



TEST REPORT NO: RU1156/6043
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FCC ID: Q639505A

**REPORT ON THE CERTIFICATION TESTING OF AN
IRIDIUM SATELLITE LLC
MONACO HANDSET
WITH RESPECT TO
THE FCC RULES CFR 47, PART 25**

TEST DATE: 28th January 2005 – 3rd February 2005

TESTED BY: J CHARTERS

APPROVED BY: P GREEN
PRODUCT MANAGER
EMC

DATE: 14th February 2005

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TRL COMPLIANCE SERVICES LTD EMC DIVISION

LONG GREEN FORTHAMPTON GLOUCESTER GL19 4QH UNITED KINGDOM

TELEPHONE +44 (0)1684 833818 FAX +44 (0)1684 833858

E-MAIL test@trlcompliance.com www.trlcompliance.com



FS 21805

CONTENTS

	PAGE	
CERTIFICATE OF CONFORMITY & COMPLIANCE	3	
APPLICANT'S SUMMARY	4	
EQUIPMENT TEST CONDITIONS	5	
TESTS REQUIRED	5	
PRODUCT DESCRIPTION & STANDARDS REFERENCES	6	
TEST RESULTS – Transmitter		
RF Output Power - Conducted	7	
Emissions Limitations - Conducted	8	
Spurious Emissions - Conducted	9	
Spurious Emissions - Radiated	10	
Frequency Stability -Temperature	11	
Frequency Stability -Voltage	12	
		ANNEX
PHOTOGRAPHS		A
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST		B
TEST EQUIPMENT LIST		C
TEST COMMANDS		D
DUTY CYCLE		E
EMISSIONS LIMITATIONS		F
TRANSMITTER SPURIOUS EMISSIONS – Conducted		G
TRANSMITTER SPURIOUS EMISSIONS – Radiated		H
FREQUENCY STABILITY – Temperature		I
FREQUENCY STABILITY – Voltage		J
Notes:		
1. Component failure during test	YES	☐
	NO	☒
2. If Yes, details of failure:		
3. The facilities used for the testing of the product contain in this report are FCC Listed.		



CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	Q639505A
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC Rules CFR 47, Part 25
TEST RESULT:	Compliant to Specification
ITU EMISSIONS DESIGNATOR	41K7V7E
EQUIPMENT UNDER TEST:	Monaco Handset
EQUIPMENT TYPE:	Satellite Telephone
MAXIMUM OUTPUT	11.15dBW, 41.15dBm, 13.03W
ANTENNA TYPE:	Part No: Radiated Antenna Type - C7032-GR082 Conducted Antenna Type - C7032-GR080
CHANNEL SPACING:	41.667 kHz
NUMBER OF CHANNELS:	252
MODULATION TYPE:	V7E
POWER SOURCE(s):	+3.7 Vdc
TEST DATE(s):	28 th January 2005 – 3 rd February 2005
ORDER No(s):	EU3087
APPLICANT:	Iridium Satellite LLC
ADDRESS:	6701 Democracy Blvd. Suite 500 Bethesda United States of America MD 20817
TESTED BY:	----- J CHARTERS
APPROVED BY:	----- P GREEN PRODUCT MANAGER EMC

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Monaco Handset
EQUIPMENT TYPE:	Satellite Telephone
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC Rules CFR 47, Part 25
TEST RESULT:	COMPLIANT Yes ☒ No ☐
APPLICANT'S CATEGORY:	MANUFACTURER ☒ IMPORTER ☐ DISTRIBUTOR ☐ TEST HOUSE ☐ AGENT ☐
APPLICANT'S CONTACT PERSON(s):	Mr C Geibel
E-mail address:	Conrad.geibel@iridium.com
APPLICANT:	Iridium Satellite LLC
ADDRESS:	6701 Democracy Blvd. Suite 500 Bethesda United States of America MD 20817
TEL:	+1 301 571 6277
FAX:	+1 301 571 6250
MANUFACTURER:	Iridium Satellite LLC
DEVELOPMENT AGENT	Cambridge Consultants Limited
DEVELOPMENT AGENT S CONTACT PERSON(s):	Mr P Williams
E-mail address:	paul.williams@cambridgeconsultants.com
ADDRESS:	Science Park Milton Road Cambridge CB4 4DW United Kingdom
TEL:	+44 (0)1223 420024
FAX:	+44 (0)1223 423373
EUT(s) COUNTRY OF ORIGIN:	United States
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	28 th January 2005 – 3 rd February 2005
TEST REPORT No:	RU1156/6043

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.	TEST/EXAMINATION	FCC Part 2	FCC Part 25	APPLICABILITY	RESULT
	RF Power Output	-	25.204 (a)	YES	PASS
	Emissions Limitations	-	25.202 (f)	YES	PASS
	Spurious Emissions at Antenna Terminals	2.1051	25.202 (f) 25.213	YES	PASS
	Protection of the Radio Navigation Satellite Service	-	25.216(c) 25.216(f)	YES	PASS
	Spurious Emissions Radiated	2.1053	25.202 (f) 25.213	YES	PASS
	Frequency Stability Temperature	2.1055	25.202 (d)	YES	PASS
	Frequency Stability Voltage	2.1055	25.202 (d)	YES	PASS

Note: The Monaco handset is subject to FCC Part 25 & Part 2 for FCC Certification for units marketed within the United States. The above tests, as specified in FCC Part 2, with limits as defined in FCC Part 25 were performed on the Monaco handset.

- | | | | |
|----|----------------------|---|----------|
| 2. | Product Use: | Satellite Telephone and Data Communications | |
| 3. | Emission Designator: | 41k7V7E | |
| 4. | Temperatures: | Ambient (Tnom) | 20°C |
| 5. | Supply Voltages: | Vnom | +3.7 Vdc |

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

- | | | | | |
|----|--|----------------------------------|-----|------------|
| 6. | Equipment Category: | Single channel | [] | |
| | | Two channel | [] | |
| | | Multi-channel | [X] | |
| 7. | Channel spacing: | Narrowband | [X] | 41.667 kHz |
| | | Wideband | [] | |
| 8. | Test Location | TRL Compliance Services | | |
| | | Up Holland | [X] | |
| | | Long Green | [] | |
| 9. | Modifications made during test program | No modifications were performed. | | |

Product Description

The satellite telephone consists of an L-Band Transceiver (LBT) capable of simultaneous transmit and receive (duplex) operation covering the frequency range of 1616MHz to 1626.5MHz. The frequency accesses used for duplex channels are organised into sub-bands each of which contains eight frequency accesses. Each sub-band, therefore occupies 333.33 kHz (i.e. $8 \times 41.667\text{kHz}$). Up to 30 sub-bands containing 240 frequency accesses may be used for duplex channels.

Standard References

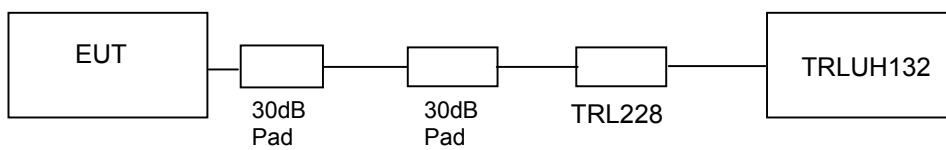
- | | |
|------------------------------|---|
| 47 CFR 2
10-1-03 Edition | Code of Federal Regulations, Title 47, Part 2, "Frequency allocations and Radio Telemetry Matters; General Rules and Regulations" |
| 47 CFR 25
10-1-03 Edition | Code of Federal Regulations, Title 47, Part 25, "Satellite Communications" Subpart C, "Technical Matters" |
| C63.4-2003 | American National Standards Institute (ANSI), "Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range 9 kHz to 40 GHz" |

COMPLIANCE TESTS

TRANSMITTER TESTS

RF OUTPUT POWER – CONDUCTED – PART 25.204 (a)

Ambient temperature	=	22°C	Radio Laboratory
Relative humidity	=	43%	
Supply voltage	=	+3.7 Vdc	
Channel number	=	See test results	



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on four channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using the manual test command 27 XXX YY Z# (See Annex D for explanation of test command). The antenna gain, included in the table below, represents the highest gain of any antenna that are used with this system.

Frequency MHz	Attenuator and cable loss dB	Level at Power Meter dBm	Antenna Gain dB	Duty Cycle Factor dB (See Annex D)	Carrier power dBm	Carrier power dBW	Limit dBW
Channel 1	61.3	-33.55	3	10.4	41.15	11.15	40
Channel 75	61.3	-35.98	3	10.4	38.72	8.72	40
Channel 150	61.3	-36.29	3	10.4	38.41	8.41	40
Channel 240	61.3	-33.89	3	10.4	40.80	10.80	40

Notes:

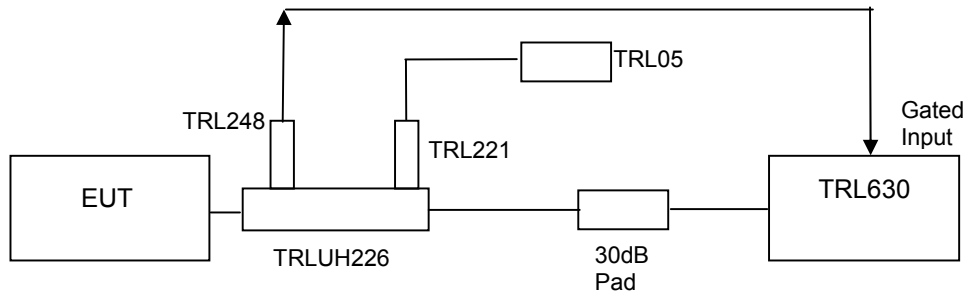
1. Duty Cycle Factor = $10 \times \log(1/X)$ Where $X = (T_{on} / T_{frame})$. See Annex E for duty cycle plots
2. Correction Factor for dBm to dBW = -30dB
3. Antenna gain of 3dBi is the worst case gain over an isotropic antenna

TRANSMITTER TESTS

EMISSIONS LIMITATIONS – CONDUCTED – PART 25.202 (f)

Ambient temperature = 22°C
 Relative humidity = 43%
 Supply voltage = +3.7 Vdc

Radio Laboratory



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on four channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using the manual test command 27 XXX YY Z# (See Annex D for explanation of test command).

To enable an average measurement to be taken the gated input trigger of the spectrum analyser was used.

The Spurious limit is as follows:

On any frequency removed from the assigned frequency by the following percentage of the authorised bandwidth

±50%	-	100%	-25 dBc
±100%	-	250 %	-35 dBc
> ±250%			At least 43 + 10 log PdB

$$(10\log P_{\text{watts}}) - (43 + 10\log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

Where the Authorised Bandwidth = 41.667 kHz

Note

1. The 3 kHz to 4 kHz bandwidth correction has been taken into account in the Ref level offset figure.
2. The antenna gain has been taken into account by lowering the limit line.

The Monaco handset was found to comply with the limits

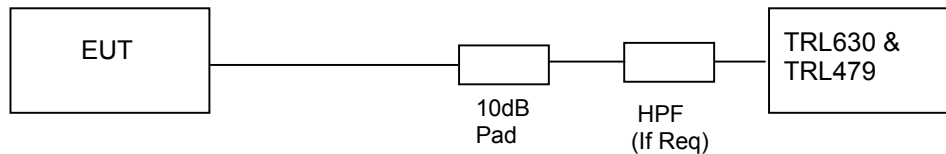
See plots in Annex F.

TRANSMITTER TESTS

SPURIOUS EMISSIONS – CONDUCTED – PART 25.202 (f) & 25.213

Ambient temperature = 26°C
Relative humidity = 33%
Supply voltage = +3.7 Vdc

Radio Laboratory



For measurements below band edge of 1610MHz use same test setup as per emissions limitations. Measurements above the band edge of 1628.5MHz use the above test setup

See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on four channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using the manual test command 27 XXX YY Z# (See Annex D for explanation of test command).

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more than 250% of the authorised bandwidth

At least $43 + 10 \log (P) \text{ dB}$

$(10 \log P_{\text{watts}}) - (43 + 10 \log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$

RESULTS

Frequency Range (MHz)	Ch N°	Freq. of Emission	Spectrum Analyser Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit dBm
30MHz – 1559MHz	No Significant Emissions Within 10dB's of the Limit					-13
1559MHz – 1605MHz	1 240	1604.352 1604.354	-75.18 -75.35	31.1 31.1	-43.98 -44.15	-40
1605MHz – 1610MHz	1 240	1605.0 1605.0	-75.63 -74.94	31.1 31.1	-44.43 -43.74	-40 (Note 4)
1628.5MHz – 16.3 GHz	No Significant Emissions Within 10dB's of the Limit					-13

Notes :

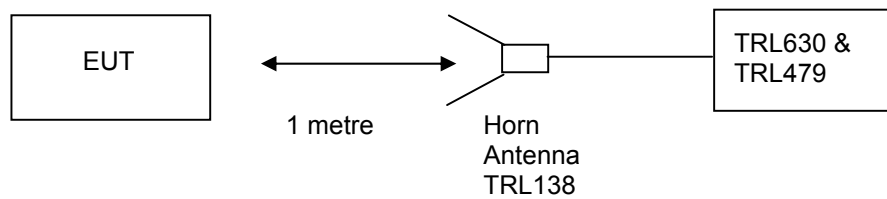
1. Emissions Checked up to 10 times F_c
2. Reference level offset of Scan plots in Annex G already have approximate attenuator losses taken into account
3. Average measurement in a carrier on state were taken in the bands 1599MHz to 1605MHz and 1605MHz -1610MHz. All other scans were peak hold for worst case.
4. -40 to -10 Linearly interpolated in dBm Vs frequency offset.
5. Correction Factor for dBm to dBW = -30dB

The Monaco handset was found to comply with the limits. See Annex G for plots

TRANSMITTER TESTS

SPURIOUS EMISSIONS – RADIATED – PART 25.202 (f) & 25.213

Ambient temperature = 18°C
 Relative humidity = 55%
 Conditions = OATS
 Supply voltage = +3.7 Vdc
 Supply Frequency = N/A



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on four channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using the manual test command 27 XXX YY Z# (See Annex D for explanation of test command). The unit was mounted on a turntable and rotated through 360° to find the worst case emission.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more than 250% of the authorised bandwidth

At least $43 + 10 \log P_{dB}$

$(10 \log P_{watts}) - (43 + 10 \log (P_{watts} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$

RESULTS

Frequency Range (MHz)	Ch No	Freq. of Emission	Spectrum Analyser Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit dBm
30MHz – 1559MHz		No Significant Emissions Within 10dB's of the Limit				-13
1559MHz – 1605MHz		No Significant Emissions Within 10dB's of the Limit				-40
1605MHz – 1610MHz		No Significant Emissions Within 10dB's of the Limit				-40 to 10 Note 4
1628.5MHz – 16.3 GHz		No Significant Emissions Within 10dB's of the Limit				-13

Notes :

1. Emissions Checked up to 10 times Fc
2. Scan plots of channels 1 & 240 with receive antenna in vertical polarization in annex H.
3. The unit was mounted on a turntable and rotated through 360° and in 3 orthogonal planes to find the worst case emission.
4. -40 to -10 Linearly interpolated in dBm Vs frequency offset.
5. Correction Factor for dBm to dBW = -30dB

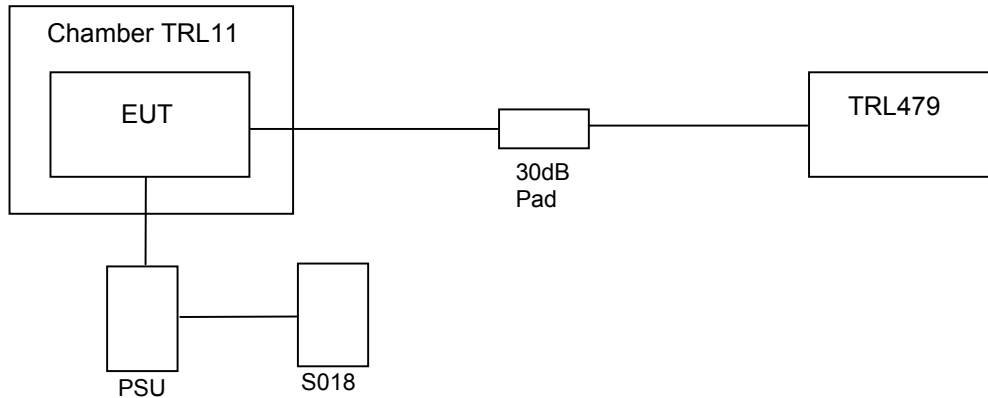
The Monaco handset was found to comply with the limits. See annex H for plots

TRANSMITTER TESTS

FREQUENCY STABILITY – CONDUCTED – TEMPERATURE – PART 25.202 (d)

Ambient temperature = 22°C
 Relative humidity = 49%
 Supply voltage = +3.7 Vdc

Radio Laboratory



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on four channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using test commands sent from a PC via the MAMBO Box that were equivalent to the manual test command 27 XXX YY Z# (See Annex D for explanation of test command). The Analyser was set to max hold

RESULTS

TEMP	Frequency (MHz)			
°C	Channel 1	Channel 75	Channel 150	Channel 240
+60	1616.0170	1619.0930	1622.2190	1625.9740
+50	1616.0090	1619.0960	1622.2350	1625.9800
+40	1616.0212	1619.1056	1622.2288	1625.9816
+30	1616.0248	1619.1068	1622.2304	1625.9748
+20	1616.0124	1619.1036	1622.2292	1625.9776
+10	1616.0160	1619.1060	1622.2320	1625.9784
0	1616.0240	1619.1100	1622.2310	1625.9780
-10	1616.0210	1619.1090	1622.2300	1625.9780
-20	1616.0130	1619.0990	1622.2210	1625.9700
-30	1616.0170	1619.1020	1622.2260	1625.9750

Notes: 1.Limit ± 10 ppm (See Annex I for plots verses limit)

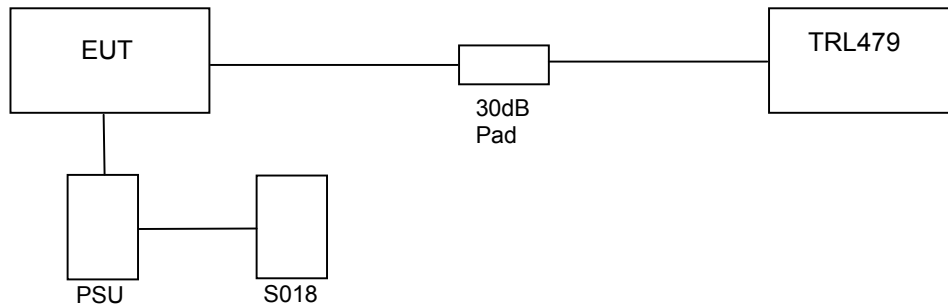
The Monaco handset was found to comply with the limits

TRANSMITTER TESTS

FREQUENCY STABILITY – CONDUCTED – VOLTAGE – PART 25.202 (d)

Ambient temperature = 25°C
 Relative humidity = 36%
 Supply voltage = +3.7 Vdc

Radio Laboratory



See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on four channels. The unit was put into test mode and set to operate at maximum power and with a random modulating signal using the manual test command 27 XXX YY Z# (See Annex D for explanation of test command). The Analyser was set to max hold.

