REPORT ON THE CERTIFICATION TESTING OF AN IRIDIUM SATELLITE LLC 9602SB TRANSCEIVER WITH RESPECT TO FCC RULES CFR 47, PART 25 AND FCC RULES CFR 47, PART 15

This report corrects the prior report for FCC ID No.Q639602A-SB
to set forth replacement data reflecting more accurate conducted power measurements

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REPORT ON THE CERTIFICATION TESTING OF AN
IRIDIUM SATELLITE LLC
9602SB TRANSCEIVER
WITH RESPECT TO
FCC RULES CFR 47, PART 25
AND
FCC RULES CFR 47, PART 15

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

DATE: 1st December 2011

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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:	Q639602-SB
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC Rules CFR 47, Part 25 & Part 15
TEST RESULT:	Compliant to Specification
ITU EMISSIONS DESIGNATOR	41K7Q7D
EQUIPMENT UNDER TEST:	9602SB Transceiver
EQUIPMENT TYPE:	Satellite Communications Module
PEAK OUTPUT POWER (EIRP):	4.39dBW, 2.74W
MEAN OUTPUT POWER (EIRP):	-5.97dBW, 0.25W
CHANNEL SPACING:	41.667 kHz
NUMBER OF CHANNELS:	252 (240 Transmit Channels)
MODULATION TYPE:	Q7D
POWER SOURCE(s):	+5Vdc
TEST DATE(s):	19th October 2011 – RF Output power 25th October – 5th November 2010 – All other tests
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):	9602SB Transceiver
EQUIPMENT TYPE:	Satellite Communications Module
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
E-mail address:	donna.bethea-murphyl@iridium.com
APPLICANT:	Iridium Satellite LLC
ADDRESS:	6707 Democracy Blvd. Suite 300 Bethesda United States of America MD 20817
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FAX:	+1 301 571 6250
MANUFACTURER:	Iridium Satellite LLC
DEVELOPMENT AGENT:	Cambridge Consultants Limited
DEVELOPMENT AGENTS CONTACT PERSON(s):	Ms M Campbell
E-mail address:	marion.campbell@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 Global, Pendle Place
TEST DATE(s):	19th October 2011 – RF Output power 25th October – 5th November 2010 – All other tests
TEST REPORT No:	TTR-002027WUS1-2

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 9602SB Transceiver 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 9602SB Transceiver.

2. Product Use: Satellite Telephone and Data Communications

3. Emission Designator: 41k7Q7D

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

5. Supply Voltages: Vnom +5Vdc

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 Global	
Pendle Place	[X]
Hull	[ ]

9. Modifications made during test program: No modifications were performed.

Product Description

The satellite communications module 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

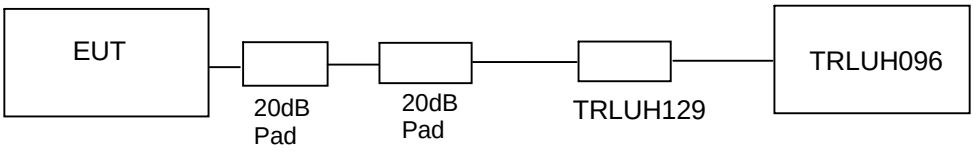
47 CFR 2 10-1-03 Edition	Code of Federal Regulations, Title 47, Part 2, “Frequency allocations and Radio Telemetry Matters; General Rules and Regulations”
47 CFR 25 10-1-03 Edition	Code of Federal Regulations, Title 47, Part 25,”Satellite Communications” Subpart C, “Technical Matters”
47 CFR 15 20-09-07 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	=	18^{o}C	Radio Laboratory
Relative humidity	=	57%	
Supply voltage	=	+5Vdc	
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 TIC PCB. The antenna gain, included in the table below, represents the highest gain of any antennas that are used with this system.

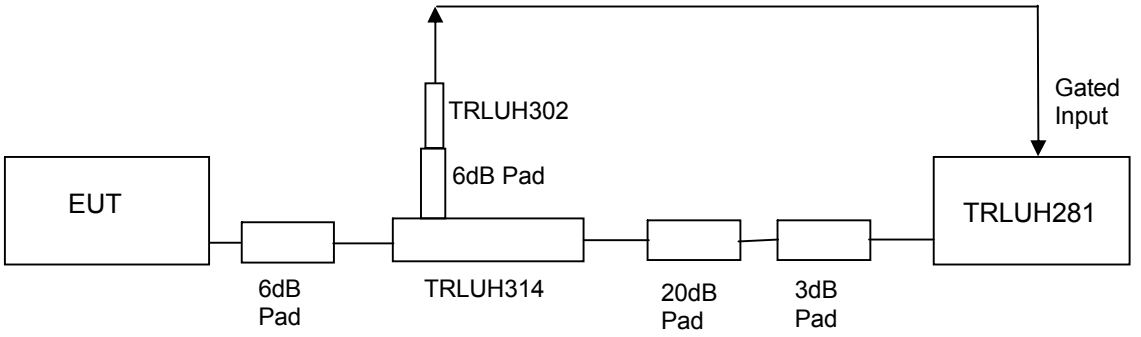
Frequency MHz	Level at Power Meter dBm	Attenuator and cable loss dB	Antenna Gain dB	Mean Carrier Power EIRP dBm	Duty Cycle Factor dB	Peak Carrier Power EIRP (dBm)	Peak Carrier Power EIRP (dBW)	Limit dBW
Channel 1	-19.98	41.00	3	24.02	10.36	34.38	4.38	40
Channel 75	-19.98	41.00	3	24.02	10.36	34.38	4.38	40
Channel 150	-19.97	41.00	3	24.03	10.36	34.39	4.39	40
Channel 240	-19.97	41.00	3	24.03	10.36	34.39	4.39	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

TRANSMITTER TESTS

EMISSIONS LIMITATIONS – CONDUCTED – PART 25.202 (f)

Ambient temperature	=	20^{o}C	Radio Laboratory
Relative humidity	=	77%	
Supply voltage	=	+5Vdc	



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 TIC PCB.

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.

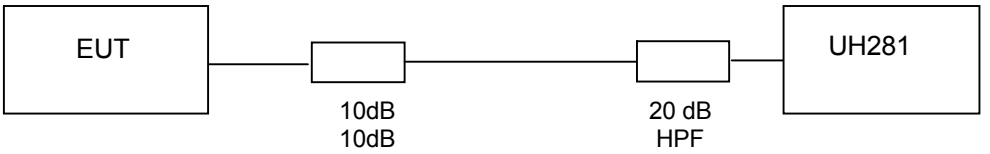
The 9602SB Transceiver was found to comply with the limits

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 = +5Vdc



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 were used for measurements below 3GHz and 10dB attenuator 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 TIC PCB.

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	1 240 240 1	1565.384 1575.579 1593.970 1600.745	-84.75 -84.66 -83.60 -81.53	30.6 30.6 30.6 30.6	-54.15 (Note 7) -54.06 (Note 7) -53.00 (Note 7) -50.93 (Note 7)	-40 (note 6)
1605MHz – 1610MHz	1 240	1605.000 1605.000	-84.94 -84.98	30.6 30.6	-54.34 -54.38	-40 (Note 4)
1628.5MHz – 16.3 GHz	1 240 1 240 1 240 1 240	3231.552 3251.859 4847.846 4877.805 6464.491 6503.687 8080.640 8129.954	-51.27 -54.03 -49.68 -48.93 -55.88 -56.55 -57.23 -57.72	12.7 12.8 14.7 13.7 12.8 13.6 14.6 14.6	-38.57 -41.23 -34.98 -35.23 -43.08 -42.95 -42.63 -43.12	-13 -13 -13 -13 -13 -13 -13 -13

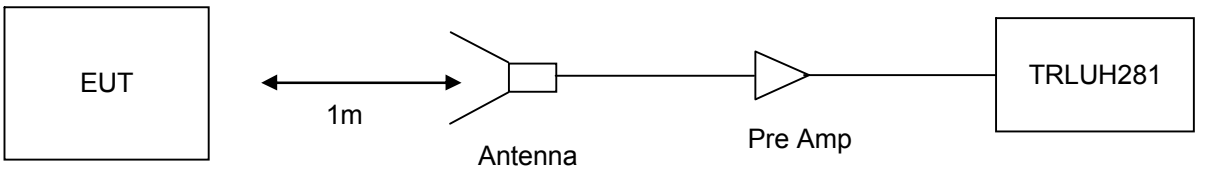
Notes :
1. Emissions Checked up to 10 times Fc
2. Reference level offset of Scan plots in Annex H already have approximate attenuator losses taken into account
3. Average measurement in a carrier on state were taken in the bands 1599MHz to 1605MHz and 1605MHz -1610MHz. All other scans were peak hold 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. Spurious level meets the -50 dBm requirement.

The 9602SB Transceiver 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	=	18°C
Relative humidity	=	54%
Conditions	=	OATS
Supply voltage	=	+5Vdc
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 TIC PCB. 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	1	3232.051	-42.08	-13
	240	3252.046	-42.15	-13
	1	4848.124	-32.38	-13
	240	4877.896	-34.21	-13
	1	6463.974	-34.62	-13
	240	6503. 915	-33.10	-13

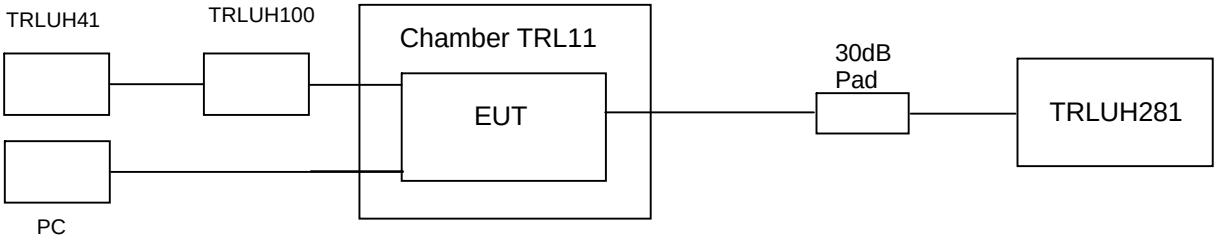
Notes :
1. Emissions Checked up to 10 times Fc.
2. Scan plots of channels 1 & 240 with receive antenna in annex H.
3. The unit was mounted on a turntable and rotated through 360^0 and in 3 orthogonal planes to find the worst case emission.
4. -40 to -10 Linearly interpolated in dBm Vs frequency offset.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

The 9602SB Transceiver was found to comply with the limits. See annex H for plots

TRANSMITTER TESTS

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

Ambient temperature = 20°C Radio Laboratory
Relative humidity = 54%
Supply voltage = +5Vdc



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 TIC PCB. The Analyser was set to max hold.

RESULTS

TEMP	Frequency (MHz)			
^{0}C	Channel 1	Channel 75	Channel 150	Channel 240
+60	1616.02071	1619.10405	1622.22904	1625.97904
+50	1616.02063	1619.10399	1622.22894	1625.97900
+40	1616.02057	1619.10390	1622.22890	1625.97889
+30	1616.02051	1619.10384	1622.22885	1625.97884
+20	1616.02059	1619.10393	1622.22892	1625.97893
+10	1616.02050	1619.10383	1622.22881	1625.97875
0	1616.02017	1619.10348	1622.22847	1625.97845
-10	1616.02047	1619.10377	1622.22876	1625.97876
-20	1616.02063	1619.10396	1622.22896	1625.97898
-30	1616.02025	1619.10358	1622.22860	1625.97866

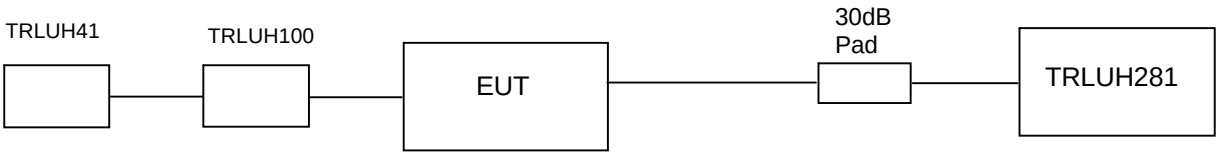
Notes: 1.Limit ± 10ppm (See Annex J for frequency stability plots verses limit)

The 9602SB Transceiver 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	=	62%	
Supply voltage	=	+5Vdc	



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	1616.02104	1619.10436	1622.22937	1625.97935
90	1616.02104	1619.10435	1622.22937	1625.97935
95	1616.02102	1619.10435	1622.22937	1625.97935
100	1616.02101	1619.10436	1622.22937	1625.97936
105	1616.02100	1619.10436	1622.22936	1625.97935
110	1616.02100	1619.10436	1622.22936	1625.97935
115	1616.02101	1619.10435	1622.22936	1625.97935

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

The 9602SB Transceiver 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	=	54% (<1GHz),	1m measurements >1GHz	[X]
Conditions	=	Alternative Test Site	3m extrapolated from 1m	[X]
Supply voltage	=	+5Vdc		

	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 the limit.**								
0.49MHz - 1.705MHz									
1.705MHz - 30MHz									
30MHz - 88MHz									
88MHz - 216MHz									
216MHz - 960MHz									
960MHz - 1GHz									
1GHz - 16.3GHz	1399.078 1409.083	58.72 58.13	26.21 26.21	1.6 1.6	37.0 37.0	49.93 49.34	9.54 9.54	104.59 97.72	500 500
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 Extrapolation of 9.54 dB as per Part 15.
3 Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
4 Receiver detector >1GHz = Average, 1MHz resolution bandwidth
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.

RECEIVER TESTS

CONDUCTED EMISSIONS – AC POWER LINE Part 15.107

SIGNIFICANT EMISSIONS

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
No Significant Emissions Within 10 dB of the Limit				

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

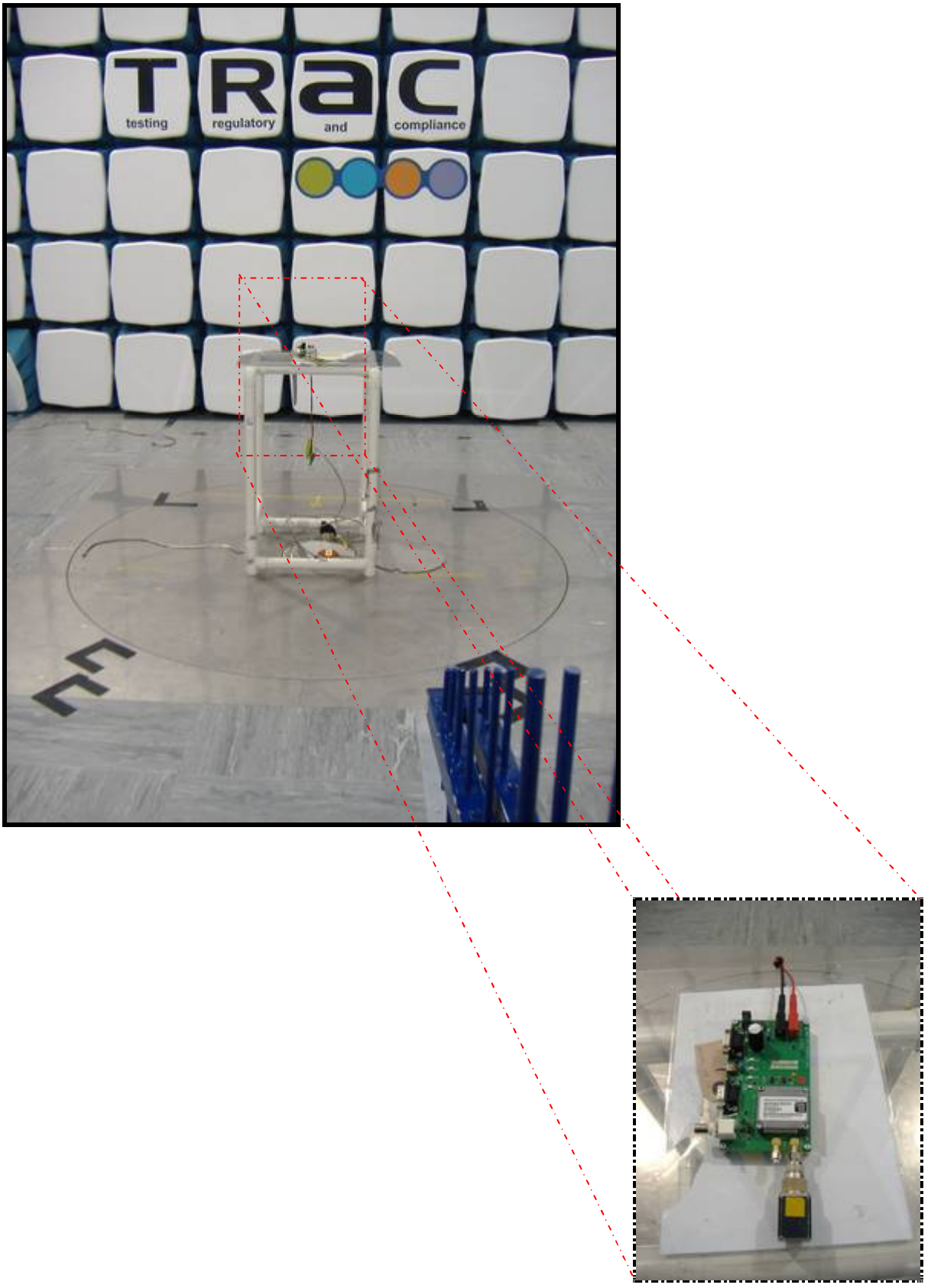
The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

