TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: IPWireless (UK) Ltd.
2.5 GHz V5 Node B Model: VS/VT

To: FCC Part 27: 2006

Test Report Serial No:
RFI/RPTE1/RP49131JD01A

This Test Report Is Issued Under The Authority Of Michael Derby, Radio Performance Service Leader: 	
Tested By: Ian Watch 	**Checked By: Michael Derby** 
Report Copy No: PDF01	
Issue Date: 26 July 2007	**Test Dates: 02 July 2007 to 09 July 2007**

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields. Furthermore, the date of creation must match the issue date stated above. This report may be copied in full. The results in this report apply only to the sample(s) tested.

RFI Global Services Ltd
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001
Email: info@rfi-global.com Website: www.rfi-global.com

Registered in England and Wales. Company number:2117901

This page has been left intentionally blank.

Table of Contents

1. Client Information

Company Name:	IPWireless (UK) Ltd.
Address:	Unit 7 Greenways Business Park Bellinger Close Chippenham Wiltshire SN15 1BN UK
Contact Name:	Mr P Warburg

2. Equipment Under Test (EUT)

The following information has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	IPWireless
Model Name or Number:	V5 Node B Digital Shelf
Unique Type Identification:	VS
Serial Number:	VS1J724001Y12
Country of Manufacture:	United Kingdom
FCC ID Number:	PKTNODEBVS
Date of Receipt:	02 July 2007

Brand Name:	IPWireless
Model Name or Number:	V5 Node B Radio Shelf
Unique Type Identification:	VT
Serial Number:	VT1J723000912
Country of Manufacture:	United Kingdom
FCC ID Number:	N/A
Date of Receipt:	02 July 2007

2.2. Description of EUT

The equipment under test is a wireless broadband base station; the base station provides high-speed internet access network. The base station contains a radio shelf connected to a digital shelf. A GPS receive module is fitted to the digital shelf.

The channel widths allowed under Part 27 are 5.5 MHz and 6 MHz, depending on the sub-band used. The EUT uses two channels, concatenated.

The EUT can be used for Broadband Radio Service (BRS) or Educational Broadband Service (EBS), as defined in FCC Part 27.4.

2.3. Modifications Incorporated In EUT

The EUT was not modified during the course of testing.

2.4. Additional Information related to Testing

Power Supply Requirement:	-48V DC		
Intended Operating Environment:	Residential, Commercial, Light Industry		
Equipment Category:	Miscellaneous Wireless Communications Services		
Type of Unit:	Wireless Broadband Base Station		
Weight:	25kg		
Dimensions:	566mm (H), 380mm (W), 202mm (D)		
Interface Ports:	Ethernet Port -48V DC Input GPS 2 Antenna Ports		
Transmit Frequency Range	2501.4 MHz to 2684.6 MHz		
Transmit Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	N/A	2501.4
	Middle	N/A	2593.0
	Top	N/A	2684.6
Receive Frequency Range	2501.4 MHz to 2684.6 MHz		
Receive Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	N/A	2501.4
	Middle	N/A	2593.0
	Top	N/A	2684.6
Highest Fundamental Frequency	2684.6 MHz		
Highest Oscillator Frequency	2303 MHz		
Maximum Power Output	34.0 dBm		

2.5. Support Equipment

The following support equipment was supplied by the applicant and used to exercise the EUT during testing:

Description:	Laptop PC
Brand Name:	Sony
Model Name or Number:	VAIO VGN-196VI
Serial Number:	282001505303659
Cable Length and Type	2 metre, Cat-5E
Connected to Port:	Ethernet Port 2 on Digital Shelf

Description:	GPS antenna
Brand Name:	Motorola
Model Name or Number:	AN14740098
Serial Number:	None marked or stated
Cable Length and Type	10 metre, RG 214 Coaxial
Connected to Port:	GPS on Digital Shelf

Description:	Bench Power Supply
Brand Name:	Wayne Kerr
Model Name or Number:	AP70308
Serial Number:	193786
Cable Length and Type	3 metre, Multiple single core
Connected to Port:	Power sockets on Radio and Digital shelves

3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	FCC Part 27: 2006
Title:	Code of Federal Regulations, Part 27 (47CFR) Subpart C Miscellaneous Wireless Communications Services
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 15: 2006 Class B
Title:	Code of Federal Regulations, Part 15 (47CFR) Radio Frequency Devices: Digital Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003
Land Mobile Communications Equipment, Measurements and performance Standards.

ANSI C63.2 (1996)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)
Title: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1998)
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

There were no deviations from the test specification

5. Operation of the EUT During Testing

5.1. Operating Modes

The EUT was tested in the following operating modes:

Transmitter Modes:

For all conducted antenna port tests, the EUT was transmitting at full power on bottom, middle and top channels, in a 15 timeslot assignment, on all 5 timeslots, and simultaneously receiving on 10 timeslots using the highest chip rate. This was stated as being the worst-case configuration. One antenna port was connected to the measuring equipment; the unused port was terminated with a 50 Ohm load. Initial verification tests were carried out on the unused port to confirm the results were the same on both ports.

For radiated tests, the EUT was transmitting at full power on bottom, middle and top channels, in a 15 timeslot assignment, on all 5 timeslots, and simultaneously receiving on 10 timeslots. This was stated as being the worst-case configuration. Both antenna ports and the GPS port were terminated with 50 Ohm loads.

Receiver Modes:

The receiver was not tested as the EUT is designed to transmit and receive on a single radio channel in TDD operation.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

An external bench power supply was used to supply DC power to the EUT.

The Ethernet port was connected to a laptop PC. The laptop PC was used to configure the EUT.

GPS was enabled and used when making frequency measurements.

6. Summary of Test Results

Transmit Mode

Range Of Measurements	Specification Reference	Port Type	Compliancy Status
AC Conducted Spurious Emissions (150 kHz to 30 MHz)	CFR 47: 2006 FCC Part 15 Section 15.207	AC Mains	Complied
Transmitter Carrier Output Power and EIRP	CFR 47: 2006 FCC Part 2.1046, Part 27.50	Antenna Terminals	Complied
Frequency Stability (Temperature Variation)	CFR 47: 2006 FCC Part 2.1055, Part 27.54	Antenna Terminals	Complied
Frequency Stability (Voltage Variation)	CFR 47: 2006 FCC Part 2.1055, Part 27.54	Antenna Terminals	Complied
Occupied Bandwidth	CFR 47: 2006 FCC Part 2.1049	Antenna Terminals	Complied
Conducted Spurious Emissions, Band Edge and Channel Edge	CFR 47: 2006 FCC Part 2.1051, Part 27.53	Antenna Terminals	Complied
Conducted Spurious Emissions	CFR 47: 2006 FCC Part 2.1051, Part 27.53	Antenna Terminals	Complied
Radiated Spurious Emissions	CFR 47: 2006 FCC Part 2.1051, Part 27.53	Enclosure	Complied
Radiated Spurious Emissions at Band Edge	CFR 47: 2006 FCC Part 2.1051, Part 27.53	Enclosure	Complied

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, UK.

FCC Site Registration Number: 90895

IC Site Registration Number: 3485

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only. Details of the test methods and procedures can be found in Appendix 2 of this report.

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

The EUT was configured for AC conducted emissions measurements, as described in Appendix 2 of this report.

Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

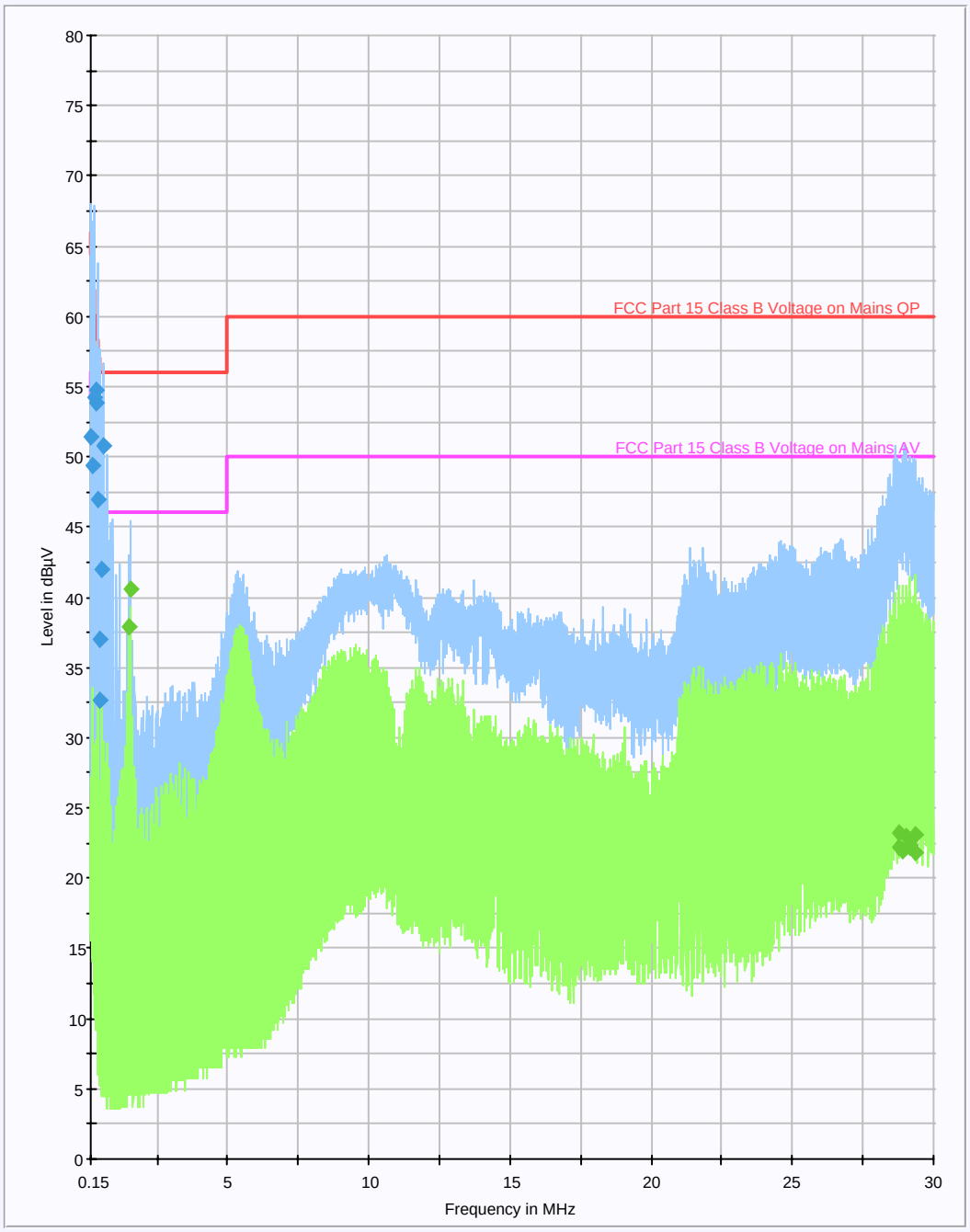
Results: Quasi-Peak Detector Measurements on Live And Neutral Lines

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.166000	Live	51.4	65.2	13.8	Complied
0.222000	Live	49.3	62.7	13.4	Complied
0.274000	Live	54.2	61.0	6.8	Complied
0.322000	Live	54.8	59.7	4.9	Complied
0.334000	Live	53.9	59.4	5.5	Complied
0.378000	Live	47.0	58.3	11.3	Complied
0.450000	Live	32.6	56.9	24.3	Complied
0.502000	Live	36.9	56.0	19.1	Complied
0.550000	Live	42.0	56.0	14.0	Complied
0.574000	Live	50.8	56.0	5.2	Complied

Results: Average Detector Measurements on Live And Neutral Lines

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
1.490000	Neutral	37.9	46.0	8.1	Complied
1.538000	Neutral	40.6	46.0	5.4	Complied
28.750000	Neutral	23.2	50.0	26.8	Complied
28.798000	Live	22.2	50.0	27.8	Complied
28.894000	Live	22.0	50.0	28.0	Complied
29.038000	Live	22.9	50.0	27.1	Complied
29.134000	Live	22.4	50.0	27.6	Complied
29.182000	Live	22.2	50.0	27.8	Complied
29.326000	Live	21.8	50.0	28.2	Complied
29.374000	Live	23.0	50.0	27.0	Complied

Transmitter AC Conducted Spurious Emissions (Continued)



7.2.2. Transmitter Carrier Output Power and Equivalent Isotropic Radiated Power (EIRP)

The EUT was configured for conducted RF output power, as described in Appendix 2 of this report.

The equivalent isotropic radiated power (EIRP) was calculated by adding the manufacturer's declared antenna gain to the figure measured for conducted RF output power.

Results:

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
Bottom	2501.4	37.3	20	57.3	27.3	40.0	12.7	Complied
Middle	2593.0	37.3	20	57.3	27.3	37.8	10.5	Complied
Top	2684.6	37.1	20	57.1	27.1	40.0	12.9	Complied

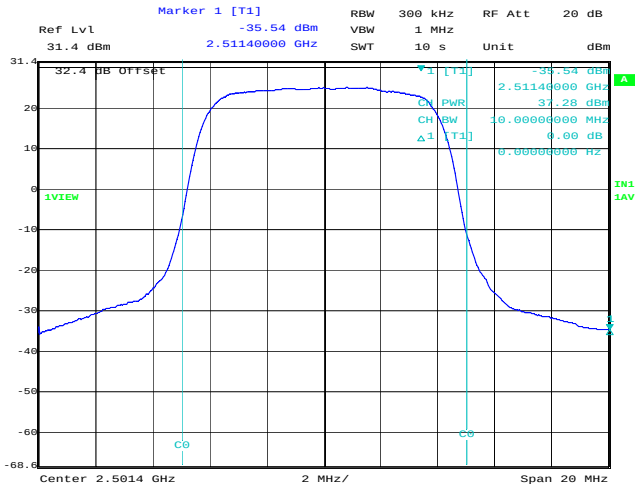
Note(s):

1. *As the EUT is a main station designed for 120° sectorisation, the limit is calculated as:*
   33+10 log (X/Y) + 10 log (360/beamwidth) dBW
   where:
   X is the actual measured channel width (9.2 MHz per Section 7.9 of this Report)
   Y is 6 MHz for channels in the MBS, or 5.5 MHz for channels in the LBS and UBS.

2. *The antenna gain stated by IPWireless is a maximum of 20 dBi and is therefore the figure used in the above table.*

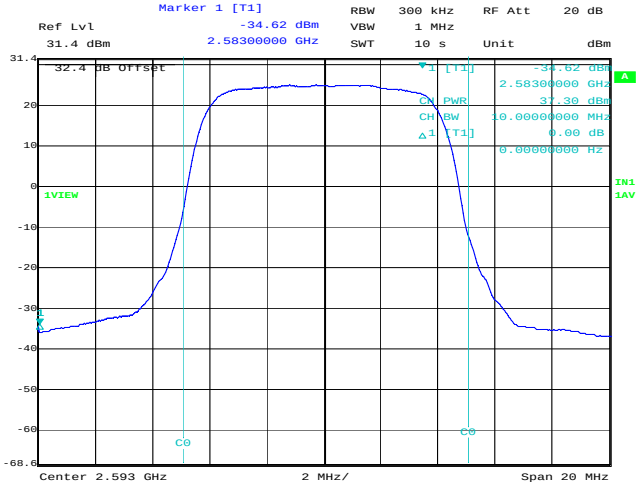
Transmitter Output Power and EIRP Limitations (Continued)

Bottom Channel



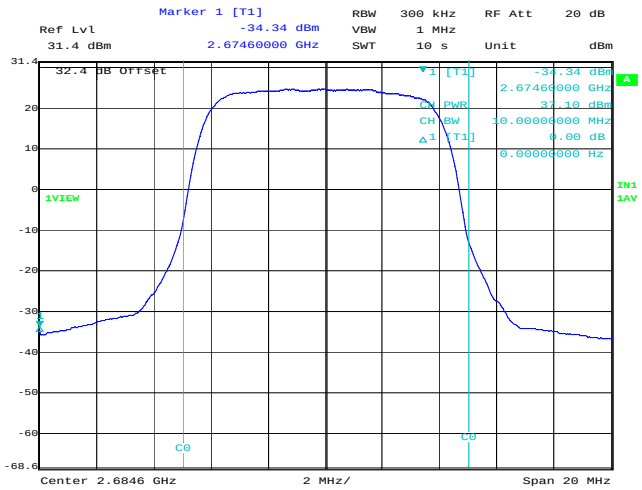
Title: 49131JD01 FCC PART 27
Comment A: CONDUCTED OUTPUT POWER - BOTTOM CHANNEL
Date: 5.JUL.2007 14:55:23

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: CONDUCTED OUTPUT POWER - MIDDLE CHANNEL
Date: 5.JUL.2007 15:02:43

Top Channel



Title: 49131JD01 FCC PART 27
Comment A: CONDUCTED OUTPUT POWER - MIDDLE CHANNEL
Date: 5.JUL.2007 15:07:24

Note(s):

1. *The plot for the Top Channel has been incorrectly labelled as Middle Channel, on the plot itself.*

7.2.3. Transmitter Frequency Stability - Temperature Variation

The EUT was configured for frequency stability measurements, as described in Appendix 2 of this report. Channel edge and carrier centre frequency measurements were made.

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

Results:

Bottom Channel Edge – (2501.4 MHz)

Temp (ºC)	Measured Frequency (MHz) at lower -20 dB point	Measured Frequency (MHz) at upper -20 dB point	Δ Lower channel edge to lower -20 dB point (kHz)	Δ Upper channel edge to upper -20 dB point (kHz)
-30	2496.81082	2505.90902	810.82	990.98
-20	2496.81082	2505.94910	810.82	950.90
-10	2496.81082	2505.94910	810.82	950.90
0	2496.81082	2505.98918	810.82	910.82
10	2496.85090	2505.94910	850.90	950.90
20	2496.85090	2505.94910	850.90	950.90
30	2496.81082	2505.94910	810.82	950.90
40	2496.85090	2505.94910	850.90	950.90
50	2496.85090	2505.94910	850.90	950.90
55	2496.85090	2505.94910	850.90	950.90

Middle Channel Edge – (2593.0 MHz)

Temp (ºC)	Measured Frequency (MHz) at lower -20 dB point	Measured Frequency (MHz) at upper -20 dB point	Δ Lower channel edge to lower -20 dB point (kHz)	Δ Upper channel edge to upper -20 dB point (kHz)
-30	2588.41082	2597.50902	910.82	990.98
-20	2588.41082	2597.54910	910.82	950.90
-10	2588.41082	2597.54910	910.82	950.90
0	2588.41082	2597.54910	910.82	950.90
10	2588.41082	2597.54910	910.82	950.90
20	2588.41082	2597.58918	910.82	910.82
30	2588.41082	2597.54910	910.82	950.90
40	2588.41082	2597.54910	910.82	950.90
50	2588.41082	2597.54910	910.82	950.90
55	2588.41082	2597.54910	910.82	950.90

Transmitter Frequency Stability - Temperature Variation (continued)

Top Channel Edge – (2684.6 MHz)

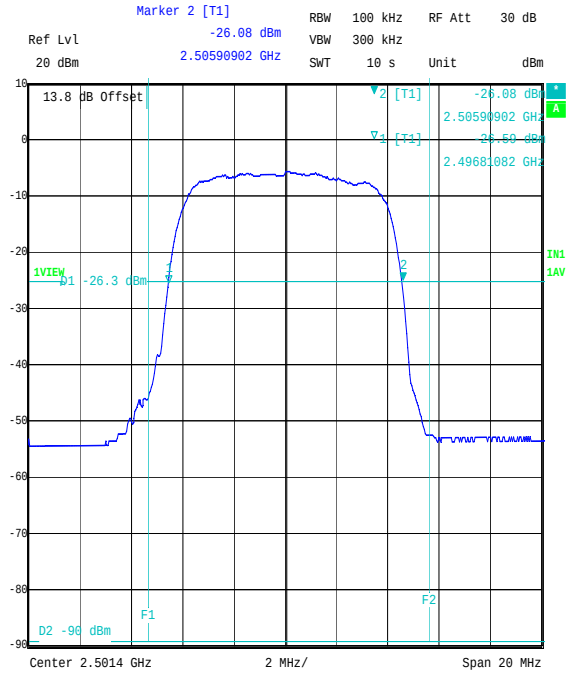
Temp (ºC)	Measured Frequency (MHz) at lower -20 dB point	Measured Frequency (MHz) at upper -20 dB point	Δ Lower channel edge to lower -20 dB point (kHz)	Δ Upper channel edge to upper -20 dB point (kHz)
-30	2680.01082	2689.10902	1010.82	890.98
-20	2680.01082	2689.10902	1010.82	890.98
-10	2680.01082	2689.14910	1010.82	850.90
0	2680.01082	2689.14910	1010.82	850.90
10	2680.01082	2689.14910	1010.82	850.90
20	2680.01082	2689.14910	1010.82	850.90
30	2680.01082	2689.14910	1010.82	850.90
40	2680.01082	2689.14910	1010.82	850.90
50	2680.01082	2689.14910	1010.82	850.90
55	2680.01082	2689.14910	1010.82	850.90

Limit:

