TEST REPORT

FCC RULES Part 90, Part2

FCC ID : R72IM400

Report File No.	:	STROR-04-021
Date of Issue	:	Dec 17, 2004
Kind of Product	:	Private Land Mobile Radio for Vehicle (UHF)
Model Name	:	IM400
Manufacturer	:	E-TECH Co., Ltd.
Serial No.	:	-
Test Result	:	Complied

The results shown in this report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of company

SGS Testing Korea Co., Ltd.
18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea, 435-041
Tel. +82 31 428 5700 / Fax. +82 31 427 2371
http://www.sgstesting.co.kr

VERIFICATION OF COMPLIANCE

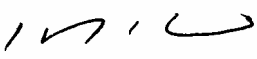
Applicant :	E-TECH Co., Ltd.
Kind of Product :	Private Land Mobile Radio for Vehicle (UHF)
Brand Name :	Lris
Model Name :	IM400
Model Difference :	-
Report File No. :	STROR-04-021
Date of test :	Nov 24, 2004 ~ Dec 17, 2004
Receiver EUT :	-

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC RULES Part 90, Part2	Compiled

The above equipment was tested by SGS Testing Korea Co., Ltd. for compliance with the requirements set forth in the FCC RULES Part90, Part2. The results of testing in this report apply to the product system that was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By: *Date* Dec 17, 2004

Feel Jeong

Approved By  *Date* Dec 17, 2004

James Kwon

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1. Description of EUT

IM400 has a compact size with a various features in range of 420.000~500.000MHz. IM400 has a various features shown as below

IM400 constructed with a microprocessor controlled, temperature compensated Phase Locked Loop (PLL)frequency synthesizer. A special integrated circuit provides supports to sub-audible signaling (CTCSS & DCS) and most of the receiving parts are switched off periodically in the power save mode to battery current drain standby.

2. General Information of EUT

Transceiver

Power Supply	DC 13.6V
Operating Frequency	420.000MHz ~500.000MHz
Transmit Power	5W(low)/50W(high)
Modulation of Channels	FM
Channel spacing	12.5kHz and 25kHz
Emission	8K5F3E/ 16K0F3E
Communication method	Simplex
Number of Channels	255channels
Antenna Type	External

3. Test Procedure

The test procedures are performed following the test stands ANSI/EIA-603, if applicable.

3.1 Output Power Conducted FCC 2.1046(a),FCC 90.205

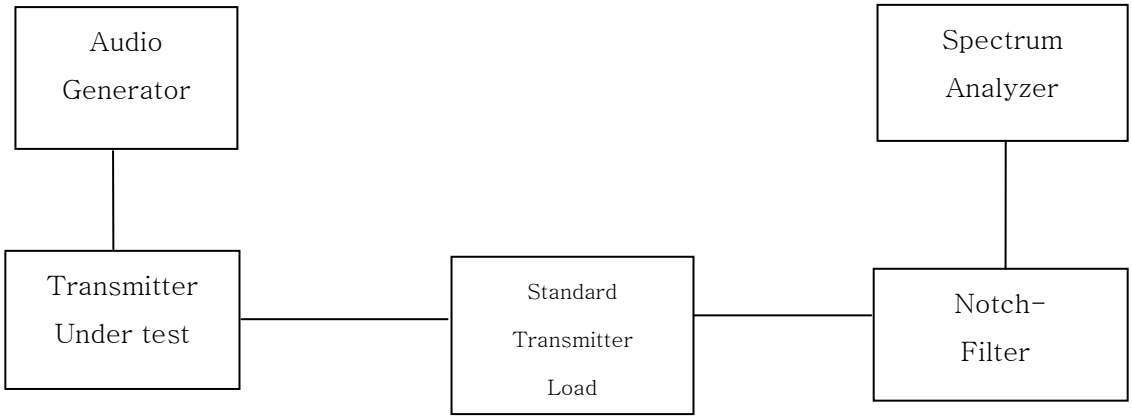
The conducted RF output power is the available power at the output terminals of the transmitter when the output terminals are corrected to the standard transmitter load.
The test sample is feeding a 50 ohm coaxial attenuator which is connected to a spectrum analyzer.
The power output at the transmitter antenna port is determined by adding the value of the attenuator to the spectrum analyzer reading.
The test are performed at the frequencies(low, middle, high channels of the EUT operating band) and full rated power levels of the transmitter.

3.2 Radiated Spurious Emissions FCC 2.1053, FCC 90.210

Radiated spurious emissions are emissions from the EUT when transmitting in non-radiating load on frequencies outside the operating band.
ERP measurement of spurious emission the general substitution method as described at 2.4.2.
In order to suppress inter-modulation products in the spectrum analyzer a notch filter is used, if applicable.

3.3 Conducted Spurious Emissions FCC 2.1051

Conducted spurious emissions are emissions at the antenna terminal on frequencies outside the operating band. The test is performed according the principle below using a computer controlled test set-up.



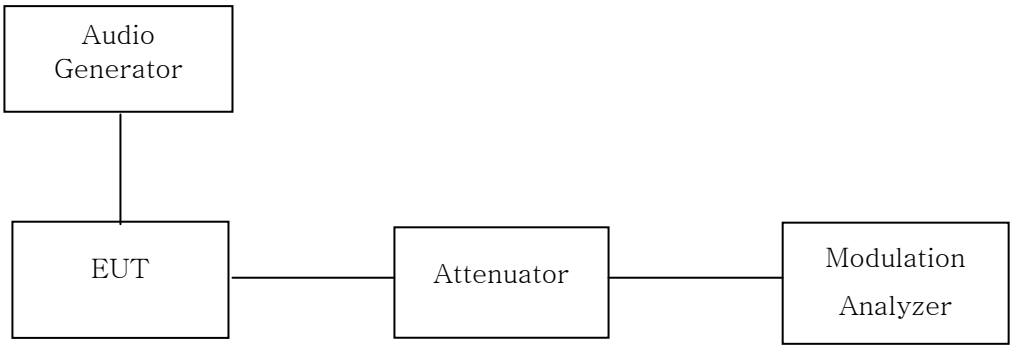
The transmitter is modulated with 2500Hz sine wave at an input level 16Db greater than that necessary to produce 50% of rated system deviation.

3.4 Audio Frequency Response FCC 2.1047(a)

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.
The frequency response of the audio modulation part is adjusted to get 20% of the rated system deviation.

The deviations obtained over the frequency range from 100Hz to 5000Hz are recorded and compared with the reference deviation as follows:

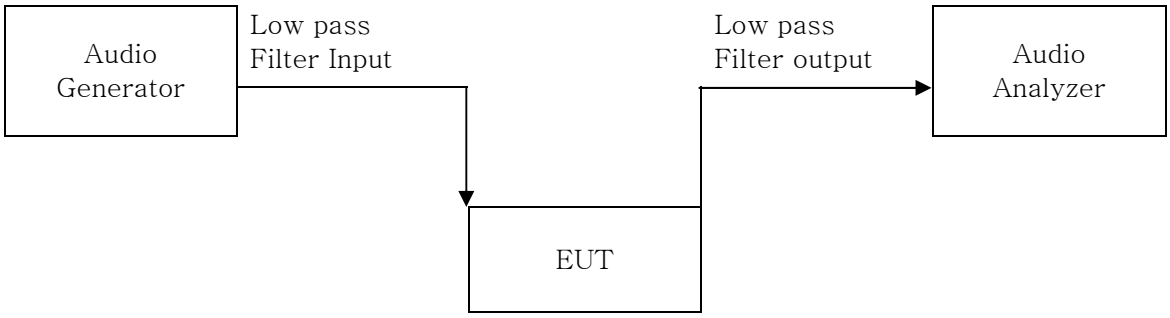
$$\text{Audio Frequency Response} = 20\log[DEV_{Freq} / DEV_{ref}]$$



3.5 Audio Low Pass Filter Frequency Response FCC 2.1047(a), FCC 90.242(b)(8)

The audio low pass filter response is the frequency response of the post limits low pass filter circuit above 3000Hz.

It is measured form 1kHz(reference point) to 50kHz with test set-up below.

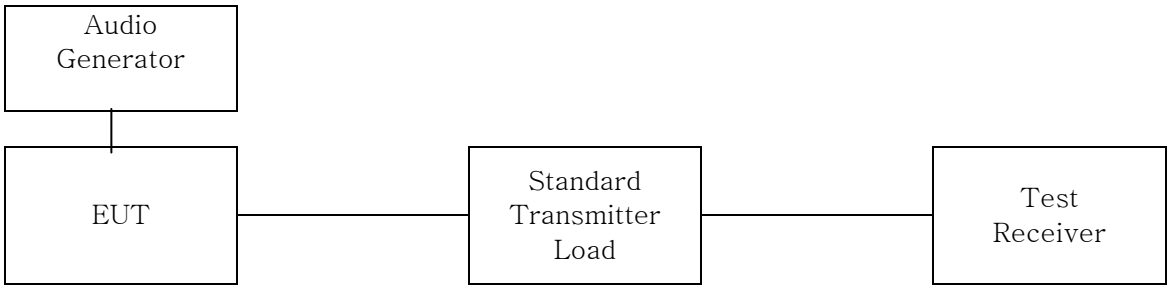


3.6 Modulation Limiting FCC 2.1047(b),22.915(b),90.210

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.

The modulation response is measured at certain modulation frequencies, related to 1000Hz reference signal. The basic setting is 60% of full rated deviation which will be increased the audio generator level from –20dBto 20dB in nine steps.

Tests are perform for positive and negative modulation.



3.7 Occupied Bandwidth FCC 2.1049,90.210

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0,5 percent of the total mean power radiated by a given emission.

The transmitter is modulated by a 2500Hz tone at an input level 16dB greater than that necessary to produce 50 percent modulation.

The input level shall be established at the frequency of maximum response of the audio modulating circuit.

Different emission masks are required.

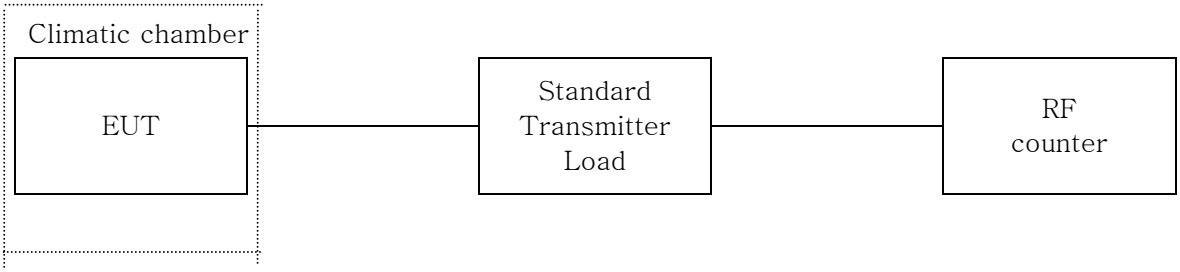
Emission Mask B for transmitters that are equipped with an audio low pass filter.

