REPORT ON THE CERTIFICATION TESTING OF AN IRIDIUM SATELLITE LLC 9555 HANDSET WITH RESPECT TO FCC RULES CFR 47, PART 25 AND FCC RULES CFR 47, PART 15

TEST REPORT NO: TTR-000169WUS1

ISSUE NO: PDF

FCC ID: Q639555A

REPORT ON THE CERTIFICATION TESTING OF AN IRIDIUM SATELLITE LLC 9555 HANDSET WITH RESPECT TO FCC RULES CFR 47, PART 25 AND FCC RULES CFR 47, PART 15

TEST DATE: 10th – 18th June 2010

APPROVED BY: ..... J CHARTERS
RADIO PRODUCT MANAGER

DATE: 29th June 2010

Distribution: Iridium Satellite LLC

TCB: TRaC EMC & Safety

TRaC Telecoms & Radio

UP HOLLAND
Moss View, Nipe Lane, Up Holland, West Lancashire, WN8 9PY, UK.
T +44 (0)1695 556666 **F** +44 (0)1695 557077 **E** test@tracglobal.com
www.tracglobal.com

CONTENTS

Notes: 1. Component failure during test YES [ ] NO [X]

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:	Q639555A
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC Rules CFR 47, Part 25 & Part 15
TEST RESULT:	Compliant to Specification
ITU EMISSIONS DESIGNATOR	41K7Q7W
EQUIPMENT UNDER TEST:	9555 Handset
EQUIPMENT TYPE:	Satellite Telephone
PEAK OUTPUT POWER:	8.81 dBW, 7.60 Watts
MEAN OUTPUT POWER:	-1.53dBw, 0.70 W
CHANNEL SPACING:	41.667 kHz
NUMBER OF CHANNELS:	252 (240 Transmit Channels)
MODULATION TYPE:	Q7W
POWER SOURCE(s):	+3.7Vdc
TEST DATE(s):	6th – 18th June 2010
APPLICANT:	Iridium Satellite LLC
ADDRESS:	6707 Democracy Blvd. Suite 300 Bethesda United States of America MD 20817
TESTED BY:	D WINSTANLEY

APPROVED BY: ..... J CHARTERS
RADIO
PRODUCT
MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	9555 Handset
EQUIPMENT TYPE:	Satellite Telephone
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC Rules CFR 47, Part 25 & Part 15
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S CONTACT PERSON(s):	Donna Bethea-Murphy
APPLICANT:	Iridium Satellite LLC
ADDRESS:	6707 Democracy Blvd. Suite 300 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 AGENTS CONTACT PERSON(s):	Mr S Hart
E-mail address:	steve.hart@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:	TRaC Telecoms & Radio, Up Holland
UKAS ACCREDITATION No:	0971
TEST DATE(s):	6th – 18th June 2010
TEST REPORT No:	TTR-000169WUS1

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 9555 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 9555 Handset.

2. Product Use: Satellite Telephone

3. Emission Designator: 41k7Q7W

4. Temperatures: Ambient (Tnom) $20^{o}C$

5. Supply Voltages: Vnom +3.7Vdc

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:
   TRaC Telecoms & Radio
   Up Holland [X]
   Hull [ ]

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. 8x41.667kHz). Up to 30 sub-bands containing 240 frequency accesses may be used for duplex channels.

Standard References

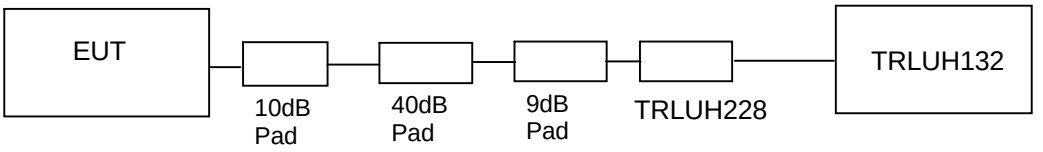
47 CFR 2 10-1-03 Edition	Code of Federal Regulations, Title 47, Part 2, “Frequency allocations and Radio Telemetry Matters; General Rules and Regulations”
47 CFR 25 10-1-03 Edition	Code of Federal Regulations, Title 47, Part 25,”Satellite Communications” Subpart C, “Technical Matters”
47 CFR 15 20-09-07 Edition	Code of Federal Regulations, Title 47, Part 15,”Radio Frequency Devices” Subpart B, “Unintentional Radiators”
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	=	23^{o}C	Radio Laboratory
Relative humidity	=	58%	
Supply voltage	=	+3.7Vdc	
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 test commands sent from a PC via the MAMBO Box. The antenna gain, included in the table below, represents the highest gain of any antennas that are used with this system.

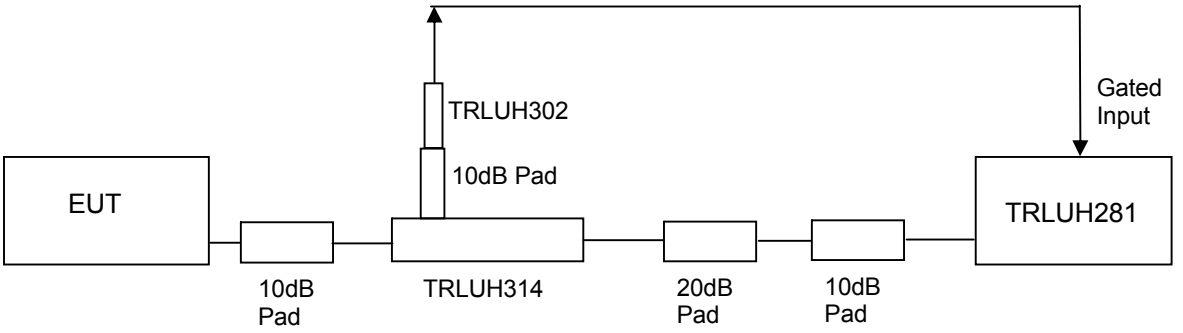
Frequency MHz	Attenuator and cable loss dB	Level at Power Meter dBm	Antenna Gain dB	Mean Carrier Power dBm	Duty Cycle Factor dB	Peak Carrier power dBm	Carrier power dBW	Limit dBW
Channel 1	60.2	-34.73	3	28.47	10.32	38.81	8.81	40
Channel 75	60.2	-34.89	3	28.31	10.32	38.65	8.65	40
Channel 150	60.2	-35.53	3	27.67	10.32	38.01	8.01	40
Channel 240	60.2	-36.63	3	26.57	10.32	36.91	6.91	40

Notes: 1. Duty Cycle Factor = 10 x log (1/**X**) Where **X**= (Ton / Tframe). 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 as declared by manufacturer

TRANSMITTER TESTS

EMISSIONS LIMITATIONS – CONDUCTED – PART 25.202 (f)

Ambient temperature	=	23^{o}C	Radio Laboratory
Relative humidity	=	58%	
Supply voltage	=	+3.7Vdc	



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.

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

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

Where the Authorised Bandwidth = 41.667 kHz

Note

1. The 3 kHz to 4 kHz bandwidth correction, cable and attenuator losses and antenna gain have been taken into account in the Ref level offset figure.

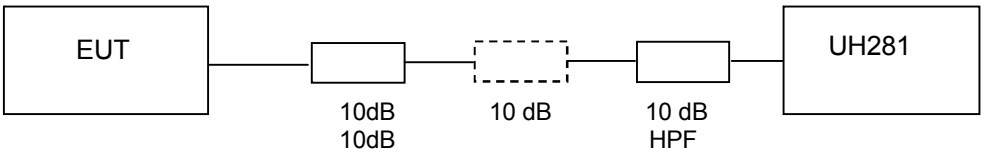
The 9555 Handset was found to comply with the limits

See plots in Annex G.

TRANSMITTER TESTS

SPURIOUS EMISSIONS – CONDUCTED – PART 25.202 (f) & 25.216

Ambient temperature = 14°C Radio Laboratory
Relative humidity = 46%
Supply voltage = +3.7Vdc



For measurements between 1559 MHz and the band edge of 1610MHz the same test setup as per emissions limitations test was used. For measurements below 1559 MHz and above the band edge of 1628.5MHz the above test setup was used. 10 dB and 20 dB attenuators was used for measurements below 3GHz and 10dB and 3dB attenuators and high pass filter for measurements above 3GHz.

See Annex C for full list of test equipment

The test setup was as per the above diagram. The unit was tested on two 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.

The Spurious limit was calculated as follows:

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

At least 43 + 10 log (P)dB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) = LIMIT = -13$ 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 20 dB of the Limit					-13
1559MHz – 1605MHz	1 240 1 240	1576.747 1579.561 1601.651 1603.306	-79.18 -81.10 -77.00 -79.55	33.04 33.04 32.60 32.60	-46.14 (Note 7) -48.06 (Note 7) -44.40 (Note 7) -46.95 (Note 7)	-40 (note 6)
1605MHz – 1610MHz	1 240	1605.000 1605.000	-78.21 -47.69	32.56 32.56	-45.56 -47.69	-40 (Note 4)
1628.5MHz – 16.3 GHz	1 240 1 240 1 240	3232.364 3251.715 4847.290 4877.465 6464.080 6503.944	-54.34 -58.41 -59.85 -58.60 -62.65 -64.89	13.35 13.14 14.30 14.05 14.99 15.87	-40.99 -45.27 -45.55 -44.10 -47.66 -53.02	-13 -13 -13 -13 -13 -13

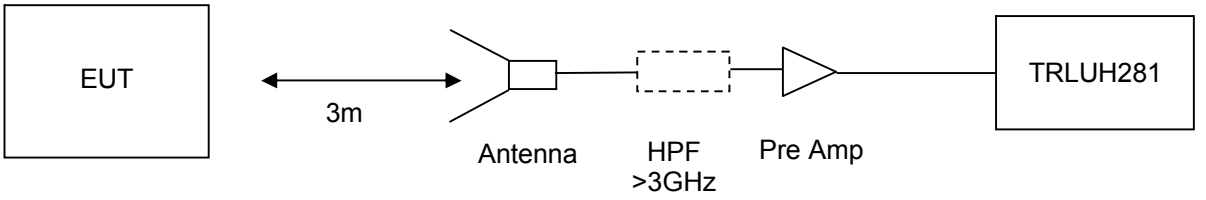
Notes :
1. Emissions Checked up to 10 times Fc
2. Reference level offset of Scan plots in Annex H already have approximate attenuator losses taken into account
3. Average measurement in a carrier on state were taken in the bands 1599MHz to 1605MHz and 1605MHz -1610MHz. All other scans were peak hold for worst case.
4. -40 to -10 Linearly interpolated in dBm Vs frequency offset.
5. Correction Factor for dBm to dBW = -30dB.
6. This limit reduces to -50 dBm for discrete emissions of less than 700Hz bandwidth.
7. Not a discrete emissions of less than 700Hz bandwidth.

The 9555 Handset was found to comply with the limits. See Annex H for plots

TRANSMITTER TESTS

SPURIOUS EMISSIONS – RADIATED – PART 25.202 (f) & 25.216

Ambient temperature	=	23°C
Relative humidity	=	46%
Conditions	=	OATS
Supply voltage	=	+3.7Vdc
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 two channels .The unit was put into test mode and set to operate at maximum power and with a tone modulating signal using test commands sent from a PC via the MAMBO Box. The unit was mounted on a turntable and rotated through 360^0 to find the worst case emission.

The Spurious limit was calculated as follows:

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

At least 43 + 10 log PdB

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

RESULTS

FREQUENCY RANGE	CHANNEL NUMBER	FREQ. (MHz)	ERP/EIRP (dBm)	LIMIT (dBm)
100kHz – 1559MHz	No Significant Emissions within 20 dBs of the Limit			-13
1559MHz – 1605MHz	No Significant Emissions within 20 dBs of the Limit			-40 Note 6
1605MHz – 1610MHz	No Significant Emissions within 20 dBs of the Limit			-40 to 10 Note 4
1628.5MHz – 16.3 GHz	3232.040	1	-36.00	-13
	3251.972	240	-36.50	-13
	4848.066	1	-35.44	-13
	4877.931	240	-35.09	-13
	6464.080	1	-40.95	-13
	6503.912	240	-41.34	-13
	12928.169	1	-39.85	-13

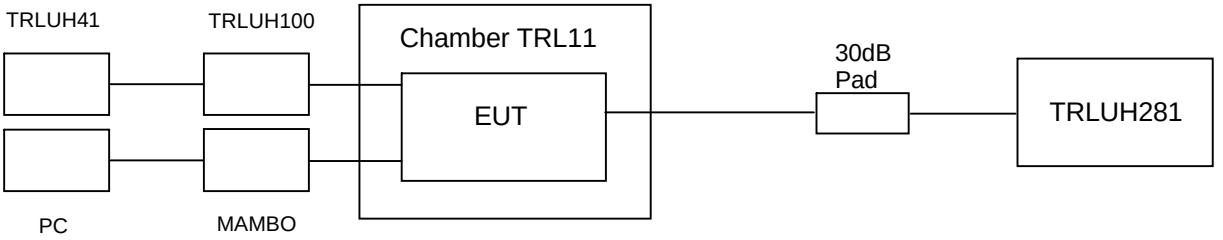
Notes :
1. Emissions Checked up to 10 times Fc.
2. Scan plots of channels 1 & 240 with receive antenna in vertical polarization in annex H.
3. The unit was mounted on a turntable and rotated through 360^0 and in 3 orthogonal planes to find the worst case emission.
4. -40 to -10 Linearly interpolated in dBm Vs frequency offset.
5. Correction Factor for dBm to dBW = -30dB.
6. This limit reduces to -50 dBm for discrete emissions of less than 700Hz bandwidth.

The 9555 Handset was found to comply with the limits. See annex I for plots

TRANSMITTER TESTS

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

Ambient temperature = 20°C Radio Laboratory
Relative humidity = 52%
Supply voltage = +3.7Vdc



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 tone modulating signal using test commands sent from a PC via the MAMBO Box. The Analyser was set to max hold.

RESULTS

TEMP	Frequency (MHz)			
^{0}C	Channel 1	Channel 75	Channel 150	Channel 240
+60	1616.022984	1619.106284	1622.231308	1625.981320
+50	1616.022744	1619.106092	1622.231148	1625.981100
+40	1616.022496	1619.105876	1622.230828	1625.980880
+30	1616.022480	1619.105844	1622.230804	1625.980912
+20	1616.022692	1619.106048	1622.231044	1625.981004
+10	1616.020140	1619.105178	1622.230298	1625.980210
0	1616.019976	1619.105150	1622.230052	1625.980128
-10	1616.021924	1619.105086	1622.230196	1625.980192
-20	1616.022954	1619.106214	1622.231172	1625.981076
-30	1616.025100	1619.108480	1622.233720	1625.983420

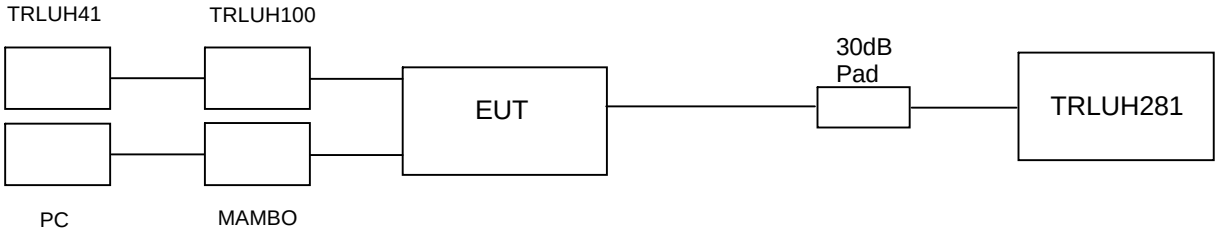
Notes: 1.Limit ± 10ppm (See Annex J for frequency stability plots verses limit)

The 9555 Handset was found to comply with the limits

TRANSMITTER TESTS

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

Ambient temperature	=	20°C	Radio Laboratory
Relative humidity	=	54%	
Supply voltage	=	+3.7Vdc	



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 tone modulating signal using test commands sent from a PC via the MAMBO Box. The Analyser was set to max hold.

RESULTS

VOLTAGE	Frequency (MHz)			
%	Channel 1	Channel 75	Channel 150	Channel 240
85	EUT Ceases transmission below 95 % of Vnom			
90				
95	1616.020000	1619.106638	1622.231596	1625.978413
100	1616.019995	1619.106606	1622.231602	1625.978314
105	1616.020037	1619.106625	1622.231647	1625.978330
110	1616.020014	1619.106651	1622.231679	1625.978833
115	1616.020014	1619.106689	1622.231625	1625.978311

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

The 9555 Handset was found to comply with the limits

UNINTENTIONAL TRANSMITTER TESTS

UNINTENTIONAL TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.109

Ambient temperature	=	18°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	80% (<1GHz),	3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[ ]
Supply voltage	=	+3.7Vdc		

	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
0.009MHz - 0.49MHz	No Significant Emissions Within 20 dB of Limit								
0.49MHz - 1.705MHz									
1.705MHz - 30MHz									
30MHz - 88MHz	60.05	16.2	0.8	5.0	-	22.0	-	12.58	100
88MHz - 216MHz	No Significant Emissions Within 20 dB of Limit								
216MHz - 960MHz	240.05	20.5	1.7	10.4	-	32.6	-	42.65	200
	300.20	17.1	1.9	13.0	-	32.0	-	39.81	200
	336.00	14.3	2.0	14.3	-	30.6	-	33.88	200
	400.20	14.4	2.3	16.3	-	33.0	-	44.66	200
	405.00	17.4	2.3	16.5	-	36.2	-	64.56	200
	432.05	21.2	2.4	16.4	-	40.0	-	100.00	200
	500.35	12.1	2.7	18.0	-	32.8	-	43.65	200
	528.10	20.4	2.8	18.8	-	42.0	-	125.89	200
	607.50	11.6	3.1	20.3	-	35.0	-	56.23	200
	630.45	8.7	3.1	20.7	-	32.5	-	42.17	200
	900.60	10.0	3.6	23.8	-	37.4	-	74.13	200
960MHz - 1GHz	No Significant Emissions Within 20 dB of Limit								
1GHz - 16.3GHz									

Limits	0.009 MHz to 0.49 MHz	2400/f(kHz) µV/m @ 300m
	0.49 MHz to 1.705 MHz	24000/f(kHz) µV/m @ 30m
	1.705MHz to 30MHz	30µV/m @ 30m
	30MHz to 88MHz	100µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m
	216MHz to 960MHz	200µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m
	1GHz to 16.3GHz	500µV/m @ 3m

Notes:
1 Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a
2 Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
3 Receiver detector >1GHz = Average, 1MHz resolution bandwidth
4 Peak Emissions >1GHz are within 20 dB of the Average limit
5 Only emissions within 20 dB of the limit are recoded.
6 See annex L for emissions plots

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2003
2 Measuring distances as Notes 1 to 4 above
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded.