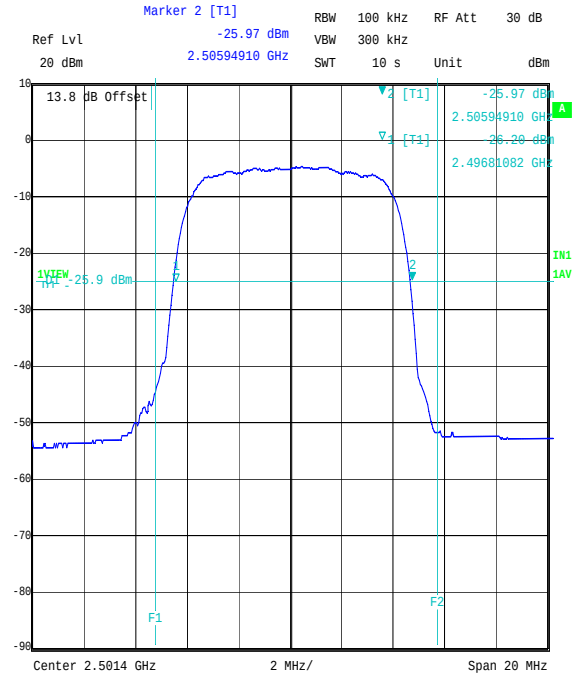
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Transmitter Frequency Stability - Temperature Variation (continued)

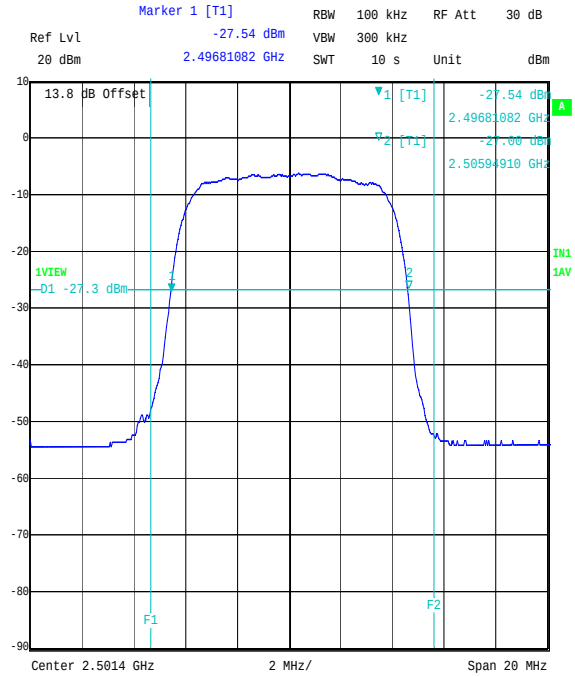
Bottom Channel Edge (2501.4 MHz)



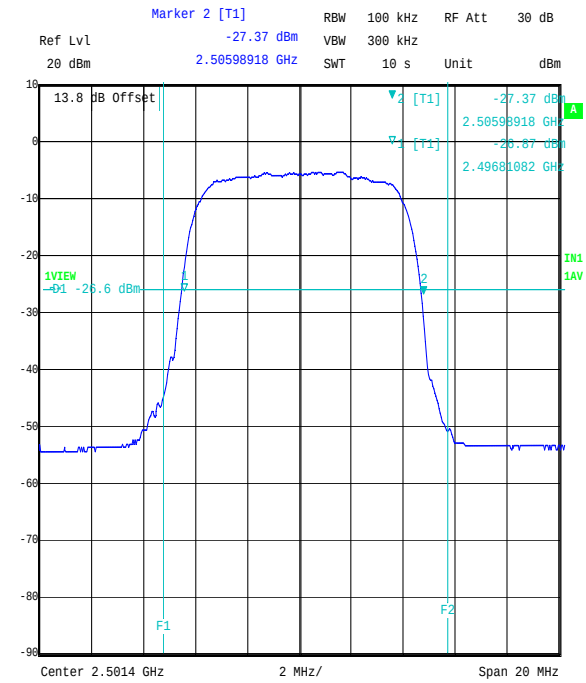
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL -30C
Date: 6.JUL.2007 10:54:38



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL -20C
Date: 6.JUL.2007 12:25:27



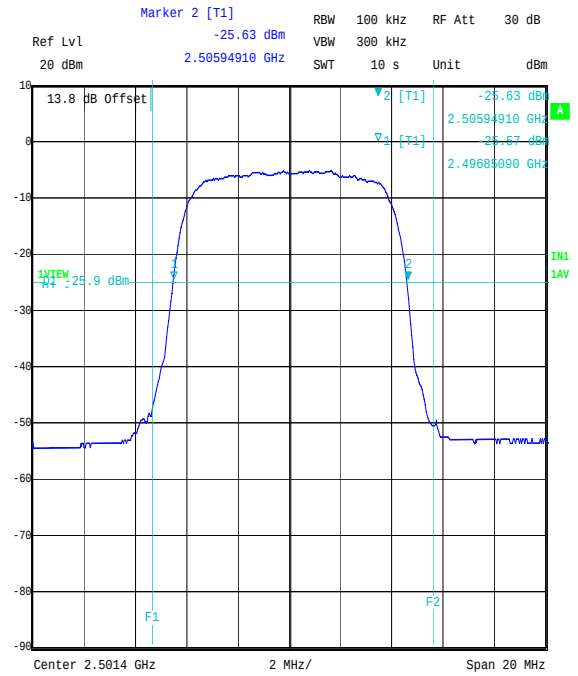
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL -10C
Date: 6.JUL.2007 13:54:34



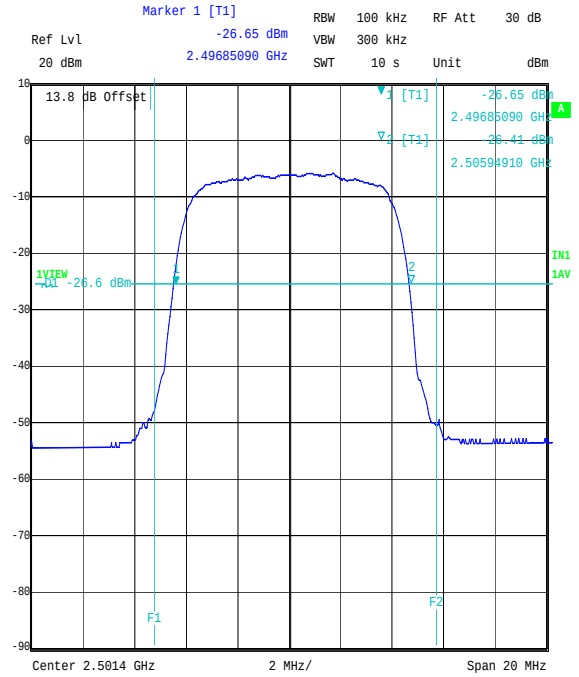
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM 0C
Date: 6.JUL.2007 14:56:09

Transmitter Frequency Stability - Temperature Variation (continued)

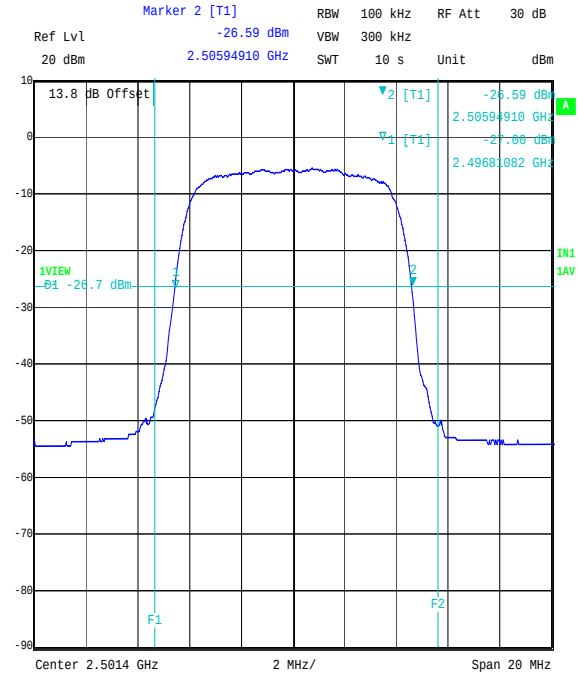
Bottom Channel Edge (2501.4 MHz)



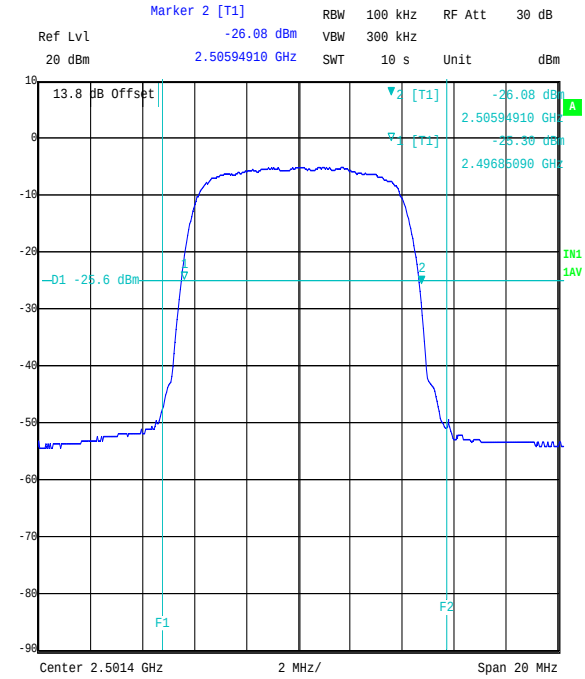
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 10C
Date: 6.JUL.2007 15:48:21



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 20C
Date: 6.JUL.2007 16:42:41



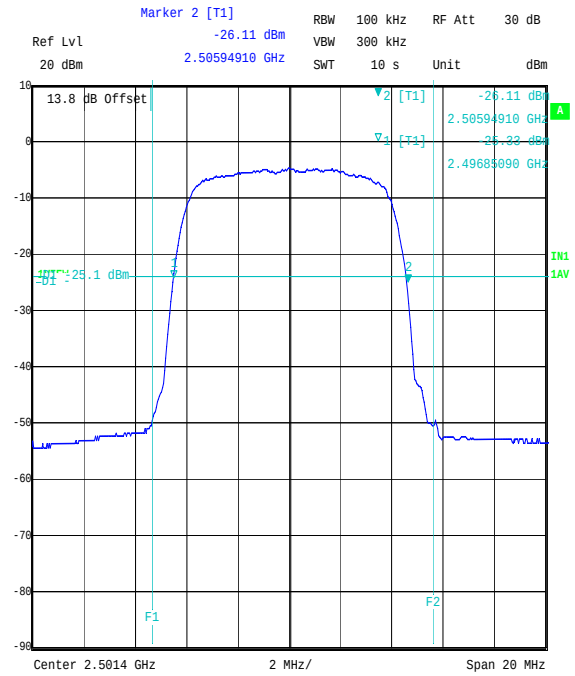
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 30C
Date: 9.JUL.2007 09:47:35



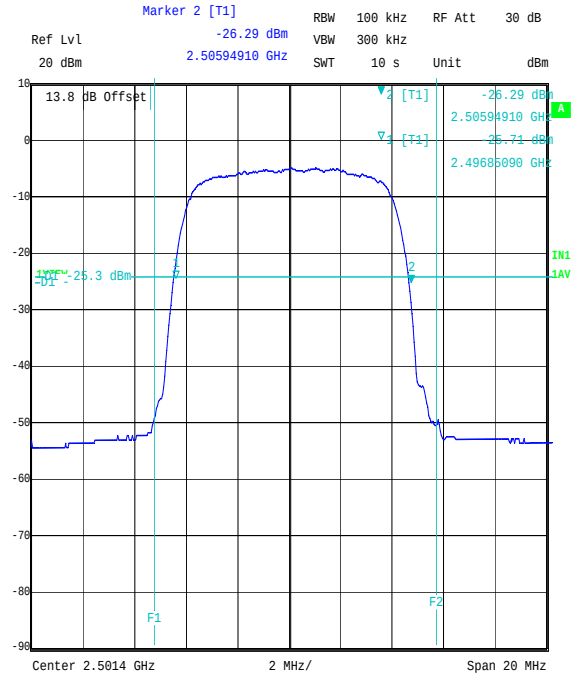
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 40C
Date: 9.JUL.2007 11:30:26

Transmitter Frequency Stability - Temperature Variation (continued)

Bottom Channel Edge (2501.4 MHz)



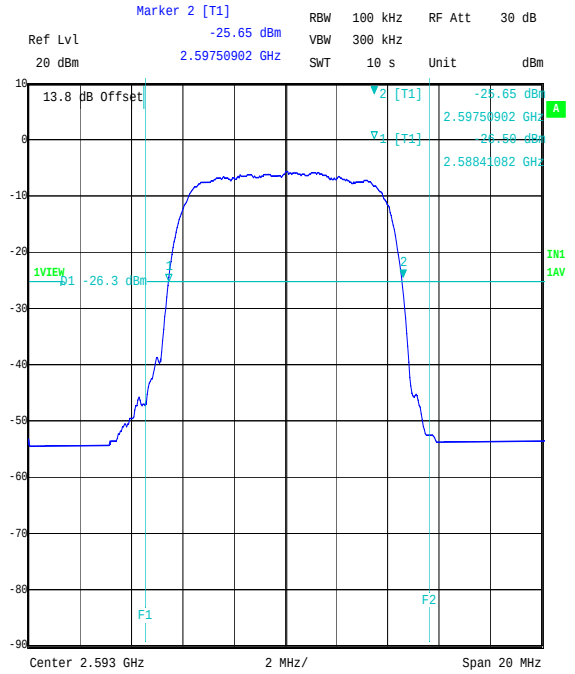
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 50C
Date: 9.JUL.2007 12:28:01



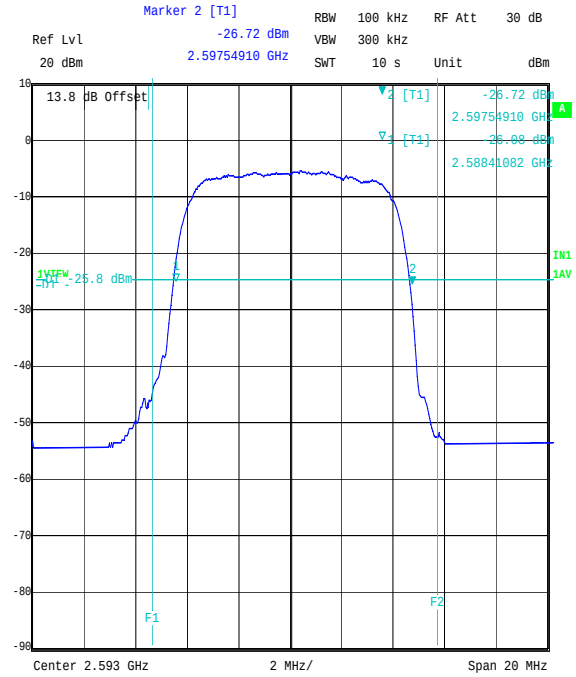
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 55C
Date: 9.JUL.2007 13:42:10

Transmitter Frequency Stability - Temperature Variation (continued)

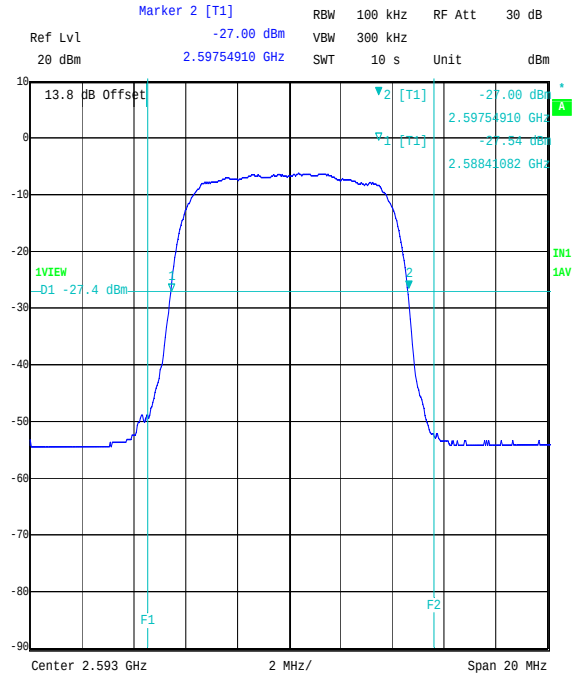
Middle Channel Edge (2593.0 MHz)



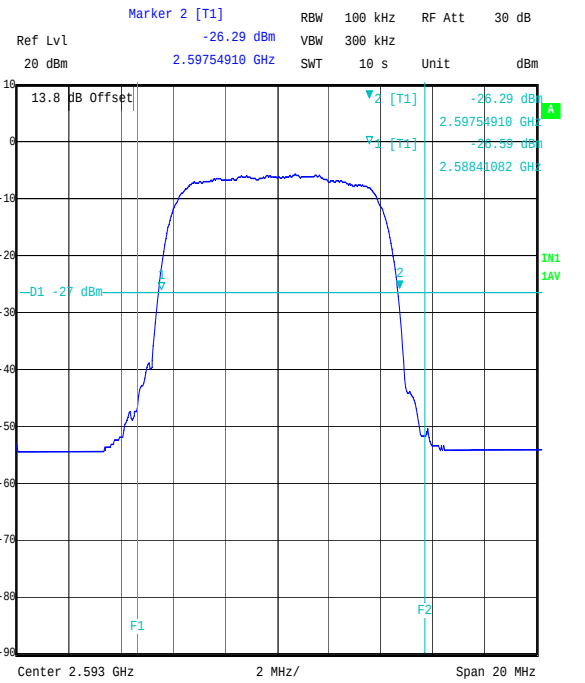
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL -30C
Date: 6.JUL.2007 10:59:56



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL -20C
Date: 6.JUL.2007 12:22:45



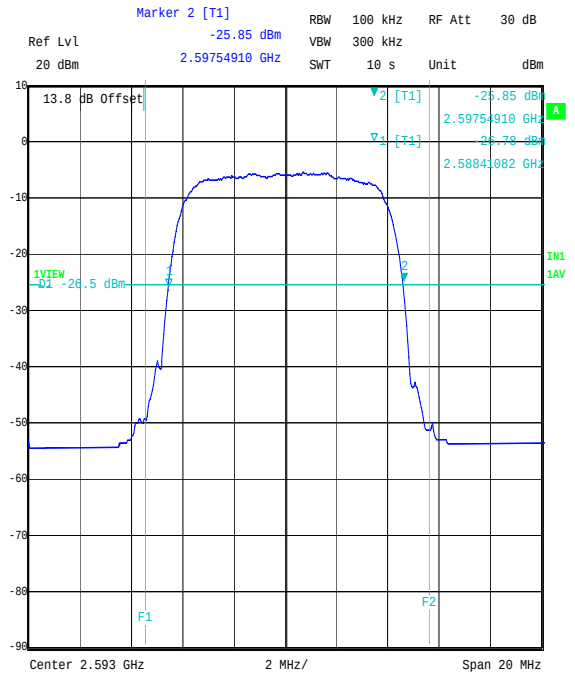
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL -10C
Date: 6.JUL.2007 13:58:19



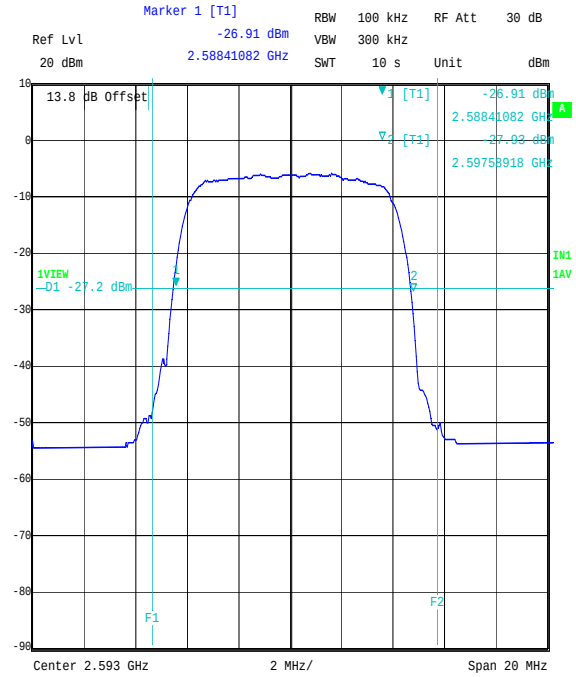
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE 0C
Date: 6.JUL.2007 14:53:18

Transmitter Frequency Stability - Temperature Variation (continued)

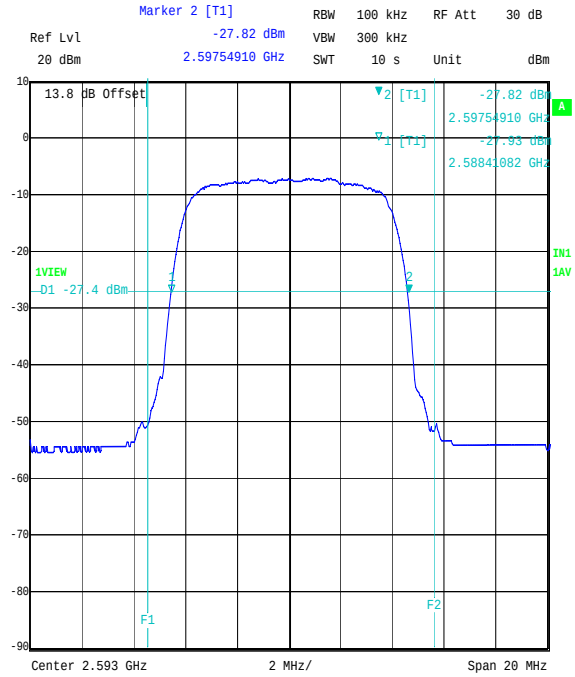
Middle Channel Edge (2593.0 MHz)



