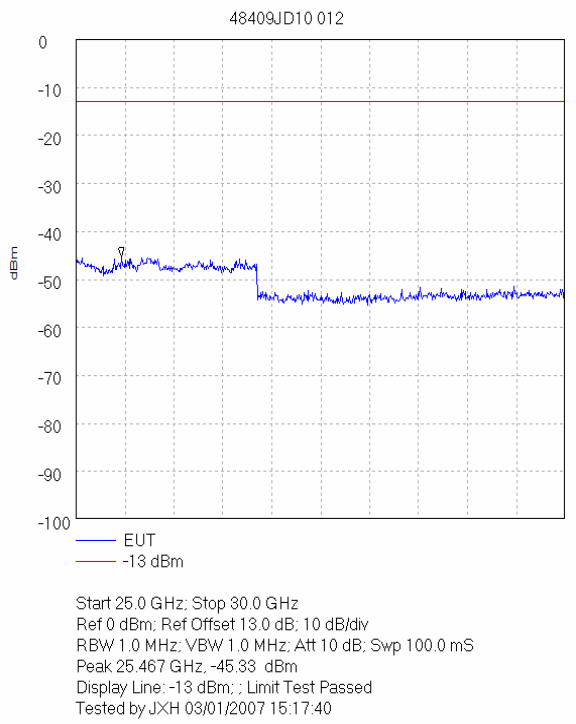
Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 17.492 GHz, -45.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:15:24

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

Transmitter Out of Band Conducted Emissions – Top Channel: Section 90.210 (Continued)



Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 24.025 GHz, -42.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:16:34



Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 25.467 GHz, -45.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:17:40

7.8. Transmitter Conducted Emissions at Band Edges: Section 90.210

The EUT was configured as for transmitter conducted emissions testing described in Section 9 of this report.

Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

Results:

Bottom Band Edge

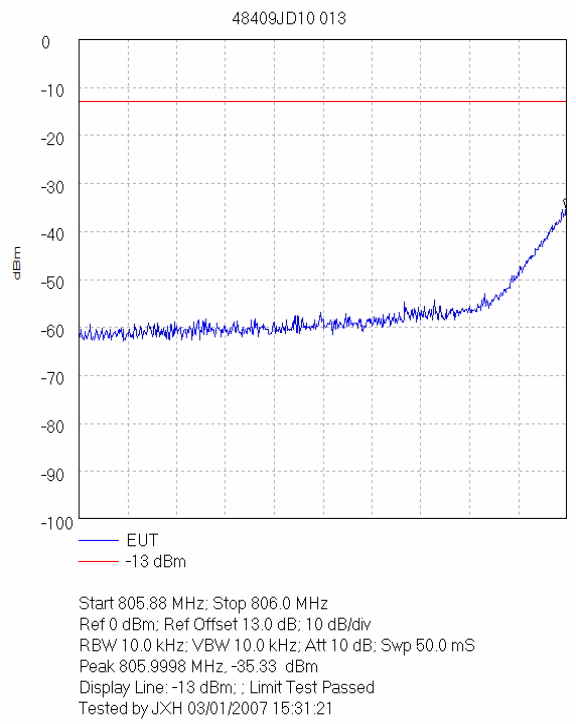
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
806.0	-35.3	-13.0	22.2	Complied

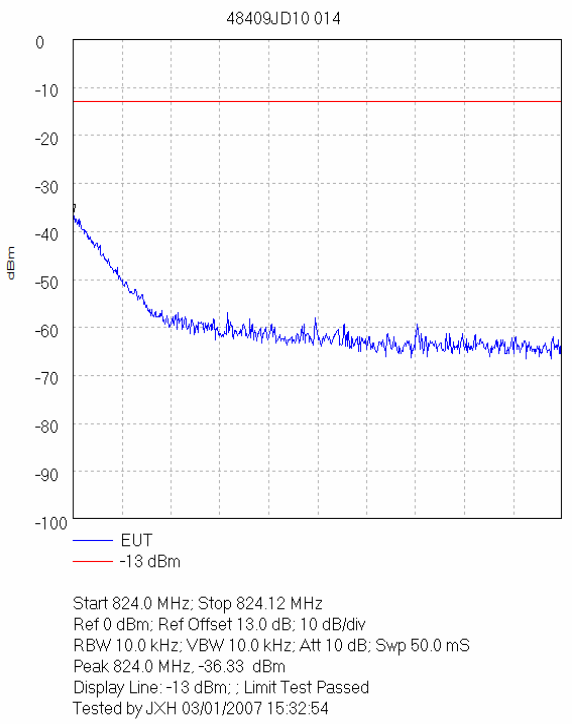
Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
824.0	-36.3	-13.0	23.3	Complied

Test of: **Zinwave Ltd**
2700 DAS
To: **FCC Part 90: 2005**
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

Transmitter Conducted Emissions at Band Edges: Section 90.210 (Continued)





Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

7.9. Transmitter Out of Band Radiated Emissions: Section 90.210

The EUT was configured as for transmitter radiated emissions testing as described in Section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Result:

Middle Channel

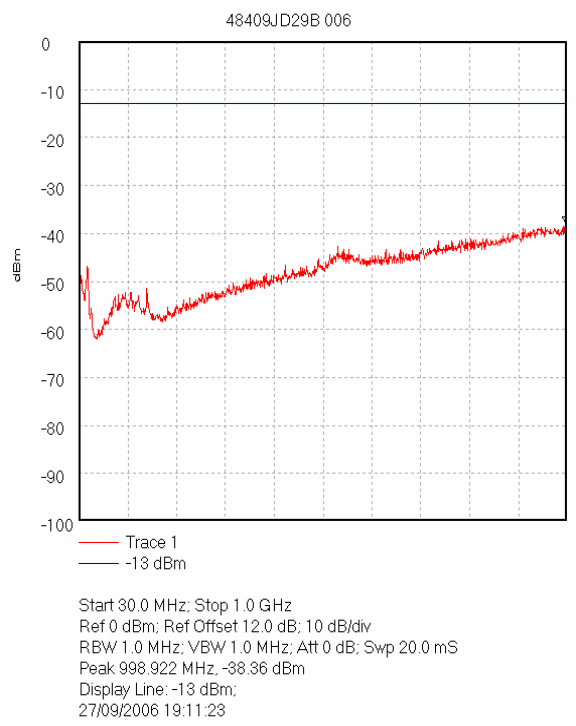
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
998.922*	-38.4	-13.0	25.4	Complied

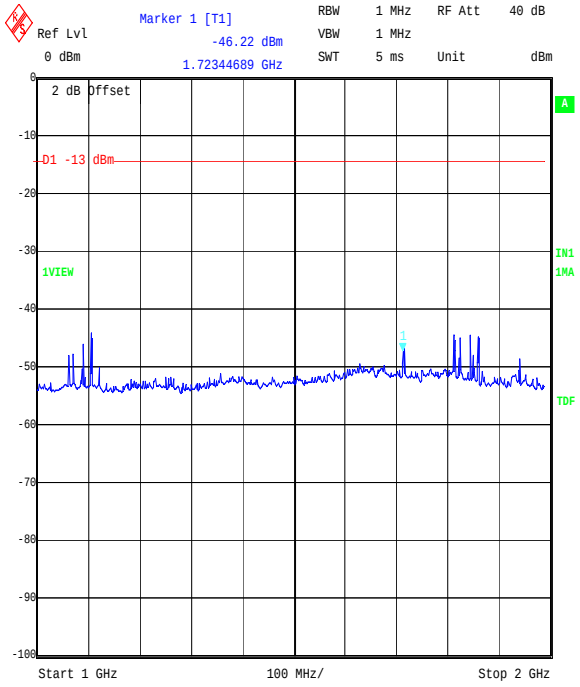
Note(s):

1. **No spurious emissions were detected above the noise floor of the measuring receiver; the highest peak noise floor reading of the measuring receiver recorded was -38.4 dBμV/m at 998.922 MHz.*

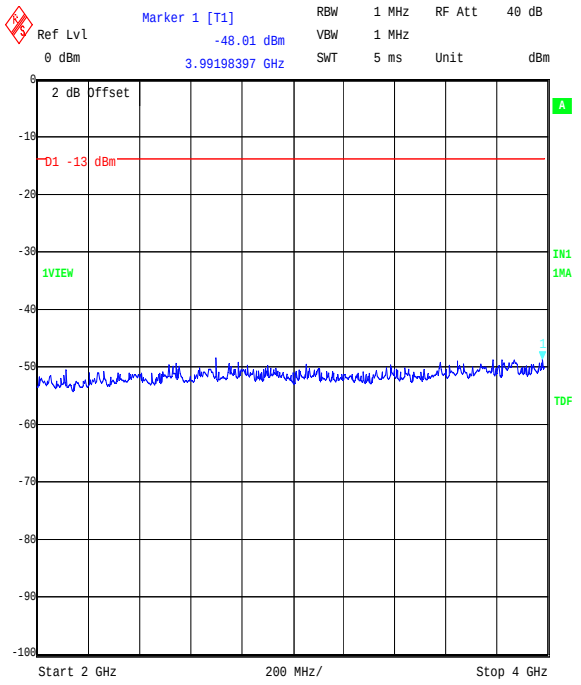
Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

Transmitter Out of Band Radiated Emissions: Section 90.210 (Continued)