Emission Mask D for transmitters designed to operate with a 12.5 kHz bandwidth.

3.8 Frequency stability FCC 2.1055,FCC 90.213

The carrier frequency is the stability of the transmitter to maintain an assigned carrier frequency.

The frequency stability is measured with variation of ambient temperature from -30℃to+ 60℃.



3.9 Transient frequency behavior FCC 90.214

Transient frequency behavior is a measure of the difference, as a function in time, of the actual transmitter frequency to the assigned transmitter frequency behavior for a 30Db step during the switch on and switch off time.

4. Output Power Conducted FCC 2.1046(a), FCC90.205

Power Level [W]	Frequency [MHz]	Channel Spacing[kHz]	RF Output Power [W]	Nominal DC Voltage[V]
5W	420.000	25	5.70	13.6
	465.000	25	5.21	13.6
	500.000	25	5.30	13.6
50W	430.000	25	52.4	13.6
	465.000	25	52.9	13.6
	500.000	25	50.7	13.6

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Signal Generator	Agilent	E4438C	May. 2005
Power Meter	Agilent	E4416A	May. 2005
Power Sensor	Agilent	E9327A	May. 2005
DC Power Supply	Agilent	6674A	May. 2005

5.Radiated Spurious Emissions FCC 2.1053(a), FCC90.210

TX FREQ=420.000MHz Low Power Setting Channel Spacing 12.5kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
840.000	V	<-30	-20	>10
1260.000	V	<-30	-20	>10
1680.000	V	<-30	-20	>10
2100.000	V	<-30	-20	>10
2520.000	V	<-30	-20	>10
2940.000	V	<-30	-20	>10
3360.000	V	<-30	-20	>10
3780.000	V	<-30	-20	>10
4200.000	V	<-30	-20	>10

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	H/P	8593E	Aug. 2005
Signal Generator	Agilent	8648D	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

TX FREQE = 420.000 MHz High Power Setting Channel Spacing 12.5kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
840.000	V	<-30	-20	>10
1260.000	V	<-30	-20	>10
1680.000	V	<-30	-20	>10
2100.000	V	<-30	-20	>10
2520.000	V	<-30	-20	>10
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3360.000	V	<-30	-20	>10
3780.000	V	<-30	-20	>10
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Signal Generator	Agilent	8648D	May. 2005
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Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

TX FREQE =420.000 MHz Low Power Setting Channel Spacing 25kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
840.000	V	<-30	-13	>17
1260.000	V	<-30	-13	>17
1680.000	V	<-30	-13	>17
2100.000	V	<-30	-13	>17
2520.000	V	<-30	-13	>17
2940.000	V	<-30	-13	>17
3360.000	V	<-30	-13	>17
3780.000	V	<-30	-13	>17
4200.000	V	<-30	-13	>17

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Spectrum analyzer	H/P	8593E	Aug. 2005
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Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

TX FREQE =420.000 MHz High Power Setting Channel Spacing 25kHz

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840.000	V	<-30	-13	>17
1260.000	V	<-30	-13	>17
1680.000	V	<-30	-13	>17
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Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

TX FREQE = 465.000 MHz Low Power Setting Channel Spacing 12.5kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
930.000	V	<-30	-20	>10
1395.000	V	<-30	-20	>10
1860.000	V	<-30	-20	>10
2325.000	V	<-30	-20	>10
2790.000	V	<-30	-20	>10
3255.000	V	<-30	-20	>10
3720.000	V	<-30	-20	>10
4185.000	V	<-30	-20	>10
4650.000	V	<-30	-20	>10

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	H/P	8593E	Aug. 2005
Signal Generator	Agilent	8648D	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

TX FREQE = 460.000 MHz High Power Setting Channel Spacing 12.5kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
930.000	V	<-30	-20	>10
1395.000	V	<-30	-20	>10
1860.000	V	<-30	-20	>10
2325.000	V	<-30	-20	>10
2790.000	V	<-30	-20	>10
3255.000	V	<-30	-20	>10
3720.000	V	<-30	-20	>10
4185.000	V	<-30	-20	>10
4650.000	V	<-30	-20	>10

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	H/P	8593E	Aug. 2005
Signal Generator	Agilent	8648D	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

TX FREQE = 460.000MHz Low Power Setting Channel Spacing 25kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
930.000	V	<-30	-13	>17
1395.000	V	<-30	-13	>17
1860.000	V	<-30	-13	>17
2325.000	V	<-30	-13	>17
2790.000	V	<-30	-13	>17
3255.000	V	<-30	-13	>17
3720.000	V	<-30	-13	>17
4185.000	V	<-30	-13	>17
4650.000	V	<-30	-13	>17

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Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
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Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
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DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
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Anechoic Chamber	Seo Young EMC	-	-

TX FREQE = 500.000 MHz Low Power Setting Channel Spacing 12.5kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
1000.000	V	<-30	-20	>10
1500.000	V	<-30	-20	>10
2000.000	V	<-30	-20	>10
2500.000	V	<-30	-20	>10
3000.000	V	<-30	-20	>10
3500.000	V	<-30	-20	>10
4000.000	V	<-30	-20	>10
4500.000	V	<-30	-20	>10
5000.000	V	<-30	-20	>10

Test Equipment Used

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Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
1000.000	V	<-30	-20	>10
1500.000	V	<-30	-20	>10
2000.000	V	<-30	-20	>10
2500.000	V	<-30	-20	>10
3000.000	V	<-30	-20	>10
3500.000	V	<-30	-20	>10
4000.000	V	<-30	-20	>10
4500.000	V	<-30	-20	>10
5000.000	V	<-30	-20	>10

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Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
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Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
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DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
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TX FREQE = 500.000 MHz Low Power Setting Channel Spacing 25kHz

Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
1000.000	V	<-30	-13	>17
1500.000	V	<-30	-13	>17
2000.000	V	<-30	-13	>17
2500.000	V	<-30	-13	>17
3000.000	V	<-30	-13	>17
3500.000	V	<-30	-13	>17
4000.000	V	<-30	-13	>17
4500.000	V	<-30	-13	>17
5000.000	V	<-30	-13	>17

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	H/P	8593E	Aug. 2005
Signal Generator	Agilent	8648D	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
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DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
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TX FREQE = 500.000 MHz High Power Setting Channel Spacing 25kHz

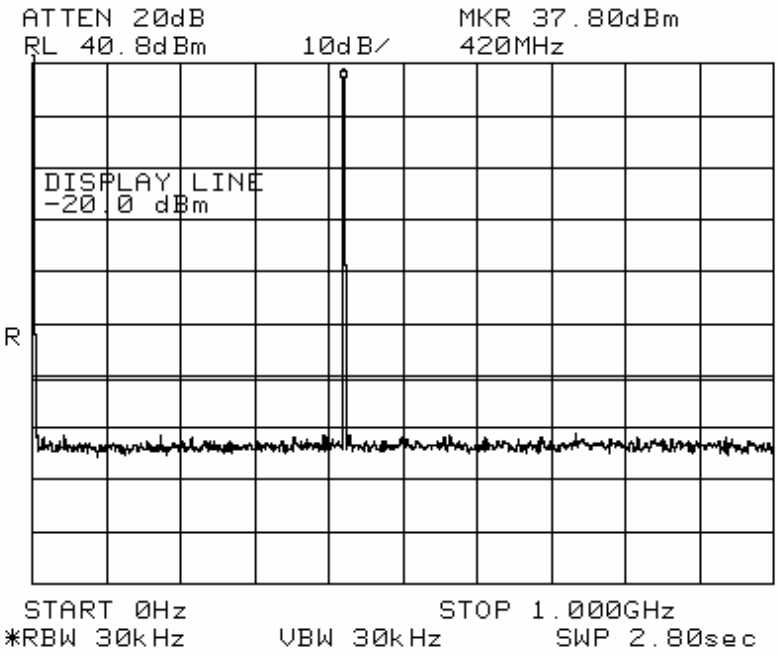
Frequency [MHz]	Polarization	Max. Power Value [dBm]	Specification Limit [dBm]	Margin [dB]
1000.000	V	<-30	-13	>17
1500.000	V	<-30	-13	>17
2000.000	V	<-30	-13	>17
2500.000	V	<-30	-13	>17
3000.000	V	<-30	-13	>17
3500.000	V	<-30	-13	>17
4000.000	V	<-30	-13	>17
4500.000	V	<-30	-13	>17
5000.000	V	<-30	-13	>17

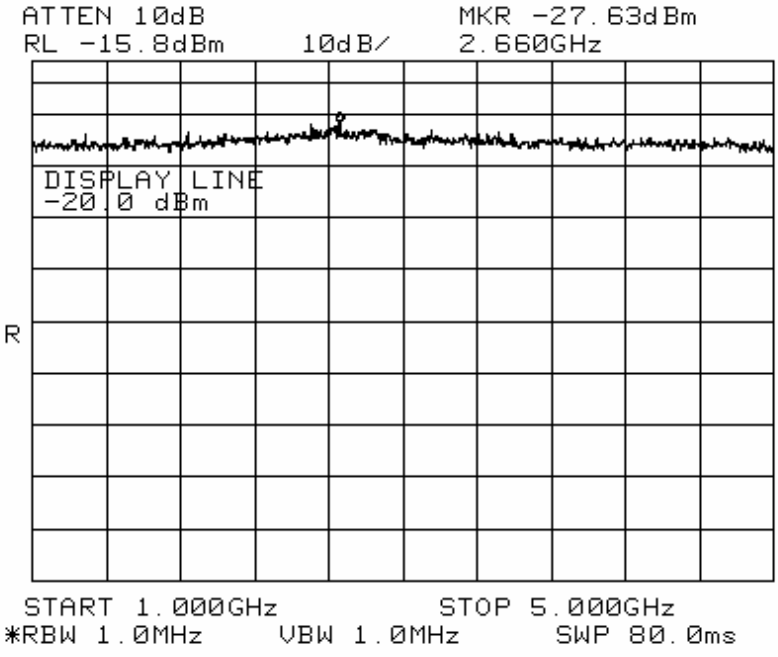
Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	H/P	8593E	Aug. 2005
Signal Generator	Agilent	8648D	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dipole Antenna	Schwarzbeck Mess	UHAP	May. 2005
Dummy Load	BIRD	8404	Dec. 2005
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Horn Antenna	Schwarzbeck	BBHA9120A	Jul. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Jan. 2005
Biconical Antenna	EMCO	3104C	Feb. 2005
Log-periodic	S/B	UHALP9107	Jan. 2005
DC Power Supply	Dea Gil Electron	DGP-300	Aug. 2005
Anechoic Chamber	Seo Young EMC	-	-