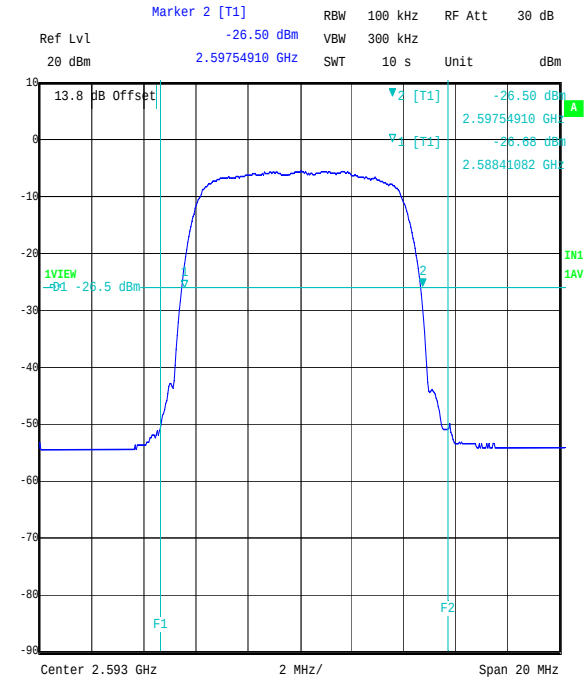
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 10C
Date: 6.JUL.2007 15:52:03



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 20C
Date: 6.JUL.2007 16:38:55



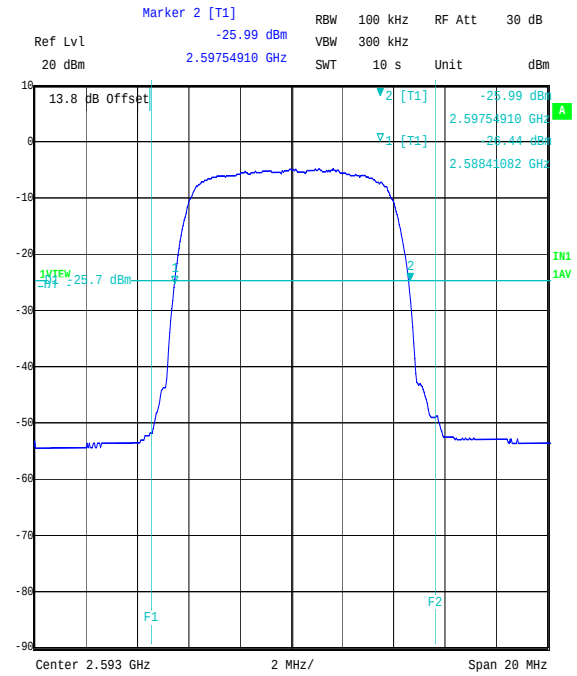
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 30C
Date: 9.JUL.2007 09:50:29



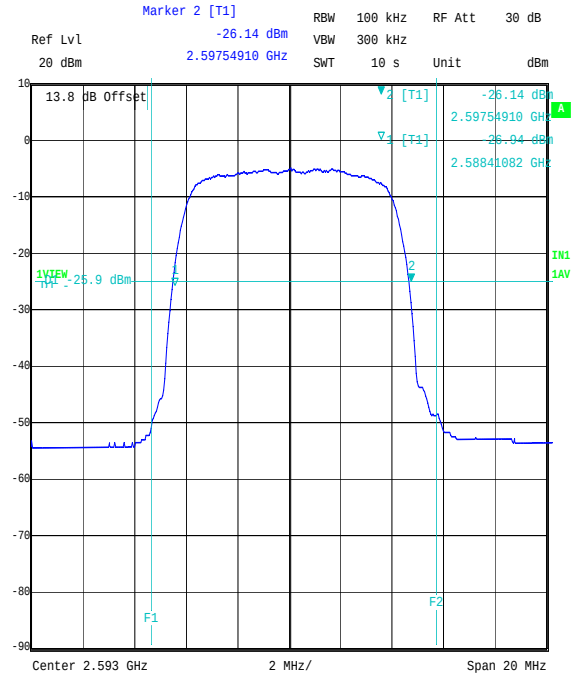
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 40C
Date: 9.JUL.2007 11:26:52

Transmitter Frequency Stability - Temperature Variation (continued)

Middle Channel Edge (2593.0 MHz)



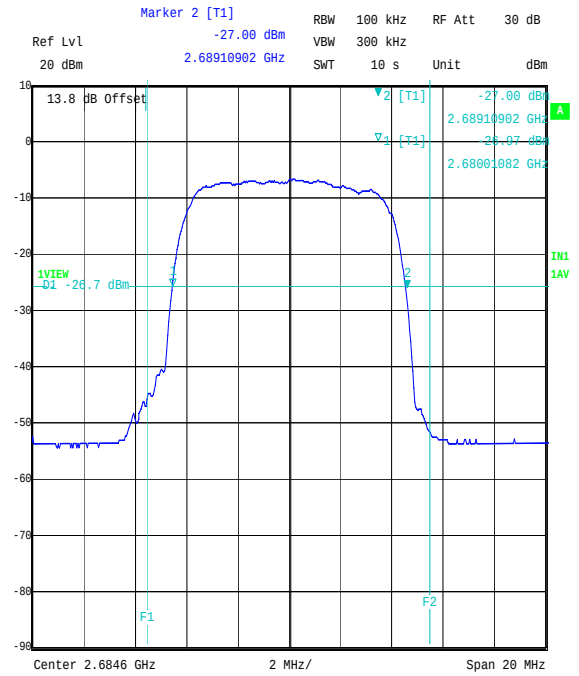
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 50C
Date: 9.JUL.2007 12:32:10



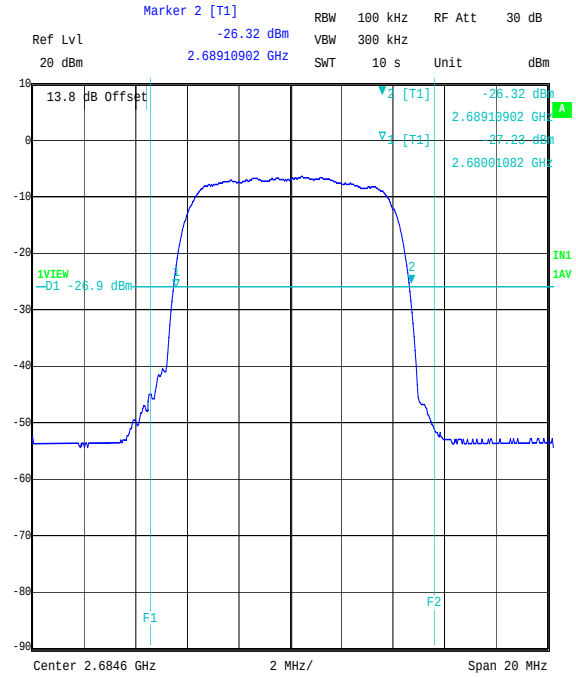
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 55C
Date: 9.JUL.2007 13:39:02

Transmitter Frequency Stability - Temperature Variation (continued)

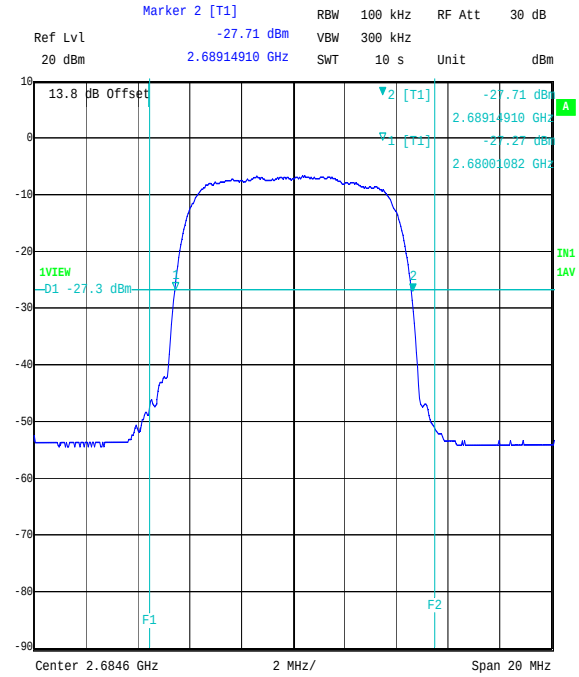
Top Channel Edge (2684.6 MHz)



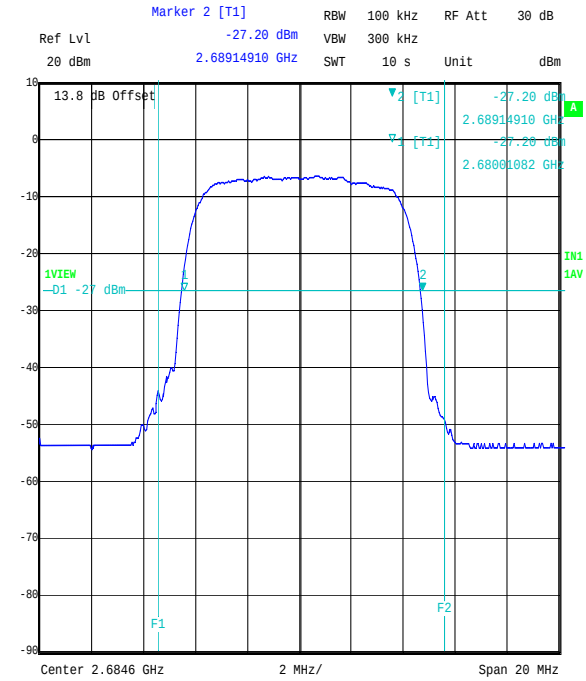
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL -30C
Date: 6.JUL.2007 11:09:43



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL -20C
Date: 6.JUL.2007 12:05:27



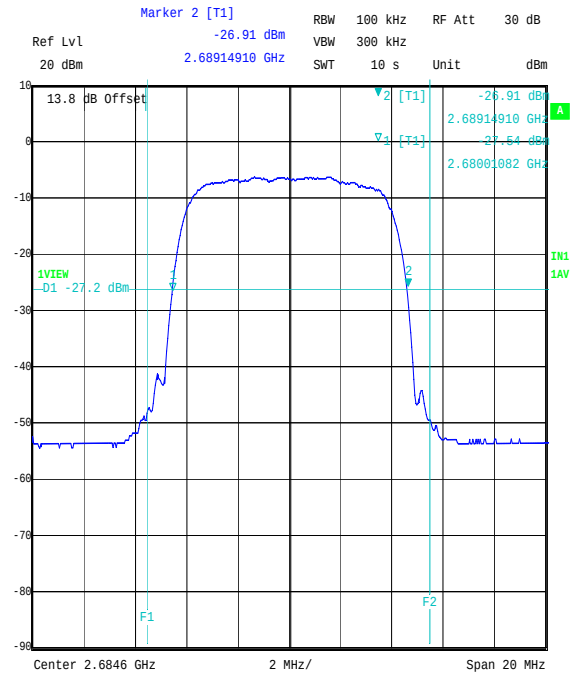
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL -10C
Date: 6.JUL.2007 14:05:16



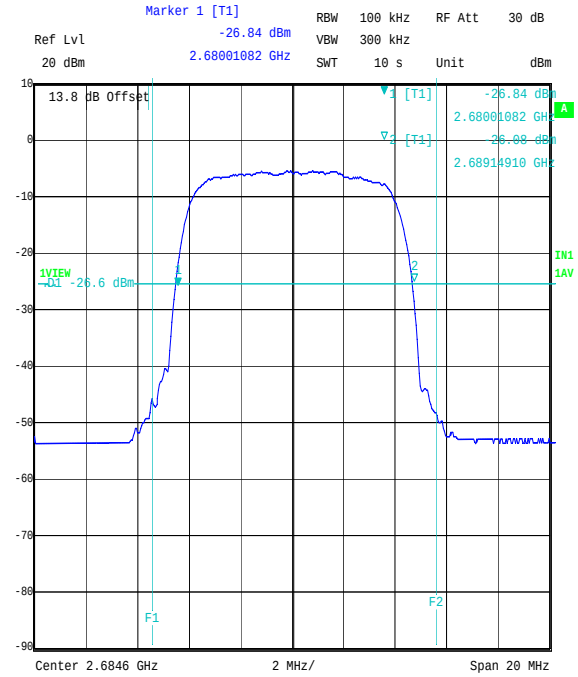
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 0C
Date: 6.JUL.2007 14:41:53

Transmitter Frequency Stability - Temperature Variation (continued)

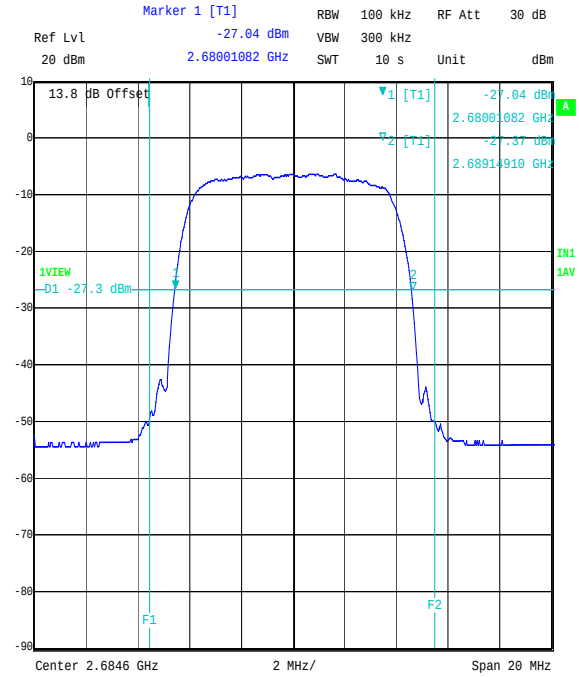
Top Channel Edge (2684.6 MHz)



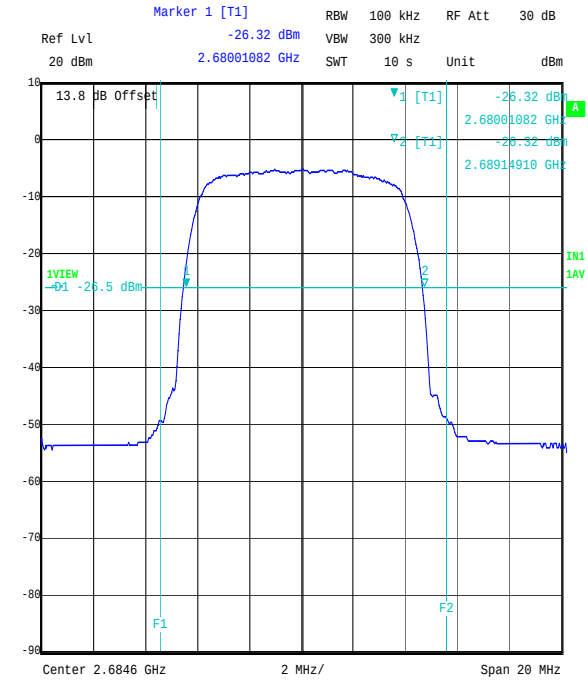
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 10C
Date: 6.JUL.2007 15:59:02



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 20C
Date: 6.JUL.2007 16:36:00



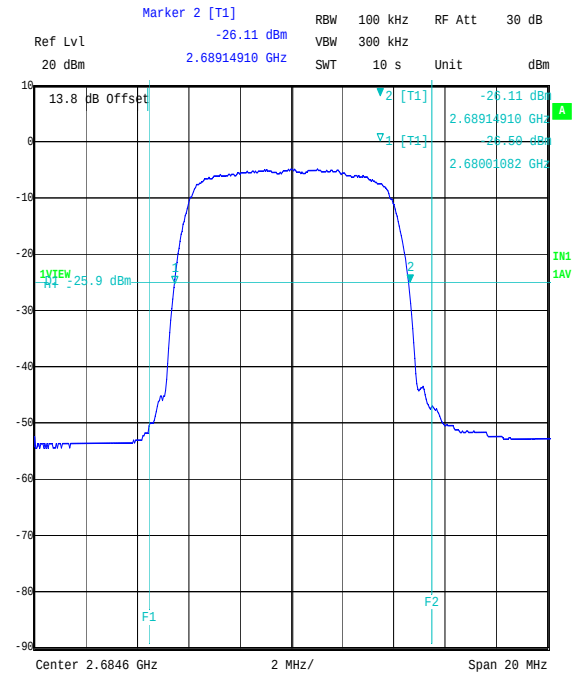
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 30C
Date: 9.JUL.2007 09:52:37



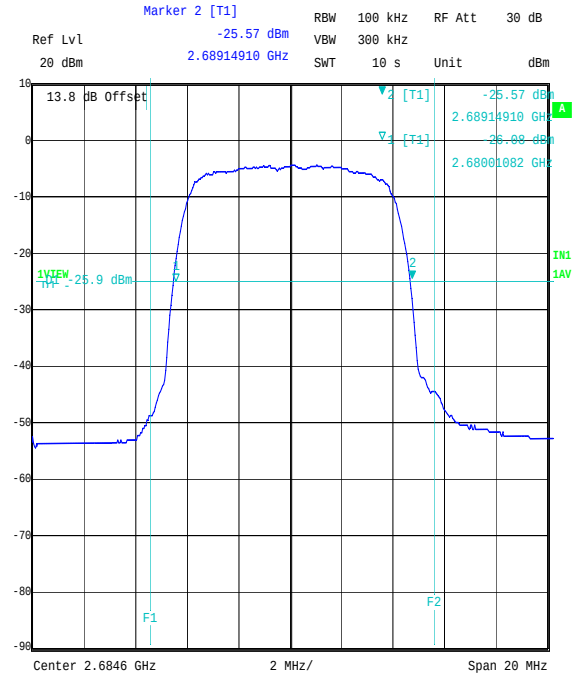
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 40C
Date: 9.JUL.2007 11:23:32

Transmitter Frequency Stability - Temperature Variation (continued)

Top Channel Edge (2684.6 MHz)



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 50C
Date: 9.JUL.2007 12:36:12



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 55C
Date: 9.JUL.2007 13:36:04

Transmitter Frequency Stability - Temperature Variation (continued)

Bottom Channel Carrier Centre (2501.4 MHz)

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (kHz)
-30	2501.40000	0
-20	2501.40030	0.300
-10	2501.40030	0.300
0	2501.40006	0.060
10	2501.40018	0.180
20	2501.40006	0.060
30	2501.40006	0.060
40	2501.40006	0.060
50	2501.40018	0.180
55	2501.40006	0.060

Middle Channel Carrier Centre (2593.0 MHz)

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (kHz)
-30	2593.00030	0.300
-20	2593.00054	0.540
-10	2593.00054	0.540
0	2593.00030	0.300
10	2593.00018	0.180
20	2593.00006	0.060
30	2593.00006	0.060
40	2593.00018	0.180
50	2593.00018	0.180
55	2593.00006	0.060

Transmitter Frequency Stability - Temperature Variation (continued)

Top Channel Carrier Centre (2684.6 MHz)

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (kHz)
-30	2684.60042	0.420
-20	2684.60066	0.660
-10	2684.60030	0.300
0	2684.60030	0.300
10	2684.60006	0.060
20	2684.60006	0.060
30	2684.60018	0.018
40	2684.60006	0.060
50	2684.60006	0.060
55	2684.60018	0.018

Note(s):

1. *The EUT was locked on to a GPS for the duration of the tests. The customer supplied GPS antenna was used and connected to the EUT GPS port on the Digital Shelf, using the Customer's coaxial cable. The Client requested that the EUT was tested to 55ºC, which is the declared upper operating temperature and greater than the FCC requirement.*

7.2.4. Transmitter Frequency Stability - Voltage Variation

The EUT was configured for frequency stability measurements, as described in Appendix 2 of this report.