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	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS 10	841429/012	UH187	**X**
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	8407 31/015	UH195	

ANNEX A

PHOTOGRAPHS

PHOTOGRAPH 1. **RADIATED TEST SETUP**



PHOTOGRAPH 2. **TOP OVERVIEW**

PHOTOGRAPH 3. **CONNECTOR 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	[X]
		-	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
TEMP CHAMBER	SHARTREE	TCC 125-815P	CS 203	11
ATTENUATOR	BIRD	8308-200	N/A	103
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
BICONE ANTENNA	CHASE	VHA 9103 balu	TRL193	193
LOG PERIODIC	CHASE	UPA6108	1061	203
ATTENUATOR	BIRD	8304-100-N	N/A	222
ATTENUATOR	BIRD	8304-0600N	N/A	246
TEMP INDICATOR	FLUKE	52 SERIES II	74700044	426
PRE AMPLIFIER	AGILENT	8449B	2118	572
LOG PERIODIC	SCHWARZBECK	UHALP 9108	AC2404C/1	UH28
BICONE ANTENNA	SCHWARZBECK	VHBA 9123	N/A	UH29
MULTIMETER	AVOMeter	M3004	M3270006	UH41
PSU	THANDAR	PL32QMD	044749	UH100
POWER METER	MARCONI	6960B	951206/006	UH096
RECEIVER	R&S	ESVS10	841431/014	UH186
RECEIVER	R&S	ESHS10	841429/012	UH187
LISN	R&S	ESH3-Z5.831.5518.52	8407 31/015	UH195
BILOG ANTENNA	YORK	CBL611/A	1618	UH191
POWER SENSOR	MARCONI	6924	236997/010	UH129
POWER METER	R&S	NRP	100001	UH266
POWER SENSOR	R&S	NRP-Z11	100004	UH267
SPECTRUM ANALYSER	R&S	FSU 46	200034	UH281
ATTENUATOR	HP	11708A	37341	UH287
CRYSTAL DETECTOR	HP	8472A	1822Z00897	UH302
DIRECTIONAL COUPLER	SINGER	117310	26	UH314
PRE AMPLIFIER	WATKINS JOHNSON	6201-69	2740	UH372
ATTENUATOR	BIRD	2-18A-MFN-06	N/A	REF 901
ATTENUATOR	BIRD	2-18A-MFN-06	N/A	REF902
HIGH PASS FILTER	AFL	N/A	N/A	N/A

ANNEX D

TEST EQUIPMENT CALIBRATION

Equipment used for testing on 19th October 2011

REF Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH096	Power meter	Marconi	11/11/2010	12	11/11/2011
UH129	Power Sensor	Marconi	11/11/2010	12	11/11/2011
N/A	20 dB Attenuator	N/A		Calibrate In Use	
N/A	20 dB Attenuator	N/A		Calibrate In Use	

Equipment used for testing between 25th October and 5th November 2010

REF Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
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
UH100	PSU	Thandar		Use Calibrated Multimeter	
UH122	Oscilloscope	Tektronix	18/12/2009	24	18/12/2011
UH186	Receiver	R&S	10/12/2009	12	10/12/2010
UH187	Receiver	R&S	10/12/2009	12	10/12/2010
UH191	Bilog	York	01/10/2008	24	01/10/2010
UH195	LISN	R&S	27/01/2010	12	27/01/2011
UH266	Power Meter	R&S	26/01/2010	12	26/01/2011
UH267	Power Sensor	R&S	26/01/2010	12	26/01/2011
UH281	Spectrum Analyser	R&S	29/01/2010	12	29/01/2011
UH287	Attenuator	HP		Calibrate in Use	
UH291	K-Type Cable	Succoflex	15/07/2009	24	15/07/2011
UH293	K-Type Cable	Megaphase	15/07/2009	24	15/07/2011
UH302	Crystal Detector	HP		For Information Only	
UH314	Bi-Directional Coupler	Narda		Calibrate In Use	
UH372	Pre Amplifier	Watkins Johnson	19/03/2009	24	19/03/2011
L011	Temperature Chamber	Shartree		Use Calibrated Temperature Indicator	
L103	Attenuator	Bird		Calibrate in Use	
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	24	23/06/2011
L193	Bicone Antenna	Chase	06/05/2008	24	06/05/2010
L203	Log Periodic Ant	Chase	06/05/2008	24	06/05/2010
L222	Attenuator	Bird		Calibrate In Use	
L246	Attenuator	Bird		Calibrate In Use	
L426	Temperature Indicator	Fluke	25/01/2010	12	25/01/2011
L572	Pre Amp	Agilent	15/07/2009	24	15/07/2011
REF901	Attenuator	Bird		Calibrate In Use	
REF901	Attenuator	Bird		Calibrate In Use	
N/A	High Pass Filter	BSC	04/12/2009	12	04/12/2010

ANNEX E

MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

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 (Power Meter) = **1.08dB**
Uncertainty in test result (Spectrum Analyser) = **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 (Power Meter) = **0.113ppm**
Uncertainty in test result (Spectrum Analyser) = **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 – Up to 8.1GHz = **3.31dB**
Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result – 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%**

[12] Power Line Conduction

Uncertainty in test result = **3.4dB**

[13] Spectrum Mask Measurements

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

[14] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[15] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[16] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[17] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[18] Receiver Threshold

Uncertainty in test result = **3.23dB**

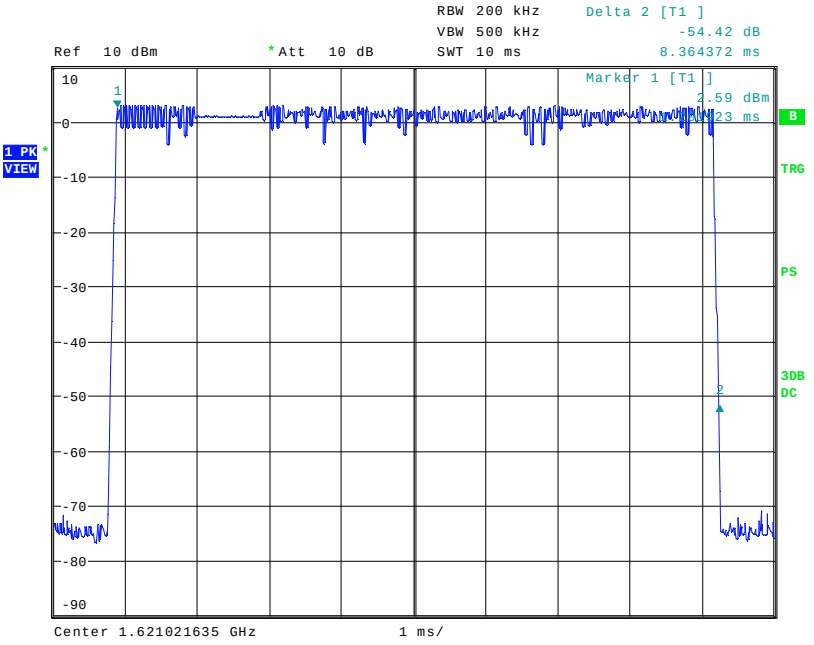
[19] Transmission Time Measurement

Uncertainty in test result = **7.98%**

ANNEX F

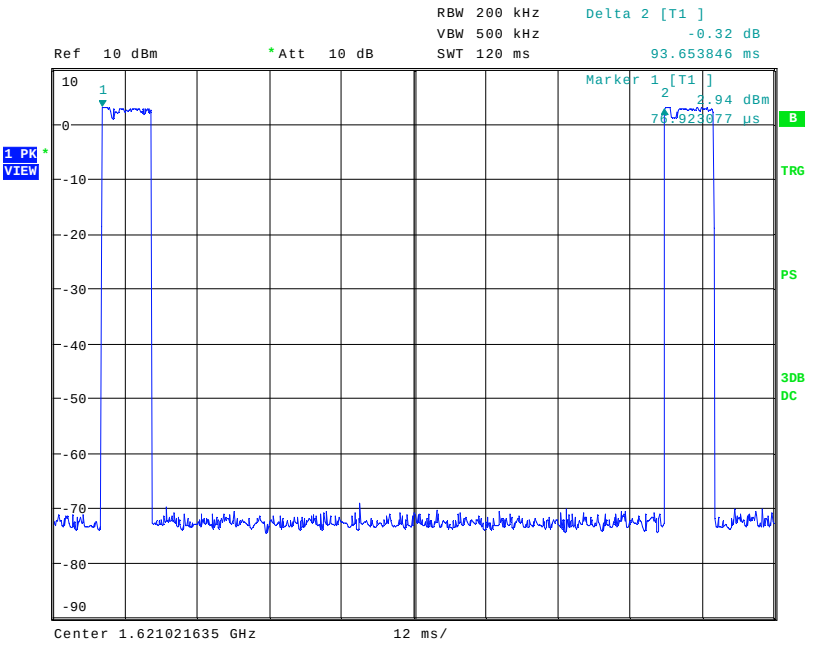
DUTY CYCLE

Duty Cycle Plots



Date: 27.OCT.2010 18:01:35

T_{on} = 8.36mS

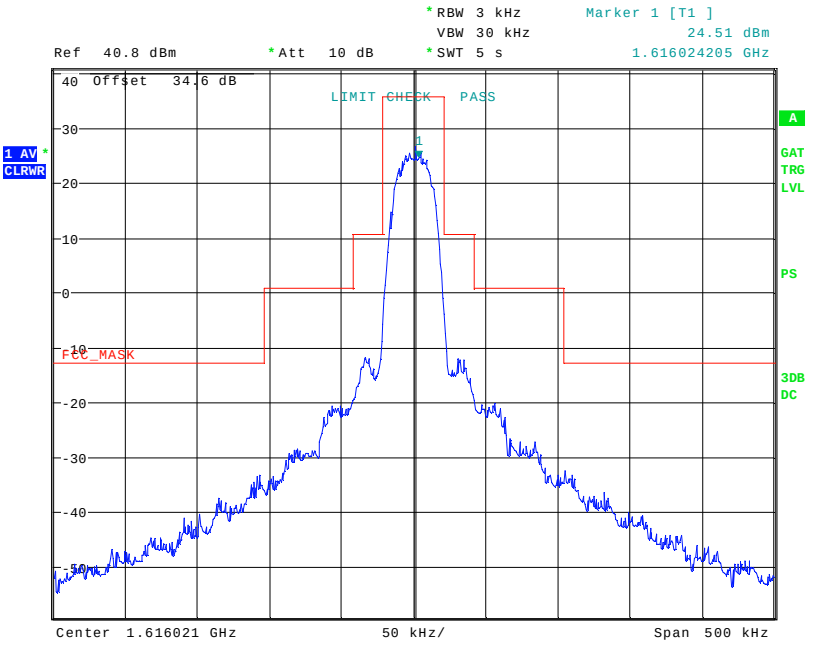


Date: 27.OCT.2010 18:03:27

T_{frame} = 90.00mS

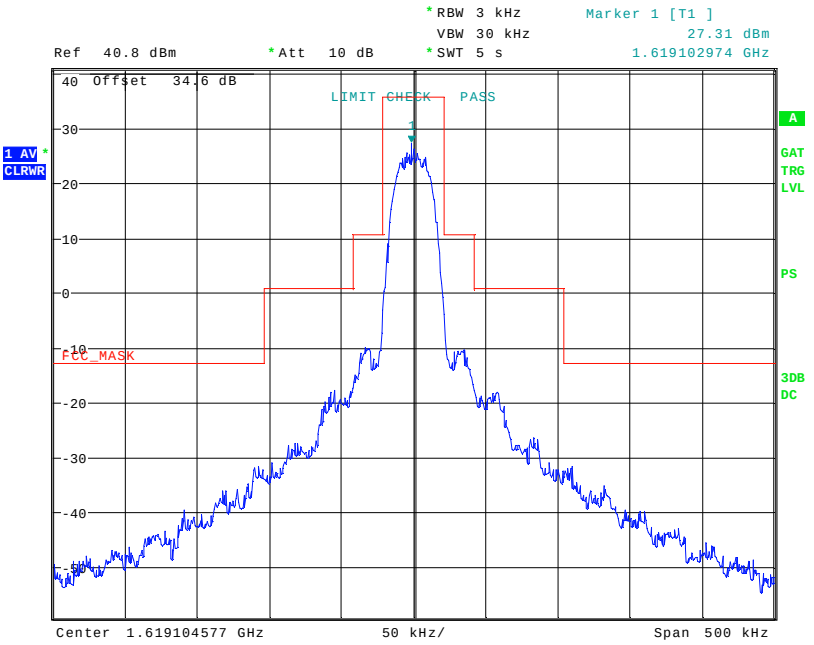
ANNEX G

EMISSIONS LIMITATIONS



Date: 27.OCT.2010 12:31:26

Channel 1



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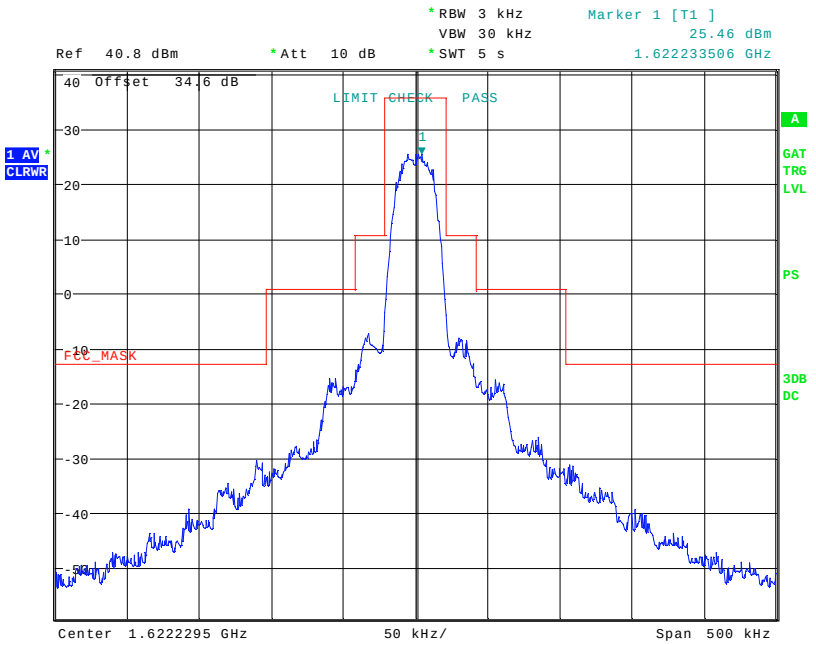
Channel 75