TRANSMITTER / RECEIVER TESTS

CONDUCTED EMISSIONS – AC POWER LINE Part 15.107 & 15.207

SIGNIFICANT EMISSIONS – Receive Mode

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
2.355	26.76	Average	Neutral	46.0
2.895	27.21	Average	Neutral	46.0
2.945	27.21	Average	Neutral	46.0

SIGNIFICANT EMISSIONS – Transmit Mode

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
2.355	26.37	Average	Neutral	46.0
2.880	26.84	Average	Neutral	46.0
3.015	26.69	Average	Neutral	46.0

Notes: 1 See attached plots annex M
2 EUT in normal operation mode.
3 Worst case result recorded.

Test Method: 1 As per Radio – Noise Emissions, ANSI C63.4: 2003

The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

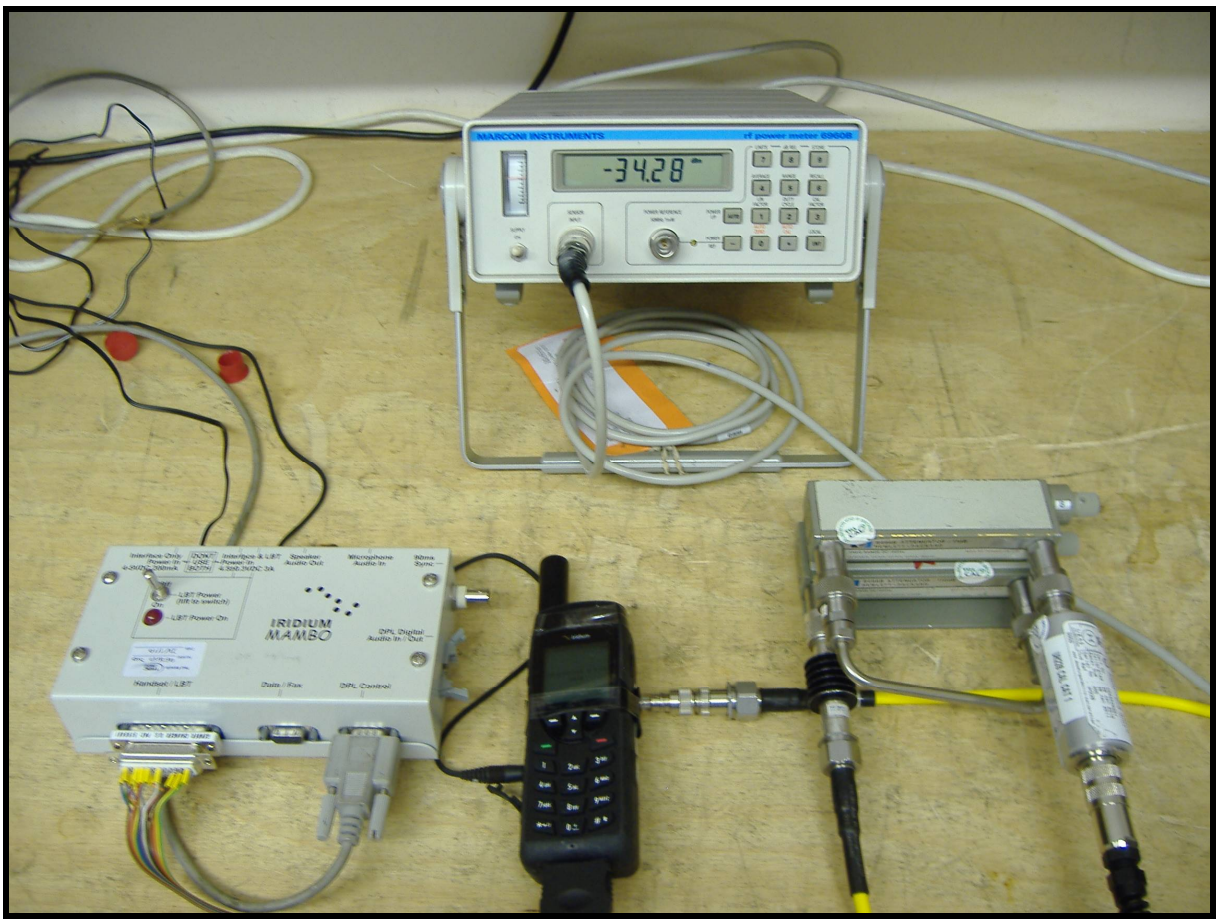
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	841429/012	UH187	**X**
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	8407 31/015	UH195	**X**

ANNEX A

PHOTOGRAPHS

PHOTOGRAPH 1. **RADIATED TEST SETUP**

PHOTOGRAPH 2. **CONDUCTED TEST SETUP**



PHOTOGRAPH 3. **TOP OVERVIEW**

PHOTOGRAPH 4. **REAR OVERVIEW**

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
ENVIRONMENTAL CHAMBER	SHARTREE	TCC 125-815P	CS 203	11
ATTENUATOR	SHUNER	68030.17.A	N/A	135
HORN	EMCO	3115	9010-3580	138
HORN	EMCO	3115	9010-3581	139
SIGNAL GENERATOR	MARCONI	2042	119388/080	176
ATTENUATOR	BIRD	8304-100-N	N/A	222
TEMPERATURE INDICATOR	FLUKE	52 SERIES II	74700044	426
PRE AMPLIFIER	AGILENT	8449B	2118	572
RECEIVER	R&S	ESHS10	830051/01	UH03
RECEIVER	R&S	ESVS10	825892/006	UH04
MULTIMETER	AVOMeter	M3004	M3270006	UH41
PSU	THANDAR	PL32QMD	044749	UH100
POWER METER	MARCONI	6960B	237036/001	UH132
BILOG ANTENNA	YORK	CBL611/A	1618	UH191
LISN	R&S	ESH3-Z5.831.5	8407 31/8015	UH195
POWER SENSOR	MARCONI	6920	1564	UH228
SPECTRUM ANALYSER	R&S	FSU 46	200034	UH281
CRYSTAL DETECTOR	HP	8472A	1822Z00897	UH302
DIRECTIONAL COUPLER	SINGER	117310	26	UH314
PRE AMPLIFIER	WATKINS JONSON	6201-69	2740	UH372
HIGH PASS FILTER	BSC	SH4141	147301	N/A
ATETNUATOR	AGILENT	8494B	N/A	N/A

ANNEX D

TEST EQUIPMENT CALIBRATION

REF Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH003	Receiver	R&S	10/12/2009	12	10/12/2010
UH004	Receiver	R&S	10/12/2009	12	10/12/2010
UH06/07	IC OATS Submission	TRL	02/07/2009	24	02/07/2011
UH06/07	NSA Calibration	TRL	19/06/2009	12	19/06/2010
UH028	Log Periodic Ant	Schwarbeck	14/08/2009	24	14/08/2011
UH029	Bicone Antenna	Schwarbeck	13/08/2009	24	13/08/2011
UH041	Multimeter	AVOmeter	25/01/2010	12	25/01/2011
UH093	Bilog	Chase	03/06/2009	24	03/06/2011
UH100	PSU	Thandar	Use Calibrated Multimeter		
UH122	Oscilloscope	Tektronix	18/12/2009	24	18/12/2011
UH132	Power meter	Marconi	27/01/2010	12	27/01/2011
UH191	Bilog	York	01/10/2008	24	01/10/2010
UH195	LISN	R&S			
UH228	Power Sensor	Marconi	28/01/2010	12	28/01/2011
UH253	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH254	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH269	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH270	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH271	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH272	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH273	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH274	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH281	Spectrum Analyser	R&S	29/01/2010	12	29/01/2011
UH288	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH291	K-Type Cable	Succoflex	15/07/2009	12	15/07/2010
UH293	K-Type Cable	Megaphase	15/07/2009	12	15/07/2010
UH302	Crystal Detector	HP	For Information Only		
UH314	Bi-Directional Coupler	Narda	Calibrate In Use		
UH365	Harmonic Mixer (33-50)	Agilent	16/07/2008	24	16/07/2010
UH366	Harmonic Mixer (50-75)	Agilent	21/07/2008	24	21/07/2010
UH367	Harmonic Mixer (75-110)	Agilent	02/07/2008	24	02/07/2010
UH368	Horn (50-75)	Flann	02/07/2008	24	02/07/2010
UH369	Horn (75-110)	Flann	02/07/2008	24	02/07/2010
UH372	Pre Amplifier	Watkins Johnson	19/03/2009	24	19/03/2010
L011	Temperature Chamber	Shartree	Use Calibrated Temperature Indicator		
L135	Attenuator	Shuner	Calibrate in Use		
L138	1-18GHz Horn	EMCO	10/09/2009	24	10/09/2011
L139	1-18GHz Horn	EMCO	17/08/2009	24	17/08/2011
L176	Signal Generator	Marconi	23/06/2009	12	23/06/2010
L193	Bicone Antenna	Chase	06/05/2008	24	06/05/2010
L203	Log Periodic Ant	Chase	06/05/2008	24	06/05/2010
L426	Temperature Indicator	Fluke	25/01/2010	12	25/01/2011
L572	Pre Amp	Agilent	15/07/2009	12	15/07/2010
N/A	High Pass Filter	BSC	04/12/2009	12	04/12/2010
N/A	Attenuator	HP	Calibrate in Use		

ANNEX E

MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**
Uncertainty in test result (Equipment – TRL05) = **1.08dB**
Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**
Uncertainty in test result (Equipment – TRL05) = **0.113ppm**
Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**
Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%,** Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

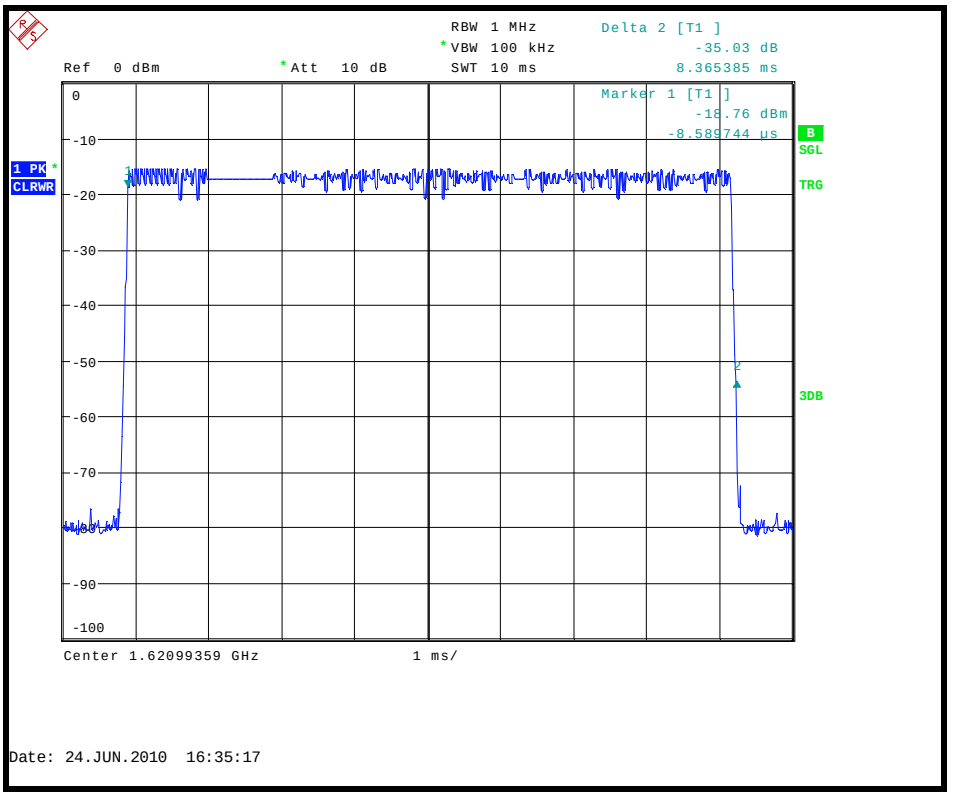
[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**