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

Results:

Bottom Channel (2501.4 MHz)

DC Supply voltage	Measured Frequency (MHz) at lower -20 dB point	Measured Frequency (MHz) at upper -20 dB point	Δ Lower channel edge to lower -20 dB point (kHz)	Δ Upper channel edge to upper -20 dB point (kHz)
-36.0	2496.81082	2505.94910	810.82	950.90
-48.0	2496.85090	2505.94910	850.90	950.90
-72.0	2496.81082	2505.94910	810.82	950.90

Middle Channel (2593.00 MHz)

DC Supply voltage	Measured Frequency (MHz) at lower -20 dB point	Measured Frequency (MHz) at upper -20 dB point	Δ Lower channel edge to lower -20 dB point (kHz)	Δ Upper channel edge to upper -20 dB point (kHz)
-36.0	2588.41082	2597.54910	910.82	950.90
-48.0	2588.41082	2597.58918	910.82	910.82
-72.0	2588.41082	2597.54910	910.82	950.90

Top Channel (2684.6 MHz)

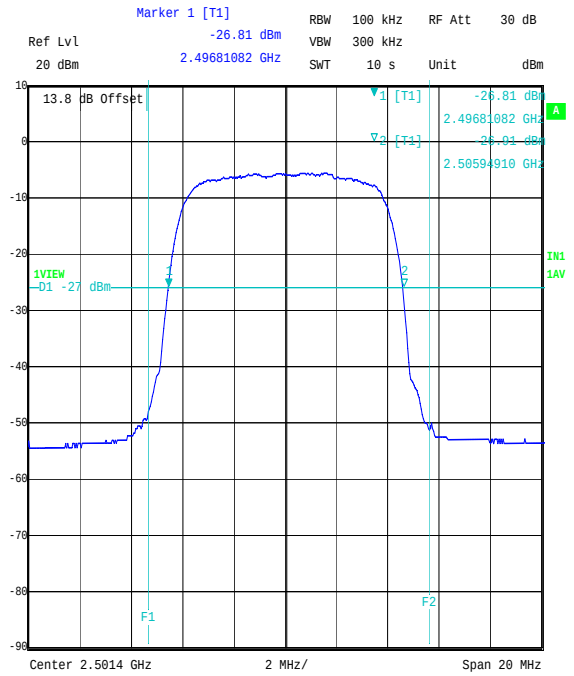
DC Supply voltage	Measured Frequency (MHz) at lower -20 dB point	Measured Frequency (MHz) at upper -20 dB point	Δ Lower channel edge to lower -20 dB point (kHz)	Δ Upper channel edge to upper -20 dB point (kHz)
-36.0	2680.01082	2689.10902	1010.82	890.98
-48.0	2680.01082	2689.14910	1010.82	850.90
-72.0	2680.01082	2689.10902	1010.82	890.98

Note(s):

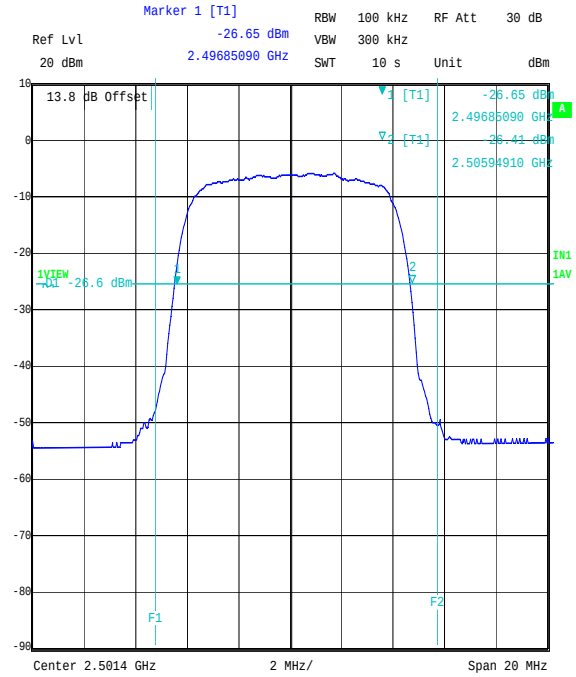
1. The DC supply voltage to the EUT was varied.
2. The EUT was locked on to a GPS for the duration of the tests. The customer supplied GPS antenna was used and connected to the EUT GPS port on the Digital Shelf, using the Customer's coaxial cable.
3. The Client requested that the EUT was tested from -36 V DC to -72 V DC, which is greater than the 85% to 115% of the nominal value and therefore greater than the FCC requirement.

Transmitter Frequency Stability - Voltage Variation (continued)

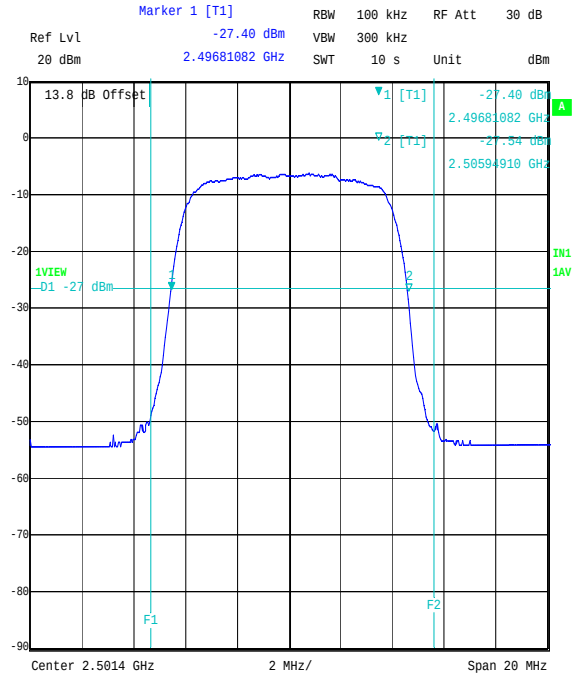
Bottom Channel Edge (2501.4 MHz)



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL NTLV
Date: 9.JUL.2007 15:23:49



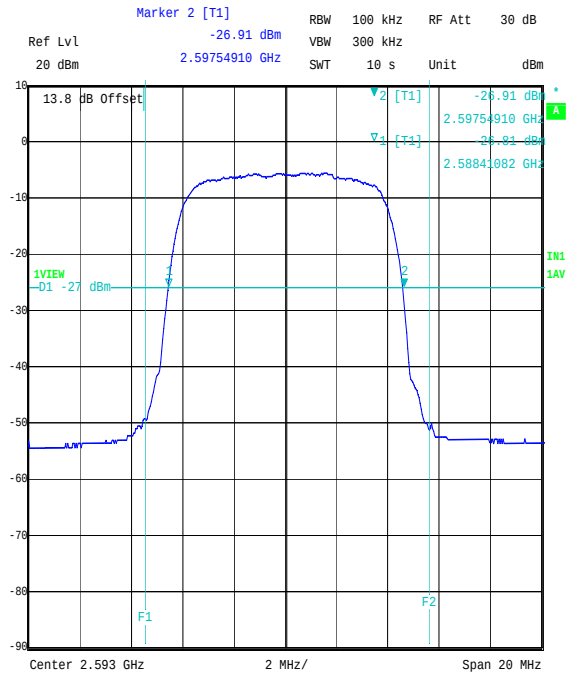
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL 20C
Date: 6.JUL.2007 16:42:41



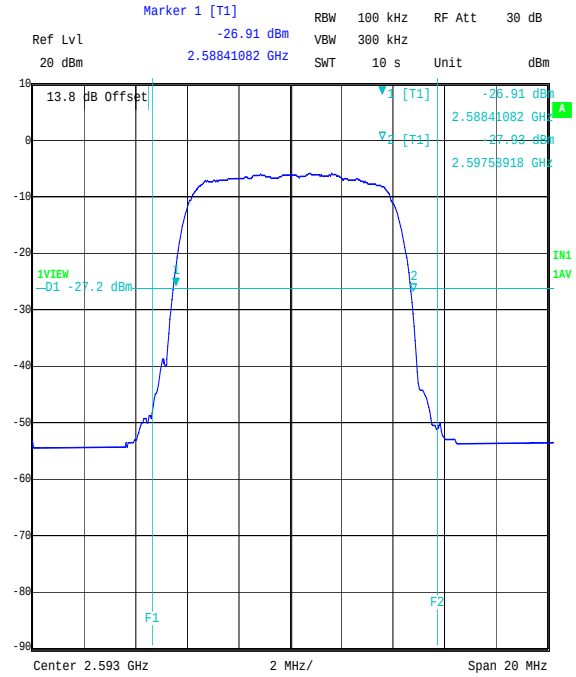
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR BOTTOM CHANNEL NTHV
Date: 9.JUL.2007 15:21:58

Transmitter Frequency Stability - Voltage Variation (continued)

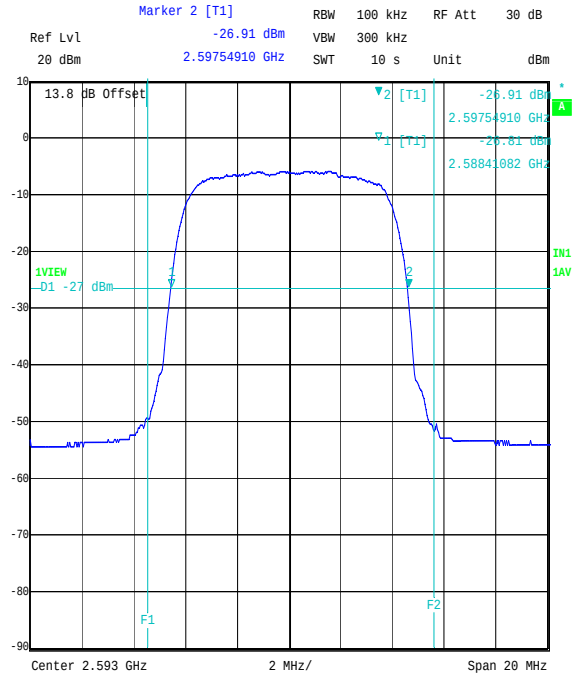
Middle Channel Edge (2593.0 MHz)



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL NTLV
Date: 9.JUL.2007 15:35:10



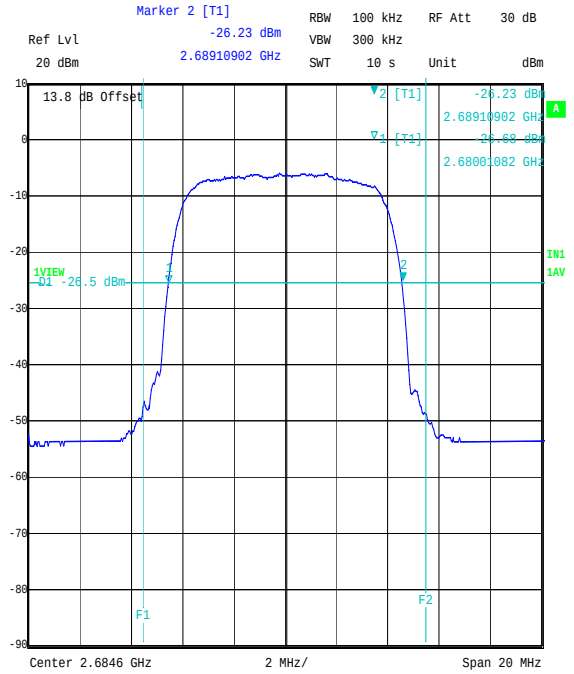
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL 20C
Date: 6.JUL.2007 16:38:55



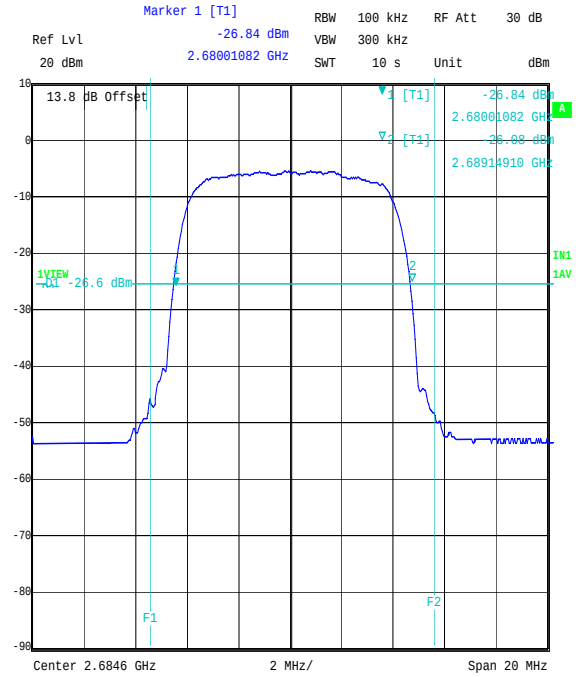
Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR MIDDLE CHANNEL NTHV
Date: 9.JUL.2007 15:34:05

Transmitter Frequency Stability - Voltage Variation (continued)

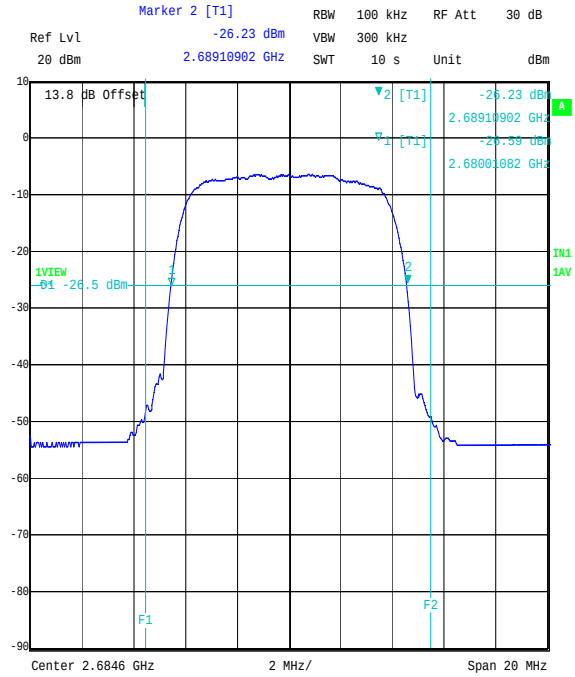
Top Channel Edge (2684.6 MHz)



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL NTLV
Date: 9.JUL.2007 15:41:57



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL 20C
Date: 6.JUL.2007 16:36:00



Title: 49131JD01 FCC PART 27
Comment A: FREQUENCY ERROR TOP CHANNEL NTHV
Date: 9.JUL.2007 15:39:04

Transmitter Frequency Stability - Voltage Variation (continued)

Bottom Channel Carrier Centre (2501.4 MHz)

Voltage	Measured Frequency (MHz)	Frequency Error (kHz)
-36	2501.40006	0.060
-48	2501.40006	0.060
-72	2501.40018	0.180

Middle Channel Carrier Centre (2593.0 MHz)

Voltage	Measured Frequency (MHz)	Frequency Error (kHz)
-36	2593.00006	0.060
-48	2593.00006	0.060
-72	2593.00006	0.060

Top Channel Carrier Centre (2684.6 MHz)

Voltage	Measured Frequency (MHz)	Frequency Error (kHz)
-36	2684.60018	0.180
-48	2684.60006	0.060
-72	2684.60006	0.060

7.2.5. Transmitter Occupied Bandwidth

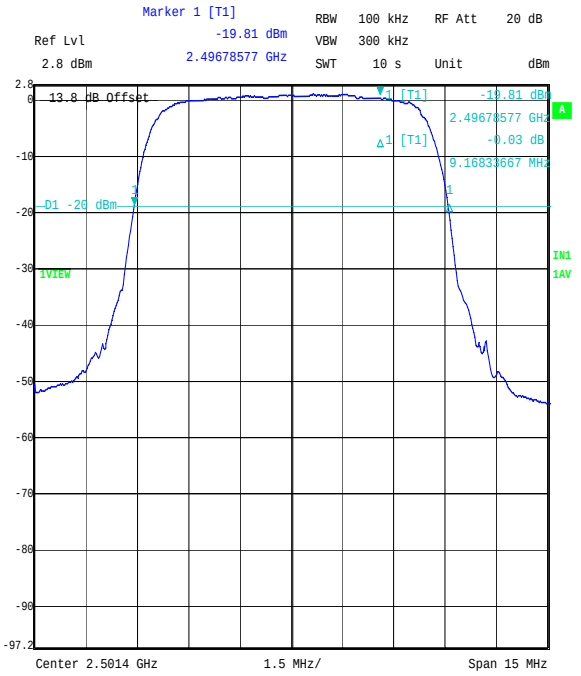
The EUT was configured for Occupied Bandwidth measurements, as described in Appendix 2 of this report.

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

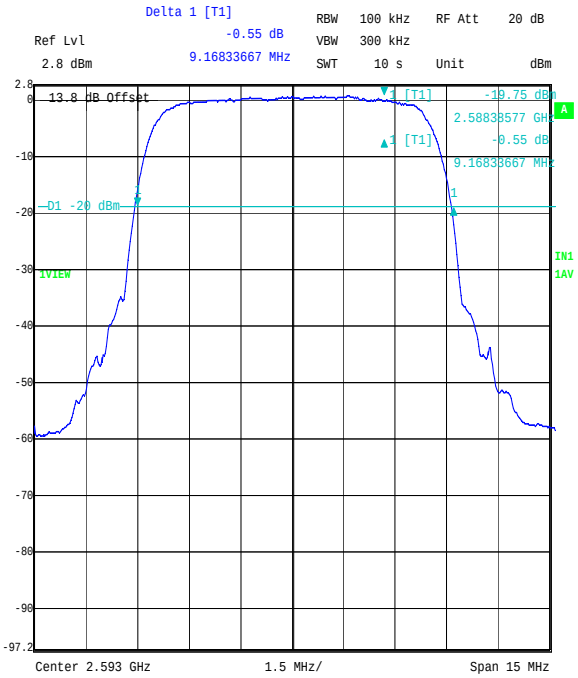
Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
Bottom	2501.4	100	300	9.168
Middle	2593.0	100	300	9.168
Top	2684.6	100	300	9.198

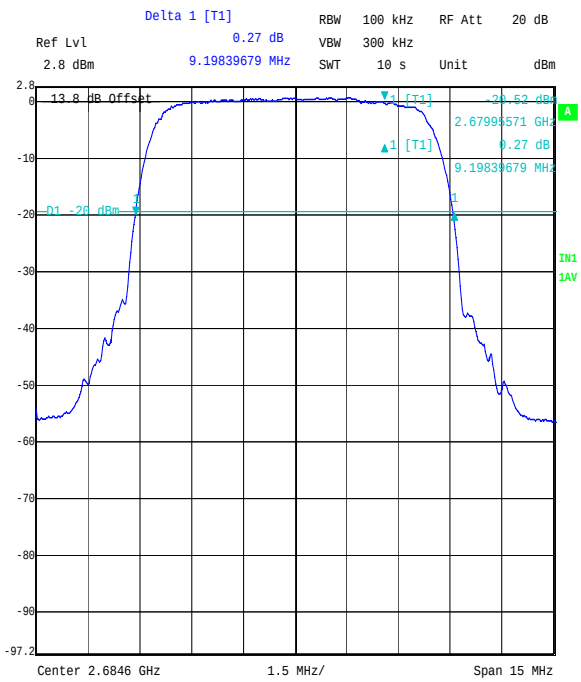
Transmitter Occupied Bandwidth (Continued)



Title: 49131JD01 FCC PART 27
Comment A: OCCUPIED BANDWIDTH - BOTTOM CHANNEL
Date: 5.JUL.2007 14:11:42



Title: 49131JD01 FCC PART 27
Comment A: OCCUPIED BANDWIDTH - MIDDLE CHANNEL
Date: 5.JUL.2007 14:24:57



Title: 49131JD01 FCC PART 27
Comment A: OCCUPIED BANDWIDTH - TOP CHANNEL
Date: 5.JUL.2007 14:22:52

7.2.6. Transmitter Conducted Emissions- Channel Edge

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

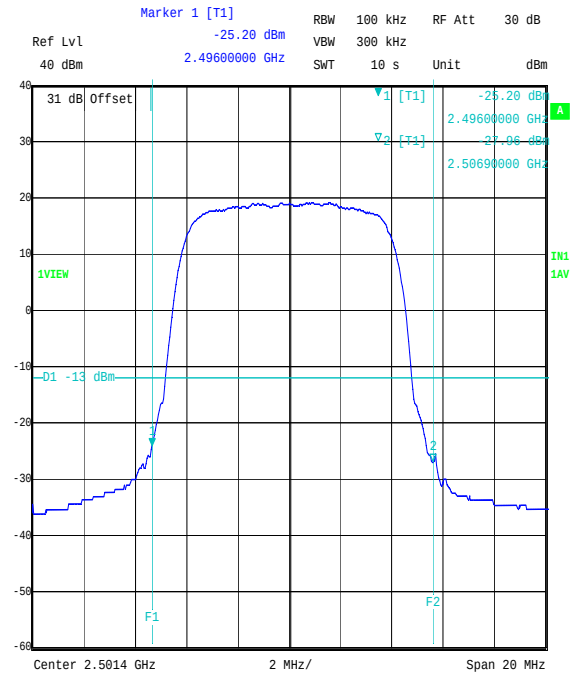
Tests were performed to determine compliance with the out of band power requirements at frequencies adjacent to the channel occupied by the fundamental frequency of the EUT.

Results:

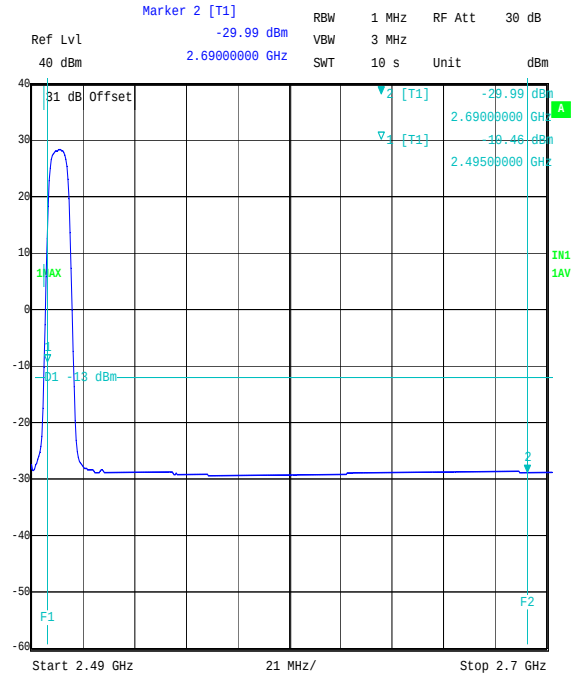
Results are presented graphically. In the following graphs, it can be seen that the EUT complies with the requirements of the relevant part of the regulations.