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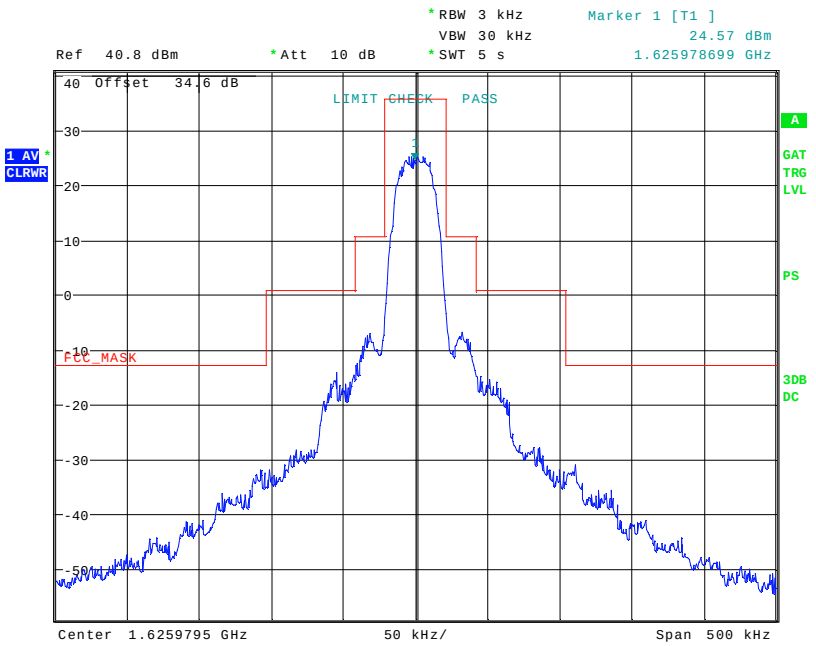
Channel 150

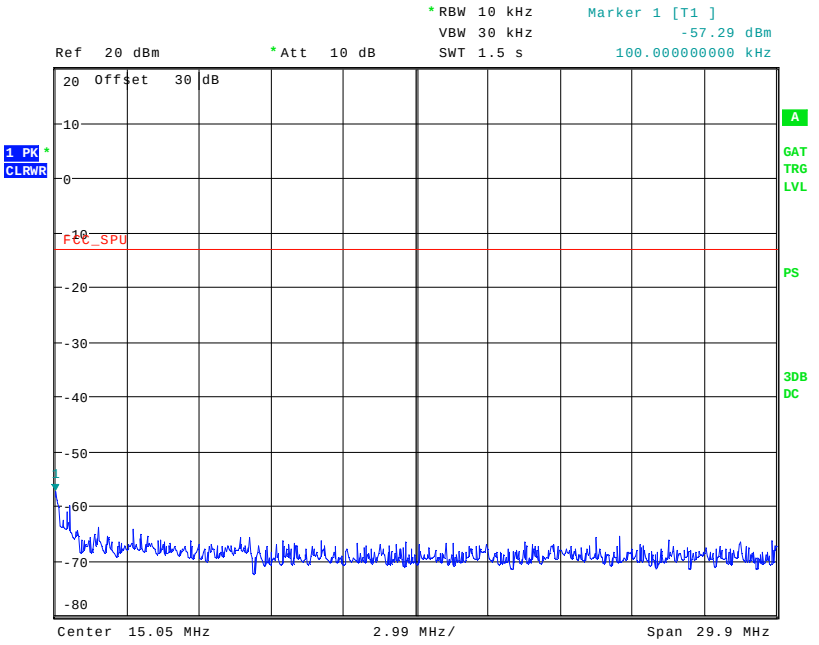


Date: 27.OCT.2010 12:50:47

Channel 240

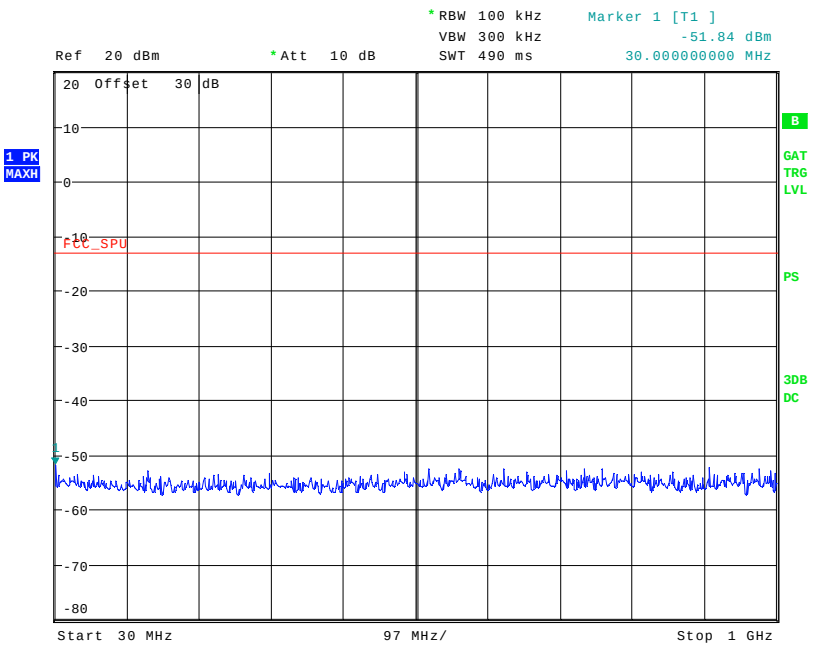
ANNEX H

TRANSMITTER SPURIOUS EMISSIONS – Conducted



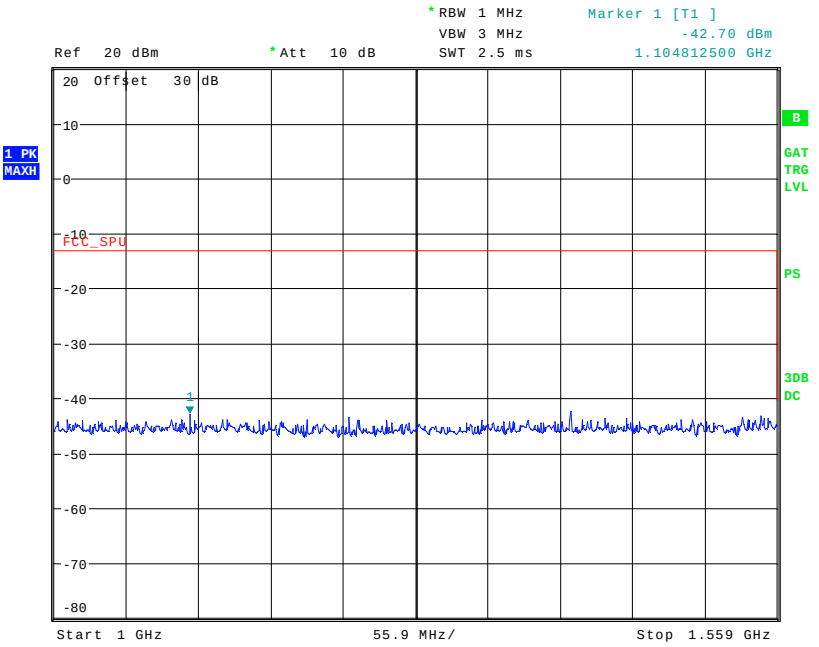
Date: 1.NOV.2010 13:18:18

100 kHz – 30MHz



Date: 1.NOV.2010 13:18:44

30MHz – 1000MHz



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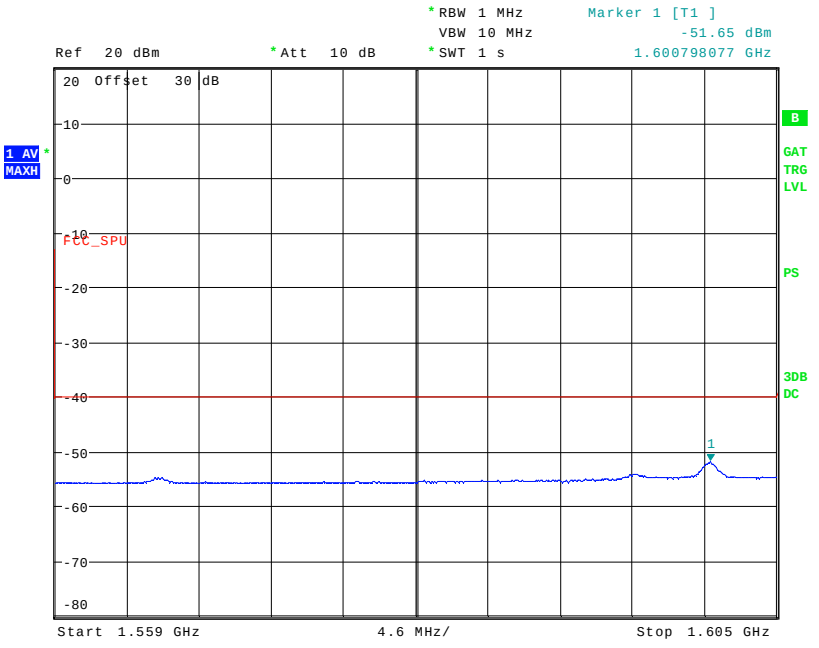
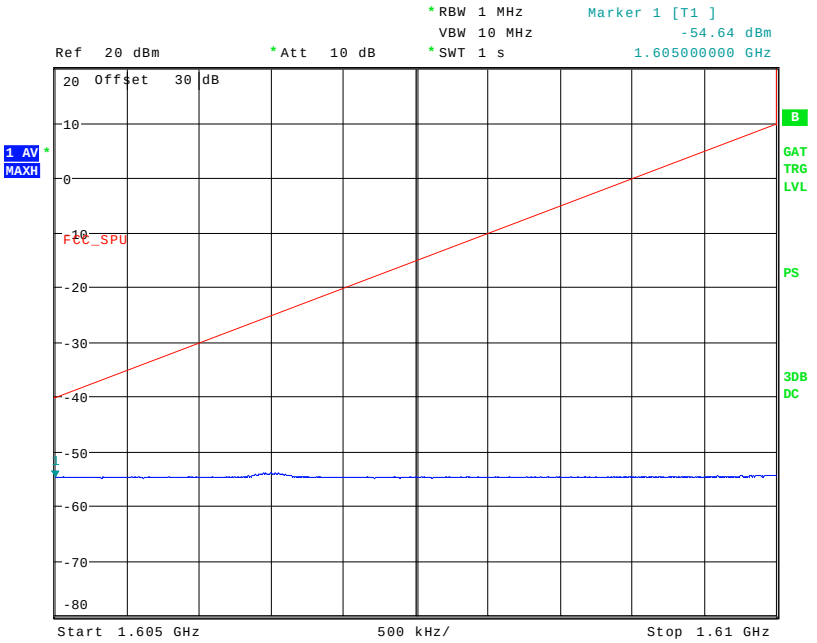
1000MHz – 1559MHz



Date: 1.NOV.2010 13:20:10

1559MHz – 1605MHz



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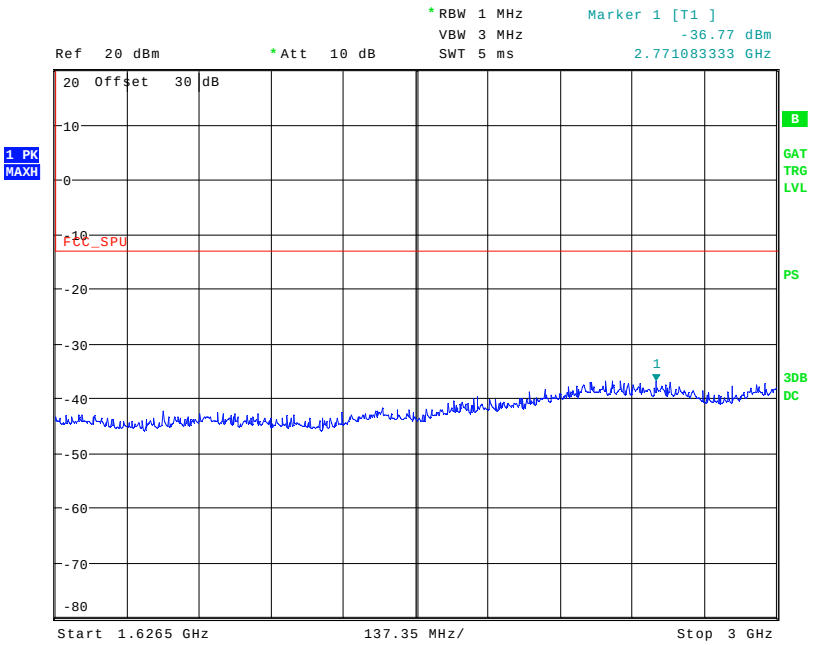
1605MHz – 1610MHz



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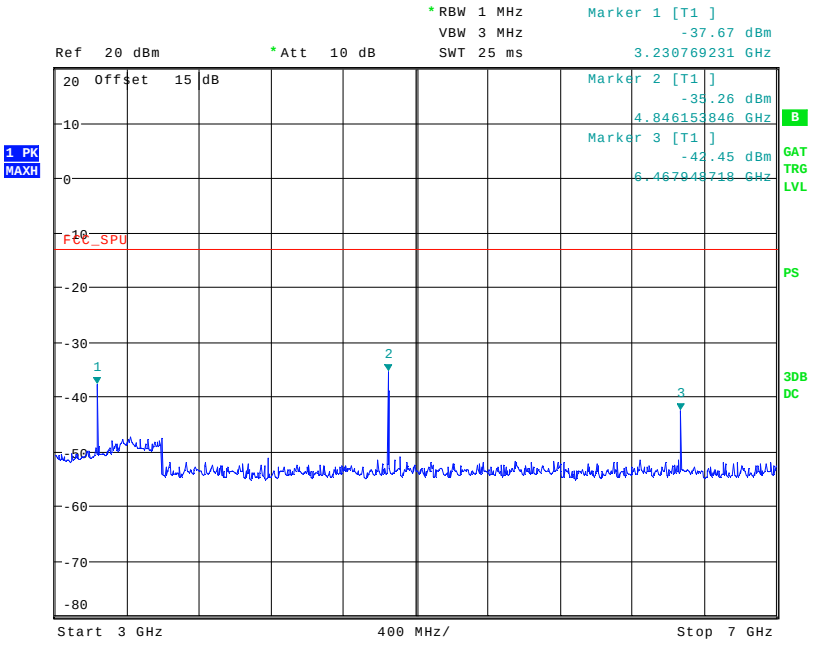
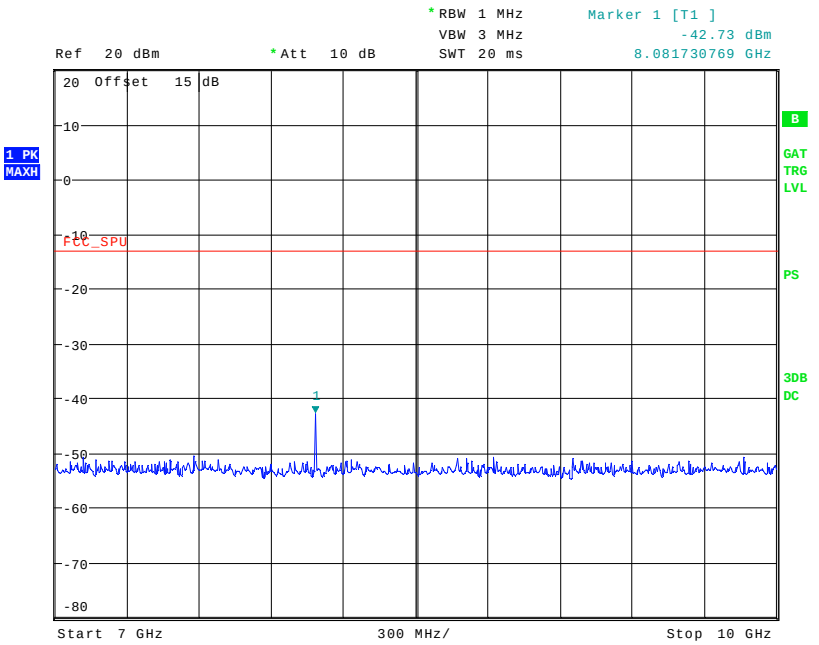
1626.5MHz – 3000MHz