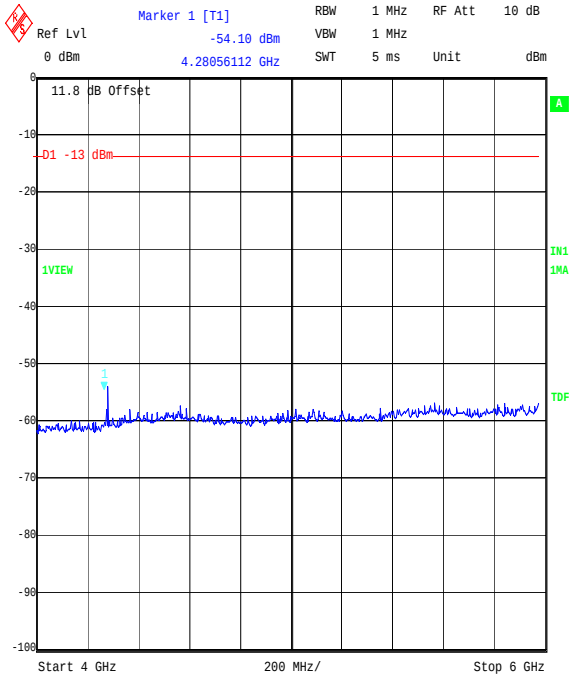




Title: Zinwave Job No 48409JD29B Radiated Emissions
Date: 1.OCT.2006 13:49:59



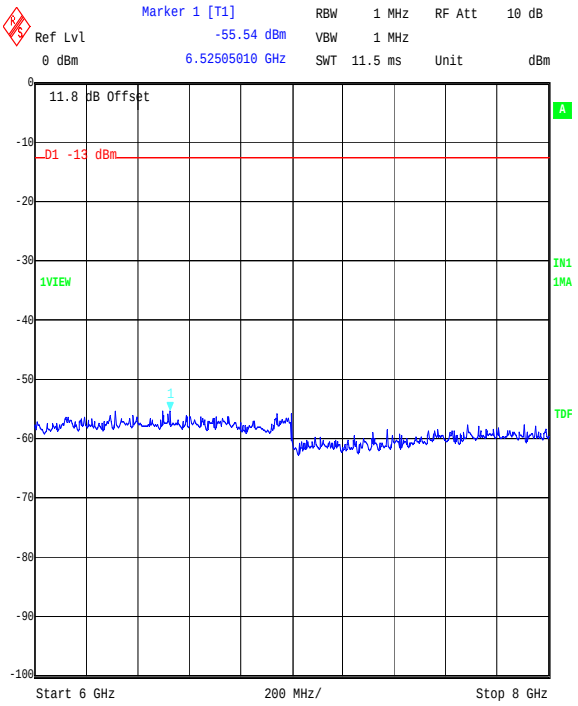
Title: Zinwave Job No 48409JD29B Radiated Emissions
Date: 1.OCT.2006 15:09:48



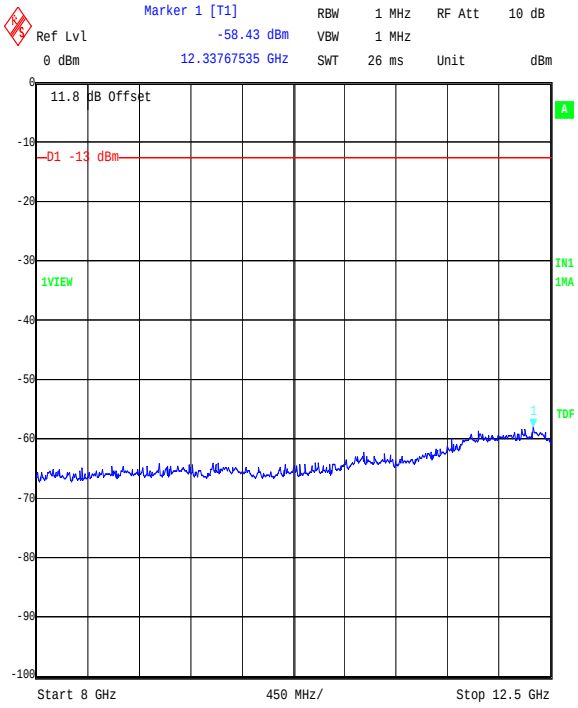
Title: Zinwave Job No 48409JD29B Radiated Emission Scans
Date: 29.SEP.2006 12:15:53

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

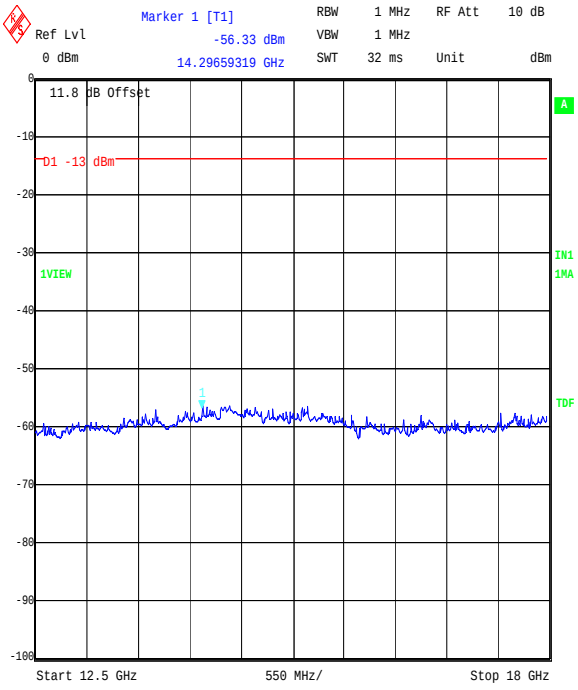
Transmitter Out of Band Radiated Emissions: Section 90.210 (Continued)



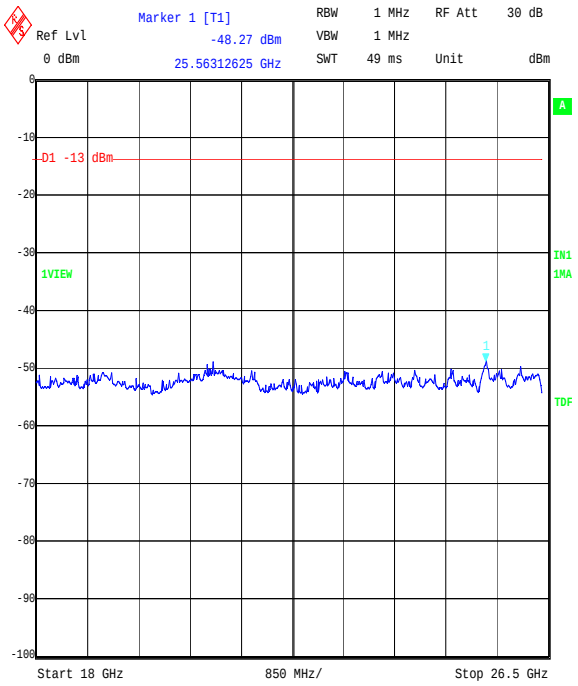
Date: 29.SEP.2006 15:31:44



Date: 29.SEP.2006 18:40:49



Title: Zinwave Job No 48409JD29B Radiated Emissions
Date: 1.OCT.2006 11:21:30



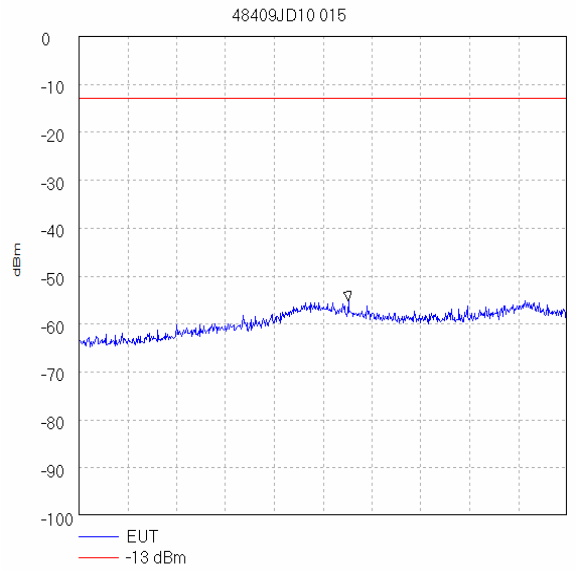
Title: Zinwave Job No 48409JD29B Radiated Emissions
Date: 1.OCT.2006 12:20:42

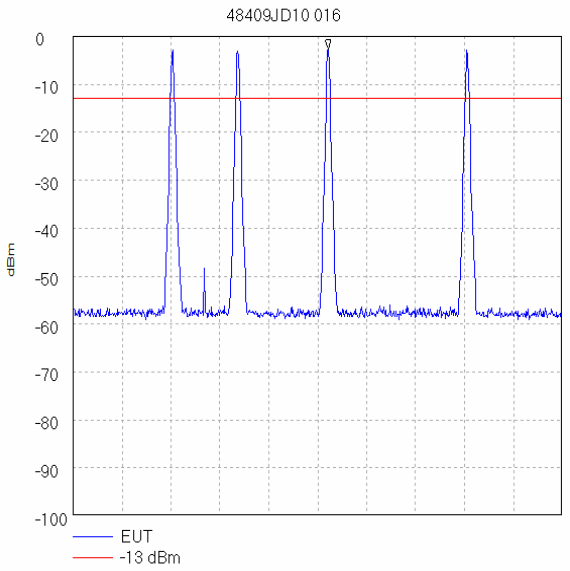
7.9.1. Intermodulation: Section 90.210

The EUT was configured as for transmitter conducted emission testing described in section 9 of this report.

Tests were performed to identify the intermodulation products level produce from the 3 intermod signals applied.