Transmitter Conducted Emissions - Channel Edge (Continued)

Bottom Channel

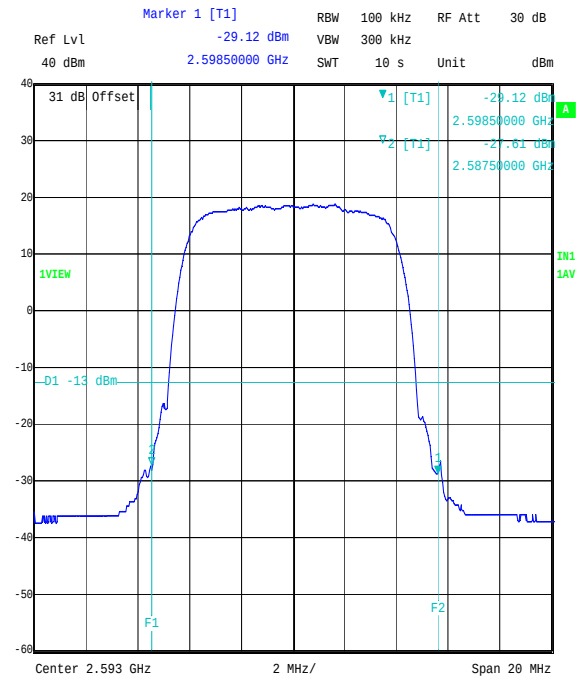


Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED IN-BAND EMISSIONS BOTTOM CHANNEL
Date: 5.JUL.2007 12:16:35

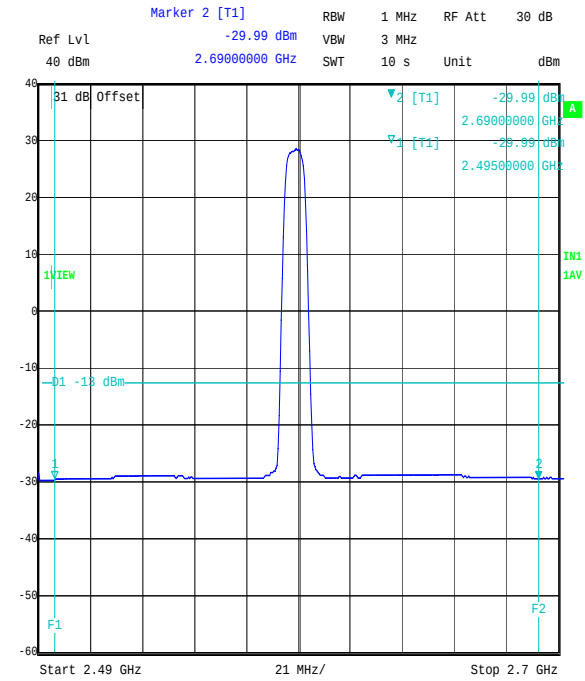


Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED IN-BAND EMISSIONS BOTTOM CHANNEL
Date: 5.JUL.2007 12:09:47

Middle Channel



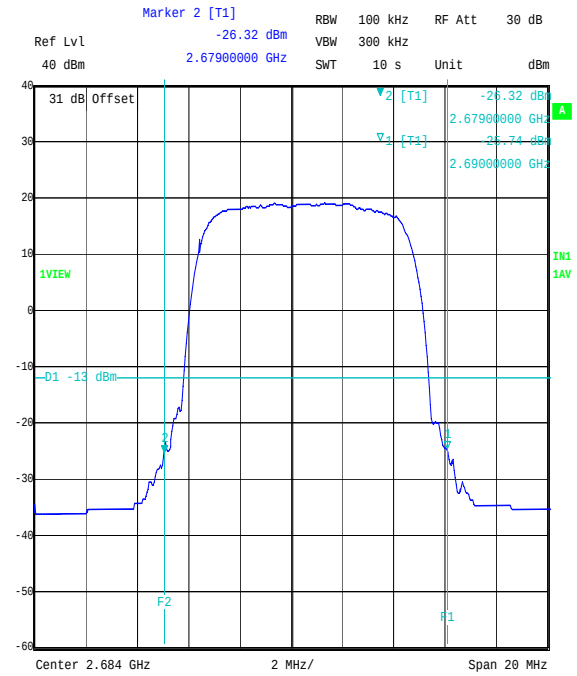
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED CHANNEL EDGE MID CHANNEL
Date: 5.JUL.2007 12:01:06



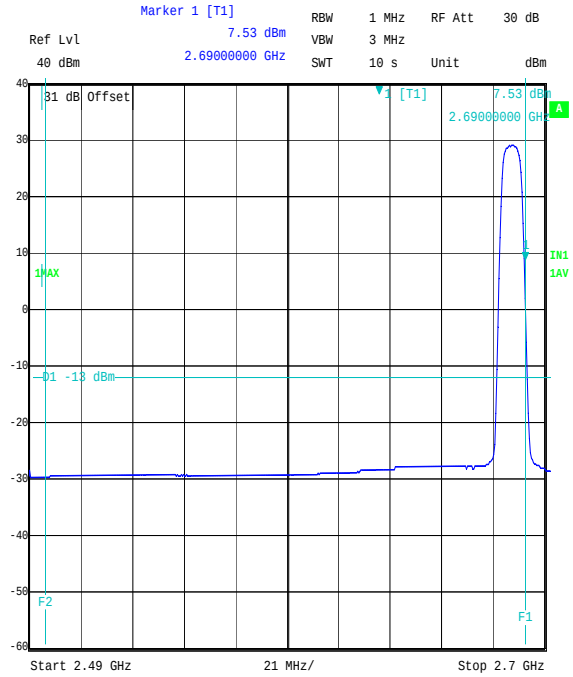
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED IN-BAND EMISSIONS MID CHANNEL
Date: 5.JUL.2007 12:04:21

Transmitter Conducted Emissions - Channel Edge (Continued)

Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED CHANNEL EDGE TOP CHANNEL
Date: 5.JUL.2007 11:53:13



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED IN-BAND EMISSIONS TOP CHANNEL
Date: 5.JUL.2007 11:38:43

Note: For more detail at the band edges, see the following section of this test report.

Test Of: **IPWireless (UK) Ltd.**
2.5 GHz V5 Node B Model: VS/VT
To: **FCC Part 27**

Transmitter Conducted Emissions at Band Edges

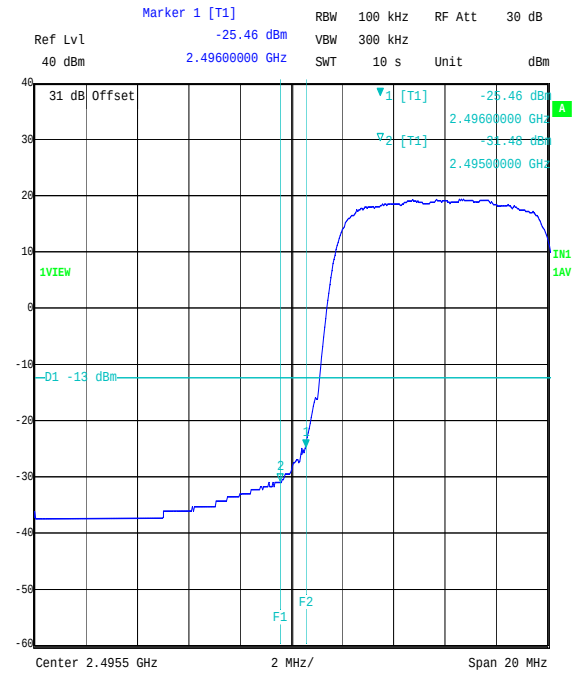
Results:

Bottom Band Edge

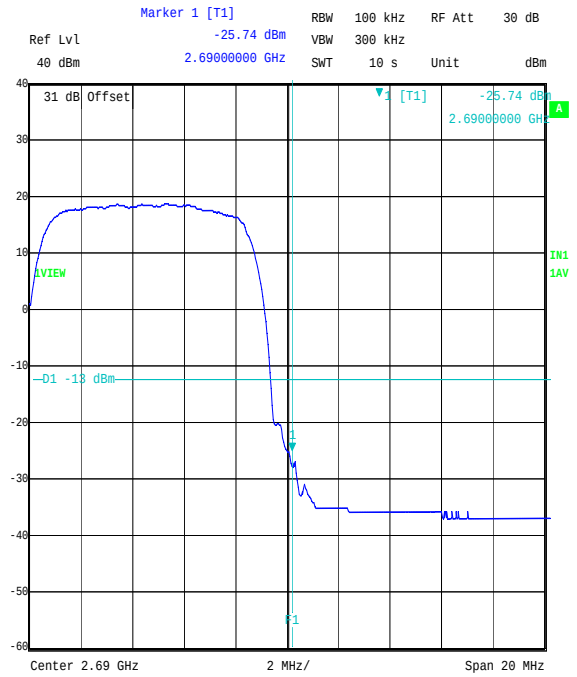
Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
2495	-31.5	-13.0	18.5	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690	-25.7	-13.0	12.7	Complied



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS LOWER BAND EDGE
Date: 5.JUL.2007 10:48:53



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS UPPER BAND EDGE
Date: 5.JUL.2007 11:03:59

7.2.7. Transmitter Conducted Emissions

The EUT was configured for conducted emissions measurements, as described in Appendix 2 of this report.

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

Result: Bottom Channel

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5002.863	-32.3	-13.0	19.3	Complied

Result: Middle Channel

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5186.032	-31.2	-13.0	18.2	Complied

Result: Top Channel

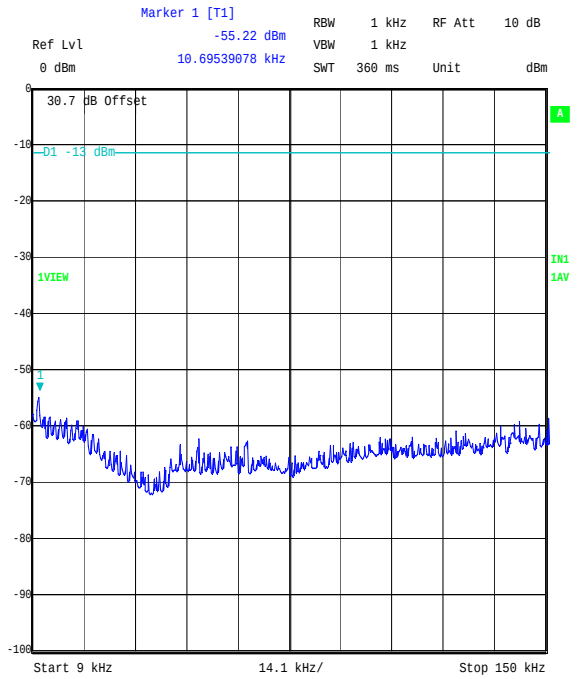
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5368.797	-32.6	-13.0	19.6	Complied

Note(s):

1. *All other emissions were below the limit by a margin of more than 20dB.*

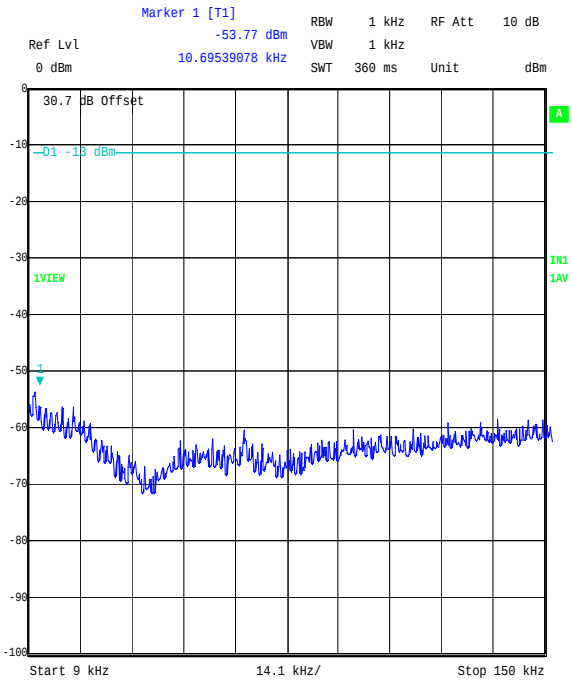
Transmitter Conducted Emissions (Continued)

Bottom Channel



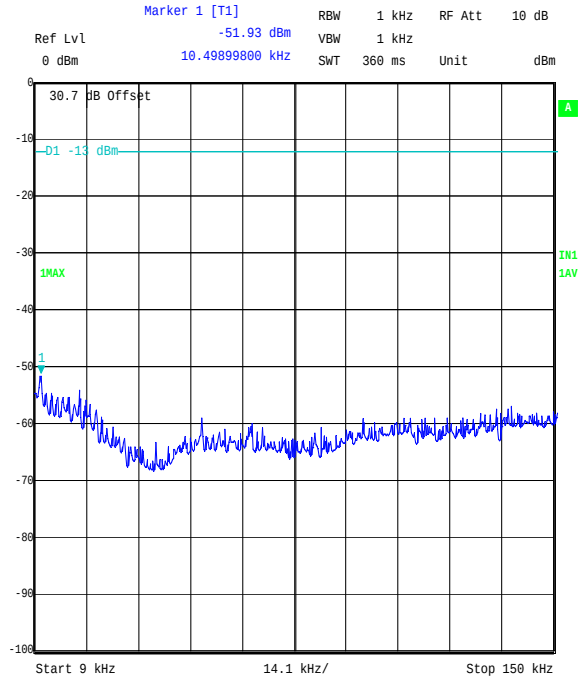
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:41:14

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:36:57

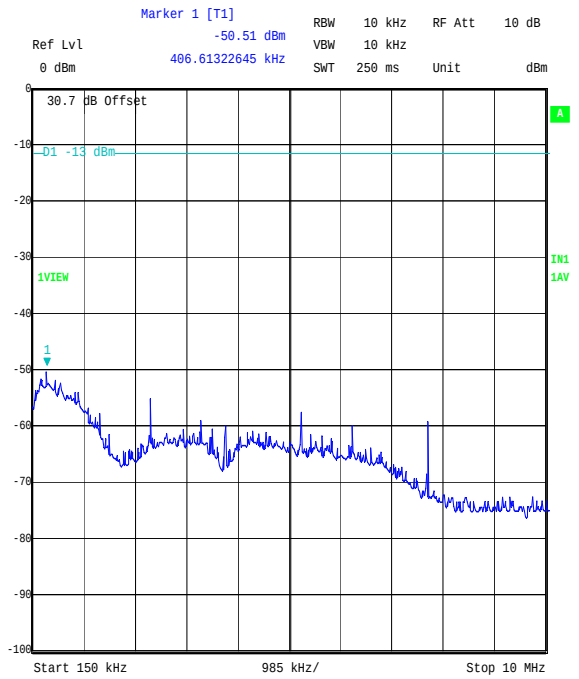
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:14:24

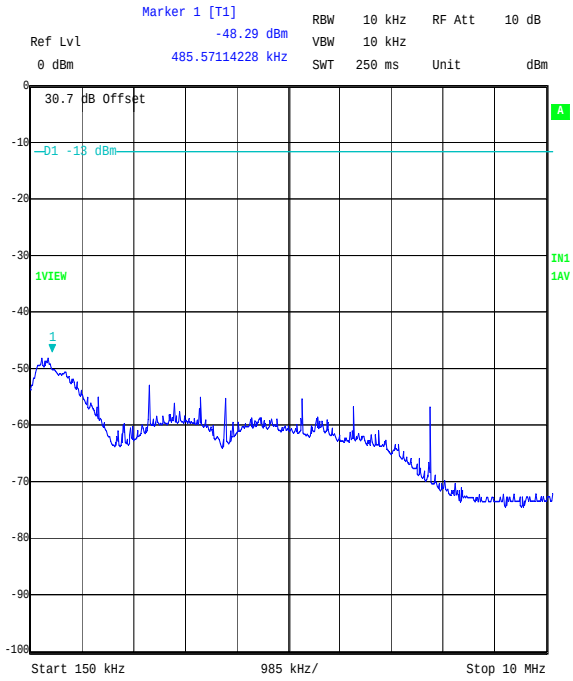
Transmitter Conducted Emissions (Continued)

Bottom Channel



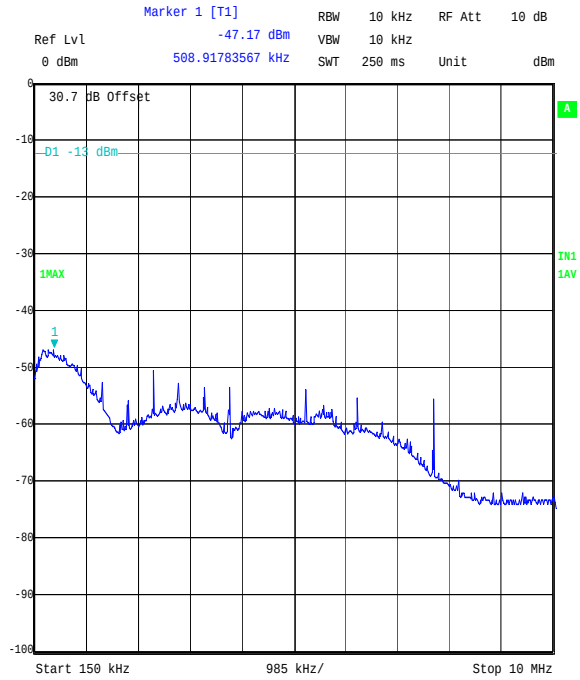
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:43:04

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:34:30

Top Channel

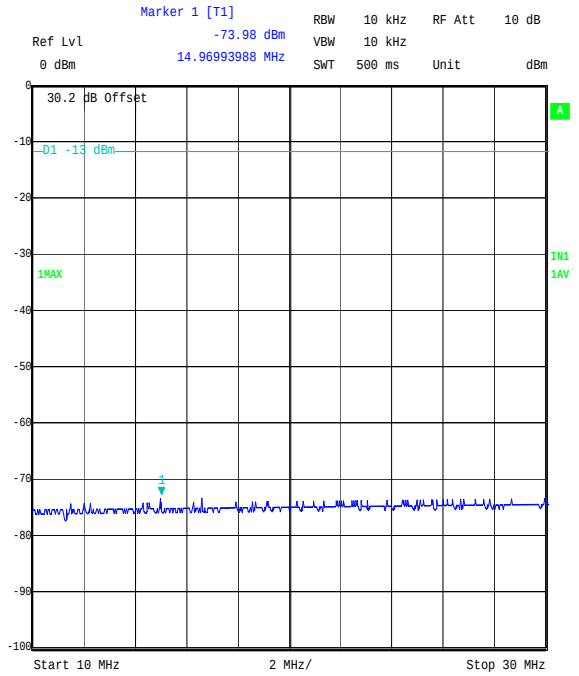


Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:23:01

Test Of: IPWireless (UK) Ltd.
2.5 GHz V5 Node B Model: VS/VT
To: FCC Part 27

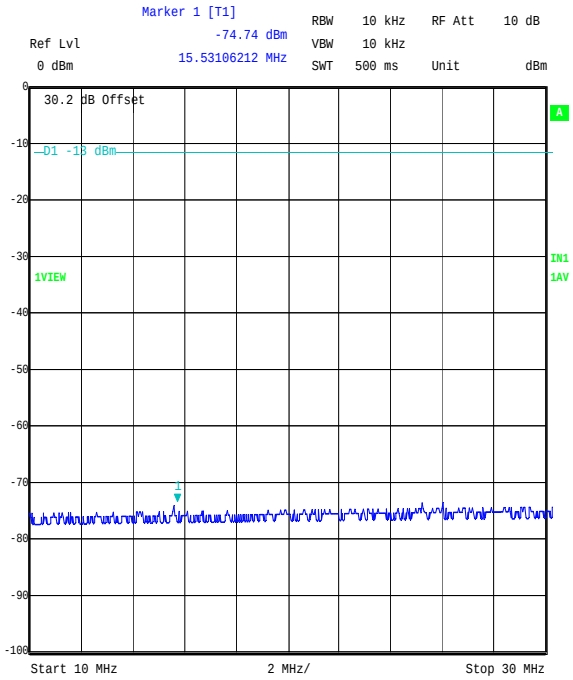
Transmitter Conducted Emissions (Continued)