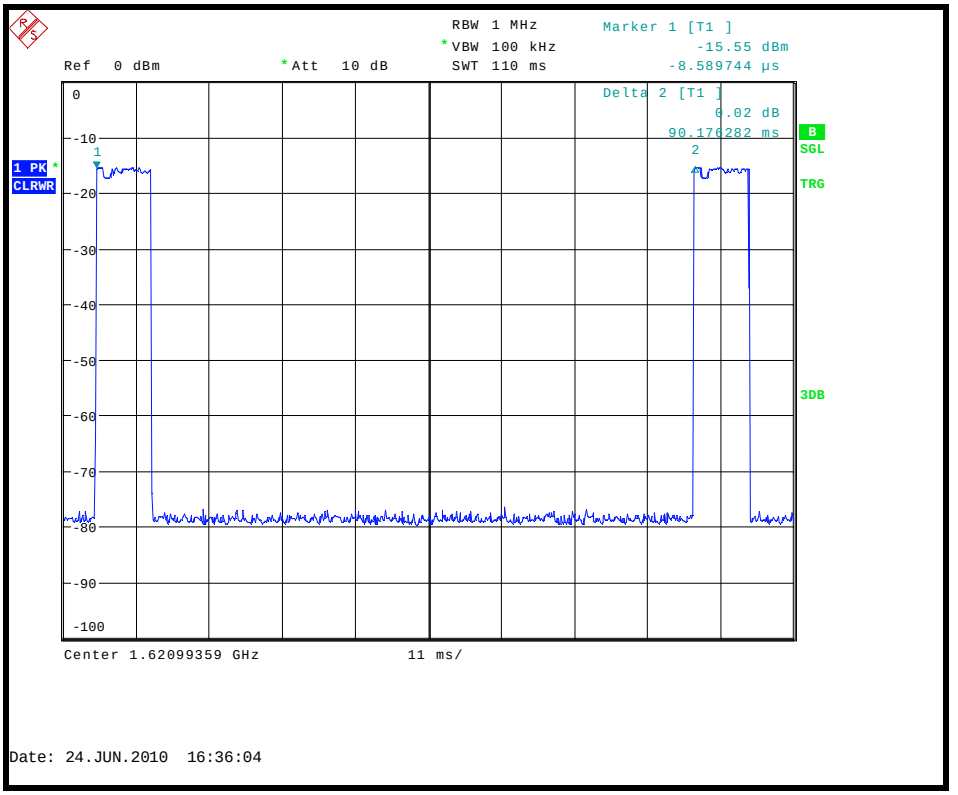
ANNEX F

DUTY CYCLE

Duty Cycle Plots



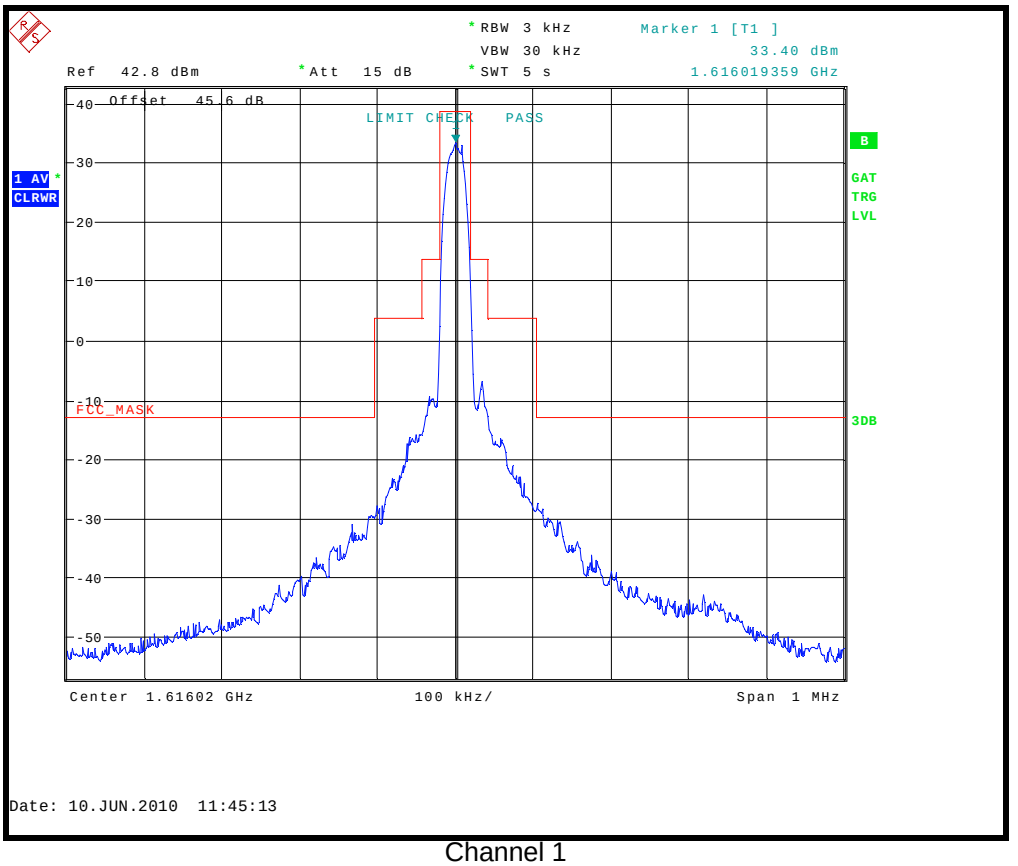
T_{on} = 8.36mS



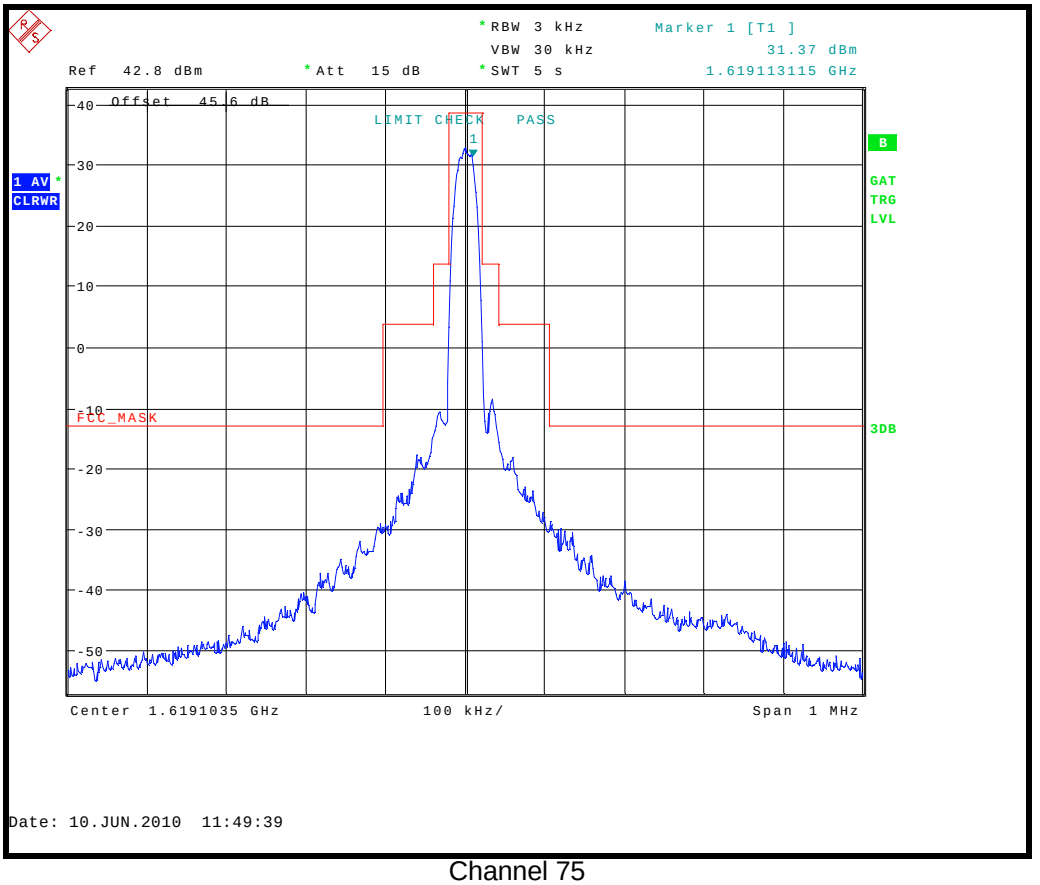
T_{frame} = 90.00mS

ANNEX G

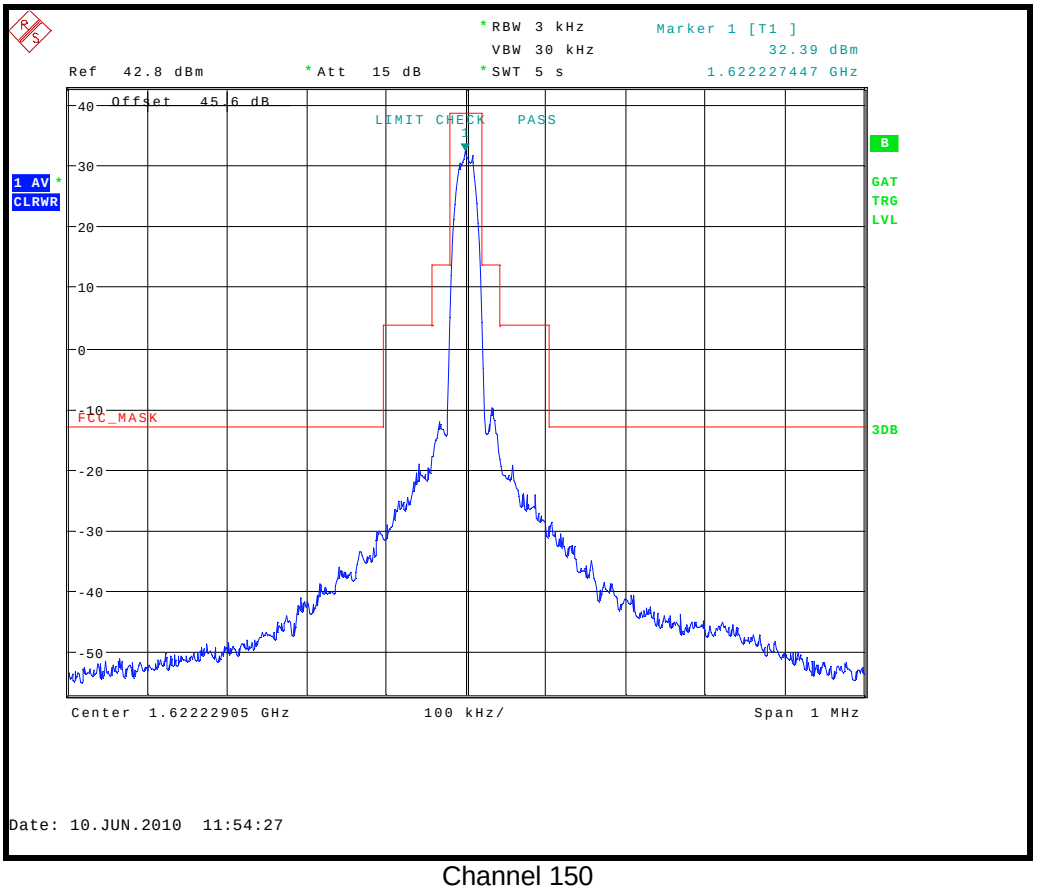
EMISSIONS LIMITATIONS



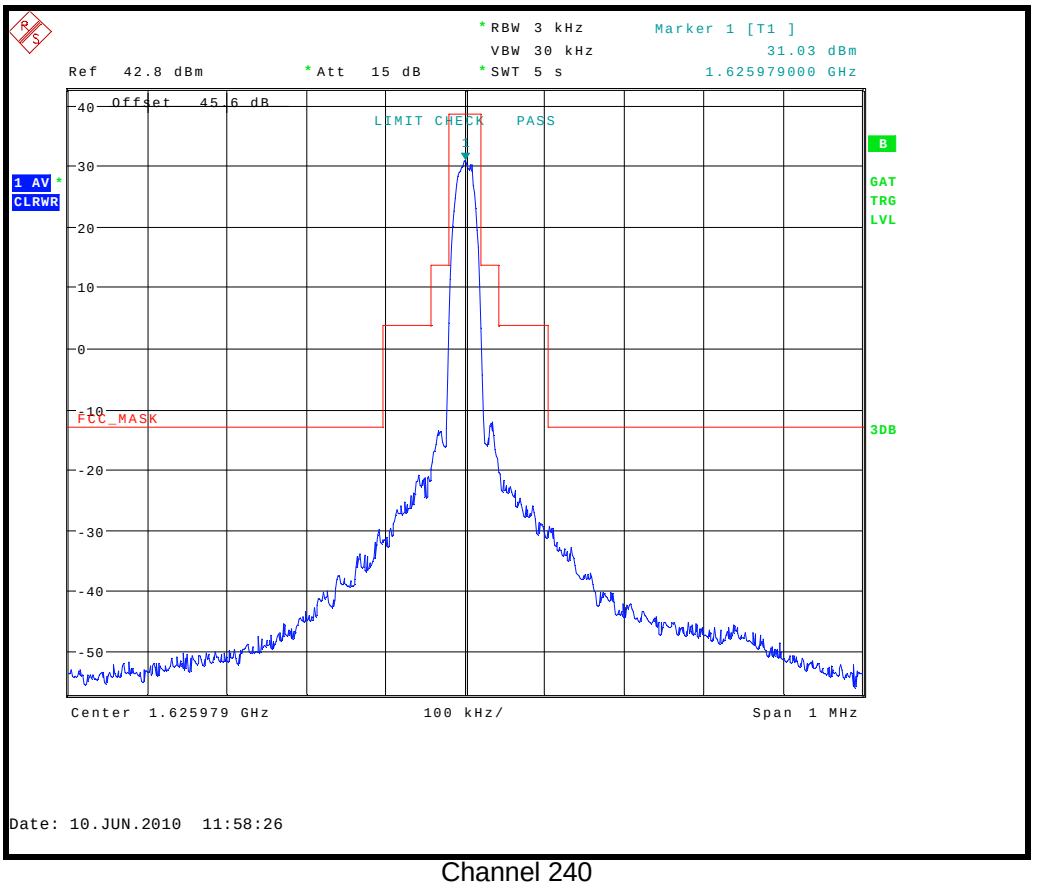
Channel 1



Channel 75



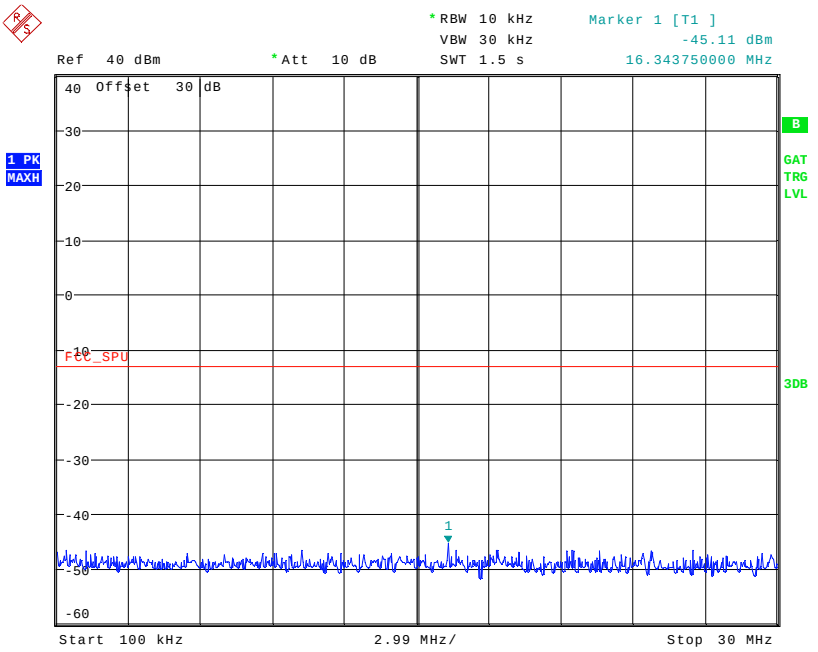
Channel 150



Channel 240

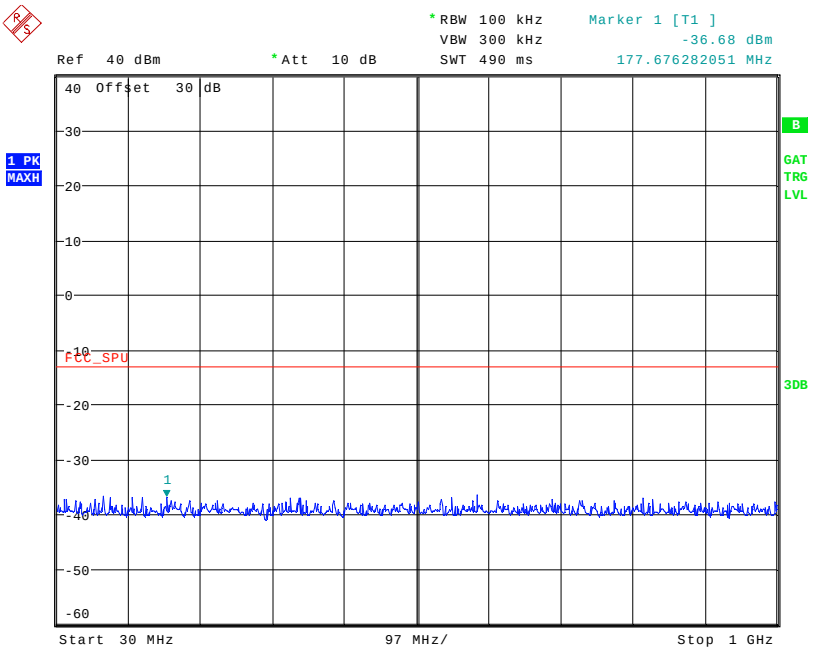
ANNEX H

TRANSMITTER SPURIOUS EMISSIONS – Conducted



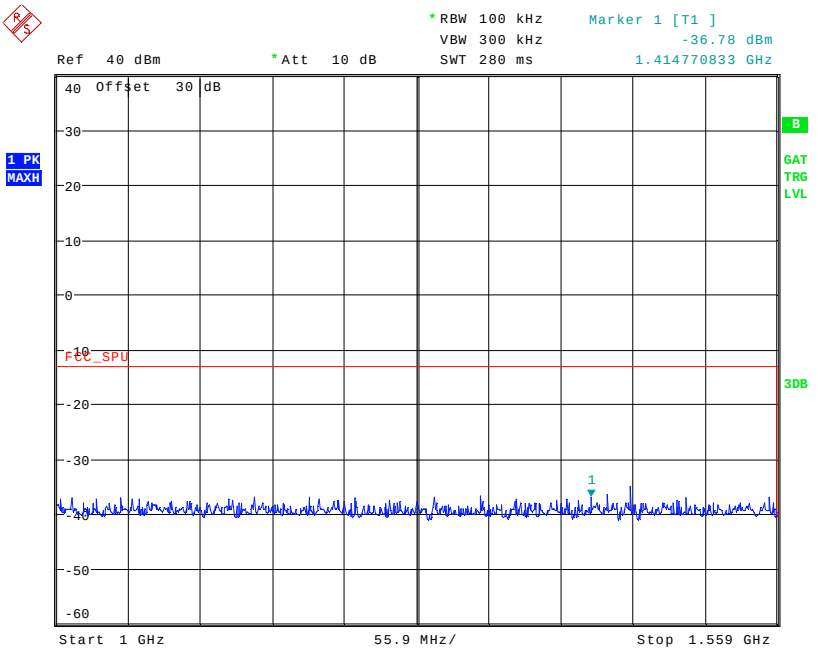
Date: 10.JUN.2010 15:18:54

100 kHz – 30MHz



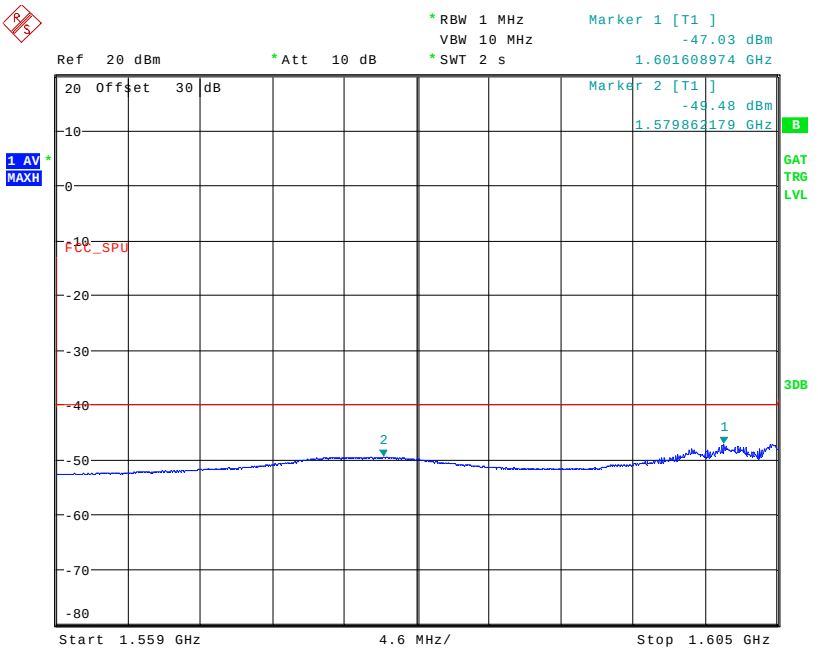
Date: 10.JUN.2010 15:19:24

30MHz – 1000MHz



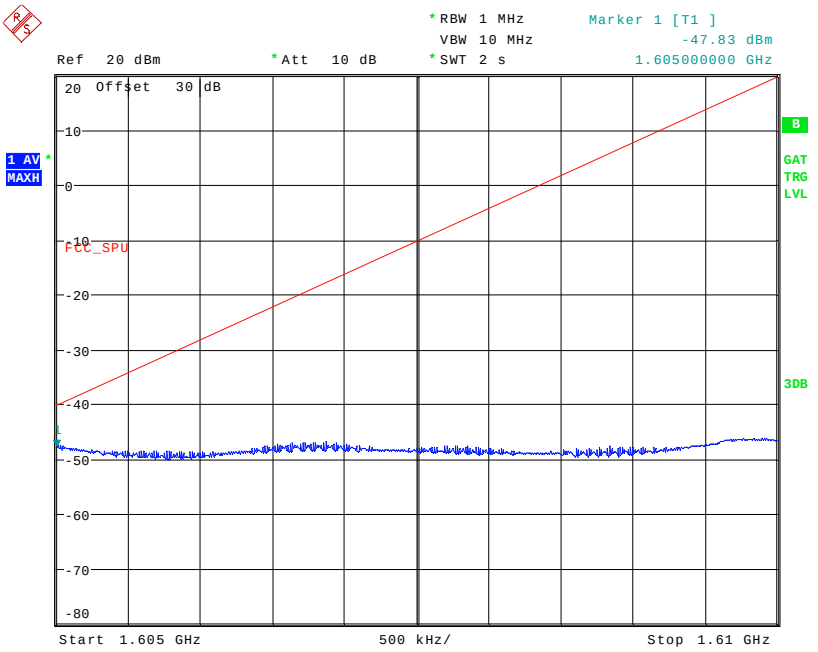
Date: 10.JUN.2010 15:19:49

1000MHz – 1559MHz



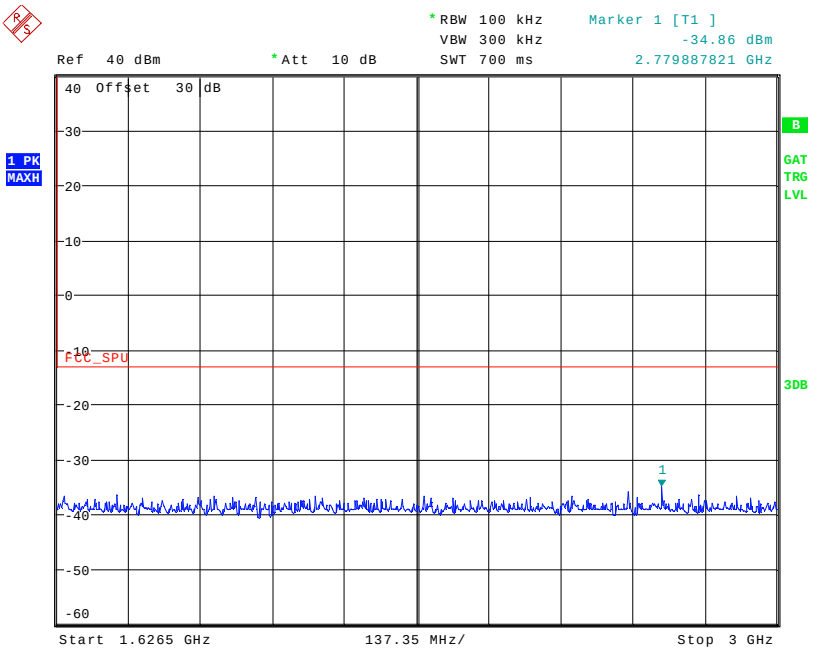