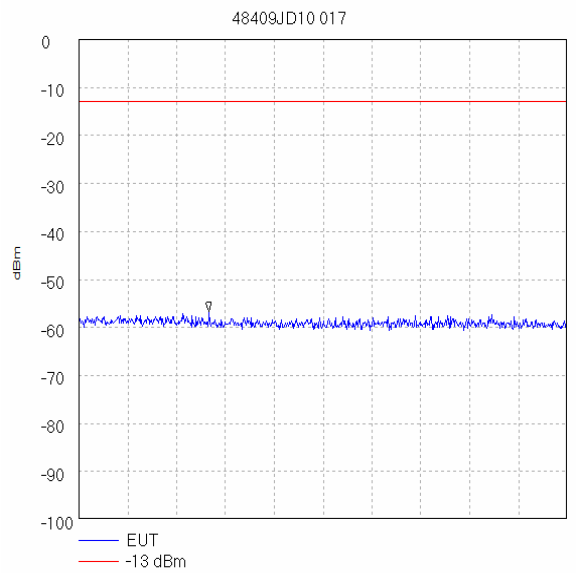
Results:



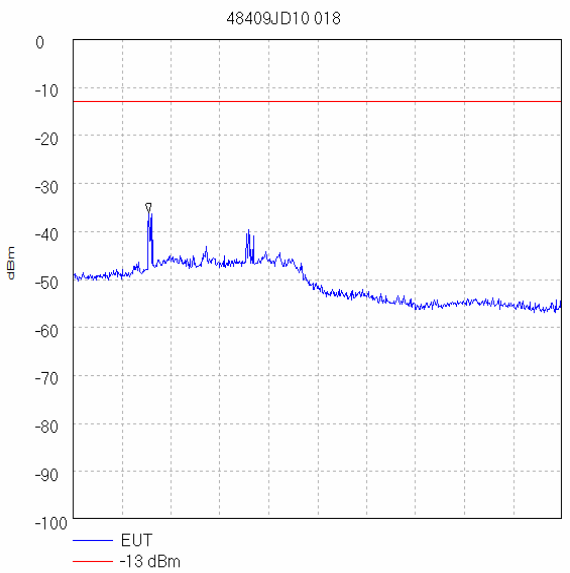


Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

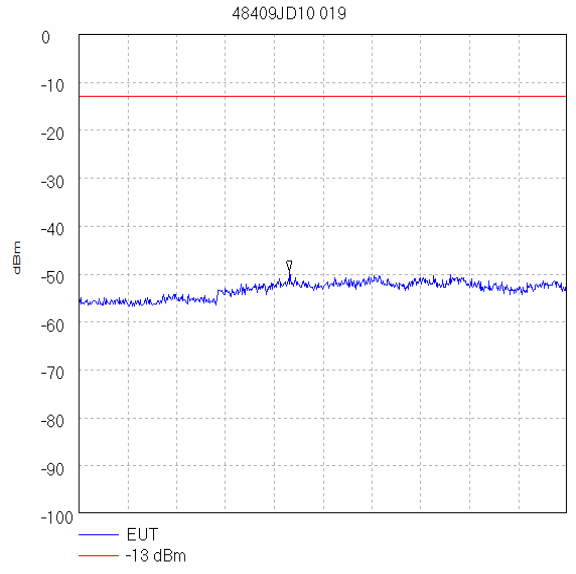
Intermodulation: Section 90.210 (Continued)



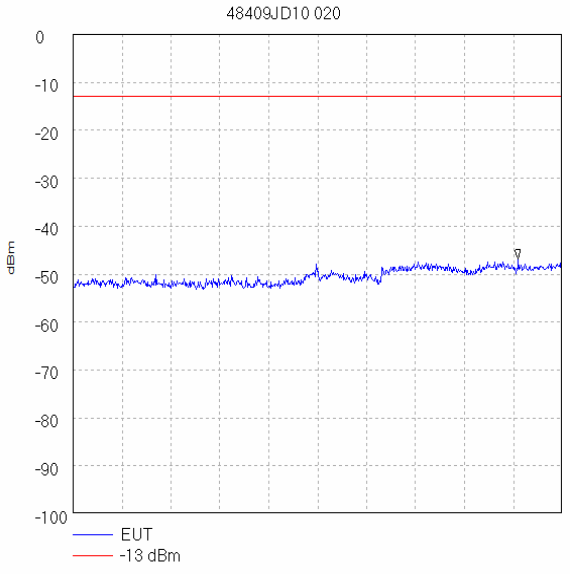
Start 830.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 50.0 mS
Peak 875.333 MHz, -56.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:50:46



Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 80.0 mS
Peak 1.62 GHz, -36.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:53:58



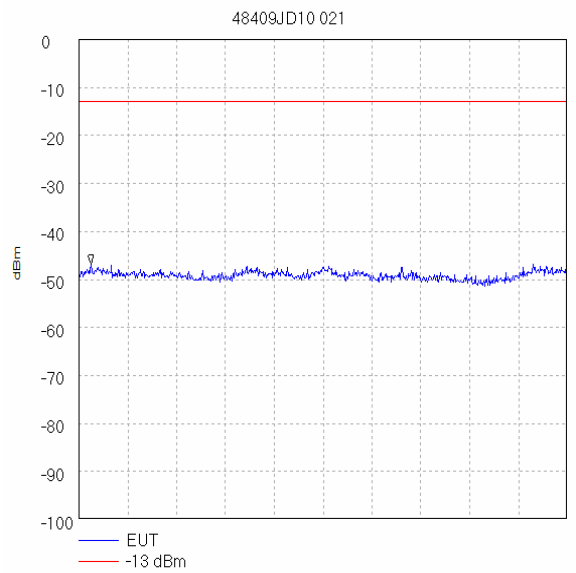
Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 7.158 GHz, -49.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:54:38



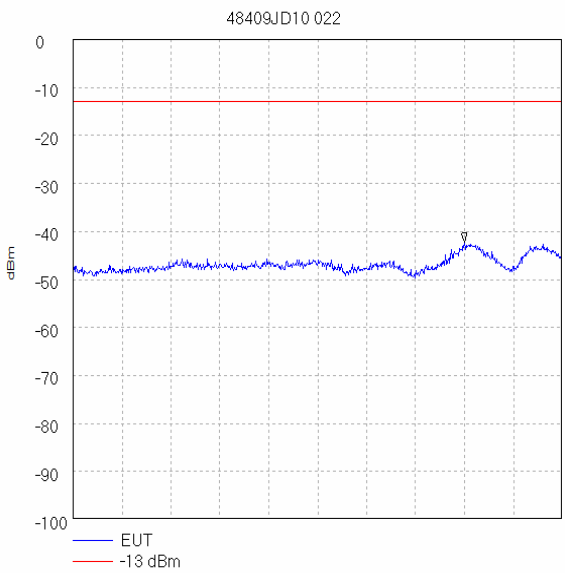
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 14.55 GHz, -46.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:55:51

Test of: **Zinwave Ltd**
2700 DAS
To: **FCC Part 90: 2005**
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

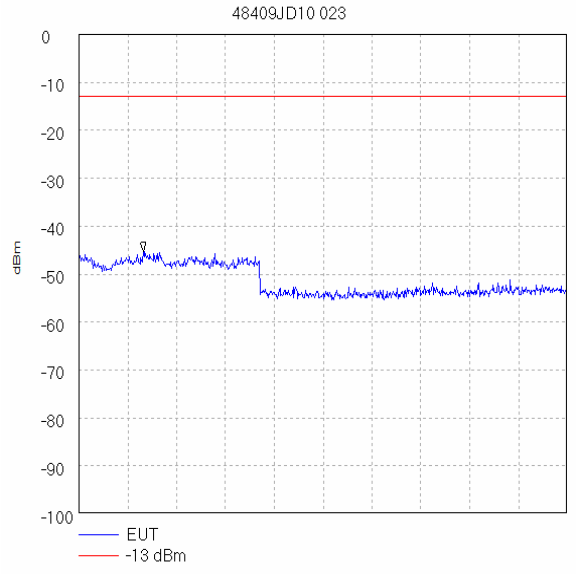
Intermodulation: Section 90.210 (Continued)



Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 15.125 GHz, -46.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:56:18



Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 24.0 GHz, -42.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:57:02



Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 25.658 GHz, -45.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by JXH 03/01/2007 15:57:25

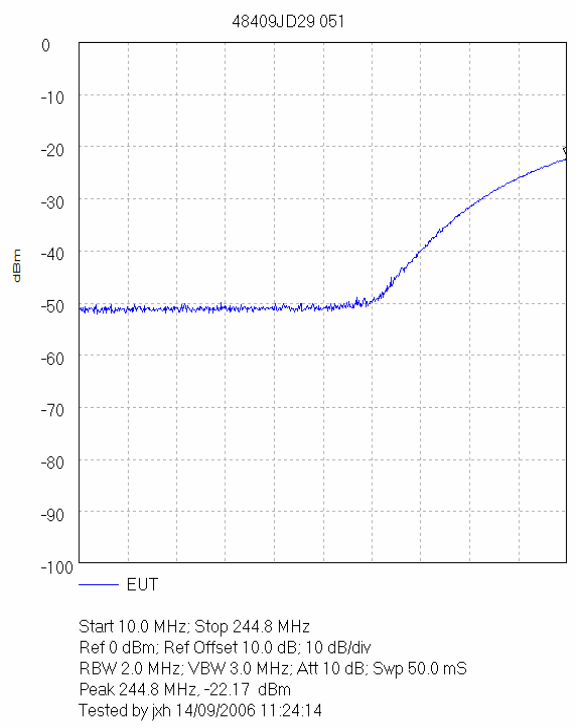
Note: Those emissions showing to have exceeded the specified limit line in plots 48409JD29FCC 110 were confirmed to be in the iDEN band as continuous wave signals used to produce the Intermodulation products, all other emissions were lower than 20dB below the limit.