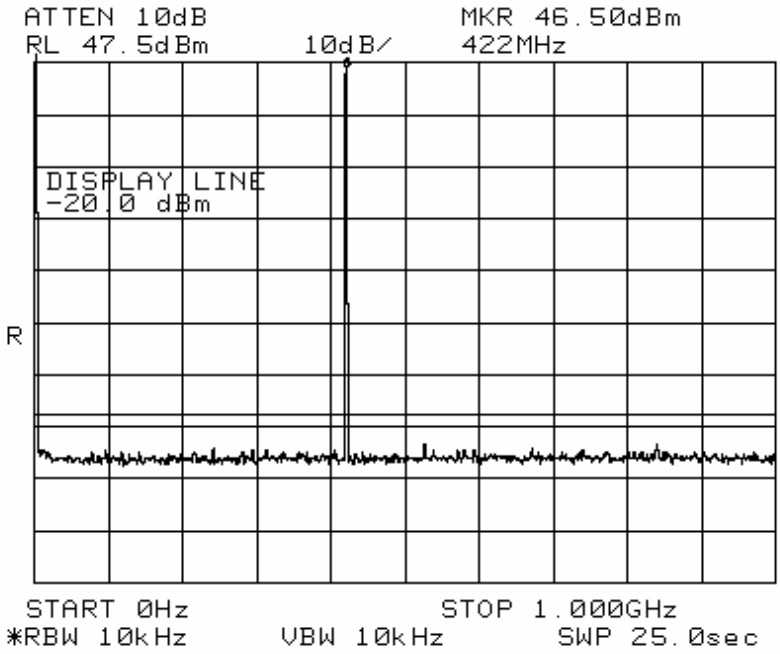
6.Conducted Spurious Emissions FCC 2.1051, FCC90.210(b) (d)

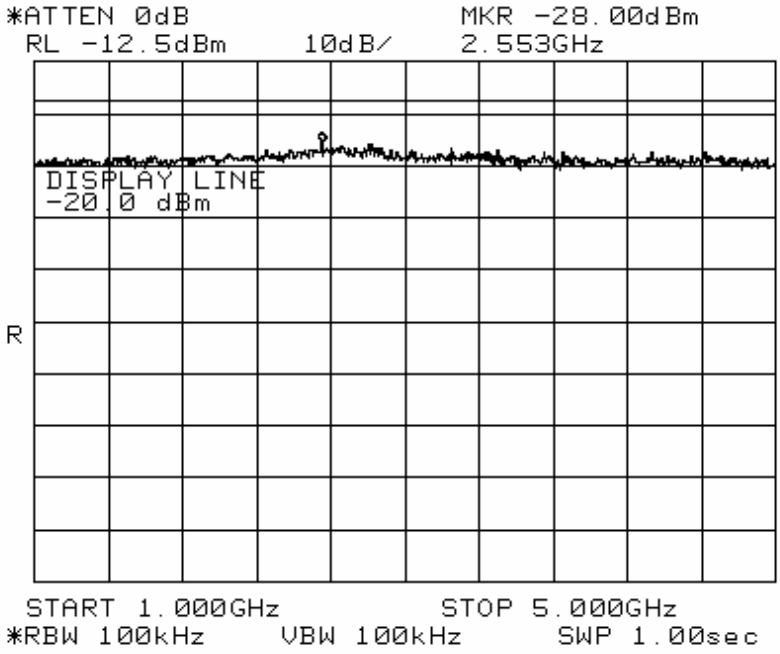
TX FREQ=420.000 MHz Low Power Setting Channel Spacing 12.5kHz



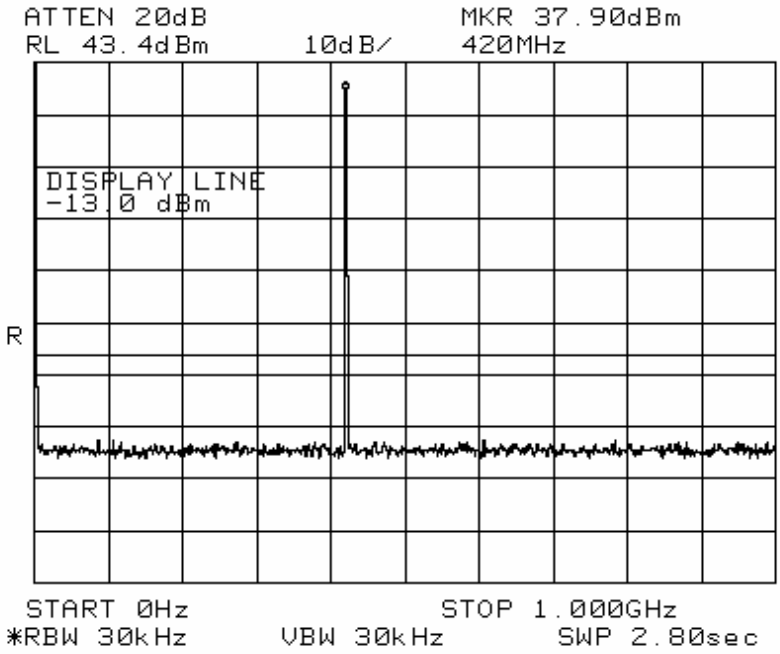


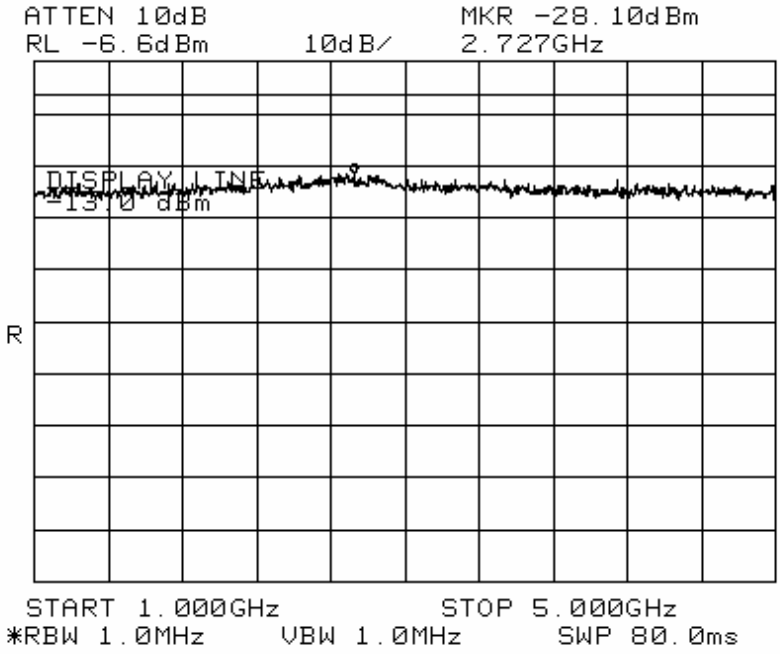
TX FREQE = 420.000 MHz High Power Setting Channel Spacing 12.5kHz



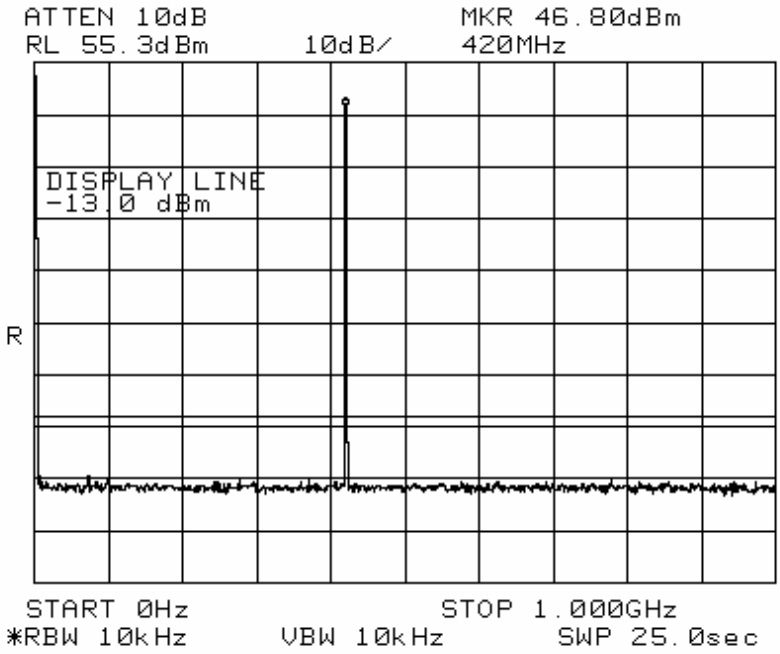


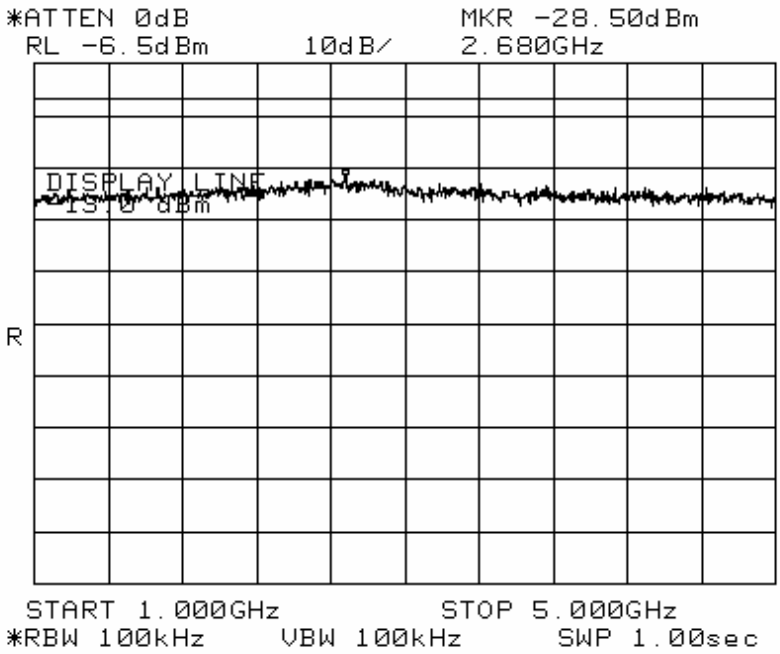
TX FREQE =420.000 MHz Low Power Setting Channel Spacing 25kHz



