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Test of AlphaWave AW400

To FCC 47 CFR Part 90 & IC RSS-119

Test Report Serial No.: ARWT01-A1 Rev B

TEST REPORT

FROM

Test of AlphaWave AW400

To FCC 47 CFR Part 90 & IC RSS-119

Test Report Serial No.: ARWT01-A1 Rev B

This report supersedes ARWT01-A1 Rev A

Manufacturer: ArWest Communications Corp.
300 Orchard City Drive, Suite #126
Campbell, California 95008
USA

Product Function: System Monitoring and Control Applications

Copy No: pdf **Issue Date:** 11th July 2005

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
3922 Valley Avenue, Suite B
Pleasanton, California 94566, USA
Phone: 925.462.0304
Fax: 925.462.0306
www.micomlabs.com

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TABLE OF CONTENTS

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LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America
Federal Communications Commission (FCC) Listing #: 102167

Canada
Industry Canada (IC) Listing #: 4143

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DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	3rd June '05	
Rev B	11th July '05	Update to Sections; 5.1.4.1 Transmitter Conducted Spurious Emissions 5.1.5 Transmitter Transient Behavior Added Section 5.1.7 dc Voltage(s) and Current(s)

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1. TEST RESULT CERTIFICATE

Manufacturer:	ArWest Communications Corp. 300 Orchard City Drive, Suite #126, Campbell, California 95008 USA	Tested By:	MiCOM Labs, Inc. 3922 Valley Avenue 'B' Pleasanton California, 94566, USA
EUT:	AlphaWave Narrowband Radio Modem	Telephone:	+1 925 462 0304
Model:	AW400	Fax:	+1 925 462 0306
S/N:	00001003		
Test Date(s):	6th May - 27th May 2005	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 90 & IC RSS-119	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

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2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 90	2001	Code of Federal Regulations
(ii)	Industry Canada RSS-119	Issue 6 March 25th 2000	Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz
(iii)	ANSI C63.4	2003	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(iv)	CISPR 22/ EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(v)	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(vi)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(vii)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(viii)	UKAS LAB 1	Edition 4 May 2004	Reference to Accreditation for Laboratories.
(ix)	DTI URN 98/997	2003	Conditions for the use of National Accreditation Marks by UKAS and UKAS Accredited Organizations.

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

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3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the AlphaWave AW400 to FCC and Industry Canada regulations
Applicant:	As manufacturer
Manufacturer:	ArWest Communications Corp. 300 Orchard City Drive, Suite #126 Campbell, California 95008 USA
Laboratory performing the tests:	MiCOM Labs, Inc. 3922 Valley Avenue, Suite "B" Pleasanton, California 94566 USA
Test report reference number:	ARWT01-A1 Rev B
Date EUT received:	6 May 2005
Dates of test (from - to):	6th May - 27th May 2005
Standard(s) applied:	FCC 47 CFR Part 90 & IC RSS-119
No of Units Tested:	1
Type of Equipment:	Product Description
Manufacturers Trade Name:	AlphaWave
Model:	AW400
Location for use:	Indoor and Outdoor
Declared Frequency Range(s):	430 to 470 MHz
Type of Modulation:	DBPSK, DQPSK, D8PSK, GMSK, D16 QAM
Declared Nominal Output Power:	+13 to +33dBm (2 Watts) in 1dB steps
EUT Modes of Operation:	Channel Spacing's: • 25 KHz • 12.5 KHz • 6.25 KHz
Transmit/Receive Operation:	Half Duplex and Simplex Device
Rated Input Voltage and Current:	Nominal: +12 Vdc, 0.5A Extremes: +9 Vdc +24 Vdc
Operating Temperature Range:	-30ºC to +50ºC
ITU Emission Designator:	PSK & 16 QAM Modulation 25 kHz Channel Spacing - 11K2G1D 12.5 kHz Channel Spacing – 5K71G1D 6.25 kHz Channel Spacing – 2K86G1D GMSK Modulation 25 kHz Channel Spacing – 11K8F1D 12.5 kHz Channel Spacing – 5K91F1D 6.25 kHz Channel Spacing – 3K00F1D
Microprocessor(s) Model:	BF532SBBC-400

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Clock/Oscillator(s):	12.288 MHz
Frequency Stability:	1).. ± 1.5ppm initial (temperature variation) 2).. ± 0.5ppm aging/year 3).. ± 3ppm/10 years
Equipment Dimensions:	5.87" x 2.93" X 1.51" (137mm X 67mm x 29mm)
Weight:	8.8oz (250g)
Primary function of equipment:	System Monitoring and Control Applications

3.2. Scope of Test Program

The scope of the test program was to test the AlphaWave AW400 Narrowband Radio Modem for compliance against appropriate FCC and Industry Canada regulatory requirements;

FCC CFR 47 Part 90, Subsection I frequency band 430 – 470 MHz

Industry Canada RSS-119

The AW400 employs several modulation schemes in the frequency range 430 –470 MHz;

- DBPSK
- DQPSK
- D8PSK
- 16 QAM
- GMSK

Unless otherwise mentioned each modulation scheme will be tested for compliance against the stated regulations.

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3.3. Equipment Model(s) and Serial Number(s)

Name	Manufacturer	Model No.	Serial No.
AlphaWave	ArWest Communications Corp.	AW400	00001003

3.4. Antenna Details

Antenna Type	Gain (dBi)	Manufacturer	Model No.	Serial No.
Gainflex	2.5	Kathrein Antenna Electronic	K71 53236	Not Available

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 15 pin D-Type Female

3.6. Test Configurations

Matrix of test configurations

Parameter	Operational Mode	Test Conditions	Frequencies (MHz)
Output power	CW & Modulated	Ambient	430, 450, 470
Occupied BW & Emission Mask	CW & Modulated	Ambient	430, 450, 470
Frequency Stability	CW	Ambient, temperature and voltage extremes	430, 450, 470
Conducted Emissions	Modulated	Ambient	430, 450, 470
Transmitter Transient	CW	Ambient	450
Unwanted Emissions	CW	Ambient	430, 450, 470

Only worst case plots are provided for each test parameter are identified within this report. Plots not included are held on file by the test laboratory and available upon request with client permission.

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3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

Frequency Stability

1. At cold temperature the EUT was found to be outside the tolerance range. Worst case appeared to be -30ºC, frequency tolerance found to be approximately -2.75 ppm.

   Correcting this problem changed two resistor values together with a recalibration of the EUT;

   R73 = 10kΩ changed to 8.2 kΩ
   R74 = 10 kΩ changed to 100 kΩ

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

3.9. Subcontracted Testing or Third Party Data

1. NONE

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4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 90** and **Industry Canada RSS-119**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
90.205(g) **5.4**	Output Power	Average unmodulated and modulated Output Power	Conducted	Complies	5.1.1
90.209(b)(5) **90.210(d)** **5.5 & 6.4**	Occupied BW & Emission Mask	Plot includes emission mask and bandwidth measurement	Conducted	Complies	5.1.2
90.213 **7**	Frequency Stability	Includes temperature and voltage variations	Conducted	Complies	5.1.3
90.210 **6.3**	Conducted Spurious Emissions Transmitter Receiver	Emissions from the antenna port 30MHz – 5 GHz 30MHz – 2 GHz	Conducted	Complies	5.1.4 *5.1.4.1* *5.1.4.2*
90.214 **6.5**	Transmitter Transient Behavior	Stabilization of RF frequency	Conducted	Complies	5.1.5
90.210 **6.3**	Unwanted Emissions	Spurious emissions 30MHz–5GHz	Radiated	Complies	5.1.6
2.1033 (8)	dc Voltage & Current	Power consumption	Conducted	No limit	5.1.7

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

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5. TEST RESULTS

5.1. Device Characteristics

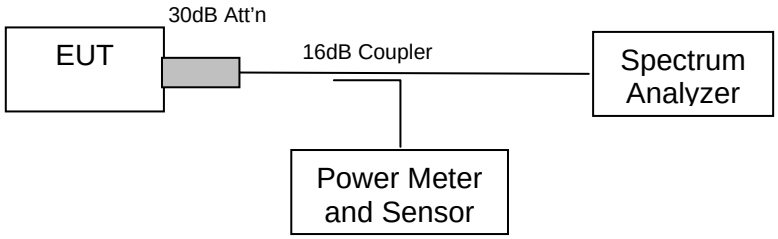
5.1.1. Output Power

FCC Part §90.205(g)
Industry Canada RSS-119 §5.4

Test Procedure
Power measurements via the power meter were recorded with;
1).. modulation OFF (i.e. CW operation mode), and
2).. modulation ON

Modulation ON was measured in a system test mode with a 100% duty cycle.

Test Measurement Set up



Test set up for unmodulated and modulated output power measurement

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS – UNMODULATED CARRIER

Center Frequency (MHz)	Power (dBm)
430	32.91
450	32.15
470	32.31

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TABLE OF RESULTS – 25 KHz Channel Spacing Modulated Carrier

Center Frequency (MHz)	Power (+dBm) V's Modulation				
	DBPSK	DQPSK	D8PSK	16 QAM	GMSK
430	29.96	30.11	30.10	29.23	30.33
450	29.31	29.48	29.52	29.67	29.78
470	30.20	30.36	30.46	30.53	30.65

TABLE OF RESULTS – 12.5 KHz Channel Spacing Modulated Carrier

Center Frequency (MHz)	Power (+dBm) V's Modulation				
	DBPSK	DQPSK	D8PSK	16 QAM	GMSK
430	29.74	29.87	29.80	29.16	28.95
450	29.95	29.30	29.27	29.54	29.38
470	30.16	30.32	30.42	30.48	30.42

TABLE OF RESULTS – 6.25 KHz Channel Spacing Modulated Carrier

Center Frequency (MHz)	Power (+dBm) V's Modulation				
	DBPSK	DQPSK	D8PSK	16 QAM	GMSK
430	29.77	29.90	29.81	30.06	29.03
450	29.96	29.33	29.28	30.31	29.43
470	30.25	30.35	30.32	30.50	30.49

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Specification

Limits

FCC Part §90.205(g)
Power limit according to 90.205(g) 450–470 MHz. The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. (i.e. 2W for service area less than 3 km.)

Industry Canada RSS-119 §5.4
Typical output powers for base and/or fixed stations (paging transmitters excepted) are 100 watts and for mobiles they are 30 watts.

Laboratory Measurement Uncertainty for Power Measurement

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Output Power'	0156, 0116, 0070, 0252, 0313, 0314

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5.1.2. Occupied Bandwidth and Emission Mask

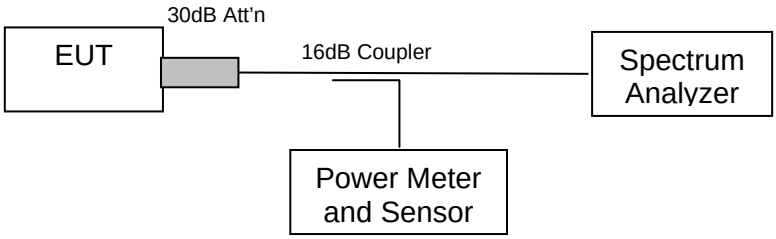
FCC, Part §90.209(b)(5), Part §90.210
Industry Canada RSS-119 §5.5 & 6.4

Test Procedure

The transmitter terminal of EUT was connected to the input of the spectrum analyzer set to measure occupied bandwidth and emission mask. The resolution filter bandwidth was set to 6 dB, peak detector selected and the analyzer built-in bandwidth function was used to measure emission mask and 99 % bandwidth.

The EUT is not equipped with an audio low-pass filter.

Test Measurement Set up



Test set up for Occupied Bandwidth and Emission Mask measurement

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

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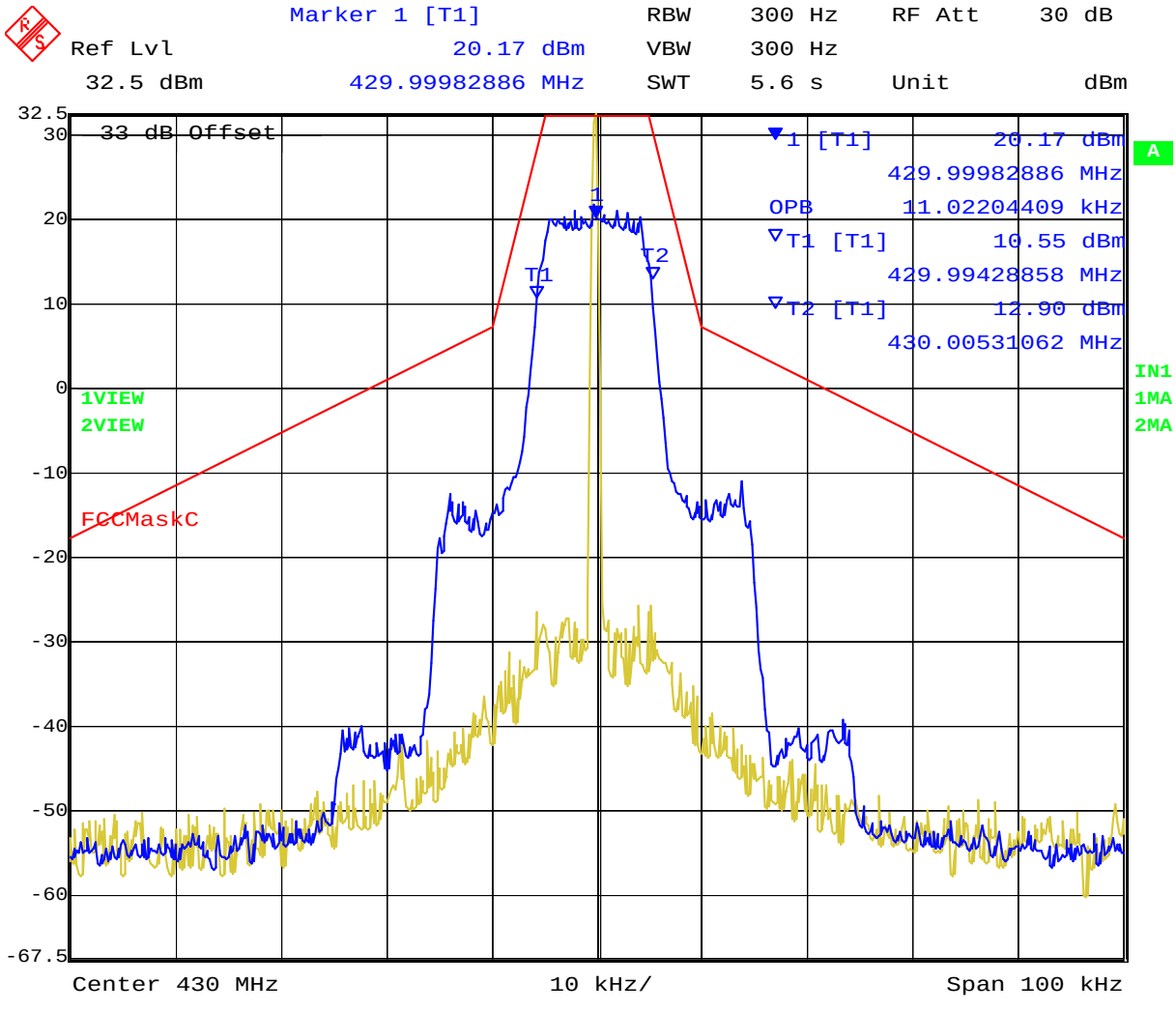
TABLE OF RESULTS – 25 KHz Channel Spacing

Frequency (MHz)	99% Bandwidth (KHz)				
	Modulation				
	DBPSK	DQPSK	D8PSK	16 QAM	GMSK
430	11.022[1]	10.822	10.822	11.222	11.824[1]
450	11.022	10.822	10.822	11.222[1]	11.824
470	11.022	11.022[1]	11.022[1]	11.222	11.824

[1] Plot provided



Date: 7.MAY.2005 17:30:29

25 KHz Channel Spacing DBPSK 430 MHz – Emission Mask C

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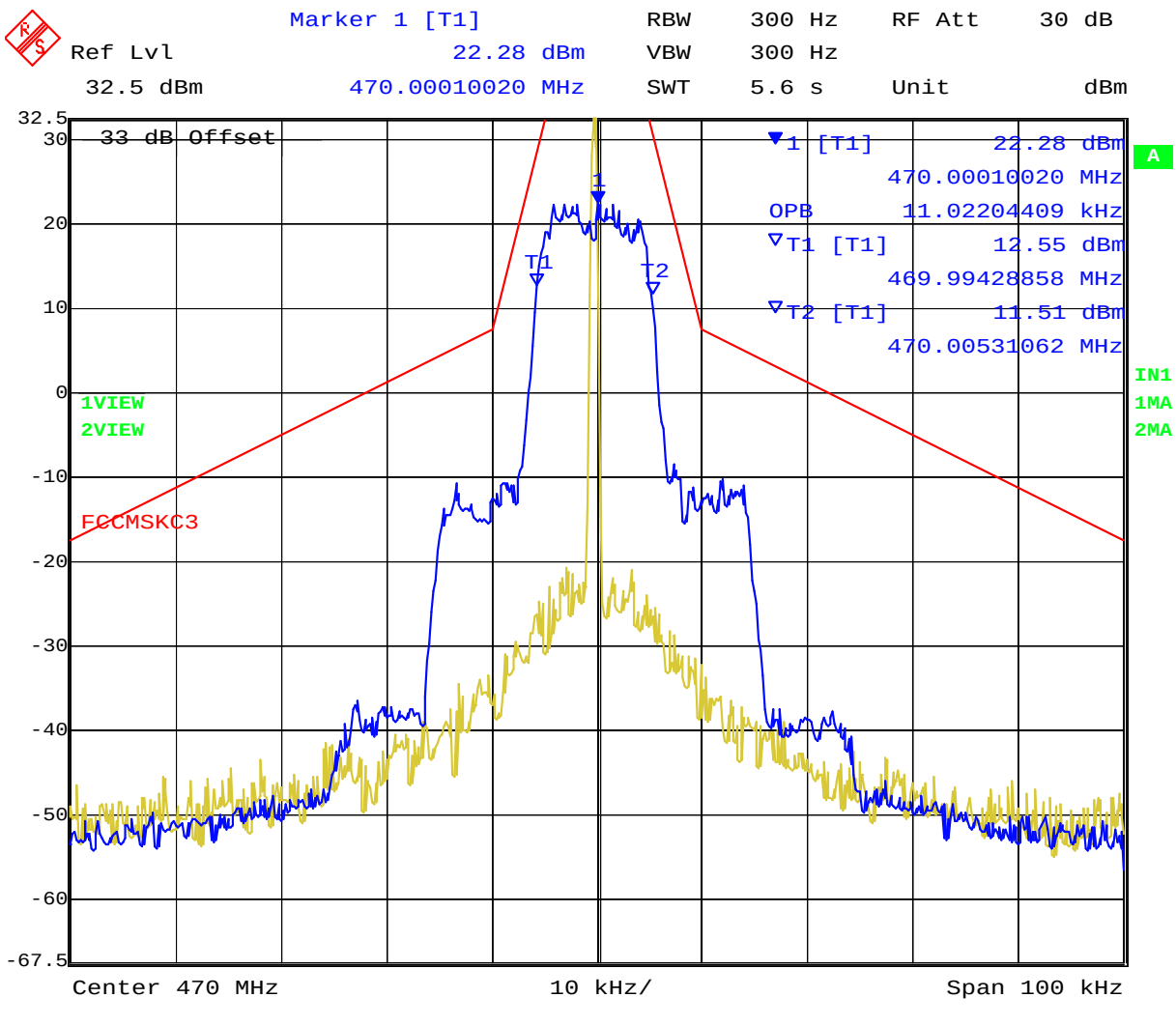