Date: 1.NOV.2010 14:32:13

3GHz – 7GHz



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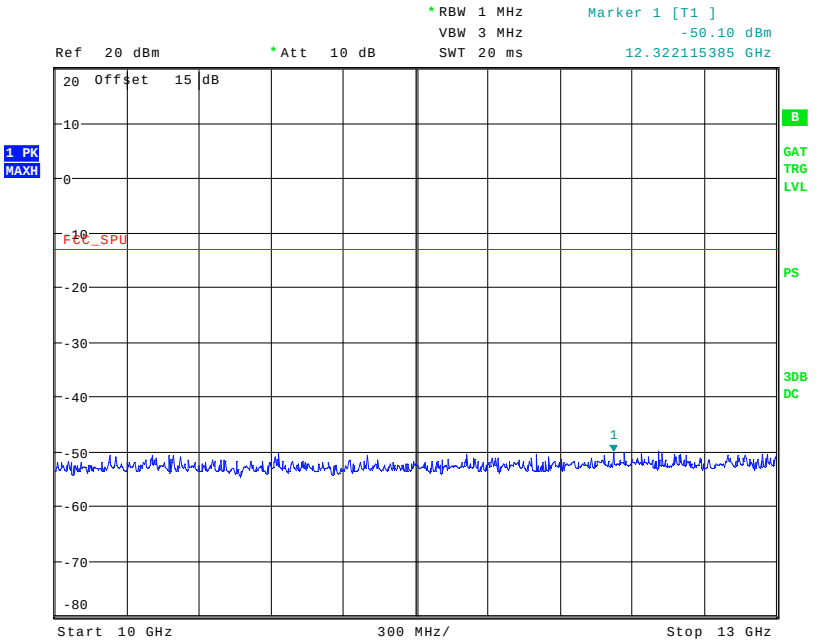
7GHz – 10GHz



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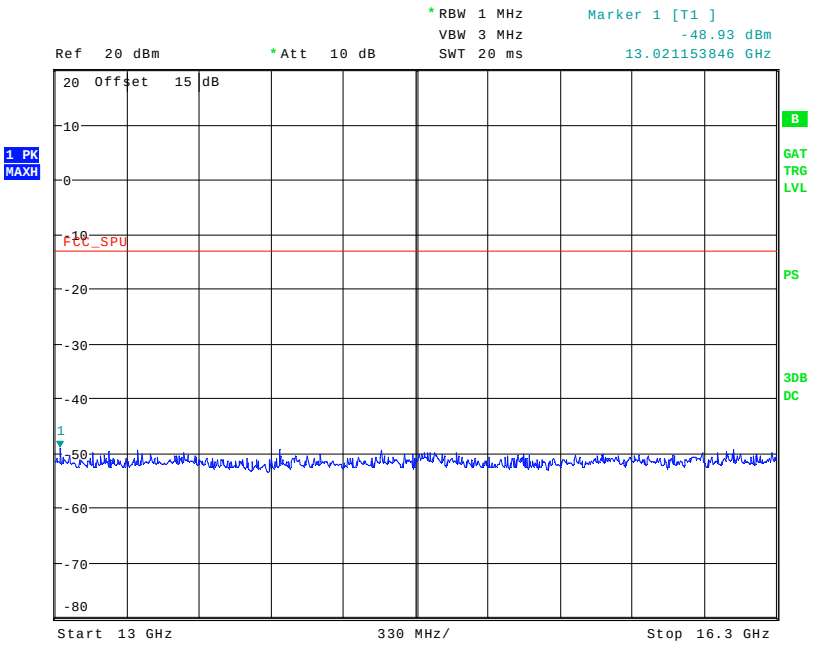
10GHz – 13 GHz



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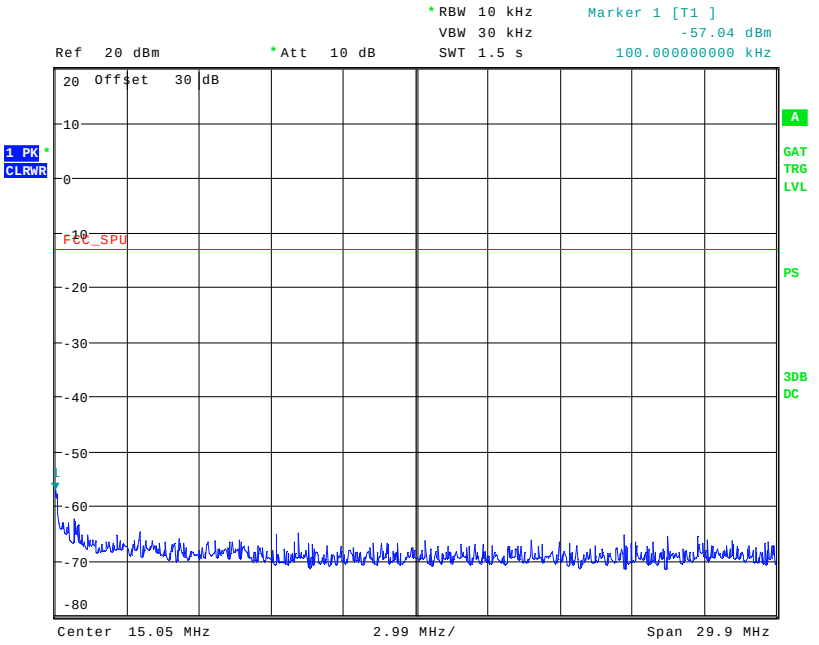
13GHz – 16.3GHz



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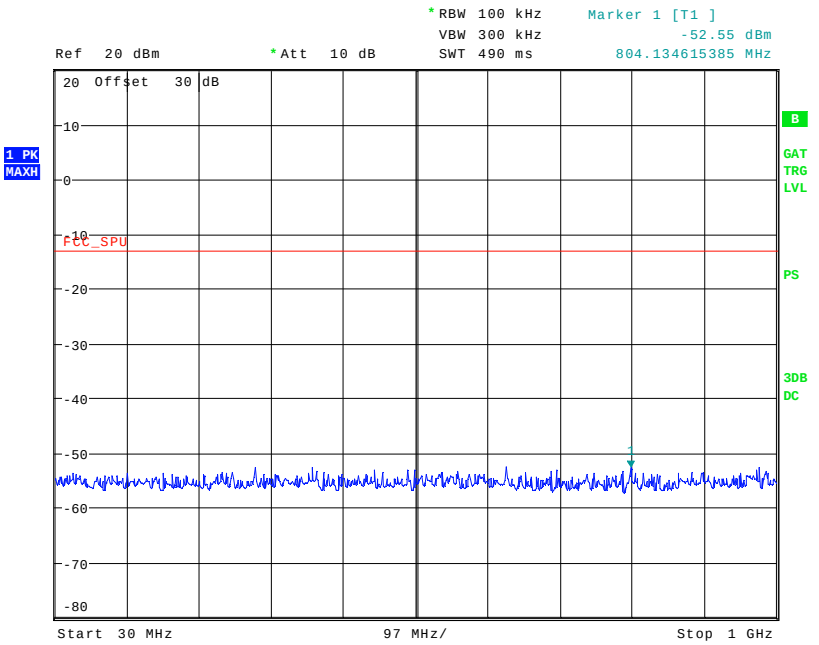
100 kHz – 30MHz



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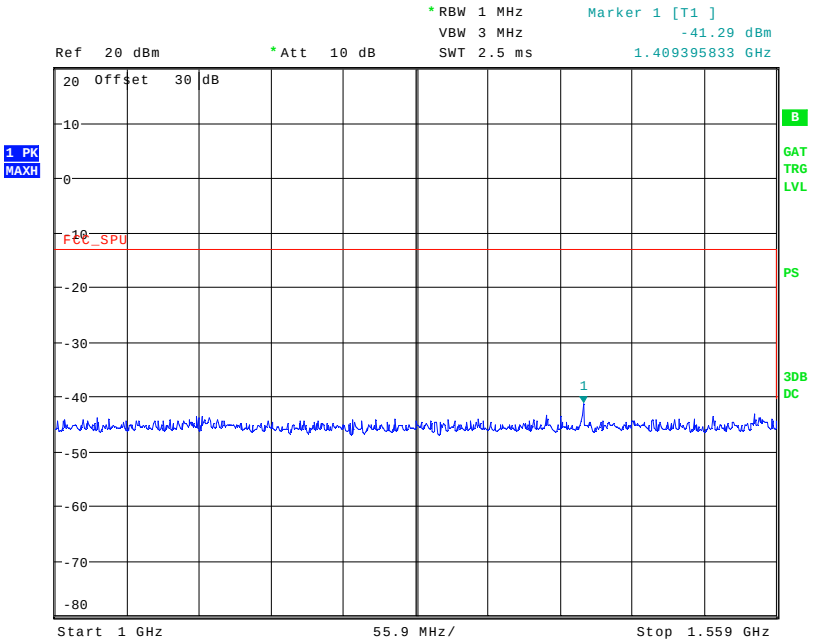
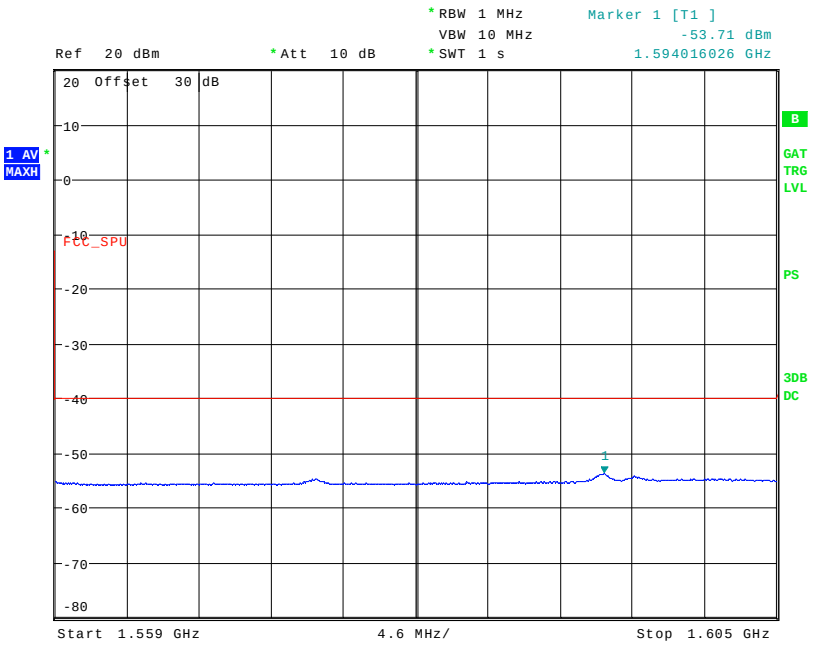
30MHz – 1000MHz



Date: 1.NOV.2010 13:14:08

1000MHz – 1559MHz



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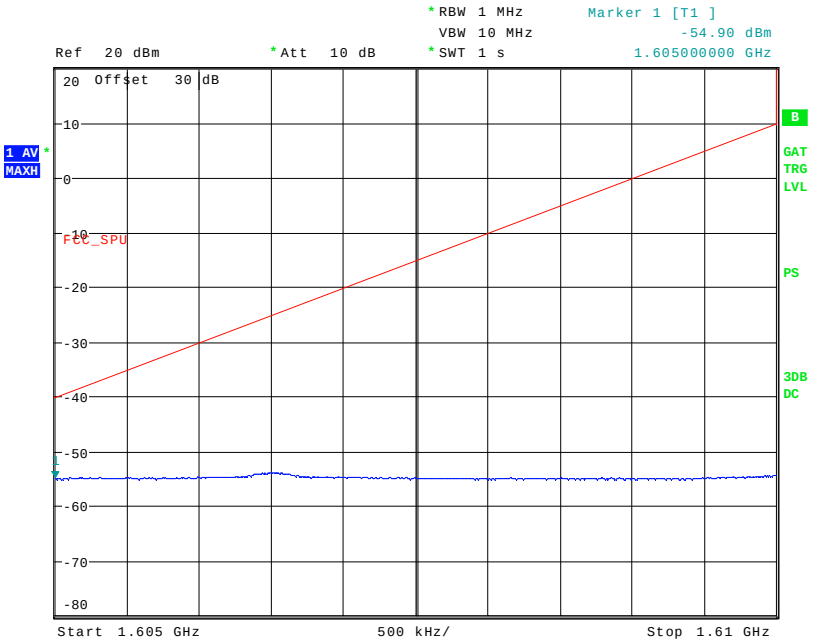
1559MHz – 1605MHz



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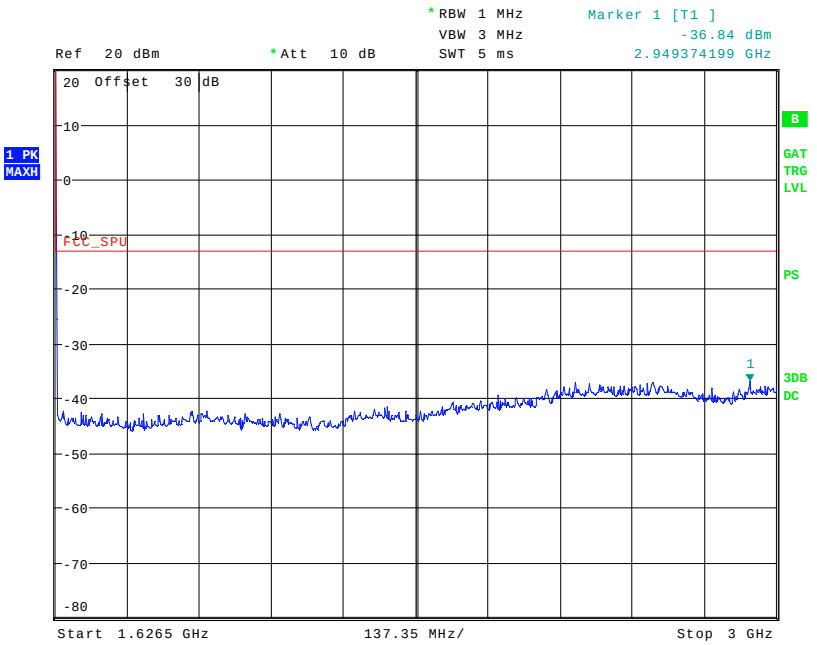
1605MHz – 1610MHz



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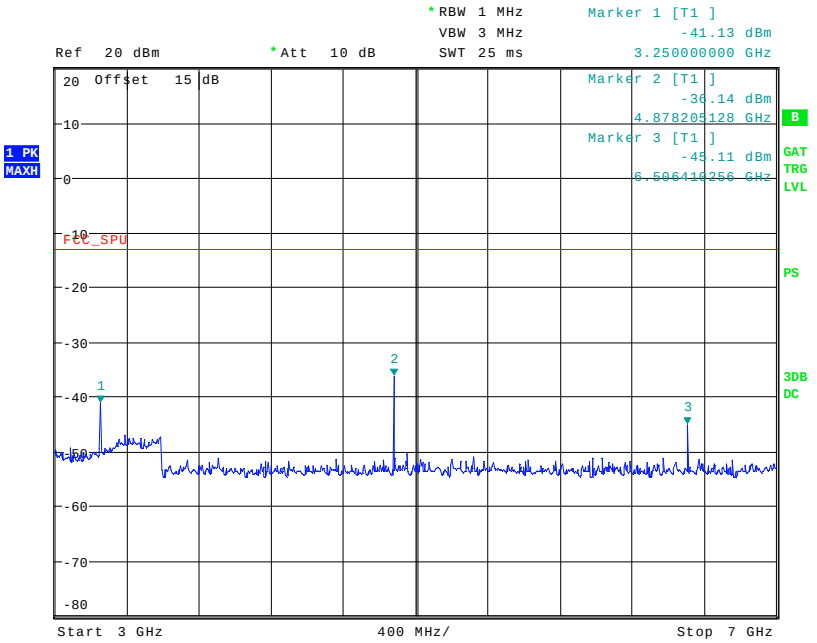
1626.5MHz – 3000MHz