Date: 10.JUN.2010 15:16:53

1559MHz – 1605MHz



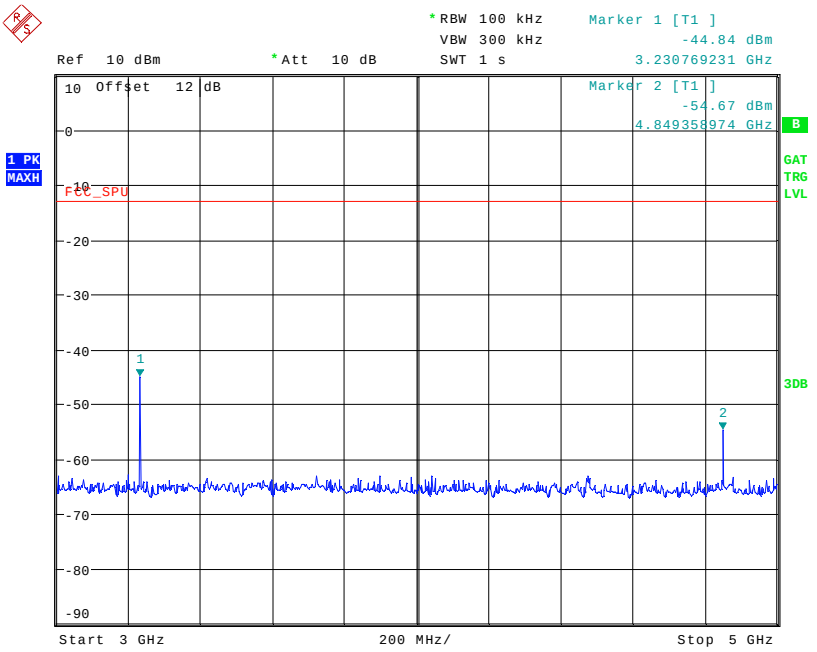
Date: 10.JUN.2010 15:16:12

1605MHz – 1610MHz



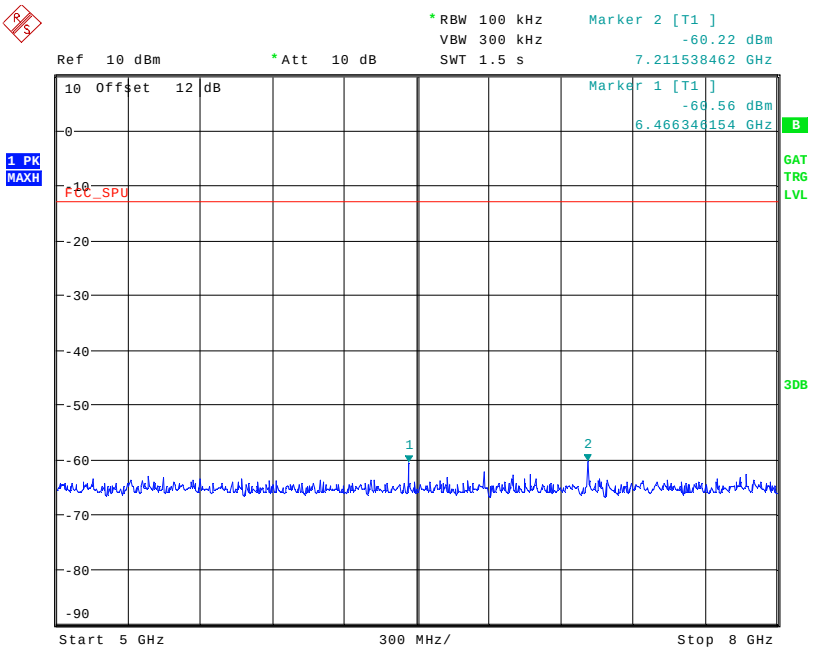
Date: 10.JUN.2010 15:17:51

1626.5MHz – 3000MHz



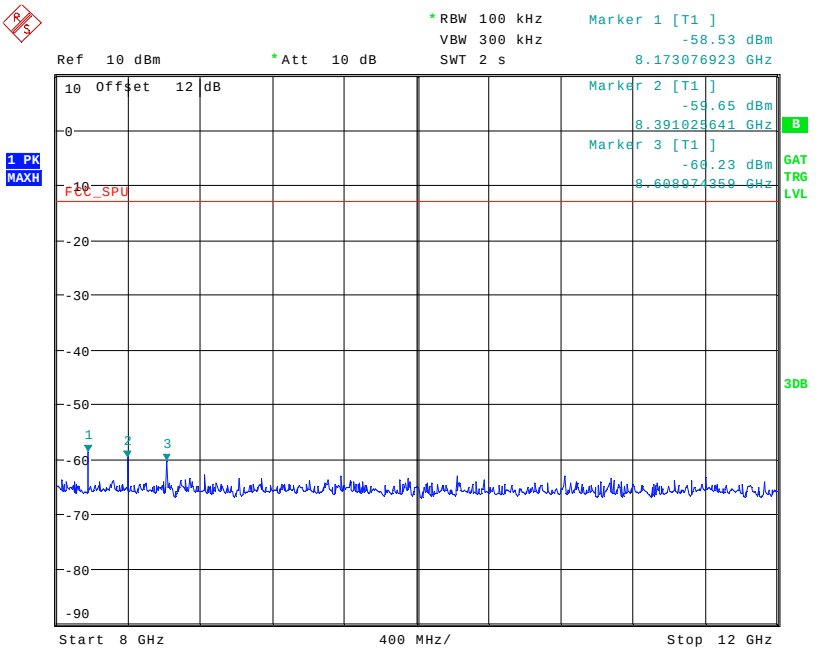
Date: 10.JUN.2010 15:31:08

3GHz – 5GHz



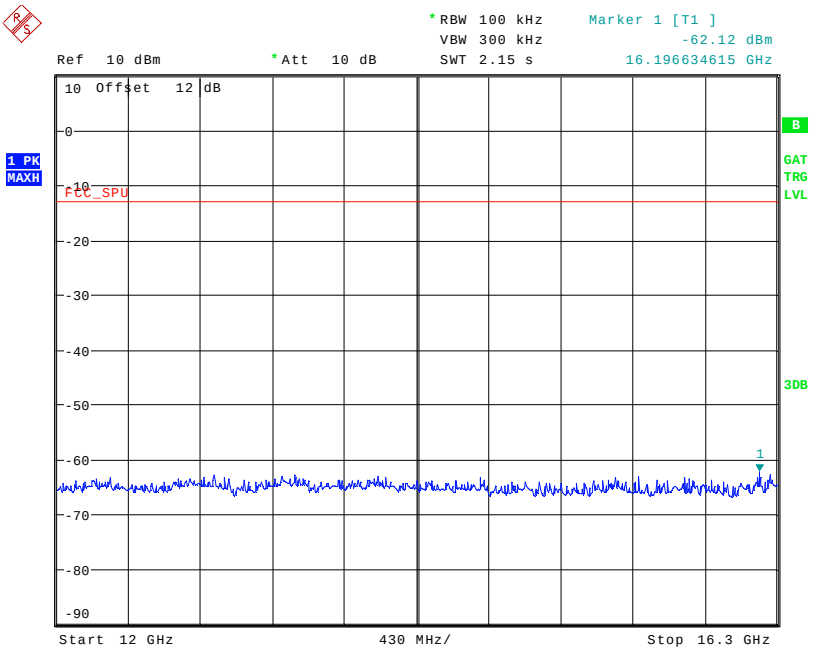
Date: 10.JUN.2010 15:32:16

5GHz – 8GHz



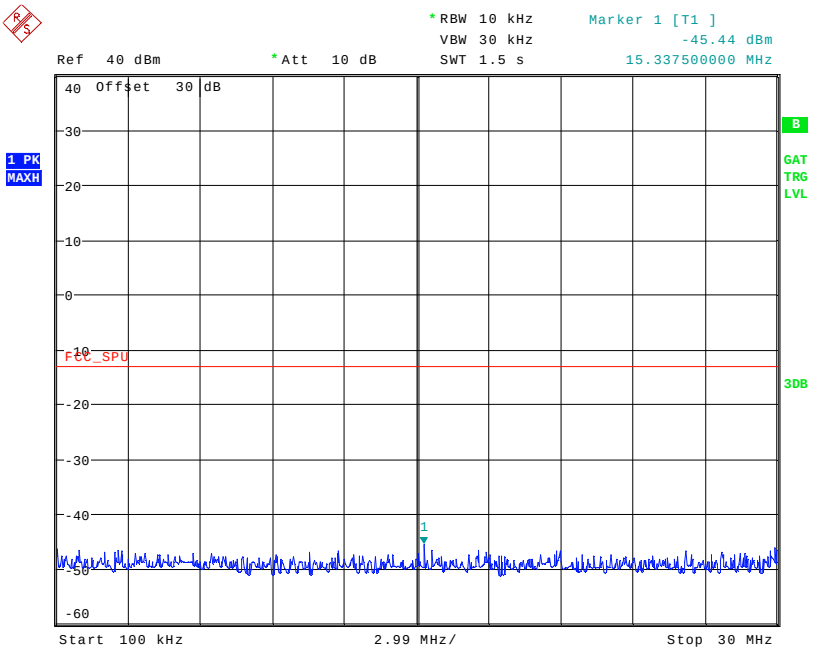
Date: 10.JUN.2010 15:33:38

8GHz – 12 GHz



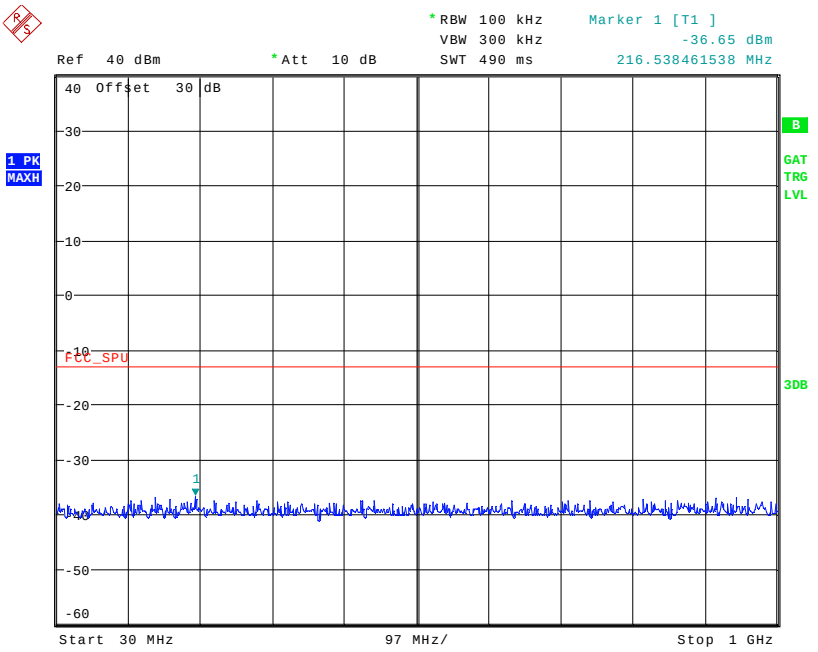
Date: 10.JUN.2010 15:30:26

12GHz – 16.3GHz



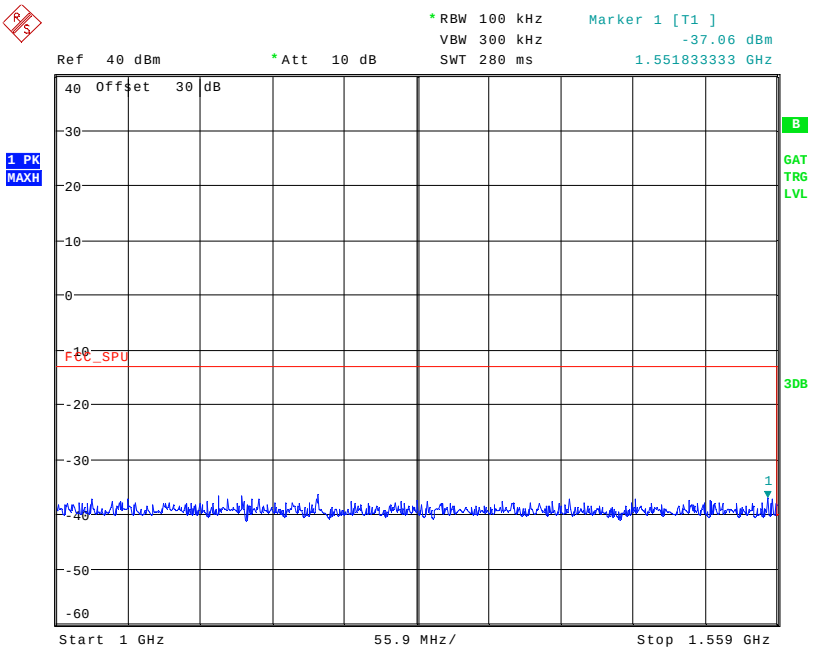
Date: 10.JUN.2010 15:05:21

100 kHz – 30MHz



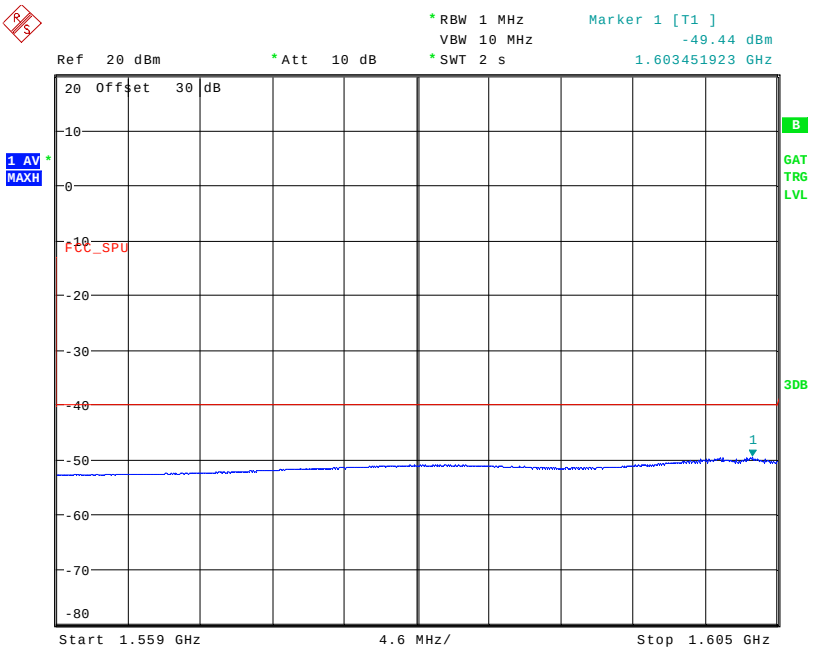
Date: 10.JUN.2010 15:05:48

30MHz – 1000MHz



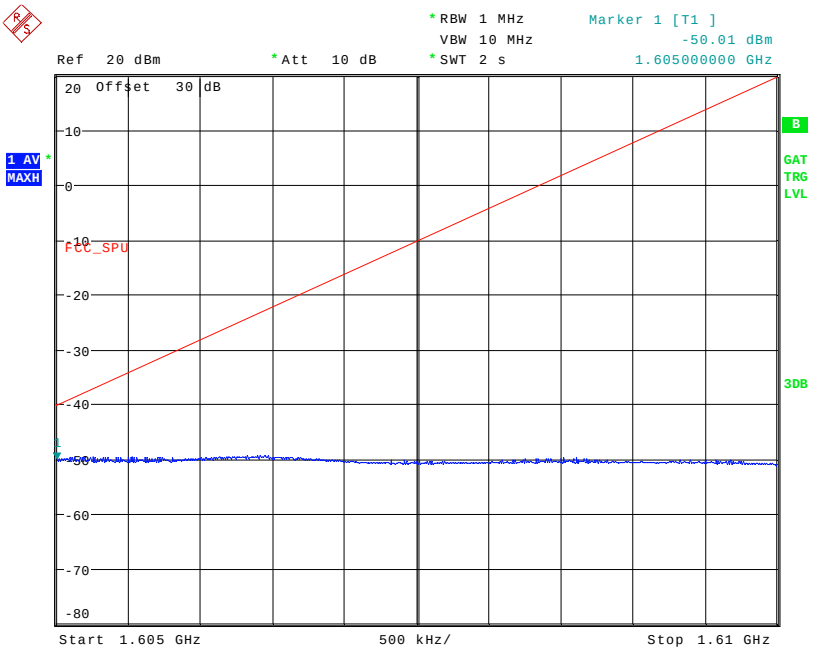