25 KHz Channel Spacing DQPSK 470 MHz – Emission Mask C

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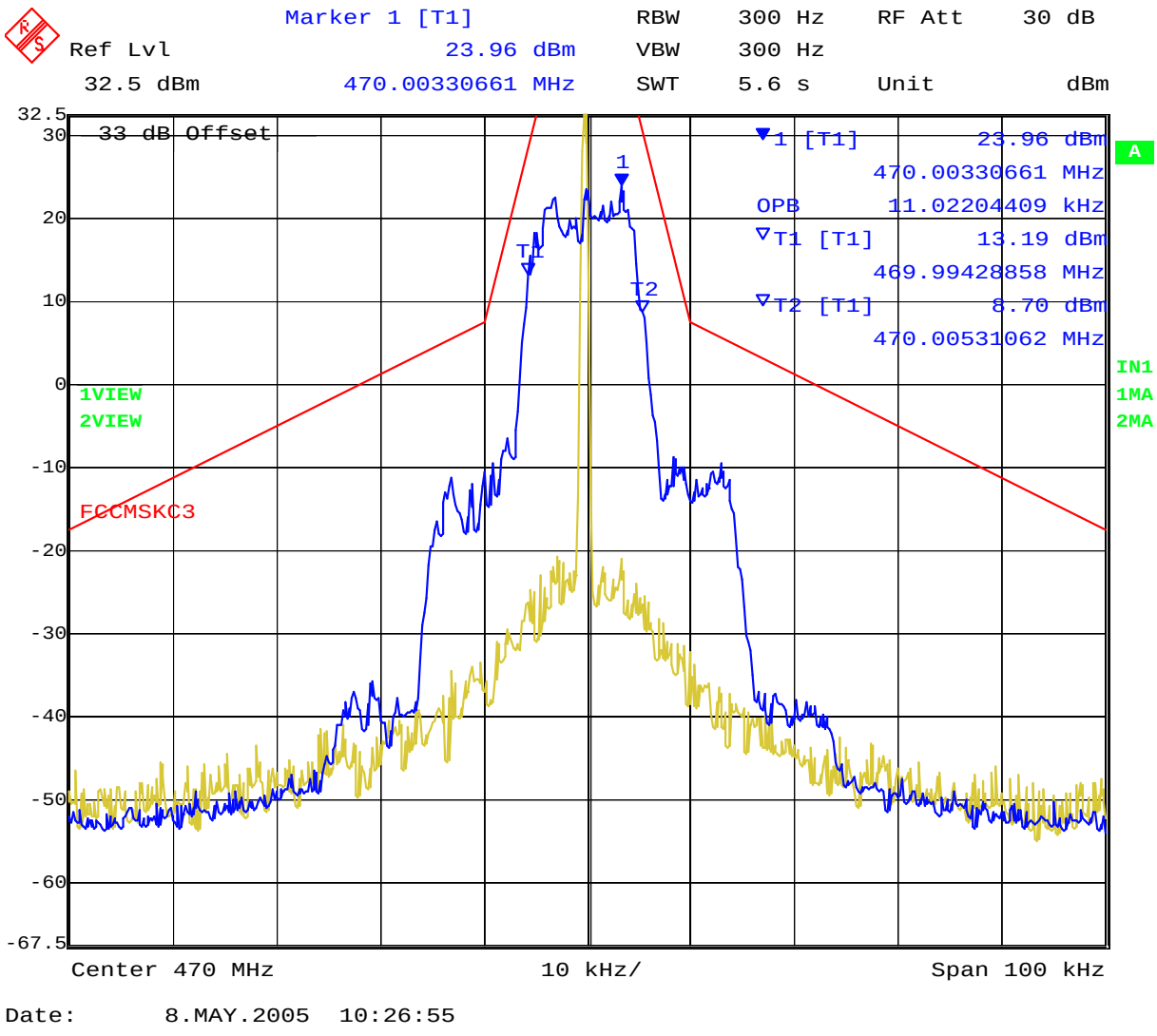

25 KHz Channel Spacing D8PSK 470 MHz – Emission Mask C

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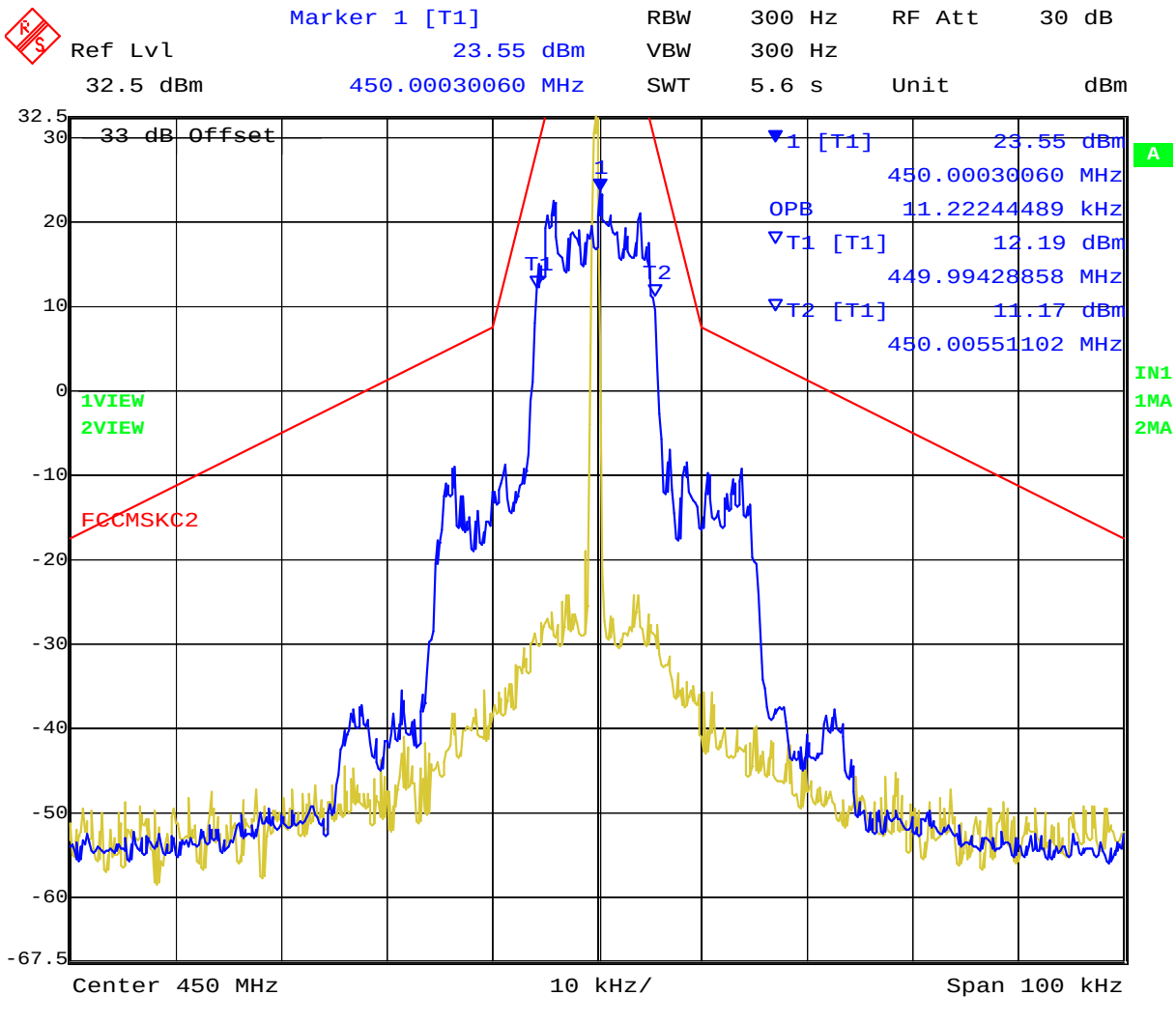

25 KHz Channel Spacing 16 QAM 450 MHz – Emission Mask C

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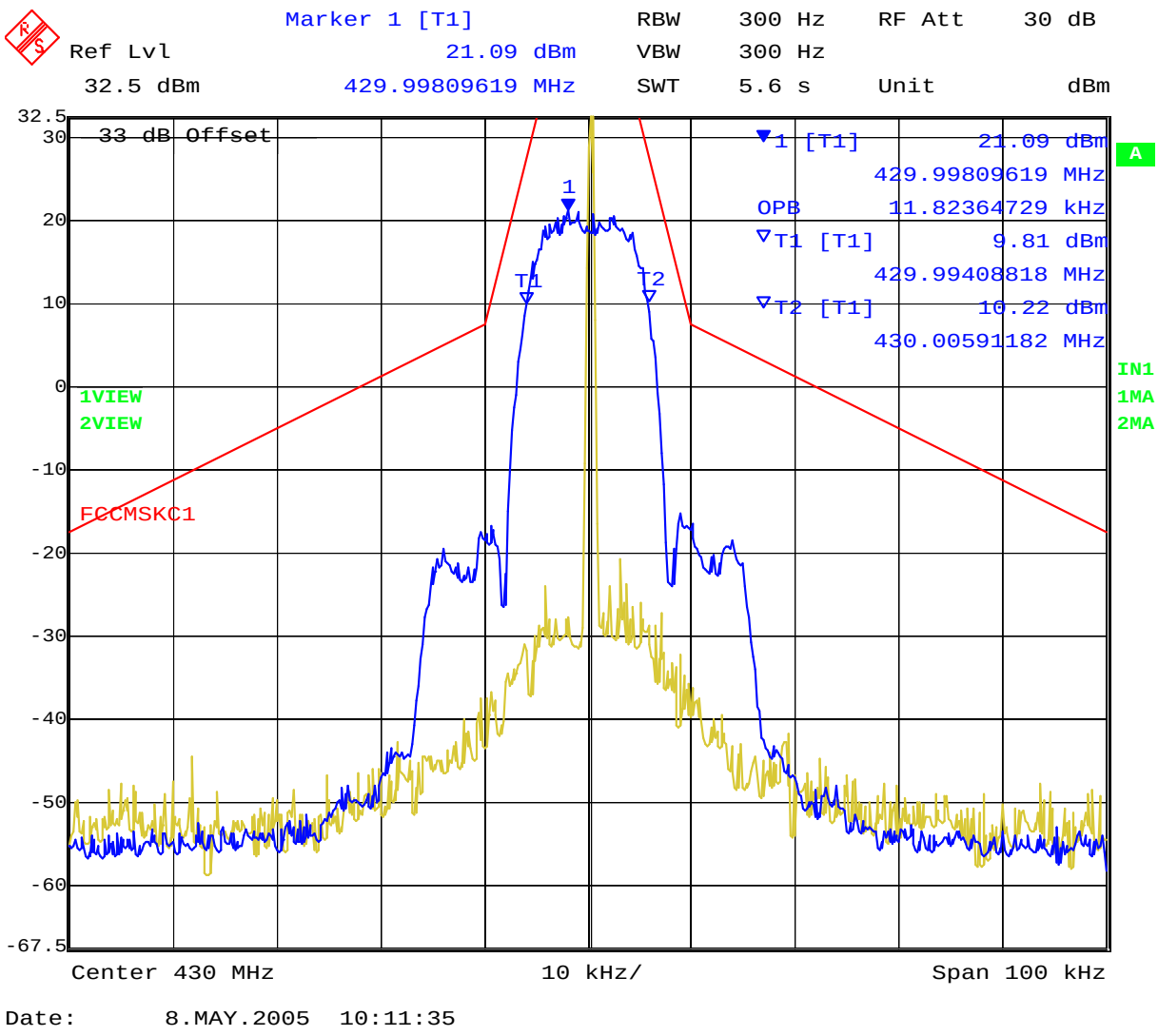

25 KHz Channel Spacing GMSK 430 MHz – Emission Mask C

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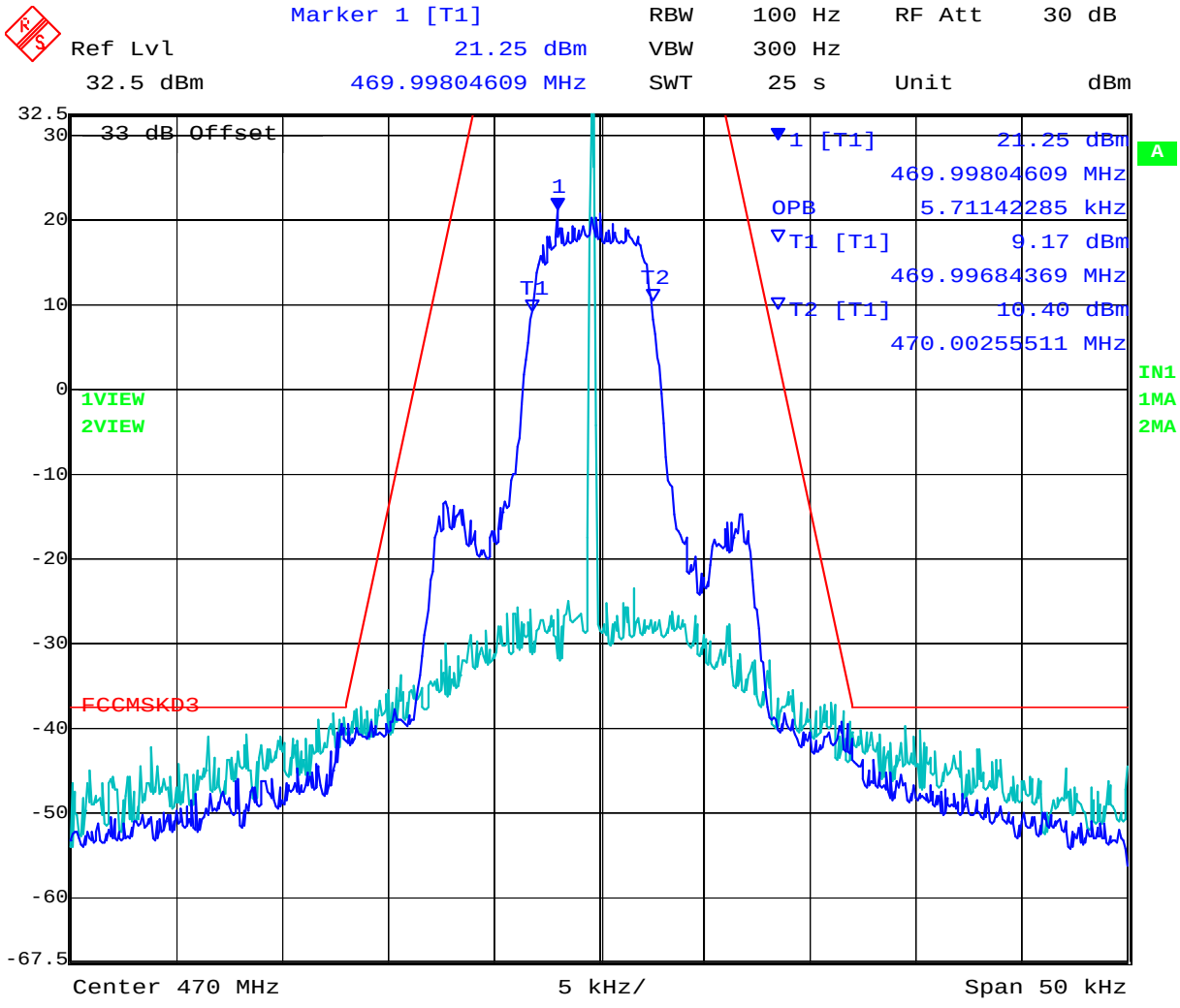
TABLE OF RESULTS – 12.5 KHz Channel Spacing

Frequency (MHz)	99% Bandwidth (KHz)				
	Modulation				
	DBPSK	DQPSK	D8PSK	16 QAM	GMSK
430	5.511	5.511	5.411[1]	5.511	5.912
450	5.511	5.511[1]	5.411	5.611	5.912[1]
470	5.711[1]	5.511	5.411	5.711[1]	5.912

[1] Plot provided



12.5 KHz Channel Spacing DBPSK 470 MHz – Emission Mask D

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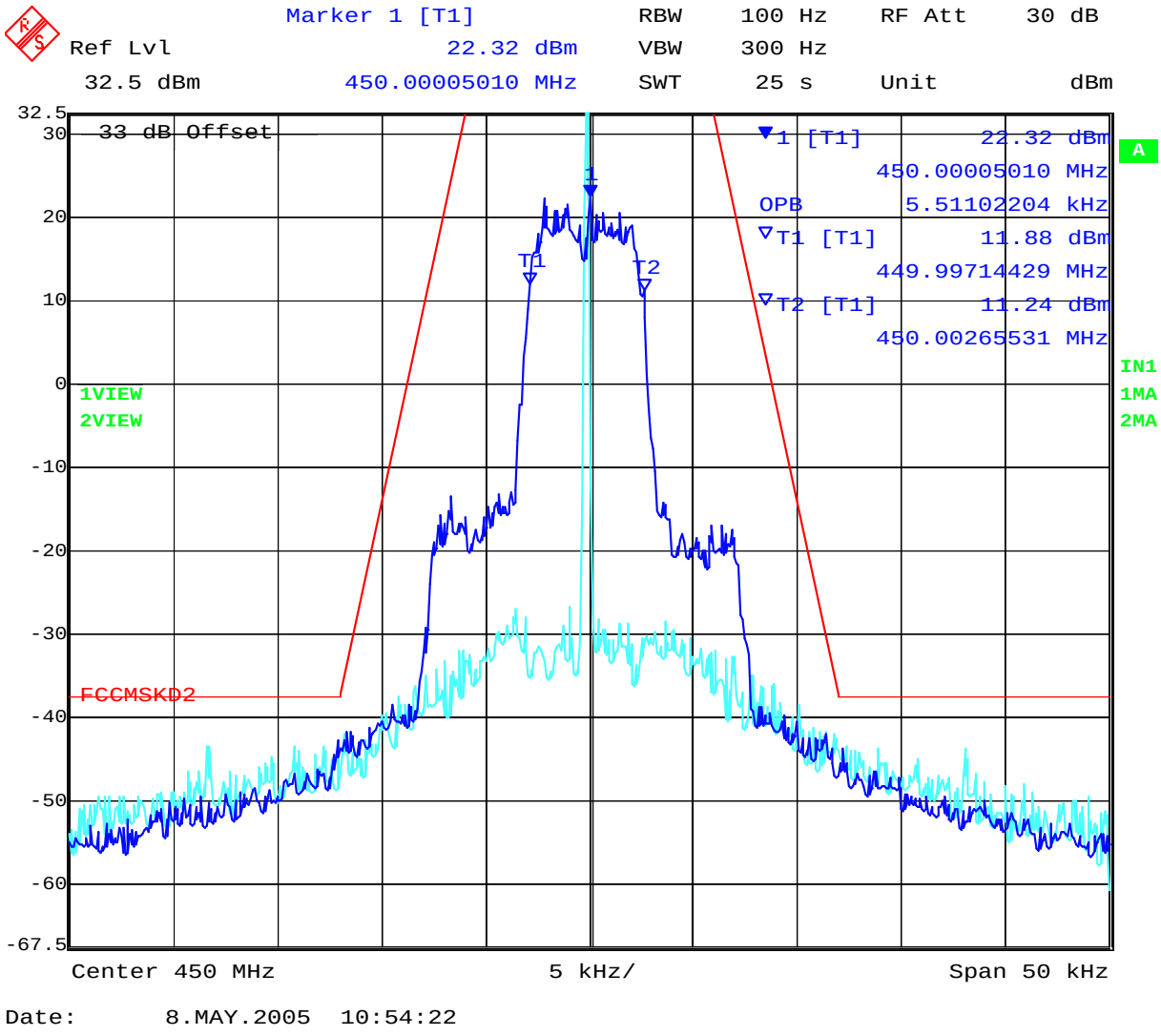

12.5 KHz Channel Spacing DQPSK 450 MHz – Emission Mask D

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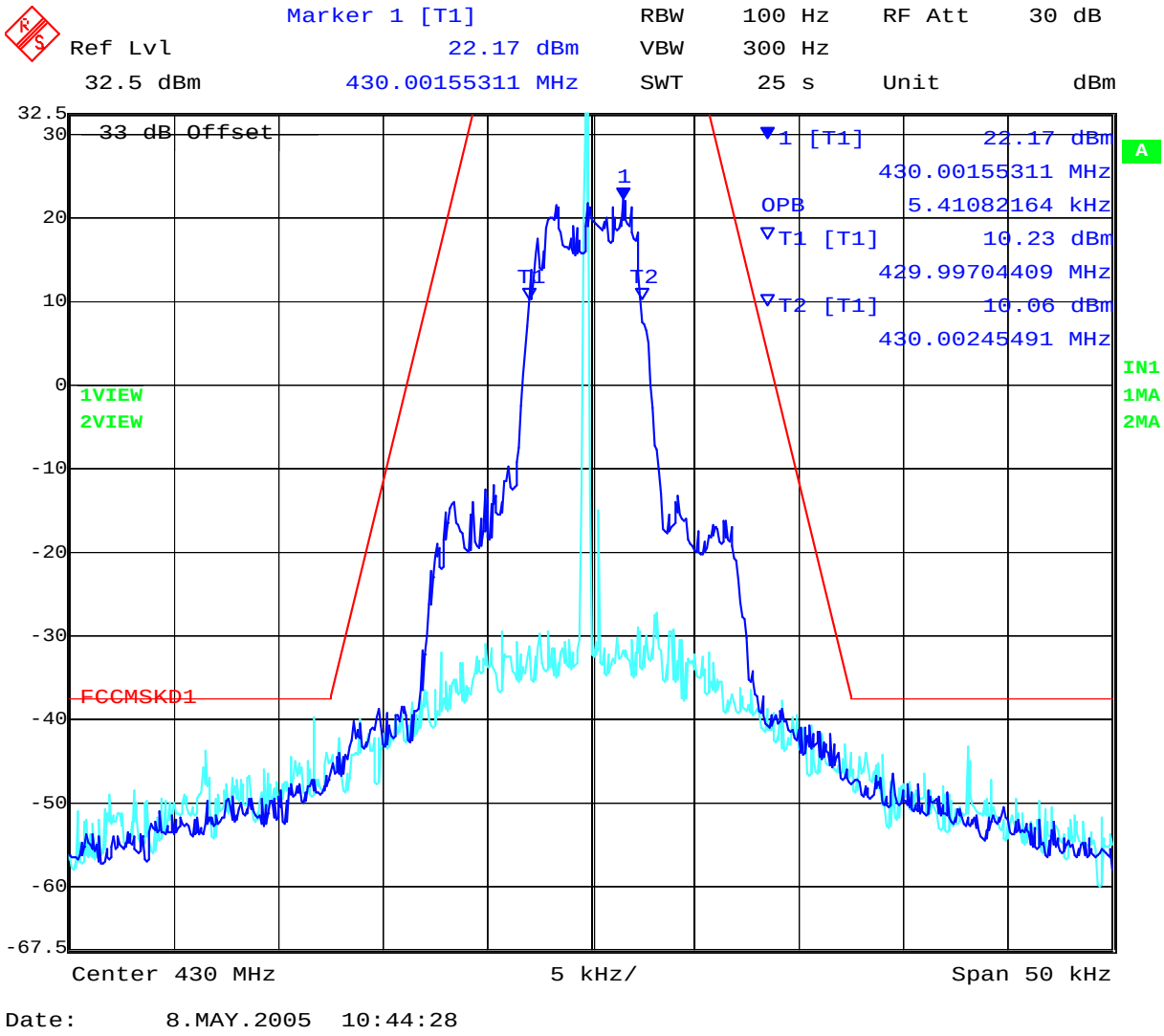