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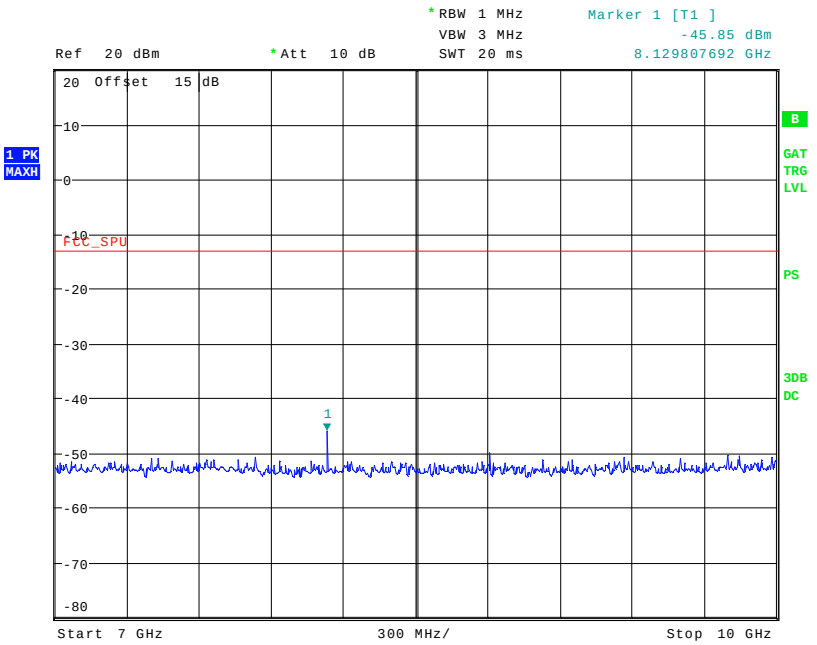
3GHz – 7GHz



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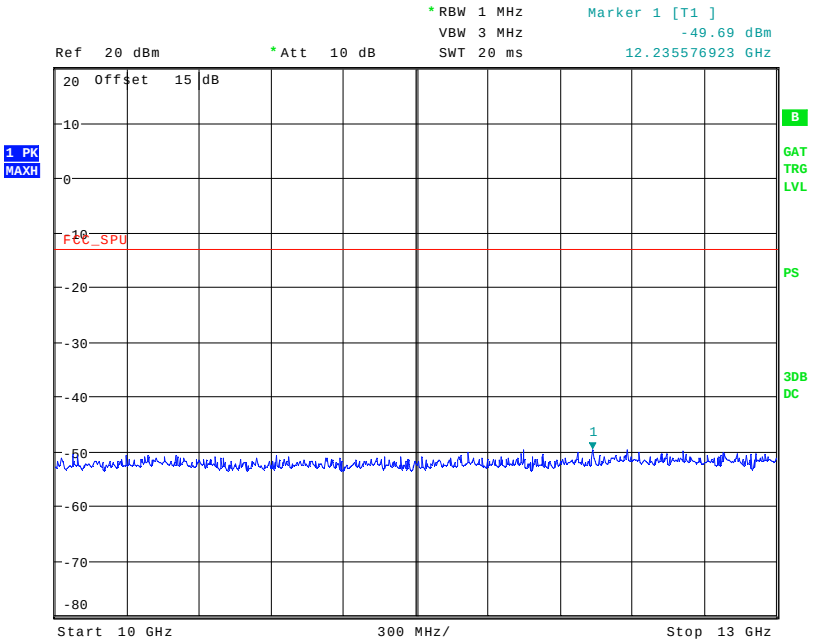
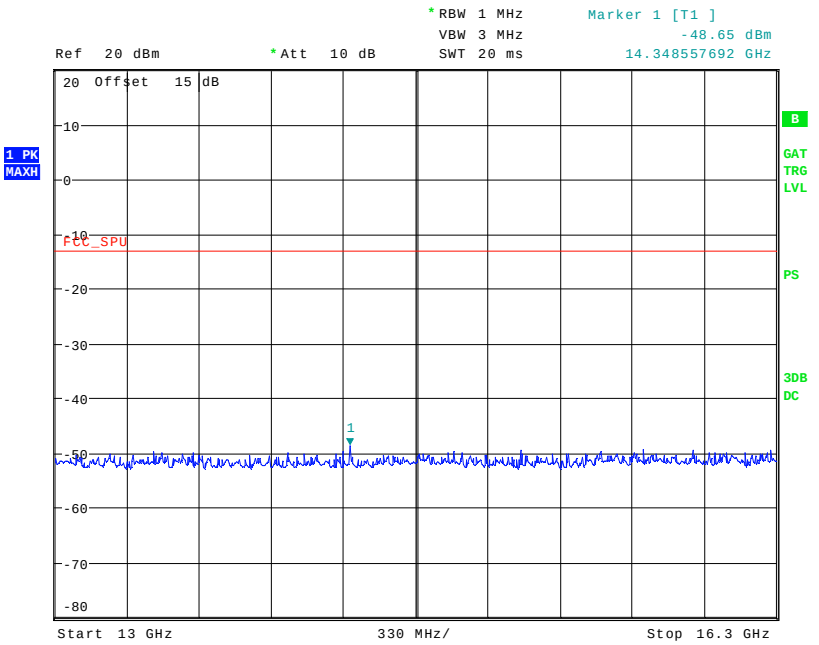
7GHz – 10GHz



Date: 1.NOV.2010 14:34:29

10GHz – 13 GHz

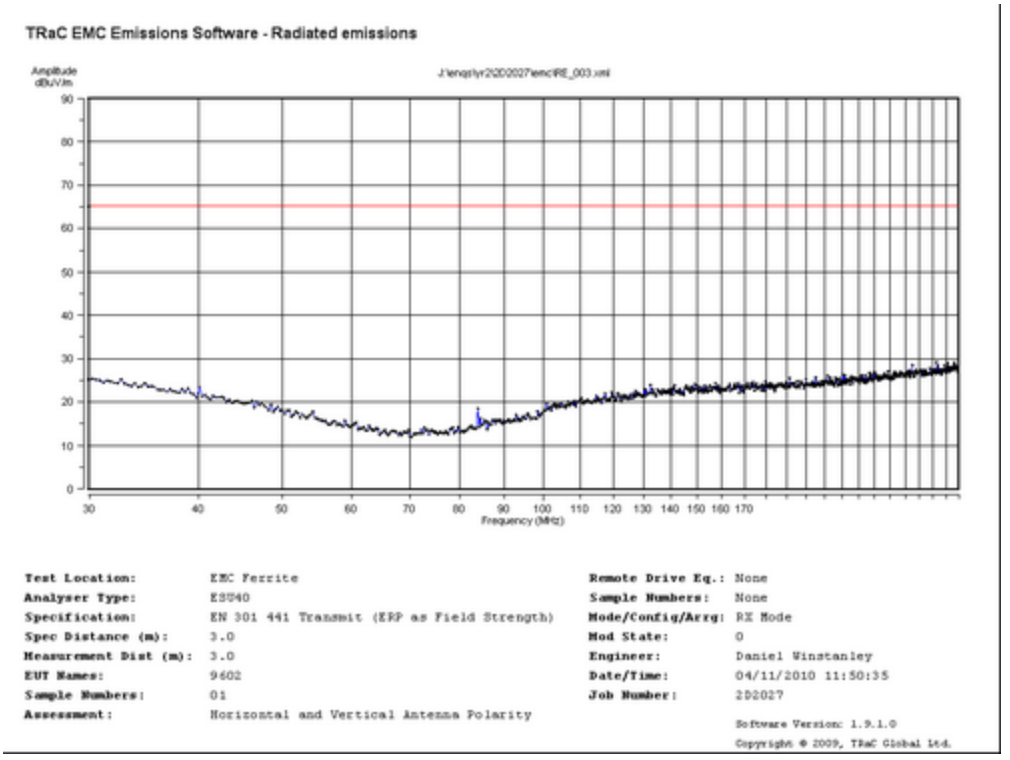


Date: 1.NOV.2010 14:34:03

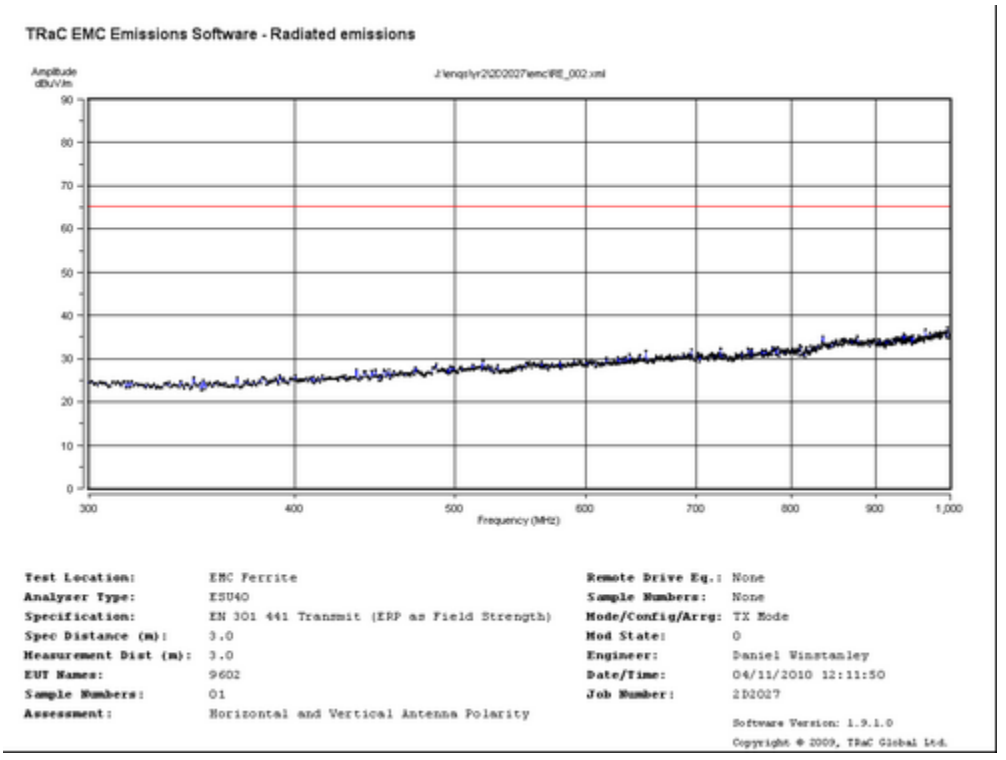
13GHz – 16.3GHz

ANNEX I

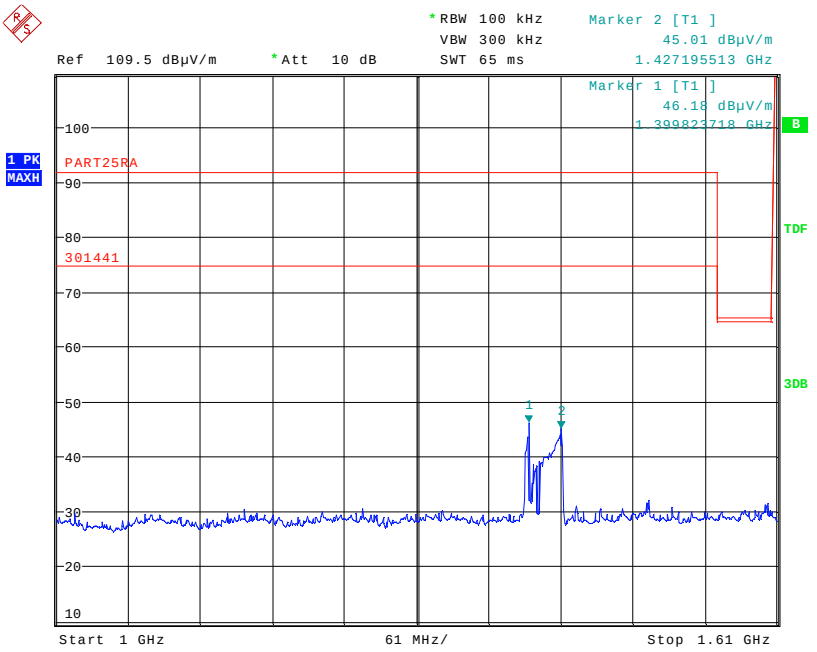
TRANSMITTER SPURIOUS EMISSIONS – Radiated



30MHz – 300MHz

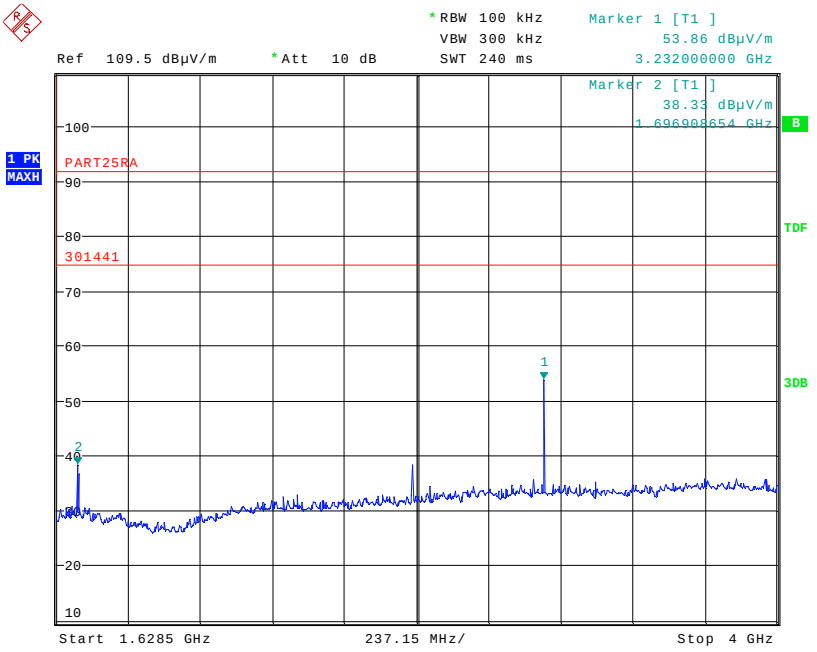


300MHz – 1000MHz



Date: 29.OCT.2010 09:25:53

1000MHz – 1610MHz



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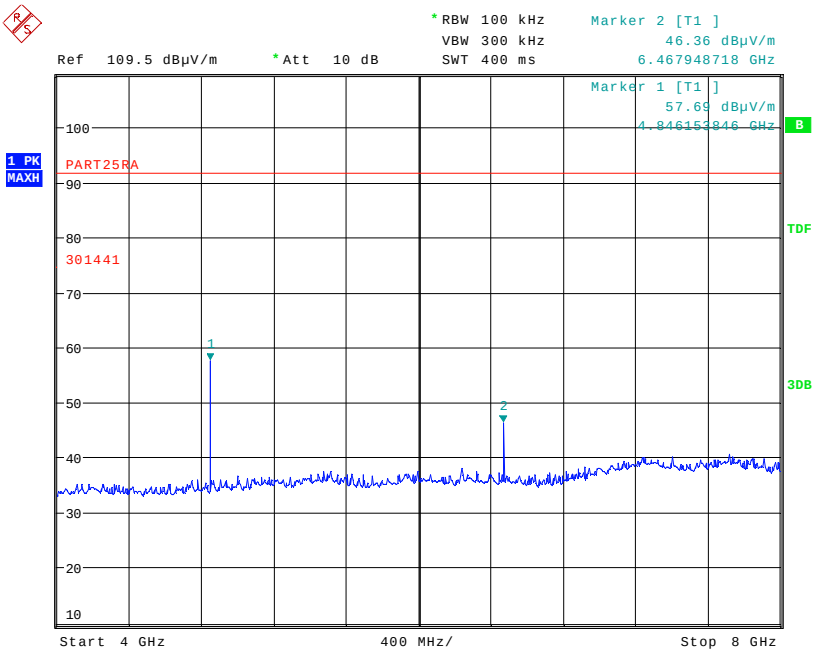
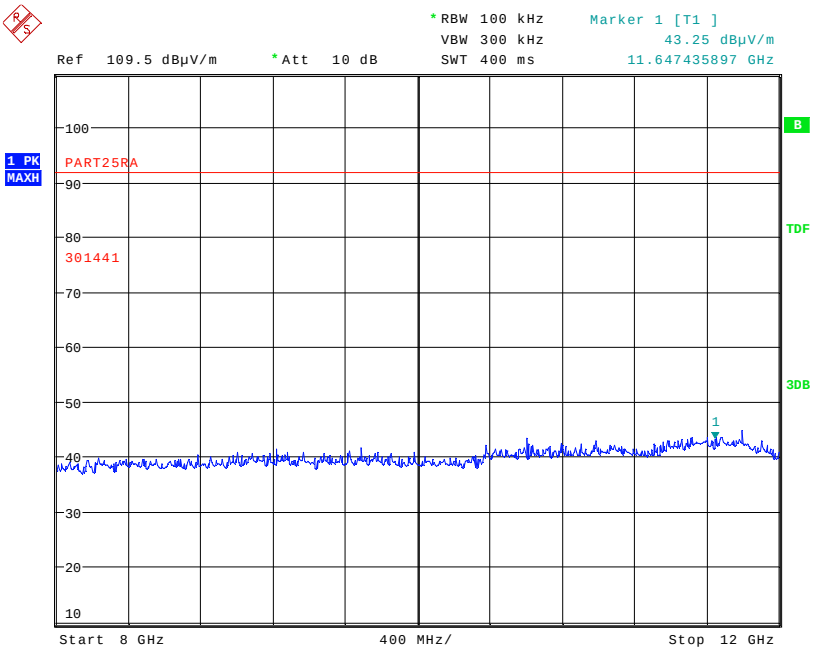
1626.5MHz – 4000MHz



