TEST RESULT SUMMARY

FCC PART 22 SUBPART H

MANUFACTURER 2 - NAME	ADC Inc.
MANUFACTURER'S ADDRESS	PO Box 1101 Minneapolis MN 55440
NAME OF EQUIPMENT	Digivance Wide Band Digital Radio 800 MHz 50-Watt System
MODEL NUMBER(S)	**DGVS-112710SYS** **DGVS-122710SYS**
MANUFACTURER 1 - NAME	Vanu, Inc.
MANUFACTURER'S ADDRESS	One Porter Square, Suite 18 Cambridge MA 02140
NAME OF EQUIPMENT	Vanu Software Radio Base Station
MODEL NUMBER(S)	**RAN-1.0**
TEST REPORT NUMBER	WC402208.4
TEST DATE	07 May 2004

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 22 Subpart H.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 22 Subpart H.

Date: 23 September 2004

Location: Taylors Falls MN USA

J. C. Sausen
Test Technician

J. T. Schneider
Chief Engineer

Not Transferable

EMC EMISSION - T E S T R E P O R T

Test Report File No.	:	**WC402208.4**	Date of issue:	23 September 2004

MANUFACTURER 2 - NAME MANUFACTURER'S ADDRESS	ADC Inc. PO Box 1101 Minneapolis MN 55440
NAME OF EQUIPMENT	Digivance Wide Band Digital Radio 800 MHz 50-Watt System
MODEL NUMBER(S)	**DGVS-112710SYS** **DGVS-122710SYS**
MANUFACTURER 1 - NAME MANUFACTURER'S ADDRESS	Vanu, Inc. One Porter Square, Suite 18 Cambridge MA 02140
NAME OF EQUIPMENT	Vanu Software Radio Base Station
MODEL NUMBER(S)	**RAN-1.0**
TEST REPORT NUMBER	WC402208.4
TEST DATE	07 May 2004

Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number Reference(s)	:	**WC402208.4**
Total pages including Appendices		**144**

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001. TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports. This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.

TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

D I R E C T O R Y - EMISSIONS

		Page(s)
A)	**Documentation**	
	Test report	1 – 136
	Directory	2
	Test Regulations	3
B)	**Test data**	
	22.355 Frequency tolerance	5 - 7
	22.913 Effective Radiated Power Limit	8 - 9
	22.915 Modulation requirements	10
	22.917 Emission Limitations for cellular	10 - 112
	2.1053 Case radiation	113 - 125
	EUT Operating Mode and Configuration Information	126
	Deviations, General Remarks and Summary	127
	Test Equipment List	128
	Test Setup Diagrams and Photo(s)	129 - 136
C)	**Product Information**	
	Product Information Form	A1 – A8

EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 50081-1 / 1991		
☐ - EN 55011 / 1991	☐ - Group 1	☐ - Group 2
	☐ - Class A	☐ - Class B
☐ - EN 55013 / 1990		
☐ - EN 55014 / 1987	☐ - Household appliances and similar	
	☐ - Portable tools	
	☐ - Semiconductor devices	
☐ - EN 55014 / A2:1990		
☐ - EN 55014 / 1993	☐ - Household appliances and similar	
	☐ - Portable tools	
	☐ - Semiconductor devices	
☐ - EN 55015 / 1987		
☐ - EN 55015 / A1:1990		
☐ - EN 55015 / 1993		
☐ - EN 55022 / 1987	☐ - Class A	☐ - Class B
■ - FCC Part 22 Subpart H		
☐ - BS		
☐ - VCCI	☐ - Class A	☐ - Class B
☐ - FCC	☐ - Class A	☐ - Class B
☐ - AS 3548 (1992)	☐ - Class A	☐ - Class B
☐ - CISPR 11 (1990)	☐ - Group 1	☐ - Group 2
	☐ - Class A	☐ - Class B
☐ - CISPR 22 (1993)	☐ - Class A	☐ - Class B

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Environmental conditions in the lab:

	Actual
Temperature	: 23 °C
Relative Humidity	: 28 %
Atmospheric pressure	: 98.0 kPa
Power supply system	: 60 Hz - 115 V - 1-phase

Sign Explanations:

☐ - not applicable
■ - applicable

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22.355 Frequency tolerance

The Frequency Tolerance measurements were performed at the following test location:

■ - ADC facility

The EUT Server is specified for indoor use only with temperature range of +10 to +35º C and was tested within its range. The EUT STM and LPA are specified with a temperature range of -30 to +50º C and were tested within their range.

The remote units are placed in the temp chamber and the temp is lowered to -30 degrees C. Incremental temperature increases are administered and test measurements are taken when the units are soaked long enough. When the testing has been completed for the temperatures up to 0 degrees, then the host unit is placed in the temp chamber and testing resumes all the way up to +50 degrees C.

Frequency tolerance data on next 2 pages

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Frequency Tolerance Test for ADC Inc
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

EUT A Band

Input Voltage	Carrier Frequency	Measured Frequency	Meets requirement?
102 VAC	869.200000 MHz	869.200000 MHz	YES
120 VAC	869.200000 MHz	869.200000 MHz	YES
138 VAC	869.200000 MHz	869.200000 MHz	YES
102 VAC	879.800000 MHz	879.800000 MHz	YES
120 VAC	879.800000 MHz	879.800000 MHz	YES
138 VAC	879.800000 MHz	879.800000 MHz	YES
102 VAC	891.400000 MHz	891.400000 MHz	YES
120 VAC	891.400000 MHz	891.400000 MHz	YES
138 VAC	891.400000 MHz	891.400000 MHz	YES
Temperature	**Carrier Frequency**	**Measured Frequency**	**Meets requirement?**
-30 Deg C	869.200000 MHz	869.200000 MHz	YES
-20 Deg C	869.200000 MHz	869.200000 MHz	YES
-10 Deg C	869.200000 MHz	869.200000 MHz	YES
0 Deg. C	869.200000 MHz	869.200000 MHz	YES
10 Deg C	869.200000 MHz	869.200000 MHz	YES
20 Deg C	869.200000 MHz	869.200000 MHz	YES
30 Deg C	869.200000 MHz	869.200000 MHz	YES
40 Deg C	869.200000 MHz	869.200000 MHz	YES
50 Deg C	869.200000 MHz	869.200000 MHz	YES
-30 Deg C	879.800000 MHz	879.800000 MHz	YES
-20 Deg C	879.800000 MHz	879.800000 MHz	YES
-10 Deg C	879.800000 MHz	879.800000 MHz	YES
0 Deg. C	879.800000 MHz	879.800000 MHz	YES
10 Deg C	879.800000 MHz	879.800000 MHz	YES
20 Deg C	879.800000 MHz	879.800000 MHz	YES
30 Deg C	879.800000 MHz	879.800000 MHz	YES
40 Deg C	879.800000 MHz	879.800000 MHz	YES
50 Deg C	879.800000 MHz	879.800000 MHz	YES
-30 Deg C	891.400000 MHz	891.400000 MHz	YES
-20 Deg C	891.400000 MHz	891.400000 MHz	YES
-10 Deg C	891.400000 MHz	891.400000 MHz	YES
0 Deg. C	891.400000 MHz	891.400000 MHz	YES
10 Deg C	891.400000 MHz	891.400000 MHz	YES
20 Deg C	891.400000 MHz	891.400000 MHz	YES
30 Deg C	891.400000 MHz	891.400000 MHz	YES
40 Deg C	891.400000 MHz	891.400000 MHz	YES
50 Deg C	891.400000 MHz	891.400000 MHz	YES

EUT B Band

Input Voltage	Carrier Frequency	Measured Frequency	Meets requirement?
102 VAC	880.000000 MHz	880.000000 MHz	YES
120 VAC	880.000000 MHz	880.000000 MHz	YES
138 VAC	880.000000 MHz	880.000000 MHz	YES
102 VAC	887.000000 MHz	887.000000 MHz	YES
120 VAC	887.000000 MHz	887.000000 MHz	YES
138 VAC	887.000000 MHz	887.000000 MHz	YES
102 VAC	893.800000 MHz	893.800000 MHz	YES
120 VAC	893.800000 MHz	893.800000 MHz	YES
138 VAC	893.800000 MHz	893.800000 MHz	YES
Temperature	**Carrier Frequency**	**Measured Frequency**	**Meets requirement?**
-30 Deg C	880.000000 MHz	880.000000 MHz	YES
-20 Deg C	880.000000 MHz	880.000000 MHz	YES
-10 Deg C	880.000000 MHz	880.000000 MHz	YES
0 Deg. C	880.000000 MHz	880.000000 MHz	YES
10 Deg C	880.000000 MHz	880.000000 MHz	YES
20 Deg C	880.000000 MHz	880.000000 MHz	YES
30 Deg C	880.000000 MHz	880.000000 MHz	YES
40 Deg C	880.000000 MHz	880.000000 MHz	YES
50 Deg C	880.000000 MHz	880.000000 MHz	YES
-30 Deg C	887.000000 MHz	887.000000 MHz	YES
-20 Deg C	887.000000 MHz	887.000000 MHz	YES
-10 Deg C	887.000000 MHz	887.000000 MHz	YES
0 Deg. C	887.000000 MHz	887.000000 MHz	YES
10 Deg C	887.000000 MHz	887.000000 MHz	YES
20 Deg C	887.000000 MHz	887.000000 MHz	YES
30 Deg C	887.000000 MHz	887.000000 MHz	YES
40 Deg C	887.000000 MHz	887.000000 MHz	YES
50 Deg C	887.000000 MHz	887.000000 MHz	YES
-30 Deg C	893.800000 MHz	893.800000 MHz	YES
-20 Deg C	893.800000 MHz	893.800000 MHz	YES
-10 Deg C	893.800000 MHz	893.800000 MHz	YES
0 Deg. C	893.800000 MHz	893.800000 MHz	YES
10 Deg C	893.800000 MHz	893.800000 MHz	YES
20 Deg C	893.800000 MHz	893.800000 MHz	YES
30 Deg C	893.800000 MHz	893.800000 MHz	YES
40 Deg C	893.800000 MHz	893.800000 MHz	YES
50 Deg C	893.800000 MHz	893.800000 MHz	YES

Note: EUT Server is specified for indoor use only with temperature range of +10 to +35º C and was tested within its range.

Note: EUT STM and LPA are specified with a temperature range of -30 to +50º C and were tested within their range.

22.913 Effective Radiated Power Limit

The Effective Radiated Power Limit measurements were tested at the following test location:

☐ - Test not applicable

■ - ADC facility

This measurement was made as a direct conducted emission measurement. The output from the EUT antenna connector was connected directly to the spectrum analyzer, which was set up with a 1 MHz resolution bandwidth. The spectrum analyzer level was offset by 20 dB to compensate for the attenuator placed between the EUT and the analyzer, and by 2 dB for the measured cable loss between the EUT and the analyzer.

ERP data on following page

Effective Isotropic Radiated Power Limit Test for ADC Inc.
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

This measurement was made as a direct conducted emission measurement. The output from the EUT antenna connector was connected to the spectrum analyzer. The Carrier Output, below, was conducted using a single CW signal. The spectrum analyzer level was offset to compensate for attenuators and cable loss between the EUT and the analyzer.

A CW signal was used at the low, mid and high parts of the selected band. The spectrum analyzer level was offset by 50.5 dB to compensate for attenuators and cable loss between the EUT and the analyzer.

Band A

Carrier Frequency	Carrier Output
869.20 MHz	+ 43.50 dBm
879.80 MHz	+ 44.83 dBm
891.40 MHz	+ 45.33 dBm

Band B

Carrier Frequency	Carrier Output
880.00 MHz	+ 46.00 dBm
887.00 MHz	+ 46.17 dBm
893.80 MHz	+ 47.17 dBm

22.915 Modulation requirements

The Modulation requirement measurements were performed at the following test location:

■ - Test not applicable

☐ - Wild River Lab Large Test Site
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room

The instantaneous frequency deviation measurements and the audio filter characteristics measurements are not applicable to this device – it is an amplifier.

22.917 Emission Limitations for cellular

The Emission limitations for cellular measurements were performed at the following test location:

☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - ADC facility

at a test distance of:

■ - 3 meters
☐ - 10 meters

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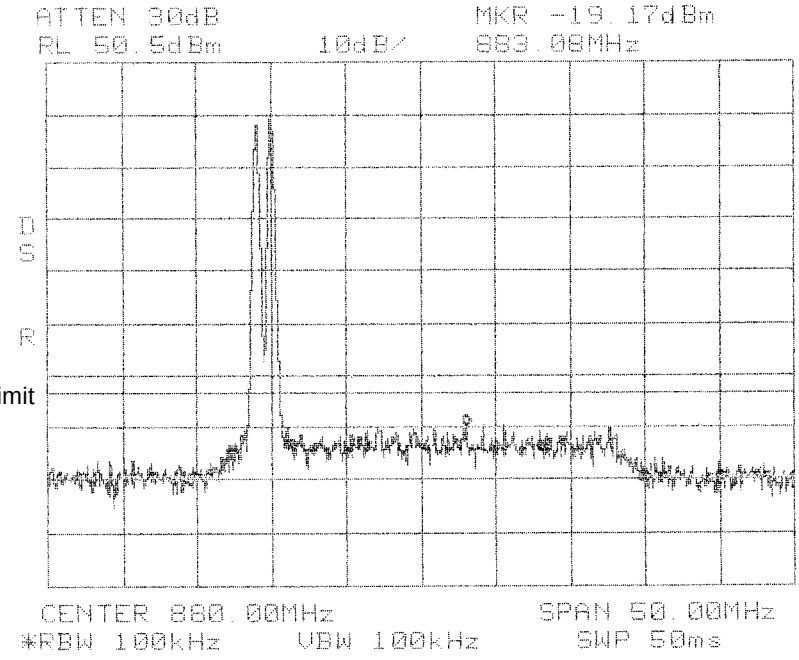
Inter-Modulation Test for ADC Inc.
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

The intermodulation product test was performed for each bandwidth setting of the EUT. Two tests were performed with each modulation type. Test 1 was with two signals input into the EUT at lower end channels. Test 2 was with two signals input into the EUT at upper end channels. The modulation type tested was GSM. An investigation was made from 30 MHz to the 10^{th} harmonic of the highest fundamental frequency (~10 GHz).

Results:

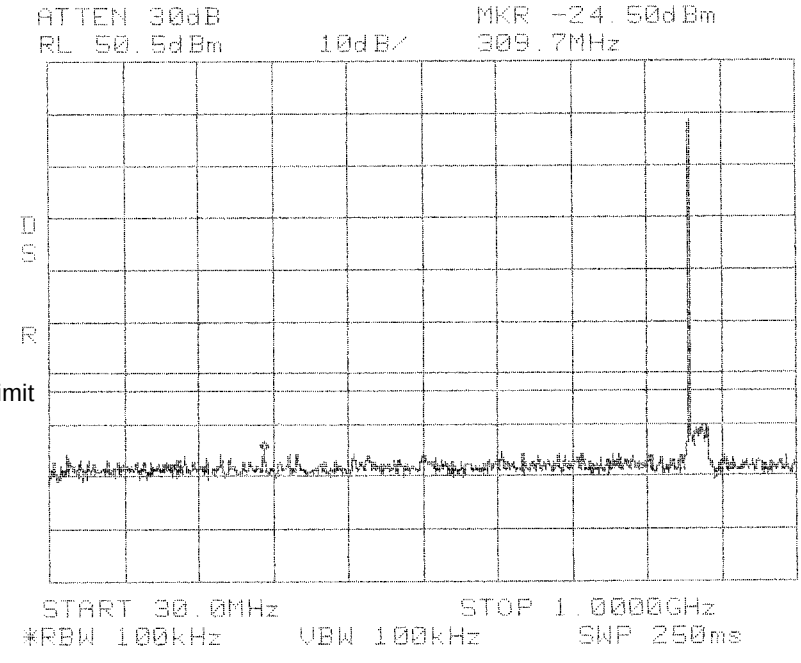
Pass (see plots)



-13 dBm Limit

Spikes are carrier signals.

Software Defined Radio
Intermodulation
Low
GSM
A BAND
Channel 128
Channel 133



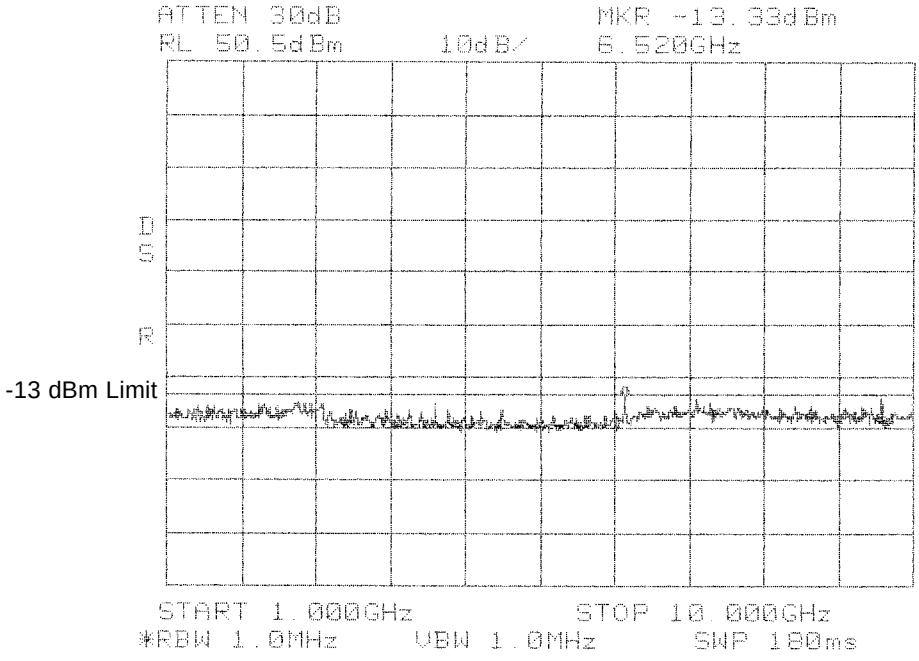
-13 dBm Limit

Spikes are carrier signals.