12.5 KHz Channel Spacing D8PSK 430 MHz – Emission Mask D

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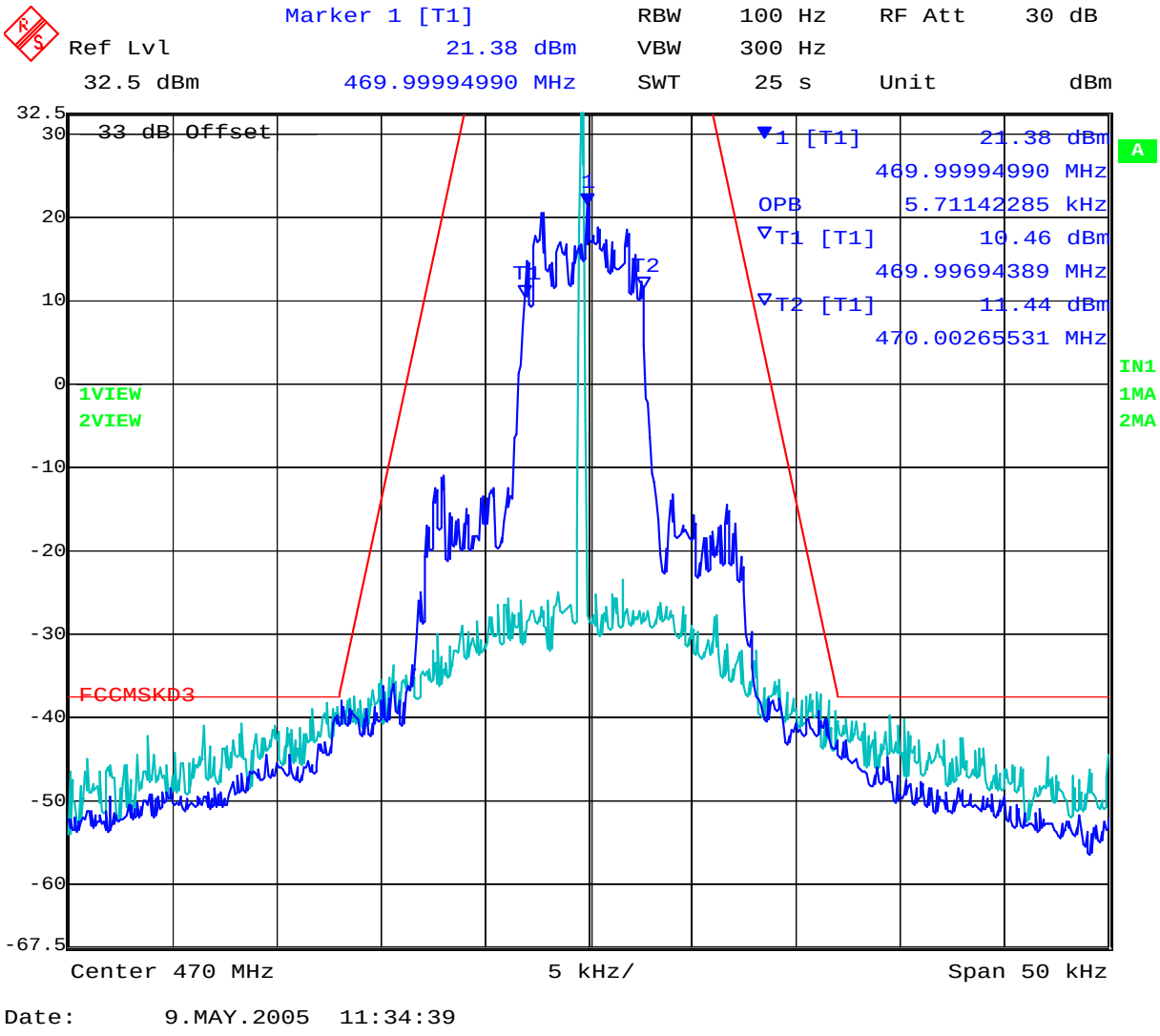

12.5 KHz Channel Spacing 16 QAM 470 MHz – Emission Mask D

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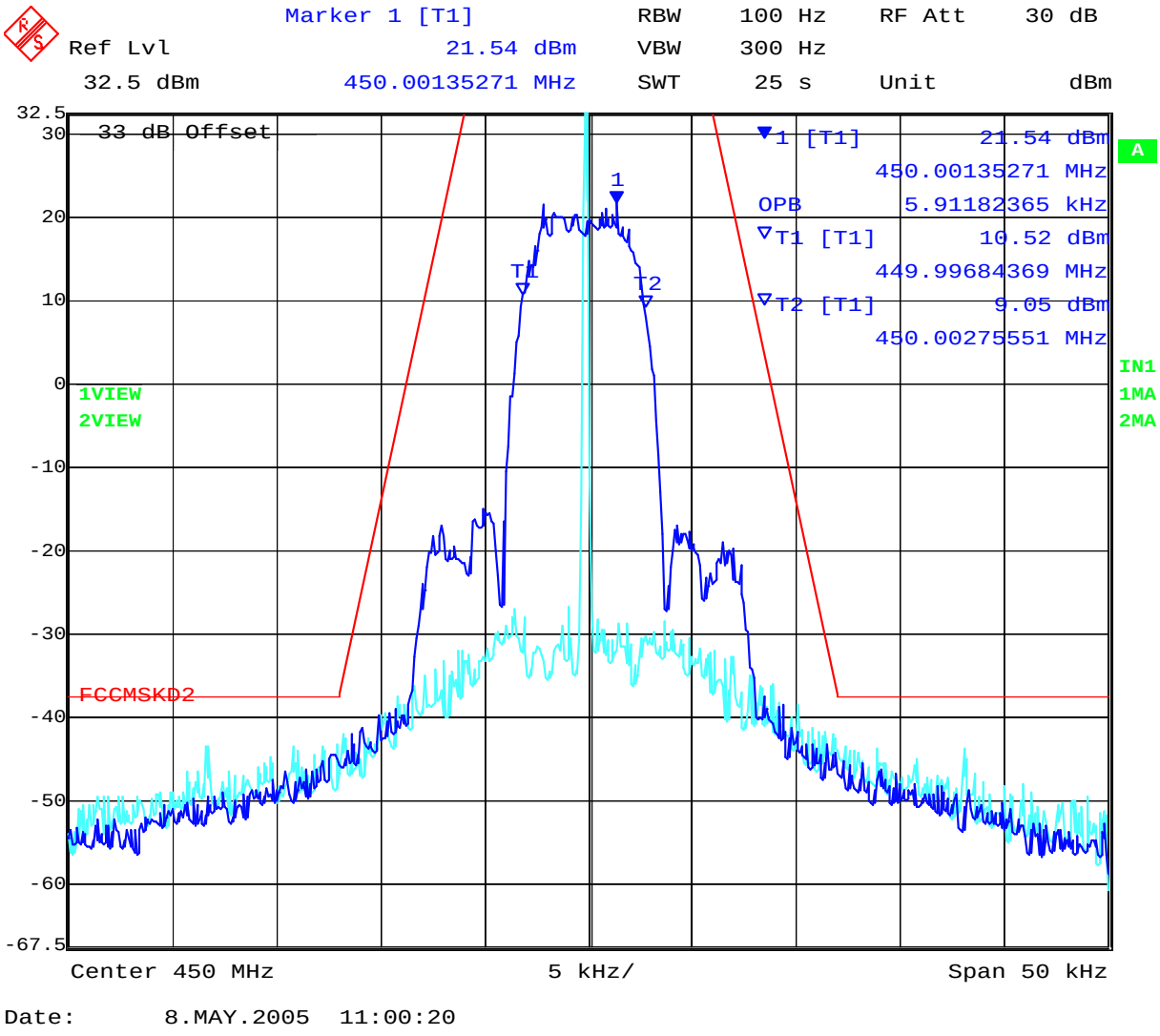

12.5 KHz Channel Spacing GMSK 450 MHz – Emission Mask D

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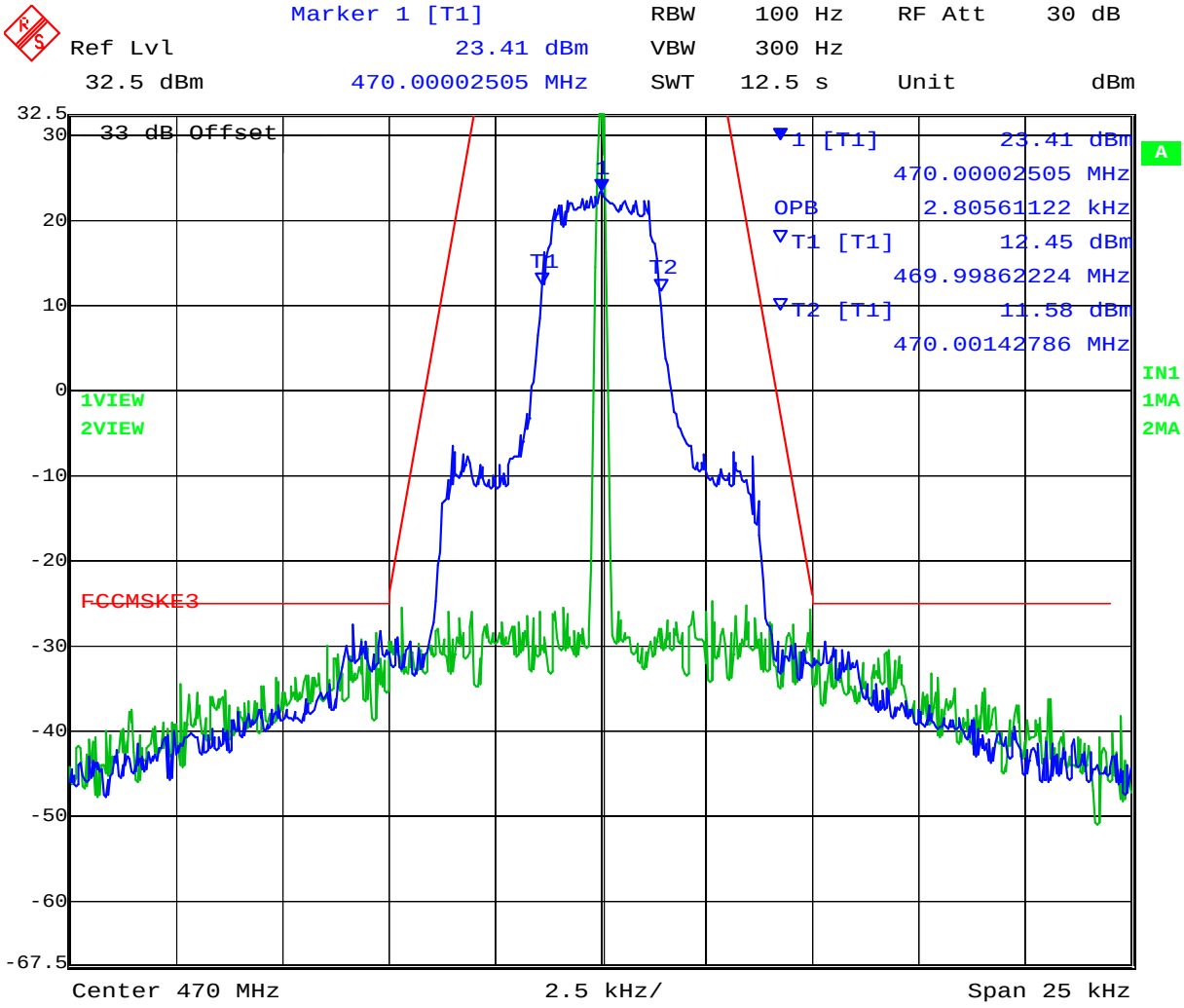
TABLE OF RESULTS – 6.25 KHz Channel Spacing

Frequency (MHz)	99% Bandwidth (KHz)				
	Modulation				
	DBPSK	DQPSK	D8PSK	16 QAM	GMSK
430	2.756	2.705	2.705	2.756	3.006[1]
450	2.705	2.705	2.705[1]	2.806	2.956
470	2.806[1]	2.756[1]	2.705	2.856[1]	2.956

[1] Plot provided



6.25 KHz Channel Spacing DBPSK 450 MHz – Emission Mask E

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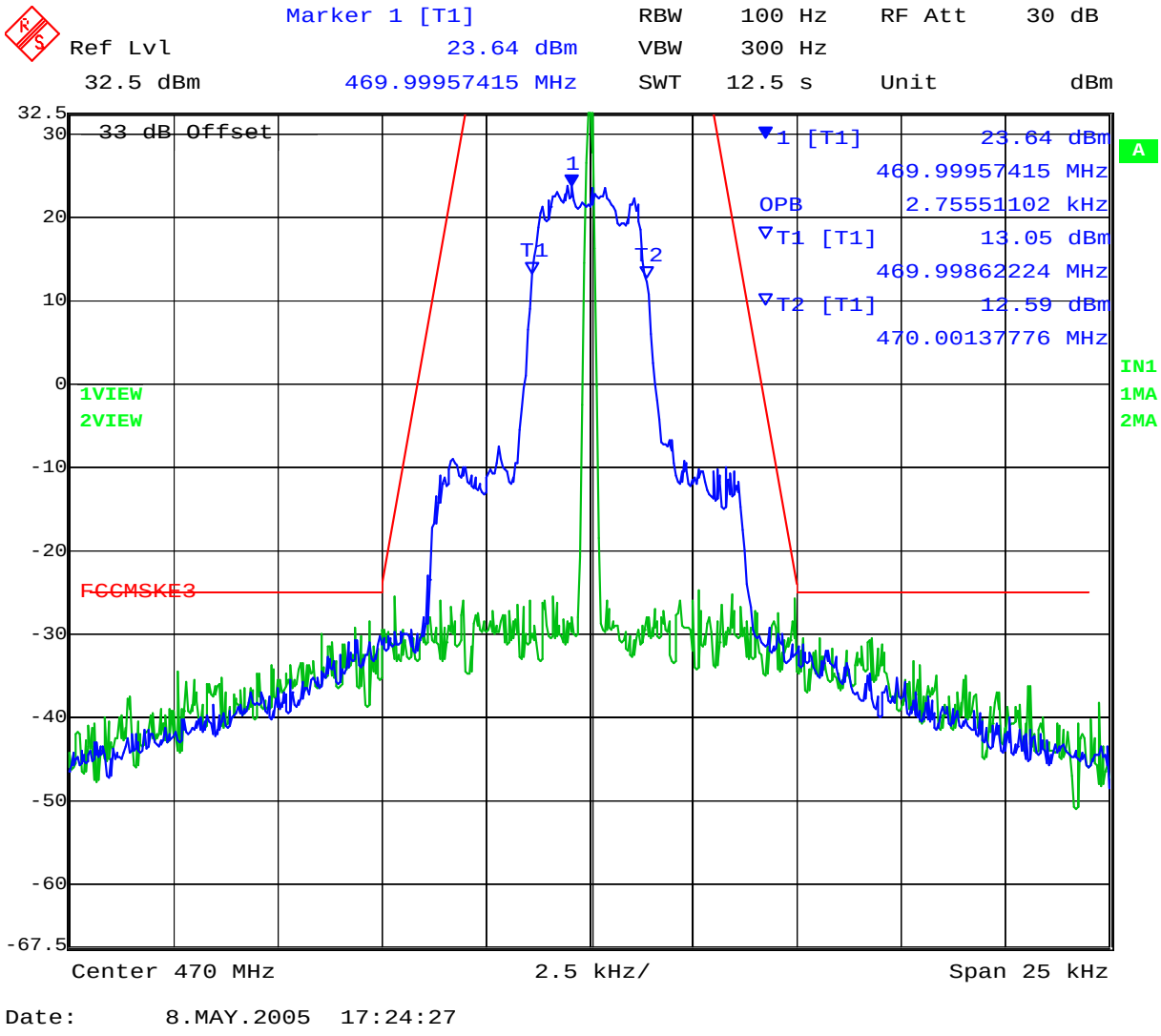

6.25 KHz Channel Spacing DQPSK 470 MHz – Emission Mask E

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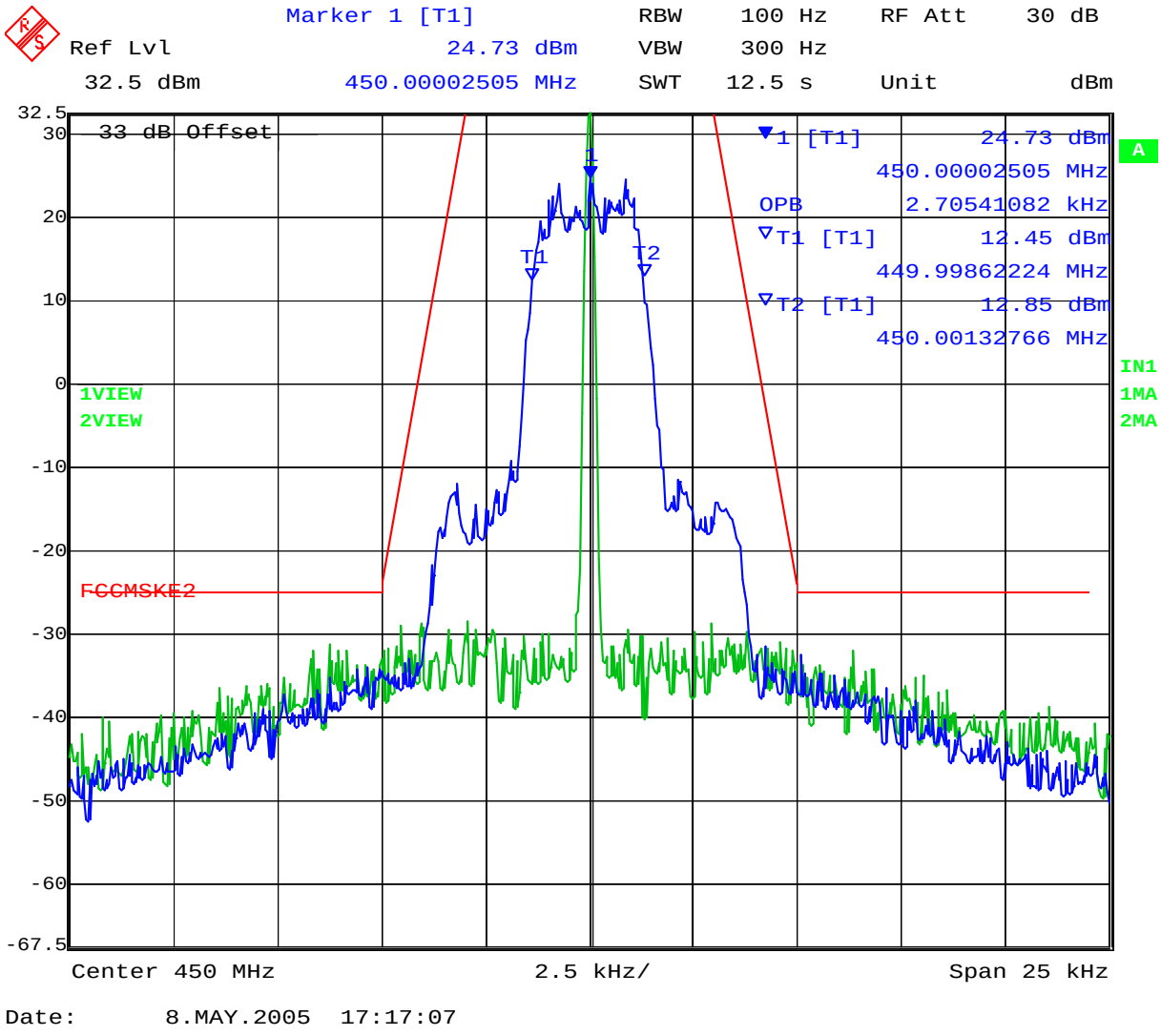