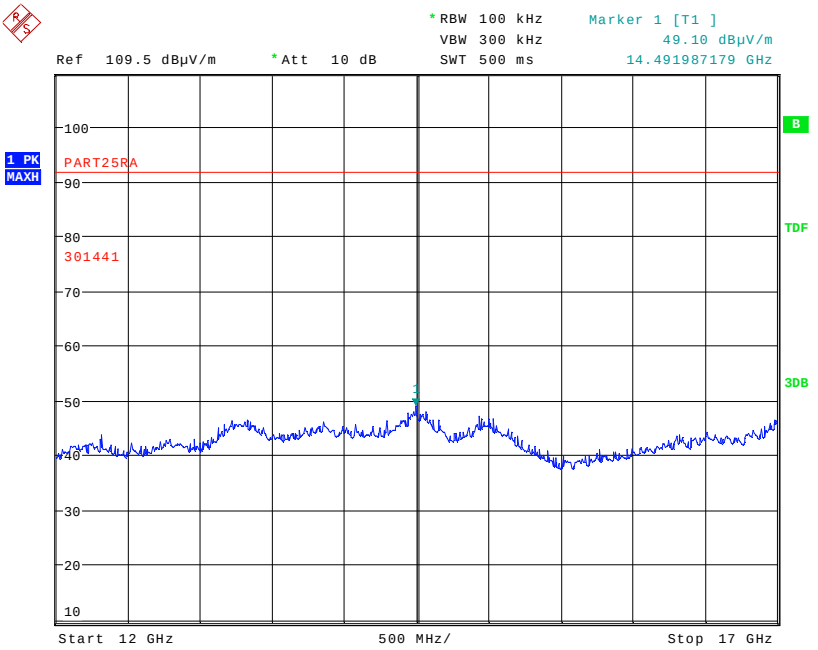
Date: 29.OCT.2010 09:29:38

4GHz – 8GHz



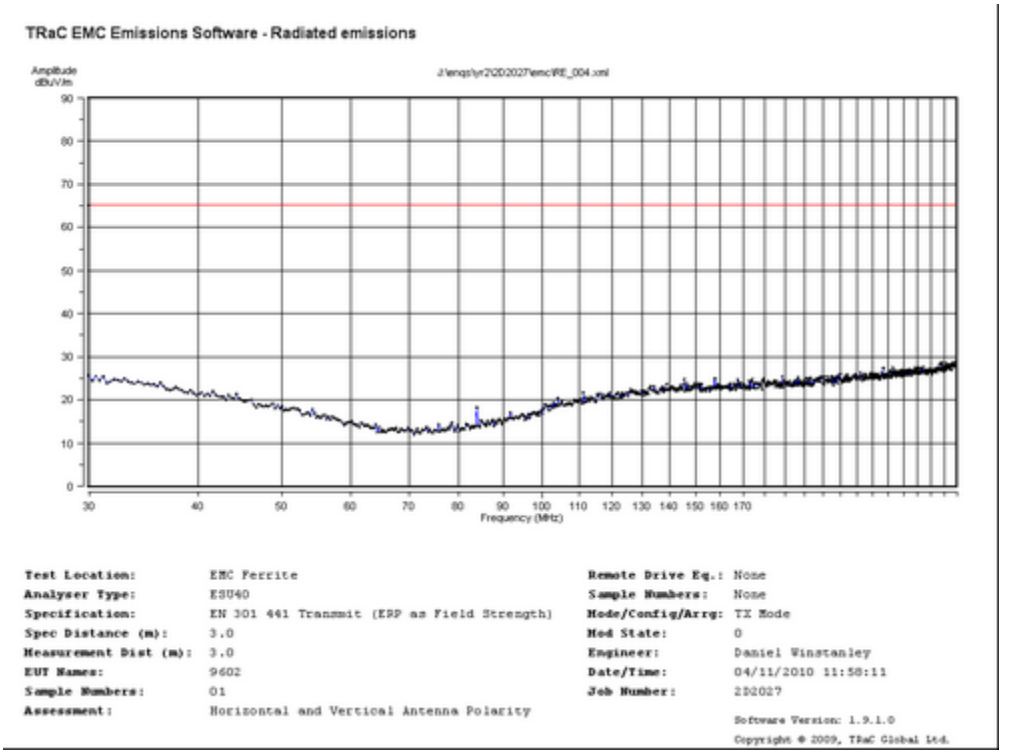
Date: 29.OCT.2010 09:31:53

8GHz – 12GHz

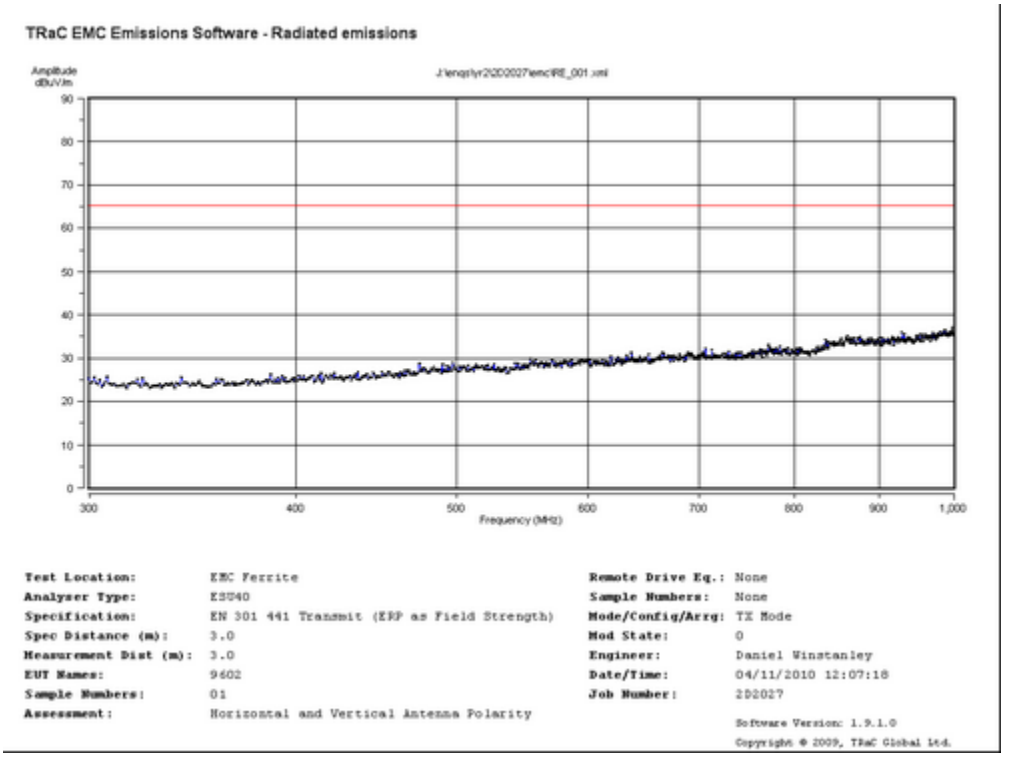


Date: 29.OCT.2010 09:31:29

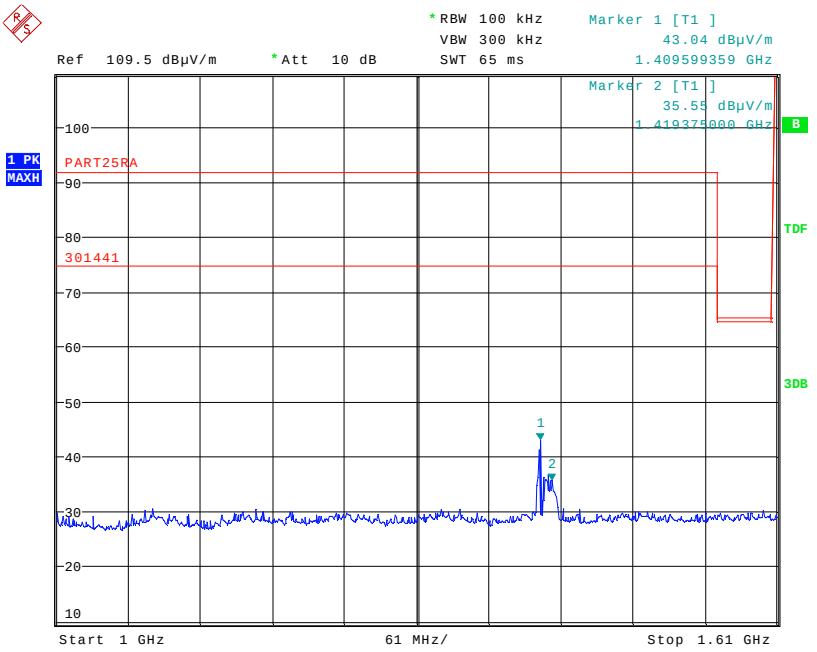
13GHz – 16.3GHz



30MHz – 300MHz

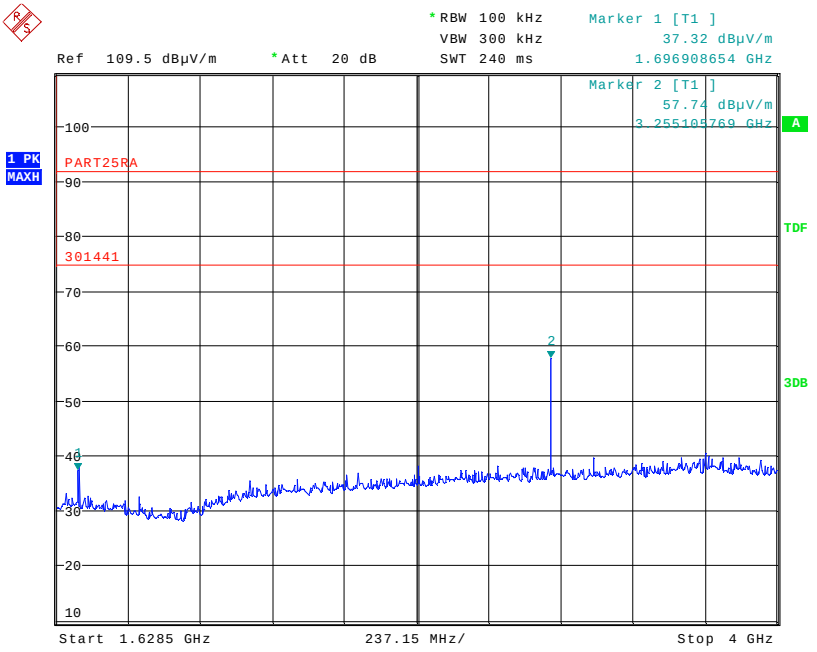


300MHz – 1000MHz



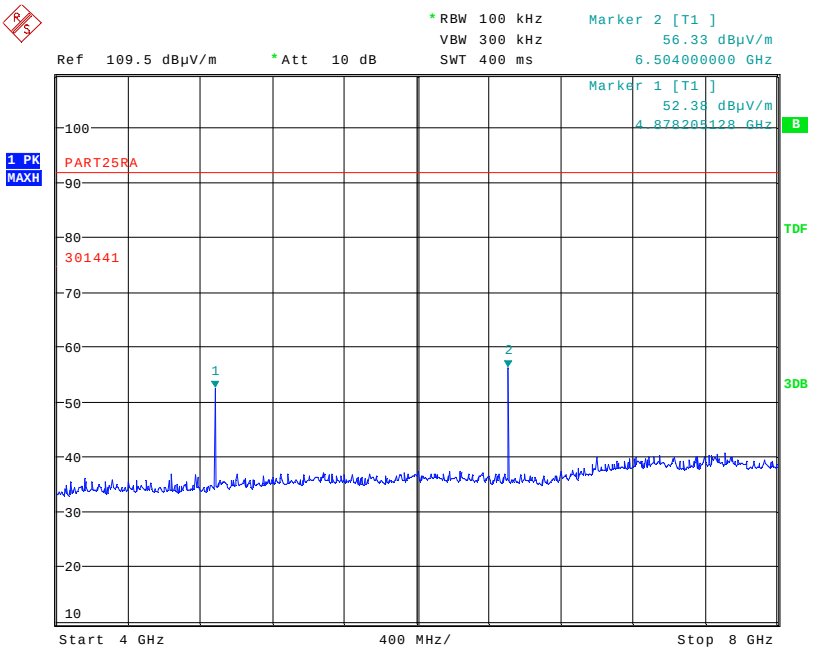
Date: 29.OCT.2010 09:41:31

1000MHz – 1610MHz



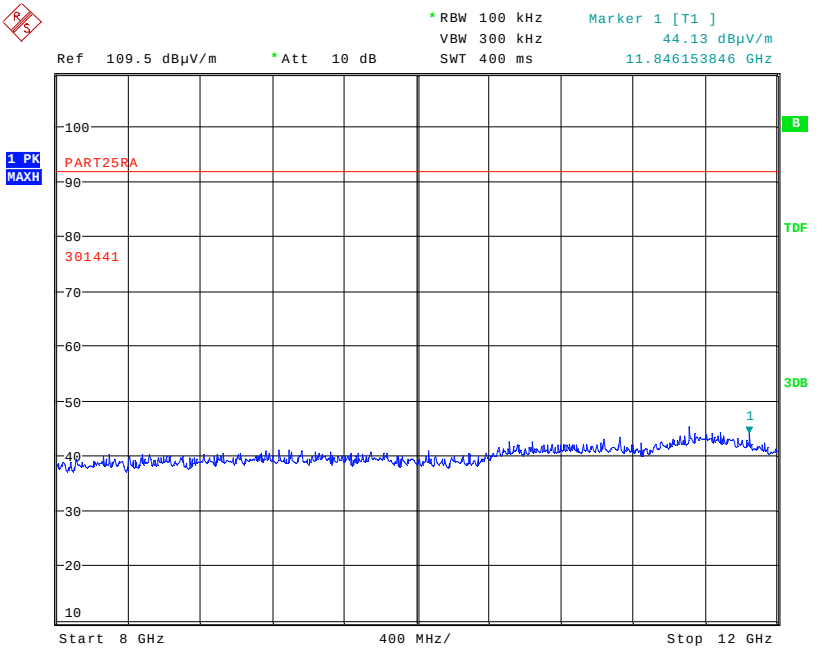
Date: 29.OCT.2010 09:48:07

1626.5MHz – 4000MHz



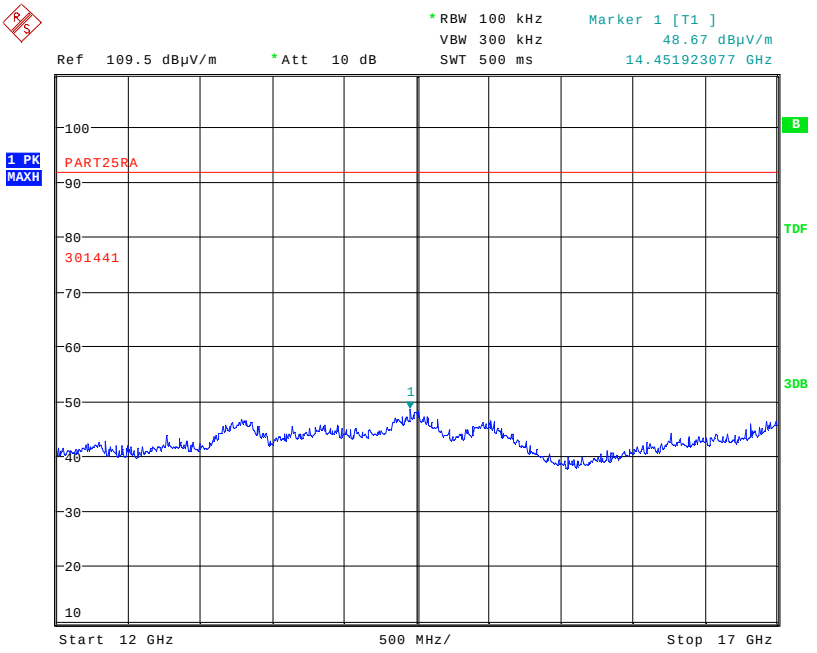
Date: 29.OCT.2010 09:43:40

4GHz – 8GHz



Date: 29.OCT.2010 09:44:02

8GHz – 12GHz



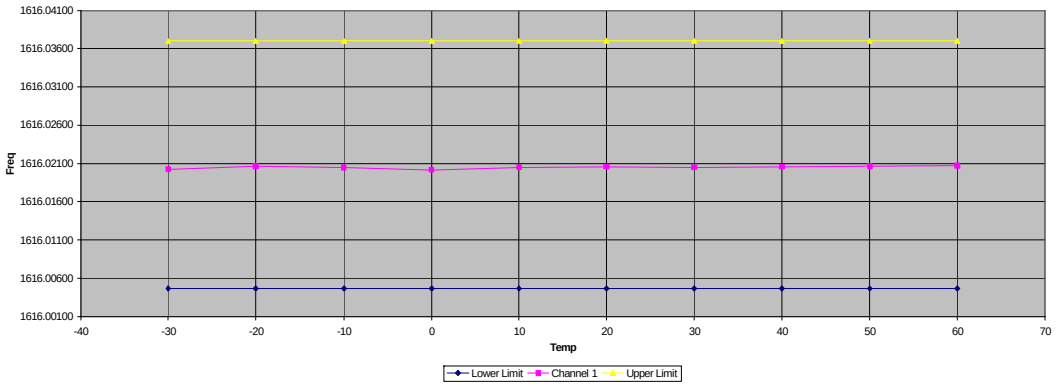