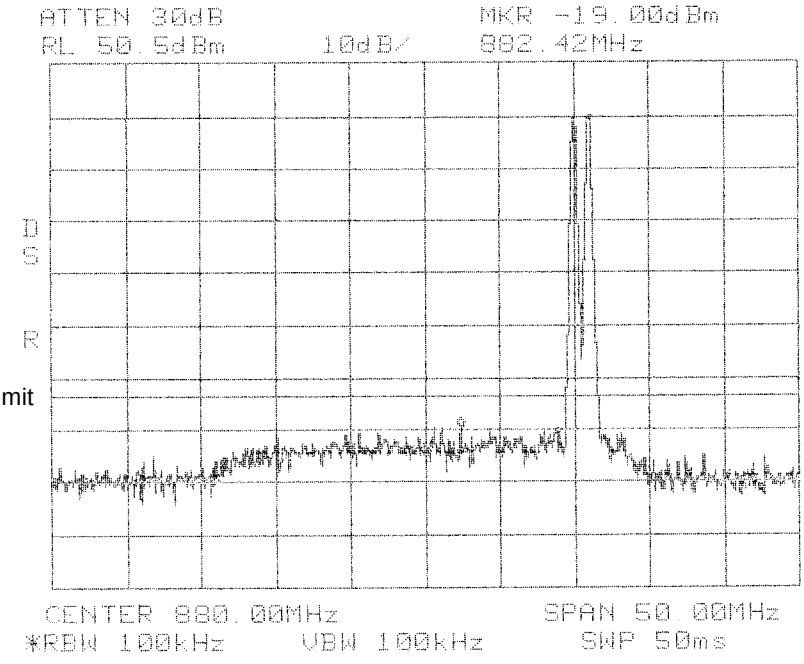
Software Defined Radio
Intermodulation
Low
GSM
A BAND
Channel 128
Channel 133

Software Defined Radio
Intermodulation
Low
GSM
A BAND

Channel 128
channel 133



Spikes are carrier signals.



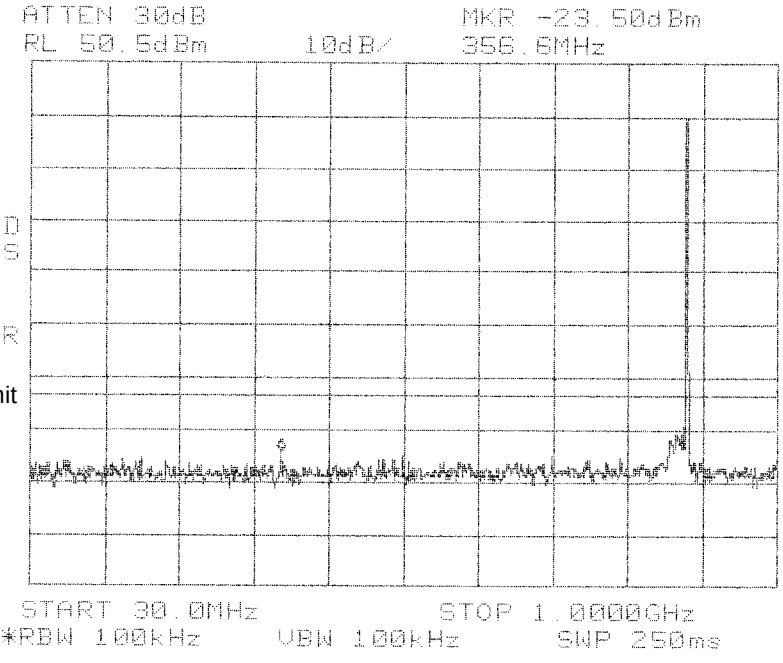
-13 dBm Limit

Spikes are carrier signals.

Software Defined Radio
Intermodulation
High
GSM
A BAND

Channel 233

Channel 238



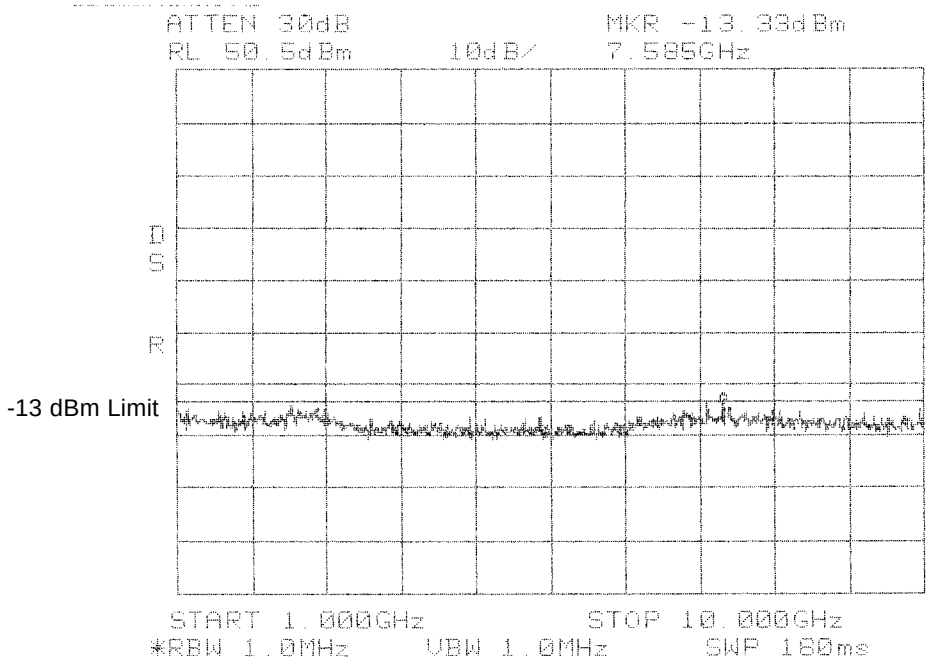
-13 dBm Limit

Spikes are carrier signals.

Software Defined Radio
Intermodulation
High
GSM
A BAND

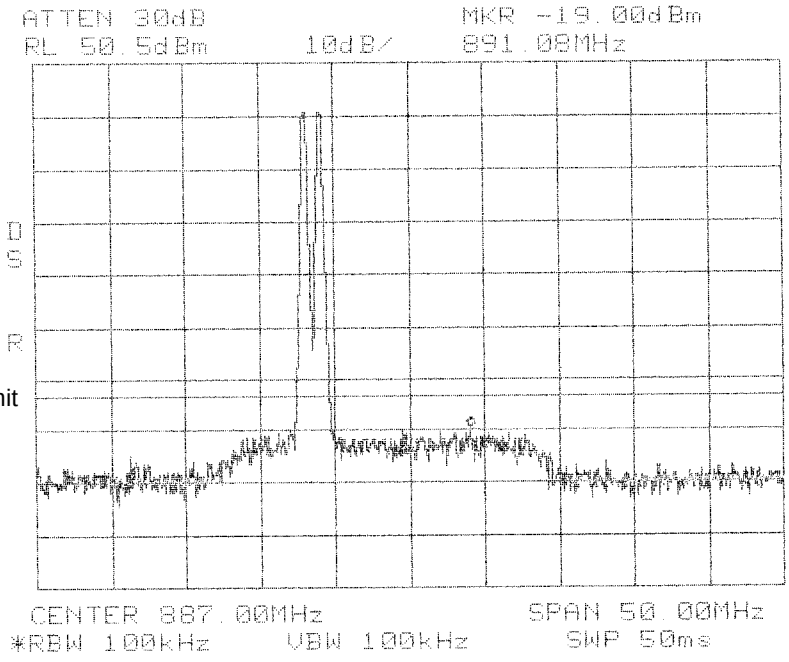
Channel 233

Channel 238



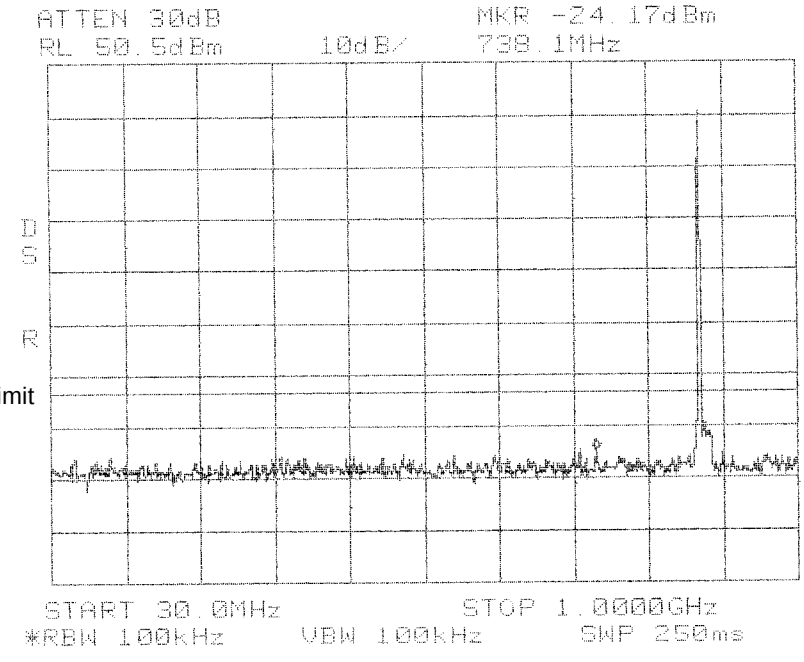
Software Defined Radio
Intermodulation
High
GSM
A BAND
Channel 233
channel 238

Spikes are carrier signals.



Spikes are carrier signals.

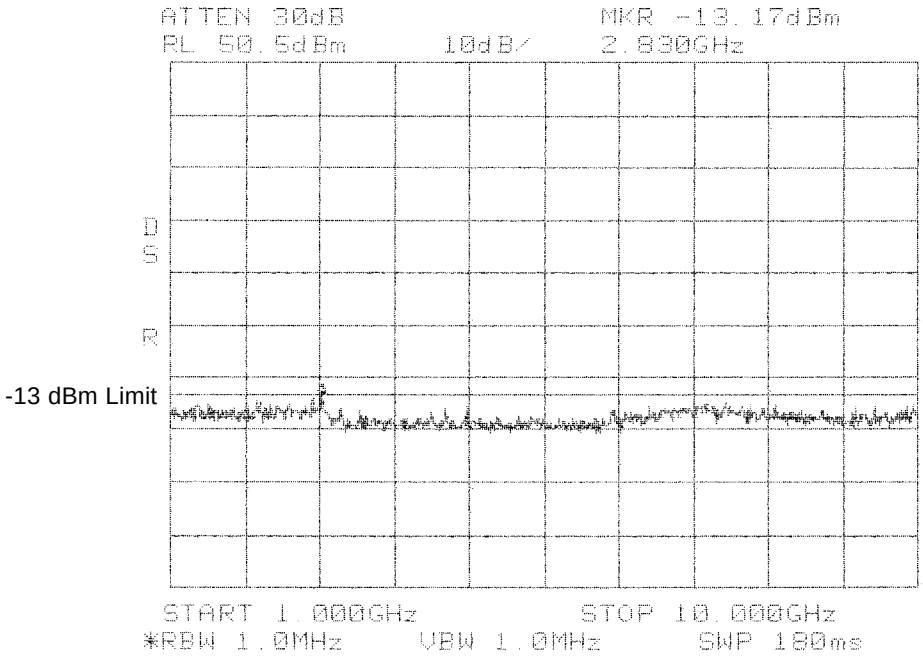
Software Defined Radio
Intermodulation
Low
GSM
B BAND
Channel 193
Channel 188



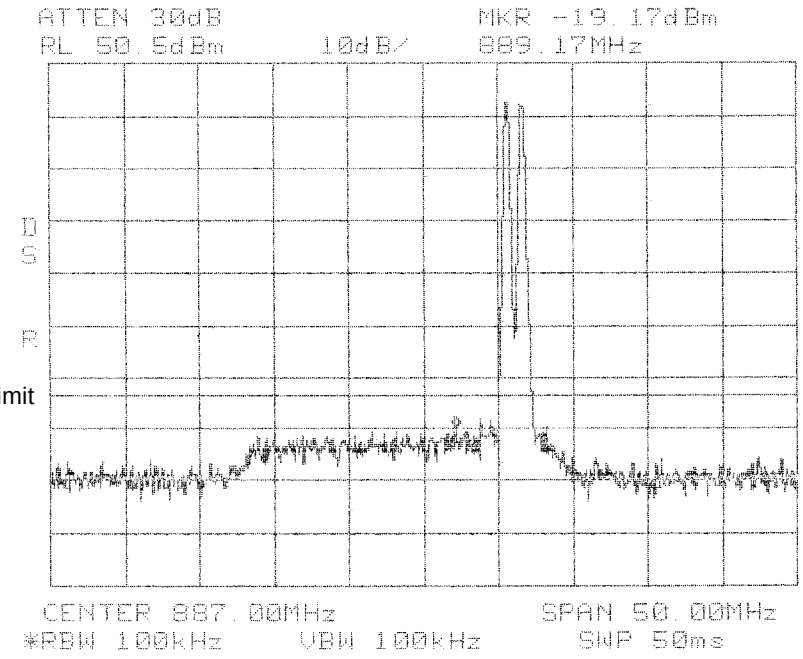
Spikes are carrier signals.

Software Defined Radio
Intermodulation
Low
GSM
B BAND
Channel 183
Channel 188

Software Defined Radio
Intermodulation
Low
GSM
B BAND
Channel 183
Channel 188



Spikes are carrier signals.

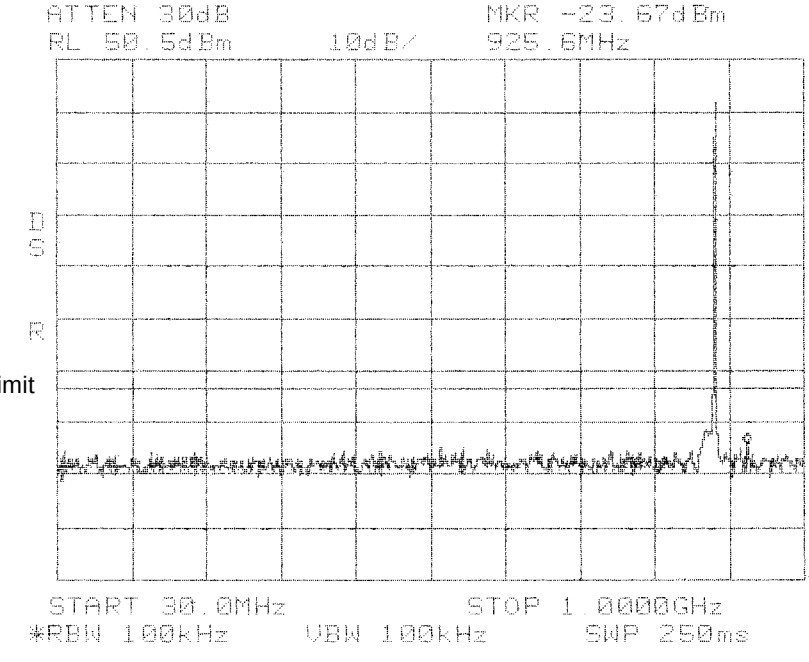


-13 dBm Limit

Spikes are carrier signals.

Software Defined Radio
Intermodulation
High
GSM
B BAND

Channel 246
Channel 251

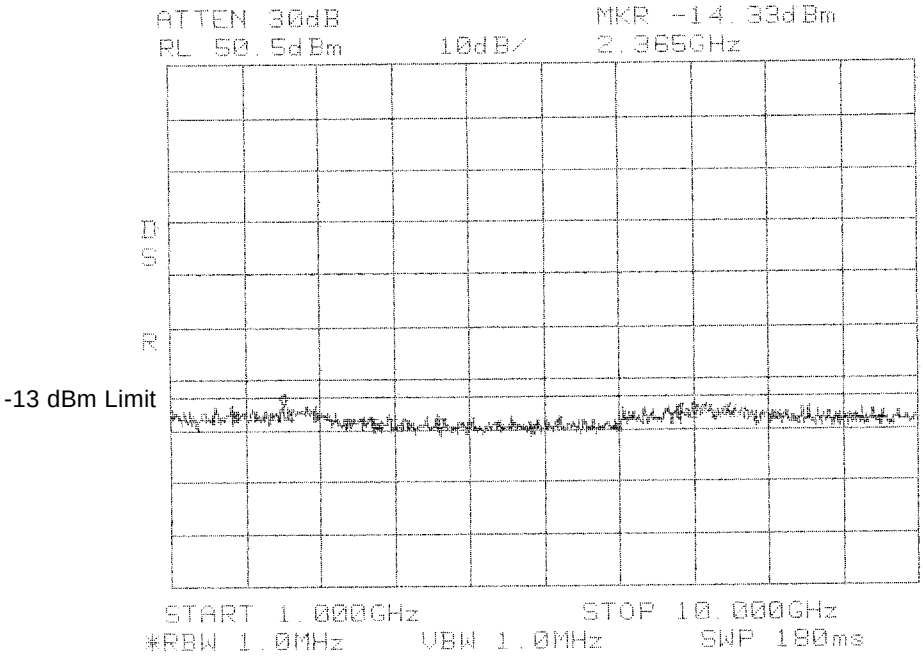


-13 dBm Limit

Spikes are carrier signals.

Software Defined Radio
Intermodulation
High
GSM
B BAND

Channel 246
Channel 251



Spikes are carrier signals.