6.25 KHz Channel Spacing D8PSK 450 MHz – Emission Mask E

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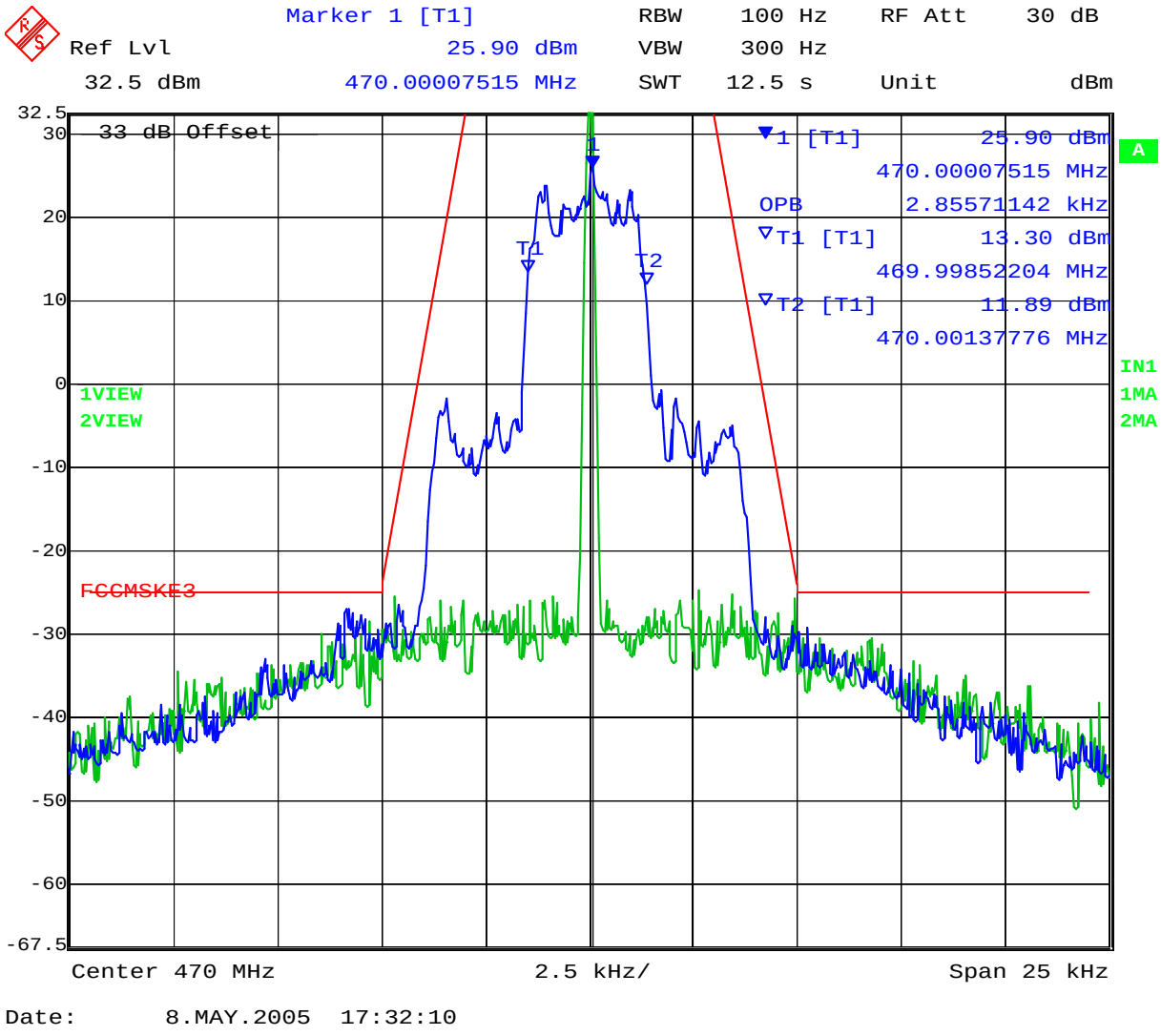

6.25 KHz Channel Spacing 16 QAM 470 MHz – Emission Mask E

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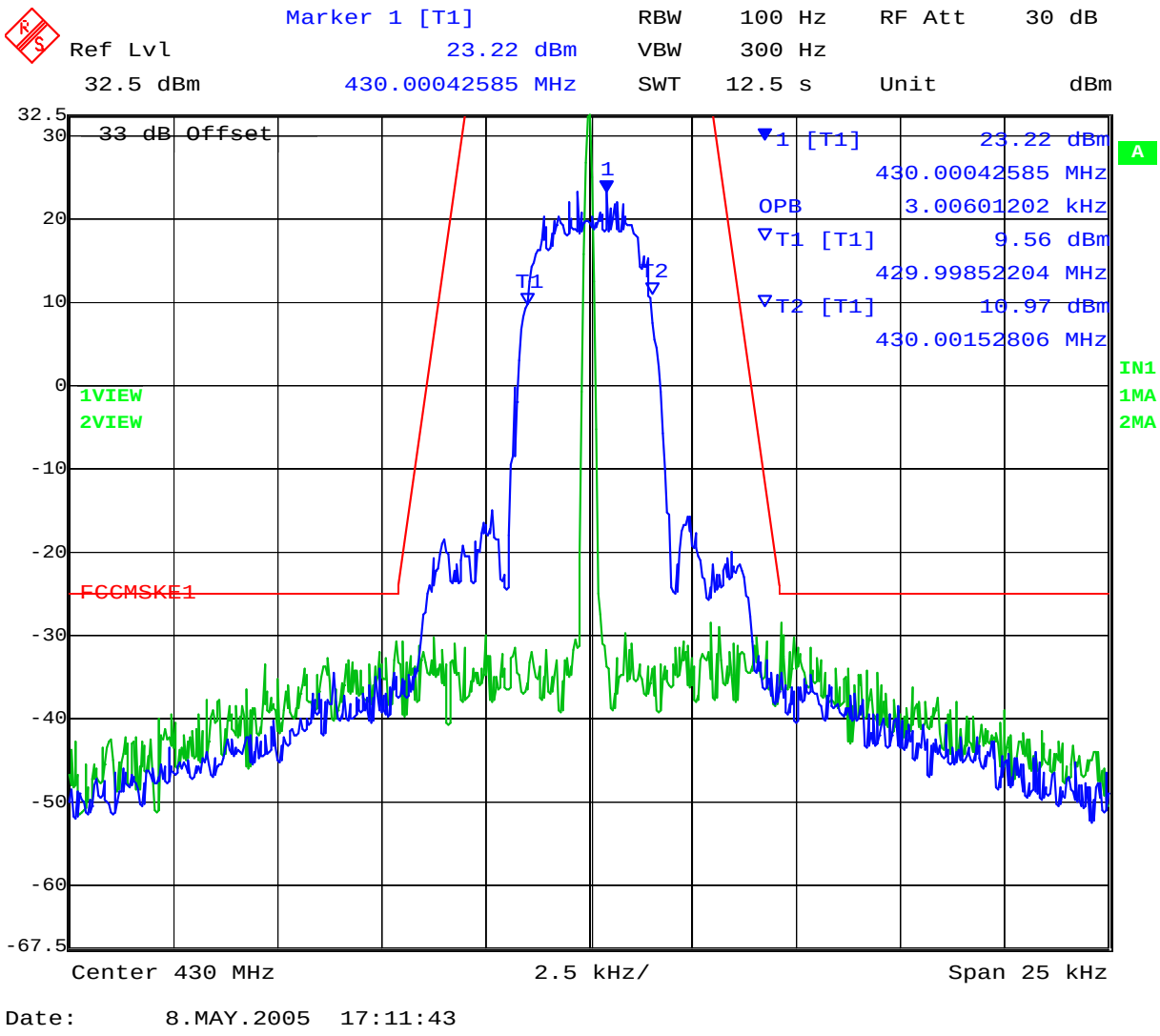

6.25 KHz Channel Spacing GMSK 430 MHz – Emission Mask E

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Specification

The limits for **FCC (Part §90.210)** and **Industry Canada RSS-119 (§6.4)** are numerically identical and therefore only the FCC rules are quoted in this section. The masks implemented are those "Without Audio Filter".

Limits for Authorized Bandwidth

Frequency Band (MHz) and Related Documents	Channel Spacing (kHz)	Authorized Bandwidth (kHz)	Spectrum Masks with Audio Filter	Without Audio Filter
406.1-430 and 450-470 MHz	25	20	B	C[1]
	12.5	11.25	D[1]	D[1]
	6.25	6	E[1]	E[1]

[1] Reference to the emission masks are provided below

Limits Emission Masks

90.210(c), Emission Mask C 25 kHz channel bandwidth equipment. For transmitters that are not equipment with an audio low-pass filter pursuant to 90.211(b), the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1).. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (fd/5) dB;

(2).. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz; but not more than 250 percent of the authorized bandwidth: At least 29 log ($fd^2/11$) dB or 50 dB, whichever is the lesser attenuation;

(3).. On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P)

90.210(d) Emission Mask D 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1).. On any frequency from the center of the authorized bandwidth f_o to 5.625 KHz removed from f_o: Zero dB.

(2).. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27 (fd – 2.88 KHz) dB.

(3).. On any frequency removed from the center of the authorized bandwidth by displacement frequency (fd in KHz) of more than 12.5 KHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(4).. The reference level for showing shall be established using a resolution bandwidth sufficiently wide (usually two to three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emissions mask up to and including 50 KHz removed from the edge of the authorized bandwidth; adjust the resolution the bandwidth 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must

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be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 KHz from the edge of the authorized bandwidth, see paragraph (m) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

90.210(e) Emission Mask E, 6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1).. On any frequency from the center of the authorized bandwidth f0 to 3.0 kHz removed from f_0: Zero dB.

(2).. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd - 3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(3).. On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two to three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emissions mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (m) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0156, 0193, 0252, 0313, 0314.

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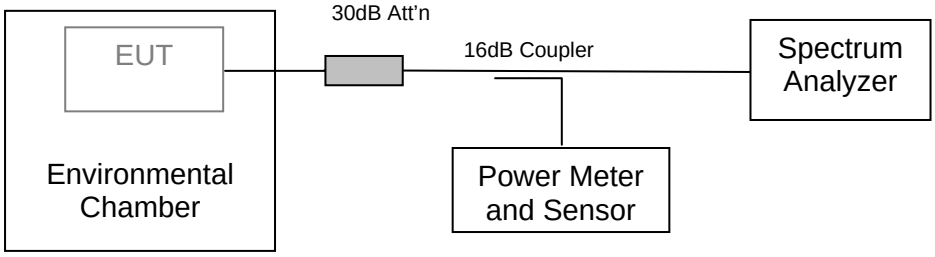
5.1.3. Frequency Stability

FCC, Part 15 Subpart C §90.213
Industry Canada RSS-210 §7

Test Procedure
The transmitter output was connected to a spectrum analyzer and the frequency stability was measured in CW mode. Frequency stability was measured both at ambient and extremes of temperature on three channels. At each temperature the equipment was switched on and left for 30 minutes for thermal balance to be obtained before measurements were taken.

Test Measurement Set up



Measurement set up for Frequency Stability

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS

Temperature	Voltage	FREQUENCY (MHz)		
		Channel 430 MHz	Channel 450 MHz	Channel 470 MHz
Ambient	+12 Vdc	430.00000701	450.00001253	469.99999248
	+10.8 Vdc	430.00002204	450.00001253	469.99997244
	+13.2 Vdc	430.00001954	450.00010020	469.99997495
-30°C	+12 Vdc	429.99982715	449.99981713	469.99979208[1]
+50°C	+12 Vdc	430.00009770	450.00011022	470.00013277[2]
Maximum Frequency Drift (±ppm)		-0.442[1] / +0.282[2]		

[1, 2] – MAXIMUM FREQUENCY DRIFT EXTREMES (UPPER & LOWER)

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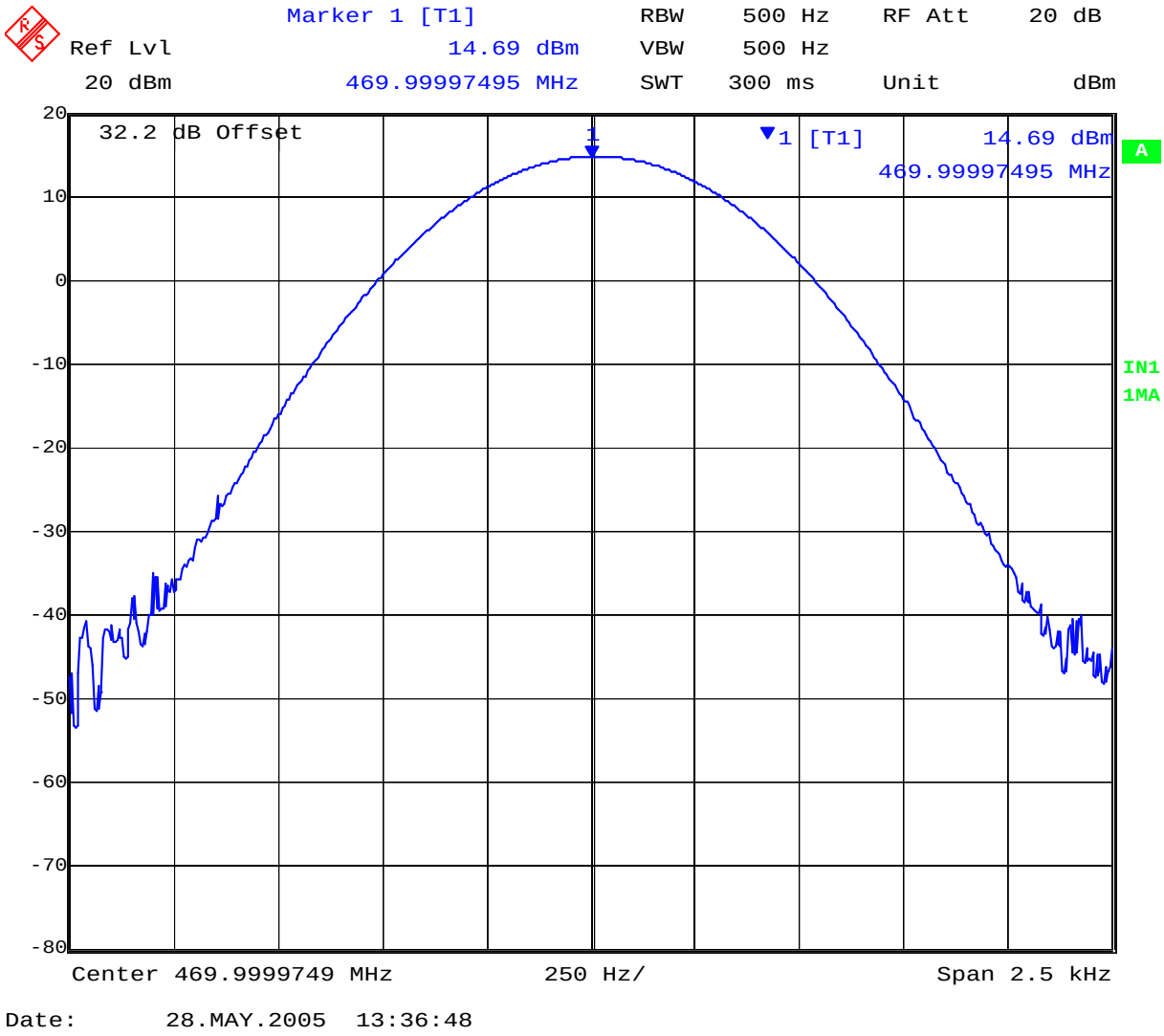
FREQUENCY STABILITY CHANNEL 470 MHz, AMBIENT 13.2 Vdc



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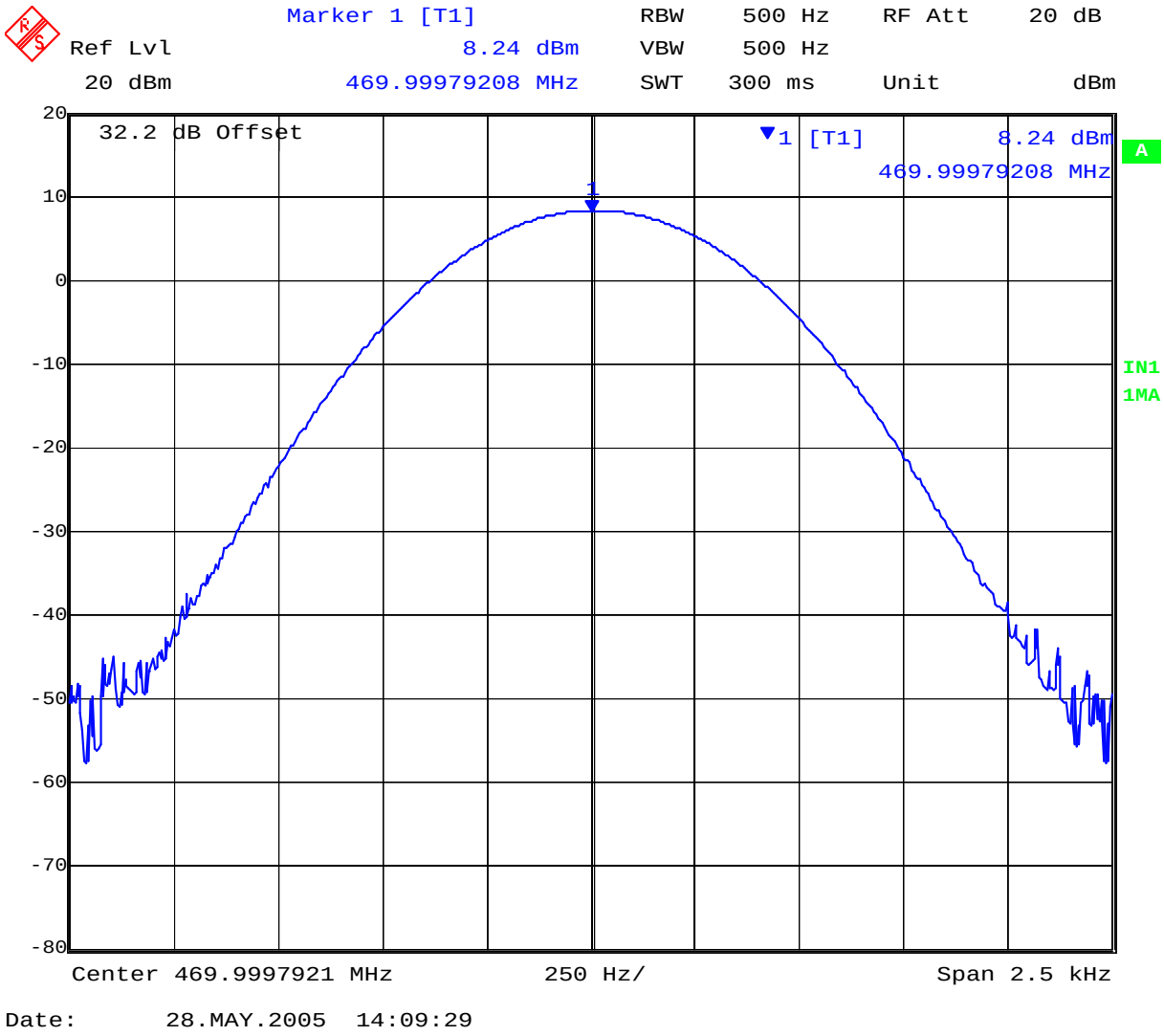
FREQUENCY STABILITY CHANNEL 470 MHz, -30C 12 Vdc



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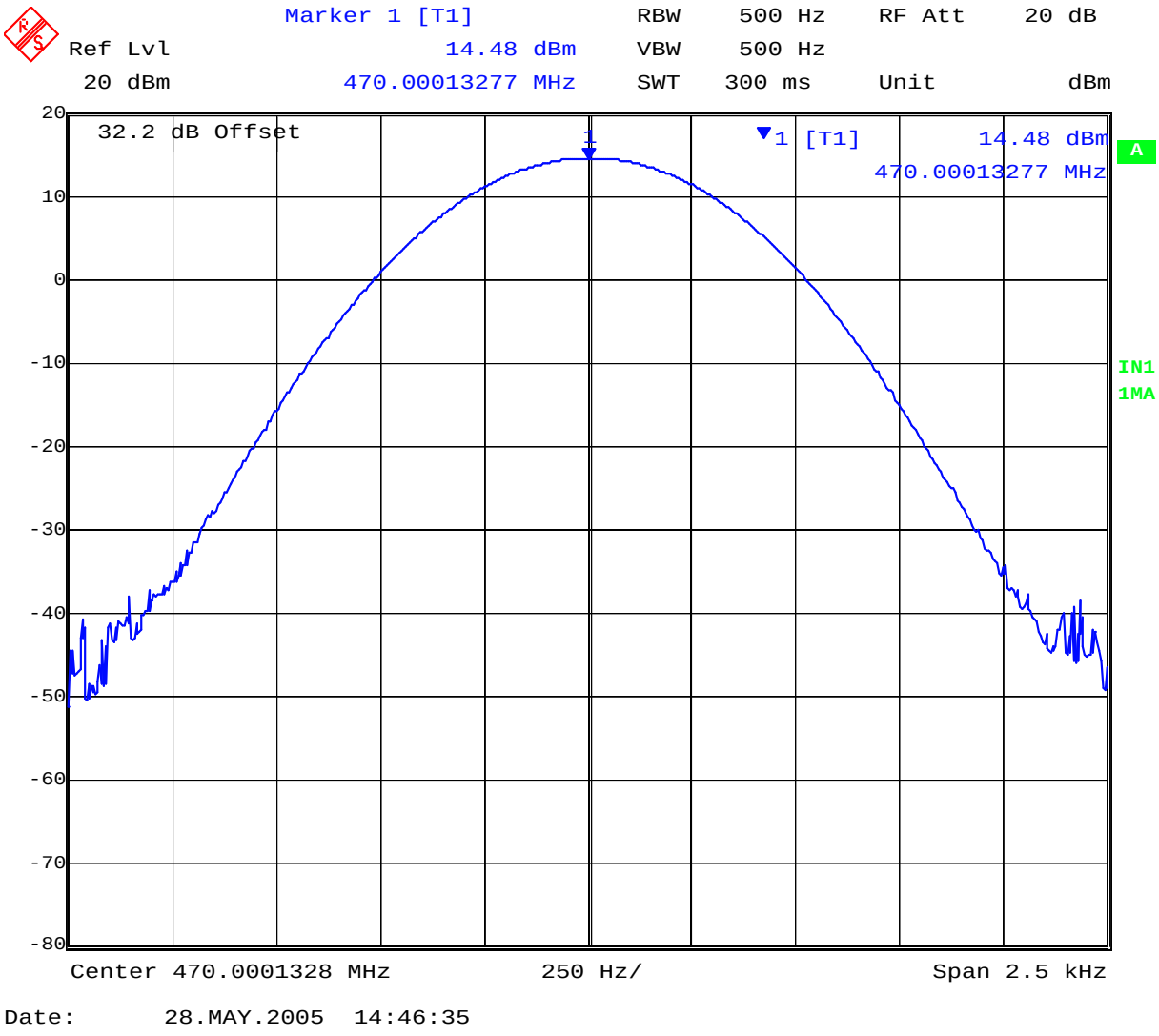
FREQUENCY STABILITY CHANNEL 470 MHz, +50C 12 Vdc



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Specification

FCC, Part 15 Subpart C §90.213

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

MINIMUM FREQUENCY STABILITY [Parts per million (ppm)]			
Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	1,2,3 100	100	200
25–50	20	20	50
72–76	5	.....	50
150–174	5,11 5	6 5	4,6 50
216–220	1 .0	.....	1 .0
220–222 12	0 .1	1 .5	1 .5
421–512	7,11,14 2 .5	8 5	8 5
806–821	14 1 .5	2 .5	2 .5
821–824	14 1 .0	1 .5	1 .5
851–866	1 .5	2 .5	2 .5
866–869	1 .0	1 .5	1 .5
896–901	14 0 .1	1 .5	1 .5
902–928	2 .5	2 .5	2 .5
902–928 13	2 .5	2 .5	2 .5
929–930	1 .5	.....	.....
935–940	0 .1	1 .5	1 .5
1427–1435	9 300	300	300
Above 2450 10	.....	.....	.....