Bottom Channel



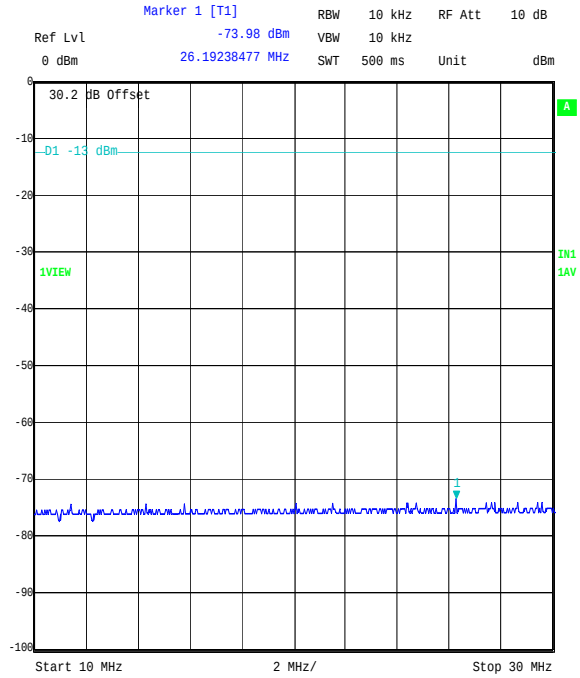
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 12:32:01

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 12:14:53

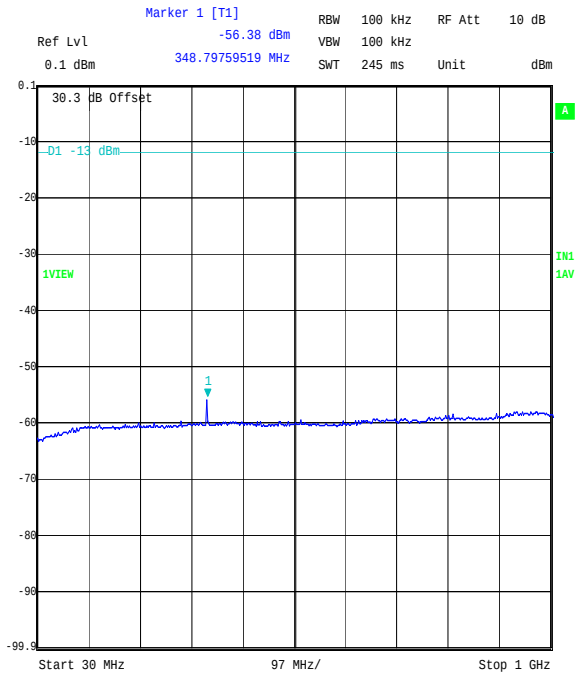
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 15:48:31

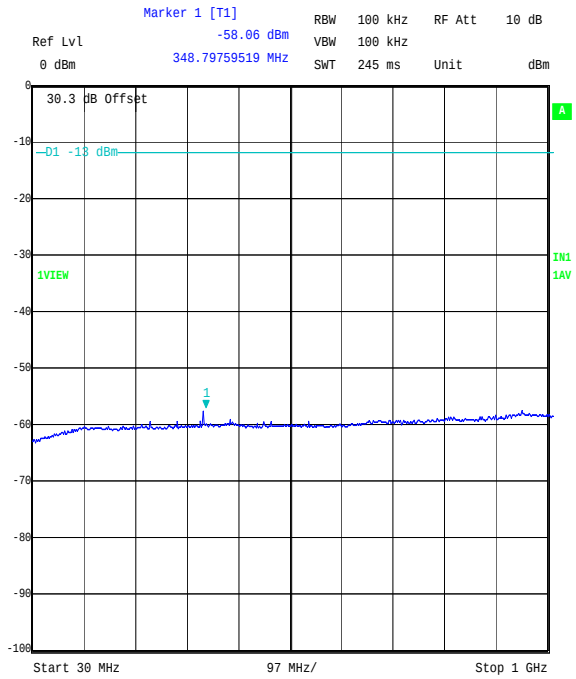
Transmitter Conducted Emissions (Continued)

Bottom Channel



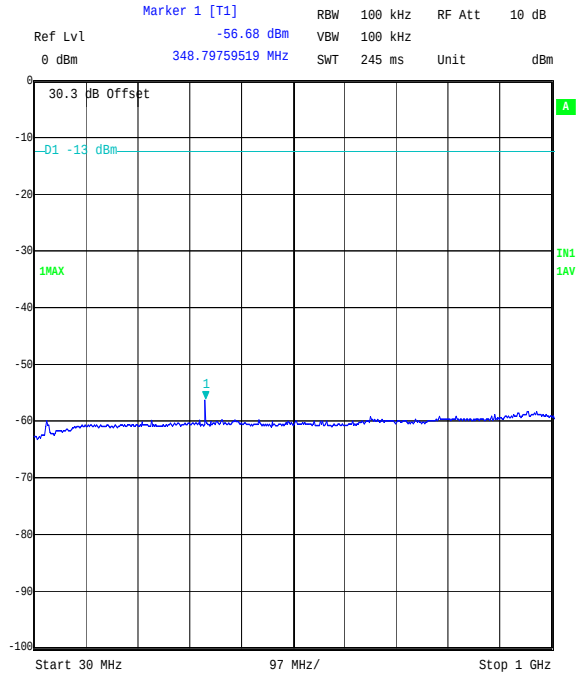
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 13:41:14

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 12:12:47

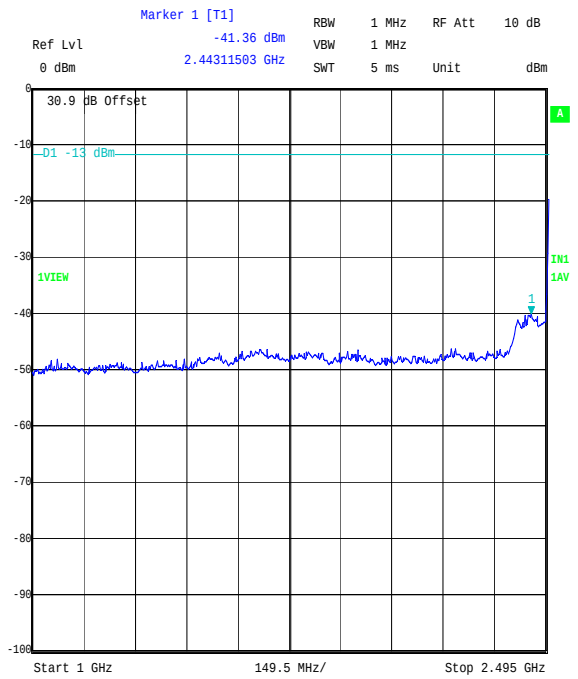
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:20:09

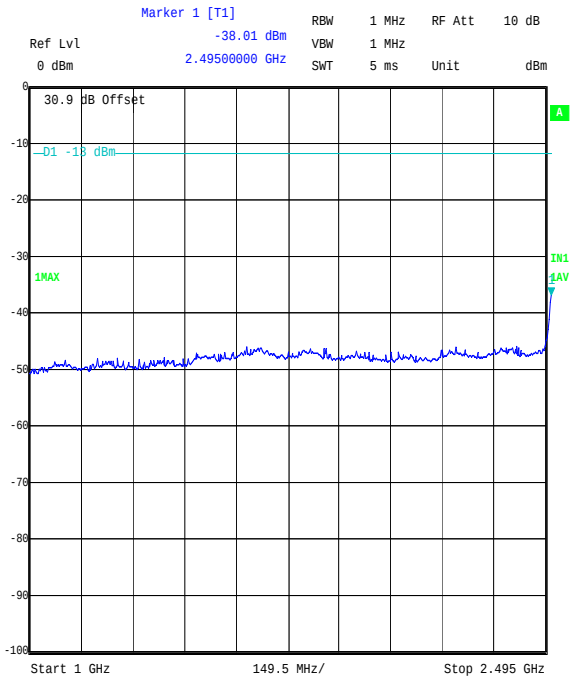
Transmitter Conducted Emissions (Continued)

Bottom Channel



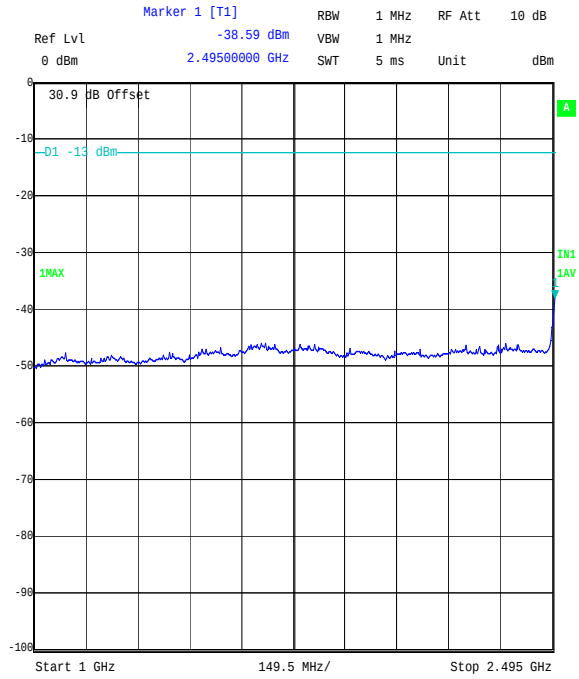
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 13:54:33

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 13:57:42

Top Channel

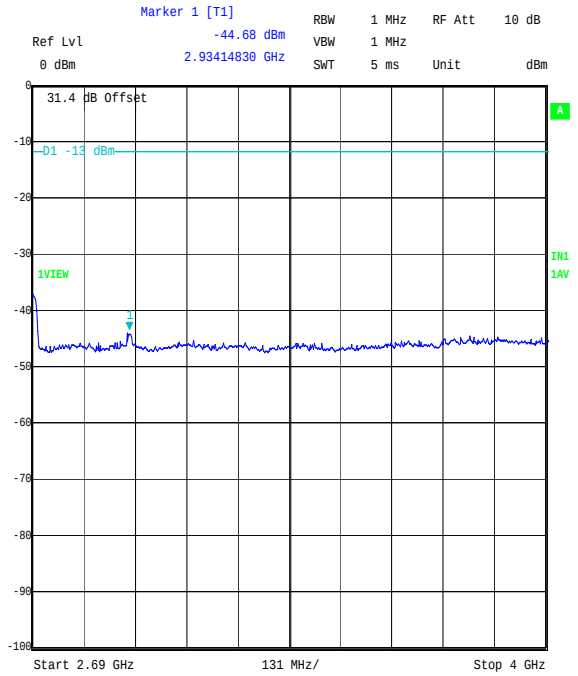


Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:23:02

Note: For greater detail at the band edges, see the previous section of this test report.

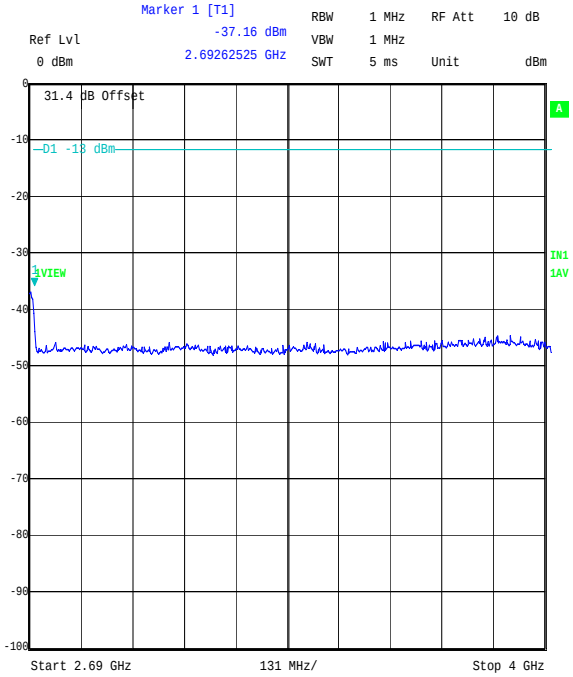
Transmitter Conducted Emissions (Continued)

Bottom Channel



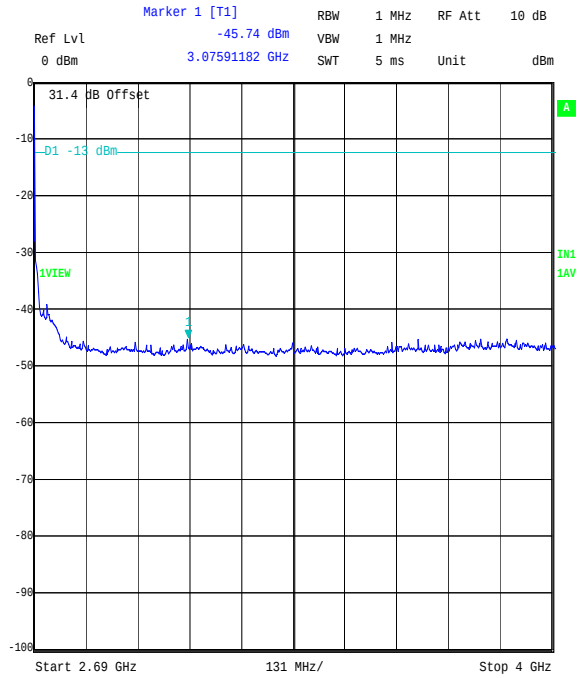
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 14:01:25

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 12:09:29

Top Channel



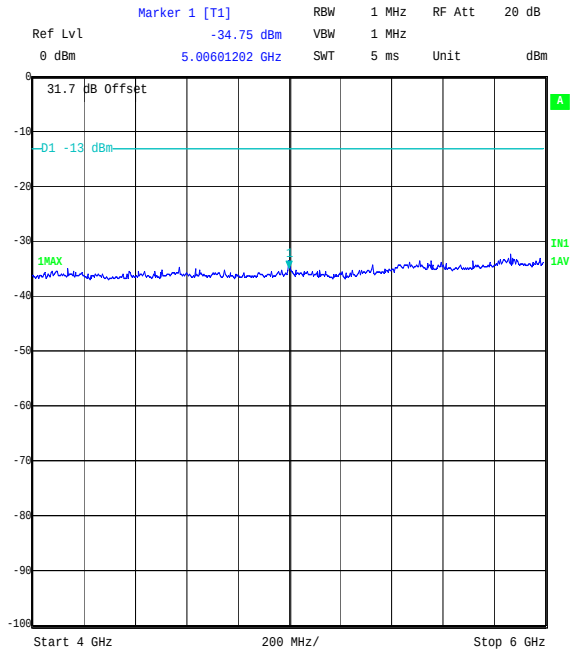
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:27:36

Note: For greater detail at the band edges, see the previous section of this test report.

Test Of: IPWireless (UK) Ltd.
2.5 GHz V5 Node B Model: VS/VT
To: FCC Part 27

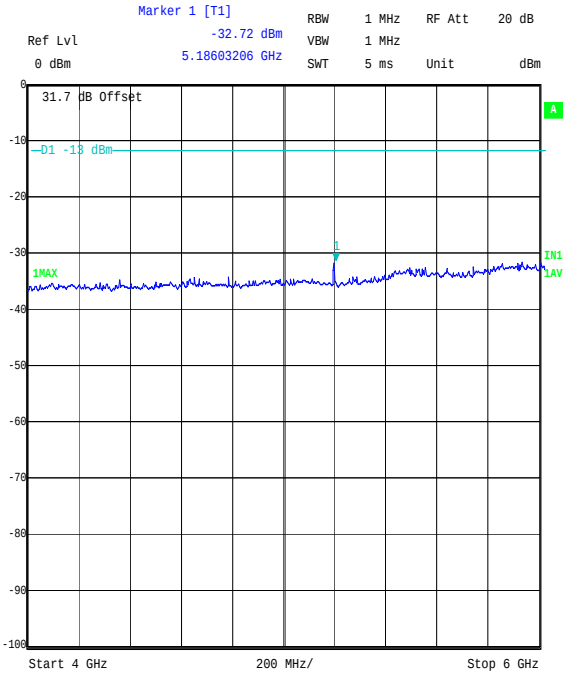
Transmitter Conducted Emissions (Continued)

Bottom Channel



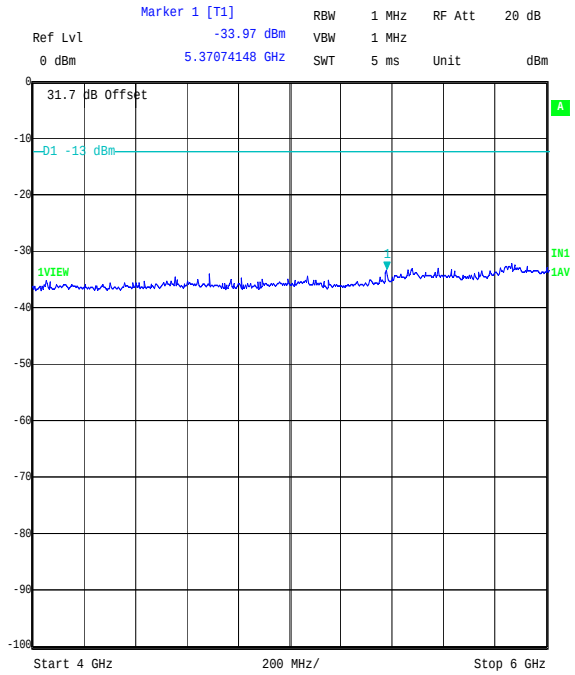
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT 20dB INT ATT
Date: 4.JUL.2007 14:05:17

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT 20dB INT ATT
Date: 4.JUL.2007 12:07:07

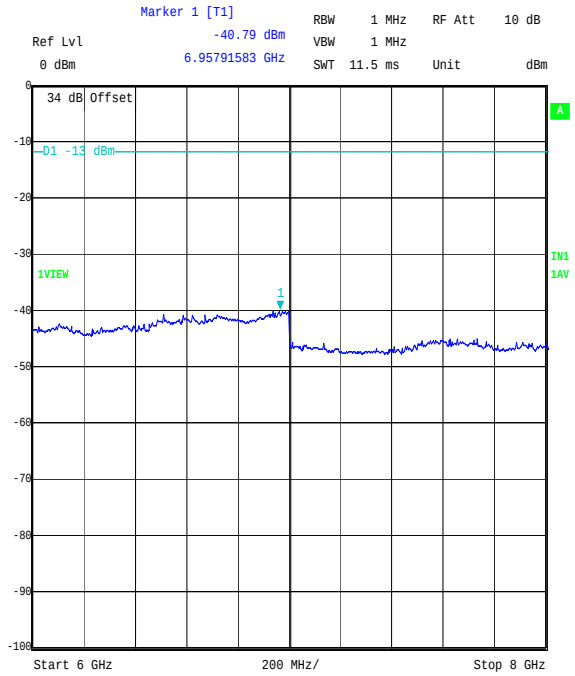
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT 20dB INT ATT
Date: 4.JUL.2007 14:22:35

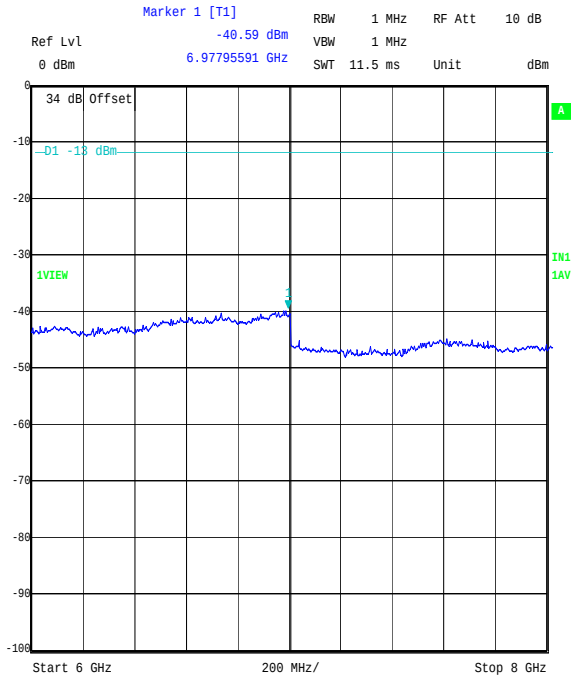
Transmitter Conducted Emissions (Continued)

Bottom Channel



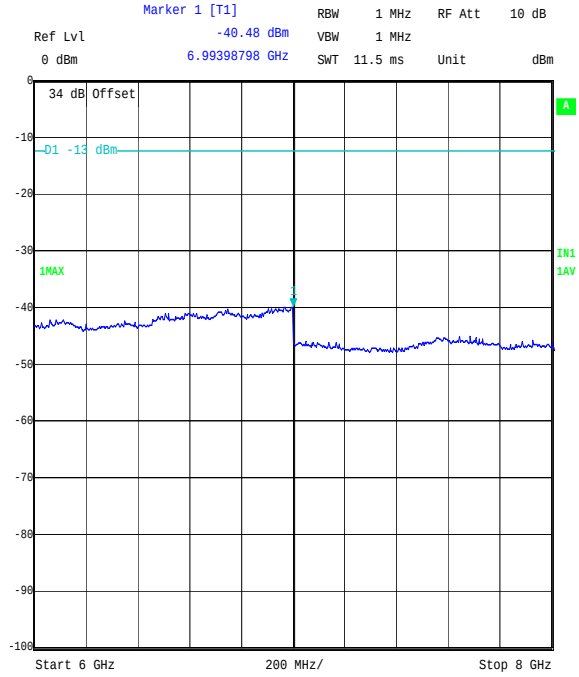
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 14:08:19