Software Defined Radio
Intermodulation
High
GSM
B BAND
Channel 246
Channel 251

Conducted Emission Limits Test for ADC Inc.
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

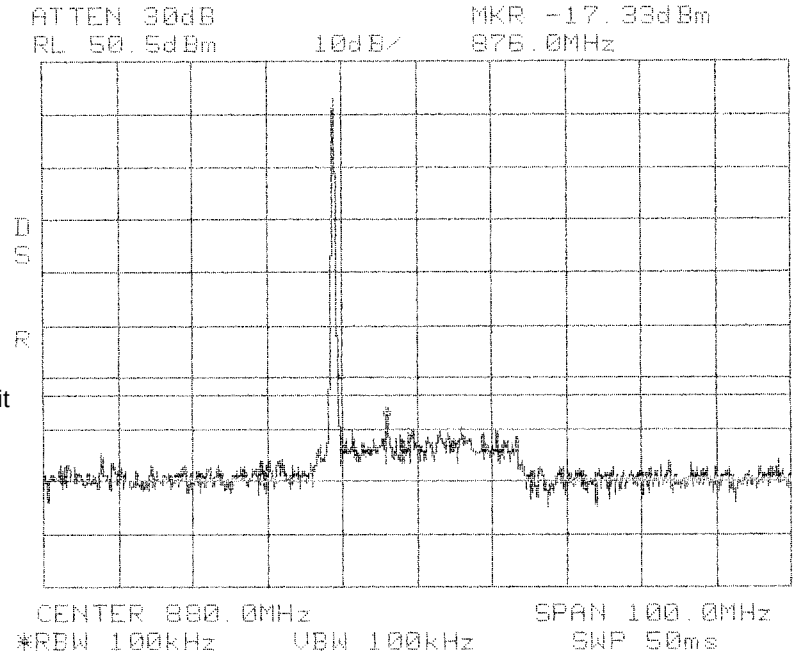
The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10^{th} harmonic of the highest carrier frequency. Test signals used are CW, and GSM. The different signals were input one at a time to the EUT. In all cases, the out of band emissions were less than –13dBm from the equation

$$(19\text{dBm} - [43 + 10\log(0.08\text{W})])$$

Band edge compliance is also demonstrated using a GSM signal at the upper and lower limits of the band and a resolution bandwidth of 1 kHz.

Results:

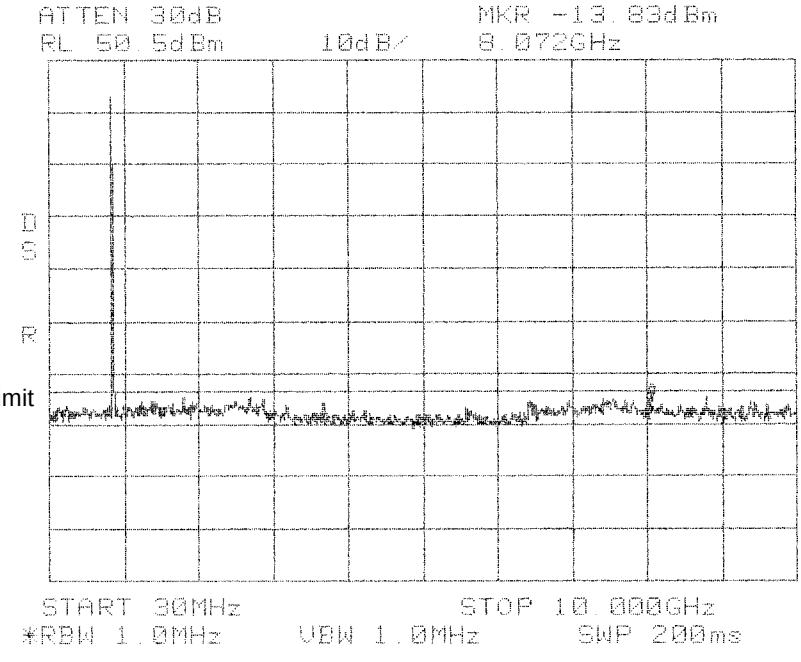
Pass (see plots)



-13 dBm limit

Software Defined Radio
Conducted Emissions
LOW
A BAND
Channel 128

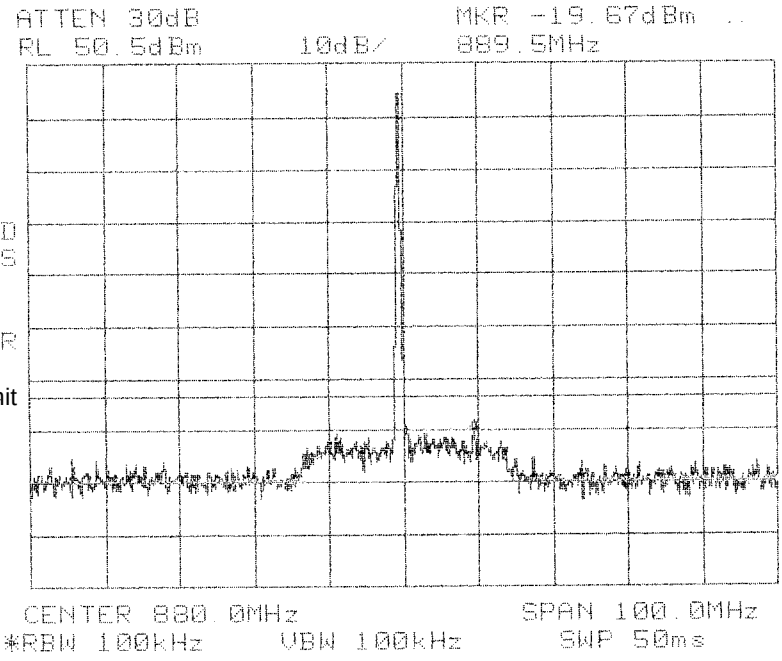
Spikes are carrier signals.



-13 dBm limit

Software Defined Radio
Conducted Emissions
LOW
A BAND
Channel 128

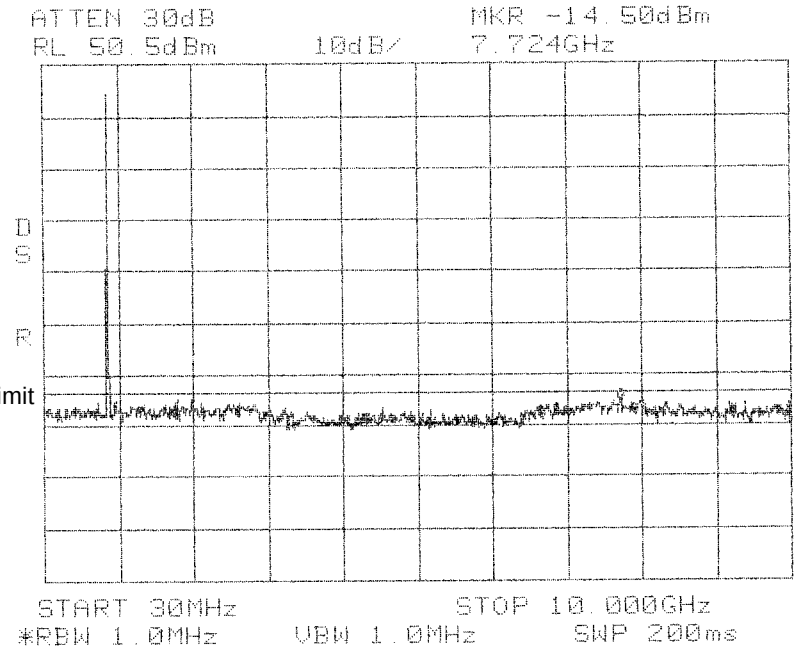
Spikes are carrier signals.



-13 dBm limit

Software Defined Radio
Conducted Emissions
MID
A BAND
Channel 191

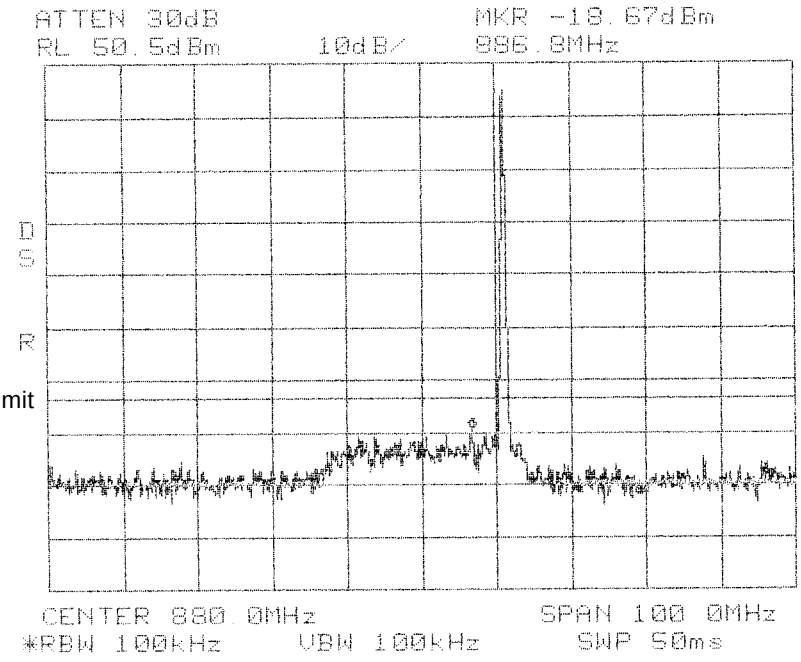
Spikes are carrier signals.



-13 dBm limit

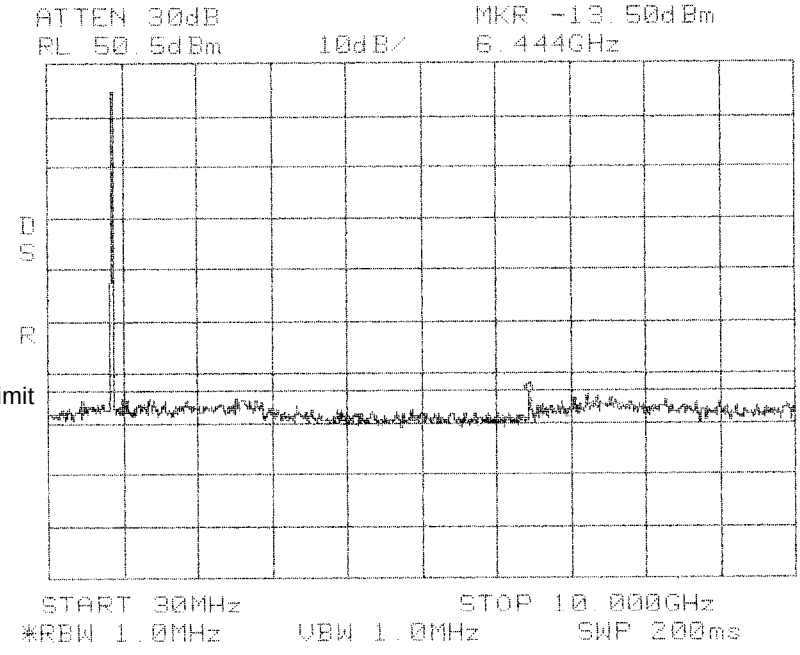
Software Defined Radio
Conducted Emissions
MID
A BAND
Channel 191

Spikes are carrier signals.



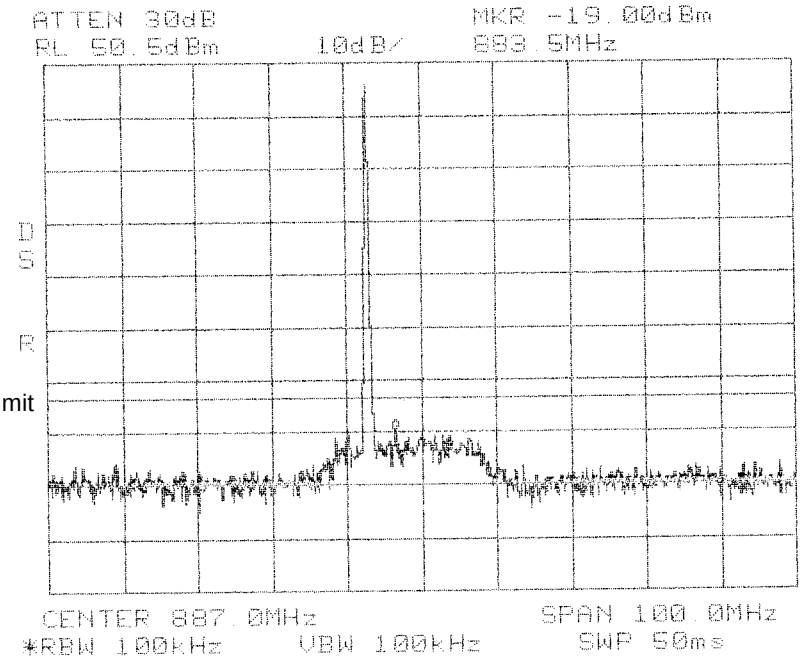
Software Defined Radio
Conducted Emissions
HIGH
A BAND
Channel 239

Spikes are carrier signals.



Software Defined Radio
Conducted Emissions
HIGH
A BAND
Channel 239

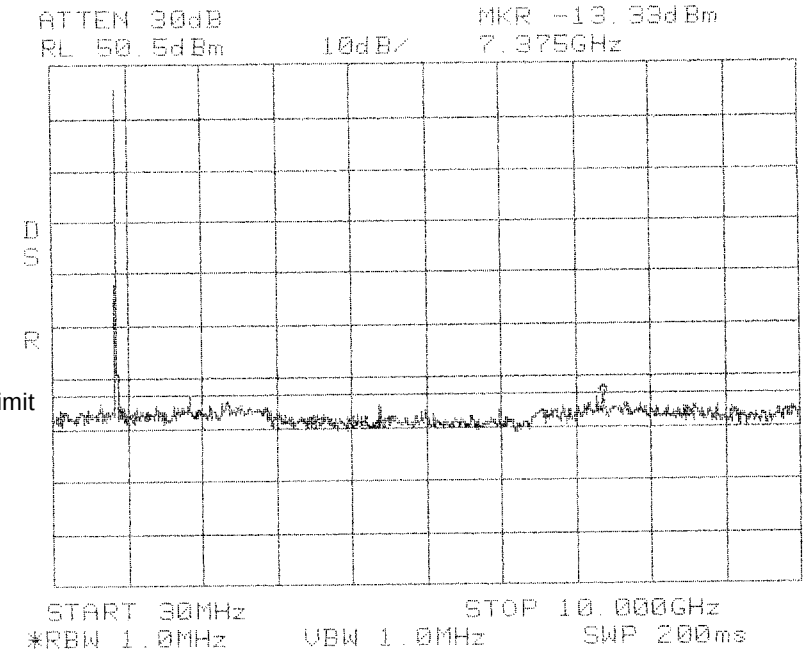
Spikes are carrier signals.



-13 dBm limit

Software Defined Radio
Conducted Emissions
LOW
B BAND
Channel 183

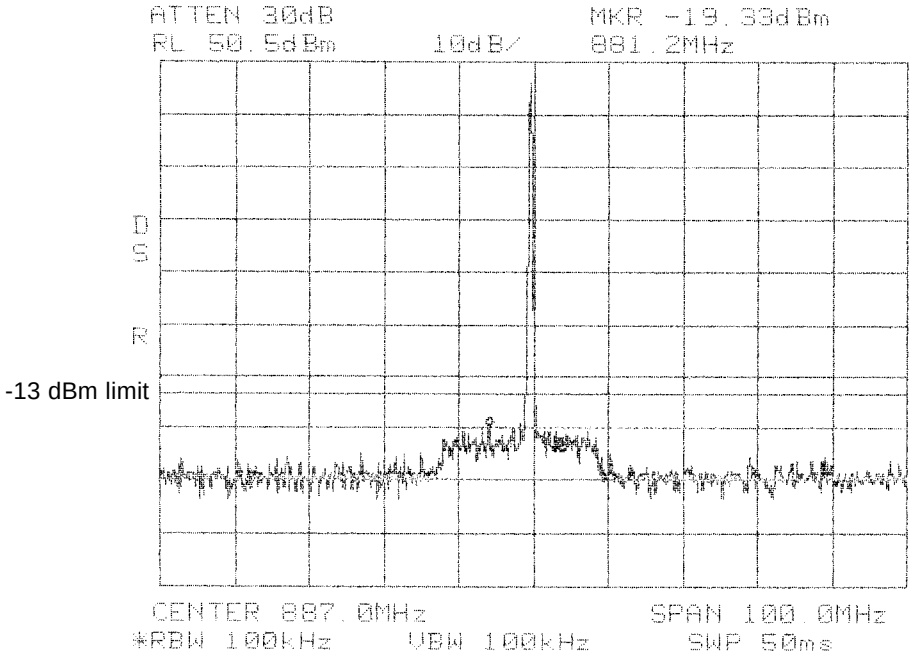
Spikes are carrier signals.