1 Fixed and base stations with over 200 watts transmitter power must have a frequency stability of 50 ppm except for equipment used in the Public Safety Pool where the frequency stability is 100 ppm.

2 For single sideband operations below 25 MHz, the carrier frequency must be maintained within 50 Hz of the authorized carrier frequency.

3 Travelers information station transmitters operating from 530–1700 kHz and transmitters exceeding 200 watts peak envelope power used for disaster communications and long distance circuit operations pursuant to §§ 90.242 and 90.264 must maintain the carrier frequency to within 20 Hz of the authorized frequency.

4 Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.

5 In the 150–174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

6 In the 150–174 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth or designed to operate on a frequency specifically designated for itinerant use or designed for low-power operation of two watts or less, must have a frequency stability of 5.0 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 2.0 ppm.
.

7 In the 421–512 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 0.5 ppm.

8 In the 421–512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

9 Fixed stations with output powers above 120 watts and necessary bandwidth less than 3 kHz must operate with a frequency stability of 100 ppm. Fixed stations with output powers less than 120 watts and using time-division multiplex, must operate with a frequency stability of 500 ppm.

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10 Frequency stability to be specified in the station authorization.

11 Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150–174 MHz band and 2.5 ppm in the 421–512 MHz band.

12 Mobile units may utilize synchronizing signals from associated base stations to achieve the specified carrier stability.

13 Fixed non-multilateration transmitters with an authorized bandwidth that is more than 40 kHz from the band edge, intermittently operated hand-held readers, and mobile transponders are not subject to frequency tolerance restrictions.

14 Control stations may operate with the frequency tolerance specified for associated mobile frequencies.

(b) For the purpose of determining the frequency stability limits, the power of a transmitter is considered to be the maximum rated output power as specified by the manufacturer.

Industry Canada RSS-210 §7

The unmodulated carrier frequency shall be measured under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement:

(a) at temperatures of -30ºC, +20ºC and +50ºC at the manufacturer's rated supply voltage, and

(b) at 85% and at 115% of the manufacturer's rated supply voltage, when the temperature is at 20ºC

The frequency stabilities can be maintained to a lesser temperature range, provided that the transmitter is automatically inhibited from operating outside the lesser temperature range.

For hand-held equipment that is only capable of operating from internal batteries, the frequency stability tests shall be performed using a new battery without any further requirement to vary the supply voltage. Alternatively, an external supply voltage can be used and set at the battery nominal voltage, and again at the battery-operating end point voltage which shall be specified by the equipment manufacturer. If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of symbol periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

Minimum Standard

(i) The RF carrier frequency shall not depart from the reference frequency (reference frequency is the frequency at +20ºC and rated supply voltage) in excess of the values given in the Table below.

(ii) The frequency stability of transmitters whose output powers do not exceed 120 mW's may comply with the limits listed in the table below, or alternatively see section 6.7 of the test standard.

Frequency Band (MHz)	Authorized Bandwidth (kHz)	Frequency Tolerance (ppm)		
		Base/Fixed	Mobile Station	
			> 2 Watts	2 Watts
406.1-430 and 450-470 MHz	20	2.5	5.0	5.0
	11.25	1.5	2.5	2.5
	6.25	0.1	0.5	0.5

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Laboratory Measurement Uncertainty for Frequency Stability

Measurement uncertainty	±0.866 ppm

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement'	0156, 0193, 0252, 0313, 0314

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5.1.4. Conducted Spurious Emissions

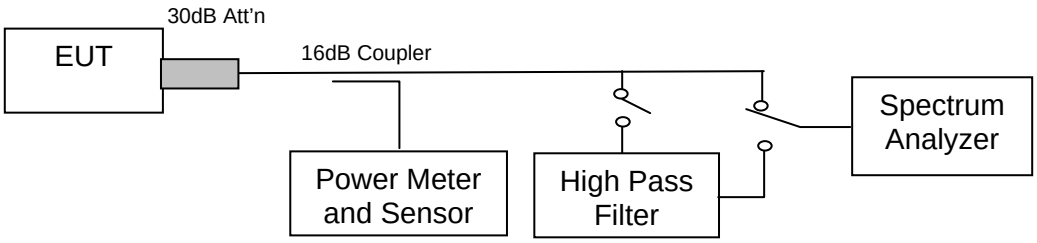
5.1.4.1. Transmitter Spurious

FCC Part §90.210
Industry Canada RSS-210 §6.3

Test Procedure
Transmitter conducted emissions were measured for each channel spacing and modulation type. Measurement were made while EUT was operating in a modulated transmit mode of operation at the appropriate center frequency with limits calculated depending on channel spacing and transmit power. Emissions were measured to beyond the 10th harmonic of the fundamental.

Limits
25 kHz Channel Spacing
12.5 kHz Channel Spacing
6.25 kHz Channel Spacing

Test Measurement Set up



Conducted spurious emission test configuration (transmitter)

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

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Channel Spacing: 25 kHz
Limit: -13 dBm

		Frequency (MHz)					
Channel (MHz)	**Modulation**	**Start**	**Stop**	**Maximum Emission**	**Emission Amplitude (dBm)**	**dBc**	**Margin (dB)**
430	DBPSK	30	1,000	860.04	-24.78	57.78	-11.78
		1,000	5,000	1721.44	-27.07	60.07	-14.07
450		30	1,000	900.86	-26.16	59.16	-13.16
		1,000	5,000	1344.69	-26.11	59.11	-13.11
470		30	1,000	941.68	-29.25	62.25	-16.25
		1,000	5,000	1408.82	-23.84	56.84	-10.84
430	DQPSK	30	1,000	860.04	-26.70	59.70	-13.70
		1,000	5,000	1288.58	-27.11	60.11	-14.11
450		30	1,000	900.86	-28.85	61.85	-15.85
		1,000	5,000	1344.69	-27.44	60.44	-14.44
470		30	1,000	941.68	-30.21	63.21	-17.21
		1,000	5,000	1408.82	-25.50	58.50	-12.50
430	D8PSK	30	1,000	860.04	-26.27	59.27	-13.27
		1,000	5,000	1721.44	-28.09	61.09	-15.09
450		30	1,000	900.86	-28.32	61.32	-15.32
		1,000	5,000	1344.69	-26.84	59.84	-13.84
470		30	1,000	941.68	-30.21	63.21	-17.21
		1,000	5,000	1408.82	-25.03	58.03	-12.03
430	16 QAM	30	1,000	860.04	-25.17	58.17	-12.17
		1,000	5,000	1721.44	-26.91	59.91	-13.91
450		30	1,000	900.86	-28.25	61.25	-15.25
		1,000	5,000	1344.69	-26.13	59.13	-13.13
470		30	1,000	941.68	-28.63	61.63	-15.63
		1,000	5,000	1408.82	-24.97	57.97	-11.97
430	GMSK	30	1,000	860.04	-28.43	61.43	-15.43
		1,000	5,000	1288.58	-28.61	61.61	-15.61
450		30	1,000	900.86	-30.23	63.23	-17.23
		1,000	5,000	1801.60	-28.98	61.98	-15.98
470		30	1,000	941.68	-30.38	63.38	-17.38
		1,000	5,000	1288.58	-27.61	60.61	-14.61

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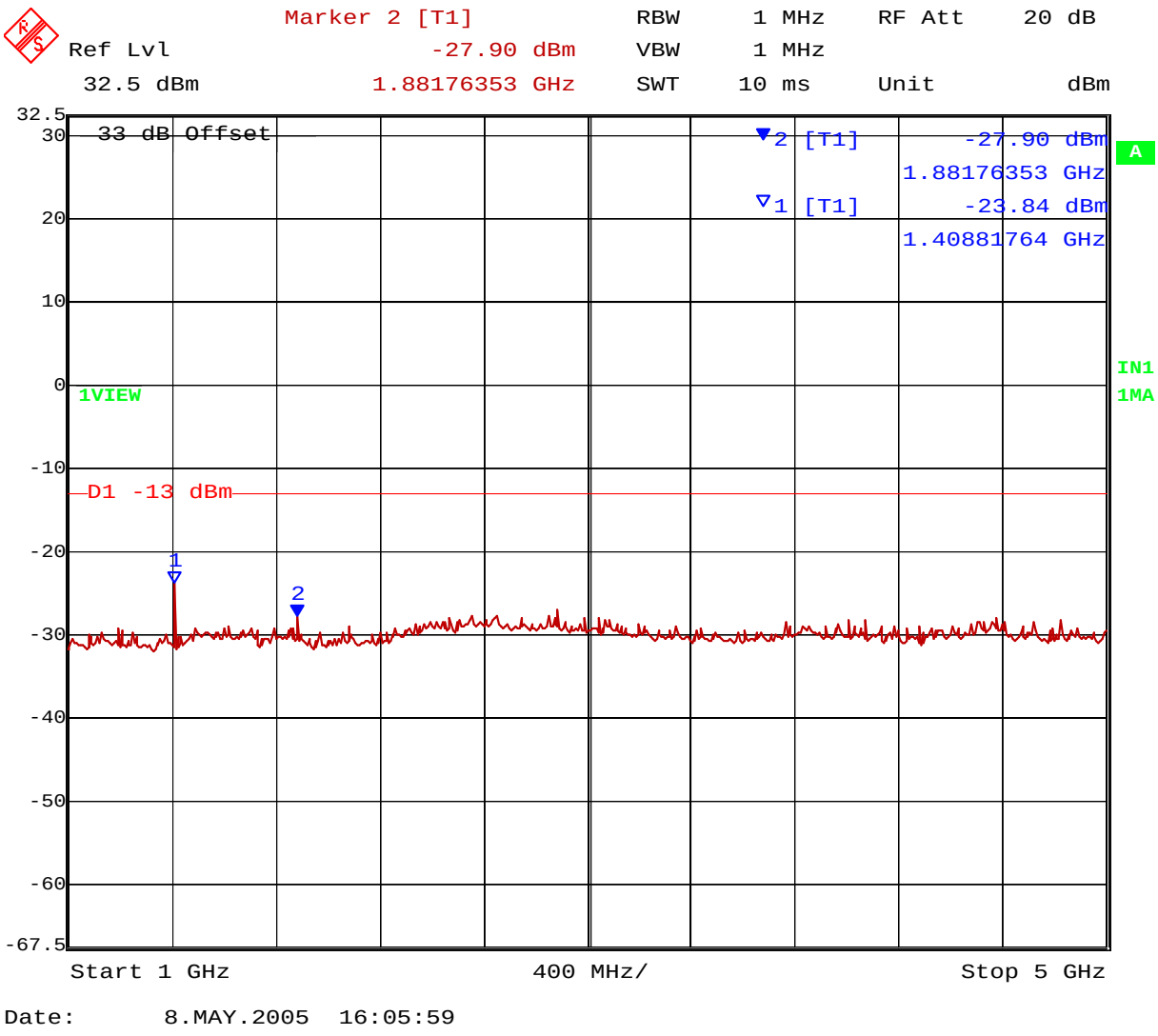

Transmitter 25 kHz Channel Spacing, DBPSK 1 – 5 GHz

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Channel Spacing: 12.5 kHz
Limit: -20 dBm

		Frequency (MHz)					
Channel (MHz)	**Modulation**	**Start**	**Stop**	**Maximum Emission**	**Emission Amplitude (dBm)**	**dBc**	**Margin (dB)**
430	DBPSK	30	1,000	860.04	-26.52	59.52	-6.52
		1,000	5,000	1288.58	-27.61	60.61	-7.61
450		30	1,000	900.86	-30.59	63.59	-10.59
		1,000	5,000	1344.69	-27.06	60.06	-7.06
470		30	1,000	941.68	-30.59	63.59	-10.59
		1,000	5,000	1408.82	-24.73	57.73	-4.73
430	DQPSK	30	1,000	860.04	-26.41	59.41	-6.41
		1,000	5,000	1721.44	-28.18	61.18	-8.18
450		30	1,000	900.86	-30.59	63.59	-10.59
		1,000	5,000	1344.69	-27.12	60.12	-7.12
470		30	1,000	941.68	-29.81	62.81	-9.81
		1,000	5,000	1408.82	-24.38	57.38	-4.38
430	D8PSK	30	1,000	860.04	-27.48	60.48	-7.48
		1,000	5,000	1288.58	-27.53	60.53	-7.53
450		30	1,000	900.86	-28.86	61.86	-8.86
		1,000	5,000	1344.69	-27.29	60.29	-7.29
470		30	1,000	941.68	-30.78	63.78	-10.78
		1,000	5,000	1408.82	-25.84	58.84	-5.84
430	16 QAM	30	1,000	860.04	-28.55	61.55	-8.55
		1,000	5,000	1288.58	-26.68	59.68	-6.68
450		30	1,000	900.86	-29.43	62.43	-9.43
		1,000	5,000	1344.69	-26.49	59.49	-6.49
470		30	1,000	941.68	-31.64	64.64	-11.64
		1,000	5,000	1408.82	-24.85	57.85	-4.85
430	GMSK	30	1,000	860.04	-28.97	61.97	-8.97
		1,000	5,000	1721.44	-28.11	61.11	-8.11
450		30	1,000	900.86	-32.21	65.21	-12.21
		1,000	5,000	1344.69	-27.21	60.21	-7.21
470		30	1,000	941.68	-32.90	65.90	-12.90
		1,000	5,000	1408.82	-26.15	59.15	-6.15

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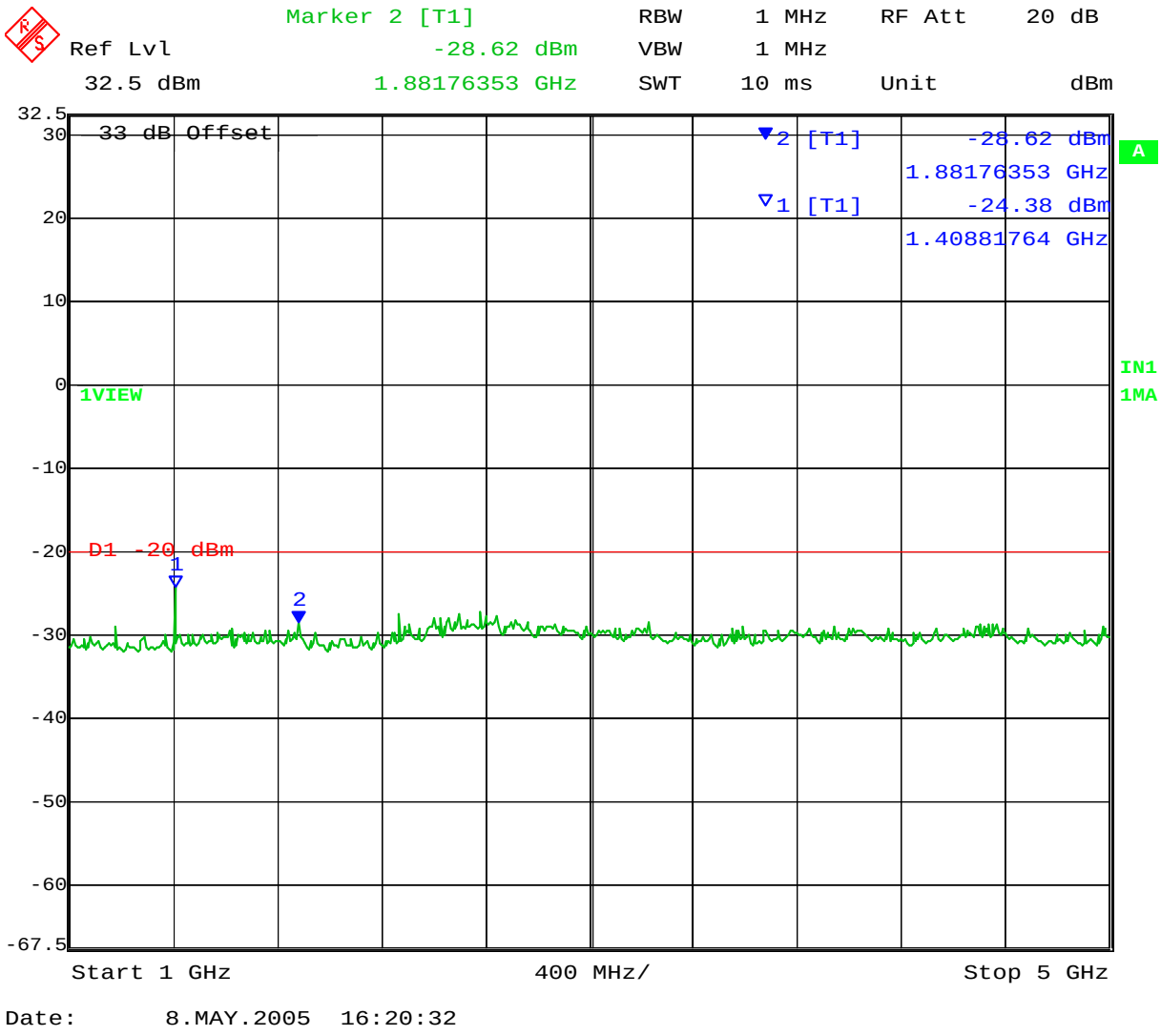

Transmitter 12.5 kHz Channel Spacing, DQPSK 1 – 5 GHz

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Channel Spacing: 6.25 kHz
Limit: -25 dBm

		Frequency (MHz)					
Channel (MHz)	**Modulation**	**Start**	**Stop**	**Maximum Emission**	**Emission Amplitude (dBm)**	**dBc**	**Margin (dB)**
430	DBPSK	30	1,000	860.04	-28.39	61.39	-3.39
		1,000	5,000	1288.58	-32.25	65.25	-7.25
450		30	1,000	900.86	-29.60	62.60	-4.60
		1,000	5,000	1344.69	-26.40	59.40	-1.40
470		30	1,000	941.68	-31.58	64.58	-6.58
		1,000	5,000	1408.82	-26.72	59.72	-1.72
430	DQPSK	30	1,000	860.04	-29.66	62.66	-4.66
		1,000	5,000	1288.58	-32.37	65.37	-7.37
450		30	1,000	900.86	-29.48	62.48	-4.48
		1,000	5,000	1344.69	-28.34	61.34	-3.34
470		30	1,000	941.68	-29.66	62.66	-4.66
		1,000	5,000	1408.82	-25.78	58.78	-0.78
430	D8PSK	30	1,000	860.04	-29.78	62.78	-4.78
		1,000	5,000	1288.58	-31.05	64.05	-6.05
450		30	1,000	900.86	-31.37	64.37	-6.37
		1,000	5,000	1344.69	-27.35	60.35	-2.35
470		30	1,000	941.68	-32.46	65.46	-7.46
		1,000	5,000	1408.82	-25.96	58.96	-0.96
430	16 QAM	30	1,000	860.04	-26.44	59.44	-1.44
		1,000	5,000	1288.58	-29.45	62.45	-4.45
450		30	1,000	900.86	-29.34	62.34	-4.34
		1,000	5,000	1344.69	-26.62	59.62	-1.62
470		30	1,000	941.68	-32.24	65.24	-7.24
		1,000	5,000	1408.82	-25.12	58.12	-0.12
430	GMSK	30	1,000	860.04	-28.06	61.06	-3.06
		1,000	5,000	1288.58	-32.42	65.42	-7.42
450		30	1,000	900.86	-30.82	63.82	-5.82
		1,000	5,000	1344.69	-29.25	62.25	-4.25
470		30	1,000	941.68	-33.16	66.16	-8.16
		1,000	5,000	1408.82	-26.75	59.75	-1.75