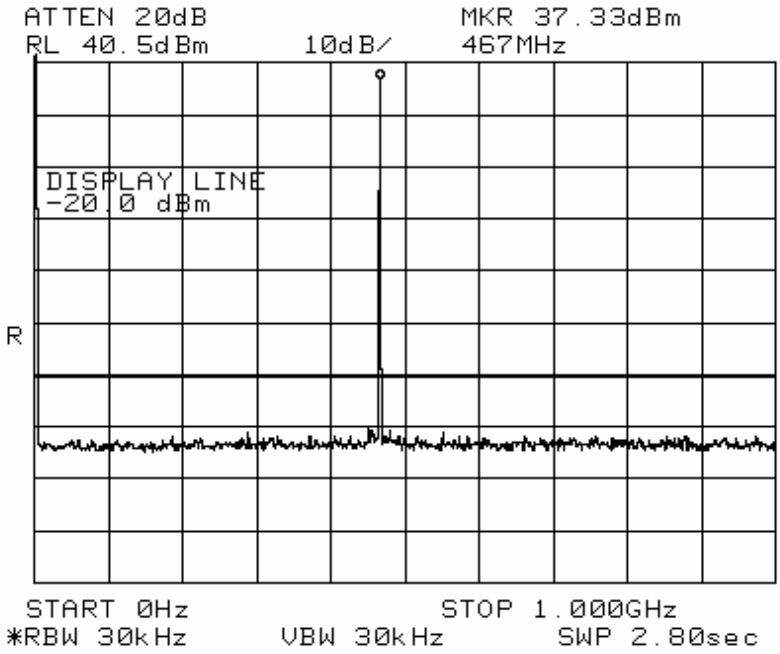


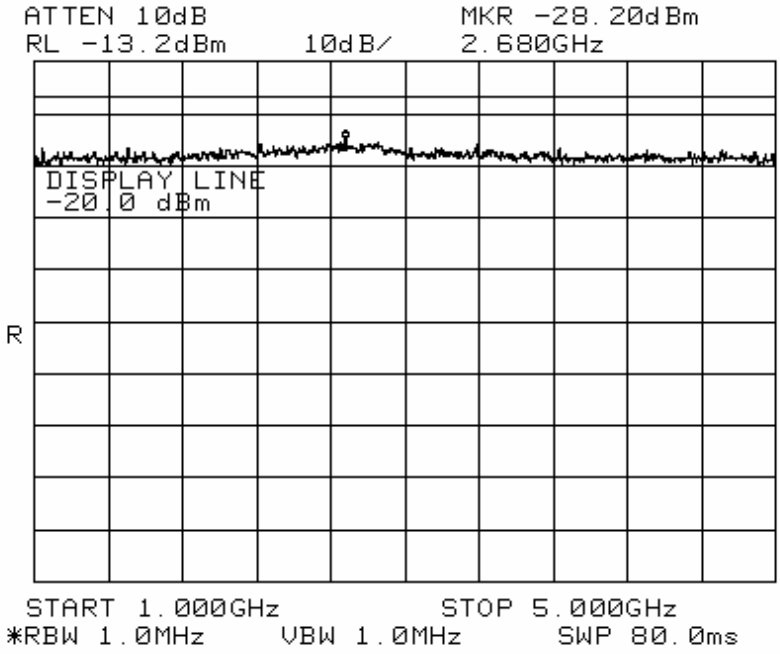
TX FREQE= 420.000 MHz High Power Setting Channel Spacing 25kHz



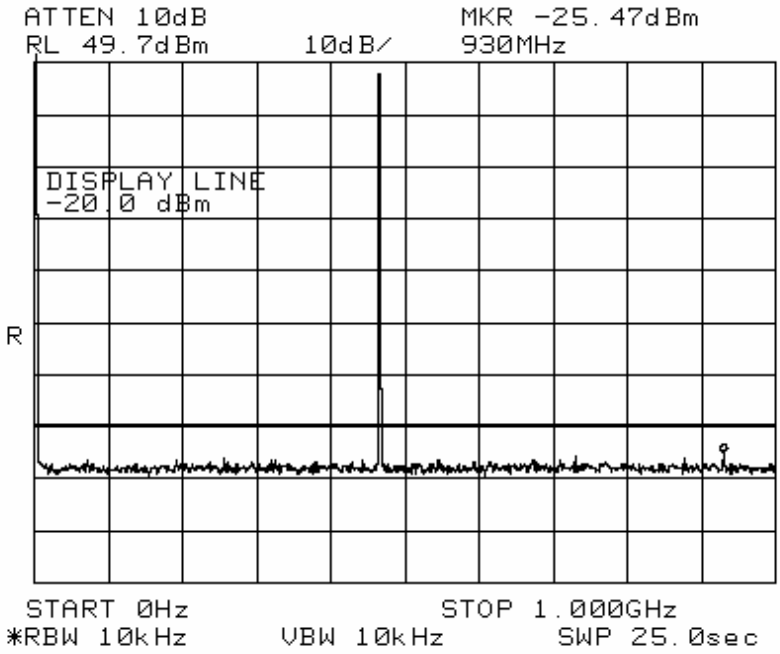


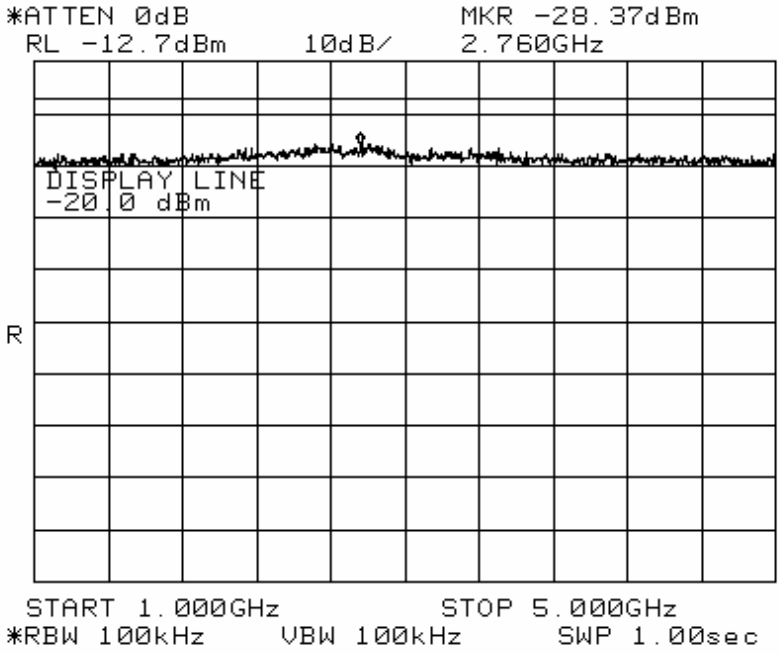
TX FREQE = 465.000 MHz Low Power Setting Channel Spacing 12.5kHz



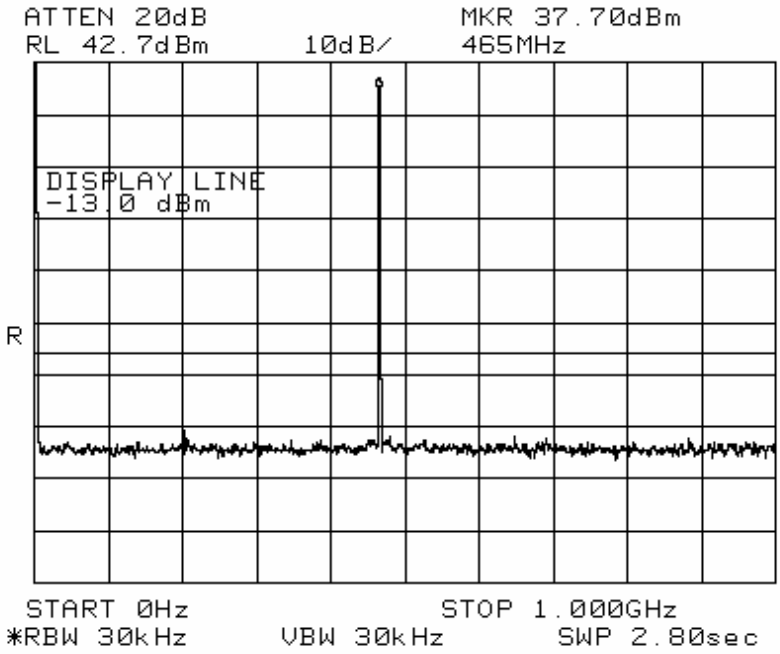


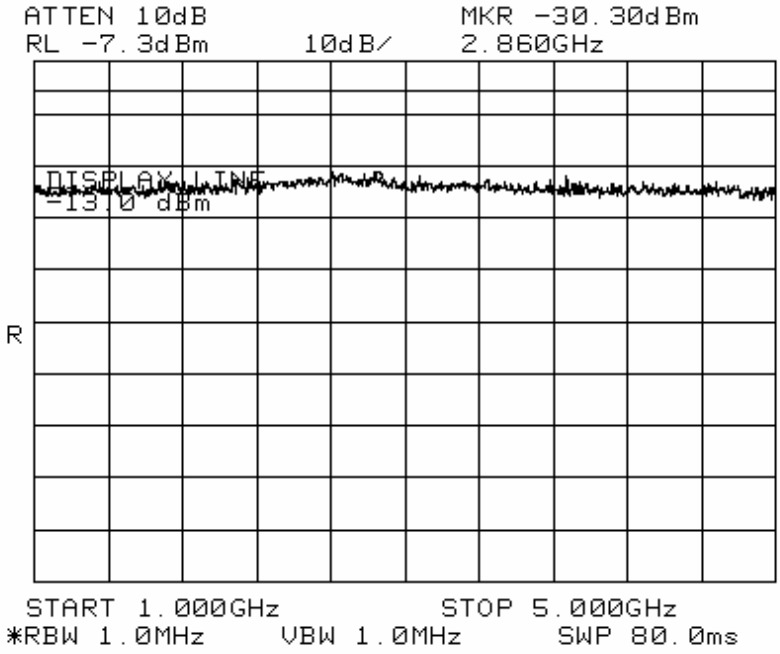
TX FREQE = 465.000 MHz High Power Setting Channel Spacing 12.5kHz