-13 dBm limit

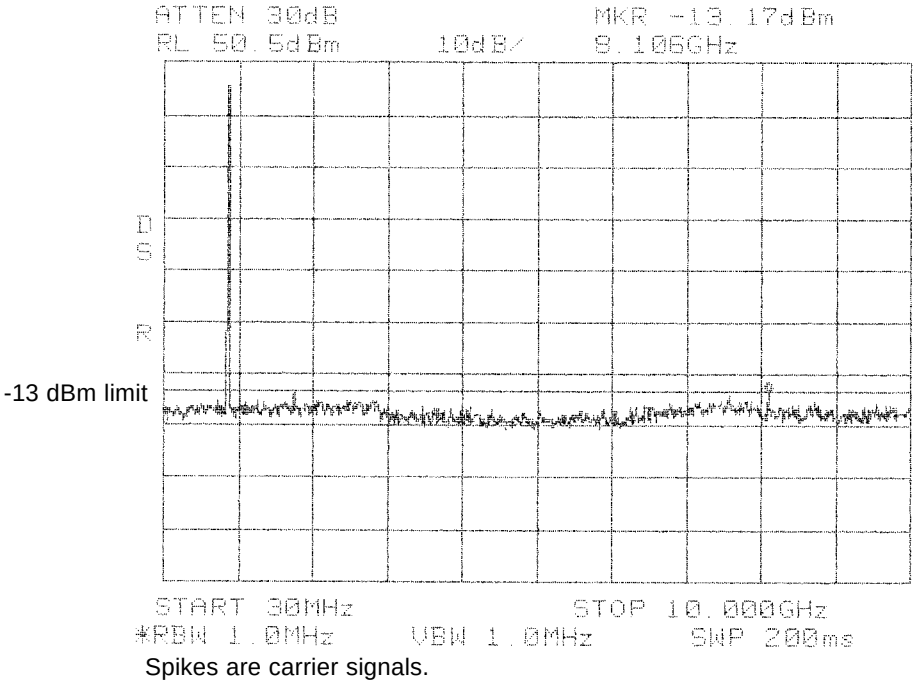
Software Defined Radio
Conducted Emissions
LOW
B BAND
Channel 183

Spikes are carrier signals.



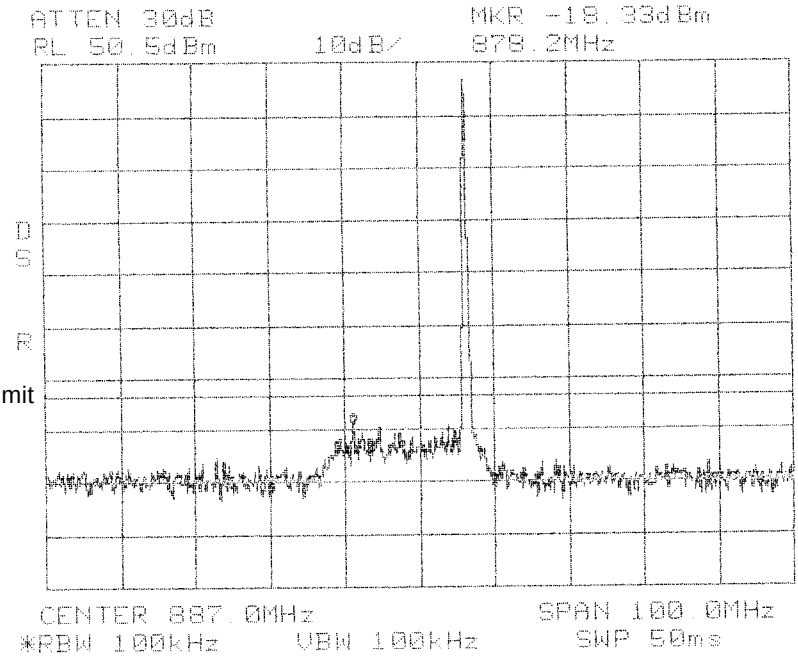
Spikes are carrier signals.

Software Defined Radio
Conducted Emissions
MID
B BAND
Channel 217



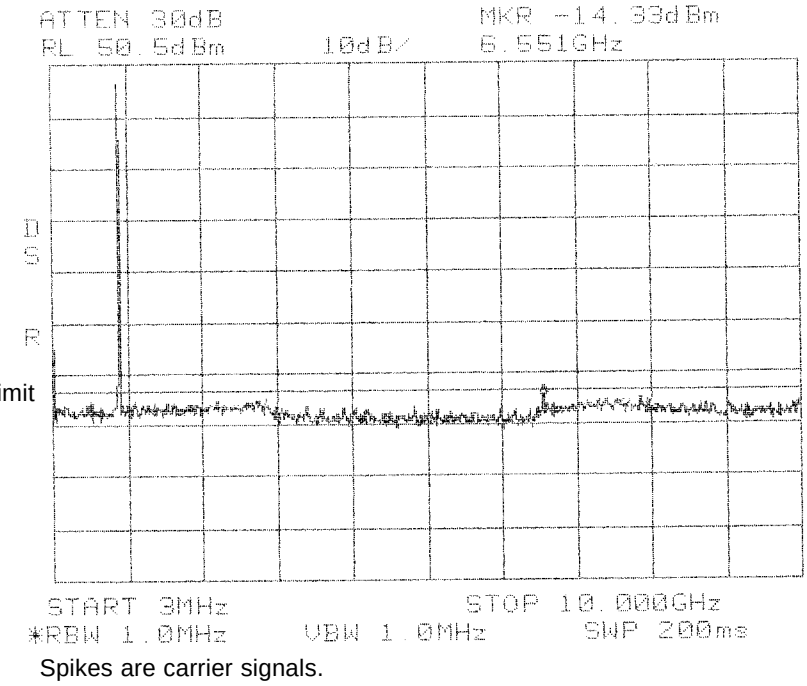
Spikes are carrier signals.

Software Defined Radio
Conducted Emissions
MID
B BAND
Channel 217



Software Defined Radio
Conducted Emissions
HIGH
B BAND
Channel 251

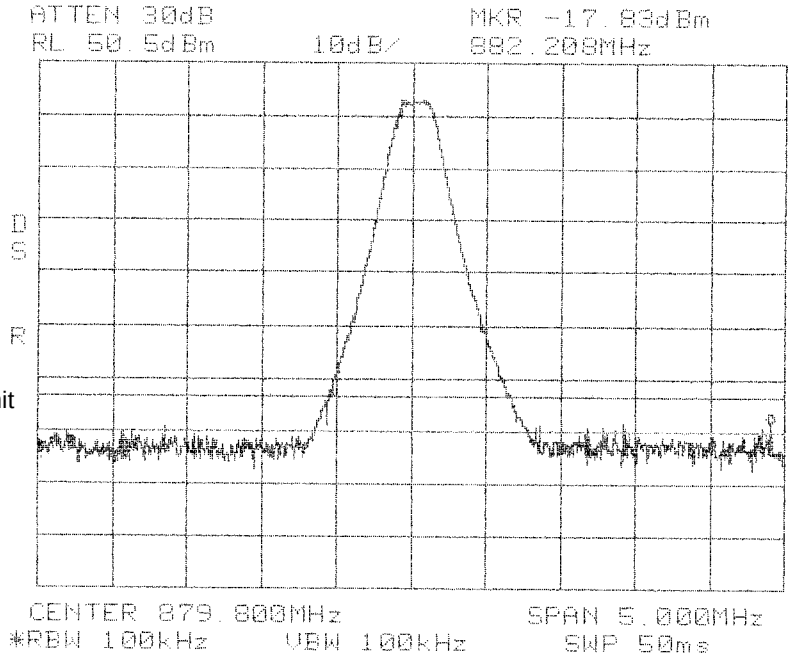
Spikes are carrier signals.



Software Defined Radio
Conducted Emissions
HIGH
B BAND
Channel 251

Spikes are carrier signals.

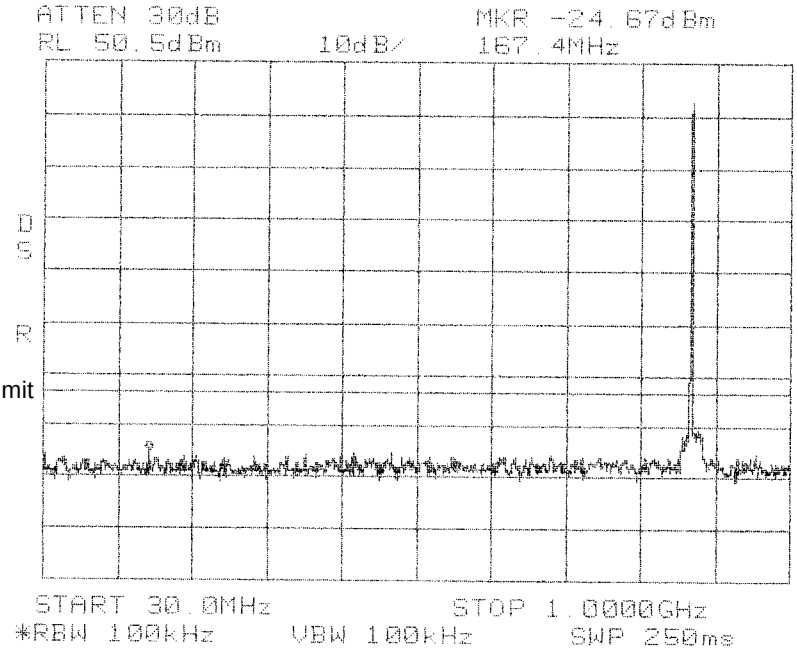
Software Defined Radio
Conducted Emissions
GSM
A BAND
Channel 181



-13 dBm limit

Spikes are carrier signals.

Software Defined Radio
Conducted Emissions
GSM
A BAND
Channel 181

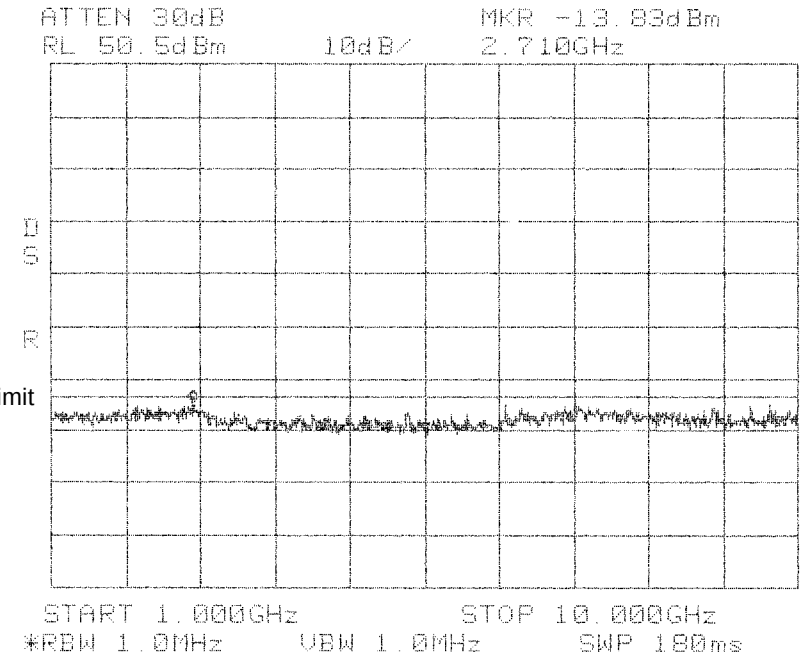


-13 dBm limit

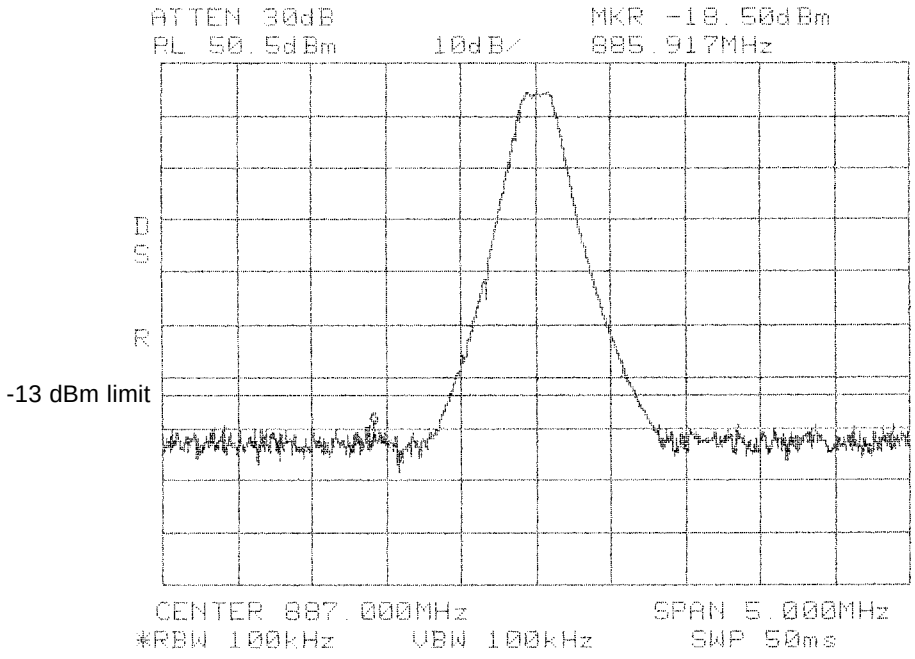
Spikes are carrier signals.

Software Defined Radio
Conducted Emissions
GSM
A BAND
Channel 181

-13 dBm limit



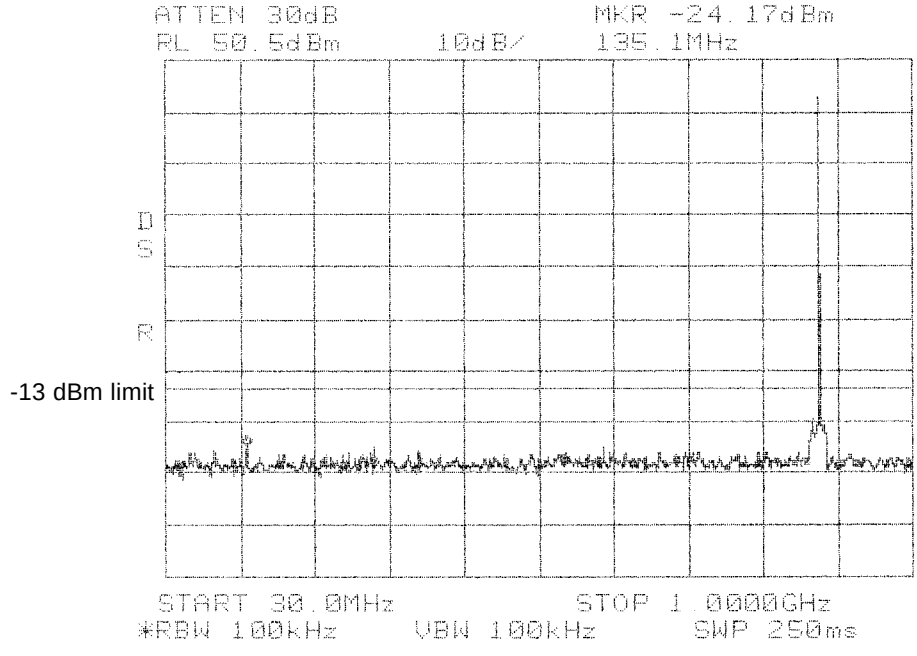
Spikes are carrier signals.



Spikes are carrier signals.

Software Defined Radio
Conducted Emissions
GSM
B BAND

Channel 217

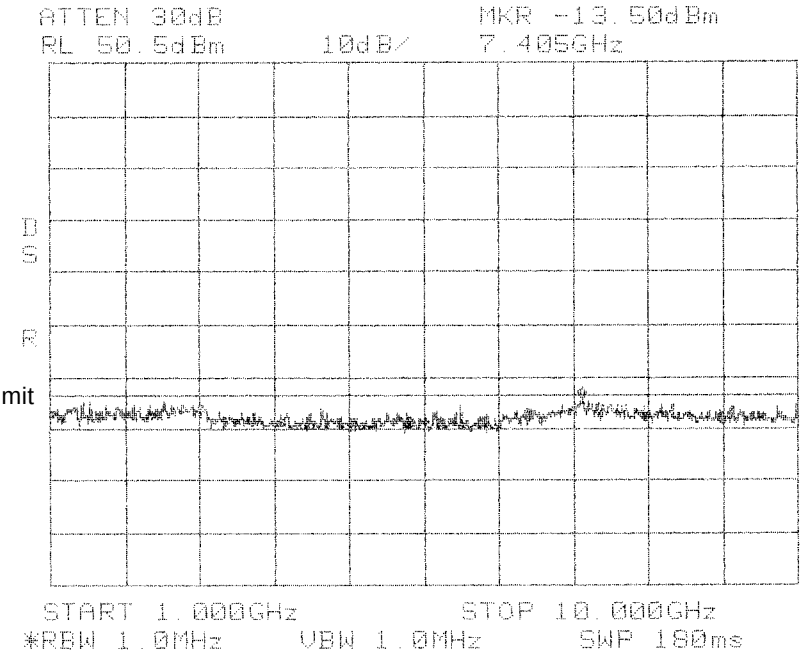


Spikes are carrier signals.