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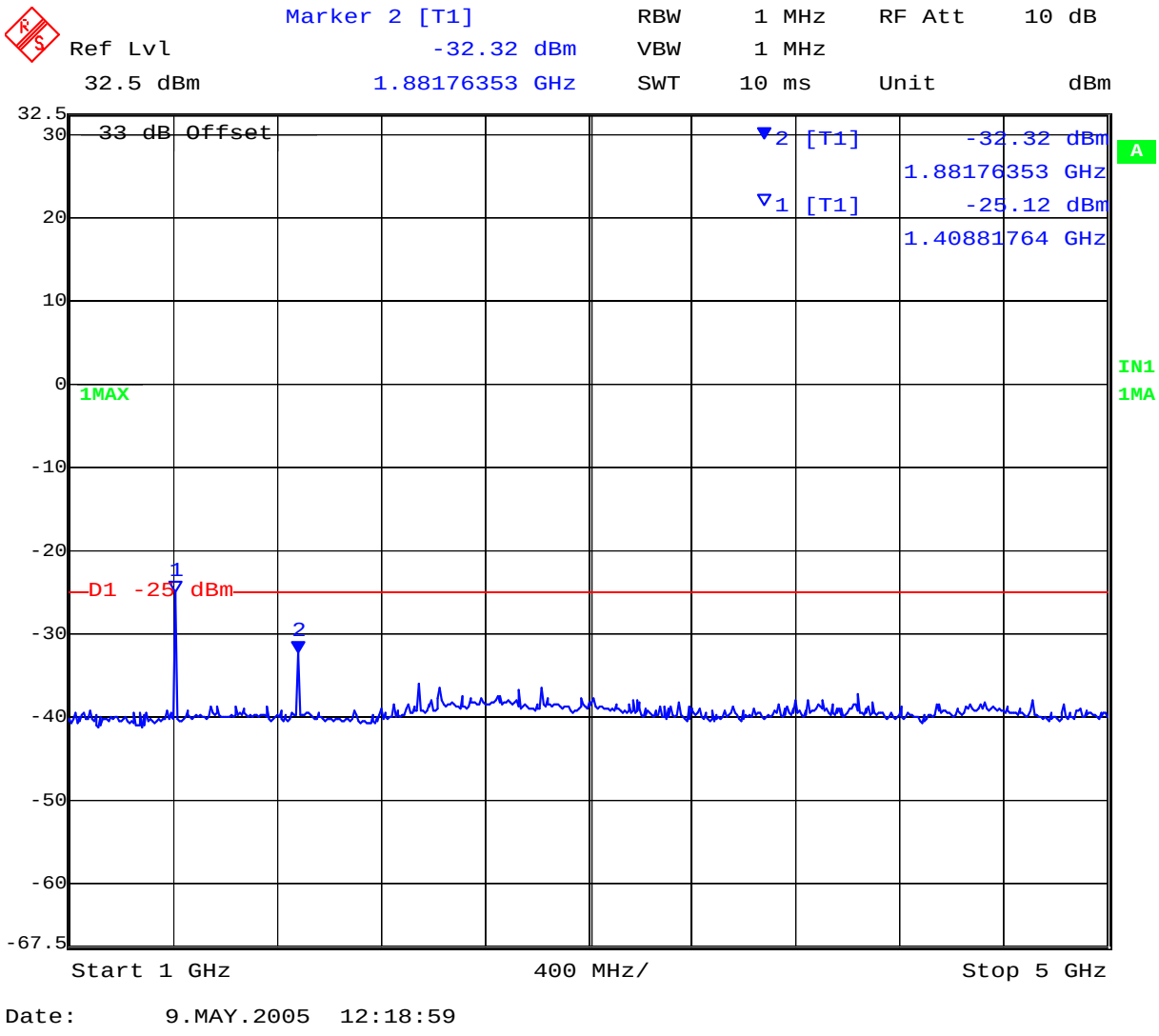

Transmitter 6.25 kHz Channel Spacing, 16 QAM 1 – 5 GHz

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5.1.4.2. Receiver Spurious Emissions

Industry Canada RSS-210 §8

Test Procedure
Receiver conducted emissions were measured for each channel spacing and modulation type. Measurement were made while EUT was operating in a modulated transmit mode of operation at the appropriate center frequency with limits calculated depending on channel spacing and transmit power. Emissions were measured to at least four times the local oscillator frequency.

Test Measurement Set up

Conducted spurious emission test configuration (receiver)

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

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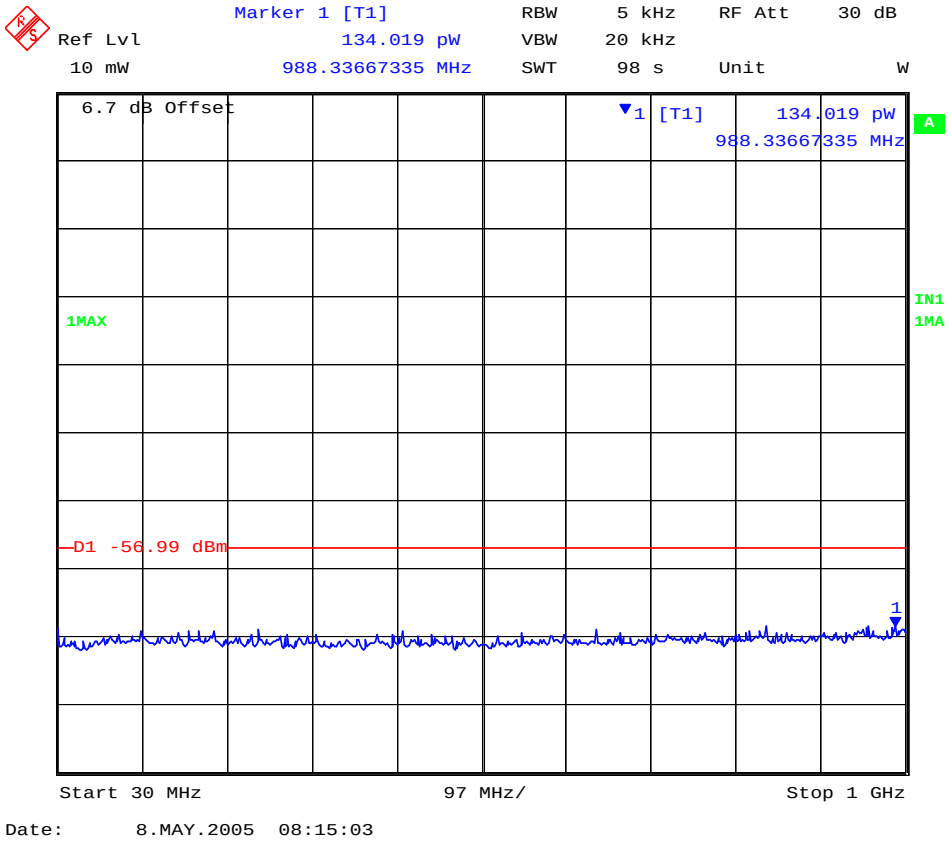
Channel Spacing: 25 kHz
Limit: 30 MHz – 1 GHz 2nW; >1 GHz 5 nW

Channel (MHz)	Modulation	Start Frequency (MHz)	Stop Frequency (MHz)	Emission Frequency (MHz)	Emission Amplitude (dBm)	Margin (dB)
450	DBPSK	30	1,000	No Emissions Observed		
	DBPSK	1,000	2,000	No Emissions Observed		
450	DQPSK	30	1,000	No Emissions Observed		
	DQPSK	1,000	2,000	No Emissions Observed		
450	D8PSK	30	1,000	No Emissions Observed		
	D8PSK	1,000	2,000	No Emissions Observed		
450	16 QAM	30	1,000	No Emissions Observed		
	16 QAM	1,000	2,000	No Emissions Observed		
450	GMSK	30	1,000	No Emissions Observed		
	GMSK	1,000	2,000	No Emissions Observed		



Receiver 25 kHz Channel Spacing, 16 QAM 30 MHz – 1 GHz

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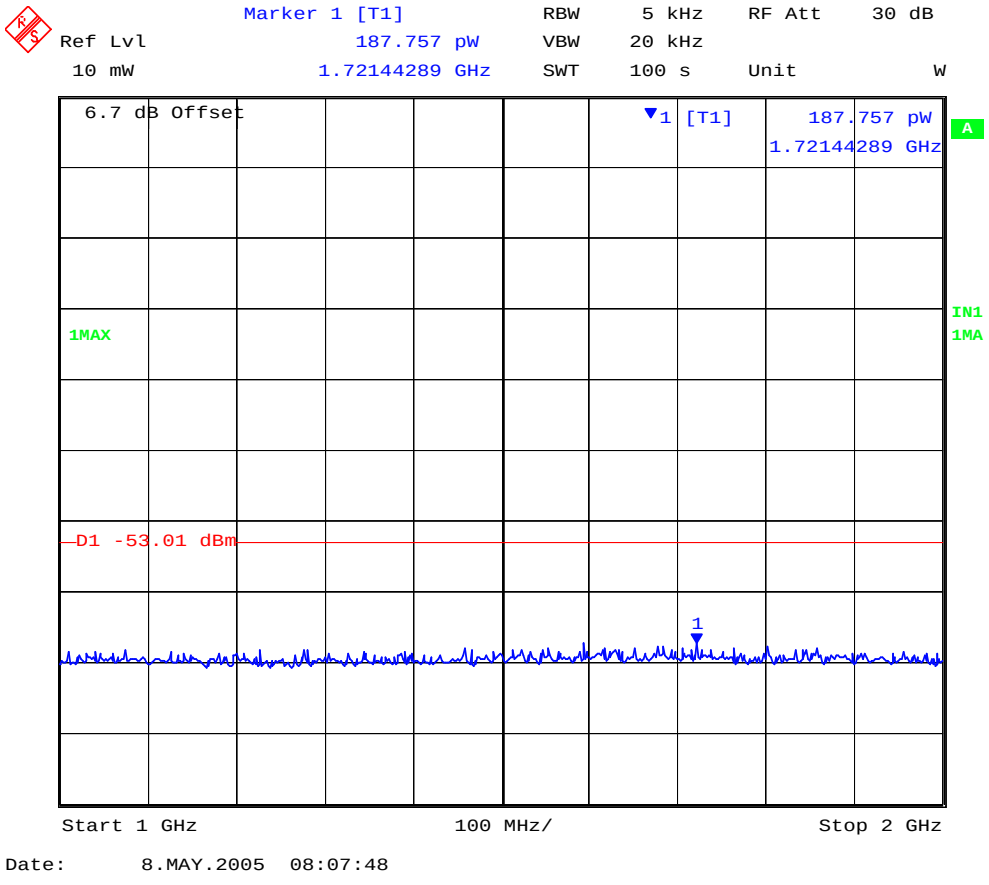
Channel Spacing: 12.5 kHz
Limit: 30 MHz – 1 GHz 2nW; >1 GHz 5 nW

Channel (MHz)	Modulation	Start Frequency (MHz)	Stop Frequency (MHz)	Emission Frequency (MHz)	Emission Amplitude (dBm)	Margin (dB)
450	DBPSK	30	1,000	No Emissions Observed		
	DBPSK	1,000	2,000	No Emissions Observed		
450	DQPSK	30	1,000	No Emissions Observed		
	DQPSK	1,000	2,000	No Emissions Observed		
450	D8PSK	30	1,000	No Emissions Observed		
	D8PSK	1,000	2,000	No Emissions Observed		
450	16 QAM	30	1,000	No Emissions Observed		
	16 QAM	1,000	2,000	No Emissions Observed		
450	GMSK	30	1,000	No Emissions Observed		
	GMSK	1,000	2,000	No Emissions Observed		



Receiver 12.5 kHz Channel Spacing, 16 QAM 1 GHz – 2 GHz

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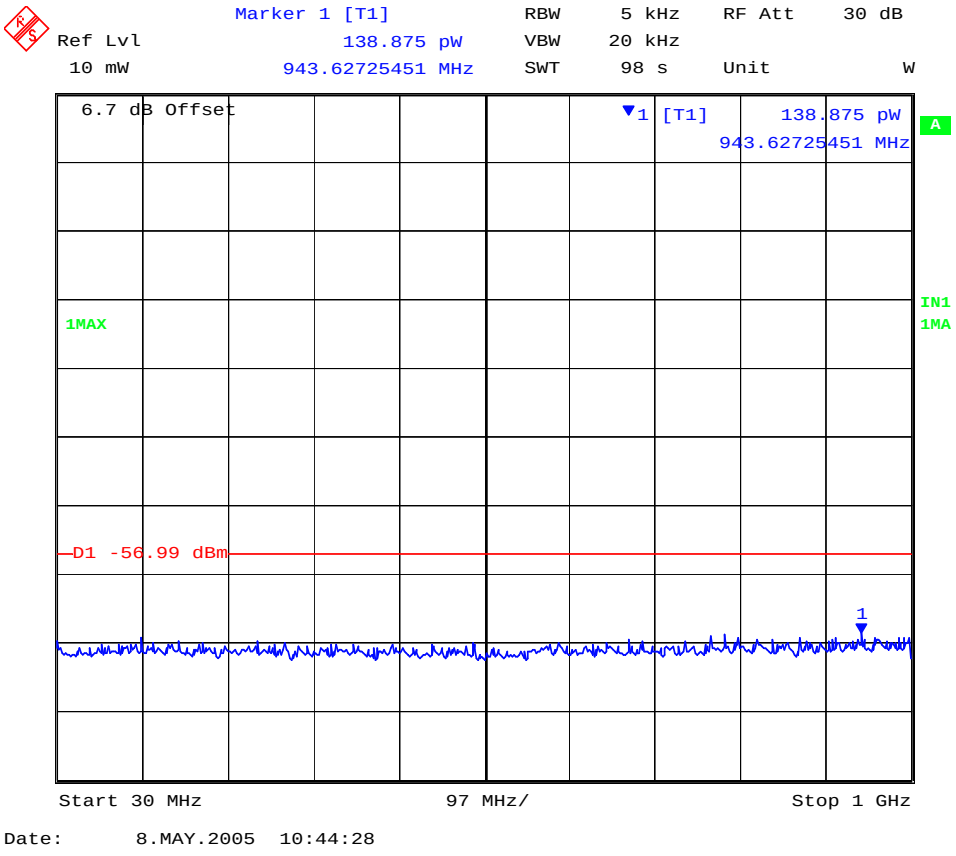
Channel Spacing: 6.25 kHz
Limit: 30 MHz – 1 GHz 2nW; >1 GHz 5 nW

Channel (MHz)	Modulation	Start Frequency (MHz)	Stop Frequency (MHz)	Emission Frequency (MHz)	Emission Amplitude (dBm)	Margin (dB)
450	DBPSK	30	1,000	No Emissions Observed		
	DBPSK	1,000	2,000	No Emissions Observed		
450	DQPSK	30	1,000	No Emissions Observed		
	DQPSK	1,000	2,000	No Emissions Observed		
450	D8PSK	30	1,000	No Emissions Observed		
	D8PSK	1,000	2,000	No Emissions Observed		
450	16 QAM	30	1,000	No Emissions Observed		
	16 QAM	1,000	2,000	No Emissions Observed		
450	GMSK	30	1,000	No Emissions Observed		
	GMSK	1,000	2,000	No Emissions Observed		



Receiver 6.25 kHz Channel Spacing, 16 QAM 30 MHz – 1 GHz

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Specification
Transmitter Limits
Limits FCC Part §90.210
Industry Canada RSS-210 §6.3

25 kHz Channel Spacing: Emission Mask C
On any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth: At least 43 + 10 Log_{10} (P) P = +33 dBm, Attenuation = 46 dB Limit = 33 - 46 = -13 dBm

12.5 kHz Channel Spacing: Emission Mask D
On any frequency removed from the carrier frequency by a displacement frequency of than 12.5 kHz: At least 50 + 10 Log_{10} (P) or 70 dB, whichever is the lesser attenuation. P = +33 dBm, Attenuation = 53 dB Limit = 33 - 53 = -20 dBm

6.25 kHz Channel Spacing: Emission Mask E
On any frequency removed from the carrier frequency by more than 4.6 kHz: At least 55 + 10 Log_{10} (P) or 65 dB, whichever is the lesser attenuation. P = +33 dBm, Attenuation = 58 dB Limit = 33 - 58 = -25 dBm

Receiver Limits
Industry Canada RSS-210 §8(ii)

Receiver Conducted Spurious Emission Limits
If spurious emissions are to be measured at the antenna connector, the emission power in any 4 kHz shall not exceed 2 nanowatts in the band 30 – 1,000 MHz or 5 nanowatts above 1 GHz.

Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB

Traceability

Method	**Test Equipment Used**
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0156, 0193, 0252, 0313, 0314, HPF

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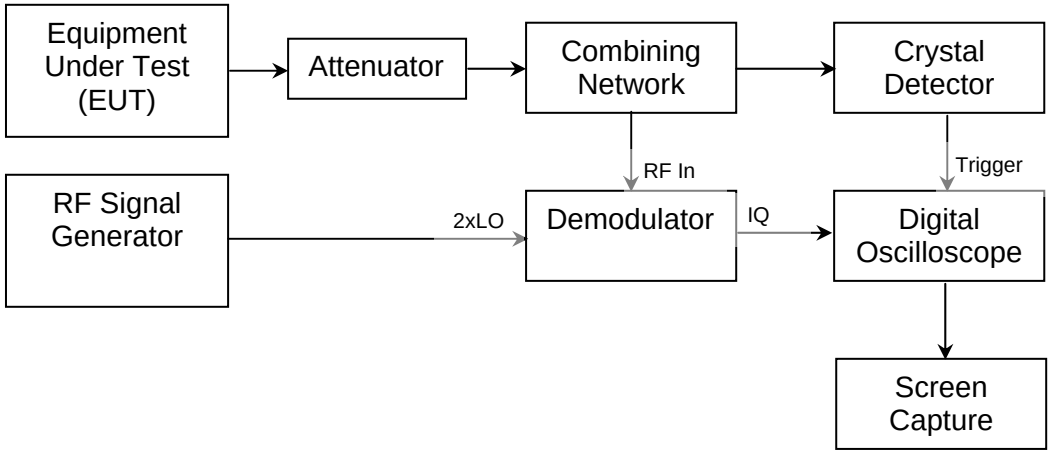
5.1.5. Transient Frequency Behavior

FCC, Part 15 Subpart C §90.214
Industry Canada RSS-210 §6.5

Test Procedure
Transmitters designed to operate in the 421 to 512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated. The transient frequency behavior of the EUT was investigated using the recommended test methodology identified in EIA/TIA Standard 603. Testing which was performed on an unmodulated carrier on the mid channel frequency (450 MHz) to the limits specified for 6.25 kHz channel spacing operation, worst case or tightest limits. Compliance to these limits implies the EUT will meet the 12.5 and 25 kHz limits given the same conditions.

Test Measurement Set up



Transient Frequency Behavior Test Configuration

Summary of Circuit Operation
EUT output (CW Mode) was fed to the demodulator via an attenuator and combining network. EUT level at the demodulator was fixed at -40 dBm. The frequency of the RF signal generator was set to provide 2 * EUT fundamental frequency at a level of –10 dBm on the demodulator LO input. The second output on the combining network was fed to a crystal detector to be used as the oscilloscope trigger input.

The oscilloscope was set to trigger when the transmitter was switched ON and the oscilloscope screen was captured electronically. This process was also repeated for the transmitter OFF condition.

Unfortunately as this device was designed for data monitoring and control purposes there was no provision to monitor a 1 kHz tone mentioned in the EIA/TIA Standard 603. In order to provide a visible indication of both the ON and OFF transmitter transient condition the frequency output of the signal generator was slightly offset. This offset appears as ripple on the demodulator output and captured electronically. The screen capture clearly identifies the transient behavior of both the transmitter ON and OFF conditions.