RESULTS

VOLTAGE	Frequency (MHz)			
%	Channel 1	Channel 75	Channel 150	Channel 240
85	1616.0160	1619.1040	1622.2160	1625.9760
90	1616.0260	1619.1050	1622.2230	1625.9790
95	1616.0140	1619.0980	1622.2280	1625.9800
100	1616.0170	1619.1060	1622.2250	1625.9830
105	1616.0140	1619.1020	1622.2280	1625.9670
110	1616.0170	1619.1050	1622.2150	1625.9780
115	1616.0150	1619.0970	1622.2150	1625.9810

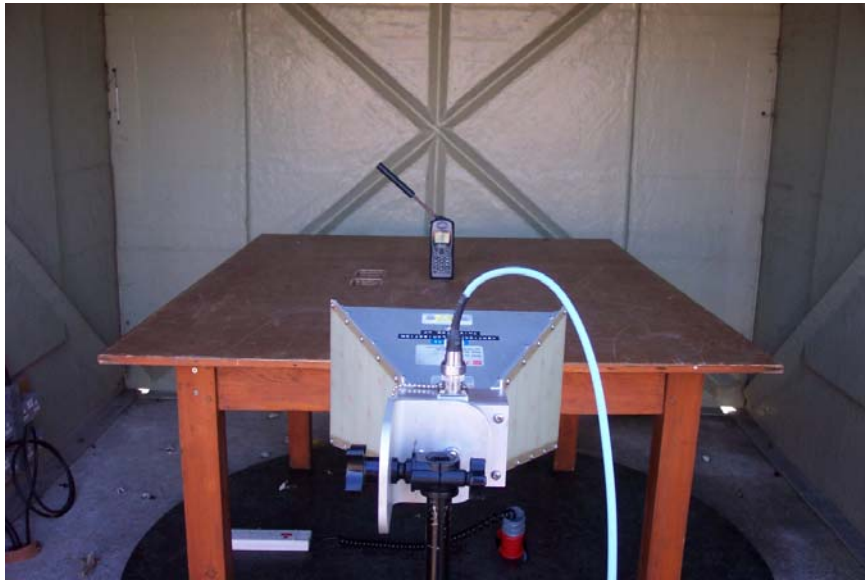
Notes: 1.Limit ± 10 ppm (See Annex J for plots verses limit)

The Monaco handset was found to comply with the limits

ANNEX A
PHOTOGRAPHS

PHOTOGRAPH 1.

RADIATED TEST SETUP



PHOTOGRAPH 2.

CONDUCTED TEST SETUP



ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[]
e.	LABELLING	-	PHOTOGRAPHS	[]
		-	DECLARATION	[]
		-	DRAWINGS	[]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
h.	CIRCUIT DIAGRAMS	-	Tx	[]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
i.	COMPONENT LOCATION	-	Tx	[]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
j.	PCB TRACK LAYOUT	-	Tx	[]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
k.	BILL OF MATERIALS	-	Tx	[]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C
TEST EQUIPMENT LIST

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No
SPECTRUM ANALYSER	R & S	ESIB 7	100182	630
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479
PSU	MANSON	EP-603	60316619	149
PSU	THURLBY THANDAR	PL320QMD	N/A	N/A
RF DIODE	SUHNER	H7	1001.17.A	248
HORN	EMCO	3115	9010-3580	138
HORN	EMCO	3115	9010-3581	139
BIDIRECTIONAL COUPLER	NARDA	3022	72622	UH226
CABLE	ROSENBERGER	MICRO COAX	N/A	280
ENVIRONMENTAL CHAMBER(TEMP)	SHARTREE	TCC125-815P	CS 203	11
POWER METER	MARCONI	6960B	236997010	UH132
POWER SENSOR	MARCONI	6920	1564	UH228
LOOP ANTENNA 9kHz - 30MHz	R & S	HFH2	881058 - 53	07
MULTIMETER	KEITHLEY	2000	0588183	S018
LOAD	SUHNER	65 BNC-50-0-1	N/A	05
20dB ATTENUATOR	BIRD	8340-200-N	MFC 70998	221
30 dB ATTENUATOR	NARDA	776C-30	619	N/A
30 dB ATTENUATOR	NARDA	776C-30	577	N/A
HIGH PASS FILTER	AFL	N/A	N/A	N/A

ANNEX D
TEST COMMANDS

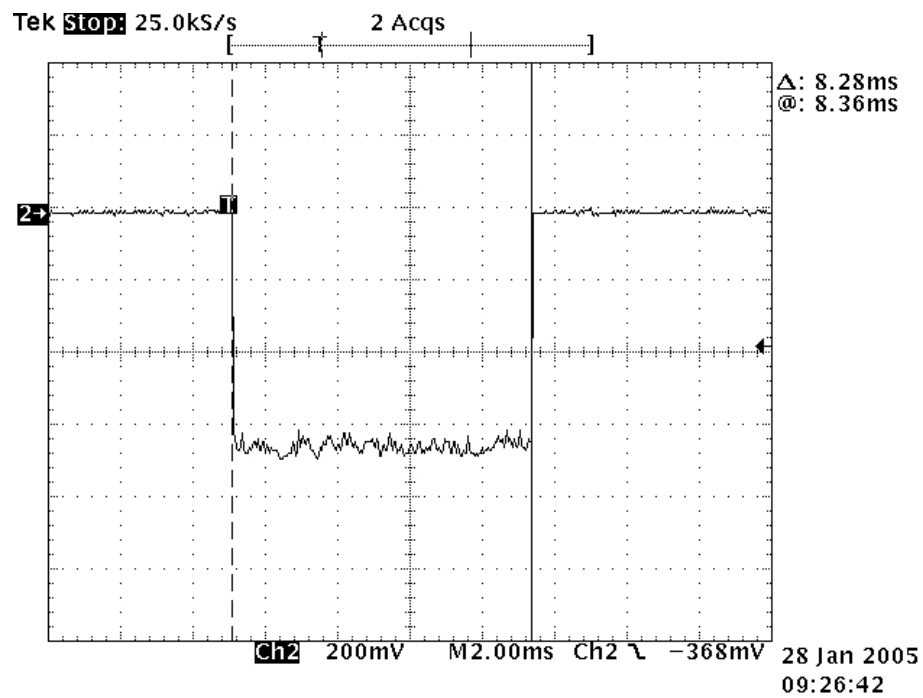
TEST COMMANDS

Command Function	Keypad Sequence
Enter Manual Test Mode	Press and Hold # Key for more than 3 seconds
Exit Manual Test Mode	01#
Turn on transmission with maximum power enabled and with random modulation	27 xxx yy z# xxx = Channel Number yy = power step z = Modulation
<u>Example 1</u> Channel number 001 (Min frequency), power level 0 (Max) Modulation set to random data (z = 1, z = 0 is a tone)	27 001 00 1#
<u>Example 2</u> Channel number 240 (Max frequency), power level 8 (Min) Modulation set to random data (z = 1, z = 0 is a tone)	27 240 1#
Turn off transmission with maximum power enabled and with random modulation	27#

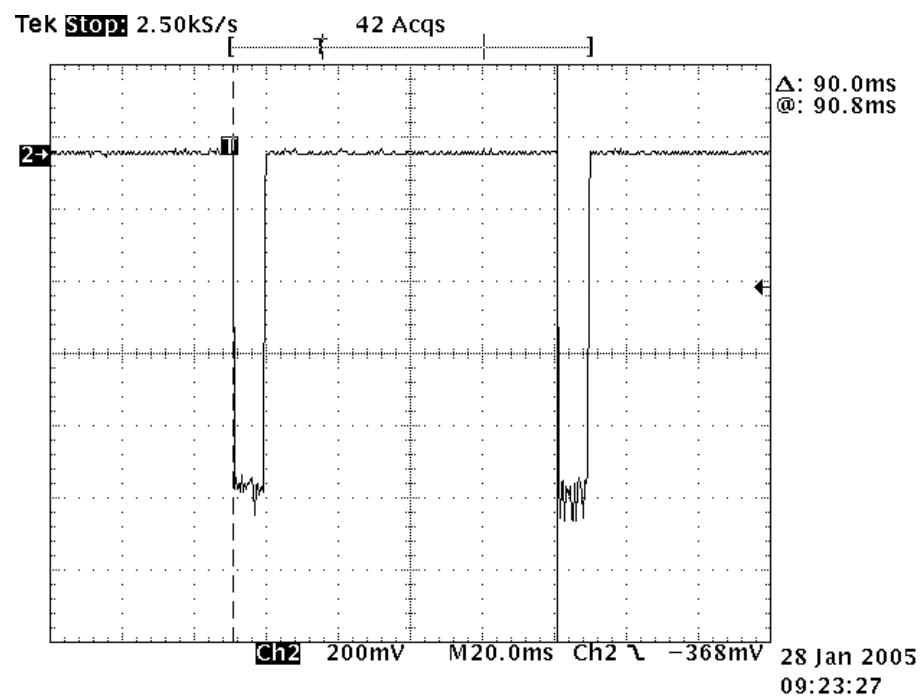
Notes: To enter test mode a test sim card is required.