Software Defined Radio
Conducted Emissions
GSM
B BAND

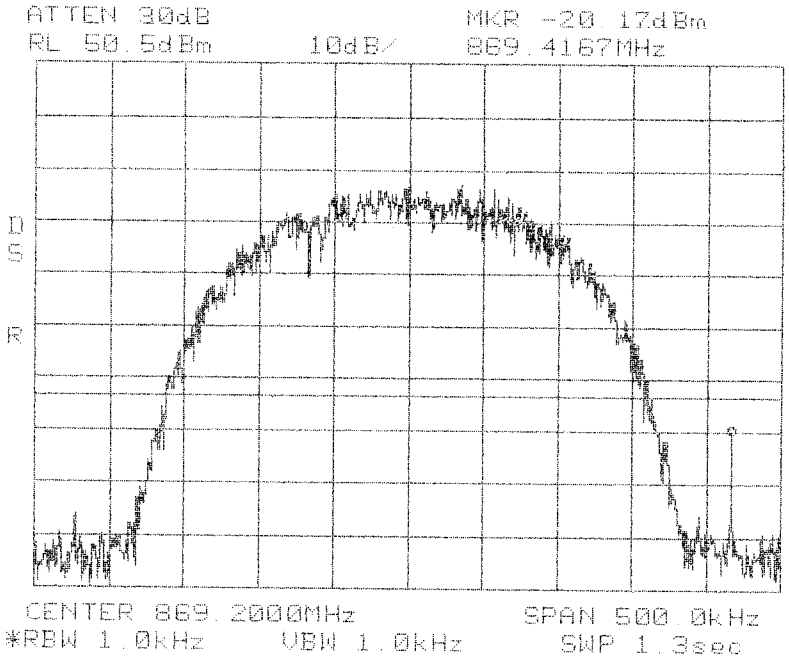
Channel 217

Software Defined Radio
Conducted Emissions
GSM
B BAND
Channel 217

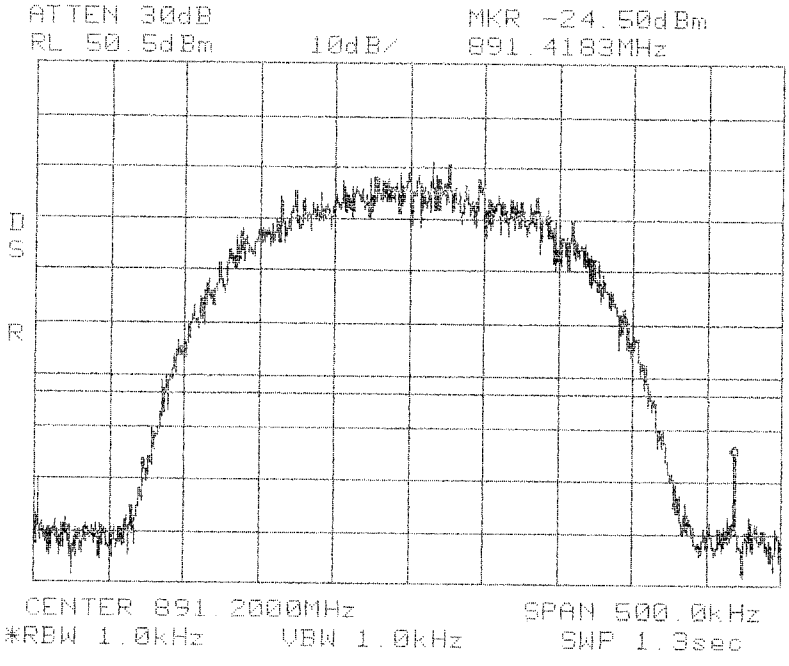


-13 dBm limit

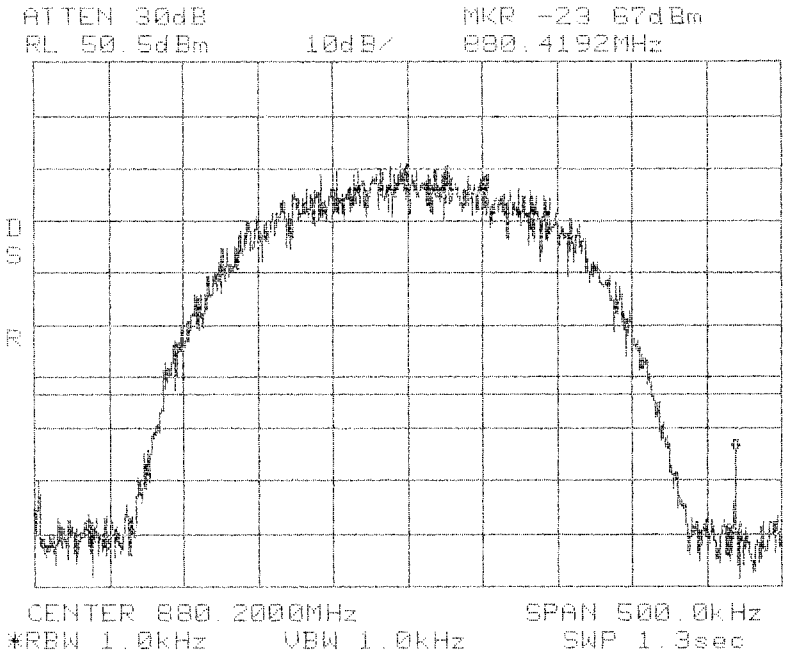
Spikes are carrier signals.



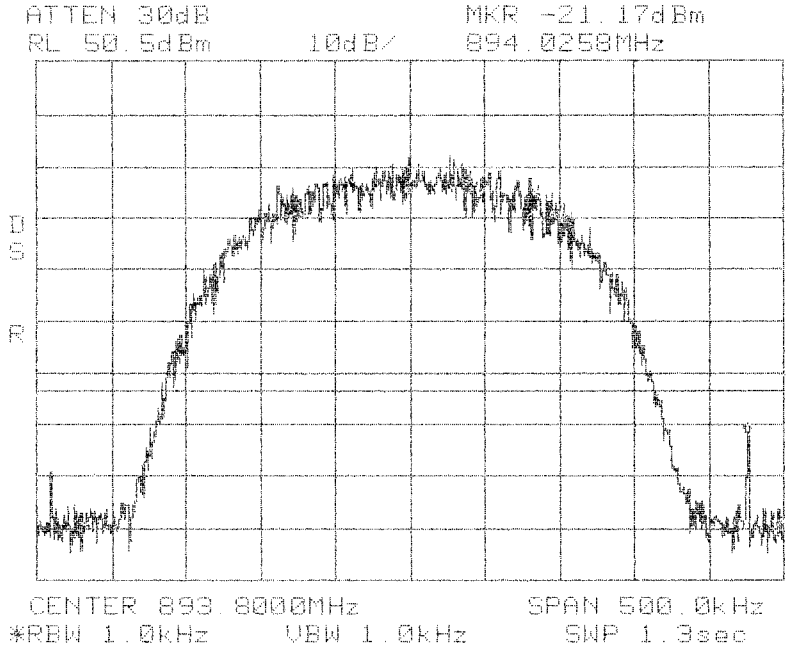
Software Defined Radio
Conducted Emissions
Band Edge
GSM
A BAND
Channel 128



Software Defined Radio
Conducted Emissions
Band Edge
GSM
A BAND
Channel 238



Software Defined Radio
Conducted Emissions
Band Edge
GSM
B BAND
Channel 183



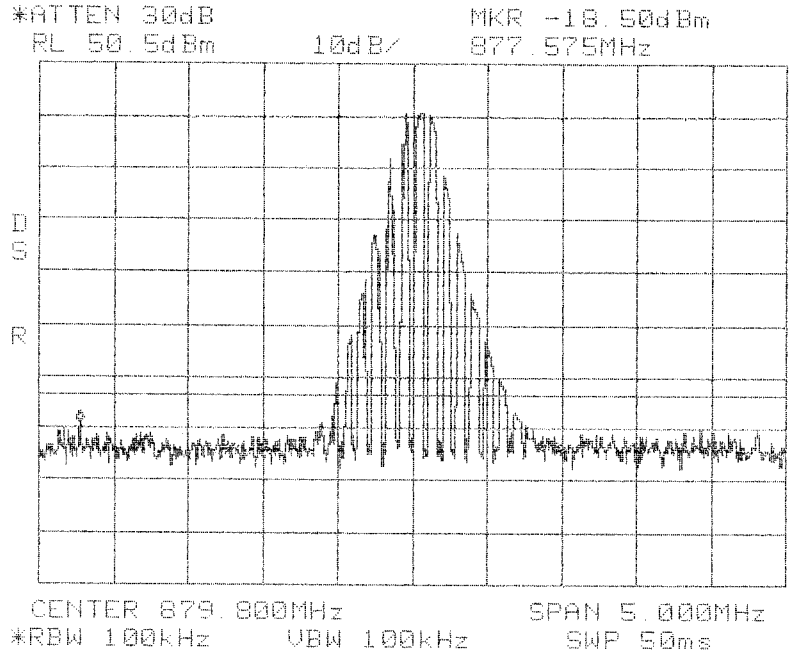
Software Defined Radio
Conducted Emissions
Band Edge
GSM
B BAND
Channel 251

Software Test 1 for ADC Inc.
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

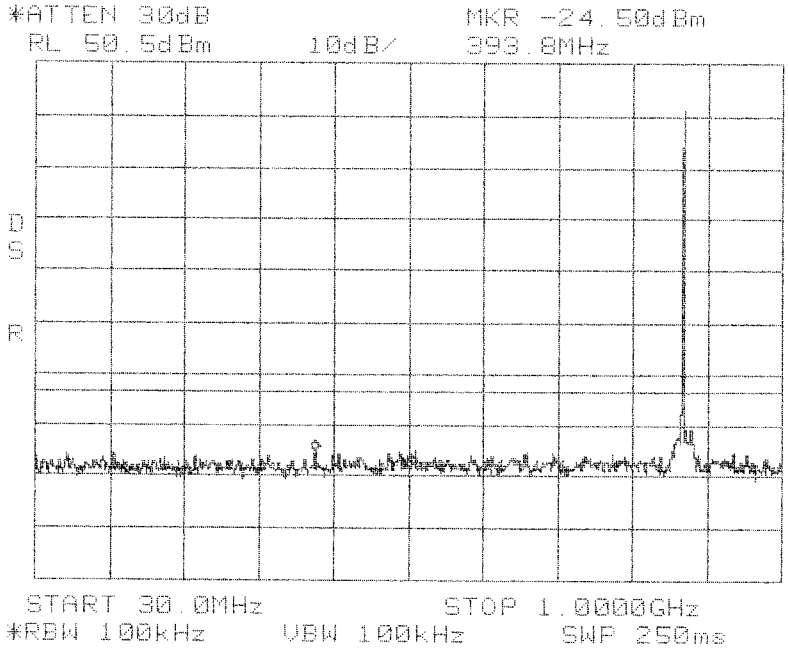
The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. The Software Test 1 simply simulates a GSM signal syncburst dropout where we are sending the PCIx card the data filling every other page with zeros.

Results:

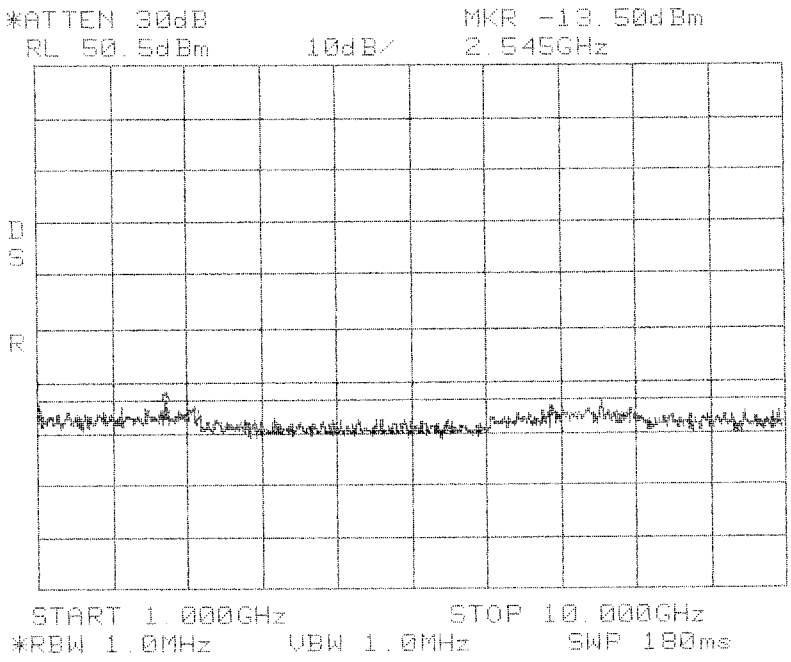
Pass (see plots)



Software Defined Radio
Software Test 1
A Band
Channel 181



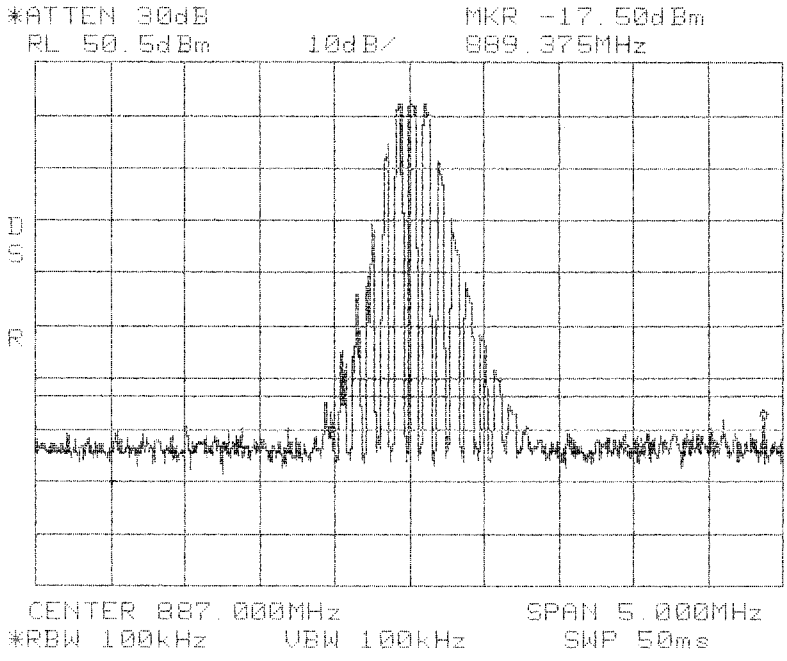
Software Defined Radio
Software Test 1
A Band
Channel 181



Software Defined Radio
Software Test 1
A Band

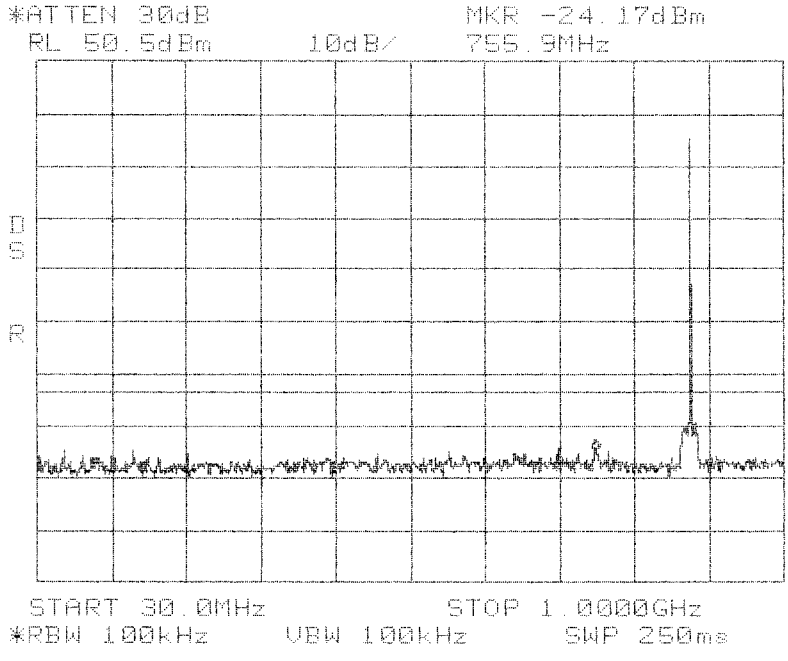
Channel 181

Software Defined Radio
Software Test 1
A Band



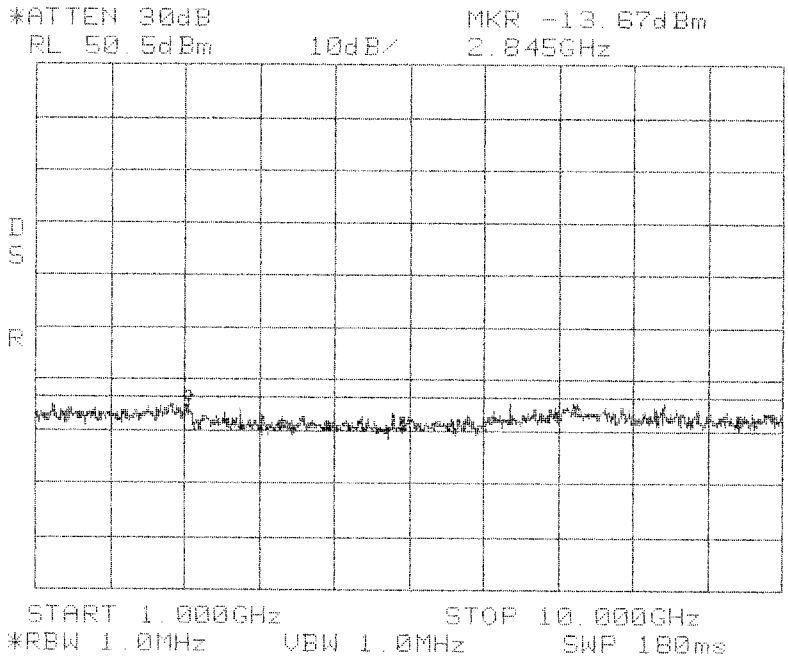
Software Defined Radio
Software Test 1
B Band

Channel 217



Software Defined Radio
Software Test 1
B Band

channel 217



Software Defined Radio
Software Test 1
B Band
channel 217

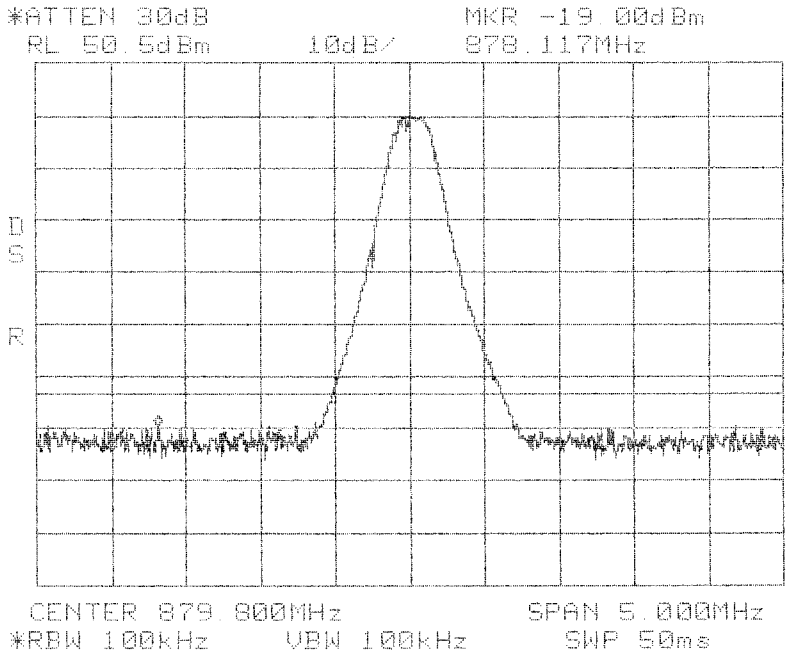
Software Defined Radio
Software Test 1
B Band

Software Test 2 for ADC Inc.
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10^{th} harmonic of the highest carrier frequency. The Software Test 2 will simply suspend the GSM signal program for seconds at a time every couple of seconds. This should be equivalent to the behavior of the base station if there is a software failure.