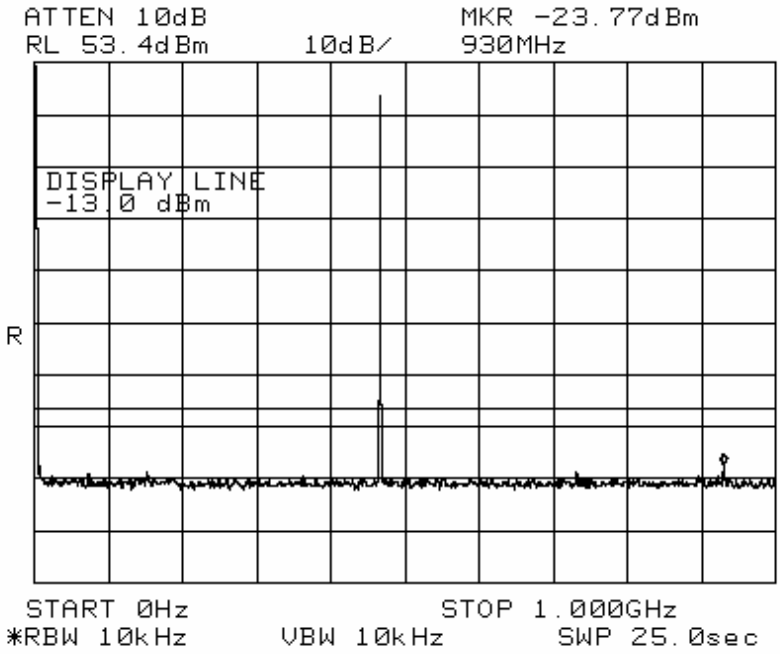


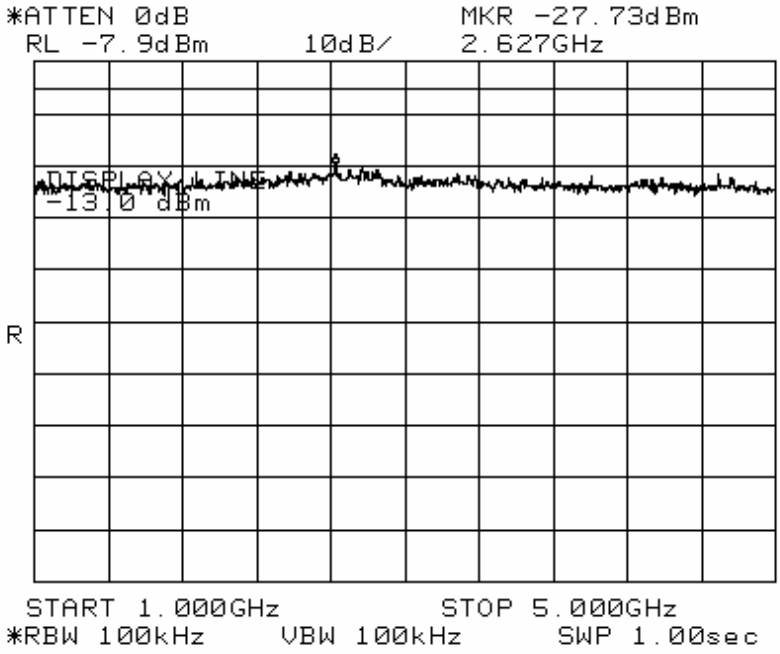
TX FREQE = 465.000 MHz Low Power Setting Channel Spacing 25kHz



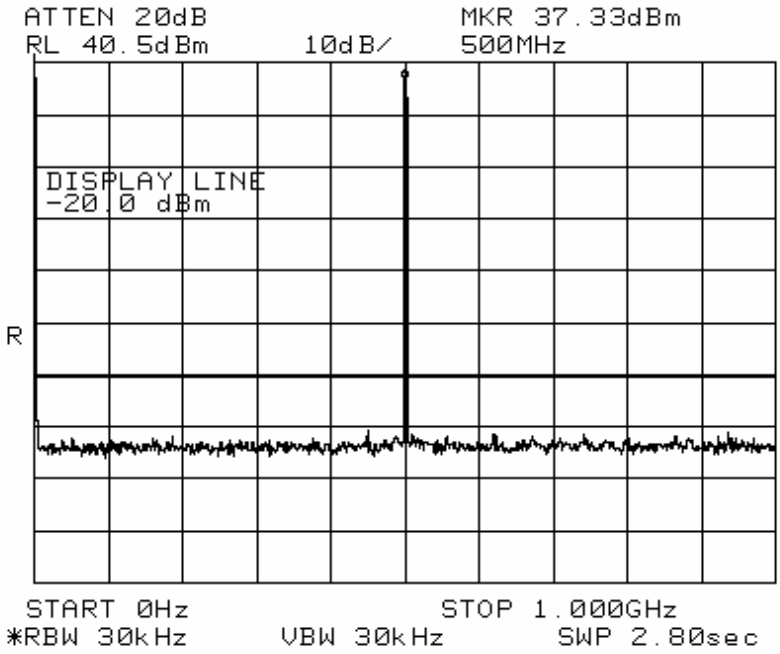


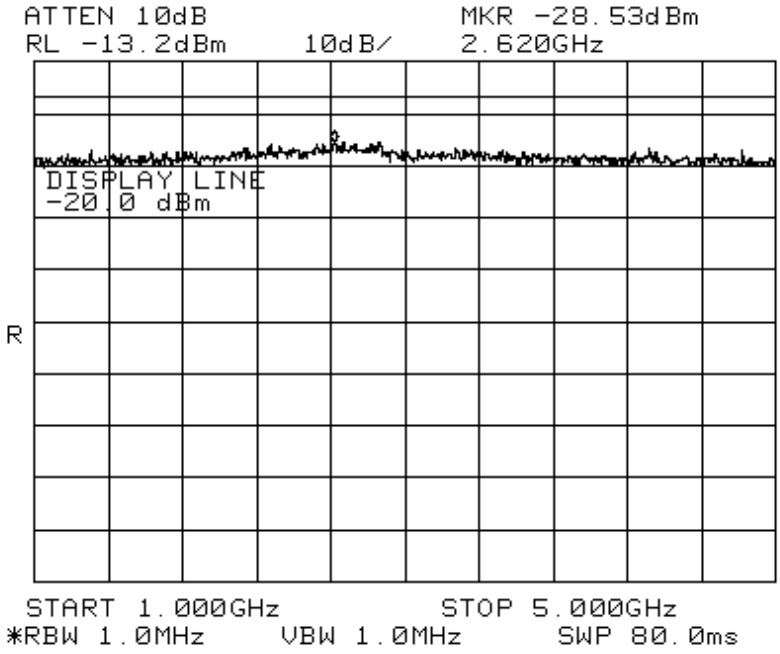
TX FREQE = 465.000 MHz High Power Setting Channel Spacing 25kHz



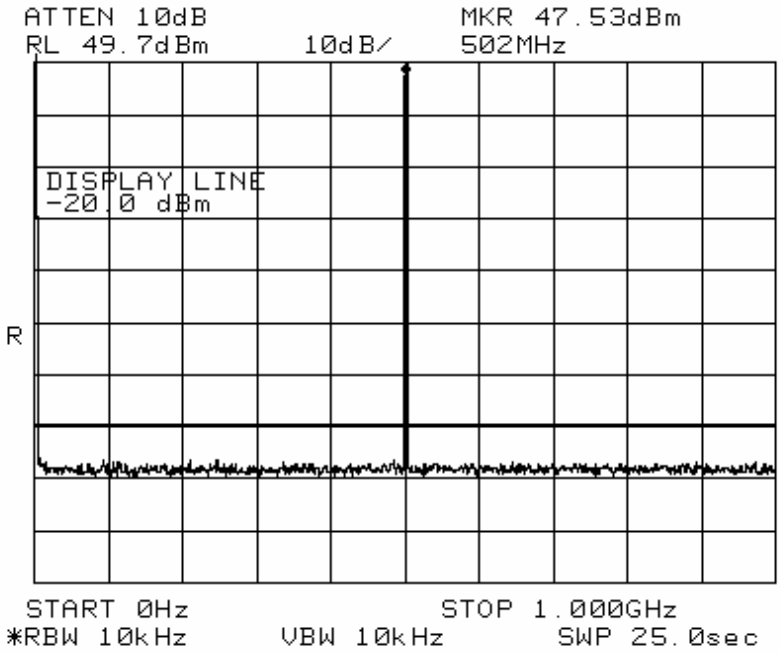


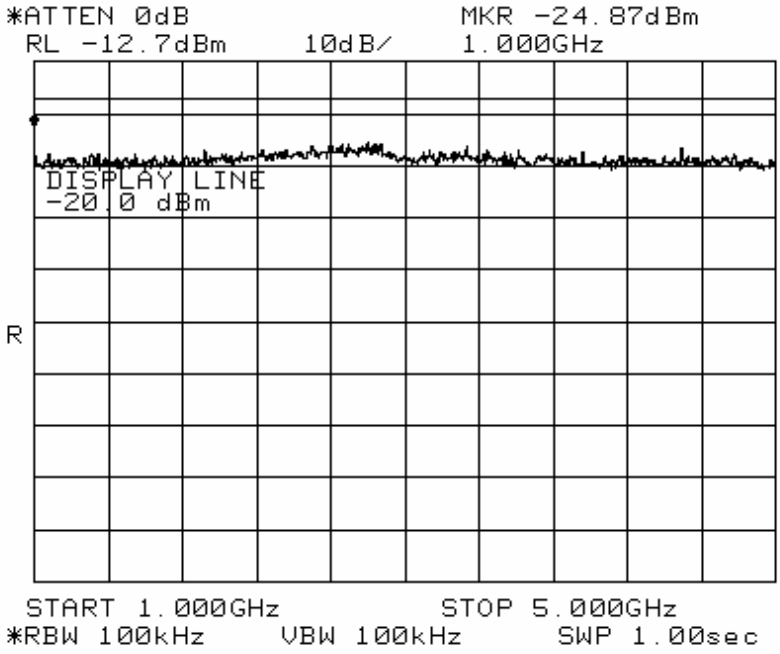
TX FREQE = 500.000 MHz Low Power Setting Channel Spacing 12.5kHz