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:58:00

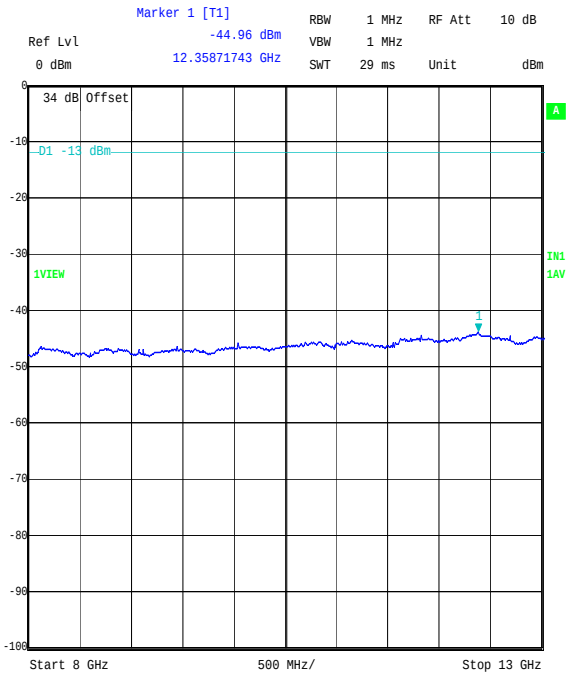
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:36:26

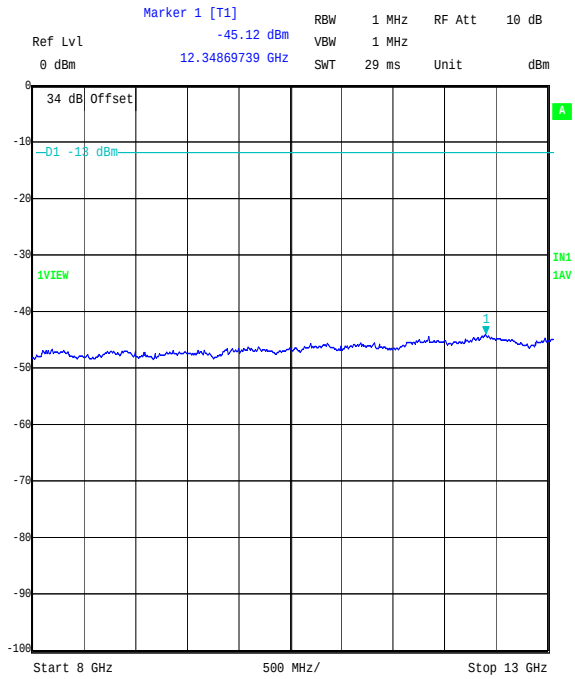
Transmitter Conducted Emissions (Continued)

Bottom Channel



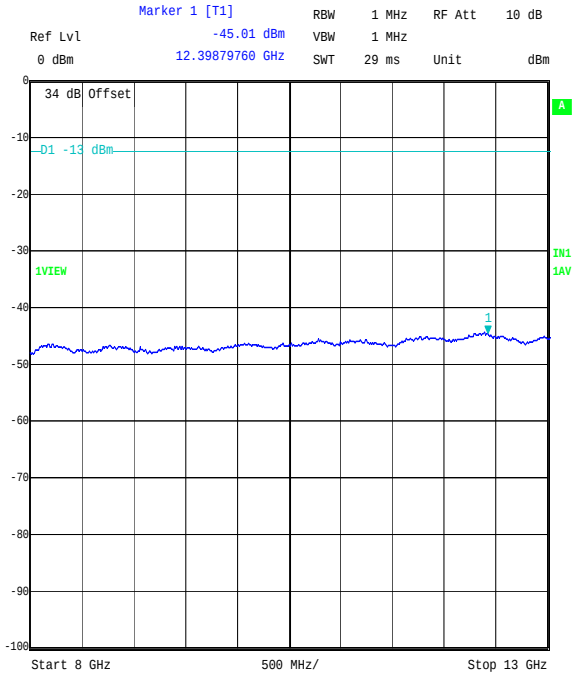
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 14:10:04

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:56:55

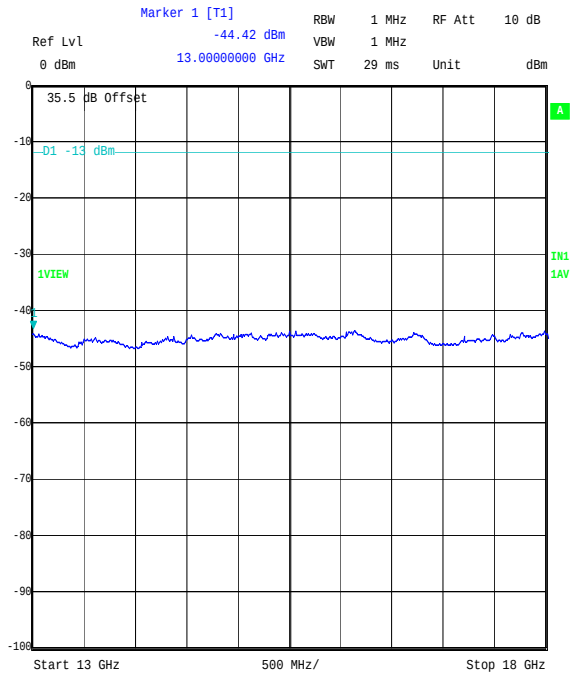
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:38:17

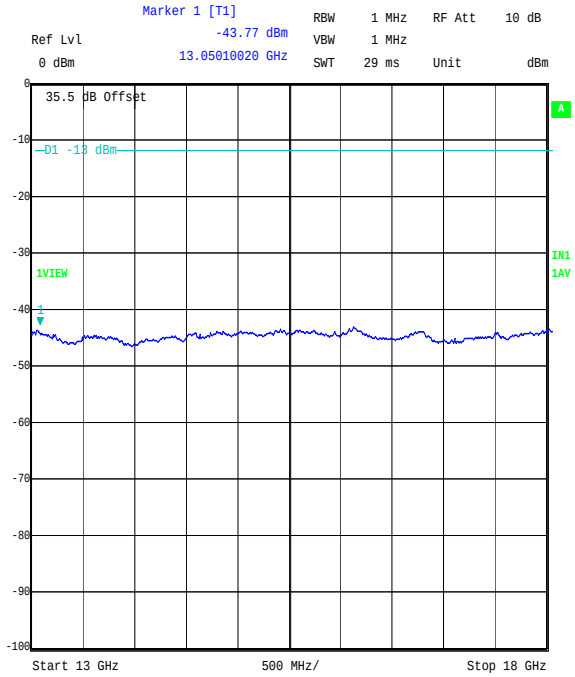
Transmitter Conducted Emissions (Continued)

Bottom Channel



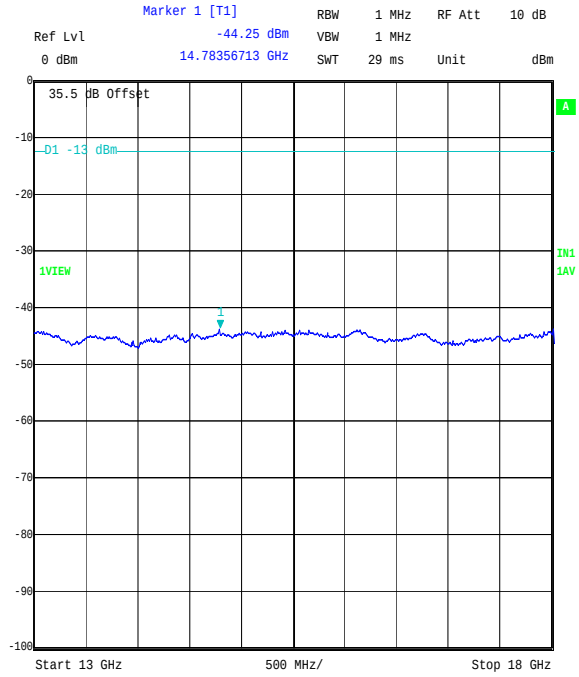
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 14:12:02

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:54:42

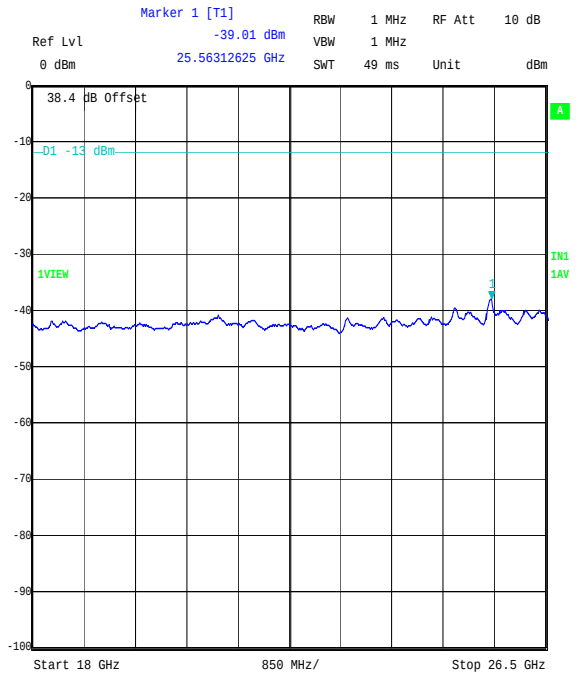
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:39:53

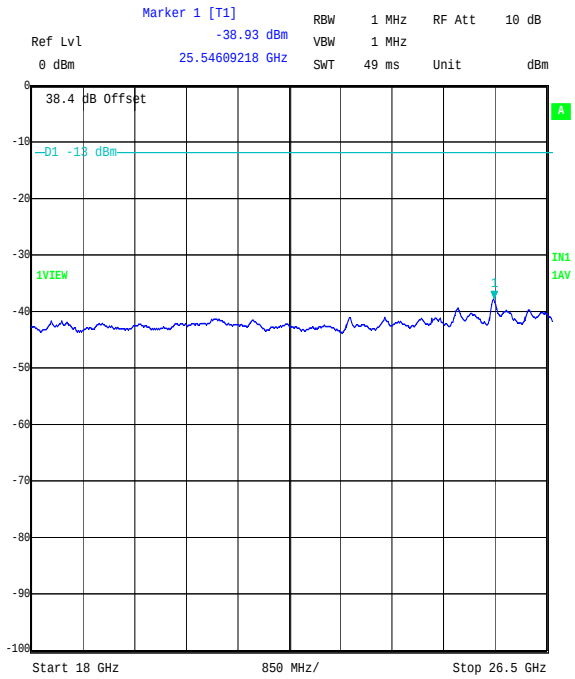
Transmitter Conducted Emissions (Continued)

Bottom Channel



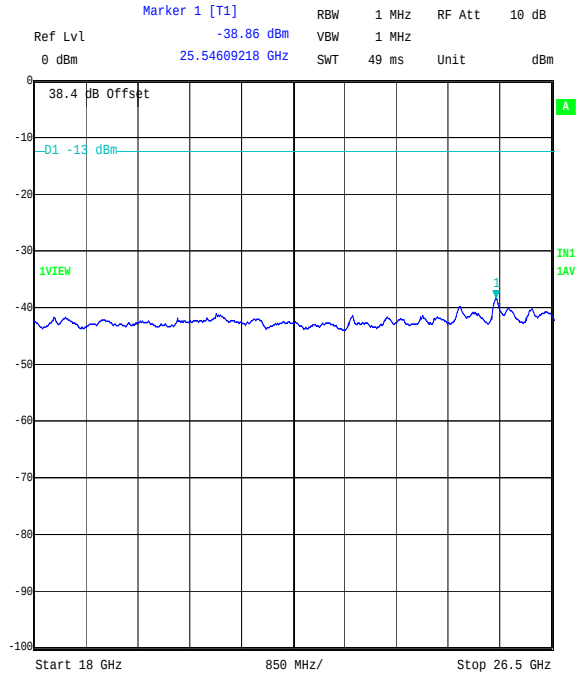
Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS BOTTOM CHANNEL ANT 1 PORT
Date: 4.JUL.2007 14:13:22

Middle Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS MID CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:52:23

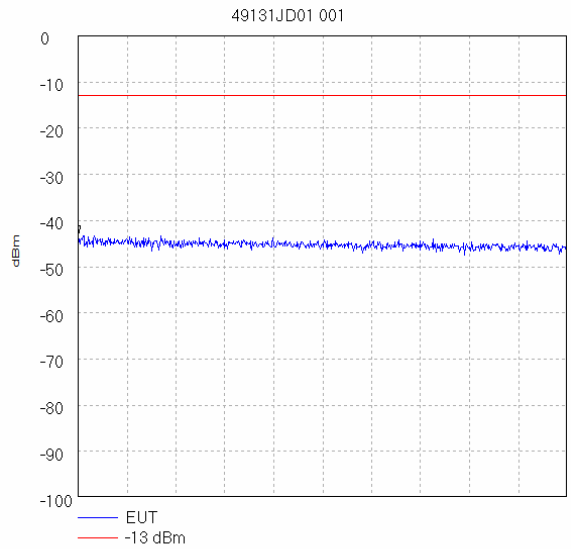
Top Channel



Title: 49131JD01 FCC PART 27
Comment A: TX CONDUCTED EMISSIONS TOP CHANNEL ANT 1 PORT
Date: 4.JUL.2007 11:41:34

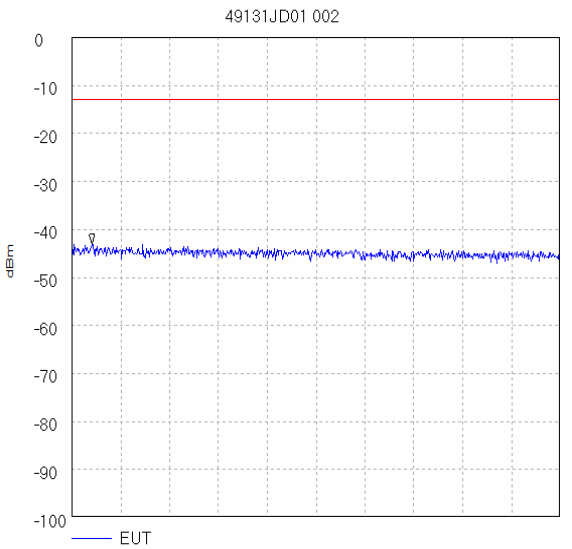
Transmitter Conducted Emissions (Continued)

Bottom Channel



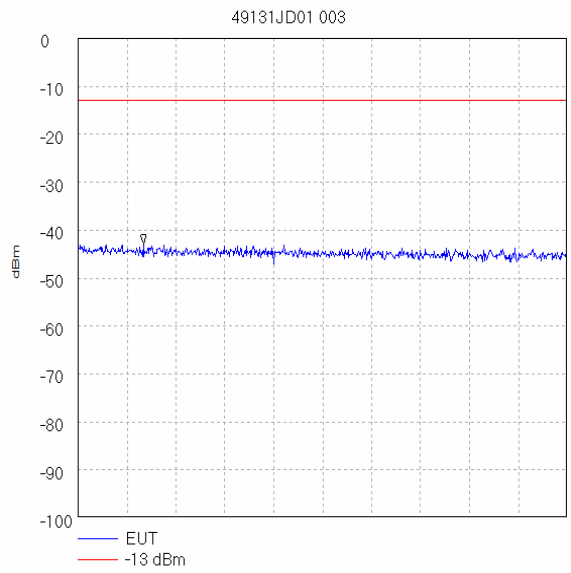
Start 26.5 GHz; Stop 27.0 GHz
Ref 0 dBm; Ref Offset 35.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS
Peak 26.5 GHz, -43.17 dBm
Display Line: -13 dBm;
Tested by jxh 04/07/2007 16:00:44

Middle Channel



Start 26.5 GHz; Stop 27.0 GHz
Ref 0 dBm; Ref Offset 35.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS
Peak 26.5208333 GHz, -43.0 dBm
Display Line: -13 dBm;
Tested by jxh 04/07/2007 16:03:42

Top Channel



Start 26.5 GHz; Stop 27.0 GHz
Ref 0 dBm; Ref Offset 35.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS
Peak 26.5666667 GHz, -42.83 dBm
Display Line: -13 dBm;
Tested by jxh 04/07/2007 16:07:40

7.2.8. Transmitter Radiated Emissions

The EUT was configured for transmitter radiated emissions testing, as described in Appendix 2 of this report.

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

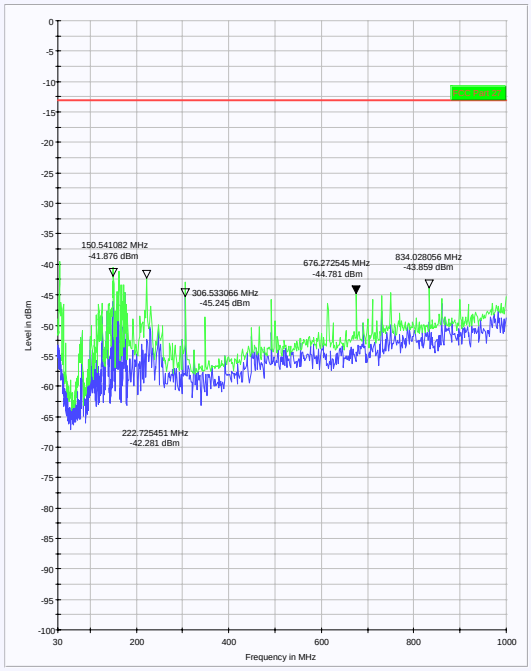
Results:

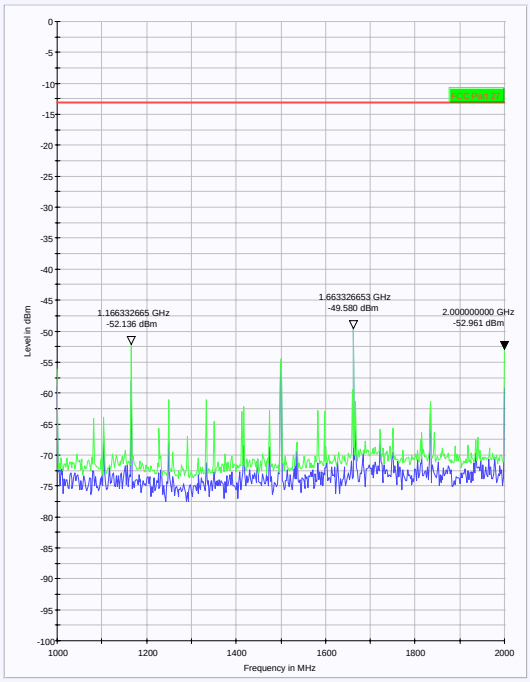
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
26548.333	-27.7	-13.0	14.7	Complied

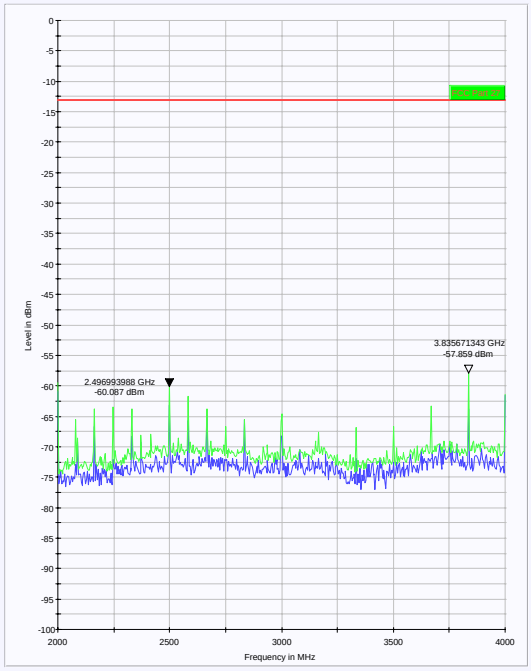
Note(s):

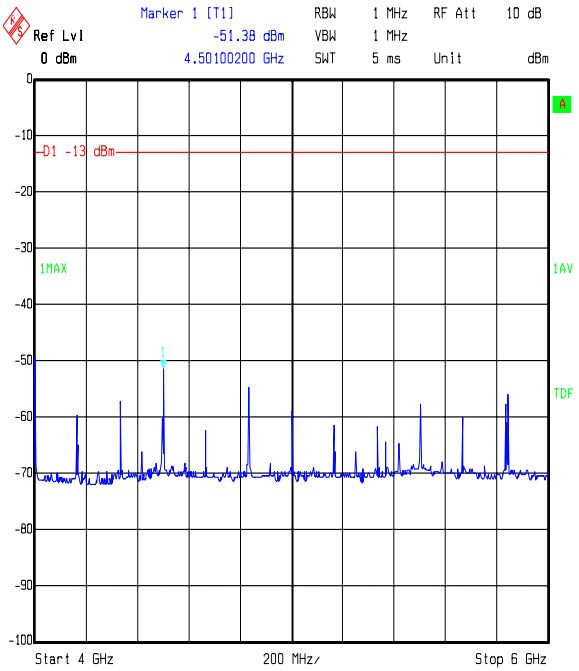
1. *All emissions were below the limit by a pass margin of greater than 20 dB, except for the system noise floor above 26.5 GHz; therefore the highest measured level of noise was measured and is recorded in the above table.*
2. *The GPS port on the Digital Shelf was terminated with a 50 Ohm load during these tests.*

Transmitter Radiated Emissions (Continued)