ANNEX E
DUTY CYCLE

Duty Cycle Plots

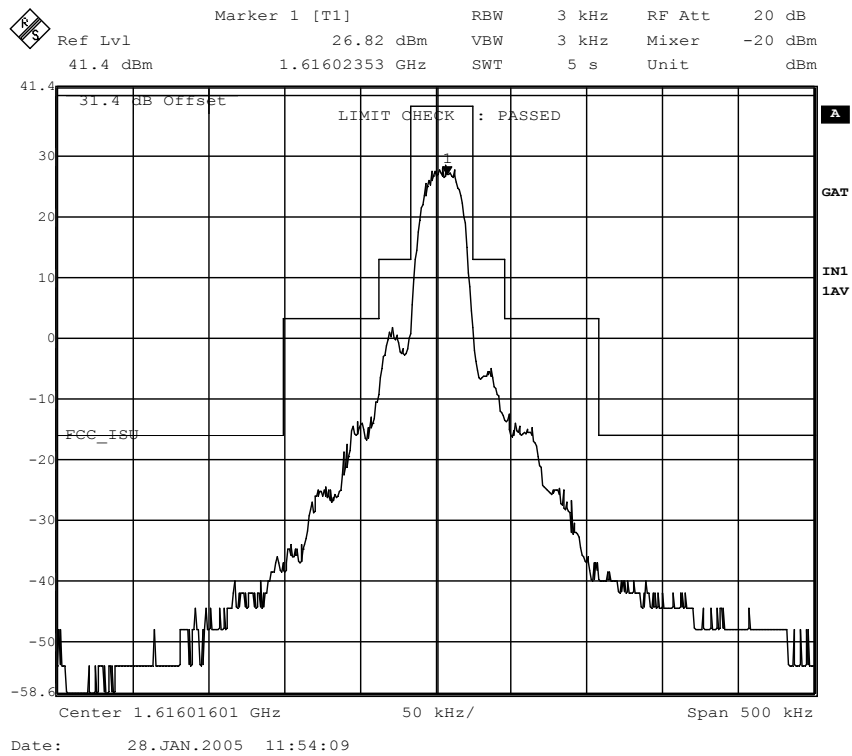


$$T_{on} = 8.28\text{mS}$$

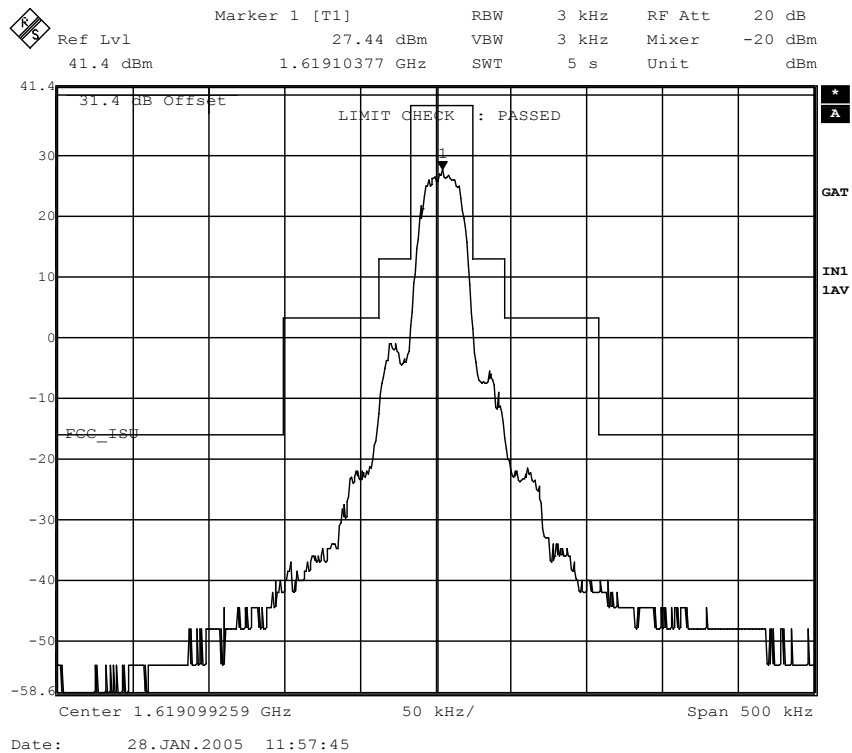


$$T_{frame} = 90\text{mS}$$

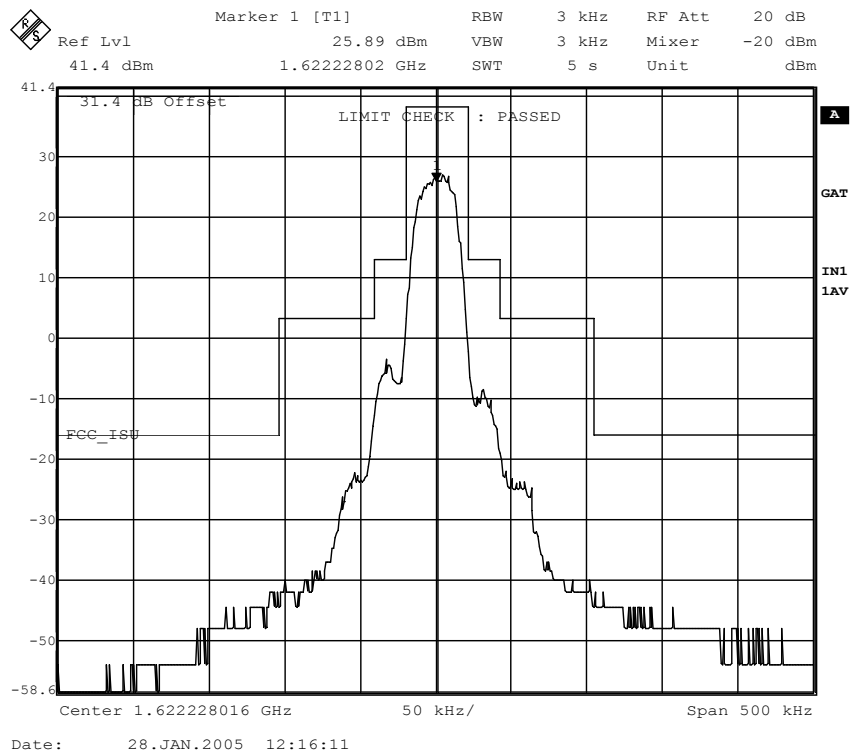
ANNEX F
EMISSIONS LIMITATIONS



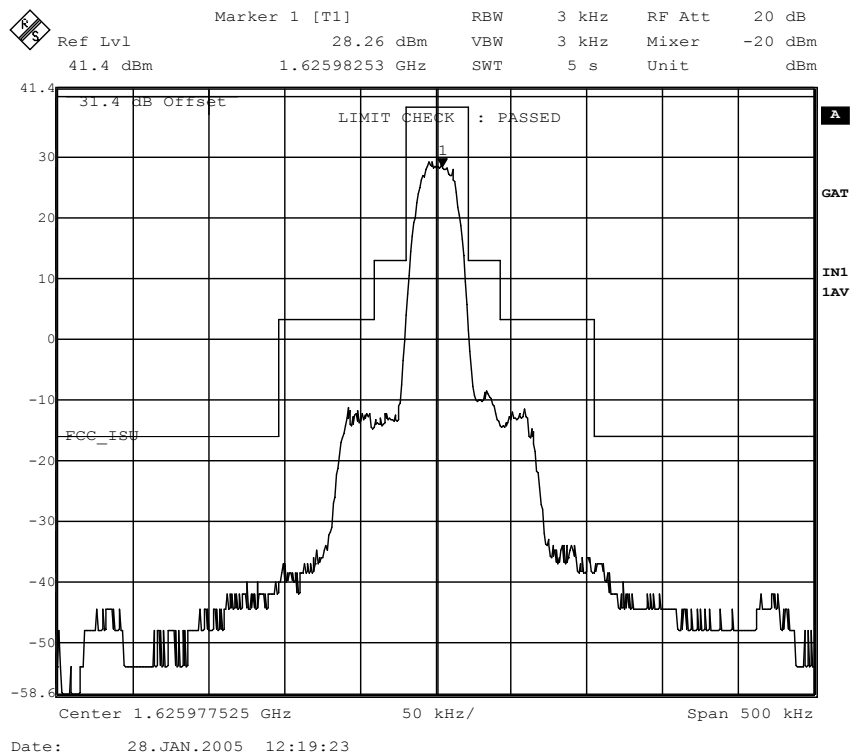
Channel 1



Channel 75



Channel 150

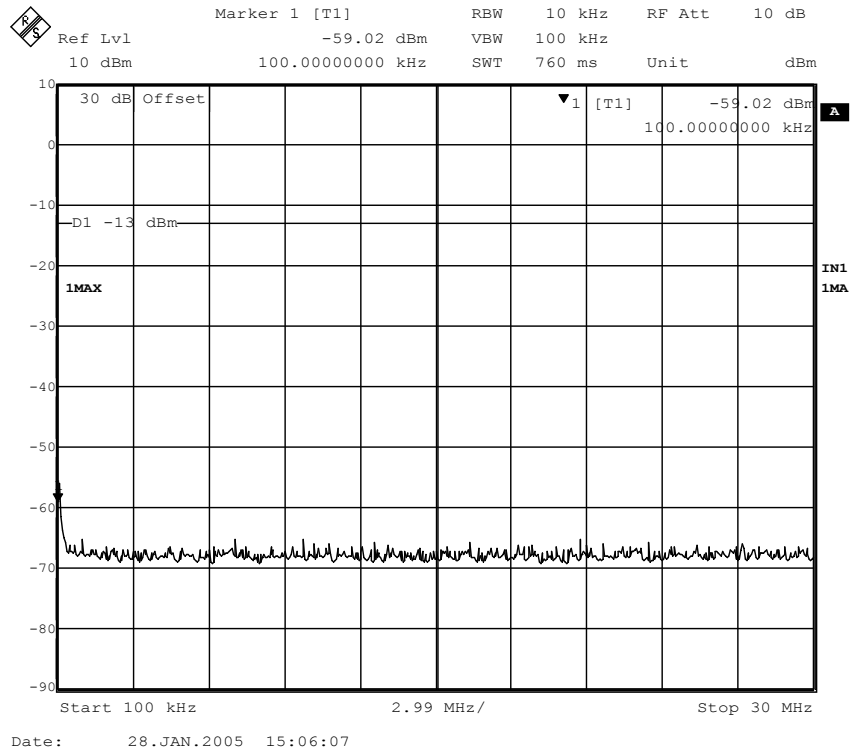


Channel 240

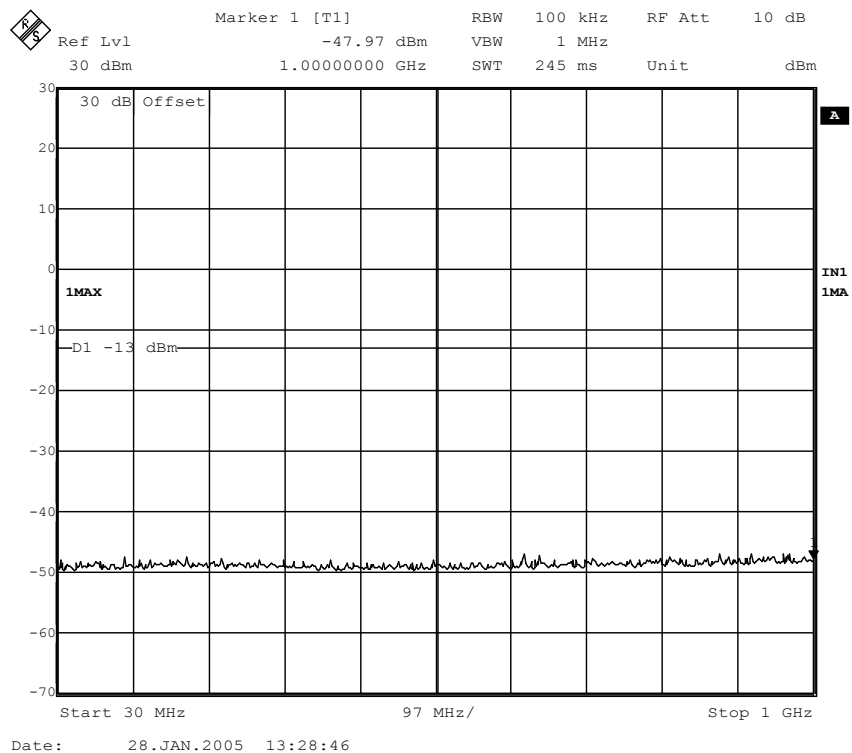
ANNEX G
TRANSMITTER SPURIOUS EMISSIONS - Conducted

TRANSMITTER SPURIOUS EMISSIONS – Conducted

Channel 1



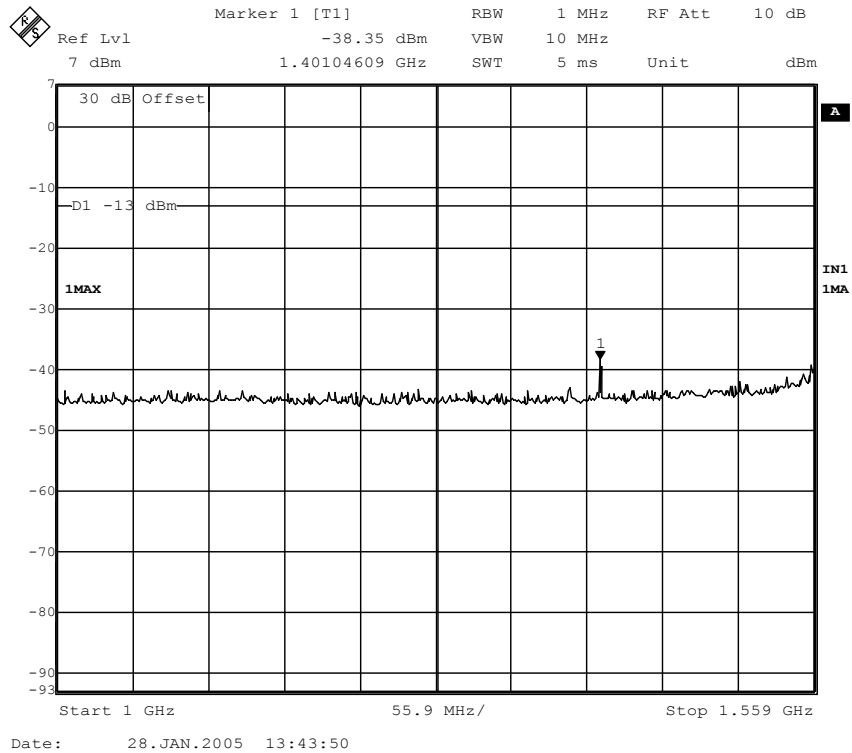
100 kHz – 30MHz



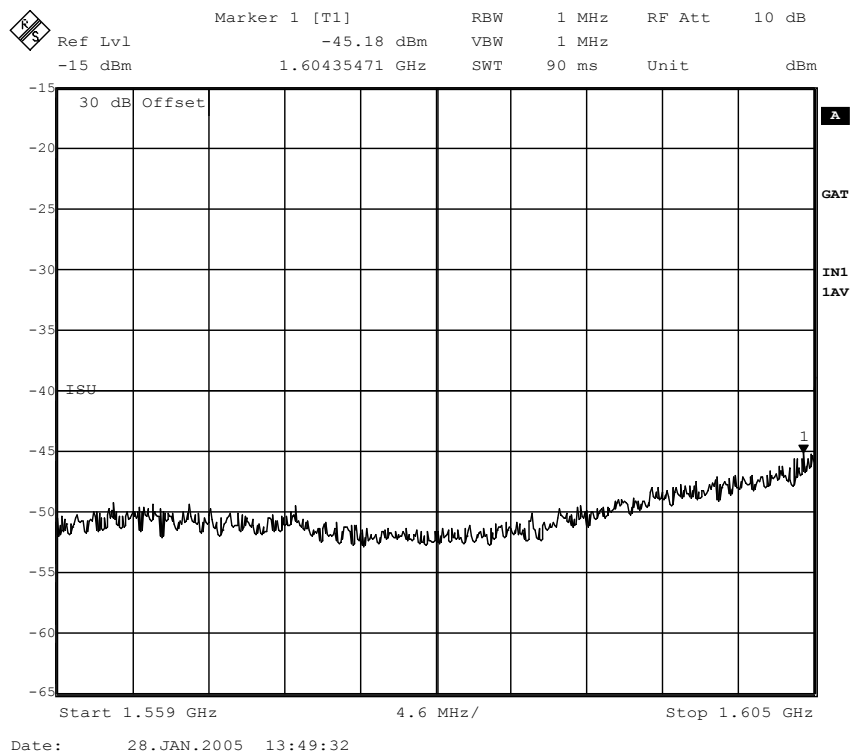
30MHz – 1000MHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

Channel 1



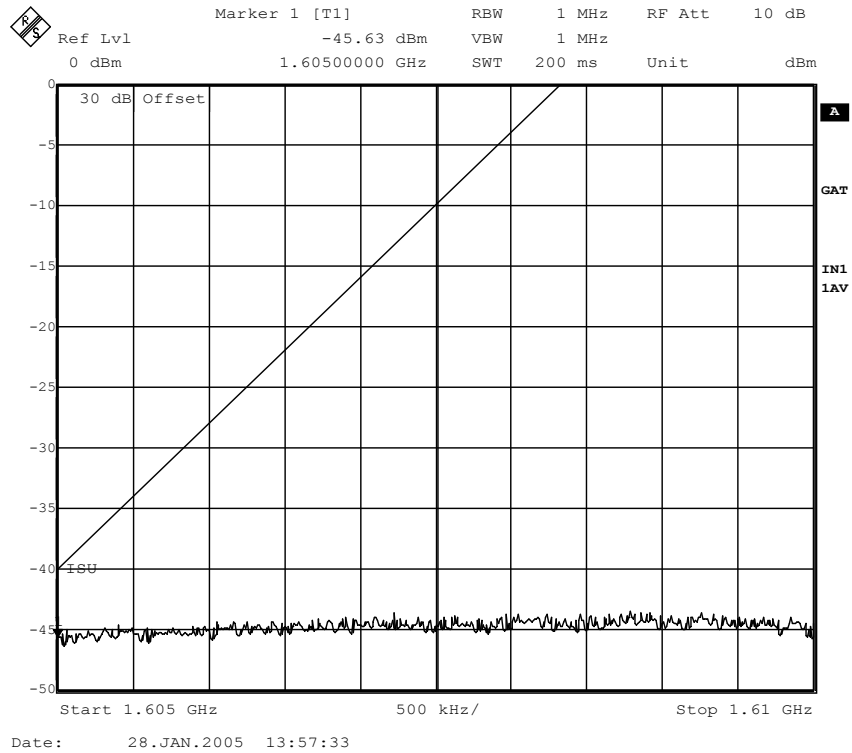
1000MHz – 1559MHz



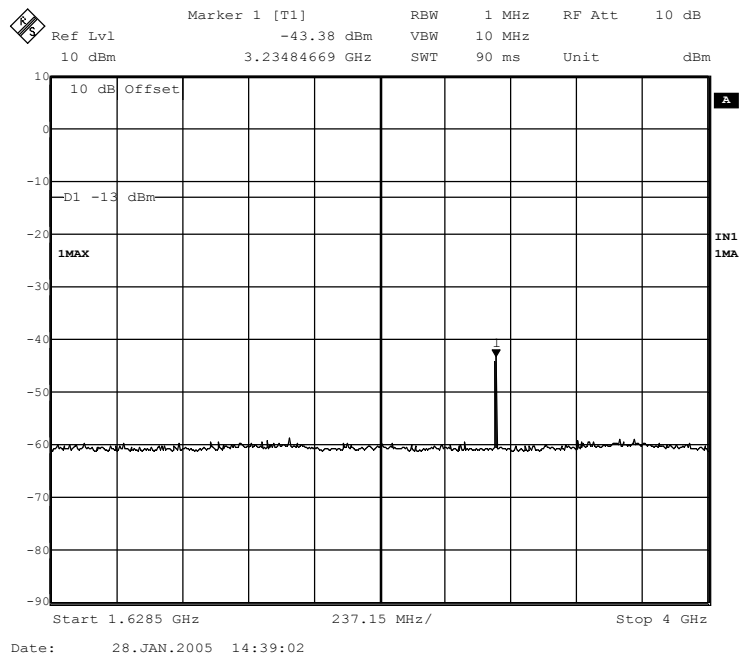
1559MHz – 1605MHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

Channel 1



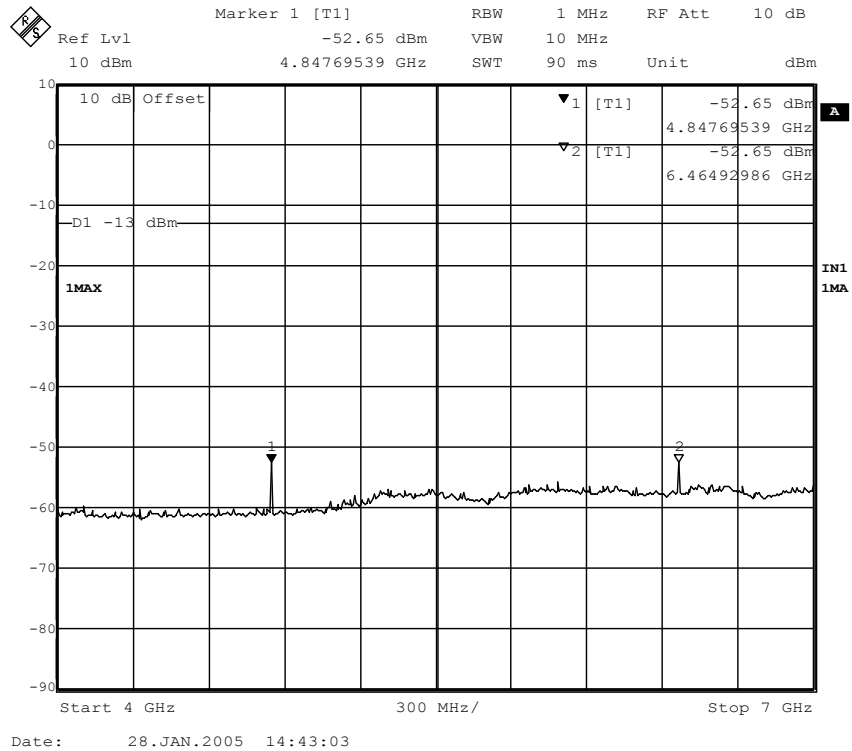
1605MHz – 1610MHz



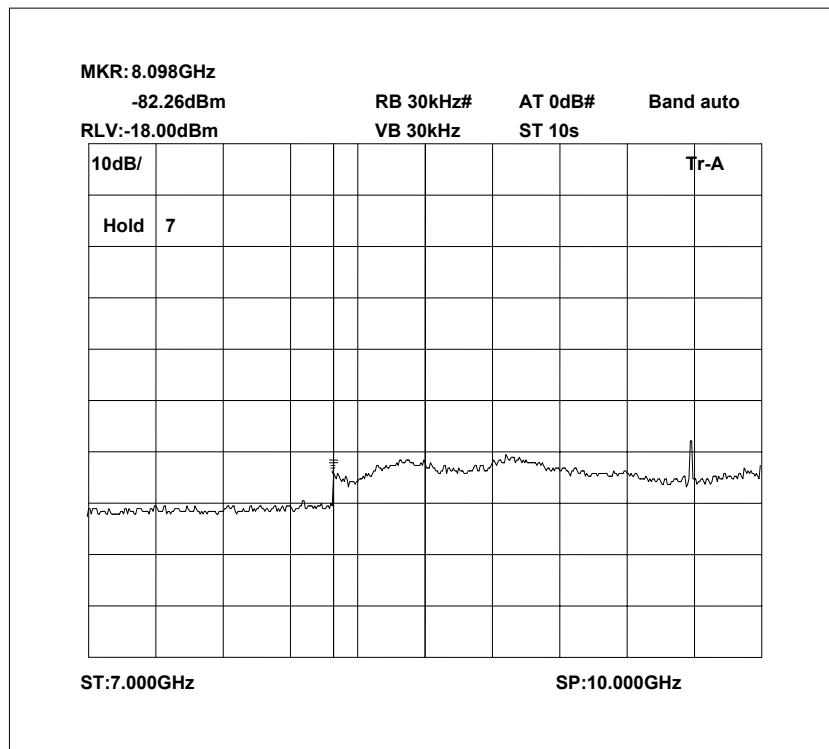
1628.5MHz – 4000MHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