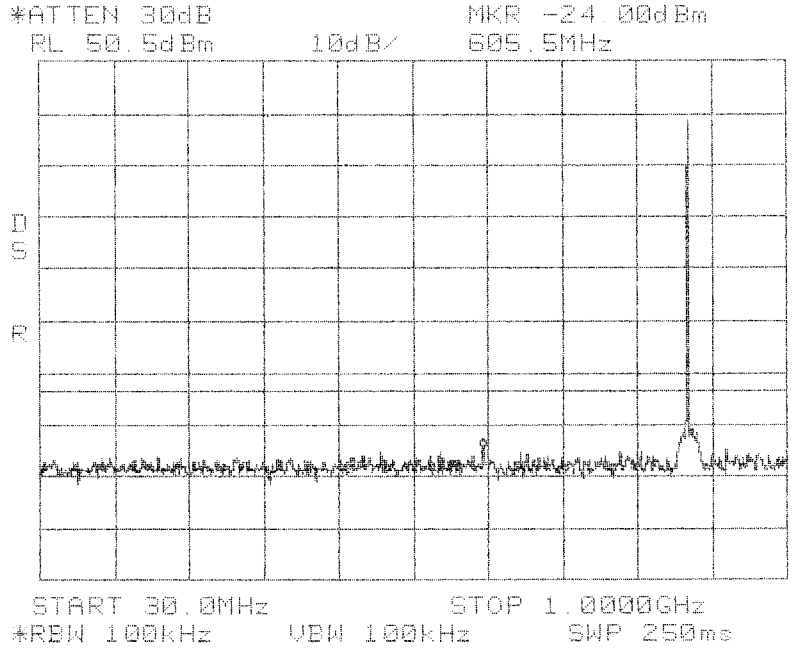
Results:

Pass (see plots)



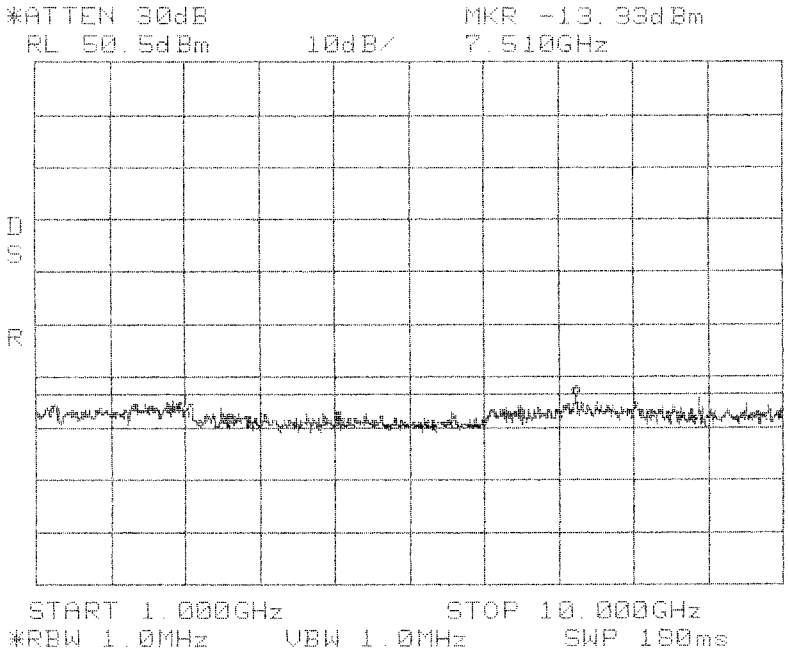
Software Defined Radio
Software Test 2
A Band

Channel 181



Software Defined Radio
Software Test 2
A Band

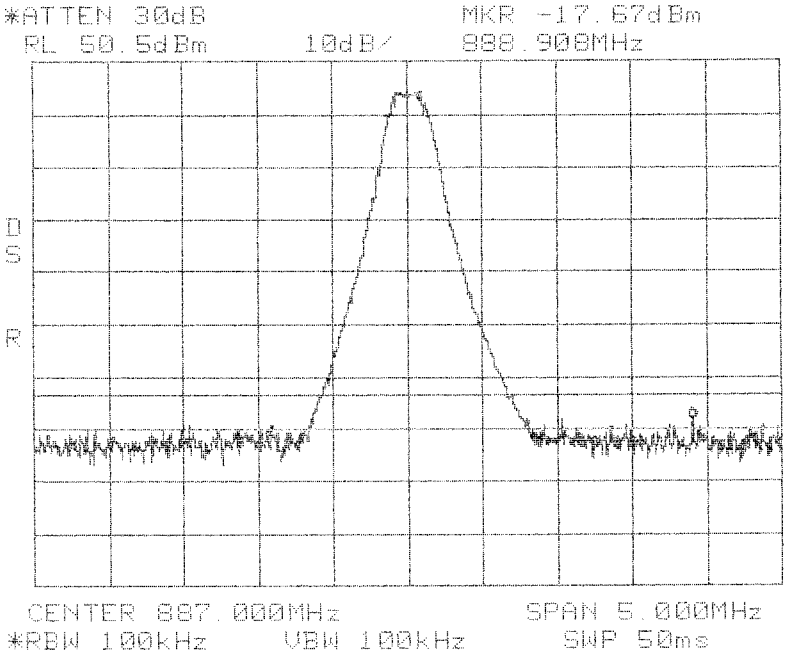
Channel 181



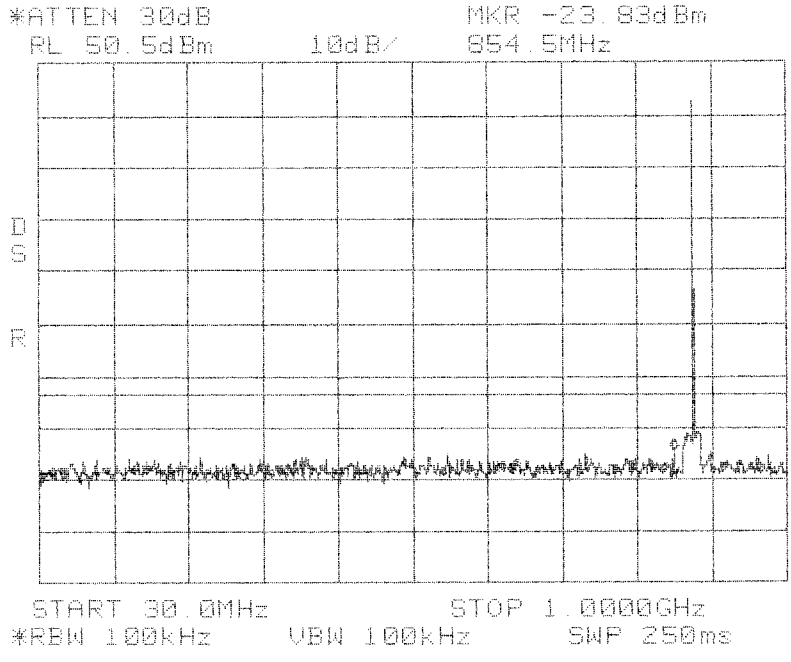
Software Defined Radio
Software Test 2
A Band

Channel 181

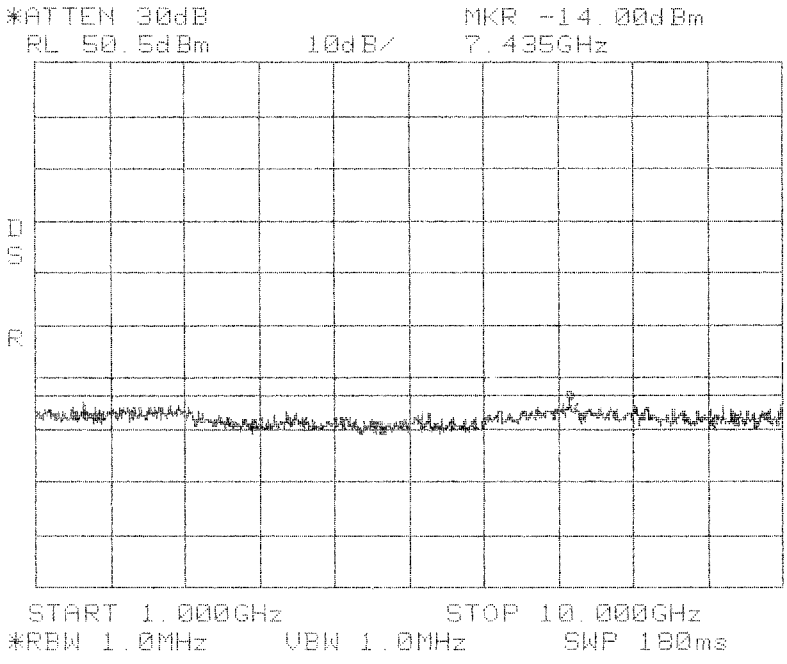
Software Defined Radio
Software Test 2
A Band



Software Defined Radio
Software Test 2
B Band
Channel 217



Software Defined Radio
Software Test 2
B Band
Channel 217



Software Defined Radio
Software Test 2
B Band
Channel 217

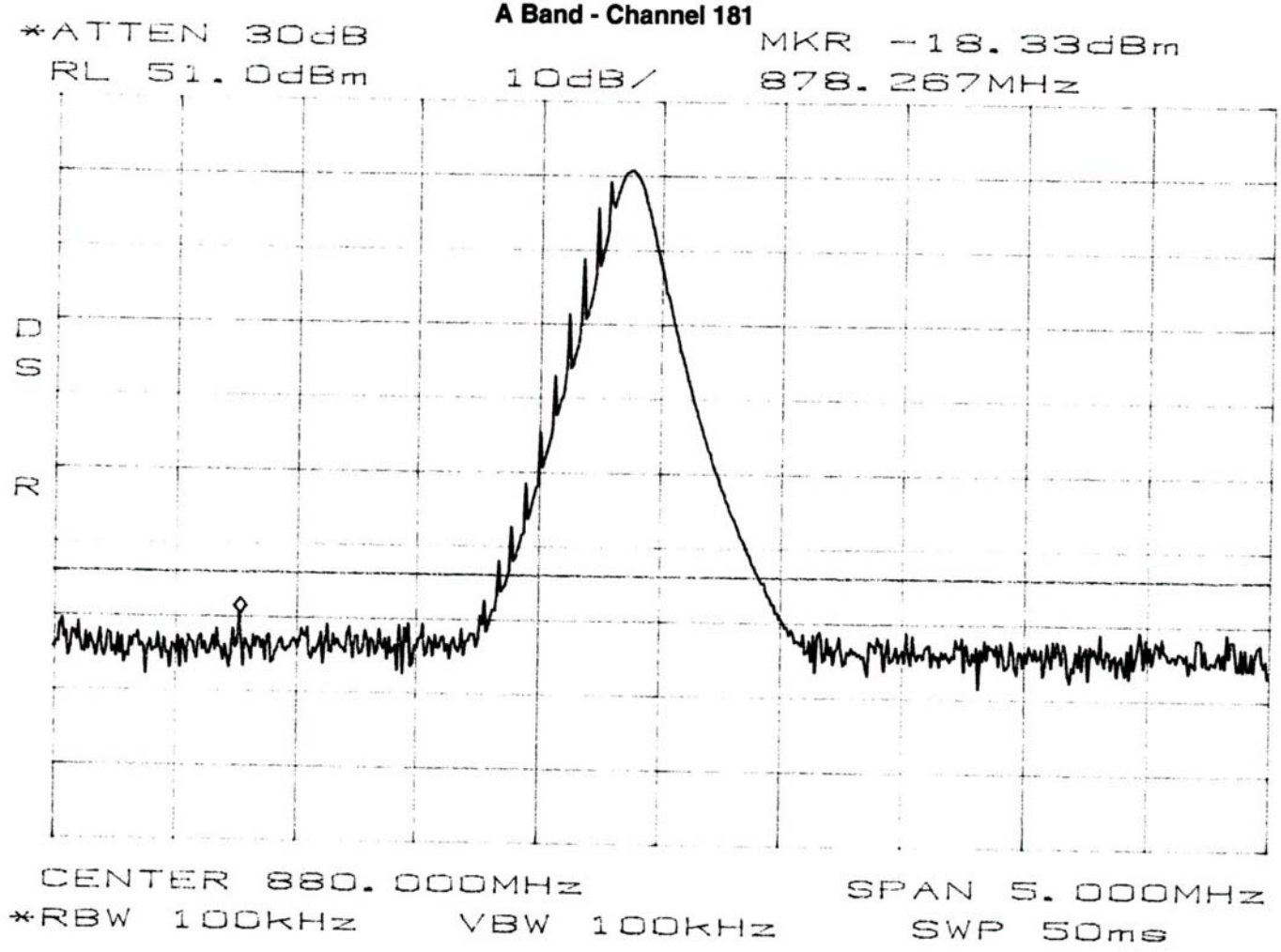
Software Test 3 for
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. The Software Test 3 simulates the GSM signal created from a sequence of all zeros.

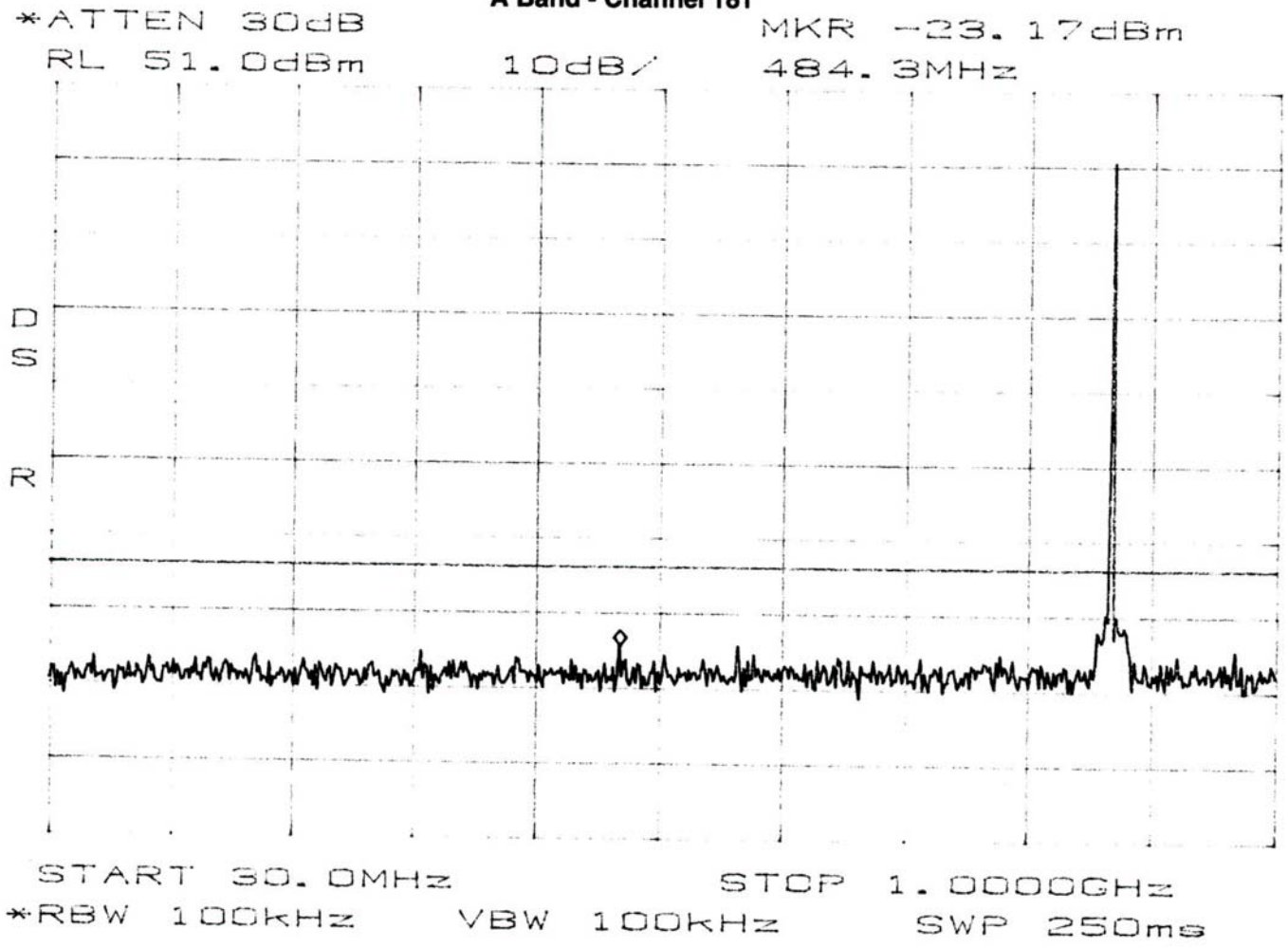
Results:

Pass (see plots)

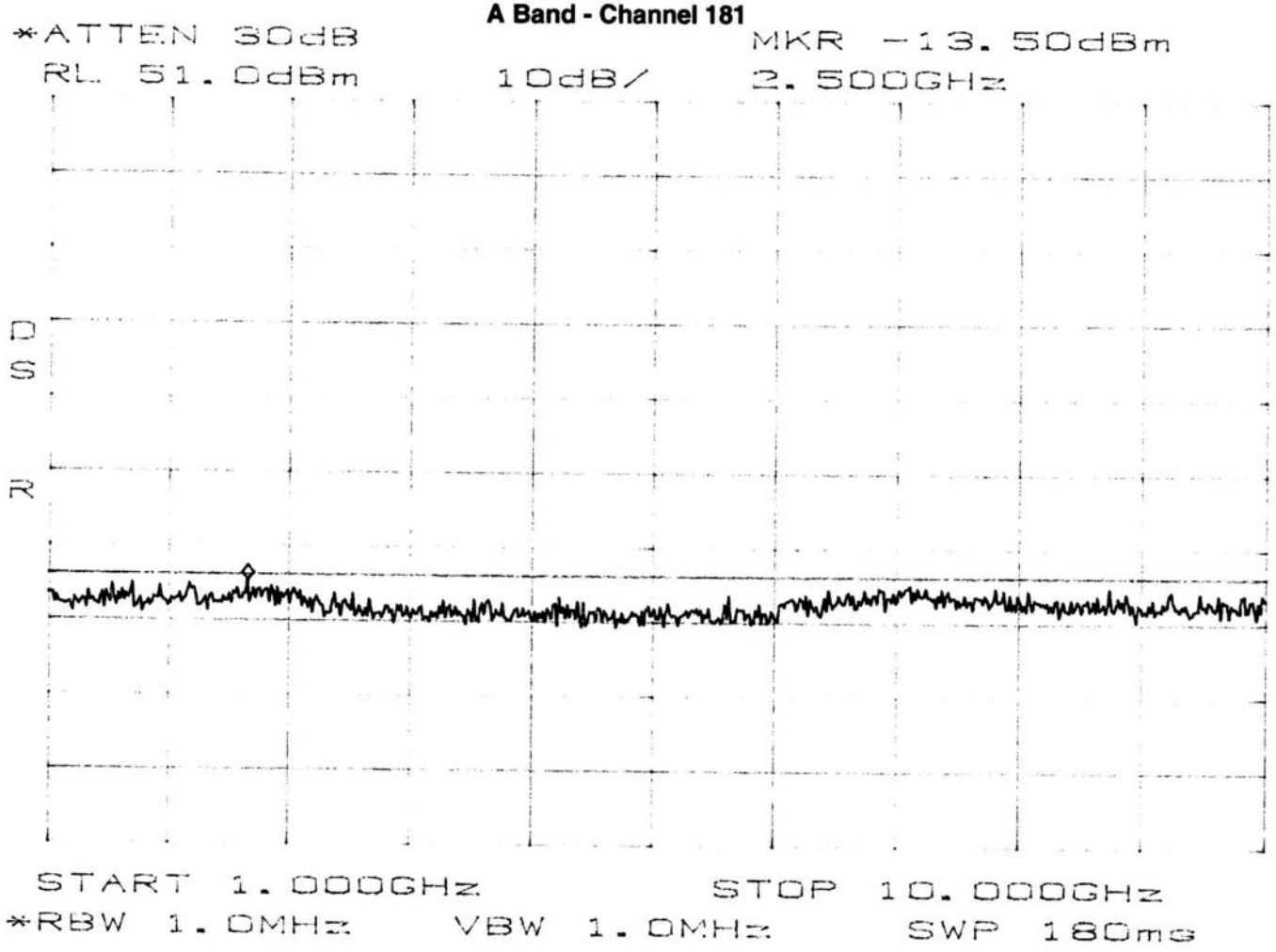
Software Defined Radio
Software Test 3
A Band - Channel 181



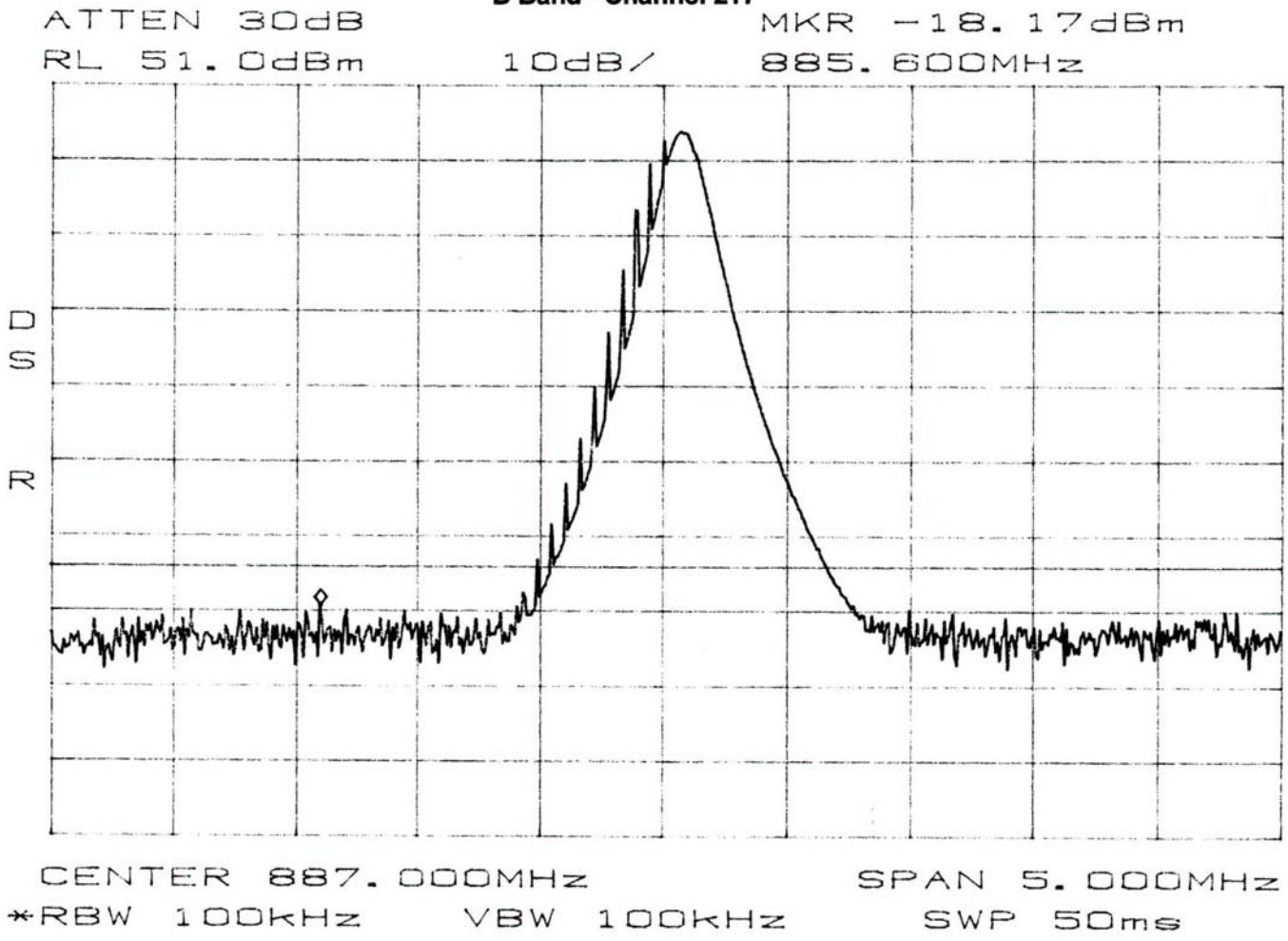
Software Defined Radio
Software Test 3
A Band - Channel 181



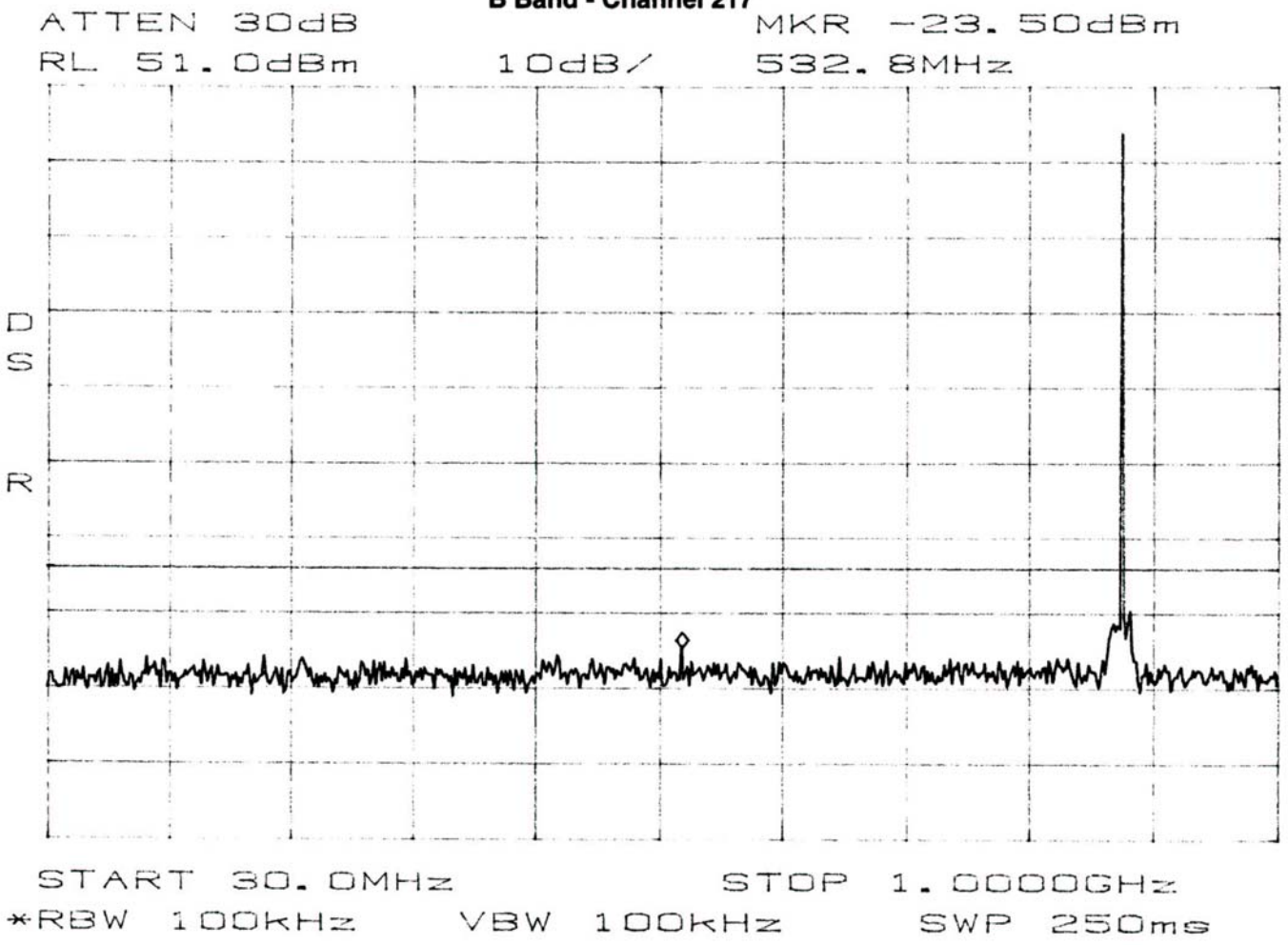
Software Defined Radio
Software Test 3
A Band - Channel 181



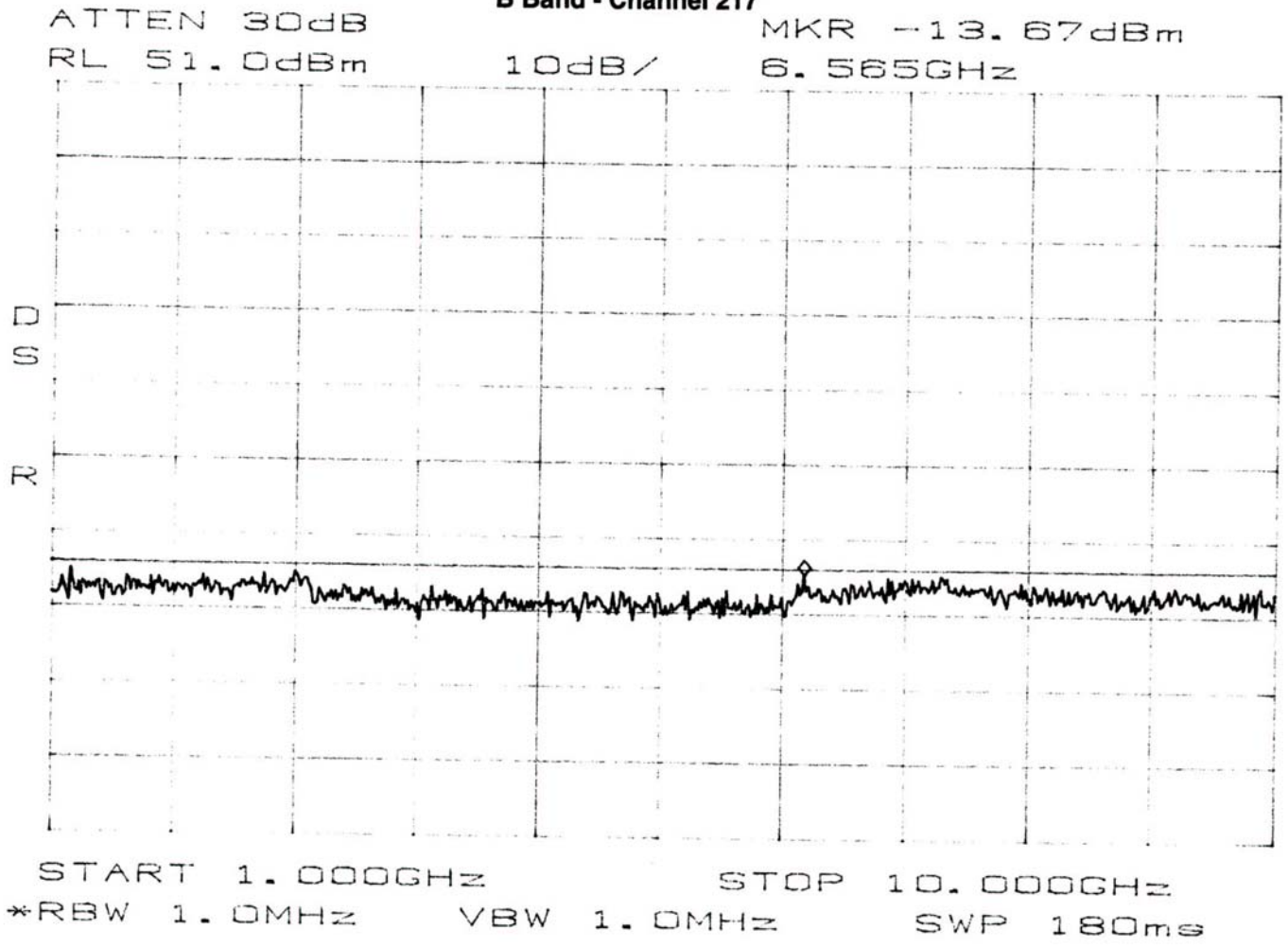
Software Defined Radio
Software Test 3
B Band - Channel 217



Software Defined Radio
Software Test 3
B Band - Channel 217



Software Defined Radio
Software Test 3
B Band - Channel 217



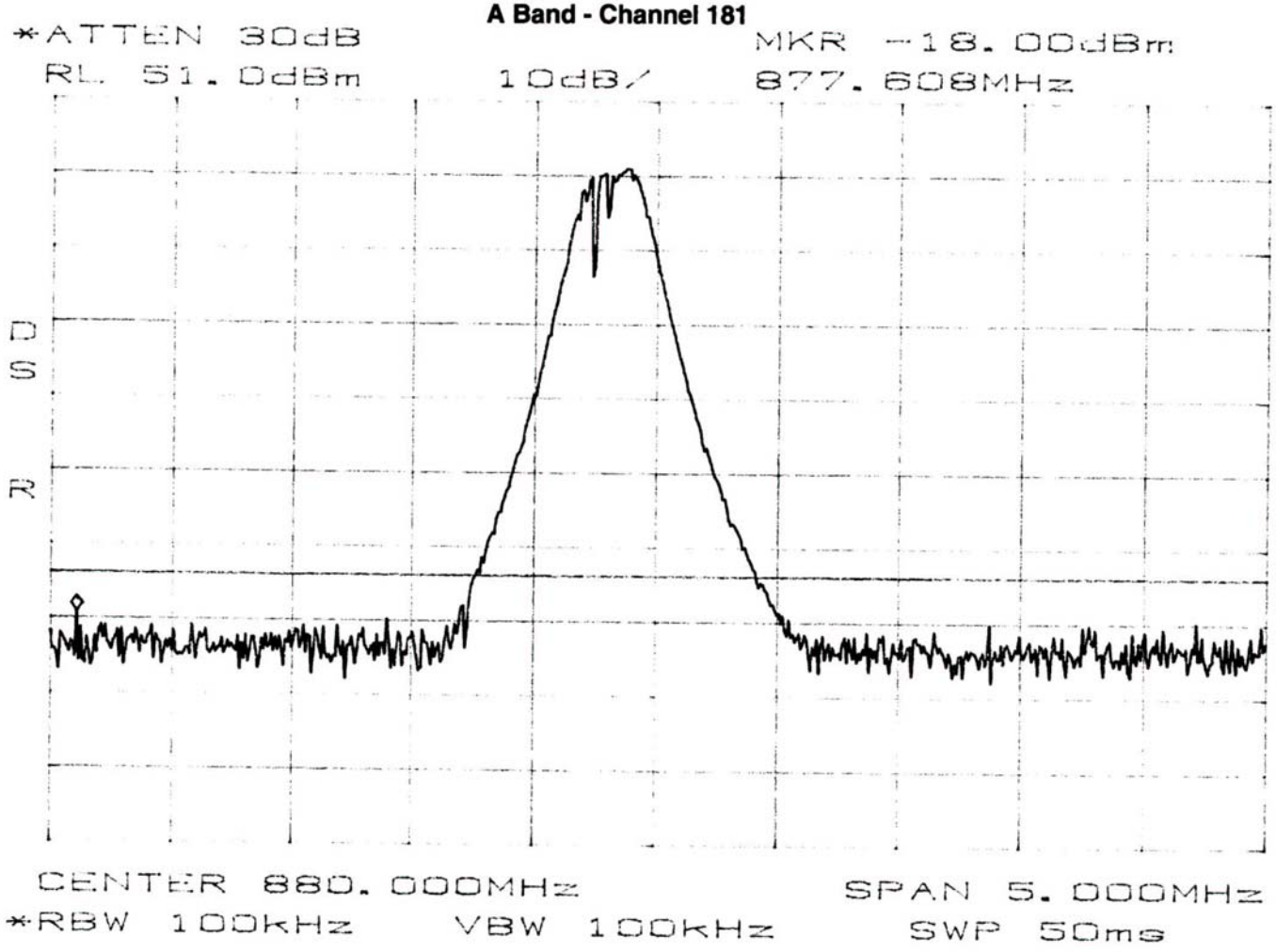
Software Test 4 for
Digivance 800 MHz 50-Watt SDR System
Model Numbers DGVS-112710SYS and DGVS-122710SYS

The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. The Software Test 4 simulates the GSM signal created from a repeated sequence of 8 bursts of valid traffic channel data followed by 8 bursts of all zeros.