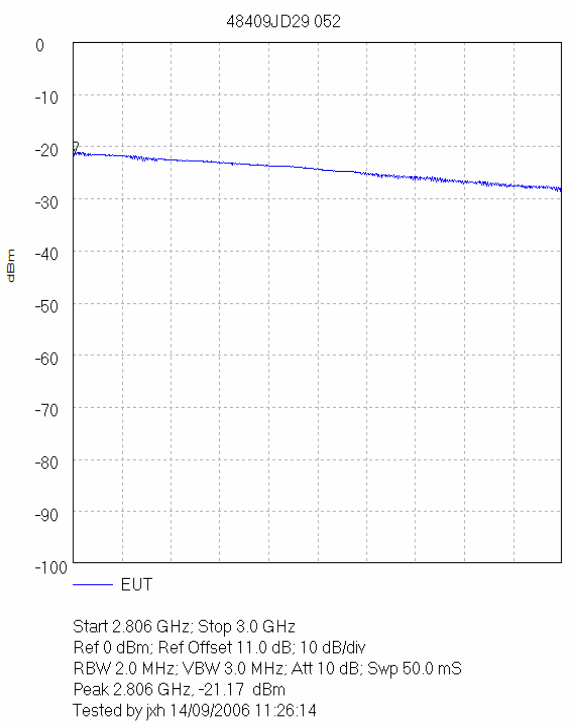
7.9.2. Out of Band Rejection

The EUT was configured as for conducted out of band rejection testing described in section 9 of this report.

Tests were performed to identify the out of band gain of the EUT.

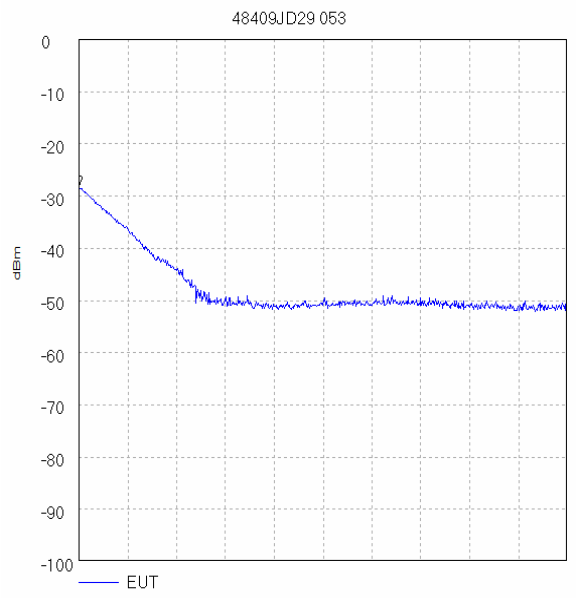
Results:



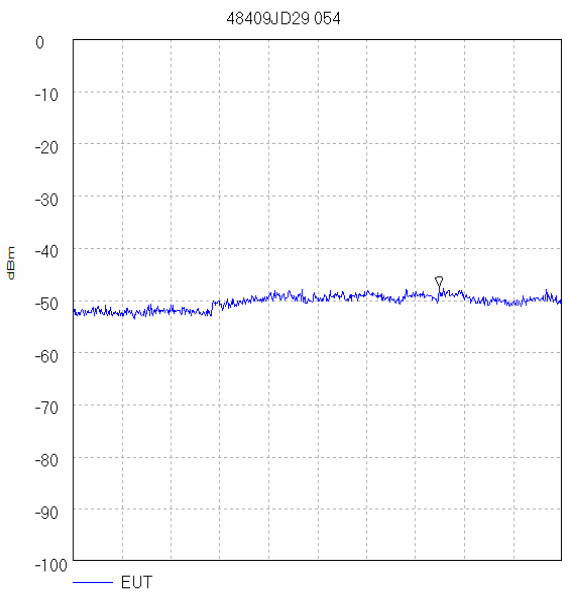


Test of: **Zinwave Ltd**
2700 DAS
To: **FCC Part 90: 2005**
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

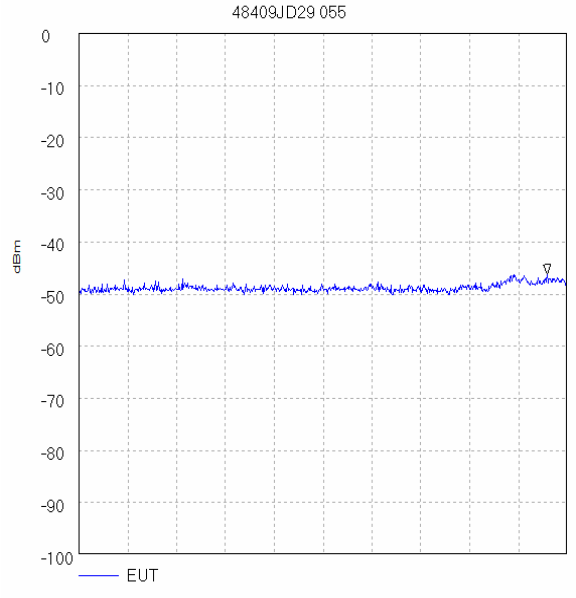
Out of Band Rejection (Continued)



Start 3.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 11.0 dB; 10 dB/div
RBW 2.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 50.0 mS
Peak 3.0 GHz, -28.17 dBm
Tested by jxh 14/09/2006 11:28:34



Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 11.0 dB; 10 dB/div
RBW 2.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 8.742 GHz, -47.5 dBm
Tested by jxh 14/09/2006 11:29:20



Start 10.0 GHz; Stop 12.75 GHz
Ref 0 dBm; Ref Offset 11.0 dB; 10 dB/div
RBW 2.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 55.0 mS
Peak 12.635 GHz, -46.17 dBm
Tested by jxh 14/09/2006 11:30:06

Note: This test case has been included in the report for reference purposes only.

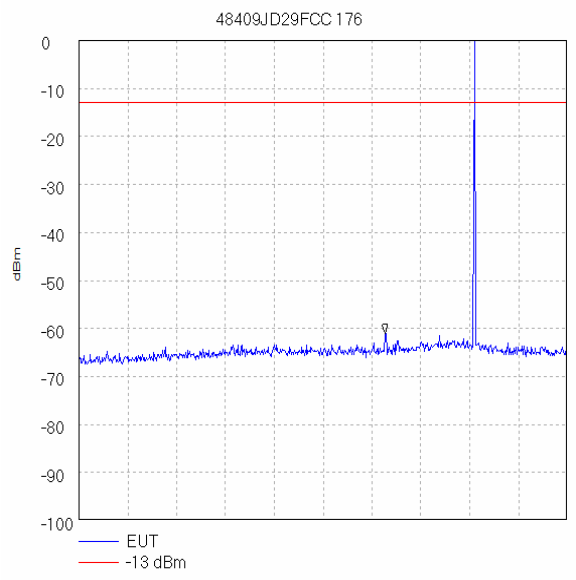
7.9.3. Fully Loaded with 4 x Signals

Results: 1 x 2 Configuration

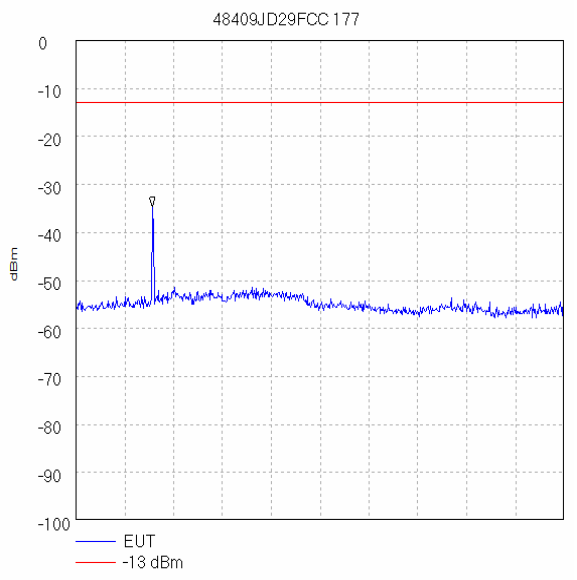
Frequency Range (GHz)	Frequency (GHz)	Bandwidth (kHz)	Level (dBm)
0.03 to 1.0	0.637	100	-61.0
1.0 to 5.0	1.627	1000	-34.7
5.0 to 10.0	7.642	1000	-50.8
10.0 to 15.0	13.800	1000	-49.7
15.0 to 20.0	17.442	1000	-49.0
20.0 to 25.0	24.050	1000	-44.3
25.0 to 30.0	25.658	1000	-45.3

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

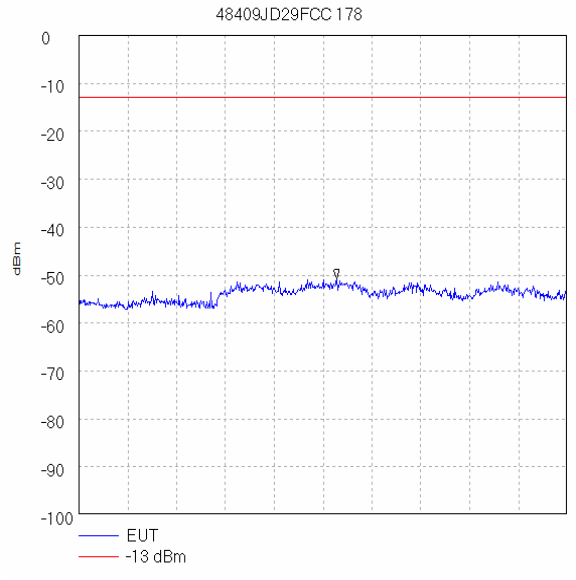
Fully Loaded with 4 x Signals (Continued)



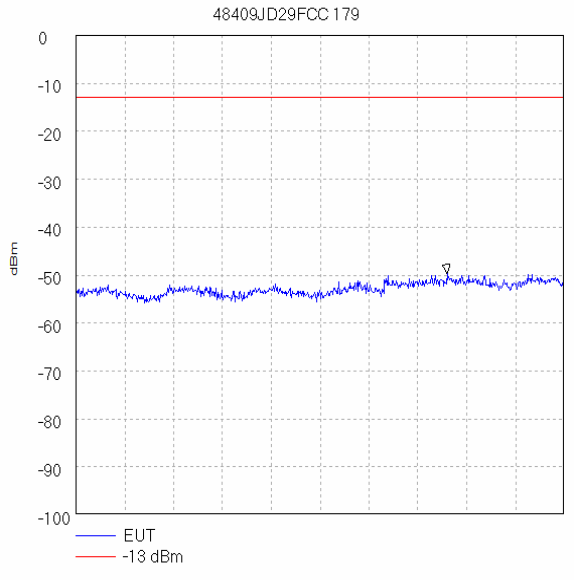
Start 30.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 250.0 mS
Marker 637.867 MHz, -61.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:13:14



Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 80.0 mS
Peak 1.627 GHz, -34.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:13:58



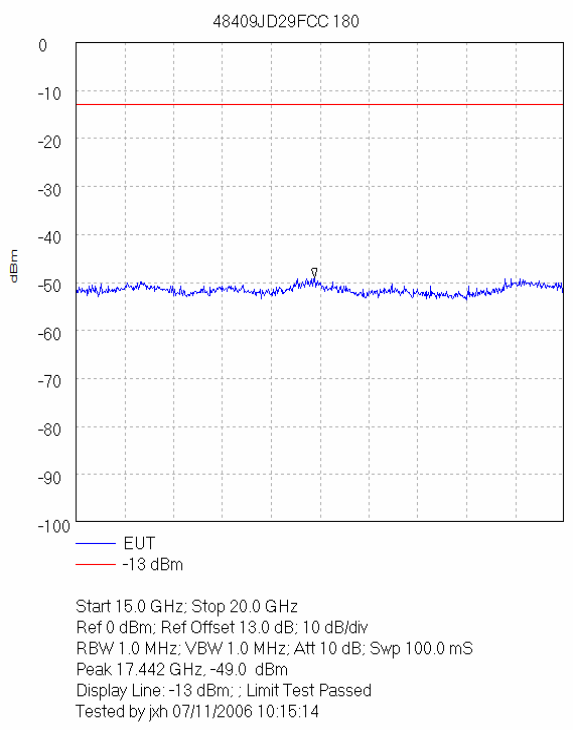
Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 7.642 GHz, -50.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:14:23



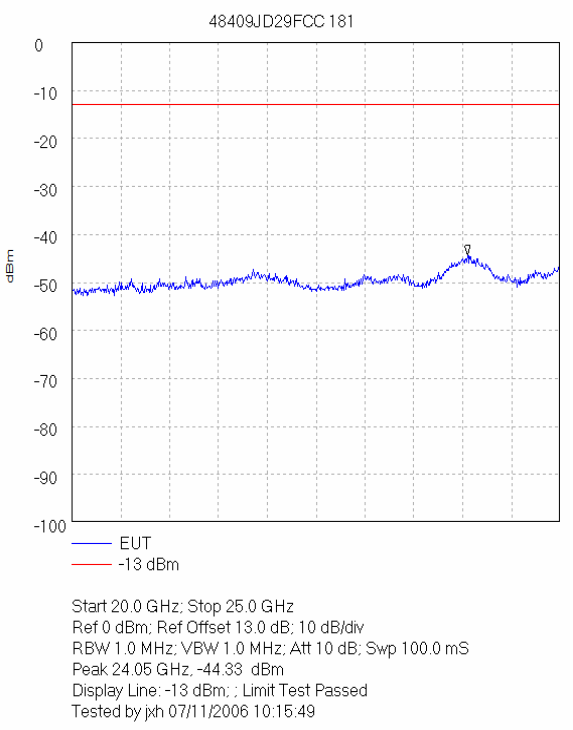
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 13.8 GHz, -49.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:14:48

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

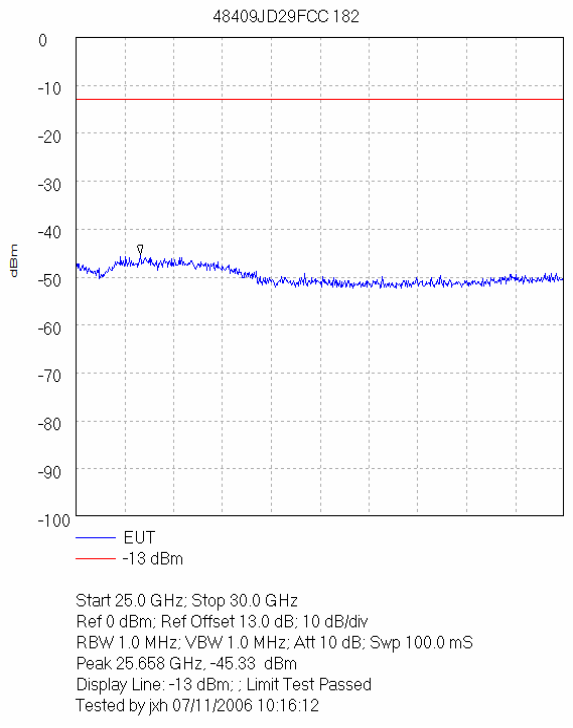
Fully Loaded with 4 x Signals (Continued)



Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 17.442 GHz, -49.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:15:14



Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 24.05 GHz, -44.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:15:49



Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 25.658 GHz, -45.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 10:16:12

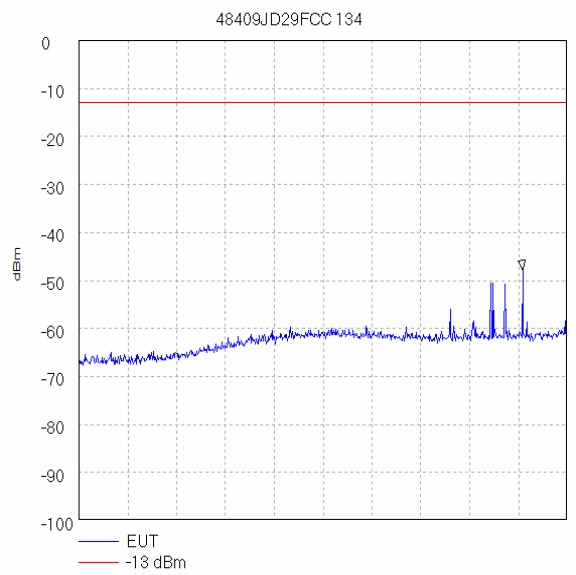
Fully Loaded with 4 x Signals (Continued)

Results: 4 x 8 Configuration

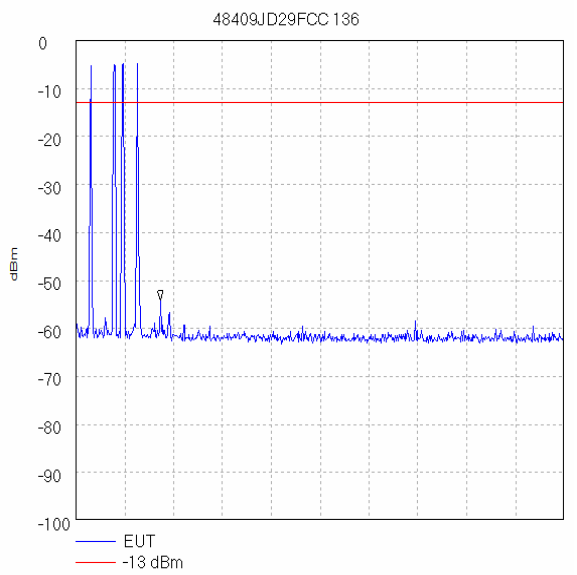
Frequency Range (GHz)	Frequency (GHz)	Bandwidth (kHz)	Level (dBm)
0.03 to 0.8	0.729	100	-47.8
0.8 to 1.0	0.834	1000	-54.2
1.0 to 5.0	1.340	1000	-44.3
5.0 to 10.0	7.425	1000	-50.3
10.0 to 15.0	13.850	1000	-49.5
15.0 to 20.0	19.533	1000	-49.0
20.0 to 25.0	23.967	1000	-44.2
25.0 to 30.0	25.717	1000	-45.8

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

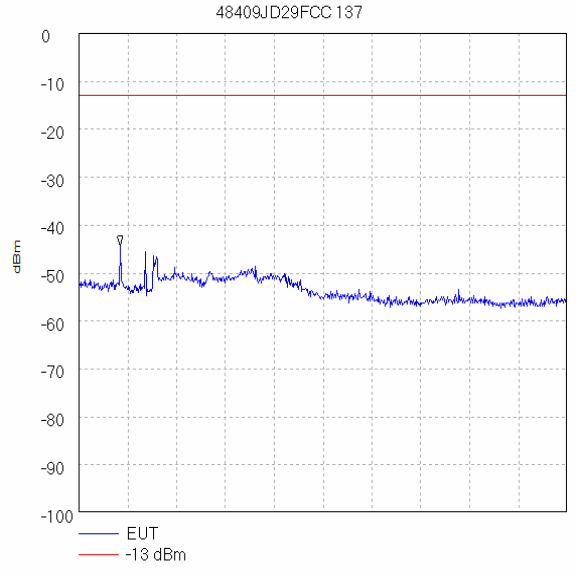
Fully Loaded with 4 x Signals (Continued)



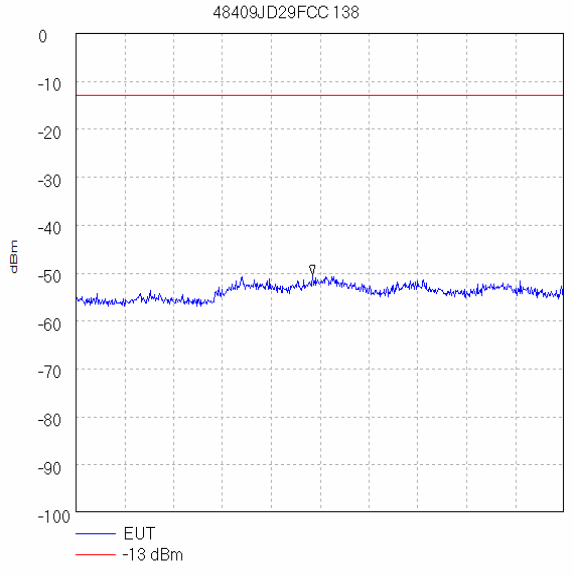
Start 30.0 MHz; Stop 800.0 MHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 200.0 mS
Peak 729.417 MHz, -47.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:05:01