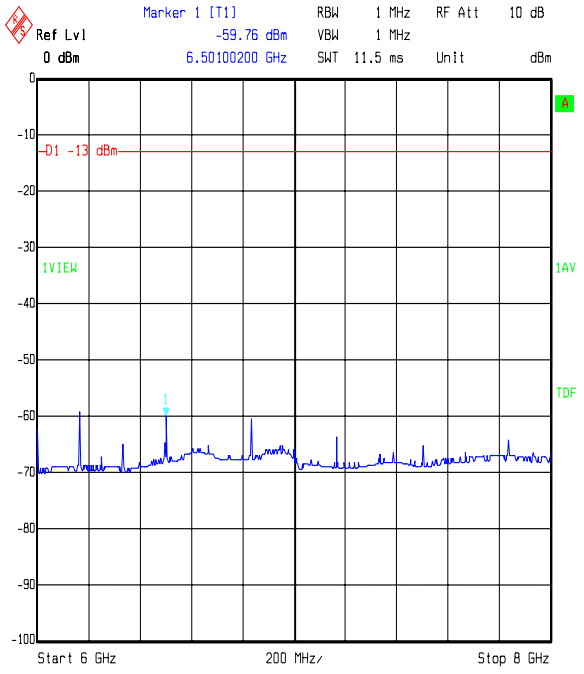




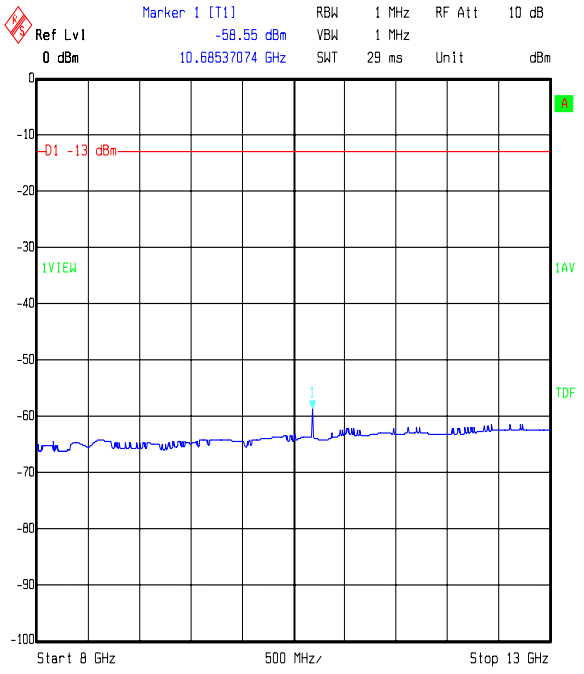
Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS TOP CHANNEL AV DETECTOR
Date: 03.JUL.2007 10:42:32

Test Of: IPWireless (UK) Ltd.
2.5 GHz V5 Node B Model: VS/VT
To: FCC Part 27

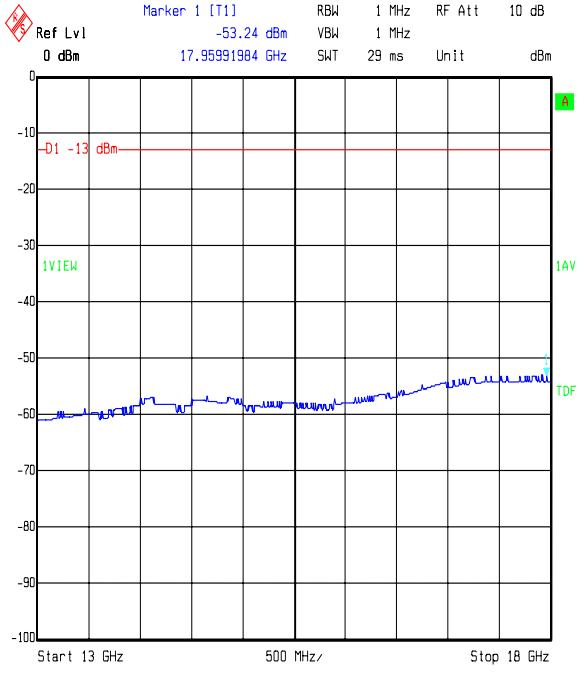
Transmitter Radiated Emissions (Continued)



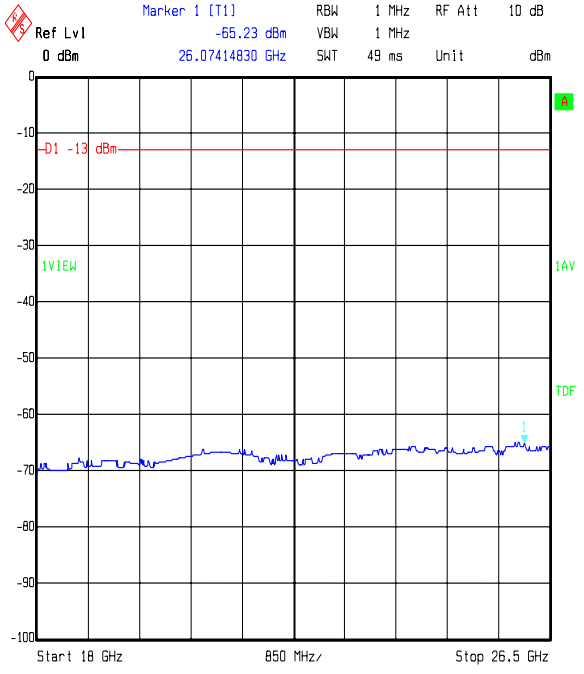
Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS TOP CHANNEL AV DETECTOR
Date: 03.JUL.2007 10:46:20



Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS TOP CHANNEL AV DETECTOR
Date: 03.JUL.2007 11:00:03

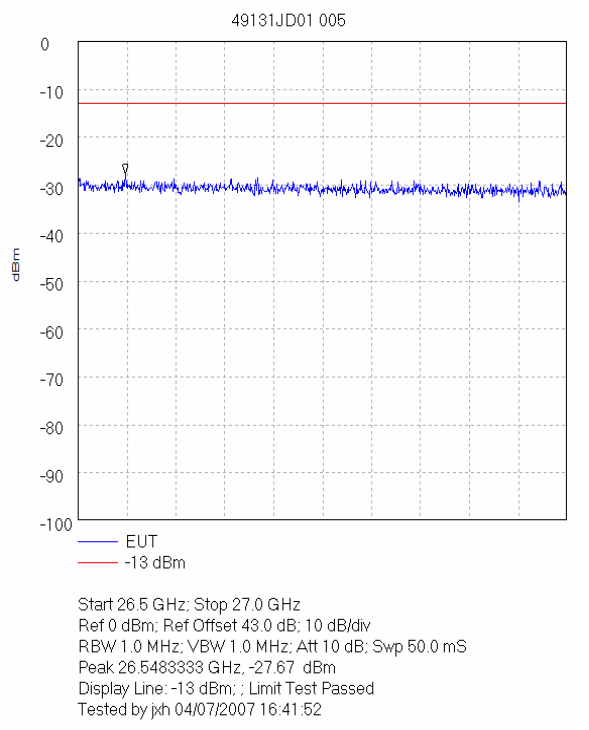


Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS TOP CHANNEL AV DETECTOR
Date: 03.JUL.2007 11:04:39



Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS TOP CHANNEL AV DETECTOR
Date: 03.JUL.2007 11:25:10

Transmitter Radiated Emissions (Continued)



7.2.9. Transmitter Radiated Emissions at Band Edges: Section 27.53(l)(2), 27.53(l)(6

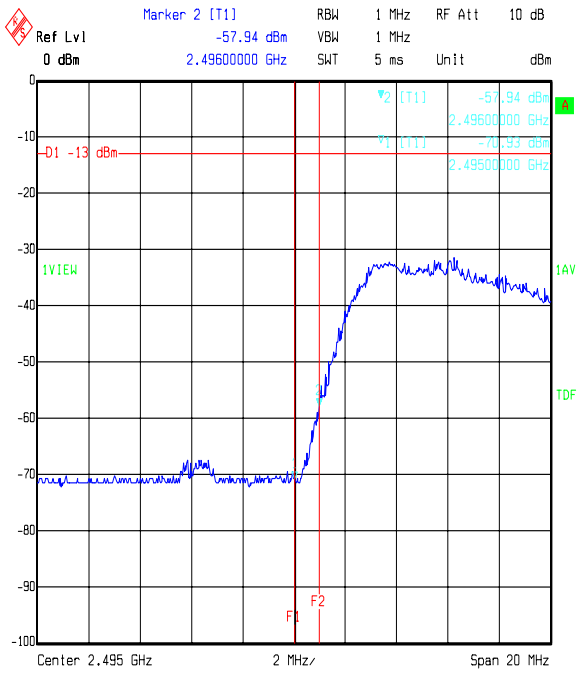
Results:

Bottom Band Edge

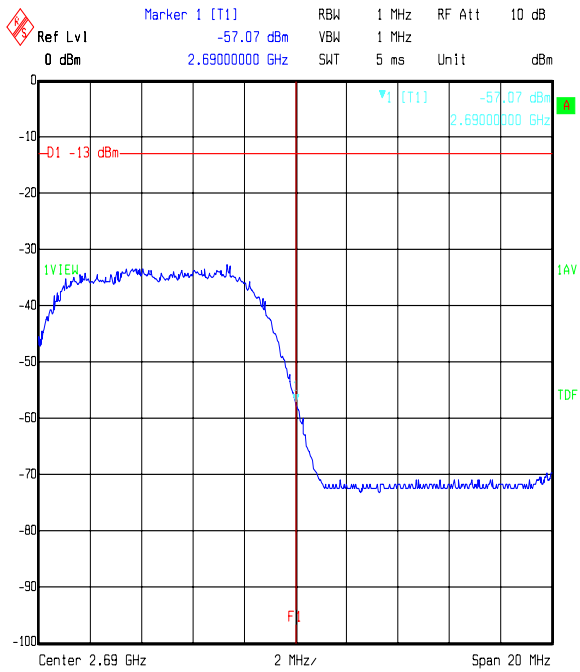
Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
2495	-70.9	-13.0	57.9	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690	-57.1	-13.0	44.1	Complied



Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS LOWER BAND EDGE AVG DET
Date: 03.JUL.2007 14:16:43



Title: 49131JD01 FCC PART 27
Comment A: TX RADIATED EMISSIONS UPPER BAND EDGE AVG DET
Date: 03.JUL.2007 14:34:27

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
Carrier Output Power	Not applicable	95%	+/- 0.46 dB
Frequency Stability	Not applicable	95%	+/- 20 Hz
Occupied Bandwidth	Not applicable	95%	+/- 0.12 %
Conducted Emissions	9 kHz to 27 GHz	95%	+/- 1.2 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 27 GHz	95%	+/- 1.78 dB
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 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.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A028	Horn Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1037	Bilog Antenna	Chase EMC Ltd	CBL6112B	2413	20 Sep 2006	12
A1069	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	837469/012	09 Feb 2007	12
A1534	Preamplifier	Hewlett Packard	8449B OPT H02	3008A00405	Cal before use	-
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	08 Jan 2007	12
A253	Horn Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Horn Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Horn Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A256	Horn Antenna	Flann Microwave	18240-20	400	17 Nov 2006	36
A436	Horn Antenna	Flann	20240-20	330	24 Apr 2006	36
C1164	Cable	Rosenberger	FA210A1015007070	43188-1	04 Jun 2007	12
C1165	Cable	Rosenberger	FA210A1020007070	43189-1	05 Jun 2007	12
C1167	Cable	Rosenberger	FA210A1030007070	43190-01	05 Jun 2007	12
C1169	Cable	Microcoax	n/a	n/a	31 May 2007	12
C1268	Cable	Rosenberger	FA210A0075008080	49356-1	Cal before use	-
C151	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Cal before use	-
C160	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Cal before use	-
C348	Cable	Rosenberger	UFA210A-1-1181-70x70	2993	Cal before use	-
C363	Cable	Rosenberger	RG142	None	Cal before use	-
E0516	Environmental Chamber	TAS	LT1000	23880706	Cal before use	-
L0779	DC Supply	Hewlett Packard	E4356A	US39290102	Cal before use	-
L0940	Attenuator	Narda	776C-30	522	Cal before use	-

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1068	Thermometer Digital	Iso-Tech	RS55	93102884	25 Jun 2007	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	08 Sep 2006	12
M1242	Spectrum Analyser	Rohde & Schwarz,	FSEM30	845986_022	08 Sep 2006	12
M1253	Spectrum Analyser	HP	8564E	3442A00262	30 Oct 2006	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12
M1269	Multimeter	Fluke	179	90250210	05 Mar 2007	12
S202	3m OATS	RFI	2	S202-15011990	17 Nov 2006	12
S212	Screened Room	RFI	12	None	Not calibrated	-
S216	Microwave Lab.	RFI	16	None	Not calibrated	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule. All equipment was within calibration at the time of the test.

Appendix 2. Measurement Methods

A2.1. 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 110V 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

A2.2. Conducted RF Output Power & Equivalent Isotropic Radiated Power (EIRP)

There are no conducted power limits specified in Part 27, therefore measurements were performed as a requirement of Part 2.1046.

The levels obtained were also used in conjunction with spurious attenuation measurements where the results are based on the conducted carrier power (P).

The EUT antenna port was connected to a spectrum analyser containing a channel power function via suitable attenuation.

The total loss of the cables and attenuators were measured and entered as a reference level offset into the spectrum analyser to correct for these losses.

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

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

In order to obtain an EIRP measurement, the manufacturer's declared maximum antenna gain was added to the measured conducted RF output power.

A2.3. Frequency Stability

The EUT was situated within an environmental test chamber and its antenna port was connected to a spectrum analyser via suitable cables and RF attenuators. A GPS antenna was positioned outside the building and this was connected to the GPS port on the EUT digital shelf. The GPS antenna and cable were provided by IPWireless.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30 to 55°C. The upper temperature of 55°C was requested by IPWireless and is greater than the FCC requirement of 50°C.

Measurements were also performed at voltage extremes by varying the supply voltage from -36 V DC to -72 V DC, as requested by IPWireless. These levels are greater than the FCC requirement, which is 85% to 115% of the nominal value.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions and ensure that transmissions remained within specified operating parameters.

Measurements were made on the top, middle and bottom channels.

The environmental chamber was stabilised at each temperature within the stated temperature range for 30 minutes before testing commenced.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded.

The reported data shows the nominal frequency drift and its margin from the declared frequency or channel edge.

A2.4. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function via 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.

The occupied bandwidth was measured using the built in occupied bandwidth function of the spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser automatically configures the measurement bandwidths to make an accurate measurement based on the channel bandwidth and channel spacing of the EUT.

A2.5. Conducted Emissions

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

A spectrum analyser 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 frequency band described above was investigated with the transmitter operating at full power on the bottom, middle and top channels. Any spurious emissions noted were then measured.

The recorded emission level was then calculated as a spurious attenuation level using the following formula as described in TIA-EIA-603B.

$$dB = 10 \log_{10} \left(\frac{TX\ power\ in\ watts}{0.001} \right) - \text{spurious level (dBm)}$$

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 in Watts for the channel under test. This calculation gives an absolute level of -13 dBm, therefore the limit is -13 dBm.

The frequency band described above was investigated with the transmitter operating at full power. 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 27.53 states that in the 1 MHz bands immediately outside and adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. The resolution bandwidth used was 100 kHz which exceeded the 1% value for the 7.68 Mcps chip rate.

For the measurements of emissions at the channel edge, plots of the spectral distribution including the fundamental frequency were recorded using a spectrum analyser for the EUT transmitting on bottom, middle and top channels. The method is in accordance with the measurement method detailed in Part 27.53(l) for measurements in the 1 MHz bands immediately outside and adjacent to the channel edge. A resolution bandwidth of 1 MHz was used.

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

Receiver Function	**Settings**
Detector Type:	Average
Mode:	Max Hold
Bandwidth:	1 MHz >1 GHz
Bandwidth:	100 kHz <1 GHz
Bandwidth:	10 kHz <30 MHz
Bandwidth:	1 kHz <150 kHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

A2.6. 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 were performed in order to identify frequencies on which the EUT was generating spurious emissions. This determined the frequencies from the EUT that 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 metres and a measurement distance of 3 metres, below 4 GHz; above 18 GHz a 1 metre measurement distance was used, above 26.5 GHz a 0.3 metre measurement distance was used. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and spectrum analyser with an average detector was used for final measurements.

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.

Once the final amplitude (maximised) had been obtained and noted, the EUT was replaced by a substitution antenna, and a substitution method applied. The substitution antennas used were a horn antenna for measurements greater then or equal to 1 GHz and a dipole for measurements below 1 GHz. 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 6 dB 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 EIRP was calculated as:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

Once the EIRP was obtained, the difference between it and the level of the fundamental emission for the EIRP of the channel under test was noted at the spurious attenuation level in dBc. The following formula was used as described in TIA_EIA_603B

$$dB = 10 \log_{10} \left(\frac{TX\ power\ in\ watts}{0.001} \right) - \text{spurious level (dBm)}$$

A2.7. 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 in Watts for the channel under test. This calculation gives an absolute level of -13 dBm, therefore the limit is -13 dBm.

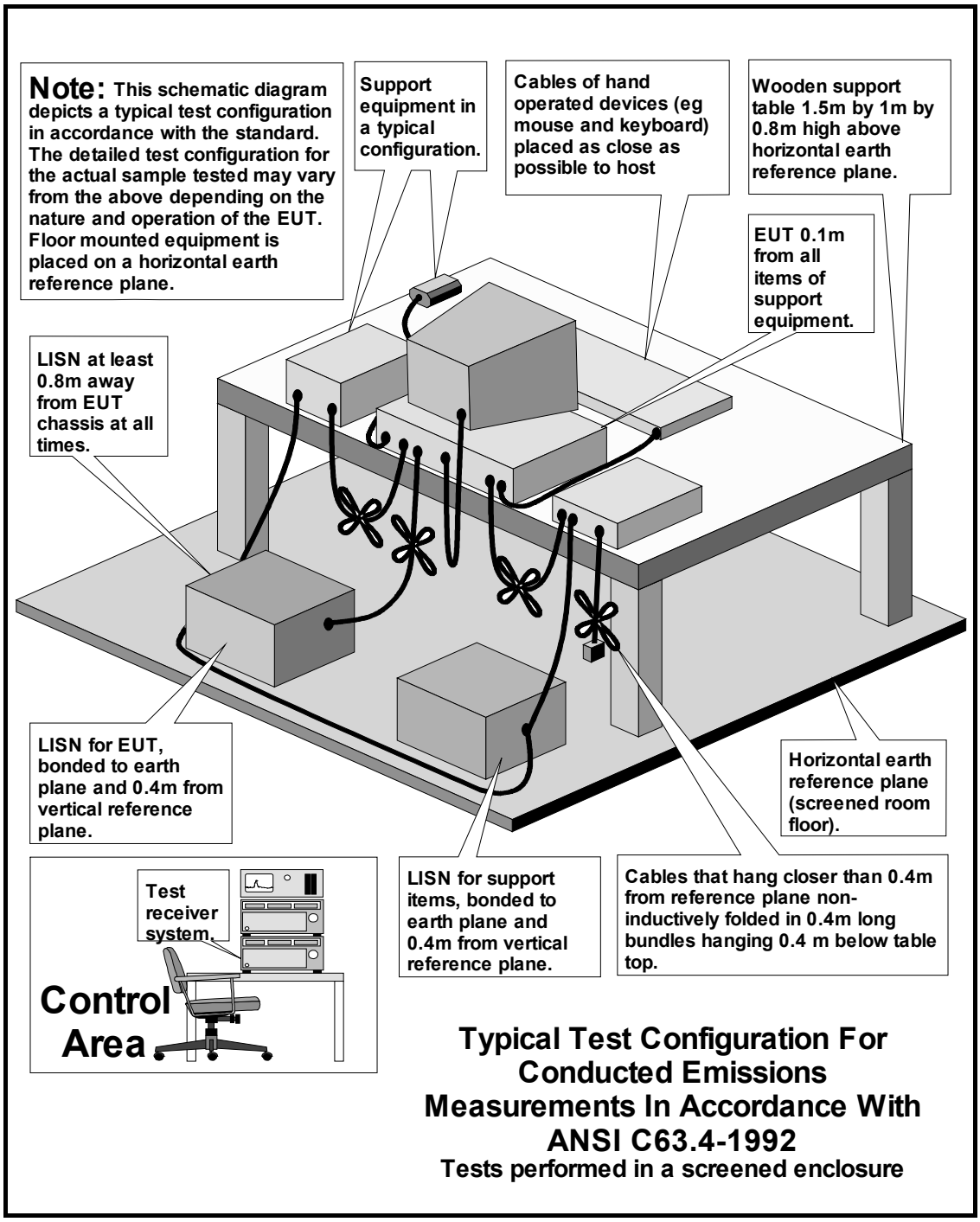
The frequency band described above was investigated with the transmitter operating at full power. Any spurious observed were then recorded and compared to the -13 dBm limit. The requirement is for the emission to be less than -13 dBm. The margin between emission and limit is recorded and should always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

Appendix 3. Test Configuration Drawings

This Appendix contains the following drawings:

Drawing Reference Number	Title
DRG\49131JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\49131JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\49131JD01\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test

DRG\49131JD01\EMICON



Note: This diagram is also applicable for the latest version of ANSI C63.4-2003.

DRG\49131JD01\EMIRAD