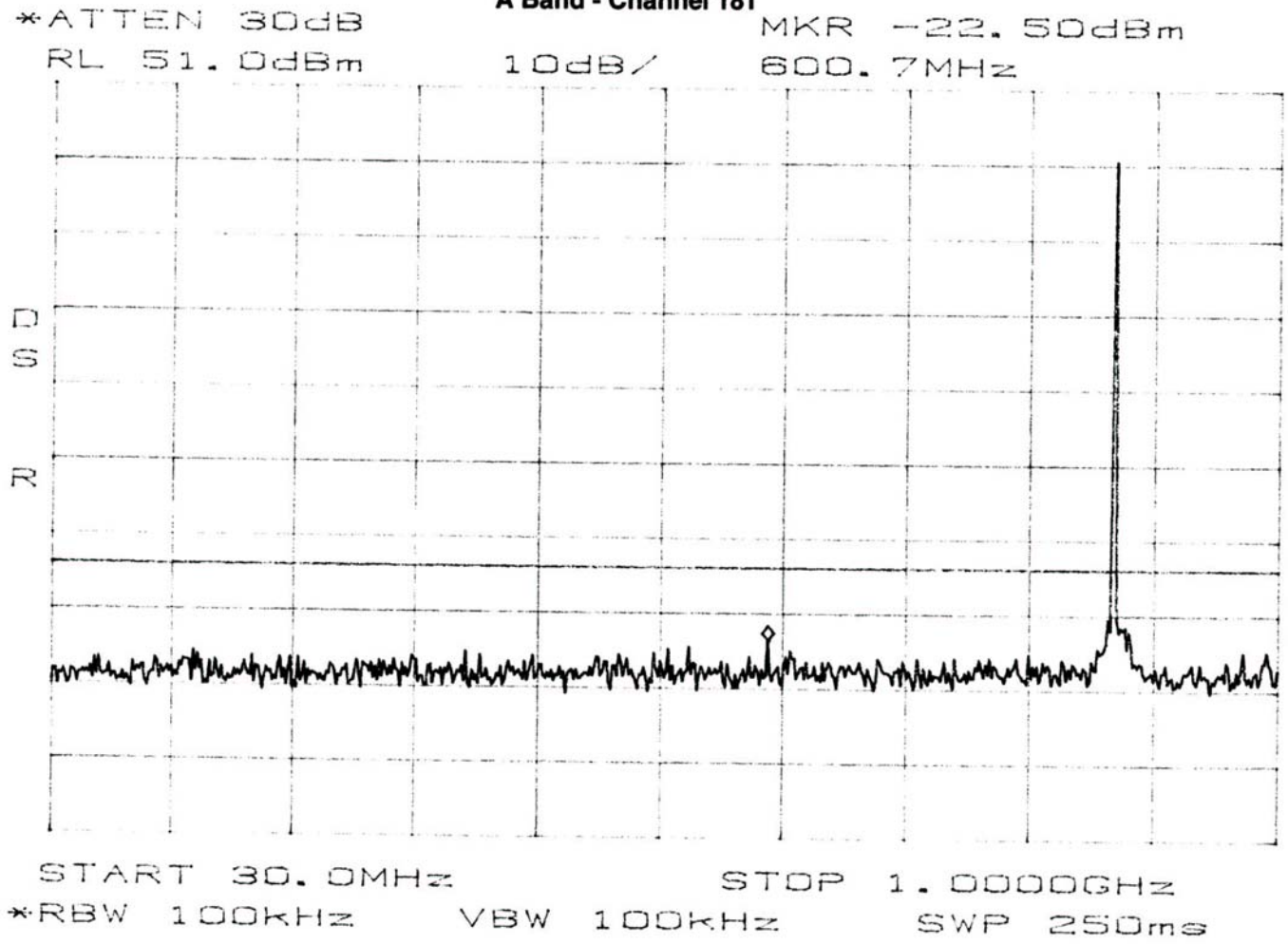
Results:

Pass (see plots)

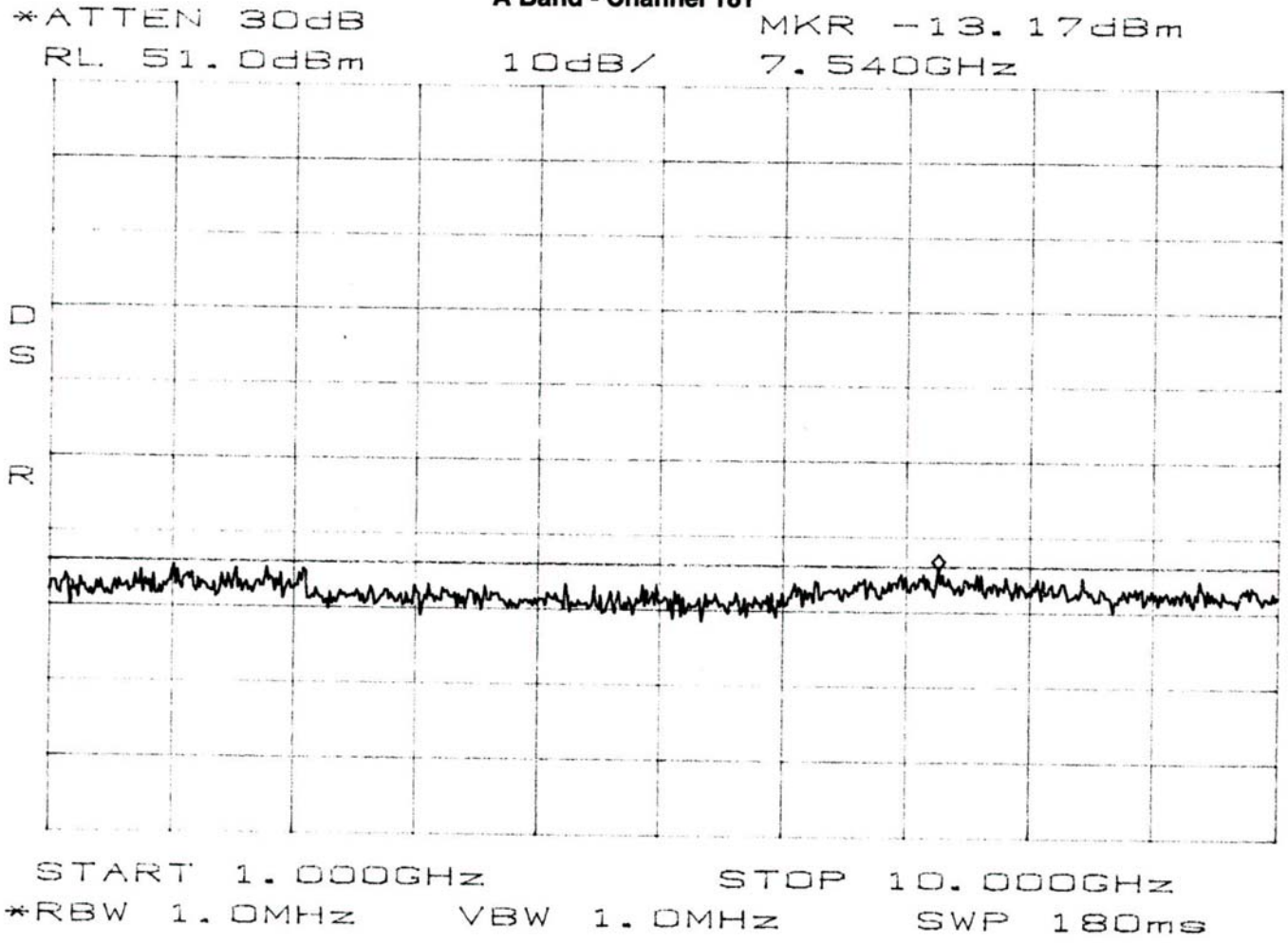
Software Defined Radio
Software Test 4
A Band - Channel 181



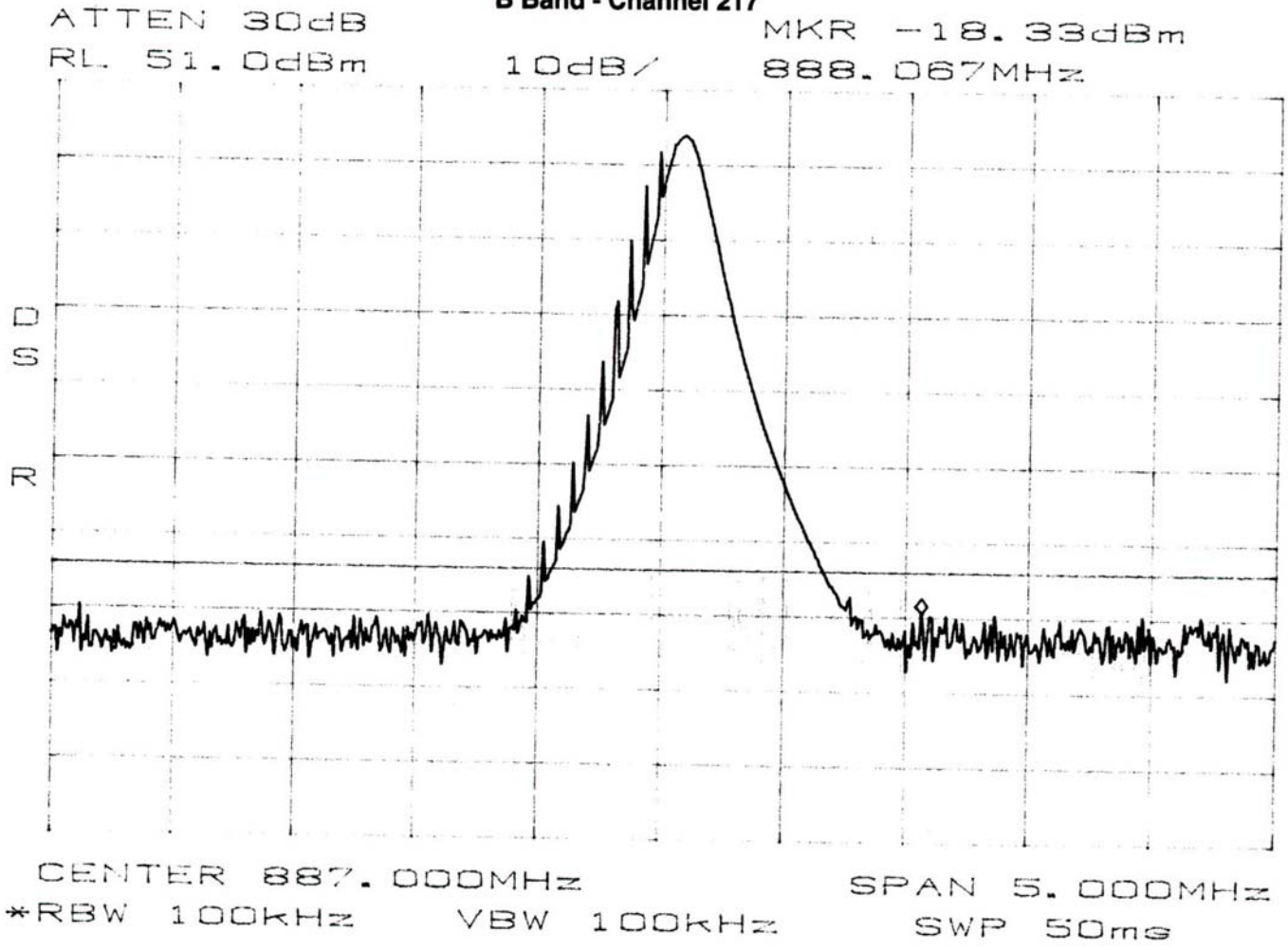
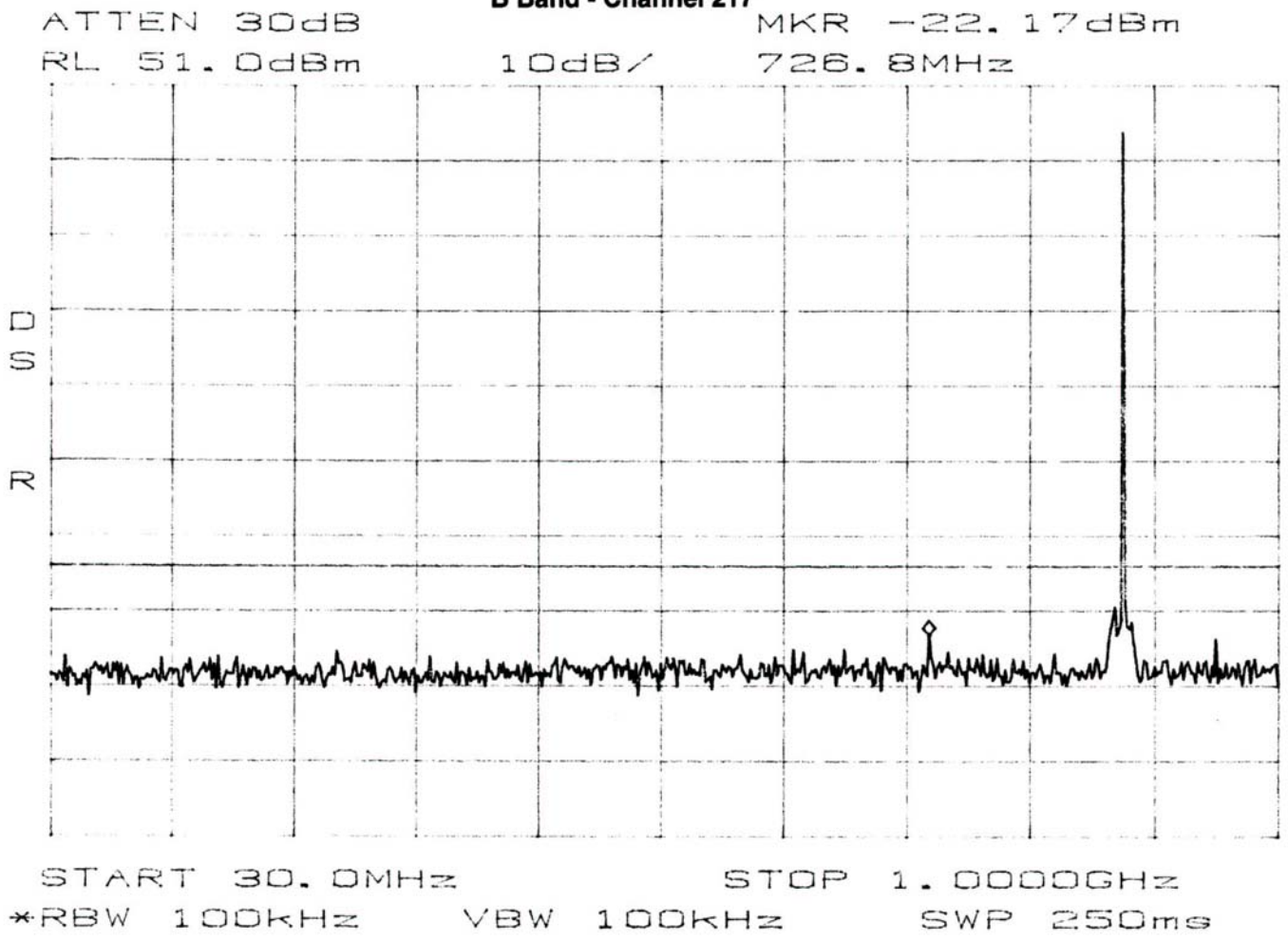
Software Defined Radio
Software Test 4
A Band - Channel 181



Software Defined Radio
Software Test 4
A Band - Channel 181



Software Defined Radio
Software Test 4
B Band - Channel 217



Software Defined Radio
Software Test 4
B Band - Channel 217