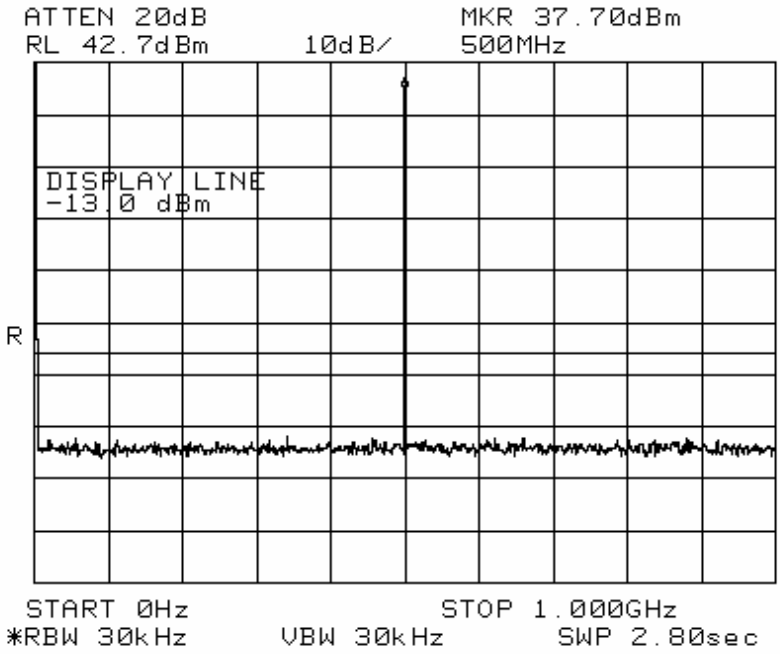


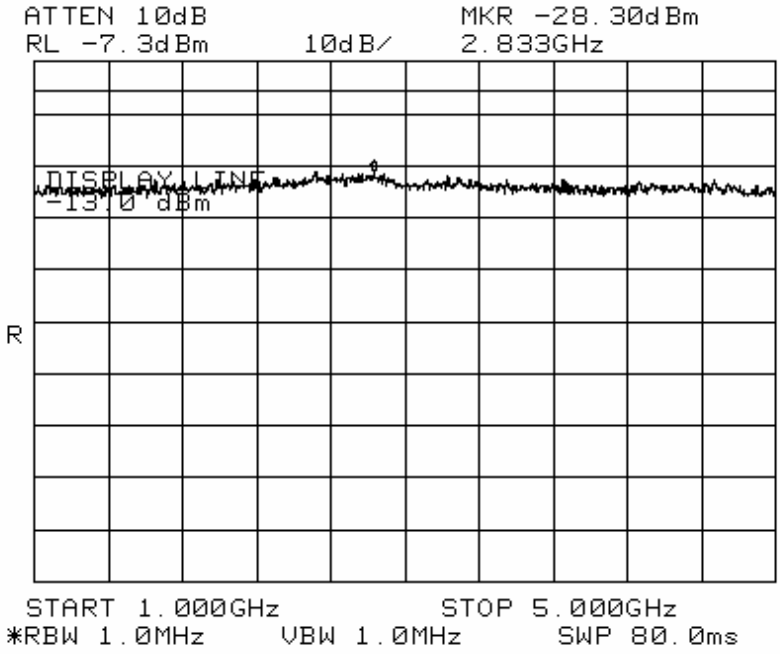
TX FREQE = 500.000 MHz High Power Setting Channel Spacing 12.5kHz



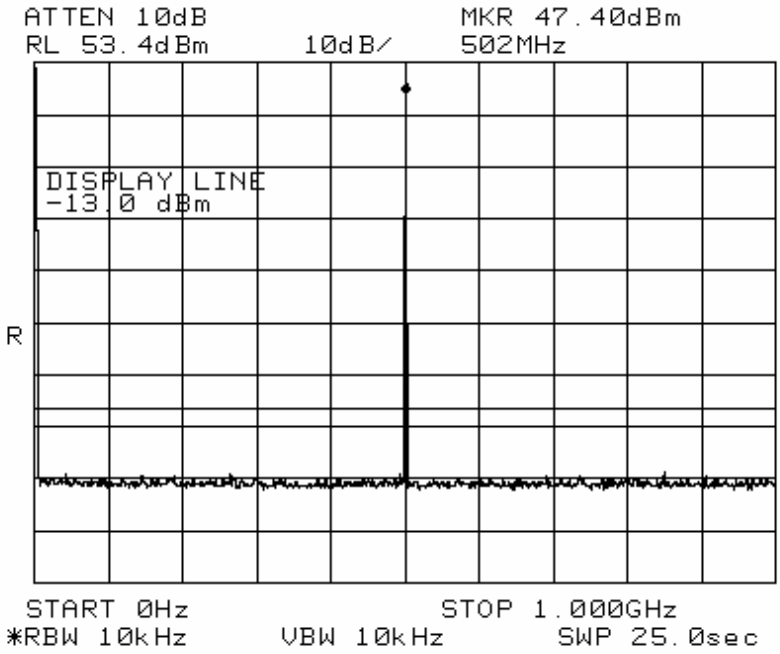


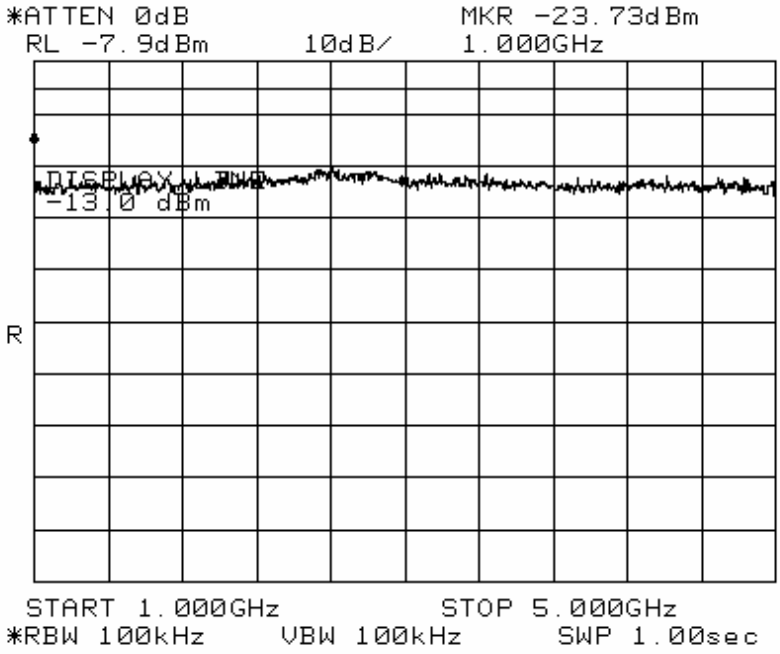
TX FREQE = 500.000 MHz Low Power Setting Channel Spacing 25kHz





TX FREQE = 500.000 MHz High Power Setting Channel Spacing 25kHz





Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
Function Generator	Agilent	33220A	May. 2005
DC Power Supply	Agilent	6674A	May. 2005

7.Audio Frequency Response FCC 2.1.047(a)

Operating Frequency : 465.000 MHz

Channel : Middle

Nominal DC Voltage: 13.6Vdc

Audio frequency [Hz]	Channel spacing 12.5kHz		Channel spacing 25kHz	
	Measured Deviation [kHz]	Calculated Response [dB]	Measured Deviation [kHz]	Calculated Response [dB]
100	0.051	-19.84	0.061	-24.29
200	0.058	-18.73	0.056	-25.04
300	0.098	-14.17	0.149	-16.53
400	0.149	-10.53	0.240	-12.40
500	0.190	-8.42	0.349	-9.14
600	0.245	-6.21	0.468	-6.59
700	0.308	-4.72	0.589	-4.61
800	0.377	-2.90	0.731	-2.73
900	0.439	-1.33	0.869	-1.23
1000	0.501	0	1.001	0
2000	1.109	6.90	2.223	6.94
2500	1.349	8.60	2.701	8.63
3000	1.308	8.33	2.613	8.34
4000	0.051	-19.84	0.061	-24.29
5000	0.063	-18.01	0.067	-23.48

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
Function Generator	Agilent	33220A	May. 2005
DC Power Supply	Agilent	6674A	May. 2005

8.Audio Low Pass Filter Frequency Response FCC 2.1047(a), FCC 90.210

Operating Frequency : 465.000 MHz

Channel : Middle Nominal DC Voltage: 13.6 Vdc

Audio frequency [kHz]	Channel spacing 12.5kHz	Channel spacing 25kHz
	Response [dB]	Response [dB]
1	0	0
2	1.45	1.41
3	-0.77	-0.79
4	-27.34	-33.07
5	-30.12	-34.10
6	-32.47	-31.00
7	-38.10	-36.81
8	-45.70	-43.01
9	-49.22	-48.81
10	-53.11	-50.00
20	<-60	-53.71
30	<-60	<-60
50	<-60	<-60

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Audio Analyzer	H/P	8903B	Dec. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
Function Generator	Agilent	33220A	May. 2005
DC Power Supply	Agilent	6674A	May. 2005

9.Modulation Limiting FCC 2.1047(b), FCC 22.915(b), FCC 90.242(b)(8)

Operating Frequency : 465.000 MHz

Channel : Middle Nominal DC Voltage:13.6 Vdc

12.5kHz channel spacing

Audio input level Relative[dB]	Positive peak deviation [kHz]			Negative peak deviation [kHz]		
	300Hz	1000Hz	3000Hz	300Hz	1000Hz	3000Hz
-20	0.070	0.206	0.499	0.066	0.202	0.478
-15	0.080	0.326	0.850	0.071	0.313	0.819
-10	0.109	0.550	1.324	0.103	0.517	1.315
-5	0.142	0.941	1.441	0.134	0.899	1.440
0	0.228	1.499	1.452	0.217	1.502	1.459
5	0.370	1.761	1.457	0.353	1.847	1.466
10	0.617	1.801	1.456	0.601	1.911	1.469
15	1.037	1.815	1.459	1.024	1.915	1.460
20	1.462	1.802	1.449	1.480	1.914	1.463

25kHz channel spacing

Audio input level Relative[dB]	Positive peak deviation [kHz]			Negative peak deviation [kHz]		
	300Hz	1000Hz	3000Hz	300Hz	1000Hz	3000Hz
-20	0.091	0.368	0.951	0.081	0.350	0.920
-15	0.109	0.621	1.659	0.104	0.581	1.601
-10	0.159	1.072	2.662	0.150	1.001	2.649
-5	0.244	1.861	2.922	0.230	1.759	2.954
0	0.401	3.001	2.949	0.382	3.004	2.981
5	0.684	3.591	2.946	0.647	3.780	2.997
10	1.182	3.665	2.949	1.120	3.908	2.991
15	1.956	3.683	2.942	1.942	3.937	2.982
20	2.849	3.681	2.948	2.823	3.937	2.983

Limits:

Channel spacing [kHz]	Rated frequency deviation [kHz]
12.5	2.5
25	5

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
Function Generator	Agilent	33220A	May. 2005
DC Power Supply	Agilent	6674A	May. 2005

10.Occupied Bandwidth FCC 2.1049, FCC 90.210

High power mode

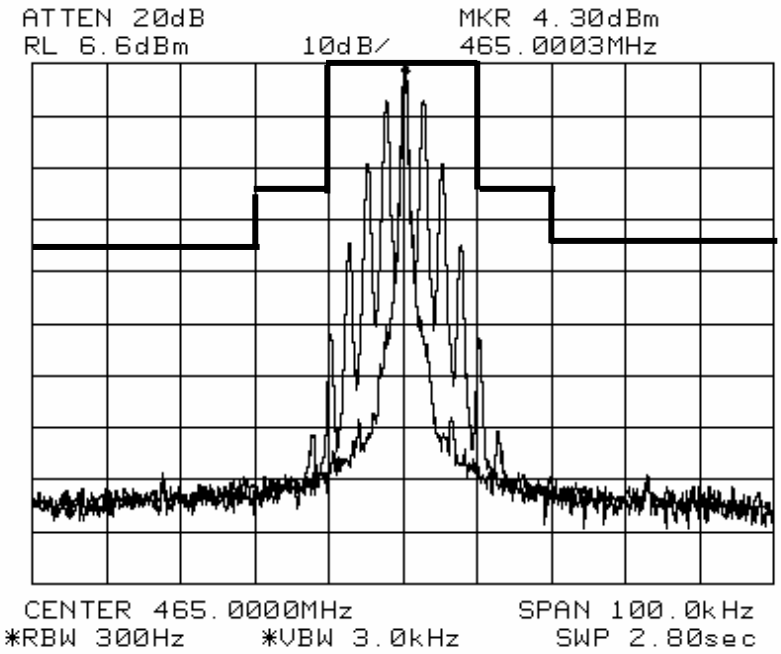
Frequency Channel	Occupied Bandwidth Mask D Channel spacing 12.5kHz	Occupied Bandwidth Mask B Channel spacing 25kHz
Middle	Pass	Pass