Start 800.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 50.0 mS
Marker 834.667 MHz, -54.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:06:27



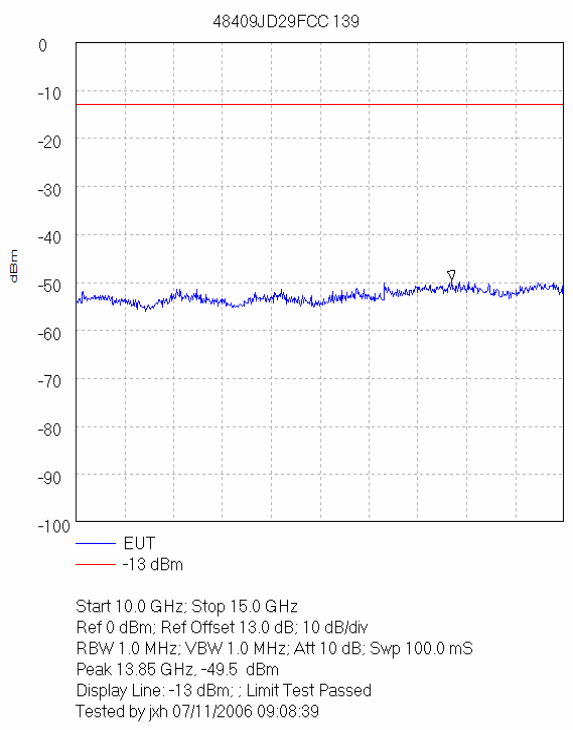
Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 80.0 mS
Peak 1.34 GHz, -44.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:07:28



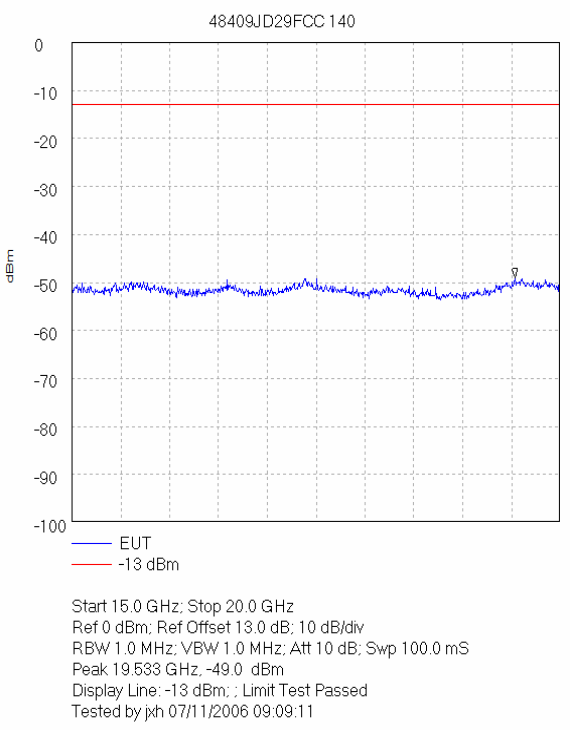
Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 7.425 GHz, -50.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:08:07

Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

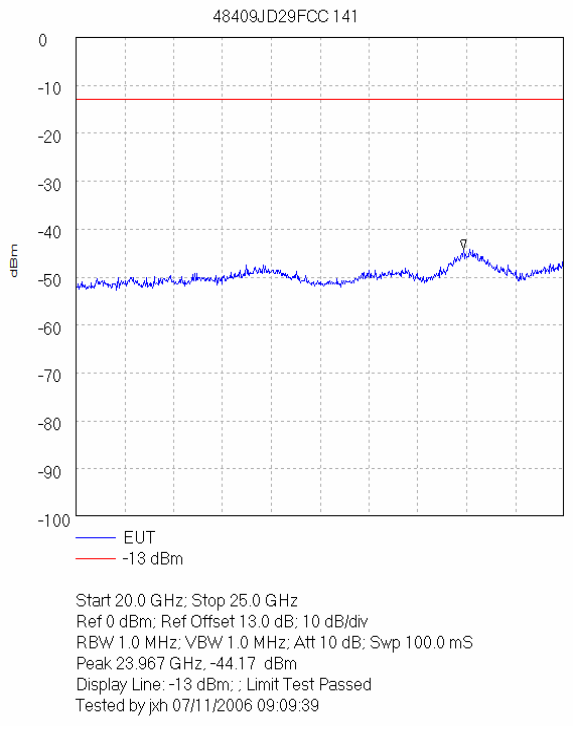
Fully Loaded with 4 x Signals (Continued)



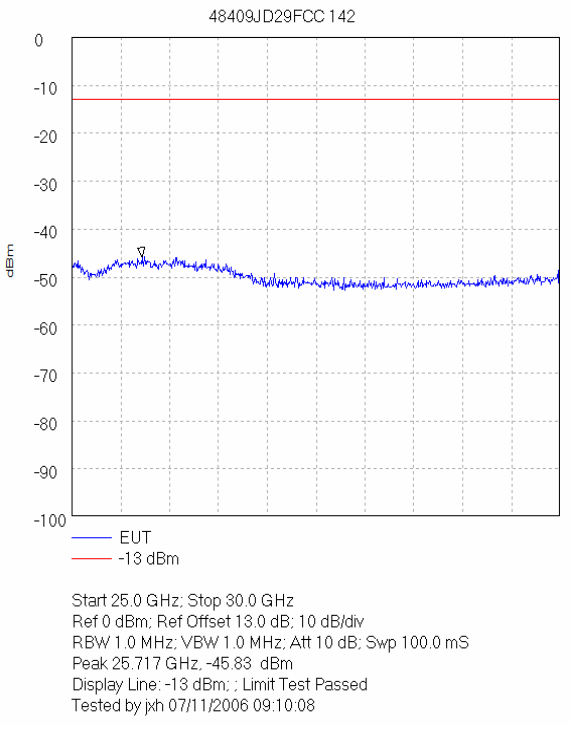
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 13.85 GHz, -49.5 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:08:39



Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 19.533 GHz, -49.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:09:11



Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 23.967 GHz, -44.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:09:39



Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 25.717 GHz, -45.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
Tested by jxh 07/11/2006 09:10:08

8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	+/- 0.46 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	+/- 1.2 dB
Spectral Power Density	Not applicable	95%	+/- 1.2 dB
6 dB/20 dB Bandwidth	Not applicable	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 1.78 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

9. Measurement Methods

9.1. Conducted Output Power

The EUT was connected to a spectrum analyser and to a GSM test set via suitable cables, RF attenuators and combiners.

The connection was made to the EUT either via an antenna port or by antenna terminals made available by the client.

The total loss of the cables, attenuators and combiner were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The EUT was set to the required channel and the transmitter set to operate at full power.

A marker was set to the maximum indicated peak and the conducted power was recorded.

This test was performed on the bottom, middle and top channels.

The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	**Setting**
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	≥ Emission Bandwidth
Amplitude Range:	100 dB
Step Size:	Continuous sweep
Sweep Time:	Coupled

9.2. FCC Part 2.1055: Frequency Stability

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via an access port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range –30 to 50 ºC.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for hand carried battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

Measurements were made on the top and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

The frequency error measured was converted to an error in ppm using the following formula as defined by TIA-603-B:-

$$\text{ppm error} = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1\right) * 10^6$$

where MCF_{MHz} is the measured carrier frequency in MHz
ACF_{MHz} is the assigned carrier frequency in MHz

The measured ppm had to be less then the relevant limits in order to comply.

9.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via a bi-directional coupler to its antenna port.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom, middle and top channels.

As the EUT is a PCS phone, no modulation input port was available. A call was thus set up using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW $\geq$ 1% of occupied bandwidth. A value of 200 Hz was used.

9.4. Transmitter Conducted Emissions Measurements:

The test was performed in a laboratory environment.

Spurious emission measurements at the antenna port were performed from the lowest declared frequency to 10 times the highest EUT fundamental frequency.

A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF Attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The limit in the standard states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to –13 dBm therefore, the limit line presented on the accompanying plots is set to –13 dBm.

The frequency band described above was investigated with the transmitter operating at full power on the top, bottom and middle channels. Any spurious observed were then recorded and compared to the –13 dBm limit. The requirement is for the emission to be less than –13 dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 22.917 states that the 1st MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found to be 3 kHz

The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	**Settings**
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	100 kHz >1 GHz
Bandwidth:	10 kHz <1 GHz
Amplitude Range:	100 dB
Step Size:	Continuous sweep
Sweep Time:	Coupled

The resolution bandwidth used for measurements in the 1 MHz blocks either side of the declared operating frequency block were set as described in the procedure above.

9.5. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 115V 60 Hz AC mains supplied via a Line Impedance Stabilisation Network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements**
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

9.6. Transmitter Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT, which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The radiated power was calculated as:-

EIRP/ERP = Signal Generator Level - Cable Loss + Antenna Gain

9.7. Transmitter Radiated Emissions (Continued)

The limit in the standard states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to -13dBm therefore, the limit line presented on the accompanying plots is set to -13dBm.

Any spurious measured were then compared to the -13dBm limit. The requirement is for the emission to be less than -13dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 22.917 states that the 1st MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

9.8. Receiver Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to the upper frequency detailed in Section 15.33(b) were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT, which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1GHz) (1MHz > 1GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

9.9. Intermodulation

The test was performed in a laboratory environment.

The measurements at the antenna port were performed.

The EUT was connected to a spectrum analyser with 3 CW signals, operating within the iDEN 800 MHz band, and feed through 3 input ports on the EUT. The CW signals selected covered the lowest and highest operating channels within an additional signal operating at least 1 channel size higher or lower than the other signals described.