Date: 10.JUN.2010 15:06:14

1000MHz – 1559MHz



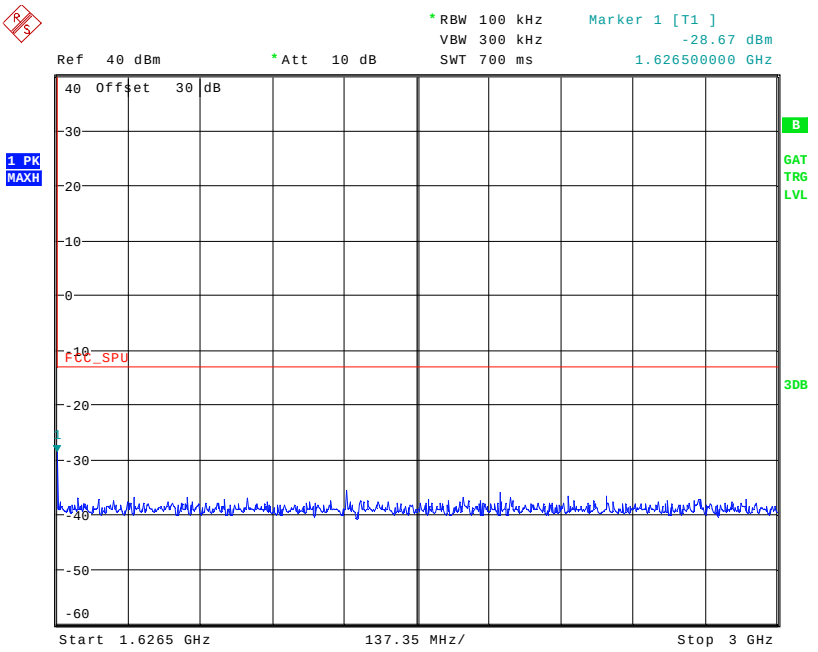
Date: 10.JUN.2010 15:12:22

1559MHz – 1605MHz



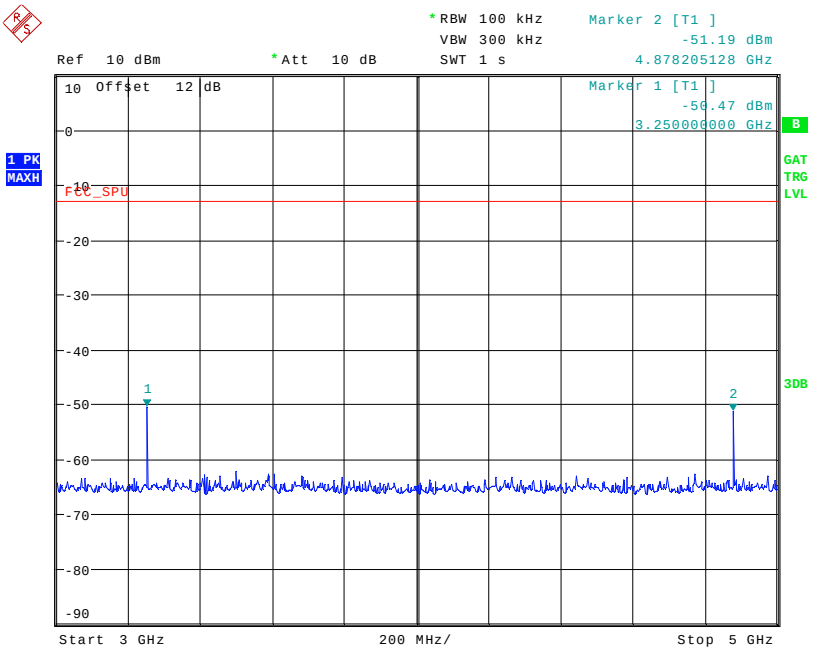
Date: 10.JUN.2010 15:15:18

1605MHz – 1610MHz



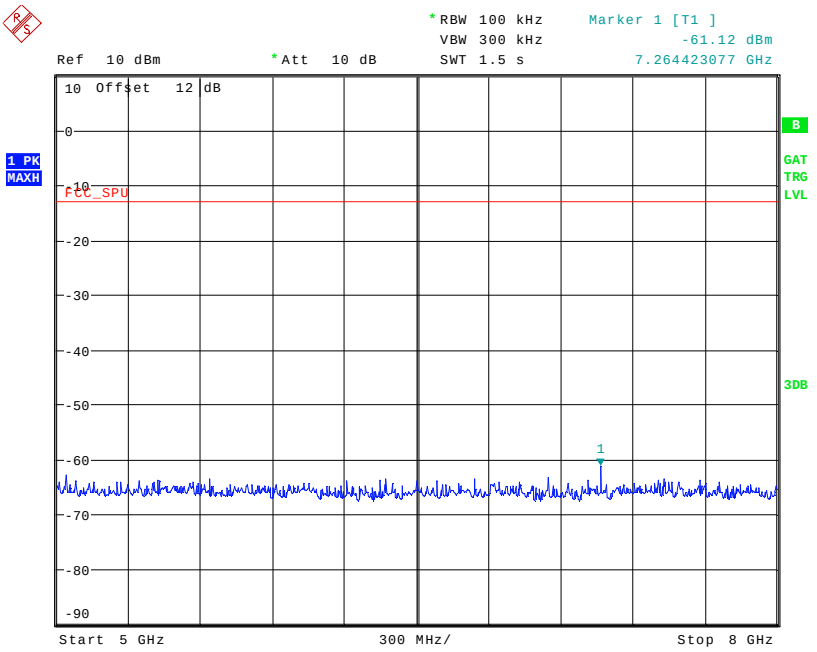
Date: 10.JUN.2010 15:06:56

1626.5MHz – 3000MHz



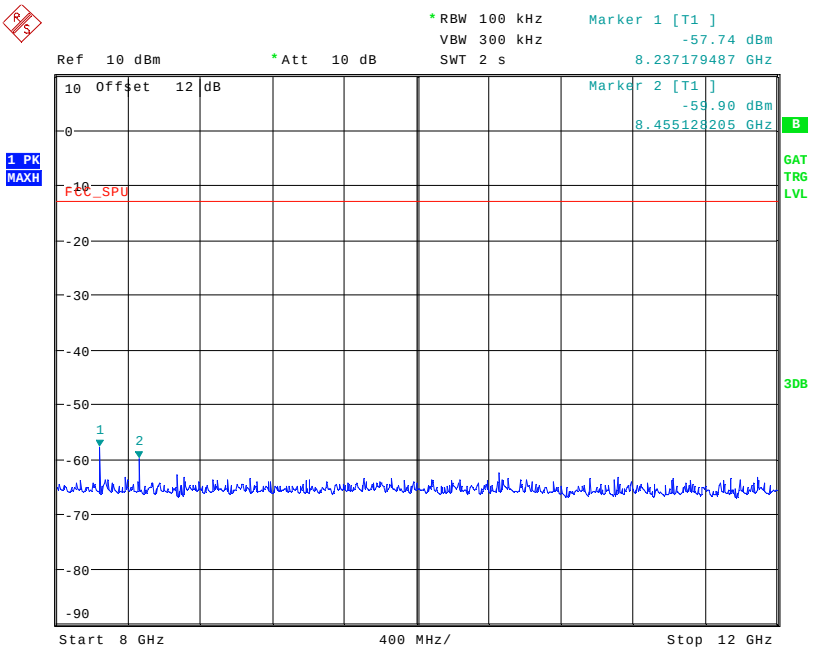
Date: 10.JUN.2010 15:26:07

3GHz – 5GHz



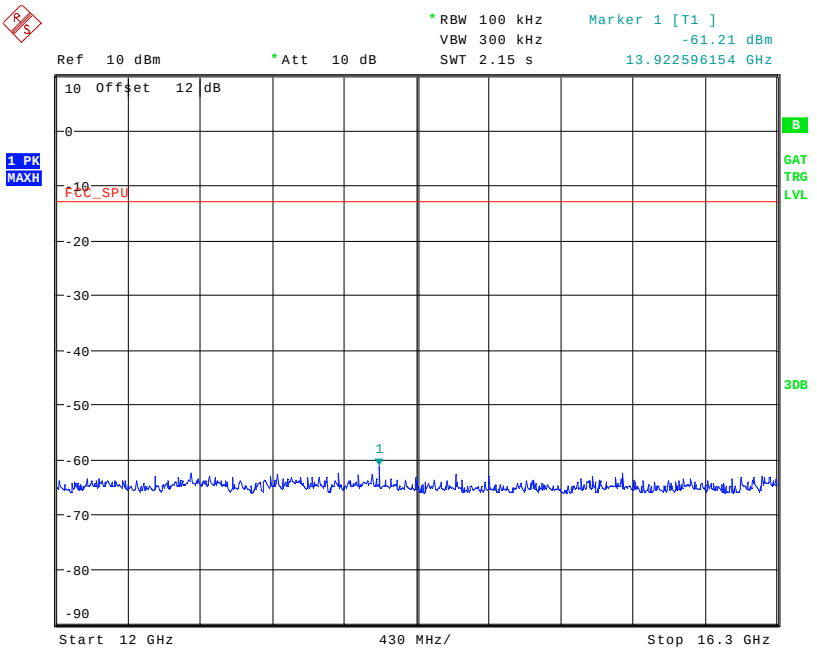
Date: 10.JUN.2010 15:27:00

5GHz – 8GHz



Date: 10.JUN.2010 15:27:56

8GHz – 12 GHz

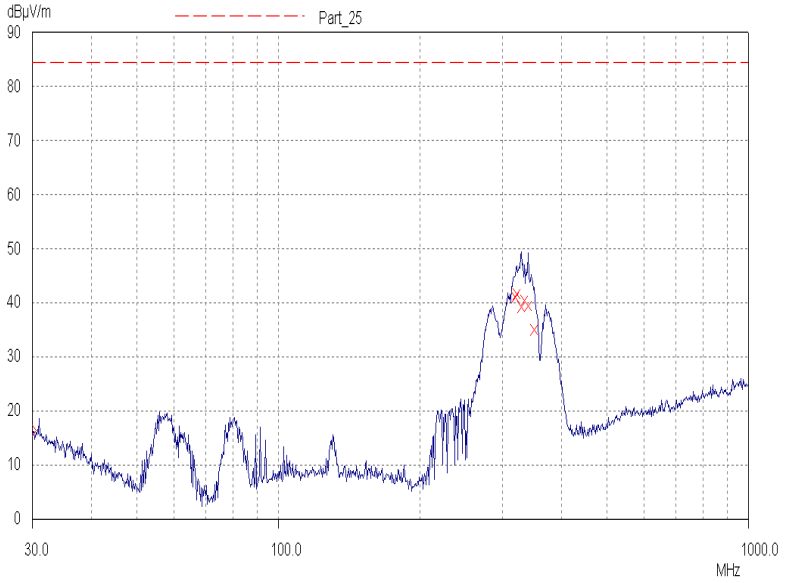


Date: 10.JUN.2010 15:29:10

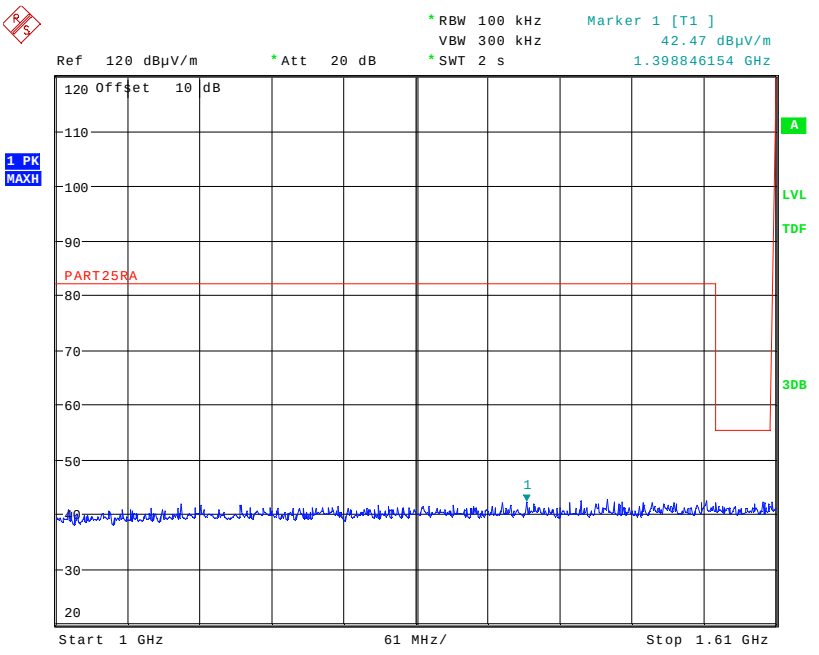
12GHz – 16.3GHz

ANNEX I

TRANSMITTER SPURIOUS EMISSIONS – Radiated

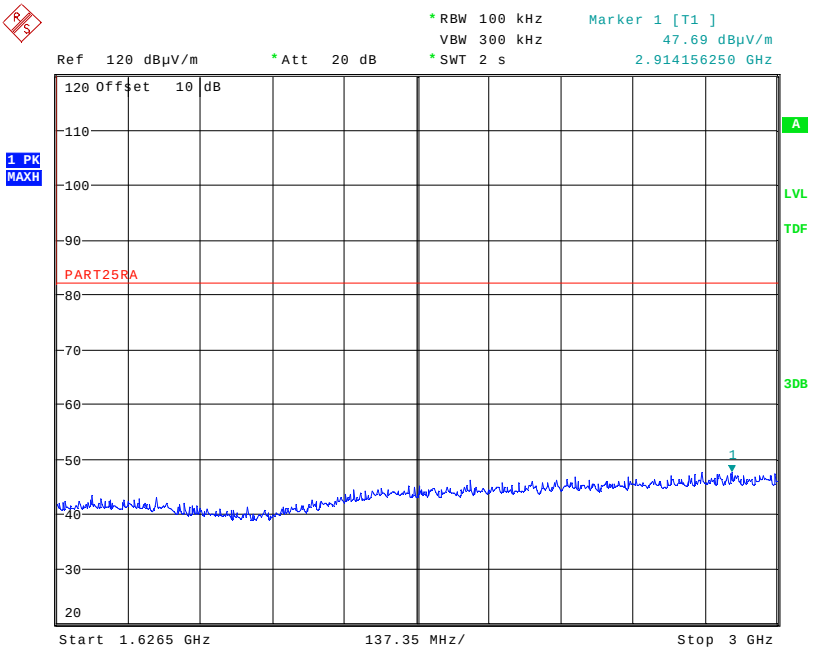


30MHz – 1000MHz



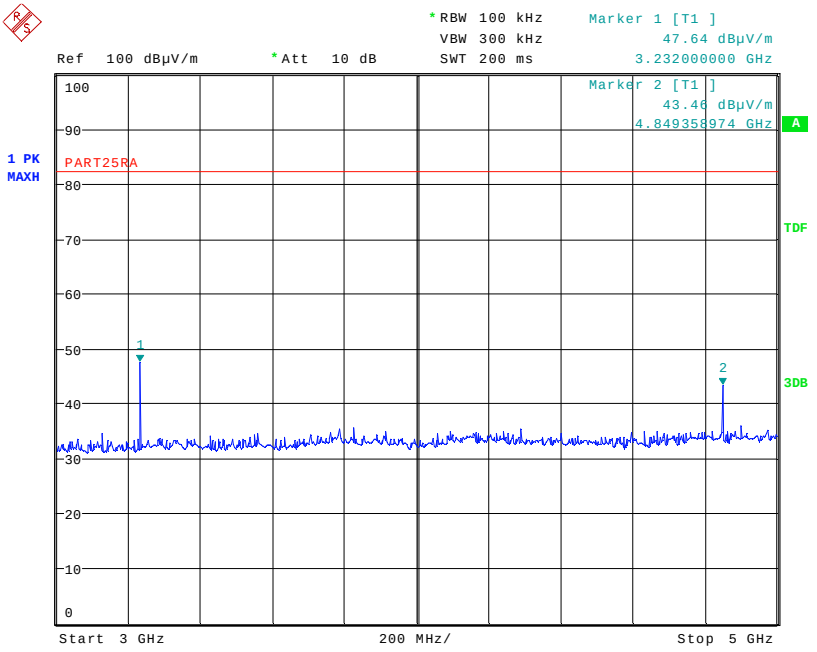