Operating Frequency : 465.000 MHz

Channel : Middle Nominal DC Voltage: 13.6Vdc

MAX POWER SETTING

MASK B CHANNEL SPACING = 25kHz



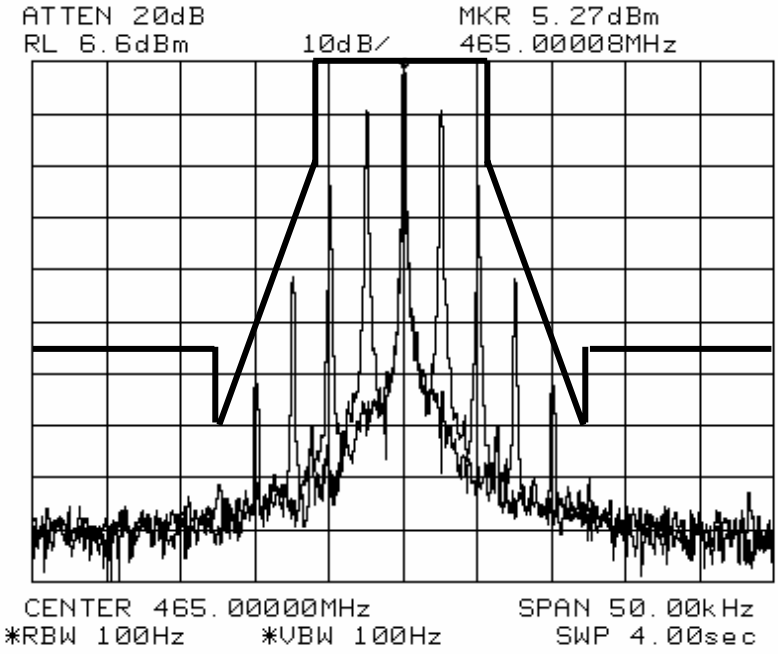
Limits: Are determined by used emission mask.

Operating Frequency : 465.000 MHz

Channel : Middle Nominal DC Voltage: 13.6Vdc

MAX POWER SETTING

MASK D CHANNEL SPACING = 12.5kHz



Limits: Are determined by used emission mask.

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
Function Generator	Agilent	33220A	May. 2005
DC Power Supply	Agilent	6674A	May. 2005

11.Frequency Stability FCC 90.213, FCC2.1055, FCC 22.915(b)

Voltage [%]	Voltage [V]	Temperature [deg C]	Measured Frequency [MHz]	Frequency Error [ppm]
100%	13.6V	-30	465.000114	0.25
100%	13.6V	-20	465.000073	0.16
100%	13.6V	-10	465.000071	0.15
100%	13.6V	0	465.000063	0.14
100%	13.6V	+ 10	465.000036	0.07
100%	13.6V	+ 20	465.000044	0.09
100%	13.6V	+ 30	465.000018	0.04
100%	13.6V	+ 40	464.999990	-0.02
100%	13.6V	+ 50	464.999963	-0.08
100%	13.6V	+ 60	464.999978	-0.05
85%	11.56V	+ 20	465.000036	0.14
115%	15.64V	+ 20	465.000014	0.03

Limits:

Channel spacing [kHz]	Frequency error [ppm]
12.5	2.5
25	5

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum Analyzer	H/P	8565E	Dec. 2005
Frequency Counter	Anritsu	MF2414B	Dec. 2005
Temperature Chamber	Han-Gil Technique	HGTP-4050	Dec. 2005
DC Power Supply	Agilent	6674A	May. 2005

12.Transient Frequency Behaviour of the Transmitter FCC 90.214

Limits:

Time intervals[1,2]	Maximum Frequency Difference[3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behaviour for Equipment Designed to Operate on 25kHz Channel			
t_1[4] ----------	±25.0kHz	5.0 ms	10.0 ms
t_2 ----------	±12.5kHz	20.0 ms	25.0 ms
t_3[4] ----------	±25.0kHz	5.0 ms	10.0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 12,5kHz Channel			
t_1[4] ----------	±12.5kHz	5.0 ms	10.0 ms
t_2 ----------	±6.25kHz	20.0 ms	25.0 ms
t_3[4] ----------	±12.5kHz	5.0 ms	10.0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 6.25kHz Channel			
t_1[4] ----------	±6.25kHz	5.0 ms	10.0 ms
t_2 ----------	±3.125kHz	20.0 ms	25.0 ms
t_3[4] ----------	±6.25kHz	5.0 ms	10.0 ms

[1] t_{on} is the instant when a 1kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on}.

t_2 is the time period immediately following t_1.

t_3 is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1kHz test signal starts to rise.

[2] During the time from the end of t_2 to the beginnig of t_3, the frequency difference must not exceed the limits specified in §90.213.

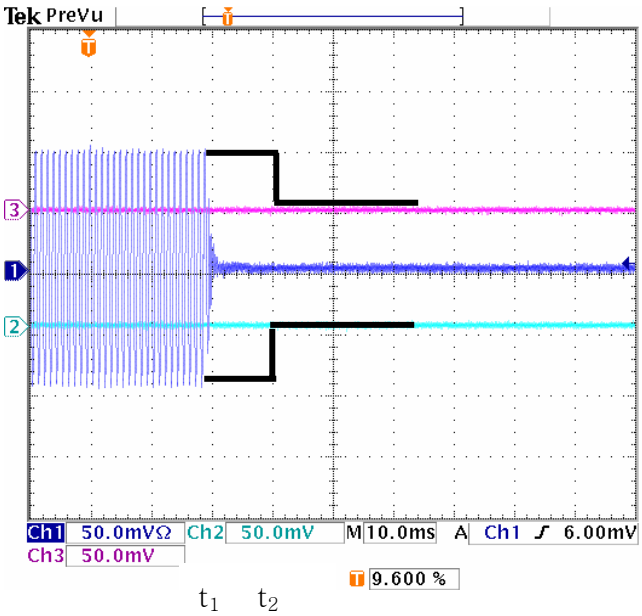
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency .

[4] If the transmitter carrier output power rating is 6watts or less, the frequency difference during this time may exceed the maximum frequency difference for this period.

Plot

CH1 Narrow

Switching from OFF to ON (t_1 & t_2)



Channel separation

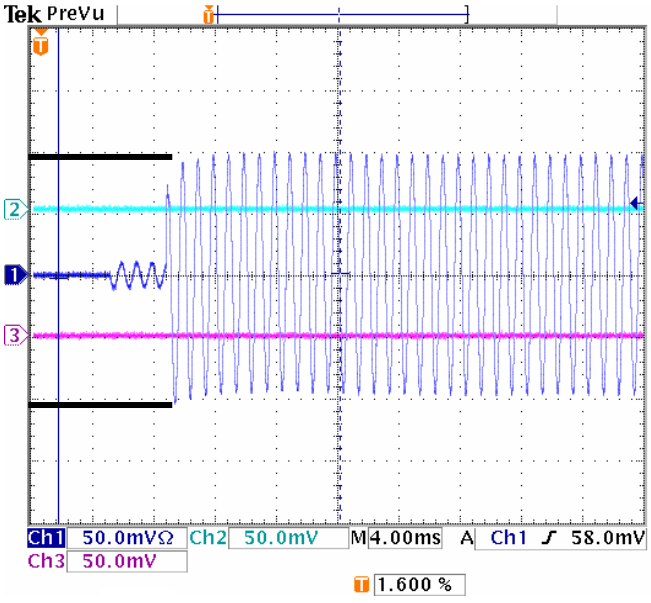
1/2 Channel separation

1/2 Channel separation

Channel separation

t_1 t_2

Switching from ON to OFF (t_3)



Channel separation

1/2 Channel separation

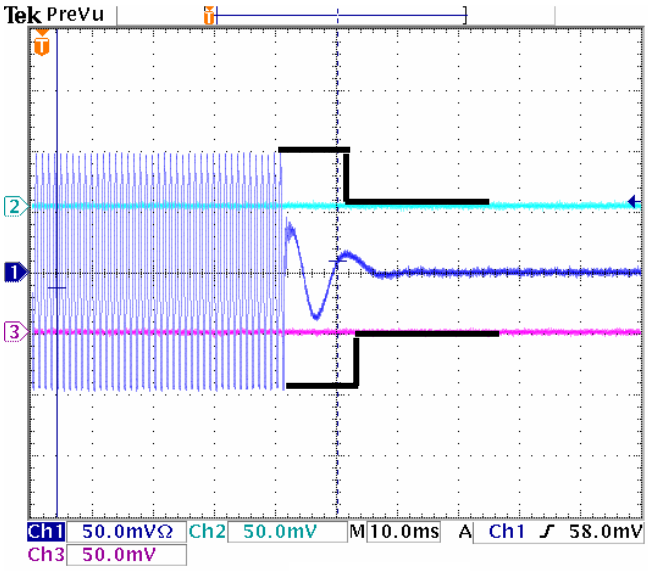
1/2 Channel separation

Channel separation

t_3

CH3 Narrow

Switching from OFF to ON (t_1 & t_2)



Channel separation

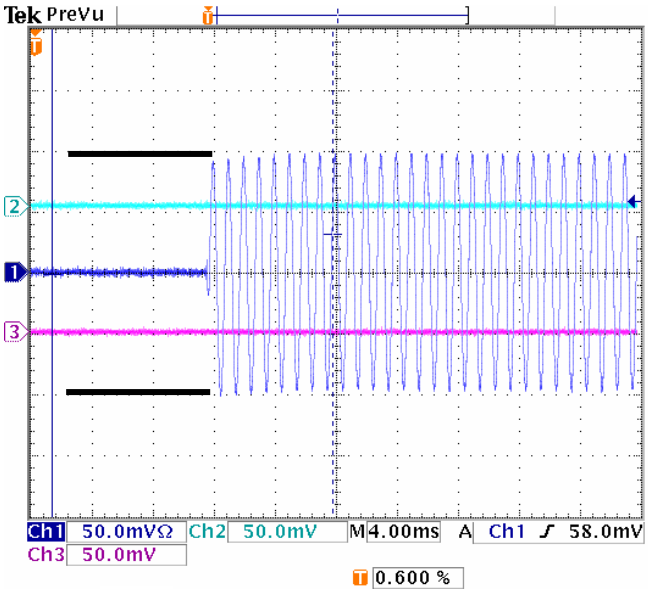
1/2 Channel separation

1/2 Channel separation

Channel separation

t_1 t_2

Switching from ON to OFF (t_3)