Date: 29.OCT.2010 09:44:48

13GHz – 16.3GHz

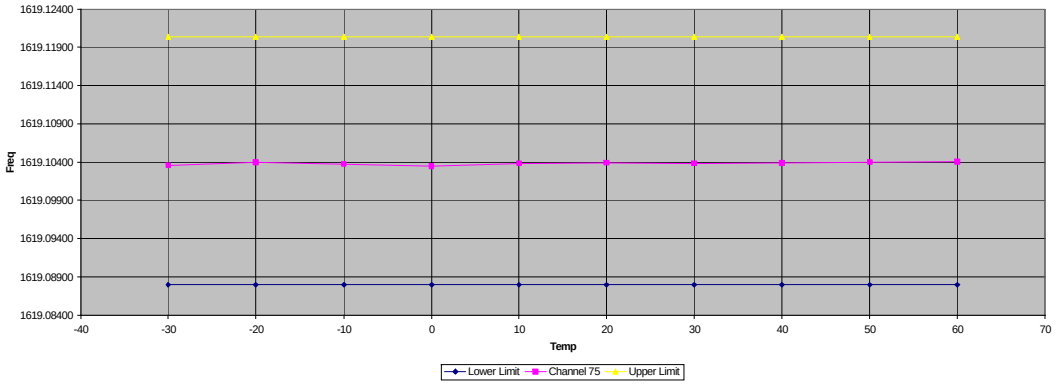
ANNEX J

FREQUENCY STABILITY – Temperature

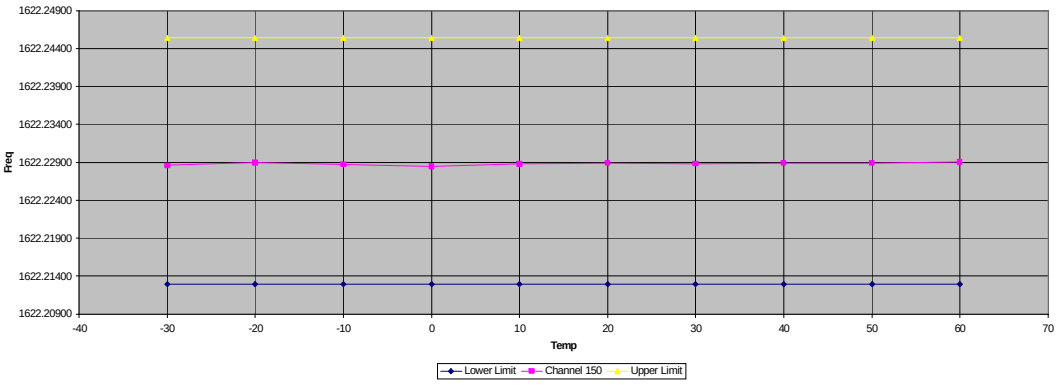
Channel 1 Frequency Stability - Temperature



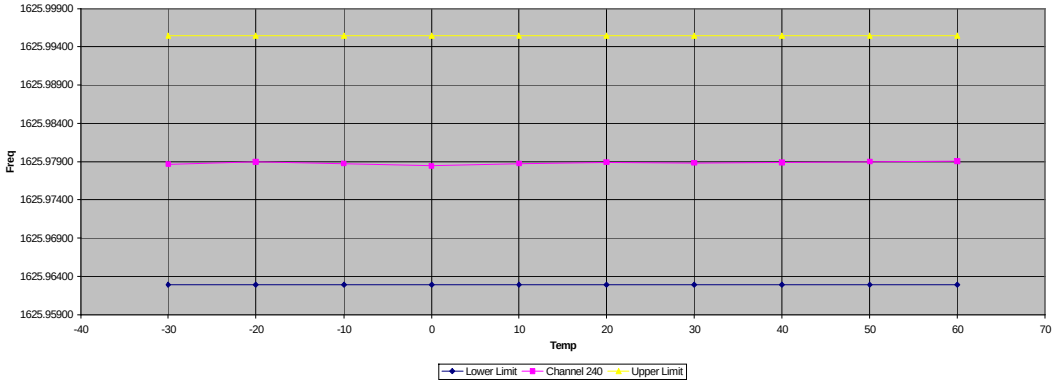
Channel 75 Frequency Stability - Temperature



Channel 150 Frequency Stability - Temperature



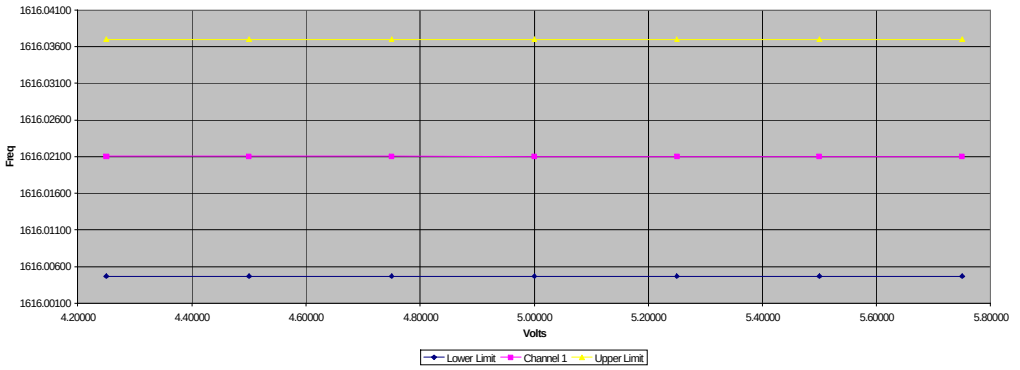
Channel 240 Frequency Stability - Temperature



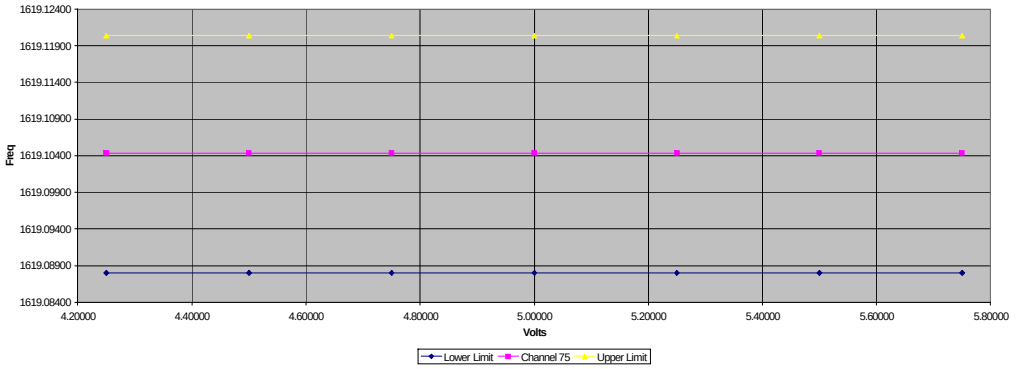
ANNEX K

FREQUENCY STABILITY – Voltage

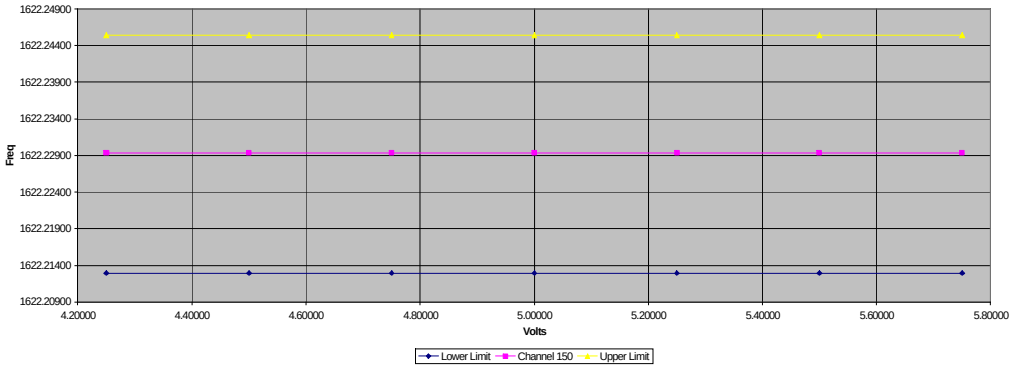
Channel 1 Frequency Stability - Voltage



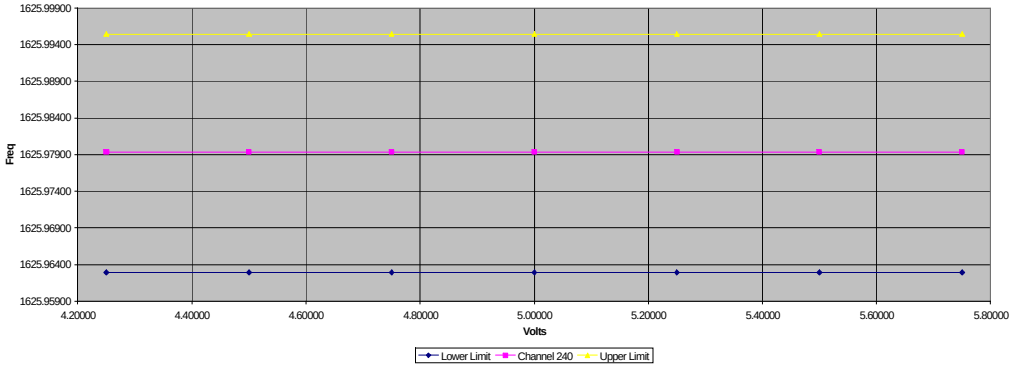
Channel 75 Frequency Stability - Voltage