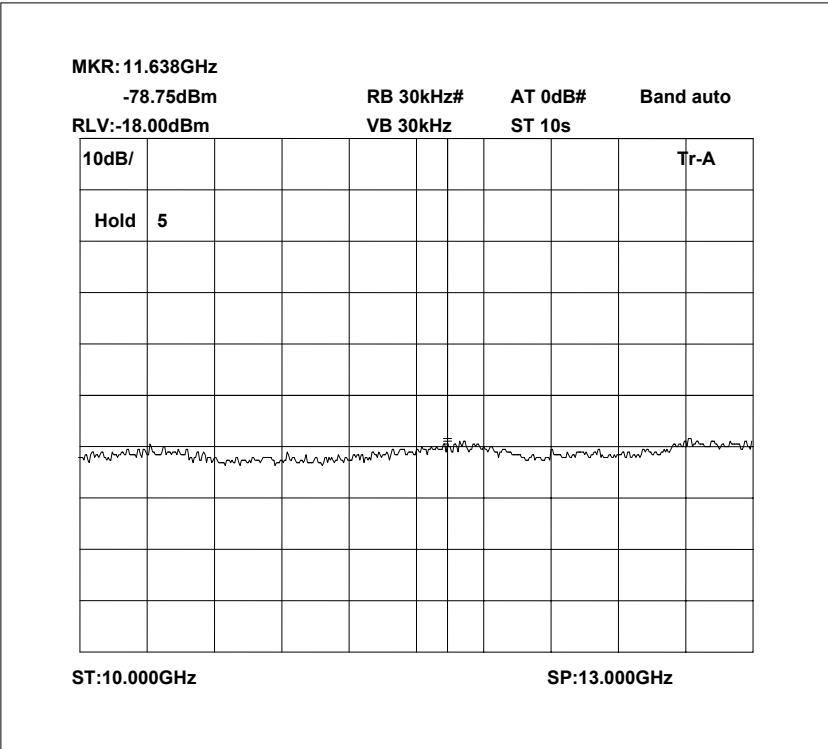
Channel 1



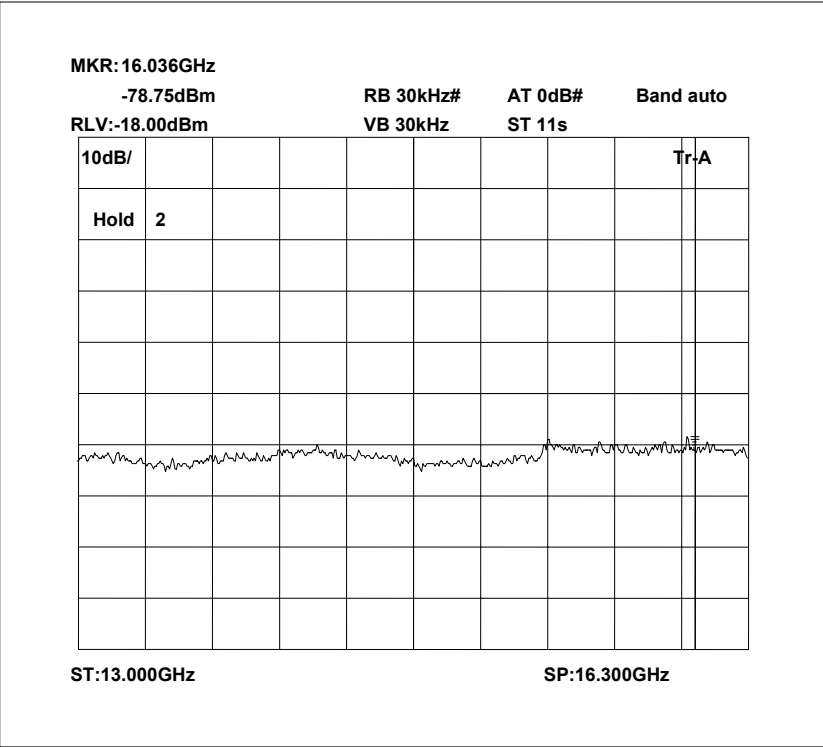
4GHz – 7GHz



7GHz – 10GHz



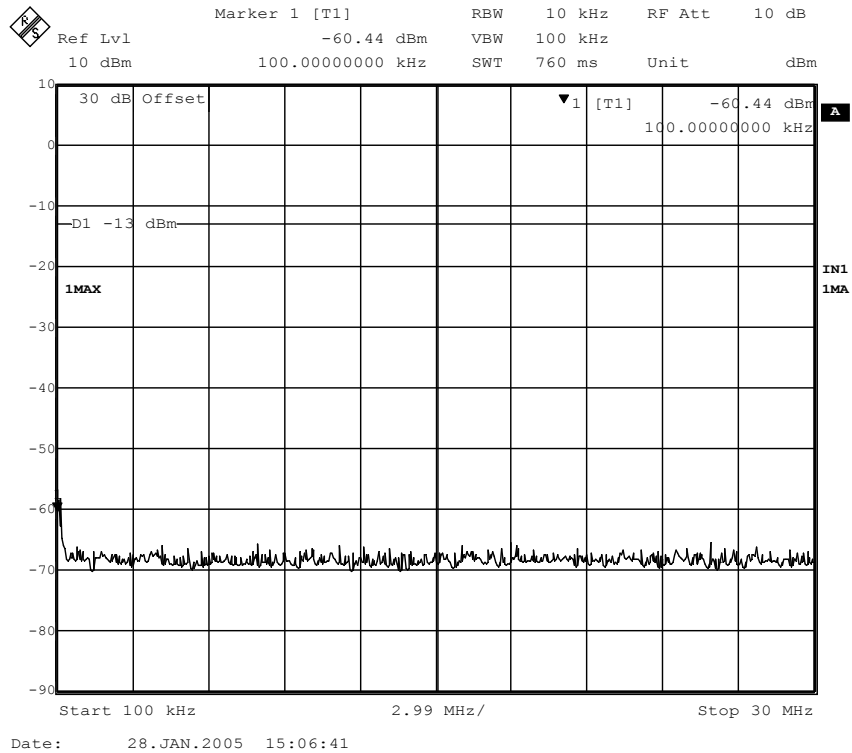
10GHz – 13GHz



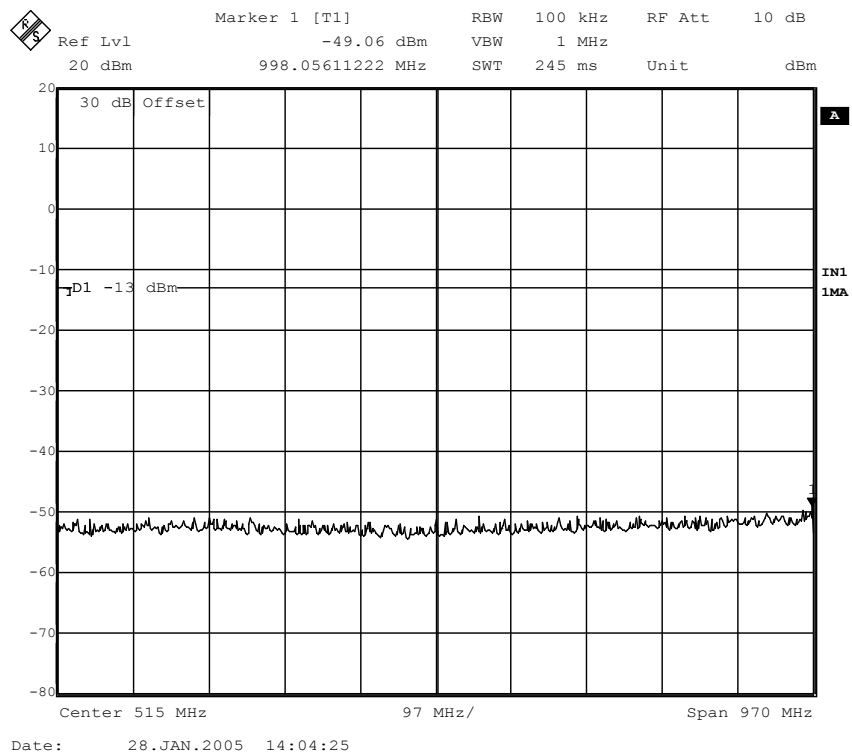
13GHz – 16.3GHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

Channel 240



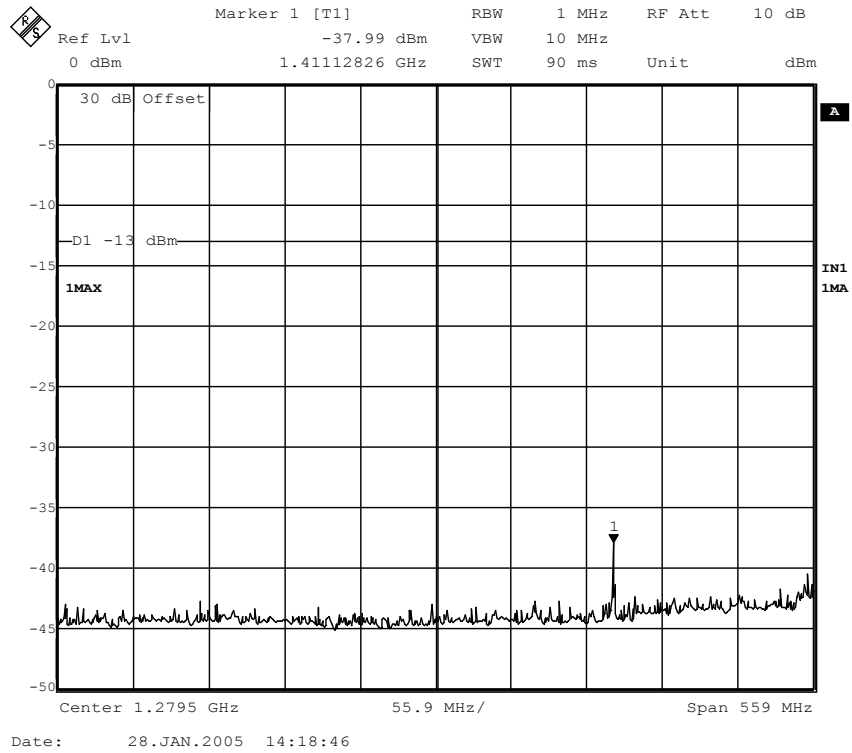
100 kHz – 30MHz



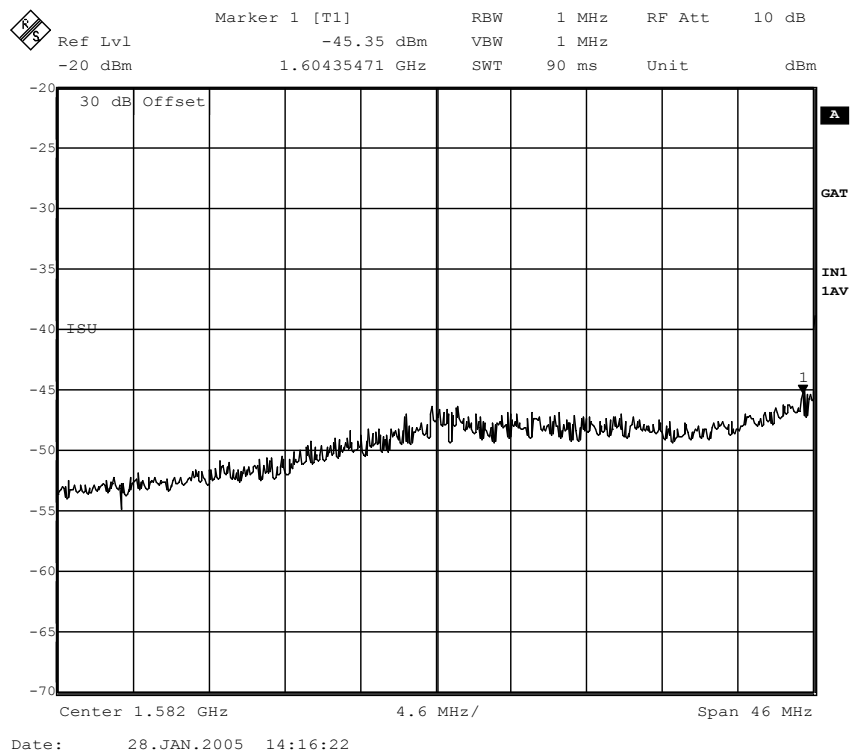
30MHz – 1000MHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

Channel 240



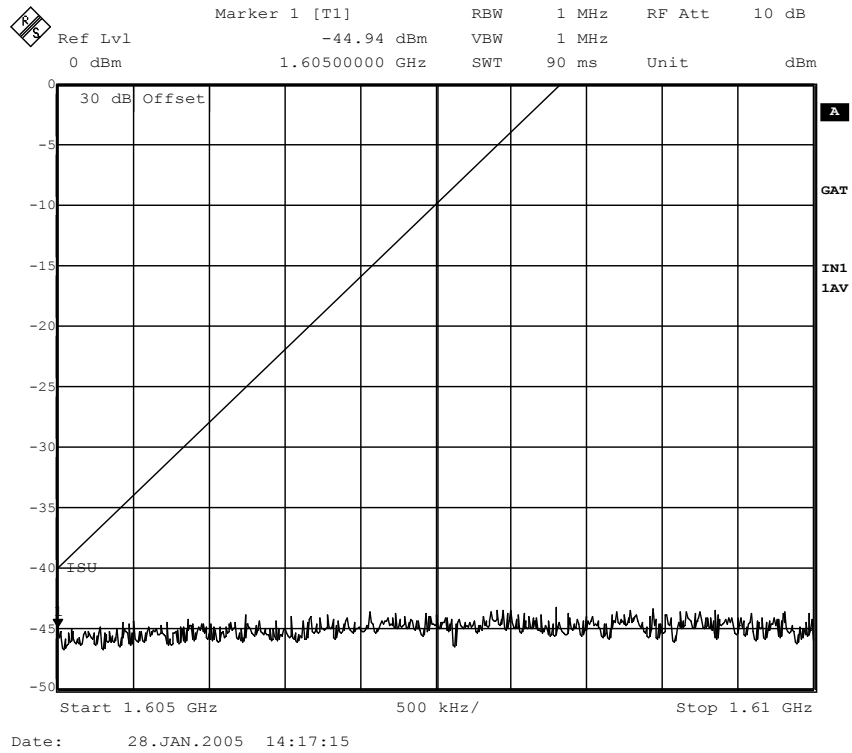
1000MHz – 1559MHz



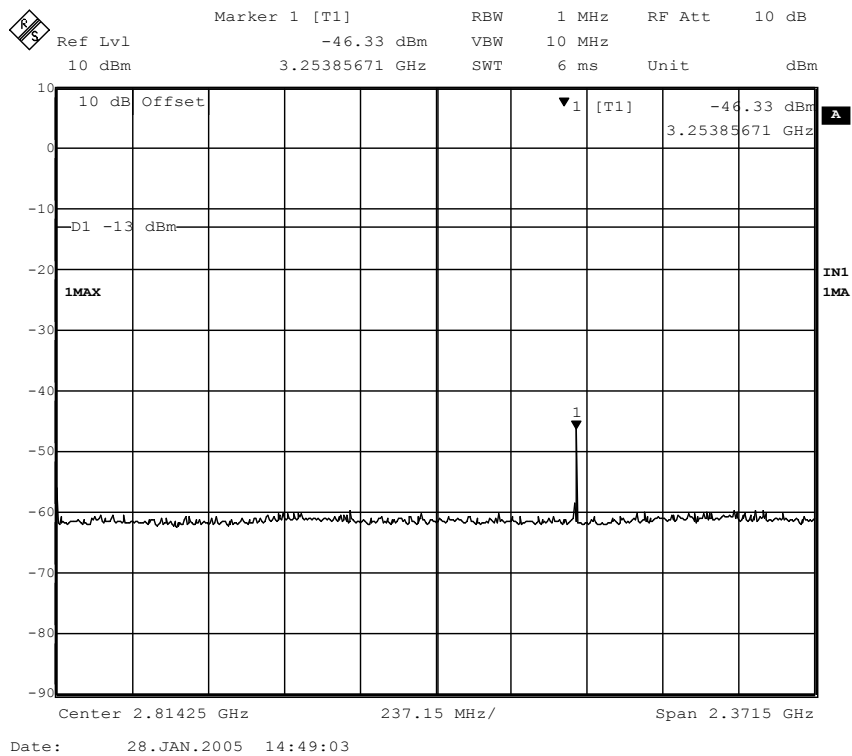
1559MHz – 1605MHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