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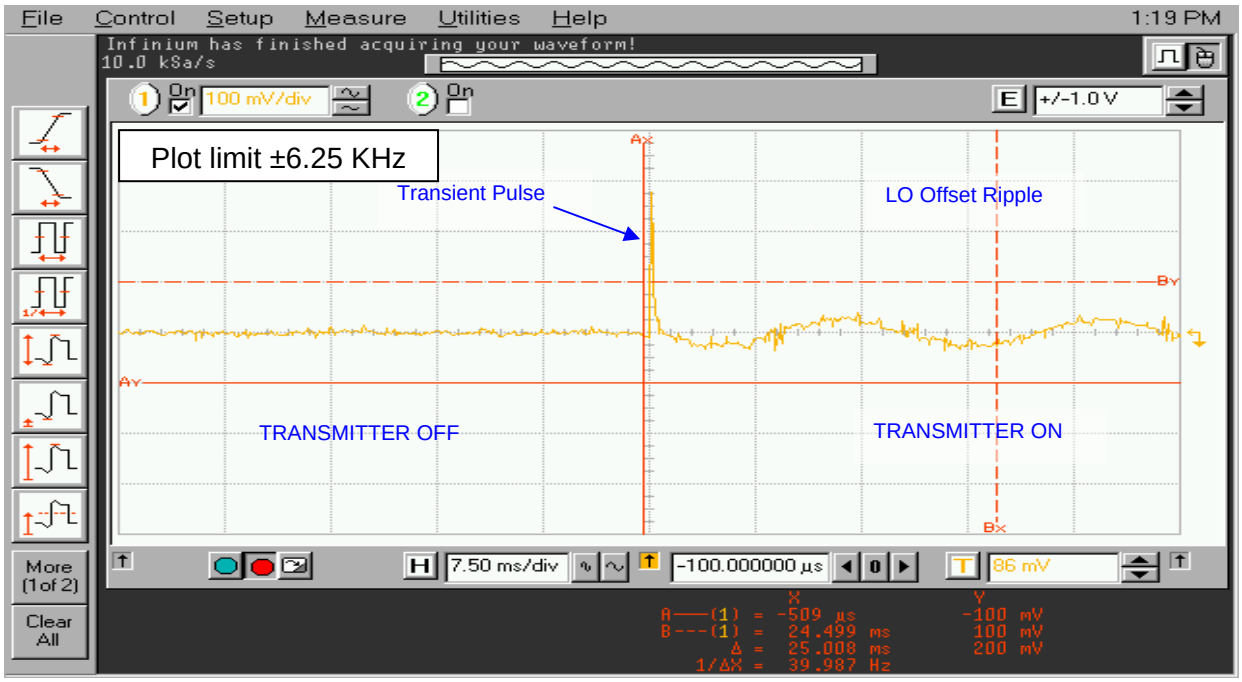
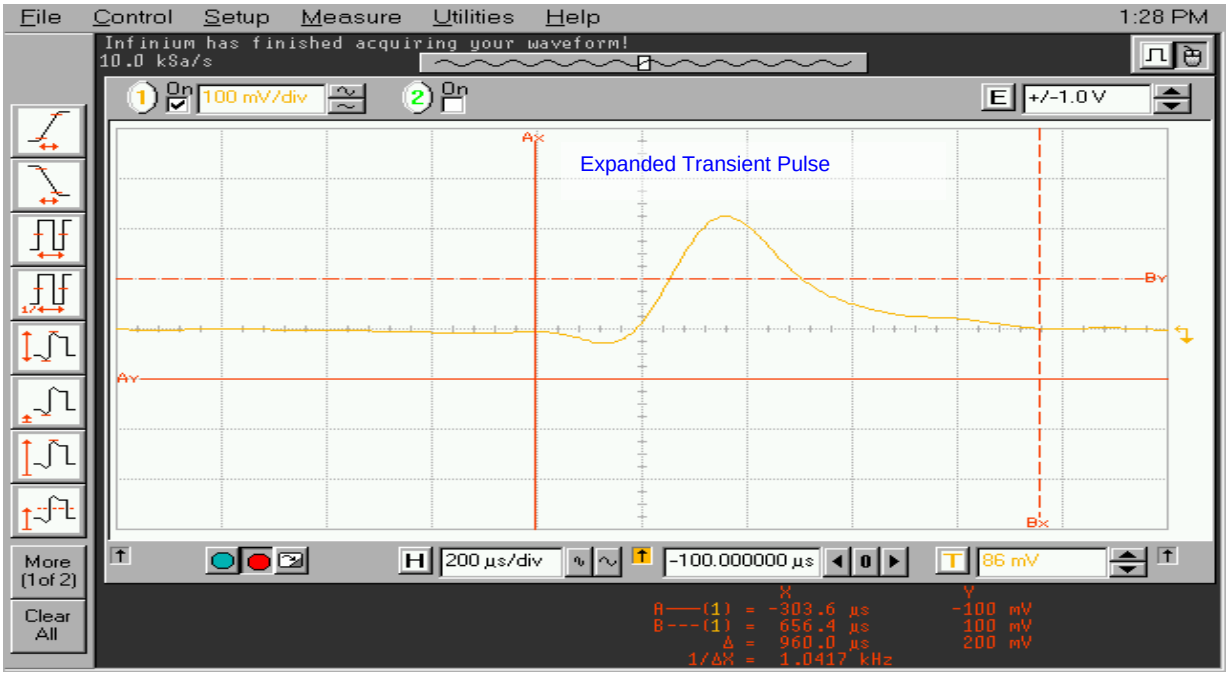
Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TRANSMITTER ON – Plot limits ±6.25 KHz





Pulse width of the transient pulse (approximately) 1mS = 1 kHz

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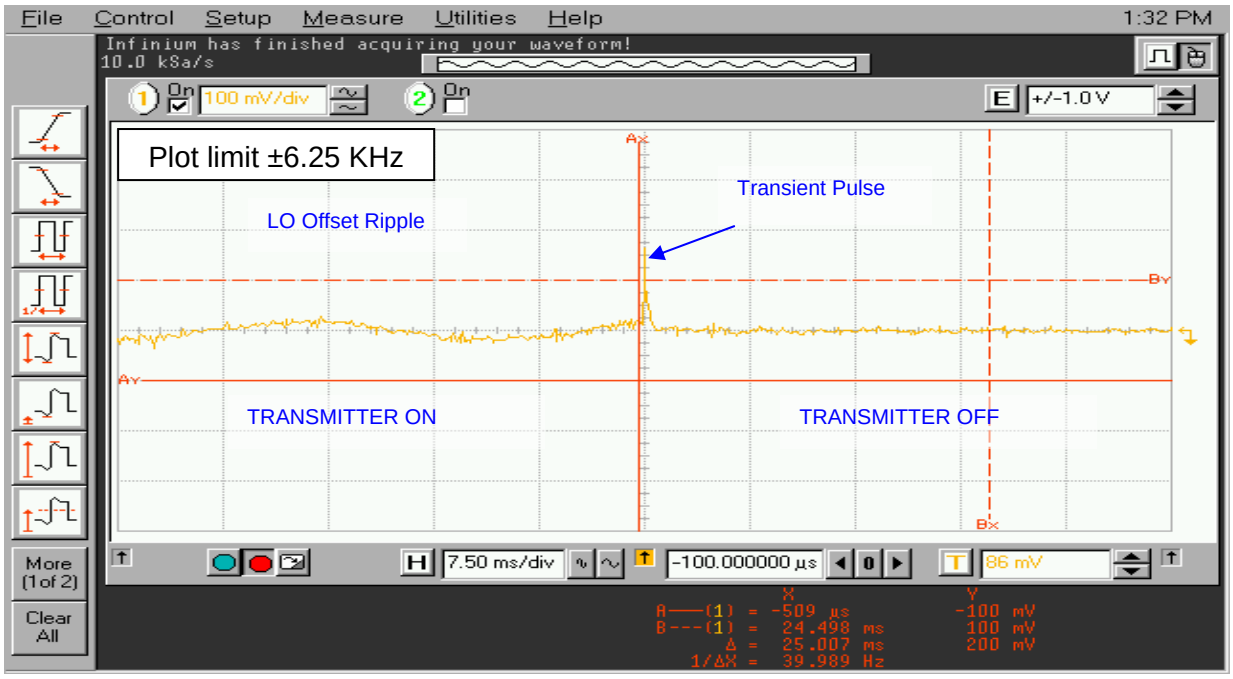
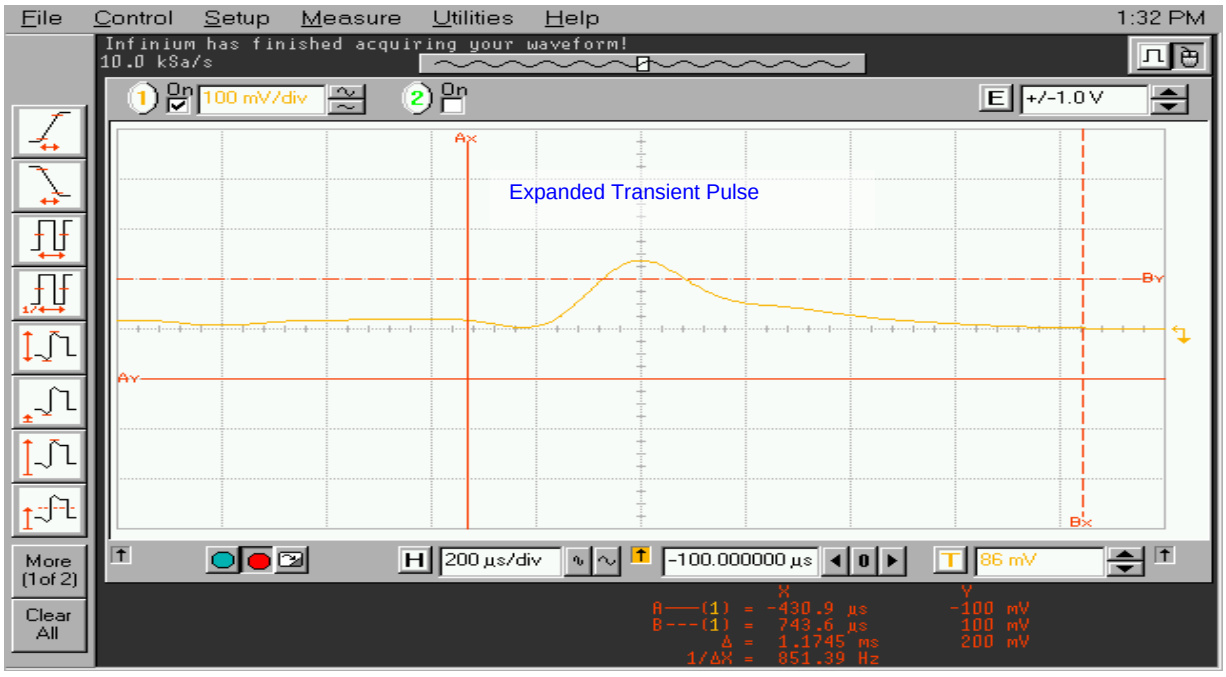
TRANSMITTER OFF –





Pulse width of the transient pulse OFF condition (approximately) 1.2mS = 0.83 kHz

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Specification

Limits FCC Part §90.214
Industry Canada RSS-210 §6.5

Frequency (MHz)	Channel Bandwidth (kHz)	Transient Period	Transient Behavior
450	6.25	t_1 = 10 ms	< ± 6.25 kHz
		t_2 = 25 ms	< ± 3.15 kHz
		t_3 = 10 ms	< ± 6.25 kHz
	12.5	t_1 = 10 ms	< ±12.5 kHz
		t_2 = 25 ms	< ± 6.25 kHz
		t_3 = 10 ms	< ±12.5 kHz
	25	t_1 = 10 ms	< ± 25.0 kHz
		t_2 = 25 ms	< ±12.5 kHz
		t_3 = 10 ms	< ± 25.0 kHz

Laboratory Measurement Uncertainty for Frequency

Measurement uncertainty	±0.25 ppm

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement'	0070, 0090, 0098, 0116, 0135, 0156, 0252, 0307, 0310, 0312, 0313, 0314, Det1, Demodulator,

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5.1.6. Unwanted Emissions

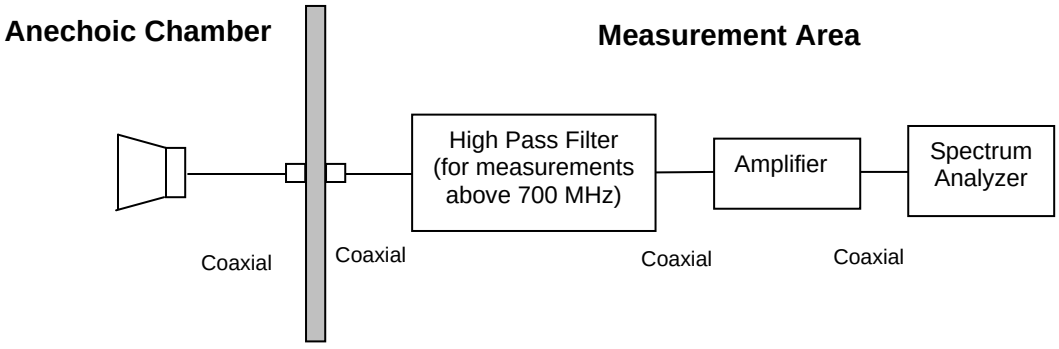
FCC, Part 15 Subpart C §15.247(c)
Industry Canada RSS-210 §6.3

Test Procedure

Radiated emissions from 30 MHz to the 10th harmonic of the fundamental i.e. 5 GHz were measured in a CW operational mode. The antenna specified in Section 3.4 Antenna Details was installed during all measurements. The measurement equipment was set to measure in peak hold mode. The total transmitter output power was measured and expressed in similar units. The emissions were measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a high pass filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

Measurements below 1 GHz utilized 100 KHz RBW, measurements above 1 GHz were performed using a minimum RBW of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

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Unwanted Emission Limits;

25 kHz Channel Spacing: Emission Mask C
On any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth: At least 43 + 10 Log_{10} (P) P = +33 dBm, Attenuation = 46 dB

12.5 kHz Channel Spacing: Emission Mask D
On any frequency removed from the carrier frequency by a displacement frequency of than 12.5 kHz: At least 50 + 10 Log_{10} (P) or 70 dB, whichever is the lesser attenuation. P = +33 dBm, Attenuation = 53 dB

6.25 kHz Channel Spacing: Emission Mask E
On any frequency removed from the carrier frequency by more than 4.6 kHz: At least 55 + 10 Log_{10} (P) or 65 dB, whichever is the lesser attenuation. P = +33 dBm, Attenuation = 58 dB

Calculated Limit

The limits calculated for 6.25 kHz channel spacing (attenuation = 58 dB) is worst case therefore in CW operational mode emissions must be a minimum of 58 dB below the peak fundamental frequency. The peak fundamental amplitude was found for each of the following channels;

Channel	Polarity	Peak Fundamental (dBµV/m)	Limit (peak - 58dB) (dBµV/m)
430 MHz	H	118.08	60.08
450 MHz	H	117.40	59.40
470 MHz	H	119.10	61.10

The unwanted emission limit was set for worst case 59.40 dBµV/m

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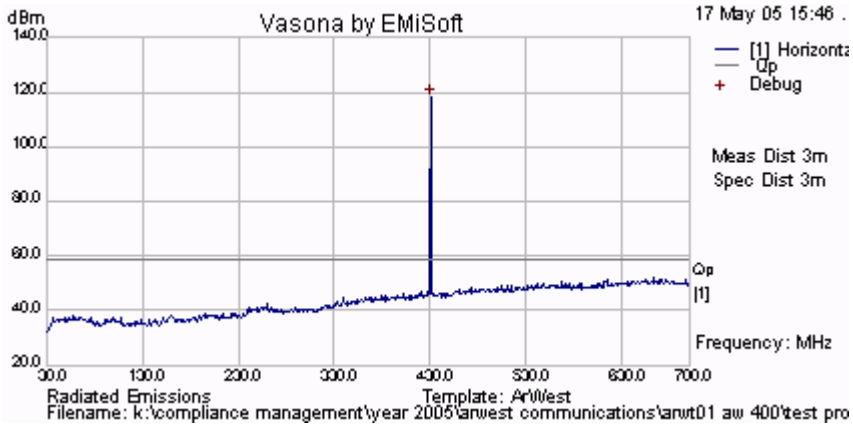
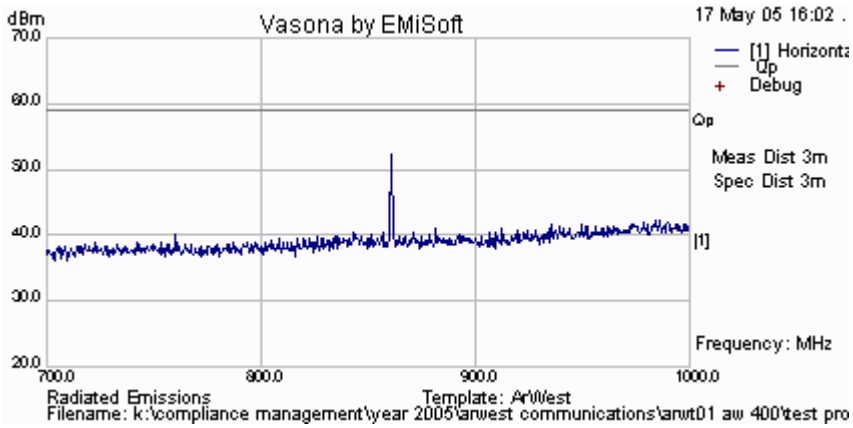
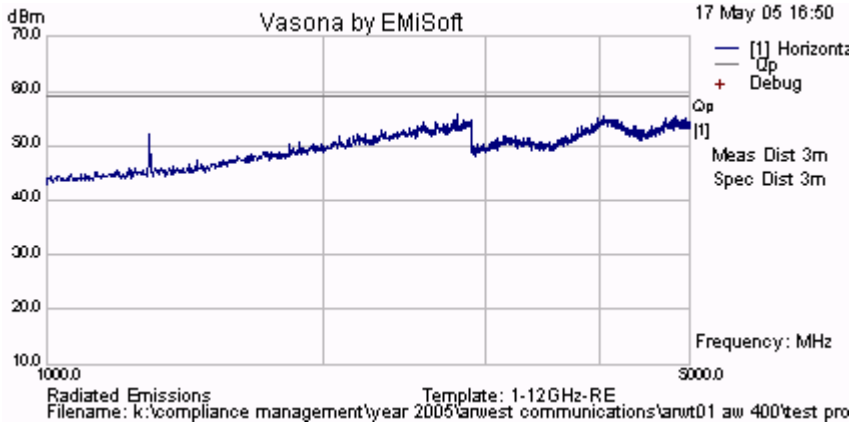
Channel 430 MHz







No emissions found on or above the limit

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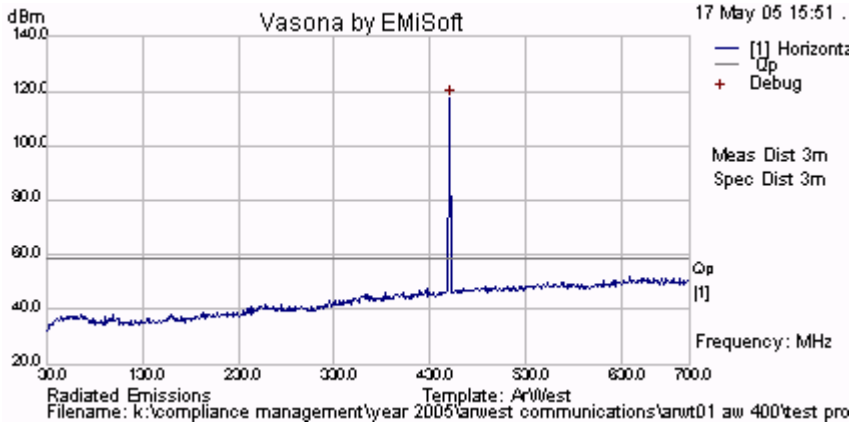
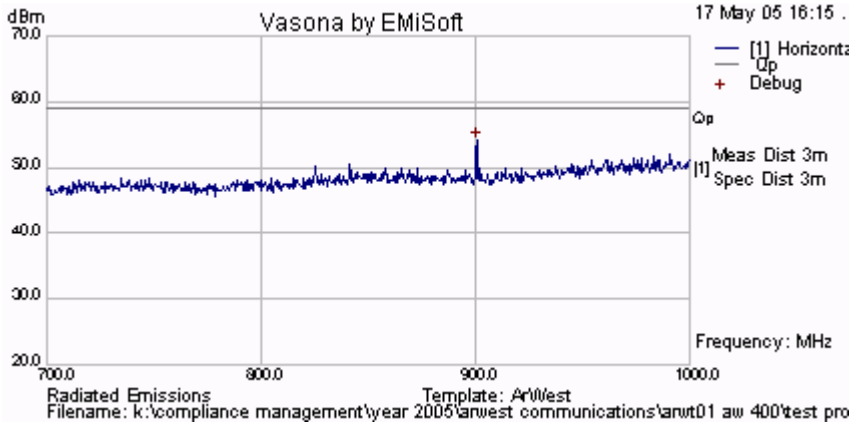
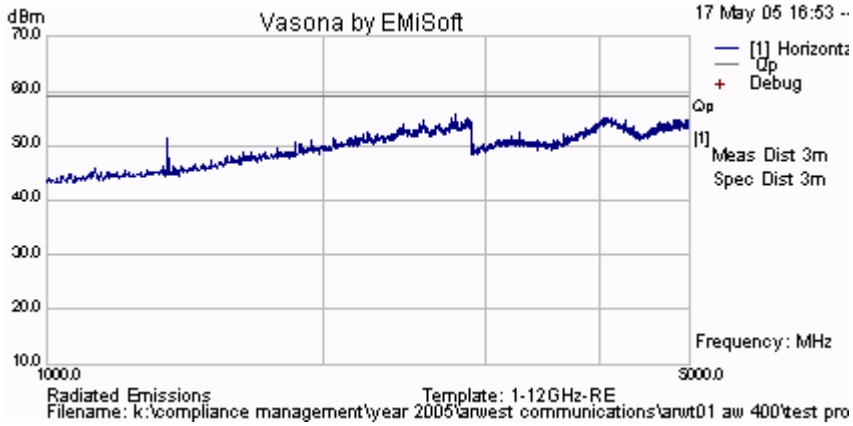
Channel 450 MHz