Channel separation

1/2 Channel separation

1/2 Channel separation

Channel separation

t_3

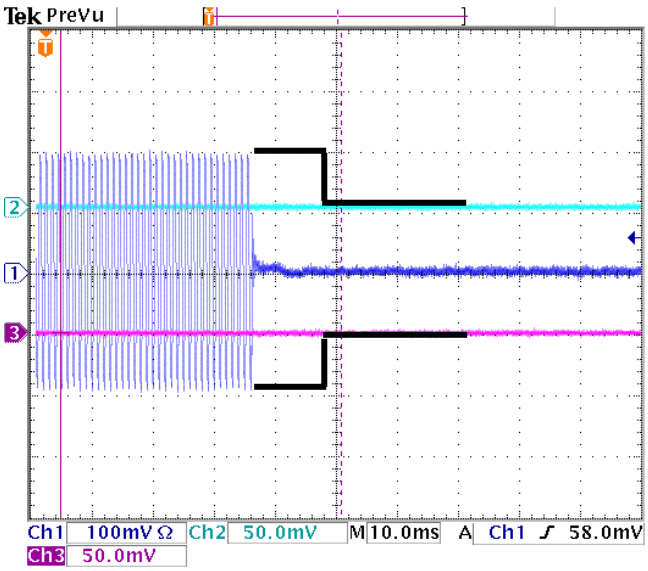
Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Signal Generator	Agilent	E4438C	May. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
DC Power Supply	Agilent	6674A	May. 2005
Digital Phosphor Oscilloscope	Tektronix	TDS3054B	May. 2005

Plot

CH1 Wide

Switching from OFF to ON (t_1 & t_2)



Channel separation

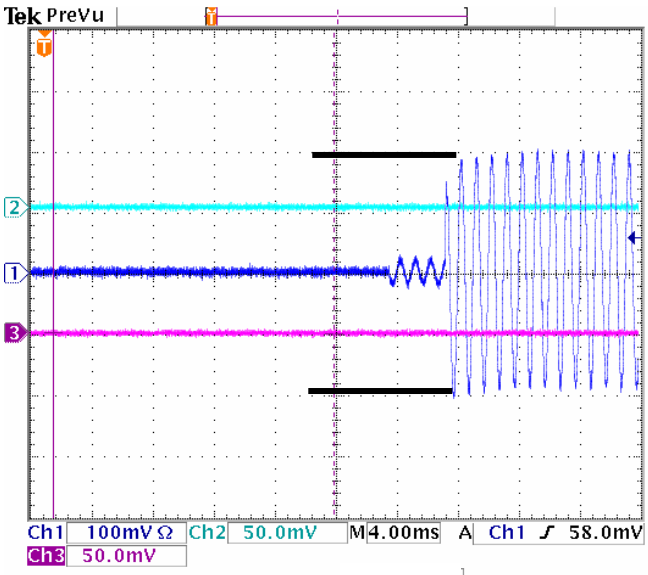
1/2 Channel separation

1/2 Channel separation

Channel separation

t_1 t_2

Switching from ON to OFF (t_3)



Channel separation

1/2 Channel separation

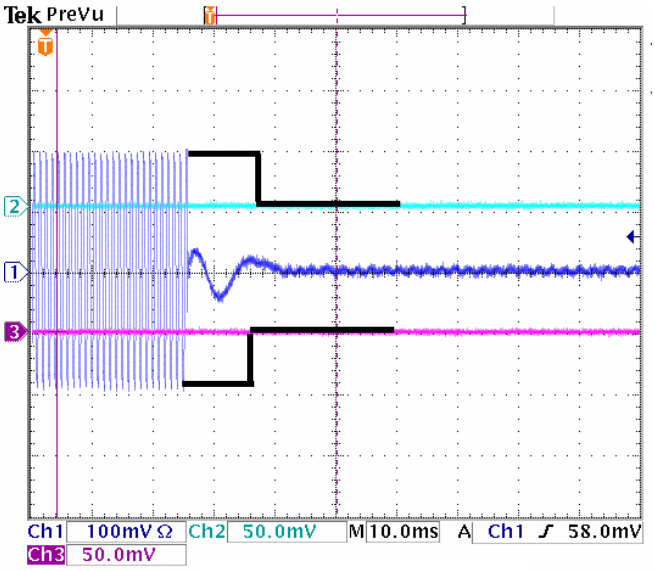
1/2 Channel separation

Channel separation

t_3

CH3 Wide

Switching from OFF to ON (t_1 & t_2)



Channel separation

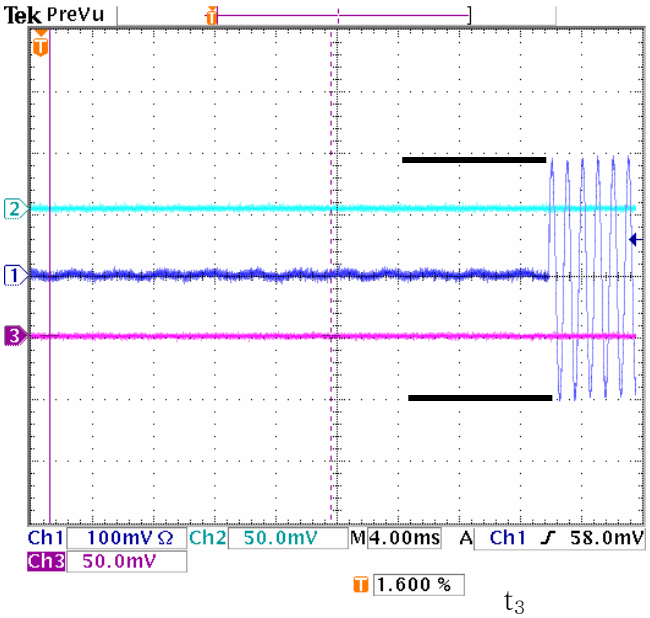
1/2 Channel separation

1/2 Channel separation

Channel separation

t_1 t_2

Switching from ON to OFF (t_3)



Channel separation

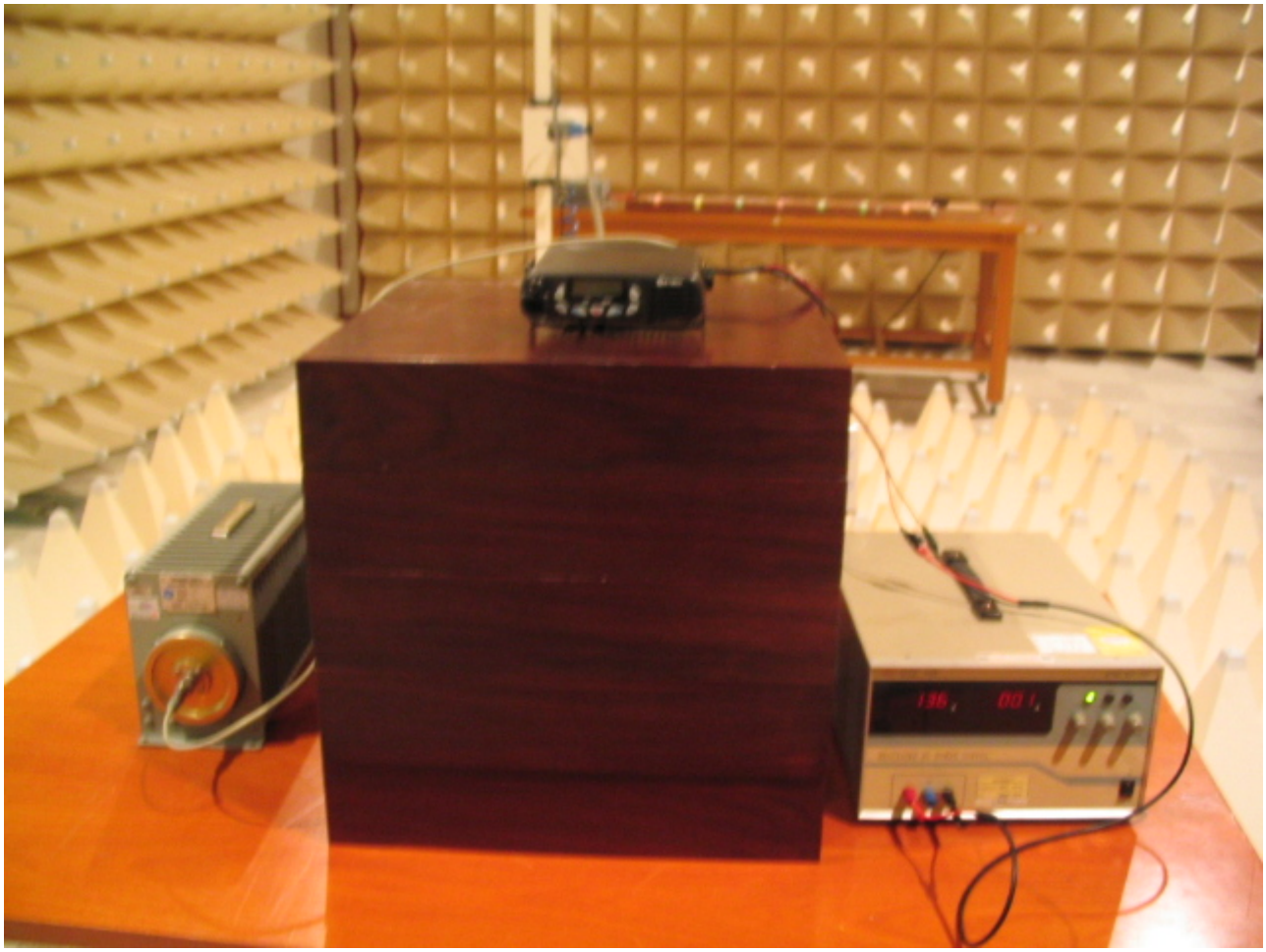
1/2 Channel separation

1/2 Channel separation

Channel separation

t_3

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Signal Generator	Agilent	E4438C	May. 2005
Modulation Analyzer	H/P	8901B	Dec. 2005
DC Power Supply	Agilent	6674A	May. 2005
Digital Phosphor Oscilloscope	Tektronix	TDS3054B	May. 2005

13. Attachment A – Photos of the test setup