Channel 240



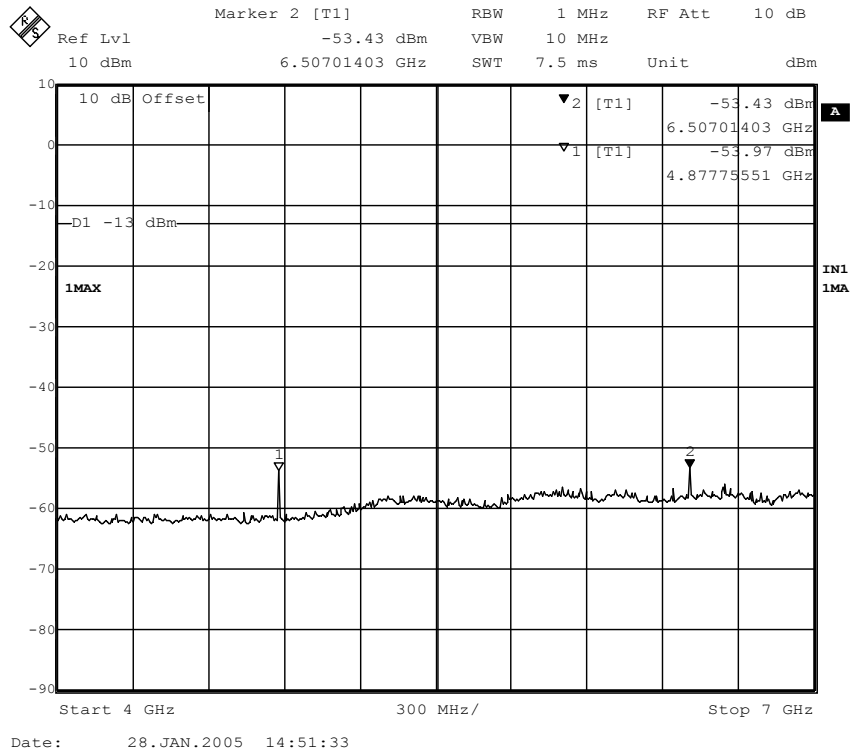
1605MHz – 1610MHz



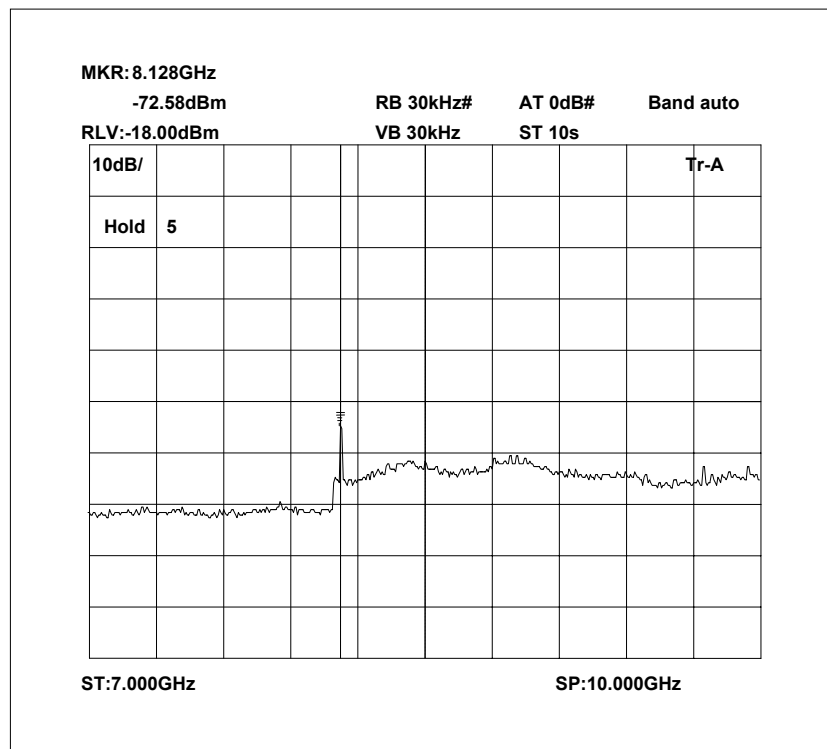
1628.5MHz – 4000MHz

TRANSMITTER SPURIOUS EMISSIONS – Conducted

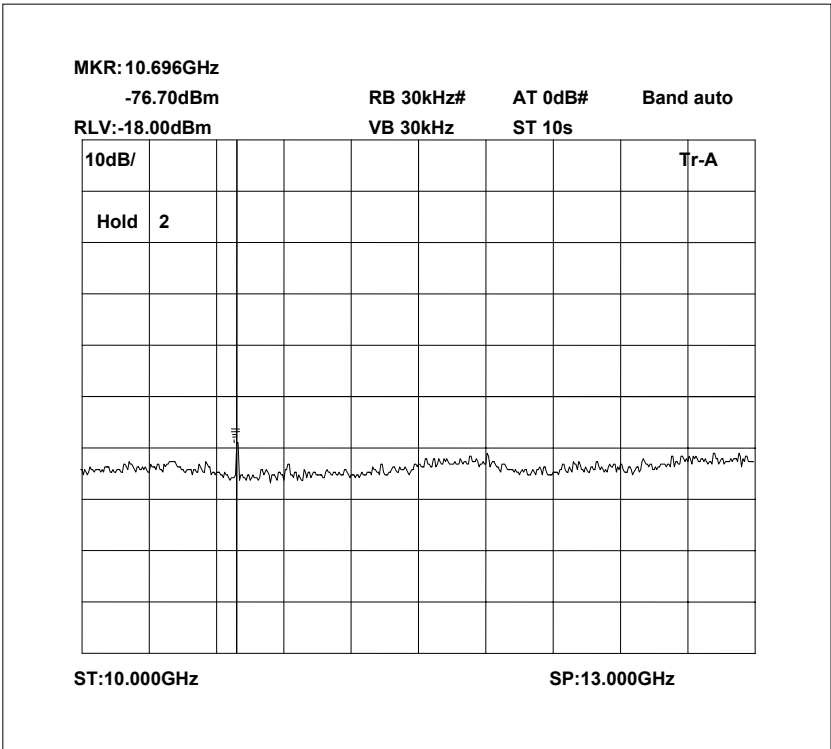
Channel 240



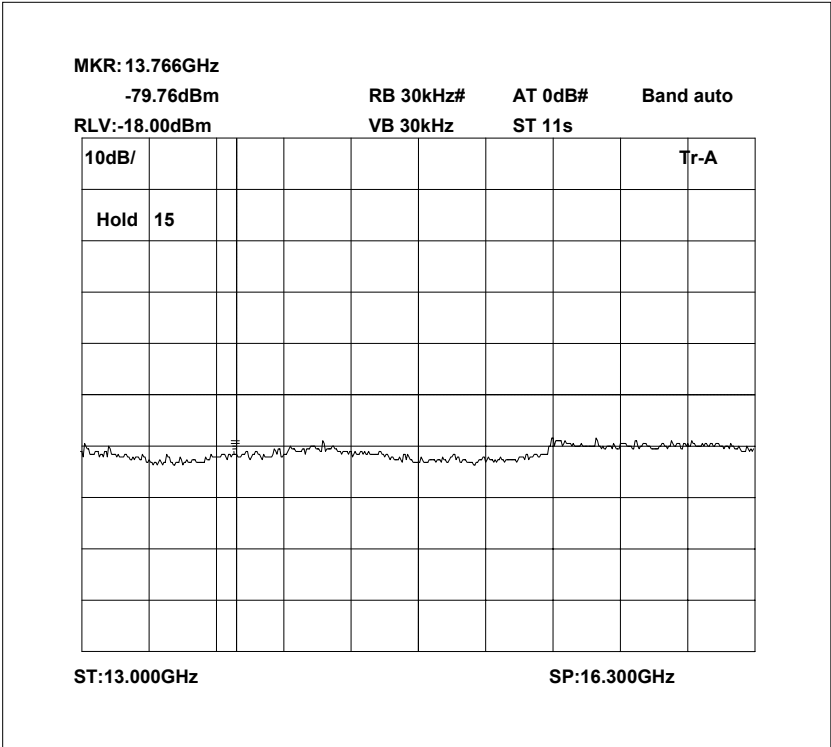
4GHz – 7GHz



7GHz – 10GHz



10GHz – 13GHz



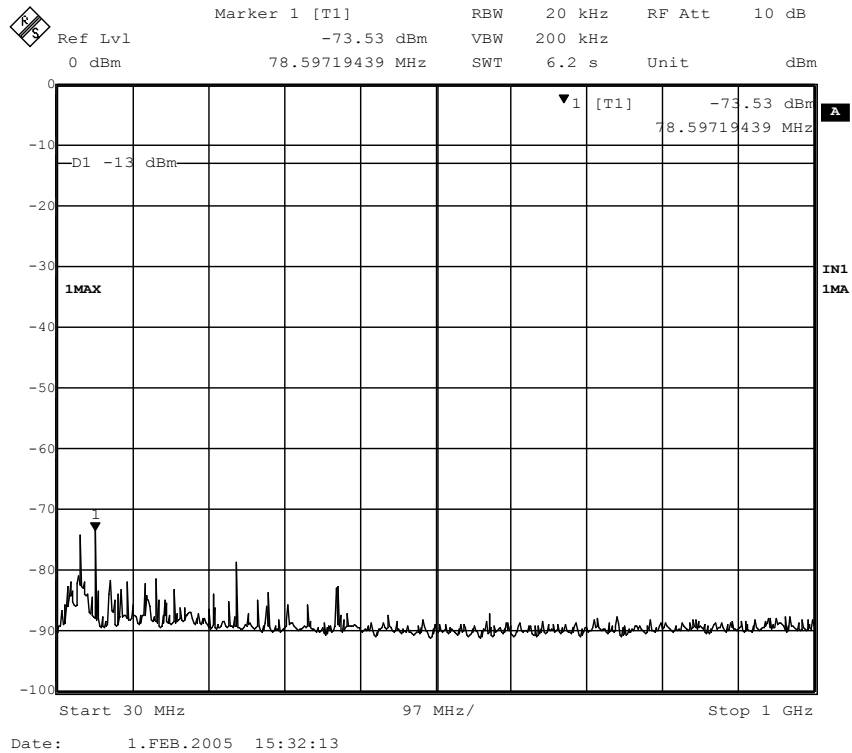
13GHz – 16.3GHz

ANNEX H

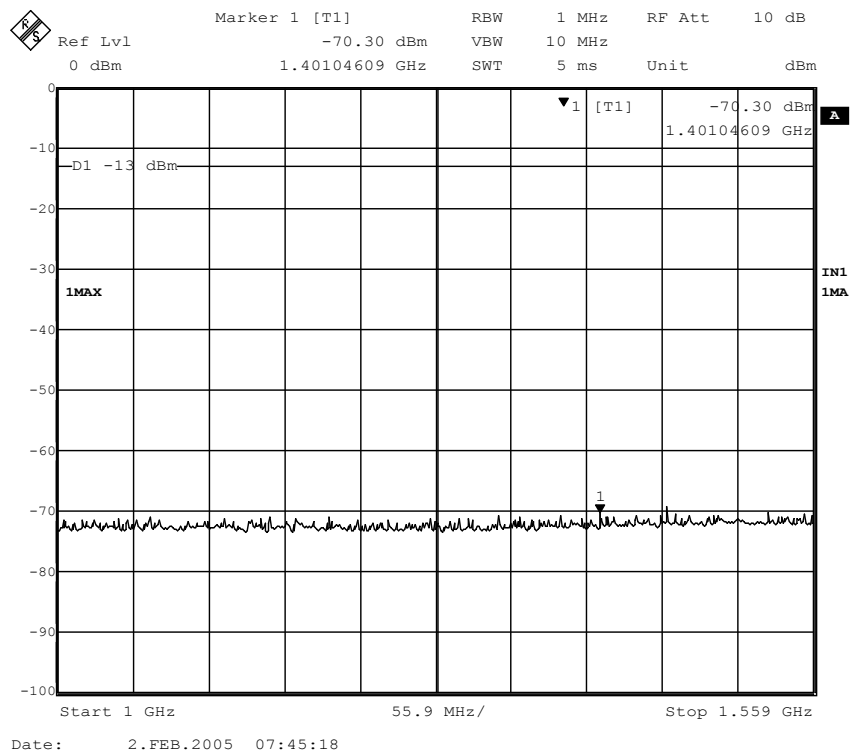
TRANSMITTER SPURIOUS EMISSIONS - Radiated