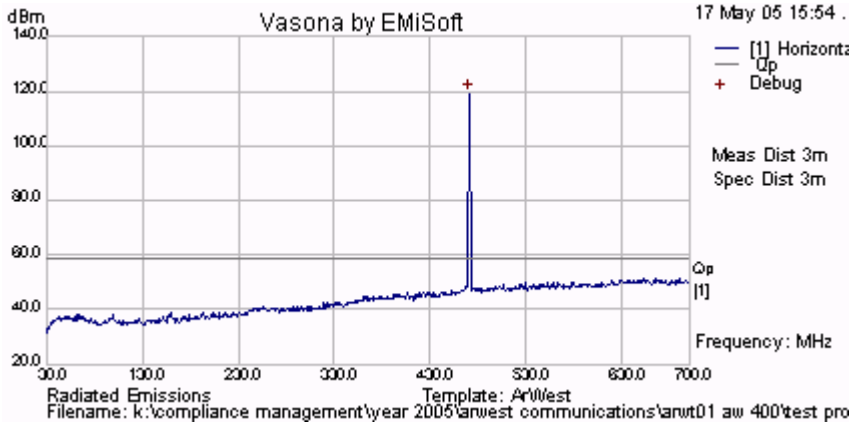


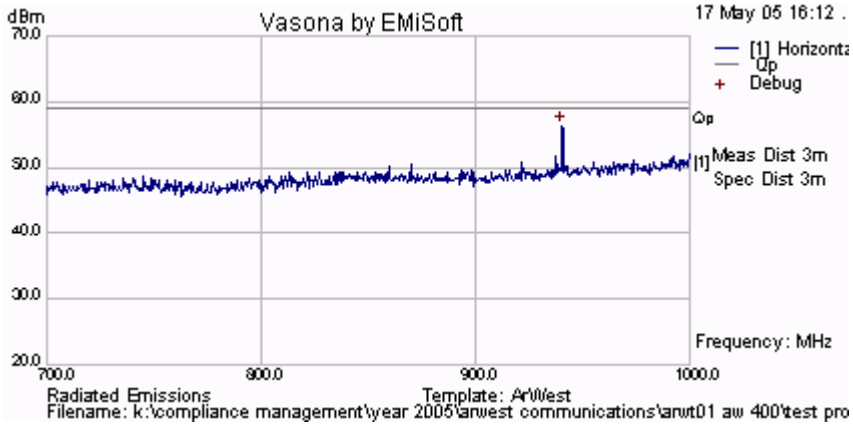


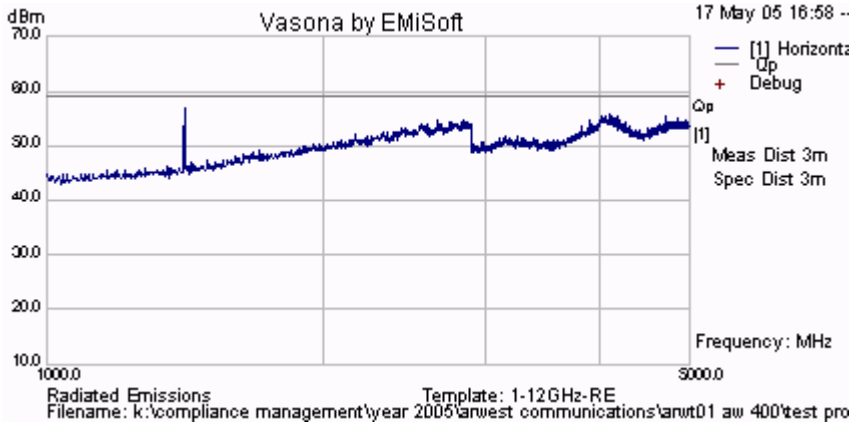


No emissions found on or above the limit

Channel 470 MHz







No emissions found on or above the limit

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Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0156, 0134, 0304, 0305, 0310, 0311, 0312, 0315

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5.1.7. dc Voltage(s) and Current(s)

FCC, Part 2.1033 (8)

Test Procedure
The dc voltage and corresponding current was measured when the equipment was transmitting at full power at ambient temperature.

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS

dc Voltage	Current (Amps)	Power (Watts)
+12	0.278	3.336
+10.8	0.306	3.305
+13.2	0.260	3.432

Limits

FCC, Part 2.1033 (8)

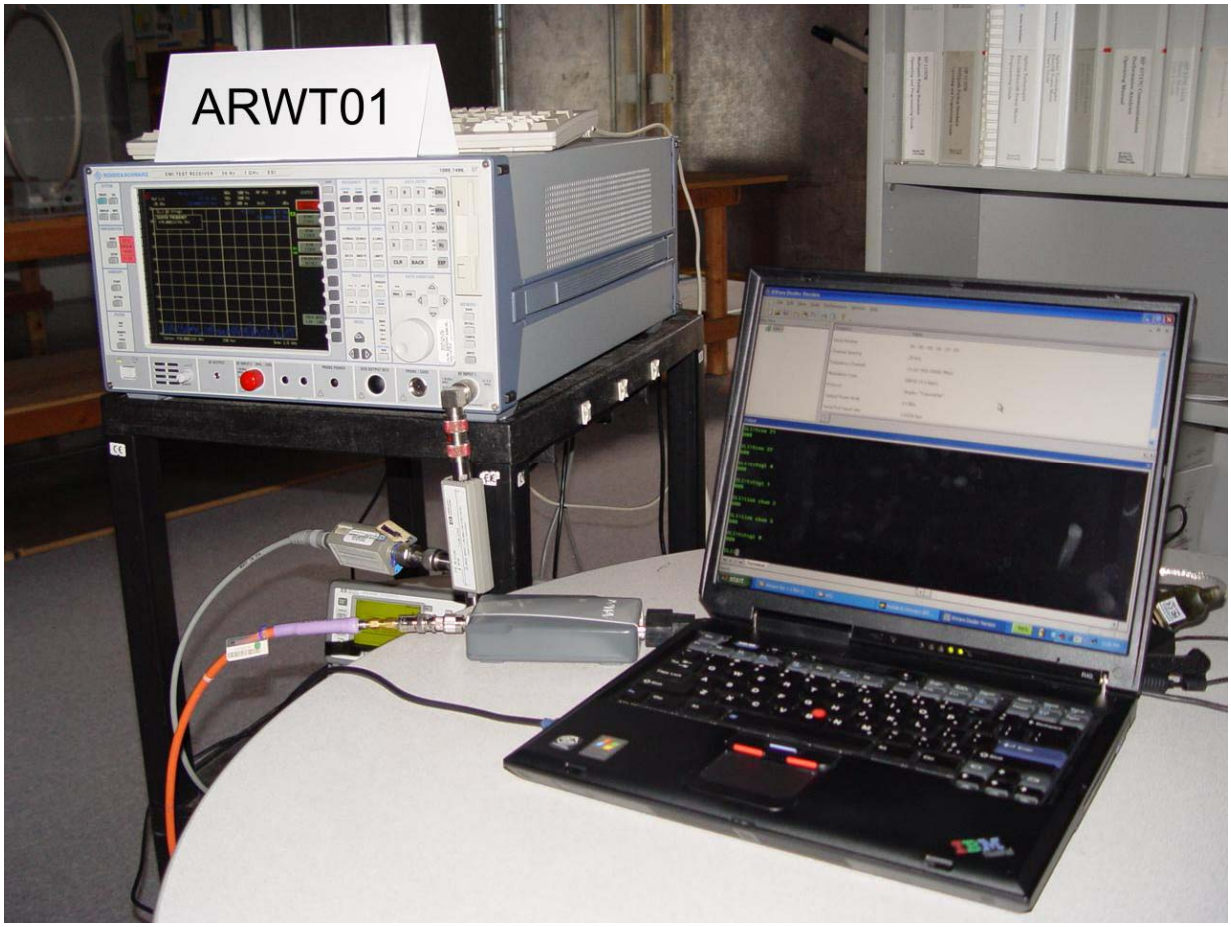
NONE

Traceability

Test Equipment Used
0073

6. TEST SET-UP PHOTOGRAPHS

6.1. General Measurement Test Set-Up



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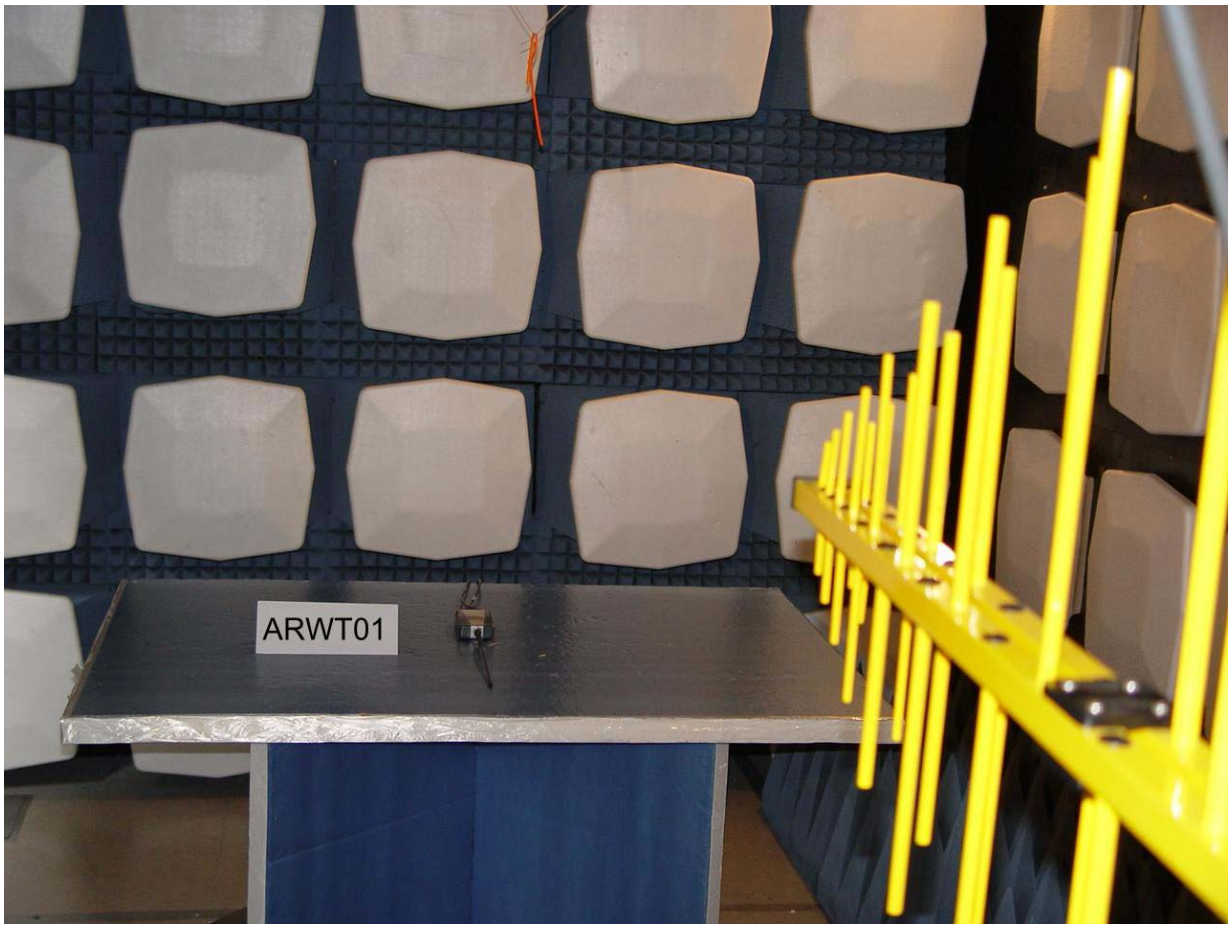
6.2. Unwanted Emissions (30 MHz - 5 GHz)



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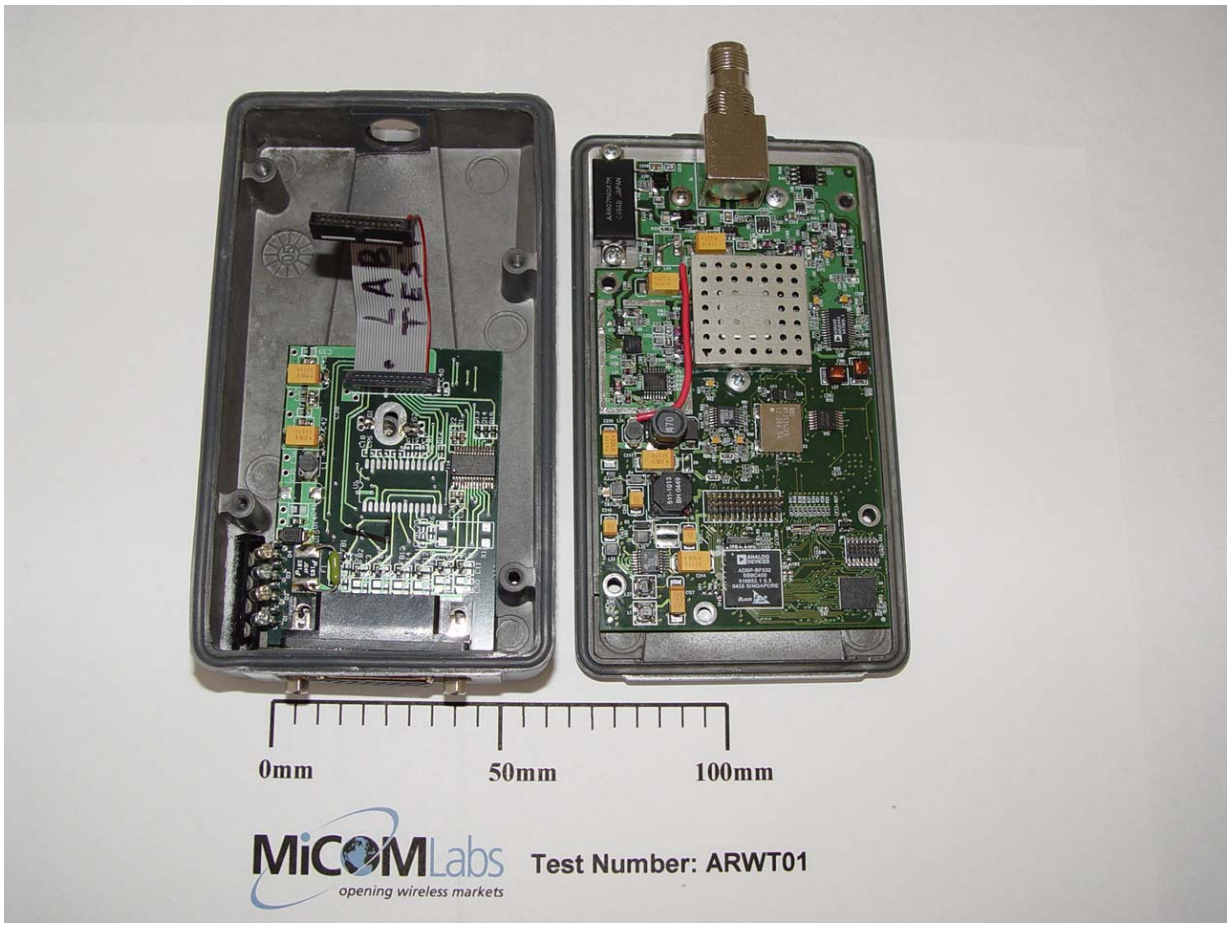
6.3. AW400 Internal Photographs – pcb Topside



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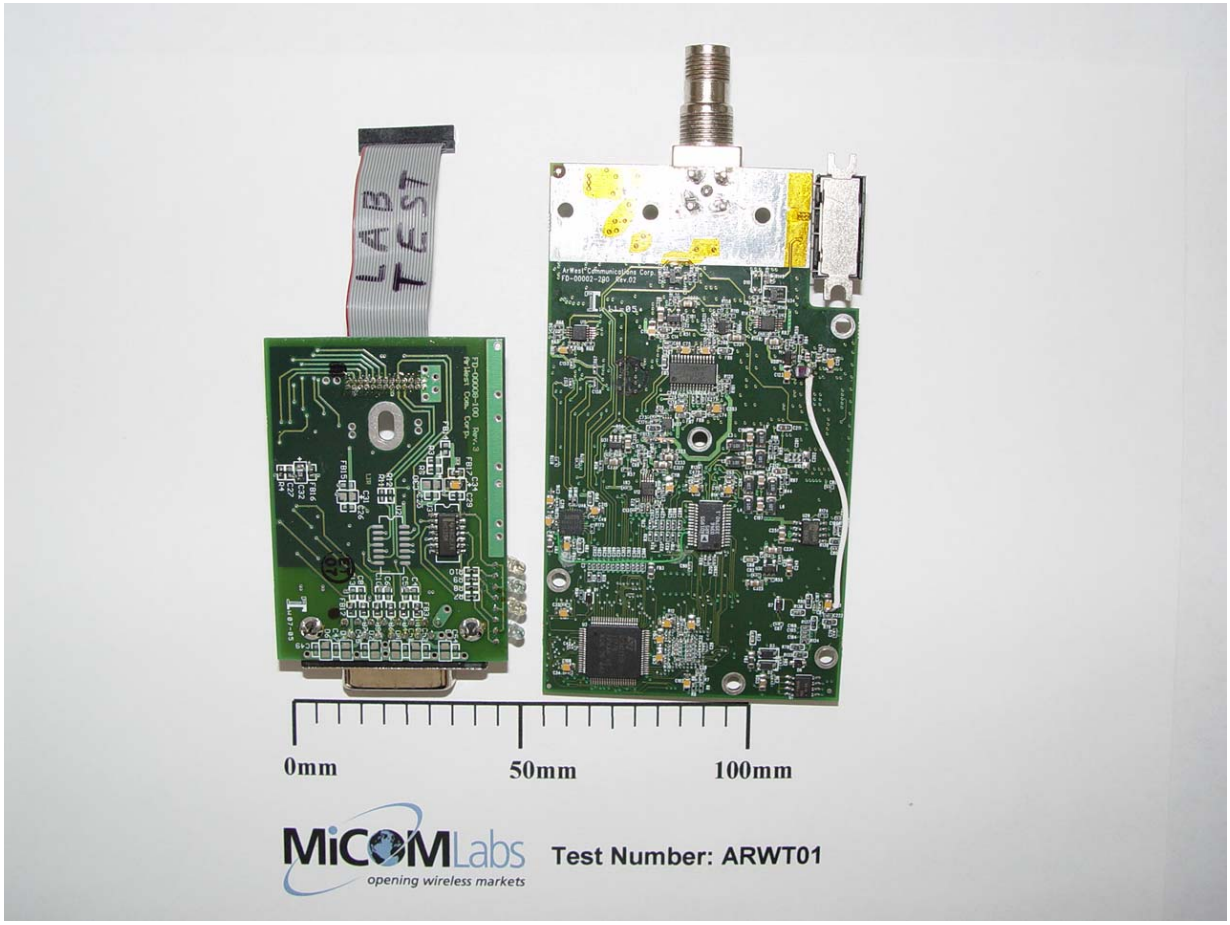
6.4. AW400 Internal Photographs – pcb Underside



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7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Calibration Due Date	Serial #
0070	Power Meter	Hewlett Packard	437B	13th May '06	3125U13554
0073	Power Supply	Hewlett Packard	HP 6574A	Not Applicable	US36340203
0078	Antenna (30M-2GHz)	Schaffner and Chase	CBLG140A	Not Applicable	1195
0090	Synthesized Signal Generator	Hewlett Packard	83640A	16-Aug-05	3036A00294
0098	Digital Oscilloscope	Hewlett Packard	HP 54810A	2nd Feb '06	US38100105
0104	1-18GHz Horn Antenna	The Electro-Mechanics Company	3115	12th Aug '05	9205-3882
0116	Power Sensor	Hewlett Packard	R8485A	7th Apr '06	3318A19694
0134	Amplifier	Com Power	PA 122	1st Sept '05	181910
0135	Attenuator	Weinschel	940-60-33	14th May '06	A6595
0156	Barometer /Thermometer	Control Co.	4196	12th Aug '05	E2844
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	1st Dec '05	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	3rd Apr '06	836679/006
0193	EMI Receiver	Rhode & Schwartz	ESI 7	8th Apr '06	838496/007
0251	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0252	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0253	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0256	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0293	BNC Cable	Megaphase	Unknown	18th Jun '05	Unknown
0305	Amplifier	ML	ML001	24th Nov '05	001
0307	BNC Cable	Megaphase	Unknown	18th Jun '05	Unknown
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	16th Dec '05	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	16th Dec '05	209092-001
0313	Coupler	Hewlett Packard	86205A	N/A	1623
0314	30dB N-Type Attenuator	NARDA	32319	N/A	--
Det1	Diode Detector	Hewlett Packard	HP423A	N/A	--
--	Demodulator	Linear Technology	DC468A	N/A	--
--	High Pass Filter	Mini Circuits	SHP - 700	N/A	--

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