Measurements were performed to determine if the Intermodulation products exceed the conducted emissions limit of -13 dBm in accordance with FCC Part 22.917. The Intermodulation products were measured from 30 MHz up to 30 GHz as per the conducted emissions procedure section 9.5 of the present document.

9.10. Out of Band Rejection

The test was performed in a laboratory environment.

The measurements at the antenna port were performed.

The EUT was connected to a spectrum analyser with a swept CW signal feed from a signal generator. The CW signal swept from 30 MHz up to 30 GHz to test the performance of the out of band rejection. The response of the system out of band gain was measured and recored.

The in band gain of the EUT was not measured during this test case.

All settings for the spectrum analyser were followed as per section 9.5, conducted emissions, of the present document.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
A1069	Single Phase LISN	R&S	ESH3-Z5	837469/012	31/01/06	12
A1360	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1360-20112003	06/09/06	12
A1455	40 GHz attenuator 10 dB	Inmet	40A-10dB	None	05/05/06	12
A1737	2 watt 20 dB Attenuator	Atlantic Microwave	BBS40-20	R4722	05/05/06	12
A1738	2 Watt 10 dB Attenuator	Atlantic Microwave	BBS40-10	R1379	05/05/06	12
C1001	Cable	Rosenberger	FA210A1020 M30309	003	07/06/06	12
C1111	Semflex Cable	Semflex Inc.	X116BFSX10 080	0337	05/05/06	12
C1112	Semflex Cable	Semflex, Inc.	X116BFSX10 080	None	05/05/06	12
C1124	Cable	Rosenberger	FA147a1020 00202	1704 34842-01	05/05/06	12
C1125	Cable	Rosenberger	FA147a1020 00202	1704 34842-02	05/05/06	12
C1168	3m N-Type Cable	Rosenberger Micro-Coax	FA210A1030 007070	43190-02	17/05/06	12
C347	Cable	Rosenberger	UFA210A-1-1181-70x70	3007	06/09/06	12
C460	Cable	Rosenberger	UFA210A-1-1182-704704	98H0304	06/09/06	12
E0513	Environmental Chamber	TAS	LT600 Series 3	23900506	N/A	12
G013	SMHU Signal Generator	Rohde & Schwarz	SMHU	894 055/003	30/08/06	12
G040	SMY Signal Generator	Rohde & Schwarz	SMY 02	841 070/004	26/05/06	24
G047	SMY Signal Generator	Rohde & Schwarz	SMY01	843 215/015	07/02/06	12
L0873	SMIQ Signal Generator	R&S	SMIQ 03B	839153/0012	14/09/06	12

Test of: **Zinwave Ltd**
2700 DAS
To: **FCC Part 90: 2005**
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
L0874	SMIQ Signal Generator	Rohde and Schwarz	SMIQ 04B	STK22903	14/09/06	12
M1001	Spectrum Analyser 8594A	Hewlett Packard	8594A	3212U0033B	25/04/06	12
M1140	Radio Communication Analyser	Anritsu	MT8820A	6K0000647	16/03/06	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	23/02/06	12
M283	8487A Power Sensor	Agilent	8487A	3318A03241	16/01/06	12
M1227	8487D Power Sensor	Agilent	8487D	3318A02122	16/03/06	12
M1228	Reference Attenuator	Agilent	11708A	31289	16/03/06	12
M1263	ESIB 7 Test Receiver	Rohde & Schwarz	ESIB7	100265	12/01/06	12
M1379	ESIB 7 Test Receiver	Rohde and Schwarz	ESIB7	100330	03/07/06	12
M166	Digital Environmental Monitor	EuroCom	None	None	23/10/05	12
M211	Digital Multimeter	Fluke	70 Series 3	71210457	16/03/06	12
M295	Spectrum Analyser	Hewlett Packard	8564E	3846A01561	19/12/06	12

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\48409JD10\EMICON	Test configuration for measurement of conducted emissions.
DRG\48409JD10\EMIRAD	Test configuration for measurement of radiated emissions.
DRG\48409JD10\001	1x2 – Single input to two outputs, no combining
DRG\48409JD10\002	4x8 – Fully loaded with different technologies, combined
DRG\48409JD10\003	4x8 – Fully loaded with different technologies, no combining
DRG\48409JD10\004	4x8 – Fully loaded with 4 signals within chosen operating band, combined

Test of: Zinwave Ltd
2700 DAS
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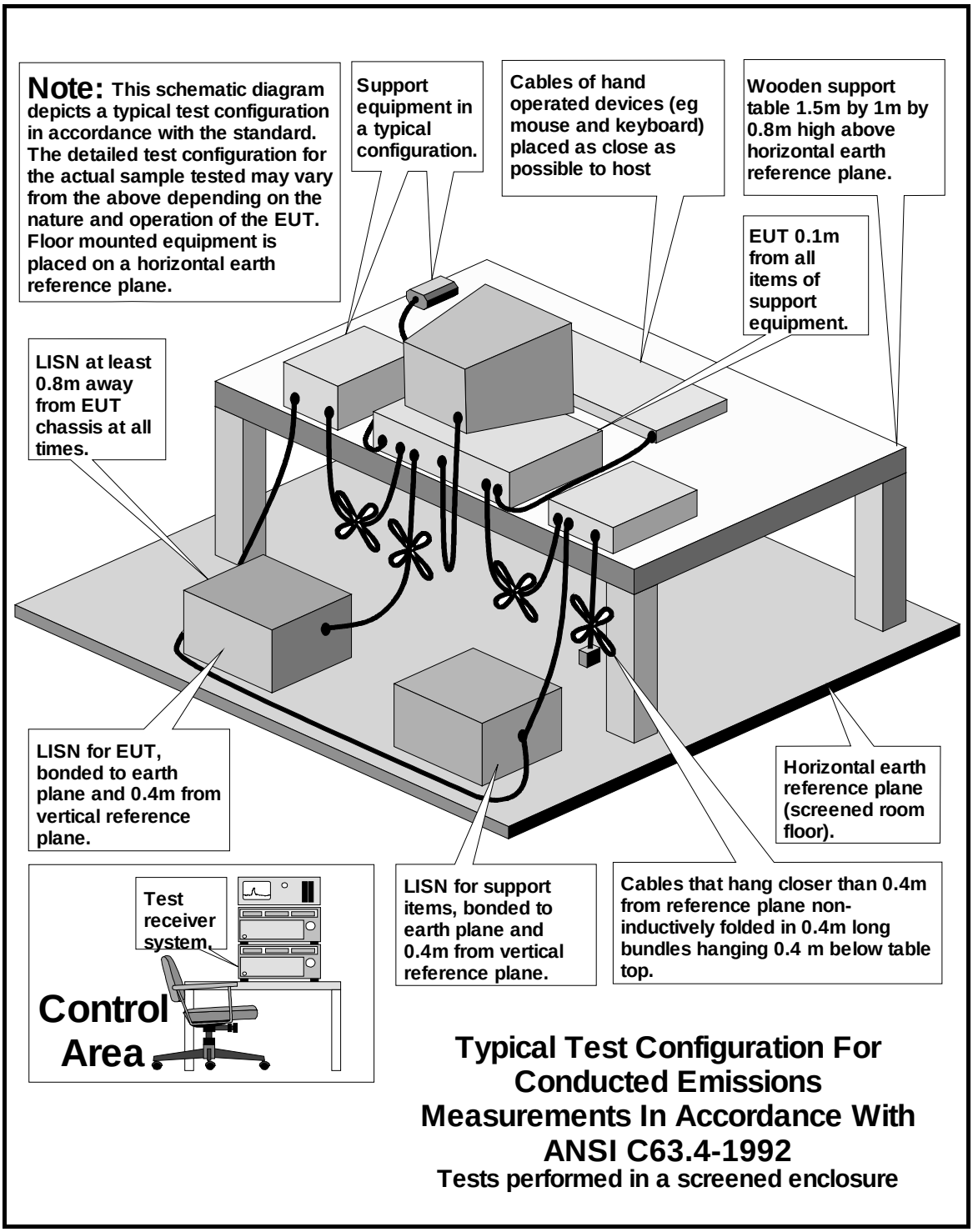
DRG\48409JD10\EMICON



Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
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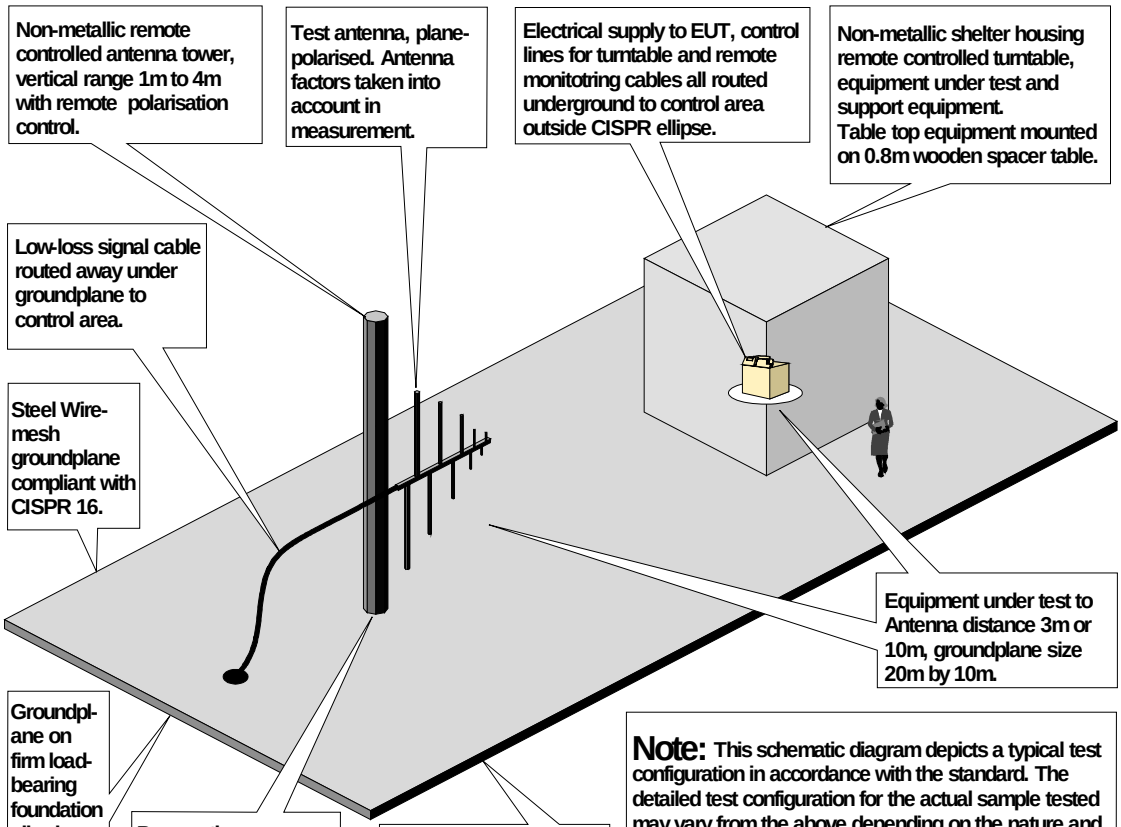
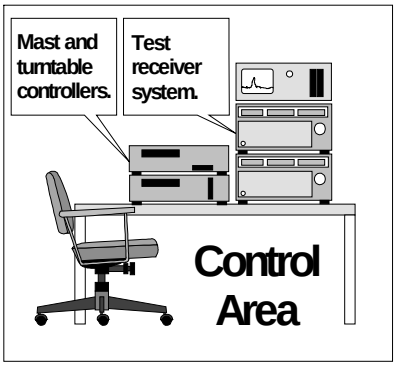
DRG\48409JD10\EMIRAD



Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m
(CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse

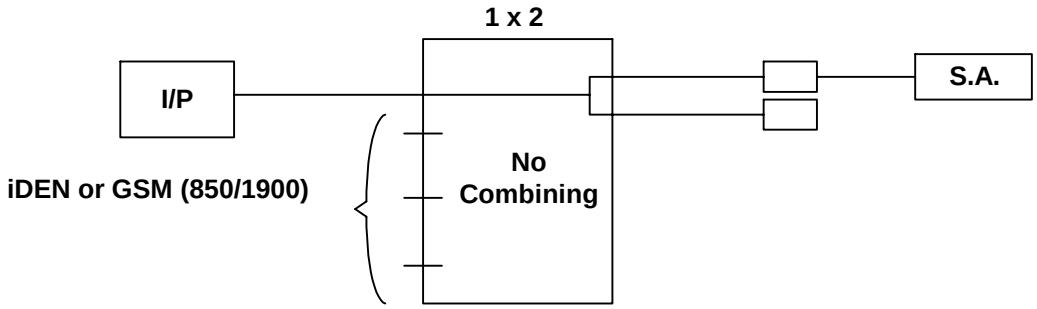


Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

DRG\48409JD10\001 - 1x2 – Single input to two outputs, no combining

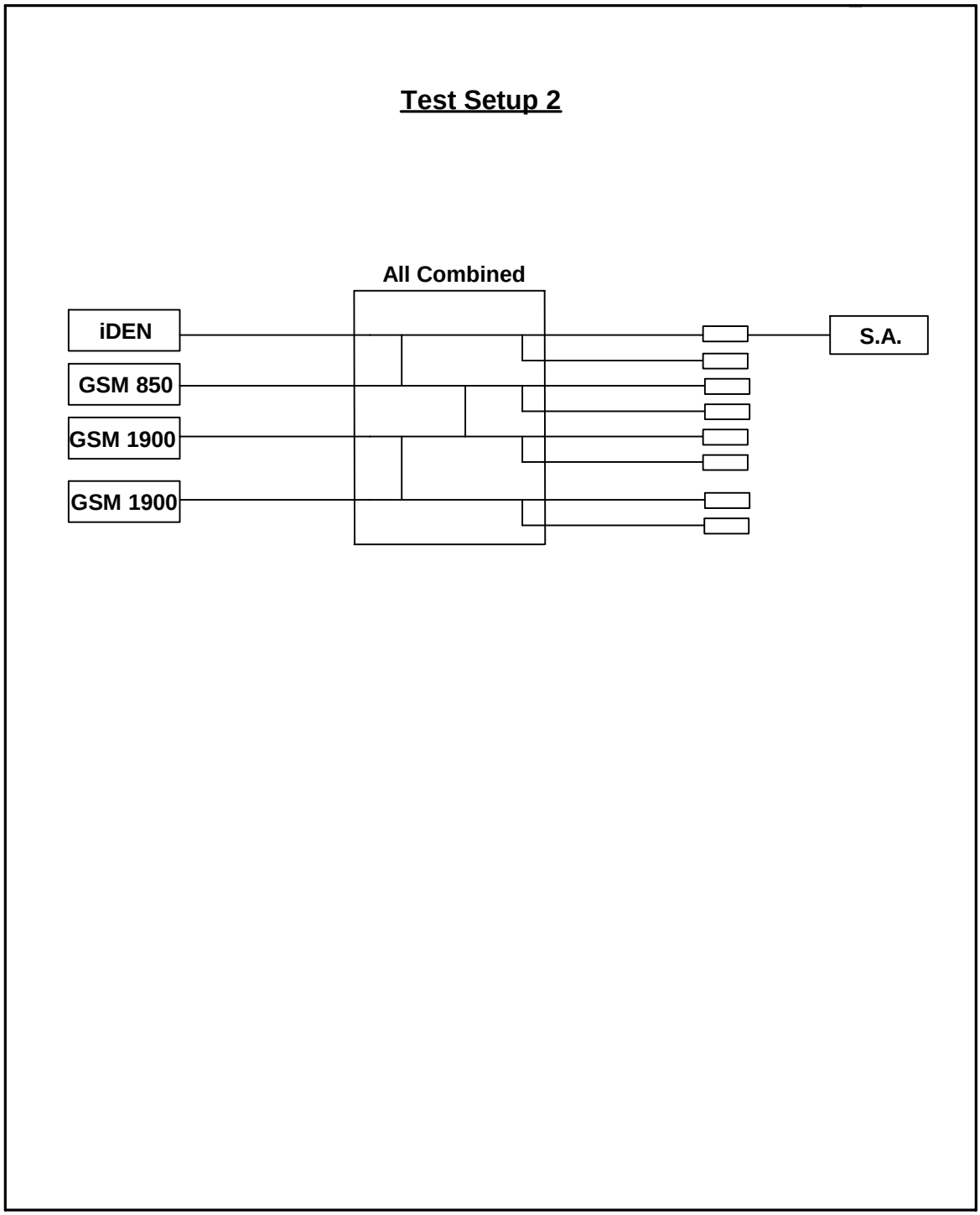
Test Setup 1

Spurious Emissions



Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

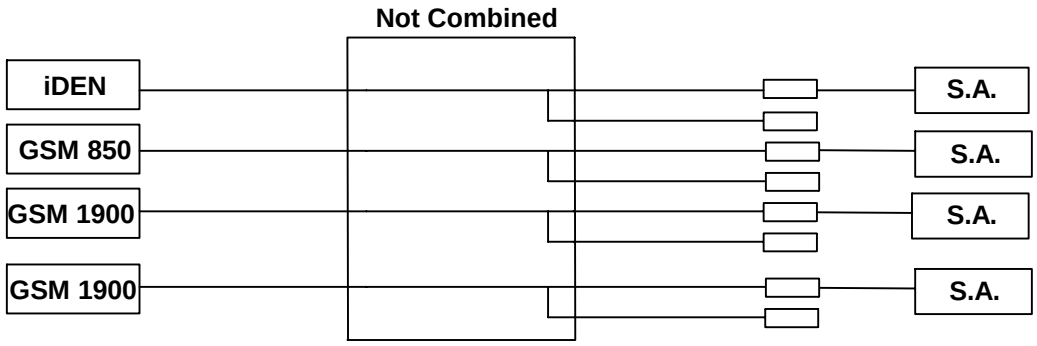
DRG\48409JD10\002 - 4x8 – Fully loaded with different technologies, combined



Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

DRG\48409JD10\003 - 4x8 – Fully loaded with different technologies, no combining

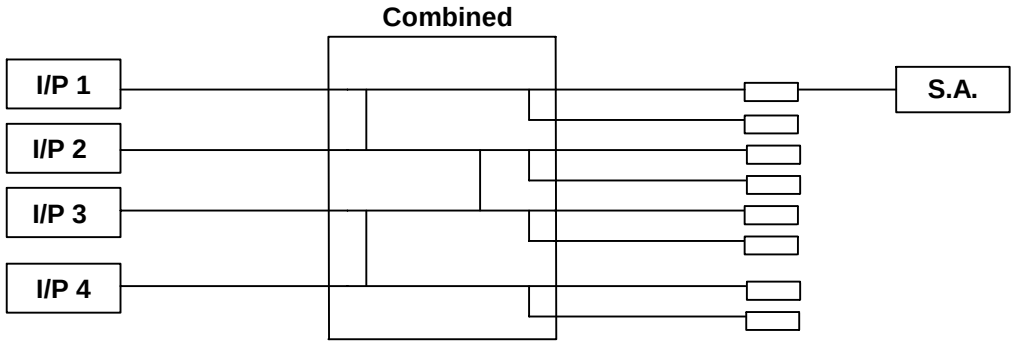
Test Setup 3



Test of: Zinwave Ltd
2700 DAS
To: FCC Part 90: 2005
Tested in Accordance to Test Plan RFI/REGA1/TP48310JD01

DRG\48409JD10\004 - 4x8 – Fully loaded with 4 signals within chosen operating band, combined

Test Setup 4



Note: The 4 I/Ps had 4 signals based on the channels of the specific band under test: iDEN or GSM 850/1900,