TRANSMITTER SPURIOUS EMISSIONS – Radiated

Channel 1



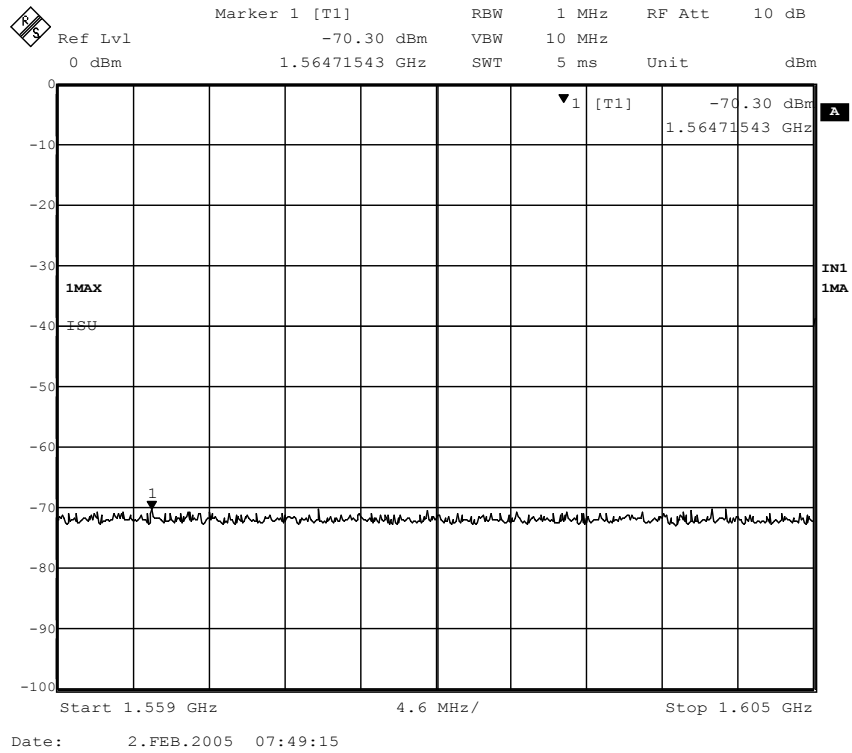
30MHz – 1000MHz



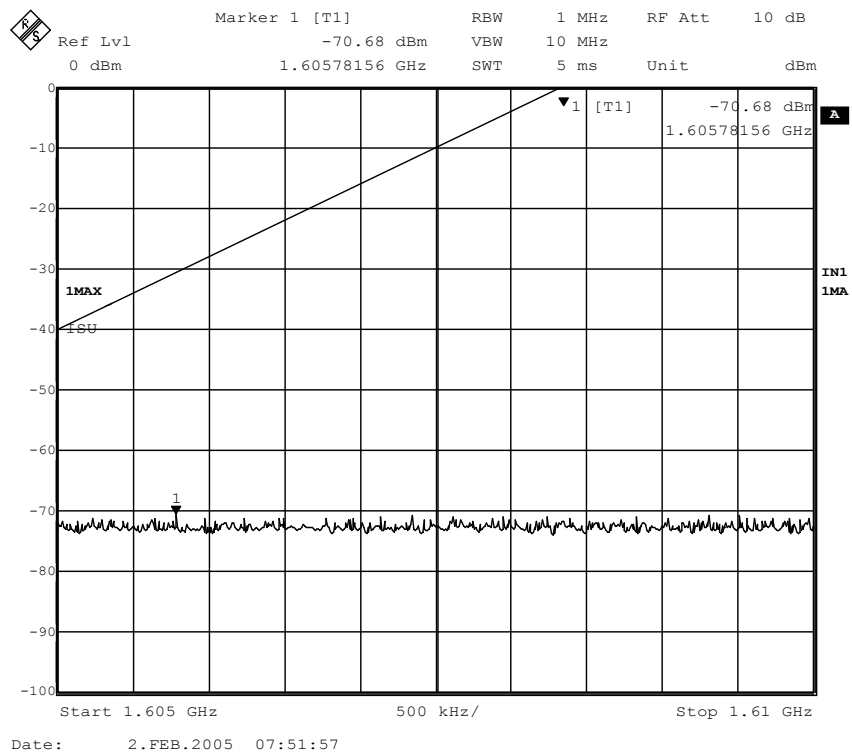
1000MHz – 1559MHz

TRANSMITTER SPURIOUS EMISSIONS – Radiated

Channel 1



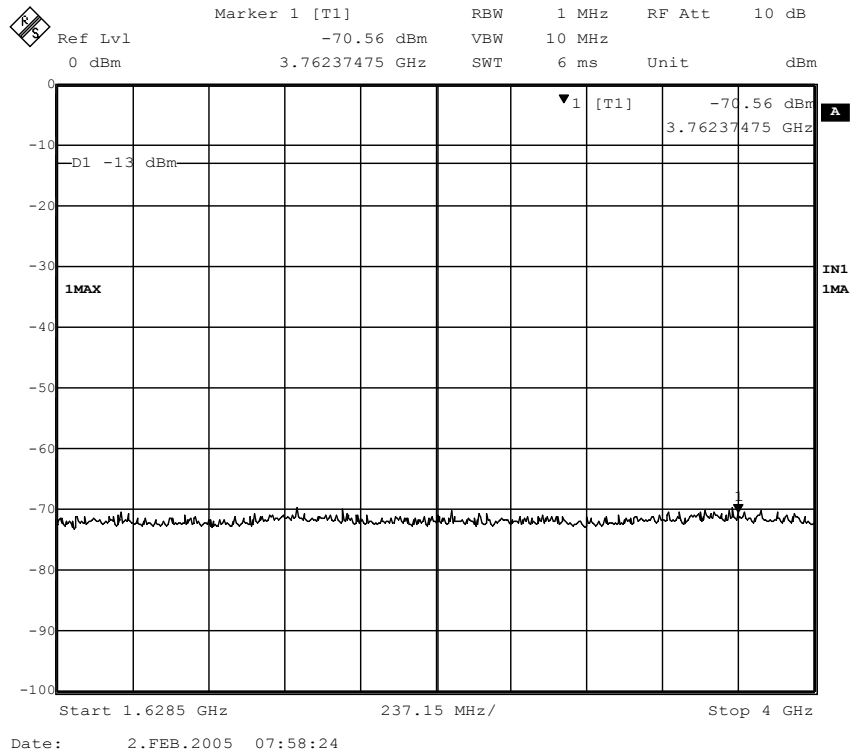
1559MHz – 1605MHz



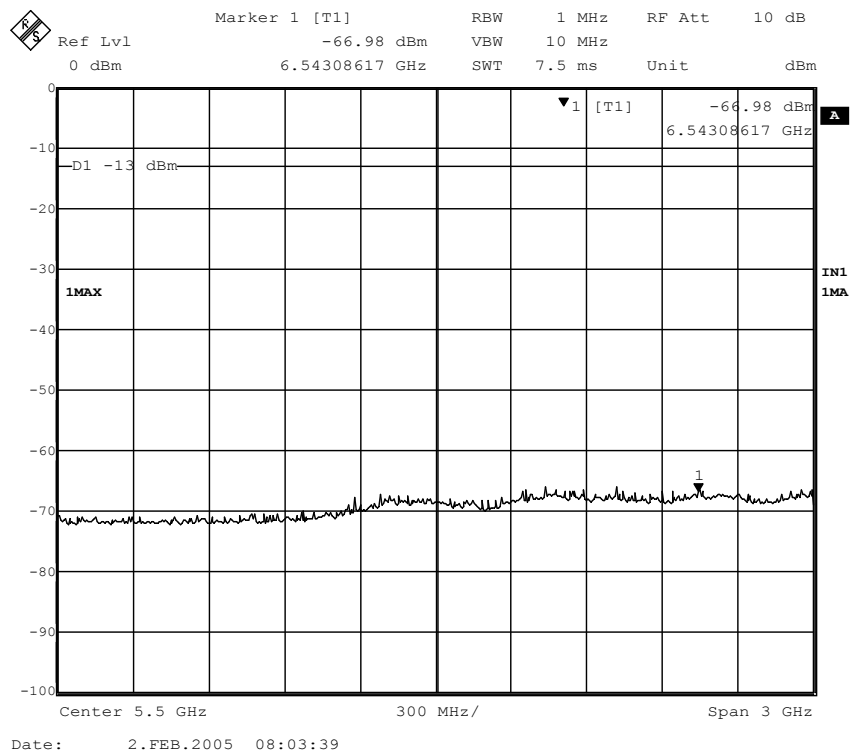
1605MHz – 1610MHz

TRANSMITTER SPURIOUS EMISSIONS – Radiated

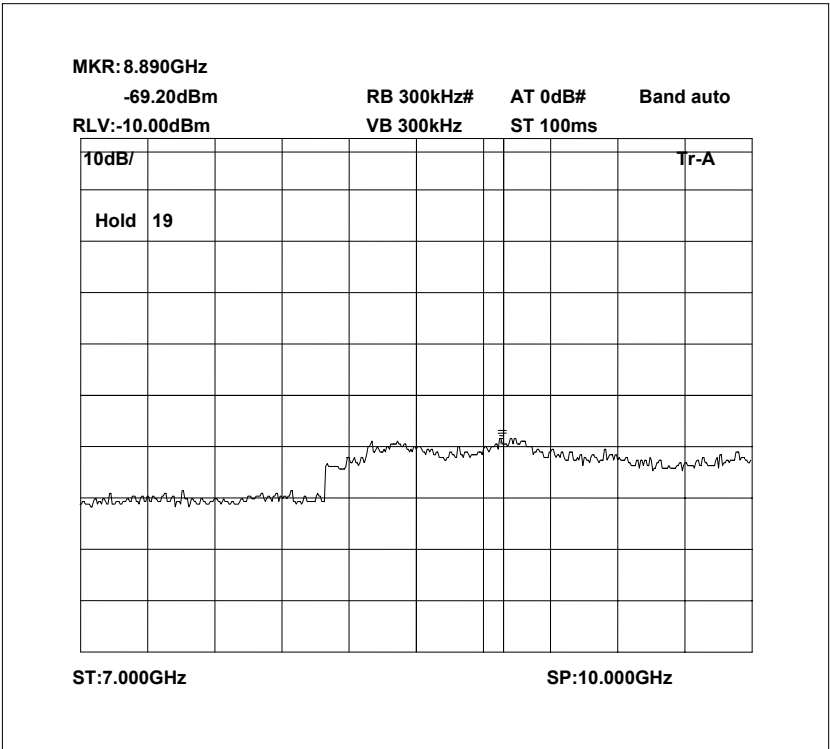
Channel 1



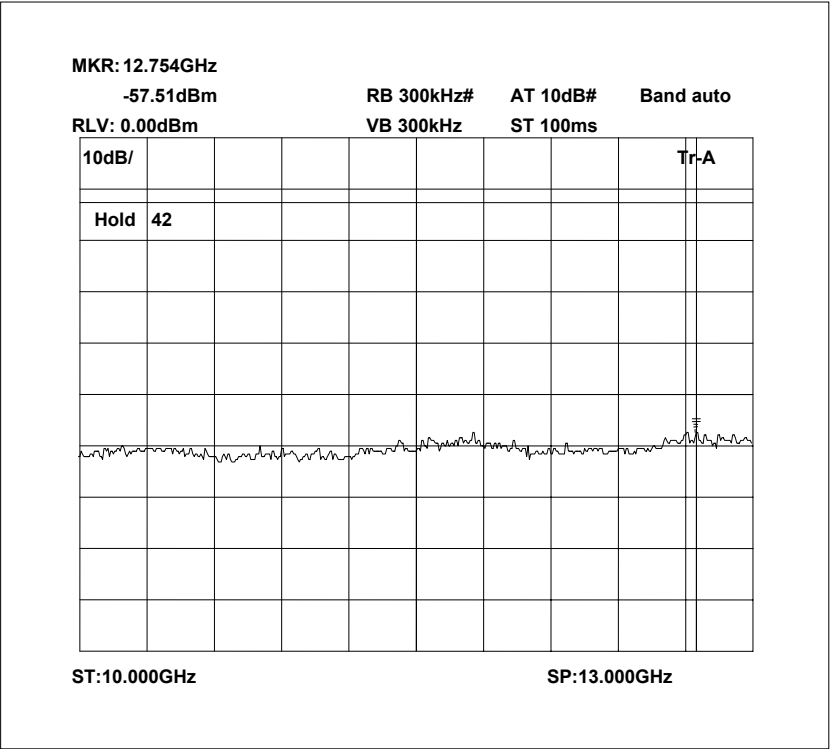
1628.5MHz – 4000MHz



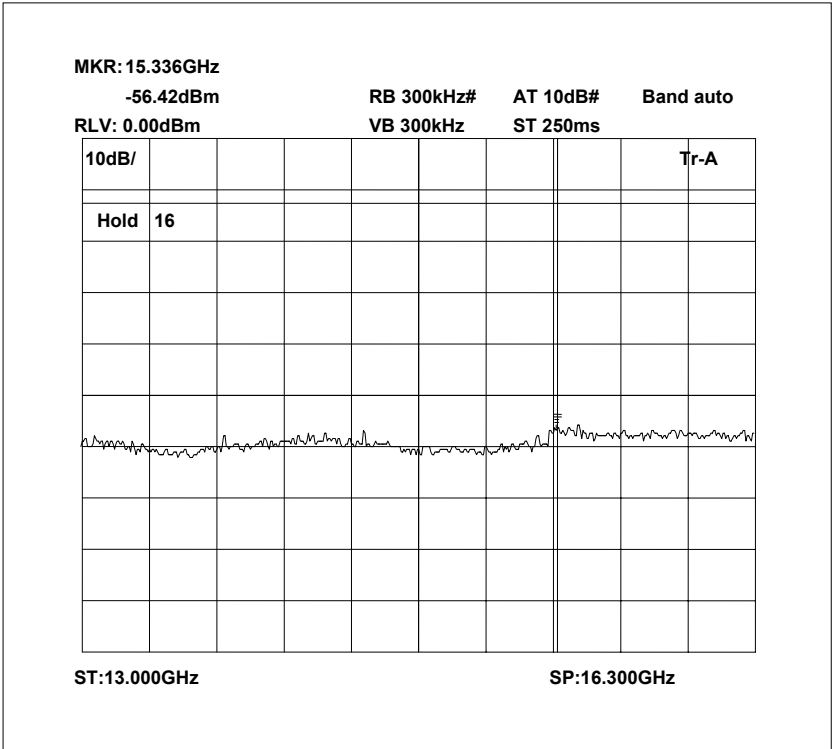
4GHz – 7GHz



7GHz – 10GHz



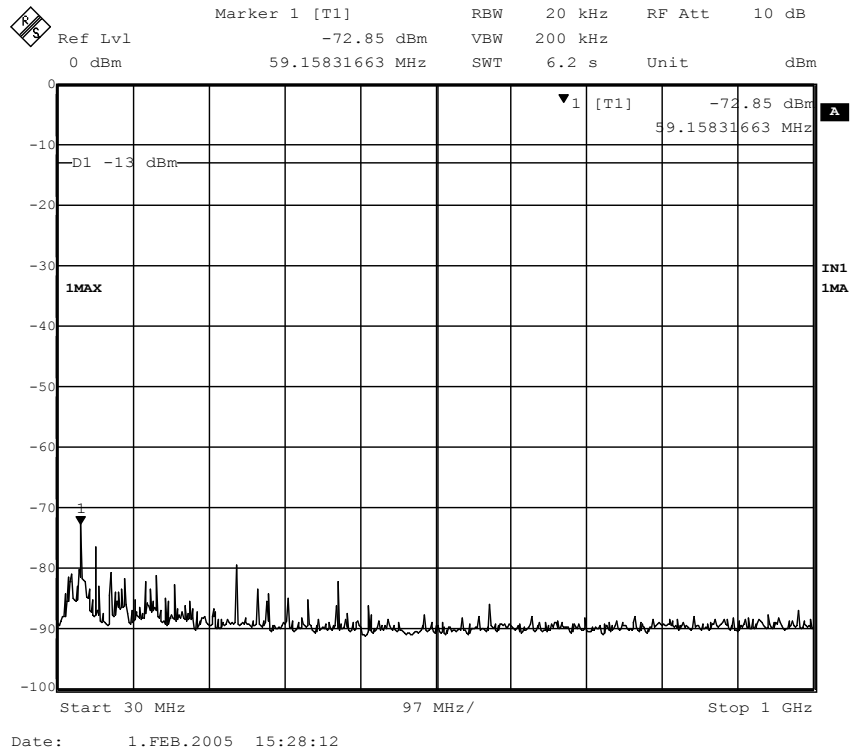
10GHz – 13GHz



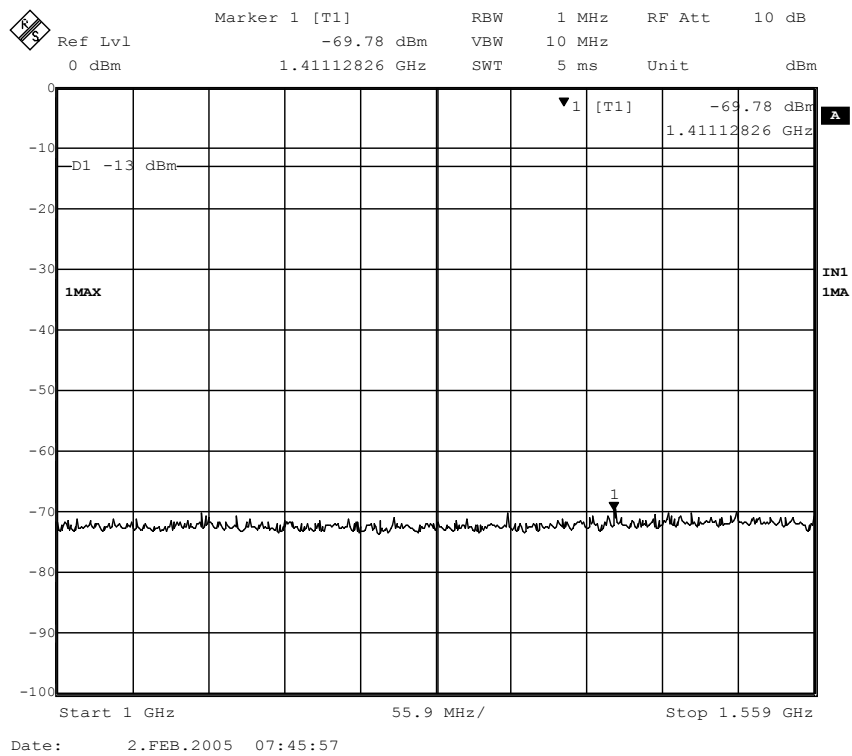