Date: 17.JUN.2010 11:40:15

1000MHz – 1610MHz



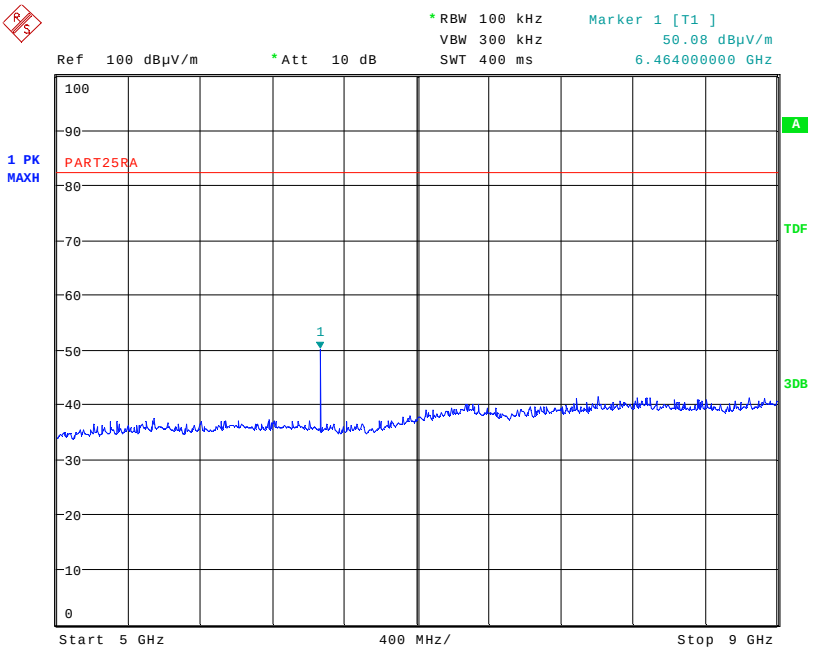
Date: 17.JUN.2010 11:40:38

1626.5MHz – 3000MHz



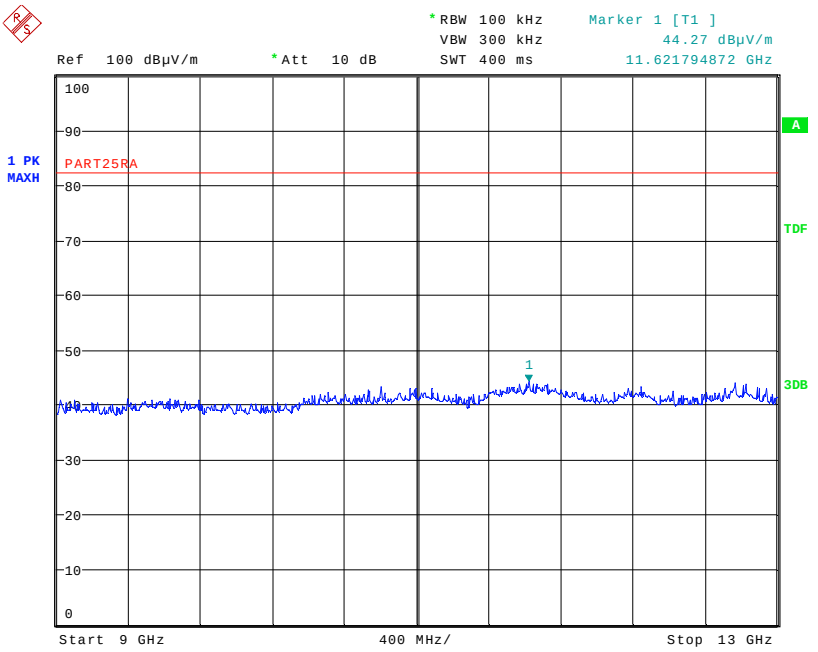
Date: 17.JUN.2010 11:12:25

3GHz – 5GHz



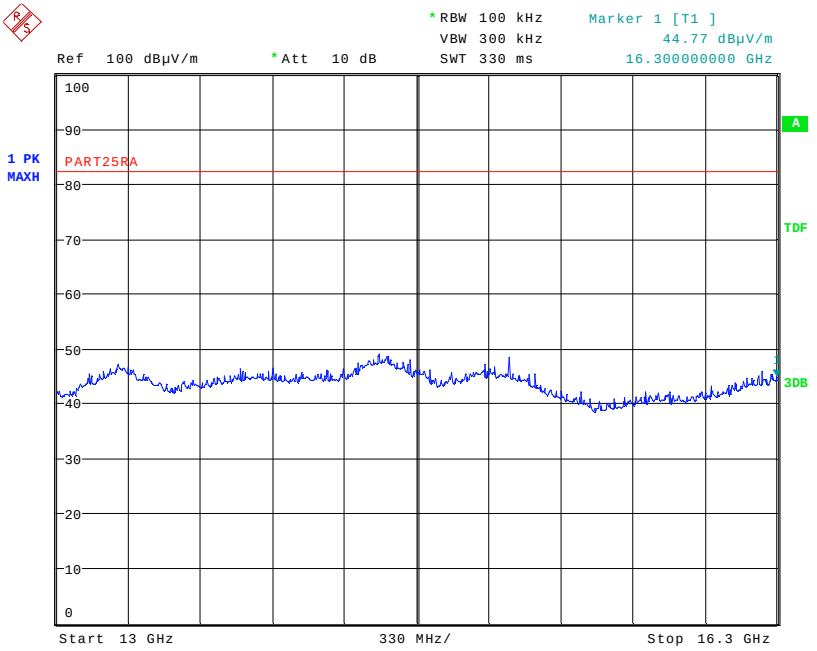
Date: 17.JUN.2010 11:14:16

5GHz – 9GHz



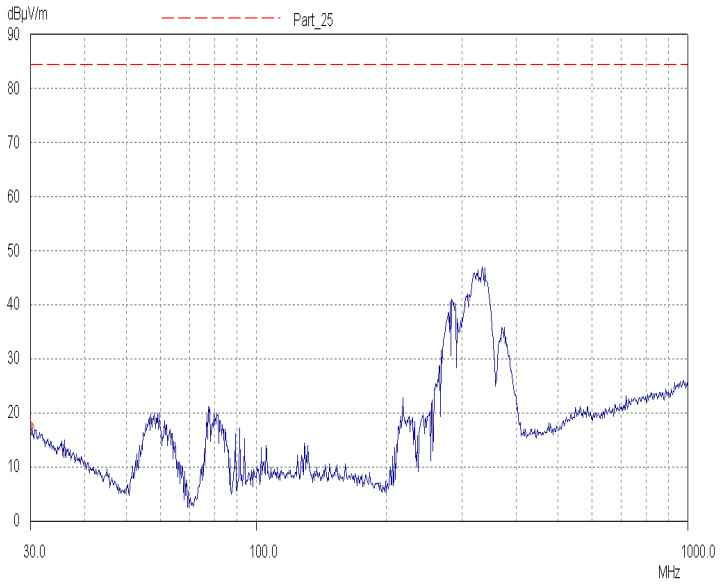
Date: 17.JUN.2010 11:14:57

9GHz – 13GHz

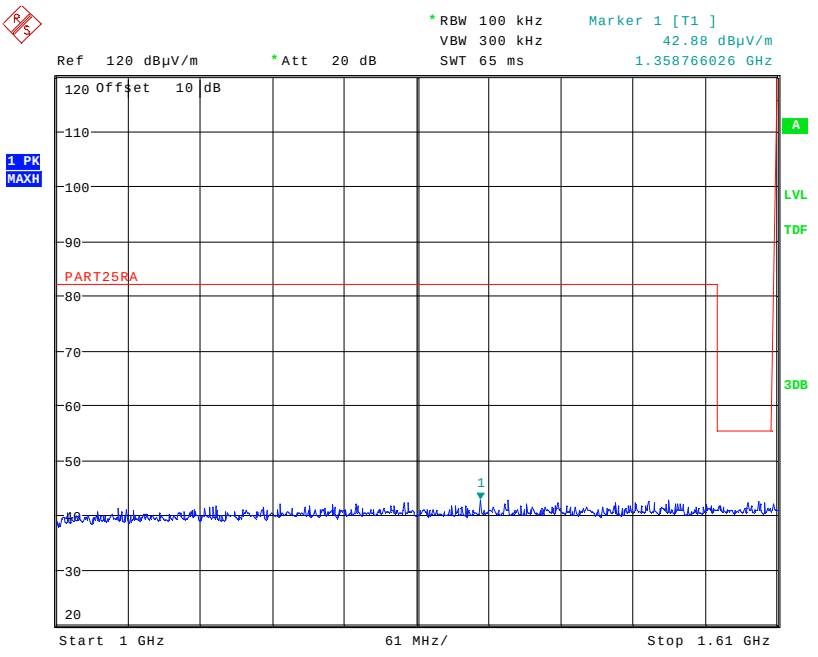


Date: 17.JUN.2010 11:16:21

13GHz – 16.3GHz

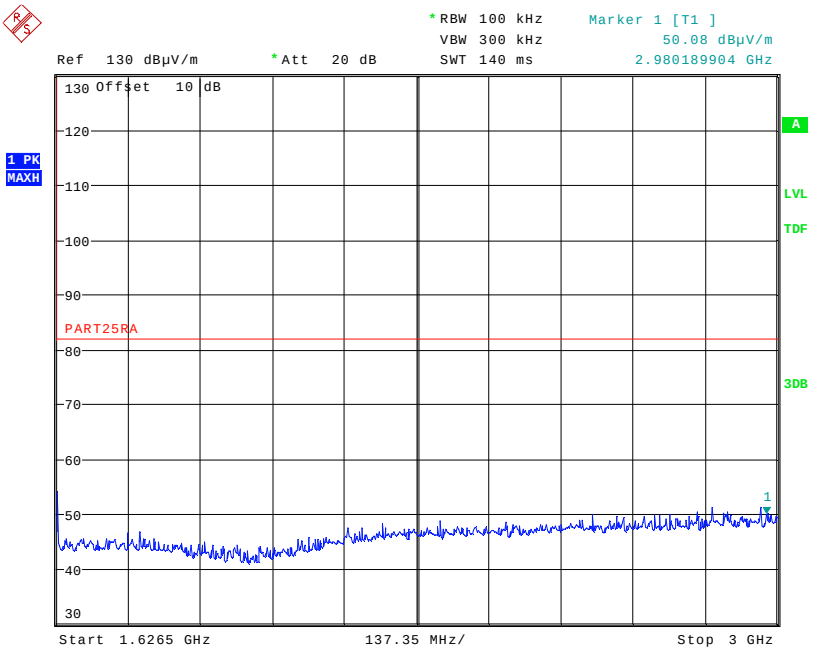


30MHz – 1000MHz



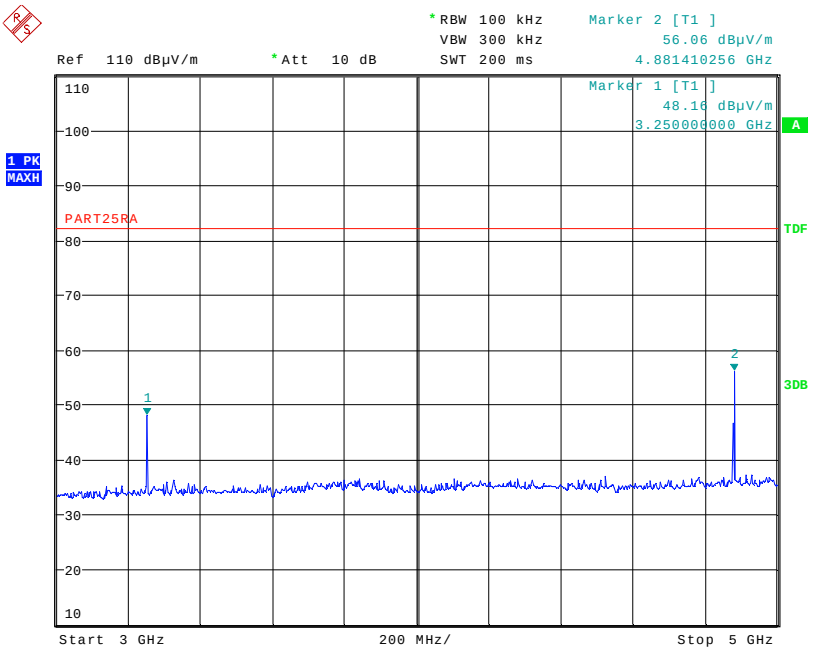
Date: 17.JUN.2010 11:47:31

1000MHz – 1610MHz



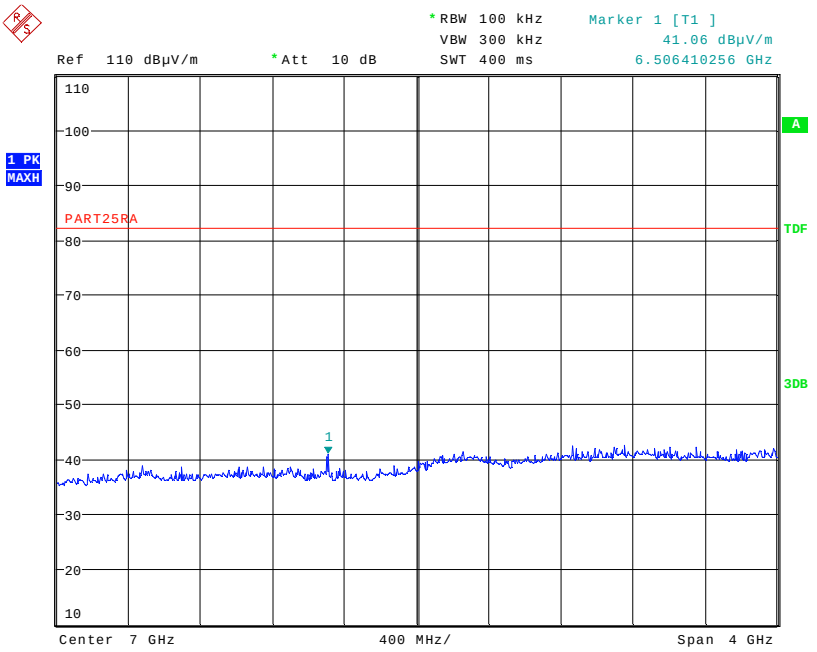
Date: 17.JUN.2010 11:50:19

1626.5MHz – 3000MHz



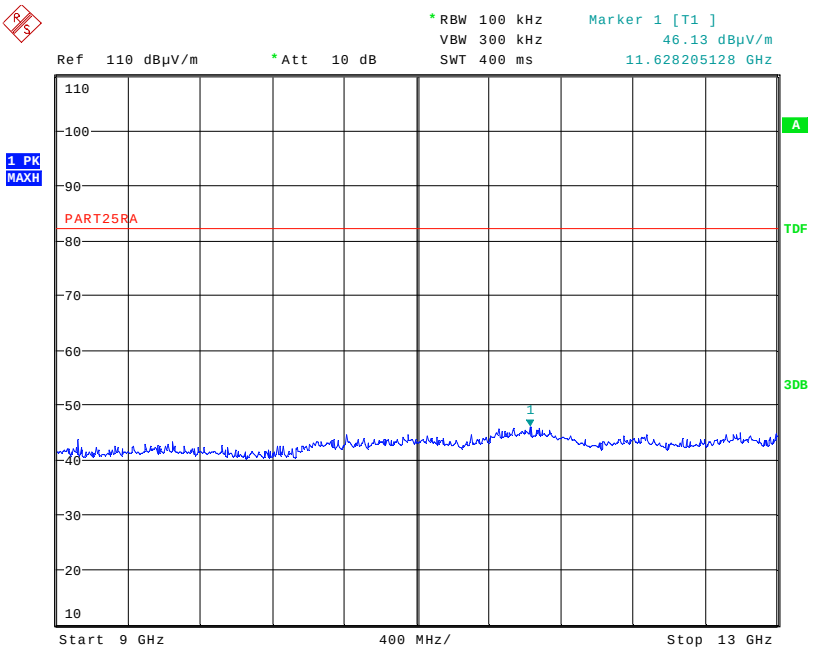
Date: 17.JUN.2010 10:53:37

3GHz – 5GHz