Channel 150 Frequency Stability - Voltage

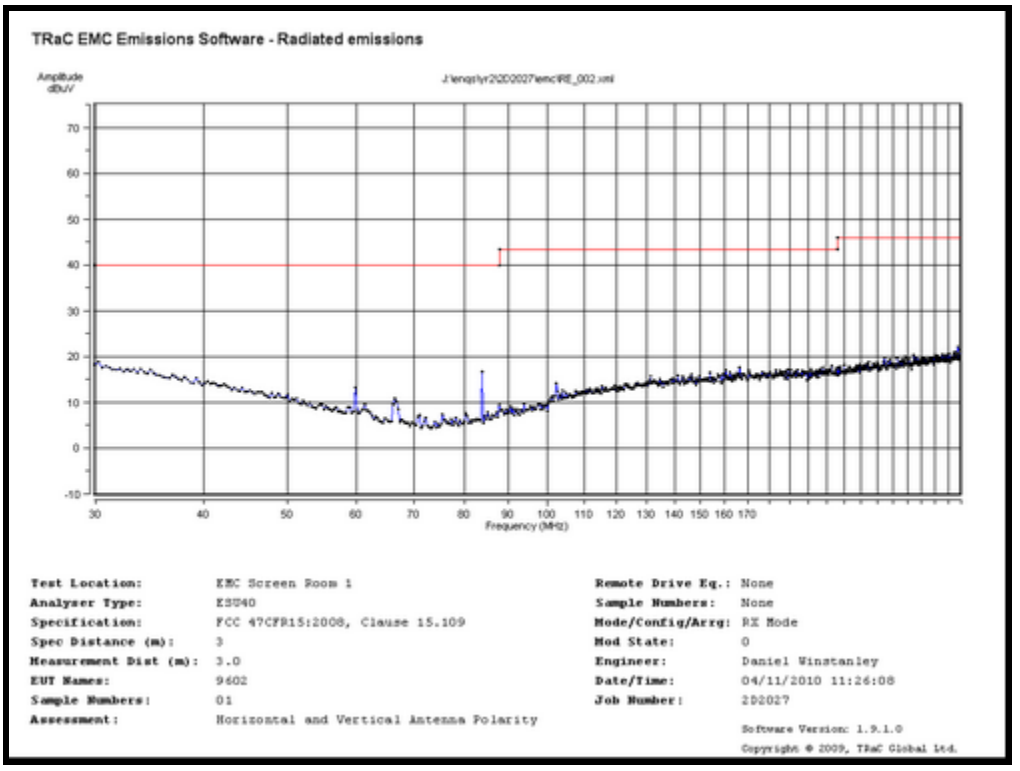


Channel 240 Frequency Stability - Voltage

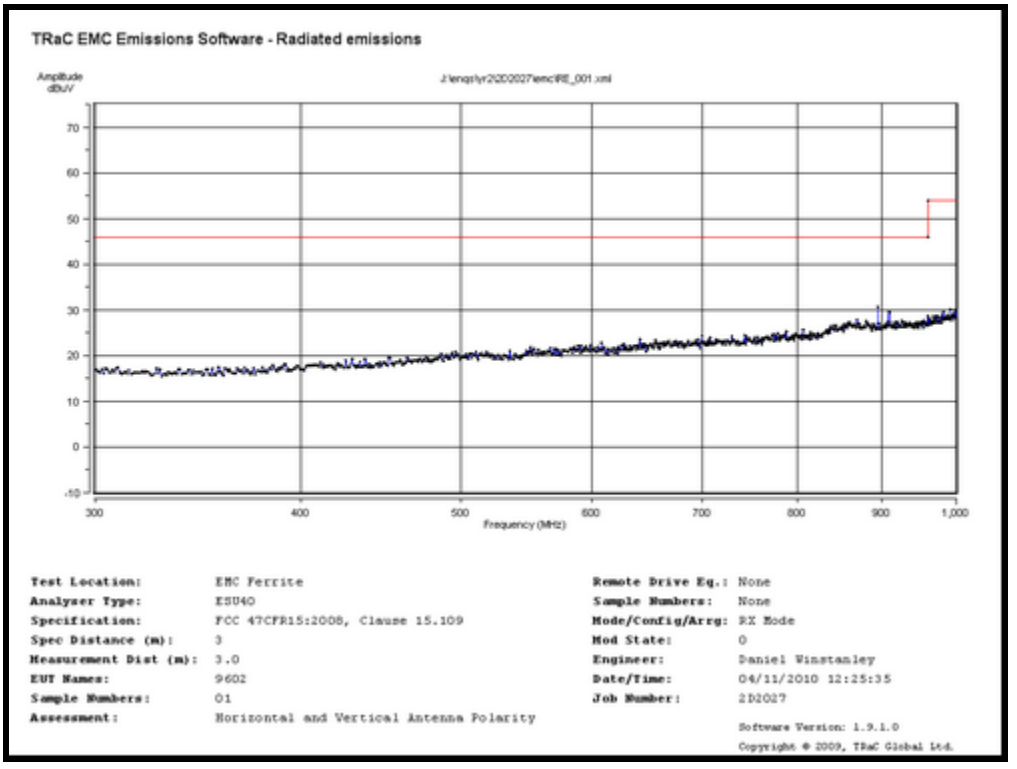


ANNEX L

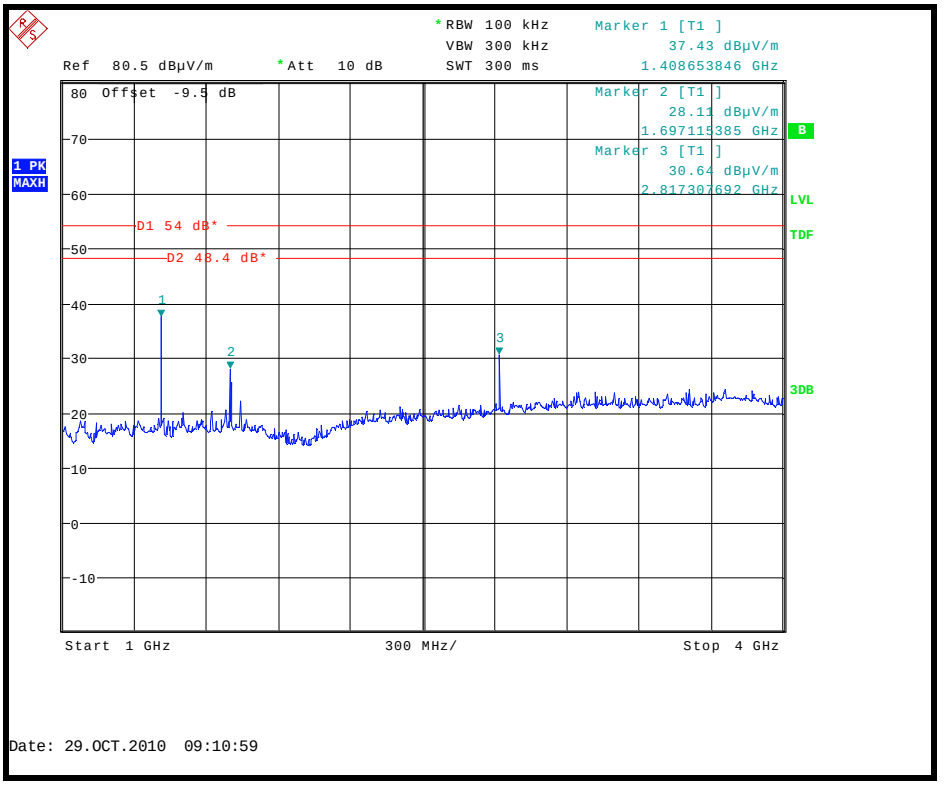
UNINTENTIONAL TRANSMITTER SPURIOUS EMISSIONS – Radiated



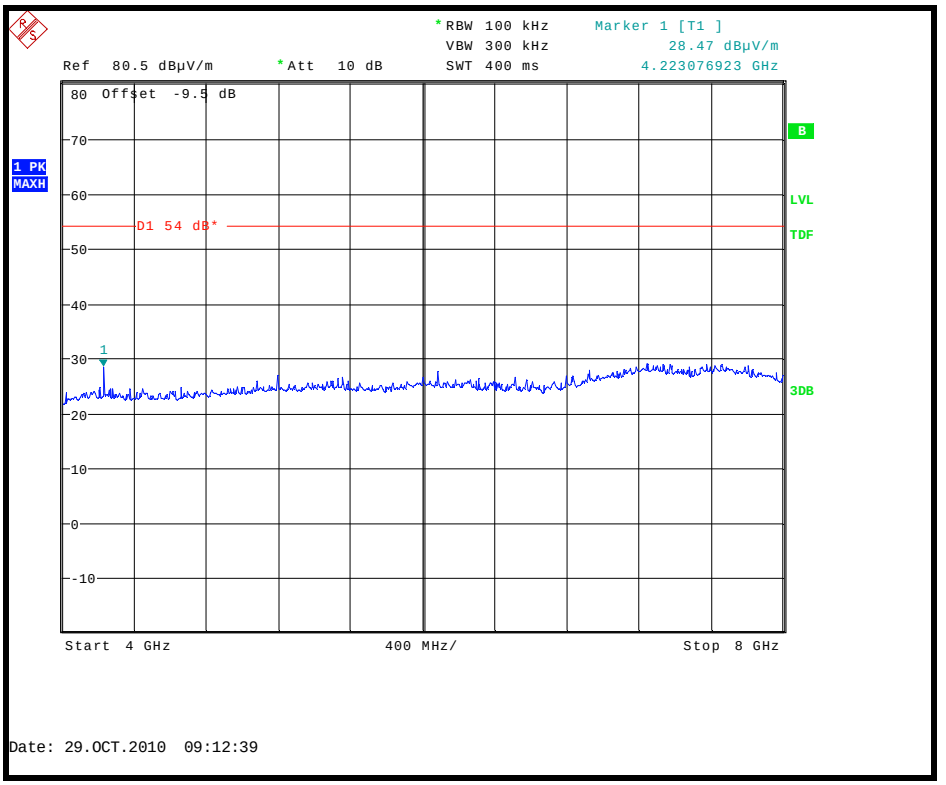
30MHz – 300MHz



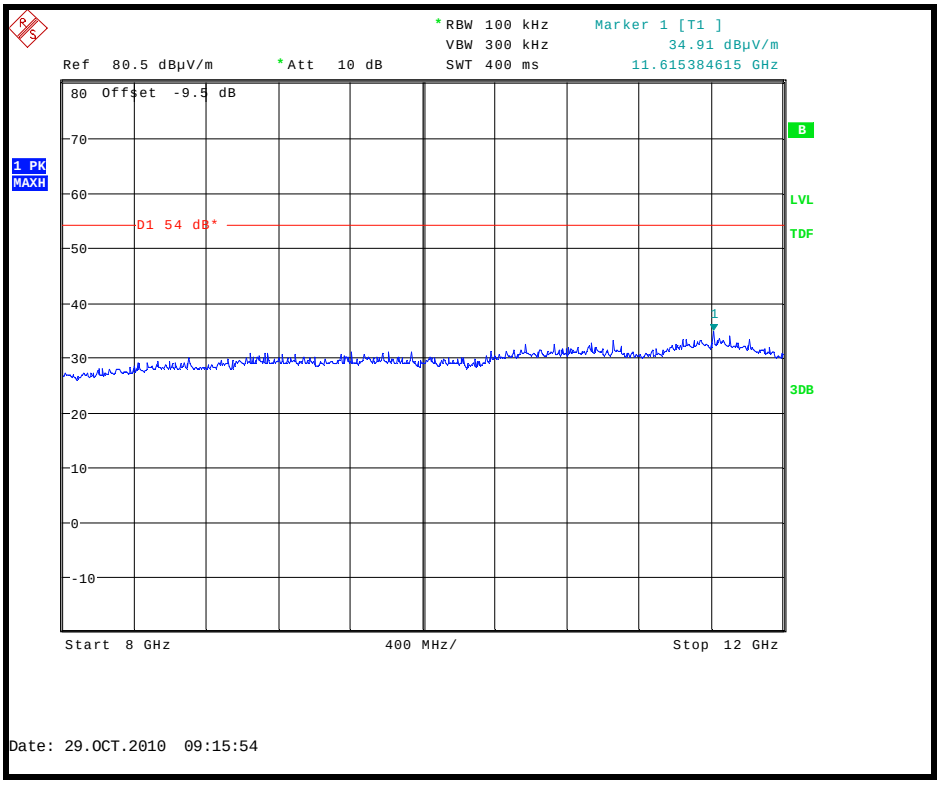
300MHz – 1000MHz



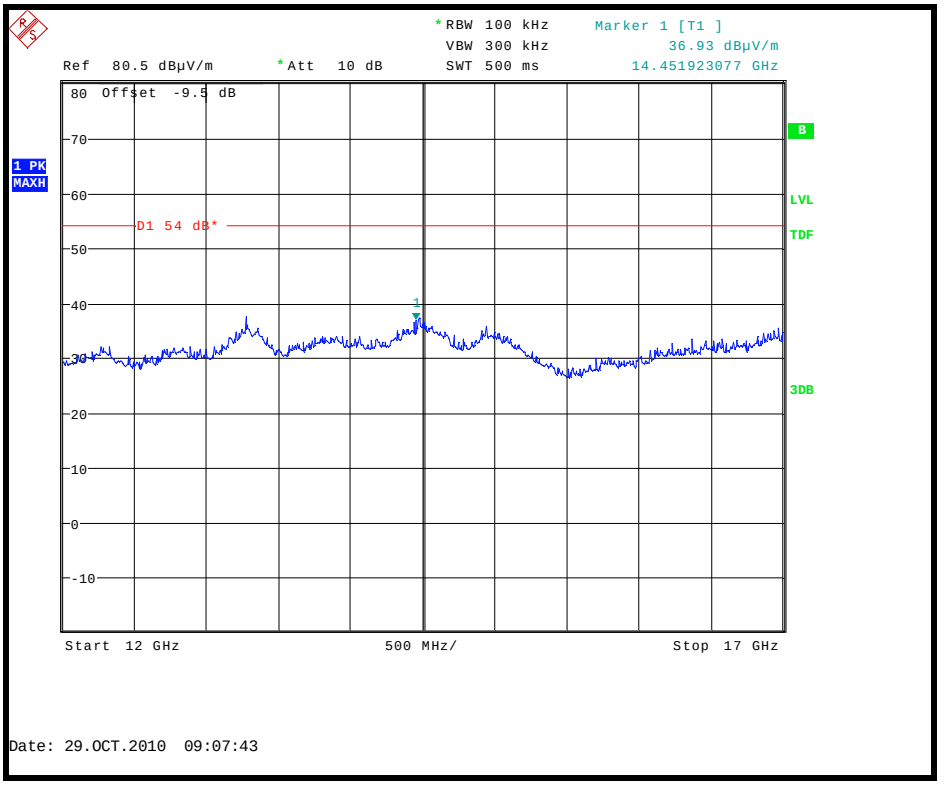
1GHz – 4GHz



4GHz – 8GHz



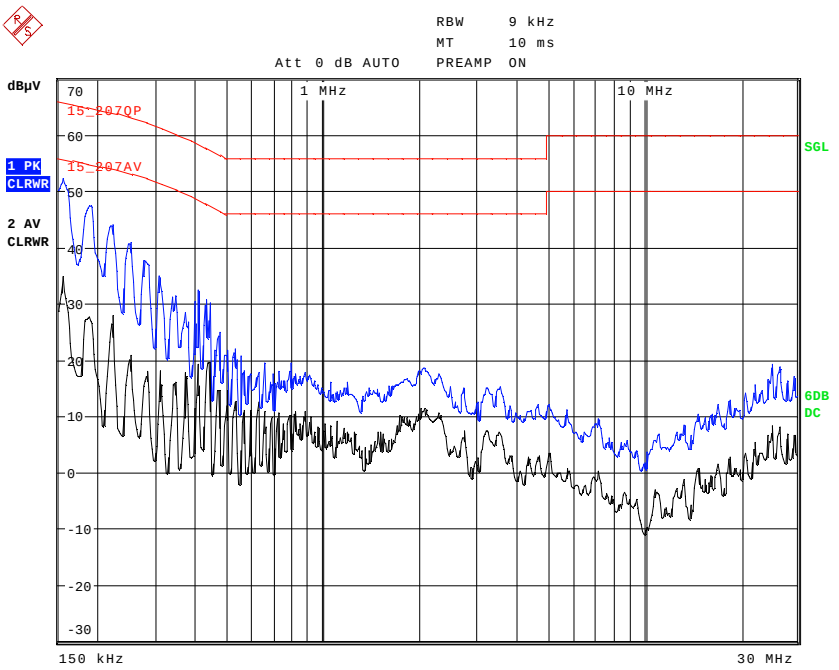
8GHz – 12GHz



12GHz – 17GHz

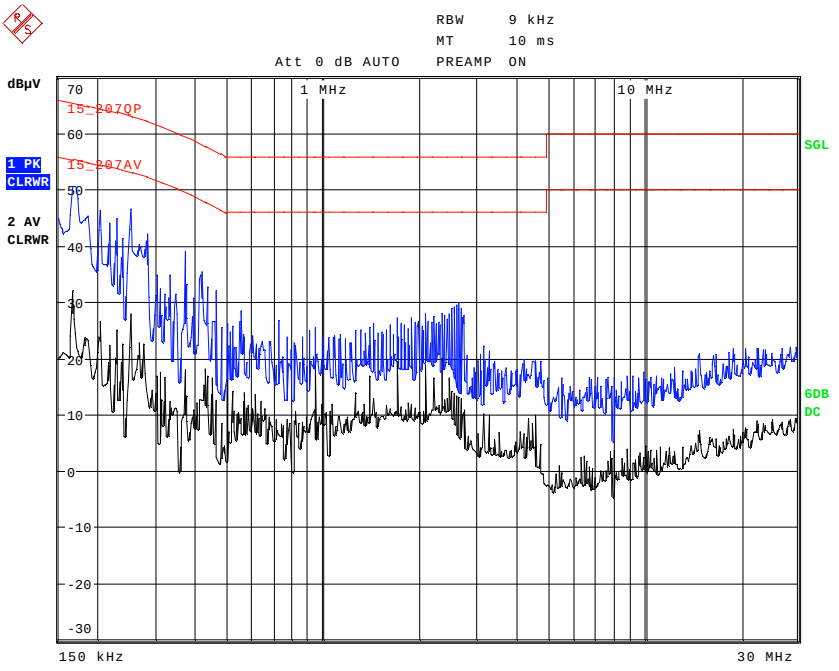
ANNEX M

CONDUCTED EMISSIONS – AC POWERLINE CONDUCTION



Date: 5.NOV.2010 16:24:06

Normal Operation – Receive



Date: 5.NOV.2010 16:34:50

Transmit Mode