13GHz – 16.3GHz

TRANSMITTER SPURIOUS EMISSIONS – Radiated

Channel 240



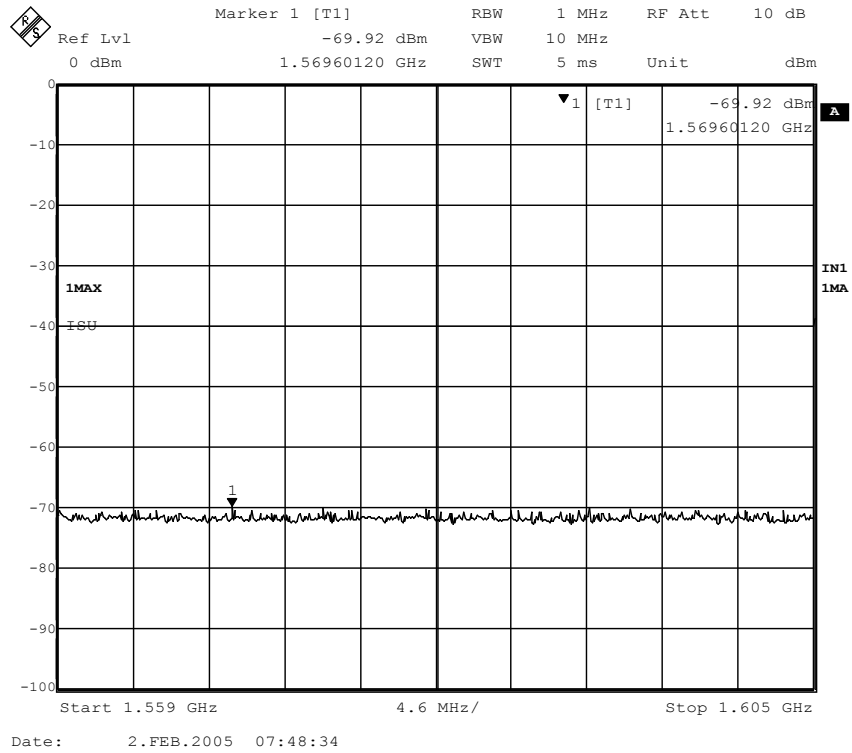
30MHz – 1000MHz



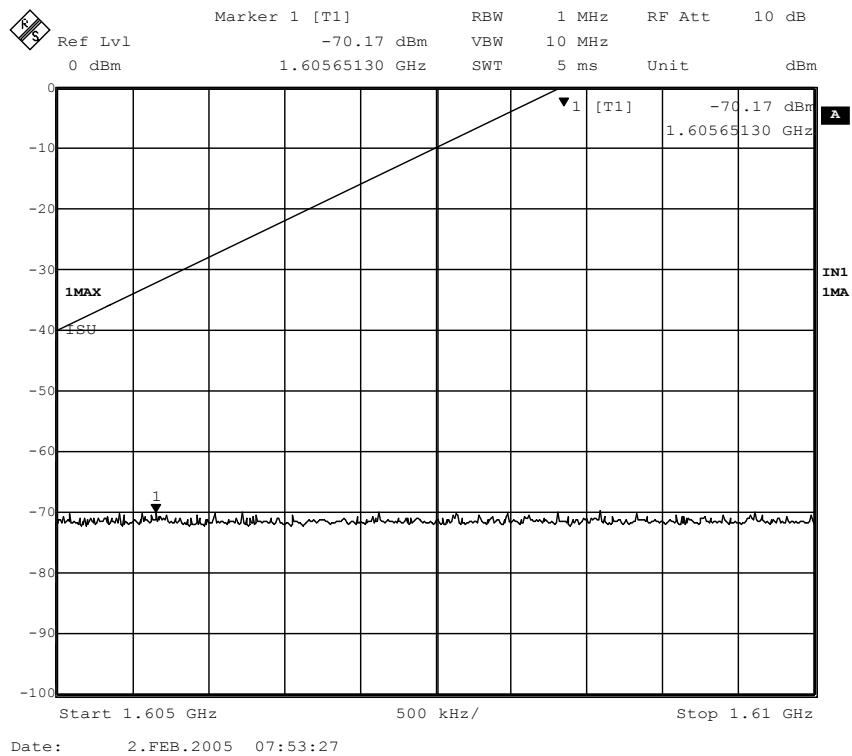
1000MHz – 1559MHz

TRANSMITTER SPURIOUS EMISSIONS – Radiated

Channel 240



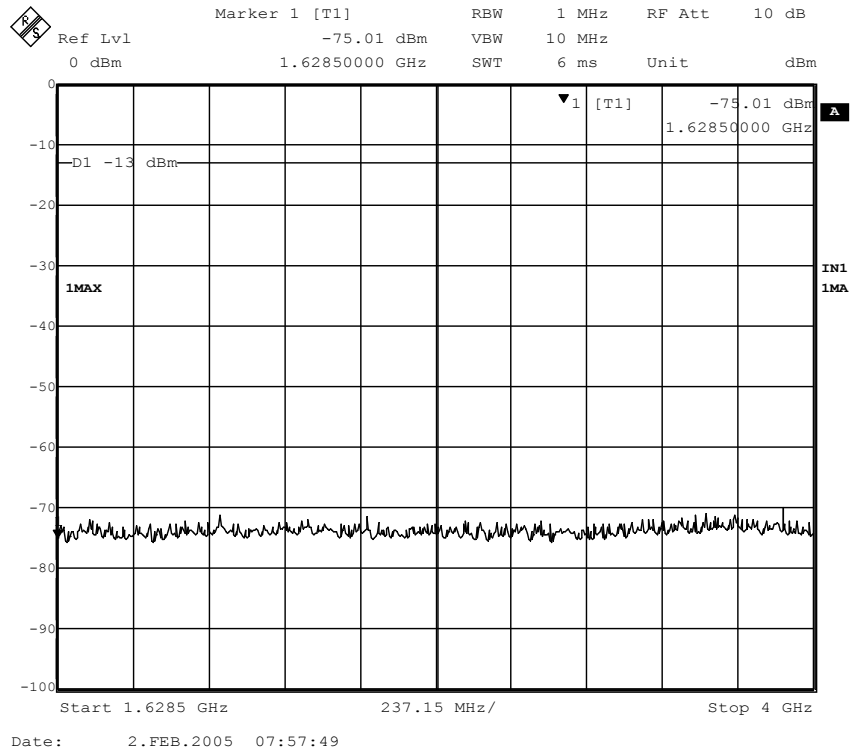
1559MHz – 1605MHz



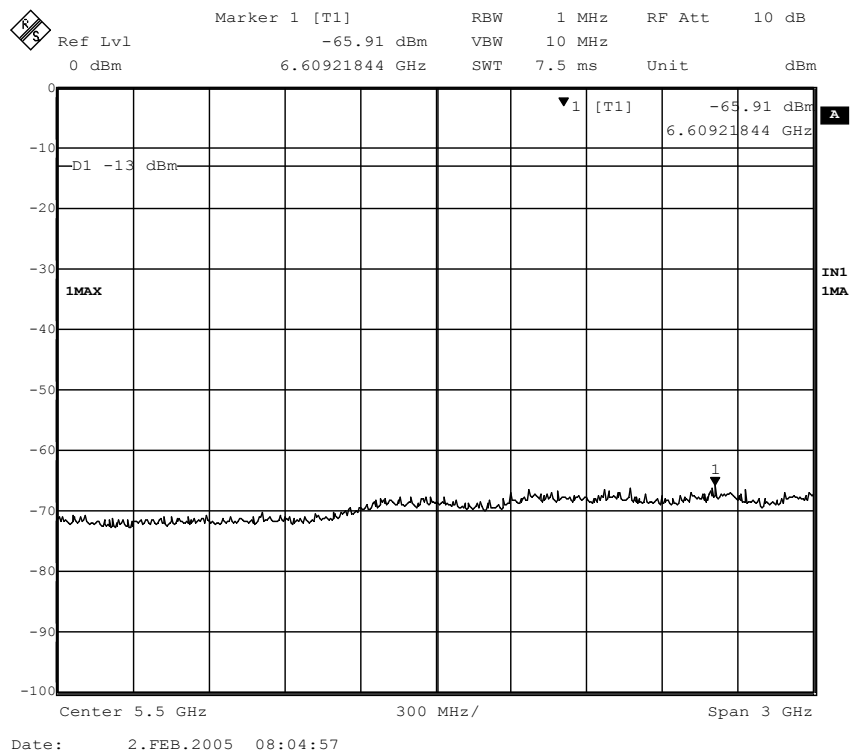
1605MHz – 1610MHz

TRANSMITTER SPURIOUS EMISSIONS – Radiated

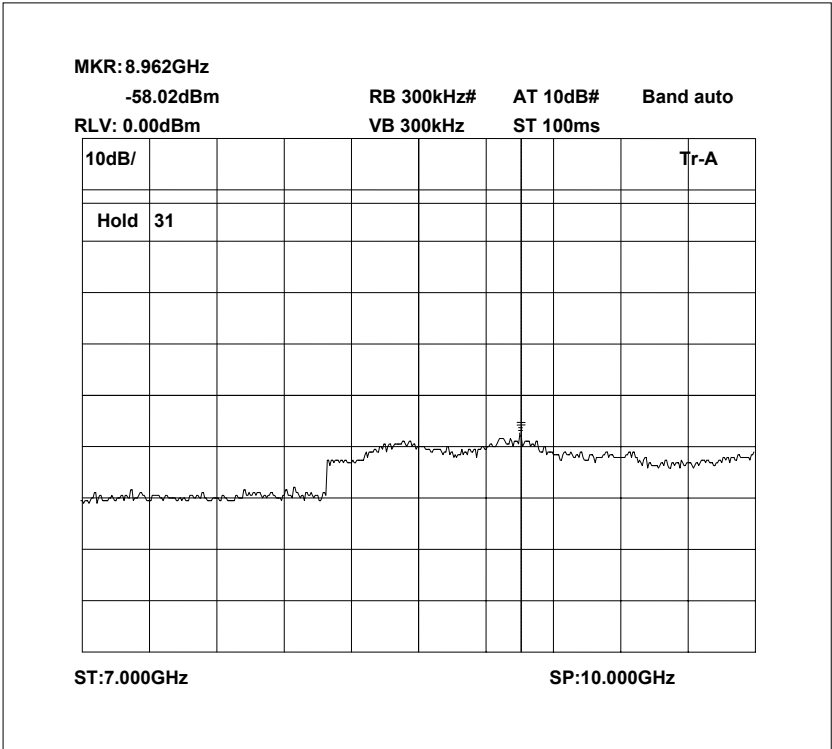
Channel 240



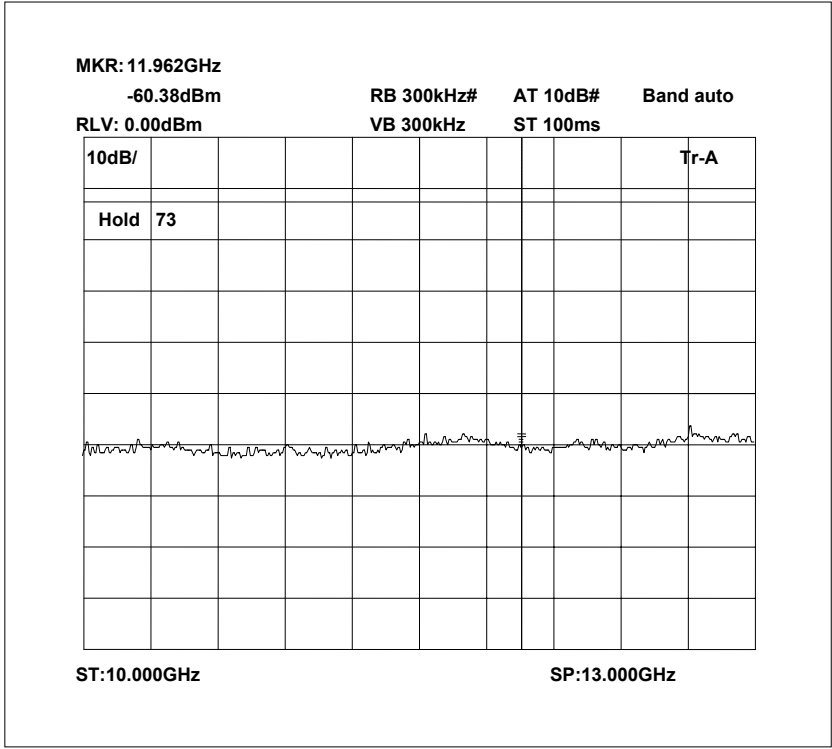
1628.5MHz – 4000MHz



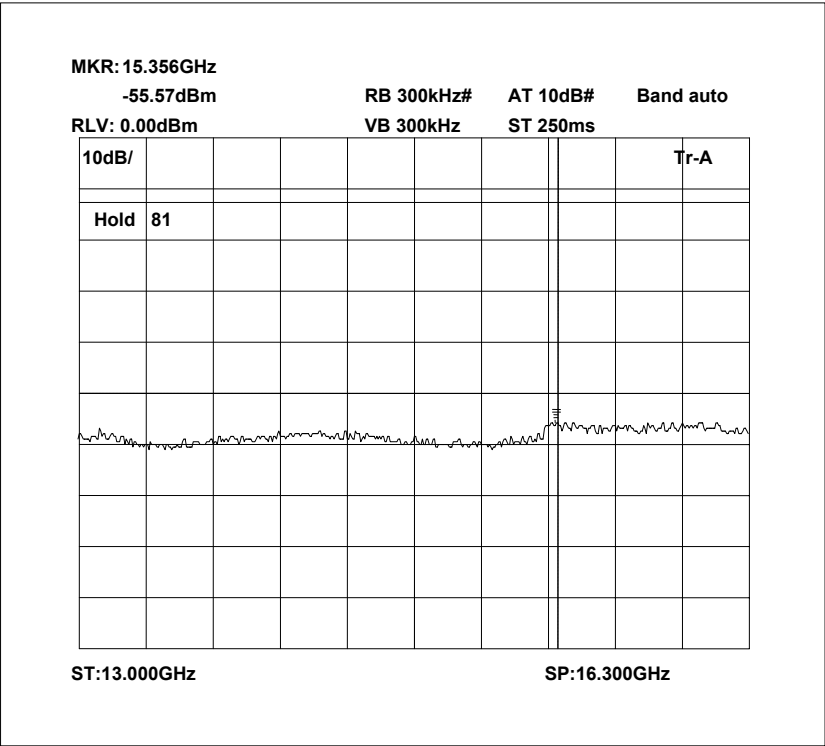
4GHz – 7GHz



7GHz – 10GHz



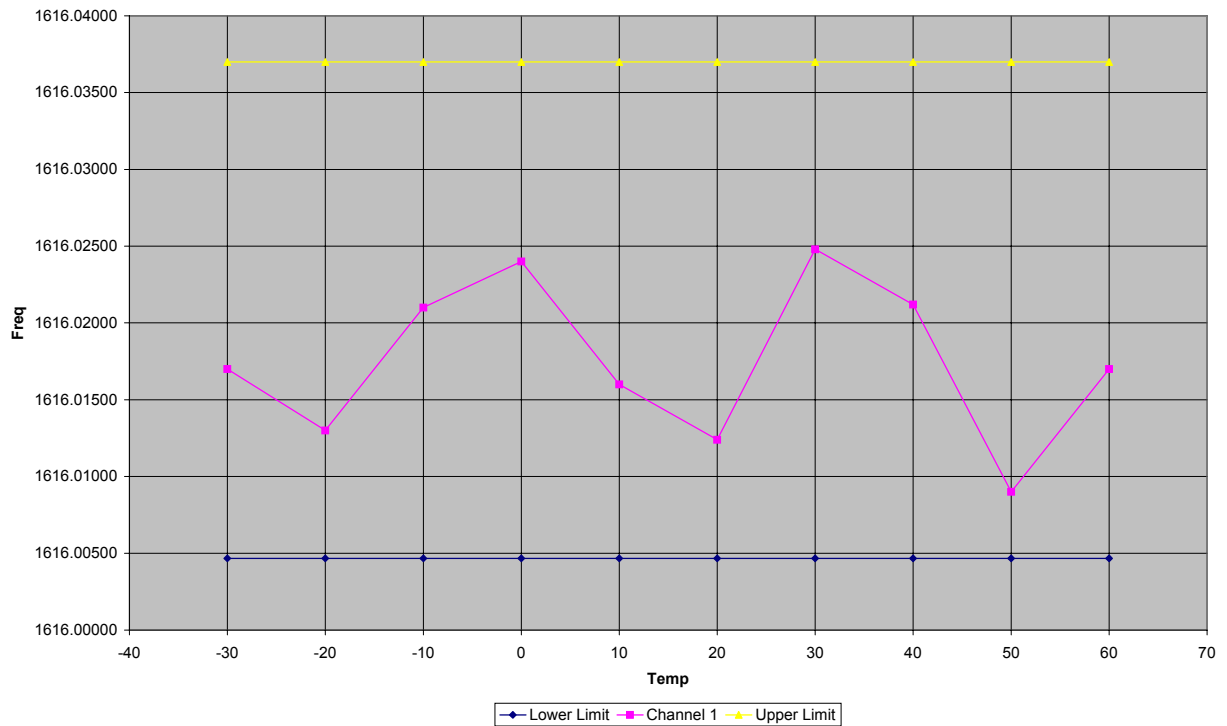
10GHz – 13GHz



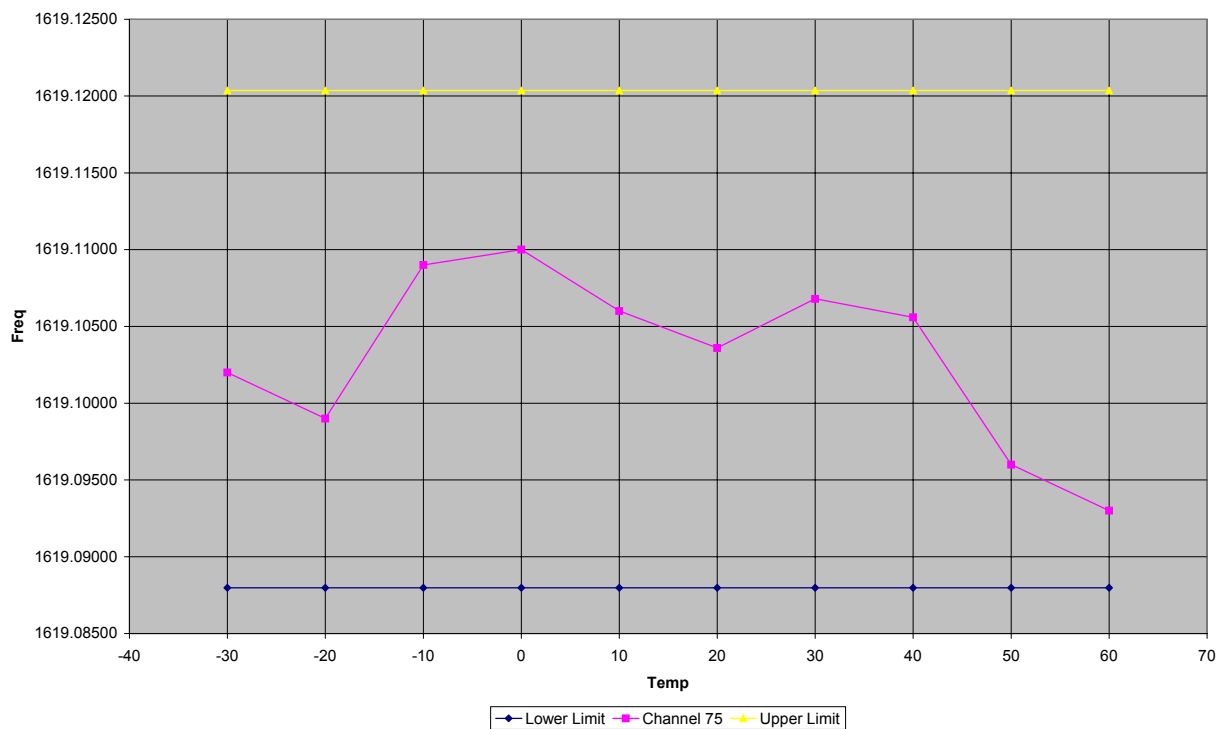