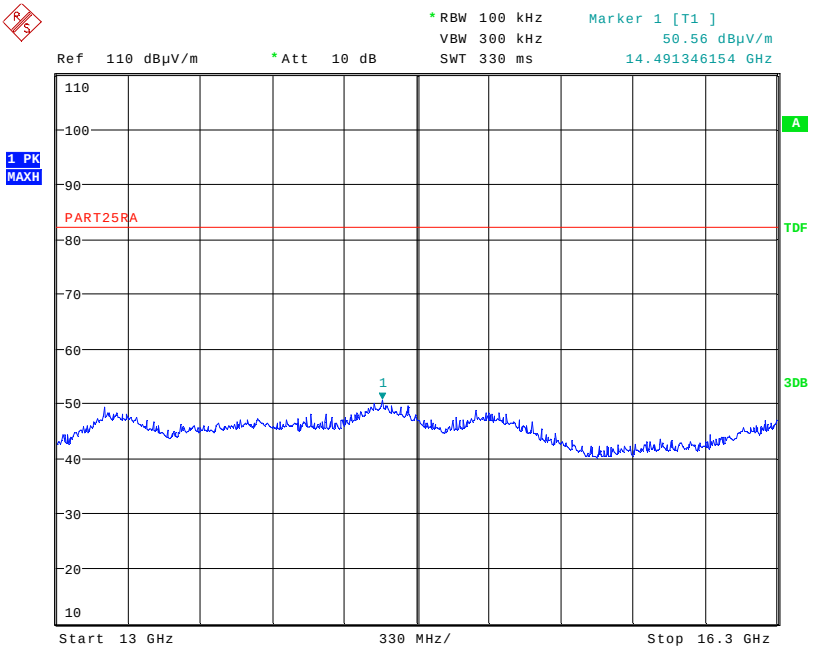
Date: 17.JUN.2010 10:56:01

5Hz – 9GHz



Date: 17.JUN.2010 10:57:25

9GHz – 13GHz



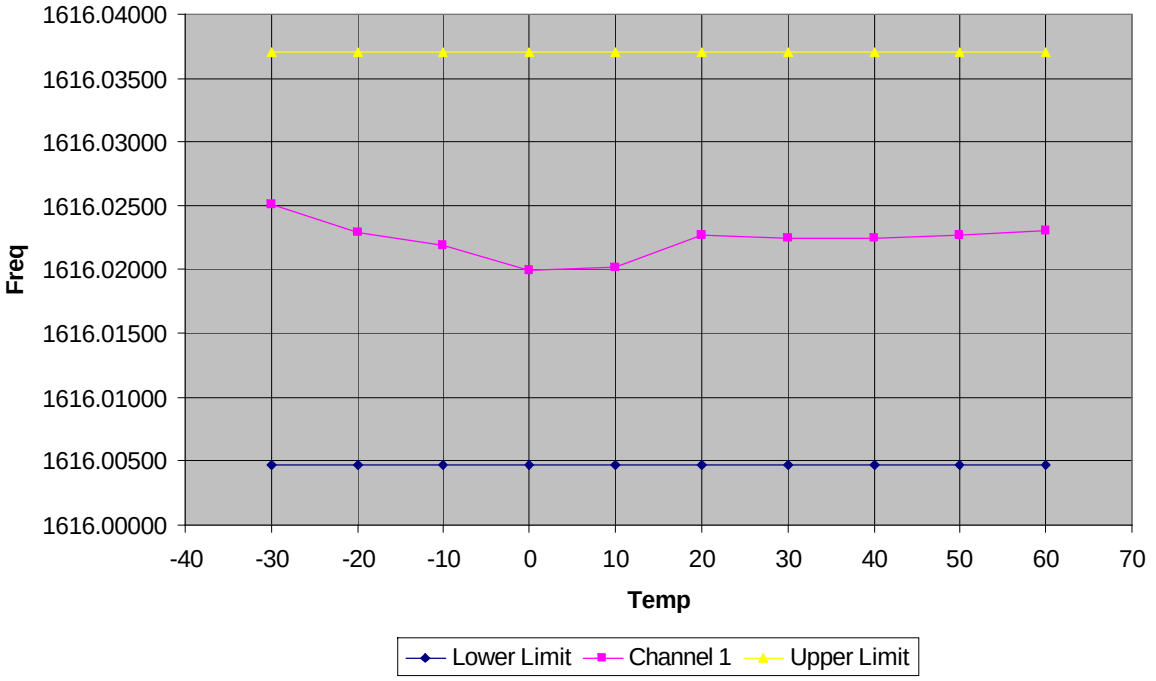
Date: 17.JUN.2010 10:58:16

13GHz – 16.3GHz

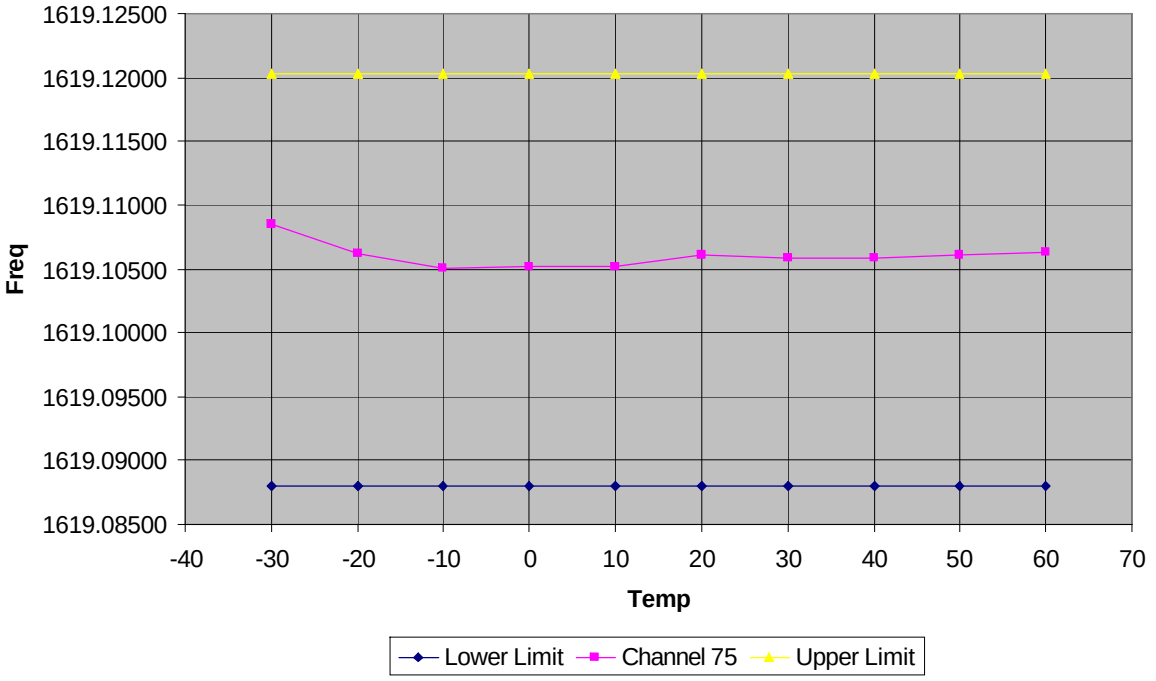
ANNEX J

FREQUENCY STABILITY – Temperature

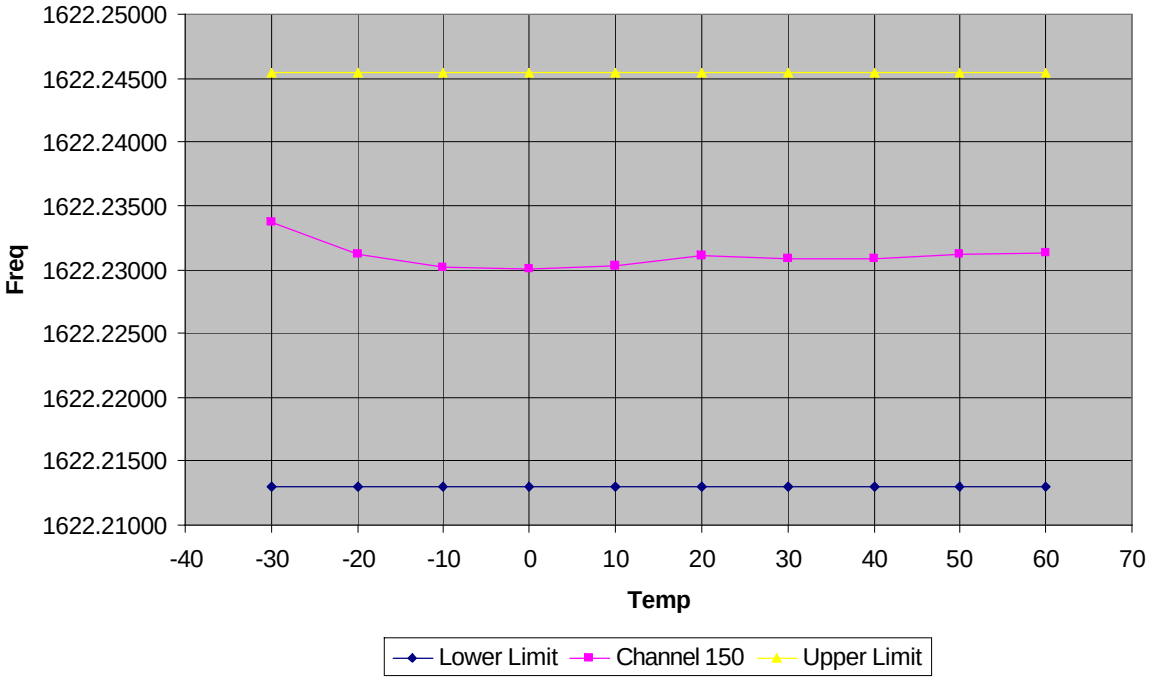
Channel 1 Frequency Stability - Temperature



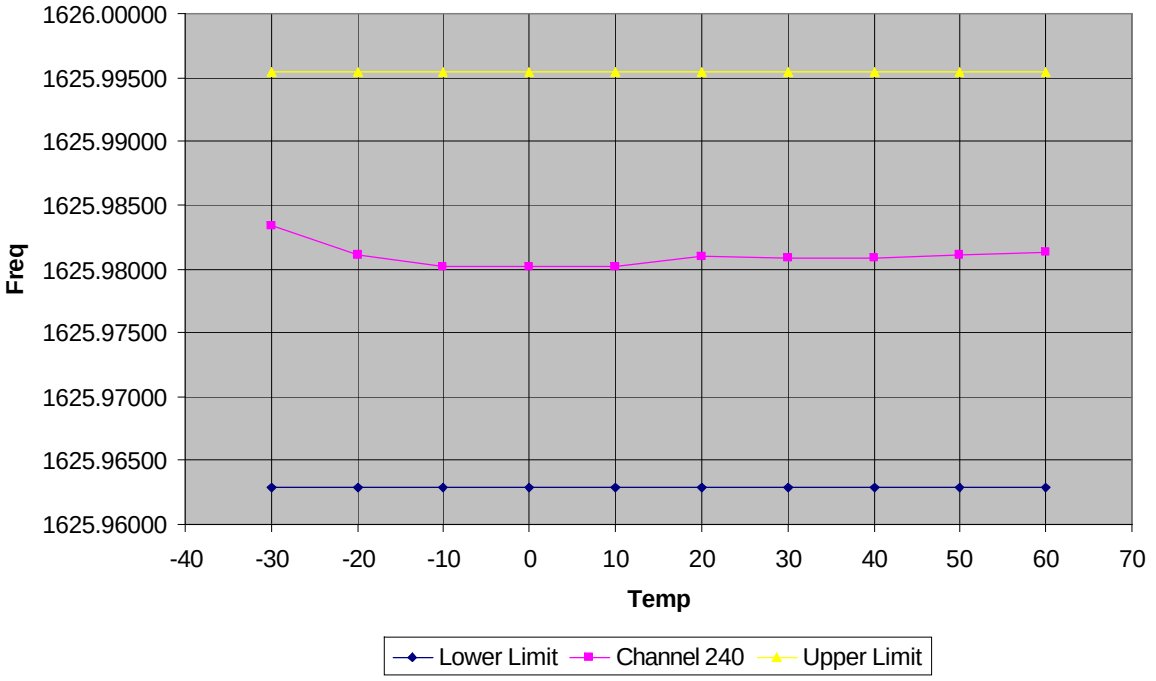
Channel 75 Frequency Stability - Temperature



Channel 150 Frequency Stability - Temperature



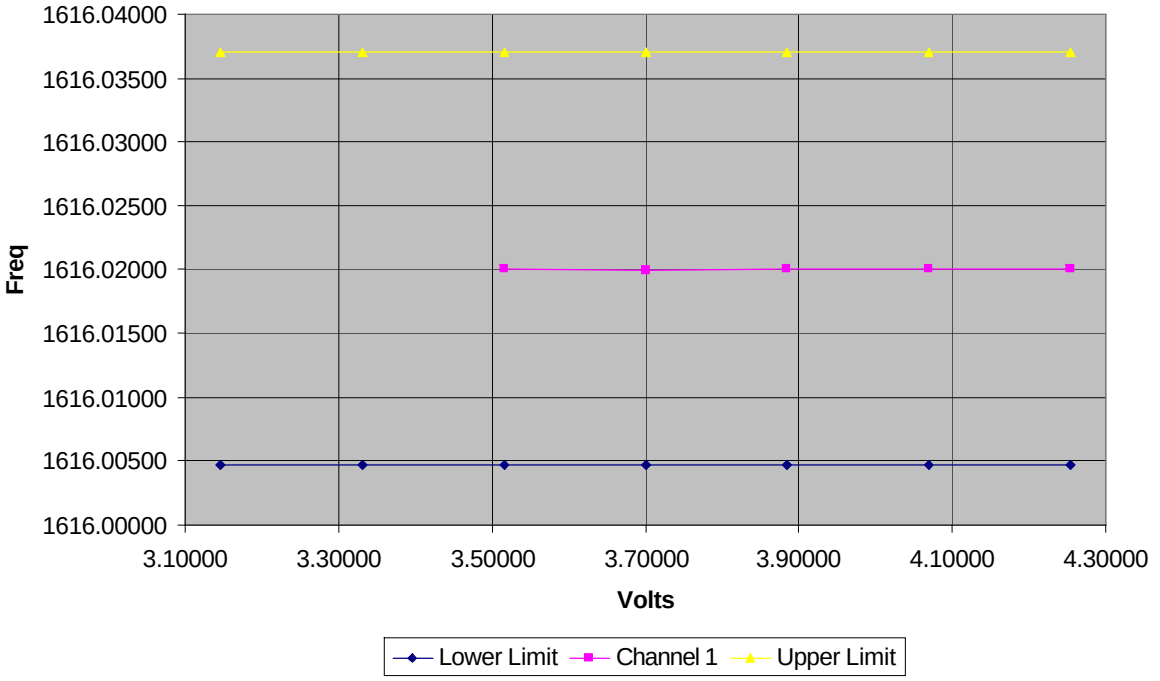
Channel 240 Frequency Stability - Temperature



ANNEX K

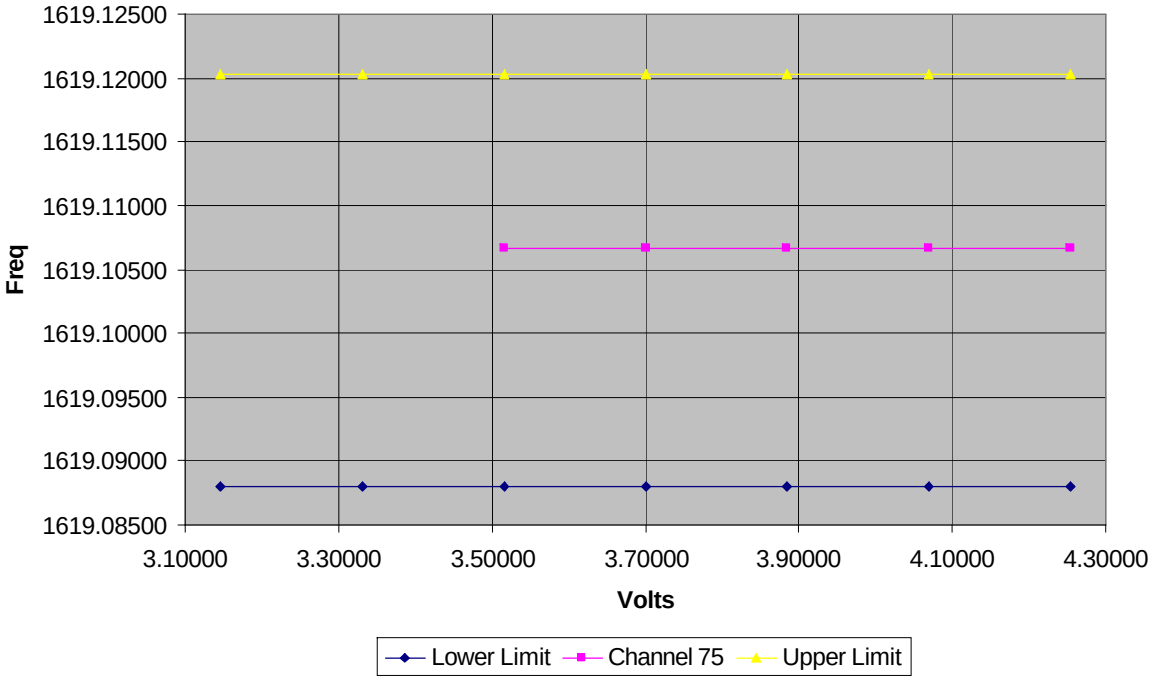
FREQUENCY STABILITY – Voltage

Channel 1 Frequency Stability - Voltage



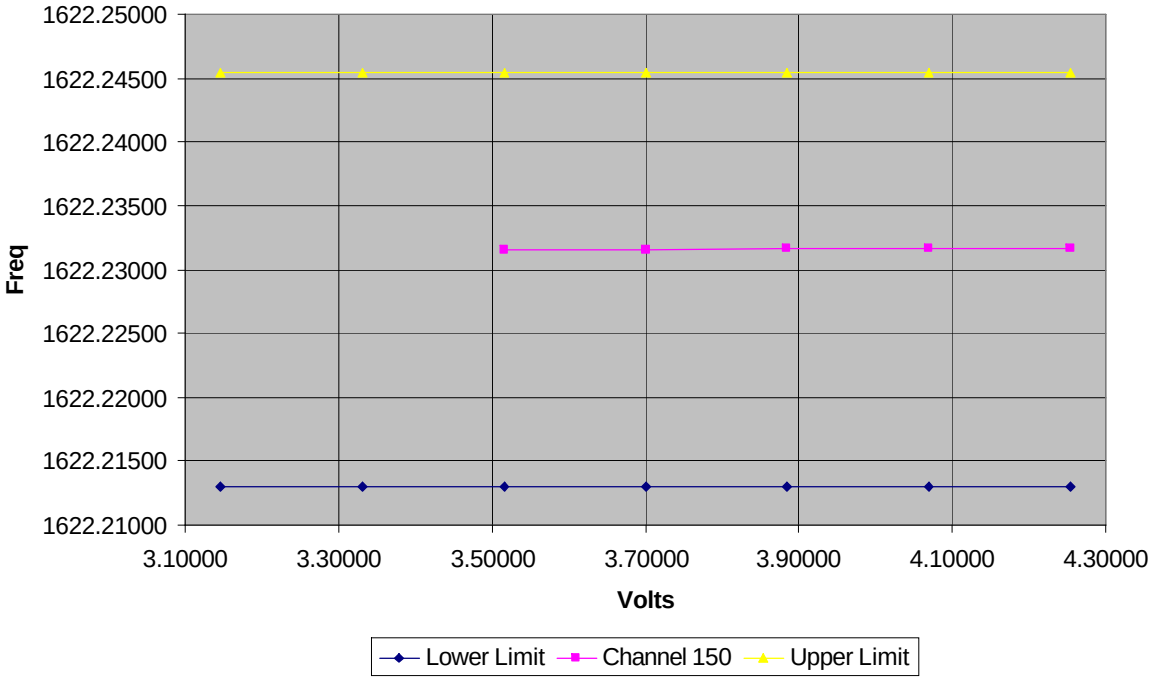
EUT Ceases transmission below 95 % of Vnom