13GHz – 16.3GHz

ANNEX I
FREQUENCY STABILITY - Temperature

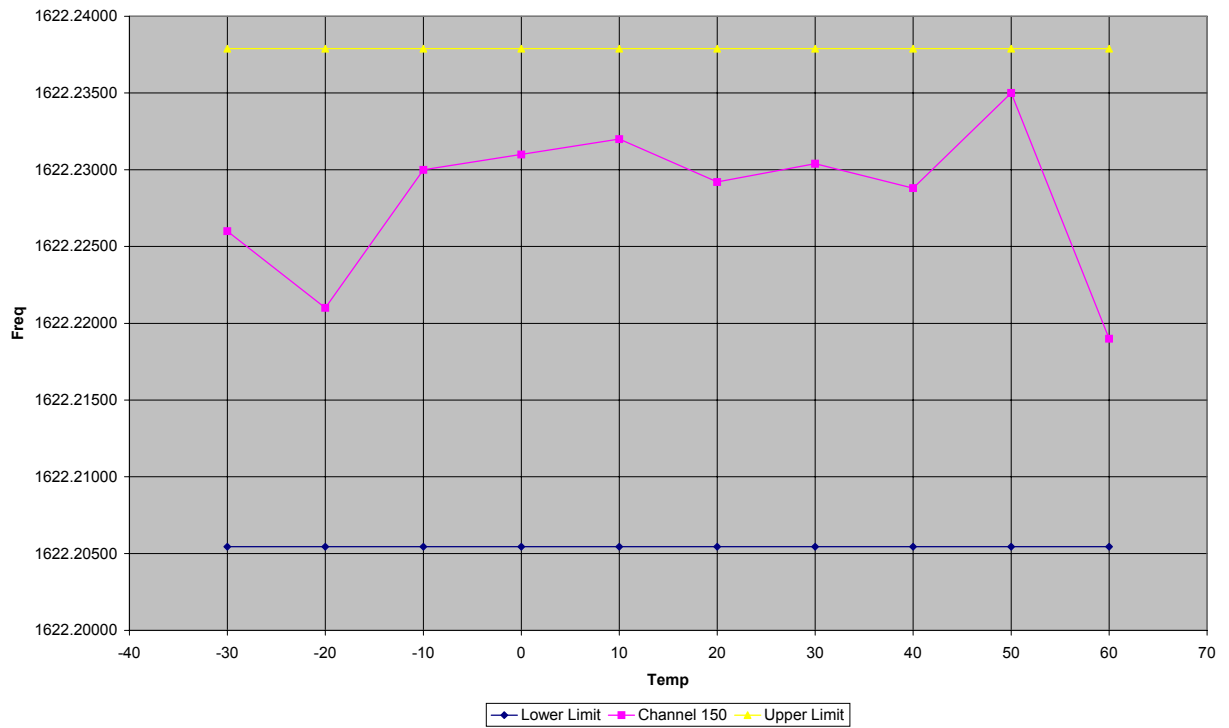
Channel 1 Frequency Stability - Temperature



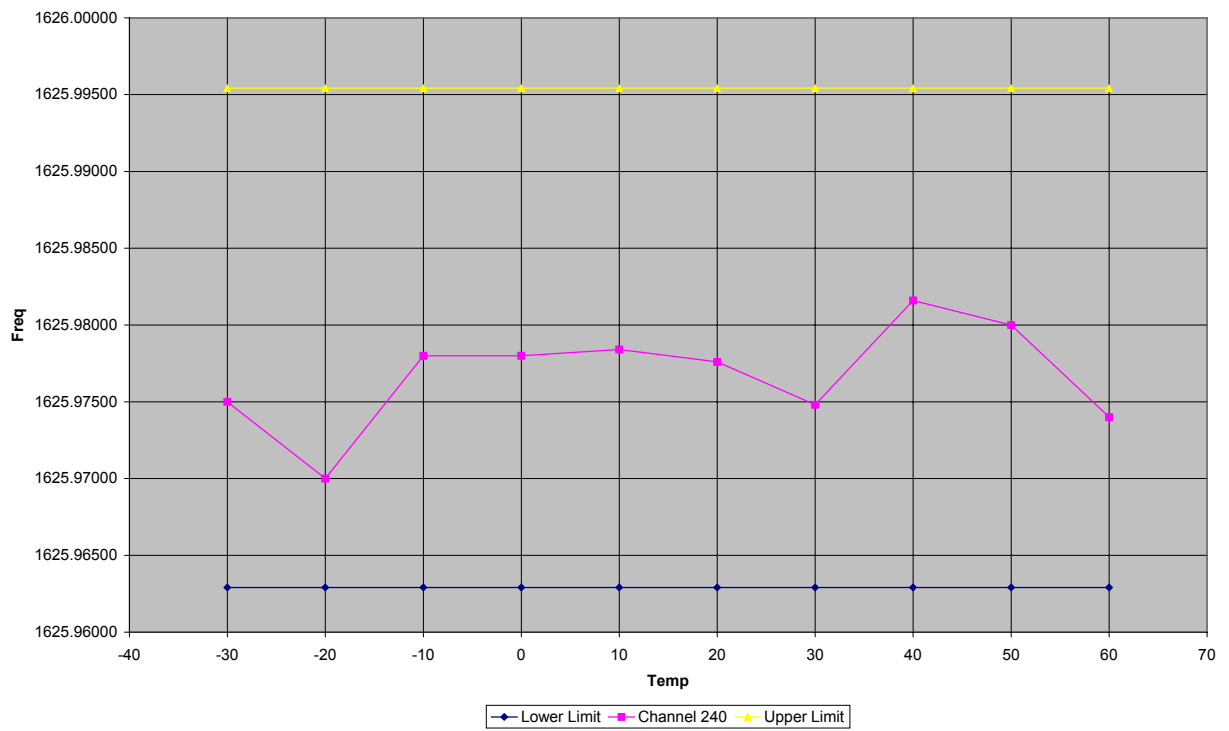
Channel 75 Frequency Stability - Temperature



Channel 150 Frequency Stability - Temperature

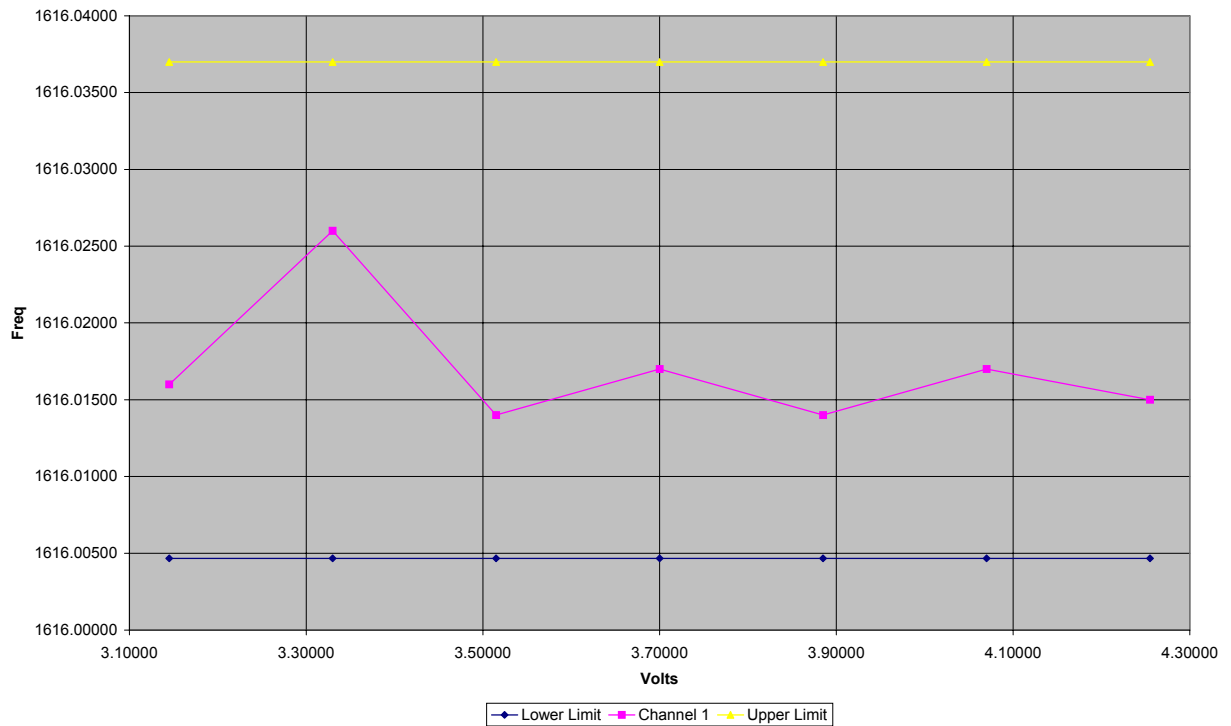


Channel 240 Frequency Stability - Temperature

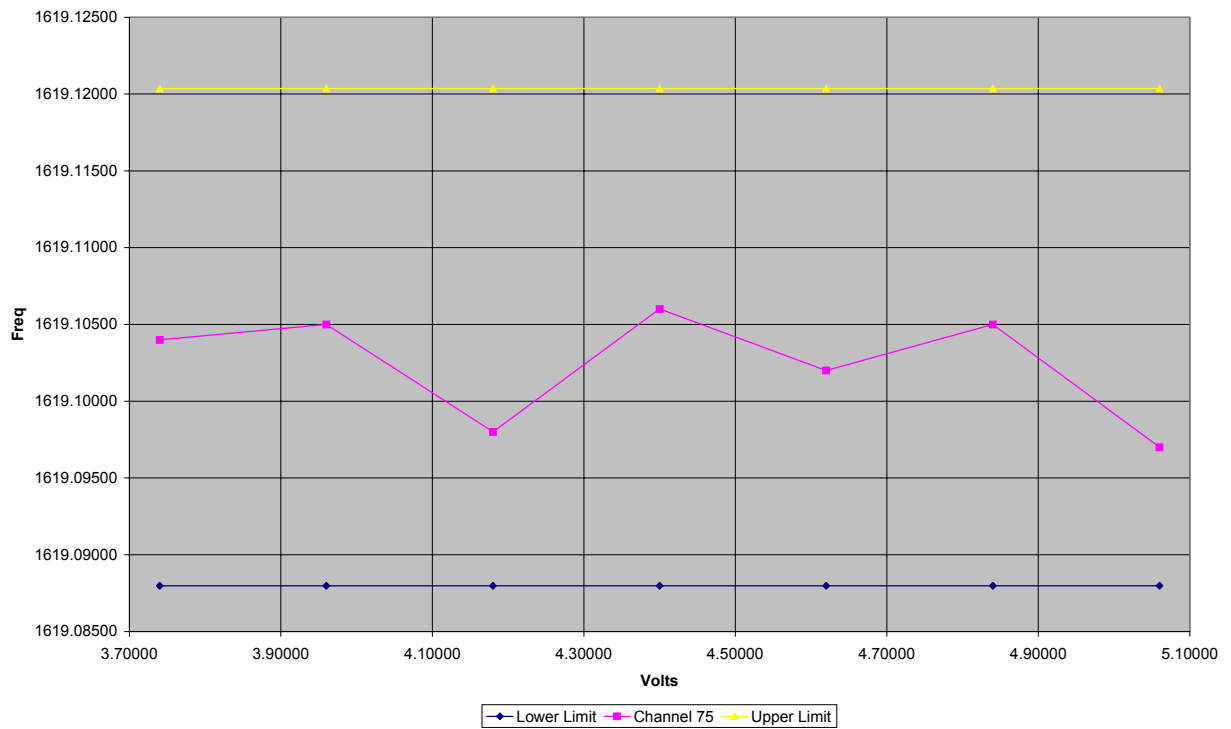


ANNEX J
FREQUENCY STABILITY – Voltage

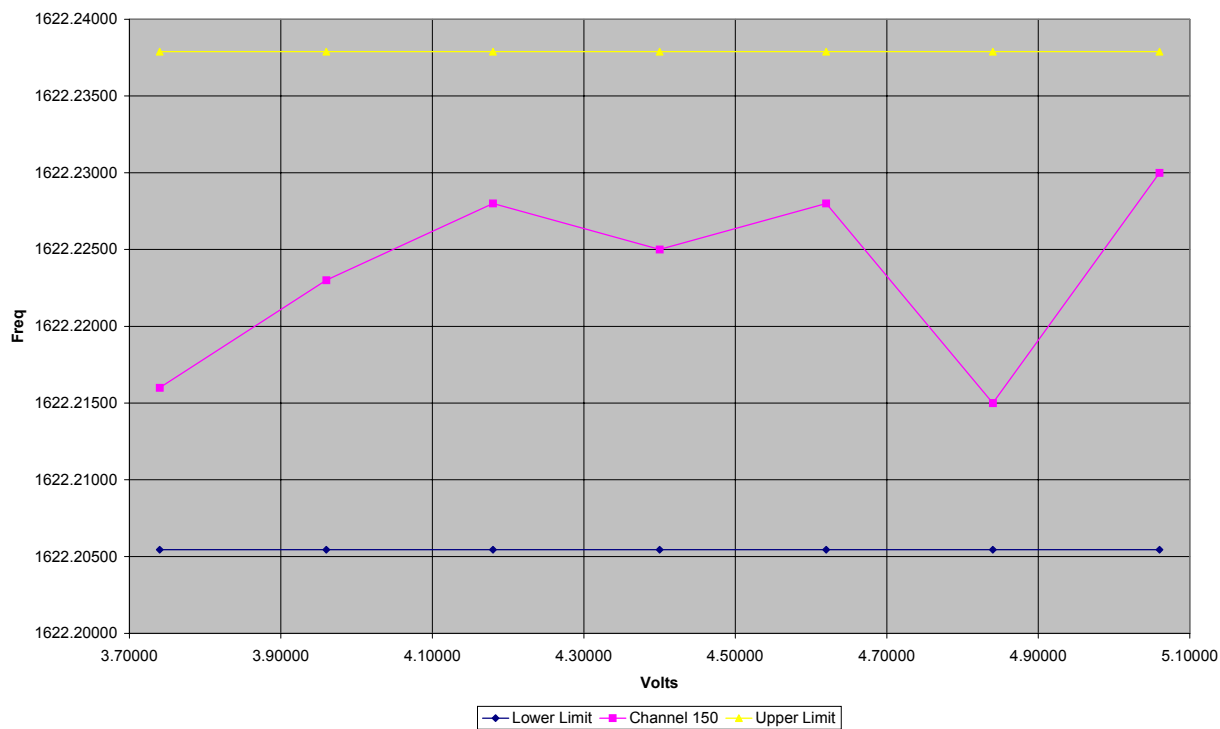
Channel 1 Frequency Stability - Voltage



Channel 75 Frequency Stability - Voltage



Channel 150 Frequency Stability - Voltage



Channel 240 Frequency Stability - Voltage