Channel 75 Frequency Stability - Voltage



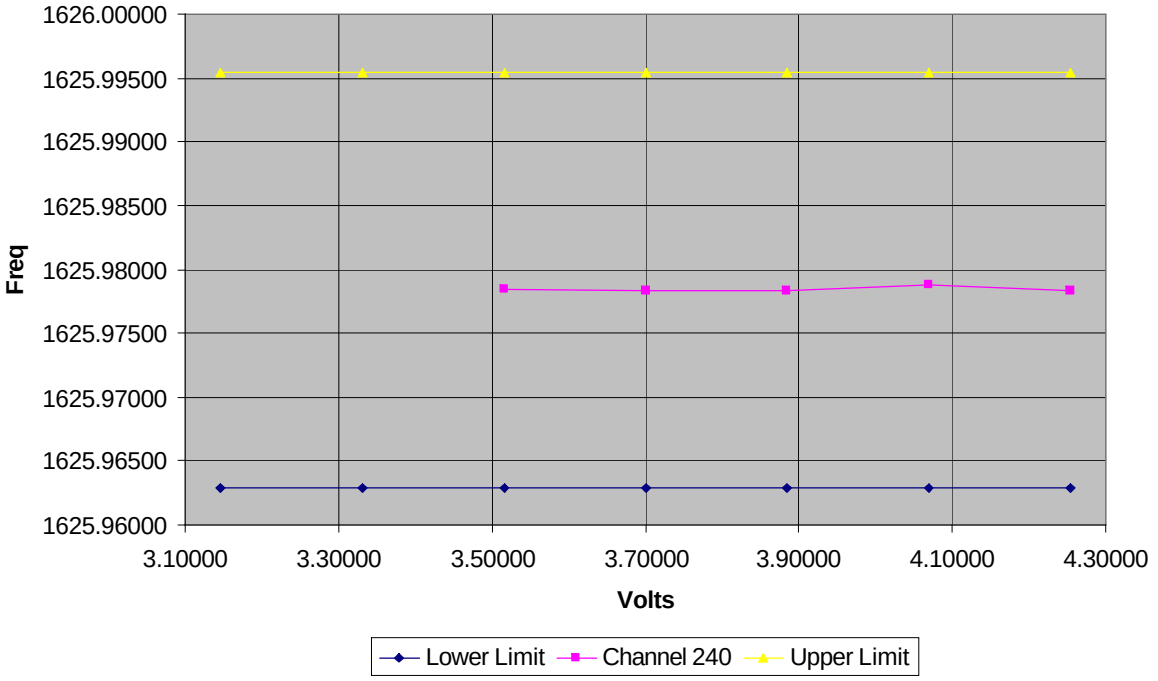
EUT Ceases transmission below 95 % of Vnom

Channel 150 Frequency Stability - Voltage



EUT Ceases transmission below 95 % of Vnom

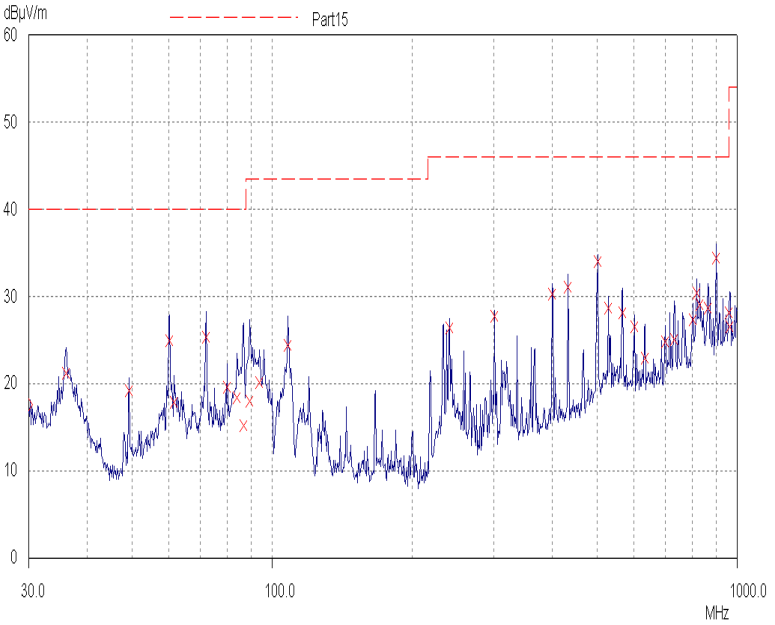
Channel 240 Frequency Stability - Voltage



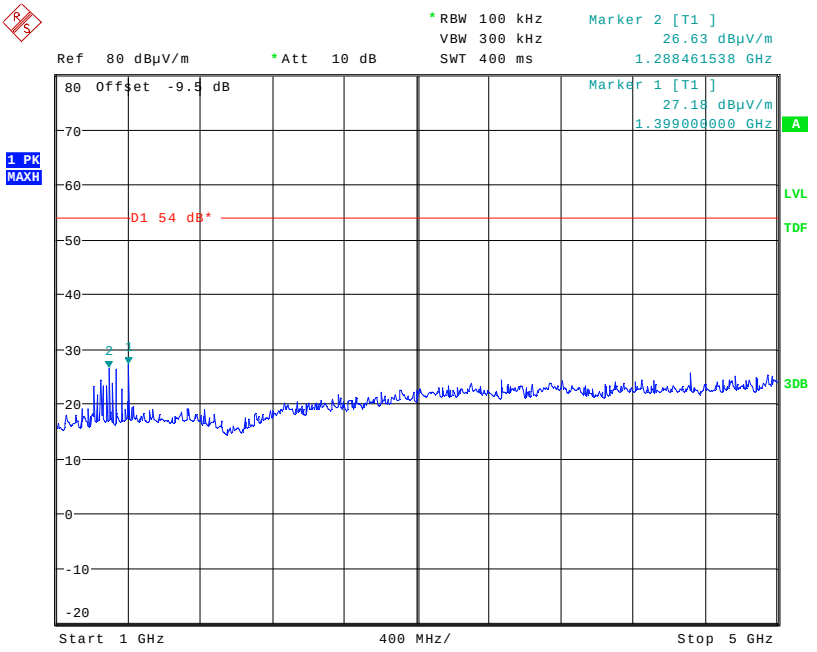
EUT Ceases transmission below 95 % of Vnom

ANNEX L

UNINTENTIONAL TRANSMITTER SPURIOUS EMISSIONS – Radiated

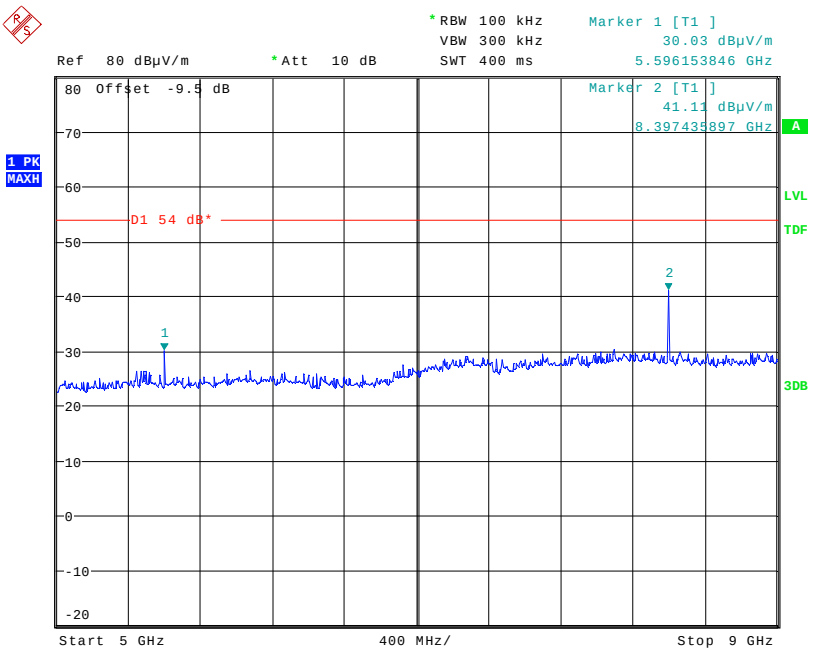


30MHz – 1000MHz



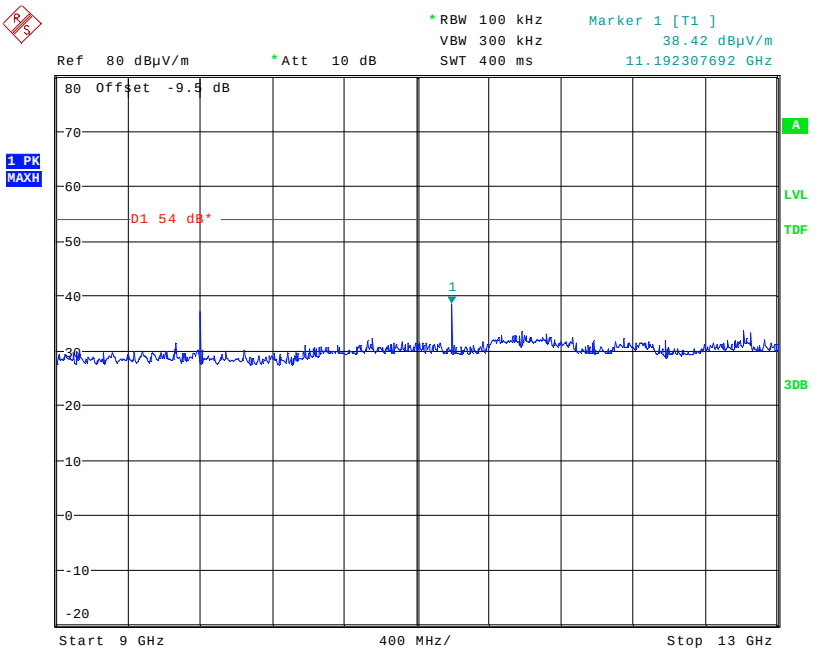
Date: 17.JUN.2010 12:22:37

1GHz – 5GHz



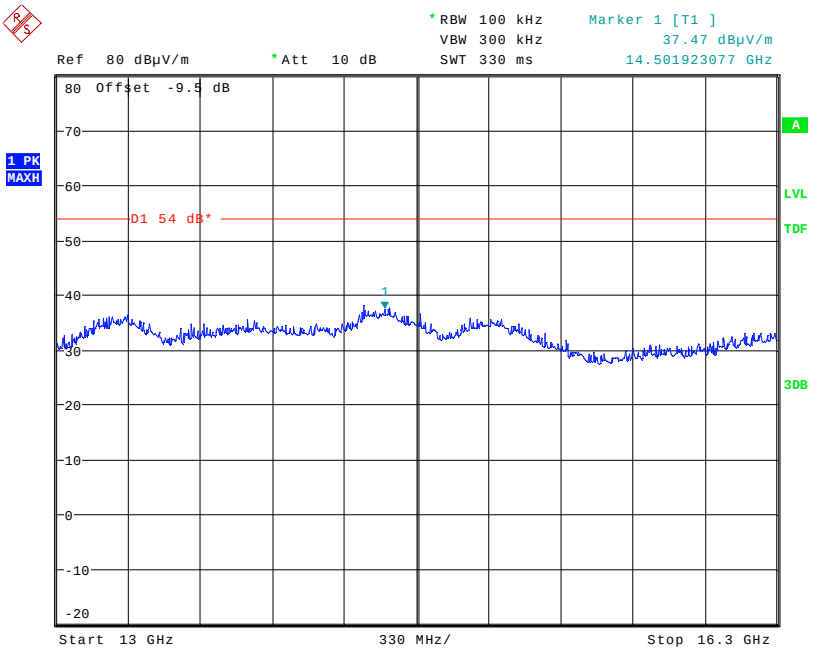
Date: 17.JUN.2010 12:19:07

5GHz – 9GHz



Date: 17.JUN.2010 12:19:22

9GHz – 13GHz

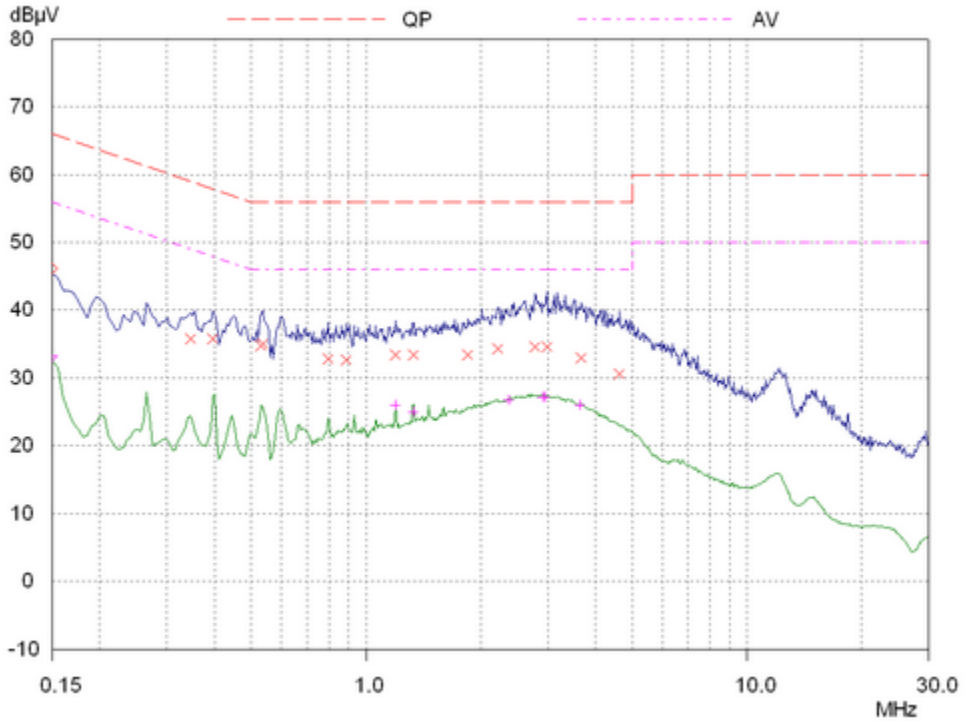


Date: 17.JUN.2010 12:19:42

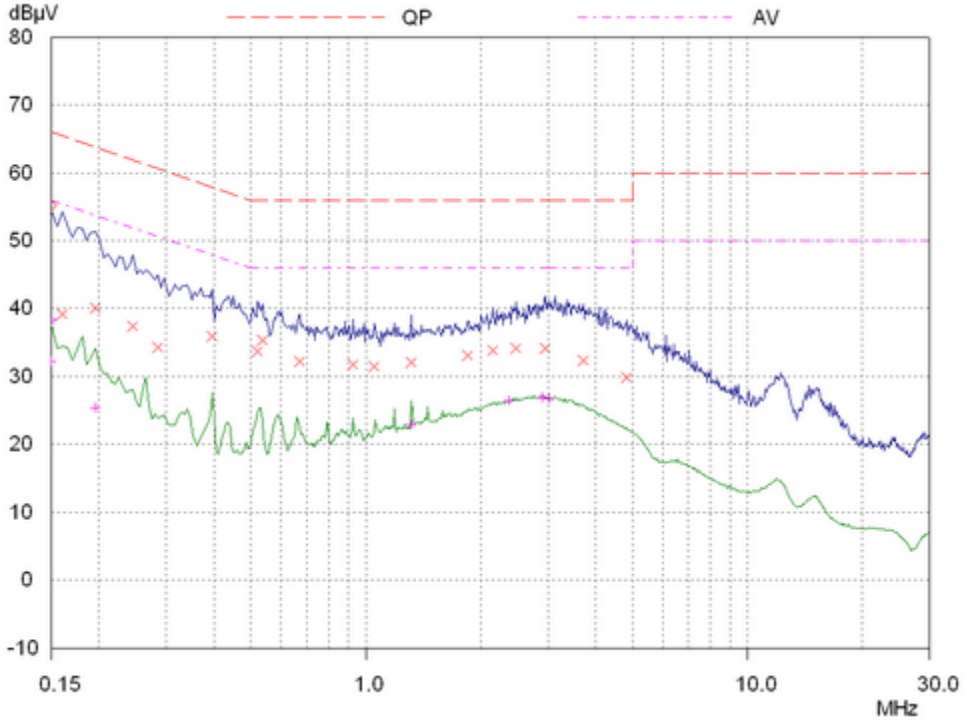
13GHz – 16.3GHz

ANNEX M

CONDUCTED EMISSIONS – AC POWERLINE CONDUCTION



Receive Mode



Transmit Mode

ANNEX N

DECLARATIONS

Daniel Winstanley

From: Steve Hart [steve.hart@cambridgeconsultants.com]
Sent: 29 April 2010 17:23
To: Daniel Winstanley
Cc: Michael.Senzig@iridium.com
Subject: RE: Declarations (File: P0600)

Hi Daniel

The highest gain is 3dB using an external antenna.

Best regards

Steve Hart

Stephen Hart
Programme Manager, Wireless

Cambridge Consultants
Science Park, Milton Road
Cambridge, CB4 0DW, England
Switchboard: +44 (0)1223 420024
Direct dial: +44 (0)1223 392335
Mobile: +44 (0)7768 467781
Fax: +44 (0)1223 423373
steve.hart@cambridgeconsultants.com
www.CambridgeConsultants.com

29/06/2010